PLEORA TECHNOLOGIES INC.

iPORT NTx-Mini-S Embedded Video Interface

User Guide

Pleora Technologies

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Chapter 1

About this Guide

The iPORT™ NTx-Mini-S Embedded Video Interface provides a flexible and economical solution for camera companies to integrate Gigabit Ethernet (GigE) connectivity into almost any industrial camera.

The NTx-Mini-S supplies these features in an ultra-small footprint with low power consumption and flexible mounting options.

The following topics are covered in this chapter:

- "What this Guide Provides" on page 2
- "Documented Product Versions" on page 2
- "Start Streaming Video" on page 2
- "Related Documents" on page 3
- "Further Reading" on page 3

What this Guide Provides

This guide provides you with all of the information you need to connect the NTx-Mini-S to your sensor and related electronics to create a camera or other imaging device. In this guide you will find a product overview, connector details, and mechanical drawings, along with instructions for installing the Pleora software, connecting the device, and performing general configuration tasks to properly display video.

The last chapter of this guide provides Technical Support contact information for Pleora Technologies.

Documented Product Versions

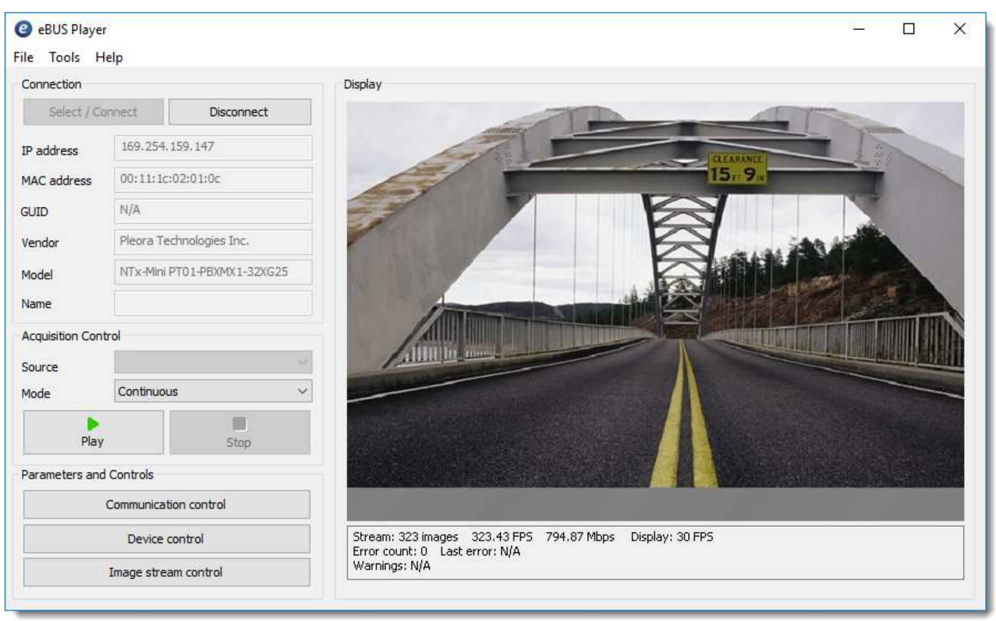
This guide covers the following product versions. The features and functionality documented in this guide may vary if you are using an earlier or later version of the product.

Table 1: Documented Product Versions

Product	Version documented in this guide...
iPORT NTx-Mini-S External Frame Grabber	2.5.40
eBUS SDK and eBUS Player Toolkit	6.0

Start Streaming Video

If you want to quickly start streaming video, you can go to “Confirming Image Streaming” on page 50.



Related Documents

The *iPORT NTx-Mini-S Embedded Video Interface User Guide* is complemented by the following Pleora Technologies documents, which are available on the Pleora Support Center at supportcenter.pleora.com:

- *eBUS Player User Guide*
- *Programmable Logic Controller Reference Guide*

Further Reading

Although not required to successfully use the *iPORT NTx-Mini-S Embedded Video Interface User Guide*, you can find details about industry-related standards and naming conventions in the following documents:

- *GigE Vision Standard*, available from the Automated Imaging Association (AIA) at www.visiononline.org
- *GenICam Standard Features Naming Convention* available from the European Machine Vision Association (EMVA) at www.emva.org.

Chapter 2

About the iPORT NTx-Mini-S Embedded Video Interface

This chapter describes the NTx-Mini-S, including the product variants and key features.

The following topics are covered in this chapter:

Model Variants

The following NTx-Mini-S variants are available and include the following parts.

Table 1: NTx-Mini-S Models

Order code	Model	Quantity
904-3016	**iPORT™ NTx-Mini-S Embedded Video Interface main board**	1

904-3017	**NTx-Mini-S development kit**	
	iPORT™ NTx-Mini-S Embedded Video Interface main board (904-3008)	1
	Flat flex cables	3
	Power supply	1
	Gigabit Ethernet desktop NIC	1
	Ethernet cable	1
	12-pin circular connector soldered on FlexEBoard	1
	Pleora eBUS SDK, provided on USB stick (includes eBUS Player sample application)	1

Feature Set

Table 2: Feature Set

Networked Video Connectivity Solutions	
iPORT™ Embedded Video Interface	• Highly reliable, 1 Gb/s data transfer rate with low, end-to-end latency • OEM board • 32 MB of DDR2 RAM
eBUS™ SDK	• eBUS Universal Pro driver • Sample applications, which demonstrate multi-device network connectivity • Driver installation tool • eBUS Player application and sample code, which demonstrates advanced API features • Documentation
AutoGEV™ XML Generation Tool	• Unique GenICam™ XML management tool for seamless GenICam integration
GigE Vision®	• Fully compliant firmware load • Guarantees delivery of all packets • Comprehensive data transfer diagnostics
Connectors	
PLC connector	• 20-pin Hirose FH12-20S-0.5SH(55)
LAN/Ethernet connector	• 8-pin (Hirose DF19G-8P-1H(54))
Raw video connector	• 60-pin (Hirose FH28E-60S-0.5SH(05))

Networking Features	
GigE-based	• 10/100/1000 Mb/s • IEEE 802.3 (Ethernet), IPv4, IGMPv.2, UDP, and ICMP (ping) • Long reach: 100 m point-to-point, further with Ethernet switches or Fiber
GigE Vision Protocol	• Guarantees delivery of all packets • Comprehensive data transfer diagnostics
Multicast capability	• Enables advanced distributed processing and control architectures
Characteristics	
Size (L x W)	• 43.0 x 67.1 x 5.0 mm
Operating temperature	• Commercial*
Storage temperature	• -40°C to 85°C
Power supply	• Nominally 4.2V to 16V**
Power consumption	• From 1.6W (input voltage and temperature dependent)
MTBF at 40°C	• 2,347,064 hours
ECCN	• 5A991.b

* Case and junction temperature limits vary by IC device. See "Thermal Requirements" on page 41.

** See "Power Supply Options" on page 36 for details.

Table 2: Feature Set (Continued)

Programmable Logic Features	
4 inputs 4 outputs to PLC connector 4 outputs to raw video connector (2.5V LVCMOS/LVTTL)	• Provides a flexible, general-purpose interface • Allows synchronization of multiple devices or system elements • Flexible triggering capabilities, including Boolean combinations, deserialized camera control signals, encoders, and time stamps • Built-in debouncers
3 serial links (2.5V LVCMOS/LVTTL)	• Serial control*** of video source and other devices via PC application over the GigE link
Delayer, rescaler, general-purpose counter	• Allows full synchronization of video source and other system elements
Timestamp trigger, counter, and reset	• Allows system actions to be triggered based on timestamps • Allows resets to be broadcast to all iPORT video interfaces in the system from a host
Host interrupts	• Allows host to be interrupted based on events on any input or internal signal

*** Various serial communication protocols are supported

Data Acquisition Features	
Raw video connector (2.5V LVCMOS/LVTTL)	• Compatible with internal signaling of video source
Integrated acquisition engine	• Can acquire images from a wide variety of sources, with pixel depths up to 24 bits, color or B/W, and multi-tap at up to 90 MHz
Free running or externally triggered	• Flexible acquisition modes
Static configuration	• Configuration settings are saved to on-board Flash memory

Chapter 3

Connector Details and Pinouts

This chapter describes the connectors on the NTx-Mini-S, including pinouts and signal information. It also provides details about the FlexEBoard, which connects to the PLC 20-pin connector to provide power and external signals. This chapter also provides timing information for the NTx-Mini-S's pixel bus and Programmable Logic Controller (PLC).

The following topics are covered in this chapter:

Connector Locations

The following figure and table describe the NTx-Mini-S connectors.

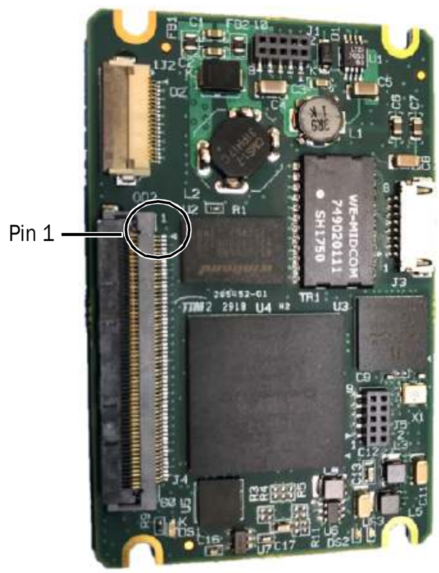
Table 3: Connector and LED Summary

Connector name	NTx-Mini-S Component ID	Notes
PLC 20-pin FFC/ FPC	J2	Connects to the FlexEBoard with a 20-pin FFC cable, providing power and external signals. You can connect a 20-pin FFC cable to the Pleora FlexEBoard or to your own board. The GPIOs on this connector are 2.5V GPIOs.
LAN/Ethernet	J3	Interfaces the NTx-Mini-S to Ethernet networks, as specified in IEEE 802.3. The Ethernet interface can operate at 100 or 1000 Mbps, and supports Internet Protocol Version 4 (IPv4).
Raw video 60-pin FFC/FPC	J4	Interfaces directly to the camera head or external device.

Raw Video 60-Pin FFC/FPC Connector (J4)

The raw video connector connects directly to a camera's PCB. This connector carries many signals, including:

- Pixel data (pixel bus) video signals
- Power signals
- Serial interface signals, which allow the NTx-Mini-S to control the camera
- System level signals, such as camera clock, NTx-Mini-S clock, and system reset controls
- Firmware selection signals



The PLC 60-pin FFC/FPC connector has gold-plated contacts. To avoid galvanic corrosion, only use FFC/FPC cables with contacts that are plated with gold or a suitable material.

The following table lists the 60-pin FFC/FPC connector pinouts.

Table 4: Raw Video 60-Pin FFC/FPC Pinouts

Pin	Signal name	Type	Notes
1	Reserved	Input	
2	Reserved	Input	
3	Reserved	Input	
4	PIXEL_CLK	Input	Camera head input clock. Can run up to 90 MHz. This signal is required by the NTx-Mini-S to properly synchronize the incoming video data (**PIXEL_DATAx**). You can also use the camera's clock to check for the presence of a powered camera.
5	SYSTEM_CLK_P	Output	33.333 MHz system clock output

Table 4: Raw Video 60-Pin FFC/FPC Pinouts (Continued)

Pin	Signal name	Type	Notes
6	SYSTEM_CLK_N	Output	Inverted 33.333 MHz system clock output
7	Reserved	Hi-Z	
8	Reserved	Hi-Z	
9	GND	Ground	
10	Reserved	Hi-Z	
11	UART1_TXD	Output	Serial port 1 (UART1) transmit data line
12	UART1_RXD	Input	Serial port 1 (UART1) receive data line
13	BULK0_CLK	Output	Bulk interface 0 USRT output clock when the interface is used in USRT mode. I2C SCL when used in I2C mode.
14	BULK0_TXD	I/O	Bulk interface 0 UART and USRT output or I2C SDA
15	BULK0_RXD	Input	Bulk interface 0 UART and USRT input
16	CC4	Output	Camera head control 4. See table note 1.
17	CC3	Output	Camera head control 3. See table note 1.
18	CC2	Output	Camera head control 2. See table note 1.
19	CC1	Output	Camera head control 1. See table note 1.
20	GND	Ground	
21	SERTC	Output	Serial port 0 (UART0_TXD (SERTC)) transmit data line
22	SERTFG	Input	Serial port 0 (UART0_RXD (SERTFG)) receive data line
23	DVAL	Input	Data valid. See table note 2.
24	FVAL	Input	Frame valid. See table note 2.
25	LVAL	Input	Line valid. See table note 2.
26	SPARE	Input	Spare line. See table note 2.
27	PIXEL_DATA23	Input	Raw pixel data from the camera
28	PIXEL_DATA22	Input	Raw pixel data from the camera
29	PIXEL_DATA21	Input	Raw pixel data from the camera
30	PIXEL_DATA20	Input	Raw pixel data from the camera
31	GND	Ground	
32	PIXEL_DATA19	Input	Raw pixel data from the camera
33	PIXEL_DATA18	Input	Raw pixel data from the camera
34	PIXEL_DATA17	Input	Raw pixel data from the camera
35	PIXEL_DATA16	Input	Raw pixel data from the camera
36	PIXEL_DATA15	Input	Raw pixel data from the camera

Table 4: Raw Video 60-Pin FFC/FPC Pinouts (Continued)

Pin	Signal name	Type	Notes
37	PIXEL_DATA14	Input	Raw pixel data from the camera
38	PIXEL_DATA13	Input	Raw pixel data from the camera
39	PIXEL_DATA12	Input	Raw pixel data from the camera
40	PIXEL_DATA11	Input	Raw pixel data from the camera
41	PIXEL_DATA10	Input	Raw pixel data from the camera
42	GND	Ground	
43	PIXEL_DATA9	Input	Raw pixel data from the camera
44	PIXEL_DATA8	Input	Raw pixel data from the camera
45	PIXEL_DATA7	Input	Raw pixel data from the camera
46	PIXEL_DATA6	Input	Raw pixel data from the camera
47	PIXEL_DATA5	Input	Raw pixel data from the camera
48	PIXEL_DATA4	Input	Raw pixel data from the camera
49	PIXEL_DATA3	Input	Raw pixel data from the camera
50	PIXEL_DATA2	Input	Raw pixel data from the camera
51	PIXEL_DATA1	Input	Raw pixel data from the camera
52	PIXEL_DATA0	Input	Raw pixel data from the camera
53	GND	Ground	
54	SYSTEM_PWR_ON_RST#	I/O	See table note 3
55	FPGA_SEL1	Input	See table note 4
56	FPGA_SEL0	Input	See table note 4
57	CAMERA_VIN	Power	Current carrying capacity up to 0.5A per pin (1.0A total for pins 57 and 58).
58	CAMERA_VIN	Power	Current carrying capacity up to 0.5A per pin (1.0A total for pins 57 and 58 combined).
59	DVCC (2.5V)	Power	Current carrying capacity up to 0.5A per pin (current supply capacity limited to 0.6A total for pins 59 and 60 combined).
60	DVCC (2.5V)	Power	Current carrying capacity up to 0.5A per pin (current supply capacity limited to 0.6A total for pins 59 and 60 combined).

