

New York City's Advanced Traffic Controller Procurement Project (ASTC)

ITE Session 28
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Outline

- Background and history of the project
- Approach to the use of standards
- Discussion of the unit as designed
- Pictures of the unit
- Observations
- Future considerations



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Background

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- NYC has > 10,000 Electro-mechanical controllers
- Communications
 - 100 VDC pulses (cir. 1968)
 - Manhattan 56 Kbps coax (cir. 1990's)
 - Next Generation - TBD
- >95% of controllers are simple 2 phase (2Veh/2Ped) pretimed
- City Requirements
 - Low cost unit
 - Small – similar to existing cabinets
 - Use proven and accepted standards based technology
 - NTCIP for next phase of expansion
 - Vendor independence for future procurements

Specification Development

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- Specification was developed 4Q1999 - 1Q2000
 - City maintenance technicians
 - City traffic engineers
 - ATC standards development program
- A 'straw man' design was developed
- NEMA and 170 vendors interviewed
- Specifications were finalized
 - Reviewed by FHWA and NYSDOT
 - Project was bid in the 4Q2000

Procurement History

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- **Project awarded April 2001**
- **Bid for 1000 controllers (a trial order)**
 - 950 ASTC Basic 2 phase
 - 50 ASTC-12
 - **Support & spare parts included**
 - Bench testers (2010, BIU, Controller)
 - Spare Parts
 - Inventory management system
 - Software development environment
- **Communications**
 - DC 100 VDC Direct control
 - Coaxial Cable re-using the existing RCU
 - NTCIP – RS232 for 9600 bps
 - NTCIP – IP to field devices
- **City to purchase 2400 additional controllers in 2002**



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Standards Based Approach

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- **NYS 170/179/330 construction and plug-ins**
 - Input Cards, L/S, FTR, Flasher
- **NEMA BIU**
 - 1 for ASTC
 - 2 for ASTC-12
- **2010ECL monitor (modified voltage thresholds)**
- **NEMA functionality (TS2-1998) & NTCIP**
- **2070 form factor modem slot in controller**
- **No mandate for 2070 (cost considerations)**
 - Specify the interfaces and functionality



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Other Requirements

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- **NYS Style PDA**
 - Added 12 VAC for Ped
 - Adopted ATC wiring for FTR/Contactor
- **Pole Mounted Cabinet – rear mounting and conduit entry**
- **.187 Aluminum cabinet**
- **Shelf mounted controller**
- **Embedded cabinet address (16 bit)**
 - Special PC card (No data key)
- **Heavy duty field terminal blocks**
- **Ease of field maintenance**

NTCIP Approach

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- **Full support for the TS2 NTCIP**
 - Compliance group A2N level 2
- **Special objects**
 - Transition
 - Download request
 - IP address XX.XX.AA.AA
- **No 'vendor specific' functionality**
 - Goal was interchangeability
- **No proprietary objects**

Major Characteristics

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- **Dimensions (ASTC)**
 - 36 inches tall
 - 19 inches wide
 - 15 inches deep
 - Front door only (no police)
- **Features**
 - 6 load switches (4 with flash)
 - 2 FTR
 - 4 Flash Programming jumpers
- **4 slot input file**
- **1 BIU**
- **2010 CFM**
- **Dimensions (ASTC-12)**
 - 49 inches tall
 - 22 inches wide
 - 15 inches deep
 - Front door only (no police)
- **Features**
 - 12 load switches
 - 6 FTR
 - 12 Flash Programming jumpers
- **10 slot input file**
- **2 BIU**
- **2010 CFM**

Major Characteristics - Continued

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- **Ethernet Interface (10/100BaseT)**
- **Fully configurable input/output mapping (EIA485 serial TS2)**
- **Lap-top interface (cabinet address = database ID)**
- **6 Serial Ports**
 - 4 Front mounted
 - 2 Modem Slot
- **4x40 Diagnostic Display – 4 button Navigation**
 - Diagnostic and view only
- **Firmware is field upgradeable (Serial Port)**
- **No batteries – super capacitors**
- **2 USB ports**

