TETRA Trunk Tracker – Set-up and Usage
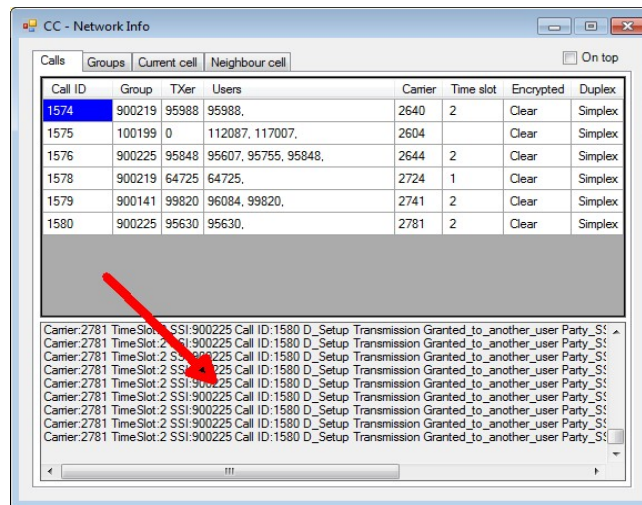by thewraith2008 (13th July 2018)

Description:

TETRA Trunk Tracker reads DATA that is output from the SDR# plug-in TETRA Demodulator (by TSSDR) via the 'Network Info' calls log window.

It interprets this DATA to determine when a call is set-up, then instructs SDR# (VC) to move to the carrier (frequency) that the call will be on. It will also watch out for other PDUs to determine when a SSI starts or completes transmissions and when calls are complete (Released).

If the TETRA Demodulator does not work for you this program will do nothing to change that.

Only tested on Windows 7 - Professional SP1 (32 bit, 64 bit), English.

Normal and Simple versions can share the record files but NOT at the same time.
Normal and Simple versions create there own settings save file. (.dat)

Currently 2 versions exist:

Normal
- • This requires 2 SDR# and 2 dongles with TETRA Demodulator and Net Remote plug-ins

Simple
- • This requires only 1 SDR# and 1 dongle with TETRA Demodulator and Net Remote plug-ins. (Has limits)

CC = Control Control (this is a fixed frequency).
VC = Voice Channel   (this varies frequency).
Carrier = Another name for any frequency in network. They are allocated a number.
Base Frequency = Used to calculate frequency for a given carrier #.

Features:

- A basic call recording (All or Selective call recording).
- Display current call details with list of seen SSIs for that call. (SSI populate as they TX).
- GSSI holding - will only allow calls with selected GSSI to be heard.
- Call lockout based on GSSI. Can be unchecked in list to lockout GSSI.
- Call Priority. (Only normal version)
  GSSI weighted 0-9, 9 is highest. If on active call and other call event occurs, if new call has higher priority then will switch to it.
- Collect/Save all seen GSSIs with Labels and Priority, By Network.
- Collect/Save seen SSIs with Labels and Last seen Date/Time, By Network.
- Set a call time-out. Returns to idle state if call does not see a release PDU
  after X time in seconds.
- Log call events to screen and file, if enabled.
- Log raw CC and VC PDU messages as seen by the 'TETRA Demodulator' plug-in, if enabled.
- Log GSSI daily call activity. (Simple version does not play calls when this is selected)
- Set base frequency via UI.
- Set CC park carrier # via UI.
- Set VC park carrier # via UI.
- Suppress some PDUs. (unchecked is mainly for testing only)
- Suppress lockout messages.
- Sort SSI and GSSIs/Lockouts (by GSSI). This only occurs on start-up.
- Country Code label, defined via file (shown as menu item)
- Network label, defined via file (shown in tool tip where MNC,LA is in 'Call Details' panel)
- Location Area label, defined via file (shown in tool tip where MNC,LA is in 'Call Details' panel)
  Only shown when Network label used.
- Ignores Encrypted PDUs (with no reference to them)
- Set a seen GSSI priority via UI.
- Update a seen GSSI/SSI label via UI.
- Call active indicator.
- Restore SDR# windows to a defined position.

