Pribusin Inc.

Manufacturers of Process Controls and Instrumentation

Instruction Manual

Model: *RCI-RPT-RFX*

Function: *Repeater for Remote Control Signal Interface*

Communication:
- ☐ *RFX=RF2: 2.4 Ghz Wireless*
- ■ *RFX=RF9: 900 Mhz Wireless*

Power:
- ☐ 117VAC, 50/60Hz
- ☐ 24 VDC

Serial #: _____

(If special or required)

For Technical Assistance And Questions Call
USA: (734) 677-0459 CANADA: (905) 660-5336

Restocking Policy

All product returned to Pribusin Inc. in prime condition (not damaged, scratched or defaced in any way) within seven (7) months from the original date of shipment is subject to a 50% restocking charge. All product must be accompanied by a Return Authorization number (RA number) which must be obtained from Pribusin Inc. prior to returning any product.

After seven (7) months from the original date of shipment, products cannot be returned for restocking.

Custom designed products, modified products or all non-standard products may not be returned for restocking.

Warranty Policy

Pribusin Inc. warrants equipment of its own manufacture to be free from defects in material and workmanship, under normal conditions of use and service, and will replace any component found to be defective, on its return to Pribusin Inc., transportation charges prepaid, within one year of its original purchase. Pribusin Inc. will extend the same warranty protection on equipment, peripherals and accessories which is extended to Pribusin Inc. by the original manufacturer. Pribusin Inc. also assumes noliability, expressed or implied, beyond its obligation to prelace any component involved. Such warranty is in lieu of all other warranties, expressed or implied.

Pribusin Inc.

Manufacturers of Process Controls and Instrumentation

Model: RCI-RPT-RF9

Repeater for Remote Control Signal Interface With 900MHz Radio Frequency Link

Standard Features:

Extends Distance of Effective Radio Transmission

Provides Access to Non-Line-of-Sight Remotes

Bi-directional Communication using License-free 900MHz Radio Band

Spread-Spectrum Radio Technology Provides Reliable Communication

Re-Transmission & Error Correction Algorithms ensure Accurate Data Transmission

Point-to-Point or Host-to-Multipoint Topologies

No Calibration Required

Microprocessor Controlled for High Accuracy

Power: 117 VAC 50/60 Hz (Optional 24 VDC)

High Noise Rejection

Function:

The RCI-RPT-RF9 is a store-and-forward radio signal repeater that can be used to extend the distance between a host and its remote(s). The unit receives data from the host and re-transmits it to the remote(s) and vice-versa. Using a repeater can provide access to remote locations that are not in direct line-of-sight with the host.

Standard RCI-XXX-RF9 units are also capable of acting as a repeater thereby serving a dual function of remote unit and signal repeater (see diagram on back).

The license-free spread-spectrum radio technology allows small systems to be set up with very little effort and at low cost. The technology ensures high communication reliability even in RF-intensive environments.

All units are sold without antennas. Pribusin carries a complete assortment of antennas and accessories.

Options:

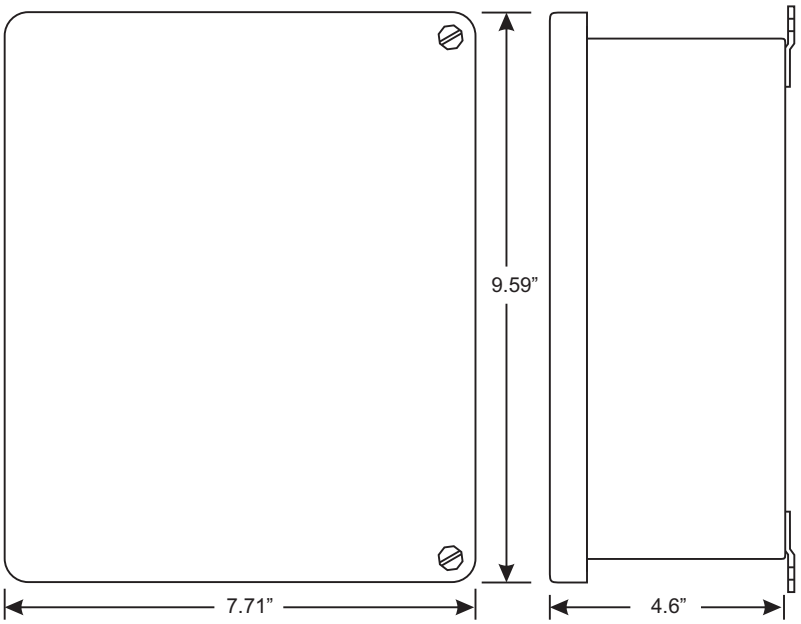
- A: 24VDC Power
- B: 240VAC Power
- N12: NEMA 12 Enclosure

