

Network Terminal

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* Indicates those sections where changes have occurred since the last printing.

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Introduction

Description

The Network Terminal (NT) is a simple, portable, operator interface to the Metasys[®] System. It plugs into a modular phone jack on any Network Control Module (NCM). With the NT connected to a networked NCM, an operator has total access to information anywhere in a facility, and can easily monitor, command, and adjust equipment connected to the Metasys Network.

Connect an NT over a separate NT trunk at distances up to one mile from the NCM. The trunk is composed of phone cable (two twisted pairs), modems, and connection kits.

Theory of Operation Overview

The NT provides data access from anywhere on the network, using passwords, data paths, and item names consistent with Metasys conventions. The NT can:

- request summaries for Alarm, Override, History, Limit, and Status
- override an object to bypass automatic start, stop, or reset operations
- change operational setpoints, or alarm and warning limits
- change the system clock, date, and daylight saving times
- display values for six objects when not logged on (Hold)
- schedule times for objects to be adjusted or commanded by adding or modifying weekly, holiday, and one time schedules

Memory

The NT functions as a dumb terminal to the system. It contains a scratch pad memory of 32 KB, which is lost when power is interrupted.

Display

The screen is a supertwist, Liquid Crystal Display (LCD) (256 x 128), capable of showing 16 lines of 40 characters.

Cursors

Character Cursor

The character cursor indicates where the next received displayable character is placed.

Mouse Cursor

The mouse cursor indicates the relative position of the activated area of the keyboard. If that area is within a defined key location, the entire key location displays in reverse video. The mouse cursor does not show if a key location is shown in reverse video.

Touchpad Operation

The touchpad, in conjunction with the display, acts as a virtual keyboard whose attributes are defined dynamically through the serial channel.

The operation of the touchpad is similar to that of a mouse device. Touching and dragging your finger across the touchpad moves a pointer in the display area.

Enter Area on the touchpad activates a selection. When you press Enter Area, the NT sounds a rising 2-tone beep to indicate a valid selection, or a falling 2-tone beep to indicate an invalid selection.

Basic NT Screen Format

Figure 1 shows the basic NT screen format. All screens use this general format. The System Option keys on the right of the screen are always present, but their functions change for different applications. The Command Option keys at the bottom of the screen are displayed when they are valid options for the operation being performed. The summary area in the center has a variety of formats.

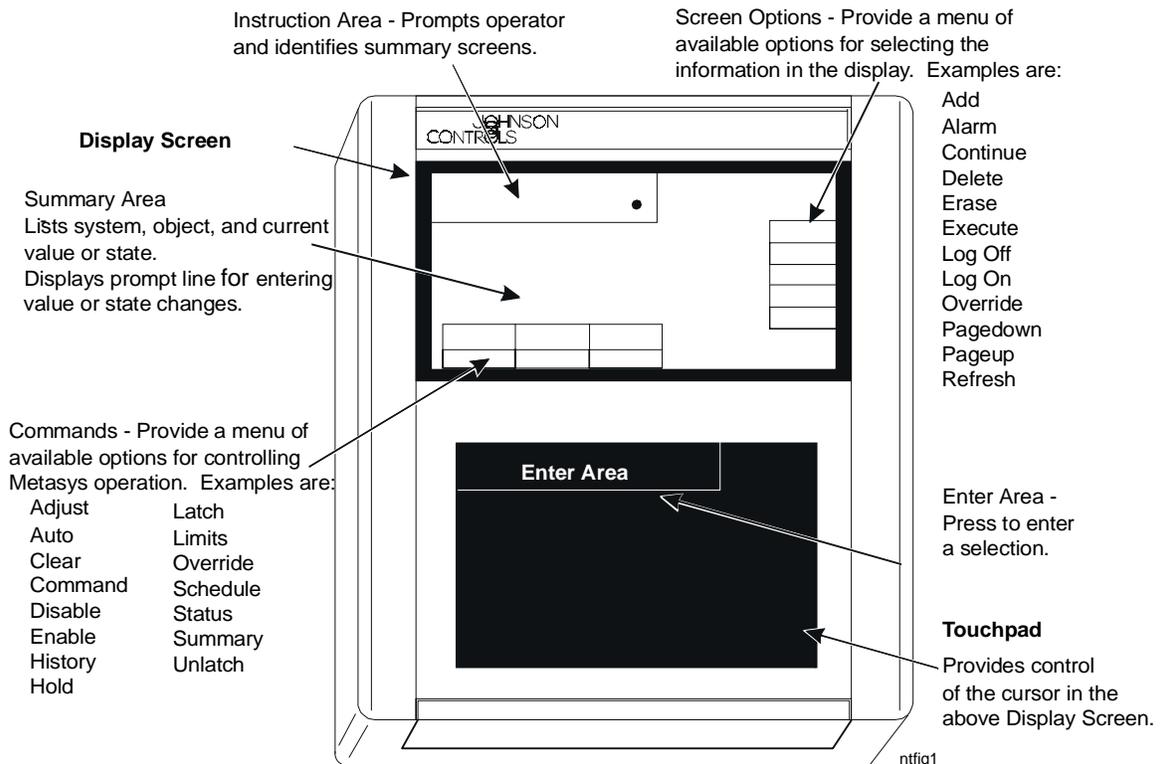


Figure 1: Basic NT Screen Format

Capabilities

Table 1 shows the Remote Network Terminal capabilities.

Table 1: Remote Network Terminal Capabilities

Capability	Description	Purpose
Portable	Weighing 2.5 pounds, the NT is easily carried between Remote NT jacks.	Allows maintenance personnel to retrieve data and execute commands as they make their daily rounds.
Operator Intervention	Allows access to: <ul style="list-style-type: none">• start, stop, or reset operations• change operational setpoints• set system clock	Provides local user override control of Metasys operations. Also useful for system test.
Dynamic Data Access™	Updates system data via any remote jack.	Allows data access from anywhere on the Network.
Extends NT Control to Remote Sites	Connects to Metasys Network at distances up to one mile (1.6 km) from NCM.	Provides operator with accessible NT interface at remote Network Expansion Units (NEUs), Application Specific Controllers (ASCs), or other sites.
Hold	In Hold, continuously displays values for six objects when not logged on.	Allows operator to view status or values for critical parameters without logging on.
Consistent Interface	Matches the Operator Workstation view of the Metasys Network in key areas: <ul style="list-style-type: none">• Access is through the same password.• Data access follows the same system\object\attribute structure.• Item names (for objects and systems, for example) are the same.	Provides ease of use, and simplifies training and internal documentation.

