

INTRODUCTION

The *groov*® EPIC Learning Center Package is designed for the *groov* EPIC Learning Center (part number GRV-EPIC-LC). The package contains files, grouped into projects, that can help you learn how to create control programs that run on a *groov* EPIC processor and interact with *groov* I/O modules. The Learning Center and these files complement the *groov* EPIC® Training Series, our FREE online training course, which is available at training.opto22.com.

VERIFY VERSION COMPATIBILITY

Because the online training courses evolve along with the Opto 22 product line, it's important to make sure that the version of the Learning Center Package that you downloaded is compatible with the firmware installed on your Learning Center.

The Opto 22 website always provides the most recent version of the package. If you want to keep older versions available for your reference, save a local copy of the older versions of the package.

Version 2.0 of the *groov* EPIC Learning Center Package requires the following minimum versions of software and firmware:

- *groov* EPIC Firmware 3.1.0
- CODESYS® Development System 3.5.16, Patch 4
- Opto 22 CODESYS Library Package 2.0.1.1
- PAC Control 10.3
- PAC Display 10.3

Check the version of firmware on the *groov* EPIC processor mounted on your Learning Center:

1. If your *groov* EPIC Learning Center is not on, turn it on and log in with a user ID with system level privileges.

If this is the first time you turn on the groov EPIC Learning Center, you'll need to create the first system user ID. For important information regarding this user ID, watch the online lesson "Creating the First Administrator Account" or see "Creating the First System User ID and Finding the Hostname" on page 4.

2. In *groov* Manage, click or tap Info and Help > About.
3. In the EPIC section, if the System Version is 3.1.0-b14 or higher, your *groov* EPIC processor is at the correct level of *groov* EPIC Firmware. If it is lower, you'll need to update the firmware. For instructions on updating the firmware, watch the video "[Installing a System Update](#)" or see "Updating Firmware on a *groov* EPIC" in the *groov* EPIC User's Guide (form 2267).

WORKING WITH THE *groov* EPIC LEARNING CENTER PACKAGE

The files in the package are for your reference and development. Here are a few ideas on how to work with them:

- As you complete courses in the online training, compare your project files with the files in the package. This is another way to check whether the results you achieve are similar to what you may find in completed and functioning project files.
- If you have working knowledge and experience with the software and firmware listed in "[Verify Version Compatibility](#)" on page 1, you can probably skip the instructions in "[Running Projects on the groov EPIC Processor](#)" on page 4, which provide step-by-step instructions on installing and running the project files.

You can install the projects on your own, then run the projects to review the programming, organization, and functionality featured in the projects.

- If you have expert knowledge with the software and firmware listed in [“Verify Version Compatibility” on page 1](#), you can install the project files and modify them to give yourself a jump-start on creating a Proof of Concept project.
- If you are familiar with PAC Control programming and want to learn more about creating IEC61131-3 compliant programs, note that the I/O in the CODESYS project files have the same names as the I/O in the PAC Control project files.

PROJECT DEPENDENCIES AND PREREQUISITES

Review the following list to understand the dependencies between the projects included in the Learning Center Package, as well as any prerequisites required by a project:

- **CODESYS**—This project associates the devices and sensors on the Learning Center's load panel to the I/O channels. The project includes examples of a Ladder Diagram and Structured Text. The files for this project are in the CODESYS Complete folder. You also need [CODESYS Development System](#) installed on your computer.
- **groov View**—This project runs a *groov View* HMI for the strategy in the PAC Control Strategy project, and has Data Stores that work with the Node-RED project flows and the MQTT online lessons. If you want to run this project, you must install and run the PAC Control strategy first. The files for this project are in the *groov View* Complete folder.
- **Node-RED**—The flows in the Node-RED project write to the PAC Control strategy and provide data for the Weather page of the *groov View* project. If you want to run this project, you must install and run the PAC Control strategy first. The files for this project are in the Node-RED Complete folder.
You will also need to create an OpenWeather account and obtain an API key. For instructions, see [“Creating an OpenWeather Account and Obtaining an API Key” on page 3](#).
- **PAC Control Strategy**—This strategy runs the logic that controls the interaction between the devices and sensors on the Learning Center's load panel and the HMI (*groov View* or PAC Display). If you want to run the *groov View* project, the Node-RED project, or the PAC Display project, you must install and run the PAC Control strategy first. The files for this project are in the PAC Control Strategy Complete folder. You also need [PAC Control](#) installed on your computer.
- **PAC Display Project**—This project runs a PAC Display HMI for the strategy in the PAC Control Strategy project. If you want to run this project, you must install and run the PAC Control Strategy project first. The files for this project are in the PAC Display Project Complete folder. You also need [PAC Display](#) installed on your computer.

