

RC1920 NR Installation Checklist

Site Name _____
 Location _____
 Serial Number _____
 BTS Donor/Sector _____
 BTS Location _____

1. EQUIPMENT INSTALLATION

- ___ 1.1 **TEST EQUIPMENT NEEDED.** Sweep Tester, Signal Generator, Spectrum Analyzer, Pilot Scanner (optional), average reading RF Power Meter, and Voltmeter.
- ___ 1.2 **VERIFY BTS OUTPUT POWER.** Verify that the BTS donor sector for to the repeater site is running at rated output power.
- ___ 1.3 **INSTALL ANTENNAS AND FEED LINES.** If using back-beam antenna(s), install power divider(s).
- ___ 1.4 **RUN SWEEP TEST.** Run sweep test on all antennas and feed lines upon completion of their installation.
- ___ 1.5 **MOUNT REPEATER CABINET.** (This step may require 2 people.) Remove mounting bracket from cabinet and mount on pole, wall or uni-strut. Hang repeater over outside of mounting bracket and secure. Leave room for antenna feed connections, Battery Box or BUPS, if applicable.
- ___ 1.6 **MOUNT BATTERY BOX if used.** Mount below Repeater Cabinet. Interconnect two cabinets together with supplied cables.
- ___ 1.7 **MOUNT BACK-UP POWER SYSTEM (BUPS) if used.** (This step may require 2 people.) Mount to right of Repeater Cabinet. This supplies DC power. (Optional)
- ___ 1.8 **GROUND EQUIPMENT.** Connect repeater cabinet, Battery Box, BUPS, antenna feeds, lightning suppressors, and any other equipment to external ground.
- ___ 1.9 **TERMINATE ANTENNA PORTS.** Use Type-N 50-Ohm 20-Watt terminations. Two ports for non-diversity, three ports for diversity repeater.
- ___ 1.10 **HOOK-UP ELECTRICAL.** Wire primary power to a dedicated breaker. Recommended breaker size is as follows:
 For AC Primary power use 15 Amp circuit Breaker
 For DC Primary power use 25Amp circuit breaker.
 Check with local electrical codes for appropriate AWG size of wire. RTI recommends #12AWG.
 Open the primary Cabinet. Verify proper voltage & polarity (24 VDC or 117/230 VAC, but not both). **DO NOT TURN ON REPEATER POWER AT THIS TIME.**

2. ANTENNA ALIGNMENTS

- ___ 2.1 **ALIGN DONOR ANTENNA.** Check RSL (Receive Signal Level) from donor BTS into the repeater. Connect Spectrum Analyzer or Pilot Scanner (optional) to antenna feed of Repeater Donor antenna and adjust donor antenna position for maximum RSL (set for 1 MHz RBW). Confirm polarization of Donor antenna. Measure input carrier at idle channel power. Adjust antenna to minimize unwanted PN's if possible.

Donor Antenna Polarity (V/H) _____

Frequency 1

Frequency _____ MHz
 Power _____ dBm
 Desired PN _____ (if using PN Scanner)
 Ec/Io _____ dB
 Power _____ dBm
 2nd Highest PN _____ (if using PN Scanner):
 Ec/Io _____ dB
 Power _____ dBm

Frequency 2 (If applicable)

Frequency _____ MHz
 Power _____ dBm
 Desired PN _____ (if using PN Scanner)
 Ec/Io _____ dB
 Power _____ dBm
 2nd Highest PN _____ (if using PN Scanner):
 Ec/Io _____ dB
 Power _____ dBm

- ___ 2.2 **ALIGN MOBILE ANTENNA(s).** Aim (using compass or topographic map) mobile/subscriber antenna in accordance with network engineering site plan.

- ___ 2.3 **CHECK ISOLATION.** (This test verifies that the donor and mobile antennas will not oscillate when the repeater is hooked-up.) Using signal generator, inject up to 4 CW signals across the channel for Frequency 1 into the donor antenna feed (suggested power level of 0 dBm). Using a Spectrum Analyzer (set for 1 kHz RBW), measure the receive level on each subscriber antenna feed. Note worst case difference in power levels. **ISOLATION MUST BE GREATER THAN 80 dB.** 110 dB is ideal. Repeat for Frequency 2, if applicable. Adjust antenna location, or introduce RF shielding, if more isolation is required.

