



Connect Tech Inc.
Embedded Computing Experts

USERS GUIDE



Cogswell Vision System

CTIM-000494 Revision 0.03 2022-03-25



CONNECT TECH
www.connecttech.com
support@connecttech.com

TABLE OF CONTENTS

Table of Contents	2
Preface	4
Disclaimer	4
Customer Support Overview	4
Contact Information	4
Limited Product Warranty	5
Copyright Notice	5
Trademark Acknowledgment	5
ESD Warning	6
Revision History	6
Introduction	7
Product Features and Specifications	7
Part Numbers / Ordering Information	8
Product Overview	8
Block Diagram	8
Connector Locations – Front	9
Connector Locations – Rear	9
Connector Summary - Front	10
Switch Summary - Front	10
Connector Summary - Rear	10
Detailed Feature Description	11
Antenna 1	11
Antenna 2	11
Gigabit Ethernet	11
USB 3.0/2.0	12
USB 2.0 OTG and USB 2.0	12
USB 3.0/2.0	13
HDMI Connector	13
POE Gigabit Ethernet 4	13
POE Gigabit Ethernet 3	14
POE Gigabit Ethernet 2	14
POE Gigabit Ethernet 1	14
CAN Bus	14
GPIO/Serial/I2C	15
microSD Card Slot	15
Power Input	16
SIM Card Slot	16
Switch Description	17
Recessed Push Button Switch – Force Recover	17
Recessed Push Button Switch – Reset	17
Push Button Switch – Power	17

Typical Installation	18
Current Consumption Details	18
Software / BSP Details	19
NVIDIA Linux For Tegra (L4T).....	19
NVIDIA Jetpack for L4T	19
Connect Tech's Custom L4T BSP (CTI-L4T)	19
Force USB Recovery Mode	19
Mechanical Details	20
System View	20
Cables	21
Cable.....	21
Power Supply	21
Power Supply.....	21
Accessories.....	21
Accessories	21

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. Our support section is 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	
Mail/Courier	Connect Tech Inc. Technical Support 489 Clair Rd. W. Guelph, Ontario Canada N1L 0H7
Contact Information	sales@connecttech.com support@connecttech.com www.connecttech.com Toll Free: 800-426-8979 (North America only) Telephone: +1-519-836-1291 Facsimile: 519-836-4878 (on-line 24 hours)
Support	Please go to the Connect Tech Resource Center for product manuals, installation guides, device drivers, BSPs and technical tips. Submit your technical support questions 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 the Cogswell Vision System. 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 © 2021 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	2018/11/15	Initial Release
0.01	2019-04-16	Added TX2i, HDMI 2.0 support
0.02	2021-11-04	Updated format, Updated address, Removed TX1 references
0.03	2022-03-25	Updated block diagram

INTRODUCTION

Connect Tech's Cogswell Vision System is pre-integrated with the NVIDIA® Jetson™ TX2 or TX2i, and is ideal for use in Gigabit Ethernet Vision applications. This product provides Gigabit Ethernet channels with built-in Power over Ethernet (PoE) sourcing capabilities, ideal for use with GigE Vision cameras.

The Cogswell Vision System design includes a total of 5 Gigabit Ethernet Ports. Four of these ports can be used for IEEE 802.3af (PoE) 15.4W power sourcing or two of these ports can be used for IEEE 802.3at (PoE+) 25.5W power sourcing. Additionally, the Cogswell Vision System also enables HDMI Video, USB 3.0, USB 2.0, USB OTG, Mini-PCIe/mSATA expansion, and RS-232 Serial Ports.

