# KA1033-01
# UxV/35™ Serial Loopback
## Datasheet

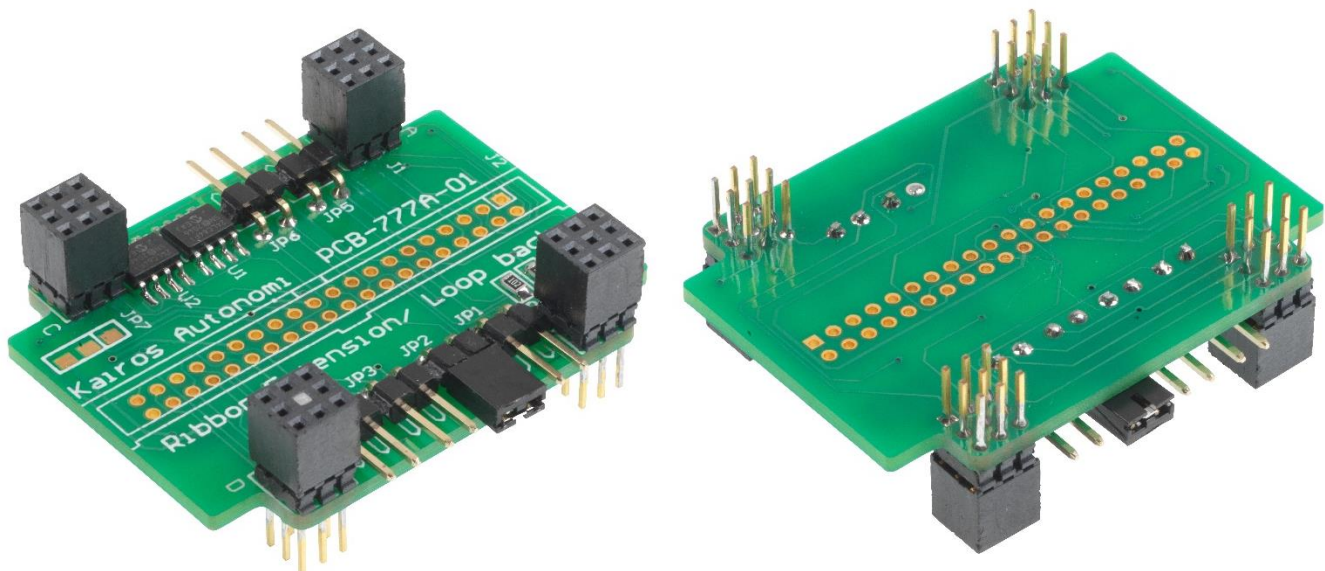## Links to Contents of This Datasheet

## Description of the Board

The UxV/35™ standard has six NRZ serial streams, often referred to as TTL serial. The easiest way to test these is by the addition of a loopback on the desired serial Tx/Rx pair.

This board provides jumpers for each of the serial pairs that shorts the Tx to the Rx so that a transmitted signal on the Tx can be read on the Rx.

Additionally, there are two I2C memories that can be read on the two I2C busses present on the UxV/35™ stack

A ribbon cable connection footprint is provided, that when loaded allows the full UxV/35™ stack to be connected elsewhere.

