

November 2021

## Description

The microNCS provides a real-time signal gateway between the field or factory floor and your control strategy. Part of Moore Industries' NCS NET Concentrator System<sup>®</sup> family of intelligent distributed I/O, the stand-alone microNCS accepts four or eight fully-isolated analog inputs and four discrete (contact closure) inputs. It "concentrates" this data onto one or multiple communication links, and transmits it long distances back to one or more host DCS, PLC or PC-based control systems.

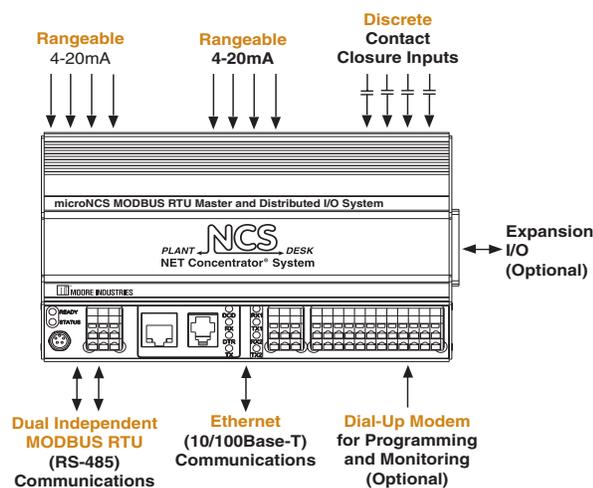
### MODBUS RTU Master Capability

One or both of the microNCS' MODBUS RTU (RS-485) ports can be configured as MODBUS master ports. This allows the microNCS to poll other MODBUS RTU slaves with all of the network polling functions of a typical MODBUS master.

### Modular with Expansion I/O

In addition to operating in a stand-alone mode, the microNCS integrates with any of the NET Concentrator System's analog, temperature, discrete and relay I/O modules (see Pages 3 and 7). Using just one microNCS module with expansion I/O, up to 124 signal inputs and outputs can be transmitted long distances on one low cost data link.

**Figure 1.** The stand-alone microNCS accepts four or eight analog inputs and four discrete (contact closure) inputs.



The DIN-rail mount microNCS features rugged metal construction that stands up to the daily rigors of demanding process and factory automation applications.

## Features

- **Simultaneous dual MODBUS RTU and Ethernet communications.** The microNCS comes standard with dual MODBUS RTU (RS-485) ports and one Ethernet (MODBUS/TCP) port.
- **Installs in harsh environments.** The microNCS features rugged metal construction, superior RFI/EMI protection and an industry-best ambient operating range of  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$  ( $-40^{\circ}\text{F}$  to  $+185^{\circ}\text{F}$ ).
- **Quick and simple programming.** Using the Internet Explorer web browser, all operating parameters can be selected and set in minutes via the module's Ethernet or dial-up modem port.
- **Data logger with battery back-up.** For historical performance trending and analysis, the microNCS can archive up to 64,000 time and date stamped values.
- **Advanced control and math capabilities.** Using ISaGRAF Control Engine Software from ICS Triplex, the microNCS delivers complex control, such as PID, and computation functions (see Page 4 for details).
- **GPS Time feature.** The GPS Time feature provides an optional method for keeping accurate time when an SNTP network is not available.

**CE** CE Conformant — EMC Directive 2004/108/EC EN61326;  
Low Voltage Directive 2006/95/EC EN61010

# microNCS<sup>®</sup>

MODBUS RTU Master  
and Distributed I/O System

## System Architecture

The microNCS MODBUS RTU Master and Distributed I/O System can be used to send just a few, or hundreds of, process signals between the field and a control system. Industrially-hardened and configurable interface stations mount throughout a site, or in dispersed locations throughout the world, to provide cost-effective distributed data acquisition and, with expansion I/O, control capabilities (see Pages 3 and 7).

