WINSYSTEMS®

SYS-427X

Industrial Embedded Computer with Intel Atom® E3900 processor, Dual Ethernet, Multi-Display, and Expansion

Product Manual

WINSYSTEMS, Inc. | 2890 112th Street, Grand Prairie, Texas 75050 | 817-274-7553 | info@winsystems.com | www.winsystems.com

Revision History

Document Version	Last Updated Date	Brief Description of Change
v1.0	02/20/2024	Initial release
v1.1	07/24/2024	Removed Block Diagram and Cables sections
v1.2	08/06/2024	Updated system photos and drawings
v1.3	08/29/2025	Updated conformal coating, warranty and web links information

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Table of Contents

1. Before You Begin

Review the warnings in this section and the best practice recommendations (See “Best Practices” on page 49.) when using and handling the WINSYSTEMS SYS-427X embedded computer. Following these recommendations provides an optimal user experience and prevents damage. Read through this document and become familiar with the SYS-427X before proceeding.

APPLYING CONFORMAL COATING AFTER PURCHASE WILL VOID YOUR WARRANTY. FAILING TO COMPLY WITH THESE BEST PRACTICES MAY DAMAGE THE PRODUCT AND VOID YOUR WARRANTY.

1.1 Warnings

Only qualified personnel should configure and install the SYS-427X. While observing best practices, pay particular attention to the following.

Avoid electrostatic discharge (ESD)
Only handle the circuit board and other bare electronics when electrostatic discharge (ESD) protection is in place. Having a wrist strap and a fully grounded workstation is the minimum ESD protection required before the ESD seal on the product bag is broken.

2. Introduction

This manual provides configuration and usage information for the SYS-427X. If you still have questions, contact Technical Support at (817) 274-7553, Monday through Friday, between 8 AM and 5 PM Central Standard Time (CST).

Refer to the WINSYSTEMS website at https://www.winsystems.com/ for other accessories (including cable drawings and pin-outs) that can be used with your SYS-427X.

3. Functionality

The SYS-427X is a rugged, embedded computer featuring the latest generation Intel Apollo Lake-I SOC processor.

The SYS-427X computer supports two video DisplayPorts, dual Ethernet jacks, two USB 3.1 Gen 1 ports, two USB 2.0 ports, eight general purpose I/O (GPIO) lines, one RS232 COM port, two RS232/422/485 COM ports and one Line Out/Mic In / PC Speaker jack.

Standard solid state storage include a soldered down 64 GB eMMC chip for operating systems (OS) and applications.

Solid state storage and CAN bus options are provided through the Mini PCIe socket (with mSATA support). A SATA connection option is also provided for an additional SSD storage. WiFi expansion options are provided through the M.2 Socket 1 with E key. For additional enclosure expansion options, contact a WINSYSTEMS Applications Engineer at +1-817-274-7553.

The SYS-427X computer supports up to 8 GB of socketed SODIMM DDR3L Error Correcting Code (ECC) SDRAM.

4. Features

The SYS-427X provides the following features.

Processor

- Intel Atom® Processor X Series
  - Processor Number - E3950
  - Code Name - Apollo Lake
- CPU Specifications
  - Total Cores - 4
  - Total Threads - 4
  - Burst Frequency - 2.00 GHz
  - Processor Base Frequency - 1.60 GHz
  - Cache - 2 MB L2 Cache
  - TDP - 12 W
- GPU Specifications
  - GPU Name - Intel® HD Graphics 505
  - Graphics Base Frequency - 500 MHz
  - Graphics Burst Frequency - 650 MHz
  - Graphics Video Max Memory - 2 GB
  - Graphics Output - eDP/DP/HDMI/MIPI-DSI
  - 4K Support - Yes, at 60Hz
  - Max Resolution (HDMI) - 3840x2160 @30Hz
  - Max Resolution (DP) - 4096x2160 @60Hz
  - Max Resolution - eDP - Integrated Flat Panel) 3840x2160 @ 60Hz
  - # of Displays Supported - 3

- Reliability
  - Intel security engine - Intel® AES New Instructions, Secure Key, Execute Disable Bit, Intel® Virtualization Technology (VT-x), Intel® Virtualization Technology for Directed I/O (VT-d), Intel® VT-x with Extended Page Tables (EPT)

Operating Systems (compatibility)

- Windows 10 x64, IoT Core
- Linux x64
- Other x86 operating systems (Please inquire our sales team for more operating system options.)

BIOS

- AMI UEFI-compliant BIOS in SPI flash device

Video Interfaces (Can support up to two simultaneous displays)

- 2x DisplayPort (version 1.2)
- 4096 x 2160 at 60 Hz

Ethernet

- 2x Intel 10/100/1000 Mbps controllers using Intel i210
- Wake-on-LAN support, both channels

Internal Storage

- Standard on-board 64 GB eMMC

Internal Storage Options

- SATA 6Gb/s port supports up to 2.TB on a 2.5" SSD drive
- SATA Version- 3.1
- mSATA SSD support (Mini PCIe card)

Bus Expansion

- M.2 E-Key socket (2230)
- Mini PCIe socket (Full Size, PCIe, USB, SATA)

NOTE **Internal Mini PCIe and M.2** available for various Expansion IO and Storage options (Please contact our sales team for more information)

Serial Interface

- 2x RS232/422/485 serial ports (COM1 and COM2)
- 1x RS232 serial port (COM3)

USB

Available on the front I/O panel

- 2x USB 3.1 Gen 1 ports
- 2x USB 2.0 ports

Power

- Supports a wide range DC input power: 10 V to 50 V

Industrial Operating Temperature

- -40° to +85°C (-40° to +185°F)
- Relative Humidity 10% to 95% (non-condensing)

Additional Specification

- Watchdog timer adjustable from 1 second to 255 minute reset
- CE / RoHS compliant

5. General Operation

WINSYSTEMS' SYS-427X I/O panel supports two DisplayPorts, dual Ethernet, two USB 3.1 Gen 1 ports, two USB 2.0 ports, three COM ports, eight general purpose I/O (GPIO) lines, and a Line Out/Mic In / PC Speaker jack.

The WINSYSTEMS SYS-427X features a 'quad-core processor and up to 8 GB of socketed SODIMM DDR3L ECC SDRAM. The embedded computer includes an mSATA socket and a soldered down eMMC device for solid state storage of operating systems and applications. Additionally, the computer supports an internal SATA device.

The SYS-427X has expansion capabilities via a M.2 Socket 1 with E key, Mini PCIe socket (with mSATA support)and WINSYSTEMS Modular IO80 interface.

The embedded computer supports Linux, Windows 10, DOS, and other x86-compatible real-time operating systems. Drivers are available from the WINSYSTEMS website.

6. Specifications

The SYS-427X adheres to the following features and specifications.

Feature	Specification
System	
Processor	– Intel Atom® Processor X Series – Processor Number - E3950 – Code Name - Apollo Lake
CPU Specifications	– Total Cores - 4 – Total Threads - 4 – Burst Frequency - 2.00 GHz – Processor Base Frequency - 1.60 GHz – Cache - 2 MB L2 Cache – TDP - 12 W
GPU Specifications	– GPU Name - Intel® HD Graphics 505 – Graphics Base Frequency - 500 MHz – Graphics Burst Frequency - 650 MHzGraphics Video – Max Memory - 2 GB – Graphics Output - eDP/DP/HDMI/MIPI-DSI – 4K Support - Yes, at 60Hz – Max Resolution (HDMI) - 3840x2160 @30Hz – Max Resolution (DP) - 4096x2160 @60Hz – Max Resolution - eDP - Integrated Flat Panel) 3840x2160 @ 60Hz – # of Displays Supported - 2
Reliability	–Intel security engine - Intel® AES New Instructions, Secure Key, –Execute Disable Bit, Intel® Virtualization Technology (VT-x), Intel® –Virtualization Technology for Directed I/O (VT-d), Intel® VT-x with –Extended Page Tables (EPT)
System Memory	8 GB ECC DDR3L SODIMM (socketed)
Watchdog	Watchdog timer adjustable from 1 second to 255 minute reset
TPM	Hardware Security - Trusted Platform Module (TPM) 2.0 Enabled

Feature	Specification
Internal Storage / Storage Options	
eMMC	Standard 64 GB eMMC for on-board storage
SATA with SATA Power	SATA 6Gb/s port supports up to 2.TB on a 2.5" SSD drive SATA Version- 3.1
mSATA	mSATA SSD support (Mini PCIe card)
Expansion Options	
Mini PCIe	Mini PCIe socket (Full Size, PCIe, USB, SATA)
M.2 E-Key	M.2 E-Key socket (2230)
NOTE	**Internal Mini PCIe and M.2** available for various Expansion IO and Storage options (Please contact our sales team for more information)
Power	
Power Mode	AT, ATX
V_{CC}	Supports a wide range DC input power: 10V to 50V
Power Connec-tor	Phoenix Contact Terminal Block Header
Maximum Power Usage	30W
Electrical	
	SYS-427**5064-8I-1** **5** = CPU (5 = E3950) **064** = EMMC (64 GB) **8** = RAM SIZE (8 GB) **I** = RAM TEMP (I = Industrial) **1** = Power Button
Mechanical	
Dimensions	6.5 in x 4.5 in x 2.5 in (165 mm x 11.3 mm x 3.5 mm)
Weight	38.09 oz (1.08kg)
Construction	Extruded Aluminum with Heavy Duty Metal

