M21 Video Analyzer/Generator

for HDMI 8K & DisplayPort UHBR

Quick Start Guide

Rev. C

October 18, 2023	P/N 934512-00 - Rev. C

1 Overview of M21 Video Analyzer / Generator

This section provides an overview of the Teledyne LeCroy quantumdata M21 Video Generator / Analyzer. The M21 is a handheld HDMI Video Generator and Analyzer for 8K and a DisplayPort Analyzer for UHBR data rates. The M21 has a large embedded touch screen for control and status. The M21 can also be managed through the Video Protocol Suite (VPS) graphical user interface running on a host PC connected to the M21 over an Ethernet cable.

1.1 Scope of this Quick Start Guide

This Quick Start Guide provides instructions on the M21 connectors, power up instructions and basic turn up procedures. This Quick Start Guide does not provide instructions on the operational features and functions of the M21. Please refer to the M21 User Guide available on the Teledyne website for detailed instructions on the operation of the M21.

Note: Please be sure to check the Teledyne website for updates to this document and the User Guide.

1.2 M21 Video Generator / Analyzer

The M21 Video Generator / Analyzer is a handheld video generator and analyzer that enables you to conduct quick verification testing of your digital video source and display devices and distribution equipment. The M21 is equipped with both an HDMI video generator and video analyzer function and a DisplayPort video analyzer function. These interfaces enable you to test audio, video and related protocols—HDCP, EDID, CEC & infoframes, HDMI FRL and DisplayPort Link Training. The M21's portability makes it ideal for your bench and even for use in the field with its battery power capability.

A 10-inch color touch display makes the M21 easy and convenient to use. When testing a digital video source device you can toggle between operating the unit through the touch screen and viewing the incoming video from the source.

M21 Video Generator / Analyzer – Quick Start Guide

M21 Rear Edge

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2 Physical Interfaces of the M21 Protocol Analyzer / Generator

This section describes the administration, video and audio interfaces on the M21 test instrument. Table 2-1 below describes the video interfaces on the M21 test instrument.

Table 2-1: M21 Video Interfaces

Video Interface	Description
HDMI (1) Output Type A	▪ FRL Lane Rates: All Lane Rates Up to 12Gb/s. ▪ Number of Lanes: 3,4 Lanes. ▪ Bit Depth: 24/30/36/48 bit. ▪ Colorimetry: RGB, YCbCr. ▪ Sampling: 4:4:4, 4:2:2, 4:2:0. ▪ Pixel rate: Timings up to 8K – 2376MHz. ▪ Audio: LPCM, Dolby Digital and DTS.
HDMI (1) Input Type A	▪ FRL Lane Rates: All Lane Rates Up to 12Gb/s. ▪ Number of Lanes: 3,4 Lanes. ▪ Bit Depth: 24/30/36/48 bit. ▪ Colorimetry: RGB, YCbCr. ▪ Sampling: 4:4:4, 4:2:2, 4:2:0. ▪ Pixel rate: Timings up to 8K – 2376MHz. ▪ Audio: LPCM, Dolby Digital and DTS.
DisplayPort Input Connector	▪ DP Lane Rates: All Lane Rates Up to 10Gb/s. ▪ Number of Lanes: 1,2,4 Lanes. ▪ Bit Depth: 24/30/36/48 bit. ▪ Colorimetry: RGB, YCbCr. ▪ Sampling: 4:4:4, 4:2:2. ▪ Audio: LPCM.
DisplayPort Aux Channel Connector	▪ Enables passive monitoring of the DisplayPort Aux channel. **Note**: There is an optional passive cable that is necessary when monitoring the Display Port link passively at higher speeds.

USB-C DP Alt Mode Input Connector	▪ DP Lane Rates: All Lane Rates Up to 13.5Gb/s. ▪ Number of Lanes: 1,2,4 Lanes. ▪ Bit Depth: 24/30/36/48 bit. ▪ Colorimetry: RGB, YCbCr. ▪ Sampling: 4:4:4, 4:2:2. ▪ Audio: LPCM.

2.1 Digital Audio interface

Table 2-2 below describes the distinct digital audio interface supported on the M21. Note audio transmission is supported only through the HDMI Tx interface.

Table 2-2: M21 HDMI RCA SPDIF Output Audio Interface

Interface	Description
SPDIF - RCA	SPDIF RCA audio connector: ▪ Channels: 8 (clips) ▪ Bits per sample: 16, 20, 24. ▪ Sampling rates (kHz): 32.0, 44.1, 48.0, 96.0 ▪ Formats: LPCM, Dolby Digital (clips), DTS (clips)

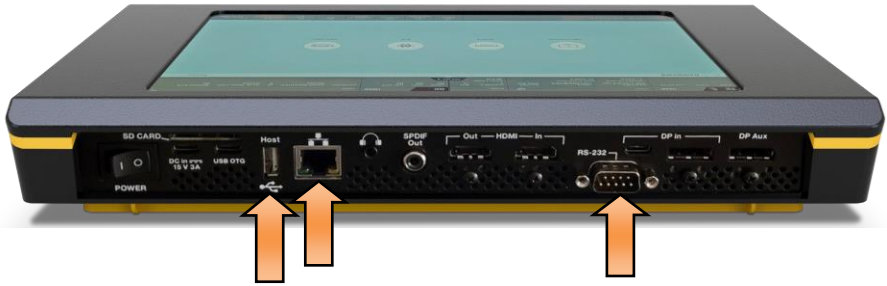
2.2 Headphone jack and speaker

The M21 test instrument is equipped with a headphone Jack and an internal speaker for monitoring the incoming audio from an HDMI or DisplayPort source or sink device for HDMI eARC. This functionality is currently not available.

2.3 Administrative Interface

The M21 test instrument is equipped with ports for control and administration. These are described below:

- RJ45 Ethernet – For control through the external VPS GUI connected from a host PC or for command line control.
- USB Type A – For connecting a mouse or keyboard to control the M21 embedded GUI.
- RS-232 – For command line control.



2.4 SD Card Slot

The M21 test instrument is equipped with an SD card slot. The SDCard is used for loading bitmaps, reports, and for recovery in the event of a failed upgrade.

Note: M21 Image above shows the front edge with SD card slot.

3 Getting Started

3.1 What is in the M21 shipping box?

The M21 instrument shipping box includes the items listed in the Table below (except where noted as optional):

M21 Shipping Box Contents	
Item Description	**Part No.**
M21 Video Generator / Analyzer	934385-00
12V DC (5 amp) Power Supply / Adapter / Charger.	42A0000011542
International Power Plug adapters.	42A0000011176
Cable: HDMI-to-HDMI Type A.	42A0000009771
Cable: DP-to-DP Standard. (Not included with M21 P/N 00-00251)	933193-00
Cable: USB-C	42A0000011304
Ethernet Cable	30-00151
CE Certificate	934512-00
Optional Cable: HDMI Cable for Passive Monitoring of the DDC channel	95-00231
Optional Cable: DisplayPort Cable for Passive Monitoring of the Aux Chan	95-00169

3.2 Getting the M21 Up and Running

Use the following procedures to get your M21 up and running.

1. Remove the M21 from the shipping box and lay it flat on your desktop or benchtop.
2. Connect the M21 wall power adapter with the USB-C connector

(provided) to a suitable outlet (100-240V 50/60Hz).
Note: The M21 can operate for a limited time on battery power. Typically you can expect one (1) hour of battery power from a four (4) hour charge depending on the intensity of the usage.

3. Connect the other end of the power supply cable with the USB-C connector to the port on the back of the M21 labeled “DC In 15V 3A.” This connector is located on the back of the unit as shown below. Use the appropriate International plug provided.

4. Turn the unit on with the power rocker switch located next to the USB-C power input.
Important Note: Please be sure to wait at least 10 seconds when power cycling the M21 before reapplying power.

Note: You can connect a mouse to one of the USB ports on the back of the M21 as shown below. This enables you to use the mouse to select and active functions rather than by touching.

4 General Operation

Once powered up the M21 is ready for testing your HDMI or DisplayPort devices. This section provides a brief overview of the application screens on the embedded touch screen display.

