Computer Requirements for *FIRST*® Programs

Last revised: October 20, 2026

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Introduction

FIRST® programs, such as *FIRST*® LEGO® League, *FIRST*® Tech Challenge, and *FIRST*® Robotics Competition, are as unique as the teams that participate in them. This uniqueness is partially due to the wide variety of vendors that provide technologies to the programs, the hardware and software necessary to manage each program's distinctive goals, and the constantly evolving landscape of tools and techniques that teams find useful to participate and excel. One commonality between programs is the need for teams to have a computer platform for software development, design, and collaboration. This document serves as a recommendation for the hardware and operating system requirements for that computer system.

Of the many factors that can affect the minimum requirements for a computer, these are the ones that affect those requirements most heavily:

- Any role-specific tasks that the computer may perform in the program
- Type of Computer-Aided Design (CAD) software that may be used on the computer
- Software development and hardware update requirements
- Vendor-specific application requirements and limitations

Program-Specific Requirements

Each program has a unique set of requirements, but each of those requirements can be met with a minimum computer configuration. This section attempts to identify the minimum requirements for each program's roles. Specific recommended hardware that meets each of the requirements are listed in the "Recommended Hardware Sets" section.

Recommended Computer Hardware for *FIRST*® LEGO® League SPIKE based platforms

FIRST LEGO League has two divisions which use the LEGO® Education SPIKE™ programmable platforms: *FIRST* LEGO League Challenge Founders Edition which uses the LEGO® Education SPIKE™ Prime platform, and *FIRST* LEGO League Explore which uses the LEGO® Education SPIKE™ Essential platform. Both platforms have virtually the same computer requirements, differences are noted below. These platforms are some of the most accessible, as they are supported by most computer configurations.

Recommended for Software Development:

- **Windows Standard Laptop**
- Also Supported:
    - **MacOS Standard Laptop**
    - **Chrome OS Standard Laptop**
    - **iOS Standard Tablet**
        - LEGO® Education SPIKE™ Essential hub cannot be updated with iPad
    - **Android Standard Tablet**
        - LEGO® Education SPIKE™ Essential not supported

It is also recommended to have an active internet connection to access the Google Play Store (for Chromebook Android apps), to download in-app content, to access teacher support materials, and to use certain features such as live weather data.

Recommended Computer Hardware for *FIRST*® LEGO® League Computer Science & AI based platforms

FIRST LEGO League Challenge Future Edition uses the LEGO® Education Computer Science & AI platform. This platform is supported by most computer configurations via Bluetooth through the web browser, though many native web browsers on those platforms are not compatible.

Recommended for Software Development:

- **Windows Standard Laptop**
  - A Chromium-based web browser like Google Chrome or Microsoft Edge is required.
- Also Supported:
  - **MacOS Standard Laptop**
    - A Chromium-based web browser like Google Chrome is required.
  - **Chrome OS Standard Laptop**
  - **iOS Standard Tablet**
    - LEGO® Education Coding Canvas requires iPadOS 17.6 or later.
  - **Android Standard Tablet**
    - A Chromium-based web browser like Google Chrome is required.

It is also recommended to have an active internet connection to access the iPad App Store (for iPadOS Apps) and to access teacher support materials and the Coding Canvas.

Recommended Computer Hardware for *FIRST*® Tech Challenge

The predominant hardware platform used in *FIRST* Tech Challenge is the REV Control Hub and REV Driver Hub managed via the REV Hardware Client 2 application. These platforms have unique operating system and application requirements, though it is possible to perform most of the basic functions with most hardware platforms (albeit with more manual steps). Teams in *FIRST* Tech Challenge use computers for two basic purposes – software development and CAD – and team preference in these two uses shapes the required hardware.

Recommended for Software Development and CAD:

- **Windows Performance Laptop**
- **MacOS Standard Laptop**

Recommended for Software Development Only:

- **Windows Standard Laptop**
  - Only cloud CAD solutions are recommended
    - OnShape, SolidWorks 3D Experience, etc.
- Also Supported:
  - **MacOS Standard Laptop**
  - **Chrome OS Standard Laptop**
    - Android Studio not supported
      - Only Blocks and OnBotJava supported
    - Only cloud CAD solutions are recommended

It is also recommended to have an active internet connection during software development. Access to GitHub is required by the REV Hardware Client to download and install required season software updates and is required for Android Studio users to download software templates.

Recommended Computer Hardware for *FIRST*® Robotics Competition

The predominant hardware platform used in *FIRST* Robotics Competition is the Systemcore. This platform has a unique set of requirements for computer hardware in competition that may be different than requirements for software development depending on the programming environment. Like *FIRST* Tech Challenge, teams in *FIRST* Robotics Competition use software development computers for two basic purposes – software development and CAD – and team preferences in these two uses shape the required hardware. However, in *FIRST* Robotics Competition there are two roles that computers can serve, such as Software and Design Development platforms and/or Driver Station platforms, and those roles also shape the requirements of the computer hardware.

It is recommended to have two separate computers, one to use for the Driver Station platform and another for Software and Design Development, though one laptop can be used for both purposes if necessary.

Driver Station

The driver station computer is used as the primary interface to the robot, is used to interface with the Field Management System (FMS) at an event and is limited by the software tools used to communicate with the hardware and software platform on the robot. Teams find it advantageous to have separate computers for the Driver Station role and for the Software and Design Development role to enable them to segregate the duties and physical demands of the systems at an event. Budget-conscious teams can certainly use a single computer for both roles if that computer at least meets the minimum requirements of the Driver Station role. Note that the Driver Station role requires a Windows operating system, as the applications required to perform the role's duties are Windows-only applications.

