CardioSoft™ to EMR System Interface Specification Reference Guide

2023324-206 Revision B

GE Medical Systems
Information Technologies

gemedical.com

NOTE: The information in this manual applies only to CardioSoft to EMR v6 and subsequent. Due to continuing product innovation, specifications in this manual are subject to change without notice.

Contents

Revision History

Each page of the document has the document part number and revision letter at the bottom of the page. The revision letter changes each time the document is updated.

Revision History, PN 2023324-206		
Revision	Date	Comment
A	25 October 2005	Initial release
B	14 February 2007	Page 15 revised / ECO 086753

Limitations

The EMR Interface is not validated with Russian, Japanese, Chinese, Polish, Hungarian and Czech languages.

The EMR Interface is not validated within a Thin Client (e.g. CITRIX) environment.

Reference Documents

- CardioSoft Service Manual (V6.0 and subsequent)
- CardioSoft Software Installation Guide, English (V6.0 and subsequent)

Conventions

The following list is a collection of helpful hints and general guidelines.

- Items shown in **Bold** text are keys on the keyboard, text to be entered, or hardware items such as buttons or switches on the equipment.
- *Italicized* items are software terms which identify menu items, buttons, or options in various windows.

Introduction

Purpose

This document is intended to be used as a technical description of the CardioSoft EMR- Interface for external EMR systems.

The objective is to provide a quick and easy mechanism for launching the CardioSoft application via an EMR system. CardioSoft receives patient demographics and clinical data from the EMR and sends test data for Resting ECG, Stress ECG, Spirometry and Ambulatory Blood Pressure (ABP) to the EMR.

CardioSoft is launched by the EMR to run, edit or view a test in any of the four modalities.

The EMR interface is available from CardioSoft V6.0 and higher. This document has been created to be consistent with CardioSoft V6.0.

Legal Notice

Our equipment contains several fields which can be filled in before performing an ECG. Some of these fields must be filled in before performing an exam, some are optional and therefore left to the user to assess whether they are needed to perform the exam. A field RACE is one of these optional fields. It has been acknowledged by the medical profession as useful to analyze some pathologies. You should be aware that, in some jurisdictions, the processing of data revealing an individual's racial origin is subject to legal requirements, such as obtaining the patient's prior consent. If you elect to collect this type of data, it is your responsibility to ensure that you comply with all applicable legal requirements.

Interface Overview

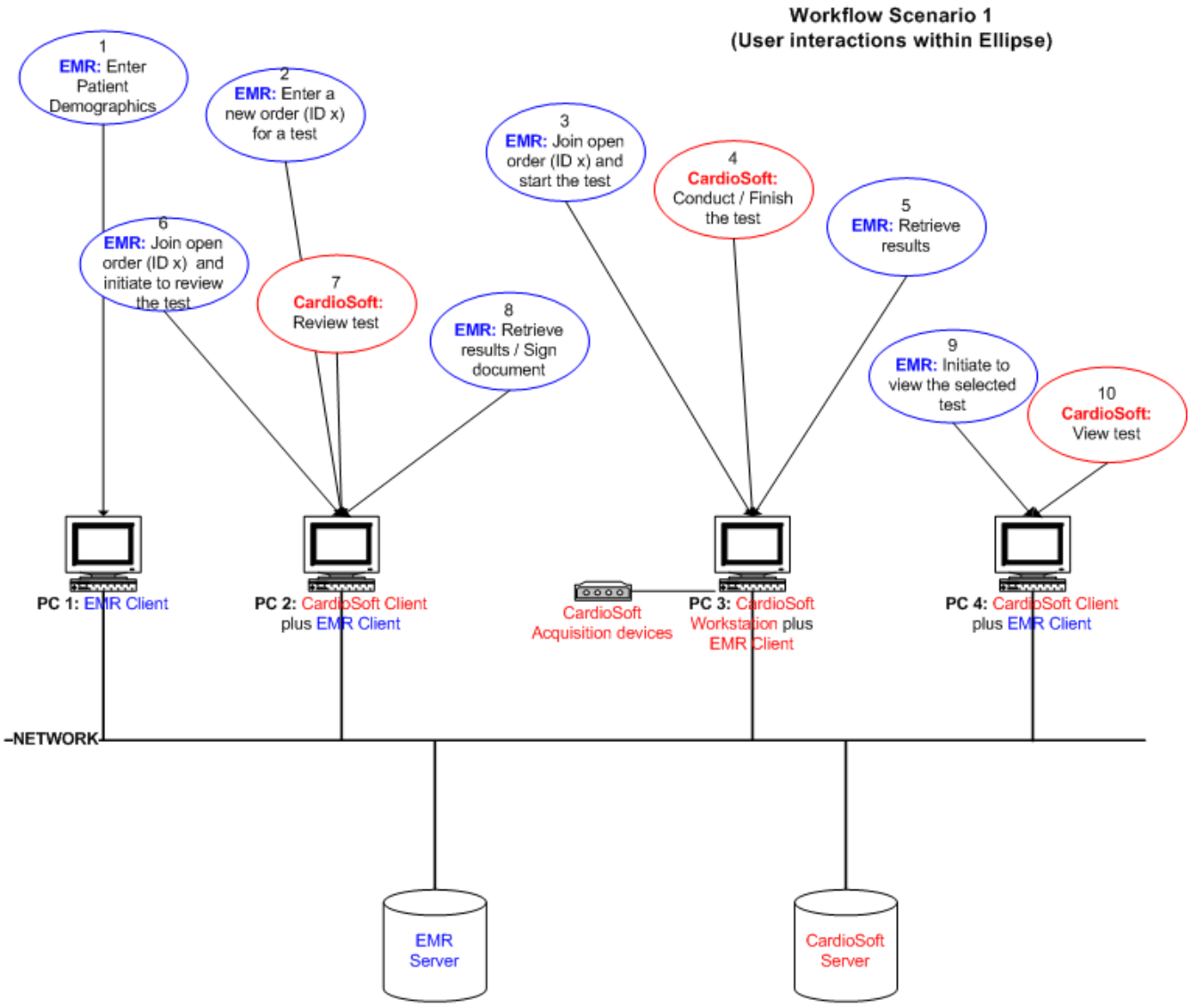
Functions

- Receive patient demographics and clinical data.
- Startup in acquisition mode of a selected modality.
- Send results and a reference to the test after the test is completed.
- Selection of patient and modality is provided by the EMR system. Changing patient demographics is only possible via EMR system.
- Edit/View an existing test. The reference to the test is sent to the EMR and is used by the EMR to edit/view the test.
- Data migration is possible to update the EMR Database with existing CardioSoft patient demographics and references to existing tests.
- Data upload of received tests from ECG Writers (patient demographics and reference to the test) can be performed automatically.
- User Interface is adapted in EMR mode (automatic detection).
- No additional installation for the EMR interface is needed (Option Code XEMR).
- Data format is HL7 V2.3.

Workflow

Both CardioSoft and EMR client need to be installed on one workstation if interaction is needed (for Conduct / Edit (Review) / View tests).

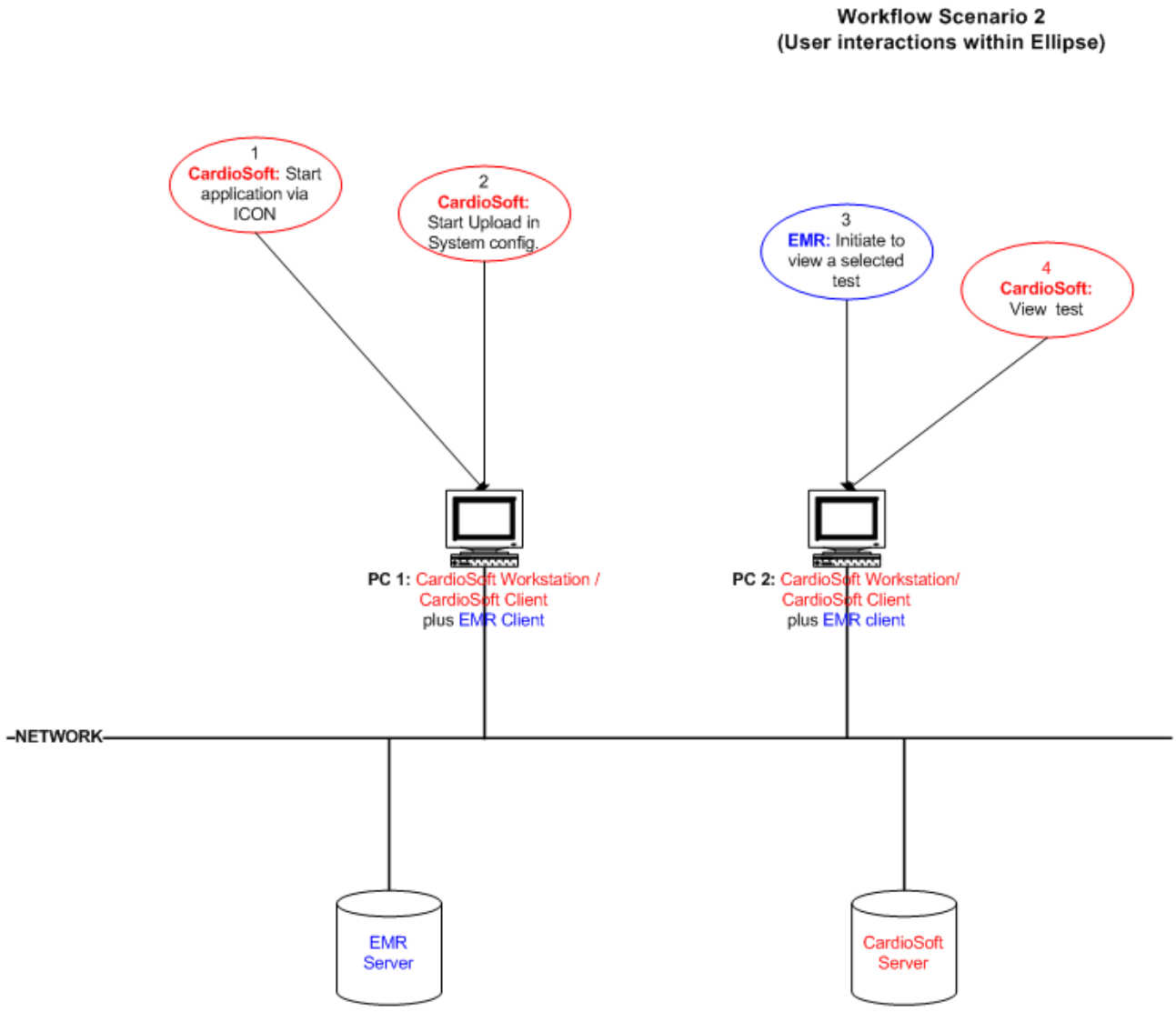
Workflow Scenario 1: Conduct / Edit (Review) / View Tests



Note: CardioSoft and EMR client need to be installed on one Workstation.
The order management is completely done in the EMR. CardioSoft stores the order ID x in its database. This ID is part of the filename of the shared in /out files and can be used by the EMR as a tag to identify on different clients what belongs together.

Workflow Scenario 1	
Client Workstation & Application	Action / Description
1. EMR Client on PC1	Enter patient demographics
2. EMR Client on PC2	Enter order for a new test
3. EMR Client on PC3	Join entered order and launch CardioSoft for New Test ■ Patient demographics, clinical data and type of test are transferred to CardioSoft (EMR order ID is part of the filename)
4. CardioSoft on PC3	Conduct test / Finish test ■ On end of test (when going to Post test Review screen) the defined observation values (results) are transferred back (EMR order ID is part of the filename) ■ Go back to EMR (button). The defined observation values (results) are transferred back again, if changes were made in Post test review screen
5. EMR Client on PC3	Retrieve Results (manually by button / automatically) ■ EMR reads/stores observation values and a reference to this test
6. EMR Client on PC2	Join open order and launch CardioSoft to review the test ■ Reference to the test is used by EMR
7. CardioSoft Client on PC2	Edit (Review) test ■ Go Back to EMR (button) ■ Defined observation values (results) are transferred back (with the originally EMR order ID in filename)
8. EMR Client on PC2	Retrieve Results (manually by button / automatically) / Sign document ■ EMR reads/stores observation values and a reference to this test ■ Sign Document (to make it part of the patients chart, from now only view this test)
9. EMR Client on PC4	Launch CardioSoft for viewing test ■ Reference to the test is used by EMR
10. CardioSoft Client on PC4	View CardioSoft test

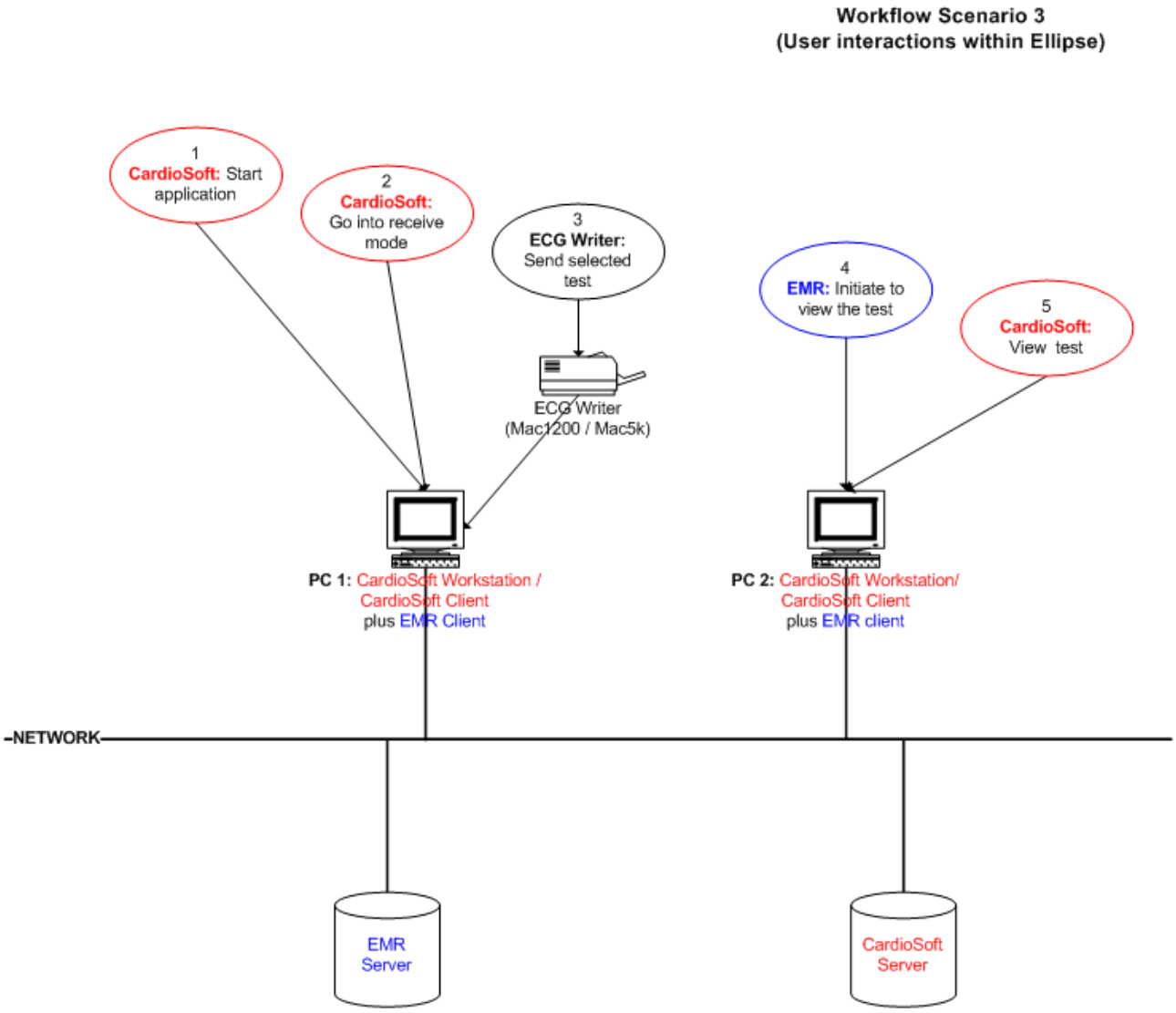
Workflow Scenario 2: Data Upload to EMR for Data Migration



Note: CardioSoft and EMR client need to be installed on one Workstation.

