INDUSTRIAL COMPUTER SOURCE®

Model WDT1000-P
Product Manual

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INDUSTRIAL COMPUTER SOURCE®

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Chapter 1: Introduction

This multifunction card contains a Watchdog Timer, an RS422/485 Serial Communications port, and an internal Temperature Alarm. It is a full length board that installs in “long” expansion slots of IBM PC/XT/AT and compatible computers.

This manual covers three models, the Model WDT1000-P, WDT1001-P, and the Model WDT-1002. The configurations are:

WDT1000-P:	Watchdog output is available on the terminal strip TB2-1
WDT1001-P:	Watchdog output is on TB2 as above plus a relay output and second terminal strip, TB1 is provided.
WDT-1002:	Same as WDT1001-P except it does not contain the TB2 terminal strip.

Watchdog

A watchdog circuit is a must in applications where computer failure can cause catastrophic damage. There are two methods to reduce risk of computer failure; (a) redundancy and (b) a watchdog circuit. Neither method offers 100% assurance but both of these methods reduce risk or consequences of failure. Redundancy, a duplication of computer circuitry, is very expensive. On the other hand, Industrial Computer Source's Watchdog card offers the best available protection at very low cost.

It's a fact of life that computers can fail. If a computer fails, it acts unpredictably and follows a strange program path. The Watchdog circuit monitors a program which constantly provides prompts. If a prompt is missed, the Watchdog initiates a computer reset. This restarts the computer from the beginning on a prescribed program. If the failure was temporary, proper operation is resumed. If, however, the failure is persistent, the Watchdog will persistently reset the computer. Thus, the Watchdog circuit depends on prompts from the applications program. The closer that prompts are located relative to critical codes, the higher degree of protection achieved. Also, the more frequently the computer is prompted (and shorter Watchdog time selected), the less time a faulty computer has to cause damage.

A type 8253-5 counter/timer chip is used in the Watchdog circuit. The clock source for counter/timer 2 is permanently set to 225 HZ and is derived from a crystal oscillator on the card, independent of the computer clock. The watchdog time-out is software programmable from 5 mSec to 291 seconds.

The counter/timer chip is operated in mode 0 wherein the output is held low by prompts which periodically reload counts into the count register. If, due to a failure, the computer deviates from a prescribed program and a prompt is not received in time, the count register will not be updated, the counter will reach zero, and the output will go high to initiate a Reset. Following the Reset, the computer will reboot and the program will be on the prescribed path again.

The address for the Watchdog circuit is completely independent of the Serial Communication address. It is jumper selectable anywhere within the I/O address range 200 to 3FF hex. At power turn-on, the counter/timer output should be disabled via SIO OUT1 until all devices are initialized. At the very end of initialization, SIO OUT1 (Output 1 of the Asynchronous Communication Element) should be programmed low to enable the Watchdog circuit. See Chapter 5, Programming, for more detail.

The output of the Watchdog circuit is an open-collector transistor output rated at up to 100 mA. That output is available at TB2-1. TB2-2 provides a ground return. If an inverted output is desired, you may cut the clad at jumper G and install a wire jumper at location H. (G and H are located immediately to the left of IC U16).

Counter / Timer

The 8253A-5 counter/timer chip contains three 16-bit counters. Counter/timer 2 is used by the Watchdog circuit. Counter/timers 0 and 1 are not available to the user.

Temperature Alarm

The WDT1000-P card also contains a temperature alarm circuit that activates if the internal temperature in the computer becomes excessive. That alarm can initiate an interrupt so that orderly shutdown can be accomplished.

The Temperature Alarm circuit operates on the principle of a PN junction voltage decrease of 2.3 mV/°C of ambient temperature increase. The voltage across five serially-connected PN junctions is compared with a preset DC level from a potentiometer. The output of the comparator circuit can be applied, via jumper, to Interrupt outputs and/or can be read on bit 0 of the Temperature Alarm register at Watchdog base address + 4.

