



# Inpixon Sniffer User Guide

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## Document History

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## 1. Introduction

The Sniffer is a tool to monitor the communication of any Inpixon brand RF nodes. The Sniffer can monitor any RF traffic depending on the transmission settings of the Chirp or UWB radio module. The number of observed nodes depends on total number of nodes within radio range, radio conditions and nodes settings.

The Sniffer is available in three variants, Sniffer-c V2 for Chirp (Part number: SNSWABEES), Sniffer-c V3 for Chirp (Part number: KN03SNILE) and Sniffer-u-v1 for UWB (Part number: KN02SNIER). The Sniffer GUI described in this document is used for both. Either version of the Sniffer comprises the following three components according to the RF technology:

1. A PC-Application with a **G**raphical **U**ser **I**nterface (GUI) which will be referred to as *Sniffer GUI* in the remainder of this document.
2. A firmware for the appropriate RF-technology and hardware version which will be referred to as *Sniffer-c firmware* (for both HW versions of Chirp) and *Sniffer-u firmware* (UWB) respectively in the remainder of this document.
3. A breakout board with the appropriate *swarm* bee module mounted, which will be referred to as DK+ board or Dev Board in the remainder of this document.
  - a. Chirp: *swarm bee* LE V2 DK+ (Part number: BN02SWBLP)
  - b. Chirp: Inpixon Swarm Chirp V3 Dev Board (Part number: KN03SWBLE)
  - c. UWB: Inpixon Swarm UWB V1 Dev Board (Part number: BN01SWBEP)

Note: A DK+ board with Sniffer firmware has monitoring capabilities only and thus is not able to initiate ranging requests and communication operations to other nodes, nor will it respond to ranging requests coming from other nodes.

### 1.1. Purpose

This document describes the GUI and the handling of the Sniffer prerequisites.

## 2. Hardware Platform

To enable the Sniffer to monitor the radio communication between nodes, a standard Dev Board with a dedicated Sniffer firmware (FW) is required. This FW is provided by Inpixon. The connection to a PC is done via an USB cable. (Type A – Type Mini USB for LE V2 DK+ and ER DK+ and Type A – Type Micro USB for Inpixon Swarm Chirp V3 Dev Board).



Figure 2-1 LE V2 DK+ Board

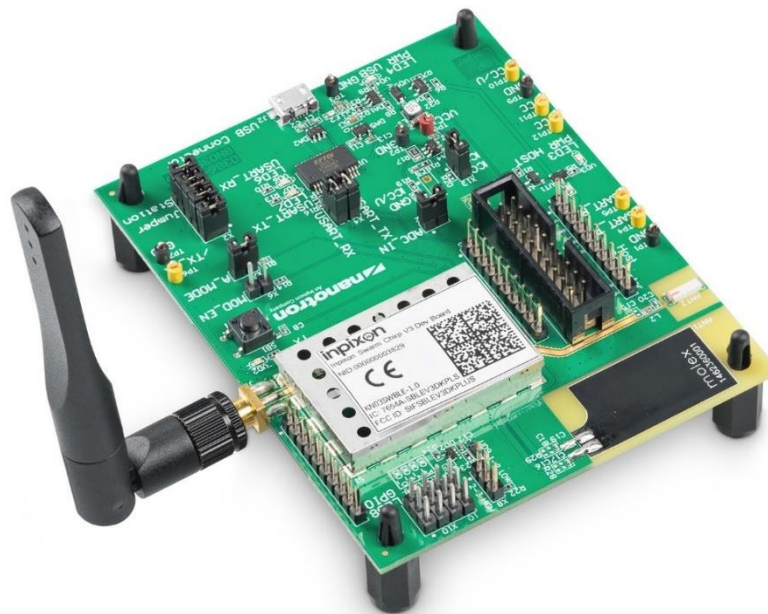


Figure 2-2 Inpixon Swarm Chip V3 Dev Board

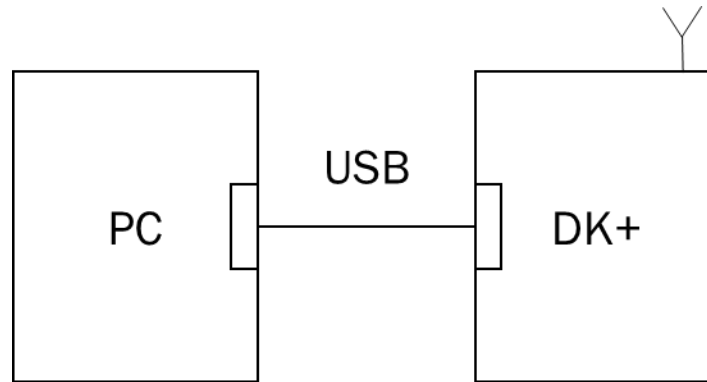


Figure 2-3 Connection PC – DK+

Depending on the RF-technology you want to investigate (UWB or Chirp), we recommend using the appropriate Inpixon hardware to monitor the chosen signal type (see Section 1).

