

Installation Check List: PES850C – PES1900C

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 donor BTS to the repeater site is running at rated output power.
- ___ 1.3 **INSTALL ANTENNAS AND FEED LINES.** If back-beam antenna is used, install power divider.
- ___ 1.4 **RUN SWEEP TEST.** Run sweep test on all antennas and feed lines upon completion of their installation.
- ___ 1.5 **MOUNT PRIMARY F1 REPEATER CABINET.** (Cabinet with Type-N RF connectors on bottom.) 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, F2 Growth Cabinet and BUPS, if applicable.
- ___ 1.6 **MOUNT F2 GROWTH CABINET if used.** (Cabinet without Type-N connectors.) Mount left of Primary F1 Repeater Cabinet (or above). Interconnect two cabinets together with supplied cables. First connect RF and alarm cables supplied in one conduit and then power cable in other conduit - remove unused AC or DC leads. (optional)
- ___ 1.7 **MOUNT BACK-UP POWER SYSTEM (BUPS) if used.** Mount to right of Primary F1 Repeater Cabinet. This supplies DC power. (optional)
- ___ 1.8 **INSTALL LIGHTNING SUPPRESSORS** for all antenna feed lines and cabinets.
- ___ 1.9 **GROUND EQUIPMENT.** Connect repeater cabinet(s), BUPS, antenna feeds, lightning suppressors, and any other equipment to external ground.
- ___ 1.10 **TERMINATE ANTENNA PORTS.** Use Type-N 50-Ohm 20-Watt terminations. Two ports for non-diversity, three ports for diversity.
- ___ 1.11 **HOOK-UP ELECTRICAL.** Wire primary power to dedicated 20-Amp breaker. Open entry box on bottom of Primary F1 Repeater Cabinet. Verify proper voltage & polarity (either +24 VDC or 117/230 VAC, not both). Connect repeater and/or BUPS to power source. Connect BUPS alarm cable to J2, if applicable. **DO NOT TURN ON POWER.**

2. ANTENNA ALIGNMENTS

- ___ 2.1 **ALIGN DONOR ANTENNA.** Check RSL (Receive Signal Level) from donor BTS. 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 at idle channel power.

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 entry box at bottom of Primary F1 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 **HOOK-UP INTERNAL BATTERY.** Connect black lead to negative terminal of internal battery backup—located in entry-box.
- ___ 3.3 **UPDATE SOFTWARE.** Load RepeaterNet Craft Software provided in accessory kit (four floppy disks) on MS Windows 95/98/NT PC. (Even if RepeaterNet is loaded on PC, a new Revision might be included with repeater.)
- ___ 3.4 **LAUNCH REPEATERNET CRAFT.** Connect PC to Craft part (9-pin DB9 connector) in Primary F1 Repeater Cabinet entry box with cable provided in accessory kit. Launch RepeaterNet Craft program on PC.
- ___ 3.5 **UPDATE FIRMWARE.** For F2 Growth Cabinet upgrades being added to existing (older) Primary F1 Repeater Cabinets, update firmware. See Step 5.16.
- ___ 3.6 **UPDATE CONFIGURATION FOR 2 CHANNELS.** Using RepeaterNet Craft, select "Configuration /Hardware Settings" and click "Growth Box". Click **APPLY**. Exit RepeaterNet Craft, and restart.
- ___ 3.7 **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.
- ___ 3.8 **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 #	_____
- ___ 3.9 **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. Be sure to click **APPLY**. Repeat for Channel 2, if applicable. **DO NOT TURN-ON PA'S AT THIS TIME.**
- ___ 3.10 **TURN OFF POWER.** Exit RepeaterNet & remove antenna terminations. Connect Donor antenna feed and Diversity TX₂ / RX_{DIVERSITY} Mobile feed (if applicable) to Repeater.

