ELI Electrocardiographs
ELI Link 4.11
DICOM Conformance Statement

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Revision History			
Rev	**Date**	**Revised By**	**Revision Notes**
-	5/18/2006	Barry Brown	Document originated.
1	6/2/2006	Barry Brown	First issue of document.
2	9/26/2007	Tim Doniere	Updated series and instance UID creation. Updated private tags. Updated table 3.2.1.3.1.3-1. Updated Section 3.2.1.3.1.3 to include new private tags. Updated Table 3.2.1.3.2.2 with new tags.
3	9/2/2008	Tim Doniere	Fixed Table 3.2.1.3.2.2 “Text description of medication” tag number to (0040,A160). Removed “e.g.” from Value for tag (0008,1090) in Table 3.2.1.3.2.2. Added Ethnic Group tag (0010,2160) with list of possible values to the Patient Module in Table 3.2.1.1.2.2. Added list of possible values to “Regular Medication” tag (0040,A160) in Table 3.2.1.1.2.2. Added “5000” as possible value for Number of Waveform Samples Tag (003A,0010) in Table 3.2.1.1.2.2. Added “500” as possible value for Sampling Frequency Tag (003A,001A) in Table 3.2.1.1.2.2. Fixed Value description for Filter Low Frequency Tag (003A, 0220) in Table 3.2.1.1.2.2. Fixed Value description for Filter High Frequency Tag (003A, 0221) in Table 3.2.1.1.2.2.
4	1/19/2009	Tim Doniere	Added Institution Name and User Specified tags to Table 3.2.1.3.1.3-1: Supported Matching Elements as SCU for MWL C-FIND. Added Modality, Time Zone Offset From UTC, Patient’s Age, Ethnic Group, Patient’s Size, Patient’s Weight, Other Patient IDs, Patient’s Institution Residence, Visit Comments, Reason For The Requested Procedure, Requesting Physician, Admission ID and Institution Name tags to Table 3.2.1.3.1.3-1: Elements Used from MWL C-FIND. Changed “Secondary ID” to “Patient Second ID” in Table 3.2.1.3.2.2. Removed “or unvalued” and “or not included” from Table 3.2.1.3.2.2. Added “or “15”” to Number of Waveform Channels and Channel definition Sequence” in Table 3.2.1.3.2.2. Added Leads V7, V8, V9, V3R, V4R, E1, E2, E3 to Code Value and Code Meaning tags in the Waveform Sequence in Table 3.2.1.3.2.2. Added “5.4.5-33-1-6" or "5.4.5-33-1-2” to the Code Value and Code Meaning tags in the Acquisition Context in Table 3.2.1.3.2.2. Changed “Automatic” to “Machine” in the Waveform Annotation section in Table 3.2.1.3.2.2. Added “Manual Interpretation Statements” (Group = 4), “Manual Global Measurements” (Group = 5) and “Manual Median Beat Fiducial Markers” (Group = 6) to the Waveform Annotation section in Table 3.2.1.3.2.2. Added “Admission ID”, “Order Number”, “Machine ID - Acquiring Device”, “Machine ID - Analyzing Device”, “Acquiring Device Info”,

			"Analyzing Device Info", "ECG Lead Definition" and "Pulse Oximetry Data" tags to Additional Attributes section in Table 3.2.1.3.2.2.
5	6/16/2009	Tim Doniere	Changed Manual Interpretation Statements Annotation Group Number to 6. Changed Manual Global Measurements Annotation Group Number to 4. Changed Manual Median Beat Fiducial Markers Annotation Group Number to 5.
6	1/19/2010	Tim Doniere	Added Device Serial Number (0018,1000) to General Equipment Module in Table 3.2.1.3.2.2. Added the Specific Character Set attribute (0008, 0005) to the SOP Common Module in Table 3.2.1.3.2.2.
7	6/14/2010	Tim Doniere	Added note in Table 3.2.1.3.2.2 that the Ethnic Group tag will not be present if the custom ID does not contain the Race field. Added Study Description (0008,1030) tag to Table 3.2.1.3.1.3-2. Added Study Description (0008,1030) tag to the General Study module in Table 3.2.1.3.2.2. Updated ECG Lead Definition (1455,100D) tag in Table 3.2.1.3.2.2 to describe WAM indication bit.
8	2/15/2013	Mark Knudtson	Added value representation definitions. Added Scheduled Procedure Step Location (0040,0011) and Requested Procedure Description (0032,1060) to modality work list and storage. Added Initials (1455,1010), Visit (1455,1011), Demographic Layout (1455,1012), Device Information (1455,1013), Alert Criteria (1455,1014), User List 1 (1455,1015), User List 2 (1455,1016), and User List 3 (1455,1017) to private block storage. Added private block value representations. Added UniPro and UniPro32 only indications for specific private block tags.
9	9/24/2013	Scott Dorsey	Added QTcB (2:15880), QTcF (2:15892) and VRate (5.10.2.5-1)
10	1/24/14	Scott Dorsey, Rich Fronek	Added ELI Link software version (1455,1018)

Approvals		
Title	**Name**	**Signature and Date**
Sr. VP Global Engineering	Johan de Bie	
Product Manager	Barry Brown	

1 Conformance Statement Overview

Mortara ELI electrocardiographs with the *DICOM Communications Option* are able to receive ECG orders using DICOM modality worklist and store acquired ECGs as DICOM 12-lead ECG Waveform objects. The table below gives a list of DICOM services supported by the ELI electrocardiograph:

1.1 Network Services

Table 1.1: ELI DICOM Network Services Supported

DICOM SOP Class Name	User of Service (SCU)	Provider of Service (SCP)
Verification		
Verification SOP Class	Yes	No
Transfer		
12-lead ECG Waveform Storage	Yes	No
Workflow Management		
Modality Worklist Information Model – FIND	Yes	No

1.2 Media Services

The ELI electrocardiograph does not support any DICOM media services.

