Geo++® SSR2OBS - Online Help

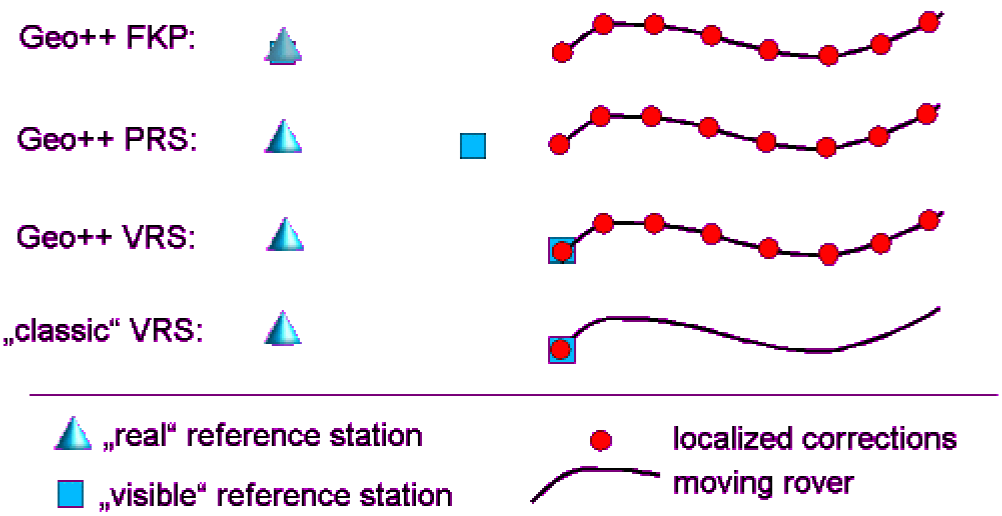
SSR2OBS - General Overview

SSR2OBS is a utility to convert state space representation (SSR) GNSS corrections to observation space representation (OSR) GNSS corrections to be used in GNSMART.

There are dufferent concepts to model distance dependent error (see for more details also RTCM_OUT). One has to distiguish between

- the "real" physical reference station and its coordinates
- the "visible" reference station and its coordinates
- the localized correction or individualization of corrections

furthermore the update of the visible reference station's coordinate in the correction stream is for kinematic applications relevant.



The update of the visible reference station's coordinates is a functionality, which must be supported by the rover algorthym and may cause a complete reset of the rover ambiguiy resolution.

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Program request

ssr2obs -i[=]*address* [options]

SSR2OBS reads an SSR data streams and converts it to legacy RTCM messages. Several SSR formats are supported.

Remark on the former spitted functionality between SSR2OBS and SSR_IN, which is not supported and recommended anymore:

The combination of SSR2OBS and SSR_IN uses a shared SQLite database in the background. Therefore an ODBC interface to support access to the SQLite database files must be present. A GPPSQLiteODBCInstaller for Windows is provided together with the SSR2OBS executable. In between, SSR2OBS is a standalone program allowing the former SSR_IN functionalities.

The conversion from SSR to OSR has to apply certain models like site displacement at rover site, which are generally not transmitted in the SSR correction stream. These additional corrections are generally the correction models which are applied on server side during the generation of the SSR corrections. However, some of the corrections applied on the server can be ignored or substituted by comparable models at the rover side depending on positioning accuracy requirements. The SSR2OBS currently re-introduces or optionally re-introduces:

- a solid earth tide model (default, always applied, please check for handling of permanent earth tides)
- (ocean loading, support in preparation for static applications)
- a standard tropospheric model (default, always applied)
- satellite PCV (option -atx_sv=)
- 15P transformation from ITRF to ECEF (option ssrdatum= , refdatum=, and -datumdef= with a dat-file)

The supported messages for GPS and GLONASS are currently listed below. The RTCM message type (MT) or Geo++ proprietary RTCM message type (Geo++ Experimental messages) are given in brackets.

SSRZ messages (with RTCM 4090 framing)

- SSRZ High Rate Correction (4090.7.1)
- SSRZ Low Rate Correction (4090.7.2)
- SSRZ Gridded Ionosphere Correction (4090.7.3)
- SSRZ Gridded Troposphere Correction (4090.7.4)
- SSRZ Satellite dependent Regional Ionosphere Correction (4090.7.5)
- SSRZ Global VTEC Ionosphere Correction (4090.7.6)
- SSRZ Regional Troposphere Correction (4090.7.7)
- SSRZ QIX Bias Correction (4090.7.8)
- SSRZ Time Tag (4090.7.9)
- SSRZ Satellite Group Definitions (4090.7.11)
- SSRZ Metadata Definition (4090.7.12)
- SSRZ Grid Definition (4090.7.13)

Remark: SSRZ requires no SSR_IN nor any SSR_IN options.

Standardized RTCM-SSR messages (combined MTs not supported)

- SSR satellite Orbit Correction (1057, 1063)

- SSR Satellite Clock Correction (1058, 1064)
- SSR Satellite Code Bias (1059, 1065)
- SSR High Rate Clock Correction (1062, 1068)
- SSR User Range Accuracy (1061, 1067)

Proposed RTCM-SSR messages:

- SSR Satellite Phase Bias (1265, 1266)
- SSR Vertical TEC Ionosphere Spherical Harmonics (1264)

Geo++ Experimental Messages for SSR:

- SSR Ionosphere Regional Slant TEC (4090.4.1)
- SSR Compressed Gridded Troposphere Correction (4090.5.1)
- SSR Grid Definition (4090.4.0)
- SSR Region Definition (4090.4.4)

Remark: The Geo++ 4090.4 are not maintained further and have been substituted by the SSRZ messages.

RTCM-Transformation messages (read, but not applied as of status 2018-05-24):

- Service CRS (1300)
- 15P Transformation (1301)

The dependency on DLLs is dynamic and may change with software versions. Required DLLs as of status 2023-03-17:
condev.dll
dbtrafo.dll
gn_ip_org.dll
gpp_astro.dll
gpp_ip_dll.dll
gpp_leapsec.dll
gpp_ssr_db.dll
gpp_ssr_geom.dll
gpp_sys_dll.dll
gpp_tides.dll
gpp_time.dll
gppparser.dll
os2win32.dll

Remarks: Generally, a NMEA GGA message is required to define the time and the position for the SSR to OSR conversion.

(Obsolete (see option **+syst**): Currently a NMEA ZDA is required for time synchronisation!)

Currently the gpp_leapsec.dll must not be older than 6 months!

Functionality of SSR_IN has been enabled in SSR2OBS. See option ssr_in::.

Options

-?

output the usage of the program.
Lists a short usage and options with parameters.

-d

debug off.

-debug[=]*n*

enable debug output, n is bitmask for different debug info.

Short Descrition	n	Remark
Epoch	1	
SsrStore/SsrSets	2	
Ephem	4	
Ssr2Osr	8	
Osr2Dgp	16	
Osr2Rtcm	32	
GGA/ZDA	64	
RTCMEpoch	128	
Gpsd	256	
GNIP	512	
SSRZ/RTCM3IN	1024	
SSZ_decode	2048	
GNS2O	4096	SSI output
GNSS_OBS	8192	
LBand	16384	
NVRam	32768	

The option allows to view the content of each message. For example -debug=129 (128+1) shows the Epoch and the RTCM Epoch. A typical value for debug output is 2049.
For the comma separated SSI (state space influence) output and additional SSRZ analysis in the debug file, the value of 6245 is typical. See example of SSI output.

Hints for debug interpretation (see also Return Codes):

- "ThreadFuncDoConv() ep_wnt=*wwww,ssssss.sss* gstates_wnt=-1,0.000"
  means that epoch week *wwww* second *ssssss.sss* is requested but not current SSR epoch is available (week -1, second 0.000).
- "WARNING: ThreadFuncDoConv() failed, rc=-20"
  indicates, that the 15 s default difference between GGA and SSRZ real time data is exceeded. Check for GGA leap seonds or use oprion -maxa
- "Warning, decoded wrong number of bits: *xx*!=*yy*"
  means the the number of bits *xx* does not fit the expect number *yy*. Most likely a unknown or changed message.

Hint for **Android** version:

The SSR2OBS App output is accessible, when an Android logging is set: adb logcat | grep 2SO .

-dly[=]*x.x*

startup delay [0.0] s.
The start of the program may be delayed on startup for test purposes.

