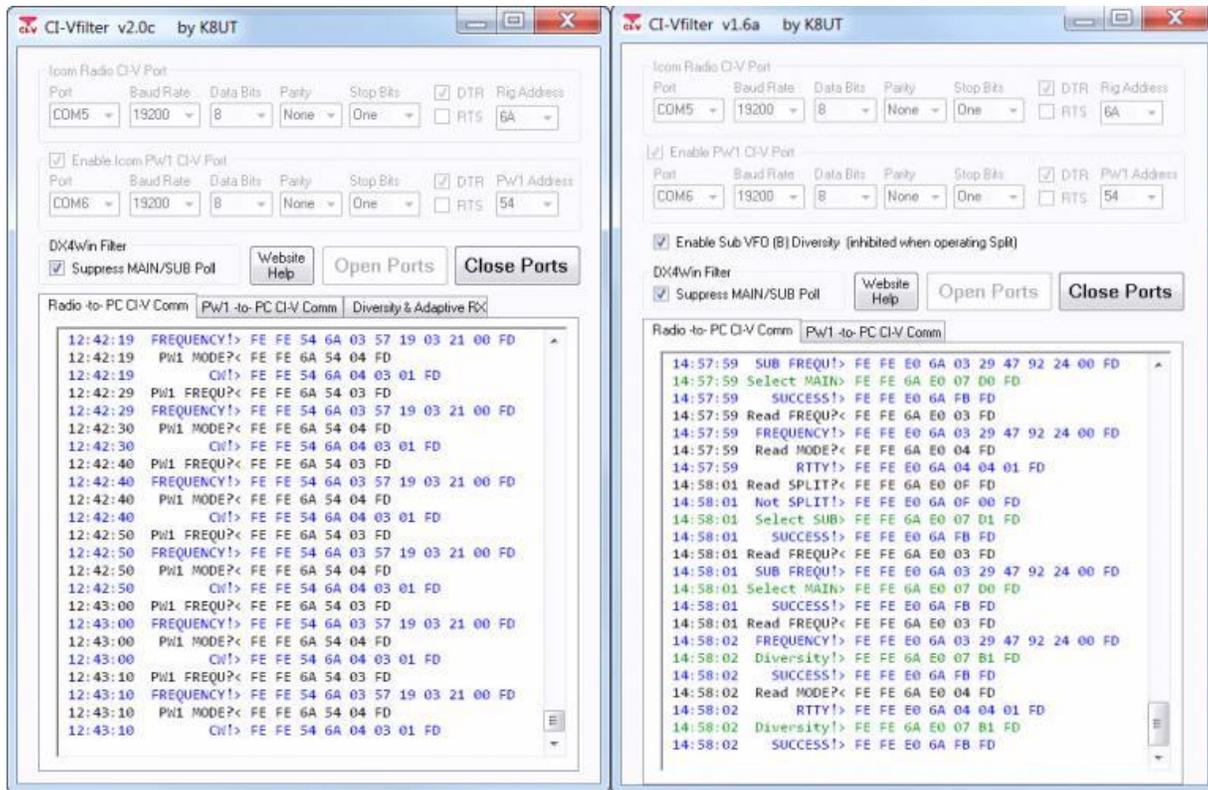


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Screenshots for v2.0c (with Diversity and Adaptive RX) and version 1.6a (with Diversity)



1. Current Version Information

- v2.0e, 2012-02-17 Eliminate repetitious sending of Adaptive RX packets. Diversity command only sends when TUNING. Fix for mode changes initiated by logging program.
- v2.0d, 2013-02-16 Added millisecond timing. Improved switching time. Standardized all screen colors (Commands, Queries, Responses, Warnings, Errors). Fix for Split operation
- v2.0, 2013-02-02 Added Adaptive RX
- v1.6a, 2013-02-01 Added VFO B Diversity
- v1.5d, 2012-06-13 Further improvements to PW1 initialization and synchronization
- v1.5c, 2012-06-12 Display window clears automatically when buffer reaches 5000 lines of packet info. Prevents problems with program hanging after long periods of operation
- v1.5, 2012-06-02 More CI-V command interpretations, including all polling commands used by DX4Win, N1MM Logger, and DXLabs Commander. Easier-to-understand labels. Better synchronization with PW1 when launching CI-Vfilter
- v1.4, 2012-04-02 Reduced screen size. Enclosed the Radio and PW1 packet logs in tab windows
- Added mouse scrollbar feature to logs. Enabled <ctrl>A and <ctrl>C - select All and Copy for inserting packet log into a file with <ctrl>C
- v1.3, 2012-04-29 Enhancements and bug fixes. Improved ini settings import
- v1.2, 2012-04-21 Added CI-V labels to packet log
- v1.1, 2012-04-17 Support added to read a *config.ini* file. Auto-connect on launch
- v1.0, 2012-04-12 Initial release