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2 Introduction

2.1 Audience

This document is the DICOM Conformance Statement for the ELI XXX electrocardiographs having the *DICOM Communications Option*. It is intended for hospital staff, health system integrators, software designers or implementers. It is assumed that the reader has a working understanding of DICOM.

2.2 Remarks

None.

2.3 Definitions, Terms and Abbreviations

VR – Value Representations

Value Representations Table

Name	Description	Length
DS	Decimal String	16 Bytes Maximum
LO	Long String	64 Bytes Maximum
OB	Other Byte String	Unlimited
OW	Other Word String	Unlimited
SH	Short String	16 Bytes Maximum
US	Unsigned Short	2 Bytes Fixed

2.4 References

None.

3 Networking

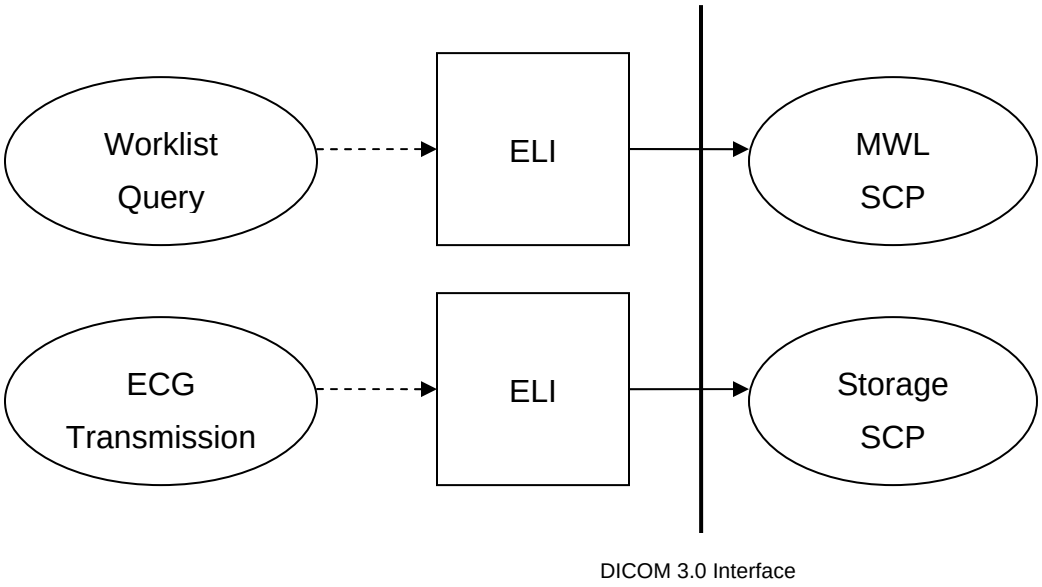
3.1 Implementation Model

3.1.1 Application Dataflow Diagram

The operator of an ELI electrocardiograph initiates a Modality Worklist query when an up-to-date list is needed. This, in turn, causes a Modality Worklist query to the configured Modality Worklist SCP.

When one or more ECGs have been acquired, the operator of an ELI electrocardiograph initiates a single or batch ECG transmission. This, in turn, causes one or more 12-lead ECG Waveform objects to be stored into the configured Storage SCP.

Figure 3.1.1: ELI DICOM Network Dataflow Diagram



3.1.2 Functional Definitions of Application Entities

3.1.2.1 Functional Definition of *ELI* Application Entity

The operator of an ELI electrocardiograph can choose to retrieve an up-to-date worklist to the electrocardiograph. When the operator initiates this function, the electrocardiograph prompts the operator for a query code. This query code can be mapped to any number of Modality Worklist query fields. (Please see the *3.2.1.3.1.3 SOP Specific Conformance for Modality Worklist* section for a list of available DICOM fields that can be mapped to the query code or configured with fixed values.) After entering the query code, the operator initiates the retrieval, and the Modality Worklist service provider is queried for the Modality Worklist using the query code as a filter. The returned list of work items is cached on the

electrocardiograph and can be displayed to the operator when a new ECG recording is initiated.

After acquiring one or more ECGs, the operator can initiate a single or batch transmission of ECGs. This causes the ELI electrocardiograph to store each ECG into the configured storage SCP. Each ECG is stored as a 12-lead ECG Waveform object.

3.1.3 Sequencing of Real-World Activities

3.2 AE Specifications

3.2.1 *ELI* Application Entity

3.2.1.1 SOP Classes

This Application Entity provides Standard Conformance to the following SOP Classes:

Table 3.2.1.1-1: Standard SOP Classes for ELI

DICOM SOP Class Name	SOP Class UID	SCU	SCP
Verification SOP Class	1.2.840.10008.1.1	Yes	No
Modality Worklist Information Model – FIND	1.2.840.10008.5.1.4.31	Yes	No

This Application Entity provides Standard Extended Conformance to the following SOP Classes:

Table 3.2.1.1-2: Standard Extended SOP Classes for ELI

DICOM SOP Class Name	SOP Class UID	SCU	SCP
12-lead ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.1	Yes	No

3.2.1.2 Association Policies

3.2.1.2.1 General

The standard Application Context Name is used:

Table 3.2.1.2.1: DICOM Application Context

Application Context Name	1.2.840.10008.3.1.1.1

3.2.1.2.2 Number of Associations

Table 3.2.1.2.2-1: Number of Associations as an Association Initiator for ELI

Maximum number of simultaneous associations	16

Table 3.2.1.2.2-2: Number of Associations as an Association Acceptor for ELI

Maximum number of simultaneous associations	0

3.2.1.2.3 Asynchronous Nature

Table 3.2.1.2.3: Asynchronous Nature as an Association Initiator for ELI

Maximum number of outstanding asynchronous transactions	1

3.2.1.2.4 Implementation Identifying Information

Implementation Class UID	2.16.840.1
Implementation Version Name	MergeCOM3_351

3.2.1.3 Association Initiation Policy

3.2.1.3.1 Real-World Activity: Modality Worklist Query

3.2.1.3.1.1 Description and Sequencing of Activities

See section 3.1.2.1 for a description of the Modality Worklist Query.

