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“Green Cabinet” Initiative

Advanced Transportation Controller (ATC) Cabinet Specification- Backpack



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Section 1

Backpack Cabinet Specification

1.1 General

This specification describes the 120 Vac High Voltage (HV) Backpack Advanced Transportation Controller (ATC) Cabinet (“the cabinet”) for the New York City DOT. The ATC Cabinet family is a modular, serially-interconnected cabinet architecture that is designed to fulfill a variety of transportation applications.

The cabinet shall include: Service Assembly (SA), Combo Input and Output Assembly, Field Input Termination Assembly (FITA) and Field Output Termination Assembly (FOTA).

1.2 Requirements

The cabinet shall adhere to the following requirements:

- The Assemblies shall be completely removable from or installable in the cabinet without removing any other equipment and using only a standard slotted or Phillips screwdriver.
- The cabinet shall be capable of Cabinet Flash signal operation in the absence of any of the following assemblies: Combo Input and Output Assembly, Cabinet Power Supply, and Controller.
- A momentary push button shall be provided that, when pressed, energizes the 24 Vdc to the HDSPs during Flash Mode. The button shall be labeled “24VDC BYPASS” and shall be located on the front of the Combo Input and Output Assembly.
- High-voltage components (over 50 V) shall be protected from incidental contact per NEC.
- All fuses, circuit breakers, switches and indicators shall be readily visible and accessible from the area accessed by opening the front door.
- All circuit breakers located on the rack shall have covers to prevent accidental tripping.
- All Assemblies shall be modular with pluggable cabling.
- The ventilation fan shall be fastened to the cabinet via one swell latch and shall not be fastened in a manner that requires any tools for removal or installation.
- Door switches shall be powered by 48 Vdc.
- Wire raceway shall be integrated as part of the cabinet allowing for neat internal and field wiring.
- All equipment in the cabinet shall be clearly and permanently labeled.
- The marker strips shall be made of material that can be easily and legibly written on using a pencil or ballpoint pen. Marker strips shall be located immediately below the item they are to identify and must be clearly visible with the items installed.
- Guides (top and bottom) shall be provided for assembly plug-in units. The guides shall begin 0.50 inch from the assembly front panel face.

1.3 Cabinet Housing

The housings shall include, but not be limited to, the following:

- Enclosure & Door
- Gasketing
- Door Latch & Lock
- Ventilation
- Cage Supports & Mounting
- Door Hinges & Catches
- Police Panel
- Aluminum Surfaces

1.3.1 Housing Construction

The housing shall be rainproof. The cabinet shall be 30" tall, 16" wide and 17" deep. It shall have front door and equipped with a lock and handle. The enclosure top shall be crowned to prevent standing water.

1.3.2 Material Thickness

The enclosure, doors, gasket channels, police panel door, spacer supports and all supports welded to the enclosure and doors shall be fabricated of 0.09 inch minimum thickness aluminum sheet.

1.3.3 Welds

All exterior seams for enclosure and doors shall be continuously welded and shall be smooth. All edges shall be filled to a radius of 0.03125 inch minimum. Exterior cabinet welds shall be done by gas Tungsten arc TIG process only. ER5356 aluminum alloy bare welding electrodes conforming to AWS A5.10 requirements shall be used for welding on aluminum. Procedures, welders and welding operators shall conform to the requirements and practices in AWS B3.0 and C5.6 for aluminum. Internal cabinet welds shall be done by gas metal arc MIG or gas Tungsten arc TIG process.

1.3.4 Aluminum Surface Protection

The aluminum surface shall be painted per NYCDOT requirements.

1.3.5 Enclosure Door Frames and Door Seals

The cabinet shall have firm seal between the door gasketing and the frame. The dimension between the door edge and the enclosure external surface when the door is closed and locked shall be 0.156 inch (+/-0.08 inches).

1.3.6 Gasketing

Gasketing shall be provided on all door openings and shall be dust-tight. Gaskets shall be 0.25 inches minimum thickness closed cell neoprene or silicone (BOYD R- 108480 or equal) and shall be permanently bonded to the metal. A gasket top and side channels shall be provided to support the top gasket on the door to prevent gasket gravitational fatigue.

1.3.7 Door Latches and Lock

The cabinet shall be equipped with paddle handle and lock. The lock shall be Corbin 1548RS7/8 keyed for a DT-9 with dust cover DT-9 key, with dust cover. One key shall be supplied with each lock. The keys shall be removable in the locked position only. The latching mechanism shall be a single point lock type. When the door is closed, the door shall be locked. The lock and lock support shall be rigidly mounted on the door. The lock shall be mounted close to the center. A swing away cover shall be placed over the key entrance to protect the lock mechanism.

