Commander 15.5.0

Overview

Commander enables you to
- control your Elecraft, FlexRadio, Icom, Kenwood, TenTec, or Yaesu radio from your PC
- see DX Spots plotted on a zoom-able bandspread display of your radio's currently-active band
- see frequency-dependent control settings for devices like tuners and amplifiers
- store and recall frequencies (and associated modes) from 100 memories organized into 10 banks
- manually or automatically switch between up to four connected radios
- monitor messages between your radio and your PC
- provide DXKeeper, PropView, SpotCollector, and WinWarbler with access to your radio's frequency and mode

Prerequisites

To use Commander, you need
- a PC running Windows 95, Windows 98, Windows 98SE, Windows NT, Windows 2000, Windows XP, Windows 7, Windows 8, or Windows 10, ideally
  - 133 MHz Pentium or better
  - 64 MB RAM or better
- an SVGA display or better
- a serial port connected to your radio via an appropriate radio interface

If you plan to run other members of the DXLab Suite in parallel with Commander, additional memory and a faster processor will be required for satisfactory performance; beyond 3 or 4 DXLab applications

Defects in Windows 95, Windows 98, and Windows 98SE precludes their use.

Windows 7, 8, and 10 require more RAM and CPU horsepower; consult Microsoft's prerequisites.

Download and Installation

Installing or Upgrading the DXLab Launcher
The **DXLab Launcher** automates the installation of new DXLab applications, including Commander, and the upgrading of already-installed DXLab applications.

If you're an aspiring DXLab user who has **not installed any DXLab applications** on your PC, or if you're a long-time DXLab user who has **never installed the Launcher**, then installing the Launcher will make it easy to install new DXLab applications and keep them up to date as upgrades are released.

Step-by-step guides for installing the Launcher are available, both in HTML for browsing (http://www.dxlabsuite.com/dxlabwiki/InstallLauncher) and in PDF for printing (http://www.dxlabsuite.com/Download%20and%20Installation.pdf).

You can uninstall Commander by running the Add/Remove Programs applet on the Windows control panel.

If you have questions or suggestions, please post them on the DXLab reflector at https://groups.io/g/DXLab.

If you're not a member, you can sign up at https://groups.io/g/DXLab.

Quick Setup

Quick Setup instructions: controlling one radio

Step	Directions
1	in the **Radio** panel on the Configuration window's **General** tab • select the radio's Model • if you've selected an **Icom** or **TenTec Omni**, o indicate whether you'll be specifying the radio's CI-V Address in decimal or hexadecimal radix (radio addresses given in Icom and TenTec manuals are in hexadecimal) o enter the radio's CI-V Address in the specified radix o set the radio's `CI-V Transceive` parameter *off* (using its menu system) • if you've selected a **FlexRadio Signature** that is connected to the same local area network as the computer hosting Commander, specify its **Serial Number** in the **Radio Selection** panel • if you've selected a **Kachina,** specify the Control Filename established by your Kachina software • if you've selected a **TenTec Pegasus,** specify the Control Folder containing your Pegasus control software; this folder should contain a file named `PEGASUS.OUT`
2	in the Serial Port panel on Configuration window's **Ports** tab (skip if the radio Model is a **FlexRadio Signature, Kachina,** or **TenTec Pegasus**) • designate the serial port that is connected to your radio interface • select the baud rate that matches your radio's settings • if the radio requires that the RTS modem control signal be asserted, place this signal in the always on state; the **Kenwood TS-2000**, for example, has this requirement. • if an external interface is being used and it derives its power from the serial port's DTR and/or RTS modem control signals, place these signals in the always on state
3	on the Configuration window's **General** tab, check the Continuous Frequency and Mode Interrogation box and set the interval to 200 ms • older radios like the Yaesu FT-767 require longer intervals, e.g. 400 ms

Note that checking the Continuous Frequency and Mode Interrogation checkbox with your Icom or TenTec Omni radio's `CI-V Transceive` parameter set *on* will degrade Commander's ability to track changes in your radio's frequency.

Configuration

Commander's Configuration window provides 10 tabs, each contains a related group of settings and controls that you can inspect and/or modify:

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General	- Radio panel - radio model and bus address - polling and command execution interval - memory scan dwell time - radio-specific options - General panel - mousewheel disablement - Dual Receive enable/disable - compute frequency-dependent device settings from transmit frequency when operating split - display of User-defined Controls - use of dual monitors - diagnostic logging enable/disable - transmit/receive switching - VFO autorepeat rate - Initial command - Sub-band definitions - Online help access
Ports	- Primary CAT Serial Port panel - serial port parameters - DTR and RTS behavior - Secondary CAT Serial Port panel - serial port parameters - DTR and RTS behavior - CAT Protocol, CI-V Address, and Interrogation interval - Radio vs. Transceiver Control Application - SO2R Serial Port panel - serial port parameters - DTR and RTS behavior - SO2R protocol - Auxiliary Output frequency-dependent device control - Parallel Port panel - parallel port parameters - radio selection and RX-TX switching - data signal frequency-dependent device control - Modem Command panel
Frequency-dependent Devices (3)	- device name (appears as tab caption) - control names - control settings for each frequency
Filter Groups	- Filter names and bandwidths - Filter Group behavior when radio's mode changes
Memories	- titles for each memory bank - memory import and export controls
Multi Radio	- names and polling rates for up to 4 controlled radios - serial port parameters for each controlled radio - automatic radio selection by band

Bandspread	o bandspread dial orientation (lower frequency on top or bottom) o time trigger for pushing a frequency onto the current band stack o bandspread mousewheel control by mode o Active DX callsign parameters for both the Bandspread and Spectrum-Waterfall windows
Transverters	o supports the specification of transverters for the 6m, 4m, 2m, 1.25m, 70cm, 33cm, and 23cm bands

A separate Spectrum-Waterfall Configuration window is provided to configure operation of the Spectrum-Waterfall window.

For information about the purpose of any Commander control, allow the cursor to linger over that control for a second or two; a box containing explanatory text will appear. This feature can be disabled if desired.

General tab
- Radio panel

Setting	Provided for	Description
Model	all radios	the radio or panadaptor being controlled, or the satellite tracking application with which Commander will interoperate
CI-V Address	all Icom, TenTec Omni VI	the radio's CI-V bus address in either hexadecimal or decimal Note: when controlling an Icom or TenTec Omni VI, Commander's Main window will display a **CI-V** indicator to the right of the **Scan** checkbox if the radio reports a CI-V bus collision
Hexadecimal	all Icom, TenTec Omni VI	if selected, the CI-V Address is interpreted as a hexadecimal (base 16) number
Decimal	all Icom, TenTec Omni VI	if selected, the CI-V Address is interpreted as a decimal (base 10) number
Interrogation	all radios	when checked, Commander directs the radio to report its frequency, mode, VFO, filter, and S-meter data at the specified rate specified by the Command Interval

Command Interval (ms)	all radios	the time interval between command groups sent to the transceiver, in milliseconds
		   ○ if no value is specified, 200 ms. is used
		   ○ values less than 10 ms. are interpreted as 10 ms.
		   ○ values greater than 60,000 ms. are interpreted as 60,000 ms.
		   ○ 200 ms. is a reasonable setting for most PCs and radios
		        ▪ if the transceiver is a Yaesu FT-747, values less than 2000 ms. are interpreted as 2000 ms.
		        ▪ if the transceiver is a Yaesu FT-767, values less than 400 ms. are interpreted as 400 ms.
		        ▪ with a fast Primary CAT port baud rate, recent radios like the IC-7800 can handle command intervals of 20 ms. or lower, yielding smooth tuning but increasing Commander's use of your PC's CPU time

No interrogation while transmitting	all radios	when checked, Commander will not ask the radio to report its frequency, mode, VFO, filter, and meter data while directing the radio to transmit; this option **should not be enabled unless** the transceiver cannot generate smooth CW while being asked to report this information
Verify CI-V command acceptance	all Icom, TenTec Omni VI	when checked, waits for a positive acknowledgement after transmitting each CI-V command and resends the command if either a negative acknowledgement or no acknowledgement is received; when enabled while controlling an Icom or TenTec Omni VI as the primary radio, the **Messages** window's Exec function is disabled note: if the **Verify CI-V command acceptance** option is enabled, the transceiver's **CI-V Transceive** menu setting must be disabled
Sync transceiver frequencies before logging or spotting	all Icom, TenTec Omni VI	when checked, informs applications that log and spot that the active transceiver does not report changes in VFO B so they can direct Commander to refresh its VFO frequencies and disseminate them so that logged and spotted frequencies are accurate
Set radio UTC time on startup or selection, and at the beginning of each hour	IC-756PROIII, IC-7600, IC-7610, C-7700, IC-7800, IC-7850, IC-7851	when checked, sets the transceiver's UTC date and time from your PC's date and time when Commander starts or when the transceiver is selected, and at the beginning of each subsequent hour
Emit subreceiver audio when dual receive enabled	IC-7800	when checked, directs the transceiver to emit subreceiver audio via backpanel connector ACC-A's AF signal when dual receive is enabled; when un-checked, the transceiver emits main receiver audio via this signal
Display outgoing CI-V commands in Message window	IC-7600, IC-7610, IC-7700, IC-7800, IC-7850, IC-7851	when checked, outgoing CI-V commands are displayed in the Message window (useful when connected to the radio via a USB cable)

Log Mode for Data-L or Data-U	transceivers for which Commander provides a Data-L or Data-U mode	specifies the "mode to be logged" conveyed to other applications, e.g. PSK31 or SSTV or FT8 If DXKeeper is installed, this selector is populated with the modes specified in DXKeeper's Modes.txt file if present, or its DefaultModes.txt file.
Log Mode for PKT or PKT-R	transceivers for which Commander provides a PKT or PKT-R mode	specifies the "mode to be logged" conveyed to other applications, e.g. PSK31 or SSTV or FT8 If DXKeeper is installed, this selector is populated with the modes specified in DXKeeper's Modes.txt file if present, or its DefaultModes.txt file.
Log Mode for DIGL or DIGU	Flex Signature 6000 Series	specifies the "mode to be logged" conveyed to other applications, e.g. PSK31 or SSTV or FT8 If DXKeeper is installed, this selector is populated with the modes specified in DXKeeper's Modes.txt file if present, or its DefaultModes.txt file.
Data sub-mode	IC-7600, IC-7700, IC-7800, IC-7850, IC-7851	specifies which Data Sub-mode is selected when the mode is set to Data-L or Data-U
RTTY sub-mode	K3, KX3, K4	determines whether the radio's data mode is set to **FSK D** or **AFSK A** when its mode is set to RTTY or RTTY-R
Control Filename	Kachina	specify the Kachina control filename
Control Folder	Pegasus	specify the folder containing your TenTec Pegasus control software; this folder should contain a file named PEGASUS.OUT
provide A/B and TF-SET buttons	TS-480, TS-590, TS-590SG, TS-2000	when checked, Commander's Main window provides A/B and TF-S buttons instead of AxB and XFC buttons
provide a TF-SET button	TS-990	when checked, Commander's Main window provides a TF-S button instead of an XFC button
Data transmission from ANI input	TS-480	when checked, the TS-480 is directed to transmit audio from the ANI signal in its backpanel ACC2 connector rather than from its front panel MIC input
Data transmission from USB interface or ANI input	TS-590, TS-590SG, TS-890, TS-990	when checked, the transceiver is directed to transmit audio from its USB interface or from the ANI signal in its backpanel ACC2 connector rather than from its front panel MIC input
Assign subreceiver to VFO A when dual receive disabled	Orion	when checked, the Orion's subreceiver is assigned to VFO A when dual receive is disabled; when unchecked, the subreceiver is unassigned

Radio's minimum VFO step is set to 10 hz	FT-1000D, MP-1000MKV, MP-1000, FT-990, FT-990_12, FT-900, or FT-890	when checked, operations that QSY the radio by 10 hz (e.g. wheeled mouse movements) will be accomplished by sending a "Step VFO" CAT command instead of the standard "QSY" CAT command, thereby avoiding any muting of receiver audio This capability is disabled if the Secondary CAT Port is configured to Lead or Follow and Lead with the Interrogate selector not set to *off*.
Convey Decoded CW to WinWarbler	K3, KX3, K4	when enabled with WinWarbler running, decoded CW is conveyed to WinWarbler
Convey Decode RTTY to WinWarbler	K3, KX3, K4	when enabled with WinWarbler running, decoded RTTY is conveyed to WinWarbler
Communicate via TCP	K4, Thetis	when enabled, connect to a K4 or Thetis panadaptor connected to the local area network via the specified IP Address

IP Address	K4, Thetis	specify the IP address to which a K4 or Thetis Panadaptor is connected on the local area network
		    o for a K4, obtain the IP address from the K4's **IP Address menu item**
		    o For a Thetis panadaptor, obtain the IP address from the **TCP/IP CAT Server** panel on the Thetis **Setup** window's **Network** tab

IP Port	Thetis	obtain the IP port from the **TCP/IP CAT Server** panel on the Thetis **Setup** window's **Network** tab
Monitor Connection	Flex Signature 6000 Series	when enabled, Commander pings the radio once per second, enabling it to report a disconnection
Create VFO B at startup	Flex Signature 6000 Series	when enabled, Commander will create VFO B (slice 1) on startup if it does not already exist
No Split on VFO B transmitting	Flex Signature 6000 Series	when enabled, the Main window's Split box will be unchecked (instead of checked) when the radio reports that slices A and B are both active with slice B configured to transmit
Full-width RX Filters	Flex Signature 6000 Series	when disabled, the maximum CW RX filter bandwidth is 1 KHz, and the maximum SSB, RTTY, and DIG RX filter bandwidth is 5 KHz when enabled, the maximum CW RX filter bandwidth is 12 KHz, and the maximum SSB, RTTY, and DIG RX filter bandwidth is 12 KHz
Radio Selection: Serial Number	Flex Signature 6000 Series	If more than one Flex 6000 is present on the network, specify the serial number of the radio to which Commander should connect
Radio Selection: IP Address and Port	Flex Signature 6000 Series	If Commander cannot connect to a Flex 6000 because its "here's my IP address" broadcast is not being heard, specify the radio's IP Address, and set its IP Port to 4992
Scan Dwell	all radios	specified the amount of time (seconds) spent listening to a memory's frequency before advancing to the next memory when Memory Scanning is enabled

Xmit Meter	Argonaut VI, Eagle FT-450, FT-950, FT-891, FT-991, FTDX-1200, FT-2000, FTDX-3000, FTDX-5000, FTDX-9000 IC-746Pro, IC-756ProIII, IC-7000, IC-7200, IC-7300, IC-7400, IC-7410, IC-7600, IC-7700, IC-7800, IC-7850, IC-7851 TS-590S, TS-590G, TS-990, TS-2000	specify the meter to display while transmitting (requires No interrogation while transmitting to be disabled)
Read radio's EEPROM to determine VFO and Split status	FT-817, FT-857, FT-857D, FT-897	when checked, determines VFO selection and Split state by reading the radio's EEPROM; this increases the risk that a CAT command will be changed by RFI or other data communications malfunction to a command that resets the radio.
Set default width & shift after mode change	FT-DX-10	when checked, changing mode sets the transceiver's width and shift to its default value for the new mode
Reset	all radios	when clicked, resets communications with the transceiver ○ can also be invoked by depressing the **CTRL** and **SHIFT** keys while clicking the Main window's **Config** button
Display Error Log	all radios	when clicked, displays Commander's Errorlog.txt file
Display License	all radios	when clicked, displays Commander's License
Set Time	IC-7300, IC-7600, IC-7700, IC-7800, IC-7850, IC-7851	when clicked, updates the transceiver with the current UTC date and time ○ for this function to work correctly, set the radio's **UTC offset** menu item to 0 ○ this button will be temporarily disabled for up to a minute after being clicked, or after startup or radio selection with the Set transceiver UTC time on startup or selection option enabled
Net Serv	all radios	when clicked, displays Commanders Network Service window, which governs communication with other applications via UDP and TCP

- General panel

Ignore Mousewheel	when checked, directs Commander to not change transceiver frequency when you rotate your mousewheel
Accept 'Dual Rcv On' directives	when checked, allows other DXLab applications to enable the radio's Dual Receive (if available), e.g. when double-clicking on one of SpotCollector's Spot Database entries that specifies split frequency operation
Accept ' Dual Rcv Off' directives	when checked, allows other DXLab applications to disable the radio's Dual Receive (if available), e.g. when double-clicking on one of SpotCollector's Spot Database entries that specifies simplex operation
Use TX freq for devices when split	when checked, settings for frequency-dependent devices are computed from the transmit frequency when operating split
Switch to simplex on 1 MHz QSY	when checked, leave Split mode when the current VFO's frequency changes by 1 MHz or more
Use multiple monitors	when checked, windows that resided on a secondary monitor during the previous session will be restored to the same secondary monitor on startup; when not checked, all windows are restored to the primary monitor on startup
Log debugging Information	when checked, directs Commander to record diagnostic information in the file `errorlog.txt` located in Commander's folder

- PTT panel

  Commander can switch the radio between receiving and transmitting by
  - sending the radio an appropriate command via the serial port (if supported by the radio, and not suppressed)
  - controlling an external interface via the serial port signals RTS and/or DTR
  - controlling an external interface via parallel port pin 17

TX	clicking this button directs the radio to switch from receiving to transmitting
RX	clicking this button directs the radio to switch from transmitting to receiving
suppress CAT	when checked, CAT commands will not be used to switch the transceiver between receiving and transmitting; presumably a hardware signal (serial port DTR, serial port RTS, or parallel port pin 17) will be exclusively used for this purpose, e.g. when an external sequencer is in use

- Frequency Colors panel

In	clicking this button specifies the font color for in-band frequencies displayed in the Main window's primary VFO panel and all frequencies displayed in the secondary VFO and Memory Bank panels
Out	click to specify the font color for out-of-band frequencies displayed in the Main window's primary VFO panel
Back	click to specify the background color for frequencies displayed in the Main window
Def	click to set the font colors for in-band frequencies and out-of-band frequencies and the background color for frequencies to the factory default values: cyan font for in-band frequencies, yellow font for out-of-band frequencies, and black background

- VFO Autorepeat Rate panel: determines the rate at which the Main window VFO's ▲, ▼, ◄, and ► buttons autorepeat when you click and hold them.

- Sub-band Definitions panel

Edit	edits the sub-band definition file BandSegments.txt; if this file doesn't exist, creates it from DefaultBandSegments.txt
Reload	reloads sub-band definitions from the file BandSegments.txt if it exists; otherwise, from the file DefaultBandSegments.txt

- You can define up to eight sub-bands for each amateur band from 160m to 23cm; when the primary VFO frequency does not lie within a defined sub-band, the frequency is displayed in the specified out-of-band color. By default, sub-bands are defined by the contents of the file `DefaultBandSegments.txt` in Commander's folder. Each line in this file defines a sub-band by specifying a name, a lower-bound (in mHz), an upper-bound (in mHz), and a code (unused, set to 0).

- ```
  160M,   1.800,     2.000, 0
  80M,    3.500,     3.750, 0
  75M,    3.750,     4.000, 0
  40M,    7.000,     7.150, 0
  40M,    7.150,     7.300, 0
  60M,    5.330,     5.405, 0
  30M,   10.100,    10.150, 0
  20M,   14.000,    14.150, 0
  20M,   14.150,    14.350, 0
  17M,   18.068,    18.168, 0
  15M,   21.000,    21.200, 0
  15M,   21.200,    21.450, 0
  12M,   24.890,    24.990, 0
  10M,   28.000,    28.300, 0
  10M,   28.300,    29.700, 0
  6M,    50.000,    54.000, 0
  4M,    70.000,    70.500, 0
  2M,   144.000,   148.000, 0
  1.25M, 222.000,  225.000, 0
  70CM, 420.000,  450.000, 0
  33CM, 902.000,  928.000, 0
  23CM, 1240.000, 1300.000, 0
  ```

- To modify these sub-band definitions or define new sub-bands, click this panel's Edit button; this will create a file named `BandSegments.txt` initialize its contents from the file `DefaultBandSegments.txt`, and open `BandSegments.txt` for editing. If you hold a General Class license in the United States, for example, you might define the following two sub-bands:

- ```
  80M,  3.525,   3.750, 0
  75M,  3.850,   4.000, 0
  ```

- Save your modifications, and click the panel's Reload button to put your new sub-band definitions into effect. When subsequently started, Commander will load sub-band definitions from `BandSegments.txt`.

