# 13. Clinical Laboratory Automation


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## 13.1 CHAPTER 13 CONTENTS


**13.1 CHAPTER 13 CONTENTS ..... 13-1**

**13.2 BACKGROUND AND INTRODUCTION ..... 13-6**

13.2.1 BACKGROUND ..... 13-6
13.2.2 INTRODUCTION ..... 13-7
13.2.3 GLOSSARY ..... 13-7
*13.2.3.1 Accession Identifier (also accession number): ..... 13-8*
*13.2.3.2 Additive: ..... 13-8*
*13.2.3.3 Aliquot: ..... 13-8*
*13.2.3.4 Analyzer: ..... 13-8*
*13.2.3.5 Automated: ..... 13-8*
*13.2.3.6 Automated instrument: ..... 13-8*
*13.2.3.7 Automation system: ..... 13-9*
*13.2.3.8 Bar code: ..... 13-9*
*13.2.3.9 Bar length: ..... 13-9*
*13.2.3.10 Barrier: ..... 13-9*
*13.2.3.11 Barrier Delta: ..... 13-9*
*13.2.3.12 Bottom of cap: ..... 13-9*
*13.2.3.13 Bottom of container//Bottom of tube: ..... 13-9*
*13.2.3.14 Bottom of tube: ..... 13-9*
*13.2.3.15 Carrier: ..... 13-9*
*13.2.3.16 Character: ..... 13-9*
*13.2.3.17 Clinical laboratory automation: ..... 13-10*
*13.2.3.18 Clinical laboratory automation systems: ..... 13-10*
*13.2.3.19 Closed-container sampling//Closed-tube sampling: ..... 13-10*
*13.2.3.20 Closed-tube sampling: ..... 13-10*

*13.2.3.21 Container//Tube//Test Tube:* ..... *13-10*
*13.2.3.22 Container Identifier* ..... *13-10*
*13.2.3.23 Cycle time components:* ..... *13-10*
*13.2.3.24 Decapping:* ..... *13-10*
*13.2.3.25 Delimiter:* ..... *13-10*
*13.2.3.26 Directions of the specimen, Transportation system, Instrument or Specimen processing and handling device interfaces:* ..... *13-10*
*13.2.3.27 Directions of the sample, Transportation system, Instrument or Specimen processing handling device and interfaces* ..... *13-13*
*13.2.3.28 Direct track sampling:* ..... *13-13*
*13.2.3.29 Docking site:* ..... *13-13*
*13.2.3.30 Flection:* ..... *13-13*
*13.2.3.31 Interaction:* ..... *13-14*
*13.2.3.32 Label:* ..... *13-14*
*13.2.3.33 Laboratory automation system (LAS):* ..... *13-14*
*13.2.3.34 Laboratory equipment control interface specification (LECIS):* ..... *13-14*
*13.2.3.35 Laboratory information system (LIS):* ..... *13-14*
*13.2.3.36 LECIS:* ..... *13-14*
*13.2.3.37 Location:* ..... *13-14*
*13.2.3.38 Open-container sampling//Open-tube sampling:* ..... *13-14*
*13.2.3.39 Open-tube sampling:* ..... *13-14*
*13.2.3.40 Pitch:* ..... *13-15*
*13.2.3.41 Point of reference//Point in space, (POR):* ..... *13-15*
*13.2.3.42 Process instruments:* ..... *13-15*
*13.2.3.43 Quiet zone:* ..... *13-15*
*13.2.3.44 Recap:* ..... *13-15*
*13.2.3.45 Robotic arm:* ..... *13-15*
*13.2.3.46 Sample//(Specimen):* ..... *13-15*
*13.2.3.47 Sample carrier:* ..... *13-15*
*13.2.3.48 Sample container:* ..... *13-15*
*13.2.3.49 Sample-positioning system:* ..... *13-16*
*13.2.3.50 Sample probe:* ..... *13-16*
*13.2.3.51 Separator:* ..... *13-16*
*13.2.3.52 Serum/Plasma Separator:* ..... *13-16*
*13.2.3.53 Service envelope:* ..... *13-16*
*13.2.3.54 Specimen:* ..... *13-16*
*13.2.3.55 Specimen carrier//Sample carrier//Carrier:* ..... *13-16*
*13.2.3.56 Specimen collection container//Specimen container//Sample container//Container:* ..... *13-16*
*13.2.3.57 Specimen-positioning system//Sample-positioning system (SPS):* ..... *13-17*
*13.2.3.58 Specimen probe//Sample probe:* ..... *13-17*
*13.2.3.59 Stay clear zone:* ..... *13-18*
*13.2.3.60 Symbol:* ..... *13-18*
*13.2.3.61 Test mnemonics:* ..... *13-18*
*13.2.3.62 Top of container//Top of tube:* ..... *13-18*
*13.2.3.63 Top of tube:* ..... *13-18*
*13.2.3.64 Tray:* ..... *13-18*
*13.2.3.65 X–direction:* ..... *13-18*
*13.2.3.66 Y–direction:* ..... *13-18*
*13.2.3.67 Z–direction:* ..... *13-18*

**13.3 TRIGGER EVENTS AND MESSAGE DEFINITIONS ..... 13-18**

13.3.1 ESU/ACK - AUTOMATED EQUIPMENT STATUS UPDATE (EVENT U01) ..... 13-19
13.3.2 ESR/ACK - AUTOMATED EQUIPMENT STATUS REQUEST (EVENT U02) ..... 13-19
13.3.3 SSU/ACK - SPECIMEN STATUS UPDATE (EVENT U03) ..... 13-19
13.3.4 SSR/ACK - SPECIMEN STATUS REQUEST (EVENT U04) ..... 13-20
13.3.5 INU/ACK – AUTOMATED EQUIPMENT INVENTORY UPDATE (EVENT U05) ..... 13-20

13.3.6 INR/ACK – AUTOMATED EQUIPMENT INVENTORY REQUEST (EVENT U06) ..... 13-20
13.3.7 EAC/ACK – AUTOMATED EQUIPMENT COMMAND (EVENT U07) ..... 13-21
13.3.8 EAR/ACK – AUTOMATED EQUIPMENT RESPONSE (EVENT U08) ..... 13-21
13.3.9 EAN/ACK - AUTOMATED EQUIPMENT NOTIFICATION (EVENT U09) ..... 13-21
13.3.10 TCU/ACK - AUTOMATED EQUIPMENT TEST CODE SETTINGS UPDATE (EVENT U10) ..... 13-22
13.3.11 TCR/ACK - AUTOMATED EQUIPMENT TEST CODE SETTINGS REQUEST (EVENT U11) ..... 13-22
13.3.12 LSU/ACK - AUTOMATED EQUIPMENT LOG/SERVICE UPDATE (EVENT U12) ..... 13-22
13.3.13 LSR/ACK - AUTOMATED EQUIPMENT LOG/SERVICE REQUEST (EVENT U13) ..... 13-22

**13.4 MESSAGE SEGMENTS ..... 13-23**

13.4.1 EQU - EQUIPMENT DETAIL SEGMENT ..... 13-23
*13.4.1.0 EQU field definitions ..... 13-23*
*13.4.1.1 EQU-1 Equipment instance identifier (EI) 01479 ..... 13-23*
*13.4.1.2 EQU-2 Event date/time (TS) 01322 ..... 13-23*
*13.4.1.3 EQU-3 Equipment state (CE) 01323 ..... 13-23*
*13.4.1.4 EQU-4 Local/remote control state (CE) 01324 ..... 13-24*
*13.4.1.5 EQU-5 Alert level (CE) 01325 ..... 13-24*
13.4.2 ISD – INTERACTION STATUS DETAIL SEGMENT ..... 13-25
*13.4.2.0 ISD field definitions ..... 13-25*
*13.4.2.1 ISD-1 Reference interaction number (NM) 01326 ..... 13-25*
*13.4.2.2 ISD-2 Interaction type identifier (CE) 01327 ..... 13-25*
*13.4.2.3 ISD-3 Interaction active state (CE) 01328 ..... 13-25*
13.4.3 SAC– SPECIMEN AND CONTAINER DETAIL SEGMENT ..... 13-25
*13.4.3.0 SAC field definitions ..... 13-26*
*13.4.3.1 SAC-1 External accession identifier (EI) 01329 ..... 13-26*
*13.4.3.2 SAC-2 Accession identifier (EI) 01330 ..... 13-27*
*13.4.3.3 SAC-3 Container identifier (EI) 01331 ..... 13-27*
*13.4.3.4 SAC-4 Primary (parent) container identifier (EI) 01332 ..... 13-27*
*13.4.3.5 SAC-5 Equipment container identifier (EI) 01333 ..... 13-28*
*13.4.3.6 SAC-6 Specimen source (CM) 00249 ..... 13-28*
*13.4.3.7 SAC-7 Registration date/time (TS) 01334 ..... 13-29*
*13.4.3.8 SAC-8 Container status (CE) 01335 ..... 13-29*
*13.4.3.9 SAC-9 Carrier type (CE) 01336 ..... 13-30*
*13.4.3.10 SAC-10 Carrier identifier (EI) 01337 ..... 13-30*
*13.4.3.11 SAC-11 Position in carrier (NA) 01338 ..... 13-30*
*13.4.3.12 SAC-12 Tray type - SAC (CE) 01339 ..... 13-31*
*13.4.3.13 SAC-13 Tray identifier (EI) 01340 ..... 13-31*
*13.4.3.14 SAC-14 Position in tray (NA) 01341 ..... 13-31*
*13.4.3.15 SAC-15 Location (CE) 01342 ..... 13-31*
*13.4.3.16 SAC-16 Container height (NM) 01343 ..... 13-31*
*13.4.3.17 SAC-17 Container diameter (NM) 01344 ..... 13-31*
*13.4.3.18 SAC-18 Barrier delta (NM) 01345 ..... 13-31*
*13.4.3.19 SAC-19 Bottom delta (NM) 01346 ..... 13-32*
*13.4.3.20 SAC-20 Container diameter/height/delta units (CE) 01347 ..... 13-32*
*13.4.3.21 SAC-21 Container volume (NM) 00644 ..... 13-32*
*13.4.3.22 SAC-22 Available volume (NM) 01349 ..... 13-32*
*13.4.3.23 SAC-23 Initial specimen volume (NM) 01350 ..... 13-32*
*13.4.3.24 SAC-24 Volume units (CE) 01351 ..... 13-32*
*13.4.3.25 SAC-25 Separator type (CE) 01352 ..... 13-32*
*13.4.3.26 SAC-26 Cap type (CE) 01353 ..... 13-33*
*13.4.3.27 SAC-27 Additive (CE) 00647 ..... 13-33*
*13.4.3.28 SAC-28 Specimen component (CE) 01355 ..... 13-33*
*13.4.3.29 SAC-29 Dilution factor (SN) 01356 ..... 13-34*
*13.4.3.30 SAC-30 Treatment (CE) 01357 ..... 13-34*
*13.4.3.31 SAC-31 Temperature (SN) 01358 ..... 13-35*
*13.4.3.32 SAC-32 Hemolysis index (NM) 01359 ..... 13-35*

*13.4.3.33 SAC-33 Hemolysis index units (CE) 01360* ..... *13-35*
*13.4.3.34 SAC-34 Lipemia index (NM) 01361* ..... *13-35*
*13.4.3.35 SAC-35 Lipemia index units (CE) 01362* ..... *13-35*
*13.4.3.36 SAC-36 Icterus index (NM) 01363* ..... *13-35*
*13.4.3.37 SAC-37 Icterus index units (CE) 01364* ..... *13-35*
*13.4.3.38 SAC-38 Fibrin index (NM) 01365* ..... *13-36*
*13.4.3.39 SAC-39 Fibrin index units (CE) 01366* ..... *13-36*
*13.4.3.40 SAC-40 System induced contaminants (CE) 01367* ..... *13-36*
*13.4.3.41 SAC-41 Drug interference (CE) 01368* ..... *13-36*
*13.4.3.42 SAC-42 Artificial blood (CE) 01369* ..... *13-36*
*13.4.3.43 SAC-43 Special handling considerations (CE) 01370* ..... *13-37*
*13.4.3.44 SAC-44 Other environmental factors (CE) 01371* ..... *13-37*
13.4.4 INV – INVENTORY DETAIL SEGMENT ..... 13-37
*13.4.4.0 INV field definitions* ..... *13-38*
*13.4.4.1 INV-1 Substance identifier (CE) 01372* ..... *13-38*
*13.4.4.2 INV-2 Substance status (CE) 01373* ..... *13-39*
*13.4.4.3 INV-3 Substance type (CE) 01374* ..... *13-39*
*13.4.4.4 INV-4 Inventory container identifier (CE) 01532* ..... *13-40*
*13.4.4.5 INV-5 Container carrier identifier (CE) 01376* ..... *13-40*
*13.4.4.6 INV-6 Position on carrier (CE) 01377* ..... *13-40*
*13.4.4.7 INV-7 Initial quantity (NM) 01378* ..... *13-40*
*13.4.4.8 INV-8 Current quantity (NM) 01379* ..... *13-40*
*13.4.4.9 INV-9 Available quantity (NM) 01380* ..... *13-40*
*13.4.4.10 INV-10 Consumption quantity (NM) 01381* ..... *13-40*
*13.4.4.11 INV-11 Quantity units (CE) 01382* ..... *13-40*
*13.4.4.12 INV-12 Expiration date/time (TS) 01383* ..... *13-41*
*13.4.4.13 INV-13 First used date/time (TS) 01384* ..... *13-41*
*13.4.4.14 INV-14 On board stability duration (TQ) 01385* ..... *13-41*
*13.4.4.15 INV-15 Test/fluid identifier(s) (CE) 01386* ..... *13-41*
*13.4.4.16 INV-16 Manufacturer lot number (ST) 01387* ..... *13-41*
*13.4.4.17 INV-17 Manufacturer Identifier (CE) 00286* ..... *13-41*
*13.4.4.18 INV-18 Supplier identifier (CE) 01389* ..... *13-41*
13.4.5 ECD - EQUIPMENT COMMAND SEGMENT ..... 13-42
*13.4.5.0 ECD field definitions* ..... *13-42*
*13.4.5.1 ECD-1 Reference command number (NM) 01390* ..... *13-42*
*13.4.5.2 ECD-2 Remote control command (CE) 01391* ..... *13-42*
*13.4.5.3 ECD-3 Response required (ID) 01392* ..... *13-43*
*13.4.5.4 ECD-4 Requested completion time (TQ) 01393* ..... *13-43*
*13.4.5.5 ECD-5 Parameters (ST) 01394* ..... *13-43*
13.4.6 ECR - EQUIPMENT COMMAND RESPONSE SEGMENT ..... 13-43
*13.4.6.0 ECR field definitions* ..... *13-43*
*13.4.6.1 ECR-1 Command response (CE) 01395* ..... *13-43*
*13.4.6.2 ECR-2 Date/time completed (TS) 01396* ..... *13-44*
*13.4.6.3 ECR-3 Command response parameters (ST) 01397* ..... *13-44*
13.4.7 NDS - NOTIFICATION DETAIL SEGMENT ..... 13-44
*13.4.7.0 NDS field definitions* ..... *13-44*
*13.4.7.1 NDS-1 Notification reference number (NM) 01398* ..... *13-44*
*13.4.7.2 NDS-2 Notification date/time (TS) 01399* ..... *13-44*
*13.4.7.3 NDS-3 Notification alert severity (CE) 01400* ..... *13-44*
*13.4.7.4 NDS-4 Notification code (CE) 01401* ..... *13-44*
13.4.8 CNS – CLEAR NOTIFICATION SEGMENT ..... 13-45
*13.4.8.0 CNS field definitions* ..... *13-45*
*13.4.8.1 CNS-1 Starting notification reference number (NM) 01402* ..... *13-45*
*13.4.8.2 CNS-2 Ending notification reference number (NM) 01403* ..... *13-45*
*13.4.8.3 CNS-3 Starting notification date/time (TS) 01404* ..... *13-45*
*13.4.8.4 CNS-4 Ending notification date/time (TS) 01405* ..... *13-45*

 

*13.4.8.5 CNS-5 Starting notification code (CE) 01406* ..... *13-45*
*13.4.8.6 CNS-6 Ending notification code (CE) 01407* ..... *13-45*
13.4.9 TCC - TEST CODE CONFIGURATION SEGMENT ..... 13-46
*13.4.9.0 TCC field definitions* ..... *13-46*
*13.4.9.1 TCC-1 Universal service Identifier (CE) 00238* ..... *13-46*
*13.4.9.2 TCC-2 Equipment test application identifier (EI) 01408* ..... *13-46*
*13.4.9.3 TCC-3 Specimen source (CM) 00249* ..... *13-46*
*13.4.9.4 TCC-4 Auto-dilution factor default (SN) 01410* ..... *13-47*
*13.4.9.5 TCC-5 Rerun dilution factor default (SN) 01411* ..... *13-47*
*13.4.9.6 TCC-6 Pre-dilution factor default (SN) 01412* ..... *13-48*
*13.4.9.7 TCC-7 Endogenous content of pre-dilution diluent (SN) 01413* ..... *13-48*
*13.4.9.8 TCC-8 Inventory limits warning level (NM) 01414* ..... *13-48*
*13.4.9.9 TCC-9 Automatic rerun allowed (ID) 01415* ..... *13-48*
*13.4.9.10 TCC-10 Automatic repeat allowed (ID) 01416* ..... *13-48*
*13.4.9.11 TCC-11 Automatic reflex allowed (ID) 01417* ..... *13-48*
*13.4.9.12 TCC-12 Equipment dynamic range (SN) 01418* ..... *13-48*
*13.4.9.13 TCC-13 Units (CE) 00574* ..... *13-48*
*13.4.9.14 TCC-14 Processing type (CE) 01419* ..... *13-49*
13.4.10 TCD - TEST CODE DETAIL SEGMENT ..... 13-49
*13.4.10.0 TCD field definitions* ..... *13-49*
*13.4.10.1 TCD-1 Universal service Identifier (CE) 00238* ..... *13-49*
*13.4.10.2 TCD-2 Auto-dilution factor (SN) 01420* ..... *13-49*
*13.4.10.3 TCD-3 Rerun dilution factor (SN) 01421* ..... *13-49*
*13.4.10.4 TCD-4 Pre-dilution factor (SN) 01422* ..... *13-50*
*13.4.10.5 TCD-5 Endogenous content of pre-dilution diluent (SN) 01413* ..... *13-50*
*13.4.10.6 TCD-6 Automatic repeat allowed (ID) 01416* ..... *13-50*
*13.4.10.7 TCD-7 Reflex allowed (ID) 01424* ..... *13-50*
*13.4.10.8 TCD-8 Analyte repeat status (CE) 01425* ..... *13-50*
13.4.11 SID – SUBSTANCE IDENTIFIER SEGMENT ..... 13-50
*13.4.11.0 SID field definitions* ..... *13-51*
*13.4.11.1 SID-1 Application / method identifier (CE) 01426* ..... *13-51*
*13.4.11.2 SID-2 Substance lot number (ST) 01129* ..... *13-51*
*13.4.11.3 SID-3 Substance container identifier (ST) 01428* ..... *13-51*
*13.4.11.4 SID-4 Substance manufacturer identifier (CE) 01429* ..... *13-51*
13.4.12 EQP - EQUIPMENT LOG/SERVICE SEGMENT ..... 13-51
*13.4.12.0 EQP field definitions* ..... *13-52*
*13.4.12.1 EQP-1 Event type (CE) 01430* ..... *13-52*
*13.4.12.2 EQP-2 File name (ST) 01431* ..... *13-52*
*13.4.12.3 EQP-3 Start date/time (TS) 01202* ..... *13-52*
*13.4.12.4 EQP-4 End date/time (TS) 01432* ..... *13-52*
*13.4.12.5 EQP-5 Transaction data (FT) 01433* ..... *13-52*

