



**Connect Tech Inc.**  
Embedded Computing Experts

# USERS GUIDE



## CTI Polaris Users Guide

CTIM-00089 Revision 0.01 2023-10-17

CONNECT TECH

[www.connecttech.com](http://www.connecttech.com)

[support@connecttech.com](mailto:support@connecttech.com)

# TABLE OF CONTENTS

<b>Table of Contents</b> .....	<b>2</b>
<b>Preface</b> .....	<b>4</b>
Disclaimer .....	4
Customer Support Overview .....	4
Contact Information .....	4
Limited Product Warranty.....	5
Copyright Notice .....	5
Trademark Acknowledgment .....	5
ESD Warning .....	6
<b>Revision History</b> .....	<b>6</b>
<b>Introduction</b> .....	<b>7</b>
Product Features and Specifications.....	7
Part Numbers / Ordering Information .....	8
<b>Product Overview</b> .....	<b>9</b>
Block Diagram .....	9
Top View.....	9
Front View .....	10
Iso View .....	10
Back View.....	10
Internal Connector Summary & Locations.....	11
Jumper and Switch Summary & Locations .....	11
External Connector Summary & Locations.....	12
<b>Detailed Feature Description</b> .....	<b>13</b>
NVIDIA® Jetson Orin™ Board-to-Board Module Connector .....	13
Power Connector .....	13
GPIO Connector .....	14
CAN Connector.....	14
Main GbE Connectors .....	15
FAKRA GMSL Connectors .....	16
FAKRA RF Connectors .....	16
USB 3.1 Type-A Connector .....	17
USB microAB Connectors .....	17
HDMI Connector.....	17
Nano-SIM Card Slot.....	18
Main Power Button .....	18
Reset and Force Recovery Button .....	18
Rotary Switch Button .....	19
RGB Status LED .....	19
<b>Typical Installation</b> .....	<b>20</b>
<b>Mechanical Details</b> .....	<b>20</b>
Accessing User Access Panel.....	20
Mounting Details.....	20
<b>Mechanical Drawings &amp; Models</b> .....	<b>20</b>

<b>Thermal Details.....</b>	<b>21</b>
<b>RMS POWER Consumption .....</b>	<b>21</b>
<b>Software .....</b>	<b>22</b>
<b>Force Recovery Mode .....</b>	<b>22</b>
<b>Cables.....</b>	<b>22</b>
<b>Approved Vendors Cameras .....</b>	<b>22</b>

## PREFACE

### Disclaimer

The information contained within this user's guide, including but not limited to any product specification, is subject to change without notice.

Connect Tech assumes no liability for any damages incurred directly or indirectly from any technical or typographical errors or omissions contained herein or for discrepancies between the product and the user's guide.

### Customer Support Overview

If you experience difficulties after reading the manual and/or using the product, contact the Connect Tech reseller from which you purchased the product. In most cases the reseller can help you with product installation and difficulties.

In the event that the reseller is unable to resolve your problem, our highly qualified support staff can assist you. Support resources are available 24 hours a day, 7 days a week on our website at: <https://connecttech.com/support/resource-center/>. See the contact information section below for more information on how to contact us directly. Our technical support is always free.

### Contact Information

Contact Information	
<b>Mail/Courier</b>	Connect Tech Inc. Technical Support 489 Clair Rd. W. Guelph, Ontario Canada N1L 0H7
<b>Contact Information</b>	<a href="mailto:sales@connecttech.com">sales@connecttech.com</a> <a href="mailto:support@connecttech.com">support@connecttech.com</a> <a href="http://www.connecttech.com">www.connecttech.com</a>  Toll Free: 800-426-8979 (North America only) Telephone: +1-519-836-1291 Facsimile: 519-836-4878 (on-line 24 hours)
<b>Support</b>	Please go to the <a href="#">Connect Tech Resource Center</a> for product manuals, installation guides, device drivers, BSPs and technical tips.  Submit your <a href="#">technical support questions</a> to our support engineers. Technical Support representatives are available Monday through Friday, from 8:30 a.m. to 5:00 p.m. Eastern Standard Time.

