# Sage Alerting Systems
# Digital ENDEC Model 3644
# Firmware Revision 96-2




Software Released November 5, 2026

**For use with United States ENDECs Only.**

Rev96-2, also referred to as 96-02, addresses eMudhra security update, password management, other security-related issues, and items previously released in version 96-1.

**Rev96-2 is a mandatory update, containing security and security-related enhancements.**

This release is to be applied to ENDECs that already have the Rev96 or Rev 96-1 firmware installed.

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# 1 Important!

Once you have installed the Rev96-2 update, **DO NOT** attempt to reload an older version. The resulting mismatch between old and new portions of the firmware will result in an inoperable system. If you feel you need to revert your ENDEC to an older version, contact Sage first.

For maximum security and greatest compatibility, we recommend always connecting to the ENDEC via HTTPS instead of HTTP.

# 2 Summary

This update addresses the eMudhra concern, a world-wide issue. The FCC's recent rule regarding security updates applies to this release:

> "11.35(d)(2) Install security patches and security-related software and firmware updates issued by equipment manufacturers promptly after those patches or upgrades become available. Security patches and security related software and firmware updates issued by equipment manufacturers may be tested before they are installed, provided that the testing begins promptly and is completed in a timeframe that is consistent with industry best practices"

Rev 96-2 updates:

- Some root certificates have been removed due to problems with certificates issued by the eMudhra Certificate Authority (CA). Those certificates allowed creation of forged trusted keys allowing impersonation of any domain in order to intercept and alter encrypted traffic.
- The SMTP2GO email service and possibly others made a recent change that the ENDEC's mailer was not compatible with, resulting in a failure to receive alert log conformance report and security audit PDF attachments.
- Corrects an issue where ENDEC passwords could not contain the "&' or '+' character.
- Adds the latest root cert bundle.

This release also includes all updates from the Rev 96-1 release. These included:

- The Missing and Endangered Persons event code (MEP)
- Selectable week start day for conformance reports
- Broadcast Tools MSRP-3 control via TCP/IP
- Network time (NTP) improvements for faster sync and issues with server pools
- Removal of an expired FEMA signing certificate
- Includes a patch to Rev96-1 where character generators might color the background red for all alert types, and LED signs will show the text in red.

Rev96-2 is a mandatory update as it contains security or security-released updates. Rev96-2 is a free update to Rev96, and will install on any model 3644 ENDEC that already has Rev96 or 96-1 installed.


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# 3 Quick Install Guide for Experienced Users

To begin, go to the download page. This is a free update, you won't need your ENDEC's serial number

Download Page: https://www.sagealertingsystems.com/rev96-2download.html

Alternatively, you can go to your ENDEC's Version page, then click the "Check For Updates" button.

Download the rev96-2.x file. Save the file on your computer, then use the "Upload Firmware" page of your ENDEC's web interface to upload the .x file.

You will also need the latest version of ENDECSetD, version 2.63. You may have already installed this if you previously updated your ENDEC to 96-1. This is available on the same web page that you used to download the rev96-2.x update file. You only need to install it once on any PC you will use to edit ENDEC settings files. You will need the latest version of ENDECSetD to configure the new features provided by Rev96-1.

# 4 Help for the Less Experienced

It is possible to upload firmware, even if you don't know much about your ENDEC.

You need to know the IP address of the ENDEC – if you access the ENDEC to download or view log files, or to send a weekly test, the IP address you use for that will be the same address you use to upload.

If you do not know the IP address of your ENDEC, you can get it from the ENDEC's front panel:

1. At the idle screen, showing the date and time at the top and MENU at the bottom, push the ENTER button to open the menu.

2. Use the arrow buttons until the arrow on the screen is pointed at "Network", then push ENTER to open the Network menu.

3. Use the arrow buttons until the arrow on the screen is pointed at "Show IP Addr", then push ENTER. If prompted for your front panel admin code, put it in. The default is 1111.

4. The ENDEC's current IP address will be displayed. Make a note of it.

You will need to know the user name and password of an administrator account. The FCC recently required all EAS users to build longer passwords; you might have accessed the ENDEC recently.


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# 5 Installing Rev96-2 Step by Step

### Step 1: Log into your ENDEC

You will need to know the IP address of your ENDEC, and the name and password for a user with administrator privileges.

