




MICROCHIP DS50003423B Clock Studio Software User Guide

[Home](#) » [MICROCHIP](#) » MICROCHIP DS50003423B Clock Studio Software User Guide 



Contents

- [1 DS50003423B Clock Studio Software](#)
- [2 Trademarks](#)
- [3 Preface](#)
- [4 Chapter 1. Introduction](#)
- [5 Chapter 2. Operation](#)
- [6 Appendix A. Supported Instruments](#)
- [7 Appendix B. Software Licenses](#)
- [8 Worldwide Sales and Service](#)
- [9 Documents / Resources](#)
 - [9.1 References](#)

DS50003423B Clock Studio Software

Note the following details of the code protection feature on Microchip products:

- Microchip products meet the specifications contained in their particular Microchip Data Sheet.
- Microchip believes that its family of products is secure when used in the intended manner, within operating specifications, and under normal conditions.
- Microchip values and aggressively protects its intellectual property rights. Attempts to breach the code protection features of Microchip product is strictly prohibited and may violate the Digital Millennium Copyright Act.

- Neither Microchip nor any other semiconductor manufacturer can guarantee the security of its code. Code protection does not mean that we are guaranteeing the product is “unbreakable” Code protection is constantly evolving. Microchip is committed to continuously improving the code protection features of our products.

This publication and the information herein may be used only with Microchip products, including to design, test, and integrate Microchip products with your application.

Use of this information in any other manner violates these terms. Information regarding device applications is provided only for your convenience and may be superseded by updates.

It is your responsibility to ensure that your application meets with your specifications.

Contact your local Microchip sales office for additional support or, obtain additional support at <https://www.microchip.com/en-us/support/design-help/client-supportservices>.

THIS INFORMATION IS PROVIDED BY MICROCHIP “AS IS”.

MICROCHIP MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY KIND WHETHER EXPRESS OR IMPLIED, WRITTEN OR ORAL, STATUTORY OR OTHERWISE, RELATED TO THE INFORMATION INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF NONINFRINGEMENT, MERCHANTABILITY, AND FITNESS FOR A PARTICULAR PURPOSE, OR WARRANTIES RELATED TO ITS CONDITION, QUALITY, OR PERFORMANCE. IN NO EVENT WILL MICROCHIP BE LIABLE FOR ANY INDIRECT, SPECIAL, PUNITIVE, INCIDENTAL, OR CONSEQUENTIAL LOSS, DAMAGE, COST, OR EXPENSE OF ANY KIND WHATSOEVER RELATED TO THE INFORMATION OR ITS USE, HOWEVER CAUSED, EVEN IF MICROCHIP HAS BEEN ADVISED OF THE POSSIBILITY OR THE DAMAGES ARE FORESEEABLE. TO THE FULLEST EXTENT ALLOWED BY LAW, MICROCHIP’S TOTAL LIABILITY ON ALL CLAIMS IN ANY WAY RELATED TO THE INFORMATION OR ITS USE WILL NOT EXCEED THE AMOUNT OF FEES, IF ANY, THAT YOU HAVE PAID DIRECTLY TO MICROCHIP FOR THE INFORMATION.

Use of Microchip devices in life support and/or safety applications is entirely at the buyer’s risk, and the buyer agrees to defend, indemnify and hold harmless Microchip from any and all damages, claims, suits, or expenses resulting from such use. No licenses are conveyed, implicitly or otherwise, under any Microchip intellectual property rights unless otherwise stated.

Trademarks

The Microchip name and logo, the Microchip logo, Adaptec, AVR, AVR logo, AVR Freaks, BesTime, BitCloud, CryptoMemory, CryptoRF, dsPIC, flexPWR, HELDO, IGLOO, JukeBlox, KeeLoq, Kleer, LANCheck, LinkMD, maXStylus, maXTouch, MediaLB, megaAVR, Microsemi, Microsemi logo, MOST, MOST logo, MPLAB, OptoLyzer, PIC, picoPower, PICSTART, PIC32 logo, PolarFire, Prochip Designer, QTouch, SAM-BA, SenGenuity, SpyNIC, SST, SST Logo, SuperFlash, Symmetricom, SyncServer, Tachyon, TimeSource, tinyAVR, UNI/O, Vectron, and XMEGA are registered trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

AgileSwitch, ClockWorks, The Embedded Control Solutions Company, EtherSynch, Flashtec, Hyper Speed Control, HyperLight Load, Libero, motorBench, mTouch, Powermite 3, Precision Edge, ProASIC, ProASIC Plus, ProASIC Plus logo, Quiet-Wire, SmartFusion, SyncWorld, TimeCesium, TimeHub, TimePictra, TimeProvider, and ZL are registered trademarks of Microchip Technology Incorporated in the U.S.A.

Adjacent Key Suppression, AKS, Analog-for-the-Digital Age, Any Capacitor, AnyIn, AnyOut, Augmented Switching, BlueSky, BodyCom, Clockstudio, CodeGuard, CryptoAuthentication, CryptoAutomotive, CryptoCompanion, CryptoController, dsPICDEM, dsPICDEM.net, Dynamic Average Matching, DAM, ECAN, Espresso T1S, EtherGREEN, EyeOpen, GridTime, IdealBridge, IGaT, In-Circuit Serial Programming, ICSP, INICnet, Intelligent Paralleling, IntelliMOS, Inter-Chip Connectivity, JitterBlocker, Knob-on-Display, MarginLink, maxCrypto, maxView, memBrain, Mindi, MiWi, MPASM, MPF, MPLAB Certified logo, MPLIB, MPLINK, mSiC, MultiTRAK, NetDetach, Omniscient Code Generation, PICDEM, PICDEM.net, PICkit, PICtail, Power MOS IV, Power MOS 7, PowerSmart, PureSilicon, QMatrix, REAL ICE, Ripple Blocker, RTAX, RTG4, SAM-ICE, Serial Quad I/O, simpleMAP, SimpliPHY, SmartBuffer, SmartHLS, SMARTI.S., storClad, SQI, SuperSwitcher, SuperSwitcher II, Switchtec, SynchroPHY, Total Endurance, Trusted Time, TSHARC, Turing, USBCheck, VariSense, VectorBlox, VeriPHY, ViewSpan, WiperLock, XpressConnect, and ZENA are trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

SQTP is a service mark of Microchip Technology Incorporated in the U.S.A.

The Adaptec logo, Frequency on Demand, Silicon Storage Technology, and Symmcom are registered trademarks of Microchip Technology Inc. in other countries.

GestIC is a registered trademark of Microchip Technology Germany II GmbH & Co. KG, a subsidiary of Microchip

Preface

NOTICE TO CUSTOMERS

All documentation becomes dated, and this manual is no exception. Microchip tools and documentation are constantly evolving to meet customer needs, so some actual dialogs and/or tool descriptions may differ from those in this document. Please refer to our website (www.microchip.com) to obtain the latest documentation available. Documents are identified with a “DS” number. This number is located on the bottom of each page, in front of the page number. The numbering convention for the DS number is “DSXXXXXXXXA”, where “XXXXXXXX” is the document number and “A” is the revision level of the document. IDE online help. For the most up-to-date information on development tools, see the MPLAB® Select the Help menu, and then Topics, to open a list of available online help files.

CONVENTIONS USED IN THIS GUIDE

This manual uses the following documentation conventions:

DOCUMENTATION CONVENTIONS

Description	Represents	Examples
Arial font:		
Italic characters	Referenced books	MPLAB® IDE User’s Guide
	Emphasized text	...is the only compiler...
Initial caps	A window	the Output window
	A dialog	the Settings dialog
	A menu selection	select Enable Programmer
All caps	An operating mode, alarm state, status, or chassis label	ALARM
Quotes	A field name in a window or dialog	“Save project before build”
Underlined, italic text with right angle bracket	A menu path	File>Save
Bold characters	A dialog button	Click OK
	A tab	Click the Power tab
N ‘Rnnnn	A number in verilog format, where N is the total number of digits, R is the radix and n is a digit.	4`b0010, 2`hF1
Text in angle brackets < >	A key on the keyboard	Press <Enter>, <F1>

DOCUMENTATION CONVENTIONS

Courier New font:		
Plain Courier New	Sample source code	#define START
	Filenames	autoexec.bat
	File paths	c:\mcc18\h
	Keywords	_asm, _endasm, static
	Command-line options	-Opa+, -Opa-
	Bit values	0, 1
	Constants	0xFF, 'A'
Italic Courier New	A variable argument	<i>file.o</i> , where <i>file</i> can be any valid filename
Square brackets []	Optional arguments	mcc18 [options] <i>file</i> [options]
Curly brackets and pipe character: { }	Choice of mutually exclusive arguments; an OR selection	errorlevel {0 1}
Ellipses...	Replaces repeated text	var_name [, var_name...]
	Represents code supplied by user	void main (void) { ... }

WARNINGS, CAUTIONS, RECOMMENDATIONS, AND NOTES

Warnings, Cautions, Recommendations, and Notes attract attention to essential or critical information in this guide.

The types of information included in each are displayed in a style consistent with the examples below.

WARNING

To avoid serious personal injury or death, do not disregard warnings. All warnings use this style. Warnings are installation, operation, or maintenance procedures, practices, or statements, that if not strictly observed, may result in serious personal injury or even death.

CAUTION

To avoid personal injury, do not disregard cautions. All cautions use this style. Cautions are installation, operation, or maintenance procedures, practices, conditions, or statements, that if not strictly observed, may result in damage to, or destruction of, the equipment.

Cautions are also used to indicate a long-term health hazard.

Note: All notes use this style. Notes contain installation, operation, or maintenance procedures, practices, conditions, or statements that alert you to important information, which may make your task easier or increase your understanding.

WHERE TO FIND ANSWERS TO PRODUCT AND DOCUMENT QUESTIONS

For additional information about the products described in this guide, please contact your Microchip representative or your local sales office. You can also contact us on the web at <https://microchip.my.site.com/s/>.

When this manual is updated the latest version will be available for downloading from Microchip's web site.

Manuals are provided in PDF format for ease of use. After downloading, you can view the manual on a computer

or print it using Adobe Acrobat Reader.

Manual updates are available at: www.microchip.com.

RELATED DOCUMENTS AND INFORMATION

See your Microchip representative or sales office for a complete list of available documentation.

To order any accessory, contact the Microchip Sales Department.

If you encounter any difficulties installing or using the product, contact Microchip Frequency and Time Systems (FTS) Services and Support:

North and South America

Microchip FTS

3870 North First Street San Jose, CA

95134-1702

Toll-free in North America: 1-888-367-7966, Option 1

Telephone: 408-428-7907

Email: sjo-ftd.support@microchip.com

Europe, Middle East, and Africa (EMEA)

Microchip FTS Altlaufstrasse 42

85635 Hoehenkirchen-Siegersbrunn

Germany

Telephone: +49 700 3288 6435

Fax: +49 8102 8961 533

Email: sjo-ftd.support@microchip.com

South Asia

Microchip Operations (M)

Sdn Bhd Level 15.01, 1 First Avenue, 2A

Dataran Bandar Utama, Damansara,

47800 Petaling Jaya, Selangor, Malaysia

Toll-free in North America: 1-888-367-7966, Option 1

Telephone: 408-428-7907

Email: sjo-ftd.support@microchip.com

THE MICROCHIP WEBSITE

Microchip provides online support via our website at www.microchip.com. This website is used as a means to make files and information easily available to customers.

Accessible by using your favorite Internet browser, the website contains the following information:

- Product Support – Data sheets and errata, application notes and sample programs, design resources, user's guides and hardware support documents, latest software releases and archived software
- General Technical Support – Frequently Asked Questions (FAQs), technical support requests, online discussion groups, Microchip consultant program member listing
- Business of Microchip – Product selector and ordering guides, latest Microchip press releases, listing of seminars and events, listings of Microchip sales offices, distributors and factory representatives

CUSTOMER SUPPORT

Users of Microchip products can receive assistance through several channels:

- Distributor or Representative
- Local Sales Office
- Field Application Engineer (FAE)
- Technical Support

Customers should contact their distributor, representative or field application engineer (FAE) for support. Local sales offices are also available to help customers. A listing of sales offices and locations is included in the back of

this document.

Technical support is available through the website at: <http://www.microchip.com/support>.

DOCUMENT REVISION HISTORY

Revision A (October 2022)

- Initial release of this document as Microchip DS50003423A.

Revision B (September 2023)

- Revised for software release 1.1 with support for 5071A and 5071B cesium instruments.