Procurement Requirements

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- **Materials Procurement – no partial payments**
- **City has license rights to source code (for NYCDOT Only)**
- **City to be provided full software development capability**
- **Comprehensive, rigorous testing program**
 - Prototype testing (Factory)
 - Integration testing with the system (NYC)
 - Design approval testing (Factory)
 - Factory acceptance testing with full burn-in (Factory)
 - On-site acceptance period (NYC)
 - Warranty 12 months after last controller installed



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Technology Being Used - Vendor's Choices

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- Intel Based CPU (32MB RAM, 2-8MB Flash, DB & code)
- QNX operating system
- Standard BIU
 - NEMA Compatible – but at 60 Hz
- Modified 2010
 - Threshold Voltages (software)
 - Relay output for Flash transfer (Fail-safe)
- Cabinet Backplane
 - Printed Circuit (low current)
 - Wired (signal wiring).

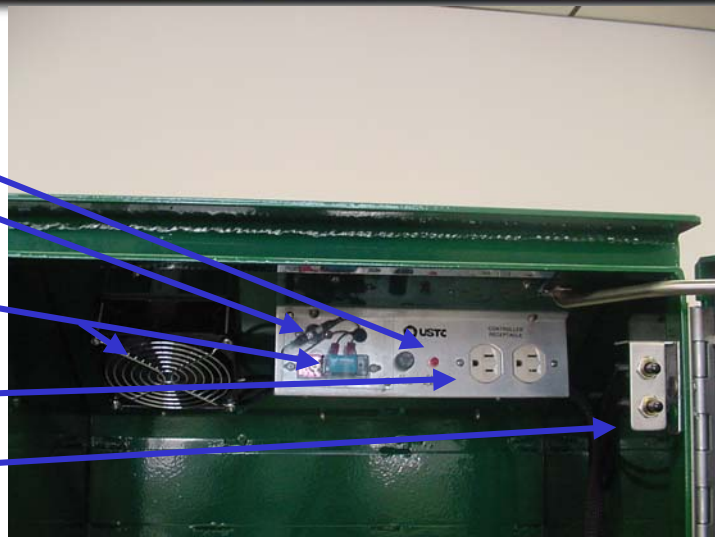


Over
temperature
alarm &
sensor

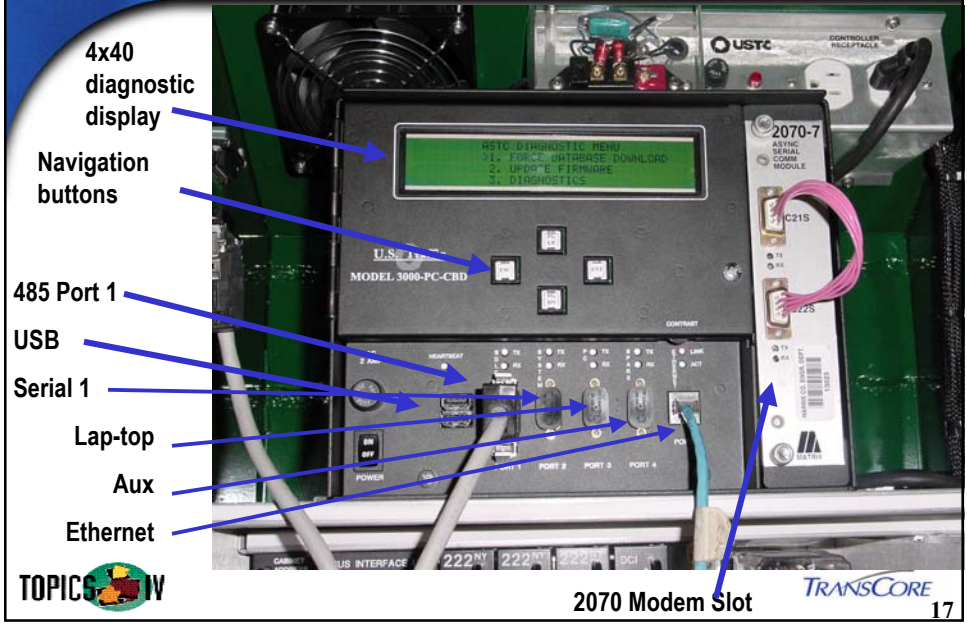
Fan &
thermostat

Controller
outlet

Door
switches

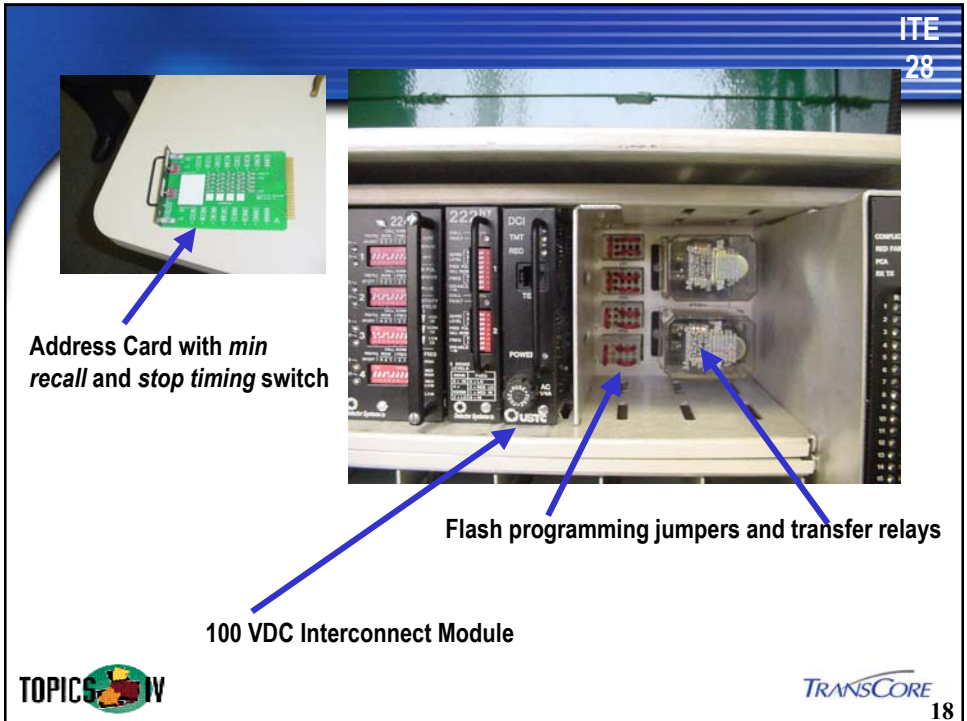


Controller Unit



- 4x4 diagnostic display
- Navigation buttons
- 485 Port 1
- USB
- Serial 1
- Lap-top
- Aux
- Ethernet

