

# ASO-CTM Quick Start

**USER'S GUIDE**

# **ASO-CTM Quick Start User's Guide**

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# Preface

The *ASO-CTM Quick Start User's Guide* describes how to get started writing programs for CTM-10 and CTM-05/A boards using the CTM-05/CTM-10 Function Call Driver. A 16-bit version of the CTM-05/CTM-10 Function Call Driver is part of the CTM-05/A & 10 Advanced SW software (for Windows™ 3.1 and Windows 3.11 for Workgroups). A 32-bit version of the CTM-05/CTM-10 Function Call Driver is part of the ASO-CTM Win 95 32-Bit Drivers software (for Windows 95 only).

The *ASO-CTM Quick Start User's Guide* is intended for programmers using a CTM-10 or CTM-05/A board in an IBM® PC AT® or compatible computer. It is assumed that users are familiar with counter/timer and digital I/O principles and have read the *CTM-10 and CTM-05/A User's Guide* to familiarize themselves with the board's features.

The *ASO-CTM Quick Start User's Guide* is organized as follows:

- **The CTM Disks** describes the contents of the disks shipped with the CTM-10 and CTM-05/A boards.
- **Setup and Installation** describes how to install the software, how to configure the boards, and how to use the control panel to test the boards.
- **Summary of Functions** contains a brief description of each of the CTM-05/CTM-10 Function Call Driver functions. Refer to the CTM FCD online help for a more detailed description of the functions. (Both the 16-bit and 32-bit drivers offer the same set of functions.)
- **Programming Flow Diagrams** contains a series of flow diagrams showing the steps required to perform each of the operations supported by the CTM-05/CTM-10 Function Call Driver. Refer to the CTM FCD online help for a more detailed description of the required procedures.

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# The CTM Disks

CTM-10 and CTM-05/A boards are shipped with the following disks:

- **CTM-10/05A Mode Software** - Use this disk for DOS application programs and for older Windows programs that use the Port I/O software (PORTIO.DLL). Copy the files from this disk to an appropriate directory. For more information, refer to FILES.TXT, which lists and describes all the copied files; PORTIO.TXT, which describes how to use the Port I/O software; and README.TXT. The *ASO-CTM Quick Start User's Guide* is not intended for use with this software package.
- **CTM-05/A & 10 Advanced SW (16-bit software package)** - Use this disk for all 16-bit programs that use the CTM-05/CTM-10 Function Call Driver. The *ASO-CTM Quick Start User's Guide* is intended for use with this software package.
- **ASO-CTM Win95 32-Bit Drivers (32-bit software package)** - Use these two disks for all 32-bit, Windows 95-based programs that use the CTM-05/CTM-10 Function Call Driver. The *ASO-CTM Quick Start User's Guide* is intended for use with this software package.

The CTM-05/A & 10 Advanced SW package is intended for programmers using the following 16-bit, Windows-based programming languages running under Windows 3.1, Windows 3.11 for Workgroups, or Windows 95:

- Microsoft<sup>®</sup> Visual C++<sup>™</sup> (Version 1.5x)
- Borland<sup>®</sup> C/C++ (Versions 4.0 and 4.5)
- Microsoft Visual Basic<sup>®</sup> for Windows, Version 3.0 and Version 4.0 (16-bit version, available only with the Professional and Enterprise Editions)

The ASO-CTM Win95 32-Bit Drivers package is intended for programmers using the following 32-bit, Windows-based programming languages running under Windows 95:

- Microsoft Visual C++ (Version 4.1)
- Borland C/C++ (Version 5.0)
- Microsoft Visual Basic for Windows, Version 4.0 (32-bit version, available with all editions)

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**Note:** Unless otherwise noted, references to the CTM-05/CTM-10 Function Call Driver include both the 16-bit and 32-bit drivers.

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# Setup and Installation

Before you use the CTM-05/CTM-10 Function Call Driver to program your CTM-10 and CTM-05/A boards, perform the following tasks:

1. Unpack and inspect your CTM-10 and CTM-05/A boards. Refer to the *CTM-10 and CTM-05/A User's Guide* for information.
2. Install the software package that is appropriate to your operating system and programming environment. Refer to the next section, "Installing the Software," for installation instructions.
3. Configure your CTM-10 and CTM-05/A boards by specifying the appropriate configuration options in the CTM-05/CTM-10 Configuration Utility and by setting the jumpers and switches on the boards appropriately. Refer to "Configuring the Boards" on page 5 for information.
4. Install the CTM-10 and CTM-05/A boards in your computer and attach the appropriate signals. Refer to the *CTM-10 and CTM-05/A User's Guide* for information.
5. Test the functions of the CTM-10 and CTM-05/A boards using the CTM-05/CTM-10 Control Panel. Refer to "Using the Control Panel" on page 9 for information.
6. Look at the example programs provided with your software package. Refer to the FILES.TXT file in the installation directory for a list and description of the example programs.

## Installing the Software

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To install the software, perform the following steps:

1. Make a back-up copy of the appropriate disk (CTM-05/A & 10 Advanced SW for 16-bit programs or ASO-CTM Win95 32-Bit Drivers for 32-bit programs). Use the copy as your working disk and store the original as a backup disk.
2. Insert the disk into the disk drive.