Table notes:

1. Camera control signals, which let you control your camera using the NTx-Mini-S's PLC. Within the NTx-Mini-S's PLC, CC1 through CC4 are named Q4 through Q7.

2. Video synchronization signals, which signify FVAL (frame valid), LVAL (line valid), DVAL (data valid), and SPARE. In general, the NTx-Mini-S can acquire images properly if it receives the LVAL signal. Note that the PLC lets you create your own FVAL and LVAL signals. For more information, see the I/O block in the *iPORT Programmable Logic Controller Reference Guide*, available at supportcenter.pleora.com. For information about the FVAL, LVAL, and DVAL signals, see "Pixel Bus Timing" on page 15.
3. **SYSTEM_PWR_ON_RST** is the NTx-Mini-S power-on-reset signal. This signal can be used as an input or output. When power is first applied to the NTx-Mini-S, the NTx-Mini-S actively holds **SYSTEM_PWR_ON_RST#** low. When the voltages stabilize, the NTx-Mini-S releases the signal and an onboard pull-up makes the signal high. This is useful when you want to suppress camera activity if the camera boots faster than the NTx-Mini-S.

   This signal can also be used as an input to the NTx-Mini-S. By holding the signal low, you can keep the NTx-Mini-S in its reset state (idle) until the camera is ready. This signal must be held low for a minimum of 500 ns. This is useful when the NTx-Mini-S boots faster than the camera. When the NTx-Mini-S resets, its state is lost, memory is flushed, connectivity with the host computer is lost, and the IP addresses are cleared. To hold the signal low, an open-drain driver is required, as long as there is no pull-down resistance on the camera side.
4. **FPGA_SEL0** and **FPGA_SEL1** are the firmware select signals. These signals determine which firmware load is used (the backup or the main firmware load). When the NTx-Mini-S boots, the bit settings determine the function, as listed in the following table.

Table 5: FPGA_SEL Settings

FPGA_SEL	Function
00	Backup firmware load
01	Reserved
10	Reserved
11	Main firmware load

Input and Output Signal Levels

The following table provides the input and output signal levels. The voltage levels are with respect to ground.

Table 6: Input and Output Signal Levels

Absolute maximum ratings	-0.5V minimum	3.95V maximum
Input voltage low	-0.3V minimum	0.7V maximum
Input voltage high	1.7V minimum	3.6V maximum
Output voltage low		0.4V maximum
Output voltage high	2.0V minimum	

Pixel Bus Timing

The NTx-Mini-S pixel bus (available on the NTx-Mini-S raw video connector) transmits data from the camera to the NTx-Mini-S in a format that is similar to deserialized Camera Link Standard data, as shown in the following image.

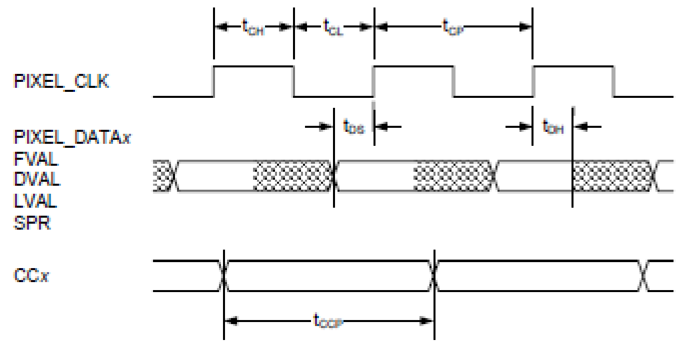


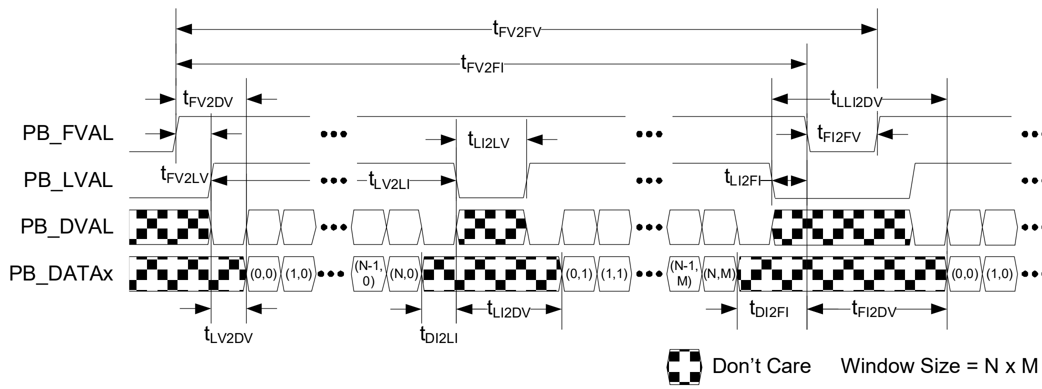
Table 7: Sub-Clock Delays on the Camera Interface

Parameter	Symbol	Minimum	Maximum	Notes
PIXEL_CLK high-level width	tCH	4.5 ns typical		
PIXEL_CLK low-level width	tCL	4.5 ns typical		
PIXEL_CLK frequency	fCP		90 MHz	
PIXEL_CLK clock period	tCP	11.0.ns		
PIXEL_DATA setup time	tDS	2 ns		By design
PIXEL_DATA hold time	tDH	2 ns		By design
CCx pulse width	tCCP	30 ns		Asynchronous with respect to **PIXEL_CLK**, but can be sampled using **SYSTEM_CLK**

Pixel Bus Signals

The output of the camera must match the format of the NTx-Mini-S. The pixel bus is available on the NTx-Mini-S raw video connector. You should select a case for your application and then refer to "Timing Values for All Cases" on page 18.

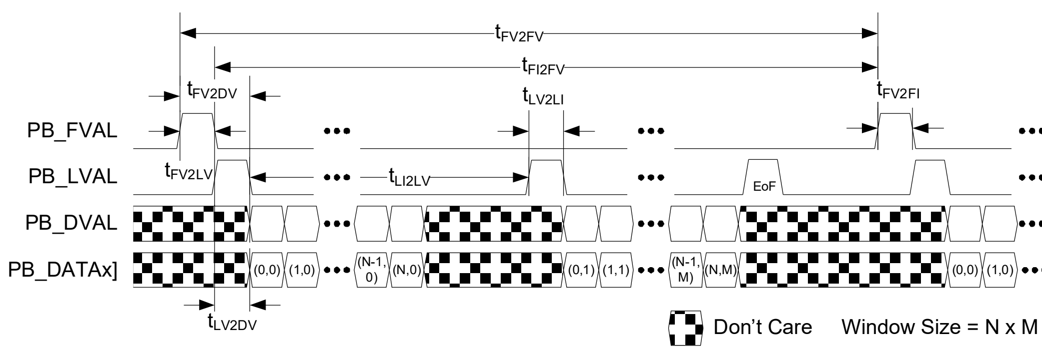
Case 1: FVAL and LVAL are Level-Sensitive



Case 2: FVAL and LVAL are Edge-Sensitive

In this case, FVAL and LVAL are edge-sensitive.

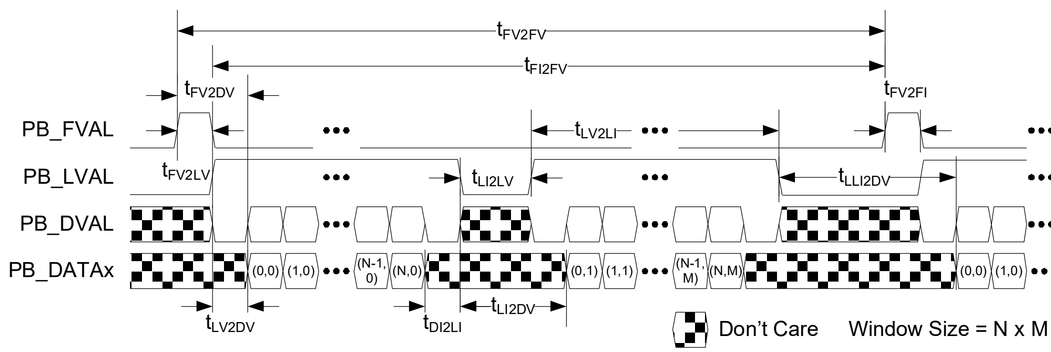
- **Start of frame/line is signaled by:** A rising (or falling) edge on FVAL, which signals the start of a *frame*. A rising (or falling) edge on LVAL, which signals the start of a *line*.
- **End of frame is signaled by:**
  - The next FVAL valid edge (rising edge when rising-edge sensitive or falling edge when falling-edge sensitive) occurs.
  - Or, when all of the pixels have been acquired (as set in the image height and width settings) **AND** an end-of-frame (EoF) occurs.
    Note: EoF occurs at LVAL rising edge (when rising-edge sensitive) or LVAL falling edge (when falling-edge sensitive). This is an additional LVAL edge, in addition to the configured/expected number of lines. See the EoF indicator in the illustration below.
- **Line Missing status and Partial Line Missing errors:** Partial Line Missing indicates lines are ending early (the next LVAL valid edge occurs before all of the pixels have been acquired). Full Line Missing indicates that the frame is ending early (the next FVAL edge occurs before all of the lines have been acquired).



Case 3: FVAL is Edge-Sensitive and LVAL is Level-Sensitive

In this case, FVAL is edge-sensitive and LVAL is level-sensitive.

- **Start of frame/line is signaled by:** A rising (or falling) edge on FVAL, which signals the start of a *frame*. The line is valid when LVAL is active (high or low depending on settings).
- **End of frame is signaled by:**
  - The next FVAL valid edge (rising edge when rising-edge sensitive or falling edge when falling-edge sensitive) occurs.
  - Or when all of the <u>lines</u> have been acquired (as set in the image <u>height</u> settings) **<u>AND</u>** the last LVAL with valid data is de-asserted (low when high level sensitive or high when low level sensitive).
- **Line Missing status or a Partial Line Missing error generated:**
  - Full Line Missing indicates that the frame is ending early (the next FVAL edge occurs before all of the lines have been acquired). Partial Line Missing indicates that lines are ending early (in this case, LVAL is de-asserted before all of the pixels in a line are captured).



Timing Values for All Cases

Table 8: Timing Values for All Cases

From	To	Symbol	Case 1 (level) (t_{cp})	Case 2 (edge) (t_{cp})	Case 3 (both) (t_{cp})
FVAL valid	LVAL valid [a]	t_{FV2LV}	0 [b]	0 [c]	1
FVAL valid	Data valid [a, d, e]	t_{FV2DV}	0 [b]	16 [c, g]	1
LVAL valid	Data valid [a, d, e]	t_{LV2DV}	0	1	0
LVAL valid	LVAL invalid [a]	t_{LV2LI}	1	1	1
LVAL invalid	LVAL valid [a]	t_{LI2LV}	1	1	1
LVAL invalid (Automatic Internal Retrigger disabled)	Data valid [a, d, e]	t_{LI2DV}	1	N/A	1

Table 8: Timing Values for All Cases (Continued)

From	To	Symbol	Case 1 (level) (t_{cp})	Case 2 (edge) (t_{cp})	Case 3 (both) (t_{cp})
LVAL invalid (Automatic Internal Retrigger enabled)	Data valid	t_{LI2DV}	16 [g]	N/A	16 [g]
Data invalid	LVAL invalid [a, d, e]	t_{DI2LI}	0	N/A	0
LVAL invalid	FVAL invalid [a]	t_{LI2FI}	0 [f]	N/A	N/A
Data invalid	FVAL invalid [a, d, e]	t_{DI2FI}	0 [f]	N/A	N/A
FVAL invalid	FVAL valid [a]	t_{FI2FV}	1	1	1
FVAL invalid	Data valid [a, d, e]	t_{FI2DV}	1	N/A	N/A
Last LVAL invalid	Data valid	t_{LLI2DV}	16 [g]	N/A	16 [g]
FVAL valid	FVAL invalid	t_{FV2FI}	16 [g]	1	1
FVAL valid	FVAL valid	t_{2FV2FV}	17 [g]	17 [g]	17 [g]

a. The valid state of FVAL and LVAL is high when they are set as level-high sensitive or rising-edge sensitive. Their valid state is low when they are set as level-low sensitive or falling-edge sensitive.

b. If LVAL is valid before FVAL becomes valid, the grabber drops the full line.

c. The configuration of FVAL as level-sensitive and LVAL as edge-sensitive is invalid and is seen as FVAL and LVAL being both edge-sensitive.

d. Data valid is defined by FVAL valid (note a), LVAL valid (note a), and DVAL valid (note e).

e. The valid state of DVAL is high when it is set as level-high sensitive, and low when set as level-low sensitive. DVAL is always valid in the grabber when the **PixelBusDataValidEnabled** parameter is off.

f. If FVAL becomes invalid and LVAL is still valid, the line is truncated.

g. This is a worst-case value. Subtract 3 cycles if the pixel type is 8-bit, 1-tap. Subtract 1 cycle for all other pixel types, except 10/12-bit, 2-tap, unpacked, and RGB unpacked. Subtract up to 7 cycles if the image size is a multiple of 32 bytes.

High-Bandwidth Serial Port: BULK0

The NTx-Mini-S has a bulk data transfer port that is used for high-bandwidth serial communication. The port supports the standard UART (Universal Asynchronous Receiver/Transmitter) and USRT (Universal Synchronous Receiver/Transmitter) protocols. Alternatively, you can use the bulk port for I2C (Inter-Integrated Circuit). This port allows you to communicate with a camera or other serial communication device.

This serial port sends many bytes over the serial link at once, improving overall transmission times, particularly for large messages.

- BULK0_TXD is an output relative to the NTx-Mini-S (transmit)
- BULK0_RXD is an input
- BULK0_CLK is a clock, though some ports may not include this signal

Note: When this interface is used for I2C, an external pull-up resistor is required on SCL (pin 13 on the raw video connector) and SDA (pin 14 on the raw video connector). To determine what resistor to use, consult the *I2C Specification*, available from NXP Semiconductors.

Depending on the selected **BulkMode**, the port signals vary, as listed in the following table.

Table 9: BULK0 Signals

Signal	BulkMode is set to UART	BulkMode is set to USRT	BulkMode is set to I2C
BULK0_RXD	RXD (receive data)	RXD (receive data)	Not applicable
BULK0_TXD	TXD (transmit data)	TXD (transmit data)	SDA data (serial data)
BULK0_CLK	Not applicable	SCK (serial clock)	SCL (serial clock)

High-Bandwidth Serial: BULK0 UART

The high-bandwidth UART serial interface uses the following signals:

- BULK0_RXD
- BULK0_TXD
- DGND (return)

High-Bandwidth Serial: BULK0 USRT

The high-bandwidth USRT serial interface resembles the UART interface, but adds a clock signal to enable synchronous communication.