4.1 Tilt Bail

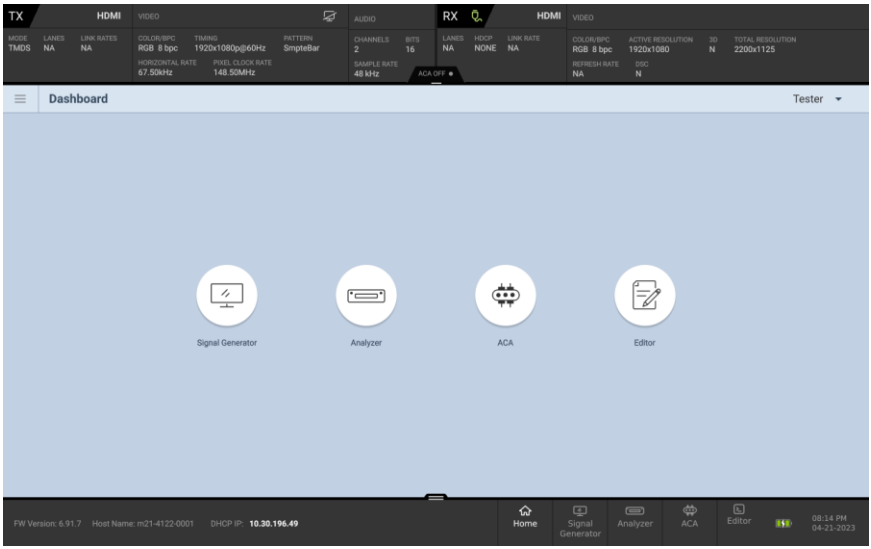
The M21 has support bail (shown below) for convenience in viewing. This is depicted in the illustration below.

4.2 Navigating through the M21 User Interface

The M21 user interface is a 10-inch color touch screen display with a 1280 by 800 resolution. A single touch will activate an item on the screen.

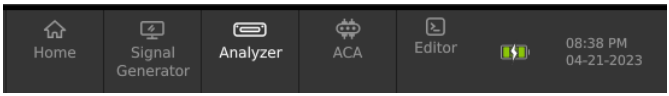
4.2.1 Home Screen

The **Home** screen is shown below.



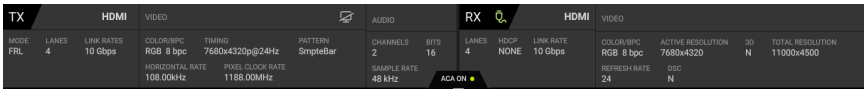
4.2.2 Navigation

You can navigate to the various applications supported by the M21 from the lower strip of the GUI as shown below:

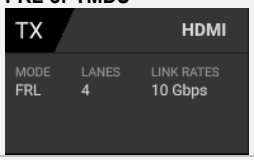
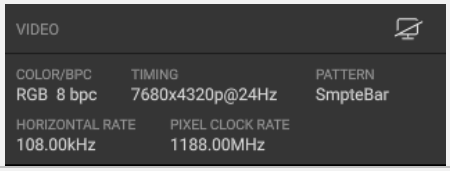
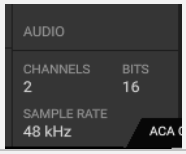


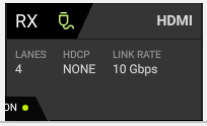
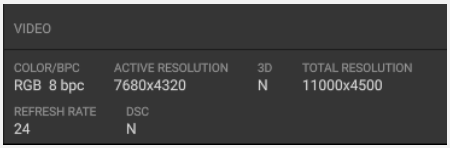
4.2.3 Status Bar

The M21 has a status bar on the top of the screen. The Tx status is on the left half and the Rx status is on the right half of the screen.

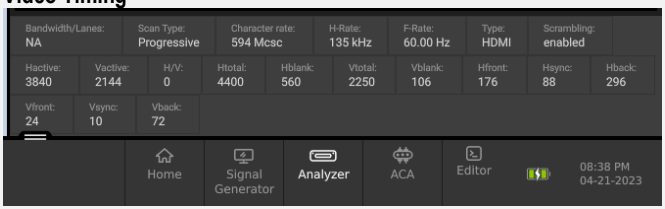


The items in the Top Status Bar are described in the Table below.

Top Status Bar		
Type	**Status Item**	**Function**
Video Generator (TX)	**HDMI (only)** **FRL or TMDS** 	
	Indicates whether the HDMI video generator is in the FRL mode or TMDS mode. If FRL then the number of lanes is shown and the lane rate.	
	Video: 	
	Indicates the Colorimetry, Timing (resolution), test pattern, horizontal rate and pixel clock of the video generator output.	
	Audio: 	
	Indicates the audio that is being transmitted. This could be LPCM or compressed.	

Video Analyzer (RX)	**Mode**: HDMI or DisplayPort For HDMI: FRL or TMDS For DP: HBR or UHBR 	Indicates whether the video analyzer is receiving HDMI or DisplayPort stream. For HDMI FRL and DisplayPort the number of Lanes and the Lane rate is shown. If FRL then the number of lanes is shown and the lane rate. The HDCP status is also shown.
	Video: 	
	Indicates the Colorimetry, Active and Total Resolution, 3D status, Refresh Rate, DSC status.	

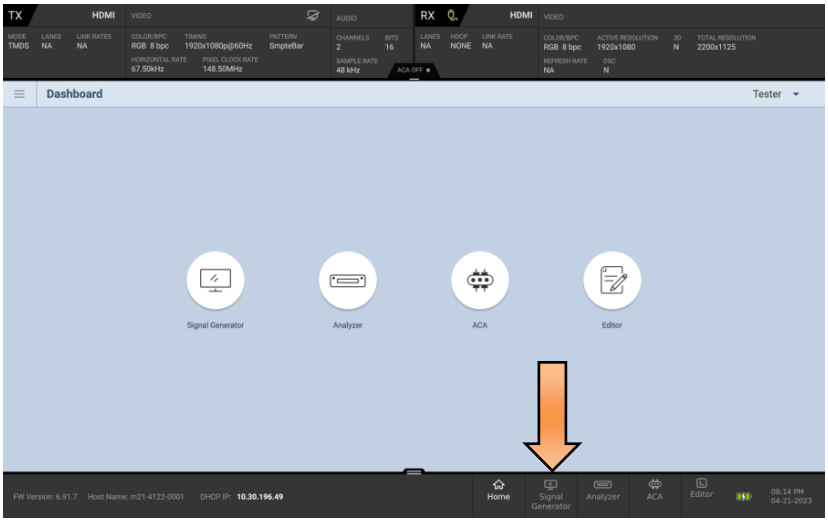
The items in the Lower Status Bar are described in the Table below.

Lower Video Analyzer Status Bar		
Type	**Status Item**	**Function**
Video Analyzer	**Video Timing** 	
	The Lower Status Bar for the Video Analyzer provides status information on the incoming stream. The incoming stream could be HDMI or DisplayPort.	

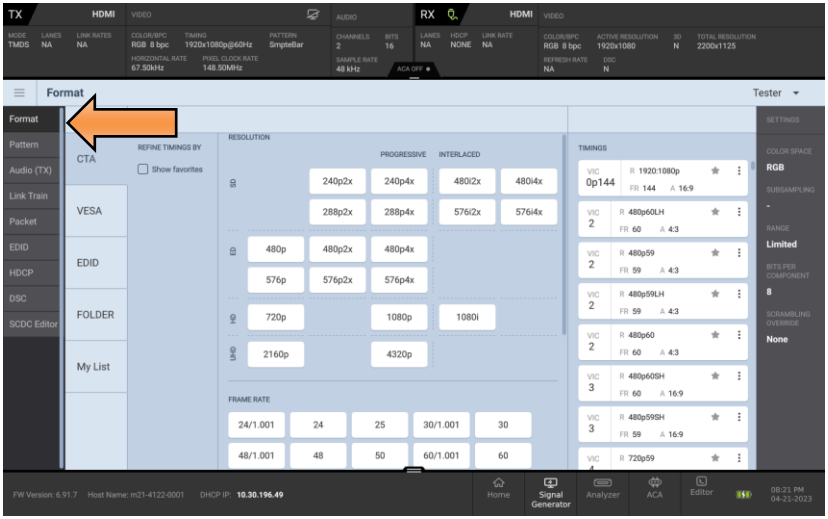
4.3 Running Basic Tests on Sink Devices

This Quick Start Guide does not cover detailed procedures for most common operations. However, the following information will get you started conducting some of the more common operations for testing sinks.

