

D2 W LT and D2 W LR

IF 1569

Wireless I/O

SAVE THESE INSTRUCTIONS FOR FUTURE REFERENCE



WARNING

To avoid the risk of fire and electric shock, this product should be installed by a qualified electrician only.



WARNING

To avoid electric shock: be certain power is OFF before and during installation and maintenance.

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Safety Information

To ensure your D2 W LT and D2 W LR enjoys a long life, double-check **ALL** your connections with the *Installation Guide* before powering on the module.



Incorrect termination of supply wires may cause internal damage and will void warranty.

Exposure to RF energy is an important safety consideration. The FCC has adopted a safety standard for human exposure to radio frequency electromagnetic energy emitted by FCC regulated equipment as a result of its actions in Docket 93-62 and OET Bulletin 65 Edition 97-01.

FCC Notice when used in USA: D2 W MIO Wireless I/O Module

Part	Additional Information
15	This device has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules (Code of Federal Regulations 47CFR Part 15). Operation is subject to the condition that this device does not cause harmful interference.
90	This device has been type accepted for operation by the FCC in accordance with Part 90 of the FCC rules (47CFR Part 90). See the label on the unit for the specific FCC ID and any other certification designations.

Industry Canada: D2 W MIO Wireless I/O Module

RSS-119 - This device has been type accepted for operation by Industry Canada in accordance with RSS-119 of the Industry Canada rules. See the label on the unit for the specific Industry Canada certification number and any other certification designations.

NOTE: Any changes or modifications not expressly approved by Cooper Crouse-Hinds could void the user's authority to operate this equipment.

To operate this equipment legally, the user must obtain a radio-operating license from the government agency. This is done so the government can coordinate radio users in order to minimize interference.

Safety Information - FCC Notice

This device complies with Part 15.247 of the FCC Rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference; and
- This device must accept any interference received, including interference that may cause undesired operation.

NOTE: This equipment is suitable for use in Class 1, Division 2, groups A, B, and C, or non-hazardous locations only.

IMPORTANT ELECTRICAL SAFETY INFORMATION

In order to comply with Electrical Safety Regulations, this module must be installed in an Electrical AND Fire enclosure. This enclosure may be single or multiple enclosures. Access to the module is to be made by a Service Person only.

About this Document

This document is the *D2 W LT and D2 W LR Wireless I/O Instruction Sheet* that describes how to install your D2 W LT and D2 W LR units and contains important information for installing your units with other equipment.

Note

If your network only contains one transmitter and receiver pair, you should also read the D2 W LT and D2 W LR Quick Start Guide.

This document contains the following sections:

Section	Read this section if you want to ...
Basic Steps for Using your Unit	Learn the basic steps for installing and using your unit.
Factory Default Configuration	Understand how the transmitter sends information to the receiver.
Unit Components	Understand the different parts of your unit.
Antenna Installation	Learn how to install an antenna with your unit.
Re-setting Factory Defaults	Reset your unit to the original factory default settings.
Linking Transmitter and Receiver Units	Link your units to work as a dedicated pair.
Safety Information	Understand important safety information related to your unit. NOTE: You must read this information before installing your unit.
Specifications	Know technical information about your unit.

For more information, see the next sections.

Installing your Unit

This section describes how to install your unit and contains the following sections:

Step	Description	For more information, see ...
1 – Read the safety information	Lets you understand important safety information related to your unit. NOTE: You must read this information before installing your unit.	Safety Information on page 3.
2 – Get to know the unit features	Understand the basic features of your unit.	Unit Components and Connections on page 6.
3 – Install the antenna	Learn how to install an antenna with your unit.	Installing the Antenna on page 11.
4 – Install the power supply	Learn how to install a power supply for your unit.	Installing the Power Supply on page 20.
5 – Install the units	Learn how to install your unit.	Installing the Unit on page 33.
6 – Linking and configuring the unit	Learn how to link and configure your units to transmit and receive information.	Configuring your Units on page 34.
7 – Test the unit	Understand the principles for testing your units.	Testing your Units on page 35.

Note

To ensure internal surge protection works correctly, you must earth each unit using the earth terminal.

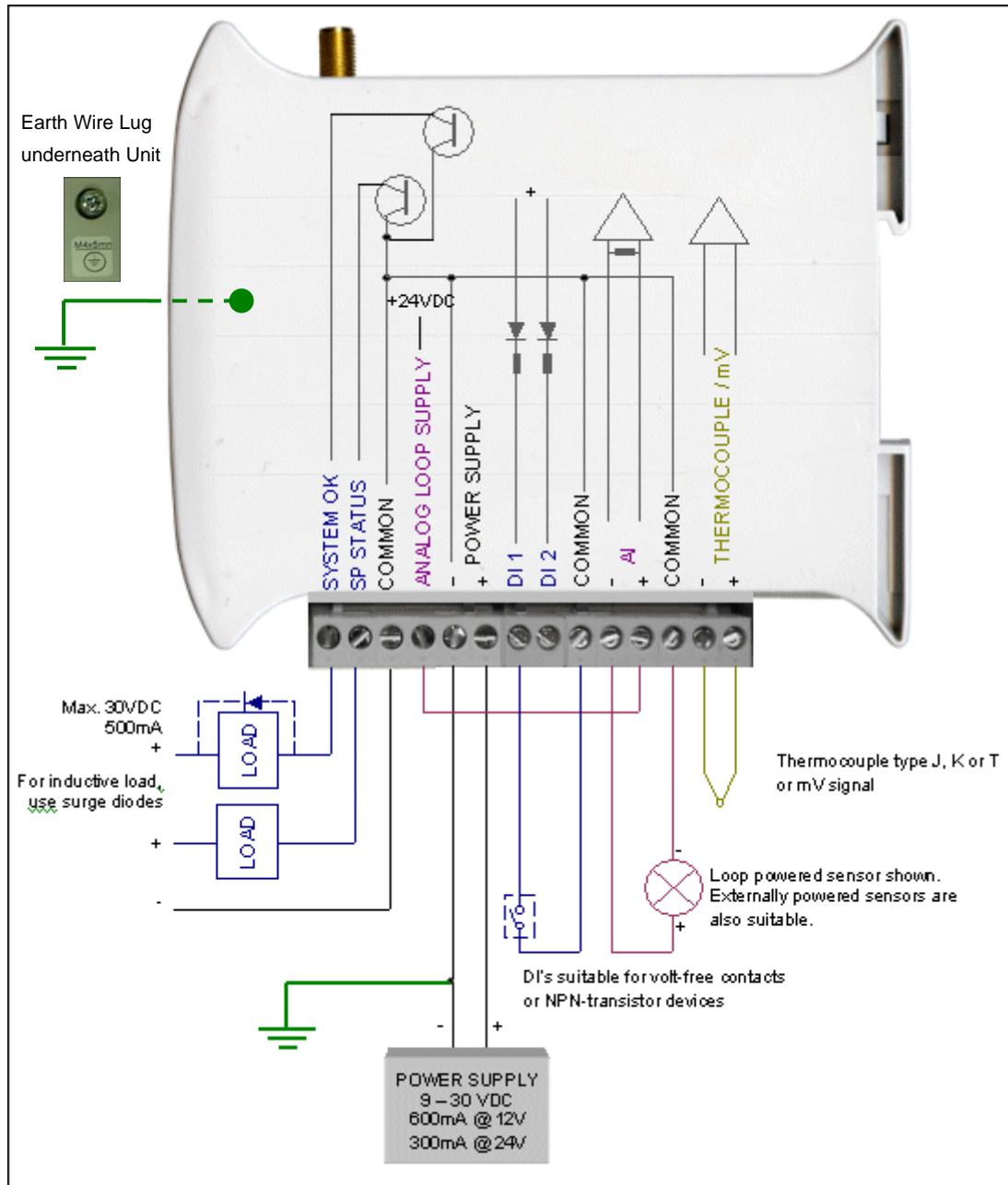
For more information, see the next sections.

