KA1004-01
UxV/35™ Multi-Constallation GPS, Baro, Compass
Datasheet

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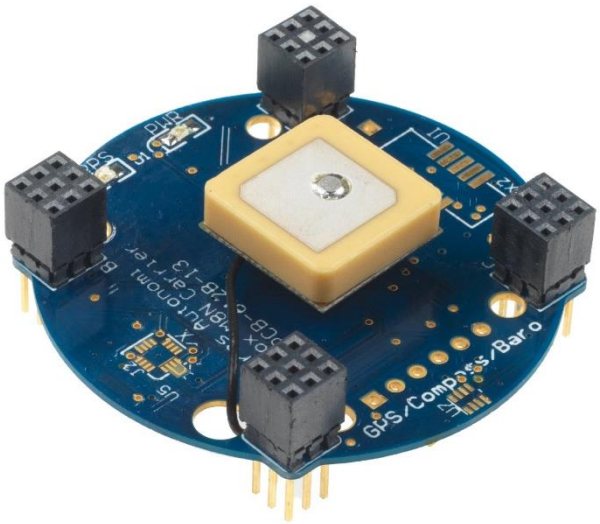
Description of the Board

Using a u-blox M8 GPS engine, the UxV/35™ Multi-Constellation GPS provides accurate GPS data to the UxV/35™ stack. The board also includes an HMC5883 compass and BMP280 barometer for UAV flight.

This board enhances the situational awareness of the UxV/35™ mission stack and is compatible with industry standard assignments. The sensor data from this board provides all the necessary sensor inputs required by most autopilots for autonomous waypoint missions.



Overview of the UxV/35™ Standard

UAVs, UGVs, and USVs consist of multi-disciplinary components, such as electronic modules, wiring harnesses, and structural members. The UxV/35™ Standard provides a modular assembly approach for uncrewed systems that minimizes wiring and increases the success rate and speed of assembly. The goal is to bring order and interoperability to these common components.

The UxV/35™ Standard, as outlined, is compatible with open-source flight and vehicle controllers from multiple vendors such as ArduPilot and Betaflight. These UxV/35™ compatible components can include functions such as:

Flight controllers	**Motive means (motors)**	**User interfaces**
Electronic speed controls (ESC)	**Communications**	**Enclosures & structures**
Power distribution	**Video systems**	**System testing**
Global orientation	**Payload systems**	**Local orientation**

Stacking for Rapid Assembly and Interoperability

Instead of requiring soldering for connecting with other boards, UxV/35™ boards snap together into “stacks” through pin connectors. They can also be used in a planar configuration. These platforms spread out the stack into a flatter format. The precision design of the connecting pins between stacked boards ensures rapid assembly and reliable performance.

The process involves:

- unpacking a set of UxV/35™ compatible boards,
- stacking them as needed, and
- configuring their software.

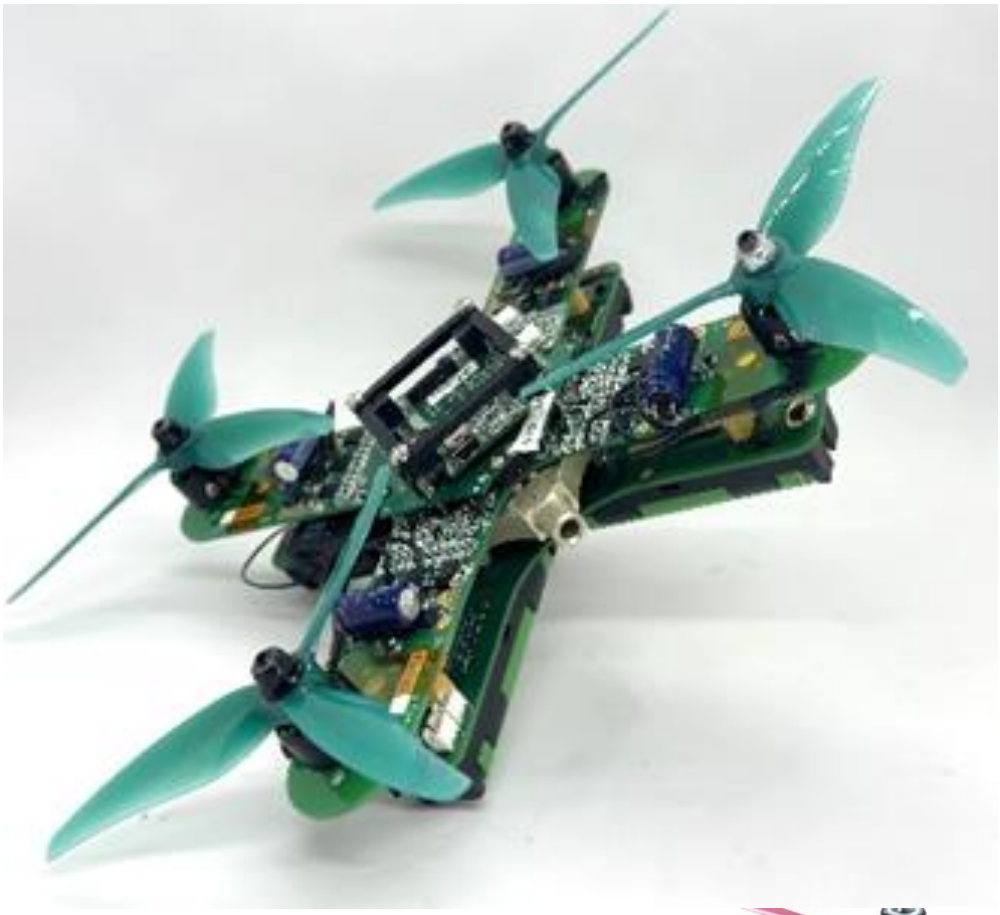
After installing the batteries, the craft can operate within minutes.