Specifications:

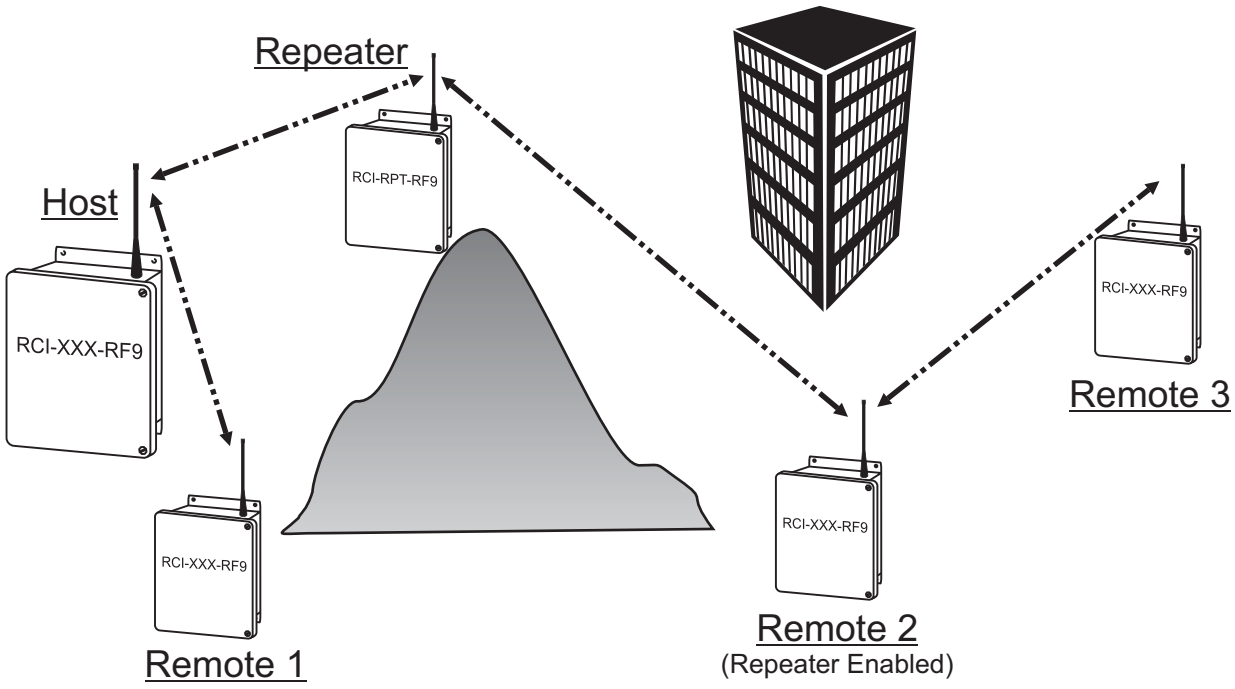
Media: 900MHz Spread-Spectrum Radio
Range: up to 1500ft indoors with omnidirectional antenna
up to 12 miles line-of-sight with directional antenna
Protocol: MODBUS ASCII
Speed: 9600 BAUD
Radio Power Output: 100mW, 1000mW (selectable)
Operating Temperature: -4°F to +140°F (-20°C to +60°C)
Power: 117 VAC, 60/50 Hz, 24VDC Available
Enclosure: NEMA4X (NEMA12 available as an option)

RCI-RPT-RF9

Enclosures & Dimensions:



Connection:



