THE EICASLAB TOOLS MANAGER

MASTER is the EICASLAB tools manager specifically devoted to manage the powerful features and tools that EICASLAB provides to support the designer in all the phases of the control design process.

The MASTER tool is available in the EICASLAB base.

MASTER OVERVIEW

MASTER is the core of the EICASLAB suite that manages the EICASLAB base and all the EICASLAB modules.

MASTER allows to manage the EICASLAB projects and runs, for each control design phase, suitable and powerful software tools necessary to develop, test and validate the overall control algorithms.

PROJECT MANAGEMENT

By means of the *Project Manager*, the MASTER tool allows to perform the general operations on the EICASLAB projects such as creating, opening, saving and removing them.

Moreover, the MASTER tool automatically traces the project history by recording a set of general information such as the name of its author, its creation time and its last access time. Besides, for each project, the user can create a report containing any information related to the project itself in order to trace all the relevant changes applied, for allowing a fast recovery of a validated previous version of a project.

PROJECT SHARING AND INTELLECTUAL PROPERTY RIGHTS (IPR) PROTECTION

EICASLAB is a multi-user environment that allows an easy and friendly data and project sharing among EICASLAB users. Data sharing sometimes implies the need of protecting some parts of project for guaranteeing the *Intellectual Property Rights* (IPR) of the users that developed them.

MASTER Highlights

- **Full management of the powerful tools and features provided by EICASLAB**

- **Advanced EICASLAB Project Manager tool**

- **Data sharing and Intellectual Property Rights (IPR) protection**

- **Fully assisted compiling process**

Tool Management

Data and project sharing in EICASLAB may be performed through the MASTER tool that always guarantees the data and the IPRs protection. In fact it is possible to create project archives protected with a password and/or sharing parts of projects with suitable restrictions. The highest restriction level allows other users to know only the inputs and outputs of the protected parts. In this way every user has enough information to develop its part, always having a guaranteed IPR.

CONTROL DESIGN PHASE MANAGEMENT

EICASLAB drives you step-by-step along all the control design phases, starting from modelling and simulation, moving to the rapid control prototyping, ending to the automatic code generation for the final target, the hardware-in-the-loop and the final in-field validation tests. For this purpose, EICASLAB provides three specific operative modes:

• *Modelling and Like Real-time Simulation*, the EICASLAB operative mode specifically studied for supporting the user in designing the overall control strategy and preliminary assessing its performance in a powerful simulated environment, able to faithfully emulate "**like real-time**" the expected final software and hardware architecture. For running this operative mode, you only need a standard PC equipped with Linux or Windows O/S and the EICASLAB suite installed.

• *Rapid Control Prototyping* **(RCP)**, the EICASLAB operative mode where the designer can validate the same control code (Application Software) already tested in "like real-time" simulation, now **executing it in real-time** by using the EICASLAB RCP platform (a single standard multi core PC, equipped with the EICASLAB suite, a Linux RTOS and suitable hardware input/output devices) able to **pilot the real plant**. The operative mode includes the automatic code generation of the Basic Software necessary to manage the RCP Platform.

• *Target*, the EICASLAB operative mode that allows the designer:
  • to automatically generate the Basic Software necessary to run in the final hardware target the same control code (Application Software) already tested in the previous operative modes;
  • to execute in real-time the hardware-in-the-loop and on-field validation tests.

MASTER runs specific tools for managing the different control design phases:

• **SIMBUILDER**, which helps the user in developing control algorithms and configuring the simulation environment for testing the designed control system;

• **SIM**, which enables like real-time simulations of the EICASLAB project and allows the evaluation of the achieved performance;

• **MPI/CPO Manager**, which provides model parameter identification and control parameter optimisation features for control system design;

• **POST**, which allows the offline analysis of the trials results;

• **RCP Manager**, which manages the EICASLAB Rapid Control Prototyping process;

• **Slow Motion**, which allows to repeat offline the experimental trials with the capability to debug step-by-step the same code that worked on field;

• **HIL Manager**, which manages the hardware-in-the-loop process.

• **Target Manager**, which manages the on-field final validation tests process;

MASTER tool

EICASLAB TOOLS MANAGEMENT

Run SIMBUILDER for project design

For designing the control system, MASTER runs SIMBUILDER that is the tool where the user may implement the accurate model of the plant, design the control architecture, develop the control algorithms and set the scheduling constraints of all the activities. The possibility of setting the scheduling for each activity is one of the most innovative aspects provided by EICASLAB, since it allows managing complex systems based on multi-processor and multi-hierarchical control architectures.

Run the Assisted Compiling Process

MASTER integrates a specific tool that provides an *Assisted Compiling Process*, that carries out the following three steps:

1. automatic code generation of software functions (including user code and EICASLAB management code) necessary for creating an executable file, starting from the project designed in SIMBUILDER. Such an executable file will be then automatically loaded when the user runs one of the EICASLAB tool managing like real-time simulations and real-time experimental trials execution: SIM, RCP Manager, Slow Motion, HIL Manager and Target Manager;
2. generation of the *makefile*;
3. compiling process, that provides full support to the user by reporting the messages displayed by the compiler.

