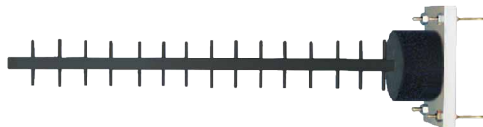
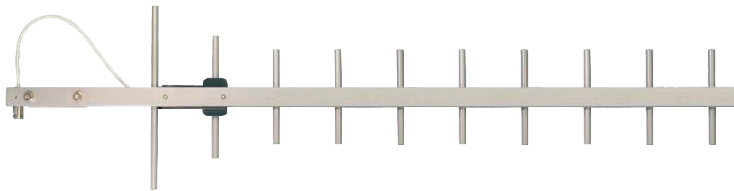


# WIRELESS DATA ACQUISITION PRODUCTS



- WIRELESS DATA ACQUISITION PRODUCTS
- POINT TO POINT
- MODBUS® RTU POLLING
- DIRECT INPUTS FOR:  
DUAL DC VOLTAGE OR CURRENT  
RTD  
BRIDGE
- ANTENNAS
- CABLES
- ACCESSORIES



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Joe E. Wilkerson

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Our products carry a limited 5 year warranty against material defects and workmanship. This warranty is extended to 10 years for Mighty Module products. Field rangeable products carry a limited permanent warranty.

During the warranty period, the company will repair or replace any unit, at its option, free of charge in the event of a warranty failure. The company further warrants, for an additional period of 5 years, to repair any unit at a fixed cost of 25% of the original purchase price in the event of a warranty failure.

All accessories carry a limited 90 day warranty. Relays are not covered by the warranty.

Damages caused by lightening strikes, power surges, and incorrect user wiring are not covered under this warranty.

## DOCUMENTATION

Each product is shipped with appropriate information for installation, operation, and calibration. Please contact the factory regarding any inquiries or additional questions you may have. All documentation can be downloaded from [www.wici.com](http://www.wici.com).

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## DR9011 - DR9021 POINT-TO-POINT DATA ACQUISITION SYSTEM

### DESCRIPTION

The sensoRAD™ Wireless Point-to-Point System requires only one DR9011 Transmitter and at least one DR9021 Receiver. The system supports an unlimited number of receivers.

The DR9011 is an RF transmitter that will accept analog and digital inputs.

The DR9011 accepts four discrete inputs. These are dry contacts or open collector NPN transistors that require no external supply voltage. The DR9011 supplies voltage across the switch inputs equal to the power supply voltage. Applying external voltage across the switch inputs may result in damage to the DR9011 and will void the warranty.

A 12 bit A/D converter is used to digitize the analog data.

Analog data and switch status is transmitted to the companion DR9021 Receiver.

The DR9021 RF Receiver receives RF signals from the DR9011 Transmitter and reconstructs the analog signals and switch status. The analog signals are reconstructed as 4/20mA outputs. When the transmitter has a dual channel input, the DR9021 Receiver has a 4/20mA output for each channel. If the transmitter has a single channel analog input, the DR9021 provides two 4/20mA outputs proportional to the single input.

Switch (digital) outputs are provided as isolated open collector NPN transistors. A DIP Switch on the DR9021 PC board allows selection of Normal Acting or Reverse Acting (failsafe) logic for the digital outputs.

The system can be ordered as a 908MHz, 922MHz, or 2.4GHz system. All three systems take advantage of the unlicensed ISM frequency bands.

The radios use frequency hopping, spread spectrum technology\* to eliminate interference and to allow multiple transmitters to operate in the same locale without interference. Each of the three frequency bands has 7 different user selectable frequency hopping sequences to allow up to 21 transmitters to work in the same locale. The transmitter module hops through 25 channels with any 1 of 7 hop sequences per frequency band. A DIP Switch on the PC board is used to set the hopping sequence.

Both the DR9011 and DR9021 have transformer isolation between the circuitry and power source. The DR9011 dual channel DC input has individual isolation for each input channel. The input isolation makes the product useful for measuring DC signals with high common mode voltages and for breaking ground connections to eliminate ground loops.

The RTD and Bridge versions do not have isolated inputs because the sensors are inherently isolated.

Pluggable screw terminal blocks allow easy wiring and removal of products.

All of the DR Series of products provide transient protection to help eliminate damage from lightning and from other transients created on the power and signal leads.

### APPLICATIONS

The DR9011 and DR9021 have numerous applications where an analog signal and/or an alarm contact needs to be monitored and the installation of signal wire between the locations is not practical or cost prohibitive. This system has been successfully installed in many application where a signal needs to be transmitted a short distance between machinery as well as longer range applications where signals are transmitted up to 20 miles.

Visit <http://www.wici.com> or call Wilkerson Instrument Company, Inc. for more information on successful applications using the sensoRad™ Wireless products.

\* See page 52 for a comprehensive definition.



# DR9011-01

## DUAL DC INPUT POINT-TO-POINT TRANSMITTER

### FEATURES

- Dual DC Voltage or Current Inputs - Individually Isolated
- Four Digital Inputs For Contact Closure or NPN Transistor
- DIN Rail Mount - Steel Clip
- 10-30VDC Power
- Reverse Polarity Screw-On SMA Antenna Connector
- 915MHz ISM\* Band - 2 Versions, 14 Hop Sequences
- 2.4GHz Unlicensed Band - 1 Version, 7 Hop Sequences
- Spread Spectrum, Frequency Hopping Technology\*
- Line of Sight Range to 20 Miles With 915MHz Band Radio
- Line of Sight Range to 10 Miles With 2.4GHz Band Radio
- 5 Year Warranty (1 Year on Radio Module)
- UL/cUL Recognized

### DESCRIPTION

The DR9011 is an RF transmitter that will accept both analog and switch contact inputs. A 12 bit A/D converter is used to digitize the analog data. Analog data and switch status is then transmitted to the companion DR9021 Receiver where the analog signal and switch status is reconstructed.

The switch inputs require a standard contact closure or an open collector NPN transistor.

Three radio modules are available for the DR9011, two 915MHz band versions with 7 Hop sequences each and a 2.4GHz band

version with 7 Hop sequences. They use spread spectrum, frequency hopping\* technology. These choices provide 21 different Hop sequences that allow 21 systems to work in the same locale without interfering with each other.

A DIP Switch on the PC board is used to set the Hop sequence.

With proper antenna and cable selection and a 915MHz band version radio, the DR9011 can transmit up to 20 miles. The 2.4GHz band version can transmit up to 10 miles.

The DR9011 provides isolation between input and power source. The DC Inputs are individually isolated. This isolation makes the product useful for measuring input signals with high common mode voltages and for breaking ground connections to eliminate ground loops.

Screw terminal blocks that plug into the case allow easy wiring and removal of products.

All of the DR Series of products provide transient protection to help eliminate damage from lightning and from other transients created on the power and signal leads.

### SPECIFICATIONS

#### INPUT

Dual DC

Current

Min Span = 1mA

Max Span = 50 mA

Voltage

Min Span = 100 mV

Max Span = 150 V

Accuracy

±0.1% of Span

Linearity

±0.05% of Span

Switch Input

Open Circuit Voltage

Equals Power Input

(10 to 30 VDC)

Closed Circuit Current

3 to 9 mA

#### RADIO

Frequency

915 MHz Band

908 or 922 MHz

2.4 GHz Band

2.4000 - 2.4835 GHz

Spread Spectrum Type

Frequency Hopping, Direct FM

I/O Data Rate Tx to Rx:

9600 bps

Update Rate

10/S

Range / Line of Sight

915 MHz Band - Up to 20 Mi.

2.4 GHz Band - Up to 10 Mi.

Receiver Sensitivity:

915 MHz Band

-110 dBm @ 9600 baud

2.4 GHz Band

-105 dBm @ 9600 baud

Transmitter Power:

915 MHz Band

100 mW (20 dBm)

2.4GHz Band

50 mW (17dBm)

Connector:

Reverse Polarity SMA Female

Certification:

FCC Part 15.247

#### COMMON MODE REJECTION

100 dB, DC to 60 Hz

#### OPERATING TEMPERATURE

-15°F to 160°F

-25°C to 70°C

#### TEMPERATURE STABILITY

±(0.01% of Span)/°C Max

#### POWER

10 to 30 VDC

1.5 Watts Max

\* See page 52 for a comprehensive definition.





## DR9011-02

### BRIDGE INPUT POINT-TO-POINT TRANSMITTER

#### FEATURES

- Direct Strain Gauge (Bridge) Input
- 10 VDC Regulated Excitation Voltage
- Four Digital Inputs For Contact Closure or NPN Transistor
- DIN Rail Mount - Steel Clip
- 10-30VDC Power
- Reverse Polarity Screw-On SMA Antenna Connector
- 915MHz ISM\* Band - 2 Versions, 14 Hop Sequences

- 2.4GHz Unlicensed Band - 1 Version, 7 Hop Sequences
- Spread Spectrum, Frequency Hopping Technology\*
- Line of Sight Range to 20 Miles With 915MHz Band Radio
- Line of Sight Range to 10 Miles With 2.4GHz Band Radio
- 5 Year Warranty (1 Year on Radio Module)
- UL/cUL Recognized

#### DESCRIPTION

The DR9011 is an RF transmitter that will accept both analog and switch contact inputs. A 12 bit A/D converter is used to digitize the analog data. Analog data and switch status is then transmitted to the companion DR9021 Receiver where the analog signal and switch status is reconstructed.

The switch inputs require a standard contact closure or an open collector NPN transistor.

Three radio modules are available for the DR9011, two 915MHz band versions with 7 Hop sequences each and a 2.4GHz band

version with 7 Hop sequences. They use spread spectrum, frequency hopping\* technology. These choices provide 21 different Hop sequences that allow 21 systems to work in the same locale without interfering with each other.

A DIP Switch on the PC board is used to set the Hop sequence.

With proper antenna and cable selection and a 915MHz band version radio, the DR9011 can transmit up to 20 miles. The 2.4GHz band version can transmit up to 10 miles.

The DR9011 provides isolation between input and power source.

A 10 VDC precision power supply is built-in and provides excitation for up to four (4) 330 ohm bridges.

Screw terminal blocks that plug into the case allow easy wiring and removal of products.

All of the DR Series of products provide transient protection to help eliminate damage from lightning and from other transients created on the power and signal leads.

#### SPECIFICATIONS

##### INPUT

Strain Gauge

Span  
0.5 mV/V to 1 V/V

Accuracy  
±0.1% of Span

Linearity  
±0.01% of Span

Excitation:  
10 VDC Precision Supply for  
up to 4 Strain Gauges  
125 mA Maximum

Switch Input

Open Circuit Voltage  
Equals Power Input  
(10 to 30 VDC)

Closed Circuit Current  
3 to 9 mA

##### RADIO

Frequency  
915 MHz Band  
908 or 922 MHz  
2.4 GHz Band  
2.4000 - 2.4835 GHz

Spread Spectrum Type  
Frequency Hopping, Direct FM

I/O Data Rate Tx to Rx:  
9600 bps

Update Rate  
10/S

Range / Line of Sight  
915 MHz Band - Up to 20 Mi.  
2.4 GHz Band - Up to 10 Mi.

Receiver Sensitivity:  
915 MHz Band  
-110 dBm @ 9600 baud  
2.4 GHz Band  
-105 dBm @ 9600 baud

Transmitter Power:  
915 MHz Band  
100 mW (20 dBm)  
2.4GHz Band  
50 mW (17dBm)

Connector:  
Reverse Polarity SMA Female

Certification:  
FCC Part 15.247

##### COMMON MODE REJECTION

100 dB, DC to 60 Hz

##### OPERATING TEMPERATURE

-15°F to 160°F  
-25°C to 70°C

##### TEMPERATURE STABILITY

±(0.01% of Span)/°C Max

##### POWER

10 to 30 VDC  
1.5 Watts Max

\* See page 52 for a comprehensive definition.



**ORDERING INFORMATION**

**Input Range**

(Must be within minimum to maximum specification)

Span

mV/V     V/V

**RADIO**

- 908 MHz - Standard
- 922 MHz - Optional
- 2.4 GHz

**\* NOTE: This unit must be used with a DR9021 wireless receiver.**

**ACCESSORIES**

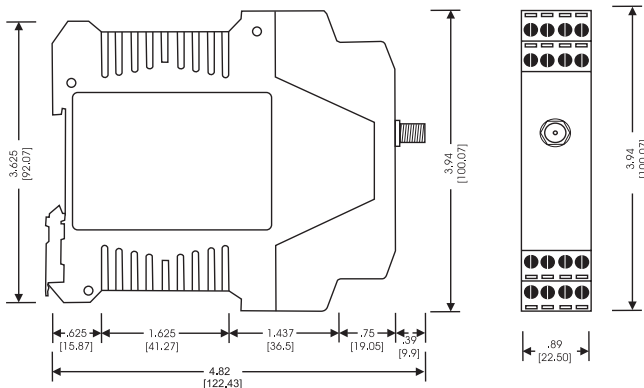
RP = Reverse Polarity

4073	Two Antenna Coupler, Transmit and Receive, 2-Port 900 MHz	QTY _____
4051	Receive Only, 2 to 4 Antenna Coupler 4-Port 900 MHz	QTY _____
4061	Receive Only, 2 to 4 Antenna Coupler 4-Port 2.4 GHz	QTY _____
4062	50 Ohm Termination, For Unused Ports On P/N 4051,4061	QTY _____
4022	PSP24-024S, 24 VDC 1 Amp Power Supply	QTY _____
4026	Bulkhead Connector Type N Female to Type N Female	QTY _____
4011	Bulkhead Surge Protector Type N Male to Type N Female	QTY _____
4035	Bulkhead Surge Protector Type N Female to Type N Female	QTY _____
CBH2	2 Ft WBC195 Cable w/ RP-SMA Male & RP-SMA Female Bulkhead Connector	QTY _____
CBH6	6 Ft WBC195 Cable w/ RP-SMA Male & RP-SMA Female Bulkhead Connector	QTY _____
CBH10	10 Ft WBC195 Cable w/ RP-SMA Male & RP-SMA Female Bulkhead Connector	QTY _____
CBH-X	Custom Length WBC195 Cable w/ RP-SMA Male & RP-SMA Female Bulkhead Connector	QTY _____
CPT2	2 Ft WBC195 Cable w/ RP-SMA Male & Type N Male Connector	QTY _____
CPT6	6 Ft WBC195 Cable w/ RP-SMA Male & Type N Male Connector	QTY _____
CPT10	10 Ft WBC195 Cable w/ RP-SMA Male & Type N Male Connector	QTY _____
CPT-X	Custom Length WBC195 Cable w/ RP-SMA Male & Type N Male Connector	QTY _____

For more accessories and cables, see the ACCESSORIES section of this catalog (Page 49).

**DIMENSIONS**

Inches [mm]



**CONNECTIONS**

TERMINAL	CONNECTION
1	Bridge Input +
2	Bridge Input -
3	Shield
4	Shield
5	Switch 1 +
6	Switch 1 -
7	Switch 2 -
8	Switch 2 +
9	Switch 3 +
10	Switch 3 -
11	Switch 4 -
12	Switch 4 +
13	10 VDC Excitation +
14	Excitation Common
15	Power +
16	Power -



## DR9011-03

### RTD INPUT POINT-TO-POINT TRANSMITTER

#### FEATURES

- Direct RTD Input
- Four Digital Inputs For Contact Closure or NPN Transistor
- DIN Rail Mount - Steel Clip
- 10-30VDC Power
- Reverse Polarity Screw-On SMA Antenna Connector
- 915MHz ISM\* Band - 2 Versions, 14 Hop Sequences
- 2.4GHz Unlicensed Band - 1 Version, 7 Hop Sequences
- Spread Spectrum, Frequency Hopping Technology\*
- Line of Sight Range to 20 Miles With 915MHz Band Radio
- Line of Sight Range to 10 Miles With 2.4GHz Band Radio
- 5 Year Warranty (1 Year on Radio Module)
- UL/cUL Recognized

#### DESCRIPTION

The DR9011 is an RF transmitter that will accept both analog and switch contact inputs. A 12 bit A/D converter is used to digitize the analog data. Analog data and switch status is then transmitted to the companion DR9021 Receiver where the analog signal and switch status is reconstructed.

The switch inputs require a standard contact closure or an open collector NPN transistor.

Three radio modules are available for the DR9011, two 915MHz band versions with 7 Hop sequences each and a 2.4GHz band

version with 7 Hop sequences. They use spread spectrum, frequency hopping\* technology. These choices provide 21 different Hop sequences that allow 21 systems to work in the same locale without interfering with each other.

A DIP Switch on the PC board is used to set the Hop sequence.

With proper antenna and cable selection and a 915MHz band version radio, the DR9011 can transmit up to 20 miles. The 2.4GHz band version can transmit up to 10 miles.

The DR9011 provides isolation between input and power source.

The product provides lead wire compensation for a 3 wire RTD.

Screw terminal blocks that plug into the case allow easy wiring and removal of products.

All of the DR Series of products provide transient protection to help eliminate damage from lightning and from other transients created on the power and signal leads.

#### SPECIFICATIONS

##### INPUT

###### RTD

100 ° Platinum, 2 or 3 Wire  
.00385 or .00392 Alpha

###### Range

-200 to +850°C Maximum  
15°C Span Minimum

###### Accuracy

±0.05% of Span

###### Linearity

±0.05% of Span

###### Open Sensor:

Full Scale

###### Switch Input

Open Circuit Voltage  
Equals Power Input  
(10 to 30 VDC)

###### Closed Circuit Current

3 to 9 mA

##### RADIO

###### Frequency

915 MHz Band  
908 or 922 MHz

###### 2.4 GHz Band

2.4000 - 2.4835 GHz

###### Spread Spectrum Type

Frequency Hopping, Direct FM

###### I/O Data Rate Tx to Rx:

9600 bps

###### Update Rate

10/S

###### Range / Line of Sight

915 MHz Band - Up to 20 Mi.  
2.4 GHz Band - Up to 10 Mi.

###### Receiver Sensitivity:

915 MHz Band  
-110 dBm @ 9600 baud  
2.4 GHz Band  
-105 dBm @ 9600 baud

###### Transmitter Power:

915 MHz Band  
100 mW (20 dBm)  
2.4GHz Band  
50 mW (17dBm)

###### Connector:

Reverse Polarity SMA Female

###### Certification:

FCC Part 15.247

##### COMMON MODE REJECTION

100 dB, DC to 60 Hz

##### OPERATING TEMPERATURE

-15°F to 160°F  
-25°C to 70°C

##### TEMPERATURE STABILITY

±(0.01% of Span)/°C Max

##### POWER

10 to 30 VDC  
1.5 Watts Max

\* See page 52 for a comprehensive definition.