2. Known Anomalies

- The packet window in CI-Vfilter uses the new Windows 7 *Consolas* font. If you are running Windows XP, you can download and install that free font from Microsoft. Otherwise your packet window columns will not be aligned properly.
- CI-Vfilter displays packet losses and errors when used with some USB CI-V cables. If you are using USB CI-V adapters, test it thoroughly using your logging software and CI-Vfilter to ensure proper operation.
- When first "waking up" the PW1, or when making manual band changes on the PW1, the PW1 packet window displays streams of fractured packets until CI-Vfilter and the amp synchronize.
- May take several polling cycles from your logging software to establish synch between CI-Vfilter and the PW1. Logging programs with slow polling intervals (DX4Win) may require up to 10 seconds before you see normal "FREQUENCY!" frequency messages in the PW1 packet window.
- Diversity command copies the MAIN VFO frequency *and* its IF filter setting (filter 1, 2, or 3) to the SUB VFO.
- DX4Win users who enable Diversity and Adaptive RX must adjust the command delay in their RIG files. See DX4Win instructions
- CI-Vfilter will crash when attempting to open serial ports that are non-existent, already in use, or mis-configured. Make sure you have *CI-Vfilter.INI* configured properly. If you do not have/need a port for the PW1, you may have to edit *CI-Vfilter.ini* and set the PW1 port = COM0 and PW1 ENABLE=NO

3. Disclaimer

Although this software has been tested and works well in my environment with my computer, radio, and peripherals, this is no proof it will perform properly at your QTH. The author offers no warranty or guarantee that your results will be similar. Install and test the software thoroughly before beginning full-scale operation. Discontinue its use if there is any indication that your PW1 amplifier is behaving erratically. If the Comm bus displays packets in orange or red, you have a problem that needs to be fixed. Your Mileage May Vary.

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4. Download

[Download Link](#) 

1.1. Purpose(s)

1.1.1. CI-V Traffic Management - For the Icom PW1 owner

As the owner of an Icom Radio and an Icom PW1 amplifier, I initially wrote CI-Vfilter to compensate for the PW1's deficiencies and allow safe, fully automatic PW1 band-switching with my favorite logging programs and my Icom transceiver. I added the Adaptive RX feature after observing my own repetitive actions during contests wherein I enabled and disabled filters with each Search and Pounce QSO.

If you are not familiar with Icom's CI-V bus architecture, packet collisions, and the design flaws in the Icom PW1 amplifier, you should read about them in four short documents titled *Riding the CI-V Bus* that you will find on my website at:

<http://www.k8ut.com/tiki-listpages.php> 

1.1.2. VFO Diversity - For the Icom dual receiver owner (IC-7800)

If you use a receive antenna, or sometimes operate with both receivers but different filters for each receiver, VFO Diversity monitors traffic from the radio and sends a CI-V command that copies the MAIN VFO frequency and IF filter setting to the SUB VFO. This results in the two VFOs, with only a slight delay based on the polling rate of your logging software, always being on the same frequency.

As of version 2.0e. the Diversity routine was modified so that it only replicates VFO-a to VFO-b when the software is TUNING. As a result, VFO-b will be on the same frequency as VFO-a but will be in WIDE (tuning) mode, whereas VFO-a will be NARROW (stationary).

1.1.3. *NEW Adaptive RX - For Contesters and DX Operators with any recent model Icom transceiver

When running the RTTY Roundup Contest, I found myself repeating the same S&P key/switch sequence with each QSO: 1) tune to station, 2) enable tight filters and RTTY TPF to block QRM and Pounce, 3) work station, 4) disable tight filters and TPF to allow for next Search, 5) repeat ad nauseam. Thinking there's gotta be a better way, I wrote something I've dubbed Adaptive RX. The feature monitors VFO changes and opens up the filters when the VFO is Tuning (searching), and closes down the filters when the VFO is Stationary (pouncing). Some timing is involved – close filters only after n.n seconds of VFO Dwell Time; allow the user to diddle the VFO by xx Hz (fine-tuning a station) before opening up the filters.