Workflow Scenario 2	
Client Workstation & Application	Action / Description
1. CardioSoft on PC1	Start CardioSoft directly via Icon on the desktop
2. CardioSoft on PC1	Start upload in System Configuration >> EMR tab ■ Patient demographics of all existing patients and references to all existing tests (that are stored in the CardioSoft database) are sent to the EMR (HL7 via TCP/IP or shared file) ■ EMR needs to read the HL7 messages, create patients chart and assign tests
3. EMR Client on PC2	Launch CardioSoft for viewing the test ■ Reference to the test is used by EMR
4. CardioSoft on PC2	View CardioSoft test

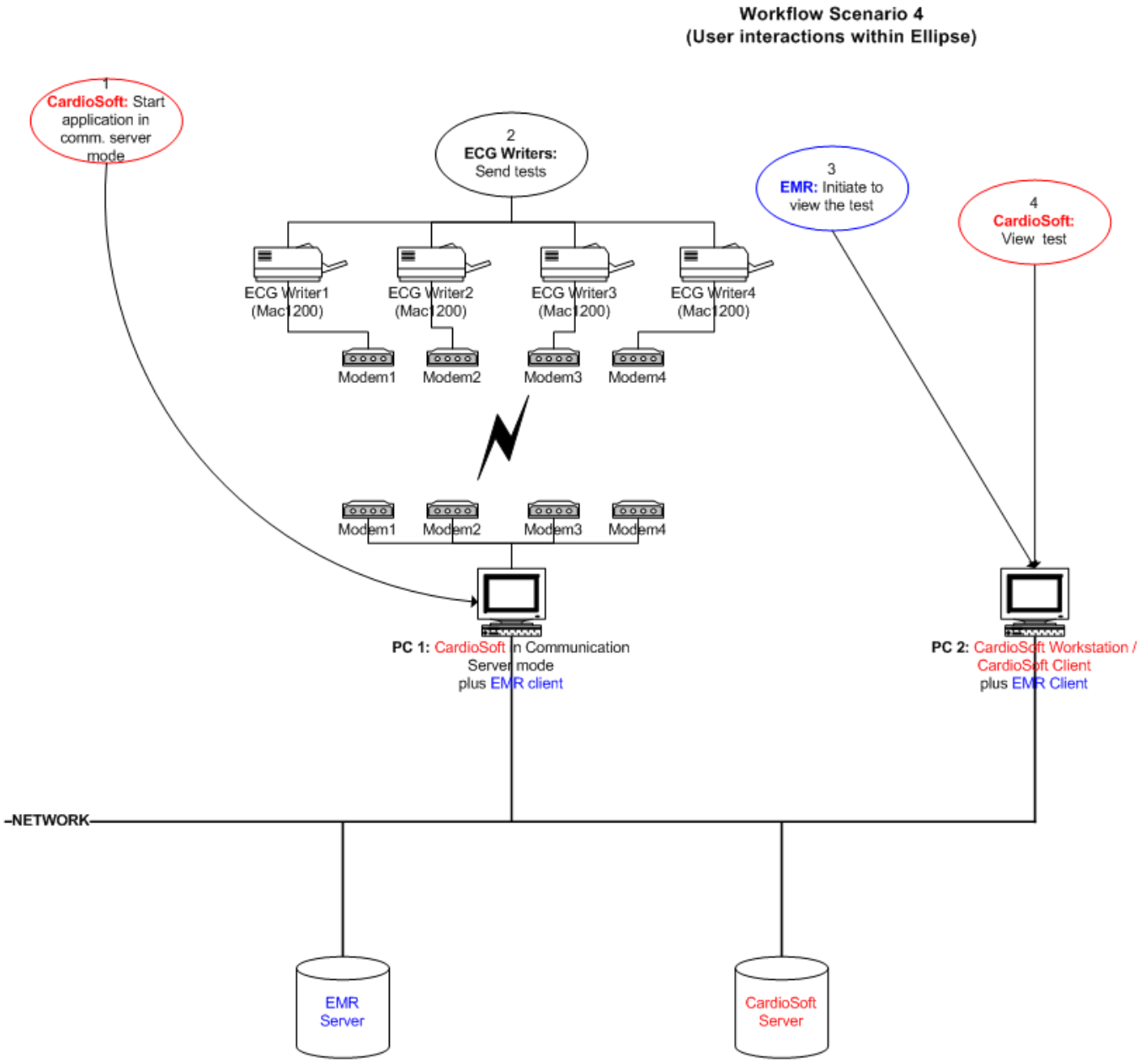
Workflow Scenario 3: Manual Reception of Resting ECGs via ECG Writer



Note: CardioSoft and EMR client need to be installed on one Workstation.

Workflow Scenario 3	
Client Workstation & Application	Action / Description
1. CardioSoft on PC1	Start CardioSoft directly via Icon on the desktop
2. CardioSoft on PC1	Go into the receive mode (System Configuration >> Receive data from ECG device)
3. ECG Writer	Send the test via serial interface. On end of transmission: ■ CardioSoft on PC1 ❍ Automatic/manual assignment (selectable in dialog) of the test: New patient record is created and test assigned or test is assigned to an existing patient. If patient demographics don't match, test is stored in a list to assign it manually ❍ Corresponding patient demographics and a reference to the test are sent to EMR (HL7 via TCP/IP or shared file) if the test was assigned successfully ■ EMR ❍ Read HL7 messages, create patient's chart and assign test
4. EMR Client on PC2	Launch CardioSoft for viewing the test ■ Reference to the test is used by EMR
5. CardioSoft on PC2	View CardioSoft test

Workflow Scenario 4: Automatic Reception of Resting ECGs via ECG Writer



Note: CardioSoft and EMR client need to be installed on one Workstation.

Workflow Scenario 4	
Client Workstation & Application	Action / Description
1. CardioSoft on PC1	Start CardioSoft in Communication Server Mode (see CardioSoft Service Manual V6.0 and subsequent). The dialog for automatic reception of Resting ECGs via modem comes up (receive mode)
2. ECG Writer	Send the test via modem. On end of transmission: ■ CardioSoft on PC1 ❍ Automatic assignment of test: New patient record is created and test assigned or test is assigned to an existing patient. If patient demographics don't match, test is stored in a list to assign it manually ❍ Corresponding patient demographics and a reference to the test are sent to EMR (HL7 via TCP/IP or shared file) if the test was assigned successfully ■ EMR ❍ Read HL7 messages, create patient's chart and assign test
3. EMR Client on PC2	Launch CardioSoft for viewing test ■ Reference to the test is used by EMR
4. CardioSoft on PC2	View CardioSoft test

Data Transfer: CardioSoft – EMR

EMR to CardioSoft

- Patient demographics
  - Patient ID, Name, DOB, Gender, Race
- Test order (Start / View / Edit)
- Test name (Stress, Resting, Spirometry, ABP)
- Clinical data
  - Height / Weight of patient
  - Pacemaker
  - Attending physician
  - Referring physician
  - Ordering physician
  - Reason for Test
  - Medical History
  - Medication

CardioSoft to EMR

- Reference to the conducted test to edit/view it later
- Test results (most observation values depend on the type of test)

  For all tests:

  - Interpretation
  - Comment (any comment)
  - Extra Questions (2 short notes containing question and response)

For Resting ECG

NOTE
Also see Table 1, “Resting ECG,” on page 22.

- Heart rate
- BP systolic / diastolic
- PR / QT / QTc interval
- QRS duration
- P / T / QRS axis
- P duration
- Average PP / RR Interval

For Stress Test

NOTE
Also see Table 2, “Stress Test,” on page 26.

- Max. heart rate
- Max. predicted heart rate
- Max. BP systolic / diastolic
- Max. load (Treadmill, Ergometer)
- Max. ST Level
- Max. TWA (T-Wave Alternans)
- Test protocol (e.g. BRUCE …)
- Total test time
- Stress test type (e.g. Treadmill, Ergometer, Persantine …)
- Baseline heart rate
- Reason for termination
- Time in exercise

For Spirometry

NOTE
Also see Table 3, “Spirometry,” on page 30.

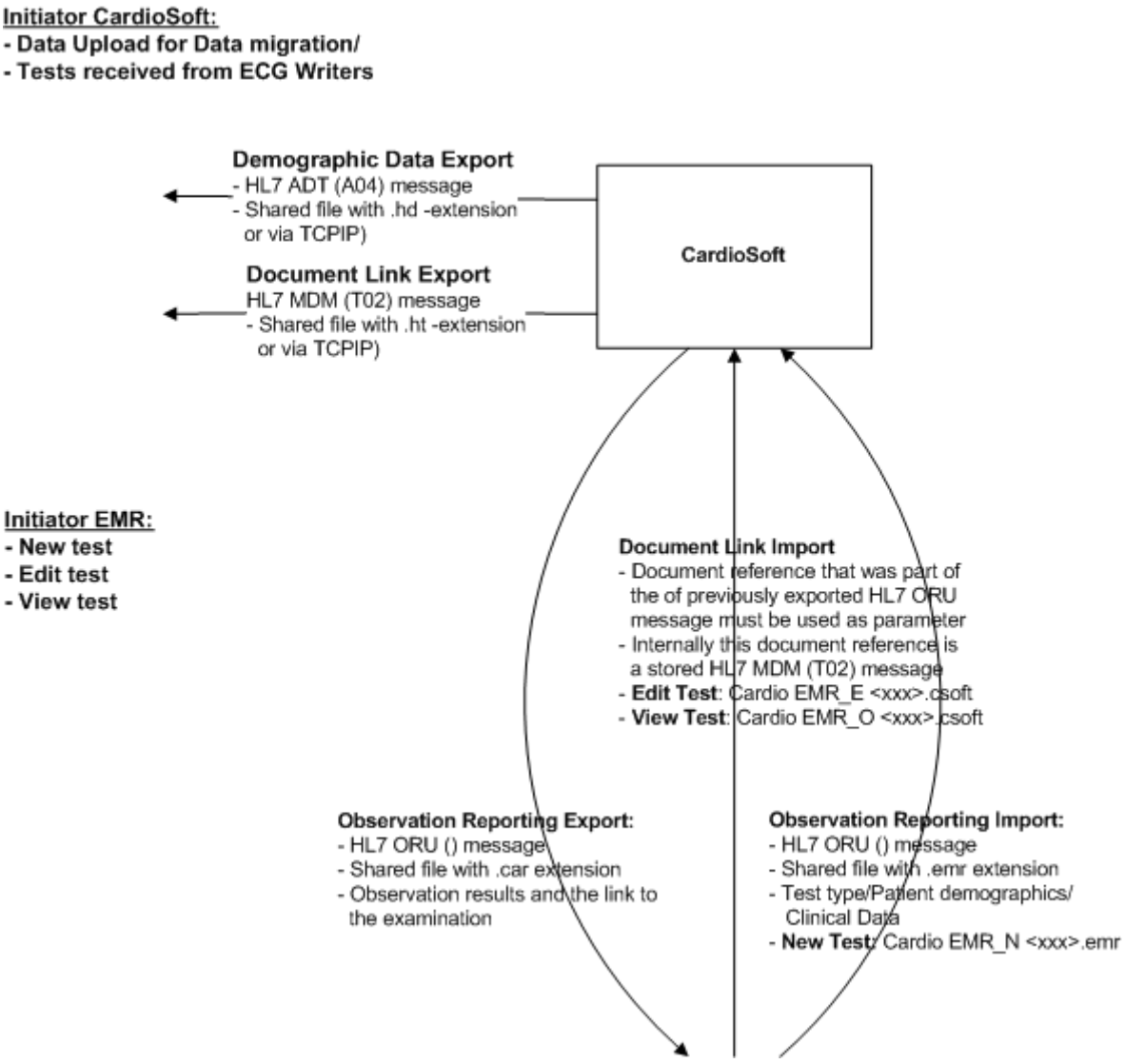
- Spirometry test type (Spirometry, Before Bronchodilation, After Bronchodilation)
- Reference values equation (e.g. Knudson …)
- FVC (Forced vital capacity)
- FEV1 (Forced expiratory volume in 1st second)
- FEV1 / FVC (FEV1 as percentage of FVC)
- Interpretation mode ("CHS" on basis of American Thoracic Society, "Europe" on basis of ECCS)
- Measurement mode ("ATS" mode, "Envelope" mode)

For ABP

NOTE
Also see Table 4, “ABP,” on page 36.

- Systolic / diastolic blood pressure, 24-hr average
- Systolic / diastolic blood pressure, day-time average
- Systolic / diastolic blood pressure, night-time average
- Total recording time

HL7 Dataflow: CardioSoft – EMR



Interface Specification

This interface uses HL7 Version 2.3.

For importing HL7 messages, CardioSoft also accepts Versions 2.2, 2.1, 2.0 or 2.0d.