See "TTT_Features_and_Usage.pdf" for more details on these features and their use.

TETRA pop-up error dismisser (Utility program)

Purpose:

'TETRA Demodulator' plug-in throws random timed error dialog pop-ups:

- Collection was modified after the enumerator was instantiated.
- Object reference not set to an instance of an object.

If not closed, TETRA Trunk Tracker can not select the "Timeslot" when call occurs.

This program waits for "Microsoft .NET Framework" error dialog pop-up.
Identifies if it is related to running SDR# processes, then closes automatically it by clicking "Continue".

The pop-up title may not always be "Microsoft .NET Framework" but that of SDR#.
Some basic code is in place to detect this.

Unrelated to SDR#, "Microsoft .NET Framework" pop-ups are not closed.

NOTE: You only need to run this utility if the above pop-up dialog plagues you.

See "Readme.txt" in zip for **'TETRA pop-up error dismisser'** for other details

Set-up: Prerequisites:

Your PC must be capable of running:
- 2 SDR# instances with TETRA Demodulator (Simple version only requires 1 SDR#)

 SDR# (v1.0.0.1637+) (2 dongles or 1 for Simple version)
 TETRA Demodulator plug-in (release 2018-June-05) - MUST be this version (Supplied)
 Net Remote plug-in (v1.2.6750 - Custom) - MUST be this version (Supplied)
 Virtual Audio Cable - optional for call recording (method #2).
 TETRA trunk tracker with run-times. (This program).

Installing: SDR#
It's assumed your installation of SDR# (with TETRA Demodulator) and dongles are already working.
If not, do this first. I can not help with this.

Make sure your using the TETRA Demodulator plug-in version that came with TETRA Trunk Tracker.

Install SDR# plug-in 'Net Remote' Custom version. (either for 32 or 64 bit version)
This version will always save last state of 'Network' as disabled, there for will always start disabled avoiding port collisions between the two SDR# on start..

see "ThisVersion.txt" in zip for more information about this.
Must set port to 3383 (VC) and 3384 (CC). NOTE: This is done by TETRA Trunk Tracker now.

Install Virtual Audio Cable: optional for call recording (method #2)
Install Virtual Audio Cable or similar.
See the below section or "TTT_Features_and_Usage.pdf" for more details on configuring for recording.

Installing TETRA Trunk Tracker:
Unzip to free location. (Program must be able to write at location)

Copy and register runtime DLL (follow instructions for 32 or 64 bit Win OSes)

Check if "mswinsck.ocx" exists in one of the following locations below.
- **Windows\System32** for 32 bit OS
- **Windows\SysWOW64** for 64 bit OS

If file does not exist, copy file "mswinsck.ocx" (in vb-runtime folder) to one of these folders based on if your OS is **32/64 bit**.

To register DLL: (change if your paths are different)

Open CMD prompt "Run as Administrator" and type:

for 32 bit:
- regsvr32 c:\Windows\System32\mswinsck.ocx

for 64 bit:
- regsvr32 c:\Windows\SysWOW64\mswinsck.ocx

This program requires access to TCP 127.0.0.1 port 3383 and 3384 to communication with SDR#
- either through Windows firewall or other installed firewall.

Configuration of SDR#

TETRA Trunk Tracker when started attempts to pre-configure SDR#, but before that can happen some items need to be manually set-up and left like this.