## 2.1. Firmware

A dedicated *Sniffer* firmware is required to enable the designated DK+ board to monitor the *swarm*. Please refer to section 3.2 for proper installation if required. For *swarm* bee LE V2, Sniffer-c V2 firmware with version 1.0.5 or higher is required. For *swarm* bee LE V3, Sniffer-c V3 firmware with version 1.0.5 or higher is required. For *swarm* bee ER, Sniffer-u-v1 firmware with version 1.0.1 or higher is required.

## 2.2. Software

Installation of the application requires Microsoft® Windows® 10 or later with a 2.0 GHz dual-core processor or equivalent and 2 GB memory. Also, a PC with an USB port is required.

# 3. Installation

**Note:** To obtain optimal results, the firmware provided with the installation file shall always be used. Always refer to section 2.1 for minimum firmware version required.

## 3.1. Windows Software (GUI)

Download the installation file from our e-library. <https://www.nanotron.com/elibrary/> or an alternative URL provided by Inpixon.

Open the downloaded installation file and follow the instructions.

## 3.2. FW

How to flash the DK+ board with the Sniffer firmware or vice versa is explained in document [2]. Please assure that you are using the correct image file before flashing. Otherwise, you may obtain unpredictable results or behavior.

## 4. Sniffer GUI and Handling

### 4.1. Overview

After the Sniffer has started, the window as shown in Figure 4-1 appears. Apart from the menu bar, two toolbars are displayed. The “Main Toolbar” serves to open, save, close a capture file session in offline mode or to start, stop an online live capture session. The “Filter Toolbar” is used to filter the captured raw data to minimize the information to the desired amount. The status bar displays if the application is connected to a DK+ board. The window has two frames. The “Short View” displays one event per line in a condensed manner while the “Detailed View” displays all the data belonging to the one selected line of the “Short View”.

