

# NTX-260 Substation Controller



The NTX-260 Substation Controller is the top-of-the-line of our NTX-200 Series substation system designs. It incorporates complete substation management functionality for extra large data concentration and protocol translation, while supporting a very large amount of local I/O for full integration of old and new substation designs. Architecturally, the NTX-260 can be described in terms of a client/server relationship. A source produces data (a server) and a destination requires the data (a client). Throughout the NTX-260, servers (e.g., NTX gateway to IEDs) produce data, and clients (e.g., NTX gateway supplying the virtual databases to the master) receive data. It can also transmit numerous selected subsets of this data to one or more master stations in that master's native protocol.

To take maximum advantage of the client/server model, the NTX-260 uses a distributed CPU processing architecture. Multiple high-performance ARM9E (Advanced RISC Machine) 32-bit microprocessors, each programmed to support specific functions, are linked together using a peer-to-peer type network. The ARM9E microprocessor-controlled high capacity NTX serial and Ethernet gateways makes it an ideal, high performance substation solution as a data concentrator and protocol converter for large power plants, transmission and distribution substation installation.



*NTXI/O-12 Expansion Card File*



*NTX-260 Front Access Card File*

# NTX-260 Substation Controller

## Design Features

- 19" rack mount card file(s); front/rear plug in expansion modules (meets IEEE 1101/11 & 1011.10 3-U standards); may be bottom-mounted for panel installations
- Distributed processing architecture featuring multiple high-performance, ARM9E 32-bit microprocessors with DSP extension in an internal client/server, peer-to-peer type LAN
- Embedded Linux operating system (not accessible by the user, for secure operating conditions)
- Legacy protocols from previous Connex/NTU models will be supported, based on demand
- Extended temperature range: -10° to 70°C (14° to 158°F)
- Multiple Virtual RTU™ database mapping
- Field programmable; remotely programmable via an Ethernet WAN/LAN
- Optional IEC 61131 and IEC 61499-compliant NTX Logic PLC program languages that execute user-defined calculation and/or control algorithms
- Comprehensive cyber security functions for meeting NERC CIP security requirements
- Deploy secure communications with DNP3.0 Secure Authentication V5
- Sequence-of-events reporting with 1ms resolution, configurable per digital input point
- Built-in IRIG-B (unmodulated) Time Code Reader and GPS time reference (NMEA 0183) interface (optional external antenna required) or NTP time synchronization supported via the Ethernet networks
- Two USB channels: one for mini-USB to USB connections to the maintenance channel; one to support a thumb drive to update NTX FLASH-based firmware
- Multiple 10/100 BaseT Ethernet with DNP or Modbus RTU protocol over TCP/IP or UDP client, server or multiples of both, with a high quantity of IP connections available per network port
- EURO Card format (3U x 84HP); mid-plane motherboard where the front module contains most of the logic (network CPU node), and the rear module contains the corresponding terminations
- Optional front access-only card file, 19" W x 10.5" H x 9" D
- Multiple master/IED isolated communication serial interfaces (configurable per port for RS-232C, with or without flow-control, to external modems or fiber optics, or RS-485 for copper)

## Application and Expansion

The NTX-260 is typically used in a traditional centralized 19" equipment rack or cabinet. An NTX System Controller with termination provides a combination of router and dual serial ports, with a 10/100 BaseT Ethernet port gateway as the base communications. The router component acts as an NTX internal network controller, where the map of all physical to virtual data is stored. The system controller also supports up to 16 external 4-20 mA DC analog output channels. A binary output controller supports up to 256 external control relays with both momentary (varying contact voltage/current ratings supported) and latch relays per output controller. The local I/O controller supports up to eight 16-point Analog Input modules, eight 32-point Digital Input modules, or eight Bell 202 FSK modems or any combination of the three. With external I/O, up to 256 analog inputs and 512 digital inputs can be supported per local I/O controller.

The NTX-260 power supply and up to 7 additional NTX quad-serial with Ethernet port gateways can be incorporated in the card file mid-plane system motherboard, for a total of 30 isolated EIA561 RS-232/RS-485 RJ45 serial ports and 8 high-capacity 10/100 BaseT Ethernet ports. The local I/O node controllers will use two of these slots when configured.

