

Elena NavIC Grid Converter User Manual

ELMN-EGC-URML-36

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USER MANUAL

Please read this user manual to know how to use the **Grid Converter**.

Product: Elena NavIC Grid Converter

Part No: ELNGC

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Ver 1.0

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This document has <u>48</u> pages, numbered serially from 01 to

<u>48</u>.

Date: 2025

Lt Col V S Velan

Place: Bengaluru, India

Chief Technology Officer

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WARNING



Ensure the product is charged before switching it on.



Do not disassemble, repair, or modify the product by yourself for any reason. In case there is any issue in its working, contact customer care. We will be happy to help!

- No installation is required. Use the product as delivered.
- This product uses NavIC satellites to show a location using PNT technology.

GENERAL INFORMATION

1. About Elena

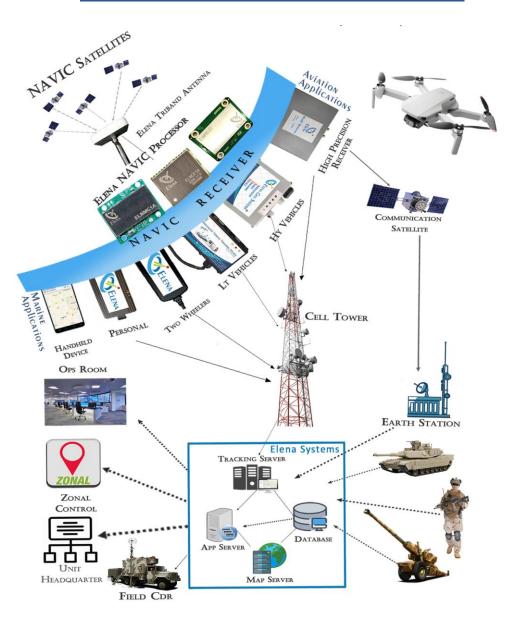
Specialist in NavIC

Elena Geo ("Elena") was founded by Lt Col V S Velan in 2012 to cater to the niche segment of NavIC-based Monitoring Solutions. Elena's latest NavIC processor/chip ELNCE1A, using 12-nm technology, was launched in April 2023. It has a small form factor that can receive and process signals of NavIC (IRNSS), GAGAN, GPS, and GLONASS. Elena has all the indigenised hardware and software required for multi-GNSS (including NavIC) Positioning, Navigation, and Timing, giving the advantage of rapid customisation and retro-fitting as required. Elena demonstrated its first processor in April 2019. (NavIC is the operational name of IRNSS.)

Elena endeavours to generate awareness regarding the predominant advantages of NavIC by participating in various conferences, conclaves, meetings, and seminars at the national level such as the Indian Defence Conclave, Aero India, Army Technology Nodes, G20 DIA, etc.

Elena has been a technical and industrial partner to organizations like TCOE India, 3GPP, RTCM, ISpA, SIDM, MCCIA, etc. It also has academic collaborations with several reputed educational institutions in India to achieve research and technological excellence in the field of GNSS, in particular, NavIC. To its credit are several awards honouring Elena for its contribution to NavIC. It received the Excellence Award from Indian Space Conclave 2023 and Pandit Deendayal Upadhyaya Telecom Excellence Award 2023. The founder and CTO of Elena Geo received the prestigious 'Igor I Sikorsky' Award for technical excellence.

2. Elena's End-to-End Presence in NavIC Domain



3. About NavIC



NavIC, Navigation with Indian Constellation is a Global Navigation Satellite System which is the third system in the world to give location

	GPS	NavIC
Differentiating Parameters	ALS THE OTHER	Sauto
India Coverage (24 Hr. Cycle)	Loss in coverage	No Loss in coverage
Satellite Position	Circular MEO Orbit	Geosynchronous Geostationary
Orbit Height	Lower	Higher
Frequency	Single Available	Dual 📀
Accuracy	Very Low	< 6 Meters

services and the best of its kind in providing accurate, reliable data all round the clock without any break. This

Advantages of NavIC when compared with GPS

NavIC provides permanent visibility over the Indian Subcontinent and is much more accurate than GPS

NavIC works in crowded locations with highest accuracy, both over Indian cities and rural areas

Unlike GPS, NavIC does not loose coverage of equatorial region from 20 minute to 180 minute in a 24-hour cycle

NavIC enables Gol to save Forex by eliminating the payment made to foreign navigation service providers

NavIC provides Gol self-dependence without relying on foreign nations that shy away to help in a crisis

system has been fully functional since June 2019. Currently, 11 navigation satellites can be used by the public for an efficient monitoring application.