## ORDERING INFORMATION

### Input Range

(Must be within minimum to maximum specification)

Zero Scale

Full Scale

°C     °F

Alpha:

.00385     .00392

### RADIO

- 908 MHz - Standard  
 922 MHz - Optional  
 2.4 GHz

\* **NOTE:** This unit must be used with a DR9021 wireless receiver.

## ACCESSORIES

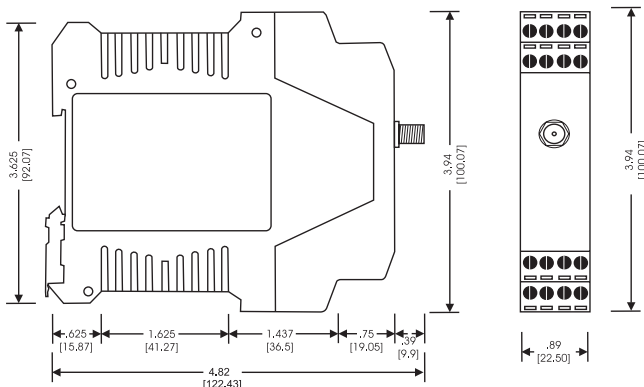
RP = Reverse Polarity

4073	Two Antenna Coupler, Transmit and Receive, 2-Port 900 MHz	QTY _____
4051	Receive Only, 2 to 4 Antenna Coupler 4-Port 900 MHz	QTY _____
4061	Receive Only, 2 to 4 Antenna Coupler 4-Port 2.4 GHz	QTY _____
4062	50 Ohm Termination, For Unused Ports On P/N 4051,4061	QTY _____
4022	PSP24-024S, 24 VDC 1 Amp Power Supply	QTY _____
4026	Bulkhead Connector Type N Female to Type N Female	QTY _____
4011	Bulkhead Surge Protector Type N Male to Type N Female	QTY _____
4035	Bulkhead Surge Protector Type N Female to Type N Female	QTY _____
CBH2	2 Ft WBC195 Cable w/ RP-SMA Male & RP-SMA Female Bulkhead Connector	QTY _____
CBH6	6 Ft WBC195 Cable w/ RP-SMA Male & RP-SMA Female Bulkhead Connector	QTY _____
CBH10	10 Ft WBC195 Cable w/ RP-SMA Male & RP-SMA Female Bulkhead Connector	QTY _____
CBH-X	Custom Length WBC195 Cable w/ RP-SMA Male & RP-SMA Female Bulkhead Connector	QTY _____
CPT2	2 Ft WBC195 Cable w/ RP-SMA Male & Type N Male Connector	QTY _____
CPT6	6 Ft WBC195 Cable w/ RP-SMA Male & Type N Male Connector	QTY _____
CPT10	10 Ft WBC195 Cable w/ RP-SMA Male & Type N Male Connector	QTY _____
CPT-X	Custom Length WBC195 Cable w/ RP-SMA Male & Type N Male Connector	QTY _____

For more accessories and cables, see the ACCESSORIES section of this catalog (Page 49).

## DIMENSIONS

Inches [mm]



## CONNECTIONS

TERMINAL	CONNECTION
1	RTD Input +
2	RTD Input -
3	RTD Lead Compensation
4	No Connection
5	Switch 1 +
6	Switch 1 -
7	Switch 2 -
8	Switch 2 +
9	Switch 3 +
10	Switch 3 -
11	Switch 4 -
12	Switch 4 +
13	No Connection
14	No Connection
15	Power +
16	Power -



## DR9021

### WIRELESS POINT-TO-POINT RECEIVER

#### FEATURES

- Dual 4/20 mADC Outputs
- Four Digital Open Collector NPN Transistor Outputs
- Reverse Polarity Screw-On SMA Antenna Connector
- 915MHz ISM\* Band - 2 Versions, 14 Hop Sequences
- 2.4GHz Unlicensed Band - 1 Version, 7 Hop Sequences
- Spread Spectrum, Frequency Hopping Technology\*
- Ranges to 20 Miles With 915MHz Band Radio
- Ranges to 10 Miles With 2.4GHz Band Radio
- DIN Rail Mount - Steel Clip
- 5 Year Warranty (1 Year on Radio Module)
- UL/cUL Recognized

#### DESCRIPTION

The DR9021 RF Receiver receives RF signals from the DR9011 Transmitter and reconstructs the analog signals as 4/20 mA outputs.

When the transmitter has a dual channel input, the DR9021 has a 4/20 mA output for each channel. If the transmitter has a single channel analog input, the DR9021 provides two 4/20 mA outputs proportional to the single input.

Switch outputs are provided as discrete Open Collector NPN transistors. A DIP Switch on the PC board allows selection of

Normal Acting or Reverse Acting (Failsafe) outputs.

Three radio modules are available for the DR9021, two 915MHz band versions with 7 Hop sequences each and a 2.4GHz band version with 7 Hop sequences. They use spread spectrum, frequency hopping\* technology. These choices provide 21 different Hop sequences that allow 21 systems to work in the same locale without interfering with each other.

A DIP Switch on the PC board is used to set the hopping sequence.

With proper antenna and cable selection and a 915MHz band version radio, the DR9021 can receive from a DR9011 up to 20 miles away.

The DR9021 provides isolation between the output and the power source.

Screw terminal blocks that plug into the case allow easy wiring and removal of products.

All of the DR Series of products provide transient protection to help eliminate damage from lightning and from other transients created on the power and signal leads.

#### SPECIFICATIONS

##### RADIO

##### Frequency

915 MHz Band  
908 or 922 MHz

2.4 GHz Band  
2.4000 - 2.4835 GHz

##### Spread Spectrum Type

Frequency Hopping, Direct FM

##### I/O Data Rate Tx to Rx:

9600 bps

##### Update Rate

10/S

##### Range / Line of Sight

915 MHz Band - Up to 20 Mi.  
2.4 GHz Band - Up to 10 Mi.

##### Receiver Sensitivity:

915 MHz Band  
-110 dBm @ 9600 baud  
2.4 GHz Band  
-105 dBm @ 9600 baud

##### Transmitter Power:

915 MHz Band  
100 mW (20 dBm)  
2.4GHz Band  
50 mW (17dBm)

##### Connector:

Reverse Polarity SMA Female

##### Certification:

FCC Part 15.247

##### OUTPUT

##### Analog

Dual 4/20 mADC  
12 VDC Compliance

##### Digital

Four Optically Isolated  
Open Collector NPN Transistors  
30 VDC Max Voltage,  
30 mA Max Current  
Operates in Saturated Mode

##### POWER

85/230 VAC  
2.0 VA Max  
12 or 24 VDC  
1.5 Watt Max

\* See page 52 for a comprehensive definition.

## ORDERING INFORMATION

### RADIO

- 908 MHz - Standard  
 922 MHz - Optional  
 2.4 GHz

NOTE: Radio used must match DR9011 Radio

### POWER

- 85/230 VAC  
 24 VDC  
 12 VDC

\* NOTE: This unit must be used with a DR9011 wireless transmitter.

## ACCESSORIES

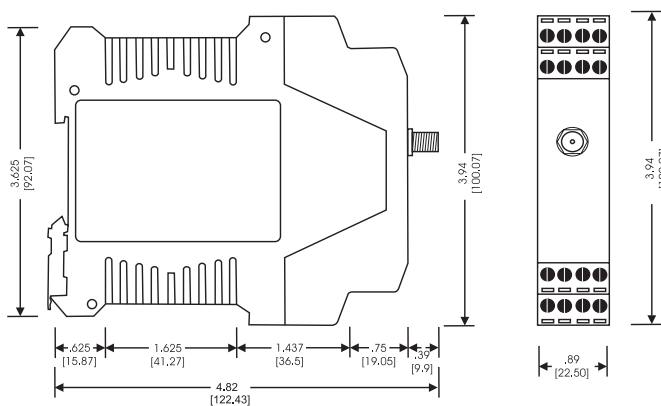
RP = Reverse Polarity

4073	Two Antenna Coupler, Transmit and Receive, 2-Port 900 MHz	QTY _____
4051	Receive Only, 2 to 4 Antenna Coupler 4-Port 900 MHz	QTY _____
4061	Receive Only, 2 to 4 Antenna Coupler 4-Port 2.4 GHz	QTY _____
4062	50 Ohm Termination, For Unused Ports On P/N 4051,4061	QTY _____
4022	PSP24-024S, 24 VDC 1 Amp Power Supply	QTY _____
4026	Bulkhead Connector Type N Female to Type N Female	QTY _____
4011	Bulkhead Surge Protector Type N Male to Type N Female	QTY _____
4035	Bulkhead Surge Protector Type N Female to Type N Female	QTY _____
CBH2	2 Ft WBC195 Cable w/ RP-SMA Male & RP-SMA Female Bulkhead Connector	QTY _____
CBH6	6 Ft WBC195 Cable w/ RP-SMA Male & RP-SMA Female Bulkhead Connector	QTY _____
CBH10	10 Ft WBC195 Cable w/ RP-SMA Male & RP-SMA Female Bulkhead Connector	QTY _____
CBH-X	Custom Length WBC195 Cable w/ RP-SMA Male & RP-SMA Female Bulkhead Connector	QTY _____
CPT2	2 Ft WBC195 Cable w/ RP-SMA Male & Type N Male Connector	QTY _____
CPT6	6 Ft WBC195 Cable w/ RP-SMA Male & Type N Male Connector	QTY _____
CPT10	10 Ft WBC195 Cable w/ RP-SMA Male & Type N Male Connector	QTY _____
CPT-X	Custom Length WBC195 Cable w/ RP-SMA Male & Type N Male Connector	QTY _____

For more accessories and cables, see the ACCESSORIES section of this catalog (Page 49).

## DIMENSIONS

Inches [mm]



## CONNECTIONS

TERMINAL	CONNECTION
1	4/20 mADC Output 1 +
2	4/20 mADC Output 1 -
3	4/20 mADC Output 2 +
4	4/20 mADC Output 2 -
5	Switch 1 +
6	Switch 1 -
7	Switch 2 +
8	Switch 2 -
9	Switch 3 +
10	Switch 3 -
11	Switch 4 +
12	Switch 4 -
13	No Connection
14	No Connection
15	Power +
16	Power -

# DR9031

## POINT-TO-POINT TRANSCEIVER

### FEATURES



- Two DR9031 products make a bi-directional acquisition and control system
- Send and Receive Data in Both Directions
- Inputs Available For DC Voltage or DC Current, RTD, or Bridge
- Dual DC Voltage or Current Inputs—Individually Isolated
- Bridge Input Provides Precision 10VDC Excitation For 4 Bridges
- Four Digital Inputs For Contact Closure or NPN Transistor Status
- Dual 4-20mA outputs
- Four Optically Isolated NPN Transistor Digital Outputs
- Each DR9031 can have different analog inputs.
- Plug-In Terminals - DIN Rail Mount - Steel Clip
- Line of Sight Range to 20 Miles With 915MHz Band Radio
- Line of Sight Range to 10 Miles With 2.4GHz Band Radio
- 915MHz ISM\* Band - 2 Versions, 14 Hop Sequences
- 2.4GHz ISM\* Band - 1 Version, 7 Hop Sequences
- Spread Spectrum, Frequency Hopping Technology\*
- 5 Year Warranty (1 Year on Radio Module)

### DESCRIPTION

The DR9031 is a 2-way wireless transceiver set which will send 1 or 2 analog channels and 4 digital switch status channels in both directions.

The transmitter input will accept both analog and switch contact inputs. The switch inputs require a standard contact closure or an open collector NPN transistor.

Dual channel DC voltage or current inputs are available. Each channel may be different.

Single channel RTD and Bridge inputs are available. The RTD input accepts 100 ohm platinum, 2 or 3 wire sensors. The Bridge input provides a precision 10VDC excitation supply that will drive four 330 ohm bridges in parallel to provide an average output from the 4 sensors.

The DR9031 provides isolation between analog inputs and power source. The DC Inputs are individually isolated. This isolation makes the product useful for measuring input signals with high common mode voltages and for breaking ground connections to eliminate ground loops.

RTD and Bridge sensors are inherently isolated, therefore the input circuits are only isolated from the power source.

A 12 bit A/D converter is used to digitize the analog data. Analog data and switch status is then transmitted to the companion DR9031 Receiver where the analog signal and switch status is reconstructed.

Dual channel input analog data is reconstructed as dual 4/20mA outputs. Single channel analog inputs are reconstructed as two 4/20mA outputs proportional to the input.

Switch status output is 4 optically isolated NPN transistors.

Three radio modules are available for the DR9031, two 915MHz band versions with 7 Hop sequences each and a 2.4GHz band version with 7 Hop sequences. They use spread spectrum, frequency hopping\* technology. These choices provide 21 different Hop sequences that allow 21 systems to work in the same locale without interfering with each other.

A DIP Switch on the Transmitter PC board is used to set the Hop sequence.

With proper antenna and cable selection and a 915MHz band version radio, the DR9031 can transmit up to 20 miles. The 2.4GHz band version can transmit up to 10 miles.

Screw terminal blocks that plug into the case allow easy wiring and removal of products.

All of the DR Series of products provide transient protection to help eliminate damage from lightning and from other transients created on the power and signal leads.

\* See page 52 for a comprehensive definition.

**INPUT**

Dual DC

Current

Min Span = 1mA  
Max Span = 50 mA

Voltage

Min Span = 100 mV  
Max Span = 150 V

Accuracy

±0.1% of Span

Linearity

±0.05% of Span

Strain Gauge

Span

0.5 mV/V to 1 V/V

Accuracy

±0.1% of Span

Linearity

±0.01% of Span

Excitation:

10 VDC Precision Supply for  
up to 4 Strain Gauges  
125 mA Maximum

RTD

100 ° Platinum, 2 or 3 Wire  
.00385 or .00392 Alpha

Range

-200 to +850°C Maximum  
15°C Span Minimum

Accuracy

±0.05% of Span

Linearity

±0.05% of Span

Open Sensor:

Full Scale

Switch Input

Open Circuit Voltage  
Equals Power Input  
(12 or 24 VDC)

Closed Circuit Current

4 to 8 mA Dual DC

**COMMON MODE REJECTION**

100 dB, DC to 60 Hz

**TEMPERATURE STABILITY**

±(0.01% of Span)/°C Max

**OUTPUT**

Analog

Dual 4/20 mA DC  
12 VDC Compliance

Digital

Four Optically Isolated  
Open Collector NPN Transistors  
30 VDC Max Voltage,  
30 mA Max Current  
Operates in Saturated Mode

**RADIO**

Frequency

915 MHz Band  
908 or 922 MHz

2.4 GHz Band

2.4000 - 2.4835 GHz

Spread Spectrum Type

Frequency Hopping, Direct FM

I/O Data Rate Tx to Rx:

9600 bps

Update Rate

Approximately 8/S

Range / Line of Sight

915 MHz Band - Up to 20 Mi.  
2.4 GHz Band - Up to 10 Mi.

Receiver Sensitivity:

915 MHz Band  
-110 dBm @ 9600 baud

2.4 GHz Band

-105 dBm @ 9600 baud

Transmitter Power:

915 MHz Band  
100 mW (20 dBm)

2.4GHz Band

50 mW (17dBm)

Connector:

Reverse Polarity SMA Female

Certification:

FCC Part 15.247

**OPERATING TEMPERATURE**

-15°F to 160°F

-25°C to 70°C

**POWER**

12 or 24 VDC

1.5 Watts Max

**ORDERING INFORMATION**

DC Inputs

**INPUT 1**

**Standard Ranges**

**Select 1 Input**

- |                                  |                                   |
|----------------------------------|-----------------------------------|
| <b>Current - DC</b>              | <b>Voltage - DC</b>               |
| <input type="checkbox"/> 0/1 mA  | <input type="checkbox"/> 0/1 V    |
| <input type="checkbox"/> 4/20 mA | <input type="checkbox"/> -1/1 V   |
|                                  | <input type="checkbox"/> 1/5 V    |
|                                  | <input type="checkbox"/> 0/5 V    |
|                                  | <input type="checkbox"/> -5/5 V   |
|                                  | <input type="checkbox"/> 0/10 V   |
|                                  | <input type="checkbox"/> -10/10 V |

**Other Input Range**

- (Must be within minimum to maximum specification)
- VDC     mADC
- Zero Scale
- Full Scale

DC Inputs

**INPUT 2**

**Standard Ranges**

**Select 1 Input**

- |                                  |                                   |
|----------------------------------|-----------------------------------|
| <b>Current - DC</b>              | <b>Voltage - DC</b>               |
| <input type="checkbox"/> 0/1 mA  | <input type="checkbox"/> 0/1 V    |
| <input type="checkbox"/> 4/20 mA | <input type="checkbox"/> -1/1 V   |
|                                  | <input type="checkbox"/> 1/5 V    |
|                                  | <input type="checkbox"/> 0/5 V    |
|                                  | <input type="checkbox"/> -5/5 V   |
|                                  | <input type="checkbox"/> 0/10 V   |
|                                  | <input type="checkbox"/> -10/10 V |

**Other Input Range**

- (Must be within minimum to maximum specification)
- VDC     mADC
- Zero Scale
- Full Scale

- RADIO**     908 MHz Standard     922 MHz Optional     2.4 GHz

- POWER**     12 VDC     24 VDC



ORDERING  
INFORMATION

┌── Bridge Input ──┐

**Input Range**(Must be within minimum  
to maximum specification) Span mV/V     V/V**RADIO**     908 MHz     922 MHz     2.4 GHz  
                  Standard            Optional**POWER**     12 VDC     24 VDC



# DR9031

## ACCESSORIES

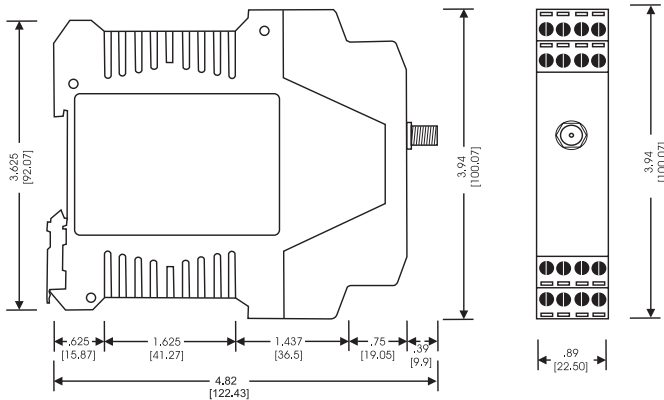
RP = Reverse Polarity

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4051	Receive Only, 2 to 4 Antenna Coupler 4-Port 900 MHz	QTY _____
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4062	50 Ohm Termination, For Unused Ports On P/N 4051,4061	QTY _____
4022	PSP24-024S, 24 VDC 1 Amp Power Supply	QTY _____
4026	Bulkhead Connector Type N Female to Type N Female	QTY _____
4011	Bulkhead Surge Protector Type N Male to Type N Female	QTY _____
4035	Bulkhead Surge Protector Type N Female to Type N Female	QTY _____
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CBH6	6 Ft WBC195 Cable w/ RP-SMA Male & RP-SMA Female Bulkhead Connector	QTY _____
CBH10	10 Ft WBC195 Cable w/ RP-SMA Male & RP-SMA Female Bulkhead Connector	QTY _____
CBH-X	Custom Length WBC195 Cable w/ RP-SMA Male & RP-SMA Female Bulkhead Connector	QTY _____
CPT2	2 Ft WBC195 Cable w/ RP-SMA Male & Type N Male Connector	QTY _____
CPT6	6 Ft WBC195 Cable w/ RP-SMA Male & Type N Male Connector	QTY _____
CPT10	10 Ft WBC195 Cable w/ RP-SMA Male & Type N Male Connector	QTY _____
CPT-X	Custom Length WBC195 Cable w/ RP-SMA Male & Type N Male Connector	QTY _____

For more accessories and cables, see the ACCESSORIES section of this catalog (Page 49).