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# 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
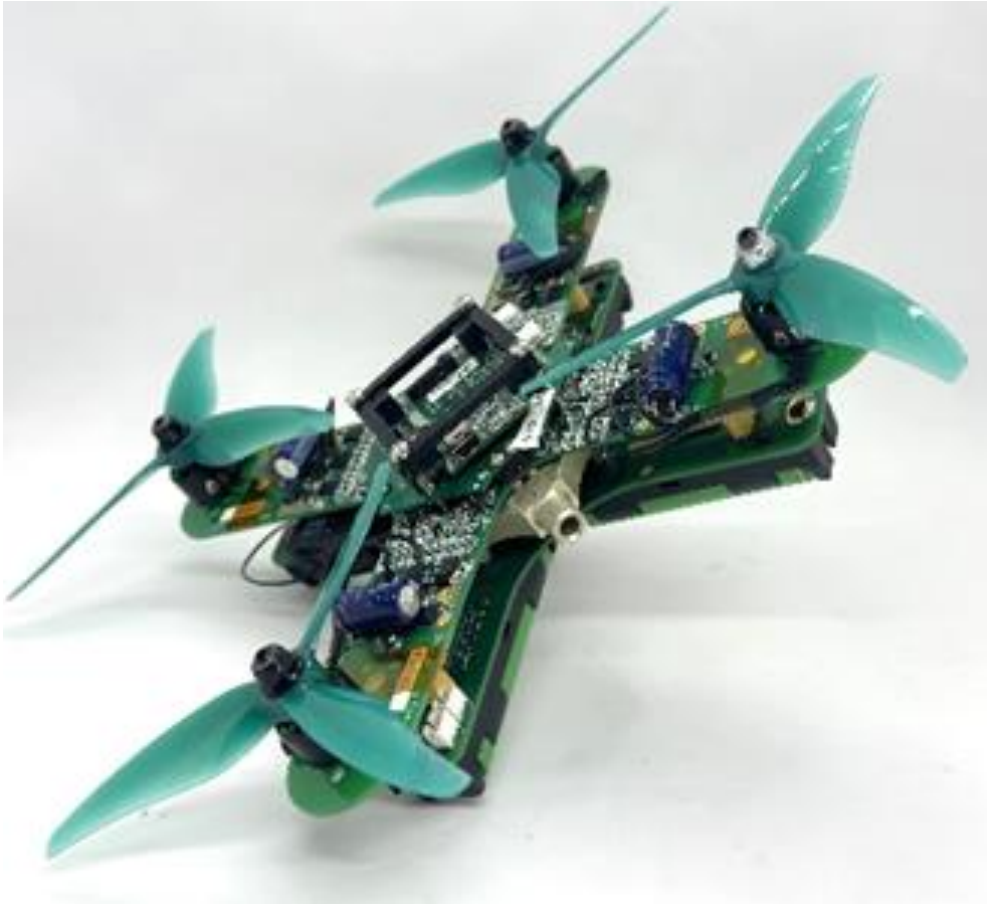
- configuring their software.

After installing the batteries, the craft can operate within minutes.
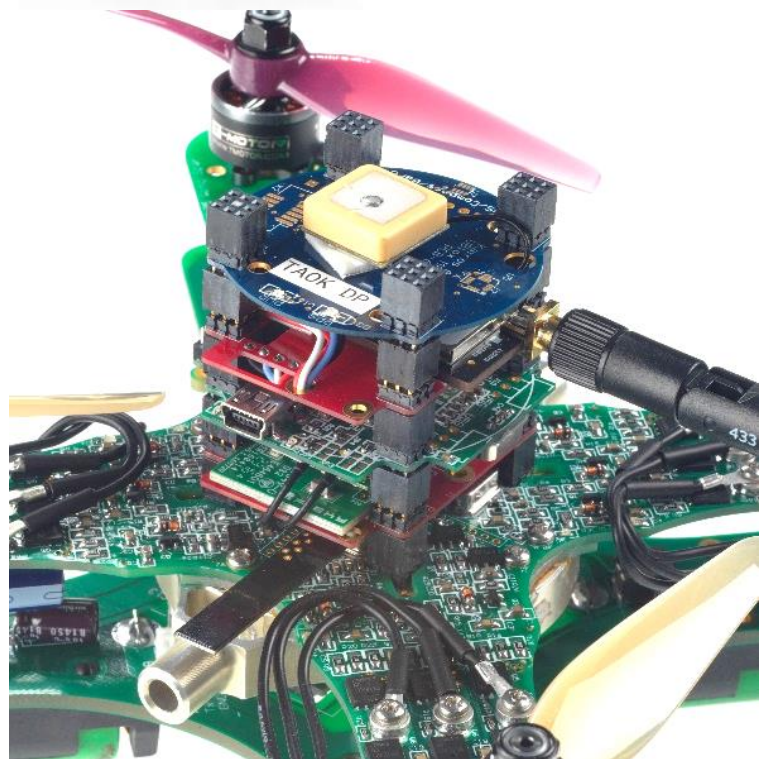
## Board Categories

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.