Unit Components and Connections

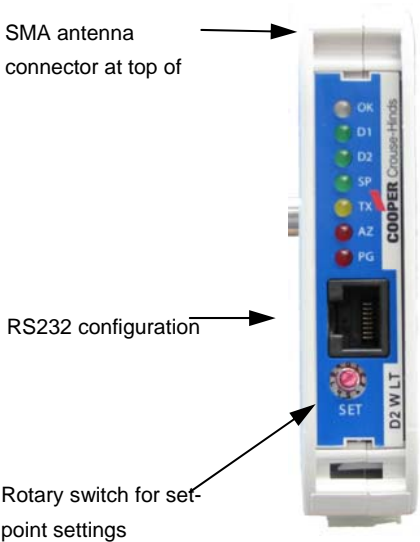
This section shows the components and terminal connections for the transmitter and receiver units.

Transmitter Unit

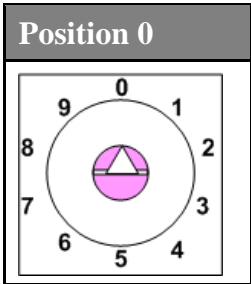
The D2 W LT transmitter unit has the following components and terminal connections:



The front panel contains the following components:



The triangle on the rotary switch indicates the current position, for example:



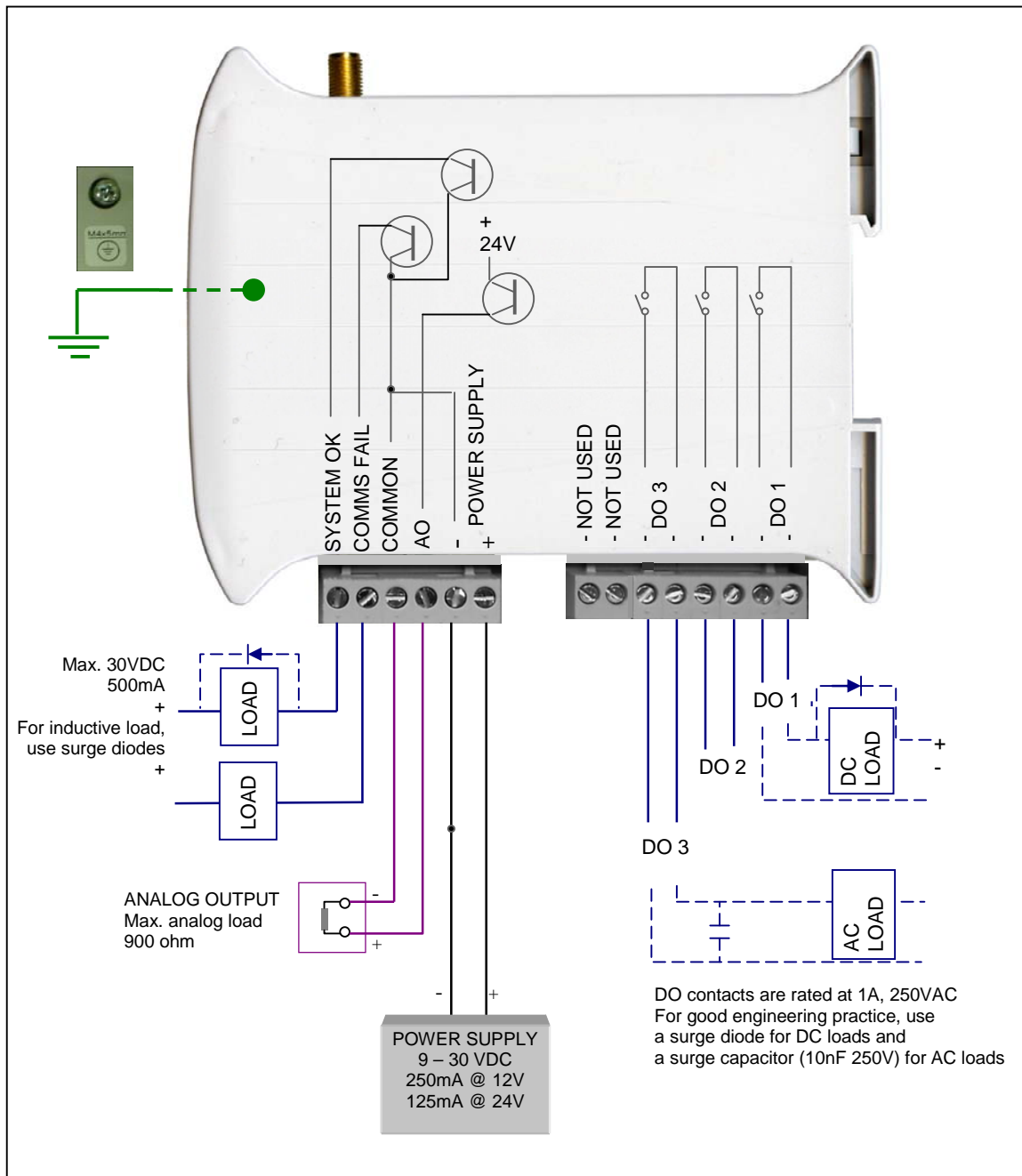
NOTE: To avoid damaging the rotary switch, use a screwdriver to change the position. The rotary switch controls the set-point levels on the Analog and Thermocouple inputs.

The LED's on the front panel indicate the unit status:

LED Status	Indicates	
None	No power supply.	
OK LED Green	Current status of the unit OK.	
OK LED Red	Fault condition detected in unit.	
TX LED Flashes	Transmitting message.	
PG LED ON	Configuration cable connected.	
Input LED ON	Input LED's (i.e. D1, D2, SP, AZ) light when the corresponding input is active.	
	D1	Digital Input 1 is active (low).
	D2	Digital Input 2 is active.
	SP	Analog Set-point is active.
	AZ	Analog Input is zero mA.
All LED's Medium Flash	Medium speed flash (1.6HZ) indicates the module is halfway through the configuration process. Medium flash also happens when you set the rotary switch to position 0 when powering on the unit.	

Receiver Unit

Your D2 W LR unit has the following components and terminal connections:



The LED's on the front panel indicate the unit status:

LED Status	Indicates			
None	No power supply.			
OK LED Green	Current status of the unit OK.			
OK LED Red	Fault condition detected in unit.			
RX Led Flashes	Receiving message.			
CF LED ON	Module communication failure output is active.			
PG LED ON	Configuration cable connected.			
Output LED ON	Output LED's (i.e. D1, D2, D3) light when the corresponding output is active.			
	D1	Relay output D1 is ON (contact closed).		
	D2	Relay Output D2 is ON.		
	D3	Relay Output D3 is ON.		
LED's with RSSI Push Button Pressed	When you press the RSSI push button, the unit shows the signal strength by lighting the LED's from the bottom to the top. Signal strength is the strength of the last message received that was addressed to this station.			
	LED	Signal Strength	LED	Signal Strength
	D1	More than -85 dBm	RX	More than -100 dBm
	D2	More than -90 dBm	CF	More than -105 dBm
	D3	More than -95 dBm	PG	Always on during RSSI test
Output LED Flashing Quickly	If an output is in communication failure, the corresponding LED flashes at 5 Hz.			
	D1	Relay Output D1 is in communication failure.		
	D2	Relay Output D2 is in communication failure.		
	D3	Relay Output D3 is in communication failure.		
	PG	Analog output is in communications failure.		

Installing the Antenna

This section explains how to install your antenna and contains the following sections:

Section	Description	For more information, see ...
Supported Antennas and Cables	Details the antennas and cables you can use with the units.	Supported Antennas on page 11.
Radio Transmission Distances	Details the distances for reliable operation.	Radio Transmission Distances on page 13.
Installing and Earthing Antennas	Details important information about installing and earthing antennas.	Installing and Earthing Antennas on page 15.
Dipole and Collinear Antennas	Details important information about using dipole and collinear antennas.	Dipole and Collinear Antennas on page 16.
Yagi Antennas	Details important information about using Yagi antennas.	Yagi Antennas on page 18.

For more information, see the next sections.

