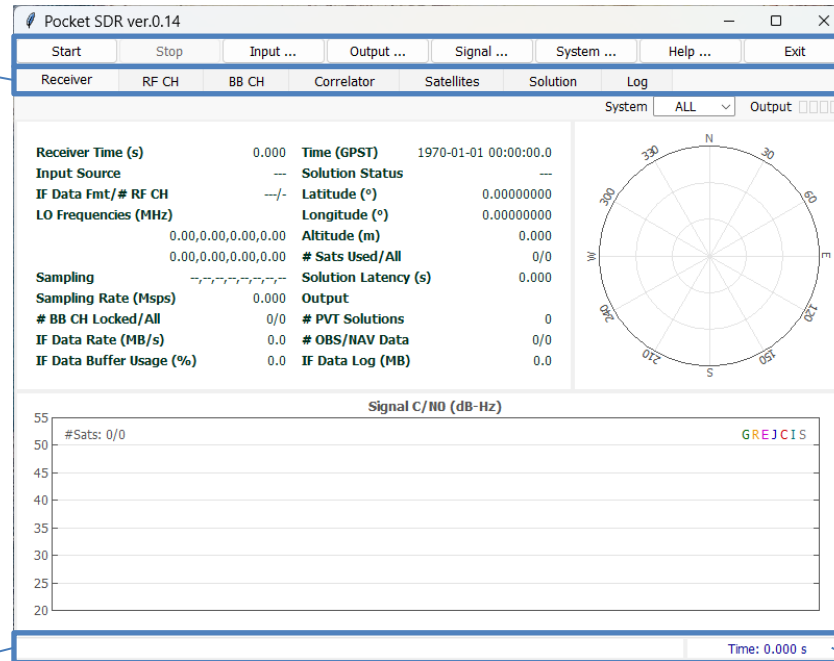


Initial Window of pocket_sdr.py

Page Tabs:

Tabs to switch current page



Command Buttons

Start : Start the receiver
 Stop : Stop the receiver
 Input... : Show Input Options dialog
 Output... : Show Output Options dialog
 Signal... : Show Signal Options dialog
 System... : Show System Options dialog
 Help : Show Help dialog
 Exit : Exit the receiver

Status Bar:

Status info or error message for the receiver

Receiver Time:

Elapsed time since the receiver started (s)

Receiver Page

Receiver Time:

Elapsed time since the receiver started

Input Source:

IF data source (RF_Frontend or IF_Data)

IF Data Fmt/# RF CH:

IF data format *3 and number of RF CHs

LO Frequencies:

Local oscillator frequencies for each RF CH (MHz)

Sampling:

IF data sampling type for each RF CH (I or IQ)

Sampling Rate:

IF data sampling rate (Mps)

BB CH Locked/All:

Number of BB CHs tracked and all

IF Data Rate:

IF data transfer rate (MB/s)

IF Data Buffer Usage:

Receiver internal IF data buffer usage rate (%)

Time (GPST):

PVT Solution time in GPST

Solution Status:

PVT Solution status (- or FIX)

Latitude, Longitude and Altitude:

PVT Solution latitude/ longitude (deg) and ellipsoidal height (m)

Sats Used / All:

Number of used satellites for PVT and all satellites with OBS data

Solution Latency:

PVT Solution latency (s)

PVT Solutions:

Total count of PVT solutions

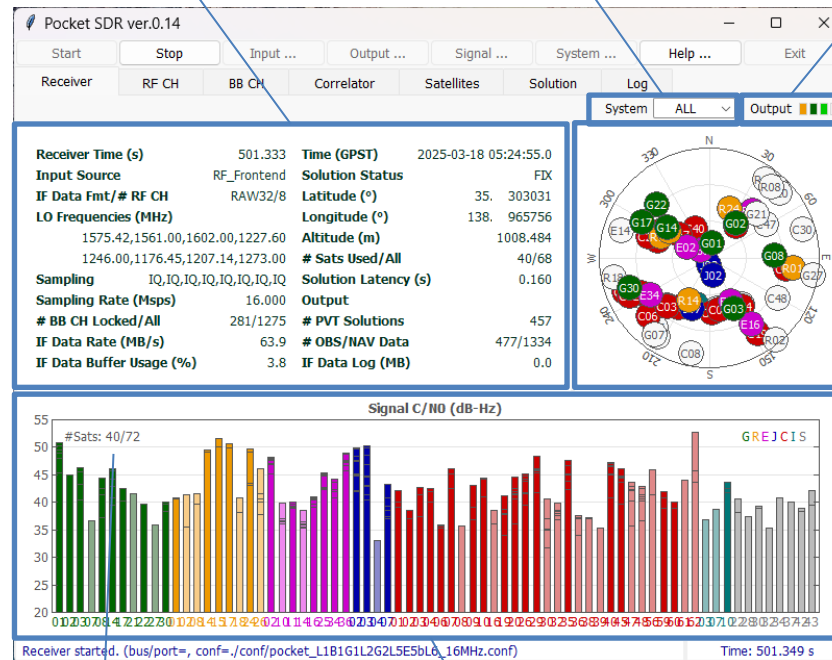
OBS/NAV Data:

