

# TPC-2012/TPC-2512

## User Manual

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## **Worldwide Technical Support and Product Information**

ni.com

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# Important Information

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The TPC-2012 and TPC-2512 are warranted against defects in materials and workmanship for a period of one year from the date of shipment, as evidenced by receipts or other documentation. National Instruments will, at its option, repair or replace equipment that proves to be defective during the warranty period. This warranty includes parts and labor.

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# Compliance

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## Compliance with FCC/Canada Radio Frequency Interference Regulations

### Determining FCC Class

The Federal Communications Commission (FCC) has rules to protect wireless communications from interference. The FCC places digital electronics into two classes. These classes are known as Class A (for use in industrial-commercial locations only) or Class B (for use in residential or commercial locations). All National Instruments (NI) products are FCC Class A products.

Depending on where it is operated, this Class A product could be subject to restrictions in the FCC rules. (In Canada, the Department of Communications (DOC), of Industry Canada, regulates wireless interference in much the same way.) Digital electronics emit weak signals during normal operation that can affect radio, television, or other wireless products.

All Class A products display a simple warning statement of one paragraph in length regarding interference and undesired operation. The FCC rules have restrictions regarding the locations where FCC Class A products can be operated.

Consult the FCC Web site at [www.fcc.gov](http://www.fcc.gov) for more information.

### FCC/DOC Warnings

This equipment generates and uses radio frequency energy and, if not installed and used in strict accordance with the instructions in this manual and the CE marking Declaration of Conformity\*, may cause interference to radio and television reception. Classification requirements are the same for the Federal Communications Commission (FCC) and the Canadian Department of Communications (DOC).

Changes or modifications not expressly approved by NI could void the user's authority to operate the equipment under the FCC Rules.

### Class A

#### Federal Communications Commission

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user is required to correct the interference at their own expense.

#### Canadian Department of Communications

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

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\* The CE marking Declaration of Conformity contains important supplementary information and instructions for the user or installer.

# Conventions

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The following conventions are used in this manual:

» The » symbol leads you through nested menu items and dialog box options to a final action. The sequence **File»Page Setup»Options** directs you to pull down the **File** menu, select the **Page Setup** item, and select **Options** from the last dialog box.



This icon denotes a note, which alerts you to important information.



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 *Safety* section of Appendix A, *Specifications*, for information about precautions to take.



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

**bold**

Bold text denotes items that you must select or click in the software, such as menu items and dialog box options. Bold text also denotes parameter names.

*italic*

Italic text denotes variables, emphasis, a cross-reference, or an introduction to a key concept. Italic text also denotes text that is a placeholder for a word or value that you must supply.

monospace

Text in this font denotes text or characters that you should enter from the keyboard, sections of code, programming examples, and syntax examples. This font is also used for the proper names of disk drives, paths, directories, programs, subprograms, subroutines, device names, functions, operations, variables, filenames, and extensions.

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# General Information

This chapter includes general information about the TPC-2012/TPC-2512 Human Machine Interface (HMI).

## Introduction

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The TPC-2012/TPC-2512 touch panel computer, a state-of-the-art HMI based on an x86 platform, includes these key features:

- **Fanless**—Because the system uses a low-power processor, it does not need fans, which often are unreliable and cause dust to circulate inside the equipment.
- **Bright display**—The TFT LCD features a 12.1 in. display that meets industrial demands for clear interfaces.
- **Powerful communication capability**—The TPC-2012/TPC-2512 is a powerful I/O interface for easy communication with other devices. The I/O interface includes serial ports, a parallel port, and Ethernet and USB 1.1 support. The TPC-2012/TPC-2512 also supports the PCI/104 expansion slot, making it easy to expand with PCI/104 modules.
- **Windows CE support**—In addition to Windows XP support, the TPC-2012/TPC-2512 supports the Windows CE and Windows XP embedded platforms. An optional Windows CE operating system specifically for the TPC-2012/TPC-2512 is available for Windows CE application programmers.

## I/O Ports

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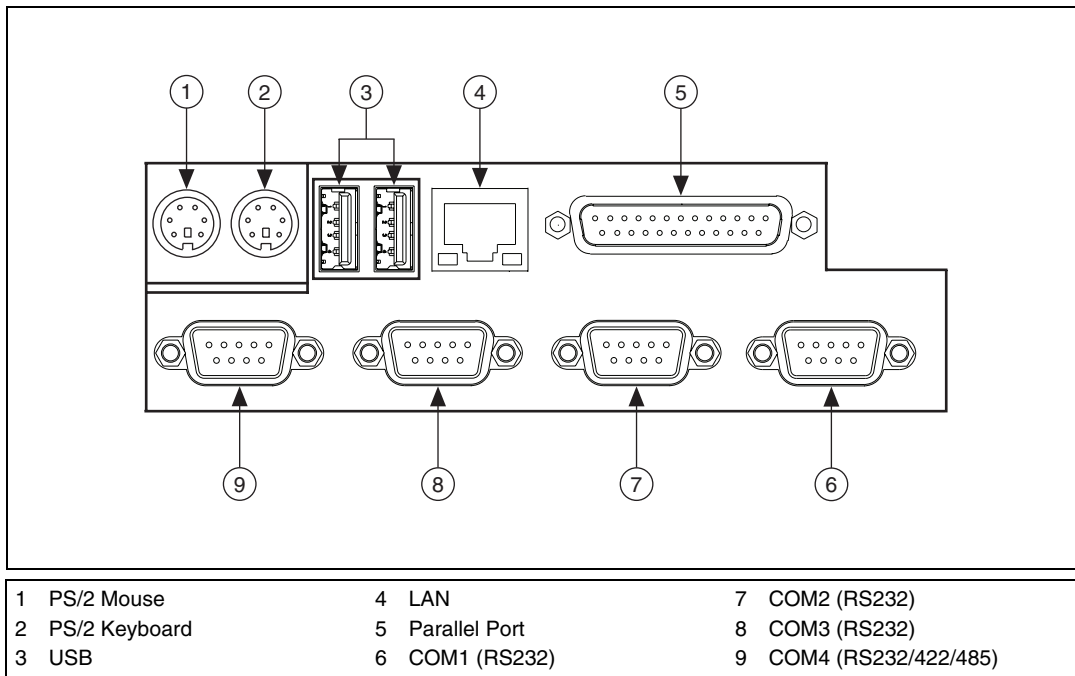
The TPC-2012/TPC-2512 includes the following ports:

- One parallel port that supports EPP/ ECP modes
- Four serial ports: RS232 (COM1, COM2, COM3) and RS232/422/485 (COM4)
- One RJ-45 Ethernet port
- Two PS/2 ports: 6-pin mini-DIN ports for keyboard and mouse



- Two USB 2.0 ports compliant with USB 1.0 and 1.1.
- One PCI/104 slot

Figure 1-1 shows the I/O port arrangement.



