Detailed Specifications and Standards
(Recommend by the Technical Working Group and submitted to the Ministry of Information Technology)

1. Standards

1.1. Infrastructure

1.1.1. Hardware

1.1.1.1.1. Specifications for typical PC based TCC system configuration

- 1.0 Ghz or above processor speed system or equivalent with appropriate mother board
- Appropriate number of Serial, parallel & USB ports.
- 10/100 Base-T LAN/Ethernet interface with Wake-On-LAN (WOL).
- Appropriate clinical device interfaces, ex. Interface for ECG and pathology camera
- 40 GB (minimum) or more HDD
- 1.44 MB FDD.
- 128 MB DD RAM, up-gradable to 1GB
- CD Writer, with 8X (minimum) re-write speed (recommended)
- Graphics with 32 MB (minimum) RAM & PAL-B composite (minimum) video output.
- 24-bit image capture hardware with image resolution of 720 x 576 (minimum) with appropriate video interface.
- High-resolution (1280 x 1024) 17” color monitor, for displaying medical data/images. Images is advisable. But 15” color monitor with 1024*768 resolution can also be considered
- Audio interface with speakers, (20W minimum) & a microphone.
- Web camera (640*)*(480~) Maximum resolution. Frame rate:30fps@VGA (640*480);Optical system; CCD; Progressive 330K effective pixels
- Standard Windows 101 US Key board.
- Scroll two-button mouse with mouse pad.
- Preferred two spare PCI slots.
- Auto shutdown facility.

Optional:
- Video switching unit.
- ISDN interface up to 384 kbps.
- Specialized interface for clinical devices & communication:
  - SCSI
Camera Link
IEEE 1394
Blue tooth
IEEE 802.11 (b)

1.1.1.1.2. Specifications for typical PC based TSC system configuration
- Intel Pentium-IV, 1.8 GHz with Intel chipset mother board or AMD Athelon, 1.8 GHz or equivalent, with appropriate mother board
- Appropriate number of Serial, parallel & USB ports.
- 10/100 Base-T LAN/Ethernet interface with Wake-On-LAN (WOL).
- 40 GB (minimum) or more HDD, operating at 7200 rpm (minimum).
- 1.44 MB FDD.
- 256 MB DD RAM, upgradeable to 1GB.
- CD Writer, with 8X (minimum) re-write speed.
- Graphics with 32 MB (minimum) RAM & PAL-B composite (minimum) video output.
- 24 bit image capture hardware with image resolution of 720 x 576 (minimum) with appropriate video interface.
- High-resolution (1280 x 1024) 17” color monitor, for displaying medical data/images. High-resolution (1280 x 1024) 17” color monitor, for displaying medical data/images is advisable. But 15” color monitor with 1024*768 resolution can also be considered.
- Audio interface with speakers, (20W minimum) & a microphone.
- Web camera (640~)* (480~) Maximum resolution. Frame rate:30fps@VGA (640*480); Optical system; CCD; Progressive 330K effective pixels.
- Standard Windows 101 US Key board.
- Scroll two-button mouse with mouse pad.
- Preferred two spare PCI slots.
- Auto shutdown facility.

Optional:
- Video switching unit.
- ISDN interface up to 384 kbps.
- Specialized interface for clinical devices & communication:
  - SCSI
  - Camera Link
  - IEEE 1394
  - Blue-tooth
  - IEEE 802.11 (b)
1.1.1.1.3. Dedicated Set-top-box:

- Printer (optional): TCC and/or TSC
- Any standard printer for text/report purpose
- Image/graphics for reference purpose with appropriate specifications.
- Diagnostic quality image printers, please refer DICOM/FDA standards
- Video Conferencing Unit: Video conferencing facility is optional and is preferred in cases where the visual interaction between patient to doctor is relevant and it is compliment/supplement the diagnostic data.

1.2. Clinical devices:

The power requirements, computer interface requirements and environmental conditions are common and are as follows

- Power requirements: 230 V AC, 50 Hz
- Computer interface: serial port/parallel port/USB/SCSI/Ethernet with relevant and appropriate drivers
- Environmental conditions:
  - Temperature: 10-35 Deg Celsius
  - Humidity: 35%-70%

Specific requirements if any, are mentioned in the relevant sections.

Minimum configuration for Telemedicine diagnostic equipment is as follows:

1.2.1. Digital ECG (12 LEAD MODULE)

Specifications:

Leads : Standard 12 Leads, with one long lead
Freq. Response : 0.5 To 125 Hz
Leakage Current : < 10 Micro amps
CMRR : >100 DB
Input Impedance : > 4 M Ohms
Filter : To suppress supply frequency fluctuations
A/D Conversion : 10 bit
Sampling Rate : 500 Samples/seconds
Recording Speed : 25/50 mm/sec.

