SmartSDR CAT User Guide

FLEX-6000 / FLEX-8000 / Aurora Series

Revision

Rev. v4.1.5

Date

March 2026

Contents

Chapter 1

Introduction

1.1 Description of the SmartSDR CAT Interface

The SmartSDR CAT interface bridges the legacy COM port interface used by many amateur radio systems to that of the FlexRadio Systems Signature Series radios. This allows third party programs such as loggers and digital mode clients that don't communicate directly with the radio using our Ethernet API to communicate without changes.

The FlexRadio CAT command set is based upon the Kenwood format. Therefore, any program that supports Kenwood models should work with our radio. In addition to the CAT protocol SmartSDR CAT also supports the Open Two Radio Switching Protocol (OTRSP) for SO2R automation, Winkeyer emulation, and PTT Port capabilities.

Because of the limitations in a legacy system like CAT, the SmartSDR CAT feature set is limited. Common features like tuning a VFO, transmitting, etc., are included. However, this means that many advanced features in a Signature Series radio will not be available via the CAT interface. Developers seeking additional access to such features should explore the API resources available at the Flex Application Developer Program (ADP) web page.

The Signature Series are a radio "server" platform that multiple "clients" can communicate with. SmartSDR for Windows is one such client and the SmartSDR CAT interface is a separate client, both of which can communicate concurrently with Signature Series radios.

1.2 Operational Notes

Most third-party CAT enabled programs are designed to control VFO A and possibly VFO B based on a 1 or 2 VFO legacy radio architecture.

With the Signature Series, the concept of a VFO maps very closely to a Slice Receiver. For this reason, a Slice Receiver Index (e.g. Slice A) is a required setup parameter for any protocol that utilizes the concept of a VFO. The selected Slice is *logically* mapped to the third-party CAT program's VFO A.

In the CAT protocol, the first time a split command such as `FT1;` or `ZZSW1;` is encountered, the SmartSDR CAT application will create a new "Split Slice" and set that Slice's Transmit flag (the typical Split configuration with a Signature Series Radio). This allows listening to either the receive and transmit frequencies or both. From that point forward, that Slice will be *logically* mapped to the third-party CAT program's VFO B. Commands that access VFO B information before one of the commands mentioned above is issued or after the Split Slice is manually closed will receive a `?;` response.

Chapter 2

Using SmartSDR CAT Interface

2.1 Starting the SmartSDR CAT Interface

SmartSDR CAT is started by two methods described below. Usually SmartSDR CAT is started by the Auto Start Up method and is never closed, so it is always communicating with the configured FlexRadio Signature Series radio.

> **Note**
> SmartSDR CAT must be able to connect to a Signature Series radio to work properly.

2.1.1 Auto Start Up

SmartSDR CAT will start automatically when SmartSDR starts, if the **Autostart CAT with SmartSDR** option is selected in SmartSDR. When selected, SmartSDR CAT starts and stops with SmartSDR. If the SmartSDR CAT application window was minimized the last time it ran, it will start minimized when SmartSDR is restarted. It will remain running unless closed by the user. Clicking on the SmartSDR CAT icon will open the SmartSDR CAT User Interface for configuration.

2.1.2 Manual Start Up

You can manually start SmartSDR CAT by double clicking on the **SmartSDR CAT** program icon located on your Desktop or in the Windows Start Menu under the FlexRadio Systems program folder. If the application is already running, its window will appear.

2.2 Configuring SmartSDR CAT

When SmartSDR CAT starts the first time, it will create a Serial CAT port automatically at the lowest open port (COM4 or above) and a TCP CAT Port on port 5002.

If the FlexVSP driver is not loaded or has not fully started at the time the SmartSDR CAT user interface starts, an error message will be displayed. This condition in which the VSP driver has not fully started can exist on systems that utilize a solid state hard drive allowing Windows to run the Startup applications before the FlexVSP service has started. If this occurs, wait 15-30 seconds and then manually restart SmartSDR CAT.

2.2.1 Main Window

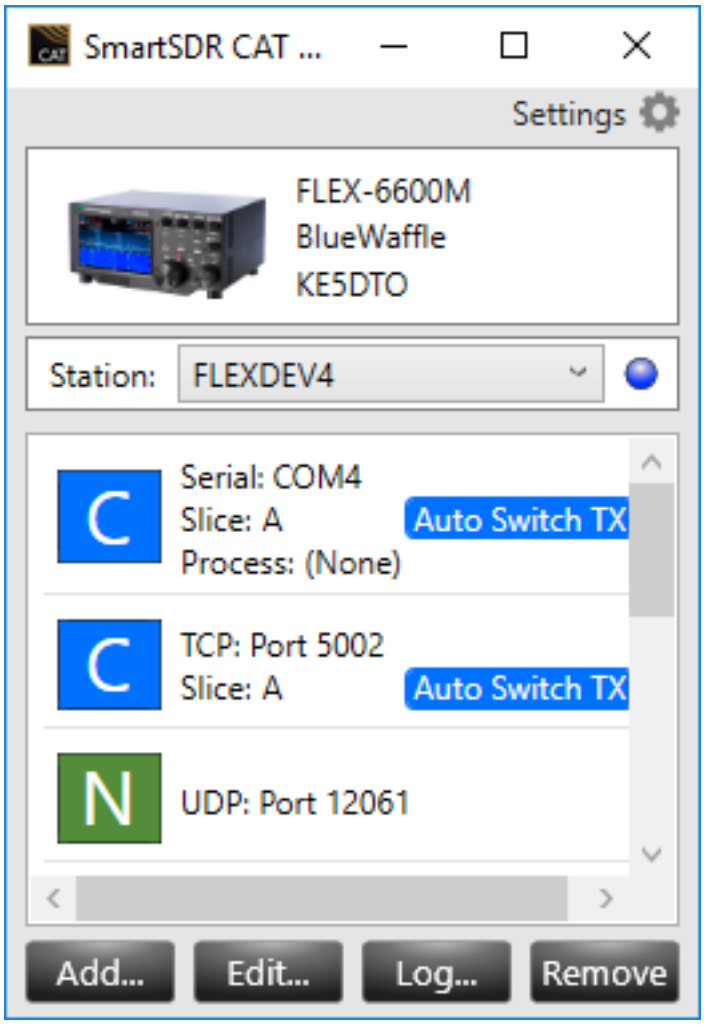

Figure 2.1: SmartSDR CAT Main Window

Near the top of the Main Window, an indicator shows whether SmartSDR CAT has connected to a radio and if it is using a SmartLink connection to a radio. Once a connection has been made, hovering the mouse cursor over this indicator will show the Model and Nickname (or Serial Number) of the connected radio. When no connection is present, this indicator will be shown as follows:

Figure 2.2: Main Window — Radio Not Connected

To select which radio to connect, click on the connection status box at the top of the window. It may also show a blue SmartLink indicator. This will bring up the radio chooser.

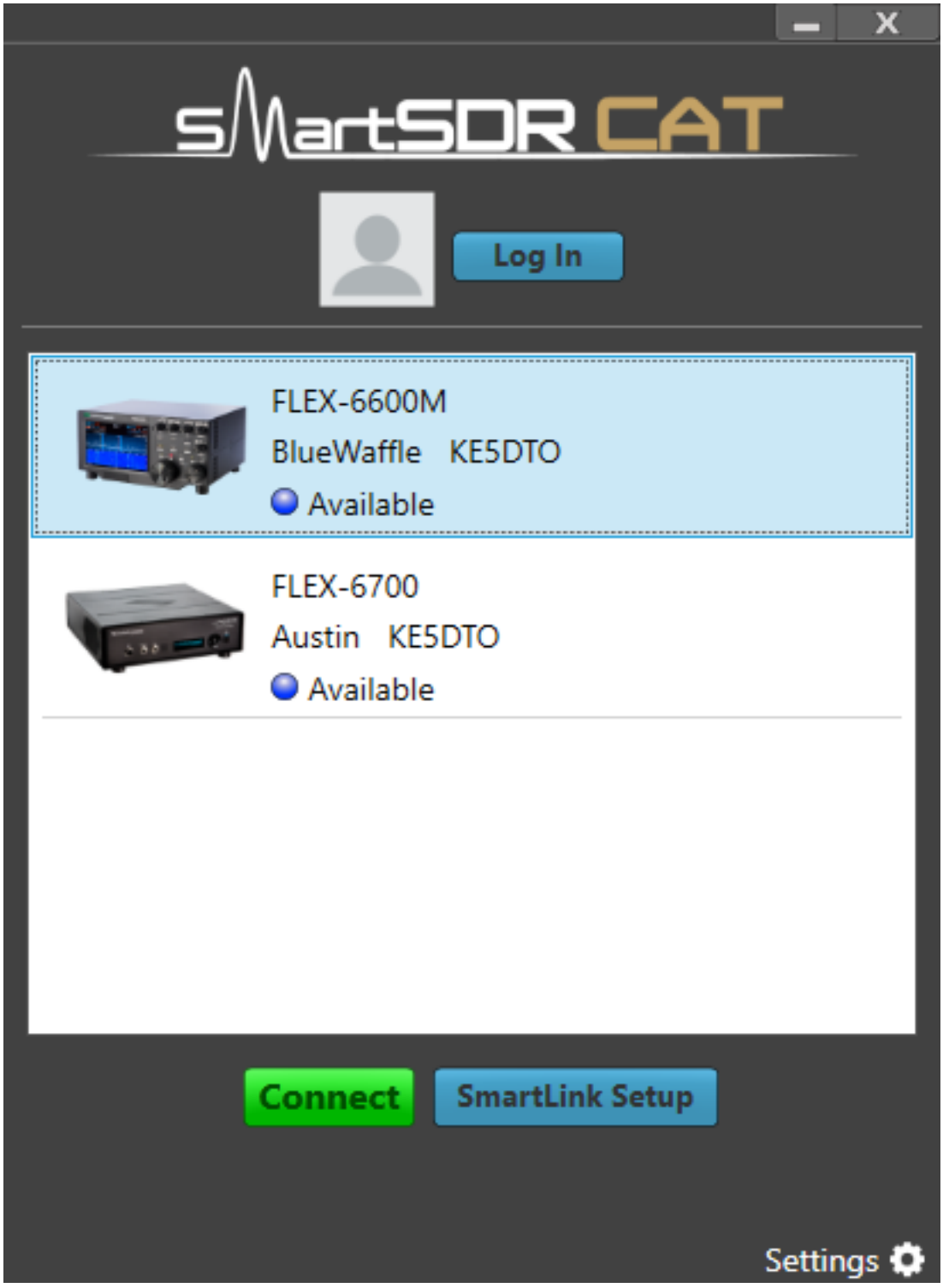

Figure 2.3: Radio Chooser

From this screen, the SmartLink Setup allows the user to verify the SmartLink settings and select a radio from the list. Once a radio is chosen, auto-connect settings are applied when starting up. These settings can be accessed by clicking on the settings icon in the SmartSDR CAT main window. Unchecking the **Auto Connect SmartLink** option will prevent automatically connecting to a remote radio which could cause unintended

network bandwidth to be used.