4. REPEATER ALIGNMENT

Requires two people, one at BTS and one at Repeater

- ___ 4.1 **REPEATER SITE SET-UP.** 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 REPEATER.** Login with RepeaterNet Craft.
- ___ 4.4 **TURN ON REVERSE PA1.** With RepeaterNet Craft, turn ON RPA1. **Ensure that FPA1, FPA2 and RPA2 are turned OFF.** Click **APPLY**. See step 3.7.
- ___ 4.5 **INJECT TEST SIGNAL.** Inject a -80 dBm signal at the Reverse (Uplink) frequency noted in Step 3.8. **Ensure that the input is -80 dBm, considering signal generator cable losses.** Turn-on signal generator output - TRANSMIT.
- ___ 4.6 **SET REVERSE GAIN.** For outdoor coverage - At Repeater site, increase Reverse gain of Channel 1 in RepeaterNet Craft (see Step 3.9), 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 -75 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 -85 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)
- ___ 4.7 **DISCONNECT TEST EQUIPMENT.** At both sites, connect antenna feeds.
- ___ 4.8 **SET FORWARD GAIN.** Connect RF Power Meter to Forward TX₁ antenna port. Turn ON Forward PA1. Set Repeater Forward Gain setting to yield +31 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)
- ___ 4.9 **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 2 dB increments (see Step 3.9) until PA is not regularly "Over Range". Repeat for Channel 1 (upper) RPA1 & Channel 2 (lower) FPA2 & RPA2, if applicable.
- ___ 4.10 **BACK-UP SYSTEM SETTINGS.** Using RepeaterNet Craft, select "File /Upload Properties", name the file, and "Save".
- ___ 4.11 **EXIT RepeaterNet,** close entry box, seal coax connections.
- ___ 4.12 **SET SWITCH TRANSLATIONS.** Modify Cell Radius /Access Acquisition Search Windows & PAM_SZ for new coverage. Modify SRCH_WIN_A, & _N for hand-offs.

5. Customizing the Repeater Installation

- 5.1 **LAUNCH REPEATERNET CRAFT.** Connect PC to Craft port (9 pin DB9 connector) in Primary F1 Repeater Cabinet entry box with cable provided in accessory kit. Launch RepeaterNet Craft program on PC.
- 5.2 **SET-UP MODEM.** Must have modem option. Select "Configure /Modem / Modem Properties". Enter Setup string, 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.
- 5.3 **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.
- 5.4 **SET-UP CELLULAR PHONE.** Must have modem option. Select "Configure /Hardware Setting" and Click "cellular phone attached". Click OK. In Primary F1 Repeater Cabinet entry box, remove cell phone and activate. Re-install cell phone in entry box. Exit RepeaterNet Craft, and restart.
- 5.5 **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.
- 5.6 **PASSWORD PROTECTION.** Select "Systems /Properties /System Login". Type in Login ID and Password. A zero indicates that feature is not active. Click APPLY.
- 5.7 **SET-UP COLOR INDEPENDENT ICONS.** Select "Options /Independent Color Icons".
- 5.8 **STORE SITE INFORMATION.** Select "System /Properties /System". Enter System Name, Site Info and Site Phone Number. Click APPLY.
- 5.9 **CONNECT EXTERNAL ALARMS.** Wire J2 for alarm info from power source; J1 for 2 digital inputs & outputs and DC Voltage Input; J23 for 2 Form C Relay Contacts; J22 for Repeater Critical, Major and Minor Alarm Form C Relays.
- 5.10 **NAME EXTERNAL ALARMS.** Select "Configuration /Alarm Control Unit". Select "I/O Description" tab and fill-out names. Click APPLY.
- 5.11 **TEST EXTERNAL OUTPUTS.** Select "Configuration /Alarm Control Unit". Select "I/O Controls" tab and toggle ON/OFF/ON. Click APPLY after each toggle.
- 5.12 **SET-UP DC VOLTAGE ALARM.** Select "Configuration /Alarm Control Unit". Select "Ext. DC Voltage" tab and enter min/max voltages. Click APPLY.
- 5.13 **CHANGE ALARM SEVERITY.** To change factory default settings, select submenus of "Configure/(each item)" for each alarm severity change. Click APPLY for each change.
- 5.14 **VIEW ALARM LOG.** Select "System/Alarm and Event Log".
- 5.15 **BACK-UP SYSTEM SETTINGS.** Using RepeaterNet Craft, select "File /Upload Properties", name the file, and "Save".
- 5.16 **UPDATE FIRMWARE.** Insert "Firmware" floppy disk into drive (A). Select "File/Update Repeater Firmware/". Click "OK" and "Save" current firmware on (C). Select firmware file on Floppy (A) and "Open". Follow on-screen directions.

