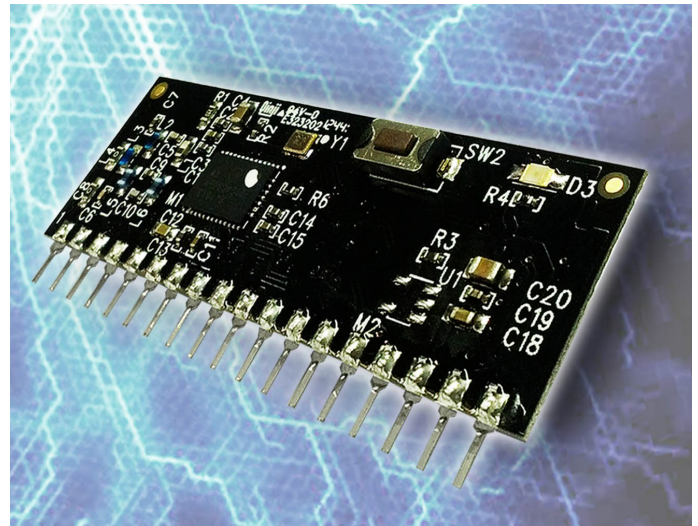


## SmartRadio Telemetry Module

### Features

- 8 Channel transceiver module
- Range up to 1,000 metres
- 8 Digital input/outputs
- Receiver outputs mirror transmitter inputs
- Minimal external components
- Secure data protocol
- Ultra low power 1.8–3.6V
- Easy pairing process
- One to one and one to many operation
- 869.5 / 915MHz\* operating versions
- +13dBm transmit power
- Single in line module
- Incorporates Self Test Mode
- CE compliant for licence free use
- FCC Approved for use in USA (TBC)\*



### Applications

- Remote Control
- Remote Networking
- Remote Switching
- Remote Traffic Lights

### Description

The BRAVO-T telemetry module provides a reliable transceiver based industrial remote switch with up to 1,000 metres range. Two or more modules may be combined to provide a simple or complex network of radio switches.

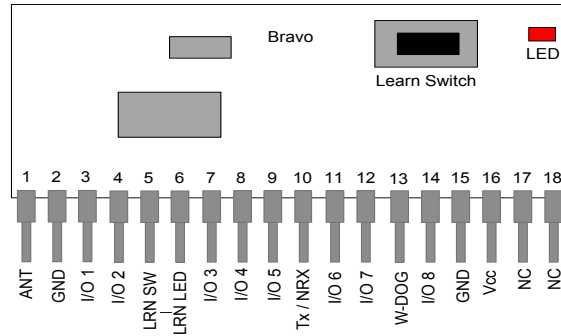
### Ordering Information

Part No	Description
BRAVO-T868	Radio telemetry module SIL package 868MHz
BRAVO-T915 (TBC)*	Radio telemetry module SIL package 915MHz (TBC)*

# BRAVO Telemetry Module



## Pin-out



## Pin Description

Pin No	Name	Direction	Description
1	ANT	In	Antenna input/output 50ohm impedance
2, 15	GND	In	Connect to ground
3, 4, 7, 8, 9, 11, 12 14	I/O1-8	In / Out	When configured as transmitter: Active low Digital inputs: high impedance inputs When configured as receiver: Active High Digital outputs: LVCMOS output drive
5	LRN SW	In	Learn switch input: Normally 'high' momentary connect to Ground to enter Learn Mode. If on board switch or to be used this input can be left unconnected
6	LRN LED	Out	Optional LED drive output Mirrors on-board LED
10	TX/RX	In	Connect to Vcc : Module is a transmitter Connect to GND : Module is a receiver
13	W-DOG	In / Out	Transmitter= Input Connect to Vcc : Watchdog is disabled Connect to GND : Watchdog is enabled Receiver= Output High : Watchdog is healthy Low : Watchdog Fault!
16	Vcc	In	Supply voltage
17	N/C	N/A	Leave unconnected
18	MOM/ LTCH	In	<b>In RX MODE ONLY</b> Momentary mode pull pin low - Connect to GND LATCH mode pull pin high - Connect to VCC

## General description of operation

Each module can be set to act as a 'transmitter' or 'receiver' A telemetry system is achieved when two modules are paired together, as transmitter (BRAVO-Tx) and receiver (BRAVO-Rx).