**Figure 1-1.** I/O Port Arrangement

For more TPC-2012/TPC-2512 specifications, see Appendix A, [Specifications](#).

## Cleaning

If you need to clean the unit, use a soft, nonmetallic brush. Make sure that the unit is completely dry and free from contaminants before returning it to service.

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# System Setup

This chapter includes setup information for the TPC-2012/TPC-2512.

## Important Safety Information

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Before setting up the TPC-2012/TPC-2512, 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. 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  $-20\text{ }^{\circ}\text{C}$  ( $-4\text{ }^{\circ}\text{F}$ ) or above  $60\text{ }^{\circ}\text{C}$  ( $140\text{ }^{\circ}\text{F}$ ). 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

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Follow these steps to set up the TPC-2012/TPC-2512:

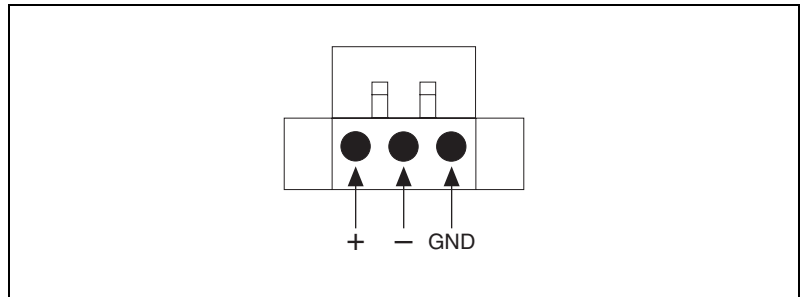
1. Unpack the TPC-2012/TPC-2512. Be sure your kit includes the following items:
  - The TPC-2012/TPC-2512 HMI
  - Eight panel mounting clamps
  - Eight panel mounting screws
  - One 3-pin power connector
  - One HMI Resource CD
  - One CompactFlash to IDE adapter card

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



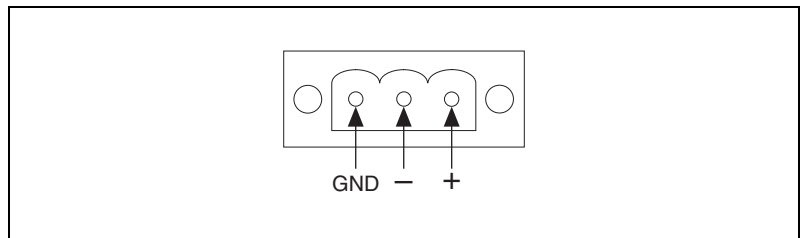
**Caution** Be sure system power is off before plugging in or pulling out the CompactFlash card.

2. Install a CompactFlash card containing Windows CE, embedded Windows XP, or another operating system.
3. Connect the power connector to 24 VDC power lines. Be sure to connect the positive, negative, and ground lines as shown in Figure 2-1. The power lines can be from either a power adapter or in-house power source.



**Figure 2-1.** Power Connector

4. Connect the power connector to the power receptor on the TPC-2012/TPC-2512. The power receptor pin assignment is shown in Figure 2-2.



**Figure 2-2.** Power Receptor and Pin Assignment

5. Switch on the power switch to power on the system.

## Touchscreen Calibration

The TPC-2012/TPC-2512 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 Appendix G, *Touchscreen Configuration*.

## Panel Mounting

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Follow these steps to mount the TPC-2012/TPC-2512 in a panel:

1. Be sure the adhesive waterproof gasket on the front bezel is in position.
2. Install the TPC-2012/TPC-2512 in the panel opening. (Refer to Appendix A, *Specifications*, for cutout dimensions.)
3. Hook the clamps included in the accessory pack to the holes around the four sides of the bezel.
4. Insert the screws included in the accessory pack into the clamps. To fasten the TPC-2012/TPC-2512 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 chapter describes the TPC-2012/TPC-2512 jumpers and connectors.

## Jumper and Connector Functions

Table 3-1 lists the jumper and connector functions.