Engineering

Design Considerations

The NT is a routine tool for the hands-on operations staff to use on a daily basis. Decisions to incorporate NTs or NT trunks into the Metasys design focus on the operator's need for convenient access to the system as well as the expected functions and adjustments an operator may typically perform.

Convenient Access to the System

Network Terminal

An operator can mount the NT on installed cradles (EWC200 and EWC500 enclosures) or carry it from one NCU to another throughout the facility. Mounting and ordering information for the cradles is in the *Network Control Unit/Network Expansion Unit Technical Bulletin (LIT-636020)*.

When no one is logged on, each NT can display a Hold Summary for up to six objects, dynamically updating (every 20 seconds) their status changes. Each NCU has a separately definable Hold Summary.

Remote Network Terminal Applications

With an NT trunk, an operator can monitor and control Metasys functions from remote sites (e.g., at an NEU, ASC, or monitoring room) through any connected NT jack (RJ-12 surface mounted adapter). A typical use would be to check on site whether a remote device is malfunctioning or just overridden. The Hold Summary displayed at each jack is defined at the NCM to which the jack is connected.

NTs used with remote applications can also connect directly into NCMs by disconnecting the modems and plugging the NT directly into the NCM's NT port.

Functions Available to User

The NT allows basic interaction with the Metasys Network. With the NT, the operations staff can receive data, adjust operating parameters, command specific operations, and change schedules.

Operator Workstations are appropriate if specific operators require access to the following operational modes:

- Automatic Data Output
- Online Definition
- Data Definition Language (DDL) Definition
- Graphic Programming Language (GPL) Definition
- System Download
- Personal Computer (PC) Operation

See the *Operator Workstation Technical Bulletin (LIT-636013)* for details on these operational modes.

Site Considerations

Space

Network Terminal

The NT requires a space 22 H x 19 W x 5.0 cm D (8.5 x 7.6 x 2.0 in.). It can be mounted outside the enclosure, or into a separately ordered cradle for the EWC200 and EWC500 enclosures. The NT coiled cord can extend up to 1.4 m (4.5 ft) from the NCM.

Remote Network Terminal Applications

The modem measures 10.3 H x 5.4 W x 2.3 cm D (4.0 x 2.2 x 0.9 in.) A flat, 3-ft cord connects the modem to the NCM. A 7-ft cord connects the modem to the remote wall jack.

The Remote Network Terminal (RNT) power-supply unit measures 5.6 H x 5.0 W x 4.4 cm D (2.25 x 2.0 x 1.75 in.), with a cord reaching 0.9 m (3.0 ft).

Power Supply

The NT draws its power from the NCM to which it connects.

Each remote NT jack requires a separate power supply (provided by the IO-NTU115-0). The 120 VAC supply line must come to within 3 feet (the length of the IO-NTU115-0 cable) of the NT jack. The 5 VDC (Volts Direct Current) line should not be extended due to possible line losses.

Voltage Protection

The NT is transformer isolated to 1500 volts.

Surge protection is recommended if the N2 Bus is wired between buildings, especially if your area experiences an above average number of thunderstorms annually. You'll find detailed information on installing the surge protector in the *N2 Communications Bus Technical Bulletin (LIT-636018)* in the *Metasys Network Technical Manual (FAN 636)*.

Baud Rate

The communications protocol for both the NT and RNT is 9600 baud, asynchronous, full duplex.

RNT Cabling

The cabling to remote NT jacks consists of four conductor unconditioned telephone line (two twisted pairs), with the wire size ranging between 18 24 AWG. Shielding is not required.

Pull the NT trunk cable to the remote NT jacks in a daisy-chain configuration (the NT trunk is usually pulled with the N2 Bus cable). The total trunk and stub length may reach up to one mile. No repeaters are necessary.

When pulling the NT trunk cables, follow all National Electrical Code (NEC) and local code requirements.

There is no limit to the number of modular jacks permitted on the RNT network. The modular jacks do not require separate addresses.

Multiple NTs on the NT Trunk

For remote applications, two or more NTs simultaneously transmitting on the NT trunk results in their data scrambling onscreen, although no harm is done to either the system or the NTs themselves.

Components

The NT consists of a portable operator's device (the NT itself) and a coiled cord. Remote applications also require:

- 4-conductor unconditioned (two twisted pairs) telephone line,
- modem for NCM; with cables and connector to the NCM (IO-NTU113-0) (See note under the IO-NTU114-0)
- modem for NT; with cable, RJ-12 adapter, and connector (IO-NTU114-0)

Note: Until recently, IO-NTU113 and 114 used Gandalf® short haul modems (line drivers), Model mLDS. IO-NTU113 and 114 now use Black Box® short haul modems, Model ME6101 A-F. The Gandalf and Black Box modems cannot talk to each other. When you replace a Gandalf modem with a Black Box modem, do so in pairs or complete sections of your network.

- wall-mount 5 VDC power supply with RJ-12 to terminal screw jack (IO-NTU115-0)

Installation Procedures

Physical Connections

Network Terminal

Figure 2 diagrams the NT to NCM connection. The NT plugs into a modular phone jack labeled “NTU,” behind the door on the NCM.

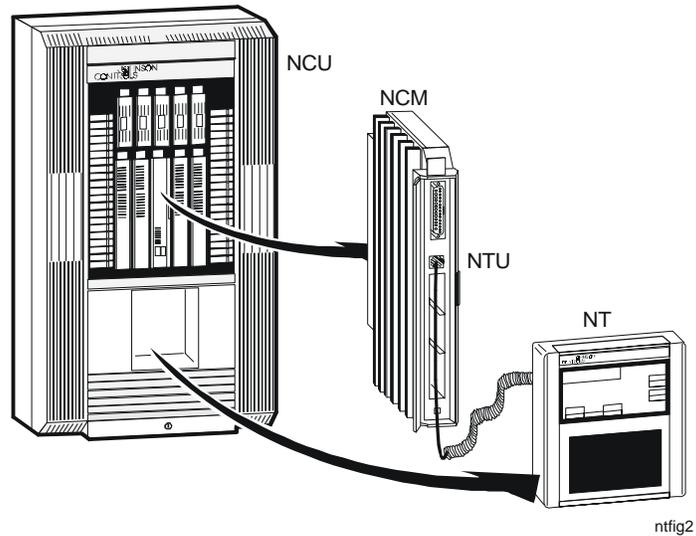


Figure 2: NT to NCM Connection

Remote Network Terminal Applications

Figure 3 diagrams the Remote Network Terminal (RNT) connections within a typical configuration, consisting of three remote access points. By unplugging the modems, you may also install the NT directly into the NCM.