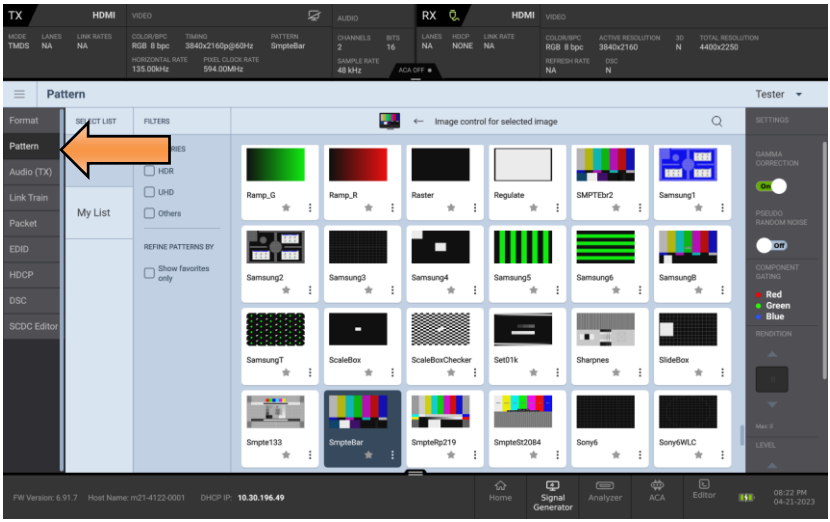
1. From the **Home** Menu, navigate to the Signal Generator screen by touch selecting the Signal Generator navigation button indicated below.



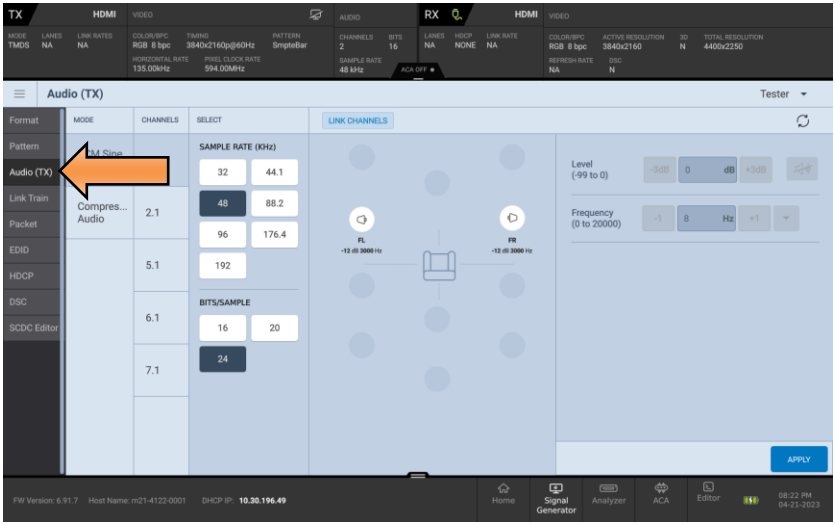
2. Navigate to the Format screen to select a format for transmission. Select the desired Resolution, Frame Rate and Aspect Ratio or simply select from the list on the right side.



3. Navigate to the Pattern screen to select a test pattern for transmission. Select the desired test pattern.



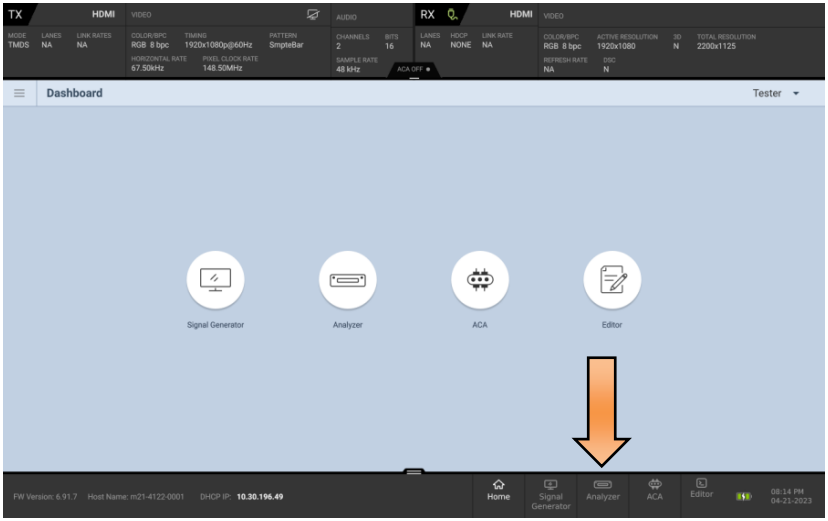
4. Navigate to the Audio screen to select an audio format for transmission. Select the desired LPCM configuration or compressed clip.



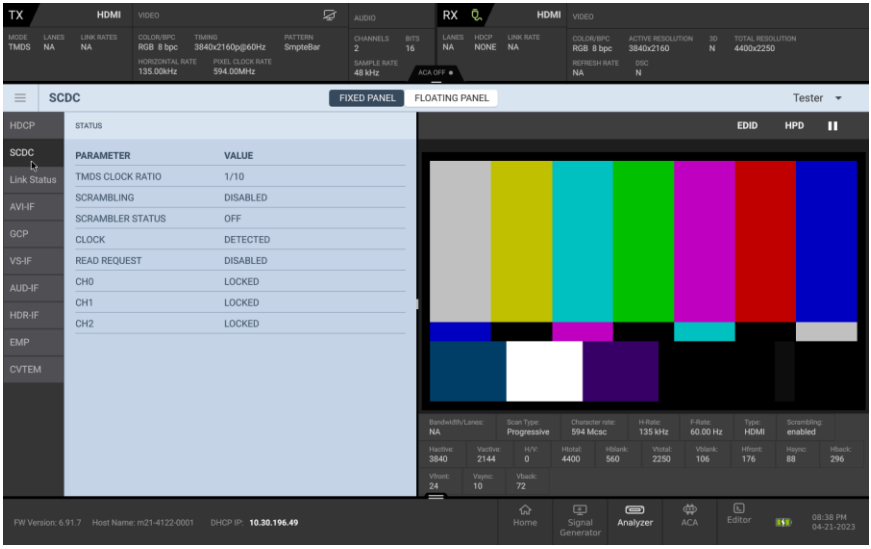
4.4 Running Basic Tests on HDMI Source Devices

This Quick Start Guide does not cover detailed procedures for most common operations. However, the following information will get you started conducting some of the more common operations for testing HDMI sources.

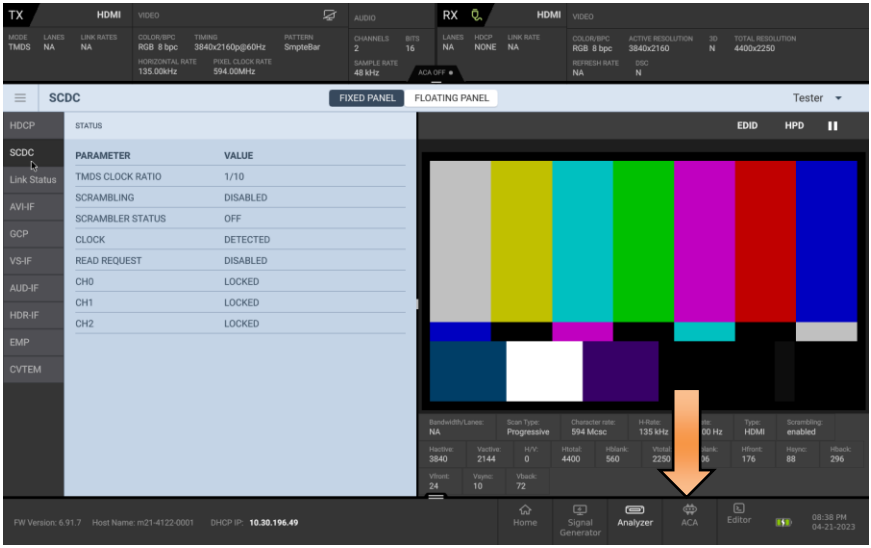
1. From the **Home** Menu, navigate to the Signal Analyzer screen by selecting the Analyzer navigation button indicated below.