Each time any input changes on the BRAVO-Tx, it will transmit the status of ALL inputs to the paired BRAVO-Rx(s). The BRAVO-Rx(s) which will set their outputs to match the BRAVO-Tx inputs. After each state change the modules will return to sleep mode.

**Note:** All of the 8 channels are common to all modules in a system

**Example:** If you are using a system with two or many Bravo modules each channel be will common to all modules ie. if you change state on transmitter input 8, then all receiver output 8's will also change state.

## BRAVO Configured as a TRANSMITTER

### 1. Operation

When configured as a transmitter the BRAVO module will automatically default to low power sleep mode until any input state change takes place.

On receipt of an input state change the BRAVO-Tx will transmit a packet showing the state of all inputs at the time of the change (multiple input changes may take place simultaneously)

#### 1.1 Watchdog

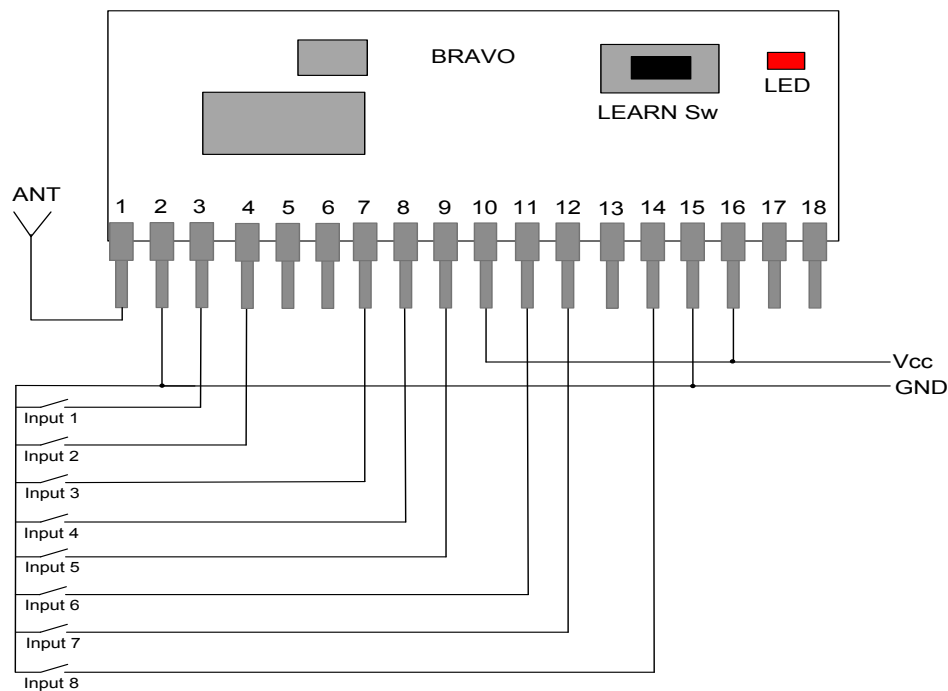
If watchdog is enabled the Bravo-Tx will transmit a background packet containing the current status of the inputs every 5 minutes.

#### 1.2 Digital Inputs

High impedance inputs, LVCMOS / LVTTTL compatible, 5V tolerant.

Can be connected directly to CMOS/TTL logic or switch inputs connected to 0V or VCC  
A change on the input will cause the BRAVO-Tx to wake, read all inputs and initiate RF transmission.

## Transmitter Application circuit example



### Description:

This example shows a BRAVO module configured as a transmitter with all 8 inputs connected and watchdog disabled.

### Notes:

All input switches would need to be connected to GND to activate.