Elena works only in this niche segment.

Of NavIC, By NavIC, For NavIC

4. Grid Converter: Device

The Elena Grid Converter, an indigenised Indian product of R&D, is state-of-the-art positioning equipment made using Elena's multi-GNSS processor, which uses NavIC, GPS, and GLONASS to provide one-meter accuracy without any external support, and shows accurate position in the following formats:

- 1. Geodetic Coordinate System (Latitude & Longitude) Supported formats:
 - Degree Decimals (DD), ex: 13.7484744
 - Degree Minutes Seconds (DMS), ex: 13° 56' 23"
- 2. ESM

Supported formats: 6 figs, 8 figs, 10 figs

3. DSM

Supported formats: 6 figs, 8 figs, 10 figs

This device, a controller-based hardware, serves as a bridge between three reference systems used by the Indian Army, such as the ESM India grid system, the new DSM grid system, and the latitude-longitude (Lat-Lon) system. It accurately provides all these reference numbers for the same point in various formats and can convert the reference from one coordinate system to another accurately.

In a technologically advanced battlefield, it is essential to maintain uniformity in purpose and basic platforms to facilitate synchronized functioning to achieve the aim. Currently, maps – the basic underlay to establish a position(s), facilitate navigation, orientate, and direct fire,

are based on different datum and projections, thus introducing errors of accuracy at the initial stage(s). The device equips the Army/Artillery with an instant location viewer to achieve uniformity in utilizing defence series maps and overcome errors of accuracy.

Powered by advanced technology and built with utmost precision, the Grid Converter offers an exceptional user experience. It combines the power of multi-GNSS reception, including NavIC (IRNSS) (L5 Band), GPS (L1), GLONASS (L1), and SBAS, ensuring robust & accurate positioning in diverse environments.

5. Grid Converter: Device Parts



Figure 1 Front view of the Grid Converter

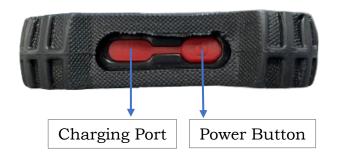


Figure 2 Charging Port and Power Button

USER MANUAL

6. Grid Converter: Application

The Elena Grid Converter software application allows users to view their current location in the form of Geodetic (Lat, Long) and Grid Reference (GR). It can display the position coordinates in terms of Latitude and Longitude in DD:MM:SS.SS and DD.DDDDD formats. It follows the Military Grid Reference System 6, 8, and 10-digit Figure GR.

7. Grid Converter: Advantages

- (a) Accurate marking of own and enemy elements on a common grid.
- (b) Auto compensation for different zones to ensure accuracy.
- (c) Accurate navigation.
- (d) Assist target management.
- (e) Assist firepower coordination.

8. Grid Converter: Features

The Elena NavIC Grid Converter offers the following features:

- (a) View current location in the form of Lat-Long coordinates, ESM and DSM Grid reference systems.
- (b) Displays map sheet reference numbers in ESM and DSM formats.

- (c) Supports display of 6, 8, and 10-digit GR in both ESM and DSM formats.
- (d) Converts Lat-Lon to ESM GR and DSM GR.
- (e) Converts ESM GR to DSM GR and Lat-Lon.
- (f) Converts DSM GR to ESM GR and Lat-Lon.
- (g) Provides atomic-clock-based accurate timing.
- (h) LCD view panel for clear daylight visibility.
- (i) Small built-in Torch light for Night use.
- (j) Adjustable device timeout.
- (k) Battery: Normal Operations for 60 hours.
- (l) Highly secure. The parameter for grid conversion is uploaded into the device by ADG Mil Svy rep, through a Windows-based easy-to-use software.
- (m) Kill button to delete all data securely.
- (n) IP67 rated.
- (o) Rugged. Confirms to Military Standards.
- (p) Rubber covering for easy holding with a gloved hand.
- (q) Supplied with a waterproof pouch for additional protection.

