TPC-2012

User Manual

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NATIONAL INSTRUMENTS™

Worldwide Technical Support and Product Information

ni.com

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Compliance

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` 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.

Compliance with EU Directives

Users in the European Union (EU) should refer to the Declaration of Conformity (DoC) for information* pertaining to the CE marking. 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`, search by model number or product line, and click the appropriate link in the Certification column.

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

Conventions

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.

Contents

1

General Information

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

Introduction

The TPC-2012 touch panel computer, a state-of-the-art HMI based on an *x*86 platform, includes these key features:

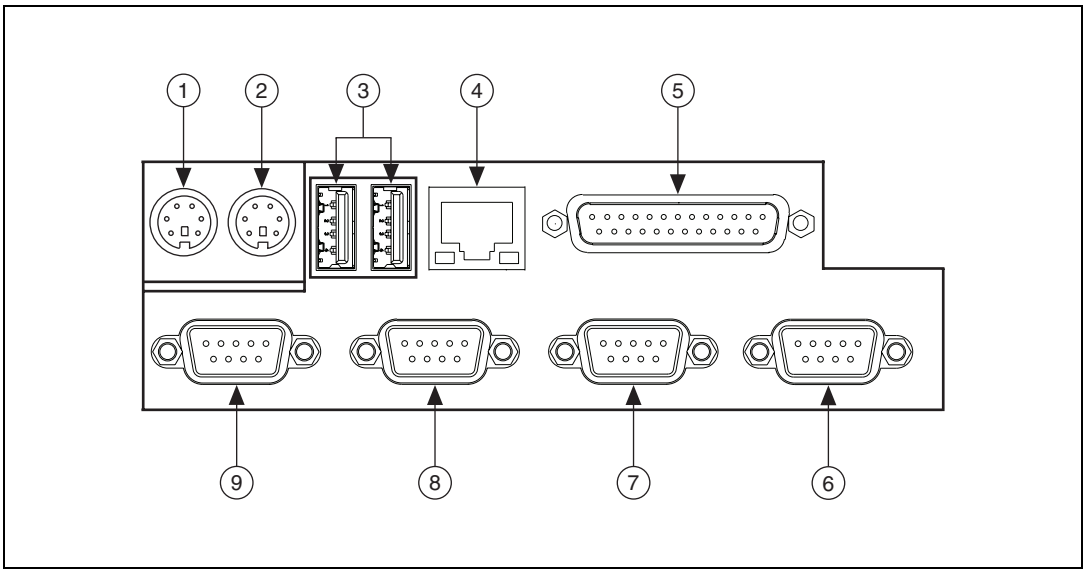
- **Fanless**—Because the system uses a low-power processor, it does not need fans, which often are unreliable and cause dust to circulate inside the equipment.
- **Bright display**—The TFT LCD features a 12.1 in. display that meets industrial demands for clear interfaces.
- **Powerful communication capability**—The TPC-2012 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 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 supports the Windows CE and Windows XP embedded platforms. An optional Windows CE operating system specifically for the TPC-2012 is available for Windows CE application programmers.

I/O Ports

The TPC-2012 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.



1	PS/2 Mouse	4	LAN	7	COM2 (RS232)
2	PS/2 Keyboard	5	Parallel Port	8	COM3 (RS232)
3	USB	6	COM1 (RS232)	9	COM4 (RS232/422/485)

Figure 1-1. I/O Port Arrangement

For more TPC-2012 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.

2

System Setup

This chapter includes setup information for the TPC-2012.

Important Safety Information

Before setting up the TPC-2012, 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 °C (–4 °F) or above 60 °C (140 °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-2012:

1. Unpack the TPC-2012. Be sure your kit includes the following items:
   - The TPC-2012 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.