You must set the CC and VC SDR# side panel for TETRA Demodulator like in left image and not right image:
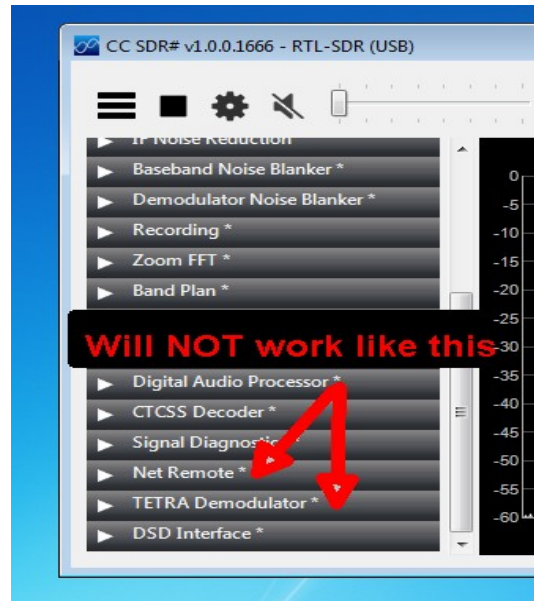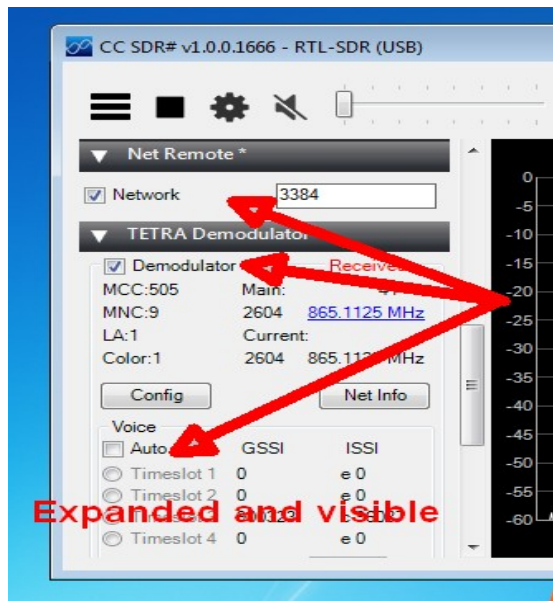
NOTE: SDR# will remember these positions on restarting SDR#.

Failure to do this means TETRA Trunk Tracker can't find the information it needs to operate and control the SDR#s.

The following section is split in two parts.
One for running normal version and one for simple version of TETRA Trunk Tracker.
Please follow exactly to ensure that programs run as expected.

Of course this doesn't mean problems won't occur.

TETRA Trunk Tracker – Initial (Normal version)

This version is a bit easier to get running once the initial set-up is complete.

Windows 10 requirement: Run TETRA Trunk Tracker with elevated privileges "Run as Administrator"

NOTE: The initial run may not start everything. Restarting programs should start everything as expected.

Start SDR# 1
- Make sure 'Net Remote' is expanded in SDR# left panel and visible as shown above.
- Make sure 'TETRA Demodulator' is expanded in SDR# left panel and visible as shown above.

The two above states will be remembered by SDR# on restart.
Failure to do this means TETRA Trunk Tracker can't find the information it needs to operate.

Start SDR# 2
- Make sure 'Net Remote' is expanded in SDR# left panel and visible as shown above.
- Make sure 'TETRA Demodulator' is expanded in SDR# left panel and visible as shown above.

The two above states will be remembered by SDR# on restart.
Failure to do this means TETRA Trunk Tracker can't find the information it needs to operate.

Start TETRA Trunk Tracker
If 1st run:
- Select 'Base Frequency' from drop down list.
- Input a CC Park Carrier #. (This must be the CC frequency to monitor.)
- Input a VC Park Carrier #. (This must be a unused frequency.)
- If you know your offset then change otherwise leave it (+12.5KHz).
  see "TTT_Features_and_Usage.pdf" for how to find your offset.
- Set 'VC Volume' to desired level. (default = 47 db)
- Configure "Checkbox Detection"
  Don't skip this or TETRA Trunk Tracker will not be able to pre-configure SDR# and you will need to configure SDR# yourself every time.

