



LAND-PAK™

User Guide



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Notices

LAND-PAK™ User Guide
PN 96-310038-3001
Rev. F
May, 2015

Serial Number: _____

Date Delivered: _____

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FCC Notice

NavCom-manufactured products comply with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

The NavCom-manufactured products have been tested in accordance with FCC regulations for electromagnetic interference. This does not guarantee non-interference with other equipment. Additionally, the products may be adversely affected by nearby sources of electromagnetic radiation.

The Global Positioning System (GPS) is under the control of the United States Air Force. Operation of the GPS satellites may be changed at any time and without warning.

The FCC compliance of other components within this system can be found inside the respective user guides or by contacting the manufacturer directly.

User Notice

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NavCom warrants that its products will be free from defects in material and workmanship at the time of delivery. A full description of the warranty policy is provided in NavCom's *Standard Terms & Conditions of Sale For NavCom Products* in force at the time of sale. Please contact your NavCom dealer or NavCom [Sales](#) for a copy of the warranty policy for your specific product. Please include your model and serial number, approximate date of purchase, and the dealer name where the unit was purchased through so that we may better service this request.

StarFire™ Licensing

The StarFire™ signal requires a subscription that must be purchased for products other than LAND-PAK in order to access the service. LAND-PAK system purchases include a limited-lifetime StarFire license, in that, the software currently only supports a ten-year license. This timeframe is inclusive of the expected serviceable life of the LAND-PAK product and is subject to StarFire service availability. Equipment which remains operational at the end of the ten-year period may be relicensed in 5-year increments beyond the initial license period. Licenses are non-transferable, and are subject to the terms of the StarFire™ Signal License Agreement. Additional

terms and conditions may apply; for full details, contact a NavCom dealer. For further details on the StarFire™ Signal Network, its capabilities, terms and conditions visit www.navcomtech.com or send an email inquiry to sales@navcomtech.com.

USG FAR

Technical Data Declaration (Jan 1997)

The Contractor, NavCom Technology, Inc., hereby declares that, to the best of its knowledge and belief, the technical data delivered herewith under Government contract (and subcontracts, if appropriate) are complete, accurate, and comply with the requirements of the contract concerning such technical data.

Global Positioning System

Selective availability (S/A code) was disabled on 02May 2000 at 04:05 UTC. The United States government has stated that present GPS users use the available signals at their own risk. The US Government may at any time end or change operation of these satellites without warning.

The U.S. Department of Commerce Limits Requirements state that all exportable GPS products contain performance limitations so that they cannot be used to threaten the security of the United States.

Access to satellite measurements and navigation results will be limited from display and recordable output when predetermined values of velocity and altitude are exceeded. These threshold values are far in excess of the normal and expected operational parameters of the SF-3040 GNSS receiver.

Revision History

Rev G – Aug 2015	<p>Deleted StarPoint Software</p> <ul style="list-style-type: none"> Removed Section D for StarPoint Post Processing Software
Rev F – May 2015	<p>Chapter 1</p> <p>Replaced Nautiz X7 with Nautiz X8</p> <p>Chapter 2</p> <p>Deleted UHF Survey System bundle (Figure 11 and Table 3)</p> <p>Deleted Network Rover bundle (Figure 12 and Table 4)</p> <p>Updated part numbers in Tables 3, 4 and 5</p> <p>Added Table 6 Bundle Options</p> <p>Chapter 3</p> <p>Added battery pack charging process for Nautiz X8</p> <p>Chapter 4</p> <p>Added GSM correction instructions</p>
Rev E – Aug 2014	<p>Chapter 1:</p> <p>Changed battery specifications in Table 2 and 3.</p> <p>Added note regarding Network RTK</p> <p>Added Archer 2 user information.</p> <p>Chapter 2:</p> <p>Added label colors to UHF antenna in Table 3.</p> <p>Chapter 5:</p> <p>Changed two SFOIP servers to one server.</p> <p>Changed RTK Extend operating time to 15 minutes for nonNavCom bases</p> <p>Added note regarding RTK Extend maximum performance</p>

	<p>Added specs and note for RTK-WL. Deleted specs for StarFire Single Added note regarding Network RTK. Revised figures and instructions for FieldGenius upgrade.</p> <p>Appendix C: Added Archer 2 specifications.</p>
Rev D – Sept 2013	<p>Chapter 2: Updated component photos and part numbers.</p> <p>Chapter 4: Added controller configuration instructions.</p> <p>Chapter 5: Updated specifications for StarFire Single. Added FieldGenius software installation and registration instructions.</p>
Rev. C – Apr 2013	<p>Table 8: Added tolerances for Static Post Processing and Rapid Static Post Processing modes.</p> <p>Eliminated all references to Galileo, E1 and E2A.</p> <p>Chapter 5: Added FieldGenius instructions for StarFire Over IP.</p> <p>Chapter 5: Revised FieldGenius instructions for StarFire Alternate Satellite.</p> <p>Trade Marks – updated</p> <p>Added Appendix E: RoHS certification (both English and Chinese)</p> <p>Added Table 14: Toxic or Hazardous Substances or Elements Disclosure by Part Number (both English and Chinese)</p> <p>Added Note that receiver will support SD card up to 16GB.</p> <p>Chapter 3: Added note to charge batteries for 12 hours prior to first use.</p>

Rev. B - Oct 2011	Chapter 1: updated <i>Communications</i> with Bluetooth connectivity information Table 8: updated bandwidth and notes Chapter 4: updated <i>Channel Spacing</i> updated <i>Data Speed</i> Table : updated <i>Measurement Performance</i> with StarFire GNSS Table 14: updated bandwidth and sensitivity Appendix A: updated <i>Additional settings</i>
Rev. A	Initial Issue

Use of This Document

This User Guide is intended to be used by someone familiar with the concepts of GPS and satellite surveying equipment.



Note indicates additional information to make better use of the product.



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

Revisions to this User Guide can be obtained in a digital format from

<http://www.navcomtech.com/Support/>

Related Documents

SF-3040 GNSS Receiver User Guide

PN 96-310034-3001

Describes the features, setup, interfacing, configuration, specifications, and operation of NavCom's SF-3040 receiver

SF-3040 GNSS Receiver Quick Start Guide

PN 96-310035-3001

Provides steps to quickly configure and operate the SF-3040 GNSS receiver

LAND-PAK™ Quick Start Guide

PN 96-310039-3001

Provides steps to configure and operate the LAND-PAK™ with minimal setup time to the point of collecting positions with RTK/UltraRTK™

Describes the standard configuration for the base and rover radio modems and controller data collection software

StarUtil 3000 User Guide

PN 96-310008-3001

Describes the operation and use of NavCom's Windows-based control program

Sapphire Technical Reference Manual

PN 96-3120001-3001

Describes the control and output data message formats utilized by this instrument (for customer programming purposes)

RINEXUtil User Guide

PN 96-310021-2101

Describes the conversion program used for NavCom proprietary output data message formats to RINEX ver 2.10 observation and navigation files (for customer programming purposes)

Field Genius User Guide

Describes the operation and use of NavCom's modified version of MicroSurvey Field Genius data collector program

SurvCE Integration Guide

Describes the installation, registration and use of Carlson Software's SurvCE data collection system for Real Time Kinematic (RTK) GNSS positioning

NavCom Release Notes

Describes software updates for NavCom products. Current and archived Release Notes are available on the NavCom web site:

<http://www.navcomtech.com/Support/DownloadCenter.cfm?category=releasenotes>.

NavCom Customer Support provides software updates described in the Release Notes. Submit a request for software updates via the Request Support Web page.

Related Standards

ICD-GPS-200

NAVSTAR GPS Space Segment / Navigation User Interfaces Standard; ARINC Research Corporation, 2250 E. Imperial Highway, El Segundo, CA 90245

GLONASS ICD, Version 5.0, 2002

Russian Space Agency, Information Analytical Centre
Internet: <http://www.glonass-ianc.rsa.ru/>

NTRIP

Radio Technical Commission for Maritime Services (RTCM) Standard 10410.0 (RTCM Paper 200-2004/SC104-STD, Version 1.0 for Networked Transport of RTCM via Internet Protocol (NTRIP)

Radio Technical Commission for Maritime Services (RTCM) Standard 10410.1 (RTCM Paper 111-2009-SC104-STD, Version 2.0 for Networked Transport of RTCM via Internet Protocol (NTRIP)

RTCM-SC-104

Recommended Standards For Differential GNSS Service; Radio Technical Commission for Maritime Services, 1800 N. Kent St, Suite 1060, Arlington, VA 22209

CMR, CMR+

Compact Measurement Record; Trimble Navigation Limited, 935 Stewart Drive, Sunnyvale, CA 94085

QZSS

Quasi Zenith Satellite System; Japan Aerospace Exploration Agency (JAXA), 7-44-1 Jindaiji Higashi-machi, Chofu-shi, Tokyo 182-8522

NMEA-0183

National Marine Electronics Association Standard for Interfacing Marine Electronic Devices. NMEA National Office; 7 Riggs Avenue; Severna Park, MD 21146

Publicly Operated SBAS Signals

RTCA/DO-229D

The Radio Technical Commission for Aeronautics (RTCA) develops consensus-based recommendations regarding communications, navigation, surveillance, and air traffic management (CNS/ATM) system issues.

RTCA. 1828 L Street, NW, Suite 805, Washington DC 20036

These organizations implement the RTCA/DO-229D standard set by RTCA:

WAAS (Wide Area Augmentation System)

U.S. Department of Transportation; Federal Aviation Administration, 800 Independence Ave, SW, Washington, DC 20591

EGNOS (European Geostationary Navigation Overlay Service)

European Space Agency; 8, 10 rue Mario-Nikis, F-75738 Paris Cedex 15, France.

MSAS (MTSAT Satellite-based Augmentation System)

Japan Civil Aviation Bureau; Ministry of Transport. Kasumigaseki 2-1-3, Chiyoda-ku, Tokyo 100, Japan

GAGAN (GPS Aided Geo Augmented Navigation)

Indian Space Research Organization; Antariksh Bhavan, New Bel Road, Bangalore - 560 094, India

Chapter 1 Introduction

This manual describes the components of the LAND-PAK™ system and the integration of those components and software features not covered in the FieldGenius documentation. Refer to the Related Documents section of this document for a complete product description of the SF-3040 and FieldGenius and CAD Basic software.

LAND-PAK is a complete end-user system designed for land survey applications. LAND-PAK pairs NavCom products with complementary technologies and solutions, providing land surveyors a complete turnkey system that does everything from field data collection to office processing.

Unique Features

LAND-PAK has many unique features:

■ A Solution That Works

The LAND-PAK data collector provides cutting-edge hardware with the most popular and easy-to-use software on the market, FieldGenius. The powerful internal radio modem gives LAND-PAK a wider coverage area, allowing for longer distances between stations.

In addition, the LAND-PAK data collector is equipped with an internal 3G cell modem that can be used to access network or NTRIP RTK corrections. These two features together with NavCom's RTK-Extend capability make LAND-PAK the ideal solution for all GNSS survey applications.



The Network RTK software option allows the receiver to generate and receive

RTCM 1000-series messages. The navigation algorithms are designed to support single-base correction configurations. Network adjusted RTK formats are not currently supported.

■ Higher Accuracy and Reliability

With the internal radio modem and RTK options on the SF-3040 receiver, LAND-PAK is capable of performing centimeter-accurate RTK surveys. The RTK algorithm developed by NavCom provides fast initialization, and the NavCom ultra-compact binary data format for RTK ensures robust data throughput. The receiver can utilize NavCom RTK/UltraRTK™, RTCM, Network RTCM, NTRIP, CMR and CMR+ data streams from other base stations to minimize base-rover separation and allow for flexibility with pre-existing GNSS survey systems.

■ GNSS Performance

The NavCom SF-3040 receivers use the NavCom Sapphire GNSS engine. The technology is based on NavCom's Touchstone™ ASIC, of which more than 100,000 are in use worldwide. Incorporated are NavCom patented interference suppression and multipath mitigation, a 5 Hz raw data rate (up to 10 Hz¹ optional), and 5 Hz geodetic-quality positioning (up to 10 Hz¹ optional).

¹Separate Software Option Required

■ RTK-Extend™

RTK-Extend™ enables continuous RTK-level positioning accuracy during radio communication outages by utilizing NavCom's global StarFire™ corrections.

Traditionally, when an RTK rover loses communication with the base station, it is unable to continue to provide position updates for more than a

few seconds, resulting in user down-time and reduced productivity. With RTK Extend™, a NavCom StarFire™ receiver operating in RTK mode, can transition to RTK Extend™ mode and maintain centimeter level positioning during communication loss for up to 15 minutes. RTK Extend™ allows more efficient and uninterrupted work, enabling focused concentration on the work rather than the tools.

■ Complete Portable System

LAND-PAK is a highly integrated solution designed for productivity with minimal setup time and maximum portability. Covering the entire land survey process, it contains a complete base and rover system for field data collection and back office processing.

Typical Applications

The LAND-PAK system meets the needs of the following applications:

Land Survey and GIS

- ✓ Boundary Survey
- ✓ Topographical Surveys in Rough Terrain
- ✓ Construction Site Stake-out
- ✓ High-Accuracy Data Collection for Post-Processing
- ✓ Hydrographic Survey

LAND-PAK Configurations

LAND-PAK is available in the following configurations:

- ✓ RTK base and rover SF-3040 GNSS receivers (one each) with internal 1W UHF modules
 - Options

- NavCom handheld controller running Windows Mobile 6 w/ internal GPRS cell modem and Bluetooth
 - NavCom FieldGenius data collector software
 - NavCom CAD Basic desktop software
 - Accessories kit; range pole, cradle, chargers, carrying cases, etc.
- ✓ RTK Rover SF-3040 GNSS Receiver
- Options
 - NavCom handheld controller running Windows Mobile 6 with internal GPRS cell modem and Bluetooth
 - NavCom FieldGenius data collector software
 - NavCom CAD Basic desktop software
 - Accessories kit; range pole, cradle, chargers, carrying cases, etc.

NavCom SF-3040 GNSS Receiver

LAND-PAK includes the SF-3040 GNSS receiver, which delivers decimeter-level position accuracy (post-convergence period) to the precise positioning community via StarFire corrections. This unique unit is designed to integrate easily into real-time kinematic (RTK), field data verification, topographical surveys, and a wide variety of surveying applications. It resolves ambiguities at startup or on satellite reacquisition typically within 2 seconds, and with appropriate software options, delivers centimeter-level position accuracy via external RTK correction formats. It is capable of RTK/UltraRTK™, RTCM 2.3 and 3.0 (code and phase), RTCM 3.1, types 1001-

1012, 1019, 1020, and 1033 (Network RTK), and CMR/CMR+ dGPS operating methods.

The receiver simultaneously accepts additional dGPS corrections¹ (WAAS, EGNOS, MSAS, GAGAN), assuring seamless position output.



¹Note that the Field Genius software disables this feature by default to avoid errors in applications where reception of these signals is not aligned for the area of intended satellite operation.

The robust SF-3040 housing has a female standard 5/8-inch BSW threaded mount (5/8-11 UNC) with a depth of 16 mm (0.63 inch) for mounting on a surveyor's pole, tripod, mast, or any apparatus that accepts the thread size.

The SF-3040 GNSS engine includes a digital ASIC to handle high-speed signal processing.

The operating software is also capable of supporting internal and external radio modems. Refer to Chapter 7 of the *SF-3040 GNSS Receiver Product User Guide* for details on the removable radio modem. The internal radio modem supports Satel, Pacific Crest, and TrimTalk over-the-air modulation formats.

The receiver can output proprietary raw satellite measurements and Position Velocity Time (PVT) data as fast as 10Hz (optional) through two 115 kbps serial ports with less than 20ms latency.

The SF-3040 is operated on internal removable batteries or on external power. Refer to Chapter 6 of the *SF-3040 GNSS Receiver Product User Guide* for details.

■ Integrated GNSS and L-Band Antenna

The housing incorporates our compact GNSS antenna with excellent tracking performance and a

stable phase center for GPS L1 and L2. It tracks and receives GPS (L1, L2, L2C, L5), GLONASS (G1, G2), StarFire, and SBAS (WAAS, EGNOS, MSAS, GAGAN) signals. The NGS calibration table for this product is available on the following link:

<http://www.ngs.noaa.gov/ANTCAL/Antennas.jsp;jsessionid=3DE81666766F189AFA9D57D343082098?ma nu=NavCom>

■ Communications

The SF-3040 provides two communication port connectors. The 7-pin female LEMO connector communication port, labeled USB-COM1, and the 6-pin female LEMO connector communication port, labeled COM2, are located on the bottom of the receiver (refer to Figure 1).



Figure 1: SF-3040 Connectors, Detail

Each port conforms to the EIA RS-232 standard. Available data rates are from 1.2 to 115.2kbps for the serial ports. The USB port operates at 2.0 Mbps.



Refer to the supplied *SF-3040 GNSS Product User Guide* for further information about the SF-3040 ports.

The SF-3040 GNSS receiver is Bluetooth-capable. The Bluetooth module permits cable-less operation between the receiver and the Nautiz X8 data controller, with less than 0.2% data loss. Wireless connectivity is provided within a range of 5 m (16 ft) once a connection is established, and a data rate of 230.4 Kbps is supported, 10 Hz maximum. The initial pairing sequence must be conducted within 2m (6ft) of the SF-3040. The Bluetooth interface allows interleaved RTK data from a data collector GSM radio modem and SF-3040 data positioning (i.e., two communication links on one port).