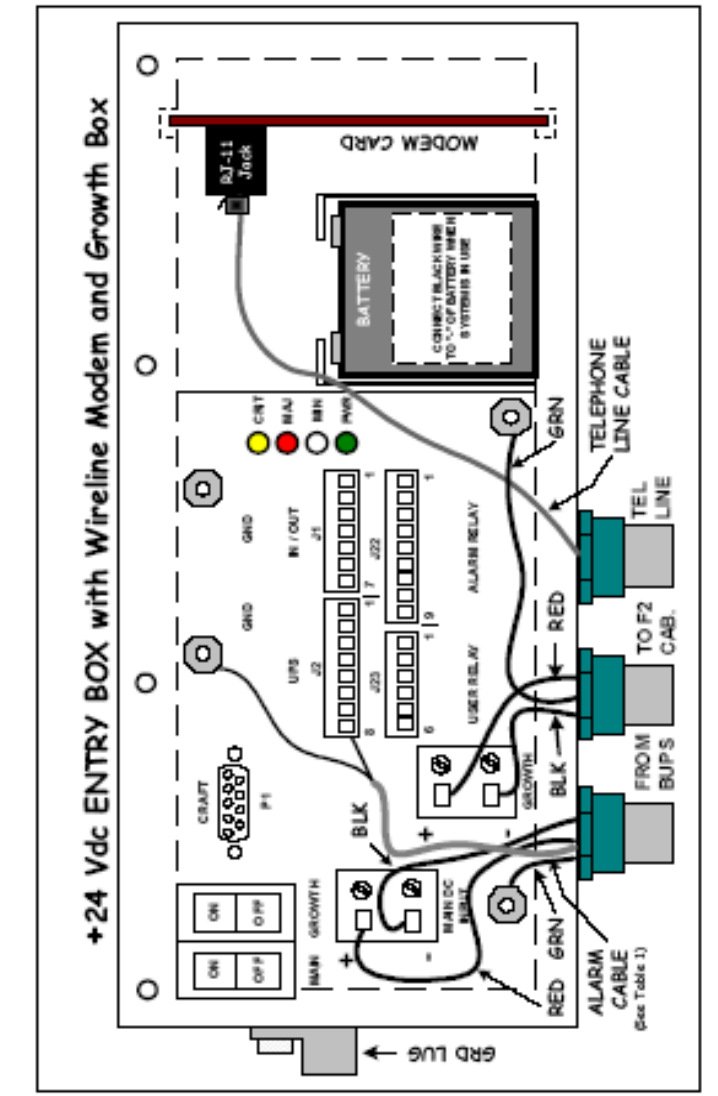
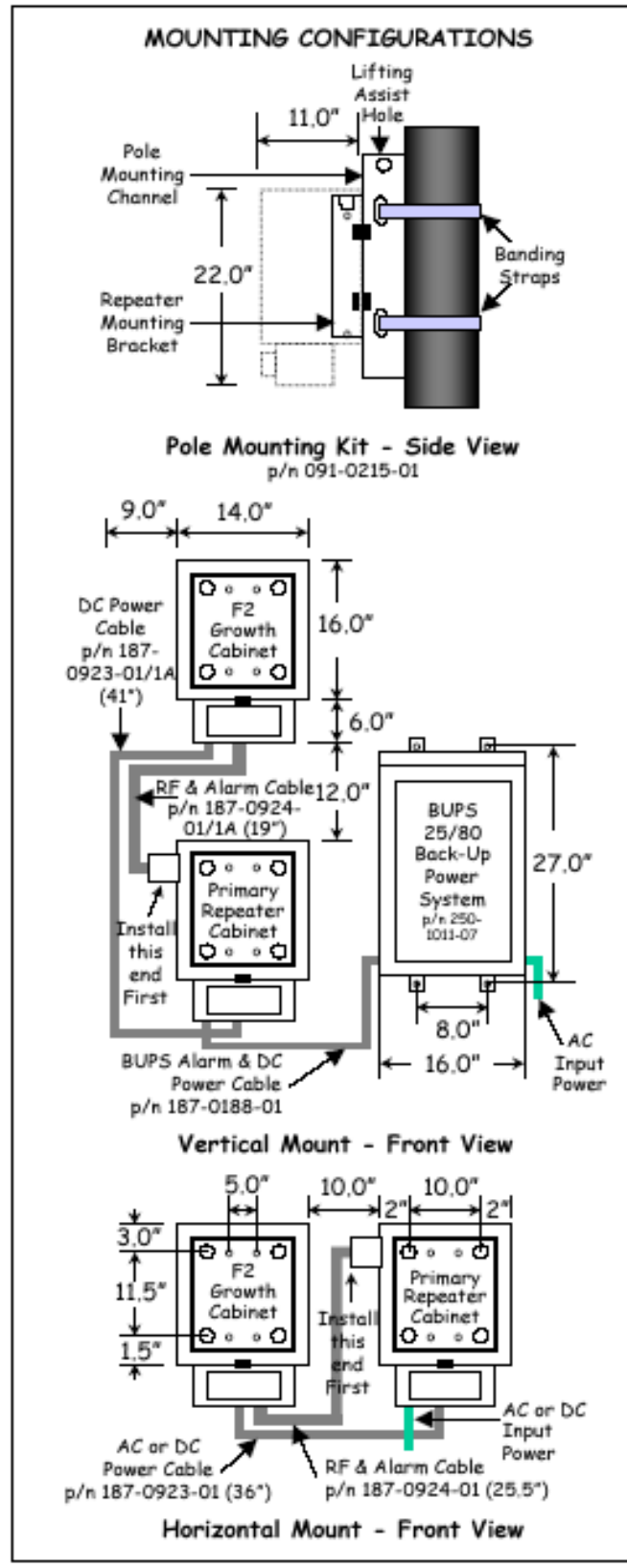
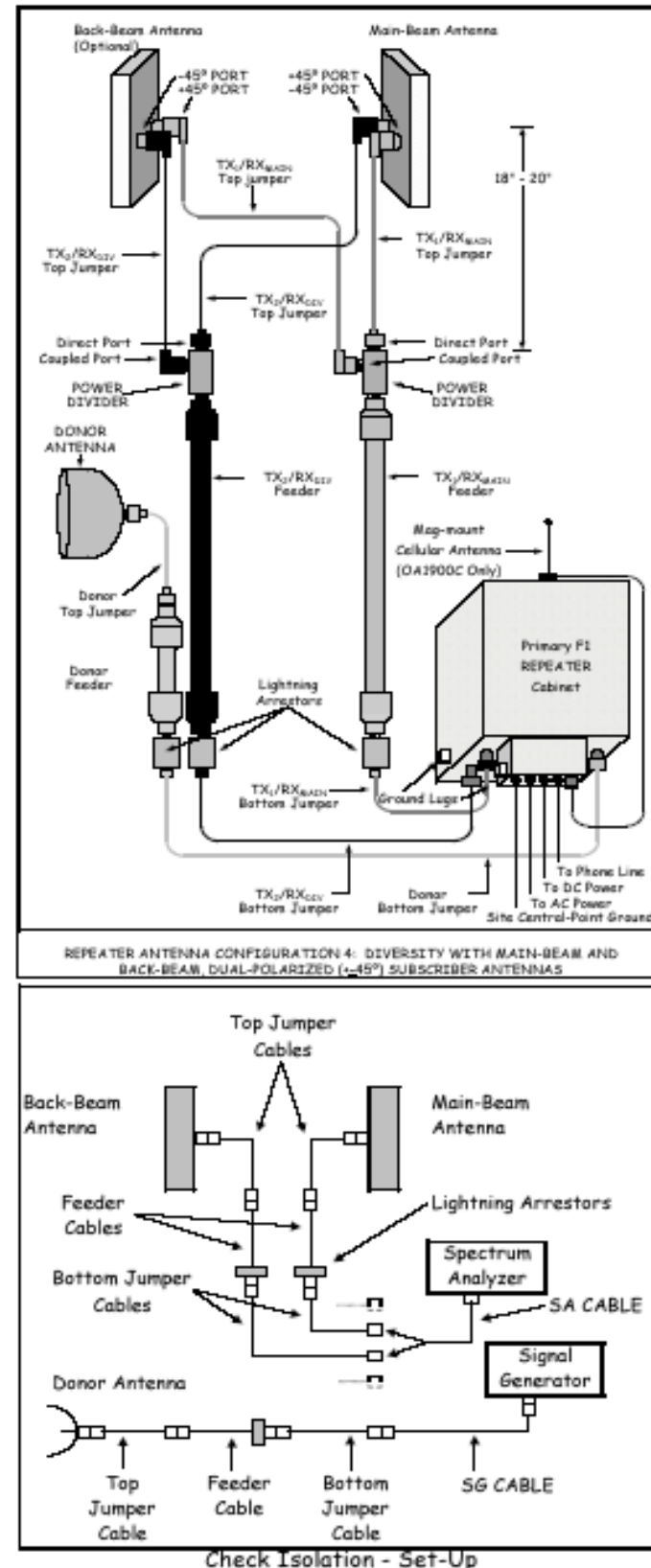


TABLE 1
OA1900C & OA850C Network Repeater To BUPS-25/80 Wiring Kit

BUPS Terminal	Connecting Condition	Wire Color	Connector	OA25K/190C Terminal	Remarks / Notes
SUMM	COM	1	BLK	7	Get Log
TRM1 DC VOLT	COM	2	BLK	8	Get Log
LOW DC VOLT	COM	3	GRN	4	UPS System Voltage
CHGR FAIL	COM	4	BLK	5	UPS Low Battery Voltage Input (16 AWG add wire)
AC FAIL	COM	5	BLK	6	UPS Charger Fail Input
DOOR (Future)	No Connection	6	BLK	3	UPS AC Fail Input
				2	UPS Transfer Input
BATT +					Red Battery Wire (+)
BATT -					Brown Battery Wire (-)
LOAD		RED	J1 (IN/OUT)	3	DC Voltage Input (Monitor)
AC INPUT		BLK			110/220 Vac Wires provided by installing electrician
GRD	Ground (Lug)	GRN			Ground Lug