### DIMENSIONS

Inches [mm]



### CONNECTIONS

#### RECEIVER

TERMINAL	CONNECTIONS
1	4/20 mADC Output 1 +
2	4/20 mADC Output 1 -
3	4/20 mADC Output 2 +
4	4/20 mADC Output 2 -
5	Switch 1 +
6	Switch 1 -
7	Switch 2 +
8	Switch 2 -
9	Switch 3 +
10	Switch 3 -
11	Switch 4 +
12	Switch 4 -
13	No Connection
14	No Connection
15	Power +
16	Power -

#### DC INPUT TRANSMITTER

TERMINAL	CONNECTION
1	DC Signal Input 1 +
2	DC Signal Input 1 -
3	DC Signal Input 2 +
4	DC Signal Input 2 -
5	Switch 1 +
6	Switch 1 -
7	Switch 2 -
8	Switch 2 +
9	Switch 3 +
10	Switch 3 -
11	Switch 4 -
12	Switch 4 +
13	No Connection
14	No Connection
15	Power +
16	Power -

#### BRIDGE INPUT TRANSMITTER

TERMINAL	CONNECTION
1	Bridge Input +
2	Bridge Input -
3	Shield
4	Shield
5	Switch 1 +
6	Switch 1 -
7	Switch 2 -
8	Switch 2 +
9	Switch 3 +
10	Switch 3 -
11	Switch 4 -
12	Switch 4 +
13	10 VDC Excitation +
14	Excitation Common
15	Power +
16	Power -

#### RTD INPUT TRANSMITTER

TERMINAL	CONNECTION
1	RTD Input +
2	RTD Input -
3	RTD Lead Compensation
4	No Connection
5	Switch 1 +
6	Switch 1 -
7	Switch 2 -
8	Switch 2 +
9	Switch 3 +
10	Switch 3 -
11	Switch 4 -
12	Switch 4 +
13	No Connection
14	No Connection
15	Power +
16	Power -

# DR9050 - DR9051 POLLING DATA ACQUISITION SYSTEM

## DESCRIPTION

The DR9050/DR9051 is a wireless data acquisition system that provides standard Modbus protocol acquisition for 1 to 247 remote DR9051 transmitters

The DR9051 is an RF transmitter that will accept both analog and switch contact inputs. A 12 bit A/D converter is used to digitize the analog data. Analog data and switch status is transmitted, upon request, to the DR9050. The switch inputs require a standard contact closure or an open collector NPN transistor or N-channel MOSFET transistor.

The DR9050 is a portal to the DR9051. A single connection to the DR9050 allows a MODBUS® RTU Master Controller access to 1 to 247 DR9051 devices. The DR9050 can be wired in parallel with other MODBUS® RTU devices to make large systems which include wireless and hard wired devices.

The controller can be a programmable logic controller, computer, data logger, or any device that is capable of acting as a MODBUS® RTU Master Controller via an RS485 or RS422 two wire port.

In response to MODBUS queries for specific information, the DR9050 sends an RF signal to request data from the addressed DR9051. Upon reception of the data, the DR9050 returns a MODBUS® RTU response to the user's Master Controller via the RS485 / RS422 port.

## REPEATER MODE

The DR9051 has a repeater capability that is useful for data monitoring in areas where the DR9050 cannot communicate directly with a DR9051 due to distance or obstructions in the transmission path.

A normal system has the DR9051 units and the DR9050 all set on the same hop sequence. The DR9050 transmits the address of the DR9051 of interest. The DR9051 responds with the desired data.

The repeater capability allows data to be collected from a DR9051 which the DR9050 cannot communicate with due to distance or obstruction.

A DR9051 that can communicate with the DR9050 and is also able to communicate with the obstructed DR9051 is chosen as a Repeater. A dip switch in this DR9051 selects the Repeater mode and allows a hop sequence to be selected with a dip switch.

The obstructed DR9051 has its system hop sequence set at a value other than the DR9050 Hop sequence(system value). The DR9051 Repeater has the same hop sequence set on the dip switch as the obstructed DR9051 has set in its memory.

When the DR9050 polls the obstructed DR9051 address, any DR9051 in the Repeater mode and in range will rebroadcast the poll data on the hop sequence set on its dip switch.

The obstructed DR9051 will receive the addressed query from the Repeater with the same hop sequence and respond by transmitting the data. The DR9051 Repeater will receive the data, change its hop sequence to the system value and transmit the data which will be received by the DR9050.

The total number of Repeaters allowed in a system is large. Each Repeater has 6 hop sequences it can use, and also has the obstructed DR9051's addresses as a further selection tool.

A simple straight line application would allow 7 DR9051's to be used to collect data up to over 140 miles distance. The hop sequences would be set as shown below, this can be varied to fit the need.

DR9050 System Hop = 0

DR9051 #1 Hop = 0 - Repeater Hop = 1

DR9051 #2 Hop = 1 - Repeater Hop = 2

DR9051 #3 Hop = 2 - Repeater Hop = 3

DR9051 #4 Hop = 3 - Repeater Hop = 4

DR9051 #5 Hop = 4 - Repeater Hop = 5

DR9051 #6 Hop = 5 - Repeater Hop = 6

DR9051 #7 Hop = 6

This system could be expanded by repeating the above system. Once a DR9051 is out of the range of a DR9051 with the same Hop sequences, the hop sequences can be repeated.

In the first example, the last DR9051 in the group would use hop sequence 6 to receive and transmit. It could be set as a Repeater and retransmit on hop 0. Another string of 7 units could be used. This expansion process could be repeated until 247 DR9051's are in the system.

A delay has to be programmed into the DR9051's to set the default recovery time from the Repeater mode. (A DR9051 changes its hop value to its set value as soon as it receives a response for the repeater query. If no response is received, the DR9051 times out its waiting and switches from its repeater hop value to its set value.)

## RF Data

The system can be ordered as a 900MHz, 923MHz or 2.4GHz system. All 3 systems take advantage of the unlicensed ISM frequency bands. The radios use frequency hopping, spread spectrum\* technology to eliminate interference and to allow multiple transmitters to operate in the same locale without interference.

Each of the 3 frequency bands has 7 different user selectable frequency hopping sequences to allow up to 21 different polling systems to work in the same locale. The radio module hops through 25 channels with any 1 of 7 hop sequences per frequency band.

Both of the 900MHz systems have a transmit power of 100mW (20dBm) with a receive sensitivity of -110dBm. The 2.4GHz system has a transmit power of 50mW (17dBm) with a receive sensitivity of -105dBm. The communication rate between the DR9050 and DR9051 is 9600 baud.

Both the DR9050 and DR9051 have transformer isolation between the product circuitry and power source. The dual channel DC input has individual isolation for each input channel. The RTD and bridge input transmitters have the transformer isolation.

The DC input isolation makes the product useful for measuring input signals with high common mode voltages and for breaking ground connections to eliminate ground loops.

Since an RTD sensor and a strain gauge sensor are inherently isolated, there is no need for an isolated input circuit.

Pluggable screw terminal blocks that plug into the case allow easy wiring and removal of products.

Setup software is supplied that allows the DR9050 to have all of the system addresses stored in the DR9050. These addresses can be edited as desired and allows adding descriptive comments to each address.

The software also allows any DR9051 to be queried by system address and the analog data and digital input status can be viewed. The data includes last received signal strength for the DR9050 and the queried DR9051. This data proves valuable in pointing antennas and testing the system for antenna problems. System Hop sequences can be ascertained and changed for the DR9050 and all of the DR9051 units in the system.



# DR9051-01

## DUAL DC INPUT POLLING TRANSMITTER

### FEATURES

- Dual DC Voltage or Current Inputs - Individually Isolated
- Four Digital Inputs For Contact Closure or NPN Transistor
- DIN Rail Mount - Steel Clip
- 10-30VDC Power
- Reverse Polarity Screw-On SMA Antenna Connector
- 915 MHz ISM\* Band - 2 Versions, 14 Hop Sequences
- 2.4GHz Unlicensed Band - 1 Version, 7 Hop Sequences
- Spread Spectrum, Frequency Hopping Technology\*
- Line of Sight Range to 20 Miles With 915MHz Band Radio
- Line of Sight Range to 10 Miles With 2.4GHz Band Radio
- 5 Year Warranty (1 Year on Radio Module)
- UL/cUL Recognized

### DESCRIPTION

The DR9051 is an RF transmitter that will accept both analog and switch contact inputs. A 12 bit A/D converter is used to digitize the analog data. Analog data and switch status is read when requested by the companion DR9050 Control Unit. The DR9050 polls the DR9051 and outputs the data in Modbus RTU format. A single DR9050 can poll up to 247 DR9051's utilizing a single Hop sequence.

The switch inputs require a standard contact closure or an open collector NPN transistor.

Three radio modules are available for the DR9051, two 915MHz band versions with 7 Hop sequences each and a 2.4GHz band version with 7 Hop sequences. They use spread spectrum, frequency hopping\* technology. These choices provide 21 different Hop sequences that allow 21 systems to work in the same locale without interfering with each other.

With proper antenna and cable selection and a 915MHz band version radio, the DR9051 can transmit up to 20 miles. The 2.4GHz band version can transmit up to 10 miles.

The DR9051 provides isolation between input and power source. The DC Inputs are individually isolated. This isolation makes the product useful for measuring input signals with high common mode voltages and for breaking ground connections to eliminate ground loops.

Screw terminal blocks that plug into the case allow easy wiring and removal of products.

All of the DR Series of products provide transient protection to help eliminate damage from lightning and from other transients created on the power and signal leads.

### SPECIFICATIONS

#### INPUT

Dual DC

Current

Min Span = 1mA

Max Span = 50 mA

Voltage

Min Span = 100 mV

Max Span = 150 V

Accuracy

±0.1% of Span

Linearity

±0.05% of Span

Switch Input

Open Circuit Voltage

Equals Power Input

(10 to 30 VDC)

Closed Circuit Current

3 to 9 mA

#### RADIO

Frequency

915 MHz Band

908 or 922 MHz

2.4 GHz Band

2.4000 - 2.4835 GHz

Spread Spectrum Type

Frequency Hopping, Direct FM

I/O Data Rate Tx to Rx:

9600 bps

Range / Line of Sight

915 MHz Band - Up to 20 Mi.

2.4 GHz Band - Up to 10 Mi.

Receiver Sensitivity:

915 MHz Band

-110 dBm @ 9600 baud

2.4 GHz Band

-105 dBm @ 9600 baud

Transmitter Power:

915 MHz Band

100 mW (20 dBm)

2.4GHz Band

50 mW (17dBm)

Connector:

Reverse Polarity SMA Female

Certification:

FCC Part 15.247

#### COMMON MODE REJECTION

100 dB, DC to 60 Hz

#### OPERATING TEMPERATURE

-15°F to 160°F

-25°C to 70°C

#### TEMPERATURE STABILITY

±(0.01% of Span)/°C Max

#### POWER

10 to 30 VDC

1.5 Watts Max

\* See page 52 for a comprehensive definition.





# DR9051-02

## BRIDGE INPUT POLLING TRANSMITTER

### FEATURES

- Direct Strain Gauge (Bridge) Input
- 10 VDC Regulated Excitation Voltage
- Four Digital Inputs For Contact Closure or NPN Transistor
- DIN Rail Mount - Steel Clip
- 10-30VDC Power
- Reverse Polarity Screw-On SMA Antenna Connector
- 915 MHz ISM\* Band - 2 Versions, 14 Hop Sequences
- 2.4GHz Unlicensed Band - 1 Version, 7 Hop Sequences
- Spread Spectrum, Frequency Hopping Technology\*
- Line of Sight Range to 20 Miles With 915MHz Band Radio
- Line of Sight Range to 10 Miles With 2.4GHz Band Radio
- 5 Year Warranty (1 Year on Radio Module)
- UL/cUL Recognized

### DESCRIPTION

The DR9051 is an RF transmitter that will accept both analog and switch contact inputs. A 12 bit A/D converter is used to digitize the analog data. Analog data and switch status is read when requested by the companion DR9050 Control Unit. The DR9050 polls the DR9051 and outputs the data in Modbus RTU format. A single DR9050 can poll up to 247 DR9051's utilizing a single Hop sequence.

The switch inputs require a standard contact closure or an open collector NPN transistor.

Three radio modules are available for the DR9051, two 915MHz band versions with 7 Hop sequences each and a 2.4GHz band version with 7 Hop sequences. They use spread spectrum, frequency hopping\* technology. These choices provide 21 different Hop sequences that allow 21 systems to work in the same locale without interfering with each other.

With proper antenna and cable selection and a 915MHz band version radio, the DR9051 can transmit up to 20 miles. The 2.4GHz band version can transmit up to 10 miles.

The DR9051 provides isolation between input and power source.

A 10 VDC precision power supply is built-in and provides excitation for up to four (4) 330 ohm bridges.

Screw terminal blocks that plug into the case allow easy wiring and removal of products.

All of the DR Series of products provide transient protection to help eliminate damage from lightning and from other transients created on the power and signal leads.

### SPECIFICATIONS

#### INPUT

- Strain Gauge
  - Span
    - 0.5 mV/V to 1 V/V
  - Accuracy
    - ±0.1% of Span
  - Linearity
    - ±0.01% of Span
  - Excitation:
    - 10 VDC Precision Supply for up to 4 Strain Gauges
    - 125 mA Maximum
- Switch Input
  - Open Circuit Voltage
    - Equals Power Input (10 to 30 VDC)
  - Closed Circuit Current
    - 3 to 9 mA

#### RADIO

- Frequency
  - 915 MHz Band
    - 908 or 922 MHz
  - 2.4 GHz Band
    - 2.4000 - 2.4835 GHz
- Spread Spectrum Type
  - Frequency Hopping, Direct FM
- I/O Data Rate Tx to Rx:
  - 9600 bps
- Range / Line of Sight
  - 915 MHz Band - Up to 20 Mi.
  - 2.4 GHz Band - Up to 10 Mi.
- Receiver Sensitivity:
  - 915 MHz Band
    - 110 dBm @ 9600 baud
  - 2.4 GHz Band
    - 105 dBm @ 9600 baud
- Transmitter Power:
  - 915 MHz Band
    - 100 mW (20 dBm)
  - 2.4GHz Band
    - 50 mW (17dBm)
- Connector:
  - Reverse Polarity SMA Female
- Certification:
  - FCC Part 15.247

#### COMMON MODE REJECTION

100 dB, DC to 60 Hz

#### OPERATING TEMPERATURE

-15°F to 160°F  
-25°C to 70°C

#### TEMPERATURE STABILITY

±(0.01% of Span)/°C Max

#### POWER

10 to 30 VDC  
1.5 Watts Max

\* See page 52 for a comprehensive definition.