Click **Start**

After starting SDR# and TETRA Trunk Tracker the following should occur:
- 'Net Remote' 'Network' should now be enabled for CC, VC SDR#. And green indicator now seen.
- "SDR#" main and "Network Info" window names should now show CC or VC in front of them.
- CC, VC SDR# will be set to frequency as set in 'CC Park' and 'VC Park'
- CC, VC SDR# will be set to WFM and bandwidth of 26000
- CC, VC SDR# will be set to Volume to 25db (mute). VC SDR# will change to value in 'VC Volume' when call is active.
- CC, VC SDR# will start playback.
- The 'TETRA Demodulator' window 'Network Info' should open for CC and VC SDR# then minimise. (These need to be open).
- Should see in status log window "GSSI loaded for this MNC network: 0"
- Should see in event window "No MCC/MNC/LA seen"

Should now see the network MNC: and LA in "Call Details" panel and calls now start to be processed.

CC and VC "Network Info" Windows MUST be left open. (Minimised is OK, but not closed.)

TETRA Trunk Tracker – Running (Normal version)(after initial set-up has been done)

- Start SDR# 1
- Start SDR# 2
- Start TETRA Trunk Tracker (then click **start**)
  Windows 10 requirement: Run TETRA Trunk Tracker with elevated privileges "Run as Administrator"

TETRA Trunk Tracker – Initial (Simple version)

This version is a bit easier to get running once the initial set-up is complete.

Windows 10 requirement: Run TETRA Trunk Tracker with elevated privileges "Run as Administrator"
 - **Not sure if this is still required for simple version.**

NOTE: The initial run may not start everything. Restarting programs should start everything as expected.

Start SDR#
- Make sure 'Net Remote' is expanded in SDR# left panel and visible
- Make sure 'TETRA Demodulator' is expanded in SDR# left panel and visible

The two above will be remembered by SDR# on restart.
Failure to do this means TETRA Trunk Tracker can't find the information it needs to operate.

Start TETRA Trunk Tracker
 If 1st run:
- Select 'Base Frequency' from drop down list.
- Input a CC Park Carrier #. (This must be the CC frequency to monitor.)
- If you know your offset then change otherwise leave it (+12.5KHz).
   see "TTT_Features_and_Usage.pdf" for how to find your offset.
- Set 'VC Volume' to desired level. (default = 47 db)
- Configure "Checkbox Detection"
  Don't skip this or TETRA Trunk Tracker will not be able to pre-configure SDR# and you will need to configure SDR# yourself every time.

Click **Start**

After starting TETRA Trunk Tracker and SDR# the following should occur:
- 'Net Remote' 'Network' should now be enabled for SDR#. And green indicator now seen.
- SDR# will be set to frequency as set in 'CC Park'
- SDR# will be set to WFM and bandwidth of 26000
- SDR# will be set to Volume to 25db (mute). Will change to value in 'VC Volume' when call is active.
- SDR# will start playback.
- The 'TETRA Demodulator' window 'Network Info' should open for SDR# then minimise.
  (This needs to be open)
- Should see in top status log "GSSI loaded for this MNC network: 0"
- Should see in event window "No MCC/MNC/LA seen"

Should now see the network MNC: and LA in "Call Details" and calls now start to be processed.

"Network Info" Window MUST be left open. (Minimised is OK, but not closed.)

TETRA Trunk Tracker – Running (Simple version)
- Start SDR#
- Start TETRA Trunk Tracker (then click **start**)

Windows 10 requirement: Run TETRA Trunk Tracker with elevated privileges "Run as Administrator"
 - **Not sure if this is still required for simple version.**

Shut-down
Close **TETRA Trunk Tracker**
Stop and close **CC SDR#**
Stop and close **VC SDR#**

Configuring Checkbox Detection:

see "Checkbox_Detection_details.txt" for more details on why this is needed.

The default values are for Windows 7 Aero/Basic theme.