Product Features and Specifications

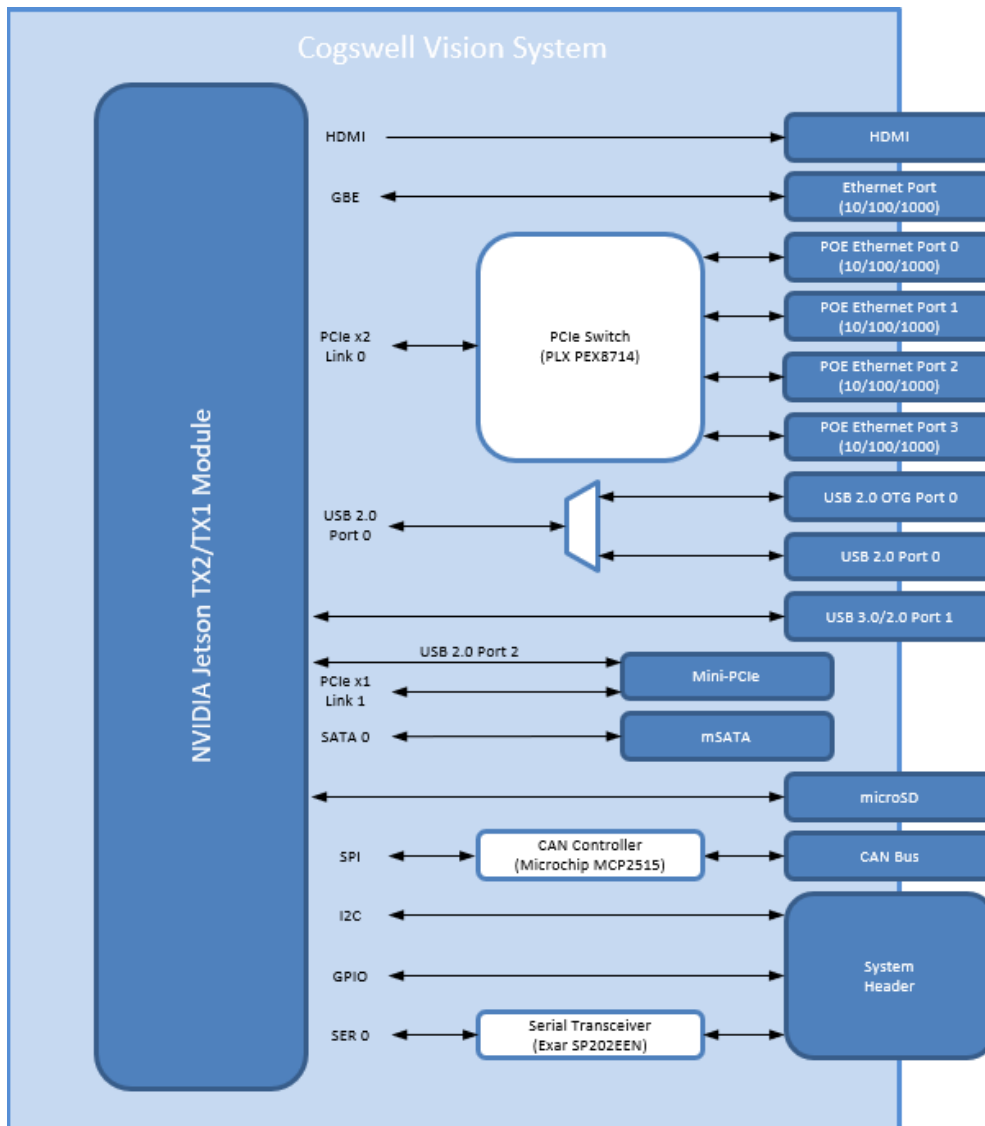
Specifications	
Module Compatibility	NVIDIA Jetson™ TX2 and NVIDIA Jetson™ TX2i
Dimensions	215mm x 162.38mm x 77m (8.465" x 6.393" x 3.032) 3D STEP Model: download here
Display	1x HDMI (Supports up to HDMI 2.0 UHD 4K [2160p] at 60Hz)
Ethernet	1x Gigabit Ethernet (10/100/1000) 4 x POE Gigabit Ethernet (10/100/1000) 4x IEEE 802.3af (POE) 15.4W or 2x IEEE 802.3at(POE+) 25.5W
USB	1x USB 3.0 Type A (Integrated USB 2.0) 1x USB 2.0 Type A/1x USB 2.0 OTG Micro-AB 1x USB 2.0 to Mini-PCIe Slot
SATA	1x mSATA Full Size (Internal to System)
Audio	HDMI Integrated
Serial	2x RS-232 (1x External, 1x Internal)
Mini-PCIe/mSATA	1x Mini-PCIe (PCIe & USB 2.0) Full Size (Internal to System)
SD Card	1x microSD Card Slot
CAN Bus	1x CAN Bus Link
Misc.	1x I2C Link (+3.3V I/O) 1x System Control 4x GPIO
Power Requirements	+12V DC Input @ 9.5A No External -48V Required, Carrier Generates its Own POE
Operating Temperature	-20°C to +80°C
Weight	TBD
Accessories	Cable Kit
Warranty and Support	1 Year Warranty and Free Support