**ORDERING INFORMATION**

**Input Range**

(Must be within minimum to maximum specification)

Span

mV/V     V/V

**RADIO**

- 908 MHz - Standard
- 922 MHz - Optional
- 2.4 GHz

**\* NOTE: This unit must be used with a DR9050 Master Control Unit.**

**ACCESSORIES**

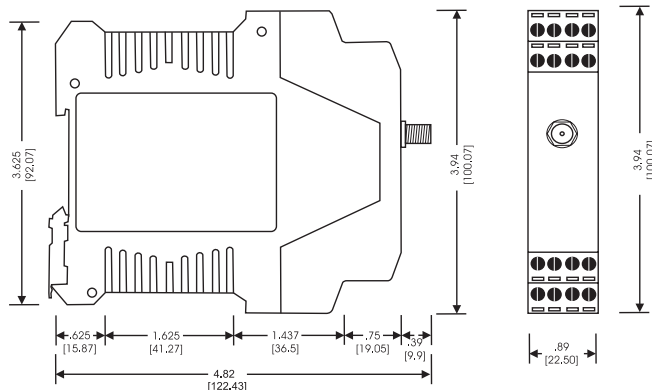
RP = Reverse Polarity

<b>POLLING</b>	4073    Two Antenna Coupler, Transmit and Receive, 2-Port 900 MHz	QTY _____
	4051    Receive Only, 2 to 4 Antenna Coupler 4-Port 900 MHz	QTY _____
	4061    Receive Only, 2 to 4 Antenna Coupler 4-Port 2.4 GHz	QTY _____
	4062    50 Ohm Termination, For Unused Ports On P/N 4051,4061	QTY _____
	4022    PSP24-024S, 24 VDC 1 Amp Power Supply	QTY _____
	4026    Bulkhead Connector Type N Female to Type N Female	QTY _____
	4011    Bulkhead Surge Protector Type N Male to Type N Female	QTY _____
	4035    Bulkhead Surge Protector Type N Female to Type N Female	QTY _____
	CBH2    2 Ft WBC195 Cable w/ RP-SMA Male & RP-SMA Female Bulkhead Connector	QTY _____
	CBH6    6 Ft WBC195 Cable w/ RP-SMA Male & RP-SMA Female Bulkhead Connector	QTY _____
	CBH10    10 Ft WBC195 Cable w/ RP-SMA Male & RP-SMA Female Bulkhead Connector	QTY _____
	CBH-X    Custom Length WBC195 Cable w/ RP-SMA Male & RP-SMA Female Bulkhead Connector	QTY _____
<b>BRIDGE INPUT</b>	CPT2    2 Ft WBC195 Cable w/ RP-SMA Male & Type N Male Connector	QTY _____
	CPT6    6 Ft WBC195 Cable w/ RP-SMA Male & Type N Male Connector	QTY _____
	CPT10    10 Ft WBC195 Cable w/ RP-SMA Male & Type N Male Connector	QTY _____
	CPT-X    Custom Length WBC195 Cable w/ RP-SMA Male & Type N Male Connector	QTY _____

For more accessories and cables, see the ACCESSORIES section of this catalog (Page 49).

**DIMENSIONS**

Inches [mm]



**CONNECTIONS**

TERMINAL	CONNECTION
1	Bridge Input +
2	Bridge Input -
3	Shield
4	Shield
5	Switch 1 +
6	Switch 1 -
7	Switch 2 +
8	Switch 2 -
9	Switch 3 +
10	Switch 3 -
11	Switch 4 +
12	Switch 4 -
13	10 VDC Excitation +
14	Excitation Common
15	Power +
16	Power -



# DR9051-03

## RTD INPUT POLLING TRANSMITTER

### FEATURES

- Direct RTD Input
- Four Digital Inputs For Contact Closure or NPN Transistor
- DIN Rail Mount - Steel Clip
- 10-30VDC Power
- Reverse Polarity Screw-On SMA Antenna Connector
- 915MHz ISM\* Band - 2 Versions, 14 Hop Sequences
- 2.4GHz Unlicensed Band - 1 Version, 7 Hop Sequences
- Spread Spectrum, Frequency Hopping Technology\*
- Line of Sight Range to 20 Miles With 915MHz Band Radio
- Line of Sight Range to 10 Miles With 2.4GHz Band Radio
- 5 Year Warranty (1 Year on Radio Module)
- UL/cUL Recognized



### DESCRIPTION

The DR9051 is an RF transmitter that will accept both analog and switch contact inputs. A 12 bit A/D converter is used to digitize the analog data. Analog data and switch status is read when requested by the companion DR9050 Control Unit. The DR9050 polls the DR9051 and outputs the data in Modbus RTU format. A single DR9050 can poll up to 247 DR9051's utilizing a single Hop sequence.

The switch inputs require a standard contact closure or an open collector NPN transistor.

Three radio modules are available for the DR9051, two 915MHz band versions with 7 Hop sequences each and a 2.4GHz band version with 7 Hop sequences. They use spread spectrum, frequency hopping\* technology. These choices provide 21 different Hop sequences that allow 21 systems to work in the same locale without interfering with each other.

With proper antenna and cable selection and a 915MHz band version radio, the DR9051 can transmit up to 20 miles. The 2.4GHz band version can transmit up to 10 miles.

The DR9051 provides isolation between input and power source.

The product provides lead wire compensation for a 3 wire RTD.

Screw terminal blocks that plug into the case allow easy wiring and removal of products.

All of the DR Series of products provide transient protection to help eliminate damage from lightning and from other transients created on the power and signal leads.

### SPECIFICATIONS

#### INPUT

##### RTD

100 ° Platinum, 2 or 3 Wire  
.00385 or .00392 Alpha

Range  
-200 to +850°C Maximum  
15°C Span Minimum

Accuracy  
±0.05% of Span

Linearity  
±0.05% of Span

Open Sensor:  
Full Scale

##### Switch Input

Open Circuit Voltage  
Equals Power Input  
(10 to 30 VDC)

Closed Circuit Current  
3 to 9 mA

#### RADIO

##### Frequency

915 MHz Band  
908 or 922 MHz

2.4 GHz Band  
2.4000 - 2.4835 GHz

Spread Spectrum Type  
Frequency Hopping, Direct FM

I/O Data Rate Tx to Rx:  
9600 bps

Range / Line of Sight  
915 MHz Band - Up to 20 Mi.  
2.4 GHz Band - Up to 10 Mi.

Receiver Sensitivity:  
915 MHz Band  
-110 dBm @ 9600 baud  
2.4 GHz Band  
-105 dBm @ 9600 baud

Transmitter Power:  
915 MHz Band  
100 mW (20 dBm)  
2.4GHz Band  
50 mW (17dBm)

Connector:  
Reverse Polarity SMA Female

Certification:  
FCC Part 15.247

#### COMMON MODE REJECTION

100 dB, DC to 60 Hz

#### OPERATING TEMPERATURE

-15°F to 160°F  
-25°C to 70°C

#### TEMPERATURE STABILITY

±(0.01% of Span)/°C Max

#### POWER

10 to 30 VDC  
1.5 Watts Max

\* See page 52 for a comprehensive definition.

**ORDERING INFORMATION**

**Input Range**

(Must be within minimum to maximum specification)

Zero Scale

Full Scale

°C     °F

Alpha:

.00385     .00392

**RADIO**

- 908 MHz - Standard
- 922 MHz - Optional
- 2.4 GHz

**\* NOTE: This unit must be used with a DR9050 Master Control Unit.**

**ACCESSORIES**

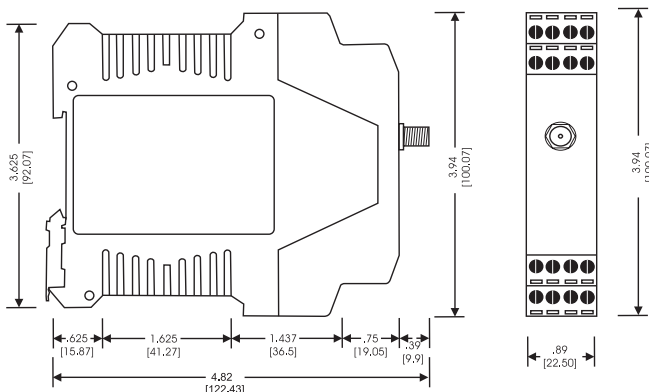
RP = Reverse Polarity

4073	Two Antenna Coupler, Transmit and Receive, 2-Port 900 MHz	QTY _____
4051	Receive Only, 2 to 4 Antenna Coupler 4-Port 900 MHz	QTY _____
4061	Receive Only, 2 to 4 Antenna Coupler 4-Port 2.4 GHz	QTY _____
4062	50 Ohm Termination, For Unused Ports On P/N 4051,4061	QTY _____
4022	PSP24-024S, 24 VDC 1 Amp Power Supply	QTY _____
4026	Bulkhead Connector Type N Female to Type N Female	QTY _____
4011	Bulkhead Surge Protector Type N Male to Type N Female	QTY _____
4035	Bulkhead Surge Protector Type N Female to Type N Female	QTY _____
CBH2	2 Ft WBC195 Cable w/ RP-SMA Male & RP-SMA Female Bulkhead Connector	QTY _____
CBH6	6 Ft WBC195 Cable w/ RP-SMA Male & RP-SMA Female Bulkhead Connector	QTY _____
CBH10	10 Ft WBC195 Cable w/ RP-SMA Male & RP-SMA Female Bulkhead Connector	QTY _____
CBH-X	Custom Length WBC195 Cable w/ RP-SMA Male & RP-SMA Female Bulkhead Connector	QTY _____
CPT2	2 Ft WBC195 Cable w/ RP-SMA Male & Type N Male Connector	QTY _____
CPT6	6 Ft WBC195 Cable w/ RP-SMA Male & Type N Male Connector	QTY _____
CPT10	10 Ft WBC195 Cable w/ RP-SMA Male & Type N Male Connector	QTY _____
CPT-X	Custom Length WBC195 Cable w/ RP-SMA Male & Type N Male Connector	QTY _____

For more accessories and cables, see the ACCESSORIES section of this catalog (Page 49).

**DIMENSIONS**

Inches [mm]



**CONNECTIONS**

TERMINAL	CONNECTION
1	RTD Input +
2	RTD Input -
3	RTD Lead Compensation
4	No Connection
5	Switch 1 +
6	Switch 1 -
7	Switch 2 -
8	Switch 2 +
9	Switch 3 +
10	Switch 3 -
11	Switch 4 -
12	Switch 4 +
13	No Connection
14	No Connection
15	Power +
16	Power -

POLLING

RTD INPUT



# DR9050

## WIRELESS MASTER CONTROL UNIT

### FEATURES

- Modbus RTU Input/Output
- RS485/422 Interface
- Open Architecture - Customer Can Write Custom Software
- DIN Rail Mount - Steel Clip
- 10-30VDC Power
- Reverse Polarity Screw-On SMA Antenna Connector
- 915MHz ISM\* Band - 2 Versions, 14 Hop Sequences
- 2.4GHz Unlicensed Band - 1 Version, 7 Hop Sequences
- Spread Spectrum, Frequency Hopping Technology\*
- Line of Sight Range to 20 Miles With 915MHz Band Radio
- Line of Sight Range to 10 Miles With 2.4GHz Band Radio
- 5 Year Warranty (1 Year on Radio Module)
- UL/cUL Recognized

### DESCRIPTION

The DR9050 is an RF transmitter/receiver that is used to poll data from companion DR9051's. A user Modbus RTU Master Controller (PLC / DCS etc) initiates a query to a Modbus address. The DR9050 MCU determines the correct DR9051 for this address, polls the DR9051 and returns the requested data. A single DR9050 can poll up to 247 DR9051's utilizing a single Hop sequence.

The radio transmitter outputs 100mW (21.5 dBm) in the 915 MHz unlicensed ISM band. It uses frequency hopping, spread spectrum\* technology to allow multiple systems to work in the same locale without interference.

Setup software is provided to program all the system addresses into the DR9050. Addresses may be edited and Hop Sequences can be changed for the system. All setup can be done at the DR9050 site.

Screw terminal blocks that plug into the case allow easy wiring and removal of products.

All of the DR Series of products provide transient protection to help eliminate damage from lightning and from other transients created on the power and signal leads.

### SPECIFICATIONS

#### RADIO

Frequency

915 MHz Band  
908 or 922 MHz

2.4 GHz Band  
2.4000 - 2.4835 GHz

Spread Spectrum Type  
Frequency Hopping, Direct FM

I/O Data Rate Tx to Rx:  
9600 bps

Range / Line of Sight  
915 MHz Band - Up to 20 Mi.  
2.4 GHz Band - Up to 10 Mi.

Receiver Sensitivity:  
915 MHz Band  
-110 dBm @ 9600 baud  
2.4 GHz Band  
-105 dBm @ 9600 baud

Transmitter Power:  
915 MHz Band  
100 mW (20 dBm)  
2.4GHz Band  
50 mW (17dBm)

Connector:  
Reverse Polarity SMA Female

Certification:  
FCC Part 15.247

#### INPUT / OUTPUT

Modbus<sup>®</sup> RTU

RS485/422  
Half Duplex  
9600 Baud  
1 Start Bit  
8 Data Bits  
1 Stop Bit

RS232

For Setup Software  
Cable Adapter Supplied

#### POWER

85/230 VAC  
2.0 VA Max

\* See page 52 for a comprehensive definition.

**ORDERING INFORMATION**

**RADIO**

- 908 MHz - Standard
- 922 MHz - Optional
- 2.4 GHz

NOTE: Radio used must match DR9051 Radio

\* NOTE: This unit must be used with DR9051 wireless transmitters.

**ACCESSORIES**

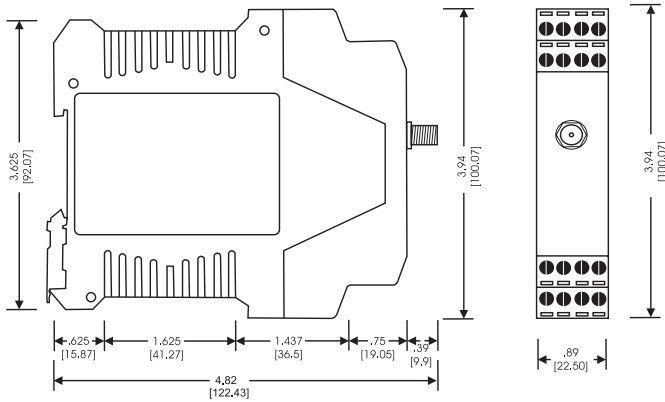
RP = Reverse Polarity

4073	Two Antenna Coupler, Transmit and Receive, 2-Port 900 MHz	QTY _____
4051	Receive Only, 2 to 4 Antenna Coupler 4-Port 900 MHz	QTY _____
4061	Receive Only, 2 to 4 Antenna Coupler 4-Port 2.4 GHz	QTY _____
4062	50 Ohm Termination, For Unused Ports On P/N 4051,4061	QTY _____
4022	PSP24-024S, 24 VDC 1 Amp Power Supply	QTY _____
4026	Bulkhead Connector Type N Female to Type N Female	QTY _____
4011	Bulkhead Surge Protector Type N Male to Type N Female	QTY _____
4035	Bulkhead Surge Protector Type N Female to Type N Female	QTY _____
CBH2	2 Ft WBC195 Cable w/ RP-SMA Male & RP-SMA Female Bulkhead Connector	QTY _____
CBH6	6 Ft WBC195 Cable w/ RP-SMA Male & RP-SMA Female Bulkhead Connector	QTY _____
CBH10	10 Ft WBC195 Cable w/ RP-SMA Male & RP-SMA Female Bulkhead Connector	QTY _____
CBH-X	Custom Length WBC195 Cable w/ RP-SMA Male & RP-SMA Female Bulkhead Connector	QTY _____
CPT2	2 Ft WBC195 Cable w/ RP-SMA Male & Type N Male Connector	QTY _____
CPT6	6 Ft WBC195 Cable w/ RP-SMA Male & Type N Male Connector	QTY _____
CPT10	10 Ft WBC195 Cable w/ RP-SMA Male & Type N Male Connector	QTY _____
CPT-X	Custom Length WBC195 Cable w/ RP-SMA Male & Type N Male Connector	QTY _____

For more accessories and cables, see the ACCESSORIES section of this catalog (Page 49).

**DIMENSIONS**

Inches [mm]



**CONNECTIONS**

TERMINAL	CONNECTION
1	RS485 Terminal A
2	RS485 Terminal B
3	RS485 Common
4	RS485 Shield
5	RS485 Terminal A
6	RS485 Terminal B
7	RS485 Terminal A
8	RS485 Terminal B
9	RS232 RX
10	RS232 TX
11	RS232 Ground
12	RS232 Ground
13	No Connection
14	No Connection
15	AC L1 Power
16	AC L2 Power

} (Termination Resistor Connection)

POLLING

MODBUS RTU OUTPUT



# 4008

2.1 dBi GAIN

915MHz BAND 1/2 WAVE DIPOLE ANTENNA

## FEATURES

- Indoor Mounting
- Mount Directly on Product or on Electrical Housing With Optional Cable
- Lightweight
- Range to 3000ft

## DESCRIPTION

Vertical omnidirectional antennas radiate in a pattern similar to a horizontal doughnut. Their gain is less than that of a yagi antenna which concentrates radiation in a single direction. This reduced gain limits the effective range of the omnidirectional antenna, but proves effective when directivity is not desired.

Omnidirectional antennas are useful in short range applications where their

use eliminates the need for antenna alignment. Omnidirectional antennas are also useful on the control end of a polling system.

When an omnidirectional antenna is used on the control end of a polling system, a yagi can be used on each slave unit for maximum gain and reduction in possible interference due to the front to back ratio gain reduction of the yagi antenna.

The 4008 antenna swivels 90° at the base to allow the antenna to remain vertical with the base mounted either vertically or horizontally.

Designed for indoor mounting, this 7" whip offers flexibility in mounting and dependable performance for short range systems.