Supported Antennas

You can use the following antennas with the units:

Antenna	Additional Information	Total Gain (inc cable)
WH900 SMA	Whip antenna for mounting directly onto the module - operation up to ½ mile (1 km).	-6 dBi
CFD890EL	0 dBi Dipole antenna with 15' of Cellfoil cable and SMA connector.	0 dBi
SG900EL	5dBi Collinear omni-directional antenna with N-type connector.	5 dBi
SG900 6	8dBi Collinear omni-directional antenna with N-type connector.	8 dBi
YU6 900	10dBi Yagi directional antenna with N-type connector.	10 dBi
YU16 900	15dBi Yagi directional antenna with N-type connector.	15 dBi

You can use the following cables with the units:

The following table shows compatible cables for different antennas when used with the D2 W LT:

Antenna	North America	Australia/NZ
SG900EL	Any cable.	CC10 or CC20.
SG900 6	Any cable.	CC20.
YU6 900	CC20.	External cable with loss > 9dB.
YU16 900	External cable with loss > 9dB.	External cable with loss > 15 dB

You must carefully select antennas for D2 W LT modules to avoid contravening the maximum power limit on the unlicensed channel. The net gain of the antenna/cable configuration should be no more than 6dB in North America (USA, Canada, and Mexico), and no more than 0 dB in Australia / New Zealand.

Note

The net gain of an antenna/cable configuration is the gain of the antenna (in dBi) less the loss in the coaxial cable (in dB).

For example, an SG900 6 antenna with a CC20 SMA cable has a net gain of 2dB (i.e. +8 dB – 6 dB) at 900 MHz.

The D2 W LR module has no limitation on antenna gain, as this module does not incorporate a radio transmitter.

The following table details the gains of some typical antennas:

Antenna	Gain (dBi)
Dipole with integral 3m cable	0
Dipole without cable	2
5dBi Collinear (3dBd)	5
8dBi Collinear (6dBd)	8
3 element Yagi	5
6 element Yagi	10

The following table details losses for typical cables:

Cable	Loss (dB per 10m) at 900 MHz
RG58	-5
RG213	-2.5
Cellfoil	-3

Radio Transmission Distances

The unit will operate reliably over large distances depending on the:

- **Antenna type;**
- **Antenna location;**
- **Amount of radio interference;** and
- **Radio path obstructions** (e.g. hills or trees).

Typical reliable distances are:

Area	Distance	Additional information
USA/Canada	20+ miles	6dB net gain antenna configuration permitted (4W Equivalent RF power permitted).
Australia/NZ	20+ km	Unity gain antenna configuration (1W Equivalent RF power permitted).

To achieve these distances, you must elevate at least one site on a hill or transmission tower.

Modules will operate reliably with some radio path obstruction; however, obstructions also reduce the reliable distance.

Note

You must test all obstructed paths to check the reliability of the path.

You can achieve maximum transmission distances if the radio path has “line-of-sight.” For example, raising antennas above intermediate obstructions including hills, trees, etc. Obstructions reduce the range; however, they may not prevent a reliable path.

The closer the obstruction is to the antenna, the greater the blocking effect. For example, a group of trees around the antenna is a larger obstruction than a group of trees further away from the antenna. You can achieve longer distances by mounting one antenna on top of a hill.

Note

Due to the earth’s curvature, you must elevate antennas higher than the ground level between the antennas for longer paths (greater than 3 miles / 5 km).

The unit can tolerate larger amounts of obstructions for shorter distances. For very short distances, you can also mount the antennas inside buildings.

If two D2 W MIO modules cannot communicate reliably, you can use a third D2 W MIO module as a “repeater” to receive and re-transmit messages. This module may also have input/output (I/O) signals connected to it and form part of the I/O network.

Note

1. Cooper Crouse-Hinds recommends using the D2 W GMD module as a repeater unit between D2 W LT and D2 W LR modules.

2. To use a repeater unit, the D2 W LT and D2 W LR modules and the repeater module must be configured using the supplied configuration software. The factory default configuration described in the Quick Start Guide cannot use a repeater unit.

Installing and Earthing Antennas

You must connect an antenna to each module using the SMA connector at the top of the enclosure.

Cooper Crouse-Hinds recommends carefully taping the connections between the antenna and coaxial cable to prevent moisture ingress. Moisture ingress in the coaxial cable is a common cause of a radio system problem as it greatly increases the radio losses.

Cooper Crouse-Hinds recommends taping the connection with three layers of tape:

Layer	Tape
1	PVC tape.
2	Vulcanizing tape (e.g. 3M 23 tape).
3	Additional layer of PVC UV-stabilized insulating tape.

The first tape layer lets you easily inspect the joint if required, as you can easily remove the vulcanizing seal.

Note

You must effectively earth all masts for mast-mounted antennas to avoid lightning surges. We also recommend using a coaxial surge diverter for antennas mounted outside industrial plant environments.

If the antenna is not already shielded from lightning strike by an adjacent earthed structure, you can provide shielding by installing a lightning rod above the antenna.

You should connect the antenna to the module using 50 ohm coaxial cable (e.g. RG58 or RG213) terminated with a male coaxial connector. The higher the antenna is mounted, the greater the transmission range; however, as the length of coaxial cable increases, so do cable losses. For use on unlicensed frequency channels, there are several types of antenna suitable for use.

If you mount antennas on elevated masts, you should effectively earth the masts to avoid lightning surges. The D2 W LT and D2 W LR radios are fitted with surge protection.

Note

For high lightning risk areas, Cooper Crouse-Hinds recommends additional surge suppression devices. If the antenna is not already shielded from lightning strike by an adjacent earthed structure, you can install a lightning rod to provide shielding.

Dipole and Collinear Antennas

This section contains important information for using dipole and collinear antennas. For more information, see the next sections.

Dipole Antennas

Unity gain dipole antennas are commonly used on unlicensed channels. The dipole antenna does not provide any gain, so the power transmitted from the antenna is the same as the power out of the module.

A dipole antenna that comes supplied with integral 15 ft cable does not require additional coaxial cable.

You should mount dipole antennas vertically, preferably no less than 1 meter away from a wall or mast for maximum performance.

Collinear Antennas

Collinear antennas transmit the same amount of radio power in all directions horizontally, and are easy to install and use. They provide gain by compressing the radiated signal to a flattened disc shape, and reducing the amount of signal radiated above and below the horizontal plane.

Collinear antennas are generally used at a central site with more than one remote site, or at a repeater site.

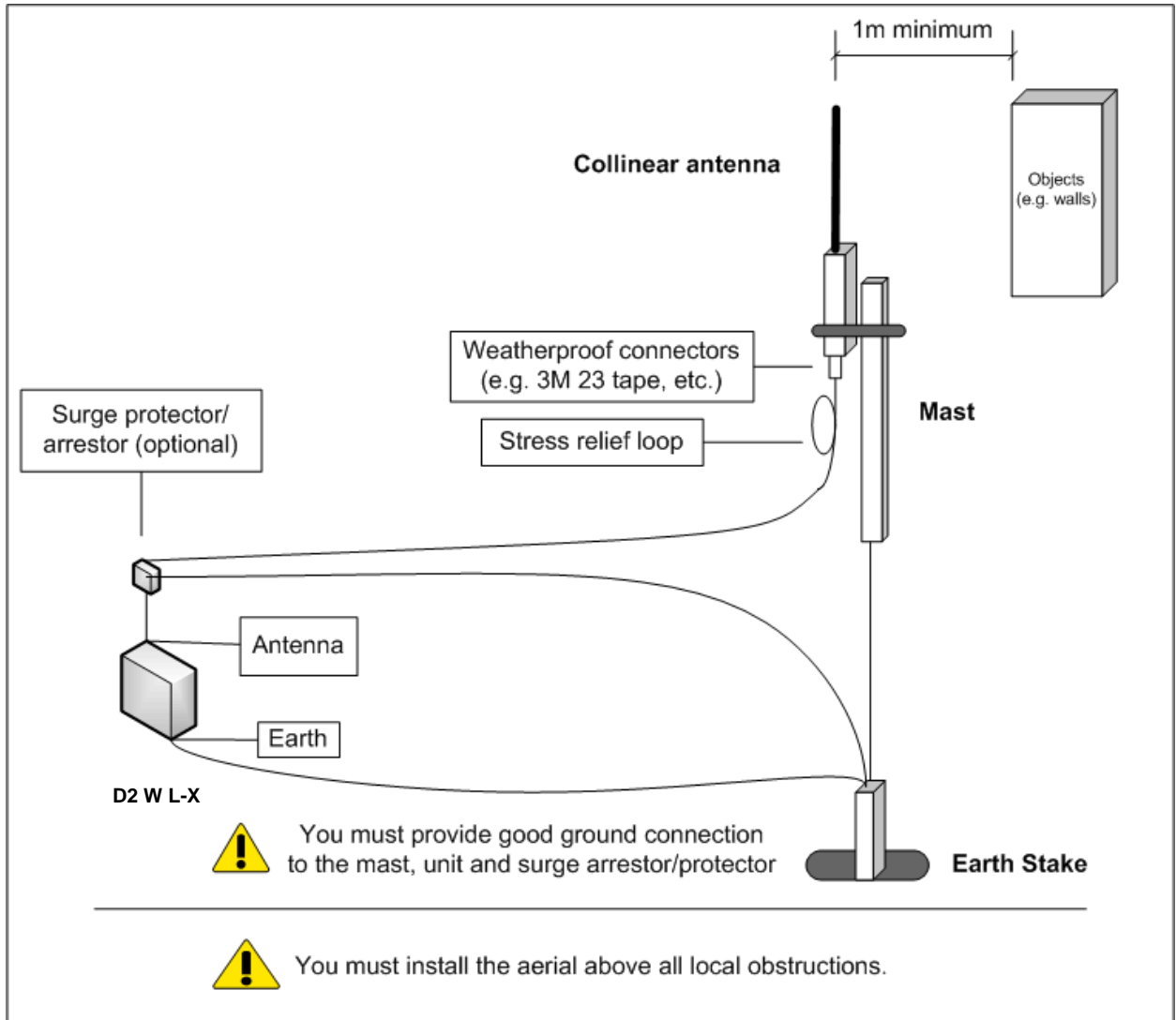
Collinear antennas are similar in appearance to dipole antennas, however, the antenna is longer.