Base Station and Rover Radio Modems

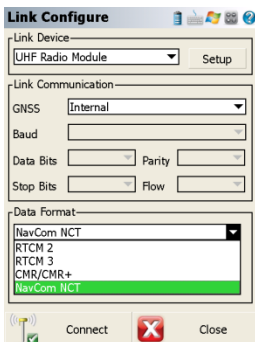
The LAND-PAK Survey System includes two internal UHF radio modules that output up to 1W of power in the 403 to 473 MHz band. The radios are digitally synthesized and can be tuned to any in-band frequency in 12.5 or 25 KHz steps. An optional 35W booster is available for the base station, but must be ordered at the desired center frequency.



Set the radio modems only to a licensed frequency. It must comply with local regulatory authorities.

It is the user's responsibility to acquire all necessary radio licenses prior to operation.

■ User Interface



The LAND-PAK 1W radio modems are configurable via FieldGenius software installed on the Nautiz X8 handheld controller, a laptop, or a PC.

Configuration of the 35W radio is accomplished by using the front-panel softkeys located on the radio.

Nautiz X8 Handheld Data Collector

The Nautiz X8 is a 4470 dual-core, 1.5GHz high-speed handheld data collector which features 1GB of RAM, 4GB of INAND Flash storage, and a 3.7V, 5200mAh Li-ion battery with up to 6 hours of operation on a single charge in typical full-time survey use (user experience may vary). It has a dedicated u-blox GPS receiver, Bluetooth 2.0, and 802.11b/g/n WLAN functionality and a built-in 8 megapixel camera with autofocus and LED flash.

With an IP67 rating, the Nautiz X8 is impervious to dust and water and can withstand vibration, and repeated drops. (Refer to Figure 2.)

Refer to the *Nautiz X8 Quick Start Guide* for detailed instructions on getting started. Refer to Table 4 for specifications.



Always use the supplied stylus on the Nautiz X8 touch screen. Never use sharp objects. Use supplied screen protectors to increase the life of the touch screen.

■ User Interface



Figure 2: Nautiz X8 Handheld Device



Figure 3: Nautiz X8 Keypad, Detail

Table 1: Nautiz X8 Keypad Controls






Name	Key	Function
BLUE		Toggles the keypad between the numeric (in white) and accessing the functions in blue.
Send		Begins dialing. Starts an action.
End		Hangs up. Cancels an action.
Enter		Performs the same function as the Enter key on a workstation.
Power		Suspends and resumes the terminal.



Figure 4: Nautiz X8 Data Collector Mating Connectors



Figure 5: Nautiz X8 Pole Clamp and Cradle



Figure 6: Nautiz X8 Mounted on the Pole Clamp



Refer to the *Nautiz X8 manual* for additional details on using this handheld device.

Juniper Archer 2 Handheld Data Collector

The Juniper Archer 2 high-speed handheld data collector features a 1.0GHz ARM Cortex A8 i.MX53 processor, 512MB of RAM, 8GB of Flash storage, and an intelligent 10600mAh Li-ion battery with up to 20 hours of operation on a single charge.

It has a high-sensitivity GPS/GLONASS/SBAS receiver, Bluetooth 2.1+EDR, and 802.11b/g/n Wi-Fi functionality with extended range and a built-in 5 megapixel camera with autofocus and LED illuminator+video capture.

With an IP68 rating, the Archer 2 is waterproof and dustproof.

■ User Interface



Figure 7: Archer 2 Handheld Device



Figure 8: Archer 2 Data Collector Mating Connectors



Figure 9: Archer 2 Mounted on the Pole Clamp





















Refer to the *Archer 2 Quick Start Guide* for detailed instructions on getting started. Refer to Table 15 for specifications.



Figure 10: Archer 2 Keypad, Detail

Table 2: Archer 2 Keypad Controls

Button	Press and Release	Shift Function 
	<ul style="list-style-type: none"> ▪ Pictures and Videos function; take a picture or start and stop video ▪ Photo and video library (for units without a camera) 	Notes application
P1 P3	Hold-to-Zoom function (press and hold)	Display brightness down
	Barcode scan Buttons control panel (for units without a barcode scanner)	Record audio note (press and release  then press and hold  until complete)
P2 P4	Right soft key	Display brightness up
	Context Menu	Back-tab
2 	2	Up (varies by screen)
	Backspace (delete)	Enable or disable touchscreen
	Home screen	Start screen (toggle)
4 	4	Left (varies by screen)

Button	Press and Release	Shift Function 
5 	5	Select OK on the screen
6 	6	Right (varies by screen)
	<ul style="list-style-type: none"> ▪ Return ▪ Take picture or start video ▪ Perform highlighted action (use default action or select using arrow keys) 	<ul style="list-style-type: none"> ▪ Return ▪ Take picture or start video ▪ Perform highlighted action (use default action or select using arrow keys)
	Shift (Function) <ul style="list-style-type: none"> ▪ Use specific shift function: Press and release  first, then press and release the button with the desired shift function. ▪ Turn shift function on for all keys: Press and release twice. To turn shift off, press and release again See blue LED description	See description of the specific button
8 	8	Down (varies by screen)
	<ul style="list-style-type: none"> ▪ Power ▪ Suspend/Resume ▪ Power Button menu (press and hold) 	None

NavCom FieldGenius

NavCom FieldGenius is designed for land surveying, civil engineering, seismic surveying, and construction staking professionals to provide unequalled data collection simplicity and field calculating performance.

The graphical user interface (GUI) provides an easy interface to build drawings as measurements are taken, providing instant visual confirmation of accurate data collection and survey calculations. It includes the ability to draw line-work as measurements from point to point are taken without the need for cumbersome line coding.



Refer to the supplied *FieldGenius User Guide* for details.

NavCom CAD Basic

NavCom CAD Basic desktop software is designed to take the FieldGenius data for the in-office field-to-finish work and vice-versa. CAD Basic is a complete desktop survey and design program created for surveyors, contractors and engineers. Each LAND-PAK system is supplied with a license dongle to activate the desktop software. The program may be installed on any number of desktop computers; however, only computers equipped with a license dongle may operate the software.



Refer to the supplied *CAD Basic User Guide* for details.

Chapter 2.....LAND-PAK Bundles and Accessories

This chapter provides the complete available parts inventory for LAND-PAK.

Two product bundles are available: the LAND-PAK System Hardware Kit and the LAND-PAK Rover Hardware Kit.

The parts inventory for the LAND-PAK System Hardware Kit is listed in Table 3. The parts inventory for the LAND-PAK Rover Hardware Kit is listed in Table 4.



If any items are missing or damaged, immediately contact NavCom Customer Support:

Telephone: +1 (310) 381-2000

Web:

<http://www.navcomtech.com/Contact/ContactSupport.cfm>

If the pre-bundled options are not desired, each accessory can be ordered 'à-la-carte' to allow the user to assemble a customized system. These accessories are listed in Table 5 below.

LAND-PAK System Hardware Kit

*Table 3: LAND-PAK System Hardware Kit Contents
(PN 92-310468-3001LF)*

Item	Qty	Part Number
SF-3040 Receiver	2	90-209549-01
Each receiver includes: GPS L1/L2, GLONASS G1/G2 or L5 Navigation 5Hz standard; 10Hz optional, PN: 97-310041-3181 RTK, including Network RTK RTK Extend StarFire-enabled License, StarFire Land Only Applications, Ten Years Service (refer to Appendix D, section 4)		
USB Device Cable, 6 ft	1	96-212169-01
COM2 Serial Cable with hardware handshake, 6 ft	1	96-212238-01
Li-Ion Battery, 7.4V, 2.6Ah	4	98-214946
Battery Charger, Dual bay	2	98-214401
SD Memory Card, 2GB	2	25-212850
LAND-PAK Quick Start Guide	1	96-310039-3001
Nautiz X8 GSM Handheld Controller Kit	1	PH98227844
Transit Case, Hard Shell - Orange	1	98-213022
Land-Pak Warranty Card	1	PH98224438

LAND-PAK Rover Hardware Kit

*Table 4: LAND-PAK Rover Hardware Kit Contents
(PN 92-310469-3001LF)*

Item	Qty	Part Number
SF-3040 Receiver	1	90-209549-01
Each receiver includes: GPS L1/L2, GLONASS G1/G2 or L5 Navigation 5Hz standard; 10Hz optional, PN: 97-310041-3181 RTK, including Network RTK RTK Extend StarFire-enabled License, StarFire Land Only Applications, Ten Years Service (refer to Appendix D, section 4)		
USB Device Cable, 6 ft	1	96-212169-01
COM2 Serial Cable with hardware handshake, 6 ft	1	96-212238-01
Li-Ion Battery, 7.4V, 2.6Ah	2	98-214946
Battery Charger, Dual bay	2	98-214401
SD Memory Card, 2GB	2	25-212850
LAND-PAK Quick Start Guide	1	96-310039-3001
Nautiz X8 GSM Handheld Controller Kit	1	PH98227844
Transit Case, Network Rover Hard Shell - Orange	1	PH98223505
Land-Pak Warranty Card	1	PH98224438

LAND-PAK Optional Accessories

Error! Reference source not found. lists available optional accessories to expand the functional use of the two kits described above.

Table 5: LAND-PAK Accessories

Item	Part Number
System Support Hardware Wood/Fiberglass Tripod, Extension Rod, Tribrach w/optical plummet, Rotating Tribrach adapter, GPS Tape Measure, Rover Pole, Controller Clamp, Canvas Tripod Bag	92-310477-3001LF
Rover Support Hardware GPS Tape Measure, Rover Pole, Controller Clamp	92-310472-3001LF
Tunable UHF Radio Module Kit (403-473Mhz) Must be purchased with either antenna 98-213686 or 98-213687	92-210206-3001LF
UHF Module Antenna (400- 435Mhz) Red label	98-213686
UHF Module Antenna (435- 470Mhz) Blue label	98-213687
LAND-PAK 35W Base Station UHF Boost Radio EPIC Pro 35W IP67 Radio, High gain antenna, antenna mount, 12' GNSS antenna cable, 6-ft snap lock antenna pole, radio antenna bracket, 35W data cable, 35W power cable	92-310478-3001LF
Aluminum Bi-Pod	98-213896
NavCom Nautiz X8 DC 12V cigarette lighter cable	PH98228476
Nautiz X8 Data Collector English OS (No Application Software, price for non-warranty replacement only)	PH98227844

Item	Part Number
Nautiz X8 Data Controller English OS with NavCom FieldGenius	PH90224423
Nautiz X8 Data Controller English OS with NavCom SurvCE	PH90224424
Archer2 Data Collector International (No Application Software, non-warranty replacement only)	PH98225411
Archer2 Data Collector North America (No Application Software, non-warranty replacement only)	PH98226244
Archer2 Data Controller International with NavCom FieldGenius	PH90225410
Archer2 Data Controller International with NavCom SurvCE	PH90226063
Archer2 Data Controller North America with NavCom FieldGenius	PH90226390
Archer2 Data Controller North America with NavCom SurvCE	PH90226391
Wood & Fiberglass Tripod	98-213004
Aluminum Rover Pole	98-213009
Fiberglass Extension Rod	PH98223451
Tribrach w/ optical plummet	98-213006
Rotating Tribrach Adapter	PH98223452
GPS Tape Measure	PH98223455
Pole Clamp for Controller Clamp	PH98223454
Clamp for Nautiz Controller	PH98228477
Canvas Tripod Bag	98-213008
LAND-PAK System Transit Case	98-213022
LAND-PAK Rover Transit Case	PH98223505
EPIC Pro 35W IP67 Radio	PH98220542
EPIC Pro 35W Radio Data Cable	PH98220541
35W Radio Power Cable	PH98220543
High Gain Antenna	98-213030
Antenna Mount	98-213015
12' GNSS Antenna Cable	94-310261-3012LF
6-ft Snap Lock Antenna Pole	98-213012
Radio Antenna Bracket	98-213013



The receiver will support a SD card with a maximum of 16GB (not listed).

Table 6: LAND-PAK Options

Item	Part Number
LAND-PAK Lite System Hardware Kit 2x LAND-PAK GNSS Receivers, 4x Li-Ion Batteries, 2x SD Memory Cards, 2x Battery Charger, USB Device Cable, COM2 Serial Cable, Hard shell transit case	PH90228260
LAND-PAK Lite System Software Kit 2x LAND-PAK Bundle – L1, L2, G1, (G2 or L5) Nav 5Hz, StarFire enabled, RTK including Network RTK, RTK Extend, Lifetime StarFire License, StarFire Over IP, USB Config Flash Drive.	PH90228262
LAND-PAK Lite Rover Hardware Kit LAND-PAK GNSS Receiver, 2x Li-Ion Batteries, SD Memory Card, Battery Charger, USB Device Cable, COM2 Serial Cable, Hard shell transit case	PH90228261
LAND-PAK Lite Rover Software Kit LAND-PAK Bundle – L1, L2, G1, (G2 or L5) Nav 5Hz, StarFire enabled, RTK including Network RTK, RTK Extend, Lifetime StarFire License, StarFire Over IP, USB Config Flash Drive.	PH90228263

Chapter 3..... Batteries

This chapter provides guidance on battery charging for optimum performance.



*All of the LAND-PAK batteries must be charged before the test setup of the system. Refer to Chapter 4 *Function Test Setup*.*



For optimum battery life and performance, it is important that all batteries receive a *full* charge before first use.



Refer to Chapter 7 *Equipment Maintenance* for safety instructions regarding battery use, storage, and disposal.

SF-3040 GNSS Receiver Battery Packs

The SF-3040 GNSS receiver is supplied with two Lithium-ion rechargeable battery packs. The battery charger has two charging bays (refer to Figure 11).



Figure 11: Battery Pack Dual-Bay Charger

Follow these steps to charge the receiver batteries:

1. Plug the supplied battery pack charger AC power adapter into a wall outlet.
2. Connect the AC power adapter to the DC in-jack on the supplied battery pack charger.
3. Place the battery packs in the charger.
4. Once the battery packs are fully charged, slide them out and unplug the power.



The temperature range over which the battery can be charged is 0°C to 45°C. Charging the battery at temperatures outside of this range may cause the battery to become hot or to break. It may also harm the performance of the battery or reduce the battery's life expectancy.

Battery Charger LEDs

The battery charger has two LEDs, one for each charger bay. The LED is green when no battery is in the charger. Once a battery is placed in the charger, the light turns red. When the battery is almost fully charged, the light turns yellow. Continue charging the battery. The light stays green when the battery packs are fully charged. Refer to the below table:

Table 7: Battery Charger LED Indicators

Off	Not charging
Red	Batteries charging
Yellow	Battery near full charge; continue charging
Green	No battery in charger or batteries are fully charged



Batteries are *not* charged in the unit. If external power is applied, the SF-3040 battery LEDs indicate the status of the batteries, not the status of the external power source.

■ Battery Charging



The SF-3040 battery packs are shipped in a partially charged state. Complete one full charge cycle (LED changes from red to green) before battery use.



All new batteries must be charged for a minimum of 12 hours prior to use, regardless of the LED indicator on the charger. Charge the batteries for 12-hours after each use to ensure longest possible usage each day



If the battery packs are left charging for longer than 5 days, the charging indicator LEDs will shut off. If this occurs, place the battery packs in the SF-3040 GNSS receiver and power on for 10 to 15 minutes to slightly discharge the batteries.

SF-3040 Battery Installation

The battery chambers are located on the side of the SF-3040 receiver. There are two locking clips on the outside edge of each battery chamber to hold the battery packs in place.

Follow these steps to install the battery packs:

1. Open the battery pack chamber (located on the left-hand side of the SF-3040 as you hold the receiver with the front facing toward you) by pressing downward on the black button.
2. Align the battery pack with the chamber.
3. Holding the locking clip to the side, insert a battery pack into each chamber, metal-contact end first.
4. Push the locking clips back into place.



Figure 12: Battery Chamber Release Button

5. Repeat steps 2 through 4 with the second battery pack.



Charge the battery packs only with the supplied battery chargers (PN 98-214401); otherwise, damage to the battery packs could occur.



Remove the battery packs from the SF-3040 GNSS receivers if they will not be used for more than one week.



Batteries are *not* charged in the unit. If external power is applied, the SF-3040 battery LEDs indicate the status of the batteries, not the status of the external power source.



Refer to the supplied *SF-3040 GNSS Receiver Product User Guide* for complete details on battery charging, installation, use, safety, and disposal.

The SF-3040 GNSS receiver battery packs are keyed to prevent improper installation. There are two locking clips on either side of the battery bay.



Figure 13: Battery Packs Installed in Chamber Showing Locking Clips



Ensure that both locking clips are *locked in place*. If both locking clips are not locked in place, the battery packs can disengage.

■ Battery Removal

With your thumb, push a locking clip to the side (refer to Figure 13). The battery pack should pop out enough to be pulled free of the chamber. Repeat for the second battery pack.

Nautiz X8 Battery Pack

This section provides steps to charge the battery pack for the Nautiz X8.

A 3.7V 5200mAh Lithium-Ion battery pack powers the Nautiz X8. It can provide approximately 6 hours of operating time on a full charge (depending on power management and use).



Before changing the battery pack, press the Power key to put the terminal in Suspend Mode to suspend all operations. ALWAYS put the terminal in Suspend Mode prior to changing the battery.



Charge the battery pack in the Nautiz X8 until it is fully charged before first use.

Installing the Nautiz X8 Battery

1. Remove the battery chamber door by moving the door lock to the left and lifting the door through the slots on the sides.
2. Insert the battery into the battery well with the connectors facing the top.
3. Replace the battery door by inserting the bottom first, then push the top until the lock is secure.



The battery door must be replaced prior to booting up the unit.

