



SunTech[®] CT50[™]

VITAL SIGNS MONITOR



Vital Signs Monitor

HL7 Interface Specifications

Changes

This manual is identified as Part number: 80-0081-00-MO. The most recent is available for download from the SunTech Medical website. Should you notice errors or omissions in this manual, please notify us at:

SunTech Medical, Inc.

507 Airport Boulevard, Suite 117

Morrisville, NC 27560 USA

Tel: 800.421.8626

919.654.2300

Fax: 919.654.2301

Email: CustomerService@SunTechMed.com Web: www.SunTechMed.com

User Responsibility

Your SunTech CT50 is designed to perform in conformity with the description contained in this operation manual and accompanying labels and inserts, when assembled, operated, maintained and repaired in accordance with the instructions provided.

Further, the user of the device bears sole responsibility for any malfunction that results from improper use, faulty maintenance, improper repair, damage or alteration by anyone other than SunTech Medical or authorized service personnel.

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Welcome to the SunTech CT50

Thank you for choosing this SunTech CT50 for accurate spot checking of vital signs.

The SunTech CT50 is designed to be very easy and efficient to use. The mobile device provides a lot of functionality in a compact, cost-effective package. The device can perform automatic blood pressure checks, including averaging of multiple blood pressure readings. It also offers an option to use a stethoscope for traditional auscultatory blood pressure measurement. The SunTech CT50 offers robust memory and also can connect to your EMR system. In addition, there are options for pulse oximetry and temperature measurement. The device can easily connect to a barcode scanner or printer.

Table of Contents

Changes.....	2
User Responsibility.....	2
Copyright Information.....	2
Welcome to the SunTech CT50.....	3
1. Introduction.....	5
1.1 Intention.....	5
1.2 Scope.....	5
1.3 Reference.....	5
2. EMR set up	6
2.1 Device Set Up.....	6
2.2 Patient Identification.....	6
3. Usage of IHE Profiles	7
4. Information flow	7
5. Message Retry.....	7
6. Verification of Patient ID	8
6.1 Overview	8
6.2 Request from Device to EMR.....	8
6.2.1 Message Structure and Segments	8
6.2.2 Sample Message.....	8
6.3 Response from EMR to Device	9
6.3.1 Message Structure and Segments	9
6.3.2 Sample Message.....	9
Case 1 : Response when EMR found the Patient using Patient ID.....	9
Case 2 : Response when EMR could not find Patient by using Patient ID	10
Case 3 : Error Response from EMR.....	10
7. Sending Vital Sign Measurements to EMR.....	11
7.1 Overview	11
7.2 Request from Device to EMR.....	11
7.2.1 Message structure and Segments.....	12
7.2.2 Sample Message.....	13
7.3 Response from EMR	15
7.3.1 Message Structure Segments	15
7.3.2 Sample Message.....	15
8. Error Codes	16

1. Introduction

1.1 Intention

This document describes the HL7 interface of the CT50 device for the interchange of data. The document is intended for the use of Integration Engineers or the likes who is responsible for the integration of the device with the integration engine and/or Electronic Medical Record (EMR) system. This document is not intended to be a stand-alone technical reference. It is assumed that the reader is familiar with the HL7 Message Standard manual, which provides the basic technical HL7 specifications, and also with the Integrating the Healthcare Enterprise (IHE) Patient Care Device (PCD) & IT Infrastructure (ITI) standards.

1.2 Scope

This document contains an overview of the IHE profiles that are implemented in the CT50, the steps within the HL7 communication, the message type used, the data provided by the device, and the expected response from the communication partner. An introduction to IHE and HL7 can be found at <http://ihe.net/> and <http://www.hl7.org/> and are not a part of this document.