Part Numbers / Ordering Information

Part Number	
CVS001	Cogswell Vision System

PRODUCT OVERVIEW

Block Diagram



Connector Locations – Front



Connector Locations – Rear



Connector Summary - Front

Designator	Connector	Description
ANT1	SMA Antenna	NVIDIA Jetson TX2/TX2i J8 U.FL (WiFi)
ANT2	SMA Antenna	NVIDIA Jetson TX2/TX2i J9 U.FL (Bluetooth)
GBE	NVIDIA Jetson TX2/TX2i Gigabit Ethernet	RJ45 Gigabit Ethernet Connector (10/100/1000)
USB SS	USB 3.0 Type A	USB 3.0 Link 1 Type A Connector
USB	USB 2.0 Type A	USB 2.0 Link 0 Type A Connector (USB Link shared with P13)
OTG	USB 2.0 OTG	USB 2.0 Link 0 OTG Micro-AB Connector (USB Link shared with P14)
HDMI	HDMI Port	HDMI Right Angle Vertical Connector
POE+ 4	POE Gigabit Ethernet Port 4	RJ45 Gigabit Ethernet Connectors (10/100/1000)
POE+ 3	POE Gigabit Ethernet Port 3	RJ45 Gigabit Ethernet Connectors (10/100/1000)
POE+ 2	POE Gigabit Ethernet Port 2	RJ45 Gigabit Ethernet Connectors (10/100/1000)
POE+ 1	POE Gigabit Ethernet Port 1	RJ45 Gigabit Ethernet Connectors (10/100/1000)

Switch Summary - Front

Designator	Connector	Description
RECOVERY	Force Recovery Button	Cogswell System Force Recovery Button (Used for NVIDIA TX2/TX2i System Reprogramming with USB OTG Port)
RESET	Reset Button	Cogswell System Reset Push Button
PWR	Power Button	Cogswell System Power ON/OFF Button

Connector Summary - Rear


Designator	Connector	Description
CAN BUS	CAN Bus	CAN Bus Header
GPIO/SER	GPIO/Serial Port	GPIO/RS-232 Samtec 2x6 Right Angle Header
MICRO SD	microSD Slot	MicroSD Card Slot
PWR	Power	Input Power TE Connector
SIM	SIM Card Slot	Mini-PCIe SIM Card Slot

DETAILED FEATURE DESCRIPTION

The Cogswell Vision System is an NVIDIA Jetson™ TX2/TX2i Embedded System. The system comes with the NVIDIA Jetson™ TX2/TX2i installed and preloaded with the latest Linux for Tegra (Ubuntu) and Connect Tech Board Support Package.


Antenna 1

The Cogswell Vision System enables access to the WiFi and Bluetooth modems on the NVIDIA Jetson™ TX2/TX2i Modules. This external SMA Antenna is connected internally to the J8 U.FL Connector for WiFi on the NVIDIA Jetson™ TX2/TX2i Module.