## Limited Product Warranty

Connect Tech Inc. provides a one-year Warranty for this product. Should this product, in Connect Tech Inc.'s opinion, fail to be in good working order during the warranty period, Connect Tech Inc. will, at its option, repair or replace this product at no charge, provided that the product has not been subjected to abuse, misuse, accident, disaster or non-Connect Tech Inc. authorized modification or repair.

You may obtain warranty service by delivering this product to an authorized Connect Tech Inc. business partner or to Connect Tech Inc. along with proof of purchase. Product returned to Connect Tech Inc. must be pre-authorized by Connect Tech Inc. with an RMA (Return Material Authorization) number marked on the outside of the package and sent prepaid, insured and packaged for safe shipment. Connect Tech Inc. will return this product by prepaid ground shipment service.

The Connect Tech Inc. Limited Warranty is only valid over the serviceable life of the product. This is defined as the period during which all components are available. Should the product prove to be irreparable, Connect Tech Inc. reserves the right to substitute an equivalent product if available or to retract the Warranty if no replacement is available.

The above warranty is the only warranty authorized by Connect Tech Inc. Under no circumstances will Connect Tech Inc. be liable in any way for any damages, including any lost profits, lost savings or other incidental or consequential damages arising out of the use of, or inability to use, such product.

## Copyright Notice

The information contained in this document is subject to change without notice. Connect Tech Inc. shall not be liable for errors contained herein or for incidental consequential damages in connection with the furnishing, performance, or use of this material. This document contains proprietary information that is protected by copyright. All rights are reserved. No part of this document may be photocopied, reproduced, or translated to another language without the prior written consent of Connect Tech, Inc.

Copyright © 2023 by Connect Tech, Inc.

## Trademark Acknowledgment

Connect Tech, Inc. acknowledges all trademarks, registered trademarks and/or copyrights referred to in this document as the property of their respective owners. Not listing all possible trademarks or copyright acknowledgments does not constitute a lack of acknowledgment to the rightful owners of the trademarks and copyrights mentioned in this document.

## ESD Warning



Electronic components and circuits are sensitive to ElectroStatic Discharge (ESD). When handling any circuit board assemblies including Connect Tech COM Express carrier assemblies, it is recommended that ESD safety precautions be observed. ESD safe best practices include, but are not limited to:

- Leaving circuit boards in their antistatic packaging until they are ready to be installed.
- Using a grounded wrist strap when handling circuit boards, at a minimum you should touch a grounded metal object to dissipate any static charge that may be present on you.
- Only handling circuit boards in ESD safe areas, which may include ESD floor and table mats, wrist strap stations and ESD safe lab coats.
- Avoiding handling circuit boards in carpeted areas.
- Try to handle the board by the edges, avoiding contact with components.

## REVISION HISTORY

Revision	Date	Changes
0.00	2023-07-21	Created
0.01	2023-10-17	Updated part numbers table

## INTRODUCTION

Connect Tech's Polaris brings a deployable NVIDIA® Jetson Orin™ NX and Orin™ Nano to the market. The Polaris features IP67 enclosure with USB ports, dual-fan, FAKRA SMB plugs, M12 ports, an RGB status LED, a power button, and non-IP67 ports under IP67 sealed user panel. Polaris is also equipped with user expansion M.2 (B-Key 3042/3052, M-Key 2280, and E-Key 2230).