Right clicking a radio in the radio chooser opens a menu selection that allows you to copy the detailed information about the selected radio to the clipboard, as shown below:

Figure 2.4: Radio Chooser — Copy Radio Info

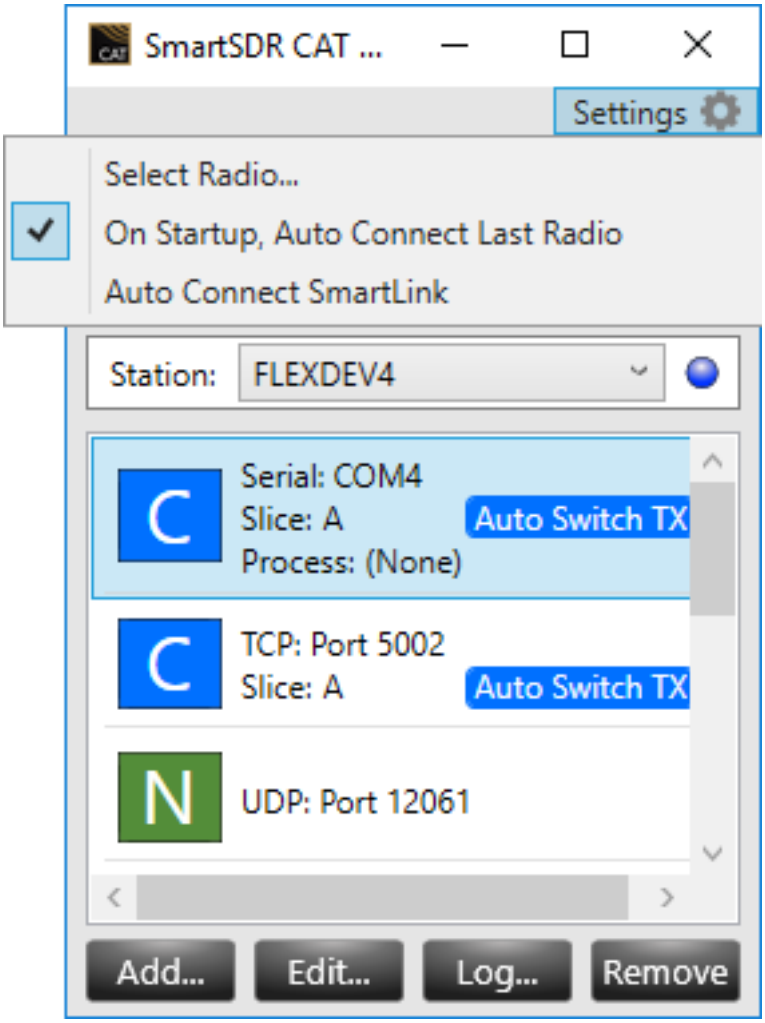

Figure 2.5: Auto Connect Options

The **On Startup, Auto Connect Last Radio** option allow SmartSDR CAT to automatically connect to the last radio that was used if the radio is available on the network. The **Auto Connect SmartLink** does the same if the last radio was connected via SmartLink. This may not be desirable depending on bandwidth issues if operating remote via a mobile connection, for example.

The **Station** selection will initially show the last selected Station and an indication of whether that Station is currently connected to the Radio. The dropdown list will show any other Stations available on the connected radio. The Station selection is necessary to resolve which context to use when fielding CAT commands. For example, FA; asks what frequency Slice A is on. To answer this question, the Station must be known.

The Port list is the primary component of the Main Window. Each item in the list represents a single Port showing the relevant details of the port including the Protocol (CAT, OTRSP, Passthrough, PTT, or Winkeyer), the Port type (e.g. COM1 or TCP port 60000), and the associated Slice (A-H). The colored icon on the left side denotes the first letter of the protocol (C for CAT, O for OTRSP, etc.) Hover the mouse cursor over the indicator to display the Port Protocol.

Note

For Virtual Serial Port (VSP) pairs, only the Client side (the side to be used by the third-party application) of the VSP is shown in the Main Window.

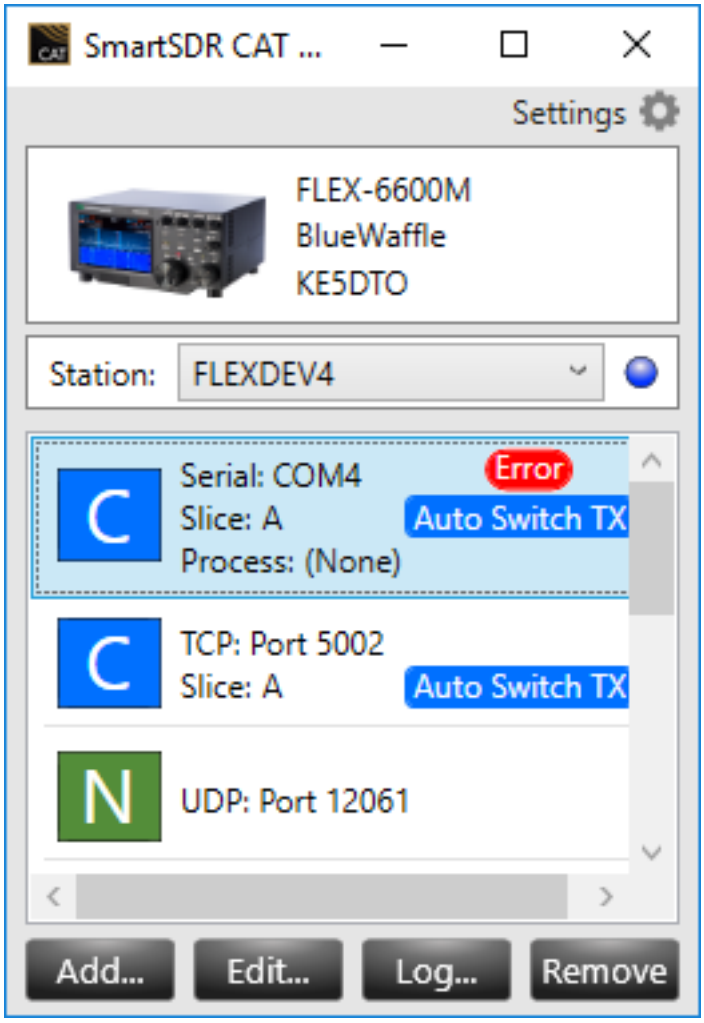

Figure 2.6: Main Window — Port Error

If there is a problem opening the Port (Serial or TCP), a red Error indicator will appear to the right of the Serial/TCP line. Hovering the mouse cursor over the error will produce a message that should help to shed some light on the source of the problem. If the Port is in conflict as a result of another program using it or if it is a hardware Serial port (perhaps a USB to Serial adapter) that is powered down or unplugged, simply closing the program, powering up the device and/or plugging the device in should resolve the problem. When the problem is resolved, the red Error indicator will disappear.

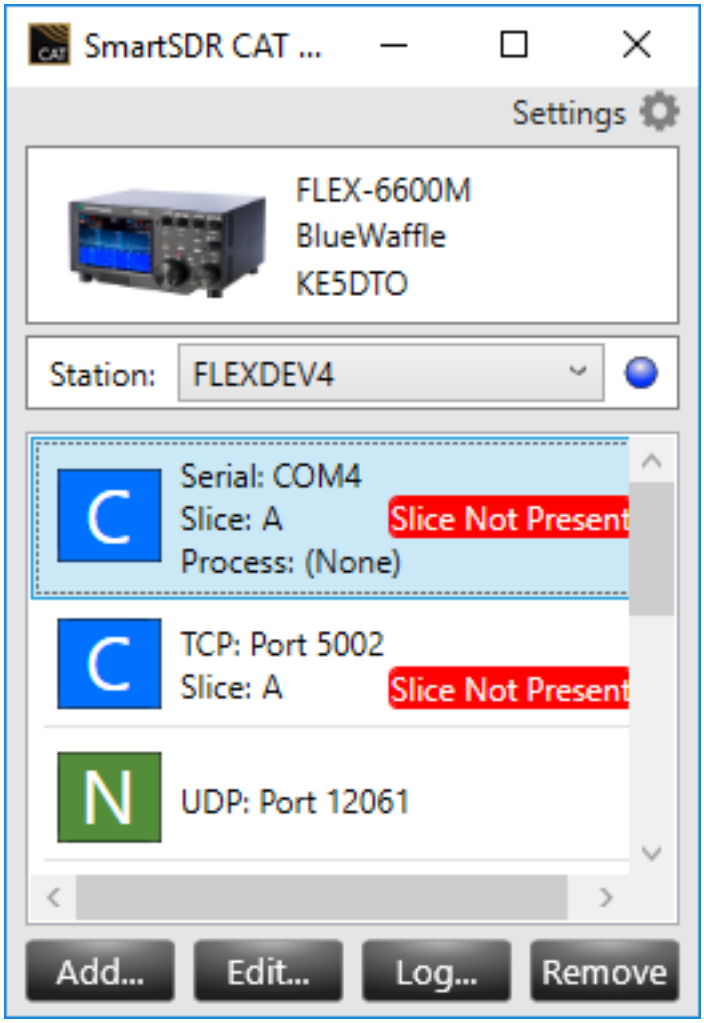

Figure 2.7: Main Window — Slice Not Present

If a Port's selected Slice is not found in the radio, a red indicator reading "Slice Not Present" will be shown. Creating a Slice using a Radio Client like SmartSDR for Windows will resolve this issue and cause the indicator to disappear.

The **Add** button allows the user to add an additional Port to the list. See the Port Edit Window description below for more information.

The **Edit** button allows the user to change Port settings. See the Port Edit Window description below for more information.

The **Log** button allows the user to open a diagnostic window. See the Log Window description below for more information.

The **Remove** button allows the user to remove a Port. Ctrl and Shift keys may be used to select multiple Ports for faster removal. Multiple selection does not apply to the Edit or Log buttons. Note that removing a FlexVSP Serial Port will result in those ports being removed from the system and may take several seconds to complete the device removal process. Right-clicking on the Remove button reveals a **Reset FlexVSP Port** option. Clicking this option will cause the system to remove all FlexVSP ports and then add back the pairs as defined in the Port list. This can help to recover a situation where the FlexVSP ports have been disassociated

from the defined Ports.

To close the SmartSDR CAT application, click the red X in the upper right corner of the Main Window. A prompt to confirm avoids accidental disconnecting of all of the Ports with the radio.