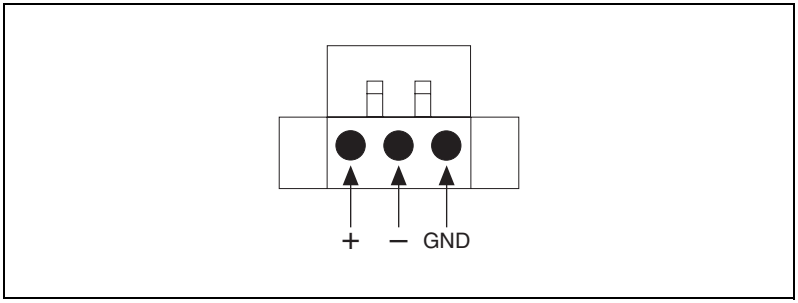


Figure 2-1. Power Connector

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

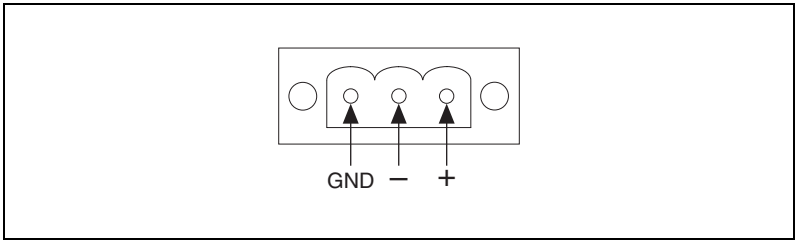


Figure 2-2. Power Receptor and Pin Assignment

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

Touchscreen Calibration

The TPC-2012 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 F, *Touchscreen Configuration*.

Panel Mounting

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

1. Be sure the adhesive waterproof gasket on the front bezel is in position.
2. Install the TPC-2012 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 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.).

3

Jumpers and Connectors

This chapter describes the TPC-2012 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)

Label	Function	Description
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.