Chapter 1. Introduction

1.1 PRODUCT DESCRIPTION

The Clockstudio™ software is a standalone graphical user interface (GUI) intended for communication and control of Microchip Atomic Clock products. It allows a user to quickly familiarize themselves with the capabilities of these products rather than entering text-based commands via a primitive command line interface.

The charting capabilities are a powerful tool for experimentation and investigating device performance under specific conditions.

See the Appendix section: Supported Instruments for a list of supported clocks products.

1.2 PRODUCT FEATURES

- Communicate with multiple devices via a single interface
- Configure device settings (Frequency, 1PPS Disciplining parameters, Time of Day, etc)
- Monitor “real-time” device telemetry in tabular form
- Display device telemetry as a chart
- Load and display previously saved data
- Import data from other text-based files
- Export data for further analysis (such as Microchip’s TimeMonitor software tool)

1.3 BASIC GUI LAYOUT

When the application is launched, the user will see a Start tab in the main window with the File menu above it (Figure 1-1). From here, a user can decide to connect to an atomic clock or open an existing data file. This action will open a new tab with four main areas:

- On the left side is a Toolbar menu
- The right side (main portion of active tabbed window) will present a different view dependent upon the tool selected from the toolbar
- North Region – The top part of the tabbed window contains the Title bar
- South Region – The bottom part of the application window contains the Status bar

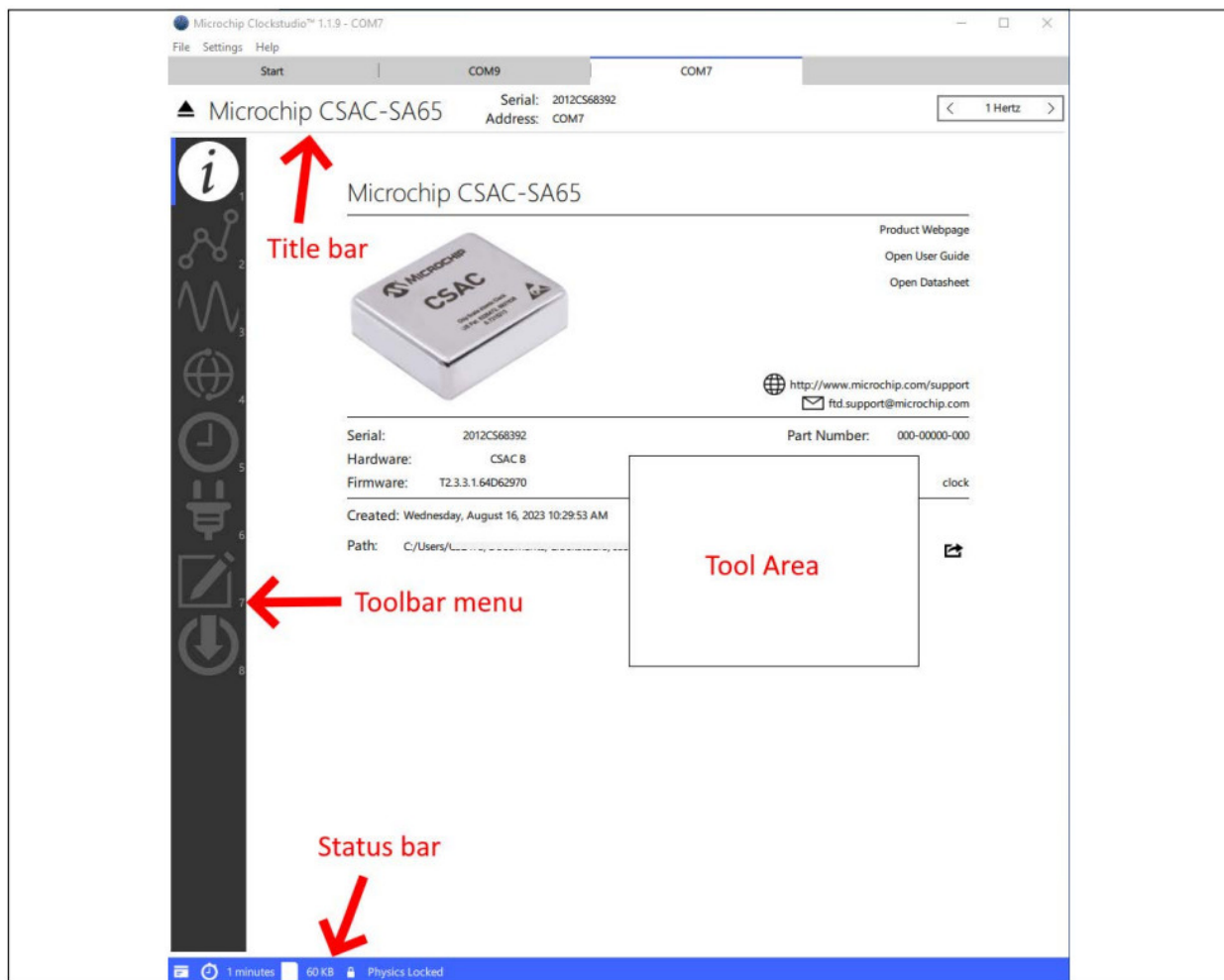


FIGURE 1-1: Basic Areas of the GUI, Labeled.

Chapter 2. Operation

A user primarily interacts with the application via mouse (such as selecting from drop-down menus and toggling radio buttons) and secondarily with the keyboard (to set device-specific parameters or enter commands via the console feature, for example).

The application was designed to run on Windows 10 and 11 based systems.

This User Guide divides the GUI in to eight main features, described in the following sections:

- File menu: describes file loading and saving
- Settings menu: lists modifiable Clockstudio™ application settings
- About menu: contains general Clockstudio software version information
- Start tab: initiate communication with a device, open a file, or link to a product support URL
- Title bar: overview of the connected device
- Toolbar: lists available interactive features of a device
- Status bar: contains the console along with active data file information
- Charting: description of how to plot telemetry parameters

2.1 FILE MENU

The File menu is always present at the top of the application and contains a number of file operations, as described in the below sections. The Clockstudio program uses file extension .ctdb for data files. New data files are created whenever a new connection is established and they are saved in the following Windows directory by default:

C:\Users\<user>\Documents\Clockstudio

The directory and other data file acquisition options can be modified. See Preferences for more information.

2.1.1 Open Telemetry...

Opens a file browser to select a previously saved file for analysis. When a file is opened, a new tab appears in the Clockstudio application, labeled with the filename.

The Title bar, Toolbar, and Status bar will also populate in this tab. Supported extensions are .ctdb, .csv, and .phd.

2.1.2 Open Recent

Displays a list of recently opened data files.

2.1.3 Export Telemetry...

Files may be exported in .csv format or also in a .txt format readable by Microchip TimeMonitor software.

2.1.4 Rename Telemetry...

Available when connected to a device. This feature is useful for moving the data file during an active data capture.

2.1.5 Quit

Exits the Clockstudio application.

2.2 SETTINGS MENU

The Settings menu is always present at the top of the application and contains the Preferences tab.

2.2.1 Preferences

The Preferences tab allows a user to adjust the telemetry capture settings. Default settings can be adjusted, including the location for storing data files, file naming convention, and the polling rate.

Visual display settings can also be adjusted, including chart density (resolution).

2.3 HELP MENU

2.3.1 About Clockstudio...

Describes the release version and links to third party license information.

2.3.2 User Guide

Links to the Clockstudio software user guide.

2.4 START TAB

The Clockstudio™ software tool can communicate with multiple devices simultaneously, depending on system capabilities.

When connecting to a device, a new tab will open with a “Connecting...” announcement briefly displaying at the top of the window.

Each new tab is labeled with the address of the device.

If a connection cannot be established, the announcement will toggle between “Connecting...” and “No Device” until canceled by the user by clicking the Pause button next to the announcements.

One can re-attempt to establish communication by clicking the Play button.

There are two options for connecting to a device with the Clockstudio software: Serial (COM) Port or TCP Host.

2.4.1 Serial Port

The pull-down menu will populate with all of the recognized COM ports. To establish communication, select one of the ports and click Connect.

2.4.2 TCP Host

The user may manually enter an IP address. To establish communication with a device, enter an address (IP: port) and click Connect.

Note: Currently supported products do not yet incorporate this feature. A TCP to Virtual COM Port adapter could be used to communicate remotely.

2.5 TITLE BAR

After establishing a new connection (or opening a telemetry file), a new tab will open with a Title bar located at the

top. The Title bar will display the following device information:

2.5.1 Disconnect/Reconnect Button

This is visible only when a connection is available. It is recommended to manually disconnect Clockstudio from the device before physically disconnecting it.

2.5.2 Device Product Name

This displays the name of the device.

2.5.3 “Serial”

The device serial number is specific to each individual device and is read directly from the device’s own saved “serial number” parameter.

2.5.4 Port “Address”

Lists the COM or IP address used to communicate with a device. This is defined when a user first connects with a device. See the Start Tab section for more information.

2.5.5 Data Polling Rate

Visible only when a connection is established. It can be adjusted from 10 Hz to 100 seconds, depending on device capabilities.

Slower data rates are recommended for reducing file sizes.

For example, changing the data rate from 1 second to 10 seconds will reduce the size by a factor of 10.

2.6 TOOLBARS

2.6.1 Common Tools

This section describes the tools in the Toolbar that are supported among all device types:

- Device Info Tool
- Telemetry Tool
- Firmware Upgrade Tool (supported devices only, connection required)
- Notes Tool

Most of these tools are available when opening a data file from disk and when connected to a live device.

2.6.1.1 DEVICE INFO TOOL

This tool displays an image of the device or product associated with the current data file, as well as some basic information, including:

- Web links to product page, user guide, and data sheet
- Microchip FTS support email
- Device serial and part numbers
- Device firmware and hardware revisions
- Path and creation date of the data file

2.6.1.2 DEVICE TELEMETRY TOOL

The Device Telemetry Tool displays the device’s telemetry and configuration parameters, with current values on the left side and selected time series charts on the right side.

When connected to a device, editable parameters are highlighted in blue. Click the blue number or checkbox on the left side of the tool to edit the value.

The user may view a parameter’s value history as a time series chart by clicking the right-pointing triangle icon next to it (supported parameters only). Up to eight charts may be displayed simultaneously.

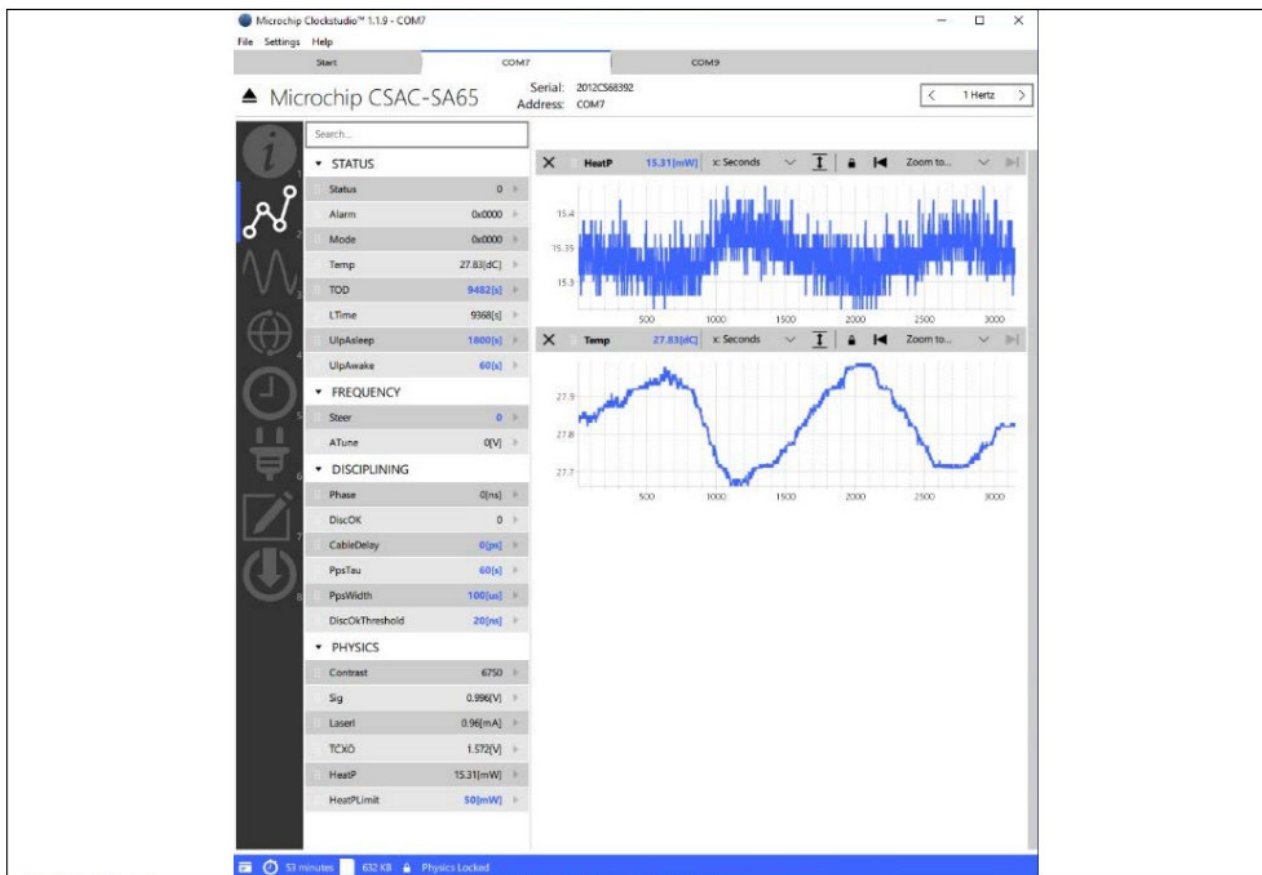


FIGURE 2-1: Device Telemetry Tool for CSAC-SA65.