## SPECIFICATIONS

### ELECTRICAL GAIN

2.1dBi

### FREQUENCY

900-928MHz

### VSWR

<2:1

### IMPEDANCE

50 ohms

### CONNECTOR

Reverse Polarity SMA Male  
Brass With Nickle and Gold  
Plating

### MECHANICAL RADIATOR

Spring SS Wire

### WHIP

Polyurethane (Black)

### SWIVEL MECHANISM

Polycarbonate (Black)

### DIAMETER

0.5"

### LENGTH

7"

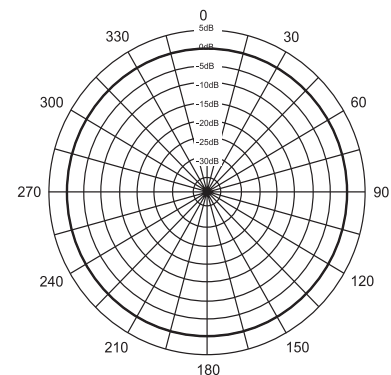
### WEIGHT

0.7 Ounces.

### MOUNTING

Direct Connect to Product  
or Remote Mount With Optional  
Extension Cable

### VERTICAL PATTERN



## ORDERING INFORMATION

4008                      915MHz Band, 2.1dBi Gain, 1/2 Wave Dipole Antenna                      QTY \_\_\_\_\_

## ACCESSORIES

For more accessories, see the ACCESSORIES section of this catalog (Page 49).

## CABLES

RP = Reverse Polarity

CBH2	2 Ft WBC195 Cable w/ RP-SMA Male & RP-SMA Female Bulkhead Connector	QTY _____
CBH6	6 Ft WBC195 Cable w/ RP-SMA Male & RP-SMA Female Bulkhead Connector	QTY _____
CBH10	10 Ft WBC195 Cable w/ RP-SMA Male & RP-SMA Female Bulkhead Connector	QTY _____
CBH-X	Custom length WBC195 Cable w/ RP-SMA Male & RP-SMA Female Bulkhead Connector	QTY _____
	Specify length from 12 inches to 120 Inches                      Length _____ Inches	QTY _____

For more cables, see the ACCESSORIES section of this catalog (Page 50).



# 4007

2 dBi GAIN

2.4GHz BAND 1/2 WAVE DIPOLE ANTENNA

## FEATURES

- Indoor Mounting
- Mount Directly on Product or on Electrical Housing With Optional Cable
- Lightweight
- Range to 1600ft

## DESCRIPTION

Vertical omnidirectional antennas radiate in a pattern similar to a horizontal doughnut. Their gain is less than that of a yagi antenna which concentrates radiation in a single direction. This reduced gain limits the effective range of the omnidirectional antenna, but proves effective when directivity is not desired.

Omnidirectional antennas are useful in short range applications where their

use eliminates the need for antenna alignment. Omnidirectional antennas are also useful on the control end of a polling system.

When an omnidirectional antenna is used on the control end of a polling system, a yagi can be used on each slave unit for maximum gain and reduction in possible interference due to the front to back ratio gain reduction of the yagi antenna.

The 4007 antenna swivels 90° at the base to allow the antenna to remain vertical with the base mounted either vertically or horizontally.

Designed for indoor mounting, this 5.4" whip offers flexibility in mounting and dependable performance for short range systems.

## SPECIFICATIONS

### ELECTRICAL

#### GAIN

2.1dBi

#### FREQUENCY

2.4-2.5GHz

#### VSWR

<2:1

#### IMPEDANCE

50 ohms

#### CONNECTOR

Reverse Polarity SMA Male  
Brass With Nickle and Gold  
Plating

### MECHANICAL

#### RADIATOR

Spring Wire

#### WHIP

Polyurethane (Black)

#### SWIVEL MECHANISM

Polycarbonate (Black)

#### DIAMETER

0.5"

#### LENGTH

5.4"

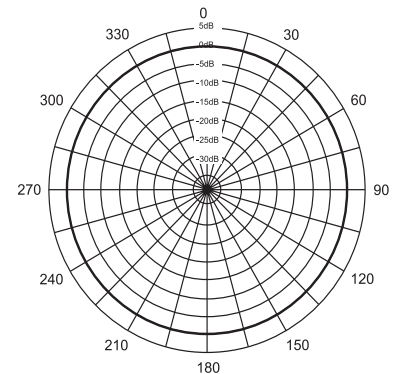
#### WEIGHT

0.6 Ounces

#### MOUNTING

Direct Connect to Product  
or Remote Mount With Optional  
Extension Cable

### VERTICAL PATTERN





## ORDERING INFORMATION

4007                      2.4GHz Band, 2dBi Gain, 1/2 Wave Dipole Antenna                      QTY \_\_\_\_\_

## ACCESSORIES

For more accessories, see the **ACCESSORIES** section of this catalog (Page 49).

## CABLES

RP = Reverse Polarity

CBH2	2 Ft WBC195 Cable w/ RP-SMA Male & RP-SMA Female Bulkhead Connector	QTY _____
CBH6	6 Ft WBC195 Cable w/ RP-SMA Male & RP-SMA Female Bulkhead Connector	QTY _____
CBH10	10 Ft WBC195 Cable w/ RP-SMA Male & RP-SMA Female Bulkhead Connector	QTY _____
CBH-X	Custom length WBC195 Cable w/ RP-SMA Male & RP-SMA Female Bulkhead Connector	QTY _____
	Specify length from 12 inches to 120 Inches                      Length _____ Inches	QTY _____

For more cables, see the **ACCESSORIES** section of this catalog (Page 50).



## 4023

2.1 dBi GAIN

915MHz / 2.4GHz DUAL BAND OMNI ANTENNA

### FEATURES

- Dual Band 880-1200MHz / 2.3-2.6GHz
- Polyester Coated Brass Radiator
- Gold Plated Contacts
- Requires Accessory 4024 or 4044 for Mounting

### DESCRIPTION

Vertical omnidirectional antennas radiate in all directions therefore their gain is less than that of a yagi antenna that concentrates radiation in a single direction. This reduced gain limits the effective range of the omnidirectional antenna.

Omnidirectional antennas are useful in applications where their use eliminates the need for antenna alignment. Omnidirectional antennas are routinely used on the control end of a polling system.

When an omnidirectional antenna is used on the control end of a polling system, a yagi can be used on each slave unit for maximum

gain and reduction in possible interference due to the front to back ratio gain reduction of the yagi antenna.

This Dual Band antenna has an ultra wide bandwidth for the 880-1200MHz and 2300-2600MHz bands and provides 2.1dBi gain on both.

The brass radiator is coated with a polyester radome for corrosion resistance. The contacts are gold plated for corrosion resistance.

This antenna requires accessory 4024 or 4044 for mounting. Part 4024 is a Type N female connector designed for bulkhead mounting. The other end of the bulkhead

mount interfaces with the antenna.

Part 4044 allows the bulkhead connector (4024) to be mounted on a right angle bracket which has hardware to allow mounting the antenna vertically on a vertical pipe.

To insure specified operation, this antenna must have a conductive surface under it when it is mounted. Mounting the antenna on a metal electrical box provides a satisfactory ground plane.

When mounting the antenna on a mast, accessory 4044 provides an adequate ground plane for 2.4GHz operation. When used for 900MHz systems, a larger ground plane is required (4045).

### SPECIFICATIONS

#### ELECTRICAL

##### FREQUENCY RANGE:

880-1200MHz  
2300-2600MHz

##### GAIN:

2.1dBi

##### VSWR:

<2:1

##### IMPEDANCE:

50 ohms

##### POWER RATING:

200 watts

#### MECHANICAL

##### RADIATOR:

Polyester coated Brass

##### BASE:

ABS, Ultrasonic Brass Insert.

##### CONTACT:

Gold plated spring loaded contact

##### LENGTH:

2 3/4"

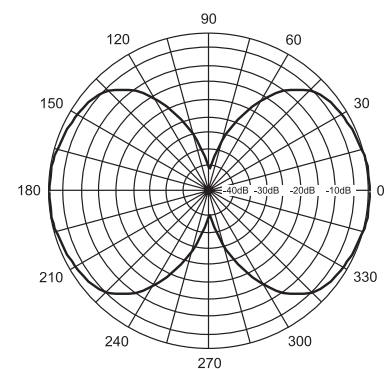
##### MOUNTING:

Accessories 4024, 4044, 4045

##### FINISH:

Black

#### VERTICAL PATTERN



## ORDERING INFORMATION

4023 2.1 dBi Gain, 915MHz / 2.4GHz Dual Band Omnidirectional Antenna QTY \_\_\_\_\_

**NOTE: Accessory 4024 or 4044 is REQUIRED to mount this antenna.**

## ACCESSORIES

4024	Type N Female to 4023 Antenna Bulkhead Connector	QTY _____
4044	Right Angle Bracket For Masts to 1" Diameter (Includes 4024)	QTY _____
4406	Right Angle Bracket of 4044 without the 4024 connector	QTY _____
4045	Ground Plane GP4 - Use with 4044 for 900MHz	QTY _____
4026	Bulkhead Connector Type N Female to Type N Female	QTY _____
4011	Bulkhead Surge Protector Type N Male to Type N Female	QTY _____
4035	Bulkhead Surge Protector Type N Female to Type N Female	QTY _____
4073	Two Antenna Coupler, Transmit and Receive, 2-Port 900 MHz	QTY _____
4051	Receive Only, 2 to 4 Antenna Coupler 4-Port 900 MHz	QTY _____
4062	50 Ohm Termination, For Unused Ports On P/N 4051,4061	QTY _____

For more accessories, see the **ACCESSORIES** section of this catalog (Page 49).

## CABLES

RP = Reverse Polarity

CPT2	2 Ft WBC195 Cable w/ RP-SMA Male & Type N Male Connector	QTY _____
CPT6	6 Ft WBC195 Cable w/ RP-SMA Male & Type N Male Connector	QTY _____
CPT10	10 Ft WBC195 Cable w/ RP-SMA Male & Type N Male Connector	QTY _____
CPT-X	Custom length WBC195 Cable w/ RP-SMA Male & Type N Male Connector Specify length from 12 inches to 120 Inches                      Length _____ Inches	QTY _____
C195NM-NM-2	2 Ft WBC195 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NF-10	10 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NF-20	20 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NF-30	30 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NF-40	40 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NF-50	50 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NF-75	75 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NF-100	100 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NM-10	10 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NM-20	20 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NM-30	30 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NM-40	40 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NM-50	50 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NM-75	75 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NM-100	100 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____

For more cables, see the **ACCESSORIES** section of this catalog (Page 50).



# 4275

6 dBi GAIN

915MHz BAND OMNIDIRECTIONAL ANTENNA

## FEATURES

- White Fiberglass Cover
- Weatherproof For Outdoor Mounting
- Lightweight <3 Pounds
- Mounting Hardware Included

## DESCRIPTION

Vertical omnidirectional antennas radiate in a pattern similar to a horizontal doughnut. Their gain is proportional to their length. Increasing the length makes the doughnut pattern thinner and thereby increases the power radiated horizontally.

Omnidirectional antennas are useful in applications where their use eliminates the need for antenna alignment. Omnidirectional antennas

are routinely used on the control end of a polling system.

When an omnidirectional antenna is used on the control end of a polling system, a yagi can be used on each slave unit for maximum gain and reduction in possible interference due to the front to back ratio gain reduction of the yagi antenna.

Designed for outdoor mounting, this 27" vertical antenna offers gain and flexibility in mounting, for ease of

installation and dependable performance for medium to long range systems.

The radiating structure of this antenna is encased in a fiberglass radome to provide protection for the copper radiators. The fiberglass radome is ultraviolet inhibited.

This antenna is supplied with integrated mounting hardware for easy mounting on a 1 1/2" standard mast.

## SPECIFICATIONS

### ELECTRICAL

#### GAIN

6dBi

#### FREQUENCY

890-970MHz

#### IMPEDANCE

50 ohms

#### VSWR

<2:1

#### VERT BEAM WIDTH

35°

#### POWER RATING

100 watts

#### CONNECTOR

Type N Female

### MECHANICAL

#### RADIATOR

Copper structure

#### RADOME

White UV inhibited fiberglass

#### SLEEVE DIAMETER

1.35"

#### LENGTH

27"

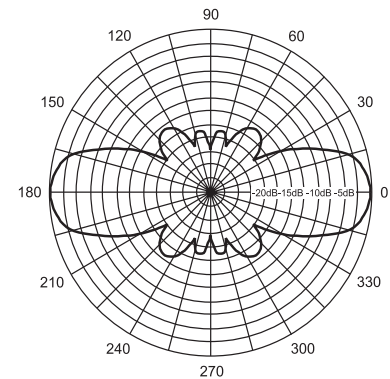
#### WEIGHT

<3 lbs.

#### MOUNTING

1 1/2" mast kit  
(supplied)

### VERTICAL PATTERN



## ORDERING INFORMATION

4275 6dBi Gain, 27" Omni Antenna with Mount Bracket QTY \_\_\_\_\_

## ACCESSORIES

4026	Bulkhead Connector Type N Female to Type N Female	QTY _____
4011	Bulkhead Surge Protector Type N Male to Type N Female	QTY _____
4035	Bulkhead Surge Protector Type N Female to Type N Female	QTY _____
4073	Two Antenna Coupler, Transmit and Receive, 2-Port 900 MHz	QTY _____
4051	Receive Only, 2 to 4 Antenna Coupler 4-Port 900 MHz	QTY _____
4062	50 Ohm Termination, For Unused Ports On P/N 4051,4061	QTY _____

For more accessories, see the **ACCESSORIES** section of this catalog (Page 49).

## CABLES

RP = Reverse Polarity

CPT2	2 Ft WBC195 Cable w/ RP-SMA Male & Type N Male Connector	QTY _____
CPT6	6 Ft WBC195 Cable w/ RP-SMA Male & Type N Male Connector	QTY _____
CPT10	10 Ft WBC195 Cable w/ RP-SMA Male & Type N Male Connector	QTY _____
CPT-X	Custom length WBC195 Cable w/ RP-SMA Male & Type N Male Connector Specify length from 12 inches to 120 Inches                      Length _____ Inches	QTY _____
C195NM-NM-2	2 Ft WBC195 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NF-10	10 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NF-20	20 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NF-30	30 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NF-40	40 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NF-50	50 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NF-75	75 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NF-100	100 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NM-10	10 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NM-20	20 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NM-30	30 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NM-40	40 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NM-50	50 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NM-75	75 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NM-100	100 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____

For more cables, see the **ACCESSORIES** section of this catalog (Page 50).



# 4241

**8.5 dBi GAIN**

**915MHz BAND OMNIDIRECTIONAL ANTENNA**

## FEATURES

- White Fiberglass Cover
- Weatherproof For Outdoor Mounting
- Lightweight 5 Pounds

## DESCRIPTION

Vertical omnidirectional antennas radiate in a pattern similar to a horizontal doughnut. Their gain is proportional to their length. Increasing the length makes the doughnut pattern thinner and thereby increases the power radiated horizontally.

Omnidirectional antennas are useful in applications where their use eliminates the need for antenna alignment. Omnidirectional antennas

are routinely used on the control end of a polling system.

When an omnidirectional antenna is used on the control end of a polling system, a yagi can be used on each slave unit for maximum gain and reduction in possible interference due to the front to back ratio gain reduction of the yagi antenna.

Designed for outdoor mounting, this 60" vertical antenna offers gain and flexibility in mounting, for ease of installation and dependable

performance for medium to long range systems.

The radiating structure of this antenna is encased in a fiberglass radome to provide protection for the copper radiators. The fiberglass radome is ultraviolet inhibited. The heavy wall aluminum mounting sleeve is epoxy coated for superior weather protection.

These antennas are lightweight at 5 lbs. and are designed to survive winds to 125 MPH.

## SPECIFICATIONS

### ELECTRICAL

#### GAIN

8.5dBi

#### FREQUENCY

900-930MHz

#### IMPEDANCE

50 ohms

#### BANDWIDTH

30MHz

#### VSWR

<2.0:1

#### VERT BEAM WIDTH

15°

#### POWER RATING

250 watts

#### CONNECTOR

Type N Female

### MECHANICAL

#### RADIATOR

Copper alloy elements

#### RADOME

White UV inhibited fiberglass

#### MOUNTING SLEEVE

Heavy wall epoxy coated aluminum

#### SLEEVE DIAMETER

1.35"

#### LENGTH

60"

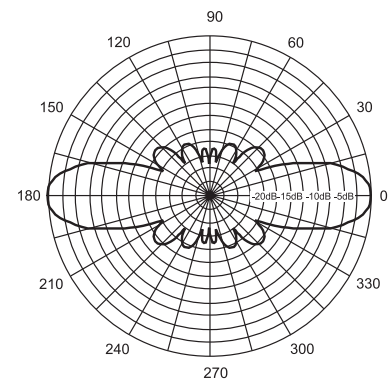
#### WEIGHT

5 lbs.

#### WIND SURVIVAL

125 MPH

### VERTICAL PATTERN



## ORDERING INFORMATION

4241 8.5dBi Gain, 54" Omni Antenna QTY \_\_\_\_\_

## ACCESSORIES

4242	Mount Bracket	QTY _____
4026	Bulkhead Connector Type N Female to Type N Female	QTY _____
4011	Bulkhead Surge Protector Type N Male to Type N Female	QTY _____
4035	Bulkhead Surge Protector Type N Female to Type N Female	QTY _____
4073	Two Antenna Coupler, Transmit and Receive, 2-Port 900 MHz	QTY _____
4051	Receive Only, 2 to 4 Antenna Coupler 4-Port 900 MHz	QTY _____
4062	50 Ohm Termination, For Unused Ports On P/N 4051,4061	QTY _____

For more accessories, see the **ACCESSORIES** section of this catalog (Page 49).

## CABLES

RP = Reverse Polarity

CPT2	2 Ft WBC195 Cable w/ RP-SMA Male & Type N Male Connector	QTY _____
CPT6	6 Ft WBC195 Cable w/ RP-SMA Male & Type N Male Connector	QTY _____
CPT10	10 Ft WBC195 Cable w/ RP-SMA Male & Type N Male Connector	QTY _____
CPT-X	Custom length WBC195 Cable w/ RP-SMA Male & Type N Male Connector Specify length from 12 inches to 120 Inches      Length _____ Inches	QTY _____
C195NM-NM-2	2 Ft WBC195 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NF-10	10 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NF-20	20 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NF-30	30 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NF-40	40 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NF-50	50 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NF-75	75 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NF-100	100 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NM-10	10 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NM-20	20 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NM-30	30 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NM-40	40 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NM-50	50 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NM-75	75 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NM-100	100 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____

For more cables, see the **ACCESSORIES** section of this catalog (Page 50).