Collinear antennas are supplied without cable and require additional coaxial cable.

You can use collinear antennas to:

- **Transmitter** – to compensate for the losses in long lengths of coaxial cable.
- **Receiver** – to increase receive sensitivity.

The following diagram shows the recommended installation for collinear and dipole antennas:



Yagi Antennas

Yagi antennas are directional and have positive gain to the front of the antenna and negative gain in other directions. You can use the gain to:

- **Compensate for coaxial cable loss for transmitter unit;** and
- **Increase receive sensitivity for receiver units.**

You should install Yagi antennas with the central beam horizontal and pointed directly in the transmission direction to benefit from the antenna gain.

Note

Yagi antennas usually have a drain hole on the folded element. You should position the drain hole at the bottom when installing the antenna.

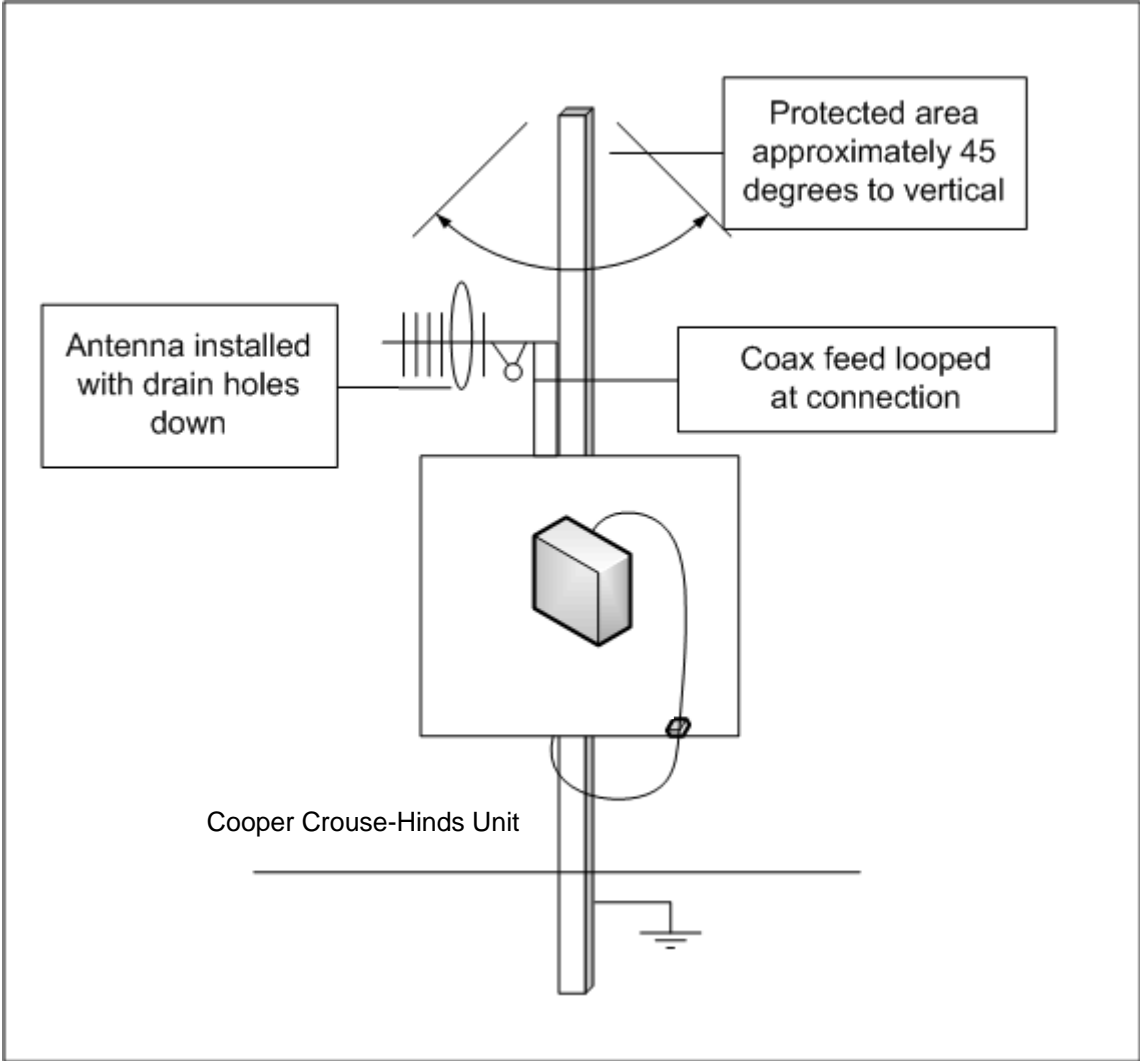
You can install Yagi antennas:

- **Vertically polarized** – with the elements in a vertical plane; or
- **Horizontally polarized** – with the elements in a horizontal plane.

The following table shows the recommended installation mode for different situations.

If your installation has ...	Cooper Crouse-Hinds recommends using ...
Two stations both using Yagi antennas	<ul style="list-style-type: none"> • Horizontal polarization for the stations.
Two or more stations communicating with a common station	<ul style="list-style-type: none"> • Vertical polarization for the stations; and • Dipole or collinear (i.e. non-directional) antenna for the central station.

The following diagram shows the recommended installation for collinear and dipole antennas:



Installing the Power Supply

The unit works with a 9-30 VDC 0.6 Amp CSA Certified Class 2 power supply. For use in Class 1, Div. 2 explosive areas, the power supply must be approved for Class 1, Div. 2 use.

Warning – explosion hazard

Do not disconnect while circuit is live unless area is known to be non-hazardous.

The following table shows the power supply requirements:

Power supply	D2 W LT	D2 W LR
12V	600 mA	250 mA
24V	300 mA	125 mA

The power supply can be a floating supply or negatively grounded.

The transmitter provides a 24V DC regulated supply for analog loop power. The supply is rated at 35 mA and should ONLY be used for powering analog loops.