## BRAVO Configured as a RECEIVER

### Watchdog enabled

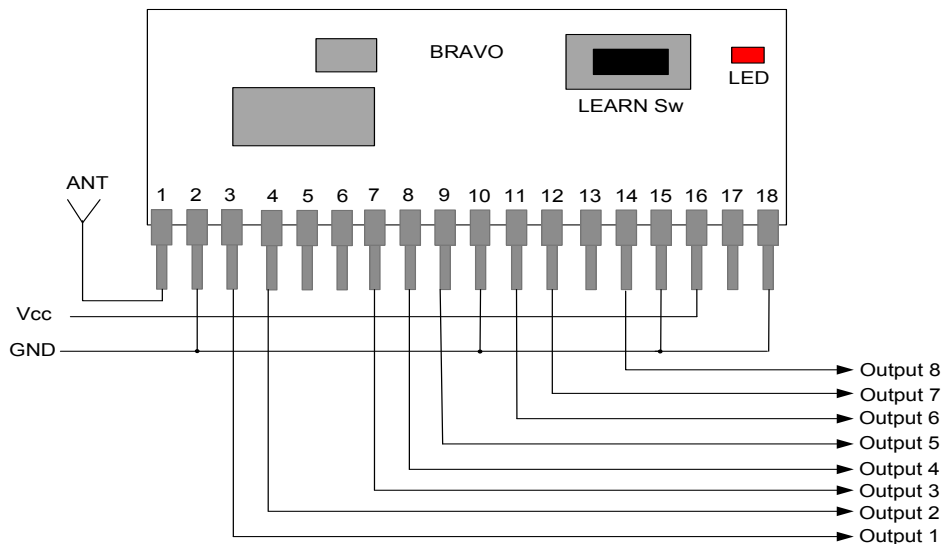
If "watchdog" is enabled the BRAVO-Rx will await a signal from a paired BRAVO-Tx module. When the Watchdog signal is received OK then the watchdog output will be maintained active high. If no watchdog signal is received in any 30minute period then the BRAVO-Rx will drop the Watchdog output. Other outputs are unaffected.

NOTE: watchdog must be enabled on BOTH Tx and Rx for it to work.

### Digital outputs

Active high LVCMOS / LVTTTL compatible outputs. Can be connected directly to CMOS/TTL logic or drive.

## Receiver example application circuit

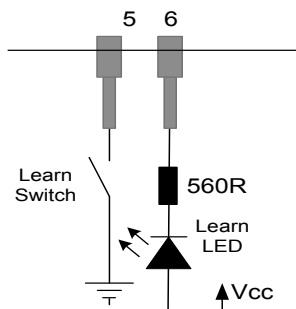


### Description:

This example shows a BRAVO module configured as a receiver with all 8 outputs connected and watchdog disabled.

Note: The external learn switch and LED are also not fitted in this example.

### Optional external learn switch and LED example circuit



## Pairing Process Bravo-Tx to Bravo-RX

Each BRAVO module has a unique serial number identity. They may be paired together using the LEARN button/input so that they operate in systems in: one:one, one:many and many:one formats. Each BRAVO-Rx can store 70 BRAVO-Tx identities.

**Note:** “watchdog” should not be enabled for many to one systems

### 3.1 Pairing process: Learn:

1. Briefly press the “LEARN” switch (or activate LEARN input) on the BRAVO-Rx
2. Briefly activate any input on the BRAVO-Tx

### Pairing process: Erase

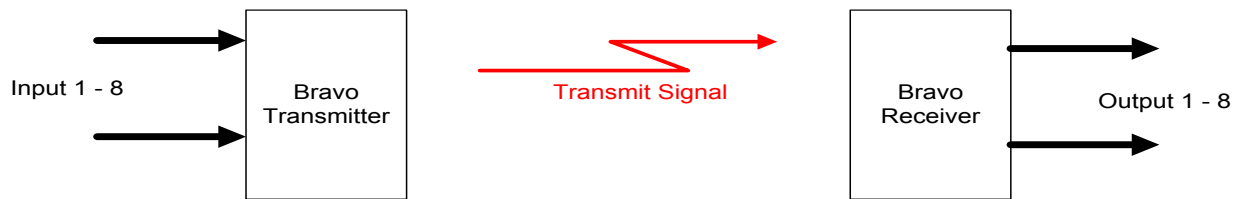
1. Press and Hold ‘LEARN’ switch (input) on the receiver for more than 10seconds.