**Table 3-1.** Mainboard Connectors and Jumpers

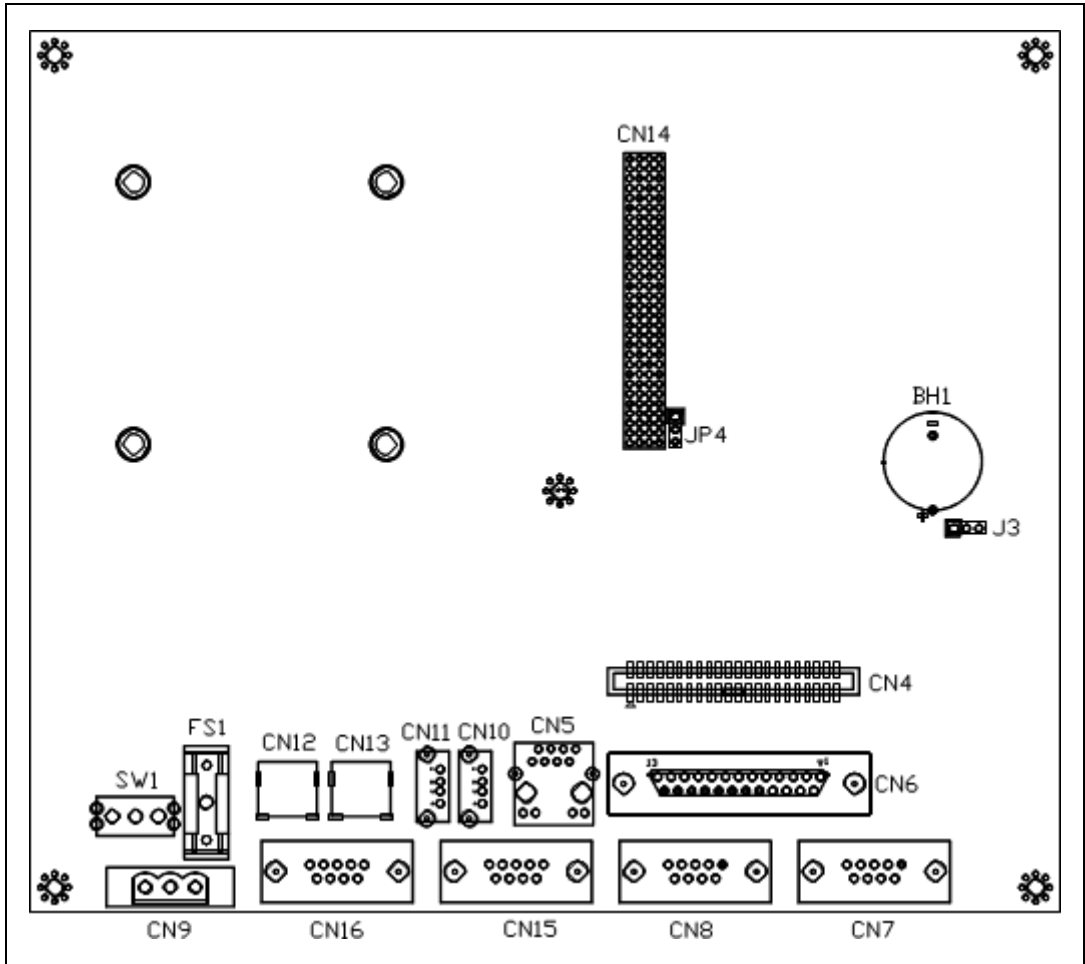
| Label | Function     | Description                                    |
|-------|--------------|--|
| CN2   | LCD power    | LCD inverter connector                         |
| CN3   | CF           | CompactFlash socket                            |
| CN4   | IDE          | Internal IDE 44-pin (2 mm) connector           |
| CN5   | Ethernet     | RJ45 LAN port                                  |
| CN6   | LPT          | Printer port                                   |
| CN7   | COM1         | Serial port: COM2 RS232                        |
| CN8   | COM2         | Serial port: COM1 RS232                        |
| CN9   | DC in        | DC power in connector (5.08 mm, 3-pin housing) |
| CN10  | USB2         | Two USB type-A female                          |
| CN11  | USB1         | Two USB type-A female                          |
| CN12  | PS2 mouse    | Standard mini-DIN 6-pin                        |
| CN13  | PS2 keyboard | Standard mini-DIN 6-pin                        |
| CN14  | PCI104       | PCI104 30*4 connector                          |
| CN15  | COM3         | Serial port: COM1 RS232                        |
| CN16  | COM4         | Serial port: COM1 RS232/485/422                |

**Table 3-1.** Mainboard Connectors and Jumpers (Continued)

| <b>Label</b> | <b>Function</b> | <b>Description</b>    |
|--------------|-----------------|-----------------------|
| JP1          | Panel           | Panel connector       |
| JP2          | Touch           | Touch connector       |
| JP4          | 5 V/3 V         | PCI104 5 V/3 V select |
| J1           | DDR             | DDR connector         |
| J3           | 1*3 pin header  | Clear CMOS            |
| SW1          | Power switch    | System power switch   |
| BH1          | Battery         | RTC battery           |
| FS1          | Fuse            | Fuse holder           |