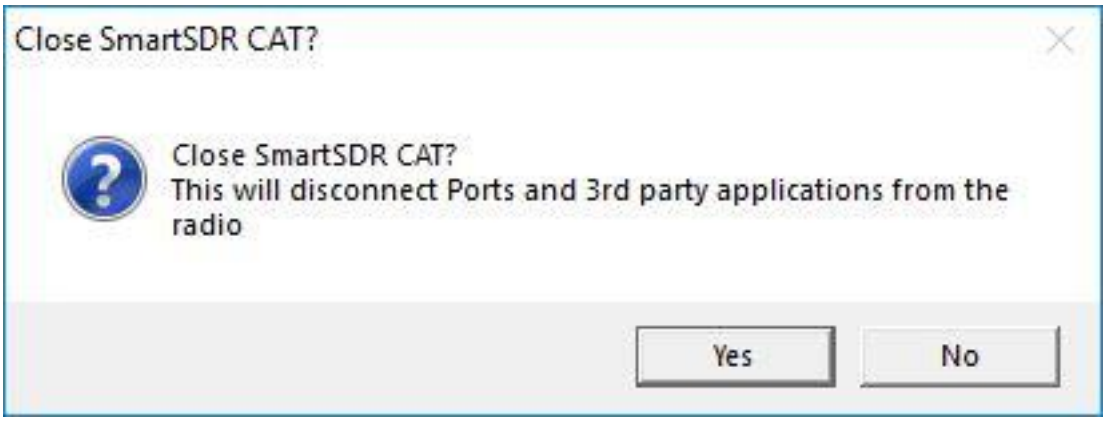

Figure 2.8: Close SmartSDR CAT Confirmation Dialog

2.2.2 Port Edit Window

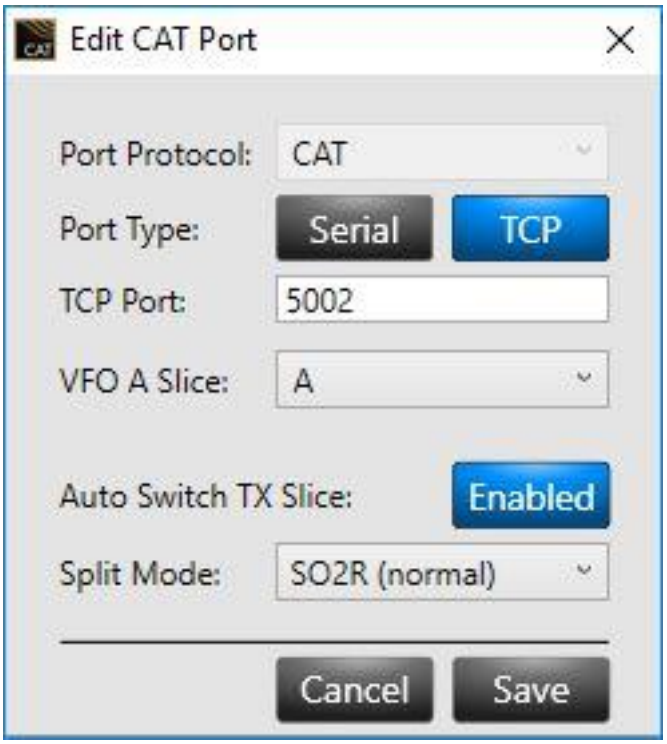

Figure 2.9: Port Edit Window

The Port Edit Window allows the user to set Port details when adding or editing a Port.

Before describing the various controls on this Window, it is appropriate to explain that the screenshots shown in the manual were taken in **Advanced mode**. To enable Advanced Mode, right click anywhere on the Port Edit Window and click the Advanced menu option.

> **Note**
> The screen image examples shown below are in Advanced Mode in order to display all of the possible options.

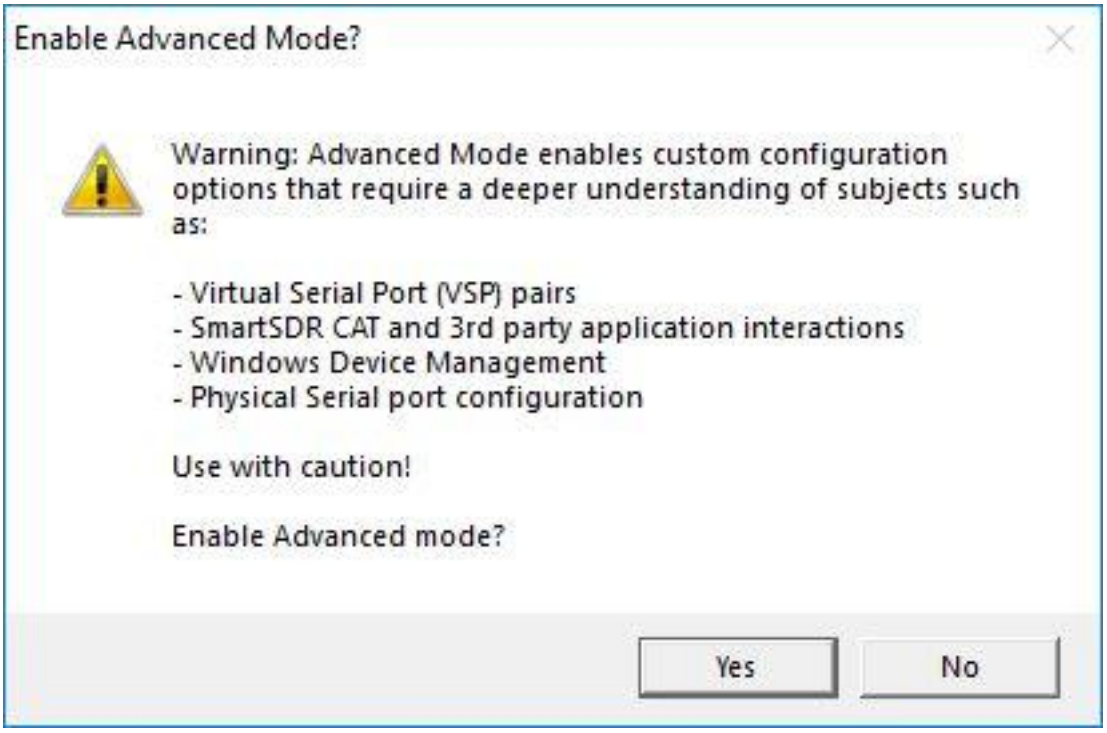

Figure 2.10: Advanced Mode Warning

A warning dialog as shown above will require confirmation that the user wants to use this mode. Using the Advanced Mode is not necessary for operation of SmartSDR CAT, but simply provides another degree of freedom in configuration for the Advanced user. In particular, when Advanced Mode is off, the CAT sides of VSP ports are not shown and the Serial Port to use for the Client side is chosen for the User. If any of this is confusing, leave Advanced Mode off.

The **Port Protocol** is the selected language of the Port. This can be CAT, OTRSP, Passthrough, PTT, or Winkeyer. Note that while editing a Port, this field cannot be changed. To change the protocol on a Port, it is necessary to Remove the port from the Main Window and then set the new protocol when Adding the Port.

2.2.2.1 Protocol Descriptions

CAT: Computer Aided Transceiver (CAT) was developed as a way to communicate with a radio through a serial interface. Commands are sent in text and are terminated with a semicolon. The command set varies depending on the transceiver make and model. The SmartSDR CAT implementation is based on the Kenwood command set including compatibility commands (2-character commands) and specialized FlexRadio specific commands (4-character commands beginning with ZZ).

> **Note**

> While the CAT protocol exposes many common radio operations, it is a dated interface and thus does not implement the entire set of features possible on a FlexRadio Signature Series radio. For more functionality and control, see the Flex Application Developer Program (ADP) web page.

OTRSP: The Open Two Radio Switching Protocol (OTRSP) was developed in order to facilitate and simplify Single Operator, 2 Radio (SO2R) configurations. Details on the protocol can be found here: http://www.k1xm.org/OTRSP/.

PTT: The Push-To-Talk (PTT) protocol to enables serial port control of the Transmit mode. This allows for easy hardware configurations for triggering transmit.

Passthrough: The Passthrough port type creates a virtual serial connection between your PC and an RS-232 serial device connected to the radio via a USB-to-serial adapter. This allows external devices such as antenna rotators, amplifiers, and tuners to appear as if they are directly connected to your PC, enabling seamless remote control over LAN or SmartLink. To use a Passthrough port, connect a compatible FTDI USB-to-RS232 cable between the radio and the serial device, configure the cable type as Passthrough in SmartSDR (under Settings > USB Cables), then create a Passthrough Port in SmartSDR CAT selecting the serial number for the cable. This exposes a local virtual COM port for use in third-party control applications such as PSTRotator.

> **Note**
> The hardware being controlled must have an RS-232 serial interface. Devices that use proprietary USB protocols (not serial/RS-232) are not supported. Requires SmartSDR v3.9.18 or above.

Winkeyer: The Winkeyer port type emulates a subset of the Winkeyer functionality for easy integration with logging applications such as N1MM. The Winkeyer spec can be found here: http://k1el.tripod.com/files/Winkey10.pdf.

2.2.2.2 Port Type

The **Port Type** allows the Port to be setup for Serial or TCP connections. Note that PTT and Passthrough ports can only be setup in Serial mode.

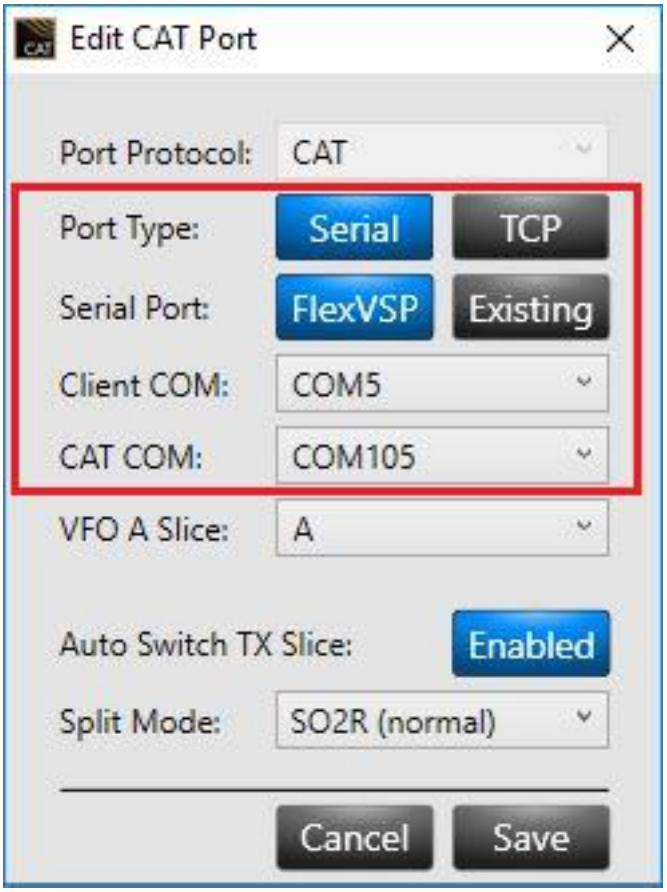

Figure 2.11: Serial FlexVSP Port Configuration

When **Serial** is selected, the Serial Port can be one of two types: FlexVSP or Existing.

