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USER MANUAL

TPC-2230

Touch Panel Computer (6.5 in./12.1 in./15 in.)

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NATIONAL INSTRUMENTS

Electromagnetic Compatibility Guidelines

This hardware has been tested and found to comply with the applicable regulatory requirements and limits for electromagnetic compatibility (EMC) as indicated in the hardware's Declaration of Conformity (DoC)[1]. These requirements and limits are designed to provide reasonable protection against harmful interference when the hardware is operated in the intended electromagnetic environment. In special cases, for example when either highly sensitive or noisy hardware is being used in close proximity, additional mitigation measures may have to be employed to minimize the potential for electromagnetic interference.

While this hardware is compliant with the applicable regulatory EMC requirements, there is no guarantee that interference will not occur in a particular installation. To minimize the potential for the hardware to cause interference to radio and television reception or to experience unacceptable performance degradation, install and use this hardware in strict accordance with the instructions in the hardware documentation and the DoC[1].

If this hardware does cause interference with licensed radio communications services or other nearby electronics, which can be determined by turning the hardware off and on, you are encouraged to try to correct the interference by one or more of the following measures:

- Reorient the antenna of the receiver (the device suffering interference).
- Relocate the transmitter (the device generating interference) with respect to the receiver.
- Plug the transmitter into a different outlet so that the transmitter and the receiver are on different branch circuits.

Some hardware may require the use of a metal, shielded enclosure (windowless version) to meet the EMC requirements for special EMC environments such as, for marine use or in heavy industrial areas. Refer to the hardware's user documentation and the DoC[1] for product installation requirements.

When the hardware is connected to a test object or to test leads, the system may become more sensitive to disturbances or may cause interference in the local electromagnetic environment.

Operation of this hardware in a residential area is likely to cause harmful interference. Users are required to correct the interference at their own expense or cease operation of the hardware.

Changes or modifications not expressly approved by National Instruments could void the user's right to operate the hardware under the local regulatory rules.



Caution To ensure the specified EMC performance, operate this product with only shielded cables and accessories connected to USB and COM ports.



Caution To ensure the specified EMC performance, the length of cables connected to USB and COM ports must be no longer that 3 m (10 ft.).

[1] The Declaration of Conformity (DoC) contains important EMC compliance information and instructions for the user or installer. To obtain the DoC for this product, visit `ni.com/certification`, search by model number or product line, and click the appropriate link in the Certification column.

Conventions



This icon denotes a caution, which advises you of precautions to take to avoid injury, data loss, or a system crash. When this symbol is marked on a product, refer to the *Important Safety Information* section for information about precautions to take.



When this symbol is marked on a product, it denotes a warning advising you to take precautions to avoid electrical shock.



When this symbol is marked on a product, it denotes a component that may be hot. Touching this component may result in bodily injury.

General Information

This section includes general information about the TPC-2230 Human Machine Interface (HMI).

Introduction

The TPC-2230 touch panel computer, an HMI based on an *x*86 platform, includes these key features:

- **Powerful processing**—The TPC-2230 uses the Intel Atom processor, specifically designed for embedded, industrial applications.
- **Fanless**—By using an advanced but low-power Intel Atom processor, the TPC-2230 does not require a fan for cooling.
- **Robust communication**—The TPC-2230 is a powerful I/O interface for easy communication with other devices. The I/O interface includes serial ports, gigabit Ethernet, and support for USB 2.0 and USB 3.0.
- **Wide operating temperature**—The TPC-2230 provides a -20 to 60 °C operating temperature range.
- **Windows Embedded support**—The TPC-2230 supports Windows Embedded Standard 7 (WES7).

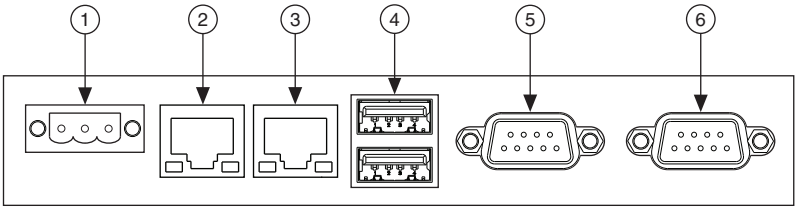
I/O Ports

The TPC-2230 includes the following ports:

- Two serial ports: RS232 (COM1) and RS232/422/485 (COM2)
- One USB 2.0 port compliant with USB 1.0 and 1.1
- One USB 3.0 port compliant with USB 2.0, 1.0 and 1.1
- Two RJ-45 Gigabit Ethernet ports
- One power connector

Figure 1 shows the I/O port arrangement.