Analyzer application screen is shown below.



2. To monitor the HDMI DDC channel, navigate to the ACA application screen.



The ACA application screen is shown below.

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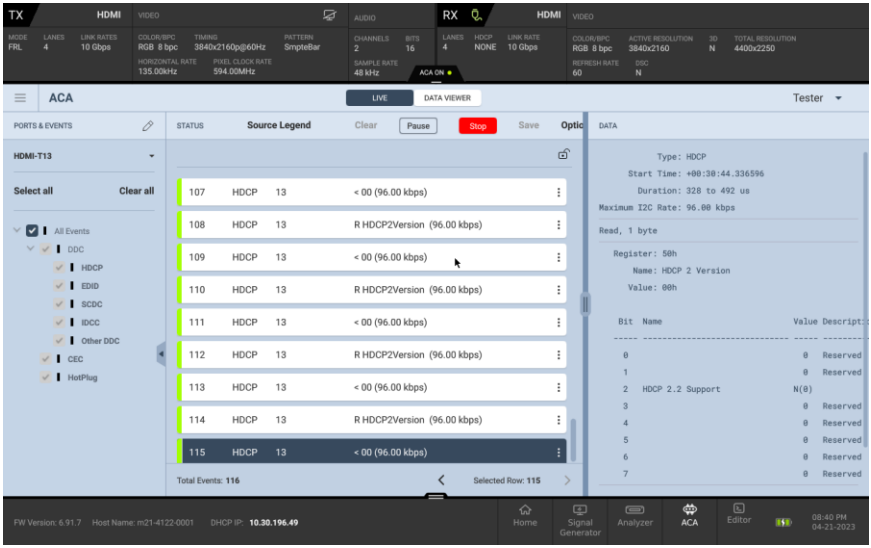


5 Managing the M21 with VPS GUI from a PC

The normal operation of the M21 is through the embedded touch screen display. However, you can also control the M21 through the external Video Protocol Suite (VPS) GUI installed on a Windows host PC. The most important use of the external VPS GUI Manager is to upgrade the M21 instrument with a new release.

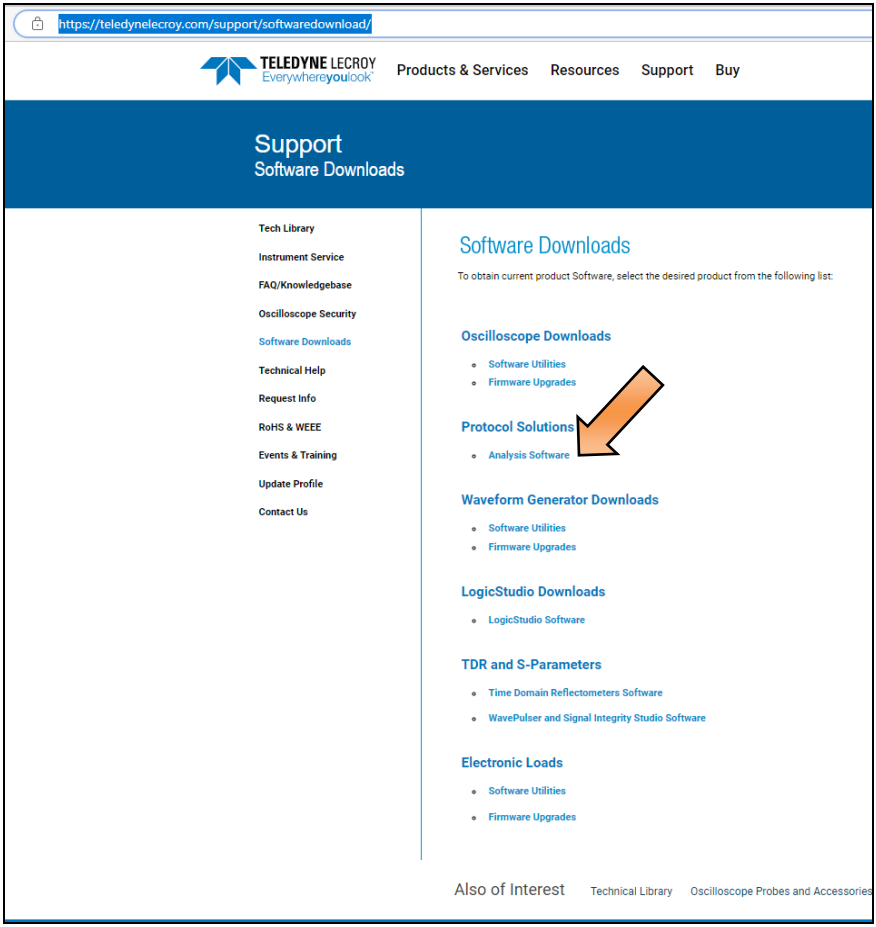
You will have to first download and install the VPS Manager GUI application on your Windows Host PC. You will then need to connect your Windows Host PC to the M21 over an Ethernet connection.

The procedures for installing the VPS GUI Manager Application on your Windows Host PC are provided below.

5.1 Install the M21 VPS GUI Manager Application

This procedure describes how to install the VPS GUI Manager application on your host PC.

1. Download the VPS Manager GUI application from the Teledyne LeCroy downloads page: https://teledynelecroy.com/support/softwaredownload/.
2. Navigate to the M21 software downloads page using the screens indicated below.


https://teledynelecroy.com/support/softwaredownload/
TELEDYNE LECROY
Everywhereyoulook
Products & Services
Resources
Support
Buy
Support
Software Downloads
Tech Library
Instrument Service
FAQ/Knowledgebase
Oscilloscope Security
Software Downloads
Technical Help
Request Info
RoHS & WEEE
Events & Training
Update Profile
Contact Us
Software Downloads
To obtain current product Software, select the desired product from the following list:
Oscilloscope Downloads
Software Utilities
Firmware Upgrades
Protocol Solutions
Analysis Software
Waveform Generator Downloads
Software Utilities
Firmware Upgrades
LogicStudio Downloads
LogicStudio Software
TDR and S-Parameters
Time Domain Reflectometers Software
WavePulser and Signal Integrity Studio Software
Electronic Loads
Software Utilities
Firmware Upgrades
Also of Interest
Technical Library
Oscilloscope Probes and Accessories

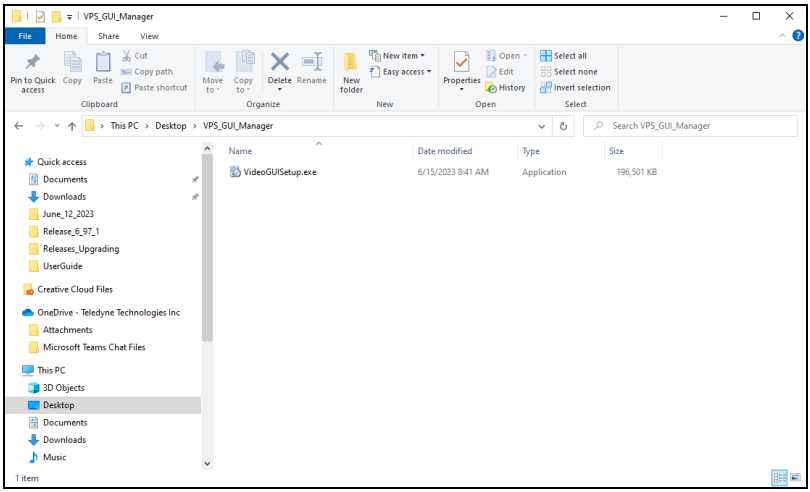
3. Double click on the latest release of the external VPS GUI Manager to download the VPS GUI Manager application.