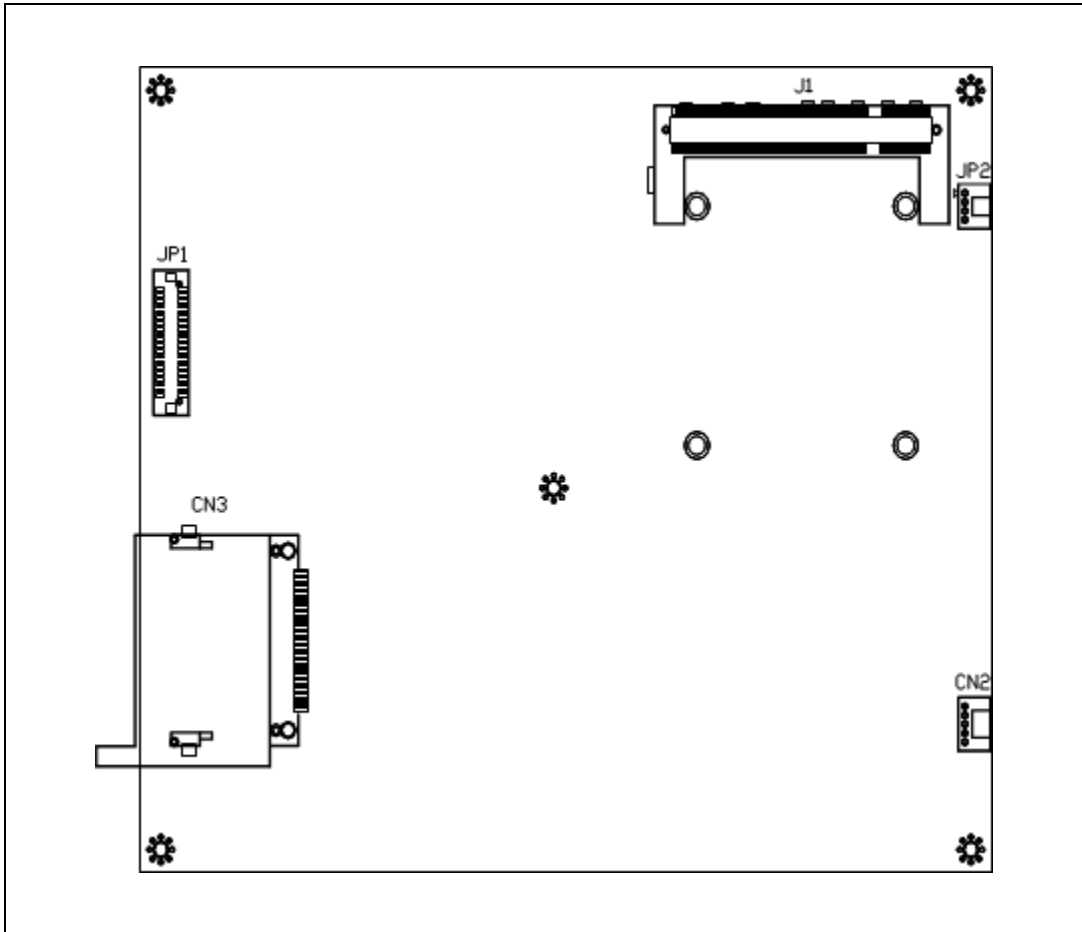
# Jumper and Connector Locations

Figures 3-1 and 3-2 show the jumper and connector locations.



**Figure 3-1.** Main Board Jumpers and Connectors





**Figure 3-2.** Main Board Jumpers and Connectors

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## Specifications

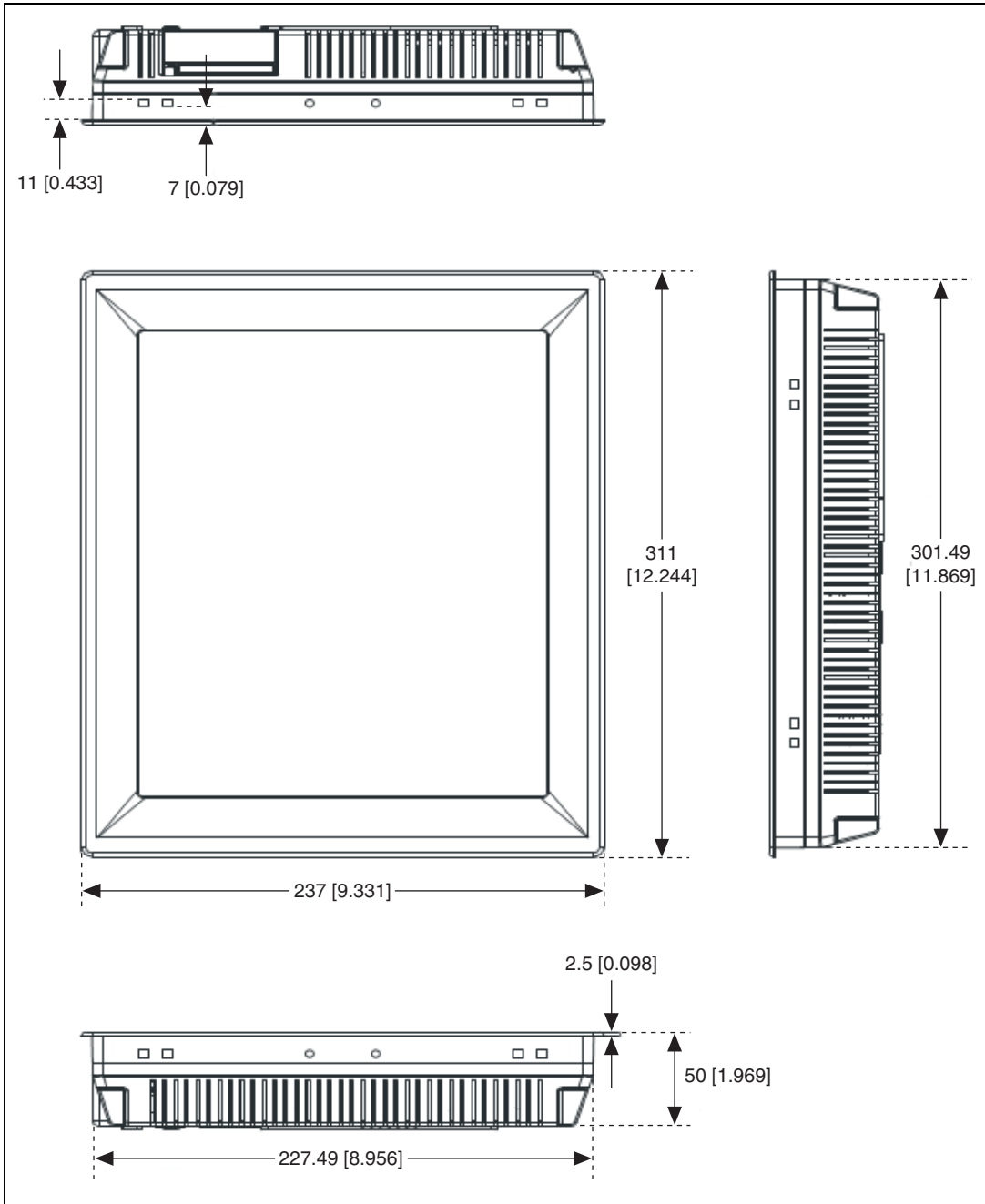
This appendix lists the TPC-2012/TPC-2512 system specifications.

### Physical

Weight..... 4.1 kg (without HDD)

Cutout dimensions..... 302 × 228 mm (suggested)

## Dimensions



## System Kernel

|                      |  |
|----------------------|--|
| CPU .....            | GeodeLink Control Processor<br>LX800 500 MHz   |
| BIOS.....            | Award 512 KB flash memory  |
| South bridge .....   | GeodeLink Control Processor<br>CS5535  |
| VGA .....            | GeodeLink Control Processor<br>LX800 500 MHz   |
| Ethernet .....       | Realtek RTL8100BL;<br>IEEE 802.3u protocol compatible  |
| Watchdog timer ..... | W83627 watchdog timer;<br>1.6 s timeout period   |
| IDE .....            | 1 EIDE channel supports one<br>CompactFlash socket onboard<br>(Master) and one IDE interface<br>hard drive (Slave) |