The microNCS saves time and money when used in place of hard-wired schemes. Concentrate just a few, or hundreds of process signals, onto a single digital data link. This saves cable, conduit, connection, and wire tray costs. You can even use an existing Ethernet and/or MODBUS network, and eliminate the time and expense of creating a new network.

A microNCS network is made up of one or more stand-alone stations. Any combination of NCS NET Concentrator System distributed I/O expansion modules may be used within a microNCS station.

The microNCS's peer-to-host architecture provides a cost-effective method to transfer monitoring and control signals to and from a host DCS, PLC or PC-based system. microNCS stations are distributed along a MODBUS RTU serial and/or Ethernet (MODBUS/TCP) network. Once the data is delivered to the host system, third-party HMI or SCADA software packages can be used to create user interface strategies that may include data acquisition, alarm summary and management, data logging, historical data collection and trending, and supervisory control functions.

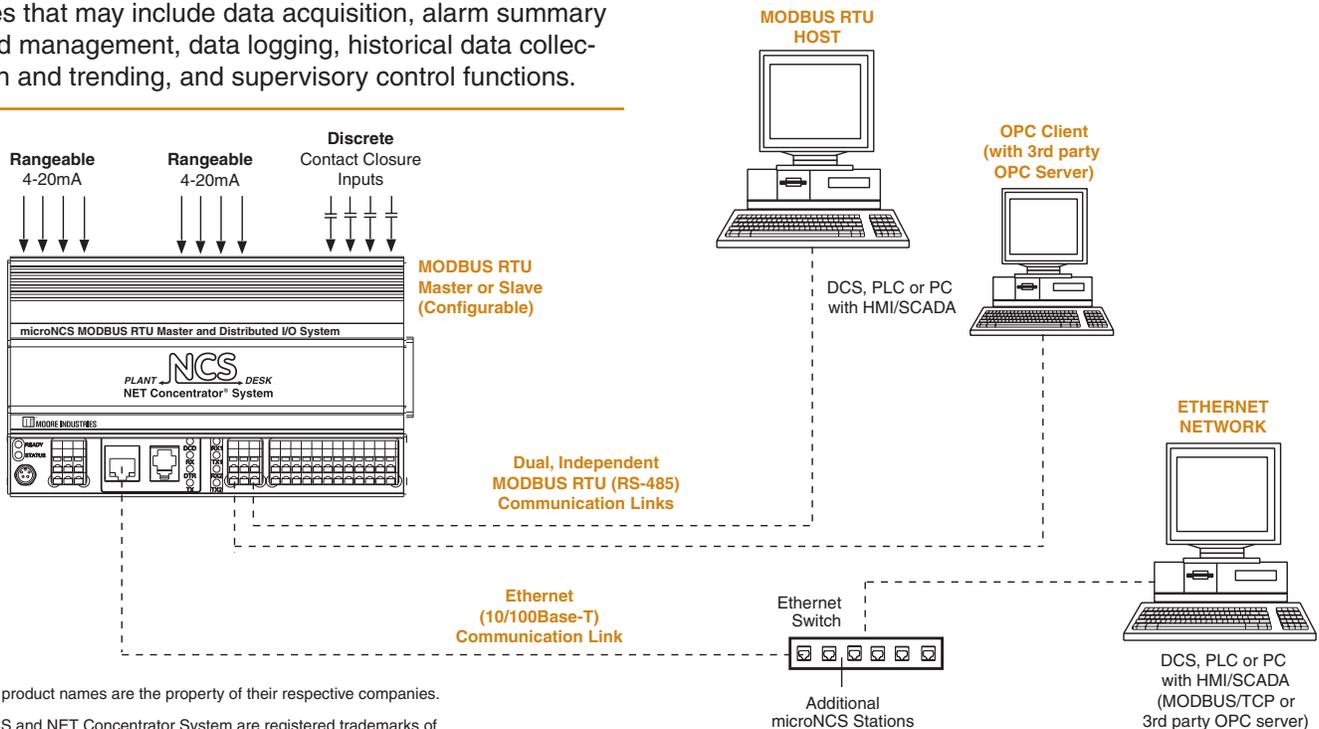
## Simultaneous Dual MODBUS RTU and Ethernet Communications

The microNCS communicates its data using dual MODBUS RTU data links and standard Ethernet.