I/O requirements beyond the base 8-slot I/O motherboard for analog and/or digital input modules are configured in an external NTXI/O-12 expansion card file, with 12 additional I/O motherboard slots. Up to 256 control relays and/or up to 16 external 4-20 mA analog output channels can additionally be configured in the NTXI/O-12 expansion card file. The external I/O expansion card chassis has its own power supply and is interfaced to the main NTX-260 via a DNP3 over TCP 100 BaseT Ethernet WAN with dual RJ45 Ethernet connections that act as a 2-port Ethernet switch for easy daisy-chaining of additional NTXI/O-12 expansion chassis. The IO expansion chassis can be mounted across the room or across the state if a fully compliant 100 MBS Ethernet WAN connection is provided.

NTX Explorer software makes it easy to configure or expand the type and number of ports and protocols communicating with the master stations or IEDs, defining local I/O points, and/or other components.

## Technical Specifications

### Card File

Base card file dimensions	Complies with IEEE 1101/11 & IEEE 1011.10; 84 HP wide & 3U high (19"W x 5.25"H x 12"D) for single Euro-card format modules, 19" rack or bottom wall- or panel-mounting Configuration: the 19" rack/bottom-mounted card file contains the power supply, an 8-slot node system mid-plane motherboard, and an 8-slot I/O mid-plane motherboard
Optional front access only	19" W x 10.5" H x 9" D front access card file contains the power supply, an 8-slot node system mid-plane motherboard, and an 8-slot I/O mid-plane motherboard
NTXI/O-12 expansion card file dimensions	Complies with IEEE 1101/11 & IEEE 1011.10; 84 HP wide & 3U high (19"W x 5.25"H x 12"D) for single Euro-card format modules, 19" rack or bottom wall- or panel-mounting Configuration: the expansion chassis for additional analog or digital inputs beyond the base card file module capacity is equipped with 12 analog input, binary input, and/or FSK modem module slots or any combination of the three. Up to 16 4-20 mA DC analog output channels can also be supported.  An additional 256 relay outputs can be supported when a binary output controller is added.

### Gateway Nodes

NTX System Controller	One DNP3 or Modbus RTU over 10/100 BaseT TCP/IP or UDP Ethernet (RJ45), configurable for up to 16 IP servers, clients, or multiples of both, is included  Includes two isolated RJ45 EIA561 serial ports, each configurable as a primary protocol device, a secondary (DNP3, Level 2 certified, Level 3 compliant) protocol device, or as a pass-through serial port from the WAN. Also supports up to 16 external 4-20 mA DC analog outputs.  One mini-USB maintenance channel port and one USB for thumb drive firmware FLASH updates are included	
Time clock	On-board UTC time/date clock, non-volatile; internal time code reader for satellite clock unmodulated IRIG-B (with P1344 extensions) time synchronization or with optional antenna, Garmin GPS clock time synchronization (NMEA 0183 protocol), or NTP via the Ethernet network	
I/O controllers	Separate node modules for local I/O and local control output functions; provides the interfaces to the card file- or externally mounted analog and digital inputs and external relay outputs	
NTX quad-serial/Ethernet	One DNP3, 60870-5-104, 61850 or Modbus RTU over 10/100 BaseT TCP/IP or UDP Ethernet (RJ45), configurable for gateway up to 64 IP servers, clients, or multiples of both  Includes four isolated serial ports with EIA561 RJ45 connectors per quad serial/Ethernet gateway node, with expansion for up to two serial/Ethernet gateway nodes  Multiple legacy and modern protocols supported  Up to seven quad-serial/Ethernet gateways supported with no local I/O	
Database capacity	14,000 data values per system controller and NTX gateway supported	
Serial port connections	EIA561-compliant RJ45 connector per port	
Ethernet connection	RJ45, with multiple client, server and multiples of both; up to 64 IP configurable per gateway	