Note: Do not plug an RNT into a regular phone jack. (However, if an RNT is inadvertently plugged into a regular phone outlet, neither the phone jack nor the RNT will suffer any damage.)

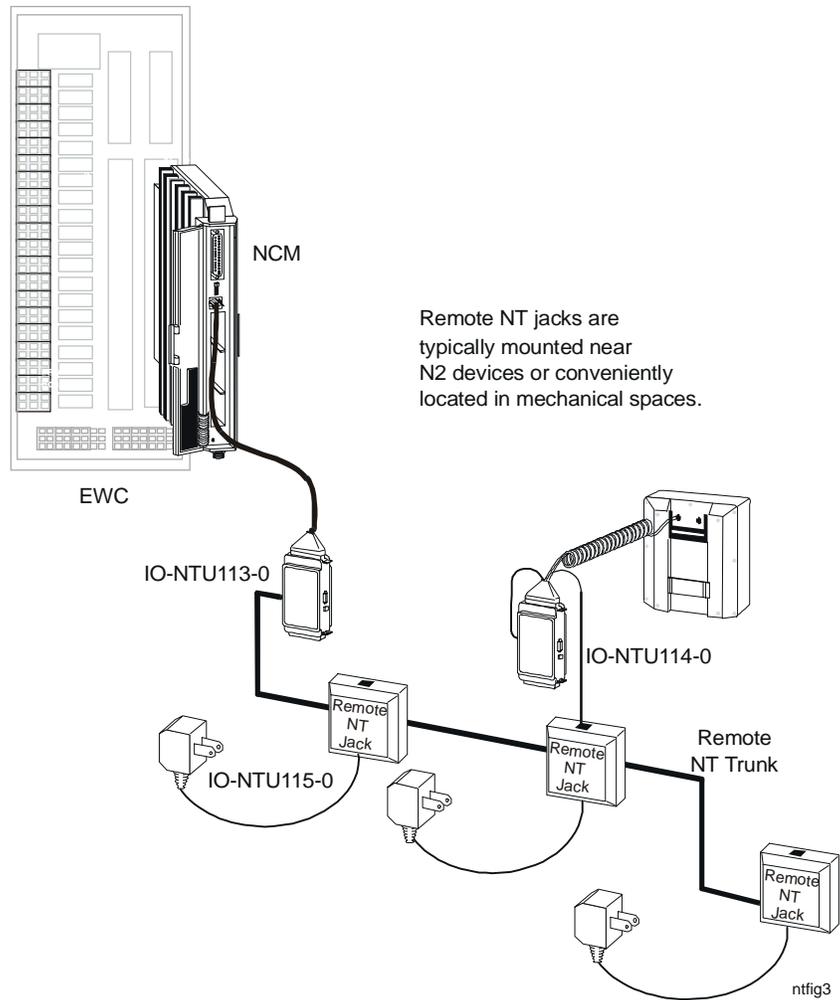


Figure 3: Remote Network Terminal Connections

Installation

Network Terminal

The Network Terminal (NT) installs by plugging it into the NCM. If it is necessary to clean the NT, apply a light, water-soluble cleaner to a soft cloth, then wipe the display and touchpad area.

Remote Network Terminal Application

Below are installation instructions for each of the three RNT component kits.

IO-NTU113-0 (Figure 4)

This kit contains the following items:

- modem (to NCM) with double-sided tape attached
 - DB-25 connector with an NT jack input
 - NT jack cable (3 ft) (Both ends have phone-plug connectors.)
 - wall jack cable (7 ft). One end with a phone-plug connector (IO-NTU113 side), the other end with four spade lugs for connection to IO-NTU115 wall mount screw terminal.
1. Connect a wall-mount jack within 5 feet of the NCU.
 2. Using the double-sided tape, mount the modem to a convenient surface inside the enclosure.
 3. Check the modem to ensure that the:
 - *jumper* is inserted (located on the side opposite the phone jack), CARR is set to ON, and Dly is set to 1.
 - *switch* next to the jumper is set to DCE (the PC or terminal connection).
 4. Attach the modem to the NCU by connecting the NT jack cable from the NCM to the DB-25 connector.
 5. Connect the RNT's wall-jack cable spade lugs to the NTU115 wall-mount terminals using Table 2 (see Figure 6 to view the wall-mount terminal diagram).

Note: The spade lug wire colors do not mate to the same wire colors at the NTU115. Reference only the NTU115 terminal numbers when connecting the spade lugs to the NTU115. The color conversion is necessary to make the latest NTU115 compatible with the NTU113 and NTU114. Reference Table 2 for applicable wiring connections.

Table 2: Wiring Connections-Spade Lug Wires/NTU115 Wall Mount Terminal Block

113 Spade Lug Wire	Corresponding 115 Wall Mount Terminal Block
N/A	Terminal 1 (not used)
N/A	Terminal 2 Power (+5 VDC factory installed supply)
Red	Terminal 3
Black	Terminal 4
Yellow	Terminal 5
Green	Terminal 6
N/A	Terminal 7 Power (supply common)
N/A	Terminal 8 (not used)

Note: A capacitor (not shown in Figure 6) is factory installed from Terminals 2-7. Do not remove the capacitor.

- After the remote NT access jacks are installed, and you are ready to test, attach the wall jack cable into the side phone jack of the NTU113 modem.

