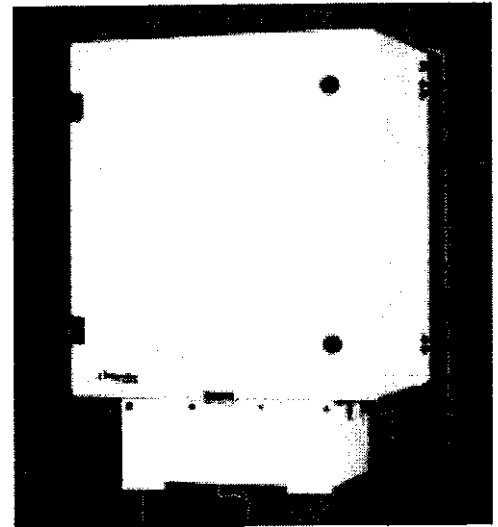


OA850C NR

Operations Manual

DRAFT



550-4999-01

Revision A

September 1998



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Chapter 1. Overview

About This Book

This manual is divided into the following chapters.

Chapter 1. Overview (page 5)

Includes a general product description, functional description, technical specifications, and ordering information.

Chapter 2. Installation Instructions (page 15)

Provides overview information about the installation process and equipment, as well as instructions for receipt and inspection of the OA850C NR.

Chapter 3. Mounting the OA850C NR (page 18)

Provides the information you need to mount the OA850C NR.

Chapter 4. Powering the OA850C NR (page 27)

Provides information about AC power, DC power, modem, and alarm and control wiring.

Chapter 5. Orienting and Isolating Antennas (page 35)

Provides information about antenna mounting, orientation, and isolation.

Chapter 6. Completing Installation (page 38)

Provides information about activating system power, assigning frequency, configuring initial gain, verifying and optimizing coverage area, and configuring for alarm reporting and system operation.

Chapter 7. Maintenance and Troubleshooting (page 42)

Includes information about the following topics: routine checks required to maintain performance and to address problems, return and repair of the OA850C NR, and the product warranty.

General Repeater Information

The *Repeater Technologies Over-the-Air 850C Network Repeater™* (hereafter referred to as the OA850C NR or the repeater) is a bi-directional, on-frequency, over-the-air RF channelized Repeater for CDMA.

The OA850C NR extends the coverage of PCS base stations. It is available with an optional diversity receive feature, which improves base station receive performance in high-mobility applications.

The repeater receives signals from a Base Transceiver Station (BTS) and re-transmits them to a subscriber Personal Communications Service (PCS) telephone; likewise, the repeater receives signals from a subscriber telephone and re-transmits them to the BTS. Repeaters significantly improve coverage in areas with weak signal reception or transmission.

The OA850C NR is designed for indoor or outdoor installation and can be either wall or pole mounted. The unit's compact cabinet simplifies installation, while its aesthetically acceptable design allows it to be zoned easily in many locations. The repeater only requires initialization. Also, as a field-replaceable unit, it requires no component-level repair.

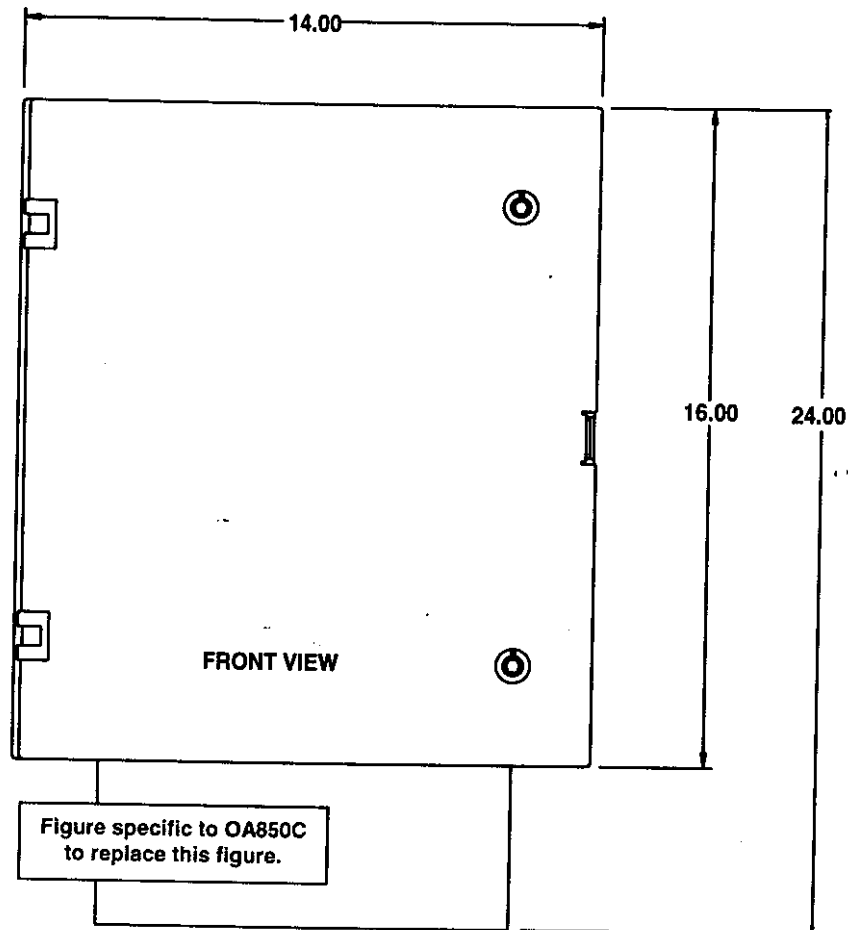


Figure 1. OA850C NR Exterior Front View

The repeater consists of the following assemblies:

- ☐ LNA (Low Noise Amplifier)
- ☐ PA (Power Amplifier)
- ☐ Channel Select Filters
- ☐ Diplexers
- ☐ Power Supplies
- ☐ ACU (Alarm and Control Unit)

All assemblies are mounted on a heatsink and enclosed in a sealed, painted aluminum, weathertight cabinet. During normal operation, the cabinet housing remains closed. Access to power and to data transmission connections is provided through an Entry Box, which extends from the bottom of the cabinet.

Install repeaters and associated hardware in locations suitable for adequate reception of signals from the BTS and for effective retransmission of these signals to a subscriber.

The OA850C NR may be equipped with an optional cellular telephone, which is mounted on the interior of the entry box front door, as shown in the following Entry Box figure. The cellular telephone feature can be used with RepeaterNet NMS for monitoring a network of repeaters. For more information, see *RepeaterNet Craft for the OA850C NR*.

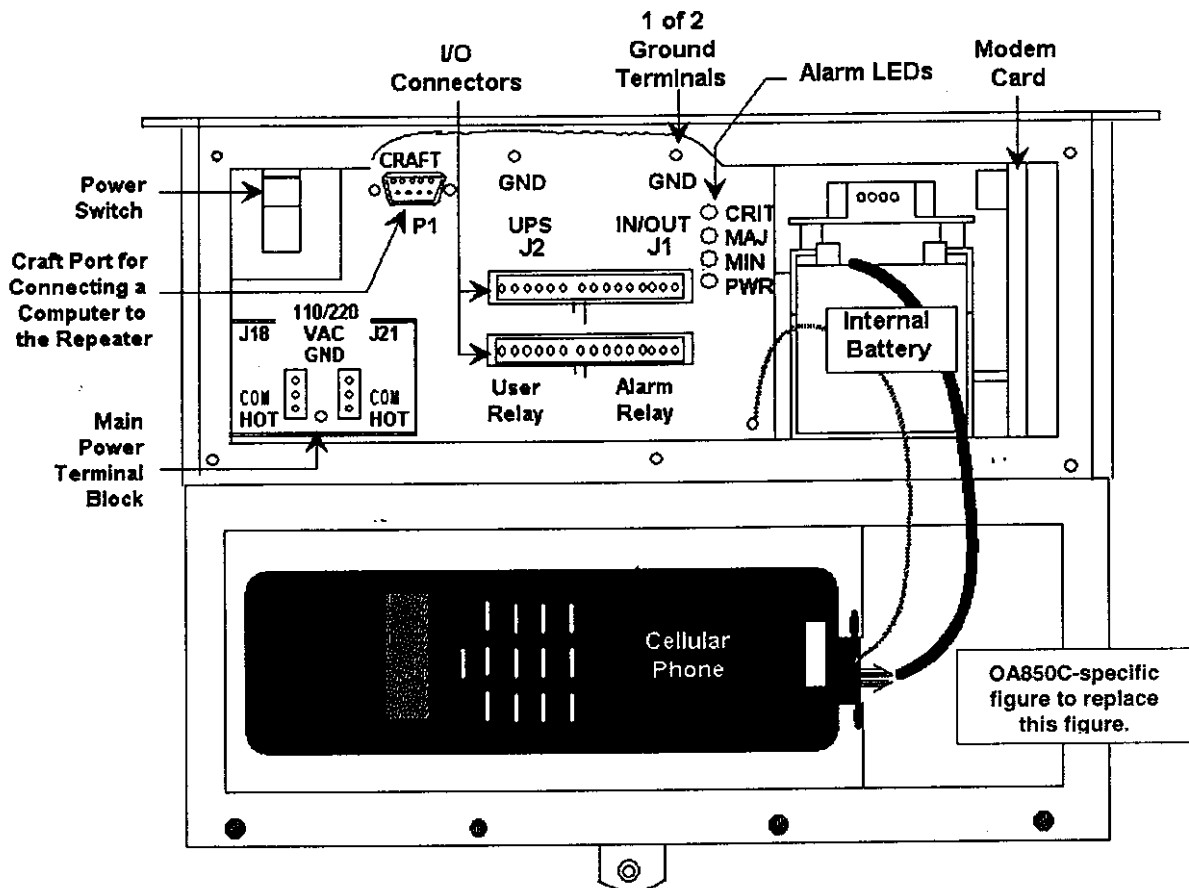


Figure 2. OA850C NR Entry Box (AC)

Functional Description

The OA850C NR uses a unique Intermediate Frequency (IF) filtering design to achieve a high degree of selectivity. It also uses a common local oscillator for up-and-down-conversion to prevent frequency conversion error.

The RepeaterNet Craft software is the configuration management and alarm monitoring interface for the OA850C NR. The repeater has two communication (COM) ports for RepeaterNet connections—a serial port for direct, laptop connections and a modem port for remote connections.

An Automatic Level Control (ALC) circuit protects the repeater's circuitry from potentially damaging high input levels and minimizes the generation of Intermodulation Distortion (IMD) in the transmit power amplifier. The following figure is a block diagram of the OA850C NR.

The signal processing flow through the repeater in the forward direction (BTS to mobile) is similar to the flow in the reverse direction (mobile to BTS).

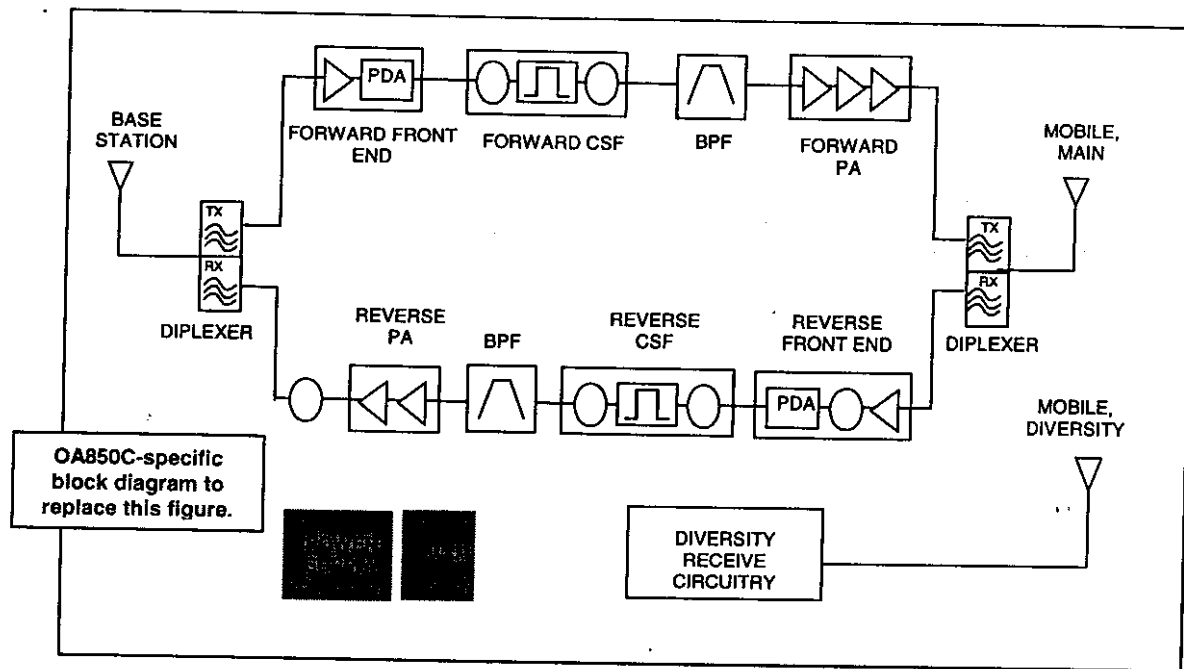


Figure 3. Simplified 1-Channel OA850C NR Block Diagram—Signal Flow

Signal flow is as follows:

1. The received signal from the BTS antenna enters the repeater through the cabinet-mounted Type N (f) connector, and feeds to a branching circulator and a diplexer filter.
2. The signal then is amplified by an LNA and down-converted to an Intermediate Frequency (IF).
3. After being filtered by Surface Acoustic Wave (SAW) filters, the output signal is up-converted and precisely restored to the original RF frequency by using the same Local Oscillator (LO) as the one in the down-converter.
4. The signal then passes through a bandpass filter to eliminate unwanted sidebands and LO leakage.
5. The transmit power amplifier further amplifies the signal to achieve final transmit Radio Frequency (RF) power levels. See **Table 2** for specific information about power output.
6. The signal finally routes through the output diplexer to the mobile antenna. (The diplexers permit use of common antennas for both transmit and receive signals while effectively separating the receive band from the transmit band.)

Licensing

All owners of the OA850C NR should consult with the appropriate local and national agencies for information on licensing.

Technical Specifications

Table 1. Models and Frequency Range

MODELS AND FREQUENCY RANGE (MHz)				
MODEL	CHANNEL BANDWIDTH	BAND	FORWARD	REVERSE
OA850C-A	1.25 MHz	A	869.0 – 880.0 & 890.0 – 891.5	824.0 – 835.0 & 845.0 – 846.5
OA850C-B	1.25 MHz	B	890.0 – 890.0 & 891.5 – 894.0	835.0 – 845.0 & 846.5 – 849.0

Table 2. Electrical Characteristics

ELECTRICAL CHARACTERISTICS			
LINK	RF OUTPUT POWER PER CARRIER AT THE ANTENNA PORT		GAIN (in 2 dB steps)
	1-CHANNEL	2-CHANNEL	
Forward	38.5 dBm	38.5 dBm	65 – 95
Main Reverse	+18 dBm	+18 dBm	65 – 95
Diversity Reverse	+18 dBm	+18 dBm	65 – 95

Table 3. Mechanical/Electrical Characteristics

MECHANICAL/ELECTRICAL CHARACTERISTICS						
POWER CONSUMPTION		SIZE	WEIGHT	INPUT VOLTAGE OPTIONS	TEMPERATURE	ANTENNA CONNECTORS
1-channel	260 Watt	16H x 14W x 11.5D (inch) 406H x 356W x 292D (mm)	<50 lbs. or 23 Kg.	110/230 VAC or +24 VDC	-40° to 55° C ambient	Type N (f)
2-channel	500 Watt (total)					

Table 4. Inputs and Outputs

INPUTS AND OUTPUTS					
LOCAL I/O	OUTPUT TYPE	LOCAL I/O	OUTPUT TYPE	LOCAL I/O	OUTPUT TYPE
Critical Alarm	Form C Relay	Remote Control Relays (2)	Form C Relay	External Battery Monitor	Analog (DC Volts)
Major Alarm	Form C Relay	Digital Outputs (2)	Opto-Isolated TTL	BUPS Monitor	6 Alarms
Minor Alarm	Form C Relay	Digital Inputs (2)	Opto-Isolated TTL		

Table 5. Additional Characteristics

ADDITIONAL CHARACTERISTICS						
WAVEFORM QUALITY DEGRADATION FACTOR (rho)	SPURIOUS RESPONSE	3 dB SAW FILTER BANDWIDTH	GROUP DELAY	MAXIMUM INPUT SIGNAL (without damage)	VSWR	NOISE FIGURE
> 0.95	per IS-95/IS-97	<1.27 MHz	<6 µsec	+10 dBm	<1.5:1	<6 dB

Table 6. RepeaterNet Alarm, Monitoring, and Control

REPEATERNET ALARM, MONITORING, AND CONTROL		
ACCESS OPTIONS	GUI	FUNCTIONS
• RS-232 (local) • POTS (dial-up) • Wireless Modem	• Windows® 95 (Craft) • Windows NT (NMS) • 32-bit • Point-and-click • Wireless Modem	• Summary Alarm • Interrupt Reporting • Definable Threshold • Remote Control: Gain, Channel, and PA On/Off

Table 7. Alternate Power Options

ALTERNATE POWER OPTIONS	
TYPE	DESCRIPTION
BUPS	2-8 hours of backup power without AC
Solar Power	PV(Photovoltaic) with regulated charging to batteries
Hybrid Solar and TEG	PV with thermal electric propane generation assistance
Hybrid Solar and MG	PV with propane or diesel generation assistance

Ordering Information

Consider the following requirements when ordering the OA850C NR.

Table 8. Ordering Considerations

Item	Requirement
Electrical Power	AC or DC, power cord, watertight conduit or connector.
Back-up Power	A power supply in case of interrupted electrical service; note that a Back-up Power System (BUPS) is available from Repeater Technologies.
Antennas, Donor or Subscriber	What types are required; what is the intended system coverage. Note that antennas are available from Repeater Technologies.
Coaxial Cabling	What type and length are required. Note that coaxial cable is available from Repeater Technologies.
Mounting	Special requirements for the repeater and antennas.
Antenna Interface Connectors	Type N to $7/16$ DIN Jumper Cables

OA850C NR Configurations and Part Numbers

Table 9. Configuration and Part Numbers

Band	No. of Channels	Voltage	Diversity	Part Number
A	1	115/230 VAC	yes	090-3100-01
	1	115/230 VAC	no	090-3100-03
	1	+24 VDC	yes	090-3100-05
	1	+24 VDC	no	090-3100-07
	2	115/230 VAC	no	090-3100-04
	2	+24 VDC	yes	090-3100-06
B	1	115/230 VAC	yes	090-3110-01
	1	115/230 VAC	no	090-3110-03
	1	+24 VDC	yes	090-3110-05
	1	+24 VDC	no	090-3110-07
	2	115/230 VAC	no	090-3110-04
	2	+24 VDC	yes	090-3110-06
C	1	115/230 VAC	yes	090-3120-01
	1	115/230 VAC	no	090-3120-03
	1	+24 VDC	yes	090-3120-05
	1	+24 VDC	no	090-3120-07
	2	115/230 VAC	no	090-3120-04
	2	+24 VDC	yes	090-3120-06
D	1	115/230 VAC	yes	090-3130-01
	1	115/230 VAC	no	090-3130-03
	1	+24 VDC	yes	090-3130-05
	1	+24 VDC	no	090-3130-07
	2	115/230 VAC	no	090-3130-04
	2	+24 VDC	yes	090-3130-06
E	1	115/230 VAC	yes	090-3140-01
	1	115/230 VAC	no	090-3140-03
	1	+24 VDC	yes	090-3140-05
	1	+24 VDC	no	090-3140-07
	2	115/230 VAC	no	090-3140-04
	2	+24 VDC	yes	090-3140-06
F	1	115/230 VAC	yes	090-3150-01
	1	115/230 VAC	no	090-3150-03
	1	+24 VDC	yes	090-3150-05
	1	+24 VDC	no	090-3150-07
	2	115/230 VAC	no	090-3150-04
	2	+24 VDC	yes	090-3150-06

Optional Equipment Available from Repeater Technologies

Table 10. Spare Parts and Accessory Items

Description	Part Number
Antennas*	Call for information.
Connectors	Call for information.
Coaxial Cable	Call for information.
Power Cord	103-0137-01
Solar Shields	To be announced.
Pole Mounting Kit	137-0438-01
McMaster-Carr 3/4-inch Banding Kit	Part No. 5653K12, McMaster-Carr Supply Co., Los Angeles, CA, USA., Tel. # (562) 692-5911)
Cabinet Door	024-0978-02
I/O Entry Box with Cover	024-1004-01
I/O Box Cover Gasket	022-0120-02
I/O Box Gasket	022-0121-01
Internal Lead Acid Back-up Battery	149-0852-01
PC Interface Cable DB9 9-Pin Female-to-Female	187-0713-01
Modem Module	087-1524-01
Wireless Interface Cable	187-0877-01
Wireless Antenna I/O - N(F) to SMA(F) Bulk head adapter connection	142-0521-01
800 MHz Mag Mount Antenna for Wireless I/O, 6' cable with N(M) connector	149-0934-01
Cellular Phone (Oki-1430)	149-0924-01
BUPS-25/40	250-1103-02
BUPS-25/80	250-1011-07
Surge Protector - N(M) to N(F) Lightning	149-0932-01
Operations Manual (Hard Copy)	550-3100-01
Operations Manual (CD-ROM)	To be announced.
Alarm, Power, and Growth Cabinet Button Plugs	137-0446-01
Conduit Fitting	137-0447-01
Back Mounting Plate	020-1229-03
Stainless Steel 3/8" Locking Washer	125-0059-07
Stainless Steel 3/8" x 1" Flat Washer	125-0068-07
Stainless Steel Pin-in Head Security Bolts	125-0212-13
Stainless Steel Hex Head Bit Pin-in Head, 7/32	129-0007-08
Door Hinge Set	137-0428-01
Allen Wrench	129-0007-02
RepeaterNet NMS Craft Software	519-1200-03
BUPS Power & Alarm Cable Assy (Kit)	187-0188-01
*Typical antennas include parabolic reflectors, corner reflectors, circular, linear, directional co-linears, cross or slant polarization, log periodic array, or Yagi.	

Back-up Power System

To select a BUPS (Back-up Power System) for your application, match the repeater you are using with the amount of back-up time required.

Table 11. Back-up Power System Selection Guide

Product Model Number	Power Consumption @ 24 Vdc	Calculated Current @ 24 Vdc	Back-up Hours	
			BUPS-25/40 25 A 40 A-H	BUPS-25/80 25 A 80 A-H
OA850C, ~~6.2 Watt~~ , 1-channel 7W	310 W	12.92 A	3.1	6.2
OA850C Growth Cabinet, ~~6.2 Watt~~ , 2-channel* 7W	570 W	23.75 A	1.7	3.4
*Growth cabinet power (2 nd channel power) is the sum of the Repeater plus the growth cabinet: 310 W + 260 W = 570 W.				