# NTX-260 Substation Controller

## Technical Specifications (cont.)

Serial communication ports	Isolated digital RS-232C DTE (with or without handshaking) or RS-485 serial interfaces, configurable per RJ-45 port  Optional external fiber optic transceiver
Serial analog operation channel	Two- or four-wire (9600 baud with optional external modem; 1200 baud with optional internal Bell 202 modem)
Serial baud rate	300 to 115,200 bits per second, selectable per port
Alternate application	NTX Logic is a Programmable Logic Controller (PLC) application that runs on an NTX Gateway platform, with a termination module fitted with the Run-Time License and external programming accessibility. The NTX Logic supports all of the standard IEC 61131 control program languages, as well as the IEC 61499 Function Block Diagram.
IEC 61131/61499 languages supported	SFC: Sequential Function Chart FBD: Function Block Diagram LD: Ladder Diagram ST: Structured Text IL: Instruction List FC: Flow Chart
<b>Local Binary Inputs <sup>1</sup></b>	
Capacity	256 points, in groups of 32 inputs (per installed I/O controller), installed in up to 8 I/O slots in the NTX-260. For externally card file-mounted modules, up to 512 inputs supported per I/O controller. Essentially unlimited expansion using externally configured NTXI/O-12 expansion chassis.  Configurable per point as binary with time (SOE2), binary without time (Status), or Form A or two consecutive points as Form C counters
Scan period	1 millisecond
Resolution	1 millisecond
Change buffer	256 events
Debounce filter	Adjustable bounce filter; changed contact must be in the same state for configurable (0-25) consecutive millisecond scans on a per point basis
Chatter filter	If enabled, provides a chatter period of 0 to 65535 milliseconds and a chatter filter change limit of 1 to 32 changes; both configurable on a per point basis
Contact input sense mode	Non-invert or invert on a per point basis
Contact wetting	Standard isolated $\pm 28$ VDC supplied by NTX-260 power supply; 32 inputs per module Optional 24, 48 or 130 VDC wetting
Input current limits	8 mA closed contact; < 4 mA open contact
Input isolation	Optically isolated
Contact input connections	10 mm compression terminal blocks, accepting up to #12 AWG (2.5mm <sup>2</sup> ) wire
AS545033 TB module dimensions	100 mm x 126 mm x ~90 mm (3.9" x 4.96" x ~3.54") with 34-pin header to 32 pole terminal block for each 16 digital inputs
Mounting	TB Module 35 mm DIN-rail mounted



<sup>1</sup> Binary inputs include binary with time (SOE), binary without time (Status/Alarm), and counter input points; <sup>2</sup> Protocol-dependent

## Technical Specifications (cont.)

### Local Counter Inputs <sup>1</sup>

Capacity	128 Form C or 256 Form A points, in groups of 1 input with NTX-260 input module I/O slot equipped Binary inputs configurable for either Form A or Form C (KYZ contacts) counters
Contact wetting	Standard isolated $\pm 28$ VDC supplied by NTX-260 power supply; 32 inputs per module Optional 48 or 130 VDC
Contact input	Configurable for count per contact transition or count per contact full cycle
Freeze command	From master station based on protocol or locally frozen by the real-time clock May be frozen (report on a freeze command) or running counts (report on a count change) Local Freeze In/Freeze Out isolated interfaces may be supported
Counter register size <sup>2</sup>	Minimum of 16 bits

### Local DC Analog Inputs

Capacity	128 points, in groups of 16 inputs (per local I/O controller), installed in up to 8 I/O slots in the NTX-260. Essentially unlimited expansion using externally configured NTXI/O-12 expansion chassis
Analog inputs	Standard: $0 \pm 1$ mA Optional: 4-20 mA, $0 \pm 1.5$ mA, $0 \pm 2$ mA, $0 \pm 10$ mA, $0 \pm 5$ VDC, etc.
A/D resolution	16-bit
A/D conversion voltage	$0 \pm 5$ VDC, configurable for $0 \pm 1$ VDC, $0 \pm 2$ VDC, and $0 \pm 10$ VDC
Analog accuracy	0.1%; $-10^\circ$ to $70^\circ\text{C}$ ( $14^\circ$ to $158^\circ\text{F}$ )
Multiplexing hardware	Differential—all solid-state (CMOS FET)
Common mode rejection	85 dB @ 0 to 60 Hz
Normal mode rejection	> 70 dB @ 60 Hz
Isolation between inputs	10 m $\Omega$
Analog Input connections	10 mm compression terminal blocks, accepting up to #12 AWG (2.5mm <sup>2</sup> ) wire
AS545032 TB module dimensions	100 mm x 126 mm x ~90 mm (3.9" x 4.96" x ~3.54") with DB25F to 24 pole terminal block for each 8 analog inputs
Mounting	TB Modules 35 mm DIN-rail mounted



### External Local DC Analog Outputs

Capacity	16 analog outputs, in groups of 1 and/or 4 channels (per System Controller)
D/A resolution	16-bit
Analog outputs	Isolated 4-20 mA
Output impedance	25 m $\Omega$
Isolation	Galvanic
Analog accuracy	0.1%; $-10^\circ$ to $70^\circ\text{C}$ ( $14^\circ$ to $158^\circ\text{F}$ )