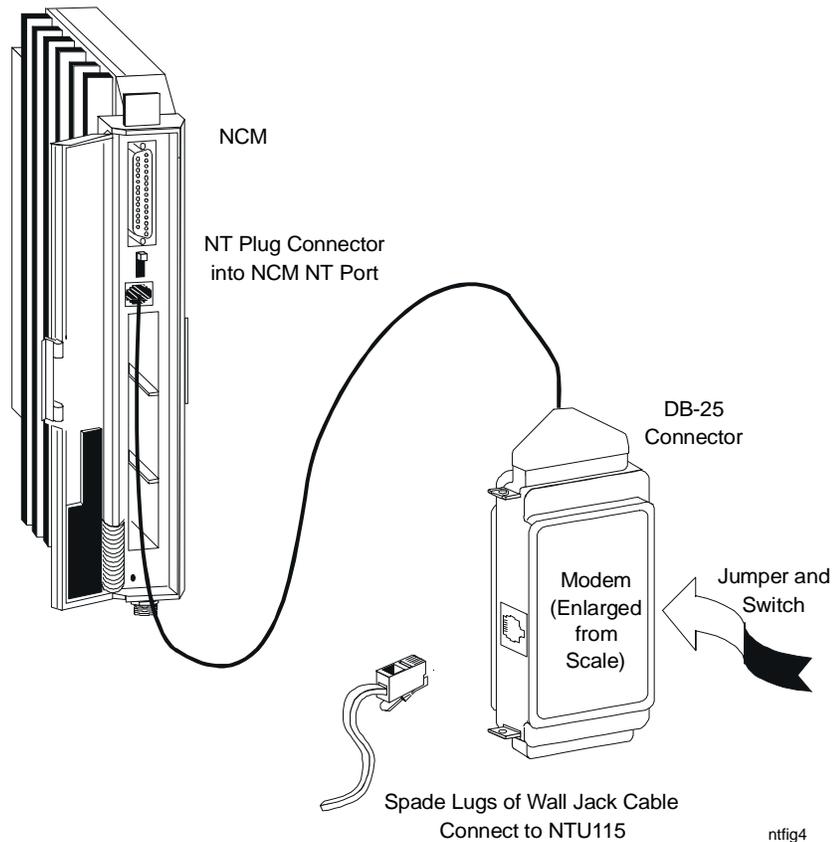


Figure 4: Installation of IO-NTU113-0

IO-NTU114-0 (Figure 5)

This kit contains the modem and a DB-25 connector with three attached cables.

1. Plug the coiled cable into either jack on the back of the NT.
2. Check that the short flat cable on the DB-25 connector is plugged into the side phone jack of the modem.
3. Check the modem to ensure that the:
 - *jumper* is inserted (located on the side opposite the phone jack), CARR is set to ON, and Dly is set to 1.
 - *switch* next to the jumper is set to DCE (the PC or terminal connection).
4. Plug the long flat cable from the DB-25 connector into the wall-mount jack.
5. Ensure that the power supply is connected.

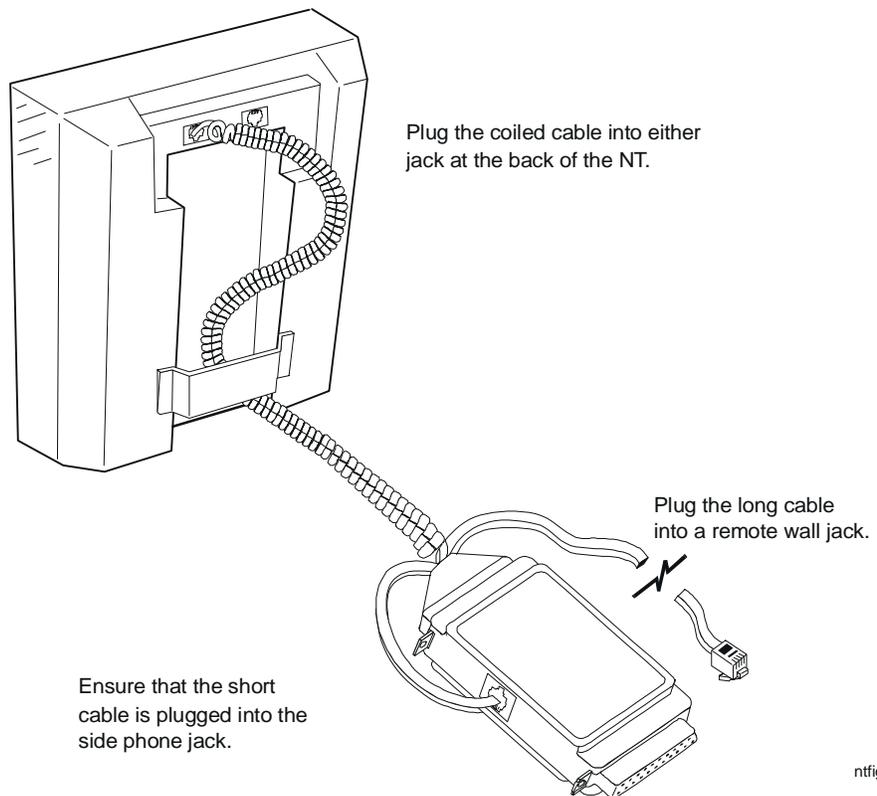


Figure 5: Installing the IO-NTU114-0

IO-NTU115-0 (Figure 6)

The IO-NTU115-0 is installed wherever an access point for the NT is desired. The access points may be up to 1.6 km (1 mile) from the NCM.

This kit contains the wall mount 5 VDC power supply and the screw terminal to RJ-12 jack adapter.

1. Remove adapter cover and connect the two twisted pair communication lines as follows:
 - From the NTU113 modem, connect as shown in Table 2 and in Figure 6.
 - When connecting to successive NTU115 wall jacks, terminal match connections 3-6 (for example, Terminal 3 to Terminal 3). Follow applicable national and local wiring codes.
 - Follow these wiring recommendations for the two twisted pair:
 - four-wire unconditioned telephone line, 24 AWG
 - unshielded cable is acceptable
 - plenum or non-plenum (application dependent)
 - Cat5 cable acceptable