Table 10: USRT Signal Nomenclature

NTx-Mini-S signal	Generic signal
BULK0_RXD	RXD
BULK0_TXD	TXD
BULK0_CLK	SCK

Table 11: Supported Clock Frequencies

Clock period, tSCK (ns)	Clock frequency a (MHz)
60	16.667
120	8.333
240	4.167
480	2.083
960	1.042
1920	0.521
3840	0.260
7680	0.130

a. To obtain the exact frequency, divide the 33.333 MHz clock speed by one of: 2, 4, 8, 16, 32, 64, 128, or 256.

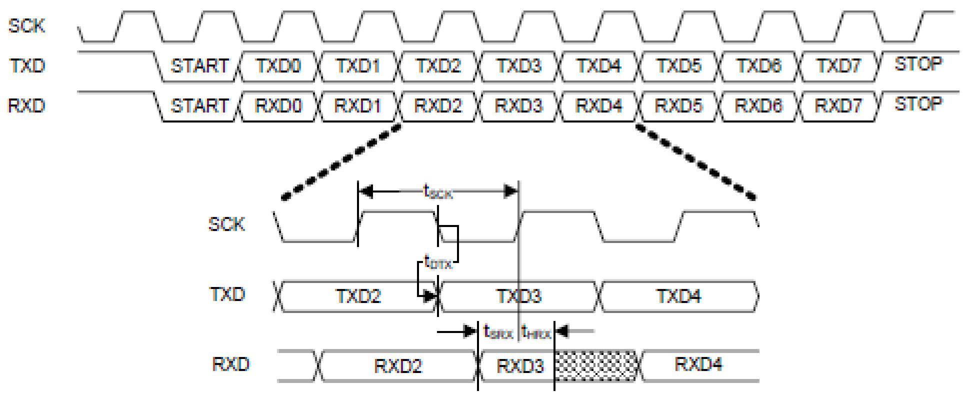


Table 12: Clock Periods, Delays, and Timing

Parameter	Symbol	Minimum	Maximum
Clock period	t SCK	60 ns [a]	960 ns [b]
SCK to TXD delay	t DTX	-5 ns	5 ns
RXD setup time	t SRX	16 ns	44 ns
RXD hold time	t HRX	0 ns	44 ns

a. Clock frequency of 16.667 MHz

b. Clock frequency of 0.130 MHz

High Bandwidth Serial: I2C

The I2C serial interface is a bi-directional serial bus that supports multi-master communication between many serial-capable devices. The NTx-Mini-S supports these features:

- I2C clock speeds of 100 kHz (standard mode) and 400 kHz (fast mode)
- Direct and indirect addressing
- Burst reads up to 64 kBytes; unlimited burst writes

For detailed timing and important implementation details, see *The I2C-Bus Specification, version 2.1, January 2000*, from Philips Semiconductors (document order number: 9398 393 40011). For a general description of how I2C works, see http://en.wikipedia.org/wiki/I%C2%B2C.

Table 13: I2C Signal Nomenclature

NTx-Mini-S signal	Generic signal
BULK0_RX	N/A
BULK0_TX	SDA
BULK0_CLK	SCL

Standard-Bandwidth Serial Port: UART

The standard-bandwidth serial port sends one byte at a time over Ethernet. The next byte is not sent until the previous byte is acknowledged.

UART0 is also referred to as SERTC (transmit data line) and SERTFG (receive data line).

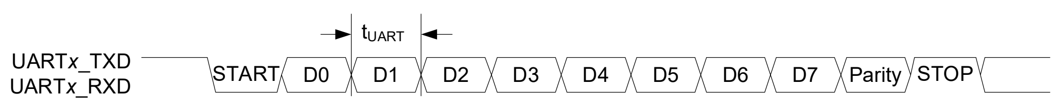
The standard-bandwidth serial port communication uses the following signals:

- UART*x*_TXD, which is an output relative to the NTx-Mini-S
- UART*x*_RXD, which is an input
- DGND (return)

UART Timing

The UART interface supports:

- 8-bit data transfer
- 1 start bit
- Programmable stop bit(s): 1 or 2
- Parity: Even, odd, or none
- Baud rates:
  - Predefined rates: 9600, 14 400, 19 200, 28 800, 38 400, 57 600, and 115 200
  - Programmable
- Loop back mode from downstream to upstream



A number of preset baud rates can be used. If you require a baud rate that is not covered by the presets, you can specify your own baud rate. To specify your own baud rate:

1. In the **Device Control** dialog box, under **Port Communication** > **Bulk/Uart*x***, choose **Programmable** in the **BulkBaudRate/Uart*x*BaudRate** list.
2. In the **BulkBaudRateFactor/Uart*x*BaudRateFactor** field, enter a baud rate between 1 and 511.

The NTx-Mini-S calculates the baud rate using the following equation:
(33.333333 MHz * 1000000)/(**BulkBaudRateFactor/Uart*x*BaudRateFactor** * 16)

Table 14: UART Baud Rates

Baud rate (BR) [bps]	Notes
9,600	Preset 0 (default)
14,400	Preset 1
19,200	Preset 2
28,800	Preset 3
38,400	Preset 4
57,600	Preset 5
115,200	Preset 6
• **Maximum BulkBaudRateValue:** 2,083,333* • **Minimum BulkBaudRateValue:** 8170 **	Programmable baud rate

* When **BulkBaudRateFactor/Uart*x*BaudRateFactor** is set to 1.

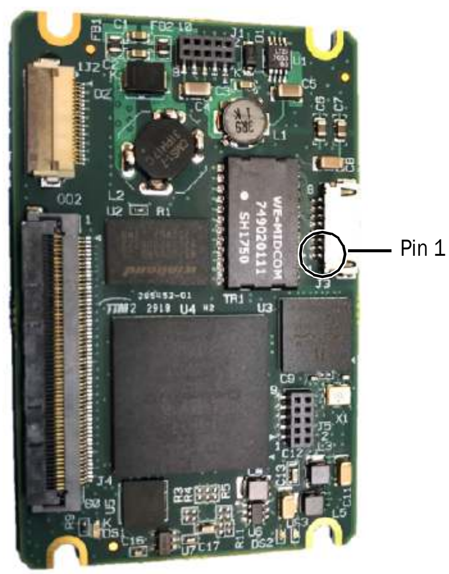
** When **BulkBaudRateFactor/Uart*x*BaudRateFactor** is set to 255.

LAN/Ethernet Connector (J3)

The LAN/Ethernet connector interfaces the NTx-Mini-S to Ethernet networks, as specified in IEEE 802.3.

You can use either Category 5E cables or Category 6/6A cables. We recommend unshielded twisted-pair (UTP) cables. Note that at greater distances, the voltage differential between the grounds at either end of the cable makes the shield behave like an antenna, which can cause noise or EMI issues.

This connector mates with a Hirose DF19G-8S-1C(05) connector.



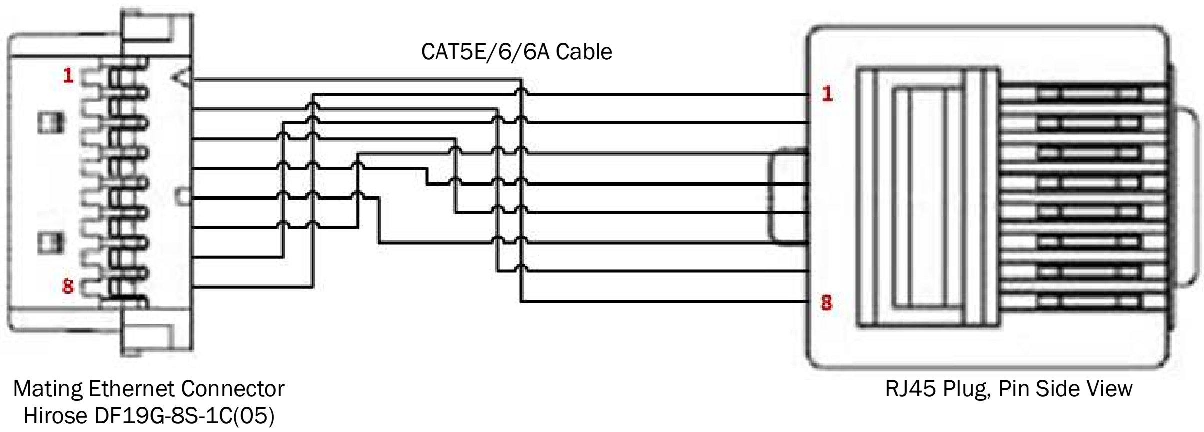
The following table lists the LAN/Ethernet connector pinouts.

Table 15: Connector Names: LAN/Ethernet Connector - Detail

DF19G-8P-1H(54) pin*	RJ-45 pin	Pair	Color
1	8	4	Brown solid
2	7	4	White/brown stripe
3	5	1	White/blue stripe
4	4	1	Blue solid
5	6	3	Green solid
6	3	3	White/green stripe
7	2	2	Orange solid
8	1	2	White/orange stripe

*The MAC/PHY on the NTx-Mini-S has the ability to automatically detect and correct some UTP cable wiring inconsistencies. In particular, the symbol decoder internally detects and compensates for the following inconsistencies:

- Swapping of pairs within the UTP cable
- Swapping of wires within a pair



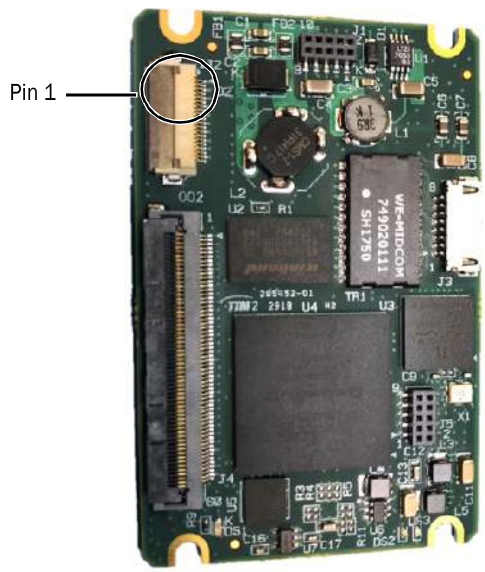
PLC 20-Pin FFC/FPC Connector (J2)

The PLC connector connects to the FlexEBoard (or your own board) with a 20-pin FFC cable. The PLC connector can carry signals that include:

- Inputs from and outputs to external machinery
- Power
- Serial communication

The PLC 20-pin FFC/FPC connector has gold-plated contacts. To avoid galvanic corrosion, only use FFC/FPC cables with contacts that are plated with gold or a suitable material.

To learn more about controlling external machinery with the NTx-Mini-S's PLC, see the *iPORT Programmable Logic Controller Reference Guide*.



The NTx-Mini-S only supports 2.5V GPIO.

The following table lists the PLC 20-pin connector pinouts.

Table 16: Connector Names: PLC 20-Pin FFC/FPC

Pin	Signal name	Type	Notes
1	RET	Power Return	0.5A maximum per pin, 1.5A total
2	RET	Power Return	0.5A maximum per pin, 1.5A total
3	RET	Power Return	0.5A maximum per pin, 1.5A total
4	PWR	Power	0.5A maximum per pin, 1.5A total. Nominally 4.2V to 16V. See "Power Supply Options" on page 36 for details.
5	PWR	Power	0.5A maximum per pin, 1.5A total. Nominally 4.2V to 16V. See "Power Supply Options" on page 36 for details.
6	PWR	Power	0.5A maximum per pin, 1.5A total. Nominally 4.2V to 16V. See "Power Supply Options" on page 36 for details.
7	GND	Ground	0.25 A. Ferrite bead filtered.
8	GPIO_IN0*	Input	
9	GPIO_OUT0*	Output	
10	GPIO_IN1*	Input	
11	GPIO_OUT1*	Output	
12	GPIO_IN2*	Input	

Table 16: Connector Names: PLC 20-Pin FFC/FPC (Continued)

Pin	Signal name	Type	Notes
13	GPIO_OUT2*	Output	
14	GPIO_IN3*	Input	
15	GPIO_OUT3*	Output	
16	Reserved	Output	
17	Reserved	Output	
18	Reserved	Hi-Z	Reserved for future use
19	Reserved	Hi-Z	Reserved for future use
20	GND	Ground	

* 2.5V LVTTL inputs/outputs from the NTx-Mini-S's PLC. Within the NTx-Mini-S's PLC, GPIO_IN0/GPIO_OUT0 through to GPIO_IN3/GPIO_OUT3 are named Q0 through to Q3.

Input and Output Signal Levels

For input and output signal levels, see Table 6 on page 14.

FlexEBoard

The FlexEBoard connects to the PLC connector, providing power and external signals. You can connect a 20-pin FFC cable to the Pleora FlexEBoard or to your own board.

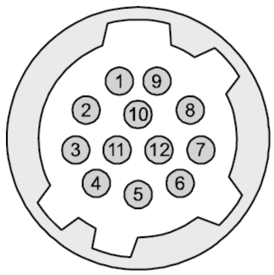
The mating connector for the 12-pin circular connector is a Hirose 12-pin connector, part number HR10A-10P-12S(73).

The NTx-Mini-S FlexEBoard makes the following pin mapping connections.

Table 17: Signal Connections

Signal name	PLC connector pin	FlexEBoard connector pin
RET	1	1
RET	2	1
RET	3	1
VIN	4	2
VIN	5	2
VIN	6	2
GND	7	5
GPIO_IN0	8	10
GPIO_OUT0	9	9
GPIO_IN1	10	8
GPIO_OUT1	11	7
GPIO_IN2	12	6
GPIO_OUT2	13	4
GPIO_IN3	14	3
GPIO_OUT3	15	N/C
Reserved	16	N/C
Reserved	17	N/C
Reserved	18	11
Reserved	19	12
GND	20	5

The FlexEBoard has no active components. For the signals on each pin, follow the outputs from the NTx-Mini-S's PLC connector, then transform the pinouts using the signal connections provided in Table 17 on page 29.



When looking into the connector

PLC Timing

Internally, the PLC operates at 33.333 MHz. The PLC signals include:

- GPIO_INx
- GPIO_OUTx
- All PLC signals remain within the PLC. For more information, see the *iPORT Programmable Logic Controller Reference Guide*, available on the Pleora Support Center at supportcenter.pleora.com.

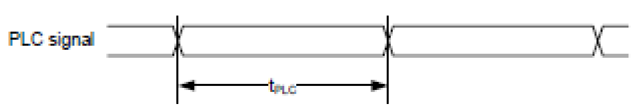


Table 18: PLC Signals

Parameter	Symbol	Minimum (ns)	Maximum (ns)
PLC signal pulse width	t_{PLC}	30	None

Chapter 4

Status LEDs

The status LEDs indicate the operating status of the NTx-Mini-S's network connection and firmware. The following figure and table describe the status LEDs.