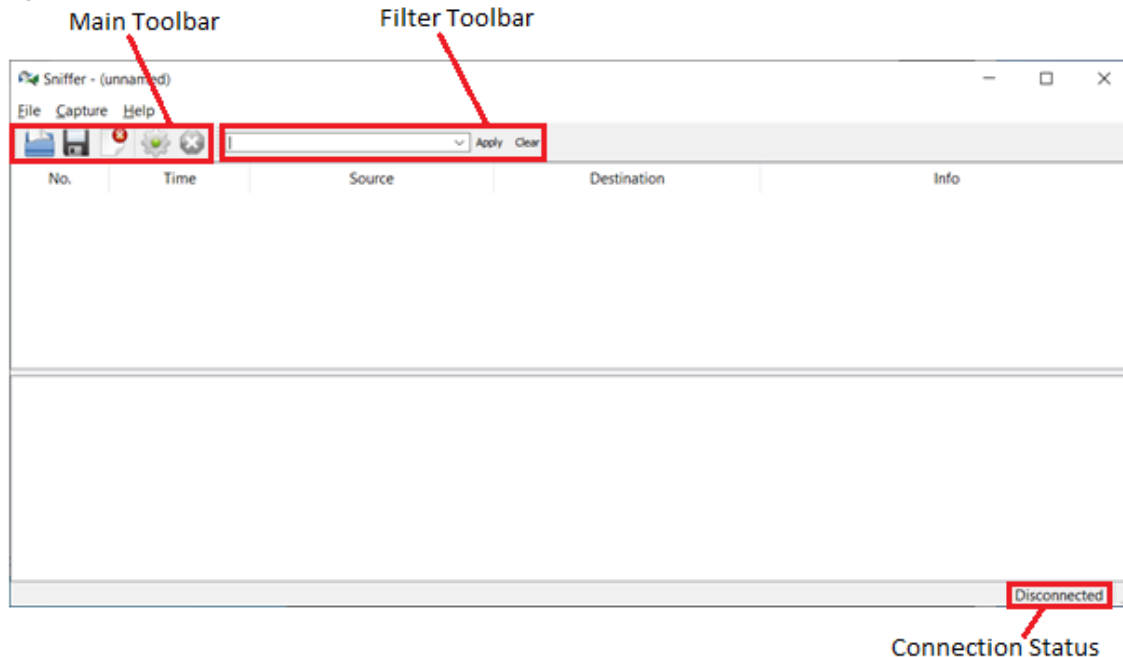


Figure 4-1 Opening window

### 4.2. Offline Mode

The offline mode allows to analyze the captured data from a file which has been saved before or when the live capture has been stopped. The data may be filtered, and the capture can be saved filtered or as raw data to a file.

### 4.3. Online Mode

The online mode is used to monitor and analyze real-time live data. The live monitoring is started and stopped using the Start/Stop in Capture settings in the Menu Bar.



## 4.4. Menu Bar

### 4.4.1. File

In the offline mode it is possible to playback a capture from a file which has been saved before or to save the filtered (refer to Section 5 for details about filtering) or unfiltered content of the current capture.

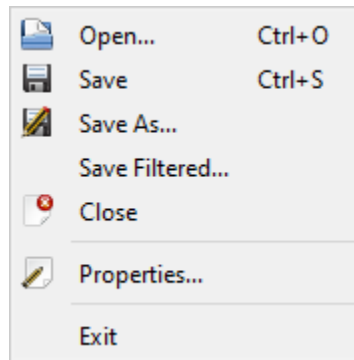







Figure 4-2 Inpixon Sniffer GUI Menu Bar - File

Table 4-1: Inpixon Sniffer GUI Menu Bar - File

Function	Description
 Open...	Opens a file
 Save	Saves file unfiltered
 Save As...	Saves file unfiltered under another name or folder
Save Filtered	Like Save as..., but with the current filter setting
 Close	Closes the current session
 Properties...	Displays the file properties
Exit	Exits the application

### 4.4.2. Capture

The live monitoring can be started and stopped with the capture settings.

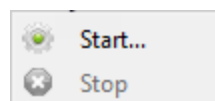




Figure 4-3 Inpixon Sniffer GUI Menu Bar – Capture

Table 4-2: Inpixon Sniffer GUI Menu Bar - Capture

Function	Description
 Start...	Starts online capture
 Stop	Stops online capture

### 4.4.3. Help

Shows the version of the Inpixon Sniffer GUI software.

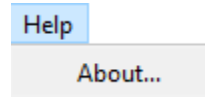


Figure 4-4 Inpixon Sniffer GUI Menu Bar – Help






## 4.5. Tool Bar

The Tool Bar allows quick access to particular settings.



Figure 4-4 Inpixon Sniffer GUI Tool Bar

Table 4-2: Inpixon Sniffer GUI Tool Bar

Function	Description
 Open	Opens a file
 Save	Saves the file
 Close	Closes the current session
 Start	Starts the capture session
 Stop	Stops the capture session

## 4.6. Capture Settings

Before starting a capture session, some elementary parameters shall be set.

For Sniffer-c firmware, the parameters are listed in Table 4-3. (Figure 4-5 shows the corresponding Capture Parameters window). Please refer to the corresponding device datasheet for supported modes on the device you want to capture data from.

Table 4-3: Inpixon Sniffer GUI Capture parameters for swarm bee LE

Parameter	Description
Serial interface	COM Port on which the DK+ board is connected to
Transmission mode	Transmission mode to listen to 80/1, 80/4 or 22/4
Channel number	Channel number to listen to. This is only needed for transmission mode 22/4
Synchronization word	Syncword to trace
Capture filter	Optionally filter settings as explained in section 5
FEC	If FEC is applied or not