3.2.1.3.1.2 Proposed Presentation Contexts

Table 3.2.1.3.1.2: Proposed Presentation Contexts for ELI

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Modality Worklist Information Model – FIND	1.2.840.10008.5.1.4.31	DICOM Implicit VR Little Endian DICOM Explicit VR Little Endian DICOM Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None

3.2.1.3.1.3 SOP Specific Conformance for Modality Worklist

The following elements can be used as query fields to filter the Modality Worklist. Most fields can be mapped to the 8-character query code entered by the ELI operator or can be set to fixed values in the configuration. A wildcard asterisk character (*) can be configured in any of the fields and can be added to the operator-entered query code.

Table 3.2.1.3.1.3-1: Supported Matching Elements as SCU for MWL C-FIND

Attribute Name	Tag	Comment
Accession Number	(0008,0050)	
Modality	(0008,0060)	Usually set to “ECG” to query for ECG procedures.
Patient’s Name	(0010,0010)	ELI query code can only be mapped to the patient’s last (family) name.
Patient ID	(0010,0020)	
Requested Procedure Description	(0032, 1060)	
Current Patient Location	(0038,0300)	
Scheduled Station AE Title	(0040,0001)	
Scheduled Procedure Step Start Date	(0040,0002)	ELI query code can not be mapped to this. This is specified as a range of dates relative to the current date.
Scheduled Procedure Step ID	(0040,0009)	
Scheduled Station Name	(0040,0010)	

Attribute Name	Tag	Comment
Scheduled Procedure Step Location	(0040,0011)	
Requested Procedure ID	(0040,1001)	
Requested Procedure Location	(0040,1005)	
Institution Name	(0008,0080)	
User Specified	(XXXX,XXXX)	Must be string type.

The following elements are used from the returned Modality Worklist.

Table 3.2.1.3.1.3-2: Elements Used from MWL C-FIND

Attribute Name	Tag	Comment
Modality	(0008,0060)	Not displayed. It is saved so it can be included in the DICOM object.
Study Instance UID	(0020,000D)	Not displayed. It is saved so it can be included in the DICOM object.
Referring Physician's Name	(0008,0090)	Custom ID field "Referring Physician"
Patient's Name	(0010,0010)	
Patient ID	(0010,0020)	
Patient's Birth Date	(0010,0030)	
Patient's Sex	(0010,0040)	
Accession Number	(0008,0050)	Not displayed. It is saved so it can be included in the DICOM object.
Scheduled Procedure Step Start Date	(0040,0002)	
Scheduled Procedure Step Start Time	(0040,0003)	
Time Zone Offset From UTC	(0008,0201)	
Current Patient Location	(0038,0300)	Custom ID field "Patient Location"
Patient's Age	(0010,1010)	
Ethnic Group	(0010,2160)	Custom ID field "Race"
Patient's Size	(0010,1020)	Custom ID field "Height"
Patient's Weight	(0010,1030)	Custom ID field "Weight"

Attribute Name	Tag	Comment
Other Patient IDs	(0010,1000)	Custom ID field “Patient Second ID”
Patient’s Institution Residence	(0038,0400)	Custom ID field “Room”
Visit Comments	(0038,4000)	Custom ID field “Comment”
Scheduled Procedure Step Location	(0040, 0011)	Custom ID field “Scheduled Proc Step Loc”
Reason For The Requested Procedure	(0040,1002)	Custom ID field “Reason For Procedure”
Requesting Physician	(0032,1032)	Custom ID field “Requesting Physician”
Requested Procedure Description	(0032, 1060)	Custom ID field “Requested Proc Desc”
Admission ID	(0038,0010)	Custom ID field “Admission ID”
Institution Name	(0008,0080)	Not displayed. It is saved so it can be included in the DICOM object.
Study Description	(0008,1030)	Not displayed. It is saved so it can be included in the DICOM object.

All communications failures are reported to the ELI operator as a retrieval failure.

3.2.1.3.2 Real-World Activity: Transmit ECGs

After acquiring one or more ECGs, the operator can initiate a single or batch transmission of ECGs. This causes the ELI electrocardiograph to store each ECG into the configured Storage SCP. Each ECG is stored as a 12-Lead ECG Waveform object.

3.2.1.3.2.1 Proposed Presentation Contexts

Table 3.2.1.3.2.1: Proposed Presentation Contexts for ELI

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
12-lead ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.1	DICOM Implicit VR Little Endian DICOM Explicit VR Little Endian DICOM Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None

3.2.1.3.2.2 SOP Specific Conformance for 12-lead ECG Waveform Storage

The ELI electrocardiograph creates 12-lead ECG Waveform objects with the following DICOM attributes. All attributes conform to the 12-lead ECG Waveform Storage SOP class specification. A private attribute block is included for the ELI's interpretation vector, custom ID format and the following custom ID fields: Social Security Number, Attending Physician, Procedural Diagnosis, Note1, Note2 and Order Request Number. The interpretation vector and custom ID formats are not disclosed.

Table 3.2.1.3.2.2 12-lead ECG Waveform Storage Attributes

Module	Attribute Name	Tag	Value
Patient	Patient's Name	(0010,0010)	ECG patient first and last names
	Patient ID	(0010,0020)	ECG patient id
	Patient's Birth Date	(0010,0030)	ECG birth date
	Patient's Sex	(0010,0040)	ECG patient gender
	Other Patient IDs	(0010,1000)	Custom ID field "Patient Second ID"
	Ethnic Group	(0010,2160)	Custom ID field "Race". One of the following: BLANK, Caucasian, Black, Oriental, Hispanic, American Indian, Aleut/Eskimo, Hawaiian, Pacific Islander, Mongolian, Asian, Unknown. Note: This tag will not be present if the custom ID does not contain the Race field.

