User Manual

Revision 9

Revision Date: June 01, 2015

C & C Technologies, Inc.
C-Nav DGNSS
730 E. Kaliste Saloom Road
Lafayette, LA 70508 U.S.A.

www.cnav.com
## Release Notice

This is the June 2015 release of the *C-NaviGator User Manual*.

## Revision History

<table>
<thead>
<tr>
<th>Revision</th>
<th>Date</th>
<th>Description</th>
<th>Author</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>06/01/2015</td>
<td>Updated to meet C-NaviGator v6.2.12</td>
<td>C. Thompson</td>
</tr>
<tr>
<td>8</td>
<td>09/08/2014</td>
<td>Updated to meet C-NaviGator v6.2.11</td>
<td>C. Thompson</td>
</tr>
<tr>
<td>7</td>
<td>08/23/2013</td>
<td>Updated to meet C-NaviGator v6.2.6</td>
<td>C. Thompson</td>
</tr>
<tr>
<td>6</td>
<td>02/18/2013</td>
<td>Modified to match C&amp;C Standards</td>
<td>C. Thompson</td>
</tr>
<tr>
<td>5.4</td>
<td>12/17/2012</td>
<td>Updated to meet C-NaviGator v6.2.4</td>
<td>C. Thompson</td>
</tr>
<tr>
<td>5.3</td>
<td>05/17/2012</td>
<td>Added C-NaviGator III hardware description</td>
<td>C. Thompson</td>
</tr>
<tr>
<td>5.2</td>
<td>08/04/2011</td>
<td>Updated to meet C-NaviGator v6.1.4</td>
<td>C. Callaway</td>
</tr>
<tr>
<td>5.1</td>
<td>01/12/2011</td>
<td>Updated to meet C-NaviGator v6.1.0</td>
<td>C. Callaway</td>
</tr>
<tr>
<td>4.0.2</td>
<td>09/05/2010</td>
<td>Updated to meet C-NaviGator v5.0.8</td>
<td>C. Callaway</td>
</tr>
<tr>
<td>4.0</td>
<td>10/06/2009</td>
<td>Updated to meet C-NaviGator v5.0.1 with C-Nav3050</td>
<td>C. Callaway</td>
</tr>
<tr>
<td>3.5</td>
<td>12/09/2008</td>
<td>Updated GPLv2</td>
<td>C. Callaway</td>
</tr>
<tr>
<td>3.4</td>
<td>09/17/2008</td>
<td>Updated to include the C-Nav1010 Features</td>
<td>C. Callaway</td>
</tr>
<tr>
<td>2.0.4</td>
<td>01/23/2008</td>
<td>Updated to meet C-NaviGator v2.0.4 released 01/23/2008</td>
<td>C. Callaway</td>
</tr>
<tr>
<td>2.0</td>
<td>12/22/2006</td>
<td>Updated to meet C-NaviGator v2.00 released 12/22/2006</td>
<td>C. Callaway</td>
</tr>
<tr>
<td>1.1</td>
<td>06/01/2006</td>
<td>Updated to meet C-NaviGator v2.00 released 06/01/2006</td>
<td>C. Callaway</td>
</tr>
<tr>
<td>1.0</td>
<td>12/12/2005</td>
<td>Updated to meet C-NaviGator v1.10 released 11/10/2005</td>
<td>C. Callaway</td>
</tr>
</tbody>
</table>
Trademarks
The C & C Technologies logo is a trademark of C & C Technologies, Inc.
C-Nav, C-Nav1010, C-Nav2000, C-Nav2050, C-Nav3050, C-Monitor, and C-NaviGator are trademarks of C & C Technologies, Inc.
Microsoft, MS-DOS, Windows, Windows 95, Windows 98, Windows 2000, and Windows NT are trademarks of Microsoft Corporation. All other brand names are trademarks of their respective holders.

Disclaimer of Warranty
EXCEPT AS INDICATED IN “LIMITED WARRANTY” HEREIN, C & C TECHNOLOGIES, SOFTWARE, FIRMWARE AND DOCUMENTATION ARE PROVIDED “AS IS” AND WITHOUT EXRESSED OR LIMITED WARRANTY OF ANY KIND BY EITHER C & C TECHNOLOGIES, INC., OR ANYONE WHO HAS BEEN INVOLVED IN ITS CREATION, PRODUCTION, OR DISTRIBUTION INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THE ENTIRE RISK, AS TO THE QUALITY AND PERFORMANCE OF THE C & C TECHNOLOGIES HARDWARE, SOFTWARE, FIRMWARE AND DOCUMENTATION, IS WITH YOU. SOME STATES DO NOT ALLOW THE EXCLUSION OF IMPLIED WARRANTIES, SO THE ABOVE EXCLUSION MAY NOT APPLY TO YOU.

Limitation of Liability
IN NO EVENT WILL C & C TECHNOLOGIES, INC., OR ANY PERSON INVOLVED IN THE CREATION, PRODUCTION, OR DISTRIBUTION OF THE C & C TECHNOLOGIES SOFTWARE, HARDWARE, FIRMWARE AND DOCUMENTATION BE LIABLE TO YOU ON ACCOUNT OF ANY CLAIM FOR ANY DAMAGES, INCLUDING ANY LOST PROFITS, LOST SAVINGS, OR OTHER SPECIAL, INCIDENTAL, CONSEQUENTIAL, OR EXEMPLARY DAMAGES, INCLUDING BUT NOT LIMITED TO ANY DAMAGES ASSESSED AGAINST OR PAID BY YOU TO ANY THIRD PARTY, RISING OUT OF THE USE, LIABILITY TO USE, QUALITY OR PERFORMANCE OF SUCH C & C TECHNOLOGIES’ SOFTWARE, HARDWARE, AND DOCUMENTATION, EVEN IF C & C TECHNOLOGIES, INC., OR ANY SUCH PERSON OR ENTITY HAS BEEN ADVISED OF THE POSSIBILITY OF DAMAGES, OR FOR ANY CLAIM BY ANY OTHER PARTY. SOME STATES DO NOT ALLOW THE LIMITATION OR EXCLUSION OF LIABILITY FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES SO, THE ABOVE LIMITATIONS MAY NOT APPLY TO YOU.
Table of Contents

Table of Contents ................................................................. 4
Manual Organization .............................................................. 9
Manual Conventions ............................................................. 10
Section 1 - Overview ............................................................. 11
  Introduction ........................................................................ 11
  Features and Functions ....................................................... 11
  C-Nav Specific Features and Functions ................................ 12
Section 2 - Hardware ............................................................. 13
  C-NaviGator II ................................................................. 13
    Controls ........................................................................... 13
    Back Panel ...................................................................... 14
      Power Section ............................................................ 14
      Mouse / Keyboard ....................................................... 14
      USB Ports ..................................................................... 14
      Input / Output Ports ..................................................... 14
  C-NaviGator ................................................................. 15
    Controls ........................................................................... 15
    Back Panel ...................................................................... 16
      Power Section ............................................................ 16
      Mouse / Keyboard ....................................................... 16
      USB Ports ..................................................................... 16
      Input / Output Ports ..................................................... 16
Section 3 - Operator Instructions ........................................... 17
  Power Up ........................................................................... 17
  Screen Layout .................................................................... 17
    Pull-Down Menus (top left): ........................................ 18
    Local Information (top right): ....................................... 18
    GNSS Quality Alert Indicators (left frame): .................. 19
  Operation ........................................................................... 20
Section 4 - Menus ................................................................. 21
  File Menu ........................................................................... 21
  Load Defaults ..................................................................... 21
Load Settings ........................................................................... 21
Save Settings ........................................................................... 22
Save Snapshot .......................................................................... 22
Upload File ............................................................................... 22
Reset Unit ................................................................................ 23
View ......................................................................................... 23
  Position Info ........................................................................... 23
  Satellite Info ........................................................................... 24
  Error Ellipse ........................................................................... 25
  Error Ellipse Settings .............................................................. 25
  Scatter Plot .............................................................................. 26
  Scatter Plot Settings ............................................................... 26
  Graphs .................................................................................... 27
  Fixes ......................................................................................... 27
  Alarms ..................................................................................... 28
  Screenshots ............................................................................. 28
Settings .................................................................................... 29
  General .................................................................................... 29
    Select Active GNSS ............................................................. 29
    Set Timezone Offset ............................................................. 29
    Select Time Device ............................................................... 29
    Units ....................................................................................... 29
  Display .................................................................................... 30
    Current Mode ....................................................................... 30
    Auto Mode Settings .............................................................. 30
  GNSS Quality Alerts ............................................................... 30
  Ports ......................................................................................... 31
  Logging .................................................................................... 31
  Network Virtual Ports ............................................................. 32
  Configure Network Output ...................................................... 32
  System Network Settings ........................................................ 33
  VNC Interface .......................................................................... 33
  Clean Screen .......................................................................... 34
  CCS OTI Configuration ........................................................... 35
  Corrections Satellite Configuration .......................................... 35
Help.................................................................36
This Page..........................................................36
File, View, Settings...........................................36
What’s New?.......................................................36
About .............................................................37
Section 5 - Devices..............................................38
C-Nav3050.........................................................39
   Receiver Information........................................39
   Extended Nav Info ...........................................39
   Solution Control.............................................40
   Navigation Mode..........................................40
   Antenna Identification....................................41
   RTK Configure..............................................41
   Corrections Receiver .......................................42
   Auxiliary Port Configuration............................42
   Output Control.............................................43
   Differential Config........................................43
   Software Options.........................................44
   Corrections Authorization...............................44
   Hardware Settings.........................................45
   Ethernet Configuration...................................45
   NTRIP Settings.............................................46
   Web Interface Settings....................................46
   Bluetooth Settings........................................47
   Settings Profile............................................47
   Firmware Update..........................................48
   Restart.......................................................48
C-Nav1010.........................................................49
   Receiver Information........................................49
   Solution Control............................................49
   Corrections Receiver........................................50
   Port Configuration..........................................50
   Output Control.............................................51
   Software Options..........................................51
   Corrections Authorization...............................52
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>C-Nav2050 Alarms</td>
<td>76</td>
</tr>
<tr>
<td>C-Nav2000 Alarms</td>
<td>77</td>
</tr>
<tr>
<td>Output Alarms</td>
<td>78</td>
</tr>
<tr>
<td>Simulator Alarms</td>
<td>78</td>
</tr>
<tr>
<td>Index</td>
<td>80</td>
</tr>
</tbody>
</table>
Manual Organization

