gx/ix™ FAQ

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1. What is gx/ix™?

OxTS gx/ix technology is a powerful GNSS/inertial tight-coupling technology developed to take full advantage of OxTS' extensive knowledge and experience in GNSS and inertial integration, Kalman filtering, and navigation processing. It is a combination of two independent technologies, gx and ix, which are each designed to improve performance in different scenarios. With gx/ix then, the system can intelligently switch between the different modes depending on the environment to ensure the best possible performance in any situation.

2. What does gx mode do?

If the environment is such that satellite visibility is good, then gx processing is used. The raw GNSS measurements are used to compute position and velocity solutions, rather than using the solutions output by the GNSS receiver. This allows gx processing to create solutions tailored for our Kalman filter that can be integrated more confidently with the inertial solution and improve performance, especially on lower grade GNSS receivers.

3. How does gx processing work?

The gx processing takes the pseudo-range (distance to each satellite) and the Doppler estimate (relative speed of each satellite) and uses these to compute velocity and position, much like a GNSS receiver would do itself. The velocity and position measurements are used by the Kalman filter to

keep the outputs accurate. GNSS receivers apply filtering to the velocity and position before they are output. This filter may be used to remove jumps based on some assumptions about the possible motion of the vehicle. It may involve "carrier phase smoothing" of the pseudo-range, which tends to increase the correlation of the position and velocity measurements. By computing our own position and velocity we can avoid some of the filters, which otherwise have to be accurately modelled in the Kalman filter. Like the receiver though, gx processing requires at least 4 satellites in view to be able to compute a solution.

4. What does ix mode do?

In harsher GNSS environments where less than 4 satellites are in view or some satellites give bad measurements due to multipath or other effects, ix processing is used. The ix processing algorithms also use the raw GNSS measurements like gx processing, but it integrates the measurements into the navigation engine one satellite at a time in a process known as single satellite aiding. Because ix processing looks at each satellite individually, it doesn't require the normal minimum of 4 visible satellites to be able to use the measurements. This can greatly help the degradation of accuracy in poor GNSS environments since as long as at least one satellite is in view, it can still be used to aid the inertial measurements and navigation engine.

5. How does ix processing work?

Although ix processing uses the raw GNSS measurements, it does not use them to compute a position and velocity solution like gx processing or a receiver does. Instead it uses the information from each individual satellite it can see to adjust and maintain the last computed position. This means position accuracy can be maintained even when less than 4 satellites are in view.

With pseudo-range or carrier phase differential corrections, the inertial solution is often more accurate than the GNSS float solution. So ix processing can also lock out ambiguities and speed up the convergence time on a correct solution.

6. What is gx/ix™ RTK?

The gx/ix RTK option is an extension of gx/ix that enables the gx and ix processing algorithms to be used in conjunction with carrier phase measurements and RTK correction data for a tightly-coupled centimetre-level accuracy solution. An additional benefit of ix RTK processing is a feature known as 'inertial relock'.

7. What is inertial relock?

Inertial relock is a feature of ix RTK processing that can greatly reduce the time it takes for ambiguity resolution and hence reacquisition time for RTK lock. This means in environments with frequent obstructions, less time is spent outside of RTK mode and the highest level of accuracy is maintained.

8. When do I need gx/ix RTK?

If you have a dual frequency INS product and are transmitting corrections in real-time, e.g. with a radio link to a base station, then gx/ix RTK is not required to reach RTK accuracy although you won't get the benefit of tight-coupling.

If you are logging base station corrections to add in post-processing then gx/ix RTK is required in order to reach RTK accuracy. Without it, even with carrier phase differential corrections the maximum accuracy achieved will be DGPS mode which gives ~40 cm position accuracy.

9. Is GLONASS compatible with gx/ix?

If your INS has GLONASS enabled, then that satellite data is currently compatible with the base gx/ix processing, meaning up to DGPS mode. Support for GLONASS in gx/ix RTK is coming soon.

10. What about Beidou, Galileo, SBAS, QZSS etc.?

These are not currently supported in any gx/ix mode.

11. What products support gx/ix processing?

All OxTS inertial navigation systems support gx/ix processing. To take advantage of gx/ix RTK, a dual frequency model is needed.

With the Inertial+, gx/ix processing can be used if using the internal receivers. It is not currently compatible with external receivers.

12. Can I use gx/ix post-processing with another manufacturer's INS?

No, gx/ix was designed by OxTS to work with OxTS products. We use the characteristics of our inertial sensors and error modelling of our GNSS receivers to create tailored solutions for our processing.

13. What base station formats does gx/ix require?

To take advantage of gx/ix with differential corrections, your base station must be configured to output RTCM V3 format corrections. If you do not have a mobile base station, RINEX files from a CORS network can also be used in post-processing.

14. Is gx/ix available in real-time?

The base level gx/ix processing is available in real-time, but currently gx/ix RTK is only possible in post-processing. We are working on implementing gx/ix RTK in real-time also.

15. Revision History

Table 1

Revision	Changes
151014	Initial version