**13.5 NOTES REGARDING USAGE ..... 13-52**

13.5.1 OTHER REQUIRED ORIGINAL HL7 MESSAGES ..... 13-52
13.5.2 TRANSFER OF LABORATORY TEST ORDERS AND RESULTS ..... 13-52
13.5.3 TRANSFER OF QC RESULTS ..... 13-53
13.5.4 QUERY FOR ORDER INFORMATION – TRIGGERS FOR DOWNLOAD OF TEST ORDERS ..... 13-53
13.5.5 TRANSFER OF ADDITIONAL INFORMATION FOR AUTOMATED PROCESSING ..... 13-53
13.5.6 LABORATORY ORDER MESSAGE ..... 13-53
13.5.7 UNSOLICITED LABORATORY OBSERVATION MESSAGE ..... 13-54
13.5.8 AUTOMATED EQUIPMENT STATUS UPDATE ..... 13-55
13.5.9 AUTOMATED EQUIPMENT STATUS REQUEST ..... 13-55
13.5.10 SPECIMEN STATUS UPDATE ..... 13-55
13.5.11 SPECIMEN STATUS REQUEST ..... 13-55
13.5.12 AUTOMATED EQUIPMENT INVENTORY UPDATE ..... 13-55
13.5.13 AUTOMATED EQUIPMENT INVENTORY REQUEST ..... 13-56

13.5.14 AUTOMATED EQUIPMENT COMMAND ..... 13-56
13.5.15 AUTOMATED EQUIPMENT RESPONSE ..... 13-56
13.5.16 AUTOMATED EQUIPMENT NOTIFICATION ..... 13-56
13.5.17 AUTOMATED EQUIPMENT TEST CODE SETTINGS UPDATE ..... 13-56
13.5.18 AUTOMATED EQUIPMENT TEST CODE SETTINGS REQUEST ..... 13-56
13.5.19 AUTOMATED EQUIPMENT LOG/SERVICE UPDATE ..... 13-57
13.5.20 AUTOMATED EQUIPMENT LOG/SERVICE REQUEST ..... 13-57

**13.6 OUTSTANDING ISSUES ..... 13-57**

# 13.2 BACKGROUND AND INTRODUCTION

## 13.2.1 Background

Clinical laboratory automation involves the integration or interfacing of automated or robotic transport systems, analytical instruments, and pre- or post-analytical process equipment such as automated centrifuges and aliquoters, decappers, recappers, sorters, and specimen storage and retrieval systems. In addition to the electrical and mechanical interfaces of these various components, the computers that control these devices or instruments must also be interfaced to each other and/or the Laboratory Information System (LIS).

The types of information communicated between these systems include process control and status information for each device or analyzer, each specimen, specimen container, and container carrier, information and detailed data related to patients, orders, and results, and information related to specimen flow algorithms and automated decision making. This wide array of communicated information is essential for a Laboratory Automation System (LAS) to control the various processes and to ensure that each specimen or aliquot has the correct tests performed in the proper sequence.

As of 1999 there are already more than 200 clinical laboratories in the world with "total laboratory automation" systems and hundreds more with a lesser level of automation – generally workcells or modular automation systems. The development of prospective standards for these aspects of clinical laboratory automation will facilitate the inter-operability of the systems being developed by the various players in lab automation – the vendors of analytical instruments, LIS systems, automation systems and components and their laboratory customers.

In the early 1990's an ad hoc task force, Clinical Testing Automation Standards Steering Committee (CTASSC), began to meet at the annual meetings of the International Conference on Automation and Robotics (ICAR) and the American Association for Clinical Chemistry (AACC). In 1996, CTASSC approached NCCLS,[1] a globally-recognized, consensus standards organization that has developed more than 125 clinical laboratory standards and related products since it was founded in 1968, about taking on a project for clinical laboratory automation. NCCLS agreed to sponsor this project which was separately funded via a direct solicitation of the vendors in lab automation, instruments, LIS systems, and automation customers. It was organized as a "fast track" project to develop prospective standards to guide future developments in laboratory automation. With the oversight of an Area Committee on Automation, five separate subcommittees have worked since 1997 to develop a series of prospective standards for:

- Specimen containers and carriers
- Bar codes for specimen container identification
- Communications
- System operational requirements and characteristics

[1] NCCLS, 940 West Valley Road, Suite 1400, Wayne, PA 19087; www.nccls.org

- Electromechanical interfaces

Approved level standards for all five of these areas are expected to be published by NCCLS in calendar year 2000.

## 13.2.2 Introduction

This chapter specifies HL7 triggers, messages, and segments required for implementation of clinical laboratory automation communication interfaces. It was developed jointly by the HL7 Laboratory Automation Special Interest Group and the NCCLS Subcommittee on Communications with Automated Systems. This chapter, by agreement between HL7 and NCCLS, is also published in its entirety as part of the NCCLS Approved Level standard:

- AUTO3, "Laboratory Automation: Communications with Automated Clinical Laboratory Systems, Instruments, Devices, and Information Systems, © NCCLS" [2]

This document contains other chapters to enable a vendor to successfully implement all of the elements essential to meet the standard.

The other related NCCLS clinical laboratory automation standards are:

- AUTO1: "Laboratory Automation: Specimen Container / Specimen Carrier", © NCCLS.
- AUTO2: "Laboratory Automation: Bar Codes for Specimen Container Identification", © NCCLS.
- AUTO4: "Laboratory Automation: Systems Operational Requirements, Characteristics, and Information Elements", © NCCLS.
- AUTO5: "Laboratory Automation: Electromechanical Interfaces", © NCCLS.

The reader is referred to any or all of these NCCLS standards, particularly AUTO3 and AUTO4, for detailed information on the communications requirements in clinical laboratory automation applications.

The control model proposed in this standard is an extension of the model described in LECIS:

- ASTM E1989-98. Laboratory Equipment Control Interface Specification (LECIS). American Society for Testing and Materials; 1998

## 13.2.3 Glossary

The terminology found in ANSI X3.182-1990[3] shall be used where applicable. Other computer-related technical terms used in this document can be found in ASTM Terminology E 1013[4], IEEE 100[5], IEEE 610[6], and ANSI X3.172[7]

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[2] (NCCLS. *Laboratory Automation: Communications With Automated Clinical Laboratory Systems, Instruments, Devices, and Information Systems*; Approved Standard - NCCLS Document AUTO3-A [ISBN 1-56238-361-2}. NCCLS, 940 West Valley Road, Suite 1400, Wayne, PA 19087-1898 USA, 2000). www.nccls.org

[3] ANSI Standard X3.182-1990. Bar Code Print Quality Guidelines. New York, NY: American National Standards Institute; 1995

[4] ASTM E1013-93. Standard Terminology Relating to Computerized Systems. West Conshohocken, PA: American Society for Testing and Materials; 1993

13.2.3.1 Accession Identifier (also accession number):

A numeric (or alphanumeric) identifier assigned by the LIS for a test order. Depending on the particular LIS a patient's test orders for a single encounter may use one or more accession identifiers and each accession identifier may encompass one or more tests and one or more specimens and/or specimen containers. However, accession identifiers are unique within each patient encounter. The Accession identifier may not be equal to the Placer or Filler Order Numbers, because of uniqueness requirement.

13.2.3.2 Additive:

As used here, refers to a substance generally a chemical that has been added to a specimen collection tube or container to prevent degradation of one or more constituents of the specimen.

13.2.3.3 Aliquot:

**1)** ***In Quantitative Analysis,*** a sample comprising a known fraction or measured portion of the whole***;*** **2)** ***In NCCLS LAB AUTOMATION Standard documents,*** a portion of a specimen placed in a separate container to facilitate concurrent testing or to hold in reserve for future use.

| | |
|---|---|
| **Notes:** | a) The portion of the specimen is typically removed from the original specimen after initial processing, such as centrifugation, to obtain serum or plasma samples, and is considered to be chemically identical to all other subdivisions of an original sample of serum, plasma, urine, CSF, etc.;<br><br>b) It may be necessary to identify the aliquot as an individual specimen distinct from the original specimen in a collection container labeled with a unique identifier that may be linked to or associated with the primary collection container. |

13.2.3.4 Analyzer:

An instrument and/or specimen processing and handling device that performs measurements on patient specimens of quantitative, clinically relevant analytes.

| | |
|---|---|
| **Note:** | A portion of a patient's specimen is consumed in the analytic process. |

13.2.3.5 Automated:

A characterization applied when all analytical processes, including sample and reagent uptake, sample/reagent interaction, chemical/biological analysis, result calculation, and result readout are mechanized**.**

13.2.3.6 Automated instrument:

A laboratory instrument that may or may not be connected to a laboratory information system (LIS), hospital information system (HIS), and/or laboratory automation system (LAS), which performs measurements on a patient's sample;

| | |
|---|---|
| **Note:** | These instruments may have specific hardware and/or software modifications that allow interface to a laboratory automation system. |

---

[5] IEEE 100. Dictionary of Electrical and Electronics Terms. Institute of Electrical and Electronics Engineers, Inc.; 1996

[6] IEEE 610. Glossary of Computer Languages. Institute of Electrical and Electronics Engineers, Inc.; 1993

[7] ANSI X3.172-1996. Information Technology – American National Standards Dictionary of Information Technology (ANSDIT). New York, NY: American National Standards Institute; 1996

13.2.3.7 Automation system:

An automation system refers to a variety of possible systems that can include some of the following types: automated instruments, laboratory information systems (LIS), laboratory automation systems (LAS), hospital information systems (HIS), and front-end processing devices.

13.2.3.8 Bar code:

An array of parallel rectangular bars and spaces that creates a symbology representing a number or alphanumeric identifier.

13.2.3.9 Bar length:

The length of the bars in the bar code.

13.2.3.10 Barrier:

See **Separator**

13.2.3.11 Barrier Delta:

Identifies the distance from the Point of Reference to the separator material (barrier) within the container. This distance may be provided by the LAS to the instrument and/or specimen processing/handling device to facilitate the insertion of a sampling probe into the specimen without touching the separator. See the Point of reference definition or in NCCLS standard AUTO5 *Laboratory Automation: Electromechanical Interfaces*.

13.2.3.12 Bottom of cap:

The farthest point from the top of the container/test tube that the cap reaches.

| **Note:** | This point may be inside the tube. |
|---|---|

13.2.3.13 Bottom of container//Bottom of tube:

The portion of the container/test tube farthest from the cap (see **Point of reference**).

13.2.3.14 Bottom of tube:

See **Bottom of container**.

13.2.3.15 Carrier:

See **Specimen carrier**.

13.2.3.16 Character:

**1)** The smallest abstract element of a writing system or script.

| **Note:** | A character refers to an abstract idea rather than to a specific shape. |
|---|---|

**2)** A code element.

13.2.3.17 Clinical laboratory automation:

The integration of laboratory personnel and preanalytical, analytical, and postanalytical processes and information systems.

13.2.3.18 Clinical laboratory automation systems:

An assemblage of components that mechanically and electronically transfers, analyzes, and processes information and material related to clinical diagnostic testing of patient specimens, controls, calibrators, standards, and images.

13.2.3.19 Closed-container sampling//Closed-tube sampling:

The action of aspirating a sample from a container/tube with the closure in place, requiring the sample probe to pierce the closure of the container/sample container.

13.2.3.20 Closed-tube sampling:

**See Closed-container sampling**.

13.2.3.21 Container//Tube//Test Tube:

See **Specimen container**.

13.2.3.22 Container Identifier

A numeric (or alphanumeric) identifier provided by the LIS or LAS to uniquely identify each specimen container or aliquot container. The *NCCLS LAB AUTOMATION Standard* requires a unique identifier for each container introduced into the LAS or leaving the LAS.

13.2.3.23 Cycle time components:

The identified time segments of the process of moving from one sample to the next, including: presentation of specimen along transportation system to docking site at instrument; identification/recognition that the correct specimen is in place; either direct aspiration from specimen container by probe, or transfer of specimen container to instrument, aspiration, and return of specimen container to specimen carrier/transportation system; departure of completed specimen container; movement into position of next specimen container.

13.2.3.24 Decapping:

The removal of a closure from a specimen container.

13.2.3.25 Delimiter:

A symbol used to separate items in a list.

13.2.3.26 Directions of the specimen, Transportation system, Instrument or Specimen processing and handling device interfaces:

The orthogonal axes.

| **Note:** | a) These axes are demonstrated in Figure 13-1. |
|---|---|

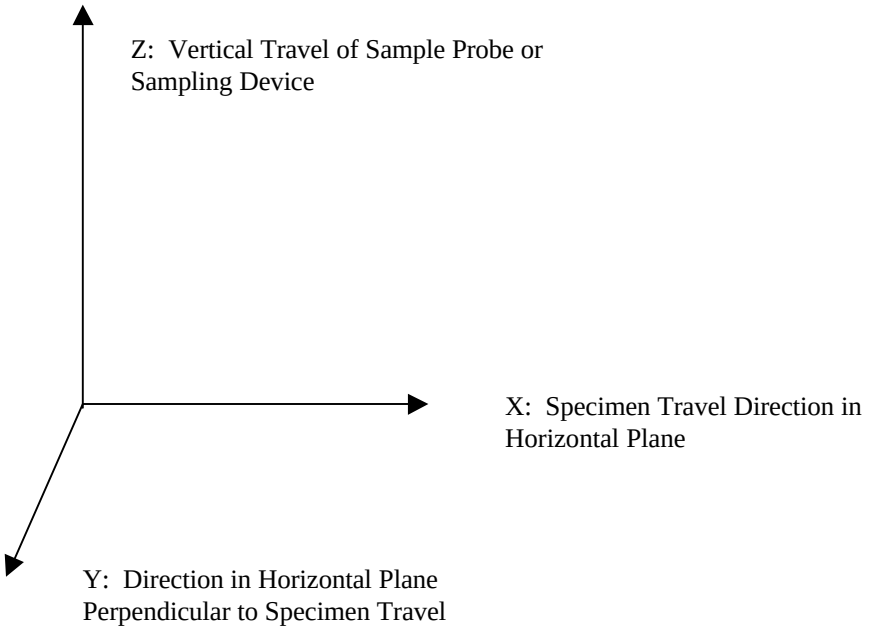



**Figure 13-1. Physical Frame of Reference in a Three-Dimensional Space (X-Y-Z)**

- X–direction, *n* - The direction that a specimen travels along a transportation system.

| | |
|---|---|
| **Note**: | b) Specimens would move along the X dimension as, for example, in transportation from station to station in a laboratory (See Figure 13-2.) |

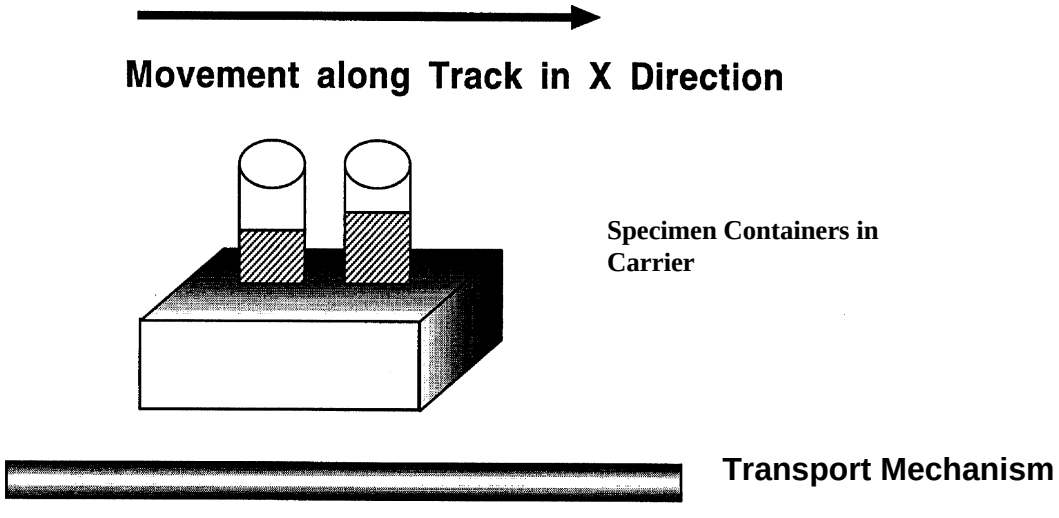



**Figure 13-2. X Direction**

- Y–direction, *n* - The horizontal direction perpendicular to specimen travel along a transportation system;

| | |
|---|---|
| **Note:** | c) Specimens could move in the Y dimension away from a transport system to be placed onto an instrument for analysis (see Figure 13-3). The sample probe would move in the Y dimension as it moves out from the instrument or specimen processing and handling device to a position directly over the specimen container. |

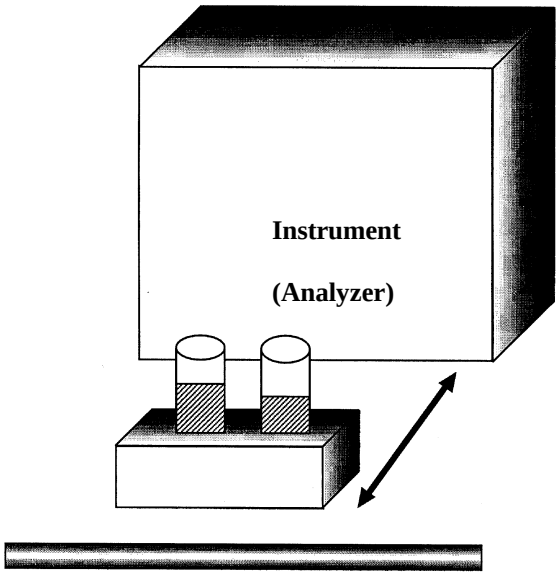



**Figure 13-3. Y Direction**

Z–direction, *n* - The vertical dimension;

| | |
|---|---|
| **Notes:** | d) Specimens could be lifted in the Z dimension off a transport system for transfer between locations;<br><br>e) The center line of a container should be controlled, so it is in the Z dimension; a specimen centering device would be referenced to the Z dimension; a sample probe would follow the Z dimension as it moves downward into a specimen container to aspirate serum, blood, etc. for analysis (see Figure 13-4);<br><br>f) Rotation about the Z dimension may be used to locate and read the bar-code label on a specimen container or to assess the quality of a specimen in terms of turbidity, hemolysis, icterus, etc. |

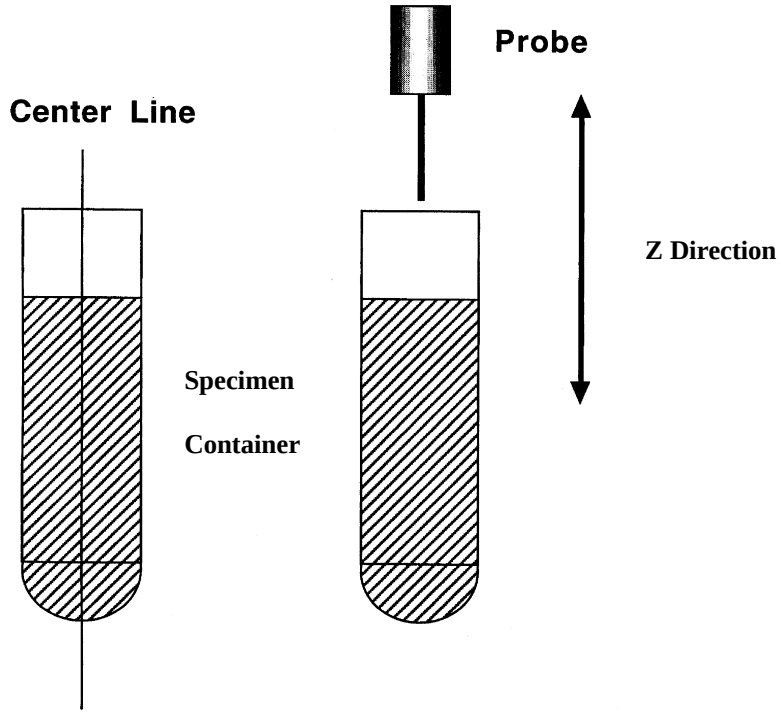



**Figure 13-4. Z Direction**

13.2.3.27 Directions of the sample, Transportation system, Instrument or Specimen processing handling device and interfaces

See **Directions of the specimen**, etc.