This manual describes how to install, configure, and operate the C-NaviGator GNSS Control & Display unit from C & C Technologies, Inc. Sections are organized in a manner that facilitates quick operator orientation.

Section 1 - Overview (Page 11) provides a brief overview of the software capabilities of the C-NaviGator. An overview of the hardware is in Section 2 - Hardware (Page 13). Instructions to guide the operator through installation and setup are provided in Section 3 - Operator Instructions (page 17).

Detailed menu descriptions can be found in Section 4 - Menus (page 21). Configuration for supported devices is in Section 5 - Devices (page 38).

Section 6 - Maintenance (page 65) concentrates on maintenance and troubleshooting.
Manual Conventions

Arial font is used for plain text in this document.

*Arial italic* font is used for settings names.

“*Arial quoted*” font is used for settings values.

*Arial Bold* font is used for button names.

*Arial Bold Italic* font is used for menu items.

*Arial Blue* font is used for cross-references.

*Arial Blue Underline* font is used for hyperlinks.

*Arial red italic* is used for typed commands.

*Arial Bold* font size 10 is used for captions.

**Arial BLACK ALL-CAPS** font is used for port connection names.

⚠️ This symbol means Reader Be Careful. It indicates a caution, care, and/or safety situation. The user might do something that could result in equipment damage or loss of data.

⚠️ This symbol means Danger. You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical and RF circuitry and be familiar with standard practices for preventing accidents.

Important notes are displayed in shaded text boxes.

**Please note:**

Such note boxes display important information that should not be ignored.

Simple file content is displayed in Courier New Black font in a text box.
Section 1 - Overview

Introduction

C-NaviGator is a self-contained, Control/Display Unit that provides a number of visual aids to help the user monitor the quality, performance, and accuracy of the position information supplied by the GNSS receiver. Position calculations are performed by the C-NaviGator along with data quality assessments to create visual and graphical data representations that instantly convey critical information to the operator. Information from external sensors is displayed in a form that enables the user to quickly recognize a decrease in reliability of the position solution. The C-NaviGator’s processor-based, windows style operating environment is straightforward and easy to use.

Information screens provide the necessary user interface. Data entry and command functions are entered through the use of the touch-screen. Information displays, alarm indicators, parameter settings, data analysis, etc. are displayed on the C-NaviGator color LCD screen. Alarm or alert states are configured by the operator.

Position calculations are performed for data output to other systems as configured by the operator. Through C-NaviGator, the operator has easy access to input and output controls.

Features and Functions

- Monitor NMEA compliant GNSS systems
- Save/load settings
- Logging of GNSS data
- User selectable units for distance, height and speed
- User selectable time zones
• Day/night display brightness settings
• Help documentation
• Software updates via USB
• Input / Output all NMEA versions (2.1 / 3.0 / 3.1)
• Multiple Input / Output ports (4 x RS232)
• Monitoring screens include
  - Position Information
  - Satellite Information
  - Error Ellipse
  - Scatter Plot
  - Quality Alert Graphs
  - Event Log “Fixes”
  - Alarms
• Display of current Quality Information with Alerts
  - Frequency Mode of Solution
  - 2D / 3D Status
  - Correction Type
  - Correction Age
  - Number of Satellites used for Solution
  - HDOP, VDOP and PDOP
  - Figure of Merit

**C-Nav Specific Features and Functions**

• Control and monitoring of C-Nav3050 receivers
• Control and monitoring of C-Nav1010 receivers
• Control and monitoring of C-Nav2050 receivers
• Control and monitoring of C-Nav2000 receivers
• Interface for the user to enter Activation / Deactivation Codes
• Monitor and control the correction signal demodulator.
• Update the receiver’s firmware.
• View L1 and L2 signal strengths for each tracked satellite.
Section 2 - Hardware

C-NaviGator II

Controls

The C-NaviGator is designed to provide the operator with a functional and easy to navigate user interface. At Power-Up, the LCD screen automatically defaults to the Position Info screen. The pull-down menus are activated using the Menu button in the upper left corner of the LCD display.

Use the On-Screen-Display (OSD) control buttons to adjust the contrast, brightness and other display settings.
**Back Panel**

All connections to the C-NaviGator are made through the connectors on the back panel.

![Back Panel Image]

**Power Section**

Includes the input **PWR** plug

**Mouse / Keyboard**

Keyboard and mouse connections (PS/2) are provided for your optional use. During typical operations, these are not needed. The C-NaviGator works with many USB keyboards and mice.

**USB Ports**

Connections for USB devices such as flash sticks and external solid-state drives are provided. A C-Nav thumb drive is supplied with the unit. With most receivers, data can be logged directory to your USB device.

**Input / Output Ports**

Connections to input and output devices are through these standard PC type COM ports. There are 4 RS232 Ports (1 – 4) available for use.
C-NaviGator Controls

The C-NaviGator is designed to provide the operator with a functional and easy to navigate user interface. At Power-Up, the LCD screen automatically defaults to the Position Info screen. The pull-down menus are activated using the white MENU button to the right of the LCD display and the Cursor Position arrows to navigate to the desired screen.

The functions and commands activated by the Softkeys (F1-F4) are linked to the current screen display.
Back Panel
All connections to the C-NaviGator are made through the connectors on the back panel.

Power Section
Includes the input PWR plug, FUSE, and ON/OFF switch.

Mouse / Keyboard
Keyboard and mouse connections (PS/2) are provided for your optional use. During typical operations, these are not needed. The C-NaviGator works with many USB keyboards and mice.

USB Ports
Provide connections for USB device such as flash sticks and external solid-state drives. A C-Nav thumb drive is supplied the unit.

Input / Output Ports
Connections to input and output devices are through these standard PC type COM ports. There are 4 RS232 ports (1 – 4) available for use. Port 5 is reserved for future development. Port 5 may be configured for RS422/485 at the factory
Section 3 - Operator Instructions

Power Up

During the power up sequence, the operator has the option to install new software from C & C Technologies. As updates become available, the user will be able to download the software from the C-Nav ftp site and transfer it to a USB memory device. A flash memory stick is supplied with each unit. See Updating Software (page 66) for details.

Allow at least one minute for the system to initialize. Program start is automatic and the last settings stored by the user are recalled. The default screen is the Position Info screen.

For a description of the C-NaviGator display items, see View (page 23). If this screen does not contain the information described, refer to Troubleshooting (page 65).

Screen Layout

The C-NaviGator screen provides easy access to system information and control functions. System performance and the quality of the position solution are conveyed by means of red, yellow, and green indicators in the left screen panel (GNSS Quality Indicators). The main system “Alarm” appears in red on the right side of the screen along with an “Active Port” indicator. Indicator colors change according to the limits set by the operator for each parameter. See GNSS Quality Alerts (page 30) for details.
Along the top edge of the C-NaviGator screen are the pull-down menus and the date/time display. The type of information to be displayed in the center of the screen is selected by the operator using the pull-down menus described in Section 4 - Menus (page 21).