UNCOMPRESSING THE *groov* EPIC LEARNING CENTER PACKAGE

The Learning Center Package is a compressed file. Uncompress the file to your computer, making note of the path where you uncompressed the files. You will need this path information when you install and run the projects.

BACKING UP PREVIOUS WORK

If you already worked with your *groov* EPIC Learning Center and want to save any work you've done, review the instructions in “Backing up Your *groov* EPIC Processor” in the [groov EPIC User's Guide](#) (form 2267) to create a back up of your work.

SETTING UP YOUR COMPUTER

If you want to run the PAC Control, CODESYS, or PAC Display projects, you'll need to install the corresponding software on your computer. The PAC Control and PAC Display software is available for download from the Opto 22 website (www.opto22.com). The CODESYS software is available from the CODESYS Store (us.store.codesys.com).

When you received your *groov EPIC* Learning Center, it included a printed document called *groov EPIC Learning Center Setup* (form 2311). The back page of that document included instructions on installing:

- PAC Project, which installs PAC Control and PAC Display
- CODESYS Development System and the Opto 22 Library Package for CODESYS Development System

Review the installation instructions in that document. If you can't find that document, you can [download it from our website](#) or follow the instructions in the following online resources:

- [PAC Project Basic](#) download page on www.opto22.com. The PAC Project Basic software package installs PAC Control, PAC Display, and several other software applications. Review the description, particularly where it describes how you indicate which applications you want to install.
- To install CODESYS Development System and the Opto 22 Library Package for CODESYS Development System, go through the online course "[Getting Ready to Use CODESYS](#)."
- Another resource for instructions on installing CODESYS Development System and the Opto 22 Library Package for CODESYS Development System is the *groov EPIC User's Guide* (form 2267). Follow the instructions in the first three sections of "Chapter 8: Configure CODESYS and *groov EPIC* for IEC61131-3":
 - Obtaining Your CODESYS Activation Key Certificate and Ticket ID
 - Downloading and Installing CODESYS Development System
 - Adding the Opto 22 Library Package to CODESYS Development System

NOTE: Typically, if you download the most recent versions of this software from their respective websites, they can run any version of the groov EPIC Learning Center Package. However, if you already have a version of these software products installed on your computer, find the version number of the installed software and compare it to the compatibility table in "[Version History](#)" on page 9 to make sure the software can run the projects.

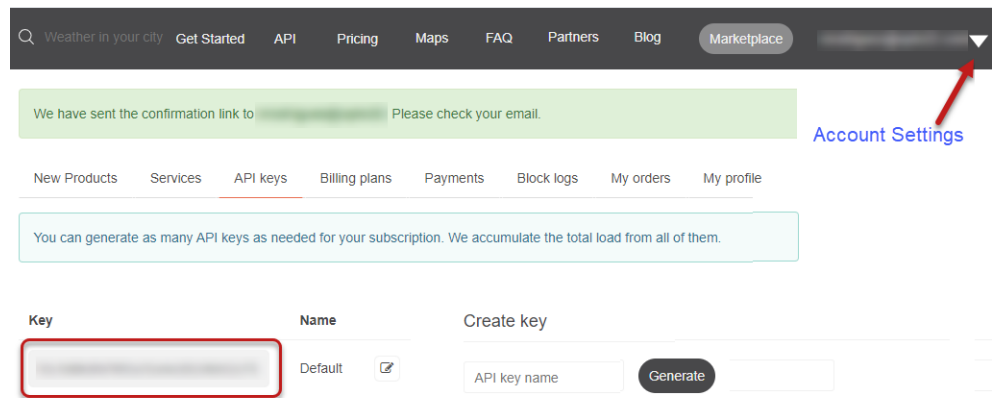
CREATING AN OPENWEATHER ACCOUNT AND OBTAINING AN API KEY

If you want to run the Node-RED project, you need to create an OpenWeather account and obtain an API key.

Go through the online course "[Getting Weather Data with an API String and Browser](#)" or follow these steps:

1. Go to the OpenWeather website (<https://home.openweathermap.org>).
2. Follow the instructions on the website to sign up/register for an account.