Recommended for the Driver Station role:

- **Windows Standard Laptop**
- Also Supported:
    - **Windows Performance Laptop**

Software Development and Design

Like *FIRST* Tech Challenge, *FIRST* Robotics Competition teams use Software Development and Design laptops for Software Development and CAD, and depending on the use of CAD the hardware requirements are slightly different:

Recommended for the Software and Design Development role with CAD:

- **Windows Performance Laptop**

Recommended for Software Development Only:

- **Windows Standard Laptop**
    - Only cloud CAD solutions are recommended
        - OnShape, SolidWorks 3D Experience, etc.
- Also Supported:
    - **MacOS Standard Laptop**

It is also recommended to have an active internet connection during software development. Access to GitHub is required by the REV Hardware Client 2 to download and install required season firmware updates, see additional network requirements. Additional software may have similar requirements.

Recommended Hardware Sets

These are the Recommended Hardware sets referenced by the Program-Specific Requirements. There are a few extra requirements and recommendations for all hardware platforms, such as:

- Windows Operating System
    - Standard support for Windows 10 ended in October 2025, with extended support lasting through October 12, 2027, so purchasing a Windows system that supports Windows 11 is highly recommended. While not all software is specifically labeled as being supported by Windows 11, virtually all the required software has been tested to work with Windows 11.
- USB Ports
    - Laptops should have at least 2 available physical USB-A ports.
    - For *FIRST* Tech Challenge, USB-C ports on laptops are not always able to work properly with the REV Control Hub nor REV Driver Hub, so it is important to have USB-A ports also available.
- Bluetooth
    - For *FIRST* LEGO League, it is important that laptops and tablets support Bluetooth 4.0 or above.
- Physical Ethernet Ports
    - While most features of hardware and software can be easily supported by Wi-Fi, in some situations (such as the Driver Station for *FIRST* Robotics Competition) having a physical RJ-45 ethernet port on the system is a huge benefit.
- SSD Hard Drive
    - While not specifically required, hard drives that use SSD technology (versus spinning disk technology) boot up faster and are less likely to be damaged when carrying while powered on or experiences “unexpected bumps” as is common for a *FIRST* Robotics Competition Driver Station computer.

Windows Performance Laptop

A laptop designed for high graphics performance containing a high-end processor, like a Dell G16 or HP Omen, with the following recommended specs:

- Processor: Intel Core i7, AMD Ryzen 7, or better
- Graphics: NVIDIA GeForce RTX 4050 or better
- Memory: 16GB RAM or more, 32GB preferred
- Storage: 512 GB SSD or greater, 1TB SSD preferred
- Ethernet: RJ-45 Ethernet Port preferred

- Ports: 2 or more USB type A ports preferred
- Bluetooth: Bluetooth 4.0 or better
- Wi-Fi: Integrated Wi-Fi, Wi-Fi 6E or better preferred
- Operating System: Windows 10 or better, Windows 11 preferred

Windows Standard Laptop

A standard Windows laptop, like a Dell Inspiron 15 or HP Pavilion Laptop, designed for smooth performance and everyday tasks,

- Processor: Intel Core i5, AMD Ryzen 5, or better
- Graphics: Intel or AMD embedded graphics adapter or better
- Memory: 8GB RAM or more, 16GB preferred
- Storage: 256GB or greater, 512 GB SSD preferred
- Ethernet: RJ-45 Ethernet Port preferred
- Ports: 2 or more USB type A ports preferred
- Bluetooth: Bluetooth 4.0 or better
- Wi-Fi: Integrated Wi-Fi, Wi-Fi 6E or better preferred
- Operating System: Windows 11

MacOS Standard Laptop

A standard MacOS laptop, like a MacBook Air or MacBook Pro, designed for smooth performance and everyday tasks.

- Processor: Apple M1 or better, Apple M2 preferred
- Memory: 4GB RAM or more
- Storage: 2GB available storage space or better
- Bluetooth: Bluetooth 4.0 or better
- Operating System: MacOS 10.15 Catalina or newer

iOS Standard Tablet

A standard iOS tablet, such as an iPad Air or iPad Mini.

- LEGO® Education Computer Science & AI platform Requirements:
  - Hardware: iPad Air 3rd Gen or later, or iPad Mini 5th Gen or later
  - Operating System: iPadOS 17.6 or newer
- LEGO® Education LEGO® Education SPIKE™ platform Requirements:
  - Hardware: iPad Air 2nd Gen or later, or iPad Mini 4th Gen or later
  - Operating System: iPadOS 13.0 or newer

Chrome OS Standard Laptop

A standard Chromebook, such as the Samsung Galaxy Chromebook 2, or similar.

- Processor: 1.40 GHz Intel Celeron 2955U dual-core processor or better
- Memory: 4GB RAM or better
- Storage: 3GB available storage space or better
- Bluetooth: Bluetooth 4.0 or above

Android Standard Tablet

A standard Android Tablet, such as the Samsung Galaxy Tab A7 Lite, or similar.

- 8” display or larger
- Memory: 3GB RAM or better
- Storage: 3GB available storage space or better
- Bluetooth: Bluetooth 4.0 or above
- LEGO® Education Computer Science & AI platform Requirements:
    - Operating System: Android 8.0 or newer
- LEGO® Education LEGO® Education SPIKE™ platform Requirements:
    - Operating System: Android 7.0 or newer