1.3 Reference

Document	Description
IHE IT Infrastructure Technical Framework	Revision 13 Final Text - September 9, 2016
IHE Patient Care Device Technical Framework	Revision 6.0 Final Text - November 09, 2016
Rosetta Terminology Mapping (RTM)	Rosetta Release 3q 2011-05-07 ftp://ftp.ihe.net/Patient_Care_Devices/Profiles/RTM



2. EMR set up

In order to validate the patient's ID and populate the patient's vitals into an EMR, the CT50 device must be set up to communicate with the EMR system. This setup will require specific information about your network configuration and EMR implementation. Specifically, there will be two sets of information you will need:

- Information required for the Patient ID validation function
- Information required for reporting measurement data to the EMR.

For both of these functions, you will need to know the following:

- A network IP address used to connect to the EMR.
- A port number used to connect to the EMR.
- Definition of the actual HL7 message fields used in these transfers.

The actual data entered must be exactly what is expected by the EMR system, and will need to be provided by your EMR administrator.

2.1 Device Set Up

Turn the device on by pressing the green power button briefly, the device will take ~25 seconds to turn on. Go to Settings – Advanced. Enter code for advanced settings and press OK.

In the Network settings either set the Static IP Address or use the DHCP option. Press Apply.

Go to the IHE Setting tab PCD Server bullet point, fill in the Host with the IP address and the PCD port. Make sure to uncheck the Use SSL. Do the same for the PDQ Server bullet point. Fill in the Host with the IP address and the PDQ port. Make sure to uncheck the Use SSL. Press Apply and OK. Double check that the settings have been retained by the device by going to (Advanced – Network – Settings) and looking at the entered fields.

2.2 Patient Identification

Within the EMR system, the identification of a patient typically is based on an alphanumeric identifier assigned to the patient. The identifier must fulfil the following requirements:

- It must be unique for the patient
- It must be sufficient to identify a patient (sometimes called a “Patient ID only”)

By using a Patient ID, it is not necessary to provide patient demographic information such as first name, last name or date of birth in addition to the patient ID in order to properly identify a patient.

3. Usage of IHE Profiles

The CT50 has implemented communication profiles from Integrating the Healthcare Enterprise (IHE), which is a consortium of healthcare and medical device professionals dedicated to improving the way healthcare information systems share information. The IHE integration statement for the CT50 can be found on the website www.suntechmed.com.

The IHE profiles implemented by the CT50 are:

IHE Domain	Integration Profile	Actor
IT Infrastructure (ITI)	Patient Demographic Query (PDQ)	Patient Demographics Consumer (PDC)
Patient Care Devices (PCD)	Device Enterprise Communication (DEC)	Device Observation Reporter (DOR)

Note : In order to successfully connect to the CT50, the EMR must support at least two HL7 versions: v2.5 and v2.6

4. Information flow

Once the Clinician logs in with their ID, the HL7 workflow would start with the input of the patient ID by the clinician. This can be either done by manual entry or by using the barcode scanner (PN: 99-0184-00). In case the CT50 device is configured to connect with the EMR the Sync button on the screen can be used to validate the Patient. See Verification of Patient ID section.

Once synced and the Patient is found, the Patient's Demographics Information would be displayed on the CT50 device.

On the Home screen user can take the reading of the patient's vital signs. Using the green Save button, the user can save the Vitals information to the device, and if configured, the Vitals information would automatically be sent to the EMR. Another way to send measurements from the device is for the user to go to the Review Tab, select the measurement and press Send. A successful sending of the message is indicated by the last column, Sent, in the review tab, it will change from N to Y.

5. Message Retry

The monitor will attempt to connect to the EMR up to 5 times and retry to send the message. It waits for 5 seconds for a response before the connection times out.

6. Verification of Patient ID

6.1 Overview

To verify a Patient ID, the CT50 uses the IT Infrastructure (ITI) domain, Patient Demographic Query (PDQ) IHE Profile. In this scenario the device is the Patient Demographics Consumer whereas the EMR is the Patient Demographics Supplier. The device queries the EMR for a given Patient ID, and the EMR sends a response whether or not the Patient ID matches any of the known IDs in the database.

The messages used are:

- Device sends a Patient Demographic Query (QBP^Q22)
- EMR responds with a Patient Demographic Response (RSP^K22)

Note : This profile is based on HL7 v2.5.