Module	Attribute Name	Tag	Value
General Study	Study Instance UID	(0020,000D)	From MWL, or generated by ELI using the following components: Mortara prefix: 1.3.6.1.4.1.20029 Product code for ELI: 40 ECG acquisition date/time Cart sequence number
	Study Date	(0008,0020)	ECG acquisition date
	Study Time	(0008,0030)	ECG acquisition time
	Referring Physician's Name	(0008,0090)	ECG referring physician From MWL
	Study ID	(0020,0010)	From MWL
	Name of Physician(s) Reading Study	(0008,1060)	Custom ID field "Overreading Physician"
	Accession Number	(0008,0050)	From MWL
	Study Description	(0008,1030)	From MWL, or one of the following: "Resting 12-lead ECG" "Resting 15-lead ECG"
Patient Study	Patient's Age	(0010,1010)	ECG patient age
	Patient's Size	(0010,1020)	ECG patient height
	Patient's Weight	(0010,1030)	ECG patient weight
General Series	Modality	(0008,0060)	"ECG"
	Series Instance UID	(0020,000E)	Created using the following components: Mortara prefix: 1.3.6.1.4.1.20029 Product code for ELI: 40 ECG acquisition date/time Cart sequence number ".1"
	Series Number	(0020,0011)	From MWL
	Laterality	(0020,0060)	From MWL

Module	Attribute Name	Tag	Value
	Operator's Name	(0008,1070)	ECG technician
General Equipment	Manufacturer	(0008,0070)	"Mortara Instrument, Inc."
	Manufacturer's Model Name	(0008,1090)	Cart model name.
	Device Serial Number	(0018,1000)	Cart serial number.
	Institution Name	(0008,0080)	Institution Name.
Waveform Identification	Instance Number	(0020,0013)	"1"
	Content Date	(0008,0023)	ECG acquisition date
	Content Time	(0008,0033)	ECG acquisition time
	Acquisition Datetime	(0008,002A)	ECG acquisition date/time
Waveform	Waveform Sequence	(5400,0100)	Has 2 items, a multiplex group for rhythm data, and another for the median beat.
	>Multiplex Group Time Offset	(0018,1068)	0
	> Trigger Time Offset	(0018,1069)	0
	> Trigger Sample Position	(0018,106E)	Rhythm: not included Median: sample of "maximum power" between QRS onset and offset
	> Waveform Originality	(003A,0004)	Rhythm: "ORIGINAL" Median: "DERIVED"
	> Number of Waveform Channels	(003A,0005)	"12" or "15"
	> Number of Waveform Samples	(003A,0010)	Rhythm: "5000" or "10000" Median: up to 1200
	> Sampling Frequency	(003A,001A)	"500" or "1000"
	> Multiplex Group Label	(003A,0020)	Rhythm: "RHYTHM" Median: "MEDIAN_BEAT"
	> Channel Definition Sequence	(003A,0200)	Has 12 or 15 items, one for each lead

Module	Attribute Name	Tag	Value	
	>> Channel Source Sequence	(003A,0208)	-	
	>>> Code Value	(0008,0100)	Lead I	“5.6.3-9-1”
			Lead II	“5.6.3-9-2”
			Lead III	“5.6.3-9-61”
			Lead aVR	“5.6.3-9-62”
			Lead aVL	“5.6.3-9-63”
			Lead aVF	“5.6.3-9-64”
			Lead V1	“5.6.3-9-3”
			Lead V2	“5.6.3-9-4”
			Lead V3	“5.6.3-9-5”
			Lead V4	“5.6.3-9-6”
			Lead V5	“5.6.3-9-7”
			Lead V6	“5.6.3-9-8”
			Lead V7	"5.6.3-9-9"
			Lead V8	"5.6.3-9-66"
			Lead V9	"5.6.3-9-67"
			Lead V3R	"5.6.3-9-11"
			Lead V4R	"5.6.3-9-12"
			Lead E1	"5.6.3-9-75"
			Lead E2	"5.6.3-9-76"
			Lead E3	"5.6.3-9-77"
	>>> Coding Scheme Designator	(0008,0102)	“SCPECG”	
	>>> Code Scheme Version	(0008,0103)	“1.3”	

Module	Attribute Name	Tag	Value	
	>>> Code Meaning	(0008,0104)	Lead I	“Lead I”
			Lead II	“Lead II”
			Lead III	“Lead III”
			Lead aVR	“Lead aVR”
			Lead aVL	“Lead aVL”
			Lead aVF	“Lead aVF”
			Lead V1	“Lead V1”
			Lead V2	“Lead V2”
			Lead V3	“Lead V3”
			Lead V4	“Lead V4”
			Lead V5	“Lead V5”
			Lead V6	“Lead V6”
			Lead V7	“Lead V7”
			Lead V8	“Lead V8”
			Lead V9	“Lead V9”
			Lead V3R	“Lead V3R”
			Lead V4R	“Lead V4R”
			Lead E1	“Lead E1”
			Lead E2	“Lead E2”
			Lead E3	“Lead E3”
	>> Channel Sensitivity	(003A,0210)	ECG sensitivity, e.g. “1.25”	
	>> Channel Sensitivity Units	(003A,0211)	-	
	>>> Code Value	(0008,0100)	“uV”	
	>>> Coding Scheme Designator	(0008,0102)	“UCUM”	
	>>> Code Scheme Version	(0008,0103)	“1.4”	
	>>> Code Meaning	(0008,0104)	“microvolt”	
	>> Channel Sensitivity Correction Factor	(003A,0212)	“1”	
	>> Channel Baseline	(003A,0213)	“0”	
	>> Channel Sample Skew	(003A,0215)	“0”	
	>> Waveform Bits Stored	(003A,021A)	“16”	

