

# FlexSATPC: Using SatPC32 with FlexRadio Systems® Radios

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The desire to utilize SatPC32 with Flex radios inspired me to develop FlexSATPC. This article provides a functional and technical overview of FlexSATPC.

SatPC32 is a highly regarded Windows application for amateur radio satellite operations, and was the satellite software of choice when starting satellite operations in 2010 at W0DHB. The FLEX-5000 with the V/U option was the preferred radio primarily because of PowerSDR's built-in panadapter, which provides a view of the entire satellite transponder.

Flex radios emulate many TS-2000 CAT commands; however, the TS-2000 CAT support in SatPC32 used commands not emulated. Several features did not work, most notably: (1) Uplink and Downlink modes were not set correctly; (2) Tones were not set correctly; and (3) other PowerSDR anomalies triggered Flex radio errors when switching between different satellites. The newest 6000 series of Flex radios using SmartSDR have most of the same issues.

Flex radios currently target HF operations unlike mainstream satellite radios such as the ICOM 910/9100 or Kenwood TS-2000. So, I was not surprised when I contacted SatPC32 author, Erich DK1TB, in 2010 to learn that he had no plans for native Flex radio support.

FlexSATPC initially was developed as a translator of TS-2000 CAT to FlexRadio PowerSDR/SmartSDR CAT and has now evolved as a program to streamline many aspects of satellite operations. Ron Parsons, W5RKN, has published two articles in *The AMSAT Journal* describing his operations using Flex radios. The first, published in the July/August 2013 issue documents operations with PowerSDR-based Flex radios, and the second (in this issue) describes FlexSATPC's operations with SmartSDR-based Flex radios.

## Functional Overview

Fundamentally, FlexSATPC software translates SatPC32's TS-2000 CAT I/O, DDE Output and SatPC32 data files to the data formats required by FlexRadio. Data coming from the radio is translated into TS-2000

CAT and passed on to SatPC32.

FlexSATPC allows full functionality with SatPC32, including:

- Uplink and Downlink Doppler Tuning
- Uplink and Downlink Mode setting, and
- Tone on/off and frequency setting.

Downlink tuning may be done either with SatPC32 tuning buttons or using any of the PowerSDR/SmartSDR tuning methods (mouse wheel, FlexControl, click tune, etc.). Uplink frequency will track with Downlink frequency.

Additional functionality:

- Uplink Calibration using SatPC32 Uplink Calibration buttons, XIT or FlexSATPC's Uplink Calibration Feature
- Multi-radio setup, PowerSDR/SmartSDR Downlink with PowerSDR, SmartSDR, TS-2000, IC-910H or IC-9100 uplink
- USB8 relay board operation based on current Uplink or Downlink frequency for Relay or sequencer switching.

Logging Capabilities (Log4OM logging software):

- Log QSO's with minimal entry of data - only callsign data required
- QRZ.com lookup (optional)
- Grid tracking (grids worked, confirmed), and
- Rover Tracking (grids worked/confirmed with a specific rover).

FlexSATPC runs on Windows 7, 8, 8.1 and 10, both 32 and 64 bit versions, and requires virtual com ports such as VSPE from Eterlogic or VSP Manager from K5FR. If using logging features, Log4OM software using SQLServer is required.

FlexSATPC will support the following equipment configurations (note that not every combination has been tested):

- FLEX 5000 with Transverters - RX2 required for full duplex operation (PowerSDR)
- FLEX 5000 with V/U option (PowerSDR)
- FLEX 6300, 6500 or 6700 with transverters (SmartSDR)
- FLEX 1500, 3000, 5000, 6300, 6500, 6700 with transverter or converter for Downlink, and for Uplink one of the following:
  - 1500, 3000, 5000, 6300, 6500, 6700 with transverters
  - TS-2000
  - IC-9100, or

- IC-910H.

FlexSATPC may also be configured to perform only the logging functions for stations not using a Flex radio. Log4OM logging software with SQLServer is required. A FlexControl or similar device is strongly recommended for Downlink tuning in transponder satellite operation.

## FlexSATPC Operations

### Main Form

Figure 1 shows an FO-29 pass, with the azimuth and elevation updated in real time from SatPC32. From this form, the operator can:

- Disconnect and connect from radio(s) and SatPC32
- Display the Logging entry form
- Display the Uplink Calibrate form
- Mute the Downlink audio
- Toggle between full duplex and half duplex operation
- Transmit a Tune carrier to assist in Calibrating transponder satellites (Flex transmit only)
- Toggle transmit and receive, and
- Set Uplink power level (0 to 100% of full power output).

### Uplink Calibrate Form

The Uplink Calibration form in Figure 2 facilitates calibrating the uplink frequency to the downlink frequency for transponder satellites. It duplicates SatPC32 functionality for enhanced convenience and ease of use, making the arrow buttons in SatPC32 more visible and easier to click on, at the same time remembering that, for inverting transponder, up is down and down is up.

