

MICAS-X Student Edition Manual

version 2.1

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1 Introduction

MICAS-X SE (Student Edition) is a limited license of the MICAS-X program intended for undergraduate and graduate level students in science, engineering, and related disciplines. MICAS-X SE is a highly configurable framework that allows many experiments to be run with little or no programming. In addition, it allows custom modules to be included for expanded functionality. The Student Edition is limited to a sub-set of all the existing modules available for MICAS-X, but those modules can be added as needed, at a significant discount for student users.

2 Getting Started

MICAS-X SE comes with two demo configuration files: SE Ramp Demo.ini and SE Daq Demo.ini. To select which configuration file to use, run the MICAS Configuration Editor program, read the desired configuration file, and then press the “Mark as Start-up File”. After exiting the Configuration Editor, run MICAS-X, and the selected configuration file will be used.

Each configuration file comes with an mDoc document explaining how to use it. This document will be shown in the Document Display tab of MICAS-X. In addition, videos are available online which step through MICAS-X SE. Also, be sure to refer to this document for information specific to the Student Edition of MICAS-X, as well as to the User Manual and Programming Manual for MICAS-X. All three manuals are supplied with the Student Edition, and can also be found on the Original Code Consulting website.

3 Included Modules

The Student Edition of MICAS-X includes the following modules and features:

Modules – These features are built in to MICAS-X.

Acquisition	Controls Drivers for data input and output. Drivers can be assigned to different loops with different cycle times.
Commands	More than 50 commands that can be used in Sequences, Triggers, Scripts, and from the User Interface.
File Writing	Any number of user-defined data files of any channels, as well as the .tdms file which always logs data in the background.
Quick Graphs	Time-series graphs which can be defined and created at run-time.
Scripts	Text files that provide additional features beyond normal Sequences.
Sequences	User-defined recipes or sets of Commands that can be used to run experiments, define instrument states, and more.
Triggers	User-defined actions that automatically execute when the condition is met.
Log File	Time-stamped text entries of major events and errors that occur while the program is running.

Drivers – Drivers allow MICAS-X to communicate with hardware or to create “virtual” channels that can be used as variables or for user interaction.

Array	Creates a look-up table that can be used programmatically inside MICAS-X.
Calculations	Allows user-created calculations to be included in MICAS-X through a simple interface.
Document	Controls the Document Display, which displays custom documentation or instructions within MICAS-X.
Equations	Creates new channels, the values of which are based on existing channels used within user-defined formulas.
Manual	Creates virtual channels that the operator can use to manually enter data, or which can be used with other Drivers.
NIDaqAD	Acquires analog input data from National Instruments Daq devices.
NIDaqDA	Controls analog output data with National Instruments Daq devices.
NIDaqDI	Acquires digital input data from National Instruments Daq devices.
NIDaqDO	Control digital output data with National Instruments Daq devices.
SE Driver1	This is a template Driver to which the user can add any desired functionality by programming it in LabVIEW.
SE Driver2	This is a template Driver to which the user can add any desired functionality by programming it in LabVIEW.
SE Driver3	This is a template Driver to which the user can add any desired functionality by programming it in LabVIEW.

Sequences	This Driver adds functionality to the Sequences module.
Timers	Creates virtual channels that count up or down in time as the program runs.
Triggers	This Driver adds functionality to the Triggers module.

Displays – These modules add data displays to MICAS-X.

3Graphs	Contains three time-series graphs that each can display two channels of data.
Big Display	Provides large-font displays of key channels for easy viewing from a distance.
Document Display	Displays custom documentation or instructions within MICAS-X.
SE Display	This is a template Display which can be customized by the user.
Sequences Display	Displays all the defined sequences and scripts and their current status.

Instruments – Modules intended for controlling more complex hardware.

SE Instrument	This is a template Instrument which can be customized by the user.
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Utilities – Programs that work with MICAS-X, either inside or outside of the MICAS-X program.

Configuration Editor	Provides a graphical interface for editing the configuration file which defines how MICAS-X will run.
Data Reader	Reads and displays user-defined data files written by MICAS-X.
Log Reader	Displays the log files created by MICAS-X.
mDoc Editor	This Utility is used to create and edit the mDoc files which the Document Display and Document Driver utilize.
TDMS File Reader	Reads and displays the .tdms file that MICAS-X is always writing.

A recent list of available modules is shown on the OCC website, and new modules are constantly being developed.