The potentiometer is factory set at 50 °C. If you desire to set the alarm at some other temperature, subtract the ambient temperature from the desired alarm temperature and multiply the difference by 5 X 2.3 mV. Then measure the voltage between pin 4 (-) and pin 5 (+) of U17 and adjust potentiometer RP1 for that calculated value.

Serial Interface

The Serial Interface function of the WDT1000-P card can be used for either RS422 serial communications or RS485 communications. (The RS485 specification allows multiple transmitters and receivers to communicate over a two-wire “party line” bus.) Opto-isolators are incorporated on this card to provide isolation from any noise that is present on the Tx, Rx, RTS, and CTS communications lines.

Type NS16450 UART’s are used as the Asynchronous Communication Element (ACE). Use of the same ACE as in IBM original equipment makes the card 100% compatible with existing programs when the base address is set as either COM-1 or COM-2. However, use of the Serial Interface is not restricted to COM-1 or COM-2 only. Different addresses can be selected anywhere within the I/O address range 000-3FF hex.

An on-board crystal oscillator permits precise selection of baud rate from 50 to 9600.

The output transceiver used, the new generation type 75176, is capable of driving extremely long communication lines at high baud rates. It can drive 60 mA on balanced lines and receive input signals as low as 200 mV differential superimposed on common mode noise of maximum -7V/+12V. In case of communication conflict, the transceivers feature thermal shutdown.

For increased noise immunity, the communication lines are loaded at the receiver and biased at the transmitter. Also, an on-board DC-DC converter provides isolated power to the transceiver.

Two LED indicators are provided in the Serial Interface circuit. These LED’s blink to indicate activity on the transmitting and receiving lines and are useful for problem diagnosis.

In addition to dual, differential Transmit and Receive lines, single-ended, buffered RTS and CTS lines are provided on the I/O connector. The RTS line can be used to control the Transmitter and Receiver. The CTS line can be used to check for proper installation of the communication cable. To check for proper cable connection, introduce +5VDC to the CTS line on the cable side of the connector. Then read the CTS bit by software. Signal ground and +5 VDC are available at the I/O connector.

Full duplex, half duplex, or simplex configuration can be selected by jumper options.

Specifications

Watchdog Timer

Time-out	Software selectable from 5 mSec to 291 Sec in 5 mSec increments.
Clock	255 Hz, crystal controlled.
Address	Continuously mappable within 000 to 3FF hex I/O range.

Temperature Alarm

Level	Factory preset at 50 ° C ±2 ° Adjustable.
Interrupt Output	Jumper selectable.
Alternate Output	Can be read at base address + 4.

Serial Interface

Multipoint	Compatible with RS422 and RS485 specifications.
Common Mode Voltage	-7V to +12V CMV will not affect operation.
Driver Output Capability	60 mA maximum.
Receiver Input Sensitivity	Can detect signals as small as ±200 mV.
Baud Rate	50 to 9600 baud. (to 56,000 baud optional). Crystal oscillator on board.
Address	Continuously mappable within I/O address range 000- 3FF hex.

Environmental

Operating Temperature Range	0 to +60 ° C.
Storage Temperature Range	-50 ° to +120 ° C.
Humidity	10% to 90% RH, non-condensing.

Power Required:

+5 VDC at 420 mA typical, 500 mA maximum.

Size

13.3 inches long. Requires full size slot.