Charging the Battery

1. Attach the appropriate plug adapter to the plug of the power cable.
 2. Insert the plug into the appropriate power source.
 3. Plug the power cable into the USB Jack on the side end of the terminal.
 4. Allow five hours to charge the battery to full capacity.
-



The red LED is ON when charging is in progress and the green LED is ON when the battery is fully charged.



After the battery has been charged, disconnect the DC Power Jack from the terminal. If the unit is used while plugged in, it is possible to break the power cable.

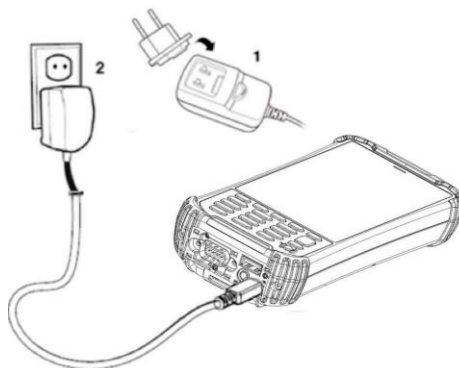


Figure 14: Battery Charger/Charging Cable

Chapter 4..... Function Test Setup

This chapter provides a test setup of the LAND-PAK before field operation to ensure system functionality. The function test setup involves the following:

- ✓ Nautiz X8 configuration
- ✓ Radio modem configuration
- ✓ Hardware setup


System inventory and battery charging must be completed before this test setup. Refer to Chapter 2 *Inventory Check* and Chapter 3 *Battery Charging*.



The function test setup does not involve satellite communication. Refer to the FieldGenius User Guide for instructions on initializing the system to start collecting computed positions.

Nautiz X8 Configuration

This section provides steps to initially configure the Nautiz X8 handheld controller prior to the installation of the desired software.

1. Remove handheld unit from packaging and install battery pack.
2. Press and hold power button  on the keypad for two seconds to allow the unit to boot up. The Windows Mobile home screen will appear.

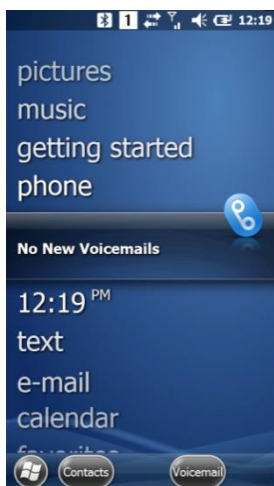


Figure 15: Windows Mobile Home Screen

3. Click the Windows icon on the lower left to access the Start screen.

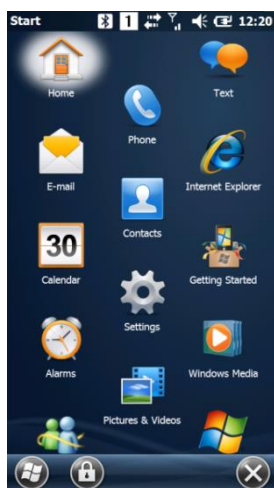





Figure 16: Windows Mobile Start Screen

4. Click the Settings  icon to open the Settings screen.

5. Click the Personal  icon to open the Personal screen.
6. Click the Phone  icon to open the Phone screen.
7. Press the right arrow > to scroll to the Data-Connections screen.
8. Set the following parameters:
 1. Uncheck the “Suspend data connection timeout” checkbox.
 2. Set the “Data connection authentication” to CHAP-PAP.

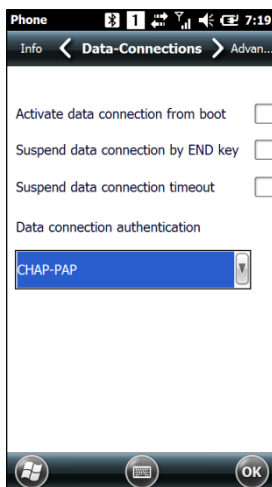


Figure 17: Data-Connections Screen

These settings will prevent the automatic disconnection of the Global System for Mobile Communications (GSM) in the absence of a signal and will enable the RTK and StarFire Over IP features to function properly.

The unit is now ready for software installation. See Chapter 5: Field Genius for installation instructions.



For SurvCE software installation, refer to the *SurvCE Integration User Guide* for instructions.

SF-3040 UHF Radio Modem Configuration

This section provides steps to initially configure the LAND-PAK radio modems. Configuration is almost identical for both the base station and rover radio modems.

A 1-Watt internal, removable, user-configurable UHF radio modem (PN 90-213034-01) is included with the LAND-PAK system.



The UHF module is configured via the FieldGenius software on the Nautiz X8 collector.



An optional 35W boost radio is available for use when using the radio as a base station and more than 1W of power is required. The boost radio is connected via a com port and is not controlled via FieldGenius; see Appendix B for details.

Licensing Requirements

This radio device requires an FCC license prior to operation in the United States. Other countries may have similar requirements. It is the user's responsibility to acquire all applicable operator licenses.

Radio Overview

The user configures the radio via software running on the Nautiz X8 handheld controller or a PC.

- ⚠ Users in North America should be aware that the frequency band 406.0 – 406.1 MHz is for government use only, the use of the radio modem on this frequency band is strictly forbidden.
- ⚠ Use only the radio modem supplied by NavCom in the SF-3040.

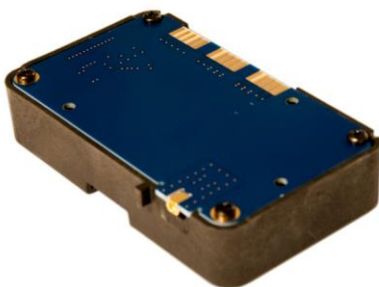


Figure 18: Radio Modem

Technical Specifications

Table 8: UHF Radio Modem Specifications

Item	Receiver	Transmitter	Notes
Operating Voltage	+3 V – +9 V		Supplied voltage: 3.8 V
Frequency Range	403 – 473 MHz		
Channel Spacing	12.5/20/25 KHz		¹ Programmable to 12.5 or 25 KHz
Tuning Range	70 MHz		
Sensitivity (BER <10 ⁻³)	-110 dBm @ 12.5 KHz -112 dBm @ 20 KHz -112 dBm @ 25 KHz		FEC OFF ²



1. Software v2.1.7 is limited to 25KHz; Software v3.0 and later allows 12.5 or 25 KHz.
2. Due to design, the radio receiver is about 6 – 15 dB less sensitive on the following frequencies: 403.000, 416.000, 429.000, 442.000, 455.000, 468.000, and 469.200 MHz

Table continued on next page...

Item	Receiver	Transmitter	Notes
Power Consumption	<1.2 W	<3 W @ 0.5 W output power <7 W @ 1 W output power	
Power Consumption, Save Modes	Sleep: 0.24 W typical DTR: 5 mW		
Transmit Power		100, 200, 500, 1000 mW	Default: 100mW
Communication	Half-Duplex		
Carrier Power Stability		< ± 1.5 dB	
Data Speed of Serial Interface	300 – 38400 bps		Programmed to 38400 bps
³ Modulation	4FSK (Satel), GMSK (PacificCrest, TrimTalk)		
Ant. Connector	TNC		
Interface	LVTTL UART		
Temperature Ranges	-30°C – +65°C		Functional
	-25°C – +55°C		Complies with standards
	-40°C – +80°C		Storage
Weight	50 g		



3. Software SF-3040 v2.1.7 is limited to Satel; Software v3.0 and later allows Satel, PacificCrest, and TrimTalk.

Not supported in the initial release of the FieldGenius v5.1.1.2 software.

RF Interface

The radio modem has a single antenna connector with an impedance of 50 ohm.

Channel Spacing

The data speed of the radio interface depends on the chosen radio channel spacing. Channel spacing is fixed at 25 KHz in software v2.1.7. Software v3.0 and later allows 12.5 or 25 KHz.

Data Speed

If the data speeds of the radio interface and the serial interface differ, the radio modem temporarily buffers data being transferred, so no data loss occurs.

A channel spacing of 25 KHz enables a data speed of 19200 bps. Channel spacing of 12.5 KHz enable a data speed of 9600 bps. The TrimTalk protocol limits the data rate to 4800bps. However, these rates are not programmable in the SF-3040. The data speed of the radio interface is always fixed (19200 bps), regardless of the data speed of the serial interface.

Transmitter

The transmitter output power is adjustable: It can be set at 100, 200, 500, or 1000 mW (1 W). To conserve battery life, the transmitter output power should be set to the lowest possible level that ensures error-free connections under variable conditions.

*Table 9: Transmission Output Power Values,
Watts vs. dBm*

Output Power	dBm
100 mW	+20
200 mW	+23
500 mW	+27
1 W	+30



High output power levels using short connection distances can, in the worst case, disturb the overall operation of the system.



The greatest allowable power depends on the limits set by local authorities, which limits must not be exceeded under any circumstance.

Base Station Test Setup

This section provides *steps to correctly* and safely set up the base station. It is important to select an open area for the test setup.



The base station tripod leg points may damage soft materials, including indoor carpets.

1. Find a safe, open, and flat location in which to set up the base station.
2. Unbuckle the strap that holds the tripod legs together.
3. Open the tripod legs until the tripod is stable. Use the tripod leg levers and the tripod wing screws to adjust the height and secure the tripod (see Figure 19). Leveling the tripod by eye is sufficient.



Figure 19: Base Station Tripod – Leg Adjustments



Figure 20: Base Station Tripod

Refer to Figure 20 for the steps below:

4. Remove the tripod cap by unscrewing the tribrach fastener.

Use the two Allen wrenches (4mm and/or 5mm, respectively) on the top plate of the tripod to tighten the hex screws at the top of the tripod if needed.

5. Store the two Allen wrenches for future use as needed.

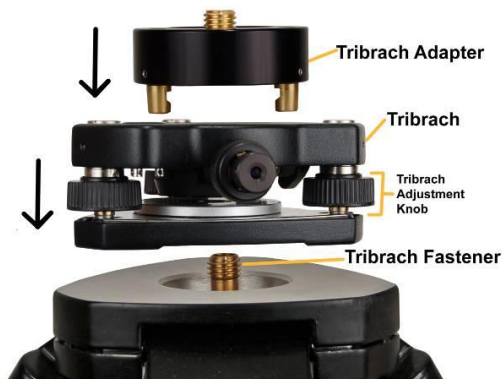


Figure 21: Mounting Tribrach & Tribrach Adapter

Refer to Figure 21 for the steps below:

6. Mount the tribrach to the top of the tripod as follows:
 - Position the tribrach so it fits evenly on the top plate and is flat.
 - Screw the tribrach fastener into the tribrach until it is secure.



The tribrach has a leveling bubble and three adjustment knobs to make fine adjustments.

7. Mount the tribrach adapter into the three holes of the tribrach, and then lock it in place by turning the knob on the side of the tribrach.
8. Screw the pole extension into the tribrach adapter. The pole extension provides easier access to the connectors and exchange of the batteries on the SF-3040 GNSS receiver.

Rover Test Setup

This section provides the steps to correctly and safely set up the rover. It is important to select an open area for the test setup.



The rover pole may damage soft materials, including indoor carpets.



Over-tightening of the attachments on the rover pole may cause damage.

1. Set up the rover in a safe, open, and flat location.



Figure 22: Pole Clamp and Cradle

Refer to Figure 22 for the steps below:

2. Connect the rover pole clamp to the Nautiz cradle, if necessary:
 - Insert the cradle quick-release adapter into the hole in the pole clamp.
 - Depress the button on the pole clamp and, if necessary, twist the cradle to the desired position by inserting the small peg into one of the available holes on the pole clamp.
 - Release the black button on the pole clamp to lock the assembly in place.



Figure 23: Mounting the MicroSurvey Nautiz X8

Refer to Figure 23 for the steps below:

3. Connect the clamp assembly to the rover pole:
 - a. Loosen the knob on the pole clamp.
 - b. Connect the pole clamp to the rover pole above the level so that it does not obscure the level from view.
 - c. Tighten the knob.
4. Mount the Nautiz X8 on the cradle clamp and tighten the cradle knob.



Do not over-tighten the cradle. Over tightening may cause damage to the Nautiz X8 screen.



Do not lean the pole in a location where the equipment is likely to fall. Though the electronic products are tested for a pole drop, repeated drops or drops on the wrong axis may still cause equipment damage.

5. Extend the rover pole to the maximum height possible and snap it into place. This may require

turning the top pole to align the spring-loaded clasps with the bottom pole.

6. Tighten the connector at the base of the extension to secure the extension pole.



Extending the rover pole reduces the possibility of satellite signal blockage by passing pedestrians or vehicles.

7. Insert the two lithium-ion battery packs into the SF-3040 GNSS receiver. Refer to Chapter 3 *Battery Charging* for details.
8. Screw the receiver antenna onto the SF-3040.
9. Mount the SF-3040 to the top of the rover pole and screw into place.

This concludes the rover test setup. Carefully, disassemble the rover attachments, and repack all the equipment.

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Chapter 5.....Field Genius

This chapter provides details on installing and registering the FieldGenius software on the Nautiz X8 controller.



For Carlson Software SurvCE installation and use, refer to the *SurvCE Integration* user guide.

Summary

NavCom's FieldGenius provides the following unique LAND-PAK functionality:

- ✓ RTK-Extend operation
- ✓ StarFire Quickstart
- ✓ StarFire Status
- ✓ StarFire Over IP
- ✓ Freeform Command Input
- ✓ UHF Radio Setup
- ✓ GNSS Receiver Setup
- ✓ GSM Setup for Ntrip
- ✓ GNSS Raw Data Logging
- ✓ Receiver Status



Refer to the supplied *FieldGenius User Guide* for all other information.

Installation

NavCom's FieldGenius software is included with the LANDPAK kit. This software is located on a USB

drive and can be loaded onto the PC desktop prior installation.



Make sure that the Controller has been properly configured (see Chapter 4: [Nautiz X8 Configuration](#)) and is connected to the PC using Windows Mobile Device Center.

1. Double-click the navcom-fieldgenius icon on the computer desktop.



Figure 24: Navcom FieldGenius icon

2. On the NavCom FieldGenius Setup Wizard screen, click the Next button.



Figure 25: NavCom FieldGenius Setup Wizard

3. Click the I Accept button on the End User License Agreement screen, then click Next.

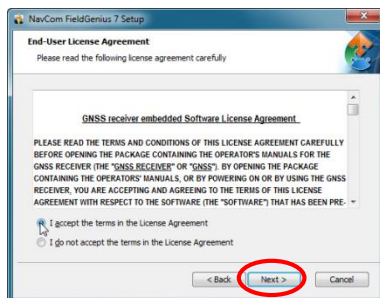


Figure 26: End-User License Agreement

4. Click the Windows Mobile 6 box on the Device Selection box and click the Next button.

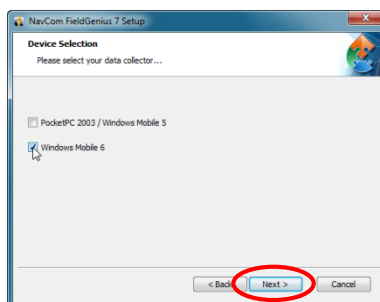


Figure 27: Device Selection screen

5. Click the Install button on the Ready to Install screen.

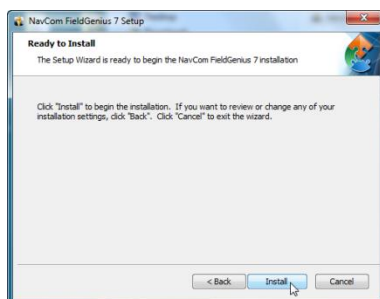


Figure 28: Ready to Install screen

6. Allow the installation to proceed.

7. When the Application Downloading Complete prompt appears, click the OK button.

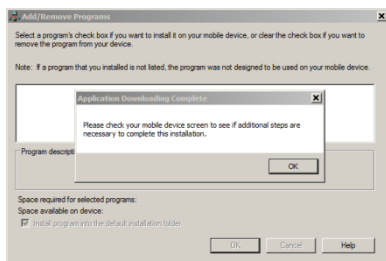


Figure 29: Application Downloading Complete Prompt

8. Select Device on the Windows Start screen and Click Install.

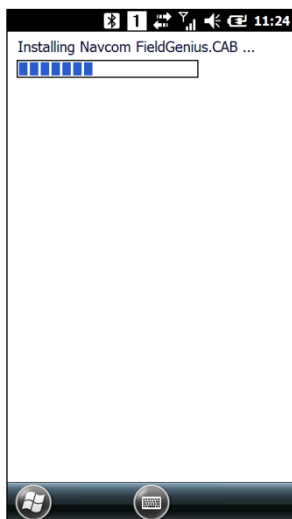


Figure 30: FieldGenius CAB screen

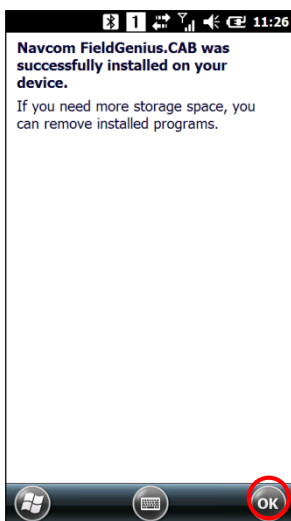


Figure 31: FieldGenius CAB Installed Screen

9. When the installation is complete, click OK to return to the Start screen.
10. Scroll down to the Navcom FieldGenius icon and click.