4 Configuration and Licensing Considerations

MICAS-X SE is a limited license of the MICAS-X program. As with all versions, it comes with a USB thumb drive that acts as the license key. Because of its limited nature, MICAS-X SE will not start without the license key present. In addition, the configuration file imposes licensing limitations on the program. In particular, one cannot edit the configuration file outside of the Configuration Editor utility. If the file is edited in a text editor, it will become unusable with MICAS-X SE. The modules which can be used with MICAS-X SE are limited to those in the above list. If other modules are needed,

contact Original Code Consulting, and those modules can be added with our assistance, for an additional (discounted) price. Finally, the New Configuration File function in the Configuration Editor does not work in the SE version of the program. Instead, choose an existing SE configuration file that most closely matches what you want to have in your new configuration file, then use the Save As function in the Configuration Editor to create a new copy with a new name. Finally, load and edit that new file, adding and removing functionality as needed to create your new configuration.

Note that MICAS-X SE configuration files CAN be used in the full licensed version of MICAS-X without any issues.

5 Expanding MICAS-X SE

As mentioned above, MICAS-X SE comes with a limited set of modules. Although these modules will allow many experiments to be configured and executed successfully, it is quite common to need additional functionality. Additional modules from Original Code Consulting can be added to MICAS-X at a discount by contacting OCC. In addition, it is also possible to write your own custom code. This section describes how to add your own modules.

5.1 MICAS-X and Modules

Note that the main MICAS-X program as well as some of its sub-VIs are password protected. It should not be necessary for you to edit these parts of the MICAS-X framework. If any bugs are found in this part of the program, OCC will be glad to address them.

Similarly, the main Modules of MICAS-X, such as Commands, Sequences, Triggers, and so on, are not intended to be edited by the end user. You can open some of these modules to see how they were written, but it is advised that you check with OCC if you feel that changes to these Modules need to be made.

MICAS-X is highly extensible, and can accommodate user written code in several places. Users can write their own Calculations, Drivers, Display, Instruments, and Utilities (though the SE license does not support user-created Utilities that run inside MICAS-X).

5.2 Calculations

The Calculations Driver, which is included in MICAS-X SE, allows for custom LabVIEW code to be included in the program in a fairly simple way. The purpose of this Driver is to allow for more complex channel-based calculations than the Equations Driver is capable of. This is implemented by creating your own Calculation VI. Open the Demo Calculation.vit in the MICAS-X\Calculations\Demo Calculation folder to see an example. Copy this VI into a new folder. Give it a new name, and make sure to name the folder exactly the same (except without the .vi or .vit extension). If the new Calculation is

given a .vi extension, you will only be allowed to instantiate it once in a MICAS-X configuration. This is necessary when the Calculation VI contains resources that cannot be shared by more than one instance. If it is given a .vit extension, you will be able to use it more than once in a MICAS-X configuration, but care must be given in order to avoid such shared resources.

In the block diagram of the new Calculation, add your custom code. On the front panel, add information in the Description string about what the calculation does, what the required input channels are, and how many output channels will be created. Use the Save as Default function to save this new Description text.

Once you have successfully completed the development of your calculation, it will show up as an Available Calculation in the Calculations Driver configuration editor.

5.3 Drivers

Only Drivers, Displays, Instruments, and Utilities that are defined as being allowed within the SE license can be configured and run with the SE license. In order to allow the user to create their own Drivers for custom code, the SE license comes with three “dummy” Drivers already created, named “SE Driver1”, “SE Driver2”, and “SE Driver3”. By editing these existing Drivers and adding custom code to interface with new instruments and devices, the SE license allows the user to expand beyond its default functionality. Within the full MICAS-X license, a new Driver would be given a descriptive name indicative of its function. For the SE license, you must retain the above Driver names, or contact OCC in order to configure your license to allow different Driver names.

To create your new Driver, open one of the three dummy Drivers and review its structure. Also review the MICAS-X Programming Manual, which has instructions for create a new Driver for the full license. Using the Programming Manual and other existing Drivers for guidance, it should not be hard to create your own Driver functionality.

5.4 Displays, Instruments, and Utilities

A custom Display or Instrument for the SE license can be created in a way similar to the Drivers described above. “Dummy” SE Display” and “SE Instrument” Modules are provided with the SE license to allow custom-programmed functionality for Displays and Drivers.

Utilities are designed so that they can be run within MICAS-X from the Utilities menu, or outside of MICAS-X either as source code inside LabVIEW or as executables. With the SE license, the end user can create their own Utilities, but these custom Utilities will not appear within MICAS-X in the Utilities menu.