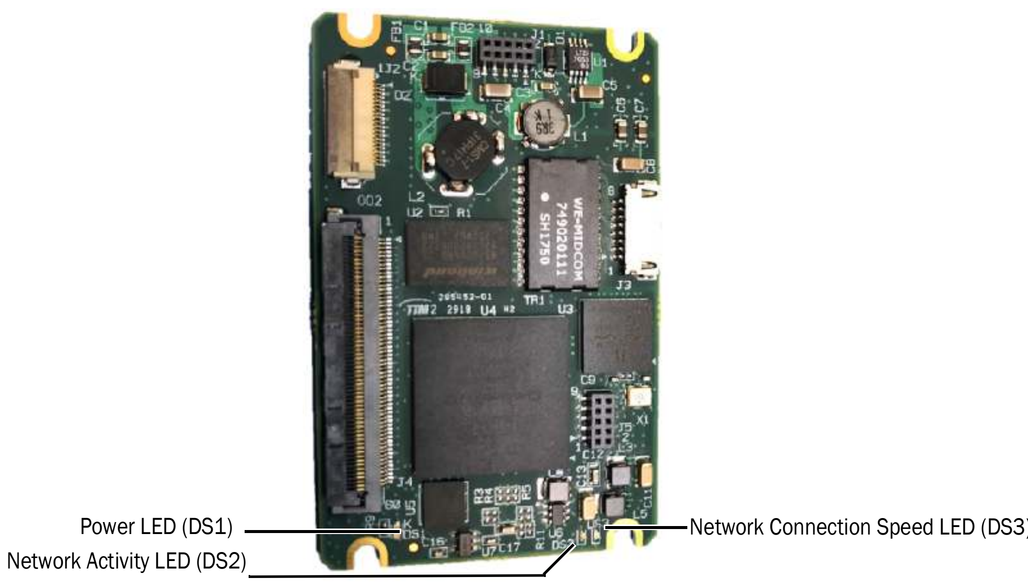


Table 19: Status LEDs

LED	ID	Description
Power	DS1 (green)	**Off:** Power is off. Or the NTx-Mini-S firmware is corrupted. **On:** Power is on.
Network link/ activity	DS2 (yellow)	**Off.** Link is down (no connection). **On:** Link is up (connected) with no activity. **Blinking:** Link is up with activity. Data is being transmitted or received.
GigE link status, network connection speed	DS3 (green)	**Off.** A GigE link is not established. No connection, 10 Mbps connection, or 100 Mbps connection. **On:** A GigE link is established

Chapter 5

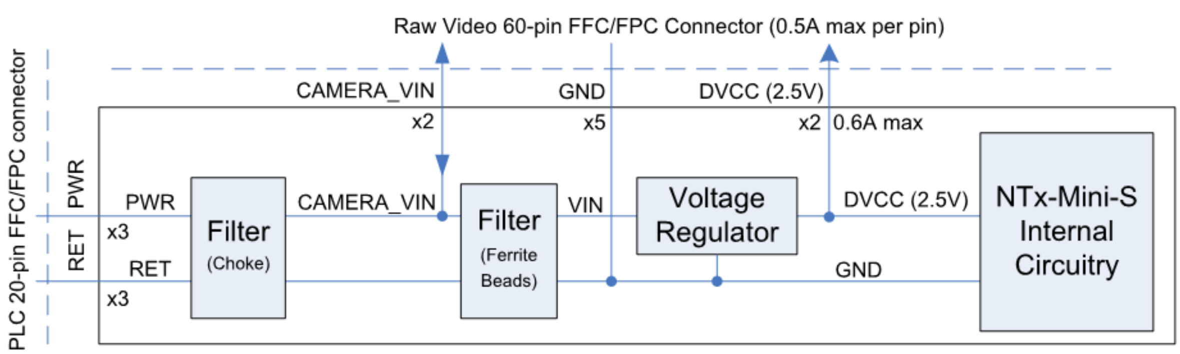
Power

This chapter describes how the NTx-Mini-S receives, distributes, and uses power. It also provides options for powering the NTx-Mini-S and camera.

There are no power sequence requirements when applying power and sending clocks/signals to the NTx-Mini-S from your camera. As soon as the NTx-Mini-S is fully powered, it can receive clocks/signals.

Power Supply Overview

The components of the NTx-Mini-S power supply are illustrated in the following figure and described in the subsequent sections.



Filter (Choke)

This filter is the first stage of a double-filtering scheme that has maximum efficiency in the range of 2-30 MHz, and allows the use of an unfiltered low voltage power supply. The filter consists of a choke, capacitors, and 16V Zener Transient Voltage Suppressor (TVS).

Filter (Ferrite Beads)

This filter is the second stage of a double-filtering power scheme recommended for electromagnetic compatibility (EMC) compliance, and is used by Pleora Technologies for all designs. This filter has the highest efficiency in the range of 100-400 MHz and isolates noise generated by the NTx-Mini-S from the power cable, to eliminate electromagnetic interference (EMI).

Note that because of the small PCB size, there is crosstalk in the board layout after this filter that causes EMI in the range of 100-400 MHz. Therefore, a ferrite cable core is required on both the PWR and RET wires.

Primary Voltage Regulator

The primary regulator supplies 2.5V to the NTx-Mini-S. The regulator operates within these conditions:

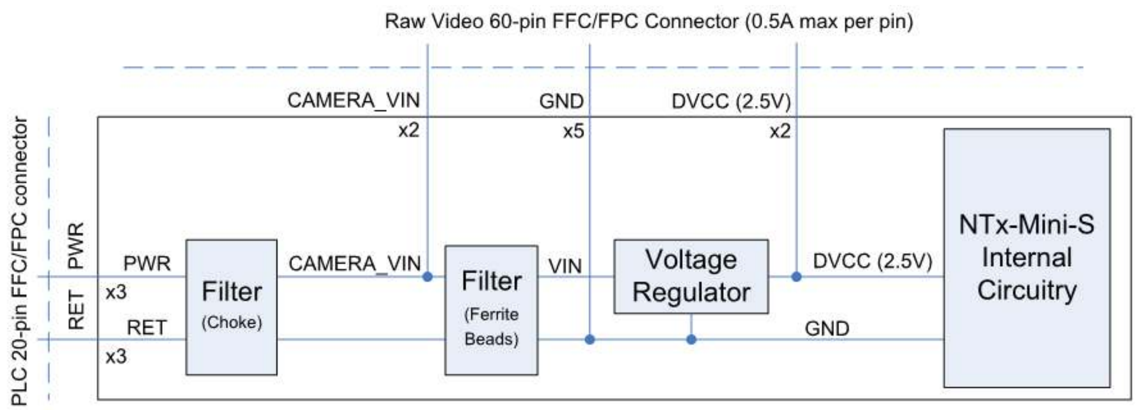
- The recommended operating range for VIN is 5 to 12V.
- The absolute operating range for VIN is 4.2 to 16V when DVCC (2.5V) is not connected, or 4.5 to 16V when DVCC is connected and supplying power.
- The maximum load at 2.5V is 1.3A. The NTx-Mini-S uses a maximum 0.7A, leaving 0.6A available for a user circuitry.

Power Connections

CAMERA_VIN

The NTx-Mini-S provides a double filtering scheme between the PWR/RET signals and the VIN/GND signals to improve electromagnetic compatibility (EMC). CAMERA_VIN is the signal between these two filtering schemes; the voltage levels remain unchanged. The CAMERA_VIN signal is available for connection to the camera either as an input or output.

A suggested circuit configuration for the raw video connector to the camera is shown in the following block diagram.



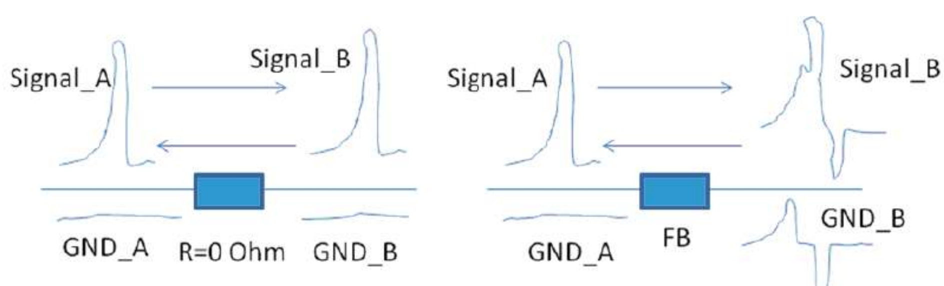
DVCC and GND

The NTx-Mini-S further filters the CAMERA_VIN and GND signals and regulates voltage levels using an onboard power supply. The DVCC and GND signals are used to power the NTx-Mini-S's internal circuitry. Due to fast level changes inherent to digital circuitry, these signals make poor voltage references (or sources) for analog camera components.

General Design Rules

Note these important design considerations for the NTx-Mini-S:

- Observe the maximum pin current rating of the connector, which is 0.5A for both the flat flex cables and the NTx-Mini-S connectors. For best performance, supply power to the board by implementing all of the available power pins from a single connector.
- Connect the GND pin to your camera for all designs. To minimize EMI, connect all available GND pins to your camera.
- Do not filter GND between the NTx-Mini-S and the camera. These design configurations are likely to cause reference-to-ground level problems, as shown in the following figure.



Use caution when referencing the GND signals to ensure signal degradation does not occur. For example, if a ferrite bead is situated between the grounds of the camera and the NTx-Mini-S, there are effectively two grounds. Signal A (camera) referenced to GND A (camera) results in no signal degradation (Signal B). However, if Signal A (camera) is referenced to GND B (NTx-Mini-S), signal degradation is observed. You will receive the same result if Signal B from the NTx-Mini-S is referenced to GND A of the camera.

Power Supply Options

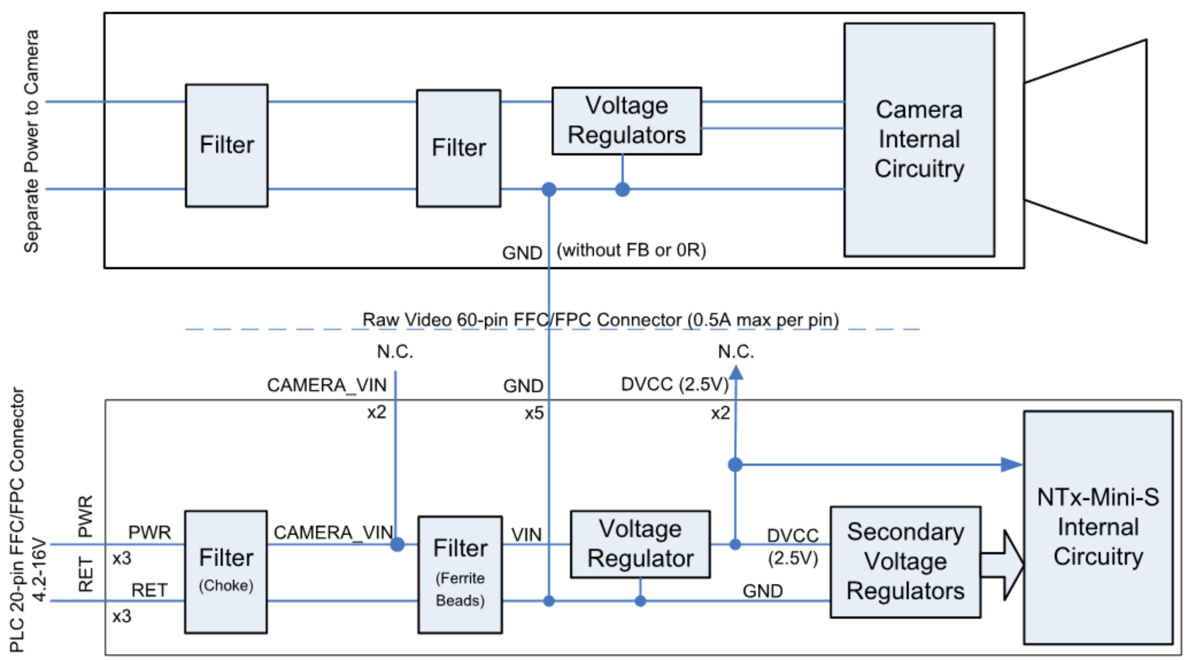
There are several options that are available for powering the NTx-Mini-S:

- **Design 1:** The NTx-Mini-S and camera are powered by separate power supplies.
- **Design 2:** The NTx-Mini-S supplies CAMERA_VIN to the camera.
- **Design 3:** The NTx-Mini-S supplies DVCC (2.5V) to the camera.
- **Design 4:** The camera supplies CAMERA_VIN to the NTx-Mini-S.

Design 1: Separate Power Supplies for the NTx-Mini-S and the Camera

This configuration uses separate power supplies for the NTx-Mini-S and the camera. The circuit layout for the separate power supplies is shown in the following figure.

Figure 1: Circuit Layout, Separate Power Supplies for NTx-Mini-S and Camera



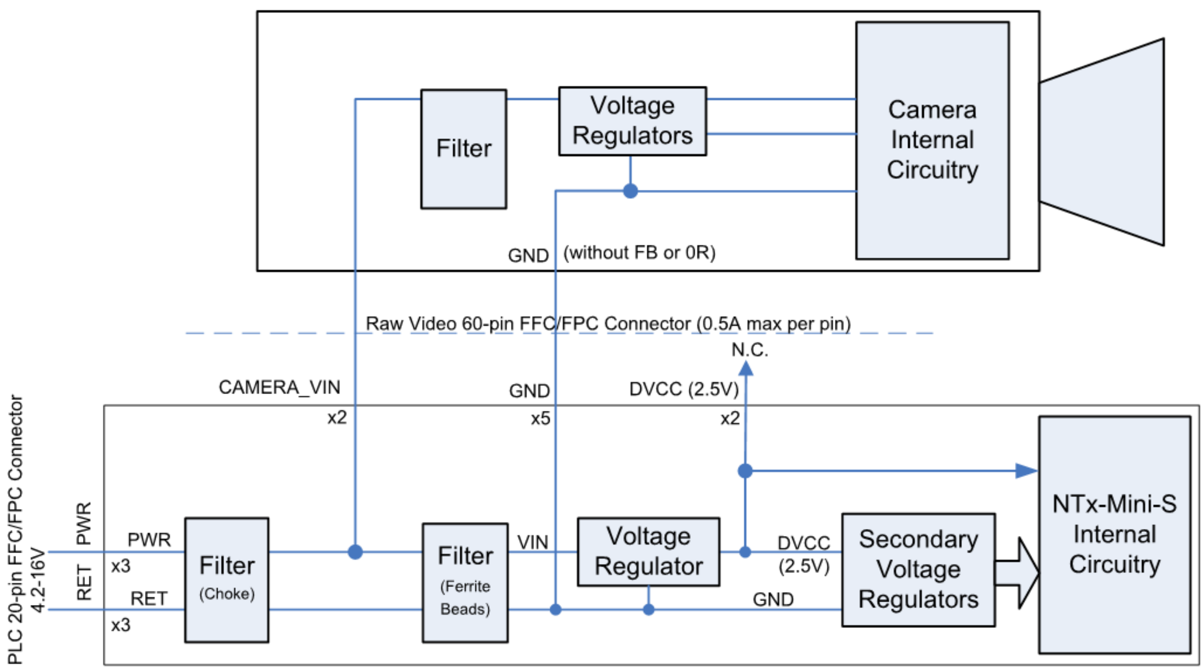
Consider these issues when using dedicated power supplies for the NTx-Mini-S and camera:

- Though separate, the grounds of both the NTx-Mini-S and camera must be at the same potential.
- Place a sufficient number of decoupling capacitors near all of the ICs in the internal circuitry of the camera, and near all of the voltage regulators. This technique minimizes the noise in the GND lines between the NTx-Mini-S and the camera.