EMR Interface Configuration

Initial Steps

To run CardioSoft with an EMR system (EMR mode), the following steps must be done:

On EMR side

1. Create the file **emr.ini** in the system folder (c:\winnt\ or c:\windows) with the following content:

   [Installation]
   LogicianInstallPathTo=<Your EMR Install Path>

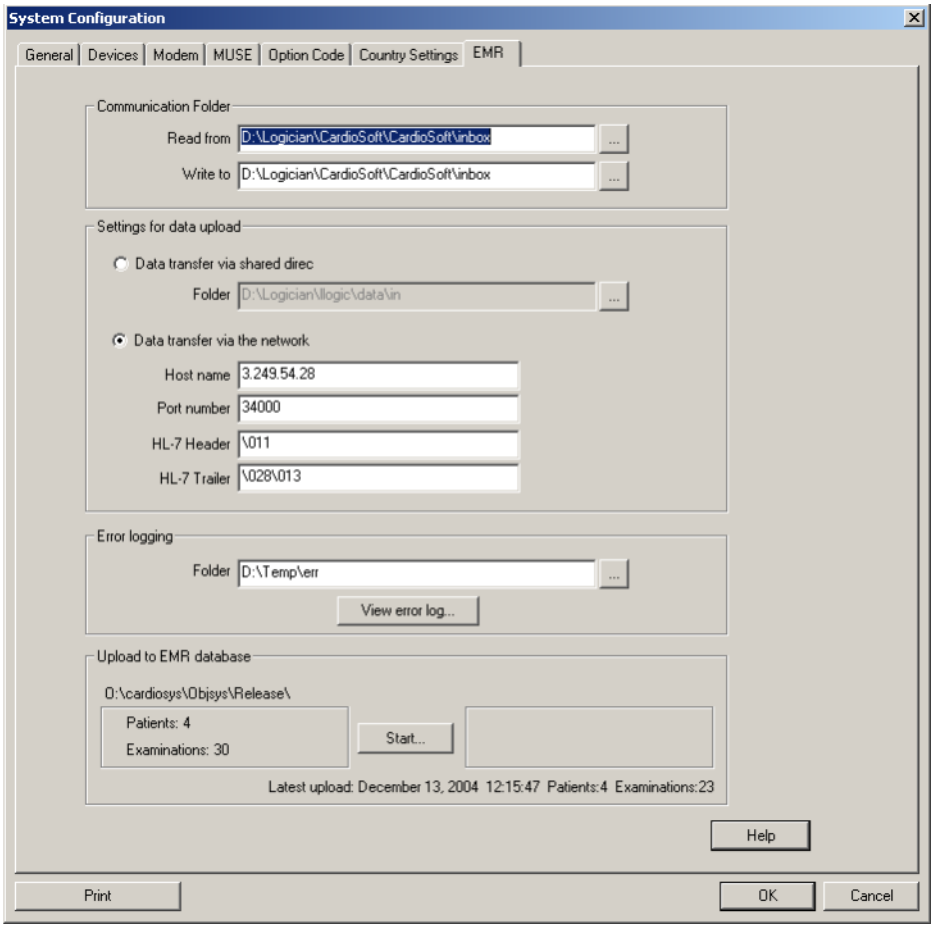
2. Create folder <EMR Install Path>/CardioSoft before starting CardioSoft.

On CardioSoft side

1. Enter a valid Option Code **XEMR** in the CardioSoft *System Configuration* screen > *Option Code* tab.

Interface Configuration to Control CardioSoft via EMR

After completing the steps in “EMR Interface Configuration” on page 15 the *EMR* tab in *System Configuration* is available.



- CardioSoft needs two communication folders for importing/exporting the HL7 files for Observation Reporting. (These folders can be identical.)
- CardioSoft imports the <xxx>.emr files from the “Read from”-folder. The EMR system needs to write these files. CardioSoft is responsible for deleting them.
- CardioSoft exports <xxx>.car files to the “Write To”-folder. The EMR system reads these files and is responsible for deleting them.

These communication folders are written and read from the file:

<Your EMR Install Path>/CardioSoft/CardioSoft.ini

It is intended, that the EMR system creates this file and writes the entries for the communication folders to be used by CardioSoft. However, this file is also created by CardioSoft, if it doesn’t exist (Important: Folder <EMR Install Path>/CardioSoft must exist). In this case, the default values for the communication folders are used (TMP path of the system, with folders /csoft_emr and /emr_csoft appended).

See the entries below that are used within the file CardioSoft.ini:

READDIR=<dir path>	CardioSoft output directory (“Write to” in system configuration dialog)
WRITEDIR=<dir path>	CardioSoft input directory (“Read from” in system configuration dialog)

Interface Configuration for Data Upload

Data upload (patient demographics and links to the tests) is conducted:

- Manually for data migration (initially existing patient records and tests within CardioSoft)
- Automatically when tests from ECG Writers are received and assigned within CardioSoft

The settings for the upload are available within the *EMR* tab (see dialog above).

Depending on how you want to transfer the data, select the corresponding settings. For HL7 specification see See “Functions Initiated by CardioSoft” on page 40.

Interface Configuration for Test Mode

CardioSoft can be launched in test mode. This means the test is conducted without acquisition modules (with simulated patient data). To achieve this, the following settings in the MSH and PID segments of the emr-file need to be edited:

1. Set MSH-11 (Processing ID) to “D”.
2. Set PID-5 Patient Name: “TEST DEMO”
3. Set PID-4 Patient ID: “TEST DEMO 000000”
4. Set PID-7 DOB: “19680428” (not required, internal data is taken)
5. Set PID-8 SEX: “M” (not required, internal data is taken)
6. Set PID-10 RACE: “U” (not required, internal data is taken)

The result file (.car) reflects these data.

Interface Configuration in Terms of User Administration

CardioSoft in EMR mode bypasses the Login-Screen, because from the workflow standpoint the EMR client on this workstation already provides the user authentication.

If CardioSoft has enabled the Password function (*System Configuration >> User List*), a mechanism is implemented to use the EMR User ID/ Name for confirming the reports in *Post Test Review* screen and event logging (*System Configuration >> User List >> Log Setup*).

To achieve this, the EMR needs to create the file:

<Your EMR install path>\cfw,ini.

Each time a user logs in, the EMR writes the current User ID and Name as follows:

CURRENTUSER=George A. Johnson

CURRENTUSERID=gjohnson

<Your EMR Install Path> is defined in emr.ini. (See "EMR Interface Configuration" on page 15.).

NOTE

If the EMR doesn't provide the User ID/Name, confirmation of reports within CardioSoft and event logging is possible, but without User ID/Name it doesn't make much sense.

HL7 Settings

All settings in terms of HL7 are stored in the file **HL7.ini** in section [GENERAL]. This file is stored on the CardioSoft server (network folder) and is valid for all CardioSoft clients.

Most settings are accessed by using the EMR tab of CardioSoft. However, there are additional settings, that can be changed manually by modifying HL7.ini. Please see those entries and their description below:

HL7 Setting	Setting Description
GEN_ReqAckFromResponder=1	HL7 in Original Mode: Application Acknowledge mode (only with TCP/IP; default value is 0)
GEN_AckTimeout=1000	Timeout after an expected Acknowledge Message from the Responder in ms (value is valid from 500 to 5000ms; default value is 2000ms)
GEN_MaxSentMess=1	Total number of messages sent before a final error is assumed (original message and 1 repetition after first occurrence of error; value is valid from 1 to 5; default value is 2)
GEN_EndOfSegmWithCRLF=0	End of segments with CR/LF (that means all segments end with CR and LF; 0 means only CR; default is 1)

Functions Initiated by EMR

The functions *New*, *Edit* and *View* are supported through the EMR interface for the Resting ECG, Stress Test, Spirometry and ABP modalities.

NOTE

Holter and external programs are not supported.

New Test Launched by EMR

General

Launching CardioSoft

CardioSoft is launched by EMR with the parameters **EMR_N** and the file name. This filename format must be: <Modality>_<ID>.emr.

File Name	Value Definitions
<Modality>	R_ECG (Resting ECG)
	S_ECG (Stress ECG)
	SPIRO (Spirometry)
	BPMONC (ABP: Configure ABP Device)
	BPMOND (ABP: Read Data from ABP Device)
<ID>	Should be used by the EMR as a unique ID, e.g. Patient-ID plus a document number (order ID). It is stored in CardioSoft for each test and used for the filename of the observation results.

The emr-file must be written by the EMR to the CardioSoft "Read from" folder, that is displayed in *System Configuration* >> *EMR* tab.

Example for launching CardioSoft to conduct a Resting ECG:

c:\cardio\cardio.exe EMR_N R_ECG_80-TEST011_42.emr

Path name:

See Win.ini (Folder C:\Winnt or C:\Windows):

CardioInstallPath=C:\Cardio

Matching of Patient ID

The functions *New Patient Record*, *Edit Patient Data*, *Delete Patient Record* and *Delete Examination* are completely disabled in CardioSoft in EMR Mode.

So all patient IDs come from the EMR, except two special cases, Data migration (see See "Data Upload of Existing CardioSoft Tests to EMR" on page 40.) and reception of external tests; e.g., from an ECG Writer (see See "Data Upload of External Tests from ECG Writers" on page 42.).

It is assumed, that the EMR system has unique patient IDs.

Patient Management of CardioSoft searches for the patient referenced in the message by PID-4. If PID-4 is empty, PID-3 is used.

Use always PID-3 for the EMRs patient ID.

Additionally use PID-4 for existing CardioSoft patient IDs in case of data migration (if data was initially uploaded to the EMR database) or in case of receiving tests from ECG Writers.

If there is a record in the database for this patient, this patient is selected and patient demographics are updated in the CardioSoft database. If there is no record found for this patient, a new record is created and this patient is selected.

Observation Results

Observation results depend on the selected modality. The results are written when *Back to EMR* or *Post Test Review* is clicked.

The observation result filename is:

<Modality>_<ID>.car

whereas <ID> is identical with the incoming <ID> of the .emr-file.

This file is written by CardioSoft to the “Write to” folder, that is displayed in *System Configuration* >> *EMR* tab.

The units of the result values are static and don’t depend on the CardioSoft *System Configuration* settings.

File Handling

CardioSoft deletes the .emr-file after processing. The EMR is responsible for deleting the .car file.

Resting ECG

Example for launching CardioSoft to conduct a Resting ECG test:

R_ECG_80-TEST011_42.emr

```
MSH|^~\&|CPO_EMR||CARDIOSOFT||20040327110218||ORU|20040327110218001|P|2.3|||NE
PID|1||EMR_PID||MARKHAM^STEVE^||19650101|M||W
PV1|1||SOUTH||||^Winston^Harry^S.|^Ref-L^Ref-F
OBR|1|||R_ECG||20040327110218|||||||||Ordering^Ordering-L^Ordering-F
OBX|1|ST|History||CORONARY ARTERY DISEASE (ICD-414.00)
OBX|1|ST|Reason||Therapy outcome control
OBX|1|ST|Reason||Checkup
OBX|1|ST|Reason||Chest discomfort
OBX|1|ST|Reason||Confirm/Rule out CAD
OBX|1|ST|Reason||Angina Pectoris
OBX|1|ST|Height||72|IN
OBX|1|ST|Weight||160|LB
OBX|1|ST|Pacemaker||Y
OBX|1|ST|Medication||LISINOPRIL|180mg tablets
OBX|1|ST|Medication||HEXORAL|1500ml
OBX|1|ST|Medication||ASPIRIN|1100mg
OBX|1|ST|Medication||ASPIRIN|13200mg
OBX|1|ST|Medication||ISOSORB|175mg
```

Items of Interest	
MSH-3=Sending App	CPO_EMR
MSH-4=Receiving App	CARDIOSOFT
MSH-10=Message Control ID	Unique ID
MSH-11=Operating mode	P (Production) D (Debug)
PID-3=Patient ID	EMR Internal Patient ID
PID-4=Alternate ID	CardioSoft ID (if one exists)
PID-5=Patient Name	used: last^first^middle
PID-7=Date of Birth	yyyymmdd
PID-8=Sex	M, F, U
PID-10=Race	See Spec for correct values
PV1-7=Attending Phys.	used: ^last^first^middle^^^degree
PV1-8=Referring Phys	used: ^last^first^middle^^^degree
OBR-4=Test Name	R_ECG (Resting_ECG)
OBR-16=Ordering Phys	^last^first^middle^^^degree
OBX-3=Observation Name	obs name (e.g. History, Reason, Height, Weight…)
OBX-5=Observation Value	numeric or text value for observation
OBX-6=Units	If applicable, the unit assoc. with the value

NOTE

The "Medication" Observation name is reused for each medication sent. Each med is delivered with the medication name in OBX-3 and the dose in OBX-5.

Resting ECG is started and clinical data

- Attending Physician
- Referring Physician
- Ordering Physician
- Reason for Test (up to 4, rest is discarded)
- Medical-History
- Medication (up to 5, rest is discarded)

are stored in CardioSoft. EMR should use the CardioSoft default list in the Reason for Test combo box. Medical-History and Medication are "Read Only" in CardioSoft.

After the button *Post Test Review* or *Back to EMR* is pressed, the following data is provided by the Resting ECG module:

Table 1. Resting ECG

CardioSoft ID	Unit	Description or Note
OTHER_REF	Text	Internal Reference to test (to use by EMR for editing or viewing)
HR	bpm	Heart rate on electrocardiogram
BP Systolic	mmHg	Blood pressure, systolic
BP Diastolic	mmHg	Blood pressure, diastolic
PR	ms	PR interval, electrocardiogram
QT	ms	QT interval, electrocardiogram
QTc	ms	Qt interval/qt interval, electrocardiogram, corrected for heart rate
QRSD	ms	QRS duration, electrocardiogram
P Axis	° (deg)	P wave axis, electrocardiogram
T Axis	° (deg)	T wave axis, electrocardiogram
EKG QRS axis	° (deg)	Electrocardiogram QRS axis
P	ms	P-duration (from P-onset to P-offset)
PP	ms	Average PP interval
RR	ms	Average RR interval
Interpretation	Text	Electrocardiogram interpretation (clinical interpretation of diagnosis)
Comment	Text	Any comment: workflow, personal, non-clinical data. (60 char max)

CardioSoft ID	Unit	Description or Note
Question 1	Text	Short note containing a question and response (52 char max)
Question 2	Text	Short note containing a question and response (52 char max)

Example for Resting ECG Observation Results:

R_ECG_80-TEST011_42.car:

```
MSH|^~\&|CARDIOSOFT||CPO_EMR||20040812174632||ORU|20040812174632001|P|2.3|||NE
PID|1||EMR_PID||MARKHAM^STEVE^^^^||19650101|M||W
OBR|1|||R_ECG|||20040812174627|||||||20040812174627||||EK||||20040812174627|||F
OBX|1|TX|OTHER_REF||000005_R_ECG_20040812174627.csoft
OBX|1|ST|HR||60|bpm|||||F
OBX|1|ST|BP Systolic|||mmHg|||||F
OBX|1|ST|BP Diastolic|||mmHg|||||F
OBX|1|ST|PR||164|ms|||||F
OBX|1|ST|QT||364|ms|||||F
OBX|1|ST|QTc||364|ms|||||F
OBX|1|ST|QRSD||86|ms|||||F
OBX|1|ST|P Axis||34|°|||||F
OBX|1|ST|T Axis||48|°|||||F
OBX|1|ST|EKG QRS axis||44|°|||||F
OBX|1|ST|P||88|ms|||||F
OBX|1|ST|PP||1000|ms|||||F
OBX|1|ST|RR||1000|ms|||||F
OBX|1|ST|Interpretation||Normal sinus rhythm\.br\Normal ECG\.br\||||||F
OBX|1|ST|Comment||This is the comment||||||F
OBX|1|ST|Question 1||Smoker Yes||||||F
OBX|1|ST|Question 2||Athlete No||||||F
```

Items of Interest	
MSH-3, MSH-4	Names reversed to indicate opposite send direction
OBR-4=Test Name	R_ECG (Resting_ECG)
OBR-18=Document Type	EK (EKG Report)
OBR-25=Result status	F indicates normal status
OBX-3=Observation Name	Obs name (e.g. History, Reason, Height, Weight…)
OBX-5=Observation Value	Numeric or text value for observation
OBX-6=Units	If applicable, the unit assoc. with the value
Question 1 & Question 2	The value field contains both the question and answer (Prompt: value)
OTHER_REF	Value for this OBX is the reference to the test.