**Dual MODBUS RTU Networks**—When the microNCS uses MODBUS for communications, each of its two MODBUS ports can be set up as a master or as a slave. The ports can also be set up identically to provide network redundancy. Up to 64 (32 per MODBUS port) microNCS stations and/or third-party MODBUS devices can be distributed throughout a plant multidropped on the dual MODBUS RS-485 data links (without repeaters). Depending on the type of expansion I/O modules used, a station can accommodate just a few or as many as 124 points when using expansion I/O (see Pages 3 and 7). With repeaters, additional microNCS stations and MODBUS devices can be added to a system.

**Ethernet (IEEE 802.3) Communications**—The number of microNCS stations that can be used on an Ethernet (MODBUS/TCP) network is limited only by the architecture of a specific network (taking into account the physical limitations of Ethernet). Standard industrial Ethernet switches or hubs are available to interconnect large numbers of microNCS stations. Ethernet switches also minimize message collisions, improving determinism in the Ethernet network (Figure 2).

Figure 2. Simultaneous dual MODBUS RTU and Ethernet data communications.



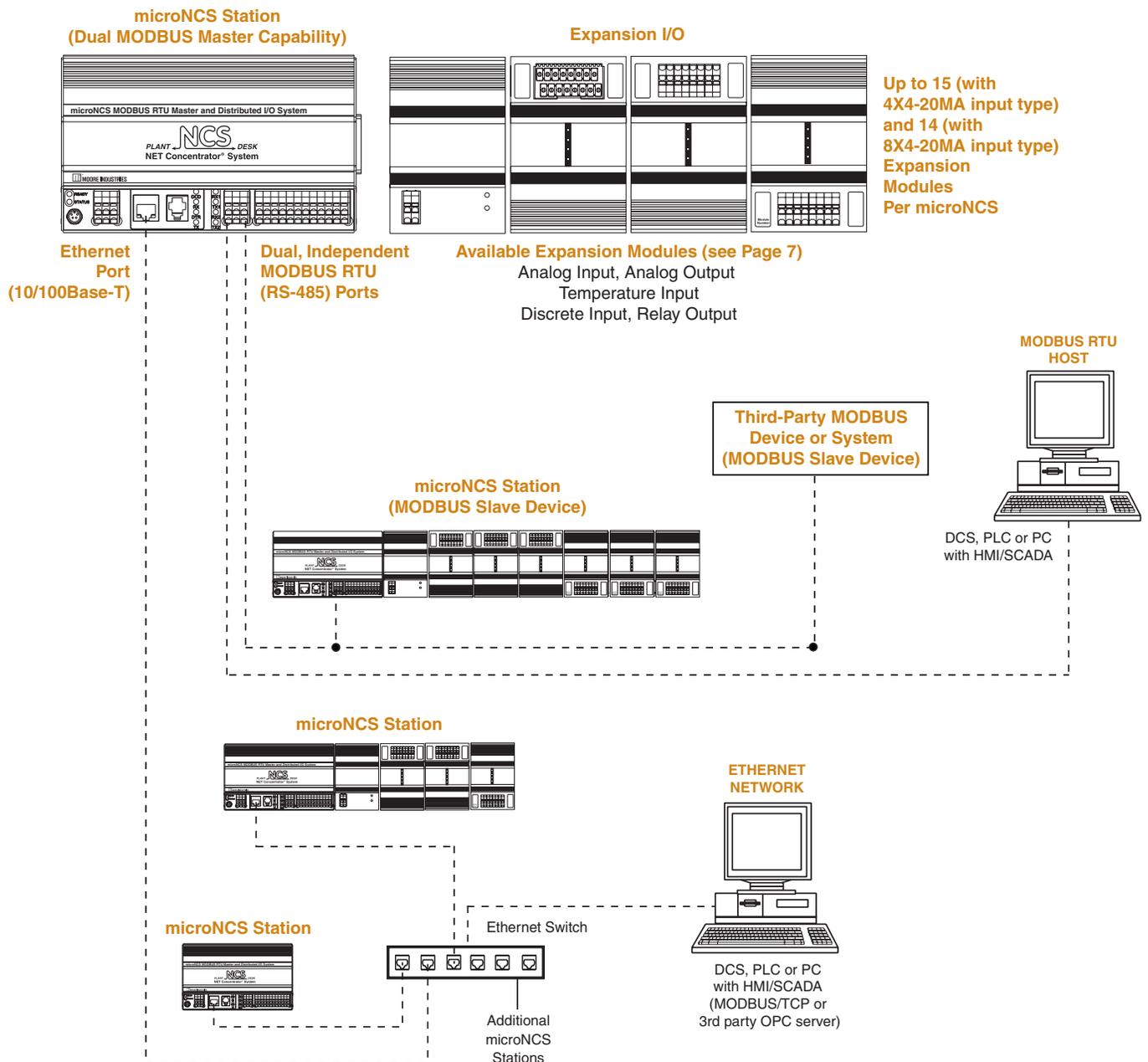
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NCS and NET Concentrator System are registered trademarks of Moore Industries-International, Inc.