Accessory Kit Items

Table 12. Contents of AC and DC Accessory Kits

AC Accessory Kit (P/N 091-0105-01)		DC Accessory Kit (P/N 091-0105-02)	
Items	Quantity	Items	Quantity
Power Cord	1 each	BUPS Powr and Alarm Cable Assembly	1 each
Wrench, Hex Key (Allen Wrench)	1 each	Wrench, Hex Key (Allen Wrench)	1 each
PC Interface Cable 9B-D-SUB/8P-SUB	1 each	PC Interface Cable 9B-D-SUB/8P-SUB	1 each
Hex Bit, Pin-in-Socket, ⁷ / ₃₂	1 each	Hex Bit, Pin-in-Socket, ⁷ / ₃₂	1 each
Alarm, Power, and Growth Cabinet Button Plugs	4 each	Alarm, Power, and Growth Cabinet Button Plugs	4 each
Conduit Fitting	4 each	Conduit Fitting	4 each
Operations Manual (Hard Copy)	1 each	Operations Manual (Hard Copy)	1 each
RepeaterNet Craft Software	1 disk	RepeaterNet Craft Software	1 disk

Ordering Procedure

When ordering, specify a shipping destination and a billing address. Repeater Technologies will return an order acknowledgment with the scheduled shipping date. Each shipment includes an equipment list showing the equipment ordered and shipped, including details about system and equipment options. Contact the Repeater Technologies Sales Department for ordering information.

Technical Services

Repeater Technologies offers technical services to supplement the manpower resources of its customers. Quotations for the following services are available upon request.

- ☐ Site and construction surveys
- ☐ Network design
- ☐ Design verification
- ☐ Training
- ☐ Installation
- ☐ Accessories (antennas, coaxial cabling, and so on)

Contacting Repeater Technologies

Contact the Repeater Technologies corporate headquarters for sales information or technical assistance for the OA850C NR, or for any other of our communications or related products.

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Web: www.repeaters.com

Customer Service

Tel: (408) 747-1946
(800) 928-1901 (USA and Canada)

Chapter 2. Installation Instructions

Installation Overview

The OA850C NR is designed for indoor or outdoor installation and can be either wall-mounted or pole-mounted. The unit's compact cabinet simplifies installation, while its aesthetically acceptable design allows it to be easily zoned in many locations.

Because the RepeaterNet Craft software is used during the physical installation of the repeater, pre-load the Craft software on the laptop computer to be used at the installation site. See *RepeaterNet Craft for the OA850C NR* for information about installing and using RepeaterNet. Bring a DB-9 cable to the installation site to connect your laptop with the repeater.

NOTE: Only qualified service or technical personnel should install the OA850C NR.

See the following illustration of a typical repeater installation with installed components.

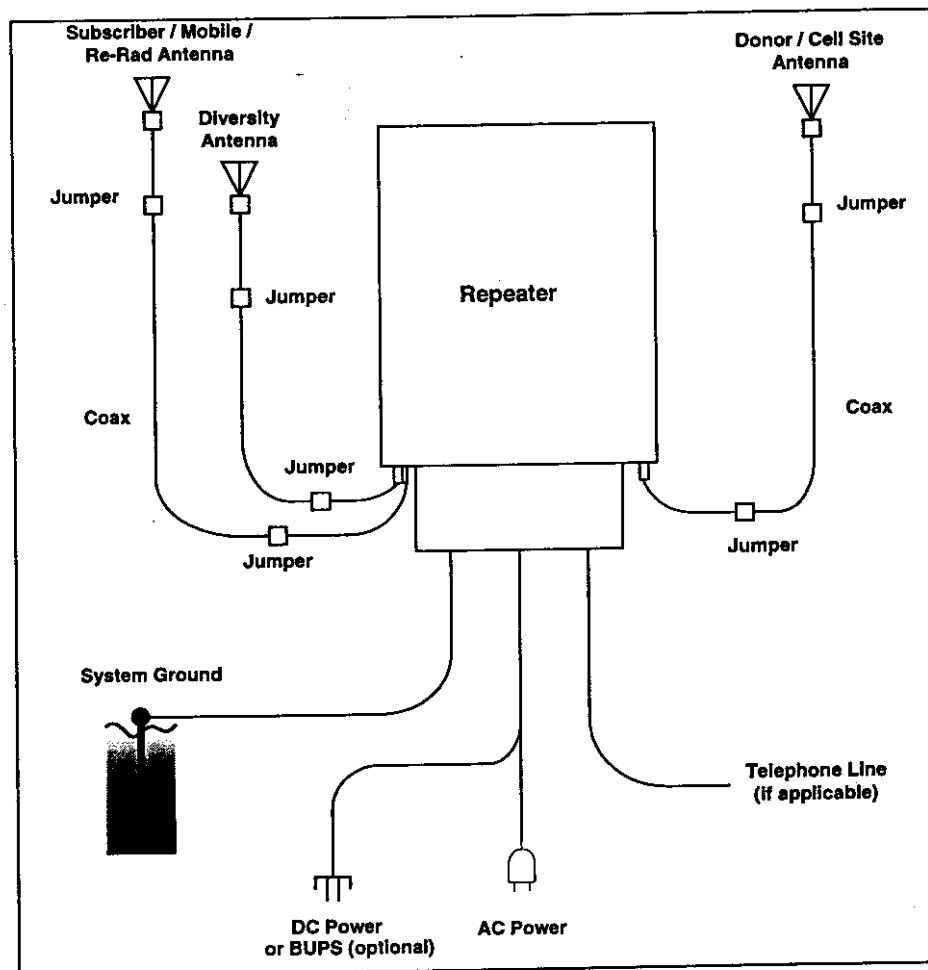


Figure 4. Typical Installation

Receipt and Inspection of the OA850C NR

Inspect the OA850C NR for damage immediately upon receipt; note any damage on the waybill. Be sure to request that the delivery agent sign the waybill for verification. Should damage be found:

- ☐ Notify the transfer company as soon as possible
- ☐ Submit a damage report to the carrier
- ☐ Inform the Field Services Department of Repeater Technologies in writing

NOTE: Save original shipping carton and packing materials for any future transport of the unit.

After unpacking the equipment, inventory the contents against the packing lists. Inspect the unit thoroughly for damage hidden by the packaging, paying particular attention to the following:

- ☐ Bent or dented sheet metal
- ☐ Loose or broken components
- ☐ Damaged connectors
- ☐ Damaged or broken wiring or coaxial cables

Also, inspect the contents of the accessory kit and any optional equipment ordered with the unit.

Installation Equipment

See the following table for a list of required installation equipment. Additional equipment could be needed, depending upon specific installation site requirements and optional accessories ordered.

NOTE: The Path Data Sheet and site plan are needed during installation to define the intended parameters of the project, including coverage area, gain settings, and antenna location. If necessary, consult a network administrator for more information.

Table 13. Required Installation Equipment

Use this equipment:	To:
Site Plan/Network Engineering documentation	Correctly configure the repeater to operate in the PCS network
Ratchet or Hex Screwdriver for $\frac{7}{32}$ Pin-in-Socket Driver	Detach security screws
Voltmeter, Fluke 75*	Test power connections and analog test points
Spectrum Analyzer HP 8591	Test power output
Cellular Service Monitor with Signal Generator, IFR-1500, HP-8594A*	Test antenna isolation and repeater power
Type N (m) 50-ohm Termination, 20 W, (2 ea.)	Terminate antenna ports during off-air test
Mounting Hardware	Mount repeater and antennas
Electrical Wiring Equipment (as needed)	Connect external systems to input and output connectors
Laptop Computer (with RepeaterNet installed)	Control and monitor the repeater
Accessory Kit	Mount and install the repeater
Pole Mounting Kit and Tightening/Crimping Tool (for pole mounting only)	Mount the repeater to a pole and secure pole mounting straps
*Equivalent substitute can be used.	

Site Survey

Review the installation site thoroughly before mounting antennas or the OA850C NR. Site review should include, but not necessarily be limited to:

Weather

Determine whether environmental conditions necessitate special shielding of the Repeater or other equipment.

Security

Determine whether some type of barrier is needed to protect equipment and whether a security light is required.

Optional Site Equipment

Determine whether additional site equipment, such as a pump, generator, or light is required. If so, where is the equipment to be located, and are special enclosures for any equipment required.

Wiring and Wiring Access

Determine any special wiring requirements.

Cabinet Access

Determine whether there is enough room for the repeater door to open once mounted.

CAUTION: *In an extremely hot environment, such as a desert, shading from direct sunlight may be necessary to prevent the repeater and associated equipment from overheating.*

Chapter 3. Mounting the Repeater

Mounting Associated Equipment

Mount the OA850C NR assembly antennas, antenna coaxial cabling, and BUPs (if used) before mounting and wiring the repeater.

If you intend to add a second frequency channel, you will need to install a growth cabinet to house the second channel. Be sure to allow enough space either above or to the right of the repeater for mounting; examples are shown in the following figure.

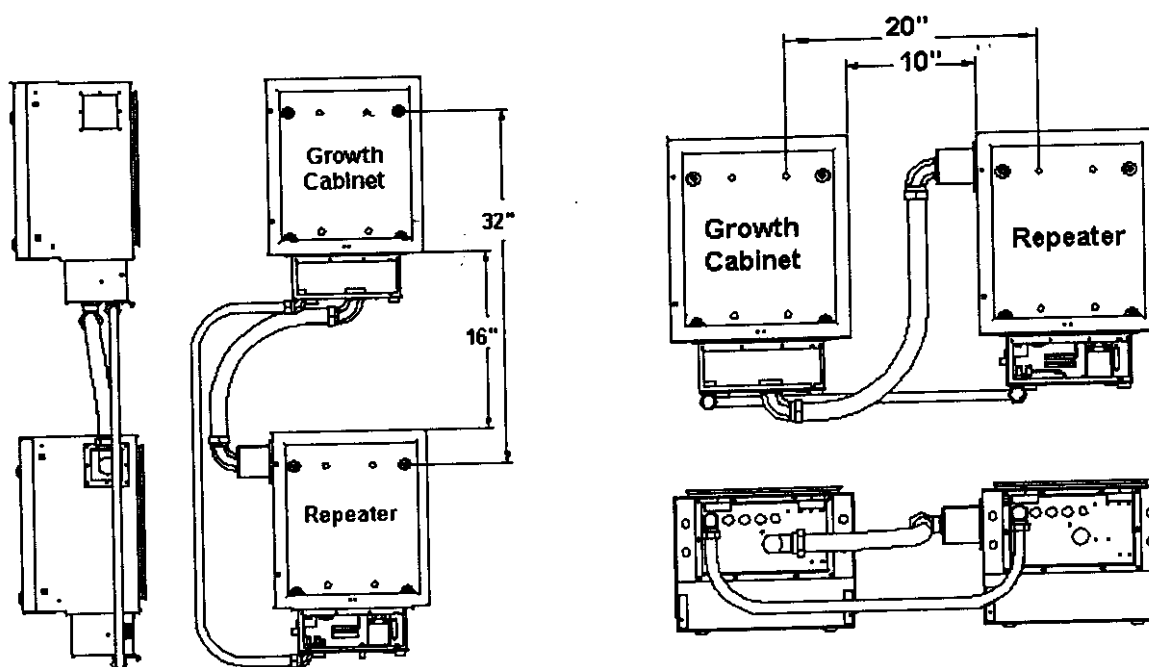


Figure 5. Mounted Growth Cabinet Examples

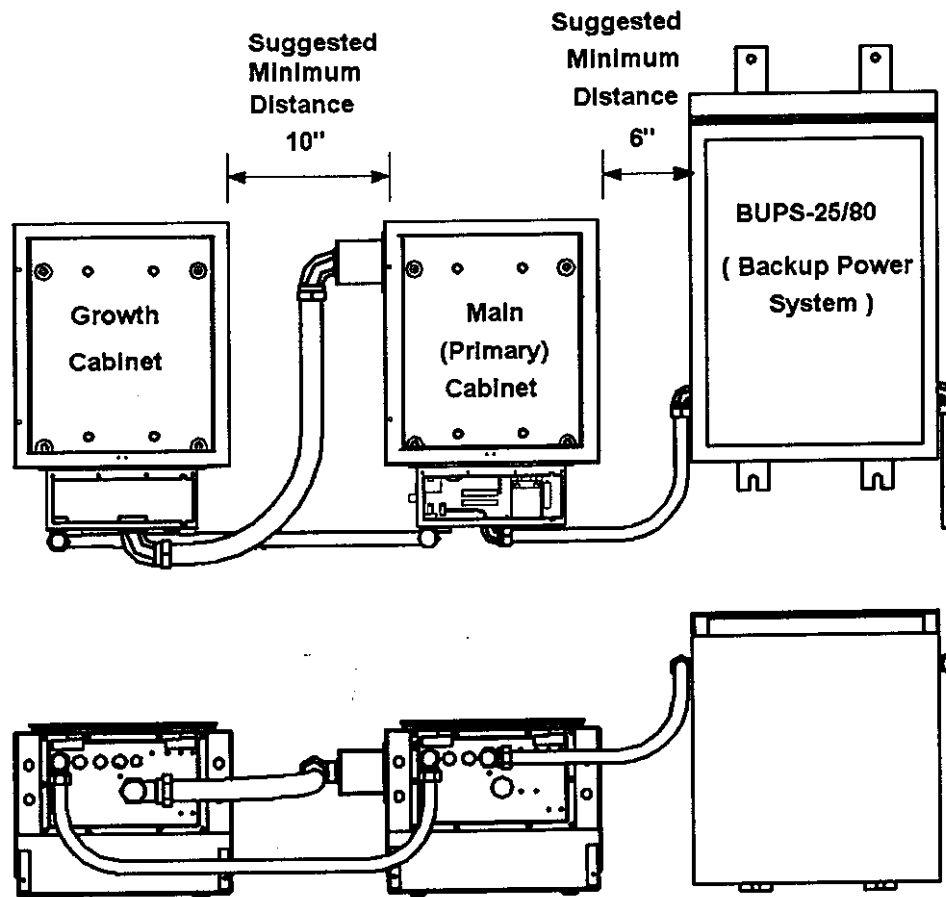


Figure 6. Growth Cabinet Example with BUPS-25/80

Mounting and Connecting Antennas

Antenna size is specified on the Path Data Sheet—do not install antennas of a different size. The size of antenna coaxial cabling for an application depends upon a number of system parameters including, but not limited to:

- ☐ Required signal output
- ☐ Antenna gain
- ☐ Transmission line length

The allowable path loss for antenna cabling, and therefore the size of the cabling, is specified on the Path Data Sheet for the project. Do *not* install cabling of a different size than specified on the Path Data Sheet.

NOTES:

- ☐ As a signal passes through coaxial cable, the strength of that signal decreases. This loss of signal strength, known as path loss, decreases as the diameter of the cable increases.
- ☐ Check the diameter of the coaxial cable before installing. If the cable is more than ½-inch (1.3 cm) in diameter, attach a coaxial jumper assembly (which you must supply) to the connector on the antenna cable. Make the jumper assembly of ½-inch (1.3 cm) coaxial cabling and use 7/16 DIN or a Type N connector, one male and one female.

To install coaxial cabling to the Base and Mobile antennas:

1. Make sure the coaxial cable is long enough to reach the OA850C NR installation site.
2. Install either a $\frac{7}{16}$ DIN (m) or a Type N (m) connector on the coaxial cable.
3. Connect cables to the Base and Mobile antennas.

CAUTION: If a coaxial cable is larger than $\frac{1}{2}$ -inch (1.3 cm) in diameter, do not connect it directly to an antenna port on the repeater, as possible damage could result. Using a coaxial jumper assembly reduces strain on equipment connectors.

4. Having read the above caution, connect the other end of the antenna cables to the appropriate ports labeled on the bottom of the repeater.

You can mount the OA850C NR on a pole or on the wall of a building. The OA850C NR is shipped with the rear mounting bracket attached to the unit.

The following figure illustrates the bracket with dimensions.

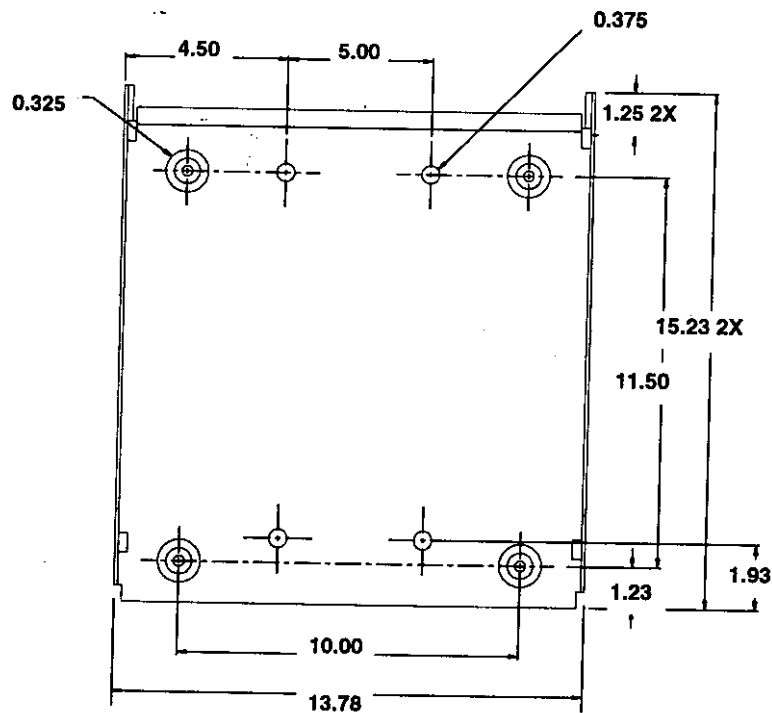


Figure 7. Rear Mounting Bracket

The following figure shows a side view of the OA850C NR and the rear mounting bracket.

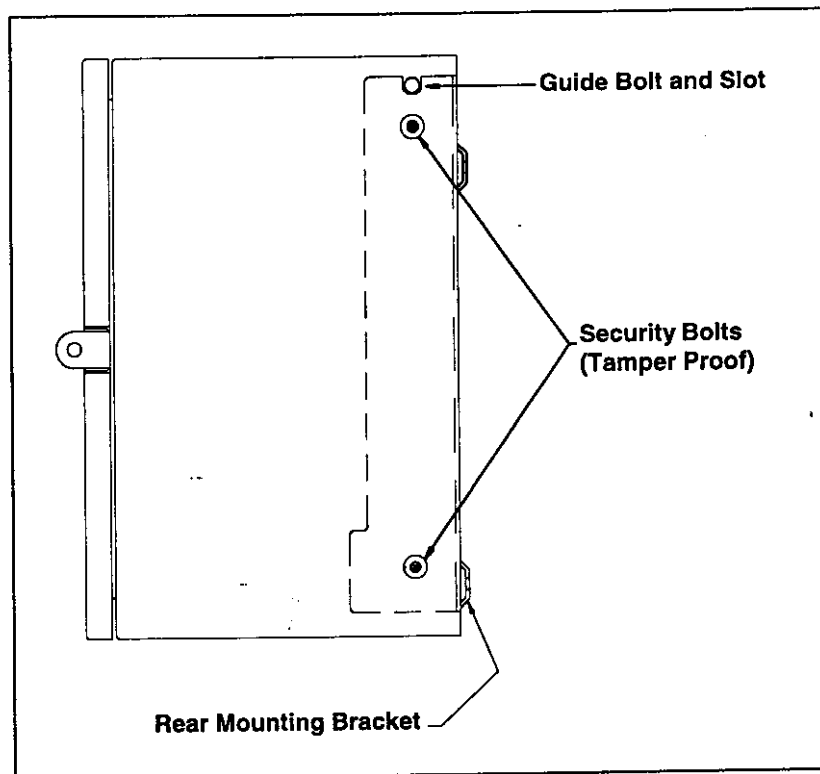


Figure 8. Rear Mounting Bracket with Unit—Side View

Wall Mounting

Wall mounting hardware, which can be ordered from Repeater Technologies, contains the following:

- ☐ Four (4) lag bolts
- ☐ Four (4) flat washers
- ☐ Four (4) lock (split) washers

To mount the OA850C NR on a wall:

1. Separate the rear mounting bracket from the Repeater by removing the attachment bolts and washers (using a ratchet or hex screwdriver and the $\frac{7}{32}$ pin-in-socket driver provided in the accessory kit).
2. Using the mounting hardware, secure the bracket to a wall—see the following figure.

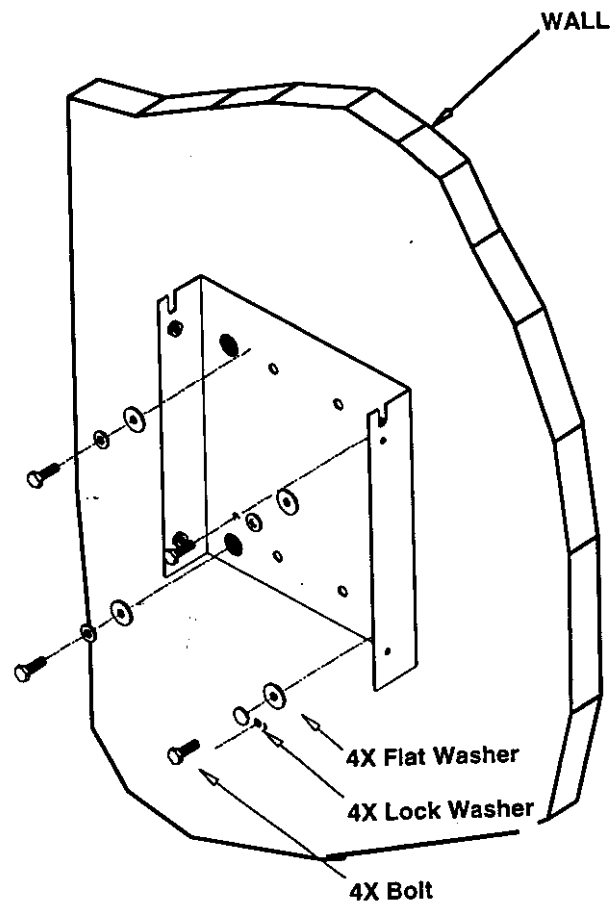


Figure 9. Installation of Rear Mounting Bracket on a Wall

Set the repeater into the bracket by sliding the guide bolt into the guide slot, then replace the attachment bolts and washers removed in Step 1—see the following two figures.

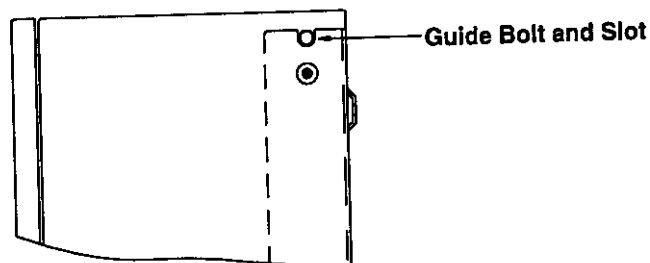


Figure 10. Guide Bolt and Slot

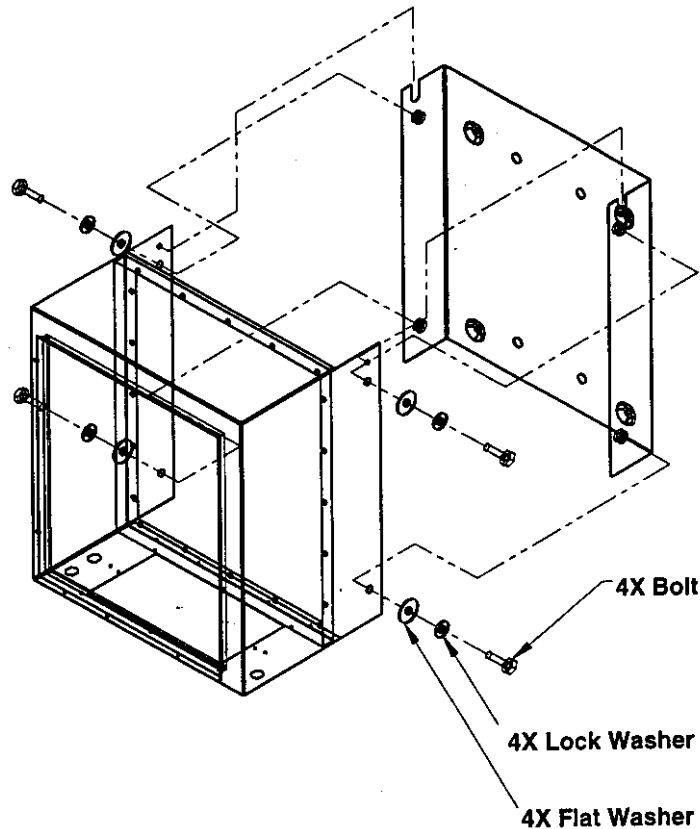


Figure 11. Repeater Mounting and Hardware Placement

Pole Mounting

Repeater Technologies offers optional pole mounting equipment for the OA850C NR, available when ordering the OA850C NR.