### 3.2 LED indication of the pairing process is given by:

Mode	LED	Description
Normal operation	Flickering ON	Module is transmitting or receiving data
	OFF	No RF data is being transmitted/received
Learn mode (BRAVO-Rx only)	Flashing at low speed	BRAVO-RX Learn button pressed: module is searching for another to pair with. Learn mode times out after 10 seconds
	Flashing at high speed for 3secs	BRAVO-Rx pairing successful

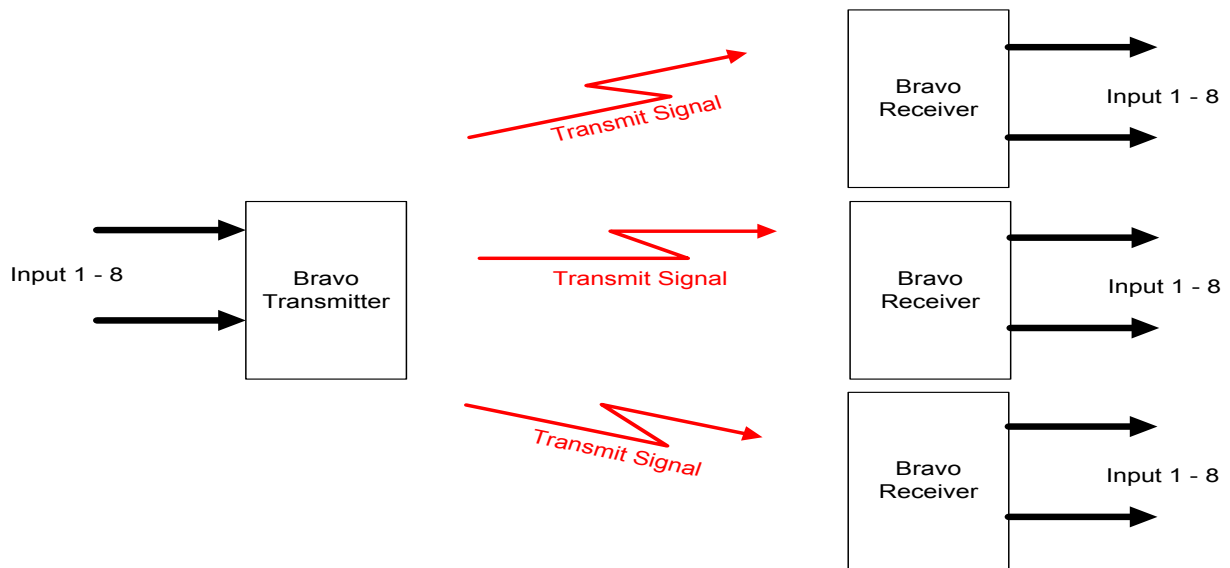
## Operational application examples

### Application example one:one operation



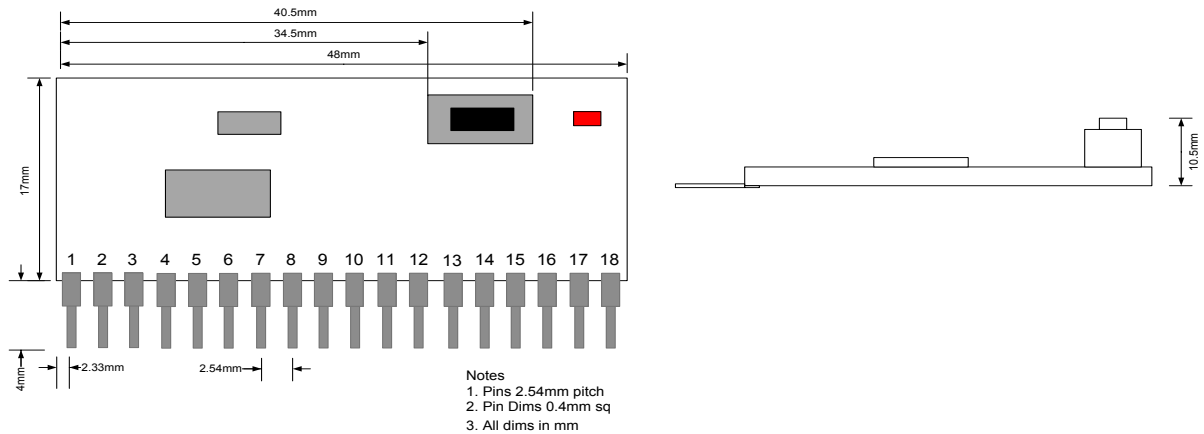
In this application the outputs at the receiver will match the inputs at the transmitter.