Total count of OBS and NAV data

IF Data Log:

Recorded size of IF Data log (MB)

Receiver Status Panel



Number of used satellites and all satellites with OBS data

Signal C/N0 (dB-Hz) Plot for Each Satellite and Signals (stacked) *1 *2

*2 Satellite ID complies with RINEX convention
*3 INT8 (int8 I-sampling), INT8X2 (interleaved-int8 IQ-sampling), RAW8, RAW16 or RAW32 (Pocket SDR FE 2CH, 4CH or 8CH raw format)

Output Status Indicators

for PVT solution, OBS/NAV data, receiver log and IF data log

Orange: waiting for connection

Green: data OK

Light-Green: data active

Red: error

White: no output

Satellite Positions in Skyplot *1 *2

*1 GNSS System Color:

Green: GPS

Orange: GLONASS

Magenta: Galileo

Blue: QZSS

Red: BeiDou

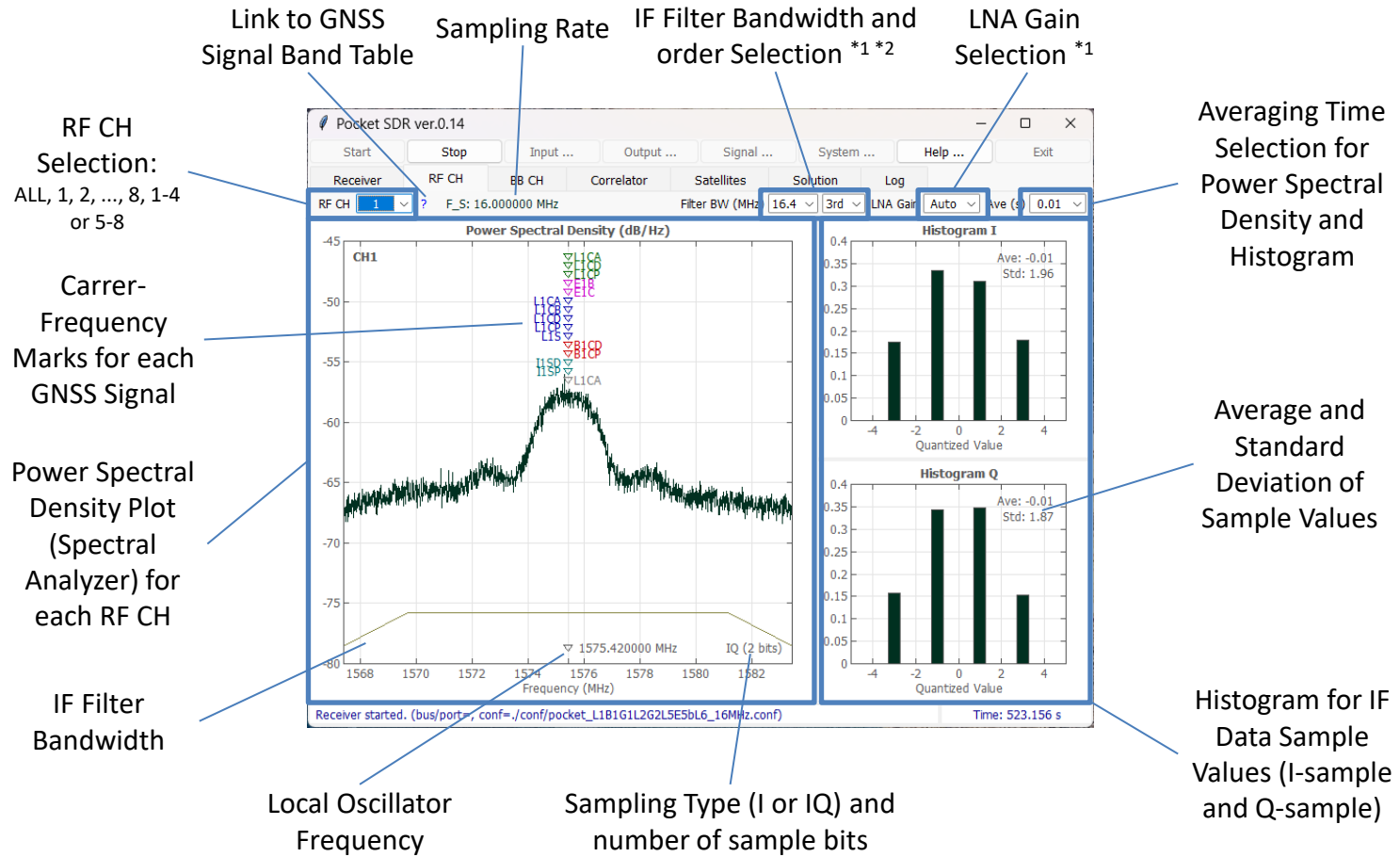
Blue-Green: NavIC

Grey: SBAS

White or light-color:

unused satellites for solution

RF CH Page



*1 Only valid for RF_Frontend Input, *2 Only valid for IQ-sampling

BB CH Page

RF CH Selection:
ALL, 1, 2, ..., 8

GNSS System Selection:
ALL, GPS, GLONASS, ...