With SDR# and TETRA Trunk Tracker running:

SDR#:
Make sure TETRA Demodulator panel is expanded and checkboxes visible with no other windows covering them.
- **We only need VC SDR# to calibrated too.**

TETRA Trunk Tracker:
- Click '**C**' in the option tabs.
- Should say "'Demodulator' and 'Auto' are Visible" and buttons will be enabled. If not go back to SDR# above.
- Whatever that state of 'Demodulator' checkbox. Click matching button 'Set ?'
- Change state of 'Demodulator' checkbox to opposite state of previous. Click matching button 'Set ?'
- Bottom line should indicate state of 'Demodulator' checkbox. Change checkbox state to validate with this line.

NOTE: When validating checkbox, move mouse off checkbox or it will give false reading.
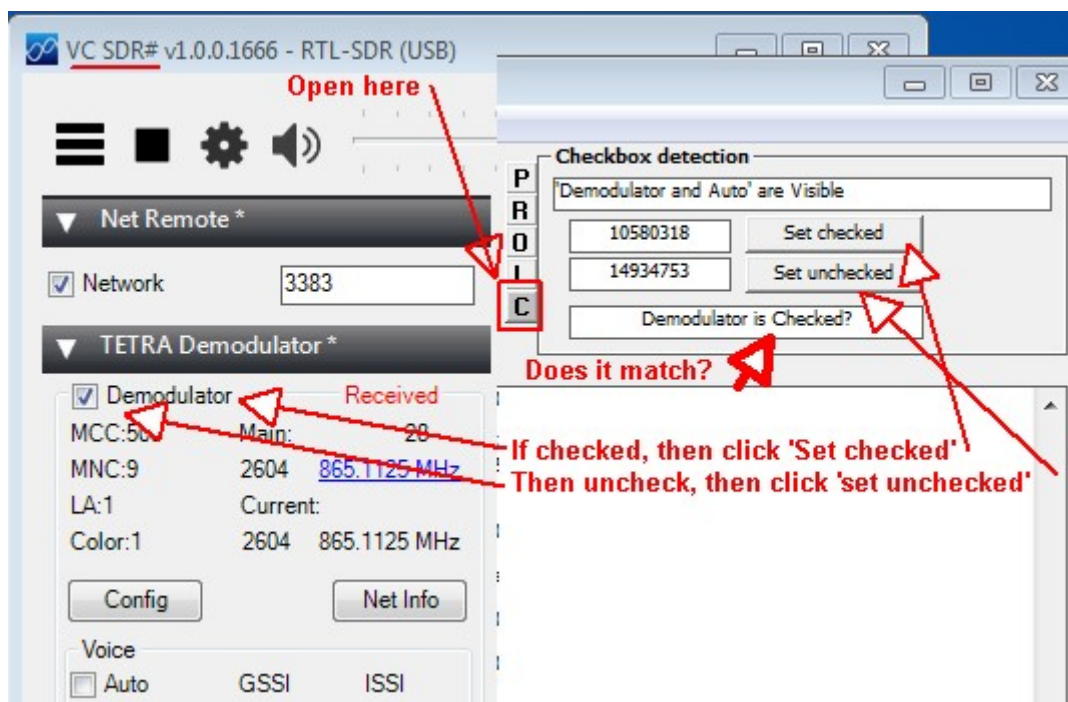
Configuring for Recording calls:

Two methods exist for recording. (see following sections)
Once selected method is chosen and set-up, select record mode in TETRA Trunk Tracker.
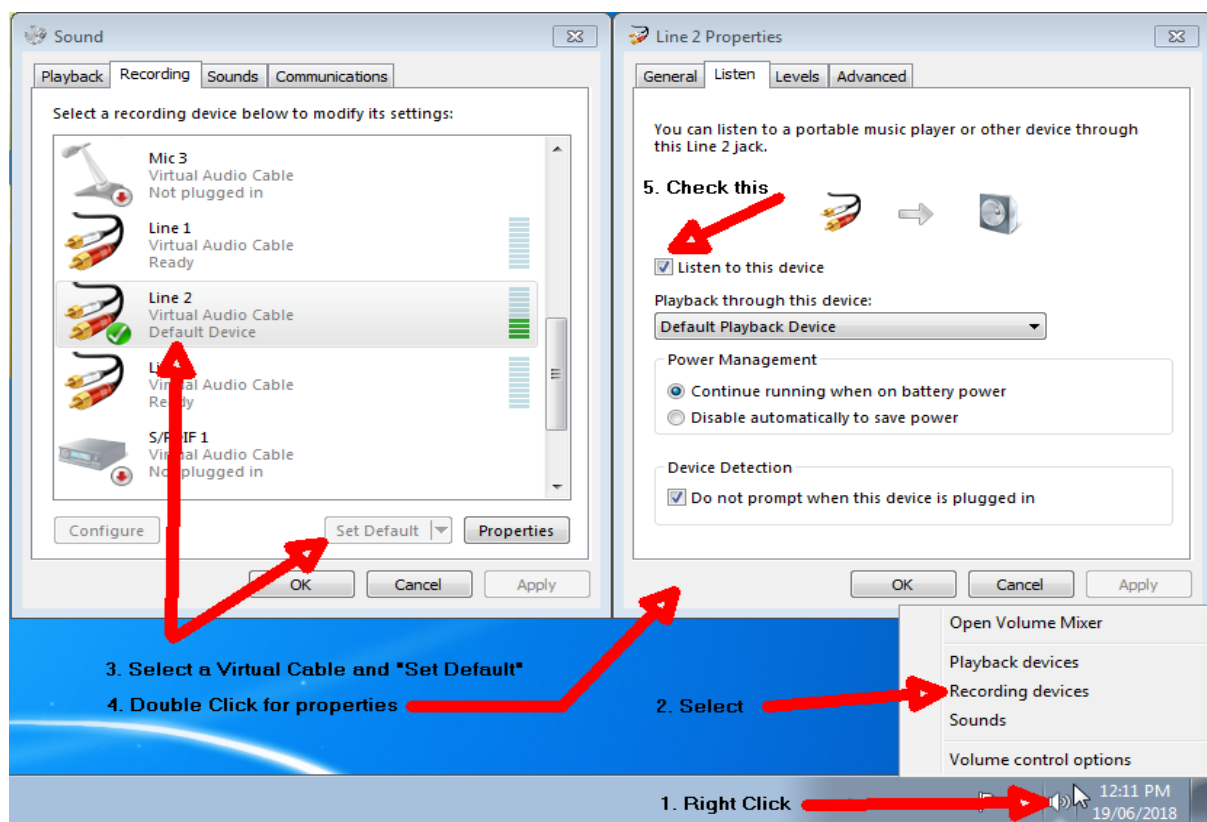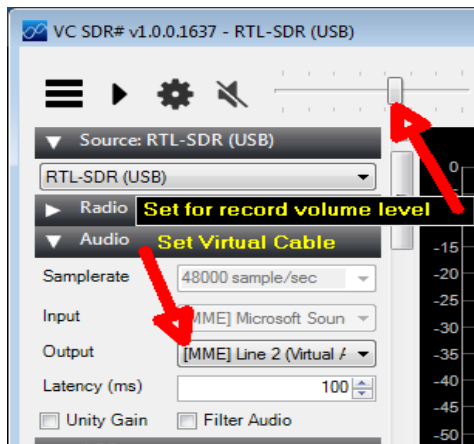
Recoding Audio set-up (Method #1)
So long as WAVE is the default recording device, TETRA Trunk Tracker will record call.
NOTE: This method will also record any system sound (Method 2 is better)