Module	Attribute Name	Tag	Value
	>> Filter Low Frequency	(003A,0220)	Cutoff frequency of the high-pass baseline roll filter in Hertz, e.g. “0.05”.
	>> Filter High Frequency	(003A,0221)	Cutoff frequency of the low pass filter in Hertz, e.g. “300”.
	>> Notch Filter Frequency	(003A,0222)	ECG AC filter, e.g. “60” in United States.
	> Waveform Bits Allocated	(5400,1004)	“16”
	> Waveform Sample Interpretation	(5400,1006)	“SS”
	> Waveform Data	(5400,1010)	ECG multiplexed samples
Acquisition Context	Acquisition Context Sequence	(0040,0555)	-
	> Concept Code Name Sequence	(0040,A043)	-
	>> Code Value	(0008,0100)	“5.4.5-33-1”
	>> Coding Scheme Designator	(0008,0102)	“SCPECG”
	>> Code Scheme Version	(0008,0103)	“1.3”
	>> Code Meaning	(0008,0104)	“Electrode Placement”
	> Concept Code Sequence	(0040,A168)	-
	>> Code Value	(0008,0100)	“5.4.5-33-1-1”, “5.4.5-33-1-6" or "5.4.5-33-1-2”
	>> Coding Scheme Designator	(0008,0102)	“SCPECG”
	>> Code Scheme Version	(0008,0103)	“1.3”
	>> Code Meaning	(0008,0104)	"Standard 12-lead positions: limb leads placed at extremities", "12-lead ECG derived from non-standard leads (pediatric)" or "Mason-Likar positions: limb leads placed on the torso"
	>Measurement Units Code Sequence	(0040,08EA)	Present if systolic blood pressure is included in the custom ID
	>>Code Value	(0008,0100)	“mmHg”

Module	Attribute Name	Tag	Value
	>>Coding Scheme Designator	(0008,0102)	“UCUM”
	>>Code Meaning	(0008,0104)	“millimeters Hg”
	>>Coding Scheme Version	(0008,0103)	“1.4”
	>Concept Name Code Sequence	(0040,A043)	-
	>>Code Value	(0008,0100)	“F-008EC”
	>>Coding Scheme Designator	(0008,0102)	“SRT”
	>>Code Meaning	(0008,0104)	“Systolic Blood Pressure”
	>Numeric Value	(0040,A30A)	Systolic Blood Pressure Value
	>Value Type	(0040,A040)	“NUM”
	>Measurement Units Code Sequence	(0040,08EA)	Present if diastolic blood pressure is included in the custom ID
	>>Code Value	(0008,0100)	“mmHg”
	>>Coding Scheme Designator	(0008,0102)	“UCUM”
	>>Code Meaning	(0008,0104)	“millimeters Hg”
	>>Coding Scheme Version	(0008,0103)	“1.4”
	>Concept Name Code Sequence	(0040,A043)	-
	>>Code Value	(0008,0100)	“F-008ED”
	>>Coding Scheme Designator	(0008,0102)	“SRT”
	>>Code Meaning	(0008,0104)	“Diastolic Blood Pressure”
	>Numeric Value	(0040,A30A)	Diastolic Blood Pressure Value
	>Value Type	(0040,A040)	“NUM”
	>Concept Name Code Sequence	(0040,A043)	Present if medication is included in the custom ID. One item for each medication.

Module	Attribute Name	Tag	Value
	>>Code Value	(0008,0100)	“G-02D0”
	>>Coding Scheme Designator	(0008,0102)	“SRT”
	>>Code Meaning	(0008,0104)	“Regular Medication”
	>Text Value	(0040,A160)	Text description of medication. One of the following: BLANK, Digitalis, Beta blocker, Quinidine/Norpace, Diuretic, Calcium antagonist, Proc/Lido/Tocainide, Other antiarrhythmic, Psychotropic, Unknown
Waveform Annotation	Waveform Annotation Sequence	(0040,B020)	-
	Machine Interpretation Statements Annotation Group Number = 0 One item per interpretation statement		
	> Unformatted Text Value	(0070,0006)	Interpretation statement text
	> Referenced Waveform Channels	(0040,A0B0)	“0001 0000”
	> Annotation Group Number	(0040,A180)	“0”
	Machine Global Measurements Annotation Group Number = 1 One item per measurement		
	> Concept Code Name Sequence	(0040,A043)	-

Module	Attribute Name	Tag	Value	
	>> Code Value	(0008,0100)	RR Interval PP Interval PR Interval QRS Duration QT Interval QTc Interval P Axis QRS Axis T Axis QTc Bazett QTc Fredericia Ventricular Heart Rate	“5.10.2.1-3” "5.10.2.1-5" "5.13.5-7" "5.13.5-9" "5.13.5-11" "5.10.2.5-5" "5.10.3-11" "5.10.3-13" "5.10.3-15" "2:15880" "2:15892" "5.10.2.5-1"
	>> Coding Scheme Designator	(0008,0102)	“SCPECG”	
	>> Code Scheme Version	(0008,0103)	“1.3”	
	>> Code Meaning	(0008,0104)	RR Interval PP Interval PR Interval QRS Duration QT Interval QTc Interval P Axis QRS Axis T Axis QTc Bazett QTc Fredericia Ventricular Heart Rate	“RR Interval” “PP Interval” “PR Interval” “QRS Duration” “QT Interval” “QTc Interval” “P Axis” “QRS Axis” “T Axis” "QTc Bazett" "QTc Fredericia" "Ventricular Heart Rate"
	> Numeric Value	(0040,A30A)	Measurement value	
	> Measurement Units Code Sequence	(0040,08EA)	-	