-dgp[=]*NAME*

enable Shrd DGP output with name NAME.
Some GNSMART modules use a DGP structure for exchanging GNSS data. The OSR conversion of SSR2OBS provides in a DGP structure for GNNSMART1, which can then be used by other GNSMART programs like GNRT or GNNET. The shared DGP structure is an essential output of SSR2OBS in a GNSMART1 environment. For other GNSS rover configuration the output of legacy RTCM messages is required (see option **-rtcm**)

-i[=]*address*

rover pos and time from GGA+ZDA input [tcp_addr:port, port, comX,...].
The option with at least a NMEA GGA content is mandatory, i.e. is an essential parameter.

The conversion from SSR to OSR requires two external information: time synchronisation and a position.

The time synchronisation can be managed with the absolute time information from a NMEA ZDA message, which is generally configured in a GNSS rover or generated by e.g. the Geo++ module NAV_OUT. The absolute time information is required as the GGA time information is redundant within one day. Alternatively, the computer time can be used with option **+syst** for absolute time resolution within half of a day. However, the +syst option requires the correct time setting of the computer hardware.

The conversion to OSR must have a position at which the OSR corrections are computed from the SSR data. The position is provided via a NMEA GGA messages. See also option **-rupd** to use only the first position received by a GGA (default setting). The position can be overwritten by the option **-rfix**.

```
NMEA GGA - Global Positioning System Fix Data
Time, position and fix related data for a GPS receiver.
NMEA ZDA - Time & Date
UTC, day, month, year and local time zone.
```

GGA input server and RTCM output server can operate on the same connection (defined with the -i option).

If the input device is a **TCP/IP server**, then *address* is the TCP port number on which the receiver input module is listening as a TCP server process (the other side is a TCP/IP client, sometimes also called "active TCP sensor connection"). *address* must be a at least 4-digit number `nnnn`. After connecting to a client, the program restarts itself as a new server process to wait for the next client.
Example: -c=8001

If input device is a **TCP/IP client**, then *address* is the IP address and TCP port number to connect to (the other side is a TCP/IP server, sometimes also called "passive TCP sensor connection"). The format for *address* is `n.n.n.n:nnnn`, where `n.n.n.n` is the numerical IP address and `nnnn` is the TCP port number of the server where the SSR2OBS client wants to connect to.
Example: -c=168.192.2.17:8001
Instead of the numerical IP address `n.n.n.n` also a hostname can be given.
Example: -c=comserver.company.com:8001

-glo[=]*xxx*

introduce GLONASS observation biases for GLO Class xxx (use -glo=? to show possible GLO classes xxx). (not active)
Please note: -glo=xxx option is still without function. Data output is always GPP GLONASS bias class (resp. bias class of SSR generating GNNET).

-maxa[=]*x.x*

max SSR age [15.0].
The incoming correction stream is checked concerning the age of the data. The maximium age of the SSR correction to be used by SSR2OBS can be changed with the option. The default timing option are chosen to work, unless bad SSRZ input is present or a very old ssr2obs version (before 2024) is used.

-mina[=]*x.x*

min SSR age [-5.0].
The incoming correction stream is checked concerning the age of the data. The minimum age of the SSR correction to be used by SSR2OBS can be changed with the option.
GNSS correction services may work with prediction of corrections, which corresponds to negative timing arguments.

-minsv[=]*n*

minimum number of SVs per GNSS [2].
A check is performed for the number of satellites per GNSS in the input data. Only epochs containing *n* satellites are used and provided in th eoutput of SSR2OBS.

-o[=]*address*

RTCM output address (if different from input).
Typically the output of SSR2OBS is send over the same channel receiving NMEA positions. The configuration is comparable to a NTRIP caster application. The option enables a different output channel.
The option supports also the output to a file (-o=filename.rtc) (2016-09-05: to be verified; hourly files not supported).
See also **TCP/IP server and client** remarks under option -i.

-oss[=]*port*

RTCM output simplex server port number.
RTCM output server and GGA input server can operate on the same connection. The simplex server allows for different clients.

-sm

enable shared memory Ephemeris.
The option supports interaction with other GNSMART modules. By default no shared memory structure is generated by SSR2OBS. The option will create a new GNSMART shared memory structure. The old GNSMART1 shared memory structure is currently not supported.

-ssrdatum[=]*NAME*

assume SSR is in datum NAME.
SSR data are generally defined in an ITRF realization. In RTCM the term "Service CRS" is used to specify the source datum. The option can define the Service CRS name explicitly. See also option **-refdatum** to define a user datum or target datum as well as option **-datumdef** to define transformation parameters.

The functionality might be substituted/augmented in the future by a message in the data stream (e.g. RTCM Service-CRS and RTCM-CRS MT).

+syst

assume system time being correct to a few minutes (then NMEA ZDA not required).
By default a NMEA ZDA message is expected to absolutely synchronize the time information. With this option, the absolute time is retrieved from the operation system (computer) time of the system running SSR2OBS. The system time has to be synchronized to GNSS, but must only be accurate to about half a day to resolve week ambiguities to the corresponding day. Often this task is done with the RCVR_IN modules (see option **-t0** for details). For operation on a GNSS rover, the use of a NMEA ZDA message is recommended.

-rdist[=]*n*

distance of virtual reference from user position [100m].
By default the position used to transform SSR data to OSR is used with an offset of 100 m in North direction. A distance of n=0 m must be defined, if the actual NMEA GGA position should be used. The localization/individualisation is set with option -rupd. The change of the visible reference station coordinate is set with option -VRS.

Do not use the option when setting up SSR2OBS, because the default settings are suitable for most GNSS rovers (this holds for -rdist=, -ro= and -re=).

-re[=]*x*

output epoch time offset to last GGA [1.0].
The time offset set by this option is added to the time of the output of legacy RTCM corrections**.**

Do not use the option when setting up SSR2OBS, because the default settings are suitable for most GNSS rovers (this holds for -rdist=, -ro= and -re=).

-refdatum[=]*NAME*

datum for DGP/RTCM output.
The SSR conversion to OSR can apply a datum transformation to the user datum or target datum. In Europe a common transformation from the Service CRS (generally an ITRF realization) to ETRF89 is useful. In RTCM the two coordinates systems are often termed source and target system, which are necessary to define a proper transformation. With option **-ssrdatum** the Service CRS (or source system) can be defined and with this -refdatum option the target system. The *NAME* strings must exactly match the information given within option **-datumdef**.

The functionality might support in the future messages in the data stream (e.g. RTCM Service-CRS/RTCM-CRS, 15P Transformation MTs).

-ri[=]*x.x*

output interval [1.0].
The output interval is not independent from the received NMEA GGA stream. RTCM corrections are only provided for the time of an NMEA GGA event. The options is therefore useful to reduce the update interval in case of higher frequency NMEA GGA messages or to have update intervals longer than 1 sec.

-ro[=]x.x

output offset to last GGA [0.8].
The output of legacy RTCM corrections (see option **-rtcm**) is triggered to be 0.8 after receiving the NMEA GGA string. This option can affect the GNSS rover prediction algorithm as the delay of the actual timing can be kept small. The option can be combined with option **-re**.

Attention: the offset depends on the rover algorithm/processing. A good starting point is the default. The option must be adjusted, if the rover does not accept and does not apply the GNSS corrections for positioning.

Do not use the option when setting up SSR2OBS, because the default settings are suitable for most GNSS rovers (this holds for -rdist=, -ro= and -re=).

-rtcm

enable RTCM output.
The input RTCM-SSR data are written as RTCM3 messages (individualized for a position) to a selected output. The output can be either a file, a RTCM output address (option **-o**) or a RTCM output simplex server port number (option **-oss**). Currently the RTCM3 messages 1006, 1008, 1033, 1230, 1012 and 1004 are generated per epoch.

-rtcmmsm

enable RTCM MSM output (with SSRZ input only).
The input RTCM-SSR data are written as RTCM3-MSM messages (individualized for a position) to a selected output. The output can be either a file, a RTCM output address (option **-o**) or a RTCM output simplex server port number (option **-oss**). Currently the RTCM3-MSM4 messages 1074, 1084, 1094, 1104, 1114 and 1124 might be generated per epoch.
Alternatively, option **-rtcm** for leagy RTCM3 messages can be used.
The option works currently only for SSRZ input data (RTCM 4090.7 input).

-rtcmid[=]*n*

set RtcmReferenceStationId to n for RTCM output [0=auto].
The Reference station ID is part of the RTCM MSM messages. The default setting can be overwritten with the option.

-rupd[=]x.x

update virtual reference position at least every x.x s or not at all [-1.0s].
The -rupd triggers the localisation or individualization of the corrections. This means, that the corrections are optimized for the actual location of the rover and are not generated for a fixed location. If an argumen greather than 0 is given, the localisation/individualisation for a kinematic rover is activated.
The first position provided by a NMEA GGA is used as the position for the visible reference station coordinates in the correction stream to compute the OSR correction. Then the NMEA GGA position updates are used every x.x s to localise/individualise the corrections, when also a significant spatial change is detected (some 10 meters).
In kinematic applications the functionality is mandatory, so the position for the computation of OSR correction is following the actual kinematic rover. An example for a highway driving application: an argument of 30.0s will update the GNSS correction position (not the transmitted reference coordinates) about ca. every 1km assuming a speed of 120km/h.

