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GPS and GSM Jamming Application Note

MiX 4000 and MiX 6000

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Overview

The purpose of this document is to provide detailed instructions on how to configure GPS and GSM Jamming detection. The document provide guidance in setting up the events for the new generation of Hardware platforms MiX 4000 and MiX 6000. For the remainder of the document we will refer to both MiX 4000 and MiX 6000units as “OBC” (on-board computer).

There is a profusion of cheap plug-in MP3 players that are being used by truck drivers. These devices typically plug into the cigarette lighter socket in the vehicle cab and can be tuned to play music via the vehicle’s radio sound system. Most vehicle tracking systems are susceptible to the GPS jamming caused by these devices which also block the positioning signals of Smart phone devices.

The new generation hardware uses the latest GNSS devices from u-blox that can concurrently receive positions from more than one space-based satellite positioning systems. The MiX 4000 for example uses the [MAX-8Q](#) that have concurrent reception of up to 3 GNSS (GPS, Galileo, GLONASS, BeiDou). Both the USA maintained “Global Positioning System” (**GPS**) and also the Russian “**Global Navigation Satellite System**” (**GLONASS**) systems are therefore supported and each can provide global coverage.

Since GLONASS operates at a broad bandwidth, unintentional jamming from MP3 players and other noisy, uncertified products will not affect the GLONASS positioning service.

Intentional, malicious jamming equipment will usually transmit at a broad bandwidth and target all forms of satellite positioning systems, thereby blocking positioning data in both GPS and GLONASS.

If the GSM channel is jammed the OBC cannot send any GPRS or SMS messages and therefore will not be able to deliver any events to warn the user. The Jamming events will be buffered in memory and only will be uploaded the next time that the OBC can communicate with the back-end system.

If the OBC is fitted with an Iridium Satellite Modem, this communication channel will be used as default fallback in case of GSM Jamming and all messages will be send as per normal during the jamming activity.

Hardware and Software Compatibility

The GSM Jamming must be enabled on the “Mobile Device Template” for both the MiX 4000 and MiX 6000.

Configuration Steps:

- Edit the “Mobile device template”
- Select the “Mobile device type”

Mobile device type : MiX4000

- Ensure that the “GSM jamming detection” checkbox is checked as shown below:

GSM jamming detection

On the GPS devices, the jamming is enabled by default and no configuration is required.

GPS Jamming

The table below shows the main differences between these GPS and GLONASS positioning systems. It must be noted that both systems have to rely on very sensitive receivers since the signals are transmitted > 25,000 km from the surface of the earth. This means that any signal originating on the surface of the earth and transmitted on one of the carrier frequencies (1575.42 to 1602 MHz) will be much stronger than the signals from the satellites and therefore jam the true GPS or GLONASS signals.

Specifications	GPS	GLONASS
Orbital radius	26,560 Km	25,510 km
Orbital period	About 11 hours and 58 minutes	11 hours and 16 minutes
Carrier signals	L1 band: 1575.42 MHz L2 band: 1227.60 MHz	L1 band: 1602 MHz + k x (9/16) MHz L2 band: 1246 MHz + k x (7/16) MHz where k is the channel number

The OBC expose a parameter called “**GPS Jamming Status**” that can be selected in events. The meaning of the various numbers that this parameter can return is defined as follows:

- 0 = Unknown status
- 1 = OK - no significant GPS jamming
- 2 = Warning - interference visible but fix GPS OK
- **3 = Critical - interference visible and no GPS fix**

In Figure 1 an example is shown of how the *GPS Jamming Detected* event can be set up in MiX Fleet Manager.

The screenshot shows the configuration for the 'GPS Jamming Detected' event. The 'Event description' field contains 'GPS Jamming Detected' and the 'Event type' is set to 'Custom'. Under the 'Conditions' section, there is a list of conditions. The first condition is 'GPS jamming status' with a value of '3'. The condition is set to 'Event occurs when the following conditions are met'.

Figure 1: GPS Jamming Detected Event

GSM Jamming

When the GSM is jammed, it means that the OBC will lose all communication ability to the back-end system and unless it is fitted with a Satellite Modem (Iridium) it will not be able to deliver the “GSM Jamming Detected” event even if you configure it as a critical event.

The OBC expose a parameter called “GSM Jamming Status” that can be selected in events. The meaning of the various numbers that this parameter can return is defined as follows:

- 0 = Not initialized
- 1 = OK
- **5 = Jamming detected**

Note that if the OBC is fitted with a Satellite Modem, it will automatically switch to Satellite if the GPRS and SMS communication channels becomes unavailable. This is default backup communication strategy and settings for any MiX OBC. If the OBC is not fitted with a backup communication mechanism, it will simply buffer all the events in memory and only deliver them at the first opportunity that the GSM modem can establish communication with the back-end again.

In Figure 2 an example is shown of how the **GSM Jamming Detected** event can be set up in MiX Fleet Manager.

The screenshot shows the configuration for a "GSM Jamming Detected" event. The "Event description" field contains "GSM Jamming Detected" and the "Event type" is set to "Custom". Under the "Conditions" section, there is a list of conditions. The first condition is "GSM jamming status" (indicated by a red asterisk), which is set to be equal to the value "5".

Figure 2: GSM Jamming Detected Event

Important Notice

“The ublox GSM modems (used in MiX4000 and MiX6000) does not provide feedback while its algorithms detects possible jamming or interference and only notifies us when it sees actual jamming. The jamming indication from ublox modules are equivalent to the "Actual Jamming" indication from Cinterion GSM modems used in the FM3xxx range of OBC's.”

“It is possible to miss the "Jamming Cleared" indication. The workaround for this is to detect and clear a false positive. The fix will clear a false positive if the GSM module has been reset, has been on for 5 minutes, and has not reported a new "jamming detected" event”

On the FM3xxx the firmware will always know what the Modem Jamming State machine is doing. The modem set different states for possible jamming, industrial noise or when it is actually jammed.

On the MIX 4000 there are 2 workarounds for 2 different problems:

1. In the U200 Modem the jamming state is never cleared. The workaround for this is to manually clear the jamming state when the unit manages to register successfully on the GSM network.
2. If the modem reboots there is a chance that the firmware will never will get the jamming cleared URC. The workaround is that the firmware manually clear the jamming state after 5 minutes if it didn't receive another jamming detected URC.

From a user's point of view:

1. The MIX4000 jamming event can last 5 minutes longer than an FM3xxx jamming event for the scenario where the modem reboots
2. The MiX4000 also does not support the possible jamming and industrial jamming states.