**Note** COM1 and COM2 support only half-duplex (maximum baud rate: 115.2 Kbps).

## LCD

|                                      |  |
|--------------------------------------|--|
| Display type .....                   | TFT color LCD                          |
| Size (diagonal) .....                | 12.1 in.                               |
| Maximum resolution .....             | 800 × 600 (SVGA)                       |
| Maximum colors .....                 | 256,000                                |
| Pixel pitch (W × H, mm).....         | 0.3075 × 0.3075                        |
| Viewing angle .....                  | 100°                                   |
| Luminance (cd/m <sup>2</sup> ) ..... | 340                                    |
| Contrast ratio.....                  | 300                                    |
| Operating temperature.....           | 0 to 50 °C (32 to 122 °F)<br>(ambient) |

Backlight.....2 CCFL

Backlight lifespan .....50,000 h



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

## Touchscreen

Touch type .....Resistive

Base glass construction.....Tempered Glass

Resolution .....1024 × 1024

Light transmission .....75% typical

Controller .....USB interface

Lifespan .....1 million touches at a single point

## Power

Input voltage .....18 to 32 VDC

Typical .....24 VDC, 2.0 A

## Fuse

Rating.....T3.15 A, 250 V

Size .....5 × 20 mm



**Note** When replacing the fuse, use only a fuse of the same type and rating.



**Note** For your protection, the fuse is set to break if the input voltage exceeds 33 VDC.

## Environment

Operating temperature .....0 to 50 °C (32 to 122 °F)

Storage temperature .....-20 to 60 °C (-4 to 140 °F)

Humidity .....40 °C @ 10 to 95% relative humidity (noncondensing)

Vibration ..... 1 grms (5 to 500 Hz)

Maximum altitude ..... 2,000 m

Pollution Degree ..... 2

Indoor use only

## 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 visit [ni.com/certification](http://ni.com/certification), search by model number or product line, and click the appropriate link in the Certification column.

## Electromagnetic Compatibility

This product is designed to meet the requirements of the following standards of EMC for electrical equipment for measurement, control, and laboratory use:

- EN 55024, CISPR 24 EMC requirements
- EN 55022, CISPR 22 Emissions; Class A
- EN 55011, CISPR 11 Emissions; Class A
- CE, C-Tick, ICES, and FCC Part 15 Emissions; Class A



**Note** For EMC compliance, operate this device according to product documentation.

## CE Compliance

This product meets the essential requirements of applicable European Directives, as amended for CE marking, as follows:

- 2006/95/EC; Low-Voltage Directive (safety)
- 2004/108/EEC; Electromagnetic Compatibility Directive (EMC)



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

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## 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](http://www.eiae.org) for more information. For specific information on lamp disposal, consult [www.lamprecycle.org](http://www.lamprecycle.org).

## Cleaning

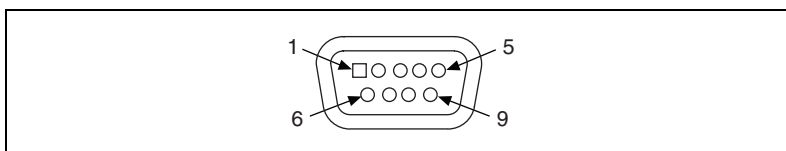
If you need to clean the unit, use a soft, nonmetallic brush. Make sure that the unit is completely dry and free from contaminants before returning it to service.

## Serial Port Settings

This appendix describes the TPC-2012/TPC-2512 serial port settings.

### COM1/COM2/COM3 Connector Pinout

The following figure and table show the COM1/COM2/COM3 connector pinout.



| Pin | Signal |
|-----|--------|
| 1   | NDCD   |
| 2   | NRX    |
| 3   | NTX    |
| 4   | NDTR   |
| 5   | GND    |
| 6   | NDSR   |
| 7   | NRTS   |
| 8   | NCTS   |
| 9   | NRI    |



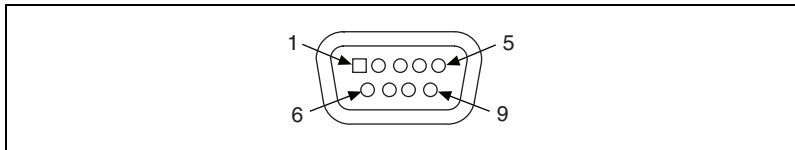
**Note** COM1 and COM2 support only half-duplex (maximum baud rate: 115.2 Kbps).



# COM4 Connector Pinout and Settings

The TPC-2012/TPC-2512 COM4 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-2012/TPC-2512 can automatically detect the data flow direction at this port when two-wired RS-485 communication is activated.

The following figure and table show the COM4 pinout and settings.



| COM4 Mode         | S1 and S2 Setting |
|-------------------|-------------------|
| RS232 Mode        |                   |
| RS485 Mode        |                   |
| RS422 Master Mode |                   |
| RS422 Slave Mode  |                   |

| <b>PIN</b> | <b>RS-232</b> | <b>RS-422</b> | <b>RS-485</b> |
|------------|---------------|---------------|---------------|
| 1          | NDCD          | TX-           | D-            |
| 2          | NRX           | TX+           | D+            |
| 3          | NTX           | RX+           |               |
| 4          | NDTR          | RX-           |               |
| 5          | GND           | GND           | GND           |
| 6          | NDSR          |               |               |
| 7          | NRTS          |               |               |
| 8          | NCTS          |               |               |
| 9          | NRI           |               |               |



---

# Watchdog Timer Programming

This appendix explains the TPC-2012/TPC-2512 watchdog timer programming.

## Overview

---

You can use the TPC-2012/TPC-2512 watchdog timer to monitor system software operation and take corrective action if the software fails to function after the programmed period. This appendix describes how to program the watchdog timer operation.

