iG3s

Static GNSS Receiver
User Manual

Revision Q 2017.03.28 (B9630)

FCC Notice iG3s receivers comply with the limits for a Class B digital device, pursuant to the Part 15 of the FCC rules when it is used in the Portable Mode.

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.

Table of Contents

Introduction

Thank you very much for choosing to purchase and use an iG3s static GNSS receiver!

The iG3s features outstanding performance and is easy-to-use with automated downloads and submissions, we know that your new static receiver will be a valuable tool that quickly pays for itself.

This guide is designed to help you familiarize yourself with your new equipment and to offer basic information on the operation of NGS OPUS.

If you have questions or suggestions, don't hesitate to contact us:

iGage Mapping Corporation
1545 South 1100 East Suite 1
Salt Lake City UT 84105 USA

+1-801-412-0011
email: support@igage.com

Your input is extremely valuable to us and we will listen to your suggestions!

Software updates and news are available from:

www.ig3s.com

The Really-Quick-Start Guide

In the Field

1. Put a charged battery in the receiver.
2. Mount the receiver over the point you want to survey. Level and measure the Instrument Height (HI.) For best results: align the button panel so it faces north, double-check your bubble and the instrument height (HI.)
   Record the HI, start time and point description in your field notes.

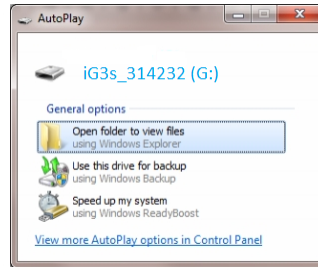
Point	Description	HI	Start Time	End
1001	*NW C Sec 14*	*2.0M V*	*9:45 am 1 March 2013*	*12:18 pm*

3. Push the ON/OFF button and hold it for 1-second until the lights flash. After 30 seconds the blue LED will flash once for every tracked Satellite.
4. Verify that the yellow 'Files' LED flashes once every 5-seconds as the receiver logs data.
5. Let the receiver record data for at least:
   OPUS-Rapid Static: 16-minutes
   OPUS-Static: 121-minutes
6. Turn the receiver off by pushing and holding the ON/OFF button for 1-second.

Office / Desktop

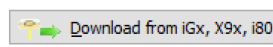
7. Install the download tool from the included DVD or get the latest version from www.ig3s.com.
8. Put a freshly charged battery in the receiver, turn on the receiver, wait 10-seconds for the power LED to flash and then plug your iG3s into a USB connector on your computer.

9. When/if you see the Windows AutoPlay screen:

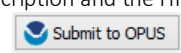


click on the red 'X' button on the upper-right corner.

10. Start the iGx Download tool from your desktop, push the 'Download from GPS' button:



11. Highlight the occupation, set the Point ID, the Description and the HI; push the 'Submit to OPUS'



button.

12. When prompted press OK, then Control-V (to paste the file location and name,) then press the "Enter" key on your keyboard, or click on 'Open' to set the ZIP filename.
13. Finally press the 'Upload to Rapid Static' or 'Upload to Static' button as prompted at the bottom of the screen.

What's in the iG3s Box?

Other than a suitable tripod or pole, iG3s receivers are sold as complete kits, ready to record OPUS compatible static raw data sets.

Each receiver kit includes these items:

A Hard Shell Carry Case 	This User Manual 
iG3s GNSS Head 	The iG Download DVD: 
GPS to PC Data Cable: Serial, USB and Ext. Power 	A high capacity 7.4 V Lithium-Ion Battery 
Quad Battery Charger 	Power Adapter with Cord: 
A SECO 91641 Stedi-Rest: 	External Battery Power Clips 

Technical Assistance

If you have questions or issues with your receiver, support is provided both by your dealer and iGage Mapping Corporation in Salt Lake City Utah:

iGage Mapping Corporation
1545 South 1100 East STE 1
Salt Lake City UTAH 84105
+1-801-412-0011

For support questions by email: support@igage.com

Warranty

Please see the full warranty at the end of this manual for details.

The iG3s GNSS receiver has a 2-year warranty.

Cables and chargers are warranted for 1-year.

Batteries are warranted for 90-days.

Advanced replacement programs are available for mission critical applications.

Service is provided by iGage Mapping Corporation in Salt Lake City Utah.

Safety Information

This manual describes the iG3s GNSS Receivers. Before you use your receiver, please make sure that you read and understand these warnings and safety requirements.

Warnings and Cautions

An absence of specific alerts does not mean that there are no safety risks involved. Warning and Caution information is intended to minimize the risk of personal injury and/or damage to the equipment.

Use and Care

The iG3s receiver is a field ready instrument; however it is also a delicate electronic instrument. Take suitable care to avoid damage to the instrument.

Avoid dropping the receiver as it can change the phase center of the antenna.

Avoid storing the receiver at excessive temperatures (hot or cold) as it will damage the internal batteries.

Avoid storing the batteries at temperatures less than -40° F (-40° C) and temperatures higher than 160°F (70°C) as it will permanently reduce the battery capacity and life

DO NOT leave the iG3s or accessories inside a vehicle in the summer. Temperatures higher than 160°F will permanently reduce battery capacity and battery life.

GNSS receivers and especially Lithium-Ion batteries are like puppies: in the summer if you leave them in your vehicle with the windows rolled up, you will kill them.

Battery Safety and Disposal

The batteries are lithium-ion type cells.

Battery Warnings

WARNING - Do not damage the rechargeable Lithium-ion battery. A damaged battery can cause an explosion or fire, and can result in personal injury and property damage.

To prevent injury or damage:

Do not use or charge the battery if it appears to be discolored, warped, or leaking battery fluid.
Do not expose the battery to fire, high temperature, or direct sunlight.
Do not immerse the battery in water.
Do not store the battery inside a vehicle during hot weather.
Do not drop or puncture the battery.
Do not open the battery or short-circuit its contacts.
Do not charge the batteries in chargers other than the supplied charger or a direct replacement.
Do not charge similar batteries in the supplied charger, even if they fit well.

WARNING - Avoid contact with the rechargeable Lithium-ion battery if it appears to be leaking. The battery fluid is extremely corrosive, and contact with it will result in personal injury and/or property damage.

If battery fluid gets into your eyes, immediately rinse your eyes with clean water and seek medical attention. Do not rub your eyes!

If battery fluid gets onto your skin or clothing, immediately use clean water to wash off the battery fluid.

Batteries

One Lithium-Ion battery is supplied with your receiver.

A battery, when new, will power the receiver for 5 hours at temperatures higher than 50 degrees F. At lower temperatures battery life is shortened.

If you plan on running the receiver for longer than 4-hours, it is suggested that you use the supplied Battery Clip Cable to connect the auxiliary power connector to an external 12-volt battery.

Heavy-duty external power cables are available as optional accessories from iGage.

Consider fully charging the batteries using the supplied charger before first use. To meet shipping regulations, batteries are discharged before shipment.

Battery Charger

The battery charger will charge 4 batteries at once.

Plug the charger into the supplied wall transformer or use the supplied alligator clip cable to connect to a 12 Volt battery. We supply alligator clips instead of cigarette adapters so you don't have to leave your keys in the ignition if you need to field charge batteries.

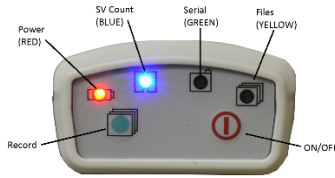
The supplied charger has a RED LED on each side to indicate that power is attached.

Next to each battery is a GREEN LED.

GREEN LED	STATUS
Off	No Battery Inserted
Blinking	Battery Charging
ON Steady	Battery is fully charged

It is okay to leave charged batteries in the charger for extended periods of time.

Front Panel Operation



Pushbuttons

The receiver's front panel has two pushbuttons **On/Off** and **Record**:

On/Off Pushbutton

Press the **On/Off** button for 1-second and release to turn ON the receiver.

If the receiver is ON, press the On/Off button for 1-second to turn the receiver OFF. The receiver will not start to shutdown until you remove your finger from the button.

Record Pushbutton

iG3s receivers are factory configured to automatically begin recording after the receiver is turned on and tracking satellites. (You probably won't ever need to use the **Record** button.)