BB CH State Selection:
LOCK or ALL

Link to GNSS Signal Table

Internal IF Data Buffer Usage Rate in %

BB CH No Searching Signal

Status for each BB CH:

CH : BB CH no

RF : Assigned RF CH no for BB CH

SAT : Satellite ID

SIG : Signal ID

PRN : PRN number or FCN for GLONASS FDMA signal

LOCK : Continuous lock time (s)

C/N0 : Signal C/N0 (dB-Hz)

(dB-Hz) : Signal C/N0 Bar (20-50 dB-Hz)

COFF : Code offset (ms)

DOP : Doppler frequency (Hz)

ADR : Accumulated Doppler range (cycle)

SYNC : Synchronization status

#NAV : Decoded subframe or message count

#ERR : NAV data error count

#LOL : Loss-of-lock count

FEC : Number of error bits corrected by FEC (-1: correction unable)

The screenshot shows the 'BB CH' tab in the Pocket SDR software. The table lists 89 locked signals with columns for CH, RF, SAT, SIG, PRN, LOCK(s), C/N0, (dB-Hz), COFF(ms), DOP(Hz), ADR(cyc), SYNC, #NAV, #ERR, #LOI, and FEC. The status bar at the bottom indicates 'Receiver started. (bus/port=, conf=, conf/pocket_L1B1G1L2G2L5ESB6_16MHz.conf)' and 'Time: 548.846 s'.

Number of Locked and All BB CHs

Synchronization Status:

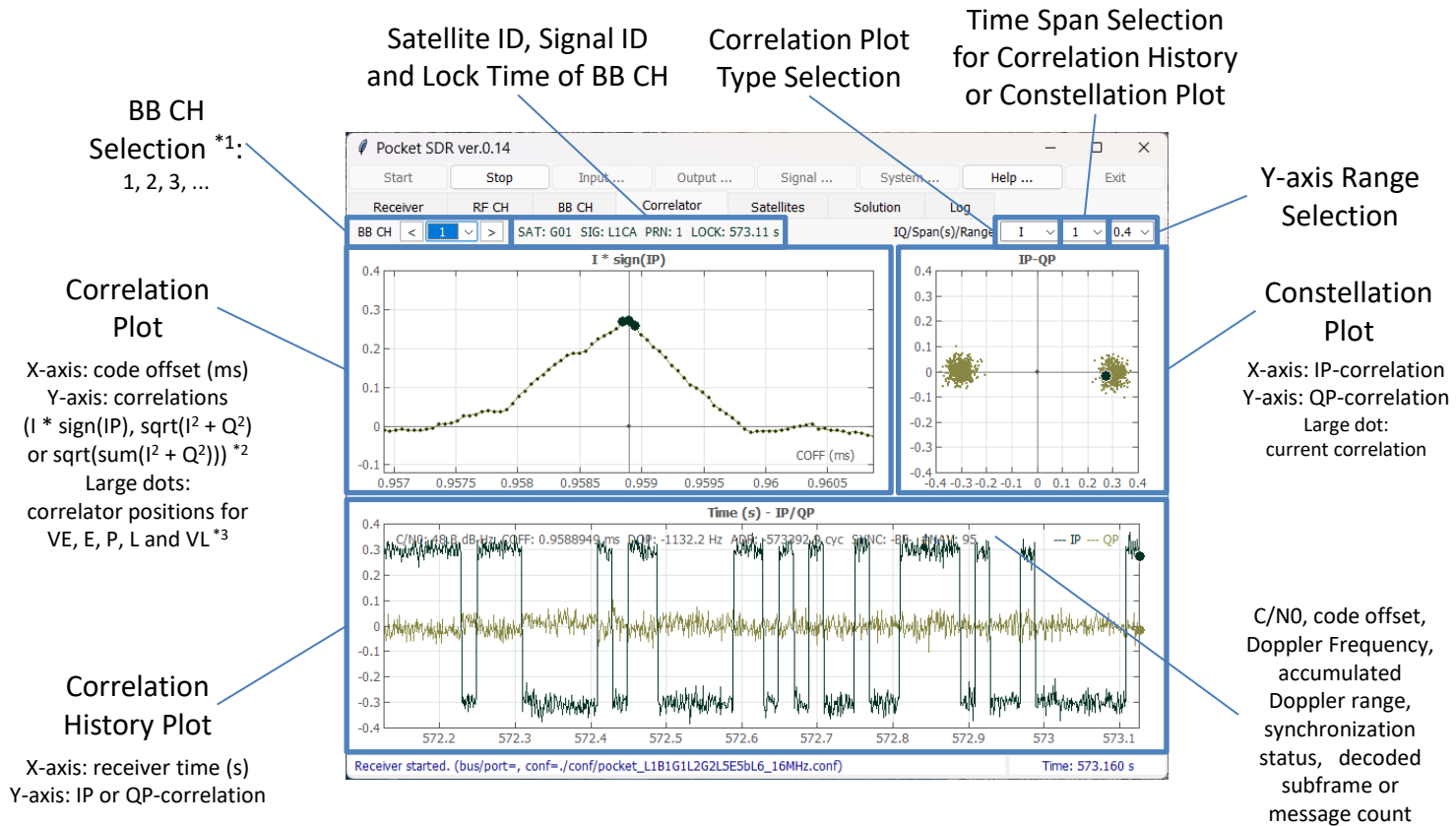
S : Secondary code sync

B : NAV symbol (bit) sync

F : Subframe or message sync

R : Polarity of subframe or message sync (R: reversed)