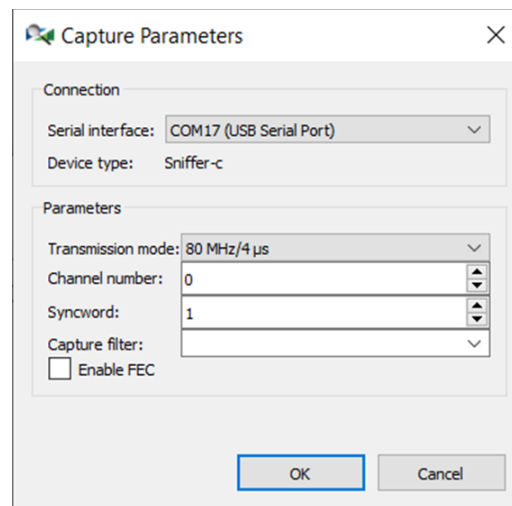


Figure 4-5 Capture parameters Sniffer-c firmware

**Note:** Depending on the FW of the monitored nodes the range of the Syncword may change.

FW: 2.1 range [0-8]

FW: 3.0 range [0-12]

For Sniffer-u firmware, the parameters are listed in Table 4-4. (Figure 4-6 shows the corresponding Capture Parameters window).

Table 4-4: Inpixon Sniffer GUI Capture parameters for swarm bee ER

Parameter	Description
SDMD	Select transmission mode according to <i>swarm</i> bee ER specification
All others	Details according the selected transmission mode are shown below the SDMD field. These cannot be changed. They are provided for informational purpose only

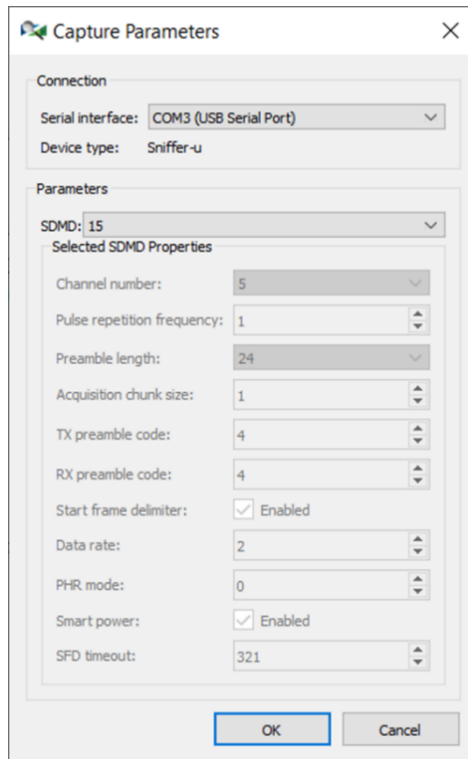


Figure 4-6 Capture parameters Sniffer-u firmware

If no device is attached or the device attached does not have any Sniffer firmware, the device type will be indicated as N/A (not available). The capture Parameters window then looks like shown in Figure 4-7.

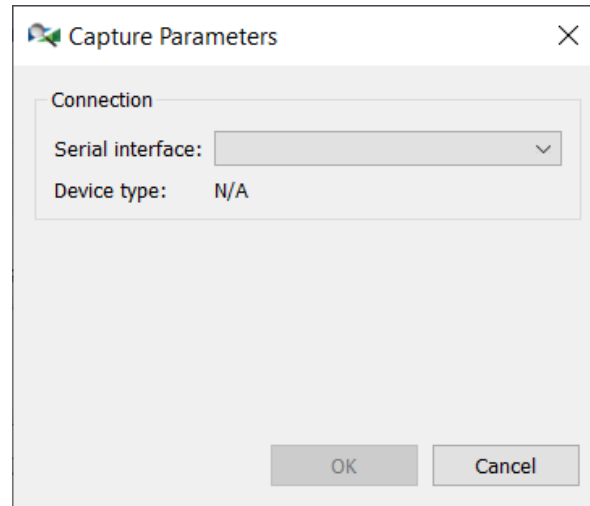


Figure 4-7 Capture parameters window with unknown device type

## 4.7. Capture View

### 4.7.1. Short View

The “Short View” displays one event per line in a condensed manner. Each column provides the following information listed in Table 4-5.








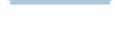




Table 4-5: Inpixon Sniffer GUI Short View Description

Parameter	Description
No.	Current sequence number
Time	Timestamp of the event generated by the DK+ board hh:mm:ss.ms
Source	Source node address
Destination	Destination node address
Info	Brief information of the event

**Note:** The destination address FF:FF:FF:FF:FF:FF is used by broadcast messages

The colors have following meanings listed in Table 4-6.