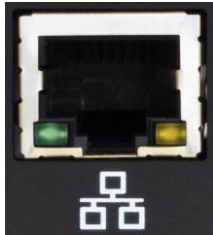
Function	WiFi Antenna	
Location	ANT1 (Front Panel)	
Type	Micro High Frequency SMA Connector (Female Socket)	
Feature	Dual Band Wifi Antenna Port 2.4/5.0GHz	

Antenna 2

The Cogswell Vision System enables access to the WiFi and Bluetooth modems on the NVIDIA Jetson™ TX2/TX2i Modules. This external SMA Antenna is connected internally to the J9 U.FL Connector for Bluetooth on the NVIDIA Jetson™ TX2/TX2i Module.


Function	Bluetooth Antenna	
Location	ANT2 (Front Panel)	
Type	Micro High Frequency SMA Connector (Female Socket)	
Feature	Bluetooth Antenna Port	

Gigabit Ethernet

Function	Gigabit Ethernet	
Location	GBE (Front Panel)	
Type	RJ-45 Connector	
Mating	Any RJ-45 Plug with Cat5/5e/6 Cabling	
Feature	10/100/1000 Base-T Gigabit Ethernet	

USB 3.0/2.0


The maximum configuration for a NVIDIA Jetson™ TX2/TX2i Module allows for one external USB 3.0 Port with an integrated USB 2.0 Port.

Function	USB 3.0/2.0	
Location	USB SS (Front Panel)	
Type	Type A USB 3.0 Connector	
Mating	Any Type A USB 3.0/2.0 Plug	
Feature	SuperSpeed USB 3.0 Port capable of either USB 3.0 or USB 2.0 Interfaces	

USB 2.0 OTG and USB 2.0


The NVIDIA Jetson™ TX2/TX2i Modules have a single USB 2.0 OTG Port that doubles as a regular USB 2.0 Port. On the Cogswell Vision System, this Port is connected to a MUX to allow for both of these functions.

Please note that you cannot use both the USB 2.0 OTG Micro-AB Connector and the USB 2.0 Type A Connector at the same time.


Function	USB 2.0	
Location	USB (Front Panel)	
Type	Type A USB 2.0 Connector	
Mating	Any Type A USB 2.0 Plug	
Feature	USB 2.0 Port capable of USB 2.0 Interfaces (Disabled when using USB 2.0 OTG Port)	

USB 3.0/2.0


To put the Cogswell Vision System into Client Mode, the ID Pin on the Micro-AB Connector needs to be pulled high. Most USB Micro-B Cables will do this internally. Once in Client Mode, the Cogswell will connect the OTG USB 2.0 Link to the Micro-AB Connector and disable the USB 2.0 Type A connector using the onboard USB MUX. At this point the System can be connected to a Host PC for software image flashing. Please refer to the Software / BSP section of the Manual for instructions on how to do this.

Function	USB 2.0 OTG	
Location	OTG (Front Panel)	
Type	Micro-AB USB Connector	
Mating	Any Micro USB 2.0 Plug	
Feature	Multi Function USB 2.0 OTG Port Can be used as a USB 2.0 Host Port, however becomes Target Device Port during Force Recovery Mode to allow for Flash Reprogramming Operations of NVIDIA Jetson™ TX2/TX2i Module	

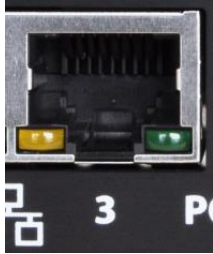
HDMI Connector

Function	HDMI Connector	
Location	HDMI (Front Panel)	
Type	HDMI Connector	
Mating	HDMI Type A Plug	
Feature	HDMI Display Output capable of Display Resolutions up to 3840 x 2160	


POE Gigabit Ethernet 4

Function	POE Gigabit Ethernet	
Location	POE+ 4 (Front Panel)	
Type	RJ-45 Connector	
Mating	Any RJ-45 Plug with Cat5/5e/6 Cabling	
Feature	10/100/1000 Base-T Power Over Ethernet, Gigabit Ethernet Port	