To install the power supply:

1. Connect the positive lead to **Power Supply Input**.
2. Connect the negative lead to **Ground**.

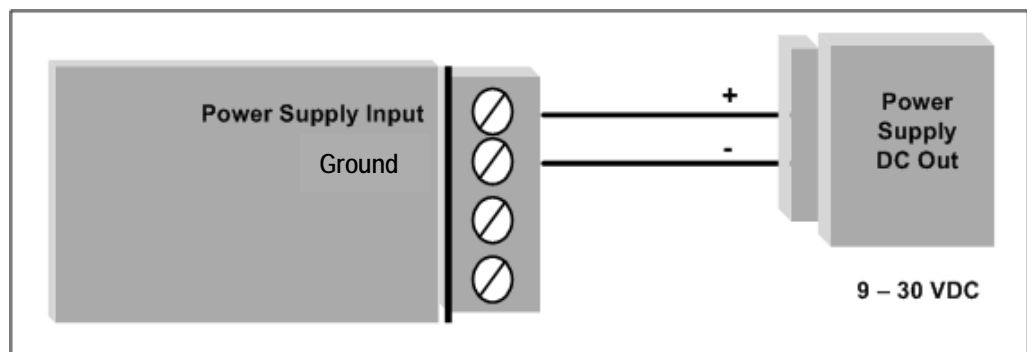
Note

To ensure internal surge protection works correctly, you must earth each unit using the earth terminal.

You should connect the module to the same ground/earth point as the antenna mounting to avoid differences in earth potential during voltage surges.

Do NOT connect the positive side of the supply to earth.

3. The following diagram illustrates the connection:



Inputs and Outputs

The units have the following inputs and outputs:

Input/output	D2 W		Description	For more information, see ...
	LT	LR		
Digital Inputs	2		Suitable for voltage-free contact, NPN transistor, 0-5V signal.	Digital Inputs on page 22.
Relay Outputs		3	250VAC 1A / 30VDC 1A.	Relay Outputs Important Information on page 23.
Status Outputs	2	2	Max 30VDC, 500 mA. Indicate module status, communication failure, and local set-point status.	Status Outputs on page 24.
Analog Inputs	1		4-20 mA with over-range and under-range. 0-10 mA with over-range.	Analog Input on page 25.
+24V Loop Supply	1		Provides power for 1 external current loop (up to 35 mA).	Installing the Power Supply on page 20.
Analog Set-point	1		Allows discrete set-point to be controlled from analog input. Threshold adjustable via rotary switch.	Refer to the <i>Instruction Sheet</i> .
Thermocouple / Millivolt Input	1		Provides measurement of E, J, K, T type thermocouple, millivolt signals and user-defined thermocouple types.	Thermocouple Input on page 28.
Thermocouple Set-point	1		Lets you control discrete set-point from thermocouple with threshold adjustable via rotary switch.	Refer to the <i>Instruction Sheet</i> .
Pulse Inputs	2		Up to 10Hz.	Pulse Input on page 29.
Analog Output		1	0-22 mA, suitable for loop powered, floating input or single-ended input device.	Analog Output on page 30.

For more information, see the next sections.

Digital Inputs

The D2 W LT module provides two digital inputs suitable for:

- **Voltage free contacts** – e.g. mechanical switches; or
- **NPN transistor devices** – e.g. electronic proximity switches; or
- **0-5V signals** - 2V – 4V Minimum range.

Note

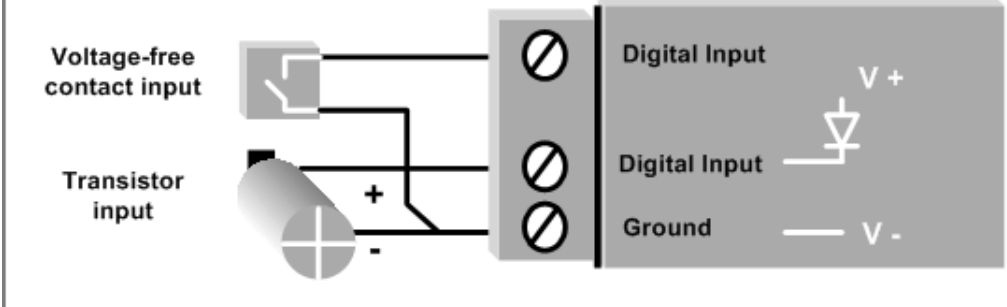
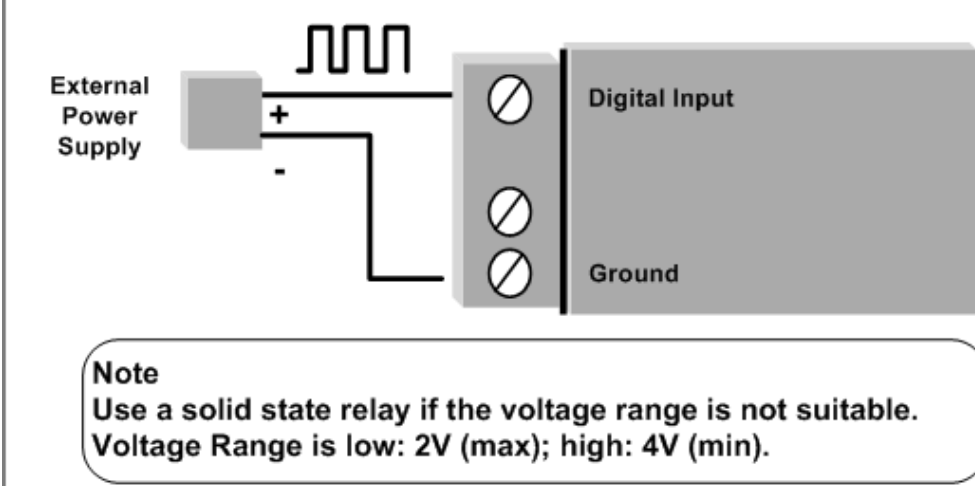
PNP transistor devices are not suitable.

The unit provides contact wetting current of approximately 5mA to maintain reliable operation of driving relays.

Each digital input is connected between the appropriate **Digital Input** terminal and **Ground**.

Each digital input circuit includes an LED indicator that lights when the digital input is active (i.e. when the input circuit is closed).

To activate the digital input, the switching device resistance must be less than 200 ohms.

Connection Method	Example
<p>Voltage-free Contact</p>	
<p>Active 0-5v Signal Device</p>	

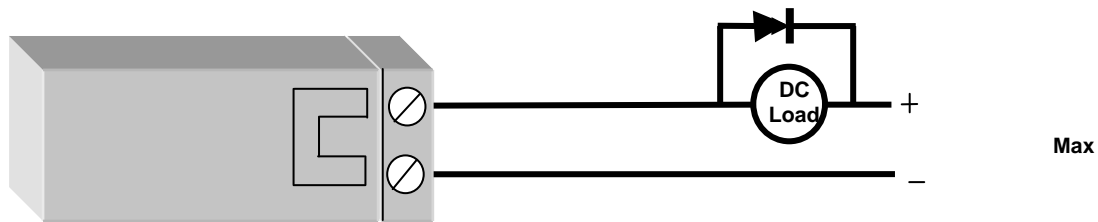
Relay Outputs

The D2 W LR module provides three normally open voltage-free relay contacts rated at 250VAC / 30VDC 1A.

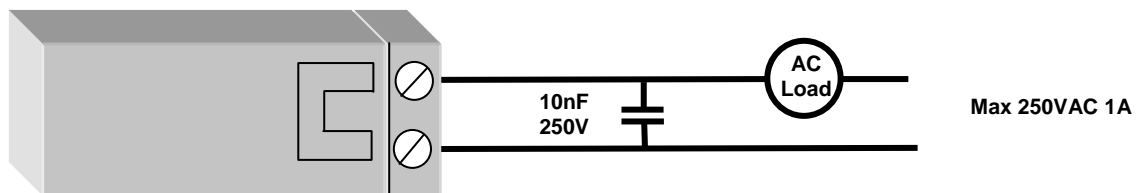
You can use these outputs to directly control low-powered equipment or power larger relays for higher-powered equipment.

For inductive loads, Cooper Crouse-Hinds recommends:

DC relays - use flyback diodes across the external circuit to prevent arcing across the relay contacts.



AC relays – use capacitors (e.g. 10nF 250V) to prevent arcing across the relay contacts.



You can individually configure digital outputs to turn off if no command message is received by the output for a certain period. This feature provides an intelligent watch dog for each output, so communications failure at a transmitting site causes the output to revert to a known state.

The output circuit is connected to the appropriate pair of **Digital Output** terminals. Each digital output circuit includes an LED indicator that lights when the digital output is active. The LED flashes if the watch dog alarm is active.

