Wireless Solutions and Solar Power Sources

Section W

A platform of smart, enabled products that optimize cost and performance and meet customer needs for information and interoperability.

New Products in the Wireless Solutions and Solar Power Product Line	Section
• Wireless Receivers, Transmitters, Transceivers and Gateways	1W
• Wireless Modems	2W
• Photovoltaic Module Kits with Battery Back-up	5W
• Solar Combiner Boxes, Recombiners, and Disconnects	5W

Wireless Solutions and Solar Power Sources

Table of Contents

Providing reliable, secure, industrial wireless systems:

Wireless connectivity from Cooper Crouse-Hinds. If motion, hazards, obstacles, expense, or distance make your wired solutions impractical or impossible, look no further. Cooper Crouse-Hinds can help.

Wireless systems are becoming more and more vital to streamlining operations in industrial environments. These systems eliminate the high cost of wiring and free up resources from having to manually collect process information in hazardous environments. In many applications, it is impossible to run wires to plant assets, but wireless systems allow you to transmit information to process monitoring systems so operators can monitor and prevent expensive shutdowns. Wireless systems also allow plant personnel to optimize the use of plant assets, and to coordinate preventative maintenance tasks, materials, and schedules. Wireless systems from Cooper Crouse-Hinds can help.

Types of Wireless Products:

Cooper Crouse-Hinds industrial wireless products provide secure and reliable solutions for a wide range of industries and applications as an alternative for signal and data wiring. The products fall into two groups: Wireless I/O (which includes transceivers, gateways, receivers, and transmitters) and Wireless Modems. All wireless devices are rated and CSA certified for Class I, Division 2 applications when housed in a suitable enclosure for the environment.

Wireless I/O:

Transceivers connect directly to sensor and control signals and transmit and receive signal values by radio. These units can also be used as a repeater to wirelessly re-transmit signals from other radios to increase distance and avoid obstructions.

Gateways perform similarly to transceivers, but can also connect signals to various protocols of databus devices, such as Programmable Logic Controllers (PLCs), Distributed Control Systems (DCS), or Supervisory Control and Data Acquisition (SCADA).

Receivers receive commands from transmitters or transceivers to operate a certain device. These units have three digital outputs and one analog output, and are an economical way of delivering data to a remote location.

Transmitters are an economical way of sending a signal from a sensor or control system to monitor or control a process.

Two types of transmitters exist:

- D2 W LT – transmits a signal to a transceiver, receiver, or gateway
- D2 W SIO – transmits a signal to a transceiver, receiver, or gateway, but can also better manage power consumption by reverting to "sleep mode" and operating with a small battery pack.

Wireless Networks:

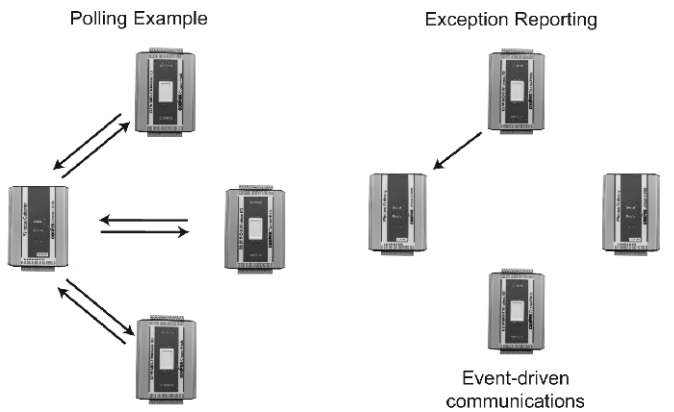
Cooper Crouse-Hinds transceivers form networks which optimize wireless density and are configured to ensure a reliable signal. The signals are transmitted by radio and re-created as output signals, or output to control systems.

Cooper Crouse-Hinds' innovative *WIB-net*™ communications protocol is specifically designed for highly reliable and secure operation on open license-free radio bands. Cooper Crouse-Hinds wireless units form a **WIB** network – **Wireless Information Backbone**. A WIB is an effective plant-wide wireless information network for transferring data and connecting signals and databuses in a highly efficient exception-reporting, peer-to-peer network. *WIB-net* provides the following features:

- **Exception-reporting**, or change-of-state transmissions, reduces needless radio messaging, preserving bandwidth for event-driven/significant monitoring/control messaging.

  I/O points have configurable integrity checking to monitor the radio link for reliability.

  The combination of event-driven communications and integrity checking of the radio path mitigates radio congestion, while ensuring the radio link is maintained.



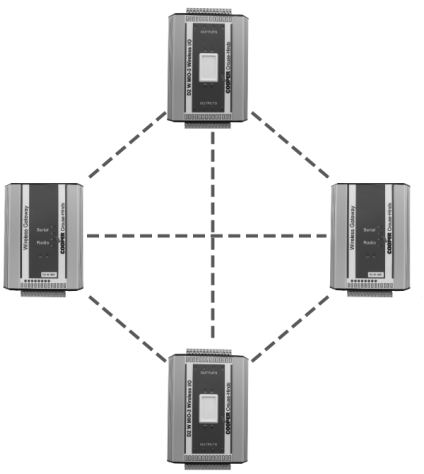
- **Error-checking** with automatic re-transmission for high reliability operation. Every radio message has a probability of corruption. Therefore, automatic error detection, acknowledgement, and re-transmission is critical to reliable operation.

WIB-net will send and then re-transmit up to five times. After the fifth attempt, a communication failure status is logged and an alarm set externally.

- **Listen-before transmit** wireless operation to maximize the chance of successful message transmission.

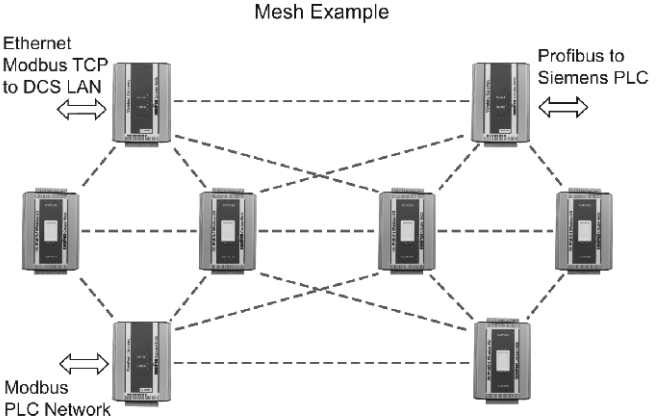
- **Peer-to-peer** networking, giving the maximum network flexibility. Each Cooper Crouse-Hinds wireless gateway and transceiver unit can transmit/receive directly to/from any other wireless gateway and transceiver, and can transmit/receive to/from multiple wireless units. There are no master units and no slaves. Any module in a network can talk to any other. Input signals can be transmitted to multiple destinations.

Peer-to-Peer Example



- **Wireless mesh structure**. *WIB-net* enables every Cooper Crouse-Hinds wireless gateway/transceiver to act as a repeater to optimize wireless message propagation. Messages can hop through multiple gateway/transceiver units to reach a destination. Providing these units have a reliable wireless link to at least one other gateway/transceiver, a wireless mesh can be configured to ensure reliable links to the whole network.

Mesh Example



- **High security encryption.** *WIB-net* uses a highly secure data encryption technique to protect against misuse of wireless data. The level of security of Cooper Crouse-Hinds wireless networks is at an equivalent or higher level than wired networks.

Input/Output Mapping:

Process signals or sensors convey the value of an input value to a designated output channel:

- System address (15-bit, 1 – 32768)
- Source module address (1 – 127)
- Destination module address (1 – 127)
- Repeater addresses (up to 5 addresses)
- Output channel number
- I/O signal value (16-bit)
- CRC error-checking (16-bit)

All modules in the same system share a unique system address to avoid cross-talk between systems in the same radio environment. The configuration software automatically generates a random system address for each system.

Destination or repeater modules automatically acknowledge messages when received with a correct error-check value, except for messages from transmit-only units. If an acknowledgement is not received within 500 milliseconds, the message is re-transmitted. The message will be transmitted up to five times with random re-try times. After the fifth attempt, a "comms-fail" event will be set, which can be used to trigger an output alarm or register.

Block Messages:

Block messages are similar to other transmissions. However, signal information is condensed into "blocks" and these blocks are sent at programmed intervals. Each block message contains up to 64 x 16 bits of values. Block messages are only transmitted or repeated by the wireless gateway product range (D2 W G).

Discrete/digital values can be packed (i.e. up to 1024 (64 x 16) digital values can be packed into a block message and unpacked at the destination gateway).

Block messaging creates a more robust, reliable, and efficient system by reducing the chance that messages will become corrupt and by minimizing radio frequency congestion.

Message Control:

The *WIB-net* protocol is based on exception-reporting for optimum performance. Messages can be triggered by any of the following:

- Exception – change in input value compared to user-configurable "sensitivity" values
- Update time – user-configurable time period since the last message, individually configured for each I/O register
- Real time – block mappings only; messages transmitted on real-time values
- On demand – block mappings only; poll command from another wireless unit or by a write command by a connected databus device

Before a message is transmitted, the radio channel is checked to ensure it is clear (listen-before-transmit). The message is preceded by a lead-in transmission; the length depends on the radio model to allow all other units to lock onto the transmitted message.

Security Encryption:

Security encryption of wireless messages is user-selectable. A 64-bit secure proprietary encryption algorithm is used. The 64-bit key is randomly generated by the configuration software and is never disclosed to the user or transmitted by radio.

Configuration files are protected by password, up to 256 characters.

Unidirectional Transmitter / Receiver Units

Cl. I, Div. 2
CSA Certified

D2 W LT (transmitter)
D2 W LR (receiver)

The unidirectional wireless range of products is suitable for connecting to a single sensor or group of sensors and provides an economical solution for remote monitoring systems. The unidirectional products can also be used in more complex networks with other Cooper Crouse-Hinds radios.

Note: Antenna sold separately.

Applications:

- Wireless connection of flowmeters or energy meters
- Monitoring of storage tanks
- Monitoring cathodic protection on pipelines
- Wireless alarms from power reticulation fault-relays

Features:

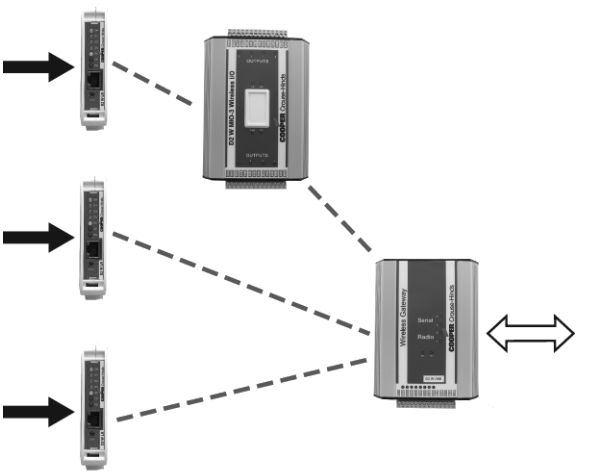
- Up to 5 intermediate transceiver or gateway units can be configured as repeaters to link inputs and outputs between transmitters and receivers
- Can be ordered as a matched transmitter/receiver pair with choice of two antenna (included)
- User-configurable with wireless I/O configuration program

Certifications and Compliances:

- Class I, Division 2 hazardous areas approved (CSA certified to U.S. and Canadian standards)

Transmitter Unit:

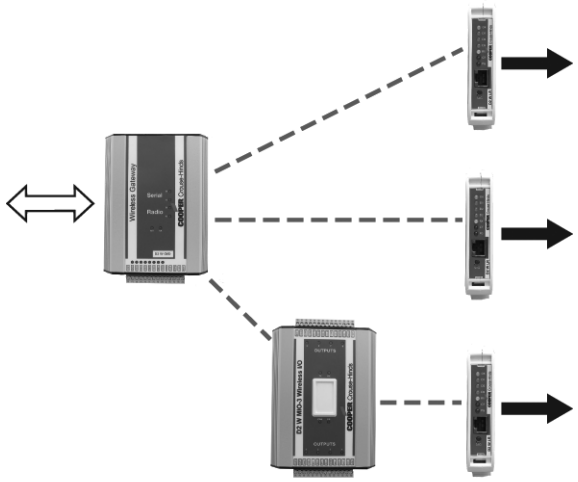
- **Input-only transmitter unit, two digital/pulse inputs, one analog input, and one thermocouple mV input**



- Transmits to receiver unit as a matched pair where the input signals are re-created as output signals or can transmit to a transceiver or gateway unit
- Up to 3000 wireless transmitters can be used in a network (255 inputs can be linked to any radio unit address)
- External inputs plus internally calculated values, including analog set-point status, pulse count, power supply voltage
- Thermocouple input -10 to +100mV with cold-junction compensation and linearization for J, K, or T-type
- Set-point status generated by comparing analog input to high and low set-points
- Digital inputs can also be used as pulse count inputs
- Power supply 9 – 30VDC, with power supply monitoring function
- 24VDC 30mA analog loop supply internally provided
- RS232 configuration and diagnostics port
- RS232 - RJ45 cable required for set-up (catalog number: **CBLSER RJ45**)

Receiver Unit:

- **Output-only receiver unit, three digital contact outputs, and one analog output**
- Receives radio commands from transmitter unit as a matched pair where the input signals are re-created as output signals, or can receive commands from a transceiver or gateway unit
- Up to 3000 wireless receivers can be used in a network (255 inputs can be linked to any radio unit address)
- Power supply 9 – 30VDC; 24VDC
- Communications failure indication and configurable output
- Outputs can be configured as retained or reset (fail-safe) on communications failure
- LED indication of radio signal strength
- RS232 configuration and diagnostics port
- RS232 - RJ45 cable required for set-up (catalog number: **CBLSER RJ45**)



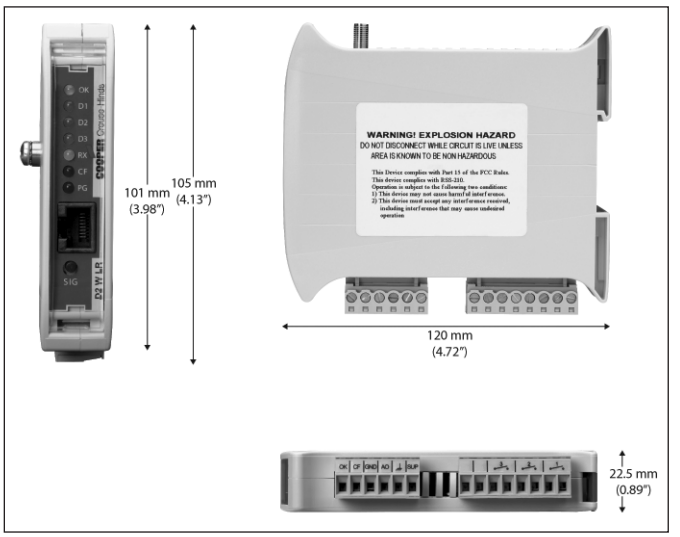
Ordering Information:

Cat. #	Description
D2 W LT 900	Wireless Transmitter (900 MHz) (Antenna sold separately)
D2 W LR 900	Wireless Receiver (900 MHz) (Antenna sold separately)
D2 WL P1 900	Wireless Transmitter / Receiver Pair with DG900 1 Whip Antenna (900 MHz)
D2 WL P2 900	Wireless Transmitter / Receiver Pair with CFD890EL Dipole Antenna (900 MHz)

1W Unidirectional Transmitter / Receiver Units

Cl. I, Div. 2
CSA Certified

Dimensions:



Technical Specifications:

- **Frequency:** frequency hopping spread spectrum 902-928 MHz, sub-bands available, 1W
- **Sensitivity:** line-of-sight range 20 miles (4W ERP - "effective radiated power"), 15 km (1W ERP); 3000' / 1000 m in obstructed industrial environments; radio distances can be increased by up to 5 intermediate transceiver or gateway units used as repeaters
- **Antenna Connector:** SMA female coaxial connector
- **Temperature:** -40 to 60°C / -40 to 140°F
- **Humidity:** 0 - 99% RH
- **Regulatory Approvals:** EMC compliant 89/336 EEC, EN 301 489, AS3548, FCC Part 15, Approved to FCC Part 15.247, RS210
- **Housing:** DIN rail thermo-plastic enclosure 3.9"x 0.9" x 4.7" (100 x 22 x 120 mm)
- **Transmitter Unit:** Power/OK, radio TX, DIN1, DIN2, analog set-point status
- **Receiver Unit:** Power/OK, radio RX, DO1, DO2, DO3, communications fail LEDs also used to provide radio signal strength indication
- **Transmission Rate:** 19.2 Kb/s (transmitter and receiver)

Transmitter Inputs:

Input Type	Source	Function
Digital	external	status
Pulse Total	external	count
Analog	external	analog
Thermocouple	external	analog
Set-point	internal	status
Supply Voltage	internal	analog

Input values transmitted as per WIB-net protocol - exception-reporting on signal change, and update time.

Digital / Pulse Inputs:

- Two inputs, suitable for voltage-free contacts / NPN, or voltage input 0-1 VDC on / >3 VDC off pulse input max. rate 10 Hz, 50 msec on time. Pulse counted as 16-bit register.

Analog Inputs:

- 0-20 mA (4-20mA, 0-10mA)
- "Floating" differential input, resolution 16-bit, accuracy < 0.1%

Thermocouple Inputs:

- Millivolt (-10mV to +100mV), J, K, or T-type linearization with on-board cold-junction compensation
- Accuracy better than 1°C

Power Supply:

- **Normal Supply:** 9 - 30VDC, power consumption
- Transmitter normal 70mA, transmitting max. 600mA at 12VDC
- Analog loop supply internally generated, 24VDC 35mA
- Internal monitoring of supply voltage may be transmitted as an "input" (transmitter unit only)

Set-point Status:

- High and low set-points generate internal digital status - set-point status sets (on) when analog value < low set-point and resets (off) when analog value > high set-point. Status is transmitted as per digital input, set-point values are set via the front panel rotary switch or configuration software.
- Separate set-points for analog (4-20 mA), thermocouple and supply inputs are configurable.