### Product Features and Specifications

Specifications	
NVIDIA® GPU SoC Module Compatibility	NVIDIA® Jetson Orin™ NX NVIDIA® Jetson Orin™ Nano
Networking	2x Gigabit Ethernet (M12 X-Code) 1x Gigabit Ethernet (RJ45) - All ports are from KSZ9897 unmanaged switch
Wireless Expansion	1x WiFi Module (M.2 2230 E-KEY) 1x 5G Module (M.2 3042/3052 B-KEY) w/ nano SIM Card Slot 5x FAKRA SMB Plug C/D/I-codes for antenna connections
Display Output	1x HDMI 1.4b (Type A)
Camera Input	4x FAKRA SMB Plug Z-code, GMSL cameras
USB	3x USB 3.1 (Type A) 1x USB 2.0 OTG (micro AB connector)
UART	1x USB based Debug UART (USB micro AB connector)
Storage	1x M.2 Key-M (NVMe) slot (4-lane PCIe Gen 3/4)
CAN Bus	2x CAN FD Isolated Ports (M12 A-Code)
GPIO	ISOLATED GPIO ports (M12 D-Code): - 2x 3.3V input (12V tolerant) - 1x 12V output (100mA max)
Fan (active cooling variant)	2x 12V BLDC Fans with Tachometer and PWM speed control
Other	1x CR2032 RTC battery holder 1x RGB status LED 1x Back-up power button 1x Reset/Forced-Recovery button 1x CAN mode/self-test rotary switch
Input Power	+18-48V DC Wide Input Power (M12 B-Code)
Dimensions	285mm x 150mm x 70mm (11.22inch x 5.91inch x 2.76inch)
Operating Temperature	-20°C to +50°C (-4°F to +122°F) (14.4CFM is need to operate higher than 35°C or 95°F)

## Part Numbers / Ordering Information

POLARIS VARIANTS	
<i>Base Part Number</i>	<i>Description</i>
ESG604*	Polaris actively cooled version with embedded fans
ESG608*	Polaris passively cooled version that requires user supplied external airflow

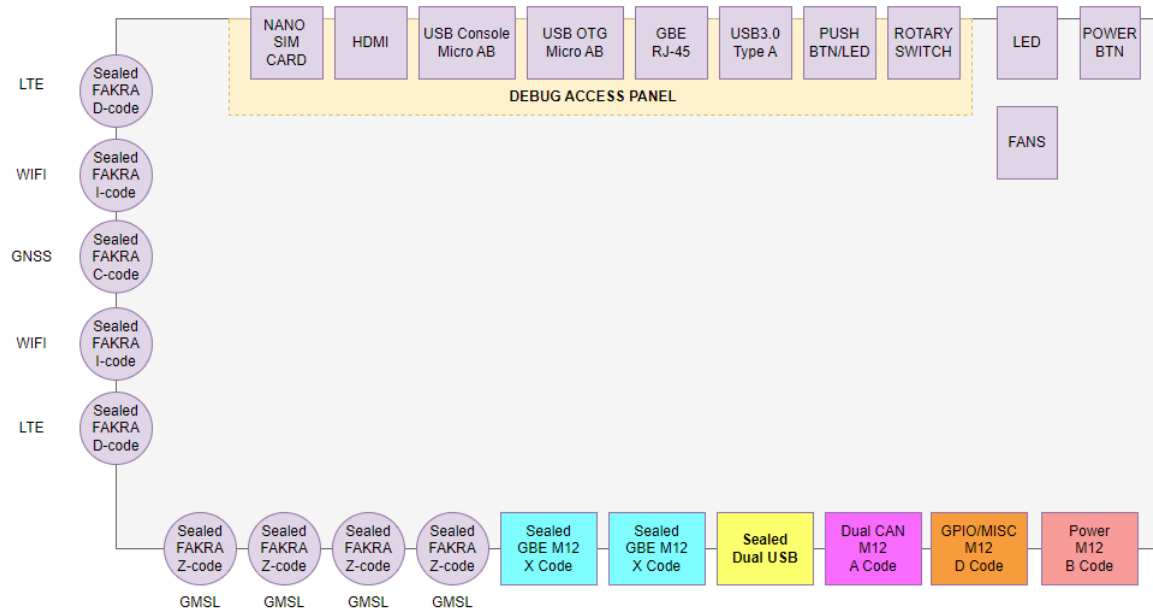
PART NUMBERS				
<i>ORDERING PART NUMBER</i>	<i>COOLING</i>	<i>WiFi6E</i>	<i>5G</i>	<i>STORAGE</i>
ESG604-1E	ACTIVE	Y	N	2TB
ESG604-22	ACTIVE	N	Y	2TB
ESG604-24	ACTIVE	Y	Y	2TB
ESG604-1C	ACTIVE	N	N	2TB
ESG608-1E	PASSIVE	Y	N	2TB
ESG608-22	PASSIVE	N	Y	2TB
ESG608-24	PASSIVE	Y	Y	2TB
ESG608-1C	PASSIVE	N	N	2TB