Board Categories

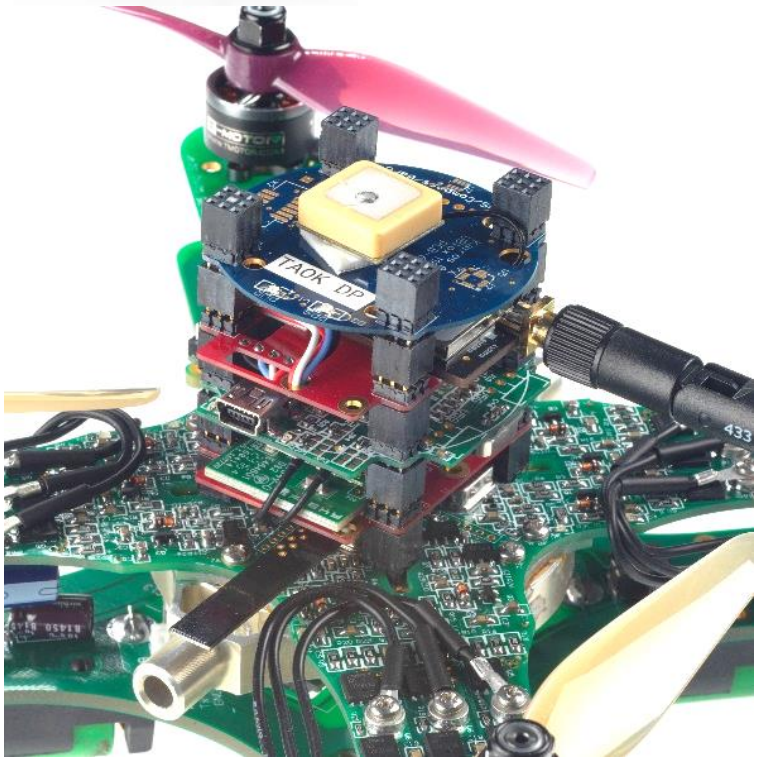
The boards are grouped into five categories:

- UxV/35™ Mission Boards control the movement and behavior of your UAV, UGV, or USV.
- UxV/35™ Platform and Power Boards direct power to any components in the stack.
- UxV/35™ Stack Management Boards let you rotate, reverse, or rearrange your stack horizontally or vertically to best fit the shape or function of your craft.
- UxV/35™ Interoperability Boards adapt the connectors on open-source boards from multiple vendors.
- UxV/35™ Test Boards enable you to test the boards and their configurations at the bench or in the field.

For a description of currently available UxV/35™ boards in each category, please see Kairos82nd.com.

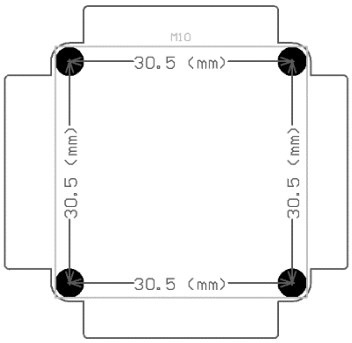


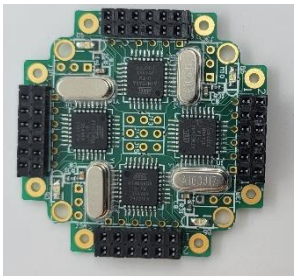
Examples of
Stacked UxV/35™ Boards



Defining the UxV/35™ standard

The UxV/35™ Bus is divided into 4 quadrants, located at the 4 corners of the 30.5mm square board (ad hoc industry standard). The four quadrants are assigned signal groups as follows:



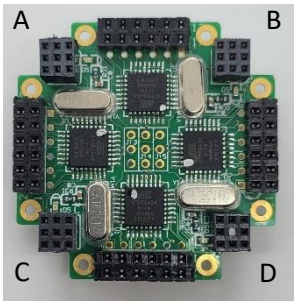


- A Servo Signals
- B I2C and General-Purpose Signals
- C Power and Power Monitoring, Analogs, Safety
- D Serial Signals

The groups are arranged on the board in the four corners. Each of the groups is assigned a letter in the range A – D. The groups are assigned as follows:

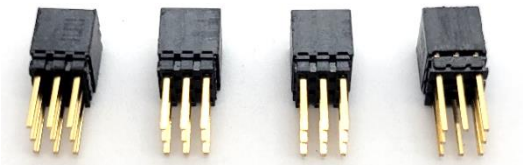
Group A	Upper Left
Group B	Upper Right
Group C	Lower Left
Group D	Lower Right

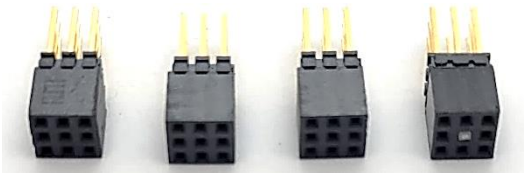
A	B
C	D



With Kairos assistance, Samtec developed a set of connectors based on a 2mm grid in a 3 x 3 pinning format. Groups A, B, and C use the full 9-pin load. Group D uses an 8-pin load. Without the middle pin, Group D becomes the key.

These connectors stack and nest forming a columnar bus of 9 pins. The concept is similar to that of PC/104. Samtec assigned these P/Ns:





Samtec P/N	Connector Type
ASP-232112-05	8-pin loaded, 2mm 3x3 format, center key
ASP-232112-06	9-pin loaded, 2mm 3x3 format

Each group is numbered 1 through 9, left to right, starting in the upper left, and proceeding across and down. The group precedes the pin number when referencing a pin. The pins of the four groups are numbered as follows:

A1	A2	A3
A4	A5	A6
A7	A8	A9

B1	B2	B3
B4	B5	B6
B7	B8	B9

C1	C2	C3
C4	C5	C6
C7	C8	C9

D1	D2	D3
D4		D6
D7	D8	D9

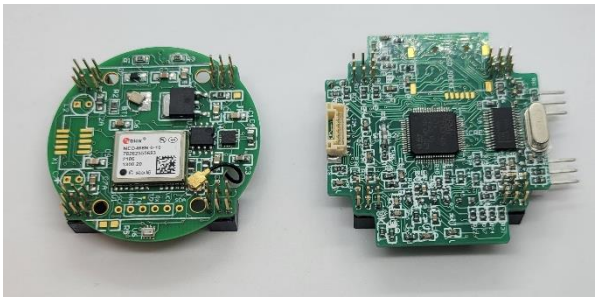
Each of the group's A-D are assigned signals that relate to the control and monitoring of unmanned ground, air, and surface vehicles. The group assignments are as follows:

A1 – Servo Output 1 Assigned to S1
A2 – Servo Output 2 Assigned to S2
A3 – Servo Output 3 Assigned to S3
A4 – Servo Output 4 Assigned to S4
A5 – Servo Output 5
A6 – Servo Output 6
A7 – Servo Output 7
A8 – Servo Output 8
A9 – SBUS Signal Serial Receive Channel E (input to FC)

B1 – Primary I2C Clock (SCL)
B2 – Primary I2C Data (SDA)
B3 – Secondary I2C Clock (SCL)
B4 – Secondary I2C Data (SDA)
B5 – GP1 Video In from Camera or Secondary SPI MISO
B6 – GP2 Video Out from Text Overlay or Secondary SPI MOSI
B7 – GP3 Serial Transmit Channel F (output from FC) or Secondary SPI SCLK
B8 – GP4 Serial Receive Channel F (input to FC) or Secondary SPI Chip Select #1
B9 – GP5 Serial Transmit Channel E (output from FC) or Secondary SPI Chip Select #2

C1 – Battery Voltage (3S or 4S) Battery +
C2 – Ground Battery –
C3 – Radio Signal Strength Indicator 0-3.3v (RSSI)
C4 – Analog Current Usage Indicator, 0-3.3v (Ain)
C5 – Return to Home
C6 – 3.3V Generated from Battery input (1 amp)
C7 – Reset
C8 – Pause
C9 – +5V Generated from Battery input (1 amp)

D1 – Serial Transmit Channel A (output from FC)
D2 – Serial Receive Channel A (input to FC)
D3 – Serial Transmit Channel B (output from FC)
D4 – Serial Receive Channel B (input to FC)
D5 – Pin not Present, used as key
D6 – Serial Transmit Channel C (output from FC)
D7 – Serial Receive Channel C (input to FC)
D8 – Serial Transmit Channel D (output from FC)
D9 – Serial Receive Channel D (input to FC)