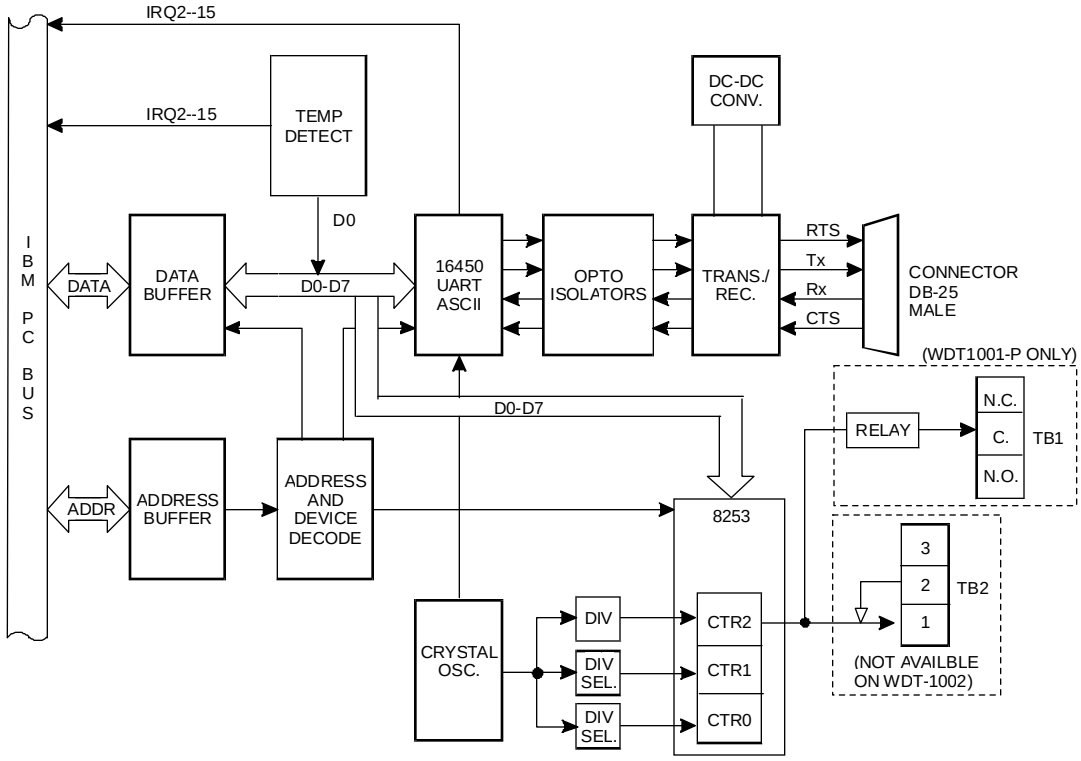

Figure 1-1: WDT1000 Block Diagram

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Chapter 2: Installation

Software Installation

Installation Program

The software should be installed first before the card is physically installed in the chassis. A setup routine titled WDTSET.EXE, describes how to set all the address switches and jumpers on the card. Each of the settings is also described in its appropriate section of this manual.

This package uses compression schemes to simplify installation and to permit use of a single diskette. A program is provided on your master disk to copy and expand the software package onto your hard-drive. To begin the installation, place the software master diskette in a floppy drive and execute the **INSTALL.EXE** program. For example, if you have placed the master disk in floppy drive A, you would type "`A:INSTALL [ENTER]`" to execute the installation program.

The installation program will ask you for various installation options, and will provide default settings. These default settings may be selected (by pressing ENTER) if they will work with your particular application and system setup, or you can respond to the questions with appropriate answers as needed.

When all of the installation options have been set, the program will expand the program files into the destination you have selected. Once this process is complete, please put your Master Diskette in a safe place as backup.

Several sample programs are included on the disk written in QuickBASIC, C, and Pascal.

Findbase Routine

One of the programs included on the installation disk is a routine titled **FINDBASE.EXE**. This program can be used to find an unused section of I/O memory to assign to the WDT100x-P. It simplifies base address selection. The program will scan your computer's I/O ports for available locations which would be suitable for the card. The program asks you to pick the number of address bytes required from the supplied list. In this case, the WDT100x-P requires 5 address bytes for the watchdog address so select 8 from the list. It will then present the first address location with that much space available. The instructions are self explanatory. The WDT100x-P also requires 8 more address byte for the communications port. You can assign the address to a standard COM port address or just continue searching for another free 8-byte location. A test file, **FINDBASE.TXT** contains more information on its use.

Hardware Installation

Before installing the card, be sure to install the software as described above, and run the **WDTSET.EXE** program. Check the appropriate section of this manual for further information on address and option selection.

