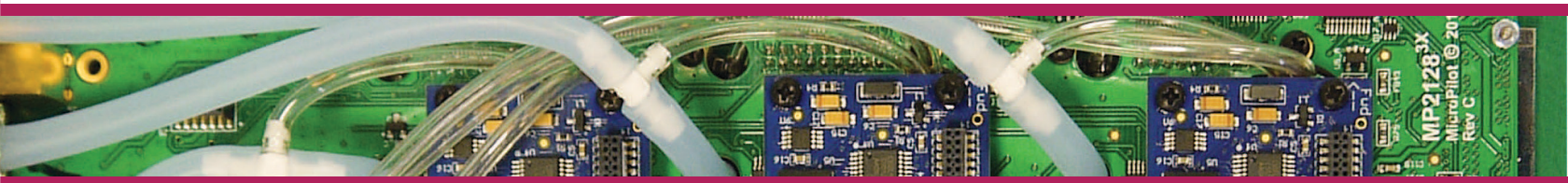
MicroPilot®

World Leader in Professional UAS Autopilots



MP2128^{3X}

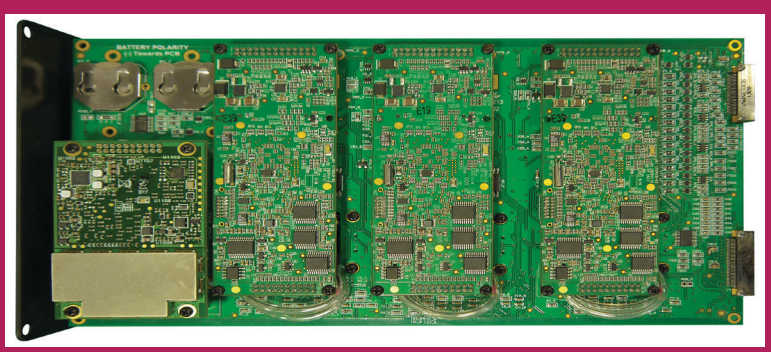
Triple Redundant UAV Autopilot

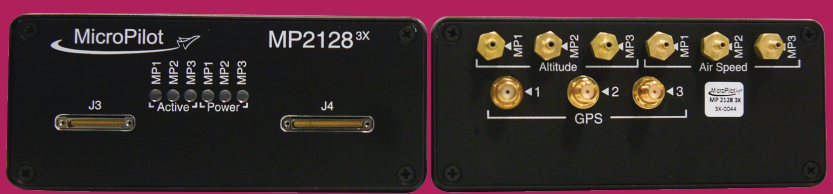
Triple redundancy (3X) gives autopilot technology the reliability necessary to safely carry out sensitive flight missions and transport valuable payloads. A triple redundant arrangement is comprised of three similar software and hardware systems. If any one of the three systems fails, the remaining two take over, offering a double redundancy arrangement. If one of the other two systems should fail, the third takes over. An additional mechanism is also included to oversee these three systems. Triple redundant systems are highly tolerant of autopilot hardware failures.

- Fly both fixed-wing and helicopter UAVs.
- Multiple communication links for onboard devices such as cameras and aircraft transponders.
- Redundant datalinks to ground control station.
- Configuration, state and waypoint synchronization among all three autopilots.
- 11 serial ports including RS232 and RS485.
- 16 independently-generated servo signals.
- 8 high current drivers controlled independently by each autopilot.
- Pass or fail voting logic reliably selects the appropriate autopilot.
- HORIZON^{mp} ground control station software with built-in software in the loop simulator.
- Feedback loop synchronization ensures smooth transition when switching autopilots.