3. Start Windows, if necessary.

4. Invoke the SETUP.EXE installation utility.

Assuming that you are using disk drive A, click **Run** on the File menu (for Windows 3.1 or Windows 3.11 for Workgroups) or on the Start menu (for Windows 95), type the following at the command line in the Run dialog box, and click **OK**:

```
A : SETUP
```

The installation program prompts you for your installation preferences, including which languages you will be using and the drive and directory where you want to copy the software.

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**Note:** If you want to use both the 16-bit and 32-bit software packages, make sure that you install them in *different* directories because the file names are exactly the same for both versions. The installation programs assign different titles only to the program groups.

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5. Respond to the prompts, as appropriate.

When the installation program prompts you for a drive designation, enter the appropriate drive or accept the default drive C. When the installation program prompts you for a directory name, enter the appropriate name or accept the default name.

The installation program creates a directory on the specified drive and copies all files, expanding any compressed files. The installation program also creates a program group for the software package, which contains icons for the CTM-05/CTM-10 Configuration Utility, CTM-05/CTM-10 Control Panel, example Windows programs, and CTM-05/CTM-10 Function Call Driver online help.

6. When the installation program notifies you that the installation is complete, review the following:

- Files.Txt lists and describes all the files copied to the hard disk by the installation program.
- Readme.Txt contains last-minute information that was not included in the online help file.

- CTM FCD Help provides the information needed to write programs for CTM-10 and CTM-05/A boards using the CTM-05/CTM-10 Function Call Driver.

## Configuring the Boards

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You can configure the following items for CTM-10 and CTM-05/A boards:

- Board name
- Base address
- Time base
- Interrupt level(s)

Table 1 lists the items that are configurable for each CTM-10 or CTM-05/A board, the available options, and whether you set the options by using the CTM-05/CTM-10 Configuration Utility, by setting switches and jumpers on the boards, or by both.

**Table 1. Configuring CTM-10 and CTM-05/A Boards**

Attribute	Options	Where Options are Set	
		Utility	Onboard
Board name	CTM-05/A, CTM-10	4	
Base address <sup>1</sup>	100h to 3F8h	4	4
Time base	1 MHz, 5 MHz	4	
Interrupt level(s) <sup>2</sup>	Utility: 0 (disabled), 3, 5, 7, 10, 11, 15 Onboard: X (disabled), 2, 3, 4, 5, 6, 7	4	4

**Notes**

<sup>1</sup> For a CTM-10, the base address is the first of eight consecutive address locations; for a CTM-05/A, the base address is the first of four consecutive address locations. The setting in the configuration utility must match the setting of the Base Address DIP switch (S1) on the board.

<sup>2</sup> For a CTM-10, you set two interrupt levels - one for each counter/timer device on the board. If you are not using interrupts, you must disable them in the configuration utility and on the IRQ Level jumper (J3) on the board. If you are using interrupts, you must set a level in the utility and on the board; however, the levels do not have to match.

## Using the Configuration Utility

The CTM-05/CTM-10 Function Call Driver requires that you specify the configuration options for each CTM-10 or CTM-05/A board you are using in the CTM-05/CTM-10 Configuration Utility. The configuration utility is provided in the 16-bit and 32-bit software packages.

The configuration utility differentiates between physical boards and logical boards. The first physical board (CTM-10 or CTM-05/A) that you configure with the configuration utility is physical board 1, the second physical board that you configure is physical board 2, and so on. Each counter/timer device (Unit A or Unit B) and each digital I/O port (Port A or Port B) on a physical board is a separate logical board. For example, if you are using three CTM-10 boards, you configure three physical boards (1, 2, and 3) and six logical boards. Unit/Port A on physical board 1 is logical board 0, Unit/Port B on physical board 1 is logical board 1, Unit/Port A on physical board 2 is logical board 2, and so on.

By default, the configuration utility assumes that you are using one CTM-05/A, configured as shown in Table 2.

**Table 2. Default Configuration**

<b>Attribute</b>	<b>Default Configuration</b>
Physical board number	1
Board name	CTM-05/A
Base address	300h
Unit/Port A	Logical board 0
Unit/Port B	Not applicable
Time base	1 MHz
Interrupt level (Unit/Port A)	0 (disabled)
Interrupt level (Unit/Port B)	Not applicable

If you are using one CTM-05/A board and the default options are appropriate for your application, you can skip the rest of this section. If you are using additional boards and/or if the default options are not appropriate for your application, you must use the CTM-05/CTM-10 Configuration Utility (CFGCTM05.EXE) to modify the configuration options.

To use the configuration utility, perform the following steps:

1. Invoke the CTM-05/CTM-10 Configuration Utility as appropriate to your operating system:
  - **Windows 3.1 or Windows 3.11 for Workgroups** - From the ASO-CTM program group in Windows Program Manager, double-click the CTM-05/CTM-10 Configuration Utility icon.
  - **Windows 95** - Click **Start**, point to **Programs** and then to the appropriate CTM-05/CTM-10 program folder. Click the CTM-05/CTM-10 Configuration Utility icon.

The software displays the CTM-05/CTM-10 Configuration panel with the default configuration options shown.

2. Modify the configuration options for physical board 1. The physical board number is displayed next to **Number**. The logical board number(s) are displayed in the Logical Brd Assignment box.

For more information about the meaning of the configuration options, refer to the online help.