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**Examples of
Stacked UxV/35™ Boards**

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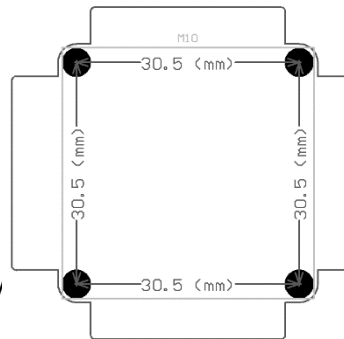V. 2023-11-14
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## Defining the UxV/35™ standard

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
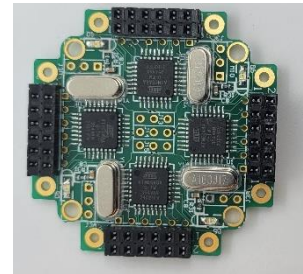


The groups are arranged on the board in the four corners. Each of the groups is assigned a letter in the range A – D. The groups are assigned as follows:
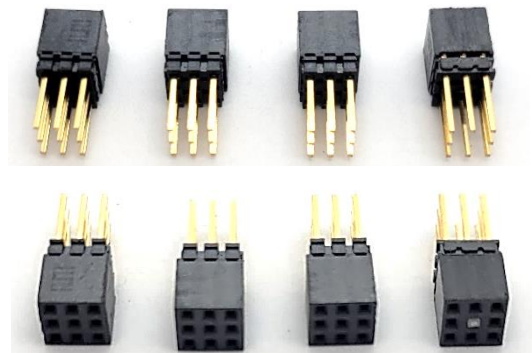
Group A          Upper Left
Group B          Upper Right
Group C          Lower Left
Group D          Lower Right
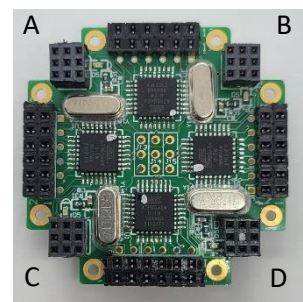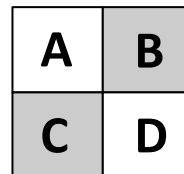


With Kairos assistance, Samtec developed a set of connectors based on a 2mm grid in a 3 x 3 pinning format. Groups A, B, and C use the full 9-pin load. Group D uses an 8-pin load. Without the middle pin, Group D becomes the key.

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 |

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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)

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# 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 |
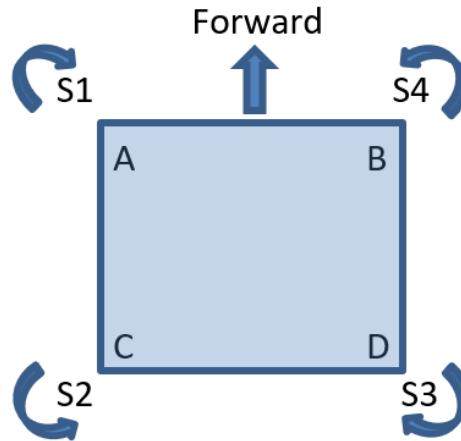
## UAV – Fixed Wing