MicroPilot

The choice of over 1000 clients in 85 countries





Front **Back**

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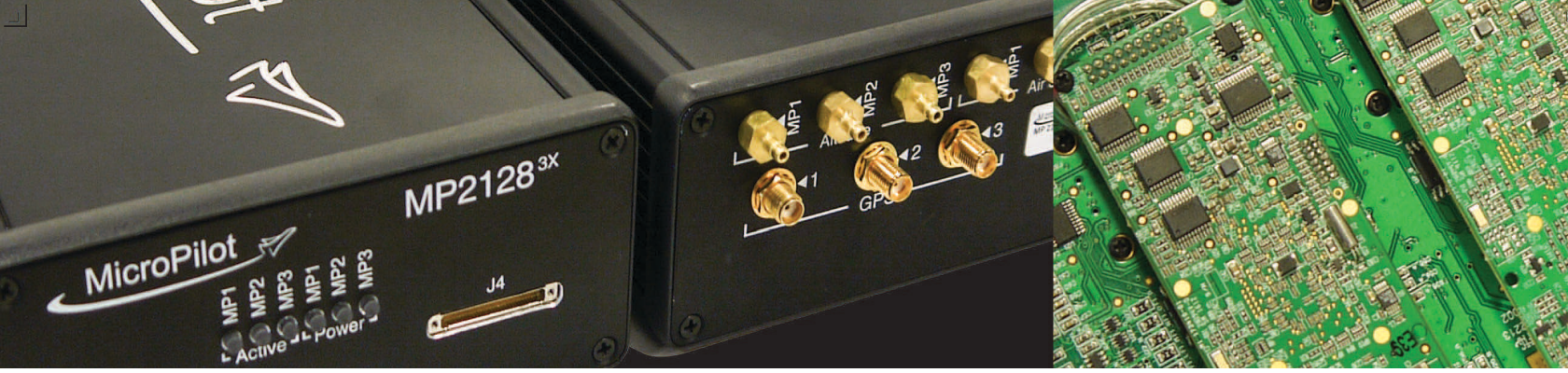

Servo & Mixing 16

Servo outputs	16
Servo resolution (Servos 1-10)	11 bit
Servo resolution (Servos 11-16)	10 bit
Elevons, flaperons, 4 servo flap/aileron, separate flaps, v-tail, x-tail, split rudders, differential thrust	Yes
3 servo mechanical	Yes
3 servo 90° CCPM	Yes
4 servo 90° CCPM	Yes
3 servo 120° CCPM	Yes
4 servo 4 corner CCPM	Yes
Servo update rate	50-200 Hz
Separate servo and main battery power supply	Yes
Separate voltage monitor for main and servo battery power supplies	Yes
Integrated manual override in LRC-PIC mode	Yes

Control System

Gain scheduling for optimum performance	Yes
Selectable inner loop update rates	30/60/180Hz
Autonomous takeoff and landing supported by AGL	Yes
User definable PID feedback loops (for camera stabilization etc)	8
User definable table lookup functions	8
MP plug-in compatible with XTENDER^{mp} software developer's kit	Yes
High current solid-state relay outputs	8

Sensors

Altimeter maximum altitude	12,000m
5g, 3 axis accelerometers	Yes
Maximum angular rate	250° per second
Attitude update rate	200Hz
15 state Kalman filter	Yes
ADC input channels	16
3 axis magnetometers	3

Telemetry, Datalog & Video

Telemetry (user defined fields transmitted each second)	100
Telemetry update rate	5 - 30 Hz
Datalog update rate	5 - 30 Hz
User definable datalog fields	24
Video overlay (number of user definable fields)	16

Navigation

GPS update rate (primary receiver)	20Hz
GPS update rate (2nd and 3rd receivers)	4Hz
Move servo at waypoint	Yes
Change altitude at waypoint	Yes
Change airspeed at waypoint	Yes
User definable holding patterns	Yes
User definable error handlers (loss of GPS, low battery etc.)	Yes
RPV and UAV modes	Yes
Supports DGPS accuracy	Yes
Supports carrier phase GPS accuracy	Yes
Commands	1,000

Ground Control Station

HORIZON^{mp} ground control software included with system	Yes
SWIL autopilot simulator for operator training	Yes
Ground control software developer's kit (XTENDERmp required)	Yes
Gains can be adjusted in flight	Yes
Change waypoints in flight	Yes
Payload servos controlled from ground station	Yes
Fly in RC mode via datalink (both stabilized and normal, LRC base required)	Yes
Point-and-click waypoint editor	Yes