Receiver Outputs:

Digital Outputs:

- Three relay contact outputs, 260VAC 1A or 50VDC 1A

Analog Outputs:

- 0-20mA, source output, 12-bit resolution, 0.1% accuracy

Communication Failure:

- Internal status based on configurable time-out value
- “Comms-fail” status can be configured to a local output

Fail-Safe:

- On “comms-fail,” outputs user-configurable as retained last correct value or reset (fail-safe)

Serial Port:

- RS232 RJ45 female DCE (Data Communications Equipment), used for configuration and diagnostics

LED Indication:

Transmitter Unit:

- Power/OK, radio TX, DIN1, DIN2, analog set-point status

Receiver Unit:

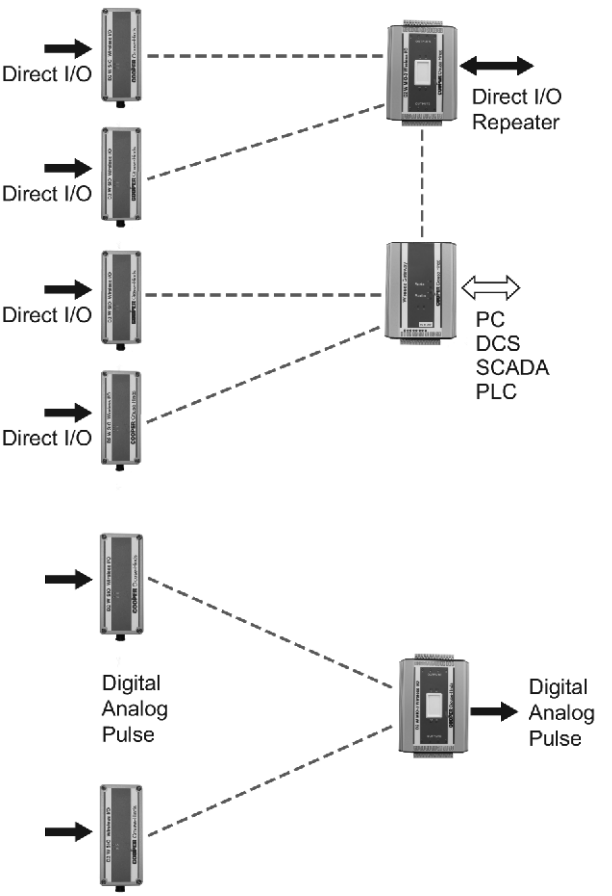
- Power/OK, radio RX, DO1, DO2, DO3, communications fail
- LEDs also used to provide radio signal strength indication

Configuration and Diagnostics:

- Factory configuration transmitter/receiver matched pair, AI to AO, 2DI to 2DO, SP status to DO3 via RS232 - RJ45 cable.
- User configuration via serial port. Unidirectional units can be configured to network with multi-I/O and gateway units.
- Diagnostics features: read input values, write output values, radio signal strength, monitor communication messages.

D2 W SIO

D2 W SIO wireless modules are economical solutions for monitoring remote process signals and are housed in a weatherproof (IP66) enclosure. They connect to discrete, pulse, or analog signals from process transducers, and transmit these signal values by radio. Capable of being powered by battery-only supplies, these products are particularly suitable where power is not available.



Applications:

- Wireless connection of flowmeters or energy meters
- Monitoring of storage tanks
- Monitoring cathodic protection on pipelines
- Wireless alarms from power reticulation fault-relays

Features:

- **Input-only transmitter unit, two digital/pulse inputs and one analog input**
- Networks with multi-I/O, gateway, and receiver radios
- Sensor signals, inputs are transmitted to a transceiver module where the signals are re-created as output signals or passed by a gateway device to a host device such as a PLC or SCADA system
- Extremely low power consumption by reverting to “sleep” mode, allowing unit to be powered by line voltage or the battery pack.
- Multiple power supply options including battery-only supply
- Up to 3000 wireless units per network
- Inputs on any D2 W SIO can be wirelessly linked to an output on any unit capable of receiving a signal. Inputs can be linked to multiple outputs.
- Up to 5 intermediate transceiver or gateway units can be configured to link SIO inputs to outputs on other units
- Interfaces to a variety of industrial protocols (i.e. Modbus RTU, EtherNet/IP) via the gateway device
- I/O available for transmission: external inputs plus internally calculated values, analog set-point status, pulse rate and pulse total, power supply voltage, and power supply alarm
- Set-point status generated by comparing analog input to high and low set-points
- Antenna sold separately
- Pulse inputs generate a separate pulse count value and a pulse rate value. Pulse rates are treated as internal analog registers with a configurable maximum value.
- Power supply generates internal signal which can be transmitted as low normal supply voltage status, low battery voltage status, and battery voltage (analog)
- Can connect to up/down counter transducers such as shaft-encoders
- Easily configured to repeat the transmission up to four additional times after the initial transmission to ensure that the transmission is received correctly
- Easy-to-use Cooper Crouse-Hinds wireless I/O software

Certifications and Compliances:

- Class I, Division 2 hazardous areas approved (CSA certified to U.S. and Canadian standards)
- Weatherproof (IP66) enclosures

Ordering Information:

Cat. #	Description
D2 W SIO 900	Wireless Transmitter (900 MHz) (Antenna sold separately)

The D2 NW BAT 2 is a battery pack for the D2 W SIO wireless device. The battery pack is used in applications where power lines are either not installed or not allowed.

Applications:

- Used to power D2 W SIO units atop of water tanks for monitoring fluid level
- Used to power D2 W SIO units to monitor pipeline cathodes
- Used where line power is not available
- Ideal for safety showers and other applications requiring IP66 protection

Features:

- 9V, 6 AA alkaline batteries
- Housed in a weatherproof (IP66) enclosure

Certifications and Compliances:

- Class I, Division 2

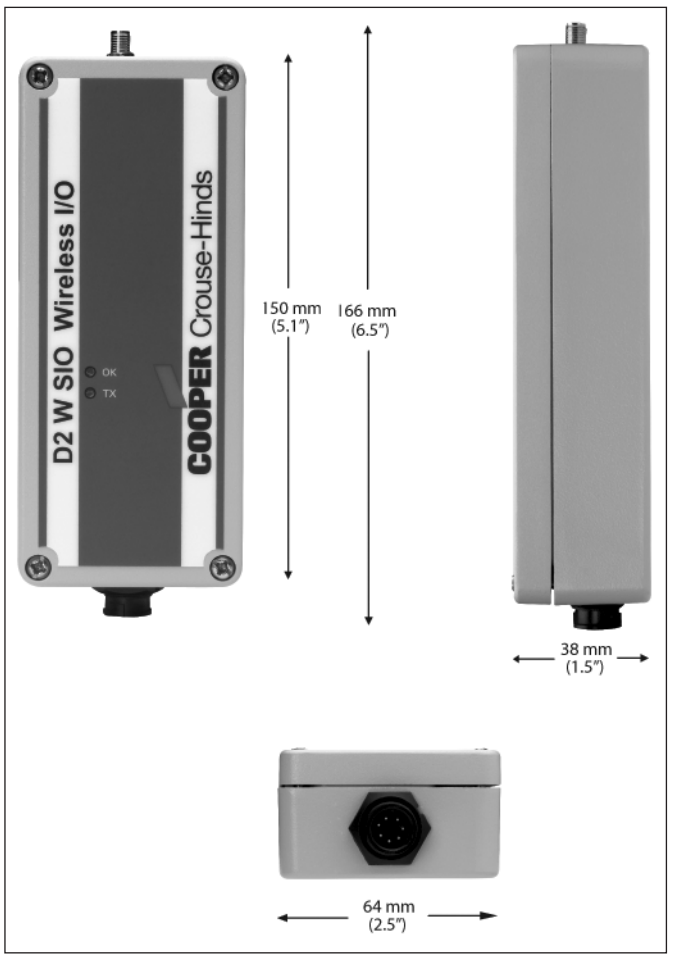
Specifications:

- **Expected Life:** up to 1 year, depending on usage and power settings (D2 W SIO will indicate low battery status)

Ordering Information:

Cat. #	Description
D2 NW BAT 2	Battery Pack for D2 W SIO

Dimensions:



Technical Specifications:

- **Frequency:** frequency hopping spread spectrum 902-928 MHz, sub-bands available
- **Power:** 1W
- **Max. Range (line-of-sight):** 20 miles (4 ERP), 15 km (1 ERP); 3000' / 1000 m in obstructed industrial environments
- **Antenna Connector:** SMA female coaxial connector
- **Temperature:** -40 to 60°C / -40 to 140°F
- **Humidity:** 0-99% RH
- **Regulatory Approvals:** approved to FCC Part 15.247, RS210; EMC compliant 89/336 EEC, EN 300 683, AS3548, FCC Part 15
- **Housing:** weatherproof (IP66) painted aluminum enclosure 6.7" x 2.5" x 1.4" (170 x 64 x 36 mm); weatherproof connector for external connections
- **Transmission Rate:** 19.2 Kb/s (radio)
- Each transmission may be configured to be sent 1 to 5 times
- LED indicators - radio TX, operation OK
- High and low set-points generate internal digital status. Set-point status sets (on) when analog value < low set-point and resets (off) when analog value > high set-point status transmitted as per digital input.

Inputs and Outputs:

Input Type	Source	Function
Digital	external	status
Pulse Total	external	count
Pulse Rate (D2 W SIO only)	internal	analog
Analog	external	analog
Set-point	internal	status
Supply Voltage (D2 W SIO only)	internal	analog
Supply Low Voltage (D2 W SIO)	internal	status

Digital Inputs:

- Two inputs, suitable for voltage-free contacts / NPN, or voltage input 0-1VDC on / >3 VDC off
- Status transmission on change of input signal and on time elapsed since last transmission - update time period 10 sec. - 5 days, a separate update time can be configured when the discrete input is "on"

Pulse Inputs:

- Pulse input max. rate 100 Hz, 3 msec on time (1000 Hz available using a $^1/_{10}$ divider). Pulse counted as 16-bit register with a 16-bit overflow register (total count 32-bit). Transmissions occur when count change exceeds configured increase or on time elapsed since last transmission. Update time 10 sec. - 5 days. Change-of-state transmissions may be suspended if increase exceeds a configured value to reduce radio traffic.
- **Up/Down Pulse Count:** the two pulse inputs may be configured to a single count to suit quadrature or incremental shaft encoder transducers
- **Pulse Rate:** calculated from rate of pulse input and treated as an internal analog input. Configurable scaling. Transmitted as per analog input.

Analog Inputs:

- 0-25 mA (4-20mA, 0-10mA) available, 0-10V also available "floating" differential input, resolution 12-bit, accuracy < 0.1% measurement continuous or sampled, sample time configurable 0 - 9.1 hours, transducer warm-up time configurable 0.5 - 127 sec.
- Analog value transmitted on change of input signal or time elapsed since last transmission, change sensitivity configurable from 0.7 - 75%, update time configurable from 0.1 min. - 5 days

Power Supply:

- **Battery Supply:** D2 NW BAT battery pack, 6 x AA batteries, 9VDC
- **Normal Supply:** 6-30VDC, power consumption @12VDC - quiescent (sleep mode) 140µA, operating mode
- 300mA @ 1W during transmission (35 msec.)
- Analog loop supply internally generated (50mA at 24VDC)
- Internal monitoring of supply low voltage status may be transmitted to remote modules as an "input"
- Power consumption increases for pulse inputs > 10 Hz

Set-point Status:

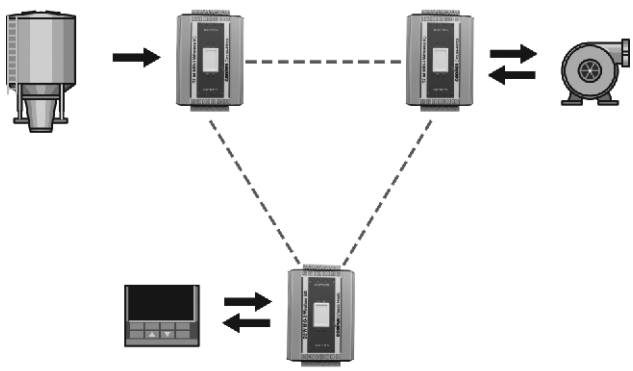
- High and low set-points generate internal digital status. Set-point status sets (on) when analog value < low set-point and resets (off) when analog value > high set-point. Status transmitted as per digital input.

Serial Port:

- RS232 DB9 female DCE used for configuration and diagnostics

D2 W MIO

A transceiver is a wireless device made up of a transmitter and receiver. Since each module can manage both input and output signals, it can be used to monitor transducers and control industrial processes. This module can also be used as a repeater to relay another wireless device's transmission, thus increasing the overall range of the system.

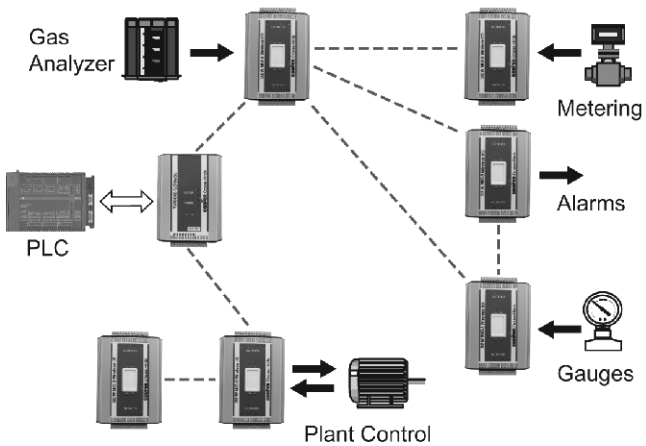


Applications:

- Wireless junction box in a process plant to connect a large number of signals to other parts of the plant and to the plant control center
- Simple Remote Terminal Unit (RTU) in a SCADA system, connecting sensors/instrumentation/process signals in pump stations, sub-stations, pipeline regulator stations, etc.
- Machine-2-Machine wireless connectivity in factories

Features:

- Multiple inputs/output channels for monitoring and control functions



- Up to 95 wireless units per network
- Each wireless unit can connect to input/output expansion modules via RS485 multi-drop with up to 10 expansion modules per wireless unit
- Sensor signals connected at one module; input signals are transmitted to another module where the signals are re-created as output signals or passed via serial to a host device such as a PLC or SCADA system
- Short distance and long distance applications with license-free and licensed products
- Multi-hop repeater functions – up to 5 intermediate units can be configured in any input/output link
- Four versions available
- Any input on any unit can be wirelessly linked to any output on another unit. Inputs can be linked to multiple outputs.
- Inputs and outputs can be added via additional serial units
- The units can be pre-programmed to consider analog set-points, pulse rate and pulse total, power supply voltage, power supply alarm
- Set-point status generated by comparing analog inputs to high and low set-points. Available on AI1 of -1 units, and AI1-4 of -2 units.
- Pulse inputs generate a separate pulse count value and a pulse rate value. Pulse rates are treated as internal analog registers with a configurable maximum value.
- Wide voltage power supply, with integral UPS battery charger (to 12 AHr) and solar regulator
- Power supply generates internal signal values which can be transmitted, low normal supply voltage status, low battery voltage status, and battery voltage (analog)
- Multiple communication failure diagnostics with output status. Fail-to-transmit alarm and fail-to-receive alarm status.
- Radio receives signal and background RF noise measurement / logging diagnostics
- Input measurement display and output "forcing" diagnostics
- Communication logging diagnostics
- Easy-to-use Cooper Crouse-Hinds wireless I/O configuration software
- Antenna sold separately

Certifications and Compliances:

- Class I, Division 2 hazardous areas approved (CSA certified to U.S. and Canadian standards)

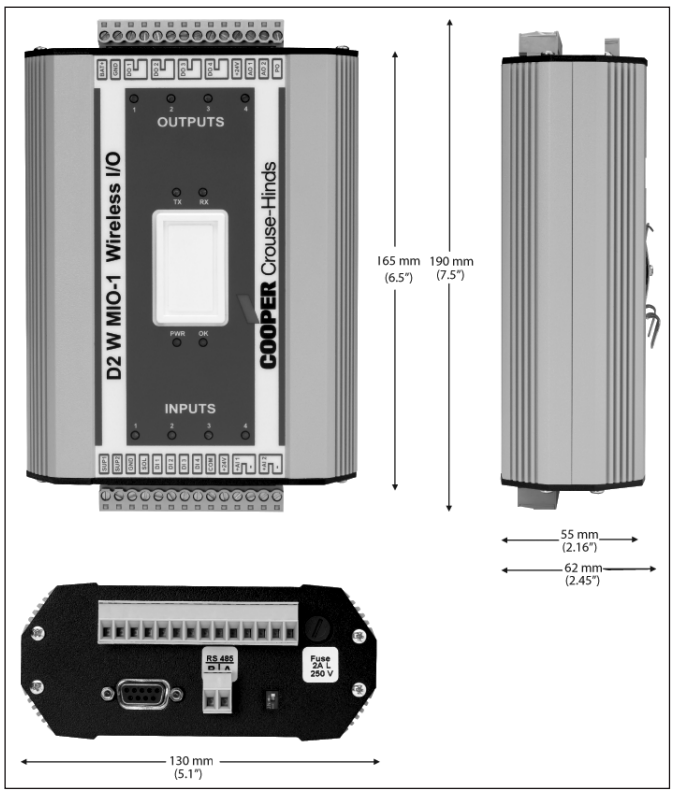
Ordering Information:

Cat. #	Description	Digital Inputs	Digital Outputs	Analog Inputs	Analog Outputs	Pulse Inputs	Pulse Outputs
D2 W MIO 1 900	Wireless Transceiver, Multiple Inputs & Outputs	4 voltage-free contacts	4 relaycontacts (5A @ 50VAC output)	2 4-20mA	2 4-20mA	1 100 Hz	1 100 Hz
D2 W MIO 2 900	Wireless Transceiver, Multiple Inputs & Outputs	4 voltage-free contacts	1 field effect transistor*	6 0-20mA	0	4 1 x 1 KHz, 3 x 100 Hz	0 100 Hz
D2 W MIO 3 900	Wireless Transceiver, Multiple Inputs & Outputs	0 voltage-free contacts	8 field effect transistors*	0	8 0-20mA	0	4 100 Hz
D2 W MIO 4 900	Wireless Transceiver, Multiple Inputs & Outputs	4-16 voltage-free contacts	4-16 field effect transistors*	0	0	4 1 x 1 KHz, 3 x 100 Hz	4 100 Hz

*Transistor outputs .5a (500 milliamp) @ 30VDC.

Note: Pulse and digital I/O are the same connection. The D2 W MIO-4 has 4 fixed inputs and 4 fixed outputs and a further 12 which may be configured as input or output combinations.

Dimensions:



Technical Specifications:

- **Frequency:** frequency hopping spread spectrum 902-908 MHz, sub-bands configurable
- **Power:** transmit power 1W, approved to FCC Part 15.247, RSS210
- **Sensitivity:** receiver data sensitivity: -108dBm
- **Max. Range (line-of-sight):** USA/Canada - 4W ERP, 20+ miles; other countries - 1W ERP, 15+ km depending on local conditions
- **Transmission Rate:** 19.2 Kb/s with forward-error correction
- **Antenna Connector:** SMA female coaxial connector
- **Temperature:** -40 to 60°C / -40 to 140°F
- **Humidity:** 0-99% RH
- **Regulatory Approvals:** EMC FCC Part 15, AS3548, 89/336/EEC, EN 301 489
- **Housing:** extruded aluminum case, 5.1" x 7.3" x 2.4" (130 x 185 x 60 mm) with DIN rail mounting
- Removable terminals up to 2.5 sqmm (12 gauge) wires
- LED indication for power supply, module status, digital I/O

Inputs and Outputs:

Digital Inputs:

- Opto-isolated (5000V) inputs suitable for voltage-free contacts or NPN transistor, contact wetting current 5mA
- **Type-1 & -2** - four inputs
- **Type-4** - up to 16 inputs (4 inputs + 12 selectable I/O). The 12 selectable inputs are surge protected, but not isolated.