Correlator Page



*1 BB CH can be selected by clicking BB CH Status row in BB CH Page

*2 Integration time is based on non-coherent integration time for DLL

*3 VE and VL are only shown in case of BOC-modulation and Bump-Jump enabled

Satellites Page

System Selection

Status for each Satellite:

SAT : Satellite ID
 FCN : Frequency channel no (FCN) for GLONASS FDMA signals
 PVT : Satellite used in PVT solution or not
 OBS : Satellite L1 OBS data availability
 EPH : Satellite ephemeris availability
 SVH : Satellite health flag in ephemeris (HEX)
 AZ : Azimuth angle (deg)
 EL : Elevation angle (deg)
 SIG1 : Signal 1 ID
 C/N0 : C/N0 of signal 1 (dB-Hz)
 SIG2 : Signal 2 ID
 C/N0 : C/N0 for signal 2 (dB-Hz)
 SIG3 : Signal 3 ID
 C/N0 : C/N0 for signal 3 (dB-Hz)
 ...

Number of satellites used for PVT solution, number of satellites tracked, number of all tracked signals

Orange: unhealthy satellite
 Grey: unused satellite for PVT solution

SAT	FCN	PVT	OBS	EPH	SVH	AZ(°)	EL(°)	SIG1	C/N0	SIG2	C/N0	SIG3	C/N0	SIG4	C/N0	SIG5	C/N0	SIG6	C/N0
G01	-	OK	OK	OK	00	10.2	76.8	L1CA	47.7	L1CD	44.5	L1CP	49.5	L2CM	49.9	L5I	51.3	L5Q	49.6
G02	-	OK	OK	OK	00	37.3	53.7	L1CA	45.8	-	-	-	-	-	-	-	-	-	-
G03	-	OK	OK	OK	00	153.7	45.0	L1CA	45.2	L2CM	42.9	L5I	47.5	L5Q	41.7	-	-	-	-
G07	-	-	OK	OK	00	215.2	12.6	L1CA	40.1	-	-	-	-	-	-	-	-	-	-
G08	-	OK	OK	OK	00	88.7	36.1	L1CA	43.4	L2CM	42.6	L5I	43.6	L5Q	38.2	-	-	-	-
G14	-	OK	OK	OK	00	305.9	47.7	L1CA	44.3	L1CD	41.2	L1CP	45.9	L2CM	45.2	L5I	43.2	L5Q	39.8
G17	-	OK	OK	OK	00	298.7	28.4	L1CA	44.5	L2CM	42.4	-	-	-	-	-	-	-	-
G21	-	OK	OK	3F	47.4	36.5	L1CA	41.1	-	-	-	-	-	-	-	-	-	-	-
G22	-	OK	OK	OK	00	315.2	29.0	L1CA	36.8	-	-	-	-	-	-	-	-	-	-
G27	-	-	OK	OK	00	100.2	3.6	L1CA	34.3	-	-	-	-	-	-	-	-	-	-
G30	-	OK	OK	OK	00	249.1	20.3	L1CA	40.2	L2CM	37.4	L5Q	38.0	-	-	-	-	-	-
R01	+1	OK	OK	OK	00	96.2	21.2	G1CA	40.0	G2CA	40.4	-	-	-	-	-	-	-	-
R02	-4	-	OK	OK	00	140.8	4.2	G1CA	34.1	G2CA	39.0	-	-	-	-	-	-	-	-
R08	+6	-	OK	OK	00	40.4	12.7	G1CA	40.2	G2CA	43.5	-	-	-	-	-	-	-	-
R14	-7	OK	OK	OK	00	205.0	50.7	G1CA	48.0	G2CA	46.9	-	-	-	-	-	-	-	-
R15	+0	OK	OK	OK	00	302.1	50.6	G1CA	49.3	G2CA	50.1	-	-	-	-	-	-	-	-
R17	+4	OK	OK	OK	00	294.5	46.9	G1CA	50.0	G2CA	51.4	-	-	-	-	-	-	-	-
R18	-3	-	-	OK	00	259.1	10.4	G1CA	38.5	G2CA	37.9	-	-	-	-	-	-	-	-
R24	+2	OK	OK	OK	00	23.7	45.8	G1CA	48.7	G2CA	49.5	G30CD	42.9	G30CP	42.5	-	-	-	-
R26	-6	-	OK	OK	01	34.8	10.5	G1CA	42.0	G10CD	40.3	G10CP	40.7	G2CA	45.5	G30CD	38.1	G30CP	38.1
E02	-	OK	OK	OK	00	295.4	70.0	E1B	47.8	E1C	47.5	ESAI	46.9	E5AQ	47.2	E5BI	49.4	E5BQ	49.3
E10	-	-	OK	OK	00	47.4	10.8	E1B	36.3	E1C	36.4	ESAI	39.5	E5AQ	39.7	E5BI	36.4	E5BQ	36.4
E11	-	OK	OK	OK	00	42.4	36.9	E1B	41.2	E1C	40.8	ESAI	39.6	E5AQ	39.8	E5BI	39.8	E5BQ	39.6
E14	-	-	OK	OK	92	287.8	14.7	E1B	35.6	E1C	35.3	ESAI	37.5	E5AQ	37.3	E5BI	37.4	E5BQ	37.6
E16	-	OK	OK	OK	00	147.7	25.7	E1B	40.0	E1C	39.7	ESAI	41.3	E5AQ	41.5	E5BI	40.2	E5BQ	40.3
E25	-	OK	OK	OK	00	153.8	50.1	E1B	45.6	E1C	45.6	ESAI	45.6	E5AQ	45.3	E5BI	43.5	E5BQ	43.7
E30	-	-	-	OK	00	0.0	0.0	ESAI	35.9	-	-	-	-	-	-	-	-	-	-
E34	-	-	-	OK	00	238.6	33.3	E1B	43.5	E1C	43.8	ESAI	44.2	E5AQ	44.2	E5BI	44.2	E5BQ	43.9
E36	-	OK	OK	OK	00	315.6	79.8	E1B	46.8	E1C	46.6	ESAI	48.1	E5AQ	48.2	E5BI	48.0	E5BQ	48.1
J02	-	OK	OK	OK	00	168.8	75.4	L1CA	47.0	L1CD	44.1	L1CP	49.2	L1S	49.1	L2CM	47.3	L5I	47.9