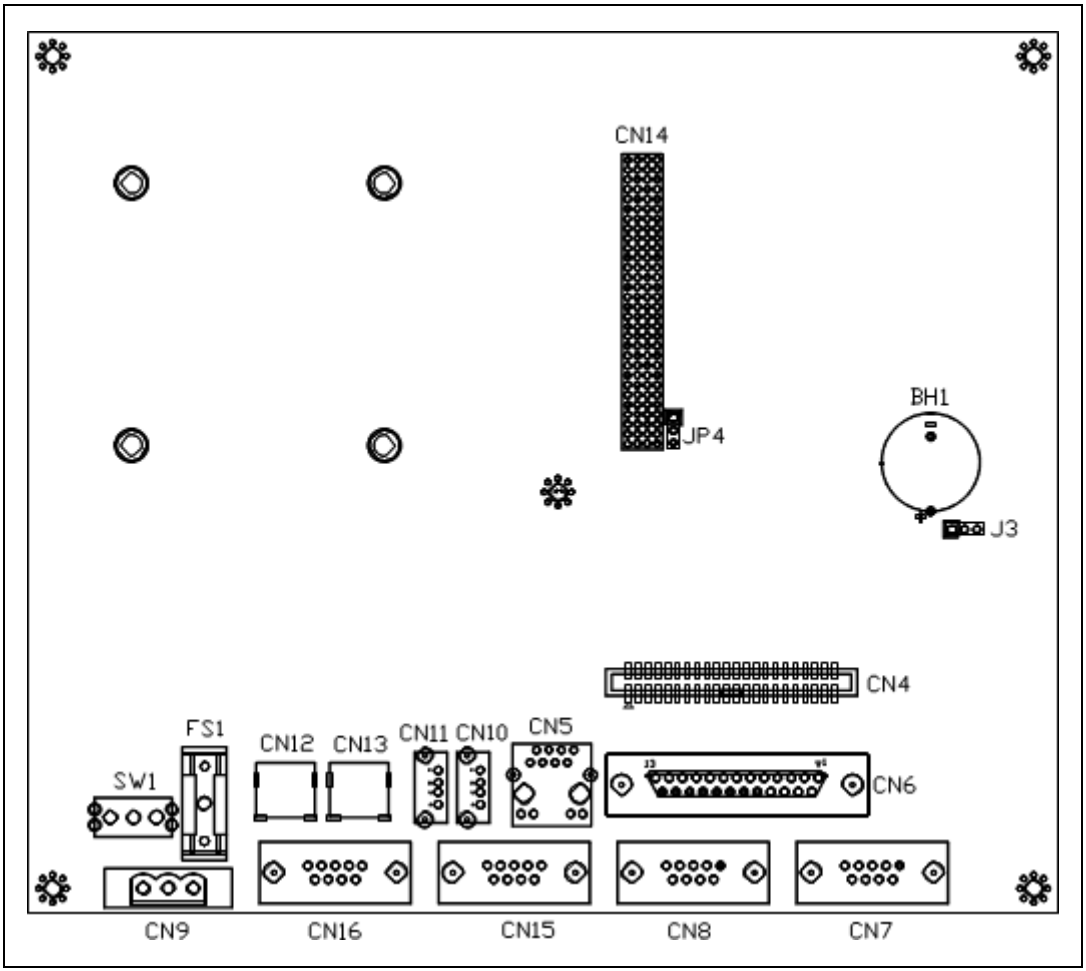


Figure 3-1. Main Board Jumpers and Connectors

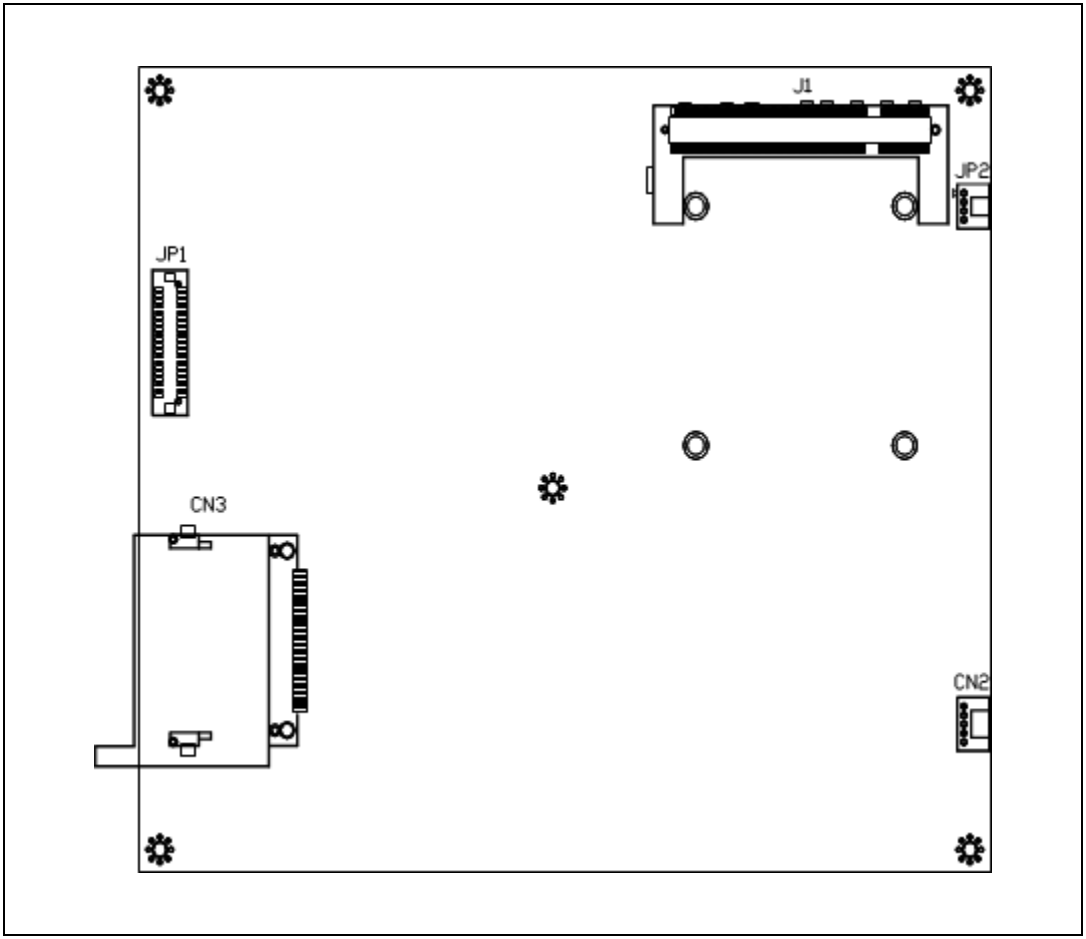


Figure 3-2. Main Board Jumpers and Connectors

A

Specifications

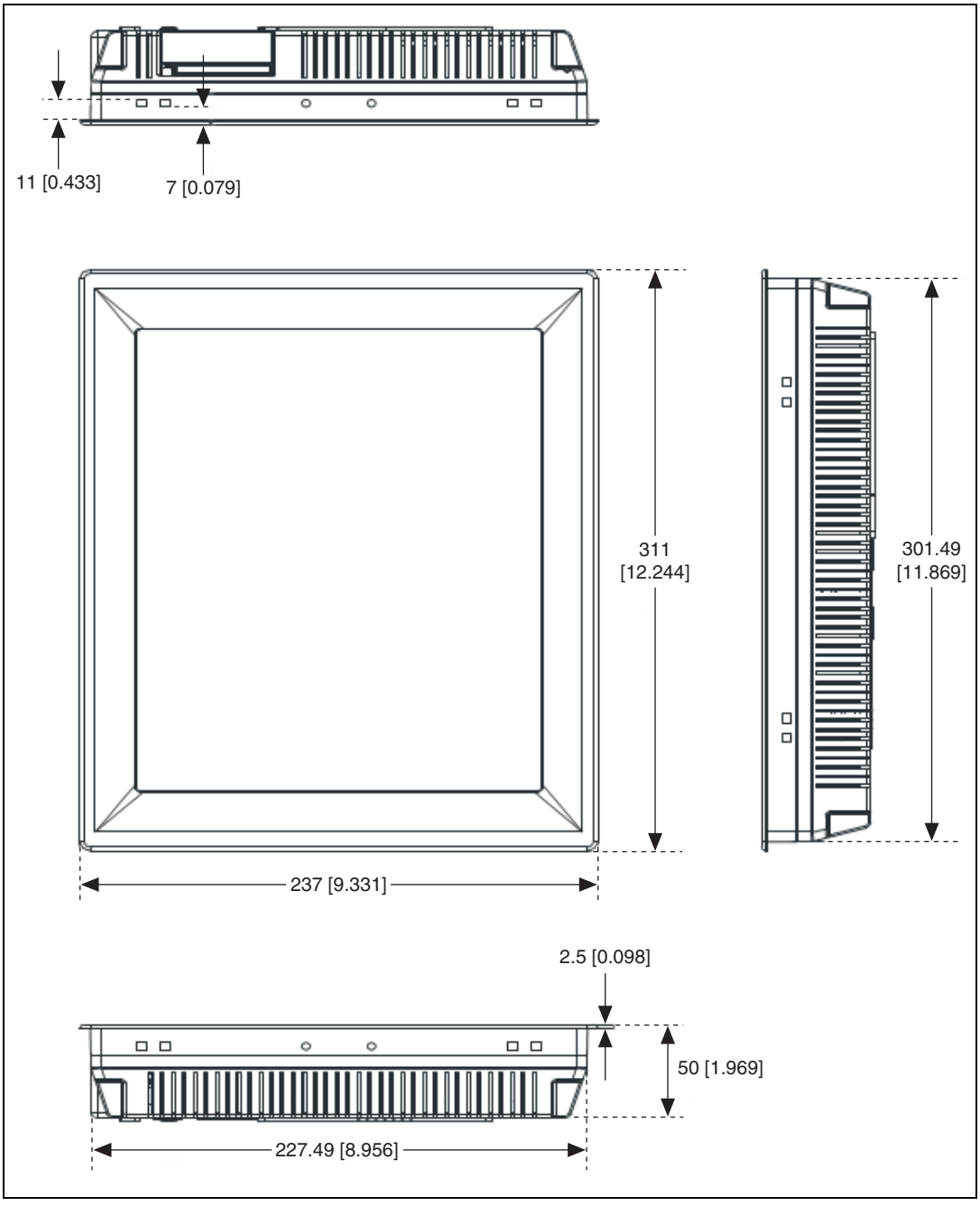
This appendix lists the TPC-2012 system specifications.

Physical

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

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

Dimensions



System Kernel

CPU	GeodeLink Control Processor LX800 500 MHz
BIOS	Award 512 KB flash memory
South bridge	GeodeLink Control Processor CS5535
VGA	GeodeLink Control Processor LX800 500 MHz
Ethernet	Realtek RTL8100BL; IEEE 802.3u protocol compatible
Watchdog timer	W83627 watchdog timer; 1.6 s timeout period
IDE	1 EIDE channel supports one CompactFlash socket onboard (Master) and one IDE interface 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^2)	340
Contrast ratio	300
Operating temperature	0 to 50 °C (32 to 122 °F) (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`, 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`, search by model number or product line, and click the appropriate link in the Certification column.

Environmental Management

National Instruments is committed to designing and manufacturing products in an environmentally responsible manner. NI recognizes that eliminating certain hazardous substances from our products is beneficial not only to the environment but also to NI customers.

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

Waste Electrical and Electronic Equipment (WEEE)

EU Customers At the end of their life cycle, all products *must* be sent to a WEEE recycling center. For more information about WEEE recycling centers and National Instruments WEEE initiatives, visit `ni.com/environment/weee.htm`.

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 soft, nonmetallic brush. Make sure that the unit is completely dry and free from contaminants before returning it to service.