- The following sub-bands are currently fixed, and cannot be modified by the user:

- ```
  1.25M:  222.000 to  225.000
  33CM:   902.000 to  928.000
  23CM:  1240.000 to 1300.000
  ```

- User-defined Controls panel

Show within Main window	checking this box
	    ○ unchecks the Show by expanding Main window box, reducing Commander's Main window to its standard height
	    ○ disables all three Frequency-dependent device panels
	    ○ displays a **User-defined Controls** panel containing 8 buttons and 4 sliders that can be used to invoke and edit User-defined Controls

Show by expanding Main window	checking this box expands the height of the Main window to display a **User-defined Controls** panel containing 16 buttons and 8 sliders that can be used to invoke and edit User-defined Command Controls

- Initial Command panel: specifies a command to be executed when Commander starts, or when a new radio Model is selected

Command	Function
a hexadecimal radio command specified by an even number of hexadecimal characters, e.g. *FEFE26EO0700FD*	all characters are sent to the radio via the primary CAT serial port, two per byte (useful for Icom, TenTec, and Yaesu radios ○ substitution strings: slider value, CI-V address
an ASCII radio command specified by a sequence of ASCII characters preceded by a single apostrophe, e.g. *'AN1;*	each character following the apostrophe is sent to the radio via the primary CAT serial port (useful for Kenwood and Elecraft radios) ○ substitution strings: slider value, ASCII character
a sequence of ascii characters preceded by a single tilde, e.g. *~slice set 0 rxant=ant1*	ASCII radio command -- each character following the tilde will be sent to your radio via the TCP/IP connection (useful for Flex Signature radios) ○ substitution strings: slider value, ascii character

- Initial Command Sequence panel

Enable	when enabled, specifies a Command Sequence to be executed when Commander starts, or when a new radio Model is selected ○ If an Initial Command is also specified, the Initial Command Sequence is executed *after* the Initial Command
Edit	when clicked, displays a window that lets you define, edit, and test the initial command sequence

- Guidance panel

Browser pathname	if this setting is blank, Commander displays online help using your PC's default HTML browser; if this setting contains the pathname of an HTML browser, Commander displays online help using that browser.
Select button	displays a file selector dialog that allows you to choose a Browser pathname
show control explanations	when checked, enables the display of explanatory information when the mouse cursor lingers over a textbox, button, checkbox, display pane, or setting.
Help button	displays the information you are now reading

A separate Spectrum-Waterfall Configuration window is provided for controlling the Spectrum-Waterfall window.

Ports tab
- **Primary CAT Serial Port** panel
  - **Port#** selector: specifies the PC serial port to which the radio is connected
  - **Baud Rate** selector: specifies the baud rate that the radio is using (hardwired in some radios, menu-configurable in others; consult the radio's manual)
  - **Parity** selector: specifies whether parity is enabled (hardwired in some radios, menu-configurable in others; consult the radio's manual)
  - **Word Length** selector: specifies the number of data bits that the radio is using (hardwired in some radios, menu-configurable in others; consult the radio's manual)
  - **Stop Bits** selector: specifies the number of stop bits that the radio is using (hardwired in some radios, menu-configurable in others; consult the radio's manual)
  - **DTR** selector: specifies the behavior of the Data Terminal Ready modem control signal of the selected port

Off	DTR is never asserted
On	DTR is always asserted (required if an external interface that derives its power from DTR is in use)
TX	DTR is asserted when Commander is directed by another application to transmit, or when TX is clicked until RX is clicked

  - **RTS** selector: specifies the behavior of the Request To Send modem control signal of the selected port

Off	RTS is never asserted
On	RTS is always asserted (required if an external interface that derives its power from RTS is in use)
TX	RTS is asserted when Commander is directed by a client application to key the radio, or when the PTT On button is clicked until the PTT Off button is clicked
Flow	RTS is asserted when Commander has data to send to the radio via the serial port; this data will not be sent until the radio responds by asserting the incoming modem control signal Clear To Send (CTS)

- **Secondary CAT Serial Port** panel
  - **Enable**: when checked, Commander will control the radio, device, or application attached to the Secondary CAT Port as specified by the Behavior options and using the specified CAT protocol
  - Behavior options
    - **Follow Primary**: when selected, Commander will direct the radio, device, or application connected to the secondary port to track changes in the primary radio's frequency and mode, and provides the Update every 200 ms option (not available when the Radio Model is set to SatPC32 or S.A.T.)
    - **Lead Primary**: when selected, Commander and the primary radio will track the frequency and mode of the radio, device, or application connected to the Secondary CAT Port (not available when the Radio Model is set to SatPC32 or S.A.T.)
    - **Follow & Lead Primary**: when selected, Commander, the primary radio and the radio, device, or application connected to the Secondary CAT Port will track each other's frequency and mode (not available when the Radio Model is set to SatPC32 or S.A.T.)
    - **Follow uplink**: when selected, Commander will direct the radio, device, or application connected to the secondary port to track changes in the primary radio's uplink frequency, and provides the Update every 200 ms option (only available when the Radio Model is set to SatPC32 or S.A.T.)

- **Follow downlink**: when selected, Commander will direct the radio, device, or application connected to the secondary port to track changes in the primary radio's downlink frequency, and provides the Update every 200 ms option (only available when the Radio Model is set to SatPC32 or S.A.T.)
- **Update every 200 ms**: when checked, Commander will update the radio, device, or application connected to the Secondary CAT Port to track primary radio's frequency and mode every 200 milliseconds; enabling this option will convey the primary radio's frequency and mode to a radio, device, or application connected to the Secondary CAT Port that is powered up or started after Commander is already running
- **Follow Alternate VFO when Split**: when checked and Commander's Split box is checked, the radio, device, or application connected to the secondary port will follow the primary transceiver's alternate VFO
- **Follow & Lead Alternate VFO when Split**: when checked and Commander's Split box is checked, the radio, device, or application connected to the secondary port will follow the primary transceiver's alternate VFO, and the primary radio's alternate VFO will track frequency changes from the radio, device, or application connected to the secondary port
- o **CAT protocol** selector: specifies the CAT protocol to be used for interaction with the device connected to the Secondary CAT Port:

Argonaut V, Argonaut VI	a TenTec Argonaut V or Argonaut VI transceiver
BobCAT	the BobCAT SDR Console using the ICOM CI-V protocol via a connected virtual serial port pair
CW Skimmer	CW Skimmer using the Kenwood protocol via a connected virtual serial port pair
Eagle	a TenTec Eagle transceiver
Elecraft	an Elecraft K3, or an application that emulates the Kenwood protocol
FlexRadio	a FlexRadio SDR via a connected virtual serial port pair
FlexRadio PGXL	a FlexRadio PowerGenius XL amplifier
FT-450, FT-817, FT-818, FT-857, FT-857D, FT-891, FT-897, FT-950, FT-991, FT-2000, FT-5000, FT-9000, FT-1000MP	a Yeasu transceiver or an application that emulates the Yaesu protocol used by these transceivers
ICOM	an Icom transceiver, or an application that emulates the Icom CI-V protocol
Jupiter	a Tentec Jupiter transceiver
Kenwood	a Kenwood transceiver, or an application that emulates the Kenwood protocol
Omni VI, Omni VII	a TenTec Omni VI or Omni VII transceiver
Orion	a TenTec Orion transceiver
Perseus	a Microtelecom Perseus • via a connected virtual serial port pair to the virtual serial port created by the radio's USB interface • communications employs the Icom CI-V protocol • CI-V commands will be sent to mute and un-mute the Perseus' audio when the primary transceiver switches from RX to TX and from TX to RX respectively

PW1	an Icom IC-PW1 amplifier (Commander will send alternating frequency and mode updates every 2.5 seconds to prevent CI-V bus collisions) Note: Commander will display a **PW1 alert** indicator above the **CAT Protocol** selector when a CI-V message is received from the PW1, and will display a **PW1** indicator to the left of the Main window's **Help** button. This is normal when powering up a connected Icom transceiver or when powering up the PW1, and should be reset by clicking either indicator. **If either PW1 indicator appears after power-up, CI-V bus collisions could be compromising frequency tracking; do not operate the PW1 with automatic frequency tracking until this situation is corrected!**
SteppIR	a SteppIR antenna controller using Icom CI-V instructions (sends frequency updates every 2.5 seconds)

- o
- o **CI-V-Addr** box: if the CAT protocol is Icom or PW1 or SteppIR, specifies the CI-V Address in hexadecimal
- o **Interrogate** selector: if the CAT protocol is Icom or Kenwood, determines whether and at what rate to request frequency and mode reports.
    - when the CAT protocol is set to Kenwood, Commander issues an AI1, or AI2; command that directs the connected device or application to automatically report frequency or mode changes, making polling unnecessary. Because some applications do not correctly respond to AI1; or AI2; commands, Commander provides the polling option. If the device or application connected to the Secondary CAT port responds to AI1; or AI2; commands by automatically reporting frequency and mode changes, the **Interrogate** selector should be set to *Off;* this can be determined by monitoring the secondary CAT port using Commander's Messages window.

- o **Port#** selector: specifies the PC serial port; if the specified port is assigned to an enabled transceiver on the Configuration window's MultiRadio tab, that transceiver's Main window selection button will be disabled ("grayed out")
- o **Baud Rate** selector: specifies the baud rate
- o **Parity** selector: specifies whether parity checking is enabled
- o **Word Length** selector: specifies the number of data bits
- o **Stop Bits** selector: specifies the number of stop bits
- o **DTR** selector specifies the behavior of the Data Terminal Ready modem control signal

Off	DTR is never asserted
On	DTR is always asserted (required if an external interface that derives its power from DTR is in use)

- o **RTS** selector: specifies the behavior of the Request To Send modem control signal

Off	RTS is never asserted
On	RTS is always asserted (required if an external interface that derives its power from RTS is in use)
Flow	RTS is asserted when Commander has data to send via this serial port; the data will not be sent until the connected device responds by asserting the incoming modem control signal Clear To Send (CTS)

- **SO2R Serial Port** panel
  - **SO2R protocol** selector specifies the SO2R protocol to be used (**microHam** or **OTRSP**)
  - **Enable**: select to send commands to an attached SO2R device using the specified protocol to convey radio selection changes, band changes (OTRSP protocol only), and ACC/Auxiliary Output changes as a function of the current transceiver's frequency; no commands will be sent unless multi-radio support is enabled and a radio is selected.
  - **ACC/Auxiliary Outputs** panel: displays the last ACC/Auxiliary Output command sent to the SO2R device

Enable	when checked, the integer value of the selected Device Control is placed onto the specified ACC or Auxiliary outputs
Device	specifies the frequency-dependent device whose Control value is placed onto the specified ACC or Auxiliary outputs
Control	specifies the frequency-dependent device's Control whose value is placed onto the specified ACC or Auxiliary outputs

    - note: if the **SO2R protocol** selector is set to **microHam**, the selected frequency-dependent device's Control must specify the band with two digits, e.g. 01 for 160m, or 11 for 6 meters.
  - **Port#** selector: specifies the PC serial port
  - **Baud Rate** selector: specifies the baud rate
  - **Parity** selector: specifies whether parity checking is enabled
  - **Word Length** selector: specifies the number of data bits
  - **Stop Bits** selector: specifies the number of stop bits
  - **DTR** selector: specifies the behavior of the Data Terminal Ready modem control signal

Off	DTR is never asserted
On	DTR is always asserted (required if an external interface that derives its power from DTR is in use)

  - **RTS** selector: specifies the behavior of the Request To Send modem control signal

Off	RTS is never asserted
On	RTS is always asserted (required if an external interface that derives its power from RTS is in use)
Flow	RTS is asserted when Commander has data to send via this serial port; the data will not be sent until the connected device responds by asserting the incoming modem control signal Clear To Send (CTS)

- **Parallel Port** panel
  - **Enable Radio & PTT**: if this box is checked, Commander encodes the currently-selected radio on pins 16 and 14 of the specified parallel **Port Address**, and asserts pin 17 when Commander is directing the transceiver to transmit.

Radio	Parallel port pin 16	Parallel port pin 14
1	0	0
2	0	1
3	1	0
4	1	1

  - **Port** selector: chooses one of four standard parallel port addresses
  - **Port Address**: selects a parallel port

- o **Data Signals** panel: if the Enable box is checked, Commander places the integer value of the selected Device Control onto data bits 7 (most significant bit, pin 9) though 0 (least significant bit, pin 2) of the specified parallel port

Enable	when checked, the integer value of the selected Device Control is placed onto the specified parallel port's data bits
Device	specifies the frequency-dependent device whose Control value is placed onto the specified parallel port's data bits
Control	specifies the frequency-dependent device's Control whose value is placed onto the specified parallel port's data bits

- **Modem Command** panel

Command	if Commander is controlling a remote transceiver via a serial port connected to a modem, use this textbox to specify the modem initialization and dialing commands to be sent when the Send button is activated; if a command is specified, Continuous Frequency and Mode Interrogation is disabled on startup
Send button	when clicked, sends the Command to the modem via the serial port

Frequency-dependent Device tabs

Devices like antenna tuners and linear amplifiers have controls whose settings are frequency-dependent. While high-end units do this automatically, most require the operator to manually set the controls whenever the operating frequency changes. Commander enables you to specify tables for such devices; it then performs a table lookup based on the transceiver's current frequency and displays the correct settings, eliminating the need for paper tables taped to the front-panel. Up to four different frequency-dependent devices are supported, each with up to three controls.

- You can optionally place the settings from one control of one device onto a parallel port's data bits; this permits the direct control of external devices like antenna switches.
- You can optionally use a control's settings to set the value of one a command-generating slider; this could be used, for example, to automatically control your transceiver's power output as a function of frequency

The right side of Commander's Main window is shared by frequency-dependent device readouts, receiver filter controls, and eight banks of ten memories. If the frequently-dependent device panels are not visible, clicking the Main window's **Filters & Devices** button will make them and the receiver filter controls appear in place of the memory banks.

Initially, Commander refers to the four frequency-dependent devices as `Device 0`, `Device 1`, `Device 2`, and `Device 3`; as part of the setup procedure, you can replace these generic names with more meaningful names like `Amplifier`, or `Tuner`.

To setup a frequency-dependent device, use the following procedure:

Step	Directions
1	on Commander's Main window, click the **Config** button
2	on Commander's Main window, click the **Filters & Devices** button if its visible
3	on Commander's Configuration window, select the **Device 0** tab (you can use the **Device 1**, **Device 2,** and **Device 3** tabs to setup a second, third, and fourth frequency-dependent device, if desired)
4	check the **Device 0** tab's **Enabled** box; in the Main window, you'll see a **Device 0** panel appear (the contents of this panel will be updated as you complete this procedure)
5	enter the name of the device in the **Device Name** box; the name of the tab will change from **Device 0** to the name you specify

6	enter the number of controls associated with this device in the **# Controls** box; accepted values are 1, 2, or 3.
7	enter the name of the first control in the **Control 1** box; if there's a second control, enter its name in the **Control 2** box and if there's a third control, enter its name in the **Control 3** box. ○ to drive a command-generating slider with a control, set the control's name to **<Sn>** where **n** is a number from 1 to 8 that identifies the slider being driven
8	scroll the **Device Table** to the frequencies of interest, and enter the control values for each such frequency; after entering each value, strike the **Enter** key ○ to modify an existing device table entry, select the information you wish to change by clicking it with the left mouse button, and then type in the new information ○ to add a new entry to a device table, scroll to its bottom, where you will find a blank line with an asterisk in the grey left-most column. Key in the entry's frequency in kilohertz, and then strike the **Enter** key. Commander automatically sorts the **Device Table** in ascending frequency order, so the new entry may disappear from view. If you're planning to add several entries, it is more efficient to first create the entries, and then scroll through the **Device Table** entering control values for the newly-created entries. ○ to delete an entry in the device table, select it by clicking in the grey left-most column; then strike the **Delete** key. ○ it is not necessary to enter control values for every frequency in the table ○ depressing the **CTRL** key while clicking on a **Device Table** entry will QSY your transceiver to that entry's frequency, making it easy to determine or verify settings
9	enter a percentage in the **Tolerance** box (2% is a reasonable default) ○ the percentage difference between the frequency of the **Device Table** entry closest to your radio's current frequency and your radio's current frequency must be less than or equal to the specified **Tolerance** for that entry's control settings to be displayed ○ if there is no **Device Table** entry within the specified **Tolerance**, the Device's control settings will be blanked
10	click the **Save** button and specify a destination filename into which the Device data just specified will be saved for use in subsequent Commander sessions.

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If Commander is terminated and later restarted, saved device data will automatically be reloaded for each Device that was enabled when Commander was terminated.

You can use the above procedure to record data for an alternate device -- e.g. a backup amplifier -- in a separate file. The **Select** button allows you to choose the file from which the Device data will be loaded. The **ReLoad** button restores the Device data to the values contained in the most recently-loaded file.

You can specify the colors used to display a Device's settings on the right side of Commander's Main window via buttons in the **Setting Readout Colors** panel:
- **Font** - click this button specify the font color for this device's settings displayed in the Main window
- **Background** - click to specify the background color for this device's settings displayed in the Main window
- **Default** - click to use "factory default" colors for this device's settings displayed in the Main window: cyan font, and black background

You can select one control of one frequency-dependent device whose integer value will be placed on data bits 7 through 0 of a specified parallel port. This can be used to control an antenna switch, for example.

Filter Groups tab

A Filter Group is a named configuration of one or more receiver bandwidth settings. If Filter Groups are supported for a particular radio Model, Commander remembers the Filter Group last used in each mode. Checking the **restore Filter Group on mode change** box directs Commander to automatically restore the last used Filter Group whenever a new mode is selected.

If the radio Model is an Icom, the Filter Groups tab displays the Icom Filter Group Names panel, which lets you assign names to the each Filter Group. Early Icom transceivers provides two Filter Groups whose functions are hardwired: group 1 provides a **wide** bandwidth filter, and group 2 provides a **narrow** bandwidth filter. Later Icom transceivers allow the user to reconfigure one or both filter groups for different bandwidth (by physical replacement or in high-end transceivers via menu selection), and some include a third group ambiguously referred to as **normal**. The **Icom Filter Group Names** panel lets you assign names to each group that are meaningful given the actual filter configuration of your transceiver; these names appear in the **Group** selector in the **Main** window's **Filters** panel, enabling you to change bandwidth with a mouse click.

If the radio Model is set to `MP1000` or `MP1000MKV`, the Filter Groups tab displays the **Yaesu FT1000MP and Mark V** panel which contains a table, each of whose rows is comprised of cells that define a Filter Group; a **Data File** panel is also display, enabling you to specify the file into which Filter Groups are saved.

- To modify an existing Filter Group's Mode, 2nd IF, 3rd IF, or Sub cell, click in the cell to display a down-pointing triangle; then on this triangle to display a list of alternatives from which you can choose with a mouse click. After you change any cell, a pencil icon appears in the row's left-most column:
    - to undo the change, strike the **ESC** key
    - to record the change, click on any other row in the table, or strike the **UpArrow** or **DownArrow** keys.
- To delete a Filter Group, click in its row's left-most column, and then strike the **Delete** key.
- To add a new Filter Group,
    1. click on any cell in the bottom-most table entry, which is marked with an asterisk in its left-most column; doing so will create an empty new row, whose cells you can then populate
    2. if you haven't specified a **Filename** in the **Data File** panel, select one by clicking the **Data File** panel's **Select** button
    3. click the **Data File** panel's **Save** button to save all **Filter Groups** to the specified **Filename**; Filter Groups saved in this way will automatically be loaded from the specified **Filename** when Commander is started

If the radio Model is set to `Argonaut VI`, the **Filter Groups** tab displays a **Argonaut VI default bandwidth by mode** panel that provides the option to set the default bandwidth to a specified value when the transceiver's mode changes.

If the radio Model is set to `Eagle`, the **Filter Groups** tab displays a **Eagle default bandwidth by mode** panel that provides the option to set the default bandwidth to a specified value when the transceiver's mode changes.

If the radio Model is set to a Flex Signature Series model, the **Filter Groups** tab displays a **Flex Signature Series** panel that provides
- the ability to specify **Low-cut** and **High-cut** frequencies for **Wide**, **Normal**, and **Narrow** filter groups for each mode: SSB, CW, DIGL, DIGU, RTTY, and AM
- a **show each mode's Filter Group** option that when enabled appends each mode with its associated Filter Group in the **Mode** panel on Commander's Main window

If the radio Model is set to `FTDX10`, the **Filter Groups** tab displays a **Yaesu default bandwidth by mode** panel that provides the option to set the default **Width** and **Shift** to specified values when the transceiver's mode changes.

If the radio Model is set to `Orion`, the **Filter Groups** tab displays an **Orion default bandwidth by mode** panel that provides the option to set the default bandwidth to a specified value when the transceiver's mode changes.

Memories tab

Textboxes in this tab's Memory panel allow you to establish a title for each memory bank; this title serves as the caption for the Main window panel that displays the currently-selected memory bank.