13.2.3.28 Direct track sampling:

The process in which aspiration of a sample occurs directly from the specimen container while it is on the transportation system, whereby the instrument probe extends to reach the specimen container on the transportation system;

| | |
|---|---|
| **Note:** | This process requires agreement between the transportation system and the instrument and specimen processing and handling devices regarding point of reference (POR) to guide movement of the probe to the specimen. |

13.2.3.29 Docking site:

**1)** The location of the physical interface between two components of a system; **2)** ***In NCCLS LAB AUTOMATION Standard documents,*** the interface between the transportation system and the instrument and/or the specimen processing and handling devices where the specimen container arrives for sampling to occur.

13.2.3.30 Flection:

The point at which the vertical (straight) walls of the specimen container bend to form the base.

13.2.3.31 Interaction:

A standard exchange of messages between two instances of equipment that synchronizes the execution of one or more commands. State models are used describe the standard interactions.

13.2.3.32 Label:

**1)** The display of written, printed, or graphic matter upon the immediate container of any article; **2)** ***In NCCLS LAB AUTOMATION Standard documents***, the paper and attached adhesive coating on which the bar code and other human readable information is printed.

13.2.3.33 Laboratory automation system (LAS):

A system of information and hardware technology that allows the operation of the clinical laboratory process without significant operator intervention;

| | |
|---|---|
| **Note:** | Typical functionality includes information system control of the instruments through direct LAS interfacing, including any technology that manipulates the specimen (i.e., centrifuge); transportation of the specimen; result evaluation, repeat testing, reflex testing; and quality assessment and results reporting. |

13.2.3.34 Laboratory equipment control interface specification (LECIS):

A high-level protocol that defines message content for standard behaviors or interactions for remote control of analytical instruments and devices (ASTM E 1989-98[10]).

13.2.3.35 Laboratory information system (LIS):

The information system that is responsible for management of data regarding patient specimen identification, tests requested, results reported, quality control testing, and other aspects of sample analysis;

| | |
|---|---|
| **Notes:** | a) The LIS interfaces directly with the LAS to communicate patient, visit, container, test orders, specimen status, and results about specific testing to be done<br><br>b) Instrument or specimen processing and handling devices may be interfaced with the LIS or the LAS to direct specific testing and to retrieve results for reporting;<br><br>c) The LIS is frequently also interfaced to a clinical information system for use by physicians and other medical personnel. |

13.2.3.36 LECIS:

Acronym for Laboratory Equipment Control Interface Specification, (ASTM E 1989-98[10]).

13.2.3.37 Location:

A physical place within the laboratory, with a unique identifier (e.g., refrigerator shelf number, instrument buffer ID, track identifier).

13.2.3.38 Open-container sampling//Open-tube sampling:

The action of aspirating a sample from a specimen container from which the closure has previously been removed;

| | |
|---|---|
| **Note:** | The sample probe contacts the surface of the specimen without other physical barriers. |

13.2.3.39 Open-tube sampling:

See **Open-container sampling**.

13.2.3.40 Pitch:

The center distance between two specimen containers in a carrier or between two sequential specimen container carriers.

13.2.3.41 Point of reference//Point in space, (POR):

The intersection of the xy plane and an infinite line in the 'z' direction.

| | |
|---|---|
| **Note:** | The POR is the reference from which all positioning and alignment of specimen containers are measured. |

13.2.3.42 Process instruments:

***In NCCLS LAB AUTOMATION Standard documents,*** components of an automated laboratory comprising the automated devices that perform a multitude of pre- and postanalytical tasks, and perform nonanalytical tasks on specimens, containers, carriers, and similar processes.

13.2.3.43 Quiet zone:

***In NCCLS LAB AUTOMATION documents,*** the white {blank} space on a bar code immediately preceding the first bar and immediately following the last bar.

13.2.3.44 Recap:

To replace the closure on a specimen container; either with the original closure or with a new replacement closure.

13.2.3.45 Robotic arm:

A device capable of moving a specimen container, specimen carrier, or another object in the X, Y, and Z directions;

| | |
|---|---|
| **Note:** | Unless this device is an integral part of the LAS system, it is considered an instrument for the purpose of this proposed standard. |

13.2.3.46 Sample//(Specimen):

**1)** A small part of anything ... intended to show the quality, style, or nature of the whole***;*** **2)** ***In NCCLS LAB AUTOMATION Standard documents,*** a portion or aliquot withdrawn from a container for the actual test;

| | |
|---|---|
| **Notes:** | ***In NCCLS LAB AUTOMATION Standard documents,*** |
| | a) samples are typically not placed in containers that will have to be uniquely identified, but may go directly into the instrument or specimen processing and handling device test stream or may be placed in sample cups unique to the instrument or specimen processing and handling device; |
| | b) the ID of the specimen is typically assured by computer linkage of the pipetting or aspiration step to the ID of the container from which it was obtained, or by a separate numbering system for the sample cups that is internal to the analytical instrument or specimen processing and handling device. |

13.2.3.47 Sample carrier:

See **Specimen carrier**.

13.2.3.48 Sample container:

See **Specimen collection container**.

13.2.3.49 Sample-positioning system:

See **Specimen-positioning system**.

13.2.3.50 Sample probe:

See Specimen probe.

13.2.3.51 Separator:

A material such as a gel which is contained in blood collection tubes to facilitate separation of blood cells from blood serum by creating a physical "barrier" between them.

13.2.3.52 Serum/Plasma Separator:

See **Separator.**

13.2.3.53 Service envelope:

***In NCCLS LAB AUTOMATION Standard documents,*** the space around the transportation system and instruments that may be accessed periodically for maintenance or repair of equipment;

| | |
|---|---|
| **Note:** | A transportation system and analytic instruments should not have mutually impinging service envelopes. |

13.2.3.54 Specimen:

The discrete portion of a body fluid or tissue taken for examination, study, or analysis of one or more quantities or characteristics, to determine the character of the whole.

| | |
|---|---|
| **Note:** | The substance may still be referred to as a specimen if it has been processed from the obtained specimen; thus, examples of specimens include whole blood and serum or plasma prepared from whole blood; saliva; cerebrospinal fluid; feces; urine; fingernail clippings; hair clippings; tissue samples, even if embedded in a paraffin block; etc. |

13.2.3.55 Specimen carrier//Sample carrier//Carrier:

A device that holds the specimen container;

| | |
|---|---|
| **Note:** | The specimen carrier interfaces mechanically with the transportation system to move the specimen from location to location, and may carry one specimen container or many specimen containers. (See Figure 13-5). |

13.2.3.56 Specimen collection container//Specimen container//Sample container//Container:

The tube that holds a patient specimen;

| | |
|---|---|
| **Note:** | The container typically consists of a glass or plastic closed-end tube with a removable closure on the opposite end. (See Figure 13-5) |

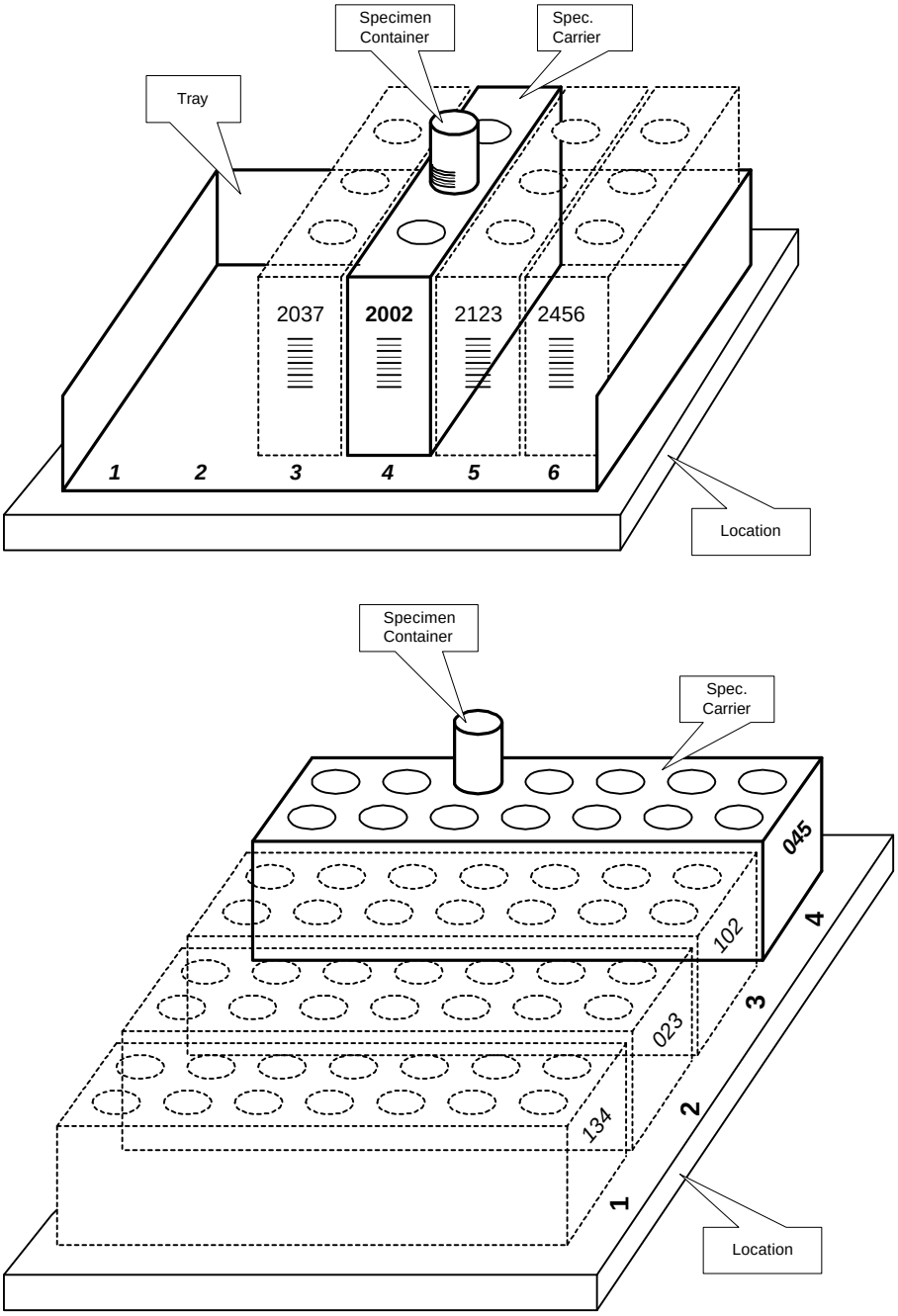



**Figure 13-5: Relationship Among Specimen Container, Specimen Carrier, Tray, and Locations.**

13.2.3.57 Specimen-positioning system//Sample-positioning system (SPS):

A device to position a specimen container within acceptable tolerances of a POR.

13.2.3.58 Specimen probe//Sample probe:

A part of an instrument or specimen processing and handling device that aspirates fluid from a specimen and delivers it to the instrument for analysis.

| **Note:** | The sample probe can also be called sample proboscis, nozzle, needle, or sampling mechanism. |
|---|---|

13.2.3.59 Stay clear zone:

***In NCCLS LAB AUTOMATION Standard documents,*** the area between the instrument or specimen processing and handling device and the automation hardware that must remain clear of any physical device, ensuring that there is adequate access by the user or service person to either system.

13.2.3.60 Symbol:

***In NCCLS LAB AUTOMATION Standard documents,*** a combination of bar-code characters, including start/stop characters, quiet zones, data elements, and check characters which form a complete scanning entity.

13.2.3.61 Test mnemonics:

Short, understandable contractions for test names.

13.2.3.62 Top of container//Top of tube:

The open end of the container/test tube, closest to the cap.

13.2.3.63 Top of tube:

See **Top of container**.

13.2.3.64 Tray:

A holder for one or more carriers (optional). (See Figure 13-5).

13.2.3.65 X–direction:

See **Directions**.

13.2.3.66 Y–direction:

See **Directions**.

13.2.3.67 Z–direction:

See **Directions**.

## 13.3 TRIGGER EVENTS AND MESSAGE DEFINITIONS

Each trigger event is listed below, along with the application form of the message exchange. The notation used to describe the sequence, optionality and repetition of segments is described in Chapter 2.

The notation used to describe the sequence, the optionality, and the repetition of segments is described in HL7, Chapter 2, under “Format for Defining Abstract Message.”

All the ACK messages are varieties of the 'general acknowledgement' message defined in Chapter 2, Section 2.14.1. The only difference is the event code.

The “Equipment Notification” message (EAN/ACK event U09) is used to send information about the occurrence of an event. An event does not necessarily cause a state transition. The “Status Update” message (EAU/ACK event U01) is used to transfer information about the current status. This status can be the result of one or more events that led to the state transition. Example: The event of a “warning level of a consumable being reached” (e.g., 10% left) does not cause a state transition, because the system can remain “In operation”. This results in an EAN/ACK message. An event “container transport jammed” causes the state transition to “Emergency stop”. This results in both EAN/ACK and EAU/ACK messages.

For the transfer of laboratory automation orders and results refer to *4.4.6 OML - laboratory order message (event O21)* instead of ORM and *7.3.2 OUL – unsolicited laboratory observation message (event O20)* instead of ORU.

## 13.3.1 ESU/ACK - automated equipment status update (event U01)

This message is used to send information about the status of a device or equipment from one application to another (e.g., automated device to a Laboratory Automation System). The status update can be sent unsolicited or as a response to the trigger “Automated Equipment Status Request.”

| ESU^U01^ESU_U01 | Equipment Status Message | Chapter |
|---|---|---|
| MSH | Message Header | 2 |
| EQU | Equipment Detail | 13 |
| [ { ISD } ] | Interaction Status Detail | 13 |
| [ ROL ] | Role Detail | 12 |

| ACK^U01^ACK | General Acknowledgement | Chapter |
|---|---|---|
| MSH | Message Header | 2 |
| MSA | Message Acknowledgment | 2 |
| [ ERR ] | Error[8] | 2 |

## 13.3.2 ESR/ACK - automated equipment status request (event U02)

This message is used to request information about a device’s or piece of equipment’s status from one application to another (e.g., Laboratory Automation System to automated equipment). The equipment identified in the EQU segment should respond with its status using the “Automated Equipment Status Update.”

| ESR^U02^ESR_U02 | Equipment Status Message | Chapter |
|---|---|---|
| MSH | Message Header | 2 |
| EQU | Equipment Detail | 13 |
| [ ROL ] | Role Detail | 12 |

| ACK^U02^ACK | General Acknowledgment | Chapter |
|---|---|---|
| MSH | Message Header | 2 |
| MSA | Message Acknowledgment | 2 |
| [ ERR ] | Error | 2 |

## 13.3.3 SSU/ACK - specimen status update (event U03)

This message is used to send information concerning the location and status of specimens from one application to another (e.g., automated equipment to a Laboratory Automation System).

The OBX segments attached to the SAC should be used for transfer of information not included in the SAC segment.