Isolation

TX₁ / RX_{MAIN} _____ dB
 TX₂ / RX_{DIVERSITY} _____ dB (if applicable)

3. COMMISSIONING THE REPEATER

- ___ 3.1 **TURN ON POWER.** Open Repeater Cabinet; turn ON system power. **NOTE: CRITICAL ALARM RED LED WILL BE ACTIVATED. REPEATER IS IN ALARMED STATE UNTIL POWER AMPLIFIERS (PAs) ARE TURNED ON.**
- ___ 3.2 **UPDATE SOFTWARE.** Load RepeaterNet Craft Software provided in accessory kit (CD ROM) on MS Windows 95 or later PC. (Even if RepeaterNet is loaded on PC, a new Revision might be included with repeater.)
- ___ 3.3 **LAUNCH REPEATER NET CRAFT.** Connect PC to Craft port (9-pin DB9 connector) in Repeater Cabinet with cable provided in accessory kit. Launch RepeaterNet Craft program on PC.
- ___ 3.4 **TURN PAs OFF.** Verify Forward PA(s) and Reverse PA(s) are turned OFF. In RepeaterNet Craft, the FPA(s) and RPA(s) icons should have a circle with a slash over them. If not, select "Configuration /Channel 1 /PA Control tab" and turn OFF both FPA & RPA. Click **APPLY**. The FPA & RPA icons should now have a circle with a slash over it. Repeat for Channel 2, if applicable.
- ___ 3.5 **SET CHANNEL NUMBERS.** Using RepeaterNet Craft, select "Configuration /Channel 1 /Channel #". Enter Channel #. Click **APPLY**. Repeat for Channel 2, if applicable.

Frequency 1 _____ MHz

Forward (Downlink) Channel # _____

Reverse (Uplink) Channel # _____

Frequency 2 (If Applicable) _____ MHz

Forward (Downlink) Channel # _____

Reverse (Uplink) Channel # _____

- ___ 3.6 **SET GAINS TO 65 dB.** Confirm that the repeater gain under the "Configuration /Channel 1 /Gain tab" screen is set to 65 dB for the forward (downlink) and reverse (uplink) paths. In order to set the gain the Automatic Gain Control (AGC) feature must be turned off. Be sure to click **APPLY**. Repeat for Channel 2, if applicable. **DO NOT TURN-ON PAs AT THIS TIME.**
- ___ 3.7 **CONNECT BACK UP BATTERY.** Make sure the back up battery (located on the door of the repeater cabinet) is connected. Then enable the battery in software Configuration /Power System /Battery Control Enable/Battery Controlled Shutdown is turned to the ON position. Be sure to click **APPLY**.

4. REPEATER ALIGNMENT

Requires two people, one at BTS and one at Repeater

- ___ 4.1 **REPEATER SITE SET-UP.** Remove the antenna terminations. Connect signal generator to Mobile TX₁ / RX_{MAIN} antenna port.
- ___ 4.2 **BTS SITE SET-UP.** Disconnect antenna feed from diversity antenna port. Connect spectrum analyzer to diversity antenna feed (set for 10 kHz RBW).
- ___ 4.3 **TURN ON REVERSE PA1.** With RepeaterNet Craft, turn ON RPA1. **Ensure that FPA1, FPA2 and RPA2 are turned OFF.** Click **APPLY**.
- ___ 4.4 **INJECT TEST SIGNAL.** Inject a -80 dBm signal at the Reverse (Uplink) frequency noted in Step 3.5. **Ensure that the input is -80 dBm, considering signal generator cable losses.** Turn-on signal generator output - TRANSMIT.
- ___ 4.5 **SET REVERSE GAIN.** For outdoor coverage - At Repeater site, increase Reverse gain of Channel 1 in RepeaterNet Craft (see Step 3.6), until a -82 dBm reading is reached on spectrum analyzer at BTS. Click **APPLY**.

If BTS Donor Sector has a Tower-Top Low-Noise Amplifier (TTLNA), the reading should be -73 dBm. (Assumes TTLNA Gain of 12 dB & cable loss of 3 dB. If the gain is higher or the loss is lower, add 1 dB for each 1 dB of improvement).

For indoor coverage, BTS readings should be -92 dBm or -83 dBm, respectively. Repeat for Channel 2, if applicable. **NOTE: DO NOT EXCEED ISOLATION IN STEP 2.3.**

Gain Setting - Reverse (Uplink)

Channel 1 _____ dB

Channel 2 _____ dB (if applicable)

- ___ 4.6 **DISCONNECT TEST EQUIPMENT.** At both sites, connect antenna feeds and weather seal appropriately.
- ___ 4.7 **SET FORWARD GAIN.** Connect RF Power Meter to Forward TX₁ antenna port. Turn ON Forward PA1. Set Repeater Forward Gain setting to yield +32 dBm (Pilot, Paging and Sync **ONLY**). Connect antenna feed. **NOTE: DO NOT EXCEED ISOLATION IN STEP 2.3.** Click **APPLY**. Repeat for PA2 and TX₂, if applicable.