A **FlexVSP** port will create a pair of Virtual Serial Ports (VSP) using the FlexVSP driver. One end of this pair is opened by the SmartSDR CAT application (the **CAT COM**) and the other end is opened by the 3rd party application (the **Client COM**). When creating or editing a FlexVSP Serial Port, note that it will take several seconds for the changes to take place due to delays in the driver.

When in Advanced Mode, when selecting a FlexVSP com port, all available or free com ports will be shown. This list is extensive since Windows can define up to 265 com ports.

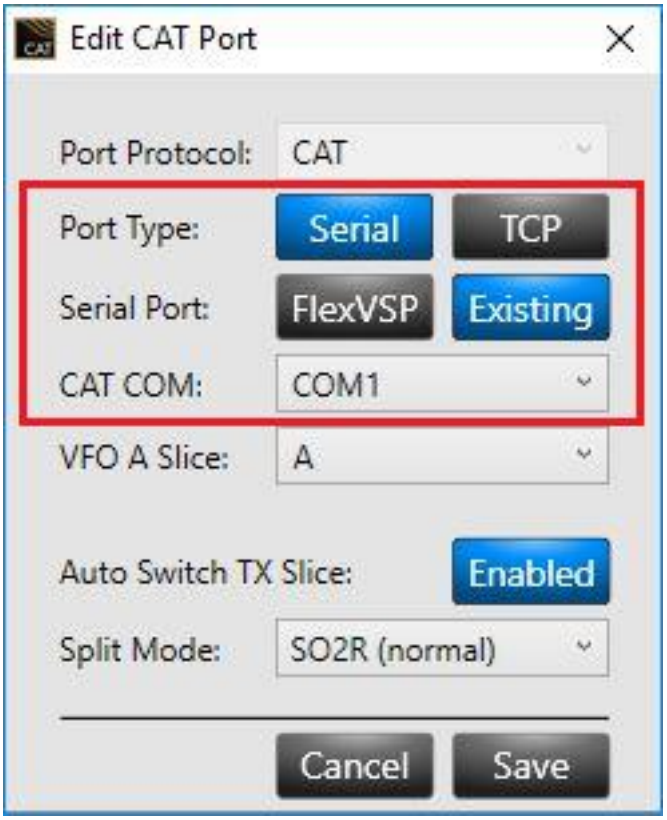

Figure 2.12: Serial Existing Port Configuration

When choosing an **Existing** Serial Port, the **CAT COM** specifies an existing COM port already present on the system. This is ideal for interfacing to hardware ports that speak the CAT language natively.

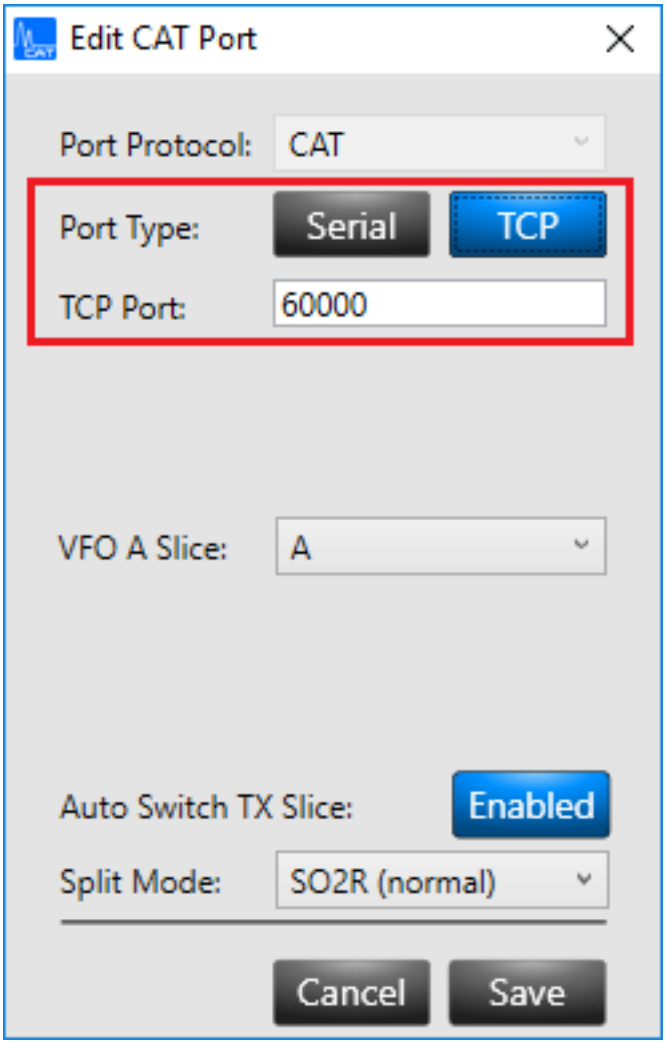

Figure 2.13: TCP Port Configuration

A **TCP** port requires only the TCP Port number to be specified. Connecting to this port will allow an application to communicate using the specified protocol (CAT, OTRSP, etc.) to the radio. Note that TCP is not available with the PTT or Passthrough protocols.

2.2.2.3 VFO and Slice Settings

The **VFO A Slice** specifies which Slice will be used for the logical VFO A in the protocol. (not used with Winkeyer or Passthrough)

When enabled **Auto Switch TX Slice** automatically switches the Transmit Slice to the VFO A Slice selected above when a CAT TX command is sent on the com port. This feature allows multiple digital mode applications to operate at the same time on different VFO A Slice assigned slices by dynamically making the slice the transmit slice when the digital mode application is transmitting. If this option is not enabled, the operator will have to manually designate the Transmit Slice.

> **Note**
> PTT type ports will not show a VFO A Slice selection if this feature is disabled and the Main Window will

> show “TX” for the Slice.

The **Split Mode** determines whether a split Slice will be removed when coming out of Split mode (`FT0;` or `ZZSW0;` commands). In SO2R (normal) mode, the split Slice will be closed. In SO2V mode, the split Slice will be left open, allowing the user to continue using it in the typical VFO A/VFO B configuration. Note that going into Split mode (`FT1;` or `ZZSW1;` commands) in either setting will still create a split Slice in the event that one is not already in place.

2.2.2.4 OTRSP Port Configuration

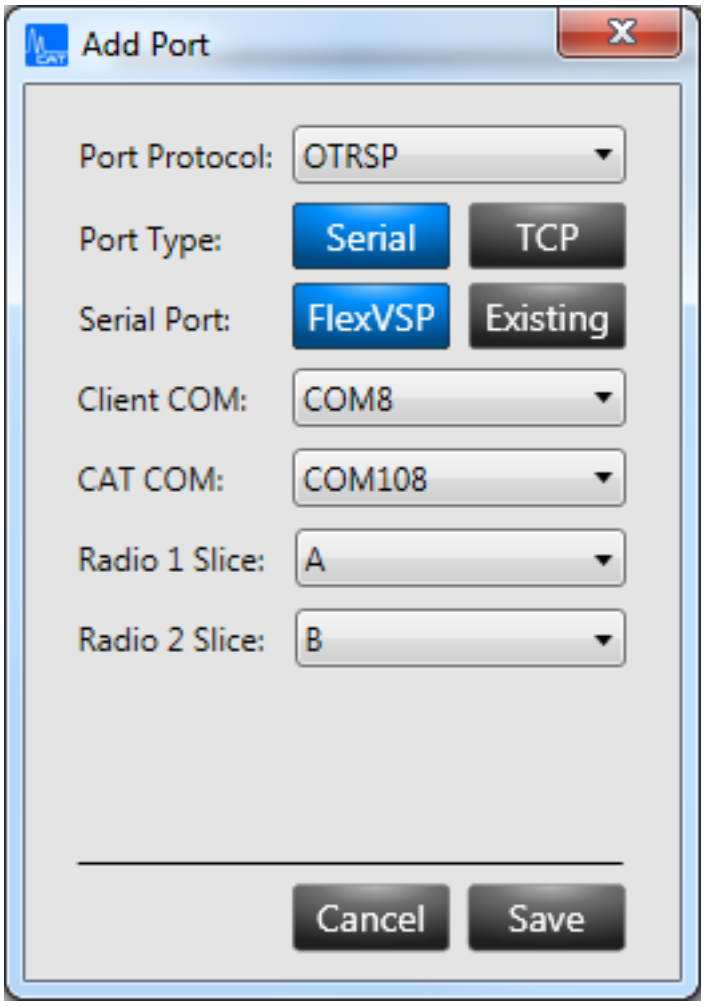

Figure 2.14: OTRSP Port Configuration

The OTRSP protocol has several unique fields.

The **Radio 1 Slice** is the Slice to be used when OTRSP commands reference the Radio 1 object. Similarly, **Radio 2 Slice** is the Slice to be used when OTRSP commands reference the Radio 2 object.

2.2.2.5 PTT Port Configuration

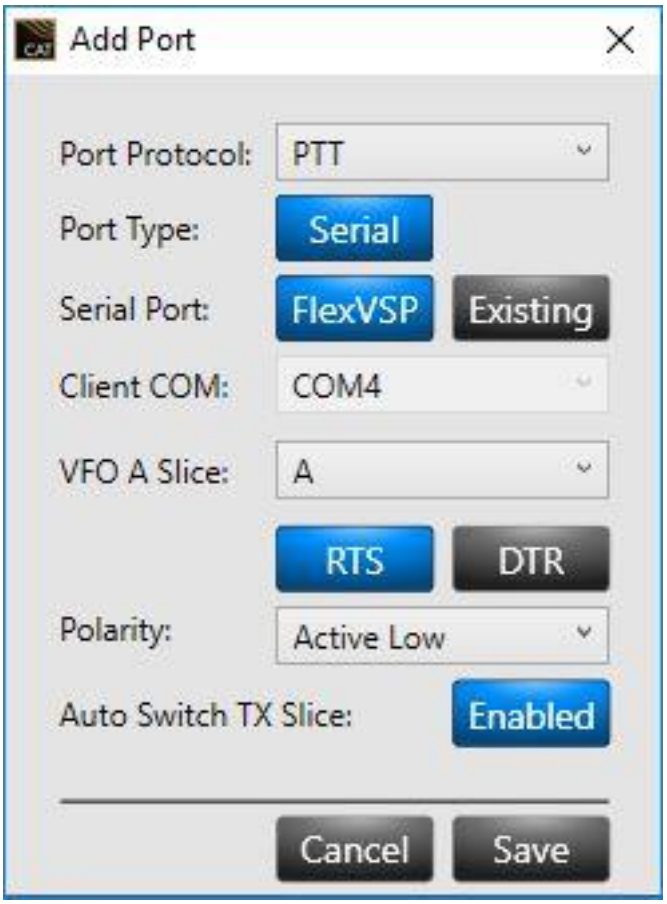

Figure 2.15: PTT Port Configuration

The PTT Protocol has several unique fields.