To install the card:

1. Remove power from the computer.
2. Remove the computer cover.
3. Remove the blank I/O backplate.
4. Install jumpers for selected options. See OPTION SELECTION, section 3 of this manual.
5. Select base addresses for the Serial Interface and for the Watchdog and Temperature Alarm functions. See ADDRESS SELECTION, section 4 of this manual.
6. Install the card in an I/O expansion slot.
7. Install the “Reset” wire from TB2-1 to the “Power Good” signal on the power supply connector J8, pin 1 using the clamp provided or to the active terminal of the Reset switch.
8. Plug in the RS422/485 communications connector and secure it with the mounting screws.
9. Inspect for proper fit of the card and connectors and tighten screws.
10. Turn the computer ON and observe the LED’s on the card. The LED’s will blink when there is activity on the communication line.
11. If everything checks good, replace the computer cover.

How to remain CE Compliant

In order for machines to remain CE compliant, only CE compliant parts may be used. To keep a chassis compliant it must contain only compliant cards, and for cards to remain compliant they must be used in compliant chassis. Any modifications made to the equipment may affect the CE compliance standards and should not be done unless approved in writing by Industrial Computer Source.

The Model WDT1000 series is designed to be CE Compliant when used in an CE compliant chassis. Maintaining CE Compliance also requires proper cabling and termination techniques. The user is advised to follow proper cabling techniques from sensor to interface to ensure a complete CE Compliant system. Industrial Computer Source does not offer engineering services for designing cabling or termination systems. Although Industrial Computer Source offers accessory cables and termination panels, it is the user's responsibility to ensure they are installed with proper shielding to maintain CE Compliance.

Chapter 3: Option Selection

Refer to the Figure 1-1: Block Diagram and Figure 3-1: Option Selection Map, when reading this section of the manual. Card operation is determined by jumper installation as described in the following paragraphs.

Termination

A transmission line should be terminated at the receiving end in its characteristic impedance. When noise is a potential problem on long lines, the terminating resistance should be divided and its center point grounded to help reduce noise voltage pickup. Install two jumpers at the positions marked LD for 68-ohm termination resistance on the positive and negative branches of the receiving lines.

To provide bias in RS485 mode, install two jumpers at the locations marked +BIAS (adjacent to I/O connector J2). This provides a balancing load between the RX+ and RX- lines.

In RS485 mode, where there are multiple terminals, only the RS485 ports at EACH END of the network should have terminating resistors as described above. To configure this card with the load center-tapped to ground, install the LD and LD GND jumpers and the +BIAS and -BIAS jumpers as described above. If the card is to have an ungrounded load, do as above except do not install the LDGND jumper.

RTS Control

Install a jumper at the location marked RTS (adjacent to transformer T1) when control of the transmitter or receiver by RTS is required.

CTS Control

If your application program is not going to control CTS, then it is necessary to install a jumper at the location marked CTS, **OR** to install a jumper between pins 5 and 9 of the mating half of the D connector.

NOTE

The card will not operate without one or the other of these two jumpers intalled if the computer is not going to control CTS.

When the jumper is installed in the mating half of the I/O connector, it provides a handy diagnostic tool because the card will not operate unless the communication cable is properly installed.

Simplex or Duplex

The receiver can be set in either Simplex or Duplex by installing jumpers marked SX or DX respectively. In the Duplex mode, the receiver is always enabled. In the Simplex mode, the receiver is under RTS control. If the RTS jumper is not installed, the receiver is disabled.

