



# Singapore Satellite Positioning Reference Network (SiReNT)

Customer Handbook

Version 1.33

Chief Surveyor  
Survey Services  
Singapore Land Authority  
Office: 55 Newton Road #12-01, Revenue House, Singapore 307987  
Phone: (65) 6323 9829  
Fax: (65) 6323 9937  
Email: [SLA\\_Enquiry@sla.gov.sg](mailto:SLA_Enquiry@sla.gov.sg)  
SiReNT Helpdesk Hotline: (65) 6356 6546  
SiReNT Helpdesk Email: [sirent\\_help@gpslands.com](mailto:sirent_help@gpslands.com)

# Revision History

Date	Version	Description of Revision
1 Sep 2006	1.0	Original document
2007	1.2	Website address updated to <a href="http://www.inlis.sirent.gov.sg">www.inlis.sirent.gov.sg</a>
20 May 2008	1.3	Added PP-On-Demand info
4 Aug 2008	1.31	Changed "RINEX 2.1" to "RINEX 2.11"
3 Oct 2008	1.32	Added "Singapore time" to sections 2.1 and 2.2
29 Jan 2009	1.33	Updated SLA address @ cover page

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## **1. Introduction**

The intent of this Customer Handbook is to provide a reference for users to familiarize with SiReNT services. The document provides a brief overview of the most essential aspects of the service, from device configurations, through user sign up, to customer support.

Singapore Land Authority (SLA) make no guarantees, representations or warranties related to the SiReNT services, including but not limited to the NTRIP software, either expressed or implied. On other aspects, please kindly refer to the Terms and Conditions signed.

## 2. SiReNT Products

SiReNT offers following products:

1. Post-Processing (PP) On-Demand
2. Post-Processing (PP) Archive
3. Real Time Kinematic (RTK)
4. Differential GPS (DGPS)

To cater for end-users with basic requirements, we offer PP On-demand, PP Archive, RTK and DGPS.

### 2.1 Post-Processing On-Demand

Post-Processing On-Demand, or PP On-Demand in short, enables users generate GPS raw data of any SiReNT Reference Stations – the RINEX files (Version 2.11), from SiReNT website (<http://www.sla.gov.sg/sirent>).

Users need to log-in using the given Username and Password to access PP On-Demand. Users can download RINEX files as far as 12-months ago. However, only 24-hour RINEX files are allowed for each download.

To generate the specific RINEX files, users need to specify the date, Singapore time, Reference Station and data rate (1-second, 5-second, 10-second, 15-second, 30-second or 60-second) of the RINEX files to be purchased. Currently, we provide only dual frequency RINEX files.

Please note that RINEX will only be available 1 hour after the end of the hourly-block requested time period.

e.g. Data between 9am to 10am will only be available after 11am

Upon purchase, users will receive a zip file containing all selected RINEX files and the file details summarised in respective ASCII files. There will be broadcast ephemeris files if applicable.

For the purpose of establishing ISN (Integrated Survey Network) Survey Control Markers, Registered Surveyors are required to refer to the latest versions of *Guidelines and Specifications for GPS Surveys of ISN Markers* available on SLA Corporate website (<http://www.sla.gov.sg/html/new/new05.htm#survey>).

### 2.2 Post-Processing Archive

For users who need archived RINEX data which are not available for download from SiReNT website, you can submit application to us for

generating archived RINEX files of specific (Singapore) time period. This SiReNT Service is called PP Archive.

We are selling PP Archive data at 1 -month blocks with 1-second epoch rate. Users need to specify the months of data to be purchased in addition to company particulars.

### **2.3 Real Time Kinematic (RTK)**

Using SiReNT RTK, field operators can determine instantaneous positions down to centimetre-level using RTK-enabled GPS receivers with the incoming carrier-phased DGPS correction messages coming from SiReNT Data Control Centre (DCC) via GPRS.

Users need to log-in using the given Username and Password via NTRIP software installed on GPS Receivers to access SiReNT RTK. We provide both Single-Base RTK and Network RTK. Users are free to select the appropriate correction data stream.

Currently, SiReNT supports CMR and RTCM 2.1/2.3 RTK data.

The general good practice of RTK survey is applicable.

### **2.4 Differential GPS (DGPS)**

In SiReNT DGPS, field operators can determine instantaneous metre-level positions using DGPS-enabled GPS receivers with the incoming pseudo-range or code-based DGPS correction messages coming from SiReNT Data Control Centre (DCC) via GPRS.