1.3.8 Hinges

Two stainless steel butt hinges shall be provided to bolt the enclosure to the door. The pin ends shall be welded to hinge and ground smooth. The pins and bolts shall be covered by the door edge and not accessible when the door is closed. A ground strap between the door and the main cabinet housing shall be required when 120 Vac components are mounted on the door.

1.3.9 Door Catch

Front door shall be provided with catches to hold the door open at both 90 and 135 (+/- 10) Degrees. The catch minimum diameter shall be 0.375 inch aluminum rods. The catches must be capable of holding the door open at 90 degrees in a 60 mph wind acting at an angle perpendicular to the plane of the door.

1.3.10 Police Panel Access (Optional)

A police panel access shall be provided to allow limited control access. The Model 358i Backpack ATC Cabinet Police Panel Access shall be equipped with a lock and master police key and shall be equipped with "SIGNALS ON / OFF" and one "FLASH / AUTO" switches. The MANUAL CONTROL ENABLE ON-OFF switch and a receptacle for the INTERVAL ADVANCE cord shall be provided. An INTERVAL ADVANCE cord, six feet in length, shall be provided.

1.3.11 Housing Ventilation

Housing ventilation shall including intake, exhaust, filtration, and continuous running fan assembly or a thermostat controlled fan.

1.3.11.1 Intake & Filter

The louvered vent depth shall be a maximum of 0.25 inch. A removable air filter shall be housed behind the door vents. The filter filtration area shall cover the vent opening area. A filter shell shall be provided that fits over the filter providing mechanical support for the filter.

1.3.11.2 Fan

Each electric fan shall be equipped with ball or roller bearings and shall have a minimum capacity of 100 cubic feet of free air delivery per minute. The fan shall be mounted within the housing and protected with a finger guard. The fan should be powered from 24 Vdc.

1.3.12 Cabinet Lights

The cabinet shall be equipped with two LED lights activated by door switch and equipped with fuse. The fan should be powered from 24 Vdc.

Section 2

Backpack Cabinet Assemblies

2.1 Combo Input and Output Assembly

The Combo Input/output Assembly shall be a 14-inch rack mounted assembly and shall house two Model 2202-HV Universal High-Density Switch Pack / Flasher Units (HDSP-FU) and two 2/4-channel input devices. The Combo Input/output Assembly shall have two additional slots to house either two HDSP-FU or two 2/4-channel input devices or a combination of the two, up to a total of 2 devices.

One resident Model 2218 Serial Interface Unit (SIU) shall provide interface and control shall be provided and mated to a DIN 96-pin connector.

The Combo Input/output Assembly shall house a CMUip-2212-HV Cabinet Monitor Unit (CMUip), Main Contactor, Stop Time Switch, Flash / Auto Switch, four Circuit Breakers and Momentary 24VDC Bypass Switch.

The Combo Input/output Assembly shall be swingable from right to left in order to access Field Input/output Termination Assembly.

The Combo Input/output Assembly shall be a 3U high rack mounted assembly.

2.2 Field Output Termination Assembly

The Field Output Termination Assembly shall be coupled with the Combo Input and Output Assembly.

The Field Output Termination Assembly shall house four Model 2205 High-Density Flash Transfer Relays (HDFTR). Each High Density Flash Transfer Relay position shall be labeled with the number of its associated High Density Switch Pack (1-4).

Flash Program Blocks (FPB) shall be provided to control and select the color (red, yellow, or dark) during cabinet Flash mode. Each FPB position shall be labeled with the number of its associated channel (1-8).

AC power Transient Protectors shall be provided for protection of the High Density Switch Pack. The Field Output Termination Assembly shall be provided with 8, 6-position Phoenix Contact terminal block model number 18-04-94-6 plugs and 18-61-19-6 sockets or equivalent. Each Load Terminal Block receptacle shall be labeled with the number of its associated channel (1-8). Additional labels shall be provided to clearly indicate which terminals correspond to the red, yellow, and green switch pack outputs. The color of these labels shall match the color of their associated output (red, yellow, or green).

2.3 Field Input Termination Assembly

The Field Input Termination Assembly shall be coupled with the Combo Input & Output Assembly. It shall have positions for landing up to 16 two-wire inputs and their associated earth ground wires. The Field Input Termination Assembly shall have positions for 8 transient surge protectors. The protectors shall be supplied with the cabinet if specified.