6.2 Request from Device to EMR

A Patient Demographic Query (QBP^Q22) is used to request whether or not a Patient ID is valid.

6.2.1 Message Structure and Segments

The table below gives an overview of the Patient Demographic Query messaging.

QBP	Query by Parameter	Chapter in HL7 v2.5
MSH	Message Header	2
QPD	Query Parameter Definition	5
RCP	Response Control Parameter	5
[DSC]	Continuation Pointer	2

Note : Segment DSC is optional and not used in this use case.

6.2.2 Sample Message

```
MSH|^~\&|RSV-100^suntech.com&URI|SunTech|Vista-Edge^demo.vista-edge.com^URI|AZ Hospital|20170127233806-0600||QBP^Q22^QBP_Q21|xRy6Yri3KE1C6404gE4N|P|2.5|||AL|NE||||ITI-21^IHE
QPD||IHE PDQ Query|PDQ104211|@PID.3.1^666656765
RCP||1^RD
```

- The device requests the EMR application "Vista-Edge" (MSH-5), facility "AZ Hospital" (MSH-6).
- An acknowledgment is always expected by (MSH-15 = "AL").
- The patient ID to verify is "666656765" (QPD-3.1.2).
- An immediate response is requested (RCP-1 = "1") and must contain exactly one hit (RCP-2.1 = "1") of type record (RCP-2.2 = "RD").
- Unique message id is "xRy6Yri3KE1C6404gE4N".
- Unique Query Tag is "PDQ104211".

6.3 Response from EMR to Device

A Patient Demographic Response (RSP^K22) is expected by the device. The response message must return exactly one PID segment. The workflow stops in all other cases.

6.3.1 Message Structure and Segments

The table below gives an overview of the Patient Demographics Response messaging:

RSP	Segment Pattern Response	Chapter in HL7 v2.5
MSH	Message Header	2
MSA	Message Acknowledgment	2
[{ERR}]	Error	2
QAK	Query Acknowledgment	5
QPD	Query Parameter Definition	5
[{PID	Patient Identification	3
[PD1]	Additional Demographics	3
[QRI]]	Query Response Instance	5
[DSC]	Continuation Pointer	2

6.3.2 Sample Message

Case 1 : Response when EMR found the Patient using Patient ID

```

MSH|^~\&|VistA-Edge^demo.vista-edge.com^URI|VE Hospital|RSV-100^suntech.com^URI|SunTech|20170127155803-0600||RSP^K22^RSP_K21|c974279c-2cf6-4cc9-98ef-aaec1d44d0a7|P|2.5|
MSA|AA|xRy6Yri3KE1C6404gE4N
QAK|PDQ104211|OK|
QPD||IHE PDQ Query|PDQ104211|@PID.3.1^666656765
PID|1||666656765^^SSN&demo.vista-edge.com&URI||H0ELLE^THOMAS^^^^L||19880101|M|||
  
```

- 6.3.2.1 The Response of the Query message is given by the Integration Engine/ EMR in the form of an Acknowledgment (RSP^K22) message.
- 6.3.2.2 The message is received from the EMR application "VistA-Edge" (MSH-3), facility "AZ Hospital" (MSH-4).
- 6.3.2.3 The application had accepted the request (MSA-1 = "AA") for the Requested Message ID "xRy6Yri3KE1C6404gE4N" (MSA-2)
- 6.3.2.4 The query response status is "OK" (QAK-2) for the Requested Query Tag"PDQ104211" (QAK-1)
- 6.3.2.5 Exactly one segment of type "PID" was returned as requested in the Query message (RCP-2.1 = "1")
- 6.3.2.6 Patient's ID is returned in PID-3.1, Name in PID-5, Date of Birth in PID-7, Sex in PID-8

Case 2 : Response when EMR could not find Patient by using Patient ID

MSH|^~\&|VistA-Edge^demo.vista-edge.com^URI|VE Hospital|RSV-100^suntech.com^URI|SunTech|20170127155803-0600||RSP^K22^RSP_K21|c974279c-2cf6-4cc9-98ef-aaec1d44d0a7|P|2.5|