2.6.1.3 UPGRADE FIRMWARE TOOL

When connected to a supported device, the Upgrade Firmware Tool may be used to update its firmware. Download the latest firmware release for your product from the Microchip customer support portal and then click Browse to select the file to load. During firmware transfer, the device will temporarily stop normal operation. After the upgrade, it will reset and resume operation.

CAUTION

If the transfer is interrupted, the device will not function properly until firmware is reloaded with a subsequent attempt. Reconnecting to the device will show "bsl" as the device's application on the Device Info Tool and telemetry will not be available.

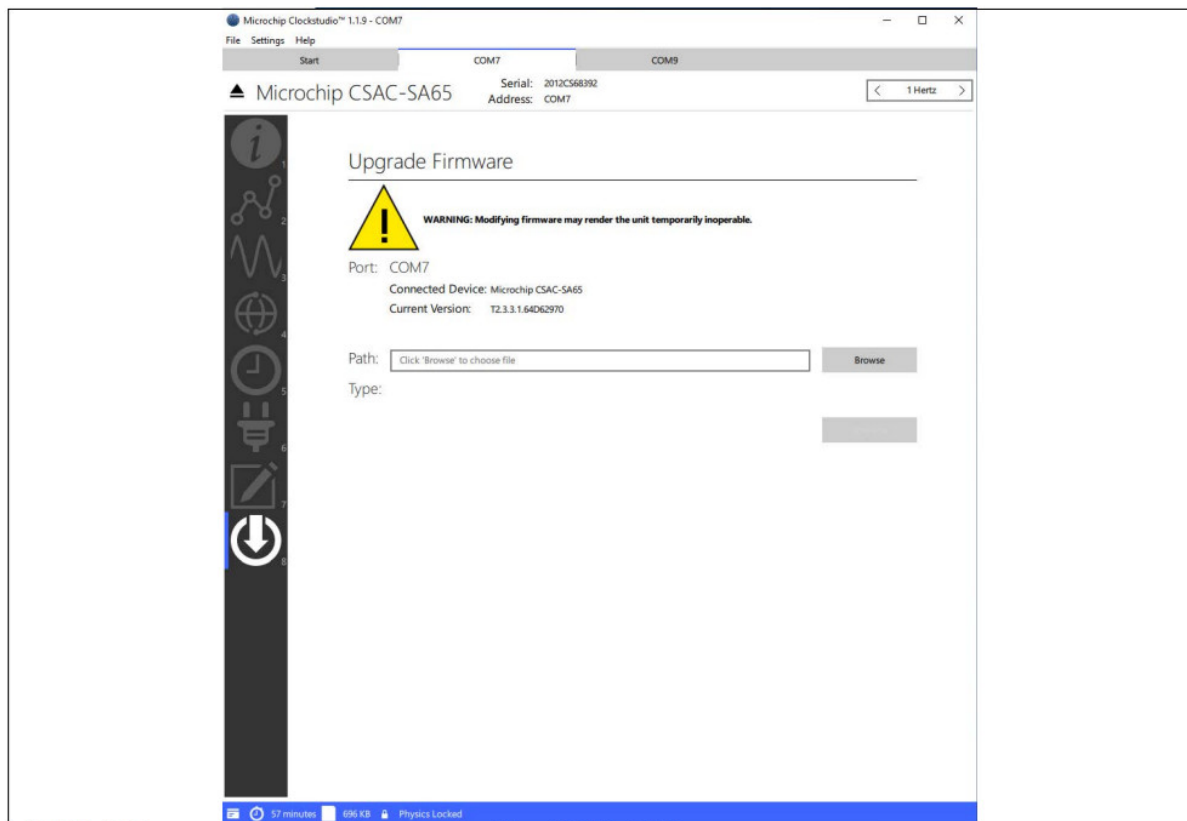


FIGURE 2-2: Upgrade Firmware Tool for CSAC-SA65.

2.6.1.4 NOTES TOOL

The Notes Tool provides space to add remarks, using Markdown syntax, to the current data file. Visit www.commonmark.org/help for a guide to the Markdown syntax.

Notes can be added to a .ctdb format data file at any time; while capturing telemetry or later, when viewing the file. External data file formats are not supported.

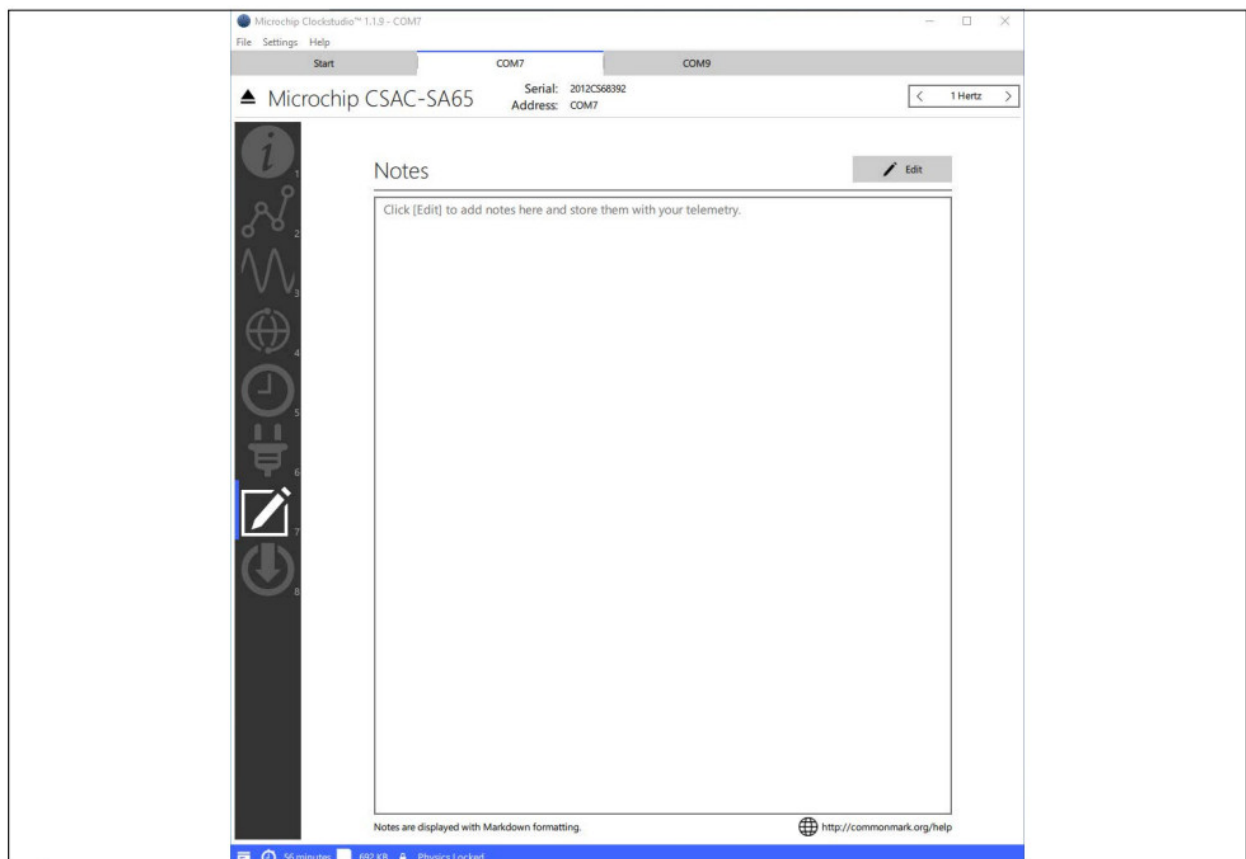


FIGURE 2-3: Notes Tool.

2.6.2 CSAC Tools

When connected to a CSAC, the following tools are available:

- Device Info
- Device Telemetry
- Frequency Adjustment
- 1PPS Disciplining
- Time of Day
- Power Management
- Notes
- Upgrade Firmware



FIGURE 2-4: Device Info Tool for CSAC-SA65.

2.6.2.1 FREQUENCY ADJUSTMENT TOOL (SA.45s/SA65)

This tool allows the user to digitally tune the output frequency, configure analog tuning, and latch the frequency offset. Both absolute and relative frequency adjustments are supported. When enabled, analog tuning voltage measurements are reported. Latching the digital tune (or Steer) stores the frequency offset to internal flash, resetting the offset. The “Steer” time series chart displays the CSAC’s effective tuning history as fractional frequency in parts-per 1012.



FIGURE 2-5: *Frequency Adjustment Tool for CSAC-SA65.*

2.6.2.2 1PPS DISCIPLINING TOOL (SA.45s/SA65)

The 1PPS (Pulse-Per-Second) Disciplining Tool provides an interface for calibrating the frequency and 1PPS outputs. This tool allows access to 1PPS synchronization, output pulse width, and disciplining servo configuration. Phase measurements and digital tuning charts are displayed to aid the user's understanding of how the disciplining servo impacts the output frequency.

Refer to the product user's guide for details and recommendations regarding 1PPS disciplining.

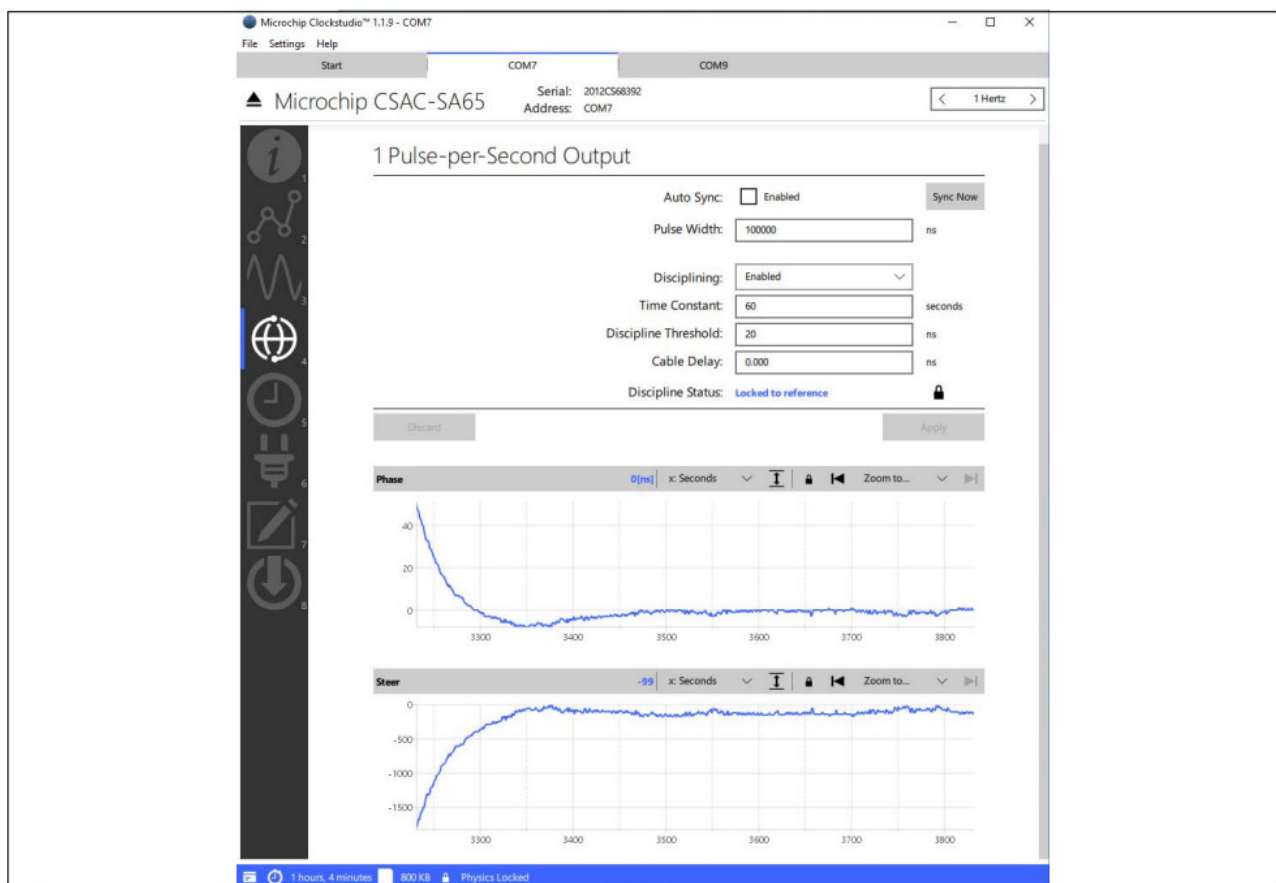


FIGURE 2-6: 1PPS Disciplining Tool for CSAC-SA65.