Full or Half Duplex

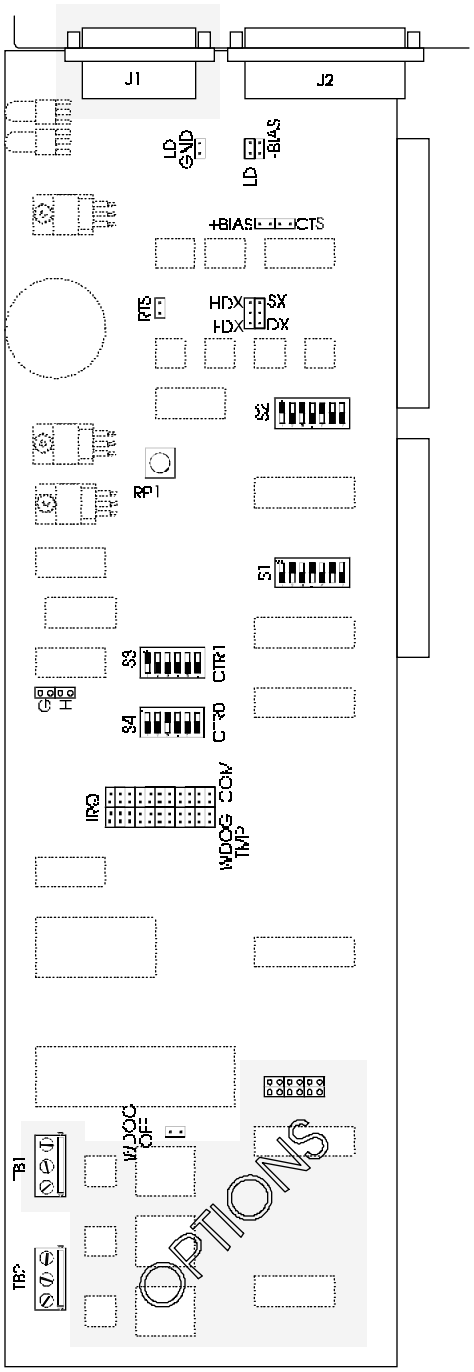
Either Full or Half Duplex can be selected by installing jumpers at the locations marked FDX or HDX respectively. Also, when operating in the Simplex mode, there must be a jumper installed in the FDX position

Watchdog

If an inverted output from the watchdog circuit (i.e., held high) is desired, you maycut the clad at jumper location “G” and install a wire jumper at location “H” (G and H are located immediately to the left of IC U16). The Watchdog circuit can be disabled by installing a jumper at the location marked WDOG.

Interrupts

Interrupts coming from the Temperature Alarm circuit and/or the Serial Interface are enabled by installing jumpers at locations marked IRQ 2, 3, 4, 5, 6, 7, 10, 11, 12, 14, and 15. Temperature Alarm interrupts are selected at the jumper block labelled TMP. Serial Communication interrupts are selected at the adjacent jumper block labelled COM. Note: Levels 10, 11, 12, 14, and 15 apply only to AT-Bus applications.



Switches:

S1=Serial Port Base Address
S2=Watchdog Base Address
S3=Counter 1 clock Input select
S4=Counter 2 clock Input select

Jumpers:

LD GND = Load Ground Select
LD = Load Select
+BIAS = +Bias Select
-BIAS = -Bias Select
CTS = Clear-To-Send Signal Control Select
RTS = Ready-To-Send Signal Control Select
HDX/FDX = Half-/Full-Duplex Select
SX/DX = Simplex/Duplex Select
IRQ-WDOG TMP = Watchdog Function IRQ Select
IRQ-COM = Serial Port IRQ Select
WDOG OFF = Watchdog Function Disable Jumper

Connectors:

J1 = Optional CTR 0 & CTR 1 & Watchdog Relay output connector
J2 = Serial port and Watchdog Function Connector
TB1 = Optional Watchdog Relay Output Connector
TB2 = Watchdog Function Connector

Shorts Positions:

G & H: Invert/non-invert Watchdog output select

Figure 3-1: WDT1000-P Jumper and Switch Locations

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Chapter 4: Address Selection

In order to facilitate use of the WDT1000-P as COM1, the card provides separate base address capabilities for the Serial Interface and for the Watchdog and Temperature Alarm. The Serial Interface requires eight bytes of address space and the Watchdog and Temperature Alarm require an additional five bytes. At the COM1 address, 3F8-3FF there is not enough address space for both. Accordingly, base addresses for these functions are separated and selected at separate jumper blocks labelled COM ADDRESS and WDOG - TMP ADDRESS respectively. Refer to Table 4-1 for address options.