The **RTS** and **DTR** controls indicate whether to use the RTS or DTR Pins to signal PTT changes on the radio. Note that either or both of these can be used in a wired OR configuration (i.e. if both are enabled, then if either signal is asserted, PTT is signaled).

The **Polarity** indicates whether Transmit (PTT) should be active on a pin transition to Ground (Active Low) or when the pin is pulled up (Active High).

2.2.2.6 Passthrough Port Configuration

[Image placeholder: Passthrough Port Configuration — screenshot needed]

The Passthrough protocol has a unique field for selecting the **USB Cable** by its serial number. This must match a USB cable that has been configured as Passthrough type in SmartSDR (under Settings > USB Cables). The serial port parameters (baud rate, stop bits, etc.) are configured on the USB Cable in SmartSDR, not in SmartSDR CAT.

2.2.2.7 Winkeyer Port Configuration

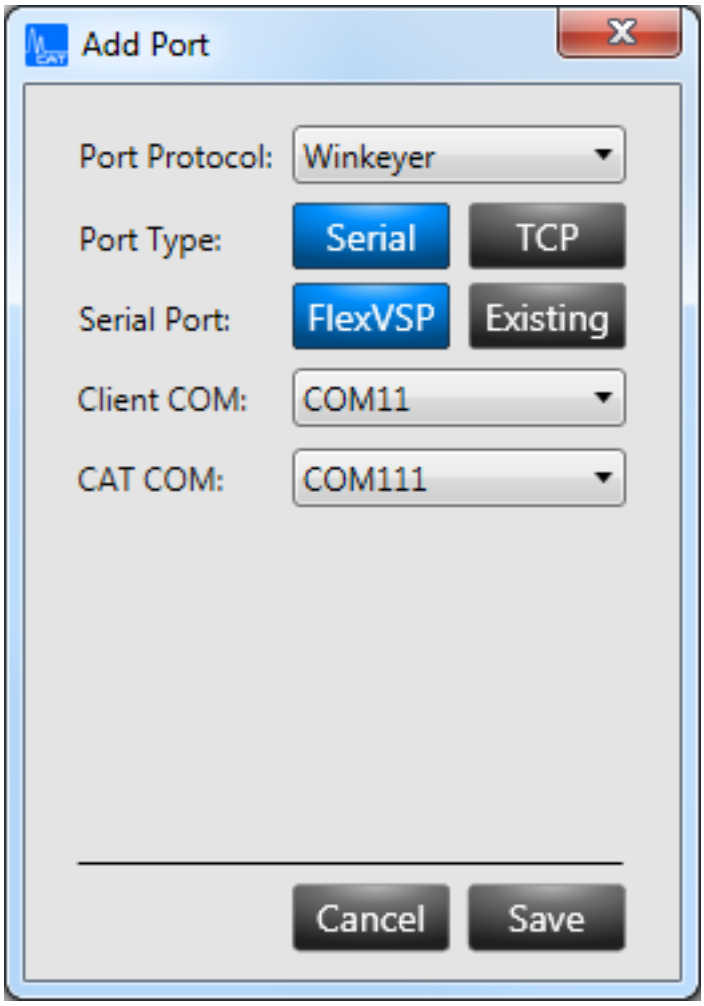

Figure 2.16: Winkeyer Port Configuration

The **Winkeyer** protocol has no unique fields.

2.2.2.8 Save and Cancel

The **Cancel** button will close the Window and cancel any changes on an Edit, or simply not execute an Add depending on how the Window was opened.

The **Save** button will execute any necessary changes to the Port on an Edit and will create the Port on an Add. Note that changes to the FlexVSP Serial Ports can take several seconds to complete.

2.2.3 Log Window

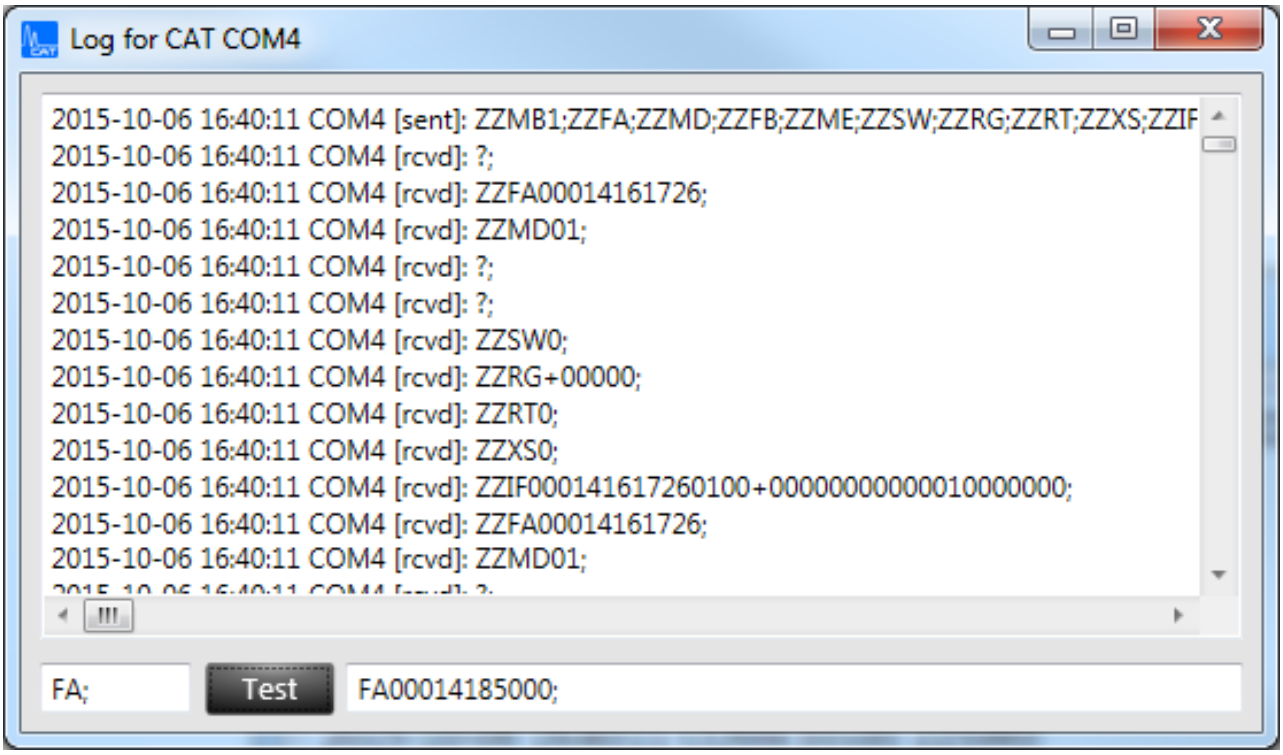

Figure 2.17: Log Window

The **Log Window** is primarily a diagnostic interface. It shows the stream of data being transferred across the Port in real time with date and timestamps to facilitate debugging of commands or connections. A test interface is also included that allows commands to be entered in the lower left Text Box. Commands can be executed by pressing Enter or by clicking on the Test button. The reply will be shown in the Text Box in the lower right corner.

Multiple Log Windows may be opened to view traffic on more than one port.

The traffic from all Ports is also logged to:

`%appdata%\FlexRadio Systems\LogFiles\CAT.log`

for further debugging. Once a file grows larger than 5 Megabytes (MB), the file will be renamed CAT.log.1, then CAT.log.2, etc. and a new CAT.log will be created. A maximum of 5 log files are kept.

Chapter 3

CAT Commands

The following are the CAT commands supported in SmartSDR CAT. There are FlexRadio (ZZ) CAT commands and a subset of the Kenwood TS-2000 CAT command set for compatibility with older third-party CAT-enabled programs that do not support the FlexRadio CAT command set.

If a third-party CAT-enabled program does not have a FLEX-6000 or FlexRadio CAT option, then use the Kenwood TS-2000 configuration.

3.1 Supported CAT Commands

Command	Description
ZZAG	Reads / Sets VFO A Audio Gain (0-100)
ZZAI	Auto Information State (On / Off)
ZZAR	Reads / Sets VFO A AGC Threshold (0-100)
ZZAS	Reads / Sets VFO B AGC Threshold (0-100)
ZZBI	Reads / Sets Binaural RX State (On / Off)
ZZDE	Reads / Sets VFO A Diversity (DIV) State (On / Off) [FLEX-6700 only]
ZZFA	Reads / Sets VFO A Frequency (11 digit Hz)
ZZFB	Reads / Sets VFO B Frequency (11 digit Hz)
ZZFI	Reads / Sets VFO A DSP Filter Index
ZZFJ	Reads / Sets VFO B DSP Filter Index
ZZFR	Toggle VFO A/B Active
ZZFT	Toggle VFO A/B Transmit
ZZGT	Reads / Sets VFO A AGC Mode
ZZIF	Reads Transceiver Status
ZZLB	Reads / Sets VFO A Audio Pan (0-100, Left to Right)
ZZLE	Reads / Sets VFO B Audio Gain (0-100)
ZZLF	Reads / Sets VFO B Audio Pan (0-100, Left to Right)
ZZMA	Reads / Sets VFO A Mute (On / Off)
ZZMB	Reads / Sets VFO B Mute (On / Off)
ZZMD	Reads / Sets VFO A DSP Mode
ZZME	Reads / Sets VFO B DSP Mode
ZZMG	Reads / Sets Transmitter Mic Gain (0-100)

Command	Description
ZZNL	Reads / Sets VFO A Wide Noise Blanker (WNB) Level (0-100)
ZZNR	Reads / Sets VFO A Noise Reduction (NR) State (On / Off)
ZZPC	Reads / Sets the RF Power Drive Level (0-100)
ZZRC	Clears RIT
ZZRD	Decrements RIT Frequency
ZZRG	Reads / Sets VFO A RIT Frequency (+/- 5 digit Hz)
ZZRT	Reads / Sets VFO A RIT State (On / Off)
ZZRU	Increments RIT Frequency
ZZRW	Reads / Sets VFO B RIT Frequency (+/- 5 digit Hz)
ZZRX	Reads Receive State (On / Off) [inverse of MOX]
ZZRY	Reads / Sets VFO B RIT State (On / Off)
ZZSM	Reads the S-Meter
ZZSW	Sets Transmit VFO (0=A, 1=B)
ZZTX	Sets MOX State (On / Off)
ZZXC	Clears XIT Frequency
ZZXG	Reads / Sets VFO A XIT Frequency (+/- 5 digit Hz)
ZZXS	Reads / Sets XIT State (On / Off)

3.2 Supported Kenwood CAT Commands

Command	Description
AG	Reads / Sets VFO A Audio Gain (0-100)
AI	Auto Information State (On / Off)
FA	Reads / Sets VFO A Frequency (11 digit Hz)
FB	Reads / Sets VFO B Frequency (11 digit Hz)
FR	Reads / Sets Active VFO (0=A, 1=B)
FT	Reads / Sets Transmit VFO (0=A, 1=B)
GT	Reads / Sets VFO A AGC Mode (0-Off, 2-Slow, 3-Medium, 4-Fast)
ID	Reads the transceiver ID number
IF	Reads Transceiver Status
KS	Reads / Sets CW Keyer Speed (5-100 WPM)
KY	Sends Text Morse Code
MD	Reads / Sets VFO A DSP Mode
NB	Reads / Sets VFO A Wide Noise Blanker State (On / Off)
PC	Reads / Sets RF Power Level (0-100)
PT	Reads / Sets CW Pitch Frequency (3 digit Hz)
RC	Clears RIT

Command	Description
RD	Decrements RIT Frequency
RT	Reads / Sets VFO A RIT State (On / Off)
RU	Increments VFO A RIT Frequency
RX	Sets Receive State (TX Off)
SH	Reads / Sets VFO A Filter High Cut Frequency Index
SL	Reads / Sets VFO A Filter Low Cut Frequency Index
SM	Reads the S-Meter
TX	Sets Transmit State (On / Off)
XT	Reads / Sets VFO A XIT State (On / Off)

3.3 FlexRadio CAT Command Syntax Detail

The following tables describe the FlexRadio CAT Command Syntax used with SmartSDR CAT.