Pull-Down Menus (top left):

- **File** - Configuration storage, recall and reset
- **View** - Monitoring screen selection (Defaults to **Position Info** at power up)
- **Settings** - View, enter, or adjust operating parameters
- **Help** - Display and control screen setting descriptions

Local Information (top right):

- **Date and time**
GNSS Quality Alert Indicators (left frame):

- **Frequency** - Mode of operation
- **2D/3D Mode** - Position solutions with or without height
- **Corrections** - Indicates the current source of correction data
- **Diff Age** - Time in seconds since last valid correction
- **Sats** - Number of satellites used in position solution
- **HDOP** - Horizontal Dilution of Precision
- **VDOP** - Vertical Dilution of Precision
- **PDOP** - Position Dilution of Precision
Operation

1) Apply power to the C-NaviGator by connecting the power supply to the back of the C-NaviGator unit.

2) In a few seconds, the system menu will appear allowing the option to update the internal program, calibrate the touch-screen, or begin normal operation (default). If no action from the operator is detected, C-NaviGator will automatically launch the program. This will take several seconds.

3) C-NaviGator automatically recalls the last settings saved and displays the Position Info screen (page 23). System operating modes and status indicators are seen on the left under GNSS Quality Alerts (page 30). To the right are the active ports switch, the active port indicator, and the general “Alarm” Indicators. The Switch Active button provides a means to quickly switch between different input sources for monitoring. The actual port programming and activation are accessed from the Menu / Settings / Ports screen as described in Ports (page 31).

4) Press Prev Page and Next Page on the C-NaviGator display to scan through the various view screens. Alternatively, press Menu / View to select the specific view screen.
Section 4 - Menus

Pull down menus (upper left of the screen) allow operator access to C-NaviGator configuration, display options, parameter settings, support documentation, etc. Menus are selected by pressing **Menu** on the display and pressing each subsequent menu item.

### File Menu

#### Load Defaults

The user can quickly revert the C-NaviGator to all factory settings as a starting point for a new configuration. When **File / Load Defaults** is selected, the user is required to configure the system, starting with assigning devices to **Ports** (page 31).

#### Load Settings

Similar to **Load Defaults** - **Menu / File / Load Settings** recalls the last configuration saved by the operator using the **Save Settings** command.
Save Settings
To store C-NaviGator’s current configuration, select **Menu / File / Save Settings** and press **Save**. These settings can be recalled with the **Load Settings** command.

Save Snapshot
Store the current C-NaviGator configuration to a USB device

Upload File
This opens the file upload screen, allowing the user to quickly upload a file to a device.

**Warning:**
Uploading an inappropriate file to the device may render the device inoperable. Use care to only upload files designed for the device.
Reset Unit

Reset Unit causes C-NaviGator to restart the internal program.

The operator is asked to confirm the Reset Unit command.

View

Pressing the Prev Page and Next Page buttons from any of these screens will ‘walk’ through the available View screens. Pressing Switch Active will change between available position devices to display.

Position Info

This is the default screen for C-NaviGator. Position Info displays horizontal position (in Latitude / Longitude), Height Above Ellipsoid (HAE), Speed Over Ground (SOG), and Course Over Ground (COG).

The height and speed units can be configured on the General settings screen (Page 29).
Satellite Info

This screen provides the operator with information about the constellation configuration and the signal strengths received from each visible satellite. Relative locations of the GNSS satellites to the GNSS receiver are plotted based on azimuth and elevation information provided by the GNSS receiver. The plot includes corrections satellite information. Additionally, the receiver’s current elevation mask is annotated on the plot.

Each visible satellite is represented in the plot by a circle with the satellite ID number inside. All satellites used to compute the PVT solution are identified as green circles. Circles turn red if data from the satellite becomes too noisy or obstructed.

Circles with a blue border represent GNSS satellites and those with an orange border represent GLONASS satellites.

The graphic center point reference represents a point directly overhead and the grid lines from the center of the graph inversely indicate satellite elevation. There is a circle every 15 degrees of elevation and azimuth lines at every 45 degrees.
Error Ellipse
The error ellipse graphically represents the sum of the horizontal error uncertainty in the system.
Graphics on the “Error Ellipse” screen show the error estimate of the PVT solution accuracy (in meters) based on residual analysis.
The range, the distance from the center of the graph to the outer ring, is user configurable using Settings.

Error Ellipse Settings
Allows the user to set the range of the graph or set it to auto range. When auto range is selected, the range will grow to accommodate the size of the error ellipse.
Scatter Plot

This screen displays a history of the positions received from the GNSS receiver. The reference Latitude and Longitude shown indicates the center position of the graph. New positions are computed and presented on the scatter plot with error displacements shown referenced to the reference position. The reference position may be set to a “Fixed” position or set to “Follow” the latest GNSS fix. The range is the distance from the center of the graph to the outer ring.

The reference position and range settings may be changed by pressing the Settings button.

Scatter Plot Settings

Using the Center drop down you can set position for the center of the graph. Select “Track Current” to track the current position. Choose “Fixed (Manual), to enter the latitude and longitude. Choose “Fixed (Here)”, to use the current position as the graph center.

Enter the range for the graph in the Range field. The display can also be set to automatically adjust the range of the graph if Auto-Range is set to “Yes”.

![Scatter Plot Diagram]
Graphs

Quality information for the previous 60 seconds is displayed in graphs. The colors change based on the quality alert settings.

Fixes

Position fixes are logged into the C-NaviGator memory when the Take Fix button is pressed. The Edit button allows the user to name / describe the fix.
Alarms

Several alarm conditions are logged and displayed on this screen. The Ack button can be used to turn off the alarm indicator in the lower right corner of the display until a new alarm is raised.

Certain more serious alarms will continuously cause the alarm indicator to light up.

See Appendix C - Alarm List (page 74) for a detailed list of available alarms.

Screenshots

From this page, the operator can preview existing screenshots. Images can be copied to USB devices. Screenshots in the list can be deleted. To preview a screenshot, select it in the list and press Preview. To copy one to a USB device, select the screenshot in the list and choose a USB device, then press Save to USB.
Settings

General

Three major system settings are accessed through this screen. These include:

- Active GNSS
- Timezone
- Time Device
- Units

Select Active GNSS

The *Active GNSS port* is used to populate the View screens and GNSS Quality Alerts.

The Active GNSS device can also be selected with *Switch Active* button while viewing any of the View screens.

Set Timezone Offset

The offset from UTC time is set here by adjusting the hour and minute values.

Select Time Device

The device used to sync system time with GPS time.

Units

Distance and speed units used for the C-NaviGator displays are selected in this section of the screen.

Note:
Changing the *Active GNSS port* settings does not alter the unit’s data output.
Display

Brightness of the C-NaviGator LCD backlight and screen colors is controlled through settings on this screen. It can be adjusted for optimum viewing depending on the time of day and physical location of the unit. Night mode settings are necessary for installations on the bridge of a vessel where bright lights interfere with the helmsman’s view.

Current Mode

This option selects the ‘Day’ or ‘Night’ color palette and backlight levels. The ‘Night’ palette is much darker than the ‘Day’ palette.

Auto Mode Settings

Programs the display to automatically switch between ‘Day’ and ‘Night’ modes. Day and night start times can be configured in 15 minute increments.

GNSS Quality Alerts

The pane on the left side of the screen display various GNSS quality figures that are color coded based on user-configurable limits. Red indicates that the data or status of the parameter is out of the acceptable range selected by the user. Similarly, yellow indicates that the value being displayed is in the range that is borderline or requires attention. A green indicator signifies that the value or status of the parameter is within the acceptable limits.
The **Menu / Settings / GNSS Quality Alerts** page allows you to configure when the quality indicators change colors. “Single Frequency” and “Auto 2D” positioning may or may not indicate a problem, depending on the situation. So, you can select any of the colors for these states. For the rest of the alerts, you have 2 columns of settings. In the **Warn (Yellow) if not** column, you select at what point the indicator turns from green to yellow. In the **Alert (Red) if not** column, you select at what point the indicator turns from yellow to red.

### Ports

This screen allows the operator to assign input / output devices to the desired ports. Each port is activated by selecting a device in the **Type** column. Also adjustable are the serial data transfer settings, including **Baud Rate** (Speed), number of **Data Bits**, **Parity** and the number of **Stop Bits**. Always press **OK** after all changes are made.

<table>
<thead>
<tr>
<th>Port</th>
<th>Type</th>
<th>Settings</th>
<th>Locked</th>
</tr>
</thead>
<tbody>
<tr>
<td>Port 1</td>
<td>C-Nav2000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Port 2</td>
<td>Unassigned</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Port 3</td>
<td>Unassigned</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Port 4</td>
<td>Unassigned</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Note:

For C-Nav2000 and C-Nav2050, factory default communication settings are 19200 8/None/1

For C-Nav1010 and C-Nav3050, factory default communication settings are 57600 8/None/1

All C-NaviGator active ports are listed below **Menu / Settings / Port**. In the example above, **PORT 1** is set to “C-Nav2050”. Additional device status, settings, and control information are available for each port when selected.

