minsait ACS

An Indra company

NTX-240 Substation Controller

The NTX-240 Substation Controller, a mid-sized version of the Minsait ACS NTX-200 series substation systems, provides complete substation management functionality. It also adds the ability to interface to a large amount of data from IEDs and to upgrade legacy RTUs interfacing to a medium to large amount of locally wired I/O devices in the substation. It does not provide any local I/O slots and is primarily designed to upgrade existing legacy Minsait ACS and 2nd source RTUs. Architecturally, the NTX-240 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-240, clients (such as NTX Gateways to IEDs) produce data, and servers (such as the 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 the master's native protocol. A medium amount of local I/O can be configured in the NTX-240.

To take maximum advantage of the client/server model, the NTX-240 uses a distributed processing architecture. Multiple high-performance ARM9E 32-bit RISC micro-processors, each programmed to support specific functions, are linked together using a peer-to-peer type network. The ARM9E microprocessor-controlled, high capacity NTX quad- serial/Ethernet gateways make it an ideal, low-cost substation solution for data concentrator and protocol converter for small- to medium-sized transmission or distribution substation installation.

NTX-240 expanded chassis

NTX-240 Substation Controller

Design Features

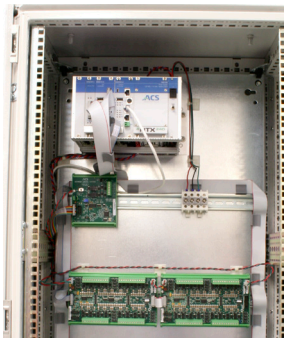
- Distributed processing architecture, featuring multiple high-performance, ARM9E 32-bit microprocessors with DSP extension in a client/server, peer-to-peer type LAN
- Embedded Linux operating system (not user-accessible, for secure operating conditions)
- Legacy protocols from previous Connex/NTU models will be supported, based on demand.
- Extended temperature range of -10° to 70°C (14° to 158°F)
- Multiple Virtual RTU™ database mapping
- Field-programmable; remotely configurable via Ethernet WAN/LAN
- Sequence-of-events reporting with 1ms resolution
- Built-in IRIG-B (unmodulated) Time Code Reader and Garmin GPS time reference (NMEA 0183) interface (optional external satellite clock/antenna required) or NTP time synchronization, supported via the Ethernet network
- Optional IEC 611131 and 61499-compliant NTX Logic PLC that executes user-defined control and/or calculation algorithms
- 2 USB channels: 1 for mini-USB to USB connections to the maintenance channel; 1 to support a thumb drive to update Flash firmware
- Multiple 10/100 BaseT Ethernet with DNP, IEC 60870-5-104 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 42HP; 9.5" W x 6" H x 12" D); mid-plane motherboard where the front modules contains the majority of the logic (system CPU nodes), and the rear modules contains the corresponding terminations
- Multiple master/IED isolated communication serial interfaces (configurable per port for RS-232, with or with- out flow-control, to external modems or fiber optics, or RS-485 for copper)
- Provides I/O interfaces for legacy Minsait ACS and 2nd source RTU upgrades
- Achieve NERC CIP compliance with the use of built-in solutions
- Deploy secure communications with DNP 3.0 SA v5

Application and Expansion

The NTX-240 can be used in a traditional centralized equipment rack- or floor-mounted cabinet. The base NTX-240 I/O interfaces support upgrading:

MPR-7010 upgrade to NTX-240 19" rack file

- Up to sixteen 16-point DIN rail-mounted or card file mounted DC analog input modules (256 points)
- Up to eight 32-point DIN rail-mounted digital input modules (256 points) or 16 card file-mounted digital input modules (512 points)
- Up to 256 momentary and/or latch control relay outputs
- Up to 16 DIN rail-mounted isolated 4-20ma Analog Outputs in groups of 1 or 4 module increments.
- Bell 202 FSK modems supported