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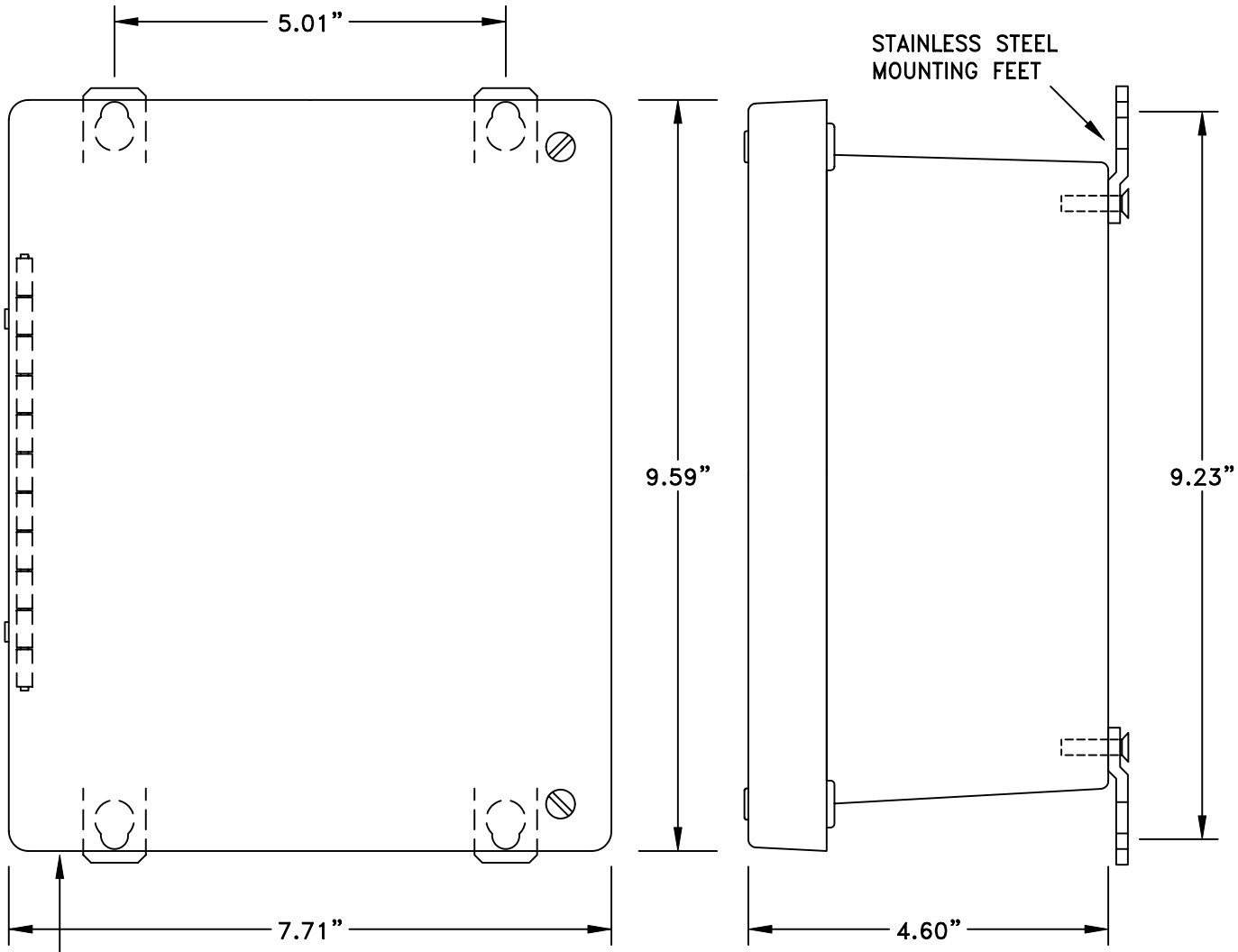


FRONT VIEW

SIDE VIEW

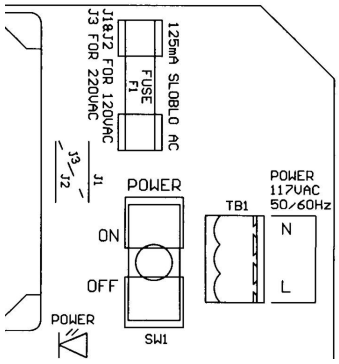
NEMA 4X AM SERIES FIBERGLASS ENCLOSURE
WITH STAINLESS STEEL HINGE
AND SCREW COVER

Pribusin Inc. ©		
CHKD:	DATE: OCT. 02/01	DRN: KS
NEMA 4X AM SERIES FIBERGLASS ENCLOSURE (BOX SIZE: 8” x 6” x 4”)		
DWG. NO.: 106470-2		REV. A

RCI-RPT Connections:

An RCI-RPT repeater functions as an intermediate between two RCI units. It acquires transmissions and them sends them out, thus allowing for two RCI units to communicate over a greater distance than without the use of an RCI-RPT repeater.