Digital Outputs:

- **Type-1** - four relay, contacts, Form A, AC 50V 5A / DC 30V 2A
- **Type-2** - 1 FET output 30VDC 500mA
- **Type-3** - 8 FET output 30VDC 500mA
- **Type-4** - up to 16 FET output (4 outputs + 12 selectable I/O)

Analog Inputs:

- "Floating" differential inputs, common mode voltage 27V. 24VDC for powering external loops provided. Digital filtering 1 sec.
- **Type-1** - two 4-20mA resolution 15-bit, accuracy 0.1% (over range indication 2-25mA)
- **Type-2** - six 0-20mA resolution 12-bit, accuracy 0.1% (over range indication 0-25mA)

Analog Outputs:

- Current sink to common, max. loop voltage 27V, max. loop resistance 1000 ohms
- **Type-1** - two 4-20mA resolution 15-bit, accuracy 0.1% (over range indication 0.5-25mA)
- **Type-3** - eight 0-20mA resolution 12-bit, accuracy 0.1% (over range indication 0-20.5mA)

Pulse Inputs:

- Specifications as per digital inputs, max. pulse rate 100Hz, pulse width min. 5 ms
- **Type-1** - one input (DI1)
- **Type-2** - four inputs (DI1-4) - first pulse input (DI1) max. 1000 Hz, pulse width min. 0.5 ms
- **Type-4** - four inputs (DI1-4) - first pulse input (DI1) max. 1000 Hz, pulse width min. 0.5 ms

Pulse Outputs:

- FET 30VDC 500mA max. 100 Hz
- **Type-1** - one
- **Type-3 & -4** - four

Power Supply:

- **Battery Supply:** 11.5-15.0VDC
- **Normal Supply:** 12-24VAC or 15-30VDC, over-voltage and reverse power protected
- Internal monitoring of power fail, solar charge status, and battery voltage. These values may be transmitted to remote modules for monitoring.
- Internal DC/DC converter provides 24VDC 150mA for analog loop supply
- Battery charging circuit included for 1.2-12 AHr sealed battery
- Solar regulator for direct connection of solar panel (up to 30W) and solar battery (100 AHr)

Serial Port:

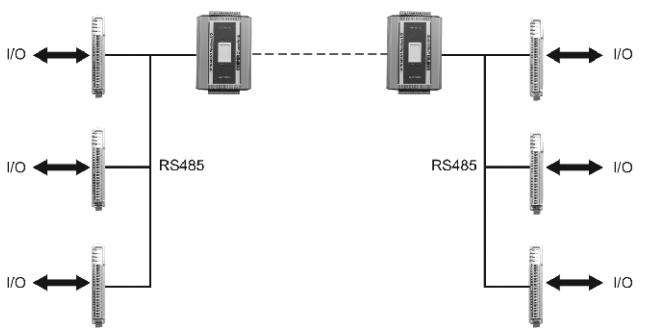
- A serial port can be used to configure transceivers and to hard-wire one transceiver to another when desired. This connection avoids the need to add wireless nodes to circumvent impenetrable obstructions, and provides a redundant path for critical applications.
- RS232/RS485 serial port 9600 baud, 8 bits, no parity, 1 stop bit
- RS232 9 pin DB9 female connector
- RS485 terminal connections (max. cable distance 2000 m)

D2 NW SER

The D2 NW SER is a wired device capable of interfacing with other Cooper Crouse-Hinds wireless radios to increase the number of signals radios can monitor/control. They can also be used as a slave to any Modbus control system.

Applications:

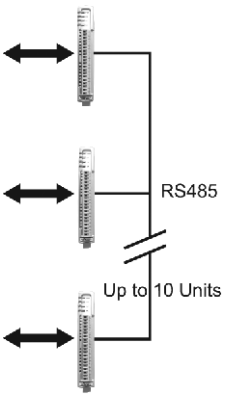
- Expansion I/O for D2 W MIO wireless units - up to 10 x D2 NW SER units can be connected to each wireless unit via RS485
- Serial unit multiplexer, signal transfer via RS485 - up to 10 units per multi-drop link
- Expansion I/O for Modbus devices - up to 99 x D2 NW SER units can be connected to each Modbus master via RS485



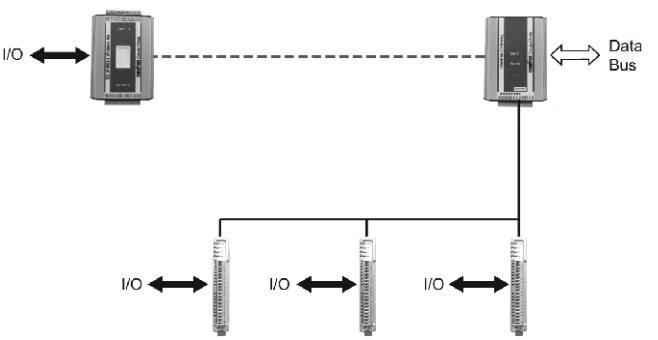
Features:

- Connected via RS485 multi-drop
- Selectable communications via *WIB-net* or Modbus protocol (both RTU and ASCII formats)
- Sensor signals connected at one module; input signals are transmitted to another module where the signals are re-created as output signals to a host device such as a PLC or SCADA system
- Connect to D2 W MIO wireless units for I/O expansion - up to 10 serial addresses per wireless unit, with a twisted pair cable
- Connect D2 NW SER units together to form a serial multi-drop system - up to 10 serial addresses per multi-drop link; no master device is required to control communications
- Connect up to 99 x D2 NW SER units as multi-drop Modbus I/O. RS485 extenders/isolators required for more than 10 units per single multi-drop length.

- RS485 multi-drop up to 2 km (1 mile) depending on installation environment
- Three versions available
- Set-point status generated by comparing analog inputs to high and low set-points
- RS485 cable required; serial units are powered by radios via cable (not provided)
- Analog inputs selectable as “floating” dual-terminal inputs or commoned single-terminal inputs. Configurable current (0-10 / 0-20 / 4-20mA) or voltage (0-5 / 0-10 / 1-5V). Configurable scaling, zero and span parameters.



- Analog outputs selectable as single-terminal source or sink outputs. Configurable current (0-10 / 0-20 / 4-20mA) or voltage (0-5 / 0-10 / 1-5V).
- Pulse inputs generate separate pulse count value and a pulse rate value. Pulse rates are treated as internal analog registers with a configurable maximum value.
- Multiple communication failure diagnostics with output status
- Input measurement display and output “forcing” diagnostics
- Easy-to-use Cooper Crouse-Hinds wireless I/O configuration tool



Certifications and Compliances:

- Class I, Division 2 hazardous areas approved (CSA certified to U.S. and Canadian standards)

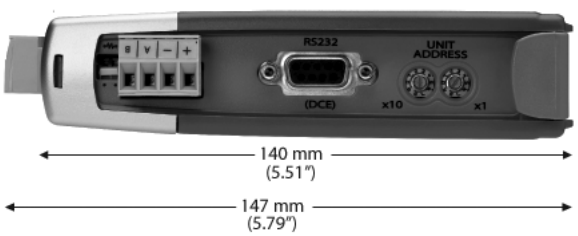
Ordering Information:

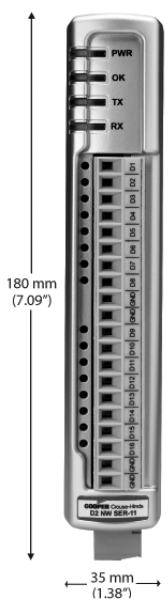
Cat. #	Description	Digital Inputs	Digital Outputs	Analog Inputs	Analog Outputs	Pulse Inputs	Pulse Outputs
D2 NW SER 11*	Non-wireless Serial Unit	up to 16	up to 16	0	0	4 1 KHz	8 100 Hz
D2 NW SER 12*	Non-wireless Serial Unit	up to 8 voltage-free contacts	up to 8 field effect transistors	4 “floating”/8 commoned 0-20mA/0-10V	0	0	8 100 Hz
D2 NW SER 13*	Non-wireless Serial Unit	up to 8	up to 8	0	8 sink/source 0-20mA /0-10V	0	8 100 Hz

*Cannot be used with D2 W GMD 900.

Note: Digital inputs and outputs are combined channels. When a channel is used as an output, it is not available as an input. Pulse and digital I/O are same connection.

Dimensions:





Technical Specifications:

- **Temperature:** -40 to 60°C / -40 to 140°F
- **Humidity:** 0-99% RH
- **Regulatory Approvals:** EMC FCC Part 15, AS3548, 89/336/EEC
- **Housing:** high density thermo-plastic, 5.91" x 7.09" x 1.38" (150 x 180 x 35 mm) with DIN rail mounting
- Removable terminals up to 12 gauge (2.5 sqmm) wires
- LED indication for power supply, processor OK, serial TX and RX, digital I/O

Inputs and Outputs:

Digital Inputs:

- Suitable for voltage-free contacts or NPN transistor, contact wetting current 5mA, inputs are surge protected
- **Type -11** - up to 16 selectable I/O
- **Type -12, -13** - up to 8 selectable I/O

Digital Outputs:

- Field Effect Transistor (FET) outputs, 30VDC 200mA
- **Type -11** - up to 16 selectable I/O
- **Type -12, -13** - up to 8 selectable I/O

Analog Inputs:

- "Floating" differential inputs, common mode voltage 27V, 24VDC for powering external loops provided, 0-20mA/0-10V, resolution 12-bit, accuracy 0.1%
- **Type-12** - 8 input channels, selectable as 4 dual-terminal floating inputs or 8 single-terminal commoned inputs

Analog Outputs:

- Selectable as current/voltage source or current sink to common, max. loop voltage 27V, max. loop resistance 1000 ohms, 0-20mA/0-10V, 12-bit, accuracy 0.1%
- **Type -13** - 8 channels

Pulse Inputs:

- Specifications as per digital inputs, max. pulse rate 1kHz, pulse width min. 0.5 ms
- **Type -11** - 4 inputs (DIO1-4)

Pulse Outputs:

- Specifications as per digital outputs, max. pulse rate 100 Hz, pulse width min. 5ms
- **Type -11,-12,-13** - 8 outputs (DIO1-8)

Power Supply:

- **Battery Supply:** 9 - 30VDC, over-voltage and reverse power protected
- Internal monitoring of supply voltage. These values may be transmitted to remote modules for monitoring.
- Internal DC/DC converter provides 24VDC 250mA for analog loop supply

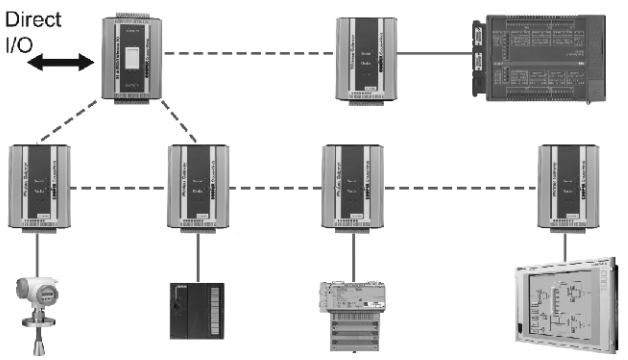
Serial Port:

- RS485 serial port configurable up to 115.2 Kb/s, 7 or 8 data bits, none/even/odd parity, 1 or 2 stop bits
- RS232 configuration port 9 pin DB9 female connector, 9.6 Kb/s, 8/n/1
- RS485 max. cable distance 2000 m terminal connections

Cl. I, Div. 2
CSA Certified

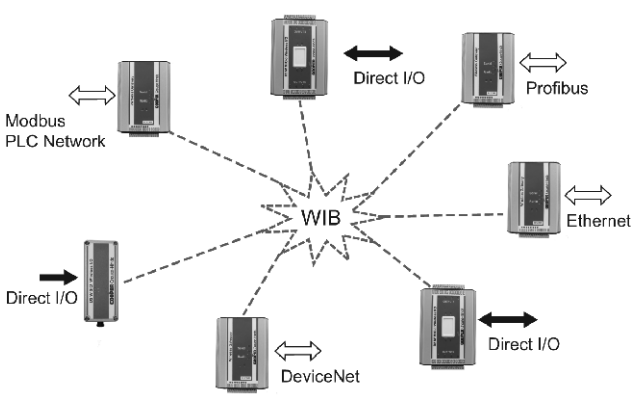
D2 W G

Wireless gateways interface between other Cooper Crouse-Hinds wireless devices and control systems (such as PLCs, DCS, and SCADA). In addition to channeling the wireless network data into one central control system, they can also act as an eight input/output transceiver.



Applications:

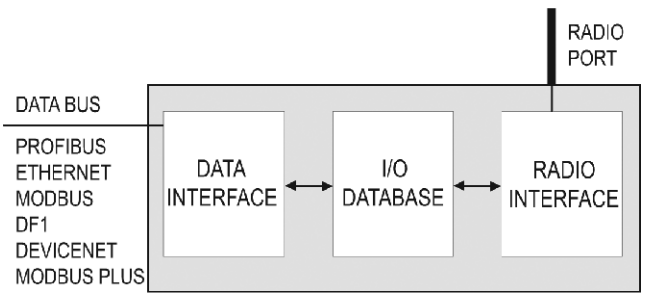
- Wirelessly connect PLCs on a new machine to an existing factory automation system
- Interface different automation systems in different sections of a plant
- Connect protocol devices into a common wireless network
- Cooper Crouse-Hinds wireless units are used to wirelessly transmit signals for PLCs or DCS



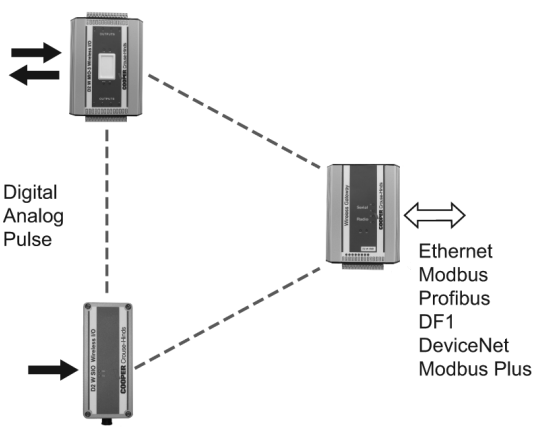
Wireless gateways connect to popular process control and automation databuses, and convert signal information to Cooper Crouse-Hinds' proven *WIB-net* wireless protocol.

Main benefits:

- Wireless extension of factory automation, providing a high security firewall. The wireless gateway connects to a databus and transfers I/O values to another wireless gateway unit via *WIB-net* communications. The other gateway interfaces to its own databus. Multiple gateway units can communicate in a WIB peer-to-peer network.
- There is an efficient wireless protocol conversion in the modules enabling an efficient transfer of data to Modbus, Profibus (Slave or Master), EtherNet/IP, DF1, DeviceNet, and/or Modbus Plus
- Interface between PLCs, DCS, HMI, or SCADA and Cooper Crouse-Hinds wireless units. The wireless gateway keeps an "image" of the remote wireless network in its memory and interfaces this image to the databus.



- Network wireless units and gateways to connect sensor signals and control systems



Features:

- Connects to databus at full bus speed
- Can interconnect master-slave, slave-slave and master-master
- Provides a peer-to-peer wireless network using *WIB-net*
- High security data encryption
- Automatic acknowledgment and error-correction
- Multiple path routing by configuration
- Eight on-board discrete I/O, individually configurable as input or output
- Network configuration is performed with easy-to-use free software
- Wide range power supply with integral back-up battery-charging feature
- Antenna sold separately

Certifications and Compliances:

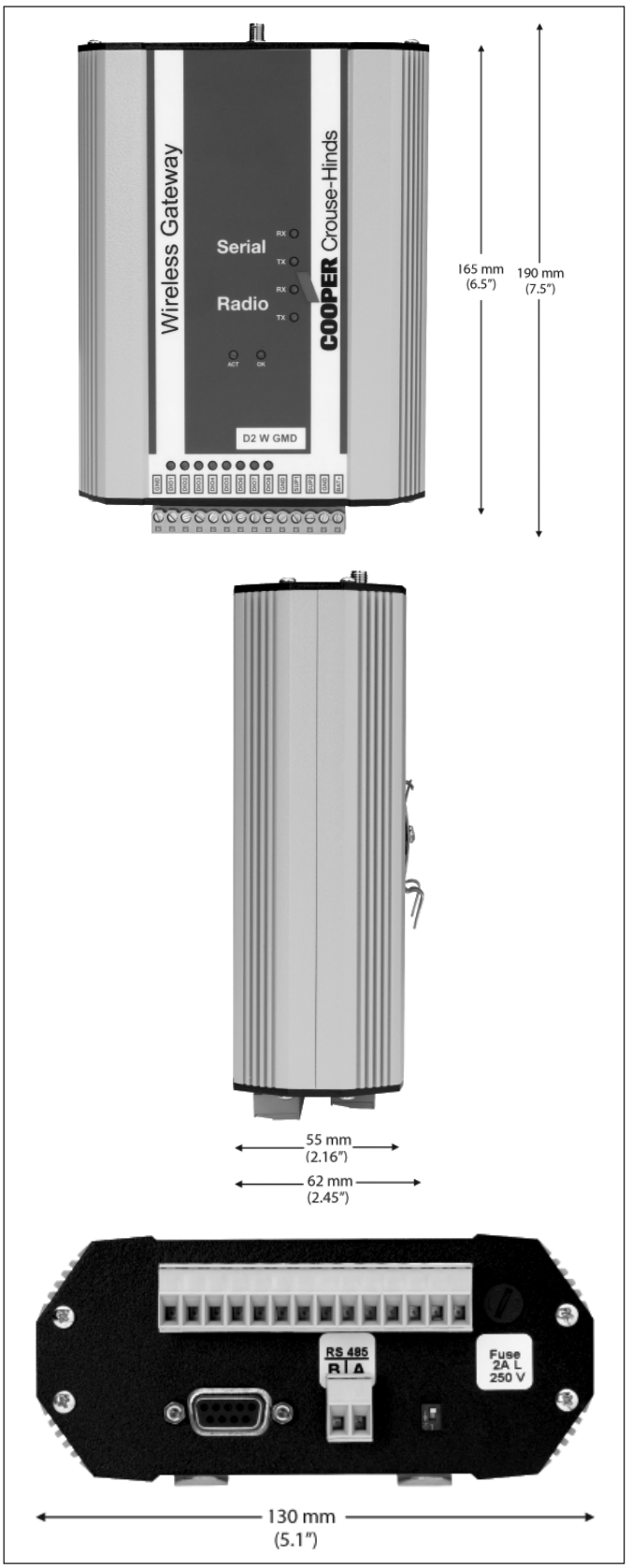
- Class I, Division 2 hazardous areas approved (CSA certified to U.S. and Canadian standards)

Ordering Information:

Cat. #	Description
D2 W GMD 900†	Wireless Gateway - Modbus RTU, DF1 (900 MHz)*
D2 W GPR1 900	Wireless Gateway - Profibus Slave (900 MHz)*
D2 W GPR2 900	Wireless Gateway - Profibus Master (900 MHz)*
D2 W GET1 900	Wireless Gateway - Allen-Bradley® EtherNet/IP, Modbus TCP, TCP/IP Functions (900 MHz)*
D2 W GDET1 900	Wireless Gateway - DeviceNet Slave (900 MHz)*
D2 W GM1 900	Wireless Gateway - Modbus Plus (900 MHz)*

†Cannot be used with D2 NW SER Series.
*Antenna sold separately.