This form also has proven useful for AO-73 operations, where the Uplink/Downlink Calibration changes during the pass, and for AO-85 where the uplink frequency can vary between passes.

### Logging Form

The logging form in Figure 3 is used for logging satellite QSO's. When the callsign of the QSO is entered, the grid and name information are populated from the operator's log and, if not found in the log, QRZ.com if configured. Information about the last QSO and grid status are also provided. Worked/confirmed grid status will appear in the upper right if Grid Tracking is enabled. The upper right corner also shows the number of different stations worked on AO-73 for tracking the "73 on 73" award.

This form can also show if you have worked a





Figure 1 - Main FlexSATPC form



Figure 2 - Uplink Calibration form



Figure 3 - Logging form



Figure 4 - Sample grid lookup

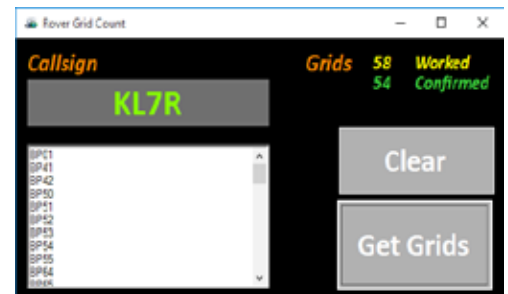


Figure 5 - Sample rover check

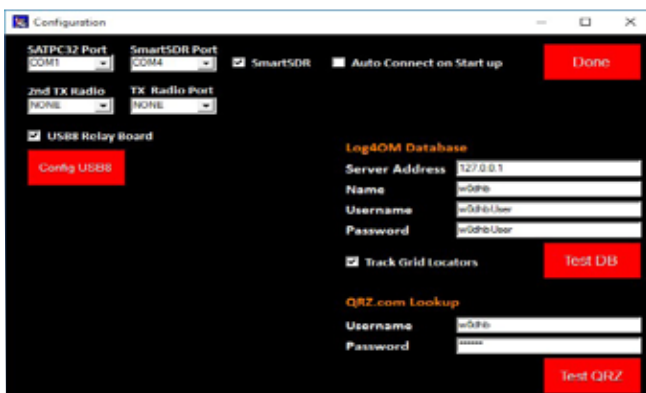


Figure 6 - Configuration form

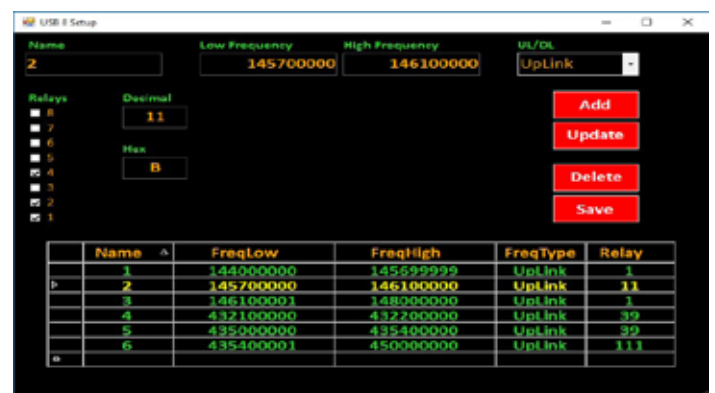


Figure 7 - USB8 setup form

specific grid or not. If you hear someone from grid EM55 on the air and enter the grid EM55 in the form, it will tell you if that is a new grid, worked-not-confirmed or confirmed. Figure 4 indicates KL7R confirmed in EM55. The Logging form also supplies lists of confirmed and worked-but-not-confirmed that can be cut and pasted into input files for grid mapping programs like GcmWin.

### Rover Check Form

The Rover Check Form is a tool that displays, for a given callsign, the grids and number of grids that callsign has given you. See an example in Figure 5.

### Configuration Form

The Configuration Form in Figure 6 facilitates configuring the operator's equipment setup

and logging database (if using the logging feature). The example shows SmartSDR being used for uplink and downlink. The COM port in the SatPC32 Radio Setup form is set to COM1, and the COM port defined in SmartSDR CAT is COM4. The Logging feature is shown with Grid Tracking and QRZ.com lookup. Configuration is typically done once and saved in the Windows registry.

### USB8 Relay Board Configuration

In Figure 7, Frequency Range 2 is selected. This rule specifies that when the uplink frequency is between 145.7 MHz and 146.1 MHz, relays 1, 2 and 4 should be energized. The relays referenced may be for switching transverters in and out, antenna switching or any other function requiring switching based on uplink or downlink frequency.

USB8 is an eight channel relay board driven by a USB interface. DDUUtil supports the same board. Boards are available online from several sources. The models that have been tested are the Denkovi DAE-CB/Ro8/I2V-JQC-USB and SainSmart SRD-I2VDC-SL-C.