MSA|AA|xRy6Yri3KE1C6404gE4N

QAK|PDQ104211|NF|

QPD|IHE PDQ Query|PDQ104211|@PID.3.1^666656765

6.3.2.7 The application had accepted the request (MSA-1 = "AA") for the Requested Message ID "xRy6Yri3KE1C6404gE4N" (MSA-2)

6.3.2.8 The query response status is Not Found (QAK-2-"NF") for the Requested Query Tag "PDQ104211" (QAK-1)

6.3.2.9 No PID segment was returned.

Case 3 : Error Response from EMR

MSH|^~\&|VistA-Edge^demo.vista-edge.com^URI|VE Hospital|RSV-100^suntech.com^URI|SunTech|20170127155803-0600||RSP^K22^RSP_K21|c974279c-2cf6-4cc9-98ef-aaec1d44d0a7|P|2.5|

MSA|AE|xRy6Yri3KE1C6404gE4N QAK|PDQ104211|AE|

QPD|IHE PDQ Query|PDQ104211|@PID.3.1^666656765

6.3.2.10 The EMR responded with an Application Error (MSA-1 = "AE") for the Requested MessageID "xRy6Yri3KE1C6404gE4N" (MSA-2)

6.3.2.11 An optional ERR segment to give Error Comments could be returned from the EMR.

6.3.2.12 The query responded with an Application Error status (QAK-2-"AE") for the Requested Query Tag "PDQ104211" (QAK-1)

6.3.2.13 No PID segment was returned.



7. Sending Vital Sign Measurements to EMR

7.1 Overview

To send vital sign measurements to an EMR, the CT50 uses the Patient Care Devices (PCD) domain, Device Enterprise Communication (DEC) IHE profile. In this scenario the CT50 is the Device Observation Reporter (DOR) whereas the EMR is the Device Observation Consumer (DOC). The device sends vital sign measurements together with a verified Patient ID to the EMR. The EMR sends a response indicating whether or not the data could be processed successfully.

The messages used are:

- Device sends a PCD-01 Communicate PCD Data (ORU^R01^ORU_R01) as a request
- EMR responds with a simple general acknowledgement (ACK)

Note : *This profile is based on HL7 v2.6.*

7.2 Request from Device to EMR

A PCD-01 Communicate PCD Data (ORU^R01^ORU_R01) is sent to the EMR in this case.

7.2.1 Message structure and Segments

The table below gives an overview of the Device Observation Reporter messaging. See the given chapters in HL7 2.6 documentation for further details.

Segment	Meaning	Usage	Card	Chapter in HL7 2.6
MSH	Message Header	R		2.14.9
{{SFT}}	Software Segment	X	[0..0]	2.14.12
[UAC]	User Authentication Credential	O	[0..1]	
{	---PATIENT_RESULT begin			
[---PATIENT begin			
PID	Patient Identification	R	[1..1]	3.4.2
[PD1]	Additional Demographics	X	[0..0]	3.4.10
{{PRT}}				
{{NTE}}	Notes and Comments	X	[0 0]	2.14.10
{{NK1}}	Next of Kin/Associated Parties	O	[0..3]	3.4.5
[--- VISIT begin			
PV1	Patient visit	R	[1..1]	3.4.3
[PV2]	Patient Visit – Additional info	X	[0..0]	3.4.4
]	--- VISIT end			
]	--- PATIENT end			
{	--- ORDER_OBSERVATION begin			
[ORC]	Order Common	X	[0..0]	4.5.1
OBR	Observation Request	R	[1..1]	7.4.1
{{NTE}}	Notes and comments	O	[0..1]	2.14.10
{{PRT}}				
{	--- TIMING_QTY begin			
TQ1	Timing/Quantity	R	[1..1]	4.5.4
{{TQ2}}	Timing/Quantity Order Sequence	X	[0..0]	4.5.5
}}	--- TIMING_QTY end			
[CTD]	Contact Data	X	[0..0]	11.6.4
{	--- OBSERVATION begin			
OBX	Observation Result	R	[1..1]	7.4.2
{{PRT}}				
{{NTE}}	Notes and comments	O	[0..1]	2.14.10
}}	--- OBSERVATION end			
{{FT1}}	Financial Transaction	X	[0..0]	6.5.1
{{CT1}}	Clinical Trial Identification	X	[0..0]	7.8.4
{	--- SPECIMEN begin			
SPM	Specimen	X	[0..0]	7.4.3
{{OBX}}	Observation related to Specimen	X	[0..0]	7
}}	--- SPECIMEN end			
}	--- ORDER_OBSERVATION end			
}	---PATIENT_RESULT end			
[DSC]	Continuation Pointer	X	[0..0]	2.14.4