\*Note that additional configuration possibilities exist with respect to storage and wireless connectivity. Contact [sales@connecttech.com](mailto:sales@connecttech.com) to discuss all available options.

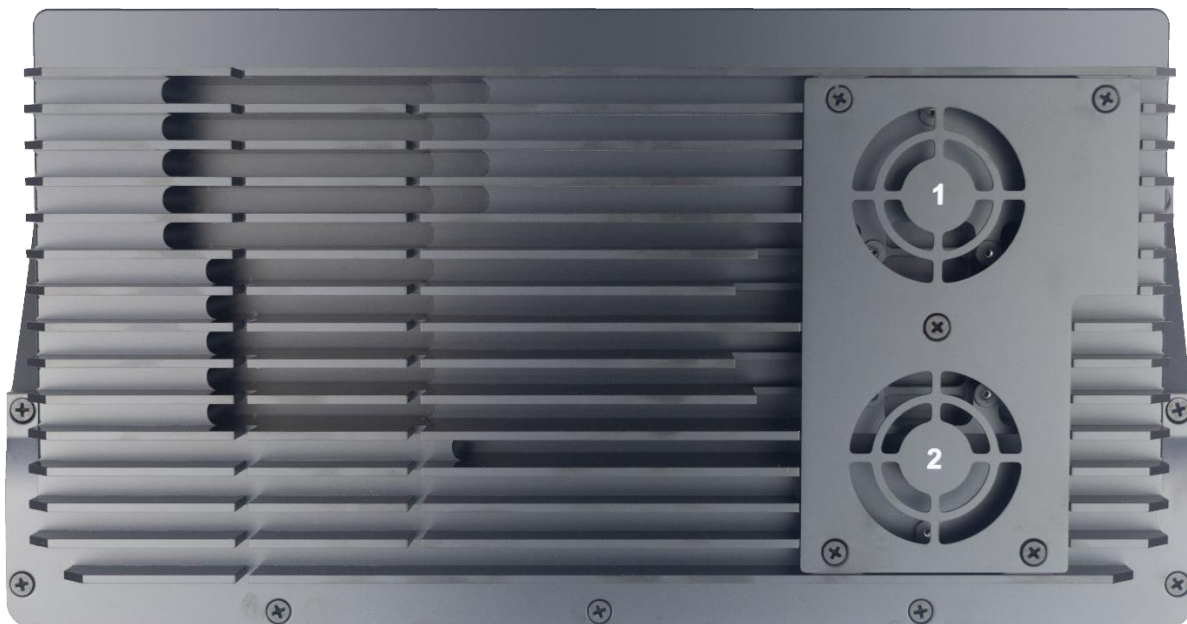


# PRODUCT OVERVIEW

## Block Diagram



## Top View



### Front View



### Iso View



### Back View



## Internal Connector Summary & Locations

Designator	Description
P1	HDMI display output connector
P2	Jetson Orin™ NX/Nano module connector
P3	M.2 key-B connector
P4	M.2 key-E connector
P5, P7, P13, P19	MMCX jack GMSL connector
P6, P8	GbE ethernet connectors
P9	CAN connectors
P10	M.2 key-M connector
P11, P21	12V fan connector
P12	Main power connector
P14	Nano SIM card slot
P15	USB2.0 OTG port
P16	USB2.0 debug UART port
P17, P18	USB3.1 dual connector
P20	GPIO connector
P22	On/off button connector
P23	BMS programming connector
P24	GbE RJ45 ethernet connector