2.6.2.3 TIME OF DAY (SA.45s/SA65)

The Time of Day Tool allows the user to manage the device's internal concept of time, represented as a count of seconds since an epoch. At power on, the device begins counting time of day from zero.

Applying the PC's time will automatically set the device's Time of Day as the count of seconds since the Linux epoch (UTC). The device time can be incremented/decremented with the "Hours" and "Seconds" buttons or set directly to an absolute number.

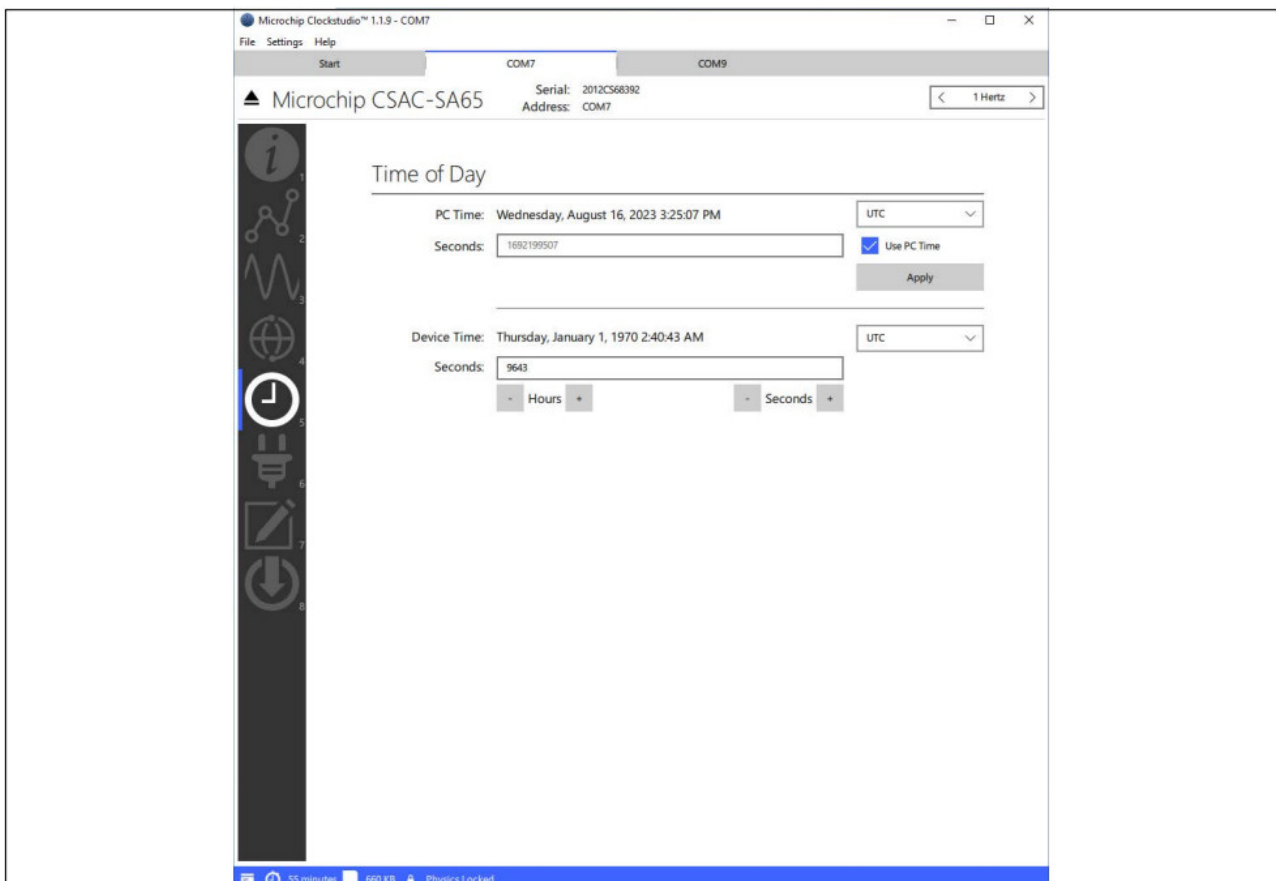


FIGURE 2-7: Time of Day Tool for CSAC-SA65.

2.6.2.4 POWER MANAGEMENT (SA.45s/SA65)

The Power Management Tool allows a CSAC's power consumption to be configured via Ultra-Low Power (ULP) mode and heater power limits. CSAC-SA65 devices contain a heater boost circuit to improve acquisition time at cold temperatures.

Refer to the CSAC user's guide for details regarding these features.

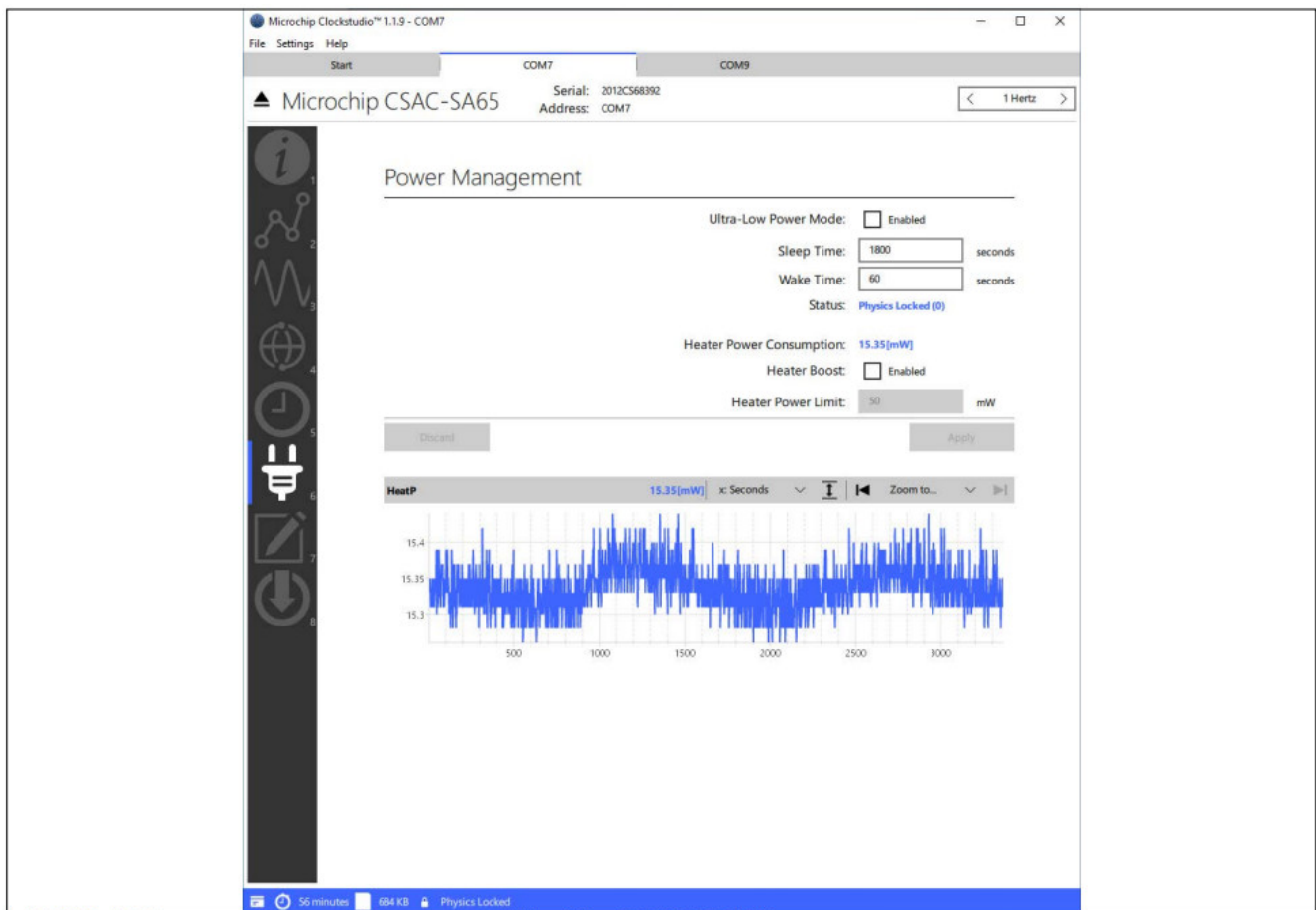


FIGURE 2-8: Power Management Tool for CSAC-SA65.

2.6.3 MAC-SA5X Tools

When connected to a MAC, the following tools are available:

- Device Info
- Device Telemetry
- Frequency Adjustment
- 1PPS Disciplining
- Time of Day
- Notes
- Upgrade Firmware



FIGURE 2-9: *Device Info Tool Connected to a MAC-SA5X.*

2.6.3.1 FREQUENCY ADJUSTMENT TOOL (MAC-SA5X)

This tool allows the user to digitally tune the output frequency, configure analog tuning, and latch the frequency offset.

The “EffectiveTuning” time series chart displays the MAC’s effective tuning history as fractional frequency in parts-per 10¹⁵.



FIGURE 2-10: Frequency Adjustment Tool for MAC-SA5X.

2.6.3.2 1PPS DISCIPLINING TOOL (MAC-SA5X)

The 1PPS Disciplining Tool allows the user to configure synchronization, output pulse, and the disciplining servo. The tool assumes that the 1PPS input 0 is connected to the reference, versus the alternate input 1. Refer to the product user's guide for details and recommendations regarding 1PPS disciplining servo settings.