Pole installation requires the following materials:

- ☐ Pole mounting kit (available from Repeater Technologies)
- ☐ Banding kit (purchased separately; available from McMaster-Carr) if you are mounting the repeater on a concrete or metal pole
- ☐ Class A - Pole Line Hardware if you are bolting the Pole Mounting Bracket to a wood pole

The Pole Mounting Channel is designed so that the repeater is “squarely” mounted on the pole and does not wobble.

If a concrete pole is used as the mounting structure, typically it is not prudent to try and drill a hole through its center. Similarly, because metal poles may have cable run up the center, drilling is not recommended. Banding is preferred over drilling. However, wood telephone-type poles are *forgiving* and the pole-mounting channel can be easily fastened to the pole with lag screws or through-pole bolts.

(Class A Pole - Line Hardware is a telephone term that specifies bolts and screws that have a heavy electro-galvanized plating so they do not rust.) This type of ruggedized hardware typically is available from distributors such as Garybar Electric, ALLTEL Supply, Spring-North Supply, PowerTel Supply, and so on. This hardware is also available from antenna suppliers and tower erector companies.)

The following table describes the Pole Mounting and Banding Kits. Because the Banding Kit comes with 100 feet of band, you need not purchase a kit with every repeater.

Quantity	Item
Pole Mounting Kit (091-0215-01)	
1	Pole Mounting Channel
4	Bolts
4	Lock (Split) Washers
4	Flat Washers
4	Tapered Plug, .312D Hole
¾-Inch Banding Kit (Part No. 5653K12) (McMaster-Carr Supply Co., Los Angeles, CA, USA, Tel. # (562) 692-5911)	
1	Tightening-Crimping Tool
100 ft.	¾-inch, Type 201 Stainless Steel Band
100	Stainless Steel Buckles
25	Stainless Steel Scru-Lockt Buckles
1	Carrying Case

NOTE: Two people are required for pole mounting.

To mount the OA850C NR to a pole:

1. Remove the attachment bolts and washers, then separate the rear mounting bracket from the repeater.
2. Using the hardware provided with the accessory kit, secure the rear mounting bracket to the two (2) pole brackets—see Figure 12 on page 25.
3. Insert the 4 plugs provided into the 4 outer holes in the rear mounting bracket.
4. Position the rear mounting bracket (with the attached pole channel) against the pole and hold it in place.
5. While one person holds the rear mounting bracket in place, the second person installs the steel bands that hold the bracket against the pole. Consult the manufacturer's instructions included with the Banding Kit for this procedure.
6. Set the repeater into the bracket by sliding the guide bolt into the guide slot.
7. Secure the repeater to the bracket with the security screws and washers removed in Step 1.

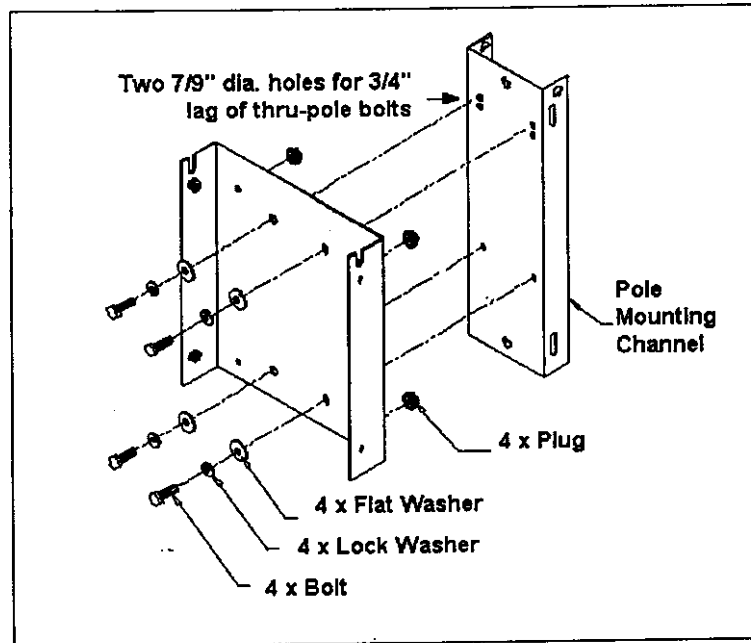


Figure 12. Pole Mounting Hardware

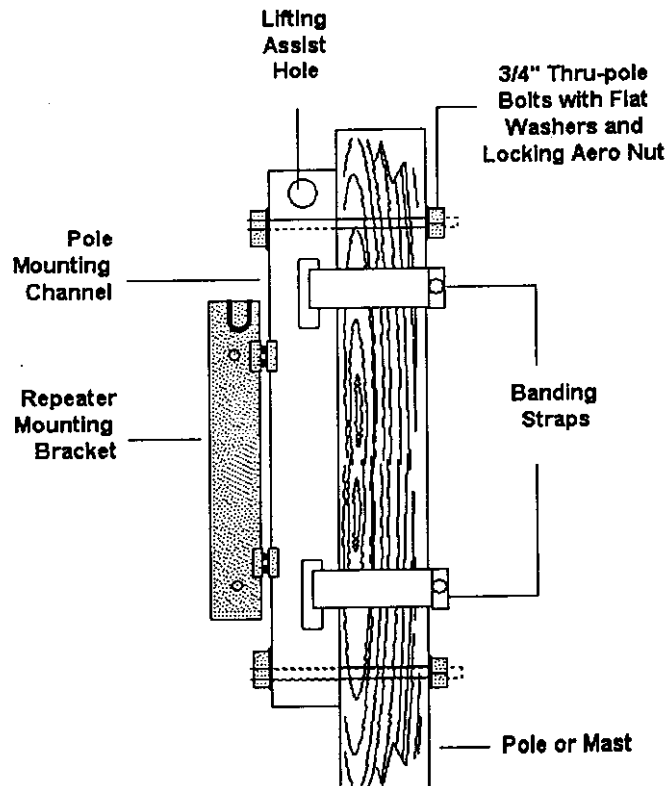


Figure 13. Pole Mount—Side View

Grounding the Repeater

If detailed grounding information is required, refer to the Repeater Technologies application note, *Installation Standards for Grounding Requirements*. Contact Repeater Technologies to receive a copy of this application note.

Connect the screw-compression ground lug (located on the left exterior of the Entry Box) to a suitable earth ground (copper ground rod, copper pipe, grounded steel building frame, or similar ground point) using 2 to 7 mm, No. 6 to 2 AWG, copper wire—see the following figure.

CAUTION: Ground all other cabinets, enclosures, antennas, and coaxial cables used for installation to reduce any damage from a lightning strike or power surge.

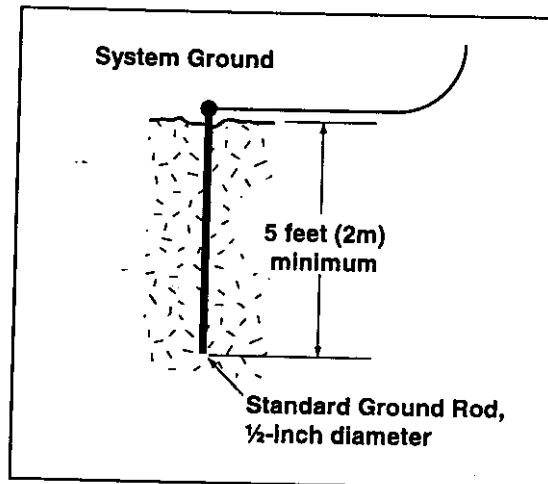


Figure 14. Typical System Ground

Chapter 4. Powering the OA850C NR

The OA850C NR is factory-configured with one of the following AC or DC (future) power supplies:

- ❑ 115 VAC/230 VAC $\pm 10\%$ (available)
- ❑ 24 VDC/~~48 VDC $\pm 10\%$ (24 VDC available; 48 VDC future)~~

NOTE: When wiring power to the repeater, match the voltage of the repeater to the voltage of the power supply.

AC Power Wiring

See the following figure for the location of power features. Note that the AC power cord enters the Entry Box through the left-most conduit and that the free end of the cord is equipped with a 3-prong plug. Also, the AC plug used for wiring is shipped connected to the J18 receptacle.

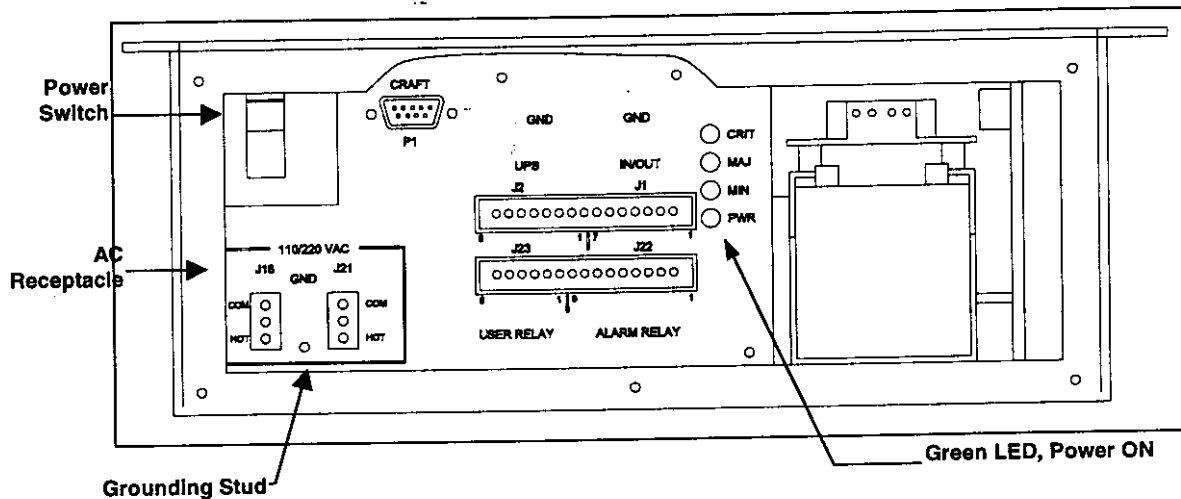


Figure 15. Power Features

To wire the AC power leads to the repeater:

1. Using a medium Phillips head screwdriver, remove the Entry Box access plate located at the front/bottom of the unit.
2. Feed the open end of the power cord through the left-most conduit and into the Entry Box. Note that the color coding of the wires is as follows:

White = Neutral
Black = Live / Hot
Yellow/Green = Ground

NOTE: Check polarity with a voltmeter before wiring.

3. Remove the nut from the grounding stud.
4. Attach the ring lug terminal of the grounding wire to the grounding stud and replace the nut. Tighten the nut until the terminal is secure.
5. Locate the AC plug connected to the J18 receptacle, and note the labels next to the plug: COM (common) designates the location of the neutral wire and HOT designates the location of the live wire.

6. Unplug the AC plug from the J18 receptacle and loosen the two end terminal screws. The middle terminal screw is not used.
7. Insert the Live and Common wires into the proper wire guard receptacles, then tighten the terminal screws to clamp wires. (If necessary, reinsert the AC into the J18 receptacle to determine proper wire locations.)
8. Re-insert the wire AC plug into the J18 receptacle.

To connect power:

1. Turn OFF the external power source (the circuit breaker). The power supply should be a fuse or circuit breaker rated at 10 amps for 115 VAC or 7.5 amps for 230 VAC mains.
2. Plug the cord from the conduit into the circuit breaker box (if there is an appropriate outlet).
3. If there is no outlet, cut off the plug from the power cord and expose the 3 colored leads. Strip about ¼ inch (α cm) from the end of each wire.
4. If the leads do not reach to the circuit breaker box, measure and cut wiring to make up the difference. Use #14 AWG wire for live and neutral lines, and #10 AWG for the ground line.
5. Connect the ends of the leads to the appropriate terminals in the circuit breaker box. **Match live, neutral, and ground lines to the correct connections.** The color coding of the wires is as follows:

White = Neutral
Black = Live / Hot
Yellow/Green = Ground

NOTE: Check polarity with a voltmeter before wiring.

6. Wrap any exposed connections with electrical tape to avoid shorts.
7. Neatly arrange or secure and, if necessary, environmentally protect power wiring.

CAUTION: Do not activate AC power at this time.

DC Power Wiring

The BUPS-25/80 provides backup DC power to your repeater.

The following is a diagram of the OA850C Network Repeater to BUPS-25/80 Wiring Kit. This diagram, as well as **Figure 6. Growth Cabinet Example with BUPS-25/80** on page 19, are provided for planning purposes.

For more information, refer to your BUPS documentation.

OA1900C Network Repeater to BUPS-25/80 Wiring Kit

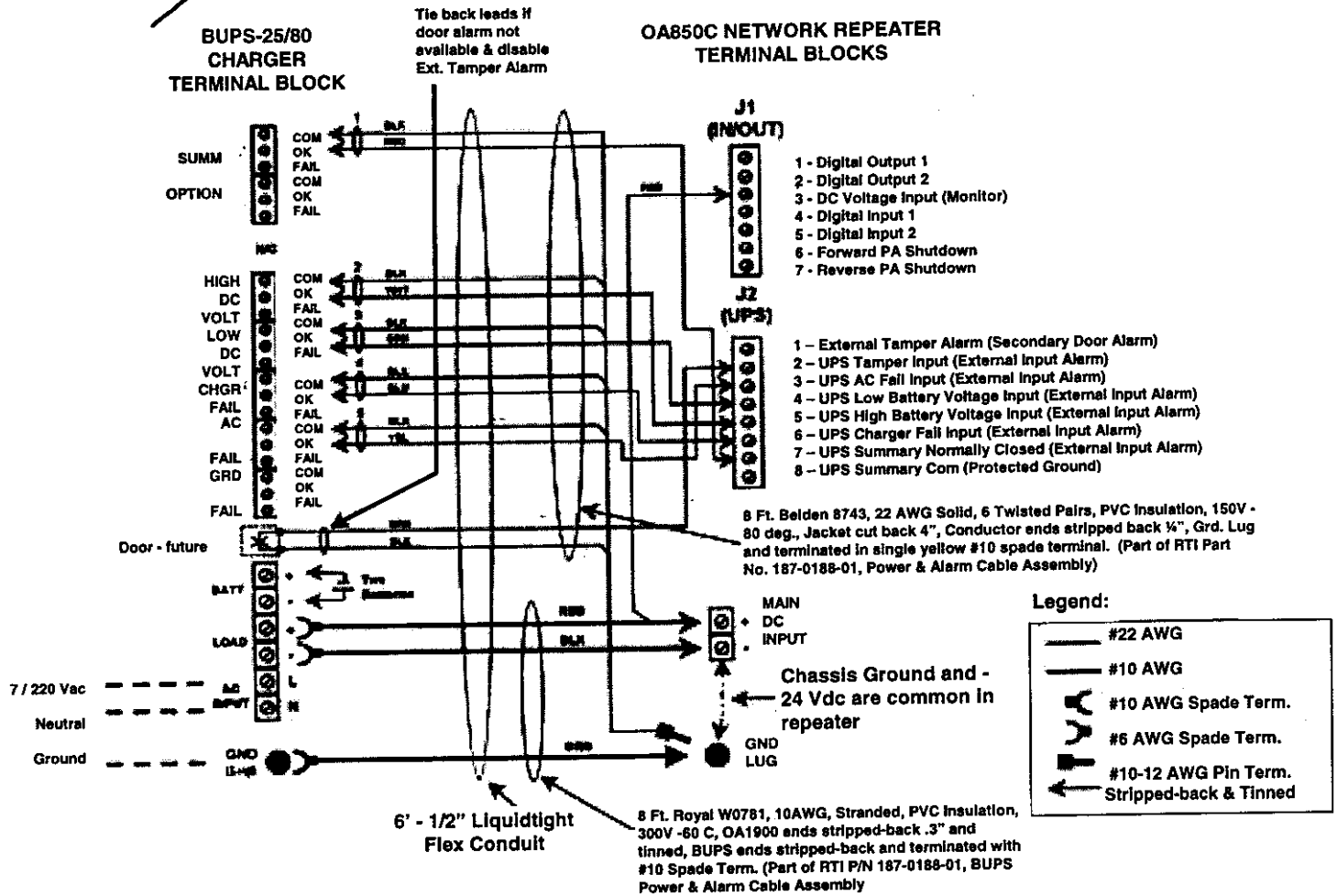


Figure 16. OA850C NR to BUPS-25/80 Wiring Kit

Alarm and Control Wiring

Repeater installation continues with alarm and control wiring. The following figure shows I/O terminal block designations.

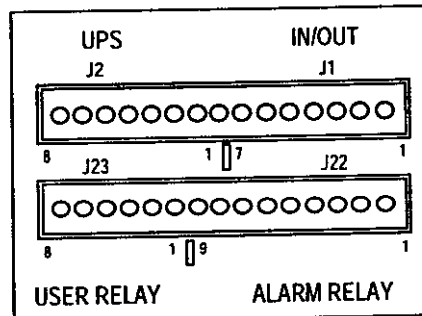


Figure 17. Customer UPS, I/O Alarm and Monitoring Terminal Blocks

The next table shows I/O lead descriptions.

Table 14. Wiring Harness Input/Output Lead Descriptions

Block	Pin No.	Signal Name	Function
J1 IN/OUT	1	Digital Output 1	User Controllable Open Collector Driver
	2	Digital Output 2	User Controllable Open Collector Driver
	3	DC Voltage Input	0–75 V Input Voltage
	4	Digital Input 1	External Input Alarm
	5	Digital Input 2	External Input Alarm
	6	Forward PA Shutdown	External PA Control
	7	Reverse PA Shutdown	External PA Control
J2 UPS	1	External Tamper Input	Secondary Door Open
	2	UPS Tamper Input	External Input Alarm
	3	UPS AC Fail Input	External Input Alarm
	4	UPS Low Battery Voltage Input	External Input Alarm
	5	UPS High Battery Voltage Input	External Input Alarm
	6	UPS Charger Failure Input	External Input Alarm
	7	UPS Summary Normally Closed	External Input Alarm
	8	UPS Summary COM	Protected Ground
J22 Alarm Relay	1	Critical Relay NO	Normally Open Output
	2	Critical Relay COM	Common Input
	3	Critical Relay NC	Normally Closed Output
	4	Major Relay NO	Normally Open Output
	5	Major Relay COM	Common Input
	6	Major Relay NC	Normally Closed Output
	7	Minor Relay NO	Normally Open Output
	8	Minor Relay COM	Common Input
	9	Minor Relay NC	Normally Closed Output
J23 User Relay		User 1 NO	Normally Open Output
		User 1 COM	Common Input
		User 1 NC	Normally Closed Output
		User 2 NO	Normally Open Output
		User 2 COM	Common Input
		User 2 NC	Normally Closed Output

WARNING: When connecting wiring, be sure the wiring assembly is not plugged into the repeater.

Digital Control Outputs

The OA850C NR has two digital outputs, each with one open collector transistor lead. When the output switch is ON, current flows through a circuit that includes the open collector transistor output—see the following figure. The reference ground is any of the panel-mounted screw lugs (repeater cabinet ground).

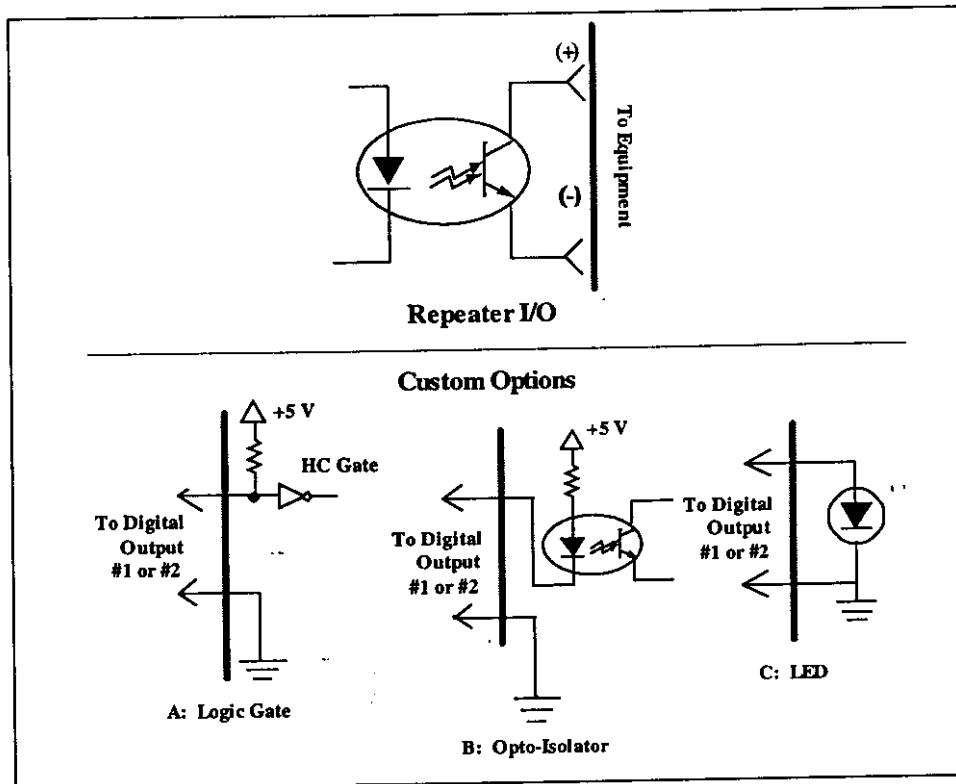


Figure 18. Typical Digital Output Applications

Outputs are *not* isolated from the repeater's power subsystem. Provide a current source on the positive lead that does *not* exceed the following specifications:

- Forward Current—Continuous----- 300 mA
- Maximum Positive to Negative Lead Voltage -----50 Volts
- Maximum Negative to Positive Lead Voltage ----- 0 Volts
- Leakage Current in OFF State ----- 1 μ A

See the "ACU Status Screen" in *RepeaterNet Craft for the OA850C NR* for instructions about activating digital outputs. See **Table 17** for lead descriptions.

Alarm and Control Relay Outputs

The OA850C NR has both alarm and control relay outputs (Form C) with common, normally open, and normally closed connections. When attached to the normally open and common leads, an alarm relay *closes* a circuit when a critical alarm activates and *opens* the circuit when the condition clears.

Relay Outputs #1 and #2 open and close circuits according to the relay output controls in RepeaterNet. For example, to activate an external light when the Relay Control switch is ON, the wiring loop includes the common connector, the normally open connector, a power source for the light, and the light—see the following figure.