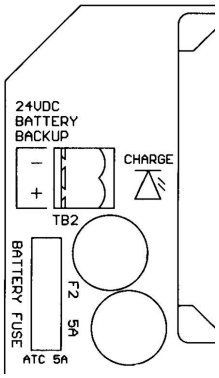
AC Power & Fuse:



The RCI-RPT is typically powered from 120VAC and protected by a 125mA SLOBLO fuse. It can be wired for 240VAC operation by removing (de-soldering) power jumpers J1 & J2 and installing (soldering) jumper J3.

When changing the RCI-RPT to 240VAC power make sure to change the fuse to half of its value, 62mA. This is important since at 240VAC the RCI-RPT requires only half the current as if it were powered from 120VAC. Proper protection is only achieved by reducing the fuse value as mentioned above.

DC Power & Battery Backup:



The RCI-RPT may also be powered from a 24VDC source which could be a battery or a DC power supply. The 24VDC power input is polarity protected with a fuse to prevent damage to the RCI-RPT by inadvertent reverse polarity. A DC fuse provision is also provided if this power option is utilized. Insert a 5A automotive type blade fuse into the Battery Fuse socket.

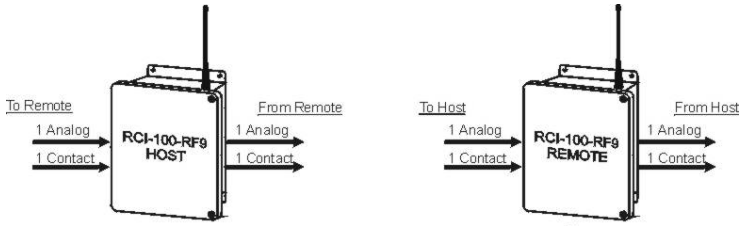
If a battery is used, it must be an 18VDC Lead-Acid type rechargeable battery. This battery is most easily made up of three 6VDC batteries connected in series. We suggest using a spill-proof gel-cell type battery to prevent accidental leakage of the corrosive acid inside the batteries. The size of the batteries can vary from 1Ah to 20Ah depending on the length of time the RCI is to operate on battery power. Keep in mind that it takes 20 times longer to bring a 20Ah battery back to full charge compared to a 1Ah battery.

To enable the internal battery charging circuit, turn on switch SW1-6.

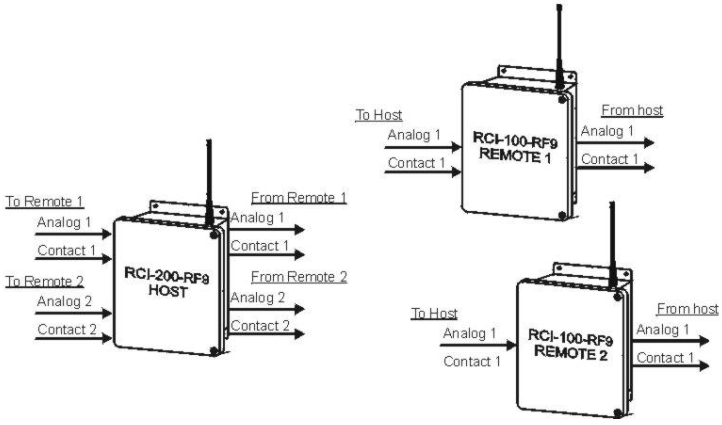
RF9 Communication Option:

The –RF9 communications option to the RCI series utilizes license-free 902-928 MHz spread spectrum radio frequency transmissions to exchange the signal data between a host and its remote(s). There are two types of **Topologies** that can be configured: 1) Point-to-Point and 2) Host-to-Multipoint.

In a **Point-to-Point** topology one host communicates with one remote. The two exchange all their signals with one another. The remote is configured as remote #1 even though it is the only remote in the system.



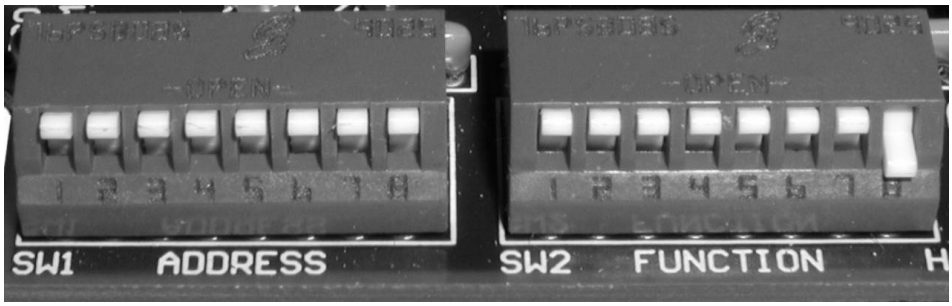
In a **Host-to-Multipoint** topology one host communicates to several remotes. Each remote is assigned an address (1,2,3, etc.) so that the host may distinguish between them. There may at most be as many remotes as there are inputs & outputs on the host.