### MODBUS RTU Network Master or Slave

Each microNCS MODBUS RTU (RS-485) port can be programmed to act as a master or slave within a network (each port is configured by the factory as a MODBUS slave port). When set as the master, the module performs all network polling functions. This includes polling of up to 32 (without repeaters) microNCS

stations, Moore Industries NET Concentrator System stations and/or third-party MODBUS slave devices per port. The microNCS will handle up to 64 slave devices if both MODBUS RTU ports are used. With repeaters, additional microNCS stations and MODBUS slave devices can be integrated into a network to accommodate hundreds of monitoring and control points.

**Figure 3.** Expansion I/O (see Page 7) allows each stand-alone microNCS module to handle up to 124 signals in a MODBUS network. The number of microNCS stations that can be used in an Ethernet network is limited only by the architecture of a specific network (taking into account the physical limitations of Ethernet).



# microNCS<sup>®</sup>

MODBUS RTU Master  
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## System Advantages

### Fast and Simple Set Up

The microNCS employs a web browser-based configuration interface which is used to configure and retrieve information. You can change operating parameters over your intranet (or the internet) from any PC, with proper security password clearance. Programming can be performed over the Ethernet data link or via the optional dial-up modem port.

### Compatible with HMI and SCADA Software

Once the data is delivered to the host PC or DCS, leading third-party HMI software packages can be used to create custom data acquisition and control strategies. These packages allow a multitude of functions including alarm summary and management, data logging and reporting, historical data collection and trending, and supervisory control functions.

### Data Logging Capabilities

microNCS stations are capable of storing 64,000 points of time-stamped data. A station can be configured to store data from one, or all, of its input channels. Sampling rate is user-selectable for any period between once every 100 milliseconds, to once every 24 hours.

### On-Line Diagnostics Speed

#### Troubleshooting

The microNCS continuously monitors its inputs, the data link and itself, to identify and report potential problems to the control system.

### Advanced Control and Math Capabilities

Using ISaGRAF Control Engine Software from ICS Triplex, the microNCS can be configured to deliver additional control, computation, and functional capabilities including:

- The ability to act as a single or multiple PID loop controller with simple, cascade, split action and inverse capabilities.
- Sequential control language programmability based on IEC 61131-3, including ladder, function block diagram, and structured text.
- Complex math capabilities including: add, subtract, multiply, divide; absolute value; square root; integrate and totalize; exponential; natural logarithm, base<sub>10</sub> logarithm; comparison; sine, cosine and tangent; arc sine, arc cosine and arc tangent.