> **Note**
> Spaces shown in the syntax tables below are for readability only and must not be included when sending commands. For example, the syntax ZZMG P1(x3) ; is sent as ZZMG123; for a value of 123. The semicolon terminates each command immediately after the last parameter digit.

3.3.1 ZZAG — VFO A Audio Gain

Operation	Syntax
Get	ZZAG;
Set	ZZAG P1(×3) ;
Answer	ZZAG P1(×3) ;

Notes: P1 Values: 000 to 100.

3.3.2 ZZAI — Auto Information Mode

Operation	Syntax
Get	ZZAI;
Set	ZZAI P1 ;
Answer	ZZAI P1 ;

Notes: P1 = 0 Auto Information disabled, P1 = 1 Auto Information enabled. When enabled, CAT will actively send any frequency change (VFO A or B) formatted as an FA; or FB; response.

3.3.3 ZZAR — VFO A AGC Threshold

Operation	Syntax
Get	ZZAR;
Set	ZZAR P1(×3) ;
Answer	ZZAR P1(×3) ;

Notes: P1 Values: 000 to 100.

3.3.4 ZZAS — VFO B AGC Threshold

Operation	Syntax
Get	ZZAS;
Set	ZZAS P1(×3) ;
Answer	ZZAS P1(×3) ;

Notes: P1 Values: 000 to 100.

3.3.5 ZZBI — Binaural Receive

Operation	Syntax
Get	ZZBI;
Set	ZZBI P1 ;
Answer	ZZBI P1 ;

Notes: P1 Values: 0 = Off, 1 = On

3.3.6 ZZDE — Diversity (DIV) Button [FLEX-6700 ONLY]

Operation	Syntax
Get	ZZDE;
Set	ZZDE P1 ;
Answer	ZZDE P1 ;

Notes: P1 Values: 0 = Off, 1 = On

3.3.7 ZZFA — VFO A Frequency

Operation	Syntax
Get	ZZFA;
Set	ZZFA P1(×11) ;
Answer	ZZFA P1(×11) ;

Notes: P1 = frequency in Hz (11 digits). Blank digits must be filled with 0. Example: 14.150.000 = 00014150000. May switch to 8 digit mode by doing an 8 digit set.

3.3.8 ZZFB — VFO B Frequency

Operation	Syntax
Get	ZZFB;
Set	ZZFB P1(×11) ;
Answer	ZZFB P1(×11) ;

Notes: P1 = frequency in Hz (11 digits). Blank digits must be filled with 0. Example: 14,150.000 = 00014150000. May switch to 8 digit mode by doing an 8 digit set.

3.3.9 ZZFI — VFO A DSP Filter

Operation	Syntax
Get	ZZFI;
Set	ZZFI P1(×2) ;
Answer	ZZFI P1(×2) ;

Notes: P1 value represents a Filter index from 0 to 7 for decreasing bandwidth. Example: If you are in LSB mode and your filter bandwidth is greater than 2.7K but less than or equal to 2.9K, ZZFI; will return ZZFI02;. If your bandwidth were 2.901K, it would return ZZFI01;.

3.3.10 ZZFJ — VFO B DSP Filter

Operation	Syntax
Get	ZZFJ;
Set	ZZFJ P1(×2) ;
Answer	ZZFJ P1(×2) ;

Notes: Similar to ZZFI for VFO B.

3.3.11 ZZFR — Toggle VFO A/B Active

Operation	Syntax
Set	ZZFR;

Notes: If VFO B is not defined, this command just toggles VFO A Active on/off. Otherwise, if the radio is in "split mode" (ZZSW1) it will toggle between VFO A Active and VFO B Active.

3.3.12 ZZFT — Toggle VFO A/B Transmit

Operation	Syntax
Set	ZZFT;

Notes: If VFO B is not defined, will just toggle VFO A Transmit on/off. Otherwise will toggle between VFO A Transmit and VFO B Transmit.

3.3.13 ZZGT — VFO A AGC Mode

Operation	Syntax
Get	ZZGT;
Set	ZZGT P1 ;
Answer	ZZGT P1 ;

Notes: P1 Values: 0 = Off, 2 = Slow, 3 = Med, 4 = Fast

3.3.14 ZZIF — Transceiver Status Query

Operation	Syntax
Get	ZZIF;
Answer	*(see format below)*

Answer format:

```
ZZIF P1(×11) P2(×4) P3(×6) P4 P5 P6 P7(×2) P8 P9(×2) P10 P11 P12 P13 P14(×2)
    P15 ;
```

Notes:

- P1 (11 characters) VFO A frequency in Hz. Same as ZZFA;
- P2 (4 characters) Frequency step size (0001 = 10 Hz / 1000 = 50 Hz)

- P3 (6 characters) RIT/XIT frequency (+nnnnn or –nnnnn). *(See note below.)*
- P4 (1 character) RIT status. 0 = off, 1 = on. *(See note below.)*
- P5 (1 character) XIT status. 0 = off, 1 = on. *(See note below.)*
- P6 (1 character) Channel bank number. Not used, defaulted to 0.
- P7 (2 characters) Channel bank number. Not used, defaulted to 00.
- P8 (1 character) MOX button status. 0 = off, 1 = on (transmitting).
- P9 (2 characters) Operating mode. See ZZMD for settings.
- P10 (1 character) VFO Split status. Same as FR.
- P11 (1 character) Scan status. Not used, defaulted to 0.
- P12 (1 character) VFO Split status. Same as FT.
- P13 (1 character) CTCSS tone. Not used, defaulted to 0.
- P14 (2 characters) More tone controls. Not used, defaulted to 00.
- P15 (1 character) Shift status. Not used, defaulted to 0.

> **Note**
>
> P3 contains the XIT frequency when XIT is on; otherwise it contains the RIT frequency. P4 and P5 reflect the actual RIT and XIT on/off states respectively.

3.3.15 ZZLB — VFO A Audio Pan

Operation	Syntax
Get	ZZLB;
Set	ZZLB P1(×3) ;
Answer	ZZLB P1(×3) ;

Notes: P1 Values: 000 (full left) to 100 (full right).

3.3.16 ZZLE — VFO B Audio Gain

Operation	Syntax
Get	ZZLE;
Set	ZZLE P1(×3) ;
Answer	ZZLE P1(×3) ;

Notes: P1 Values: 000 to 100.

3.3.17 ZZLF — VFO B Audio Pan

Operation	Syntax
Get	ZZLF;
Set	ZZLF P1(×3) ;

Operation	Syntax
Answer	ZZLF P1(×3) ;

Notes: P1 Values: 000 (full left) to 100 (full right).

3.3.18 ZZMA — VFO A Mute

Operation	Syntax
Get	ZZMA;
Set	ZZMA P1 ;
Answer	ZZMA P1 ;

Notes: P1 Values: 0 = Off, 1 = On

3.3.19 ZZMB — VFO B Mute

Operation	Syntax
Get	ZZMB;
Set	ZZMB P1 ;
Answer	ZZMB P1 ;

Notes: P1 Values: 0 = Off, 1 = On

3.3.20 ZZMD — VFO A DSP Mode

Operation	Syntax
Get	ZZMD;
Set	ZZMD P1(×2) ;
Answer	ZZMD P1(×2) ;

P1 Values:

Value	Mode
00	LSB
01	USB
03	CWL (Mode is CW, Lower Sideband style tuning)
04	CWU (Mode is CW, Upper Sideband style tuning)
05	FM

Value	Mode
06	AM
07	DIGU
09	DIGL
10	SAM
11	NFM
12	DFM
20	FDV
30	RTTY (ASKF — requires third-party RTTY software)
40	DSTR (D-STAR requires ThumbDV waveform and dongle)

3.3.21 ZZME — VFO B DSP Mode

Operation	Syntax
Get	ZZME;
Set	ZZME P1(×2) ;
Answer	ZZME P1(×2) ;

Notes: See ZZMD for values.

3.3.22 ZZMG — Transmitter Mic Gain Level

Operation	Syntax
Get	ZZMG;
Set	ZZMG P1(×3) ;
Answer	ZZMG P1(×3) ;

Notes: P1 Values: 000 to 100.

3.3.23 ZZNL — VFO A Wide Noise Blanker (WNB) Level

Operation	Syntax
Get	ZZNL;
Set	ZZNL P1(×3) ;
Answer	ZZNL P1(×3) ;

Notes: P1 Values: 000 to 100.

3.3.24 ZZNR — Slice Noise Reduction (NR) State

Operation	Syntax
Get	ZZNR;
Set	ZZNR P1 ;
Answer	ZZNR P1 ;

Notes: P1 Values: 0 = Off, 1 = On

3.3.25 ZZPA — Panadapter Data IP Address:Port

Operation	Syntax
Set	ZZPA <IP> : <Port> ;

3.3.26 ZZPC — RF Power Drive Level

Operation	Syntax
Get	ZZPC;
Set	ZZPC P1(×3) ;
Answer	ZZPC P1(×3) ;

Notes: P1 Values: 000 to 100.

3.3.27 ZZPE — Panadapter Data Enabled

Operation	Syntax
Set	ZZPE P1 P2 ;

Notes: P1 = Radio number (0 or 1). P2 = Enable state (0 = Disabled, 1 = Enabled). Example: ZZPE01; enables panadapter data on radio 0.

3.3.28 ZZRC — Clear Slice A RIT Frequency

Operation	Syntax
Set	ZZRC;

Notes: Sets the RIT Frequency to zero.