### Step 2: Verify prerequisites

Your ENDEC must be running Rev96 or Rev96-1. Click the *Version* button of the ENDEC's web interface, then check for those to be indicated as in this image:

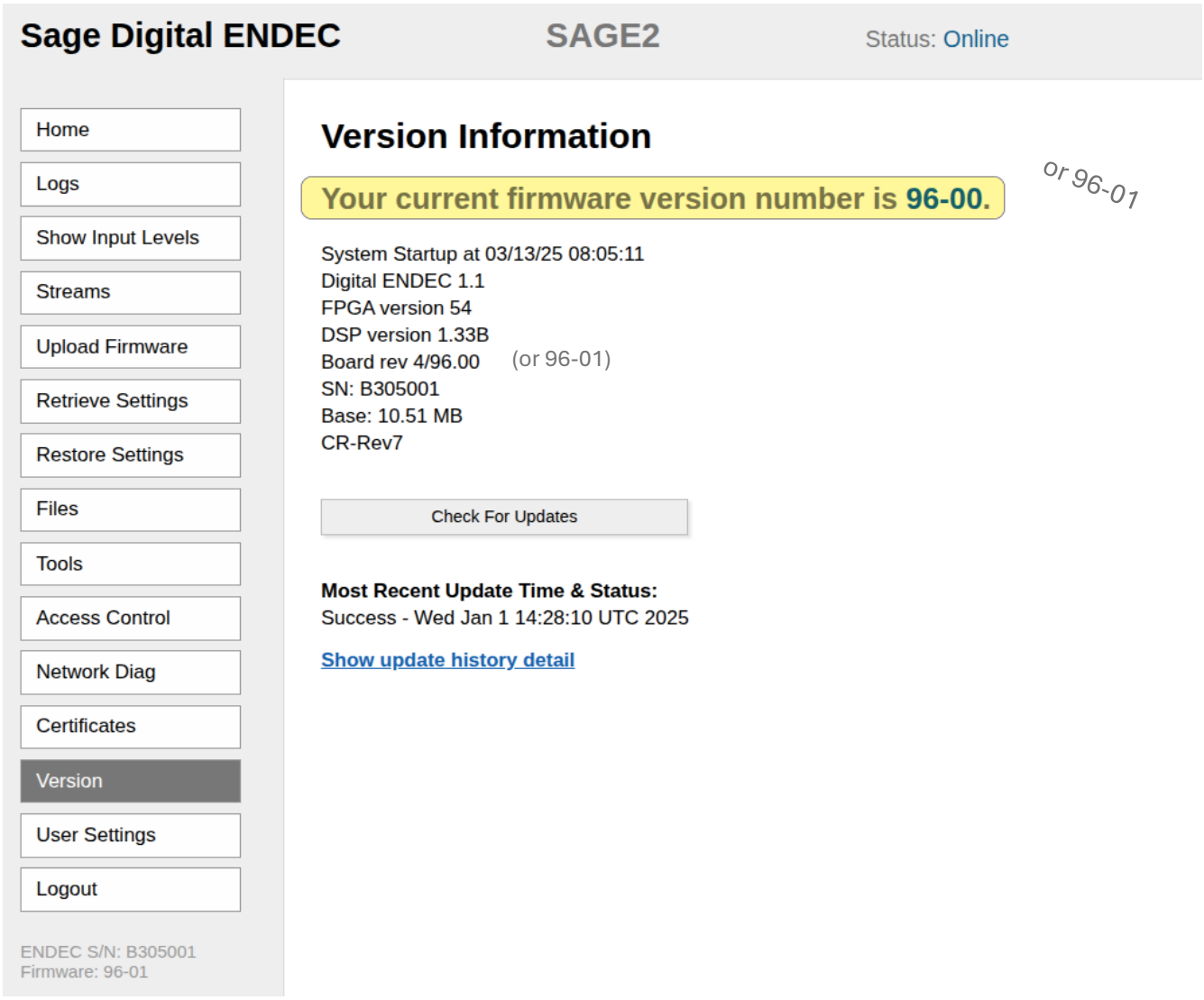



*Figure 1: Version page, showing that firmware version 96 update was previously installed.*

If your version page does not show a current firmware version of 96-00 or 96-01, you will need to first install the Rev96 firmware, and possibly older updates as well before you can proceed any further. You can contact support@sagealertingsystems.com for guidance on those steps.