See [Appendix B - NMEA Data Strings](#) (page 73) for a table of NMEA strings and the data extracted from each.
Logging
This screen allows the operator to assign configure logging of the data from an input device to a USB mass storage device. Each port can be configured to log input data. Select the port from the list, and press the settings button. On the logging settings dialog select the frequency to create new files, and the USB device to place the files. Once configured you can use the “Start” and “Stop” buttons to control data logging.

Network Virtual Ports
This screen shows the network virtual port summary and allows the operator to configure network output messages. Press the New button to create a new output. Use the Settings button to show details of an existing network output. To copy an existing configuration, press the Copy button. Pressing Delete will remove a network output. See the Configure Network Output and screen for more information.
Configure Network Output

This screen allows the operator to configure the settings for a network connection. Specify the Name, Protocol, Source Port, Destination Port, and the Destination Host, then press Apply. A device will be created for each virtual network port. The device can be configured from the Settings / {DeviceName} menu item. See Section 5 - Devices (Page 38) for more information on configuration for the selected device types.

System Network Settings

This screen allows the operator to networking configuration for the unit. Choose the Config Type “DHCP”, “Static”, or “Disabled”. Provide settings from your network administrator, and press the Apply button.
VNC Interface

This screen allows the operator to configure the VNC server. Once configured, VNC clients can connect and control the C-NaviGator.

System networking must be configured in order for VNC to function.

Clean Screen

Choose this option to physically clean the screen of the unit. Choosing this option, the display will ignore input from the touch screen for 10 seconds.
CCS OTI Configuration
This screen allows the operator to update the CCS OTI Configuration file stored in the C-NaviGator.

Corrections Satellite Configuration
This page allows for the configuration of the information necessary for receivers to receive CCS corrections during INMARSAT frequency changes.
Help

This Page
As an operator aid, Menu / Help / This Page contains information about the screen currently displayed. It provides a quick reference should there be a question that requires a quick answer.

File, View, Settings
Under Menu / Help, the operator can also find the latest information relating to other menu items. The information here is similar to that presented in this manual.

What’s New?
As each new version is released, Menu / Help / What’s New? describes the modifications, additions, and corrections. These may include software enhancements, bug fixes, new feature, etc. The user should always review these changes after installing new software.
About

Support contact information from C & C Technologies can be found by selecting Menu / Help / About menu. There you will find the current version number, contact information, etc. to assist the operator should problems arise.
Section 5 - Devices

This section describes the available device drivers and their use.
C-Nav3050

Receiver Information

General information about the C-Nav3050 GNSS receiver (such as firmware / hardware versions, serial numbers, etc.) is displayed on this screen. Message indicators (green / white circles) indicate when data messages are received.

The **Query** button can be used to request updated information from the receiver.

Extended Nav Info

Detailed information about the C-Nav3050 navigation status including Solid Earth Tide deltas, Standard Deviation Error Estimates, and Velocity deltas.
Solution Control

Control settings relevant to computing the position are displayed on this screen. The user can configure the use of corrections. See “SBAS” in Appendix A - Glossary of Terms (Page 67) for a description of “Correction Signals”.

Navigation Mode

This screen allows the user to configure the navigation modes for the C-Nav3050. The vertical navigation mode, which signals to use for measurements and the dynamic mode of the receiver can be set here.
Antenna Identification
Use this page to adjust the phase center height, slant range, and radius of your antenna.

RTK Configure
Use this page to adjust your RTK settings, and MBRTK settings.
**Corrections Receiver**

This screen contains status indicators relative to GNSS corrections received. Also, the user can manually set the C-Nav corrections frequency here.

**Auxiliary Port Configuration**

**COM1** and **COM2** on the C-Nav3050 receiver can be configured here. Serial data transfer parameters (*Baud Rate* and *Parity*) should be set to match that of the C-NaviGator port. Settings for the 1PPS output can also be modified.
Output Control

Output data strings from the C-Nav3050 can be chosen by the settings in this screen. Some messages can be output "On Change", thus output at the navigation rate. The Navigation Rate can be set on the Solution Control page. Other strings can be set to output every 'fixed' number of seconds.

Differential Config

The RTCM (Radio Technical Commission for Maritime Services) standard SC-104 correction type and rates for the C-Nav3050 are implemented here.
Software Options

The options available to the user are encoded into and activated by the Options Code. This determines which settings and features are enabled in the system. Various system operational status indicators are shown including status of the RTK remote units (if applicable).

Corrections Authorization

License information is displayed and authorization code entered here.
Hardware Settings
This page allows the user to configure the USB mode, control logging to the internal memory and USB devices when in host mode. Restarting the receiver can also be done from this page.

Ethernet Configuration
Use this page to configure the Ethernet settings for the receiver. Virtual Ports for the C-Nav3050 are also configured on this page.
NTRIP Settings
This page allows users to configure the settings for NTRIP input to the receiver.

Web Interface Settings
This page allows you to upload a new C-Nav3050 Web Interface to the receiver.
Bluetooth Settings
This page allows you to configure the Bluetooth settings for the C-Nav3050.

Settings Profile
Settings can be saved in the C-Nav3050. Use this dialog to save and activate settings profiles within the receiver.
Firmware Update

Use this page to update the firmware of your C-Nav3050.

Warning:
Do not unplug the USB device while the firmware is loading.

Restart

Use this page to update the restart your C-Nav3050.
Receiver Information

General information about the C-Nav1010 GNSS receiver (such as firmware / hardware versions, serial numbers, etc.) is displayed on this screen. Message indicators (green / white circles) indicate when data messages are received. The **Query** button can be used to request updated information from the receiver.

Solution Control

Various status indicators and control settings relevant to the corrections applied in the position solution are displayed on this screen. This information verifies system performance with respect to limits set by the operator. See “SBAS” in Appendix A - Glossary of Terms (Page 67) for a description of “Correction Signals”.
Corrections Receiver

This screen contains status indicators relative to GNSS corrections received. Also, the user can manually set the C-Nav corrections frequency here.

Port Configuration

**COM1** and **COM2** on the C-Nav1010 receiver can be configured here. Serial data transfer parameters (*Baud Rate* and *Parity*) should be set to match that of the C-NaviGator port. Input / output protocols for the C-Nav Auxiliary Port and the PPS port can also be accessed,
Output Control

Output data strings from the C-Nav1010 can be chosen by the settings in this screen. Some messages can be output “On Change”, thus output at the navigation rate. The Navigation Rate can be set on the Solutions Control page. Other strings can be set to output every ‘fixed’ number of seconds.

Software Options

The options available to the user are encoded into and activated by the Options Code. This determines which settings and features are enabled in the system. Various system operational status indicators are shown including status of the RTK remote units (if applicable).
Corrections Authorization

License information is displayed and authorization code entered here.

Firmware Update

The C-Nav1010 receiver's firmware can be installed from this screen. Ensure that the USB memory device is installed. Press the Scan USB button to search the USB memory stick for available firmware. Press Update Firmware to upload the new code into C-Nav1010 memory. Information regarding the new version is displayed in the information window.

Warning:
Do not unplug the USB device while the firmware is loading.
C-Nav2050

Receiver Information

General information about the C-Nav2050 GPS receiver (such as firmware / hardware versions, serial numbers, etc.) is displayed on this screen. Message indicators (green / white circles) indicate when data messages are received. The Query button can be used to request updated information from the receiver.

Solution Control

Various status indicators and control settings relevant to the corrections applied in the position solution are displayed on this screen. This information verifies system performance with respect to limits set by the operator. See “SBAS” in Appendix A - Glossary of Terms (Page 67) for a description of “Correction Signals”.
Corrections Receiver

This screen contains status indicators relative to GNSS corrections received. Also, the user can manually set the C-Nav corrections frequency here.

Port Configuration

**COM1** and **COM2** on the C-Nav2050 receiver can be configured here. Serial data transfer parameters (**Baud Rate** and **Parity**) should be set to match that of the C-NaviGator port. Input / output protocols for the C-Nav Auxiliary Port and the 1PPS port can also be accessed.
NMEA Output Control

Output data strings from the C-Nav2050 can be chosen by the settings in this screen. Some messages can be output “On Change”, and will be delivered when new data is available; typically this is at the navigation rate of the receiver. The Navigation Rate can be set on the Solutions Control page. Other strings can be set to output every ‘fixed’ number of seconds.

RTCM Output Control

The RTCM (Radio Technical Commission for Maritime Services) standard SC-104 correction type and rates for the C-Nav2050 are implemented here.
Software Options

The options available to the user are encoded into and activated by the Options Code. This determines which settings and features are enabled in the system. Various system operational status indicators are shown including status of the RTK remote units (if applicable).