Connex 60, upgraded to NTX-240

An NTX System Controller with termination provides a combination of router and dual-serial ports with an Ethernet port as the base communications. An NTX I/O network controller for upgrading DIN rail-mounted analog and digital inputs utilizes a system node slot for up to 256 analog inputs, 256 digital inputs and 16 analog output channels (e.g., to upgrade a Connex 30 or Connex 60 model). An expanded I/O network controller for upgrading card file- mounted analog and digital inputs will utilize the same system node slot for up the 256 analog inputs, 512 digital inputs, and up to 16 analog outputs (e.g., to upgrade an MPR-3010, MPR-7010, NTU-7510, very large Connex 30 models, and many 2nd source RTUs). With the addition of a binary output controller that will utilize another of the five system motherboard slots, up to 256 external control relays can be upgraded with both momentary (varying contact voltage/current ratings supported) and latch relays. The unit power supply and up to 4 additional NTX quad-serial with Ethernet port gateways (two with the local I/O and binary output controller installed) can be incorporated in the card file mid-plane system motherboard–for a maximum of 18 isolated EIA561 RS-232/RS-485 RJ45 serial ports and 5 high-capacity 10/100 BaseT Ethernet ports. NTX Explorer software makes it easy to configure or expand the type and number of ports.

Technical Specifications

Card File

Card file dimensions	Complies with IEEE 1101/11 & IEEE 1011.10 standards; 42 HP wide x 3U high (9.5" W x 6" H x 12" D) for single Euro-card format modules, bottom wall with front and rear access, or rear-mounted with front-only access
	Option: can be supplied in a standard 19" W x 5.25" H x 12" D card file for rack mounting
Configuration	The half- or full-size card file contains the power supply, a 5-slot node system mid-plane node motherboard

System Nodes

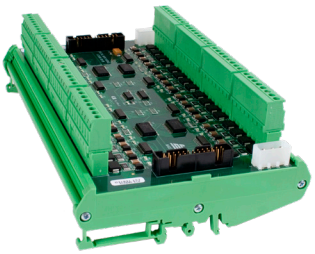
NTX System Controller	One DNP3 or Modbus RTU over 10/100 BaseT TCP/IP or UDP Ethernet (RJ45), configurable as a server, a client, or multiples of both
	Includes two isolated EIA561 RJ45 serial ports, each configurable as a primary protocol device, a secondary (DNP3, Level 2 certified) protocol device, or as a pass-through port from the WAN
	One mini-USB maintenance channel port; one USB for thumb drive firmware updates
I/O controller	Utilizes one of the five system node slots that provide the ribbon cable interfaces to the external DIN rail- or card file-mounted I/O modules.
	For upgrades using DIN rail modules: up to 256 digital inputs; 256 analog inputs; 16 analog outputs
	For card file mounted I/O: up to 512 digital inputs; 256 analog inputs; 16 analog outputs
	Not installed where I/O is not required
Binary output controller	Utilizes one of the five system node motherboard slots for external DIN-rail mounted relay modules for up to 256 relays (momentary or latching). AGC Pulse Control also supported.
	Not installed where no local control outputs are required
NTX quad-serial/Ethernet	One DNP3, IEC 60870-5-104, 61850 or Modbus RTU over 10/100 BaseT TCP/IP or UDP Ethernet server, a client, or multiples of both Includes four isolated serial ports with EIA561 RJ45 connectors per quad serial/Ethernet gateway node, with expansion for up to four NTX quad serial/ Ethernet gateway nodes Multiple legacy and modern protocols supported
Database capacity	14,000 data values per system controller and NTX gateway
Serial port connections	EIA 561 standard RJ45 DTE connectors
Ethernet connection	RJ45, with multiple client, server and multiples of both; 64 IP connections configurable
Serial communication ports	Isolated digital EIA561 RS-232 DTE (with or without handshaking) or RS-485 serial interfaces, configurable per RJ45 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 the NTX System Controller platform
	Firmware fitted with the Run-Time license
	NTX Logic supports all the standard IEC 61131 and 61499 control program languages, as well as Flow Chart

NTX-240 Substation Controller

Technical Specifications (cont.)