For example, an RCI-200, having two analog/contact inputs and outputs, may communicate with up to two RCI-100 remotes each having one analog/contact input and output. In this case all **#1 inputs and outputs on the host correspond to the #1 inputs and outputs on remote #1** and all **#2 inputs and outputs on the host correspond to the #1 inputs and outputs on remote #2**. The second analog/contact input and output on each of the two remotes would be unused.

A **Network ID** allows multiple RFM systems to co-exist within close proximity without interfering with one another. There are four Network ID's to choose from: A, B, C or D. The host and its remote(s) must be set to the same Network ID in order for them to communicate with each other.

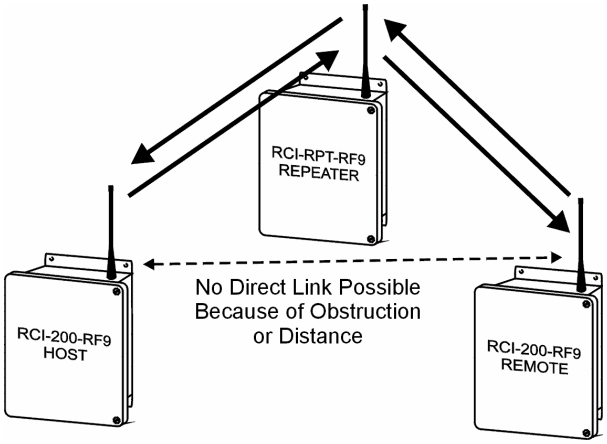
All radio configurations are done via two banks of DIPswitches. SW1 assigns the remote address from 1 to 100 using a binary encoding scheme. SW2 assigns the Topology, Network ID, Channel Numbers and Host/Remote Mode. The switches are located on the communications board just below the radio. They are a slanted rocker type that flips **up for OFF** and **down for ON**.



Radio Repeaters:

Both the Point-to-Point and Host-to-Multipoint topologies can make use of radio repeaters (RCI-RPT-RF9) to extend the reach between host and remote(s). A repeater acts as a store-and-forward radio in that it receives a transmission from one unit, temporarily stores it, and then passes it on to the next unit.

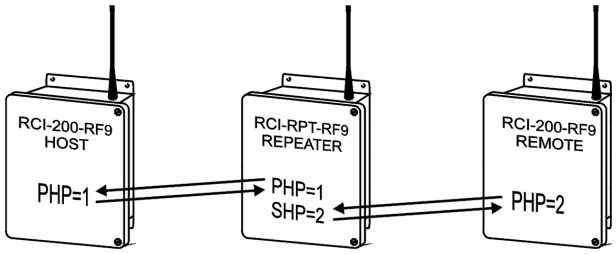
This allows remote units to be placed where they cannot be reached directly from the host unit. Currently, a repeater cannot act as a remote unit but future version of firmware will allow a dual function repeater that can also act as a remote unit.



It is possible to string several repeaters together in a chain-like fashion to extend the reach of a host unit far beyond its regular coverage. It is important to note however, that every repeater introduces a small propagation delay, which slows down the response time of the entire system.

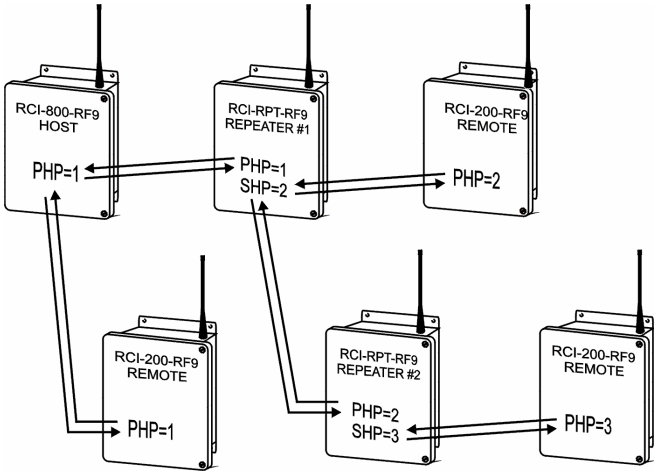
The configuration in a repeater system becomes a bit more complex since all units in a network must know how the transmissions are to be routed. To achieve this the repeater uses two different hop patterns. One to communicate with the host and one to communicate with the next unit down the line (either a remote or another repeater). A hop pattern is a radio configuration parameter that allows several spread-spectrum radios to communicate simultaneously. Hop patterns are numbered 1 through 7 and the host always uses hop pattern 1.