The visible reference station coordinate in the RTCM correction stram is not updated. See also option -VRS with respect to changes of the reference coordinates.

This special argument -1.0s disables the localisation/individualisation of the corrections completely.

A continous generation of the OSR is obtained, if the first NMEA GGA position is used. E.g. a jump in the rover position due to a false fixing is not affecting the generation of the GNSS corrections. For a static applications, this is recommended.

-datumdef[=]*FNAME*

datum trafo defined in file FNAME.
The file *FNAME* contains transformation parameters. Generally a 15 parameter transformation is applied. The file format is identical to the corresponding GNNET/GPPNET option **-DAT**. The "FROM" and "TO" entries must exactly match the options **-ssrdatum** for Service CRS (or source system or FROM) and option **-datumdef** for the user system (or target system or TO).
The functionality might be substituted/augmented in the future by a message in the data stream (e.g. RTCM 15P Transformation MT).

Hint for **Android** version:
A pre-difined dat-file with the name sysdatum.dat is used in the Android version. Within the sysdatum.dat pre-defined FROM=USERSYS TO=SSRSYS is used. The transformation parameters can be edited. The FROM= and TO= must be the default and fixed values USERSYS and SSRSYS. For an ITRF2014 to ETRF200 transformation, the Android sysdatum.file reads:

```
#
# Datum Definition File, Translations in [cm], Rotation in [mas] Scale in 10**(-8)
#
# Caution: Despite ssr2obs applying an ITRF2014 to ETRF2000 transformation, it requires opposite transformation definition here!
#        (inversion is done by ssr2obs internally)
#
# latest ETRF + ITRF
# FROM=ETRF2000 TO=ITRF2014 T0=2000.0 DX=-5.37 DY=-5.12 DZ=5.51 RX=-0.891 RY=-5.390 RZ=8.712 S=-0.102 DXDOT=-0.01 DYDOT=-0.01 DZDOT=0.19 RXDOT=-0.081 RYDOT=-0.490 RZDOT=0.792 SDOT=-0.011

# actually use this transformation (modify if needed, a new/update SSR2OBS App won't override your changes -- hopefully)
# SSR2OBS is hard-wired to use the fixed system/datum names:  'USERSYS' + 'SSRSYS'
FROM=USERSYS TO=SSRSYS T0=2000.0 DX=-5.37 DY=-5.12 DZ=5.51 RX=-0.891 RY=-5.390 RZ=8.712 S=-0.102 DXDOT=-0.01 DYDOT=-0.01 DZDOT=0.19 RXDOT=-0.081 RYDOT=-0.490 RZDOT=0.792 SDOT=-0.011
```

The file can be manually updated. The file is located in an Android folder of the App. The location might differ due to mobile phone manucaturer and Android version. For Samsung, the location was *\Android\data\de.geopp.android.ss2obsdemo\files.

-ont

enable fake NTRIP server on RTCM output server.
Option intended for testing purposes.

-n[=]*name*

set GN_IP rcvr_id to name (default: shrd DGP name or TCP/IP output server port or process PID).
GNSMART uses a specific GN_IP messages system which requires to identify the application. One part of the identification is the rcvr_id. The option is only required in combination with oher GNSMART modules.

-nognip

don't start GN_IP thread (implies '-C' argument).
GNSMART modules communicate via the so-called GNIP system, which needs a registration of the module. The option does ignore the GNIP system. It is recommended for the use without additional GNSMART modules.

-C

do not connect to GNMAIN.
GNMAIN is a GNSMART utility program.It requires a registration of every module in the so-called GNIP system.GNMAIN shows shows allmodules registered to GNIP. It is recommended for the use without additional GNSMART modules.

-rfix[=]*B,L,h*

fixed virtual reference position [deg,deg,m] with B = latitude x.xxxx, L = longitude x.xxxx, h = ellips. height.
The option overwrites the position received by the NMEA GGA stream. The GGA stream is still required to trigger the correction update rate (see option **-ro**). The coordinate given with the option is used for the individualization of all corrections and the RTCM 1005/1006 output.

-g

disable GLONASS data output.
The option is for test purposes and disables the output of GLONASS in the generated RTCM3 data stream.
See also option **-dis-**.

-1029dbg[=]*n*

enable ssr2obs epoch status output via RTCM 1029 UTF8 message [0].
RTCM allows to send Unicode Text String messages. The MT 1029 is used to provide SSR2OBS epoch status information in the output stream.

-ptides[=]*n*

include permanent tides' influence in output [0|1], default is 0.
The earth tides are applied by default. The earth tide model stated in the IERS convention is applied. There are different strategies to consider the permanent earth tides (for details also see the IERS convention). The earth tide model should correspond to the setting in the GNSS correction computation on the server side. For more details see GNNET option PERMTIDE.
The impact of the earth tides is re-substituted in the OSR.

-tropo[=]*n*

which troposphere model to use [2|3|4|5|25|35|45|55], default is 45.

2
3
4
5
25
35
45
55

For details see GNSMART SSR ACSII documentation, section global troposphere.

-of[=]*nnnn*

overrun flush' when input has more than nnnn bytes pendings [8000].
Additional flush memory for pending data. Can be set to 0 in case of realtime data streams.
The options -of, -bf and +av are affecting each other and are highly depending on the actual individual application characteristic (client hardware, communication link). Therefore, they have to evaluated together and case dependent.

-bf[=]*nnnn*

busy flush' when input not idle for nnnn milliseconds [7000].
Store flush memory for nnnn millseconds for an active input, means data is streamed continuously. In case of an inactive input the memory will kept stored. Can be decreased for real-time data streams to get faster the latest data.
The options -of, -bf and +av are affecting each other and are highly depending on the actual individual application characteristic (client hardware, communication link). Therefore, they have to evaluated together and case dependent.

+av[=]*x*

auto-vacuum SDB database every x seconds [300] (0=disabled).
The database should be cleared regularly to release the memory. During the database action "vaccuum" the dataflow is stopped. In case of data gaps due to the vacuum decrease the interval.
The options -of, -bf and +av are affecting each other and are highly depending on the actual individual application characteristic (client hardware, communication link). Therefore, they have to evaluated together and case dependent.

Recommended setting is +sdbpurge=90,-2,-2 together with option +av=121.

+sdbpurge[=][*x*[,*i*[,*j*]]]

delete content older than x seconds from SDB database. Delete content older than x seconds from SDB database with:

x seconds after end of SSR validity (maximum age) [300]
i SSR Provider ID, -1:auto, -2:all [-1]
j SSR Solution ID, -1:auto, -2:all [-1]

In case of data gaps decrease the maximum age x and delete all data.

Recommended setting is +sdbpurge=90,-2,-2 together with option +av=121.

-atx_sv=FNAME

read Satellite Antenna PCV corrections from file: FNAME.
The satellite antenna phase variations are read from an ANTEX file and are applied in the conversion from SSR to OSR.
The impact of the satellite PCV is re-substituted in the OSR.

Hint for operation **without** using **-atx_sv**:
If the satellite antenna phase variations is not re-substituted at rover site, the option -ATX_SV=igs20.atx in the GPPNET network configuration should be changed to -ATX_SV_0=igs20.atx to compensate the major offset differences.

Hint for **Android** version:
A pre-defined ANTEX file with SV corrections only and name igs14.atx is used in the Android version. It can be manually updated. The file is located in an Android folder of the App. The location might differ due to mobile phone manucaturer and Android version. For Samsung, the location was *\Android\data\de.geopp.android.ss2obsdemo\files.SSRZ input Options

-dis-XXX

disable GNSS: XXX one of [GPS,GLO,GAL,BDS]
The option allows to reject specific GNSS from the OSR output.

-rtcmres

enable RTCM Network Residuals messages (experimental).
RTCM Network Residual messages describe the quality of the correction data. The data can be used to do an observation weighting.

-quiet

be more quiet on stderr.

SSRZ Input Options

-z[*n*]=*address*

activate SSRZ mode and connect to SSRZ server address [tcp_addr:port].
Use n={0..9} if you want to run multiple SSRZ input channels.
Warning: data on all channels will be merged and must be 'coherent'!

The address and port of the incoming SSRZ correction stream is specified.
See also **TCP/IP server and client** remarks under option -i.