The ISaGRAF workbench software is available from Moore Industries for use in configuring custom applications.

### Precise Digital Input and Output Trimming

To produce highly accurate readings, input channels and output channels (with expansion I/O) can be precisely trimmed to essentially eliminate measurement errors introduced by the input (such as a RTD or T/C sensor error) and compensate for readout device inaccuracies.

### Specifications

#### Communications **MODBUS**

**Type:** Two independently configurable RS-485 ports (according to EIA-485, 1993)  
**Protocol Type:** MODBUS RTU  
**Baud Rates:** 1200, 2400, 4800, 9600, 19.2k, 38.4k and 57.6k (user-selectable; default is 9600)  
**Parity:** Even, Odd or No Parity (1 stop bit, fixed; default is No Parity)  
**Device Address:** 1-255 (Default is 1)  
**Character Timeout:** 5, 10, 25, 50, 100, 200 and 255 character times (user-selectable; factory set to default)  
**Response Delay:** 1-255 character times (user-selectable; factory set to default)

#### **ETHERNET**

**Ethernet Port:** 10/100Base-T supports speeds up to 100Mb/sec  
**Connection Type:** Standard RJ-45  
**Protocol Type:** MODBUS/TCP

#### **DIAL-UP MODEM**

**Connection Type:** RJ-11  
**Data Rate:** V.92 (up to 56K)

#### Performance **ANALOG INPUTS**

**Input Accuracy:** ±0.01% of maximum span  
**Stability (% of max. span):**  
 1-year, 0.08%  
 3-year, 0.14%  
 5-year, 0.18%  
**Input Impedance:** 20 ohms, nominal  
**Maximum Input Over Range:** ±100mA  
**Filter Configuration:** 50/60Hz rejection selection (user-selectable)  
**Scan Time:** 16ms  
**Response Time:** 150ms

**DISCRETE INPUTS**  
**Contact Closure:** 24V@3.7mA, internally powered  
**Input Logic Threshold:** 8V low-going; 16V high-going  
**Maximum Input Over Range:** 24Vdc  
**Scan Time:** 16ms  
**Response Time:** <15ms  
**Data Access Time:** Time to detect or effect a change in an I/O signal from a MODBUS master polling a microNCS is the sum of 3 timing components:  
 1. Network Communication Time: Depends on network architecture

#### Performance (continued)

and traffic. For a PC locally networked to a microNCS, this time is negligible  
 2. Scan Time: Time required by the microNCS to scan real-time data in all I/O modules connected to it (see *Module Scan Time* specification for each expansion I/O module type and add times for each I/O module connected to the microNCS)  
 3. Signal Response Time: Time to convert between physical I/O and digital signals (see specification for specific I/O type)  
**Isolation:** 1000Vrms between case, input, output, each MODBUS port, each discrete input channel and power, continuous, and will withstand a 1200Vac dielectric strength test for one minute (with no breakdown). 500Vrms between analog input channels.  
**Power Supply:** 24VDC power input, 20-30Vdc; UAC power input, 90-260Vac  
**Power Consumption:** 24VDC power input, 7.0W max.; UAC power input, 8.0W max.

#### Status and System:

**Fault Indicators**  
**READY:** Green when ready; Off when not ready; Red during CPU reset  
**STATUS:** Green when OK; Red when not OK  
**Ethernet:** For Firmware version 5.0.00 or later:  
**LINK/ACT:** This LED indicates transmit and receive activity in addition to the status of the Link. The LED will be ON when Link is good. It will blink when the transmitter or receiver is active.  
**SPEED:** This LED is ON when the Ethernet connection is 100 Mb/s and OFF when it is 10 Mb/s. For Firmware version prior to 5.0.00:  
**LINK:** Amber LED indicates a network link is present  
**ACT:** Flashes green in response to data reception and transmission  
**MODBUS:**  
**TX1:** Green blinks when Transmit activity on MODBUS 1 occurs; Off when no Transmit activity on MODBUS 1

