# IO Series

## I2-IOS Industrial 2.4 GHz Industrial Radio

**I2-IOS**

### OVERVIEW

The I2-IOS radio with embedded I/O functions is available only at the board. The I2-IOS can operate in one of two modes: Modbus and Wire Replacement. In Modbus mode, the I2-IOS connects as an I/O peripheral to a SCADA network. For wire replacement (wireless signal replication), the I2-IOS operates as a slave linked to an I2-IOM (master) radio. The enclosure version also includes switchable and protected resistors for convenience when using 4 - 20 mA sensors. The I2-IOS is Class 1, Division 2 approved by UL-US and C-UL

All radios are designed, manufactured and tested in Boulder, Colorado.

| MODEL | DIMENSIONS | PRODUCT OPTIONS |
|---|---|---|
| **I2-IOS-C-U** | 127 L x 62 W x 16 H (mm) | Board Level |

### APPLICATIONS

Oil & Gas    Smart Grid    Water & Wastewater    Precision Agriculture

### KEY FEATURES

→ User Configurable I/O: Digital & Analog

→ Up to 65,535 Slave Radios on a single Modbus network

→ Extends range and coverage to other FGR-family radios by Slave/Repeater operation

→ Supply rated to +30 V

→ All AIs reported as 16-bit integers or 32 bit floating points

→ Pulse counting (32 bit) DIs allow detection of 500 usec. Pulses and count to 1000 Hz

→ Active data port allows extension by adding external devices

→ Single register access to 16 bit a/d; 2 register access for full 20 bits

→ Enhance proportional control by 4 to 20 mA AOs with programmable offsets and comm-loss set points

→ DOs control up to 60 W each and have optional pulse-output to protect intermittent rated loads

# I2-IOS 2.4 GHz Industrial Radio Technical Specifications

| TRANSMITTER | |
|---|---|
| Frequency Range | 2.4 to 2.483 GHz (FHSS) |
| Output Power | 5 mW to 500 mW |
| Data Link Range | 20 miles, Clear Line of Sight |
| Modulation | 2 level GFSK, 115.2 kbps |
| Occupied Bandwidth | 230 kHz |
| Hopping Patterns | 15 per Band, 105 total, user selectable |
| Hopping Channels | 50 to 80 out of 240, user selectable |
| Hopping Bands | 7, user selectable |
| RF Connector | Type SMA, TNC (Female connectors) |

| RECEIVER | |
|---|---|
| Sensitivity | -105 dBm for BER $10^{-6}$<br>-107 dBm for BER $10^{-4}$ |
| Selectivity | TBD |
| System Gain | 134 dB |

| DATA TRANSMISSION [1] | |
|---|---|
| Error Detection | 32 bit CRC, Retransmit on error |
| Data Throughput | 115.2 kbps |
| Protocol | RS232/RS485/RS422, 1200 baud to 115.2 kbaud |
| Data Interface | Serial |
| Data Connector | 10 pin header with locking ramp 0.1 inch spacing, power/data connector |

| INPUT | Modbus | Wire Replacement |
|---|---|---|
| 2: Precision AIs (20 bit, 0 - 5.625 V, 0.1% FS Accuracy), also act as exact-threshold Dis | X | X |
| 2: Dis with counters (32 bits, 1000 Hz), also act as aux. AIs (10 bits, 0-3.5V, 0.25% FS Accuracy) | X | [2] |
| 1: DI with pull down resistor (5 kohm) | X | |
| 1: DI with pulsed 50 mA pull-up for long-lines or high noise | X | |

| OUTPUT | Modbus | Wire Replacement |
|---|---|---|
| 2: High Current (2 A sink to GND) Dos with current sensing and self-resetting protection | X | X[3] |
| 1: AO - 15 bits, 4 - 22 mA, 0.1% FS Accuracy, also acts as 50 mA sensor power or DI | X | |
| 1: AO - 16 bits, 4 - 22 mA, 0.1% FS Accuracy | X | |

| INTERNAL | Modbus | Wire Replacement |
|---|---|---|
| 1: Battery/Supply Voltage - 10 bits, 0 to 30 V, 1% FS Accuracy | X | |
| 1: Radio Temperature - 1° C units, -40° C to +70° C, 4° C accuracy | X | |

| DIAGNOSTICS | Modbus | Wire Replacement |
|---|---|---|
| Connector: Separate 20-pin PCB header | X | X |

| POWER REQUIREMENTS | Modbus | Wire Replacement |
|---|---|---|
| Operating Voltage: +6 to +30 VDC | X | X |

| Typical Current (mA) | Mode | +6 VDC | +12 VDC | +30 VDC |
|---|---|---|---|---|
| | Transmit | 375 mA | 295 mA | 140 mA |
| | Receive | 120 mA | 80 mA | 51 mA |
| | Idle | 9 mA | 16 mA | 8 mA |
| | Modbus Linked Lowpoer = 4 | 10 mA | 5 mA | 3 mA |
| | Wire Replacement Linked | 30 mA | 15 mA | 8 mA |

**Example Modbus Configurations**

| | AIs | Dis | AOs | DOs |
|---|---|---|---|---|
| #1 | 2 | 2 | 2 | 2 |
| #2 | 0 | 4 | 2 | 2 |
| #3 | 4 | 0 | 2 | 2 |
| #4 | 3 | 1 | 2 | 2 |
| #5 | 1 | 3 | 2 | 2 |

| GENERAL INFORMATION | |
|---|---|
| Operating Temperature | -40° C to +75° C |
| Humidity | 0 to 95%, non-condensing |
| Dimension | Board Level: 127 L x 62 W x 16 H (mm)<br>Enclosure: 173 L x 96 W x 35 H (mm) |
| Weight | Board Level: 58 g<br>Enclosure: 1.2 lbs |

*Notes:*
(1) Data port not operative in wire replacement mode.
(2) DIs operative, but there are no counters in wire replacement mode.
(3) No current sensing in wire.