



ECN #: 80200668
REV #: 1.2

DATE: 02-AUG-2021

ENGINEERING CHANGE NOTIFICATION

CHANGE TYPE:	HW_FW Modification	REASON FOR CHANGE:	Component Obsolete
DESCRIPTION:	The processor and receiver on LC-1x1 have reached end of life. The processor and receiver have been replaced with similar parts. The firmware is updated to 3.11 to support the new processor and receiver.		

Products Affected	
Product Families	Models
LC-1x1	All LC-1x1 model variants

Detailed Change Notes:

Issue 1: Processor on the above listed product families has reached end of life.

Resolution: The processor was replaced with a similar processor in production that is form, fit, and function compatible. The firmware was updated to support the new processor while maintaining functional compatibility.

Issue 2: GPS Receiver on the above listed product families have reached end of life.

Resolution: The GPS receiver was replaced with a similar receiver in production that is form, fit, and function compatible. The new receiver is also capable of concurrent multi-GNSS. The firmware was updated to add support the new GNSS receiver while maintaining functional compatibility (see added features section for details on GNSS support).

Issue 3: The new processor allows higher clock rates for increased time capture resolution.

Resolution: The firmware v3.11 improves the time capture resolution from $\pm 8\text{ns}$ to $\pm 5\text{ns}$ using the higher clock rates, while maintaining power consumption at the current specifications. Increased time capture resolution results in improved oscillator stability while locked to GPS.

Firmware release 3.11 for LC-1x1-G2 provide the following added features:

1. Concurrent GNSS Capabilities

Firmware 3.11 or later with uBlox 8 receiver is capable of simultaneously receiving up to three concurrent GNSS systems at one time. Concurrent GNSS operation aids performance by allowing reception of up to 72 GNSS satellites in challenged reception areas such as in urban canyons, under foliage, indoors, or close to the earth's poles, etc. Using multiple GNSS systems also increases robustness by not relying on a single GNSS

system. Several of the systems operate at different carrier frequencies, so using multiple GNSS systems can increase immunity against jamming which often occurs at only one carrier frequency.

The multiple GNSS systems each have their own reference time and representation of UTC. For example, GPS uses the GPS time standard and provides a method to convert GPS time to UTC as defined by the US Naval Observatory (USNO). GLONASS, Galileo and BeiDou have similar reference times and UTC definitions. The unit with multi-GNSS support automatically adjusts for offsets between the different GNSS time reference standards and synchronizes the 1PPS output to UTC (USNO) when GPS is being received. If GPS is not being received, the 1PPS output is synchronized to the best representation of UTC (USNO) available.

The selection of GNSS systems is made with the `GPS:SYST:SEL` command as detailed below. Because these systems operate at different carrier frequencies with different bandwidths, it is necessary to use a GNSS antenna that is designed to receive all the required GNSS systems. Please note that the new and emerging Galileo system is now functional, and uses the same carrier frequency as GPS L1, albeit with a wider bandwidth. In our experience Galileo sats can be received with good C/No carrier to noise figures (>40dB) with standard legacy GPS antennae and distribution amplifiers/splitters. JLT thus recommends enabling at a minimum GPS, Galileo, and SBAS concurrently with the command: `GPS:SYST:SEL GPS GAL SBAS`, see also below. Using other GNSS systems such as Glonass will require an antenna system designed to support Glonass signals.

The internal GNSS receiver can track up to three different GNSS systems concurrently, such as GPS, Galileo, Glonass, and SBAS at the same time, however only two different carrier frequencies may be received at any given time, so BeiDou and Glonass cannot be enabled concurrently when either GPS, Galileo, or QZSS are simultaneously enabled as that would require tracking three different carrier frequencies. Attempting to configure an invalid combination of GNSS systems with the `GPS:SYST:SEL` command will result in a Command Error response with no change to the configuration.

2. `GPS:SYSTEM:SElect` [GPS | SBAS | QZSS | GAL | BD ^ GLO]

This command selects the GNSS systems that are enabled in the GNSS receiver and are used to generate the timing and positioning information for the NMEA data, and to generate the 1PPS reference for the GNSDO. The command is followed by a list of the shortened names of the GNSS systems to enable. The shortened names of supported GNSS system include GPS, SBAS, QZSS, BD (BeiDou), GAL (Galileo) and GLO (GLONASS). Please see above for restrictions on the concurrent GNSS systems that can be enabled. Invalid combinations of GNSS systems will result in a Command Error response and no change to the configuration.

The following example command will enable GPS, SBAS, Galileo and GLONASS all concurrently:

```
GPS:SYST:SEL GPS SBAS GAL GLO
```

The following command will query the currently enabled GNSS systems:

```
GPS:SYST:SEL?
```

The unit with multi-GNSS support will respond to the query with the list of enabled GNSS systems such as:

```
GPS SBAS GAL GLO
```

Reference Documents / Attachments

Not Applicable

TITLE	NAME	E-MAIL
Embedded Software Engineer	Min Lan	support@jackson-labs.com

PLEASE CONTACT JACKSON LABS TECHNOLOGIES, INC. WITH ANY QUESTIONS