The jumpers are marked A3 through A9. The DIP switch that sets the base address of the Serial Interface is located to the right of U1 and the DIP switch for the Watchdog and Temperature Alarm is located to the right of U2.

The base addresses can be selected anywhere within the I/O address range 200-3FF provided that they do not overlap with other functions. If you are unsure of your available space, run the **FINDBASE** utility provided on the included diskette. Refer to the Findbase Section of Chapter 2 for further information

Hex Range	Usage
000-1FF	Internal System - Not Usable
200-207	Game Control
208-277	Reserved by various manufacturers
278-27F	Parallel Printer (LPT2)
2E8-2EF	Serial Port
2F0-2F7	Reserved
2F8-2FF	Asynchronous Communications (COM2)
300-31F	Prototype Card
320-32F	Hard Disk (XT)
378-37F	Parallel Printer (LPT1)
380-38F	SDLC Communications
3A0-3AF	SDLC Communications
3B0-3BB	MDA
3C0-3CF	EGA
3DO-3DF	CGA
3E0-3E7	Reserved by various manufacturers
3E8-3EF	Serial Port
3F0-3F7	Floppy Disk
3F8-3FF	Asynchronous Comunications (COM1)

Table 4-1: Standard Address Assignments

Address Setup

Switch locations are marked A3 through A9. In order to configure the desired address, assign "1" to the OFF position of these switches and assign "0" to the ON position of these switches. These 1's and 0's are a binary representation of the base address. This binary number is then converted to a hexadecimal number.

Switch Label	A9	A8	A7	A6	A5	A4	A3
Address Line Controlled	A9	A8	A7	A6	A5	A4	A3

For example, as illustrated below, switch selection corresponds to binary 10 1101 1xxx (or hex 2D8). The "xxx" represents address lines A2, A1, and A0 used on the card to select individual registers. See PROGRAMMING section of this manual.

Switch Label	A9	A8	A7	A6	A5	A4	A3
Switch Position	OFF	ON	OFF	OFF	ON	OFF	OFF
Binary Representation	1	0	1	1	0	1	1
Conversion Factors	2	1	8	4	2	1	8
Hex Representation	2		D				8

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Chapter 5: Programming

This section of the manual is divided into two parts; programming for the Watchdog and Temperature Alarm functions, and programming for the Serial Interface function. The program examples provided are intended as a guide rather than working software. Industrial Computer Source assumes no liability for their use.

Watchdog

The Watchdog and Temperature Alarm functions of the WDT1000-P card use five consecutive addresses in I/O space as listed in the following table.

Address	Read	Write
Base Address	Read Counter 0	Load Counter 0
Base Addres +1	Read Counter 1	Load Counter 1
Base Address +2	Read Counter 2	Load Counter 2
Base Address +3	Illigal	Load Counter Reg.
Base Address +4	Read Temp. Alarm	Illigal

Table 5-1: Address Map

The Watchdog function includes an eight-bit control register at base address + 3. That control register allows software selection and/or control of the function. The format of this register and bit functions are as follows:

D7	D6	D5	D4	D3	D2	D1	D0
SC1	SC0	RL1	RL0	M2	M1	M0	BCD

Functions of the bits are as follows:

SC1 and SC0: These bits are used to select counter/timers 0, 1, or 2. (ACCESS to counters 1 and 2 on special order only) SC1 is the most significant bit. The code assignment for bits SC1 and SC0 is:

00 = Select Counter/Timer 0

01 = Select Counter/Timer 1

10 = Select Counter/Timer 2

11 = Illegal

RL1 and RL0: These bits control reading and loading of the Counter/Timer selected by SC1 and SC0. RL1 is the most significant bit and code assignment is:

00 = Counter Latching

01 = Read/Load Least significant Byte Only

10 = Read/Load Most Significant Byte Only

11 = Read/Load Least, Then Most Significant Byte

BCD: This bit commands counting modulus; 0= binary, 1= BCD.