Physical Characteristics

Weight	859g(30 oz) (not including GPS antenna)
Power (typical)	750mA @ 12V
Supply Voltage	9 - 27V
Size - Length	227 mm (8.938in)
Size - Width	127 mm (5.031in)
Size - Height	54 mm (2.125in)
Software upgradable in the field	Yes
Autopilot	MP2128^{HELI2}
GPS Receiver	1x Novatel, 2x Ublox

Mean Time Between Failure

	0°C MTBF(hrs)	25°C MTBF(hrs)	50°C MTBF(hrs)
1 allowable failure from 3	56,866	35,293	25,505
2 allowable failure from 3	115,156	71,233	48,040

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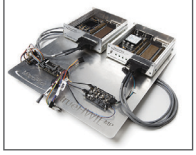
Board Autopilots

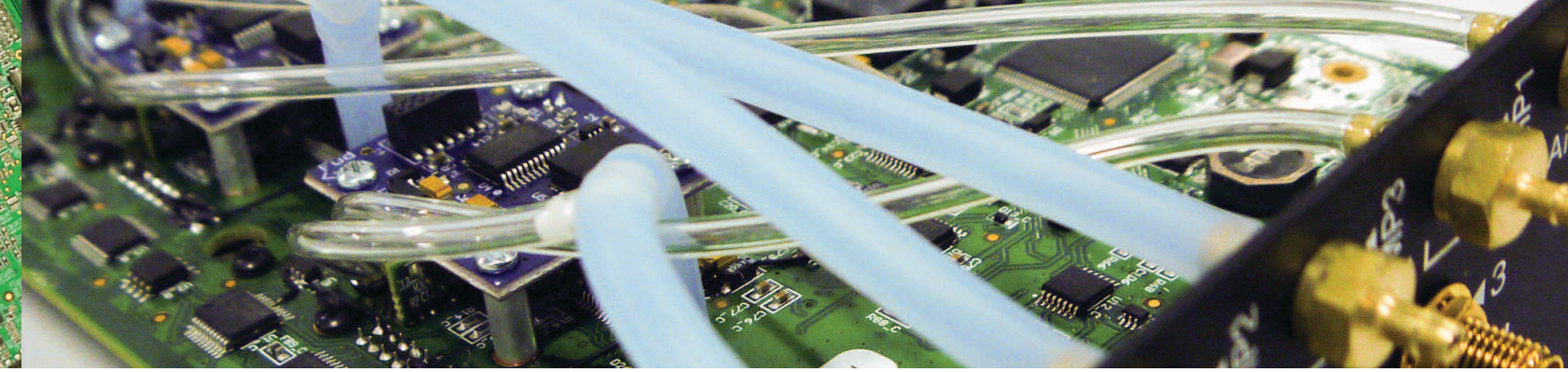
trueHWIL²



Triple Redundant Autopilots

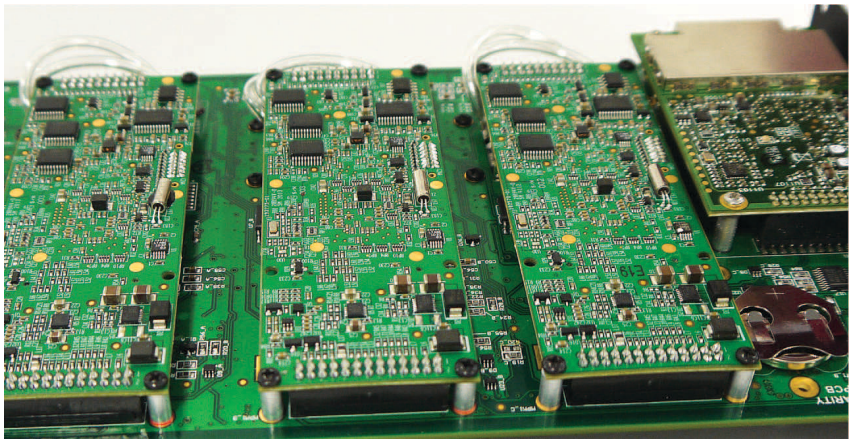
HORIZON^{mp}

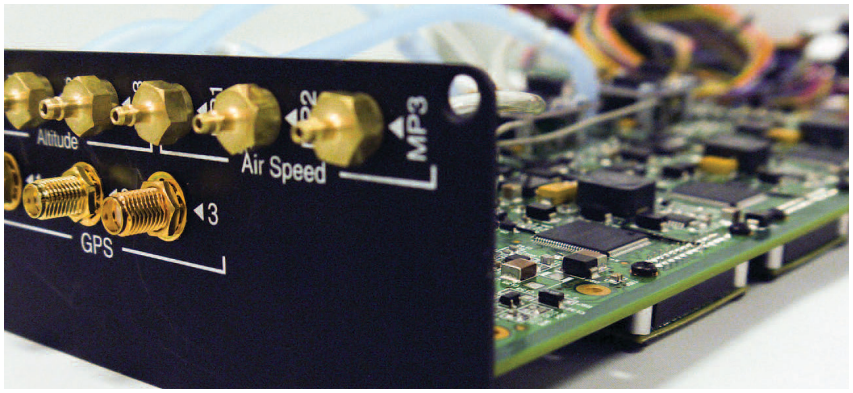
Enclosed Autopilots



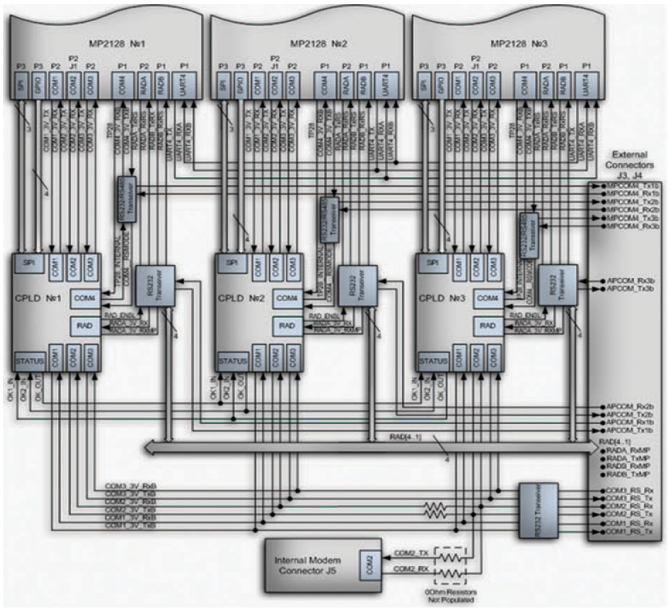
Multiple Communication Links