Unlike many contest software features for Big Gun stations, this is a Little Pistol tool, aimed at the guy who can't declare and hold a Run frequency when the bands are crowded but can amass a respectable score via a serious S&P effort {ummmm... like me).

1.2. Features

1.2.1. Original Release - Version 1.0 - 1.5

- Splits the CI-V bus into two segments: a segment for PC-to-Radio, another segment for PC-to-PW1
- When not using the Diversity feature, operates in listen-only mode on the PC-to-Radio segment, without affecting communication between the logging software and the Icom radio. Displays all of the PC-to-Radio segment's traffic as of v1.4
- Detects frequency related packets on the PC-to-Radio segment and forwards them to the amplifier on the PC-to-PW1 segment

- Detects frequency and mode requests from the PW1 on the PC-to-PW1 segment and forwards them to the radio on the PC-to-Radio segment
- Inhibits the notorious PW-1 polling by sending any frequency updates to the PW1
 - When your logging software polls the radio for its current VFO frequency, CI-Vfilter converts the radio's response to a broadcast packet and forwards it to the PW-1. The PW1 update speed in this instance is based on your logging software polling rate
 - When your logging software instructs the radio to change its current VFO band or frequency (for example, after you click in the bandmap and packet window), CI-Vfilter forwards that packet to the PW-1. The PW1 update speed in this instance is essentially instantaneous
 - When you change the band or frequency on the radio by pushing a band select button or spinning the VFO dial, and your Icom radio is configured for Transceive=ON, CI-Vfilter forwards those transceive packets to the PW1. The PW1 update speed in this instance is essentially instantaneous
- Supports different serial port speeds between the PC-to-Radio segment and the PC-to-Amplifier segment
- Includes special "DX4Win filter" compensation for DX4Win logging software, preventing the SUB VFO poll (which causes the MAIN <> SUB VFO flickering in newer Icom radio definitions) from causing band flickering in the PW1 amplifier when your VFO's are crossbanded
- Allows radio configurations with Icom Transceive = ON or OFF, based on the recommendation of your logging software. See your Icom owner's manual for menu instructions on how to set your radio to Transceive ON or OFF
- Requires one or two additional CI-V connections. See Configuration Options

1.2.2. Version 1.6 with VFO Diversity

- Includes a VFO Diversity feature for dual receive radios (ic-7800) whereby the SUB VFO (B) will continuously track any changes made to the MAIN VFO (A)
- Placing the radio in <Split> mode overrides the Diversity command and allows separate frequencies for the MAIN and SUB VFOs
- The PW1 port can be disabled, allowing dual receive radio owners who do not have PW1 amplifiers to take advantage of the Diversity feature