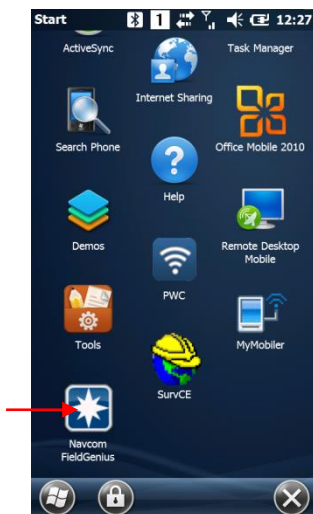


Figure 32: FieldGenius icon

Registration

NavCom's FieldGenius software opens in Demo mode. In order to take advantage of all the features, it is necessary to register the software.

1. Click Yes to open the Registration screen. The Device ID field will show the unit ID code.



Figure 33: FieldGenius Registration screen

2. On the PC, access Internet Explorer
3. Type <http://www.microsurvey.com/register/> into the address bar.
4. On the MicroSurvey Software Inc. License Maintenance screen, enter the serial number from the *GUID Quick Start Guide* included in the LANDPAK kit. Click the Submit button.

Figure 34: MicroSurvey License Maintenance screen

5. Enter your Device ID from the FieldGenius registration screen into the Device ID field. Enter it again in the Confirm (Device ID) screen.
6. Click the Submit button. The Expiry Date and Password will appear.

Figure 35: MicroSurvey Password screen

7. Access the Key Pad on the handheld unit by doubletapping the stylus in the first Key field on the Navcom FieldGenius registration screen located beneath the Device ID field.

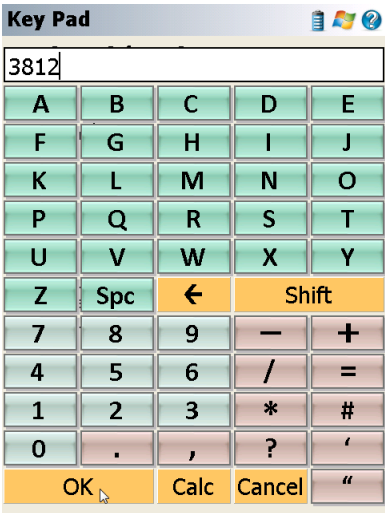


Figure 36: Keypad

8. Enter the first four characters of the password and click OK. Enter the next four characters and click OK. Repeat until all 32 characters are entered into the eight Key fields.

It is not possible to enter all 32 characters at once. You must enter only four characters at a time and click OK on the Keypad before entering another four characters.



About Navcom Field...

MicroSurvey Software Inc.
Copyright © 2001-2012 MicroSurvey Software,
Version 6.0.6.6 (2013-07-26)

Device ID

Key

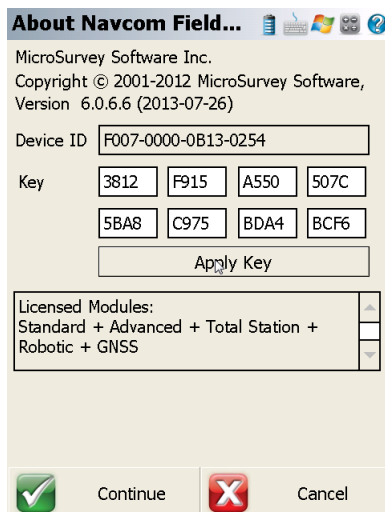
Apply Key

Invalid key. Please check the entered keys.
If the problem persists, please contact your
dealer for support.

☒ Run Demo Mode ☐ Cancel

Figure 37: FieldGenius Registration Key Screen

9. When all the fields are filled in, click the Apply Key button. The Licensed Modules field appears to that the registration was successful.



About Navcom Field...

MicroSurvey Software Inc.
Copyright © 2001-2012 MicroSurvey Software,
Version 6.0.6.6 (2013-07-26)

Device ID

Key

Apply Key

Licensed Modules:
Standard + Advanced + Total Station +
Robotic + GNSS

☒ Continue ☐ Cancel

Figure 38: Complete FieldGenius Registration screen



If the Invalid Key prompt appears, re-enter the password again. If it persists, contact Customer Service.

SF-3040 GNSS Receiver Commands

Refer to the *Sapphire Technical Reference Manual* on the NavCom website for detailed information on these commands. These commands (and others) may be manually entered using the Freeform Command Input feature:

[RTKDEFAULTS]
[RTKFIXMODE]
[RTKFLOATTIMEOUT]
[RTKMODE]
[RTKMULTIPATH]
[RTKNAVRESET]
[RTKSYNCMODE]
[RTKTIMEOUT]
[REFSTNPOS]
[REFNAME]
[RADIOSTAT]
[PRDGPSTIMEOUT]
[PRDGPSMODE]
[PDOPLIMIT]
[NTRIPSERVER]
[NTRIPCONFIG]
[NTRIPCLIENT]
[NAVMEASURE]
[NAVELEV MASK]
[L1FALLBACK]
[GLONASSCORRECTION]
[GGM02STATUS]
[GGAMODE]
[DYNAMICS]
[DEFINESFSAT]
[ANTENNAHEIGHT]
[2DNAVMODE]
[STARFIREALTSAT]
[TRACKELEV MASK]

Configure the Internal Radio as the Data Collector

Perform these steps to configure the LAND-PAK 1W internal radio:

1. Open FieldGenius and select a project or create a new one (see the *Field Genius User Guide* for detailed instructions).
2. On the **Instrument Selection** dialog box (refer to Figure 39), select **GPS Rover**.



The only time you select **GNSS Reference** is when you are setting up a base station with the internal 1W or external UHF radio boost.



If the SF-3040 is not already in the Instrument Profile list, add it to the list first; then edit the settings. The Rover and Reference are handled separately.

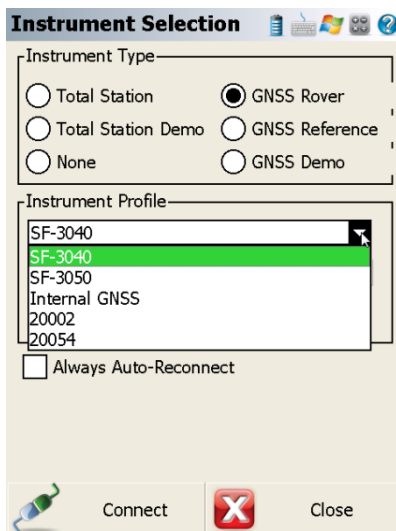


Figure 39: Instrument Selection

3. Click **Connect** to connect to the SF-3040.
4. On the **Link Configure** dialog box (refer to Figure 40), select **Internal UHF Radio** as the **Link Device**. The **GNSS Port** is **Internal**.
5. Select a **Data Format** from the drop-down list.
6. Click **Connect**.

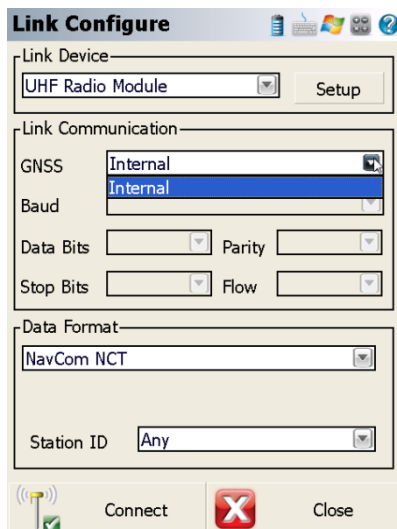


Figure 40: Link Configure

7. On the **Radio Setup** dialog (refer to Figure 41), set the network ID (the Base and Rover radio network ID's must match), type a frequency in the **Frequency** text box (between 403.000 and 473.000MHz in 0.025MHz steps with 25KHz channel spacing or 0.0125MHz steps with 12.5KHz channel spacing), and set the transmit power.
8. Click **OK**.

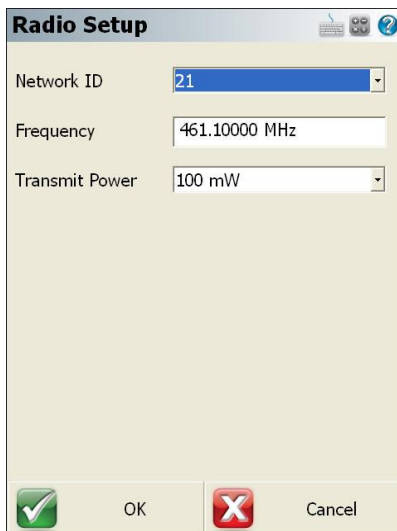


Figure 41: Radio Setup

9. On the **Link Configure** dialog box (refer to Figure 40), set the RTK correction format in the **Data Format** dropdown window.
10. On the **Link Configure** dialog box, click **Connect**.

The radio is configured to transmit and receive correction data.

Perform a StarFire Quick Start

StarFire Quick Start allows the receiver to perform as though it is fully converged just a few moments after startup by initializing on a known point. If a known point is available, follow these steps to perform a StarFire quick start:

1. Open FieldGenius and select an existing project (see the *Field Genius User Guide* for detailed instructions).


2. On the **Instrument Selection** dialog box (refer to Figure 39), select **GNSS Rover**.
3. Click **Connect** to connect to the SF-3040 receiver.



If the SF-3040 is not already in the Instrument Profile list, add it to the list first then edit the settings. The Rover and Reference are handled separately.

4. On the **Link Configure** dialog box (refer to Figure 40), select **StarFire**. This sets the positioning mode to StarFire.
5. Click **Connect**.



6. From the map display, click .
7. On the **Instrument Settings** dialog box (refer to Figure 42), click **StarFire QuickStart**.



If StarFire QuickStart Reset or StarFire Reset Cancel are displayed, cancel the Quick Start and reinitiate StarFire QuickStart.

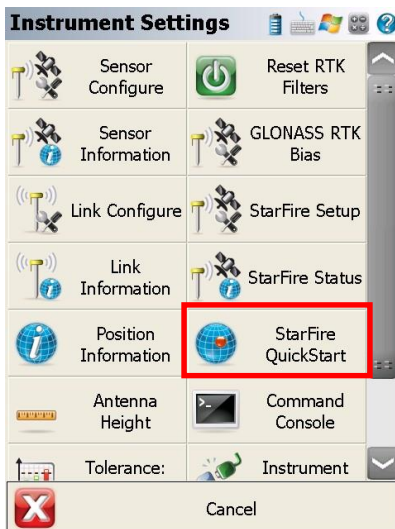


Figure 42: Instrument Settings/StarFire QuickStart

8. On the **Point Database** screen (refer to Figure 43), select a point ID from an existing project and click **Select** to initiate a quick start.

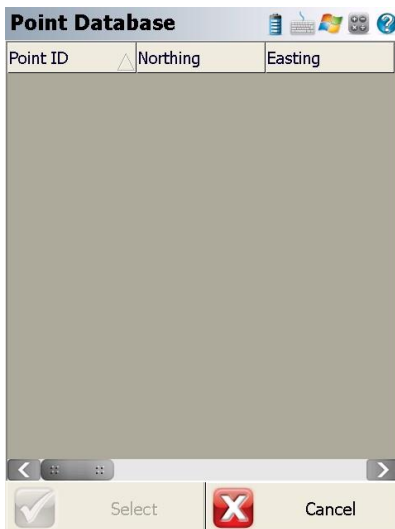



Figure 43: Select QuickStart Point

View StarFire Status

Perform the following steps to check StarFire status:

1. Open FieldGenius and create a project or select an existing project (see the *Field Genius User Guide* for detailed instructions).
2. On the **Link Configure** dialog box (refer to Figure 40), select **StarFire**.
3. Click **Connect**.



4. On the map page, click .
5. On the **Instrument Settings** dialog (refer to Figure 44), select **StarFire Status**.

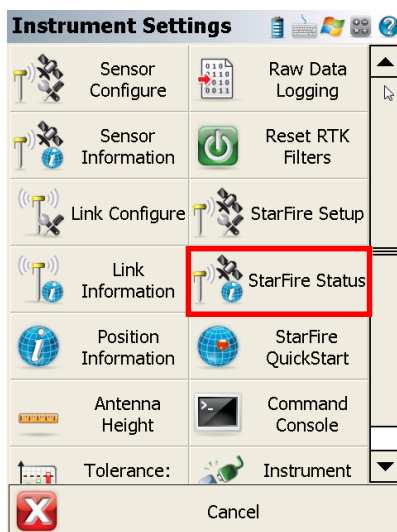


Figure 44: Instrument Settings/StarFire Status

6. On the **StarFire Status** dialog (refer to Figure 45), view the StarFire parameters.

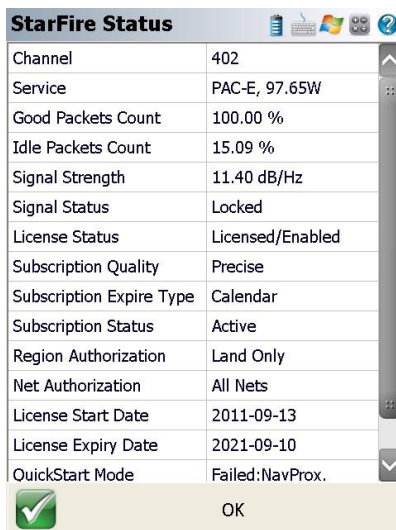



Figure 45: StarFire Status

Choose an Alternate StarFire Satellite

After logging on to FieldGenius and selecting a project or creating a new project, follow these steps to change the StarFire satellite configuration:

7. On the **Instrument Selection** dialog (refer to Figure 39), select **GNSS Rover**.
8. Click **Connect** to connect to the SF-3040.
9. On the **Link Configure** dialog box (refer to Figure 40), select **None**.
10. Click **Connect**.



11. On the map page, click .
12. On the **Instrument Settings** dialog (refer to Figure 46), select **StarFire Setup**.

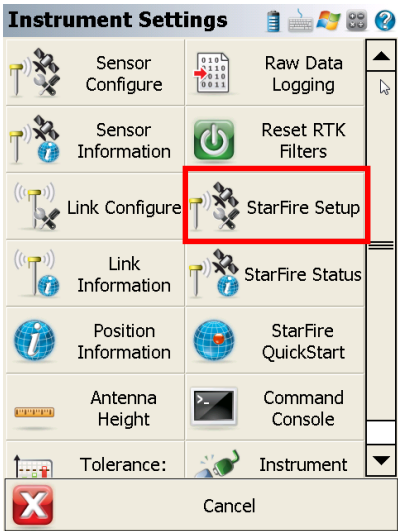


Figure 46: Instrument Settings/StarFire Setup

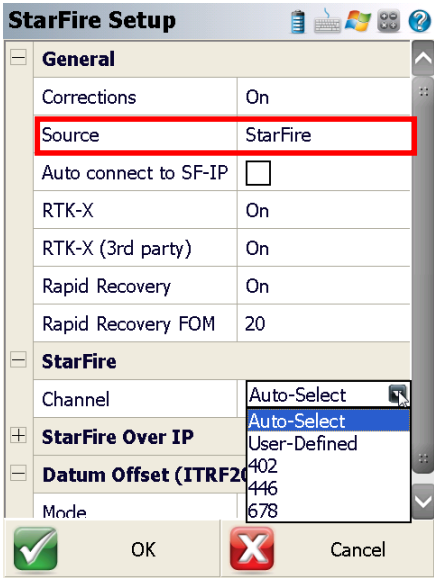


Figure 47: StarFire Setup/Source

13. Click the Source field in the **General** section of the StarFire Setup screen.
14. Select StarFire from the dropdown list.
15. Click the Channel field under the **StarFire** section.
16. Select **User-Defined** and enter valid Satellite ID# and Frequency as provided by NavCom OR select from the available and visible alternate satellites to force a connection OR choose Auto Select to automatically connect to the satellite with the strongest signal.
17. Click **OK**.

Set up StarFire Over IP

This feature is used to access the StarFire Over IP network. This network consists of an independent StarFire server which can be accessed through four mountpoints with a choice of three data delivery rates. This connection can be made by means of a cellular phone modem.

Follow these steps to access the StarFire Over IP server:

1. Open FieldGenius and select an existing project or create a new project (see the *Field Genius User Guide* for detailed instructions).
2. On the **Instrument Selection** dialog box (refer to Figure 39), select **GNSS Rover**.
3. Click **Connect** to connect to the SF-3040.
4. On the **Link Configure** dialog box (refer to Figure 40), select **None**.
5. Click **Continue**.

6. On the Map page, Click the tools icon .
7. On the **Instrument Settings** dialog (refer to Figure 52), click **StarFire Setup**.

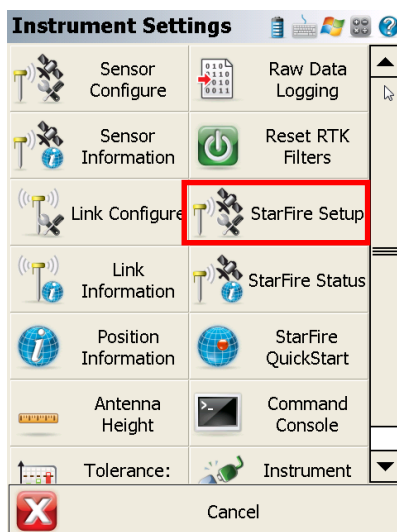
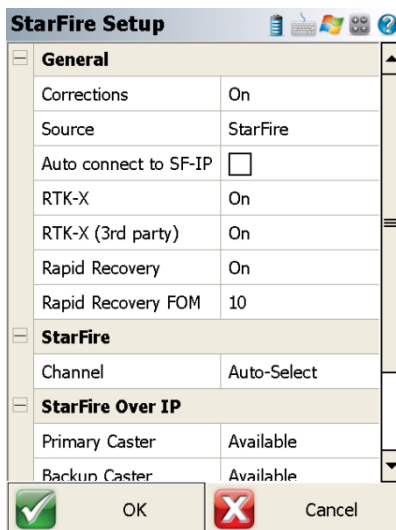


Figure 48: Instrument Settings/StarFire Setup

8. Allow StarFire Setup to complete the configuration and dial out to the internet.
9. Access the **StarFire Setup** screen.