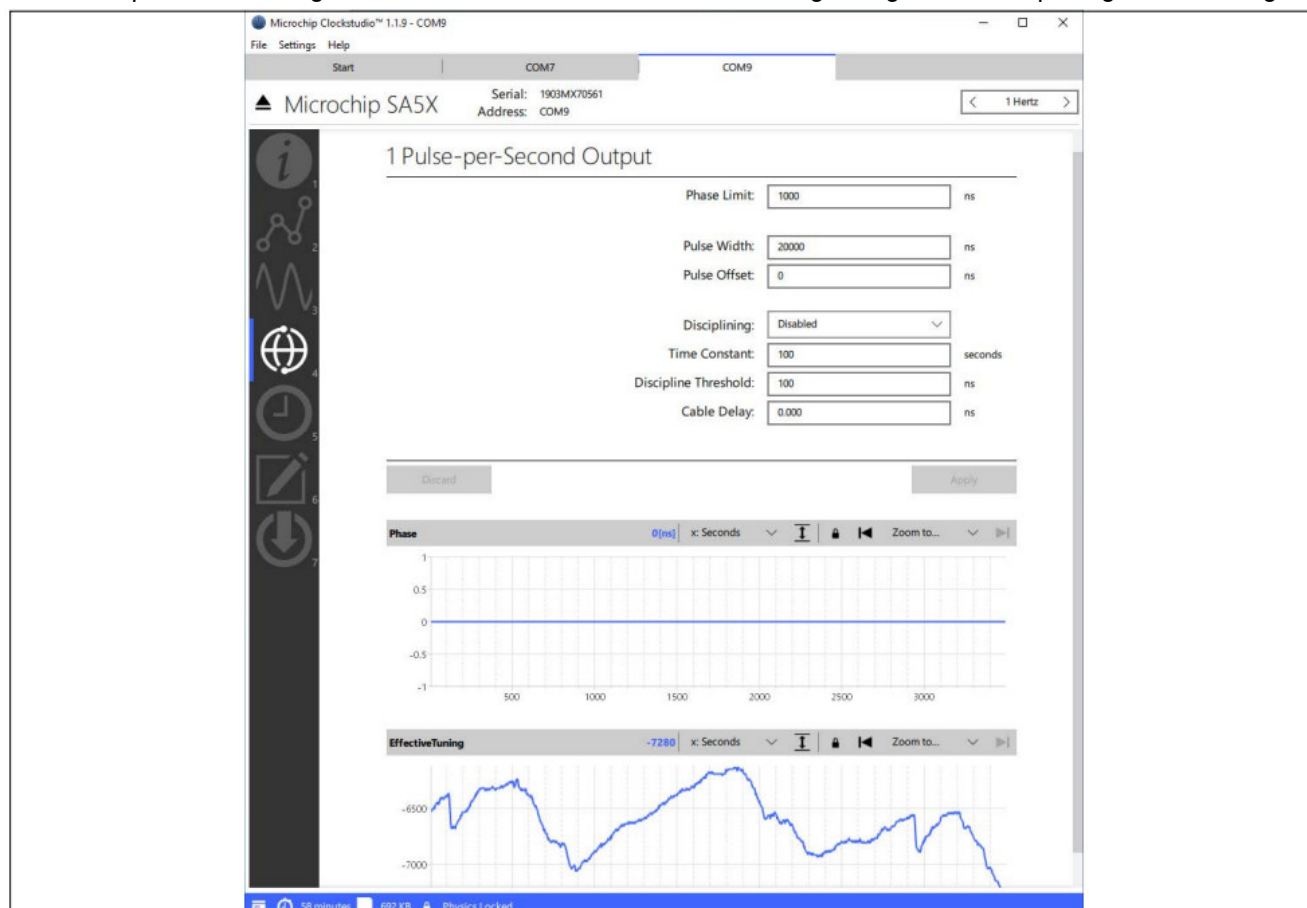


FIGURE 2-11: 1PPS Disciplining Tool for MAC-SA5X.

2.6.3.3 TIME OF DAY (MAC-SA5X)

The Time of Day Tool for the MAC operates the same as described for the CSAC. Refer to Section 2.6.2.3 “Time of Day (SA.45s/SA65)” for details.

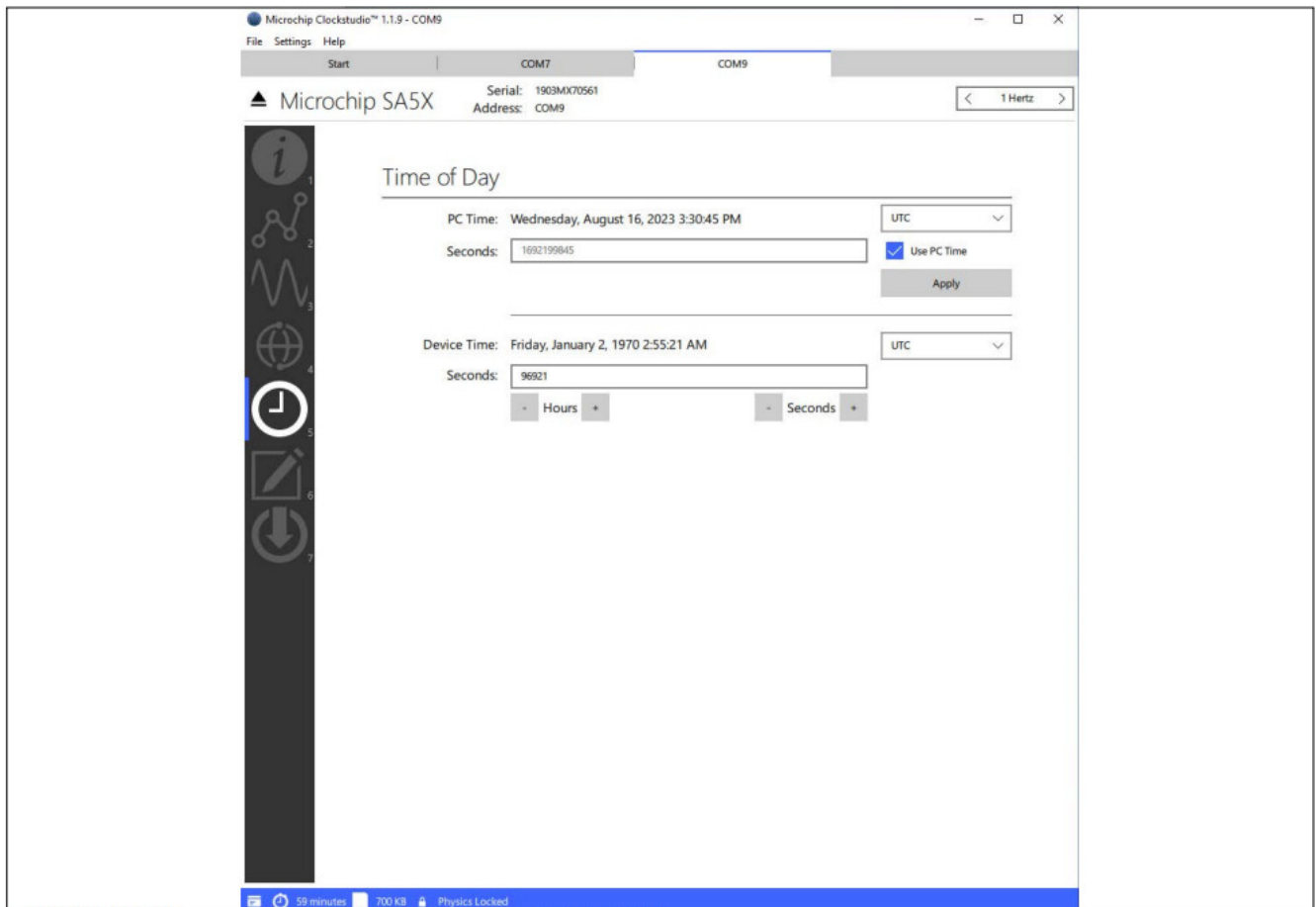


FIGURE 2-12: Time of Day Tool for MAC-SA5X.

2.6.4 5071 Primary Frequency Standard Tools

The Clockstudio software tool supports remote operation of the A and B revisions of the 5071 Primary Frequency Standard. When connected to a 5071, the following tools are available:

- Device Info
- Device Telemetry
- Time of Day
- Device Configuration
- Event Log
- Notes

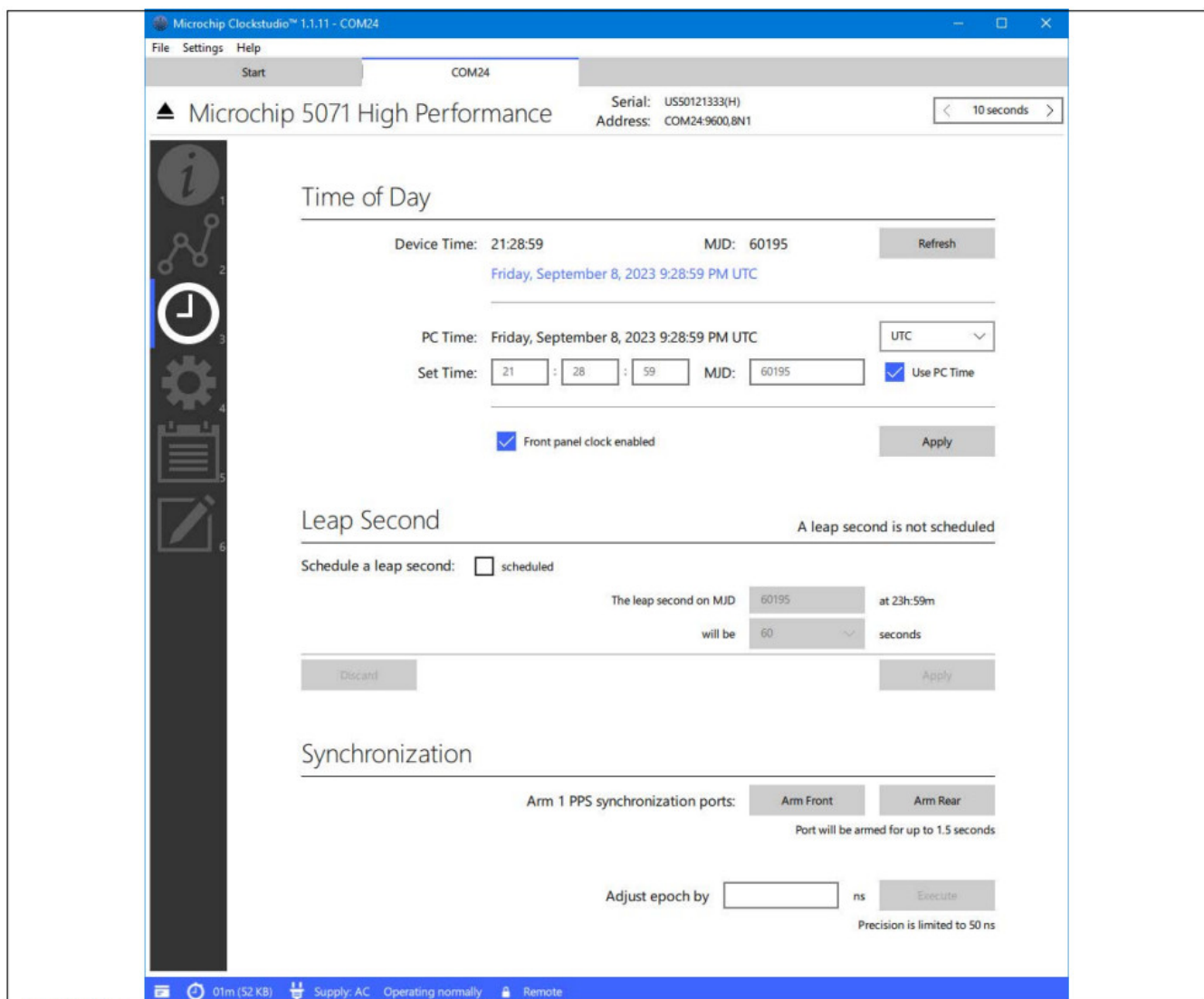


FIGURE 2-14: *Time of Day Tool for the 5071.*

2.6.4.2 DEVICE CONFIGURATION TOOL

The Device Configuration Tool for the 5071 allows users to set the output frequency of the rear ports 1 and 2, configure the RS-232 serial port settings, and store these settings to persistent memory in the 5071. Stored settings will be maintained across power cycles.

