# Frontline X240$^{TM}$ Protocol Analyzer
## *Quick Start Guide*

# 1 Introduction

Use this document for quick installation and setup.

Frontline® X240$^{TM}$ is capable of capturing and demodulating all RF channels and packet types defined in all released Bluetooth specifications and beyond. The user is not required to specify the addresses of the devices to be captured or their roles (central or peripheral) during the connection lifetime. Prior to capturing the data the user does not need to enter any information (PIN, OOB, long term key, link key) used to encrypt or decrypt data. X240$^{TM}$ provides live capture of all 79 Classic Bluetooth channels or 40 Bluetooth low energy channels storing data for both live and post-capture analysis. This quick start guide provides sufficient information to begin data capture. Detailed hardware and software information is contained in the *Wireless Protocol Suite Hardware and Software User Manual*. The manual is available on FTE.com.



**Frontline X240$^{TM}$ Protocol Analyzer**

# 2 Components

Inspect the received shipping container for any damage. Unpack the container and account for each of the system components listed on the accompanying packing list. Visually inspect each component for absence of damage. In the event of damage, notify Teledyne LeCroy. Retain all shipping materials for shipper's inspection. The X240$^{TM}$ hardware does not contain any user serviceable items. Any repairs and maintenance must be performed by a service technician that has been trained and approved by Teledyne LeCroy. Before any service is performed on X240$^{TM}$, all power sources must be removed. This includes disconnecting any USB cables. The user should use the AC power supply and car adapter included with the X240. USB Type C power must be provided via PD.
The analyzer package includes the following components in addition to the X240:

| Qty | Description | Qty | Description |
|---|---|---|---|
| 1 | 5V @ 3A PowerPort C 1 Type C PD Power Supply | 1 | 6' Ethernet Cable, CAT 6 (1 Gbps), BLACK |
| 2 | 3' USB 3.0 Type C to C cable | 3 | RF 2.45GHZ/5.3GHZ WHIP TILT Antenna |
| 1 | 3' USB 3.0 Type C to A cable | 1 | USB Car Charger PD |

# 3  Computer System Requirements

## Supported Systems

- Operating System: Windows 10 and 11
- USB: USB 2.0 and later

## Minimum Requirements

- Processor: Core i5 at 2.7 GHz
- RAM: 4 GB
- Free Hard Disk Space on C: drive: 20 GB

## Install Software

- From Download: Download the latest Wireless Protocol Suite installer from FTE.com. http://fte.com/x240-soft. Once downloaded, double-click the installer and follow the directions. When the installation is complete pin the Wireless Protocol Suite icon to your taskbar.

# 4  Front Panel Controls and Connectors

Front panel controls:

Frontline X240 front panel is shown below. The panel provides controls to power up and shut down the Frontline X240 hardware, and it provides indicators to show the power and capture status.

## 1. Front Panel Connectors

### Frontline X240 Front Panel Controls and Indicators



Antenna Connector SMA (Partially Hidden In View)

Antenna Connector SMA (Hidden In View)

Antenna Connector SMA (Partially Hidden In View)

Power Button and Indicator

Status Indicator

RF Overload Indicator

Oculink connectors

Excursion Mode
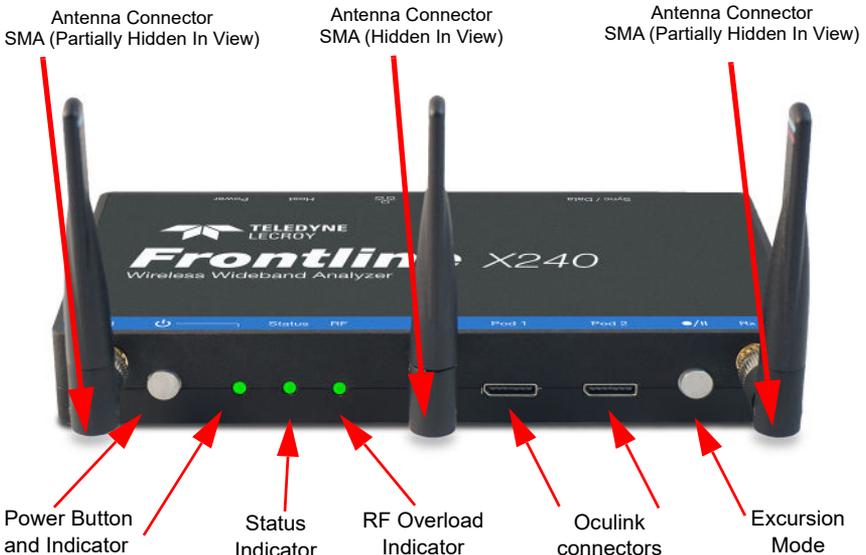
**Power On/Off Button**: Press and release the button to power on or power off the system.