StarFire Setup

General

Corrections	On
Source	StarFire
Auto connect to SF-IP	<input type="checkbox"/>
RTK-X	On
RTK-X (3rd party)	On
Rapid Recovery	On
Rapid Recovery FOM	10

StarFire

Channel	Auto-Select
---------	-------------

StarFire Over IP

Primary Caster	Available
Backup Caster	Available

OK Cancel

Figure 49: StarFire Setup/StarFire Over IP

10. In the Source field, make sure that StarFire is selected.
11. In the StarFire Over IP section, determine that the Primary Caster and Backup Caster fields show "Available."



Casters are hardcoded and cannot be changed.

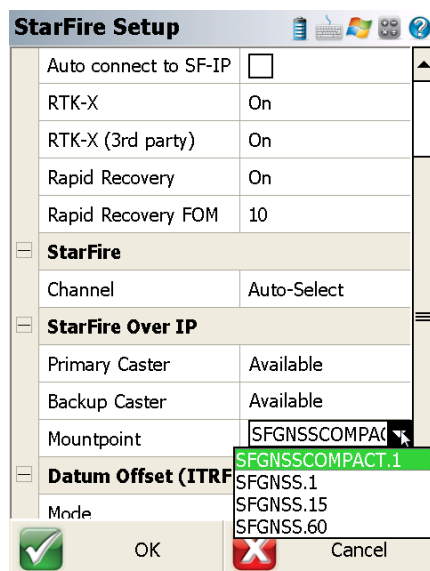


Figure 50: StarFire Setup/Mountpoint Selection

12. Select a Mountpoint from the Mountpoint dropdown list. Four Mountpoints are available:

SFGNSSCOMPACT.1 – This option has a frequency of one per second but delivers a smaller data packet. Can be used when cellular signal strength is less than optimal.

SFGNSS.1 – This option delivers the standard StarFire data packet at the rate of one per second.

SFGNSS.15 – This option delivers the standard StarFire data packet at the rate of one every 15 seconds.

SFGNSS.60 – This option delivers the standard StarFire data packet at the rate of one every 60 seconds.

13. Click **OK**

14. Allow the StarFire Over IP setup to complete the configuration.

Auto connect to SFOIP

This configuration directs the software to automatically connect to the StarFire Over IP service if the StarFire corrections become unavailable.

1. In the Source field, select StarFire from the pulldown list.



The checkbox is only available when StarFire appears in the source field.

StarFire Setup	
General	
Corrections	On
Source	StarFire
Auto connect to SF-IP	<input checked="" type="checkbox"/>
RTK-X	On
RTK-X (3rd party)	On
Rapid Recovery	On
Rapid Recovery FOM	10
StarFire	
Channel	Auto-Select
StarFire Over IP	
Primary Caster	Available
Backup Caster	Available
<input checked="" type="button" value="OK"/> <input type="button" value="Cancel"/>	


Figure 51: StarFire Setup/Auto connect to SF-IP

2. Click the checkbox next to the Auto connect to SF-IP field.
3. Click **OK**

Reset RTK Filters

This feature is used to reset the Kalman filter and ambiguity resolution process when RTK performance is suspected to be in error.

Follow these steps to reset the RTK filters:

1. Open FieldGenius and select an existing project or create a new project (see the *Field Genius User Guide* for detailed instructions).
2. On the **Instrument Selection** dialog box (refer to Figure 39), select **GPS Rover**.
3. Click **Connect** to connect to the SF-3040.
4. On the **Link Configure** dialog box (refer to Figure 40), select **StarFire**.
5. Click **Connect**.
6. Click .
7. On the **Instrument Settings** dialog (refer to Figure 52), click **Reset RTK Filters**.

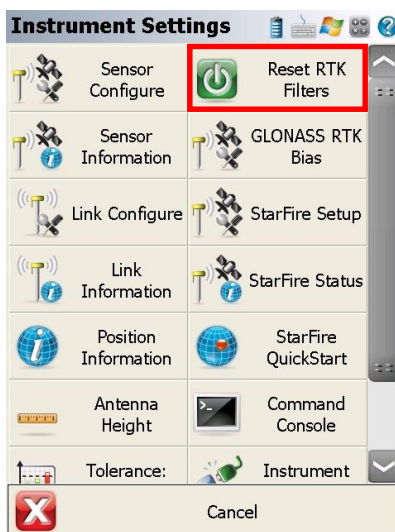


Figure 52: Instrument Settings/Reset RTK Filters

Setting Tolerances

Set the tolerance for all possible modes of operation. Regardless of the user selection, StarFire and RTK-Extend are automatically set as fall-back modes unless the user configures the receiver otherwise.

Table 10: Measurement Performance

RTK Positioning – Multi-Frequency <40kms (RMS)	
Position (H):	$\pm 1\text{cm} +0.5\text{ppm}$
Position (V):	$\pm 2\text{cm} +1\text{ppm}$
RTK WL Positioning – Multi-Frequency <40kms (RMS) (see note below)	
Position (H):	$\pm 5\text{cm} +2\text{ppm}$
Position (V):	$\pm 10\text{cm} +2\text{ppm}$
RTK Extend (see note below)	
Position (H):	$\pm 3\text{cm} +1\text{ppm}$
Position (V):	$\pm 6\text{cm} +2\text{ppm}$
RTK Float	
Position (H):	$\pm 20\text{cm} +3\text{ppm}$
Position (V):	$\pm 40\text{cm} +3\text{ppm}$
StarFire	
Position (H):	$\pm 5\text{cm}$, GNSS; $\pm 10\text{cm}$, GPS
Position (V):	$\pm 10\text{cm}$, GNSS; $\pm 15\text{cm}$, GPS
Code Differential GPS <200kms (RMS)	
Position (H):	$\pm 45\text{cm} +3\text{ppm}$
Position (V):	$\pm 90\text{cm} +3\text{ppm}$
Velocity (for all DGPS described above)	
Velocity:	0.01m/s
Enhanced SBAS (WAAS/EGNOS/MSAS/GAGAN) Position Accuracy (RMS)	
Position (H):	$\pm 30\text{cm}$
Position (V):	$\pm 60\text{cm}$
Static Post Processing Mode: Multi-frequency; L1/L2/L2C/L5/G1/G2	
Accuracy (H)	$\pm 3\text{mm} +0.1\text{ppm}$

Accuracy (V)	$\pm 5\text{mm} +0.5\text{ppm}$
Rapid Static Post Processing Mode: Multi-frequency; L1/L2/L2C/L5/G1/G2	
Accuracy (H)	$\pm 5\text{mm} +0.1\text{ppm}$
Accuracy (V)	$\pm 10\text{mm} +0.5\text{ppm}$



The specifications herein are based on the following: PDOP <4, 1-sigma (65%), 24-hour averaged set of data. Further, performance is dependent on, but not limited to, location, satellite geometry, atmospheric conditions (i.e., solar storm activity), local interference, DoD signal degradation (i.e., Selective Availability or similar techniques), satellite messaging or timing errors, and augmentation correction messages. Equipment operated on a single frequency is more susceptible to atmospheric and solar storm activity than is multi-frequency operated equipment.



The Network RTK software option allows the receiver to generate and receive RTCM 1000-series messages. The navigation algorithms are designed to support single-base correction configurations. Network adjusted RTK formats are not currently supported.



RTK WL is a positioning mode that is necessary for phase ambiguity resolution. However when this navigation mode is indicated, it is likely that the receiver is in a corner case navigation condition. As such, it is not likely that the end user will wish to use it as a valid navigation mode.

If the above conditions are met, then the receiver will not need to be put into RTK-WL mode.



RTK Extend uses StarFire to provide continuous RTK positioning during non-reception of RTK corrections. When a StarFire-enabled receiver with RTK Extend falls out of RTK mode, the system automatically transitions to RTK Extend mode. Positioning is maintained because of the close correlation in phase measurement corrections between RTK and StarFire.

Depending on how long the RTK base station has been running and is StarFire-fixed, the duration of RTK Extend is limited to:

- 2 to 15 minutes for a NavCom Technology base station

- 2 to 15 minutes for a non-NavCom Technology base station

For RTK Extend to achieve maximum performance, the rover must be fully converged, which typically requires one (1) hour of operation.

The correlation between RTK and StarFire phase measurement corrections decreases over time, until the system automatically transitions out of RTK Extend mode to the next available dGPS mode.

This option is only required on the Rover receiver. LAND-PAK systems are sold with both Base and Rover optioned for RTK Extend.

StarFire Tolerance

Perform these steps to set the StarFire tolerance parameters:

1. Open FieldGenius and select a project or create a new one.
2. On the **Instrument Selection** dialog (refer to Figure 39), select **GNSS Rover**.
3. Click **Edit**.
4. **On the GNSS Profile** dialog box (refer to Figure 53), select **Tolerance Setting [StarFire]**.
5. On the **Tolerance 1** dialog box (refer to Figure 54), set the parameters and click **OK**.



The recommended setting is:

Position (H): 10cm

Position (V): 15cm



When setting the above parameters, keep the selection **StarFire Dual** on the **Solution** drop-down list box.

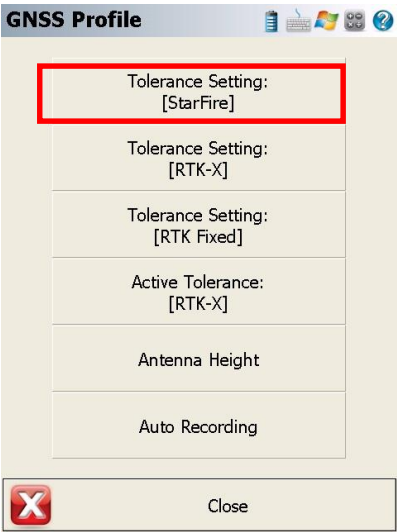


Figure 53: GNSS Profile/Tolerance Setting [StarFire]

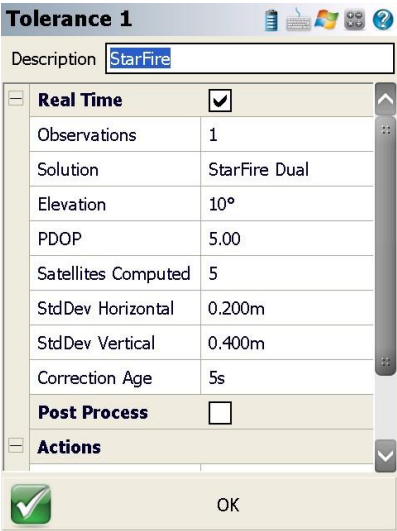


Figure 54: Tolerance 1/StarFire

RTK-X Tolerance

The receiver must have attained an RTK fix and have tracked StarFire Dual mode before an RTK-X position can be obtained. Both of these caveats normally occur within 5 minutes of normal RTK operation.

Perform these steps to set the RTK-X (RTK-Extend) tolerance parameters:

1. Log on to FieldGenius and select a project or create a new one.
2. On the **Instrument Selection** dialog box (refer to Figure 39), select **GNSS Rover**.
3. Click **Edit**.
4. On the **GNSS Profile** dialog box (refer to Figure 53), select **Tolerance Setting [RTK-X]**.
5. On the **Tolerance 2** dialog box (refer to Figure 55), set the parameters and click **OK**.



The recommended setting for a short baseline is:

Position (H): 3cm

Position (V): 6cm



When setting the above parameters, keep the selection **StarFire Dual** on the **Solution** drop-down list box.

GNSS Profile

Tolerance Setting:
[StarFire]

Tolerance Setting:
[RTK-X]

Tolerance Setting:
[RTK Fixed]

Active Tolerance:
[RTK-X]

Antenna Height

Auto Recording

X

Close

Figure 55: GNSS Profile/Tolerance Setting [RTK-X]

Tolerance 2

Description

RTK-X

<div>Real Time</div>	<div><input checked="" type="checkbox"/></div>
Observations	1
Solution	RTK-X
Elevation	10°
PDOP	4.00
Satellites Computed	5
StdDev Horizontal	0.100m
StdDev Vertical	0.200m
Correction Age	5s
<div>Post Process</div>	<div><input type="checkbox"/></div>
<div>Actions</div>	

✓

OK

Figure 56: Tolerance 2/RTK Extend



When setting the above parameters, keep the selection **RTK-X** on the **Solution** drop-down list box.

RTK Fixed Tolerance

Perform these steps to set the RTK Fixed tolerance parameters:

1. Log on to FieldGenius and select a project or create a new one.
2. On the **Instrument Selection** dialog box (refer to Figure 39), select **GNSS Rover**.
3. Click **Edit**.
4. On the GNSS Profile dialog box (refer to
5. Figure 57), click Tolerance Setting [RTK Fixed].
6. On the **Tolerance 3** dialog box (refer to Figure 58), set the parameters and click **OK**.



The recommended setting for a long baseline is:

Position (H): 3cm

Position (V): 6cm



When setting the above parameters, keep the selection **RTK Fixed** on the **Solution** drop-down list box.

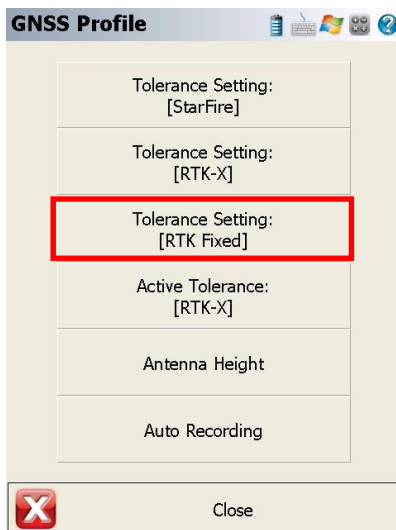


Figure 57: GNSS Profile/Tolerance Setting [RTK Fixed]

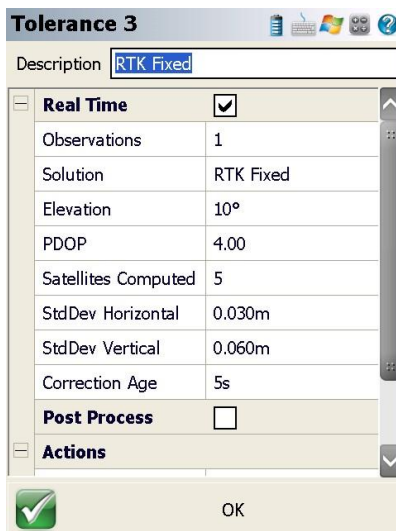


Figure 58: Tolerance 3/RTK Fixed

Set the Active Tolerance

To set a tolerance as the active tolerance, perform these steps:

1. Open FieldGenius and select a project or create a new one.
2. On the **Instrument Selection** dialog (refer to Figure 39), select **GNSS Rover**.
3. Click **Edit**.
4. On the **GNSS Profile** dialog (refer to Figure 59), click **Active Tolerance [StarFire]**.
5. On the **Select Tolerance** dialog (refer to Figure 60), select an active tolerance, and then click **OK** on the **GNSS Profile** dialog box.

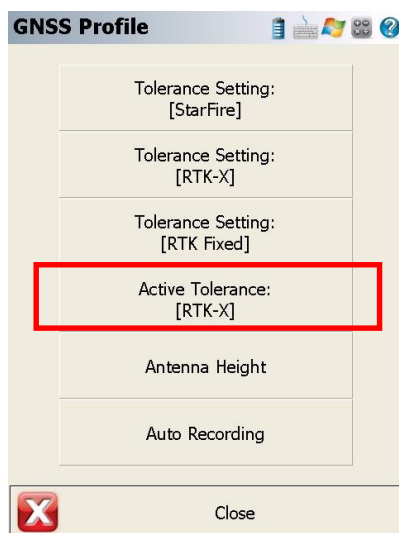


Figure 59: GNSS Profile/Active Tolerance [StarFire]

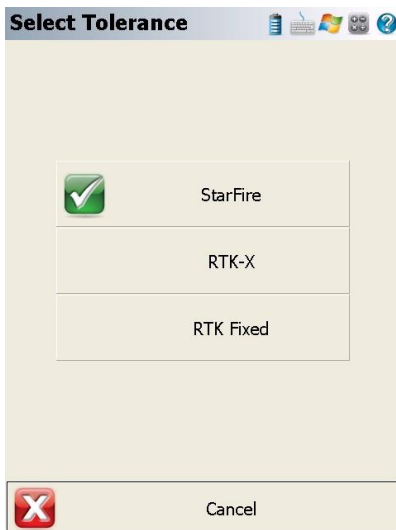


Figure 60: Select Tolerance

Chapter 6..... Equipment Maintenance

Users must be familiar with the use of portable GPS equipment, radio modems, Bluetooth-enabled controllers, the limitations thereof, and these safety instructions prior to the use of LAND-PAK.

Transport

Always carry the LAND-PAK equipment in the supplied packing materials. The cases must be secured during transport to minimize shock and vibration.

Maintenance

The LAND-PAK equipment must be properly cleaned with the appropriate materials. NavCom equipment may be cleaned using a new lint free cloth moistened with pure alcohol. Manufacturer's equipment other than that of NavCom Technology, Inc. must be cleaned in accordance with the instructions issued by the manufacturer.

Connectors must be inspected, and if necessary cleaned before use.

Inspect cables regularly for kinks and cuts as these may cause interference and equipment failure.

Damp GPS equipment must be dried at a temperature less than +40°C (104°F), but greater than 5°C (41°F) at the earliest opportunity.