Gain Setting - Forward (Downlink)

Channel 1 _____ dB

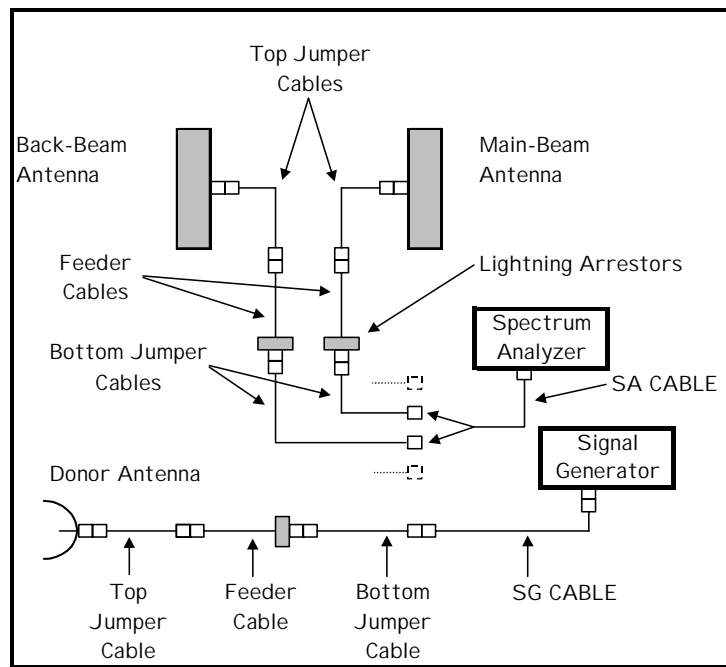
Channel 2 _____ dB (if applicable)

- ___ 4.8 **CHECK FOR OSCILLATION.** In RepeaterNet Craft click upper (Channel 1) "FPA icon /Channel 1 Forward PA Status /Measurement Tab". Click *Reset Low/ High*, observe PA power levels. If PA is consistently running "Over Range", turn PA Gain down in 1 dB increments until PA is not regularly "Over Range". Repeat for Channel 1 (upper) RPA1 & Channel 2 (lower) FPA2 & RPA2, if applicable.
- ___ 4.9 **SET SWITCH TRANSLATIONS.** Modify Cell Radius /Access Acquisition Search Windows & PAM_SZ for new coverage. Modify SRCH_WIN_N_A, & _N for hand-offs.

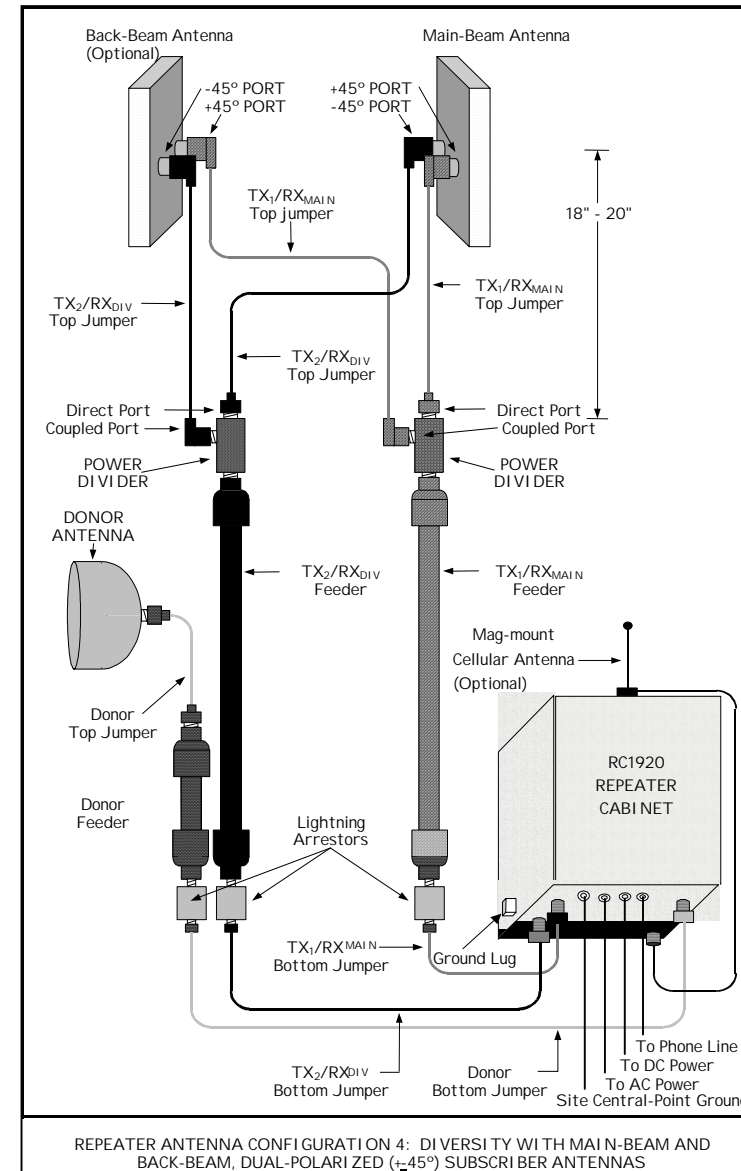
5. Customizing the Repeater Installation