**Status Indicators**: Colored LEDs show the status of power and capture.

**Table 1: X240 Front Panel Status Indicators**

| Indicator | Color | State | Status Indicated |
|-----------|-------|-------|------------------|
| **Power** | Blue | Constant | Unit is connected to power source but powered off. |
| | Purple | Constant | Insufficient Power |
| | Green | Constant | Unit is switched on. |
| | Red | Fast Flash | Unit is approaching its maximum thermal load and should be shut down. |
| | | Constant | Unit has reached thermal overload or Unit has started a controlled/sequenced shutdown. |
| **Status** | None | Off | Unit is powered off. |
| | Yellow | Slow Flash | Initializing (may not be seen if initialization is quick). |
| | | Fast Flash | Unit is shutting down. |
| | | Constant | Unit is in Recovery Mode. |
| | Green | Constant | Unit is initialized and ready to capture. |
| | Blue | Slow Flash | Unit is waiting for a Trigger (future). |
| | | Fast Flash | Unit is capturing in Excursion mode or capture is not "OK" (future). |
| | | Constant | Unit is capturing data. |
| | Red | Constant | The unit failed to initialize or has a System Error. |
| **RF** | None | Off | Unit is powered off or Unit is not actively capturing data. |
| | Green | Constant | Unit is capturing Bluetooth data. |
| | Red | Fast Flash | The RF signal is too strong. |

**Antenna SMA Connectors:** Antenna attaching points.

**Excursion Mode**: When configured Excursion mode, pressing this button will begin data capture - the same as the Record/Recording button on the X240 Window Datasource toolbar. The **Excursion Mode** button is inactive when X240 is connected to a computer. To operate in the Excursion mode, the X240 hardware must have been previously configured from the **Wireless Protocol Suite** prior to disconnecting from the computer. The X240 hardware will retain those configuration settings when disconnected from the computer. Refer to the Wireless Protocol Suite Hardware and Software User Manual for Excursion mode operating details.

**Oculink Connectors:** For connection to eight (8) channel PODs used for hardwired connection to user's equipment under test.

**2. Rear Panel Connectors**

The rear panel is shown below. The panel provides connectors for external power and for a connection to the computer hosting the **Wireless Protocol Suite** software.
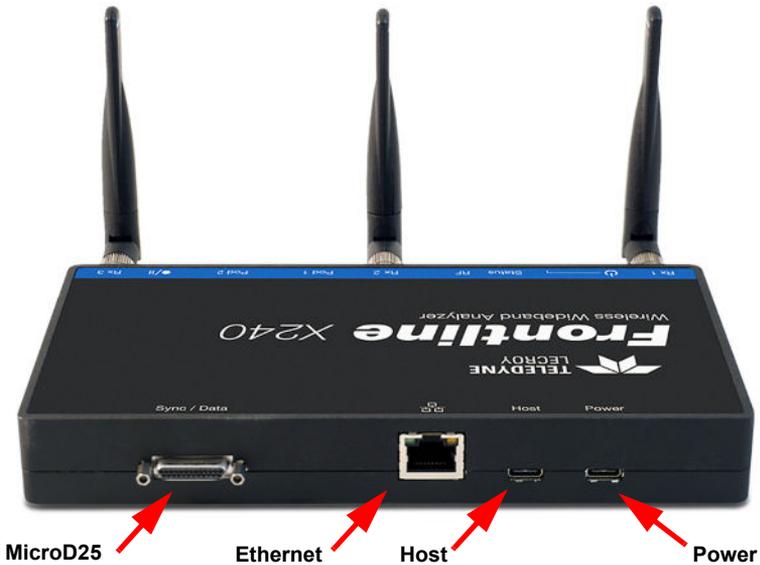


## Frontline X240 Rear Panel Connectors

**Host:** USB C 2.0/3.0 port for connecting X240 to the host computer where the **Wireless Protocol Suite** resides. This connector provides host computer command, control, and data transfer. If the USB cable is connected to a computer with a USB C 3.0 with power delivery or higher then the X240 can be powered through this port as well and will not need a USB cable connected to the Power connector on the X240.