Figure 1. I/O port arrangement



1	Power connector	4	USB 2.0 (bottom) & USB 3.0 (top)
2	LAN B	5	COM2 (RS232/422/485)
3	LAN A	6	COM1 (RS232)

For more TPC-2230 specifications, refer to the *Specifications* section.

System Setup

This section includes setup information for the TPC-2230.

Important Safety Information

Before setting up the TPC-2230, read these safety instructions carefully.

Disconnect this equipment from any AC outlet before cleaning. Use a damp cloth. Do not use liquid or spray detergents for cleaning.

For plug-in equipment, the power outlet socket must be located near the equipment and must be easily accessible.

Keep this equipment away from excessive humidity.

Place this equipment on a reliable surface during installation. Dropping it or letting it fall may cause damage.

The openings on the enclosure are for air convection and protect the equipment from overheating. *Do not cover the openings.*

Make sure the power source voltage is correct before connecting the equipment to the power outlet.

Position the power cord so that it cannot be stepped on. Do not place anything over the power cord.

All cautions and warnings on the equipment should be noted.

If the equipment is not used for a long time, disconnect it from the power source to avoid damage by transient overvoltage.

Never pour any liquid into an opening. This may cause fire or electrical shock.

Never open the equipment. For safety reasons, only qualified service personnel should open the equipment.

If one of the following situations arises, have service personnel check the equipment:

- The power cord or plug is damaged.
- Liquid has penetrated into the equipment.
- The equipment has been exposed to moisture.
- The equipment does not work well, or you cannot get it to work according to the user manual.
- The equipment has been dropped and damaged.
- The equipment has obvious signs of breakage.

Do not leave this equipment in an environment where the storage temperature may go below -30 °C (-22 °F) or above 80 °C (176 °F). Doing so could damage the equipment. The equipment should be in a controlled environment.

Caution There is a danger of explosion if the battery is incorrectly replaced. Replace the battery only with the same or equivalent type recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions.

The sound pressure level at the operator's position according to IEC 704-1:1982 is no more than 70 dB (A).

Caution The protection this equipment provides may be impaired if it is used in a manner not described in this manual.

Setup

Follow these steps to set up the TPC-2230:

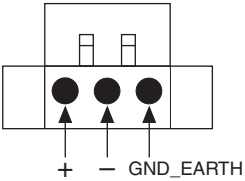
1. Unpack the TPC-2230. Be sure your kit includes the following items:
   - The TPC-2230 HMI
   - Six panel mounting clamps (6.5 in.)
   - Six panel mounting screws (6.5 in.)
   - Eight panel mounting clamps (12.1 in. and 15 in.)
   - Eight panel mounting screws (12.1 in. and 15 in.)
   - One 3-pin power connector
   - One HMI Resource Recovery USB
   - One earth ground cable

   If any items are missing or damaged, contact National Instruments.

Caution Be sure system power is off before plugging in or pulling out the CFast card.

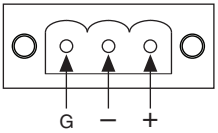
2. Verify that the CFast card containing Windows Embedded or another operating system is installed in the unit.
3. Connect the power connector to an 24 VDC power line. Be sure to connect the positive, negative, and ground lines as shown in Figure 2. The power lines can be from either a power adapter or in-house power source. Connect GND_EARTH to chassis GND.

Figure 2. Power connector



4. Connect the power connector to the power receptacle on the TPC-2230. The power receptacle pin assignment is shown in Figure 3. Note the position of the earth ground pin, marked *G*.

Figure 3. Power receptacle and pin assignment



5. The system turns on immediately after you apply power.

Touchscreen Calibration

The TPC-2230 touchscreen should be correctly calibrated and ready to use when you power on the system. However, if the calibration is not correct or you want to choose custom calibration options, refer to the *Touchscreen Configuration* section.