1.2.3. Version 2.0 with VFO Diversity and Adaptive RX

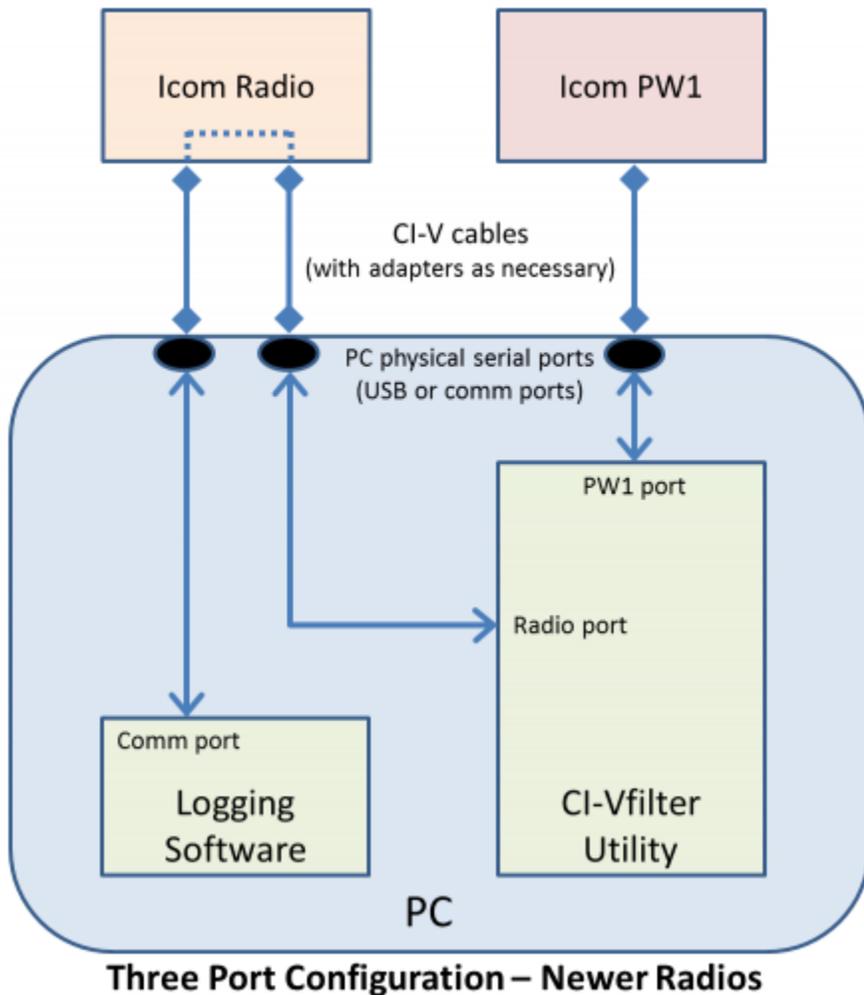
- Defines two states for the radio: the VFO is either Tuning or Stationary
- Selects IF filters and APF/TPF filters based on whether the VFO is Tuning or Stationary
- Determines whether the radio is Tuning or Stationary based on configurable VFO Dwell time (in seconds) and QSY Tolerance (in Hz)

1.3. Three Configuration Options

Choose based on Icom radio model and number of PC serial ports. *NOTE that the amplifier connection is not required for operators without PW1 amplifiers who only want to use the software's Diversity or Adaptive RX feature. In fact, without a PW1 you must disable that connection or the software will fail.*

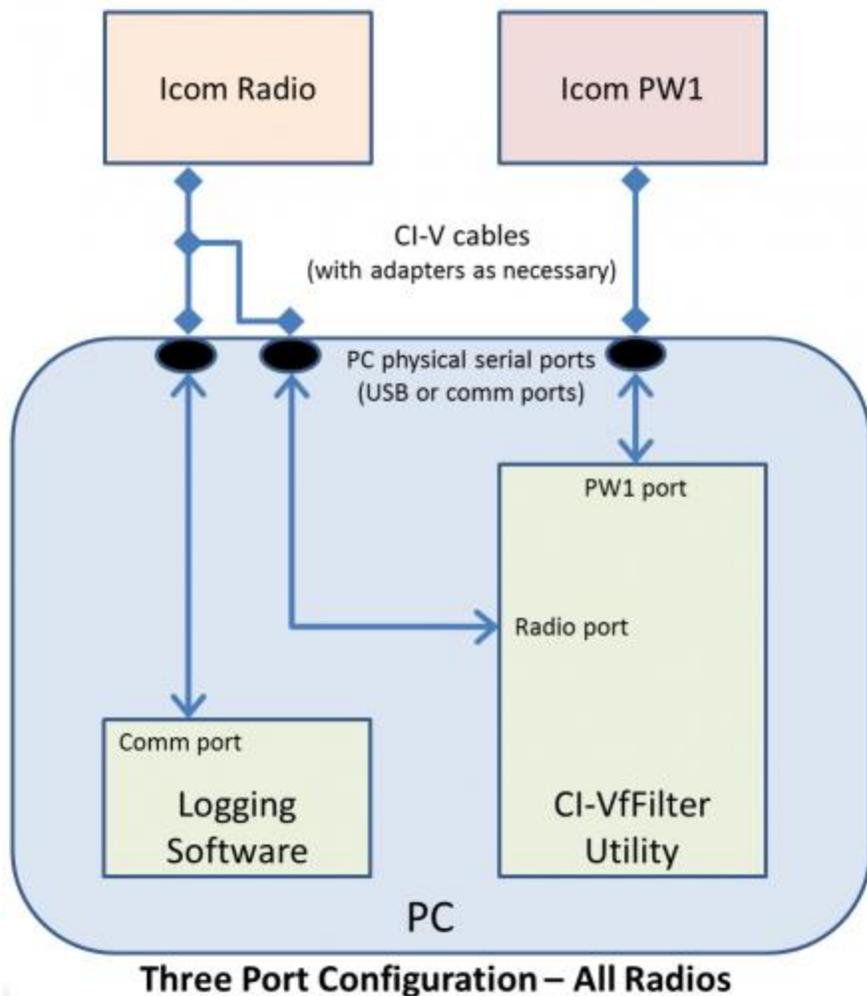
1.3.1. Three Ports, Newer Icom Radios with Two CI-V Outputs