- 5.1 **SET-UP MODEM.** Must have remote monitoring option. Select *"Configure /Modem / Modem Properties"*. Enter phone number to dial for NOC access, and # of call attempts. Click **APPLY**. Select *"Configure /Hardware Settings"* and Click *"modem attached"*. Click **OK**. Exit RepeaterNet Craft, and restart.
- 5.2 **SET-UP PAGER.** Must have modem option. Select *"Configure /Modem / Pager Properties"* and enter pager number to dial, # of call attempts, and unique numeric ID message to be sent to pager. Click **APPLY**.
- 5.3 **SET-UP CELLULAR PHONE.** Must have remote monitoring option. Select *"Configure /Hardware Setting"* and Click *"cellular phone attached"* and then select the appropriate cell phone type from the pull down menu. Click **OK**. In Repeater Cabinet, remove cell phone and activate. Re-install cell phone in Repeater Cabinet. Exit RepeaterNet Craft, and restart.
- 5.4 **SET-UP REMOTE OR DIRECT ACCESS.** Must have modem option. Use to define for RepeaterNet Craft access via direct connection or remote access. Launch RepeaterNet Admin and Click *"Direct Connection"* or *"Modem Connection"* for remote access. Click **SAVE**.
- 5.5 **PASSWORD PROTECTION.** Select *"Systems /Properties /System Login"*. Type in a new Login ID and Password (if required). Write down the new password and login for future use in accessing the repeater. Click **APPLY**.
- 5.6 **ENTER SITE INFORMATION.** Select *"System /Properties /System"*. Enter System Name, Site Info and Site Phone Number. Click **APPLY**.
- 5.7 **CONNECT EXTERNAL ALARMS AS NEEDED.** Wire the UPS connector for alarm information from the BUPS; the IN/OUT connector for 2 digital outputs, 4 digital inputs, and 1 external input analog voltage; the ALARM RELAY connector for repeater critical, major, and minor alarm form C relays; the USER RELAY connector for 2 form C relay contacts.
- 5.8 **NAME EXTERNAL ALARMS.** Select *"Configuration /Alarm Control Unit"*. Select *"I/O Description"* tab and fill-out names. Click **APPLY**.
- 5.9 **TEST EXTERNAL OUTPUTS.** Select *"Configuration /Alarm Control Unit"*. Select *"I/O Controls"* tab and toggle ON/OFF/ON. Click **APPLY** after each toggle.
- 5.10 **SET-UP DC VOLTAGE ALARM.** Select *"Configuration /Alarm Control Unit"*. Select *"Ext. DC Voltage"* tab and enter min/max voltages. Click **APPLY**.
- 5.11 **CHANGE ALARM SEVERITY.** To change factory default settings, select submenus of *"Configure/(each item)"* for each alarm severity change. Click **APPLY** for each change.
- 5.12 **VIEW ALARM LOG.** Select *"System/Alarm and Event Log"*.
- 5.13 **BACK UP SYSTEM SETTINGS.** Using RepeaterNet Craft, select *"File/Upload Properties"*, name the file and *"Save"*.
- 5.14 **EXIT** RepeaterNet, close repeater cabinet, seal coax connections (the drip ring can be removed around the coax cables to facilitate sealing of the type N connectors).