Corrections Authorization

License information is displayed and authorization code entered here.
Firmware Update

The C-Nav2050 receiver’s firmware can be installed from this screen. Ensure that the USB memory device is installed. Press the Scan USB button to search the USB memory stick for available firmware. Press Update Firmware to upload the new code into C-Nav2050 memory. Information regarding the new version is displayed in the information window.

**Warning:**
Do not unplug the USB device while the firmware is loading.

MultiMediaCard (MMC) Administration

Control of the internal MMC Logging is handled here. Data can be logged to the internal MMC of the C-Nav2050.
MMC Files

Control of files on the MMC Internal memory is handled here. Including transferring a file to a USB device.
C-Nav2000

Receiver Information

Specific information regarding the GNSS receiver (including firmware / hardware version, etc.) is displayed on this screen. Message indicators (green / white circles) indicate the Message status. Green circles indicate messages are being received by C-NaviGator.

The Query button can be used to request updated information from the receiver.

Solution Control

General operating parameters and position solution control are for the C-Nav2000 are accessed here. These settings define the acceptable operating limits, correction signal settings, vertical / 3D control, correction devices and signals, etc.
Output Control

NMEA and RTCM output are controlled from this screen.

Corrections Receiver

This screen contains mainly status indicators relative to the GNSS corrections received by the system. Also, the user can manually set the C-Nav corrections frequency here.
Corrections Authorization

The operator can access information and enter the authorization code into the C-Nav2000 receiver. As part of standard procedure, operators should periodically check the expiration date to avoid gaps in service.

Firmware Update

The C-Nav2000 receiver’s firmware can be installed from this screen. Ensure that the USB memory device is installed. Press the Scan USB button to search the USB memory stick for available firmware. Press Update Firmware to upload the new code into C-Nav2000 memory. Information regarding the new version is displayed in the information window.

Updates of a C-Nav2000 typically require 25-30 minutes. This process should not be interrupted as it may leave the receiver in an inoperable state if not completed successfully.
**Warning:**
Do not unplug the USB device while the firmware is loading.
NMEA Input

Status
Sentence string status indicators identify which information the GNSS receiver supplies.
Output

Settings

All output control and data transfer functions are accessible from this screen. These include Port information, NMEA string selections, output filter settings, etc.
Section 6 - Maintenance

Troubleshooting

No Position Information

*Position Info* screen is blank.

1) Check cable interconnections.
2) Go to *Menu / Settings / Ports* and verify that the settings correspond to the correct input connection.
3) Go to *Menu / Settings / General* to verify that the correct “COM Port” is selected as the *Active GNSS Port*.

**Please note:**
Active Port # is displayed on the right side on View screens.

No Serial Input / Output

The most common cause of data transfer problems is an incorrect setting in the port configuration.

1) Check that the serial port settings are correct and that they match the input / output device. Select *Menu / Settings / Ports / xxxx*.
2) The C-Nav2000 and C-Nav2050 data transfer settings should be “19.2K / 8 / None / 1”.
   The C-Nav1010 and C-Nav3050 data transfer settings should be “57.6K / 8 / None / 1”.
Updating Software

New software versions for the C-NaviGator will be posted on the C-Nav web site at [www.cnav.com](http://www.cnav.com). The software can be downloaded and saved to the supplied USB Thumb Drive for use with C-NaviGator.

To verify that the latest software is installed, check the About (Page 37) page from the Help (Page 36) menu.

Follow these procedures:

1) Plug the USB memory device that contains the new software into one of the USB ports on the C-NaviGator rear panel.
2) Reset the C-NaviGator unit.
3) When the system menu screen appears, press the Update button.
4) Follow the on screen instructions.
Appendix A - Glossary of Terms

1PPS (1 Pulse Per Second) A precision electronic pulse output (at TTL levels) from the GNSS receiver that marks exact second intervals (1 s). It is used for precise timing and to synchronize sensors and acquisition computers.

Azimuth The horizontal angle of the observer's bearing in surveying, measured clockwise from a referent direction, as from the north, or from a referent celestial body, usually Polaris.

Bad Packets The percentage of bad C-Nav correction packets received since the unit was turned on.

Bit Error Rate Number of received bits of a data stream over a communication channel that have been altered due to noise, interference, distortion or bit synchronization errors. The Bit Error Rate is considered good if less than 20. The maximum reported value is 500.

C-Monitor A utility program used to monitor the quality of the position information received from a GNSS receiver. No position calculations are done in C-Monitor. C-Monitor simply creates a visual representation of the data received from a GNSS unit.

C-Nav1010 The C-Nav GNSS receiver combines a dual-frequency, geodetic grade, GNSS receiver with an integrated LBAND communication RF detector and decoder -- all linked by an internal microprocessor. The entire assembly is combined into a single integrated package that is durable, lightweight and water/weatherproof.

C-Nav2000 The C-Nav2000 GNSS navigational receiver is a 10-channel dual frequency unit with two additional channels for receiving Satellite Based Augmentation System (SBAS) signals and an L-Band demodulator for reception of the C-Nav
C-Nav2050 The C-Nav2050 survey GNSS receiver has expanded capabilities including RTK, PPS output, etc. As with the model C-Nav2000, the C-Nav2050 is a 10-channel, dual frequency, precision GNSS receiver, with two additional channels for receiving SBAS signals and an L-Band demodulator for reception of C-Nav subscription signals. Maximum data output rate is 50Hz and Position Velocity Time (PVT) data can output at 25Hz. Two 115kbps serial ports are available. For more information, go to www.cnav.com.

C-Nav3050 The C-Nav3050 survey GNSS receiver has expanded capabilities including RTK, PPS output, etc. As with other C-Nav receivers, the C-Nav3050 includes dual frequency, precision GNSS receiver, with two additional channels for receiving SBAS signals and an L-Band demodulator for reception of C-Nav subscription signals. For more information, go to www.cnav.com.

<table>
<thead>
<tr>
<th>Correction Signal</th>
<th>The Correction Signal-to-Noise ratio. This graph is only available with the C-Nav system.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correction Type</td>
<td>The type or source of differential corrections being applied to the GNSS receiver.</td>
</tr>
<tr>
<td>Course True</td>
<td>The course computed by the GNSS receiver.</td>
</tr>
<tr>
<td>Differential Age</td>
<td>The time in seconds since the GNSS unit received the last differential correction update.</td>
</tr>
<tr>
<td>Differential GPS</td>
<td>A technique for improving GPS solution accuracy by reducing the error based on signals received at a known location. Single point code positioning with pseudorange</td>
</tr>
</tbody>
</table>
corrections are applied from simultaneous observations at the known position. One to ten meter accuracy is typical.

**DOP**

Dilution of Precision is a scale factor representing the effect of satellite constellation geometry positioning accuracy. Standard terms for GNSS applications are:

- **GDOP** Geometric Dilution of Precision -- three coordinates plus clock offset
- **PDOP** Position Dilution of Precision) -- three coordinates (See PDOP definition below)
- **HDOP** Horizontal Dilution of Precision -- two coordinates
- **VDOP** Vertical Dilution of Precision -- height only
- **TDOP** Time Dilution of Precision) -- clock offset only

**Elevation**

Height of the GNSS antenna above the reference ellipsoid.

**Error Ellipse**

A statistical measure of the positional error at a given point computed from the propagation of all errors affecting the position solution and expressed by its semi-major and semi-minor axis (vectors of greatest and least magnitude) and the covariance (rotation angle in the reference coordinate system). Two-dimensional errors are typically propagated at one-standard deviation (39.4% probability that the position lies on or within the ellipse) or 2.1447 times the standard deviation (95% confidence) level.

**FOM** Figure of Merit

**GNSS Receiver**

A GNSS receiver consists of a number of basic components: an antenna with optional preamplifier, a radio-frequency and intermediate-frequency (RF / IF) "front end" section, a signal tracker / correlator section, and a microprocessor to control the receiver, process the signals, and compute the receiver's coordinates. The receiver will also include a power supply and memory devices to store instructions and data.

**HAE** Height Above Ellipsoid – RTK vertical reference plane.
L1-L2 Sig. Strength

GNSS satellites transmit spread spectrum signals in two frequency bands, L1 and L2 (1575.42 and 1223.6 MHz, respectively). The satellite signals carry both time information and a data strings, referred to as the GNSS navigation message. This message is transmitted at a rate of 50 bits per second. Using the data from 4 or more satellites, a GNSS receiver can accurately determine local latitude, longitude and height. Civilian applications are confined to the L1 band for computing position. The C & C Technologies and military receivers employ both L1 and L2 bands, offering a significant improvement in accuracy.