Feature	Specification
Mounting Options	Wall mounting SIDE / VESA / Din-Rail Mounting (Optional)
Front I/O Panel	
Display Port 1 & 2	2x DisplayPort (version 1.2) 4096 x 2160 at 60 Hz
USB	2x USB 3.1 Gen 1 ports 2x USB 2.0 ports
Serial	2x RS232/422/485 serial ports (COM1 and COM2) 1x RS232 serial port (COM3)
GPIO	8x GPIO bidirectional lines 2x analog to digital (ADC) lines 1x MIPI-CSI (4-Lane) 1x SPI bus 1x I2C bus
Ethernet (LAN)	2x Intel 10/100/1000 Mbps controllers using Intel i210 Wake-on-LAN support, both channels
Audio Jack	Combo Line Out/Mic In / PC Speaker
Operating System	
Supports	Linux x64 Other x86 operating systems (Please inquire our sales team for more operating system options.)
BIOS	
Supports	AMI UEFI-compliant BIOS in SPI flash device
Environment	
Operating Tem-perature	-40°C to 85°C (-40°F to +185°F) Relative Humidity 10% to 95% (non-condensing)
Certification	CE / RoHS Compliant

Feature	Specification
Mechanical shock testing	IEC 60068-2-27 40 g half-sine, 6 ms, 18 shocks
Random vibration testing	IEC 60068-2-64 7 g rms for all X, Y, and Z directions; 3 hours
Mean time between failure (MTBF) [b]	MTBF (hours) 171370.5013 MTBF (years) 19.5628
RoHS compliant	Yes

7. Compliance and Safety

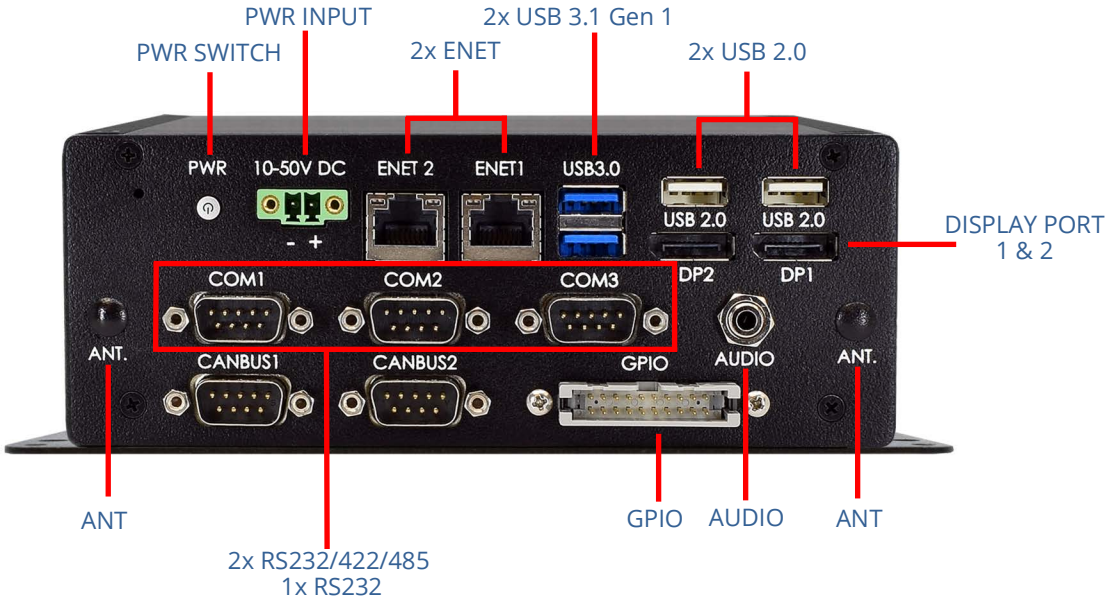
WINSYSTEMS, INC.
SYS-427X
Conforms To UL STD 62368-1
Certified To CSA STD C22.2 # 62368-1

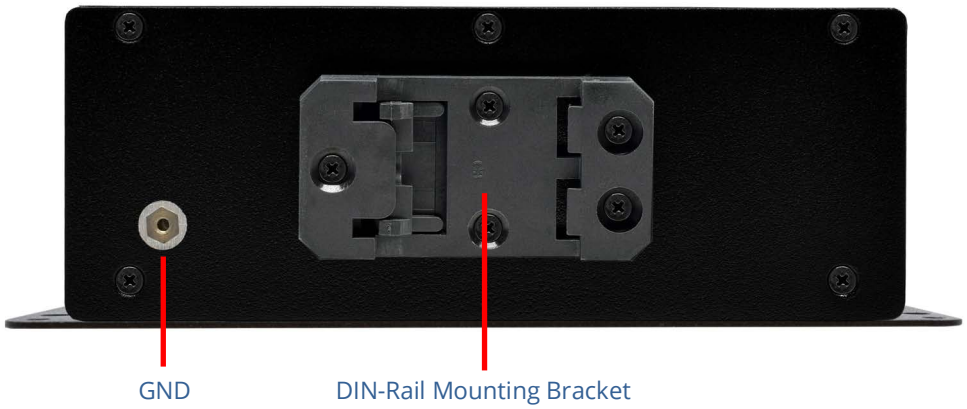
8. Configuration

This section describes the SYS-427X components and configuration.