3. If you want to configure another physical board, click the **Number** up-arrow. The software asks you to confirm that you want to configure another physical board; go to step 4.

If you do not want to configure another physical board, go to step 7.

4. Click **Yes**. The software updates the physical and logical board numbers.
5. Modify the configuration options for the next physical board.
6. Repeat steps 3 to 5 for any additional boards you want to configure.

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**Note:** At any time, you can click **New** on the File menu to return all options to their default settings.

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7. To save the new settings without exiting the configuration utility, click **Save** on the File menu.

To save the new settings and exit the configuration utility, click **Save and exit**.

To exit the configuration utility without saving the new settings, click **Exit**.

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**Note:** The configuration utility creates a file called CTSHELL.INI to store your configuration options. Do not modify CTSHELL.INI directly. Always use the configuration utility to change your configuration options, when necessary.

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## Setting Switches and Jumpers on the Boards

Use the Base Address DIP switch (S1) to specify a base address from 100h to 3F8h. For a CTM-10, the base address is the first of eight consecutive address locations; for a CTM-05/A, the base address is the first of four consecutive address locations. The setting of the Base Address DIP switch must match the base address setting in the CTM-05/CTM-10 Configuration Utility.

If desired, you can use the Show Switch button in the configuration utility to display the switch setting corresponding to the setting you selected in the configuration utility. You can use this display as a reference when setting the switch on the board.

If you are planning to use interrupts, use the IRQ Level jumper (J3) to set an interrupt level of 2, 3, 4, 5, 6, or 7. Note that the interrupt level does not have to match the interrupt level setting in the CTM-05/CTM-10 Configuration Utility.

If you are not planning to use interrupts, you can disable interrupts by setting the IRQ Level jumper to the X position.

Refer to the *CTM-10 and CTM-05/A User's Guide* for more information about setting switches and jumpers on the boards.

## Using the Control Panel

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The CTM-05/CTM-10 Control Panel, shipped with the ASO-CTM software packages, is a utility program that allows you to test the functions of your CTM-10 and CTM-05/A boards.

To use the control panel, perform the following steps:

1. Invoke the CTM-05/CTM-10 Control Panel as appropriate to your operating system:
  - **Windows 3.1 or Windows 3.11 for Workgroups** - From the ASO-CTM program group in Windows Program Manager, double-click the CTM-05/CTM-10 Control Panel icon.
  - **Windows 95** - Click **Start**, point to **Programs** and then to the appropriate CTM-05/CTM-10 program folder. Click the CTM-05/CTM-10 Control Panel icon.

The software displays the Setup Information panel for logical board 0. The board name, base address, interrupt level, and time base for logical board 0 are shown.

2. Under **Board Number**, click the number of the logical board you want to test. The software updates the board information as appropriate.
3. At the bottom of the control panel, click the tab that indicates the operation you want to perform (**EC** for event counting, **FM** for frequency measurement, **PO** for pulse output, or **DIO** for digital I/O). The software displays the panel for the operation you selected.
4. Set up the operation appropriately. For more information, refer to the online help.
5. Click **Start** to perform the operation. The results of the operation are displayed on the panel.
6. If necessary, click **Stop** to stop the operation.
7. If you want to perform another operation, repeat steps 3 through 6.  
If you want to test another board, click the **Setup** tab at the bottom of the control panel and then repeat steps 2 through 6.
8. To exit the control panel, click **Exit** on the File menu.

# Summary of Functions

The functions included in the CTM-05/CTM-10 Function Call Driver are described in Table 3. These functions are included in both the 16-bit and 32-bit drivers. Refer to the CTM FCD online help for details.

**Table 3. Summary of Functions**

Type of Function	Name of Function	Description
Initialization	CT_OpenDriver	Initializes a Function Call Driver.
	CT_CloseDriver	Closes a Function Call Driver.
	CT_GetDevHandle	Initializes a board.
	CT_FreeDevHandle	Frees a device handle.
	CT_DevInit	Reinitializes a board.
Frame management	CT_GetECFrame	Accesses an event counting frame.
	CT_GetFMFrame	Accesses a frequency measurement frame.
	CT_GetPOFrame	Accesses a pulse output frame.
	CT_FreeFrame	Frees a frame.
	CT_ClearFrame	Sets frame elements to default values.



**Table 3. Summary of Functions (cont.)**

<b>Type of Function</b>	<b>Name of Function</b>	<b>Description</b>
Operation	CT_Start	Starts a single-frame counter/timer operation.
	CT_Status	Gets the status and value of a single-frame counter/timer operation.
	CT_Stop	Stops a single-frame counter/timer operation.
	CT_StartMultiple	Starts a multiple-frame counter/timer operation.
	CT_StatusMultiple	Gets the status and value of a multiple-frame counter/timer operation.
	CT_StopMultiple	Stops a multiple-frame counter/timer operation.
Interrupt	CT_IntEnable	Enables the generation of a Windows event.
	CT_IntDisable	Disables the generation of a Windows event.
Event counting	CT_SetChn	Specifies the counter/timer channel used to count events.
	CT_SetEdgePol	Specifies the type of events to count.
	CT_SetECMode	Specifies the event counting mode (continuous or counted), the size of the counter (16 bits or 32 bits), and the number of events to count (counted mode only).
	CT_SetGateEnable	Enables/disables an external gate.
	CT_SetGatePol	Specifies the gate polarity.
	CT_SetStartTrigEnable	Enables/disables an external trigger.
	CT_SetStartTrigPol	Specifies the trigger polarity.