Receiver started. (bus/port=, conf=, /conf/pocket_L1B1G1L2G2L5ESbL6_16MHz.conf) Time: 596.376 s

Solution Page

PVT Solution Plot
Selection:
Pos ENU or Pos Horiz

Show Ref Pos
Dialog Button

PVT Solution
Clear Button

Time Span and Y-axis
Range Selections

Current Solution and
Number of Used/All
Satellites

PVT Solution Plot:
Pos E, N, U: position errors
east-west, north-south,
up-down *¹,
Sats: Number of used/all
satellites
or
Position error horizontal *¹
(east-west and north-west,
horizontal scatter plot)



Ref Pos Dialog

Ref Pos

Latitude (°)

35.87299504

Longitude (°)

138.38966428

Altitude (m)

1013.862

OK

Cancel

*¹ The reference position is automatically selected from the first epoch solution.
It can be modified by using Ref Pos Dialog

Log Page

Additional Receiver Log Filter:
filter string, like G01 or L1CA, separated
by spaces, | indicates OR condition
(e.g., G10|G02|G03)

Receiver Log
Type Selection:
Blank: all log

Receiver
Logs *1 *2

Receiver Log
Pause Button

Receiver Log
Clear Button

Receiver started. (bus/port=, conf= ./conf/pocket_L1B1G1L2G2L5ESbL6_16MHz.conf) Time: 660.831 s

*1 Refer p.14 for the receiver log formats

*2 To copy the logs to Clip-board, push Pause button, select the logs and push Ctrl-C of the keyboard

Input Options Dialog

Input Source Selection:
RF Frontend or IF Data

Device Configuration File:
RF Frontend configuration (MAX2771 register settings for Pocket SDR FE) to be loaded at the receiver started. Check Device Configuration File and fill the file path. If unchecked, the current configuration for the device is used.

IF Data File *1:
IF data file path, if IF Data selected as the input source. The IF data can be captured by pocket_dump or as IF data log of the receiver with tag files.

The screenshot shows the 'Input Options' dialog box. It has two tabs: 'RF Frontend' (selected) and 'IF Data'. Under 'RF Frontend', there is a 'Device Type' dropdown set to 'Pocket SDR FE', a 'Device Selection (Blank: Any)' dropdown set to 'USB Bus/Port', and a checked 'Device Configuration File' checkbox with a text field containing './conf/pocket_L1B1G1L2G2L5E5bL6_16MHz.conf'. Under 'IF Data', there is a 'Path (File: local_path)' text field with 'C:/share/log_bin/test_2025022408.bin', 'Time Offset (s)' set to '0.0', 'Time Scale' set to '1.0', and an 'IF Data Format*' dropdown set to 'RAW32'. Below these is a 'Sampling Rate (Mpsps)*' dropdown set to '24.000'. At the bottom is a table with 8 columns: RF, LO Freq (MHz)*, I/IQ*, and Bits* for CH1 through CH8. The table is populated with values for each channel. At the very bottom, there is a note: '* Automatically configured if <Path>.tag file exists.' and 'OK' and 'Cancel' buttons.