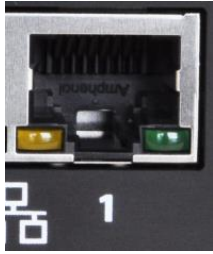
POE Gigabit Ethernet 3

Function	POE Gigabit Ethernet	
Location	POE+ 3 (Front Panel)	
Type	RJ-45 Connector	
Mating	Any RJ-45 Plug with Cat5/5e/6 Cabling	
Feature	10/100/1000 Base-T Power Over Ethernet, Gigabit Ethernet Port	


POE Gigabit Ethernet 2

Function	POE Gigabit Ethernet	
Location	POE+ 2 (Front Panel)	
Type	RJ-45 Connector	
Mating	Any RJ-45 Plug with Cat5/5e/6 Cabling	
Feature	10/100/1000 Base-T Power Over Ethernet, Gigabit Ethernet Port	

POE Gigabit Ethernet 1


Function	POE Gigabit Ethernet	
Location	POE+ 1 (Front Panel)	
Type	RJ-45 Connector	
Mating	Any RJ-45 Plug with Cat5/5e/6 Cabling	
Feature	10/100/1000 Base-T Power Over Ethernet, Gigabit Ethernet Port	

CAN Bus

Function	CAN Bus		
Location	CAN BUS (Rear Panel)		
Type	Three Pin 3.5mm Shrouded Terminal Connector		
Mating	Phoenix Contact 1840379		
Pinout	Pin	Description	
	1	CAN_P	
	2	CAN_N	
	3	CAN_GND	
Feature	CAN Bus 2.0b Capable Interface with Internally Isolated GND Reference		

GPIO/Serial/I2C


Function	GPIO/Serial/I2C			
Location	GPIO/SER (Rear Panel)			
Type	2x6 0.100" Pitch Header Block			
Mating	Samtec ISDM-06-K Any 0.1" Pitch Connector			
Pinout	Pin	Description	Pin	Description
	1	GPIO1	2	GPIO3
	3	GPIO0	4	GPIO2
	5	GND	6	-
	7	GND	8	-
	9	I2C_SDA	10	RS-232_RX
	11	I2C_SCL	12	RS-232_TX
Feature	GPIO/Serial/I2C Expansion Port to allow for General Purpose Add-On Features			



GPIO/SER

microSD Card Slot

Function	microSD Card Slot	
Location	MICRO SD (Rear Panel)	
Type	microSD Memory Card Connector	
Feature	Micro SD Card Secure Digital Card Interface	

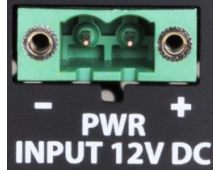


MICRO SD

Power Input


The Cogswell Vision System accepts a single power input to power all on-board devices. A power input range of +7.5V to +14V is acceptable, while a single +12V input is nominal for operation.

Function	Power	
Location	PWR (Rear Panel)	
Type	Two Pin 5.0mm Shrouded Terminal Connector	
Mating	TE Connectivity 796858-2	
Pinout	Pin	Description
	1	+12V
	2	GND
Feature	Input Power has Reverse Polarity and Surge Protection	



SIM Card Slot


Function	SIM Card Slot	
Location	SIM (Rear Panel)	
Type	Molex SIM Card Connector	
Feature	Full Sized SIM Card Interface used Exclusively with the Mini-PCle Module Slot for Cell Modem Expansion	




SWITCH DESCRIPTION

The Cogswell Vision System has two three Switches for various system control.


