TECHNICAL REFERENCE / VERSION 1.1

Nitrax Mathematical Keyboard

Windows and macOS 15+ Compatibility

Symbol input method, companion applications, setup, compatibility, hardware, privacy, and usage guide

Version	Author	Date	Archive identifier
1.1	Rony Sitbon	August 2026	v1.0 DOI: 10.5281/zenodo.20744644

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mathematicalkeyboard.com/nitrax-mathematical-keyboard-technical-reference/

Version 1.1 adds the released macOS companion application and its macOS 15 or later requirement. The DOI above identifies archived Version 1.0 and is not presented as a DOI for Version 1.1.

1. Abstract and document status

The Nitrax Mathematical Keyboard is a compact physical keyboard for typing mathematical, Greek, and scientific symbols in everyday writing applications. Symbols are printed directly on the keys in blue and gray layers. This reference documents the physical keyboard, the two printed symbol layers, the Windows and macOS companion applications, setup, compatibility, hardware, privacy, limitations, and troubleshooting.

The main audience is STEM students. Teachers and educators are a secondary audience, with additional relevance to researchers, engineers, scientists, and technical writers.

Document status

This is a first-party technical reference, not a peer-reviewed paper or controlled performance study. It documents verified product behavior and operating procedures as of Version 1.1.

Field	Value
Full title	Nitrax Mathematical Keyboard: Technical Reference, Symbol Input Method, Compatibility, and Usage Guide
Version	1.1
Publication date	August 2026
Language	English
Resource type	Technical report
License	Creative Commons Attribution 4.0 International for this report and original supporting documentation
Archive note	Version 1.0 remains archived under DOI 10.5281/zenodo.20744644

Product boundary

The keyboard accelerates character entry. It is not a virtual keyboard, calculator, equation solver, generic keypad, or replacement for LaTeX and professional equation typesetting. The target application remains responsible for layout, semantic equation structure, and font rendering.

2. Physical keyboard and symbol input model

The physical keyboard remains usable for ordinary typing independently of Math Mode. The additional mathematical, Greek, and scientific characters are accessed with key combinations that correspond to the blue and gray legends printed on the keycaps.

Printed layer	Windows key combination	macOS key combination
Blue	Ctrl + Alt + printed key	Control + Option + printed key
Gray	Ctrl + Alt + Shift + printed key	Control + Option + Shift + printed key

Typical workflow

- Connect and power on the physical Nitrax Mathematical Keyboard.
- Select the keyboard OS mode: Fn + Q for Windows or Fn + W for Mac mode.
- Run the companion application for the current operating system.
- Enable Math Mode from the companion application.
- Hold the printed layer combination and press the key carrying the required symbol.

Output model

The companion applications insert standard Unicode characters such as √, ∫, Σ, and Greek letters. Compatibility therefore depends on the target application's text input, reserved key combinations, and available fonts.

When Math Mode is off, the keyboard works as a standard keyboard. Disabling Math Mode is the fastest way to separate normal keyboard behavior from a printed-layer issue.

3. Companion applications

Windows companion application

The Windows companion application is a lightweight, local, single-file utility. It requires no installer, administrator rights, telemetry, or internet access for normal operation. The system-tray menu provides Math Mode, Start with Windows, Help, and Quit controls.

macOS companion application

The macOS companion application is available for macOS 15 or later. It runs from the menu bar and works together with Karabiner-Elements to enable the printed blue and gray symbol layers. The guided setup assists with Karabiner-Elements and the permissions required by macOS.

Property	Windows	macOS 15+
Control location	System tray	Menu bar
Printed-layer requirement	Nitrax Windows companion app	Nitrax macOS companion app with Karabiner-Elements
Keyboard OS mode	Fn + Q	Fn + W
Math Mode off	Standard keyboard behavior	Standard keyboard behavior
Minimum OS	Use the current Windows documentation	macOS 15 or later

Privacy and trust

The documented companion workflows operate locally. The Windows utility does not require network access or telemetry for normal operation. The macOS workflow uses the open-source Karabiner-Elements utility and the permissions shown during guided setup. Users should obtain software only from the official Nitrax pages and repositories.

4. macOS 15+ setup procedure

The macOS application requires macOS 15 or later. Complete the following sequence before testing the printed symbol layers.

1. Select Mac mode

Press Fn + W so the keyboard uses the expected Mac modifier behavior.

2. Connect the keyboard

Use the included 2.4 GHz USB receiver or Bluetooth. For Bluetooth, hold the Bluetooth button for about three seconds, then select the keyboard in macOS Bluetooth settings.

3. Download and open the Nitrax macOS app

Use the official Quick Start page or the latest GitHub release. Open the DMG and follow the guided setup.

4. Install or confirm Karabiner-Elements

Karabiner-Elements provides the system-level keyboard customization used by the printed math layers. The Nitrax setup assistant guides this step; do not substitute unrelated remapping profiles.

5. Grant the requested permissions

macOS may request permissions required for keyboard event handling. Follow the labels and sequence shown by the current Nitrax setup assistant, then return to the menu bar app.

6. Enable Math Mode and test

Turn Math Mode on from the Nitrax menu bar icon. Test a printed blue-layer and gray-layer symbol in a simple text field before moving to a specialized application.

If the standard keys work but printed symbols do not, recheck macOS version, Mac mode, Karabiner-Elements, permissions, the menu bar app, and Math Mode in that order.