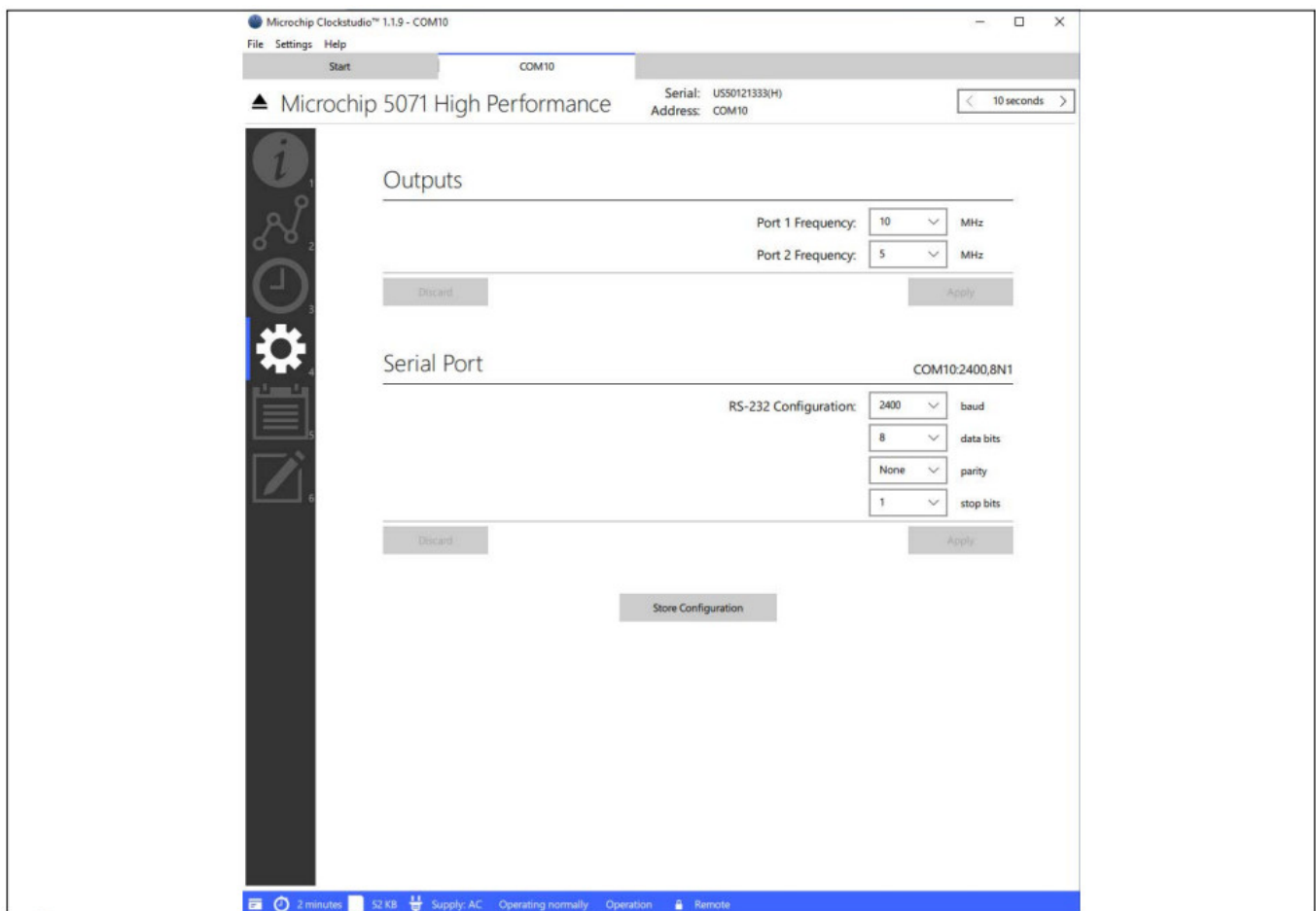


FIGURE 2-15: *Device Configuration Tool for the 5071.*

2.6.4.3 EVENT LOG TOOL

The Event Log Tool displays the 5071's internal event log. Each entry is displayed on a separate line and timestamped with the device's MJD and front panel clock time.

Click Save to store a copy of the displayed text into the data file's console log. It will be preserved alongside telemetry and notes in the current .ctdb data file. Click Export... to save a copy of the displayed text to a new text file.

The 5071's internal event log may be cleared by pressing and holding the Clear Log button for one full second. This operation cannot be undone; be sure that you want to permanently erase the device's event log.

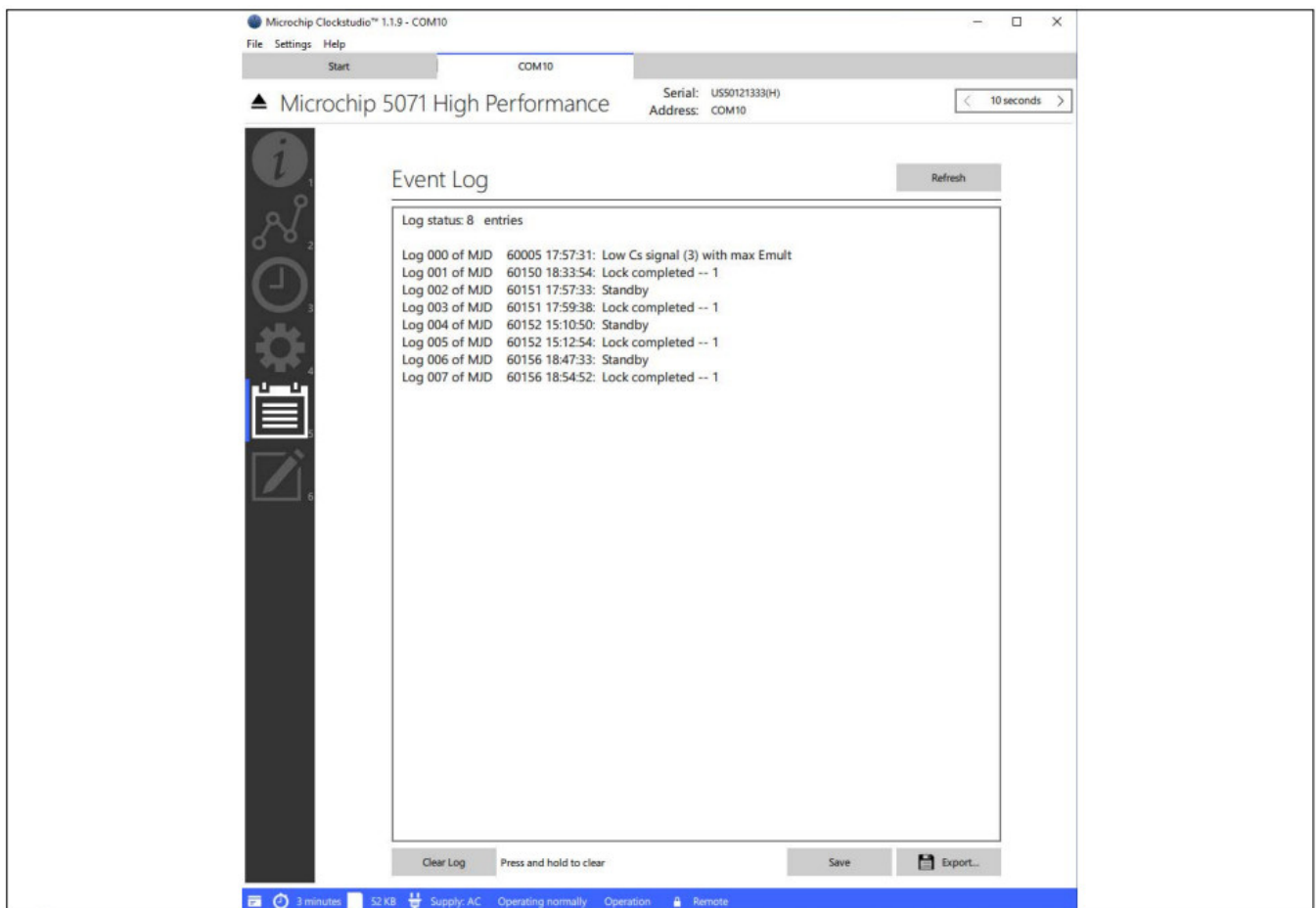


FIGURE 2-16: Event Log tool for the 5071.

2.7 STATUS BAR

The Status Bar is located at the bottom of the window. It displays data file statistics and important device status information.

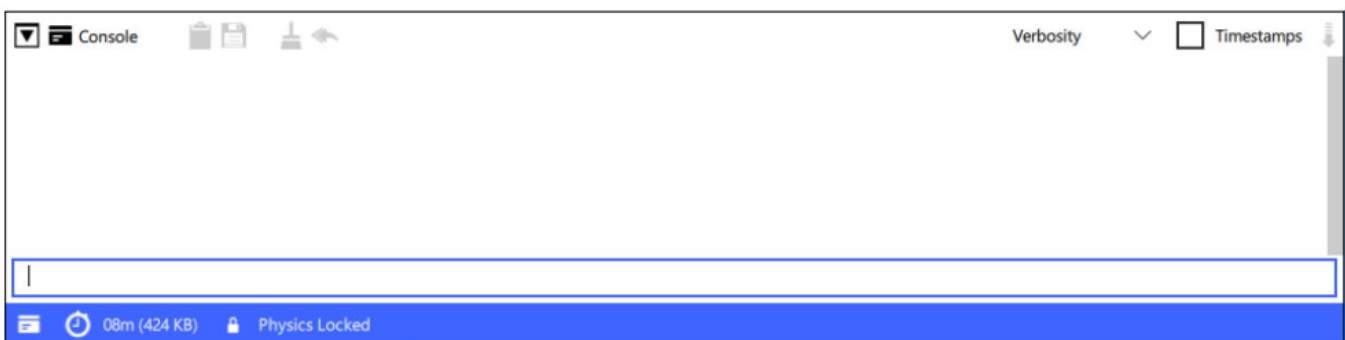


FIGURE 2-17: Status Bar Shown Below the Device Console.

The following sections describe elements that appear on the status bar, depending on the product and connection status.

2.7.1 Toggle Console

A button to open and close the console window is located on the left side of the Status bar. The console allows the user to type commands directly to the device. Refer to the product user guide for details regarding its serial command syntax and usage.

2.7.2 Capture Duration (Stopwatch Icon)

Lists the capture duration and file size of the current telemetry file. Click to reveal the data file in an Explorer window.

2.7.3 Alarms (Alert! Icon)

If the connected device has any active alarms, “Alarms” will be shown on the status bar. The presence of

critical/fault alarms will highlight the “Alarms” notification in red. Click “Alarms” to view a list of the active alarm bits and descriptions.



FIGURE 2-18: *An Active Alarm for MAC-SA5X.*

2.7.4 Physics Status (Lock Icon) (CSAC, MAC)

Displays the status of the device’s servo lock to the atoms. When the device has successfully acquired a lock, its output frequency will be stable and dependable.

2.7.5 Power Supply Status (Power Plug Icon) (5071)

Displays the 5071’s current power source: AC, DC, or Battery. If the power source is low, the notification will be highlighted in red with a warning icon. See the 5071 user’s guide for details regarding power supply.

2.7.6 Global Status (5071)

Displays the global operational status of the 5071, for example: “Standby,” “Warming up,” or “Operating normally.” If the device encountered a fatal error, the status will be highlighted in red.

2.7.7 Operation Status Conditions (5071)

The Operation button is shown on the status bar when a bit is set in the 5071’s operation status register.

Click to view a list of the active status bits and descriptions.

See the 5071 user’s guide for details regarding the operation status register.

2.7.8 Questionable Data Conditions (5071)

The Questionable button is shown on the status bar when a bit is set in the 5071’s questionable data register. Click to view a list of the active questionable data bits and descriptions. See the 5071 user’s guide for details regarding the questionable data register.

2.7.9 Continuous Operation (5071)

When the 5071’s continuous operation state is on or enabled, the Continuous Operation button is shown.

The appearance of the button reflects the appearance of the Continuous Operation light on the front panel of the device: it blinks when enabled and then remains solid when it has been reset.

Click the button while it is blinking to reset the continuous operation state.

See the 5071 user’s guide for details regarding the continuous operation light.

2.7.10 Remote (Lock Icon) (5071)

The Remote button is displayed on the status bar with a lock icon when the 5071’s remote operation mode is enabled. This mode will be initially enabled by the application, locking the user from making any changes with the front panel of the device.

Click the button at any time to disable the mode and unlock the front panel.

Remote operation mode will be automatically enabled when connecting over RS-232 again, or when making a change to the device state from the Clockstudio software tool.

See the 5071 user’s guide for details regarding Remote Operation.

2.8 TIME SERIES CHARTS

This feature is available from the Device Telemetry tool. Newly added charts will be added to the top of the window, though the order may be changed by simply clicking on the chart title and dragging the chart to the desired location. Each chart has a menu bar at the top with the following features (from left to right):

- X button to close a chart
- Telemetry Parameter name (Chart Title)
- Toggle button for x-axis units

- Toggle button for Vertical scaling
- Padlock toggle button for synchronizing x-axis view range on all charts, or using independent range
- Left-arrow button to move x-axis range to beginning of data set
- Right-arrow button to move x-axis range to end of data set

2.8.1 Adding Charts

A user may view a particular parameter as a chart by clicking the right-arrow next to a given parameter within the telemetry list.

2.8.2 Adjusting the X-Axis

All charts have the same x-axis view range by default. Adjustment of one chart's view range will adjust the other charts accordingly. However, an individual chart may have an independent (unsynchronized) x-axis when the Padlock toggle button is set to display as unlocked (unsynchronized).

Range: A mouse scroll-wheel is the easiest way to expand or reduce a chart's x-axis view range. Alternatively, one may select a pre-defined range by using the "Zoom to..." drop down list within a chart's title bar menu or use the <+> and <-> keys, when focused. Use the <0> key to zoom all the way out.