CardioSoft creates and stores an HL7-file (internally) to reference the conducted test. This filename is located in the OBX segment with OBX-3 OTHER_REF and must be used by the EMR to edit/view this test.

When no test is started and button *Back to EMR* is pressed, an *Abort* message is sent. The *Abort* message has the following format:

```
MSH|^~\&|CARDIOSOFT||CPO_EMR||20040812174812||ORU|20040812174812001|P|2.3|||NE
PID|1||EMR_PID||MARKHAM^STEVE^^^^||19650101|M||W
OBR|1|||R_ECG|||20040812174812|||||||20040812174812||||EK||||20040812174812|||X
OBX|1|ST|Comment||No test performed!||||||F
```

Items of Interest	
OBR-4=Test Name	Resting_ECG
OBR-18=Document Type	EK (EKG Report)
OBR-25=Result status	X indicates aborted test
OBX record	Is used to return comment providing the reason for aborting the test. The comment is generated by the application. It is not entered by the user.

Stress ECG

Example for launching CardioSoft to conduct a Stress ECG test:

S_ECG_80-TEST011_43.emr

```
MSH|^~\&|CPO_EMR||CARDIOSOFT||20040327110218||ORU|20040327110218001|P|2.3|||NE
PID|1||EMR_PID||MARKHAM^STEVE||19650101|M||W
PV1|1||SOUTH||||^Winston^Harry^S.|^Ref-L^Ref-F
OBR|1|||S_ECG||20040327110218|||||||||Ordering^Ordering-L^Ordering-F
OBX|1|ST|History||ANGINA, FUNCTIONAL CLASS III (ICD-786.5)
OBX|1|ST|Reason||Abnormal ECG
OBX|1|ST|Reason||Chest Discomfort
OBX|1|ST|Reason||Vascular Disease
OBX|1|ST|Reason||Pre-Op Evaluation
OBX|1|ST|Reason||Evaluation
OBX|1|ST|Height||72|IN
OBX|1|ST|Weight||160|LB
OBX|1|ST|Pacemaker||Y
OBX|1|ST|Medication||LISINOPRIL 80mg tablets
OBX|1|ST|Medication||HEXORAL|500ml
OBX|1|ST|Medication||ASPIRIN|100mg
OBX|1|ST|Medication||ASPIRIN|1320mg
OBX|1|ST|Medication||ISOSORB|75mg
OBX|1|ST|Medication||LISINOPRIL|180mg tablets
OBX|1|ST|Medication||HEXORAL|1500ml
OBX|1|ST|Medication||ASPIRIN|1100mg
OBX|1|ST|Medication||ASPIRIN|13200mg
OBX|1|ST|Medication||ISOSORB|175mg
```

Items of Interest	
MSH-3=Sending App	CPO_EMR
MSH-4=Receiving App	CARDIOSOFT
MSH-10=Message Control ID	Unique ID
MSH-11=Operating mode	P (Production), D (Debug)
PID-3=Patient ID	EMR Internal Patient ID
PID-4=Alternate ID	CardioSoft ID (if one exists)
PID-5=Patient Name	used: last^first^middle
PID-7=Date of Birth	yyyymmdd
PID-8=Sex	M, F, U
PID-10=Race	See Spec for correct values
PV1-7=Attending Phys.	used: ^last^first^middle^^^degree
PV1-8=Referring Phys	used: ^last^first^middle^^^degree
OBR-4=Test Name	S_ECG (Stress ECG)
OBR-16=Ordering Phys	used: ^last^first^middle^^^degree
OBX-3=Observation Name	obs name (e.g. History, Reason, Height, Weight…)

Items of Interest	
OBX-5=Observation Value	numeric or text value for observation
OBX-6=Units	If applicable, the unit assoc. with the value

NOTE

The "Medication" Observation name is reused for each medication sent. Each med is delivered with the medication name in OBX-3 and the dose in OBX-5.

Stress test is started and clinical data

- Attending Physician
- Referring Physician
- Ordering Physician
- Reason for Test (up to 3, rest is discarded)
- Medical-History
- Medication (up to 10, rest is discarded)

are stored in CardioSoft. EMR should use the CardioSoft default list in the Reason for Test combo box. Medical-History and Medication are "read only" in CardioSoft.

After the button *Post Test Review* or *Back to EMR* is pressed, the following data is provided by the Stress ECG module:

Table 2. Stress Test

Cardio Soft ID	Unit	Description
OTHER_REF	Text	Internal Reference to test (to use by EMR for editing or viewing)
Max HR	bpm	Maximum heart rate achieved
Max predicted HR	bpm	Maximum predicted heart rate
Max BP Systolic	mmHg	Blood pressure, systolic, maximum exercise
Max BP Diastolic	mmHg	Blood pressure, diastolic, maximum exercise
Max Load	METS	Maximum load, treadmill
Max Load	Watt	Maximum load, ergometer
Max ST Level	mv	Maximum ST level (maximum ST depression)
Max TWA	uV	Maximum TWA (T-Wave alternans)
Protocol	Text	Protocol, as in load sequence of a stress test such as Bruce, Naughton, Cornell, etc.
Total Test Time	Text	Exercise tolerance test, total test time
Interpretation	Text	Stress electrocardiogram, interpretation
Comment	Text	Any comment: workflow, personal, non-clinical data. (60 char max)

Cardio Soft ID	Unit	Description
Question 1	Text	Short note containing a question and response (52 char max)
Question 2	Text	Short note containing a question and response (52 char max)
Stress Test Type	Text	Stress test type (Treadmill, Egometer, Persantine…)
Baseline HR	bpm	Resting HR
Reas. For Term.	Text	Reason for Termination (Fatigue)
Total Ex Time	Text	Time in Exercise

Example for Stress ECG Observation Results

S_ECG_80-TEST011_43.car

```
MSH|^~\&|CARDIOSOFT||CPO_EMR||20040812175140||ORU|20040812175140001|P|2.3|||NE
PID|1||EMR_PID||MARKHAM^STEVE^^^^||19650101|M||W
OBR|1|||S_ECG|||20040812175027|||||||20040812175027||||EK||||20040812175027|||F
OBX|1|TX|OTHER_REF||000002_S_ECG_20040812175027.csoft
OBX|1|ST|Max HR||60|bpm|||||F
OBX|1|ST|Max predicted HR||158|bpm|||||F
OBX|1|ST|Max BP Systolic||155|mmHg|||||F
OBX|1|ST|Max BP Diastolic||99|mmHg|||||F
OBX|1|ST|Stress Test Type||Treadmill Stress Test||||||F
OBX|1|ST|Baseline HR||60|bpm|||||F
OBX|1|ST|Reas. for Term.||Leg discomfort||||||F
OBX|1|ST|Max Load||2.90|METS|||||F
OBX|1|ST|Protocol||BRUCE||||||F
OBX|1|ST|Total Ex Time||01:05||||||F
OBX|1|ST|Total Test Time||01:42||||||F
OBX|1|ST|Interpretation||Reasons for Termination: Leg discomfort\.br\Summary: Resting ECG: normal.
Functional Capacity: above average (>20%).  \.br\Conclusion: This is the conclusion||||||F
OBX|1|ST|Comment||This is a comment||||||F
OBX|1|ST|Question 1||Smoker Yes||||||F
OBX|1|ST|Question 2||Athlete yes||||||F
```

Items of Interest	
MSH-3, MSH-4	Names reversed to indicate opposite send direction
OBR-4=Test Name	S_ECG (Stress ECG)
OBR-18=Document Type	EK (EKG Report)
OBR-25=Result status	F indicates normal status
OBX-3=Observation Name	Obs name (e.g. History, Reason, Height, Weight…)
OBX-5=Observation Value	Numeric or text value for observation
OBX-6=Units	If applicable, the unit assoc. with the value

Items of Interest	
Question 1 & Question 2	The value field contains both the question and answer
OTHER_REF	Value for this OBX is the reference to the test.

CardioSoft creates and stores an HL7-file (internally) to reference the conducted test. This filename is located in the OBX segment with OBX-3 OTHER_REF and must be used by the EMR to edit/view this test.

When no test is started and button *Back to EMR* is pressed, an *Abort* message is sent. The *Abort* message has the following format:

```
MSH|^~\&|CARDIOSOFT||CPO_EMR||20040812174812||ORU|20040812174812001|P|2.3|||NE
PID|1||EMR_PID||MARKHAM^STEVE^^^^||19650101|M||W
OBR|1|||S_ECG|||20040812174812|||||||20040812174812||||EK||||20040812174812|||X
OBX|1|ST|Comment||No test performed!||||||F
```

Items of Interest	
OBR-4=Test Name	S_ECG (Stress ECG)
OBR-18=Document Type	EK (EKG Report)
OBR-25=Result status	X indicates aborted test
OBX record	Is used to return comment providing the reason for aborting the test. The comment is generated by the application. It is not entered by the user.

After the button *Back to EMR* is pressed, the .car file described above is written again, when the test was modified during Post Test Review.

Spirometry

Example for launching CardioSoft to conduct a Spirometry test:

SPIRO_80-TEST011_44.emr

```
MSH|^~\&|CPO_EMR||CARDIOSOFT||20040327110218||ORU|20040327110218001|P|2.3|||NE
PID|1||EMR_PID||MARKHAM^STEVE||19650101|M||W
PV1|1||SOUTH||||^Winston^Harry^S.|^Ref-L^Ref-F
OBR|1|||SPIRO||20040327110218|||||||||Ordering^Ordering-L^Ordering-F
OBX|1|ST|History||DEPRESSION (ICD-311.)
OBX|1|ST|Reason||Respiratory problems
OBX|1|ST|Reason||Shortness of breath
OBX|1|ST|Reason||Pain
OBX|1|ST|Reason||Follow-up
OBX|1|ST|Height||72|IN
OBX|1|ST|Weight||160|LB
OBX|1|ST|Pacemaker||Y
OBX|1|ST|Medication||LISINOPRIL|180mg tablets
OBX|1|ST|Medication||HEXORAL|1500ml
OBX|1|ST|Medication||ASPIRIN|1100mg
OBX|1|ST|Medication||ASPIRIN|13200mg
OBX|1|ST|Medication||ISOSORB|175mg
```

Items of Interest	
MSH-3=Sending App	CPO_EMR
MSH-4=Receiving App	CARDIOSOFT
MSH-10=Message Control ID	Unique ID
MSH-11=Operating mode	P (Production), D (Debug)
PID-3=Patient ID	EMR Internal Patient ID
PID-4=Alternate ID	CardioSoft ID (if one exists)
PID-5=Patient Name	used: last^first^middle
PID-7=Date of Birth	yyyymmdd
PID-8=Sex	M, F, U
PID-10=Race	See Spec for correct values
PV1-7=Attending Phys.	used: ^last^first^middle^^^degree
PV1-8=Referring Phys	used: ^last^first^middle^^^degree
OBR-4=Test Name	SPIRO (Spirometry)
OBR-16=Ordering Phys	used: ^last^first^middle^^^degree
OBX-3=Observation Name	obs name (e.g. History, Reason, Height, Weight…)
OBX-5=Observation Value	numeric or text value for observation
OBX-6=Units	If applicable, the unit assoc. with the value

NOTE

The “Medication” Observation name is reused for each medication sent. Each med is delivered with the medication name in OBX-3 and the dose in OBX-5.

Spirometry test is started and clinical data

- Attending Physician
- Referring Physician
- Ordering Physician
- Reason for Test (up to 4, rest is discarded)
- Medical-History
- Medication (up to 5, rest is discarded)

are stored in CardioSoft. EMR should use the CardioSoft default list in the Reason for Test combo box. Medical-History and Medication are “read only” in CardioSoft.

After the button *Post Test Review* or *Back to EMR* is pressed the following data is provided by the Spirometry module:

Table 3. Spirometry

Cardio Soft ID	Units	Description
OTHER_REF	Text	Internal Reference to test (to use by EMR for editing or viewing)
SpiroTestType	Text	Spirometry test type
RefValEquation	Text	Spirometry reference values equation (name of formula used for calculation of reference values such s ECCS, Austrian, ECCS/ZAP, Forche, NHANESIIII, Knudson, Finland, Brazil)
Interpretation	Text	Spirometry interpretation
Comment	Text	Any comment: workflow, personal, non-clinical data. (60 char max)
Question 1	Text	Short note containing a question and response (52 char max)
Question 2	Text	Short note containing a question and response (52 char max)
FVC	l (liters)	Forced vital capacity
FEV1	l (liters)	Forced expiratory volume in 1st second
FEV1FVC	% (percent)	FEV1/FVC (FEV1 as a percentage of FVC)
SPI Interpr. Mode	Text	Interpretation Mode; 2 modes are available: "CHS" on the basis of ATS (American Thoracic Society), "Europe" on the basis of ECCS
SPI Meas. Mode	Text	Measurement Mode; "ATS" mode (mostly used in US) or "Envelope" mode

Example for Spirometry Observation Results

SPIRO_80-TEST011_44.car

```
MSH|^~\&|CARDIOSOFT||CPO_EMR||20040812175140||ORU|20040812175140001|P|2.3|||NE
PID|1||EMR_PID||MARKHAM^STEVE^^^^||19650101|M||W
OBR|1|||SPIRO|||20040812175548||||||20040812175548||||DR||||20040812175548|||F
OBX|1|TX|OTHER_REF||000003_SPIRO_20040812175548.csoft
OBX|1|ST|Comment||This is the comment||||||F
OBX|1|ST|Question 1|| Smoker Yes||||||F
OBX|1|ST|Question 2||Athlete No||||||F
OBX|1|ST|Interpretation||Normal spirometry||||||F
OBX|1|ST|RefValEquation||Knudson||||||F
OBX|1|ST|SpiroTestType||Spirometry||||||F
OBX|1|ST|FVC||3.28|l|||||F
OBX|1|ST|FEV1||2.88|l|||||F
OBX|1|ST|FEV1FVC|| 87|%|||||F
OBX|1|ST|SPI Interpr. Mode||CHS|||||F
OBX|1|ST|SPI Meas. Mode||Envelope||||||F
```

Items of Interest	
MSH-3, MSH-4	Names reversed to indicate opposite send direction
OBR-4=Test Name	SPIRO (Spirometry)
OBR-18=Document Type	DR (Diagnostic Report Other)
OBR-25=Result status	F indicates normal status
OBX-3=Observation Name	Obs name (e.g. History, Reason, Height, Weight…)
OBX-5=Observation Value	Numeric or text value for observation
OBX-6=Units	If applicable, the unit assoc. with the value
Question 1 & Question 2	The value field contains both the question and answer
OTHER_REF	Value for this OBX is the reference to the test

CardioSoft creates and stores an HL7-file (internally) to reference the conducted test. This filename is located in the OBX segment with OBX-3 OTHER_REF and must be used by the EMR to edit/view this test.