The watchdog timer is built into the W83627HF I/O controller. It includes the following programmable functions:

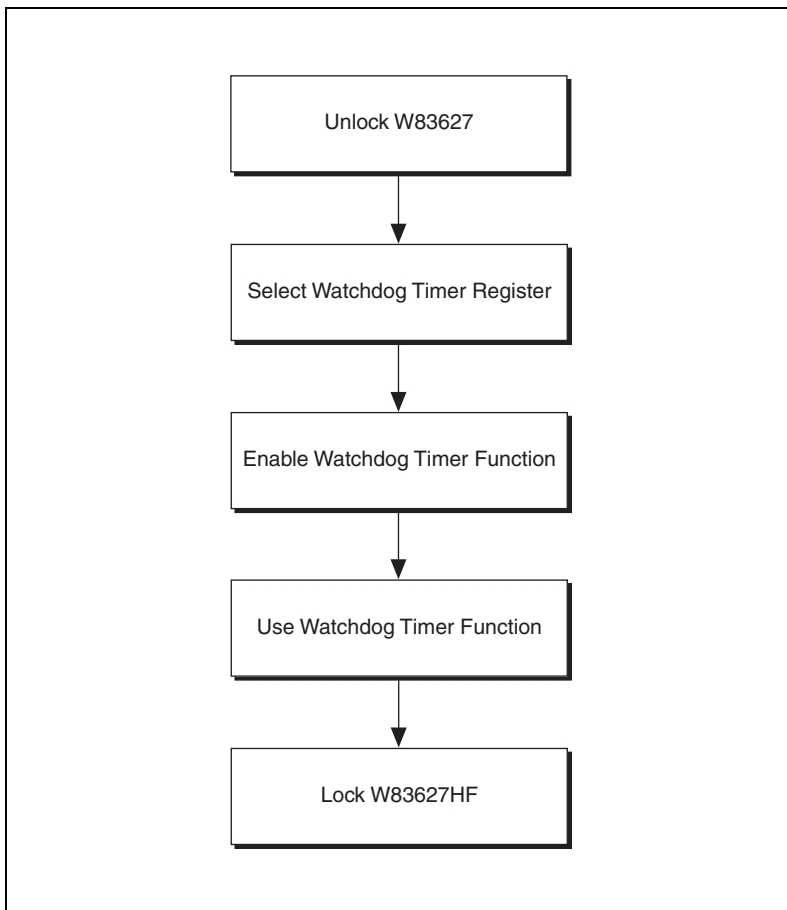
- You can enable and disable the timer via programming.
- You can set the timer interval from 1 to 255 seconds or 1 to 255 minutes.
- The timer generates an interrupt or resets the signal if the software fails to reset the timer after a timeout.

## Watchdog Timer Programming

---

The watchdog timer I/O port address is 2E (hex) (the address port) and 2F (hex) (the data port). You must first assign the register address by writing the address value to address port 2E (hex), then write/read data to/from the assigned register through data port 2F (hex).

Figure C-1 describes the watchdog timer programming procedure, and Table C-1 describes the watchdog timer registers.



**Figure C-1.** Watchdog Timer Programming Procedure

**Table C-1.** Watchdog Timer Registers

| Address of Register (2E) | Attribute                  | Description   |
|--------------------------|----------------------------|---|
| Read/Write               | Value (2F) and description | —   |
| 87 (hex)                 | —                          | Write this address twice to I/O address port 2E (hex) to unlock the W83627HF.   |
| 07 (hex)                 | Write                      | Write 08 (hex) to select the watchdog timer register.   |
| 30 (hex)                 | Write                      | Write 01 (hex) to enable the watchdog timer function. The default is disabled.  |
| F5 (hex)                 | Write                      | Set seconds or minutes as the timer unit.<br>Write 0 to bit 3 (default): second.<br>Write 1 to bit 3: minute.   |
| F6 (hex)                 | Write                      | 0: Stop timer<br>01 to FF (hex) (default): The count amount, in seconds or minutes, depends on the value set in register F5 (hex). This number determines how long the watchdog timer waits for the strobe before generating an interrupt or reset signal. Writing a new value to this register resets the timer to count with the new value. |
| F7 (hex)                 | Read/Write                 | Bit 6: Write 1 to enable the keyboard to reset the timer. Write 0 to disable.<br>Bit 5 (default): Write 1 to generate a timeout signal immediately and automatically return to 0.<br>Bit 4 (default = 0): Read the watchdog timer status. 1 means the timer is timeout.   |
| AA (hex)                 | —                          | Write this address to I/O port 2E (hex) to lock the watchdog timer.   |

## Example Programs

---

### Example 1: Enable the Watchdog Timer and Set 10 s as the Timeout Interval

```

;-----
Mov dx,2eh ; Unlock W83627HF
Mov al,87h
Out dx,al
Out dx,al
;-----
Mov al,07h ; Select registers of watchdog timer
Out dx,al
Inc dx
Mov al,08h
Out dx,al
;-----
Dec dx ; Enable the function of watchdog timer
Mov al,30h
Out dx,al
Inc dx
Mov al,01h
Out dx,al
;-----
Dec dx ; Set second as counting unit
Mov al,0f5h
Out dx,al
Inc dx
In al,dx
And al,not 08h
Out dx,al
;-----
Dec dx ; Set timeout interval as 10 seconds and start counting
Mov al,0f6h
Out dx,al
Inc dx
Mov al,10
Out dx,al
;-----
Dec dx ; lock W83627HF
Mov al,0aah
Out dx,al

```

## Example 2: Enable the Watchdog Timer and Set 5 Min as the Timeout Interval

```

;-----
Mov dx,2eh ; unlock W83627H
Mov al,87h
Out dx,al
Out dx,al
;-----
Mov al,07h ; Select registers of watchdog timer
Out dx,al
Inc dx
Mov al,08h
Out dx,al
;-----
Dec dx ; Enable the function of watchdog timer
Mov al,30h
Out dx,al
Inc dx
Mov al,01h
Out dx,al
;-----
Dec dx ; Set minute as counting unit
Mov al,0f5h
Out dx,al
Inc dx
In al,dx
Or al,08h
Out dx,al
;-----
Dec dx ; Set timeout interval as 5 minutes and start counting
Mov al,0f6h
Out dx,al
Inc dx
Mov al,5
Out dx,al
;-----
Dec dx ; lock W83627HF
Mov al,0aah
Out dx,al

```

### Example 3: Enable the Mouse to Reset the Watchdog Timer

```
-----  
Mov dx,2eh ; unlock W83627H  
Mov al,87h  
Out dx,al  
Out dx,al  
-----  
Mov al,07h ; Select registers of watchdog timer  
Out dx,al  
Inc dx  
Mov al,08h  
Out dx,al  
-----  
Dec dx ; Enable the function of watchdog timer  
Mov al,30h  
Out dx,al  
Inc dx  
Mov al,01h  
Out dx,al  
-----  
Dec dx ; Enable watchdog timer to be reset by mouse  
Mov al,0f7h  
Out dx,al  
Inc dx  
In al,dx  
Or al,80h  
Out dx,al  
-----  
Dec dx ; lock W83627HF  
Mov al,0aah  
Out dx,al
```