If the receiver is recording data, pressing the **Record** button for two seconds toggles the receiver from collecting data, to not collecting data and closes the current occupation file. The yellow **Files** LED will stop flashing when recording stops.

When the receiver is not recording, pressing the record button again for two seconds will open a new observation file and begin collecting observation data.

You can also use the **Record** button to check the collection state:

Tapping the **Record** button will cause either the Serial or the Files button to flash:

Serial green	receiver is recording
Files yellow	receiver is NOT recording

LED Indicators

There are four LED indicators on the receiver:

Power (Red)

Power is ON. If flashing, the battery charge is very low.

SV's (Satellite Count) (Blue)

Blinks once for each tracked satellite, waits 5-seconds, repeats.

Serial (Green)

Blinks when data is received by the serial port. Blinks when the 'Record' button is pressed if the receiver is storing to a static file.

Files (Yellow)

Blinks each time data is stored to the static file.

When the receiver turns on:

All LEDs will flash.

The Blue **SV's** LED will flash three times, then after 1-second, once more.

The Red Power LED will flash three times.

After the Blue **SV's** LED flashes three times, the receiver will automatically begin searching for satellites. When enough satellites are found to determine the receiver position and current date/time, a new occupation file is opened and the Yellow **Files** LED will begin to flash, once each epoch (the default epoch is 5-seconds.)

NOTE: If the receiver is deployed after not being used for more than a month, or was last turned on more than a couple hundred miles from the current location, it may take an extra few minutes for the receiver to obtain a position.

NOTE: if the Yellow LED is not blinking, then the receiver is NOT collecting data. If you have waited a few minutes and the receiver is not collecting data, something is wrong.

After the Blue **SV's** LED flashes three-times, you may plug the receiver into your PC and it will mount as a fixed USB drive.

To turn the iG3s off, press and hold the **On/Off** button for one second. All four LED's will quickly flash three times and the receiver will power down.

> NOTE: If the two right LEDS (Green and Yellow) flash at the same time, then the flash memory has been corrupted (typically by removing the cable while downloading data.) Check the troubleshooting section at the end of this manual for instructions on fixing this issue.

Collecting Static Data

> **OPUS-Static, OPUS-RS and OPUS-Projects**
>
> Additional information on OPUS-Static and OPUS-Rapid Static can be found in the 'OPUS' section of this manual.

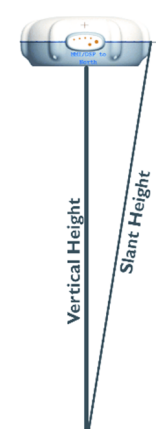
Prior to using the receiver, charge the battery to ensure that the static occupation is not interrupted by power failure.

A fresh battery when new and fully charged will run the receiver for about 5 hours.

When making occupations longer than 4-hours you should provide external power to the receiver with the included battery clips (or the power supply.)

1. Place a freshly charged battery into the receiver.
2. Place the receiver above the point you want to survey.
3. Rotate the receiver so the pushbutton panel faces the North.
4. Level the receiver.
5. Record the 'Vertical Height' from the top of the survey mark to the bottom of the receiver; alternatively, you may measure a 'Slant Height' to the bottom of the blue rubber gasket.
6. At a minimum, make a careful note of the following items in your field book:

   Start Time and Date
   Instrument Height (HI)



PID (Point ID, Mark Name)
Description

Point	Description	HI	Start Time	End
1001	*NW C Sec 14*	*2.0M V*	*9:45 am 1 March 2013*	

7. Turn on the receiver. After 30 to 90-seconds, you will see the Yellow "Files" LED flash once every epoch (default 5-seconds) as the receiver records observables. Check that 5 or more satellites are tracked (the blue LED will blink 5 or more times.)
8. Wait an appropriate time period for data collection:

   OPUS-RS (Rapid Static)

   Minimum of 15-minutes
   Maximum of 2-hours

   OPUS-STATIC

   Minimum of 2-hours
   Maximum 48-hours
   4-hours suggested minimum

   Remember that the data is going to be decimated to 15-second intervals. It is best to wait at least 1-minute longer than required to insure that the decimation process does not leave your file too short.

9. At the end of the occupation Press and hold the ON/OFF key for one-second until the receiver closes the current file and turns off.
10. Make a note of the end time in your field book:

Point	Description	HI	Start Time	End
1001	*NW C Sec 14*	*2.0M V*	*9:45 am 1 March 2013*	***12:18 pm***

Downloading, Processing and Archiving Data

Your iG3s GNSS receiver includes a download, preprocessing and archive tool called

iGx Download

for use with the NGS OPUS, RTX, AUSPOS and IBGE online products.

Installing the Download Tool

You can always get the latest version of the iGx Downloader from the internet and install it directly:

http://www.ig3s.com

Look for the 'UPDATES' button on the top of the page. Or insert the provided disk in the DVD ROM drive of your computer and the installation tool should automatically run.

If you don't have a DVD ROM drive, you can download the latest version of the tool from

Follow the on-screen instructions to install the download tool and support tools on your computer.

Downloading Data from iG3s Reciever

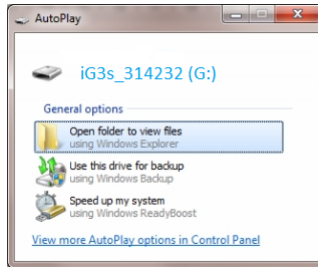
Summary: Turn on the GPS, wait fo 10-seconds; plug in the USB Cable to your computer.

The iG3s receiver mounts just like a USB thumb drive (flash drive) on your Windows computer. No special drivers are required.

To download data from your receiver:

1. Turn on the GPS receiver
2. Wait 10 seconds for the power LED (Red) to blink 3 times.
3. Plug the USB connector into a port on your computer

4. Wait for the Windows disk mount screen to appear



When/if you see this 'AutoPlay' dialog, close it by clicking on the red 'X' in the upper-right corner.

The first time you attach a receiver, you may need to wait up to 2-minutes for standard device drivers to be downloaded / installed.

The drivers are built into Windows XP, Windows Vista, Windows 7, Windows 8 and Windows 10.

If your iG3s receiver does not mount or an error message is displayed, you can usually unplug the receiver, wait a moment, then plug it back in.

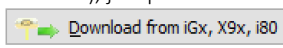
If you continue to have problems check the 'Troubleshooting…' section at the end of this manual.

Starting the iGx Download Tool

You can start the iGx download tool by clicking on the iGx shortcut on your desktop:

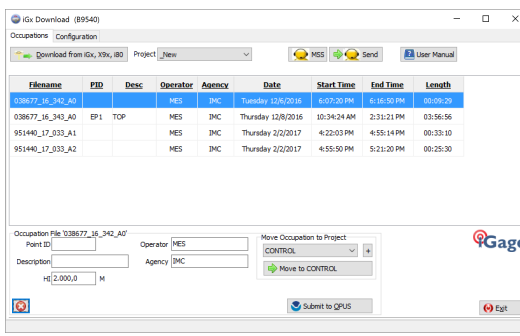
Using the Download Tool

Assuming the iG3s receiver is plugged in and has mounted (as a lettered drive), just press:



The program will automatically switch to the '_New' project and download every new file from your receiver.

As the .HCN binary files are downloaded from the receiver they are automatically converted to RINEX and added to the '_New' project and finally displayed in the occupation grid.



You can sort the grid by Filename, PID, Description, Operation, Agency, Start Date/Time, End Date/Time and Length by clicking on the column header. Clicking twice on the header will reverse order the grid.

If you have any really short or unneeded occupations, you can select and delete them with:

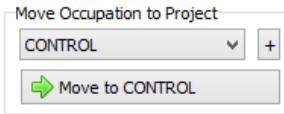
 <- the 'Delete Occupation' button

For the remaining observations, enter the values you recorded in your field book:

1. **PID** (Point ID) A unique short identifier for each marker (usually a 4 digit integer.) Only letters, numbers and the underscore are allowed in the PID.
2. **Description** A longer description of the point. Note that quotes " and ' are not allowed in the description.