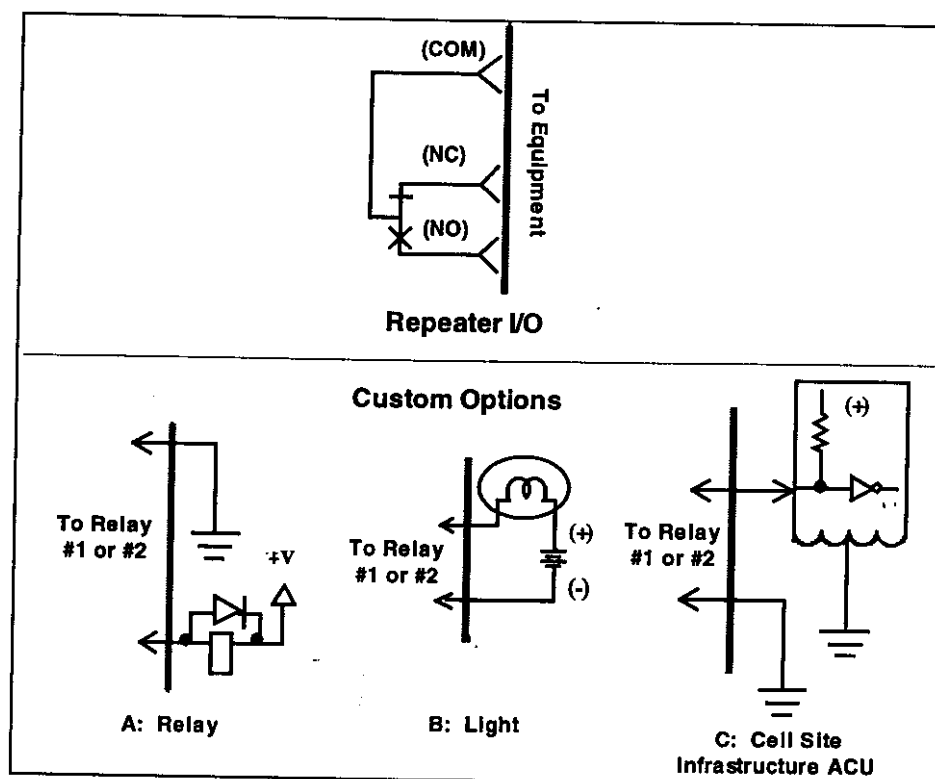


Figure 19. Typical Relay Applications

Do not exceed the following specifications with relay connections:

Maximum Switching Voltage and Current: 30 VDC/2 Amps, 200 VDC/200 mA

See the “ACU Status Screen” in RepeaterNet Craft for the OA850C NR for instructions about activating digital outputs. **Table 14** on page 30 shows I/O lead descriptions.

Digital Inputs

The OA1900 NR has digital inputs for external alarm monitoring and for disabling the Forward and Reverse PAs. Each input triggers an alarm (or disables the PA) if the leads form a high impedance circuit (an open contact) and clears an alarm if the leads form a low impedance circuit (a contact closing).

NOTE: If a PA is disabled using the digital inputs, the PA Alarm is triggered. To avoid triggering a PA Alarm in this manner, set the PA Alarm severity to disabled—see “Redefining Alarm Severity” in RepeaterNet Craft for the OA850C NR.

Connect digital inputs with two leads—the digital input lead and any ground lead. See the next two figures.

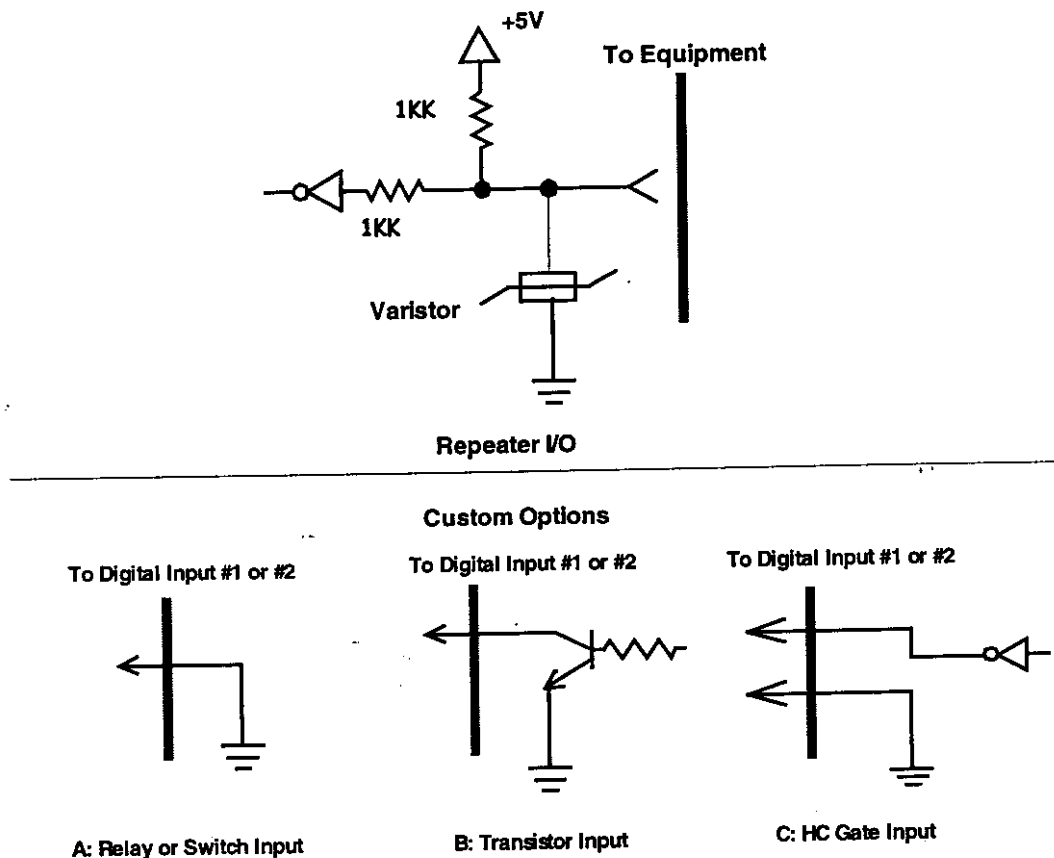


Figure 20. Typical Digital Input Applications

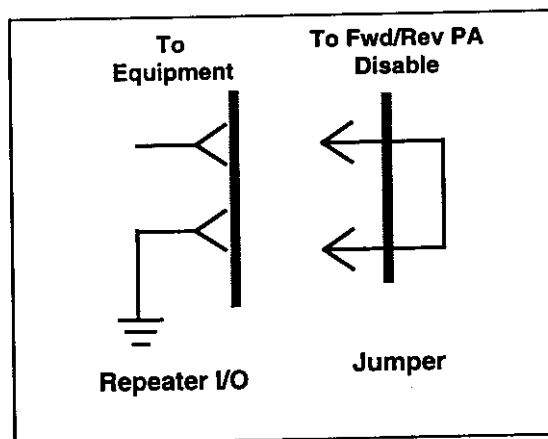


Figure 21. Typical PA Disable Input

Do not exceed the following specifications when connecting digital inputs:

Input Voltage for Logic 0.....	<0.5 Volts
Input Voltage for Logic 1 (active alarm/disable PA).....	>4.0 Volts
Maximum Input Voltage.....	5.0 Volts
Minimum Input Voltage.....	0.0 Volts
Maximum Input Current.....	2 mA

External DC Input Voltage

The OA850C NR has one analog input to monitor an external DC power source. The monitoring range is from 0 to 60 volts, with a resolution of 250 mV.

Connect an external DC power source to the repeater with a single lead from the positive line/terminal of the battery—see the following figure.

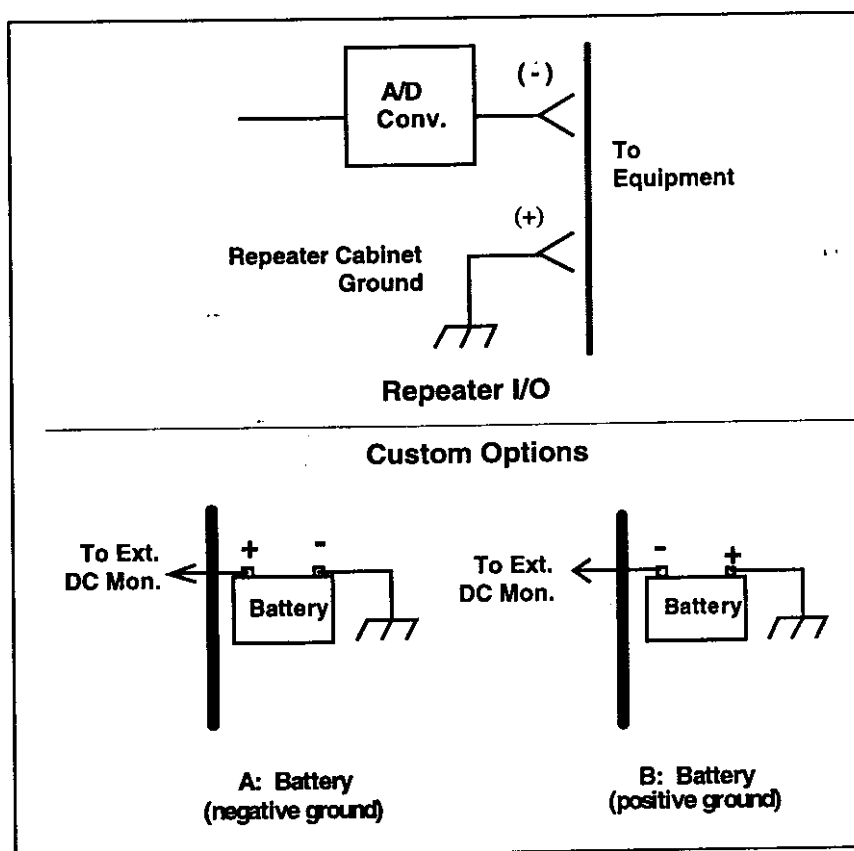


Figure 22. Typical DC Monitoring Applications

CAUTION: Do not allow any input to exceed the 60 Volts limit.

Chapter 5. Orienting and Isolating Antennas

Preliminary Antenna Orientation

With the antennas mounted, coaxial cables installed, and the Repeater power OFF, antenna orientation can begin.

BTS Antenna

To orient the BTS antenna:

1. Disconnect the coaxial cable from the donor BTS antenna at the antenna port on the repeater.
2. Connect the service monitor to the cable from the BTS receiving antenna.
3. While monitoring the control channel assigned to the donor BTS, position the BTS antenna to maximize the RSL (Received Signal Level).
4. Analyze the signal to ensure it is correct.

NOTE: Record the level of the control channel and other active carriers from the donor BTS for later reference.

If the RSL is less than Maximum RF Output Power Level minus Maximum Gain, full repeater output power may not be reached when installed. See **Technical Specifications** on page 9 for RF output and maximum gain levels. To correct the problem, reposition the antenna, change the mounting height of the antenna, or use an antenna with greater gain to reach the required RSL.

Mobile Antenna

The Mobile service antenna can only be *bore-sighted* (aimed by eye) at this time. Aim the antenna as closely as possible to its final position. Accuracy is important because the antenna position affects antenna isolation.

Antenna Fundamentals

An **antenna** is a transducer between electromagnetic waves in space and voltages or currents in a transmission line. When transmitting, the antenna converts electrical signals into radio waves; a receiving antenna reverses the process and transforms radio waves back into electrical signals.

All antennas are directional, transmitting more power in some directions than others. The direction of maximum transmission or reception is called the **bore-sight direction**. The directional properties of an antenna are described by its radiation pattern, a pictorial representation of relative radiated power versus direction. Radiation patterns exhibit a lobe structure in which the largest lobe in three-dimensional space constitutes the beam through which the antenna radiates or receives most of its power.

The tendency of the antenna to concentrate its radiated power is called **gain**. The angular width of the main beam measured between the half-power points is called the **beamwidth** of the antenna. Beamwidth and gain vary inversely with each other; a high-gain antenna has a narrow beamwidth and vice versa. Gain is proportional to the physical area of an antenna expressed in square wavelengths.

Radiation pattern lobes other than the main beam are called **sidelobes**. The higher the sidelobe level, the more likely an antenna is to interfere with or be interfered with by a receiver in the direction of the largest sidelobe.

An antenna has an **operating frequency**—the frequency at which the antenna exhibits optimum performance—and a **bandwidth**—the frequency range over which the antenna impedance and radiation pattern remain within some required tolerance.

Antenna Isolation

To prevent oscillation or severe passband distortion, **the antennas must have a port-to-port isolation equal to 15 dB plus the OA850C NR active gain**. For example, an OA850C NR set for a maximum available gain of 95 dB requires a minimum antenna isolation of 110 dB (95 dB + 15 dB) for proper operation.

Be aware that the motion of objects near the antennas can change the isolation significantly. If possible, perform tests with expected objects present to ensure the isolation does not drop below minimum required levels.

To measure the isolation:

1. Disconnect both antenna signal cables from the antenna ports on the repeater.
2. Inject a signal into one of the antennas and measure the power level of that signal at the other antenna. The difference in power levels (measured in dB) between the injected signal and the measured signal is the isolation of the antennas.

NOTE: *Because antennas are not yet connected to the repeater, isolation is obtained through the air.*

3. Repeat the test at several frequencies across the Forward and Reverse passband, confirming that minimum antenna isolation is met at *all* applicable frequencies.
4. If isolation is not met, try repositioning the antennas or adding intervening shielding, and measure again.

The following method can be used to *estimate* antenna isolation (referenced to dBd). During installation, always rely upon actual measurements, not estimated data.

$$\text{Isol} = \text{Ls} + \text{Lf} + \text{Lo} - \text{Gd} + \text{ADd} - \text{Gr} + \text{ADr} + \text{XPD}$$

US Standard

$$\text{Ls} = -42.2 + 20\log_{10}(\text{F} \times \text{D}), \text{ F in MHz, D in feet, Ls in dBd}$$

Metric

$$\text{Ls} = -31.8 + 20\log_{10}(\text{F} \times \text{D}), \text{ F in MHz, D in meters, Ls in dBd.}$$

Where

The following are all in dB:

Isol	Antenna isolation
Ls	Antenna separation loss
Lf	Total Feedline Loss
Lo	Obstruction loss from structure or shield
Gd	Gain of antenna toward donor BTS
ADd	Angular discrimination of donor BTS antenna toward re-radiation antenna
Gr	Gain of re-radiation antenna toward Mobile
ADr	Angular discrimination of re-radiation antenna toward donor BTS antenna
XPD	Cross polarization discrimination between antennas (if applicable)

Antenna Orientation and Output Measurement

To orient antennas:

1. Turn OFF system power. The power switch is located in the upper left corner of the Entry Box.
2. Remove the 50-ohm terminators from the antenna ports.
3. Connect the Donor and Mobile antenna feeders to the proper antenna ports.
4. Turn ON system power.
5. Open a session with the repeater by selecting the repeater on the dialog box displayed after the Welcome screen.
6. Turn ON Forward PA and Reverse PA power:
 - A) Select **Forward PA** from the **Configuration** menu.
 - B) Click the **Control** tab.
 - C) Click the **PA Power** switch to turn it ON.
 - D) Click **Apply** or **OK**.

Repeat for **Reverse PA**.

7. Check Forward PA and Reverse PA RF output power:
 - A) Select **Forward PA** from the **Configuration** menu.
 - B) Click the **Measurements** tab.
 - C) Compare displayed output power levels to the intended RF output power levels for the system (defined in the site plan or network engineering documentation) and the maximum output power of the repeater.
8. Repeat for **Reverse PA**.

NOTE: *Forward transmit power increases as the orientation of the Donor antenna is optimized. Make any required adjustments to the Donor antenna facing the Cell Site to maximize Forward power output.*

Adjusting for Hot Input Levels

The OA850C NR has an adjustable gain range of 30 dB with upper and lower limits defined by the PA level of the repeater. In some applications, however, hot input levels require that antenna gain be set below the lower limit of this range.

To set antenna gain below the lower limit of the operating range:

1. Choose a fixed attenuator pad that is able to set the gain to a level about 5 dB lower than what is required.
2. Install the attenuator pad at the antenna port.
3. Make the final *upward* gain adjustment with RepeaterNet.

NOTE: *If an attenuator pad is inserted in this manner, RepeaterNet cannot show the actual antenna gain. For example, if the Attenuator pad reduces gain by 5 dB, the system gain is actually 5 dB lower than the setting shown on the PA Properties screen.*

Chapter 6. Completing Installation

Turning On System Power

RepeaterNet Craft is used for the first time during the installation procedure in this section. RepeaterNet Craft is the software program that confirms, controls, and monitors the OA850C NR. Make sure RepeaterNet has been loaded on the laptop computer being used (at the installation site) to perform the initial configuration of the repeater. If necessary, see *RepeaterNet Craft for the OA850C NR*.

To turn ON system power:

1. Terminate the OA850C NR antenna ports with $\frac{7}{16}$ DIN or Type N 50 OHM Power Loads.
2. Using a medium Phillips head screwdriver, remove the Entry Box access plate located at the front bottom of the unit and locate the internal backup battery. (See Internal Backup Battery on page 44 for information on the operation of this unit.)

Problem	Cause	Solution
Low RF Output or No RF Output	Alarm Conditions	⇒ Check for alarm conditions and resolve, if necessary.
	Strong, Out-of-Band Inputs	⇒ Check antenna orientation.
	Improper gain setting	⇒ Check gain and reset, if necessary.

3. Activate the power source to the repeater, then turn ON the repeater's power switch (located in the upper left corner of the Entry Box).

NOTE: The power switch is also a magnetic sensing circuit breaker.

4. Connect the red lead (quick disconnect type) of the internal backup battery.

Confirming Proper System Voltage

You now must check the repeater, using RepeaterNet, to confirm proper system voltage.

To connect to the repeater and to confirm proper system voltage:

1. Plug the female end of the DB-9 serial cable into the serial port of the computer.
2. Plug the male end of the cable into the serial port located in the Entry Box.
3. Start RepeaterNet.

Start->Programs->RepeaterNet->RepeaterNet

4. If there is more than one repeater, select the appropriate from the list displayed to display the Main Control screen.
5. On the Login dialog box, enter a **Login ID** and **Password**.
6. Click **OK** to open the RepeaterNet Main Control screen.
7. Check the operation (color) of the Power subsystem (2-prong plug icon at the bottom of the screen):
 - ☐ **Green**—Normal Operation. Proceed to step 8.
 - ☐ **Red and flashing**—Alarm Condition.

Select **Power System** from the **Configuration** menu to open the Power System Properties screen. Identify the subsystem that triggered the alarm, and see Table 17 on page 43 for information about resolving the alarm.

NOTE: Clear any active alarms before proceeding with the installation.

8. If there are no alarms, or after clearing active alarms, continue with the procedure in the following section.

Checking that Power Amplifiers are OFF

All units are shipped with PAs turned OFF as indicated by the PA OFF indicator (a circle with a slash through it) displaying over each PA subsystem icon (FPA or RPA) on the Main Control screen. PAs should remain OFF until you adjust the gain. If any PA subsystem icon is not displaying the OFF indicator, do the following:

1. Select Forward PA or Reverse PA from the Configuration menu to open the **Properties** window.
2. Click the **Control** tab.
3. Click the PA Power button to turn it OFF.
4. Click **Apply** or **OK**.

Determining the Correct Frequency

Consult the site plan or network engineering documentation for the proper channel or band settings for this application. In CDMA applications, primary and secondary assignments depend upon the Donor BTS with which the repeater is coordinated. See the following table for a listing of CDMA channel assignments. Note that Korea and Japan use different CDMA channel assignments.

Table 15. Valid CDMA Channel No. to Frequency Cross Reference Chart

Frequency Block	Quasi Channel Number	Official Channel No.	Base to Mobile Forward (MHz)	Base to Mobile Forward (MHz)
A	1	25	1851.250	1931.250
	2	50	1852.500	1932.500
	3	75	1853.750	1933.750
	4	100	1855.000	1935.000
	5	125	1856.250	1936.250
	6	150	1857.500	1937.500
	7	175	1858.750	1938.750
	8	200	1860.000	1940.000
	9	225	1861.250	1941.250
	10	250	1862.500	1942.500
	11	275	1863.750	1943.750

Replace w/Cellular Channel No.'s + Freq's.

Frequency Block	Quasi Channel Number	Official Channel No.	Base to Mobile Forward (MHz)	Base to Mobile Forward (MHz)
B	1	425	1871.250	1951.250
	2	450	1872.500	1952.500
	3	475	1873.750	1953.750
	4	500	1875.000	1955.000
	5	525	1876.250	1956.250
	6	550	1877.500	1957.500
	7	575	1878.750	1958.750
	8	600	1880.000	1960.000
	9	625	1881.250	1961.250
	10	650	1882.500	1962.500
	11	675	1883.750	1963.750
C	1	925	1896.250	1976.250
	2	950	1897.500	1977.500
	3	975	1898.750	1978.750
	4	1000	1900.000	1980.000
	5	1025	1901.250	1981.250
	6	1050	1902.500	1982.500
	7	1075	1903.750	1983.750
	8	1100	1905.000	1985.000
	9	1125	1906.250	1986.250
	10	1150	1907.500	1987.500
	11	1175	1908.750	1988.750
D	1	325	1866.250	1946.250
	2	350	1867.500	1947.500
	3	375	1868.750	1948.750
E	1	725	1886.250	1966.250
	2	750	1887.500	1967.500
	3	775	1888.750	1968.750
F	1	825	1891.250	1971.250
	2	850	1892.500	1972.500
	3	875	1893.750	1973.750

Setting the Channel or Band

To set the operational channel or band:

1. Confirm that the repeater is ON and a direct connection has been established.
2. From the Craft Main Control screen menu bar, select **Channel 1** from the **Configuration** menu to open the Channel 1 Properties screen.
3. On the Channel 1 Properties screen, click the **Channel #** tab.
4. Type the channel number in the **Channel** field to define a channel.
5. Click **Apply** or **OK** to set the channel.

Configuring Gain Initially

When initially setting Forward and Reverse Gain, use the gain settings defined on the project site plan or in network engineering documentation. (If necessary, contact your network administrator.) Final adjustments to gain settings are made during system optimization.

To initially set gain:

1. Confirm that the repeater is ON and a direct connection has been established.
2. From the Craft Main Control screen, select **Channel 1** from the **Configuration** menu to open the Channel 1 Properties screen.
3. Click the **Gain** tab.
4. Click-drag each horizontal slider to define Forward and Reverse gain, noting that gain adjusts in 2 dB increments. The gain value box (centered under each slider) displays selected gain.
5. Click **Apply** or **OK** to set the gain and return to the Main Control Screen.

NOTE: For 2-channel units, select Channel 2 and repeat steps 3 and 4 for the Channel 2 Forward and Reverse PAs.

Verifying and Optimizing the Coverage Area

For detailed information about repeater installation and link engineering, request the engineering handbook, *Installation, Operation, and Optimization of Over-the-Air Cellular and PCS Repeaters*, directly from Repeater Technologies.

Chapter 7. Maintenance and Troubleshooting

The OA850C NR is a field-replaceable unit that requires no component-level repair. The use of highly reliable components virtually eliminates maintenance. Routine checks of the OA850C NR and its supporting equipment are recommended to ensure reliable operation and early detection of problems.

Routine Maintenance

Repeater Technologies recommends a semi-annual maintenance schedule for the repeater. A procedure for routine maintenance follows:

1. Inspect the installation site and correct any problems.
2. Verify that the OA850C NR and all associated hardware, including antennas, is securely mounted and properly in place.
3. Check input electrical wiring and BUPS for damage and ensure that connections are tight.
4. Check any battery terminals for corrosion; clean terminals, if necessary.
5. Clean solar panels and remove obstructions, if applicable.

CAUTION: *Follow manufacturers instructions when cleaning solar panels. Abrasive or acetone-based solutions can cause damage to some types of panels.*

6. Check antennas and coaxial cabling for damage and ensure that connections are tight.
7. Check the fins of the heatsink and clear any debris.

LEDs

The OA850C NR Entry Box displays four LED indicators—see the following table.