IMPORTANT SAFETY INFORMATION

In order to comply with Electrical Safety Standards, when connecting SELV **AND** voltages which are greater than SELV (30VAC or 60VDC) together, then Relay Output 2 must **NOT** be used in order to provide sufficient isolation between the outputs.

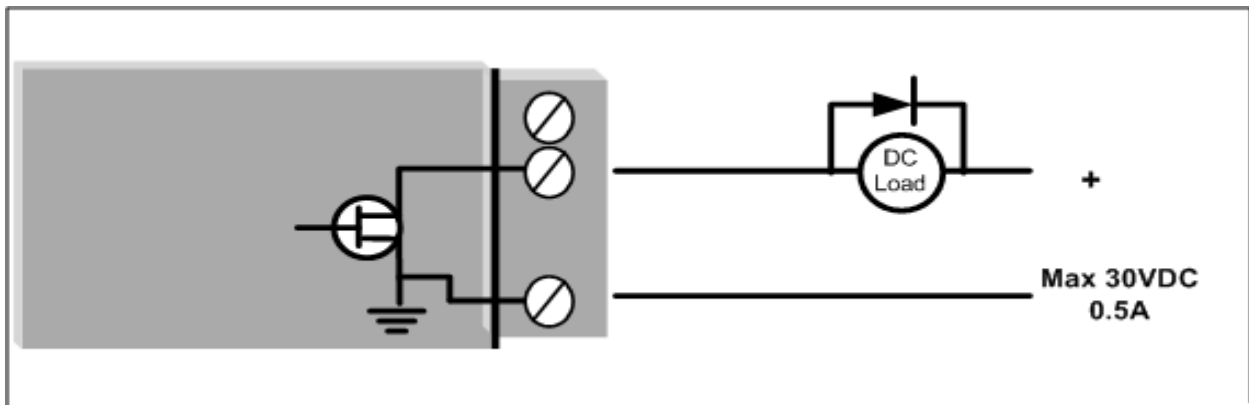
Status Outputs

The unit contains the following status outputs:

- **System OK;**
- **Set-point Output;** and
- **Communications Failure.**

Status outputs are FET output to common rated at 30VDC 500 mA.

Connect the output circuit to the appropriate Status **Output** terminal. Each status output circuit is associated with an LED indicator that lights when the digital output is active.



The following table details the status output behavior:

Status Output	LED	Status	Description
System OK Active (both modules)	OK	Green	No fault detected.
System OK Inactive	OK	Red	<ul style="list-style-type: none"> • Internal fault detected. • Supply voltage low • Analog loop supply overloaded
Set-point Output (D2 W LT)	SP	Green	Local set-point attached to 4-20mA analog input.
Communications Failure (D2 W LR)	CF	Red	Watch dog alarms active on digital outputs or analog outputs.

Analog Input

The D2 W LT module provides one 0 - 20 mA DC analog input for connecting to instrument transducers (e.g. level, moisture, pressure transducers, etc.).

Note

The D2 W LT module inputs measure down to 0mA and can also be used for zero based signals (e.g. 0 - 10 mA).

The analog input has a positive and negative terminal and can be placed at any point in the current loop, providing neither input rises above the 24 volt **Analog Loop Supply** level.

Each input has a loop resistance of less than 250 ohms and zener diode protection is provided against over-voltage and reverse voltage.

Note

You may require additional protection in high voltage or noisy environments or for long wiring runs.

A 24VDC loop supply is available on the D2 W LT module for powering the analog transducer loops. In this situation, connect the:

- **Analog Loop** - between an **Analog Input (-)** terminal and **Ground**.
- **Positive Terminal** – i.e. **Analog Input (+)** to the +24V **Analog Loop Supply**.

Externally powered loops may be connected by connecting the input between "Analog Input (+)" and "Analog Input (-)." Common mode voltage may be -0.5V to 27V.

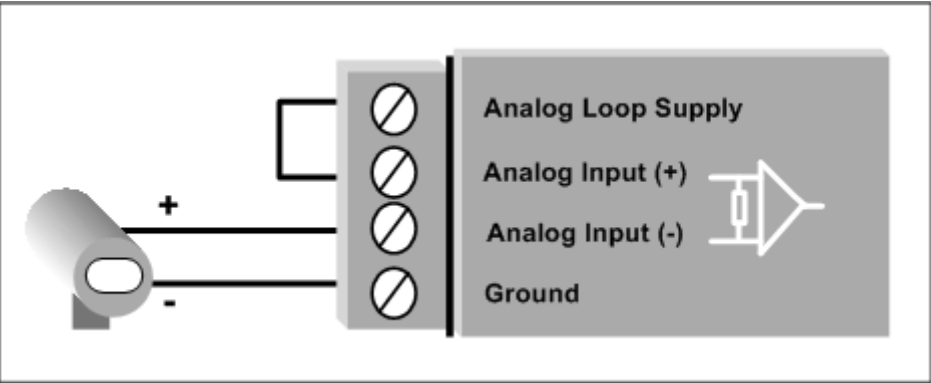
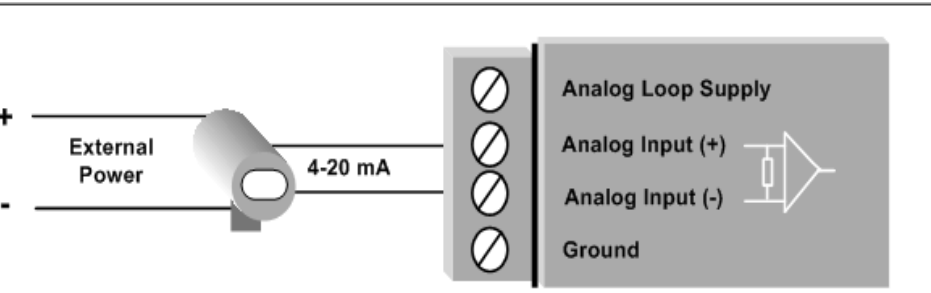
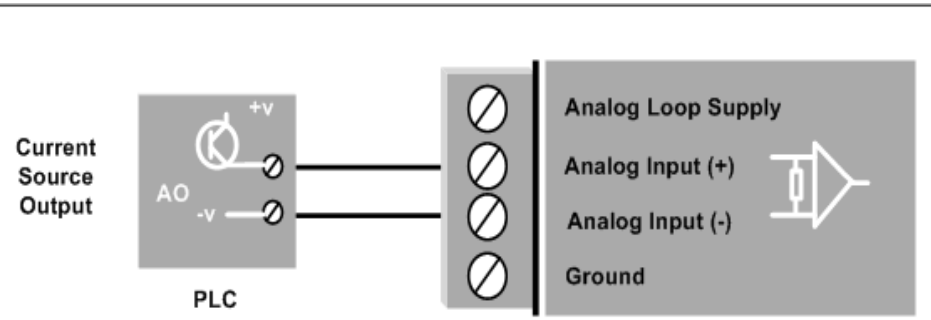
Cooper Crouse-Hinds recommends using shielded cable for analog I/O loops to minimize induced noise and Radio Frequency Interference (RFI).

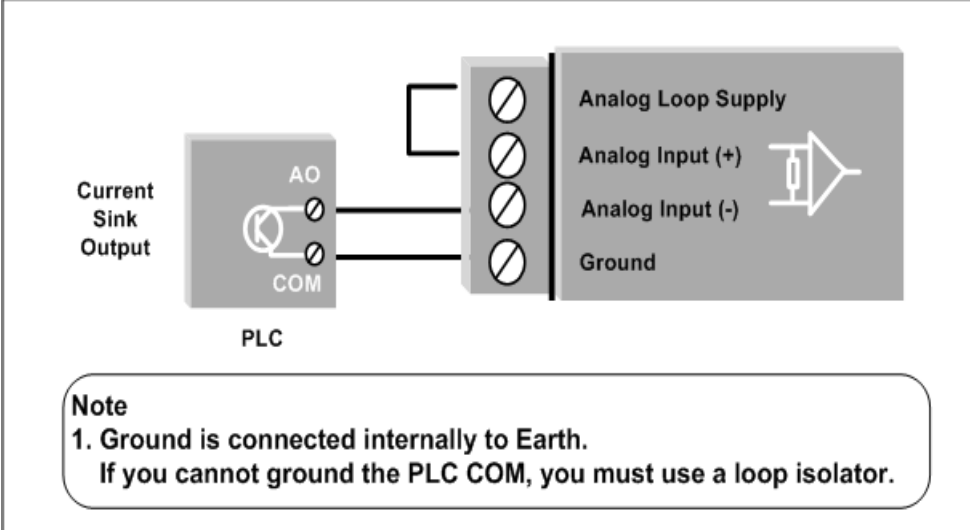
Note

You should only connect one end of the cable shield to earth.