-zid=*name*

gives the SSRZ input a name (used also for storage of metadata and crypto keys).

-N[*n*]=*name*[,*user:pwd*]

select SSRZ NTRIP source name with User:Password.
Use n={0..9} if you want to run multiple SSRZ NTRIP input channels.
In combination with option -z, the credentials for the NTRIP access are defined.
With the [n] feature in the option name, multiple inputs can be configured (eg -N1=).

-MC[*n*]=*group-addr*[,*if*]

join UDP multicast group on specified interface.
Use n={0..9} if you want to run multiple UDP input channels.
(to be used with '-z=portnumS'), with:

group-addr - multicast address
if - network interface IP address []

With the [n] feature in the option name, multiple inputs can be configured (eg -MC1=).

-dbcz[=]*x.x*

detect broken ssrz input connection feature, timeout [s], default 0=disabled.
In a bi-directional communication link a broken connection can be detected, if data is send and expected in bothe directions. If data is send only in one direction (often a broadcast from a server), a brocken connection is not detected by the applications and often an operating system timeout finally detects the broken link. SSRZ is a broadcast format and no continuous information must be send to the server. To overcome this problem, the option can send a kind of "stay alive" message.The interval of the message can be configured in seconds.
See also option -dbce for the ephemeris input.

-dbce[=]*x.x*

detect broken ephemeris input connection feature, timeout [s], default 0=disabled.
The same functionality as for option -dbcz, but for the ephemeris input.

-eph[*n*]=*address*

read ephemerides messages from server address [tcp_addr:port].
Use n={0..9} if you want to run multiple input channels.
RTCM3 ephemeris messages are supported as input format.

With the [n] feature in the option name, multiple inputs can be configured (eg -eph1=).

The conversion of SSRZ messages requires ephemeris from the GNSS. The ephemeris can be provides by any RTCM3 stream. The RTCM3 ephemeris cam also be part of the SSR data input stream to SSR2OBS.

In GNSMART2 the ephemeris structure can be configured. Alternatively a shared memory structure can be set up (see option -sm) or other GNSMART program can provide the ephemeris structure.

See also **TCP/IP server and client** remarks under option -i.

Note: Although it is seldom required, the -eph option can also used to as an input for RTCM MSM data from rover to support ionospheric aiding with the option -IA.

-NE[*n*]=*name*[,*user:pwd*]

select Ephemeris NTRIP source name with User:Password.
Use n={0..9} if you want to run multiple input channels.
The option allows to access ephemeris from an NTRIP caster.
With the [n] feature in the option name, multiple inputs can be configured (eg -NE1=).

-meta[=*dir*]

enable metadata storage/cache at filesystem path 'dir', default='.\s2odata'.

The -meta option can store and use the SSRZ leap seconds message, which allows an automatic update. A manual update is also possible. The corresponding quasi standardized leap-seconds.list file must be updated or modified. The format of the leap-seconds.list is the the IERS leap second file format.

SSRZ Processing Options

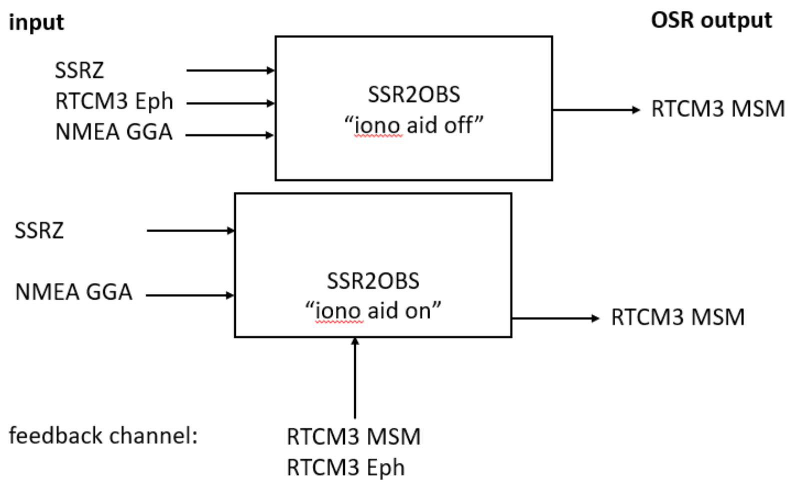
For a typical RTK network with interstation distances of 70 to 120 km no specific interpolation option is required. The application of SSR2OBS should work with the internal default settings. For sparse RTK networks with larger the interstation distances, the option for the interpolation have to be adjusted.

-IA[=]n

set iono-aiding mode [0|1], default is 0.
Activate ionospheric aiding with parameter set to "1". The options requires a feedback channel with the GNSS data in RTCM3 MSM format (recommended MSM4) from the rover. Ephemeris and RTCM MSM observation data from the rover should be configured on the same port (status 2023-04-14).
The option can be checked in the debug, which shall contain information line like

```
DBG: ThreadFuncDoConv() epo_wnt=2256,399372.000, gstates_wnt=2256,399370.000
DBG: _gns2o->UseSt2Obs(2256,399372.000), rc=0
IonoAiding at 399372.000, age 2
DBG: GnssObsEpoApplySTECRover() OK
DBG: RTCM EPOCH OUT 2256,399372.000,664
```

Sketch of data flow without and with iono-aiding:



See option -z for SSRZ input, -eph for RTCM3 ephemeris input, -i for rover data (or see Note).

-IPF=*n*

enable/set iono filter mode [0|1], default is 0.

-TI,O=*n*

set Tropo Interpolation Order to n (0<=n<=2) [1].
See e.g. SSM2G.

-TI,WS=*x.x*

set Tropo Interpolation Weight Scale to x.x [1.0].
See e.g. SSM2G.

-TI,WP=*n*

set Tropo Interpolation Weight Power to n (n>=1) [3].
See e.g. SSM2G.

-TI,MS=*n*

set Tropo Interpolation min number of fixed SVs per station [4].
See e.g. SSM2G.

-TI,MD=*x.x*

set Tropo Interpolation max station distance [km] [500.].
See e.g. SSM2G.

-TI,ND=*x.x*

set Tropo Interpolation max nearest station distance [km] [100.].
See e.g. SSM2G.

-TI,MB=*n*

set Tropo Interpolation min number of stations [0].
See e.g. SSM2G.

-II,O=*n*

set Iono Interpolation Order to n (0<=n<=2) [1].
See e.g. SSM2G.

-II,WS=*x.x*

set Iono Interpolation Weight Scale to x.x [1.0].
See e.g. SSM2G.

-II,WP=*n*

set Iono Interpolation Weight Power to n (n>=1) [3].
See e.g. SSM2G.

-II,MS=*n*

set Iono Interpolation min number of fixed SVs per station [0].
See e.g. SSM2G.

-II,MR=*n*

set Iono Interpolation min number of fixed signals per RX/SV [2].
See e.g. SSM2G.

-II,MD=*x.x*

set Iono Interpolation max station distance [km] [500].
See e.g. SSM2G.

-II,ND=*x.x*

set Iono Interpolation max nearest station distance [km] [100].
See e.g. SSM2G.

-II,MB=*n*

set Iono Interpolation min number of stations [0].
See e.g. SSM2G.

-ET,P=*x.x*

set Epoch Maximum Prediction Time to x.x [s] [5.0].
In case of timing issues, the prediction of the correction output can be modified. For example, the SSR corrections are provided not regulary with at a 5sec update rate, the option can be used with an increased value of 15sec or 30sec. The option is sometimes of help in combination with options -mina and -maxa.

-VRS=*dist*

moving VRS coordinates with min. update distance dist [m], -1.0=off.
By default, the reference VRS/PRS coordinate is initialisied 100m away from the NMEA GGA position.
The VRS cordinates and corrections transmitted to the rover are changing, when the spatial distance or the temporal parameter specified in option -rupd are triggered.

For kinematic applycations, the -rupdt option is mandatory.

Some receivers switch the RTK/AR-mode, when the transmitted reference coordinate exceeds a certain distance. In this case the moving/changing VRS should be used in the correction stream instead of fixed reference station coordinates. This is the task of the -VRS option depending on a spatial threshold. The RTCM station ID is incremented with every RTCM msg 1006, which is supported by most RTK rovers.

Attention: not all rover and rover algorithm support a changing position of e.g. a non-physical (virtual) reference station.

RTCM SSR Processing Options

-sn[=]*name*

set shared SSR name [gppssrdb.sdb].
...

-pid[=]*nnn*

use SSR Provider ID nnn [default -1 == any].
RTCM-SSR uses a SSR Provider ID to identify a SSR service, which shall be globally unique. The SSR Provider ID is provided by RTCM on request. The range from 0 to 255 is reserved for experimental services. The range from 256 to 65535 are unique SSR Provider IDs. RTCM maintains an Internet site at http://software.rtcm-ntrip.org/wiki/SSRProvider hosted by BKG to list SSR Provider IDs.