Dimensions:



Technical Specifications:

- **Frequency:** frequency hopping spread spectrum 902-928 MHz, sub-bands configurable
- **Power:** transmit power 1W, approved to FCC Part 15.247, RSS210
- **Sensitivity:** receiver data sensitivity: -108dBm
- **Max. Range (line-of-sight):** USA/Canada, 4W ERP 20+ miles; other countries, 1W ERP, 15+ km depending on local conditions
- **Data Rate:** 19.2 Kb/s with forward-error correction
- **Antenna Connector:** SMA female coaxial connector
- **Temperature:** -40 to 60°C / -40 to 140°F (Modbus/DF1 version); 0 to 60°C / 30 to 140°F (Profibus, Ethernet, DeviceNet, and Modbus Plus versions)
- **Humidity:** 0 - 99% RH (Modbus/DF1 version); 0 - 95% RH (Profibus, Ethernet, DeviceNet, and Modbus Plus versions)
- **Regulatory Approvals:** EMC Compliant EN 301 489, FCC Part 15
- **Housing:** extruded aluminum case 5.1" x 7.3" x 2.4" (130 x 185 x 60 mm), DIN rail mounting, removable terminal blocks for ease of module replacement, terminals suitable for 12 gauge (2.5 sqmm) wire
- **Transmission Rate:** 19.2 Kb/s (radio)
- LED indication for processor OK, radio TX and RX, serial TX and RX, active status
- **Wireless Communications:** Radio communications can be configured for combination of event-reporting (change-of-state), update time, read/write blocks, and poll response. Radio message includes system addressing, unit addressing, error-checking, and configurable security encryption. Communication control includes message acknowledgments and up to four re-transmissions.
- Peer-to-peer addressing. Messages may be routed through five intermediate repeater addresses.
- Fail-to-transmit and fail-to-receive alarms are configurable

Inputs and Outputs:

- Eight discrete I/O, individually configurable as input or output. Inputs suitable for voltage-free contacts. Outputs are FET, 30VDC 500mA.

Power Supply:

- **Battery Supply:** battery charging circuit included for 12V back-up battery, max. charge current regulated to 0.7A (>12V supply)
- **Normal Supply:** 9 - 30VDC / 12 - 24VAC
- **Normal Current Drain:** 12V 150mA; 24V 90mA (MD1 version); 12V 270mA; 24V 170mA (other versions); add 5mA per active I/O
  For current drain during radio transmission, add to above: 12V 350mA; 24V 200mA

I/O Capability:

- **Modbus/DF1:** 4300 I/O points (analog plus discrete)
- **Profibus Master, Ethernet, Modbus Plus:** 2048 bytes input and 2048 bytes output up to 4300 discrete I/O points, or up to 1024 analog in / 1024 analog out
- **Profibus Slave:** 416 I/O bytes up to 1952 DI / 1952 DO, or up to 122 AI / 122 AO
- **DeviceNet:** 512 bytes input and 512 bytes output up to 4300 discrete I/O points, or up to 256 analog in / 256 analog out

Serial Port:

- **Modbus:** Modbus RTU (binary), master / slave configurable; RS232 or RS485, 300 - 19200 bit/sec.
- **DF1:** Allen Bradley DF1 full duplex; RS232 only, 300 - 19200 bit/sec.
- **Profibus:** Profibus-DP functionality according to EN 50170; RS485 optically isolated with on-board DC/DC converter, automatic baud rate detection (9600 bit/s. - 12 Mbit/s.)
- **Ethernet:** $^{10}/_{100}$ Mbit/s., RJ45 connector, transformer isolated interface; Modbus/TCP class 0, class 1, and partially class 2 slave; EtherNet/IP level 2 I/O server; embedded web system (dynamic HTTP), on-board file system via a 1.4 MB flash disc, user downloadable web pages through FTP server, e-mail functionality (SMTP)
- **DeviceNet:** DeviceNet 2.0 Slave, optically isolated RS422 with selectable baud rate between 125, 250, and 500 Kbit/sec.
- **Modbus Plus:** Modbus Plus Slave, optically isolated RS485 with standard baud rate of 1 Mbit/sec., global database transactions with routing for up to six networks

Configuration and Diagnostics:

- Diagnostics include online read/write of I/O registers, radio signal strength values from remote units, and off-line testing of databus protocol

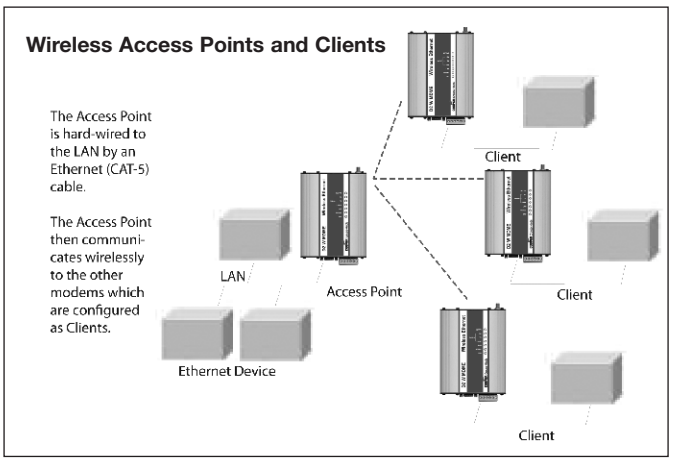
Modem Overview:

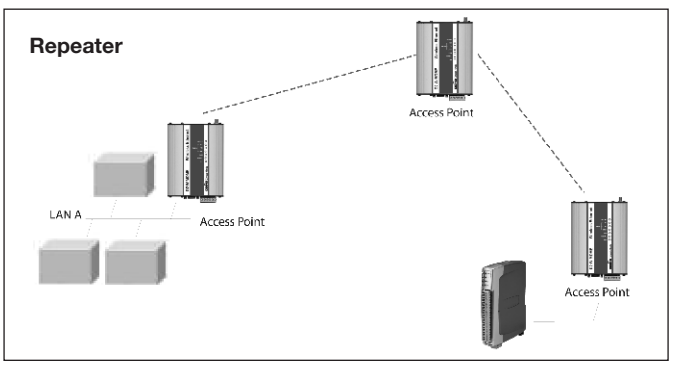
Wireless modems transmit serial or Ethernet data, for connecting PLC to PLC, linking SCADA to a group of PLCs, or to form a wireless PLC LAN. These modems provide a transparent data transfer and offer encrypted AES wireless transmissions via an embedded firewall. Modems are well suited for industrial or remote environments, and are easily configured.

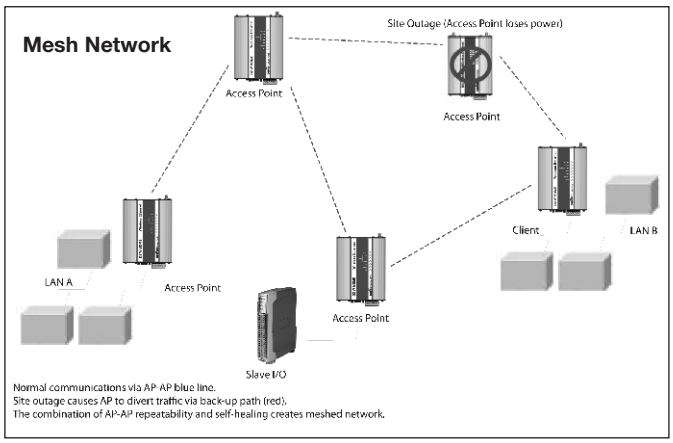
Modems also have the ability to send or receive multiple combinations of input or output signals using any of the D2 NW SER units, and do not wirelessly communicate with the remainder of the I/O line of products.

Each Ethernet modem is configured as: 1) an Access Point or a Client; and 2) a Bridge or a Router. The Wireless Access Point (WAP) acts as the "master" device, and can connect to a wireless network using Wi-Fi and communicate with multiple clients.

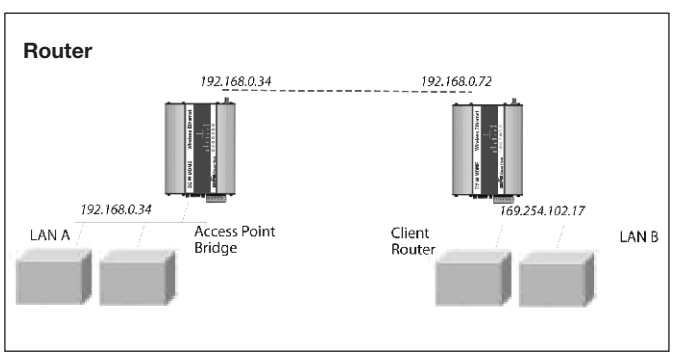
Modems are available at two different frequencies and various transmitting power capabilities. The D2 W MDME 900 (900 MHz Ethernet, 1W) and D2 W MDME 2400 (2.4 GHz Ethernet, 100mW or 300mW) modems can communicate in a point-to-point or point-to-multipoint mode. Both modems can be configured to allow for a self-healing of communications between network points (nodes) via Spanning Tree Algorithm technology. The D2 W MDME 2400 products can also use Wireless Distribution System (WDS) technology to extend radio coverage by linking two Access Points (AP/AP connectivity).



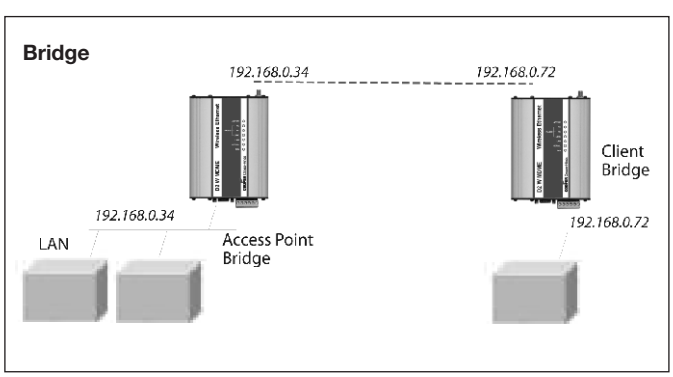




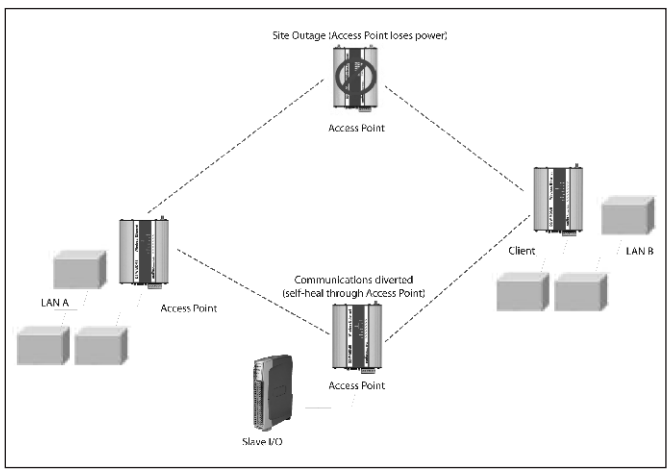
A router joins separate Ethernet networks together (i.e. links a LAN to a different LAN). The router has different IP addresses on its wired and wireless ports, reflecting the different IP addresses of the separate Ethernet networks. When devices on one network wish to communicate with devices on the other network, they direct their packets at the router for forwarding.



Bridges are typically used to connect sections of the same IP network together. For a bridge, the IP section for the wireless side is the same as the Ethernet side. Two routers can exist within the same radio network. There is no limit to the number of bridges in the same network - although, there is a limit of 128 (for the D2 W MDME 2400) and 255 (for the D2 W MDME 900) clients linked to any one Access Point.



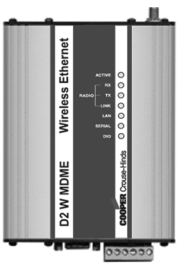
The Spanning Tree Algorithm function was introduced to handle network loops and provide redundant paths in networks. The Spanning Tree Algorithm can be configured; however, the factory default setting is “disabled.” There is some overhead in maintaining a network utilizing the Spanning Tree Algorithm. Users wishing to increase their throughput, at the expense of redundancy, should disable Spanning Tree.

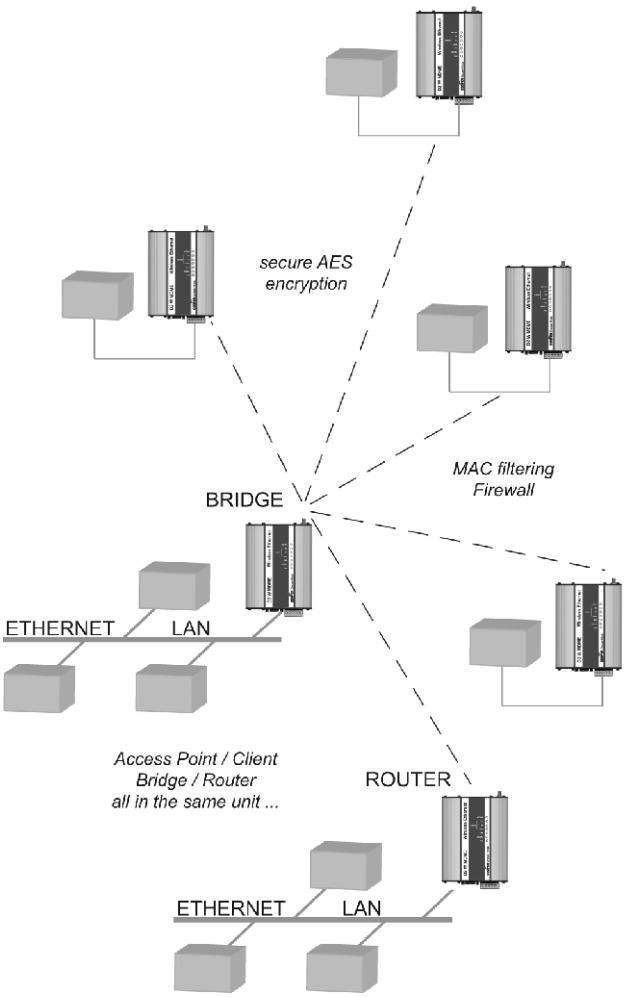


Consider this network above which has a redundant wireless link. If the Spanning Tree Algorithm function is enabled, one of the two wireless links will be disabled - that is, all wireless data will be transferred by one link only. If the active link fails, the other link will automatically start transferring the wireless data.

D2 W MDME 900

The D2 W MDME 900 Wireless Ethernet Modem is an ideal solution for Ethernet connections in process control and automation applications with PLCs, DCS, and SCADA acquisition. The D2 W MDME 900 can handle multiple applications simultaneously.





Applications:

- Remote RTU connectivity
- PLC connectivity

Features:

- License-free frequency for North and South America, Australia/New Zealand, Hong Kong, India
- $^{10}/_{100}$ BaseT Ethernet, wireless data up to 200 Kbit/sec.
- 902 - 928 MHz, 0.1 - 1W, frequency hopping spread spectrum
- Typical line-of-sight distance: 20+ miles North America when using a higher gain antenna; 15 km elsewhere (1W ERP)
- Configurable as Access Point / Client; Bridge / Router
- Security, reliability, redundancy
- Multiple layers of error detection and correction
- Automatic changeover to another Access Point if a wireless link fails
- Military grade AES security encryption of wireless data
- Firewall protection and efficient wireless management
- Message filtering at MAC and IP address level
- Filtering via Black or White List
- Two serial interfaces: RS232 and RS485
- Serial connectivity + Ethernet connectivity at the same time, both RS232 and RS485
- PPP and serial server functionality
- Serial Modbus to Modbus TCP conversion
- Discrete channel for status I/O, for failure status or external status transfer
- Easy-to-use configuration and powerful diagnostics
- Configuration and diagnostics via web browser
- Remote configuration and diagnostics via the wireless link
- Antenna sold separately

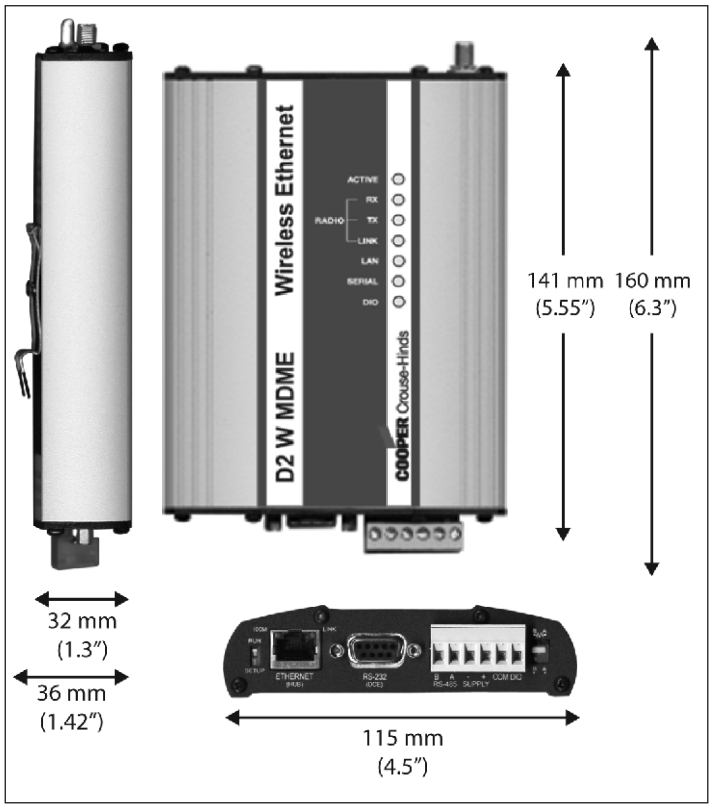
Certifications and Compliances:

- Class I, Division 2 hazardous areas approved (CSA certified to U.S. and Canadian standards)

Ordering Information:

Cat. #	Description
D2 W MDME 900	Wireless Ethernet Modem (900 MHz)

Dimensions:



Technical Specifications:

- **Antenna Connector:** SMA female coaxial connector
- **Temperature:** -40 to 140°F / -40 to 60°C
- **Humidity:** 99% RH
- **Power Supply:** 10 - 30VDC
- **Current When Idle:** 280mA (12V), 150mA (24V)
- **Current When Transmitting:** (1W) 500mA (12V), 300mA (24V)
- **Housing:** case - heavy-duty painted aluminum, DIN rail mounting
- **Approvals:** FCC 15.247, RSS210

Ethernet:

- $^{10}/_{100}$ BaseT RJ45 connection, IEEE 802.3 compliant
- Bridge / Router functions work with all Ethernet protocols (Embedded Protocols: TCP/IP, UDP ARP, PPP, ICMP, HTTP, FTP, TFTP, TELNET, Modbus TCP Client and Server)

Serial:

- RS232 V.24 DCE, 1.2 to 115.2 Kb/s
- RS485, 1.2 to 115.2 Kb/s
- Serial server, PPP, Modbus TCP to Modbus RTU conversion

Discrete I/O:

- One I/O channel
- Input: voltage-free contact / Output: FET 30VDC 500mA

Networking:

- Configurable as Access Point / Client; Bridge / Router
- Point-to-point, point-to-multipoint, user-configurable addressing
- Repeater functionality
- MAC filtering and IP filtering, White List or Black List

Radio:

- Frequency hopping spread spectrum
- Frequency bands
- USA/Canada: 902 - 928 MHz
- Transmit power 0.1 - 1W (20 - 30dBm) configurable
- Receiver sensitivity: -108dBm @ 10-6 Bit Error Rate (BER)
- Data rates 19.2, 38.4, 100, 200 Kb/s or auto rate selection
- Protocol CSMA/CA with 32-bit CRC and auto-correction
- Radio range up to 60 miles with repeaters, 20 miles line-of-sight / 100 km line-of-sight using high gain antennas (up to 4W ERP permitted in USA/Canada)
- SMA female coaxial antenna connection

Security:

- 128-bit AES or 64-bit proprietary encryption (configurable)
- MAC filtering and IP filtering
- Password protected configuration

Configuration and Diagnostics:

- HTTP with remote configuration via wireless link
- Receive Signal Strength Indicator (RSSI), channel noise, BER, connection monitoring and statistics
- Firmware upgrade via radio or Ethernet port

D2 W MDME 2400

The D2 W MDME 2400 Wireless Ethernet Modem provides reliable and secure high-speed wireless Ethernet connectivity across a broad range of applications in process and automation plants.