To connect an analog signal from a PLC or DCS output to an analog input on the D2 W LT, you must carefully check the internal circuit of the output, as different devices use different ways to create an analog signal.

The following diagrams illustrate different connection methods:

Analog Signal Source	Example
<p>2 wire transducer</p>	
<p>4 wire transducer</p>	 <p>Note Analog input must be within 27V of Ground. If your terminal voltage exceeds this, you must use a loop isolator.</p>
<p>Current source output</p>	 <p>Note</p> <ol style="list-style-type: none"> 1. Analog input must be within 27V of Ground. If your terminal voltage exceeds this, you must use a loop isolator. 2. Ground is connected to ground/earth. If you cannot ground the PLC COM, you must use a loop isolator.

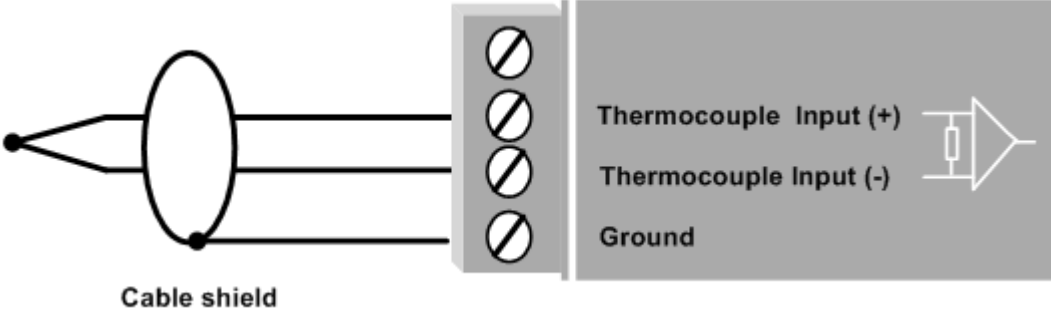
Analog Signal Source	Example
Current sink output	 <p>Note 1. Ground is connected internally to Earth. If you cannot ground the PLC COM, you must use a loop isolator.</p>

Thermocouple Input

The D2 W LT provides one input suitable for connection to a thermocouple or a millivolt level signal. The module provides linearization tables for J, K, and T type thermocouples and also supports other types via a user linearization table.

Millivolt signals in the range -10mV to +100 mV are supported.

For more information on configuring the thermocouple input and cold-junction compensation to suit your application, refer to the *Instruction Sheet*.



Note:

The cable shield is optional; however Cooper Crouse-Hinds recommend cable shields for long cable runs.

Pulse Input

The D2 W LT module lets you configure the digital inputs as pulse inputs with the following characteristics:

Characteristic	Value
Maximum rate	10 Hz
Minimum off time	20 mSec
Minimum on time	20 mSec

Using this mode, you can map the pulse count to a remote output by transmitting the pulse count to a D2 W GMD module register or re-generating as a Pulse Output on D2 W MIO-1 or Digital Output on a D2 W MIO-3 unit.

Note

You should connect the pulse input in the same way as a digital input.

The following diagrams illustrate different connection methods:

Connection method	Example
Passive transistor	<p>The diagram shows a 'Passive Transistor Device' with two terminals labeled '+' and '-'. The '+' terminal is connected to a terminal on a panel labeled 'Digital Input'. The '-' terminal is connected to a terminal on the same panel labeled 'Ground'. There are three terminals in total on the panel, with the top one being 'Digital Input' and the bottom two being 'Ground'.</p>
Active pulse device	<p>The diagram shows an 'External Power Supply' with '+' and '-' terminals. The '+' terminal is connected to a terminal on a panel labeled 'Digital Input'. The '-' terminal is connected to a terminal on the same panel labeled 'Ground'. A square wave pulse is shown above the 'Digital Input' terminal. There are three terminals in total on the panel, with the top one being 'Digital Input' and the bottom two being 'Ground'.</p> <div style="border: 1px solid black; border-radius: 15px; padding: 10px; margin-top: 10px;"> <p>Note Use a solid state relay if the voltage range is not suitable. Voltage Range is low: 2V (max); high: 4V (min).</p> </div>

Analog Output

The D2 W LR module provides a 4 - 20 mA DC analog output for connecting to instrument indicators to display remote analog measurements. The analog output is a current source provided from an internally generated +24V loop supply.

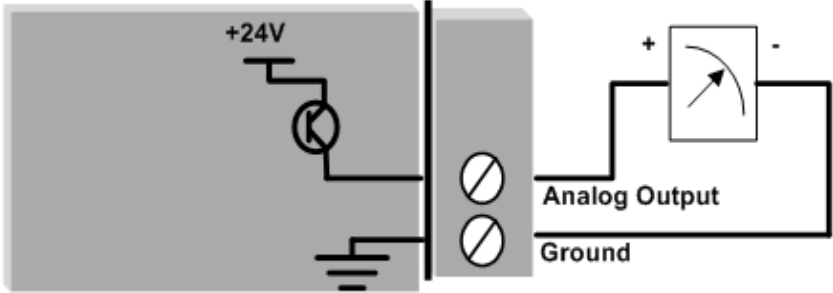
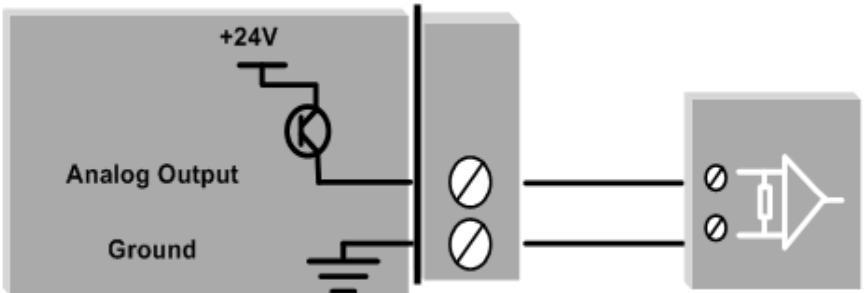
When connecting to an external device (e.g. electronic indicator, recorder, PLC / DCS input, etc.) by connecting the output between the **Analog Output** terminal (+) and the **COM** terminal (-).

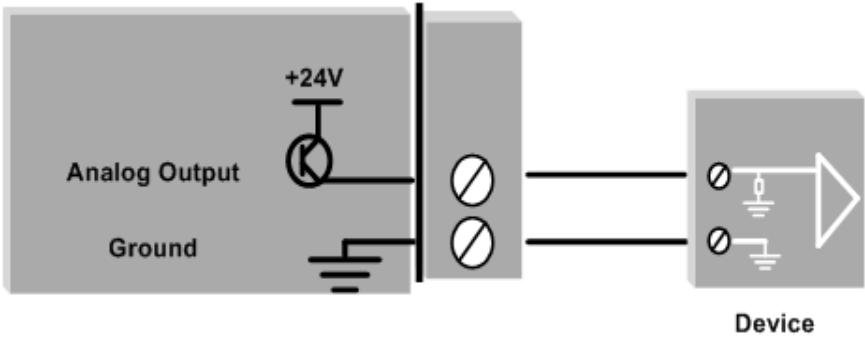
Note

Zener protection of analog outputs provides protection against short periods of over-voltage; however, longer periods may result in module damage.

You can also individually configure analog outputs to turn off (i.e. 0 mA) if no command message is received to the output for a certain period.