Module	Attribute Name	Tag	Value	
	>> Code Value	(0008,0100)	RR Interval PP Interval PR Interval QRS Duration QT Interval QTc Interval P Axis QRS Axis T Axis QTc Bazett QTc Fredericia Ventricular Heart Rate	“ms” “ms” “ms” “ms” “ms” “ms” “deg” “deg” “deg” "ms" "ms" "BPM"
	>> Coding Scheme Designator	(0008,0102)	“UCUM”	
	>> Code Scheme Version	(0008,0103)	“1.4”	
	>> Code Meaning	(0008,0104)	RR Interval PP Interval PR Interval QRS Duration QT Interval QTc Interval P Axis QRS Axis T Axis QTc Bazett QTc Fredericia Ventricular Heart Rate	“millisecond” “millisecond” “millisecond” “millisecond” “millisecond” “millisecond” “degree” “degree” “degree” “millisecond” “millisecond” beats/min
	> Referenced Waveform Channels	(0040,A0B0)	“0001 0000”	
	> Annotation Group Number	(0040,A180)	“1”	

Module	Attribute Name	Tag	Value	
	Machine Median Beat Fiducial Markers Annotation Group Number = 2 One item per marker			
	> Concept Code Name Sequence	(0040,A043)	-	
	>> Code Value	(0008,0100)	P Onset P Offset QRS Onset Fiducial Point QRS Offset T Offset	"5.10.3-1" "5.10.3-2" "5.10.3-3" "5.7.1-3" "5.10.3-4" "5.10.3-5"
	>> Coding Scheme Designator	(0008,0102)	“SCPECG”	
	>> Code Scheme Version	(0008,0103)	“1.3”	
	>> Code Meaning	(0008,0104)	P Onset P Offset QRS Onset Fiducial Point QRS Offset T Offset	“P Onset” “P Offset” “QRS Onset” “Fiducial Point” “QRS Offset” “T Offset”
	> Referenced Sample Positions	(0040,A132)	Sample position of fiducial marker	
	>Temporal Range Type	(0040,A130)	“POINT”	
	> Referenced Waveform Channels	(0040,A0B0)	“0001 0000”	
	> Annotation Group Number	(0040,A180)	“2”	
	Pacemaker Spike Markers Annotation Group Number = 3 One item per marker			
	> Concept Code Name Sequence	(0040,A043)	-	
	>> Code Value	(0008,0100)	“5.10.1.2”	

Module	Attribute Name	Tag	Value
	>> Coding Scheme Designator	(0008,0102)	“SCPECG”
	>> Code Scheme Version	(0008,0103)	“1.3”
	>> Code Meaning	(0008,0104)	“Pacemaker spike”
	> Referenced Sample Positions	(0040,A132)	Sample position of detected pacemaker spike
	> Referenced Waveform Channels	(0040,A0B0)	“0001 0000”
	> Annotation Group Number	(0040,A180)	“3”
	Manual Global Measurements Annotation Group Number = 4 One item per measurement		
	> Concept Code Name Sequence	(0040,A043)	-
	>> Code Value	(0008,0100)	RR Interval PP Interval PR Interval QRS Duration QT Interval QTc Interval P Axis QRS Axis T Axis
	>> Coding Scheme Designator	(0008,0102)	“SCPECG”
	>> Code Scheme Version	(0008,0103)	“1.3”

Module	Attribute Name	Tag	Value
	>> Code Meaning	(0008,0104)	RR Interval PP Interval PR Interval QRS Duration QT Interval QTc Interval P Axis QRS Axis T Axis
	> Numeric Value	(0040,A30A)	Measurement value
	> Measurement Units Code Sequence	(0040,08EA)	-
	>> Code Value	(0008,0100)	RR Interval PP Interval PR Interval QRS Duration QT Interval QTc Interval P Axis QRS Axis T Axis
	>> Coding Scheme Designator	(0008,0102)	“UCUM”
	>> Code Scheme Version	(0008,0103)	“1.4”
	>> Code Value	(0008,0100)	RR Interval PP Interval PR Interval QRS Duration QT Interval QTc Interval P Axis QRS Axis T Axis

Module	Attribute Name	Tag	Value
	>> Coding Scheme Designator	(0008,0102)	“UCUM”
	>> Code Scheme Version	(0008,0103)	“1.4”
	>> Code Meaning	(0008,0104)	RR Interval PP Interval PR Interval QRS Duration QT Interval QTc Interval P Axis QRS Axis T Axis
	> Referenced Waveform Channels	(0040,A0B0)	“0001 0000”
	> Annotation Group Number	(0040,A180)	“4”
	Manual Median Beat Fiducial Markers Annotation Group Number = 5 One item per marker		
	> Concept Code Name Sequence	(0040,A043)	-
	>> Code Value	(0008,0100)	P Onset P Offset QRS Onset Fiducial Point QRS Offset T Offset
	>> Coding Scheme Designator	(0008,0102)	“SCPECG”
	>> Code Scheme Version	(0008,0103)	“1.3”

Module	Attribute Name	Tag	Value	
	>> Code Meaning	(0008,0104)	P Onset P Offset QRS Onset Fiducial Point QRS Offset T Offset	
	> Referenced Sample Positions	(0040,A132)	Sample position of fiducial marker	
	>Temporal Range Type	(0040,A130)	“POINT”	
	> Referenced Waveform Channels	(0040,A0B0)	“0001 0000”	
	> Annotation Group Number	(0040,A180)	“5”	
	Manual Interpretation Statements Annotation Group Number = 6 One item per interpretation statement			
	> Unformatted Text Value	(0070,0006)	Interpretation statement text	
	> Referenced Waveform Channels	(0040,A0B0)	“0001 0000”	
	> Annotation Group Number	(0040,A180)	“6”	
	Rhythm Beat Fiducial Markers Annotation Group Number = 100 through 163, one for each beat up to 64 beats One item per marker			
	> Concept Code Name Sequence	(0040,A043)	-	
	>> Code Value	(0008,0100)	P Onset P Offset QRS Onset Fiducial Point QRS Offset T Offset	"5.10.3-1" "5.10.3-2" "5.10.3-3" "5.7.1-3" "5.10.3-4" "5.10.3-5"