Design 2: NTx-Mini-S Supplies CAMERA_VIN to the Camera

For this configuration, the NTx-Mini-S supplies CAMERA_VIN to the camera. The circuit layout is shown in the following figure.

Figure 2: Circuit Layout, NTx-Mini-S Supplies CAMERA_VIN to Camera



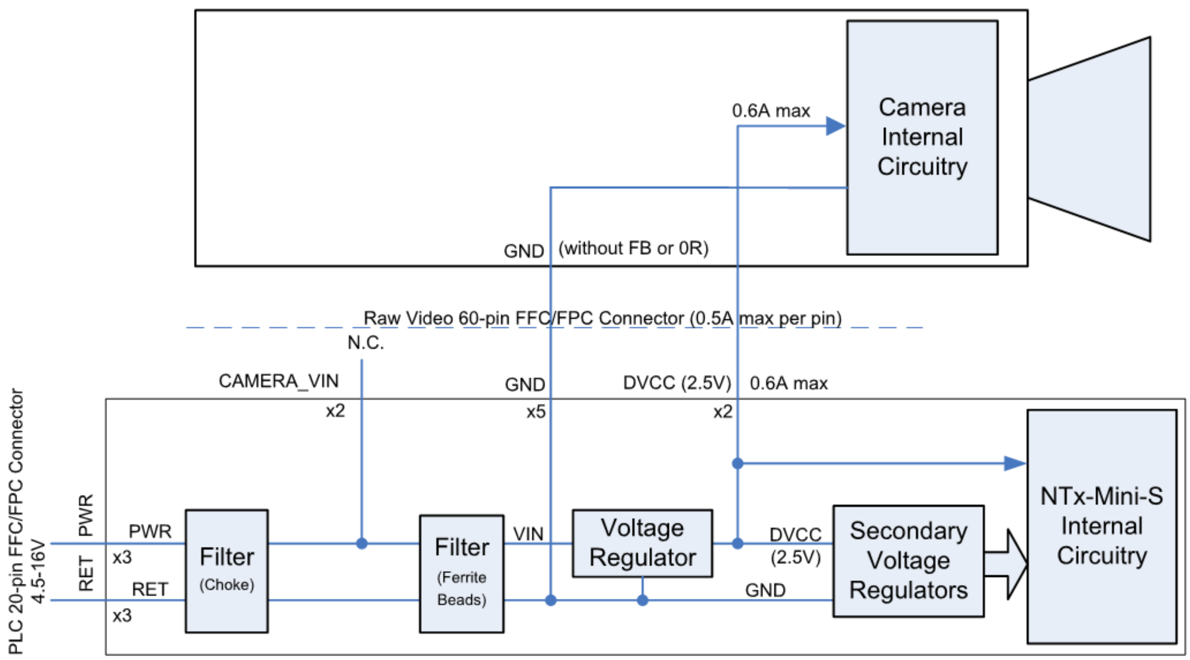
Consider these issues when supplying CAMERA_VIN to the camera from the NTx-Mini-S:

- The NTx-Mini-S partially filters the voltage, but most of the regulation is dependent on the power supply attached to PWR. For best results, filter and regulate the CAMERA_VIN signal before sending this voltage to the internal circuitry of the camera.
- Place a sufficient number of decoupling capacitors near all of the ICs in the internal circuitry of the camera and near all of the voltage regulators. This technique minimizes the noise in the GND lines between the NTx-Mini-S and the camera.

Design 3: NTx-Mini-S Supplies 2.5V DVCC to Camera

For this configuration, the NTx-Mini-S supplies 2.5V+/-3% DVCC to the camera. The NTx-Mini-S can supply a maximum of 0.6A (1.5W) to the camera. The circuit layout is shown in the following figure.

Figure 3: Circuit Layout, NTx-Mini-S Supplies 2.5V DVCC to Camera



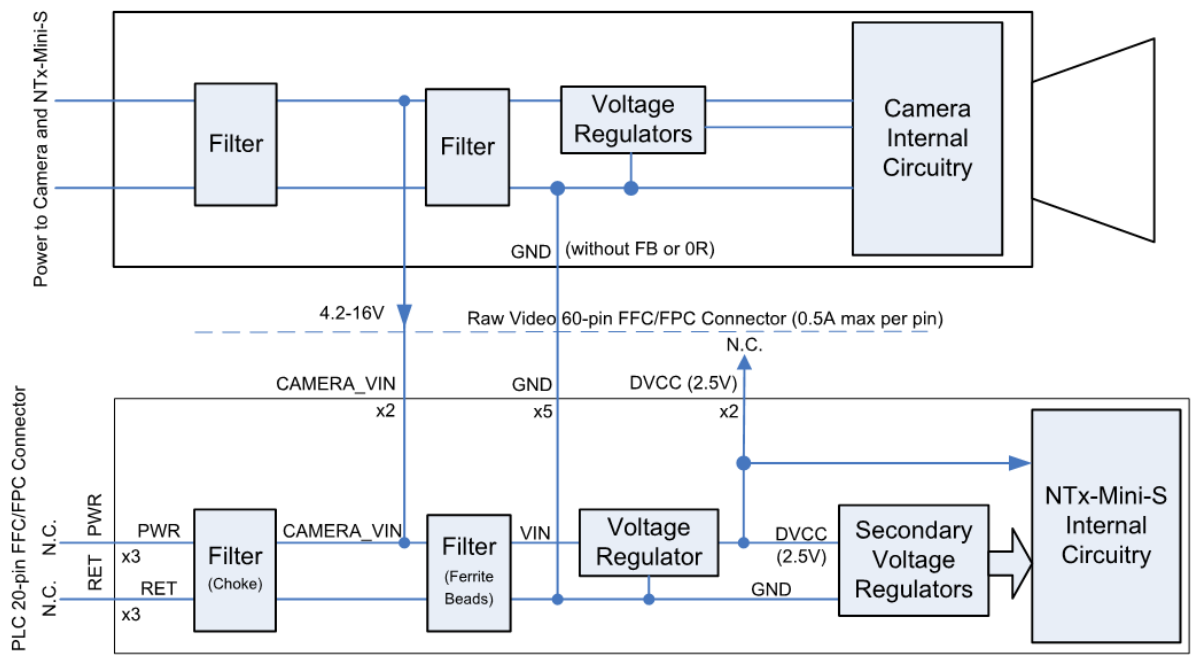
Consider these issues when supplying 2.5V to the camera from the NTx-Mini-S:

- The 2.5V supply is sufficiently filtered for digital circuitry. However, unfiltered 2.5V might not be suitable for the low-ripple, tightly controlled voltage required by the analog components (with a corresponding result in noisier images). If your camera requires 2.5V for the analog components, consider using a separate voltage regulator on the camera, or filter 2.5V further. Ferrite beads are recommended for this purpose.
- Place a sufficient number of decoupling capacitors close to all of the ICs in the internal circuitry of the camera, and close to all of the voltage regulators. This technique minimizes noise in the GND lines between the NTx-Mini-S and the camera.

Design 4: Camera Supplies CAMERA_VIN to the NTx-Mini-S

For this configuration, the camera supplies CAMERA_VIN to the NTx-Mini-S. The camera head must supply a minimum of 2.1W to the NTx-Mini-S. Note that this power value is the maximum for version 2.5.40 of the NTx-Mini-S firmware. Power requirements will vary as firmware upgrades become available. Specifications are subject to change without notice.

Figure 4: Circuit Layout, Camera Supplies CAMERA_VIN to NTx-Mini-S



Note that this arrangement bypasses the NTx-Mini-S's preliminary filter, including a Zener diode that minimizes ESD damage and voltage spikes. Therefore, filtering on the camera must also protect the voltage supplied to the NTx-Mini-S.

Power Consumption

The following table lists the power consumption of the NTx-Mini-S with version 2.5.40 of the NTx-Mini-S firmware.

Table 20: Power Consumption at Room Temperature

Power supply source	Streaming rate	Power (watts)
4.5V	Idle	1.60
	400 Mbps	1.75
	800 Mbps	1.90
6V	Idle	1.55
	400 Mbps	1.70
	800 Mbps	1.85
9V	Idle	1.70
	400 Mbps	1.85
	800 Mbps	2.00
12V	Idle	1.75
	400 Mbps	1.90
	800 Mbps	2.05

Chapter 6

Thermal Requirements

This chapter provides you with the information you need to ensure the optimal operating temperature for your NTx-Mini-S.

> You should store the NTx-Mini-S at temperatures between -40° to +85°C.

Ambient and Junction Temperatures

The following table lists the components that consume the largest amount of power on the NTx-Mini-S and will therefore be most affected by high temperatures. If you are designing a product to operate in high temperature conditions, you must provide a method to cool these components using a heat sink or thermal pad.

Table 21: NTx-Mini-S Thermal Guidelines

Reference designator	Component and manufacturer part number	Rating for component on standard Pleora product
U3	Broadcom PHY **Part number:** BCM5461A1KFBG	**T_A:** 0°C to +70°C **T_J:** 0°C to +125°C **Theta JC:** 15.2°C/W **Theta JA:** 38.6°C/W **Power consumption:** ~ 500 mW

Table 21: NTx-Mini-S Thermal Guidelines (Continued)

Reference designator	Component and manufacturer part number	Rating for component on standard Pleora product
U2	Winbond DDR2 **Part number:** W9725G6KB-25	**T_A:** Not specified **T_J:** Not specified **T_C:** 0°C to +85°C **Power consumption:** ~ 200 mW
U4	Altera FPGA **Part number:** EP3C25F324C8N	**T_A:** Not specified **T_J:** 0° to +85°C **Theta JC:** 5.5°C/W **Power consumption:** ~ 450 mW

Chapter 7

Pixel Bus Definitions

This chapter describes the interface responsible for transmitting data from the camera to the NTx-Mini-S.

Mono/RGB/Bayer

Table 22: Mono/RGB/Bayer Pixel Bus Definitions

	Mono8 / Bayer8		Mono10 / Bayer10		Mono12 / Bayer12		Mono14		Mono16 / Bayer16		BGR8		RGB8	
	Tap	Bit	Tap	Bit	Tap	Bit	Tap	Bit	Tap	Bit	Comp.	Bit	Comp.	Bit
PB_Data 0	0	0	0	0	0	0	0	0	0	0	B0	0	R0	0
PB_Data 1	0	1	0	1	0	1	0	1	0	1	B1	1	R1	1
PB_Data 2	0	2	0	2	0	2	0	2	0	2	B2	2	R2	2
PB_Data 3	0	3	0	3	0	3	0	3	0	3	B3	3	R3	3
PB_Data 4	0	4	0	4	0	4	0	4	0	4	B4	4	R4	4
PB_Data 5	0	5	0	5	0	5	0	5	0	5	B5	5	R5	5
PB_Data 6	0	6	0	6	0	6	0	6	0	6	B6	6	R6	6
PB_Data 7	0	7	0	7	0	7	0	7	0	7	B7	7	R7	7
PB_Data 8	1	0	0	8	0	8	0	8	0	8	G0	0	G0	0
PB_Data 9	1	1	0	9	0	9	0	9	0	9	G1	1	G1	1
PB_Data 10	1	2	-	nc	0	10	0	10	0	10	G2	2	G2	2
PB_Data 11	1	3	-	nc	0	11	0	11	0	11	G3	3	G3	3
PB_Data 12	1	4	1	8	1	8	0	12	0	12	G4	4	G4	4
PB_Data 13	1	5	1	9	1	9	0	13	0	13	G5	5	G5	5

Table 22: Mono/RGB/Bayer Pixel Bus Definitions (Continued)

	Mono8 / Bayer8		Mono10 / Bayer10		Mono12 / Bayer12		Mono14		Mono16 / Bayer16		BGR8		RGB8	
	Tap	Bit	Tap	Bit	Tap	Bit	Tap	Bit	Tap	Bit	Comp.	Bit	Comp.	Bit
PB_Data 14	1	6	-	nc	1	10	-	nc	0	14	G6	6	G6	6
PB_Data 15	1	7	-	nc	1	11	-	nc	0	15	G7	7	G7	7
PB_Data 16	2	0	1	0	1	0	-	nc	1	0	R0	0	B0	0
PB_Data 17	2	1	1	1	1	1	-	nc	1	1	R1	1	B1	1
PB_Data 18	2	2	1	2	1	2	-	nc	1	2	R2	2	B2	2
PB_Data 19	2	3	1	3	1	3	-	nc	1	3	R3	3	B3	3
PB_Data 20	2	4	1	4	1	4	-	nc	1	4	R4	4	B4	4
PB_Data 21	2	5	1	5	1	5	-	nc	1	5	R5	5	B5	5
PB_Data 22	2	6	1	6	1	6	-	nc	1	6	R6	6	B6	6
PB_Data 23	2	7	1	7	1	7	-	nc	1	7	R7	7	B7	7

YUV 4:1:1

Table 23: YUV411_8_UYYVYY: 1 Tap Pixel Bus Definitions

	Clock 1		Clock 2		Clock 3		Clock 4	
	Component	Bit	Component	Bit	Component	Bit	Component	Bit
PB_Data 0	Y11	0	Y11	4	Y13	0	Y13	4
PB_Data 1	Y11	1	Y11	5	Y13	1	Y13	5
PB_Data 2	Y11	2	Y11	6	Y13	2	Y13	6
PB_Data 3	Y11	3	Y11	7	Y13	3	Y13	7
PB_Data 4	U11	0	Y12	0	V11	0	Y14	0
PB_Data 5	U11	1	Y12	1	V11	1	Y14	1
PB_Data 6	U11	2	Y12	2	V11	2	Y14	2
PB_Data 7	U11	3	Y12	3	V11	3	Y14	3
PB_Data 8	U11	4	Y12	4	V11	4	Y14	4
PB_Data 9	U11	5	Y12	5	V11	5	Y14	5
PB_Data 10	U11	6	Y12	6	V11	6	Y14	6
PB_Data 11	U11	7	Y12	7	V11	7	Y14	7
PB_Data 12 through to PB_Data 31	-	-	-	-	-	-	-	-

YUV 4:2:2 and 4:4:4

Table 24: YUV 4:2:2 and 4:4:4 Pixel Bus Definitions

Signal name	YUV 4:2:2 (8 bit)	YUV 4:4:4
PIXEL_DATA0	Clk1: U0, Clk2: V0	U0
PIXEL_DATA1	Clk1: U1, Clk2: V1	U1
PIXEL_DATA2	Clk1: U2, Clk2: V2	U2
PIXEL_DATA3	Clk1: U3, Clk2: V3	U3
PIXEL_DATA4	Clk1: U4, Clk2: V4	U4
PIXEL_DATA5	Clk1: U5, Clk2: V5	U5
PIXEL_DATA6	Clk1: U6, Clk2: V6	U6
PIXEL_DATA7	Clk1: U7, Clk2: V7	U7
PIXEL_DATA8	Y0	Y0
PIXEL_DATA9	Y1	Y1
PIXEL_DATA10	Y2	Y2
PIXEL_DATA11	Y3	Y3
PIXEL_DATA12	Y4	Y4
PIXEL_DATA13	Y5	Y5
PIXEL_DATA14	Y6	Y6
PIXEL_DATA15	Y7	Y7
PIXEL_DATA16	Reserved	V0
PIXEL_DATA17	Reserved	V1
PIXEL_DATA18	Reserved	V2
PIXEL_DATA19	Reserved	V3
PIXEL_DATA20	Reserved	V4
PIXEL_DATA21	Reserved	V5
PIXEL_DATA22	Reserved	V6
PIXEL_DATA23	Reserved	V7

Chapter 8

Installing the eBUS Player Toolkit

This chapter describes how to install the eBUS Player Toolkit, and also provides information about the Pleora GigE Vision driver.