-sid[=]*nnn*

use SSR Solution ID nnn [default -1 == any].
The SSR Solution ID indicates different SSR services of one SSR provider (see option **-pid**). The range is from 0 to 15.

-creq[=]*x*

set required SSR parameters required for using SSR epochs [207].
The option allows the check of the data stream for certain messages to be expected for an individual application. The required/expected SSR parameters are the sum of:

1	=	CodeBias	(SSR satellite code bias)
2	=	PhaseBias	(SSR satellite phase bias)
4	=	Clock	(SSR satellite clock correction)
8	=	Orbit	(SSR satellite orbit correction)
16	=	HRClock	(SSR high rate clock correction)
32	=	URA	(SSR User Range Accuracy)
64	=	VTEC	(SSR ionosphere Vertical TEC spherical harmonics)
128	=	STEC	(SSR ionosphere regional Slant TEC)
4096	=	TropoGrid	(SSR gridded tropospheric correction)

The default is 207 (1+2+4+8+64+128). To ignore or discard SSR message types see also option **-cdis**.

Currently, if the SSR input stream does not contain STEC corrections, one has to set option -creq=79 (1+2+4+8+64) to **overrule the default setting**. Otherwise SSR2OBS will reject the use of any SSR epoch.

-cdis[=]x

set which SSR parameters are to be ignored/discarded.
See option **-creq** option for description of parameter x. Default is 0.

Currently, one may use -cdis=128 (128) to generate RTCM3 output without including STEC correction applied from an SSR input stream containing STEC.

Testing/Debugging Options

-always_ph

add DGP flag PHCL without phase bias SSR also.
...

-unfix_sv

add DGP flag PHCL without integer or widelane ambiguity fix flag also.
The default operation is to provide only SSR correction data for satellites with fixed ambiguities. The option allows to provide also SSR correction data for satellites with unresolved ambiguities.

+dLS=*NAME*

enable stdout logging (redirection) to file [GN_DATA\]NAMEddds.out.
Debug and error output might change without any notice with a new version.
The output file of the option +dLE contains information on

```
WARNING: high HR Clock state
etc
```

+dLE=*NAME*

enable stderr logging (redirection) to file [GN_DATA\]NAMEddds.err.
Debug and error output might change without any notice with a new version.
The output file of the option +dLE contains information on

```
reading GGA and GGA string
system GPS time
keeping virtual ref position
RTCM EPOCH OUT
etc
```
+dLE

redirect stderr output into stdout file/pipe.

+dPOS=*NAME*

enable rover position/GGA loggin to file [GN_DATA\]NAMEddds.log.

-dnb

SSR debug option: delayed_next_best epoch.
...

-prof

enable runtime profiling.
Option for test purposes.

-edb=*PATH*

enable ephemeris database usage, specify path.
Use a GNSMART ephemeris database for ephemeris input.

-meta_dr

disable reading SSRZ metadata from file storage.

-meta_dw

disable writing SSRZ metadata to file storage.

-meta_dis

ignore/discard SSRZ metadata received by SSRZ input stream.

-meta_co

enable coalescing of metadata files.

+move=*spd*

simulate moving rover with speed spd [km/h].
A circle around the rover position is used to simulate a moving rover.

RTCM SSR Input Options:

-ssr_in=*FNAME* (not yet supported!)

start SSR_IN thread(s) with options given in FNAME options file.
Use standalone 'ssr_in -?' to list possible options.
If no '-sn' option is given to ssr2obs, shared in-memory database will be used.

-ssr_in::

start SSR_IN thread(s), treat all following cmdline args as ssr_in args.
The functionality of the program SSR_IN is accessible also within the program SSR2OBS.
This special option considers all arguments following the options as SSR_IN options. See SSR_IN for details.

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Return Codes

WARNING: week past *nnnn* The SSR2OBS version is expired at week *nnnn*. Please contact the suppport.
DBG: ERROR, don't know current leap seconds, Please update GPP_LEAPSEC.DLL. Please contact the suppport.

Only some prominent return codes are listed. It is not attempted to document a complete and updated list of return codes.

Return Code	***Meaning***	***Description***
-50	No Epoch	indicates, that SSR2OBS did not receive sufficient input SSR data to generate virtual observations. First, check option **-creq**.
-46001	RICE_ENCODING	
-46002	RICE_DECODING	
-46003	VALUE_OUT_OF_BITS	
-46004	SV_ORDER	
-46005	GROUP_ID_MISMATCH	
-46006	RICE_ENCODING_INVALID	
-46007	WAVELENGTH	
-46008	MISMATCH_LOWRATE_HIGHRATE	
-46009	MAKE_CHAIN	
-46010	INVALID_SSRZ_HANDLE	
-46011	INVALID_SSRZ_META	
-46012	INVALID_SSRZ_LOWRATE_OUT	
-46013	INVALID_SSRZ_META_GROUP	
-46014	INVALID_SSRZ_META_GRID	
-46015	INVALID_SSRZ_META_GRIDS	
-46016	INVALID_SSRZ_META_LOWRATE	
-46017	INVALID_SSRZ_META_HIGHRATE	
-46018	INVALID_SSRZ_META_LOWRATE_CLK	
-46019	INVALID_SSRZ_META_LOWRATE_ORB	
-46020	INVALID_SSRZ_META_LOWRATE_BIAS	
-46021	INVALID_SSRZ_META_LOWRATE_GROUP	
-46022	INVALID_SSRZ_META_LOWRATE_GROUPS	
-46023	INVALID_SSRZ_META_HIGHRATE_CLK	
-46024	INVALID_SSRZ_META_HIGHRATE_GROUP	
-46025	INVALID_SSRZ_META_HIGHRATE_GROUPS	
-46026	INVALID_RTCM_IONOGRID	
-46027	INVALID_RTCM_IONOGRID_SV	
-46028	INVALID_RTCM_IONOGRID_SV_STAT	
-46030	INVALID_RTCM_TROPOGRID	

-46031	INVALID_RTCM_TROPOGRID_STAT	
-46032	INVALID_RTCM_DATAGRID	
-46033	INVALID_RTCM_DATAGRID_STAT	
-46034	INVALID_RTCM_LOWRATE	
-46035	INVALID_RTCM_HIGHRATE	
-46036	INVALID_SSRZ_META_TROPO	
-46037	INVALID_SSRZ_META_TROPOGRID	
-46038	INVALID_SSRZ_META_TROPOGLOBAL	
-46039	INVALID_SSRZ_META_GROUPLIST	
-46040	LOWRATE2DATAZ	
-46041	HIGHRATE2DATAZ	
-46042	IONOGRID2DATAZ	
-46043	DATAZ2LOWRATE	
-46044	DATAZ2HIGHRATE	
-46045	DATAZ2IONOGRID	
-46046	INVALID_RTCM_QIX	
-46047	INVALID_SSRZ_META_IONOGRID	
-46048	NOT_ENOUGH_MEMORY	
-46049	MISMATCH_IONOGRID_DATA_GRID	
-46050	NO_PREDICTION_POINTS	
-46051	UNDEFINED_GRID_ID	
-46052	TOO_MANY_GRID_DEFINITIONS	
-46053	INVALID_BITMASK	
-46054	INVALID_SSRZ_META_QIX	
-46055	INVALID_SSRZ_META_QIX_CB	
-46056	INVALID_SSRZ_META_QIX_PB	
-46057	INVALID_SSRZ_META_GROUPS	
-46058	NO_GROUPS	
-46060	NO_LOWRATE_STRUCTURE	
-46061	NO_HIGHRATE_STRUCTURE	
-46062	NO_SSRZ_HANDLE_STRUCTURE	
-46063	UNKNOWN_MESSAGE_ID	
-46064	NOT_IMPLEMENTED	
-46065	UNDEFINED_GROUP_ID	
-46066	META_TROPO_NOT_ENOUGH_SPACE	
-46067	META_IONO_NOT_ENOUGH_SPACE	
-46068	LOG_TROPO_NOT_ENOUGH_SPACE	
-46069	LOG_IONO_NOT_ENOUGH_SPACE	
-46070	GROUP_INVALID_ID	
-46071	GROUP_INVALID_SYS	
-46072	GROUP_INVALID_PRN	
-46073	GROUP_NOT_ENOUGH_SPACE	
-46074	GROUP_DEFINITION_MODUS	
-46075	INVALID_SSRZ_MSG_HANDLE	