When no test is started and button *Back to EMR* is pressed, an *Abort* message is sent. The *Abort* message has the following format:

```
MSH|^~\&|CARDIOSOFT||CPO_EMR||20040812174812||ORU|20040812174812001|P|2.3|||NE
PID|1||EMR_PID||MARKHAM^STEVE^^^^||19650101|M||W
OBR|1|||SPIRO|||20040812174812||||||20040812174812||||DR||||20040812174812|||X
OBX|1|ST|Comment||No test performed!||||||F
```

Items of Interest	
OBR-4=Test Name	Stress ECG
OBR-18=Document Type	DR (Diagnostic Report Other)
OBR-25=Result status	X indicates aborted test
OBX record	Is used to return comment providing the reason for aborting the test. The comment is generated by the application. It is not entered by the user

After the button *Back to EMR* is pressed, the .car file described above is written again when the test was modified during Post Test Review.

ABP: Configuration of ABP Device

Example for launching CardioSoft to configure an ABP device:

BPMONC_80-TEST011_45.emr

```
MSH|^~\&|CPO_EMR||CARDIOSOFT||20040327110218||ORU|20040327110218001|P|2.3|||NE
PID|1||EMR_PID||MARKHAM^STEVE||19650101|M||W
PV1|1||SOUTH||||^Winston^Harry^S.|^Ref-L^Ref-F
OBR|1|||BPMONC||20040327110218|||||||||Ordering^Ordering-L^Ordering-F
OBX|1|ST|History||Text of the history goes here.
OBX|1|ST|Reason||Therapy outcome control
OBX|1|ST|Reason||Suspected sleep-apnea syndrome
OBX|1|ST|Reason||Kidney transplant
OBX|1|ST|Reason||Reason for Test-4
OBX|1|ST|Height||72|IN
OBX|1|ST|Weight||160|LB
OBX|1|ST|Pacemaker||Y
OBX|1|ST|Medication||LISINOPRIL|180mg tablets
OBX|1|ST|Medication||HEXORAL|1500ml
OBX|1|ST|Medication||ASPIRIN|1100mg
OBX|1|ST|Medication||ASPIRIN|13200mg
OBX|1|ST|Medication||ISOSORB|175mg
```

Items of Interest	
MSH-3=Sending App	CPO_EMR
MSH-4=Receiving App	CARDIOSOFT
MSH-10=Message Control ID	Unique ID
MSH-11=Operating mode	P (Production), D (Debug)
PID-3=Patient ID	EMR Internal Patient ID
PID-4=Alternate ID	CardioSoft ID (if one exists)
PID-5=Patient Name	used: last^first^middle

Items of Interest	
PID-7=Date of Birth	yyyymmdd
PID-8=Sex	M, F, U
PID-10=Race	See Spec for correct values
PV1-7=Attending Phys.	used: ^last^first^middle^^^degree
PV1-8=Referring Phys	used: ^last^first^middle^^^degree
OBR-4=Test Name	BPMONC (ABP: Configuration)
OBR-16=Ordering Phys	used: ^last^first^middle^^^degree
OBX-3=Observation Name	obs name (e.g. History, Reason, Height, Weight…)
OBX-5=Observation Value	numeric or text value for observation
OBX-6=Units	If applicable, the unit assoc. with the value

NOTE

The "Medication" Observation name is reused for each medication sent. Each med is delivered with the medication name in OBX-3 and the dose in OBX-5.

ABP modality is started and clinical data

- Attending Physician
- Referring Physician
- Ordering Physician
- Reason for Test (up to 4, rest is discarded)
- Medical-History
- Medication (up to 5, rest is discarded)

are stored in CardioSoft. EMR should use the CardioSoft default list in the *Reason for Test* combo box. Medical-History and Medication are "read only" in CardioSoft.

In the ABP modality the user can clear data in the device and program the device. The button *Download Data* is disabled.

After the button *Back to EMR* is pressed, the Configuration Status is provided by the ABP module.

Example for ABP Observation Results (Configuration Status)

BPMONC_80-TEST011_45.car

```
MSH|^~\&|CARDIOSOFT||CPO_EMR||20040812174812||ORU|20040812174812001|P|2.3|||NE
PID|1||EMR_PID||MARKHAM^STEVE^^^^||19650101|M||W
OBR|1|||BPMONC|||20040812174812|||||||20040812174812||||DR||||20040812174812|||X
OBX|1|ST|Comment||Setup of BP device successfully completed!||||||F
```

Items of Interest	
OBR-4=Test Name	BPMONC (ABP: Configuration)
OBR-18=Document Type	DR (Diagnostic Report Other)
OBR-25=Result status	X indicates aborted test
OBX record	Is used to return comment providing the configuration status. The comment is generated by the application. It is not entered by the user

This configuration status is only informational. CardioSoft does not store configuration status. An abort message is sent when CardioSoft cannot establish a connection to the ABP device. The OBX record (OBX-5) returns the reason for aborting the test (Message as shown above).

ABP: Read Data from ABP Device

Example for launching CardioSoft to read data from an ABP device:

BPMOND_80-TEST011_46.emr

```
MSH|^~\&|CPO_EMR||CARDIOSOFT||20040327110218||ORU|20040327110218001|P|2.3|||NE
PID|1||EMR_PID||MARKHAM^STEVE||19650101|M||W
PV1|1||SOUTH||||^Winston^Harry^S.|^Ref-L^Ref-F
OBR|1|||BPMOND||20040327110218|||||||||Ordering^Ordering-L^Ordering-F
OBX|1|ST|History||Text of the history goes here.
OBX|1|ST|Reason||Reason for Test-1
OBX|1|ST|Reason||Reason for Test-2
OBX|1|ST|Reason||Reason for Test-3
OBX|1|ST|Reason||Reason for Test-4
OBX|1|ST|Height||72|IN
OBX|1|ST|Weight||160|LB
OBX|1|ST|Pacemaker||Y
OBX|1|ST|Medication||LISINOPRIL|180mg tablets
OBX|1|ST|Medication||HEXORAL|1500ml
OBX|1|ST|Medication||ASPIRIN|1100mg
OBX|1|ST|Medication||ASPIRIN|13200mg
OBX|1|ST|Medication||ISOSORB|175mg
```

Items of Interest	
MSH-3=Sending App	CPO_EMR
MSH-4=Receiving App	CARDIOSOFT
MSH-10=Message Control ID	Unique ID
MSH-11=Operating mode	P (Production), D (Debug)
PID-3=Patient ID	EMR Internal Patient ID
PID-4=Alternate ID	CardioSoft ID (if one exists)

Items of Interest	
PID-5=Patient Name	used: last^first^middle
PID-7=Date of Birth	yyyymmdd
PID-8=Sex	M, F, U
PID-10=Race	See Spec for correct values
PV1-7=Attending Phys.	used: ^last^first^middle^^^degree
PV1-8=Referring Phys	used: ^last^first^middle^^^degree
OBR-4=Test Name	BPMOND (ABP: Read Data from ABP Device)
OBR-16=Ordering Phys	used: ^last^first^middle^^^degree
OBX-3=Observation Name	obs name (e.g. History, Reason, Height, Weight…)
OBX-5=Observation Value	numeric or text value for observation
OBX-6=Units	If applicable, the unit assoc. with the value

NOTE

Note that the "Medication" Observation name is reused for each medication sent. Each med is delivered with the medication name in OBX-3 and the dose in OBX-5.

ABP test is started and clinical data:

- Attending Physician
- Referring Physician
- Ordering Physician
- Reason for Test (up to 4, rest is discarded)
- Medical-History
- Medication (up to 5, rest is discarded)

are stored in CardioSoft. EMR should use the CardioSoft default list in the *Reason for Test* combo box. Medical-History and Medication are "read only" in CardioSoft.

After connection to the ABP device is established, the user can download data from the BP monitor. The buttons to program and clear data in the ABP device is disabled.

After the button *Download Data* is pressed, the following results are provided by the ABP module:

Table 4. ABP

Cardio Soft ID	Units	Description
OTHER_REF	Text	Internal Reference to test (to use by EMR for editing or viewing)
24h aver BPsys	mmHg	Systolic blood pressure, 24-hr average
24h aver BPdia	mmHg	Diastolic blood pressure, 24-hr average
Interpretation	Text	Blood pressure interpretation, ambulatory
Comment	Text	Any comment: workflow, personal, non-clinical data. (60 char max)
Question 1	Text	Short note containing a question and response (52 char max)
Question 2	Text	Short note containing a question and response (52 char max)
Day aver BPsyst	mmHg	Day Time Average Systolic
Day aver BPdia	mmHg	Day Time Average Diastolic
Night aver BPsyst	mmHg	Night Time Average Systolic
Night aver BPDia	mmHg	Night Time Average Diastolic
ABP Tot Rec Time	Text	Total Recording Time

Example for Observation Results (Data from ABP Device):

BPMOND_80-TEST011_46.car

```
MSH|^~\&|CARDIOSOFT||CPO_EMR||20040812175140||ORU|20040812175140001|P|2.3|||NE
PID|1|| EMR_PID||MARKHAM^STEVE^^^^||19650101|M||W
OBR|1|||BPMOND|||20040812175548|||||||20040812175548||||DR||||20040812175548|||F
OBX|1|TX|OTHER_REF||000003_BPMOND_20040812175548.csoft
OBX|1|ST|Comment||This is a comment||||||F
OBX|1|ST|Question 1||Smoker Yes||||||F
OBX|1|ST|Question 2||Athlete Yes||||||F
OBX|1|ST|Interpretation||||||||F
OBX|1|ST|24h aver BPsys||133.3 |mmHg|||||F
OBX|1|ST|24h aver BPdia|| 86.6 |mmHg|||||F
OBX|1|ST|Day aver BPsyst||133.3 |mmHg|||||F
OBX|1|ST|Day aver BPdia|| 86.6 |mmHg|||||F
OBX|1|ST|Night aver BPsyst|||mmHg|||||F
OBX|1|ST|Night aver BPdia|||mmHg|||||F
OBX|1|ST|ABP Tot Rec Time||0:10 h||||||F
```

Items of Interest	
MSH-3, MSH-4	Names reversed to indicate opposite send direction
OBR-4=Test Name	BPMOND (ABP: Read Data from ABP Device)

Items of Interest	
OBR-18=Document Type	DR (Diagnostic Report Other)
OBR-25=Result status	F indicates normal status
OBX-3=Observation Name	Obs name (e.g. History, Reason, Height, Weight…)
OBX-5=Observation Value	Numeric or text value for observation
OBX-6=Units	If applicable, the unit assoc. with the value
Question 1 & Question 2	The value field contains both the question and answer
OTHER_REF	Value for this OBX is the reference to the test

CardioSoft creates and stores an HL7-file (internally) to reference the conducted test. This filename is located in the OBX segment with OBX-3 OTHER_REF and must be used by the EMR to edit/view this test.

If no successful download of the data in the APB device was possible, an abort message is sent. The *Abort* message has the following format:

```
MSH|^~\&|CARDIOSOFT||CPO_EMR||20040812174812||ORU|20040812174812001|P|2.3|||NE
PID|1||EMR_PID||MARKHAM^STEVE^^^^||19650101|M||W
OBR|1|||BPMOND|||20040812174812|||||||20040812174812||||DR||||20040812174812|||X
OBX|1|ST|Comment||Ambulatory Blood Pressure test/ setup not done!||||||F
```

Items of Interest	
OBR-4=Test Name	BPMOND (ABP: Read Data from ABP Device)
OBR-18=Document Type	DR (Diagnostic Report Other)
OBR-25=Result status	X indicates aborted test
OBX record	Is used to return comment providing the reason for aborting the test. The comment is generated by the application. It is not entered by the user.

After the button *Back to EMR* is pressed, the .car file described above is written again when the test was modified during Post Test Review.

Edit Test

CardioSoft is launched in Edit-Mode by the EMR with the parameters:

EMR_E <internal patient id>_<modality>_<time of teststamp>.csoft.

The EMR needs to take the filename with the extension .csoft (this is the document reference) out of the .car-file, that was written to the “Write To” folder by CardioSoft, after a new test was finished.

It is located in OBX-5 of that OBX segment, whose OBX-3 value is OTHER_REF.

Examples for launching CardioSoft in Edit-Mode:

Edit a Resting ECG test:

C:\Cardio\Cardio.exe EMR_E 000002_R_ECG_20050802135947.csoft

Edit a Stress ECG test:

C:\Cardio\Cardio.exe EMR_E 000003_S_ECG_20050902145947.csoft

Edit a Spirometry test:

C:\Cardio\Cardio.exe EMR_E 000004_SPIRO_20051002155947.csoft

Edit an ABP test::

C:\Cardio\Cardio.exe EMR_E 000005_BPMOND_20051102165947.csoft

Path name:

See Win.ini (Folder C:\Winnt or C:\Windows) in section [CARDIO]:

CardioInstallPath=C:\Cardio

After having clicked *Back to EMR*, data is passed back as .car file, even if no changes were made. The format is identical as described in “Resting ECG” on page 21 for Resting ECG, “Stress ECG” on page 25 for Stress ECG, “Spirometry” on page 29 for Spirometry and “ABP: Read Data from ABP Device” on page 34 for ABP Read Data.

The ID in the .car filename is identical to that one, that was received within the .emr-filename, when this test initially was conducted.

The EMR is responsible to delete the file.

View Test

CardioSoft is launched in View Only-Mode by the EMR with the parameters

EMR_O <internal patient id>_<modality>_<time of teststamp>.csoft.

The EMR needs to take the filename with the extension .csoft (this is the document reference) out of the .car-file, that was written to the “Write To” folder by CardioSoft, after a new test was finished.

It is located in OBX-5 of that one OBX segment, that has the string OTHER_REF as OBX-3.

With the CardioSoft Install program:

- the system variable “Path” is expanded with the location of the csoft-file
- and the file extension .csoft is mapped to <CardioSoft Local Install Folder>/Cardio.exe EMR_O <xxx>.csoft

So to view tests, CardioSoft can be started:

- either by using Cardio.exe and reading the Path name out of Win.ini (as stated in “Edit Test” on page 38)
- or directly by launching the .csoft-file

Examples for launching CardioSoft in View Only-Mode:

View a Resting ECG test:

C:\Cardio\Cardio.exe EMR_O 000002_R_ECG_20050802135947.csoft

or directly launch

000002_R_ECG_20050802135947.csoft

View a Stress ECG test:

C:\Cardio\Cardio.exe EMR_O 000003_S_ECG_20050902145947.csoft

or directly launch

000003_S_ECG_20050902145947.csoft

View a Spirometry test:

C:\Cardio\Cardio.exe EMR_O 000004_SPIRO_20051002155947.csoft

or directly launch

000004_SPIRO_20051002155947.csoft

View an ABP test:

C:\Cardio\Cardio.exe EMR_O 000005_BPMOND_20051102165947.csoft

or directly launch

000005_BPMOND_20051102165947.csoft

After having clicked *Back to EMR*, no data is passed back.