# 4009

8 dBi GAIN

915MHz BAND 3 ELEMENT HEAVY DUTY YAGI

## FEATURES

- Rugged and Weatherproof
- Lightweight Aluminum
- SS Mounting Hardware Included
- Wind Survival to 125 MPH

## DESCRIPTION

Yagi antennas achieve more gain than vertical antennas by concentrating radiation in a single direction. Their reduced gain from the back end helps keep other signals from interfering with normal operation. The front to back ratio is an important characteristic of a yagi antenna.

A yagi antenna can be operated with the elements mounted vertically or horizontally, but the most common use

for industrial wireless is vertical. The transmitting and receiving antenna must both have the same element polarization for satisfactory operation. A large loss in signal is experienced when the elements are crossed polarized.

When a vertical omnidirectional antenna is used on the control end of a polling system, a yagi can be used on each slave unit for maximum gain

and reduction in interference due to the front to back ratio gain reduction.

These heavy duty yagi antennas are constructed of 1" aluminum U channel with 3/8" solid elements. All exposed areas are coated with UV polyester. The balun assembly is filled and sealed with elastomeric thermoplastic.

The connector is a Type N Female on a 12" teflon pigtail cable.

## SPECIFICATIONS

### ELECTRICAL

#### GAIN

8dBi  
Front to Back Ratio  
15dB

#### FREQUENCY

900-930MHz

#### IMPEDANCE

50 ohms

#### VSWR

<2:1

#### VERT BEAM WIDTH

70°

#### HORIZ BEAM WIDTH

90°

#### POWER RATING

300 watts

#### CONNECTOR

Type N Female on 12" Teflon  
Pigtail

### MECHANICAL

#### MATERIAL

1" aluminum U channel boom  
3/8" solid elements

#### FINISH

UV inhibited polyester coat

#### LENGTH

18"

#### WEIGHT

<4 lbs.

#### MOUNT

Stainless Hardware for  
2<sup>3</sup>/<sub>8</sub>" mast

#### FLAT PLATE AREA

.147 ft<sup>2</sup>

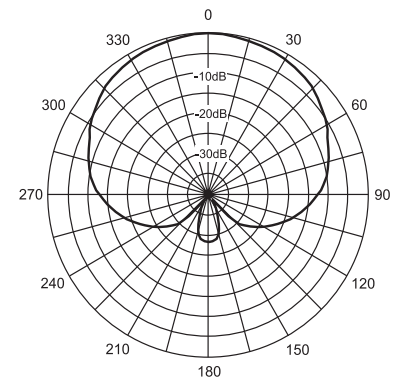
#### WIND RATING

125 MPH

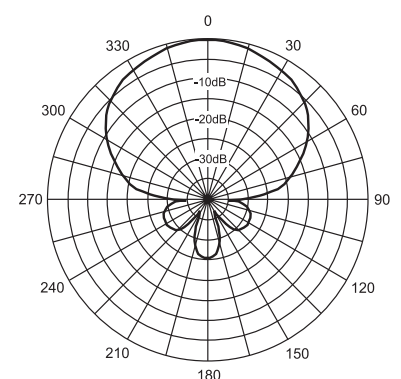
#### WIND LOAD

8.8 lbs.

### HORIZONTAL PATTERN



### VERTICAL PATTERN





## ORDERING INFORMATION

4009 8dBi Gain, 3 Element, Heavy Duty Yagi Antenna QTY \_\_\_\_\_

## ACCESSORIES

4026	Bulkhead Connector Type N Female to Type N Female	QTY _____
4011	Bulkhead Surge Protector Type N Male to Type N Female	QTY _____
4035	Bulkhead Surge Protector Type N Female to Type N Female	QTY _____
4073	Two Antenna Coupler, Transmit and Receive, 2-Port 900 MHz	QTY _____
4051	Receive Only, 2 to 4 Antenna Coupler 4-Port 900 MHz	QTY _____
4062	50 Ohm Termination, For Unused Ports On P/N 4051,4061	QTY _____

For more accessories, see the **ACCESSORIES** section of this catalog (Page 49).

## CABLES

RP = Reverse Polarity

CPT2	2 Ft WBC195 Cable w/ RP-SMA Male & Type N Male Connector	QTY _____
CPT6	6 Ft WBC195 Cable w/ RP-SMA Male & Type N Male Connector	QTY _____
CPT10	10 Ft WBC195 Cable w/ RP-SMA Male & Type N Male Connector	QTY _____
CPT-X	Custom length WBC195 Cable w/ RP-SMA Male & Type N Male Connector Specify length from 12 inches to 120 Inches                      Length _____ Inches	QTY _____
C195NM-NM-2	2 Ft WBC195 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NF-10	10 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NF-20	20 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NF-30	30 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NF-40	40 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NF-50	50 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NF-75	75 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NF-100	100 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NM-10	10 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NM-20	20 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NM-30	30 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NM-40	40 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NM-50	50 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NM-75	75 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NM-100	100 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____

For more cables, see the **ACCESSORIES** section of this catalog (Page 50).



# 4078

**11 dBi GAIN**

**915MHz BAND 5 ELEMENT HEAVY DUTY YAGI**

## FEATURES

- Rugged and Weatherproof
- Lightweight Aluminum
- SS Mounting Hardware Included
- Wind Survival to 125 MPH

## DESCRIPTION

Yagi antennas achieve more gain than vertical antennas by concentrating radiation in a single direction. Their reduced gain from the back end helps keep other signals from interfering with normal operation. The front to back ratio is an important characteristic of a yagi antenna.

A yagi antenna can be operated with the elements mounted vertically or horizontally, but the most common use

for industrial wireless is vertical. The transmitting and receiving antenna must both have the same element polarization for satisfactory operation. A large loss in signal is experienced when the elements are crossed polarized.

When a vertical omnidirectional antenna is used on the control end of a polling system, a yagi can be used on each slave unit for maximum gain

and reduction in interference due to the front to back ratio gain reduction.

These heavy duty yagi antennas are constructed of 1" aluminum U channel with 3/8" solid elements. All exposed areas are coated with UV polyester. The balun assembly is filled and sealed with elastomeric thermoplastic.

The connector is a Type N Female on a 12" teflon pigtail cable.

## SPECIFICATIONS

### ELECTRICAL

#### GAIN

11dBi  
Front to Back Ratio  
18dB

#### FREQUENCY

866-960MHz

#### IMPEDANCE

50 ohms

#### VSWR

<2:1

#### VERT BEAM WIDTH

55°

#### HORIZ BEAM WIDTH

65°

#### POWER RATING

300 watts

#### CONNECTOR

Type N Female on 12" Teflon  
Pigtail

### MECHANICAL

#### MATERIAL

1" aluminum U channel boom  
3/8" solid elements

#### FINISH

UV inhibited polyester coat

#### LENGTH

21"

#### WEIGHT

<4 lbs.

#### MOUNT

Stainless Hardware for  
2<sup>3</sup>/<sub>8</sub>" mast

#### FLAT PLATE AREA

.206 ft<sup>2</sup>

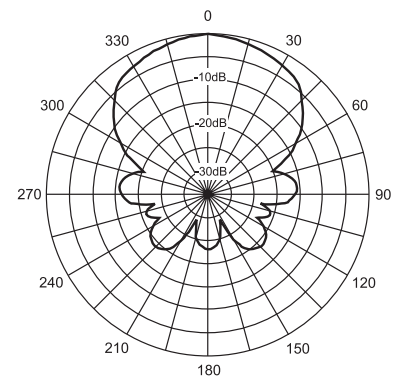
#### WIND RATING

125 MPH

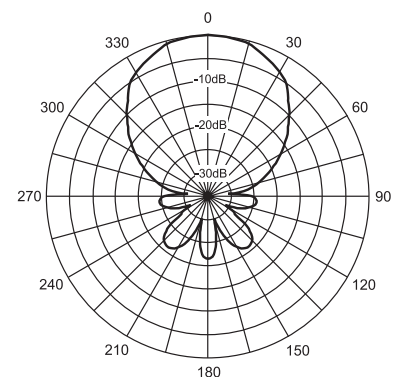
#### WIND LOAD

12.3 lbs.

### HORIZONTAL PATTERN



### VERTICAL PATTERN



## ORDERING INFORMATION

4078 11dBi Gain, 5 Element, Heavy Duty Yagi Antenna QTY \_\_\_\_\_

## ACCESSORIES

4026	Bulkhead Connector Type N Female to Type N Female	QTY _____
4011	Bulkhead Surge Protector Type N Male to Type N Female	QTY _____
4035	Bulkhead Surge Protector Type N Female to Type N Female	QTY _____
4073	Two Antenna Coupler, Transmit and Receive, 2-Port 900 MHz	QTY _____
4051	Receive Only, 2 to 4 Antenna Coupler 4-Port 900 MHz	QTY _____
4062	50 Ohm Termination, For Unused Ports On P/N 4051,4061	QTY _____

For more accessories, see the **ACCESSORIES** section of this catalog (Page 49).

## CABLES

RP = Reverse Polarity

CPT2	2 Ft WBC195 Cable w/ RP-SMA Male & Type N Male Connector	QTY _____
CPT6	6 Ft WBC195 Cable w/ RP-SMA Male & Type N Male Connector	QTY _____
CPT10	10 Ft WBC195 Cable w/ RP-SMA Male & Type N Male Connector	QTY _____
CPT-X	Custom length WBC195 Cable w/ RP-SMA Male & Type N Male Connector Specify length from 12 inches to 120 Inches                      Length _____ Inches	QTY _____
C195NM-NM-2	2 Ft WBC195 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NF-10	10 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NF-20	20 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NF-30	30 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NF-40	40 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NF-50	50 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NF-75	75 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NF-100	100 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NM-10	10 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NM-20	20 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NM-30	30 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NM-40	40 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NM-50	50 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NM-75	75 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NM-100	100 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____

For more cables, see the **ACCESSORIES** section of this catalog (Page 50).

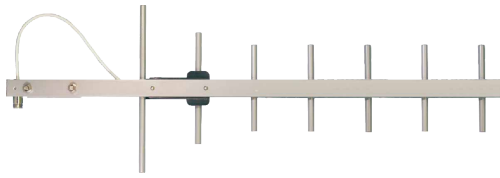
# 4079

12 dBi GAIN

915MHz BAND 7 ELEMENT HEAVY DUTY YAGI

## FEATURES

- Rugged and Weatherproof
- Lightweight Aluminum
- SS Mounting Hardware Included
- Wind Survival to 125 MPH



## DESCRIPTION

Yagi antennas achieve more gain than vertical antennas by concentrating radiation in a single direction. Their reduced gain from the back end helps keep other signals from interfering with normal operation. The front to back ratio is an important characteristic of a yagi antenna.

A yagi antenna can be operated with the elements mounted vertically or horizontally, but the most common use

for industrial wireless is vertical. The transmitting and receiving antenna must both have the same element polarization for satisfactory operation. A large loss in signal is experienced when the elements are crossed polarized.

When a vertical omnidirectional antenna is used on the control end of a polling system, a yagi can be used on each slave unit for maximum gain

and reduction in interference due to the front to back ratio gain reduction.

These heavy duty yagi antennas are constructed of 1" aluminum U channel with 3/8" solid elements. All exposed areas are coated with UV polyester. The balun assembly is filled and sealed with elastomeric thermoplastic.

The connector is a Type N Female on a 12" teflon pigtail cable..

## SPECIFICATIONS

### ELECTRICAL

#### GAIN

11dBi  
Front to Back Ratio  
20dB

#### FREQUENCY

900-930MHz

#### IMPEDANCE

50 ohms

#### VSWR

<2:1

#### VERT BEAMWIDTH

50°

#### HORIZ BEAM WIDTH

55°

#### POWER RATING

300 watts

#### CONNECTOR

Type N Female on 12" Teflon  
Pigtail

### MECHANICAL

#### MATERIAL

1" aluminum U channel boom  
3/8" solid elements

#### FINISH

UV inhibited polyester coat

#### LENGTH

26"

#### WEIGHT

<4 lbs.

#### MOUNT

Stainless Hardware for  
2<sup>3</sup>/<sub>8</sub>" mast

#### FLAT PLATE AREA

.265 ft<sup>2</sup>

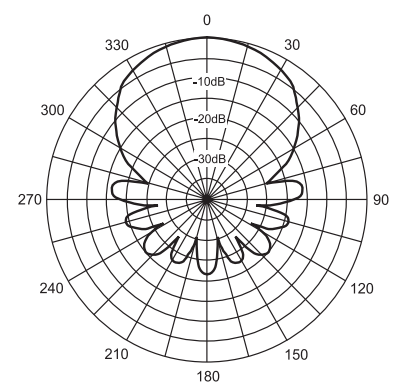
#### WIND RATING

125 MPH

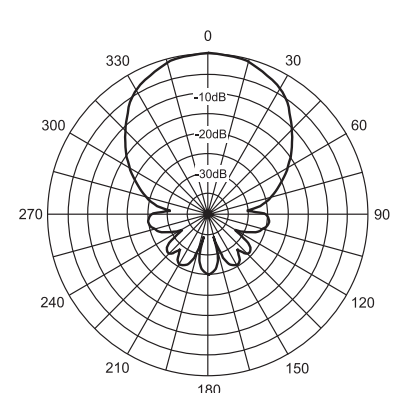
#### WIND LOAD

15.9 lbs.

### HORIZONTAL PATTERN



### VERTICAL PATTERN



## ORDERING INFORMATION

4079 12dBi Gain, 7 Element, Heavy Duty Yagi Antenna QTY \_\_\_\_\_

## ACCESSORIES

4026	Bulkhead Connector Type N Female to Type N Female	QTY _____
4011	Bulkhead Surge Protector Type N Male to Type N Female	QTY _____
4035	Bulkhead Surge Protector Type N Female to Type N Female	QTY _____
4073	Two Antenna Coupler, Transmit and Receive, 2-Port 900 MHz	QTY _____
4051	Receive Only, 2 to 4 Antenna Coupler 4-Port 900 MHz	QTY _____
4062	50 Ohm Termination, For Unused Ports On P/N 4051,4061	QTY _____

For more accessories, see the **ACCESSORIES** section of this catalog (Page 49).

## CABLES

RP = Reverse Polarity

CPT2	2 Ft WBC195 Cable w/ RP-SMA Male & Type N Male Connector	QTY _____
CPT6	6 Ft WBC195 Cable w/ RP-SMA Male & Type N Male Connector	QTY _____
CPT10	10 Ft WBC195 Cable w/ RP-SMA Male & Type N Male Connector	QTY _____
CPT-X	Custom length WBC195 Cable w/ RP-SMA Male & Type N Male Connector Specify length from 12 inches to 120 Inches                      Length _____ Inches	QTY _____
C195NM-NM-2	2 Ft WBC195 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NF-10	10 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NF-20	20 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NF-30	30 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NF-40	40 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NF-50	50 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NF-75	75 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NF-100	100 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NM-10	10 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NM-20	20 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NM-30	30 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NM-40	40 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NM-50	50 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NM-75	75 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NM-100	100 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____

For more cables, see the **ACCESSORIES** section of this catalog (Page 50).

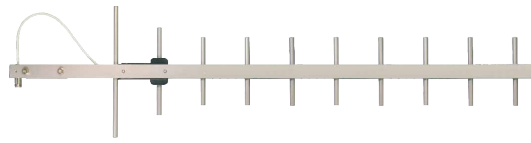
# 4025

14 dBi GAIN

915MHz BAND 10 ELEMENT HEAVY DUTY YAGI

## FEATURES

- Rugged and Weatherproof
- Lightweight Aluminum
- SS Mounting Hardware Included
- Wind Survival to 125 MPH



## DESCRIPTION

Yagi antennas achieve more gain than vertical antennas by concentrating radiation in a single direction. Their reduced gain from the back end helps keep other signals from interfering with normal operation. The front to back ratio is an important characteristic of a yagi antenna.

A yagi antenna can be operated with the elements mounted vertically or horizontally, but the most common use

for industrial wireless is vertical. The transmitting and receiving antenna must both have the same element polarization for satisfactory operation. A large loss in signal is experienced when the elements are crossed polarized.

When a vertical omnidirectional antenna is used on the control end of a polling system, a yagi can be used on each slave unit for maximum gain

and reduction in interference due to the front to back ratio gain reduction.

These heavy duty yagi antennas are constructed of 1" aluminum U channel with 3/8" solid elements. All exposed areas are coated with UV polyester. The balun assembly is filled and sealed with elastomeric thermoplastic.

The connector is a Type N Female on a 12" teflon pigtail cable.

## SPECIFICATIONS

### ELECTRICAL

#### GAIN

- 14dBi
- Front to Back Ratio  
20dB

#### FREQUENCY

- 900-930MHz

#### IMPEDANCE

- 50 ohms

#### VSWR

- <2:1

#### VERT BEAMWIDTH

- 45°

#### HORIZ BEAM WIDTH

- 50°

#### POWER RATING

- 300 watts

#### CONNECTOR

- Type N Female on 12" Teflon  
Pigtail

### MECHANICAL

#### MATERIAL

- 1" aluminum U channel boom
- 3/8" solid elements

#### FINISH

- UV inhibited polyester coat

#### LENGTH

- 48"

#### WEIGHT

- <4 lbs.