The MP2128^{3X} acts as the UAV's communication hub. Two radio modems can be installed, which offers two independent lines of communication between the autopilot and the ground control station. Devices such as Pan-Tilt-Zoom cameras (PTZ) and aircraft transponders (which enable ground control to identify the UAV) can also be connected to the autopilot. The MP2128^{3X}'s redundant datalink between the UAV and the ground control station ensures the UAV operator can continue to monitor and control the UAV as well as other important on-board equipment even if one radio link fails. The MP2128^{3X} switches communication links when flight operation is transferred from one autopilot to another. This ensures the operator on the ground is always monitoring and controlling the autopilot flying the UAV.

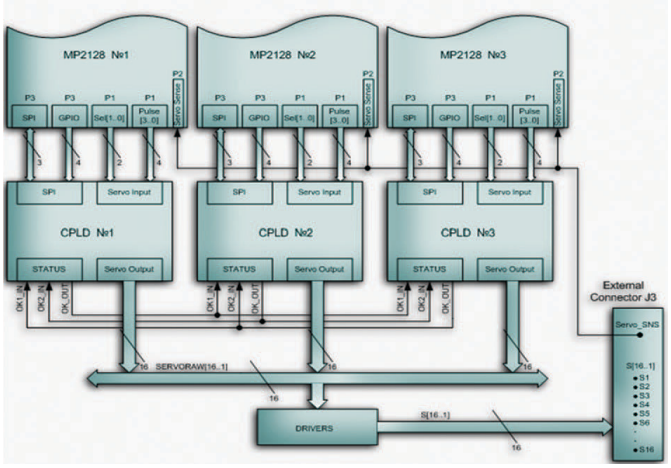




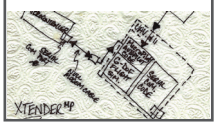
Serial communication architecture in MP2128^{3x} redundancy board