NMEA 0183

This guideline for Interfacing marine electronics devices is a voluntary industry standard, first released in March of 1983. NMEA 0183 defines electrical signal requirements, data transmission protocol, timing, and specific sentence formats for up to 38.4K-baud serial data bus.

PDOP

Position Dilution of Precision is the most common mathematical expression of the quality of solutions. It is based on the geometry of the satellites with the best case being a value of 1. Higher numbers indicate worse quality. The best DOP would occur with one satellite directly overhead and three others evenly spaced about the horizon. PDOP has a multiplicative effect on range error. For example, a range error of 32 meters with a PDOP of 1 would give a user an assumed best accuracy of 32 meters. A PDOP of 2 would result in an assumed accuracy of 64 meters. C-NaviGator can be programmed to stop providing position solutions above a specific PDOP level (6 is common).

Position

Includes Current Latitude, Longitude, Geoidal Height, HDOP, PDOP, Type of corrections, Current Station ID, Differential Age, Velocity, UTC Time and UTC Date if available.

PPS

Precise Positioning Service – a positioning service that includes velocity and timing information. PPS is continuously available, worldwide to authorized users. PPS
information is usually (but not always) encrypted to prevent use by unauthorized users.

**Pseudorange**  
A measure of the apparent propagation time from the satellite to the receiver antenna, expressed as a distance. The apparent propagation time is determined from the time shift required to align a replica of the GNSS code generated in the receiver with the received GNSS code. The time shift is the difference between the time of signal reception (measured in the receiver time frame) and the time of emission (measured in the satellite time frame). Pseudorange is obtained by multiplying the apparent signal-propagation time by the speed of light. Pseudorange differs from the actual range by the amount that the satellite and receiver clocks are offset, by propagation delays, and other errors including those introduced by selective availability.

**PVT**  
**Position Velocity Time**

**RTCM**  
**Radio Technical Commission for Maritime Services** – A Commission set up to define a differential data link to relay GNSS correction messages from a monitor station to a field user. The RTCM SC-104 recommendation is the de facto standard for differential GNSS correction transmission. It defines the correction message format and 16 different correction message types.

**RTK**  
**Real Time Kinematic** (or Kinematic Surveying) involves a roving receiver that does not need to stop to collect precision information. Meter/centimeter level accuracy is available using modern dual-frequency carrier-phase measurement techniques.

**SBAS**  
**Satellite Based Augmentation System** - Includes, but is not limited to: WAAS (Wide Area Augmentation System) and EGNOS (European Geo-stationary Navigation Overlay System). Ranging signals generated on the ground and provided via C-band (or K-band) downlink are provided to the end user. These signals contain integrity data on satellite system.
<table>
<thead>
<tr>
<th>Sky Plot</th>
<th>This option displays a plot of the current GNSS satellite locations with reference to the GNSS receiver. C-NaviGator refers to this presentation as “Position Information”.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scatter Plot</td>
<td>This option displays a plot of satellite positions relative to the receiver and provides an indication of relative signal strength in the two frequency bands.</td>
</tr>
<tr>
<td>Visible Sats</td>
<td>The number of Satellites used by the receiver in the position solution.</td>
</tr>
<tr>
<td>WAAS</td>
<td><strong>Wide Area Augmentation Service</strong> -- A system of satellites and ground stations that provide GNSS signal corrections over a wide area. An accuracy improvement on the order of three meters, with 95 percent confidence, is realized.</td>
</tr>
<tr>
<td>WCT</td>
<td><strong>Wide Area Correction Transform</strong></td>
</tr>
</tbody>
</table>
Appendix B - NMEA Data Strings

C-NaviGator is capable of reading and writing NMEA 0183 compliant messages as they relate to positioning. Version 2.1, 3.0 and 3.01 are supported. The following table lists the available strings:

<table>
<thead>
<tr>
<th>NMEA String</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALM</td>
<td>Almanac data</td>
</tr>
<tr>
<td>GBS</td>
<td>GNSS Satellite Fault Detection</td>
</tr>
<tr>
<td>GRS</td>
<td>GPS Range Residuals</td>
</tr>
<tr>
<td>MLA</td>
<td>GLONASS Almanac Data</td>
</tr>
<tr>
<td>GGA</td>
<td>Global Positioning System Fix Data</td>
</tr>
<tr>
<td>GLL</td>
<td>Geographic Position – Latitude / Longitude</td>
</tr>
<tr>
<td>GNS</td>
<td>GNSS Fix Data</td>
</tr>
<tr>
<td>GSA</td>
<td>GNSS DOP and Active Satellites</td>
</tr>
<tr>
<td>GST</td>
<td>GNSS Pseudorange Error Statistics.</td>
</tr>
<tr>
<td>GSV</td>
<td>GNSS Satellites in View</td>
</tr>
<tr>
<td>RMC</td>
<td>Recommended Minimum Specific GNSS Data</td>
</tr>
<tr>
<td>VTG</td>
<td>Course Over Ground and Ground Speed</td>
</tr>
<tr>
<td>ZDA</td>
<td>Time &amp; Date</td>
</tr>
</tbody>
</table>

In addition to standard NMEA messages, C-NaviGator recognizes the following C-Nav proprietary sentences:

<table>
<thead>
<tr>
<th>NMEA String</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DPGGA</td>
<td>Filtered GGA output for DP vessels.</td>
</tr>
<tr>
<td>RTCM</td>
<td>C-NaviGator can output RTCM if a C-Nav2000, C-Nav2050, or C-Nav3050 is connected.</td>
</tr>
<tr>
<td>SATS</td>
<td>Sky Plot Information</td>
</tr>
<tr>
<td>TRINAV</td>
<td>Statistical information.</td>
</tr>
</tbody>
</table>
Appendix C - Alarm List

General Alarms

Invalid Navigation:
Valid navigation data is unavailable on the Device port. The communication link is operational.

No Communications:
C-NaviGator can no longer communicate with the attached device.

Output Error: Output data and/or commands from this serial port has failed.

C-Nav3050 Alarms

Correction Signal Invalid Messages:
Information received in the correction signal is missing or incorrect.

Correction Signal Lost Lock:
Input of the correction signal has failed.

Too few measurements:
The number of satellites available is too low to compute a position.

PDOP too high:
The positional dilution of precision exceeds the user-configured maximum.

Export height/velocity limits exceeded:
Input of the correction signal has failed.
Requested mode unavailable:
The settings requested are not available with the receiver’s configured options.

No Valid C-Nav Corrections License:
The C-Nav Corrections Service has expired. Please contact C-Nav Support:
E-mail: support@cnav.com -or-
Phone: +1 (337) 210-0000

C-Nav Corrections License Expires Within 3 Days:
The C-Nav Corrections Service is set to expire in 3 days. Please contact C-Nav Support:
E-mail: support@cnav.com -or-
Phone: +1 (337) 210-0000

C-Nav1010 Alarms

Correction Signal Invalid Messages:
Information received in the correction signal is missing or incorrect.

Correction Signal Lost Lock:
Input of the correction signal has failed.

Correction Signal Poor Reception:
The selected correction signal source is weak.

No Valid C-Nav Corrections License:
The C-Nav Corrections Service has expired. Please contact C-Nav Support:
E-mail: support@cnav.com -or-
Phone: +1 (337) 210-0000

C-Nav Corrections License Expires Within 3 Days:
The C-Nav Corrections Service is set to expire in 3 days. Please contact C-Nav Support:
E-mail: support@cnav.com -or-
Phone: +1 (337) 210-0000

Unstable GPS Clock:
The GPS receiver's internal clock (time reference) has become unstable. The receiver's ability to measure pseudo ranges is compromised.

C-Nav2050 Alarms

Correction Signal Invalid Messages:
Information received in the correction signal is missing or incorrect.

Correction Signal Lost Lock:
Input of the correction signal has failed.

Correction Signal Poor Reception:
The selected correction signal source is weak.

Low voltage x.x V:
The GNSS receiver input voltage is too low.

No Valid C-Nav Corrections License:
The C-Nav Corrections Service has expired. Please contact C-Nav Support:
E-mail: support@cnav.com -or-
Phone: +1 (337) 210-0000

C-Nav Corrections License Expires Within 3 Days:
The C-Nav Corrections Service is set to expire in 3 days. Please contact C-Nav Support:
E-mail: support@cnav.com -or-
Unstable GPS Clock:
The GPS receiver’s internal clock (time reference) has become unstable. The receiver’s ability to measure pseudo ranges is compromised.

C-Nav2000 Alarms

Correction Signal Invalid Messages:
Information received in the correction signal is missing or incorrect.

Correction Signal Lost Lock:
Input of the correction signal has failed.

Correction Signal Poor Reception:
The selected correction signal source is weak.

