

Introduction

Many RTK GPS users are already using **GSM** as the RTK data link between the reference and rover (in Europe we estimate that there are now more GSM users than radio modem users). However, for a few users, there is still some mystery around the use of GSM and the misconception that it is difficult to use.

This newsletter introduces the basics of using GSM as an RTK data link and then moves on to describe some more advanced features that even existing users may not be aware of.

The Basics

GSM (Global System for Mobile Communications) is a digital cellular radio network operating in over 200 countries worldwide. It provides almost complete coverage in Europe, and growing coverage in the Americas, Asia and elsewhere.

There are many advantages of using a GSM data link between the reference and rover instead of the more “traditional” radio modem data link. These include the fact that there is no limit to the range between the reference and rover to which the GSM data link can be used, there is no possibility of radio jamming from other users and a pair of GSM modems are cheaper to buy than a pair of radio modems.

The main disadvantage is of course that you must pay for time that the GSM network is being used. This cost is however always being reduced and some GSM operators now offer “special deals” such as reduced rates on frequently used numbers.

Don't forget of course that with a System 500 reference station you can use a GSM modem and radio modem simultaneously. This is possibly the “ultimate” reference station set up – use the radio when you are within radio range of the reference and switch to using the GSM when radio reception is not possible. No other GPS RTK system has such a neat solution.

The Hardware

The most commonly used GSM modem is the **Siemens M20** modem



(900MHz), which fits into a housing connected to the System 500 sensor.

This modem is being phased out by Siemens and will be replaced by the **Siemens TC35** modem (900 and 1800MHz), which will also fit into a housing and is planned to be available in September this year.

Alternatively, the **Wavecom WMOD2** and **M12000** series (900, 1800 and 1900 MHz) are currently available and fit into housings (article number **724643**).



Note, 900 MHz is the most common frequency range in Europe and the world. 1800 MHz is found in an increasing number of countries (including France, Germany, Switzerland and UK) and 1900 MHz is the only frequency used in the United States and Canada.

Take care to order the correct antenna for the GSM you are using (article number 667237 for 900/1800 MHz and 724642 for 1900MHz).

Whichever GSM modem you use, you will also need a SIM card. This is the same SIM card as you use in your mobile phone (which could be used in the RTK data link GSM modem). You must ensure that your SIM card is enabled to transmit data – contact your service provider to enable the SIM card.

Configuring the Sensor

From the **CONFIGURE\ Interfaces** panel (**CONFIG** and then **4 Interfaces**), access the **CONFIGURE\ Real-Time** panel and configure the port to which the GSM is attached by pressing **F5(DEVCE)**.

```
CONFIGURE\ Real-Time
R-Time Data: Rover▼
Data Format: Leica▼
Port : 1 *Siemens M20▼
Ref Sensor : Unknown▼
Ref Antenna: Unknown▼
Use Phase : YES▼
Radio Down : Don't Log Obs▼
CONT DEUCE
```

The **Siemens M20** and **TC35** and **Wavecom WMOD2** and **M12000** devices can be selected from the list of available devices.

Note, other GPS RTK Systems do not offer already defined devices – the user must always define their own.

Press **F1(CONT)** to return the **CONFIGURE\ Interfaces** panel and choose **F5(CTRL)**. This accesses the **CONFIGURE\ GSM Connection** panel.

```

CONFIGURE\ GSM Connection
Station      : Heerbrugg
Number      : 0041717274187
Protocol     : ISDN U.110
Accept Ref  : User defined
Ref Stn Id  : 0
NetDataRate : 9600 bps
Connelement: Non-Transparent
    
```

For both reference and rover the **PIN code** must be entered in order to use the SIM card. Press **F3(CODES)** to access the **CONFIGURE\ GSM Codes** panel and enter the PIN (and if required the PUK) codes.

On the rover it is necessary to enter the number of the reference station to be dialled. In the **CONFIGURE\ GSM Connection** panel open the **Station** closed list box and press **F2(NEW)** to create new GSM stations. Enter a station name, the number of the reference to be dialled, and the network protocol being used.

Note, it is possible here to enter the approximate coordinates of the reference station being used – the reason for this functionality will be explained later.

Using the GSM Data Link

After turning on the System 500 sensor, which is configured to be used with GSM, the sensor will initialise the modem and the message “**GSM initialised**” appears.

Pressing the **F4(CONEC)** button on the rover instructs the rover to dial the reference station. The GSM icon flashes as the connection is established and once the connection is made, the GSM icon is permanently displayed and the RTK data icon flashes to indicate the RTK reference data is being received.

Once the survey is complete or you wish to end the connection, press **F4(DISCO)**.