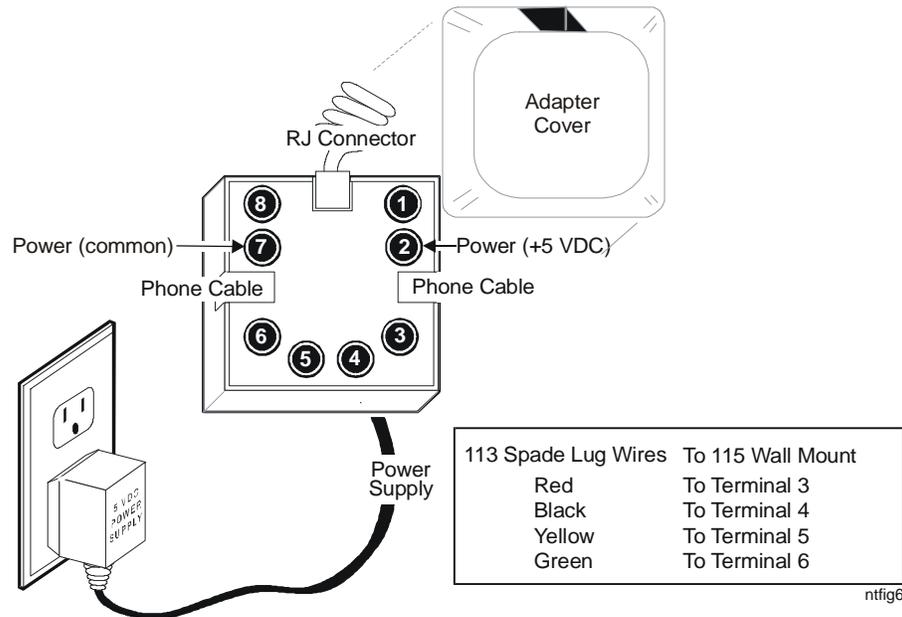


Figure 6: Installing the IO-NTU115-0

2. Plug in the supply. Verify 5 VDC at Terminals 2-7. Connect the NTU114 cable into any remote wall jack (NTU115) via the flat cable assembly. See Figure 3 and Figure 5.

Commissioning

Assumptions

The following procedure to install and verify the Network Terminal and Remote Network Terminal assumes:

- The NCU panel is installed.
- You are familiar with Metasys Network terminology.
- Power is available at the panel power supply and, for remote applications, close to each remote NT jack.
- The NCM software is downloaded.
- Cabling and terminations to the remote jacks are complete.

Connecting the Network Terminal

To connect the Network Terminal:

1. Connect one end of the coiled cable to either port on the back of the NT. You can plug in the NT while the NCM power is on.
2. Connect the other end of the cable directly into the modular phone jack labeled “NTU” in the NCM. If you want to close the door on the NCM, connect the uncoiled end of the cable to the NTU port.
3. Observe the NT display and verify a normal startup sequence (Table 3, Figure 9).

If it is necessary to clean the NT, apply a light, water-soluble cleaner to a soft cloth, then wipe the display and touchpad area.

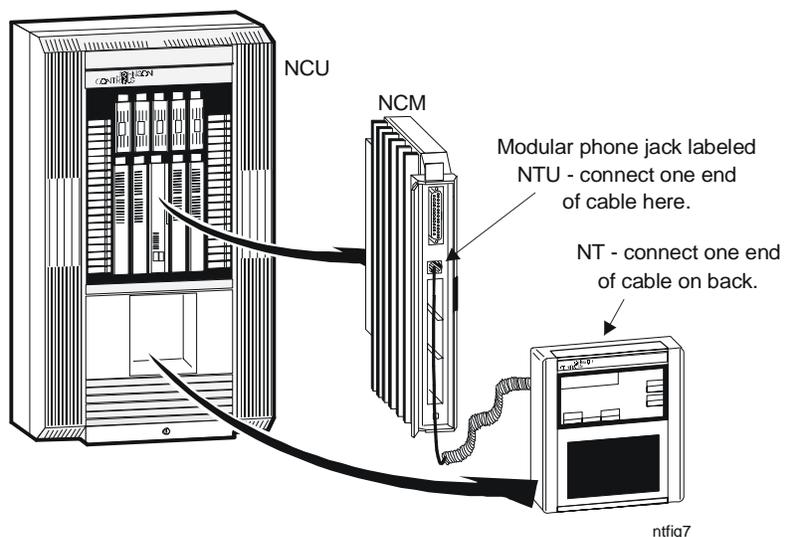


Figure 7: Network Terminal Connection

Connecting the Remote Network Terminal

To connect the Remote Network Terminal:

1. At the NCM, connect the 3-ft flat cable from the IO-NTU113-0 modem into the NCM's NT Port (labeled "NTU").
2. Connect the coiled cable from the remote NT's modem (IO-NTU114-0) into either jack on the back of the NT. Plug the long, flat cable from the modem into any designated remote NT jack. Ensure that the jack's power supply is plugged in.
3. Check each modem to ensure that the:
 - *jumper* is inserted (located on the side opposite the phone jack),
 - *CARR* is set to ON, and *Dly* is set to 1.
 - *switch* next to the jumper is set to DCE (the PC or terminal connection).
4. Observe the NT's display and verify that the startup sequence is normal. Refer to Table 3 and Figure 9.