| | |
|---|---|
| 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 |

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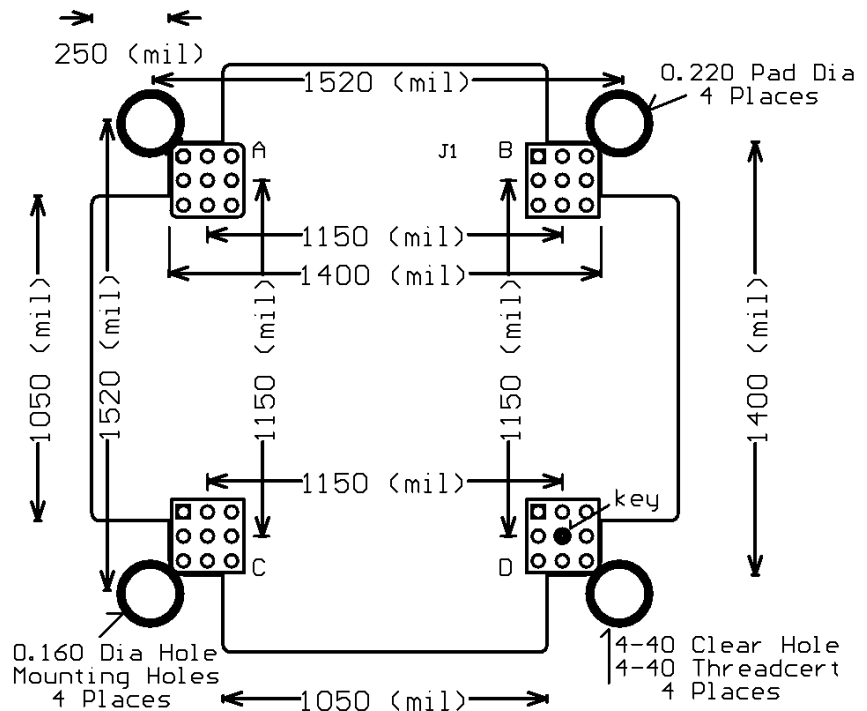
# Country of Origin

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.

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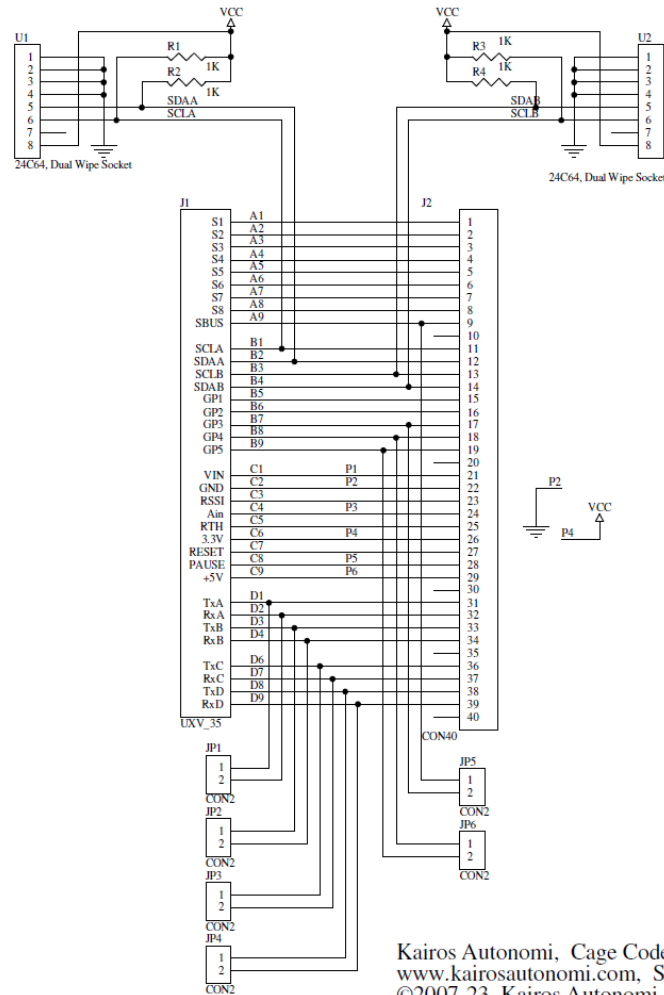
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# UxV/35 Ribbon Cable Adapter and Loopbacks



Kairos Autonomi,  Cage Code: 4ESW8
www.kairosautonomi.com,  Sandy, Utah, USA
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Patented Technology

| Title |  |  |
|---|---|---|
| **SFF/36, UxV/35 Ribbon & Loopbacks** | | |
| Size | Number | Revision |
| B | **DJPCB-777B-01** | |
| Date: 27-Sep-2023 | | Sheet of |
| File: D:\Protel99SE\Active\Kairos_UxV35.ddb | | Drawn By: |

Kairos Autonomi
PCB-777B-01
Ribbon Extension/ Loop back

J2
J1
A
B
C
D

R1
R2
R3
R4

ChE
ChF
ChA
ChB
ChC
ChD

JP5
JP6
JP1
JP2
JP3
JP4

U1
U2