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

Upgrading Local Binary Inputs[1]



Capacity	256 points, in groups of 32 inputs maximum, DIN rail-mounted; or 512 card file-mounted maximum Configurable per point as binary with time (SOE 2), binary without time (Status), or Form A or two consecutive as Form C counters
Scan period	1 millisecond
Resolution	1 millisecond
Change memory	256 events
Debounce filter	Configurable for 0 to 25 consecutive millisecond scans before allowing a change 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 ± 28 VDC supplied by NTX-240 power supply; 32 inputs per module; optional external 24, 48 or 130 VDC
Input current limits	8 mA closed contact; < 4 mA open contact
Input isolation	Optically isolated
Time clock	On-board UTC time/date clock, non-volatile; internal time code reader for unmodulated IRIG-B (with P1344 extensions) time synchronization or with optional antenna; GPS clock time synchronization (NMEA 0183 protocol), NTP via the Ethernet network, or via protocol where supported

Upgrading Local Counter Inputs[1]

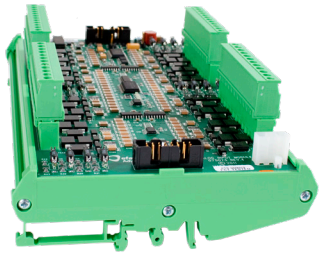
Capacity	128 Form C or 256 Form A points, in groups of one input Binary inputs configurable for either Form A or Form C counters
Freeze command	From master station based on protocol or locally frozen by the real-time clock May be frozen (report on a freeze command) or running counts (report on a count change)
Counter register size[2]	Minimum of 16 bits

1 Binary inputs include binary with time (SOE), binary without time (Status/Alarm), and counter input points

2 Protocol-dependent

Technical Specifications (cont.)

Upgrading Local DC Analog Inputs

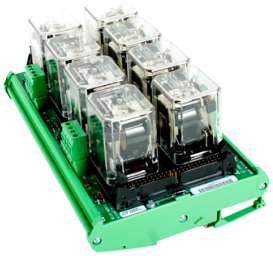


Capacity	256 points, in groups of 16 inputs, DIN rail- or card file-mounted
Analog inputs	Standard: 0 ± 1 mA
	Optional: ± 10 mA, ± 1.5 mA, 4-20 mA, ± 5 VDC, etc.
A/D resolution	16-bit
A/D conversion voltage	0 ± 5 VDC; configurable for ± 1 VDC, ± 2 VDC, ± 10 VDC
Analog accuracy	0.1%; -10° to 70°C (14° to 158°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 Ω

Upgrading External Local DC Analog Outputs

Capacity	16 analog outputs, in groups of 1 and/or 4 channels
D/A resolution	16-bit
Analog outputs	Isolated 4–20 mA
Output impedance	25 m Ω
Isolation	Galvanic
Analog accuracy	0.1%; -10° to 70°C (14° to 158°F)
Analog output connections	10 mm compression terminal blocks, accepting up to #12 (2.5mm 2) wire
Mounting	35 mm DIN-rail mounted

External Control Outputs



Capacity	Optically isolated 16 x 16 matrix drivers for up to 256 relays (in groups of 6, 8 or 16 relays). Pulse Control 32 Relays for 16 AGC Raise/Lower outputs)
Relay coil	24 VDC
Control sequence	Internal select-before-operate; Pulse Control Direct Operate
Local/remote options	Card file external switch
Contact interface connections #12 AWG (2.5mm 2) wire	10 mm removable compression terminal blocks,accepting up to
DIN module dimensions	202 mm x 108 mm x ~90 mm (7.9" x 4.25" x ~3.54") Mounting35 mm DIN-rail mounted (20 amp @ 150 VDC panel-mounted)
Momentary contact ratings	10 A @ 277 VAC (or 32 VDC)
	Optional: 10 A and/or 20 A @150 VDC Latch relay contact ratings 10 A @ 277 VAC (or 32 VDC)
Contact closure times[2]	Selectable: 0.001 second increments

NTX-240 Substation Controller

Technical Specifications (cont.)