5. Operating-system and application compatibility

Platform	Standard keyboard	Printed math layers	Notes
Windows	Supported	Supported with the Windows companion app	Use Fn + Q for Windows mode.
macOS 15 or later	Supported	Supported with the macOS app and Karabiner-Elements	Use Fn + W for Mac mode and complete permissions.
Earlier macOS	May work as a standard keyboard	Not supported by the current macOS companion app	Upgrade to macOS 15+ for the documented printed-layer workflow.
Other systems	Depends on host support	No official companion layer documented in Version 1.1	Do not assume printed-layer compatibility.

Application considerations

The applications insert standard Unicode text. Word processors, notes, email, presentation tools, and ordinary text fields are typical use cases. A program may reserve the same key combination, reject a character, or render it differently depending on the active font.

- Microsoft Word: equation mode can improve structured equation entry.
- Google Docs and browser apps: browser or extension key combinations can occasionally conflict.
- Spreadsheets on macOS: retain the current documentation's cautions; behavior can be unstable.
- OneNote and Overleaf: retain the current application-specific limits documented on the website.

Keyboard layout considerations

The printed legends are optimized for a QWERTY-like physical layout. AZERTY and QWERTZ users may need to select a compatible host input layout when exact physical-position matching is important.

6. Hardware and connectivity

Property	Documented value
Form factor	Compact external physical keyboard
Approximate dimensions	295 x 128 x 22 mm
Approximate weight	300 g
Charging	USB-C; typical full charge around 2 hours
Typical operating time	Approximately 70 hours under documented usage conditions
Power management	Automatic sleep after approximately 10 minutes of inactivity
Wireless modes	2.4 GHz USB receiver or Bluetooth; one active mode at a time
Typical range	Approximately 8-10 m, depending on environment
Receiver storage	Recessed slot under the keyboard
OS mode keys	Fn + Q for Windows mode; Fn + W for Mac mode

Connection guidance

For 2.4 GHz mode, connect the receiver, select 2.4G, and hold the 2.4G button for about three seconds if re-pairing is needed. For Bluetooth, hold the Bluetooth button for about three seconds and select the keyboard in the host settings. The device may appear as IOP 582, IOP 583, or IOP 584 depending on batch.

Wireless range, charging time, and battery duration vary with usage, host hardware, radio conditions, and power state.

7. Troubleshooting

Symptom	Likely cause	Recommended action
No printed symbol appears	Companion app, Math Mode, permissions, or unsupported OS	Confirm the current OS, run the correct app, enable Math Mode, and test in a simple text field.
Normal keys do not behave as expected	Incorrect keyboard OS mode	Use Fn + Q on Windows or Fn + W on macOS.
macOS app is open but layers do not work	Karabiner-Elements or permission setup incomplete	Return to the guided setup and confirm each required permission.
A key combination triggers an app command	Application-level conflict	Test in another editor; the target app may reserve that combination.
Bluetooth will not reconnect	Stale pairing	Remove the device in host Bluetooth settings and pair again.
2.4G will not connect	Receiver or mode not selected	Reconnect the receiver, select 2.4G, and re-pair if needed.
Character appears incorrectly	Font or input-field limitation	Try a font with the required Unicode glyph or another text field.

Diagnostic principle

First separate standard keyboard behavior from printed-layer behavior. If normal typing works, focus on the operating system, companion app, permissions, Math Mode, and target application. If a printed symbol works in a simple editor but not in a specialized application, the cause is probably application-level.

8. Limitations and interpretation

- The macOS companion app requires macOS 15 or later.
- Application-specific key combinations can prevent individual mappings from operating.
- Unicode insertion does not automatically create semantic equation structure or advanced typesetting.
- The printed legends are optimized for a QWERTY-like physical layout.
- Spreadsheet behavior on macOS remains subject to the current documentation's cautions.
- Not every symbol is guaranteed to work or render identically in every application or font.
- The product exposes a curated set of printed symbols; specialized disciplines may require other characters.

Research integrity

This report does not claim a quantified productivity improvement. Any future benchmark should publish its protocol, task set, participant criteria, analysis method, and limitations separately from product marketing.

Versioning policy

Material changes to the symbol map, hardware, supported platforms, companion applications, or compatibility guidance should be documented in a new report version. Archived editions remain useful for historical reference.

9. Official resources and citation

Official resources

- Website: https://mathematicalkeyboard.com/
- Setup hub: https://mathematicalkeyboard.com/how-to-use-the-nitrax-math-keyboard/
- Windows Quick Start: https://mathematicalkeyboard.com/how-to-use-the-nitrax-math-keyboard-windows/
- macOS 15+ Quick Start: https://mathematicalkeyboard.com/how-to-use-the-nitrax-math-keyboard-macos/
- Windows repository: https://github.com/NitraxMathematicalKeyboard/download-keyboard-layout
- macOS repository and releases: https://github.com/NitraxMathematicalKeyboard/nitrax-math-keyboard-macos
- Archived Version 1.0 DOI: https://doi.org/10.5281/zenodo.20744644

Recommended citation for Version 1.1

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Archive note

DOI 10.5281/zenodo.20744644 identifies Version 1.0. No external Zenodo record is changed by this Version 1.1 publication.

Revision record

Version	Date	Summary
1.0	June 2026	Initial public reference centered on the Windows companion application.
1.1	August 2026	Added macOS 15+ support, the macOS app and Karabiner-Elements workflow, permissions, OS compatibility, resources, and revised troubleshooting.