3. **HI** The Instrument Height which is the distance from the ground mark to the bottom of the receiver
   add '**F**' to enter feet
   add '**S**' to enter slant height
   add '**SF**' or '**FS**' to enter slant feet height
4. **Operator** This value gets placed in exported RINEX files
5. **Agency** This value gets placed in exported RINEX files

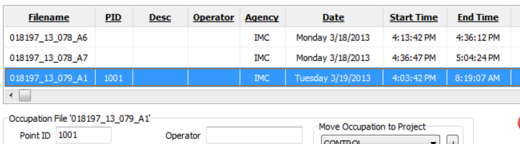
If the '_New' folder gets too full, you can make a new project folder (with the "+" button) and move occupations to the project:



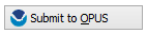
Submitting an Occupation to OPUS

Once all of the new occupations have been deleted or assigned to a project you can submit an occupation to NGS OPUS, NGS OPUS-RS, RTX, AUSPOS. IBGE or post-process them using other software / services.

Click on an occupation to select it:



Click on the 'Submit for OPUS' button:

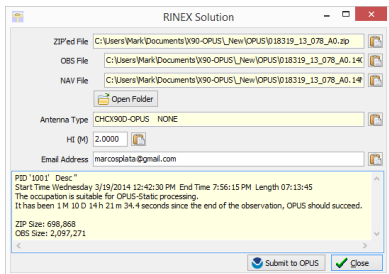


The currently selected occupation will be processed and prepared for upload to OPUS:

1. the file is decimated to 15-second epochs, header information is stuffed
2. the file is run through TEQC to insure it will be acceptable to OPUS
3. an Observation file and a Navigation file are generated

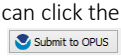
4. the Observation file is compressed into a ZIP file

If the 'Show Advanced Settings' is set to "Simple" then the program will skip directly to the **'Verify Filename to Upload'** screen (shown below.) If 'Show Advanced Settings' is set to "Normal", "Support OPUS-Projects" or "Advanced" then this 'RINEX Solution' helper screen is shown:



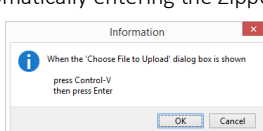
The program will suggest which service (OPUS-Static or OPUS-RS) and list the time since the end of the occupation with notes about the observation.

You can click the 'Submit to OPUS' button:

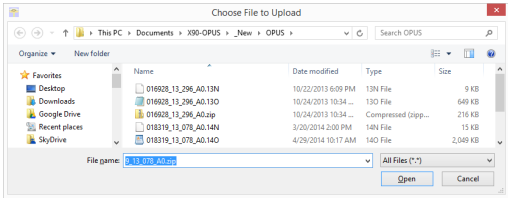


to automatically open an internet browser, which will load the NGS OPUS Submission form. After the web page has loaded, the program will automatically fill in the 'Antenna Type', the 'Antenna Height' and the 'Email address.'

Next the program will prompt you with instructions for automatically entering the Zipped observation file:

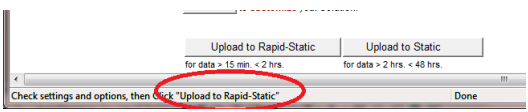


Click OK and then 'Choose File to Upload' will be displayed:



Press Control-V, then the 'Enter' key on your keyboard. You may also press Control-V, then click the 'Close' button with your mouse.

The NGS OPUS Submission form will be ready to submit, check the entries and any extended options that you might want to use. The status bar will prompt you with the correct submission button:



Press either the 'Upload to Rapid-Static' or 'Upload to Static' button as directed and your occupation will be uploaded to OPUS for processing.

Note, you may select an alternative PPP Service provider (on the configuration tab.) Some of the alternative providers are:

Trimble's RTX Service

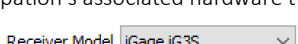
AUSPOS

Brazilian Institute of Geography and Statistics

Setting the Receiver Type

(Hidden when Simple)

When files are downloaded from the receiver, the receiver type is associated with the .HCN file. The 'Receiver Model' shows an occupation's associated hardware type:



If this is consistently incorrect, you can modify the device type while the receiver is connected on the 'Configuration' tab.

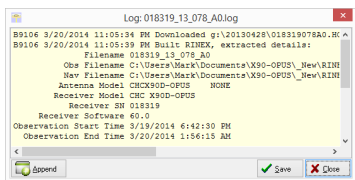
Viewing the Observation Log

(Hidden when Simple)

A detailed log is automatically kept for the files that you download and submit for processing.

Pressing the 'Log'

button shows the log file for the currently selected observation:



Pressing the 'Append'

button adds a date/time stamp and opens the log for user editing.

Press 'Save' to store your changes or 'Close' to close without saving.

Trimming Occupation Files

(Hidden when Simple)

Sometimes you may want to trim the start or end of an occupation file before you submit it to OPUS.

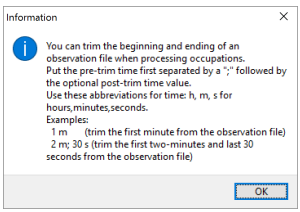
Common reasons for wanting to do this include:

- Receiver is turned on while sitting on your tailgate and then moved 20 feet and spun onto the tripod. The first 5-minutes of the observation are bogus.
- The operator forgets to turn off the receiver and observation data is collected while the receiver is

transported back to the truck. The last 2 minutes of the observation file are bogus.

- The observation extends 5-minutes past midnight UTC, you don't want to wait an extra day to process. Trim 6 minutes from the end of the file.

Clicking the '?' button to the right of the trim dialog displays usage instructions:



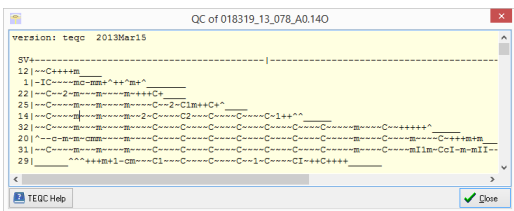
Note: the trimmed length is not reflected in subsequent screens or on the occupation grid. Only the submitted file is trimmed, all of the original data remains in the occupation. The trim settings must be reloaded after each submission.

Performing Quality Control Checks

(Hidden when Simple)

Pressing the

button will launch the UNAVCO TEQC tool and run a standard RINEX QC run on the currently selected observation file. When the run is complete, the results will be shown in a window:



You can press the 'TEQC Help' button to download the User Guide for TEQC from the UNAVCO web site.

TEQC is a great tool for evaluating both the receiver's performance and the site suitability for collected data.

We use it to verify receiver operation in our hardware validation process.

The MSS Factory Support Button

If you contact iGage for support, the technician may ask to view your computer screen remotely. Clicking the MSS button will download a support tool and provide a passcode that you can read to the technician.

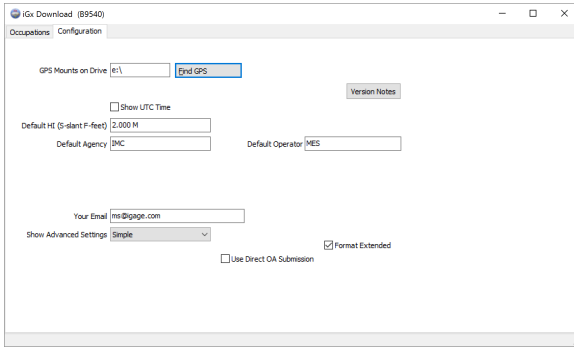
The Send to Factory Support Button

An iGage support technician may ask you to send a troublesome occupation to the factory for assistance. Simply highlight the occupation in the grid, click the 'Send' button and the occupation with all of the support files and settings will be bundled into a single ZIP file and pushed to the factory.

Advanced Download Settings

Configuring the Download Tool

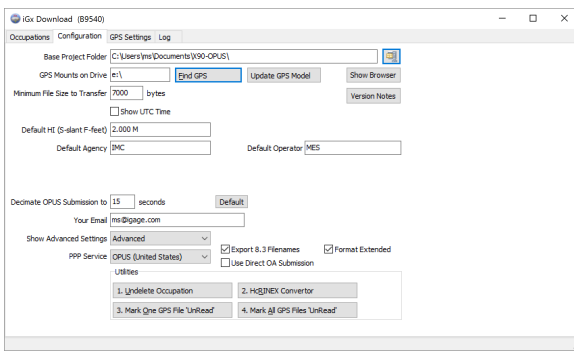
Click on the 'Configuration':



At a minimum enter these values:

Agency	your company name
Operator	the name of the default operator
Email	your email address

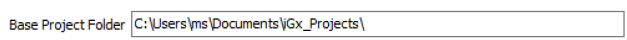
If you change 'Show Advanced Settings' from 'Simple' to 'Normal', 'Support OPUS Projects' or 'Advanced' additional setup values are shown:



You can change the rest of the configuration values as needed. Here are detailed descriptions for each of them:

'Base Project Folder'

(Hidden when Simple)



This is the full Window's path to the base folder where all of the data is stored. The default location is in your 'Documents' folder in a folder named 'iGx_Projects'. (If you have previously used the X9x download tool the default location may be 'X90-OPUS'.)