Optional features in the PC interface software: Display and printing

1.2.2. X-Ray Digitizer

Resolution : 1200 dpi/lpi (horizontal/vertical) *
Color resolution : 12-14 bits/channel(gray scale)
Active area: As per the application (commercially available A3 and A4 scanners can also be deployed)

Computer interface: Other than Rs-232

Backlighting optimized for X-ray application

*Commercially available dedicated X-ray scanners of lesser dpi (at least 150 dpi) may also be considered, as appropriate

1.2.3. Ultrasound (Sonography machine)
Scanning Method: Electronic Convex, Micro convex and Linear Array
Imaging Modes: B, B/B, B/M, M
Electronic Array: 3.5 MHz, 5.0 MHz
Probes: Linear convex, Trans- Vaginal (for Gynecology/obstetrics applications)
Display Frame Rate: 24-30 fps
Depth Selection: 4.5, 6, 9 12, 15, 18, 21CM, Scroll Function
Gray Scale: 64 shades of Gray, at least
Converter: 512x512x6 bits, at least
Measurements: Mouse/Trackball Operations
B-Mode: Distance, Area Ellipse
M-Mode: Heart Rate (optional)
Calculations: Fetal Parameters: BPD, HC, CRL, AC, FL, HI, GS, LV, TA as relevant
Image Management: Report: Patient and Measurements Summary Image
Computer interface: Using Image grabber/video capture card (PAL/NTSC/Composite video)/DICOM format output

1.2.4. Glucometer
Test: Glucose in capillary whole blood
Sampling size: 3 µL of whole blood
Sampling: Blood is automatically drawn into the Sensor by capillary action
Measuring range: 1.1-33.3mmol/L (20-600mg/Dl)
Test principle: Electrochemical
Specificity: Sensor reacts specifically with βD-glucose
This Glucometer can be either hand-held and/or standalone
Optional: Computer interface

1.2.5. Portable X-ray machine
Generator: 1 Pulse, Half wave
Output (max): 60mA-70kV- 0.4s; 40MA-80kV-2.0s; 20mA-100kV-6.0s
Line Resist : Max.0.4 ohm
KV : 45 to 100 kV, 5 kV per step
Rad. Timer : 0.04 s to 6.0 s in multiple steps
X-ray Tube : Focus 2.8 x 2.8 mm
: Anode capacity 40 KHU or equivalent
Power Supply : Single Phase, AC, 50Hz (in addition to general Supply

**Suggested features**

Easy Mobility and steering
Integrated cassette box
Easy transportation, in normal elevator and narrow passages

1.2.6. **Pulmonary Function Test (PFT) machine**

Flow Measurement : Screen type Pneumotach
Volume Measurement : Flow integration
Flow Range : 15 L/Sec
Volume Range : 0 – 8 L
Flow Accuracy : +/- 5% of reading
Volume Accuracy : +/- 3% of reading
Frequency Response : 0 to 30 Hz.
Sampling Rate : 128 samples/sec
A/D Resolution : 12 bit
Measuring Parameters: FVC, FEV 0.5, FEV1, FFV3, FFV1/FVC, FEV3/FVC,
FEF25-75, FEF 25%, FEF-50%, FEF 75%, PEFR, FIVC, FIV1, FIV2, PIF, MVV.

Computer interface : with Real time display of flow volume loops with online display of flow and volume v/s time

1.2.7. **Fetal Heart Rate monitor**

KV : 45 to 100 kV, 5 kV per step
Technique : Continuous Doppler with Auto Correlation
Frequency : 2.5 MHz
Intensity : < 10 mW/sq. cm
HR Range : 30 to 240 BPM
Uterine Contraction Range : 0-100 Units

Bandwidth : 0-0.2 Hz
Heart Rate (HR) Uterine Activities (UA)
Scaling : 30 bpm/cm 25 mmHg/cm
Range : 30-240 bpm
Resolution : 1 bpm 1 m/Hg
Speed : 1/3 cm/min

1.2.8. Tele-Pathology Microscope including Camera

A compound microscope, digital camera for tele-pathology applications, microscope system with modular concept upgrade able to phase contrast, dark field contrast, fluorescence (optional), photomicrograph and analysis, Delta/infinity corrected optics.

Range : 30-240 bpm
Optics : Delta/infinity corrected with harmonic components
Nose-Piece : 3 or more objectives
Objectives : Standard achromatic objectives, oil with phase contrast, Magnification as per application, BF/DF observations
Eye Pieces : 10X 22X with harmonic components optics
Illumination : 12V, 30 W stabilized

1.2.9. Trinocular tube

Binocular with fixed photo tube/1X with 30 deg viewing angle with inter-papillary distance adjustment from 55mm-75mm, with constant focus and beam splitter position vision/photo 50/50% fixed, condenser sub stage: universal condenser upgradeable for phase contrast dark field and bright field 0.90/1.25.

1.2.10. Filter Magazine

Built in the stand with day light filter, green & neutral density filter 16%. The filter changing level is near to X 1Y knob of the stage for agronomy field diaphragm built in stand.