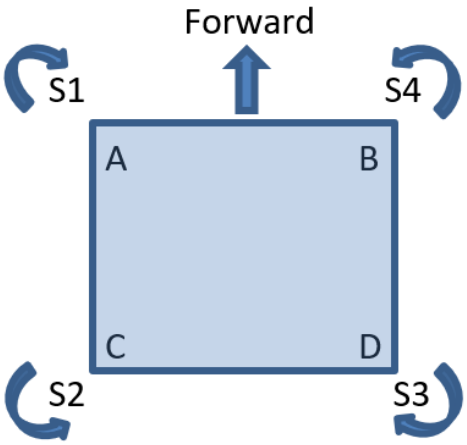


Suggested Pin Assignments for UAV, UGV, and USV

Although autopilots for uncrewed systems have significant configuration abilities (mostly I/O), these suggested assignments enable lower-skilled interoperability:

UAV – Quadcopter

S1	Forward Left Rotor, CW
S2	Rear Left Rotor, CCW
S3	Rear Right Rotor, CW
S4	Front Right Rotor, CCW
TxC/RxC	GPS
TxB/RxB	MavLink
TxA/RxA	Commander/Swarm
I2CA	Baro, Compass



UAV – Fixed Wing

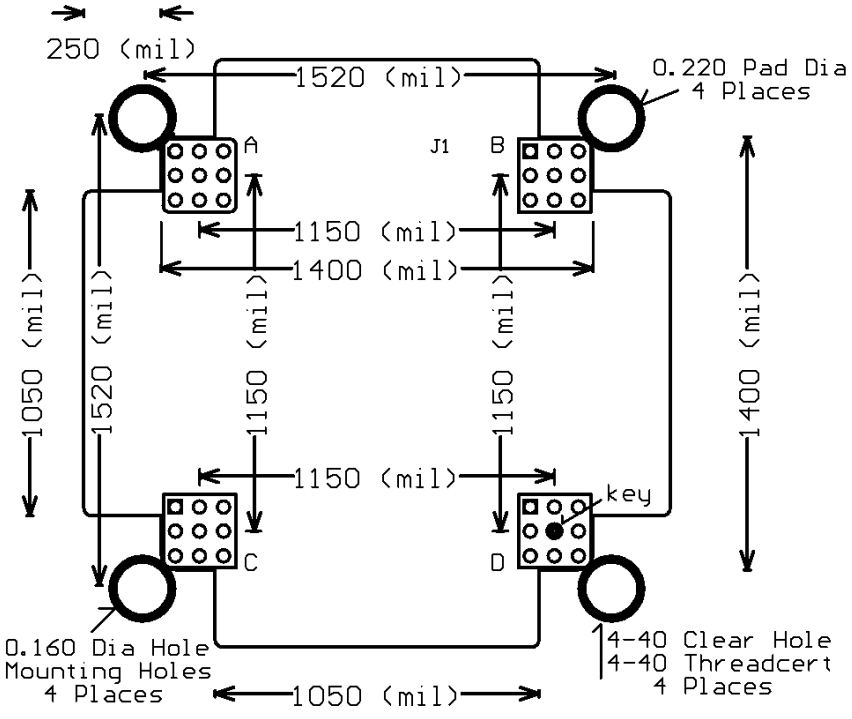
S1	Elevator
S2	Flaperon Right
S3	Flaperon Left
S4	Throttle ESC
TxC/RxC	GPS
TxB/RxB	MavLink
I2CA	Baro, Compass
TxA/RxA	Commander

UGV

S1	Steering
S2	Throttle
S3	Brake
S4	Transmission
TxC/RxC	GPS
I2CA	Compass
TxA/RxA	Commander

USV

S1	Steering
S2	Throttle
TxC/RxC	GPS
I2CA	Compass
TxA/RxA	Commander



Country of Origin

Kairos82nd uses the color of the PCB to assist in the determination of country of origin. ***One hundred percent of Kairos82nd UxV/35™ components are manufactured in Salt Lake City, Utah. The PCBs are sourced and assembled locally. The firmware on these boards is source code managed by Kairos82nd or is available as open source.***

All Kairos82nd UxV/35™ PCB boards that are **Blue** or **Green** are built with components sourced from domestic and global foundries. Any firmware is owned, managed, or controlled by Kairos82nd.

Any of our PCBs that are **Red** indicate that they may contain components from a country of origin that is not acceptable for usage by the U.S. Government without a waiver. All interoperability boards are **Red** because they can be adapted to and used with third party boards where Kairos82nd cannot manage the country of origin.

Warranty

Kairos82nd warrants its products for one (1) year from date of purchase. Kairos82nd will repair or replace, at Kairos82nd's discretion, products found to be defective. Repair or replacement will not be covered for a product that has been physically damaged or where power was misapplied.

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