Panel Mounting

Follow these steps to mount the TPC-2230 in a panel:

1. Install the TPC-2230 in the panel opening. (Refer to the *Specifications* section for cutout dimensions.)
2. Hook the clamps included in the accessory pack to the holes around the four sides of the bezel. Be sure to remove the protective inserts in the panel mounting holes.
3. Insert the screws included in the accessory pack into the clamps. To fasten the TPC-2230 to the panel, tighten the screws so they push against the mounting panel.

Note The mounting panel thickness should be less than 6 mm (0.236 in.).

Jumpers and Connectors

This section describes the TPC-2230 jumpers and connectors.

Jumper and Connector Functions

Table 1-4 lists the jumper and connector functions.

Table 1-4. Mainboard Connectors and Jumpers

Label	Function	Description
BH2	Battery	RTC battery bracket
CN1	CMOS	CMOS clear select
CN7/CN8	LAN	RJ45 connection
CN10	USB connector	USB data and power
CN12	SATA connector	SATA data connection
CN13	SATA power	SATA device power
CN14	CFast slot	CFast power and data
CN15	COM1	Serial port: COM1 RS232
CN16	COM2	Serial port: COM2 RS232/422/485
CN18	Power in connector	Device power input
MINIPCIE	Mini PCIe	Connection for Mini PCIe device
SW2	COM2 mode	Select COM2 RS232/422/485
SW3	Termination	Termination resistor select

Jumper and Connector Locations

Figures 5 and 6 show the jumper and connector locations.