Applies to newer Icom Radios with two CI-V ports: IC7800, IC7700, IC7600, others. This configuration uses both ports on the rear of the radio, sending packets to two serial ports on the PC (with CI-V adapters where necessary). The PC's third serial port provides the dedicated direct line to the PW1



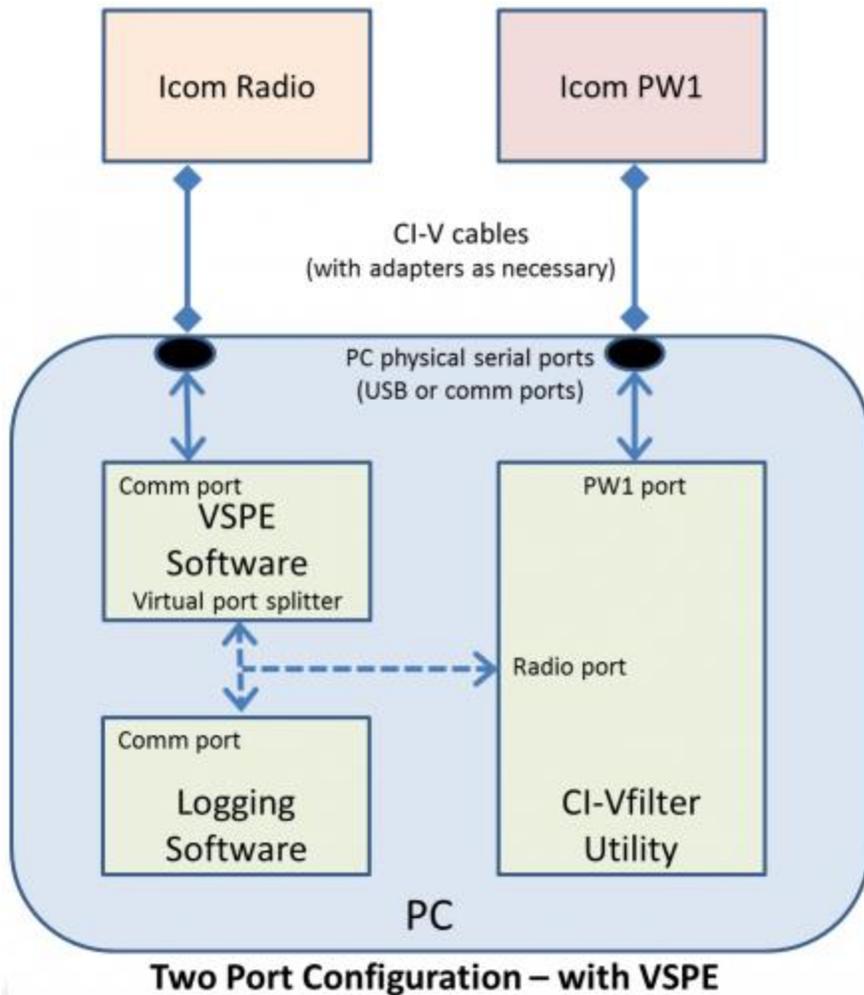
1.3.2. Three Ports, Any Icom Radio with At Least One CI-V Output

Applies to Icom Radios with at least one CI-V port. This configuration creates a three-connection CI-V bus with the port from the radio connecting to two ports from the PC (with CI-V converters where necessary). The third serial port provides the dedicated direct line to the PW1.



1.3.3. Two Ports, with VSPE

Applies to Icom Radios with at least one CI-V port. This configuration uses Virtual Serial Port software (google Virtual Serial Port software or visit Eterlogic.com) to split one physical port from the radio into two virtual ports that connect to the logging software and the CI-V Filter software. The VSPE attached external port connects the PC (with appropriate CI-V-to-Serial converters where necessary) to the radio. The second (physical) serial port provides the dedicated direct line to the PW1.



1.4. Installation and Operation

1.4.1. Installation

Simple installation – no SETUP program. Extract CI-Vfilter.EXE from the ZIP archive and copy it to any directory on your PC. Create a shortcut on your desktop or run using Windows Explorer.