RF	LO Freq (MHz)*	I/IQ*	Bits*	RF	LO Freq (MHz)*	I/IQ*	Bits*
CH1	1568.000	IQ	2	CH5	1602.000	IQ	2
CH2	1227.600	IQ	2	CH6	1246.000	IQ	2
CH3	1176.450	IQ	2	CH7	1207.140	IQ	2
CH4	1278.750	IQ	2	CH8	1268.520	IQ	2

RF Frontend Type Selection:
Currently, only Pocket SDR FE is selectable

USB Bus/Port:
To select device in case of multiple devices connected. If blank, the device is automatically selected.

Time Offset and Scale:
Start time offset and time scale to playback the IF Data.

IF Data File Property *1:
IF Data Format, Sampling Rate, LO frequency, Sampling Type (I or IQ), Number of sample bits for each RF CH. If the tag file exist for the IF data file, these are automatically configured according to the tag file.

*1 Refer p.13 for the IF data file formats

Output Options Dialog

PVT Solution Output

Path:

PVT Solution (NMEA 0183
GNRMC, GNGGA, GNGSA,
GxGSV) path *¹.

OBS and NAV Data

Output Path:

OBS and NAV Data (RTCM 3.4
MSM (MT1077, 1087, 1097, 1117,
1127, 1137 and 1107) with
extension and EPH (MT1019,
1020, 1045, 1046, 1044, 1042
and 1041) path *¹ *²

Receiver Log

Output Path:

Receiver Log Path *¹ *³

Receiver Log Type

Selections *³

IF Data Log Output Path:

IF Data Log Path *¹ *⁴,
It is only valid for RF
Frontend selected as the
input source

*¹ The output path should be one of the followings.

- (1) <local path>: A local file path <local path>. It can contain time keywords replaced by the log start time. Optionally, it can include the file swapping order “::S=<tint>” by the specified interval <tint> (H).
- (2) :<port>: TCP server with the port number <port>. The TCP server waits for and accepts the external TCP connection at the port and output data
- (3) <addr>:<port>: TCP client with the address <addr> and the port number <port>. The TCP client connects the external TCP server and output data

*² The output RTCM 3.4 MSM (with extensions) and EPH can be converted to RINEX OBS and NAV by CONVBIN utility included in the Pocket SDR package

*³ Refer p.14 for the receiver log format. The receiver log can be plotted by the Log Viewer pocket_plot.py in the Pocket SDR package

*⁴ Refer p.13 for the IF data log format. The output format is automatically selected according to the RF Frontend (RAW8, RAW16 or RAW32). The tag file is also generated.

Signal Options Dialog

GNSS System and Signal Selections:

System: GNSS System,
Satellite No: Satellite number or
number range (n-m) separated
by , *1
GNSS Signals: Signal IDs to be
tracked

RF CH Assignment Options:

RF CH is automatically assigned for
signals. To assign signals to specific
RF CH(s) manually, use the option
as the format <sig>:<ch_list>
separated by spaces, where, <sig>
is signal ID and <ch_list> is RF CH
number list like 1,3,5-7.
Additionally, SRCH:<ch_list> can be
used to specify signal search CH(s)
to shorten the acquisition time.

Link to Detailed GNSS
Signal Table

Pocket SDR Signal ID Table

System	Signal	Signal ID	System	Signal	Signal ID
GPS	L1C/A	L1CA	BeiDou	B1I	B1I
	L1C-D	L1CD		B1C-D	B1CD
	L1C-P	L1CP		B1C-P	B1CP
	L2C-M	L2CM		B2a-D	B2AD
	L5-I	L5I		B2a-P	B2AP
GLONASS	L5-Q	L5Q	NavIC	B2I	B2I
	L1C/A	G1CA		B2b-I	B2BI
	L10Cd	G10CD		B3I	B3I
	L10Cp	G10CP		L1-SPS-D	I1SD
	L1C/A	G2CA		L1-SPS-P	I1SP
Galileo	L20Cp	G20CP	SBAS	L5-SPS	I5S
	L30Cd	G30CD		S-SPS	ISS*3
	L30Cp	G30CP		L1C/A	L1CA
	E1-B	E1B		L5-I	L5I
	E1-C	E1C		L5-Q	L5Q
QZSS	E5a-I	E5AI			
	E5a-Q	E5AQ			
	E5b-I	E5BI			
	E5b-Q	E5BQ			
	E6-B	E6B			
QZSS	E6-C	E6C			
	L1C/A	L1CA			
	L1C/B	L1CB			
	L1C-D	L1CD			
	L1C-P	L1CP			
QZSS	L2C-M	L2CM			
	L5-I	L5I			
	L5Q	L5Q			
	L5S-I	L5SI			
	L5S-Q	L5SQ			
QZSS	L6D	L6D			
	L6E	L6E			
	L5S-I	L5SIV*2			
	L5S-Q	L5SQ			
	L5S-Q	L5SQV*2			

*1 For GPS, Galileo, BeiDou, NavIC and SBAS, these satellite numbers are the same as the signal PRN numbers. For GLONASS, use the frequency channel number (FCN) for FDMA signals and satellite slot number for CDMA signals instead separated by /.
For QZSS, which has complicated satellite numbering, use SV IDs (1-5, 8, 9) or non-standard code numbers (6, 10) instead as the satellite numbers.