[8] This error segment indicates the fields that caused a transaction to be rejected.

| SSU^U03^SSU_U03 | Specimen Status Message | Chapter |
|---|---|---|
| MSH | Message Header | 2 |
| EQU | Equipment Detail | 13 |
| { SAC | Specimen and Container Detail | 13 |
| [ OBX ] | Observation Result | 7 |
| } | | |
| [ ROL ] | Role Detail | 12 |

| ACK^U03^ACK | General Acknowledgment | Chapter |
|---|---|---|
| MSH | Message Header | 2 |
| MSA | Message Acknowledgment | 2 |
| [ ERR ] | Error | 2 |

### 13.3.4 SSR/ACK - specimen status request (event U04)

This message is used to request information concerning the location and status of specimens from one application to another (e.g., Laboratory Automation System to automated equipment). The request can be addressed for a specific container, a specific carrier, a specific tray or a specific location, depending on the arguments set in the SAC segment. The equipment specified in the EQU segment should respond with the "Specimen Status Update."

| SSR^U04^SSR_U04 | Specimen Status Message | Chapter |
|---|---|---|
| MSH | Message Header | 2 |
| EQU | Equipment Detail | 13 |
| { SAC } | Specimen and Container Detail | 13 |
| [ ROL ] | Role Detail | 12 |

| ACK^U04^ACK | General Acknowledgment | Chapter |
|---|---|---|
| MSH | Message Header | 2 |
| MSA | Message Acknowledgment | 2 |
| [ ERR ] | Error | 2 |

### 13.3.5 INU/ACK – automated equipment inventory update (event U05)

This message is used to send information about inventory items from one application to another (e.g., automated Equipment to a Laboratory Automation System).

| INU^U05^INU_U05 | Inventory Update Message | Chapter |
|---|---|---|
| MSH | Message Header | 2 |
| EQU | Equipment Detail | 13 |
| { INV } | Inventory Detail | 13 |
| [ ROL ] | Role Detail | 12 |

| ACK^U05^ACK | General Acknowledgment | Chapter |
|---|---|---|
| MSH | Message Header | 2 |
| MSA | Message Acknowledgment | 2 |
| [ ERR ] | Error | 2 |

### 13.3.6 INR/ACK – automated equipment inventory request (event U06)

This message is used to request information about inventory items from one application to another (e.g., Laboratory Automation System to automated equipment). The equipment specified in the EQU segment should respond with the information about inventory item requested in the INV segment (or all items).

| INR^U06^INR_U06 | Inventory Request Message | Chapter |
|---|---|---|
| MSH | Message Header | 2 |
| EQU | Equipment Detail | 13 |
| { INV } | Inventory Detail | 13 |
| [ ROL ] | Role Detail | 12 |

| ACK^U06^ACK | General Acknowledgment | Chapter |
|---|---|---|
| MSH | Message Header | 2 |
| MSA | Message Acknowledgment | 2 |
| [ ERR ] | Error | 2 |

### 13.3.7 EAC/ACK – automated equipment command (event U07)

This message is used to send equipment commands from one application to another (e.g., a Laboratory Automation System to an automated Equipment).

| EAC^U07^EAC_U07 | Equipment Command Message | Chapter |
|---|---|---|
| MSH | Message Header | 2 |
| EQU | Equipment Detail | 13 |
| { ECD } | Equipment Command Detail | 13 |
| [ SAC ] | Specimen and Container Detail | 13 |
| [ CNS ] | Clear Notification | 13 |
| [ ROL ] | Role Detail | 12 |

| ACK^U07^ACK | General Acknowledgment | Chapter |
|---|---|---|
| MSH | Message Header | 2 |
| MSA | Message Acknowledgment | 2 |
| [ ERR ] | Error | 2 |

### 13.3.8 EAR/ACK – automated equipment response (event U08)

This message is used to send equipment responses to previously issued commands from one application to another (e.g., automated Equipment to a Laboratory Automation System).

| EAR^U08^EAR_U08 | Equipment Command Message | Chapter |
|---|---|---|
| MSH | Message Header | 2 |
| EQU | Equipment Detail | 13 |
| { ECD | Equipment Command Detail | 13 |
| [ SAC ] | Specimen and Container Detail | 13 |
| ECR } | Equipment Command Response | 13 |
| [ ROL ] | Role Detail | 12 |

| ACK^U08^ACK | General Acknowledgment | Chapter |
|---|---|---|
| MSH | Message Header | 2 |
| MSA | Message Acknowledgment | 2 |
| [ ERR ] | Error | 2 |

### 13.3.9 EAN/ACK - automated equipment notification (event U09)

This message is used to send equipment notifications from one application to another (e.g., alerts sent by automated equipment to a Laboratory Automation System).

| EAN^U09^EAN_U09 | Equipment Status Message | Chapter |
|---|---|---|
| MSH | Message Header | 2 |
| EQU | Equipment Detail | 13 |
| { NDS | Notification Detail | 13 |
| [ NTE ] | Notification Note | 2 |
| } | | |
| [ ROL ] | Role Detail | 12 |

| ACK^U09^ACK | General Acknowledgment | Chapter |
|---|---|---|
| MSH | Message Header | 2 |
| MSA | Message Acknowledgment | 2 |
| [ ERR ] | Error | 2 |

## 13.3.10 TCU/ACK - automated equipment test code settings update (event U10)

This message is used to send information concerning test codes and parameters from one application to another (e.g., automated equipment to a Laboratory Automation System). This message transfers the current snapshot of the test parameters of the sending system. The sent parameter sets are supposed to replace the parameter sets existing at the receiver of this message before the trigger (there is no selective "Add" or "Delete").

| TCU^U10^TCU_U10 | Test Code Settings Update | Chapter |
|---|---|---|
| MSH | Message Header | 2 |
| EQU | Equipment Detail | 13 |
| { TCC } | Test Code Configuration | 13 |
| [ ROL ] | Role Detail | 12 |

| ACK^U10^ACK | General Acknowledgment | Chapter |
|---|---|---|
| MSH | Message Header | 2 |
| MSA | Message Acknowledgment | 2 |
| [ ERR ] | Error | 2 |

## 13.3.11 TCR/ACK - automated equipment test code settings request (event U11)

This message is used to request information concerning test codes from one application to another (e.g., Laboratory Automation System to automated equipment).

| TCR^U11^TCU_U10 | Test Code Settings Request | Chapter |
|---|---|---|
| MSH | Message Header | 2 |
| EQU | Equipment Detail | 13 |
| { TCC } | Test Code Configuration | 13 |
| [ ROL ] | Role Detail | 12 |

| ACK^U11^ACK | General Acknowledgment | Chapter |
|---|---|---|
| MSH | Message Header | 2 |
| MSA | Message Acknowledgment | 2 |
| [ ERR ] | Error | 2 |

## 13.3.12 LSU/ACK - automated equipment log/service update (event U12)

This message is used to send log and/or service events from one application to another (e.g., automated equipment to Laboratory Automation System).

| LSU^U12^LSU_U12 | Equipment Log/Service Message | Chapter |
|---|---|---|
| MSH | Message Header | 2 |
| EQU | Equipment Detail | 13 |
| { EQP } | Equipment Log/Service | 13 |
| [ ROL ] | Role Detail | 12 |

| ACK^U12^ACK | General Acknowledgment | Chapter |
|---|---|---|
| MSH | Message Header | 2 |
| MSA | Message Acknowledgment | 2 |
| [ ERR ] | Error | 2 |

## 13.3.13 LSR/ACK - automated equipment log/service request (event U13)

This message is used to request log and/or service events from one application to another (e.g., Laboratory Automation System to automated equipment).

| LSR^U13^LSU_U12 | Equipment Log/Service Message | Chapter |
|---|---|---|
| MSH | Message Header | 2 |
| EQU | Equipment Detail | 13 |
| { EQP } | Equipment Log/Service | 13 |

| LSR^U13^LSU_U12 | Equipment Log/Service Message | Chapter |
|---|---|---|
| [ ROL ] | Role Detail | 12 |

| ACK^U13^ACK | General Acknowledgment | Chapter |
|---|---|---|
| MSH | Message Header | 2 |
| MSA | Message Acknowledgment | 2 |
| [ ERR ] | Error | 2 |

# 13.4 MESSAGE SEGMENTS

The following section identifies the message segments proposed for incorporation in this standard, and will be submitted for incorporation or reference in other HL7 and NCCLS standard documents. Valid entries are presented in an Attribute Table for each segment.

## 13.4.1 EQU - equipment detail segment

The equipment detail segment contains the data necessary to identify and maintain the equipment that is being used throughout the Laboratory Automation System.

HL7 Attribute Table – EQU – Equipment Detail

| SEQ | LEN | DT | OPT | RP/# | TBL# | ITEM # | ELEMENT NAME |
|---|---|---|---|---|---|---|---|
| 1 | 22 | EI | R | | | 01479 | Equipment Instance Identifier |
| 2 | 26 | TS | R | | | 01322 | Event Date/Time |
| 3 | 250 | CE | C | | 0365 | 01323 | Equipment State |
| 4 | 250 | CE | O | | 0366 | 01324 | Local/Remote Control State |
| 5 | 250 | CE | O | | 0367 | 01325 | Alert Level |

### 13.4.1.0 EQU field definitions

### 13.4.1.1 EQU-1 Equipment instance identifier (EI) 01479

```
Components: <entity identifier (ST)> ^ <namespace ID (IS)> ^ <universal ID (ST)> ^ <universal ID
            type (ID)>
```

Definition: This field identifies the equipment. This is the identifier from an institution's master list of equipment. The <namespace ID> identifies the institution.

### 13.4.1.2 EQU-2 Event date/time (TS) 01322

Definition: This field is the date/time that the event (e.g., state transition, issuing of command, finishing of command execution) occurred.

### 13.4.1.3 EQU-3 Equipment state (CE) 01323

```
Components: <identifier (ST)> ^ <text (ST)> ^ <name of coding system (IS)> ^ <alternate identifier
            (ST)> ^ <alternate text (ST)> ^ <name of alternate coding system (IS)>
```

Definition: This field identifies the status that the equipment was in at the time that the transaction was initiated. Refer to *HL7 Table 0365 – Equipment state* for valid values. The Equipment State is required in the ESU message and is optional otherwise.

HL7 Table 0365 - Equipment state

| Value | Description |
|---|---|
| PU | Powered Up |
| IN | Initializing |
| ID | Idle |
| CO | Configuring |
| OP | Normal Operation |
| CL | Clearing |
| PA | Pausing |
| PD | Paused |
| ES | E-stopped |
| | (null) No state change |

This table is based on LECIS (see sub-chapter "Introduction and Overview")

#### 13.4.1.4 EQU-4 Local/remote control state (CE) 01324

```
Components: <identifier (ST)> ^ <text (ST)> ^ <name of coding system (IS)> ^ <alternate identifier
            (ST)> ^ <alternate text (ST)> ^ <name of alternate coding system (IS)>
```

Definition: This field identifies the current state of control associated with the equipment. An equipment can either work autonomously ('Local' control state) or it can be controlled by another system, e.g., LAS computer ('Remote' control state). Refer to *HL7 Table 0366 – Local/remote control state* for valid values.

HL7 Table 0366 - Local/remote control state

| Value | Description |
|---|---|
| L | Local |
| R | Remote |
| | (null) No state change |

This table is based on LECIS (see sub-chapter "Introduction and Overview")

#### 13.4.1.5 EQU-5 Alert level (CE) 01325

```
Components: <identifier (ST)> ^ <text (ST)> ^ <name of coding system (IS)> ^ <alternate identifier
            (ST)> ^ <alternate text (ST)> ^ <name of alternate coding system (IS)>
```

Definition: This field identifies the highest level of the alert state (e.g., highest alert severity) that is associated with the indicated equipment (e.g. processing event, inventory event, QC event). Refer *to HL7 Table 0367 – Alert level* for valid values.

HL7 Table 0367 - Alert level

| Value | Description | Note |
|---|---|---|
| N | Normal | No Corrective Action Needed |
| W | Warning | Corrective Action Anticipated |
| S | Serious | Corrective Action Required |
| C | Critical | Shut Down, Fix Problem and Re-init |

| Value | Description | Note |
|---|---|---|
| | (null) No level change | |

## 13.4.2 ISD – interaction status detail segment

The interaction detail segment contains information about the status of specific interaction (e.g., processing — see section Glossary) on the specific equipment.

HL7 Attribute Table – ISD – Interaction Status Detail

| SEQ | LEN | DT | OPT | RP/# | TBL# | ITEM # | ELEMENT NAME |
|---|---|---|---|---|---|---|---|
| 1 | 20 | NM | R | | | 01326 | Reference Interaction Number (unique identifier) |
| 2 | 250 | CE | O | | 0368 | 01327 | Interaction Type Identifier |
| 3 | 250 | CE | R | | 0387 | 01328 | Interaction Active State |

### 13.4.2.0 ISD field definitions

### 13.4.2.1 ISD-1 Reference interaction number (NM) 01326

Definition: This number uniquely identifies the interaction. If the interaction is performed as the result of a previous command, then the Reference Command Number should be used. (See 13.4.5.1 ECD-1 Reference command number (NM) 01390)

### 13.4.2.2 ISD-2 Interaction type identifier (CE) 01327

```
Components: <identifier (ST)> ^ <text (ST)> ^ <name of coding system (IS)> ^ <alternate identifier
            (ST)> ^ <alternate text (ST)> ^ <name of alternate coding system (IS)>
```

Definition: This field specifies the type of interaction. If the interaction is performed as the result of a previous command, then the interaction type as specified *in User-defined Table 0368 - Remote control command* should be used.

### 13.4.2.3 ISD-3 Interaction active state (CE) 01328

```
Components: <identifier (ST)> ^ <text (ST)> ^ <name of coding system (IS)> ^ <alternate identifier
            (ST)> ^ <alternate text (ST)> ^ <name of alternate coding system (IS)>
```

Definition: This field transfers the state of the interaction. If the interaction is performed as the result of a previous command, then the interaction state should be one of the Command Responses (Refer to *User-defined Table 0387 – Command response*). If the interaction is not performed as a result of a command (e.g., periodically time triggered automatic maintenance) then this state is interaction specific, and should refer to either the LECIS state transitions for interactions or a user or equipment specific table.

## 13.4.3 SAC– specimen and container detail segment

The container detail segment is the data necessary to maintain the containers that are being used throughout the Laboratory Automation System.

HL7 Attribute Table – SAC – Specimen and container detail

| SEQ | LEN | DT | OPT | RP/# | TBL# | ITEM # | ELEMENT NAME |
|---|---|---|---|---|---|---|---|
| 1 | 80 | EI | O | | | 01329 | External Accession Identifier |
| 2 | 80 | EI | O | | | 01330 | Accession Identifier |
| 3 | 80 | EI | C | | | 01331 | Container Identifier |
| 4 | 80 | EI | C | | | 01332 | Primary (parent) Container Identifier |
| 5 | 80 | EI | O | | | 01333 | Equipment Container Identifier |
| 6 | 300 | CM | O | | 0070/ 0369 | 00249 | Specimen Source |
| 7 | 26 | TS | O | | | 01334 | Registration Date/Time |
| 8 | 250 | CE | O | | 0370 | 01335 | Container Status |
| 9 | 250 | CE | O | | 0378 | 01336 | Carrier Type |
| 10 | 80 | EI | O | | | 01337 | Carrier Identifier |
| 11 | 80 | NA | O | | | 01338 | Position in Carrier |
| 12 | 250 | CE | O | | 0379 | 01339 | Tray Type - SAC |
| 13 | 80 | EI | O | | | 01340 | Tray Identifier |
| 14 | 80 | NA | O | | | 01341 | Position in Tray |
| 15 | 250 | CE | O | Y | | 01342 | Location |
| 16 | 20 | NM | O | | | 01343 | Container Height |
| 17 | 20 | NM | O | | | 01344 | Container Diameter |
| 18 | 20 | NM | O | | | 01345 | Barrier Delta |
| 19 | 20 | NM | O | | | 01346 | Bottom Delta |
| 20 | 250 | CE | O | | | 01347 | Container Height/Diameter/Delta Units |
| 21 | 20 | NM | O | | | 00644 | Container Volume |
| 22 | 20 | NM | O | | | 01349 | Available Volume |
| 23 | 20 | NM | O | | | 01350 | Initial Specimen Volume |
| 24 | 250 | CE | O | | | 01351 | Volume Units |
| 25 | 250 | CE | O | | 0380 | 01352 | Separator Type |
| 26 | 250 | CE | O | | 0381 | 01353 | Cap Type |
| 27 | 250 | CE | O | Y | 0371 | 00647 | Additive |
| 28 | 250 | CE | O | | | 01355 | Specimen Component |
| 29 | 20 | SN | O | | | 01356 | Dilution Factor |
| 30 | 250 | CE | O | | 0373 | 01357 | Treatment |
| 31 | 20 | SN | O | | | 01358 | Temperature |
| 32 | 20 | NM | O | | | 01359 | Hemolysis Index |
| 33 | 250 | CE | O | | | 01360 | Hemolysis Index Units |
| 34 | 20 | NM | O | | | 01361 | Lipemia Index |
| 35 | 250 | CE | O | | | 01362 | Lipemia Index Units |
| 36 | 20 | NM | O | | | 01363 | Icterus Index |
| 37 | 250 | CE | O | | | 01364 | Icterus Index Units |
| 38 | 20 | NM | O | | | 01365 | Fibrin Index |
| 39 | 250 | CE | O | | | 01366 | Fibrin Index Units |
| 40 | 250 | CE | O | Y | 0374 | 01367 | System Induced Contaminants |
| 41 | 250 | CE | O | Y | 0382 | 01368 | Drug Interference |
| 42 | 250 | CE | O | | 0375 | 01369 | Artificial Blood |
| 43 | 250 | CE | O | Y | 0376 | 01370 | Special Handling Considerations |
| 44 | 250 | CE | O | Y | 0377 | 01371 | Other Environmental Factors |

### 13.4.3.0 SAC field definitions

### 13.4.3.1 SAC-1 External accession identifier (EI) 01329

```
Components: <entity identifier (ST)> ^ <namespace ID (IS)> ^ <universal ID (ST)> ^ <universal ID
            type (ID)>
```

Definition: This field identifies the laboratory accession (see section *Glossary*). This identifier is assigned by the external laboratory information system.

Example: If laboratory A sends a specimen to laboratory B, then within laboratory B this field contains accession identifier of lab A.

#### 13.4.3.2 SAC-2 Accession identifier (EI) 01330

```
Components: <entity identifier (ST)> ^ <namespace ID (IS)> ^ <universal ID (ST)> ^ <universal ID
            type (ID)>
```

Definition: This field identifies the laboratory accession (see section *Glossary*). This identifier is assigned by the information system of the laboratory performing the tests.

An accession identifier can refer to more than one container. A Container Identifier (see below) is a Unique Identifier for that container.

#### 13.4.3.3 SAC-3 Container identifier (EI) 01331

```
Components: <entity identifier (ST)> ^ <namespace ID (IS)> ^ <universal ID (ST)> ^ <universal ID
            type (ID)>
```

Definition: This field identifies the container. This field is the container's unique identifier assigned by the corresponding equipment. A container may contain the primary (original) specimen or an aliquot (secondary sample) of that specimen. For primary sample this field contains Primary Container ID; for bar-coded aliquot samples this field contains Aliquot Container ID; for non-bar-coded aliquot samples (e.g., microtiter plate) this field is empty[9]

The NCCLS standard requires a unique identifier for each container introduced into the Laboratory Automation System. The combination of the fields: Primary Container ID, Container ID, Carrier ID / Position, Tray ID / Position must identify the container uniquely within the LAS. The naturally best solution is unique machine-readable id attached to the container (which of course is sufficient to ensure the uniqueness of the fields' combination). A bar code that symbolizes this ID should meet the proposed standard NCCLS AUTO2 (*Laboratory Automation: Bar Codes for Specimen Container Identification).*

#### 13.4.3.4 SAC-4 Primary (parent) container identifier (EI) 01332

```
Components: <entity identifier (ST)> ^ <namespace ID (IS)> ^ <universal ID (ST)> ^ <universal ID
            type (ID)>
```

[9] Example of use of container ID fields for various sample types:

| SAC field | Primary container | Aliquot container with Bar-code | Aliquot container without Bar-code, e.g. microtiter well |
|---|---|---|---|
| "Container ID" (SAC-3) | Primary container ID | Aliquot container ID | — |
| "Primary (parent) Container ID" (SAC-4) | — | Primary container ID | Primary container ID |

Definition: If this field is filled in, it identifies the primary container from which this specimen came. For primary samples this field is empty; for aliquot samples this field should contain the identifier of primary container.