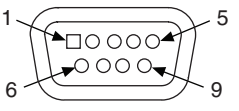
B

Serial Port Settings

This appendix describes the TPC-2012 serial port settings.

COM1/COM2/COM3 Connector Pinout

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



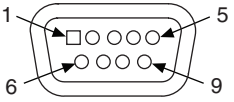
Pin	Signal
1	NDCD
2	NRX
3	NTX
4	NDTR
5	GND
6	NDSR
7	NRTS
8	NCTS
9	NRI

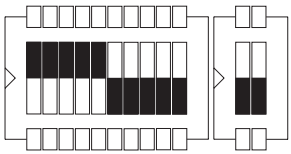
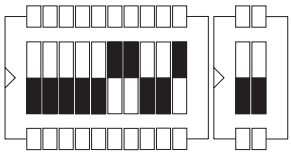
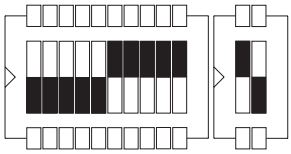
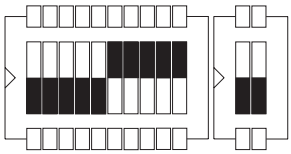
Note COM1 and COM2 support only half-duplex (maximum baud rate: 115.2 Kbps).

COM4 Connector Pinout and Settings

The TPC-2012 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 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	

PIN	RS-232	RS-422	RS-485
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		

C

Watchdog Timer Programming

This appendix explains the TPC-2012 watchdog timer programming.

Overview

You can use the TPC-2012 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.

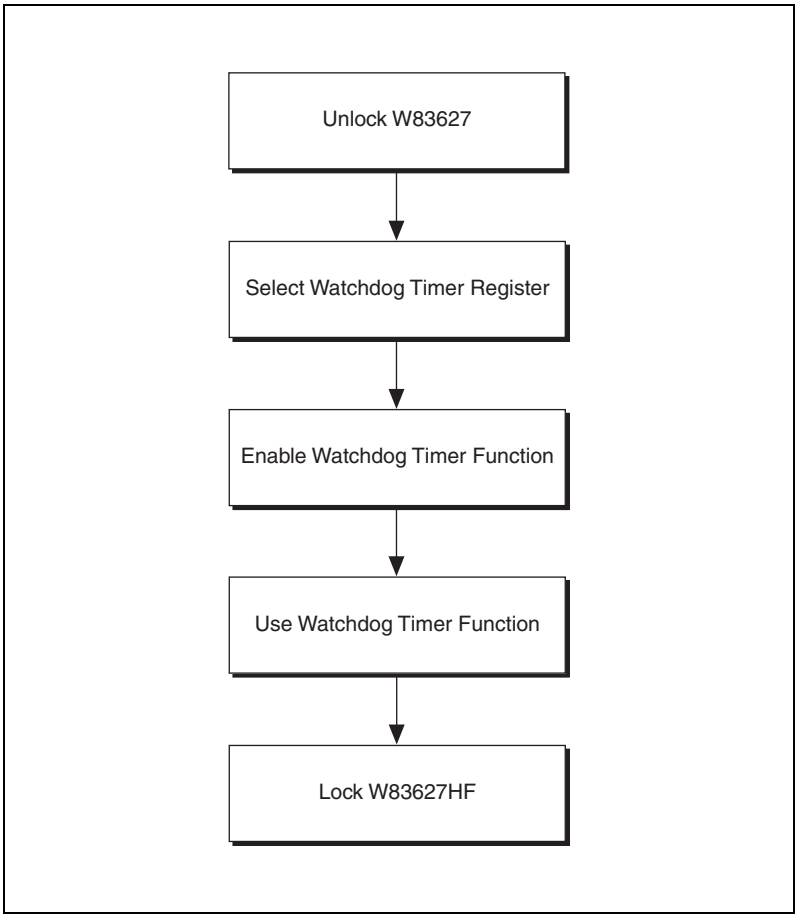


Figure C-1. Watchdog Timer Programming Procedure

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. Write 0 to bit 3 (default): second. Write 1 to bit 3: minute.
F6 (hex)	Write	0: Stop timer 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. Bit 5 (default): Write 1 to generate a timeout signal immediately and automatically return to 0. 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
```

D

Watchdog Timer Programming on WinCE

Windows CE includes a watchdog timer for the TPC-2012. You can access the timer through the WIN32 API. The TPC-2012 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 it 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);
```

E

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.

F

Touchscreen Configuration

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

Touchscreen Calibration

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.

G

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.

H

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