Failed Geofence:
The C-Nav receiver is outside the Land Based correction signal area. To extend, Contact C-Nav Support for a marine license:
E-mail: support@cnav.com -or-
Phone: +1 (337) 210-0000

Firmware Update Mode:
A firmware update is in progress or has failed.

Low Voltage x.x V:
The GNSS receiver input voltage is too low.

No Valid C-Nav Corrections License:
The C-Nav Corrections Service has expired. Please contact C-Nav Support:
E-mail: support@cnav.com -or-
Phone: +1 (337) 210-0000

C-Nav Corrections License Expires Within 3 Days:
The C-Nav Corrections Service is set to expire in 3 days.
Please contact C-Nav Support:
E-mail: support@cnav.com or-
Phone: +1 (337) 210-0000

Unstable GNSS Clock:
The GNSS receiver’s internal clock (time reference) has become unstable. The receiver’s ability to measure pseudo ranges is compromised.

Output Alarms

Position Filtered - Max Error:
The position solution has exceeded the error allowance.

Position Filtered - Max HDOP:
The Horizontal Dilution of Precision computation has exceeded the alarm setting (See GNSS Quality Alerts).

Position Filtered - Min 2D/3D Time:
The Min 2D/3D time computation has exceeded the alarm setting (See GNSS Quality Alerts).

Position Filtered - Min Satellites:
The number of usable satellites has dropped below the minimum number set on the GNSS Quality Alerts screen.

Position Filtered - No Data:
Data through the C-NaviGator active port is not present or is invalid.

Simulator Alarms

Simulator mode:
C-NaviGator is in Simulator mode (operator selected as the active port on the Ports (Page 31) screen). This alarm cannot be acknowledged.
Index

I

1PPS .............................................................................................................. 67

A

Azimuth ........................................................................................................ 67

B

Bad Packets ................................................................................................ 67
Bit Error Rate ............................................................................................. 67

C

CCS .............................................................................................................. 35
C-Monitor .................................................................................................... 67
C-Nav .......................................................................................................... 67
C-Nav1010 Alarms ...................................................................................... 75
C-Nav2000 ................................................................................................... 59, 67
C-Nav2000 Alarms ..................................................................................... 74, 77
C-Nav2050 .................................................................................................. 53, 68
C-Nav2050 Alarms ..................................................................................... 76
C-Nav3050 .................................................................................................. 39
Correction Signal ....................................................................................... 68
Correction Type ......................................................................................... 68
Course True ................................................................................................. 68

D

Differential Age ......................................................................................... 68
Differential GPS ......................................................................................... 68
DOP .............................................................................................................. 69

E

Elevation ...................................................................................................... 69
Error Ellipse ............................................................................................... 69

F

F1-EDIT ....................................................................................................... 27
F4 – SWITCH ACTIVE ................................................................................ 23
FIX .............................................................................................................. 27
FOM ............................................................................................................ 69
Front Panel Controls .................................................................................. 13, 15

G

GDOP ............................................................................................................ 69
General Alarms .......................................................................................... 74
GPS Receiver ............................................................................................. 69
| H | HAЕ .................................................................................................................. 69 |
| L | L1-L2 Sig. Strength ......................................................................................... 70 |
| M | MENU .............................................................................................................. 15, 21, 65 |
| N | NMEA 0183 .................................................................................................... 70 |
| O | NMEA Input .................................................................................................... 63 |
| P | Output ............................................................................................................ 64 |
|    | Output Alarms ............................................................................................... 78 |
|    | PDOP .............................................................................................................. 69, 70 |
|    | Position ........................................................................................................... 70 |
|    | PPS ............................................................................................................... 70 |
|    | Pseudorange ................................................................................................. 71 |
|    | PVT ................................................................................................................ 71 |
| R | RTCM ............................................................................................................. 71 |
|    | RTK ................................................................................................................ 71 |
| S | SBAS .............................................................................................................. 71 |
|    | Scatter Plot ................................................................................................. 72 |
|    | Simulator Alarms ......................................................................................... 78 |
|    | Sky Plot ........................................................................................................ 72 |
| T | TDOP .............................................................................................................. 69 |
|    | This Page ..................................................................................................... 36 |
|    | Troubleshooting ......................................................................................... 17, 65 |
| U | Updating Software ...................................................................................... 66 |
| V | VDOP .............................................................................................................. 69 |
|    | Visible Sats ................................................................................................. 72 |
GNU GENERAL PUBLIC LICENSE
Version 2, June 1991

Copyright (C) 1989, 1991 Free Software Foundation, Inc.,
51 Franklin Street, Fifth Floor, Boston, MA 02110-1301 USA
Everyone is permitted to copy and distribute verbatim copies of this license document, but changing it is not allowed.

Preamble

The licenses for most software are designed to take away your freedom to share and change it. By contrast, the GNU General Public License is intended to guarantee your freedom to share and change free software--to make sure the software is free for all its users. This General Public License applies to most of the Free Software Foundation's software and to any other program whose authors commit to using it. (Some other Free Software Foundation software is covered by the GNU Lesser General Public License instead.) You can apply it to your programs, too.

When we speak of free software, we are referring to freedom, not price. Our General Public Licenses are designed to make sure that you have the freedom to distribute copies of free software (and charge for this service if you wish), that you receive source code or can get it if you want it, that you can change the software or use pieces of it in new free programs; and that you know you can do these things.

To protect your rights, we need to make restrictions that forbid anyone to deny you these rights or to ask you to surrender the rights. These restrictions translate to certain responsibilities for you if you distribute copies of the software, or if you modify it.

For example, if you distribute copies of such a program, whether gratis or for a fee, you must give the recipients all the rights that you have. You must make sure that they, too, receive or can get the source code. And you must show them these terms so they know their rights.

We protect your rights with two steps: (1) copyright the software, and (2) offer you this license which gives you legal permission to copy, distribute and/or modify the software.
Also, for each author's protection and ours, we want to make certain that everyone understands that there is no warranty for this free software. If the software is modified by someone else and passed on, we want its recipients to know that what they have is not the original, so that any problems introduced by others will not reflect on the original authors' reputations.

Finally, any free program is threatened constantly by software patents. We wish to avoid the danger that redistributors of a free program will individually obtain patent licenses, in effect making the program proprietary. To prevent this, we have made it clear that any patent must be licensed for everyone's free use or not licensed at all.

The precise terms and conditions for copying, distribution and modification follow.

GNU GENERAL PUBLIC LICENSE
TERMS AND CONDITIONS FOR COPYING, DISTRIBUTION AND MODIFICATION

0. This License applies to any program or other work which contains a notice placed by the copyright holder saying it may be distributed under the terms of this General Public License. The "Program", below, refers to any such program or work, and a "work based on the Program" means either the Program or any derivative work under copyright law: that is to say, a work containing the Program or a portion of it, either verbatim or with modifications and/or translated into another language. (Hereinafter, translation is included without limitation in the term "modification".) Each licensee is addressed as "you".

Activities other than copying, distribution and modification are not covered by this License; they are outside its scope. The act of running the Program is not restricted, and the output from the Program is covered only if its contents constitute a work based on the Program (independent of having been made by running the Program). Whether that is true depends on what the Program does.

1. You may copy and distribute verbatim copies of the Program's source code as you receive it, in any medium, provided that you conspicuously and appropriately publish
on each copy an appropriate copyright notice and disclaimer of warranty; keep intact all the notices that refer to this License and to the absence of any warranty; and give any other recipients of the Program a copy of this License along with the Program.

You may charge a fee for the physical act of transferring a copy, and you may at your option offer warranty protection in exchange for a fee.

2. You may modify your copy or copies of the Program or any portion of it, thus forming a work based on the Program, and copy and distribute such modifications or work under the terms of Section 1 above, provided that you also meet all of these conditions:

   a) You must cause the modified files to carry prominent notices stating that you changed the files and the date of any change.

   b) You must cause any work that you distribute or publish, that in whole or in part contains or is derived from the Program or any part thereof, to be licensed as a whole at no charge to all third parties under the terms of this License.

   c) If the modified program normally reads commands interactively when run, you must cause it, when started running for such interactive use in the most ordinary way, to print or display an announcement including an appropriate copyright notice and a notice that there is no warranty (or else, saying that you provide a warranty) and that users may redistribute the program under these conditions, and telling the user how to view a copy of this License. (Exception: if the Program itself is interactive but does not normally print such an announcement, your work based on the Program is not required to print an announcement.)

These requirements apply to the modified work as a whole. If identifiable sections of that work are not derived from the Program, and can be reasonably considered independent and separate works in themselves, then this License, and its terms, do not apply to those sections when you distribute them as separate works. But when you distribute the same sections as part of a whole which is a work based on the Program, the distribution of the whole must be on the terms of this License, whose permissions for other
licensees extend to the entire whole, and thus to each and
every part regardless of who wrote it.