#### 13.4.3.5 SAC-5 Equipment container identifier (EI) 01333

```
Components: <entity identifier (ST)> ^ <namespace ID (IS)> ^ <universal ID (ST)> ^ <universal ID
            type (ID)>
```

Definition: This field identifies the container in a particular device (e.g., one container in a carousel or rack of containers within an analyzer, analyzer specific bar code mapping, etc.).

#### 13.4.3.6 SAC-6 Specimen source (CM) 00249

```
Components:  <specimen source name or code (CE)> ^ <additives (TX)> ^ <free text (TX)> ^ <body
             site (CE)> ^ <site modifier (CE)> ^ <collection method modifier code (CE)> ^
             <specimen role (CE)>

Subcomponents of specimen source name or code:  <identifier (ST)> & <test (ST)> & <name of coding
             system (IS)> & <alternate identifier (ST)> & <alternate text (ST)> & <name of
             alternate coding system (ST)>

Subcomponents of body site:  <identifier (ST)> & <test (ST)> & <name of coding system (IS)> &
             <alternate identifier (ST)> & <alternate text (ST)> & <name of alternate coding
             system (ST)>

Subcomponents of site modifier:  <identifier (ST)> & <test (ST)> & <name of coding system (IS)> &
             <alternate identifier (ST)> & <alternate text (ST)> & <name of alternate coding
             system (ST)>

Subcomponents of collection method modifier code:  <identifier (ST)> & <test (ST)> & <name of
             coding system (IS)> & <alternate identifier (ST)> & <alternate text (ST)> & <name of
             alternate coding system (ST)>

Subcomponents of specimen role: <identifier (ST)> & <test (ST)> & <name of coding system (IS)> &
             <alternate identifier (ST)> & <alternate text (ST)> & <name of alternate coding
             system (ST)>
```

Definition: This field is the site where the specimen should be obtained or where the service should be performed.

The first component contains the specimen source name or code (as a CE data type component). (Even in the case of observations whose name implies the source, a source may be required, e.g., blood culture: heart blood.) Refer to *HL7 Table 0070 – Specimen source codes* for valid entries.

The second component should include free text additives to the specimen such as heparin, EDTA, or oxalate, when applicable.

The third is a free text component describing the method of collection when that information is a part of the order. When the method of collection is logically an observation result, it should be included as a result segment.

The fourth component specifies the body site from which the specimen was obtained, and the fifth is the site modifier. For example, the site could be antecubital fossa, and the site modifier "right." The components of the CE fields become sub-components. Refer to *HL7 Table 0163 - Administrative site* for valid entries.

The sixth component indicates whether the specimen is frozen as part of the collection method. Suggested values are F (Frozen); R (Refrigerated). If the component is blank, the specimen is assumed to be at room temperature.

The 7th component indicates the role of the sample. Refer to *User-defined Table 0369 – Specimen role* for suggested values. Each of these values is normally identifiable by the systems and its components and can influence processing and data management related to the specimen.

User-defined Table 0369 - Specimen role

| Value | Description |
|---|---|
| P | Patient (default if blank component value) |
| Q | Control specimen |
| C | Calibrator |
| B | Blind Sample |
| R | Replicate (of patient sample as a control) |

#### 13.4.3.7 SAC-7 Registration date/time (TS) 01334

Definition: This field is the date/time that the container was last registered with the "automated system.", e.g., reading of a container bar code by a device.

#### 13.4.3.8 SAC-8 Container status (CE) 01335

```
Components: <identifier (ST)> ^ <text (ST)> ^ <name of coding system (IS)> ^ <alternate identifier
            (ST)> ^ <alternate text (ST)> ^ <name of alternate coding system (IS)>
```

Definition: This field identifies the status of the unique container in which the specimen resides at the time that the transaction was initiated. Refer to *HL7 Table 0370 - Container status* for valid values. The equipment specific container status should be sent as <*alternate identifier*> as needed.

HL7 Table 0370 - Container status

| Value | Description |
|---|---|
| I | Identified |
| P | In Position |
| O | In Process |
| R | Process Completed |
| L | Left Equipment |
| M | Missing |
| X | Container Unavailable |
| U | Unknown |

The container states are relevant for the exchange of information among devices (within the LAS). Not all of them are relevant for information transfer between the LAS and the LIS.

In the explanations below the system means the LAS or any equipment interfaced to it or to another equipment.

*Identified* status is used by one system to inform another that it has received a container. In the exchange between the LAS and LIS the *Identified* status can be used for reporting of the "In Lab" (Specimen Received) status. In some cases this may not be equal to the first event of sample recognition.

*In Position* status is used by one system to inform another that the container is in position for specimen transfer (e.g., container removal from track, pipetting, etc.).

*In Process* status is used by one system to inform another that the specific container is being processed by the equipment. It is useful as a response to a query about Container Status, when the specific step of the process is not relevant.

*Process Completed* status is used by one system to inform another that the processing has been completed, but the container has not been released from that system.

*Left Equipment* status is used by one system to inform another that the container has been released from that system.

*Missing* status is used by one system to inform another that the container did not arrive at its next expected location.

*Cancelled* status is used by one system to inform another that the container is no longer available within the scope of the system (e.g., tube broken or discarded).

*Unknown* status is used by one system to inform another that the container has not been identified.

#### 13.4.3.9 SAC-9 Carrier type (CE) 01336

```
Components: <identifier (ST)> ^ <text (ST)> ^ <name of coding system (IS)> ^ <alternate identifier
            (ST)> ^ <alternate text (ST)> ^ <name of alternate coding system (IS)>
```

Definition: This field identifies the type of the carrier (see section Glossary). Refer *to User-defined Table 0378 – Carrier type* for suggested values. Because the geometry can be different, the carrier type should, if possible, express the number of positions in the carrier.

The definition assumes hierarchical nesting using the following phrases: container is located in a carrier, carrier is located in a tray.

User-defined Table 0378 – Carrier type

| Value | Description |
|---|---|
| | No suggested values defined |

Examples of values: R01 (one position carrier), R05 (five position carrier)

#### 13.4.3.10 SAC-10 Carrier identifier (EI) 01337

```
Components: <entity identifier (ST)> ^ <namespace ID (IS)> ^ <universal ID (ST)> ^ <universal ID
            type (ID)>
```

Definition: This field identifies the carrier. It is the ID (e.g., number or bar code) of the carrier where the container (e.g., tube) is located.

Example: A carrier could be a rack with single or multiple specimen containers. A carrier is usually used for automated specimen transport. Multiple carriers can be stacked in a tray, which is then used for manual or automatic transport.

#### 13.4.3.11 SAC-11 Position in carrier (NA) 01338

```
Components:  <value1 (NM)> ^  <value2 (NM)> ^  <value3 (NM)> ^  <value4 (NM)> ^ ...
```

Definition: This field identifies the position of the container in the carrier (e.g., 1…3…). The sub-components allow, if necessary, to transfer multiple axis information, e.g., 2-dimensional carrier (X^Y).

#### 13.4.3.12 SAC-12 Tray type - SAC (CE) 01339

```
Components: <identifier (ST)> ^ <text (ST)> ^ <name of coding system (IS)> ^ <alternate identifier
            (ST)> ^ <alternate text (ST)> ^ <name of alternate coding system (IS)>
```

Definition: This field identifies the type of the tray (see section Glossary). Refer to *User-defined Table 0379 – Tray type* for suggested values. Because the geometry can be different, the tray type should if possible express the number of positions in the tray.

The definition assumes hierarchical nesting using the following phrases: container is located in a carrier, carrier is located in a tray.

User-defined Table 0379 – Tray type

| Value | Description |
|---|---|
| | No suggested values defined |

#### 13.4.3.13 SAC-13 Tray identifier (EI) 01340

```
Components: <entity identifier (ST)> ^ <namespace ID (IS)> ^ <universal ID (ST)> ^ <universal ID
            type (ID)>
```

Definition: This field identifies the tray identifier (e.g., a number of a tray or a bar code on the tray), where the container carrier is located.

#### 13.4.3.14 SAC-14 Position in tray (NA) 01341

```
Components:  <value1 (NM)> ^  <value2 (NM)> ^  <value3 (NM)> ^  <value4 (NM)> ^ ...
```

Definition: This field identifies the position of the carrier in the tray. The sub-components allow, if necessary, to transfer multiple axis information, e.g., 2-dimensional tray (X^Y).

#### 13.4.3.15 SAC-15 Location (CE) 01342

```
Components: <identifier (ST)> ^ <text (ST)> ^ <name of coding system (IS)> ^ <alternate identifier
            (ST)> ^ <alternate text (ST)> ^ <name of alternate coding system (IS)>
```

Definition: This field is the physical location that the specimen was at the time that the transaction was initiated. The location description can vary with the LAS. For example, it can be an X,Y,Z coordinate in a storage system; a refrigerator number and drawer number where the container-carrier-tray is located; or it can be the name of the institution and the laboratory which owns the container currently. The repeating of this field allows for hierarchical representation of location (lowest level first), e.g., shelf number, refrigerator storage id, lab name, institution name, etc.

#### 13.4.3.16 SAC-16 Container height (NM) 01343

Definition: This field identifies the height of the container in units specified below.

#### 13.4.3.17 SAC-17 Container diameter (NM) 01344

Definition: This field identifies the outside diameter of the container in units specified below.

#### 13.4.3.18 SAC-18 Barrier delta (NM) 01345

Definition: This field identifies the distance from the Point of Reference to the separator material (barrier) within the container in units specified below. This distance may be provided by the LAS to the instrument and/or specimen processing/handling device to facilitate the insertion of a sampling probe into the

specimen without touching the separator. Refer to Point Of Reference definition in section *Glossary* or in NCCLS standard AUTO5 *Laboratory Automation: Electromechanical Interfaces*.

#### 13.4.3.19 SAC-19 Bottom delta (NM) 01346

Definition: This field identifies the distance from the Point of Reference to the outside bottom of the container in units specified below. Refer to Point Of Reference definition in section *Glossary* or in NCCLS standard AUTO5 *Laboratory Automation: Electromechanical Interfaces*.

#### 13.4.3.20 SAC-20 Container diameter/height/delta units (CE) 01347

```
Components: <identifier (ST)> ^ <text (ST)> ^ <name of coding system (IS)> ^ <alternate identifier
            (ST)> ^ <alternate text (ST)> ^ <name of alternate coding system (IS)>
```

Definition: This field is the unit identifier that is being used to describe the diameter, height and deltas of the container. If the units are ISO+ units, they should be recorded as single case abbreviations. If the units are ANS+ or L (local), the units and the source code table must be recorded, except that in this case, component delimiters should be replaced by subcomponent delimiters. The default unit is millimeters (mm), which should be assumed if no units are reported.

#### 13.4.3.21 SAC-21 Container volume (NM) 00644

Definition: This field indicates the capacity of the container in the units specified below.

#### 13.4.3.22 SAC-22 Available volume (NM) 01349

Definition: This field identifies the current volume available for use in the container in the units specified below.

#### 13.4.3.23 SAC-23 Initial specimen volume (NM) 01350

Definition: This field identifies the draw volume of the container in the units specified below.

#### 13.4.3.24 SAC-24 Volume units (CE) 01351

```
Components: <identifier (ST)> ^ <text (ST)> ^ <name of coding system (IS)> ^ <alternate identifier
            (ST)> ^ <alternate text (ST)> ^ <name of alternate coding system (IS)>
```

Definition: This field is the unit identifier that is being used to describe the volume of the container. If the units are ISO+ units, they should be recorded as single case abbreviations. The default unit is milliliters (ml), which should be assumed if no units are reported.

#### 13.4.3.25 SAC-25 Separator type (CE) 01352

```
Components: <identifier (ST)> ^ <text (ST)> ^ <name of coding system (IS)> ^ <alternate identifier
            (ST)> ^ <alternate text (ST)> ^ <name of alternate coding system (IS)>
```

Definition: This field identifies the type of the separator that is being used (e.g., gel separator in the container – not to be confused with the communication separators). Refer *to* *User-defined Table 0380 – Separator type* for suggested values. It is recommended that the first table entry be "NO" meaning "No Separator".

User-defined Table 0380 – Separator type

| Value | Description |
|---|---|
| | No suggested values defined |

Examples of values: NO (no separator), GEL (gel separator), M01 (manufacturer specific)

### 13.4.3.26 SAC-26 Cap type (CE) 01353

```
Components: <identifier (ST)> ^ <text (ST)> ^ <name of coding system (IS)> ^ <alternate identifier
            (ST)> ^ <alternate text (ST)> ^ <name of alternate coding system (IS)>
```

Definition: This field indicates the type of cap that is to be used with this container for decapping, piercing or other mechanisms. Refer to *User-defined Table 0381 – Cap type* for suggested values.

User-defined Table 0381 – Cap type

| Value | Description |
|---|---|
| | No suggested values defined |

Examples of values: SCR (screw cap), PSH (push cap), FOIL (foil)

### 13.4.3.27 SAC-27 Additive (CE) 00647

```
Components: <identifier (ST)> ^ <text (ST)> ^ <name of coding system (IS)> ^ <alternate identifier
            (ST)> ^ <alternate text (ST)> ^ <name of alternate coding system (IS)>
```

Definition: This field identifies any additives introduced to the specimen before or at the time of collection. It is a repetitive field. Refer to *HL7 Table 0371 – Additive* for valid values. The table's values are taken from *NCCLS AUTO4*. The value set can be extended with user specific values.

HL7 Table 0371 – Additive

| Value | Description |
|---|---|
| EDTK | Potassium/K EDTA |
| EDTN | Sodium/Na EDTA |
| HEPL | Lithium/Li Heparin |
| HEPN | Sodium/Na Heparin |
| C32 | 3.2% Citrate |
| C38 | 3.8% Citrate |
| BOR | Borate |
| HCL6 | 6N HCL |

### 13.4.3.28 SAC-28 Specimen component (CE) 01355

```
Components: <identifier (ST)> ^ <text (ST)> ^ <name of coding system (IS)> ^ <alternate identifier
            (ST)> ^ <alternate text (ST)> ^ <name of alternate coding system (IS)>
```

Definition: This field identifies the specimen component, e.g., supernatant, sediment, etc. Refer to *User-defined Table 0372 – Specimen component* for valid values. This table's values are taken from *NCCLS AUTO4*. The value set can be extended with user specific values.

User-defined Table 0372 - Specimen component

| Value | Description |
|---|---|
| SUP | Supernatant |
| SED | Sediment |

| Value | Description |
|---|---|
| BLD | Whole blood, homogeneous |
| BSEP | Whole blood, separated |
| PRP | Platelet rich plasma |
| PPP | Platelet poor plasma |
| SER | Serum, NOS (not otherwise specified) |
| PLAS | Plasma, NOS (not otherwise specified) |

### 13.4.3.29 SAC-29 Dilution factor (SN) 01356

```
Components:  <comparator (ST)> ^ <num1 (NM)> ^ <separator/suffix (ST)> ^ <num2 (NM)>
```

Definition: This field identifies the factor of dilution already performed on the specimen. The equipment entity that changes the dilution is responsible for sending this information to other equipment. If the endogenous content of the test (analyte) in the diluent is required for the calculation of the test (analyte) concentration, then the test (analyte) specific values should be exchanged between the systems via Master Files or other means.

Examples of use:

|^1^:^5| - means dilution 1 to 5, i.e., 1 part sample, 4 parts diluent

|^1^+| - sample is diluted, but the factor is unknown

|^1^:^1| - not diluted sample

|| - dilution not changed

### 13.4.3.30 SAC-30 Treatment (CE) 01357

```
Components: <identifier (ST)> ^ <text (ST)> ^ <name of coding system (IS)> ^ <alternate identifier
            (ST)> ^ <alternate text (ST)> ^ <name of alternate coding system (IS)>
```

Definition: This field identifies the specimen collection treatment. Refer to *User-defined Table 0373 – Treatment* for valid values. This table's values are taken from *NCCLS AUTO4*. The value set can be extended with user specific values.

User-defined Table 0373 – Treatment

| Value | Description |
|---|---|
| LDLP | LDL Precipitation |
| RECA | Recalification |
| DEFB | Defibrination |
| ACID | Acidification |
| NEUT | Neutralization |
| ALK | Alkalization |
| FILT | Filtration |
| UFIL | Ultrafiltration |

#### 13.4.3.31 SAC-31 Temperature (SN) 01358

```
Components:  <comparator (ST)> ^ <num1 (NM)> ^ <separator/suffix (ST)> ^ <num2 (NM)>
```

Definition: This field identifies the specimen temperature in degrees Celsius [°C] at the time of the transaction specified in the EQU segment.

#### 13.4.3.32 SAC-32 Hemolysis index (NM) 01359

```
Components:  <comparator (ST)> ^ <num1 (NM)> ^ <separator/suffix (ST)> ^ <num2 (NM)>
```

Definition: This field is the index identifier that is being used to describe the Hemolysis Index of the specimen.

#### 13.4.3.33 SAC-33 Hemolysis index units (CE) 01360

```
Components: <identifier (ST)> ^ <text (ST)> ^ <name of coding system (IS)> ^ <alternate identifier
            (ST)> ^ <alternate text (ST)> ^ <name of alternate coding system (IS)>
```

Definition: This field is the unit's identifier that is being used to describe the Hemolysis Index of the specimen. It is recommended to use g/L. (The transmission of the index values is added here instead of the original use of the OBX segments, because the frequency of the transfer of the specimen details justifies use of more efficient mechanism.)

If this field is null, the recommended value is assumed.

#### 13.4.3.34 SAC-34 Lipemia index (NM) 01361

Definition: This field is the index identifier that is being used to describe the Lipemia Index of the specimen. It is recommended to use the optical turbidity at 600 nm (in absorbance units).

#### 13.4.3.35 SAC-35 Lipemia index units (CE) 01362

```
Components: <identifier (ST)> ^ <text (ST)> ^ <name of coding system (IS)> ^ <alternate identifier
            (ST)> ^ <alternate text (ST)> ^ <name of alternate coding system (IS)>
```

Definition: This field is the unit's identifier that is being used to describe the Lipemia Index of the specimen.

If this field is null, the recommended value is assumed.

#### 13.4.3.36 SAC-36 Icterus index (NM) 01363

Definition: This field is the index identifier that is being used to describe the Icterus Index of the specimen.

#### 13.4.3.37 SAC-37 Icterus index units (CE) 01364

```
Components: <identifier (ST)> ^ <text (ST)> ^ <name of coding system (IS)> ^ <alternate identifier
            (ST)> ^ <alternate text (ST)> ^ <name of alternate coding system (IS)>
```

Definition: This field is the unit's identifier that is being used to describe the Icterus Index of the specimen. It is recommended to use mMol/L of bilirubin.

If this field is null, the recommended value is assumed.

### 13.4.3.38 SAC-38 Fibrin index (NM) 01365

Definition: This field is the index identifier that is being used to describe the Fibrin Index of the specimen. In the case of only differentiating between Absent and Present, we recommend using 0 and 1 respectively and send the field Fibrin Index Units null.