The repeater uses the Primary Hop Pattern (PHP) to communicate with the device before it (host or another repeater). It uses the Secondary Hop Pattern (SHP) to communicate with the device after it (remote or another repeater).



Remember the host always uses PHP=1 and remotes have no SHP since the transmission does not get repeated by a remote.

The diagram to the right shows a network of repeaters and remotes and how the PHP and SHP hop patterns are used to identify which unit is 'connected' to which other unit.



Radio Configuration:

The radio communication board has two banks of 8-position DIPswitches: SW1 and SW2. The function of these switches is different for a host, remote and repeater unit. We recommend powering the unit down while making any changes to the configuration.

SW1-	HOST	REMOTE	REPEATER
1	# of Remotes	Remote Address	Repeater Number
2	# of Remotes	Remote Address	Repeater Number
3	# of Remotes	Remote Address	Repeater Number
4		PHP	PHP
5		PHP	PHP
6		PHP	PHP
7			
8	Repeater Select	Repeater Select	Repeater Select

SW2-	HOST	REMOTE	REPEATER
1	# of Channels on each Remote	# of Channels on this Remote	SHP
2	# of Channels on each Remote	# of Channels on this Remote	SHP
3	# of Channels on Host		SHP
4	# of Channels on Host		
5	Network ID	Network ID	Network ID
6	Network ID	Network ID	Network ID
7	RF Output Power	RF Output Power	RF Output Power
8	Host / Remote Select	Host / Remote Select	Host / Remote Select

Network ID:

The Network ID is common to both the host and remote modes of operation. All hosts and remotes that are intended to communicate with each other must be set to the same Network ID. Four ID's are available: A, B, C, D. They are set as shown in the table.

SW2-5	SW2-6	Network ID
UP	UP	A
DOWN	UP	B
UP	DOWN	C
DOWN	DOWN	D

RF Output Power:

The radio output power can be selected with SW2-7. For shorter transmission ranges select the 100mW range to limit the amount of 'RF pollution'. Select the 1W setting for: a) longer transmission ranges, b) heavy foliage transmission scenarios, c) if there is no communication at the 100mW setting, or d) if the signal strength is less than -93dBm.

SW2-7	RF Power
UP	100 mW
DOWN	1 W

Repeater Configuration:

To make an RCI-RPT operate as a REPEATER unit, make sure that SW1-8 is down and SW2-8 is up.

Next, set **the repeater number** using SW1-1, -2 & -3. Each repeater in a system must have a unique number.

SW1-1	SW1-2	SW1-3	Repeater Number
UP	UP	UP	1
DOWN	UP	UP	2
UP	DOWN	UP	3
DOWN	DOWN	UP	4
UP	UP	DOWN	5
DOWN	UP	DOWN	6
UP	DOWN	DOWN	7
DOWN	DOWN	DOWN	8

Next, set the **repeater PHP** using SW1-4, -5, -6. The PHP of the repeater must match the SHP of the unit before it. If this is a host than set the repeater PHP=1.

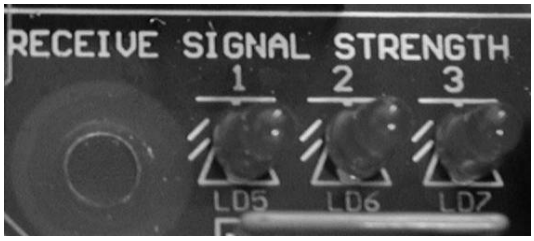
SW1-4	SW1-5	SW1-6	REPEATER PHP
UP	UP	UP	1
DOWN	UP	UP	2
UP	DOWN	UP	3
DOWN	DOWN	UP	4
UP	UP	DOWN	5
DOWN	UP	DOWN	6
UP	DOWN	DOWN	7
DOWN	DOWN	DOWN	8

Next, set the **repeater SHP** using SW2-1, -2, -3. The SHP of the repeater must match the PHP of the unit after it.