Figure 5. Main Board Jumpers and Connectors—Top Side

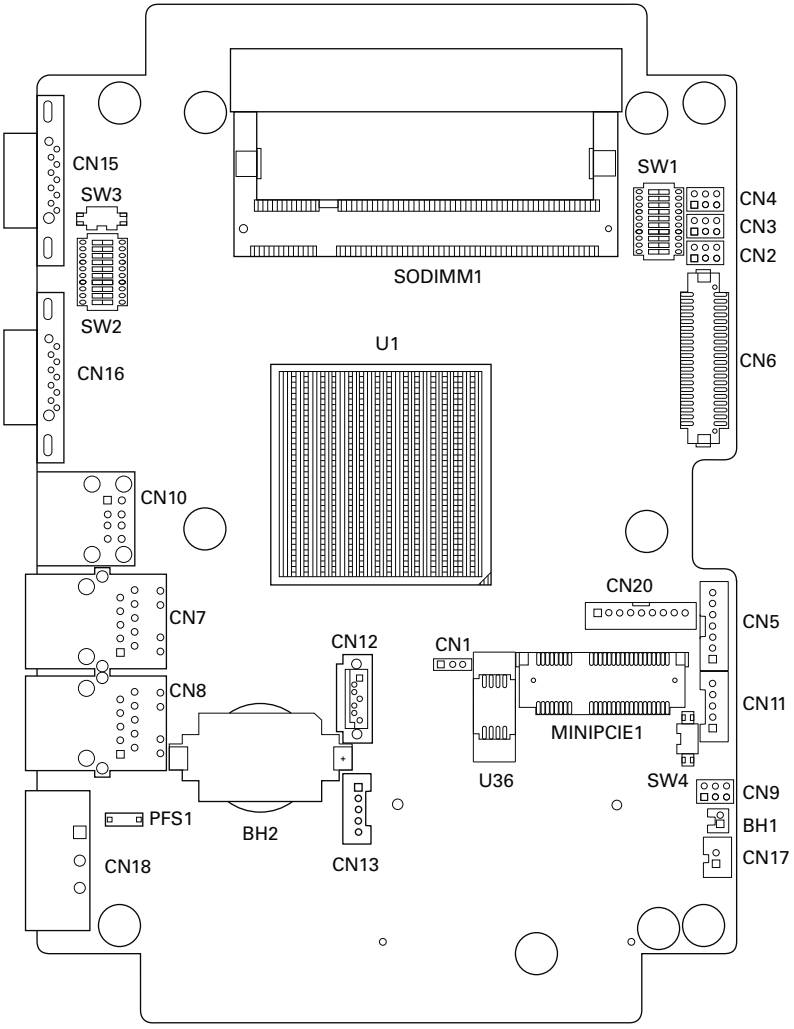
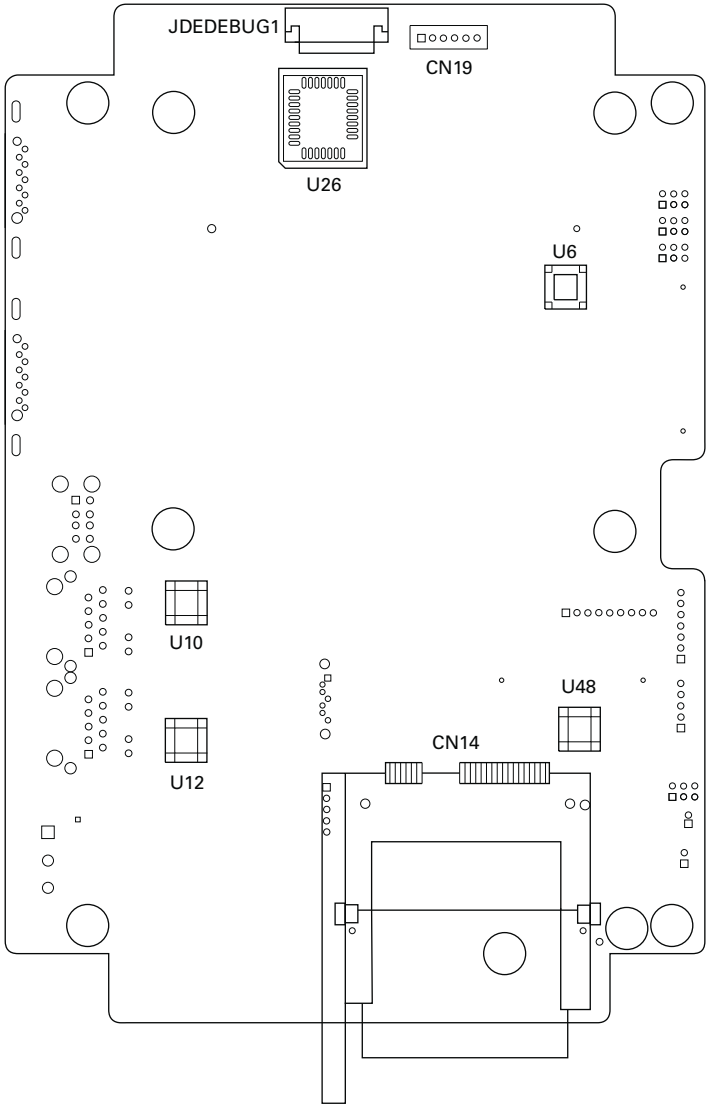


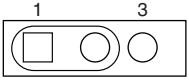
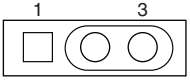
Figure 6. Main Board Jumpers and Connectors—Bottom Side



CMOS Clear Jumper (CN1)

The CMOS Clear jumper is disabled by default. To enable CMOS Clear, move the jumper from the 1-2 position to the 2-3 position. Pin 1 is the pin on CN1 closest to the front panel connectors.

Table 1-7. CN1 Jumper Functions

Position	Function
1-2 	Disabled
2-3 	Clear CMOS

Specifications

This section lists the TPC-2230 system specifications.

Physical

6.5 in.

Weight	1.5 kg
Dimensions (W × H × D)	199 × 152 × 58.9 mm (7.83 × 5.98 × 2.32 in.)
Cutout dimensions	189.1 × 142.1 mm (suggested) (7.44 × 5.59 in.)

12.1 in.

Weight	2.5 kg
Dimensions (W × H × D)	311.8 × 238 × 57.2 mm (12.28 × 9.37 × 2.25 in.)
Cutout dimensions	303 × 229 mm (suggested) (11.93 × 9.02 in.)

15 in.

Weight	3.9 kg

Dimensions (W × H × D)	383.2 × 307.3 × 61.1 mm (15.09 × 12.10 × 2.41 in.)
Cutout dimensions	374.5 × 298.5 mm (suggested) (14.74 × 11.75 in.)