Recessed Push Button Switch – Force Recover

Function	NVIDIA Jetson™ TX2/TX2i Force Recover	
Location	RECOVERY (Front Panel)	
Note	<p>Pinhole Recessed Force Recovery Button to Protect from Accidental Contact</p> <p>Used in Conjunction with USB OTG Port for Reprogramming the NVIDIA Jetson™ TX2/TX2i Module.</p>	

Recessed Push Button Switch – Reset

Function	NVIDIA Jetson™ TX2/TX2i Reset	
Location	RESET (Front Panel)	
Note	Pinhole Recessed Reset Button to Protect from Accidental Contact	

Push Button Switch – Power

Function	NVIDIA Jetson™ TX2/TX2i Power	
Location	PWR (Front Panel)	
Note	<p>Nearly Flush Push Button Switch with an Easy Toggle Press to turn the System ON/OFF. A Blue Center LED Indicates if the System is Fully Powered.</p> <p>System will Turn OFF if the PWR Button is Held for Several Seconds</p>	

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
 - b) HDMI video display cable
 - c) Keyboard and mouse via USB

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
4. Switch ON the Power Supply. DO NOT power up your system by plugging in live power.

CURRENT CONSUMPTION DETAILS

Below are the maximum ratings of the Cogswell Vision System.

Theoretical Maximum	Watts
Theoretical absolute maximum total draw of all functionality on the Cogswell Vision System Board (not including Jetson Module)	100

Below are measurements taken with the Cogswell Vision System running in various configurations. Some values will change depending on what operation or software is installed. Measurements also include the Jetson™ TX2/TX2i Module. No mSATA or Mini-PCIe modules were installed while taking these measurements. All measurements were taken in a lab environment with an ambient temperature of 25 degrees Celsius.

Actual Measurements	Watts
Module installed, booted into Ubuntu, idle	11.2
Module Installed, booted into Ubuntu, running a NVStreamer Demo with a USB camera, and 1080p video	22.4
Module Installed, booted into Ubuntu, running a NVStreamer Demo with a USB camera, four POE camera's, and 1080p video	39

SOFTWARE / BSP DETAILS

NVIDIA Linux For Tegra (L4T)

The Cogswell Vision System is designed to be used with the stock **NVIDIA Linux For Tegra (L4T) Builds**. HDMI, Gigabit Ethernet, USB 3.0, UARTs, GPIO, Mini PCIe, mSATA, and I2C will all be supported natively with no BSP modifications needed. Please note that Fan PWM (speed control) is NOT natively supported by the stock L4T builds, nor are any camera sensors.

NVIDIA's L4T can be downloaded directly from NVIDIA here:

<https://developer.nvidia.com/embedded/linux-tegra>

NVIDIA Jetpack for L4T

The JetPack for L4T is an on-demand all-in-one package that bundles and installs all software tools required to develop for the NVIDIA's Jetson TX Platform with Connect Tech's TX Carrier Boards. JetPack includes host and target development tools, APIs and packages (OS images, tools, APIs, middleware, samples, documentation including compiling samples) to enable developers to jump start their development environment for developing with the Jetson Embedded Platform. The latest release of JetPack runs on an Ubuntu 14.04 Linux 64-bit host system and supports both the latest Jetson TX Development Kit and Jetson TK1 Development Kit.

NVIDIA's Jetpack can be downloaded directly from NVIDIA here:

<https://developer.nvidia.com/embedded/jetpack>

Connect Tech's Custom L4T BSP (CTI-L4T)

Connect Tech also offers a custom BSP to add in additional peripheral support on CTI's TX2/TX2i Carrier Boards. In the case of the Cogswell Vision System Board the CTI-L4T will expose software control of the TX2/TX2i Fan PWM (Fan Speed Control) as well as the camera interfaces. Other features and add-ons will be added into the CTI-L4T in the future, please see the README file in the CTI-L4T package for full details.