*2 QZSS L5S verification mode signals

*3 Pocket SDR FE currently does not support S-band signals

System Options Dialog

PVT Options Selection:

Epoch Interval (s), Max Epoch Lag (s) and Elevation angle Mask (deg)

Signal Acquisition and Tracking Options Selection:

Correlation Spacing (chip), Non-coherent Integration Time for Acquisition (s), Non-coherent Integration Time for DLL (s), Loop filter bandwidth for DLL, PLL, FLL (wide-band) and FLL (narrow-band) (Hz), Max Doppler Frequency search range (Hz), C/N0 thresholds for signal-lock or signal-lost decision (dB-Hz), Bump-Jump for BOC modulation enabled or disabled.

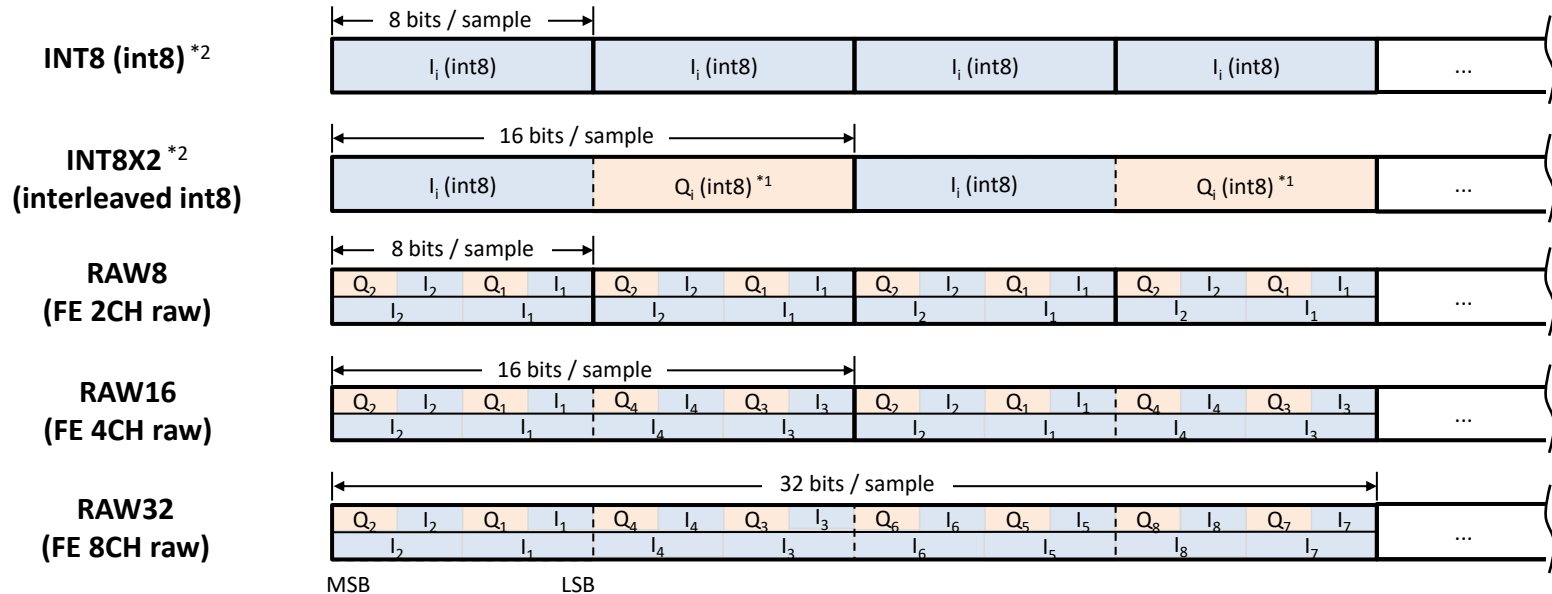
Option	Value
Epoch Interval for PVT (s)	1.0
Max Epoch Lag for PVT (s)	0.5
Elevation Mask for PVT (°)	15
Correlator Spacing (chip)	0.1
Integration Time for Acquisition (s)	0.02
Integration Time for DLL (s)	0.02
DLL Loop Filter Bandwidth (Hz)	0.25
PLL Loop Filter Bandwidth (Hz)	5.0
FLL Loop Filter Bandwidth Wide (Hz)	5.0
FLL Loop Filter Bandwidth Narrow (Hz)	2.0
Max Doppler Frequency to Search Signal (Hz)	5000
C/N0 Threshold for Signal Locked (dB-Hz)	34.0
C/N0 Threshold for Signal Lost (dB-Hz)	30.0
Bump Jump for BOC Modulation	ON
FFTW Wisdom Path	./python/fftw_wisdom.txt

FFTW Wisdom Path:

FFTW wisdom file path to shorten the signal acquisition time. The file can be generated by the utility `fftw_wisdom` in the Pocket SDR package.