## Jumper and Switch Summary & Locations

Designator	Description
SW4	Reset and Forced-Recovery mode momentary button
RSW1	CAN Bus Termination control rotary switch

## External Connector Summary & Locations

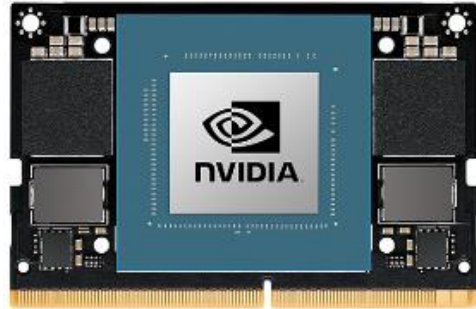
Location	Connector	Description
Front	GMSL-1 GMSL-2 GMSL-3 GMSL-4	GMSL FAKRA SMB plug connectors
Front	GbE-1 GbE-2	GbE ethernet – M12 X-code connectors
Front	CAN	CAN – M12 A-code connector
Front	POWER	Power input – M12 B-code connector
Front	USB-1 USB-2	USB3.1 dual port
Front	GPIO	GPIO – M12 D-code connector
Side	RF-1 RF-2 RF-3 RF-4 RF-5	WiFi, LTE, and GNSS antenna connectors
Back	Power Button	Main on/off power button
Back	Status LED	RGB LED
Back	Access Panel	User access panel consisting: <ul style="list-style-type: none"> <li>- RESET and Forced-Recovery mode push button</li> <li>- CAN mode rotary switch</li> <li>- USB 3.1 Type-A port</li> <li>- GbE RJ45 port</li> <li>- HDMI</li> <li>- USB microAB OTG port</li> <li>- USB microAB debug UART port</li> <li>- Nano SIM card slot</li> </ul>

## DETAILED FEATURE DESCRIPTION

### NVIDIA® Jetson Orin™ Board-to-Board Module Connector

The NVIDIA® Orin™ SoC and NVIDIA® Ampere GPU are implemented on the Jetson Orin™ NX or Nano system-on-module (SOM). This module is connected to the Polaris' carrier PCB via a TE Connectivity DDR4 SODIMM 260 Pin connector.

Function	NVIDIA® Jetson Orin™ NX/Nano Module Interface
Location	Internal to Polaris
Type	SOM
Pinout	Refer to NVIDIA® Jetson Orin™ System-on-Module datasheet and OEM design guide for pinout details
Features	Refer to NVIDIA® Jetson Orin™ System-on-Module datasheet and OEM design guide for features details



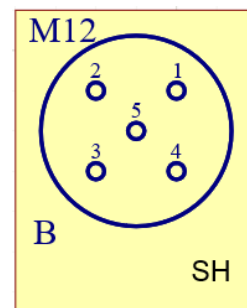
### Power Connector

Function	Description
Location	Front
Type	M12 B-Code 5-pin
Part Number	Amphenol MSBS-05PFFR-SF7003
Mating Connector	Standard M12 B-Code 5-pin plug. Example: M12B05ML-12BML
Voltage	+18 – 48VDC
Power	Max 185W



### Pinout:

Pin	Signal
1	VIN (+)
2	VIN (+)
3	VIN (-)
4	VIN (-)
5	VIN (-)
Outer Shell	Frame Ground



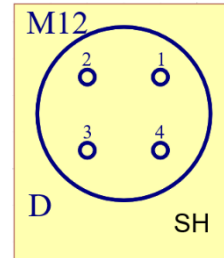
## GPIO Connector

Function	Description
Location	Front
Type	M12 D-Code 4-pin
Part Number	Amphenol MSDS-04PFFR-SF7003
Mating Connector	Standard M12 D-Code 4-pin plug. Example: TAD14147101-002 (TE)
Voltage	Max I/O 12VDC



### Pinout:

Pin	Signal
1	Input1; 2.74k PU to 12V
2	Input2; 2.74k PU to 12V
3	Output1; 12V/100mA
4	VIN (-)
Outer Shell	Frame Ground