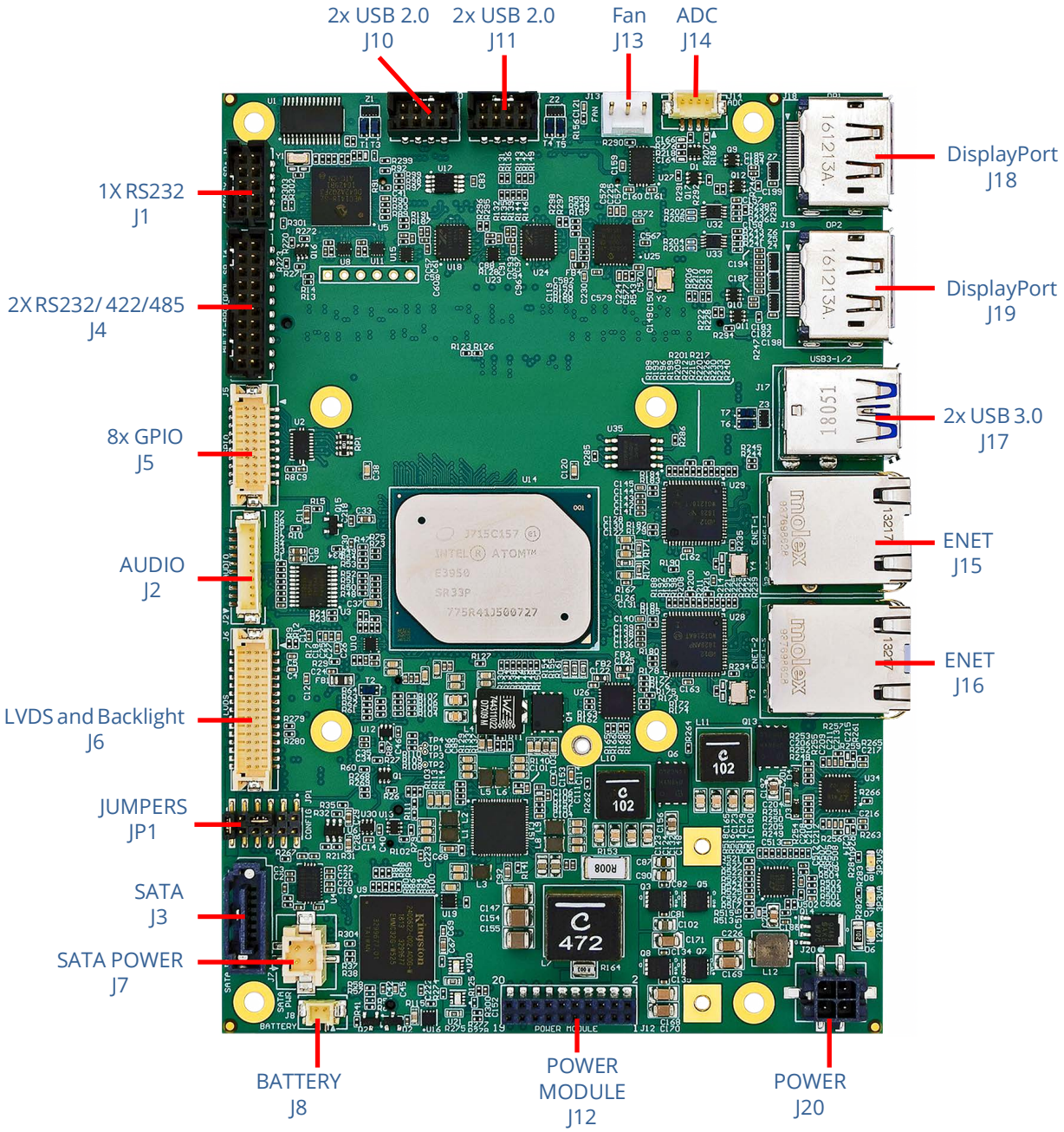
8.1 Component Layout

8.1.1 Front and Rear View





8.1.2 Top View


2x USB 2.0
J10
2x USB 2.0
J11
Fan
J13
ADC
J14
DisplayPort
J18
DisplayPort
J19
1X RS232
J1
2X RS232/ 422/485
J4
2x USB 3.0
J17
8x GPIO
J5
ENET
J15
AUDIO
J2
ENET
J16
LVDS and Backlight
J6
JUMPERS
JP1
SATA
J3
SATA POWER
J7
BATTERY
J8
POWER
MODULE
J12
POWER
J20

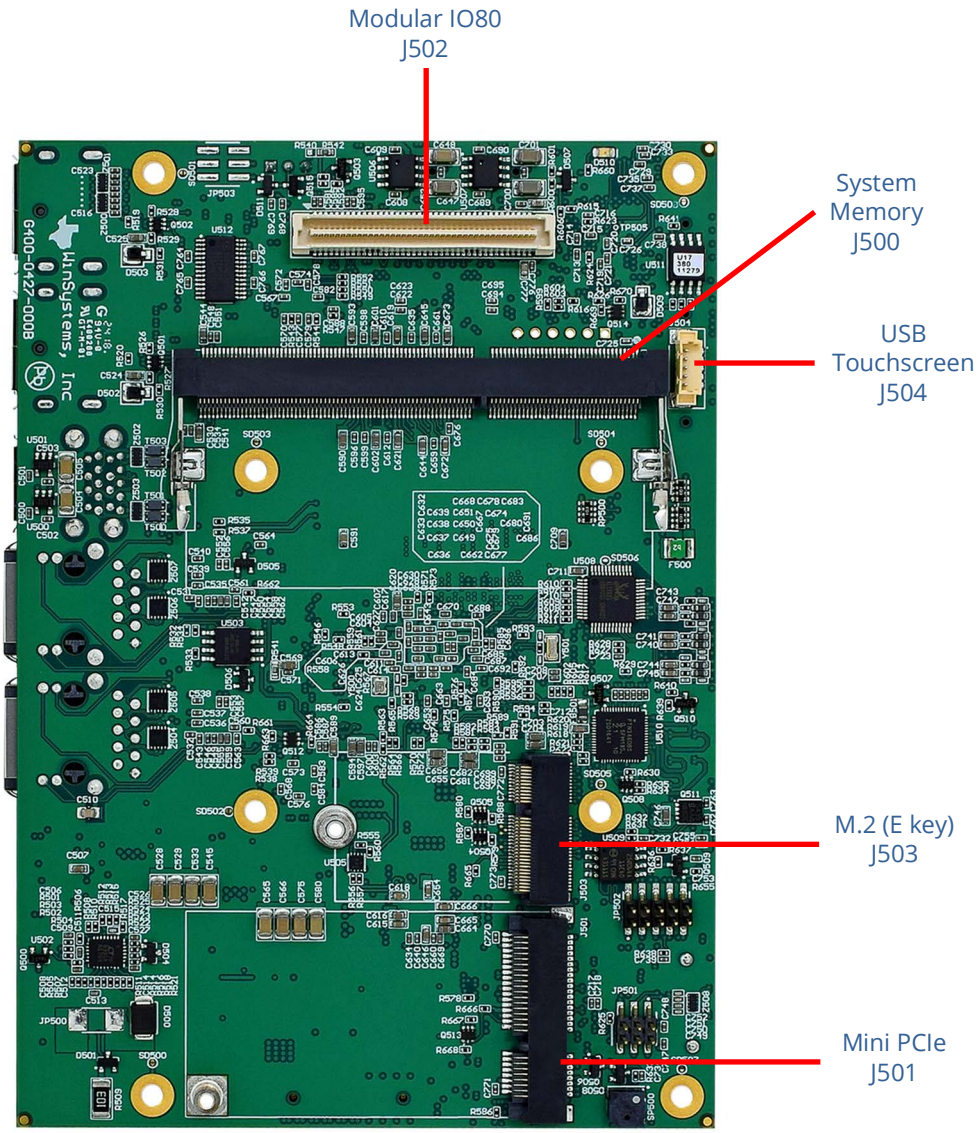
The WINSYSTEMS Front Panel Expansion Module can support connectors such as two video DisplayPorts, dual Ethernet jacks, two USB 3.1 Gen 1 ports, two USB 2.0 ports, eight general purpose I/O (GPIO) lines, one RS232 COM port, two RS232/422/485 COM ports and one Combo Line Out/Mic In / PC Speaker jack.

NOTE Most of the top view connectors have limited acess when installed in the SYS-427X. Some connectors are used to supply connections to the front IO panel. (Please contact a WINSYSTEMS Applications Engineer at +1-817274-7553 for more information.)

Top View Components (CPU Only)

Item	Description	Reference
J1	Legacy RS232 Header	page 31
J2	HD Audio Header	page 30
J3	SATA 6Gb/s Port	page 34
J4	Serial Ports (RS232/422/485) Header	page 32
J5	GPIO General-Purpose Input/Output Header	page 34
J6	LVDS Data and Backlight Header	page 28
J7	SATA Power Header	page 27
J8	Battery Header	page 26
J10/J11	USB 2.0 Port 2x Headers	page 21
J12	Power Module Header	page 25
J13	Fan Header	page 27
J14	Analog Inputs (Analog to Digital) Header	page 36
J15/J16	Ethernet (LAN) RJ45	page 19
J17	USB 3.1 Gen 1 Ports	page 20
J18/J19	DisplayPort	page 22
J20	Input Power Header	page 25
JP1	Board Configuration Jumpers	page 38

8.1.3 Bottom View



Bottom View Components

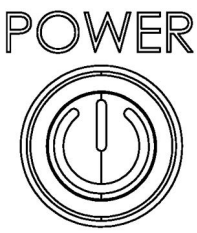
Item	Description	Reference
J500	System Memory (RAM)	page 34
J501	Mini PCIe (with mSATA Support)	page 38
J502	Modular IO80	page 37
J503	M.2 Socket 1, with E key	page 38
J504	USB Touchscreen Header	page 29

8.2 Connectors and Buttons

8.2.1 Power Button

The Power Button is located on the left side of the IO plate. It controls power to the SYS-427X. Once the fully powered power cable is connected to the unit, it will power up the system without pressing the Power Button. Once the system is up and running you can power off and on the system using the Power Button.

Power Button

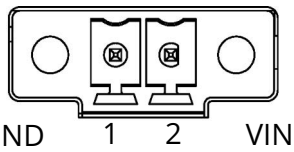


8.2.2 Power Input Connector

Use this connection to supply power to the SYS-427X. This computer supports a wide range DC input power from 10V to 50V. Once you connect a fully powered power cable to this connector for the first time, it will power on the system.

Layout and Pin Reference

Power Input Connector



Pin	Name	Pin	Name
1	Ground (GND)	2	Voltage In (VIN)

Connector

- Phoenix Contact terminal block header

  Part number: 1827868

Matching Connector

- Phoenix contact terminal block plug

  Part number: 1827703

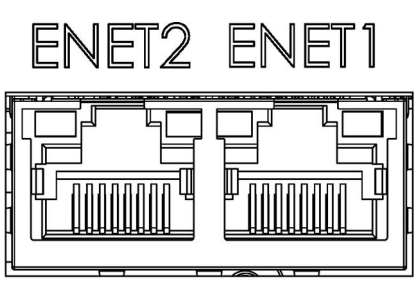
8.2.3 J15/J16 Ethernet (LAN) Dual RJ45

Two Gigabit Ethernet controllers provide standard IEEE 1588 and 802.1AS protocol time-stamping. Each Ethernet interface includes 10/100/1000 Mbps multi-speed, full, and half-duplex operation.

The left RJ45 port uses an Intel i210 Ethernet controller.

The right RJ45 port uses a RGMII PHY Ethernet controller.