7.2.2 Sample Message

**MSH|^~\&|RSV-100^suntech.com^URI|SunTech|VistA-Edge^demo.vista-edge.com^URI|VE Hospital|20170203004555-0600||ORU^R01^ORU_R01|aSsNsqFxxfMyP0W0yiE5k3|P|2.6|||AL|NE|||||HE_PCD_001^IHE PCD^1.3.6.1.4.1.19376.1.6.1.1.1^ISO
PID|||120047^^^SSN&demo.vista-edge.com&URI||ALBIN^THOMAS^L||19880101 **PV1||||WARD^ROOM^BED
**OBR|1|aSsNsqFxxfMyP0W0yiE5k3|licWP^SERIAL_NO^suntech.com^URI|aSsNsqFxxfMyP0W0yiE5k3|licWP^SERIAL_NO^suntech.de^URI|61746007^Taking patient vital signs^SCT|||20170128011438-0600
**NTE|1||Clinician initiated vitals reading
**OBX|1|ST|69837^MDC_DEV_METER_PHYSIO_MULTL_PARAM_MDS^MDC|1.0.0.0|||||X|||||SERIAL_NO^CT50-100^suntech.com^URI
**OBX|2|ST|69642^MDC_DEV_ANALY_SAT_O2_VMD^MDC|1.1.0.0|||||X|||||SPO2_ID^CT50-100^suntech.com^URI
**OBX|3|ST|69643^MDC_DEV_ANALY_SAT_O2_CHAN^MDC|1.1.1.0|||||X
**OBX|4|NM|150456^MDC_PULS_OXIM_SAT_O2^MDC|1.1.1.1|99|262688^MDC_DIM_PERCENT^MDC||||F|||20170128011438-0600||123^JOSEPH^PREM|AMEAS^auto-measurement^MDC
**OBX|5|NM|149530^MDC_PULS_OXIM_PULS_RATE^MDC|1.1.1.2|46|264864^MDC_DIM_BEAT_PER_MIN^MDC||||F|||20170128011438-0600||123^JOSEPH^PREM|AMEAS^auto-measurement^MDC
**OBX|6|ST|69854^MDC_DEV_METER_PRESS_BLD_VMD^MDC|1.2.0.0|||||X|||||BP_ID^CT50-100^suntech.com^URI
**OBX|7|ST|70687^MDC_DEV_PRESS_BLD_NONINV_CHAN^MDC|1.2.1.0|||||X
**OBX|8|NM|150301^MDC_PRESS_CUFF_SYS^MDC|1.2.1.1|11|266016^MDC_DIM_MMHG^MDC||||F|||20170128011438-0600||123^JOSEPH^PREM|AMEAS^auto-measurement^MDC
**OBX|9|NM|150302^MDC_PRESS_CUFF_DIA^MDC|1.2.1.2|68|266016^MDC_DIM_MMHG^MDC||||F|||20170128011438-0600||123^JOSEPH^PREM|AMEAS^auto-measurement^MDC
**OBX|10|NM|150303^MDC_PRESS_CUFF_MEAN^MDC|1.2.1.3|79|266016^MDC_DIM_MMHG^MDC||||F|||20170128011438-0600||123^JOSEPH^PREM|AMEAS^auto-measurement^MDC
**OBX|11|NM|149514^MDC_PULS_RATE^MDC|1.2.1.4|46|264864^MDC_DIM_BEAT_PER_MIN^MDC||||F|||20170128011438-0600||123^JOSEPH^PREM|AMEAS^auto-measurement^MDC
**NTE|1||Measurement is an average measurement
**OBX|12|ST|69902^MDC_DEV_METER_TEMP_VMD^MDC|1.3.0.0|||||X|||||TEMP_ID^CT50-100^suntech.com^URI
**OBX|13|ST|69903^MDC_DEV_METER_TEMP_CHAN^MDC|1.3.1.0|||||X
OBX|14|NM|150388^MDC_TEMP_SKIN^MDC|1.3.1.1|36.6|268192^MDC_DIM_DEGC^MDC||||F|||20170128011438-0600||123^JOSEPH^PREM|AMEAS^auto-measurement^MDC************************************