Figure 8. Dimensions of 6.5 in. Device

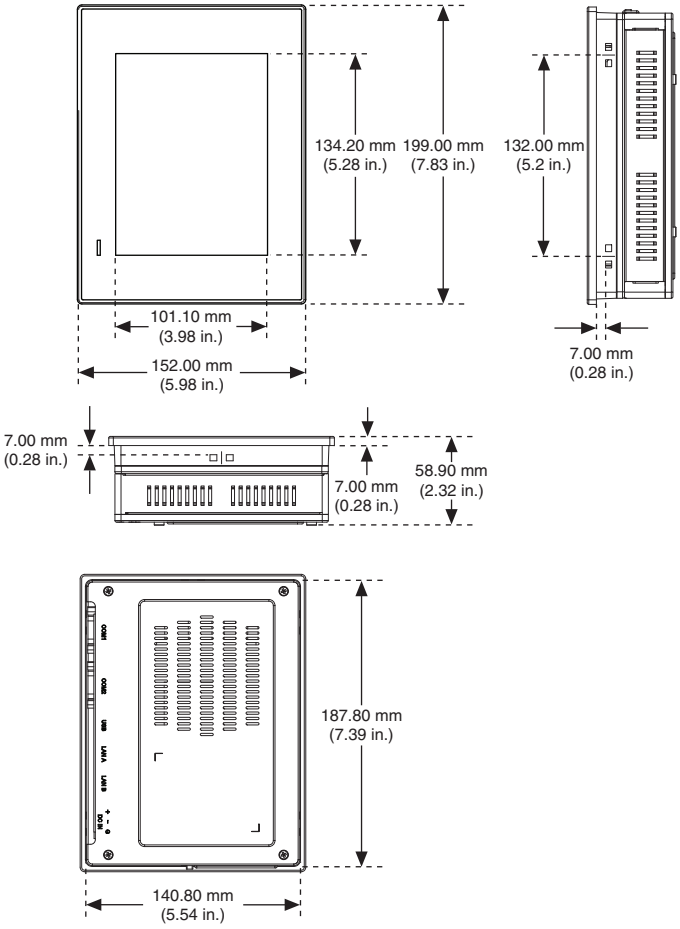


Figure 9. Dimensions of 12.1in. Device

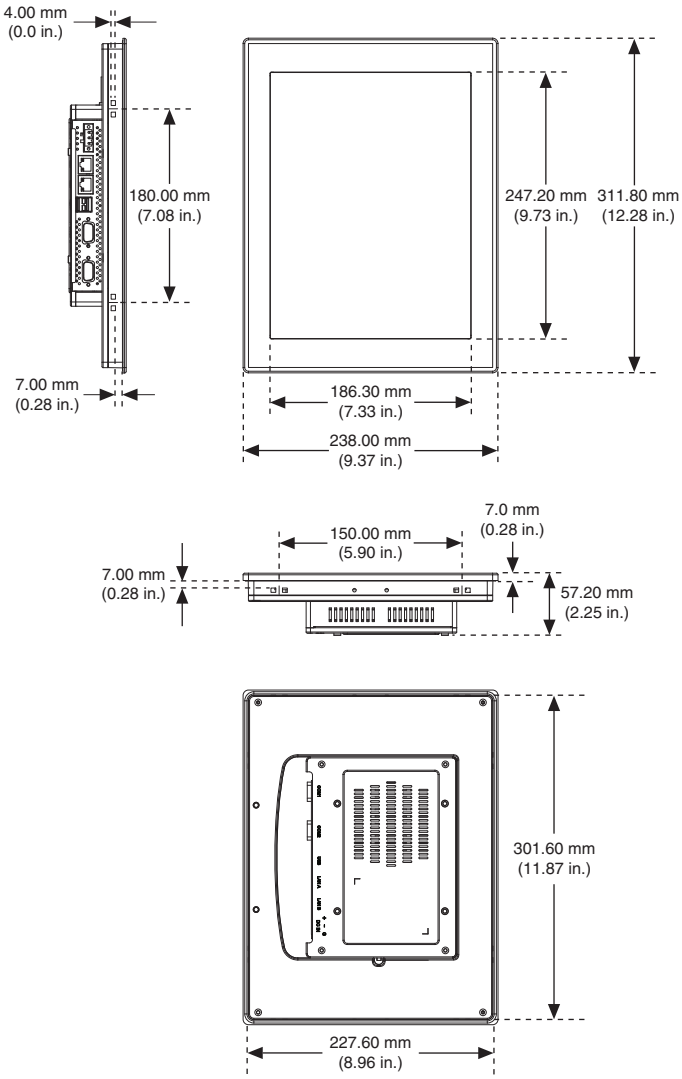
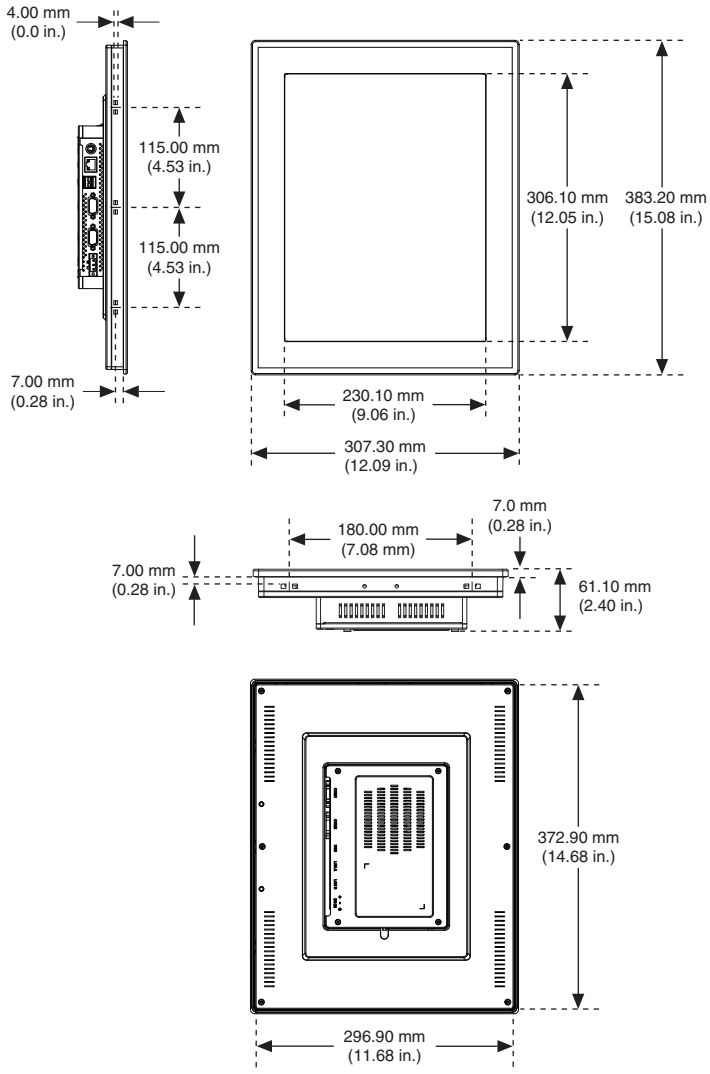


Figure 10. Dimensions of 15 in. Device



System

CPU	Intel Atom Processor E3827 1.75 GHz
Video	Integrated
BIOS	AMI UEFI BIOS
LAN	10/100/1000 Base-T 2 ports

RAM	4 GB DDR3L 1600MHz SO-DIMM
Watchdog timer	1 to 255 s timeout period
Storage	CFast, 1 slot

LCD

Display type	TFT LED LCD
Maximum resolution	
6.5 in.	640 × 480 XGA
12.1 in.	1024 × 768 XGA
15 in.	1024 × 768 XGA
Maximum colors	
6.5 in.	262,000
12.1 in.	262 k/16.2 M
15 in.	262 k/16.2 M
Viewing angle	160°/140°
Luminance (cd/m^2)	
6.5 in.	800
12.1 in.	600
15 in.	400
Contrast ratio	
6.5 in.	600:1
12.1 in.	700:1
15 in.	700:1
Backlight	LED
Backlight lifespan	50,000 hr

Note There may be several bright or dark pixels on the LCD. This phenomenon is normal in LCD manufacturing.