#### MOUNT

- Stainless Hardware for  
2<sup>3</sup>/<sub>8</sub>" mast

#### FLAT PLATE AREA

- .265 ft<sup>2</sup>

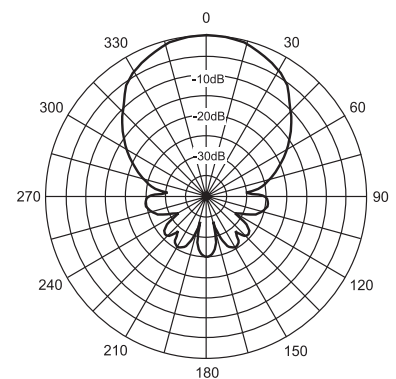
#### WIND RATING

- 125 MPH

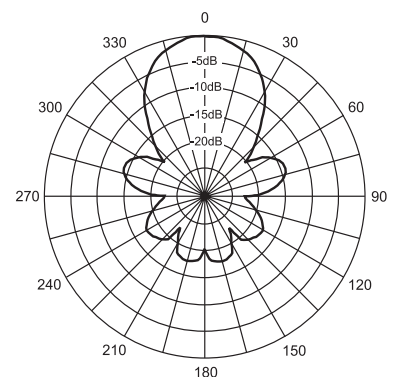
#### WIND LOAD

- 15.9 lbs.

### HORIZONTAL PATTERN



### VERTICAL PATTERN



## ORDERING INFORMATION

4025 16dBi Gain, 10 Element, Heavy Duty Yagi Antenna QTY \_\_\_\_\_

## ACCESSORIES

4026	Bulkhead Connector Type N Female to Type N Female	QTY _____
4011	Bulkhead Surge Protector Type N Male to Type N Female	QTY _____
4035	Bulkhead Surge Protector Type N Female to Type N Female	QTY _____
4073	Two Antenna Coupler, Transmit and Receive, 2-Port 900 MHz	QTY _____
4051	Receive Only, 2 to 4 Antenna Coupler 4-Port 900 MHz	QTY _____
4062	50 Ohm Termination, For Unused Ports On P/N 4051,4061	QTY _____

For more accessories, see the **ACCESSORIES** section of this catalog (Page 49).

## CABLES

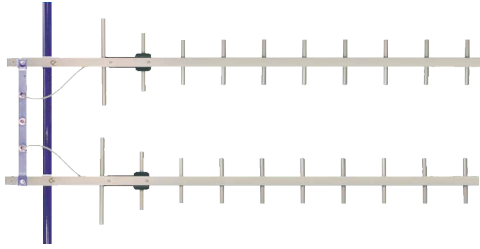
RP = Reverse Polarity

CPT2	2 Ft WBC195 Cable w/ RP-SMA Male & Type N Male Connector	QTY _____
CPT6	6 Ft WBC195 Cable w/ RP-SMA Male & Type N Male Connector	QTY _____
CPT10	10 Ft WBC195 Cable w/ RP-SMA Male & Type N Male Connector	QTY _____
CPT-X	Custom length WBC195 Cable w/ RP-SMA Male & Type N Male Connector Specify length from 12 inches to 120 Inches                      Length _____ Inches	QTY _____
C195NM-NM-2	2 Ft WBC195 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NF-10	10 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NF-20	20 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NF-30	30 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NF-40	40 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NF-50	50 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NF-75	75 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NF-100	100 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NM-10	10 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NM-20	20 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NM-30	30 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NM-40	40 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NM-50	50 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NM-75	75 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NM-100	100 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____

For more cables, see the **ACCESSORIES** section of this catalog (Page 50).

# 4152

17 dBi GAIN  
915MHz BAND DUAL STACKED  
10 ELEMENT HEAVY DUTY YAGI



## FEATURES

- High Performance
- Rugged
- Weatherproof
- Lightweight
- Durable

## DESCRIPTION

This kit includes two (2) 4025 heavy duty yagi antennas that are terminated with Type N male connectors that mate with a supplied 4074 two-port coupler. The coupler adds the output of the two antennas and provides approximately 2X the signal of one antenna (3dB).

A yagi antenna can be operated with the elements mounted vertically or horizontally, but the most common use

for industrial wireless is vertical. The transmitting and receiving antenna must both have the same element polarization for satisfactory operation. A large loss in signal is experienced when the elements are crossed polarized.

When a vertical omnidirectional antenna is used on the control end of a polling system, a yagi can be used on each slave unit for maximum gain

front to back ratio gain reduction.

These heavy duty yagi antennas are constructed of 1" aluminum U channel with 3/8" solid elements. All exposed areas are coated with UV polyester. The balun assembly is filled and sealed with elastomeric thermoplastic.

The output of the 4074 two-port coupler is a Type N Female connector.

## SPECIFICATIONS

### ELECTRICAL GAIN

17dBi  
Front to Back Ratio  
20dB

### FREQUENCY

896-960MHz

### IMPEDANCE

50 ohms

### VSWR

60MHz  
<1.5:1

### POWER RATING

300 watts

### CONNECTOR

Type N Female On 2  
Port Coupler

### MECHANICAL MATERIAL

1" aluminum U channel boom  
3/8" solid elements

### FINISH

UV inhibited polyester coat

### LENGTH

48"

### WEIGHT

8 lbs.

### MOUNT

Stainless Hardware for  
2<sup>3</sup>/<sub>8</sub>" mast

### FLAT PLATE AREA

.998 ft<sup>2</sup>

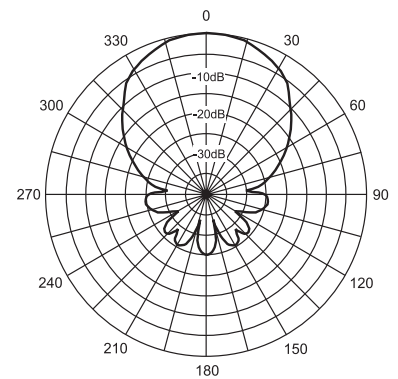
### WIND RATING

125 MPH

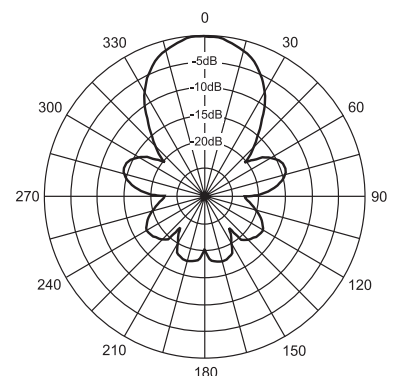
### WIND LOAD

67.4 lbs.

### HORIZONTAL PATTERN



### VERTICAL PATTERN





## ORDERING INFORMATION

4152 17dBi Gain, 10 Element, Heavy Duty Stacked Yagi Antenna QTY \_\_\_\_\_

## ACCESSORIES

4026	Bulkhead Connector Type N Female to Type N Female	QTY _____
4011	Bulkhead Surge Protector Type N Male to Type N Female	QTY _____
4035	Bulkhead Surge Protector Type N Female to Type N Female	QTY _____
4073	Two Antenna Coupler, Transmit and Receive, 2-Port 900 MHz	QTY _____
4051	Receive Only, 2 to 4 Antenna Coupler 4-Port 900 MHz	QTY _____
4062	50 Ohm Termination, For Unused Ports On P/N 4051,4061	QTY _____

For more accessories, see the **ACCESSORIES** section of this catalog (Page 49).

## CABLES

RP = Reverse Polarity

CPT2	2 Ft WBC195 Cable w/ RP-SMA Male & Type N Male Connector	QTY _____
CPT6	6 Ft WBC195 Cable w/ RP-SMA Male & Type N Male Connector	QTY _____
CPT10	10 Ft WBC195 Cable w/ RP-SMA Male & Type N Male Connector	QTY _____
CPT-X	Custom length WBC195 Cable w/ RP-SMA Male & Type N Male Connector Specify length from 12 inches to 120 Inches                      Length _____ Inches	QTY _____
C195NM-NM-2	2 Ft WBC195 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NF-10	10 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NF-20	20 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NF-30	30 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NF-40	40 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NF-50	50 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NF-75	75 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NF-100	100 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NM-10	10 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NM-20	20 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NM-30	30 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NM-40	40 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NM-50	50 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NM-75	75 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NM-100	100 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____

For more cables, see the **ACCESSORIES** section of this catalog (Page 50).

# 4063

14 dBi GAIN

2.4GHz BAND 16 ELEMENT HEAVY DUTY YAGI



## FEATURES

- Rugged
- Weatherproof
- Lightweight
- Durable

## DESCRIPTION

Yagi antennas achieve more gain than vertical antennas by concentrating radiation in a single direction. Their reduced gain from the back end helps keep other signals from interfering with normal operation. The front to back ratio is an important characteristic of a yagi antenna.

A yagi antenna can be operated with the elements mounted vertically or horizontally, but the most common use for industrial wireless is vertical. The transmitting and receiving antenna must

both have the same element polarization for satisfactory operation. A large loss in signal is experienced when the elements are crossed polarized.

When a vertical omnidirectional antenna is used on the control end of a polling system, a yagi can be used on each slave unit for maximum gain and reduction in interference due to the front to back ratio gain reduction.

These heavy duty yagi antennas are constructed of 1" aluminum U channel with 3/8" solid elements. All exposed

areas are coated with UV polyester. The balun assembly is filled and sealed with elastomeric thermoplastic.

The connector is a Type N Female on a 12" teflon pigtail cable.

Hybrid radome construction provides excellent weather protection for the driven element. The radome is constructed of UV inhibited ABS. The heavy duty mounting plate is extruded aluminum. Stainless steel V bolts are provided for long term reliability and resistance to corrosion.

## SPECIFICATIONS

### ELECTRICAL GAIN

14dBi  
Front to Back Ratio  
20dB

### FREQUENCY

2.4-2.5GHz

### IMPEDANCE

50 ohms

### BANDWIDTH

>100MHz

### VSWR

<1.5:1

### POWER RATING

150 watts

### CONNECTOR

Type N Female on  
12" Teflon Pigtail

### MECHANICAL MATERIAL

1/2" aluminum U channel boom  
3/16" solid elements

### RADOME

3" UV inhibited ABS

### LENGTH

18"

### WEIGHT

2 lbs.

### MOUNT

SS and Aluminum Hardware For  
2 1/2" mast maximum

### FLAT PLATE AREA

.11 ft<sup>2</sup>

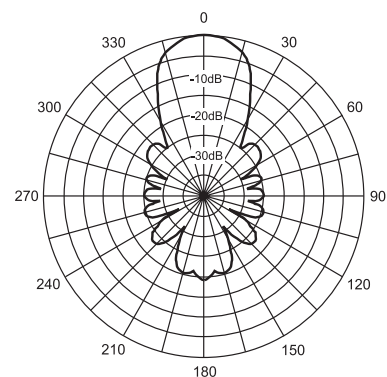
### WIND RATING

125 MPH

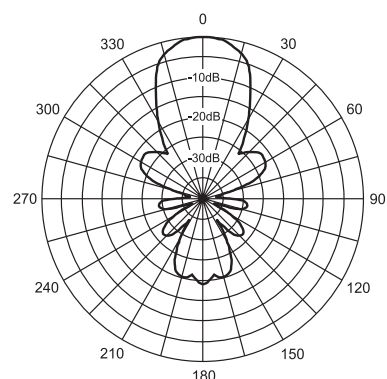
### WIND LOAD

6.6 lbs.

### HORIZONTAL PATTERN



### VERTICAL PATTERN



## ORDERING INFORMATION

4063 14dBi Gain, 16 Element, 2.4GHz Yagi Antenna QTY \_\_\_\_\_

## ACCESSORIES

4026	Bulkhead Connector Type N Female to Type N Female	QTY _____
4011	Bulkhead Surge Protector Type N Male to Type N Female	QTY _____
4035	Bulkhead Surge Protector Type N Female to Type N Female	QTY _____
4061	Receive Only, 2 to 4 Antenna Coupler 4-Port 2.4 GHz	QTY _____
4062	50 Ohm Termination, For Unused Ports On P/N 4051,4061	QTY _____

For more accessories, see the **ACCESSORIES** section of this catalog (Page 49).

## CABLES













RP = Reverse Polarity

CPT2	2 Ft WBC195 Cable w/ RP-SMA Male & Type N Male Connector	QTY _____
CPT6	6 Ft WBC195 Cable w/ RP-SMA Male & Type N Male Connector	QTY _____
CPT10	10 Ft WBC195 Cable w/ RP-SMA Male & Type N Male Connector	QTY _____
CPT-X	Custom length WBC195 Cable w/ RP-SMA Male & Type N Male Connector Specify length from 12 inches to 120 Inches                      Length _____ Inches	QTY _____
C195NM-NM-2	2 Ft WBC195 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NF-10	10 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NF-20	20 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NF-30	30 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NF-40	40 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NF-50	50 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NF-75	75 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NF-100	100 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NM-10	10 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NM-20	20 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NM-30	30 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NM-40	40 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NM-50	50 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NM-75	75 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NM-100	100 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____

For more cables, see the **ACCESSORIES** section of this catalog (Page 50).

## ACCESSORIES

## ACCESSORIES

4024		Type N Female to 4023 Antenna Bulkhead Connector Feed through bulkhead connector mounts the antenna on a horizontal metal surface. Weather proof gasket provided. Accepts Type N Male connector.	QTY _____
4044		Right Angle Bracket For Masts to 1" Diameter (Includes 4024) Right angle bracket mounts antenna 4023 vertically on a vertical mast to 1" diameter. Uses 4024 bulkhead connector as mount. Accepts Type N Male connector.	QTY _____
4406		Right Angle Bracket of 4044 without the 4024 connector	QTY _____
4045		Ground Plane GP4 - Use with 4044 for 900MHz Metal disc to provide ground plane for 4024 when mounted on plastic enclosure or on bracket 4044. Mounts like a large washer on connector.	QTY _____
4242		Mount Bracket (For P/N: 4241 Includes 2 Brackets) Extruded aluminum bracket to hold antenna 4241. Stainless steel V bolts to mount bracket to masts to 2 3/8" diameter.	QTY _____
4026		Bulkhead Connector Type N Female to Type N Female Feed through bulkhead connector to pass cable through wall of enclosure. Accepts Type N Male connector on both ends. Use small diameter coax to radio and large cable to antenna, to lower loss.	QTY _____
4011		Bulkhead Surge Protector Type N Male to Type N Female Feed through bulkhead arrestor. Mounts in single hole. Accepts Type N Male and Type N Female. Replaceable gas arrestor tube.	QTY _____
4035		Bulkhead Surge Protector Type N Female to Type N Female Feed through bulkhead arrestor. Mounts in single hole. Accepts Type N Male connector on both ends. Replaceable gas arrestor tube.	QTY _____
4073		Two Antenna Coupler, Transmit and Receive, 2-Port 900 MHz Coupler allows 2 antennas to be connected together to increase gain. Antennas can then be used for transmitting or receiving. Accepts Type N Male connectors.	QTY _____
4051		Receive Only, 2 to 4 Antenna Coupler 4-Port 900 MHz Allows 1 to 4 DR9021 receivers to be connected to a single antenna. Unused ports must be terminated with 4062.	QTY _____
4061		Receive Only, 2 to 4 Antenna Coupler 4-Port 2.4 GHz Allows 1 to 4 DR9021 receivers to be connected to a single antenna. Unused ports must be terminated with 4062.	QTY _____
4062		50 Ohm Termination, For Unused Ports On P/N 4051,4061 Used to terminate unused ports on 4051 and 4061.	QTY _____
4022		PSP24-024S, 24 VDC 1 Amp Power Supply Power supply to power wireless products, 2 wire transmitters, and other signal conditioners.	QTY _____

**ACCESSORIES**

**CABLE ASSEMBLIES**

RP = Reverse Polarity

CBH2	2 Ft WBC195 Cable w/ RP-SMA Male & RP-SMA Female Bulkhead Connector	QTY _____
CBH6	6 Ft WBC195 Cable w/ RP-SMA Male & RP-SMA Female Bulkhead Connector	QTY _____
CBH10	10 Ft WBC195 Cable w/ RP-SMA Male & RP-SMA Female Bulkhead Connector	QTY _____
CBH-X	Custom length WBC195 Cable w/ RP-SMA Male & RP-SMA Female Bulkhead Connector Specify length from 12 inches to 120 Inches                      Length _____ Inches	QTY _____
CPT2	2 Ft WBC195 Cable w/ RP-SMA Male & Type N Male Connector	QTY _____
CPT6	6 Ft WBC195 Cable w/ RP-SMA Male & Type N Male Connector	QTY _____
CPT10	10 Ft WBC195 Cable w/ RP-SMA Male & Type N Male Connector	QTY _____
CPT-X	Custom length WBC195 Cable w/ RP-SMA Male & Type N Male Connector Specify length from 12 inches to 120 Inches                      Length _____ Inches	QTY _____
C195NM-NM-2	2 Ft WBC195 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NF-10	10 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NF-20	20 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NF-30	30 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NF-40	40 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NF-50	50 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NF-75	75 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NF-100	100 Ft WBC400 Cable w/ Type N Male & Type N Female Connector	QTY _____
C400NM-NM-10	10 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NM-20	20 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NM-30	30 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NM-40	40 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NM-50	50 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NM-75	75 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____
C400NM-NM-100	100 Ft WBC400 Cable w/ Type N Male & Type N Male Connector	QTY _____

## Coaxial Cable Data

### Coaxial Cable Specifications

Cable Designation	Strands/ Cond. Dia.	Dielectric	Jacket / O.D. In.	Wt Lb/Ft	Impedance	Temp. Range
RG-58/U	1/.033 BC	PE	PVC/.193	.025	51.5	-40/+80C
RG-174/U	7/.0063 CCS	PE	PVC/.110	.007	50.0	-40/+75C
*LMR195	1/0.037 BC	FPE	PE/.195	.021	50.0	-20/+60C
			PVC/.195	.021	50.0	-40/+85C
*LMR400	1/0.108 BC	FPE	PE/.405	.068	50.0	-40/+85C
			FR-PVC/.405	.068	50.0	-20/+60C
LMR600	1/0.176 BC	FPE	PE/.590	.131	50.0	-40/+85C
			FR-PVC/.590	.131	50.0	-20/+60

### Coaxial Cable Loss

Cable Type	dB Loss/100Ft at 900 MHz	dB Loss/100Ft at 2.4GHz
RG58/U	15.8	24.8
RG174/U	27.9	43
* LMR195	11.1	18.6
* LMR400	3.9	6.6
LMR600	2.5	4.3

\* Wilkerson Instrument Co., Inc standard cables.