The following topics are covered in this chapter:

- "Installing the eBUS SDK and eBUS Player Toolkit" on page 48
- "Installing the eBUS Universal Pro Driver" on page 48

Installing the eBUS SDK and eBUS Player Toolkit

The eBUS SDK and eBUS Player Toolkit include applications to assist with setup, configuration, and troubleshooting. It also includes drivers that optimize the performance of your system. You can download the eBUS Player Toolkit (which is a free download) and eBUS SDK (available for purchase) from the Pleora Support Center at supportcenter.pleora.com

You can use the eBUS Player application to control the parameters of NTx-Mini-S. The player receives video and allows you to view streaming data and adjust device configuration settings to determine the optimal settings for your system.

The eBUS SDK is also available for software developers. It provides an extensive library of sample applications and with source code that you can use to create working applications for device configuration and control, image and data acquisition, and image display and diagnostics. For more information, visit www.pleora.com/products/ebus-sdk

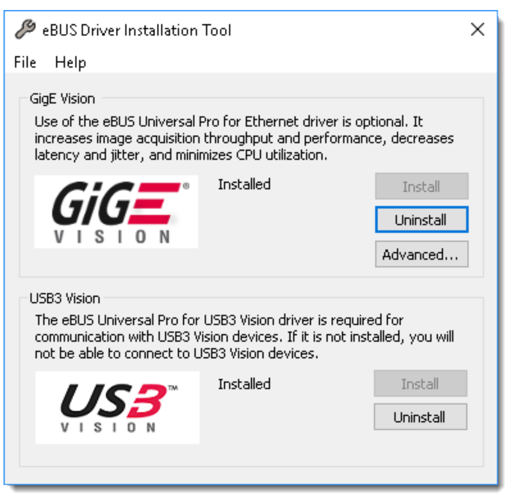
Installing the eBUS Universal Pro Driver

The eBUS Player Toolkit automatically installs the Pleora GigE Vision driver. The driver enhances existing general-purpose drivers shipped with NICs, increases image acquisition throughput and performance, decreases latency and jitter, and minimizes CPU utilization.

To use the eBUS Driver Installation Tool

1. Click **Start** > **All Programs** > **eBUS** > **eBUS Driver Installation Tool**.
2. Under **GigE Vision**, click **Install** or **Uninstall**.

   After a moment, the driver status changes. If you are installing the driver, the driver is installed across all network adapters or USB3 Vision devices on your computer.



3. Close the eBUS Driver Installation Tool.

   To see the versions of the installed drivers, click **Help** > **About**.

Chapter 9

Connecting to the NTx-Mini-S and Configuring General Settings

After you have set up the physical connections to the NTx-Mini-S, you can start eBUS Player to configure image settings to ensure images are received and displayed properly. You can also configure the buffer options to reduce the likelihood of lost packets.

eBUS Player is documented in more detail in the *eBUS Player User Guide*. The *iPORT NTx-Mini-S Embedded Video Interface User Guide* provides you with the eBUS Player instructions and overviews that will help you set up and configure the NTx-Mini-S.

The following topics are covered in this chapter:

Confirming Image Streaming

The NTx-Mini-S can communicate with your computer using either a direct connection or by connecting to a GigE switch.

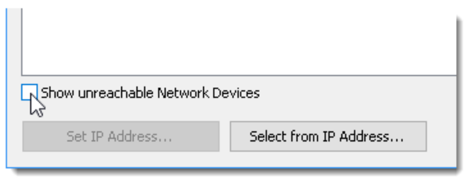
To connect the cables and apply power

- Connect the NTx-Mini-S to the RJ-45 Ethernet connector on your computer's NIC or a GigE switch. Then, apply power.

To start eBUS Player and connect to a device

1. Start eBUS Player from the Windows **Start** menu.
2. Click **Select/Connect**.

   If the NTx-Mini-S does not appear in the list, click the **Show unreachable Network Devices** check box to show all devices.



3. In the **Device Selection** dialog box, click the NTx-Mini-S.

If the IP address is not valid for the NTx-Mini-S, a warning ( ) appears in the **Device Selection** dialog box. Provide the device with an IP address, as outlined in "Providing the NTx-Mini-S with an IP Address" on page 52.

4. Click **OK**.

   eBUS Player is now connected to the NTx-Mini-S.

To confirm image streaming

1. Click **Play** to stream live images or the test pattern.

   For information about using the test pattern, see "To turn the test pattern on or off" on page 53.
2. After you confirm that images are streaming, click **Stop**.

Configuring the Buffers

You can increase the buffer count using eBUS Player to make streaming more robust. A high number of buffers are needed in high frame rate applications, while a small number of buffers are needed for lower frame rates. Latency increases as the number of buffers increases.

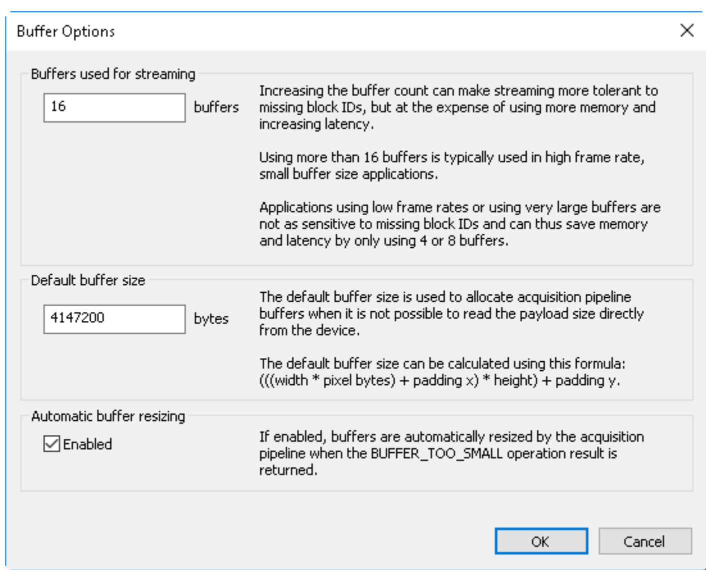
To configure the buffers

1. Start eBUS Player and connect to the NTx-Mini-S.

   For more information, see "To start eBUS Player and connect to a device" on page 50.

2. Click **Tools** > **Buffer Options**.
3. Click the buffer option that suits your requirements.
4. Click **OK**.

Default size for streaming is 16 buffers.



Providing the NTx-Mini-S with an IP Address

The NTx-Mini-S requires an IP address to communicate on a video network. The address must be on the same subnet as the computer that is performing the configuration and receiving the image stream.

To provide the NTx-Mini-S with an IP address

1. Start eBUS Player.
2. Click **Select/Connect**.
3. Click the NTx-Mini-S.
4. Click **Set IP Address**.
5. Provide the NTx-Mini-S with a valid IP address and subnet mask. You can optionally provide a default gateway.

If you are using a unicast network configuration, the management entity/data receiver and the NTx-Mini-S must be on the same subnet.

6. Click **OK** to close the **Set IP Address** dialog box.
7. Click **OK** to close the **Device Selection** dialog box and connect to the device.

Configuring an Automatic/Persistent IP Address

The Device Control dialog box allows you to configure a persistent IP address for the NTx-Mini-S. Alternatively, the NTx-Mini-S can be configured to automatically obtain an IP address using Dynamic Host Configuration Protocol (DHCP) or Link Local Addressing (LLA). The NTx-Mini-S uses its persistent IP address first, but if this option is set to **False**, it can be configured to attempt to obtain an address from a DHCP server. If this fails, it will use LLA to find an available IP address. LLA cannot be disabled and is always set to **True**.

To configure a persistent IP address

1. Start eBUS Player and connect to the NTx-Mini-S.

   For more information, see "To start eBUS Player and connect to a device" on page 50.
2. Under **Parameters and Controls**, click **Device control**.
3. Under **TransportLayerControl**, set the **GevCurrentIPConfigurationPersistentIP** feature to **True**.
4. Set the **GevPersistentIPAddress** feature to a valid IP address in the **GevPersistentIPAddress** field.
5. Set the **GevPersistentSubnetMask** feature to a valid subnet mask address.
6. Optionally, enter a valid default gateway in the **GevPersistentDefaultGateway** field.
7. Close the **Device Control** dialog box.
8. Power cycle the NTx-Mini-S.

To automatically configure an IP address

1. Start eBUS Player and connect to the NTx-Mini-S.

   For more information, see "To start eBUS Player and connect to a device" on page 50.
2. Under **Parameters and Controls**, click **Device control**.
3. Under **TransportLayerControl**, set the **GevCurrentIPConfigurationPersistentIP** feature to **False**.
4. Set the **GevCurrentIPConfigurationLLA** and/or **GevCurrentIPConfigurationDHCP** values to **True**, depending on the type of automatic addressing you require.
5. Close the **Device Control** dialog box.
6. Power cycle the NTx-Mini-S.

Configuring the Image Settings

You can configure the NTx-Mini-S's image settings, which provide it with information about the image coming from the camera. These settings allow the images to appear correctly.

The image settings are located under **ImageFormatControl** in the **Device Control** dialog box.

> Changes that you make to the NTx-Mini-S are not persisted across power cycles, unless you use the **UserSetSave** feature. For information about saving settings to the NTx-Mini-S's flash memory, see the *eBUS Player User Guide*, available on the Pleora Support Center.

To turn the test pattern on or off

1. Start eBUS Player and connect to the NTx-Mini-S.

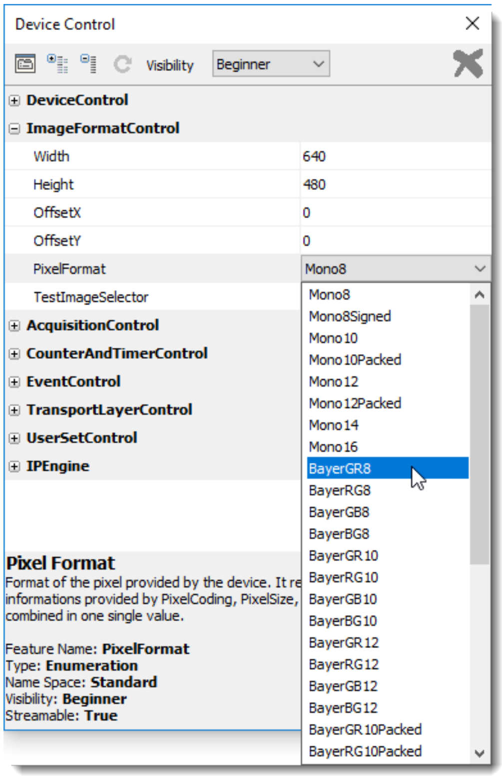
   For more information, see "To start eBUS Player and connect to a device" on page 50.
2. Under **Parameters and Controls**, click **Device control**.
3. Under **ImageFormatControl**, click a test pattern option in the list.
4. Close the **Device Control** dialog box.

To change the pixel format

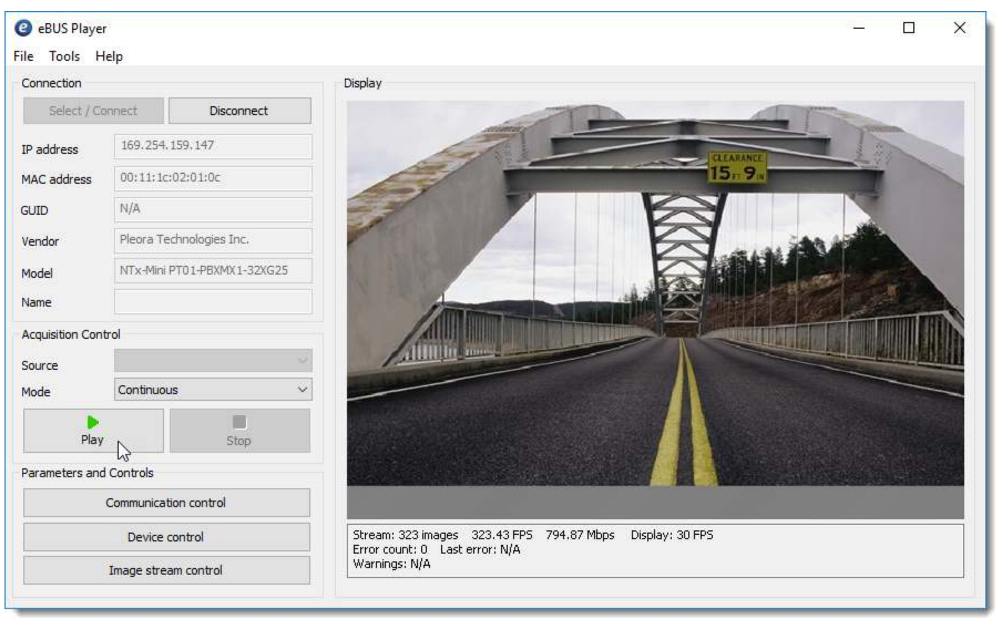
1. Start eBUS Player and connect to the NTx-Mini-S.