<sup>2</sup> Protocol-dependent

# NTX-260 Substation Controller

## Technical Specifications (cont.)

Analog output connections	Module fitted with 10 mm compression terminal blocks, accepting up to #12 (2.5mm <sup>2</sup> ) wire
Mounting	Modules 35 mm DIN-rail mounted

### External Control Outputs

Capacity	Optically isolated drivers for up to 256 relays (in groups of 6, 8 or 16 relays); per binary output controller
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Relay coil	24 VDC
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Control sequence	Internal select-before-operate
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Local/remote switch	Standard: rear termination module fitted switch
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Contact interface connections	10 mm removable compression terminal blocks, accepting up to #12 AWG (2.5mm <sup>2</sup> ) wire
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Relays with 20 amp, 150 VDC rated contacts use #8 screw terminals suitable for #10 wire

Relays with 20 amp, 150 VDC rated form X or 2 form C Contacts use #8 screw terminals suitable for #10 wire

Module dimensions	100 mm x 126 mm x ~90 mm (3.9" x 4.96" x ~3.54")
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Mounting	35 mm DIN-rail mounted (relays with 20 amp, 150 VDC rated contact modules are panel-mounted)
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Momentary contact ratings	10 A @ 277 VAC (or 32 VDC) Optional: 10 A or 20 A @150 VDC
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Latch relay contact ratings	10 A @ 277 VAC (or 32 VDC)
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Contact closure times <sup>2</sup>	Selectable: 0.001 second increments
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### I/O Protection Certifications

Inputs and outputs	IEEE SWC protected (certified to ANSI/IEEE C37.90.1-2002)
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Impulse voltage protected (certified to IEC 255-5 Standards)

NERC CIP Compliance	Fully complies with the NERC CIP Version 5.2 requirements; contact Minsait ACS for a complete Table of NERC CIP Compliance Statements for the NTX-200 series Substation Controllers
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### Power Requirements

Power supply mounting	Internal card file module; combines the various input voltage pre-regulator and 5 VDC logic supply into a single package
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Input voltage	24 VDC, 48 VDC, 125 VDC, 120 VAC, 250 VDC, 230 VAC Tolerance range: $\pm 15\%$ minimum
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Power consumption	30 watts, typical
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Power supply certifications	Internal noise < 1.5% of input voltage (certified to IEEE Standard C37.1-1994) Input voltage range > $\pm 15\%$ nominal (certified to CFE U0000-11)
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Optional battery charger	Sealed lead-acid; 6 to 12 hours backup, typical
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Backup with AC	Automatic no-break failover
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## Technical Specifications (cont.)

### Enclosures

Enclosure ratings	Various sizes NEMA 12 (indoor) or NEMA 4 (outdoor) cabinets
Rack mounting	19" rack or bottom card file panel mounting (with module removal clearance) 35 mm DIN rail-mounted analog and digital input terminal block modules, control output modules, analog output modules, and RS-485 serial communication terminal blocks external to card file (20 amp, 150 VDC relay modules are panel-mounted)
Access	Front/rear card file access; alternate: front card file only access

### Operating Range

Operating temperature	-10° to 70°C (14° to 158°F)
With heater option	For operation down to -30°C (-22°F)
Humidity	10% to 95% non-condensing

### NTX Explorer Configuration and Monitor Software

User interface	Keyboard- and mouse-driven menus & views emulate Microsoft® Windows® Explorer
Platform	Portable PC, IBM-compatible
Operating system	Windows XP/WIN7/WIN8/WIN 10
Accessibility	File transfer from the PC to the NTX or from the NTX to the PC via a micro-USB serial connection to the NTX USB maintenance port or via the WAN with permissions
PC serial interface	Mini-USB to USB interface port cable
Monitor parameters	Input and output state/values; control relay or IED tests, selective tracing of internal network traffic Manually modify analog, counter, or binary data values for on-line simulation testing of all inputs On-line IED communication statistics Enabled for either local or remote WAN access; can be disabled by the customer

### Miscellaneous Options

Custom enclosures, with or without optional heater	Other external terminal block options
Bell 202 or 9600 baud 4-wire multi-drop telephone modem	External GPS satellite clock and antenna
35 mm DIN-rail, in 2-meter lengths	RJ45 RS-232 to 9-pin or 25-pin interface cables
RJ45 RS-485 to 8 terminal block assembly interface cables	

### Protocols

Master and IED protocol compatibility expand constantly. Visit [acspower.com](http://acspower.com) for a complete and up-to-date list.