9. Grid Converter: Application Screens

The Elena NavIC Grid Converter application has the following pages:

Application Pages:

- (a) Initialisation Screen
- (b) Login Screen
- (c) Home Page
- (d) Convert Page
- (e) Settings Page

For detailed, step-wise instructions for each page, refer to

Section 10 Step-wise Instructions.

9.1 Initialisation Screen

Upon powering the device, an initialisation screen will be displayed. After a 2-second duration, the screen transitions to the login page.

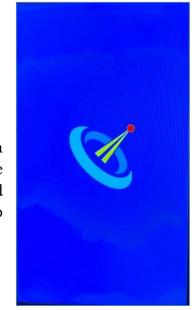


Figure 3 Initialisation screen

9.2 Login Screen

At the initial launch of the app, a user is required to enter login credentials to gain access to the app. A Home page and a menu bar at the bottom of the screen appear.

Grid Converter Fw.Ver-1.0 LOGIN

9.3 <u>Home Page</u>



Figure 5 Home page

Figure 4 Login screen

On the **Home** page, the user can observe latitude and longitude coordinates on receiving the satellite signals. Also, there is an automatic conversion of the live or own position Lat-Long coordinates into ESM and DSM grid reference formats.

Note: To acquire a good satellite fix, hold the device under the open sky with no interference.

During swift movements, a user may not be able to note the Lat-Long coordinates due to variations in the decimal values. For this reason, a **Pause Button** as seen in Figure 5 (Home Page) is provided. When tapped, the pause button turns into **Play Button** and displays the computed average of the last 10 recorded positions and the time of taping the Pause button, allowing the user to note the coordinates and time of pausing. When the Play button is tapped again, it displays the current time from the satellites.

The elements on the home page are as follows:

(a) The **Fig**. option allows the user to display the ESM and DSM grid reference values to 6, 8, or 10-digit Figure.

(b) **ESM** section:

- (i) **Datum**: Everest is the geodetic reference datum for India.
- (ii) **GR**: is the Grid reference value as per ESM.
- (iii) **MAP**: is the mapsheet number respective to the location.
- (c) **DSM** section:



Figure 6 Home page after obtaining satellite fix

- (i) **Datum**: WGS84 is the World Geodetic System 1984, which is a global datum.
- (ii) **GR**: is the Grid reference value as per DSM.
- (iii) **MAP**: is the mapsheet number respective to the location.
- (d) Coordinate format options: Here users can switch the latitude and longitude between **DD** (decimal degrees) and **DMS** (degrees, minutes, seconds) formats.
- (e) **Latitude** and **Longitude**: Real-time coordinates are displayed.
- (f) **Time**: Time of pause or the current time received from satellites is displayed.
- (g) **Ht** (Ellipsoidal): Shows the current height in meters Above Mean Sea Level.
- (h) **Pause/Play Button** enables the user to freeze the current computed coordinates and the time of pause or resume collecting data showing the current time.

9.4 Convert Page

The **Convert** Page allows users to transform location coordinates between different formats. It supports conversion between Latitude-Longitude (Geodetic), DSM, and ESM grid references. Users can manually input coordinates for conversion and receive accurate transformed outputs.

The elements on the **Convert** page are as follows:



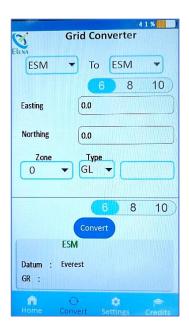


Figure 8 Convert page

Figure 7 Coordinate input fields (ESM)

(a) Input-output format selection fields, the user can select between Latitude-Longitude, DSM and ESM formats in both fields.

Note: Selecting alike coordinate formats to be input and output will result in an **INVALID SELECT** message.

(b) Coordinate format options, here users can switch the input formats of latitude and longitude between DD.DD (decimal degrees) and DMS (degrees, minutes, seconds).

- (c) The input fig. fields allow the user to select the input value of the ESM and DSM grid reference from 6, 8, or 10-digit Figure.
- (d) Coordinate input fields, here the coordinate values can be input. Depending on the formats selected the input fields will change accordingly.
- (e) The output fig. fields allow the user to select the output value of the ESM and DSM grid reference from 6, 8 or 10-digit Figure.
- (f) **Convert** button, after the user has input the coordinate values, tapping on this button will convert it to the desired format and the output will be displayed below the button with a *SUCCESS* message.