The following diagrams illustrate different connection methods:

Connection method	Example
<p>Loop powered device</p>	
<p>Floating input device</p>	

Connection method	Example
To single-ended input device	 <p>The diagram illustrates the connection of an Analog Output module to a single-ended input device. On the left, the Analog Output module has three terminals: +24V, Analog Output, and Ground. The +24V terminal is connected to the top terminal of the Device. The Analog Output terminal is connected to the input terminal of the Device. The Ground terminal is connected to the bottom terminal of the Device.</p>

Installing and Configuring the Unit

This section describes how to install and configure your unit and contains the following sections:

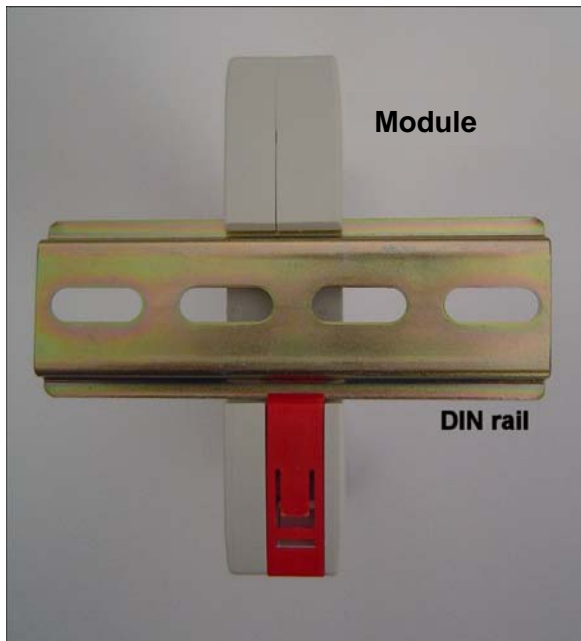
Section	Description	For more information, see ...
Installing the Unit	Describes how to physically install your unit.	Installing the Unit on page 33.
Configuring your Unit	Describes the different ways to configure your unit.	Configuring your Units on page 34.
Testing your Unit	Describes Cooper Crouse-Hinds' recommendations for testing your unit.	Testing your Units on page 35.

For more information, see the next sections.

Installing the Unit

To install the unit:

1. Connect signals to the supplied terminals.
2. Connect the radio antenna.
3. Install DIN rail to mount the module.
4. Clip the module to the DIN rail:



You can now configure your unit. For more information, see **Configuring your Units** on page 34.

Configuring your Units

You can configure your network using:

- **Default factory configuration** – that lets you easily set up your network as a simple send/receive; or
- **User-defined customized configuration** – that lets you set specific information about your network and allows communication with other Cooper Crouse-Hinds devices.

For more information on setting a user-defined customised configuration, see the *Instruction Sheet*.

For more information on setting the factory default configuration, refer to the *Quick Start Guide* included with your module.

The following table details the factory default configuration:

Signals sent over radio		
D2 W LT(Transmitter)	Sends	D2 W LR (Receiver)
Digital Input 1	⇒	Digital Output 1
Digital Input 2	⇒	Digital Output 2
Analog Set-point	⇒	Digital Output 3
Analog Input (4-20 mA)	⇒	Analog Output

Other Signals	
D2 W LT(Transmitter)	D2 W LR (Receiver)
Thermocouple Input (not used)	Communication Failure (comes on if no messages from D2 W LT)
Set-point Output (local indication)	
System OK (on if system OK)	System OK (on if system OK)

Testing your Units

We recommend you bench test the complete system before installing a new system.

Configuration problems are easier to identify and fix when the units are next to each other.

The following table describes common problems and recommended solutions:

If your installation has ...	You should check ...	Cooper Crouse-Hinds recommends ...
Poor radio channel communications <ul style="list-style-type: none"> • TX LED flashes but no RX LED • Output LED's flash quickly 	<ul style="list-style-type: none"> • The antenna installation • For radio interference on the same channel • The radio path is adequate 	<ul style="list-style-type: none"> • Higher performance antennas if the path is too long • Higher mounting points to overcome obstructions • Using an intermediate unit as a repeater
Red OK LED	<ul style="list-style-type: none"> • Power supply voltage 	<ul style="list-style-type: none"> • Supply should be between 9 and 30VDC
	<ul style="list-style-type: none"> • Analog loop supply current 	<ul style="list-style-type: none"> • The analog loop supply is rated for 35 mA max
	<ul style="list-style-type: none"> • Module configuration 	<ul style="list-style-type: none"> • Your module configuration may be invalid. Re-load or restore factory default configuration.
TX LED flashes but no RX LED (bench testing)	<ul style="list-style-type: none"> • Ensure the D2 W LR is set to the same country and frequency band as the D2 W LT 	<ul style="list-style-type: none"> • Register the receiver with the transmitter. (Refer to the <i>Quick Start Guide</i>).
RX LED flashes but no outputs change	<ul style="list-style-type: none"> • For a user-defined customized configuration, check the configuration 	<ul style="list-style-type: none"> • Check the configuration and re-program the modules
	<ul style="list-style-type: none"> • For default configuration, check the receiver is registered with the transmitter 	<ul style="list-style-type: none"> • Repeat the procedure to register the receiver with the transmitter

For support for other testing issues, please contact Cooper Crouse-Hinds.

Unit Specifications – This section details the specifications for each unit

Transmitter Unit

Input/Output	Number	Additional Information
Digital Inputs	2	Dry-contact digital inputs slow-pulsed at 10Hz. All inputs are suitable for voltage-free contacts (e.g. mechanical switches) or NPN transistor devices (e.g. electronic proximity switches). NOTE: PNP transistor device inputs are NOT suitable.
Status Outputs	2	Separate System OK and Set-point Status
Analog Inputs	1	0-20mA differential input; 16-bit resolution, 0.1% accuracy, 10 ohm input impedance.
Thermocouple Inputs	1	J, K, or T type thermocouple with on-board cold-junction compensation. Cold junction compensation accuracy $\pm 1^\circ$ over ambient temp range: -40° to $+70^\circ\text{C}$.
Power Supply	1	9-30 VDC 0.6 Amp CSA Certified Class 2 power supply. For use in Class 1, Div. 2 explosive areas, the power supply must be approved for Class 1, Div. 2 use. WARNING: Explosion hazard - do not disconnect while circuit is live unless area is known to be non-hazardous.
Transmitter	1	1-Watt Frequency Hopping Spread Spectrum (FHSS) Transmitter.
Frequency	902-928 MHz	Actual frequency range depends on country.

Receiver Unit

Input/Output	Number	Additional Information
Digital Outputs	3	Voltage-free contacts rated at 250 VAC, 1A, 30VDC 1A 2 for digital inputs and 1 for set-point.
Status Outputs	2	Separate System OK and communication failure output.
Analog Output	1	16-bit resolution, 0.1% accuracy, single-ended source output.
Power Supply	1	9-30 VDC 0.25 Amp CSA Certified Class 2 power supply. For use in Class 1, Div. 2 explosive areas, the power supply must be approved for Class 1, Div. 2 use. WARNING: Explosion hazard - do not disconnect while circuit is live unless area is known to be non-hazardous.
Radio Receiver	1	High sensitivity FHSS UHF radio receiver.
Frequency	902-928 MHz	Actual frequency range depends on country.
Sensitivity	-110 dBm	At PER (Packet Error Rate) 8%.

Ancillary Hardware Reference Information

This section contains reference information about additional hardware components you may need for your unit.

RS232 Serial Cable

You can connect the unit to a PC using an RS-232 serial cable to:

- **Transfer configuration information;**
- **Perform factory and field-testing.**

The serial port is an 8-pin RJ-45 plug that communicates using standard RS-232 signals:

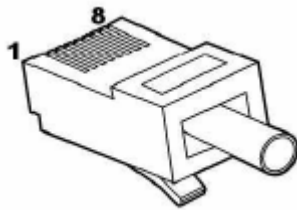
Signal information	Value
Baud rate	9600
Bits	8 bits with 1 stop bit
Parity	No parity

Cooper Crouse-Hinds supplies a green configuration cable wired to the following pin-out:

Note

The following pin-out information is for reference only.

RJ-45	Required	Signal name	Normal colour	DB9
1		Ring Indicator	Green / White	9
2		Data Carrier Detect	Green	1
3	Y	Data Terminal Ready	Orange / White	4
4	Y	Signal Common	Blue	5
5	Y	Receive Data (from Modem)	Blue / White	2
6	Y	Transmit Data (to Modem)	Orange	3
7		Clear to Send	Brown / White	8
8		Request to Send	Brown	7



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