**Table 3. Summary of Functions (cont.)**

<b>Type of Function</b>	<b>Name of Function</b>	<b>Description</b>
Frequency measurement	CT_SetChn	Specifies the counter/timer channel used to count events.
	CT_SetFMPeriodChn	Specifies the counter/timer channel used to keep track of the sampling period.
	CT_SetEdgePol	Specifies the type of events to count.
	CT_SetFMMode	Specifies the frequency measurement mode (single or continuous).
	CT_SetPeriod	Specifies the sampling period.
	CT_GetPeriod	Gets the sampling period.
	CT_SetGateEnable	Enables/disables an external gate.
	CT_SetGatePol	Specifies the gate polarity.
	CT_SetStartTrigEnable	Enables/disables an external trigger.
	CT_SetStartTrigPol	Specifies the trigger polarity.
Pulse output	CT_SetChn	Specifies the counter/timer channel from which pulses are generated.
	CT_SetPOMode	Specifies the type of pulse output (continuous or single).
	CT_SetPOHigh	Specifies the length of the first (high) pulse.
	CT_SetPeriod	Specifies the length of the period.
	CT_GetPOHigh	Gets the length of the first (high) pulse.
	CT_GetPeriod	Gets the length of the period.
	CT_SetGateEnable	Enables/disables an external gate.

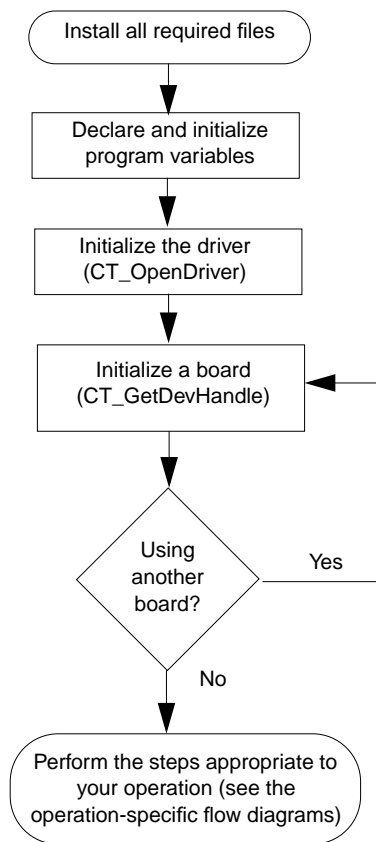
**Table 3. Summary of Functions (cont.)**

<b>Type of Function</b>	<b>Name of Function</b>	<b>Description</b>
Pulse output (continued)	CT_SetGatePol	Specifies the gate polarity.
	CT_SetStartTrigEnable	Enables/disables an external trigger.
	CT_SetStartTrigPol	Specifies the trigger polarity.
Digital input/output	CT_DIRead	Reads a single digital input value.
	CT_DOWrite	Writes a single digital output value.
Miscellaneous	CT_GetErrMsg	Gets the address of an error message string.
	CT_GetVer	Gets revision numbers.
	CT_GetShellVer	Gets the current shell version.