Applications:

- PLC connectivity
- SCADA data transfer
- Wireless Ethernet
- Wireless video feeds

Features:

- Uses global 2.4 GHz ISM band
- $^{10}/_{100}$ BaseT Ethernet, wireless data up to 11 Mbit/sec.
- 802.11b compliant 2.4 GHz Direct Sequence Spread Spectrum (DSSS), 100mW or 300mW
- Typical line-of-sight distance: 3+ mi/5+ km North America when using a higher gain antenna (300mW model); 1 km elsewhere (100mW ERP)
- Configurable as Access Point / Client; Bridge / Router
- Security, reliability, redundancy
- High RF output and superior receiver sensitivity gives excellent penetration in congested industrial environments
- Wireless Distribution System (WDS) mesh networking
- Multiple layers of error detection and correction
- Automatic changeover to another Access Point if a wireless link fails
- Industrial ratings down to -35°C
- Military grade WPA2 AES security encryption of wireless data
- Firewall protection and efficient wireless management
- Message filtering at MAC and IP address level
- Filtering via Black or White List
- Two serial interfaces: RS232 and RS485
- Serial connectivity + Ethernet connectivity at the same time, both RS232 and RS485
- PPP and serial server functionality
- Serial Modbus to Modbus TCP conversion
- Discrete channel for status I/O, for failure status or external status transfer
- Easy-to-use configuration and powerful diagnostics
- Configuration and diagnostics via web browser
- Remote configuration and diagnostics via the wireless link
- Dual SMA female coaxial antenna connection for antenna diversity (for improved performance in difficult environments)
- Antenna sold separately

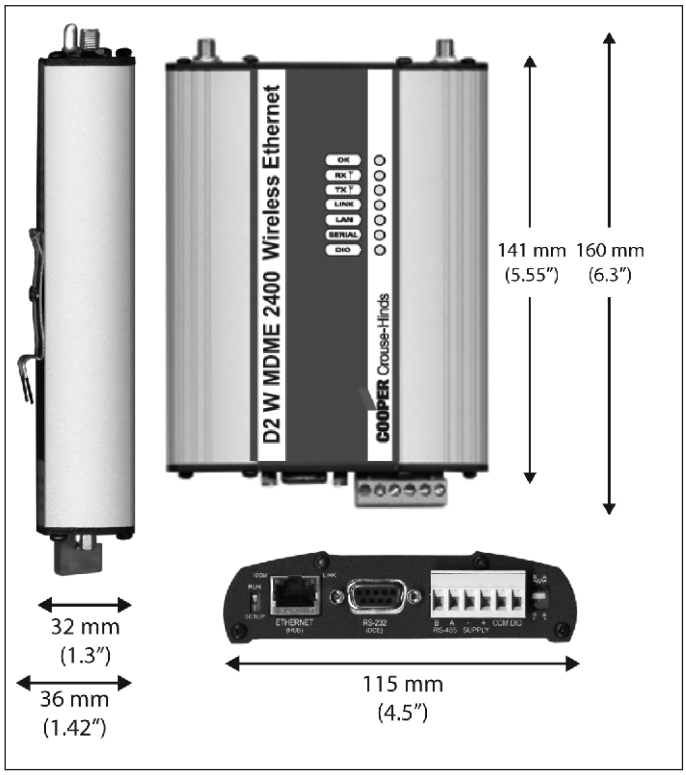
Certifications and Compliances:

- Class I, Division 2 hazardous areas approved (CSA certified to U.S. and Canadian standards)

Ordering Information:

Cat. #	Description
D2 W MDME 2400 1	100mW Wireless Ethernet Modem (2.4 GHz)
D2 W MDME 2400 3	300mW Wireless Ethernet Modem (2.4 GHz)

Dimensions:



Technical Specifications:

- **Antenna Connector:** SMA female coaxial connector
- **Temperature:** -35 to 150°F / -35 to 65°C
- **Humidity:** 99% RH
- **Power Supply:** 9 - 30VDC, current 240mA (12VDC), 150mA (24VDC)
- **Housing:** case - heavy-duty painted aluminum, DIN rail mounting
- **Approvals:** FCC 15.247, CE ETS 300 328, RSS210
- **Certifications:** IEC 60950, CSA

Ethernet:

- 10/100 BaseT RJ45 connection, IEEE 802.3 compliant
- Bridge / Router functions work with all Ethernet protocols (Embedded Protocols: TCP/IP, UDP ARP, PPP, ICMP, HTTP, FTP, TFTP, TELNET, Modbus TCP)

Serial:

- RS232 V.24 DCE, 1.2 to 115.2 Kb/s
- RS485, 1.2 to 115.2 Kb/s
- Serial server, PPP, Modbus TCP to Modbus RTU conversion

Discrete I/O:

- One I/O channel
- Input: voltage-free contact / Output: FET 30VDC 500mA

Networking:

- Configurable as Access Point / Client; Bridge / Router
- Point-to-point, point-to-multipoint, user-configurable addressing
- WDS self-organizing mesh networking
- MAC filtering and IP filtering, White List or Black List
- Serial gateway TELNET

Wireless:

- 2.400 - 2.484 GHz Direct Sequence Spread Spectrum (DSSS), 13 selectable zones
- 802.11b compliant, auto rate selection 1 MB, 2 MB, 5.5 MB, 11 MB
- Transmit power 100mW (20dBm) / 300mW (25dBm), dependent on local regulations
- Receiver sensitivity: -96dBm @ 1 MB/s, -91dBm @ 11 MB/s < 8% BER
- Line-of-sight range: 1 km @ 100mW ERP, 8 km @ 4W ERP
- Range may be extended using repeater features
- Dual SMA female coaxial antenna connection for antenna diversity (for improved performance in difficult environments)

Security:

- 128-bit AES encryption (WPA), TKIP (WPA), or 128-bit / 64-bit WEP
- MAC address and IP address filtering
- Password protected configuration

Configuration and Diagnostics:

- HTTP with remote configuration via wireless link
- Web-based system management, RF signal strength, Bit Error Rate, connection monitoring and statistics
- PPP protocol access to diagnostics
- Firmware upgrade via radio or Ethernet port

Antennas

Antennas should be selected considering the desired transmit distance, line-of-sight, RF cable length, and height of transmission. Each of these parameters should be evaluated in selecting the right antenna for your application. For more information, please visit crouse-hinds.com/WirelessIO/. Cooper Crouse-Hinds Sales Representatives can also help you select the right antenna using a diagnostic tool embedded in the Demonstration Kit transceiver modules.

900 MHz Dipole Antenna (CFD890EL):

- 0dB gain (including cable loss)
- Used in applications where signal strength is important in all directions from the antenna
- A ground independent half wave dipole suitable for 900 MHz products
- 15' (5 m) of RG58 coaxial cable already terminated with a crimped SMA male connector
- Includes a 304 stainless steel standard pole bracket and clamps

900 MHz Collinear Antenna (SG900EL):

- 5dB gain
- A short RG58 coaxial tail is terminated with a crimped N-Type female connector; the CC3 SMA, CC10 SMA, and CC20 SMA coaxial extender kits are also suitable for use with this antenna
- Includes a 304 stainless steel standard pole bracket and clamps

900 MHz Collinear Antenna (SG900 6):

- 8dB gain
- A short RG58 coaxial tail is terminated with a crimped N-Type female connector; the CC3 SMA, CC10 SMA, and CC20 SMA coaxial extender kits are also suitable for use with this antenna
- Mounted at the base tube by a U-bracket **(ordered separately - catalog number: ANT BR COL KIT)**
- Used when maximum range is required or as a base station antenna

900 MHz Division 1 Antenna (D1 NW ANT 1 900):

- 2dB gain
- Designed for use in hazardous/classified and industrial applications
- Omni-directional and designed for flexible mounting on a variety of explosionproof housings (with a ¾" NPT pipe thread)
- Mounting base is made of heavy, nickel plated brass with an integrated TNC (female) coaxial connector for ease of installation with a (catalog number: A53649A) cable
- The radome is optimized for rugged industrial applications, while maintaining maximum radio frequency transmission and reception efficiency
- May be mounted up to 18” away from the enclosure within a hazardous location without an additional seal

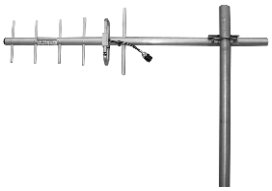
900 MHz Whip Antenna (DG900 1):

- -2dB gain
- Fitted with approximately 3.28' (1m) coaxial cable with SMA male connector; further coaxial extensions are not recommended
- Designed for short range use only (2 miles maximum)
- Mounted from the base through a ⅜" (10 mm) hole or with a bracket **(ordered separately - catalog number: ANT BR COL KIT)**

900 MHz Whip Antenna (WH900 SMA):

- -2dB gain
- Made for use with the D2 W DEMO 900 Demonstration Kit
- Measures only 3.5" (90 mm) in length
- Designed for internal use only; may be connected directly to Cooper Crouse-Hinds modules
- Fitted with a SMA male connector

900 MHz 6 Element Yagi Antenna (YU6 900):



- 10dB gain
- Focuses power in a forward direction for longer range applications
- Higher gain antennas direct power into a tighter beam
- Requires a single mounting bracket **(ordered separately - catalog number: ANT BR YAG KIT)**
- A standard female N-Type connection from a 6" (150 mm) tail provides a simple connection method when using the CC3 SMA, CC10 SMA, or CC20 SMA extender cable
- The narrow beam width and high front-to-back ratio is effective in reducing the effects of interference and counteracting losses in long coaxial runs

900 MHz 16 Element Yagi Antenna (YU16 900):

- 15dB gain
- Suitable for use when extended coaxial cable runs are encountered with 9dB loss or greater
- Equivalent to the YU6 900, but has additional director elements which provide additional gain
- A standard female N-Type connection from a 6" (150 mm) tail provides a simple connection method when using the CC3 SMA, CC10 SMA, or CC20 SMA extender cable

2.4 GHz Whip Antenna (WH2400 SMA):

- 0dB gain
- Made for use with the D2 W MDME 2400 Wireless Ethernet Modem
- Measures only 3.5" (90 mm) in length
- Fitted with SMA male connector

2.4 GHz Collinear Antenna (SG2400EL):

- 5.1dB gain
- A short RG58 coaxial tail is terminated with a crimped N-Type female connector
- Includes a 304 stainless steel standard pole bracket
- Designed for use with the CC10 SMA or custom coaxial cable extender kits
- At data link 2.4 GHz frequencies, it is important to keep cable runs to the shortest length possible; where a long run is unavoidable, a suitable low loss cable should be used

2.4 GHz Collinear Antenna (MD2400EL):

- 1dB gain (including cable)
- Approximately 15' (5 m) of low loss RG58 coaxial cable is terminated with a male SMA connector
- Includes a 304 stainless steel standard pole bracket and clamps

2.4 GHz 18 Element Yagi Antenna (Y2400 18EL):

- 18dB gain
- Suitable for use with the CC3 SMA, CC10 SMA, and CC20 SMA coaxial extenders
- A standard female N-Type connection from a 150 mm tail provides a simple connection method
- Includes mounting brackets

2.4 GHz Collinear Antenna (Z2400EL):

- 10dB gain
- An N-Type female connector is built into the stainless steel mount tube
- Mounting brackets **(ordered separately - catalog number: ANT BR COL KIT)** are ideal for mounting to a mast up to 50 mm in diameter

2.4 GHz Division 1 Antenna (CTX 2400 TR):

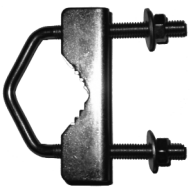
- 2dB gain
- Designed for use in hazardous/classified and industrial applications
- Omni-directional and designed for flexible mounting on a variety of explosionproof housings (with a ¾" NPT pipe thread)
- Mounting base is made of heavy, nickel plated brass with an integrated TNC (female) coaxial connector for ease of installation with a (catalog number: A10832A) cable

Brackets:

Brackets are available to provide a solid support for any antenna. Mounting brackets may be replaced if the antenna is dismantled for maintenance. The brackets are suitable for pole sizes up to a maximum of 2" (50 mm) in diameter.

Yagi Antenna Brackets (ANT BR YAG KIT):

- The Yagi antenna requires a single mounting bracket
- Bracket assembly consists of 1 x U-bolt, 1 x D-plate with nuts and washers
- Brackets are zinc plated mild steel



Collinear Antenna Brackets (ANT BR COL KIT):

- The collinear antenna requires two mounting brackets to hold the antenna in position
- Bracket assembly consists of 1 x U-bolt, 3 x D-plates with nuts and washers
- Brackets are zinc plated mild steel

Cables:

Cables are available for use between any Cooper Crouse-Hinds radio and its antenna, or between a PC and radio for configuration and diagnostics.

Serial Cable (CBLSER DB9):

- A RS232 serial cable used for Cooper Crouse-Hinds telemetry products requiring connection to a computer or laptop's RS232 port for diagnostic and configuration purposes
- Fitted with a molded DB9 male and DB9 female straight-through connector

Serial Cable (CBLSER RJ45):

- Equivalent to the CBLSER DB9, but is fitted with a molded RJ45 male (Ethernet connector) and a DB9 female connector for use with D2 W LT and D2 W LR radios only

Coaxial Cable (CC900TAIL):

- A 24" (800 mm) RG58 coaxial lead; tail is terminated with a SMA (male) connector for module connection and a flanged N-Type (female) bulkhead connector

Coaxial Extension Cable (CC Series):

- Lengths: CC3 SMA - 10′ (3 m); CC10 SMA - 33' (10 m); CC20 SMA - 66' (20 m)
- Cables are terminated and ready for use with a SMA male and N-Type male connector; the SMA connector is provided for direct module connection, and the N-Type connects directly to the antenna tail lead

Coaxial Cable (A53649A):

- Length: 2′
- Ideally suited for connecting any radio or modem to the 900 MHz Division 1 antenna (D1 NW ANT 1 900)
- Fitted with a TNC male and a SMA male connector

Coaxial Cable (A10832A):

- Length: 2′
- Ideally suited for connecting any radio or modem to the 2.4 GHz Division 1 antenna (CTX 2400 TR)
- Fitted with a RPTNC male and a SMA male connector

Straight-through Configuration Cable (CBLETH C5A):

- Used to connect to and communicate with Cooper Crouse-Hinds Wireless Ethernet Modems using a PC or via a network router, switch, or hub
- Length: 2 m
- Fitted with two RJ45 male connectors

Crossover Configuration Cable (CBLETH C5X):

- Used to connect to and communicate with the D2 W GET1 900 Ethernet gateway using a PC or via a network router, switch, or hub
- Length: 2 m
- Fitted with two RJ45 male connectors

Power Supplies:

Power supplies are available for any radio, and come either standard or DIN rail mounted.

Power Supply (PS 110 20): *

- Designed for use with Cooper Crouse-Hinds telemetry modules
- 110 Volt AC pack that mounts directly into a wall-mounted power outlet

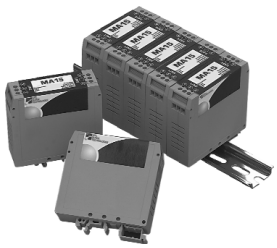
DIN Rail Mounted Power Supply (PS DR Series): *

- Designed for use with Cooper Crouse-Hinds telemetry modules
- Single power output
- Universal AC input / full range (110/240VAC)
- Can be mounted on TS-35/7.5 or 15 DIN rail

Surge Devices:

These components are ideally suited for protecting panel-mounted equipment, and are typically used in the controls section of a motor control center (MCC).

15 Amp Surge / Filter Device (MA15 Series): *



- AC/DC mains power surge protector, filter, and ring suppressor
- Absorbs transient surges that may otherwise damage equipment
- Filters noise in the system
- Prevents surges, causing the filter to “ring” (oscillate) under low load conditions

I/O Signal Surge Diverter (IOP32 Series): *

- Redirects electrical surges safely to ground, and then resets automatically
- Cost-effective surge protection solution which uses minimal space

Antenna Surge Diverter (CSD 900): *

- Installed between the antenna and any Cooper Crouse-Hinds wireless device to reduce lightning surge voltages from entering the radio module
- Fitted with a male SMA connector and a female SMA connector

* Device not certified or rated for use in Class I, Division 2 locations.
Must use EJB enclosure or suitable alternative enclosure for Class I hazardous locations.

Accessory Ordering Information:

	Cat. #	Description	Gain (dBd)	Connector
ANTENNAS & BRACKETS	**CFD890EL**	Dipole Antenna with 15' RG58 Coax Cable	0	SMA (male)
	SG900EL	Collinear Antenna with 1¼" Pole Bracket	5	N-Type (female)
	SG900 6	Collinear Antenna	8	N-Type (female)
	D1 NW ANT 1 900	Division 1 Antenna with RG58 Coaxial Lead	2	TNC (female)
	DG900 1	Whip Antenna with 3.28' (1m) RG58 Coaxial lead	-2	SMA (male)
	WH900 SMA	¼ Wave Whip Antenna	-2	SMA (male)
	YU6 900	Yagi Antenna, 6 Element	10	N-Type (female)
	YU16 900	Yagi Antenna, 16 Element	15	N-Type (female)
	WH2400 SMA	2.4 GHz Demo Whip Antenna	0	SMA (male)
	SG2400EL	2.4 GHz Collinear Antenna	5.1	N-Type (female)
	MD2400EL	2.4 GHz Dipole Antenna 5M RG58	1	SMA (male)
	Y2400 18EL	2.4 GHz Yagi Antenna	18	N-Type (female)
	Z2400EL	2.4 GHz Antenna	10	N-Type (female)
	CTX 2400 TR	2.4 GHz Division 1 Antenna	2	RPTNC (female)
	ANT BR YAG KIT	Yagi U-bolt Bracket	-	-
	ANT BR COL KIT	Collinear U-bolt Bracket	-	-
CABLES	**CBLSER DB9**	PC Serial Cable	-	DB9 (male); DB9 (female)
	CBLSER RJ45	PC Serial Cable	-	DB9 (female); RJ45 (male)
	CC900TAIL	RG58 Coaxial Lead - 24" (0.8 m) long	-0.8 (900 MHz); -1.2 (2.4 GHz)	SMA (male); N-Type (female)
	CC3 SMA	RG58 Coaxial Extender Kit - 10′ (3 m) long	-1 (900 MHz); -2 (2.4 GHz)	SMA (male); N-Type (male)
	CC10 SMA	RG58 Coaxial Extender Kit - 33′ (10 m) long	-3.2 (900 MHz); -5.9 (2.4 GHz)	SMA (male); N-Type (male)
	CC20 SMA	RG58 Coaxial Extender Kit - 66′ (20 m) long	-6.2 (900 MHz); -11.4 (2.4 GHz)	SMA (male); N-Type (male)
	A53649A	RG58 Coaxial Cable - 24" long	-1.1	TNC (male); SMA (male)
	A10832A	RG58 Coaxial Cable - 24" long	-1.3	RPTNC (male); SMA (male)
	CBLETH C5A	Ethernet Cable - Direct	-	RJ45 (male); RJ45 (male)
	CBLETH C5X	Ethernet Cable - Crossover	-	RJ45 (male); RJ45 (male)
POWER SUPPLY	**PS 110 20**	20VDC Power Supply	-	-
	PS DR3012	DIN Rail 12VDC Power Supply	-	-
	PS DR3024	DIN Rail 24VDC Power Supply	-	-
	D2 NW BAT 2	Battery Pack	-	-
SURGE PROTECTION	**MA15 D 1 SI**	110VAC Single Phase Power Surge Protector	-	-
	MA15 D 2 SI	240VAC Single Phase Power Surge Protector	-	-
	IOP32	Single Channel, 24VDC I/O Signal Surge Diverter	-	-
	IOP32D	Dual Channel, 24VDC I/O Signal Surge Diverter	-	-
	CSD 900	900 MHz Coax Surge Diverter	-0.2	SMA (male); SMA (female)

EJB Enclosures

Cl. I, Div. 1, Groups B, C, D*
Cl. I, Div. 2, Groups B, C, D*

NEMA 3, 4, 7B Div. 2, 7CD, 12
Explosionproof
Watertight

For Wireless Components

EJBs are used to house Cooper Crouse-Hinds radios, terminal blocks, and other electrical devices in indoor or outdoor areas which are wet and hazardous due to combustible gases and dust.