1.2.11. Camera

Digital Camera system composed of a C-mount CCD camera 1/2” image sensor with RGB 3 prime color filter, resolution 2.1 mega pixel or better with a minimum illumination of 5 lux/F2.0 with an interface to the computer.

1.3. Video-conferencing units

- Software based desktop video-conferencing using web camera as an economical option when low bit rate channel less than 64 kbps are used.

1.3.1. Specifications – Video-conferencing-Stand-alone Type
1.3.1.1. Codec

Interoperability: Full ITU-T H.32x Standards-compliant (full forms to be added in legend)
- H.320 for ISDN line*
- H.323 for LAN/Ethernet*
- H.324 for PSTN (POTS) line*

Video Compression: H.261 (H.263 for Standard H.324)

Video Resolution:
- SQCIF - 128 x 96 (H.263)
- QCIF - 176 x 144
- FCIF - 352 x 288

Video Frame Rate: 15 - 25 fps

External Video: 2 color composite

Inputs: CCIR PAL-B

Video interface: BNC or RCA

Display Mode: VGA and SVGA up to 1024 x 768, 24-bit color

Video Outputs: Minimum 1 color composite CCIR, PAL-B

Audio Compression Standard:
- G.711: 3.4 kHz @ 64 kbps
- G.722: 7.1 kHz @ 48 / 56 / 64 kbps
- G.723.1: 3.4 kHz @ 5.3 / 6.4 kbps (H.263)
- G.728: 3.4 kHz @ 16 kbps
- G.729: 3.4 kHz @ 8 kbps (H.263)

External audio input: 1 (desirable)

Audio Outputs: Minimum 1

Audio Performance: 100-7100 Hz frequency response
  - Full duplex
  - Automatic Gain Control
  - Automatic Noise Suppression
  - Acoustical echo cancellation

Signaling Standards: H.221, H.230, H.231, H.242

Data Rates: 64 kbps to 2048 kbps.

External Data: Compliant to ITU -T

Interface: T.120 std. (desirable)

Far End: H.281 compliant

* As per network requirement.
1.3.1.2. Camera

Camera may be an integrated part of the video conferencing unit or it can be a separate unit with proper interfaces with the video conferencing unit.

Video Standard : CCIR PAL-B
Camera sensor : CCD
Picture resolution : 450 TV lines, minimum

Optional:
Control (local end) : Remote control for pan, tilt & zoom

1.3.1.3. Display

Minimum 21” or bigger color TV with video and audio inputs.(recommended is 29” color TV)

Video Standard : CCIR PAL-B
Video Format : Composite color
Picture resolution : 350 TV lines, minimum
Video interface : BNC or RCA
Audio interface : RCA

1.3.2. Specifications - Video conferencing - PC add-on card type

Interoperability : Full ITU-T H.32x Standards-compliant
H.320 for ISDN line*
H.323 for LAN/Ethernet*
H.324 for PSTN (POTS) line*

Video Compression : H.261 (H.263 for Standard H.324)
Video Resolution : SQCIF – 128 X 96 (H.263)
Q CIF – 176 x 144 FCIF – 352 x 288

Video Frame Rate : Up to 25 fps
Video Input : Color composite CCIR PAL-B
Video interface : BNC or RCA
Display Mode : VGA & SVGA upto 1024 x 768, 24-bit color

Audio Compression : G.711: 3.4 kHz @ Standard 64 kbps
G.722: 7.1 kHz @ 48 / 56 / 64 kbps
G.728: 3.4 kHz @ 16 kbps

Audio input : RCA or phono-jack
Audio Performance : 100-7100 Hz frequency response Full duplex
Data Rates : 64 kbps to 768 kbps.

* As per network requirement.
Optional:
Automatic Noise Suppression
Acoustical echo cancellation

1.3.2.1. Camera (With microphone)
Data Rates : 64 kbps to 768 kbps.
Camera sensor : CCD
Picture resolution : 400 TV lines, minimum
Video output : Color composite CCIR PAL-B
Video interface : BNC or RCA

1.3.3. Specifications - Video conferencing - Camera with built-in encoder type

1.3.3.1. Codec
Interoperability : Full ITU-T H.323 Standards-compliant
Video Compression : H.261 and H.263 Standard
Video Resolution : QCIF – 176 x 144
FCIF – 352 x 288
Video Frame Rate : Up to 25 fps
Audio Compression : G.711: 3.4 kHz
Standard @ 64 kbps
G.722: 7.1 kHz @ 48 / 56 / 64 kbps
G.728: 3.4 kHz @ 16 kbps
Audio Performance : 100-7100 Hz frequency response
Full duplex
Data Rates : 64 kbps to 384/512 kbps
Camera sensor : CCD
Picture resolution : 400 TV lines, minimum

Optional:
Automatic Noise Suppression
Acoustical echo cancellation

1.3.4. Specifications - Video conferencing - Software based web Camera
Max.Resolution : 640(h)*480(v)
Frame Rate : 30 fps @VGA (640*480) 400 M-bits /sec. capable
Optical System : CCD
Progressive 330k effective pixels