BUPS Terminals		Connecting Conduit (P/N 187-0188-01)		RC1920 Terminals		Remarks / Notes
Description	Designation	Pair #	Wire Color	Connector	Description	
SUMM	COM	1	BLK	(UPS)	7	Grd Lug
HIGH DC VOLT	OK	2	RED		5	UPS Sum (NC)
LOW DC VOLT	OK	3	WHT		4	UPS Battery Voltage
CHGR FAIL	COM	4	BLK		6	Grd Lug
AC FAIL	OK	5	GRN		3	UPS Low Battery Voltage Input
DOOR (Future)	No Connection	6	BLK		2	UPS Charger Fail Input
			BRN		Grd Lug	# 22 AWG solid wire
BATT	+					Red Battery Wire (+)
	-					Brown Battery Wire (-)
LOAD	+		RED	(IN/OUT)	3	DC Voltage Input (Monitor)
	-		BLK			MAIN DC INPUT (# 10 AWG stranded wire)
AC INPUT	L					117/230 Vac - Wires provided by installing electrician
	N					
GRD	Ground (Lug)		GRN			Ground Lug

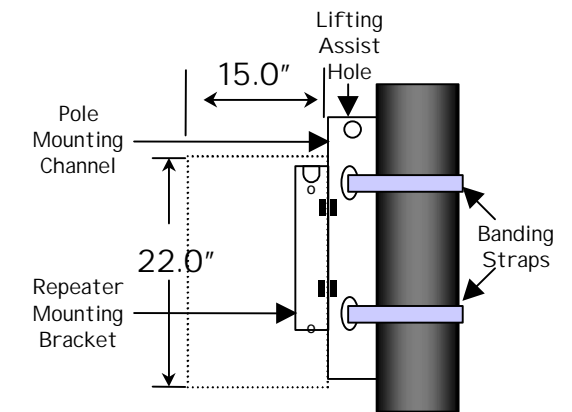


Check Isolation - Set-up



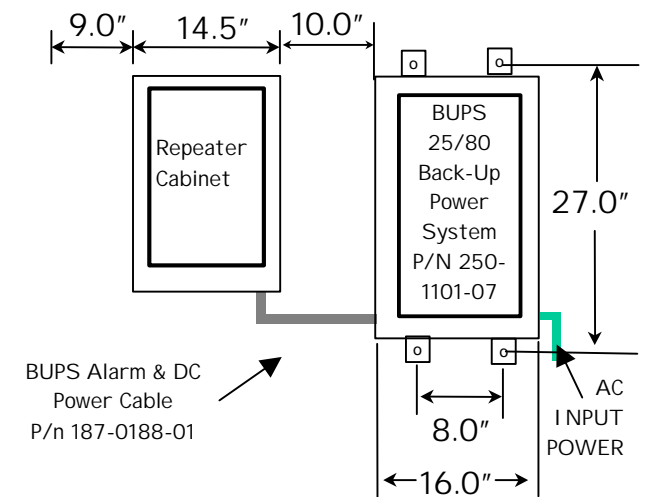
REPEATER ANTENNA CONFIGURATION 4: DIVERSITY WITH MAIN-BEAM AND BACK-BEAM, DUAL-POLARIZED (+45°) SUBSCRIBER ANTENNAS

MOUNTING

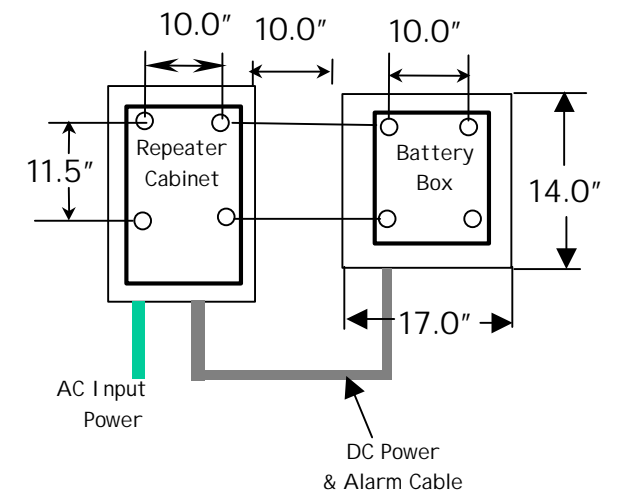


Pole Mounting Kit - Side

p/n 091-0215-01



RC1920 with BUPS - Front



RC1920 with Battery Box
Front View