3.3.29 ZZRD — Decrement the RIT Frequency

Operation	Syntax
Set	ZZRD P1(×5) ;
Set	ZZRD;

Notes: ZZRD without parameter P1 will decrement the RIT frequency 10 Hz in CW, DIGU, and DIGL modes; 50 Hz in USB, LSB, and AM modes. P1 (00000 to 99999) will decrement the VFO A RIT Frequency by the amount entered.

3.3.30 ZZRG — VFO A RIT Frequency

Operation	Syntax
Get	ZZRG;
Set	ZZRG P1 P2(×5) ;
Answer	ZZRG P1 P2(×5) ;

Notes: P1 = Polarity (+ or -), P2 = 00000 to 99999

3.3.31 ZZRT — VFO A RIT State

Operation	Syntax
Get	ZZRT;
Set	ZZRT P1 ;
Answer	ZZRT P1 ;

Notes: P1: 1 = On, 0 = Off.

3.3.32 ZZRU — Increment VFO A RIT Frequency

Operation	Syntax
Set	ZZRU P1(×5) ;
Set	ZZRU;

Notes: ZZRU without parameter P1 will increment the RIT frequency 10 Hz in CW, DIGU, and DIGL modes; 50 Hz in USB, LSB, and AM modes. P1 (00000 to 99999) will increment the VFO A RIT Frequency by the amount entered.

3.3.33 ZZRW — VFO B RIT Frequency

Operation	Syntax
Get	ZZRW;
Set	ZZRW P1 P2(×5) ;
Answer	ZZRW P1 P2(×5) ;

Notes: P1 = Polarity (+ or -), P2 = 00000 to 99999

3.3.34 ZZRX — Receive State

Operation	Syntax
Get	ZZRX;
Set	ZZRX1;
Answer	ZZRX P1 ;

Notes: P1 Answer Values: 0 = Off, 1 = On. ZZRX0; is not supported.

3.3.35 ZZRY — VFO B RIT State

Operation	Syntax
Get	ZZRY;
Set	ZZRY P1 ;
Answer	ZZRY P1 ;

Notes: P1: 1 = On, 0 = Off.

3.3.36 ZZSM — Read the S-Meter

Operation	Syntax
Get	ZZSM;
Answer	ZZSM P1(×3) ;

This command will read the S-Meter value for the slice that is assigned to the CAT port.

P1 = 000 to 260

ZZSM reads the received signal strength in dBm where S9 = -73 dBm. The range is -140 dBm to -10 dBm with a scale factor of 2 (P1 max = 260). The actual signal strength, in dBm, is the value of ZZSM divided by 2 minus 140.

3.3.37 ZZSW — Transmit Flag (VFO A or B)

Operation	Syntax
Get	ZZSW;
Set	ZZSW P1 ;
Answer	ZZSW P1 ;

Notes: P1 = 0 VFO A Transmit flag is set, P1 = 1 VFO B Transmit flag is set. If VFO B has not been created, and ZZSW1; is sent, VFO B will be created near VFO A. Note that logical VFO B is not necessarily Slice B, and could be any Slice depending on which Slices already exist. The Split Slice will be shown on the Main Window on the Slice line for the Port when one is defined. The Split Slice will be removed (if it exists) when processing the ZZSW0; command.

3.3.38 ZZTX — Transmit State (MOX)

Operation	Syntax
Get	ZZTX;
Set	ZZTX P1 ;
Answer	ZZTX P1 ;

Notes: P1 = 0 Radio is in receive mode, P1 = 1 Radio is in transmit mode.

3.3.39 ZZXC — Clear VFO A XIT Frequency

Operation	Syntax
Set	ZZXC;

Notes: Sets the XIT frequency to zero.

3.3.40 ZZXG — VFO A XIT Frequency

Operation	Syntax
Get	ZZXG;
Set	ZZXG P1 P2(×5) ;
Answer	ZZXG P1 P2(×5) ;

Notes: P1 = Polarity (+ or -), P2 = 00000 to 99999

3.3.41 ZZXS — VFO A XIT State

Operation	Syntax
Get	ZZXS;
Set	ZZXS P1 ;
Answer	ZZXS P1 ;

Notes: P1: 0 = Off, 1 = On.

3.4 Kenwood CAT Command Syntax Detail

The following tables describe the Kenwood CAT Command Syntax used with SmartSDR CAT.

3.4.1 AI — Auto Information Mode

Operation	Syntax
Get	AI;
Set	AI P1 ;
Answer	AI P1 ;

Notes: P1 = 0 Auto Information disabled, P1 = 1 Auto Information enabled. When enabled, CAT will actively send any frequency change (VFO A or B) formatted as an FA; or FB; response.

3.4.2 AG — VFO A Audio Gain

Operation	Syntax
Get	AG;
Set	AG P1(×3) ;
Answer	AG P1(×3) ;

Notes: P1 = 000 to 100.

3.4.3 FA — VFO A Frequency

Operation	Syntax
Get	FA;
Set	FA P1(×11) ;
Answer	FA P1(×11) ;

Notes: P1 = frequency in Hz (11 digits). Blank digits must be filled with 0. Example: 14,150.000 = 00014150000. May switch to 8 digit mode by doing an 8 digit set.

3.4.4 FB — VFO B Frequency

Operation	Syntax
Get	FB;
Set	FB P1(×11) ;
Answer	FB P1(×11) ;

Notes: P1 = frequency in Hz (11 digits). Blank digits must be filled with 0. Example: 14,150.000 = 00014150000. May switch to 8 digit mode by doing an 8 digit set.

3.4.5 FR — VFO A/B Active Flags

Operation	Syntax
Get	FR;
Set	FR P1 ;
Answer	FR P1 ;

Notes: P1 will be “0” when VFO A Active flag is set. P1 will be “1” when VFO B Active flag is set. Setting FR1; without VFO B will result in ?;.

3.4.6 FT — VFO A/B Transmit Flags

Operation	Syntax
Get	FT;
Set	FT P1 ;
Answer	FT P1 ;

Notes: P1 = “0” sets VFO A Transmit flag. P1 = “1” sets VFO B Transmit flag. If VFO B has not been created, and FT1; is sent, VFO B will be created near VFO A. Note that logical VFO B is not necessarily Slice B, and could be any Slice depending on which Slices already exist. The Split Slice will be shown on the Main Window on the Slice line for the Port when one is defined. The Split Slice will be removed (if it exists) when processing the FT0; command.

3.4.7 GT — VFO A AGC Mode

Operation	Syntax
Get	GT;
Set	GT P1 ;
Answer	GT P1 ;

Notes: P1 Values: 0 = Off, 2 = Slow, 3 = Med, 4 = Fast

3.4.8 ID — Transceiver ID Number

Operation	Syntax
Get	`ID;`
Answer	`ID P1(×3) ;`

P1 Values:

ID	Radio Model
904	FLEX-6700
905	FLEX-6500
906	FLEX-6700R
907	FLEX-6300
908	FLEX-6400 / FLEX-6400M
909	FLEX-6600 / FLEX-6600M
910	FLEX-8400 / FLEX-8400M
911	FLEX-8600 / FLEX-8600M
930	AU-510 / AU-510M
931	AU-520 / AU-520M

3.4.9 IF — Transceiver Status Query

Operation	Syntax
Get	`IF;`
Answer	*(see format below)*

Answer format:

```
IF P1(×11) P2(×4) P3(×6) P4 P5 P6 P7(×2) P8 P9 P10 P11 P12 P13 P14(×2) P15 ;
```

Notes:

- P1 (11 characters) VFO A frequency in Hz. Same as FA;
- P2 (4 characters) Frequency step size (0001 = 10 Hz / 1000 = 50 Hz)
- P3 (6 characters) RIT/XIT frequency (+nnnnn or –nnnnn).
- P4 (1 character) RIT status. 0 = off, 1 = on.
- P5 (1 character) XIT status. 0 = off, 1 = on.
- P6 (1 character) Channel bank number. Not used, defaulted to 0.
- P7 (2 characters) Channel bank number. Not used, defaulted to 00.
- P8 (1 character) MOX button status. 0 = off, 1 = on (transmitting).

- P9 (1 character) Operating mode. See MD for settings.
- P10 (1 character) VFO Split status. Same as FR.
- P11 (1 character) Scan status. Not used, defaulted to 0.
- P12 (1 character) VFO Split status. Same as FT.
- P13 (1 character) CTCSS tone. Not used, defaulted to 0.
- P14 (2 characters) More tone controls. Not used, defaulted to 00.
- P15 (1 character) Shift status. Not used, defaulted to 0.

3.4.10 KS — CW Keying Speed

Operation	Syntax
Get	KS;
Set	KS P1(×3) ;
Answer	KS P1(×3) ;

Notes: P1 = 005 to 100.

3.4.11 KY — Send Text to CWX for Morse Conversion

Operation	Syntax
Get	KY;
Set	KY P1 P2(×24) ;
Answer	KY P1 ;

Notes: P1 = character buffer available; 0=YES / 1=NO (SmartSDR is not buffer limited so P1 will always return a “0”). P2 = Any of the 56 printable ASCII characters. Empty character positions in P2 must contain a space. SmartSDR CAT will accept the Kenwood protocol as shown above but it is not limited to the same strict formatting. The number of P2 characters is limited to 256.

3.4.12 MD — VFO A DSP Mode

Operation	Syntax
Get	MD;
Set	MD P1 ;
Answer	MD P1 ;

P1 Values:

Value	Mode
1	LSB

Value	Mode
2	USB
3	CW
4	FM (NFM, DFM, FDV, DSTR)
5	AM (SAM)
6	DIGL (RTTY)
9	DIGU

3.4.13 NB — VFO A Wide Noise Blanker (WNB)

Operation	Syntax
Get	NB;
Set	NB P1 ;
Answer	NB P1 ;

Notes: P1: 0 = Off, 1 = On

3.4.14 PC — RF Power Drive Level

Operation	Syntax
Get	PC;
Set	PC P1(×3) ;
Answer	PC P1(×3) ;

Notes: P1 Values: 000 to 100

3.4.15 PT — CW Pitch Frequency

Operation	Syntax
Get	PT;
Set	PT P1(×3) ;
Answer	PT P1(×3) ;

Notes: P1 Values: 100 to 999. Values below 100 are silently ignored.

3.4.16 RC — Clear VFO A RIT Frequency

Operation	Syntax
Set	RC;

Notes: Sets the RIT frequency to zero.

3.4.17 RD — Decrement VFO A RIT Frequency

Operation	Syntax
Set	RD;
Set	RD P1(×5) ;

Notes: RD; without parameter P1 will decrement the RIT frequency 10 Hz in CW, DIGU, and DIGL modes; 50 Hz in USB, LSB, and AM modes. P1 (00000 to 99999) will decrement the VFO A RIT Frequency by the amount entered.