Ethernet (LAN) Dual RJ45



Pin	Function	Description
1	TX_D1+	Transceive Data+
2	TX_D1-	Transceive Data-
3	RX_D2+	Receive Data+
4	BI_D3+	Bi-Directional Data+
5	BI_D3-	Bi-Directional Data-
6	RX_D2-	Receive Data
7	BI_D4+	Bi-Directional Data+
8	BI_D4-	Bi-Directional Data-

Connector

- Gigabit dual-port RJ45 connector with integrated magnetics and LEDs

Matching Connector

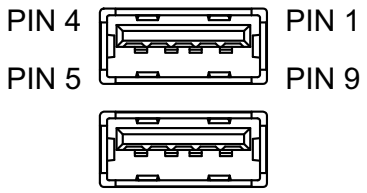
Standard Gigabit Ethernet cables with RJ45 connectors

8.2.4 J17 USB 3.1 Gen 1 Type-A Connector

The SYS-427X provides two USB 3.1 Gen 1 Type A port. This port supplies 1A maximum continuous current and 5 Gbps transfer speed. When using serial downloader mode, this USB port must be used. A USB 3.0 cable is not required during serial downloader mode.

Layout and Pin Reference

USB 3.1 Type-A Connector



Pin	Name
1	USBVCC
2	D-
3	D+
4	GND
5	RX-
6	RX+
7	GND
8	TX-
9	TX+

Connector

• Dual-port stacked standard USB 3.1 Gen 1 Type A

Matching Connector

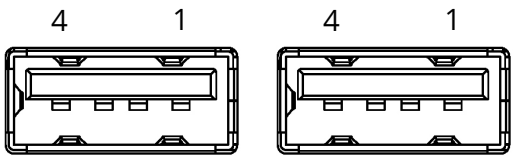
• Standard USB 3.1 Gen 1 cables and devices

8.2.5 J10/J11 USB 2.0 Type-A Connector

The SYS-427X provides two USB 2.0 Type A port. This port supplies 500 mA maximum continuous current and 480 Mbps transfer speed.

Layout and Pin Reference

USB 2.0 Type-A Connector



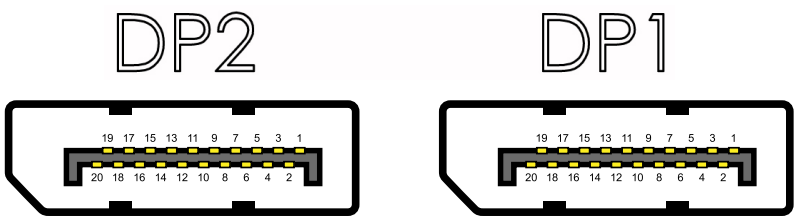
Pin	Name
1	USBVCC
2	D-
3	D+
4	GND

8.2.6 J18/J19 Display Ports

Layout and Pin Reference

Two Standard full-size 20-pin DisplayPort (Version 1.2)

Display Ports 1 and 2



Pin	Name
1	ML_Lane 0 (p)
2	GND
3	ML_Lane 0 (n)
4	ML_Lane 1 (p)
5	GND
6	ML_Lane 1 (n)
7	ML_Lane 2 (p)
8	GND
9	ML_Lane 2 (n)
10	ML_Lane 3 (p)
11	GND
12	ML_Lane 3 (n)
13	CONFIG1
14	CONFIG2
15	AUX CH (p)
16	GND
17	AUX CH (n)
18	Hot Plug
19	Return
20	DP_PWR

Connector

• Molex 47272 series DisplayPort receptacle

Matching Connector

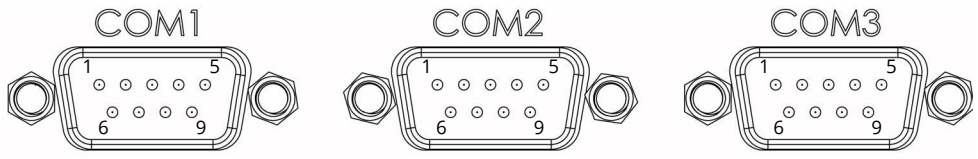
• Standard DisplayPort compliant cable

8.2.7 COM1 COM2 and COM3

The SYS-427X is equipped with three serial ports (COM 1 and 2 = RS-232/ 422/485 / COM 3 = RS-232) located on the front IO plate. All serial channels use the advanced EXAR SP335E multiprotocol transceiver. All COM ports are configurable and include options for 120-ohm receiver termination, slew rate, and protocol.

Layout and Pin Reference

COM Port Connectors



Pin	RS-232	RS-422	RS-485
1	DCD	N/A	N/A
2	RX	TX+	TX/RX+
3	TX	RX+	N/A
4	DTR	N/A	N/A
5	GND	GND	GND
6	DSR	TX-	TX/RX-
7	RTS	RX-	N/A
8	CTR	N/A	N/A
9	RI	N/A	N/A

Connector

- Standard DB9 male connector.

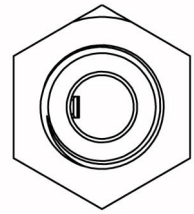
Matching Connector

- Standard DB9 female connector.

8.2.8 Audio Jack (Combo Line Out/Mic In and PC Speaker)

The SYS-427X provides a Combo Line Out / Mic In jack and or use of a PC speaker.

Audio Jack

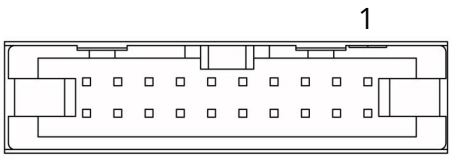


8.2.9 GPIO Connector

The SYS-427X provides 8 general purpose input/output connections that are 5-volt tolerant with rising/falling edge event sense interrupt generation.

Layout and Pin Reference

GPIO Connector



Pin	Name	Pin	Name
1	VIN	2	GND
3	VIN	4	GND
5	VIN	6	GND
7	VIN	8	GND
9	VIN	10	GND
11	VIN	12	GND
13	V12 RUN	14	GPIO 0
15	I2C PM SCL	16	GPIO 1
17	I2C PM SDA	18	PMU RSTBTN N
19	ALL SYS PWRGD	20	PMU PWRBTN N

Connector

- 3M™ Wiremount Plug 20-Pin With Threaded Mounting Flanges, Pitch 2.54mm
- Part number: 4620-7005

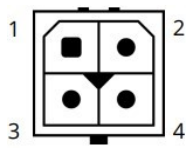
Matching Connector

- 3M™ Wiremount Plug 20-Pin, Pitch 2.5mm
- Part number: 8520-4500XL or 9120-4500XL

8.2.10 J20 - Input Power Header

Use this connection to supply power to the SYS-427X. This computer supports a wide range DC input power from 10 V to 50 V.

Layout and Pin Reference

Pin	Name	Pin	Name
			
1	Voltage In (VIN)	2	Voltage In (VIN)
3	Ground (GND)	4	Ground (GND)

Connector

- Molex Micro-Fit 3.0 vertical header

  Part Number: 43045-0418

Matching Connector

- Molex Micro-Fit 3.0 receptacle housing

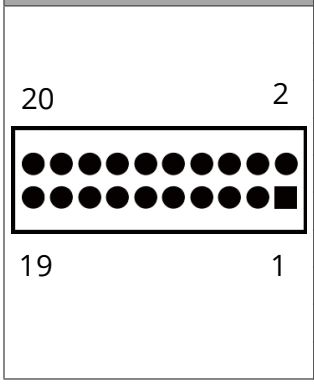
  Part Number: 43025-0400

8.2.11 J12 - Power Module Header (Internal)

This connection accepts WINSYSTEMS power modules providing additional power options such as PoE PD, and UPS backup.

NOTE J12 is used to power the power adapter board in the SYS-427X. Power Module part number is (ADP-PS-433).
For alternative front panel input/output options such as analog to digital signals, COM ports, or GPIO, contact a WINSYSTEMS Applications Engineer at +1-817-274-7553.

Layout and Pin Reference

Diagram	Pin	Name	Pin	Name
	1	VIN	2	GND
	3	VIN	4	GND
	5	VIN	6	GND
	7	VIN	8	GND
	9	VIN	10	GND
	11	VIN	12	GND
	13	V12_RUN	14	PM_GPIO0
	15	I2C_PM_SCL	16	PM_GPIO1
	17	I2C_PM_SDA	18	PMU_RSTBTN_N
	19	ALL_SYS_PWRGD	20	PM_PWRBTN_N

Connector

- Samtec SQW series 2.00 mm rugged sockets

  Part Number: SQW-110-01-F-D-VS-A-K-TR

Matching Connector

- Samtec TW series 2.00 mm flex stack

  Part Number: TW-10-03-F-D-280-SM-A

8.2.12 J8 - Battery Header (Internal)

An battery connected to the SYS-427X provides standby power for the real-time clock.

Layout and Pin Reference

Pin	Name
	
1	VBAT
2	GND

Connector

- Hirose DF13 series 1.25 mm 2-pin

  Part Number: DF13C-2P-1.25V (51)

Matching Connector

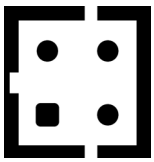
- Hirose DF13C 1.25 mm 2-pin

  Part Number: DF13C-2S-1.25C

8.2.13 J7 - SATA Power Header (Internal)

Power is supplied to the SATA device via the connector at J7.