Table 16. Descriptions of LED Indicators

LED Indicator	Description	LED Color	Normal	Trouble
System Ready	Power ON	Green	On	Off
Critical Alarm	Critical Alarm triggered	Red	Off	On steady
Major Alarm	Major Alarm triggered	Red	Off	On steady
Minor Alarm	Minor Alarm triggered	Yellow	Off	On steady

Troubleshooting

Perform all troubleshooting of the OA850C NR with RepeaterNet. See the following table for a listing of common problems and possible solutions.

NOTE: *Contact the Repair Department of Repeater Technologies whenever problems with the unit can not be resolved—see “Repair and Return Procedure.”*

Table 17. System Troubleshooting

Problem	Cause	Solution
Unable to Start RepeaterNet	Corrupted Program Data	⇒ Run the Scan Disk and Defragmenter utilities included with Windows 95.
	Improper Installation of RepeaterNet	⇒ Reinstall RepeaterNet.
	Damaged Hard Drive	⇒ Repair or replace hard drive.
No Connection	Improper COM Settings	⇒ Check telephone number, COM port, stop bits, parity settings, and baud rate. Correct settings, if necessary. ⇒ Check advanced settings from the COM Properties screen. Reduce buffer sizes or disable buffer and retry connection.
	Serial Cable Failure	⇒ Check the cable for a tight connection. ⇒ Check the cable and connection ports for damage. Replace cable, if necessary. Contact Repeater Technologies if the connection port is damaged.
	Modem Failure	⇒ Check telephone line connections at the computer and the Repeater. Re-connect, if loose. ⇒ Check telephone line for damage. Replace, if necessary. ⇒ Log in to a direct session with the Repeater and check the modem and cell phone alarms. If either alarm is active and does not clear, contact Repeater Technologies. ⇒ Check the computer's modem. Replace or repair computer modem, if necessary.
Overheating (Temp. Alarm)	Insufficient Cooling	⇒ Check the heatsink. Clear any airflow obstructions. ⇒ Shade the unit if it is in an extremely hot environment.
Low Voltage or No Voltage (Input Power Alarm)	Improper Solar Charging	⇒ Clean solar panels or remove obstructions. Do <i>not</i> use an acetone-based solution for cleaning.
	Power Supply Failure	⇒ Check the condition of the power source. ⇒ Check all wiring and power leads to the power source. ⇒ Check any fuses or circuit breakers in power supply equipment. ⇒ Check AC power service for outages or other service problems.
	Internal Power Converter Failure	⇒ Contact Repeater Technologies to replace unit.
ALC Power Limit Alarm	Gain Incorrectly Set	⇒ Adjust gain.
	PA Failure	⇒ Contact Repeater Technologies.
Low RF Output or No RF Output	Controls Not Turned ON	⇒ Check to ensure Repeater power is ON and both PAs are turned ON.
	Mobile or Base Antennas Oriented Incorrectly	⇒ Check antenna orientation and re-align, if necessary.

Problem	Cause	Solution
Low RF Output or No RF Output	Alarm Conditions	⇒ Check for alarm conditions and resolve, if necessary.
	Strong, Out-of-Band Inputs	⇒ Check antenna orientation.
	Improper gain setting	⇒ Check gain and reset, if necessary.
Oscillation	Active Alarm	⇒ Resolve alarm.
	Foreground reflections	⇒ Remove object causing reflection; adjust antenna orientation; move antenna mounting.
	Improper Antenna Isolation	⇒ Clear area around antennas of excessive plant growth.
	Improper Gain Settings	⇒ Adjust gain.

Internal Backup Battery

The OA850C NR includes an internal backup battery to provide limited back-up power for the ACU and, if applicable, the cell phone and internal modem. In the event of a loss of system power, the internal battery provides power for the repeater to call out and report the failure, and to save the Alarm and Event Log. The length of time that the internal battery provides power depends upon Repeater configuration and environmental conditions (such as temperature).

Table 20. Internal Battery Backup Operation Estimates

Configuration	Operating Time*
Repeater with no internal modem	5 hours
Repeater with internal modem and no cell phone	2 hours
Repeater with internal modem and cell phone, with modem and phone continuously transmitting	20 minutes
*Values are estimates only: actual battery life may vary. Estimates assume a fully charged battery, adverse environmental conditions, and a 600 mW AMPS cell phone.	

System power charges the internal battery during normal operation. Note that the internal battery has a low voltage cut-off to allow for a full recharge when power is restored.

If a power outage lasts longer than the operational limit of the internal battery, the modem cannot send or receive calls, and Alarm and Event Log data is lost. Save the Alarm and Event Log when the repeater calls out to report a system power failure—see “The System Menu” in *RepeaterNet Craft for the OA850C NR* for more information about the Alarm and Event Log.

NOTES:

- ❑ The internal battery does not provide power for RF transmission during a primary power outage. Service is interrupted during a loss of primary system power.
- ❑ The battery should be replaced on a 3-year cycle to allow for normal aging, wear, and environmental deterioration.

Sparing Recommendation

Because repeaters are often used to provide critical coverage, customers are advised to follow a sparing policy. While most carriers have internal policies related to equipment sparing, in the event that one does not exist, Repeater Technologies recommends that a carrier maintain a minimum of one (1) spare unit for every increment of 10 units or fraction thereof. This assumes that all spares are immediately available to the technician for installation. It is advised that each carrier develop a company-specific, equipment-specific policy, one that accounts for geographic and environmental factors and the total number of repeaters deployed in a given network.

Repair and Return Procedure

If a repair or return of the OA850C is necessary, contact the Repeater Technologies Customer Service Department for instructions. Note that Customer Service needs the following information from you when you call:

- ☐ A detailed explanation of the problem
- ☐ The model name
- ☐ The serial number of the unit

For equipment returns, a Repeater Technologies representative issues an RMA (Return Material Authorization) and shipping and packaging instructions. When returning the OA850C NR, always use the original shipping carton and packaging materials. If the original shipping materials are unavailable, Repeater Technologies can send replacement materials at the cost of the purchaser.

CAUTION: *If equipment is not returned to Repeater Technologies in the original packaging materials, possible damage could result. Repeater Technologies is not liable for any damage resulting from improper shipment.*

Customer Service phones are staffed or monitored 24 hours a day, 7 days a week. Phone numbers for the Customer Service Department are as follows:

(408) 747-1946

(800) 938-1901 (USA and Canada only)

Product Warranty

A one-year product warranty is provided with the OA1900 NR. A copy of the product warranty is included with the Standard Terms and Conditions in every sales agreement. For more information, contact the Repeater Technologies Customer Service Department.

Glossary

This glossary defines communications industry acronyms, symbols, and terms. Hardware- and software-related acronyms have also been included. As this glossary supplements all operations manuals of Repeater Technologies, not all items listed here necessarily appear in this manual.

A	Amp or Amps.	FORWARD	
ACU	Alarm Control Unit.	DIRECTION	Direction of transmission from the base station through the Repeater and on to Mobile or hand-held units. Downlink transmission.
ALC	Automatic Level Control.		
AMPS	Advanced Mobile Phone System.	FORWARD	
BNC	Type of connector.	GAIN	Gain setting for Forward transmissions.
BTS	Base Transceiver Station.	FRU	Field Replaceable Unit
BUPS	Back-up Power Supply.	FSK	Frequency-Shift Keying.
		GSM	Global System for Mobile Communications or Groupe Speciale Mobile.
CDMA	Code Division Multiple Access.	GUI	Graphical User Interface.
C/E	Carrier-to-Echo Ratio.	HAND-OFF	The act of transferring the service of a call in progress on a cellular system from one cell or sector to another, typically also involving a change in the voice channel used.
C/I	Carrier-to-Interface Ratio. The ratio between the mean signal level of the desired radio signal and the signals from other, interfering sources, typically expressed in dB.	HOT TONE	If a Mobile transmits at full power in close proximity to a receive antenna, a hot tone—for example, a receive signal above -40 dBm—is produced. Too hot a tone can over-modulate a system and force it to drop all calls. Systems designed to control reverse attenuation will moderate the potentially damaging effect of hot tones.
CPC	Circular Plastic Connector.		
CRC	Cyclical Redundancy Check.	IF	Intermediate Frequency.
DAMPS	Digital Advanced Mobile Phone System (equivalent of TDMA).	IM	Intermodulation.
dB	Decibel or decibels.	IMD	Intermodulation Distortion.
dBc	Decibels referenced to the carrier level.	LED	Light-emitting diode.
dbi	Decibels referenced to the isotropic antenna.	LNA	Low Noise Amplifier.
dBm	Decibels referenced to one milliwatt.	LO	Local Oscillator, high-level input into mixer.
DF, DFB	Distributed Feedback (Laser).	microCell	Any small, low-power cell site.
DVM	Digital Voltmeter.	MSC	Mobile Switching Center (equivalent to MTSO).
EM	Electromagnetic.	MTSO	Mobile Telephone Switching Office (equivalent to MSC).
EMI	Electromagnetic Interference.		
ERP	Effective Radiated Power.		
F/B	Front-to-Back Ratio.		
FCC	Federal Communications Commission (USA).		
FE	Front End.		
FIFO	First In First Out.		

MULTIPATH	Radio propagation between a transmitter and receiver where the received signal is a compound of multiple rays that have undergone one or more reflections and/or refractions. Cellular coverage is most often provided in a multipath environment, especially in high-density city areas.	REVERSE GAIN	Gain setting for Reverse transmissions.
NR	Network Repeater.	RF	Radio Frequency.
OTU	Optical Transceiver Unit.	RFI	Radio Frequency Interference.
PA	Power Amplifier.	RSL	Receive Signal Level.
PCS	Personal Communications Service.	RSA	Rural Service Area.
PSTN	Public Switched Telephone Network.	RSSI	Receive Signal-Strength Indicator.
PEP	Peak Envelope Power.	RX	Receive.
PLL	Phase Locked Loop.	SIMULCAST	The process of transmitting the same signal from two or more sites simultaneously.
QCCB	Quick Connect Connecting Block.	SMA	A type of connector.
RBS	Radio Base Station. <i>See also</i> BTS.	SMB	A type of connector.
REVERSE DIRECTION	Direction of transmission from the Mobile or portable through the repeater and onto the RBS. Uplink transmission.	TDMA	Time Division Multiple Access (equivalent to DAMPS).
		TSA	Traffic Service Area.
		TX	Transmit.
		UHF	Ultra High Frequency.
		UPS	Uninterruptable Power Supply.
		V	Volt or Volts.
		VAC	Voltage, Alternating Current.
		VDC	Voltage, Direct Current.
		VSWR	Voltage to Standing Wave Ratio.
		W	Watt or Watts.
		XPD	Cross Polarization.

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RepeaterNet Craft for the OA850C NR

DRAFT



**550-4999-02
Revision A**

**RepeaterNet Software
Version 2.2**

September 1998



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Chapter 1. Installing RepeaterNet

This chapter briefly describes the components of the RepeaterNet software, identifies minimum system requirements, and describes the installation procedure.

RepeaterNet Craft Software

The RepeaterNet **Craft** software (Craft) provides Windows 95- and Windows NT-based configuration management and alarm monitoring for individual Repeater Technologies repeaters and dynamically manages sessions in real time through one of these connections:

- ❑ A **laptop** computer with a **direct** connection to the repeaters—a technician can visit repeater sites and connect to the repeaters directly using the serial port on the laptop.
- ❑ A **laptop** or **desktop** computer with a **modem** connection to the repeater—with the modem connection, a technician need not visit the physical repeater sites to connect to the repeaters.

The Craft user interface varies, depending upon the model repeater being configured or monitored.

Minimum System Requirements

Craft system requirements include:

- ❑ Pentium 120 MHz running Windows 95 with 32 MB of memory
- ❑ Approximately 10 MB of free disk space
- ❑ Modem (if a modem connection is to be used)

NOTES:

- ❑ *The Craft system must be used with Windows 95 with Service Pack 1 Update (Version 4.00.950 A) or later releases or Windows NT, Service Pack 3 Update.*
 - ❑ *Use "Hayes-compatible" modems only. "Connect with Rockwell" certified for modems of 56K and above. US Robotics modems are not supported.*
 - ❑ *If you use a fax program such as Microsoft Fax, make sure that the Auto Answer feature is disabled. See **Appendix D. Troubleshooting** on page 38, Problem 7, for how to disable Auto Answer for Microsoft Fax.*
-

Installation Procedure

The OA850C NR Craft software is distributed on 4 HD floppy disks. To install:

1. Insert **Disk 1** in your **a:** drive.
2. From the Windows **Start** menu, select **Run**.
3. Type **a:\setup** and click on **OK**.
4. Follow the online instructions to install the Craft software.

The Craft software comes with default configuration files, which you can download to your repeater according to the repeater type and number of channels. This eliminates the need to configure the properties manually. See **Download Properties** on page 27.

Chapter 2. RepeaterNet Craft

Configuring the Repeater Connection

You must use the **RepeaterNet Craft Admin** program to configure the connection to the repeater before you can access the RepeaterNet Craft software. Follow this path from the **Start** menu to invoke the RepeaterNet Administrator:

Start -> Programs -> RepeaterNet Craft 2.2 -> RepeaterNet Craft Admin

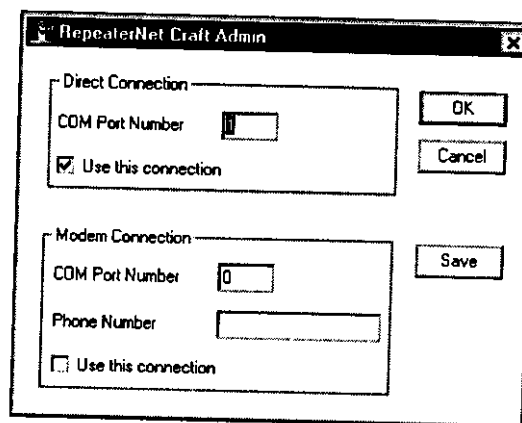
When you invoke the Administrator, a window such as the following is displayed:

You can save both **Direct** and **Dial-Out (Modem)** configurations, but remember to assign a unique **COM Port Number** to each. Also, be sure to check **Use this connection** for only one of the configurations. The connection checked is the connection RepeaterNet Craft uses to connect to the repeater.

For example, you may assign the connection type as **Direct** through **COM Port 1**. You can check the **Use this connection** box to make this your default configuration. Click on **Save**.

Next, you can save a **Modem** configuration to another COM port, such as **COM Port 2**:

1. Assign a **COM Port Number** that is different from the COM Port Number used for **Direct** connection.
2. Click on **Save**, then click on **OK** to exit RepeaterNet Admin.



Starting Craft

Double-click the Craft icon to display this window.

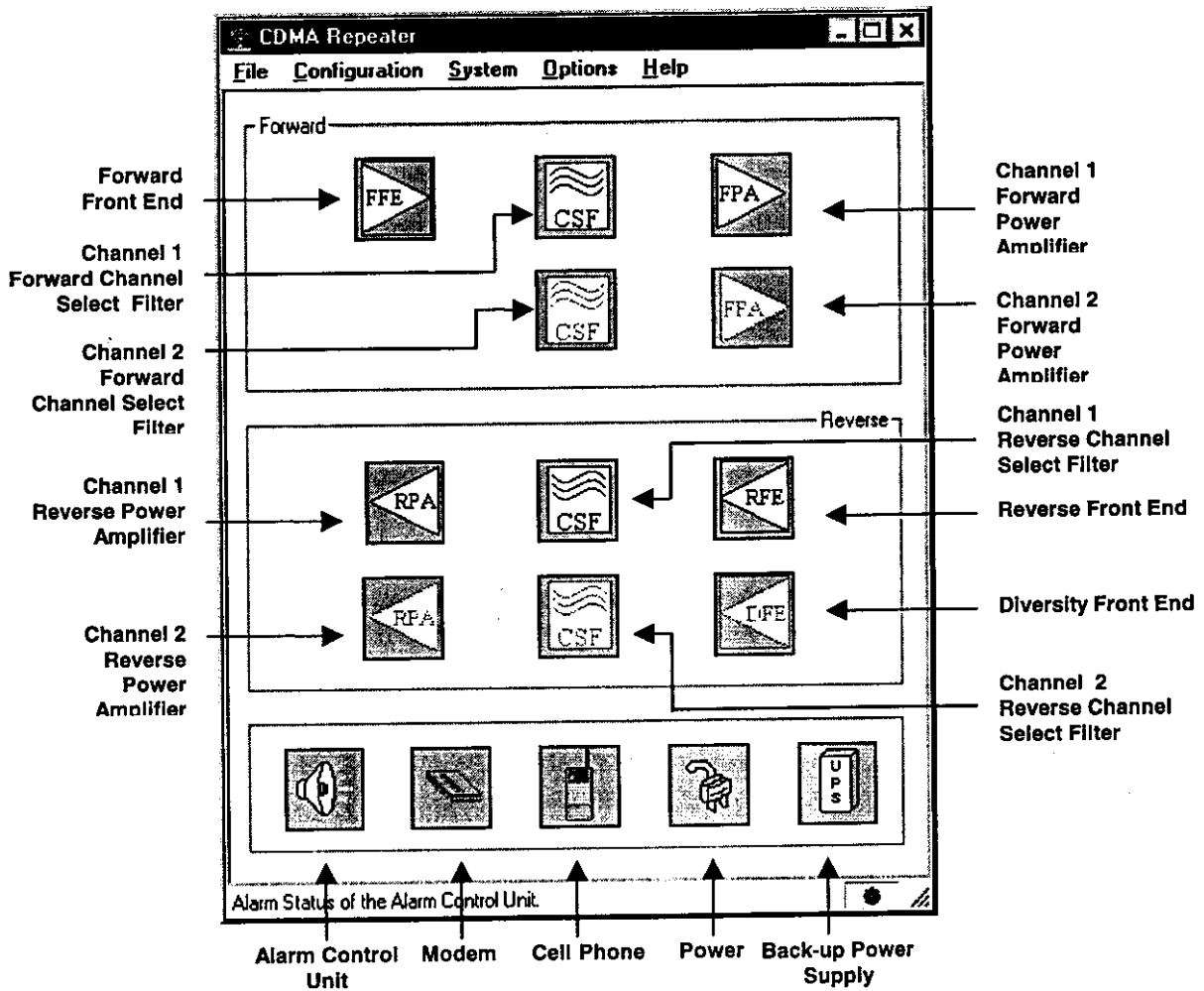
RepeaterNet connects to the repeater and displays the Craft Main Control screen for the OA850C NR.

OA850C NR Craft Main Control Screen

The Craft Main Control screen provides access to all monitor and control functions of the OA850C Network Repeater (NR).



Main Control screen icons (labeled on the following screen) provide access to subsystem status screens and report alarms.



OA850C NR Craft Main Control Screen

NOTES:

- ❑ All units are shipped with PAs turned OFF as indicated by the PA OFF indicator (a circle with a slash through it) displaying over each PA subsystem icon (FPA and RPA). PAs should remain OFF until gain is adjusted.
- ❑ The Main Control screen displays differently depending on the hardware configuration of the unit. For example, Channel 2 icons are grayed-out (unavailable) for a single-channel repeater.

Configuration

Configure the OA850C NR on subsystem **Properties** screens, which you can display from the Craft **Configuration** menu.

The Configuration menu contains the following:

Front End.....	Forward, Reverse, and Diversity
Channel 1	Available on all units
Channel 2	Available on 2-channel units only
Alarm Control Unit.....	ACU
Modem	Internal or external modem option
Cellular phone	Cellular option only
Power System	Input, battery, and internal
UPS	Backup power system

Status Reporting

Once you have configured the repeater, you can monitor and control repeater system functions on subsystem **Status** screens. Click a subsystem icon to open its status screen.

When an alarm is triggered, the subsystem icon changes appearance, blinks, and activates an audible alarm. Clicking on the icon and viewing the subsystem status screen stops the blinking and the audible alarm. The display of the icon does not revert to normal until the alarm condition is cleared.

The display of the Forward PA and Reverse PA icons also indicate the operational status of the PAs. If a PA is OFF, a circle with a slash is displayed over the associated icon.

When RepeaterNet displays a subsystem as disabled, that subsystem is not available to the repeater. For example, in repeaters without a cellular phone, the cellular icon is displayed in light gray.

Alarm Status Reporting on the Main Control Screen

RepeaterNet uses a color system to report subsystem alarm status on the Main Control screen.

The meanings of the colors, and color independent icons, is shown in the following table.

Subsystem Alarm Status	Icon Color	Color Independent Icon	Action
Normal—No Alarm	Green	N/A	N/A
Critical Alarm	Red		Call Out
Major Alarm	Yellow		Call Out
Minor Alarm	Blue		Call Out
Event	White	None	None
Disabled	Dark Gray*	N/A	None
System Not Available	Light Gray	N/A	N/A

* When all alarms in an individual subsystem are disabled or set to event severity, the icon color is displayed in dark gray.

When an alarm is triggered, the icon color of the affected subsystem changes from green (normal) to the color of the alarm definition, and the icon blinks.

RepeaterNet also offers two optional alarm features:

- ☐ **Color Independent Icons** is provided for operators unable to distinguish colors
- ☐ **Alarm Sounds** adds an audible alarm

Should more than one alarm within an individual subsystem be triggered, the higher severity alarm is reported on the Main Control screen.

For example, if both a major and a minor Reverse PA alarm triggers, a yellow subsystem icon is reported. If the major alarm is cleared while the minor alarm remains active, a blue subsystem icon is reported. Color-independent icons also report the higher severity alarm, should more than one alarm on an individual subsystem be triggered.

NOTE: *When an subsystem alarm is triggered, click the icon (to open the status screen) to terminate the icon blinking feature and silence the audible alarm. Icon color continues to report and a color independent icon (if applicable) continues to display until the alarm is cleared. Color reporting does not apply to subsystems set to Event severity.*

Defining Alarm Severity

The OA850C NR is factory-configured with a standard set of alarm severity settings. Adjust alarm severity on the subsystem **Properties** screens. See **Chapter 3. Configuring OA850C NR Properties** on page 10 for more information about alarm severity and the factory configuration.

The levels of alarm severity are:

- ☐ Critical
- ☐ Major
- ☐ Minor
- ☐ Event
- ☐ Disabled

To define alarm severity:

1. Login to a session with the repeater.
2. Select **Configuration** from the Main Control menu bar, then select a subsystem to open its **Properties** screen. For example, select **Configuration -> Channel 1**.

The **Alarms** tab is displayed.

1. Click the down-arrow next to an **Alarm** field to select a new alarm severity.
2. Click **Apply** or **OK**.

Chapter 3. Configuring OA850C NR Properties

Use the subsystem **Properties** screens to perform configuration of the repeater. To open a Properties screen, select a subsystem from the **Configuration** menu.

- ☐ Front End
- ☐ Channel 1
- ☐ Channel 2
- ☐ Alarm Control Unit
- ☐ Modem
- ☐ Cellular Phone
- ☐ Power System
- ☐ UPS

The Properties screens display tabs specific to each subsystem. Some subsystem Properties screens include tabs for redefining alarm severity and specifying operational settings; others have a single tab for redefining alarm severity.

Configuration includes:

- ☐ Redefining alarm severity
- ☐ Specifying operational settings for the repeater

Front End Properties

The **Front End Properties** screen lets you configure the Front End subsystems. This screen includes tabs that let you set the alarm severity for:

- ☐ Forward FE
- ☐ Reverse FE
- ☐ Diversity FE

Forward FE Tab

The **Forward FE** tab lets you set the alarm severity of the Forward FE alarm. The Forward FE alarm is activated when the forward signal power level is too strong and is being attenuated to protect the repeater from possible damage.

NOTE: Do not adjust power amplifier gain while this alarm is active.