The CTI-L4T can be downloaded directly from Connect Tech here:

<https://www.connecttech.com/jetson/>

Force USB Recovery Mode

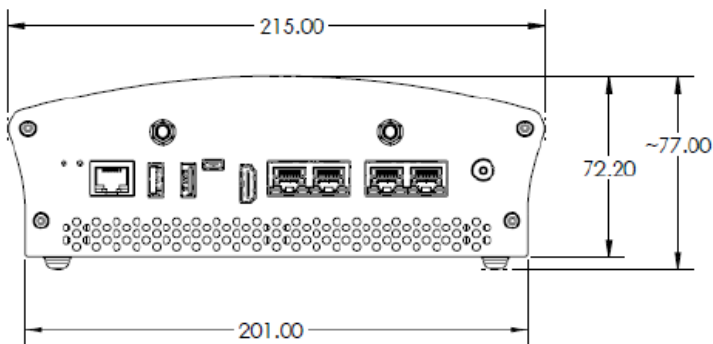
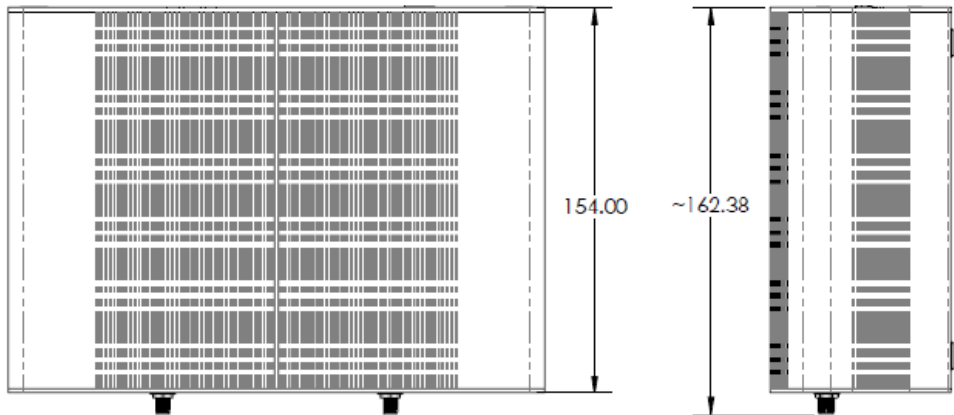
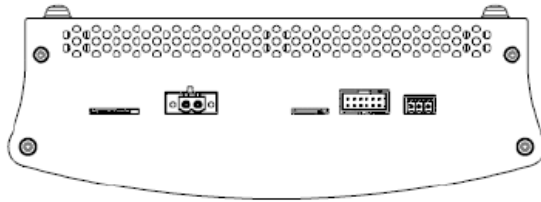
The Cogswell Vision System does support USB Force Recovery Mode or USB OTG on the USB 2.0 port. To update the firmware on your NVIDIA Jetson Module, simply place the system into USB OTG Client Mode. This is done by attaching a USB Micro B Cable/Connector to the Cogswell OTG Port. From there follow the instructions as detailed in the NVIDIA Jetson TX2 Developer Kit User Guide or contact support@connecttech.com.

MECHANICAL DETAILS

A complete **3D STEP Model** file of Cogswell Vision System can be downloaded here:
https://www.connecttech.com/ftp/3d_models/CVS001_3D_MODEL.zip

2D Mechanical Dimensioned Drawing (Top View) - PCB and Mounting Hole Dimension are in mil.

System View



CABLES

The following table summarizes the Cogswell Vision System cables available.

Cable

Drawing No.	Part No.	Description
OEM	CBG247	Micro USB to USB Type-A Male
CTIC-00597	CBG258	GPIO/SER Breakout Cable

Cable drawings are available upon request. Send an email request to: support@connecttech.com

POWER SUPPLY

The following table summarizes the Cogswell Vision System power supplies available.

Power Supply

Part No.	Description
MSG074	Universal Power Supply (+12VDC/8.5A) – No Line Cord
MSG078	Universal Power Supply (+12VDC/8.5A) – EU Line Cord
MSG079	Universal Power Supply (+12VDC/8.5A) – NA Line Cord

ACCESSORIES

The following table summarizes the Cogswell Vision System accessories available.

Accessories

Part No.	Description
MSG066	Dual Band Antennas
MSG084	Mounting Brackets