#### Status and Fault Indicators (continued)

**RX1:** Green blinks when Receive activity on MODBUS 1 occurs; Off when no Receive activity on MODBUS 1  
**TX2:** Green blinks when Transmit activity on MODBUS 2 occurs; Off when no Transmit activity on MODBUS 2  
**RX2:** Green blinks when Receive activity on MODBUS 2 occurs; Off when no Receive activity on MODBUS 2  
**TX:** Green blinks when Transmit activity on Modem occurs; Off when no Transmit activity on Modem  
**RX:** Green blinks when Receive activity on Modem occurs; Off when no Receive activity on Modem  
**DCD:** Green when Modem connection is established; Off when no Modem connection is present  
**DTR:** Green when Modem connection is active and status is OK; Off when no Modem connection active

#### System Time **Real Time Clock (RTC):**

**Accuracy** ±1 Minute/Month (when not connected to an authoritative time source)  
**SNTP/GPS:** <100ms of authoritative time source

#### Data Logger

Records up to 64,000 time-stamped data points; minimum sample period, 100msec; maximum sample period, 24 hour  
 Non-volatile memory holds time-stamped data; measurement parameters are software configurable; 18,000 data points stored in BBRAM

#### Ambient Operating Range: Conditions

-40°C to +85°C (-40°F to +185°F)  
**Storage Range:** -40°C to +85°C (-40°F to +185°F)  
**Relative Humidity:** 0-95%, non-condensing  
**Ambient Temperature Effect:** 0.01% of maximum span/°C  
**RFI/EMI Protection:** 20V/m@80-1000MHz, 1kHz AM when tested according to EN61326 with errors of 0.5% or span or less  
**Common Mode Rejection:** 100dB@50/60Hz  
**Normal Mode:** 60dB typical@20mA peak-to-peak, 50/60Hz

**Weight** 1.26 kg (44.3 oz)

# microNCS®

MODBUS RTU Master  
and Distributed I/O System

## Ordering Information

Unit	Input	Output	Power	Options	Housing
<b>MNCS</b> MODBUS RTU Master and Distributed I/O System	<b>4X4-20MA</b> Four configurable 4-20mA input channels with four discrete (contact closure) input channels <b>8X4-20MA</b> Eight configurable 4-20mA input channels with four discrete (contact closure) input channels	<b>COM</b> Redundant (Dual) MODBUS RTU (RS-485) communication links and One Ethernet (MODBUS/TCP) communication link	<b>20-30VDC</b> <b>UAC</b> Accepts any range between 90-260Vac	<b>-DM</b> Dial-up modem for programming and monitoring inputs and outputs  <b>-GPST</b> GPS time receiver option allows the microNCS to set its internal time clock to GPS satellite network; SMA female connector	<b>DIN</b> Aluminum DIN-style rail-mount housing mounts on G-type (EN50035) and 35mm Top Hat (EN50022) rails

To order, specify: Unit / Input / Output / Power / Options [Housing]

Model number example: MNCS / 8X4-20MA / COM / UAC / -DM [DIN]

See Page 7 for Expansion  
I/O Ordering Information

## System Accessories

The following technology is available from 3rd parties.

### Industrial Ethernet Switches

Intelligent multi-port communications switches automatically determine and remember where a microNCS station is located, and routes messages only through the appropriate port to that station. This minimizes network loading and improves deterministic communications over Ethernet.

### Ethernet Routers

Connects multiple microNCS segments or sub-networks, forwards messages from one network to another, and provides message traffic isolation between segments.

### RS-485 to RS-232C/RS-422 Converter

For MODBUS RTU (RS-485) networks, converts the RS-485 signal to either RS-232C or RS-422 standard to allow direct interface with a modem or computer-based systems, such as a PC.