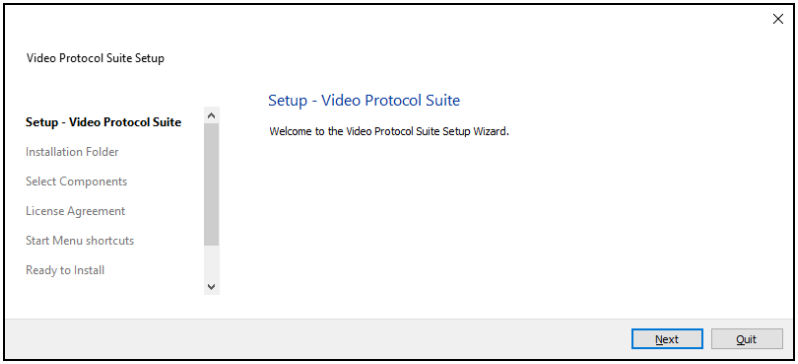
   Note 1: The screen shot above shows access to the M21 System software. There will also be a link to the M21 VPS GUI Manager

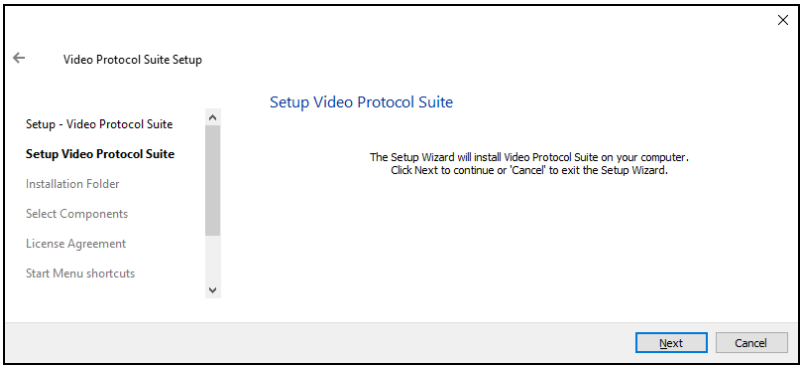
which is not shown in the example above. Place the VPS GUI Manager software on your Windows Host PC in a convenient location.

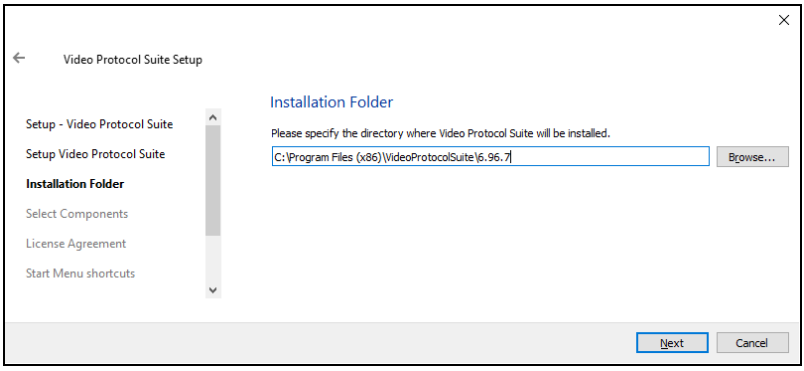
Note 2: If you are going to be upgrading the M21 system software, download the M21 system firmware and save on a convenient location on your host Windows PC.

4. Run the installation program for your VPS GUI Manager by double clicking on the VideoGUIsetup.exe. Refer to the screen shots below and follow the prompts to install the VPS GUI Manager application.




Video Protocol Suite Setup
Setup - Video Protocol Suite
Installation Folder
Select Components
License Agreement
Start Menu shortcuts
Ready to Install
Setup - Video Protocol Suite
Welcome to the Video Protocol Suite Setup Wizard.
Next
Quit


Video Protocol Suite Setup
Setup - Video Protocol Suite
Setup Video Protocol Suite
Installation Folder
Select Components
License Agreement
Start Menu shortcuts
Setup Video Protocol Suite
The Setup Wizard will install Video Protocol Suite on your computer.
Click Next to continue or 'Cancel' to exit the Setup Wizard.
Next
Cancel


Video Protocol Suite Setup
Setup - Video Protocol Suite
Setup Video Protocol Suite
Installation Folder
Select Components
License Agreement
Start Menu shortcuts
Installation Folder
Please specify the directory where Video Protocol Suite will be installed.
C:\Program Files (x86)\VideoProtocolSuite\6.96.7
Browse...
Next
Cancel

5. After installation completes, run the new VPS Manager. It will be available in the Start Menu under All Programs → VPS or from an icon on your PC Desktop.

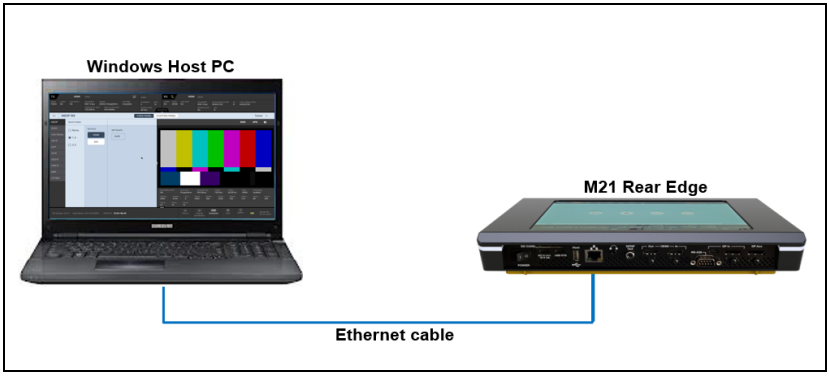
   Note: Verify that the version number in the title bar matches the version on the website. If not, contact Teledyne Customer Support.

5.2 Connecting the VPS GUI Manager to the M21 Test Instrument

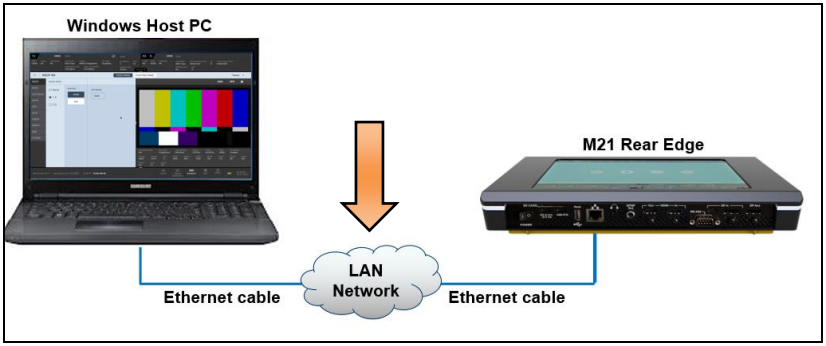
This procedure describes how to connect your Windows Host PC running the VPS GUI Manager application to the M21. You can either connect to the M21 from your Windows Host PC through a network or you can connect directly using the provided Ethernet cable. You can connect from the external VPS running on the Windows Host PC to the M21 instrument either through a local host name or an IP address.

1. Connect your Windows host PC to the M21 using the provided Ethernet cable. The connection is made to the RJ45 jack on the back of the M21 as shown below.

2. The Ethernet connection from the host PC to the M21 can be accomplished through your local network or you can connect directly. Both scenarios are depicted below.



Host PC Running VPS Manager w/ Direct Ethernet Connection



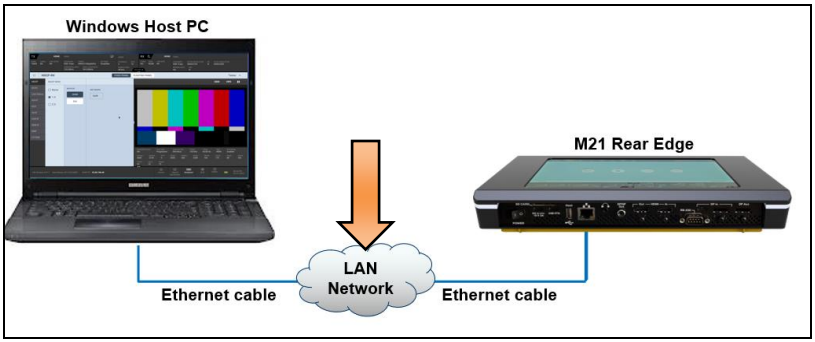
Host PC Running ATP Manager w/ Ethernet Connection thru LAN

5.3 Connecting with VPS GUI Manager from the Windows Host PC to the M21 Using a Network IP Address with DHCP

You can establish a connection to the M21 from your Windows Host PC running the VPS GUI Manager application using an IP address obtained from the network with DHCP. Use the procedures below.