## NTX Explorer Configuration and Monitor Software

NTX Explorer and Monitor programs work on a PC using the Microsoft Windows (XP, WIN7, WIN8 and WIN 10) operating system. It emulates the standard PC Windows Explorer file management system. Drag-and-drop techniques are employed for database-mapping. NTX Explorer is used to configure the unit, either in the field or at your office. Using Ethernet links to the NTX-260, it is easy to remotely download or upload a configuration to or from the NTX-260 via the WAN. Configuration parameters include baud rate, Virtual RTU addresses, modem type, local I/O configurations, etc. All configuration changes can be made independently, stored in a file on the PC, and downloaded to the NTX-260 when convenient. Configuration in an NTX-260 can also be uploaded to a PC.

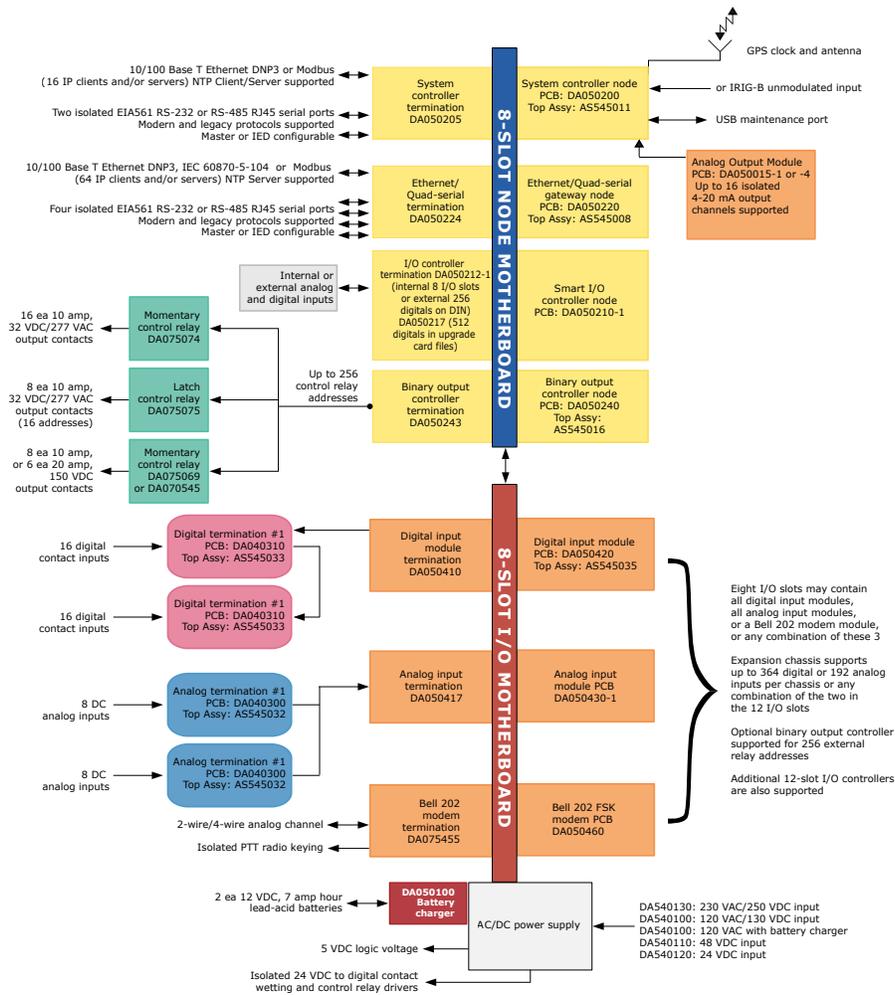
# NTX-260 Substation Controller

NTX Monitor is used for field diagnostics. It is used to display real-time data and functions such as binary and counter inputs, SOE data, analog points, IED inputs and outputs, state and activity of the binary output system, and internal LAN traffic. Local and IED control points can be tested directly in NTX Monitor. It is helpful in troubleshooting IED communications (through the monitor of communications statistics for each connected device) and application problems.

Monitored local input data can be modified manually by a technician for testing or database verification purposes. Monitored data has two quality flags associated with each data value in the database:

- Data that is not updating from the external source (off-line IED, etc.) is displayed with a gray background
- Manually modified data is displayed with a red background

With a 10/100 BaseT Ethernet interface to the NTX-260, NTX Explorer can be connected via a WAN for remote configuration and/or Monitor. NTX Monitor Control via the WAN requires access authorization via the stored password.



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