Module	Attribute Name	Tag	Value	
	>> Coding Scheme Designator	(0008,0102)	"SCPECG"	
	>> Code Scheme Version	(0008,0103)	"1.3"	
	>> Code Meaning	(0008,0104)	P Onset P Offset QRS Onset Fiducial Point QRS Offset T Offset	"P Onset" "P Offset" "QRS Onset" "Fiducial Point" "QRS Offset" "T Offset"
	> Referenced Sample Positions	(0040,A132)	Sample position of fiducial marker	
	> Referenced Waveform Channels	(0040,A0B0)	"0001 0000"	
	> Annotation Group Number	(0040,A180)	"100" for 1st beat "101" for 2nd beat … "163" for 64th beat	
SOP Common	SOP Class UID	(0008,0016)	"1.2.840.10008.5.1.4.1.1.9.1.1"	
	SOP Instance UID	(0008,0018)	Created by appending ".1" to the Series Instance UID	
	Specific Character Set	(0008,0005)	"ISO_IR 100" or "ISO_IR 101"	
	Instance Creation Date	(0008,0012)	Date ECG is transmitted	
	Instance Creation Time	(0008,0013)	Time ECG is transmitted	
Additional Attributes	Current Patient Location	(0038,0300)	Custom ID field "Location"	
	Patient's Institution Residence	(0038,0400)	Custom ID field "Room"	
	Visit Comments	(0038,4000)	Custom ID field "Comment"	
	Scheduled Procedure Step Location	(0040, 0011)	Custom ID field "Scheduled Proc Step Loc"	
	Admission ID	(0038,0010)	Custom ID field "Admission ID"	
	Reason for the Requested Procedure	(0040,1002)	Custom ID field "Reason For Procedure"	

Module	Attribute Name	Tag	Value
	Requested Procedure Description	(0032, 1060)	Custom ID field “Requested Proc Desc”
	Reason for Study	(0032,1030)	Custom ID field “Diagnosis”
	Private Block Mortara_Inc		
	Manufacturer Name	(1455,0010)	“Mortara Instrument, Inc.”
	ELI Interpretation Vector	(1455,1000)	ELI interpretation vector VR Type - OW
	Custom ID	(1455,1001)	The custom ID format (UniPro and UniPro32 only) VR Type - OB
	Social Security Number	(1455,1003)	Custom ID field “Social Security Number” VR Type - LO
	Attending Physician	(1455,1004)	Custom ID field “Attending Physician” VR Type - LO
	Note1	(1455,1006)	Custom ID field “Note1” VR Type - LO
	Note2	(1455,1007)	Custom ID field “Note2” VR Type - LO
	Order Number	(1455,1008)	Custom ID field “Order Number” VR Type - LO

<table>
<tr><th>Module</th><th>Attribute Name</th><th>Tag</th><th>Value</th></tr>
<tr><td rowspan="2"></td><td>Machine ID - Acquiring Device</td><td>(1455,1009)</td><td>UNIPRO Tag 14 (Unipro and Unipro32 only)
<table><tr><th>Byte</th><th>Contents</th></tr><tr><td>1</td><td>Institution number
Binary - Low byte</td></tr><tr><td>2</td><td>Institution number
Binary - High byte</td></tr><tr><td>3</td><td>Department number
Binary - Low byte</td></tr><tr><td>4</td><td>Department number
Binary - High byte</td></tr><tr><td>5</td><td>Cart ID: Binary - Low byte</td></tr><tr><td>6</td><td>Cart ID: Binary - High byte</td></tr><tr><td>7</td><td>Device type-ASCII
"C" = Cart
"S" = System</td></tr><tr><td>8</td><td>Manufacturer code binary.
0 - Unknown
1 - Burdick
2 - Cambridge
3 - Compumed
4 - Datamed
5 - Fukuda
6 - Hewlett Packard
7 - Marquette Electronics
8 - Mortara Instruments
9 - Ninon Konden
10 - Okin
11 - Quinton
12 - Siemens
13 - Spacelabs
14 - Telemed</td></tr><tr><td>9-13</td><td>ASCII model description</td></tr></table>
VR Type - OB</td></tr>
<tr><td>Machine ID - Analyzing Device</td><td>(1455,100A)</td><td>UNIPRO Tag 15 (formatted the same as UNIPRO Tag 14) (Unipro and Unipro32 only)
VR Type - OB</td></tr>
</table>

<table>
<tr><th>Module</th><th>Attribute Name</th><th>Tag</th><th>Value</th></tr>
<tr><td></td><td>Acquiring Device Info</td><td>(1455,100B)</td><td>UNIPRO32 Tag 32 (Unipro32 only)
<table>
<tr><th>Byte</th><th>Contents</th></tr>
<tr><td>1-8</td><td>Extended Model Description - ASCII</td></tr>
<tr><td>9-11</td><td>Device SW version (xx.yy.zz)</td></tr>
<tr><td>12-14</td><td>Interpretation SW version (xx.yy.zz)</td></tr>
<tr><td>15-26</td><td>Device Serial Number - ASCII</td></tr>
<tr><td>27</td><td>Device Language
0 - English
1 - Italian
2 - Spanish
3 - German
4 - Finnish
5 - French
6 - Portuguese
7 - Dutch
8 - Polish
9 - Swedish
10 - Hungarian
11 - Czech
12 - Chinese
13 - Japanese
14 - Russian</td></tr>
<tr><td>28</td><td>Plot Format
0 – 3+1
1 – 6
2 – 3+3
3 – 12
4 – 6+6
5 – 3+1 Cabrera
6 – 6 Cabrera
7 – 3+3 Cabrera
8 – 12 Cabrera
9 – 6+6 Cabrera</td></tr>
<tr><td>29</td><td>3+1 Rhythm lead
Lead identification as in Section D.</td></tr>
<tr><td>30</td><td>3+3 Rhythm lead1
Lead identification as in Section D.</td></tr>
<tr><td>31</td><td>3+3 Rhythm lead2
Lead identification as in Section D.</td></tr>
<tr><td>32</td><td>3+3 Rhythm lead3
Lead identification as in Section D.</td></tr>
</table>
VR Type - OB</td></tr>
</table>