Reverse FE Tab

The **Reverse FE** tab lets you set the alarm severity of the Reverse FE alarm. The Reverse FE alarm is activated when the reverse signal power level is too strong and is being attenuated to protect the repeater from possible damage.

The screenshot shows the 'Front End' dialog box with the 'Forward FE' tab selected. The dialog has a title bar with a close button. Below the title bar are four tabs: 'Forward FE', 'Reverse FE', 'Diversity FE', and 'Diversity FE Gain'. The 'Forward FE' tab is active. Inside the dialog, there is a table with two columns: 'Alarm Description' and 'Severity'. The table contains one row: 'FwdFE Alarm Props' with a severity of 'Major'. At the bottom of the dialog are three buttons: 'OK', 'Cancel', and 'Help'.

Alarm Description	Severity
FwdFE Alarm Props	Major

The screenshot shows the 'Front End' dialog box with the 'Reverse FE' tab selected. The dialog has a title bar with a close button. Below the title bar are four tabs: 'Forward FE', 'Reverse FE', 'Diversity FE', and 'Diversity FE Gain'. The 'Reverse FE' tab is active. Inside the dialog, there is a table with two columns: 'Alarm Description' and 'Severity'. The table contains two rows: 'RevFE Alarm Props' with a severity of 'Minor', and 'RevFE Protect Alarm Props' with a severity of 'Minor'. At the bottom of the dialog are three buttons: 'OK', 'Cancel', and 'Help'.

Alarm Description	Severity
RevFE Alarm Props	Minor
RevFE Protect Alarm Props	Minor

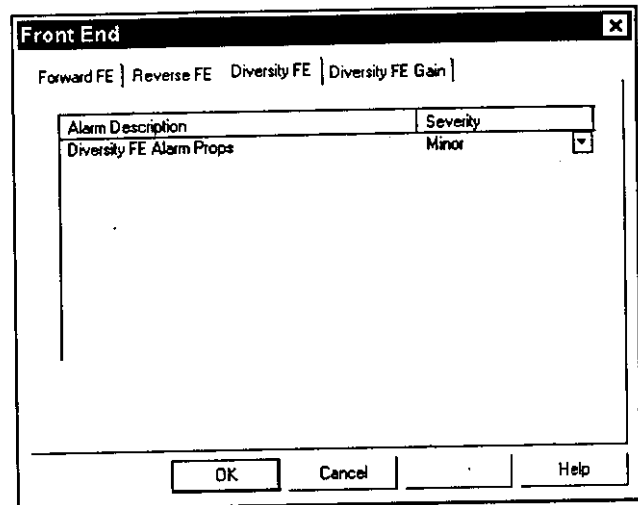
NOTE: Do not adjust power amplifier gain while this alarm is active.

Diversity FE Tab

The **Diversity FE** tab lets you set the alarm severity of the Diversity FE Alarm and set the gain of the Diversity receiver.

The Diversity FE alarm is activated when the Diversity Receive signal power level is too strong and is being attenuated to protect the repeater from possible damage.

NOTE: Do not adjust power amplifier gain while this alarm is active.

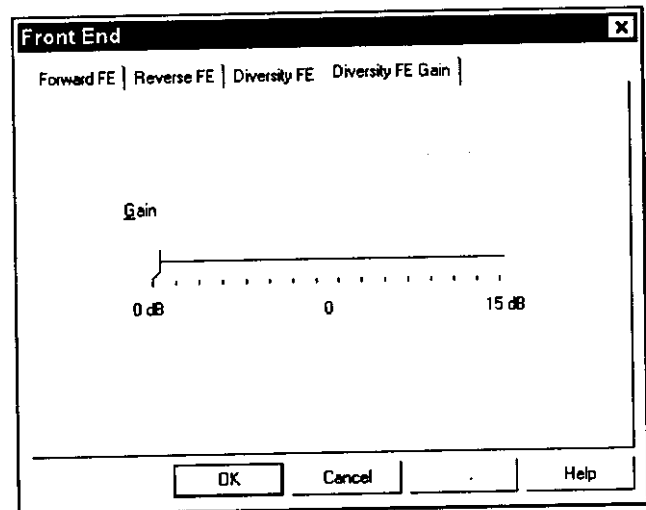


Diversity FE Gain Tab

Gain must be carefully balanced in any application to ensure proper hand-off and system operation. Note that RepeaterNet detects the configuration of the repeater and displays the applicable gain range on the **Diversity FE Gain** tab. You can adjust the Diversity FE gain. The adjustable gain range depends upon the type of repeater you are using and the power level of the power amplifiers.

To adjust Diversity FE gain:

1. Select **Configuration ->Front End** to open the Front End Properties screen.
2. Click the **Diversity FE Gain** tab.
3. Click-drag the horizontal sliders to define forward and reverse gain, noting that gain adjusts in 2 dB increments. The gain value box (centered under slider) displays selected gain.
4. Click **Apply** or **OK**.



Channel Properties

From the Main Control screen menu bar, select **Channel 1** or **Channel 2** (for 2-channel units only) to open a Channel Properties screen.

Channel properties include:

- ☐ Reverse PA
- ☐ Forward PA
- ☐ PA Control
- ☐ Reverse Filter
- ☐ Forward Filter
- ☐ Channel #
- ☐ Gain

Channel Reverse PA Tab

The Reverse PA tab shows the most recent alarm state, including severity, date, and time, for these alarms:

PA Alarm

Indicates a component failure in the power amplifier; the repeater is inoperative.

VSWR Alarm

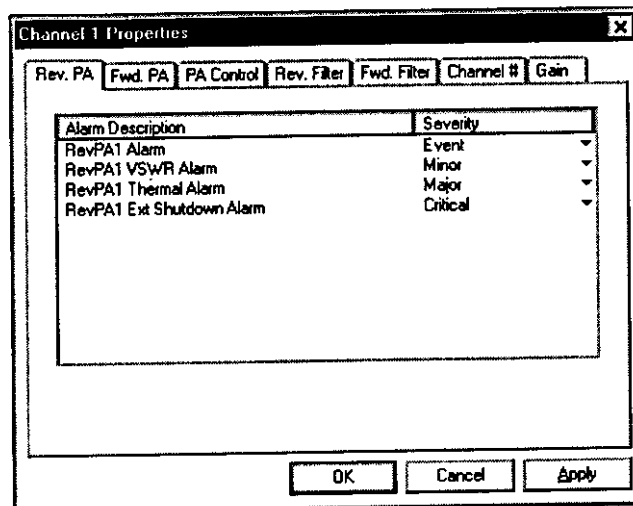
Indicates a problem with the Voltage to Standing Wave Ratio.

Thermal Alarm

Indicates the system temperature has exceeded the alarm threshold. The repeater has been shut down. When the temperature falls below subsystem tolerances, the repeater automatically reactivates the PA.

External Shutdown Alarm

Indicates that the repeater has been shut down by a user; also activates one RPA alarm.



Redefine alarm severity for the **Reverse PA** subsystem on this tab.

1. Click the down-arrow next to an **Alarm** field to select a new alarm severity.
2. Click **Apply** or **OK**.

See **Forward PA** for a sample screen.

Channel Forward PA Tab

The Forward PA tab shows the most recent alarm state, including severity, date, and time, for these alarms:

PA Alarm

Indicates a component failure in the power amplifier; the repeater is inoperative.

VSWR Alarm

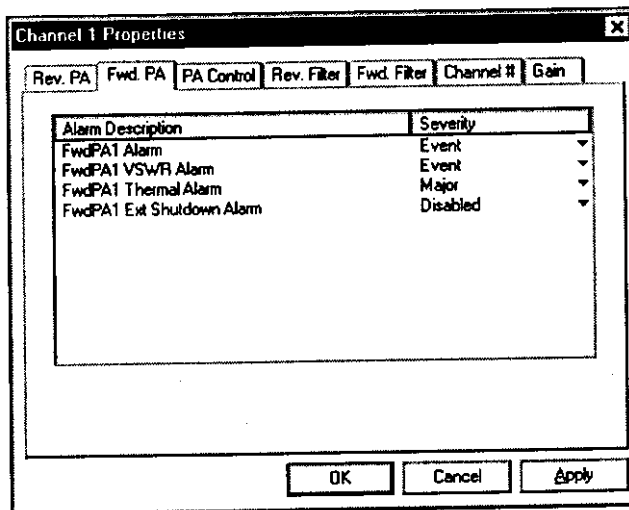
Indicates a problem with the Voltage to Standing Wave Ratio.

Thermal Alarm

Indicates the system temperature has exceeded the alarm threshold. The repeater has been shut down. When the temperature falls below subsystem tolerances, the repeater automatically reactivates the PA.

External Shutdown Alarm

Indicates that the repeater has been shut down by a user; also activates one RPA alarm.



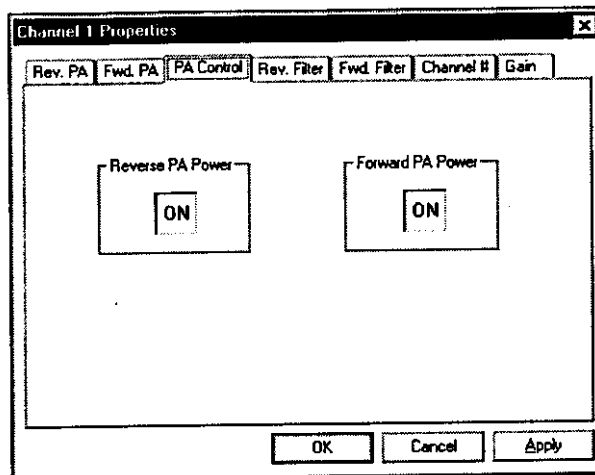
Redefine alarm severity for the **Forward PA** subsystem on this tab.

1. Click the down-arrow next to an **Alarm** field to select a new alarm severity.
2. Click **Apply** or **OK**

Channel PA Control Tab

The **PA Control** tab provides a switch to turn PA power ON or OFF.

1. Click on **ON** or **OFF** in the **PA Power** box to change the value.
2. Click **Apply** or **OK** for the setting to take effect.



Channel Reverse Filter Tab

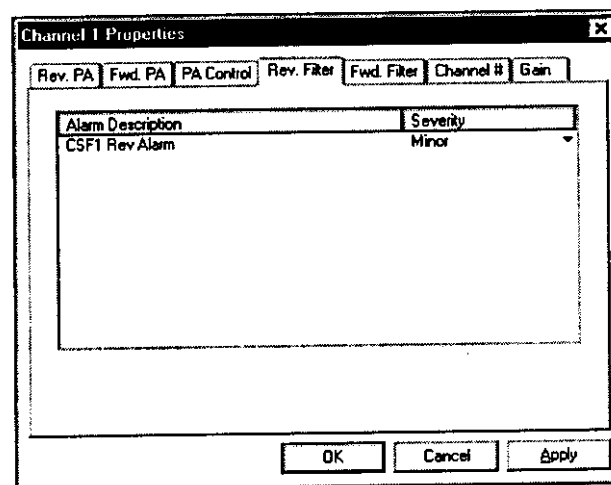
This tab displays the most recent alarm state for a single channel select filter alarm. A failure in the Reverse Filter assembly triggers an alarm and the filter becomes inoperative.

Redefine alarm severity for the **Reverse Filter** subsystem on this tab.

1. Click the down-arrow next to an **Alarm** field to select a new alarm severity.
2. Click **Apply** or **OK**

Values are Disabled, Event, Minor, Major, and Critical.

See **Forward Filter** for a screen example.



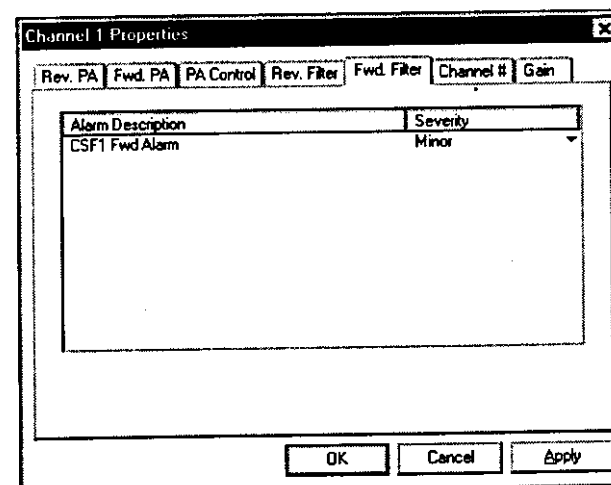
Channel Forward Filter Tab

This tab displays the most recent alarm state for a single channel select filter alarm. A failure in the Forward Filter assembly triggers an alarm and the filter becomes inoperative.

Redefine alarm severity for the **Forward Filter** subsystem on this tab.

1. Click the down-arrow next to an **Alarm** field to select a new alarm severity.
2. Click **Apply** or **OK**.

Values are **Disabled**, **Event**, **Minor**, **Major**, and **Critical**.



Channel # Tab

The **Channel #** tab lets you set the operating channel or band for Channel 1 or Channel 2. Once you select a channel, the corresponding frequencies are displayed. Consult your network administrator or the system Site Plan for the proper channel or band setting.

Channel Gain Tab

RepeaterNet detects the configuration of the repeater and displays the applicable gain range on the **Gain** tab. You can adjust Forward and Reverse gain for the selected channel.

The adjustable gain range depends upon the type of repeater you are using and the power level of the power amplifiers. RepeaterNet limits gain adjustment to valid selections only.

NOTE: Set gain for the Diversity Receiver on the Diversity FE tab of the Front End Properties screen.

Gain must be carefully balanced in any application to ensure proper hand-off and system operation.

To adjust Forward PA or Reverse PA gain:

1. Select **Configuration -> Channel 1 or Channel 2** to open the Channel Properties screen.
2. Click the **Gain** tab.
3. Click-drag the horizontal sliders to define forward and reverse gain, noting that gain adjusts in 2 dB increments. The gain value box (centered under each slider) displays selected gain.
4. Click **Apply** or **OK**.

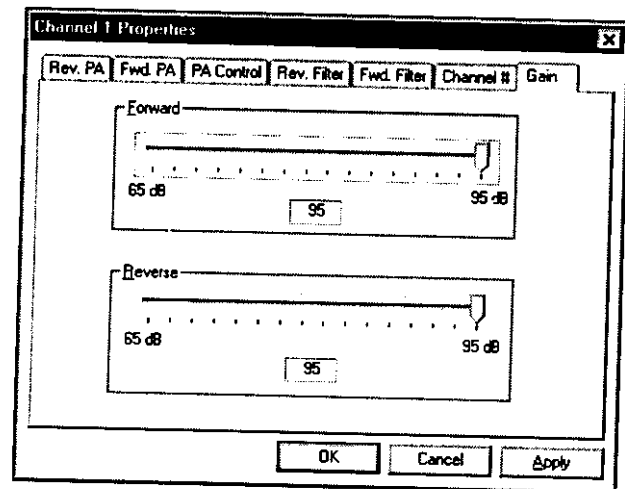
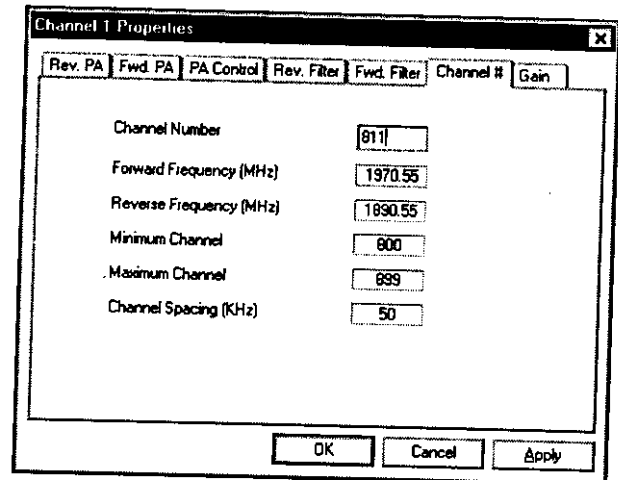
ACU Properties

Select **Alarm Control Unit** from the Main Control screen **Configuration** menu to open the **ACU Properties** screen. This screen includes tables for **I/O Descriptions**, **I/O Control**, **Alarms**, and **DC Voltage Alarm Threshold**.

The ACU subsystem provides alarm and control functions for the repeater. The ACU monitors all the repeater subsystems and reports status to a connection device or to remote devices through a dial-up modem connection. In addition to monitoring the repeater system, the ACU contains a number of external inputs and outputs to monitor and control external devices.

Inputs and Outputs

RepeaterNet lets you monitor two digital alarm inputs and one DC voltage input from external devices. You also can activate up to four external devices with two relay outputs and two digital outputs.



NOTE: Alarm settings for digital input 1 and digital input 2 are initially set to Disabled.

The inputs and outputs are as follows:

Relay Outputs 1 and 2

The two relay outputs are configured with three leads in a Form C Contact Closure, with normally closed and common connectors closed with the switch in the OFF position and normally open and common connectors closed with the switch in the ON position.

Digital Outputs 1 and 2

The two digital outputs each have two leads that provide an opto-isolated circuit that presents a low impedance connection when the switch is in the ON position and a high impedance connection when the switch is in the OFF position.

Digital Inputs 1 and 2

The two digital inputs each have leads that generate an alarm condition if the leads form a low impedance circuit (a closed contact), and a clear condition if the leads form a high impedance circuit (an open circuit).

For information about connecting inputs and outputs to the repeater, see the *OA850C NR Operations Manual*.

ACU I/O Descriptions Tab

Label external equipment connected to the repeater's inputs and outputs using the **I/O Descriptions** tab. External equipment could be a security light or any other site equipment.

To add I/O Descriptions:

1. Select **Configuration->Alarm Control Unit** to open the ACU Properties screen. The **I/O Descriptions** tab is active.
2. Provide I/O Descriptions in available data fields.
3. Click **Apply** or **OK**.

ACU I/O Controls Tab

The **I/O Controls** tab contains switches to turn Relay Outputs and Digital Outputs for channels 1 and 2 ON or OFF.

See **Inputs and Outputs**.

Alarm Control Unit Properties

I/O Descriptions | I/O Controls | Alarms | Ext. DC Voltage

Enter the descriptions for the device's inputs and outputs.

Outputs

Relay 1: Digital:

Relay 2: Digital:

Inputs

DC: Digital 1:

Digital 2:

OK Cancel Apply

Alarm Control Unit Properties

I/O Descriptions | I/O Controls | Alarms | Ext. DC Voltage

Relay Outputs

1: 2:

ON ON

Digital Outputs

1: 2:

ON ON

OK Cancel Apply

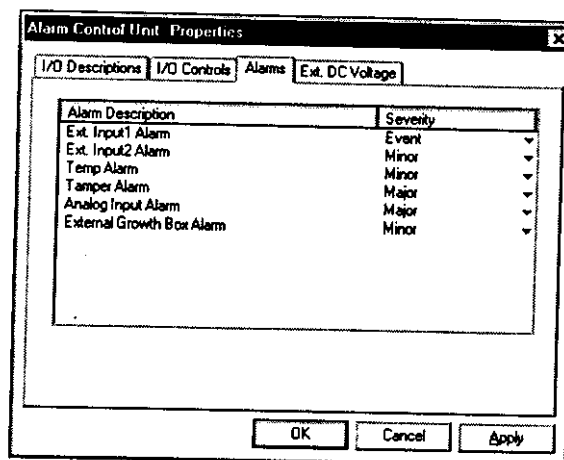
ACU Alarms Setting Tab

Redefine alarm severity for ACU subsystems on the **Alarms Settings** tab.

1. Click the down-arrow next to an **Alarm** field to select a new alarm severity.

2. Click **Apply** or **OK**.

Values are Disabled, Event, Minor, Major, and Critical.



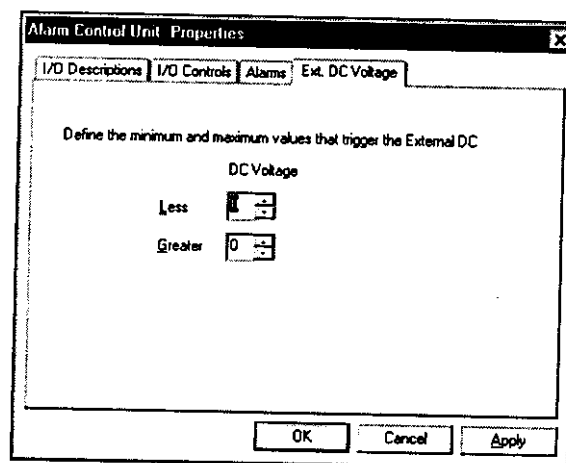
ACU DC Voltage Alarm Threshold Tab

RepeaterNet can monitor an external DC voltage power source (a battery) in a range of 0 to 60 volts in 250 mV increments. In addition to monitoring the voltage level, you can define upper and lower limits for the voltage that is to activate the DC Voltage alarm in the ACU subsystem.

Monitor the voltage of a DC power source (supplied by you) used to power external site equipment using the **DC Voltage Alarm Threshold** tab. An alarm is triggered if the voltage fluctuates from a defined operating range.

To define an operating range for DC voltage:

1. Select **Configuration->Alarm Control Unit** to open the ACU Properties screen.
2. Click the **DC Voltage Alarm Threshold** tab.
3. Define (type in or arrow-click) the normal operating range for the DC power source in the **Less Than** and **Greater Than** data fields.
4. Click **Apply** or **OK**.



Modem Properties

From the Main Control screen menu bar, select **Configuration->Modem** to open the Modem Properties screen. This screen has three tabs:

Alarm Setting

Lets you set the alarm severity for the Modem alarm. This alarm indicates a failure of the internal modem.

Modem Setting

Lets you define the port settings for the internal or external modem.

Pager Setting

Lets you configure a pager to be notified when a certain severity level alarm occurs.

Alarm Setting

Use the **Alarm Setting** tab to redefine alarm severity for the repeater's modem.

1. Click the down-arrow next to an **Alarm** field to select a new alarm severity.
2. Click **Apply** or **OK**.

Values are Disabled, Event, Minor, Major, and Critical.

Modem Setting

Define modem settings for the repeater's modem using the **Modem Properties** tab.

To define modem settings:

1. Select **Modem** from the Main Control screen **Configuration** menu to open the Modem Properties screen.
2. Click the **Modem Settings** tab.
3. Define the **Setup String**, **Phone Number**, and **Call Attempts**.
4. Click **Apply** or **OK**.

Setup String is reserved for configuring a cell phone or modem. The cellular phone setup string is **S37=6**.

Phone Number is the phone number of a remote computer to be called. This value is **0** unless you are using RepeaterNet Network Management software or other network management software.

Call Attempts is the number of callout attempts before disconnecting; a zero (0) disables calling.

Baud Rate is the communication speed between the modem and cell phone (which must be greater than 2400). Baud Rate is adjusted automatically downwards by the modem when necessary.

Set **Parity** to **None**. Parity must be set the same as the computer's modem.

Set **Data Bits** to **8**. Data Bits must be set the same as the computer's modem.