After you confirm your email address and log in with your new account, the OpenWeather website shows you your API key (blurred in the following image), under your Account Settings > My API Keys.



3. Highlight the API key and press CTRL+C to copy the text to the computer’s clipboard.
4. Open your favorite text editor and paste the secret key into the editor. Save it with a filename like `OpenWeatherMap_API.txt`. You may want to save the file in a secure location.

When you are preparing the Node-RED project, you’ll need the OpenWeather API key when you get to “Configure Nodes” on page 7.

CREATING THE FIRST SYSTEM USER ID AND FINDING THE HOSTNAME

In any of the following situations, you will need to create a new system user ID:

- Turning on a new *groov* EPIC Learning Center for the first time.
- Turning on a *groov* EPIC Learning Center after installing a firmware update.
- Resetting a *groov* EPIC processor to factory defaults.

To create a system ID for the first time, go through online lesson “[Creating the First Administrator Account](#).” Create this user ID with a password that follows strong security recommendations. This user ID is the first administrator level user for your Learning Center. **Remember it!** *groov* EPIC does not provide a way to recover a lost password or username.

You can find the *groov* EPIC’s *hostname* if you did not note it when you turned on the Learning Center for the first time. It’s on the Network page of *groov* Manage (Home > System > Network).

RUNNING PROJECTS ON THE *groov* EPIC PROCESSOR

The instructions in this section take you step-by-step through installing and running each project.

Running the PAC Control Project

Make sure you have PAC Control installed. (See “[Setting Up Your Computer](#)” on page 3.)

1. Start PAC Control in Config mode.
2. Load the strategy.
 - a. In PAC Control, click File > Open Strategy.
 - b. Navigate to the folder where you uncompressed the Learning Center Package and open the PAC Control Strategy Complete folder.

- c. Select `Cstore.idb` and click Open.
3. Set the Control Engine to the *groov* EPIC processor on your Learning Center.
 - a. Expand the Control Engines folder in the Cstore strategy tree by clicking the + sign.
 - b. Double-click `EpicLC`.
 - c. In the Configure Control Engines window, click Add.
 - d. Find your *groov* EPIC Learning Center in the Select Control Engine window, select it, and click OK. If you haven't configured a control engine, click Add to add one.

For help, go through the online lesson "[Adding and Configuring a Control Engine.](#)"
 - e. Click Set Active in the Configure Control Engines window.
 - f. Click OK to close the Configure Control Engines window.
4. Open the charts.
 - a. Expand Charts in the strategy tree by clicking the +.
 - b. Double-click the Freezer Monitor chart to open it.
 - c. Maximize it.
 - d. Open all of the other charts.
5. Save changes and run the strategy.
 - a. Click File > Save Strategy.
 - b. Click Mode > Debug. In the Download Warning window, click Yes to acknowledge the warnings or notifications and download the strategy to the processor.
 - c. Click Debug > Run to run the strategy.


Running the PAC Display Project

Make sure you have PAC Display installed. (See "[Setting Up Your Computer](#)" on page 3.)

1. Start PAC Display Configurator.
2. Load the PAC Display project and select the control engine and strategy.
 - a. In PAC Display Configurator, click File > Open Project.
 - b. Navigate to the folder where you uncompressed the Learning Center Package and open the PAC Display Project Complete folder.
 - c. Select `Learning_Center.UUI` and click Open.
 - d. In the Cannot find the strategy file window, click OK.
 - e. In the Control Engines window, select `EpicLC`, then click Replace.
 - f. In the Primary Control Engine field of the Control Engine Properties window, click Browse.
 - g. In the Select Control Engine window, select your *groov* EPIC Learning Center control engine in the Configured Control Engines list, then click OK.
 - h. In the Strategy field, click Browse, navigate to the PAC Control Strategy Complete folder, select `Cstore.idb`, and click Open.
 - i. Click OK to close the Control Engine Properties window.
 - j. Click OK to close the Control Engines window.
3. Save the project and run it.
 - a. Click File > Save Project and Load Runtime.
 - b. If a message appears indicating PAC Display needs to regenerate all IO scanner tag names, click OK. The Event Log Viewer displays a message indicating the date and time that the PAC Display runtime was started, as well as the version.
 - c. Click OK to close the window.

The PAC Display project is running. You can click through the interface to interact with the screen, as well as interact with the load panel to observe changes on the PAC Display HMI.