Servos signals in the MP2128^{3x} redundancy board



XTENDER^{mp}

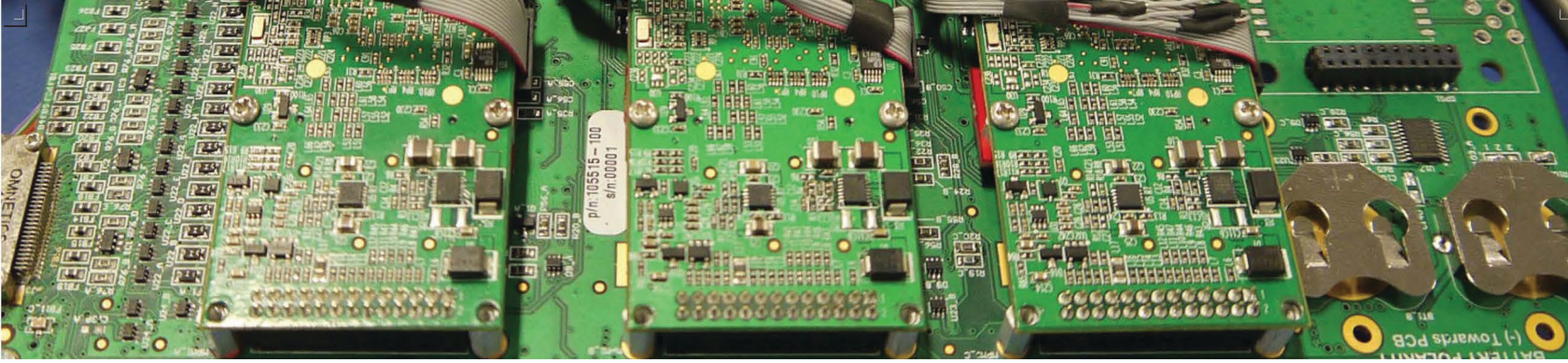


XTENDER^{validate}

Custom Hardware/Software Development

Training & Integration Service

NON ITAR PRODUCTS 100% ITAR ISO 9001:2015 QUASAR REGISTERED Since 1994



MP2128^{3X} Ultimate Reliability Measures

In addition to the three MP2128^{HELI2}'s incorporated into the MP2128^{3X}, MicroPilot's triple redundant autopilots provide even more backup components. These include provisions for multiple communication links, backup high current drivers, backup power supplies and independently generated servo signals. Two different types of global positioning systems are also used to improve reliability.

Supporting Products

MicroPilot's UAV autopilots are available with a complete suite of development tools. MicroPilot modified several of its auxiliary products to support the MP2128^{3X}. For example: its update program was simplified to more efficiently renew data stored in three separate autopilots.
HORIZON^{mp} and in-the-loop simulator programs are also members of MicroPilot's suite of MP2128^{3X} development tools.

- HORIZON^{mp}
- qHWIL Simulator
- trueHWIL^{2} Simulator

Although triple redundant technology is established within the aviation industry, triple redundant autopilots are a relatively new addition to unmanned aerial vehicles (UAVs). MicroPilot, the leading UAV autopilot manufacturer, is setting the benchmark for triple redundant UAV autopilots. MicroPilot, based in Canada, has been designing autopilots for fixed-wing, transitional and helicopter UAVs since 1994. In 2006 MicroPilot started designing a triple redundancy autopilot for helicopter and fixed-wing UAVs.

The MP2128^{3X} is comprised of three MicroPilot MP2128^{HELI2} autopilots, mounted on an adapter board, or redundancy board. The three MP2128^{HELI2}'s are prioritized. At the start, the autopilot in position one flies the airframe. If this autopilot should fail, the MP2128^{HELI2} in position two takes over, and so on. The redundancy board provides several input/output (I/O) ports. The board also includes two RS232 serial ports designed to communicate with a ground control system via radio modems. As a result of this design, users never need to work directly with bare circuit boards. Additionally, the autopilots do not have an individual casing, keeping overall weight to a bare minimum; however, the entire redundancy board is enclosed to protect the system.

Front

Back

Three complete autopilots, advanced voting logic, carrier phase GPS for helicopter and fixed-wing.

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