

Selecting the appropriate reference frequency solution

RF-SUISSE provides several models of GPS guided oscillators (references) with or without integrated GPS receivers. Why are these different models offered and which one is the best solution? We want to show the differences based on the RS-GGOxx-Ty but the same is valid for all other solutions.

If we take the RS-GGOxx as an example it is available with a 1PPS input (RS-GGO10-T) and with integrated GPS receiver (RS-GGO10-TG).

The user has the following options:

- RS-GGO10-T with a small external integrated GPS antenna/receiver (“puck”)
- RS-GGO10-T with one of the RF-SUISSE or other GPS receivers and an additional antenna
- RS-GGO10-TG with an active antenna, either puck-style or a fix mounted model

On the first view the last option looks like the easiest one but we would only recommend it for mobile applications where the antenna cable can be kept short. The antenna cables are usually pretty thin and unfortunately have quite some attenuation at the 1.5GHz GPS frequency. If multiple modules have to be supplied it also requires an L-band power splitter and, due to the losses, additional amplifiers. Specifically for the RS-GGO10-TG the additional current consumption and spikes reduce the achievable accuracy by a factor of 2 compared with the RS-GGO10-T and an external receiver (this assumes a good insulated application).

A slightly better solution for the supply of multiple references is the RS-GGO10-T with a puck style GPS receiver. This also makes for a less critical mobile solution as the signal to be distributed is the 1PPS signal only. The major disadvantage of this type of installation is that the GPS receiver is outdoors and thus exposed to the elements. Changes in ambient temperature caused by exposure to the elements can offset the timing in the GPS receiver leading to potential errors in frequency. Please make sure to use a receiver which discontinues the 1PPS signal when it loses reception of the satellite! Old style Garmin pucks are fine whereas the newer systems using CSR-SiRF chips (due to their firmware) keep the 1PPS on and produce huge errors thus being useless unless additional circuitry is used.

The best solution for permanent installations is a combination of a 1PPS input module (in this case RS-GGO10-T), a RF-SUISSE GPS receiver (RS-GPSPPSx) or another indoor receiver mounted as close as possible to the antenna and a commercial grade active external GPS antenna (I.E. RS-GPSANTxx) installed with as much sight of the sky as possible under a cover which prevents accumulation of snow, ice, water and dirt. This combination has the antenna at the optimum location, the GPS receiver is in a better controlled and stable environment and only a 1PPS pulse has to be routed to the modules with 1PPS input. Especially in a laboratory environment this solution is much cheaper and cleaner than routing RF coaxial cables all around. It is crucial that the receiver discontinues the 1PPS signal once it loses the GPS signal. CSR-SiRF chip based solutions can usually NOT be used but most Trimble and especially all u-blox based receivers are suited if a non RF-SUISSE solution is chosen.

For best performance and reliability we recommend an optical 1PPS transmission (RS-GPSPPS4 or RS-PPSOT) for product we supply with fibre-optic inputs and outputs or an optical receiver (RS-PPSFR or RS-PPSD).

As one can see from the above there isn't a clear winner in terms of performance. It all depends on the application requirements and usage model and all installation types yield in excellent results if done right. Please see our application note “WHAT STABILITY IS REQUIRED FOR A LABORATORY REFERENCE” for a discussion about important stability parameters.

In case of questions please feel free to contact your RF-SUISSE representative or use our tech@rf-suisse.ch email for support.

The above not only applies to our modules but to all our reference sources, desktop or wall-mount or rack-mount, too. Especially in a laboratory environment we strongly suggest to have a 1PPS distribution with an external GPS receiver and antenna.

RF-SUISSE provides the following GPS guided crystal oscillator based references:

Modules		Enclosure	
RS-GGO10-T2	TCXO based, 1PPS input	RS-CGGO10-T	connectorized RS-GGO10-T2 with GPS
RS-GGO10-T2G	TCXO based, GPS receiver	RS-CGGO10-O-GPSx-yyy	connectorized RS-GGO10-O with GPS
RS-GGO10-T3P	high performance TCXO, 1PPS input	RS-CGGO10-O-PPS-yyy	connectorized RS-GGO10-O with optical 1PPS
RS-GGO10-T3G	high performance TCXO, GPS receiver	RS-MRGGT10	Small TCXO based laboratory reference, GPS or 1PPS
RS-GGO10-O	OCXO based, 1PPS input		
RS-GGO10-OG	OCXO based, GPS receiver		

In addition RF-SUISSE also provides all required components to build a reference distribution system.

For the latest product information, datasheets and application information please visit our website at <http://www.rf-suisse.ch>

As we continuously improve our product we reserve the right to change published specifications without further notice. All product manufactured and sold by INWAVE AG under the RF-SUISSE brand is intended for laboratory use or are components (modules) not suitable for consumer use. Thus they are not required to and do not carry CE certification.

Except as noted otherwise all RF-SUISSE product is RoHS 5 compliant meeting the requirements as per the date of shipping.

Inquiries, quote requests and questions: please email to info@rf-suisse.ch or your RF-SUISSE representative. Technical questions please email to tech@rf-suisse.ch . Please use English or German if you email us.

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