Certifications and Compliances:

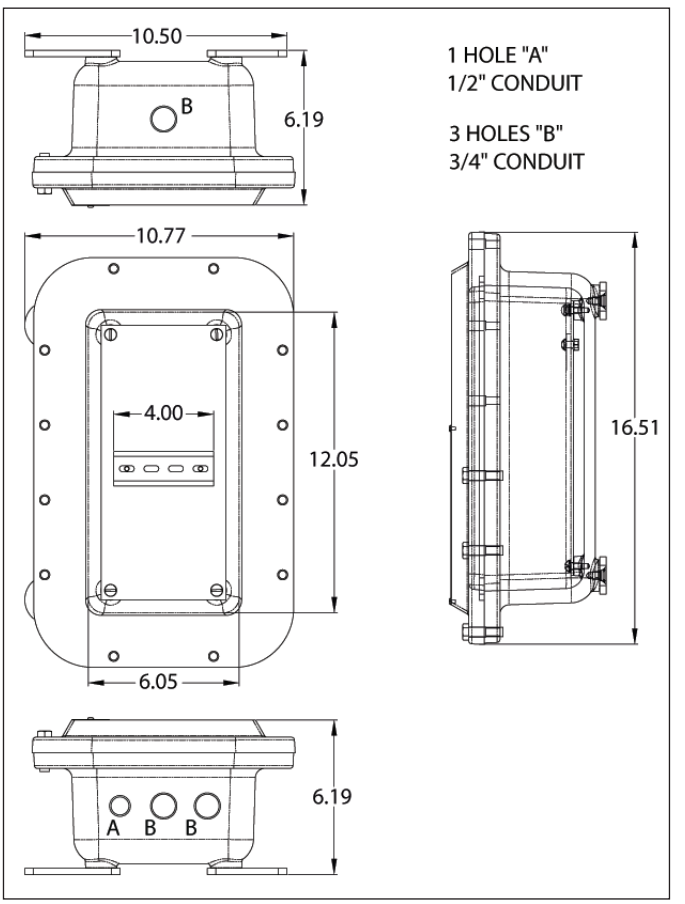
- Class I, Division 1 and 2, Groups B, C, D*
- NEMA 3, 4, 7B Div. 2, 7CD, 12
- Explosionproof, watertight

Design Features:

- Special neoprene cover gasket provides a watertight seal to meet NEMA 4 requirements, and provides superior protection for enclosed equipment against water corrosion
- Steel cover bolts
- External flange design - wide unobstructed cover opening provides a completely accessible interior for wiring and electrical equipment
- Furnished with a mounting plate, DIN rail, tapped and plugged conduit entries, and tapped and plugged drain and antenna entries

Note: AC/DC power supply will not fit in this enclosure with certain radios. Please consult factory for larger enclosure options.

Dimensions:



Ordering Information:

Cat. #	Description
EJB120604 MP SA RF KIT**	EJB Enclosure Assembly (Recommended for use with G, MIO, MDME)

*All conduit entries must be sealed per installation instructions. Mounting instructions and provisions provided.

**EJB120604 MP SA RF KIT assembly includes the following:
- (1) EJB120604 MP SA (Explosionproof Junction Box drilled and tapped per above drawing)
- (1) MTG PLATE 1299003 (Mounting Plate)
- (1) PLG1 SA (½" Plug)
- (3) PLG2 SA (¾" Plug)
- (1) 1298201 (4" DIN Rail)

For Wireless Components

GUBs are used in applications similar to the EJB Series, but offer a glass window for quick visual inspection of internal devices which are protected in harsh and wet environments.

Certifications and Compliances:

- Class I, Divisions 1 & 2, Group D†
- NEMA 3, 7D, 12
- Explosionproof, raintight

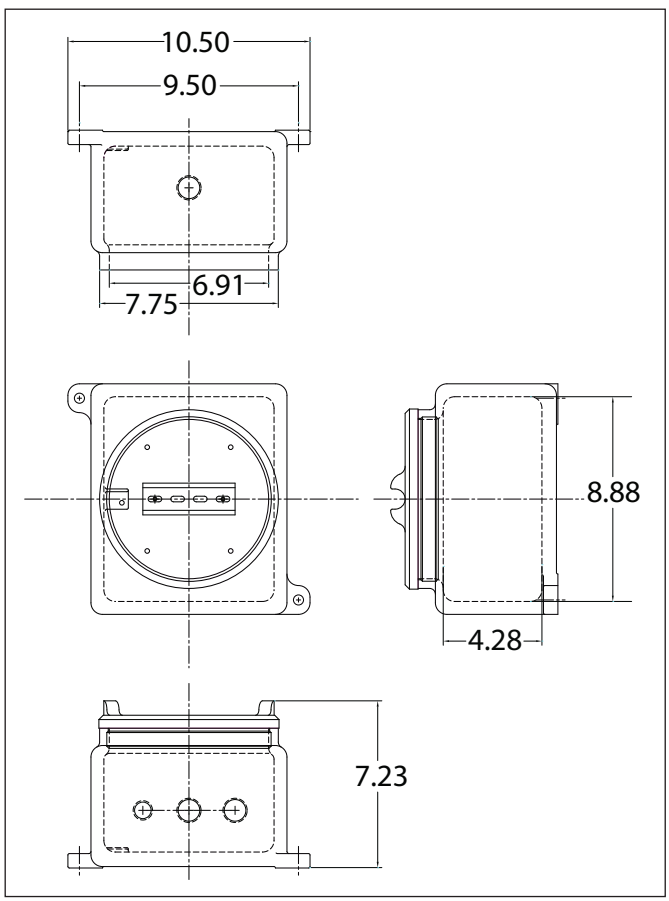
Design Features:

Domed cover or glass window cover can be selected:

- Glass window cover offers visibility of LED lights used for diagnostics
- Furnished with a mounting plate, DIN rail, tapped and plugged conduit entries, and tapped and plugged drain and antenna entries

Note: A larger GUB kit is available **(catalog number: GUB319 MP SA RF KIT)** to house radios and additional components.

Dimensions:



Ordering Information:

Cat. #	Description
GUB06 SA RF KIT††	GUB Enclosure Assembly (Recommended for use with LT, LR, MDME)

†All conduit entries must be sealed per installation instructions. Mounting instructions and provisions provided.

††GUB06 SA RF KIT assembly includes the following:

- (1) GUB06 (Explosionproof Junction Box)
- (1) GUB0108 (Glass Window Cover)
- (1) PLG1 SA (½" Plug)
- (3) PLG2 SA (¾" Plug)
- (1) 1298201 (4" DIN Rail)

Note: Mounting plate not required.

FJDS Non-metallic Enclosures

For Wireless Components

Cl. I, Div. 2

NEMA 1, 3, 3R, 4, 4X, 6P, 7 Div. 2, 12
Watertight
Raintight
Dust-tight
Corrosion Resistant

The FJDS Series is a cost-effective solution for housing Cooper Crouse-Hinds radios in environmentally harsh conditions.

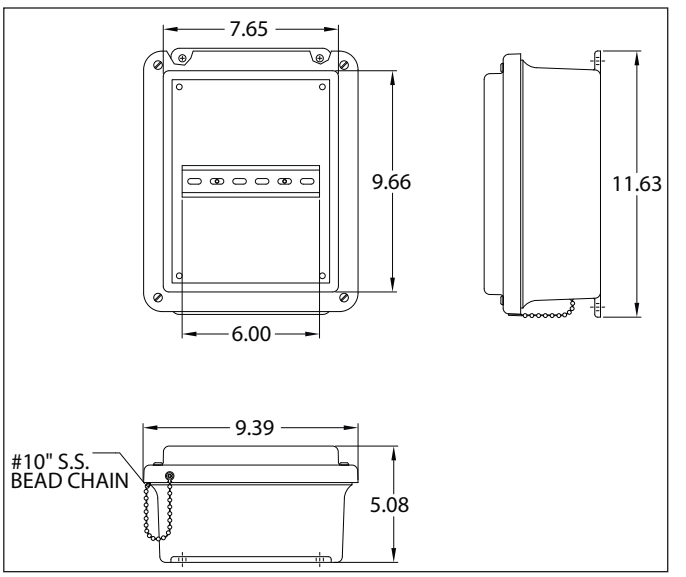
Certifications and Compliances:

- Class I, Division 2
- NEMA 1, 3, 3R, 4, 4X, 6P, 7 Division 2, 12
- Watertight, raintight, dust-tight, corrosion resistant

Design Features:

- Lift off cover design
- Surface flat stainless steel screw
- Integral mounting flange
- Soft, rounded edges
- Overhang cover
- Stainless steel beaded cover retention chain
- Provided with a mounting plate and DIN rail for easy mounting of Cooper Crouse-Hinds radio components

Dimensions:



Ordering Information:

Cat. #	Description
FJDS100804 MP FG RF KIT*	Lift Cover Enclosure Kit (Recommended for use with G, MIO, SIO, MDME, BAT)

*FJDS100804 MP FG RF KIT assembly includes the following:
- (1) FJDS100804 (Enclosure Box)
- (1) 1299013 (Mounting Plate)
- (1) 1298628 (6" DIN Rail)

FXDJ Non-metallic Enclosures

For Wireless Components

Cl. I, Div. 2

NEMA 1, 3, 4X, 7 Div. 2, 12
Watertight
Raintight
Dust-tight
Corrosion Resistant

The FXDJ Series provides easy access to Cooper Crouse-Hinds wireless devices, and will keep all electrical components free from rain and dust.

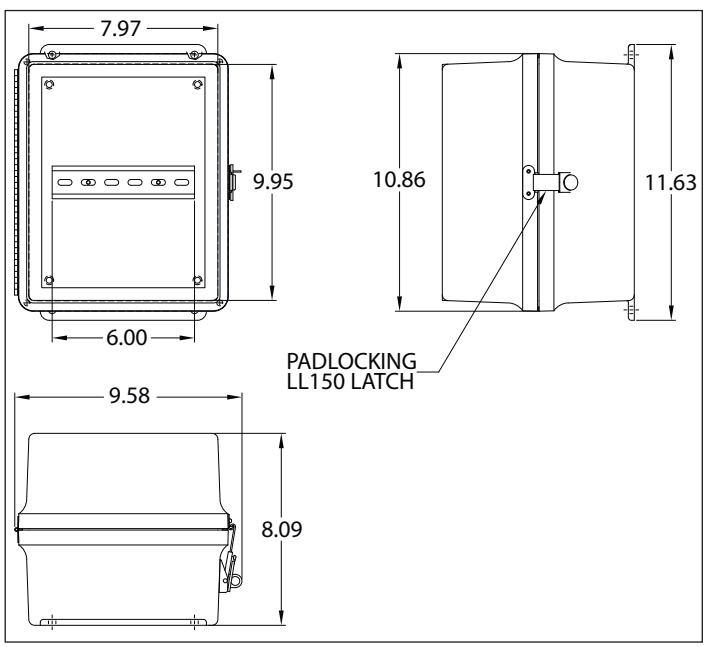
Certifications and Compliances:

- Class I, Division 2
- NEMA 1, 3, 4X, 7 Division 2, 12
- Watertight, raintight, dust-tight, corrosion resistant

Design Features:

- Latched cover allows for quick entry (can also be locked)
- Latch lies flat on side of enclosure
- Can be lifted and turned with ease
- Full 180º door opening
- Provided with a mounting plate and DIN rail for easy mounting of Cooper Crouse-Hinds radio components

Dimensions:



Ordering Information:

Cat. #	Description
FXDJ100808 MP FG RF KIT**	Latched Cover Enclosure Kit (Recommended for use with G, MIO, LT, LR, MDME)

**FXDJ100808 assembly includes the following:
- (1) FXDJ100808 (Enclosure Box)
- (1) 1299013 (Mounting Plate)
- (1) 1298628 (6" DIN Rail)

5W Photovoltaic Module Kit with Battery Back-up

Cl. I, Div. 2, Groups A, B, C, D (NEC Only)

NEMA 3R
NEMA 4†
NEMA 4X†

Cooper Crouse-Hinds solar kits provide reliable power in remote applications, eliminating expensive utility power investments. These systems are pre-wired per the National Electrical Code (NEC®) and Canadian Electrical Code (CEC®) to minimize installation time and wiring errors. Solar kits are installed in weatherproof enclosures to withstand harsh weather conditions (such as rain, dust, ice, etc.) and high wind loads.

Pre-configured systems can be selected to minimize purchasing and specification efforts, and they are constructed from quality components to maximize reliability and system life.

Applications:

Solar kits are:

- Installed with devices and equipment in remote locations (e.g. wireless radios), offering added flexibility for applications requiring DC power
- Especially well suited for sunny locations
- Used for obstruction lighting; instrumentation; cathodic protection; navigational aids; seismic monitoring; video surveillance; irrigation monitoring and control; telecommunications; tank and well level monitors; flow meters

Features:

- Supply power to monitor remote assets and their locations to improve emergency response time and eliminate time-consuming, on-site inspection
- Solar power is a mature technology which has been used for over 30 years in many applications requiring safe/reliable power sources
- Eliminate the need for conduit, cables, cable tray, and the necessary infrastructure involved in developing grid power in remote applications
- Pre-wired kits allow for quick installation by any qualified electrician
- Long, maintenance-free battery life (4-6 years) eliminates the need for frequent battery replacement
- Recommended temperature range: -30ºC to 50ºC (consult factory for more extreme temperatures)
- Class I, Division 2 assemblies available

Larger power requirements and other voltages may be accommodated. Please consult factory for custom designs, or for applications involving other types of equipment.

Certifications and Compliances:

Solar Panel

- cULus Listed
- FM Certified:
  Class I, Division 2, Groups A, B, C, D
  T3C: Ta = 60°C

Regulator

- UL Listed:
  UL1604
- CSA Certified:
  CSA 22.2 No. 213-M1987
- FM Certified:
  Class I, Division 2, Groups A, B, C, D

Enclosure

- cULus Listed
- UL Listed:
  UL508A
  NEMA 3R (standard)
  NEMA 4 and 4X options available (consult factory)

Circuit Protection

- UL Listed:
  UL489
- FM Certified (for Div. 2 version):
  Units < 10A: Class I, Division 2, Groups A, B, C, D, T6
  Units ≥ 10A: Class I, Division 2, Groups A, B, C, D, T4A
  UL1077

Battery

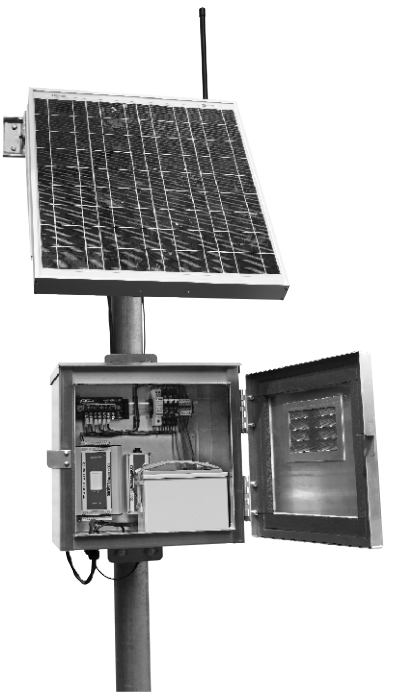
- UL Listed:
  UL1989

Standard Materials:

- PV module (solar panel) – clear anodized aluminum frame, potted or terminal-type junction box, high transmission 1/8" thick tempered glass front with white polyester back and EVA (ethylene vinyl acetate) encapsulant
- Enclosure - aluminum NEMA 3R standard
  - painted sheet steel NEMA 4 (optional)
  - 316 stainless steel NEMA 4X (optional)

Electrical Ratings:

- 0-20A, 12VDC (consult factory for applications above 20A)
- Regulator prevents the battery from deep discharging by disconnecting the battery at 11.5V and re-connecting the battery at 12.5V



Solar panel assembly shown with wireless transceiver and antenna installed as example. Radio and antenna to be ordered separately.

†NEMA 4 and NEMA 4X enclosures available upon request.

Components: PV Module (Solar Panel)

Cooper Crouse-Hinds solar panels are made of high efficiency polycrystalline silicon modules - durable materials capable of weathering any environment.

Features and benefits:

- Multi-crystalline modules offer high efficiency
- Small footprint - more compact than other solar technologies
- Fully encapsulated panel resists harsh weather conditions (hail, rain, wind, etc.)
- J-version junction box with terminal connection block accepts various conduit sizes, providing ease of installation
- 25 year expected life
- Provided with 15 feet of UV resistant cord for field connection of assemblies 30 watts and higher

Components: Regulator

Regulators manage your power requirements even in the harshest conditions. Regulators are used to channel the sun's energy into your equipment when energy is needed, or to charge the battery when energy is not required.

Features and benefits:

- Efficient and reliable solid state components
- Adjustable duty cycle for improved control
- Robust design rated for 25% overloads
- Encapsulated in epoxy potting for superior corrosion resistance
- Marine rated terminals/anodized case provides corrosion resistance
- Temperature compensation provides reliable power supply at extreme temperatures
- Green charging/red low voltage disconnect (LVD) indicators help expedite troubleshooting

Components: Enclosure

Cooper Crouse-Hinds enclosures are specifically designed to protect your solar kit components and equipment from the elements (wind, rain, snow, debris, etc.). These enclosures can be used with the Division 2 certified components listed to meet the needs of Division 2 rated locations.