Double-click over the current path to change the folder location.

In the Base Folder, the download tool will create a sub-folder for each Project that you add. In addition there are always three special folders:

_New	new occupation files downloaded from the receiver are placed here first
_Deleted	if you delete an occupation, it is not really deleted, just moved to the _Deleted folder. An undelete function is included in Utilities.
_Error	sometimes short occupations won't include navigation records, these short files end up here.

'Archive All Projects'

(Hidden when Simple)

Pressing the 'Archive' button to the right of the Base Project Folder entry will backup every occupation in every project to a single ZIP file.

This is handy if you want to move all of your data to another computer or make regular disaster recovery backups.

There are similar Archive buttons on the main page: one archives the current occupation and the other archives the entire current project.

The download tool does not provide a method to restore these backups, however they are standard ZIP files and the Windows operating system does include a tool to decompress them.

'GPS Mounts on Drive'

This is the drive letter that the GPS receiver was last found on. Don't worry if the drive letter changes, the program will automatically find the receiver when you download data.

If you want to verify that the GPS receiver is connected and has successfully mounted as a drive, press 'Find GPS'.

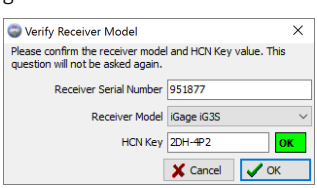
> Note: If you manually delete every single file and folder on the GPS receiver, the program won't be able to automatically find the receiver until after the GPS has recorded at least one file.

'Update GPS Model'

(Shown only when Advanced selected.)

The GPS Model is written into the receiver at the factory. If you delete ALL of the files on the receiver or format the receiver (it is a standard flash drive) it is possible that it will lose its receiver type.

With the receiver attached to your computer with the USB cable, click on the 'Update GPS Model' button to display this dialog:

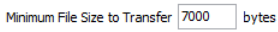


Use the drop down 'Receiver Model' to change the receiver type. If the HCN Key has been lost, it is written on a white sticker inside the battery compartment. You cannot edit the 'Receiver Serial Number'.

If the HCN Key has been correctly entered, the 'OK' will be shown in a green box, otherwise it will display '????' in a red box. The correct HCN key should be printed on a white label inside the battery compartment.

'Minimum File Size to Transfer'

(Hidden when Simple)



Every time you turn on the GPS receiver, it will attempt to track satellites and open a new occupation file. Often several small junk files will be created that don't have any meaningful data and are of no value.

The download tool will automatically ignore files smaller than this minimum value. This keeps useless files from cluttering your computer.

'Show UTC Time'

When unchecked (the default,) the download tool will show the observation start and end times in your local time zone. If you check 'Show UTC Time', then the times are displayed in UTC time.

'Default HI'

When you download an occupation from the receiver, this HI will be the default associated with every occupation. You can change the HI for each individual occupation later, this is just the default.

If you ALWAYS use a 2-meter range pole, then this value will always be 2.000 and you won't have to worry about HI blunders.

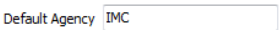
FEET: If you measure up in feet, you can enter the height in decimal feet and put an 'F' after the measurement. The program will automatically convert to Meters for you.

SLANT HEIGHT in Meters: If you measure a slant height, enter an 'S' after the measurement and the program will compute the vertical height for you.

SLANT HEIGHT in FEET: If you measure a slant height in feet, enter 'SF' or 'FS' after the measurement and the program will compute the vertical height in Meters for you.

Note: if you use the 'PPP Service' = 'RTX (CenterPoint)' the submitted RINEX file spoofs a 'UNKNOWN EXT NONE' and adjusts your actual HI to reflect the generic antenna L1 offset.

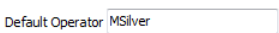
'Default Agency'



Enter your company code here. This value is placed into every RINEX file that is exported. You can override this value on a file-by-file basis.

Typically the Agency is 2 to 10 characters in length however the RINEX definition allows values up to 40 characters in length.

'Default Operator'



Enter the default name of the operator / observer here. This value is placed into every RINEX file that is exported. You can override this value on a file-by-file basis.

Typically the observer is 2 to 10 characters or the operator's initials, however the RINEX definition allows values up to 20 characters in length.

'Decimate OPUS Submission to ...'

(Hidden when Simple)

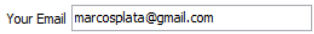
When you submit a file to OPUS, it is always decimated at the NGS server to 30-second epochs (recording interval = 1 point every 15 seconds.)

The default recording interval for **static** receivers sold by iGage is 5-seconds. The default recording interval for **RTK** receivers sold by iGage is 1-second.

By pre-decimating the RINEX file before uploading, the file is reduced to 1/6 or 1/60th the original size. This makes the upload process much faster while having no impact on the resulting solution.

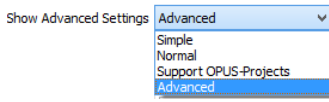
Observations submitted to RTX are not decimated, AUSPOS submissions are decimated to 15 seconds. Observations exported directly to RINEX are not decimated.

'Your Email'



When you submit a file to OPUS, you need to provide your Email address so the OPUS processor can return a solution to you. The email address that you enter here will be automatically entered for all submissions performed by the program.

'Show Advanced Settings'



This setting determines the complexity of the iGx-Download program.

Simple: *(the Default setting)*

Hides archive functions, Minimum File size, Receiver Model, Antenna Name Decimate setting, QC function, Export to RINEX button, OPUS-Projects, the GPS Settings tab and the Log tab.

Normal:

Shows everything except for OPUS-Projects, the GPS Settings and Log tab.

OPUS-Projects:

Displays the OPUS-Projects checkbox which allows automatic submission to a NGS registered project.

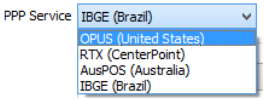
Advanced:

Displays the GPS Settings and Log tabs.

Typically you will never need to use the 'Advanced' functions.

'PPP Service'

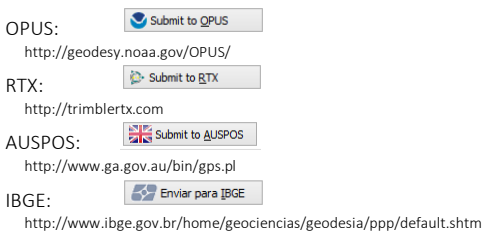
(Hidden when Simple)



The iGx download tool supports several PPP (Precise Point Positioning) services.

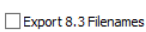
The submit button on the main page tracks this setting and the upload strategy is adjusted to each available service.

Additional Information is available on each service on the web:



Export 8.3 Filenames

(Hidden when Simple)



Normally, the iGx download program submits files using filenames like this:

917226_14_072_A0.OBS

The device serial number, the year, the Julian day of year and the observation number. Some services and programs prefer names in an 8.3 (xxxxxxxx.xxx) format.

Checking this box results in exported filenames like:

10050720.14O

Where 1005 is the Point ID, 072 is the Julian date, 0 is the observation number, 14 is the year and O indicates an observation file.

Format Extended

(Only shown when PPP Service = OPUS)

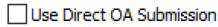
The NGS returns three styles of reports:

Standard: Single Page Report
Extended: Standard + baseline details + State Plane in (s)Ft
Standard + XML: Single Page + XML

For new OPUS users, the 'Format Extended' includes one important addition: State Plane coordinates are shown in both Meters and US Survey Feet (or International Feet) at the bottom of the report. We recommend keeping 'Extended' checked by default for this reason.

Prior to submitting an OPUS report, you can modify any of the Option settings, checking this box results in the extended output initially being checked.

Use Direct OA Submission



Some older computers are not able to browse to the secure (HTTPS:) NGS website. Clicking this box allows your occupation to be directly submitted. All 'Windows XP' computers fall into this category.