9.5 Settings Page

On the **Settings** page, a user can configure various aspects of the device. The available options include:

- (a) **Device Settings:** This screen displays configurable options related to automatic logout and idle shutdown of the device.
- (b) **Change Password:** Allows the user to change password.
- (c) **Erase:** Allows the user to delete the current system configuration.



Figure 9 Settings page

(d) **Kill**: Disables the device completely, removing the UI and elements in the process. This option is provided for security reasons.

Note: Do not attempt to trigger this option.

- (e) **Logout**: Allows the user to log out of the application.
- (f) **Power off**: Allows the user to shut down the device

9.6 Credits Page

The **Credits** Page acknowledges parties involved in the inception and development process of the Elena NavIC Grid Converter.

10. Step-wise Instructions

10.1 Login Screen

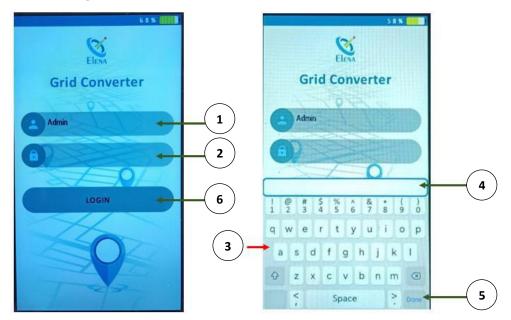


Figure 10 Login screen

- 1. Username input field (default: admin).
- 2. Password input field (default: 12345).
- 3. Keyboard: Appears when tapped on the username or password fields to enter username or password.
- 4. Line edit tab: User can see the entered value in the Line edit tab.
- 5. Press Done (Enter) button after entering values in the Line edit tab.
- 6. **Login** button: Enter the username and password as shown above then press the **Login** button.

10.2 Home Page: Own Position

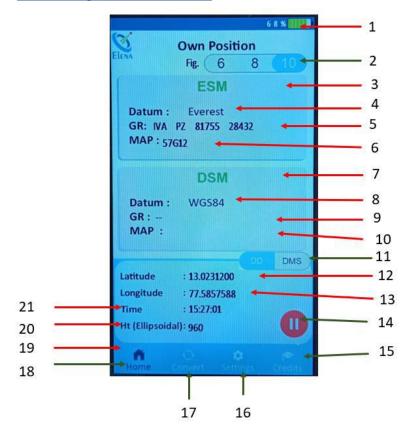


Figure 11 Home page: Own Position

The information displayed on the Home page is described below:

- 1. **Battery percentage** is shown on the top right of the display.
- 2. **Tab 1**: User can select the number of digits of figures of ESM and DSM GR (Grid Reference) to be shown.

3. ESM section

- 4. Datum of ESM
- 5. ESM GR
- 6. ESM mapsheet number
- 7. **DSM** section
- 8. Datum of DSM
- 9. DSM GR
- 10. DSM mapsheet number
- 11. **Tab 2**: User can select the format of the Lat Long display (**DD** Degree Decimals or **DMS** Degree Minutes Seconds)
- 12. Latitude
- 13. Longitude
- 14. **Pause** button: Pause button can be used to freeze the location data for making a note of the same.
- 15. Navigation to Credits page
- 16. Navigation to **Settings** page
- 17. Navigation to **Convert** page
- 18. Navigation to **Home** page
- 19. Menu bar
- 20. Height information
- 21. Time (IST)

10.3 Convert Page: Lat Long to ESM

- Step 1: Select Lat Long from dropdown 1 as shown.
- Step 2: Select ESM from dropdown 2.
- Step 3: Select Lat Long format (DD/DMS) from tab 1.

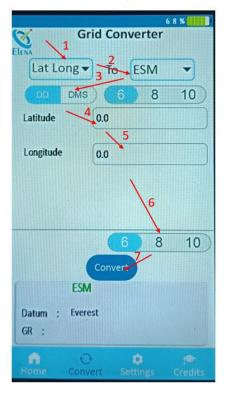


Figure 12 Convert page: Lat Long to ESM

- Step 4: Enter Latitude.
- Step 5: Enter Longitude.
- Step 6: Select output ESM fig.
- Step 7: Tap **Convert** button for the results.

10.4 Covert Page: ESM to Lat Long

10.4.1 Grid Letter (GL) + GR to Lat Long



Figure 13 Covert page: ESM to Lat Long - Grid Letter (GL) + GR to Lat Long

- Step 1: Select ESM from dropdown 1 as shown in the figure.
- Step 2: Select Lat Long from dropdown 2.
- Step 3: Select input fig of Easting and Northing format from tab 1.
- Step 4: Enter Easting value.