- When checked, the **Disable Save Buttons** box disables (grays out) the Save buttons in the Main window's Memory Bank panel; clicking the word **Save** in the Main window's Memory Bank panel will display the Config window's Memories tab
- The **Export Memories** button saves the information associated with all memories that contain at least a frequency and mode to a specified file.
- The **Import Memories** button loads memories from information contained in a specified file. Any errors are placed in an error file that's displayed after the operation completes.
- The **Clear Memories** button erases the contents of all memories in the current memory bank
- The **User-defined Sequence after Memory Select** option lets you specify the name of a User-defined Command Sequence to automatically be executed when a Memory Bank panel's Sel button is clicked after a **Delay** specified in milliseconds (up to a maximum of 10,000). If no name is specified, no sequence will be executed; if no delay is specified, the named sequence will be executed immediately.

Multi Radio tab

Using the controls on this tab, you can configure Commander to support rapid switching among up to four radios. Switching can be manual, via a set of buttons on the VFO panel on Commander's Main window, or automatic as a function of amateur band.

Controls on this tab's **Control** panel let you specify a transceiver model, a CI-V Address (for Icom and TenTec radios), the need for continuous frequency and mode interrogation, and the interval (in milliseconds) between command groups for up to four radios; these controls are identical in function to the controls on the General tab. You can specify a unique name for each radio, which is used to identify the radio for both manual and automatic switching; if you have a pair of Icom 756 Pro radios, for example, with one dedicated to HF operation and the other to VHF operation, you might name the first *HF 756Pro* and the second *VHF 756Pro*. The Enable boxes in this panel let you designate which radios are active. If you are switching between radios 1 and 2, enable them both, and uncheck the enable boxes associated with radios 3 and 4.

- If the **Model** selector is set to *K4*, clicking the provided **Select** button displays a small window that
  - provides a **Communicate via TCP** box that if checked means that the K4 is connected to the local area network, and that Commander should communicate with it via TCP (as opposed to via a serial port)
  - provides an **IP Address** box that specifies the IP address to use if the **Communicate via TCP** box is checked
  - provides an **IP Port** box that is not used, and can be left empty
- If the **Model** selector is set to *Kachina*, clicking the provided **Select** button enables you to choose a Control Filename for the radio
- If the **Model** selector is set to *Pegasus*, clicking the provided **Select** button enables you to choose a Control Folder for the radio
- If the **Model** selector is set to *SDR-6300*, *SDR-6400, SDR-6500*, *SDR-6600*, or *SDR-6700*,
  - clicking the provided **Select** button enables you to specify the radio's Serial Number, or its IP Address and IP Port
  - the **Interrogate** checkbox controls the Monitor Connection setting

Controls on the **Serial port** panel let you specify serial communication port settings for each of four radios. These controls are identical in function to those on the Ports tab's Primary CAT Serial Port panel. If you are controlling multiple Icom or TenTec radios on the same CI-V bus, assign identical serial port parameters to these radios. Due to space compression, the Serial Port control uses a hyphen to mean "none", and the Parity, DTR, and RTS controls use single letter abbreviations:

-
Parity Abbreviation	Meaning
N	No parity
O	Odd parity
E	Even parity
M	Mark parity
S	Space parity

-
DTR and RTS Abbreviation	Meaning
N	Always off
Y	Always on while this radio is selected
X	On to transmit
F	Flow control (RTS only)

Note that each transceiver's Enable box will remain disabled (grayed out) until all of its items have been selected. If your transceiver doesn't need DTR or RTS, for example, set those selectors to N rather than leave the blank.

If the port assigned to an enabled transceiver is currently specified as the Secondary CAT Serial Port panel, the transceiver's Main window selection button will be disabled ("grayed out").

Clicking a radio's **Update** button will update that radio's Multi Radio serial port settings from the settings specified on the Ports tab's Primary CAT Serial Port panel. Thus once you have the settings on the Primary CAT Serial Port panel properly configured to enable Commander to control a transceiver, you can "transfer" those settings to the **Multi Radio** tab's **CAT Serial Port** panel by clicking the appropriate Update button.

User-defined Control Set Configuration window
To create, display, or modify a radio's User-defined Control Set, click the radio's **Edit** button in this tab's **User-defined Control Sets** panel. to display the **User-defined Control Set Configuration** window, which specifies the Control Set's contents:
- an Initial Command to be executed when Commander starts, or when a new radio model is selected
- the pathname of a file that specifies an Initial Command Sequence to be executed when Commander starts, or when a new radio mode is selected (after executing the initial CAT command, if one is specified)
- the pathnames of up to 32 files, each specifying a Command Sequence
- the pathnames of up to 16 files, each specifying a Command-generating Slider

The 32 Sequence pathnames and 16 Slider pathnames are organized into two **banks**, each specifying two **rows** of 8 Sequence pathnames and 4 slider pathnames; use the **Second row** and **Alt bank** checkboxes to select the bank and row whose pathnames you wish to view or modify.

To populate an empty new Control Set, in the **User-defined Control Set Configuration** window,
- optionally specify an Initial Command to be run when a radio associated with the Control Set is selected
- optionally specify an Initial Command Sequence to be run when a radio associated with the Control Set is selected
- specify a pathname for each Command Sequence to be made accessible when a radio associated with the Control Set is selected
- specify a pathname for each Command-generating Slider to be made accessible when a radio associated with the Control Set is selected

If a Control Set for this radio has already been defined, clicking the **User-defined Control Sets** panel's **Edit** button populates the **User-defined Control Set Configuration** window with the Initial Command, Initial Command Sequence, Command Sequence selections, and Command-generating Slider selections from that Control Set.

In the **User-defined Control Set Configuration** window,
- to load the Control Set with an Initial Command, Initial Command Sequence, Command Sequence selections, and Command-generating Slider selections previously saved to a file from a Control Set, click the **Load** button and select that file
- to save the Control Set's Initial Command, Initial Command Sequence, Command Sequence selections, and Command-generating Slider selections to a file, click the **Save** button and select that file
- to clear the contents of a Control Set, click the **Clea**r button

Selecting a radio for which a Control Set is specified
- directs the transceiver to execute the CAT command specified in the Control Set's Initial Command
- directs the transceiver to execute the Control Set's Initial Command Sequence
- loads the 32 Command Sequences from the pathnames specified in the Control Set
- loads the 16 Sliders from the pathnames specified in the Control Set

By default, switching between radios is manual, effected by clicking the radio selection buttons on the Main window's VFO panel. To enable automatic radio switching, use the **Selection by band** panel to choose a radio for each amateur band, and then check the Auto box.

You can configure Commander to identify the currently-selected radio via a binary encoding on pins 16 and 14 of a specified parallel port.

Bandspread tab
The controls on this tab influence the behavior of the Bandspread window's slide rule dial, its Band Stack, and its presentation of DX Spots. Controls in this tab's **DX Spot** panel also govern the handling of active callsigns in the Spectrum-Waterfall window's DX Callsign Section, and the handling of callsigns displayed on SmartSDR's panadaptor.

The **always on top** box, when checked, ensures that the Bandspread window will not be obscured by any other application window except one similarly configured.

If the **color-code frequency pointer** box is checked, the current frequency indicator on the Bandspread window's slide rule dial will be rendered in the specified in-band color if the transceiver's frequency is in-band, or in the specified out-of-band color if the transceiver's frequency is out-of-band. If the box is unchecked, the current frequency indicator will be rendered in red, independent of transceiver frequency.

The **Spectrum-Waterfall window** box is enabled if Commander is controlling an Icom IC-7300, IC-7610, IC-7850, IC-7851, or IC-9700 and if the Primary CAT Port baud rate is set to 115,200. Checking this box will display Commander's Spectrum-Waterfall window, which horizontally displays realtime spectrum data, a waterfall, and the callsigns of active DX stations. Note that Icom radios will only report spectrum data if they are directly connected to a computer via USB.

The **Display calls on panadaptor** box is enabled if Commander is controlling a Flex Signature radio. Checking this box display active callsigns on SmartSDR's panadaptor,

The **Orientation** panel determines whether the slide rule dial shows lower frequencies at its top and higher frequencies at its bottom, or higher frequencies at its top and lower frequencies at its bottom.

The **Band Stack** panel's **dwell time** setting specifies the interval that determines how long the radio must pause on a frequency before that frequency and the radio's current mode are saved onto the current Band Stack; the dwell time is specified in seconds.

The **Mousewheel Motion** panel determines the increment by which your radio is QSYed when the Bandspread window is active and you rotate your mouse's wheel by one click. Increments are specified by mode, and expressed as a percentage of the slide rule dial's frequency range; negative percentages can be used to reverse the meaning of mouse wheel rotation to suit the user's taste. Fractional values like `0.05` can be specified for very slow tuning rates. The mode-specific settings make it convenient to setup a faster tuning rate for SSB operation than for CW or RTTY operation.

In the **DX Spot Font** panel,
- the **Name** sub-panel lets you specify a large font to be used to render DX spots on the Bandspread window's slide rule dial when the font size is 8 or greater, and a small font to be used when the font size is less than 8; this allows the use of fonts design to be readable at small point sizes, e.g. *Small Fonts*
- The **Size** sub-panel specifies the font size with which DX spots are to be rendered on the Bandspread window's slide rule dial; font sizes can be specified independently for each dial range.

DX Spot settings govern the handling of active callsigns in the Bandspread window, callsigns in the Spectrum-Waterfall window's DX Callsign Section, and callsigns displayed on SmartSDR's panadaptor:
- if **hide duplicates** is checked, only a station's most recent spot in each mode will be displayed on the Bandspread window's slide rule dial and the Spectrum-Waterfall window's DX Callsign Section ; if not checked, every spot will be displayed.
- if **Request prop forecast** is checked, clicking on the callsign of an active DX callsign in the Bandspread window or in the Spectrum-Waterfall window's DX Callsign Section will request a propagation forecast from PropView
- if **Set Xcvr split** is checked, clicking the callsign of an active DX callsign in the Bandspread window or in the Spectrum-Waterfall window's DX Callsign Section that is operating split will place the transceiver in in split mode (if supported) with its alternate VFO set to the spot's QSX frequency
- spots whose age exceeds the **lifetime** setting (in hours) will not be displayed on the slide rule dial; you can specify fractions of an hour using decimal notation, e.g. `.5`
- the **Spot Filter** panel determines what subset of the active stations known to SpotCollector is shown in Commander's Bandspread and Spectrum-Waterfall windows. There are two fixed filter settings and 4 user-defined filters:
    - **none**: all active stations known to SpotCollector are shown
    - **SC filter**: active stations present in SpotCollector's Spot Database Display are shown (so the filtering is that currently specified in SpotCollector
    - user-defined 1: active stations known to SpotCollector are shown if they comply with the first user-defined SQL expression
    - user-defined 2: active stations known to SpotCollector are shown if they comply with the second user-defined SQL expression
    - user-defined 3: active stations known to SpotCollector are shown if they comply with the third user-defined SQL expression
    - user-defined 4: active stations known to SpotCollector are shown if they comply with the fourth user-defined SQL expression

To specify or modify the user-defined SQL expressions, click the **Spot Filter** panel's **Edit** button. In the **Commander User-defined SpotCollector Filters** window that appears, you can specify a **Caption** and an **SQL** expression for each of the four user-defined filters. The **Caption** appears in the **Spot Filter** panel, making it easy to recall the function of each user-defined filter. The **SQL** expression determine what subset of active stations known to SpotCollector are displayed in Commander's Bandspread and Spectrum-Waterfall windows; all of the SQL filtering capabilities described here are available.

If one of the user-defined filters is selected in the **Spot Filter** panel, that filter's SQL expression cannot be modified via the **User-defined SpotCollector Filter** window until another filter setting is selected. You can click the window's **Clear Spot Filter** button to set the **Spot Filter** panel to **none**, thereby allowing any of the user-defined SQL expressions to be modified. If one of the user-defined filters is selected in the **Spot Filter** panel, the number to the left of its caption in the **User-defined SpotCollector Filter** window is rendered in bold red font.

- the **Log Filter** panel determines which QSOs DXKeeper will display when you click on an active DX callsign in the Bandspread window or in the Spectrum-Waterfall window's DX Callsign Section
    - if **call** is selected, DXKeeper will display all previous QSOs with the spot's callsign
    - if **entity** is selected, DXKeeper will display all previous QSOs with the DXCC entity associated with the spot's callsign
- clicking the **Clear** button removes all current spots from the slide rule dial
- Controls on the **Digital Mode Application** panel let you specify the Digital Mode Application to which Commander will send frequency and mode information when you select an active DX callsign on the Bandspread window or in the Spectrum-Waterfall window's DX Callsign Section, subject to settings on the panels described below. By default, the Digital Mode Application textbox is set to WinWarbler; if the Digital Mode Application textbox is empty on startup, Commander sets it to WinWarbler . If you specify a Digital Mode Application like MultiPSK and click the **Connect** button, then when you select an active DX callsign on the Bandspread window or on the Spectrum-Waterfall window's DX Callsign Section, Commander will send the frequency and mode information to that Digital Mode Application from then on.
- the **RTTY Mode if no Digital Mode Application** panel specifies the mode to which the transceiver should be set when you click on a RTTY mode active DX station's callsign with the specified Digital Mode Application not running

RTTY	set the transceiver to normal RTTY mode
RTTY-R	set the transceiver to reversed RTTY mode
USB	set the transceiver to USB mode
LSB	set the transceiver to LSB mode
PKT	set the transceiver to PKT mode
PKT-R	set the transceiver to PKT-R mode
Data-L	set the transceiver to Data-L mode
Data-U	set the transceiver to Data-U mode
DIGL	set the transceiver to DIGL mode
DIGU	set the transceiver to DIGU mode

- the **CW Mode** panel specifies the mode to which the transceiver should be set when you click on a CW mode active DX station's callsign

CW	set the transceiver to normal CW mode
CW-R	set the transceiver to reversed CW mode
CW via DMA	if the specified Digital Mode Application is running, convey the spot information to it if the specified Digital Mode Application isn't running, set the transceiver to normal CW mode

- the **Phone Modes** panel specifies the mode to which the transceiver should be set when you click on an SSB, AM, or FM mode active DX station's callsign

SSB via DMA	if the specified Digital Mode Application is running, convey the spot information to it if the specified Digital Mode Application isn't running, set the transceiver to USB or LSB mode as a function of frequency
AM via DMA	if the specified Digital Mode Application is running, convey the spot information to it if the specified Digital Mode Application isn't running, set the transceiver to AM mode
FM via DMA	if the specified Digital Mode Application is running, convey the spot information to it if the specified Digital Mode Application isn't running, set the transceiver to FM mode

The **User-defined Sequence after Band Change** panel specifies the name of a User-defined Command Sequence to be automatically executed when a band button in the **Bandspread** window's **Band** panel or the **Spectrum-Waterfall** window's Band panel is clicked after a **Delay** specified in milliseconds (up to a maximum of 10,000). If no name is specified, no sequence will be executed; if no delay is specified, the named sequence will be executed immediately.

Transverters tab
A transverter is an external device that enables transmission and reception on a frequency significantly offset from that of one's transceiver. When operating with a transverter, Commander's VFO displays the transverter output frequency, and sets your transceiver to the required transceiver input frequency.
Commander supports transverters with outputs on the 6m, 4m, 2m, 1.25m, 70cm, 33cm, and 23cm bands, providing a dedicated panel on the Transverters tab that lets you specify the frequency offset (in kHz) and relationship (additive or subtractive) for each band. If, for example, your 6m transverter requires your transceiver to operate on the 10m band, then you would set the 6M transverter panel's offset setting to 22000, select the + (additive) button, and check the Enabled box; If QSYed to 50100, Commander would set your transceiver to 28100. If you have configured Commander to control more than one transceiver, each transverter panel lets you specify the transceiver connected to its associated transverter.

Spectrum-Waterfall Configuration window
To display the Spectrum-Waterfall Configuration window, click the Spectrum Config button in the Spectrum-Waterfall window's Control Section.
- the **Always on top** box, when checked, ensures that the Spectrum-Waterfall window is always visible
- the **Mode AutoTrack** box, when checked with a Fixed range, responds to a mode change to CW, Data, or Phone by setting the range to the sub-band associated with the new mode; changing to any other mode sets the range to the entire band
- the **Frequency AutoTrack** box, when checked with a Fixed range
  - responds to tuning out of the range (but still within the band) by automatically sliding the range up or down so that the transceiver frequency is visible in the range
  - if Mode AutoTrack is disabled, responds to a band change by setting the range to the lowest-frequency sub-band that contains the transceiver frequency; if the current frequency is not within any of the new band's sub-bands, the range is set to the entire band
- the **Use radio's scroll options** box, when checked, enables selection of the **SCROLL-C** and **SCROLL-F** spectrum tracking modes by providing a **Scroll** checkbox in the Spectrum-Waterfall window's Range panel. **Use radio's scroll options** is automatically enabled if the radio reports its spectrum tracking mode to be **SCROLL-C** or **SCROLL-F.**
- the **Low Pass Filter** panel enables smoothing of the spectrum data displayed in the Spectrum Section
  - the **Enabled** checkbox governs whether low pass filtering is enabled
  - in the **Time constant** slider, higher values produce increased smoothing

- the **DX Spot Rows** panel specifies the number of rows of active DX callsigns present in the DX Callsign Section. Increasing the number of rows increases the height of the DX Callsign Section, and increases the height of the Spectrum-Waterfall window; decreasing the number of rows decreases the height of the DX Callsign Section, and decreases the height of the Spectrum-Waterfall window. Any change to the number of rows is reflected in the Spectrum-Waterfall window's DX Rows panel; any change to the Spectrum-Waterfall window's DX Rows panel setting is reflected in the Spectrum-Waterfall Configuration window's DX Spot Rows panel.
- In the **DX Spot Font** panel,
    - the **Name** sub-panel lets you specify a large font to be used to render DX spots on the DX Callsign Section when the font size is 8 or greater, and a small font to be used when the font size is less than 8; this allows the use of fonts design to be readable at small point sizes, e.g. *Small Fonts*
    - The **Size as function of Range** sub-panel specifies the font size with which DX spots are to be rendered on the DX Callsign Section; font sizes can be specified independently for each range.
- In the **Colors** panel,
    - clicking the **Receive Freq Marker** button displays a color selector that lets you choose the color of the vertical marker used to indicate the transceiver frequency when not split, or the receive frequency when split; the currently-selected color is shown in a square to the right of the button
    - clicking the **Transmit Freq Marker** button displays a color selector that lets you choose the color of the vertical marker used to indicate the transmit frequency (when split); the currently-selected color is shown in a square to the right of the button
    - clicking the **Frequency Labels** button displays a color selector that lets you choose the color of the text used to indicate frequencies in the Frequency Axis Section; the currently-selected color is shown in a square to the right of the button
    - in the **Spectrum Section** sub-panel
        - clicking the **Spectrum Data** button displays a color selector that lets you choose the color used to display spectrum data in the Spectrum Section
        - clicking the **white background** button displays spectrum data against a white background
        - clicking the **black background** button displays spectrum data against a black background
    - in the **Waterfall Section** sub-panel,
        - clicking the **black-to-white** button displays a monochromatic waterfall where the absence of signal is rendered in black, the strongest signals are rendered in white, and signals of intermediate strength are rendered in shades of grey
        - clicking the **black-to-white** button displays a polychromatic waterfall using this gradient to represent signal strength, from the absence of signal in black to the strongest signals in white:

        - clicking the **black-to-red** button displays a polychromatic waterfall using this gradient to represent signal strength, from the absence of signal in black to the strongest signals in red:

- The **Mousewheel motion** panel determines the increment by which your radio is QSYed when the Spectrum-Waterfall window is active and you rotate your mouse's wheel by one click. Increments are specified by mode, and can be specified either as a **% or range** or as a **fixed frequency** increment. These mode-specific settings make it convenient to setup a faster tuning rate for SSB operation than for CW or RTTY operation
    - If the panel's **% or range** option is selected, increments are specified as a percentage of the range; negative percentages can be used to reverse the meaning of mouse wheel rotation if desired. Fractional values like `0.05` can be specified for very slow tuning rates.
    - If the panel's **fixed frequency** option is selected, increments are specified in hertz; negative values can be used to reverse the meaning of mouse wheel rotation if desired.
- The **Band Settings** panel provides the following settings for each Band from 160m through 4m:
    - **Gain**: a value between 1 and 2 that expands the magnitude of signals displayed in the Spectrum Section
    - parameters for each band
        - **Lower**: specifies the band's lower frequency; striking the **Enter** key will immediately update the range for the current band
        - **Upper**: specifies the band's upper frequency; striking the **Enter** key will immediately update the range for the current band
        - **Ref**: specifies the Reference Level to be used when the range is set to the entire band; striking the **Enter** key will immediately update the Reference Level for the current band
        - clicking a band's **Default** button sets the band's Lower and Upper frequencies from frequencies specified in the sub-band definition file
        - clicking the **Default All** button is equivalent to clicking every band's **Default** button
    - parameters for each band's CW sub-band, Data sub-band, and Phone sub-band
        - **Lower**: specifies the sub-band's lower frequency; striking the **Enter** key will immediately update the range for the current sub-band
        - **Upper**: specifies the sub-band's upper frequency; striking the **Enter** key will immediately update the range for the current sub-band
        - **Ref**: specifies the Reference Level to be used when the range is set to this sub-band; striking the **Enter** key will immediately update the Reference Level for the current sub-band

S-Meter Display

If your transceiver is capable of reporting its S-meter reading via its PC interface, then Commander will continuously display this reading above the VFO's frequency display. By default, the numeric value of this reading is displayed as an integer between 1 and 16. If Commander's `Smeter` folder contains a text file whose name matches your transceiver model (as displayed in Commander's title bar), then Commander will use the entries in that file to display textual data rather than integers.