If you use direct submission then you will not be able to specify CORS stations to include and exclude. OPUS Projects and extended outputs are supported.

Utilities

(Hidden when Simple)

Additional utilities for working with observations are included.

"1. Undelete Occupations"

When you delete an observation, it is actually moved to a special "_Deleted" folder.

Clicking the **Undelete Occupation** button allows you to specify a deleted observation to restore. When an occupation is undeleted, it is always returned to the _New project.

“2. HcRINEX Convertor”

Files are stored on the receiver in a .HCN binary file. When the iGx download tool downloads a file, it is automatically converted to standard RINEX using the HxRINEX tool.

Clicking this button runs the HcRINEX tool in manual mode. You can browse for HCN files and manually convert them to standard RINEX files. Results are always placed in a subfolder named ‘RINEX’ under the file to be converted.

“3. Mark One File Unread”

When files are downloaded from the receiver, they are not deleted from the receiver. The filename on the receiver is modified to begin with an underscore ‘_’.

This function allows you to specify a single file to mark as ‘unread.’ Once a file is unread the next download action will re-download and convert the file.

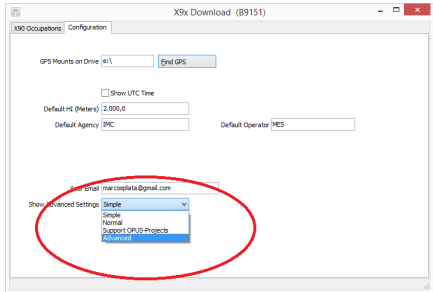
“4. Mark All GPS Files Unread”

This function marks EVERY observation file on the receiver as unread. The next download will read every single file on the receiver. (This will take quite a bit of time if your receiver had hundreds of files.)

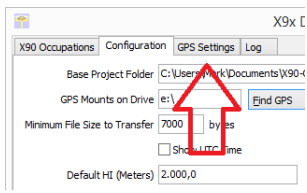
GPS Settings

(Hidden when Simple)

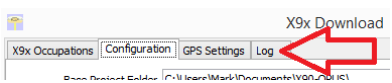
To modify the ‘GPS Settings’ or view the log, select the 'Configuration' tab, then choose 'Show Advanced Settings = Advanced.’



When ‘Advanced’ is selected, two additional tabs will be displayed:



The ‘Log’ Tab



The ‘Log’ tab shows detailed results of the current program operation. It may be useful to debug some aspect of file processing.

GPS 'Settings' Tab

The 'GPS Settings' tab allows you to change these receiver behaviors:

Automatic End of Sessioning
Recording Interval for Static Data
Elevation Mask
Check and Update Receiver Firmware

To configure the GPS settings, first connect the GPS receiver to your computer using the 'Serial Port' connector. If your

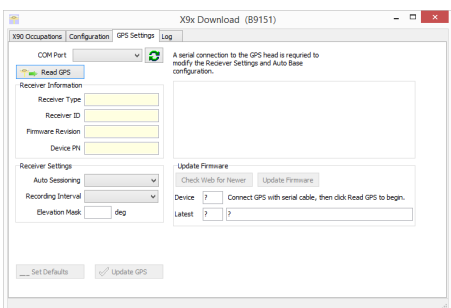
computer does not have a built-in serial port, you will need to use a 'USB to Serial' converter.

We highly recommend the

> PN: USB2-VE487-TG ; Tera Grand - Premium USB 2.0 to RS232 Serial DB9 Adapter - Supports Windows 10, 8, 7, Vista, XP, 2000, 98, Linux and Mac - Built with FTDI Chipset

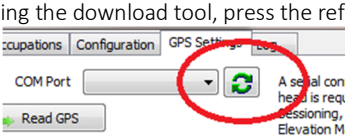
Which is available from Amazon for less than $12.

To configure the receiver, turn on the GPS receiver, select the 'Show Advanced Settings' checkbox and then select the 'GPS Settings' tab:



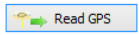
The configuration tool should automatically detect the correct COM (Serial) port number. If you have more than one serial port, you may need to manually adjust the 'COM Port' setting to match the port that the GPS is connected to.

If you plug a USB-to-serial port adapter into your computer after starting the download tool, press the refresh button:



the program should find the newly installed port. (Only ports in the range 1 through 32 are detected.)

Click on the 'Read GPS' button:



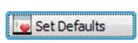
The configuration tool will interrogate the GPS receiver and display the 'Receiver Type', the 'Receiver ID' (the Serial Number), the GPS 'Firmware Revision' and the 'Device PN'.

The current values for 'Auto Sessioning', 'Recording Interval' and 'Elevation Mask' will also be shown and can be edited.

To return to the factory defaults:

'Auto Sessioning'	None
'Recording Interval'	5-seconds
'Elevation Mask'	0 degrees

Press the 'Set Defaults' button:



Or you can change the settings as required for your application. When you have made your selections, click on the 'Update GPS' button to send the changes to the GPS receiver.

Additional details for each of these settings follow.

Recording Interval

The recording interval defaults to 5-seconds on the iG3. Additional recording rates are also available:

1 second, 2 seconds, 3 seconds…59 seconds
1 minute, 2 minutes, 3 minutes…190 minutes
2 Hz , 5 Hz

The default interval (5-seconds) allows for files to safely contain over 7-days of continuous observations.

If you intend to use the observation files with OPUS you must use one of these recording intervals:

1, 2, 3, 5, 10, 15 or 30 seconds

Auto Sessioning

The default 'Auto Sessioning' setting is 'NONE.' Some applications may benefit from having the receiver automatically close files after a preset period.

'Auto Sessioning' only closes the current file. A new file is not automatically opened.

Elevation Mask

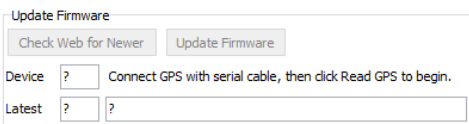
The default setting for 'Elevation Mask' is 0 degrees. All visible satellites are tracked.

OPUS automatically ignores satellites lower than 10-degrees.

There is a benefit to having the receiver track satellites for as long as possible as they rise to 10-degrees. (We don't want to start tracking at the exact moment that OPUS begins to use the satellite.)

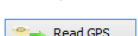
The internal memory of the receiver is huge. There probably is no advantage to raising the tracking elevation for any application and it is recommended that you keep the tracking angle set to the default 0-value unless you have a really good reason to change it.

Update Firmware

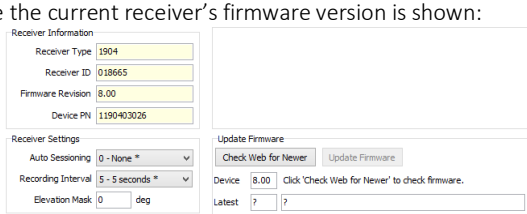


Updating the firmware in your receiver requires that the GPS be connected to a COM port on your computer (COM1 is best) and that your computer has an active internet connection.

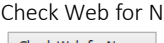
To update your receiver firmware click on:



Once the current receiver's firmware version is shown:

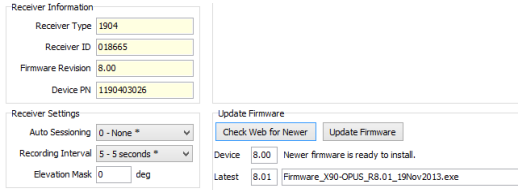


the 'Check Web for Newer' will be enabled. Click on:

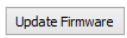


The program will check the internet for a newer version of GPS

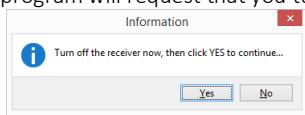
control software:



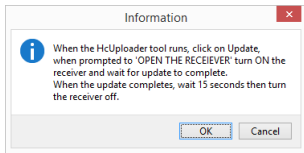
If updated firmware is available, the new firmware will be downloaded and the 'Update Firmware' button will be enabled, click on:



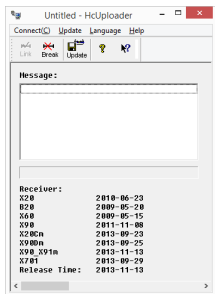
The program will request that you turn off the receiver:



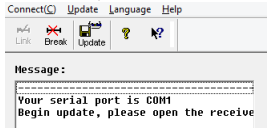
The firmware will be downloaded and a short instruction screen is shown:



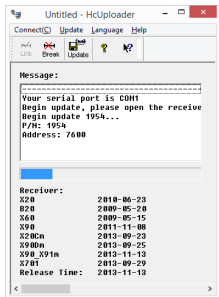
Click on OK. The firmware uploader tool will be displayed:



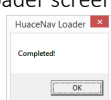
Click on the ‘Update’ button:



Turn on the GPS receiver:



After 5-seconds, the blue-bar will slowly move across the uploader screen. When it reaches the end:



Click on OK, then wait 30-seconds, turn off the GPS receiver, finally turn it back on. Your receiver has the latest firmware.

