



GSM options overview

Datawell - Oceanographic Instruments

GSM mode: SMS, dial-in, GPRS

The GSM link on Waverider buoys is a popular option, especially in near-shore applications. It offers instant and multiple receiving stations along the coastline, two-way communication and high data capacity.

The GSM option can be operated in three different modes: SMS, dial-in and more recent GPRS. Each mode has its own possibilities and users can switch mode.

An overview of all three GSM modes is presented in this technical note, to help select the most suitable mode for any particular application.

Hardware and Firmware

As mentioned, three modes are available: SMS, dial-in and GPRS. All share the same hardware on the side of the buoy, i.e. GSM antenna and GSM modem are identical.

However, two different firmware versions exist: one for SMS (e.g. Firmware version B) and one for dial-in and GPRS alike (e.g. Firmware version E).

On the receiving side the software also differs: gsmBuoy for SMS and iBuoy for dial-in and GPRS.

Each mode will be discussed below, after which an overview is given in a table.

SMS mode

In this mode the GSM modem in the buoy will connect to a GSM modem on your desk over the GSM network. Short text or data messages (SMS) are transferred and processed by gsmBuoy software running on your PC. Available messages are buoy status and directional spectrum messages.

Due to message length limitations, only compressed directional spectra with 27 frequency bins can be sent. Spectra are generated in the buoy at half-hourly intervals and spectrum messages are only sent when a new spectrum is ready.

Buoy status messages can be requested at all times. However, the buoy typically operates in "sleep mode" and powers down the GSM modem until the next half hour when a new spectrum becomes available. Therefore the buoy status response is also delayed until that time. Before power down, a few minutes are allowed for receiving SMS command messages, which are not immediately available on the GSM network. This impacts average power consumption.

In "active mode" the buoy will immediately respond to buoy status requests, but because of the increased energy consumption this mode is more useful for testing. The gsmBuoy software stores all messages in the XML-style waft-format and runs a TCP/IP service to make them available to e.g. W@ves21.

In case PC and desk GSM modem are switched off, the GSM service provider will buffer all messages.

At typically €0.05 or \$0.05 per text message and half-hourly messages the operational cost of this communication link amounts to €70 or \$70 per month. Some savings in terms of money and battery life can be made by extending the message intervals to up to 3 hours.



Photographs of earlier Siemens and later Telit GSM modems used in Waverider buoys.

As for the Siemens modem the particular model is critical. Check the label on the bottom side (area inside red ellipse).

Dial-in mode

In dial-in mode the buoy's GSM modem connects to the user's PC over the GSM network and the internet. No GSM modem on the desk is required. This time, as long as the user requires data updates, the PC should remain switched on since data is not buffered on the internet.

Due to larger bandwidth, full directional spectra of 64 frequency bins can be transmitted. Still, compressed directional spectrum messages are implemented as well. Even raw heave, north, west-displacement messages are possible.



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Actually half-hourly raw displacements messages, as contained in the RDT files on the internal data logger, or SDT files in case of half-hourly directional spectrum messages, are transmitted. Their respective message sizes are 14 and 0.5 Kbyte.

GSM dial-in is charged per minute, typically at €0.10/minute or \$0.10/minute. Merely a few seconds dial-in overhead are required for setting up a TCP/IP connection.

Once up and running an effective baudrate of 2400 baud is achieved. A month worth of half-hourly raw displacements messages amounts to 20 Mbyte and requires 1400 minutes transmission time.

Neglecting the overhead time the monthly cost totals to €140 or \$140.

Considerable reductions are possible by skipping the raw data, selecting compressed spectra and collecting several spectra in one transmission, however at the price of less data, lower data quality and a larger latency.

All types of GSM modems in Datawell buoys are capable of dial-in mode.

GPRS mode

GPRS is short for General Packet Radio Service. In this case the packets contain buoy data, but (sampled and compressed) speech and also SMS are packed in these same packets.

The same GSM network is used and often the same GSM modem can be used.

As a result, network coverage on the customer's buoy location and performance in their typical wave conditions remain identical.

However, there is one important difference: GPRS has lower priority than speech (dial-in) and SMS. But in case of missing data, it can easily be requested and collected at a later time.

GPRS is charged per Mbyte, typically €10 or \$10 for a one month data limit of 500 Mbyte. This limit largely suffices to transmit all data that comes available in the buoy in one month.

Furthermore it does not depend on the baudrate achieved. Hence the cost is fixed. Apart from the lower cost, there may be another reason to change to GPRS. Some mobile

networks in some countries have discontinued their dial-in service, in favour of GPRS.

Except for the early Siemens TC35i modem, all later GSM modems (Siemens MC55 and MC55i modems and Telit modems) in Datawell buoys can operate in GPRS mode.

Overview

The table below gives an overview of the three possible GSM modes. Due to its low cost and high data capacity GPRS mode is increasingly used. Switching between SMS and the other two modes requires a buoy firmware update. In general, firmware updates must be carried out by Datawell Service. Customers with a Siemens TC35i modem can still switch to GPRS by upgrading to a later GSM modem in the buoy. This may be done by customers themselves.

GSM mode	SMS	dial-in	GPRS
buoy modems compatible	all models	all models	only later models
buoy firmware	...B...	...E...	...E...
receiving hardware	desk GSM modem connected to PC	permanent running PC connected to internet	permanent running PC connected to internet
receiving software	gsmBuoy	iBuoy	iBuoy
directional spectrum (frequency bins)	only compressed (27)	full (64) and compressed (27)	full (64) and compressed (27)
raw heave, north, west timeseries	no	yes	yes
data availability	last half hour	all logged data	all logged data
average energy consumption	60 mW	20 mW	20 mW
airtime cost € or \$ @ half-hourly, all available data	70/month	140/month	10/month