Battery Disposal

Dispose of batteries safely in accordance with manufacturer's specifications and local regulations.

Safety First

The owner of the LAND-PAK must ensure that all users are properly trained prior to using the equipment and are aware of the potential hazards and how to avoid them.

Manufacturer's equipment other than that of NavCom Technology, Inc. must be used in accordance with the safety instructions issued by the manufacturer. This includes other manufacturer's equipment that is attached to NavCom Technology, Inc. manufactured equipment.

Always use the equipment in accordance with local regulatory practices for safety and health at work.

There are no user-serviceable parts inside LAND-PAK components. Accessing the inside of the equipment will void the equipment warranty.

Take care to ensure LAND-PAK does not come into contact with electrical power installations, that the equipment is securely fastened, and that it is protected against electromagnetic discharge in accordance with local regulations.

A Base Station UHF Boost Radio

The radio connects to the SF-3040 Com 2 port with the supplied cable (PN: 98-214267).

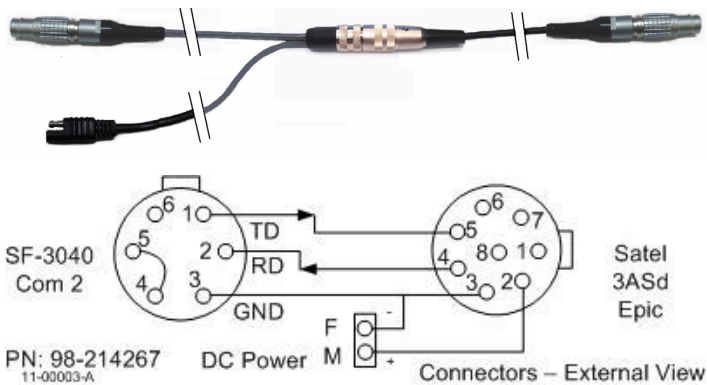


Figure 61: Boost Radio Wiring Diagram

The six pin connector is a Lemo PN: FGA-0K-306-CYCC.5CZ. The eight pin connector is a Lemo PN: FGA-1B.3D8.CLAD52Z. Each cable segment is 2ft (0.6m) long.

The factory-set central RF frequency is listed with the serial number on the radio modem. The RF frequency can be set within 1MHz of the central frequency, at 25 kHz increments.

If tuning beyond 1 MHz is necessary, the user must ship the radio to the manufacturer's factory for hardware modification. Any shipping and customs charges are the responsibility of the customer.



Check with local regulatory authorities to ensure compliance.

*Table 11: LAND-PAK Base Station UHF Amplifier
(Optional) (PN 92-310460-3001LF)*

Item	Qty	Part Number
EPIC 35W IP67 Radio	1	PH98220542
High Gain Antenna	1	98-213030
Antenna Mount	1	98-213015
12 ft GNSS Antenna Cable	1	94-310261-3012LF
6 Ft Snap Lock Antenna Pole	1	98-213012
Radio to Receiver Data Cable	1	98-214267

Configuration

The following sections provide steps to configure the 35W base radio menu items:

- ✓ RF Frequency
- ✓ RF Power Output (set for base station only)
- ✓ Channel Spacing
- ✓ Receiver Sensitivity
- ✓ Network ID
- ✓ Port Configuration

The radio modem is configurable without any external device via the integrated LCD display and soft keys. The soft keys access on-screen menus.

During operation, the LED indicators display RF frequency, battery status, data port speed, and signal strength (in dBm).

■ LED Indicators



The LED indicators provide a quick status view of both the radio channel and the serial interface with the receiver.

The CTS LED illuminates when the radio modems are powered on. Refer to Table 12 for LED indications.

Table 12: Radio Modem LED Indications

LED	Description	Active Status
RTS	Request To Send	Red
CTS	Clear To Send	Red
TD	Transmit Data (Input of the data to be transmitted from the DTE to the radio modem.)	Red = data transmit Green = test Tx active
RD	Receive Data (Output of the data received from the radio modem to the DTE.)	Red
CD	Carrier Detect (radio status)	Red = transmission Orange = noise Green = reception

Soft Keys






Figure 62: Radio Modem Soft Keys

By using the four soft keys below the LCD display, all configurable settings are accessible through on-screen menus (see Figure 62).

The function of each soft key, which varies depending on menu requirements, appears at the bottom of the LCD display.

Table 13: Radio Modem Soft Key Functions

Soft Key	Function
	CANCEL/BACK/EXIT: Cancel changes. Go back to a previous screen. Exit the main menu. Upon exiting the main menu, a confirmation screen opens for saving or discarding changes to settings.
	UP/DOWN: Move through menus and options. Change numerical values.
	SETUP/SELECT/CHANGE/SET/NEXT: Setup the radio modem configuration – the main menu opens. Select a menu or option. Change an option setting. Set changes. For numerical values, move to the next digit.

Priority RX/TX

Set the radio priority is TX.

Forward Error Correction (FEC) and Error Checking

FEC is disabled and unavailable in the SF-3040.
Disable FEC in the 35W radio.

Operating Modes

The radio modem operates in data transfer mode by default. Programming mode is used to configure the radio modem.



The sensitivity of the receiver depends on the channel spacing of the radio mode (data speed of the radio interface) and on the mode of the forward error correction (FEC), which is OFF on the SF-3040. Refer to Table 14.

Table 14: Receiver Sensitivity

Bandwidth, KHz	FEC OFF (Default)
25	-110 dBm
12.5	-112 dBm



The signal threshold level setting of the receiver determines the level above which the search for the actual data transfer signal is active.



Do not install the radio modem on a strongly vibrating surface. Suitable dampening and /or isolation materials should be used in cases where the

installation surface will be subjected to vibration.

■ Data Transfer Mode

In data transfer mode, which appears at power-up, the LCD display shows the operating settings of the radio modem, signal strength, and battery status (see Figure 63).

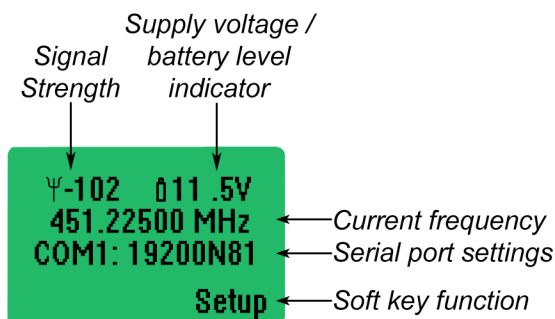


Figure 63: LCD Display – Data Transfer Mode

■ Programming Mode

Programming mode is accessed from the data transfer mode screen. Press the *Setup* soft key. The programming mode main menu opens (see Figure 64). The cursor ">" indicates the active option.



Figure 64: LCD Display – Programming Mode

RF Frequency Configuration



Set the radio modem only to a licensed frequency. It must comply with local regulations.



A label on the front of the base station radio lists the initial (center) frequency. The frequency can be set within 1 MHz of the center frequency, in 25 KHz increments.

1. Press the *Select* soft key to select RF frequency from the main menu (see Figure 64). The frequency of the active channel is displayed (see Figure 65).

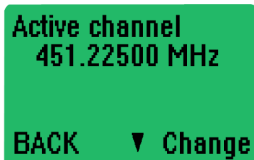


Figure 65: Active Channel

2. Press the *Change* soft key to change the frequency. The center frequency is displayed with a cursor pointing up to the first digit. The first digit cannot be changed.
3. Set the radio modem to the licensed frequency:
 - a. Press the *next* soft key to move the cursor to the next digit (see Figure 66).

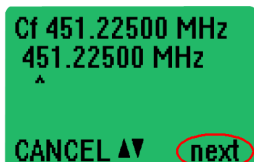


Figure 66: Next Digit

- b. Press the *up* or *down* arrow soft key to change the value of the digit, if needed.
- c. Repeat steps a and b, above, for each configurable digit.

When the cursor is at the last configurable digit, the *Set* option appears in the bottom right of the LCD display (see Figure 67).

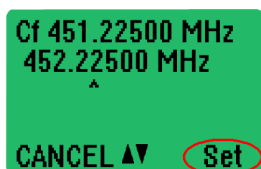


Figure 67: Set Frequency

- d. Change the value of the last configurable digit, if needed.
- e. Press the *Set* soft key to set the frequency changes. Or, press the *Cancel* soft key to cancel the changes.
 - If the frequency is set within the acceptable range, a confirmation message is displayed temporarily. Then the main menu returns.
 - If the frequency is set outside the acceptable range, an error message is displayed temporarily. Then the main menu returns. No change is made to the center frequency. Repeat the RF frequency configuration procedure to change the frequency.
 - If the frequency changes are canceled, the display returns to the main menu.
4. Continue to the next section, to configure the RF power output.

RF Power Output

1. Press the *down* arrow soft key to move the cursor down the main menu to *Radio settings* (see Figure 68).



Figure 68: Main Menu – Radio Settings

2. Press the *Select* soft key to select *Radio settings*. A submenu is displayed with the cursor at the option, *TX level* (see Figure 69).



Figure 69: TX Level Option

3. Press the *Change* soft key to change the TX level. A submenu is displayed with RF power output settings. Figure 70 shows the RF power output settings for the 3ASd Epic radio modem.

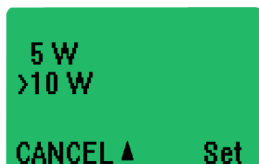


Figure 70: RF Power Output Settings

4. Press the *up* or *down* arrow soft key to move the cursor to a desired RF power output.

- *3ASd Epic radio modem:* The RF power output options are 1, 2, 5, or 10 watts. The 10 watt setting provides the maximum range and causes the maximum discharge on the battery. Select a lower setting for surveys over small areas.
5. Press the *Set* soft key to set the RF power output. The display returns to the submenu with the cursor at TX level.
 6. Press the *Back* soft key to return to the main menu. Continue to the next section.

Signal Threshold

This feature is only important if it is necessary to send a GGA message periodically from the rover to the base.

1. Press the *down* arrow soft key to move the cursor down the main menu to *Radio settings* (see Figure 71).



Figure 71: Main Menu – Radio Settings

2. Press the *Select* soft key to select *Radio settings*. A submenu is displayed with the cursor at the option, *TX level* (see Figure 72).




Figure 72: Sig. Threshold option

3. Press the *down* arrow soft key to move the cursor down the main menu to *Sig. Threshold*.
4. Press the *Change* soft key to change the Signal Threshold level. A submenu is displayed with available negative dBm settings. Set the threshold to *-116dBm*.
5. Press the *Set* soft key to set the threshold level. The display returns to the submenu with the cursor at *TX level*.
6. Press the *Back* soft key to return to the main menu.

Addressing Settings

The Addressing factory default is set to *Off*. The *TX addr* must be *ON* and the address ID must match the rover setting. The rover requires a network ID in the SF-3040 (other than 0).



```

RX addr OFF
TX addr OFF
RX addr->RS OFF
TX add auto OFF
BACK  ▲▼ Change
    
```

Figure 73: Network Address

1. Press the *Change* soft key to change the TX Address. A submenu is displayed with available settings. Set the TX addr to *ON*.
2. On the first row of 4-digit values, set the network ID of the UHF radio. The rover network ID must match this value, otherwise RTK corrections will not be received by the SF-3040.
3. Press the *Set* soft key to set the addressing. The display returns to the submenu with the cursor at *RX addr Off*.

4. Press the *Back* soft key to return to the main menu.

Serial Port Settings

1. Press the *down* arrow soft key to move the cursor down the main menu to *Port 1* (see Figure 74).

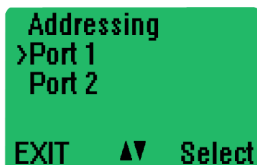


Figure 74: Main Menu – Port 1 Setting

2. Press the *Select* soft key to select Port 1. A submenu is displayed. The cursor points to the status of Port 1. The default is *ON*. Do not change the default.
3. Press the *down* arrow soft key to move the cursor to the next setting on the submenu. It is for the currently set baud rate (see Figure 75).

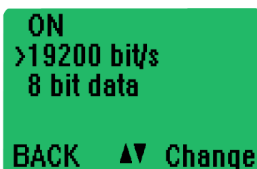


Figure 75: Baud Rate Setting

4. Press the *Change* soft key to change the baud rate. A submenu appears with a list of baud rates.
5. Press the *down* arrow soft key to move the cursor to *38400 bit/s* (see Figure 76).



Figure 76: Baud Rate Setting Change

6. Press the *Set* soft key to set the baud rate to 38400 bit/s. The previous submenu returns with 38400 bit/s listed as the current baud rate.



The SF-3040 GNSS receivers RTK corrections com port will be configured to the same baud rate.

7. Press the *Back* soft key once to return to the main menu.
8. Continue to the next section.

Handshaking

The Handshaking menu functions remain at the default settings: CTS: Clear To Send, CD: RSSI, and RTS: Ignored.

Additional

Error correction and error checking is not used in the SF-3040 and must be set to *OFF*.

✓ FEC Signal Thresholds

- *Channel Spacing*: 25 KHz or 12.5KHz (base and rover must match)
- *FEC Off*: -110 dBm or -112dBm (must match bandwidth)



The setting for error correction must be set to *OFF* on all radio modems

that will communicate with each other.
If the transmitting radio modem and
the receiving radio modem have
different settings, data will not be
received correctly.

1. Press the *down* arrow soft key to move the cursor down the main menu to *Additional* (see Figure 77).



Figure 77: Main Menu – Additional Setting

2. Press the *Select* soft key to select *Additional*.
 - a. A submenu is displayed. The cursor points to *Error corr.*

Refer to Figure 78 and Figure 79 for the steps below.

3. Press the *Change* soft key to turn error correction *OFF*.
4. Press the *down* arrow soft key to move the cursor down the submenu to *Error check*.
5. Press the *Change* soft key to turn error checking *OFF*.

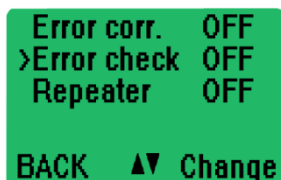


Figure 78: Error Correction and Error Checking

6. Press the *down* arrow soft key to move the cursor down the submenu to *SL-commands*.
 - a. Set *SL-commands* to *OFF*.

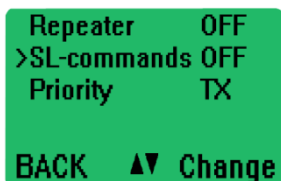


Figure 79: SL-Commands and Priority

- b. Press the *down* arrow soft key to move the cursor down the submenu to *Priority*. Set *Priority* to *TX* by pressing the *Change* key.
7. Press the *Back* soft key twice. *Save changes?* is displayed (see Figure 80).

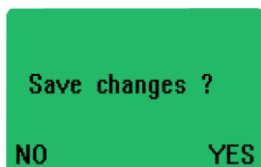


Figure 80: Save Changes

8. Press the soft key to select the *Yes* option. All of the configuration changes are saved and the *Setup* screen is displayed.


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B UHF Boost Radio Setup



Figure 81: Mounting the Radio Antenna Bracket

Refer to Figure 81 for the steps below:

1. Mount the radio antenna bracket to the tripod:
 - a. Unscrew the rear knob of the bracket and remove the rear plate.
 - b. Place the bracket against the opening on a tripod leg.
-  Do not mount the bracket to the tripod leg on which the shoulder strap is attached.
- c. At the back of the tripod leg, put the rear plate on the bracket screw.
 - d. Guide the bracket screw through the hole in the bracket plate until the bracket plate is flush against the tripod leg, and then turn the knob to secure the bracket plate and bracket.



Over-tightening the knob may cause damage to the tripod leg finish.

2. Level the bracket by eye. Loosen the knob on the side of the bracket to make any necessary adjustments. This ensures that the radio antenna pole will be vertical when mounted.



Figure 82: Mounting the Antenna and Cable

Refer to Figure 82 for the steps below:

3. Screw the antenna adapter to the top of the radio antenna pole.
4. Screw the radio modem antenna to the antenna adapter on the top of the radio antenna pole.
5. Connect the straight male TNC connector end of the radio antenna cable to the bottom of the antenna adapter.
6. Extend the radio antenna pole to the maximum height possible.



Extending the radio antenna pole increases the radio modem range, isolates the receiver signals from the

radio modem, and avoids radiation hazard.



To avoid radiation hazard when performing a survey, users and bystanders must be at least 25cm (10 inches) away from the transmitting antenna (see Figure 83).



Figure 83: Avoiding Radiation Hazard

7. Screw the radio antenna pole onto the round mounting plate of the radio antenna bracket (see Figure 81). Make sure that there are no obstructions overhead.
8. Hook the radio modem to the tripod leg using the hook on the back of the modem.
9. Connect the male TNC connector end of the radio antenna cable to the female TNC connector of the radio modem (see Figure 84).



Figure 84: Mounting the Cable to the Radio

10. Connect the serial cable:

- a. Connect the LEMO 8-Pin end of the cable to the radio modem
- b. Connect the LEMO 7-Pin end of the cable to COM 1 of the SF-3040 GNSS receiver
- c. Connect the battery terminal cables to a battery for power.



The external battery is not included with LAND-PAK.



A 60Wh battery is sufficient to power the SF-3040 for 10 hours. For a 12V battery, the capacity should be rated 5Ah, and for a 7.4V battery, the capacity should be 8.1Ah.