-46076	INVALID_SSRZ_SV_MSG_HANDLE	
-46077	INVALID_SSRZ_META_GLOBAL_IONO	Interpretation of Message not possible. Normal at startup. Meta data available?
-46078	INVALID_SSRZ_META_GLOBAL_SV_IONO	Interpretation of Message not possible. Normal at startup. Meta data available?
-46079	INVALID_SSRZ_META_REG_TROPO	Interpretation of Message not possible. Normal at startup. Meta data available?
-46080	LOWRATE_NOT_ENOUGH_SPACE	
-46081	HIGHRATE_NOT_ENOUGH_SPACE	
-46082	IONOGRID2DATAZ_NOT_ENOUGH_SPACE	
-46083	DATAZ2IONOGRID_NOT_ENOUGH_SPACE	
-46084	TROPOGRID2DATAZ_NOT_ENOUGH_SPACE	
-46085	QIX_NOT_ENOUGH_SPACE	
-46086	INVALID_SSRZ_STATES	
-46087	INVALID_SSRZ_META_REG_SV_IONO	
-46088	RESOLUTION_OUT_OF_RANGE	
-46089	INVALID_SSRZ_TIME_TAG_DEFINITION	
-46091	MSG_HANDLE_HIGHRATE	
-46092	MSG_HANDLE_LOWRATE	
-46093	INVALID_SSRZ_TIME_TAG_MSG_HANDLE	
-46094	INVALID_RESOLUTION	
-46095	INVALID_TAG	
-46096	INVALID_MSG_ID	
-46097	INVALID_PB_CYCLE_RANGE	
-46098	INVALID_TAG_SIZE	
-46099	INVALID_COEFF_DIMENSION	
-46100	INVALID_SSR_GROUP	
-46101	INVALID_META_NO_OF_GRIDS	
-46102	MISMATCH_SSRZ_MCSTREAM	
-46103	MODEL_NOT_SUPPORTED	
-46104	SSRZ_WARNING	
-46105	SSRZ_RESOLUTION	
-46106	DO_USAGE	
-46107	QIX_MISSING_SAT_GROUP	
-46108	INVALID_META_TAG	
-46109	INVALID_META_IOD	
-46110	MODEL_NOT_SUPPORTED_REG_TROPO	
-46111	INVALD_TRANS_HDL	
-46112	SSRZ_BITS_NUM	
-46113	INVALID_REG_TROPO_VERTICAL_SCALE	
-46114	INVALID_REG_TROPO_HORIZONTAL_SCALE	
-46120	INVALD_META_TIMING_PARAMETERS	
-46121	INVALD_META_TIMING_PARAMETERS_SET	
-46122	INVALD_META_TIMING_PARAMETERS_GROUPS	
-46123	INVALD_META_TIMING_PARAMETERS_GRIDS	

-46124	INVALD_META_TIMING_PARAMETERS_REGIONS	
-46130	INVALID_REGION_ID	
-46140	INVALID_GLO_IONO_LAYER	

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Examples

Example 1:

Task:

Generate a real-time stream with legacy **RTCM 3 messages generated from a SSRZ** data stream.

Job Details:

```
 ssr2obs in combination with GPPNET
```

Solution:

```
:: get 1000 and GGA output
set GGA_OUT_PORT=9005
set RCVR_ID=cpos
set RCVR_IN=javad_in
set RCVR_IN_OPTS=-c212.59.35.100:2101 -N1000,login:pw +n -n -B
start %RCVR_IN% %RCVR_ID% %RCVR_IN_OPTS% -t0 -RD8000,200,120000 +t5000
wait 200
start "%RCVR_ID%" /MIN gnrt %RCVR_ID% 123 +K
wait 200
gn_get_mc -SRV=wox.geopp.de:2101,SERV_EPH,login:pw -n=NDSE
start "GGA_Source" /MIN nav_out 15,27 -d +C%GGA_OUT_PORT%,20 -W -w=2500 -Q -GGA3,6 -oGNRT,%RCVR_ID%
ssr2obs +syst -oss=9100 -i=127.0.0.1:9005 -z=85.214.42.127:2101 -N=SSRZ_NDS1,login:pw -debug=2049 -sm -prof -
dgp=ROVE -rtcm -rfix=52.43079824,9.608171564,108.9535 -rdist=0.0
gpplisttype gnss_obs
gn_show_obsd -SHOW=ssr2obs,,ROVE
```

Explanations:

The program SSR2OBS provides a ShrdObs structure with legacy RTCM message types 1004, 1012 on port 9100. A RTK rover can access the RTCM 3 data stream from the configured port. The ephemeris are generally available from the rover. Therefore a transmission is not meaningful considering bandwidth issues. Therefore the ephemeris data stream is configured separately.

Example 2:

Task:

SSR2OBS with the use of **transformation** options. The OSR corrections are defined in the service CRS of the SSR generation, i.e. typically current epoch of the latest ITRF realization. Use a 15 parameter transformation to convert to the datum requested by the user application e.g. an ECEF.

Job Details:

```
 ssr2obs start "ssr2obs" /MIN ssr2obs -i=%GGA:PORT% -dgp=2001 -sm -ro=0.8 -maxa=40 -mina=30 -ssrdatum=ITRF2008
-refdatum=ETRF89 -datumdef=etrfitrf.dat
```

Explanations:

```
SSR data is generally provided in ITRF. A 15P geodetic datum transformation is required to transform to a
different datum.
SSR2OBS supports this using the options
 -datumdef=
 -ssrdatum=
```

```
 -refdatum=
Alternatively, the 15P transformation can be configure and executed in the positioning application/system.
```

Example 3:

Task:

A **typical start of SSR2OBS** reads as follows

Job Details:

```
    start bin/ssr2obs.exe +syst -o=- -i=%GGA:PORT% -z=%Caster-IP%:%Caster-port% -N=%Stream%,%User%:%PW% -
pid=%ProviderID% -sid=%ServiceID% -eph=%EPH_SOURCE% -rdist=0.0 -ro=0.3 -re=0 -rtcmmsm
```

Explanations:

- open TCP/IP port GGA_PORT and wait for one client connection
- read NMEA GGA position from client connection
- output RTCM MSM (-rtcmmsm) to client on this connection (-o=-)
- emulate NTRIP login on connection (-z=, -N=)
- NMEA, ZDA not required (take calendar date from system time)
- OSR corrections are defined in the service CRS of the SSR generation, i.e. typically current epoch ITRF; use a 15 parameter transformation to convert to e.g. an ECEF

Example 4:

Task:

Start **SSR2OBS without SSR_IN** with integrated SSR_IN option in SSR2OBS.The command expects RTCM-SSR/4090.4/4090.5 messages and provides leagcy RTCM. The Geo++ 4090.4 and 4090.5 are only available using GNSMART1 (GNNET) and the support is fading out in favor of the Geo++ SSRZ format.

Job Details:

```
    ssr2obs +syst -i=44332 -oss=44333 -sm -prof -rtcm -rdist=0.0 -ro=0.3 -re=0 -ssr_in:: -s=10.192.91.54:4002 -
N=SSR04_SUED,login:pw -s=85.214.79.175:2101
```

Explanations:

- GGA input expected from port 44332
- legacy RTCM written to local port 44333 (-rtcm)
- ephemeris are expected from a server without access information (10.192.91.54)
- SSR correction are read from the mount point SSR04_SUED with access information from a NTRIP caster (85.214.79.17)
- OSR corrections are defined in the service CRS of the SSR generation, i.e. typically current epoch ITRF; use 15 parameter transformationto convert to e.g. an ECEF

Example 5

Task:

Start **SSR2OBS with datum transformation and satellite PCV correction:**

Job Details:

```
    start "ssr2obs FRA2" ssr2obs -i=9104 +syst -o=- -z=*.*.*.*:2101 -N=FRA2_SSRZ,login:pwd -pid=1 -sid=1 -
TI,MD=1000 -II,MD=1000 -TI,ND=500 -II,ND=500 -datumdef=etrfitrf_giscad.dat -ssrdatum=ITRF2014_CE -
refdatum=ETRF2000_2010 -atx_sv=C:\geopp\conf\gnsmart\igs14.atx -debug=6209 +dLS +dLE -rdist=0.0 -ro=0.3 -re=0 -
sm -rtcmmsm -eph=wox.geopp.de:2101 -NE=SERV_EPH,login:pwd
```

Explanations:

- datum transformation from ITRF2014 current epoch to ETRF2000
- IGS SV PCV corrections considered for RTCM output
- interpolation options set

Example 6

Task:

Start SSR2OBS with **debug options to check and verify update rate**:

Job Details:

```
    rem 2022-08-29 Geo++

    rem First please edit the variables according to your environment settings
    rem
    set ProviderID=1
    set ServiceID=1

    set SSRZ-Caster-IP=217.175.51.161
    set SSRZ-Caster-port=2101
    set SSRZ-Stream=CZE1_SSRZ
    set SSRZ-User=useruser
    set SSRZ-PW=pwpw

    set GGA_IN_PORT=3003
    set MSM_OUT_PORT=9100

    set EPH-Caster-IP=wox.geopp.de
    set EPH-Caster-port=2101
    set EPH-Stream=SERV_EPH
    set EPH-User=useruseruser
    set EPH-PW=pwpwpw

    rem SSR data is generally provided in ITRF
    rem  please provide a 15P geodetic datum transformation
    rem  to transform to a different datum using the options:
    rem  -datumdef=
    rem  -ssrdatum=
    rem  -refdatum=
    rem  e.g -datumdef=etrfitrf.dat -ssrdatum=ITRF2014 -refdatum=ETRF2000
    rem OR configure it in your positioning application/system

    rem Second start of SSR2OBS module
    rem

    rem Case 1)
    rem SSR2OBS receives SSRZ correction messages (-z=) and position/timing data from NMEA (GGA [ZDA], -i=).
    rem From these information it computes non-physical (VRS/PRS) observations for the position
    rem provided via the GGA_IN_PORT (-i=) and provides RTCM3 MSM data on the same TCP port (-o=-) or a
    rem separate port (-oss=)
    rem Ephemeris Source expects RTCM3 , e.g. from the local GNSS receiver (-eph=, plain TCP, no NTRIP) or
    rem from a Caster (-eph= -NE=)
    rem
    start bin/ssr2obs.exe +syst -oss=%MSM_OUT_PORT% -i=127.0.0.1:%GGA_IN_PORT% -z=%SSRZ-Caster-IP%:%SSRZ-
Caster-port% -N=%SSRZ-Stream%,%SSRZ-User%:%SSRZ-PW% -pid=%ProviderID% -sid=%ServiceID% -eph=%EPH-Caster-
IP%:%EPH-Caster-port% -NE=%EPH-Stream%,%EPH-User%:%EPH-PW% -rdist=0.0 -ro=0.3 -re=0 -rtcmmsm -atx_sv=igs14.atx
-ssrdatum=ITRF2014_CE -refdatum=ETRF2000_2010 -datumdef=etrfitrf_giscad.dat -debug=6209 -TI,MD=1000 -II,MD=1000
-TI,ND=500 -II,ND=500 +dPOS=gga_rec.log +dLE +dLS


    rem --------------------------------------------
    rem testing data flow with GNNET modules
    rem --------------------------------------------

    rem Get Ephemeris, check if weph already opened
    gniptest -1 |findstr /c:"RTCMR_IN        weph" >nul 2>&1
    if not %errorlevel% == 0 start rtcmr_in weph -c=%EPH-Caster-IP%:%EPH-Caster-port% -N=%EPH-Stream%,%EPH-
User%:%EPH-PW% -RD=3000 -t0 +t3000 +SOBS
    wait 1000

    set GN_DATA=.\Data,DAY

    rem CSUM outside network: ITRF CSUM 11558M001    3931871.34802  1200665.59209  4860559.31009
    rem                       ITRF CSUM 49  57  53.18791   16  58  51.47870        378.3702
    start rtcmr_in mobi -c=217.175.51.161:2101 -a0.0 +X1 +XN60 -RD=5000,100,6000 +t3000 -
N=CSUM,usrusrusrusr:pwpwpwpw
    wait 500

    start "GNRT Mobile Station" /MIN gnrt mobi +D -e0 -s2 +M -GLO=GPP
    wait 500

    start stagra -o=GNRT,mobi
    wait 500

    start nav_out 15 -oGNRT,mobi -d +C%GGA_IN_PORT%,20 -W -w=2500 -Q -GGA3,6
```

```
    wait 500

    start nav_in +c=127.0.0.1:%GGA_IN_PORT% -d
    wait 500

    start rtcmr_in MSMO -c=127.0.0.1:%MSM_OUT_PORT% -a0.0 +X1 +XN60 -RD=5000,100,6000 +t3000
    wait 500

    rem In the debug output file of SSR2OBS is a lines stating "epo_wnt=":
    rem   DBG: ThreadFuncDoConv() epo_wnt=2177,223229.000, gstates_wnt=2177,223228.000
    rem   DBG: ThreadFuncDoConv() epo_wnt=2177,223230.000, gstates_wnt=2177,223228.000
    rem The epo_wnt line states, which SSRZ epoch (gstates) is used for the computation of a SSI epoch output
(epo_wnt).
```

Explanations:

- SSR2OBS started with debug option -debug=6209 +dLE +dLS, which write debug out file like SR2O241i.out and SSI files like SR2O241i.ssi
- SSR2OBS gga output options +dPOS=gga_rec.log allows to check the GGA messages
- for further checks, GNSS data from a test site CSUM are tracked with RTCMR_IN to generate a GGA stream for input to SSR2OBS. For this task a combination of GNRT and NAV_OUT is used
- the finally converted SSR data in OSR MSM format generated by SSR2OBS is tracked by an RTCMR_IN MSMO
- as the test site is outside of the network, the interpolation options for the atmospheric corrections are modified with options -TI* and -II*

Example SSI:

Example of the "SSI" line from an SSR2OBS debug output:

```
T396188.7: SSI,week,time,SAT,signal,wavelength(m),azimuth(deg),elevation(deg),range(m),X(m),Y(m),Z(m),LowRate
clock (m),HighRate clock(m),orbit(m),CodeBias(m),PhaseBias(m),STEC total(m),STEC total(TECU),STEC
GVI(TECU),STEC GSI(TECU),STEC RSI(TECU),STEC
GRI(TECU),tropo(m),GT(m),RT(m),GRT(m),modelZTDdry(m),modelZTDwet(m),modelSTDdry(m),modelSTDwet(m),windup(cyc),r
```

```
elativity(m),solidEarthTide dN(m),solidEarthTide dE(m),solidEarthTide dU(m),solidEarthTide dX(m),solidEarthTide
dY(m),solidEarthTide dZ(m),oceanLoading dN(m),oceanLoading dE(m),oceanLoading dU(m),oceanLoading
dX(m),oceanLoading dY(m),oceanLoading dZ(m)
T396188.7:
SSI,2249,57638.0,G02,1C,0.190293673,72.818019993,57.117701880,21413047.161536552,12735804.117386131,12263371.65
9454582,20378449.532328736,-3.16880,0.00000,-0.19623,0.000000,-1.560219,6.320383,38.925220,38.913837,0.000000,-
0.044218,0.055601,2.917025,0.000000,0.124320,0.004638,2.299765,0.042791,2.737125,0.050943,-
0.165679020,0.013515010,-
0.017224298,0.010218271,0.107309959,0.083392000,0.017553157,0.068221536,0.000000000,0.000000000,0.000000000,0.0
00000000,0.000000000,0.000000000
T396188.7:
SSI,2249,57638.0,G02,2W,0.244210213,72.818019993,57.117701880,21413047.161536552,12735804.117386131,12263371.65
9454582,20378449.532328736,-3.16880,0.00000,-0.19623,-3.337200,-
1.777284,10.409320,38.925220,38.913837,0.000000,-
0.044218,0.055601,2.917025,0.000000,0.124320,0.004638,2.299765,0.042791,2.737125,0.050943,-
0.165679020,0.013515010,-
0.017224298,0.010218271,0.107309959,0.083392000,0.017553157,0.068221536,0.000000000,0.000000000,0.000000000,0.0
00000000,0.000000000,0.000000000
T396188.7:
SSI,2249,57638.0,G18,1C,0.190293673,163.931333844,55.265698915,21142686.286886752,24120665.966407772,5457489.53
3491408,9883426.776230050,0.01360,0.00000,-0.86288,0.000000,-
0.493272,6.420305,39.540608,39.533454,0.000000,0.022461,-
0.015308,2.980639,0.000000,0.127031,0.004739,2.299765,0.042791,2.796813,0.052056,-0.159084348,0.013471551,-
0.017224298,0.010218271,0.107309959,0.083392000,0.017553157,0.068221536,0.000000000,0.000000000,0.000000000,0.0
00000000,0.000000000,0.000000000
```