## Example 4: Enable the Keyboard to Reset the Watchdog Timer

```

;-----
Mov dx,2eh ; unlock W83627H
Mov al,87h
Out dx,al
Out dx,al
;-----
Mov al,07h ; Select registers of watchdog timer
Out dx,al
Inc dx
Mov al,08h
Out dx,al
;-----
Dec dx ; Enable the function of watchdog timer
Mov al,30h
Out dx,al
Inc dx
Mov al,01h
Out dx,al
;-----
Dec dx ; Enable watchdog timer to be strobed reset by keyboard
Mov al,0f7h
Out dx,al
Inc dx
In al,dx
Or al,40h
Out dx,al
;-----
Dec dx ; lock W83627HF
Mov al,0aah
Out dx,al

```

## Example 5: Generate a Timeout Signal without Timer Counting

```
;-----  
Mov dx,2eh ; unlock W83627H  
Mov al,87h  
Out dx,al  
Out dx,al  
;-----  
Mov al,07h ; Select registers of watchdog timer  
Out dx,al  
Inc dx  
Mov al,08h  
Out dx,al  
;-----  
Dec dx ; Enable the function of watchdog timer  
Mov al,30h  
Out dx,al  
Inc dx  
Mov al,01h  
Out dx,al  
;-----  
Dec dx ; Generate a time-out signal  
Mov al,0f7h  
Out dx,al ;Write 1 to bit 5 of F7 register  
Inc dx  
In al,dx  
Or al,20h  
Out dx,al  
;-----  
Dec dx ; lock W83627HF  
Mov al,0aah  
Out dx,al
```

---

# Watchdog Timer Programming on WinCE (TPC-2012)

Windows CE includes a watchdog timer for the TPC-2012/TPC-2512. You can access the timer through the WIN32 API. The TPC-2012/TPC-2512 includes a WDT driver, WDT1;, for enabling/disabling the watchdog timer. You must open this driver before using the resources, and then use the DeviceIOControl function to enable/disable the watchdog timer.

This appendix describes DeviceIOControl and its parameters. It also includes a programming example.

## DeviceIOControl

---

DeviceIOControl sends a control code directly to a specified device driver, causing the corresponding device to perform the specified operation. The function and its parameters are:

```
BOOL DeviceIoControl( HANDLE hDevice, DWORD  
dwIoControlCode, LPVOID lpInBuffer, DWORD nInBufferSize,  
LPVOID lpOutBuffer, DWORD nOutBufferSize, LPDWORD  
lpBytesReturned, LPOVERLAPPED lpOverlapped );
```

## Parameters

DeviceIOControl includes the following parameters:

- `hDevice`  
(in) Handle to the device that performs the operation. Call the `CreateFile` function to obtain a device handle.

- `dwIoControlCode`

(in) Specifies the operation control code. This value identifies the specific operation to be performed and the type of device on which the operation is to be performed. No specific values are defined for the `dwIoControlCode` parameter. However, if you write a custom device driver, you can define `IOCTL_XXXX` control codes, per the `CTL_CODE` macro. You then can advertise these control codes, and an application can use these control codes with `DeviceIoControl` to perform driver-specific functions.
- `lpInBuffer`

(in) Long pointer to a buffer that contains the data required to perform the operation. This parameter can be `NULL` if the `dwIoControlCode` parameter specifies an operation that does not require input data.
- `nInBufferSize`

(in) Size, in bytes, of the buffer pointed to by `lpInBuffer`.
- `lpOutBuffer`

(out) Long pointer to a buffer that receives the operation's output data. This parameter can be `NULL` if the `dwIoControlCode` parameter specifies an operation that does not produce output data.
- `nOutBufferSize`

(in) Size, in bytes, of the buffer pointed to by `lpOutBuffer`.
- `lpBytesReturned`

(out) Long pointer to a variable that receives the size, in bytes, of the data stored into the buffer pointed to by `lpOutBuffer`. The `lpBytesReturned` parameter cannot be `NULL`. Even when an operation produces no output data, and `lpOutBuffer` can be `NULL`, `DeviceIoControl` makes use of the variable pointed to by `lpBytesReturned`. After such an operation, the variable value has no meaning.
- `lpOverlapped`

(in) Ignored; set to `NULL`.
- Return Values

Nonzero indicates success. Zero indicates failure. To get extended error information, call `GetLastError`.

## How to Use the Control Codes

---

There are six control codes for the WDT driver operation codes.

### IOCTL\_WDT\_ENABLE

Enables the application watchdog timer. By default, if the watchdog timer is enabled, the WDT driver automatically triggers itself after the specified period, and your application does not need to trigger the watchdog timer.

- lpInBuffer: unused
- nInBufferSize: unused
- lpOutBuffer: unused
- nOutBufferSize: unused

### IOCTL\_WDT\_DISABLE

Disables the application watchdog timer.

- lpInBuffer: unused
- nInBufferSize: unused
- lpOutBuffer: unused
- nOutBufferSize: unused

### IOCTL\_WDT\_STROBE

Triggers the watchdog. If your application uses IOCTL\_WDT\_ENABLE to enable the watchdog first and then sends IOCTL\_WDT\_REBOOT to the WDT driver, your application must trigger the watchdog once during the watchdog timer period. If your application has not triggered at the specified period, the device reboots automatically.

- lpInBuffer: unused
- nInBufferSize: unused
- lpOutBuffer: unused
- nOutBufferSize: unused

### IOCTL\_WDT\_GETTIMEOUT

Gets the watchdog time setting.