M2, M1, and M0: These bits control the operating mode of the Counter/Timer selected by SC1 and SC0. Bit assignments and mode commanded are as follows:

M2	M1	M0	Mode
0	0	0	Mode 0: Pulse on terminal count
0	0	1	Mode 1: Retriggerable one-shot
x	1	0	Mode 2: Rate generator
x	1	1	Mode 3: Square Wave generator
1	0	0	Mode 4: Software triggered strobe
1	0	1	Mode 5: Hardware triggered strobe

The 8253 modes of operation are described in the following paragraphs to familiarize you with the versatility and power of this device. The following definitions apply for use in describing operation of the 8253 :

Clock: A positive pulse into the counter's clock input.

Trigger: A rising edge input to the counter's gate input.

Counter Loading: Programming of a binary count into the counter.

Mode 0: Pulse on Terminal Count

After the counter is loaded, the output is set low and will remain low until the counter decrements to zero. The output then goes high and remains high until a new count is loaded into the counter. A trigger enables the counter to start decrementing. This mode is commonly used for event counting with Counter #0.

Mode 1: Retriggerable One-Shot

The output goes low on the clock pulse following a trigger to begin theone-shot pulse and goes high when the counter reaches zero. Additional triggers result in reloading the count and starting the cycle over. If a trigger occurs before the counter decrements to zero, a new count is loaded. Thus, this forms a re-triggerable one-shot. In mode 1, a low output pulse is provided with a period equal to the counter count-down time.

Mode 2: Rate Generator

This mode provides a divide-by-N capability where N is the count loaded into the counter. When triggered, the counter output goes low for one clock period after N counts, reloads the initial count, and the cycle starts over. This mode is periodic, the same sequence is repeated indefinitely until the gate input is brought low.

Mode 3: Square Wave Generator

This mode operates periodically like mode 2. The output is high for half of the count and low for the other half. If the count is even, then the output is a symmetrical square wave. If the count is odd, then the output is high for (N+1)/2 counts and low for (N-1)/2 counts. Periodic triggering or frequency synthesis are two possible applications for this mode.

Mode 4: Software Triggered Strobe

This mode sets the output high and, when the count is loaded, the counter begins to count down. When the counter reaches zero, the output will go low for one input period. The counter must be reloaded to repeat the cycle. A low gate input will inhibit the counter.

Mode 5: Hardware Triggered Strobe

In this mode, the counter will start counting after the rising edge of the trigger input and will go low for one clock period when the terminal count is reached. The counter is re-triggerable. The output will not go low until the full count after the rising edge of the trigger.

In order to program the Watchdog circuit, consider the following code:

```
WDBASE% = &H300                 'Set watchdog base address to 'hex300.
OUT WDBASE% + 3, &H90           'Set counter 2 to mode 0,
                                'Read/Load Least Sig. Byte,
                                'Mode 0, binary.
OUT WDBASE +2, 100              'Load Counter 2 Low Byte
'100*4.44mSec.
COMBASE% = &H3F8                'Set serial commun'n base 'address as com1 (3F8).
MCR% = INP(COMBASE%+4)          'Read modem control register at   'COMBASE + 4.
OUT COMBASE%+4,MCR% OR 4        'Enable watchdog controlled by 'bit 2 of modem
control 'register without changing the 'remaining bits.
```

Before the timeout expires, counter 2 must be reloaded:

```
OUT WDBASE + 2, 100          'Reload counter 2 low byte '100*4.44 mSec.
```

Temperature Alarm

To test if the internal computer temperature exceeds the preset level, read bit 0 at the Temperature Alarm register (Watchdog base address + 4). Bit 0 will be a “0” if temperature is normal and “1” if temperature is excessive. Bits 1 through 7 of this register are meaningless.

Serial Output

The serial communications port has its own base address. If that base address is set as COM1 or COM2, simply follow standard DOS procedures. If serial communications port is NOT set as COM1 or COM2, follow the NS16450 chip (ACE) specification.