Note, the **F4(CONEC/DISCO)** buttons are available to be used in the **Main Menu**, the **SURVEY** panel, and the **Stake Out** panel. The use of these buttons allows easy and visible control of the use of the GSM data link.

If you wish to know the strength of the GSM signal being received, you can press the **STATUS** button and press **F5(DEVCE)**.

```

STATUS\ GSM
Firmware:    LEICA Simulation
Operator:    Swiss GSM
Status      : Registered (home)

Signal      : |-----|
    
```

Note that this status information is not available if the GSM connection is established and the rover is receiving RTK data from the reference. You must first end the GSM connection and then access the **STATUS** panel.

Other GSM Modems

What other GSM modems are supported by System 500? Could you for example use your own mobile phone connected to the System 500 sensor?

The answer is.... It depends.

System 500 communicates to GSM modems using AT commands. If your modem or mobile phone uses this command language then it is quite likely that this modem will work with System 500.

Note, many “popular” other modems are already supported with System 500 (the command lines needed to communicate with the GSM device are already supplied), but are not directly available in the list of supported devices. For example, the Siemens S25/S35i mobile phone can easily be used with System 500.

After pressing **F5(DEVCE)** in the **CONFIGURE\ Real Time** panel, highlight the ***GSM** device and press **F2(NEW)**. Enter a name for the new GSM device and press **F4(OPT)** to access the **CONFIGURE\ New Port Settings** panel.

```

CONFIGURE\ GSM Options
Type      : Siemens S25/S35i
Init 1    : AT&FE000V1X4S0=1\U0^M
           : AT+CMEE=0^M
Init 2    :
Dial      : ATD^#^M
    
```

In the **Type** line it is possible to select the modem you wish to use.

If the modem you wish to use is not in the list, then the correct command lines must be manually entered. These command lines can be found either from the modem's user manual or from the manufacturer.

You must also ensure that the correct cable is used between the GSM modem and System 500.

Note that the use of GSM is only directly supported on ports 1 and 3 of the System 500 sensor. This is because **Flow Control** is needed with the use of GSM – flow control is not possible with port 2. Refer to the Technical Reference manual for the pin layout of all ports on System 500.

More Advanced Features

There are many "more advanced" features available with the use of GSM modems on System 500.

- **Automatically select the closest reference station**

Some countries have now set up a network of reference stations where each of these reference stations can be dialled into by the user – Denmark for example has a network of around 50 stations.

When the user travels to a different part of the country to perform a survey, he will not always know which is the closest reference to the area in which he will be working.

For this reason it is possible on the rover to additionally enter the coordinates of a reference station when a new reference station is being created together with the name and number of the reference station.

```
CONFIGURE\ GSM Connection
Station      : Heerbrugg
Number       : 0041717274187
Protocol     : ISDN V.110
Accept Ref   : User defined
Ref Stn Id   : 0
NetDataRate : 9600 bps
ConnElement : Non-Transparent
CONT NEAR CODES SCAN
```

At the start of the survey and when a position is available, the user can now access the **CONFIGURE\ GSM Connection** panel and press **F2(NEAR)**. The **Station**, which is then closest to the user's current position, is automatically displayed in the **Station** prompt.

- **Transferring Station Information**

In such countries as described above where a lot of reference stations are available to be used, it may be useful to transfer all GSM stations from one sensor to another. This is possible by choosing **18 Modem/GSM Station List** from the **Transfer\ Menu** panel.

- **Sending Specific Commands to the GSM Modem**

In certain circumstances it is necessary to send specific commands to the GSM modem. For example you may wish to "lock" the GSM to use the services of a certain GSM service provider.

Note that this can be done on the GSM device itself if the device has a keyboard, but if the device has no keyboard (such as the Siemens M20) then this can only be achieved using AT commands sent from the System sensor.

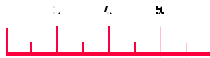
To do this, press **shift F4(CMD)** in the **CONFIGURE\ GSM Connection** panel to access the **CONFIGURE\ Command** panel.

```
CONFIGURE\ Command
Command: AT&FE=FF=??
CONT SEND CLEAR
```

The required AT command can now be entered and pressing **F4(SEND)** sends the commands to the modem.

Remember...

- It is simple to set up the System 500 to use a GSM modem.
- Many different GSM modems are directly supported with System 500. If the modem you wish to use is not directly supported, new GSM devices can be created using the necessary AT commands.
- Using GSM on System 500 is easy. The user is completely in control as to when the rover



should connect to and disconnect from the reference.

- No other GPS RTK System is as easy to use with GSM and offers so much functionality.