Thus, it is not the intent of this section to claim rights
or contest your rights to work written entirely by you;
rather, the intent is to exercise the right to control the
distribution of derivative or collective works based on the
Program.

In addition, mere aggregation of another work not based on
the Program with the Program (or with a work based on the
Program) on a volume of a storage or distribution medium
does not bring the other work under the scope of this
License.

3. You may copy and distribute the Program (or a work
based on it, under Section 2) in object code or executable
form under the terms of Sections 1 and 2 above provided
that you also do one of the following:

   a) Accompany it with the complete corresponding
      machine-readable source code, which must be distributed
      under the terms of Sections 1 and 2 above on a medium
      customarily used for software interchange; or,

   b) Accompany it with a written offer, valid for at
      least three years, to give any third party, for a charge no
      more than your cost of physically performing source
      distribution, a complete machine-readable copy of the
      corresponding source code, to be distributed under the
      terms of Sections 1 and 2 above on a medium customarily
      used for software interchange; or,

   c) Accompany it with the information you received as to
      the offer to distribute corresponding source code. (This
      alternative is allowed only for noncommercial distribution
      and only if you received the program in object code or
      executable form with such an offer, in accord with
      Subsection b above.)

The source code for a work means the preferred form of the
work for making modifications to it. For an executable
work, complete source code means all the source code for
all modules it contains, plus any associated interface
definition files, plus the scripts used to control
compilation and installation of the executable. However,
as a special exception, the source code distributed need
not include anything that is normally distributed (in either source or binary form) with the major components (compiler, kernel, and so on) of the operating system on which the executable runs, unless that component itself accompanies the executable.

If distribution of executable or object code is made by offering access to copy from a designated place, then offering equivalent access to copy the source code from the same place counts as distribution of the source code, even though third parties are not compelled to copy the source along with the object code.

4. You may not copy, modify, sublicense, or distribute the Program except as expressly provided under this License. Any attempt otherwise to copy, modify, sublicense or distribute the Program is void, and will automatically terminate your rights under this License. However, parties who have received copies, or rights, from you under this License will not have their licenses terminated so long as such parties remain in full compliance.

5. You are not required to accept this License, since you have not signed it. However, nothing else grants you permission to modify or distribute the Program or its derivative works. These actions are prohibited by law if you do not accept this License. Therefore, by modifying or distributing the Program (or any work based on the Program), you indicate your acceptance of this License to do so, and all its terms and conditions for copying, distributing or modifying the Program or works based on it.

6. Each time you redistribute the Program (or any work based on the Program), the recipient automatically receives a license from the original licensor to copy, distribute or modify the Program subject to these terms and conditions. You may not impose any further restrictions on the recipients' exercise of the rights granted herein. You are not responsible for enforcing compliance by third parties to this License.

7. If, as a consequence of a court judgment or allegation of patent infringement or for any other reason (not limited to patent issues), conditions are imposed on you (whether by court order, agreement or otherwise) that contradict the conditions of this License, they do not excuse you from the conditions of this License. If you cannot distribute so as
to satisfy simultaneously your obligations under this License and any other pertinent obligations, then as a consequence you may not distribute the Program at all. For example, if a patent license would not permit royalty-free redistribution of the Program by all those who receive copies directly or indirectly through you, then the only way you could satisfy both it and this License would be to refrain entirely from distribution of the Program.

If any portion of this section is held invalid or unenforceable under any particular circumstance, the balance of the section is intended to apply and the section as a whole is intended to apply in other circumstances.

It is not the purpose of this section to induce you to infringe any patents or other property right claims or to contest validity of any such claims; this section has the sole purpose of protecting the integrity of the free software distribution system, which is implemented by public license practices. Many people have made generous contributions to the wide range of software distributed through that system in reliance on consistent application of that system; it is up to the author/donor to decide if he or she is willing to distribute software through any other system and a licensee cannot impose that choice.

This section is intended to make thoroughly clear what is believed to be a consequence of the rest of this License.

8. If the distribution and/or use of the Program is restricted in certain countries either by patents or by copyrighted interfaces, the original copyright holder who places the Program under this License may add an explicit geographical distribution limitation excluding those countries, so that distribution is permitted only in or among countries not thus excluded. In such case, this License incorporates the limitation as if written in the body of this License.

9. The Free Software Foundation may publish revised and/or new versions of the General Public License from time to time. Such new versions will be similar in spirit to the present version, but may differ in detail to address new problems or concerns.

Each version is given a distinguishing version number. If the Program specifies a version number of this License
which applies to it and "any later version", you have the option of following the terms and conditions either of that version or of any later version published by the Free Software Foundation. If the Program does not specify a version number of this License, you may choose any version ever published by the Free Software Foundation.

10. If you wish to incorporate parts of the Program into other free programs whose distribution conditions are different, write to the author to ask for permission. For software which is copyrighted by the Free Software Foundation, write to the Free Software Foundation; we sometimes make exceptions for this. Our decision will be guided by the two goals of preserving the free status of all derivatives of our free software and of promoting the sharing and reuse of software generally.

11. BECAUSE THE PROGRAM IS LICENSED FREE OF CHARGE, THERE IS NO WARRANTY FOR THE PROGRAM, TO THE EXTENT PERMITTED BY APPLICABLE LAW. EXCEPT WHEN OTHERWISE STATED IN WRITING THE COPYRIGHT HOLDERS AND/OR OTHER PARTIES PROVIDE THE PROGRAM "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THE ENTIRE RISK AS TO THE QUALITY AND PERFORMANCE OF THE PROGRAM IS WITH YOU. SHOULD THE PROGRAM PROVE DEFECTIVE, YOU ASSUME THE COST OF ALL NECESSARY SERVICING, REPAIR OR CORRECTION.

12. IN NO EVENT UNLESS REQUIRED BY APPLICABLE LAW OR AGREED TO IN WRITING WILL ANY COPYRIGHT HOLDER, OR ANY OTHER PARTY WHO MAY MODIFY AND/OR REDISTRIBUTE THE PROGRAM AS PERMITTED ABOVE, BE LIABLE TO YOU FOR DAMAGES, INCLUDING ANY GENERAL, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE PROGRAM (INCLUDING BUT NOT LIMITED TO LOSS OF DATA OR DATA BEING RENDERED INACCURATE OR LOSSES SUSTAINED BY YOU OR THIRD PARTIES OR A FAILURE OF THE PROGRAM TO OPERATE WITH ANY OTHER PROGRAMS), EVEN IF SUCH HOLDER OR OTHER PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

END OF TERMS AND CONDITIONS
How to Apply These Terms to Your New Programs

If you develop a new program, and you want it to be of the greatest possible use to the public, the best way to achieve this is to make it free software which everyone can redistribute and change under these terms.

To do so, attach the following notices to the program. It is safest to attach them to the start of each source file to most effectively convey the exclusion of warranty; and each file should have at least the "copyright" line and a pointer to where the full notice is found.

<one line to give the program's name and a brief idea of what it does.>
Copyright (C) <year>  <name of author>

This program is free software; you can redistribute it and/or modify it under the terms of the GNU General Public License as published by the Free Software Foundation; either version 2 of the License, or (at your option) any later version.

This program is distributed in the hope that it will be useful, but WITHOUT ANY WARRANTY; without even the implied warranty of MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the GNU General Public License for more details.

You should have received a copy of the GNU General Public License along with this program; if not, write to the Free Software Foundation, Inc., 51 Franklin Street, Fifth Floor, Boston, MA 02110-1301 USA.

Also add information on how to contact you by electronic and paper mail.

If the program is interactive, make it output a short notice like this when it starts in an interactive mode:

Gnomovision version 69, Copyright (C) year name of author
Gnomovision comes with ABSOLUTELY NO WARRANTY; for details type `show w'.
This is free software, and you are welcome to redistribute it
under certain conditions; type `show c' for details.
The hypothetical commands `show w' and `show c' should show the appropriate parts of the General Public License. Of course, the commands you use may be called something other than `show w' and `show c'; they could even be mouse-clicks or menu items--whatever suits your program.

You should also get your employer (if you work as a programmer) or your school, if any, to sign a "copyright disclaimer" for the program, if necessary. Here is a sample; alter the names:

Yoyodyne, Inc., hereby disclaims all copyright interest in the program
`Gnomovision' (which makes passes at compilers) written by James Hacker.

<signature of Ty Coon>, 1 April 1989
Ty Coon, President of Vice

This General Public License does not permit incorporating your program into proprietary programs. If your program is a subroutine library, you may consider it more useful to permit linking proprietary applications with the library. If this is what you want to do, use the GNU Lesser General Public License instead of this License.

To download a copy of the GPL sources for C-NaviGator:
For a copy on CDROM, contact:

        C-NaviGator GPL’d Source
        730 E. Kaliste Saloom Road
        Lafayette, LA 70508, USA