Layout and Pin Reference

Pin	Name	Pin	Name
1 			
1	+12V SB	2	+5V SB
3	GND	4	GND

Connector

- Hirose DF11 series 2.00 mm dual-row 4-pin

  Part Number: DF11C-4DP-2V(57)

Matching Connector

- Hirose DF11 series 2.00 mm crimping socket 4-pin

  Part Number: DF11-4S-2C

8.2.14 J13 - Fan Header (Internal)

Layout and Pin Reference

Pin	Name
 1	
1	TACH_EC
2	+12 VDC
3	GND

Connector

- Hirose DF13 series 1.25 mm 3-pin

  Part Number: DF13C-3P-1.25V (51)

Matching Connector

- Hirose DF13C 1.25 mm 3-pin

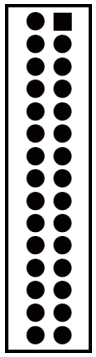
  Part Number: DF13C-2S-1.25C

8.2.15 J6 - LVDS Data and Backlight Header (Internal)

The SYS-427X supports single channel LVDS flat panel displays with resolutions up to 1440 x 1080 or 1600 x 900 at 24 bpp.

The LVDS output signals are odd bus, differential signals to the LVDS receiver. Each LVDS **P** output makes a differential pair with LVDS **N**.

Layout and Pin Reference

Pin	Name	Description	Pin	Name	Description
2  1 30 29					
1	LVDSAO_P	Channel A - Positive LVDS Output	2	LVDSBO_P	Channel B - Positive LVDS Output
3	LVDSAO_N	Channel A - Negative LVDS Output	4	LVDSBO_N	Channel B - Negative LVDS Output
5	GND	Ground	6	GND	Ground
7	LVDSCO_P	Channel C - Positive LVDS Output	8	LVDSDO_P	Channel D - Positive LVDS Output
9	LVDSCO_N	Channel C - Negative LVDS Output	10	LVDSDO_N	Channel D - Negative LVDS Output
11	GND	Ground	12	GND	Ground
13	LVDSCKO_P	Positive LVDS Clock Output	14	DDC_SCL	Open-drain DDC Data I/O
15	LVDSCKO_N	Negative LVDS Clock Output	16	DDC_SDA	Open-drain DDC Clock I/O
17	GND	Ground	18	GND	Ground
19	I2C_TC_SCL	I2C Touch Control Clock	20	VCC_LVDS	+3.3 VDC
21	I2C_TC_SDA	I2C Touch Control Data	22	VCC_LVDS	+3.3 VDC
23	GND	Ground	24	GND	Ground
25	BKLTPWM	Backlight PWM brightness control	26	BKLT_PWR	Backlight Power (+5 VDC or +12 VDC)
27	BKLT_EN	Backlight Enable	28	BKLT_PWR	Backlight Power (+5 VDC or +12 VDC)
29	SEL68	Select 8/6-bit	30	BKLT_PWR	Backlight Power (+5 VDC or +12 VDC)

Connector

- Hirose DF13 Series 1.25 mm double row 30-pin

  Part Number: DF13EA-30DP-1.25V(51)

Matching Connectors

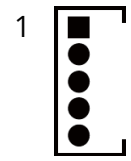
- Hirose DF13C 1.25 mm double row 30-pin

  Part Number: DF13-30DS-1.25C

8.2.16 J504 - USB Touchscreen Header (Internal)

J504 provides plug-and-play support for a USB touchscreen. Aside from a simpler and faster interface, it also provides power within the USB cable, eliminating the need for a separate, dedicated cable to power the touchscreen.

Layout and Pin Reference

Pin	Name
	
1	GND
2	+5V SB
3	DATA+
4	DATA-
5	GND

Connector

- Molex 1.25 mm PicoBlade

  Part Number: 53398-0571

Matching Connector

- Molex 1.25 mm PicoBlade housing

  Part Number: 51021-0500

8.2.17 SP500 - Speaker (Internal)

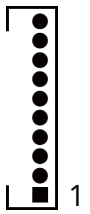
An on-board speaker, SP500, is available for sound generation. The BIOS activates the speaker to beep during POST failure. Each error has its own unique beep code. Refer to *BIOS Status and Errors* in the supplemental BIOS Manual located under documentation on the WINSYSTEMS SYS-427X webpage.

8.2.18 J2 - HD Audio Header (Internal)

The HD audio header supports sample rates ranging from 44.1 to 192 kHz. The left and right front audio channels provide concurrent independent stereo sound output (multiple streaming).

NOTE J2 is used to supply Line Out/Mic In to the front I/O panel. For alternative front panel input/output options such as analog to digital signals, COM ports, or GPIO, contact a WINSYSTEMS Applications Engineer at +1-817-274-7553.

Layout and Pin Reference

Pin	Name
	
1	HDA GND
2	MIC L
3	MIC R
4	HDA GND
5	LINE L
6	LINE R
7	HDA GND
8	FRONT L
9	FRONT R
10	HDA GND

Connector

- Hirose DF13 series 1.25 mm 10-pin

  Part Number: DF13C-10P-1.25V (51)

Matching Connector

- Hirose DF13C 1.25 mm 10-pin

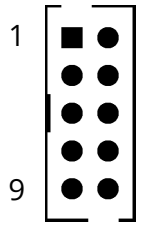
  Part Number: DF13C-10S-1.25C

8.2.19 J1 - Legacy RS232 Header (Internal)

The legacy RS232 header provides port IO addresses defined in the original PC specification. The legacy UART allows software originally designed for older PCs to function on the SYS-427X.

NOTE J1 is used to to run the IO address lines to COM3 connector located on the front I/O panel. For alternative front panel input/output options such as analog to digital signals, COM ports, or GPIO, contact a WINSYSTEMS Applications Engineer at +1-817-274-7553.

Layout and Pin Reference

Diagram	Pin	Name	Pin	Name
	1	DCD	2	DSR
	3	RXD	4	RTS
	5	TXD	6	CTS
	7	DTR	8	RI
	9	GND	10	NC

Connector

- Molex Milli-Grid header, shrouded with locking window

  Part Number: 87832-1006

Matching Connectors

- Molex Milli-Grid receptacles (with locking ramp)

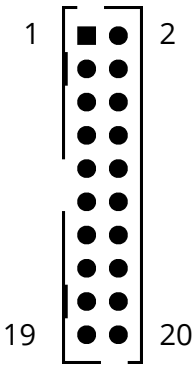
  Part Number: 51110-1060

Warning
Do not use receptacle with center polarization key.

8.2.20 J4 - Serial Ports (RS232/422/485) Header (Internal)

NOTE J4 is used to to run the IO address lines to COM1 and COM2 connectors located on the front I/O panel. For alternative front panel input/output options such as analog to digital signals, COM ports, or GPIO, contact a WINSYSTEMS Applications Engineer at +1-817-274-7553

Layout and Pin Reference

Pin	Name	Pin	Name
			
1	NC	2	NC
3	RXD1/ RX+	4	RTS1/ TX+/ TXRX+
5	TXD1/ TX-/ TXRX-	6	CTS1/ RX-
7	NC	8	NC
9	GND	10	NC
11	NC	12	NC
13	RXD2/ RX+	14	RTS2/ TX+/ TXRX+
15	TXD2/ TX-/ TXRX-	16	CTS2/ RX-
17	NC	18	NC
19	GND	20	NC

Connector

- Molex Milli-Grid header, shrouded with center polarization slot and locking windows

  Part Number: 87832-2020

Matching Connectors

- Molex Milli-Grid receptacles with center polarization key and locking ramps

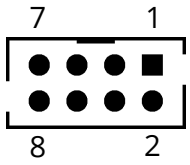
  Part Number: 51110-2051

8.2.21 J10/J11 - USB 2.0 Port 2x Headers (Internal)

J10 and J11 provide four USB 2.0 ports supplying 500 mA maximum continuous current per channel.

NOTE J11 is used to deliver two USB 2.0 ports to the front panel I/O Type A connectors via the ADP-USB-445. J10 is not accessible when using the dual USB Type A Flex-IO Module (ADP-USB-445).
For alternative front panel input/output options such as analog to digital signals, COM ports, or GPIO, contact a WINSYSTEMS Applications Engineer at +1-817-274-7553.

Layout and Pin Reference

Pin	Name	Pin	Name
			
1	USB1 VCC	2	USB2 VCC
3	DATA1-	4	DATA2-
5	DATA1+	6	DATA2+
7	GND	8	GND

Connector

- Molex Milli-Grid header, shrouded with locking window

  Part Number: 87832-0806

Matching Connectors

- Molex Milli-Grid receptacles (with locking ramp)

  Part Number: 51110-0860

Warning
Do not use receptacle with center polarization key.