Features and benefits:

- Corrosion resistant enclosures house all electrical components (battery/regulator/wiring), improve system reliability, and minimize maintenance
- Enclosures include mounting features, offering several different mounting options (poles, walls, or other structures)
- Enclosures have latches to ensure the door is sealed effectively and can be padlocked for tamper resistance

Components: Circuit Protection

These components will ensure the protection and integrity of your equipment in the field. Factory-sealed circuit protectors are available for use in Division 2 hazardous applications.

Features and benefits:

- Compact DIN rail mounted design
- 100 Megaohm insulation resistance for complete protection of internal components
- Sound, proven, and reliable design
- Custom configuration offers flexibility to meet a wide variety of needs

Components: Battery

Cooper Crouse-Hinds batteries supply the load when sunlight decreases at night. Each system can be designed to provide as many days of back-up power that your application requires. Batteries have been selected to support the repeated loading and unloading cycles encountered in solar power systems.

Features and benefits:

- Battery is designed for maintenance-free deep cycling solar applications
- Low stand loss minimizes deterioration between transport and storage
- Tank formed plates ensure that cells have equal voltages
- Non-spillable ICAO, IATA, and DOT ratings ensure safe transport without the need for special containers
- Cooper Crouse-Hinds wireless radio can detect and send a low battery status

†NEMA 4 and NEMA 4X enclosures available upon request.

Photovoltaic Module Kit with Battery Back-up

Cl. I, Div. 2, Groups A, B, C, D (NEC Only)

NEMA 3R
NEMA 4†
NEMA 4X†

Ordering Information Example:

SOL **30W** **12V** **48** **WR** **3R** **2**

1. Solar - **SOL**
2. Panel Size:
   5W (5 Watt Photovoltaic Module)
   20W (20 Watt Photovoltaic Module)
   30W (30 Watt Photovoltaic Module)
   40W (40 Watt Photovoltaic Module)
   50W (50 Watt Photovoltaic Module)
   65W (65 Watt Photovoltaic Module)
   75W (75 Watt Photovoltaic Module)
   80W (80 Watt Photovoltaic Module)
   Note: Cooper Crouse-Hinds offers panels up to 140W. Please contact factory for more information.
3. Battery:
   12V (12 Volt Gelled Electrolyte Battery)
   Note: Cooper Crouse-Hinds offers batteries up to 48VDC and AC. Please contact factory for more information.
4. Battery Storage Capacity Rating:
   7 (7.2 Amp-hour Rated Battery at c/100 hr rate to 1.75 VPC)
   36 (36 Amp-hour Rated Battery c/100 hr rate to 1.75 VPC)
   48 (48 Amp-hour Rated Battery c/100 hr rate to 1.75 VPC)
   70 (70 Amp-hour Rated Battery c/100 hr rate to 1.75 VPC)
   99 (99 Amp-hour Rated Battery c/100 hr rate to 1.75 VPC)
   Note: Cooper Crouse-Hinds offers battery storage up to 265AHr. Please contact factory for more information.
5. Regulator:
   WR (with Regulator)
6. Enclosure Type:
   3R (NEMA 3R Enclosure**)
   4X (NEMA 4X Enclosure)
7. Circuit Protector:
   2 (Division 2 Circuit Protector) - NEC only; not available in Canada
   CSA (CSA circuit protector - ordinary locations, CEC)
   Leave blank if ordinary location, NEC

**Enclosures suitable for other environments available upon request. Surge protection also available upon request.
†NEMA 4 and NEMA 4X enclosures available upon request.

Selecting a System:

Key questions to select a system:

- What location to install (i.e. how much sun)?
- What load, in amperes and volts? (size the panel and the battery)
- How often will the load need power?
- How many days of system autonomy are needed?

Determine the installation location, the load you wish to supply, and its duty cycle (what percentage of the time you wish to apply the load) following the three simple steps below:

1) Use a solar insolation map to determine the sun hours in your area.

2) Determine the load requirements for your application in Amp-hours / day. Please refer to the solar calculator on the Cooper Crouse-Hinds website for wireless load calculations.

- Determine the duty cycle (i.e. 100% for continuous vs. 50% for 12 hours per day) of your load.
- Adjust for a 1.2 Service Factor to account load requirement variability.

3) Select the solar kit capable of meeting or exceeding the load requirements (in Amp-hours / day) for your application. Please consult factory for higher load requirements.

Amp-Hours / Day Calculation:

Load requirement (Amp-hours / day) = (amps of device x duty cycle x Service Factor) x 24 hours / day

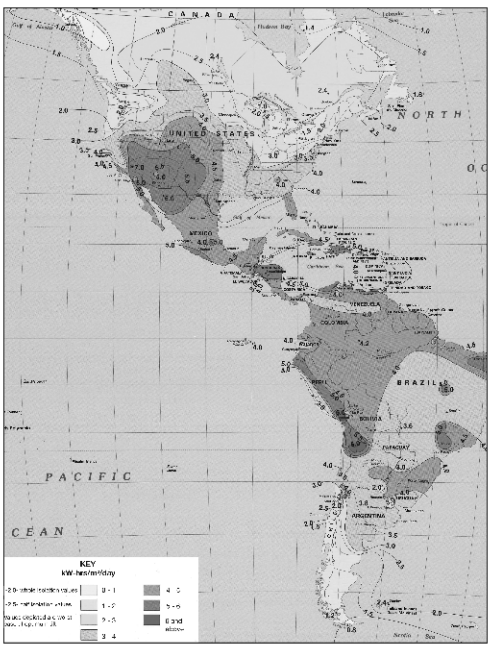
Example:

16.5 mA, continuous duty cycle, temperature = 10°C (50°F)

Load requirement = (16.5 mA x 100% x 1.2) x 24 hours / day = 475 mA-hr / day

Load requirement = 0.475 Amp-hours / day

Solar Insolation Map:



Insolation map courtesy of BP Solar.

**For specific color information, see the following Web site: http://www.crouse-hinds.com/wirelessIO/Solar_Calculator.cfm.

***Please consult Cooper Crouse-Hinds for insolation maps of additional continents.

Pre-configured Solar Kits - Ordering Information:

	Equivalent Sun Hours ‡				
Solar Kit Cat. #	**2**	**3**	**4**	**5**	**6**
SOL 5W 12V 7 WR 3R	0.54 / 10.30	0.81 / 6.90	1.08 / 5.18	1.35 / 4.10	1.62 / 3.40
SOL 20W 12V 36 WR 3R	2.38 / 12.10	3.57 / 8.10	4.76 / 6.10	5.95 / 4.80	7.14 / 4.10
SOL 20W 12V 48 WR 3R	2.38 / 16.10	3.57 / 10.80	4.76 / 8.10	5.95 / 6.50	7.14 / 5.40
SOL 30W 12V 36 WR 3R	3.56 / 8.10	5.34 / 5.40	7.12 / 4.10	8.90 / 3.30	10.68 / 2.70
SOL 30W 12V 48 WR 3R	3.56 / 10.80	5.34 / 7.20	7.12 / 5.40	8.90 / 4.30	10.68 / 3.50
SOL 30W 12V 70 WR 3R	3.56 / 15.70	5.34 / 10.50	7.12 / 7.80	8.90 / 6.30	10.68 / 5.20
SOL 40W 12V 36 WR 3R	4.60 / 6.30	6.90 / 4.20	9.20 / 3.10	11.50 / 2.50	13.80 / 2.00
SOL 40W 12V 48 WR 3R	4.60 / 8.30	6.90 / 5.60	9.20 / 4.20	11.50 / 3.40	13.80 / 2.80
SOL 40W 12V 70 WR 3R	4.60 / 12.20	6.90 / 8.10	9.20 / 6.00	11.50 / 4.80	13.80 / 4.00
SOL 50W 12V 48 WR 3R	5.80 / 6.60	8.70 / 4.40	11.60 / 3.30	14.50 / 2.60	17.40 / 2.20
SOL 50W 12V 70 WR 3R	5.80 / 9.60	8.70 / 6.40	11.60 / 4.80	14.50 / 3.80	17.40 / 3.20
SOL 65W 12V 48 WR 3R	7.38 / 5.20	11.07 / 3.30	14.76 / 2.60	18.45 / 2.00	22.14 / 1.70
SOL 75W 12V 70 WR 3R	8.60 / 6.50	12.90 / 4.30	17.20 / 3.30	21.50 / 2.60	25.80 / 2.10
SOL 80W 12V 99 WR 3R	9.00 / 8.80	13.50 / 5.90	18.00 / 4.40	22.50 / 3.50	27.00 / 2.90

†NEMA 4 and NEMA 4X enclosures available upon request.
‡ First number in table indicates the system production in amp-hours/day at 12VDC. Second number indicates the days of autonomy of the solar kit (days the battery can provide power to the specified load).

Larger power requirements may be accommodated. Please consult factory for custom designs, or for applications involving other types of equipment (additional Amp-hours / day production, additional days of autonomy, etc.).

cULus 1741 Listed (combiners)
cETLus 1741 Listed (combiners and disconnects)
NEMA 4X (fiberglass and stainless steel)
NEMA 3R (painted steel)
Made in America

Solar Combiner Solutions

Combiners and disconnects that offer superior resistance and durability from harsh weather and abusive solar environments

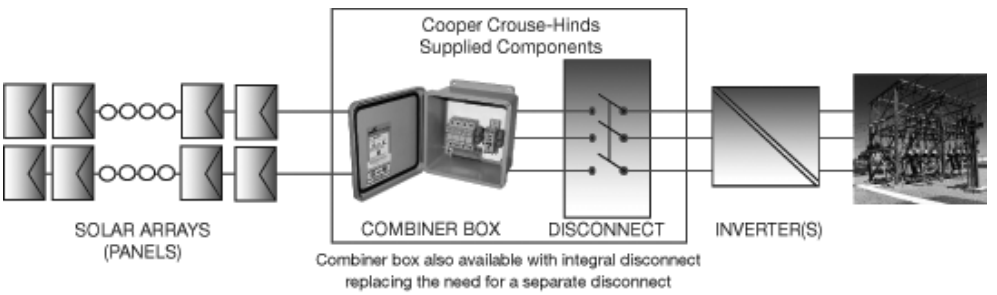
Leading the way in Solar Technology

Cooper Crouse-Hinds combiner boxes and disconnects for the solar market integrate a comprehensive line of electrical products with expert support, industry insights, and local availability to improve safety and productivity in the most demanding industrial, commercial and residential environments worldwide.

Solar Background Information
A solar array may be one panel or many in series, and may range from a single 12 volt panel up to multi-panel high voltage array for grid-tied systems. Grid-tied systems can go as high as 1000 VDC, while battery systems are typically 12, 24, or 48 V.

Higher voltage systems (over 48 V) have different NEC code requirements than those for low voltage battery systems, and the two types are NOT interchangeable.

Cooper Crouse-Hinds Solar Combiners are designed for higher voltage circuits used in grid-tied applications. All meet NEC requirements and are made in accordance with UL requirements and are protected by Cooper Bussmann® families of fast-acting fuses specifically designed for the protection and isolation of photovoltaic strings.



Cooper Crouse-Hinds Product Offering

Solar Combiners
Cooper Crouse-Hinds Solar Combiners are used to group input wires/circuits from several arrays and/or solar panels. The combined circuit results in fewer output circuits and combines them into one main buss or feed going to the inverter, saving labor and material costs.

Solar Pass Through Boxes
Solar Pass Through Boxes are used in residential applications to provide a low profile, cost effective way to group input wires/circuits from several arrays and/or solar panels and transition from solar (PV) cable to traditional building wire. The Pass Through Box was designed for PV applications where over current protection is not necessary due to the low power rating of the PV string.

Solar Cord Grips
Solar Cord Grips are used in both commercial and residential grid-tied PV solar applications and are designed to accommodate the entry of multiple PV wires coming into a combiner or pass through box. The Solar Cord Grips provide mechanical strain relief as well as a liquid tight seal around the solar panel wires.

Solar Cable Assemblies
A comprehensive offering of solar cable assemblies are also available in molded to cable or mechanical termination configurations. Typical conductor size is #12 or #10. Available in standard or custom cable lengths, with or without an in-line fuse. Consult factory for more details.

Solar Recombiners
Cooper Crouse-Hinds Recombiner Boxes are used in larger photovoltaic systems. A Recombiner Box effectively groups the output wires from several combiner boxes into one main output feed which then goes to the inverter.

Solar Disconnects
The National Electrical Code® requires a disconnect switch which provides circuit interruption to the down stream inverter. The disconnect can be internally mounted in the combiner or externally mounted between the combiner and inverter. The disconnect switch can be located at one of two places: either inside the building nearest the point of entrance of the system conductors, or outside the building. If the solar disconnect is not located near the utility company's meter, then a plaque is required by the front door stating where the solar disconnect is located.

Cooper Crouse-Hinds Solar Protection for Fiberglass Enclosures
The Cooper Crouse-Hinds solar protection formula provides the enclosure the strength and durability to provide long, dependable service even in the most demanding environmental conditions. Cooper Crouse-Hinds fiberglass enclosures retain gloss and color even when exposed to harsh UV light and offer superior resistance to chemicals and are fire retardant.

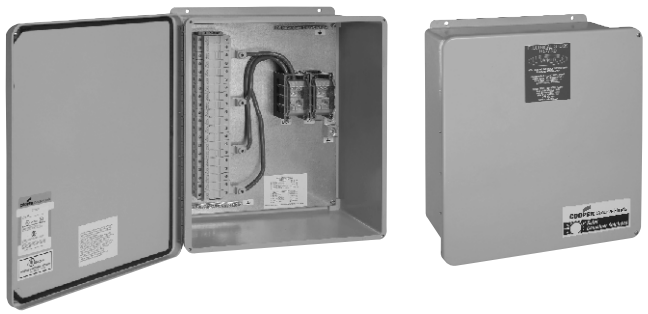
A special UV absorber is added into this solar protection formula and works to absorb UV energy and release it without damaging the fiberglass enclosure, thus providing increased protection of the polyester material and increased resistance to the damaging effects of UV radiation. For additional information on Cooper Crouse-Hinds Solar Protection, choose Fiberglass Enclosures from: http://www.crouse-hinds.com.

Solar Combiners

cULus 1741 Listed
cETLus 1741 Listed
NEMA 4X (fiberglass and stainless steel)
NEMA 3R (painted steel)
Made in America

Application:

Cooper Crouse-Hinds Solar Combiner Solutions are designed and built to minimize system costs by providing maximum flexibility. Solar Combiner Solutions offer a range of 1 to 48 input circuits, with a durable non-metallic (NEMA 4X) enclosure, engineered and manufactured to perform in the harshest environmental conditions. UL 1741 Listed* as standard, providing peace of mind and plenty of wiring room for ease of installation.



Features:

- cULus 1741 Listed* - UL File No. E330318
- cETLus 1741 Listed
- RATED FOR 600 VDC - CONTINUOUS DUTY
- Touch-Safe fuse holders and power distribution blocks for safe operation
- 90ºC output terminals
- Fiberglass enclosures provided as standard; also available in NEMA 3R painted steel or NEMA 4X stainless steel
- Configured for positive and negative grounded arrays
- 1000VDC rated capability - consult factory
- Smart combiners available (DC string monitoring) - consult factory

Standard Materials and Finishes:

- Hot compression molded fiberglass-reinforced thermoset polyester
- Non-conductive, impact resistant, UV resistant, flame retardant
- Captive cover screws can't be dropped or lost
- Poured polyurethane seamless gasket provides watertight, dust-tight environmental seal
- Stainless steel used on all external hardware

Solar Combiner Ordering Information:

Most commonly ordered configurations

No. of Strings	N4X Fiberglass Cat. #	N3R Sheet Steel Cat. #	Description
4	**CCBF04 F15**	**CCBS04 F15**	4 string, 15A fused
6	**CCBF06 SP**	**CCBS06 SP**	6 string, 600VDC surge protection
10	**CCBF10**	**CCBS10**	10 string
12	**CCBF12 F15**	**CCBS12 F15**	12 string, 15A fused

Catalog Numbering System

Use the table below to build a catalog number for a combiner configuration that matches your specific project requirement

BASE SOLAR COMBINER		WITH OPTIONAL FACTORY SUPPLIED FUSES		WITH OPTIONAL INTEGRAL DISCONNECT		W/OPTIONAL SURGE PROTECTION	DC MONITORING
CCBF	12	F	15	DS	200	SP	DCM

Enclosure Type	Number of Input Circuit	Fused	Fuse Amperage	Integral Disconnect	Trip Rating for Integral Disconnect	Surge Protection	DC Monitoring
CCBF (Fiberglass N4X) **CCBS** (Painted Steel N3R) **CCBSS** (Stainless Steel N4X)	**01** (1 input circuit) **02** (2 input circuit) **03** (3 input circuit) **04** (4 input circuit) **05** (5 input circuit) **06** (6 input circuit) Offered up to 48 circuits	**F** (Fuses provided) **BLANK** (Fuses not supplied by factory) • Cooper Bussmann fuses recommended - DCM fuses for 600VDC combiner boxes - PV fuses for 1000VDC combiner boxes	**08** (8A fuse) **10** (10A fuse) **12** (12A fuse) **15** (15A fuse) **BLANK** (Fuses not provided by factory)	**DS** (Disconnect Switch for use with 1 - 48 input circuits) **BLANK** (No integral disconnect)	**100** (100A) **200** (200A) **400** (400A) **BLANK** (No integral disconnect)	**SP** (Surge protection) • UL 1449 3rd Edition Listed • 40kA Total Discharge Current (8/20 us) • 30kA/600VDC Interrupting Rating • Small size takes up minimal space in enclosure (Only 2 inches wide) **BLANK** (No surge protection)	**DCM** (DC monitoring units installed) **BLANK** (No DC monitoring)

5W Solar Combiners with Integral Disconnects

cETLus 1741 Listed
Built to UL1741 standards
NEMA 4X (fiberglass and stainless steel)
NEMA 3R (painted steel)
Made in America

Application:

Cooper Crouse-Hinds Solar Combiners with Integral Disconnects provide all the strong and durable features of our standard Solar Combiners and are available with 1-24 input circuits. Integral disconnects save material costs, installation time and labor by joining the combiner box and disconnect within one enclosure and eliminating the need for a disconnect in a separate enclosure.

Features:

- cETLus 1741 Listed
- Constructed in accordance to UL 1741 Standards
- Integral Disconnects available in 100A, 200A and 400A
- Rated for 600 VDC - continuous duty
- Touch-Safe fuse holders and power distribution blocks for safe operation
- 90ºC output terminals
- Fiberglass enclosures with captive stainless steel screws and formed-in-place polyurethane seamless gasket provided as standard
- Also available in NEMA 3R painted steel or NEMA 4X stainless steel
- Configured for positive and negative grounded arrays
- 1000VDC rated capability - consult factory
- Smart combiners available (DC string monitoring) - consult factory

Standard Materials and Finishes:

- Hot compression molded fiberglass-reinforced thermoset polyester
- Non-conductive, impact resistant, UV resistant, flame retardant
- Captive cover screws can't be dropped or lost
- Poured polyurethane seamless gasket provides watertight, dust-tight environmental seal
- Stainless steel used on all external hardware

Integral Disconnect Rating:

To determine the rating of the integral disconnect, simply multiply the number of input circuits by the ampacity rating of each fuse in these circuits. Round to the next (higher) trip rating. In NO case can the max current exceed the trip rating of the disconnect switch or breaker. Example: a 12 string combiner box with every input circuit with a fuse rated at 8 Amps is 12 x 8 = 96. Required rating for the switch or circuit breaker would be 100 Amps.