**Power:** Type C PD power adapter - preferably the adapter/s supplied with the X240 is required.

**Ethernet:** The Ethernet connector is for a future release to support PoE (Power over Ethernet) and Host communications.

# 5 Attach Antennas



Antenna Attachment Points
**Frontline X240 Antenna Attachment Points on Front Panel**

Remove the Frontline X240 hardware from the box and attach the three **ANTENNAS** to the SMA connectors on the front panel. The base of the antennas can be carefully rotated by 90 degrees, so that the antenna points upward.

# 6 Applying Power

Teledyne LeCroy recommends that the X240 hardware be powered by the supplied PD adapters or equivalent. Connect the USB C cable to the connector labeled **Power** on the back panel of the X240.

To apply power to X240 hardware depress and release the Power button on the front panel. This action will provide a clean start for X240 hardware. The front panel **Power** indicator LED will be a constant green. Should the front panel **Power** indicator begin blinking red, the X240 hardware is approaching thermal overload temperature between 70° C and 80° C (158° F and 185° F) and should be shutdown. When the hardware reaches thermal overload it will automatically shut down and the **Power** indicator will turn off.

# 7 Recovery Mode

Recovery mode occurs when something prevents the x240 unit from successfully loading the firmware images during power up. In this state, the x240 powers on with an alternate recovery firmware image. When the unit is in recovery mode, the status indicator light is a solid yellow.

In recovery mode, the system prevents the user from capturing data. However, the user can upgrade the firmware. The upgrade process should correct the problem allowing the unit to power on normally. When the Wireless Protocol Suite software starts, the software automatically prompts the user to update the firmware.

# **8** Data Capture Method

Connect a USB C cable to the USB connector labeled **Host** on the back panel of the X240 and the other end of the cable to the Host PC. When the **X240 Analyzer** is connected to the Host PC running the **Wireless Protocol Suite** the **Start Page** window will display the **X240** option.
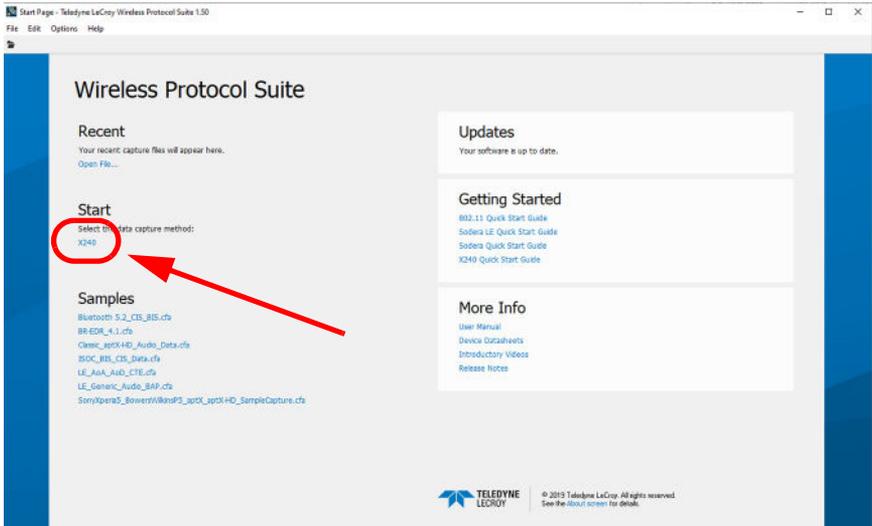


Click on **X240.**

Select **X240** to bring up the **Wireless Protocol Suite window**. The **Wireless Protocol Suite window** icon will be placed in your taskbar, at the bottom of your screen.



When the **Wireless Protocol Suite window** pops up, you will see an Analyzer Toolbar with the following functions:



**Analyzer Toolbar**

# 9 Wireless Protocol Suite Window



**Wireless Protocol Suite**

# 10 User Configuration Overview

X240 uses a two-stage capture analysis process, record and analyze. In the record stage clicking the Start Record button will activate the datasource to begin capturing data from all Bluetooth devices in range. In the analyze stage the user selects one or more wireless devices for analysis, clicks the **Start Analyze** button, and the X240 will begin sending captured data that is to/from those devices to the Wireless Protocol Suite. The data appears in the **Summary Pane, Message Sequence Chart, Coexistence View, Bluetooth Timeline, Low Energy Bluetooth Timeline, PER Stats,** etc.