### 13.4.3.39 SAC-39 Fibrin index units (CE) 01366

```
Components: <identifier (ST)> ^ <text (ST)> ^ <name of coding system (IS)> ^ <alternate identifier
            (ST)> ^ <alternate text (ST)> ^ <name of alternate coding system (IS)>
```

Definition: This field is the unit's identifier that is being used to describe the Fibrin Index of the specimen.

### 13.4.3.40 SAC-40 System induced contaminants (CE) 01367

```
Components: <identifier (ST)> ^ <text (ST)> ^ <name of coding system (IS)> ^ <alternate identifier
            (ST)> ^ <alternate text (ST)> ^ <name of alternate coding system (IS)>
```

Definition: This field describes the specimen contaminant identifier that is associated with the specimen. Refer to *User-defined Table 0374 – System induced contaminants* for valid values. This table's values are taken from *NCCLS AUTO4*. The value set can be extended with user specific values.

User-defined Table 0374 - System induced contaminants

| Value | Description |
|---|---|
| CNTM | Present, type of contamination unspecified |

### 13.4.3.41 SAC-41 Drug interference (CE) 01368

```
Components:  <identifier (ST)> ^ <text (ST)> ^ <name of coding system (IS)> ^ <alternate
             identifier (ST)> ^ <alternate text (ST)> ^ <name of alternate coding system (IS)>
```

Definition: This field describes the drug interference identifier that is associated with the specimen. Refer to *User-defined Table 0382 – Drug interference* for suggested values.

User-defined Table 0382 – Drug interference

| Value | Description |
|---|---|
| | No suggested values defined |

### 13.4.3.42 SAC-42 Artificial blood (CE) 01369

```
Components: <identifier (ST)> ^ <text (ST)> ^ <name of coding system (IS)> ^ <alternate identifier
            (ST)> ^ <alternate text (ST)> ^ <name of alternate coding system (IS)>
```

Definition: This field describes the artificial blood identifier that is associated with the specimen. Refer to *User-defined Table 0375 – Artificial blood* for valid values. This table's values are taken from *NCCLS AUTO4*. The value set can be extended with user specific values.

User-defined Table 0375 - Artificial blood

| Value | Description |
|---|---|
| SFHB | Stromal free hemoglobin preparations |
| FLUR | Fluorocarbons |

#### 13.4.3.43 SAC-43 Special handling considerations (CE) 01370

```
Components: <identifier (ST)> ^ <text (ST)> ^ <name of coding system (IS)> ^ <alternate identifier
            (ST)> ^ <alternate text (ST)> ^ <name of alternate coding system (IS)>
```

Definition: This field describes any special handling considerations that are associated with the specimen. (E.g. centrifugation). Refer to *User-defined Table 0376 – Special handling considerations* for valid values. This table's values are taken from *NCCLS AUTO4*. The value set can be extended with user specific values.

User-defined Table 0376 - Special handling considerations

| Value | Description |
|---|---|
| PRTL | Protect from light |
| CFRZ | Critical Frozen |
| CATM | Critical do not expose to atmosphere – Do not uncap |
| CREF | Critical refrigerated |
| CAMB | Critical ambient temperature |
| C37 | Critical maintain at 37C (e.g., cryoglobulin specimen |

#### 13.4.3.44 SAC-44 Other environmental factors (CE) 01371

```
Components: <identifier (ST)> ^ <text (ST)> ^ <name of coding system (IS)> ^ <alternate identifier
            (ST)> ^ <alternate text (ST)> ^ <name of alternate coding system (IS)>
```

Definition: This field describes other environmental factors that are associated with the specimen, e.g., atmospheric exposure. Refer to *User-defined Table 0377 – Other environmental factors* for valid values. This table's values are taken from *NCCLS AUTO4*. The value set can be extended with user specific values.

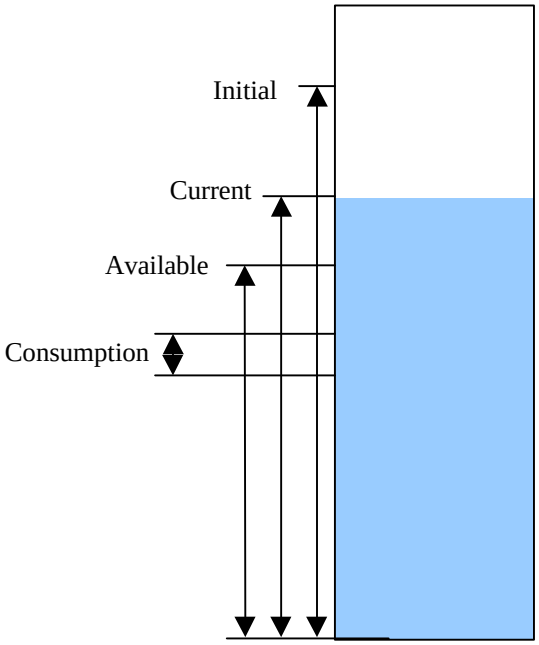
User-defined Table 0377 - Other environmental factors

| Value | Description |
|---|---|
| ATM | Opened container, atmosphere/duration unspecified |
| A60 | Opened container, indoor atmosphere, 60 minutes duration |

### 13.4.4 INV – inventory detail segment

The inventory detail segment is the data necessary to track the inventory of substances (e.g. reagent, tips, waste) on equipment.

**Figure 13-6. Information on the Types of Measures on a Container**




HL7 Attribute Table – INV – Inventory Detail

| SEQ | LEN | DT | OPT | RP/# | TBL# | ITEM # | ELEMENT NAME |
|---|---|---|---|---|---|---|---|
| 1 | 250 | CE | R | | 0451 | 01372 | Substance Identifier |
| 2 | 250 | CE | R | Y | 0383 | 01373 | Substance Status |
| 3 | 250 | CE | O | | 0384 | 01374 | Substance Type |
| 4 | 250 | CE | O | | | 01532 | Inventory Container Identifier |
| 5 | 250 | CE | O | | | 01376 | Container Carrier Identifier |
| 6 | 250 | CE | O | | | 01377 | Position on Carrier |
| 7 | 20 | NM | O | | | 01378 | Initial Quantity |
| 8 | 20 | NM | O | | | 01379 | Current Quantity |
| 9 | 20 | NM | O | | | 01380 | Available Quantity |
| 10 | 20 | NM | O | | | 01381 | Consumption Quantity |
| 11 | 250 | CE | O | | | 01382 | Quantity Units |
| 12 | 26 | TS | O | | | 01383 | Expiration Date/Time |
| 13 | 26 | TS | O | | | 01384 | First Used Date/Time |
| 14 | 200 | TQ | O | | | 01385 | On Board Stability Duration |
| 15 | 250 | CE | O | Y | | 01386 | Test/Fluid Identifier(s) |
| 16 | 200 | ST | O | | | 01387 | Manufacturer Lot Number |
| 17 | 250 | CE | O | | 0385 | 00286 | Manufacturer Identifier |
| 18 | 250 | CE | O | | 0386 | 01389 | Supplier Identifier |

### 13.4.4.0 INV field definitions

### 13.4.4.1 INV-1 Substance identifier (CE) 01372

```
Components: <identifier (ST)> ^ <text (ST)> ^ <name of coding system (IS)> ^ <alternate identifier
(ST)> ^ <alternate text (ST)> ^ <name of alternate coding system (IS)>
```

Definition: Unique identifier for the substance that is in inventory. This is a manufacturer-specific identifier.

User-defined Table 0451 – Substance identifier

| Value | Description |
|---|---|
| ALL | Used for query of all inventory items |

#### 13.4.4.2 INV-2 Substance status (CE) 01373

```
Components: <identifier (ST)> ^ <text (ST)> ^ <name of coding system (IS)> ^ <alternate identifier
            (ST)> ^ <alternate text (ST)> ^ <name of alternate coding system (IS)>
```

Definition: The status of the inventoried item. The status indicates the current status of the substance. Refer *to* *HL7 Table 0383 – Substance status* for suggested values.

HL7 Table 0383 - Substance status

| Value | Description |
|---|---|
| EW | Expired Warning |
| EE | Expired Error |
| CW | Calibration Warning |
| CE | Calibration Error |
| QW | QC Warning |
| QE | QC Error |
| NW | Not Available Warning |
| NE | Not Available Error |
| OW | Other Warning |
| OE | Other Error |
| OK | OK Status |

#### 13.4.4.3 INV-3 Substance type (CE) 01374

```
Components: <identifier (ST)> ^ <text (ST)> ^ <name of coding system (IS)> ^ <alternate identifier
            (ST)> ^ <alternate text (ST)> ^ <name of alternate coding system (IS)>
```

Definition: The type of substance. Refer to *HL7 Table 0384 – Substance type* for suggested values.

HL7 Table 0384 - Substance type

| Value | Description |
|---|---|
| SR | Single Test Reagent |
| MR | Multiple Test Reagent (consumption cannot be tied to orders for single test) |
| DI | Diluent |
| PT | Pretreatment |
| RC | Reagent Calibrator |
| CO | Control |
| PW | Purified Water |
| LW | Liquid Waste |

| Value | Description |
|---|---|
| SW | Solid Waste |
| SC | Countable Solid Item (e.g., Tip, etc.) |
| LI | Measurable Liquid Item |
| OT | Other |

#### 13.4.4.4 INV-4 Inventory container identifier (CE) 01532

```
Components: <identifier (ST)> ^ <text (ST)> ^ <name of coding system (IS)> ^ <alternate identifier
            (ST)> ^ <alternate text (ST)> ^ <name of alternate coding system (IS)>
```

Definition: Identifies the inventory container, e.g., unique identifier of a specific package instance of a specific substance. This is a manufacturer-specific identifier.

#### 13.4.4.5 INV-5 Container carrier identifier (CE) 01376

```
Components: <identifier (ST)> ^ <text (ST)> ^ <name of coding system (IS)> ^ <alternate identifier
            (ST)> ^ <alternate text (ST)> ^ <name of alternate coding system (IS)>
```

Definition: This is the carrier used to transport the substance containers, (e.g., a removable rotor with reagent bottles).

#### 13.4.4.6 INV-6 Position on carrier (CE) 01377

```
Components: <identifier (ST)> ^ <text (ST)> ^ <name of coding system (IS)> ^ <alternate identifier
            (ST)> ^ <alternate text (ST)> ^ <name of alternate coding system (IS)>
```

Definition: Identifies the position (e.g., index) on the carrier.

#### 13.4.4.7 INV-7 Initial quantity (NM) 01378

Definition: This field identifies the initial quantity of the substance in inventory.

#### 13.4.4.8 INV-8 Current quantity (NM) 01379

Definition: This field is the current quantity, i.e., initial quantity minus what has been actually used.

#### 13.4.4.9 INV-9 Available quantity (NM) 01380

Definition: This field is the available quantity of substance. This is the current quantity minus any planned consumption (e.g., tests that are planned).

#### 13.4.4.10 INV-10 Consumption quantity (NM) 01381

Definition: This field is the consumption that is used each time the equipment uses this substance.

#### 13.4.4.11 INV-11 Quantity units (CE) 01382

```
Components: <identifier (ST)> ^ <text (ST)> ^ <name of coding system (IS)> ^ <alternate identifier
            (ST)> ^ <alternate text (ST)> ^ <name of alternate coding system (IS)>
```

Definition: This field is the units of measure of the available quantity. If the units are ISO+ units, they should be recorded as single case abbreviations. If the units are ANS+ or L (local), the units and the source code table must be recorded, except that in this case, component delimiters should be replaced by sub-component delimiters. For example, “l” indicates liters, whereas pt&&ANS+ indicates pints (ANSI units). The default unit is milliliters (ml), which should be assumed if no units are reported.

#### 13.4.4.12 INV-12 Expiration date/time (TS) 01383

Definition: This field is the expiration date/time of the substance.

#### 13.4.4.13 INV-13 First used date/time (TS) 01384

Definition: This field is the time and date when the substance was first used. This date and time can be necessary to determine the stability of the substance.

#### 13.4.4.14 INV-14 On board stability duration (TQ) 01385

```
Components:  <quantity (CQ)> ^ <interval (CM)> ^ <duration (ST)> ^ <start date/time (TS)> ^ <end
             date/time (TS)> ^ <priority (ST)> ^ <condition (ST)> ^ <text (TX)> ^ <conjunction
             (ID)> ^ <order sequencing (CM)>
```

Definition: This field is the time duration that the substance is stable.

#### 13.4.4.15 INV-15 Test/fluid identifier(s) (CE) 01386

```
Components: <identifier (ST)> ^ <text (ST)> ^ <name of coding system (IS)> ^ <alternate identifier
             (ST)> ^ <alternate text (ST)> ^ <name of alternate coding system (IS)>
```

Definition: This field is the list of tests and body fluid that apply to this substance. This is a repeating field. An empty field means that this substance is not test specific, i.e., it applies to all tests.

#### 13.4.4.16 INV-16 Manufacturer lot number (ST) 01387

Definition: This field specifies the lot number assigned by the manufacturer during production of the substance.

#### 13.4.4.17 INV-17 Manufacturer Identifier (CE) 00286

```
Components: <identifier (ST)> ^ <text (ST)> ^ <name of coding system (IS)> ^ <alternate identifier
             (ST)> ^ <alternate text (ST)> ^ <name of alternate coding system (IS)>
```

Definition: This field identifies the manufacturer of this substance. Refer to *User-defined Table 0385 – Manufacturer identifier* for suggested values

User-defined Table 0385 – Manufacturer identifier

| Value | Description |
|---|---|
| | No suggested value defined |

#### 13.4.4.18 INV-18 Supplier identifier (CE) 01389

```
Components: <identifier (ST)> ^ <text (ST)> ^ <name of coding system (IS)> ^ <alternate identifier
             (ST)> ^ <alternate text (ST)> ^ <name of alternate coding system (IS)>
```

Definition: This field identifies the supplier of this substance. Refer to User-defined Table 0386 – Supplier identifier for suggested values.

User-defined Table 0386 – Supplier identifier

| Value | Description |
|---|---|
| | No suggested value defined |

## 13.4.5 ECD - equipment command segment

The equipment command segment contains the information required to notify the receiving component what is to happen.

HL7 Attribute Table – ECD – Equipment Command

| SEQ | LEN | DT | OPT | RP/# | TBL# | ITEM # | ELEMENT NAME |
|---|---|---|---|---|---|---|---|
| 1 | 20 | NM | R | | | 01390 | Reference Command Number |
| 2 | 250 | CE | R | | 0368 | 01391 | Remote Control Command |
| 3 | 80 | ID | O | | 0136 | 01392 | Response Required |
| 4 | 200 | TQ | O | | | 01393 | Requested Completion Time |
| 5 | 65536 | ST | O | Y | | 01394 | Parameters |

### 13.4.5.0 ECD field definitions

### 13.4.5.1 ECD-1 Reference command number (NM) 01390

Definition: This field contains the unique identifier for this particular command that should be used by the various components for future referral to this command. It is similar to the concept of MSH-10 "Message control ID", but at the equipment command/response level. This number is generated by the originator of this command.

### 13.4.5.2 ECD-2 Remote control command (CE) 01391

```
Components: <identifier (ST)> ^ <text (ST)> ^ <name of coding system (IS)> ^ <alternate identifier
            (ST)> ^ <alternate text (ST)> ^ <name of alternate coding system (IS)>
```

Definition: This field identifies the command that the component is to initiate. Refer to *User-defined Table 0368 – Remote control command* for valid values. Refer to LECIS standard for details.

User-defined Table 0368 - Remote control command

| Value | Description |
|---|---|
| SA | Sampling |
| LO | Load |
| UN | Unload |
| LK | Lock |
| UC | Unlock |
| TT | Transport To |
| CN | Clear Notification |
| IN | Initialize/Initiate |
| SU | Setup |
| CL | Clear |
| PA | Pause |
| RE | Resume |
| ES | Emergency –stop |
| LC | Local Control Request |
| RC | Remote Control Request |

| Value | Description |
|---|---|
| AB | Abort |
| EN | Enable Sending Events |
| DI | Disable Sending Events |
| EX | Execute (command specified in field Parameters (ST) 01394) |

#### 13.4.5.3 ECD-3 Response required (ID) 01392

Definition: This field identifies the mode of synchronization that is to be used in relation to the execution of the command. "Y" (Yes) means that the response is required immediately after execution, "N" (No) response is not required at all. Refer to *HL7 Table 0136 – Yes/no indicator* for valid values.

#### 13.4.5.4 ECD-4 Requested completion time (TQ) 01393

```
Components:  <quantity (CQ)> ^ <interval (CM)> ^ <duration (ST)> ^ <start date/time (TS)> ^ <end
             date/time (TS)> ^ <priority (ST)> ^ <condition (ST)> ^ <text (TX)> ^ <conjunction
             (ID)> ^ <order sequencing (CM)>
```

Definition: This field identifies when the remote control action must be completed. The devices managed in the LAS should have synchronized time (use original HL7 message NMQ, NMD with "System Clock Segment" NCK). If relative time quantity is used, then the referenced time is the time transferred in the EQU segment.

#### 13.4.5.5 ECD-5 Parameters (ST) 01394

Definition: This field identifies the parameters of the command (if they are not included in separate segment[s]).

| **Note:** | Elements of this segment (or other elements not defined here) may be required for certain vendor-specific equipment such as centrifuges, aliquoters, sorters, uncappers, recappers, automated storage units, etc. |
|---|---|

### 13.4.6 ECR - equipment command response segment

The equipment command response segment contains the receiving component's response to the previously received command.

HL7 Attribute Table – ECR – Equipment Command Response

| SEQ | LEN | DT | OPT | RP/# | TBL# | ITEM # | ELEMENT NAME |
|---|---|---|---|---|---|---|---|
| 1 | 250 | CE | R | | 0387 | 01395 | Command Response |
| 2 | 26 | TS | R | | | 01396 | Date/Time Completed |
| 3 | 65536 | ST | O | Y | | 01397 | Command Response Parameters |

#### 13.4.6.0 ECR field definitions

#### 13.4.6.1 ECR-1 Command response (CE) 01395

```
Components: <identifier (ST)> ^ <text (ST)> ^ <name of coding system (IS)> ^ <alternate identifier
            (ST)> ^ <alternate text (ST)> ^ <name of alternate coding system (IS)>
```

Definition: This field identifies the response of the previously issued command. Refer *to User-defined Table 0387 – Command response* for valid values.

User-defined Table 0387 - Command response

| Value | Description |
|---|---|
| OK | Command completed successfully |
| TI | Command cannot be completed within requested completion time |
| ER | Command cannot be completed because of error condition (see response parameters) |
| ST | Command cannot be completed because of the status of the requested equipment |
| UN | Command cannot be completed for unknown reasons |

#### 13.4.6.2 ECR-2 Date/time completed (TS) 01396

Definition: This field contains the date and time that the receiving component completed the requested command.

#### 13.4.6.3 ECR-3 Command response parameters (ST) 01397

Definition: This field identifies any associated parameters that relate to the returned response command message.