8.2.22 J3 - Serial SATA 6Gbps Connector (Internal)

J3 provides a serial SATA 6 Gbps 7-pin connector for interfacing with hard disk drives and solid state disk drives.

Connectors

- Standard 7-pin serial ATA connector

Matching Connector

- Standard serial ATA 6 Gbps signal cables

8.2.23 J500 - System Memory (Internal)

Connector J500 is a DDR3L, 204-pin, SODIMM socket, accommodating a maximum of 8 GB error-correcting code (ECC) RAM.

Warning
Do not install non-ECC RAM in this SODIMM socket.

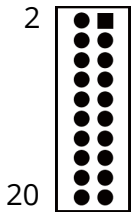
8.2.24 J5 - GPIO General-Purpose Input/Output Header (Internal)

The SYS-427X supplies eight 5V-tolerant GPIO lines with rising/falling edge event sense interrupt generation.

J5 is used to deliver GPIO lines to theh GPIO connector located on the front I/O panel.

NOTE For alternative front panel input/output options such as analog to digital signals, COM ports, or GPIO, contact a WINSYSTEMS Applications Engineer at +1-817-274-7553.

Layout and Pin Reference

Pin	Name	Pin	Name
			
1	GPIO_0	2	GND
3	GPIO_1	4	GND
5	GPIO_2	6	GND
7	GPIO_3	8	GND
9	GPIO_4	10	GND
11	GPIO_5	12	GND
13	GPIO_6	14	GND
15	GPIO_7	16	GND
17	+5V	18	GND
19	+5V	20	GND

Connector

- Hirose DF13 series 1.25 mm double row 30-pin

  Part Number: DF13EA-20DP-1.25V(51)

Cables

- Hirose DF13C 1.25 mm double row 20-pin

  Part Number: DF13-20DS-1.25C

8.2.25 J14 - Analog Inputs (Analog to Digital) Header (Internal)

Layout and Pin Reference

Pin	Name
	
1	ADC_CH0
2	GND
3	ADC_CH1
4	GND

Connector

- Hirose DF13 series 1.25 mm 4-pin

  Part Number: DF13C-4P-1.25V (51)

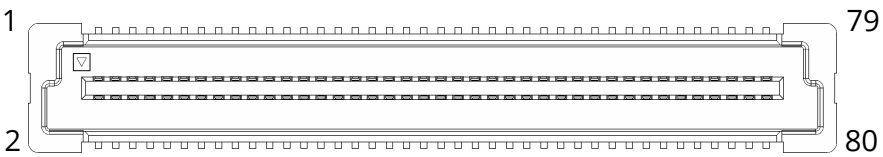
Matching Connector

- Hirose DF13C 1.25 mm 4-pin

  Part Number: DF13C-4S-1.25C

8.2.26 J502 - Modular IO80 (Internal)

Layout and Pin Reference

Pin	Name	Pin	Name		Pin	Name	Pin	Name
								
1	PCIE4_TX+	2	USB3_TX+		41	GND	42	GND
3	PCIE4_TX-	4	USB3_TX-		43	RESERVED	44	LPC_CLK (3.3V)
5	GND	6	GND		45	RESERVED	46	LPC_FRAME (3.3V)
7	PCIE4_RX+	8	USB3_RX+		47	GND	48	LPC_AD3 (3.3V)
9	PCIE4_RX-	10	USB3_RX-		49	RESERVED	50	LPC_AD2 (3.3V)
11	GND	12	GND		51	RESERVED	52	LPC_AD1 (3.3V)
13	PCIE5_TX+	14	USB2_D0+		53	GND	54	LPC_AD0 (3.3V)
15	PCIE5_TX-	16	USB2_D0-		55	RESERVED	56	BUF_PLTRST_N (3.3V)
17	GND	18	GND		57	RESERVED	58	LPC_SERIRQ (3.3V)
19	PCIE5_RX+	20	USB2_D1+		59	GND	60	GND
21	PCIE5_RX-	22	USB2_D1-		61	ISH_GPIO[11] (1.8V)	62	I2C1_SCL (1.8V)
23	GND	24	GND		63	ISH_GPIO[12] (1.8V)	64	I2C1_SDA (1.8V)
25	PCIE_REFCLK+	26	USB_OC#		65	ISH_GPIO[13] (1.8V)	66	ISH_GPIO[10] (1.8V)
27	PCIE_REFCLK-	28	USB_OC#		67	GND	68	GND
29	GND	30	GND		69	LINE_OUT_L	70	HDA_GND
31	RESERVED	32	SPI1_CLK (1.8V)		71	LINE_OUT_R	72	HDA_GND
33	RESERVED	34	SPI1_MOSI (1.8V)		73	BUF_PLTRST_N (3.3V)	74	PCIE_WAKE_N (3.3V)
35	GND	36	SPI1_MISO (1.8V)		75	ALL_SYS_PWRGD (3.3V)	76	PMU_SLP_S3 (3.3V)
37	RESERVED	38	SPI1_CS0 (1.8V)		77	12VA	78	V5A
39	RESERVED	40	SPI1_CS1 (1.8V)		79	12VA	80	V5A

Connector

- Amphenol BergStak Mezzanine connector 0.8 mm 80-pin

  Part Number: 61083-082602LF

Matching Connector

- Amphenol BergStak receptacle 0.8 mm 80-pin

  Part Number: 61082-081400LF

For additional enclosure expansion options, contact a WINSYSTEMS Applications Engineer at +1-817-274-7553.

8.2.27 J503 - M.2 Socket 1, with E key (Internal)

The M.2 expansion socket typically provides support for E key, type 2230 form factor WiFi and Bluetooth modules.

This connector supports PCIe Gen2 x1, SDIO, USB 2.0, UART, and I2C interfaces.

8.2.28 J501 - Mini PCIe (with mSATA Support) (Internal)

The SYS-427X Mini PCIe socket supports a variety of peripherals as available in this format. Though the sockets support other devices, they are most often used to add mSATA SSD, wireless Ethernet cards from Broadcom, Foxconn (Atheros), or others. This Mini PCIe socket supports SATA, PCIe, and USB.

8.3 Jumpers

8.3.1 JP1 - Board Configuration Jumpers (Internal)

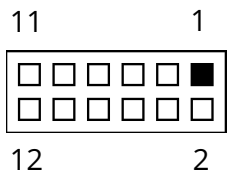
Jumpering pins 1-2 enable you to reset the BIOS CMOS settings to factory defaults. The BIOS reads this pin during system boot and forces the settings to reset if the pin is at ground.

To reset the BIOS CMOS parameters:

1. Remove power from the SYS-427X.
2. Place a jumper across 1-2.
3. Apply power to the computer, and let it boot into the BIOS.
4. Power off the SYS-427X, and remove the jumper at 1-2.

Jumpering pins 3-4 configures LVDS output as 24-bit. Removing the jumper configures the output as 18-bit.

Layout and Pin Reference

Diagram	Selection	Jumper Positions
	Backlight Power = 12V	11-12 (Default)
	Backlight Power = 5V	9-11
	Backlight Enable = Active Low	7-8
	Backlight Enable = Active High	5-7 (Default)
	LVDS 18-bit/24-bit Select	3-4 (Default)
	Load BIOS Defaults	1-2

8.4 LED Indicators

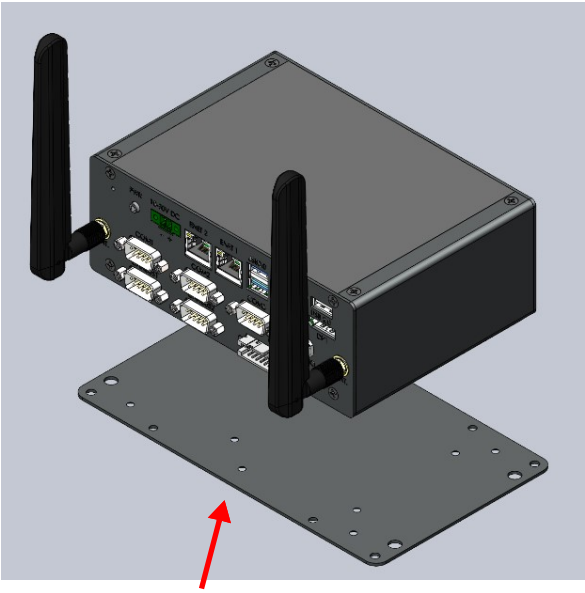
LED Reference

LED	Description	Color
D6	+12 VDC	Red
D7	+3.3 VDC	Yellow
D8	+3.3 VSB	Green
D510	EC_LED	Green
ETH1_LED1	LINK1000=GREEN, LINK100=YELLOW	Green/yellow
ETH1_LED2	LINK=SOLID, ACTIVITY=BLINKING	Green
ETH2_LED2	LINK1000=GREEN, LINK100=YELLOW	Green/yellow
ETH2_LED1	LINK=SOLID, ACTIVITY=BLINKING	Green

If the EC_LED is toggling, the chip is in full on running state. If the EC_LED is not toggling, then the chip has entered the programmed sleep state.