   For more information, see "To start eBUS Player and connect to a device" on page 50.
2. If images are streaming, click the **Stop** button.
3. Under **Parameters and Controls**, click **Device control**.

4. Under **ImageFormatControl**, set the **PixelFormat** feature to a color format.



5. Close the **Device Control** dialog box.
6. Click **Play** to see the changes.



To configure the image width and height

1. Start eBUS Player and connect to the NTx-Mini-S.

   For more information, see "To start eBUS Player and connect to a device" on page 50.
2. If images are streaming, click the **Stop** button.
3. Under **Parameters and Controls**, click **Device control**.
4. Under **ImageFormatControl**, change the **Width** and **Height** to suit your camera.
5. Close the **Device Control** dialog box.

Implementing the eBUS SDK

Software developers can create their own image acquisition software for the NTx-Mini-S using the Pleora eBUS SDK. Visit www.pleora.com/products/ebus-sdk for more information.

Chapter 10

Network Configurations for the NTx-Mini-S

After you have connected to the NTx-Mini-S and provided it with a unique IP address on your network, you can configure it for either unicast or multicast.

The following topics are covered in this chapter:

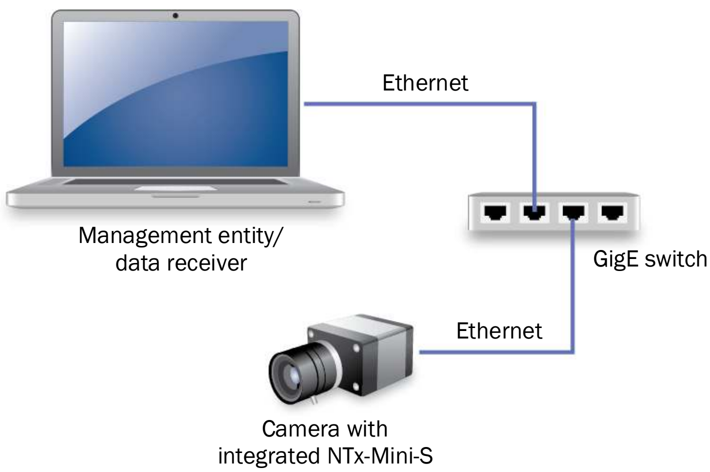
- "Unicast Network Configuration" on page 58
- "Multicast Network Configuration" on page 60

Unicast Network Configuration

In a unicast configuration, an NTx-Mini-S is connected to a GigE switch that sends a stream of images over Ethernet to the computer. Alternatively, the NTx-Mini-S can be connected directly to the computer.

The computer is configured as both a data receiver and controller, and serves as a management entity for the NTx-Mini-S.

Figure 5: Unicast Network Configuration



Required Items — Unicast Network Configuration

You require the following components to set up a unicast network configuration:

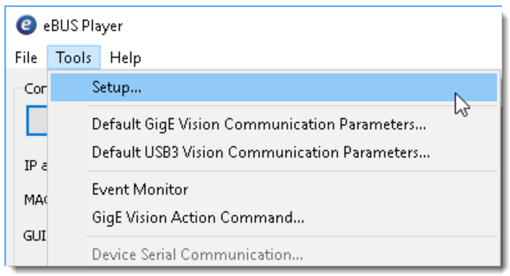
- Camera with integrated NTx-Mini-S and cables
- Power supply
- CAT5E/6/6A Ethernet cables
- GigE switch (optional)
- Desktop computer or laptop with the eBUS Player Toolkit or eBUS SDK installed

NTx-Mini-S Configuration — Unicast Network Configuration

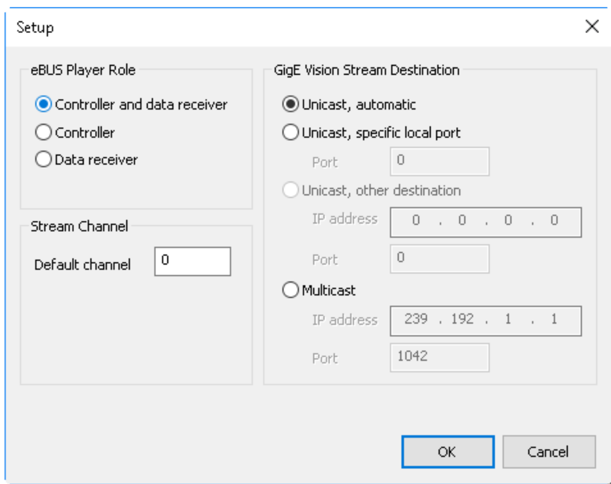
After you have connected and applied power to the hardware components, use eBUS Player to configure the NTx-Mini-S.

To configure the NTx-Mini-S for a unicast network configuration

1. Start **eBUS Player**.
2. Click **Tools** > **Setup**.



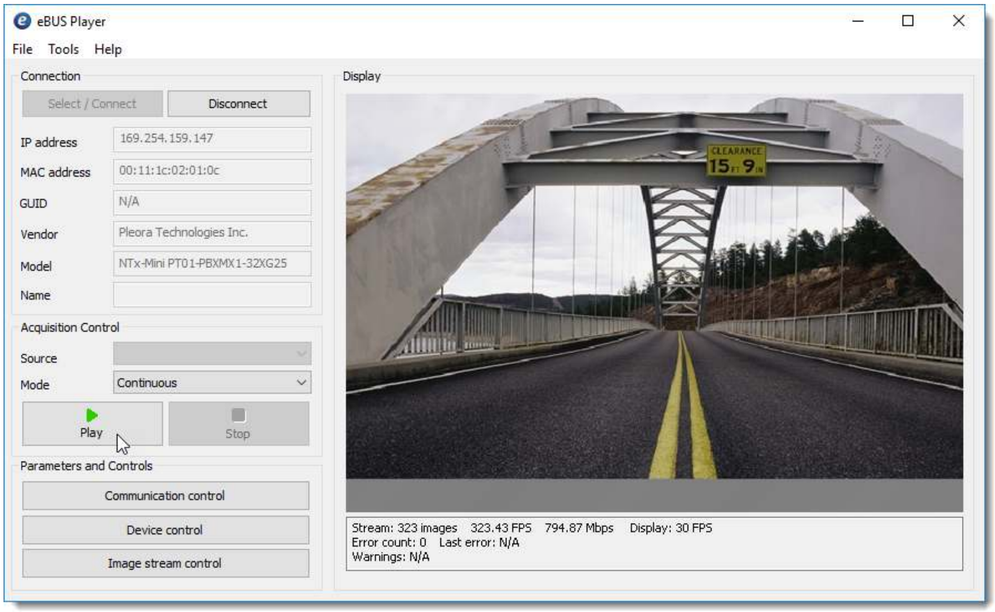
3. Under **eBUS Player Role**, click **Controller and data receiver**.



4. Under **GigE Vision Stream Destination**, click **Unicast, automatic**.
5. Click **OK**.
6. Connect to the NTx-Mini-S.

   For more information, see "To start eBUS Player and connect to a device" on page 50.

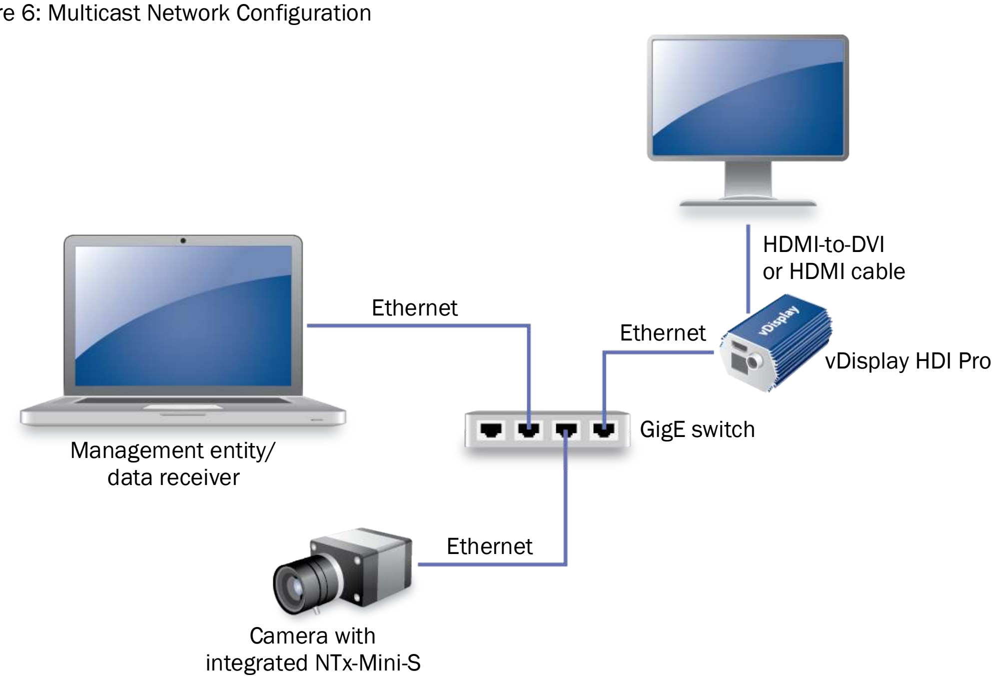
7. Click **Play** to view a live image stream.



Multicast Network Configuration

In a multicast network configuration, the NTx-Mini-S is connected to a GigE switch, and sends a stream of images over Ethernet simultaneously to both a computer and to a vDisplay HDI-Pro External Frame Grabber. Then, the vDisplay HDI-Pro External Frame Grabber converts it to an image stream for display on a monitor.

Figure 6: Multicast Network Configuration



Required Items — Multicast Network Configuration

You require the following components to set up a multicast network configuration:

- Camera with integrated NTx-Mini-S and cables
- Power supply
- vDisplay HDI-Pro External Frame Grabber and corresponding power supply
- Compatible display monitor
- Cable to connect the vDisplay HDI-Pro External Frame Grabber to the display monitor
- CAT5E/6/6A Ethernet cables
- GigE switch (optional)
- Desktop computer or laptop with the eBUS Player Toolkit or eBUS SDK installed

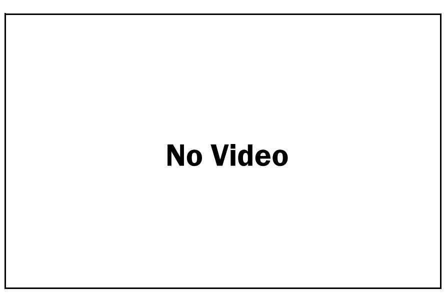
Connecting the Hardware and Power

The following procedure explains how to connect the power, network, and data cables to the vDisplay HDI-Pro External Frame Grabber and the NTx-Mini-S.

To connect the network cables and apply power

1. Connect one end of an Ethernet cable to the Ethernet connector on your computer's NIC. Attach the other end to an available port on the GigE switch.
2. Attach one end of the video cable to the display monitor. Attach the other end to the HDI connector on the vDisplay HDI-Pro External Frame Grabber.
3. Connect one end of an Ethernet cable to the vDisplay HDI-Pro External Frame Grabber Ethernet connector. Attach the other end to an available port on the GigE switch.
4. Connect one end of an Ethernet cable to the NTx-Mini-S Ethernet connector. Attach the other end to an available port on the GigE switch.
5. Apply power to the devices.

The message **No Video** appears on the display monitor.



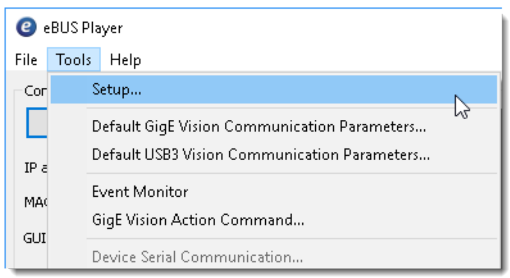
Configuring the Devices for a Multicast Network Configuration

After you have connected and applied power to the hardware components, use eBUS Player to configure the vDisplay HDI-Pro External Frame Grabber and NTx-Mini-S for multicast configuration. You may want to launch two instances of eBUS Player to perform both configurations. Begin by configuring the vDisplay HDI-Pro External Frame Grabber. Then, configure the NTx-Mini-S to transmit images to a multicast IP address and port.

The vDisplay HDI-Pro External Frame Grabber is documented in the *vDisplay HDI-Pro External Frame Grabber User Guide*. The *iPORT NTx-Mini-S Embedded Video Interface User Guide* provides you with the vDisplay HDI-Pro External Frame Grabber instructions and overviews required to set up and configure the vDisplay HDI-Pro External Frame Grabber for a multicast configuration.

To configure the devices for a multicast network configuration

1. Start **eBUS Player**.
2. Click **Tools** > **Setup**.

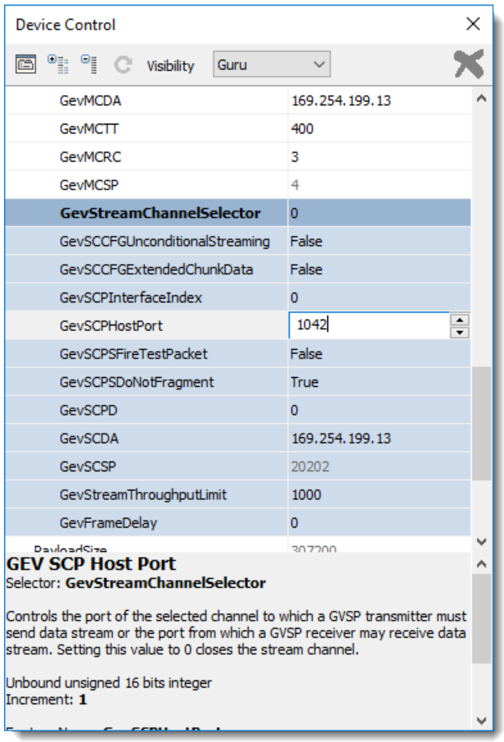


3. Under **eBUS Player Role**, click **Controller**.

   You do not need to specify the **GigE Vision Stream Destination**, as the stream destination is not applicable to a video receiver.
4. Click **OK**.
5. Connect to the vDisplay HDI-Pro External Frame Grabber.

   For more information, see "To start eBUS Player and connect to a device" on page 50.

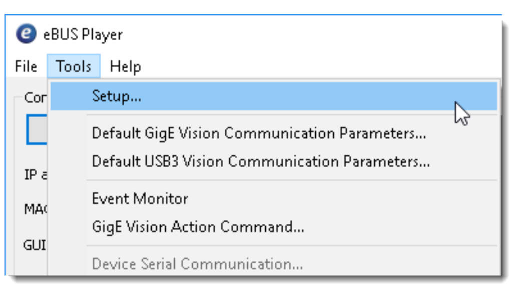
6. Click **Device control**.
7. Click **Guru** in the **Visibility** list.
8. In the **TransportLayerControl** > **GigEVision** category, set **GevSCPHostPort** to a streaming channel port (for example, 1042).