Functions Initiated by CardioSoft

CardioSoft is started directly via an icon on the desktop.

Data Upload of Existing CardioSoft Tests to EMR

In those cases where an EMR is newly installed into an environment that CardioSoft has been in for some time, CardioSoft provides one-time upload of data from CardioSoft to the EMR.

This ensures that a chart exists in the EMR for every patient on CardioSoft. In addition, CardioSoft provides document references, that allows access to test reports.

For each patient in the CardioSoft database a demographics file is created, then for each test a document reference file is created. All files are copied to a folder or data is sent via TCP/IP communication. See *System Configuration* >> *EMR* Tab.

Acknowledging is configurable manually in HL7.ini: See "HL7 Settings" on page 18, HL7 settings.

Patient Demographics File (HL7-message: ADT, A04)

Filename	<pid>_<modality>.hd
PID	CardioSoft Internal Patient ID
Modality	R_ECG, S_ECG, SPIRO, BPMOND

Example for a Demographics File:

Name: 000002_S_ECG.hd

Format:

```
MSH|^~\&|CARDIOSOFT||LINLOGIC|LOGICIAN|20040327110218||ADT^A04|20040327110218001|P|2.3|||NE
EVN|A04|20040327110218||
PID|1||Cardiosoft_PID||MARKHAM^STEVE^^^^||19650101|M||W
```

Document Reference File (HL7-message: MDM, T02)

Filename	<pid>_<modality>_<time of testtimestamp>.ht
PID	CardioSoft Internal Patient ID
Timestamp time of test	yyyymmddhhmmss (time of test)
Modality	R_ECG, S_ECG, SPIRO, BPMOND

Example for Document Reference File:

Name: 000002_R_ECG_20040504140211.ht

Format:

```
MSH|^~\&|CARDIOSOFT||LINKLOGIC|LOGICIAN|20040327110218||MDM^T02|20040327110218001|P|2.3|||NE
EVN|T02|20040504140211||
PID|1||Cardiosoft_PID||MARKHAM^STEVE||19650101|M||W
TXA||EK|TX|20040504140211||20040504140211||||||000002_R_ECG_20040504140211||||||
OBX|1|ST|||CASE/CardioSoft: Resting ECG||||||F
OBX|1|ST|||\.br\\.br\\.br\To review the test, click on the paperclip icon to the right.||||||F
OBX|1|TX|OTHER_REF||000002_R_ECG_20040504140211.csoft
```

Items of interest:

TXA-2	Document Type: DR for Diagnostic Report other or EK for EKG Report
TXA-4	Time of Test
TXA-6	Time of Test
TXA-12	Unique Document number: (<internal patient id>_<modality>_<time of test>) Modality: R_ECG, S_ECG, SPIRO, BPMOND. To support legacy tests from CardioSoft releases prior V5.0, R_ECG42, S_ECG42 are used. These are old versions of stress and Resting ECG.
First OBX-5	Text: CardioSoft <Modality> report
OTHER_REF	Value for this OBX is the reference to the test.

NOTE

If the EMR wants to launch a new test with one of the uploaded patient IDs, EMR must use PID-4 of the uploaded A04 messages for PID-4 of the emr-file and use the EMR patient ID for PID-3 of the emr file.

Data Upload of External Tests from ECG Writers

When a test is received from an ECG Writer (*System Configuration* >> *Receive Data from ECG Device*), CardioSoft does the Patient ID matching as follows:

- If External Patient ID found:
  - If Patient's Last Name and First Name and Gender and Date Of Birth are identical (empty fields of received data don't care)

    Assign test in CardioSoft to the patient's chart
  - If different, assign the test manually (Side by Side-Dialog comes up)
- If External Patient ID not found:
  - Use received Patient ID and patient demographic data to create a new patient record in the database
  - Assign this test

For each test that is received from an ECG Writer and assigned to the CardioSoft database, a patient demographics file and a document reference file will be created and written to a folder or sent via TCP/IP to the EMR.

Acknowledging is configurable manually in HL7.ini: See "HL7 Settings" on page 18., HL7 settings.

The same settings are used as for data migration of existing CardioSoft tests in "Data Upload of Existing CardioSoft Tests to EMR" on page 40. (See *System Configuration* >> *EMR* Tab).

Format of Patient demographics file and document reference file are identical to "Data Upload of Existing CardioSoft Tests to EMR" on page 40.

HL7 Messages

General

The abstract message definition syntax used to describe the supported HL7 messages is consistent with the syntax used in the HL7 specification, version 2.3.

Although not required, it is preferred that Ignored or Not Used message segments not be included in a supported HL7 message. When present, Ignored message segments are ignored and CardioSoft performs no data validation. When present, Not Used message segments are parsed and CardioSoft validates the data. If there is invalid data, CardioSoft generates an error and does not import the file or the segment with the invalid data.

HL7-Errors are logged in HL7_ERR.LOG with timestamp, reason of error plus reference to the HL7-Message. The HL7 message itself is completely stored by using MSH-10 as filename (<MSH-10>.log). The erroneous field is marked to identify the issue. If MSH-10 is not available, the type of error is only logged in HL7_ERR.LOG.

Legend

The following legend is used throughout the document.

Value	Description
R	Required. This field is required to have valid data. Missing or invalid data causes CardioSoft to generate an error and to not import the file or the segment with the missing or invalid data.
O	Optional. This field is not required to have data. On import, if data is provided, it is validated. If the data is invalid, CardioSoft generates an error and does not import the file or the segment with the invalid data. On export, if CardioSoft has data, it exports it.
C	Conditional. Data may be either required or optional, depending on the condition. For further clarification, read the associated footnote.
I	Ignored. Data is not required and it is not used in CardioSoft. If there is data, CardioSoft does not validate it.
N	Not Used. Data is not required and it is not used in CardioSoft. However, if data is present, CardioSoft parses and validates the data. If the data is invalid, CardioSoft generates an error and does not import the file or the segment with the invalid data.
U	Used. CardioSoft exports data in this field.

ORU – Observation Reporting

The ORU message supports the import (patient demographics, observation request and clinical data) and export of observation data (including link to the report). It uses a subset of the complete HL7 message set for Observation Reporting and only includes support for the ORU message.

Each ORU message contains one OBR message segment in which observations were documented. Nested under the OBR message segment are one or more OBX message segments, one for each documented observation.

Legend: R = Required, O = Optional, C = Conditional, I = Ignored

ORU				
Message Segments	Import		Export	
MSH	R		R	
{				
[				
PID	R	[0]	R	[0]
[{NTE}]	I		I	

ORU				
[PV1]	O		I	
]				
{				
[ORC]	I		I	
OBR	R	[1]	R	[1]
{[NTE]}	I		I	
{				
{[OBX]}	O		O	
{[NTE]}	I		I	
}				
}				
}				
[DSC]	I	[2]	I	[2]
MSH	C	[3]	C	[3]
MSA	C	[3]	C	[3]
[ERR]	I		I	

Note	Description
[0]	Although this message segment is considered optional in the HL7 specification, CardioSoft requires it. One PID segment per message is allowed.
[1]	One OBR segment per message is allowed.
[2]	The application-specific HL7 message continuation protocol is not supported.
[3]	Acknowledging is only supported in Upload mode.

ORU Message Segments

ORU-MSH – Message Header
Legend: R = Required, O = Optional, C = Conditional, N = Not Used, U = Used

MSH Segment								
					CardioSoft Applicability			
Seq	Length	Data Type	HL7 Table	Element Name	Import		Export	
1	1	ST		Field Separator	R		U	
2	4	ST		Encoding Characters	R		U	
3	40	HD		Sending Application	O		U	
4	20	HD		Sending Facility	O		U	
5	40	HD		Receiving Application	N		C	[1]
6	30	HD		Receiving Facility	N		C	[2]
7	26	TS		Date/Time Of Message	O		U	
8	40	ST		Security	N		N	
9	7	CM	0076	Message Type	R	[3]	U	[3]
10	20	ST		Message Control ID	R	[4]	U	[4]
11	3	PT	0103	Processing ID	R	[5]	U	
12	8	ID	0104	Version ID	R	[6]	U	
13	15	NM		Sequence Number	N		N	
14	180	ST		Continuation Pointer	N		N	
15	2	ID	0155	Accept Ack Type	O	[7]	N	
16	2	ID	0155	Application Ack Type	N	[8]	U	[8]
17	2	ID		Country Code	N		N	
18	6	ID	0211	Character Set	N		N	
19	60	CE		Principal Language Of Message	N		N	

Note	Description
[1]	MSH-5 contains MSH-3 of the initiating system, if we are the responder
[2]	MSH-6 contains MSH-4 of the initiating system, if we are the responder

Note	Description
[3]	The supported values for Message Type include: ■ ORU = Unsolicited transmission of an observation ■ ACK = General acknowledgment message Note: The second component, trigger event, is ignored on import and not used on export.
[4]	On Import, MSH-10 is used as a unique ID to log potential errors of this HL7 message. In this case the HL7 message is stored with MSH-10 as filename (<MSH-10>.log). Reason of error plus reference to this filename is stored in file HL7_ERR.Log. For the error file location, see setting in EMR-tab in system configuration screen of CardioSoft. On Export, the creation time of the message is used for MSH-10 (time stamp yyyymmddhhmmssxxx, where <xxx> is a sequence number in case of identical time stamp).
[5]	The supported values for Processing ID include: ■ D = Debugging ■ P = Production Note: D is used, if interface is in test mode with simulated patient data: See “Interface Configuration for Test Mode” on page 17.
[6]	The supported values for Version ID include: ■ 2.0 = Release 2.0, Sept. 1988 ■ 2.0D = Release 2.0D, Oct. 1988 ■ 2.1 = Release 2.1, March 1990 ■ 2.2 = Release 2.2, December 1994 ■ 2.3 = Release 2.3, April 1997
[7]	In this mode only NE (Never) is supported.
[8]	Application acknowledgment is currently unsupported on import and export. On export, the value NE is used. The Ack types are still validated for import.

ORU-PID – Patient Identification

Legend: R = Required, O = Optional, C = Conditional, N = Not Used, U = Used

PID Segment								
					CardioSoft Applicability			
Seq	Length	Data Type	HL7 Table	Element Name	Import		Export	
1	4	SI		Set ID - Patient ID	N		N	
2	20	CX		Patient ID (External ID)	N		N	
3	20	CX		Patient ID (Internal ID)	R	[1]	U	[1]

PID Segment								
					CardioSoft Applicability			
Seq	Length	Data Type	HL7 Table	Element Name	Import		Export	
4	30	CX		Alternate Patient ID-PID	O	[2]	O	[2]
5	48	XPN		Patient Name	R		U	
6	48	XPN		Mother's Maiden Name	N		N	
7	26	TS		Date/Time of Birth	O		O	
8	1	IS	0001	Sex	O	[3]	U	
9	48	XPN		Patient Alias	N		N	
10	1	IS	0005	Race	O	[4]	O	
11	106	XAD		Patient Address	N		N	
12	4	IS		County Code	N		N	
13	250	XTN		Phone Number - Home	N		N	
14	250	XTN		Phone Number - Work	N		N	
15	60	CE	0296	Primary Language	N		N	
16	1	IS	0002	Marital Status	N		N	
17	3	IS	0006	Religion	N		N	
18	20	CX		Patient Account Number	N		N	
19	11	ST		SSN Number - Patient	N		N	
20	25	DLN		Driver's License Number-Patient	N		N	
21	20	CX		Mother's Identifier	N		N	
22	3	IS	0189	Ethnic Group	N		N	
23	60	ST		Birth Place	N		N	
24	2	ID	0136	Multiple Birth Indicator	N		N	
25	2	NM		Birth Order	N		N	
26	4	IS	0171	Citizenship	N		N	

PID Segment								
					CardioSoft Applicability			
Seq	Length	Data Type	HL7 Table	Element Name	Import		Export	
27	60	CE	0172	Veterans Military Status	N		N	
28	80	CE		Nationality	N		N	
29	26	TS		Patient Death Date and Time	N		N	
30	1	ID	0136	Patient Death Indicator	N		N	

Note	Description			
[1]	PID-3, Patient ID (Internal ID), is assumed to contain the patient identifier of the EMR system used to match the import data with a CardioSoft patient ID, if PID-4 is not available (See “General” on page 42.).			
[2]	PID-4, Alternate Patient ID, is assumed to be the CardioSoft’s Patient’s ID, that was previously uploaded to the EMR database (data migration of existing patients and tests). If available, PID-4 is used primarily to access to existing CardioSoft’s Patient IDs. Although HL7 states a length of 20, with CardioSoft a maximum length of 30 is possible (due to data migration of existing patients and tests).			
[3]	The supported values for Sex include: F = Female M = Male O = Other (treated as Unknown) U = Unknown			
[4]	The supported values for Race include:			
		Value =	Definition >>	CardioSoft
	On Import (if not supported, CardioSoft uses <Unknown>)	B C H J N 0 P W T U	Black Chinese Hispanic Japanese Native Am. Orient./Asian Pacific Isl.r White Other Undeterm.	Black Asian Hispanic Asian Native American Asian Pacific Islander Caucasian Unknown Unknown (Default)

Note	Description			
		Value =	Definition >>	CardioSoft
	On Export (if not supported, <Unknown> is used)	Asian Black Caucasian Hispanic Native American Oriental Pacific Islander Unknown	O B W H N O P U	Oriental/Asian Black White Hispanic Native American Oriental/Asian Pacific Islander Undetermined (default)

ORU-PV1 – Patient Visit

Legend: R = Required, O = Optional, C = Conditional, N = Not Used, U = Used

PV1 Segment								
					CardioSoft Applicability			
Seq	Length	Data Type	HL7 Table	Element Name	Import		Export	
1	4	SI		Set ID-PV1	N		N	
2	1	IS	0004	Patient Class	N		N	
3	80	PL		Assigned Patient Location	N		N	
4	2	IS	0007	Admission Type	N		N	
5	20	CX		Preadmit Number	N		N	
6	80	PL		Prior Patient Location	N		N	
7	60	XCN	0010	Attending Doctor	O	[1]	N	
8	60	XCN	0010	Referring Doctor	O	[1]	N	
9	60	XCN	0010	Consulting Doctor	N		N	
10	3	IS	0069	Hospital Service	N		N	
11	80	PL		Temporary Location	N		N	
12	2	IS	0087	Pre-admit Test Indicator	N		N	
13	2	IS	0092	Readmission Indicator	N		N	
14	3	IS	0023	Admit Source	N		N	
15	2	IS	0009	Ambulatory Status	N		N	
16	2	IS	0099	VIP Indicator	N		N	