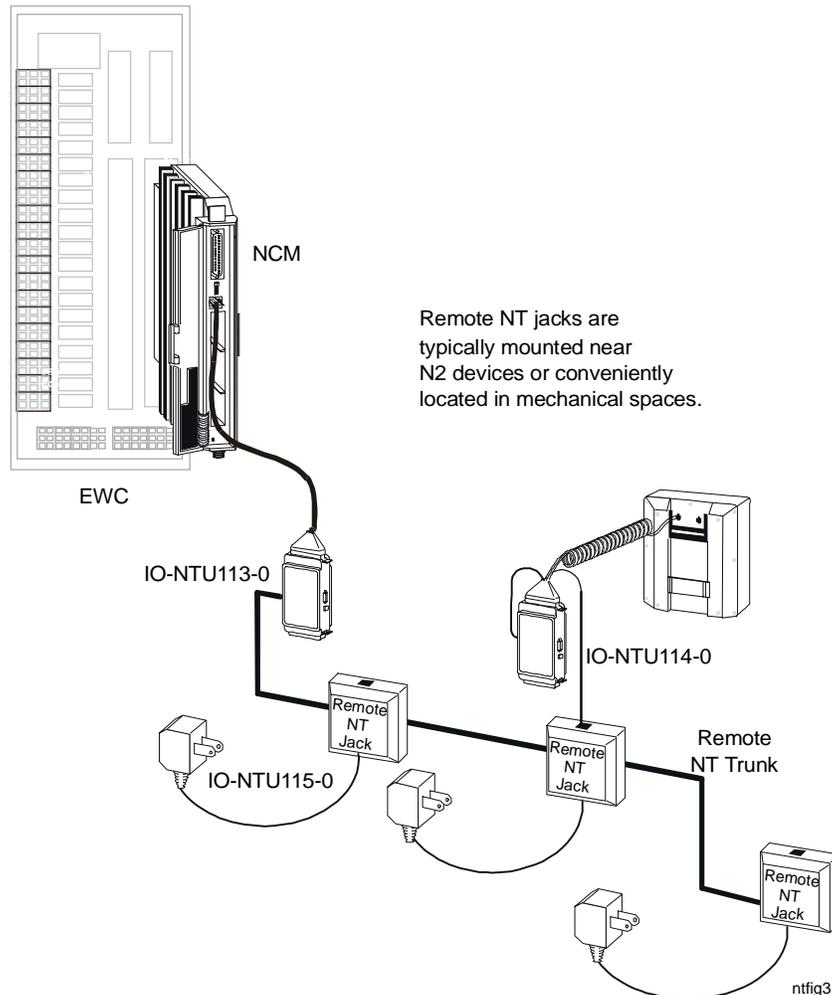


Figure 8: Connections for Remote Network Terminal Applications

**Startup
Sequence**

Table 3 defines the normal startup sequence for the NT, whether connected directly into the NCM or into a remote NT jack.

Table 3: NT Self-Diagnostic Tests

Diagnostic Self-Test	Failure Mode	Pass Mode
Is checksum value set to default, FFFDH?	Does not apply.	Yes - Calculate new checksum value and skip checksum test. No - Perform checksum test.
Checksum Test Compare checksum of EPROM (address range 00000H through 0FFFCH) to value at address FFFDH.	All NT operation ceases.	Continue to next test.
RAM Test - Data Bits Memory locations are cycled to test for shorted data bits.	NT operation ceases after sounding: - four short beeps - one long beep	Issue a short beep and continue to next test.
RAM Test - Addressing Memory locations are individually addressed to verify access capability.	NT operation ceases after sounding: - two long beeps - three short beeps	Issue a short beep and continue to next test.
Watchdog Timer Test 1 Verify that Watchdog timer trips within 1 second.	NT operation ceases after sounding: - three long beeps - two short beeps	Continue to next test.
Watchdog Timer Test 2 Verify that Watchdog timer does not trip in less than 100 ms intervals.	NT operation ceases after sounding: - four long beeps - one short beep	Continue to next test.
LCD Test Display fills with these patterns: - All Hs - All Is - All Xs - Vertical lines alternating with space - Horizontal lines alternating with space The NT sounds one short beep after each pattern. Entire test takes 1.25 seconds.	Inconsistent patterns. NT proceeds to display the self-diagnostic test results, as shown in Figure 9.	Consistent patterns. NT proceeds to display the self-diagnostic test results, as shown in Figure 9.

At startup, the following occur:

1. When first connected, the NT performs the self-diagnostic tests listed in Table 3. It emits a rapid sequence of beeps as it passes through each stage; the tests take 3-4 seconds to complete, and then the NT displays the results (Figure 9). The backlit NT model displays only briefly during the self-diagnostics, then resumes a continuous display at the copyright screen (Figure 10).

Failed diagnostics will freeze the display. See the *Troubleshooting* section.

2. After successfully completing the self-diagnostic tests, the NT displays the messages shown in Figure 9.

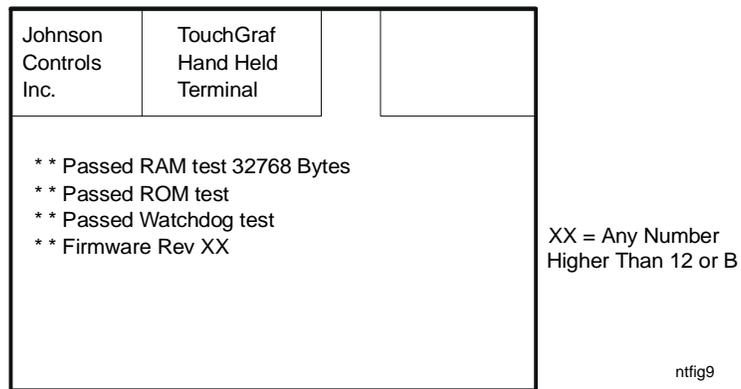


Figure 9: NT Self-Diagnostics Results

- After displaying the self-diagnostic test results, the NT briefly displays the Copyright screen shown in Figure 10.

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```

ntfig10

Figure 10: NT Copyright Screen

- After displaying the Copyright screen, the NT displays the Metasys software Log On screen shown in Figure 11.

Select LOG ON, then press ENTER.		LOG ON
REGULAR Thu 7-01-89 14:35		
System and Object IDs	AHU1	22.0% Open
	OSA_DMPH	
	AHU2	ON Sched
	CHIL_FRS	
	CHIL_STG	OFF
	1STFLOOR	
	LIGGRP2	ON Sched
	AHU3	
	MIXED_SP	55.0 Deg F
	NC2	
XM_2_HOL	ONLINE	
		Data

ntfig11

Figure 11: Log On Screen

Troubleshooting

Overview

Use the diagram in Figure 12 as an NT troubleshooting guide, whether the NT is connected into the NCM or into a remote NT jack.

The flowchart in Figure 13 isolates problems in the RNT configuration to a specific component (modems, wiring, or power supply). Figure 14 illustrates one of the procedures referred to in the RNT troubleshooting flowchart.