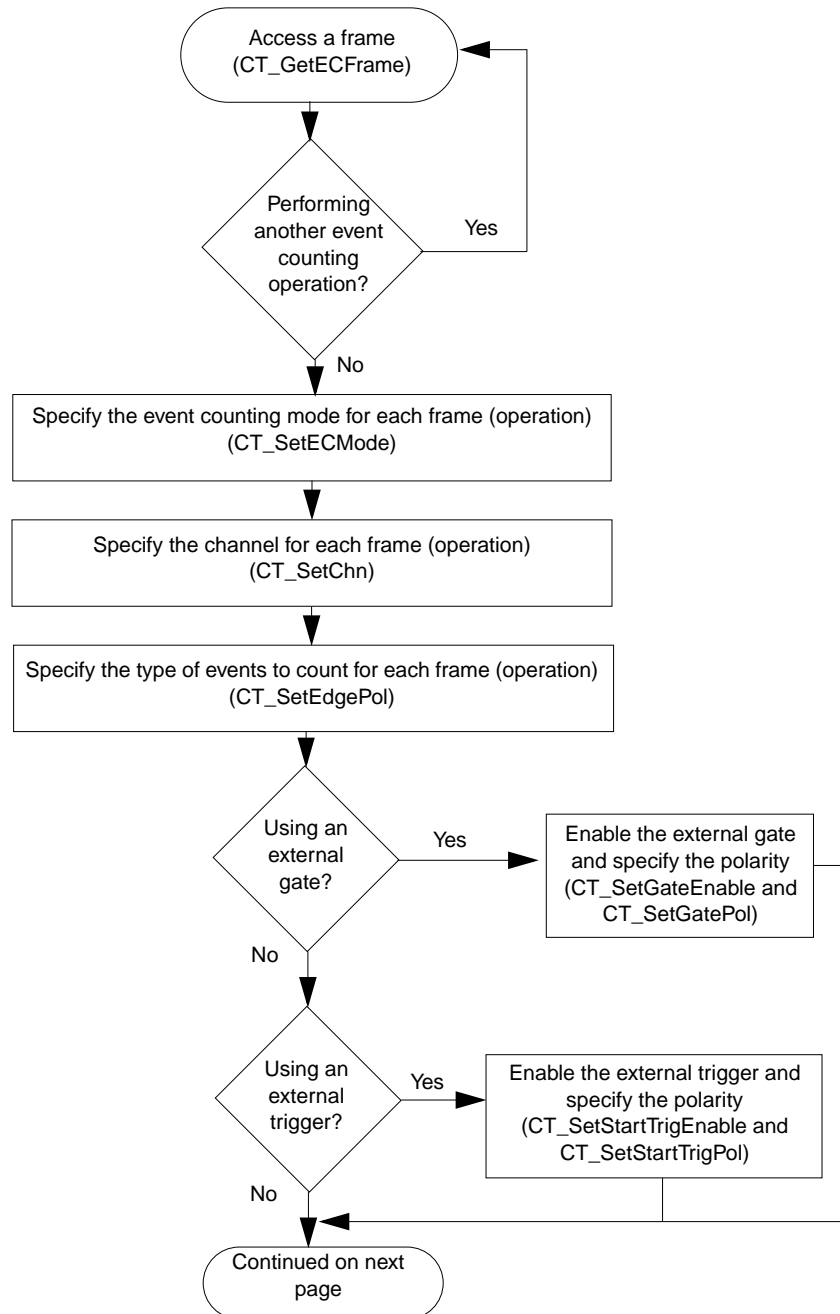
# Programming Flow Diagrams

This section contains a series of programming flow diagrams showing the steps required to perform each of the operations supported by the CTM-05/CTM-10 Function Call Driver. Although error checking is not shown in the flow diagrams, it is recommended that you check the error/status code returned by each function used in your application program.