Table 4-6: Inpixon Sniffer GUI Messages Color Code

Color	Description
Plum (  )	Swarm ranging result
Deep-Pink (  )	Swarm ranging error
Lawn-Green (  )	ISO blink
Navjo-White (  )	Ranging step 0 of Swarm Chirp and UWB
Orange (  )	All other ranging steps of Swarm Chirp and UWB
Light-Blue (  )	Swarm Chirp Broadcast (pacer and TDOA blinks) Swarm UWB data packet (pacer and TDOA blinks)
Light-Steel-Blue (  )	AIR protocol of Swarm Chirp and UWB
Deep-Sky-Blue (  )	Asset Tag TDOA Blink
Light-Sky-Blue (  )	Asset Tag AIR protocol
Seashell (  )	Swarm Chirp and UWB flashme packet
Blanched-Almond (  )	FOTA Chirp and UWB packet
Bisque (  )	FOTA Chirp and UWB status packet

No.	Time	Source	Destination	Info
51	01:55:59.739	00:00:11:01:4f:12	ff:ff:ff:ff:ff:ff	swarm Node Id Notification
52	01:55:59.741	00:00:59:04:75:c4	00:00:11:01:4f:12	Ranging 3W_A step 0
53	01:55:59.743	00:00:11:01:4f:12	00:00:59:04:75:c4	Ranging 3W_A step 1
54	01:55:59.744	00:00:11:01:4f:12	00:00:59:04:75:c4	Ranging 3W_A step 2
55	01:55:59.748	00:00:59:04:75:c4	ff:ff:ff:ff:ff:ff	Ranging result: 0.00m [00:00:59:04:75:c4->00:00:11:01:4f:12]

Figure 4-8 Short View Sniffer-c Firmware

The output of Sniffer-u firmware looks very similar to the Sniffer-c firmware. The address format has 8 bytes instead of 6 bytes.

No.	Time	Source	Destination	Info
230	00:58:55.687	00:00:00:00:00:00:39:17	ff:ff:ff:ff:ff:ff:ff:ff	swarm Node Id Notification
231	00:58:55.689	00:00:00:00:00:00:38:dd	00:00:00:00:00:00:39:17	Ranging 3W_A step 0
232	00:58:55.690	00:00:00:00:00:00:39:17	00:00:00:00:00:00:38:dd	Ranging 3W_A step 1
233	00:58:55.692	00:00:00:00:00:00:38:dd	00:00:00:00:00:00:39:17	Ranging 3W_A step 2
234	00:58:55.693	00:00:00:00:00:00:39:17	00:00:00:00:00:00:38:dd	Ranging 3W_A step 3
235	00:58:55.697	00:00:00:00:00:00:38:dd	ff:ff:ff:ff:ff:ff:ff:ff	Ranging result: 1.07m [00:00:00:00:00:00:38:dd->00:00:00:00:00:39:17]

Figure 4-9 Short View Sniffer-u Firmware

## 4.7.2. Detailed View

The “Detailed View” gives detailed information of the selected event line in the “Short View”. An example of a ranging result for *swarm* bee Chirp (Figure 4-10) and *swarm* bee UWB (Figure 4-11) is shown below.

```

General information
Packet number: 20
Time: 00:00:19.843
Source: 00:00:00:00:4a:3e:76:3a
Destination: ff:ff:ff:ff:ff:ff:ff:ff

Raw data
Frame type: 3
Packet type: 0
Length: 54
Data:
0000 02 13 08 32 30 75 00 01 00 61 20 01 00 00 27 15 ...20u...a...'.
0010 01 2e 00 04 0f 02 27 00 03 28 00 2a 00 ec 03 05 .....(.*....
0020 86 4e 1d 00 00 00 00 4a 3e 76 3a 00 00 20 6f af .N.....J>v:...o.
0030 07 00 00 00 00 cd .....

Packet type analysis
Broadcast frame: true
Data packet: true

TD0A Blink
Blink ID: 8
TD0A Length: 50
Blink Interval: 30000
RX Slot: 1

swarm Packet
Protocol: 97
Version: 32
Device Class: 1
Power Mode: 0
Wakeup Reason: 0
Length: 39

swarm Sensors
Battery Voltage: 4.600000000000005
GPIO: 15
Temperature: 39
Acceleration X: 0.04
Acceleration Y: 0.042
Acceleration Z: 1.004
Timestamp: 1920646

swarm Ranging Result
Error Code: 0
Source: 00:00:00:00:4a:3e:76:3a
Destination: 00:00:00:00:20:6f:af:07
Range: 0
RSSI: -51
User Data:

```

Figure 4-10 Detailed View for Dev Board with Sniffer-c Firmware

General information	
Packet number:	214
Time:	00:26:28.622
Source:	00:00:00:00:00:00:38:dd
Destination:	ff:ff:ff:ff:ff:ff:ff:ff
Raw data	
Pan Id:	0x6e6e
Frame Control:	0xc841
Packet type:	4
Length:	54
Data:	
0000	02 13 01 32 30 75 00 01 00 61 20 01 00 00 27 15 ...20u...a....'
0010	01 2d 00 04 0f 02 1e 00 03 e1 ff 6d 00 b8 03 05 ..-.....m....
0020	4c 42 07 00 00 00 00 00 00 38 dd 00 00 00 00 39 LB.....8.....9
0030	17 5f 00 00 00 ad .....
Packet type analysis	
Data frame:	true
Blink packet:	true
TD0A Blink	
Blink ID:	1
TD0A Length:	50
Blink Interval:	30000
RX Slot:	1
swarm Packet	
Protocol:	97
Version:	32
Device Class:	1
Power Mode:	0
Wakeup Reason:	0
Length:	39
swarm Sensors	
Battery Voltage:	4.5
GPIO:	15
Temperature:	30
Acceleration X:	-0.031
Acceleration Y:	0.109
Acceleration Z:	0.9520000000000001
Timestamp:	475724
swarm Ranging Result	
Error Code:	0
Source:	00:00:00:00:00:00:38:dd
Destination:	00:00:00:00:00:00:39:17
Range:	0.9500000000000001
RSSI:	-83
User Data:	

Figure 4-11 Detailed View for Dev Board with Sniffer-u Firmware



## 5. Filter

Two menus are offered for filtering. "Apply Filter" and "Prepare Filter". The "Apply Filter" is used to filter a single condition and to apply the setting. Alternatively, it can be used when a suite of conditions has been set by the "Prepare Filter" to add the last condition and apply the whole setting. The "Prepare Filter" is used to concatenate several logical conditions. Moreover, the filter line can be edited to refine or to create more complex settings.

### 5.1. Apply Filter

To filter a particular item, position the mouse cursor to the row and line of this item in the "Short View" and click the right mouse button. Then:

Apply Filter -> Selected

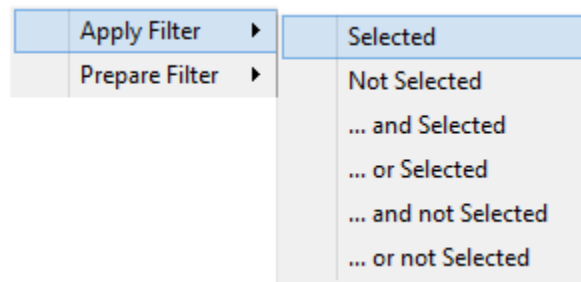


Figure 5-1 Apply Filter

In the case it is the last condition of concatenated conditions, select the appropriate logical operation after "Apply Filter". This will close and apply the setting immediately.

E.g.: Cond\_1 or Cond\_2

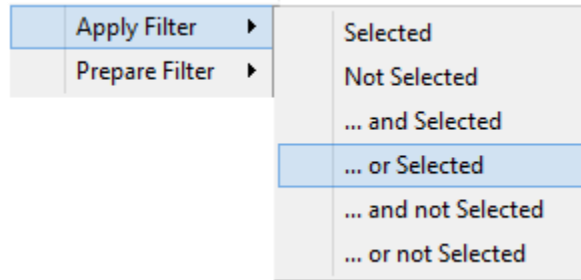


Figure 5-2 Apply Filter with "or" condition

**Note:** It is also possible to select an item in the "Detailed View" as filter condition

## 5.2. Prepare Filter

“Prepare Filter” is used to concatenate several logical conditions. The principle is the same as for the “Apply Filter” except it won’t apply the settings immediately. The filter line is left open and a new condition can be added. To apply the settings, press the “Apply” button next to the filter line or alternatively use “Apply Filter” as last step as explained in the previous section.