Touchscreen

Touch type	Resistive 5-wire
Base glass construction	Tempered glass
Resolution	
6.5 in.	640 × 480
12.1 in.	1024 × 1024
15 in.	1024 × 1024
Light Transmission	80% ± 3%
Controller	USB interface
Lifespan	1 million touches at a single point

Power

Input voltage	24 VDC ± 20%
Power consumption (typical)	
6.5 in.	19.2 W
12.1 in.	45.6 W
15 in.	40.8 W

Note Providing power levels either below or above the stated range is not recommended.

Environment

Operating temperature	-20 to 60 °C (-4 to 140 °F)
Storage temperature	-30 to 70 °C (-22 to 158 °F)
Humidity	40 °C @ 10 to 95% relative humidity (noncondensing)
Vibration	2 grms (5 to 500 Hz)
Maximum altitude	2,000 m
Pollution Degree	2
Indoor use only	

Note The front bezel is compliant with IP66.

Safety

This product is designed to meet the requirements of the following standards of safety for information technology equipment:

- IEC 60950-1, EN 60950-1
- UL 60950-1, CSA 60950-1

Note For UL and other safety certifications, refer to the product label or the *Online Product Certification* section.

Electromagnetic Compatibility

This product meets the requirements of the following EMC standards for information technology equipment:

- EN 55024 (CISPR 24); Immunity
- EN 55022 (CISPR 22); Class A Emissions
- AS/NZS CISPR 22; Class A Emissions
- FCC 47 CFR Part 15B: Class A Emissions
- ICES-003: Class A Emissions

Note For the standards applied to assess the EMC of this product, refer to the *Online Product Certification* section.

CE Compliance CE

This product meets the essential requirements of applicable European Directives as follows:

- 2014/35/EU; Low-Voltage Directive (safety)
- 2014/30/EU; Electromagnetic Compatibility Directive (EMC)

Online Product Certification

Refer to the product Declaration of Conformity (DoC) for additional regulatory compliance information. To obtain product certifications and the DoC for this product, visit `ni.com/certification`, search by model number or product line, and click the appropriate link in the Certification column.

Environmental Management

NI is committed to designing and manufacturing products in an environmentally responsible manner. NI recognizes that eliminating certain hazardous substances from our products is beneficial to the environment and to NI customers.

For additional environmental information, refer to the *Minimize Our Environmental Impact* web page at `ni.com/environment`. This page contains the environmental regulations and directives with which NI complies, as well as other environmental information not included in this document.

Waste Electrical and Electronic Equipment (WEEE)



EU Customers At the end of the product life cycle, all products *must* be sent to a WEEE recycling center. For more information about WEEE recycling centers, National Instruments WEEE initiatives, and compliance with WEEE Directive 2002/96/EC on Waste and Electronic Equipment, visit `ni.com/environment/weee`.

电子信息产品污染控制管理办法 （中国 RoHS）



中国客户 National Instruments 符合中国电子信息产品中限制使用某些有害物质指令 (RoHS)。关于 National Instruments 中国 RoHS 合规性信息，请登录 `ni.com/environment/rohs_china`。 (For information about China RoHS compliance, go to `ni.com/environment/rohs_china`.)

Mercury Disposal and Recycling

LCD lamp(s) in this monitor contain mercury. Dispose or recycle according to local, state or federal laws. Consult the Electronic Industries Alliance at `www.eiae.org` for more information. For specific information on lamp disposal, consult `www.lamprecycle.org`.

Cleaning

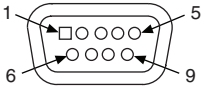
If you need to clean the unit, use a damp cloth. Do not use liquid or spray detergents for cleaning. Make sure that the unit is completely dry and free from contaminants before returning it to service.

Serial Port Settings

This section describes the TPC-2230 serial port settings.

COM1 Connector Pinout

The TPC-2230 COM1 serial port is RS232 only. The following figure and table show the COM1 connector pinout.