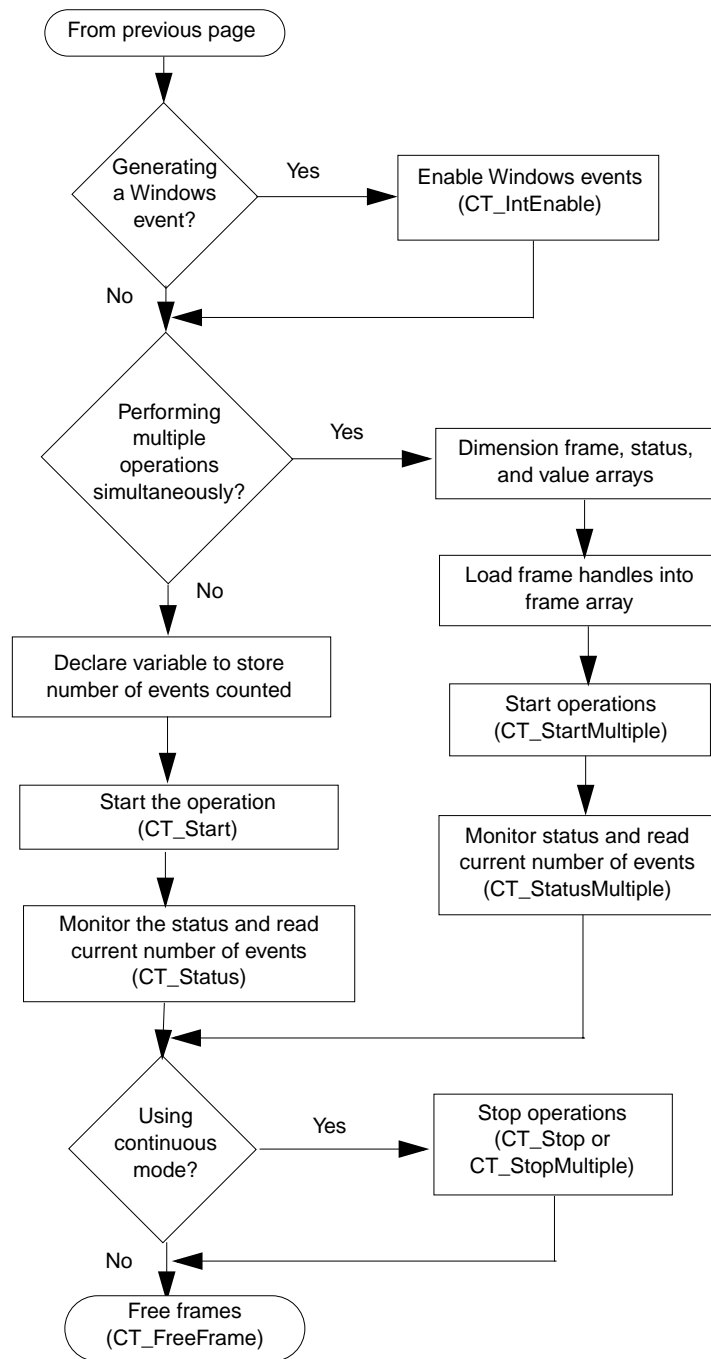
## Preliminary Steps for All Operations



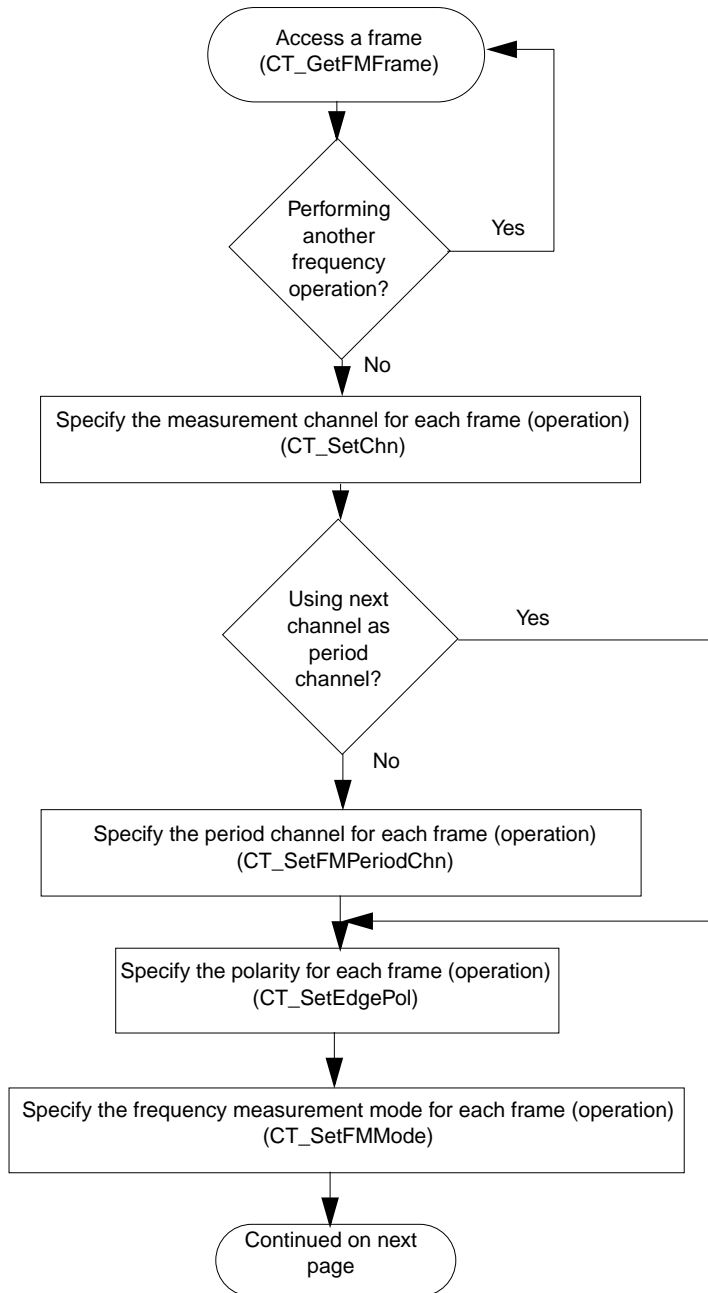
## Steps for Event Counting Operations



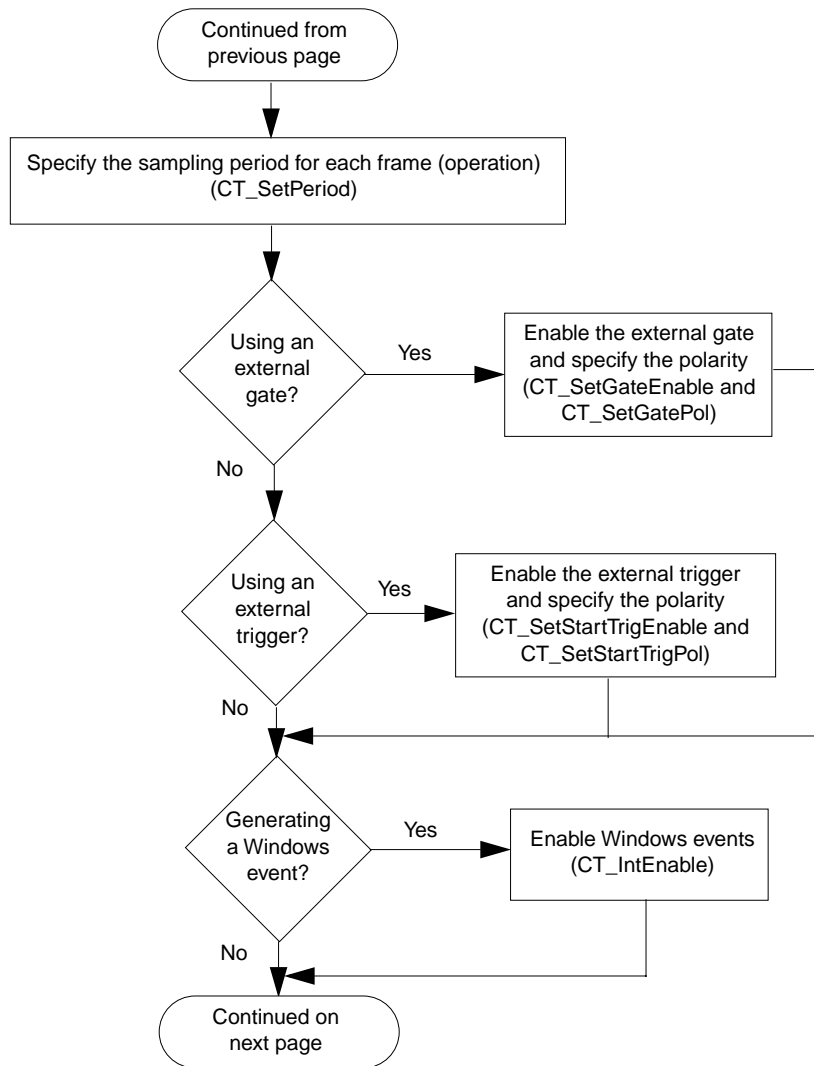
## Steps for Event Counting Operations (cont.)