IF Data File Formats

I_i : i-CH I-sample, Q_i : i-CH Q-sample



^{*1} Polarity inverted due to MAX2771 convention

^{*2} Quantized values only supported in the range [-7 ... +7]

2 bits IQ-sampling

bits	00	01	10	11
I	+1	+3	-1	-3
Q ^{*1}	-1	-3	+1	+3

2 bits I-sampling

bits	**00	**01	**10	**11
I	+1	+3	-1	-3

3 bits I-sampling

bits	0000	1000	0001	1001	0010	1010	0011	1011
I	+1	+3	+5	+7	-1	-3	-5	-7

IF Data Tag File (<path>.tag)

```

PROG = Pocket SDR
TIME = 2024/11/01 20:48:00.776 (Start Time GPST)
FMT = RAW16 (Format)
F_S = 24 (Sampling Freq. MHz)
F_LO = 1568,1237.8,1176.45,1278.75 (LO Freq. MHz)
IQ = 2,2,2,2 (Sampling, 1:I, 2:IQ)
BITS = 2,2,2,2 (Sampling Bits)
    
```

Receiver Logs

\$TIME,time,year,mon,day,hour,min,sec,tsys (time info)
\$OBS,time,year,month,day,hour,min,sec,sat,code,cn0,pr,cp,dop,lli,fcn (OBS data)
\$NAV,time,sat,sig,nerr,size,data (raw NAV data)
\$POS,time,year,month,day,hour,min,sec,lat,lon,hgt,Q,ns,stdn,stde,stdu,dtr (position solution)
\$SAT,time,year,month,day,hour,min,sec,sat,pvt,obs,cn0,az,el,res (satellite info)
\$EPH,time,sat,sig,IODE,IODC,SVA,SVH,Toe,Toc,Ttr,A,e,i0,OMEGA0,omega,M0,delta-n,OMEGAdot,Idot,Crc,Crs,Cuc,Cus,Cic,Cis,Toes,Fit,Af0,Af1,Af2,TGD,code,flag (GPS/Galileo/QZSS/BeiDou/NavIC decoded ephemeris)
\$EPH,time,sat,sig,tb,fcn,SVH,SVA,age,Toe,Tof,pos-x,pos-y,pos-z,vel-x,vel-y,vel-z,acc-x,acc-y,acc-z,tau-n,gamma-n,delta-tau-n (GLONASS decoded ephemeris)
\$CH,time,ch,rfch,sat,sig,prn,lock,cn0,coff,dop,adr,ssync,bsync,fsync,rev,srev,err_phas,err_code,tow_v,tow,week,type,nnav,nerr,nlol,nfec (receiver channel info)
\$LOG,time,message (error, warning, general info message)

\$TIME	\$NAV	\$SAT	\$CH
time receiver time (s)	time receiver time (s)	time receiver time (s)	time receiver time (s)
year year (2000-2099)	sat satellite ID	year,month,day solution day (GPST)	ch receiver channel number
mon month (1-12)	sig signal ID	hour,min,sec solution time (GPST)	rfch RF channel number
day day (1-31)	nerr number of corrected error bits	sat satellite ID	sat satellite ID
hour hour (0-23)	size raw NAV data size (bits)	pvt PVT status (0:not used,1:used)	sig signal ID
min minute (0-59)	data raw NAV data HEX dump	obs L1 obs data status (0:unavailable,1:available)	prn PRN number
sec second (0.000-59.999)		cn0 L1 signal C/N0 (dB-Hz)	lock lock time (s)
tsys time system (GPST or UTC)		az azimuth angle (deg)	cn0 C/N0 (dB-Hz)
	\$POS	el elavation angle (deg)	coff code offset (ms)
\$OBS	time receiver time (s)	res L1 pseudorange residual (m)	dop Doppler frequency (Hz)
time receiver time (s)	year,month,day solution day (GPST)		adr accumulated Doppler range (cyc)
year,month,day	hour,min,sec solution time (GPST)	\$EPH	ssync secondary code sync flag (0:async,1:sync)
obs data day (GPST)	lat solution latitude (deg,+:north,-:south)	time receiver time (s)	bsync symbol/bit sync flag (0:async,1:sync)
hour,min,sec	lon solution longitude (deg,+:east,-:west)	sat satellite ID	fsync frame sync flag (0:async,1:sync)
obs data time (GPST)	hgt solution ellipsoidal height (m)	sig signal ID	rev primary code polarity (0:normal,1:reversed)
sat satellite ID	Q quality flag (=5: single)	... decoded ephemeris parameters	srev secondary code polarity (0:normal,1:reversed)
code RINEX obs code	ns number of valid satellites		err_phas phase error (cyc)
cn0 C/N0 (dB-Hz)	stdn solution standard-dev north (m)	\$LOG	err_code code error (10^-6 s)
pr pseudorange (m)	stde solution standard-dev east (m)	time receiver time (s)	tow_v tow valid flag (0:invalid,1:valid,2:ambiguity unresolved)
cp carrier phase (cyc)	stdu solution standard-dev up (m)	message error, warning or general info message	tow time of week (ms)
dop Doppler frequency (Hz)	dtr receiver clock bias (s)		week week number (week)
lli loss-of-lock indicator			type navigation subframe or message type
fcf frequency channel number for GLONASS FDMA signals			nnav navigation subframe/message count
			nerr error subframe/message count
			nlol loss-of-lock count
			nfec number of error corrected (bits)