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**Step 3: Download the Rev96-2 firmware file, then upload to ENDEC**

Go to the Sage Rev96-2 download page: https://www.sagealertingsystems.com/rev96-2.html

Download the rev96-2.x file and save it to a convenient folder on your PC, then upload it to the ENDEC via the *Upload Firmware* page of the ENDEC's web interface. Once the file has been uploaded, the update process will begin, and may take several minutes to complete. At that point, the ENDEC will reboot and your web browser will automatically refresh.

Do not close the browser tab or navigate away from the ENDEC page during the update process.

**Step 4: Verify update success**

After the process completes and the web interface has automatically refreshed in your browser, click the *Version* button. The version details should indicate that the firmware version is 96-02.

Version Information

Your current firmware version number is 96-02

System Startup at 10/28/26 15:53:44
Digital ENDEC 1.1
FPGA version 54
DSP version 1.33C
Board rev 4/96.02
SN: B305001
Base: 10.51 MB
CR-Rev8

*Figure 2: Version page text showing that Rev96-2 has been successfully installed.*

**What If the Version Does Not Show 96-02 After Reboot?**

If the Version page continues to show a firmware version number of 96-00 or some value other than 96-02 after the update procedure, there will be a failure report explaining why. Click the "*Show update history detail*" link. The update history will be displayed, with the most recent update attempt at the top.

You will see an indication like the following:

**FAILED – Minimum firmware version not met (rev96).**

This means that Rev96 was not on board prior to uploading the Rev96-2 update.

For assistance with this or any other error, please contact support@sagealertingsystems.com.

Note that the update history will show both successful and failed update attempts, indicating the time of the attempt, version tags of the update itself, and version tags of what firmware was running on the ENDEC at the time.


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# 6 Changes

## 6.1 New for Rev 96-2

### 6.1.1 eMudhra Root Certificates

eMudhra Certificate Authority (CA), a company that issues security certificates, mistakenly issued certificates in their hierarchy with a weak key that could be easily guessed. This can allow the creation of forged intermediate certificates that appear to be signed by a trusted CA but are not. This affects computer systems worldwide. The ENDEC uses CA certificates to validate TLS connections to web servers, such as those used to transport CAP message audio.

The mitigation being used by the IT industry is to remove the involved eMudhra roots and cross-signing certifications from trust lists. Your operating systems and browsers for your desktop equipment will very likely have been automatically updated by a patch process. The Sage ENDEC does not perform automatic software updates; the at-risk certificates must be removed by installing our 96-2 update.

### 6.1.2 eMail Attachments

The SMTP2GO email service and possibly others made a recent change that the ENDEC's mailer was not compatible with, resulting in pdf log and security audit attachments not being received. REV96-2 updates the ENDEC to handle this change.

### 6.1.3 Password special characters

Two special characters were not usable for the web GUI interface: '&' and '+'. This has been corrected. If you have previously used those characters to change passwords for a user, and did not test to make sure you could log in as expected, you should do so now. Modify any password that won't allow you to login.

## 6.2 Included From Rev96-1

### 6.2.1 Missing and Endangered Persons event code

This is not a mandatory event code. Refer to your State Plan to see recommendations and requirements for handling the MEP alert in your area.

### 6.2.2 Weekly Report Day of Week

The weekly alert log conformance report can now be sent on the weekday of your choice. This selection also defines the week start and end days for the report - for example, setting it to Monday results in a weekly report being emailed Monday morning at 12:50 am, covering alert activity from 12:00 am on the previous Monday through 11:59:59 pm Sunday night. If the weekly web access report email is enabled, it is also sent at this time.

This selection is located at the bottom of the Email tab in ENDECSetD.


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### 6.2.3 MSRP-3 TCP Interface

Rev96-1 adds support for network control of the MSRP-3 multi-station relay panel from Broadcast Tools, eliminating the need for a direct serial connection, for MSRP-3 models that include an ethernet interface. Serial port control of the MSRP-3 and legacy multi-station relay panels continues to be supported.

### 6.2.4 NTP Date

Rev96-1 reduces time required to sync with an NTP server after boot and improves sync reliability when using NTP server pool addresses.

### 6.2.5 CA Root Certificate Bundle

The Root Cert bundle issued with Rev-96 and Rev96-1 is replaced by the Rev96-2 bundle, removing the eMudhra roots and a cross signed root.

### 6.2.6 Removal of Expired FEMA Intermediate Certificates

These certificates are used to validate IPAWS messages from FEMA. Two have expired since the last update, and are removed in Rev96-1. The Certificates/Certificate Management/View Cap Certs page will not have any certs highlighted in red.


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