The format of this file is illustrated by the contents of MP1000.txt, which is included in Commander's `Smeter` folder:

```
1, S0
2, S1
3, S2
4, S3
5, S4
6, S5
7, S6
8, S7
9, S8
10,S9
11,S9+10db
12,S9+20db
13,S9+30db
14,S9+40db
15,S9+50db
16,S9+60db
```

Note that there are exactly 16 entries (lines), each containing an entry number, followed by a comma, followed by textual data; the textual data cannot contain a comma. The following example - the contents of FT817.txt -- illustrates the display of more precise signal level information.

```
1, < -108 dbm
2, > -108.3 dbm
3, > -107.3 dbm
4, > -106.7 dbm
5, > -106.0 dbm
6, > -105.1 dbm
7, > -104.2 dbm
8, > -103.0 dbm
9, > -100.4 dbm
10,> -84 dbm
11,> -74.5 dbm
12,> -70.1 dbm
13,> -58.9 dbm
14,> -50.8 dbm
15,> -40.8 dbm
16,> -30.1 dbm
```

By default, the S-meter is rendered as a green bar on a black background. An optional third parameter may be added to each line of an S-meter file to specify the color used to render the S-meter at that signal strength. The color-specifying third parameter can be one of the words `black, blue, cyan, green, magenta, red, white,` or `yellow`. Alternatively, the color-specifying third parameter can be of the form

```
R-G-B
```

where `R`, `G`, and `B` are each integers between 0 and 255 that specify the relative content of red, green, and blue in the desired color. Some examples of valid S-meter file entries that include a color-specifying third parameter follow:

```
11,S9 + 10db,176-0-0
12,S9 + 20db,192-0-0
13,S9 + 30db,208-0-0
14,S9 + 40db,224-0-0
15,S9 + 50db,240-0-0
16,S9 + 60db,red
```

To make changes to the S-meter file being used by the current primary transceiver take immediate effect, direct your editor to save your changes, and then click the **Reset** button in the **Radio** panel on the Configuration window's **General** tab.

Transmission Meter Display

While transmitting, Commander can continuously display transmission readings above the VFO's frequency display for the following transceivers:

Transceiver	RF	SWR	ALC	Comp	Volts	Amps	Temp
FTDX-9000	x	x	x	x	x	x	
FTDX-5000	x	x	x	x	x	x	
FTDX-3000	x	x	x	x	x	x	
FT-2000	x	x	x	x	x	x	
FTDX-1200	x	x	x	x	x	x	
FT-1000MP	x	x	x		x	x	
FT-1000MP MarkV	x	x	x		x	x	
FT-991	x	x	x	x	x	x	
FT-950	x	x	x	x	x	x	
FT-450	x	x	x				
IC-746 Pro	x	x	x				
IC-756 Pro III	x	x	x	x			
IC-7000	x	x	x	x			
IC-7100	x	x	x	x	x	x	
IC-7200	x	x	x				
IC-7300	x	x	x	x	x	x	
IC-7400	x	x	x				
IC-7410	x	x	x	x			
IC-7600	x	x	x	x	x	x	
IC-7700	x	x	x	x	x	x	
IC-7800	x	x	x	x	x	x	
IC-7850	x	x	x	x	x	x	
IC-7851	x	x	x	x	x	x	
IC-9100	x	x	x	x			
K3, K3S, KX3, KX2		x (see note 1)					
TS-480		x	x	x			
TS-590S, TS-590SG	x	x	x	x			
TS-990							
TS-2000		x	x	x			

Disable the No interrogation while transmitting option, and select the meter to be displayed while transmitting via the **Xmit Meter** selector on the Configuration window's General tab.

By default, meter readings are displayed as a percentage between 0 and 100. If Commander's `TXmeter` subfolder contains a text file whose name matches your transceiver model (as displayed in Commander's title bar), then Commander will use the entries in that file to display textual data rather than integers. This file must contain a 17-line section for each transmission meter, with as section's first line specifying a transmission meter name and its remaining 16 lines specifying data: an entry number and the information to be displayed, separated by a comma. The format of this file is illustrated by the contents of `IC-7800.txt`, which is included in Commander's `TXmeter` folder:

```
RF                    SWR                   COMP
1,1 W                 1,1:1,green           1,0 db
2,5 W                 2,1:1.3,green         2,2 db
3,10 W                3,1:1.4,green         3,4 db
4,15 W                4,1:1.5,green         4,6 db
5,25 W                5,1:1.7,yellow        5,8 db
6,40 W                6,1:2.0,red           6,10 db
7,50 W                7,1:2.5,red           7,12 db
8,70 W                8,1:2.7,red           8,14 db
9,90 W                9,1:3.2,red           9,16 db
10,110 W              10,1:3.7,red          10,18 db
11,130 W              11,1:4+,red           11,20 db
12,150 W              12,1:4+,red           12,22 db
13,170 W              13,1:4+,red           13,24 db
14,200 W              14,1:4+,red           14,26 db
15,200 W              15,1:4+,red           15,28 db
16,200 W              16,1:4+,red           16,30 db

ALC                   Volts                 Amps
1,0,green             1,8,red               1,0,red
2,1,green             2,12,red              2,1,yellow
3,3,green             3,16,red              3,2,yellow
4,4,green             4,20,red              4,3,green
5,5,green             5,24,red              5,4,green
6,6,green             6,28,red              6,5,green
7,7,green             7,32,red              7,6,green
8,8,green             8,34,red              8,7,green
9,9,yellow            9,38,red              9,8,green
10,10,red             10,40,red             10,9,green
11,11,red             11,44,red             11,10,green
12,12,red             12,48, green          12,11,yellow
13,13,red             13,52,red             13,12,red
14,14,red             14,56,red             14,13,red
15,15,red             15,60,red             15,14,red
16,16,red             16,64,red             16,15,red
```

By default, a transmission meter is rendered as a green bar on a black background. An optional third parameter may be added to each data line of an transmission meter file to specify the color used to render the transmission meter at that value. The color-specifying third parameter can be one of the words `black, blue, cyan, green, magenta, red, white,` or `yellow.` Alternatively, the color-specifying third parameter can be of the form

        R-G-B

where `R`, `G`, and `B` are each integers between 0 and 255 that specify the relative content of red, green, and blue in the desired color. Some examples of transmission meter file data lines that include a color-specifying third parameter follow:

        6,1:2.0,176-0-0
        7,1:2.5,192-0-0
        8,1:2.7,208-0-0
        9,1:3.2,224-0-0
        10,1:3.7,240-0-0
        11,1:4+,red

To make changes to the TX meter file being used by the current primary transceiver take immediate effect, direct your editor to save your changes, and then click the **Reset** button in the **Radio** panel on the Configuration window's **General** tab.

Notes:
1. When controlling a capable K3-family transceiver, Commander displays any SWR worse than 1:3.8 as "1:3.9+".

User-defined Controls

Increasingly, modern radios provide for computer control beyond VFO, mode, and filter selection. To provide access to these capabilities, Commander lets you specify

- up to 33 Command Sequences, each containing up to 64 transceiver commands
- up to 16 Command-generating Sliders

To enable access to all Command Sequences and Command-generating Sliders, check the Show by expanding Main window box in the User-defined Controls panel on the General tab of Commander's Configuration window; Commander's Main window will be expanded in height to display a panel containing two rows of eight buttons and two rows of four horizontal slider controls; if you don't need all four rows of buttons and sliders, you can adjust the bottom border of Commander's Main window upward by dragging it with the left mouse button depressed. Alternatively, you can check the Show within Main window box, which will

- display a **User-defined Controls** panel containing 8 buttons and 4 sliders that can be used to invoke and edit User-defined Controls - setting Commander's Main window to its standard height
- disable all three Frequency-dependent device panels

Each Command Sequence can optionally display a "LED-like display" beneath its button, and specify this LED's color.

If you specify Command Sequences or Command-generating Sliders, and are controlling more than one transceiver, you must specify a User-defined Control Set for each transceiver.

Command Sequences
A Command Sequence specifies 64 commands, where each command can accomplish one of several things:

- convey an instruction to your transceiver (CAT)
- terminates execution of the sequence
- conditionally or unconditionally change the flow of control within the sequence
- do nothing
- update the caption shown on the button used to activate the sequence
- `specify the text font color, text font bold property, and surface color of the button used to activate the sequence`
- specify the color displayed by an LED the button used to activate the sequence
- update the contents of the explanatory popup window that appears when the mouse cursor hovers over the button used to activate the sequence

Command Sequences are numbered **1** through **32**, and organized as two banks of sixteen sequences. Two rows of eight buttons are used to activate the sequences in the current bank; you can also activate sequences in the current bank by striking the **F5** through **F12** function keys for the bank's first row of eight sequences, and **SH-F5** through **SH-F12** function keys for the bank's second row eight sequences (depress this **SHIFT** key while striking a function key between **F5** and **F12**). The **ALT checkbox** located between the sequence buttons determines which bank is current. To switch banks, check or uncheck the **ALT checkbox**. Depressing the **ALT** key while clicking a sequence button or striking one of **F5** through **F12** activates a sequence in the first row of the second bank; depressing the **ALT** key while clicking a sequence button or depressing both the **ALT** and **SHIFT** keys while striking one of **F5** through **F12** activates a sequence in the second row of the second bank

An Initial Command Sequence can be optionally executed when Commander starts, or when a new radio Model is selected. To define, edit, or test this sequence, click the Edit button in the Initial Command Sequence Panel on the Config window's General tab.

A specified Command Sequence can be executed when you change bands by clicking a button in the Band panel at the bottom of Commander's Bandspread window.

A specified Command Sequence can be executed when you activate a memory by click a Sel button in the Memory Bank panel on Commander's Main window.

To define, edit, or test a Command Sequence for a button in the **User-defined Controls** panel, right-click the button; you can also depress the **CTRL** key while clicking that button or while striking it's associated function key (**F5** through **F12**, as designated above each button). To define a Command Sequence in the second bank, check the **ALT** box and then right-click the appropriate button, or depress both the **ALT** and **CTRL** keys while clicking on the button or while striking its associated function key. Commander will display a window that enables you to name and document a sequence of up to 32 radio commands to be sent to your transceiver when the associated Command Sequence button is clicked, when its associated function key is struck, or when a directive is received from another application (e.g. WinWarbler). Each Command Sequence is composed by a list of 32 **Commands** and **Notes**, a **Name**, and a **Function**:

Name	specifies the name of the sequence; this name serves as the caption on the associated User-defined Command Sequence button, so choose a name of appropriately-short length • if you plan to use conditional branching commands (see Command table below), the name cannot contain a comma Note: if you wish to include the ampersand character in the name, use a pair of back-to-back ampersands, e.g. `R&&B`.
Button Colors	• click the **Text** button to choose a color for the sequence's button text • CTRL-click the **Text** button to make the sequence's button text color be black • check the **Bold** box to render the sequence's button text in bold font; uncheck this box to render the button text in regular font • click the **Surface** button to choose a color for the sequence's button surface • CTRL-click the **Surface** button to make the sequence's button surface color be the default button surface color (as specified in Windows)
Commands	• click the **1 - 32** button to display the first 32 commands in the sequence • click the **33 - 64** button to display the second 32 commands in the sequence
LED Display	if the **Enabled** box is checked, a LED-like display appears beneath the associated User-defined Command Sequence button; the color displayed by this LED is specified by the **Initial Color** selector
Function	describes the function of the Command Sequence; this information will appear in a popup explanation window when the mouse cursor lingers above the associated Command Sequence button if the display of control explanations is enabled.
Command (1-32)	a sequence of radio commands to be executed, beginning with Command 1
Note (1-32)	optional information used to document the associated command; this information is not sent to your radio

Valid commands are enumerated in the following table:

Command	Function
an even number of hexadecimal characters, e.g. *FEFE26E00700FD*	hexadecimal radio command -- characters are sent to your radio via the primary CAT serial port, two per byte (useful for Icom, TenTec, and Yaesu radios) • substitution strings: slider value, CI-V address • execution proceeds with the following command.

a sequence of ascii characters preceded by a single apostrophe, e.g.
    'AN1;
	ASCII radio command -- each character following the apostrophe will be sent to your radio via the primary CAT serial port (useful for Kenwood and Elecraft radios)
	  • substitution strings: slider value, ascii character
	  • execution proceeds with the following command.

a sequence of ascii characters preceded by a single tilde, e.g.
    ~slice set 0 rxant=ant1
	ASCII radio command -- each character following the tilde will be sent to your radio via the TCP/IP connection (useful for Flex Signature radios)
	  • substitution strings: slider value, ascii character
	  • execution proceeds with the following command.

<Band mHz>	activates the Bandspread window's Band Stack for the specified band, setting the radio's frequency to the most recent frequency used on that band, setting its mode to the mode in use at that time, and clearing Split **mHz Band** 1 160 m 3 80 m 5 60 m 7 40 m 10 30 m 14 20 m 18 17 m 21 15 m 24 12 m 28-29 10 m 50-53 6 m 70 4 m 144-147 2 m 222-224 1.25 m 420-449 70 cm 902-927 33 cm For example, the command <Band 14> will QSY to the most recent 20m frequency and mode, and clear Split.
<ButtonTextBold On> <ButtonTextBold Off>	sets the current Command Sequence's button text bold property to on or off

<ButtonTextColor *color*>	sets the current Command Sequence's button text color to *color* • *color* can be *red, blue, green, black, white, yellow, cyan*, or *magenta*
<ButtonTextColor *Q, color*>	sets the specified Command Sequence's button text color to *color* • *color* can be *red, blue, green, black, white, yellow, cyan*, or *magenta* • Q is a number between 0 and 31 that specifies one of the 32 Command Sequences (0 for command sequence #1, 1 for command sequence #2, etc.)
<ButtonSurfaceColor *color*>	sets the current Command Sequence's button surface color to *color* • *color* can be *red, blue, green, black, white, yellow, cyan*, *magenta*, or *default* (*default* means *"the default button color specified in Windows")*
<ButtonSurfaceColor *Q, color*>	sets the specified Command Sequence's button surface color to *color* • *color* can be *red, blue, green, black, white, yellow, cyan*, *magenta*, or *default* (*default* means *"the default button color specified in Windows")* • Q is a number between 0 and 31 that specifies one of the 32 Command Sequences (0 for command sequence #1, 1 for command sequence #2, etc.)
<DataSignalsEnable On> **<DataSignalsEnable Off>**	<DataSignalsEnable On> checks the Parallel Port Data Signals panel's Enable box, thereby enabling frequency-based control of the parallel port data output. <DataSignalsEnable Off> un-checks the Parallel Port Data Signals panel's Enable box, thereby disabling frequency-based control of the parallel port data output. When the value of the Parallel Port Data Signals panel's Enable box is changed by either of these commands, the new Enable box setting is not saved in the Windows Registry.
<Dual On> <Dual Off>	enables or disables the current transceiver's Dual Receive
<End>	termination • execution of the Command Sequence terminates.
<FreqDepDevEnable On, N> <FreqDepDevEnable Off, N>	<FreqDepDevEnable On, N> enables Frequency-dependent Device N, where N is a number the range of 0 to 3. <FreqDepDevEnable Off, N> disables Frequency-dependent Device N, where N is a number the range of 0 to 3. If the specified frequency-dependent device is disabled, <FreqDepDevEnable On, N>loads the device's data from the Data File pathname specified on the device's tab on the Configuration window
<Goto *N*>	unconditional branch • execution proceeds with command *N*. • be careful to avoid an infinite loop

<IfBand *bandname, N*>	conditional branch based on the current transceiver's current band • if the current transceiver's current band is *bandname*, then execution proceeds with command *N* • if the current transceiver's current band is not *bandname*, then execution proceeds with the following command • *bandname* is a valid band name specified in the current sub-band definition file; the names 1.25m, 33cm, and 23cm are also accepted • be careful to avoid an infinite loop
<IfButtonTextBold *N*>	conditional branch based on the Command Sequence's current bold button text property • if the Command Sequence's bold button text property is enabled, then execution proceeds with command N • if the Command Sequence's bold button text property is not enabled, then execution proceeds with the following command • be careful to avoid an infinite loop
<IfLED *color, N*>	conditional branch based on the Command Sequence's current LED color • if the Command Sequence's LED color is *color*, then execution proceeds with command *N* • if the Command Sequence's LED color is not *color, then* execution proceeds with the following command • be careful to avoid an infinite loop
<IfMode *modename, N*>	conditional branch based on the current transceiver's mode as last reported to Commander • if the current transceiver's last reported mode is *modename*, then execution proceeds with command *N* • if the current transceiver's last reported mode is not *modename*, then execution proceeds with the following command • *modename* is AM, CW, CW-R, Data-L, Data-U, FM, LSB, PKT, PKT-R, RTTY, RTTY-R, USB, or WBFM • be careful to avoid an infinite loop
<IfName *name, N*>	conditional branch based on the Command Sequence's current button caption • if the Command Sequence's button caption is *name*, then execution proceeds with command *N* • if the Command Sequence's button caption is not *name, then* execution proceeds with the following command • the comparison between button caption and *name* is case-independent. • *name* can contain spaces, but not a comma • be careful to avoid an infinite loop
<IfRadioName *name, N*>	conditional branch based on the current primary transceiver's name • if the current primary transceiver's name is *name*, then execution proceeds with command *N* • if the current primary transceiver's name is not *name, then* execution proceeds with the following command • the comparison between the current primary transceiver's name and *name* is case-independent. • *name* can contain spaces, but not a comma • be careful to avoid an infinite loop

<IfSeqName Q, *name, N*>	conditional branch based on the specified Command Sequence's current button caption • Q is a number between 0 and 31 that specifies one of the 32 Command Sequences (0 for command sequence #1, 1 for command sequence #2, etc.) • if the specified Command Sequence's button caption is *name*, then execution proceeds with command *N* • if the specified Command Sequence's button caption is not *name, then* execution proceeds with the following command • the comparison between button caption and *name* is case-independent. • *name* can contain spaces, but not a comma • be careful to avoid an infinite loop
<IfSplit *N*>	conditional branch based on whether the current transceiver is operating split • if the current transceiver is operating split, then execution proceeds with command *N* • if the current transceiver is not operating split, then execution proceeds with the following command
<LED *color*>	sets the current Command Sequence's LED color to *color* • *color* can be *red, blue, green, black, white, yellow, cyan*, or *magenta*
<LED Q, *color*>	sets the specified Command Sequence's LED color to *color* • *color* can be *red, blue, green, black, white, yellow, cyan*, or *magenta* • Q is a number between 0 and 31 that specifies one of the 32 Command Sequences (0 for command sequence #1, 1 for command sequence #2, etc.)
<LED QF:QL, *color*>	sets the specified range of Command Sequence LED colors to *color* • *color* can be *red, blue, green, black, white, yellow, cyan*, or *magenta* • QF is a number between 0 and 31 that specifies the first of the 32 Command Sequences in the range (0 for command sequence #1, 1 for command sequence #2, etc.) • QL s a number between 0 and 31 that specifies the last of the 32 Command Sequences in the range (0 for command sequence #1, 1 for command sequence #2, etc.) • If QL<QF, an error message is displayed and the command is ignored
<Mode *modename*>	sets the current transceiver's mode to *modename* • *modename* is AM, CW, CW-R, DATA-L, DATA-U, DIGL, DIGU, FM, LSB, PKT, PKT-R, RTTY, RTTY-R, USB, or WBFM
<Name *text*>	sets the current Command Sequence's button caption to *text*
<Name Q, *text*>	sets the specified Command Sequence's button caption to *text* • Q is a number between 0 and 31 that specifies one of the 32 Command Sequences (0 for command sequence #1, 1 for command sequence #2, etc.)
<ParData N>	sets the specified parallel port's eight data bits (pins 9 through 2) to the least significant 8 bits of N