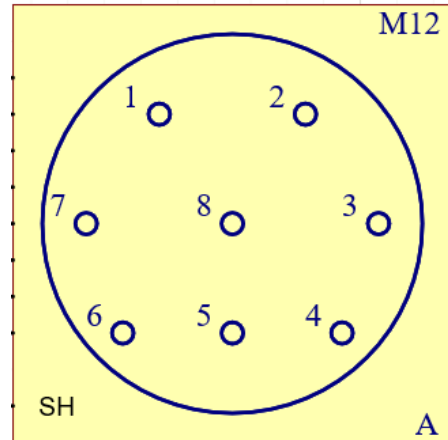
## CAN Connector

Function	Description
Location	Front
Type	M12 A-Code 8-pin
Part Number	Amphenol MSAS-08PFFR-SF7003
Mating Connector	Standard M12 A-Code 8-pin plug. Example: 1406094 (Phoenix Contact)
Voltage	Max 12VDC, isolated up to 1500VRMS



**Pinout:**

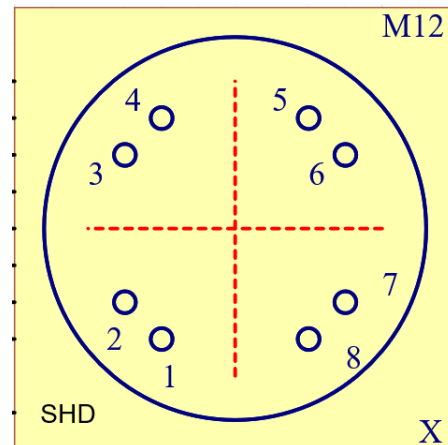
Pin	Signal
1	12V; Max 750mA
2	VIN (-)
3	CAN1H
4	CAN1L
5	GNDCAN1
6	CAN2H
7	CAN2L
8	GNDCAN2
Outer Shell	Frame Ground


**Main GbE Connectors**

Function	Description
Location	Front
Type	M12 X-Code 8-pin
Part Number	Amphenol MSXS-08PFFR-SF7003
Mating Connector	Standard M12 X-Code 8-pin plug Example: TRG610-T6T-1M
Voltage	Follow IEEE 802.3 standard up to 1000BASE-T, isolated up to 1500VRMS



**Pinout:**

Pin	Signal
1	ETH – A+
2	ETH – A-
3	ETH – B+
4	ETH – B-
5	ETH – D+
6	ETH – D-
7	ETH – C-
8	ETH – C+
Outer Shell	Frame Ground






## FAKRA GMSL Connectors

Function	Description
Location	Front
Type	FAKRA SMB Plug Z-Code (water blue)
Part Number	SHM. 900. 0006-72.Z.I.A-XX
Mating Connector	Standard FAKRA Jack Z-code (water blue)
Voltage	12VDC
Current	Max load 1.5A
Impedance	50Ω
Pinout	Refer to standard FAKRA SMB plug 



## FAKRA RF Connectors

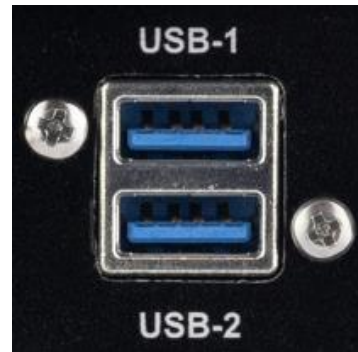
Function	Description
Location	Side
Type	<b>GNSS:</b> FAKRA SMB Plug C-Code (blue) <b>WiFi/Bluetooth:</b> FAKRA SMB Plug I-Code (beige) <b>LTE/5G:</b> FAKRA SMB Plug D-Code (violet)
Part Number	SHM. 900. 0006-24.C.IV.A-XX (blue) SHM. 900. 0006-24.I.IV.A-XX (beige) SHM. 900. 0006-24.D.IV.A-XX (violet)
Mating Connector	<b>These are low-power ANTENNA connectors.</b> <b>GNSS:</b> FAKRA SMB Jack C-Code (blue) <b>WiFi/Bluetooth:</b> FAKRA SMB Jack I-Code (beige) <b>LTE/5G:</b> FAKRA SMB Jack D-Code (violet)
Impedance	50Ω
Pinout	Refer to standard FAKRA SMB plug 