Solar Combiner with Integral Disconnect Ordering Information:

Most commonly ordered configurations

No. of Strings	N4X Fiberglass Cat. #	N3R Sheet Steel Cat. #	Description
8	**CCBF08 F15 DS100**	**CCBS08 F15 DS100**	8 string, 15A fused, 100A integral disconnect
12	**CCBF12 F15 DS200**	**CCBS12 F15 DS200**	12 string, 15A fused, 200A integral disconnect
16	**CCBF16 DS200 SP**	**CCBS16 DS200 SP**	16 string, 200A integral disconnect, 600VDC surge protection
24	**CCBF24 F15 DS200**	**CCBS24 F15 DS200**	24 string, 15A fused, 200A integral disconnect

Catalog Numbering System

Use the table below to build a catalog number for a combiner configuration that matches your specific project requirement

BASE SOLAR COMBINER		WITH OPTIONAL FACTORY SUPPLIED FUSES		WITH OPTIONAL INTEGRAL DISCONNECT		W/OPTIONAL SURGE PROTECTION	DC MONITORING
CCBF	12	F	15	DS	200	SP	DCM

Enclosure Type	Number of Input Circuit	Fused	Fuse Amperage	Integral Disconnect	Trip Rating for Integral Disconnect	Surge Protection	DC Monitoring
CCBF (Fiberglass N4X) **CCBS** (Painted Steel N3R) **CCBSS** (Stainless Steel N4X)	**01** (1 input circuit) **02** (2 input circuit) **03** (3 input circuit) **04** (4 input circuit) **05** (5 input circuit) **06** (6 input circuit) Offered up to 48 circuits	**F** (Fuses provided) **BLANK** (Fuses not supplied by factory)	**08** (8A fuse) **10** (10A fuse) **12** (12A fuse) **15** (15A fuse) **BLANK** (Fuses not provided by factory)	**DS** (Disconnect Switch for use with 1 - 48 input circuits) **BLANK** (No integral disconnect)	**100** (100A) **200** (200A) **400** (400A) **BLANK** (No integral disconnect)	**SP** (Surge protection) • UL 1449 3rd Edition Listed • 40kA Total Discharge Current (8/20 us) • 30kA/600VDC Interrupting Rating • Small size takes up minimal space in enclosure (Only 2 inches wide) **BLANK** (No surge protection)	**DCM** (DC monitoring units installed) **BLANK** (No DC monitoring)

- Cooper Bussmann fuses recommended
  - DCM fuses for 600VDC combiner boxes
  - PV fuses for 1000VDC combiner boxes

5W

COOPER Crouse-Hinds

Solar Cable Assemblies, Recombiners and Disconnect Switches

Solar Cable Assemblies

Application:

A comprehensive offering of solar cable assemblies are also available in molded to cable or mechanical termination configurations. Typical conductor size is #12 or #10. Available in standard or custom cable lengths, with or without an in-line fuse. It is constructed of stranded copper conductors with single layer XLP insulation, rated to 90 degrees C in exposed or concealed, wet or dry locations, and sunlight and direct burial resistant per the NEC and CEC requirements.

Ordering Information:

Consult factory for ordering information

Recombiners

Application:

In large photovoltaic (PV) systems, multiple combiner boxes are often necessary, and the outputs of these combiner boxes may need to be combined again—recombined—before reaching a central inverter. Cooper Crouse-Hinds Recombiner Boxes allow for ease of installation, saving time, labor, and most importantly, system costs.

Ordering Information:

Consult factory for ordering information

Disconnects

Application:

Cooper Crouse-Hinds Solar Disconnect Solutions are used as a disconnecting means and rated for 600 VDC/AC. The disconnects are offered separately in a sheet steel enclosure or as an integral mounted device to the Cooper Crouse-Hinds Combiner Solutions, offering reduced space and cost of installation, the ability to disconnect power from a remote location, and provide short circuit protection.

Features:

- Switches are heavy duty 3-pole, with visible blades; a quick make-and-break mechanism with reinforced, positive pressure type blade and jaw construction. Fusible types have fuse clips with steel reinforcing springs of positive pressure type. Pressure connectors are used for wire connectors.
- Switch enclosure covers are interlocked with the body and operating mechanism and cannot be opened when the switch is closed ("ON"). When the switch is open ("OFF"), the switch cannot be put in a closed ("ON") position with the door open.
- The switch operating handle may be padlocked in the "ON" or "OFF" position. In addition, the interlock construction has been designed to allow the door of the unit to be padlocked. This feature allows operation while preventing unqualified or unauthorized entry.

Materials and Finishes:

- Enclosure – sheet steel
- Operating handle – non-metallic
- Other exterior parts – stainless steel

Enclosure Certification & Compliances:

- NEMA Types 3R
- UL Standard 98

Electrical Rating Ranges:

- 3 and 4† Pole; fusible or non-fusible; 250 VDC; 600 VDC
- 30, 60, 100, 200 or 400 amperes†

Disconnect Switches Ordering Information Specifications:

Heavy Duty Disconnect Switch - 600 VDC 3-Pole	30 Amp Sheet Steel	30 Amp Fiberglass	60 Amp Sheet Steel	60 Amp Fiberglass	100 Amp Sheet Steel	100 Amp Fiberglass	200 Amp Sheet Steel	200 Amp Fiberglass
Catalog Number - Fusible	**CH361R**	**CH361F**	**CH362R**	**CH362F**	**CH363R**	**CH363F**	**CH364R**	**CH364R**
Catalog Number - Non-fusible	**CHU361R**	**CHU361F**	**CHU362R**	**CHU362F**	**CHU363R**	**CHU363F**	**CHU364R**	**CHU364R**

† For 4-Pole, 400 Amp or disconnect switches in stainless steel enclosure - Consult Factory.

Combiner Technical Information:

Wire Size & Torque Table

Strings	Positive Input Terminal		Negative & Ground Input Terminal		Positive Output Terminal		Negative Output Teminal		Ground Output Terminal	
	Wire Size (AWG/kcmil)	Torque (in-lbs)	Wire Size (AWG/kcmil)	Torque (in-lbs)	Wire Size (AWG/kcmil)	Torque (in-lbs)	Wire Size (AWG/kcmil)	Torque (in-lbs)	Wire Size (AWG/kcmil)	Torque (in-lbs)
01	#16-#8	20-25	#14-#4	20-35	#4-250 #10-1/0**	110-325 20-35**	#4-250 #8-2/0**	110-325 120-500**	#4-250 #14-#4**	110-325 20-35**
02										
03										
04										
05										
06										
07					#3-250	150-325	#3-250	150-325	#3-250	150-325
08					#2-250		#2-250		#2-250	
09					#1-250		#1-250		#1-250	
10					1/0-250	180-325	1/0-250	180-325	1/0-250	180-325
11					1/0-250		1/0-250		1/0-250	
12					2/0-250		2/0-250		2/0-250	
13	#18-#8	20-25			1/0-250		1/0-250		1/0-250	
14					2/0-250		2/0-250		2/0-250	
15										
16					3/0-250	250-325	3/0-250	250-325	3/0-250	250-325
17					2/0-250	180-325	2/0-250	180-325	2/0-250	180-325
18					3/0-250	250-325	3/0-250	250-325	3/0-250	250-325
19										
20										
21										
22										
23										
24					4/0-250		4/0-250		4/0-250	

Note 1: For models with no integral disconnect switch use the values marked **

Note 2: Torque and wiring sizing to be compliant with UL 1741 Articles 66.1/66.4F and NEC 310.15.

Enclosure Sizing

	String Count	NEMA Type	Size (Inches)
Base Models	1-6	4X	12X10X05
		3R	12X10X06
	7-12	4X	16X14X06
		3R	16X16X06
	13-20	4X	18X16X08
		3R	18X18X06
	21-24	4X	20X16X08
		3R	20X16X06
With Disconnect Switch	1-15	4X	18X16X08
		3R	18X18X10
	16-19	4X	20X16X08
		3R	24X24X10
	20-24	3R	24X24X10
With DC Monitoring	1-8	4X	20X16X08
		3R	24X20X08
	9-16	4X	30X24X10
		3R	30X24X08
	17-24	3R	36X30X12

Mechanical Combiner Box Characteristics

Combiner Technical Information:

	Electrical Properties													
	Catalog number (i.e. CCBF12)		Maximum Input Fuse Rating	Maximum Continuous Operating Current	Maximum Input Short Circuit Current (Isc)	Maximum Voltage		Catalog number (i.e. CCBF12)		Maximum Input Fuse Rating	Maximum Continuous Operating Current	Maximum Input Short Circuit Current (Isc)	Maximum Voltage
	Base	String Input	(A)	(A)	(A)	(VDC)		Base	String Input	(A)	(A)	(A)	(VDC)
1 Through 12 String	CCBF_ CCBS_	01	15	12	9.60	600	12 Through 24 String	CCBF_ CCBS_	13	15	130 136.5*	8.00 8.40*	600
	CCBF_ CCBS_	02	15	24	9.60			CCBF_ CCBS_	14	15	140 147*	8.00 8.40*	
	CCBF_ CCBS_	03	15	36	9.60			CCBF_ CCBS_	15	15	150 157.5*	8.00 8.40*	
	CCBF_ CCBS_	04	15	48	9.60			CCBF_ CCBS_	16	15	160 168*	8.00 8.40*	
	CCBF_ CCBS_	05	15	60	9.60			CCBF_ CCBS_	17	15	153 178.5*	7.20 8.40*	
	CCBF_ CCBS_	06	15	72	9.60			CCBF_ CCBS_	18	15	162 189*	7.20 8.40*	
	CCBF_ CCBS_	07	15	84	9.60			CCBF_ CCBS_	19	15	171 199.5*	7.20 8.40*	
	CCBF_ CCBS_	08	15	96	9.60			CCBF_ CCBS_	20	10 15*	160 210*	6.40 8.40*	
	CCBF_ CCBS_	09	15	108	9.60			CCBF_ CCBS_	21	10 15*	168 220.5*	6.40 8.40*	
	CCBF_ CCBS_	10	15	120	9.60			CCBF_ CCBS_	22	10 15*	176 231*	6.40 8.40*	
	CCBF_ CCBS_	11	15	132	9.60			CCBF_ CCBS_	23	10 15*	184 241.5*	6.40 8.40*	
	CCBF_ CCBS_	12	15	120 126*	8.00 8.40*			CCBF_ CCBS_	24	10 15*	192 252*	6.40 8.40*	

*Note: All marked dual values are for applications with #10 AWG input conductors ONLY

Electrical Combiner Box Characteristics

Overcurrent Protection - PV Fuse-Links

Current Rating	Energy Integrals (A2s)		Power Loss (watts)	
	Pre-Arcing	Total at 1000V	0.8 In	In.
8A	3	32	0.5	2.0
10A	7	50	0.6	2.1
12A	10	100	1.3	2.6
15A	20	200	1.8	3.0

Combiner Dimensional Information

# of Input Circuits	Enclosure Size Inches (HxWxD)	Overall Dimensions Inches (HxWxD)	Inside Dimensions Inches (HxWxD)	Mounting Dimensions Inches (HxW)	Approximate Weight (lbs)
1-6	12x10x5	13.56 x 11.43 x 5.21	11.79 x 9.80 x 4.94	12.75 x 8.00	10
7-12	16x14x6	17.53 x 15.46 x 6.23	15.63 x 13.60 x 5.94	16.75 x 12.00	18
13-20	18x16x8	19.62 x 17.61 x 8.82	17.69 x 15.69 x 8.45	18.88 x 12.00	27
21-24	20x16x8	22.00 x 17.68 x 8.83	19.72 x 15.72 x 8.45	21.25 x 10.00	33
25-28	24x20x8	27.00 x 21.24 x 9.90	24.05 x 20.39 x 9.25	25.75 x 14.00	47
29-37	30x20x6	32.86 x 20.99 x 7.89	29.90 x 20.14 x 7.23	30.75 x 14.25	60
38-48	36x30x8	39.31 x 32.50 x 10.05	36.31 x 31.69 x 9.36	38.13 x 23.88	112

Applications:

Cooper Crouse-Hinds Solar Pass Through Boxes (sometimes referred to as “transition boxes”) are used in residential applications to provide a low profile, cost effective way to group input wires/circuits from several arrays and/or solar panels and transition from solar (PV) cable to regular building wire. The Pass Through Box was designed for PV applications where over current protection is not necessary due to the low power rating of the PV string.

Features:

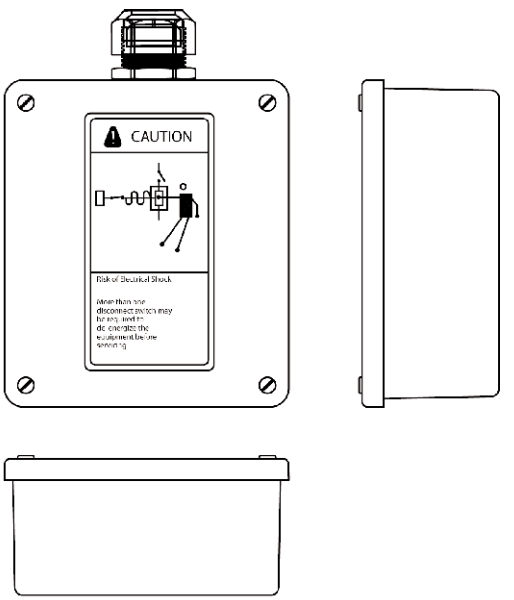
- Rated 600VDC continuous duty
- Constructed in accordance with UL 1741 standards providing spacious wiring room for quick easy wire termination
- Factory installed multi-hole solar cord grip provides dependable secure wire termination to enclosure and saves field installation – eliminating the need for enclosure drilling – saving time & labor
- Fiberglass enclosures with captive stainless steel screws and formed-in-place polyurethane seamless gasket provided as standard
- Available in N3R sheet steel enclosures – consult factory
- Light weight design offers easy mounting capabilities. Optional mounting feet are available for increased customer flexibility

Certifications and Compliances:

- NEMA 4X

Materials and Finishes:

- Hot compression molded fiberglass reinforced thermoset polyester
- Non-Conductive, impact resistant, UV resistant, flame retardant
- Poured Polyurethane seamless gasket provides water-tight, dust-tight environmental seal
- Stainless steel used on all external hardware



Solar Pass Through Box Ordering Information

Cat. #	Description
CPBF03	3 Circuit Pass Through Box
CPBF04	4 Circuit Pass Through Box

For additional configurations, please consult factory

Applications:

Cooper Crouse-Hinds Solar Cord Grips are used in both commercial and residential grid-tied PV solar applications and are designed to accommodate the entry of multiple PV wires coming into a combiner or pass through box. The Solar Cord Grips provide mechanical strain relief as well as a liquid tight seal around the solar panel wires.

Features:

- Multi-hole cord grip to allow for entry of multiple PV wires.
- Solar cord grips offer customer flexibility by allowing the termination from 1 to 31 PV wires in a single connector.
- Skinned over glands provide a durable, liquid tight seal around the wires.
- No disassembly required for installation.
- 5MM offering accommodates USE-2, 12AWG and 10AWG wire.
- 7MM offering accommodates 1000V PV cable, 12AWG and 10AWG wire.
- Temperature rating: -22°F (-30°C) to 212°F (100°C) to meet the most demanding environmental conditions.

Photo shown with steel locknut
(locknuts must be ordered separately)

Certifications and Compliances:

- UL/cUL listed
- IP68
- Flammability rating: 94-V2

Standard Materials:

- 6/6 nylon with TPE/Buna N sealing glands

Ordering Information:

Cat. #	Trade Size	No. of Holes	Hole Cable Diam.	Wire Type	Size
NCGS25	¾"	5 Holes	5MM	USE-2	12AWG, 10AWG
NCGS237	¾"	3 Holes	7MM	1000V PV Cable	12AWG, 10AWG
NCGS39	1"	9 Holes	5MM	USE-2	12AWG, 10AWG
NCGS357	1"	5 Holes	7MM	1000V PV Cable	12AWG, 10AWG
NCGS413	1¼"	13 Holes	5MM	USE-2	12AWG, 10AWG
NCGS497	1¼"	9 Holes	7MM	1000V PV Cable	12AWG, 10AWG
NCGS631	2"	31 Holes	5MM	USE-2	12AWG, 10AWG
NCGS6197	2"	19 Holes	7MM	1000V PV Cable	12AWG, 10AWG

Locknut Ordering Information:

Material	Cat. #	Trade Size
Steel	**12**	¾"
	13	1"
	14	1 ¼"
	16	2"
Aluminum	**12 SA**	¾"
	13 SA	1"
	14 SA	1 ¼"
	16 SA	2"
Non-metallic	**12N**	¾"
	13N	1"
Zinc	**12DC**	¾"
	13DC	1"
	14DC	1 ¼"
	16DC	2"

Applications:

Cooper Crouse-Hinds Solar Cord Grips are used in both commercial and residential grid-tied PV solar applications and are designed to accommodate the entry of multiple PV wires coming into a combiner or pass through box. The Solar Cord Grips provide mechanical strain relief as well as a liquid tight seal around the solar panel wires.

Features:

- Multi-hole cord grip to allow for entry of multiple PV wires.
- Solar cord grips offer customer flexibility by allowing the termination from 1 to 31 PV wires in a single connector.
- Skinned over glands provide a durable, liquid tight seal around the wires.
- No disassembly required for installation.
- 5MM offering accommodates USE-2, 12AWG and 10AWG wire.
- 7MM offering accommodates 1000V PV cable, 12AWG and 10AWG wire.
- Temperature rating: -22°F (-30°C) to 212°F (100°C) to meet the most demanding environmental conditions.

Photo shown with steel locknut
(locknuts must be ordered separately)

Certifications and Compliances:

- UL/cUL listed
- IP68
- Flammability rating: 94-V2

Standard Materials:

- 6/6 nylon with TPE/Buna N sealing glands

Ordering Information:

Cat. #	Trade Size	No. of Holes	Hole Cable Diam.	Wire Type	Size
NCGS25	¾"	5 Holes	5MM	USE-2	12AWG, 10AWG
NCGS237	¾"	3 Holes	7MM	1000V PV Cable	12AWG, 10AWG
NCGS39	1"	9 Holes	5MM	USE-2	12AWG, 10AWG
NCGS357	1"	5 Holes	7MM	1000V PV Cable	12AWG, 10AWG
NCGS413	1¼"	13 Holes	5MM	USE-2	12AWG, 10AWG
NCGS497	1¼"	9 Holes	7MM	1000V PV Cable	12AWG, 10AWG
NCGS631	2"	31 Holes	5MM	USE-2	12AWG, 10AWG
NCGS6197	2"	19 Holes	7MM	1000V PV Cable	12AWG, 10AWG

Locknut Ordering Information:

Material	Cat. #	Trade Size
Steel	**12**	¾"
	13	1"
	14	1 ¼"
	16	2"
Aluminum	**12 SA**	¾"
	13 SA	1"
	14 SA	1 ¼"
	16 SA	2"
Non-metallic	**12N**	¾"
	13N	1"
Zinc	**12DC**	¾"
	13DC	1"
	14DC	1 ¼"
	16DC	2"