## Steps for Frequency Measurement Operations

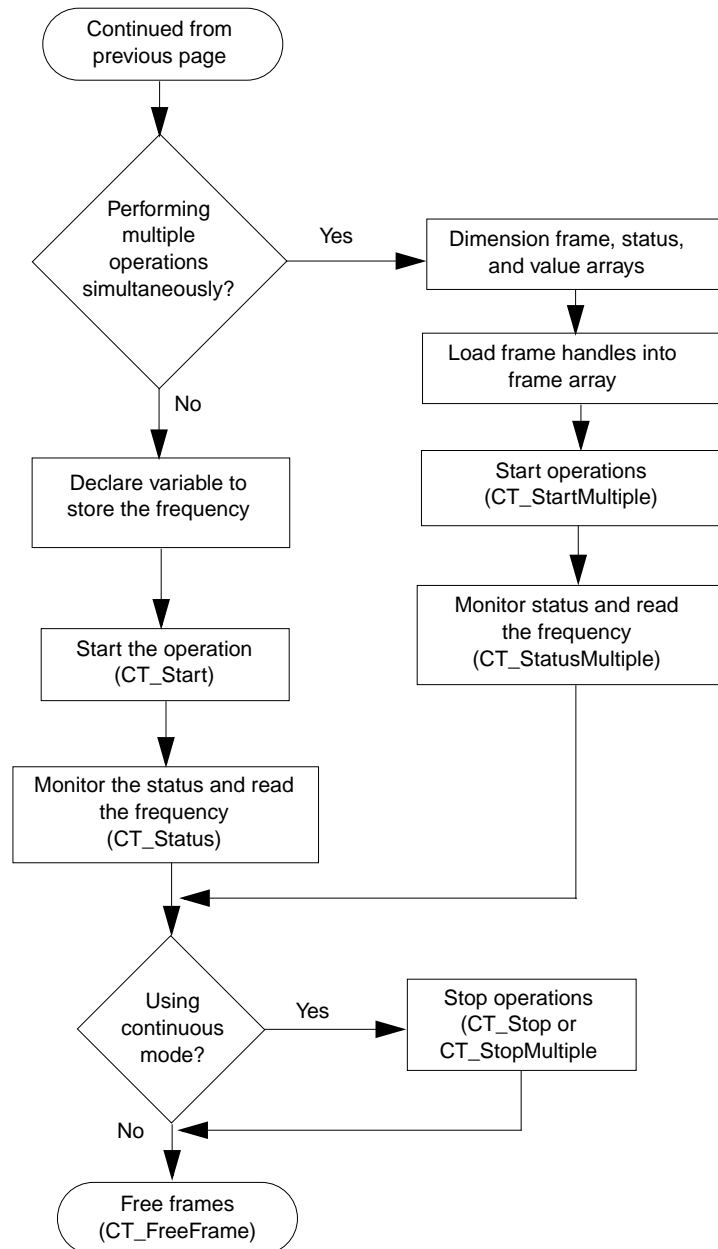


## Steps for Frequency Measurement Operations (cont.)

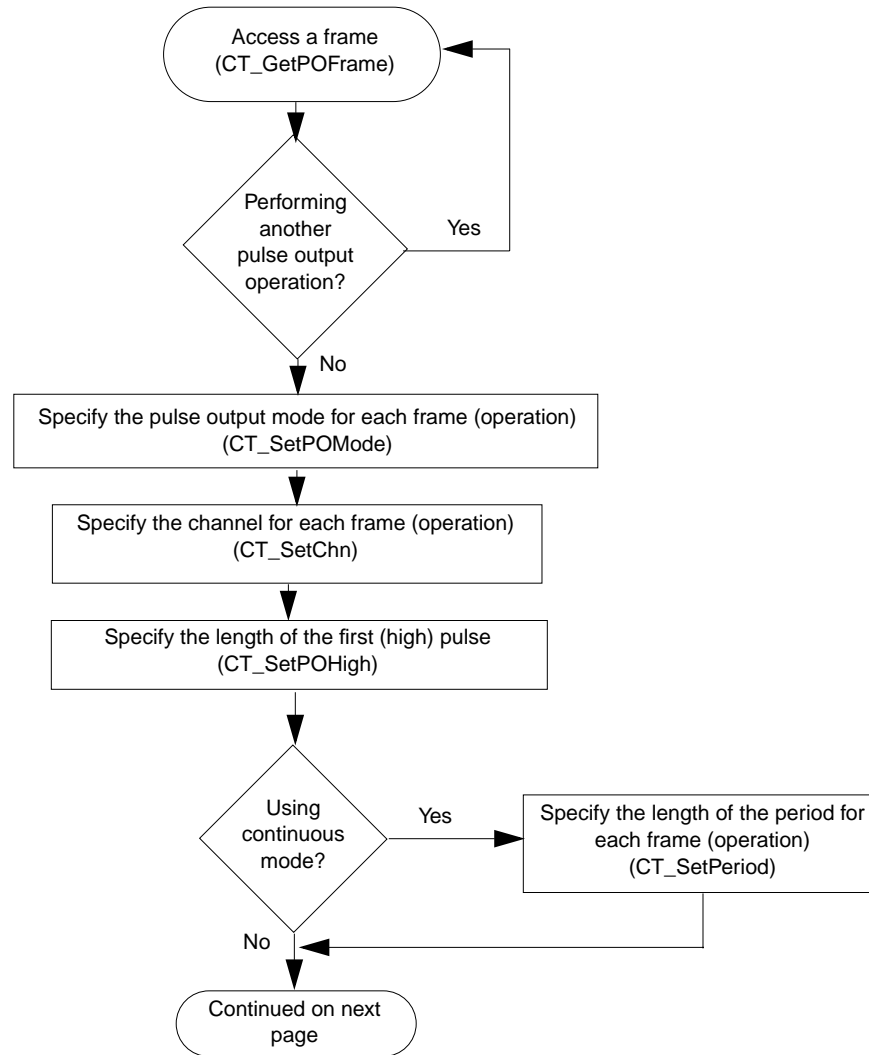




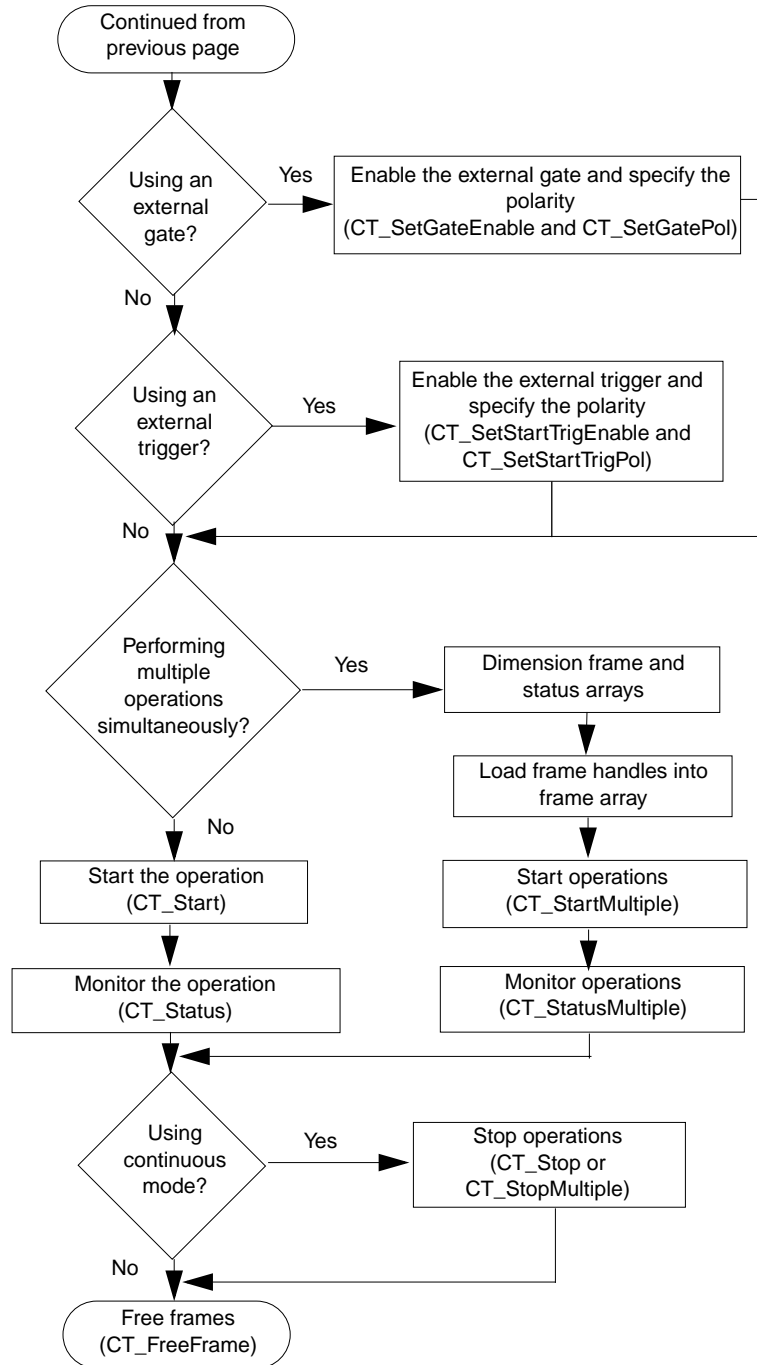
## Steps for Frequency Measurement Operations (cont.)



## Steps for Pulse Output Operations

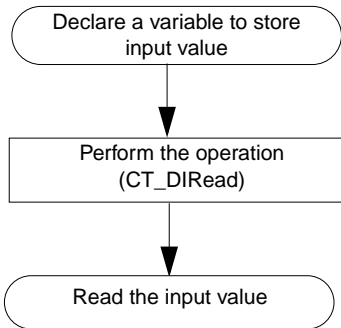


## Steps for Pulse Output Operations (cont.)



## Steps for Digital Input and Digital Output Operations

### Digital Input Operations



### Digital Output Operations