OPUS: What is it?

OPUS (Online Positioning User Service) is a free service provided by the NGS (National Geodetic Survey.)

From the NGS Website:

> "This Online Positioning User Service (OPUS) provides simplified access to high-accuracy National Spatial Reference System (NSRS) coordinates. Upload a GPS data file collected with a survey-grade receiver and obtain an NSRS position via email. OPUS requires minimal user input and uses software which computes coordinates for NGS' Continuously Operating Reference Station (CORS) network. The resulting positions are accurate and consistent with other National Spatial Reference System users."

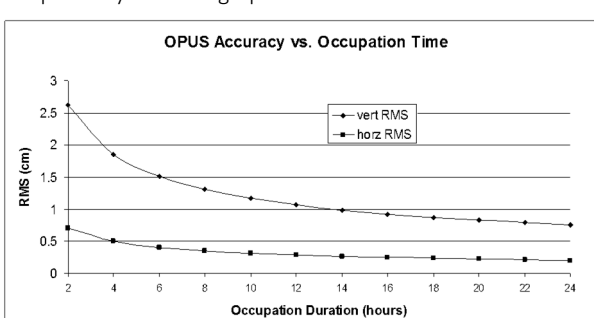
Here are direct links to more detailed information:

> http://geodesy.noaa.gov/INFO/OnePagers/OPUSOnePager.pdf
> http://geodesy.noaa.gov/OPUS/about.jsp

One of the most important contributors to vertical accuracy computed by OPUS-Static is the length of occupation. Longer times are better.

If you are concerned about elevation, please remember that a 2 hour OPUS static observation has an expected height accuracy of 2.5 cm. A 6-hour occupation has an expected accuracy of 1.5 cm.

Again, longer times are better. Your expectations should be tempered by this NGS graph:



OPUS-RS (Rapid Static)

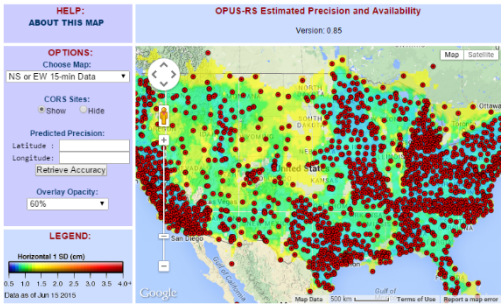
Standard OPUS-Static sessions require 2-hour observations. OPUS-RS sessions can be as short as 15-minutes.

However, OPUS-RS solutions are not available universally. In general, OPUS-RS requires:

> 3 (or more) CORS within 250 km of your site
> your site must be within 50 km of the polygon formed by the CORS sites

If you are working in Southwest Nevada, along the high line of Montana or in North or South Dakota, OPUS-RS probably will not work and you will have to collect more than 2 hours of data for submission to OPUS-STATIC!

Prior to collecting data for OPUS-RS check the latest status map to insure that OPUS-RS will work. The online OPUS-RS resource http://geodesy.noaa.gov/OPUSI/Plots/Gmap/OPUSRS_sigmap.shtml is updated routinely and reflects the probability that an occupation at a given location will be successful and the expected accuracy for a 15-minute and 1-hour occupation.



In some areas there is a risk that if a single CORS site is unavailable, your OPUS-RS job will not be processed. Caution and planning are suggested for OPUS-RS jobs.

OPUS-Projects

OPUS Projects is a relatively new online tool. Its use requires taking a NGS training class, but the invested time is well worth it

as OPUS-Projects will allow you to combine the observation files from multiple receivers and multiple sessions.

There is an excellent article and video describing OPUS Projects in the October 2013 'American Surveyor' magazine. Search for "OPUS-Projects: The Next Revolution in GPS" to find a full resolution PDF.

OPUS Error Messages and Failures

There are lots of possible error messages when processing OPUS solutions. It is our experience that almost all errors fall into a single category:

> "There is not enough nearby CORS data to effectively process your occupation…**yet**."

In general, the solution is nearly always the same:

> "Wait until more data becomes available and resubmit your job."

If you are processing OPUS-RS jobs in an area with very few CORS stations, and one CORS station was offline, waiting will not help. OPUS-Static is the solution for locations where OPUS-RS is not dependable.

CORS stations can report observations hourly or daily. In some areas (typically UNAVCO PBO sites) most of the sites report once at the end of each day (GMT.) So data that is needed to process your job is not available until 4:00 am GMT on the day after you collect data.

The iGx download tool allows you to submit jobs to alternative services like AUSPOS and RTX. Typically solutions from these alternative services closely match those from OPUS.

If you submit an observation to OPUS and nothing comes back, check your SPAM folder. OPUS solutions are regularly misidentified as spam.

OPUS is sometimes unavailable or takes longer than other times.

Interpreting OPUS Results

When you receive an OPUS solution by email from the NGS, it will look something like this:

```
      USER: ms@igage.com                          DATE: May 06, 2014
RINEX FILE: p4490900.14o                          TIME: 16:08:35 UTC

  SOFTWARE: page5  1209.04 master93.pl 022814   START: 2014/03/31 00:00:00
 EPHEMERIS: igs17861.eph [precise]               STOP: 2014/03/31 23:59:00
  NAV FILE: brdc0900.14n                     OBS USED: 45735 / 47174   :97%
  ANT NAME: TRM29659.00     SCIT           # FIXED AMB:   162 /   171   :95%
ARP HEIGHT: 0.0083                         OVERALL RMS: 0.011(m)

 REF FRAME: NAD_83(2011)(EPOCH:2010.0000)            IGS08(EPOCH:2014.2452)

         X:     -2184137.494(m)   0.003(m)          -2184138.362(m) 0.003(m)
         Y:     -3839941.381(m)   0.001(m)          -3839940.177(m) 0.001(m)
         Z:      4585410.516(m)   0.005(m)           4585410.529(m) 0.005(m)

       LAT:   46 15 35.23578      0.005(m)            46 15 35.25052 0.005(m)
     E LON:  240 22  8.47069      0.002(m)           240 22  8.40767 0.002(m)
     W LON:  119 37 51.52931      0.002(m)           119 37 51.59233 0.002(m)
    EL HGT:          208.861(m)   0.003(m)                 208.444(m) 0.003(m)
 ORTHO HGT:          230.163(m)   0.018(m) [NAVD88 (Computed using GEOID12A)]

                        UTM COORDINATES    STATE PLANE COORDINATES
                         UTM (Zone 11)         SPC (4602 WA S)
Northing (Y) [meters]     5126276.950           103343.987
Easting (X)  [meters]      297235.684           566995.383
Convergence  [degrees]    -1.90148112           0.63125220
Point Scale                1.00010542           0.99993063
Combined Factor            1.00007268           0.99989789
```

Here are some general rules to help judge the quality of a solution:

> The orbit [precise] should be precise or rapid (not-ultra rapid.)
> > 90% observations used or > 80% # Fixed Ambiguities
> > 50% Fixed Ambiguities or > 95% observations used
> Overall RMS < 0.030(m)
> Lat / Lon RMS < 0.030(m)

If you collect data under canopy or in an area where there are buildings or trees that obstruct the view above 10° elevation, the number of observations used will be lower.

Make sure you use the left-hand column (NAD_83) results, not the right-hand column (IGS08.)

Be careful with heights. Both ellipsoid and orthometric heights are listed. The orthometric height is NAVD88 GPS derived and typically is the elevation you need.

The RMS error estimate for the orthometric height includes an error estimate for the GEOID in addition to the RMS value for the ellipsoid height.