Note:

- If a user selects 10-fig and the Easting value has only 4 digits, ex: 7567, then the user must add zero as a prefix to make Easting 5-fig. The user should input 07567 instead of 7567. Adding zero is the same for 6 and 8-fig as well.
- A user must enter only integer values, not float.
- Error will be displayed on top of the screen if values are invalid.
- These points are the same for all conversions from Easting and Northing.
- Step 5: Enter Northing value (the above note applies to Northing as well).
- Step 6: Select Zone.
- Step 7: Select type of input GL (Grid Letter).
- Step 8: Enter Grid letter.
- Step 9: Select Output format of Lat Long
- Step 10: Tap **Convert** button for the results.

10.4.2 Mapsheet + GR to Lat Long

- Step 1: Select ESM from dropdown 1 as shown in the figure.
- Step 2: Select Lat Long from dropdown 2.
- Step 3: Select input fig of Easting and Northing format from tab 1.
- Step 4: Enter Easting value.



Figure 14 Covert page: ESM to Lat Long - Mapsheet + GR to Lat Long

Note:

- If a user selects 10-fig and the Easting value has only 4 digits, ex: 7567, then the user must add zero as a prefix to make Easting 5-fig. The user should input 07567 instead of 7567. Adding zero is the same for 6 and 8-fig as well.
- A user must enter only integer values, not float.
- Error will be displayed on top of the screen if values are invalid.
- These points are the same for all conversions from Easting and Northing.

- Step 5: Enter Northing value (the above note applies to Northing as well).
- Step 6: Select type of input MAP (Mapsheet number).
- Step 7: Enter Mapsheet number (no space or symbol between the mapsheet number and the alphabet/number ex: 54H/12 must be entered as 54H12).
- Step 8: Select Output format of Lat Long.
- Step 9: Tap **Convert** button for the results.

10.5 Covert Page: Lat Long to DSM

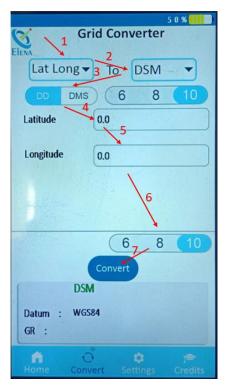


Figure 15 Covert page: Lat Long to DSM

- Step 1: Select Lat Long from dropdown 1 as shown in figure.
- Step 2: Select DSM from dropdown 2.
- Step 3: Select Lat Long format from tab 1.
- Step 4: Enter Latitude.
- Step 5: Enter Longitude.
- Step 6: Select output DSM fig.
- Step 7: Tap **Convert** button for the results.

10.6 Covert Page: DSM to Lat Long

10.6.1 Grid Letter (GL) + GR to Lat Long

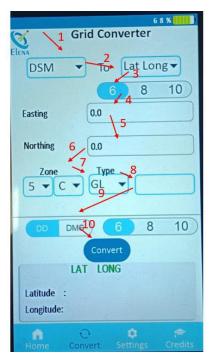


Figure 16 Covert page: DSM to Lat Long - Grid Letter (GL) + GR to Lat Long

- Step 1: Select DSM from dropdown 1 as shown in the figure.
- Step 2: Select Lat Long from dropdown 2.
- Step 3: Select input fig of Easting and Northing format from tab 1.
- Step 4: Enter Easting value.

Note:

- If a user selects 10-fig and the Easting value has only 4 digits, ex: 7567, then the user must add zero as a prefix to make Easting 5-fig. The user should input 07567 instead of 7567. Adding zero is the same for 6 and 8-fig as well.
- A user must enter only integer values, not float.
- Error will be displayed on top of the screen if values are invalid.
- These points are the same for all conversions from Easting and Northing.
- Step 5: Enter Northing value (the above note applies to Northing as well).
- Step 6: Select Zone.
- Step 7: Select type of input GL (Grid Letter).
- Step 8: Enter Grid letter.
- Step 9: Select Output format of Lat Long.
- Step 10: Tap **Convert** button for the results.