## USB 3.1 Type-A Connector

Function	Description
Location	Front (2pcs) and Inside Access Panel
Type	USB 3.1 Type-A connector (receptacle)
Mating Connector	USB Type-A plug
Voltage	Max 5VDC
Speed	Max 5 Gbps (access panel) Max 10 Gbps (front face)



## USB microAB Connectors

Function	Description
Location	Inside Access Panel
Type	USB 2.0 microAB connector (receptacle)
Mating Connector	USB 2.0 micro-A (OTG port only) or micro-B
Voltage	Max 5VDC




## HDMI Connector


Function	Description
Location	Inside Access Panel
Type	HDMI Type-A connector
Mating Connector	HDMI Type-A plug
Voltage	Max 5VDC




## Nano-SIM Card Slot

Function	Description	
Location	Inside Access Panel	
Type	Push-pull Nano-SIM card slot	
Mating Connector	Nano-SIM card (4FF)	

## Main Power Button


Function	Description	
Location	Back	
Type	Momentary push button	
Function	Press 0.5-1 second to turn-on or turn-off Polaris.	

## Reset and Force Recovery Button

Function	Description	
Location	Inside Access Panel	
Type	Momentary push button	
Function	Quick press (~200ms) to reset Jetson module, long press (~10s) to enter Force Recovery mode	

## Rotary Switch Button

Function	Description
Location	Inside Access Panel
Type	Rotary switch
Termination	120 $\Omega$ (each CAN bus)



### Setting Table

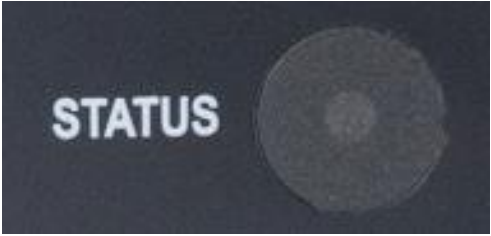
No	CAN1	CAN2	Termination
0	ON	ON	OFF
1	ON	ON	CAN1
2	ON	ON	CAN2
3	ON	ON	CAN1 and CAN2
4	ON	OFF	OFF
5	ON	OFF	CAN1
6	ON	OFF	CAN2
7	ON	OFF	CAN1 and CAN2

**Note:**

- Units are shipped with setting #3.
- Setting#5 to 7 are RSVD for testing purpose only. Do not use.

## RGB Status LED

Function	Description
Location	Back
Type	RGB and dimmable LED
Function	User programmable Green and Blue LED; Red LED is for the main system status and not programmable



## TYPICAL INSTALLATION

1. Ensure all external system power supplies are off.
2. Install the necessary cables for application. At a minimum these would include:
  - a) Power cable to the input power connector on the carrier
  - b) USB micro-B cable to access debug port

For additional information on the relevant cables, please see the Cables and Interconnects section of this manual.

3. Connect the Power Cable to the Power Supply. Ensure M12 screws are tighten properly. Failure to do so will create a hazard from loose energized cable.
4. Switch ON the Power Supply. DO NOT power up your system by plugging in live power.
5. Unit will auto power-on or auto-boot once power is given.

## MECHANICAL DETAILS

Accessing User Access Panel

TBD

Mounting Details

TBD

## MECHANICAL DRAWINGS & MODELS

TBD

## THERMAL DETAILS

The Polaris has an Operating Temperature Range of -20°C to +50°C.

However, it is important to note that the NVIDIA® Jetson Orin™ Module has its own properties separate to that of the Polaris. The NVIDIA® Jetson Orin™ SoC Operating Temperature is -25°C to +105°C. Operating at +35°C and higher requires 14.4CFM airflow. With ESG604, this can be achieved by running both fans at full power, but ESG608 requires an external airflow blown directly at the unit.