Running the *groov* View Project

1. Connect to your *groov* EPIC processor from a browser.
 - a. Open a browser and type in the hostname of your Learning Center in the URL bar:
`https://<hostname>`
 - b. Log in with the system user ID and password you created in [“Creating the First System User ID and Finding the Hostname”](#) on page 4.
2. Start *groov* View and load the *groov* View project.
 - a. In the *groov* Manage Home page, click *groov* View.
 - b. Click the menu button (), then choose Switch to Build mode.
 - c. Click File > Restore Project from Computer.
 - d. In the Restore Project window, click Browse.
 - e. Navigate to the folder where you uncompressed the Learning Center Package and open the *groov* View Complete folder.
 - f. Select `groov-View_COMPLETE_v2.0.tar.gz` and then click Open.
 - g. In the Restore Project window, type in `opto` for both the user name and password.
 - h. Click Restore.
 - i. Click OK to restore the project window.
3. Set the Controller Address to the *groov* EPIC processor on your Learning Center.
 - a. From the *groov* Build menu, select Configure > Devices and Tags.
 - b. Highlight CStore, and click Edit Device.
 - c. Verify that the Controller Address is set to either localhost, the hostname, or the IP address of your *groov* EPIC Learning Center's processor.
4. Click File > Save All Changes and Switch to *groov* View.
The *groov* View project is now running.
5. Click the navigation icon.
The *groov* View pages are divided into two page categories. The C-Store 001 category has pages that are animated with simulated data. The Learning Center category has pages that are animated with tags that are connected to the *groov* EPIC Learning Center load panel.
You can click through the interface to interact with the screen, as well as interact with the load panel to observe changes on the *groov* View HMI.

Running the Node-RED Project

Before you start, make sure you have your OpenWeather API key readily available.

Connect to your *groov* EPIC processor from a browser

1. Open a browser and type in the hostname of your Learning Center in the URL bar:
`https://<hostname>`
2. Log in with the system user ID and password you created in [“Creating the First System User ID and Finding the Hostname”](#) on page 4.

Load the Node-RED project

1. From the *groov* Manage Home page, click Node-RED.
2. Click Project Management.
3. Click Upload Project.
4. Navigate to the folder where you uncompressed the Learning Center Package and open the Node-RED Complete folder.

5. Select the `node-red.project.COMPLETE_v2.0.zip` file and click Open. *groov* Manage displays a message that it is uploading the project. When the upload is done, click Start Node-RED.
6. When *groov* Manage displays a message that it started Node-RED, click Close.

If Some Nodes are Missing

Starting with *groov* RIO firmware v3.0.0, user-installed Node-RED nodes are included when you restore a project. If Node-RED indicates there are missing nodes, follow these instructions to install them. Otherwise, continue to [“Configure Nodes” on page 7](#), below.

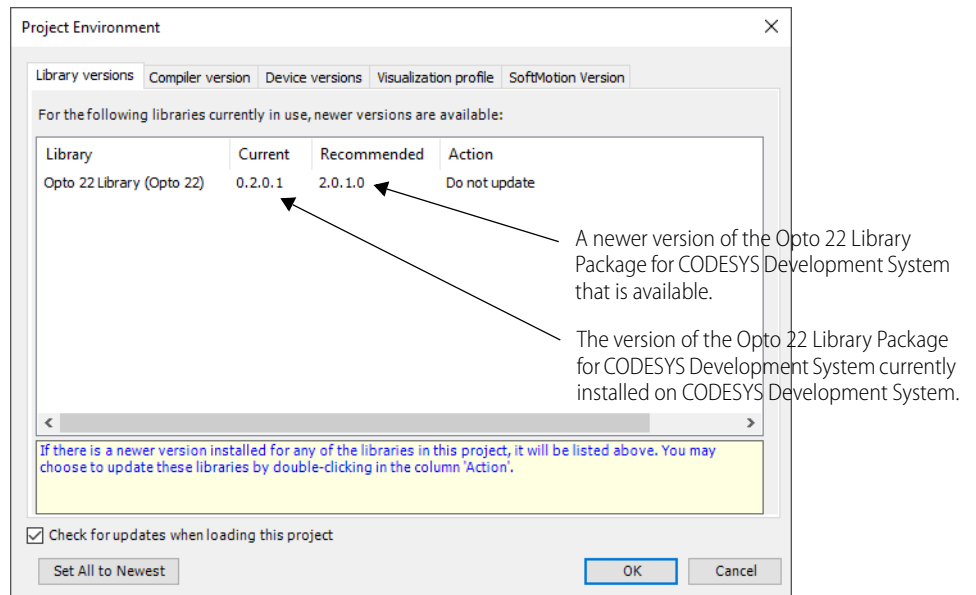
1. From the *groov* Manage Home page, click Node-RED > Open Node-RED Editor.
2. Click the menu button (menu.png), then Manage Palette.
3. Click the Install tab.
4. Type `opto 22` in the search field.
5. Find the `node-red-contrib-groov` node and click Install. In the message box, click Install. Wait for the installation to finish before going to the next step.
6. Find the `node-red-contrib-pac` node and click Install. In the message box, click Install. Wait for the installation to finish before going to the next step.
7. In the search field, replace Opto 22 with `mssql`
8. Find the `node-red-contrib-mssql` node and click Install. In the message box, click Install. Wait for the installation to finish before going to the next step.
9. Click Close, and close the Node-RED Editor tab on your browser.