10.6.2 Mapsheet + GR to Lat Long

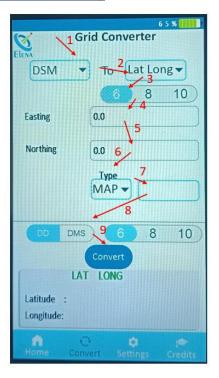


Figure 17 Covert page: DSM to Lat Long - Mapsheet + GR to Lat Long

- Step 1: Select DSM from dropdown 1 as shown in the figure.
- Step 2: Select Lat Long from dropdown 2.
- Step 3: Select input fig of Easting and Northing format from tab 1.
- Step 4: Enter Easting value.

Note:

• If a user selects 10-fig and the Easting value has only 4 digits, ex: 7567, then the user must add zero

as a prefix to make Easting 5-fig. The user should input 07567 instead of 7567. Adding zero is the same for 6 and 8-fig as well.

- A user must enter only integer values, not float.
- Error will be displayed on top of the screen if values are invalid.
- These points are the same for all conversions from Easting and Northing.
- Step 5: Enter Northing value (the above note applies to Northing as well).
- Step 6: Select type of input MAP (Mapsheet number).
- Step 7: Enter Mapsheet number (no space or symbol between the mapsheet number and the alphabet/number ex: 54H/12 must be entered as 54H12).
- Step 8: Select Output format of Lat Long.
- Step 9: Press **Convert** button for the results.

10.7 Covert Page: DSM to ESM

10.7.1 Grid Letter (GL) + GR to ESM

- Step 1: Select DSM from dropdown 1 as shown in the figure.
- Step 2: Select Lat Long from dropdown 2.
- Step 3: Select input fig of Easting and Northing format from tab 1.
- Step 4: Enter Easting value.

Note:

- If a user selects 10-fig and the Easting value has only 4 digits, ex: 7567, then the user must add zero as a prefix to make Easting 5-fig. The user should input 07567 instead of 7567. Adding zero is the same for 6 and 8-fig as well.
- A user must enter only integer values, not float.
- Error will be displayed on top of the screen if values are invalid.
- These points are the same for all conversions from Easting and Northing.

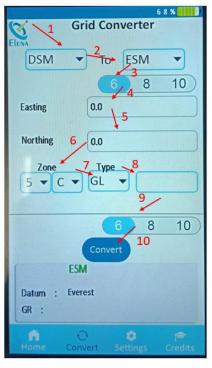


Figure 18 Covert page: DSM to ESM - Grid Letter (GL) + GR to ESM

Step 5: Enter Northing value (the above note applies to Northing as well).

Step 6: Select Zone.

Step 7: Select type of input GL (Grid Letter).

Step 8: Enter Grid letter.

Step 9: Select Output fig of ESM.

Step 10: Press **Convert** button for the results.

10.7.2 Mapsheet + GR to ESM

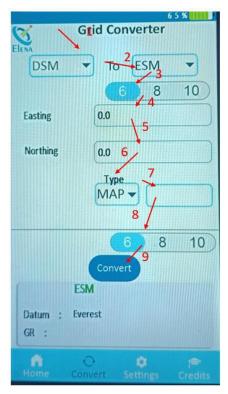


Figure 19 Covert page: DSM to ESM - Mapsheet + GR to ESM

- Step 1: Select DSM from dropdown 1 as shown in the figure.
- Step 2: Select Lat Long from dropdown 2.
- Step 3: Select input fig of Easting and Northing format from tab 1.
- Step 4: Enter Easting value.

Note:

- If a user selects 10-fig and the Easting value has only 4 digits, ex: 7567, then the user must add zero as a prefix to make Easting 5-fig. The user should input 07567 instead of 7567. Adding zero is the same for 6 and 8-fig as well.
- A user must enter only integer values, not float.
- Error will be displayed on top of the screen if values are invalid.
- These points are the same for all conversions from Easting and Northing.
- Step 5: Enter Northing value (the above note applies to Northing as well).
- Step 6: Select type of input MAP (Mapsheet number).
- Step 7: Enter Mapsheet number (no space or symbol between the mapsheet number and the alphabet/number ex: 54H/12 must be entered as 54H12).
- Step 8: Select Output fig of ESM.
- Step 9: Press **Convert** button for the results.

10.8 Covert Page: ESM to DSM

10.8.1 Grid Letter (GL) + GR to DSM

Step 1: Select ESM from dropdown 1 as shown in the figure.