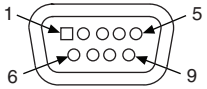


Pin	Signal
1	DCD
2	RX
3	TX
4	DTR
5	GND
6	DSR
7	RTS
8	CTS
9	RI

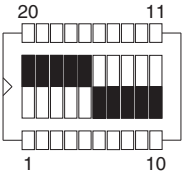
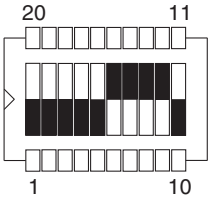
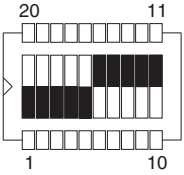
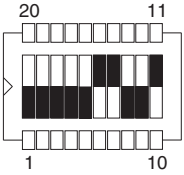
COM2 Connector Pinout

The TPC-2230 COM2 serial port is adjustable. You can set it to RS-232, RS-422, or RS-485, and it has auto data flow control capability. In other words, the TPC-2230 can automatically detect the data flow direction at this port when two-wired RS485 communication is activated.

The following figure and table show the COM2 pinout and settings.



PIN	RS-232	RS-422	RS-485
1	DCD	TX-	D-
2	RX	TX+	D+
3	TX	RX+	—
4	DTR	RX-	—
5	GND	GND	GND
6	DSR	—	—
7	RTS	—	—
8	CTS	—	—
9	RI	—	—

COM4 Mode	SW2 Setting
RS232 Mode	
RS422 Master Mode	
RS422 Slave Mode	
RS485 Mode	

Features in Windows Embedded Standard 7

The TPC-2230 supports Windows Embedded Standard 7 (WES7).

EWF and FBWF

Enhanced Write Filter (EWF) provides an upper filter in the storage device driver stack that redirects disk write operations to volatile (RAM) or nonvolatile (disk) storage. EWF protects a volume from write access and offers the following benefits:

- Write-protects one or more partitions on your system.
- Enables read-only media, such as CD-ROM or flash, to boot and run.
- Prolongs the lifespan of write-sensitive storage, such as CFast.

File Based Write Filter (FBWF) also redirects disk write operations to volatile (RAM) or nonvolatile (disk) storage. Where EWF protects entire volumes from writes, FBWF protects only individual files and directories. Although FBWF is not as robust as EWF, because EWF protects entire volumes, it is very useful when you need to write to specific files and have those changes persist between reboots.

You can enable and disable EWF and FBWF only between reboots.

To disable/enable EWF/FBWF in Windows Embedded Standard 7 (WES7), search for Info Code `ewftpc` on `ni.com/info` for more information.

When EWF is enabled, the `C:` partition is protected from any disk writing. In this mode, any changes on the `C:` partition (including modifications to files or the registry) are redirected to memory. Thus, these changes are discarded in the next system startup. You can enable this mode manually after finishing all system changes such as installing your applications or adjusting system settings.

HORM

Hibernate Once, Resume Many (HORM) enables users to create a single hibernation file and boot to that file repeatedly. Using HORM, you can boot to a known state each time the system is powered on. HORM works only when EWF is enabled on all system partitions. HORM does not work with FBWF. Depending on the system state, HORM can reduce boot times.

To enable HORM is in Windows Embedded Standard 7 (WES7), search for Info Code `ewftpc` on `ni.com/info` for more information.

Note You can programmatically control EWF, FBWF, and HORM using VIs included with the LabVIEW 2010 or later Touch Panel Module.

Drivers

The TPC-2230 is configured with all necessary drivers installed. If you need to reinstall any drivers, they are on the HMI Resources USB, which is included in the kit.

Touchscreen Configuration

This section explains how to configure the TPC-2230 touchscreen using the PenMount Control Panel.

To calibrate the TPC-2230, launch **All Programs»PenMount Windows Universal Driver» Utility»PenMount Control Panel**. Select **PenMount 6000 USB** under **Select a device to configure** and click **Configure**. Here you can select either **Standard Calibration** or **Advanced Calibration**. Follow the onscreen instructions for either choice.

Worldwide Support and Services

The National Instruments website is your complete resource for technical support. At ni.com/support you have access to everything from troubleshooting and application development self-help resources to email and phone assistance from NI Application Engineers.

Visit ni.com/services for NI Factory Installation Services, repairs, extended warranty, and other services.

Visit ni.com/register to register your National Instruments product. Product registration facilitates technical support and ensures that you receive important information updates from NI.

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