Users need to log-in using the given Username and Password via NTRIP module installed on GPS Receivers to access SiReNT DGPS. We provide both Single -Base DGPS and Network DGPS. Users are free to select the appropriate correction data stream.

Currently, SiReNT supports RTCM 2.1/2.3 DGPS data.

The general good practice of DGPS survey is applicable.

## 2.5 Product Service Levels<sup>1</sup>

Positional Accuracy	
Horizontal Accuracy	RTK: 3cm @ 10km (95% confidence) DGPS: 1m @ 10km (95% confidence)
Vertical Accuracy	RTK: 6cm @ 10km (95% confidence) DGPS: 2m @ 10km (95% confidence)

Response Time	
Processing of User Account Application	5 working days
Generation of Post-Processing Archive data	5 working days

System Availability	
Service Availability	98%
Data Communication	Latency: <2 seconds Packet loss: <1%

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<sup>1</sup> Note:

1. The accuracies are based on good GPS observing conditions (i.e. good GPS configuration, good sky-view, clean site/environment, quiet atmospheric noise, good satellite geometry, etc.)
2. Outages due to scheduled preventative maintenance and performance improvements are excluded from the availability calculation.

## 3. Technical Information

SiReNT services are based on Trimble technology. However, SLA has ensured that open standards are adopted throughout the system. This section will provide a brief overview of the components of SiReNT Reference Station hardware, processing software and communications.

### 3.1 SiReNT Reference Station Hardware

Each of the 5 SiReNT Reference Station consists of the same hardware configuration:

- Trimble L1/L2 Choke Ring Antenna
- Trimble NetRS GPS Receiver
- Uninterrupted Power Supply
- ADSL Communication Links
- Cooling fan with thermal switch
- Lightning Protection Devices

### 3.2 Data Control Centre (DCC) Software

The software component of SiReNT Control Centre software is the Trimble GPSNet software package. GPSNet controls the network of 5 GPS Reference Stations to provide real-time corrections in both RTK and DGPS modes and RINEX data for Post-Processing. GPSNet also monitors the quality of the GPS data being received and the “health” of the network. Warnings and alarms are provided to the System Administrator which are then investigated and, if necessary, alerts sent to users.

### 3.3 Communications

There are several data communications mechanisms which connect various components in SiReNT:

- **Connect GPS Reference Stations to Data Control Centre (DCC):**  
The RTK Server, running the GPSNet software, communicates with the 5 GPS Reference Stations via ADSL by SingTel.
- **Transmit RTK & DGPS Corrections to field users:** Real-time GPS corrections (including RTK and DGPS) are sent to the suitably equipped users via wireless internet – GPRS.
- **Disseminate RINEX data to users:** RINEX data is available for downloads by users via SiReNT website (<http://www.sla.gov.sg/sirent>).



## 4. How do I access SiReNT services?

It is simple:

- Step 1: Submit your application
- Step 2: Acquire suitable devices
- Step 3: Subscribe to GPRS data plan

### **Step 1     Submit your application**

#### **Where can I find the Application Form?**

Application Forms are available as follows:

- For download over the Internet at:  
<http://www.sla.gov.sg/sirent>

If you do not have an existing GIRO account with SLA, you need to submit the Direct Credit Authorisation Form together with application form.

#### **Who can submit the Application?**

If the Applicant is a company, the company should designate 1 or 2 Contact Person(s) who will complete and submit the Application Form.

The Contact Person(s) will also be the SLA's and System Vendor's single point of contact for Service information, such as:

- Application queries/issues
- Accounting queries/issues
- Reporting
- Service broadcast messages
- Username and password policies

The Contact Person(s) is/are required to provide particulars and information requested by SLA upon signing up SiReNT services.

#### **How is the Application submitted?**

The Application Form is submitted via mail, post or hand-delivery to SLA with following contact information:

Survey Services  
Singapore Land Authority,  
55 Newton Road #12-  
01 Revenue House

Singapore 307987  
Phone: (65) 6323 9829  
Fax: (65) 6323 9937

Application Form has to be submitted together with cheque for fees payable when necessary.

If you do not have an existing GIRO account with SLA, you need to submit the Direct Credit Authorisation Form together with application form.

### **What happens after I apply?**

SLA will review the application and will either approve it or request for more information. When the application has been approved, System Vendor will contact the Applicant with their subscription status and any other information required.

In addition, SLA and System Vendor will also review user's proposed GPS receiver hardware/firmware to ensure that it has been tested or validated and inform the Applicant of any follow-on procedures.