Recoding Audio set-up (Method #2)
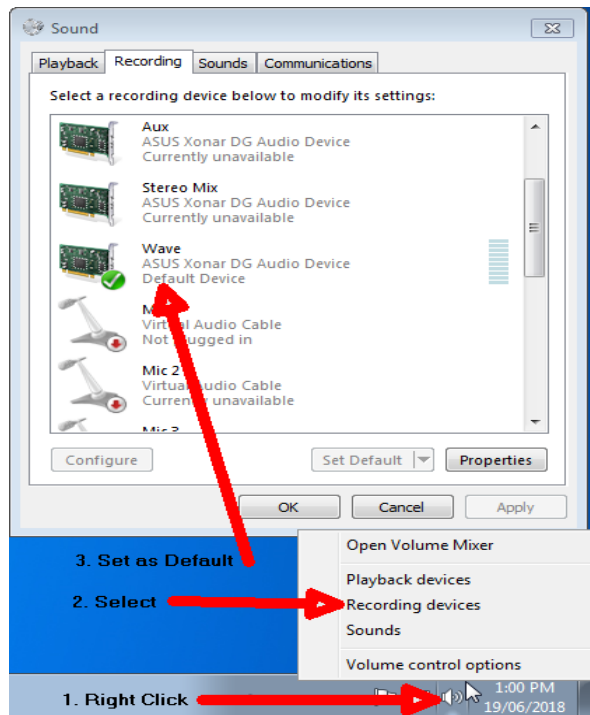
You must have a Virtual Audio Cable Installed.

In SDR# set audio output device. Set volume in TETRA Trunk Track now, NOT SDR# as shown.

#5 "Listen to this device" must be used to hear the calls when using a Virtual Audio Cable (e.g. Line 2). Disable it if you wish to do something else with PC. i.e. Playback calls. Calls will still be recorded when disabled.

BUG:

TETRA Demodulator locks up when changing "Listen to this device" from disabled to enabled. A workaround would be to disable "Demodulator" for both CC, VC then switch "Listen to this device". Then enable "Demodulator" for CC, VC again.

Problems/issues/bugs/limitations

Currently on some OS (windows), two errors are seen from TETRA Demodulator plug-in.
- System.InvalidOperationException: Collection was modified after the enumerator was instantiated.
- System.NullReferenceException: Object reference not set to an instance of an object.

This occurs after a random amount of time when 'Network Info' windows are open. These error pop-ups may prevent
TETRA Trunk Tracker from selecting timeslot while these are present. (Clicking 'Continue' in pop-up continues OK)
These errors are not caused by TETRA Trunk Tracker, but it may make them appear more often.
You can use the little utility I made call "TETRA pop-up error dismisser" to automatically close these dialogs.

Limitations:
As this is alpha stage, as is the TETRA Demodulator plug-in, this program can/will break on new release of the plug-in.

Sorting of G/SSIs is only done on program start-up, and does delay start a little. Larger lists will take longer.

Possible that large numbers of GSSI/SSI could eat too much RAM.
 - Each GSSI entry is 42 bytes (1 million entries would be 42Mb
 - Each SSI entry is 50 bytes (1 million entries would be 50Mb)

For now Individual calls are treated as group calls. All SSIs seen in Individual calls are stored
under GSSI of 0. (I have not seen Individual calls to properly test.)

Probably many more.

Bugs:
A very rare random WinSock error using Net Remote comms. While this occurs, code is in place to reset and continue on.

TETRA Demodulator locks up when changing "Listen to this device" (from method 2 call recording) from disabled to enabled. A workaround would be to disable "Demodulator" for both CC, VC then switch "Listen to this device". Then enable "Demodulator" for CC, VC again.

 Probably many more.

Necessary Disclaimer:
- **This program is "as is"**
- **This program is alpha experimental. It most probably contains errors, bugs or whatever and that it may crash   itself, SDR#, the plug-ins, windows or your car. You accept that you use it at your own risk.**
- **I make no promises to update it or support it.**
- **I'm under no obligation to implement anything.**
- **The creators of SDR# and the plug-ins TETRA Demodulator (by TSSDR) and Net Remote have the right to change there code as they see fit. Because of this, the program can and probably will break.**
- **Not reading readme/set-up and usage files may cause you issues.**