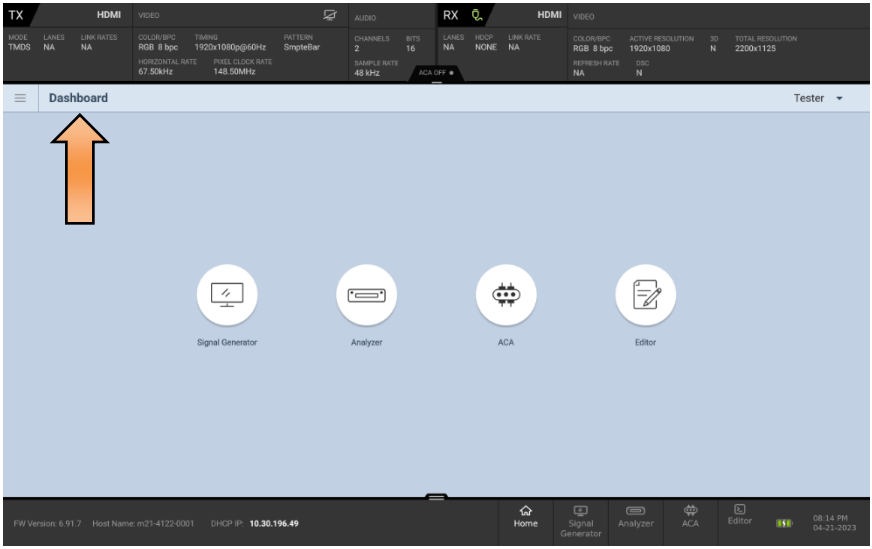
Note: This procedure assumes that the M21 is physically connected to the network using the provided Ethernet cable.

1. Make a physical connection from your Windows Host PC to your network as shown below:



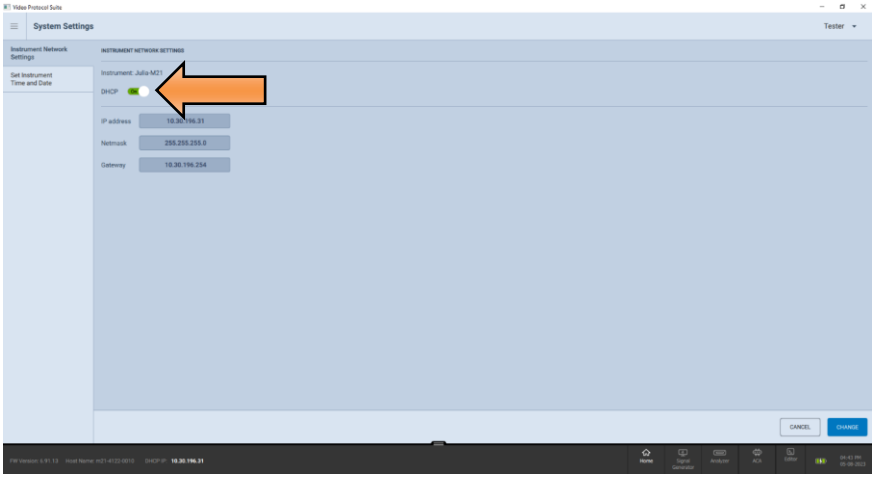
Host PC Running ATP Manager w/ Ethernet Connection thru LAN

2. From the M21 embedded touch screen, select Dashboard to access the Administration utilities for setting the IP address. Refer to the screen shot below.



The Administration utilities screen appears as shown below.

3. Select System Settings and then Instrument Network Settings. The Systems Settings menu will be presented.



4. Enable DHCP using the slide button. Green-On indicates that DHCP is enabled. Gray-Off indicates that DHCP is disabled. For this procedure set DHCP to on as shown above.

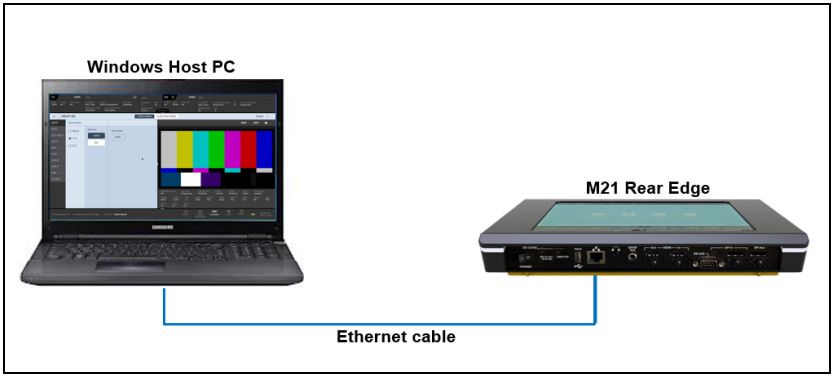
5. Power cycle the M21 to obtain an IP address from the network.

   The external VPS GUI Manager will automatically connect to the M21 when the M21 boots up.

5.4 Connecting with VPS GUI Manager from the Windows Host PC to the M21 Using Local Host Name

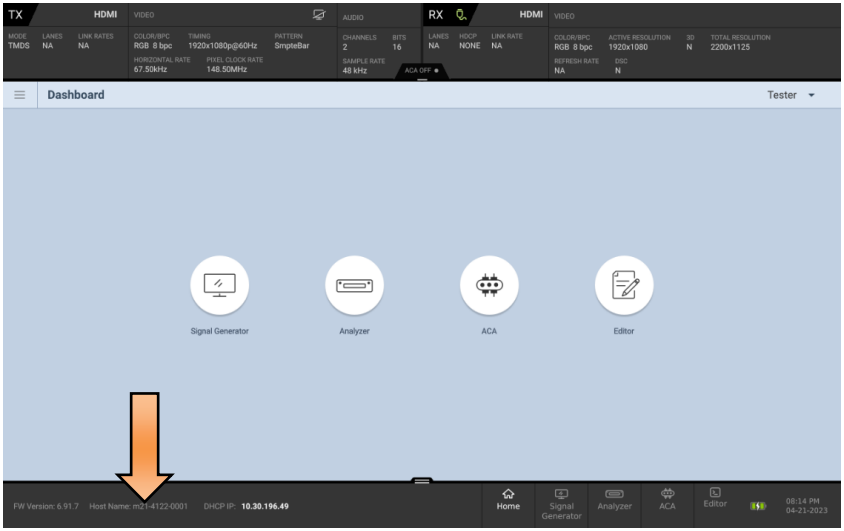
You can establish a connection to the M21 from your Windows Host PC running the VPS GUI Manager application using the M21 local host name. Use the procedures below.

1. Make a direct physical connection from your Windows Host PC to the M21 with the provided Ethernet cable as described in the previous section. Refer to the diagram below.