If any keys needed for decryption are known from past captures those keys are automatically applied to the devices under test. Prior to protocol analysis the user can enter any unknown keys. X240 will identify the specific key necessary for data decryption, for example Link Key, Passkey, PIN, or Temporary Key. Decryption keys are entered into the Security Pane. The Security pane is a dockable pane available from View in the toolbar.



**Security Pane**

# 11 Record: Begin Capture

When starting a capture session:
- the active status of all devices is cleared in the **Device Database** panes,
- the **Security** pane is emptied, and
- the **Event Log** pane retains all prior logged events.

**🔴 Start Record** On the **Wireless Protocol Suite's** Toolbar, click on the **Start Record** button or select **Start Record** from the **Capture** menu option. When the **Start Record** button changes to **Stop Record** the X240 hardware is capturing data from all active Bluetooth devices within range and recording data on the PC. Depending on license/capture configuration, either Classic or LE will be displayed during any particular session.

**▶ Start Analyze** On the **Wireless Protocol Suite's** Toolbar, clicking on the **Stop Record** button, or selecting **Stop Recording** from the **Capture** menu options will halt live capture.

The **Device Database** pane populates with any newly discovered devices. Selecting devices for analysis can be done while recording.

The **Security** pane will show all encrypted Bluetooth links.

The **Event Log** pane will begin to populate with information, warnings, and error messages.

The **Status Bar** will show a running total of captured packets.

**Note**: Starting a new capture session will clear all unsaved data from both the X240 hardware and the Wireless Protocol Suite. If it has not been saved, then a pop-up warning message will appear.

# 12 Selecting Devices for Analysis

Once a capture session starts by clicking Start Record, data from all active devices within range are being captured. To analyze the data using the **Wireless Protocol Suite**, select specific devices of interest to include in the analysis.
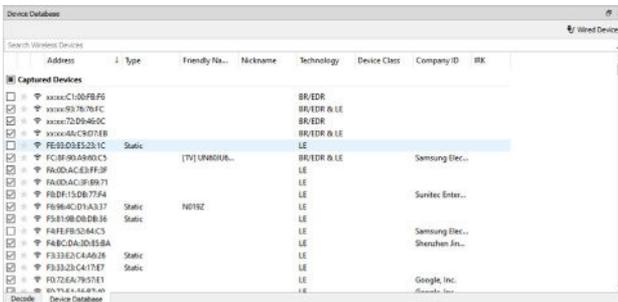


**Device Database Pane**

In the **Device Database** pane, place a check in the row of each active device 📶 to be analyzed. Active devices can also be selected while the recording is in progress.

**Note:** Data filtered by the device selection is an "OR" function, not an "AND" function. When selecting device1, device2, device3,… the recorded data filtered into the analyzer is data involving device1 OR device2 OR device3 OR …However, if the Options menu, analysis of LE Empty packets is selected an AND function is included. For example: (device2 AND LE Empty packets) OR (device3 AND LE Empty packets).

The following table lists some common data capture and device selection scenario.

### Table 4 - Common Data Capture and Device Selection Scenarios

| Scenario | Device Database Pane Selection |
|---|---|
| Analyzing traffic between a peripheral Device Under Test (DUT) and its central | Select only the peripheral DUT for analysis. |
| Analyzing all traffic involved in Inquires | In the Options menu select Analyze Inquiry Process Packets in the Options menu |

Once devices are selected, analysis of the capture can begin.

# 13 Start Analysis

▶ Start Analyze   The analysis begins by clicking on the **Start Analyze** button in the **Wireless Protocol Suite** Main Window. In the Main window you can also select **Start Analyzing** from the **Capture** menu. The **X240** will begin sending captured packets involving the selected device(s) to the **Wireless Protocol Suite** software.
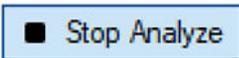
■ Stop Analyze   Once analysis has begun, you cannot change the device selection. All device rows in the **Device Database** pane are grayed-out. To stop the analysis, click the **Stop Analyze** button. You can then change your device selection and restart analysis by clicking the **Start Analyze** button.
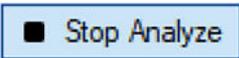
To stop the analysis, click the   ■ Stop Analyze   button in the **Wireless Protocol Suite** Main window. You can also select the **Stop Analyzing** option in the **Capture** menu in the Main window as well.