8.5 System Mounting Options

WINSYSTEMS provides optional brackets and DIN rail mounting hardware for mounting the SYS-427X rugged enclosure to your system. See the diagram below for hardware type and product part numbers.



Floor Mount Bracket (standard)

WINSYSTEMS PN: KIT-MNT-427X-FLAT

VESA Mount Bracket (optional)
100x100 mm
75x75 mm

WINSYSTEMS PN: KIT-MNT-427X-VESA

DIN Rail Mount Bracket (optional)

WINSYSTEMS PN: KIT-MNT-427X-DIN

8.6 Watchdog Timer (WDT)

8.6.1 WDT Register Usage

The Watchdog Timer (WDT) implemented in the SYS-427X's embedded controller (EC) can be used to reset the system if a lock-up prevents a software task from periodically resetting the watchdog timer. The WDT is controlled through a set of virtual registers that are exposed to Apollo Lake applications by the EC on the SYS-427X. The WDT can be programmed to count in either seconds or minutes; it has a minimum granularity of 1 second, and a maximum granularity of 255 minutes.

8.7 Real-time Clock/Calendar

A real-time clock is used as the AT-compatible clock/calendar. It supports a number of features including periodic and alarm interrupt capabilities. In addition to the time and date-keeping functions, the system configuration is kept in CMOS RAM contained within the clock section. A battery must be enabled for the real-time clock to retain time and date during a power down.

WINSYSTEMS has software available for manipulating the CMOS RTC from a high-level application.

8.8 System Management Software

The system management software for the SYS-427X consists of a set of library functions and example applications that demonstrate the functionality of the system management software. The software is available for both Windows 10 and Ubuntu Linux.

The system management software is custom software designed to use the built-in functionality of the SYS-427X's embedded controller (MicroChip MEC1418) to perform system management tasks such as reporting of board voltages (3.3V, 5V, 12V, V_{ddq}, V_{core}, V_{bat}, and the pair of user ADC inputs), the control of the system fan, reporting of the ambient temperature and setting of temperature sensor thresholds. Additional functionality allows applications to determine the version of the EC firmware, report the boot image used when the system started, and allow the EC to update its own firmware image. The EC contains a pair of identical images for redundancy and rolls over to a correct image if the first image is compromised.

9. BIOS Functionality

The SYS-427X BIOS settings and option descriptions can be found in our supplemental SYS-427X BIOS Manual.

9.1 Software Description

This section provides details on the AMI BIOS components to be used in the implementation of the SYS-427X BIOS firmware.

9.1.1 Software Design Specification: UEFI Operating System Support

The BIOS supports the booting of the following UEFI compliant operating systems:

- Windows 10 x64, IoT Core, and Professional
- Linux x64
- Most x86 operating systems

9.1.2 Software Design Specification: Legacy Operating System Support

The BIOS supports the booting of the following legacy OS capabilities:

- MS-DOS 6
- Compatibility support module (CSM)
- Legacy boot support
- Legacy option ROM support

9.1.3 Software Design Specification: Boot Device Configuration

The BIOS supports booting an OS from the following devices:

- USB mass storage device
- mSATA MiniCard
- Serial ATA (SATA) device
- eMMC
- Network boot - PXE

9.1.4 Software Design Specification: BIOS Update Mechanisms

The BIOS supports the following update mechanisms:

- BIOS update with UEFI shell
- Software utilities
- Flash recovery via USB mass storage device

- Flash recovery via eMMC device
- Embedded controller (EC) firmware update with UEFI shell

9.1.5 Software Design Requirements: BIOS Components

The BIOS includes the following components:

- **Advanced Host Controller Interface (AHCI) support:** Provides SATA host controller functionality.
- **Display switching in setup:** Implements display switching using the UEFI GOP driver under the SETUP environment.
- **Boot order:** Generates the default boot order on the platform's first boot.
- **Boot/resume from S4 device:** Allows the platform to boot from the last S4 hibernated device, disregarding the current boot priority.
- **Cryptographic support:** Provides cryptographic related libraries, PPI, and UEFI protocols for security modules (secure FW update, secure boot, etc.)
- **Source level support:** Provides source level debug functionality for the BIOS project.
- **Fastboot:** Provides optimization of the boot time.
- **Fixed boot order:** Provides infrastructure that allows custom handling of available boot options to meet specific customer needs. Custom boot behavior may include different requests, such as always boot from specific device, default support of various kinds of grouping of boot devices.
- **Generic error logging:** Provides support for logging POST and runtime errors to the GPNV area.
- **Keyboard controller emulation** for USB keyboard/mouse.
- **Physical memory testing:** Supports testing of physical memory present in the system.
- RTC registration and ability to handle wakeup from S5 sleep state.
- **Secure boot support:** provides support and functionality to conform with UEFI 2.3.1 secure boot requirements and includes the following components:
  - Extended functionality of EFI NVRAM driver with support for authenticated EFI variables.
  - EFI image authentication module that installs EFI security architecture protocol with image authentication and image execution policy.
  - Secure boot variable (PK, KEK, db, and dbx) provisioning.
- Support for the booting to the built in UEFI shell.

9.2 BIOS Update with UEFI Shell

9.2.1 Scope

The Unified Extensible Firmware Interface (EFI or UEFI for short) is a new model for the interface between operating systems and firmware. It provides a standard environment for booting an operating system and running pre-boot applications.

An optional feature of a UEFI implementation is the ability to boot the system to a built-in shell. The UEFI shell provides a command prompt and a rich set of commands that extend and enhance the capability of the UEFI BIOS.

This section describes the process for updating the SYS-427X BIOS firmware image using the built-in UEFI shell.

9.2.2 Process

1. Insert a USB flash drive containing the BIOS update program into a USB socket on the SYS-427X platform.
2. Turn on the SYS-427X and press the **ESC** or **DEL** key during the boot process, which starts the BIOS setup utility.
3. In the BIOS setup utility, use the cursor keys to highlight the **Save & Exit** menu option.
4. Use the cursor keys to select **UEFI: Built-In EFI Shell** from the list of boot devices displayed under the **Boot Override** section.
5. Press **Enter**.

   The SYS-427X executes the built-in UEFI shell, and displays a list of attached storage devices. The USB flash drive shows up in the list; depending on other boot devices attached, it may be listed as **fs0**, **fs1**, etc.

6. From the UEFI shell command prompt, enter the following command where `N` is the number of the fs device representing the USB flash drive:

   `fsN:`

   Example: `fs1:`

   The shell prompt changes to indicate that device fsN is now the active storage device, e.g., `fs1:`

7. Execute the following command:

   `ls`

   The output of the `ls` command is similar to the display listing available with the Linux or MS-DOS list directory command. If the correct storage device was selected in step 6 above, the `ls` command should

show the BIOS update program in the directory listing obtained with the ls command.

8. Assuming the BIOS update program is named `Update.efi`, enter the following command at the shell command prompt:

   ```
   Update.efi
   ```

   The BIOS update program begins executing.

9. When the update program completes, power cycle the platform to force the new BIOS image to load and execute.
10. Verify that the BIOS update was successful by comparing the displayed BIOS version with the version specified in the BIOS update notification.

9.3 Embedded Controller (EC) Update with UEFI Shell

9.3.1 Scope

The Unified Extensible Firmware Interface (EFI or UEFI for short) is a new model for the interface between operating systems and firmware. It provides a standard environment for booting an operating system and running pre-boot applications.

An optional feature of a UEFI implementation is the ability to boot the system to a built-in shell. The UEFI shell provides a command prompt and a rich set of commands that extend and enhance the capability of the UEFI BIOS.

This section describes the process for updating the SYS-427X Embedded Controller (EC) image using the built-in UEFI shell.

9.3.2 Process

1. Insert a USB flash drive containing the EC update program into a USB socket on the SYS-427X platform.
2. Turn on the SYS-427X and press the **ESC** or **DEL** key during the boot process, which starts the BIOS setup utility.
3. In the BIOS setup utility, use the cursor keys to highlight the **Save & Exit** menu option.
4. Use the cursor keys to select **UEFI: Built-In EFI Shell** from the list of boot devices displayed under the **Boot Override** section.
5. Press **Enter**.

   The SYS-427X executes the built-in UEFI shell, and displays a list of attached storage devices. The USB flash drive shows up in the list; depending on other boot devices attached, it may be listed as **fs0**, **fs1**, etc.

6. From the UEFI shell command prompt, enter the following command where `N` is the number of the fs device representing the USB flash drive:

   `fsN:`

   Example: `fs1:`

   The shell prompt changes to indicate that device fsN is now the active storage device, e.g., `fs1:`

7. Execute the following command:

   `ls`

   The output of the `ls` command is similar to the display listing available with the Linux or MS-DOS list directory command. If the correct storage device was selected in step 6 above, the `ls` command should show the EC update program in the directory listing obtained with the ls command.