### Application example: one:many operation



In this application the outputs at each of the receivers will track the inputs at the transmitter.

## Mechanical Dimensions



## Range Considerations

The antenna choice and position directly affects the system range, keep it clear of any large metal parts. The best position is protruding vertically from the top of the product. This is often not desirable for practical reasons and thus a compromise may be needed. Note that the space around the antenna is as important as the antenna itself. All radio systems are dependent on a radio signal being received through airspace.

The range quoted is the optimal in direct line of sight without obstacles and in good atmospheric conditions. Range is affected by many things, for example local environmental conditions, atmospheric conditions, interference from other radio transmitters. For evaluating the local environment please see our RF Meter (DS006)

In very worse case applications the range quoted may be reduced dramatically below

## Self Test Mode

The Bravo Module incorporates a self test which is initiated by applying power with the learn Button being held down.

The Bravo Module then performs the following functions;

1. All I/O are set to outputs and are operated
2. in a traffic light sequence 0 to 8 to 0 again.
3. 4 on 4 off sequence
4. Transmits a full power RF signal for 10 seconds and operates the Learn LED
5. Enters RSSI (Received signal Strength) mode where outputs 1-8 are activated as a bar graph type output according to the strength of a valid RF signal received (from any carrier operating at the appropriate frequency (869.50MHz or 915MHz)

# BRAVO Telemetry Module



## Technical Specifications

Absolute Maximums:

Temperature Range: Storage -50 to +125°C.

DC Characteristics

Parameter	Min	Max	Units
Supply Voltage	-0.3	3.6	V
Voltage on any Input	$V_{cc} > 2.2V$	5.8	V
	$V_{cc} < 2.2V$	$V_{cc}+3.6$	V
Max Input power (through RX antenna)		+5	dBm
Max Current Sourced / Sunk (Per I/O)		100	mA
Max Current Sourced / Sunk (Total)		200	mA

DC Characteristics

Parameter	Min	Typical	Max	Units
Supply Voltage	1.8		3.6	V
Operating Temperature	-40		+85	°C
BRAVO- Tx Supply Current:				
When Transmitting		30		mA
When sleeping		6		uA
BRAVO- Rx Supply Current:				
When Receiving		24		mA

AC Characteristics

Parameter	Min	Typical	Max	Units
Operating Frequency		869.5		MHz
Operating Freq for 915Mhz version	915.00		915.27	MHz
Operating Temperature	-40		+85	°C
BRAVO- Tx Output Power			+13	dBm
BRAVO- Tx–Rx FSK Raw RF Data Rate			9.6	Kbps
BRAVO- Rx Sensitivity		-121		dBm



# BRAVO Telemetry Module



## RF Meter

RF Multi Meter is a versatile handheld test meter checking Radio signal strength or interference in a given area. The Multi-Meter can both transmit and receive signals making it possible to test an installation location for suitability before installing equipment. The Multi-Meter is very hard wearing, long lasting and simple to use. It has 4 selectable frequencies, changeable at the touch of a button. It also has an auto shut off feature for battery saving.



## Recommended Antenna 868MHz

We have a range of antennas on 868Mhz that are suitable for use with the Bravo modules.

To view our range please visit our website:

<http://www.rfsolutions.co.uk>



### RF Solutions Ltd. Recycling Notice

Meets the following EC Directives:

#### DO NOT

Discard with normal waste, please recycle.



#### ROHS Directive 2002/95/EC

Specifies certain limits for hazardous substances.

#### WEEE Directive 2002/96/EC

Waste electrical & electronic equipment. This product must be disposed of through a licensed WEEE collection point. RF Solutions Ltd., fulfills its WEEE obligations by membership of an approved compliance scheme.



### Waste Batteries and Accumulators

#### Directive 2006/66/EC

Where batteries are fitted, before recycling the product, the batteries must be removed and disposed of at a licensed collection point.

#### Environment Agency producer registration number:

WEE/JB0104WV.

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