Conducting analysis from a capture file is identical to the live capture method.

The **Wireless Protocol Suite** Main window is shown below:
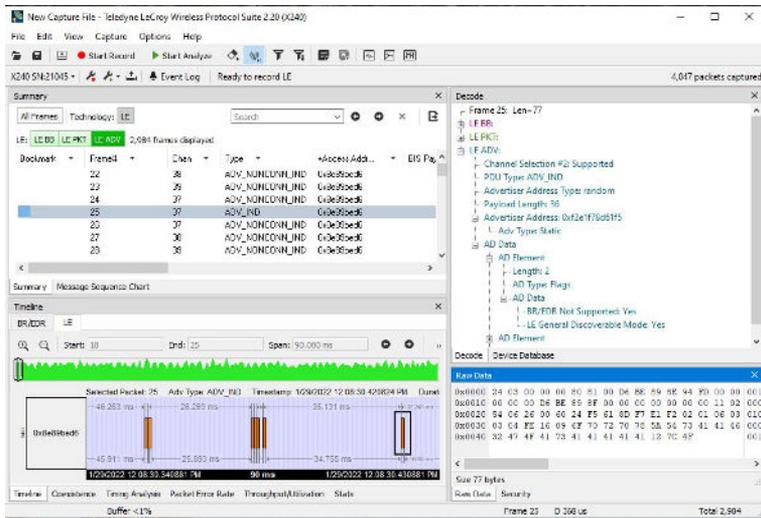
**Wireless Protocol Suite: Main Window**

The Main Window icon will be shown in your taskbar,



**Wireless Protocol Suite: Application Icon**

# **14** Saving Analyzed Data to Disk

**Note: Start Record** is not available when viewing a previously recorded Capture file. **Start Analyze/Stop Analyze** is available in Wireless Protocol Suite Main window, allowing different analyses to be performed on previously recorded and saved captures.

**Note:** Choose File Locations… from the File menu to change the default file location.

1.  Click the **Start Record**  button in the **Wireless Protocol Suite** Main window, or the **Start Recording** under the **Capture** option in the Main window. X240 will begin capturing data from all wireless devices within range.

2.  In the **Device Database** pane, select the active devices for analysis.

3.  Click on the **Start Analyze**  button in the **Wireless Protocol**

 **Suite** Main window or **Start Analyzing** under **Capture** menu to begin capturing data traffic.

Files are placed in **My Capture Files** folder by default and have a .cfa extension.

4.  Watch the Status Bar on the Wireless Protocol Suite Main window to monitor how full the file is.

5.  Click on the **Stop Record**  button to stop recording.
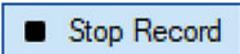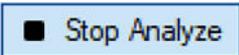
6. Click the **Stop Analyze** ■ Stop Analyze button to stop analyzing.

7. Clicking on the **Save** icon will save the file to the selected location.

8. To clear captured data, click the **Clear** icon.

- If you select **Clear** after stopping analysis and have not saved it already, a dialog appears asking whether you want to save the data.

  - You can click **Save File** and enter a file name when prompted.
  - If you choose **Do Not Save**, all data will be cleared.
  - If you choose **Cancel**, the dialog closes with no changes.

- If you select the **Clear** icon while a capture is occurring:

  - The capture stops.
  - A dialog appears asking if you want to save the capture.
  - You can select **Yes** and save the capture or select **No** and close the dialog. In either case, the existing capture file is cleared and a new capture file is started.
  - If you choose **Cancel**, the dialog closes with no changes.

# 15 License Manager

The user can find out the status of the X240's license by selecting **Manage License from the X240 Analyzer Toolbar.**

# 16 Environmental Conditions

- Temperature: Operating 32° F to 104° F (0° C to 40° C)
- Humidity: Operating 10% to 90% RH (non-condensing)

## Other Specifications

- Dimensions: 7.5" wide X 4" deep X 1" tall
  190.5 mm X 101.6 mm X 25.4 mm

- Weight: 1.5 lbs

- Input Voltage: 5 V

- Max Power: 15 W

## Teledyne LeCroy Customer Support

Online Download

Periodically check the Teledyne LeCroy Protocol Solutions Group web site for software updates and other support related to this product. Software updates are available to users with a current Maintenance Agreement.

Web:        http://www.fte.com/products/default.aspx
E-mail:     Frontline_OnlineSales@Teledyne.com
Support:    Frontline_Techsupport@Teledyne.com

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