SW2-1	SW2-2	SW2-3	REPEATER PHP
UP	UP	UP	1
DOWN	UP	UP	2
UP	DOWN	UP	3
DOWN	DOWN	UP	4
UP	UP	DOWN	5
DOWN	UP	DOWN	6
UP	DOWN	DOWN	7
DOWN	DOWN	DOWN	8

Received Signal Strength Indicator (RSSI):

The radio communications board has a signal strength indicator to show the level of the signal that was received from another radio. The indicator consists of 3 LED's labeled 1, 2 & 3. It is desirable to operate with the highest signal strength achievable. If the signal strength is less than -93 dBm, it is advisable to try to make adjustments to then system to bring the signal strength up. A higher power setting on the radio or a higher gain antenna can be used to increase signal strength and achieve more reliable operation of the radio system.

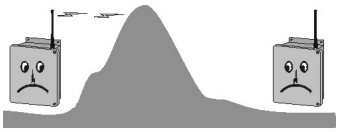


Signal Strength (dBm)	LED 1	LED 2	LED 3
-108	Flashing	Off	Off
-101	On	Off	Off
-93	On	Flashing	Off
-86	On	On	Off
-79	On	On	Flashing
-71	On	On	On

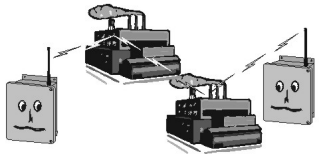
Cable & Antenna Selection & Installation:

The antenna is a very important component in a radio system. Make sure you consult the factory for proper antenna selection for your project. Cable leading from the radio to the antenna is just as important in establishing a reliable link. Special low-loss cable is available to ensure minimal signal losses in the cable leading to the antenna. This cable must be kept as short as possible. We recommend purchasing the cable from Pribusin Inc. to ensure a good match for the entire system. **Regular TV coaxial cable or even satellite dish coaxial cable will not work.** Even 'good' TV cables have enormous losses at the high frequency of this radio.

Line-of-Sight Installation:



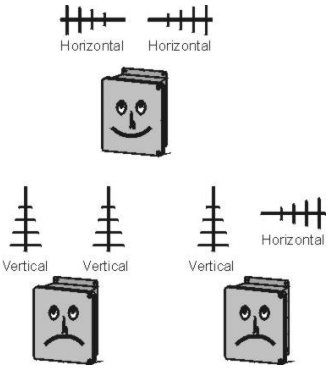
To achieve maximum operational reliability, all antennas in a system must be installed in a line-of-sight fashion. This means that there are no obstructions between the host antenna and each of the remote antennas. This may require the antenna to be raised on a mast with some low-loss coaxial cable being installed. We recommend coaxial cables be kept as short as possible and not exceed 100ft.



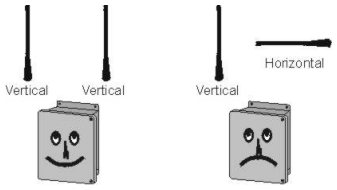
In some cases a direct line-of-sight may not be established, but if there are solid structures such as buildings, tanks etc. in the vicinity, the signal may reflect off these surfaces and reach an antenna via an indirect path. Such installations are not easy and are difficult to predict without on-site testing.

Antenna Polarization:

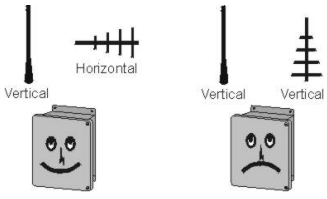
When installing antennas keep in mind that polarity matters. Alignment for antennas depends on the type of antennas being used. For example, if using omni-directional antennas, point them parallel to one another as shown in the diagram below. Do not point them in different directions or the range of the antennas will be greatly diminished to the point where no transmission may take place. If using an omni-directional and a YAGI antenna, align them perpendicular to one another with the YAGI pointing towards the OMNI. If using YAGI antennas, align them facing one another as shown in the diagram to the right. Placing them parallel to one another greatly diminishes the transmission between antennas.



(YAGI-YAGI)



(OMNI-OMNI)



(OMNI-YAGI)

We suggest you consult Pribusin Inc. or your local Sales Rep. to discuss your antenna and cable requirements.