11. The Base Boost Radio is now ready for setup and use.

C..... Handheld Device Specifications

Table 15: Nautiz X8 Handheld Device Specifications

Specification	Description
Size (LxWxH)	190.9mm (7.5in) x 79.7mm (3.1in) x 34.6mm (1.3in)
Weight	490g (17.3oz)
Operating Temperature	-30°C to 60°C (-22°F to 140°F) MIL-STD 810G, Method 501.5, Procedure II, Method 502.5, Procedure I, II & III
Storage Temp	-40°C to 70°C (-40°F to 158°F)
Temp Shock	Cycles between -22 °F and 140 °F (-30 °C and +60 °C), MIL-STD-810G, Method 503.5, Procedure I-C
Drop	4 ft/1.22 m; MIL-STD-810G 516.6 IV
Vibration	MIL-STD-810G, Method 514.6 Procedure I and II, Category 5
Sand & Dust	IP67, IEC 60529
Water	IP67, IEC 60529
Humidity	90% relative at -30 °C to +60 °C; MIL-STD-810G 507.5 II
Altitude	15,000 ft/4,500+ m; MIL-STD-810G 500.5 I, II and III
Processor	Texas Instruments 4470 dual-core @1.5GHz
Memory	1 GB RAM
Data Storage	4 GB iNAND Flash
Operating Sys.	Windows Embedded Handheld 6.5.3
Display	4.7" FWVGA (854x480); IPS; 600 nits, capacitive multi-touch Asahi Dragontrail chemically strengthened glass

Specification	Description
Keyboard	Numeric with 3 programmable function keys
Battery	Li-Ion, 3.7V 5200mAh (19.2 Wh) (Warm-swappable) with smart gauge
Connections	USB A Host USB micro (PC sync and charging) DB9 RS-232 serial 3.5 mm headset (stereo and mic)
Communication	Audio: Built in: Receiver, loud-speaker; mic Bluetooth: Class 2 (10 m), v2.0 in Windows Mobile OS Cellular (WWAN): Voice and data, 3.8G GSM HSPA+/HSUPA or CDMA EVDO Rev. A Wireless LAN: 802.11 b/g/n
Navigation	Integrated with stand-alone u-blox® GPS
Camera	8-megapixel rear-facing camera with autofocus and LED illumination
Indicators	LEDs: 1. Charge state, 2. GPS, 3. Notification; Vibration motor
Sensors	3-axis accelerometers 3-axis gyroscope Ambient light sensor Digital compass Altimeter/barometer Proximity Ambient temperature

Table 16: Archer 2 Specifications

Specification	Description
Size (LxWxH)	184mm (7.25in) x 91mm (3.6in) x 38mm (1.5in)
Weight	590g (1.3lbs)
Operating Temperature	-30°C to 60°C (-22°F to 140°F)
Storage Temperature	-30°C to 70°C (-22°F to 158°F)
Drop	MIL-STD-810G, Method 516.5, Procedure IV: multiple drops from ft. (1.5m) onto concrete
Vibration	MIL-STD-810G, Method 514.5 Procedure I
Sand & Dust	IP68, IEC-529 Dust: MIL-STD-810G, Method 516.5, Procedure IV
Water	IP68, IEC 529 MIL-STD-810G, Method 512.4, Procedure I.
Processor	1.0GHz ARM Cortex A8i.MX53
Memory	512MB RAM
Data Storage	8GB flash
Operating Sys.	Windows Embedded Handheld 6.5.3
Display	Active viewing area: 109mm (4.3in) WVGA LCD TFT (800x480), High visibility backlit LCD, portrait or landscape orientation
Keyboard	Adjustable LED backlit keys, numeric keypad (6 user-reassignable), OEM configurable/customizable
Battery	Intelligent Li-Ion battery 3.7VDC@10600mAh, 38.16Whr
Connections	COM1, RS-232C 9-pin D connector with 5VDC power output on pin 9 software-

Specification	Description
	enabled; USB host, USB client; 12, 24VDC input, 10-36V unregulated; 3.5mm audio jack; I/O module OEM configurable/customizable
Communication	Bluetooth 2.1 + EDR WiFi-802.11b/g/n with extended range 3.75G modem Frequencies: HSPA+/UMTS: 800/850/900/1800/1900/2100mHz Data communications interface, SMS
Navigation	High-sensitivity GPS/GLONASS/SBAS receiver; horizontal autonomous Mode 25 meters, Differential mode 1 meter; BINR protocol for post-processing 32 channel all-in-view tracking
Camera	5MP resolution w/autofocus and LED illuminator+video capture Juniper Geotagging embed and emboss photo w/date, time and GPS position.

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1. Single User License

The StarFire License applies to StarFire signals used by a single StarFire receiver and only that receiver with which the License is sold. The License is created, subject to the terms and conditions set out in this document and the License may not be transferred to or used on any other StarFire receiver without permission from NavCom. You agree that the StarFire signal will be used only in a StarFire receiver that is provided by NavCom or by a NavCom authorized StarFire distributor.

2. Levels of Service

This License covers the use of the StarFire GNSS service only. This Level of Service provides the accuracy described in the StarFire Quality of Service Specification in Attachment B. NavCom may, at its choosing, alter the

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3. Licensed Areas

StarFire Licenses may be issued with certain geographic and/or application restrictions which permit the use of the signals only in these Licensed Areas. This License permits the use of the StarFire GNSS service only in the Land Area as described below. The User understands that the use of geo-fencing may apply in order to ensure the use of the License within the Licensed Areas.

Land: This Licensed Area generally includes all continental land masses except Antarctica and also bounded by the area between 72 degrees North Latitude and 72 degrees South Latitude and also further bounded by the satellite line of sight requirements set out in Attachment B, whichever is most restrictive. This generally contains the following land masses: North America, South America, Europe, Asia, Australia, and Africa. The airspace above these areas is included. This License enables the use of the StarFire GNSS Service on inland waterways and lakes but does not permit its use on seas or oceans.

Furthermore there are certain application areas that are not licensed for use under this license. These are defined as Restricted Applications and are set out in more detail in Attachment A. You agree that You will not use the StarFire signals in geographic areas or in applications for which the License does not authorize their use. See Attachment A.

4. Period of Validity

This License holds a Life Time Period of Validity. “Life Time Period of Validity” is defined as the greater of the actual useful life of the receiver that this License is purchased with or a period of ten years from the Effective Date. In the event that the ten year period of the License expires and the receiver it is purchased with is still capable of use, at the written request of the User and subject to the User accepting NavCom’s then current License terms and conditions, the License can be extended for an additional five year incremental period. Finally in the event that NavCom in its sole discretion decides to discontinue offering the StarFire GNSS service, this License will terminate simultaneously with the termination of the StarFire GNSS service.

Navcom reserves the right to alter the Period of Validity, at its discretion, for any reason.

5. Effective Date

The License becomes effective on the date the User first accesses the GNSS correction data provided by the StarFire Service.

6. License Fee

The License Fee is included and paid for as part of the purchase price of the receiver that the License is provided with at the time of purchase by the User. NavCom reserves the right to change the License Fee for the StarFire signal at any time. Changes in the License Fee will not affect Your current License through the Life Time Period of Validity of the License.

7. Intellectual Property Rights.

You agree that if NavCom, in the performance of its obligations under this Agreement, makes available to you any intellectual property or materials in which intellectual property rights owned by NavCom subsist:

- (a) those intellectual property rights will remain the sole property of NavCom;

- (b) you must not use or reproduce those intellectual property rights except to the extent necessary to receive the benefit of the StarFire Service and always in accordance with the terms of any license granted to you by NavCom in respect of those intellectual property rights;
- (c) NavCom shall own all intellectual property rights subsisting in any and all adaptations of, modifications and enhancements to and works derived from such materials or intellectual property rights; and
- (d) upon the expiry or termination of this Agreement, you must cease to use such intellectual property rights.

8. Disclaimer of Liability/Limitation of Liability

THE USER OF THE STARFIRE SIGNALS ACCEPTS ALL LIABILITY FOR THE USE OF THE STARFIRE SIGNAL. UNDER NO CIRCUMSTANCES SHALL NAVCOM, ITS PRINCIPALS, SHAREHOLDERS, OFFICERS, EMPLOYEES, CONTRACTORS, AFFILIATES, SUBSIDIARIES, OR PARENT ORGANIZATIONS BE LIABLE TO YOU OR TO ANY THIRD PARTIES FOR DIRECT OR INDIRECT DAMAGES OF ANY KIND, INCLUDING DAMAGES FOR CROP LOSS, DAMAGE TO LAND, LOST PROFITS, LOSS OF BUSINESS OR LOSS OF GOODWILL, LOSS OF USE OF EQUIPMENT OR SERVICES OR DAMAGES TO BUSINESS OR REPUTATION ARISING FROM THE USE OF THE STARFIRE SIGNAL OR FROM THE PERFORMANCE OR NON-PERFORMANCE OF ANY ASPECT OF THIS AGREEMENT AND WHETHER OR NOT NAVCOM, ITS PRINCIPALS, SHAREHOLDERS, OFFICERS, EMPLOYEES, CONTRACTORS, AFFILIATES, SUBSIDIARIES, OR PARENT ORGANIZATIONS HAVE BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. IN NO EVENT SHALL THE CUMULATIVE LIABILITY OF NAVCOM, ITS PRINCIPALS, SHAREHOLDERS, OFFICERS, EMPLOYEES, CONTRACTORS, AFFILIATES, SUBSIDIARIES, OR PARENT ORGANIZATIONS EXCEED THE AMOUNT PAID BY YOU TO NAVCOM UNDER THIS AGREEMENT. ANY USE OF THE STARFIRE SIGNAL IS ENTIRELY AT THE USER'S RISK, AND YOU AGREE TO HOLD NAVCOM HARMLESS FROM ANY CLAIMS OR LOSSES RELATING TO ANY USE OF THE STARFIRE SIGNAL. THIS LIMITATION OF LIABILITY IS AN ESSENTIAL CONDITION OF THE LICENSE.

9. Disclaimer of Warranty

NAVCOM DISCLAIMS ALL WARRANTIES (WHETHER EXPRESS OR IMPLIED), ANY FITNESS FOR A PARTICULAR PURPOSE, AND ANY MERCHANTABILITY CONDITIONS. NAVCOM MAKES NO REPRESENTATIONS ABOUT THE SUITABILITY OF THE STARFIRE SIGNAL FOR ANY PURPOSE. THE STARFIRE SIGNAL IS DISTRIBUTED “AS-IS” AND THE USER ACCEPTS FULL RESPONSIBILITY FOR ITS USE. THIS DISCLAIMER OF WARRANTY IS AN ESSENTIAL CONDITION OF THE LICENSE.

10. Quality of Service

While NavCom will make reasonable efforts to ensure that the StarFire signal is continually broadcast and meets its Quality of Service Specification as defined in Attachment B, no warranty is made or guarantee given that this will always be true. NavCom accepts no responsibility for the availability or quality of the signal under any conditions.

11. Legal Use of the StarFire Signals

As a condition of the License, You agree that You will not use the StarFire signal for any purpose that is in contravention of the terms of this Agreement or is unlawful under United States Federal, State, or Local laws and regulations. You agree that You will comply with all applicable United States trade control and export laws and regulations.

12. Redistribution

The StarFire signal may not be redistributed, rebroadcast, or resold in any manner whatsoever. All rights to the use of the StarFire signal, other than those expressly granted in the License, are reserved to NavCom. Notwithstanding the foregoing, during the period in which the License is valid, the signal may be recorded, provided that the recorded information is only used for archival or analysis purposes by the User. Recorded data may not be redistributed, rebroadcast, or resold in any manner whatsoever.

13. Misuse

You agree that You will take all steps to prevent abusive, fraudulent, or unlawful use of the StarFire signal. If

Navcom determines there is abuse, fraud or unlawful use of the StarFire signal, Navcom may terminate the License.

14. Termination

NavCom may terminate the License if NavCom reasonably determines that User has violated any provision of the License. Upon termination, User shall immediately cease using the StarFire signals, and no pro-rata refund of the unused portion of the License shall be due to User.

The User may terminate the License if NavCom changes the terms of the License as defined in Modifications below. Upon such termination, no pro-rata refund of the unused portion of the License shall be due to User.

Either party may terminate the License in the event the other party seeks protection or become subject to debtor protection legislation, including, but not limited to, filing for bankruptcy. In the event that User seeks to terminate the License because User is seeking protection or becomes subject to debtor in possession legislation, including, but not limited to, filing for bankruptcy, no pro-rata refund of the unused portion of the License shall be due to User.

In the event that NavCom elects to terminate any License in accordance with the provisions of this Section 14, User agrees to cooperate with NavCom in such cancellation by processing the relevant cancellation instructions issued by NavCom and by returning to NavCom the appropriate cancellation code for the receiver in question. No pro-rata refund of the unused portion of the License shall be due to User.

15. Notices

All notices to NavCom shall be sent by fax or mail to the address below and shall be effective upon receipt:

NavCom Technology, Inc.
20780 Madrona Avenue
Torrance, CA 90503
Attn: General Manager - Fax: 310-381-2001

All notices required to be given to the User shall be provided via the navcomtech.com website. User agrees

that it is User's responsibility to periodically access the website for updates.

16. Indemnification

You agree to defend, indemnify and hold NavCom, including its affiliates, officers, directors, employees, agents and representatives, harmless from and against all claims, demands proceedings, injuries, liabilities, judgments, losses, or costs and expenses (including reasonable legal fees) resulting from any third party claim against NavCom, its affiliates or third party service partners, arising from or in connection with your use of the StarFire Service.

17. Assignment

The License may not be assigned, sublicensed, or transferred to any other receiver, person, company, or entity without the express written consent of NavCom.

18. Arbitration

You agree that, to the fullest extent provided by law, any and all disputes arising out of or relating to the License shall be resolved by arbitration.

At the request of either party, any controversy or claim arising out of or relating to the License shall be settled by final and binding arbitration pursuant to the commercial arbitration rules of the American Arbitration Association. Any arbitration proceedings required under this provision will be held in Los Angeles, California, USA and each party shall cover their own expenses associated with the arbitration. Notwithstanding the foregoing NavCom may seek injunctive relief in court to require User to cease using the StarFire signal.

19. Export Control

You hereby represent and warrant that You and Your employees and contractors shall comply with all U.S. export and foreign trade control laws and regulations with respect to the release, distribution or use of the GNSS StarFire Receiver Service, including U.S. laws and regulations prohibiting exports, re-exports or disclosure of U.S. origin technology or materials to:

- (a) countries subject to comprehensive economic embargo sanctions or designated as terrorist-supporting by the United States (currently Cuba, Iran, North Korea, Sudan and Syria, and subject to change); the government entities of such countries, wherever located; nationals of such countries, wherever located (including specifically, employees or contractors in the United States on temporary visas); or any person, wherever located, known to be acting for or on behalf of such a country;
- (b) other entities or persons designated on the Treasury Department's list of Specially Designated Nationals and Blocked Persons, the Commerce Department's Denied Party list or Entity list, or persons otherwise prohibited from receiving such information or materials under U.S. export law or regulation (see www.bis.doc.gov for information); or
- (c) any end-user engaged in design, development or production of chemical, biological, or nuclear weapons.

20. Severability

If any part of the License shall be held invalid or unenforceable, such determination shall not affect the validity or enforceability of any remaining portion, which shall remain in force and effect as if the License had been executed with the invalid or unenforceable portion thereof eliminated.

21. Modification of the License

NavCom may change the terms of the License at any time and such modifications shall be effective immediately upon sending the modified License to the User via the process defined in Section 15. If You do not terminate the License within 10 business days of receiving NavCom's notice of a change, the modifications will be binding upon You as if You had physically signed the modified License. Your continued use of the StarFire signals shall be Your conclusive acceptance of the modified License.

22. Governing Law

The License is governed by the laws of the State of California, and the exclusive venue and jurisdiction for all matters relating to the License shall be in the courts of California.

23. Complete Agreement

The License constitutes the complete agreement between NavCom and the User with respect to the StarFire signal, and supersedes any prior agreement or understandings on this subject. By signing the License Instrument you agree to be bound by all of its terms and conditions, including those set out in Attachments A and B attached to this document.

E..... RoHS Certification

RoHS (Restriction of Use of Hazardous Substances) regulations limit or ban specific substances – lead, cadmium, polybrominated biphenyl (PBB), mercury, hexavalent chromium, and polybrominated diphenyl ether (PBDE) flame retardants – in new electronic and electric equipment.

For Cadmium and Hexavalent chromium, there must be less than 0.01% of the substance by weight at raw homogeneous materials level. For Lead, PBB, and PBDE, there must be no more than 0.1% of the material, when calculated by weight at raw homogeneous materials. Any RoHS compliant component must have 100 ppm or less of mercury and the mercury must not have been intentionally added to the component.

The following components are RoHS compliant. They have been tested for RoHS controlled substances and found to be in accordance with RoHS regulations.