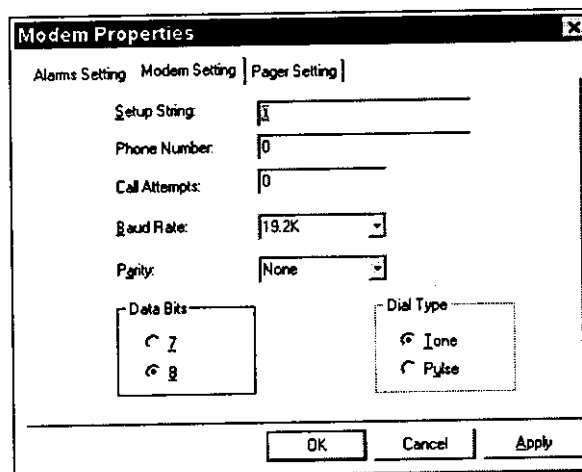
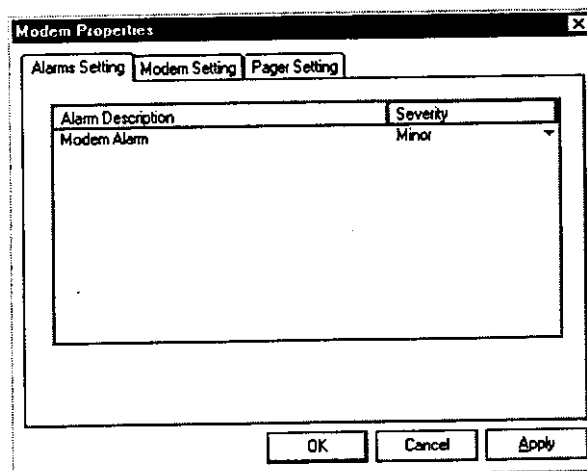
Set **Dial Type** to **Tone**.

Over-the-Air Repeater Modem Setup

If an external wireless interface (such as the Telular) is connected to an OA (Over-the-Air) repeater, you must properly configure the repeater's modem. If the modem is not properly set up, few if any of the calls to the repeater will be successful.

To properly set up your modem for all Repeater Technologies OA products (including the OA800, OA850, and OA1900):

1. Connect to the repeater through the local Craft port.



2. Launch RepeaterNet.
3. Once the connection to the repeater has been established, select **Configuration** from menu bar at the top of the screen.
4. From the **Configuration** menu, select **Modem Properties**.
5. Click on the **Modem Setting** tab.
6. Enter **S37=6** in the **Modem Init String** field (the top field on the Modem tab).
7. Enter a **Phone Number**; for example **9, (222) 123-4567**. Each comma creates a 2-second delay in dialing. Parentheses () and spaces are ignored.
8. Enter the number of times you want RepeaterNet to attempt to make the connection; for example, **3**; **0** (zero) in this field disables calling.
9. Click on **Apply** or **OK** at the bottom of the window.

This procedure forces the repeater to initialize the modem to 2400 baud, which improves the connection on analog wireless networks.

Changes made to the default settings on the Modem Properties screen take effect upon exiting RepeaterNet.

In addition:

- ☐ If you configure a repeater to automatically call out and report alarm status, the repeater COM port settings **must match** the settings of the modem to be called.
- ☐ For users to log in to the repeater with a modem, the port settings of their computer's modem (defined in the configuration file) **must match** the settings of the repeater modem.
- ☐ If the repeater is equipped with an internal modem, the setup string is controlled automatically by the repeater's hardware. If the repeater is connected to an external modem, consult the modem's documentation for the setup string.
- ☐ Changes you make to the default settings on the Modem Properties screen take effect upon exiting RepeaterNet.

Pager Setting

You can set RepeaterNet to send out a page when a certain severity level alarm occurs with the **Pager Setting** tab.

A page is generated if the summary alarm severity is greater than or equal to the **Minimum Severity** you select. When a page request is detected, the repeater terminates any current modem connection and generates a page. The page format consists of the repeater number followed by the severity level; for example, 123456-2.

If a change in the current alarm severity is detected, note the following:

- ☐ If the **Minimum Severity** is set to **Major** and a **Major** alarm comes in, a page with a severity of **2** is generated.

The screenshot shows the 'Modem Properties' dialog box with the 'Pager Setting' tab selected. The dialog has three tabs: 'Alarms Setting', 'Modem Setting', and 'Pager Setting'. The 'Pager Setting' tab contains the following fields and controls:

- Pager Number:** A text input field with a cursor at the end.
- Call Attempts:** A numeric input field with the value '0'.
- Repeater Number:** A numeric input field with the value '0'.
- Minimum Alarm Severity:** A dropdown menu currently set to 'Critical'.

At the bottom of the dialog are three buttons: 'OK', 'Cancel', and 'Apply'.

- ☐ If a **Critical** alarm is detected, page is generated again with a severity of **3** (Critical plus Major).
- ☐ If the **Major** alarm is cleared but the **Critical** alarm remains, a page is generated with a severity of **1** (Critical)
- ☐ If the **Critical** alarm is cleared, a page is generated with a severity of **0**.
- ☐ If a **Minor** alarm is detected, no page is generated because the **Minimum Severity** is set to **Major**.
- ☐ **Events** do not generate a page.

Severity numbers are:

No Alarms	0	Minor	4
Critical	1	Critical + Minor	5
Major	2	Major + Minor	6
Critical + Major	3	Critical + Major + Minor	7

To set a pager:

- Click on the **Pager Setting** tab of the **Modem Properties** screen.
- Enter the **Pager Number**, the number of times RepeaterNet should attempt to call the pager number (**Call Attempts**), and the number of the repeater (**Repeater Number**).

The **Pager Number** is the phone number to be called. This reflects the pager phone number, including networking access number (9), 1, and area code (if needed). Access the network dial number and wait 5 seconds before sending the page sequence.

Several commas must follow the phone number—each comma generates a delay of 1 second. Generally, it takes about 3 seconds for the pager company to pick up the line, and a maximum of 5 seconds before they drop the connection. A good delay would be 5 seconds, in which case you would add 5 commas; for example, **9 1 (408) 555-1212,,,,,**. Spaces, dashes, and parentheses are ignored.
- Enter the **Call Attempts**, which are the number of retry calls to be attempted. A value of 0 in this field disables paging.
- Enter the **Repeater Number** (a system identification number or description).
- Select the minimum alarm severity for paging. Values can be **Critical**, **Major**, or **Minor**.
- Click on **Apply** to set the values without exiting the properties screen; click on **OK** to set the values and exit.

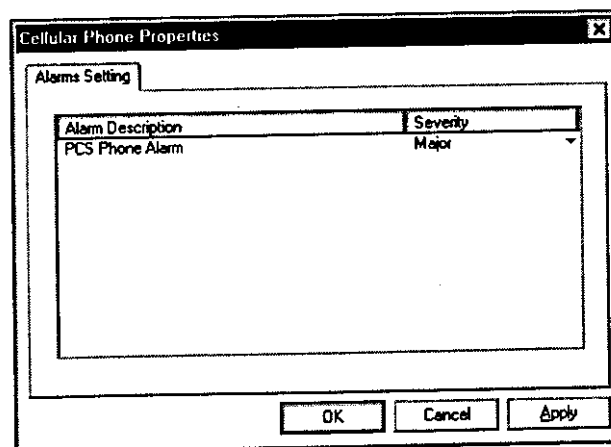
Cell Phone Properties

From the Main Control screen **Configuration** menu, select **Cellular Phone** to open the **Cell Phone Properties** screen.

The **Alarms** tab lets you set the alarm severity for the Cellular Alarm. This alarm indicates a failure of a cellular phone.

To change alarm severity:

- Click the down-arrow next to an **Alarm** field to select a new alarm severity.



1. Click the down-arrow next to an **Alarm** field to select a new alarm severity.
2. Click **Apply** or **OK**.

Severity levels include **Disabled**, **Event**, **Minor**, **Major**, and **Critical**.

NOTE: *This severity should be minor. The Cell Phone alarm is generated when the cell phone fails to report an alarm after all retry attempts by either the modem or the pager. This alarm clears when the cell phone succeeds in reporting an alarm.*

When there is no cell phone, the Cell Properties selection is disabled.

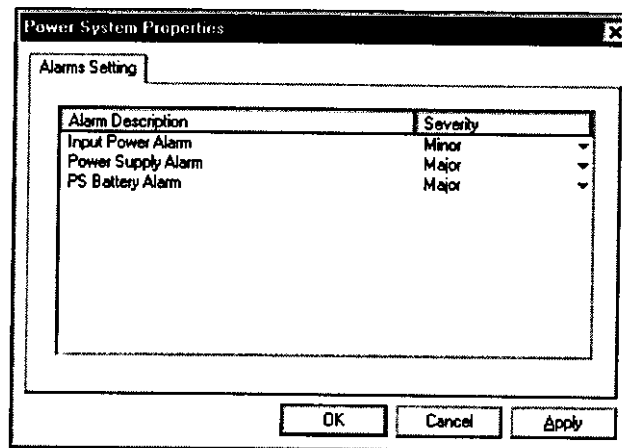
Power System Properties

From the Main Control screen **Configuration** menu, select **Power System** to open the **Power System Properties** screen. This screen lets you access initial configuration settings for the power subsystem.

Redefine alarm severity for Power systems using the **Alarms Setting** tab.

1. Click the down-arrow next to an **Alarm** field to select a new alarm severity.
2. Click **Apply** or **OK**.

Values are **Disabled**, **Event**, **Minor**, **Major**, and **Critical**.



The **Alarm Setting** tab lets you set the alarm severity of the following alarms:

Input Power Alarm

The input power to the repeater is out of system tolerances.

Power Supply Alarm

The internal system power of the repeater is out of tolerances.

Battery Alarm

The voltage of the internal battery is below tolerances. This battery supplies power to the ACU, modem, and cell phone in the event of a system power failure, letting the repeater call out and report its status. It also supplies power to the memory that stores the Alarm and Event Log.

Battery Charger Alarm

The internal battery charger is not charging the internal battery.

NOTE: *The internal battery does not provide power for RF components and the repeater will not be able to provide RF coverage during a power failure.*

Backup Power System (UPS) Properties

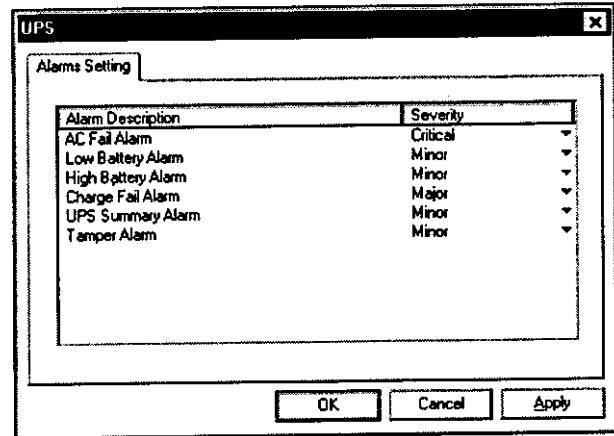
The UPS Properties screen lets you access initial configuration settings for the optional, external backup power supply.

From the Main Control screen menu bar, select **Configuration -> UPS** to open the **UPS Properties** screen.

Redefine alarm severity for backup power systems using the **Alarms Setting** tab.

1. Click the down-arrow next to an **Alarm** field to select a new alarm severity.
2. Click **Apply** or **OK**.

Values are **Disabled**, **Event**, **Minor**, **Major**, and **Critical**.



You can set the severity for the following alarms:

AC Fail Alarm

Indicates that the input power to the BUPS has failed. In this case, the BUPS provides 40 or 80 amp-hours (depending upon which BUPS model is installed) of backup power for the repeater before shutdown. (The AC source powers the charger.)

Battery Low Alarm

Indicates that battery voltage of the BUPS is below operating tolerances and the BUPS cannot power the repeater.

Battery High Alarm

Indicates that battery voltage of the BUPS is above operating tolerances and the BUPS cannot power the repeater.

Charge Fail Alarm

Indicates that the internal charger of the BUPS has failed and the BUPS is unable to recharge its batteries.

Summary Alarm

Indicates that one or more of the BUPS alarms have been triggered.

Tamper Alarm

Indicates that the door of the BUPS is open.

Chapter 4. Monitoring OA850C NR Status

Monitor and control repeater system functions on subsystem **Status** screens. Click a subsystem icon to open its **Status** screen.

Each Status screen includes one or more of the following tabs:

Alarms

Reports present subsystem alarm states, with date and time stamps.

Measurements

Reports power and operational temperature measurements, including Low and High values. A Reset Low/High button resets values.

Voltages

Reports present voltages for a subsystem.

Control

Includes ON/OFF switches for internal and external subsystem hardware.

Status screens for the OA850C NR are:

- ☐ Front End Status
- ☐ Channel Status
 - ™ Filter Status (Forward and Reverse)
 - ™ PA Status (Forward and Reverse)
 - ⇒ Alarm Control Unit (ACU) Status
 - ⇒ Modem Status
 - ⇒ Cellular Phone Status
 - ⇒ Power System Status
 - ⇒ UPS Status

Front End Status

Click an FFE (Forward Front End) icon to display the **Front End Status** screen. The Front End Status screen **Alarm** tab reports these alarms:

Forward FE alarm

Activated when the forward signal power level is too strong and is being attenuated to protect the repeater from possible damage.

Reverse FE alarm

Activated when the reverse signal power level is too strong and is being attenuated to protect the repeater from possible damages.

Alarm			
Description	Status	Date	Time
FwdFE Alarm Status	Active	Jan 01, 2000	12:00:00 AM

Alarm			
Description	Status	Date	Time
RevFE Alarm Status	Active	Jan 01, 2000	12:00:00 AM
RevFE Protect Alarm Status	Active	Jan 01, 2000	12:00:00 AM

Diversity FE alarm

Activated when the Diversity Receive signal power level is too strong and is being attenuated to protect the repeater from possible damage.

Channel Filter Status

Click a Channel 1 or Channel 2 filter icon (sine waves) to open a filter Status screen, which reports a CSF1 Forward Alarm (Forward Filter) and CSF1 Reverse Alarm (Reverse Filter) with date and time stamps. A failure in the Reverse or Forward filter assembly triggers an alarm.

Channel PA Status

Click a Channel 1 or Channel 2 FPA or RPA icon to open a PA Status screen.

PA Alarm Tab

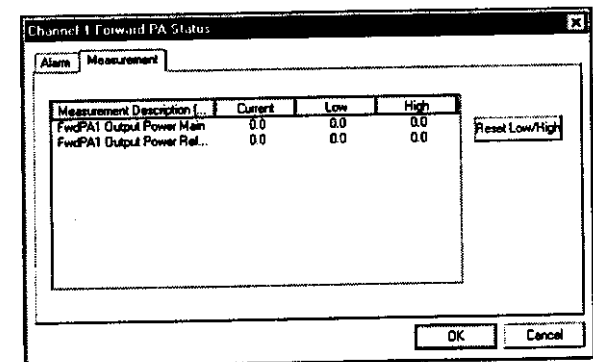
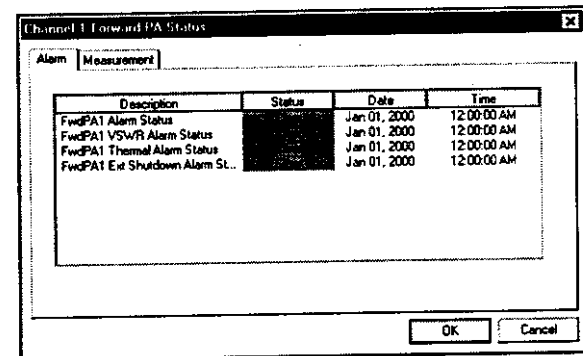
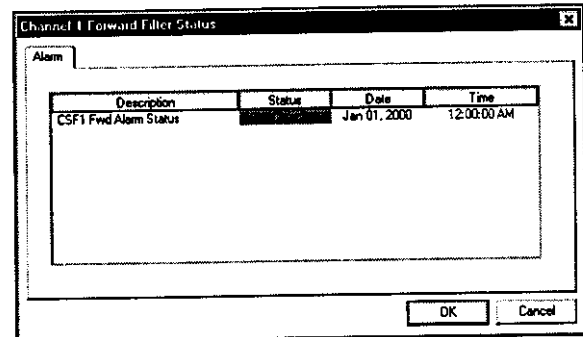
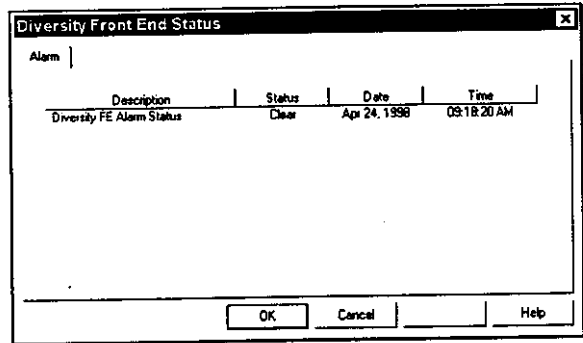
The PA Alarms tab reports subsystem alarms with date and time stamps: A failure in the Forward or Reverse PA assembly triggers an alarm.

PA Measurement Tab

The Channel 1 and Channel 2 PA Measurement tabs reports the output power of the repeater, including low and high output values. To reset low and high output values, click **Reset Low/High**.

ACU Status

Click the ACU icon to open the **ACU Status** screen. There are two tabs—**Alarm** and **Measurement**.



ACU Alarm

The **Alarm** tab reports subsystem alarms with date and time stamps. A failure in the ACU assembly triggers an alarm.

The ACU alarms include:

External Input Alarms (1 and 2)

An alarm generated from optional, external equipment.

Temperature Alarm

The system temperature threshold has been exceeded.

Tamper Alarm

The repeater door is open.

Analog Input Alarm

The upper or lower limits for monitoring of the analog input DC voltage source have been exceeded.

Description	Status	Date	Time
Ext. Input1 Alarm Status (0)	Disabled	Jan 01, 2000	12:00:00 AM
Ext. Input2 Alarm Status (0)	Disabled	Jan 01, 2000	12:00:00 AM
Temp Alarm Status	Disabled	Jan 01, 2000	12:00:00 AM
Tamper Alarm Status	Disabled	Jan 01, 2000	12:00:00 AM
Analog Input Alarm Status (0)	Disabled	Jan 01, 2000	12:00:00 AM
External Growth Box Alarm Status	Disabled	Jan 01, 2000	12:00:00 AM

Measurement Description	Current	Low	High
Temp Value	0.0	0.0	0.0
Analog Input Value	0.0	0.0	0.0

Reset Low/High

Measurement

The **Measurement** tab reports current, low, and high system temperature and DC voltage source values. Click on the **Reset Low/High** button to reset the low and high values.

Modem Status

Click the Modem icon to open the **Modem Status** screen, which reports a modem alarm with a date and time stamp. Internal modem component failure triggers an alarm.

Description	Status	Date	Time
Modem Alarm Status	Disabled	Jan 01, 2000	12:00:00 AM

Cell Phone Status

Click the Cell Phone icon to open the Cell Phone Status screen, which reports a Cell Phone Alarm with a date and time stamp. Internal cellular phone component failure triggers an alarm.

Description	Status	Date	Time
PCS Phone Alarm Status	Disabled	Jan 01, 2000	12:00:00 AM

Power System Status

Click the Power icon to open the **Power System Status** screen. This screen allows access to monitoring and operating tasks for the repeater's power subsystem.

Alarm

The **Alarms** tab reports the status of the following alarms with severity, date, and time information for each:

Input Power Alarm

Indicates the input power to the repeater is out of tolerances.

Power Supply Alarm

Indicates system power of the repeater is out of tolerances.

Battery Alarm

Indicates the voltage of the internal battery is out of tolerances. This battery supplies power to the ACU, modem, and cellular phone in the event of a system power failure, letting the repeater call out and report its status. It also supplies power to the memory that stores the Alarm and Event Log.

Battery Charger Alarm

Indicates that the internal battery charger is not charging the internal battery.

NOTE: The internal battery does not provide power for RF components and the repeater will not be able to provide RF coverage during a power failure.

Description	Status	Date	Time
Input Power Alarm Status	OK	Jan 01, 2000	12:00:00 AM
Power Supply Alarm Status	OK	Jan 01, 2000	12:00:00 AM
PS Battery Alarm Status	OK	Jan 01, 2000	12:00:00 AM

Description	Voltage
PS Battery Volts	0.0
PS Volts	0.0

Voltages

The Voltages tab shows the current power values for Battery Volts, Channel 1 PA Volts, and Channel 2 PA volts.

UPS Status

The **UPS Status** screen allows access monitoring of the optional, external backup power supply.

This screen includes an **Alarms** tab, which displays the alarm status of the following alarms:

AC Fail Alarm

Indicates that the input power to the BUPS has failed. In this case, the BUPS provides 40 or 80 amp-hours (depending upon which BUPS model is installed) of backup power for the repeater before shutdown. (The AC source powers the charger.)

Battery Low Alarm

Indicates that battery voltage of the BUPS is below operating tolerances and the BUPS cannot power the repeater.

Battery High Alarm

Indicates that battery voltage of the BUPS is above operating tolerances and the BUPS cannot power the repeater.

Charge Fail Alarm

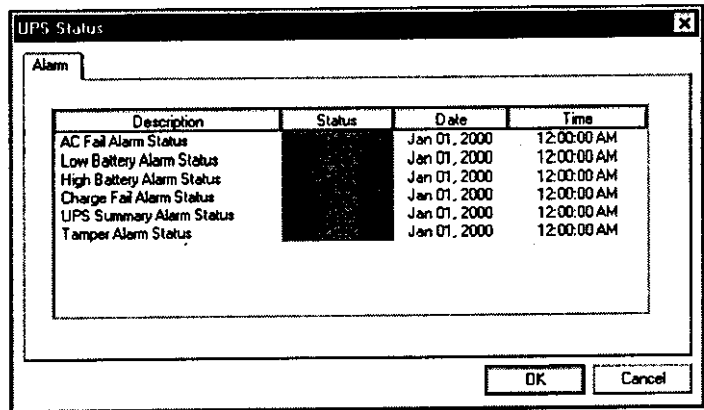
Indicates that the internal charger of the BUPS has failed and the BUPS is unable to recharge its batteries.

Summary Alarm

Indicates that one or more of the BUPS alarms have been triggered.

Tamper Alarm

Indicates that the door of the BUPS is open.



The screenshot shows a window titled "UPS Status" with a tab labeled "Alarm". Inside the window is a table with four columns: "Description", "Status", "Date", and "Time". The table contains six rows of alarm events, all dated "Jan 01, 2000" at "12:00:00 AM". The "Status" column for all entries is blacked out. At the bottom right of the window are "OK" and "Cancel" buttons.

Description	Status	Date	Time
AC Fail Alarm Status		Jan 01, 2000	12:00:00 AM
Low Battery Alarm Status		Jan 01, 2000	12:00:00 AM
High Battery Alarm Status		Jan 01, 2000	12:00:00 AM
Charge Fail Alarm Status		Jan 01, 2000	12:00:00 AM
UPS Summary Alarm Status		Jan 01, 2000	12:00:00 AM
Tamper Alarm Status		Jan 01, 2000	12:00:00 AM

Chapter 5. RepeaterNet Commands

Commands available from the OA850C NR Main Control screen's menu bar are described in this chapter.

File Menu—OA850C Craft

Open the Main Control screen **File** menu to display the RepeaterNet commands described in this section.

Download Properties

You can download all settings previously uploaded to a repeater with the **Download Properties** command. You can use **Download Properties** to:

- ☐ Download the default configuration file distributed with your Craft software to avoid having to manually configure each setting.
- ☐ If you have used the **Upload Properties** command to store repeater configuration settings.