If placed in a system, Customer is responsible to provide a proper implementation of a thermal solution that maintains the Polaris temperatures below the specified temperatures (shown in the tables below) under the maximum thermal load and system conditions for their use case.

### NVIDIA® Jetson Orin™ NX

Parameter	Value	Units
Maximum SoC Operating Temperature	99	°C
SoC Shutdown Temperature	105	°C

### Polaris

Parameter	Value	Units
Maximum Operating Temperature @14.4 CFM (1 fan CFM x 1.5) ESG604-21 configuration was used in this test	T.cpu = TBD	°C
	T.gpu = TBD	°C
	T.nvme = TBD	°C
	T.amb = TBD	°C

## RMS POWER CONSUMPTION

Parameter	Value	Units	Temperature
NVIDIA® Jetson Orin™ NX Module, Passive Cooling, Idle, HDMI, WiFi, Mouse, and Keyboard plugged in	45	W	25°C (typ.)
NVIDIA® Jetson Orin™ NX Module, Active Cooling, 25W - 8 core mode, CPU stressed, GPU stressed, HDMI, WiFi, Mouse, and Keyboard plugged in	75	W	25°C (typ.)

**Recommended power supply specification: 48VDC, 200W**

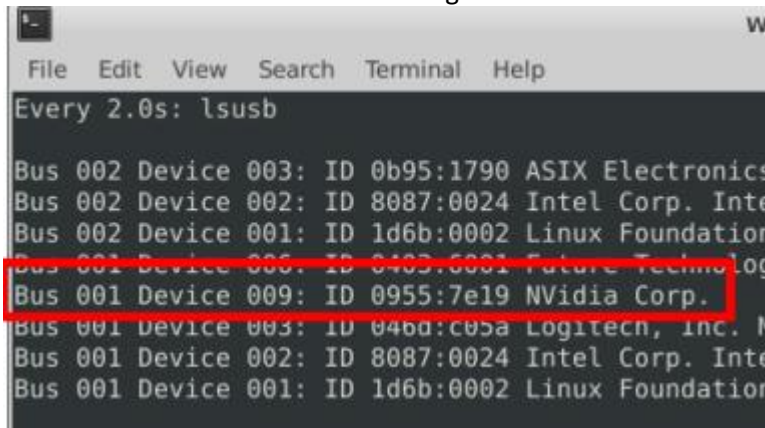
## SOFTWARE

L4T (Linux for Tegra) BSPs and Software Support NVIDIA® Jetson Orin™ are not yet available for public. Please contact [support@connecttech.com](mailto:support@connecttech.com).

## FORCE RECOVERY MODE

Open the user access panel, then connect a micro-A plug onto micro-AB OTG port. The other end of the USB cable is connected to a LINUX HOST machine, that has the new system file.

- 1) The system must be turned ON, preferably at idle state, i.e., not running critical user threads.
- 2) Hold down the Force Recovery Button for 10 seconds, then release the button.
- 3) HOST machine will show the following NVIDIA device:



```

File Edit View Search Terminal Help
Every 2.0s: lsusb
Bus 002 Device 003: ID 0b95:1790 ASIX Electronics
Bus 002 Device 002: ID 8087:0024 Intel Corp. Inte
Bus 002 Device 001: ID 1d6b:0002 Linux Foundation
Bus 001 Device 009: ID 0955:7e19 NVidia Corp.
Bus 001 Device 003: ID 046d:c05a Logitech, Inc. M
Bus 001 Device 002: ID 8087:0024 Intel Corp. Inte
Bus 001 Device 001: ID 1d6b:0002 Linux Foundation
    
```

- 4) After successfully updating the system software, power off the system. A clean power up will revert the OTG port back into host mode.

## CABLES

Part No.	Description	Max Quantity per System
<b>MSG110</b>	Polaris Power Cable Assembly, 48VDC 200W. Universal IEC 320-C14 AC input.	1

## APPROVED VENDORS CAMERAS

<https://connecttech.com/supported-cameras/>