MASTER runs the compiler selected by the user and displays a compiling report including the list of errors and warnings found in the user ANSI C code. Furthermore MASTER provides a *Project Warning Window* showing the inconsistencies in the graphical model implemented in the SIMBUILDER (e.g. missing connections between blocks).

Run SIM for project simulation

For verifying the performance of the system designed in SIMBUILDER, MASTER runs the SIM tool that performs the simulation of the overall designed project components.

Debug SIM

The MASTER tool allows to run SIM controlled by the debugger preferred by the user, in order to debug the overall source code and easily solve bugs.

Run MPI/CPO model parameter identification and parameter control optimisation

When the MPI/CPO module is enabled, MASTER runs SIM integrated with the MPI/CPO tool that allows running a smart procedure for identifying the parameters of the plant model and/or optimising control parameters. If the RCP module is also enabled the MASTER runs the RCP Manager tool integrated with the MPI/CPO tool.

Run POST for post-processing analysis

MASTER runs the POST tool specifically conceived for performing the post-processing analysis of the data recorded during the like real-time simulations and the experimental trials execution.

Run RCP Manager for Rapid Control Prototyping on field

When the RCP module is enabled, MASTER runs the RCP Manager tool which manages all the steps for performing in real-time RCP on field activity, that is a very important and strategic control design phase for testing and iterating the control strategies on a single PC, equipped with real-time operating system and input/output devices.

Run Slow Motion for repeating offline the trials performed on field

When the RCP module is enabled, MASTER runs the Slow Motion tool which carries out, step-by-step and variable by variable, the analysis of the control software performance run during the RCP on field activity. The user can repeat offline the experimental trials and then debug the same code that ran in field.

Run the hardware-in-the-loop

When the HIL/FVT module is enabled, MASTER runs the hardware-in-the-loop, where the control algorithms run on the final target suitable connected with the EICASLAB RCP platform, where the simulated plant is executed. The overall process is managed by the HIL Manager tool that provides in real-time direct visual feedback and data recording capabilities.

Run the final validation tests

When the HIL/FVT module is enabled, MASTER runs the final validation tests, where the target hardware is programmed with the generated code and it commands the real plant. If needed, the EICASLAB RCP platform can be suitable connected to the target as host PC for monitoring system. The overall process is managed by the Target Manager tool.
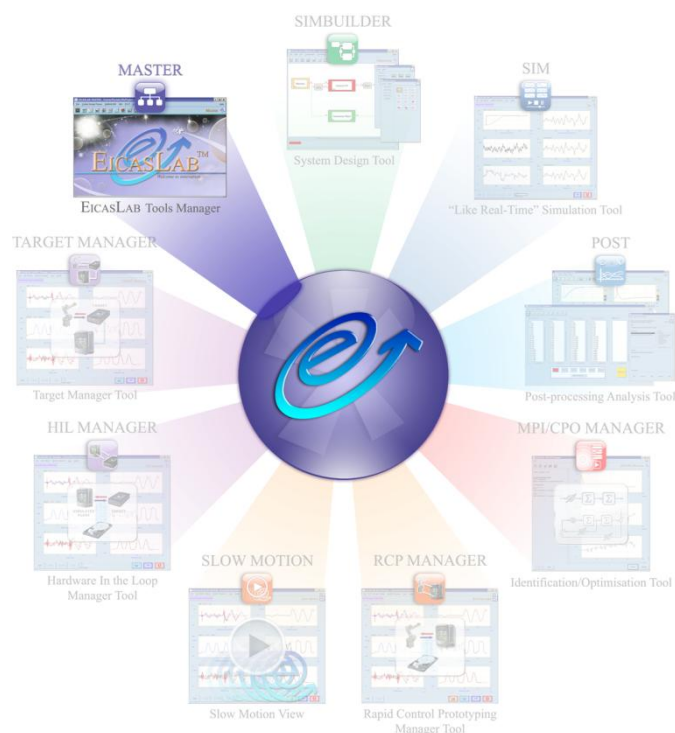
MANUAL, DOCUMENTATION AND ONLINE SUPPORT

The MASTER tool provides all the necessary support to get started, use and maintain the EICASLAB software in order to guarantee our Customers the suitable level of assistance they need:

- a specific chapter of the EICASLAB User Manual is devoted to illustrate the overall MASTER capabilities for helping the user to make profit in using the EICASLAB software;

- the EICASLAB website can be directly accessed to get information, to contact us, to buy new EICASLAB software modules and extend the capabilities of your professional control design suite;

- the online support is always available to receive your requests in terms of services and/or assistance, in order to provide all the support you need;

- the *Check for Update* feature maintains your software suite permanently up-to-date, by downloading and automatically installing the new patches and software releases that solve problems and improve the performance of your EICASLAB;

- an *Install New Modules* feature takes care to install in the EICASLAB suite the new software modules you got online.

Our service support is always at disposal of our Customers with the aim to guarantee the best assistance.

Welcome to EICASLAB Suite.
Welcome to Innovation!

EICAS Automazione S.p.A.

excellence and passion
in automatic control design