<ParClearBit B>	clears the specified parallel port's data bit B • B is a value between 7 and 0 • B=7 selects pin 9; B=0 selects pin 2 • clearing a data bit sets its output to ~0 VDC • after starting Commander, at least one <ParData N> command must be executed before executing a <ParClearBit B> command
<ParSetBit B>	sets the specified parallel port's data bit B • B is a value between 7 and 0 • B=7 selects pin 9; B=0 selects pin 2 • setting a data bit sets its output to ~5 VDC • after starting Commander, at least one <ParData N> command must be executed before executing a <ParSetBit B> command
<PriDTR On> <PriDTR Off>	enables or disables the Primary CAT Port's DTR modem control signal
<PriRTS On> <PriRTS Off>	enables or disables the Primary CAT Port's RTS modem control signal
<priXcvr N>	selects primary radio N
<QSY +*F*>	increases the current transceiver's frequency by *F* KHz, e.g. <QSY +1>
<QSY -F>	decreases the current transceiver's frequency by *F* KHz, e.g. <QSY -2>
<QSY *freq*>	sets the current transceiver's frequency to *Freq* KHz, e.g. <QSY 14200>
<Receive>	directs the radio to switch from transmitting to receiving (equivalent to clicking the RX button)
<Reset>	resets communications with the primary transceiver and then re-initializes it
<Slider S, V>	sets a specified slider to a specified value • S is a digit between 1 and 16 that specifies one of the 16 Command-generating slider controls • V is a numeric value between the specified slider's lower bound and upper bound
<SO2R *text*>	if the SO2R Serial Port is Enabled, sends the text followed by a carriage return (ascii 13) to the SO2R Serial Port

<SPECTRUMFIXEDRANGE L,U>	when controlling a radio with a Spectrum-Waterfall window enabled and in Fixed mode, sets the range's lower bound to L and the range's upper bound to U, where L and U are specified with one of 5 formats:

Format	Meaning	Example
F	set the bound to F KHz	<SPECTRUMFIXEDRANGE 7005,7010>
A+F	sets the bound to the frequency in VFO A (or the Main VFO) plus F KHz	<SPECTRUMFIXEDRANGE A-1,A+5>
A-F	sets the bound to the frequency in VFO A (or the Main VFO) minus F KHz	<SPECTRUMFIXEDRANGE A-1,A+5>
B+F	sets the bound to the frequency in VFO B (or the Sub VFO) plus F KHz	<SPECTRUMFIXEDRANGE A-1,B+5>
B-F	sets the bound to the frequency in VFO B (or the Sub VFO) minus F KHz	<SPECTRUMFIXEDRANGE A+1,B-5>

<SPECTRUMMODE M>	when controlling a radio with a Spectrum-Waterfall window enabled, • <SPECTRUMMODE C> sets the Spectrum-Waterfall mode to *Centered* • <SPECTRUMMODE F> sets the Spectrum-Waterfall mode to *Fixed*
<SPECTRUMREFLEVEL R>	when controlling a radio with a Spectrum-Waterfall window enabled, sets the curent Reference Level to R db without changing the reference level associated with the current band or sub-band
<Split On> <Split Off>	enables or disables the current transceiver's Split
<Tooltip *text*>	sets the current Command Sequence button's popup explanation to *text*
<Tooltip Q, *text*>	sets the specified Command Sequence button's popup explanation to *text* • Q is a number between 0 and 31 that specifies one of the 32 Command Sequences (0 for command sequence #1, 1 for command sequence #2, etc)
<Transmit>	directs the radio to switch from receiving to transmitting (equivalent to clicking the TX button)
<TXMeter *MeterName*>	sets the Xmit Meter selector to the specified *MeterName*
<UDPAntSelEnable On> <UDPAntSelEnable Off>	enables inclusion of the specified Antenna name in Radio Info messages sent to active UDP connections disables inclusion of the specified Antenna name in Radio Info messages sent to active UDP connections
<UDPAntSelName *text*>	specifies the Antenna name in Radio Info messages sent to active UDP connections

<UDPAuxAntSelEnable On> <UDPAuxAntSelEnable Off>	enables inclusion of the specified Auxiliary Antenna number and Auxiliary Antenna name in Radio Info messages sent to active UDP connections disables inclusion of the specified Auxiliary Antenna number and Auxiliary Auxiliary Antenna name in Radio Info messages sent to active UDP connections
<UDPAuxAntSelNumber *text*>	specifies the Auxiliary Antenna number in Radio Info messages sent to active UDP connections
<UDPAuxAntSelName *text*>	specifies the Auxiliary Antenna name in Radio Info messages sent to active UDP connections
<UDPSendRadioInfo>	directs Commander to send a Radio Info message bearing the primary transceiver's frequency, mode, and other informationto active UDP connections
<XcvrA=B>	directs the radio to set the VFO B (or sub-receiver) frequency to the VFO A (or main receiver) frequency
<XcvrAxB>	directs the radio to exchange the VFO A (or main receiver) and VFO B (or sub-receiver) frequencies
<Wait>	pauses for the duration indicated in the Command Interval textbox after executing the previous transceiver command in the sequence before executing the next transceiver command in the sequence.

The conditional branch and sequence button naming commands make it possible to create sequences that toggle a sequence button's function, as shown in this simple example for the Icom IC-756:
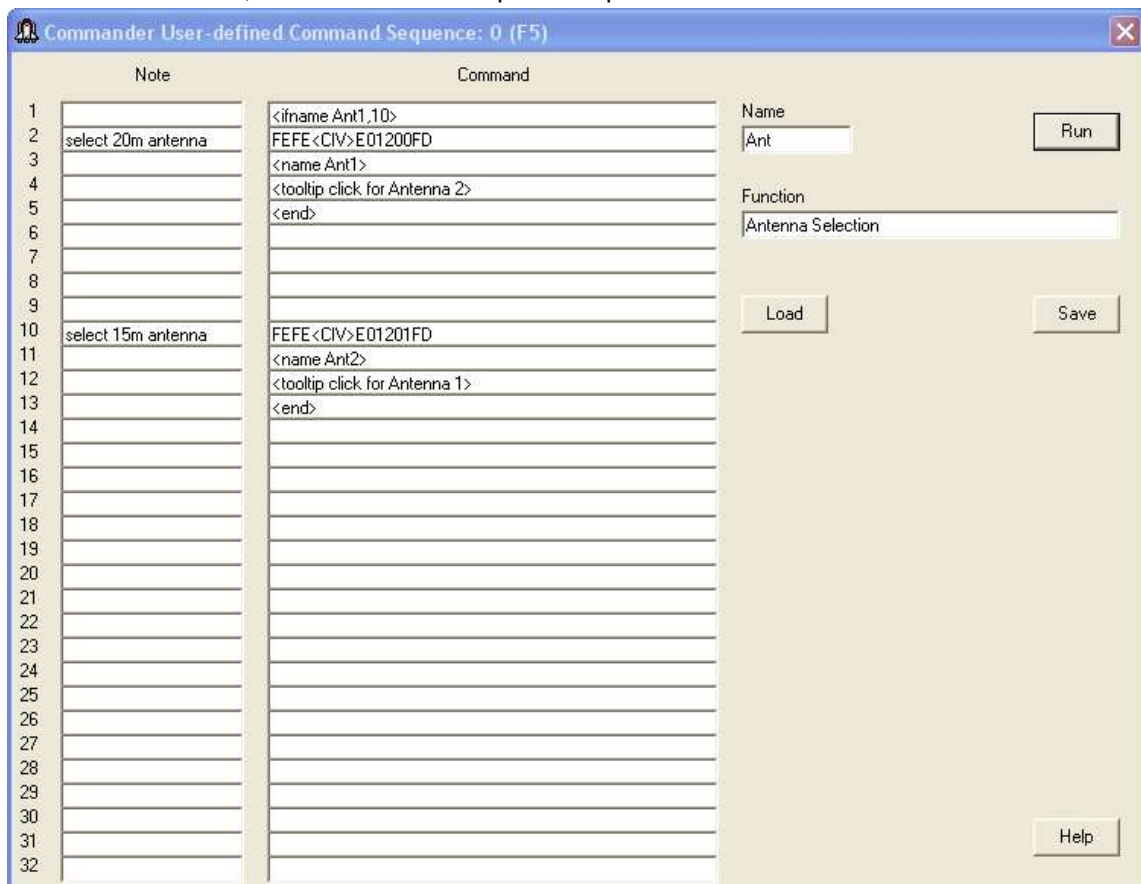
Using LED color to display the state of a controlled element, in this case an Icom IC-7700's Twin Peak Filter:
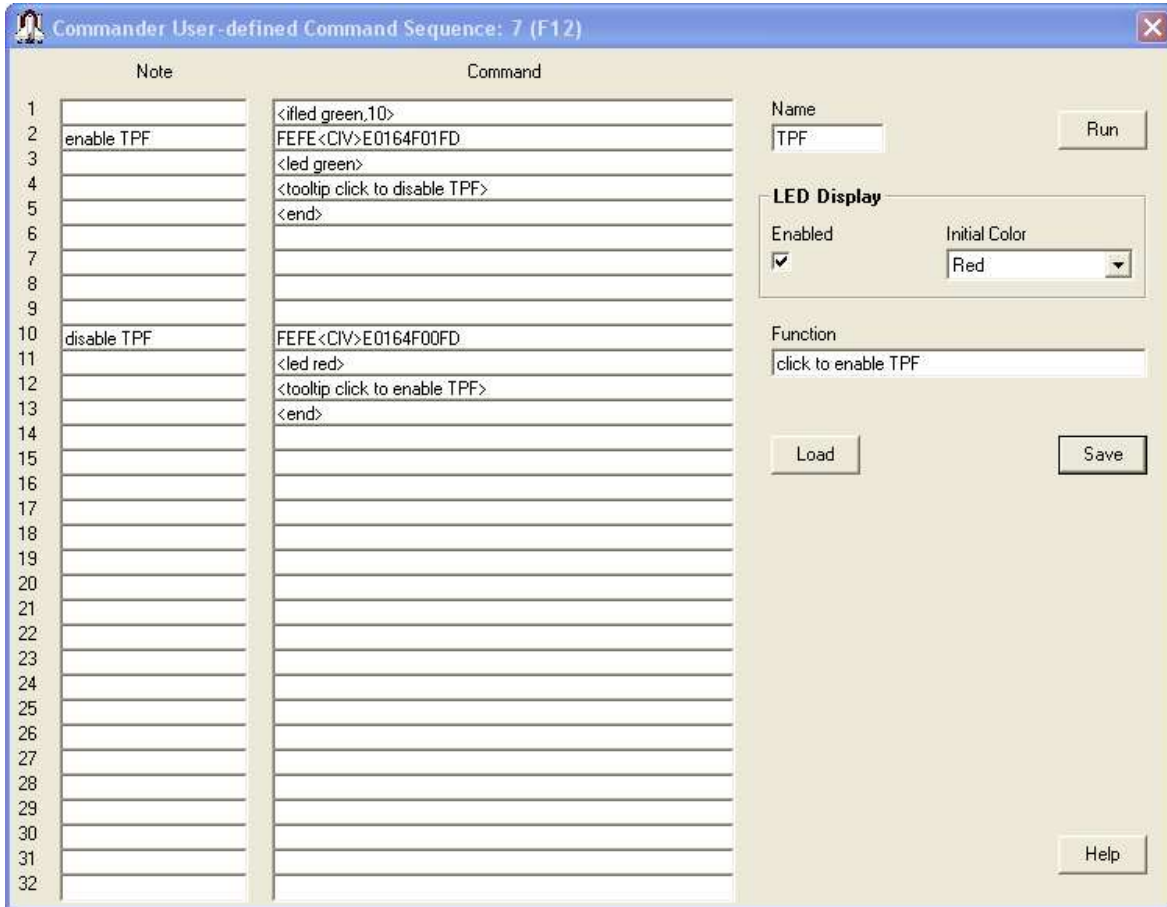
The **Save** and **Load** buttons enable you to save a Command Sequence to a specified file, and load a Command Sequence from a specified file.

If you are controlling multiple primary transceivers, you can define a user-defined control set that specifies the Command Sequences to be loaded when you switch among primary transceivers.

Substitution strings
Substitution strings let you insert the value of a command-generating slider, CI-V address, or ascii character into a specified position within a radio command.

The insertion of a slider's value into a template instruction is specified via a substitution string of the form **<SFN>**, where
- **S** is an optional* integer between 1 and 16 that specifies one of the 16 command-generating **S**liders
- **F** is a single letter indicating the **F**ormat of the inserted value
  - D means "decimal digits" with leading zeros
  - E means "decimal digits" without leading zeros
  - F means "decimal digits" without leading zeros, with the value divided by 1000 before being inserted into the command
  - R means "6 signed decimal digits in the scrambled format employed by Icom "set RIT" and "set delta-TX" commands; note: N must be set to 6.
  - S means "signed decimal digits"
  - H means "hexadecimal bytes"
  - B means "unsigned binary bytes"
- **N** is an optional digit indicating the **N**umber of decimal digits (including the sign in a signed decimal format) or hexadecimal bytes to insert; when not present, a single decimal digit or hexadecimal byte or binary byte is inserted. For unsigned binary bytes, N is limited to the values 1 or 2.

For example, the command *FEFE6EE01401<2D4>FD* will use the current value of slider 2 to set an Icom 756 Pro III's AF gain. The **S** is only optional when the substitution string appears in the Command of a command-generating slider's Configuration window; in this case, the slider's own value is used, as shown in the screenshot in the section below.

The substitution string <CIV> is replaced hexadecimal radio commands by the current transceiver's specified CI-V address. Thus, the command *FEFE<CIV>E01401<2D4>FD* will be executed by the transceiver whose CI-V address is specified in the **Radio** panel on the **Configuration** window's **General** tab.

When controlling a Flex Signature transceiver, the substitution string <FlexSigPanStream> is replaced by the hexadecimal ID of VFO A's panadapter. This ID is required by some of the commands used to control a Flex Signature transceiver.

The substitution string <n> (where n is an integer between 0 and 127) is replaced in ASCII radio commands by a single character whose ascii value is n; for example, <13> will be replaced by the "carriage return" character.

Command-generating Sliders
One can set the AF gain of a Kenwood TS-2000 by sending it the ASCII command *AG0NNN;* where *NNN* is a 3-digit decimal number between 0 and 255 that specifies the desired gain. One can set the AF gain of an Icom 756 Pro III by sending it the hexadecimal command FEFE6EE01402XXXXFD when XXXX is a 4-digit decimal number between 0 and 255. A Command-generating Slider lets you "fill in" the *NNN* or *XXXX* with an appropriate value determined by the handle position of a horizontal slider control in Commander's **User-defined Commands** panel. To control a TS-2000's AF gain with a slider control, one must at minimum configure the slider with
- a lower bound
- an upper bound
- a specification of where and how the slider's value will be inserted into the command

This information is captured by the slider's Configuration window, which can be made to appear by double-clicking the label beneath the slider control:

Lower bound	the slider's value when its handle is positioned to the extreme left
Upper bound	the slider's value when its handle is positioned to the extreme right
Small step	the amount by which the slider's value is decreased or increased when you click the arrow at its extreme left or extreme right, respectively
Big step	the amount by which the slider's value is decreased or increased when you click the in the space to the left or the right of its handle, respectively
Label	text that will appear immediately below the slider • the string <value> will be replaced by the slider's current numeric value • the string <value U> (where U is a number) will be replaced by the slider's current numeric value scaled into the range between 0 and U • the string <value L, U> (where L and U are numbers) will be replaced by the slider's current numeric value scaled into the range between L and U
Function	text that will appear in an explanatory popup window if the mouse cursor hovers above the label immediately below the slider • the string <value> will be replace by the slider's current numeric value
Command	a hexadecimal or ASCII radio command that includes a substitution string specifying where and how the slider's value is inserted to create a command that is sent to the transceiver • when Commander starts • when a new transceiver is selected (if Commander is configured to control multiple transceivers) • whenever the slider's value is changed
Initialize Radio	when checked, a slider command is sent to the radio on startup or after switching radios that sets the slider to its previous value

The <**D3**> substitution command does not specify a **S**lider number, so Slider 1's value is used (because this is Slider 1's configuration)

A slider's value is changed by
- dragging it's handle left or right,
- clicking its left-arrow or right-arrow
- clicking the space to the left or right of its handle
- executing a <slider> command in a Command Sequence
- a frequency-dependent device control configured to drive the slider
- receiving a directive from another application (e.g. WinWarbler).

In the example shown in the above screenshot of Commander User Slider 4's Configuration window, the ASCII command *AG0000;* will be generated when slider 4's handle is moved to the extreme left, the ASCII command *AG0255;* will be generated when slider 4's handle is moved to the extreme right, and the ASCII command *AG0128;* will be generated when slider 4's handle is centered.

Note that while the CI-V commands used to control Icom transceivers are expressed in hexadecimal, variable settings must often be expressed in decimal. For example, the template used to control an Icom 756 Pro III's AF gain with slider #2 is *FEFE6EE01401<2D4>FD* (with a lower bound of 0 and an upper bound of 255) *.* In contrast, using slider #5 to select a Yaesu FT-1000MP's mode would be accomplished with *000000<5H>0C* (with a lower bound of 0 and an upper bound of 11).

Only the signed decimal and hexadecimal formats should be used with sliders that can take on negative values. For example, the FlexRadio template *'ZZWB<1S4>* will generate commands like *ZZWB+028* or *ZZWB-014* .

Commander's 16 sliders are numbered **1** through **16** and organized into two banks of 8, which each bank containing two rows of 4 sliders. The same **ALT checkbox** that switches between banks of Command Sequences also switches between banks of sliders.

When clicked, the **Save** button saves the slider definition to a file you specify; the slider definition includes the slider's current value. The **Load** button loads the slider definition from a file you specify and sets the slider to the value saved in the file.

If you are controlling multiple primary transceivers, you can define a user-defined control set that specifies the Command-generating Sliders to be loaded when you switch among primary transceivers.

Changing Frequency

Using Commander, you can change your transceiver's frequency by
- activating controls on the Main window's VFO panel
- rotating your mouse's wheel
- striking keyboard shortcuts
- selecting a memory
- scanning memories in the current memory bank
- actions in the Bandspread window
- actions in the Spectrum-Waterfall window

If you have configured Commander to support automatic switching between multiple transceivers, then the above actions may trigger a switch from one transceiver to another when a new amateur band frequency is specified.

If you have configured one or more frequency-dependent device, the settings for these devices will be continuously updated as a function of frequency. The panels displaying these settings reside on the right side of Commander's Main window, along with the secondary VFO, Filter, and PTT panels. This part of the Main window is shared with the Memory Bank panel. If the Memory Bank panel is visible, click the **Filters & Devices** button and the device panels will appear. You can select one control of one frequency-dependent device whose integer value will be placed on pins 2-9 of a specified parallel port. This can be used to control an antenna switch, for example.

The **primary VFO** panel on Commander's Main window displays the frequency last reported by your radio, unless a transverter is active; if you have configured Commander to support one or more transverters on the 6m, 4m, 2m, 70cm, 33cm, or 23cm bands, your transceiver will automatically be set to drive the transverter to the frequency specified by Commander's VFO. The primary VFO panel's caption indicates whether the radio is displaying VFO A, VFO B, the Main VFO, or the Sub VFO. For most Elecraft, Kenwood, TenTec, and Yaesu radios, this VFO identification will always be accurate; for Icom and TenTec Omni radios, however, the VFO identification will only be correct if VFO selection is accomplished via the controls on Commander's Main window, rather than via controls on the radio's front panel. You can define up to eight sub-bands per band. You can specify the font colors to be used to display the primary VFO frequency when it lies within a defined sub-band, and when it does not lie within a defined sub-band; you can also specify the background color used to display frequencies in the primary VFO panel.

Commander also displays a **secondary VFO** panel whose caption indicates whether its contents are those of VFO A, VFO B, the Main VFO, or the Sub VFO; the panel's caption **and its contents** will only be valid for Icom and TenTec Omni radios if VFO selection and modification is accomplished via Commander, rather than via the radio's front panel. If the secondary VFO panel is not visible, click the **Filters & Devices** button as described above.

Changing frequency via the primary VFO panel
- Modifying the frequency display contents and striking the **Enter** key will radio's primary VFO to the specified frequency; modifying the frequency display contents and striking the **Esc** key will set the frequency display contents to the radio's current frequency.
- The ▲ and ▼ buttons to the left of the frequency display will shift your radio up or down one band. If the **Ham Bands** box is checked, these buttons sequence among the ham bands and among 1 MHz segments of ham bands wider than 1 Mhz; depressing the CTRL key while clicking these buttons will sequence among the ham bands independent of band width. If the **Ham Bands** box is not checked, these buttons shift up or down 1 MHz. If you click and hold these buttons, they will autorepeat at a rate governed by the VFO Autorepeat Rate slider. If a User-defined Sequence after Band Change is specified, that sequence will be executed after either of these buttons are clicked.