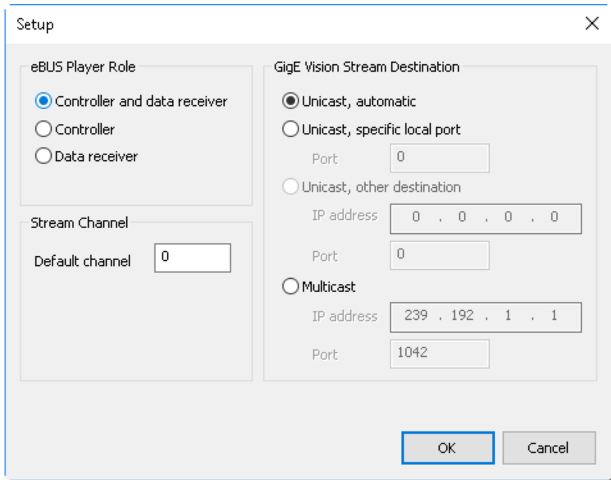
9. Set **GevSCDA** to a multicast address (for example, 239.192.1.1).
10. Close the **Device Control** dialog box.
11. Now, configure the NTx-Mini-S, as outlined in "To configure the NTx-Mini-S for a multicast network configuration" on page 63.

To configure the NTx-Mini-S for a multicast network configuration

1. Start an additional instance of eBUS Player.
2. Click **Tools** > **Setup**.



3. Under **eBUS Player Role**, click **Controller and data receiver**.



4. Under **GigE Vision Stream Destination**, click **Multicast** and enter the **IP address** and **Port** number.

   The address and port must be identical to that configured for the vDisplay HDI-Pro External Frame Grabber in step 8 and 9 of “To configure the devices for a multicast network configuration” on page 62.

5. Click **OK**.

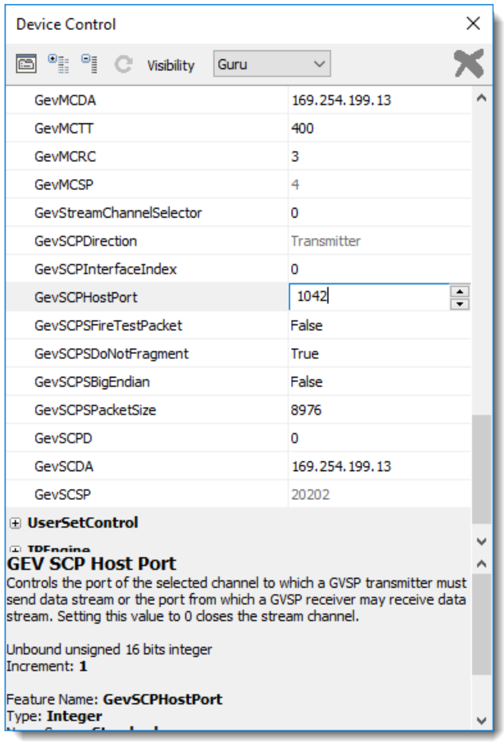
6. Connect to the NTx-Mini-S.

   For more information, see “To start eBUS Player and connect to a device” on page 50.

7. Under **Parameters and Controls**, click **Device control**.

8. Click **Guru** in the **Visibility** list.

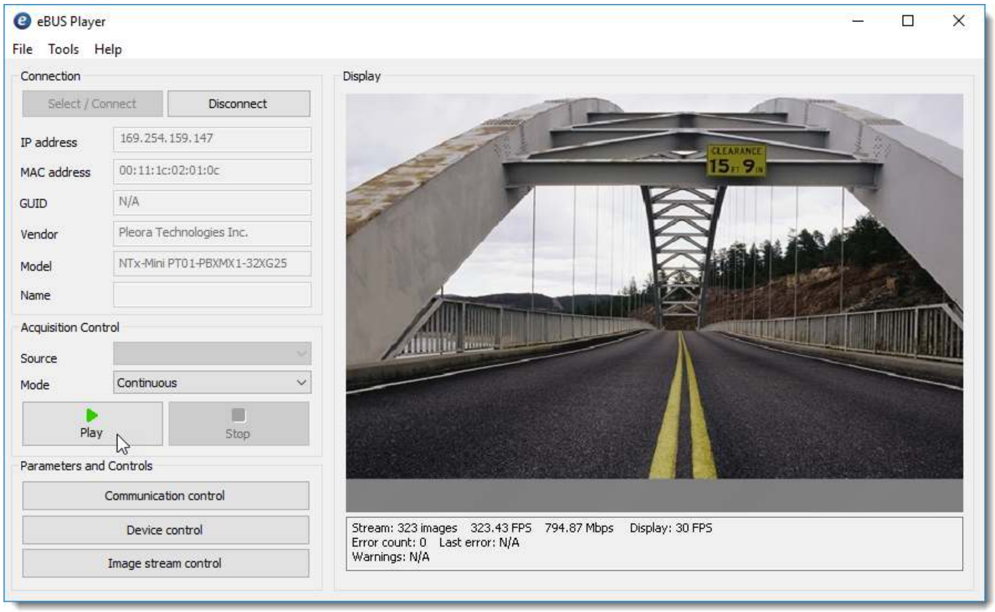
9. Under **TransportLayerControl** > **GigEVision**, ensure that the port in the **GevSCPHostPort** field and the multicast IP address in the **GevSCDA** field are correct. They are configured automatically to the values set in step 4 of this procedure.



10. Close the **Device Control** dialog box.

11. Click **Play** to view the source image stream both on the computer and the display monitor.

The multicast image is shown on the computer and the display monitor receiver, as shown below.



Chapter 11

Onboard Memory

The NTx-Mini-S uses onboard memory to store images from the camera before sending them to your computer.

The following topics are covered in this chapter:

High-Bandwidth Bursts

Though your NTx-Mini-S can transmit data to your computer over Ethernet at 1 Gbps, some cameras can exceed this data rate. For short, high-bandwidth data bursts from your camera, the NTx-Mini-S's onboard memory can store images until they can be transmitted over the Ethernet to your computer.

For sustained rates over 1 Gbps, the NTx-Mini-S can reduce Ethernet data by 25% by packing your image data.

Calculating Onboard Memory

Your NTx-Mini-S uses its onboard memory very efficiently. It uses only 1/32 of its onboard memory for memory management and has a memory granularity of 32 bytes. If you can pack your images (reducing them to 75% of their original size without any loss of information), you can store even more images in the NTx-Mini-S's memory.

To calculate the number of images that can be stored in NTx-Mini-S onboard memory:

1. Calculate the footprint, in bytes, of your image using the following simplified equation. The value of *packingFactor* is either 1.0 or 0.75.

$$\text{imageFootPrintInBytes} = \text{pixelsX x pixelsY x effectivePixelDepth x packingFactor}$$

2. Round *imageFootprintInBytes* up to the nearest 32 bytes.
3. Calculate the number of images your NTx-Mini-S can store in its onboard memory. An NTx-Mini-S with 32MB of internal memory has 32 x 1024 x 1024 bytes.

$$\text{maximumNumberofImagesInMemory} = \frac{31 \text{ x onboardMemoryInBytes}}{32 \text{ x imageFootprintInBytes}}$$

4. Truncate *maximumNumberOfImagesInMemory*.

Chapter 12

Reference: Mechanical Drawings and Material List

This chapter provides the NTx-Mini-S mechanical drawings, and also provides a list of connectors and cables, with corresponding manufacturer details.

Three-dimensional (3-D) mechanical drawings are available at the Pleora Support Center at supportcenter.pleora.com

The following topics are covered in this chapter:

Mechanical Drawings

The mechanical drawings in this section provide the NTx-Mini-S's dimensions, features, and attributes. All dimensions are in millimeters.

The mechanical drawings have the following tolerances:

- .X ± .5
- .XX ± .25
- .XX* ± .13
- ANGLES: ± 0 30'

Figure 1: Isometric View

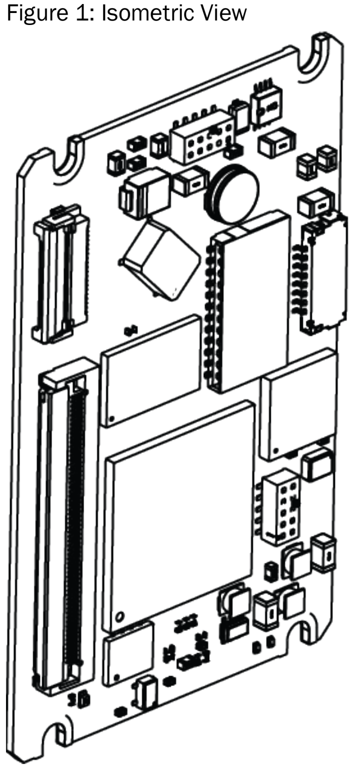


Figure 2: Top, Bottom, and Side Views

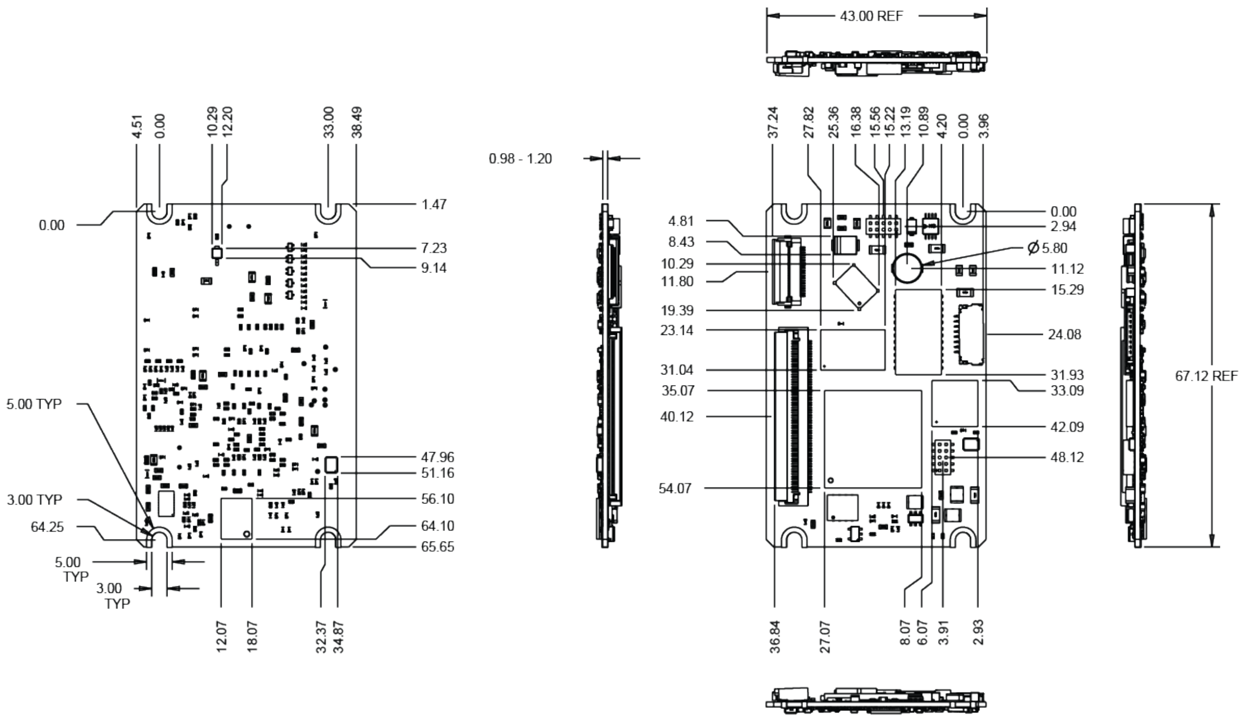
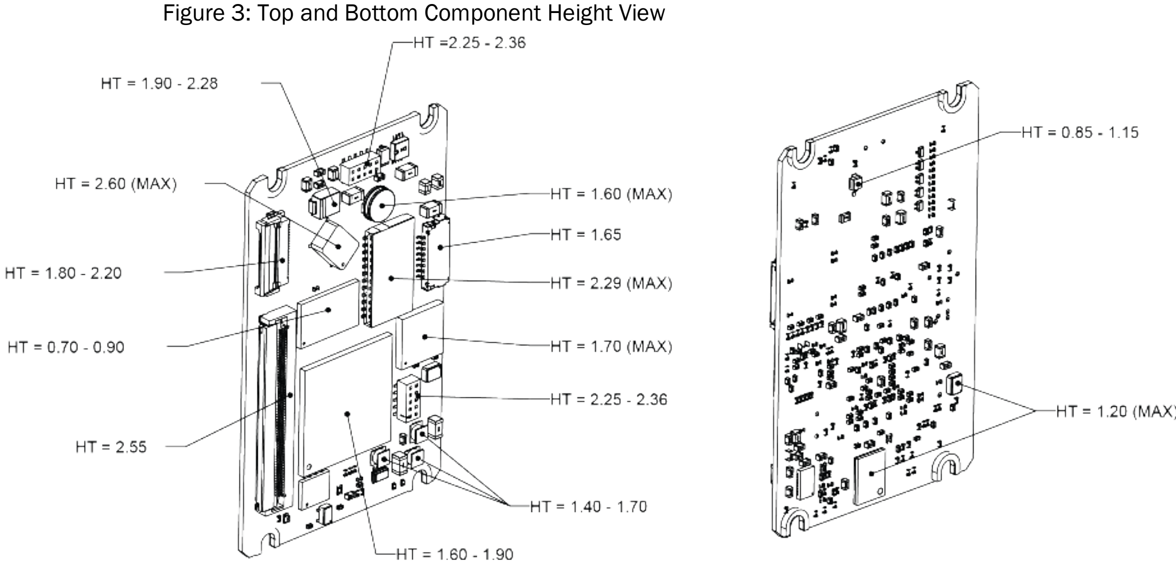


Figure 3: Top and Bottom Component Height View



Material List

The connector summaries for the NTx-Mini-S are listed in the following table.

Table 25: Connector Summary

ID	Description	Manufacturer part number	Manufacturer
J2	PLC connector	FH12-20S-0.5SH(55)	Hirose
J3	LAN/Ethernet connector	DF19G-8P-1H(54)	Hirose
J4	Raw video connector	FH28E-60S-0.5SH(05)	Hirose

Source manufacturer, description, and identification may vary and are subject to change for each connector.

Chapter 13

Technical Support

On the Pleora Support Center, you can:

- Download the latest software and firmware.
- Log a support issue.
- View documentation for current and past releases.
- Browse for solutions to problems other customers have encountered.
- Read knowledge base articles for information about common tasks.

To visit the Pleora Support Center

- Go to supportcenter.pleora.com.

  Most material is available without logging in to a Support Center account. To access software and firmware downloads, in addition to other content, log in to the Support Center. If you do not have an account, click **Request Account**.

  Accounts are usually validated within one business day.