The state plane coordinates are listed at the bottom in the right-hand column. They are in Meters. If you need Feet, you can convert them, however be careful to convert to International Feet or U.S. Survey Feet as required by your State and application:

US Survey Feet	= Meters * (3937/1200)
International Feet	= Meters / 0.3048

The misapplication of Ft/M scale factor can result in a 30 foot coordinate blunder! If you request an 'Extended Format' OPUS results, the state plane coordinates are computed and returned at the bottom of the report.

If your survey is at a significant elevation (> 100 feet) you may need to apply the Combined Factor (listed on the OPUS report for both UTM and State Plane Coordinates) to inversed distances to match optical shots made at ground level.

Getting ready to use OPUS

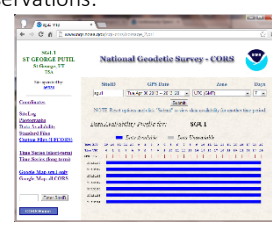
OPUS is a great tool for grounding your survey. But OPUS is part of a larger toolset. Before you begin a project take a moment to think about the 'Big Picture':

A. What are your GOALS?
    a. Required accuracy
    b. Horizontal and Vertical Datum; Geoid model choice
    c. Survey style: OPUS-Static, OPUS-Rapid Static, OPUS-Projects
    d. Consider FGDC Standards:

http://www.fgdc.gov/standards/projects/FGDC-standards-projects/accuracy

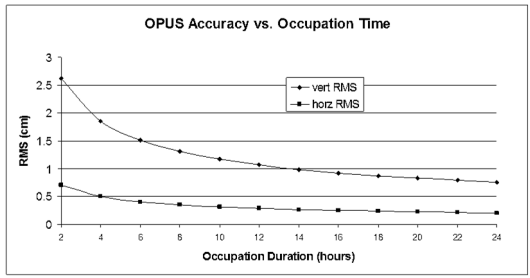
B. Are there passive marks available for control?
    a. Will CORS, passive or a combination control the survey?
    b. Are local passive marks recoverable, undisturbed, sufficient quality, stable and GPS friendly?
    c. Where are the nearby NGS CORS (active) marks? This will determine 'Rapid Static' or 'Static' availability.

C. OPUS-Rapid Static Requirements
    a. Find the closest 9 CORS sites with available observations
    b. A minimum of 3 CORS stations within 250 KM are required.
    c. Your site must be within 50 km of a polygon created by the remaining available CORS.
    d. If the eligible CORS count is low, check the past reliability of recent observations to insure that there is a high probability of sufficient sites for OPUS-RS to compute a solution. Use the CORS 'Data Availability' to check for recent observations:



D. Mission Planning: Satellite Availability and Network Planning
    a. How many receivers will you use for simultaneous observations? If you are using OPUS-Projects then More = More-Better.
    b. Checkout online 'Mission Planning' tools for U.S. satellite availability using reasonable masks (>15 degrees) during collection periods. If there are any periods with fewer than 6 SV's or PDOPS higher than 3, plan on occupying points longer.

E. How long will you observe a site? Again:



F. Are your sites GPS compatible? Are there obstructions higher than 10 degrees?

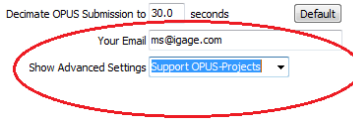
G. Field Checklist:

o Maps, aerial photography, ingress/egress plans
o Receiver with memory available
o Batteries fully charged plus battery-to-receiver cables with 12V external battery
o Compass for orienting receiver to North, current declination
o Fixed Height Tripods: Bubbles calibrated? Height verified?
o Tripods / Bipods /Tribrachs / Tribrach adaptors: Tribrachs calibrated?
o Tools for adjusting bubbles (the correct Allen wrenches)
o Measure tape for slant measurements
o Digital Camera, batteries, memory: take close ups of cap and 4 horizon shots w/ receiver
o Station information observation log sheets
o Inclinometer for checking and documenting horizon obstructions
o Field Book, Observation Schedule, pencils
o Cell phone
o Flagging, paint, PK nails, hubs, rebar, caps, hammer
o Fluorescent vest, hat, bug dope, sunscreen, lunch, water, traffic control equipment
o Names, addresses, telephone numbers of property owners
o Gate keys / combinations

Using OPUS-Projects

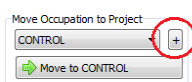
If you are contributing occupations to a registered OPUS-Project (note that NGS Training and authorization is required to use 'OPUS-Projects'), the iGx tool can assist you when uploading files into your project:

1. Turn ON OPUS-Projects support. On the 'Configuration' tab, set 'Show Advanced Settings' to "Support OPUS-Projects":

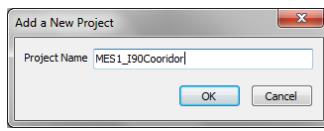


2. Add the NGS registered OPUS-Projects 'Project Identifier' supplied by your project administrator:

Click the "+" button

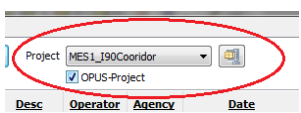


Enter the exact identifier



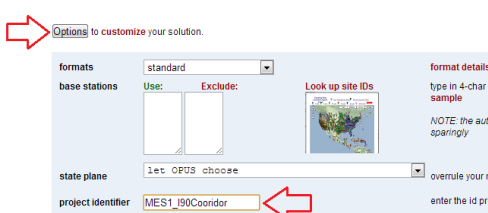
as the new project name.

Select the new Project



and check the new 'OPUS-Project' checkbox.

3. Now, when you submit an occupation that has been moved to the project, the upload tool will automatically press the 'OPTIONS' button on the OPUS submission form and fill in the project identifier:



Troubleshooting the iG3s Receiver

1. Receiver won't turn on:

Battery is installed backwards or upside down: remove and install properly.
Battery contacts are not aligned with the metal pads on the battery: bend them slightly to align and reinsert the battery.
Battery is fully discharged: Charge battery or use external power.
Contacts on battery are dirty: Clean battery and receiver contacts with a soft cloth.
Battery is bad: Try another battery.

2. Is the receiver tracking satellites?

The BLUE LED flashes once for each SV (satellite vehicle) that is currently tracked.
If you are indoors, the LED will flash once every 5-seconds. However no SV's will be tracked.
The receiver should begin tracking within 30-seconds after a warm start. After a cold start (off for more than 1 week) it may take 90-seconds for the receiver to begin tracking.

3. Is the receiver storing observation data?

The right-hand YELLOW LED will flash once every time data is stored to the current occupation file. The default recording rate is 5-seconds, thus the YELLOW LED will flash once every 5-seconds when data is being stored.
It is possible to stop the recording of data and close the observation file by pressing and holding the BLUE Record button.
You can verify the mode by quickly pressing the record button:
If the GREEN radio LED flashes, then the receiver is RECORDING.
If the YELLOW files LED flashes, then the receiver is NOT RECORDING.

4. The RED Power LED is flashing!

If the RED Power LED is flashing, then the internal battery is very low. Connect external power or turn receiver off and replace the battery.

5. The GPS receiver won't mount as a Disk Drive.

A. Before plugging GPS cable into your PC try turning on the GPS and waiting for 20 seconds?
B. Unplug, wait 15-seconds, try again
C. Try another USB port.
D. Use an external USB Hub (this fixes intermittent disk mounts, but we don't know why.)

E. Try other computers.
F. Try turning off your PC, wait a minute and then turn on again. Reinsert the USB cable.
G. Get the DevView tool from http://www.nirsoft.net/utils/usb_devices_view.html and use it to uninstall the errant device driver for the GPS receiver.
Download the **USBDeview** tool, there is a 32-bit and a 64-bit version, choose the correct version for your computer.
Unzip the distribution ZIP file, run the "USBDeview" tool as an administrator.
Unplug the GPS receiver.
Look for the entry "OLIMEX LPC1766 Storage USB Device", right-click it and "Uninstall Selected Devices", answer yes to 'Do you want to uninstall?" wait 10-seconds and then plug the GPS receiver back in.