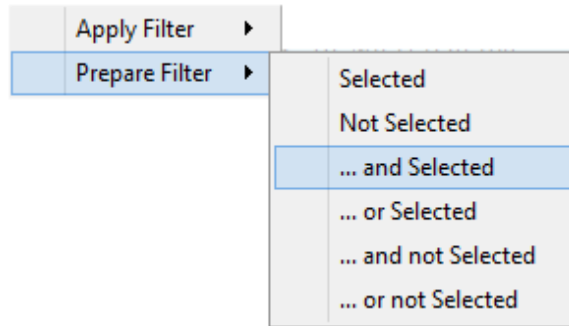


Figure 5-3 Add Filter with "and" condition

## 5.3. Example

This example shows how to filter the ranging steps 0 to 2.

No.	Time	Source	Destination	Info
1	00:46:15.272	00:00:59:04:75:c4	ff:ff:ff:ff:ff:ff	swarm Id Notification
2	00:46:15.273	00:00:11:01:4f:12	00:00:59:04:75:c4	Ranging 3W_A step 0
3	00:46:15.274	00:00:59:04:75:c4	00:00:11:01:4f:12	Ranging 3W_A step 1
4	00:46:15.275	00:00:59:04:75:c4	00:00:11:01:4f:12	Ranging 3W_A step 2
5	00:46:15.279	00:00:11:01:4f:12	ff:ff:ff:ff:ff:ff	Ranging result: 0.00m [00:00:11:01:4f:12->00:00:59:04:75:c4]
6	00:46:18.244	00:00:11:01:4f:12	ff:ff:ff:ff:ff:ff	swarm Node Id Notification

Figure 5-4 Original Screen

1. Move mouse pointer to row 2, info field Prepare Filter -> Selected
2. Move mouse pointer to row 3, info field Prepare Filter -> ... or Selected
3. Move mouse pointer to row 4, info field Apply Filter -> ... or Selected

No.	Time	Source	Destination	Info
2	00:46:15.273	00:00:11:01:4f:12	00:00:59:04:75:c4	Ranging 3W_A step 0
3	00:46:15.274	00:00:59:04:75:c4	00:00:11:01:4f:12	Ranging 3W_A step 1
4	00:46:15.275	00:00:59:04:75:c4	00:00:11:01:4f:12	Ranging 3W_A step 2
7	00:46:18.246	00:00:59:04:75:c4	00:00:11:01:4f:12	Ranging 3W_A step 0
8	00:46:18.248	00:00:11:01:4f:12	00:00:59:04:75:c4	Ranging 3W_A step 1
9	00:46:18.249	00:00:11:01:4f:12	00:00:59:04:75:c4	Ranging 3W_A step 2
12	00:46:20.275	00:00:11:01:4f:12	00:00:59:04:75:c4	Ranging 3W_A step 0
13	00:46:20.277	00:00:59:04:75:c4	00:00:11:01:4f:12	Ranging 3W_A step 1
14	00:46:20.277	00:00:59:04:75:c4	00:00:11:01:4f:12	Ranging 3W_A step 2

Figure 5-5 Filtered Screen

## 5.4. Edit Filter

To refine or to create complex filter settings, it is possible to edit the setting in the filter line of the “Filter Toolbar”.



Figure 5-6 Filter Line

One way is to type the filter expression by hand or to use the “Prepare-, Apply Filter” tool to gather the correct parameters and to apply manually the necessary changes like brackets to group conditions or logical operators.

### 5.4.1. Reset Filter

To reset the current filter, press the “Clear” button. This will clear the expression in the filter line. It is then necessary to press the “Apply” button.

### 5.4.2. Example

This example will change the filter from Ranging Step 0 to 2.

Looking at Figure 5-4 select pointer 1 and apply. The result is displayed below

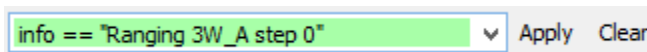


Figure 5-7 First Step

Replace 0 by 2 and press “Apply”

**Note:** If an expression cannot be parsed, the background color becomes pink and it is not possible to “Apply”

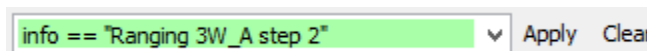


Figure 5-8 Second Step

More details about the syntax and the field properties can be found in document [1]

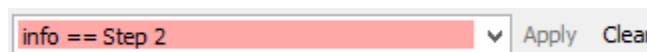


Figure 5-9 Incorrect Expression

## 6. Capture Properties

The properties of the current capture (live or file) can be displayed. These are mainly the settings as explained in section [4.6](#). This can be meaningful when the capture settings are unknown or forgotten.