The following code sample is in BASIC and demonstrates the recommended steps to initialize the NS16450 for normal operation. This sample assumes a base address of 3F8 and the device will be setup for 9600 baud with an 8-bit, no-parity format. The assumed clock frequency is 1.8432 MHz and, thus, a divisor of 12 is required. (The divisor is determined by dividing the clock frequency by 16 then by the baud rate).

```
OUT &H3FC, &H10              'Put into loopback.
OUT &H3FB, &H80              'Select divisor latch.
OUT &H3F8, 12                'Lower half of 9600 baud divisor.
OUT &H3F9, 0                 'Upper half of 9600 baud 'divisor.
OUT &H3F8, 3                 'Deselect divisor latch, set 8 'bits/1 stop/no
parity.
TMP = INP(&H3F8)             'Read input port.
FOR TMP = 1 TO 2             'Wait for at least two character 'times.
NEXT
TMP = INP(H3F8)              'Read input port a second time.
OUT &H3FC, 1                 'Take out of loopback; set "Dir".
```

The following code is a PASCAL version of the preceding BASIC routine.

```
Const ace = $3F8;
var i:integer;
port[ACE+4] := $10;          (put in loopback)
port[ACE+3] := $80;          (select divisor latch)
port[ACE+0] := 12;           (divisor lower byte)
port[ACE+1] := 0;            (divisor upper byte)
port[ACE+3] := 3;            (deselect divisor, set 8 bits/1 stop)
i :=port[ACE];               (read input port)
delay(2);                    (wait two character times)
i :=port[ACE];               (read input port a second time)
port[ACE+4] := 1;            (take out of loopback and set DTR)
```

When the above steps are completed, the chip is ready to communicate.

When operating in RS485 mode, RTS is used to control the transmitter/receiver. For this mode, install the RTS and HDX jumpers. Then install the SX jumper to control receiver on/off OR install the DX jumper to enable the receiver unconditionally.

Using Visual Basic

Included in the supplied software is a DLL (Dynamic Link Library) called **VBACCES.DLL**. It is compatible with Visual Basic Version 3.0. **VBACCES.DLL** must be copied to your Windows directory. Also included is a sample program to help you interface this DLL with Visual Basic. The program is titled **VBACCES.FRM**, and its global definition file is **VBACCES.GBL**. The information in the **.GBL** file must be contained in any application that uses the DLL, but does not have to be in a separate file. A project file **VBACCES.MAK** is also included.

The commands provided are:

OutPort, OutPortB: Allows write acces to the I/O bus, similar to the C language outport and outportb functions.

InPort, InPortB: Allows read access to the I/O bus, similar to the C language inport and inportb functions.

Peek, poke: Allows read and write access to RAM, similar to BASIC's Peek and Poke statements.

Please refer to the **VBACCES.GBL** file for programming information related to the above functions.

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Appendix A: Connector Pin Assignments

The popular 25-pin D-subminiature connector is used to interface to communication lines. The connector is equipped with 4-40 threaded standoffs (screw lock) to provide strain relief. The mating connector is AMP type 747304-2 or equivalent. Connector pin assignments are as follows:

Pin	Assignments
1-3	N/A
4	Request to Send (RTS)
5	Clear to Send (CTS)
6	N/A
7	Ground
8	N/A
9	+5 Volts thru a 100 ohm Resistor
10-11	N/A
12	Receive Line + (RX+)
13	Receive Line - (RX-)
14-23	N/A
24	Transmit Line + (TX+)
25	Transmit Line - (TX-)

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-EN 55022 Measurement of radio interference characteristics of information technology equipment.

EN 50082-1:1992 Immunity, Generic Requirements.

-IEC 801-2:1984 Immunity for AC lines, transients, common, and differential mode.
-IEC 801-3:1984 Immunity for radiated electromagnetic fields.
-IEC 801-4:1988 Immunity for AC and I/O lines, fast transient common mode.

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September 11, 1997
San Diego, CA

Mr. Steven R. Peltier
President & Chief Executive Officer

BUG REPORT

While we have tried to assure this manual is error free, it is a fact of life that works of man have errors. We request you to detail any errors you find on this BUG REPORT and return it to us. We will correct the errors/problems and send you a new manual as soon as available. Please return to:

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