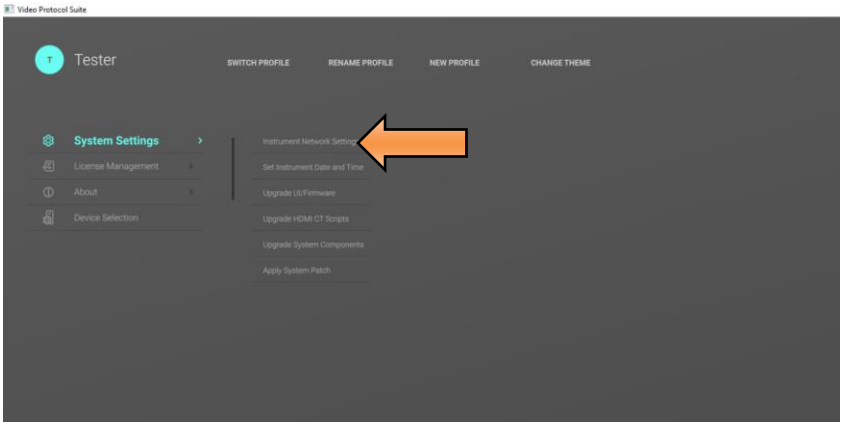


Host PC Running VPS Manager w/ Direct Ethernet Connection

2. From the M21 embedded touch screen, view the M21 host name at the bottom status bar. Refer to the screen shot below.



3. From the external VPS GUI Manager, access the System Settings screen and click on Instrument Network Settings.

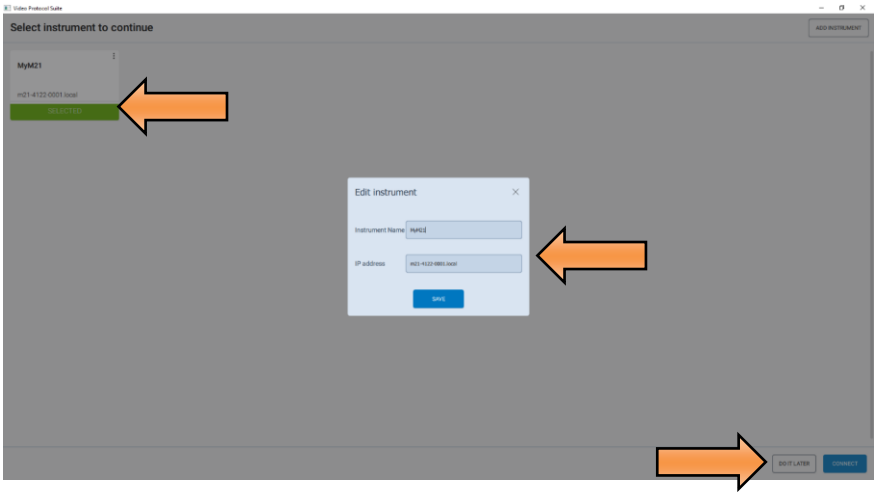


The System Settings screen appears.

4. On the external VPS GUI Manager, access the Edit Instrument dialog box from the three dot menu of the M21 instrument icon as shown below.

5. Enter the local host name of the M21 instrument that you are connecting to in the IP address field as shown below. Select Save and then Connect.

   Important Note: Be sure to include the ".local" appended to the host name.

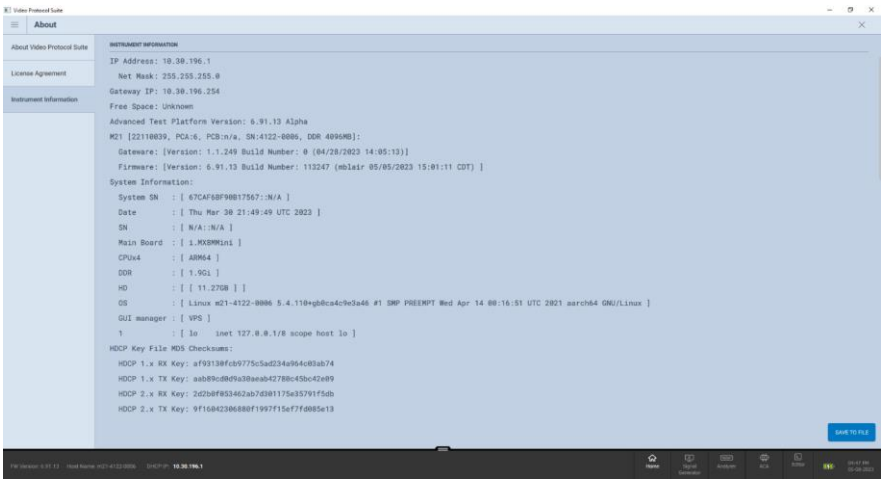


The VPS GUI Manager will connect to the M21.

5.5 Viewing the M21 Instrument Information

You can view the M21 instrument Information from Systems Settings menu. Use the procedures below.

1. View the Instrument Information by navigating to the Administration screen and selecting System Settings as shown below.



5.6 Upgrading the M21 System Software

This section describes how to upgrade the system software on your M21. The upgrade process upgrades both the M21 system firmware and the embedded VPS GUI. The upgrade procedure requires that you have installed the latest VPS GUI Manager application on your Host PC using the procedures described in a previous section.

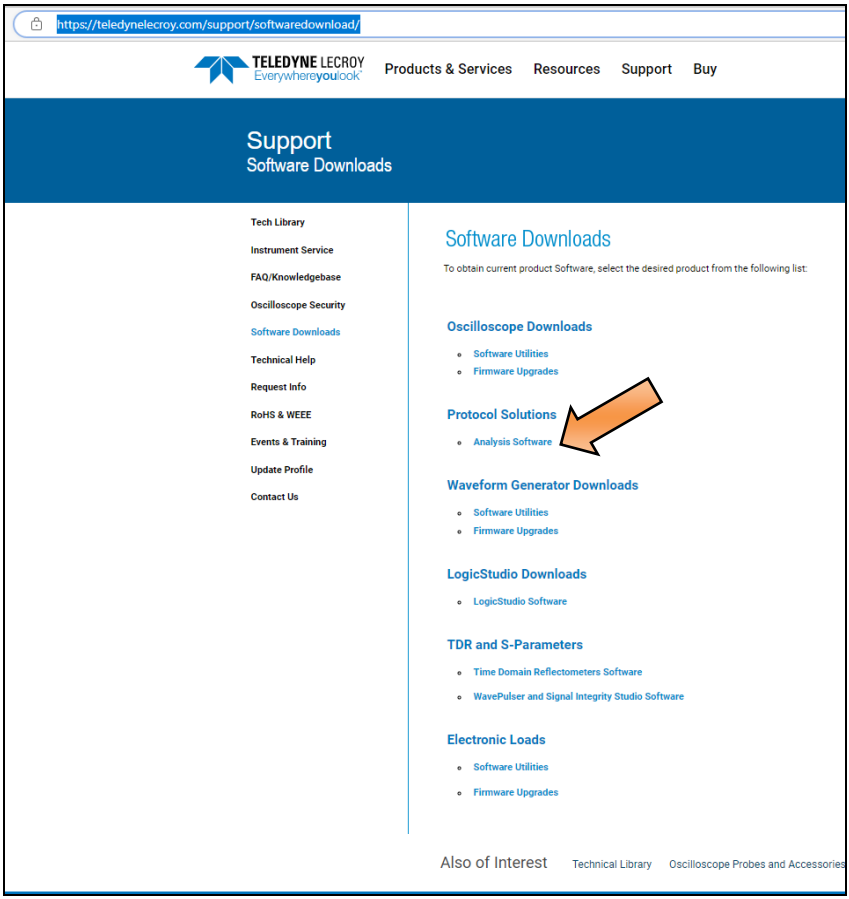
Important Note: When upgrading the M21 system firmware, please be sure to disconnect any video cables that are connected to the Protocol Analyzer / Video Generator modules. Failure to do so may result in issues during upgrade.