- PID segment gives the Patient demographic information
- PV1-3 gives the Patient Location
- OBR-4 gives the Filler order Number as generated by the CT50 module to identify the vitals measurement.
- NTE-3 gives the comments for the Observation or Observation value based on its position.
- OBX-3 defines the vitals sign or the device information. (see OBR-3 identifiers in AppendixA for more details)
- OBX-4 defines the containment tree. The hierarchy defines several levels: the Medical Device System (MDS) levels, the Virtual Medical Device (VMD) levels, and the channel and source levels.
- OBX-5 provides the value of the vital sign
- OBX-6 gives the measurement Units
- OBX-14 gives the observation date time of when the vital sign was measured
- OBX-16 if defined gives the responsible observer's information
- OBX-17 gives the Observation method. In most cases this would be auto-measured
- OBX-18 defines the device which sent the message

The PCD-01 message from the CT50 monitor consists of an ORU^R01 message with the vitals measurement taken from the CT50 monitor to the EMR. The CT50 monitor is capable of sending the measurement of following vital signs.

1. SpO2
2. Pulse rate from SpO2 module
3. Blood pressure systolic
4. Blood pressure diastolic
5. Mean blood pressure
6. Pulse rate from BP module
7. Temperature

7.3 Response from EMR

A simple Acknowledgment Message (ACK_R01_ACK) is sent from the EMR to the device.

7.3.1 Message Structure Segments

The table below gives an overview of the Device observation Consumer messaging. See the given chapters in HL7 2.6 documentation for further details.

ACK^R01^ACK	General Acknowledgment	Chapter in HL7 2.6
MSH	Message Header	2.14.9
[(SFT)]	Software Segment	2.14.12
[UAC]	User Authentication	2.14.13
MSA	Message acknowledgment	2.14.8
[(ERR)]	Error	2.14.5

7.3.2 Sample Message

MSH|^~\&|VistA-Edge^^|VE Hospital|CT50-100^^|SunTech|20170210061957-0600||ACK^R01^ACK|add15bae-72f9-472a- a968-107719322075|P|2.6|||||||IHE_PCD_001^IHE PCD^1.3.6.1.4.1.19376.1.6.1.1.1^ISO

MSA|AE|aSsNsqFxxfMyPOW0yiE5k3|

7.3.2.1 MSA-2 gives the response value from the EMR. AA or CA is for a positive acknowledgment. An error is reported from the EMR by passing AE in MSA-2

7.3.2.2 MSA-3 gives the Message ID of the ORU^R01 message for which the acknowledgment was generated.

8. Error Codes

Definition	Explanation
OK	OK
NO_NET_WORK	No network connection
TIME_OUT	Connection timed out
REFUSED	Connection refused
SSL_ERROR	SSL handshake error
CONNECT_ERROR	Could not connect to host
SEND_ERROR	Sending error
TRANSMIT_ERROR	Transmission error
PARSE_ERROR	Parser error
UNEXPECTED_RESPONSE	Unexpected response received
MSG_REJECTED	Message rejected
PATIENT_NOT_FOUND	Patient not found
NO_PID_RETURNED	No PID segment returned
MULTIPLE_PATIENTS	Multiple patients received
PATIENT_PARSEERROR	Could not parse patient ID