Troubleshooting the NT

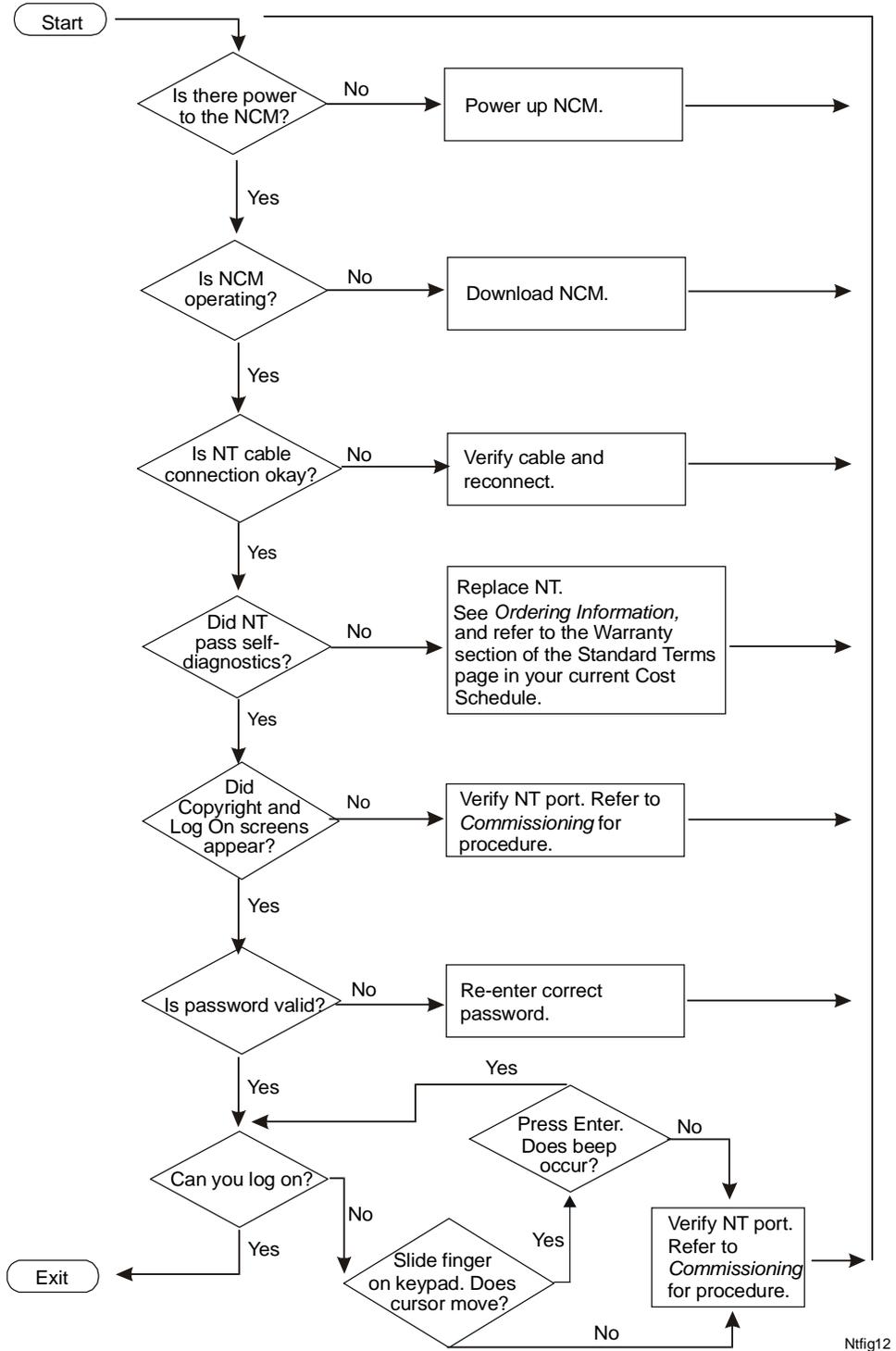
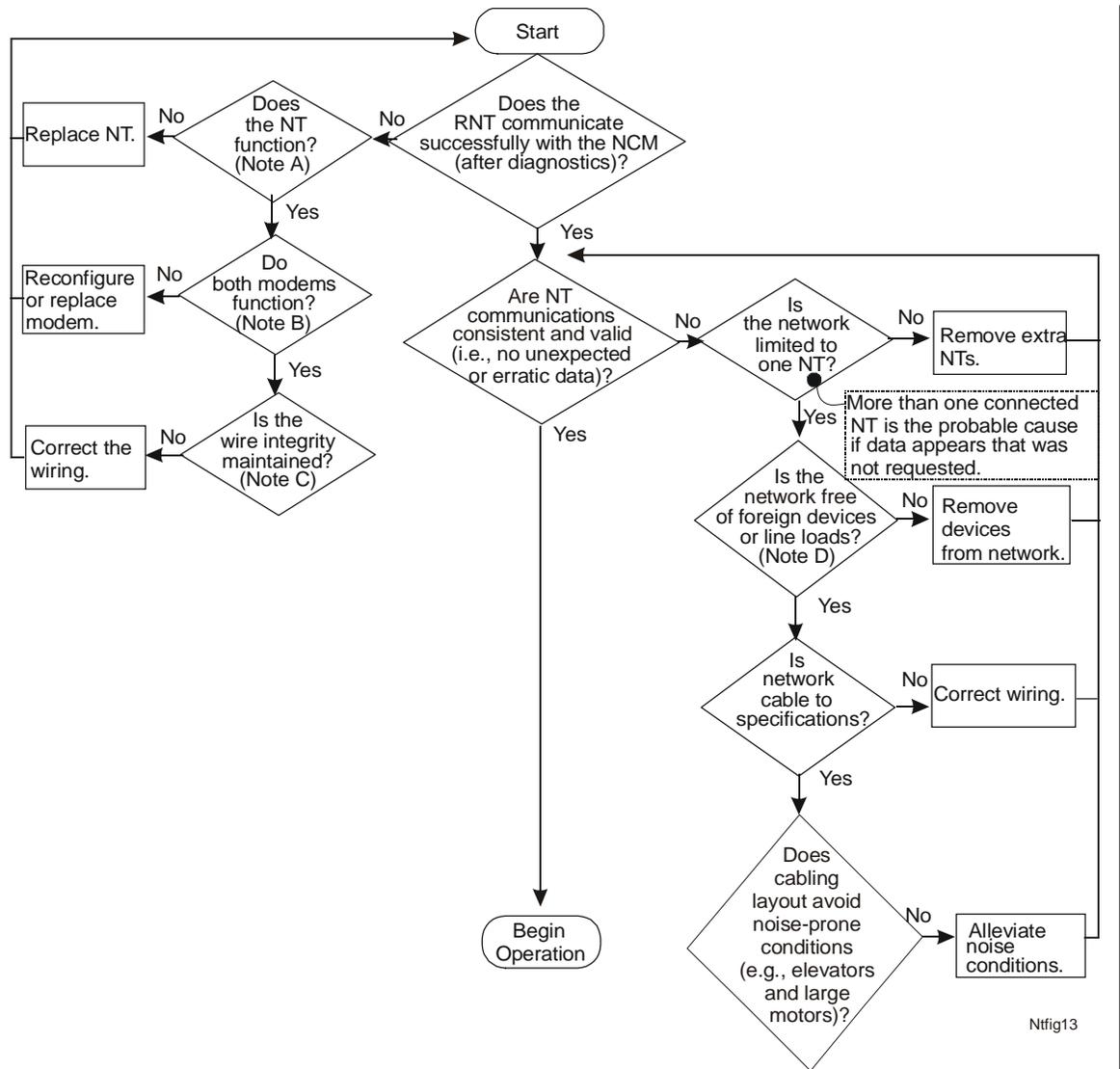