### RS-485 to Fiber Optics Converter

Converts the microNCS' RS-485 signal to light for signal transmission over a fiber optic cable.

### Ethernet/RS-485 Repeater

Repeaters are available to extend the typical reach of Ethernet and RS-485.

### Wireless RF Modems

Where wires can't be run for practical or economic reasons, spread spectrum wireless radio (RF) communication provides accurate and reliable connectivity between sites. Distances between modems can be up to 20 miles, and repeaters can extend coverage even further (see the WLM Wireless Link Module data sheet for details).

### Short Haul Modem

Some short haul modems convert to a different signal type to gain greater distances over copper.

### Data Line (Surge) Protectors

Mounts on a G-type rail next to the microNCS to protect the data link from damaging voltage and current surges caused by lightning, welding, heavy electrical equipment, and switch gears.

### Instrument Power Supplies

Moore Industries offers a complete line of instrument power supplies for mounting alongside and powering the microNCS.

### Expansion I/O

The microNCS integrates with any of Moore Industries' NET Concentrator System's analog, temperature, discrete and relay distributed I/O modules. Using just one microNCS module with expansion I/O, up to 124 signal inputs and outputs can be transmitted long distances on one low cost data communication link. Expansion I/O programs using the Internet Explorer web browser via Ethernet or using the dial-up modem. All operating parameters can be viewed, selected and set in minutes. See the NCS NET Concentrator System data sheet for details.

#### Important Note:

If the microNCS is a 4-channel input model (4X4-20MA), it will supply power to one additional expansion I/O module. If additional expansion I/O modules will be used in a station, a CPM Concentrator Power Module is required (see Ordering Information below). If the microNCS is an 8-channel input model (8X4-20MA), a CPM is required to power any additional NCS expansion I/O in a station. The CPM may be installed at any position within a microNCS station. It works in conjunction with the microNCS to power up to eight expansion I/O modules. If more than 8 I/O modules are used in a station, two CPMs will be needed. The CPM will only power units that are mounted to its left (from the user's front view perspective, this would be the right side of the CPM).

For specifications and additional information on expansion I/O, see "Module Types" in the NCS NET Concentrator System data sheet.

### Ordering Information (Continued)

Unit	Module Type	Input/Output Configuration	Power	Options	Housing
<b>INPUT/OUTPUT MODULES (Up to 15 Maximum per microNCS with 4X4-20MA input, 14 with 8X4-20MA input)</b>					
<b>AIM*</b> Analog Input Module	<b>IO</b> Input/Output Module	<b>AI4</b> Four Configurable Analog Input Channels (0-20mA, -10V to 10V)	<b>IP</b> Input and Output Modules are powered by the MNCS or CPM Module (see the note above)	<b>-NB</b> Spare or replacement Input/Output Module Electronics <u>without</u> the Mounting Base <b>-NM</b> Spare or replacement Mounting Base <u>without</u> Input/Output Module Electronics	<b>DIN</b> Aluminum rail-mount housing mounts on G-type (EN50035) and 35mm Top Hat (EN50022) rails
<b>AOM*</b> Analog Output Module	<b>IO</b> Input/Output Module	<b>AO4</b> Four Configurable Analog Output Channels (0-20mA, 0-10V)			
<b>TIM*</b> Temperature Input Module	<b>IO</b> Input/Output Module	<b>TI4</b> Four Configurable Temperature Input Channels (RTD, T/C, mV, ohms, Pot; see Table 1 for details)			
<b>DIM*</b> Discrete Input Module	<b>IO</b> Input/Output Module	<b>CC8</b> Eight Discrete Contact Closure Input Channels (24V/3.7mA, internally-powered)			
		<b>HV8</b> Eight Discrete Voltage Input Channels (High Range: 120/240Vac)			
		<b>LV8</b> Eight Discrete Voltage Input Channels (Low Range: 30Vac/Vdc)			
<b>ROM*</b> Relay Output Module	<b>IO</b> Input/Output Module	<b>RNC8</b> Eight (Normally Closed) Relay Output Channels, SPST relay, 1 form A, rated 2A@250Vac, 50/60Hz, non-inductive, or 2A@30Vdc	*Input/Output Modules come with a Mounting Base unless the <b>-NB</b> or <b>-NM</b> option is specified.		
		<b>RNO8</b> Eight (Normally Open) Relay Output Channels SPST relay, 1 form B, rated 2A@250Vac, 50/60Hz, non-inductive, or 2A@30Vdc			
<b>POWER SUPPLY MODULE (See Important Note Above)</b>					
<b>CPM</b> Concentrator Power Module	<b>20-30Vdc</b>	<b>NCSPWR</b> Up to Eight I/O Modules (See Important Note above)		No Options	<b>DIN</b> (see description above)