Configure Nodes

You'll configure Opto 22 pac read and *groov* write nodes so that they refer to the *groov* EPIC processor on your Learning Center, and add your OpenWeather API key.

1. Go to the *groov* Manage Home page, then click Accounts.
2. Click Users.
3. Click the user ID that will run the Node-RED project, typically the first user ID you created when you turned on the Learning Center for the first time. (See [“Creating the First System User ID and Finding the Hostname” on page 4](#).)
4. In the API Key section, select the text in the API Key field and press CTRL+C to copy it to the computer clipboard.
5. Click Cancel, Accounts, and then Home.
6. Switch back to the Node-RED Editor.
7. For the temperature, fuelLevel, and SlushyStartButton nodes, repeat the following steps:
 - a. Double-click the node.
 - b. Click the modify button next to the Device field.
 - c. In the Address field, type in `localhost`.
 - d. In the API Key **Value** field, paste the API key you copied from [step 4](#) (above).
 - e. Click Add.
 - f. Click Done.
8. For the *groov* write node:
 - a. Double-click the node.
 - b. Click the modify button next to the Data Store field.
 - c. Click the modify button next to the Groov Project field.
 - d. In the API Key **Value** field, paste the API key you copied from [step 4](#) (above).
 - e. Click Add (or Update).
 - f. Click Update.

Project Environment window, where you can indicate whether you want CODESYS Development System to upgrade the library in the current project to the level installed:



- e. In the Action column, double-click Do not update. From the list of actions to take, choose Update and then click OK.
3. Add your Learning Center's *groov* EPIC processor to the project; then download and run the project.
 - a. Double-click Device in the Devices view, then Scan Network.
 - b. Select your *groov* EPIC Learning Center processor, and click OK.
 - c. Click File > Save Project.
 - d. Click Build > Build.
 - e. Click Online > Login.

If you get a warning about the current application replace an existing application that's running on the *groov* EPIC processor, click Yes.
 - f. Click Debug > Start.

Now that the CODESYS application is running, you can do things like set breakpoints, cycle through the ladder diagram, and toggle channels to see how the lights change on the Learning Center's load panel.

VERSION HISTORY

Because the Opto 22 product line and online training are always evolving, it's possible that the Learning Center Package you download or saved is incompatible with the version of firmware installed on the processor mounted on your Learning Center, or the software running on your computer. Review the following table to determine compatibility:

If you have this version of the Learning Center Package...	...it works with this version of firmware and software:
2.0.0 or higher	<ul style="list-style-type: none">• <i>groov</i> EPIC firmware 3.1.0 or higher• CODESYS Development System 3.5.16 Patch 4• Opto 22 CODESYS Library Package 2.0.1.1 or higher• PAC Control 10.3• PAC Display 10.3
1.3.2 or higher	<ul style="list-style-type: none">• <i>groov</i> EPIC firmware 1.3.0 or higher• CODESYS Development System 3.5.13 Patch 1• Opto 22 CODESYS Library Package 1.0.0.1 or higher• PAC Control 10.2• PAC Display 10.2
1.0.0 or higher	<ul style="list-style-type: none">• <i>groov</i> EPIC firmware 1.3.0 or higher• CODESYS Development System 3.5.13 Patch 1• Opto 22 CODESYS Library Package 1.0.0.0 or higher• PAC Control 10.2• PAC Display 10.2

