Tantalus Utility Network™

TUNet™ NC-2200
Network Controller

System Release Version 1.10

Your Power. Your Data. One Wireless Network.

NC-2200 v1.10 Installation Guide

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Revisions

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Typographical conventions

All web screen titles, field names and button names are in *italics.*

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About This Document

The NC-2200 Installation Guide describes the requirements to complete a typical installation. Site conditions will vary from site to site however the basic requirements for power, grounding and antenna connection will be the same.

Overview of Contents

This document contains the following sections:

- *Overview* describes the Tantalus Utility Network.

- *Site Requirements* describes the basis site requirements that apply to all sites.

- *Equipment Description* describes the major subsystems in the NC-2200

- *Installation* describes the required power, antenna and network connections

- *Initial Configuration and Testing* describes the minimum initial configuration required to put the NC-2200 into service.

FCC Compliance Statement

Changes or modifications not expressly approved by Tantalus Systems Corp. may void your authority to operate the equipment described in this manual.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

FCC RF Exposure Warning

Users and installers must be provided with appropriate antenna installation instructions and transmitter operating conditions, including antenna co-location requirements of §1.1307(b)(3), for satisfying RF exposure compliance. The antenna used with this transmitter must not exceed 6 dBd. The antenna should be mounted to provide a separation distance of at least 4 meters from all persons. Unauthorized antenna installations may violate FCC regulations.
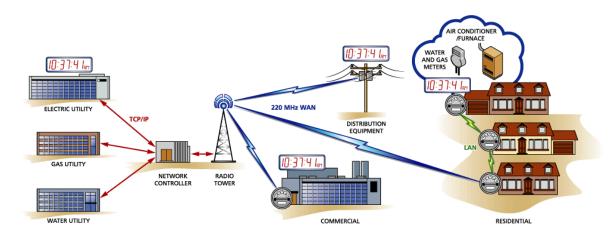
Referenced Documents

NC-2200 Network Administration Guide, P/N 900.0003

1 Overview

TUNet connects to residential and C&I meters, distribution equipment (e.g. reclosers, capacitor banks), load control devices, fault indicators, and a variety of other devices. Data from the devices is transmitted over the wireless network to an NC-2200 Network Controller located at the base station radio site. The NC-2200 delivers the data to the utility's operations and customer service centers via any standard TCP/IP link (e.g. cable, fibre, satellite, public telephone).

Figure 1 Tantalus Utility Network™

Authorized utility operations personnel interface to the NC-2200 and manage the TUNet using a standard web browser. No other software is required. Access to the web interface is restricted users with an assigned username and password.

A 220 MHz Wide-Area Network (WAN) reaches the utility's service area up to 20 to 30 miles from the base station. In applications with large concentrations of devices, such as advanced metering, a Local-Area Network (LAN) collects data from as many as 60 devices in a local area and relays the information to a WAN radio placed on a centrally located device.

2   Site Requirements

2.1   Site Environment

The site environment for the NC-2200 should be a clean environment with adequate space and lighting to allow for the equipment to be serviced. The room should have a heating, ventilation and air conditioning (HVAC) system to maintain the room temperature within the operating temperature range of the NC-2200, -30 to +40 Celsius. If necessary a cabinet cooling option can be ordered for the equipment cabinet which will extend the upper operating range to +60 Celsius.

2.2   Space Requirement

The NC-2200 Cabinet is a 19" EIA equipment cabinet with outside dimensions of 74"H x 23"W x 33.5"D with the doors on. The cabinet has locking front and rear doors. A minimum of 24" of clear space should be provided in front of and behind the cabinet to allow access for servicing.

2.3   Primary Power Requirement

The NC-2200 requires a dedicated 120VAC 15A circuit. A duplex receptacle should be located within 6' of the cabinet.

2.4   Grounding Requirement

The site should have a proper grounding electrode system designed to the standards described in the Motorola R56 Standards and Guidelines for Communications Sites. The NC-2200 rack ground bus (RGB) should be bonded to the master ground bus (MGB) of the building using a #2 AWG green jacketed stranded copper ground wire.

2.5   Antenna System Requirements

The typical antenna used for the NC-2200 is the RFS Celwave 220-8 antenna. This is a 6 dBd omni fibreglass antenna. The antenna is typically side mounted on a tower with a Celwave 561 side mount kit. Other antennas and mounting arrangements may be considered. The minimum mounting height for the antenna is 15 meters above ground to ensure that no persons walking within proximity of the antenna are exposed to harmful radiation.