3.4.18 RT — VFO A RIT State

Operation	Syntax
Get	RT;
Set	RT P1 ;
Answer	RT P1 ;

Notes: P1: 0 = Off, 1 = On.

3.4.19 RU — Increment VFO A RIT Frequency

Operation	Syntax
Set	RU;
Set	RU P1(×5) ;

Notes: RU; without parameter P1 will increment the RIT frequency 10 Hz in CW, DIGU, and DIGL modes; 50 Hz in USB, LSB, and AM modes. P1 (00000 to 99999) will increment the VFO A RIT Frequency by the amount entered.

3.4.20 RX — Set Receive Mode

Operation	Syntax
Set	RX;

Notes: RX is a write only command.

3.4.21 SH — VFO A DSP Filter High Cut Index

Operation	Syntax
Get	SH;
Set	SH P1(×2) ;
Answer	SH P1(×2) ;

P1 Values (LSB/USB/CW/DIGU/DIGL):

Index	Frequency
00	1400
01	1600
02	1800
03	2000
04	2200
05	2400
06	2600
07	2800
08	3000
09	3400
10	4000
11	5000

P1 Values (AM):

Index	Frequency
00	2500
01	3000
02	4000
03	5000

3.4.22 SL — VFO A DSP Filter Low Cut Index

Operation	Syntax
Get	SL;
Set	SL P1(×2) ;
Answer	SL P1(×2) ;

P1 Values (LSB/USB/CW/DIGU/DIGL):

Index	Frequency
00	0
01	50
02	100
03	200
04	300
05	400
06	500
07	600
08	700
09	800
10	900
11	1000

P1 Values (AM):

Index	Frequency
00	0
01	100
02	200
03	500

3.4.23 SM — VFO A S-Meter

Operation	Syntax
Get	SM;
Answer	SM P1(×3) ;

This command will read the S-Meter value for the slice that is assigned to the CAT port.

Notes: Read-only. P1 = 000 to 030. S9 reads approximately 015. Use ZZSM for extended range if possible.

3.4.24 TX — Set Transmit Mode (MOX)

Operation	Syntax
Set	TX P1 ;

Notes: TX is a write only command. P1 is optional: 0 = Transmit via MIC, 1 = Transmit via DATA SEND, 2 = TX TUNE. TX; with no parameter defaults to MIC.

3.4.25 XT — XIT State

Operation	Syntax
Get	XT;
Set	XT P1 ;
Answer	XT P1 ;

Notes: P1: 0 = Off, 1 = On.

Chapter 4

OTRSP Commands

The following are the OTRSP commands supported in SmartSDR CAT. The full OTRSP command set can be found here: http://www.k1xm.org/OTRSP/.

4.1 Supported OTRSP Commands

Command	Description
RX1	Connect Radio 1 to both headphones
RX2	Connect Radio 2 to both headphones
RX1S	Connect Radio 1 to Left, Radio 2 to Right (focus Radio 1)
RX2S	Connect Radio 1 to Left, Radio 2 to Right (focus Radio 2)
RX1R	Connect Radio 1 to Right, Radio 2 to Left (focus Radio 1)
RX2R	Connect Radio 1 to Right, Radio 2 to Left (focus Radio 2)
TX1	Set Radio 1 as the transmitter
TX2	Set Radio 2 as the transmitter

Chapter 5

Winkeyer Commands

The following are the Winkeyer commands supported in SmartSDR CAT. The full Winkeyer command set can be found here: http://k1el.tripod.com/files/Winkey10.pdf.

5.1 Supported Winkeyer Commands

Command	Description
<0x00>	Admin Command
<0x02>	Set CW sending speed
<0x08>	Backup input pointer (backspace)
<0x0A>	Clear input buffer
<0x0F>	Load Defaults (speed only)
<0x1C>	Buffered Speed Change (implemented as immediate for now)

Chapter 6

Appendices

6.1 Appendix A: Uninstalling SmartSDR CAT versions prior to v1.2.11

> **Note**
> This procedure is not required if you have installed SmartSDR v1.2.17 or greater.

1. Close the **SmartSDR CAT** application and any programs that connect to the FLEX-6000 via CAT. This includes DDUtil.
2. Open the **Windows Control Panel** and select **Uninstall a Program**.
3. Look for the **SmartSDR CAT**, **CAT_32** or **CAT_64** program entries and right click on them to display the Uninstall menu.

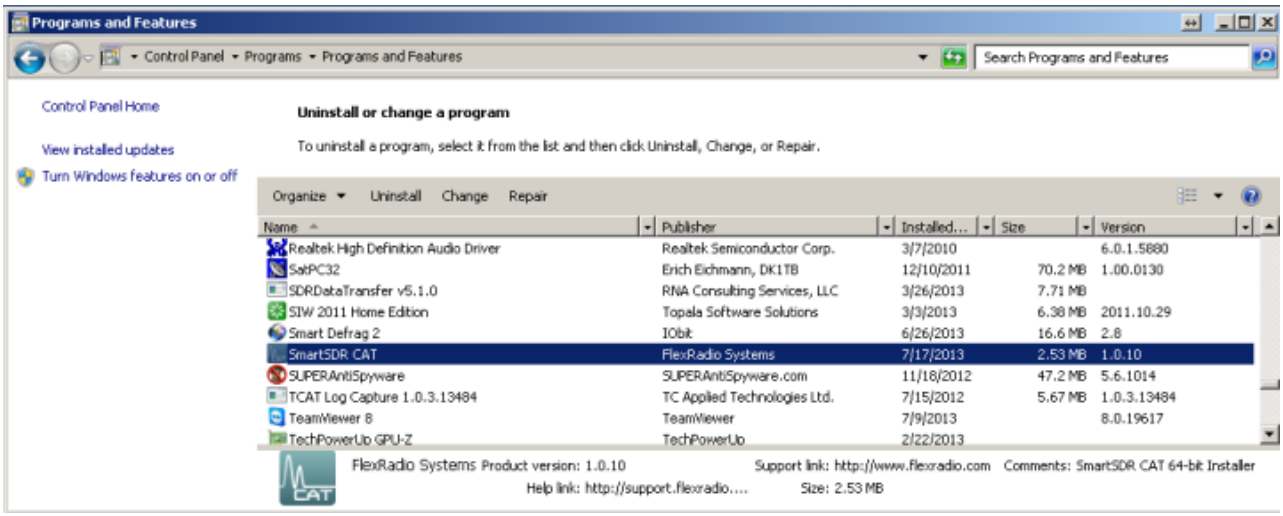

Figure 6.1: Programs and Features — Legacy SmartSDR CAT

4. Left click on the Uninstall option.
5. Answer **Yes** to the prompt *"Are you sure you want to uninstall SmartSDR CAT"*.
6. SmartSDR CAT will begin to uninstall.
7. If you receive a prompt to *"Automatically close applications and attempt to restart them after setup is complete"*, click on **OK** to continue. See image below.

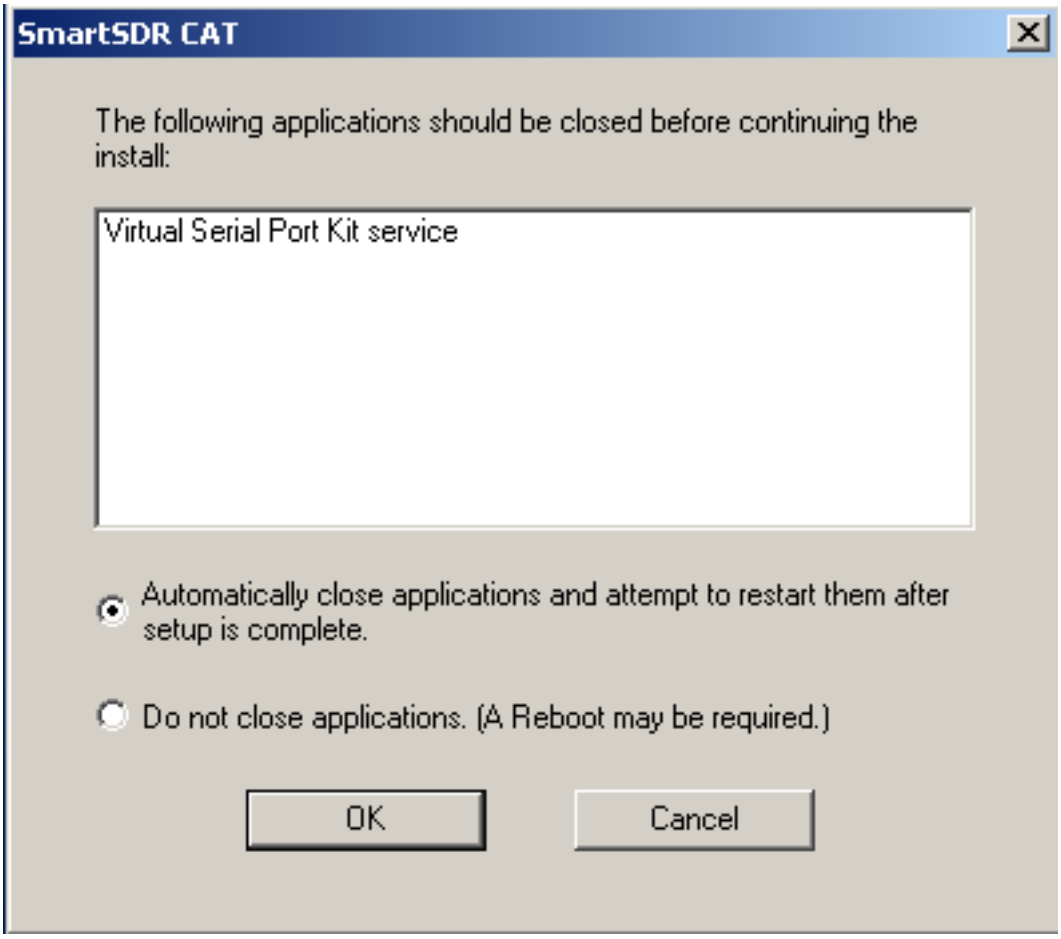

Figure 6.2: Close Applications Prompt — Legacy Uninstall

8. After SmartSDR CAT has finished uninstalling, reboot your PC.

6.2 Appendix B: Key Terms

The following table provides definitions for terms relevant to this document.

Term	Definition
AGC	Automatic Gain Control
CAT	Computer Assisted Transceiver
DSP	Digital Signal Processing
LAN	Local Area Network
MOX	Manually Operated Switch
NR	Noise Reduction
OTRSP	Open Two Radio Switching Protocol
PA	Power Amplifier
RIT	Receiver Incremental Tuning
RX	Receive or Receiver

Term	Definition
SO2R	Single Operator, 2 Radios
TCP/IP	Transmission Control Protocol / Internet Protocol
XIT	Transmitter Incremental Tuning
TX	Transmit or Transmitter
VFO	Variable Frequency Oscillator