**To order, specify:** Unit / Module Type / Input/Output Configuration / Power / Options [Housing]

**Model number examples (see the NCS NET Concentrator System data sheet for additional examples and information):**

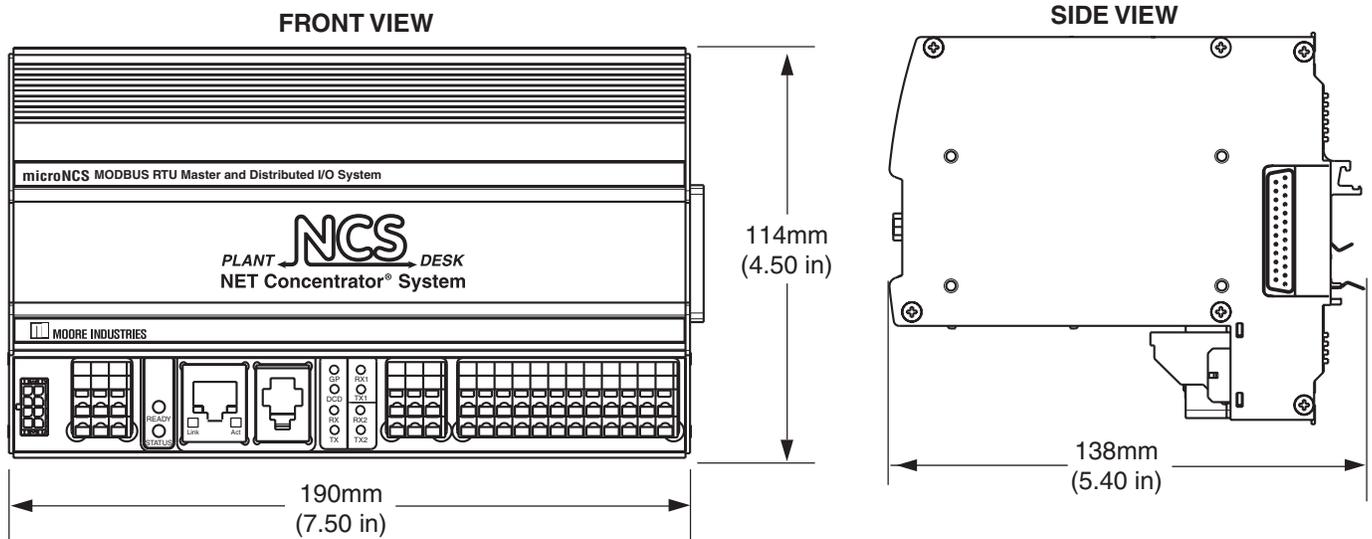
**Analog Output Module**  
AOM / IO / AO4 / IP [DIN]

**Temperature Input Module**  
TIM / IO / TI4 / IP [DIN]

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MODBUS RTU Master  
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Figure 4. microNCS Dimensions (see the NCS NET Concentrator System data sheet for installation dimensions for expansion I/O).



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