### 13.4.7 NDS - notification detail segment

The equipment notification detail segment is the data necessary to maintain an adequate audit trail as well as notifications of events, (e.g., alarms that have occurred on a particular piece of equipment.

HL7 Attribute Table – NDS – Notification Detail

| SEQ | LEN | DT | OPT | RP/# | TBL# | ITEM # | ELEMENT NAME |
|---|---|---|---|---|---|---|---|
| 1 | 20 | NM | R | | | 01398 | Notification Reference Number |
| 2 | 26 | TS | R | | | 01399 | Notification Date/Time |
| 3 | 250 | CE | R | | 0367 | 01400 | Notification Alert Severity |
| 4 | 250 | CE | R | | | 01401 | Notification Code |

#### 13.4.7.0 NDS field definitions

#### 13.4.7.1 NDS-1 Notification reference number (NM) 01398

Definition: This field contains a unique sequential reference number that may be used by various components to refer to this transaction. This number is generated by the originator of this notification.

#### 13.4.7.2 NDS-2 Notification date/time (TS) 01399

Definition: This field is the date/time of the notifications.

#### 13.4.7.3 NDS-3 Notification alert severity (CE) 01400

```
Components: <identifier (ST)> ^ <text (ST)> ^ <name of coding system (IS)> ^ <alternate identifier
            (ST)> ^ <alternate text (ST)> ^ <name of alternate coding system (IS)>
```

Definition: The severity of the specific notification. Refer to *HL7 Table 0367 - Alert level* for valid entries.

#### 13.4.7.4 NDS-4 Notification code (CE) 01401

```
Components: <identifier (ST)> ^ <text (ST)> ^ <name of coding system (IS)> ^ <alternate identifier
            (ST)> ^ <alternate text (ST)> ^ <name of alternate coding system (IS)>
```

Definition: This field contains information about the type of notification being sent. These are manufacturer and equipment specific error or status codes, e.g., AQN0123 – aliquoting error – clot detected.

## 13.4.8 CNS – clear notification segment

The clear equipment notification segment contains the data necessary to allow the receiving equipment to clear any associated notifications.

HL7 Attribute Table – CNS – Clear Notification

| SEQ | LEN | DT | OPT | RP/# | TBL# | ITEM # | ELEMENT NAME |
|---|---|---|---|---|---|---|---|
| 1 | 20 | NM | O | | | 01402 | Starting Notification Reference Number |
| 2 | 20 | NM | O | | | 01403 | Ending Notification Reference Number |
| 3 | 26 | TS | O | | | 01404 | Starting Notification Date/Time |
| 4 | 26 | TS | O | | | 01405 | Ending Notification Date/Time |
| 5 | 250 | CE | O | | | 01406 | Starting Notification Code |
| 6 | 250 | CE | O | | | 01407 | Ending Notification Code |

### 13.4.8.0 CNS field definitions

### 13.4.8.1 CNS-1 Starting notification reference number (NM) 01402

Definition: This field contains the starting notification reference number that is to be cleared.

### 13.4.8.2 CNS-2 Ending notification reference number (NM) 01403

Definition: This field contains the ending notification reference number that is to be cleared. If empty, then only notification with Starting Notification Reference Number will be cleared.

### 13.4.8.3 CNS-3 Starting notification date/time (TS) 01404

Definition: This field is the starting date/time of the notifications to be cleared. If this field is empty but Ending Notification Date/Time is filled, then all notifications before Ending Notification Date/Time will be cleared.

### 13.4.8.4 CNS-4 Ending notification date/time (TS) 01405

Definition: This field is the ending date/time of the notifications to be cleared. If this field is empty but Starting Notification Date/Time is filled, then all notifications after Starting Notification Date/Time will be cleared.

### 13.4.8.5 CNS-5 Starting notification code (CE) 01406

```
Components: <identifier (ST)> ^ <text (ST)> ^ <name of coding system (IS)> ^ <alternate identifier
            (ST)> ^ <alternate text (ST)> ^ <name of alternate coding system (IS)>
```

Definition: This field contains the starting notification code that is to be cleared (see 13.4.7.4 NDS-4 Notification code (CE) 01401).

### 13.4.8.6 CNS-6 Ending notification code (CE) 01407

```
Components: <identifier (ST)> ^ <text (ST)> ^ <name of coding system (IS)> ^ <alternate identifier
            (ST)> ^ <alternate text (ST)> ^ <name of alternate coding system (IS)>
```

Definition: This field contains the ending notification code that is to be cleared (see 13.4.7.4 NDS-4 Notification code (CE) 01401). If empty, then only notification with Starting Notification Code will be cleared.

## 13.4.9 TCC - test code configuration segment

The test (e.g., analyte) code configuration segment is the data necessary to maintain and transmit information concerning the test entity codes that are being used throughout the "automated system."

HL7 Attribute Table – TCC – Test Code Configuration

| SEQ | LEN | DT | OPT | RP/# | TBL# | ITEM # | ELEMENT NAME |
|---|---|---|---|---|---|---|---|
| 1 | 250 | CE | R | | | 00238 | Universal Service Identifier |
| 2 | 80 | EI | R | | | 01408 | Test Application Identifier |
| 3 | 300 | CM | O | | 0070/ 0163/ 0369 | 00249 | Specimen Source |
| 4 | 20 | SN | O | | | 01410 | Auto-Dilution Factor Default |
| 5 | 20 | SN | O | | | 01411 | Rerun Dilution Factor Default |
| 6 | 20 | SN | O | | | 01412 | Pre-Dilution Factor Default |
| 7 | 20 | SN | O | | | 01413 | Endogenous Content of Pre-Dilution Diluent |
| 8 | 10 | NM | O | | | 01414 | Inventory Limits Warning Level |
| 9 | 1 | ID | O | | 0136 | 01415 | Automatic Rerun Allowed |
| 10 | 1 | ID | O | | 0136 | 01416 | Automatic Repeat Allowed |
| 11 | 1 | ID | O | | 0136 | 01417 | Automatic Reflex Allowed |
| 12 | 20 | SN | O | | | 01418 | Equipment Dynamic Range |
| 13 | 250 | CE | O | | | 00574 | Units |
| 14 | 250 | CE | O | | 0388 | 01419 | Processing Type |

### 13.4.9.0 TCC field definitions

### 13.4.9.1 TCC-1 Universal service Identifier (CE) 00238

```
Components: <identifier (ST)> ^ <text (ST)> ^ <name of coding system (IS)> ^ <alternate identifier
            (ST)> ^ <alternate text (ST)> ^ <name of alternate coding system (IS)>
```

Definition: This field identifies the test code that information is being transmitted about. The alternate elements represent the test code identifier that has been assigned by the manufacturer to this particular test code.

### 13.4.9.2 TCC-2 Equipment test application identifier (EI) 01408

```
Components: <entity identifier (ST)> ^ <namespace ID (IS)> ^ <universal ID (ST)> ^ <universal ID
            type (ID)>
```

Definition: This field identifies the test application code assigned by the manufacturer of the equipment or reagents and associated with performing of the particular test specified by the Universal Test Identifier.

### 13.4.9.3 TCC-3 Specimen source (CM) 00249

```
Components:  <specimen source name or code (CE)> ^ <additives (TX)> ^ <freetext (TX)> ^ <body site
             (CE)> ^ <site modifier (CE)> ^ <collection method modifier code (CE)> ^ <specimen
             role (CE)>

Subcomponents of specimen source name or code:  <identifier (ST)> & <test (ST)> & <name of coding
             system (IS)> & <alternate identifier (ST)> & <alternate text (ST)> & <name of
             alternate coding system (ST)>
```

```
Subcomponents of body site:  <identifier (ST)> & <test (ST)> & <name of coding system (IS)> &
             <alternate identifier (ST)> & <alternate text (ST)> & <name of alternate coding
             system (ST)>

Subcomponents of site modifier:  <identifier (ST)> & <test (ST)> & <name of coding system (IS)> &
             <alternate identifier (ST)> & <alternate text (ST)> & <name of alternate coding
             system (ST)>

Subcomponents of collection method modifier code:  <identifier (ST)> & <test (ST)> & <name of
             coding system (IS)> & <alternate identifier (ST)> & <alternate text (ST)> & <name of
             alternate coding system (ST)>

Subcomponents of specimen role: <identifier (ST)> & <test (ST)> & <name of coding system (IS)> &
             <alternate identifier (ST)> & <alternate text (ST)> & <name of alternate coding
             system (ST)>
```

Definition: This field is the site where the specimen should be obtained or where the service should be performed.

The first component contains the specimen source name or code (as a CE data type component). (Even in the case of observations whose name implies the source, a source may be required (e.g., blood culture: heart blood.) Refer to *HL7 Table 0070 - Source of specimen* for valid entries.

The second component should include free text additives to the specimen such as heparin, EDTA, or oxalate, when applicable.

The third is a free text component describing the method of collection when that information is a part of the order. When the method of collection is logically an observation result, it should be included as a result segment.

The fourth component specifies the body site from which the specimen was obtained, and the fifth is the site modifier. For example, the site could be antecubital fossa, and the site modifier "right." The components of the CE fields become sub-components. Refer to *HL7 Table 0163 - Administrative site* for valid entries.

The sixth component indicates whether the specimen is frozen as part of the collection method. Suggested values are F (Frozen); R (Refrigerated). If the component is blank, the specimen is assumed to be at room temperature.

The 7th component indicates the role of the sample. Refer to *User-defined Table 0369 – Specimen role*

#### 13.4.9.4 TCC-4 Auto-dilution factor default (SN) 01410

```
Components:  <comparator (ST)> ^ <num1 (NM)> ^ <separator/suffix (ST)> ^ <num2 (NM)>
```

Definition: This field is the value that is to be used as the default factor for automatically diluting a specimen by an instrument for this particular test code. (See examples in definition of "Dilution factor" in the "Specimen and Container Detail Segment".)

#### 13.4.9.5 TCC-5 Rerun dilution factor default (SN) 01411

```
Components:  <comparator (ST)> ^ <num1 (NM)> ^ <separator/suffix (ST)> ^ <num2 (NM)>
```

Definition: This field is the value that is to be used as the default factor for automatically diluting a specimen in case of rerun for this particular test code.

#### 13.4.9.6 TCC-6 Pre-dilution factor default (SN) 01412

```
Components:  <comparator (ST)> ^ <num1 (NM)> ^ <separator/suffix (ST)> ^ <num2 (NM)>
```

Definition: This field is the value that is to be used as the default factor for a specimen that is delivered to the laboratory automation system as pre-diluted for this particular test code.

#### 13.4.9.7 TCC-7 Endogenous content of pre-dilution diluent (SN) 01413

Definition: This field represents a baseline value for the measured test that is inherently contained in the diluent. In the calculation of the actual result for the measured test, this baseline value is normally considered.

#### 13.4.9.8 TCC-8 Inventory limits warning level (NM) 01414

Definition: This field is the value that is to be used as the threshold for initiating inventory warning-level messages.

#### 13.4.9.9 TCC-9 Automatic rerun allowed (ID) 01415

Definition: This field identifies whether or not automatic reruns are to be initiated on specimens for this particular test code. Refer to *HL7 Table 0136 -Yes/no indicator* for valid values.

#### 13.4.9.10 TCC-10 Automatic repeat allowed (ID) 01416

Definition: This field identifies whether or not automatic repeat testing is to be initiated on specimens for this particular test code. Refer to *HL7 Table 0136 -Yes/no indicator* for valid values.

#### 13.4.9.11 TCC-11 Automatic reflex allowed (ID) 01417

Definition: This field identifies whether or not automatic or manual reflex testing is to be initiated on specimens for this particular test code. Refer to *HL7 Table 0136 -Yes/no indicator* for valid values.

#### 13.4.9.12 TCC-12 Equipment dynamic range (SN) 01418

```
Components:  <comparator (ST)> ^ <num1 (NM)> ^ <separator/suffix (ST)> ^ <num2 (NM)>
```

Definition: This is the range over which the equipment can produce results.

#### 13.4.9.13 TCC-13 Units (CE) 00574

```
Components: <identifier (ST)> ^ <text (ST)> ^ <name of coding system (IS)> ^ <alternate identifier
            (ST)> ^ <alternate text (ST)> ^ <name of alternate coding system (IS)>
```

Definition: This field is the units that have a data type of CE. The default coding system for the units codes consists of the ISO+ abbreviation for a single case unit (ISO 2955-83) plus extensions, that do not collide with ISO abbreviations (see Section 4.1). We designate this coding system as ISO+. Both the ISO unit's abbreviations and the extensions are defined in Section TBD," and listed in Figure 7-13. The ISO+ abbreviations are the codes for the default coding system. Consequently, when ISO+ units are being used, only ISO+ abbreviations need be sent, and the contents of the units field will be backward compatible to HL7 Version 2.1. For more information on this field see reference Chapter 7, Section 7.4.2.6.

These units apply to fields "Endogenous content of pre-dilution diluent" and "Equipment dynamic range".

#### 13.4.9.14 TCC-14 Processing type (CE) 01419

```
Components: <identifier (ST)> ^ <text (ST)> ^ <name of coding system (IS)> ^ <alternate identifier
            (ST)> ^ <alternate text (ST)> ^ <name of alternate coding system (IS)>
```

Definition: This field identifies the processing type that applies to this test code. If this attribute is omitted, then regular production is the default. Refer to *HL7 Table 0388 – Processing type* for valid values.

HL7 Table 0388 - Processing type

| Value | Description |
|---|---|
| P | Regular Production |
| E | Evaluation |

## 13.4.10 TCD - test code detail segment

The test code detail segment contains the data necessary to perform operations or calculations, or execute decisions by the laboratory automation system, and which are not supported by the original HL7 segments related to orders (ORC, OBR). For detail of use see messages of laboratory orders and observations in chapters 4 and 7.

HL7 Attribute Table – TCD – Test Code Detail

| SEQ | LEN | DT | OPT | RP/# | TBL# | ITEM # | ELEMENT NAME |
|---|---|---|---|---|---|---|---|
| 1 | 250 | CE | R | | | 00238 | Universal Service Identifier |
| 2 | 20 | SN | O | | | 01420 | Auto-Dilution Factor |
| 3 | 20 | SN | O | | | 01421 | Rerun Dilution Factor |
| 4 | 20 | SN | O | | | 01422 | Pre-Dilution Factor |
| 5 | 20 | SN | O | | | 01413 | Endogenous Content of Pre-Dilution Diluent |
| 6 | 1 | ID | O | | 0136 | 01416 | Automatic Repeat Allowed |
| 7 | 1 | ID | O | | 0136 | 01424 | Reflex Allowed |
| 8 | 250 | CE | O | | 0389 | 01425 | Analyte Repeat Status |

#### 13.4.10.0 TCD field definitions

#### 13.4.10.1 TCD-1 Universal service Identifier (CE) 00238

```
Components: <identifier (ST)> ^ <text (ST)> ^ <name of coding system (IS)> ^ <alternate identifier
            (ST)> ^ <alternate text (ST)> ^ <name of alternate coding system (IS)>
```

Definition: This field identifies the test code that information is being transmitted about.

#### 13.4.10.2 TCD-2 Auto-dilution factor (SN) 01420

```
Components:  <comparator (ST)> ^ <num1 (NM)> ^ <separator/suffix (ST)> ^ <num2 (NM)>
```

Definition: This field is the value that is to be used as the factor for automatically diluting a particular specimen by an instrument for this particular test code. (See examples in definition of “Dilution factor” in the “Specimen and Container Detail Segment”.)

#### 13.4.10.3 TCD-3 Rerun dilution factor (SN) 01421

```
Components:  <comparator (ST)> ^ <num1 (NM)> ^ <separator/suffix (ST)> ^ <num2 (NM)>
```

Definition: This field is the value that is to be used as the factor for automatically diluting a particular specimen in case of rerun for this particular test code.

#### 13.4.10.4 TCD-4 Pre-dilution factor (SN) 01422

```
Components:  <comparator (ST)> ^ <num1 (NM)> ^ <separator/suffix (ST)> ^ <num2 (NM)>
```

Definition: This field is the value that is to be used as the factor for a particular specimen that is delivered to the automated system as pre-diluted for this particular test code.

#### 13.4.10.5 TCD-5 Endogenous content of pre-dilution diluent (SN) 01413

```
Components:  <comparator (ST)> ^ <num1 (NM)> ^ <separator/suffix (ST)> ^ <num2 (NM)>
```

Definition: This field represents the rest concentration of the measured test in the diluent. It is the value that is to be used for calculation of the concentration of pre-diluted specimens for this particular test code.

#### 13.4.10.6 TCD-6 Automatic repeat allowed (ID) 01416

Definition: This field identifies whether or not automatic repeats are to be initiated for this particular specimen for this particular test code. Refer to *HL7 Table 0136 -Yes/no indicator* for valid values.

#### 13.4.10.7 TCD-7 Reflex allowed (ID) 01424

Definition: This field identifies whether or not automatic or manual reflex testing is to be initiated for this particular specimen. Refer *to HL7 Table 0136 -Yes/no indicator* for valid values

#### 13.4.10.8 TCD-8 Analyte repeat status (CE) 01425

```
Components: <identifier (ST)> ^ <text (ST)> ^ <name of coding system (IS)> ^ <alternate identifier
            (ST)> ^ <alternate text (ST)> ^ <name of alternate coding system (IS)>
```

Definition: This field identifies the repeat status for the analyte/result (e.g. original, rerun, repeat, reflex). Refer to *HL7 Table 0389 – Analyte repeat status* for valid values.

For purpose of this chapter we assume the following:

Repeated test without dilution — performed usually to confirm correctness of results (e.g., in case of results flagged as “Panic” or mechanical failures).

Repeated test with dilution — performed usually in the case the original result exceeded the measurement range (technical limits).

Reflex test — this test is performed as the consequence of rules triggered based on other test result(s)

HL7 Table 0389 - Analyte repeat status

| Value | Description |
|---|---|
| O | Original, first run |
| R | Repeated without dilution |
| D | Repeated with dilution |
| F | Reflex test |

## 13.4.11 SID – substance identifier segment

The Substance Identifier segment contains data necessary to identify the substance (e.g., reagents) used in the production of analytical test results. The combination of these fields must uniquely identify the substance, i.e., depending on the manufacturer all or some fields are required (this is the reason the

optionality is 'C' (conditional)). If the analysis requires multiple substances, this segment is repeated for each substance. The segment(s) should be attached to the TCD segment.

Another purpose of this segment is to transfer the control manufacturer, lot, etc. information for control specimens. In this case the SID segment should be attached to the SAC segment describing the container with the control specimen.