- The ▲ and ▼ buttons to the right of the frequency display will increase or decrease your radio's frequency as shown in the following table:

Control Keys	Change
	10 Hz.
Shift	100 Hz.
Ctrl	1 KHz.
Alt	10 KHz.
Ctrl + Alt	100 KHz.

If you click and hold these buttons, they will autorepeat at a rate governed by the VFO Autorepeat Rate slider.

- The horizontal scrollbar below the frequency display allows rapid frequency change within the current band or band segment; the ◄ and ► buttons at either end change frequency down or up as shown in the following table:

Control Keys	Change
	1 KHz.
Shift	5 KHz.
Ctrl	10 KHz.
Alt	50 KHz.
Ctrl + Alt	100 KHz.

If you click and hold these buttons, they will autorepeat at a rate governed by the VFO Autorepeat Rate slider.

- Depending upon your radio's capabilities, one or more of the following buttons and checkboxes may appear in the VFO panel:

Button	Keyboard	Function
A	SHIFT-F1	selects VFO A
B	SHIFT-F2	selects VFO B
A = B	SHIFT-F3	sets VFO B to VFO A's frequency
A X B	SHIFT-F4	simultaneously sets VFO A to VFO B's frequency and VFO B to VFO A's frequency (available if provide A/B and TF-SET buttons is not enabled)
Main	SHIFT-F1	selects the Main VFO
Sub	SHIFT-F2	selects the Sub-receiver VFO
M = S	SHIFT-F3	sets the Sub VFO to the Main receiver VFO's frequency
M X S	SHIFT-F4	simultaneously sets the Main VFO to the Sub-receiver VFO's frequency and the Sub-receiver VFO to the Main VFO's frequency
XFC	F1	momentarily exchanges the A and B (or Main and Sub-receiver) VFOs (available if provide A/B and TF-SET buttons is not enabled)
A / B	SHIFT-F4	swaps VFO roles (available if provide A/B and TF-SET buttons is enabled)
TF-S	F1	momentarily swaps VFO roles (available if provide A/B and TF-SET buttons is enabled, and radio is in split mode)
Split box		selects split frequency operation (if using an Icom or TenTec Omni VI transceiver, see the note below) • selects VFO B or Sub-receiver VFO on entry • selects VFO A or Main VFO on exit

Dual receive box		selects dual receive or dual watch operation • selects VFO B or Sub-receiver VFO on entry • selects VFO A or Main VFO on exit
Dual track box		when enabled, automatically updates the Sub-receiver VFO frequency to match the Main VFO frequency; this option is available if the Dual receive box is checked and the transceiver is • an Icom IC-7610, IC-7800, IC-7850, or IC-7851 • an Elecraft K3 with subreceiver installed • a Flex Signature transceiver • a Yaesu FT-1000D • a Yaesu FTDX-5000 • a Yaesu FTDX-9000 with the PEP firmware installed • a Yaesu FTDX-101 if Dual Track is enabled when a "Set frequency and mode" directive is received from another application, both VFOs will be set to the specified frequency; example: double-clicking a Spot Database Entry for a station that is operating simplex.

Sat Mode box		sets or clears Satellite Mode when controlling an Icom IC-910H or IC-9100
		• if Satellite Mode is cleared, Commander
		   o displays the VFO A and VFO B frequencies
		   o clears Split, and selects VFO A
		• if Satellite Mode is set, Commander
		   o displays the MAIN and SUB frequencies
		   o sets Split, and disables the Split box

Note: Some Icom transceiver models label their VFOs A and B; other Icom transceiver models label their VFOs Main and Sub. When the primary transceiver is a TenTec Omni VI or an Icom transceiver with A and B VFOs, Commander assumes that when Split is enabled, VFO A specifies the receive frequency and that VFO B specifies the transmit frequency. When the primary transceiver is an Icom transceiver with Main and Sub VFOs, Commander assumes that when Split is enabled, the Main VFO specifies the receive frequency and that the Sub VFO specifies the transmit frequency.

- When controlling a Flex Signature radio, two buttons appear beneath the Main window's **Mode** panel:
  - **Slice => VFO A** is enabled when a slice other than A or B is made active in SmartSDR.
    - clicking this button will save the state of VFO A (frequency, mode, pass-band, RX and TX antenna selection), and then copy the state of the active slice to VFO A
    - CTRL-clicking this button will copy the state of the active slice to VFO A without first saving the state of VFO A
  - **Restore VFO A** is enabled when the **Slice => VFO A** button is clicked without the CTRL key being depressed; clicking this button will restore the state of VFO A to the last saved values
- The *transceiver command buffer overflow* message indicates that one or more directives from Commander to your radio have been discarded. This occurs when large frequency changes are attempted by holding down auto-repeating keys or buttons, exceeding the radio's ability to keep up. Recovery in this situation is automatic -- simply click the *ok* button, wait for your radio to catch up, and continue.

Changing frequency via the secondary VFO panel
Modifying the frequency display contents and striking the **Enter** key will set radio's secondary VFO to the specified frequency. You can specify the font color and background color used to display frequencies in the secondary VFO panel.

Clicking the **1**, **2**, **5**, or **10** *quick split* button will select split frequency operation, and set the transmit frequency to the receive frequency plus 1 kHz, 2 kHz, 5 kHz, or 10 kHz respectively. Depressing the **CTRL** key while left-

clicking one of these buttons, or right-clicking one of these buttons will select split frequency operation, and set the transmit frequency to the receive frequency minus 1 kHz, 2 kHz, 5 kHz, or 10 kHz respectively. Depressing the **SHIFT** key while left-clicking one of these buttons will select split frequency operation, and increase the transmit frequency by 1 kHz, 2 kHz, 5 kHz, or 10 kHz respectively. Depressing the **SHIFT** and **CTRL** keys while left-clicking one of these buttons, or depressing the **SHIFT** key while right-clicking one of these buttons will select split frequency operation, and decrease the transmit frequency by 1 kHz, 2 kHz, 5 kHz, or 10 kHz respectively.

Changing frequency via mouse wheel
If you have a wheeled mouse, you can QSY your transceiver clicking in Commander's Main VFO panel and then rotating the mouse's wheel.

When you first rotate the wheel after clicking in Commander's Main VFO panel , a cyan-colored horizontal bar will appear over the right-most digit in the primary VFO panel's frequency display; this indicates the rotating the mouse wheel will adjust the transceiver frequency in units of 10 Hz. Clicking the mouse on any other digit position in the primary VFO panel's frequency will shift the cyan horizontal bar to that digit position, indicating that subsequent mouse wheel rotation will adjust the transceiver frequency in the units of that digit position.

Clicking in the secondary VFO panel will provide similar mouse wheel control of the secondary VFO's frequency -- except on the following transceivers, which do not provide the CAT control of their secondary VFO to necessary to implement this capability:
- all Icom models except the IC-7100, IC-7300, IC-7600, IC-7610, IC-7700, IC-7800, IC-7850, IC-7851
- the TenTec Omni V.9 and Omni VI
- the Yaesu FT-747, FT-757, FT-757GXII, FT-817, FT-857, FT-857D, FT-897, and FT-1000D,

If inadvertent mousewheel rotation is problematic, check the Ignore Mousewheel box and Commander will no longer QSY your transceiver when you rotate the mouse's wheel.
Note: if the minimum adjustment you can achieve by rotating the mouse wheel is larger than one unit, check to see if you are running the most recent driver for your wheeled mouse.

Changing frequency via the keyboard
- After clicking on the primary VFO's frequency display or the Bandspread window, you can increase or decrease your radio's frequency by striking the *PageUp* or *PageDown* keys respectively:

Control Keys	Change
	10 Hz.
Shift	100 Hz.
Ctrl	1 KHz.
Alt	10 KHz.
Ctrl + Alt	100 KHz.

- After clicking on the VFO panel's frequency display, you can select its contents by striking the *Insert* or **CTRL-A** key; any digits subsequently entered will replace the frequency display's contents; strike the *Enter* key to change your radio's frequency to that shown in the VFO.

Changing frequency via the Bandspread window
Clicking the Main window's **Bandspread button** displays Commander's **Bandspread window**, which provides a vertical slide rule dial showing range of frequencies around your radio's current frequency, and optionally a **Band** panel containing an array of buttons corresponding to the 160m through 2m amateur bands.

The **Range** panel determines the range of frequencies depicted on the slide rule dial. You can vary this range from 1 kHz to 500 kHz in seven steps; your radio's current frequency will always appear centered in the dial

unless one of the current band's edges is visible, in which case the current frequency indicator will move toward the band edge.

You can resize the Bandspread window both vertically and horizontally. The Band panel will appear when the Bandspread window is sufficiently wide. As you reduce the width of the Bandspread window, the number of options available in the Range panel will decrease.

The current frequency indicator in the slide rule dial can be configured to distinguish between in-band and out-of-band frequencies.

Clicking on the dial will QSY your radio's primary VFO to the associated frequency. Double-clicking the dial will QSY your radio to the associated frequency and then reduce the range by one step, unless the range is already 1 kHz. Depressing the **Alt** button while clicking on the dial will set your radio's secondary VFO to the associated frequency. Any click or double-click in the dial will terminate scanning. Allowing the mouse cursor to hover over the dial will produce a small popup showing the associated frequency to which your radio would be QSY'd if you were to click or double-click.

You can also QSY via the *PageUp* and *PageDown* keys.

Commander remembers the last 5 frequencies you visited on each band, and the mode in use for each such visit; this information is stored in a **Band Stack** associated with each band. If you QSY the radio, and then let it remain on a frequency for longer than the dwell time setting, the new frequency and mode will be saved on the appropriate Band Stack. The Bandspread window's **Band** panel contains a button for each band between 160m and 33cm. Clicking a band button sets the radio's frequency to the most recent frequency used on that band, sets its mode to the mode in use at that time, and clears Split; the Band Stack is then advanced, so that clicking the same band button a second time sets the frequency/mode to the next-most-recent frequency/mode used on that band. Using this mechanism, you can QSY to the most recent 5 frequencies. The Band panels in the Bandspread and Spectrum-Waterfall windows share the same Band Stack for each band.

Executing the Band command in a User-defined Sequence is equivalent to clicking the Bandspread window's Band button for the band it specifies. If a User-defined Sequence after Band Change is specified, that sequence will be executed after any button in the **Band** panel is clicked.

The memory used to provide the slide rule dial and Band Stack are freed when the Bandspread window is closed. The rectangular indicator in the Bandspread window's lower-left corner changes color to indicate the maximum degree of need for any active DX station received by SpotCollector but not visible in the Bandspread window.

- allowing the mouse cursor to hover over this indicators displays a small popup window showing the most recent and needed, unseen, active DX station's callsign, frequency, mode, and time of arrival
- clicking in this indicator resets its color to that corresponding with unneeded
- double-clicking in this indicator sets the transceiver's frequency and mode to that of the most recent and needed, unseen, active DX station, and terminates scanning.

Clicking the **SpotCollector** button on the Bandspread window displays SpotCollector's Main window, if SpotCollector is running.

Changing frequency via the Spectrum-Waterfall window

If Commander is controlling an Icom IC-7300, IC-7610, IC-7850, and IC-7851 using a direct USB connection with the Primary CAT Port configured for 115,200 baud, checking the Spectrum-Waterfall window box on Configuration window's Bandspread tab will display Commander's Spectrum-Waterfall window. Depressing the CTRL key while clicking the Main window's **Bandspread** button will enable and display the Spectrum-Waterfall window.

The Spectrum-Waterfall window provides a **Control Section** positioned above four information-bearing sections:

- the **Spectrum Section** displays realtime spectrum data
- the **DX Callsign Section** displays active DX station callsigns
- the **Frequency Axis Section** displays the range of frequencies being displayed in the Spectrum-Waterfall window
- the **Waterfall Section** displays a history of the spectrum section's realtime spectrum data
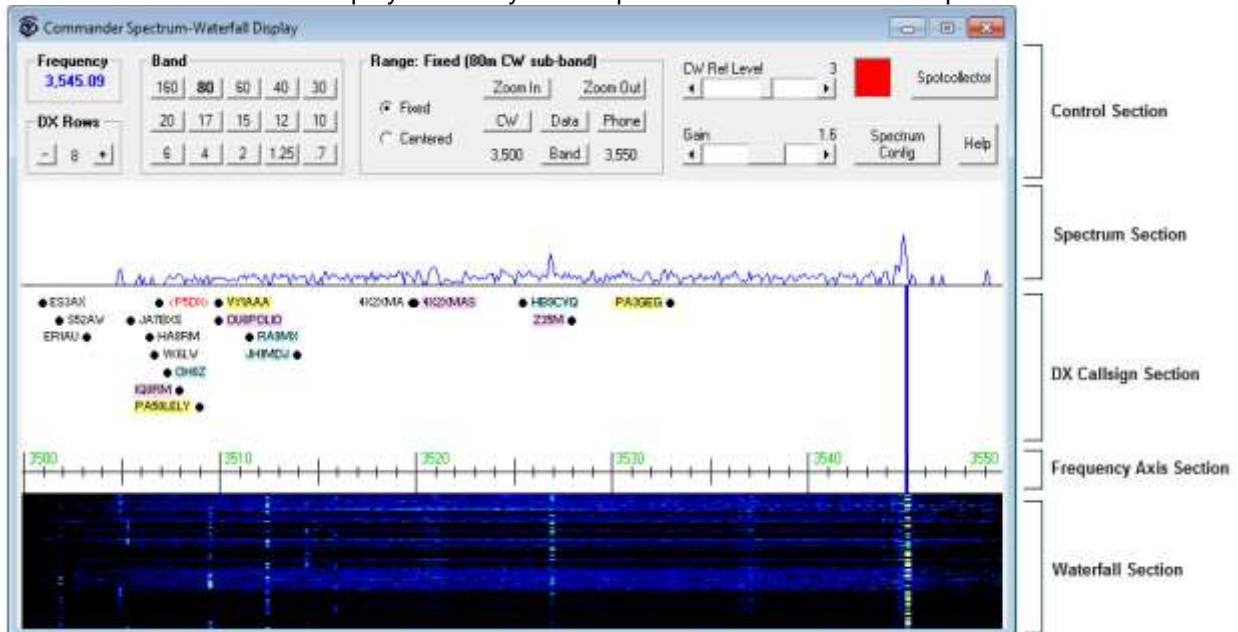
In the **Control Section**,

- the **Frequency** panel shows the transceiver's current frequency; if operating split, the current receive frequency is shown.
- the **DX Rows** panel controls the number of rows of DX Callsigns displayed in the DX Callsign Section
- the **Band** panel contains a button for each band between 160m and 70cm. Commander remembers the last 5 frequencies you visited on each band, and the mode in use for each such visit; this information is stored in a Band Stack associated with each band. If you QSY the radio, and then let it remain on a frequency for longer than the dwell time setting, the new frequency and mode will be saved on the appropriate Band Stack. Clicking a **Band** panel button sets the radio's frequency to the most recent frequency used on that band, sets its mode to the mode in use at that time, and clears Split; the Band Stack is then advanced, so that clicking the same **Band** panel button a second time sets the frequency/mode to the next-most-recent frequency/mode used on that band. Using this mechanism, you can QSY to the most recent 5 frequencies. The **Band** panels in the Bandspread and Spectrum-Waterfall windows share the same Band Stack for each band.

- The **Range** panel can switch the transceiver between **Fixed** and **Centered** spectrum tracking modes
  - When the range is **Fixed**, the Range panel
    - provides buttons that make the Spectrum-Waterfall window display the entire Band, or a particular sub-band:

Band	sets the range to the entire current band
CW	sets the range to the current band's CW sub-band
Data	sets the range to the current band's Data sub-band
Phone	sets the range to the current band's Phone sub-band

    - provides a **Zoom In** button that when clicked cuts the range in half and centers it on the transceiver's receive frequency
    - provides a **Zoom Out** button that when clicked doubles the range and centers it on the transceiver's receive frequency
    - displays the range's lower frequency to the left of the Band button, and the range's upper frequency to the right of the Band button, and updates these frequencies if they are changed from the transceiver's front panel
  - When the range is **Centered**, the Range panel provides buttons that set the range to widths from 5 kHz to 1000 kHz, and updates this selection when the range width is changed from the transceiver's front panel
  - The **Scroll** box, if present, enables selection of the radio's **SCROLL-C** (centered with automatic scrolling) and **SCROLL-F** (fixed with automatic scrolling) spectrum tracking modes; if the radio supports the **SCROLL-C** and **SCROLL-F** tracking modes, check the Use radio's scroll options box on the Spectrum-Waterfall Configuration window.
  - If you change the range using the transceiver's front panel, the Spectrum-Waterfall window's **Range** panel will be updated to reflect that change
- The **Ref Level** slider controls the *sensitivity* of the transceiver's spectrum display for the current sub-band or band. Changes update the **Re**f settings in the Spectrum-Waterfall Configuration window's Band Settings panel, and thus are preserved between operating sessions.
- The **Gain** slider specifies a value between 1 and 2 for the current band that expands the magnitude of signals displayed in the Spectrum Section. Changes update the **Gain** settings in the Spectrum-Waterfall Configuration window's Band Settings panel, and thus are preserved between operating sessions.
- The rectangular indicator to the left of the SpotCollector button changes color to indicate the maximum degree of need for any active DX station received by SpotCollector but not visible in the Spectrum-Waterfall window's DX Callsign Section
  - allowing the mouse cursor to hover over this indicators displays a small popup window showing the most recent and needed, unseen, active DX station's callsign, frequency, mode, and time of arrival
  - clicking in this indicator resets its color to that corresponding with unneeded
  - double-clicking in this indicator sets the transceiver's frequency and mode to that of the most recent and needed, unseen, active DX station, and terminates scanning.
- Clicking the **SpotCollector** button on the Spectrum Waterfall window displays SpotCollector's Main window, if SpotCollector is running.
- Clicking the **Spectrum Config** button displays the Spectrum-Waterfall Configuration window
- Click the **Help** button displays this section of Commander's documentation

In the **Spectrum Section**, Commander displays spectrum data from the radio for the current range. You can adjust the reference level and gain via sliders in the Control Section. If not split, clicking in this section will set the transceiver frequency to the designated frequency; ALT-clicking will enable split and set the transceiver's transmit frequency to the designated frequency. If split, clicking in this section will set the transceiver's receive frequency to the designated frequency; ALT-clicking will set the transceiver's transmit frequency to the designated frequency See the table below for additional QSY options using the Shift and CTRL keys. You can adjust the color used to display the spectrum data and the background color via the Spectrum-Waterfall Configuration window's Colors panel.

In the **DX Callsign Section**, Commander displays active DX stations received from SpotCollector, if running. Between 4 and 32 rows of callsigns can be displayed, as specified in the DX Rows panel; the appearance of a **+** symbol in this section means that more DX stations could be displayed if the number of rows were increased. Increasing or decreasing the number of rows will increase or decrease the vertical height of the Spectrum-Waterfall window so that the heights of all other sections are unchanged. Settings governing the acquisition, display, management, and handling of active DX stations are shared with the Bandspread window, and provided on the DX Spots panel on the Configuration window's **Bandspread** tab. Commander's behavior when you click on or hover above a callsign displayed in the DX Callsign Section is described below. If not split and the mouse cursor not above a callsign, clicking in the DX Callsign Section will set the transceiver frequency to the designated frequency; ALT-clicking will enable split and set the transceiver's transmit frequency to the designated frequency. If split and the mouse cursor not above a callsign, clicking in this section will set the transceiver's receive frequency to the designated frequency; ALT-clicking will set the transceiver's transmit frequency to the designated frequency. See the table below for additional QSY options using the Shift and CTRL keys. Allowing the mouse cursor to hover for a few seconds over a location without a callsign will display an explanatory popup with the frequency associated with the location.

In the **Frequency Axis Section**, Commander displays a horizontal slide rule with frequencies rendered in the specified font color. If not split, clicking in this section will set the transceiver frequency to the designated frequency; ALT-clicking will enable split and set the transceiver's transmit frequency to the designated frequency. If split, clicking in this section will set the transceiver's receive frequency to the designated frequency; ALT-clicking will set the transceiver's transmit frequency to the designated frequency. See the table below for additional QSY options using the Shift and CTRL keys. Allowing the mouse cursor to hover for a few seconds over a location in this section will display an explanatory popup with the frequency associated with the location.