NOTE: This is a Microsoft .NET application written in Visual Basic 2010. When attempting to run the software for the first time, you may be prompted to install the latest version of .NET on your computer. This is normal and is required for operation of CI-Vfilter.

1.4.2. Basic Operation

Icom Radio CI-V Port

Port	Baud Rate	Data Bits	Parity	Stop Bits	<input checked="" type="checkbox"/> DTR	Rig Address
COM5	19200	8	None	One	<input type="checkbox"/> RTS	6A

Enable PW1 CI-V Port

Port	Baud Rate	Data Bits	Parity	Stop Bits	<input checked="" type="checkbox"/> DTR	PW1 Address
COM6	19200	8	None	One	<input type="checkbox"/> RTS	54

Enable Sub VFO (B) Diversity (inhibited when operating Split)

DX4Win Filter

Suppress MAIN/SUB Poll

[Website Help](#) [Open Ports](#) [Close Ports](#)

CI-Vfilter requires at least two com ports. Refer to the configuration diagrams and configure the two CI-Vfilter ports to match the settings in your Icom radio and your Icom PW1 amplifier.

- **Port:** DO NOT set the Radio port and the PW1 port to the same com number
- **Rig Address:** Varies based on Icom model number. Refer to your owner's manual
- **PW1 Address:** Is always 54, unless you changed the address selector switches inside the PW1
- **DTR & RTS:** Some CI-V converters derive power from the serial DTR/RTS lines. Adjust as necessary
- **DX4Win Filter:** Enable if using DX4Win software with newer radio definitions and MAIN/SUB polling
- **Enable PW1:** Enable if using a PW1; disable if only using Diversity
- **Enable Diversity:** Enable for SUB VFO (B) tracking of the MAIN VFO (A)
- **Website Help:** Don't bother looking at this. Does anybody read this stuff?

1.4.2.1. The CI-Vfilter.ini Configuration File

CI-Vfilter reads the contents of a configuration file upon launch.

CI-Vfilter.ini features:

- Set all values for the Radio and CI-V ports
- Enable the DX4Win filter
- Open the ports upon launch
- Run as a minimized window upon launch

The file, *ci-vfilter.ini*, must be located in the same directory as the executable program. Open the file with a text editor (Notepad) and read the comments in the file for information about the program settings.

This feature enables the program to auto-launch within Windows without any user intervention. Detailed instructions are included in comment statements within the file.



INI File problems? CI-Vfilter will crash!

CI-Vfilter will not function when attempting to open serial ports that are non-existent, already in use, or mis-configured. Make sure you have CI-Vfilter.INI configured properly

1.4.3. The CI-Vfilter Launch Routine

After configuring CI-Vfilter, you can observe the initialization packet streams between your radio and the PW1.

Exit your logging program (turn it off). Turn off your radio.

1. Launch CI-Vfilter
2. Press the >Open Ports button
3. Turn on your radio. You should see initialization packets from the PW1 (see screenshot). The PW1 will begin sending frequency requests ("PW1 FREQU?", 03h) until the radio responds. Once receiving responses from the radio, the PW1 will begin polling the radio every 10 seconds for frequency and mode settings
4. Launch your polling program. The polling program should begin polling the radio for frequency information. (NOTE: DX4Win does not begin polling until you press <F9>, or click on a packet spot) The logging program's polling packets will be translated by CI-V filter and passed to the PW1 bus, inhibiting the PW1's 10-second polling
5. The previous sequence *Launch CI-Vfilter; Turn on radio; Launch logging program* is the best method for ensuring that CI-Vfilter will properly initialize your radio-to-amp connection
6. If your PW1 still does not synchronize with radio band changes, press the PW1's <Down> button until the "Auto" lamp re-lights.

1.4.4. Diversity Operation - VFO-b Tracks VFO-a

In versions 1.6 and beyond, CI-Vfilter includes a feature for VFO tracking in dual VFO radios. When enabled, CI-Vfilter will emulate the pressing of the radio's "M=S" button. The exact performance of the Diversity feature depends on Adaptive RX.

1.4.4.1. Diversity When Adaptive RX is Enabled

When Adaptive RX is enabled, CI-Vfilter recognizes whether the VFO is Stationary or Tuning. The Diversity command (M=S) is only sent to the radio when VFO-a is Tuning, resulting in VFO-b inheriting the Tuning IF and A/TPF filter (wide) settings. When you stop tuning VFO-a, its filter will become narrow (Stationary settings) but VFO-b will remain wide (Tuning).