Position: The x-axis range start position may be adjusted by a left mouse drag. Alternatively, one may press the left-arrow or right-arrow buttons within a chart's title bar menu to move the range to the beginning or end of a data set, respectively.

Press the <Home> or <End> keys to jump to the beginning or end of the data series, respectively.

Units: The default x-axis units are in seconds. The units may be adjusted with the toggle button within a chart's title bar menu (Seconds, minutes, hours, days, or MJD).

2.8.3 Adjusting the Y-Axis

Range: The y-axis automatically adjusts to display the minimum and maximum y-values within the visible data range.

The range can be changed by selecting the Vertical Scaling button within a chart's title bar menu.

2.8.4 Charting Tools

Right click on a chart to set the cursor. Next to the cursor, an informational pane will display the Y value of the telemetry at the selected time (X).

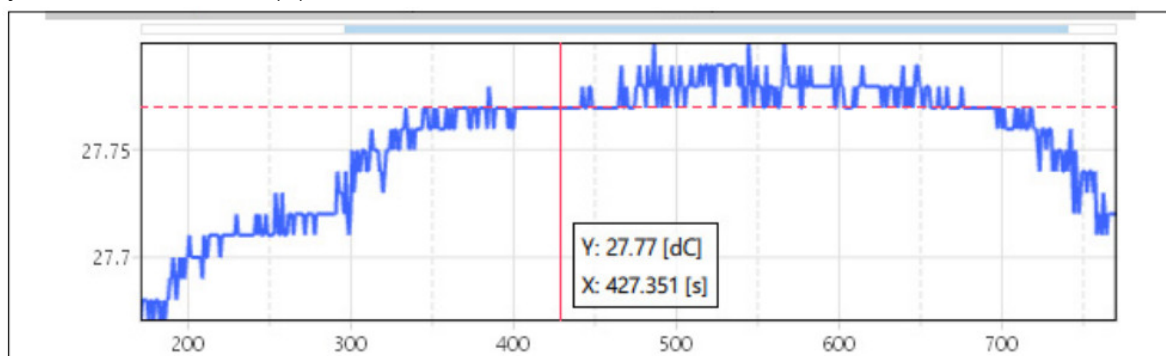


FIGURE 2-19: A Telemetry Cursor.

Select a range with right mouse press and drag, to place two cursors on the chart. An informational pane will display the time between the two cursors "dX" and the average Y value "Avg" over the selected range. A thick blue line will also display the average visually, on the chart plotting area.

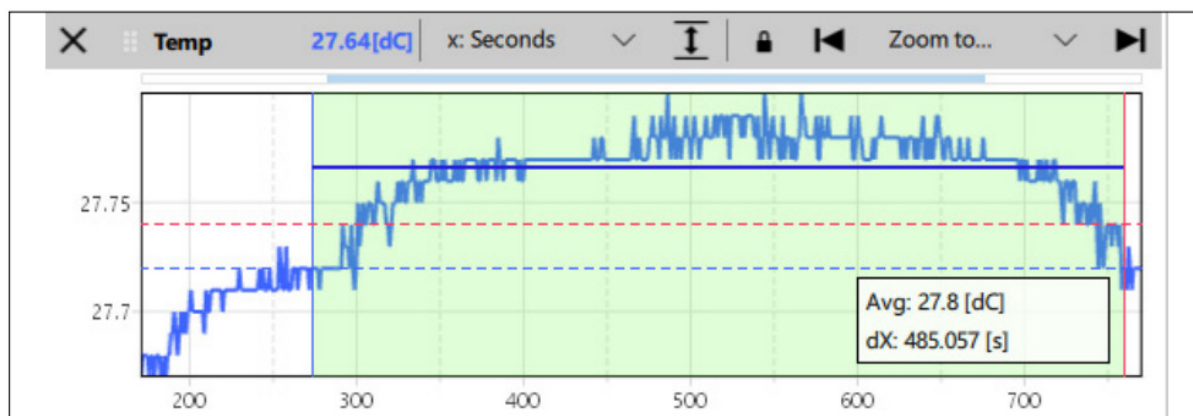


FIGURE 2-20: Two Cursors with Average.

When hovering over the informational pane with the mouse cursor, three additional buttons appear:

1. The ellipsis button toggles the displayed metric between Average and Slope.
2. The plus button zooms the chart view to the selected range.
3. The X button removes the cursors.

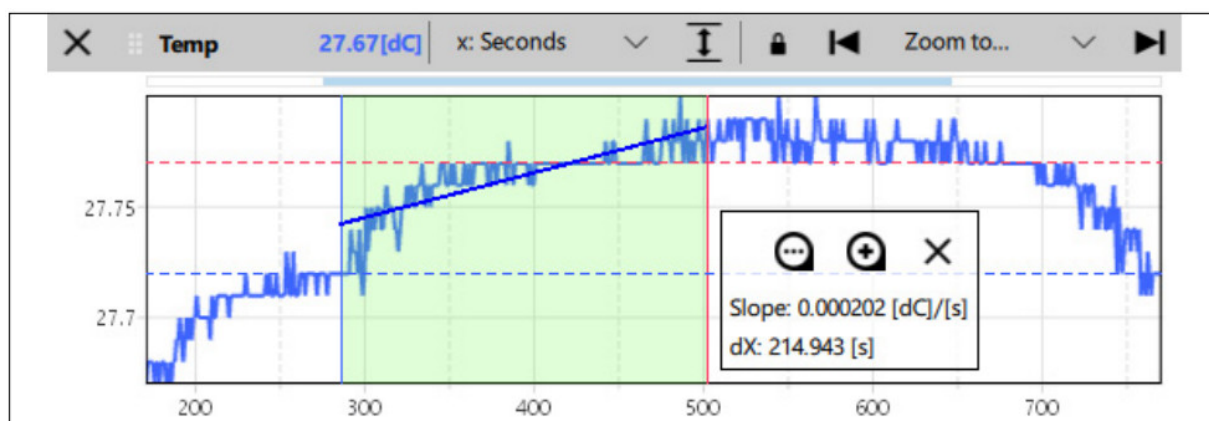


FIGURE 2-21: A Selected Range Displaying the Slope Metric.

Appendix A. Supported Instruments

The user can find more info in the Clockstudio™ application itself, including links and more. Supported devices include:

- Miniature Atomic Clock (MAC-SA5X): High performance Rb-based atomic oscillator.
- Chip Scale Atomic Clock (CSAC-SA45s and CSAC-SA65): Low-power atomic oscillator.
- Low Noise Chip Scale Atomic Clock (LN-CSAC): Low-power, low-noise atomic oscillator.
- 5071A and 5071B: Primary Frequency Standard.

Appendix B. Software Licenses

MICROCHIP SOFTWARE IS PROVIDED SOLELY TO ASSIST YOU IN DEVELOPING PRODUCTS AND SYSTEMS THAT USE MICROCHIP PRODUCTS.

DOWNLOAD AND USE OF THE SOFTWARE REQUIRE THAT YOU ACCEPT THIS SOFTWARE LICENSE AGREEMENT. TO ACCEPT, CLICK "I ACCEPT" AND PROCEED WITH THE DOWNLOAD.

IF YOU DO NOT ACCEPT, CLICK "I DO NOT ACCEPT," AND DO NOT DOWNLOAD OR USE ANY OF THE SOFTWARE. DOWNLOADING OR USING THE SOFTWARE CONSTITUTES YOUR ACCEPTANCE OF THIS SOFTWARE LICENSE AGREEMENT.

SOFTWARE LICENSE AGREEMENT

This Software License Agreement ("Agreement") is an agreement between you (if licensing as an individual) or the entity you represent (if licensing as a business) ("you" or "Licensee") and Microchip Technology Incorporated, a Delaware corporation, with a place of business at 2355 W. Chandler Blvd., Chandler, AZ 85224-6199, and its affiliates including Microchip Technology Ireland Limited, a company organized under the laws of Ireland, with a principal address at Ground Floor, Block W., East Point Business Park, Dublin, Ireland 3 (collectively, "Microchip") for the Microchip software and documentation included in the download or otherwise provided by Microchip to Licensee (collectively, the "Software").

1. **Use.** Subject to the terms of this Agreement, Microchip hereby grants Licensee a limited, revocable, non-exclusive, non-transferable, worldwide license to (a) use the Software, and (b) modify the Software provided in source code form, if any (and use and copy modifications of such Software made by Licensee), provided that in each case (with respect to clauses (a) and (b)) Licensee solely uses the Software with Microchip Products, Licensee Products, or other products agreed to by Microchip in writing. Licensee has no right to (i) substitute third party products for Microchip Products, or (ii) except as expressly provided in Section 2 below, sublicense its rights under this Agreement or otherwise disclose or distribute the Software to any third party. Licensee may make a reasonable number of copies of the Software solely as necessary to exercise its license rights in this Section 1. Licensee will not remove or alter any copyright, trademark, or other proprietary notices contained on or in the Software or any copies. "Microchip Products" means those Microchip devices purchased from Microchip or one of its authorized distributors that are identified in the Software, or if not identified in the Software, then such Microchip devices that are consistent with the purpose of the Software. "Licensee Products" means products manufactured by or for Licensee that use or incorporate Microchip Products.
2. **Subcontractors.** If Licensee wishes for its subcontractor to obtain and use the Software in order to provide design, manufacturing, or other services to Licensee: (a) such subcontractor may (i) download and agree to the terms of this Agreement or (ii) contact Microchip directly for a copy of this Agreement and agree to its terms; or (b) Licensee may sublicense the rights described in Section 1 directly to its subcontractor, provided that (i) such subcontractor agrees in writing to the terms of this Agreement – a copy of which will be provided to Microchip upon request, and (ii) Licensee is liable for such subcontractor's acts and omissions.
3. **Third Party Software.** (a) **Third Party Materials.** Licensee agrees to comply with third party license terms applicable to Third Party Materials, if any. Microchip will not be held responsible for Licensee's failure to comply with such terms. Microchip has no obligation to provide support or maintenance for Third Party Materials. "Third Party Materials" means the third party software, systems, tools, or specifications (including those of a standards setting organization) referenced in, bundled with, or included in the Software. (b) **Open Source Components.** Notwithstanding the license grant in Section 1 above, Licensee acknowledges that the Software may include Open Source Components. To the extent required by the licenses covering Open Source Components, the terms of such license apply in lieu of the terms of this Agreement. To the extent the terms of the licenses applicable to Open Source Components prohibit any of the restrictions in this Agreement with respect to such Open Source Components, those restrictions will not apply to the Open Source Component. "Open Source Components" means components of the Software that are subject to the terms of an Open Source License. "Open Source License" means any software license approved as an open source license by the Open Source Initiative or any substantially similar license, including without limitation any license that, as a condition of distribution of the software licensed under such license, requires that the distributor make the software available in source code format.
4. **Licensee Obligations.** (a) **Restrictions.** Except as expressly permitted by this Agreement, Licensee agrees that it will not (i) modify or alter the Software or a Microchip Product; (ii) adapt, translate, decompile, reverse engineer, disassemble the Software provided in object code form, any Microchip Product, or any samples or

prototypes provided by Microchip, or create derivative works thereof; or (iii) use the Software with any software or other materials that are subject to licenses or restrictions (e.g., Open Source Licenses) that, when combined with the Software, would require Microchip to disclose, license, distribute, or otherwise make all or any part of such Software available to anyone. (b) Indemnity. Licensee will indemnify (and, at Microchip's election, defend) Microchip from and against any and all claims, costs, damages, expenses (including reasonable attorneys' fees), liabilities, and losses, arising out of or related to: (i) Licensee's modification, disclosure, or distribution of the Software or Third Party Materials; (ii) the use, sale, or distribution of Licensee Products; and (iii) an allegation that Licensee Products or Licensee's modification of the Software infringe third party intellectual property rights. (c) Licensee Products. Licensee understands and agrees that Licensee remains responsible for using its independent analysis, evaluation, and judgment in designing Licensee Products and systems and has full and exclusive responsibility to assure the safety of its products and compliance of its products (and of all Microchip Products used in or for such Licensee Products) with applicable laws and requirements.