In the **Waterfall Section**, Commander displays a historical record of the spectrum data, with the most recent signals at top, and the oldest signals at the bottom. You can increase or decrease the height of the Waterfall section by increasing or decreasing the height of the Spectrum-Waterfall window; doing so will leave the heights of all other sections unchanged. If not split, clicking in this section will set the transceiver frequency to the designated frequency; ALT-clicking will enable split and set the transceiver's transmit frequency to the designated frequency. If split, clicking in this section will set the transceiver's receive frequency to the designated frequency; ALT-clicking will set the transceiver's transmit frequency to the designated frequency. See the table below for additional QSY options using the Shift and CTRL keys. Allowing the mouse cursor to hover for a few seconds over a location in this section will display an explanatory popup with the frequency associated with the location. You can select the range of colors used to indicate Waterfall signal strength via the Spectrum-Waterfall Configuration window's Colors panel.

Gesture	Action in Spectrum, Frequency Axis, or Waterfall section	Action in DX Callsign section
Left click	• set current VFO to designated frequency	• set VFO A or Main VFO to selected callsign's frequency • if selected callsign is operating split, enable split and set VFO B or Sub VFO to selected callsign's QSX frequency
Shift-Left click	• set current VFO to nearest 100 Hz	• set VFO A or Main VFO to selected callsign's frequency • if selected callsign is operating split, enable split and set VFO B or Sub VFO to selected callsign's QSX frequency

Control-Left click	• set current VFO to nearest 500 Hz	• set VFO A or Main VFO to selected callsign's frequency • if selected callsign is operating split, enable split and set VFO B or Sub VFO to selected callsign's QSX frequency • if DXKeeper and DXView are running, rotate antenna to selected callsign's short-path header
Shift-Control-Left click	• set current VFO to nearest 1 KHz	• set VFO A or Main VFO to selected callsign's frequency • if selected callsign is operating split, enable split and set VFO B or Sub VFO to selected callsign's QSX frequency • if DXKeeper and DXView are running, rotate antenna to selected callsign's short-path header
Alt-Left click	• enable split and set transmit frequency to designated frequency	• set VFO A or Main VFO to selected callsign's frequency • if selected callsign is operating split, enable split and set VFO B or Sub VFO to selected callsign's QSX frequency • if DXKeeper and DXView are running, rotate antenna to selected callsign's long-path header
Right click	• set other VFO to designated frequency	• set VFO A or Main VFO to selected callsign's frequency • if selected callsign is operating split, enable split and set VFO B or Sub VFO to selected callsign's QSX frequency

When the transceiver is not operating split, Commander displays a single vertical frequency marker in the **DX Callsign** and **Frequency Axis** sections, its color is set to that specified for the Receive Freq Marker. When operating split, two vertical frequency markers are displayed in the **DX Callsign** and **Frequency Axis** sections, one designating the transceiver's receive frequency and the other designating the transceiver's transmit frequency. The colors of these frequency markers are specified on the Spectrum-Waterfall Configuration window's Colors panel.

Scrolling a wheeled mouse while the Spectrum-Waterfall window is active will QSY the transceiver as a function of the transceiver's current mode and the mousewheel motion settings.

When the range is Fixed and you change bands - by using the transceiver's front panel, by double-clicking on the entry for an active DX station in SpotCollector, by clicking a Band button in the Bandspread or Spectrum-Waterfall window, or by selecting one of Commander's memories,
- if the Mode AutoTrack option is enabled, Commander will set the range to the sub-band associated with the transceiver's mode
- if the Mode AutoTrack option is disabled but the Frequency AutoTrack option is enabled, Commander will set the range to the lowest-frequency sub-band that contains the transceiver's frequency (receive frequency, if split); if the transceiver's frequency is not within any of the new band's sub-bands, then Commander will set the range to the entire band.
- if neither the Mode AutoTrack nor the Frequency AutoTrack option is enabled, Commander will set the range to the sub-band most recently used on that band

When the range is Fixed, the Mode AutoTrack option is enabled, and you change the transceiver's mode, Commander will set the range to the sub-band associated with the transceiver's mode.

When the range is Fixed, the Frequency AutoTrack option is enabled, and you QSY out of the current range but still within the current band, Commander will automatically slide the range up or down so that the transceiver's frequency (receive frequency if split) will be visible in the new range.

Viewing and Selecting DX Spots
If SpotCollector (version 2.7.4 or later) is running and Commander's Bandspread window or Spectrum-Waterfall window is open, then SpotCollector will automatically send to Commander spots of active DX stations operating on the transceiver's current band that meet SpotCollector's current filter criteria (with the exception that wildcard characters in the Call and DXCC filters are not handled). Commander displays each active DX station on the Bandspread window's slide rule dial and in the Spectrum-Waterfall window unless the active DX station's age exceeds the specified lifetime.

The size of the font used to display active DX stations in the Bandspread window can be specified as a function of its slide rule dial range, making it possible to use larger font sizes with smaller ranges. The size of the font used to display active DX stations in the Spectrum-Waterfall window can be independently specified as a function of its range.

Active DX station callsigns are color-coded based on settings in the **Font Colors** panel on the **Spot Database Display** tab of SpotCollector's Configuration window; callsigns known to participate in the ARRL's Logbook of the World (LotW) and/or hold Authenticity Guaranteed membership in eQSL.cc are highlighted as specified in the **Background Colors** tab on the **Spot Database Display** tab of SpotCollector's Configuration window.

In the Bandspread window active DX station callsigns that are close together in frequency are separated horizontally to form a list of up to 8 spots. For busy frequencies and a long lifetime, it may be necessary to expand the Bandspread window horizontally to see all of the spots; alternatively, zooming in to a smaller dial range may separate the spots, or a smaller spot font size can be specified. The appearance of a + at the right of a callsign means that additional callsigns have been spotted on or near the frequency.

In the Spectrum-Waterfall window, active DX station callsigns that are close together in frequency are separated vertically in up to 32 rows. For busy frequencies and a long lifetime, it may be necessary to expand the Spectrum-Waterfall window horizontally to see all of the spots; alternatively, zooming in to a smaller dial range may separate the spots, or a smaller spot font size can be specified. The appearance of a **+** below a callsign means that additional callsigns have been spotted on or near the frequency; you can increase or decrease the number of rows displayed via the DX Rows panel on Spectrum-Waterfall window.
- allowing the mouse cursor to hover over an active DX station callsign displays a small popup window showing the spot's callsign, transmit frequency, QSX (listening) frequency if operating split, mode, UTC time last spotted, LotW participation, areas from which the station was spotted, and spot notes
- clicking on an active DX station callsign in the Bandspread or Spectrum-Waterfall window will
  - if WinWarbler is not running, or if WinWarbler is running but the station's mode is CW, SSB, AM, or FM and Commander has been configured to not route spots in this mode to WinWarbler
    - if the station is operating simplex
      - set the radio to the spot's frequency and the appropriate mode (as specified by the CW mode and RTTY mode panels)
      - configure the radio for simplex operations (disable split and dual mode, if available)
    - if the station is operating split and the set Xcvr split option is enabled
      - set the radio's VFOs to the appropriate transmit and receive frequencies
      - set the radio to the appropriate mode (as specified by the CW mode and RTTY mode panels)
      - configure the radio for split operations (enable split and dual mode, if available)
  - if WinWarbler is running
    - if the station is operating PSK31, PSK63, or RTTY, direct WinWarbler to the specified mode and optimal frequency;
    - if the station is operating CW, SSB, AM, or FM and Commander has been configured to route spots in this mode to WinWarbler, direct WinWarbler to the specified mode and frequency

- if the station is operating split, the set Xcvr split option determines whether QSX frequency is conveyed to WinWarbler; if not, WinWarbler will not direct Commander to configure the radio for split frequency operations
  - o direct DXKeeper (if running) to
    - initialize its Capture window with the DX spot's callsign, frequency, mode, and gridsquare (if available)
    - filter its Log Page Display to show all previous QSOs with the DX spot's callsign or DXCC entity, as specified by the Log Filter setting
  - o if both DXView and DXKeeper are running
    - direct DXView to perform a lookup of the DX spot callsign
    - if the CTRL key was depressed while clicking on the DX spot, rotate the antenna to the short path bearing to the spotted station
    - if the ALT key was depressed while clicking on the DX spot, rotate the antenna to the long path bearing to the spotted station
- double-clicking an active DX station callsign in the Bandspread window performs all of the operations described above under single-clicking, and then reduces the slide rule dial range by one step, unless the range is already 1 kHz.

When the radio QSYs from one band to another with the Bandspread and/or Spectrum-Waterfall windows open, Commander clears the active DX station callsigns from the Bandspread window and Spectrum-Waterfall window, and SpotCollector sends Commander each Spot Database entry on the new band that meet its current filter criteria (subject to the above-mentioned wildcard character limitation). Thus Commander always displays that subset of SpotCollector's filtered Spot Database entries that are operating in the range of frequencies shown on the Bandspread window and on the Spectrum-Waterfall window

Commander displays a rectangular indicator in the lower-left corner of the Bandspread window, and in the upper-right corner of the Spectrum-Waterfall window. The color of the rectangle in the Bandspread window indicates the maximum degree of need for any active DX station received by SpotCollector but not visible on the Bandspread window's slide rule dial. Similarly, the color of the rectangle in the Spectrum-Waterfall window indicates the maximum degree of need for any active DX stations received by SpotCollector but not visible on the Waterfall-Spectrum window.
- allowing the mouse cursor to hover over one of these rectangular indicators displays a small popup window showing the most recent and needed unseen active DX station's callsign, frequency, mode, and time of arrival
- clicking a rectangular indicator resets its color to that corresponding with unneeded
- double-clicking a rectangular indicator sets the radio's frequency and mode to that of the most recent and needed unseen active DX station, and terminates scanning.

Clicking the **SpotCollector** button on the Bandspread window or on the Spectrum Waterfall window activates SpotCollector's Main window, if SpotCollector is running.

The memory used to maintain and display active DX spots is freed when the Bandspread window and Spectrum-Waterfall windows are both closed.

Changing Mode and Filter Setting

Buttons representing the modes supporting by your radio appear in the Main window's **Mode** panel, and identify the radio's current mode. To change your radio's mode, click the appropriate button in the Mode panel. You can also change your radio's mode by selecting a memory.

If your radio supports Filter Groups and the restore Filter Group on mode change box is checked, the caption on each mode button will indicate the last Filter Group used in that mode. In this case, clicking a mode button both directs your radio to change mode, and establishes receiver bandwidth settings specified by that Filter Group.

LSB	selects lower sideband modulation
USB	selects upper sideband modulation
CW	selects continuous wave
CW-R	selects continuous wave, reversed
RTTY	selects radioteletype
RTTY-R	selects radioteletype, reversed
FM	selects frequency modulation
WBFM	select wide-band frequency modulation
AM	selects amplitude frequency modulation
PKT	selects packet
PKT-R	selects packet, reversed
Data-L	selects data mode, lower sideband
Data-U	selects data mode, upper sideband

When an Elecraft K3 transceiver's mode is changed to RTTY or RTTY-R, its **data mode** is set to **FSK D** or **AFSK A** as specified in the RTTY sub-mode panel.

When an Icom IC-7600, IC-7700, or IC-7800 transceiver's mode is changed to Data-L or Data-U, its **data sub-mode** is set to D1, D2, or D3 as specified in the Data sub-mode panel.

If you are using **PKT** or **PKT-R** to log digital-mode QSOs in DXKeeper without running a digital mode application like WinWarbler or MultiPSK, use the Log Mode for PKT or PKT-R setting to specify the digital mode to be logged.

If you are using **Data-L** or **Data-U** to log digital-mode QSOs in DXKeeper without running a digital mode application like WinWarbler or MultiPSK, use the Log Mode for Data-L or Data-U setting to specify the digital mode to be logged.

Changing Receiver Bandwidth

Radios differ in the degree to which they permit receiver bandwidth to be controlled from PC software. If Commander provides bandwidth controls for the current the radio Model, they are presented in the **Filters** panel on the right side of the Main window, sharing space with the Memory Bank panel; if the Filters panel is not visible, click the **Filters & Devices** button. Commander uses the concept of a **Filter Group** to bridge these disparate capabilities: a Filter Group is a named configuration of one or more receiver bandwidth settings. If Filter Groups are supported for a particular radio Model, Commander remembers the Filter Group last used in each mode. Checking the restore Filter Group on mode change box directs Commander to automatically restore the last used Filter Group whenever a new mode is selected.

Elecraft Transceivers
For the Elecraft K3 and KX3, Commander's Main window's **Filters** panel provides **Width** and **Shift** controls. Clicking the **X** button to the right of the **Width** slider selects the default filter widths for each mode. Clicking the **X** button to the right of the **Shift** slider centers the current filter; you can set the **Shift** control's resolution to **10** Hz or **5**0 Hz. The Main window's **Filters** panel also provides **Group** selector that lets you quickly choose pre-set **Wide**, **Normal**, or **Narrow** width and shift settings that you've defined for the SSB, CW, Data-L, Data-U, RTTY, and AM modes on the Configuration window's **Filter Groups** tab. Enabling the **restore Filter Group on mode change** setting on this tab causes Commander to remember the last Filter Group used in each mode, parenthetically display each mode's last Filter Group in the Main window's **Mode** panel, and automatically select a mode's last Filter Group when the mode becomes active.

Flex Signature (6000) Transceivers
When controlling a Flex Signature transceiver, Commander's Main window's **Filters** panel provides **Width** , **High-cut**, and **Low-cut** controls. The Main window's **Filters** panel also provides **Group** selector that lets you quickly choose pre-set **Wide**, **Normal**, or **Narrow** width and shift settings that you've defined for the SSB, CW, DIGL, DIGU, RTTY, and AM modes on the Configuration window's **Filter Groups** tab. Enabling the **show each mode's Filter Group** setting on this tab causes Commander to parenthetically display each mode's last Filter Group in the Main window's **Mode** panel.

Icom Transceivers
Early Icom transceivers provide two Filter Groups, whose functions are hardwired: group 1 provides a **wide** bandwidth filter, and group 2 provides a **narrow** bandwidth filter. Later Icom transceivers allow the user to reconfigure one or both filter groups to a different bandwidth (by physical replacement, or in high-end transceivers via menu selection), and some include a third group ambiguously referred to as **normal**. The Icom Filter Group Names panel lets you assign names to each group that are meaningful for the actual filter configuration of your transceiver. With the radio Model set to an Icom transceiver, the Main window's **Filters** panel presents a **Group** selector with the choices whose names you've specified. You can activate a Filter Group by selecting its name in the **Group** selector on the Main window's Filter panel. When you change filters via the radio's front panel, the **Group** selector is updated to reflect your choice. Enabling the **restore Filter Group on mode change** setting on this tab causes Commander to remember the last Filter Group used in each mode, parenthetically display each mode's last Filter Group in the Main window's **Mode** panel, and automatically select a mode's last Filter Group when the mode becomes active.

For the Icom IC-756ProIII, IC-7000, IC-7200, IC-7300, IC-7600, IC-7700, IC-7800, IC7850, and IC-7851, the **Filters** panel also provides **Width**, **PBT1**, and **PBT2** controls; **PBT1** corresponds to the transceiver's "inner" PBT knob, and **PBT2** corresponds to its "outer" PBT knob. Clicking the **X** button to the right of the **Width** slider selects the default filter width for the current mode. Clicking the **X** button to the right of either **PBT** control centers that control, eliminating any shift.

Kenwood Transceivers

The **Filters** panel on Commander's Main window provides mode-specific receiver bandwidth controls for the TS-480, TS-570D, TS-570S, TS-870, and TS-2000 as shown in the following table:

Transceiver	SSB	CW, CW-R	RTTY, RTTY-R	AM	FM
TS-480	High-cut, Low-cut	Shift, Width	Width		High-cut, Low-cut
TS-570S, TS-570D	High-cut, Low-cut	Shift, Width	Shift, Width	High-cut, Low-cut	High-cut, Low-cut
TS-870	High-cut, Low-cut	Shift, Width	Width		Width
TS-2000	High-cut, Low-cut	Shift, Width	Width		High-cut, Low-cut

TenTec Transceivers

For the TenTec Orion and Orion II, the Main window's **Filters** panel provides **Width** and **Shift** controls.

Clicking the **X** button to the right of the **Width** slider selects the default filter width for the current mode. You can specify the default filter width on the **Config** window's **Filter Groups tab.** You can optionally configure Commander to select the default filter width whenever the transceiver changes mode.
Clicking the **X** button to the right of the **Shift** control centers that control, eliminating any shift.

Yaesu Transceivers

Commander's Main window's **Filters** panel provides comprehensive bandwidth control for the Yaesu 1000MP family, including the MarkV and MarKV Field. The **Filters** panel provides controls that allow direct selection of 2nd IF, 3rd IF, and sub-receiver filters. With the radio Model set to `MP1000` or `MP1000MKV`, the Config window's Filter Groups tab lets you define 12 Filter Groups, specifying a name, mode, 2nd IF filter, 3rd IF filter, and sub-receive filter for each; you can revise or delete these definitions, and provide new ones. You can activate a Filter Group by selecting its name in the **Group** selector on the Main window's Filter panel. When you change filters via the radio's front panel, Commander determines whether the new filter configuration matches a defined Filter Group; if so, the Group selector is updated to show the name of the matching Filter Group. Enabling the **restore Filter Group on mode change** setting on this tab causes Commander to remember the last Filter Group used in each mode, parenthetically display each mode's last Filter Group in the Main window's **Mode** panel, and automatically select a mode's last Filter Group when the mode becomes active.

For the Yaesu FT-450, FT950, FT-2000, and FT-9000, the Main window's **Filters** panel provides **Width** and **Shift** controls. Clicking the **X** button to the right of the **Width** slider selects the default filter width for the current mode. Clicking the **X** button to the right of the **Shift** control centers that control, eliminating any shift.

Using Memories

Commander provides 100 memories, organized into ten banks of 10. Memories in the currently-selected memory bank appear in a panel that shares the right side of Commander's Main window with readouts for frequency-dependent devices and receiver filter controls. This panel also contains a button for each memory bank that, when clicked, selects that memory bank and displays its memories. If the currently-selected memory bank is not visible, click the Main window's **Mem** button to make it appear in place of the device and bandwidth controls.

Within a memory bank, each memory stores a frequency, mode, and filter setting.

- Clicking on a memory's **Save** button saves your radio's current frequency, mode, and filter setting in that memory, as well as the state of Commander's Split, Ham bands only, and Dual receive checkboxes (if those functions are supported by your radio); to protect memories from inadvertent modification, the Save buttons can be disabled.
- You can edit any memory's frequency, mode, and filter setting using standard Window's gestures and keystrokes.
- After clicking on a memory's frequency display, you can select its contents by striking the **Insert** key; any digits subsequently entered will replace the frequency display's contents.
- Clicking on a memory's **Sel** button will set your transceiver to that memory's frequency, mode, and filter setting if the frequency and mode are valid, and will set Commander's Split, Ham bands only, and Dual receive checkboxes to the values stored in that memory (if those functions are supported by your transceiver). Commander disables the **Sel** buttons associated with memories that do not contain a valid frequency and mode.
  A specified Command Sequence can be executed when you activate a memory by clicking its **Sel** button.
- You can specify the font color and background color used to display frequencies.

By editing textboxes in the Memory Banks panel on the Configuration window's Memories tab, you can establish a title for each memory bank ; the title for the currently-selected memory bank serves as the caption of the Main window panel that displays the currently-selected memory bank. To quickly edit a memory bank's title, depress the **Ctrl** key while clicking that memory bank's button.

To help keep track of each memory's purpose, you can record notes that pop up whenever the mouse cursor hovers over the memory's **Sel** button. To record such notes, depress the **Ctrl** key while clicking the **Sel** button; Commander will display a Memory Notes Editor window that allows you to capture notes:

- notes may not contain the angle bracket characters **<** or **>** .
- clicking the Notes Editor's **Insert Timestamp** button appends a the current UTC date and time to the notes

You can direct Commander to display each memory's notes in place of its frequency, mode, and filter -- simply click the command button captioned **~** in the upper right corner of the memory bank panel. To return to a display of memory frequency, mode, and filter, click the **~** button again.

To clear a memory's frequency, mode, filter setting, and notes, depress the **Ctrl** key while clicking the **Save** button.

To continuously scan valid memories in the current bank, check the **Scan** box on the Main window. With memory scanning enabled, Commander will sequentially activate each of the current bank's memories that contain a valid frequency and mode, skipping memories not containing a valid frequency or mode. The time between activations is defined by the Scan Dwell setting. If none of the current bank's memories are valid, Commander will uncheck the **Scan** box and stop scanning. While scanning, the following actions will uncheck the **Scan** box and stop scanning:

- clicking in the Bandspread window's frequency dial
- double-clicking the Bandspread window's SpotCollector Alert indicator
- receipt of a QSY directive from another application

To save the information associated with all memories that contain at least a frequency and mode, click the Export Memories button on the Configuration window's Memories tab. Commander will prompt you for a filename, and then store the data in a format described below.