Step 2: Select Lat Long from dropdown 2.

Step 3: Select input fig of Easting and Northing format from tab 1.

Step 4: Enter Easting value.

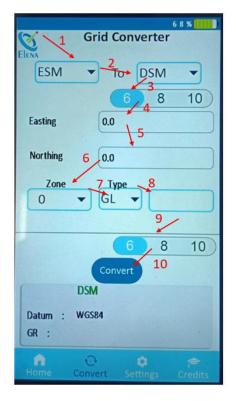


Figure 20 Covert page: ESM to DSM - Grid Letter (GL) + GR to DSM

Note:

- If a user selects 10-fig and the Easting value has only 4 digits, ex: 7567, then the user must add zero as a prefix to make Easting 5-fig. The user should input 07567 instead of 7567. Adding zero is the same for 6 and 8-fig as well.
- A user must enter only integer values, not float.
- Error will be displayed on top of the screen if values are invalid.
- These points are the same for all conversions from Easting and Northing.
- Step 5: Enter Northing value (the above note applies to Northing as well).
- Step 6: Select Zone.
- Step 7: Select type of input GL (Grid Letter).
- Step 8: Enter Grid letter.
- Step 9: Select Output fig of DSM.
- Step 10: Press **Convert** button for the results.

10.8.2 Mapsheet + GR to DSM

- Step 1: Select ESM from dropdown 1 as shown in the figure.
- Step 2: Select Lat Long from dropdown 2.
- Step 3: Select input fig of Easting and Northing format from tab 1.
- Step 4: Enter Easting value.

Note:

- If a user selects 10-fig and the Easting value has only 4 digits, ex: 7567, then the user must add zero as a prefix to make Easting 5-fig. The user should input 07567 instead of 7567. Adding zero is the same for 6 and 8-fig as well.
- A user must enter only integer values, not float.
- Error will be displayed on top of the screen if values are invalid.
- These points are the same for all conversions from Easting and Northing.

Step 5: Enter Northing value (the above note applies to Northing as well).

Step 6: Select type of input MAP (Mapsheet number).

Step 7: Enter Mapsheet number (no space or symbol between the mapsheet number and the alphabet/number ex: 54H/12 must be entered as 54H12).

Step 8: Select Output format of DSM.

Step 9: Press **Convert** button for the results.



Figure 21 Covert page -ESM to DSM: Mapsheet + GR to DSM

11. SATELLITE FIX

Acquiring satellite fix can be observed in two ways:

- (a) On the Home page of the device, the availability of fix fills the respective Lat-Long, ESM and DSM fields.
- (b) There is a small hole at the top right corner of the face of the device through which LED pulses for the fix can be seen. These pulses are denoted by:
 - (i) No fix: Rapid LED pulse every second.
 - (ii) Acquired fix: LED pulse every 3 seconds.

In case of unavailability of a fix, please make sure to take the following measures:

- (a) Move to an open area: Ensure the device has a clear view of the sky with no nearby obstructions or interference.
- (b) Check battery: Low power can affect signal reception.
- (c) Restart device: A reboot can help reacquire signals.
- (d) Wait: Sometimes it may take a few minutes to obtain a fix.

12. Battery Health

The following measures can be taken to improve the battery life and health:

- (a) Avoid leaving the device switched on when not in use.
- (b) Use the timeout settings in the device settings to efficiently manage device usage.
- (c) Use only the provided OEM charger to charge the device.
- (d) Avoid overcharging or completely draining the battery frequently as this may reduce the battery health.

13. Maintenance Guidelines

To ensure optimal performance and longevity of the device, adhere to the following guidelines:

- (a) Store the device in a cool, dry place away from direct sunlight and extreme temperatures.
- (b) Wipe the screen and casing with a soft, dry cloth. Avoid using water or liquid cleaners.
- (c) Do not expose the device to water or dust.
- (d) Avoid dropping the device or subjecting it to strong vibrations.
- (e) Avoid inducing excess stress to the membrane covering the charging port and power button. Remember, only the membrane section that covers the charging port can be temporarily removed and plugged back in.

14. Contact Us

Contact Elena's customer support for support.

We are happy to assist you!

For customer support and feedback:

Mobile: +91 6366229433

For sales enquiries:

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Know more about our company and our products at:

https://www.elenageo.com/

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'Sky is the Limit' is old saying; We believe in 'Space', the boundless