# Frequency Hopping Spread Spectrum Technology

In conventional wireless communications systems, a transmitter and receiver are tuned to the same frequency. The total bandwidth required is related to the type of modulation used on the transmitter.

A common form of modulation used for digital data was the audio tone modems which provided 2 audio tones where one tone represented a digital 0 and the other represented a digital 1.

The weakness of the system was the ability to interfere with the communications by having another transmitter on the same or nearly the same frequency. Such interference totally destroyed the usefulness of the communication system.

With modern technology in solid state radio frequency circuits, and microprocessors, a method was developed that made direct interference between wireless systems difficult.

The method involved setting aside a wide bandwidth of frequency spectrum and allowing the transmitter to hop around inside the allocated space. The receiver was designed so it could match the hopping sequence and thereby the communications between the two was reliable but nearly impossible to interfere with. If an interfering transmitter could not match the hop sequence, it could not destroy the communication link between the hopping transmitter and receiver.

This form of communications was designated Spread Spectrum, Frequency Hopping technology. The Spread Spectrum implies the bandwidth used is broad, and the Frequency Hopping indicates the transmitter and receiver change frequency rapidly in a defined pattern which is known to the transmitter and receiver.

The Wilkerson Instrument Company wireless products have 3 available frequency bands, 2 in the 915MHz ISM band and 1 in the 2.4GHz band. Each of these hops on 25 different frequencies and each has 7 available Hop Sequences.

This allows 7 systems on the same band to operate in close proximity without interfering with each other. Utilizing all 3 bands allows 21 systems to operate in close proximity.

The Wilkerson Instrument Company Modbus® RTU Protocol wireless system can poll from 1 to 247 remote transmitters on 1 Hop Sequence. With 7 Hop Sequences per frequency band, each frequency band can have 7 X 247 (1729) remote transmitters.

## ISM

The ISM radio bands, as relates to the wireless products manufactured and sold by Wilkerson Instrument Company, are license free radio bands designated for Industrial, Scientific, and Medical use. The 2 bands of interest are 915MHz (902 - 928MHz) and 2.400 - 2.500GHz.

These bands are defined by international treaty for license free use in Region 2 of the treaty. Region 2 comprises the Americas, except Greenland, and some of the Eastern Pacific Islands. Australia and Israel specifically allow use of the 915MHz band.

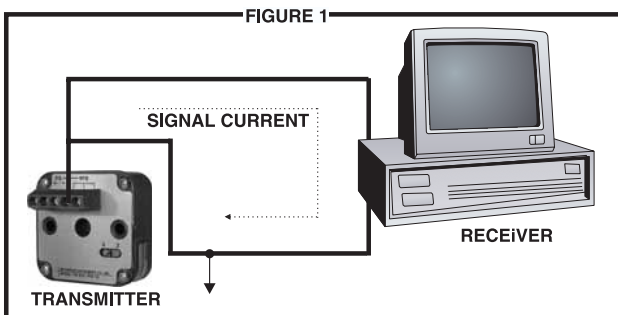
Uses of these bands, in the United States, are governed by Part 18 of the Federal Communications Commission (FCC) rules, while Part 15, subpart B, of the FCC rules governs the requirements for unlicensed communication devices.

Designers of the wireless circuits must follow the FCC requirements in their design. Products sold and used in Region 2 must be marked as certified for this use.

# A Ground Loop Primer

One of the most frustrating problems of the measurement and control industry is that of the ground loop. Its effects can appear and disappear with no apparent reason and can range from mere annoyance to down right destructive. It seems that ground loops carry some mystical connotation to the point that our industry has made it a "catch all" culprit for anything that cannot be explained.

While ground loops can be complex problems and may not always be predictable they can be understood and dealt with if we have a little insight into just what they are and how they can affect a transmitted signal. Let us first refer to Figure 1. This Figure depicts what we might consider to be a typical measurement loop. It has a transmitter sending a signal to a receiver, some finite distance away, over a pair of wires. One side of the signal current has become grounded via internal circuitry and ultimately is tied to earth ground usually via the instrument case.



As depicted in Figure 1, this measurement loop would probably work fine and not have any influence from ground loop currents. However, reality sets in and we have to abide by plant safety procedures, the National Electric Code, etc. Safety procedures almost always will mandate that each piece of equipment be grounded to earth at its respective installed location. This is where the trouble starts. Once we ground two pieces of equipment at two different locations we have set the stage for ground loop problems. If we could take a volt meter (Figure 2) with very long leads and measure the voltage between the ground points of the transmitter and the receiver we would measure some voltage. It may measure in millivolts or it could be many volts. Either way, if there is a potential difference, then current will flow between these two points. Since the earth presents itself as a resistor between these two ground points the amount of current that flows between the points will be directly proportional to the voltage difference and inversely proportional to the resistance. For those who are fans of Ohms Law you will recognize this equated as  $I=E/R$ . I being the ground current; E being the voltage between the ground points; and R being the resistance of the earth between the two ground points.

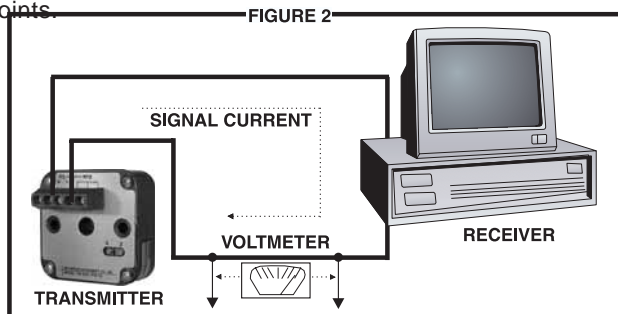
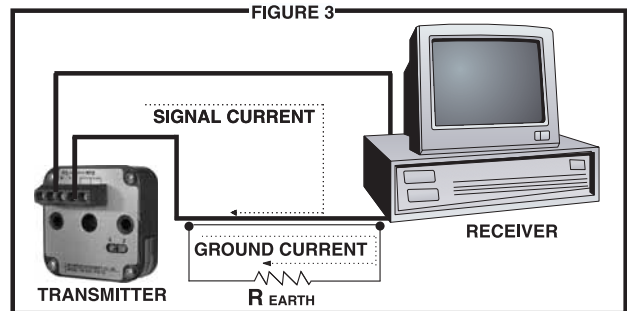
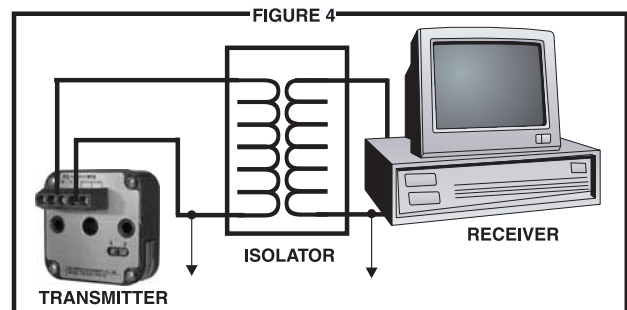


Figure 3 shows that we now have two currents that can flow through the wiring between the transmitter and receiver. If it all stopped here we could just calibrate the measurement loop to nullify the effects of the ground current and go on about our business. Many times this is exactly what happens. A technician calibrates the loop and comes back a few days later to find that his calibration is no longer accurate. What has happened? It could be a lot of things. Maybe it rained and the resistance of the earth changed. Suffice it to say there are many phenomenon, either natural or man-made, that can change the resistance or the voltage between the two ground points thus effecting the calibration of the loop.



It is apparent that we are "fighting a losing battle" thinking we can anticipate the interactive affect of ground loop currents on our measurement loop. What can we do to get around this problem? The answer is to provide DC isolation between each component in our loop. (Figure 4)



DC isolation can be accomplished either in the transmitter, the receiver, or with a third component as shown in Figure 4. Figure 4 shows DC isolation being accomplished by using a transformer. An isolator module, of course, is much more than just a transformer, but it is the transformer component in a signal isolator that, in fact, provides the isolation since DC cannot pass through a transformer. Now that we have inserted this "transformer" into the circuit, the ground loop between the transmitter and the receiver no longer exists, thus eliminating its effects on the signal current.

The Wilkerson product line provides several options for implementing DC isolation depending on how the isolator is powered. There are three basic ways of powering an isolator. These are listed below with the respective modules:

1. **Input Powered or Loop Powered**  
DM4391-1      DM4391-2
2. **Output Powered or Two Wire**  
SR2101      TW8101
3. **External Powered**  
MM4300 Series      MM4380A  
DM4300 Series      DM4380A



# Wiring For Trouble Free Signal Conditioning

Signal conditioning equipment for process signals has kept pace with modern technology, but many users never realize the full potential of the equipment because of poor installation and wiring practices. Such practices can degrade equipment performance from a small percentage of error to the point where the equipment is unusable.

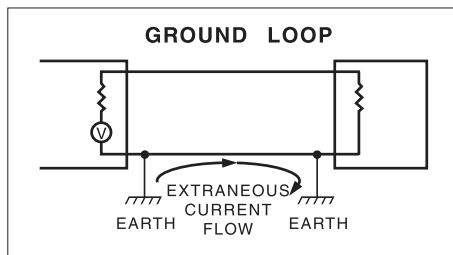
The most common complaints heard by this company are invariably associated with wiring problems. The most common problem encountered is an installation where **all** wiring is pulled in a common conduit or cable trough. A relay coil being switched or a relay contact switching an inductive load can easily generate a transient in excess of 1000 volts. This transient can easily couple into a signal conditioner and cause severe measurement problems.

Many products have input signal levels as low as 5 millivolts full scale and an output of 10 volts. With a gain of 2000, it is easy to understand the necessity of using good installation and wiring practices.

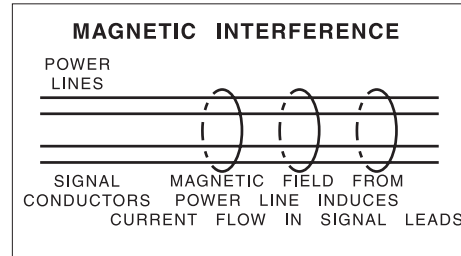
Accurate signal measurement and conditioning is vital if one is to maintain quality in their process control. Understanding the correct way to install and wire this important equipment is the proper responsibility of anyone who specifies control panels, wiring installations, or who manages factory personnel who install such equipment.

## DEFINITIONS OF SOME COMMON PROBLEMS

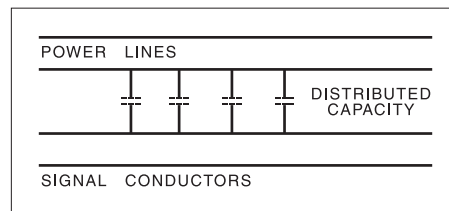
**Ground Loop** - A ground loop exists whenever an extraneous current flows in a conductor carrying the desired signal. If the extraneous current is related to the power mains, it generally manifests itself as "noise". If the extraneous current is DC, it can create an offset that can be difficult to recognize. The measured signal becomes the sum of the signal and ground loop current.



**Magnetic Coupling** - AC currents can be induced into the conductors carrying the desired signal. The AC can be power mains, magnetic transients from switching inductive loads, or magnetic fields from coils, transformers, or motors.



**Capacitive Coupling** - AC voltages can be capacitively coupled to the signal carrying conductors. This is accomplished by locating the signal leads near an AC voltage source such as power mains, SCR drive inputs or outputs, or any other source of AC potential.



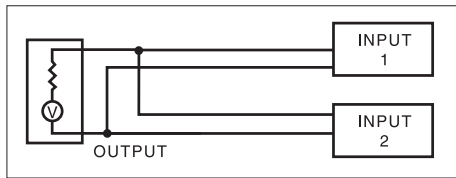
**Radio Interference** - Radiation from radio transmitters can create measurement problems by having some portion of the signal conditioning circuit rectify the radio energy and adding the resultant DC to the process signal. The radio energy source can be a portable two-way radio or a fixed installation radio or television transmitter. The interference can be momentary with portable radio equipment or a permanent offset with fixed installations. AM radio transmitters can often modulate the process signal with the voice or music modulation on the radio carrier.

**Lightning** - Lightning interference is sporadic and the primary concern is for survival of the equipment. Central Florida in the United States has the most frequent and intense lightning storms in the country. It is nicknamed the "lightning belt". Survival is the desire in this environment.

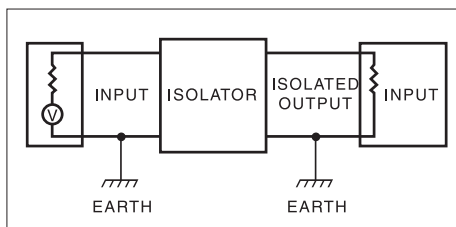
## INSTALLATION CONSIDERATIONS

The location of signal conditioning equipment is important for the prevention of the common problems defined above. Avoid mounting equipment next to high voltage sources such as breakers, fuse blocks, or terminal strips. Also avoid magnetic field sources such as large transformers, motor control relays, or motors. Wiring paths should also be considered when mounting equipment. Insure paths exist to route signal wires without having to run them in proximity to noise sources.

**Ground Loop Avoidance** - Avoiding a ground loop is simple. Never let an extraneous current flow in the signal leads. If a device must drive two or more loads with a voltage signal, use individual leads from the output to the input of each driven device.

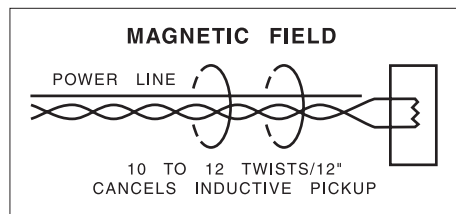


When the driven device and the driver must both connect to earth ground, use an isolator to break the ground path for extraneous currents.



### Magnetic Coupling Avoidance

Every effort should be made to keep signal leads away from AC magnetic field sources such as motors, transformers, or large relays. If it is necessary to route signal wiring near these devices, use a twisted pair of conductors for each signal. A pair of conductors with ten to twelve twists per foot offers an effective method of reducing magnetic pickup.



A major source of magnetic interference is created by running untwisted signal leads parallel to and in proximity to conductors carrying AC currents.

Twisting the signal leads and the power leads are an effective way to reduce this form of magnetic interference.

Mounting signal conditioning equipment in powerful magnetic fields can create interference inside the circuit boards and internally in the integrated circuits used in the equipment. The most reasonable and effective cure for this condition is to move the equipment away from the magnetic field.

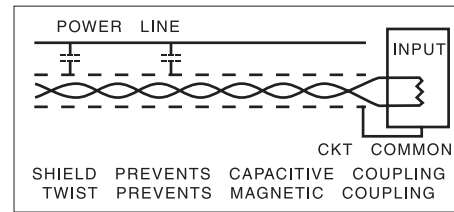
### Capacity Coupling Avoidance

AC potentials near signal carrying conductors can capacitively couple the AC to the signal conductors. The higher the frequency of the AC source the more extreme the potential interference problem. Common sources of interference are SCR drives, relay coil circuits, welders, and fluorescent lamp conductors.

If the interference can not be avoided by equipment location and wire paths, shielded wire should be used between

products.

Twisted shielded wire is the best choice because the twist provides magnetic interference protection and the shield prevents capacitive coupled interference.



The shield should be connected to the circuit common of the driven device. It should never be connected to both devices. Current could flow in the shield and magnetically couple to the signal leads. If the signal conditioner is mounted near a high potential source, capacitively coupled interference can occur by direct coupling to components inside the product. Metal housed products can be effective in preventing direct coupling, but the preferred practice is to locate the equipment in a better environment.

### Radio Interference

Well designed products will include internal filters to desensitize the product to radio frequency signals. There is no cure for direct radiation pickup by components in the product except extensive shielding. Metal housings with RFI gaskets can be used to shield the product. If the RFI source is powerful enough, individual RFI filters may be required on each conductor entering the metal housing.

### Lightning

Lightning is basically radio interference except when a direct hit occurs on a power line or signal cable. Standard RFI shielding techniques work on radiation from lightning - to a point. The energy levels associated with lightning radiation can induce currents in conductors that will destroy products. Good lightning protection requires the following techniques as a minimum:

1. Mount all equipment in a metal housing.
2. All signal leads should have a gas discharge transient protector to circuit common.
3. Circuit common should have a gas discharge transient protector to a good earth connection (very short heavy lead).
4. Power connections should have a transient protector from each line to earth.
5. Use twisted shielded pair for all signal leads.
6. Run all wire underground where feasible - otherwise use metal conduit which is well grounded.

### Fundamental Requirements

1. **Never** run signal leads in the same conduit or bundle that carries power mains, relay coil drive, relay contact leads, or other high level voltages or currents.
2. **Never** connect the shield of a shielded wire to anything other than the circuit common of the input of the product



# sensorRAD™

## Wireless Signal Conditioning



DR9011 / DR9021

### DR9011 / DR9021

#### Point to Point Wireless Transmitter / Receiver

- Transmit 2 Analog and 4 Digital Signals
- Direct Sensor Inputs via Plug and Play Input Cards
- DC, RTD or Bridge Analog Inputs Available
- Receive Dual 4/20mA and 4 Digital Outputs
- **UL/cUL Recognized**



DR9050

### DR9050

#### Modbus® RTU Polling Control Unit

- Provides Interface from Modbus Master Controller to DR9051 Remote Transmitter
- RS485/422 2 Wire Interface
- Poll up to 247 DR9051's
- Can be Wired in Parallel With Other Modbus Devices on RS485 Network
- **UL/cUL Recognized**



DR9051

### DR9051

#### Remote Transmitter Unit

- Direct Sensor Inputs via Plug and Play Input Cards
- DC, RTD, or Bridge Analog Inputs Available
- 4 Digital Inputs
- **UL/cUL Recognized**

#### Common Characteristics

- 900MHz and 2.4GHz Versions Available
- Spread Spectrum Frequency Hopping Technology
- 14 Hop Sequences Available for 900MHz Versions
- 7 Hop Sequences Available for 2.4GHz Version
- Line of Sight Range to 20 Miles

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