To load memories with information from a file, click the Import Memories button on the Configuration window's Memories tab. Commander will prompt you for a filename, and then interpret each line of the file as specifying the contents of one memory via the following tags:

Tag	Description
<Memory *n*>	*n* is an integer between 1 and 100, inclusive
<Frequency *f*>	*f* is a valid frequency, in kHz
<Mode *mode-name*>	*mode-name* specifies a valid mode, e.g. USB or CW
<Filter *fg-name*>	*fg-name* specifies a valid filter group name, e.g. narrow or sharp
<Split on>	enables split
<Split off>	disables split (default)
<Hambands on>	enables "ham band only"
<Hambands off>	disables "ham band only" (default)
<Dual on>	enables "dual receive"
<Dual off>	disables "dual receive" (default)
<Notes *note-text*>	*note-text* contains any valid ascii characters except the angle brackets < or >

- To be valid, a memory specification line must contain a valid <Memory *n*> tag, a valid <Frequency *f*> tag, and a valid <Mode *mode-name*> tag.
- The absence of a <Split on> tag is interpreted to mean "disable split"; the equivalent is true for the <Hambands on>, and <Dual on> tags.
- The order of memories within the file is irrelevant, as is the order of tags within a line.

Here are some sample memory specification lines:

        <Memory 1> <Freq 3,013> <Mode CW> <Filter Narrow> <Split On> <Notes 5R8FU stakeout>
        <Memory 11> <Freq 14,260> <Mode USB> <Filter Narrow> <Notes 20m IOTA>
        <Memory 12> <Freq 21,260> <Mode USB> <Notes 15m IOTA>

Errors encountered while importing memory specifications are recorded in an error file that is displayed when the import operation completes. The name of the error file is composed by appending _errors to the name of the file being imported.

Controlling Multiple Radios

Primary CAT Port Switching

Commander can be configured to rapidly switch its Primary CAT Port among up to four simultaneously-connected radios, either by clicking selection buttons that appear in the Main window's VFO panel, or automatically based on frequency. The Configuration window's Multi Radio tab lets you specify control and serial port settings for each radio, and assign each radio a unique name. If a FlexRadio Signature, Kachina, or TenTec Pegasus radio is chosen, a Select button appears that when clicked lets you specify a Radio Selection, Control File or Control Folder respectively. Each enabled radio's name appears on a selection button on the Main window's VFO panel; a radio can only be enabled on the Configuration window's Multi Radio tab if its Model has been specified.

Clicking a radio's Update button in the Multi Radio tab's **CAT Serial port** panel will update that radio's Multi Radio serial port settings from the settings specified on the Ports tab's Primary CAT Serial Port panel. Thus once you have the settings on the Primary CAT Serial Port panel properly configured to enable Commander to control a transceiver, you can "transfer" those settings to the Multi Radio tab's **CAT Serial Port** panel by clicking the appropriate Update button.

Clicking a radio's selection button on the Main window's VFO panel sets the Radio Model, CI-V Address (if an Icom), Continuous Interrogation, Interrogation Interval, and Primary CAT Serial Port settings to the values specified for that radio on the Multi Radio tab.

User-defined Control Sets

If you've specified an Initial Command, an Initial Command Sequence, on or more Command Sequences, or one or more Command-generating Sliders, and are controlling more than one primary transceiver, you can define a **User-defined Control Set** that enables these items to be automatically populated when a primary transceiver is selected at startup, manually, or automatically:

- an Initial Command to be executed when the transceiver is selected
- the pathname of a file that specifies an Initial Command Sequence to be executed when the transceiver is selected (after executing the Initial Command, if one is specified)
- the pathnames of up to 32 Command Sequences to be made accessible when the transceiver is selected
- the pathnames of up to 16 Command-generating Sliders to be made accessible when the transceiver is selected

The 32 Sequence pathnames and 16 Slider pathnames are organized into two banks, each specifying 16 Sequence pathnames and 8 slider pathnames.

To create, display, or modify a radio's Control Set, click that radio's Edit button in the User-defined Controls Sets panel on the Config window's Multi Radio tab to display the User-defined Control Set Configuration window.

Selecting a radio for which a Control Set is specified

- directs the transceiver to execute the CAT command specified in the Control Set's Initial Command
- directs the transceiver to execute the Control Set's Initial Command Sequence
- loads the 32 Command Sequences from the pathnames specified in the Control Set
- loads the 16 Sliders from the pathnames specified in the Control Set

You can configure Commander to automatically switch among simultaneously-connected radios by specifying the radio to use for each amateur band. Check the Selection by band panel's Auto box, and Commander will automatically switch to the correct radio as a function of operating frequency.

You can also configure Commander to identify the currently-selected radio via a binary encoding on pins 16 and 14 of a specified parallel port. These signals can be used to control external hardware that connects an antenna, microphone, key, headset, soundcard, and/or FSK signal to the currently-selected radio.

Secondary CAT Port

Commander's Secondary CAT Port can be connected to

- a radio or (via connected virtual serial ports) so that it can track and/or control the Primary transceiver's frequency and mode
- a Software Defined Radio (SDR) Console so that it can track and/or control the Primary transceiver's frequency and mode
- an external device like a tuner or amplifier so that it can track the Primary transceiver's frequency

You can configure the Secondary CAT port so that the connected radio or SDR Console

- follows frequency and mode changes in the radio connected to the Primary CAT Port
- leads the radio connected to the Primary CAT Port by conveying frequency and mode changes
- follows and leads: both follows frequency and mode changes in the radio connected to the Primary CAT Port, and conveys its frequency and mode changes to the radio connected o the Primary CAT Port

When connected to an external device like a tuner or amplifier, the Secondary CAT port should be configured to follow frequency and mode changes in the radio connected to the Primary CAT Port

Select the CAT protocol to be used on the Secondary CAT Port. If the Secondary CAT Port is connected to an Icom or Icom-emulating transceiver, specify its CI-V Address.

- If the Secondary CAT Port is connected to an Icom or Icom-emulating transceiver whose **CI-V Transceive** menu setting is disabled, and if the Secondary CAT Port is configured to lead or follow and lead, direct Commander to periodically poll the secondary transceiver's frequency and mode by specifying an Interrogation Interval; in this configuration, the Radio's minimum VFO step is set to 10 hz option available with certain Yaesu models will be disabled.
- If the Secondary CAT port is configured to follow frequency and mode changes in the radio connected to the Primary CAT Port, the Update every 200m option will if enabled causes Commander to update the radio, device, or application connected to the Secondary CAT Port with the primary radio's frequency and mode 5 times per second; this can be used to update a radio, device, or application connected to the Secondary CAT Port that is powered up or started after Commander is already running.
- If the Secondary CAT Port is connected to a software-defined radio controlled by the PowerSDR console, enable the **Allow Kenwood AI Command** option on the **PowerSDR Setup** window's **Cat Control** tab.
- If the Secondary port's CAT protocol is set to **PW1**, Commander assumes that an Icom PW1 amplifier is connected to the Secondary CAT Port, and emulates an Icom transceiver whose CI-V address is specified by the **CI-V Addr** box by sending the PW1 alternating frequency update and mode update messages every 2.5 seconds. This enables the **PW1** to track primary transceiver's frequency, even if the primary transceive is not an Icom transceiver. It also prevents CI-V bus collisions that can prevent the **PW1** from accurately tracking the primary transceiver's frequency.

Instructions for configuring Commander for use with a PW1 can be found in
https://www.dxlabsuite.com/dxlabwiki/PW1Control.

Keyboard Shortcuts

To allow operation without removing one's hands from the keyboard, Commander provides the following keyboard shortcuts for navigation.

Main window Main VFO frequency display shortcuts
 The following shortcuts are effective when the mouse cursor resides in the Main window's Main VFO frequency display

Control Key Shortcut	Effect
Control-A	selects the current contents of the Main VFO frequency display

Shift Key Shortcut	Effect
Shift-A	sets the transceiver mode to AM
Shift-B	equivalent to clicking the Main window's **Bandspread** button
Shift-C	sets the transceiver mode to CW
Shift-D	equivalent to clicking the Main window's **Filters & Devices** button
Shift-F	sets the transceiver mode to FM
Shift-L	sets the transceiver mode to LSB
Shift-M	equivalent to clicking the Main window's **Memories** button
Shift-P	sets the transceiver mode to PKT or Data-L
Shift-Q	sets the transceiver mode to PKTR or Data-U
Shift-R	sets the transceiver mode to RTTY
Shift-U	sets the transceiver mode to USB
Shift-X	selects the Configuration window's **General** tab

Function Key	Control Keys	Effect
F1	Shift	equivalent to clicking the **A** or **Main** button
F2		switch from transmitting to receiving
F2	Shift	equivalent to clicking the **B** or **Sub** button
F3	Shift	equivalent to clicking the **A=B** or **M=S** button
F4		switch from receiving to transmitting
F4	Shift	equivalent to clicking the **AxB**, **A/B**, or **MxS** button

Key	Control Keys	Frequency Change
PageUp		+ 10 Hz.
PageUp	Shift	+ 100 Hz.
PageUp	Ctrl	+ 1 KHz.
PageUp	Alt	+ 10 KHz.
PageUp	Ctrl + Alt	+ 100 KHz.
PageDown		- 10 Hz.
PageDown	Shift	- 100 Hz.
PageDown	Ctrl	- 1 KHz.
PageDown	Alt	- 10 KHz.
PageDown	Ctrl + Alt	- 100 KHz.

Configuration window tab shortcuts
The following shortcuts are effective when a Configuration window's tab name is selected

Shift Key Shortcut	Effect
Shift--B	selects the Configuration window's **Bandspread** tab
Shift--F	selects the Configuration window's **Filter Groups** tab
Shift--G	selects the Configuration window's **General** tab
Shift--0	selects the Configuration window's **Device 0** tab
Shift--1	selects the Configuration window's **Device 1** tab
Shift--2	selects the Configuration window's **Device 2** tab
Shift--3	selects the Configuration window's **Device 3** tab
Shift-M	selects the Configuration window's **Memories** tab
Shift-P	selects the Configuration window's **Ports** tab
Shift-R	selects the Configuration window's **MultiRadio** tab
Shift-T	selects the Configuration window's **Transverter** tab
Shift-X	selects the Main window's Main VFO frequency display
Shift +	selects the first tab-able control on the current Configuration window's tab

Network Service

Commander's network services are configured via its **Network Service** window, which can be displayed by clicking the **Net Serv** button in the **Radio** panel on the **Configuration** window's **General** tab.

Commander can
- issue N1MM-style Radio Info messages via UDP to applications running on the host computer, or to applications running on computers connected to the host computer via local area network.
- listen for incoming commands conveyed via TCP from applications running on the host computer.
- interoperate with the Waterfall Bandmap application via UDP messages

UDP Network Service
Commander's **Radio Info** messages include fields that describe the currently-selected transceiver's
- Freq - receive frequency
- TXFreq - transmit frequency
- Mode
- IsSplit
- RadioNr - primary transceiver number (1-4)
- App - DXLab

Radio Info messages can be configured to include the **Antenna name** specified in the **Antenna Selection** panel by checking this panel's **Enable** box via the <ANTENNA> tag.

Radio Info messages can be configured to include the **Auxiliary Antenna number** and **Auxiliary Antenna name** specified in the **Auxiliary Antenna Selection** panel by checking this panel's **Enable** box via the <AuxAntSelected> and >AuxAntSelectedName> tags, respectively.

Checking the **Enable** box causes Commander to send **Radio Info** messages to each address-port pair that specify an IP address and port
- when the primary transceiver's receive frequency changes
- when the primary transceiver's transmit frequency changes
- when the primary transceiver's mode changes
- when the primary transceiver's Split state changes from disabled to enabled, or from enabled to disabled
- when the primary transceiver's Transmitting state changes from Receiving to Transmitting, or from Transmitting to Receiving
- when a new primary transceiver is selected
  - setting the **New Xcvr Delay** textbox to a value other than 0 will delay the outgoing **Radio Info** message by the specified number of seconds after a new primary transceiver is selected
- when the UDP Network Service panel's **Send RadioInfo Packet** button is clicked
- every 10 seconds

To send **Radio Info** messages to
- an application running on the computer hosting Commander, specify an IP address of 127.0.0.1
- an application running on another computer connected by LAN to the computer hosting Commander, specify the other computer's IP address
- multiple applications running on multiple computers connected by LAN to the computer hosting Commander (e.g. all on the same subnet), specify a network address with the subnet address set to 255, e.g. 192.168.1.255

Click the **Restart** button after making any changes to an **IP Address** or **Port**.

By default, N1MM+ sends **Radio Info** messages to port 12060. If you have the **Broadcast Data** tab of the N1MM+ **Configurer** window configured to send **Radio Info** messages to

127.0.0.1:12060 192.168.1.255:12060

then to configure Commander to emulate this behavior when N1MM+ is not running, specify:

UDP #	IP Address	Port
1	127.0.0.1	12060
2	192.168.1.255	12060
3		
4		

TCP Network Service

The **TCP Network Service** panel enables you to specify the **Base Port** that determines the port to which Commander listens for incoming TCP commands

- Commander accepts TCP/IP commands at an offset of 2; e.g. if the strong>Base Port is set to 52000, Commander accepts commands via Port 52002
- The **Defaul**t button sets the **Base Port** to 52000
- The **Restart** button re-initializes TCP command acceptance; after changing the **Base Port**, click the **Restart** button

Waterfall Bandmap Service

The Waterfall Bandmap is a separate application developed by Steve N2IC with which Commander can interoperate via UDP messages. It provides a live waterfall display with callsign and frequency spotting information. The Waterfall Bandmap tracks the frequency of your transceiver, and can obtain the callsigns of active DX stations from Commander (which receives them from SpotCollector). Commander provides all the information that the Waterfall Bandmap needs to work with your SDR receiver or sound card I/Q output to synchronize with Commander's primary transceiver. The Waterfall Bandmap works with any radio compatible with LP-PAN (such as the K3), with the FlexRadio Signature series, and with most SDR receivers, such as the Perseus, QS1R, or SDRplay.

In the **Waterfall Bandmap Service** panel,

- check the Enable box to enable interoperation with the Waterfall Bandmap application; the square rectangle to the right of the Enable box will be red if Commander is not receiving messages from the Waterfall Bandmap application, or green if messages are being received.
- the **Directives IP Address** and **Reports IP Address** specify the IP address of the computer hosting the Waterfall Bandmap application; if the Waterfall Bandmap application is hosted by the same computer that hosts Commander, set both IP addresses to *127.0.0.1*
- the **Directives Por**t should be set to *13063*
- the **Reports Port** should be set to *13064*
- clicking the **Default** button sets the **Directives IP Address** and **Reports IP Address** to *127.0.0.1*, sets the **Directives Por**t to *13063*, and sets the **Reports Por**t to *13064*.
- clicking the **Restart** button restarts the Waterfall Bandmap service on the specified **IP Address** and **Ports**.

Monitoring Messages

Commander's **Messages** window can capture and display messages between your PC and the radio connected to Commander's Primary CAT Port, and can capture and display messages between your PC and the radio or application connected to Commander's Secondary CAT Port . If more than 65K message characters are received, the first 8K characters received are deleted and message capture continues.

You can also use the **Messages** window to send an arbitrary CAT command to the Primary CAT Port, and enable or disable Continuous Frequency and Mode Interrogation.

To display Commander's Messages window, click the Main window's **Msgs** button.

- To enable the capture of Primary CAT Port messages, check the **Capture and display Primary CAT Port Messages** box; note that capturing messages may reduce program performance, resulting in poor tracking between the radio's frequency display and the program's frequency display.
- To enable the capture of Secondary CAT Port messages, check the **Capture and display Secondary CAT Port Messages** box; note that capturing messages may reduce program performance, resulting in poor tracking between the radio's frequency display and the program's frequency display.
- Captured messages are preceded by a **P** or **S** (for Primary or Secondary), a sequence number, a date, and a directional indicator: **>** for transmitted messages, **<** for received messages
    - when monitoring an Icom or TenTec CI-V bus, all messages will be designated as "received".
    - Messages can be displayed in **Decimal**, **Hexadecimal**, or **Ascii** as specified by settings in the **Message Display** panel.
    - When capturing messages from both the Primary and Secondary CAT Ports when these ports are configured for different CAT protocols, set the **Message Display** panel to **Native**; this will display messages in the most natural representation for their protocol, e.g. Kenwood messages are displayed in Ascii, Icom messages are displayed in Hexadecimal, etc.
- Selecting text in a captured message and striking CTRL-C places the selected text in the Windows Clipboard
- If the Configuration window's Continuous Frequency and Mode Interrogation box is checked, you should see the PC issuing "request frequency report" and "request mode report" messages, and your radio's responses; if not, check your radio's address, baud rate, and PC connections.
- If the Configuration window's Continuous Frequency and Mode Interrogation box is not checked, you will only see messages when the radio's frequency, mode, or filter selection changes, or when Commander sends a directive to your radio.
- The **Interrogate Radio** panel's **Freq?** and **Mode?** buttons send messages to your radio requesting that it report its current frequency and mode respectively.
- The **Interrogation** panel's **Continuous** checkbox shows the state of Continuous Frequency and Mode Interrogation and provides a convenient means of enabling or disabling it.

- In the **Execute CAT Command** panel,
  - the **Exec** button sends the command specified in the **CAT command** box to the transceiver connected to the Primary CAT Port; this function is disabled when Verify CI-V command acceptance is enabled while controlling an Icom or TenTec Omni VI as the primary radio
  - the **Clear** button clears the **CAT command** box
  - the **CAT command** box specifies the command to be sent to the transceiver connected to the Primary CAT Port
    - precede an ascii command with a single apostrophe to send that command to the transceiver via the primary CAT serial port (e.g. for DZKit, Elecraft, Flex, Kenwood, and recent Yaesu transceivers); in an ascii command, the substitution string <n> (where n is an integer between 0 and 127) is replaced by a single character whose ascii value is n; for example, <13> will be replaced by the "carriage return" character.
    - precede an ascii command with a single tilde to send that command to the transceiver via the TCP/IP connection (e.g. for a Flex Signature); in an ascii command, the substitution string <n> (where n is an integer between 0 and 127) is replaced by a single character whose ascii value is n; for example, <13> will be replaced by the "carriage return" character.
    - striking the Enter key will send the command to the transceiver connected to the Primary CAT Port (equivalent to clicking the **Exec** button)
    - striking CTRL-W will clear the **CAT command** box (equivalent to clicking the **Clear** button)
- In the **Captured Messages** panel,
  - the **Note** button records documentary text to be inserted into the message store; the note will not appear in the message store until the next message arrives
  - the **Save** button places all captured messages in a file
  - the **Clear** button empties the store of captured messages.

Interoperating with Satellite Tracking Applications

Commander can be configured to interoperate with the SatPC32 satellite tracking application or the S.A.T. (**Self-contained Antenna Tracker**). In these forms of interoperation, SatPC32 or S.A.T. directly and exclusively control your transceiver; Commander

- interacts with SatPC32 or S.A.T. to track your transceiver's **uplink frequency**, **downlink frequency**, and **mode**, making these available to other applications just as it does when directly controlling a transceiver
- obtains the current **satellite name** from SatPC32 or S.A.T., and makes this available to other applications

  - to satisfy LoTW, **AO-07** is reported to other applications as **AO-7**, and **ISS** is reported to other applications as **ARISS**
- computes the **satellite mode** from the **uplink frequency** and **downlink frequency**, and makes this available to other applications

To configure Commander to interoperate with SatPC32,
1. on the Configuration window's **General** tab, set the **Radio** panel's **Model** selector to *SATPC32*
   - a **SATPC32** panel will appear in the upper-right corner of Commander's Main window showing
     - **connection status**
     - if not *connected* to SatPC32, a **Connect** button
     - if *connected* to SatPC32 with its *active satellite* above the horizon, the name and mode of that satellite
   - panels and buttons not used when interoperating with **SatPC32** will be hidden or disabled
2. if SatPC32 is not already running
   a. start SatPC32
   b. after SatPC32 is running, click the **Connect** button in Commander's **SATPC32** panel

To configure Commander to interoperate with an S.A.T.,
1. on the Configuration window's **General** tab, set the **Radio** panel's **Model** selector to *S.A.T*
   - a **S.A.T.** panel will appear in the upper-right corner of Commander's Main window showing
     - **connection status**
     - if not *connected* to S.A.T., a **Connect** button
     - if *connected* to S.A.T., the name and mode of its selected satellite
   - panels and buttons not used when interoperating with S.A.T will be hidden or disabled
2. if your S.A.T. is not already running
   a. start S.A.T.
   b. after S.A.T. is running, click the **Connect** button in Commander's **S.A.T.** panel