### Summary

This brief overview of the functionality and "look and feel" of FlexSATPC may seem overly complex. In actual operation, the most complex part is setting up the configuration. From that point on, just fire up the program, select the target satellite in SatPC32, and start making QSO's.

A more detailed User Guide/Reference manual provides more detail and is currently being revised to incorporate recently added

SmartSDR and USB8 relay functionality with availability around mid-February 2016. If you have questions or would like to get a copy of software, contact the author at [w0dhb@amsat.org](mailto:w0dhb@amsat.org) or on the air. A download site should be up in early 2016.

### Technical Information

FlexSATPC was developed in the Visual Studio 2013 environment and is written primarily in Visual Basic.net with some low level I/O routines written in C#.


The interfacing with all external programs and hardware uses standard well-documented interfaces:

- PowerSDR (Flex 1500, 3000, 5000) – CAT interface (Input/Output)
- SmartSDR (Flex 6300, 6500, 6700)
  - SmartSDR CAT (Input/Output)
  - SmartSDR API (Input/Output)
- SatPC32
  - TS-2000 CAT (Input/Output)
  - DDE (Input only)
  - Config.sqf (Input only – used to determine which SatPC32 configuration you are using)
  - Doppler.SQF file (Input only – used to differentiate which mode of a satellite has been selected)
- Log4OM
  - Log4OM Communicator
  - SQLServer
- USB8 (8 Channel Relay Board) – Standard FTDI drivers
- IC9100 – CAT (CI-V using either CI-V or USB interface)
- IC910 – CAT (CI-V)
- TS-2000 – CAT

### Author

David Beumer, W0DHB, lives in Boulder County, Colorado. Licensed since 1965 as WA3FDB, he also has held the calls WA1HKL and WB6LXM. Dave retired after 30 years of developing CAD/CAM software for the design and manufacture of PC Boards, hybrid circuits and ICs. He has been active in amateur radio satellites since 2010.

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## Report from the 2015 AMSAT Space Symposium and Annual Meeting

### Paul Stoetzer • N8HM Secretary

The 33rd Annual AMSAT Space Symposium, Annual General Meeting, and Board of Directors Meeting were held at the Crowne Plaza Hotel in Dayton, Ohio, October 15-19, 2015. Thanks go to the Dayton Area Amateur Radio Association (DARA) for hosting a wonderful event!

The Symposium and related events included:

- AMSAT Board of Directors Meeting – October 15-16
- 33rd Annual 2015 AMSAT Space Symposium – October 16-17
- AMSAT Annual General Meeting – October 17
- Field Coordinator's Annual Breakfast – October 18, and
- Tour of the National Museum of the United States Air Force – October 19.

### Summary of the Board of Directors Meeting



The Board of Directors meeting was held on October 15-16. Full minutes of the board's actions and discussions will be published in a future issue of *The AMSAT Journal*. Following is a summary of the board's discussions.

AMSAT President Barry Baines, WD4ASW, opened the meeting by welcoming the board members, officers, and visitors in attendance. He then presented the slate of officers that were approved by a board vote. He noted that there were three vacancies: Executive Vice President, Vice President User Services, and Vice President Marketing. He reviewed

the key leaders appointed by the President and noted that *The AMSAT Journal* Editor position was open.

Barry then reviewed the organizational accomplishments from the past year. Most notably, Fox-1A was launched on October 8, 2015, and designated AO-85. He reported that satellites Fox-1Cliff, Fox-1D, and RadFXSat/Fox-1B were all scheduled for launch next year. He noted AMSAT's evolving partnerships with several universities and other organizations, such as Virginia Tech, which is working with AMSAT on Phase 3E and Phase 4B satellite projects, as well as providing the cameras on Fox-1Cliff and Fox-1D. Vanderbilt University supplied experimental payloads on Fox-1A and the upcoming RadFXSat/Fox-1B. The University of Iowa's HERCI experiment will fly on Fox-1D. AMSAT is also working with Ragnarok on its entry in the NASA CubeQuest Challenge. Barry noted that the success of Fox-1A may help to foster new relationships and mentioned that Auburn University is interested in the Fox-1E RF design for its CubeSat.

Barry next focused on the 2016 challenges, which included:

- New funding relationships being created for ARISS
- AMSAT's need to navigate the new export control requirements with the shift of certain items from ITAR to EAR
- CubeSat licensing continuing to be an issue with experimental versus amateur satellite service licenses as the IARU is no longer coordinating experimental licensees in the 2-meter band
- The need to improve AMSAT's IT, such as the website and membership resources, and
- AMSAT's need to continue building awareness and support.

Barry advised that AMSAT was working on two new major projects with Virginia Tech, Phase 3E and Phase 4B, which will take considerable resources. The board discussed what other future projects to undertake after the Fox program, given that work on Phase 3E may consume a large amount of time and resources. The board reached general agreement that the success of Fox-1A may evolve into AMSAT working with universities by providing CubeSat transceiver boards and