SSI	state space influence	remarks
week	GPS week [-]	
time	GPS week seconds [s]	
SAT	SV (G=GPS, R=GLONASS, E=Galileo, C=BDS)	
signal	RINEX signal abbrevation	
wavelength	wavelength frequency [m]	
azimuth	azimuth of SV [deg]	
elevation	elevation of SV [deg]	
range	range to SV [m]	
X	X-coordinate BE of SV	
Y	Y-coordinate BE of SV	
Z	Z-coordinate BE of SV	
LowRate clock	low rate clock SSI [m]	
HighRate clock	low high rate clock SSI [m]	ie decoded value
orbit	orbit correction SSI [m]	
CodeBias	code bias SSI [m]	ie decoded value
PhaseBias	phase bias SSI [m]	ie decoded value
STEC total	sum of GVI + GSI + RSI + GRI SSI [m]	

STEC total	sum of GVI + GSI + RSI + GRI SSI [TECU]	
STEC GVI	Global VTEC Ionosphere SSI [TECU]	
STEC GSI	Global STEC Ionosphere SSI [TECU]	
STEC RSI	Regional STEC Ionosphere SSI [TECU]	
STEC GRI	Gridded STEC Ionosphere SSI [TECU]	
tropo	sum of GT + RT + GRT [m]	
GT	Global Troposphere [m]	
RT	Regional Troposphere [m]	
GRT	Gridded Troposphere [m]	
modelZTDdry	dry component of Model Zenith Tropospheric Delay [m]	
modelZTDwet	wet component of Model Zenith Tropospheric Delay [m]	
modelSTDdry	dry component of Model Slant Tropospheric Delay [m]	
modelSTDwet	dry component of Model Slant Tropospheric Delay [m]	
windup	windup correction of phase [cyc]	ie decoded value
relativity	relativistic correction (only Shapiro) [m]	ie user correction, no SSR component
solidEarthTide dN	solid Earth tides North [m]	ie user correction, no SSR component
solidEarthTide dE	solid Earth tides East [m]	ie user correction, no SSR component
solidEarthTide dU	solid Earth tides Up [m]	ie user correction, no SSR component
solidEarthTide dX	solid Earth tides X-component [m]	ie user correction, no SSR component
solidEarthTide dY	solid Earth tides Y-component [m]	ie user correction, no SSR component
solidEarthTide dZ	solid Earth tides Z-component [m]	ie user correction, no SSR component
oceanLoading dN	ocean loading North [m]	ie user correction, no SSR component
oceanLoading dE	ocean loading East [m]	ie user correction, no SSR component
oceanLoading dU	ocean loading Up [m]	ie user correction, no SSR component
oceanLoading dX	ocean loading X-component [m]	ie user correction, no SSR component
oceanLoading dY	ocean loading Y-component [m]	ie user correction, no SSR component
oceanLoading dZ	ocean loading Z-component [m]	ie user correction, no SSR component

Example 7

Task:

SSR2OBS configuration file from an **Alberding A10 receiver with iono aiding** configured and switched on

Job Details:

```
#config file for /usr/lib/systemd/system/ssr2obs.service
#Check ssr2obs -? for more information

# for debug
#ssr2obs -debug=5121 -z=127.0.0.1:22000 -eph=127.0.0.1:22001 -i=127.0.0.1:22002 -oss=22003 +syst -maxa=30 -dbcz=12 -IA=1 -TI,ND=150 -II,ND=150 -atx_sv=/var/euronav/geodata/igs20.atx -VRS=5000 -rtcmmsm -ro=0.8 -re=0 -datumdef=/etc/euronav/etrfitrf.dat -ssrdatum=IGS20 -refdatum=ETRF_R2016 &>debug.log

# SSRZ input stream
# activate SSRZ mode and connect to SSRZ server address [tcp_addr:port]
SSR_INPUT="-z=127.0.0.1:22000"

# Ephemeris input
# -eph=         - read ephemerides messages from server address [tcp_addr:port]
EPHEM_INPUT="-eph=127.0.0.1:22001"

# SSR options
# -maxa[=]x.x - max SSR age [15.0]
#               The incoming correction stream is checked concerning the age of
#               the data. The maximium age can be changed with the option
SSR_OPT="-maxa=30"

# SSRZ options
# -dbcz[=]x.x - detect broken ssrz input connection feature, timeout [s],
#               default 0=disabled.
SSRZ_OPT="-dbcz=12"

# SSRZ Processing options, Tropo/Iono interpolation
# -IA[=]n       - set iono-aiding mode [0|1], default is 0. Activate ionospheric
#                 aiding with parameter set to "1". The options requires a feedback
#                 channel with the GNSS data in RTCM3 MSM format from the rover
# -TI,MD=x.x    - set Tropo Interpolation max station distance [km] [500.000000]
# -II,MD=x.x    - set Iono Interpolation max station distance [km] [500.000000]
# -TI,ND=x.x    - set Tropo Interpolation max nearest station distance [km] [100.000000]
# -II,ND=x.x    - set Iono Interpolation max nearest station distance [km] [100.000000]
# PROC_OPT="-IA=1 -TI,MD=1500 -II,MD=1500 -TI,ND=800 -II,ND=800"
# PROC_OPT="-IA=1"
PROC_OPT="-IA=1 -TI,ND=150 -II,ND=150"

# Satellite Antenna PCV corrections file
# -atx_sv=FNAME - read Satellite Antenna PCV corrections from file: FNAME. The
#                 satellite phase variations are read from an ANTEX file and
#                 applied in the conversion from SSR to OSR
SAT_ATX_FILE="-atx_sv=/var/euronav/geodata/igs20.atx"

# Position and time from Rover
# -i[=]address - rover pos and time from GGA+ZDA input [tcp_addr:port, port, comX,...]
#                The option with at least a NMEA GGA content is mandatory,
#                i.e. is an essential parameter.
# -oss[=]port  - RTCM output simplex server port number. RTCM output server
#                and GGA input server can operate on the same connection. The simplex
#                server allows for different clients.
IPS_IO="-i=127.0.0.1:22002 -oss=22003"

# System time
# assume system time beeing correct to a few minutes (then NMEA ZDA not required)
USE_SYSTEM_TIME="+syst"

# Virtual reference options
# -rupd  - update virtual reference position (1.0 default value)
#          -1, the first GGa position is used
# -glo   - introduce GLONASS observation biases for GLONASS
#          UBX or SEP0, see -glo=?
# -rdist[=]n - distance of virtual reference from user position [100m]. By default
#              the position used to transform SSR data to OSR is offset by 100 m
#              in north. A distance of 0 m must be defined, if the actual
#              NMEA GGA position should be used. The option therefore allows
#              the configuration of a PRS (Pseudo Reference Station) mode.
#VREF_OPTS="-rupd=60.0 -rdist=1500 -glo=SEP0"
#VREF_OPTS="-rupd=60.0 -rdist=0.0 -glo=SEP0"
#VREF_OPTS="-rdist=0.0"
VREF_OPTS="-VRS=5000"

# RTCM MSM
# enable RTCM MSM output (with SSRZ input only)
```

```
RTCM_OPTS="-rtcmmsm"

# Offsets
# -ri[=]x.x   - output interval [1.0]
#               The output interval is not independent from the received NMEA GGA
#               stream. RTCM corrections are only provided for the time of an
#               NMEA GGA event. The options is therefore useful to reduce the
#               update interval in case of higher frequency NMEA GGA messages or
#               to have update interval longer than 1 sec.
# -ro[=]x.x   - output offset to last GGA [0.8]
#               The output of legacy RTCM corrections (see option -rtcm) is
#               triggered to be 0.8 after receiving the NMEA GGA string. This
#               option can affect the GNSS rover prediction algorithm as the delay
#               of the actual timing can be kept small.
#               The option can be combined with option -re.
#               was set to 0.2 from geo++, this produced a data delay of -0.6 sec,
#               it is unusable for Javad Triumph from DLR
# -re[=]x     - output epoch offset to last GGA [1.0]
#               The time offset set by this option is added to the time of the
#               output legacy RTCM corrections.
#RATE_OPTS="-ri=1.0 -ro=0.8 -re=1.0"
#RATE_OPTS="-ro=0.3 -re=0"
RATE_OPTS="-ro=0.8 -re=0"

# Transformation from ITRF08 (PPP) to ETRF_D (SAPOS)
# -datumdef=FNAME - datum trafo defined in file FNAME
# -ssrdatum=NAME  - assume SSR is in datum NAME
# -refdatum=NAME  - datum for DGP/RTCM output
GEO_DATUM_OPTS="-datumdef=/etc/euronav/etrfitrf.dat -ssrdatum=IGS20 -refdatum=ETRF_R2016"

# enable shared memory ephemeris
#MISC="-sm"

# debug options
DEBUG_OPTS=""
#DEBUG_OPTS="-debug=5121"
```

Explanations:

- The receiver must be configured, that RTCM MSM messages are provided. This can b ethe same port as the NMEA port.