HL7 Attribute Table – SID – Substance Identifier

| SEQ | LEN | DT | OPT | RP/# | TBL# | ITEM # | ELEMENT NAME |
|---|---|---|---|---|---|---|---|
| 1 | 250 | CE | C | | | 01426 | Application / Method Identifier |
| 2 | 20 | ST | C | | | 01129 | Substance Lot Number |
| 3 | 200 | ST | C | | | 01428 | Substance Container Identifier |
| 4 | 250 | CE | C | | 0385 | 01429 | Substance Manufacturer Identifier |

#### 13.4.11.0 SID field definitions

#### 13.4.11.1 SID-1 Application / method identifier (CE) 01426

```
Components: <identifier (ST)> ^ <text (ST)> ^ <name of coding system (IS)> ^ <alternate identifier
            (ST)> ^ <alternate text (ST)> ^ <name of alternate coding system (IS)>
```

Definition: This field identifies the application / method used for the analysis.

Example: GLUCOSE is an orderable test. GLUCOSE can be analyzed using various applications / methods, which have manufacturer specific identifiers.

#### 13.4.11.2 SID-2 Substance lot number (ST) 01129

Definition: This field specifies the lot number assigned by the manufacturer during production of the substance.

#### 13.4.11.3 SID-3 Substance container identifier (ST) 01428

Definition: This field specifies the container assigned by the manufacturer during production of the substance. This identifier should be unique within specific lot of specific application / method.

#### 13.4.11.4 SID-4 Substance manufacturer identifier (CE) 01429

```
Components: <identifier (ST)> ^ <text (ST)> ^ <name of coding system (IS)> ^ <alternate identifier
            (ST)> ^ <alternate text (ST)> ^ <name of alternate coding system (IS)>
```

Definition: This field identifies the manufacturer of this substance. Refer to *User-defined Table 0451 - Manufacturer identifier* for suggested values.

### 13.4.12 EQP - equipment log/service segment

The equipment log/service segment is the data necessary to maintain an adequate audit trail of events that have occurred on a particular piece of equipment.

HL7 Attribute Table – EQP – Equipment/log Service

| SEQ | LEN | DT | OPT | RP/# | TBL# | ITEM # | ELEMENT NAME |
|---|---|---|---|---|---|---|---|
| 1 | 250 | CE | R | | 0450 | 01430 | Event type |
| 2 | 20 | ST | O | | | 01431 | File Name |
| 3 | 26 | TS | R | | | 01202 | Start Date/Time |
| 4 | 26 | TS | O | | | 01432 | End Date/Time |
| 5 | 65536 | FT | R | | | 01433 | Transaction Data |

13.4.12.0 EQP field definitions

13.4.12.1 EQP-1 Event type (CE) 01430

```
Components: <identifier (ST)> ^ <text (ST)> ^ <name of coding system (IS)> ^ <alternate identifier
            (ST)> ^ <alternate text (ST)> ^ <name of alternate coding system (IS)>
```

Definition: This field identifies the type of event of the message. Refer to *HL7 Table 0450 – Event type* for valid values.

HL7 Table 0450-Event type

| Value | Description |
|---|---|
| LOG | Log Event |
| SER | Service Event |

13.4.12.2 EQP-2 File name (ST) 01431

Definition: This field is the physical file name that is being used to store information about the transmitted log and/or service event.

13.4.12.3 EQP-3 Start date/time (TS) 01202

Definition: This field is the date/time that the event started.

13.4.12.4 EQP-4 End date/time (TS) 01432

Definition: This field is the date/time that the event was completed.

13.4.12.5 EQP-5 Transaction data (FT) 01433

Definition: This field is the data that the log and/or service event was about and is to be logged.

# 13.5 NOTES REGARDING USAGE

## 13.5.1 Other required original HL7 messages

The transaction for synchronization of system clocks must be supported by all equipment as receiver. The master (sender) of the time is either the LAS computer or the LIS.

## 13.5.2 Transfer of laboratory test orders and results

For the transfer of laboratory automation orders and results refer to *4.2.6 OML - laboratory order message (event O21)* instead of ORM and *7.2.2 ORL – unsolicited laboratory observation message (event O20)* instead of ORU.

### 13.5.3 Transfer of QC results

Use the 7th component of *OBR-15-specimen source* or *SAC-6 -specimen source* to indicate that this is a control specimen. Use *SAC-3-container identifier* for the identification of a control specimen container. The SID segment appended to this SAC segment specifies the manufacturer, lot identifiers, etc. for the control specimen.

The identification of the instrument performing the QC measurement, should be transferred with the *OBX-18-equipment instance identifier*), the measurement data/time with *the OBX-19 date/time of the analysis*.

### 13.5.4 Query for order information – triggers for download of test orders

There is no specific query for laboratory order information. Instead, the order information should be downloaded to the LAS either unsolicited (based on LIS internal triggers such as Sample Collected or Order Entered) or after an implicit trigger such as Sample Status Update – sample identified by the LAS.

### 13.5.5 Transfer of additional information for automated processing

Instruments requiring additional information for performing of automated processing based on automatic validation, such as Expected Date of Birth (Delivery Date), Menstrual Status, History of Medication Use, should consider using OBX segments and LOINC codes. For example, the LOINC code for Delivery Date is 11778-8, Menstrual status is 8678-5, History of Medication Use is 10160-0.Example Messages

### 13.5.6 Laboratory order message

Laboratory order with multiple containers and multiple test orders related to each container.

```
MSH|^~\&|INSTPROG|AUTINST|LASPROG|LASSYS|19980630080040|SECURITY
    |OML^O21|MSG00001|P|2.4|<cr>

PID|1||28514753||Joan^Howard^J||196303241225|F<CR>

SAC|991912376^EXTLAB|01039421^THISLAB|092321A^LAS|092321^LAS||SER
    |19980620080037|U^UNKNOWN<cr>

ORC|NW|5212400021A||||^^^^^R<CR>

OBR|1|5212400021A||2951-2^SODIUM^LN|||199808101444||||A|||SER<CR>

ORC|NW|5212400021A||||^^^^^R<CR>

OBR|1|5212400021A||2000-8^CALCIUM.TOTAL^LN|||199808101444||||A|||XXX<CR>

SAC|991912376^EXTLAB|01039421^THISLAB|092321B^LAS|092321^LAS||SER
    |19980620080037|U^UNKNOWN<cr>

ORC|NW|5212400021A||||^^^^^R<CR>

OBR|1|5212400021A||4064-2^TRAZODONE^LN|||199808101444||||A|||SER<CR>

ORC|NW|5212400021A||||^^^^^R<CR>

OBR|1|5212400021A||3042-9^TRICHLOROETHANOL^LN|||199808101444||||A|||SER<CR>
```

Laboratory order with test order requiring multiple containers (1st with special treatment, 2nd without).

```
MSH|^~\&|INSTPROG|AUTINST|LASPROG|LASSYS|19980630080040|SECURITY
    |OML^O21|MSG00001|P|2.4|<cr>

PID|1||28514753||Joan^Howard^J||196303241225|F<CR>

ORC|NW|5212400021A||||^^^^^R<CR>

OBR|1|5212400021A||11054-4^CHOLESTEROL.LDL/CHOLESTEROL.HDL^LN||
    |199808101444||||A|||XXX<CR>

SAC|991912376^EXTLAB|01039421^THISLAB|092321T^LAS|092321^LAS||ORH
    |19980620080037|I^IDENTIFIED|R5^5_HOLE_RACK|120|1||||BUF1^IN BUFFER 1
    ||||||||||||||^1^:^1|LDLP<cr>
```

```
SAC|991912376^EXTLAB|01039421^THISLAB|092321A^LAS|092321^LAS||SER
    |19980620080037|I^IDENTIFIED|R5^5_HOLE_RACK|732|3||||BUF1^IN BUFFER 1
    |||||||||||||^1^:^1<cr>
```

Laboratory order with test order with previous result, where patient data did not change.

```
MSH|^~\&|INSTPROG|AUTINST|LASPROG|LASSYS|19980630080040|SECURITY
    |OML^O21|MSG00001|P|2.4|<cr>

PID|1||28514753||Joan^Howard^J||196303241225|F<CR>

SAC|991912376^EXTLAB|01039421^THISLAB|092321A^LAS|092321^LAS||BLDV
    |19980620080037|U^UNKNOWN<cr>

ORC|NW|5212400021A|||||^^^^^R<CR>

OBR|1|5212400021A||2951-2^SODIUM^LN|||199808101444||||A||||SER<CR>

ORC|RE|5212498721A|||||^^^^^R<CR>

OBR|1|5212498721A||2951-2^SODIUM^LN|||199807240826|||||||SER<CR>

OBX|1|NM|2951-2^SODIUM^LN||24.3|ug/g||N<CR>
```

## 13.5.7 Unsolicited laboratory observation message

Analysis results related to a particular container with patient sample.

```
MSH|^~\&|INSTPROG|AUTINST|LASPROG|LASSYS|19980630080040|SECURITY
    |OUL^R21|MSG00001|P|2.4|<cr>

PID|1||28514753||Joan^Howard^J||196303241225|F<CR>

SAC|991912376^EXTLAB|01039421^THISLAB|092321A^LAS|092321^LAS||SER
    |19980620080037|R^PROCESS COMPLETED<cr>

ORC|RE|5212498721A|||||^^^^^R<CR>

OBR|1|5212498721A||2951-2^SODIUM^LN|||199807240826|||||||SER<CR>

OBX|1|NM|2951-2^SODIUM^LN||24.3|ug/g||N<CR>
```

Analysis results related to a particular container with QC sample and the lot and manufacturer information about this sample (see use of SAC-SID segments).

```
MSH|^~\&|INSTPROG|AUTINST|LASPROG|LASSYS|19980630080040|SECURITY
    |OUL^R21|MSG00001|P|2.4|<cr>

SAC|||Q092321^LAS|||SER^^^^^^Q |19980620080037|R^PROCESS COMPLETED<cr>

SID|01230^Na|ABCDE-01234567890||04^RD<cr>

ORC|RE|5212498721A|||||^^^^^R<CR>

OBR|1|5212498721A||2951-2^SODIUM^LN|||199807240826|||||||SER^^^^^^Q<CR>

OBX|1|NM|2951-2^SODIUM^LN||24.3|ug/g||N<CR>
```

Analysis results of a reflex test for a patient sample with basic identification data (lot, manufacturer, etc.) of the reagent involved in the results generation (see TCD-SID segments).

```
MSH|^~\&|INSTPROG|AUTINST|LASPROG|LASSYS|19980630080040|SECURITY
    |OUL^R21|MSG00001|P|2.4|<cr>

PID|1||28514753||Joan^Howard^J||196303241225|F<CR>

SAC|991912376^EXTLAB|01039421^THISLAB|092321A^LAS|092321^LAS||SER
    |19980620080037|R^PROCESS COMPLETED<cr>

ORC|RE|5212498721A|||||^^^^^R<CR>

OBR|1|5212498721A||2951-2^SODIUM^LN|||199807240826|||||||SER<CR>

OBX|1|NM|2951-2^SODIUM^LN||24.3|ug/g||N<CR>

TCD|2951-2^SODIUM^LN||||||F

SID|01230^Na|PQRST-01234567890||04^RD<cr>
```

### 13.5.8 Automated equipment status update

The chemistry analyzer 0001 was powered up directly by the operator (local control) and correctly performed the initialization process. This information is sent by the analyzer to the LAS.

```
MSH|^~\&|INSTPROG|AUTINST|LASPROG|LASSYS|19980630080040|SECURITY
    |ESU^U01|MSG00001|P|2.4|<cr>

EQU|0001^CHEMISTRYANALYZER|19980630080038|PU^POWERED_UP|L^LOCAL|N^NORMAL<cr>

ISD|123456789|IN^INIT|OK<cr>
```

### 13.5.9 Automated equipment status request

The LAS queries the chemistry analyzer 0001 for status information.

```
MSH|^~\&|LASPROG|LASSYS|INSTPROG|AUTINST|19980630080040|SECURITY
    |ESR^U02|MSG00001|P|2.4|<cr>

EQU|0001^CHEMISTRYANALYZER|19980630080038<cr>
```

### 13.5.10 Specimen status update

The chemistry analyzer 0001 recognized an aliquot container (id=092321A) with blood. This container is in a position 1 of carrier type R5 (id=120) and is located in the input buffer 1.

```
MSH|^~\&|INSTPROG|AUTINST|LASPROG|LASSYS|19980630080040|SECURITY
    |SSU^U03|MSG00001|P|2.4|<cr>

EQU|0001^CHEMISTRYANALYZER|19980630080038<cr>

SAC|991912376^EXTLAB|01039421^THISLAB|092321A^LAS|092321^LAS||BLD^BLOOD
    |19980620080037|I^IDENTIFIED|R5^5_HOLE_RACK|120|1||||BUF1^INPUT BUFFER 1<cr>
```

A pre-analytical instrument 0001 performed aliquoting and sorting operation.
(See Fig. 13-5 for visualization of positions and locations)
The carrier (id=2002) with primary/parent container (id=12345) at position 2 was transported in the location: output buffer 1, into position 4 of the output tray (id=A1203).
The aliquot container (id=12345A) was sorted into the manual transportable carrier (id=045), in row 3, column 2. This carrier is located in the sorter bed at location 4.

```
MSH|^~\&|PREANPROG|AUTPREAN|LASPROG|LASSYS|19980630080040|SECURITY
    |SSU^U03|MSG00002|P|2.4|<cr>

EQU|0001^AQS|19980630080043<cr>

SAC|991912376^EXTLAB|01039421^THISLAB|12345^LAS||||19980620080039|R^COMPLETED
    |R3^3_HOLE_RACK|2002|1|OT^OUTPUTTRAY|A1203^AQSTRAY|4|OB1^OUTPUTBUFFER<cr>

SAC|991912376^EXTLAB|01039421^THISLAB|12345A^LAS|12345^LAS|||19980620080039
    |R^COMPLETED|R14^14_HOLE_RACK|045|3^2|||AQSBED||||||2|0.5||ml<cr>
```

### 13.5.11 Specimen status request

The chemistry analyzer 0001 queries the LAS for status of specimen/container (id=092321A).

```
MSH|^~\&|LASPROG|LASSYS|INSTPROG|AUTINST|19980630080040|SECURITY
    |SSR^U04|MSG00001|P|2.4|<cr>

EQU|0001^CHEMISTRYANALYZER|19980630080038<cr>

SAC|991912376^EXTLAB|01039421^THISLAB|092321A^LAS||||199806200823<cr>
```

### 13.5.12 Automated equipment inventory update

The chemistry analyzer 0001 sends to the LAS the status of a TSH reagent (id=MF01239) in bottle (id=12345).

```
MSH|^~\&|INSTPROG|AUTINST|LASPROG|LASSYS|19980630080040|SECURITY
    |INU^U05|MSG00001|P|2.4|<cr>
```

```
EQU|0001^CHEMISTRYANALYZER|19980630080038<cr>

INV|MF01239^REAGENT1|OK^OK_STATUS|SR^SINGLE_TEST_REAGENT
    |12345^BOTTLE_NUM|||||190||ML|20000101||^^D60|TSH|A12345678|PROD1<cr>
```

## 13.5.13 Automated equipment inventory request

The LAS queries the chemistry analyzer 0001 for status of all packages of the substance (id=MF01239).

```
MSH|^~\&|LASPROG|LASSYS|INSTPROG|AUTINST|19980630080040|SECURITY
    |INR^U06|MSG00001|P|2.4|<cr>

EQU|0001^CHEMISTRYANALYZER|19980630080038<cr>

INV|MF01239^REAGENT1|OK^OK_STATUS<cr>
```

## 13.5.14 Automated equipment command

The LAS sends command of “Clearing Notification” to the chemistry analyzer 0001.

```
MSH|^~\&|LASPROG|LASSYS|INSTPROG|AUTINST|19980630080040|SECURITY
    |EAC^U07|MSG00001|P|2.4|<cr>

EQU|0001^CHEMISTRYANALYZER|19980630080038<cr>

ECD|89421|CN^CLEAR NOTIFICATION|Y^YES<cr>

CNS|1209|1500|199806010800|199806300800<cr>
```

## 13.5.15 Automated equipment response

The chemistry analyzer confirms completion of the execution of the initialization command.

```
MSH|^~\&|INSTPROG|AUTINST|LASPROG|LASSYS|19980630080040|SECURITY
    |EAR^U08|MSG00001|P|2.4|<cr>

EQU|0001^CHEMISTRYANALYZER|19980630080038<cr>

ECD|89421|IN^INIT|Y^YES<cr>

ECR|OK^COMMAND_COMPLETE|19980630080035<cr>
```

## 13.5.16 Automated equipment notification

The chemistry analyzer sends a notification (warning) about drift in the detection unit.

```
MSH|^~\&|INSTPROG|AUTINST|LASPROG|LASSYS|19980630080040|SECURITY
    |EAN^U09|MSG00001|P|2.4|<cr>

EQU|0001^CHEMISTRYANALYZER|19980630080038<cr>

NDS|8923|199806300800|W^WARNING^|DU001^DETECTIO UNIT DRIFT<cr>
```

## 13.5.17 Automated equipment test code settings update

The LAS send update of configuration parameters for Glucose test.

```
MSH|^~\&|LASPROG|LASSYS|INSTPROG|AUTINST|19980630080040|SECURITY
    |TCU^U10|MSG00001|P|2.4|<cr>

EQU|0001^CHEMISTRYANALYZER|19980630080038<cr>

TCC|15074-8^GLUCOSE|GLU-HK^CHEMISTRYANALYZER|SER^SERUM|10|10|0|0|500|
    Y^YES|Y^YES|N^NO  |^2^-^400|mg/dL|P<cr>
```

## 13.5.18 Automated equipment test code settings request

The chemistry analyzer 0001 queries the LAS for configuration parameters of the Glucose test.

```
MSH|^~\&|INSTPROG|AUTINST|LASPROG|LASSYS|19980630080040|SECURITY
    |TCR^U11|MSG00001|P|2.4|<cr>

EQU|0001^CHEMISTRYANALYZER|19980630080038<cr>
```

```
TCC|15074-8^GLUCOSE|GLU-HK^CHEMISTRYANALYZER<cr>
```

### 13.5.19 Automated equipment log/service update

The chemistry analyzer 0001 sends 1 record from the event log to the LAS.

```
MSH|^~\&|INSTPROG|AUTINST|LASPROG|LASSYS|19980630080040|SECURITY
     |LSU^U12|MSG00001|P|2.4|<cr>

EQU|0001^CHEMISTRYANALYZER|19980630080038<cr>

EQP|LOG^LOG_EVENT||199806300755|199806300800|I976 Instrument Initialization<cr>
```

### 13.5.20 Automated equipment log/service request

The LAS queries chemistry analyzer for log file of events occurring between 7am and 8am on 30th June 1998.

```
MSH|^~\&|LASPROG|LASSYS|INSTPROG|AUTINST|19980630080040|SECURITY
     |LSR^U13|MSG00001|P|2.4|<cr>

EQU|0001^CHEMISTRYANALYZER|19980630080038<cr>

EQP|LOG^LOG_EVENT||199806300700|199806300800<cr>
```

## 13.6 OUTSTANDING ISSUES

None.