Table 17: Toxic or Hazardous Substances or Elements Disclosure by Part Number

92-310501-3001LF

Part Name	Toxic or hazardous substances and elements					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent Chromium (Cr(VI))	Polybrominated biphenyls (PBB)	Polybrominated dephenyl ethers PBDE)
PCBA	X	O	O	O	O	O
USB Flash Drive	O	O	O	O	O	O
Antenna	X	O	O	O	O	O
Labels	O	O	O	O	O	O

92-310503-3001LF

Part Name	Toxic or hazardous substances and elements					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent Chromium (Cr(VI))	Polybrominated biphenyls (PBB)	Polybrominated diphenyl ethers (PBDE)
PCBA	X	O	O	O	O	O
USB Flash Drive	O	O	O	O	O	O
Antenna	O	O	O	O	O	O
Labels	O	O	O	O	O	O

92-310411-3001LF

Part Name	Toxic or hazardous substances and elements					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent Chromium (Cr(VI))	Polybrominated biphenyls (PBB)	Polybrominated diphenyl ethers (PBDE)
PCBA	X	O	O	O	O	O
Labels	O	O	O	O	O	O

92-210206-3001LF

Part Name	Toxic or hazardous substances and elements					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent Chromium (Cr(VI))	Polybrominated biphenyls (PBB)	Polybrominated diphenyl ethers (PBDE)
PCBA	X	O	O	O	O	O
Radio	O	O	O	O	O	O
Spacer	O	O	O	O	O	O
Pad	O	O	O	O	O	O
Housing	O	O	O	O	O	O
Labels	O	O	O	O	O	O
Shim	O	O	O	O	O	O
Cable	O	O	O	O	O	O
Hardware	O	O	O	O	O	O

92-310459-3001LF

Part Name	Toxic or hazardous substances and elements					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent Chromium (Cr(VI))	Polybrominated biphenyls (PBB)	Polybrominated diphenyl ethers (PBDE)
Memory Card	O	O	O	O	O	O
PCBAs	X	O	O	O	O	O
Switch	O	O	O	O	O	O
Shield	O	O	O	O	O	O
Housings	O	O	O	O	O	O
Labels	O	O	O	O	O	O
Tripod/ Poles	O	O	O	O	O	O
Measuring Instruments	O	O	O	O	O	O
Carrying Cases	O	O	O	O	O	O
PDA	O	O	O	O	O	O
Bumper	O	O	O	O	O	O
Antenna	X	O	O	O	O	O
Cables	X	O	O	O	O	O
Hardware	O	O	O	X	O	O
Gaskets	O	O	O	O	O	O
Battery	X	O	O	O	O	O
Battery Charger	O	O	O	O	O	O
USB Flash Drive	O	O	O	O	O	O

92-310520-3001LF

Part Name	Toxic or hazardous substances and elements					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent Chromium (Cr(VI))	Polybrominated biphenyls (PBB)	Polybrominated diphenyl ethers (PBDE)
PCBAs	X	O	O	O	O	O
Switch	O	O	O	O	O	O
Shield	O	O	O	O	O	O
Housings	O	O	O	O	O	O
Labels	O	O	O	O	O	O
Bumper	O	O	O	O	O	O
Antenna	X	O	O	O	O	O
Cables	X	O	O	O	O	O
Hardware	O	O	O	X	O	O
Gaskets	O	O	O	O	O	O

92-310458-3001LF

Part Name	Toxic or hazardous substances and elements					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent Chromium (Cr(VI))	Polybrominated biphenyls (PBB)	Polybrominated diphenyl ethers (PBDE)
Memory Card	O	O	O	O	O	O
PCBAs	X	O	O	O	O	O
Switch	O	O	O	O	O	O
Shield	O	O	O	O	O	O
Housings	O	O	O	O	O	O
Labels	O	O	O	O	O	O
Tripod/ Poles	O	O	O	O	O	O
Measuring Instruments	O	O	O	O	O	O
Carrying Cases	O	O	O	O	O	O
PDA	O	O	O	O	O	O
Bumper	O	O	O	O	O	O
Antenna	X	O	O	O	O	O
Cables	X	O	O	O	O	O
Hardware	O	O	O	X	O	O
Gaskets	O	O	O	O	O	O
Battery	X	O	O	O	O	O
Battery Charger	O	O	O	O	O	O
USB Flash Drive	O	O	O	O	O	O

92-310441-3001LF

Part Name	Toxic or hazardous substances and elements					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent Chromium (Cr(VI))	Polybrominated biphenyls (PBB)	Polybrominated diphenyl ethers (PBDE)
Memory Card	O	O	O	O	O	O
PCBAs	X	O	O	O	O	O
Switch	O	O	O	O	O	O
Shield	O	O	O	O	O	O
Housings	O	O	O	O	O	O
Labels	O	O	O	O	O	O
Bumper	O	O	O	O	O	O
Antenna	X	O	O	O	O	O
Cables	X	O	O	O	O	O
Hardware	O	O	O	X	O	O
Gaskets	O	O	O	O	O	O
Battery	X	O	O	O	O	O
Battery Charger	O	O	O	O	O	O

92-310413-3002LF

Part Name	Toxic or hazardous substances and elements					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent Chromium (Cr(VI))	Polybrominated biphenyls (PBB)	Polybrominated diphenyl ethers (PBDE)
PCBAs	X	O	O	O	O	O
Switch	O	O	O	O	O	O
Clamp	O	O	O	O	O	O
Housing	O	O	O	O	O	O
Labels	O	O	O	O	O	O
End Plate	O	O	O	O	O	O
End Cover	O	O	O	O	O	O
Cable	O	O	O	O	O	O
Hardware	O	O	O	X	O	O
Gaskets	O	O	O	O	O	O
Brackets	O	O	O	O	O	O

92-310416-3001LF

Part Name	Toxic or hazardous substances and elements					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent Chromium (Cr(VI))	Polybrominated biphenyls (PBB)	Polybrominated diphenyl ethers (PBDE)
Antenna	O	O	O	O	O	O
PCBAs	X	O	O	O	O	O
Switch	O	O	O	O	O	O
Clamp	O	O	O	O	O	O
Housing	O	O	O	O	O	O
Labels	O	O	O	O	O	O
End Plate	O	O	O	O	O	O
End Cover	O	O	O	O	O	O
Power Cord	O	O	O	O	O	O
Cables	O	O	O	O	O	O
Hardware	O	O	O	X	O	O
Gaskets	O	O	O	O	O	O
Brackets	O	O	O	O	O	O

92-310418-3001LF

Part Name	Toxic or hazardous substances and elements					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent Chromium (Cr(VI))	Polybrominated biphenyls (PBB)	Polybrominated diphenyl ethers (PBDE)
PCBAs	X	O	O	O	O	O
Switch	O	O	O	O	O	O
Clamp	O	O	O	O	O	O
Housing	O	O	O	O	O	O
Labels	O	O	O	O	O	O
End Plate	O	O	O	O	O	O
End Cover	O	O	O	O	O	O
Cables	O	O	O	O	O	O
Hardware	O	O	O	O	O	O
Gaskets	O	O	O	O	O	O
USB Flash Drive	O	O	O	O	O	O
Brackets	O	O	O	O	O	O

92-310413-3003LF

Part Name	Toxic or hazardous substances and elements					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent Chromium (Cr(VI))	Polybrominated biphenyls (PBB)	Polybrominated diphenyl ethers (PBDE)
PCBAs	X	O	O	O	O	O
Switch	O	O	O	O	O	O
Clamp	O	O	O	O	O	O
Housing	O	O	O	O	O	O
Labels	O	O	O	O	O	O
End Plate	O	O	O	O	O	O
End Cover	O	O	O	O	O	O
Cables	O	O	O	O	O	O
Hardware	O	O	O	O	O	O
Gaskets	O	O	O	O	O	O
Brackets	O	O	O	O	O	O

92-310415-3001LF

Part Name	Toxic or hazardous substances and elements					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent Chromium (Cr(VI))	Polybrominated biphenyls (PBB)	Polybrominated diphenyl ethers (PBDE)
Power Adapter	O	O	O	O	O	O
PCBAs	X	O	O	O	O	O
USB Flash Drive	O	O	O	O	O	O
Switch	O	O	O	O	O	O
Clamp	O	O	O	O	O	O
Housing	O	O	O	O	O	O
Labels	O	O	O	O	O	O
End Cover	O	O	O	O	O	O
Spacer	O	O	O	O	O	O
Cable	X	O	O	O	O	O
Hardware	O	O	O	X	O	O
Gaskets	O	O	O	O	O	O
Brackets	O	O	O	O	O	O

92-310413-3001LF

Part Name	Toxic or hazardous substances and elements					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent Chromium (Cr(VI))	Polybrominated biphenyls (PBB)	Polybrominated diphenyl ethers (PBDE)
Clamp	O	O	O	O	O	O
PCBAs	X	O	O	O	O	O
Housing	O	O	O	O	O	O
Switch	O	O	O	O	O	O
Labels	O	O	O	O	O	O
End Cover	O	O	O	O	O	O
Spacer	O	O	O	O	O	O
Cable	X	O	O	O	O	O
Hardware	O	O	O	X	O	O
Gaskets	O	O	O	O	O	O
Bracket	O	O	O	O	O	O



“O” indicates that this toxic or hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement in SJ/T11363-2006 (Standard of the Electronics Industry of the People’s Republic of China).

“X” indicates that this toxic or hazardous substance contained in at least one of the homogeneous materials for this part is above the limit requirement in SJ/T11363-2006 (Standard of the Electronics Industry of the People's Republic of China).

RoHS 认证

说明

RoHS (危险物质的使用限制) 法规限制或禁止在新的电气和电子设备中使用特定物质，这些物质包括铅、镉、多溴二苯醚 (PBB)、汞、六价铬和多溴代二苯醚 (PBDE) 阻燃剂。

对于镉和六价铬，在原材料均匀级别下按重量计算物质含量必须低于 0.01%。对于铅、PBB 和 PBDE，在均匀的原材料水平下，按材料重量计算时的不能超过 0.1%。任何符合 RoHS 的部件汞含量必须小于等于 100 ppm，并且不能将汞故意添加到部件中。

下列部件符合 RoHS 技术规格。 这些物质的测试结果显示它们是 RoHS 受控物质，并且符合 RoHS 法规的要求。

表18：按部件号列出的有毒或危险物质或原件

92-310501-3001LF

部件号	有毒或危险物质和元件					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴二苯 醚 (PBB)	多溴代二苯 醚 (PBDE)
PCBA	X	O	O	O	O	O
USB 闪存驱动器	O	O	O	O	O	O
天线	X	O	O	O	O	O
标签	O	O	O	O	O	O

92-310503-3001LF

部件号	有毒或危险物质和元件					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴二苯 醚 (PBB)	多溴代二苯 醚 (PBDE)
PCBA	X	O	O	O	O	O
USB 闪存驱动器	O	O	O	O	O	O
天线	O	O	O	O	O	O
标签	O	O	O	O	O	O

92-310411-3001LF

部件号	有毒或危险物质和元件					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴二苯 醚 (PBB)	多溴代二苯 醚 (PBDE)
PCBA	X	O	O	O	O	O
标签	O	O	O	O	O	O

92-210206-3001LF

部件号	有毒或危险物质和元件					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴二苯 醚 (PBB)	多溴代二苯 醚 (PBDE)
PCBA	X	O	O	O	O	O
收音机	O	O	O	O	O	O
隔片	O	O	O	O	O	O
衬垫	O	O	O	O	O	O
外壳	O	O	O	O	O	O
标签	O	O	O	O	O	O
垫片	O	O	O	O	O	O
线缆	O	O	O	O	O	O
固定件	O	O	O	O	O	O

92-310459-3001LF

部件号	有毒或危险物质和元件					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴二苯醚 (PBB)	多溴代二苯 醚 (PBDE)
存储卡	O	O	O	O	O	O
PCBA	X	O	O	O	O	O
开关	O	O	O	O	O	O
屏蔽板	O	O	O	O	O	O
外壳	O	O	O	O	O	O
标签	O	O	O	O	O	O
三脚架/ 柱杆	O	O	O	O	O	O
测量仪表	O	O	O	O	O	O
便携包	O	O	O	O	O	O
PDA	O	O	O	O	O	O
减震台	O	O	O	O	O	O
天线	X	O	O	O	O	O
线缆	X	O	O	O	O	O
固定件	O	O	O	X	O	O

衬垫	○	○	○	○	○	○
电池	X	○	○	○	○	○
电池充电器	○	○	○	○	○	○
USB 闪存驱动器	○	○	○	○	○	○

92-310520-3001LF

部件号	有毒或危险物质和元件					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴二苯 醚 (PBB)	多溴代二苯 醚 (PBDE)
PCBA	X	○	○	○	○	○
开关	○	○	○	○	○	○
屏蔽板	○	○	○	○	○	○
外壳	○	○	○	○	○	○
标签	○	○	○	○	○	○
减震台	○	○	○	○	○	○
天线	X	○	○	○	○	○
线缆	X	○	○	○	○	○
固定件	○	○	○	X	○	○
衬垫	○	○	○	○	○	○

92-310458-3001LF

部件号	有毒或危险物质和元件					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴二苯醚 (PBB)	多溴代二苯 醚 (PBDE)
存储卡	○	○	○	○	○	○
PCBA	X	○	○	○	○	○
开关	○	○	○	○	○	○
屏蔽板	○	○	○	○	○	○
外壳	○	○	○	○	○	○
标签	○	○	○	○	○	○

三脚架/ 柱杆	○	○	○	○	○	○
测量仪表	○	○	○	○	○	○
便携包	○	○	○	○	○	○
PDA	○	○	○	○	○	○
减震台	○	○	○	○	○	○
天线	X	○	○	○	○	○
线缆	X	○	○	○	○	○
固定件	○	○	○	X	○	○
衬垫	○	○	○	○	○	○
电池	X	○	○	○	○	○
电池充电器	○	○	○	○	○	○
USB 闪存 驱动器	○	○	○	○	○	○

92-310441-3001LF

部件号	有毒或危险物质和元件					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴二苯醚 (PBB)	多溴代二苯 醚 (PBDE)
存储卡	○	○	○	○	○	○
PCBA	X	○	○	○	○	○
开关	○	○	○	○	○	○
屏蔽板	○	○	○	○	○	○
外壳	○	○	○	○	○	○
标签	○	○	○	○	○	○
减震台	○	○	○	○	○	○
天线	X	○	○	○	○	○
线缆	X	○	○	○	○	○
固定件	○	○	○	X	○	○
衬垫	○	○	○	○	○	○
电池	X	○	○	○	○	○
电池充 电器						

92-310413-3002LF

部件号	有毒或危险物质和元件					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴二苯醚 (PBB)	多溴代二苯 醚 (PBDE)
PCBA	X	O	O	O	O	O
开关	O	O	O	O	O	O
线箍	O	O	O	O	O	O
外壳	O	O	O	O	O	O
标签	O	O	O	O	O	O
端板	O	O	O	O	O	O
端盖	O	O	O	O	O	O
线缆	O	O	O	O	O	O
固定件	O	O	O	X	O	O
衬垫	O	O	O	O	O	O
支架	O	O	O	O	O	O

92-310416-3001LF

部件号	有毒或危险物质和元件					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴二苯醚 (PBB)	多溴代二苯 醚 (PBDE)
天线	O	O	O	O	O	O
PCBA	X	O	O	O	O	O
开关	O	O	O	O	O	O
线箍	O	O	O	O	O	O
外壳	O	O	O	O	O	O
标签	O	O	O	O	O	O
端板	O	O	O	O	O	O
端盖	O	O	O	O	O	O
电源线	O	O	O	O	O	O
线缆	O	O	O	O	O	O
固定件	O	O	O	X	O	O
衬垫	O	O	O	O	O	O
支架	O	O	O	O	O	O

92-310418-3001LF

部件号	有毒或危险物质和元件					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴二苯醚 (PBB)	多溴代二苯 醚 (PBDE)
PCBA	X	O	O	O	O	O
开关	O	O	O	O	O	O
线箍	O	O	O	O	O	O
外壳	O	O	O	O	O	O
标签	O	O	O	O	O	O
端板	O	O	O	O	O	O
端盖	O	O	O	O	O	O
线缆	O	O	O	O	O	O
固定件	O	O	O	O	O	O
衬垫	O	O	O	O	O	O
USB 闪存驱动器	O	O	O	O	O	O
支架	O	O	O	O	O	O

92-310413-3003LF

部件号	有毒或危险物质和元件					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴二苯醚 (PBB)	多溴代二苯 醚 (PBDE)
PCBA	X	O	O	O	O	O
开关	O	O	O	O	O	O
线箍	O	O	O	O	O	O
外壳	O	O	O	O	O	O
标签	O	O	O	O	O	O
端板	O	O	O	O	O	O
端盖	O	O	O	O	O	O
线缆	O	O	O	O	O	O
固定件	O	O	O	O	O	O
衬垫	O	O	O	O	O	O
支架	O	O	O	O	O	O

92-310415-3001LF

部件号	有毒或危险物质和元件					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴二苯醚 (PBB)	多溴代二苯 醚 (PBDE)
电源适 配器	0	0	0	0	0	0
PCBA	X	0	0	0	0	0
USB 闪 存驱动 器	0	0	0	0	0	0
开关	0	0	0	0	0	0
线箍	0	0	0	0	0	0
外壳	0	0	0	0	0	0
标签	0	0	0	0	0	0
端盖	0	0	0	0	0	0
隔片	0	0	0	0	0	0
线缆	X	0	0	0	0	0
固定件	0	0	0	X	0	0
衬垫	0	0	0	0	0	0
支架	0	0	0	0	0	0

92-310413-3001LF

部件号	有毒或危险物质和元件					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴二苯醚 (PBB)	多溴代二苯 醚 (PBDE)
线箍	0	0	0	0	0	0
PCBA	X	0	0	0	0	0
外壳	0	0	0	0	0	0
开关	0	0	0	0	0	0
标签	0	0	0	0	0	0
端盖	0	0	0	0	0	0
隔片	0	0	0	0	0	0
线缆	X	0	0	0	0	0
固定件	0	0	0	X	0	0
衬垫	0	0	0	0	0	0

支架	0	0	0	0	0	0
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“O” 表示本部件中所有均匀物质中的有毒物质或危险物质含量均低于 SJ/T11363-2006 (中华人民共和国电子工业标准) 的限制要求。

“X” 表示本部件中至少有一项均匀物质中的有毒物质或危险物质含量均超过了 SJ/T11363-2006 (中华人民共和国电子工业标准) 的限制要求。