<table>
<tr><th>Module</th><th>Attribute Name</th><th>Tag</th><th>Value</th></tr>
<tr><td></td><td>Acquiring Device Info</td><td>(1455,100B)</td><td>UNIPRO32 Tag 32 (Unipro32 only)
<table><tr><th>Byte</th><th>Contents</th></tr><tr><td>33</td><td>Print Speed
0 – 5 mm/s
1 – 10 mm/s
2 – 25 mm/s
3 – 50 mm/s
4 – 100 mm/s</td></tr><tr><td>34</td><td>ECG Gain
0 – 2.5 mm/mV
1 – 5 mm/mV
2 – 10 mm/mV
3 – 20 mm/mV</td></tr><tr><td>35-64</td><td>Site Name – ASCII</td></tr><tr><td>65</td><td>Height/Weight Units
0 – in/lb
1 – cm/kg</td></tr></table>
VR Type - OB</td></tr>
<tr><td></td><td>Analyzing Device Info</td><td>(1455,100C)</td><td>UNIPRO32 Tag 33 (formatted the same as UNIPRO32 Tag 32) (Unipro32 only)
VR Type - OB</td></tr>
<tr><td></td><td>ECG Lead Definition</td><td>(1455,100D)</td><td>UNIPRO32 Tag 34 (Unipro32 only)
The 7 LSBs of this field indicate which ECG leadset has been used. The definitions are:
0 - Standard
1 - Pediatric V3R
2 - Mason-Likar
The MSB of this field indicates if the data were acquired with a WAM:
0 - Normal Front End
1 WAM
VR Type - US</td></tr>
<tr><td></td><td>Pulse Oximetry Data</td><td>(1455,100E)</td><td>UNIPRO32 Tag 35 (Unipro32 only)
<table><tr><th>Byte</th><th>Contents</th></tr><tr><td>1</td><td>SpO2 value in % units</td></tr><tr><td>2</td><td>Pulse Rate in ppm units</td></tr></table>
VR Type - OB</td></tr>
<tr><td></td><td>Print Filter</td><td>(1455,100F)</td><td>The print filter setting (in Hz) on the cardiograph (Unipro32 only)
VR Type - DS</td></tr>
<tr><td></td><td>Initials</td><td>(1455,1010)</td><td>Custom ID field “Initials”
VR Type - SH</td></tr>
</table>

Module	Attribute Name	Tag	Value
	Visit	(1455,1011)	Custom ID field “Visit” VR Type - LO
	Demographic Layout	(1455,1012)	XML data representing the demographic layout. (UniPro64 only) VR Type - OB
	Device Information	(1455,1013)	XML data representing the device information. (UniPro64 only) VR Type - OB
	ELI Link Software Version	(1455,1018)	VR Type - SH
	Alert Criteria	(1455,1014)	Unsigned short representing interpretation condition per the following: 1 – Normal ECG 2 – Atypical ECG 3 – Borderline ECG 4 – Abnormal Rhythm ECG 5 – Abnormal ECG 6 – ***ACUTE MI*** 7 – No Further Interpretation Possible 99 – Unknown VR Type - US
	User List 1	(1455,1015)	Custom ID field “User List 1” (UniPro64 only). VR Type - LO
	User List 2	(1455,1016)	Custom ID field “User List 2” (UniPro64 only). VR Type - LO
	User List 3	(1455,1017)	Custom ID field “User List 3” (UniPro64 only). VR Type - LO

All communications exceptions are reported to the ELI operator as a transmission failure.

3.2.1.4 Association Acceptance Policy

The ELI electrocardiographs do not accept any associations. All associations are initiated by the electrocardiograph.

3.3 Network Interfaces

3.3.1.1 Physical Network Interface

The ELI can use 10/100 Mbps Ethernet and 802.11b/g wireless LAN.

3.3.1.2 Additional Protocols

None.

3.4 Configuration

ELI supports the following configuration parameters:

Table 3.4-1: ELI Configuration Parameters

Parameter	Configurable	Default Value
General		
The number of seconds to use as a timeout waiting for association request or waiting for the peer to shut down an association.	No	30
The number of seconds to wait for reply to associate request.	No	15
The number of seconds to wait for reply to associate release.	No	15
The number of seconds to wait for a network write to be accepted.	No	15
The number of seconds to wait for a network connect to be accepted.	No	15
The number of seconds to wait for data between TCP/IP packets on a call to	No	15
Modality Worklist		
Modality Worklist SCU AE Title (AE Title of ELI as seen by MWL SCP)	Yes	(none)
Modality Worklist SCP AE Title (AE Title of MWL SCP as seen by ELI)	Yes	(none)
Modality Worklist SCP IP Address	Yes	(none)
Modality Worklist SCP Port Number	Yes	(none)
12-lead ECG Waveform Storage		
12-lead ECG Waveform Storage SCU AE Title (AE Title of ELI as seen by Storage SCP)	Yes	(none)

12-lead ECG Waveform Storage SCP AE Title (AE Title of Storage SCP as seen by ELI)	Yes	(none)
12-lead ECG Waveform Storage SCP IP Address	Yes	(none)
12-lead ECG Waveform Storage SCP Port Number	Yes	(none)