2070 Modem Slot

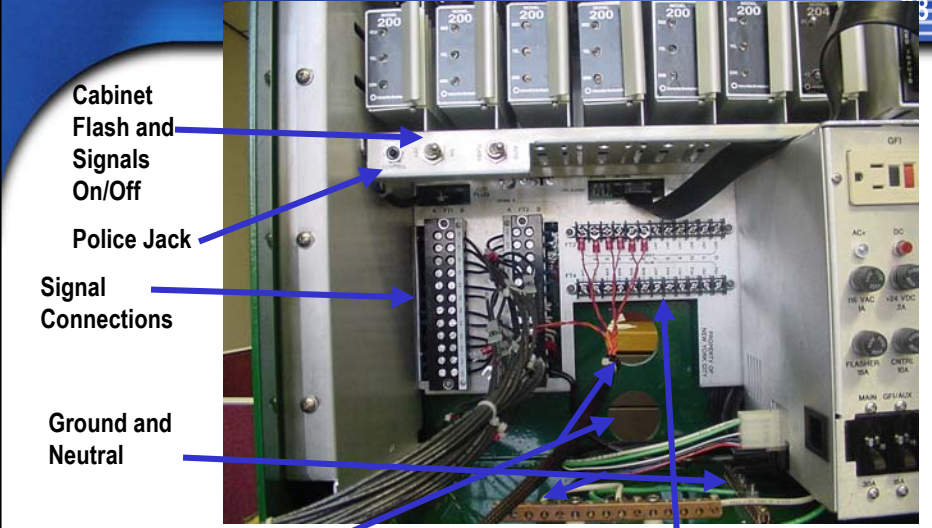


Address Card with min recall and stop timing switch

Flash programming jumpers and transfer relays

100 VDC Interconnect Module





Red Monitor Cable

2010 CFM

PDA

Service Outlet

12 VAC

24 VDC

Main breaker

Service breaker

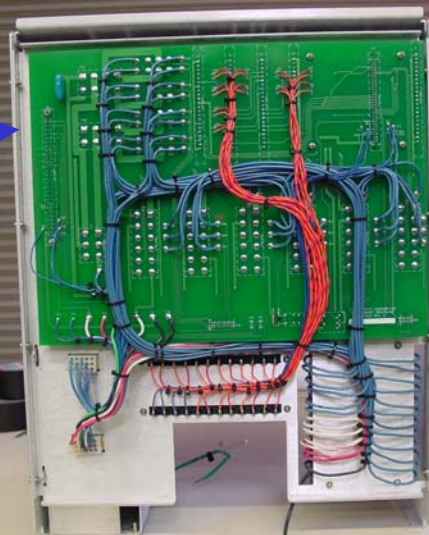
Signal Breakers (2)

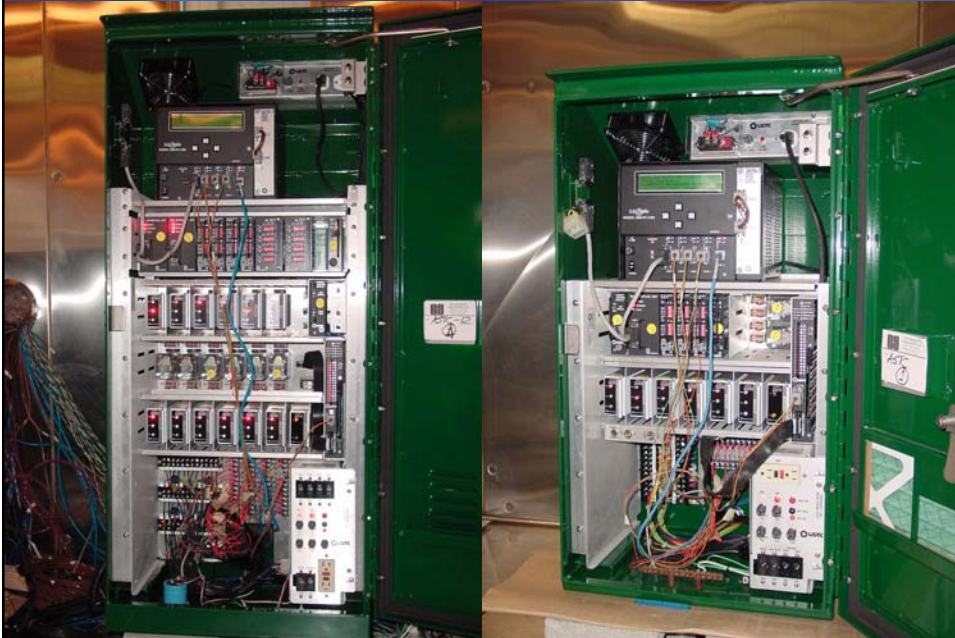


Backplane Wiring

Basic ASTC

ASTC-12 input file





Observations

Lessons Learned

- Manufacturer 'interpretation' of BIU functionality and limitations are different – NEMA silent on some issues
- Voltage thresholds vary by customer; NYC wants operation down to roughly 93 VAC.
- Cost was modest; ~ \$4,100 (Public Bid Documents) @ 1000 pcs. Including:
 - Engineering, development, and testing
 - DC Interconnect Interface module
 - Plug-ins listed
 - Controller
- Standards were a moving target (2000-2002)

- **IP addressing –**
 - Initial implementation NN.NN.AA.AA
 - NN.NN is an NTCIP object
 - AA.AA is the 16 bit cabinet address
 - DHCP + machine ID and the cabinet address
- **Cabinet Monitoring**
 - 2010X with all connections to backplane
 - 485 bus for monitoring controller
 - ATC ITS Cabinet Standard
 - CMU
 - AMU

- **Serial Interface**
 - BIU vs. SIU (ATC ITS Cabinet)
- **Power Issues – where standards are needed**
 - DC Cabinet
 - Reduced power devices
 - Load Switches
 - FTR
 - Flasher
 - Contactor
 - Backup Power
- **2070 Engine Card and/or ATC API**
 - Depends upon the next ATC standard

Questions ?

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