6. Yellow and Green LED's Flash Once Each Second

If your receiver has both the YELLOW and GREEN LED's flash simultaneously, then the internal flash memory directory block has become corrupted. This is a status message indicating that the receiver is unable to open or write to a new file in the 4 GB Flash memory.
Follow these instructions to fix this issue:

- Attach the receiver to a computer, it will mount as a disk drive letter. Note the drive letter. If your operating system requests that you check the disk for errors, do so.
- Download all of the current files from the receiver using the iGx tool.
- Reformat the receiver using the Windows Explorer on your computer.

More Information

The receiver is a flash memory drive. Just like a real thumb drive, the directory block on the flash memory can become corrupted if the battery dies at the exact moment the receiver is writing to the occupation file (once every 5 seconds typically) or if the USB cable is removed from a computer while the receiver is downloading a file, or if the battery dies while the receiver is attached to a computer.

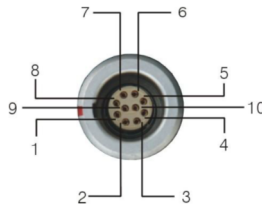
Just as a USB thumb drive can become corrupted, the receiver's memory will suffer the same issue. Sometimes a 'Checkdisk' operation will fix this issue, however a drive format will always fix this issue.

The chance of the battery expiring at the exact same moment that the receiver is writing occupation to the flash memory is extremely low: the write occurs once every 5-seconds (by default) and the write operation is very-very quick. In addition, the receiver monitors the battery voltage and automatically closes output files and shuts down a few seconds before the battery expires.

However, if the battery has been allowed to deplete and then is used when downloading to the computer the battery will likely run down while the files are transferring. Downloading files keeps files open most of the time and the probability of a nearly depleted battery failing during transfer is quite high.

For this reason, it is best to use a freshly charged battery when downloading a receiver to a PC.

iG3s
10-Pin Connector

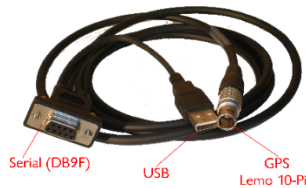


WARNING! If you attach external power with reversed polarity you will destroy the GPS receiver.

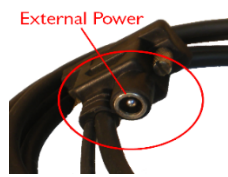
PIN	Signal Name	Description
1	TXD	Transmit Data(PC receive data through this pin)
2	RXD	Receive Data(PC transmit data through this pin)
3	PWR	External Power Input (9-15 V DC)
4	PWR	External Power Input (9-15 V DC)
5	GND	External Power Ground
6	GND	External Power Ground
7	USB PWR	
8	D-	
9	D+	
10	Not Used	

iG3s PC Data Cable

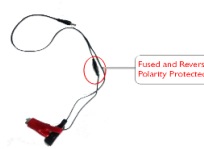
The supplied interface cable includes connections for GPS, USB, Serial and External Power:



Interface Cable



External Power



Battery Clips

External power should be in the range: 9 VDC to 18 VDC.

The supplied battery clip cable includes a fuse and is reverse polarity protected.

iG3s Antenna Calibration

The NGS (National Geodetic Survey) **Absolute** calibration for the iG3s is: "IGAIG3S NONE". Check the NGS website:

https://www.ngs.noaa.gov/ANTCAL/

for the current iG3s L1 and L2 calibration values.

‘Slant Height’ to ‘Vertical Height’:

The iGx Download tool automatically converts from ‘feet to meters’ and from ‘slant to vertical’ using the currently selected receiver model.

If you have a vertical measurement in feet you can enter an ‘F’ after the measured vertical height:

“4.512 F” becomes “1.375” meters vertical

If you have a slant height in feet you can enter a ‘FS’ (or ‘SF’) after the measured slant height:

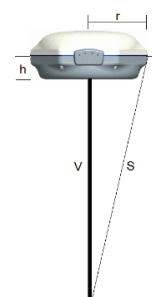
“4.512 FS” becomes “1.323” meters vertical

If you have a slant height in meters, enter an ‘S’ after the measured slant height:

“1.523 S” becomes “1.472” meters vertical

Manually Converting Heights

Receiver	r (meters)	h (meters)
X90S-OPUS	0.117	0.047
X900S-OPUS	0.102	0.040
iG3s	0.102	0.040



$$v = \sqrt{s^2 - r^2} - h$$

Examples

Measured Slant s (feet)	Slant s (m)	X90-OPUS Vertical v	iG3s X900-OPUS Vertical v
6.965	2.123	2.073	2.081
5.148	1.569	1.518	1.526

Warranty

IMC is “iGage Mapping Corporation” of Salt Lake City Utah USA.

IMC warrants the iG3s receiver to be free of defects in material and workmanship and will conform to our published specifications for these periods:

GPS receivers:	2-years
Cables and accessories:	1-year
Batteries:	90-days

This warranty applies only to the original purchaser of the product.

Hardware: Purchaser's exclusive remedy under this warranty shall be limited to the repair or replacement, at IMC's option, of any defective part of the receiver or accessories which are covered by this warranty. Repairs under this warranty shall only be made by IMC at an IMC service center. Any repairs by a service center not authorized by IMC will void this warranty.

In the event of a defect, IMC will at its option, repair or replace the hardware product with no charge to the purchaser for parts or labor. The repaired or replaced product will be warranted for 30-days from the date of return shipment, or for the balance of the original warranty, whichever is longer.

Software: IMC warrants that software products included with hardware products will be free from media defects for a period of 30-days from the date of shipment and will substantially conform to the then-current user documentation provided with the software. IMC's sole obligation shall be the correction or replacement of the media so that it will substantially conform to the then-current user documentation. IMC does not warrant the software will meet purchaser's requirements or that its operation will be uninterrupted, error-free or virus-free. Purchaser assumes the entire risk of using the software.

Exclusions

The following are excluded from the warranty coverage:

1. Periodic maintenance and repair or replacement of parts due to normal wear and tear.
2. Product Finishes.
3. Batteries exposed to heat, cold; or batteries opened or physically damaged.
4. Installations or defects resulting from installation.
5. Any damage caused by (i) shipping, misuse, abuse, negligence, tampering, or improper use; (ii) disasters such as fire, flood, wind, and lightning; (iii) unauthorized attachments or modification.
6. Service performed or attempted by anyone other than an authorized IMC service center.
7. That the receiver will be free from any claim for infringement of any patent, trademark, copyright or other proprietary right, including trade secrets.
8. Any damage due to accident, resulting from inaccurate satellite transmissions. Inaccurate transmissions can occur due to changes in the position, health or geometry of a satellite or modifications to the receiver that may be required due to any change in the GPS. IMC GPS receivers use GPS, GLONASS, BDS and GALILEO satellites to obtain position, velocity and

time information. GPS is operated by the US government, which is solely responsible for the accuracy and maintenance of the GPS system. OPUS and OPUS-RS is a service of the NGS and IMC shall not be responsible for issues with NGS provided services.

Except as set forth in this limited warranty, all other expressed or implied fitness for any particular purpose, merchantability or non-infringement, are hereby disclaimed.

IMC shall not be liable to the purchaser or any other person for any incidental or consequential damages whatsoever, including but not limited to lost profits, damages resulting from delay or loss of use, loss of or damages arising out of breach of this warranty or any implied warranty even though caused by negligence or other fault of IMC or negligent usage of the product.

In no event will IMC be responsible for such damages, even if IMC has been advised of the possibility of such damages.

This written warranty is the complete, final and exclusive agreement between IMC and the Purchaser.

RMA

To obtain warranty service the purchaser must obtain a return materials authorization (RMA) number prior to shipping by calling 1-801-412-0011.

Purchaser's return address and the RMA number must be clearly printed on the outside of the package. IMC reserves the right to refuse to provide free-of-charge service if the date of sale cannot be determined or if the serial number is altered or removed. IMC will not be responsible for any losses or damage to the product incurred while the product is in transit or is being shipped for repair. Insurance is recommended. IMC suggests using a traceable shipping method such as UPS, FedEx or USPS with signature tracking when returning a product for service.

NEVER INCLUDE BATTERIES in return shipments. If you ship batteries to iGage, they **WILL NOT BE RETURNED TO YOU**.

The Purchaser shall always pay shipping to IMC, IMC will return warranty repairs by UPS ground, unless the Purchaser agrees to prepay expedited service costs. IMC will not pay for warranty returns to destination outside of the contiguous 48-states. The purchaser shall always pay any associated duty associated with warranty repairs.