I/O Protection Certifications

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

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
Input voltage	24, 48, 130, 260 VDC; 115, 220 VAC Tolerance range: ± 15% minimum
Power consumption	30 watts, typical
Power supply certifications	Internal noise < 1.5% of input voltage certified to IEEE Standard C37.1-1994) Input voltage range > ± 15% nominal (certified to CFE U0000-11)
Optional battery charger	Sealed lead-acid; 6 hours backup, typical
Backup with AC	Automatic no-break failover

Enclosures

Enclosure ratings	Utilize existing legacy RTU enclosure/rack, indoor or outdoor cabinets
Rack mounting	Floor mounted 19" cabinet or rack; existing 35 mm DIN-rail for I/O modules Optional bottom or rear front-access mounting Front/rear or front only card file 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

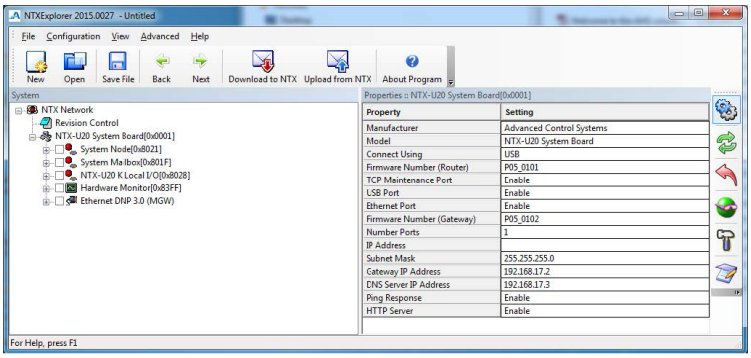
NTX Explorer Configuration and Monitor Software

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
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

Technical Specifications (cont.)

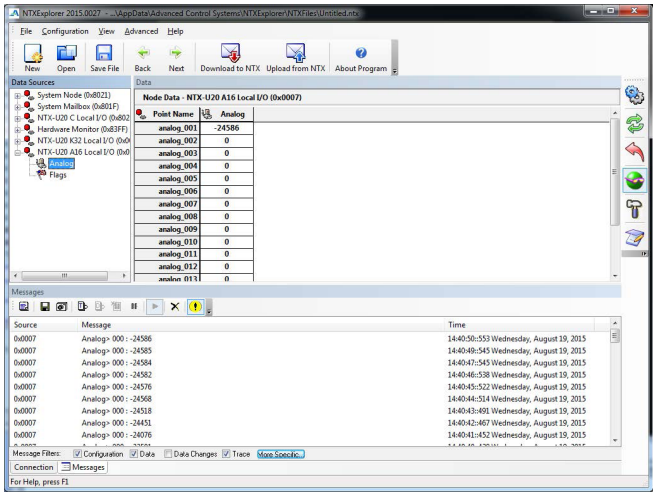
Miscellaneous options	Custom enclosures, with or without optional heater Other external terminal block options Bell 202 or 9600 baud 4-wire multi-drop telephone modem External GPS satellite clock and antenna RJ45 RS-232 to 9-pin or 25-pin interface cables RJ45 RS-485 to 8 terminal block assembly interface cables
Protocols	Master and IED protocol compatibility expand constantly. Visit our web site for a complete and up-to-date list.

NTX Explorer Configuration and Monitor Software



The NTX Explorer and Monitor programs work on a personal computer using the Microsoft® Windows® (XP, WIN7, WIN8 and WIN 10) operating system. It emulates the standard PC Windows Explorer file management system to minimize special training requirements. Drag-and-drop techniques are employed for database-mapping. NTX Explorer is used for configuration of the unit; in the field or the convenience of your office. Using Ethernet links to the NTX-240 provides an easy way to remotely download or upload a con- figuration to or from the NTX-240 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-240 when it is convenient. Configuration in an NTX-240 can also be uploaded to a PC.

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.