- lpInBuffer: unused
- nInBufferSize: unused

- `lpOutBuffer`: The DWORD points to your watchdog time setting. The watchdog time settings are:

| Setting     | Time          |
|-------------|---------------|
| 0           | 2 s           |
| 1 (default) | 5 s (default) |
| 2           | 10 s          |
| 3           | 15 s          |
| 4           | 30 s          |
| 5           | 45 s          |
| 6           | 60 s          |

- `nOutBufferSize`: unused

## IOCTL\_WDT\_SETTIMEOUT

Sets the watchdog time setting.

- `lpInBuffer`: The DWORD points to your watchdog time setting. The watchdog time settings are:

| Setting     | Time          |
|-------------|---------------|
| 0           | 2 s           |
| 1 (default) | 5 s (default) |
| 2           | 10 s          |
| 3           | 15 s          |
| 4           | 30 s          |
| 5           | 45 s          |
| 6           | 60 s          |

- `nInBufferSize`: unused
- `lpOutBuffer`: unused
- `nOutBufferSize`: unused

## IOCTL\_WDT\_REBOOT

If you want your application to trigger the watchdog, use `IOCTL_WDT_REBOOT` to notify the watchdog driver timer (WDT). Otherwise, the WDT triggers itself automatically.

- `lpInBuffer`: unused
- `nInBufferSize`: unused
- `lpOutBuffer`: unused
- `nOutBufferSize`: unused

## Programming Example

---

```
#define WDT_CODE(ID) CTL_CODE(FILE_DEVICE_UNKNOWN, ID, METHOD_BUFFERED,
FILE_ANY_ACCESS)
#define IOCTL_WDT_ENABLE WDT_CODE (0x900)
#define IOCTL_WDT_DISABLE WDT_CODE(0x901)
#define IOCTL_WDT_STROBE WDT_CODE(0x902)
#define IOCTL_WDT_GET_TIMEOUT WDT_CODE(0x903)
#define IOCTL_WDT_SET_TIMEOUT WDT_CODE(0x904)
#define IOCTL_WDT_REBOOT WDT_CODE(0x905)
// for compatibility reasons, you can define IOCTL as below:
// #define IOCTL_WDT_ENABLE 0x1001
// #define IOCTL_WDT_DISABLE 0x1002
// #define IOCTL_WDT_STROBE 0x1003
// #define IOCTL_WDT_GETTIMEOUT 0x1004
// #define IOCTL_WDT_SETTIMEOUT 0x1005
// #define IOCTL_WDT_REBOOT 0x1006
HANDLE m_hWDT=NULL;
TCHAR szClassName[60];
// assign the WDT driver name wsprintf(szClassName, TEXT("WDT1:"));
// Open the WDT driver
m_hWDT = CreateFile(szClassName, GENERIC_READ | GENERIC_WRITE, 0, NULL,
OPEN_EXISTING, FILE_ATTRIBUTE_NORMAL, NULL);
if ( m_hWDT == INVALID_HANDLE_VALUE ) { DebugMsg(CString("WDT driver fail"));
return;
}
DWORD dwTemp; DWORD nIndex=2;
// Set the Watchdog Timer as 10 seconds. Number 2 means 10 seconds.
DeviceIoControl(m_hWDT, IOCTL_WDT_SET_TIMEOUT, &nIndex, sizeof(nIndex),
NULL, 0, &dwTemp, NULL);
// Enable the Watchdog timer
DeviceIoControl(m_hWDT, IOCTL_WDT_ENABLE, NULL, 0, NULL, 0, &dwTemp, NULL);
```

```
While (1) {  
    // do your job here.  
    Sleep(8000);  
    DeviceIoControl(m_hWDT, IOCTL_WDT_STROBE, NULL, 0, NULL, 0, &dwTemp, NULL);  
}  
DeviceIoControl(m_hWDT, IOCTL_WDT_DISABLE, NULL, , NULL, 0, &dwTemp, NULL);  
CloseHandle(m_hWDT);
```



---

# Features in Windows XP Embedded (TPC-2512)

The TPC-2512 supports the Windows XP Embedded platform (commonly abbreviated XPe), which is a componentized version of the Windows XP Professional edition. This appendix explains the version information and the EWF utility for Windows XP Embedded.

## Version Information

---

You can access the version information by selecting **Start»All Programs»Utilities**.

The version information states the current XPE runtime information including hardware platform, version, build number, release date, XPE QFEs installed in the component database, and Windows XP Pro patches installed.

## EWF

---

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 life span of write-sensitive storage, such as CompactFlash.

To disable/enable EWF, go to **Start»All Programs»Utilities** and select the **EWF** tab. The default setting is disabled.

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 manually enable this mode after finishing all system changes such as installing your applications or adjusting system settings.

---

## Accessory Kit Assembly Procedure

This appendix explains how to connect to a CD-ROM via the CompactFlash slot.

### CompactFlash to IDE Transfer Kit Assembly

---

Follow these steps to connect to a CD-ROM via the CompactFlash slot:

1. Connect the IDE cable to the adapter board.
2. Insert the adapter board into the CompactFlash slot.
3. Connect the CD-ROM to the IDE cable.
4. Connect the external power line to the CD-ROM.



---

# Touchscreen Configuration

This appendix explains how to configure the TPC-2012/TPC-2512 touchscreen using the PenMount Control Panel.

## Touchscreen Calibration (TPC-2012)

---

To calibrate the TPC-2012, go to **Start»Control Panel»Stylus**, which displays the Stylus Properties screen. You can set the double-tap sensitivity in the **Double-Tap** tab. To recalibrate the stylus, use the **Calibration** tab. Press the **Recalibrate** button, then press and briefly hold the stylus on the center of each target as it appears on the screen. When finished, tap on the screen with the stylus to save the settings.

## Touchscreen Calibration (TPC-2512)

---

To calibrate the TPC-2512, go to **Start»All Programs»PenMount USB Utilities»Control Panel** and click **Calibrate**. Here you can select either **Standard Calibration** or **Advanced Calibration**. Follow the onscreen instructions for either choice.

---

# Fuse Replacement



**Caution** *Do not* replace the fuse unless it is damaged. *Do not* replace the fuse with a differently rated fuse. For more information, see the fuse specifications in Appendix A, *Specifications*.

Follow these steps to replace the fuse:

1. Remove the fuse cover.
2. Replace the damaged fuse with a new one.
3. Place the fuse cover back into position.

---

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