PV1 Segment								
					CardioSoft Applicability			
Seq	Length	Data Type	HL7 Table	Element Name	Import		Export	
17	60	XCN	0010	Admitting Doctor	N		N	
18	2	IS	0018	Patient Type	N		N	
19	20	CX		Visit Number	N		N	
20	50	FC	0064	Financial Class	N		N	
21	2	IS	0032	Charge Price Indicator	N		N	
22	2	IS	0045	Courtesy Code	N		N	
23	2	IS	0046	Credit Rating	N		N	
24	2	IS	0044	Contract Code	N		N	
25	8	DT		Contract Effective Date	N		N	
26	12	NM		Contract Amount	N		N	
27	3	NM		Contract Period	N		N	
28	2	IS	0073	Interest Code	N		N	
29	1	IS	0110	Transfer to Bad Dept Code	N		N	
30	8	DT		Transfer to Bad Dept Date	N		N	
31	10	IS	0021	Bad Debt Agency Code	N		N	
32	12	NM		Bad Debt Transfer Amount	N		N	
33	12	NM		Bad Debt Recovery Amount	N		N	
34	1	IS	0111	Delete Account Indicator	N		N	
35	8	DT		Delete Account Date	N		N	
36	3	IS	0112	Discharge Disposition	N		N	
37	25	CM	0113	Discharged to Location	N		N	
38	2	IS	0114	Diet Type	N		N	
39	2	IS	0115	Servicing Facility	N		N	
40	1	IS	0116	Bed Status	N		N	
41	2	IS	0117	Account Status	N		N	
42	80	PL		Pending Location	N		N	
43	80	PL		Prior Temporary Location	N		N	
44	26	TS		Admit Date/Time	N		N	
45	26	TS		Discharge Date/Time	N		N	

PV1 Segment								
					CardioSoft Applicability			
Seq	Length	Data Type	HL7 Table	Element Name	Import		Export	
46	12	NM		Current Patient Balance	N		N	
47	12	NM		Total Charges	N		N	
48	12	NM		Total Adjustments	N		N	
49	12	NM		Total Payments	N		N	
50	20	CX	0192	Alternate Visit ID	N		N	
51	1	IS	0326	Visit Indicator	N		N	
52	60	XCN	0010	Other Healthcare Provider	N		N	

Note	Description
[1]	Attending and Referring Doctor: Part of CardioSoft test information

ORU-OBR – Observation Request

Legend: R = Required, O = Optional, C = Conditional, N = Not Used, U = Used

OBR Segment								
					CardioSoft Applicability			
Seq	Length	Data Type	HL7 Table	Element Name	Import		Export	
1	4	SI		Set ID - OBR	N		N	
2	75	EI		Placer Order Number	N		N	
3	75	EI		Filler Order Number	N		N	
4	200	CE		Universal Service ID	R	[0]	U	[0]
5	2	ID		Priority	N		N	
6	26	TS		Requested Date/Time	N		N	
7	26	TS		Observation Date/Time	N		U	[1]
8	26	TS		Observation End Date/Time	N		N	
9	20	CQ		Collection Volume	N		N	
10	60	XCN		Collector Identifier	N		N	
11	1	ID	0065	Specimen Action Code	N		N	

OBR Segment								
					CardioSoft Applicability			
Seq	Length	Data Type	HL7 Table	Element Name	Import		Export	
12	60	CE		Danger Code	N		N	
13	300	ST		Relevant Clinical Information	N		N	
14	26	TS		Specimen Received Date/Time	N		U	[1]
15	300	CM	0070	Specimen Source	N		N	
16	80	XCN		Ordering Provider	O	[2]	N	
17	40	XTN		Order Callback Phone Number	N		N	
18	60	ST		Placer Field 1	N		O	[3]
19	60	ST		Placer Field 2	N		N	
20	500	ST		Filler Field 1	N		N	
21	60	ST		Filler Field 2	N		N	
22	26	TS		Results Rpt/Status Chng - Date/Time	N		U	[1]
23	40	CM		Charge to Practice	N		N	
24	10	ID	0074	Diagnostic Service Sect ID	N		N	
25	1	ID	0123	Result Status	N		U	[4]
26	400	CM		Parent Result	N		N	
27	200	TQ		Quantity/Timing	N		N	
28	150	XCN		Result Copies To	N		N	
29	150	CM		Parent	N		N	
30	20	ID	0124	Transportation Mode	N		N	
31	300	CE		Reason for Study	N		N	
32	200	CM		Principal Result Interpreter	N		N	
33	200	CM		Assistant Result Interpreter	N		N	
34	200	CM		Technician	N		N	
35	200	CM		Transcriptionist	N		N	
36	26	TS		Scheduled Date/Time	N		N	
37	4	NM		Number of Sample Containers	N		N	
38	60	CE		Transport Logistics of Collected Sample	N		N	
39	200	CE		Collector's Comment	N		N	

OBR Segment								
					CardioSoft Applicability			
Seq	Length	Data Type	HL7 Table	Element Name	Import		Export	
40	60	CE		Transport Arrangement Responsibility	N		N	
41	30	ID	0224	Transport Arranged	N		N	
42	1	ID	0225	Escort Required	N		N	
43	200	CE		Planned Patient Transport Comment	N		N	

Note	Description
[0]	OBR-4, Universal Service IDs is populated as follows: First component, Identifier: ■ R_ECG for Resting ECG test ■ S_ECG for Stress ECG test ■ SPIRO for Spirometry test ■ BPMONC for ABP: Configure ABP Device ■ BPMOND for ABP: Read Data from ABP Device
[1]	Date/Time of conducted CardioSoft test.
[2]	Ordering Provider: Part of CardioSoft test information.
[3]	OBR-18, Placer Field 1, is populated with the document type ID (Additional to HL7 table 270). Used IDs: ■ EK (EKG Report for Resting ECG and Stress Test) ■ DR (Diagnostic Report Other for Spirometry and ABP test)
[4]	OBR-25, Result Status: ■ F (Final) for completed tests ■ X (Deleted) for aborted tests

ORU-OBX – Observation/Result

Legend: R = Required, O = Optional, C = Conditional, N = Not Used, U = Used

OBX Segment								
					CardioSoft Applicability			
Seq	Length	Data Type	HL7 Table	Element Name	Import		Export	
1	10	SI		Set ID - Observation Simple	N		N	
2	2	ID	0125	Value Type	O	[0]	U	[0]
3	590	CE		Observation Identifier	R	[1] [3]	U	[1] [3]

OBX Segment								
					CardioSoft Applicability			
Seq	Length	Data Type	HL7 Table	Element Name	Import		Export	
4	20	ST		Observation Sub-ID	N		N	
5	2000	ST		Observation Value	O	[3]	U	[3]
6	60	CE		Units	O	[2] [3]	C	[2] [3]
7	60	ST		Reference Range	N		N	
8	10	ID	0078	Abnormal Flags	N		N	
9	5	NM		Probability	N		N	
10	5	ID	0080	Nature of Abnormal Test	N		N	
11	2	ID	0085	Observation Result Status	N		U	[4]
12	26	TS		Date Last Obs Normal Values	N		N	
13	20	ST		User Defined Access Checks	N		N	
14	26	TS		Date/Time of the Observation	N		N	
15	200	CE		Producer's ID	N		N	
16	80	XCN		Responsible Observer	N		N	
17	60	CE		Observation method	N		N	

Note	Description
[0]	OBX-2, Value Type: On Import, Value types must be one of ST, FT or TX. On Export, only value type ST and TX (only for Identifier OTHER_REF) is used.
[1]	OBX-3, Observation Identifier, is populated as follows: ■ The first component, Identifier, contains the unique CardioSoft Observation Identifier ■ Other imported Identifiers as listed below are disregarded (no error)
[2]	OBX-6, Units, is populated as follows: ■ The first component, Identifier, contains the appropriate unit ■ Other imported units for the listed Identifiers are treated as error
[3]	Table of supported OBX Identifiers / Units (see [3] table below)
[4]	OBX-11, Observation Result Status, is always set to F (Final)

[3] Imported Identifiers / Units / Values			
Cardio Soft ID (OBX-3)	Units (OBX-6)	Value (OBX-5)	Description/Notes
History	-	Text	Medical History of patient. If multiple OBX segments with this ID are used, the text is appended.
Reason	-	Text	Reason for test. Recommended: use separate OBX segments for each reason for test.
Medication	Text (e.g. 5 MG)	Text	Medications and dose. Recommended: use separate OBX segments for each medication. OBX-6 is used as Dose (separate field in CardioSoft test information)
Height	CM or IN	Numeric Value (e.g. 178, 178.6)	Height of Patient. Use this ID only once.
Weight	KG or LB	Numeric Value (e.g. 75, 75.6)	Weight of patient. Use this ID only once.
Pacemaker	-	Y or N	Pacemaker patient. Use this ID only once.

NOTE

Exported Identifiers are listed separately for each modality in this document (see corresponding tables).

MDM – Document Management

The MDM message is used to export document references of already conducted CardioSoft tests (Data upload of already existing tests or new tests, that are conducted on an ECG Writer and received by CardioSoft. See “Data Upload of Existing CardioSoft Tests to EMR” on page 40, and “Data Upload of External Tests from ECG Writers” on page 42).

The document reference is transferred within an OBX segment with the Identifier OTHER_REF.

Legend: R = Required, O = Optional, C = Conditional, I = Ignored

MDM				
	T02			
Message Segments	Import		Export	
MSH			R	
EVN			R	
PID			R	
PV1			I	[1]
TXA			R	[2]
{OBX}			R	[3]
MSH	C			
MSA	C			
[ERR]	I			

Note	Description
[0]	MDM-Import is only internally supported, because all document references that are exported by CardioSoft are also stored internally as a MDM-T02 message. The EMR only uses the exported document reference to view or edit the test.
[1]	Although the HL7 specification considers this message segment to be required, CardioSoft does not use it on export.
[2]	The TXA message segment is always exported as part of an MDM message.
[3]	The first exported OBX segment states the type of test, that is referenced by this message. The 2nd OBX segment can be ignored. The 3rd OBX segment (Identifier OTHER_REF) shall be used by the EMR as document reference.

MDM Message Segments

MDM-MSH – Message Header

Legend: R = Required, O = Optional, C = Conditional, N = Not Used, U = Used

MSH Segment						
					CardioSoft Applicability	
Seq	Length	Data Type	HL7 Table	Element Table	Export	
1	1	ST		Field Separator	U	
2	4	ST		Encoding Characters	U	
3	40	HD		Sending Application	U	
4	20	HD		Sending Facility	U	
5	40	HD		Receiving Application	C	[1]
6	30	HD		Receiving Facility	C	[2]
7	26	TS		Date/Time Of Message	U	
8	40	ST		Security	N	
9	7	CM	0076	Message Type	U	[3]
10	20	ST		Message Control ID	U	[4]
11	3	PT	0103	Processing ID	U	[5]
12	8	ID	0104	Version ID	U	[6]
13	15	NM		Sequence Number	N	
14	180	ST		Continuation Pointer	N	
15	2	ID	0155	Accept Ack Type	N	
16	2	ID	0155	Application Ack Type	U	[7]
17	2	ID		Country Code	N	
18	6	ID	0211	Character Set	N	
19	60	CE		Principal Language Of Message	N	

Note	Description
[1]	MSH-5 contains MSH-3 of the initiating system, if we are the responder
[2]	MSH-6 contains MSH-4 of the initiating system, if we are the responder

Note	Description
[3]	The supported values for Message Type include: ■ ORU = Unsolicited transmission of an observation ■ ACK = General acknowledgment message The second component, trigger event, is ignored on import and not used on export
[4]	On Export, the creation time of the message is used for MSH-10 (time stamp yyyymmddhhmmssxxx, where <xxx> is a sequence number in case of identical time stamp).
[5]	The supported values for Processing ID include: D = Debugging P = Production
[6]	On export, 2.3 is used for Version ID
[7]	The supported values for Accept Ack Type include: AL = Always NE = Never (default) If application acknowledgment should be used, an entry in HL7.INI needs to be done manually (See "HL7 Settings" on page 18.)

MDM-EVN – Event Type

Legend: R = Required, O = Optional, C = Conditional, N = Not Used, U = Used

EVN Segment						
					CardioSoft Applicability	
Seq	Length	Data Type	HL7 Table	Element Name	Export	
1	3	ID	0003	Event Type Code	U	[1]
2	26	TS		Recorded Date/Time	U	[2]
3	26	TS		Date/Time of Planned Event	N	
4	3	IS	0062	Event Reason Code	N	
5	60	XCN	0188	Operator ID	N	
6	26	TS		Event Occurred	N	

Note	Description
[1]	The supported values for Event Type Code include: ■ T02 Original document notification and content ■ Trigger event T02 is always used
[2]	EVN-2, Date/Time of Event, is populated with the creation date/time of the test (referenced document)

MDM-PID – Patient Identification

Legend: R = Required, O = Optional, C = Conditional, N = Not Used, U = Used

PID Segment						
					CardioSoft Applicability	
Seq	Length	Data Type	HL7 Table	Element Name	Export	
1	4	SI		Set ID - Patient ID	N	
2	20	CX		Patient ID (External ID)	N	
3	20	CX		Patient ID (Internal ID)	U	[1]
4	30	CX		Alternate Patient ID-PID	O	[2]
5	48	XPN		Patient Name	U	
6	48	XPN		Mother's Maiden Name	N	
7	26	TS		Date/Time of Birth	O	
8	1	IS	0001	Sex	U	[3]
9	48	XPN		Patient Alias	N	
10	1	IS	0005	Race	O	[4]
11	106	XAD		Patient Address	N	
12	4	IS		County Code	N	
13	250	XTN		Phone Number - Home	N	
14	250	XTN		Phone Number - Work	N	
15	60	CE	0296	Primary Language	N	
16	1	IS	0002	Marital Status	N	
17	3	IS	0006	Religion	N	
18	20	CX		Patient Account Number	N	

PID Segment						
					CardioSoft Applicability	
Seq	Length	Data Type	HL7 Table	Element Name	Export	
19	11	ST		SSN Number - Patient	N	
20	25	DLN		Driver's License Number-Patient	N	
21	20	CX		Mother's Identifier	N	
22	3	IS	0189	Ethnic Group	N	
23	60	ST		Birth Place	N	
24	2	ID	0136	Multiple Birth Indicator	N	
25	2	NM		Birth Order	N	
26	4	IS	0171	Citizenship	N	
27	60	CE	0172	Veterans Military Status	N	
28	80	CE		Nationality	N	
29	26	TS		Patient Death Date and Time	N	
30	1	ID	0136	Patient Death Indicator	N	

Note	Description
[1]	PID-3, Patient ID (Internal ID), is assumed to contain the patient identifier of CardioSoft.
[2]	PID-4, Alternate Patient ID, is assumed to be the CardioSoft's Patient's ID, that was previously uploaded to the EMR database (data migration of existing patients and tests). If available, PID-4 is used primarily to access to existing CardioSoft's Patient IDs. Although HL7 states a length of 20, with CardioSoft a maximum length of 30 is possible (due to data migration of existing patients and tests).
[3]	The supported values for Sex include: F = Female M = Male O = Other (treated as Unknown) U = Unknown
[4]	The supported values for Race include:

Note	Description			
		Value =	Definition >>	CardioSoft
	On Export (if not supported, <Unknown> is used)	Asian Black Caucasian Hispanic Native American Oriental Pacific Islander Unknown	O B W H N O P U	Oriental/Asian Black White Hispanic Native American Oriental/Asian Pacific Islander Undetermined (default)

MDM-TXA – Transcription Document Header

Legend: R = Required, O = Optional, C = Conditional, N = Not Used, U = Used

TXA Segment						
					CardioSoft Applicability	
Seq	Length	Data Type	HL7 Table	Element Name	Export	
1	4	SI		Set ID - Document	O	
2	30	IS	0270	Document Type	U	[1]
3	2	ID	0191	Document Content Presentation	U	[2]
4	26	TS		Activity Date/Time	U	[3]
5	60	XCN		Primary Activity Provider Code/Name	N	
6	26	TS		Origination Date/Time	U	[3]
7	26	TS		Transcription Date/Time	N	
8	26	TS		Edit Date/Time	N	
9	60	XCN		Originator Code/Name	N	
10	60	XCN		Assigned Document Authenticator	N	
11	48	XCN		Transcriptionist Code/Name	N	
12	30	EI		Unique Document Number	U	[4]
13	16	ST		Parent Document Number	C	[5]
14	22	EI		Placer Order Number	N	
15	8	EI		Filler Order Number	N	
16	30	ST		Unique Document File Name	N	

TXA Segment						
					CardioSoft Applicability	
Seq	Length	Data Type	HL7 Table	Element Name	Export	
17	2	ID	0271	Document Completion Status	U	[6]
18	2	ID	0272	Document Confidentiality Status	N	
19	2	ID	0273	Document Availability Status	N	
20	2	ID	0275	Document Storage Status	N	
21	30	ST		Document Change Reason	N	
22	60	PPN		Authentication Person, Time Stamp	N	
23	60	XCN		Distributed Copies (Code and Name of Recipients)	N	

Note	Description
[1]	CardioSoft uses the following document types: ■ EK (for Resting ECG, and Stress ECG) ■ DR (for Ambulatory Blood Pressure and Spirometry)
[2]	On Export, the supported values for Document Content Presentation are shown below: TX = Machine readable text document
[3]	TXA-4/6 is populated with the creation date/time of the exported document.
[4]	TXA-12, Unique Document Number of referenced CardioSoft document: <internal patient ID>_<modality identifier>_<creation date/time of document>
[5]	TXA-13, Parent Document Number: For internal use (used in MDM-T02 message of the .csoft files for storing the EMR document ID (order ID), that is part of the .emr-filename)
[6]	TXA-17 On Export, always IP is used

MDM-OBX – Observation/Result

Legend: R = Required, O = Optional, C = Conditional, N = Not Used, U = Used

OBX Segment						
					CardioSoft Applicability	
Seq	Length	Data Type	HL7 Table	Element Name	Export	
1	10	SI		Set ID - Observation Simple	N	
2	2	ID	0125	Value Type	U	[1]
3	590	CE		Observation Identifier	C	[2]
4	20	ST		Observation Sub-ID	N	
5	65536	ST		Observation Value	U	[3]
6	60	CE		Units	N	
7	60	ST		Reference Range	N	
8	10	ID	0078	Abnormal Flags	N	
9	5	NM		Probability	N	
10	5	ID	0080	Nature of Abnormal Test	N	
11	2	ID	0085	Observation Result Status	N	
12	26	TS		Date Last Obs Normal Values	N	
13	20	ST		User Defined Access Checks	N	
14	26	TS		Date/Time of the Observation	N	
15	200	CE		Producer's ID	N	
16	80	XCN		Responsible Observer	N	
17	60	CE		Observation method	N	

Note	Description
[1]	OBX-2 is always populated with ST or TX
[2]	OBX-3 is populated with OTHER_REF, if the document reference (test reference) is used in OBX-5
[3]	OBX-5, Observation value: Type of test, that is referenced by this message (1st OBX segment). The 2nd OBX segment can be ignored. The 3rd OBX segment (Identifier OTHER_REF) shall be used by the EMR as document reference (test reference)

MDM-MSA – Message Acknowledgment

Legend: R = Required, O = Optional, C = Conditional, N = Not Used, U = Used

MSA Segment						
					CardioSoft Applicability	
Seq	Length	Data Type	HL7 Table	Element Name	Import	
1	2	ID	0008	Acknowledgement COde	R	[1]
2	20	ST		Message Control ID	R	
3	80	ST		Text Message	O	
4	15	NM		Expected Sequence Number	N	
5	1	ID	0102	Delayed Ack Type	N	
6	100	CE		Error Condition	N	

[1]	The supported values for Acknowledgment Code include: ■ AA = Original mode: Application Acknowledgment: Accept ■ AR = Original mode: Application Acknowledgment: Reject ■ AE = Original mode: Application acknowledgment: Error

NOTE

Receipt of either AR or AE initiates message re-send events.

ADT – Admission, Discharge and Transfer

The ADT message is used to export patient demographics data of CardioSoft patient records.

ADT messages are uploaded once to the EMR for data migration (all already existing patient records in the database).

ADT messages are uploaded at any time, when CardioSoft receives Resting ECG tests, that were conducted on an ECG Writer. (See “Data Upload of Existing CardioSoft Tests to EMR” on page 40 and “Data Upload of External Tests from ECG Writers” on page 42.)

Legend: R = Required, O = Optional, C = Conditional, I = Ignored

ADT				
	A04			
Message Segments	Import [0]		Export	
MSH			R	
EVN			R	
PID			R	
MSH	C			
MSA	C			
[ERR]	I			

Note	Description
[0]	ADT-Import currently is not supported.

ADT Message Segments

ADT-MSH – Message Header

Legend: R = Required, O = Optional, C = Conditional, N = Not Used, U = Used

MSH Segment						
					CardioSoft Applicability	
Seq	Length	Data Type	HL7 Table	Element Name	Export	
1	1	ST		Field Separator	U	
2	4	ST		Encoding Characters	U	
3	40	HD		Sending Application	U	
4	20	HD		Sending Facility	U	
5	40	HD		Receiving Application	C	[1]
6	30	HD		Receiving Facility	C	[2]
7	26	TS		Date/Time Of Message	U	
8	40	ST		Security	N	

MSH Segment						
					CardioSoft Applicability	
Seq	Length	Data Type	HL7 Table	Element Name	Export	
9	7	CM	0076	Message Type	U	[3]
10	20	ST		Message Control ID	U	[4]
11	3	PT	0103	Processing ID	U	[5]
12	8	ID	0104	Version ID	U	[6]
13	15	NM		Sequence Number	N	
14	180	ST		Continuation Pointer	N	
15	2	ID	0155	Accept Ack Type	N	
16	2	ID	0155	Application Ack Type	U	[7]
17	2	ID		Country Code	N	
18	6	ID	0211	Character Set	N	
19	60	CE		Principal Language Of Message	N	

Note	Description
[1]	MSH-5 contains LINKLOGIC
[2]	MSH-6 contains LOGICIAN
[3]	he supported values for Message Type include: ■ ADT = Admission, discharge, and transfer message ■ ACK = General acknowledgment message On Export, the second component trigger event is always populated with A04 and is identical to EVN-1 (Event Type Code)
[4]	On Export, the creation time of the message is used for MSH-10 (time stamp yyyymmddhhmmssxxx, where <xxx> is a sequence number in case of identical time stamp).
[5]	The supported values for Processing ID include: ■ D = Debugging ■ P = Production
[6]	On export, 2.3 is used for Version ID
[7]	The supported values for Accept Ack Type include: ■ AL Always ■ NE Never (default) If application acknowledgment should be used, an entry in HL7.INI needs to be done manually (See “HL7 Settings” on page 18.)

ADT-EVN – Event Type

Legend: R = Required, O = Optional, C = Conditional, N = Not Used, U = Used

EVN Segment						
					CardioSoft Applicability	
Seq	Length	Data Type	HL7 Table	Element Name	Export	
1	3	ID	0003	Event Type Code	U	[1]
2	26	TS		Recorded Date/Time	U	[2]
3	26	TS		Date/Time of Planned Event	N	
4	3	IS	0062	Event Reason Code	N	
5	60	XCN	0188	Operator ID	N	
6	26	TS		Event Occurred	N	

Note	Description
[1]	The supported values for Event Type Code include: ■ A04 = Register a patient
[2]	EVN-2, Date/Time of Event, is populated with the creation date/time of the message

ADT-PID – Patient Identification

Legend: R = Required, O = Optional, C = Conditional, N = Not Used, U = Used

PID Segment						
					CardioSoft Applicability	
Seq	Length	Data Type	HL7 Table	Element Name	Export	
1	4	SI		Set ID - Patient ID	N	
2	20	CX		Patient ID (External ID)	N	
3	20	CX		Patient ID (Internal ID)	U	[1]
4	30	CX		Alternate Patient ID-PID	O	[2]
5	48	XPN		Patient Name	U	
6	48	XPN		Mother's Maiden Name	N	
7	26	TS		Date/Time of Birth	O	

PID Segment						
					CardioSoft Applicability	
Seq	Length	Data Type	HL7 Table	Element Name	Export	
8	1	IS	0001	Sex	U	[3]
9	48	XPN		Patient Alias	N	
10	1	IS	0005	Race	O	[4]
11	106	XAD		Patient Address	N	
12	4	IS		County Code	N	
13	250	XTN		Phone Number - Home	N	
14	250	XTN		Phone Number - Work	N	
15	60	CE	0296	Primary Language	N	
16	1	IS	0002	Marital Status	N	
17	3	IS	0006	Religion	N	
18	20	CX		Patient Account Number	N	
19	11	ST		SSN Number - Patient	N	
20	25	DLN		Driver's License Number-Patient	N	
21	20	CX		Mother's Identifier	N	
22	3	IS	0189	Ethnic Group	N	
23	60	ST		Birth Place	N	
24	2	ID	0136	Multiple Birth Indicator	N	
25	2	NM		Birth Order	N	
26	4	IS	0171	Citizenship	N	
27	60	CE	0172	Veterans Military Status	N	
28	80	CE		Nationality	N	
29	26	TS		Patient Death Date and Time	N	
30	1	ID	0136	Patient Death Indicator	N	

Note	Description			
[1]	PID-3, Patient ID (Internal ID), is assumed to contain the patient identifier of CardioSoft.			
[2]	PID-4, Alternate Patient ID, is assumed to be the CardioSoft's Patient's ID, that was previously uploaded to the EMR database (data migration of existing patients and tests). If available, PID-4 is used primarily to access to existing CardioSoft's Patient IDs. Although HL7 states a length of 20, with CardioSoft a maximum length of 30 is possible (due to data migration of existing patients and tests).			
[3]	The supported values for Sex include: F = Female M = Male O = Other (treated as Unknown) U = Unknown			
[4]	The supported values for Race include:			
		Value =	Definition >>	CardioSoft
	On Export (if not supported, <Unknown> is used)	Asian Black Caucasian Hispanic Native American Oriental Pacific Islander Unknown	O B W H N O P U	Oriental/Asian Black White Hispanic Native American Oriental/Asian Pacific Islander Undetermined (default)

ADT-MSA – Message Acknowledgment

See MDM-MSA segment (See "MDM-MSA – Message Acknowledgment" on page 64.)

Appendix A – Interpretation of HL7 Data Types

Character Set

- In V6.0 the used character set is not delivered/interpreted within the MSH segment. CardioSoft uses for all languages (except the list below) the ANSI (ISO-8859-1) character set (Windows-1252).
  - For Chinese language the Chinese Simplified (GB2312) character set is used (Windows-936).
  - For Japanese language the Shift-JIS character set is used (Windows-932).
  - For Polish/ Hungarian/ Czech languages the Central Europe (ISO-8859-2) character set is used (Windows-1250).
  - For Russian language the Cyrillic (ISO-8859-5) character set is used (Windows-1251).

  Please also See “MDM-MSA – Message Acknowledgment” on page 64.
- CardioSoft doesn’t interpret or otherwise support check digit schemes employed within compound data types.
- On import, the NULL string (“”) can be used to replace an existing string field with a NULL value.

ST (String), TX (Text) and FT (Formatted Text)

These data types are treated identically.

The following escape sequences are defined, where \ represents the escape delimiter defined in MSH

Delimiter	Description
\F\	Field separator
\S\	Component separator
\T\	Subcomponent separator
\R\	Repetition separator
\E\	Escape character
\.br\	Line break

All other escape sequences are removed from the data.

DT (Date) and TS (Timestamp)

Unless otherwise specified, the format for date and timestamp fields must be YYYYMMDDHHMMSS. Although the month and day are considered optional in the HL7 specification of the date format, CardioSoft requires them.

PN or PN - Person Name

Components:

<family name (ST)> ^ <given name (ST)> ^ <middle initial or name (ST)> ^ <suffix (e.g., JR or III) (ST)> ^ <prefix (e.g., DR) (ST)> ^ <degree (e.g., MD) (ST)>

CardioSoft only uses family name, given name, middle initial or name (example: PID-5). All other components are ignored.

HL7	CardioSoft patient name (patient demographics)
Jones^Robin^D.^II^Dr.^MD	Last Name: Jones First Name: Robin D.

CN or XCN - Composite ID Number and Name

Components:

<ID number (ST)> ^ <family name (ST)> ^ <given name (ST)> ^ <middle initial or name (ST)> ^ <suffix (e.g., JR or III) (ST)> ^ <prefix (e.g., DR) (ST)> ^ <degree (e.g., MD) (ST)> ^ <source table (IS)> ^ <assigning authority (HD)>

CardioSoft only uses family name, given name, middle initial or name and degree (Example: PV1-7, PV1-8, OBR-16). All other components are ignored.

HL7	CardioSoft doctors name (for test information)
rjones^Jones^Robin^D.^II^Dr.^MD	One String: Jones MD, Robin D.

For your notes

Index

GE Medical Systems
Information Technologies

gemedical.com

World Headquarters
GE Medical Systems
Information Technologies, Inc.
8200 West Tower Avenue
Milwaukee, WI 53223 USA
Tel: + 1 414 355 5000
1 800 558 5120 (US only)
Fax: + 1 414 355 3790

European Representative
GE Medical Systems
Information Technologies GmbH
Munzinger Straße 3-5
D-79111 Freiburg
Germany
Tel: + 49 761 45 43 - 0
Fax: + 49 761 45 43 - 233

Asia Headquarters
GE Medical Systems
Information Technologies Asia; GE (China) Co., Ltd.
24th Floor, Shanghai MAXDO Center,
8 Xing Yi Road, Hong Qiao Development Zone
Shanghai 200336, P.R. China
Tel: + 86 21 5257 4650
Fax: + 86 21 5208 2008