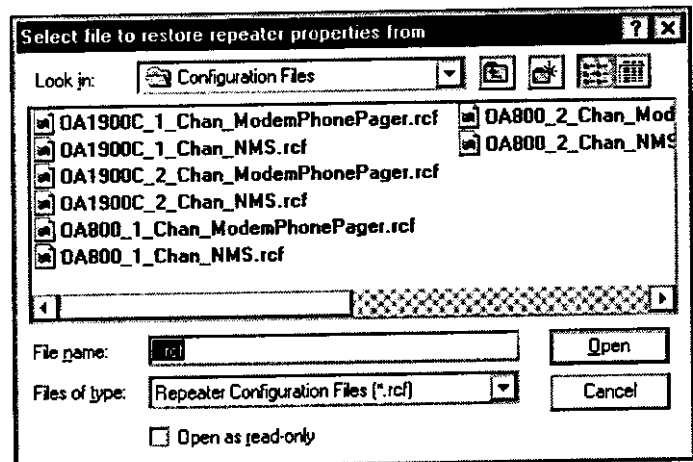
The following preset configuration files are distributed with RepeaterNet Craft installation software and can be found by following this path:

Program Files -> Repeater Technologies -> RepeaterNet Craft 2.1 -> Config Files

Configuration File	Configuration
OA850C_2_Chan_NMS.rcf	OA850C repeater <i>without</i> modem or phone
OA850C_2_Chan_ModemPhoneNMS.rcf	OA850C repeater <i>with</i> modem or phone

To download settings to a repeater using the standard repeater configuration file:

- From the Craft Main Control **File** menu, select **Download Properties**; a confirmation box is displayed to give you an opportunity to change your mind about the download operation.
- Click on **OK** to proceed; a **Select file to restore** box is displayed.
- Select the repeater configuration file whose properties you want to download.
- Click on **Open** to proceed with the download.



Upload Properties

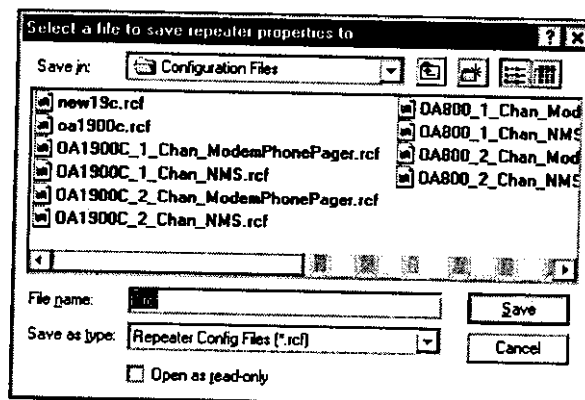
System settings are stored in a repeater configuration (.rcf) file, which you can use to download all settings from one repeater to additional repeaters in a network, or to configure a replacement unit.

Once you have configured a repeater, you can upload the configuration from that repeater to your workstation with the **Upload Properties** command. You then can use the **Download Properties** command to copy the configuration to individual repeaters in your network.

To upload system settings and create a repeater configuration file:

1. Select a repeater and open Craft.
2. Select **File->Upload Properties** to open the **Select a file to save repeater properties to** dialog box.
3. Enter a name for the file without a file extension. An .rcf extension is added automatically to the file name; for example, *filename.rcf*.
4. Click **Save** to initiate the upload.
5. Click **OK** when the upload is complete.

Save a copy of the repeater configuration file on a floppy disk for safekeeping.



NOTES:

- ❑ When you create a backup file, be aware that Repeater Configuration (.rcf) files created using a Network Monitor login include IDs and passwords.
- ❑ The Repeater Configuration (.rcf) file is saved in the RepeaterNet program directory.

Update Repeater Firmware

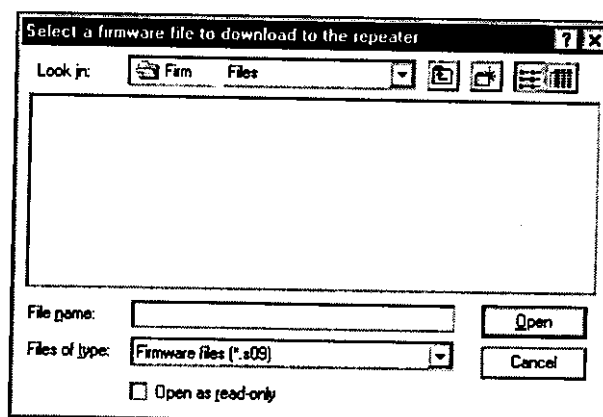
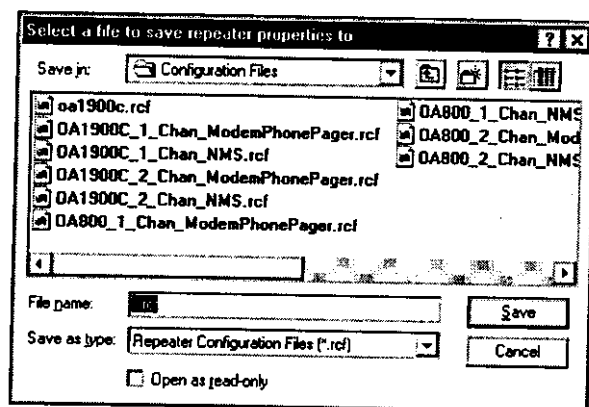
Install a firmware upgrade with the **Update Repeater Firmware** command. Note that firmware updates are sent automatically to the designated point of contact for every affected owner of the repeater. Update packages are sent using overnight delivery and include a detailed notice, a floppy disk, and installation instructions. Any questions concerning the update should be directed to the Repeater Technologies Customer Service Department.

To install a firmware upgrade:

1. Read documentation provided with the firmware upgrade.
2. Login to a session with the repeater to be upgraded.
3. Insert the upgrade disk into the computer's floppy drive.
4. From the Main Control screen menu bar, select **File->Update Repeater Firmware**.

An **Open** dialog box is displayed to let you save the repeater's configuration. You can choose to select a file into which the configuration should be saved, or click on **Cancel** to proceed with the firmware update.

- To save the configuration and continue with the firmware update, select an .rcf file and click **Open**.
- If you do not want to save the repeater configuration, click on **Cancel**.



- Clicking **Open** or **Cancel** causes the upload operation to proceed; an **Uploading Repeater** window displays the progress of the upload.
- 5. When the upload is complete, the **Select a firmware file to download to the repeater** box is displayed. In the **Look In** box, select the drive in which the upload disk is located.
- 6. Double-click the upgrade file. It is labeled with an **.s09** extension—for example, *filename.s09*. The previous firmware version is overwritten.
- 7. When the upgrade is complete, the repeater's configuration is restored automatically from the file you chose in the **Open** dialog.

Exit

The **Exit** command ends an active session with RepeaterNet and returns to the Welcome screen.

Configuration Menu—OA850C NR Craft

Initial configuration of the repeater is done from the Configuration menu commands. See **Chapter 4. Configuring OA850C NR Properties** on page 10 for detailed information.

System Menu—OA850C NR Craft

Open the **System** menu to display the **Properties** and **Alarm and Event Log** commands described in this section.

Properties

Select **Properties** from the **System** menu to open the **System Properties** screen.

NOTE: When the repeater is on a network, the system name must be entered to match that at the Network Management Station in order for unsolicited alarms to be recognized.

System Tab

The **System** tab includes data fields for storing site-specific information—the system name (name of the repeater), brief site information (such as a network name or city location), and the repeater phone number for a repeater with a modem option.

Entering summary data on the System Tab, although optional, is recommended. As a minimum, type a name for the repeater in the **System Name** field: during automatic reporting, the repeater name is displayed in the title bar of the Main Control screen, identifying the selected repeater.

To record system data:

1. Type required information in the data fields.
2. Click **Apply** or **OK**.

System Properties	
System System Inventory System Login	
System Name:	Midcal
Site Info1:	Coyote
Site Info2:	0
Site Phone Number:	555-4968
OK Cancel Apply Help	

System Inventory Tab

The **System Inventory** tab includes data fields that provide information about the repeater to which you are connected. RepeaterNet reads this information directly from the repeater upon successful login.

These information-only fields are described as follows:

Assembly Part Number

The part number of the repeater (for example, 090-1200-09).

Serial Number

The 9-digit serial number of the repeater.

Date Code

The date the repeater was built.

Hardware Revision

The repeater hardware revision (such as Rev. A).

Boot Code Version

The version of the boot code installed in the repeater.

Installed Options

Optional internal equipment in the repeater (such as a cell phone).

Firmware Version

The firmware version installed in the repeater.

The screenshot shows the 'System Properties' dialog box with the 'System Inventory' tab selected. The fields are as follows:

System	System Inventory	System Login
Assembly Part Number:	090-1200-09	
Serial Number:	0	
Date Code:	0	
Hardware Version:	0	
Boot Code Version:	70-01-60	
Installed Options:	0	
Firmware Version:	70-02-04	

Buttons: OK, Cancel, Help

Login Tab

The **Login** tab includes fields to type in login IDs and passwords and to configure the Auto-Logout function.

In the **Auto-Logout Inactivity Time** field, define how long RepeaterNet should wait, during a period of inactivity, before terminating a session. A time interval in minutes between 1 and 60 can be defined independently for each access level. If you enter a zero in a time field, this feature is disabled.

NOTE: When the repeater is part of a network, the time field must be zero (0).

The screenshot shows the 'System Properties' dialog box with the 'System Login' tab selected. The fields are as follows:

System	System Inventory	System Login
Login Type	Login ID	Password
Craft	CRAFT	0A800
Network Monitor	NETMON	0A800
Factory		
Auto-Logout Inactivity Time	0	0

Buttons: OK, Cancel, Apply

To change a login ID or password:

1. Login to the repeater (as an administrator).
2. Select **Properties...** from the **System** menu.
3. Click the **Login** tab.
4. Type the new login ID or password (using six or fewer characters) into the appropriate fields.
5. Write down login IDs and passwords and secure in a safe place.
6. Click **Apply** or **OK** to set the new information.
7. Notify affected operators of ID and password changes.

NOTE: When the repeater is networked, this information also must reside in the NMS Database.

Alarm and Event Log

Open the **Alarm and Event Log** from the System menu to view the alarm and event history of the OA1900 NR. The log is dynamically updated during viewing.

Line entries in the Alarm and Event Log are organized as follows:

1. Subsystem affected by an alarm or event
2. Alarm severity
3. Date and time stamp

Saving , Printing, and Editing the Log

Alarm and Event Log entries can be printed, saved, or edited using Notepad. Click on **Run Notepad**; a copy of the Alarm and Event Log is displayed in a Notepad window, in which you can edit the log. To print or save the log, select **Print** or **Save as...** from the Notepad **File** menu.

Options Menu—OA850C NR Craft

Open the **Options** menu to display the **Color Independent Icons** and **Alarm Sounds** RepeaterNet commands.

Color Independent Icons

Color Independent Icons are special graphic indicators designed to assist operators unable to distinguish colors. As part of the alarm reporting system, Color Independent Icons display on the Main Control screen for a Critical, Major, or Minor alarm. By default, the Color-Independent Icons feature is OFF.

From the Main Control screen menu bar, select **Options->Color Independent Icons** to turn ON this feature.

Alarm Type	Color Independent Icon
Critical Alarm	 through subsystem icon
Major Alarm	 through subsystem icon
Minor Alarm	 through subsystem icon

Alarm Sounds

The Alarm Sounds feature allows for an intermittent alarm to activate when a subsystem triggers an alarm. By default, the Alarm Sounds feature is OFF.

From the Main Control screen menu bar, select **Alarm Sounds** from the **Options** menu to turn ON this feature.

NOTE: During an alarm, either clicking a subsystem icon to open the Status screen or clearing the alarm silences an audible alarm.

Hold Connection

The Hold Connection feature maintains the direct or dial-in connection to the repeater for monitoring until you terminate the connection.

Help Menu—OA850C NR Craft

RepeaterNet on-line help is designed to provide quick access to information related to the operation of the repeater.

- ❑ To open RepeaterNet Help, select **Help->Help Topics**.
- ❑ To learn about the version of RepeaterNet Craft, RepeaterNet NMS, or RepeaterNet Administrator installed, select **About...** from the **Help** menu of any program window.

Navigating Help

- ❑ From the **Contents** tab, double-click a book icon to open its contents, then double-click a topic icon to open its Help page. A help page provides detailed topic information. Help pages can contain links—identified by green, underlined text—to related topics.
- ❑ From the **Index** tab, type a topic name in the data field to automatically jump to a topic or use the scroll bar to locate a topic entry. Double-click an index entry to open its Help page.
- ❑ Click the **Index** tab to open the **Find Setup Wizard** utility, which searches for specific words and phrases instead of searching by category. Follow the prompts.
- ❑ To find out the version of RepeaterNet in use, select **About** from the Main Control screen **Help** menu.

Exiting RepeaterNet

To exit RepeaterNet, return to the Main Control screen **File** menu and select **Exit**.

Appendix A. Default Alarm Settings

Subsystem	Option	Alarm	Default Setting
Front End	Forward	Fwd FE Alarm	Critical
	Reverse	RevFE Alarm RevFEProtect Alarm	Critical Critical
	Diversity	DiversityFE Alarm	Critical
Channel 1	Reverse PA	Rev PA Alarm Rev PA VSWR Alarm Rev PA Thermal Alarm Rev PA Ext Shutdown Alarm	Critical Disabled Major Disabled
	Forward PA	Fwd PA Alarm Fwd PA VSWR Alarm Fwd PA Thermal Alarm Fwd PA Ext Shutdown Alarm	Critical Disabled Major Disabled
	PA Control	Reverse PA Forward PA	OFF OFF
	Reverse Filter	CSF Rev Alarm	Event
	Forward Filter	CSF Fwd Alarm	Event
	Gain	Forward and Reverse	65DB
Channel 2	Reverse PA	Rev PA Alarm Rev PA VSWR Alarm Rev PA Thermal Alarm Rev PA Ext Shutdown Alarm	Critical Disabled Major Disabled
	Forward PA	Fwd PA Alarm Fwd PA VSWR Alarm Fwd PA Thermal Alarm Fwd PA Ext Shutdown Alarm	Critical Disabled Major Disabled
	PA Control	Reverse PA Forward PA	OFF OFF
	Reverse Filter	CSF Rev Alarm	Event
	Forward Filter	CSF Fwd Alarm	Event
Alarm Control Unit (ACU)	(*If external inputs or equipment are used, set alarm severity as appropriate.)	External Input 1* Alarm External Input 2* Alarm Temperature Alarm Tamper Alarm Analog Input Alarm Ext. Growth Box Alarm	Disabled Disabled Minor Major Disabled Disabled
Power Supply		Channel PS Input Power Power Supply Alarm Battery Alarm	Critical Critical Minor
Backup Power Supply		AC Fail Alarm Low Battery Alarm High Battery Alarm Charge Fail Alarm UPS Summary Alarm Tamper Alarm	Disabled Disabled Disabled Disabled Disabled Disabled
Modem		Modem Alarm	Minor
Cell Phone		Cell Phone Alarm	Minor

Appendix B. RepeaterNet Executables

The installation program installs all necessary application executables and associated support drivers in a Windows folder you select or, by default, in `c:\Program Files\Repeater Technologies\ RepeaterNet`. The installation program also provides entries into the system registry.

The main RepeaterNet executable files are:

CraftAdmin

The Database Administrator program used to configure and select the communications port used by RepeaterNet Craft.

RepeaterNet

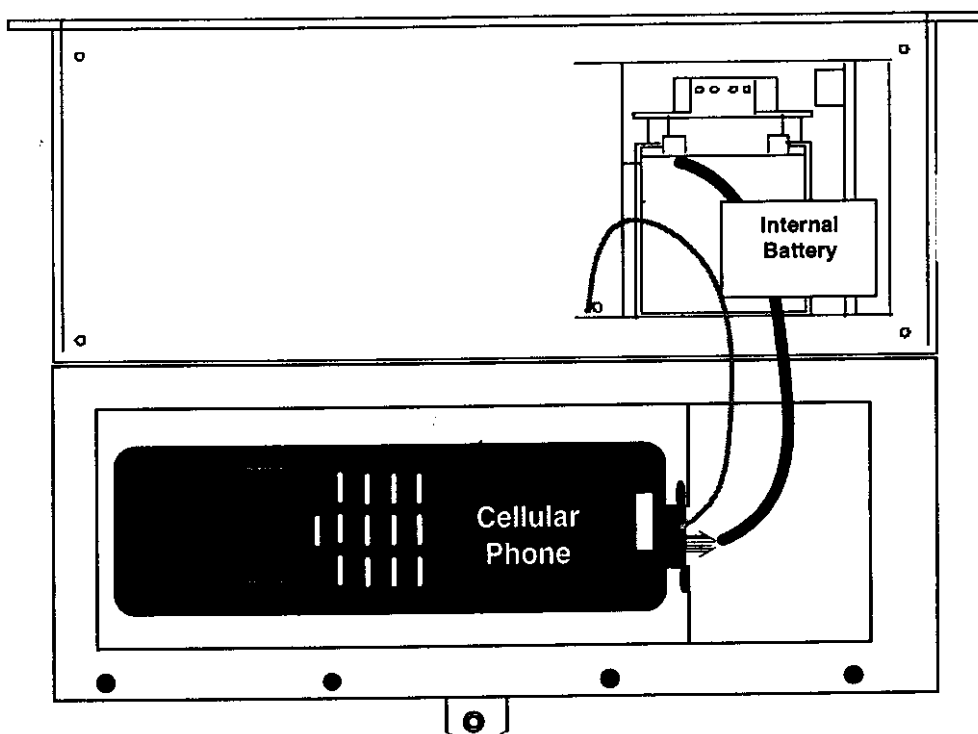
The Craft graphical user interface for different repeater hardware types. Used in the setting and viewing of individual repeater items.

When any of these executable files are running, an icon is displayed on the Windows Task Bar.

Appendix C. The Oki Cellular Phone

Accessing the OKI Cellular Phone

The cellular phone is located on the inside door of the OA850C NR entry box. Unscrew the four screws securing the metal box lid.



NOTE: The AC charger and cell phone antenna are provided in the accessory kit.

Programming the OKI Cellular Phone

An abbreviated set of instructions for NAM programming of your Oki Phone is provided in this section. For more detailed information, see your OKI PHONES 1400 Series documentation.

Programming Mode Access

1. Turn the power on and press **Rcl + Func** keys at the same time.
2. Enter your 5-digit special password within 30 seconds.
3. After the special password is logged in successfully, **ESN/HEZ Number** and **Software Version Number** are displayed for two seconds each.
4. Two seconds later the **Speed Dial Memory reset prompt** is displayed.

5. Proceed to the next section, "Speed Dial Memory Clear," or press volume ▼▲ to scroll within the NAM Programming menu.

Speed Dial Memory Clear

Scroll the NAM Programming Menu until "**Spd dial**" appears on the display, followed by the reset prompt ("reset-0"). Press **0** to clear the Speed Dialing Memory.

Default Data Set

Scroll the NAM programming menu until "**def data**" appears on the display, followed by the reset prompt ("reset-0"). Press **0** to reset all user programmable functions to the Manufacturer's default.

Lock/Unlock Code Programming

1. Scroll the NAM Programming Menu until "Uloc and (current code)" appears on the display. The default is "1234."
2. Enter a new 1-to-4 digit unlock code and press **Sto** key.

Telephone Number Programming

1. In this menu, you can program information that is unique to Telephone #1. Follow the instructions or press **Clr** to skip to Telephone #2 or the next item on the main NAM Programming menu.
2. The display indicates "**tel.no 1**" followed by the last seven digits of the current phone number. Enter the new number (area code plus telephone number) and press **Sto**.

Authentication Key Programming

The display indicates "**Auth.no.**" followed by "**Entr.no.**" Enter the authentication key provided by the carrier (up to 26 digits) and press **Sto**. If an invalid number is entered, the display shows "**not good**" followed by "**Entr.no.**"

Home SID Programming

Enter a 5-digit SID number and press **Sto**. The IPCH Number Initial paging channel number is set automatically depending on the stored Home SID number.

ACCOLC Number

The current number is displayed. Enter a new number if required, then press **Sto**.

GID Number

1. The current number is displayed. Enter a new number if required, then press **Sto**.
2. Press **Clr** to return to the main NAM Programming menu.

Emergency Number

1. The display shows "**Help no.**" and the current setting. Enter a new number (up to 11 digits) if required.
2. Press **Sto**.

Preferred SID Programming

1. Scroll the Preferred NAM Programming menu. Press **Rcl** and enter the desired Preferred SID number (5 digits).
2. Press **Sto**. You can enter up to 50 SID locations.

3. Press **Clr** key to advance to the next programming option.

Language Option Set

Press **Rcl** and scroll through the available options. When the desired language is displayed, press **Sto**.

System Options Programming

1. Scroll the NAM Programming menu and press **Rcl** to enter the **Option Programming** menu.
2. While in this menu, press **Rcl** to change settings and **Sto** to save and go on to the next setting. Press **Clr** at any time to return to the main NAM Programming menu.

Option bits are defined as follows: 0 0 0 1 1 0 1 0

- 0 = Reserved for future use
- 0 = Reserved for future use
- 0 = Reserved for future use
- 1 = MINMK = Mobile ID Number Mark (0=No, 1=Yes)
- 1 = LUMK = Local Use Mark (0=No, 1=Yes)
- 0 = AMMK = Audio Mute Mark (0=Call, 1=Always)
- 1 = HFMK = Handsfree Mark (0=No, 1=Yes)
- 0 = HAMK = Horn Alert Mark (0=No, 1=Yes)

Appendix D. Troubleshooting

The following attempts to identify the most common problems associated with the successful operation of the RepeaterNet system. The steps listed to resolve the problem may not include all of the possible reasons for non-operability, but may assist in identifying the actual difficulty. The problem attributes in the following paragraphs have been ordered with the most likely problem listed first.

If you continue to have problems, call Repeater Technologies Customer Support for assistance. See inside the front cover of this document for current telephone numbers.

Problem 1: *The RepeaterNet Server reports that it cannot open the NMS database.*

Either the DSN is configured improperly, does not point to the proper location, or the system did not find the DSN itself. Call Customer Support for assistance.

- ☐ The correct DSN or User ID is not identified.
- ☐ The Windows ODBC drivers are not installed.
- ☐ The database file pointed to by the DSN is corrupted or needs repair.

Problem 2: *The Process Manager component of the RepeaterNet Server reports that it cannot read the database Ports table.*

No ports have been configured in the system database.

The Ports table in the database may be corrupted. Repair the database and retry.

Problem 3: *The System starts up without error but, when a repeater graphical user interface is launched, no detailed data is displayed..*

Wait for up to 4 minutes (cell modem connection) to see whether the program can connect to the repeater. If not, a warning will pop-up indicating communications could not be established.

Problem 4: *A specific port does not seem to be in use and an Alert exists, or the database log reports the error "Unable to initialize port COMn" where n is the designation of the non-functioning port.*

The port number has been configured incorrectly or the port does not exist.

The port is assigned to another program operating in the same PC. Windows does not permit the sharing of communications ports between active programs. Shut down the other program.

Problem 5: *The system reports "Unable to connect to repeater..."*

This can be an indication of:

- ☐ The cellular carrier is not handling the call
- ☐ The phone number provided is incorrect or out of service
- ☐ A problem with the modem or phone line
- ☐ A problem with the repeater

Problem 6: The system reports the message “An unsupported operation was attempted.”

This message appears when the installation failed to register the OLE controls for alarm bitmaps.

Problem 7: RepeaterNet conflicts with Microsoft Fax.

To disable the auto answer mode:

1. Open the mail icon from the **Control Panel**.
2. Select **Microsoft Fax** from the **Services** tab.
3. Click on the **Properties** button.
4. Select either **Manual** or **Don't answer radio** button.
5. Click **OK** to save.

Problem 8: NMS Client reports “Cannot find application RepeaterNet Server.”

This can occur when the Server is not running or a network failure prevents the NMS Client from connecting to the Server. Verify that the Server is running and that the Server's host is accessible.

Another possibility is a conflict with the port assigned to the Server. This problem has been known to occur with a port number that previously had no conflict. Run the program “RepNetConfig.exe” in the RepeaterNet directory and increase the value of “Server Port” by one. Restart the Server and NMS Client.

End of Document