1.4.4.2. Diversity When Adaptive RX is Disabled

When Adaptive RX is disabled, CI-Vfilter issues the Diversity command (M=S) which will result in VFO-b inheriting the current IF filter setting from VFO-a.

1.4.4.3. Diversity Inhibited when Operating Split - or Not?

If you have Diversity enabled but place your radio in Split mode (or click on a packet spot for a DX station operating Split), CI-Vfilter will inhibit the Diversity (M=S) command *only if* your logging software polls the radio for Simplex/Split status.

How will you know? Look at the packets in the Radio -to- PC window. If you see packets labeled SPLIT or SIMPLEX, then CI-Vfilter will know when you are in Split mode and will inhibit the Diversity command.

1.4.5. Adaptive RX Operation - Two Operating States: Tuning or Stationary

With the release of version 2.0, CI-Vfilter includes the ability to automatically select or deselect filters when operating in CW or RTTY modes. The premise is that contest operators want wide filters when tuning for stations, and narrow filters after locating stations and trying to work them - without interference from adjacent stations on crowded bands. This same premise may hold true for DXpedition operators working split and listening for calling stations in a pileup.

1.4.5.1. Filter Configuration Options - Identical Choices while either Tuning or Stationary

- IF Filter: 1, 2, or 3
- In CW, Audio Pass (APF) Filter: 1, 2, 3, or 0 (off)
- In RTTY, Twin Peak (TPF) Filter: On or Off

1.4.5.2. Dynamic Determination of either Tuning or Stationary States

- QSY Sensitivity in Hz - This setting allows the user to make minor frequency changes while remaining in a Stationary state. This permits fine-tuning one station without having the filters jump from narrow (Stationary) to wide (Tuning) and back to narrow (Stationary) again.
- QSY Dwell Time in Seconds - This setting dampens the program's tendency to rapidly jump back-and-forth from Stationary -to- Tuning states.

1.4.5.3. Adaptive RX Limitations

CI-Vfilter was designed to co-exist on the Icom CI-V bus without interfering with normal polling and communication between your logging software and your Icom radio. As such, it eavesdrops on the PC-to-radio communication and only reacts when certain frequency- and filter-related packets are sent from the radio to the PC. The disadvantage to this approach is that the responsiveness of CI-Vfilter to changes in frequency - shifting it from a Stationary state to a Tuning state - is dependent on the polling rate of your logging software. Logging software with fast polling rates - like DXLabs Commander and N1MM Logger - deliver faster reaction times than slower polling software like DX4Win.

2. Decoding the Icom CI-V Protocol

2.1. Icom's CI-V Protocol - a Primer

The following primer on Icom's CI-V protocol should help in understanding the information in CI-Vfilter's packet panels. Refer to the CI-Vfilter screenshot at the beginning of this document for packets captured from a live interface.

The basic CI-V packet structure consists of a byte array of hex values and includes a packet prefix, packet content, and a packet suffix. The prefix (FE FE) and suffix (FD) bytes are always the same: **<prefix> <content> <suffix> FE FE <content> FD** Packet content varies based on packet function, but almost always includes the packet TO address as the third byte, the FROM address as the fourth byte, a packet descriptor/command as the fifth byte, and optional packet arguments as the remainder of the content: **FE FE <to> <from> <command> <arguments> FD** As an example of a simple query that uses no optional arguments, a query to an Icom IC7800 (6Ah) from the PW1 (54h) asking for current frequency (04h) would appear in the CI-Vfilter lower panel as: **FE FE 6A 54 04 FD** A more complicated packet with arguments would be a response to the logging software (E0h) from an Icom 756 Pro III (6Eh) with current frequency (03h) data for 014.123456 MHz (bytes 6 – 10 in reverse order). This type of packet will appear in the CI-Vfilter upper panel as: **FE FE E0 6E 03 56 34 12 14 00 FD** Another complicated packet with arguments would be a broadcast message to all devices on the bus (00H) sent from an Icom 746 (56h) with the current VFO frequency (00h) data for 014.123456 MHz (bytes 6 – 10 in reverse order). This broadcast packet will appear in the CI-Vfilter upper panel as: **FE FE 00 56 00 56 34 12 07 00 FD** These are just a few of the CI-V protocol commands. For a complete list of the CI-V commands refer to your Icom owner's manual.