The typical antenna transmission line is Andrew LDF5-50A 7/8" Foam Heliax. This cable has approximately .5 dB loss per 100' at 220 MHz and is recommended for cable runs in excess of 100'. Other low loss cable may be used for shorter runs. Andrew LDF4-50A ½" Foam Heliax has approximately 1.0 dB loss per 100'.

3 Equipment Description

3.1 Major Subsystems

Several major subsystems are integrated in NC-2200. The major subsystems are listed here with a brief description of each.

- **Uninterruptible Power Supply (UPS).** The UPS is a 1500VA unit which is used to power all of the equipment within the cabinet. An essential feature of the UPS is a serial communications protocol which allows the NC-2200 Network Controller computer to detect when the system is operating on battery power and when the battery power source is near the low voltage limit. This allows the Network Controller to do a graceful shutdown of the system.

- **Network Controller Computer.** The Network Controller computer is an industrial 2U rack mount computer. The computer has no rotating media. It uses a flash drive to store the database and configuration. The computer uses an Ethernet interface to communicate over a TCP/IP link to the Network Server. The Network Server is typically located in the utility operations center. The computer communicates with the RF Control Shelf and the UPS via RS-232 serial connections.

- **Fan assembly.** The fan assembly is a cross flow / tangential fan which draws air through the louvered front door, blows up through the Control Shelf and exhausts through the rear louvered door.

- **Controller Shelf.** The Controller Shelf is the heart of the 220MHz base station radio. The Controller Shelf includes a Reference Card and one each Controller Card, Transmitter Card and Receiver for a single channel.

- **Power Supply.** The power supply shelf supplies 8V and 15V D.C. power to the Controller Shelf.

- **Power Amplifier.** The Power Amplifier is fed from the Transmitter Card in the Controller Shelf and delivers the RF output power to the duplexer transmitter port.

- **Duplexer.** The duplexer is a band-pass, band-reject series of cavity filters which allows for the sharing of a single antenna for both transmit and receive with full-duplex operation. The antenna is connected to the duplexer antenna port through a lightning surge arrestor.

- **LNA & Splitter Panel.** The LNA (low noise amplifier) provides pre-amplification of the received signal before it is delivered to the Receiver Card. The splitter allows the receive signal from the LNA to be distributed to additional channels allowing for future expansion.

- **Receiver Filter.** An additional receiver cavity filter is provided for protection of the receiver from harmful interference.

- **Network Power Bar.** The Network Power Bar allows Tantalus to remotely control the power to any of the subsystems in the cabinet. The Network Power Bar has password protected access and is used for remote technical support.

- **Ethernet switch.** The 5 port Ethernet switch is provided to allow the Network Controller computer and Network Power Bar to share one physical Ethernet connection to the cabinet. In addition it allows for the connection of a laptop for access to the system for local support.

3.2   Controls and Indicators

3.2.1 Controller Shelf

The Controller Shelf has the following indicators:

Table 3-1: Controller Shelf Indicators

Card	Indicators	Description
Reference Card	Power	Card has DC power
	Alarm	Card fault
Receiver Card	Power	Card has DC power
	Alarm	Receiver PLL out of lock
Transmitter Card	Power	Card has DC power
	Alarm	Transmitter PLL out of lock
Controller Card	Power	Card has DC power
	Ready	Card has passed self test and is ready for operation
	Pulse	Heartbeat indication of card status
	BFC	On to indicate Base Station Frequency Correction in progress
	Serial Rx, Tx	Flash to indicate RS-232 data communications with the Network Controller computer.
	WAN Rx, Tx	Flash to indicate data communications over the 220MHz WAN radio.
	A, B, C, D	Reserved for future use
	0 – 7	Error code bit status

In addition the Controller Card has a Data monitor jack for monitoring of received data with an oscilloscope and the Transmitter card has Data monitor jack for monitoring of the transmitter data with an oscilloscope.

3.2.2 UPS

The UPS has the following controls indicators:

Table 3-2: UPS Controls and Indicators

Indicators	Controls
Line Present	Alarm Silence
Line Failure	Manual Start
Service	
Low Battery Warning	
Low Battery Shutdown	
Output Load	
Test	

Consult the UPS manual for detailed descriptions of the controls and indicators.

3.2.3 Power Amplifier

The Power Amplifier has the following indicators:

Table 3-3: Power Amplifier LED Indicators

Indicators	Description
RF On	Steady Green indicates drive present to P.A.
SWR	Flashing RED indicates high VSWR alarm
Over Temp	Flashing RED indicates high temperature alarm
Low Pwr	Flashing RED indicates low drive to the P.A.
Fans	Flashing RED indicates P.A. fan failure

In addition to the alarm indicators the power amplifier has an LCD status indicator and a switch to step the LCD display through a series of test points.