8. Assuming the EC update program is named `Update.efi`, enter the following command at the shell command prompt:

   `Update.efi`

   The EC update program begins executing.

9. When the update program completes, power cycle the platform to force the new EC image to load and execute.

10. Verify that the EC update was successful by comparing the displayed EC version in the BIOS with the version specified in the EC update notification.

10. Software Drivers

Go to https://www.winsystems.com/ for information on available software drivers.

11. Accessories

WINSYSTEMS accessories and batteries simplify connection to the SYS-427X. The following table lists available items.

Go to https://www.winsystems.com/ for more information on WINSYSTEMS cables and batteries.

Item	Part Number	Connection	Description
Battery	BAT-LPC-BR2330	J8 - External battery header on page 26	(3V 255 mAH Removable Battery -40°C to +85°C) Hirose DF13C 1.25 mm 2-pin

12. Options

Option 3 Shown Below

(SYS-427X)

Fully Loaded System

12.0.1 Option 1 Parts List (SYS-427X-1) WIFI Only

Item	Part Number	Description
Adapter Card for WIFI	ADP-MPCIE-M.2-WL	MINI-PCIE TO M.2 WIRELESS ADP.
WiFi 6 Card	RS-INT-9260-M2AE-2	INTEL WIFI6 AC9260 M.2 2230 A+E-KEY KIT WITH TWO ANTENNAS

Appendix A. Best Practices

The following paragraphs outline the best practices for operating the SYS-427X in a safe, effective manner, that does not damage the board. Read this section carefully.

Power Supply

Avoid electrostatic discharge (ESD)
Only handle the circuit board and other bare electronics when electrostatic discharge (ESD) protection is in place. Having a wrist strap and a fully grounded workstation is the minimum ESD protection required before the ESD seal on the product bag is broken.

Power Supply Budget

Evaluate your power supply budget. It is usually good practice to budget twice the typical power requirement for all of your devices.

Zero-load Power Supply

Use a zero-load power supply whenever possible. A zero-load power supply does not require a minimum power load to regulate. If a zero-load power supply is not appropriate for your application, then verify that the single board computer's typical load is not lower than the power supply's minimum load. If the single board computer does not draw enough power to meet the power supply's minimum load, then the power supply does not regulate properly and can cause damage to the SYS-427X.

Use proper power connections (voltage)
When verifying the voltage, measure it at the power connector on the SYS-427X. Measuring it at the power supply does not account for voltage drop through the wire and connectors.

The SYS-427X requires 10V to 50V to operate. Verify the power connections. Incorrect voltages can cause catastrophic damage.

The SYS-427X has a single power connector on the front IO plate. A single 10V-50V DC input and ground is required to power the SYS-427E.

Power Harness

Minimize the length of the power harness. This reduces the amount of voltage drop between the power supply and the SYS-427X.

Gauge Wire

Use the largest gauge wire that you can. Most connector manufacturers have a maximum gauge wire they recommend for their pins.

Contact Points

WINSYSTEMS boards mostly use connectors with gold finish contacts. Gold finish contacts are used exclusively on high-speed connections. Power and lower speed peripheral connectors may use a tin finish as an alternative contact surface. It is critical that the contact material in the mating connectors is matched properly (gold to gold and tin to tin). Contact areas made with dissimilar metals can cause oxidation/corrosion, resulting in unreliable connections.

Pin Contacts

Often the pin contacts used in cabling are not given enough attention. The ideal choice for a pin contact would include a design similar to Molex or Trifurcon designs, which provide three distinct points to maximize the contact area and improve connection integrity in high shock and vibration applications.

Power Down

Make sure that power has been removed from the system before making or breaking any connections.

Power supply OFF—Always turn off the power supply before connecting to the I/O Module. Do not hot-plug the SYS-427X on a host platform that is already powered.

I/O connections OFF—Turn off all I/O connections before connecting them to the embedded computer modules or any I/O cards. Connecting hot signals can cause damage whether the embedded system is powered or not.

Conformal Coating

Conformal coating by any source other than WINSYSTEMS voids the product warranty and will not be accepted for repair by WINSYSTEMS. If such a product is sent to WINSYSTEMS for repair, it will be returned at customer expense and no service will be performed. A WINSYSTEMS product conformally coated by WINSYSTEMS will be subject to regular WINSYSTEMS warranty terms and conditions.

Operations/Product Manuals

Every Winsystems computer system and single board computer has an Operations manual or Product manual.

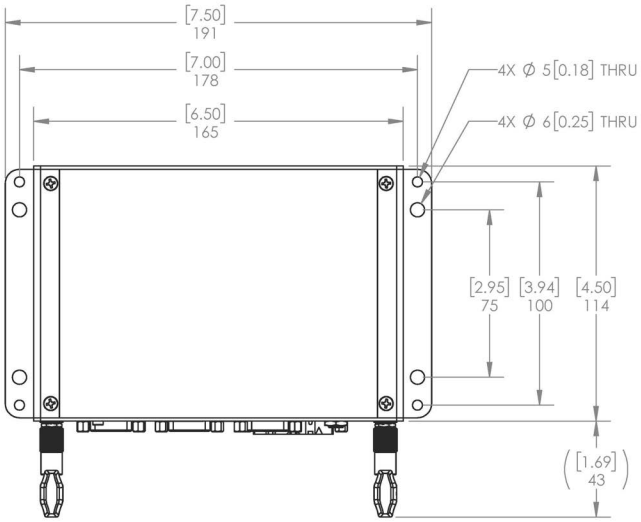
Periodic updates—Operations/product manuals are updated often. Periodically check the WINSYSTEMS website (https://www.winsystems.com/) for revisions.

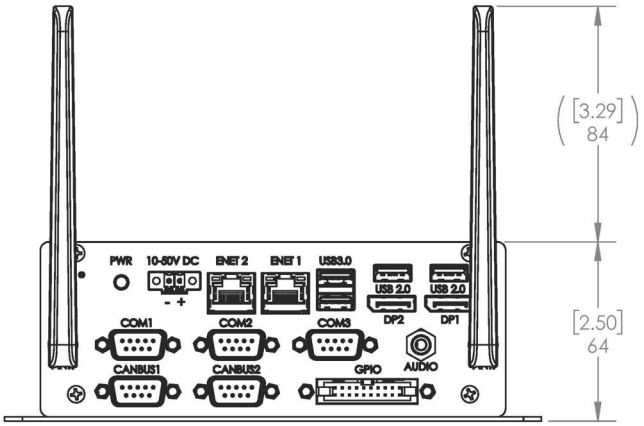
Check pin-outs—Always check the pin-out and connector locations in the manual before plugging in a cable. Many I/O modules have identical headers for different functions and plugging a cable into the wrong header can have disastrous results.

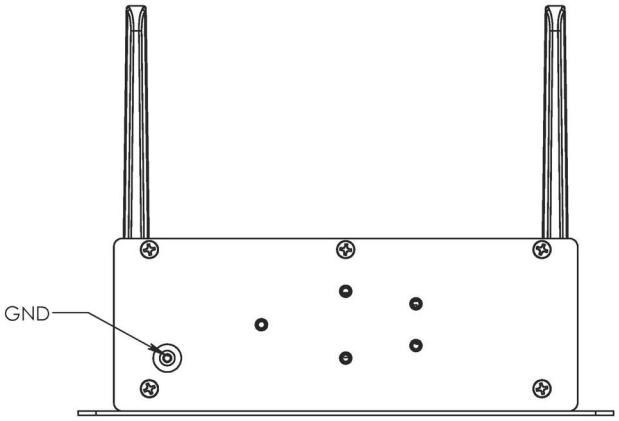
Contact an applications engineer—If a diagram or chart in a manual does not seem to match your board, or if you have additional questions, contact a WINSYSTEMS applications engineer at +1-817-274-7553.

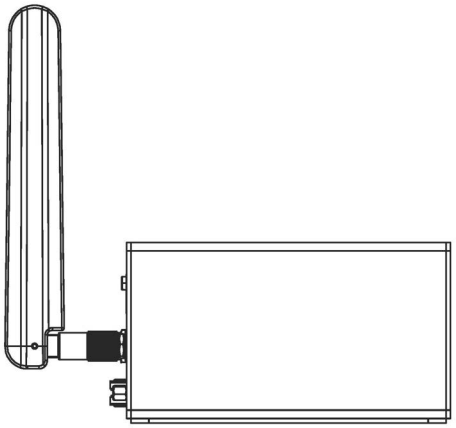
Appendix B. Mechanical Drawings

SYS-427X Mechanical Drawings









Top measurements are in inches.

Bottom measurement are in millimeters.

Appendix C. Warranty Information

Full warranty information is at https://winsystems.com/company-policies/warranty/.