From the Menu Bar: File -> Properties

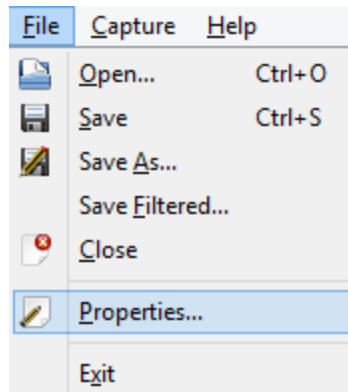


Figure 6-1 Open Properties

An example for the properties window for Chirp is shown in Figure 6-2. An example for UWB in Figure 6-3. The difference are the transmission mode parameter which are apparently different for *swarm* bee Chirp and *swarm* bee UWB.

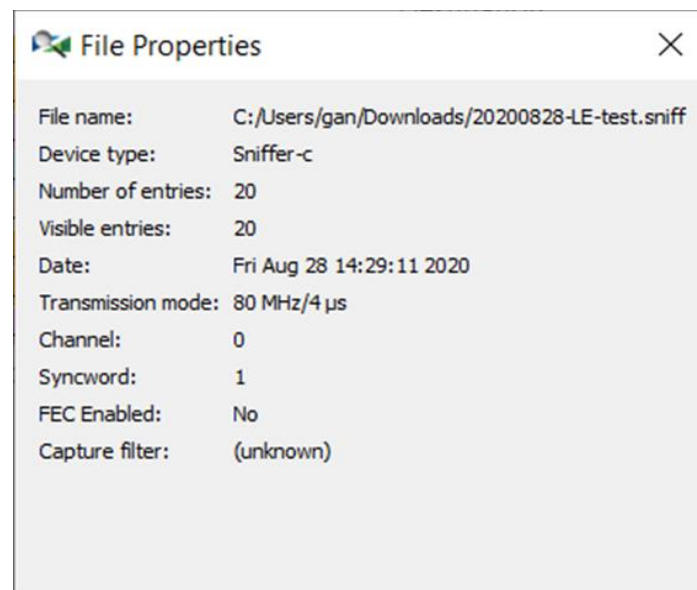


Figure 6-2 Properties Chirp

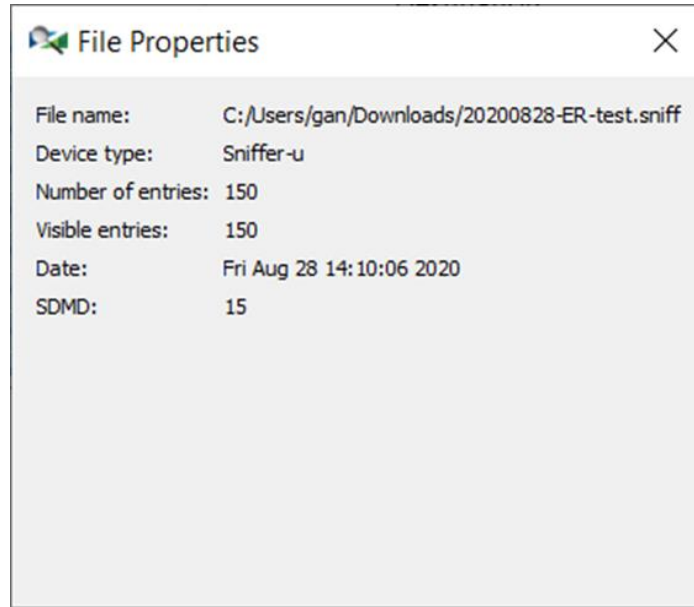


Figure 6-3 Properties UWB

## 7. References

- [1] Sniffer Filter Expression NA-16-0356-0044
- [2] AN0507 *swarm* bee LE Firmware Update NA-14-0267-0017-1.0

## Life Support Policy

These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Inpixon (including its affiliates and subsidiaries) customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify for any damages resulting from such improper use or sale.

## About Inpixon

Inpixon® (Nasdaq: INPX) is the innovator of Indoor Intelligence™, delivering actionable insights for people, places and things. Combining the power of mapping, positioning and analytics, Inpixon helps to create smarter, safer, and more secure environments. Inpixon customers can take advantage of industry leading location awareness, RTLS, workplace and hybrid event solutions, analytics, sensor fusion and the IoT to create exceptional experiences and to do good with indoor data.

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