Table 3-4: Power Amplifier LCD Status Indicator

Indicators	Description
Fwd Pwr	Output power in watts
Ref Pwr	Reflected power in watts
RF Input	RF drive level in units
Driver V	Driver Voltage
Final V	Final Voltage
A Curr	Final A side current
B Curr	Final B side current
Total Curr	Total current

4 Installation

4.1 Cable Access and Connections

4.1.1 Cable Access

Typical cable access is from an overhead cable tray. Two cable access ports are provided in the top of the cabinet to feed cable connections into the cabinet. There are two additional cable access ports at the bottom rear of the cabinet to accommodate cables which are fed from the floor.

4.2 Antenna Connection

The antenna transmission line is normally terminated just inside the entrance to the building at the waveguide port. From the transmission line termination a short, typically 2', flexible jumper is used to connect to the lightning surge arrestor and another flexible jumper is used to connect from the surge arrestor to the NC-2200 duplexer antenna port. The duplexer antenna port is a Type N female connector.

4.3 Surge Protection

A lightning surge arrestor is required in the antenna feed line for all installations. The surge arrestor should be mounted at the antenna cable termination just inside the cable entry to the building. The surge arrestor is typically mounted directly to a ground bus located directly below the waveguide entry ports. A recommended model for the surge arrestor is the Polyphaser IS-50NX-C1 Coaxial Surge Arrestor.

4.4 Ground Connection

The NC-2200 must be bonded to the building ground electrode system. The vertical Rack Ground Bus in the NC-2200 cabinet must be bonded to the building ground using a #2 AWG green jacketed stranded copper cable.

4.5 Ethernet Connection

The Ethernet connection to equipment cabinet is made to the Uplink port on the 5 port Ethernet switch. Ethernet patch cables connect the Network Controller computer and Network Power Bar to the Ethernet switch.

4.6 Earthquake Bracing

Some jurisdictions or landlords will require earthquake bracing for the equipment cabinet. Consult with the site owner to see if this requirement applies. If bracing is required the braces are typically bolted to the top of the cabinet. It will be necessary to drill holes in the cabinet to attach the bracing.

4.7 FCC RF Exposure Warning

Users and installers must be provided with appropriate antenna installation instructions and transmitter operating conditions, including antenna co-location requirements of §1.1307(b)(3), for satisfying RF exposure compliance.   The antenna used with this transmitter must not exceed 6 dBd. The antenna should be mounted to provide a separation distance of at least 4 meters from all persons. Unauthorized antenna installations may violate FCC regulations.

5   Initial Configuration and Testing

5.1   IP Address Configuration

All configuration of the NC-2200 is normally done through the HTTP web interface from the NS-2000 Network Server. In order for the server to connect to the NC-2200 the IP configuration of the NC-2200 Network Controller must be done. A local monitor, keyboard and mouse are required to complete the IP configuration. This is the only time the monitor, keyboard and mouse will be required.

With the monitor, keyboard and mouse connected login to the NC-2200 as root with the root password. Start a Phindows session by typing "ph". Under Configure click on the Network tab then click on the Devices tab. Configure the following information:

- Connection: Manual

- IP: enter the assigned static IP address

- Netmask: enter the required netmask

From the Network tab configure the following:

- Host name: enter the host name, usually the site name

- Domain name: not required

- Default Gateway: enter the IP address of the default gateway

- Name servers: At least one name server IP address is required. Enter the IP address of a name server in the IP field and click the Add button to add the name server.

5.2   Server connection

The NC-2200 configuration screens are on the NS-2000 server. The TCP/IP connection must be established between the server and the Network Controller in order to access these screens.

Configure the IP configuration on the server following the same steps described above.

Establish the TCP/IP connection between the server and the Network Controller.

5.3   Configure the Network Controller Frequency and Power Level

Refer to the NC-2200 Network Administrators guide for a description of the configuration screens for the Network Controller. An assigned username and password are required to access the server and the Network Controller.

5.4   Initial Tests

Perform the following initial tests to put the NC-2200 into service:

- Check the base station power output

- Check the transmitter modulation levels

- Test the receiver 12 DB SINAD sensitivity

- Test for receiver desensitization during full duplex operation

- Perform initial Packet Error Rate tests with a remote TUNet 3205 WAN Transceiver

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6 Revision History

Date dd/mm/yy	Author	Changes	Revision
04/07/04	Joe Mick	New document	0.1
23/07/04	Robert De Angelis	Added FCC RF exposure warning	1.0