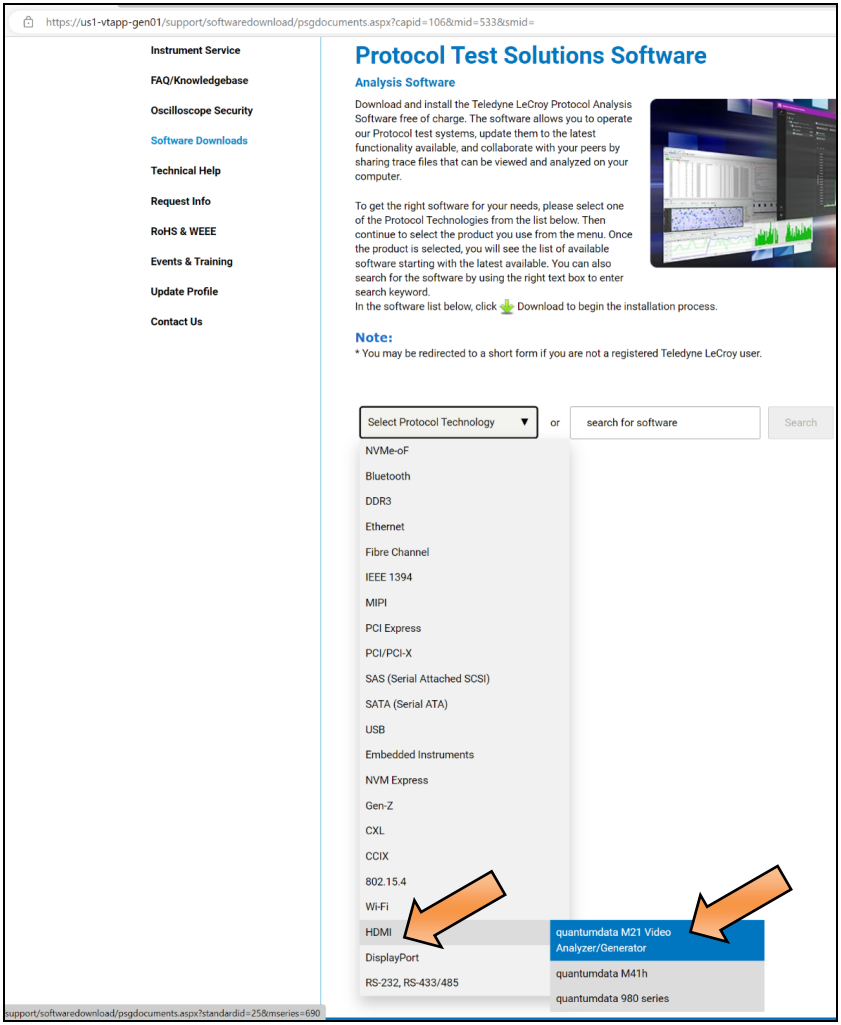
Follow the procedure below to upgrade your M21. You will first have to install the VPS GUI Manager application on your Windows Host PC using the procedures provided in the previous section. Also, you will have to have downloaded the M21 system firmware when you downloaded the VPS GUI software.

1. If not already done, download and install the external VPS GUI Manager application from the Teledyne website to your Windows Host PC using the procedures provided in the previous section. The procedures and screens are shown below.

2. Download the M21 System software from the Teledyne LeCroy downloads page: https://teledynelecroy.com/support/softwaredownload/.

3. Navigate to the M21 software downloads page using the screens indicated below.





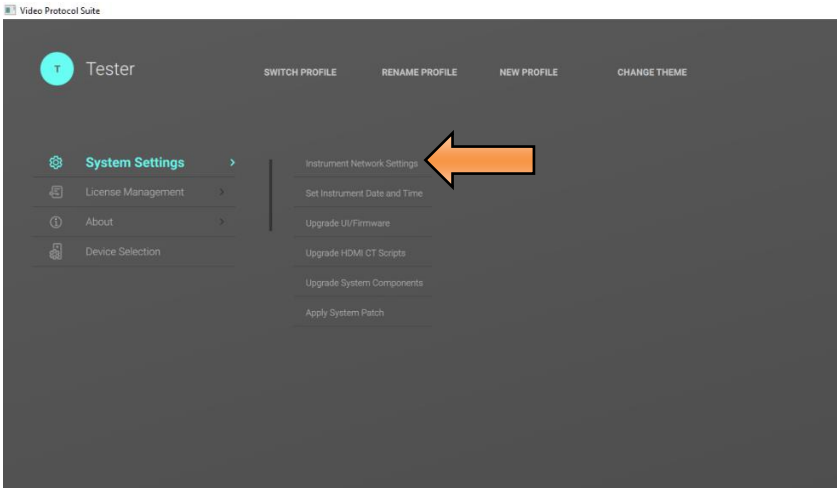
4. Select the M21 release and download to your Windows Host PC and store in a convenient location.

5. If not already done, establish an Ethernet connection from the host Windows PC to the M21 instrument. Use the procedures provided in the previous section.

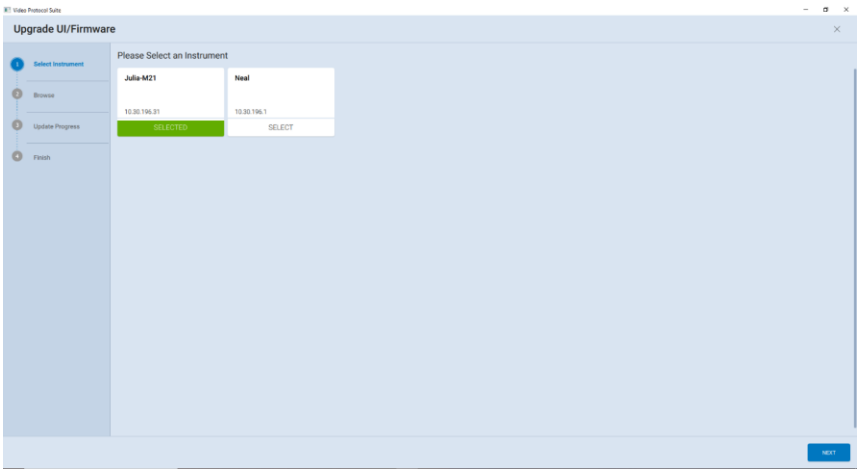
   Note: You can connect via an IP address or a host name. Refer to the procedures in the previous section.

6. Run the VPS GUI manager on your host PC by entering the VPS from the Windows prompt.

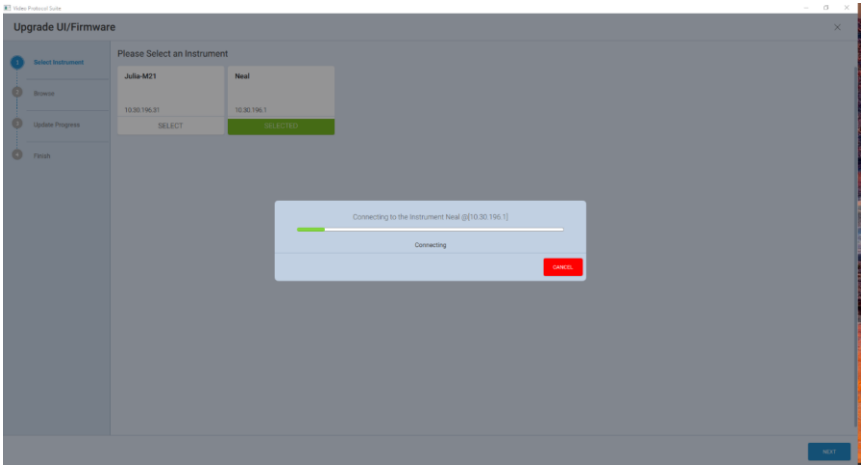
7. From the external VPS GUI manager, navigate to the Systems Settings screen and select Upgrade Firmware as shown below.



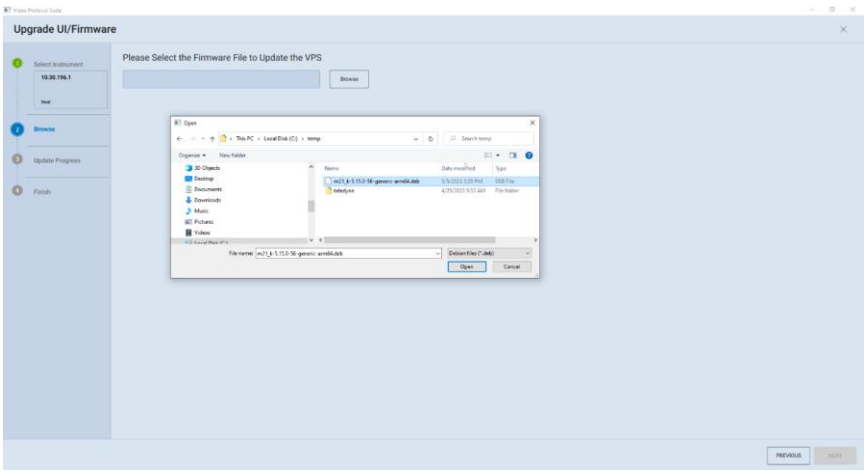
8. Navigate to the Upgrade UI/Firmware screen and select the M21 instrument. The example below shows two M21s; this is not typical.



The M21 firmware will be transferred to the M21.



9. Finish by browsing to the location where you have installed the system firmware on your host PC (example below). Click Open and follow the prompts to upgrade your M21.



10. Once you get confirmation that the upgrade has finished, you will be instructed to power cycle the M21. You can now use your M21.