## **Step 2 Acquire suitable devices**

Users need to have compatible GPS equipment and mobile handset if any. Once the Applicant receives acknowledgement that their application for the service has been accepted and they have received the UserID(s) and Password(s), the Applicant can now decide on a GPRS-enabled Mobile Handset and GPRS data plan which satisfies their operational needs.

Users can refer to SiReNT website at <http://www.sla.gov.sg/sirent> for the list of compatible GPS receivers.

## **Step 3 Subscribe to GPRS data plan**

Users can subscribe GPRS data plans provided by any Mobile Operators in Singapore, e.g. SingTel, M1 and StarHub. However, SLA does not guarantee the availability issues caused by the Mobile Operators.

### **Which Data Plan should I purchase?**

This depends on how much you plan to use the services. A good rule-of-thumb is:

*One hour of RTK data access, using the RTCM2.3 or CMR data formats, is equivalent to 0.5MB of GPRS data*

### **Should I do anything to my Mobile Handset?**

Users must ensure that the following procedures have been carried out before using the service:

- The GPRS service has been activated on the Mobile Handset
- SiReNT network domain including IP Address and Port Number has been provided to you
- Username(s) and password(s) have been provided to you

## 5. What do I need to access SiReNT services?

### 5.1 Mobile Handsets

Users have to ensure their Mobile Handsets can operate with their GPS Receivers in various modes (e.g. cabled, Bluetooth, etc.).

### 5.2 NTRIP Client Software

The NTRIP protocol is a new standard that defines a protocol for streaming real-time DGPS correction data or other kinds of Global Navigation Satellite System (GNSS) data to stationary or mobile users over the Internet. The standard is named for the widely used RTCM data format, but it can also be used for other data formats. Documents describing the standard fully are available from the RTCM organisation at <http://www.rtcn.org>.

Various versions of NTRIP client exist for different operating systems (e.g. Windows, Pocket PC, Java, Linux, etc.). Also, some of the newer GPS receiver models have the NTRIP client software integrated into the controller software.

### 5.3 GPS Receivers

The list of GPS Receivers capable of operating in DGPS or RTK mode provided on the SiReNT website have been tested with a number of handsets and in a number of operating modes (e.g. cabled, Bluetooth, etc.) and are considered acceptable for use with SiReNT services.

## **6. How do I pay for my SiReNT services?**

It is simple. All you need is an approved GIRO account with SLA.

Upon signing up for SiReNT services, users would have submitted the GIRO Application Form together with fees payable, i.e. Application Fee and first month subscription fee(s), by cheque. Users will pay for subsequent monthly subscription fee of SiReNT services by GIRO.

### **How do I check and pay my bills?**

The SiReNT's Statement of Account will be updated daily. You can always log-in to SiReNT website to check your current month's data usage up to the day before. The 7<sup>th</sup> day of every month is the payment due date for monthly charges of the previous month. Please kindly ensure there is sufficient fund in your designated bank account for GIRO deduction.

### **What if there is no sufficient fund in my account?**

Please ensure that there is sufficient fund in your account for GIRO deduction to avoid late payment interests. If the GIRO transaction fails, a notice will be sent to the users. Late payment interests will be charged to the next month's bill.

## 7. Customer Support

### 7.1 Customer Support Operating Hours

Monday – Friday: 9am – 5pm

### 7.2 Problem Resolution

All technical issues and questions related to SiReNT services (except GPRS connection) should be reported (within operating hours) to the System Vendor at:

Helpdesk Hotline: (65) 6356 6546  
Helpdesk Email: [sirent\\_help@gpslands.com](mailto:sirent_help@gpslands.com)

Any issues and enquiries pertaining to sale should be reported to SLA at:

Rashid Md Noor  
Survey Services  
Singapore Land Authority  
Phone: (65) 6325 6071  
Fax: (65) 6323 9937  
Email: [Rashid\\_Md\\_Noor@sla.gov.sg](mailto:Rashid_Md_Noor@sla.gov.sg)

Issues related to GPRS and internet connection and availability should be reported to your respective Service Provider of GPRS.

### 7.3 Customer Feedback

We would like to hear from you if you have any feedback so that we could improve our services to you. Customers can go to <http://app.sla.gov.sg/fee/fee01.asp> for feedback.

### 7.4 System Maintenance Notification

Scheduled maintenance downtime will be announced to the Applicant Forty-eight (48) hours in advance.