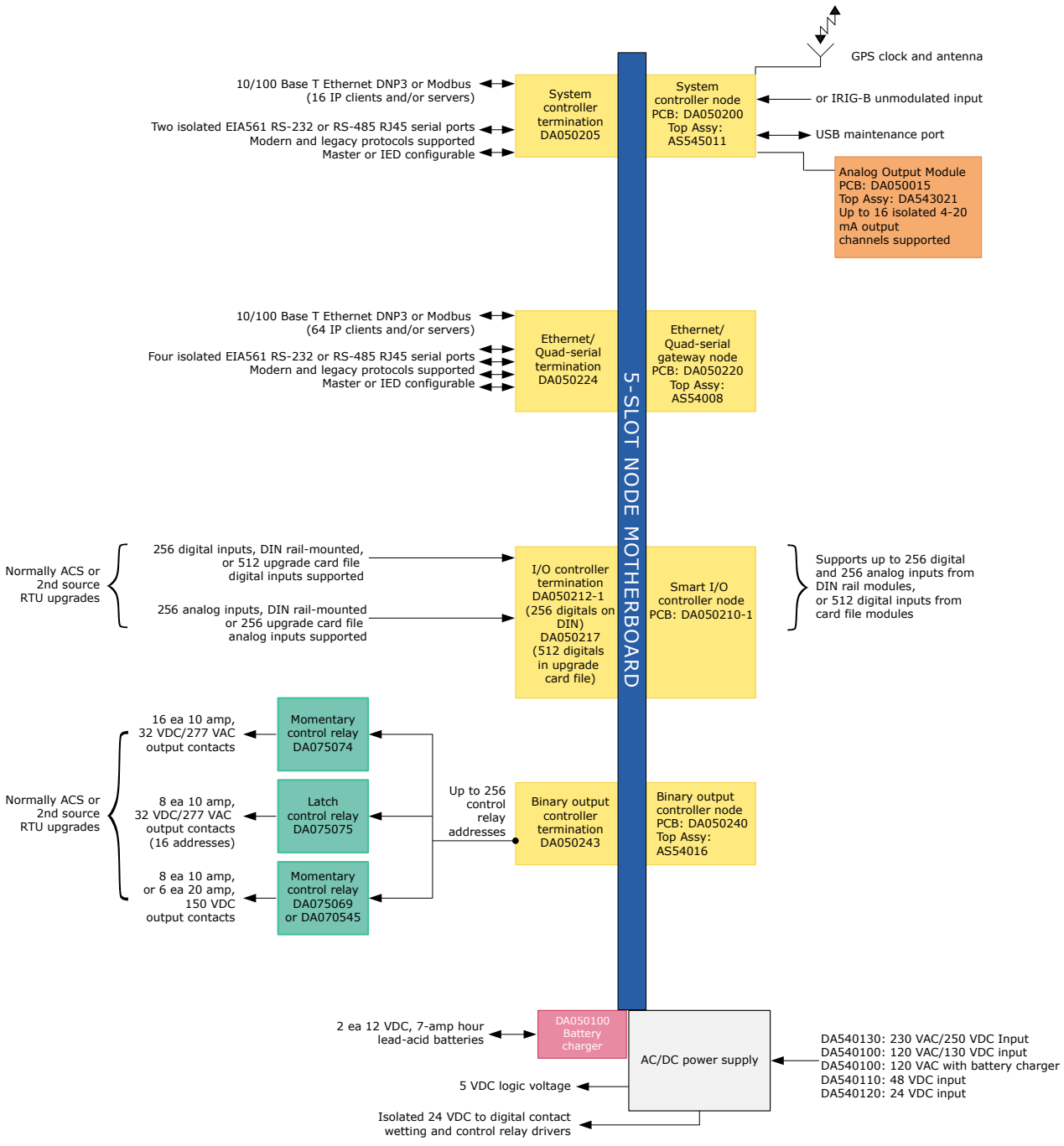


Monitored local input data can be modified manually by a technician for testing or database verification purposes. Monitored data has two quality flags associated with each data value in the database:

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

With a 10/100 BaseT Ethernet interface to the NTX-240, NTX Explorer can be connected via a WAN for remote configuration.

NTX-240 Substation Controller



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