2.2. CI-Vfilter's Packet Labels

Beginning with v1.3, the CI-Vfilter displays contain color-coded labels describing the packet transaction.

2.2.1. Log entry colors

- Black - A Query, ending with a "?". A device on the CI-V bus is asking another device for information or requesting an action
 - Read MODE?> The logging software asks the radio for the current mode
 - PW1 MODE?> The PW1 polling the radio for its current mode
 - FREQUENCY?> The logging software asks the radio for its current frequency
 - PW1 FREQU?> The PW1 10 polling the radio for its current frequency
 - SETTING?> The logging software is asking the radio for the configuration details
 - Read SPLIT?> The logging software asks the radio if it is in Split more
 - Select SUB?> The logging software asks the radio to select the SUB VFO
- Blue - A response to a query
 - CW > The radio supplies current mode information
 - SUB FREQU > The radio supplies current SUB VFO frequency information
 - SETTING > The radio is supplying configuration details to the logging software
 - SUCCESS > The radio successfully completing a Command
- Green - A Directive or Command, usually ending with an "!"

- Select SUB!> Logging software commanding radio to select SUB VFO
- DIVERSITY!> CI-Vfilter commanding radio to make the SUB VFO frequency equal to the MAIN VFO
- Yellow - Packet errors and unrecognized CI-V traffic
 - +ERROR+ Fractured packets less than 5 bytes in length were detected by CI-Vfilter
 - Undefined> An undefined packet. The CI-Vfilter library of commands does not recognize this entry. In some cases, this may be a legitimate transaction between the radio and the logging software that the CI-Vfilter developer did not include in the set of label definitions. In other cases, this may be the result of packet collisions on the bus when merged packet traffic is undecipherable by CI-Vfilter.
- Red - A collision on the CI-V bus
 - !COLLISION! FC FC FC FC FC - a collision notice

2.2.2. CI-Vfilter's Packet Window Screenshots

2.2.2.1. Rig Bus Traffic with Collisions

NOTE that the developer intentionally instigated this collision by bombarding the bus with packets from two active logging programs while simultaneously spinning the VFO in Transceive = ON mode. Under most circumstances, packet collisions should be a rare event on your Radio-to-PC CI-V bus. Spinning your VFO in Transceive = ON may cause occasional collisions - which is normal - but you should not see repetitive collisions in CI-Vfilter during normal logging software polling.

2.2.2.2. Rig Bus Traffic from DX4Win

2.2.2.3. Rig Bus Traffic from N1MM Logger

2.2.2.4. Rig Bus Traffic from DXLabs Commander

3. Caveats and Other Considerations

- CI-Vfilter has been successfully tested with N1MM Logger, DXLabs Commander, and DX4Win* (see below)
- CI-Vfilter behavior varies when Windows goes into sleep mode while connected to a USB port, or to a CI-V converter that derives power from DTR/RTS
- You should use the fastest possible baud rate between the PC and your radio, but my recommended baud rate for reliable operation with the PW1 is 19200 baud
- Neither the PW1 amplifier nor this software support cross-band contest operation. DON'T DO IT
- Although I don't endorse any particular USB-to-CI-V converters, I advise against using the orange-cased Radio Shack model. Throw it away

3.1. DX4Win Poll Timing - Diversity and Adaptive RX Requirements

The Diversity and Adaptive RX command packets may cause CI-V collisions and other packet errors on the Radio-to-PC bus when used with DX4Win. You can avoid these problems by adjusting your radio's Command Delays in the RIG file. Within DX4Win, select >File >Databases >Radios to open the rig dialog window for your transceiver. Within the Edit Radio dialog screen, select the >Cmds/Flds tab. In the Command section, set the >Delay(ms) field for two commands, "Read VFO A" and "Read Mode," to a value between 75ms and 100ms, depending on the processing power of your PC. When done, >File >Save changes. Note that after changing this RIG file DX4Win clears your radio setting in Preferences. (why?) You will need to remind DX4Win which radio you are using by visiting >File >Preferences >Radio dialog. Unfortunately, due to the excessively long polling interval for DX4Win (2000 ms!), many users may find the filter enable/disable timing is uncomfortably slow. Most logging software uses polling intervals near 250 ms. Only the DX4Win developer can solve this problem.