Figure 12: NT Troubleshooting

Troubleshooting RNT Components



Ntfig13

- Note A: Disconnect the NT from its modem and plug it directly into the NCM. Troubleshoot via Figure 12.
- Note B: Verify the terminations at NTU115. Verify switch is set to DCE and for the Jumper, CARR is ON and Dly is 1. Test modems by swapping with known good assemblies.
- Note C: Isolate the problem to the wiring by setting up a 5-foot test trunk line, according to Figure 14. You can also check the line continuity by shorting two pairs on one end and measuring the resistance on the other end. The ohm value should drop significantly.
- Note D: To check for foreign devices (e.g., telephones) or line loading (dirt, moisture, salts) disconnect both the IO-NTU113-0 and IO-NTU114-0 from the trunk. Use an ohmmeter to verify that the DC resistance between any two wires exceeds 100K ohms. Check all RNT access jacks if the ohm reading is less.

Figure 13: RNT Configuration Troubleshooting

Creating a Temporary Trunk to Check Wire Continuity

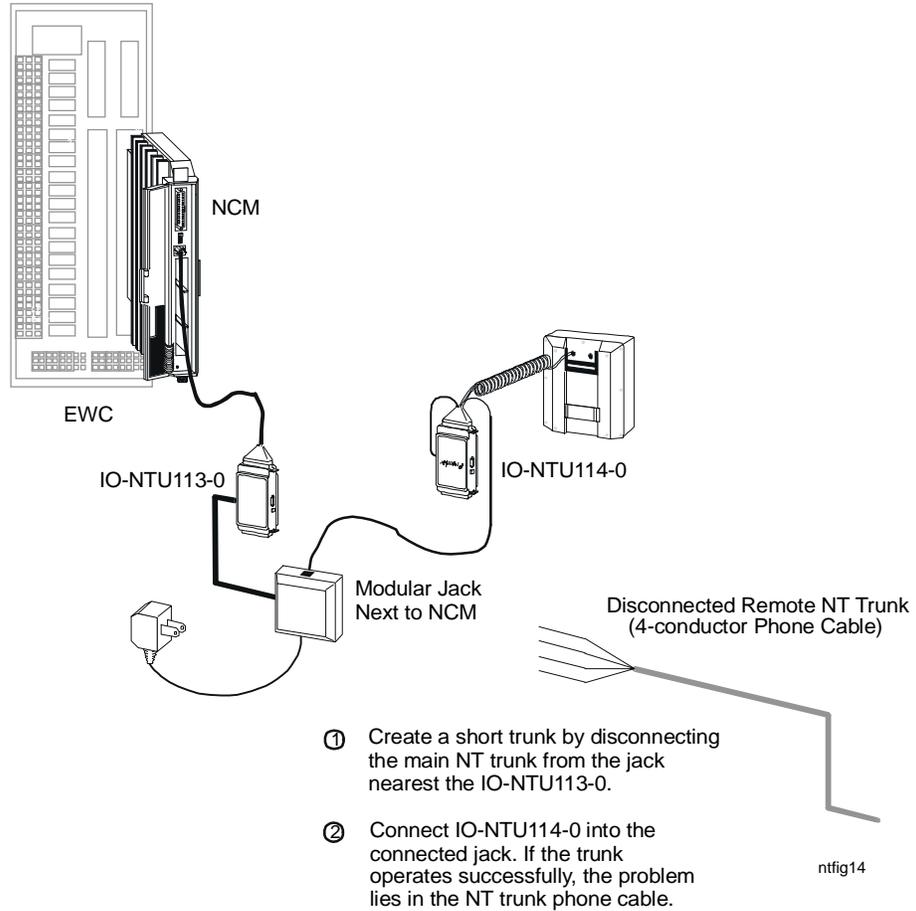


Figure 14: Creating a Temporary Trunk to Check Wiring

Ordering Information

Table 4: Ordering Information

Description	Code Number
Network Terminal	IO-NTU101-0
Network Terminal w/Backlight Display	IO-NTU102-0
Carrying Case for NT	IO-BAG101-0
Local Line Driver	IO-NTU113-0
Remote Line Driver	IO-NTU114-0
Remote Access Point	IO-NTU115-0

Specifications

Table 5 shows the Network Terminal specifications.

Table 5: Remote Network Terminal Specifications

Category	Specifications For Configurations
Remote Network Terminal Modem to NCM	
Product Code Number	IO-NTU113-0
Source Power	Power is from the NCM.
Size (H x W x D)	150 x 53 x 22 mm (6 x 2.1 x 0.9 in.)
Weight	5 oz (170 gm)
Remote Network Terminal Modem to NT	
Product Code Number	IO-NTU114-0
Source Power	Power from IO-NTU115-0, required at each access point.
Size (H x W x D)	164 x 53 x 22 mm (.4 x 2.1 x 0.9 in.)
Weight	5.5 oz (185 gm)
Remote Network Terminal Power Supply to Modular Jack	
Product Code Number	IO-NTU115-0
Source Power	Power from 120 VAC line.
Size (H x Q x D)	56 x 50 x 44 mm (.25 x 2 x 1.75 in.)
Weight	5.5 oz (185 gm)
Operating Environmental Requirements	0 to 50°C (2 to 122°F) 10 to 90% non-condensing relative humidity 30°C (86°F) maximum dew point
Baud Rate	9600 asynchronous, full duplex
Storage/Shipping Environmental Requirements	-40 to 70°C (- 40 to 158°F) 5 to 95% non-condensing relative humidity 30°C (86°F) maximum dew point.
Agency Compliance	FCC Part 15 Subpart J - Class A, UL 916, CSA C22.2 No. 205
Agency Listings	UL Listed and CSA Certified as part of the Metasys system.

Notes



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