5. **Confidentiality.** (a) Licensee agrees that the Software, underlying inventions, algorithms, know-how, and ideas relating to the Software, and any other non-public business or technical information disclosed by Microchip to Licensee are confidential and proprietary information, including information derived therefrom, belonging to Microchip and its licensors (collectively, "Confidential Information"). Licensee will use Confidential Information only to exercise its rights and perform its obligations under this Agreement and will take all reasonable measures to protect the secrecy of and avoid unauthorized access, disclosure, and use of Confidential Information. Such measures include, but are not limited to, the highest degree of care that it uses to protect its own information of a similar nature, but not less than reasonable care. Licensee will only disclose Confidential Information to its employees, subcontractors, consultants, auditors and representatives (collectively "Representatives") who have a need to know such information and who have use and confidentiality obligations to Licensee at least as restrictive as those set forth in this Agreement. Licensee is responsible for disclosure or misuse of Confidential Information by its Representatives. Use of Confidential Information for personal gain, for the benefit of a third party or to compete with Microchip, whether directly or indirectly, is a breach of this Agreement. Licensee will notify Microchip in writing of any actual or suspected misuse, misappropriation, or unauthorized disclosure of Confidential Information that comes to Licensee's attention. Confidential Information will not include information that: (i) is or becomes publicly available without breach of this Agreement; (ii) is known or becomes known to Licensee from a source other than Microchip without restriction and without breach of this Agreement or violation of Microchip's rights, as demonstrated by credible evidence in existence at the time of disclosure; (iii) is independently developed by Licensee without use of or reference to the Confidential Information, as demonstrated by credible evidence in existence at the time of independent development; or (iv) is disclosed generally to third parties by Microchip without restrictions similar to those contained in this Agreement. Licensee may disclose Confidential Information to the extent required under law, rule, or regulation (including those of any national securities exchange), by subpoena, civil investigative demand, or similar process, or by a court or administrative agency (each a "Requirement"), provided, that to the extent permitted by applicable law, Licensee will provide prompt notice of such Requirement to Microchip to enable Microchip to seek a protective order or otherwise prevent or restrict such disclosure. (b) Return of Materials. Upon Microchip's request and direction, Licensee will promptly return or destroy the Confidential Information, including any physical information or materials provided to Licensee (together with any copies, excerpts, syntheses, CD ROMS, diskettes, etc.), and, in the case of information derived therefrom, provide written certification that all the Confidential Information has been expunged from any such materials or that all such materials have been destroyed. Further, if Licensee or its affiliates become competitors of Microchip, and Microchip notifies Licensee in writing of its status as a competitor in a given

market, then Licensee will promptly engage in the return and certification process described above in this Section 5(b).

6. **Ownership and Retention of Rights.** All rights, title, and interest (including all intellectual property rights) in and to the Software, including any derivative works of the Software and any incremental modifications to the Software whether made by or for Licensee or Microchip (collectively, "Microchip Property"), are and will remain the sole and exclusive property of Microchip, whether such Microchip Property is separate or combined with any other products. Licensee, on behalf of itself and its affiliates, agrees to, and does hereby, assign to Microchip or its designee all right, title and interest (including all intellectual property rights) in and to derivative works of and any incremental modifications to the Software. Licensee will take (and will cause its affiliates, their subcontractors, and all related individuals to take) all action as may be reasonably necessary, proper or advisable to perfect and secure the ownership, licenses, intellectual property and other rights of or to Microchip as set forth in this Agreement. All rights not expressly granted under this Agreement are reserved to Microchip and its licensors and suppliers, and there are no implied rights. Licensee retains all right, title, and interest in and to any technology independently developed by Licensee not derived, directly or indirectly, from the Microchip Property or any other item of tangible property provided to Licensee by Microchip hereunder.
7. **Termination.** This Agreement will start once accepted by Licensee and continue unless and until terminated as provided in this Agreement. This Agreement automatically terminates immediately if Licensee violates the restrictions set forth in Sections 1, 2 or 4(a). Microchip may terminate this Agreement immediately upon notice if (a) Licensee or its affiliates become competitors of Microchip, or (b) Licensee breaches any other term of this Agreement and does not cure such breach within 30 days after receipt of written notice of such breach from Microchip. Upon termination of this Agreement, (i) the license grants in Sections 1 and 2(b) terminate, and (ii) Licensee will return to Microchip or destroy (and certify the destruction of) all Microchip Property and Confidential Information in its possession or under its control, and all copies thereof. The following sections survive termination of this Agreement: 3, 4, 5, 6, 7, 8, 9, 10 and 11.
8. **EU Consumers – Applicable Terms.** WHERE LICENSEE IS A CONSUMER LOCATED IN EUROPE, THE FOLLOWING PROVISIONS APPLY INSTEAD OF SECTIONS 9 AND 10 BELOW: Microchip and its licensors will not be liable (a) for any loss suffered by Licensee in connection with the Software where such loss was not reasonably foreseeable when the Software was first downloaded by Licensee, even if such loss was the result of negligence or the failure of Microchip and its licensors to comply with this Agreement; or (b) irrespective of the basis of claim, for any loss of revenue, profit or other business or economic loss suffered. Some Software is made available to Licensee free of charge, and Licensee may at any time download further copies without charge to replace the Software initially downloaded and others may require a fee to be downloaded, or to download any further copies. In all circumstances, to the extent liability may lawfully be limited or excluded, the cumulative liability of Microchip and its licensors will not exceed USD\$1,000 (or equivalent sum in the currency of the country in which Licensee resides). However, none of the foregoing limits or excludes any liability for death or personal injury arising from negligence, or for fraud, fraudulent misrepresentation or any other cause that by law cannot be excluded and limited.
9. **Warranty Disclaimers.** EXCEPT FOR CONSUMERS TO WHOM SECTION 8 APPLIES, THE SOFTWARE IS LICENSED ON AN "AS-IS" BASIS. MICROCHIP MAKES NO WARRANTIES OF ANY KIND WITH RESPECT TO THE SOFTWARE, WHETHER EXPRESS, IMPLIED, STATUTORY OR OTHERWISE, AND EXPRESSLY DISCLAIMS ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, TITLE OR NON-INFRINGEMENT AND ANY WARRANTIES THAT MAY ARISE FROM USAGE OF TRADE OR COURSE OF DEALING. MICROCHIP AND ITS LICENSORS HAVE NO OBLIGATION TO

CORRECT ANY DEFECTS IN THE SOFTWARE. TECHNICAL ASSISTANCE, IF PROVIDED, WILL NOT EXPAND THESE WARRANTIES. IF CUSTOMER IS A CONSUMER, THE ABOVE WILL NOT ACT TO EXCLUDE YOUR STATUTORY RIGHTS.

10. **Limited Liability.** EXCEPT FOR CONSUMERS TO WHOM SECTION 8 APPLIES, IN NO EVENT WILL MICROCHIP BE LIABLE, WHETHER IN CONTRACT, WARRANTY, REPRESENTATION, TORT, STRICT LIABILITY, INDEMNITY, CONTRIBUTION OR OTHERWISE, FOR ANY INDIRECT, SPECIAL, PUNITIVE, EXEMPLARY, INCIDENTAL OR CONSEQUENTIAL LOSS, DAMAGE, COST OR EXPENSE OF ANY KIND WHATSOEVER, HOWEVER CAUSED, OR ANY LOSS OF PRODUCTION, COST OF PROCUREMENT OF SUBSTITUTE PRODUCTS OR SERVICES, ANY LOSS OF PROFITS, LOSS OF BUSINESS, LOSS OF USE OR LOSS OF DATA, OR INTERRUPTION OF BUSINESS ARISING OUT OF THIS AGREEMENT, HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, EVEN IF MICROCHIP HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH LOSS, AND NOTWITHSTANDING ANY FAILURE OF ESSENTIAL PURPOSE OF ANY LIMITED REMEDY. MICROCHIP'S TOTAL AGGREGATE LIABILITY UNDER THIS AGREEMENT WILL NOT EXCEED USD\$1,000.
11. **General.** (a) This Agreement will be governed by and construed in accordance with the laws of the State of Arizona and the United States, without regard to conflicts of law provisions. The parties hereby irrevocably consent to the exclusive personal jurisdiction and venue of the state and federal courts in Maricopa County, Arizona for any dispute relating to this Agreement. WHERE LICENSEE IS A CONSUMER LOCATED IN EUROPE, this Agreement is subject to the laws of the country in which the Software is downloaded, and, to the extent so mandated by such laws, subject to the jurisdiction of the courts of that country. The parties expressly disclaim the applicability of the United Nations Convention on Contracts for the International Sale of Goods in connection with this Agreement. (b) Unless the parties have a mutually executed agreement relating to the licensing of this Software by Microchip to Licensee ("Signed Agreement"), this Agreement constitutes the entire agreement between the parties with respect to the Software and supersedes and replaces prior or contemporaneous written or verbal agreements or communications between the parties regarding the Software, including any purchase orders. If the parties have a Signed Agreement, this Agreement does not supersede or replace that Signed Agreement. This Agreement may not be modified by Licensee except by a written agreement signed by an authorized representative of Microchip. Microchip reserve the right to update this Agreement from time to time and to replace the existing Agreement without notice to Licensee. If any provision of this Agreement is held by a court of competent jurisdiction to be illegal, invalid, or unenforceable, that provision will be limited or eliminated to the minimum extent necessary so that this Agreement will otherwise remain in full force and effect and enforceable. No waiver of any breach of any provision of this Agreement constitutes a waiver of any prior, concurrent, or subsequent breach of the same or any other provisions of this Agreement, and no waiver will be effective unless made in writing and signed by an authorized representative of the waiving party. (c) Licensee agrees to comply with all import and export laws and restrictions and regulations of the Department of Commerce or other United States or foreign agency or authority. (d) This Agreement will bind and inure to the benefit of each party's permitted successors and assigns. Licensee may not assign this Agreement in whole or in part, whether by law or otherwise, without Microchip's prior written consent. Any merger, consolidation, amalgamation, reorganization, transfer of all or substantially all assets or other change in control or majority ownership ("Change of Control") is considered an assignment for the purpose of this Section. Any attempt to assign this Agreement without such consent will be null and void. However, Microchip may assign this Agreement to an affiliate, or to another entity in the event of a Change of Control. (e) Licensee acknowledges its breach of any confidentiality or proprietary rights provision of this Agreement would cause Microchip irreparable damage, for which the award of damages would not be

an adequate remedy. Licensee, therefore, agrees if Microchip alleges that Licensee has breached or violated any such provisions then Microchip may seek equitable relief, in addition to all other remedies at law or in equity. (f) Consistent with 48 C.F.R. §12.212 or 48 C.F.R. §227.7202-1 through 227.7202-4, as applicable, the Software is being licensed to U.S. Government end users (i) only as Commercial Items, and (ii) with only those rights as are granted to all other end users pursuant to the terms and conditions of the applicable Microchip licenses. To the extent the Software (or a portion thereof) qualifies as 'technical data' as such term is defined in 48 C.F.R. §252.227-7015(a)(5), then its use, duplication, or disclosure by the U.S. Government is subject to the restrictions set forth in subparagraphs (a) through (e) of the Rights in Technical Data clause at 48 C.F.R. §252.227-7015. Contractor/manufacturer is Microchip Technology Inc., 2355 W. Chandler Blvd., Chandler, AZ 85224-6199.

Questions about this Agreement should be sent to: Microchip Technology Inc., 2355 W. Chandler Blvd., Chandler, AZ 85224-6199 USA. ATTN: Marketing.
v.11.12.2021

Worldwide Sales and Service

AMERICAS

Corporate Office

2355 West Chandler Blvd.
Chandler, AZ 85224-6199

Tel: 480-792-7200

Fax: 480-792-7277

Technical Support: <http://www.microchip.com/support>

Web Address: www.microchip.com

Canada – Toronto

Tel: 905-695-1980

Fax: 905-695-2078

ASIA/PACIFIC

Australia – Sydney

Tel: 61-2-9868-6733

ASIA/PACIFIC

India – Bangalore

Tel: 91-80-3090-4444

EUROPE

UK – Wokingham

Tel: 44-118-921-5800


Fax: 44-118-921-5820



DS50003423B-page 41

© 2022 – 2023 Microchip Technology Inc. and its subsidiaries

Documents / Resources

	<p>MICROCHIP DS50003423B Clock Studio Software [pdf] User Guide DS50003423B Clock Studio Software, DS50003423B, Clock Studio Software, Studio Software, Software</p>
---	---

References

-  [Microchip Lightning Support](#)
-  [Markdown Reference](#)
-  [Empowering Innovation | Microchip Technology](#)
-  [Quality | Microchip Technology](#)
-  [Microchip Lightning Support](#)
-  [Client Support Services | Microchip Technology](#)
- [User Manual](#)