2.4 Service Assembly

The Service Assembly shall be modular and mounted across the cabinet. It shall house: Model 2202-HV Universal HDSP-FU, Cabinet Power Supply, HESO HE1750R or approved equal, GFCI, Convenient Outlets and Circuit Breakers.

The Service Assembly shall be swingable from right to left in order to access the Field Input and Field Output Termination Assembly.

2.5 SB1/SB2 and DC Power Bus

SB1/SB2 and DC Power Bus shall be embedded into the Service Assembly to accommodate interconnection between the assemblies

2.6 AC Clean Power Bus

The AC Clean Power Bus shall be embedded into the Service Assembly to provide Clean Power for the Controller Unit, Cabinet Power Supply and input devices.

Section 3

Backpack Cabinet Components

3.1 Model 2202-HV High-Density Switch Pack-Flasher Unit (HDSP-FU)

The HDSP-FU shall be compact, pluggable, modular PCB-based, and equipped with DIN connector. The HDSP-FU shall be compatible with ultra-low power LED signal heads and it shall have a current monitoring feature for each output of each channel. The HDSP-FU shall use real-time standardized high speed SB3 communications with the Cabinet Monitor Unit to send a complete set of RMS voltage and load current measurements. The HDSP-FU shall be 4.5" H x 6.5" D and shall be equipped with a handle, reset push button switch, six RYG LED indicators, four flasher LED indicators, one power LED indicator and two Rx/Tx LED indicators.

The HDSP-FU can function as either a switch pack (HDSP) or as a flasher unit (HDFU). When installed in the Output Assembly, the High-Density Switch Pack (HDSP) shall provide two RYG channels of operation (6 outputs).

When installed in the Service Assembly, the High-Density Flasher Unit (HDFU) shall function as a four output flasher.

3.2 Model 2212-HV Cabinet Monitor Unit (CMUip)

The Cabinet Monitor Unit (CMUip) shall be compact, pluggable and modular. The CMUip shall use real-time standardized 614.4 Kbs SDLC communications with the ATC to transfer command and response data on Serial Bus #1 (SB1). The CMUip shall be capable of monitoring up to 32 physical switch pack channels (RYG) and shall have optional four virtual channels. The CMUip shall provide a Flasher Alarm feature. The CMUip shall analyze the ATC output commands and field input status to isolate the failure source by channel and color. The CMUip configuration programming shall be provided by an interchangeable Datakey nonvolatile memory device. This rugged key shall store all CMUip configuration parameters and shall eliminate programming using jumpers, diodes, or DIP switches. The CMUip shall maintain a nonvolatile event log recording the complete intersection status as well as time stamped previous fault events, AC Line events, configuration changes, monitor resets, cabinet temperature and true RMS voltages and currents for all field inputs. The signal sequence history log stored in nonvolatile memory graphically shall display up to 30 seconds of signal status prior to the fault trigger event with 50 ms resolution to ease diagnosing of intermittent and transient faults.

3.3 Model 2218 Serial Interface Unit (SIU)

The Model 2218 Serial Interface Unit (SIU) shall be a compact, pluggable and modular. The SIU shall use real-time standardized 614.4 Kbs SDLC communications with the ATC to transfer command and response data on Serial Bus #1 (SB1). The SIU shall be equipped with 54 programmable input/out pins, four optically isolated input pins, one line

sync reference input pin and 4 address select input pins. The optically isolated inputs shall work with either 12 Vac or 24 Vdc.

The SIU outputs shall be rated at 150 mA continuous sink current. Each output shall provide a 500 mA typical current limit and shall be rated to 50 V and utilize a voltage clamp for inductive transient protection. The SIU shall be equipped with a front panel LED indicator that can report the current SIU assembly address assignment of the SIU for cabinet configuration verification.

3.4 Model 2220C Auxiliary Display Unit (ADU)

The ADU shall install in a 1U height 19" rack space and shall provide a menu driven user interface to the enhanced features of the CMUip monitor including the built-in Diagnostic Wizard. The ADU shall provide 32 channels of Red, Yellow and Green LED indicators that display full intersection status and 32 Blue fault status LED indicators shall identify faulty channels. The ADU shall provide proper electrical termination to SB3. The ADU shall have a 4 line by 20 character menu driven liquid crystal display with backlight and heater. The ADU built-in Diagnostic Wizard shall automatically pinpoint faulty signals and offers trouble-shooting guidance and automatically isolate and identify problems. The ADU shall be equipped with Event Logging displaying the CMUip time-stamped nonvolatile event log records with the complete intersection status as well as AC Line events, monitor resets, temperature and true RMS voltages and currents.

3.5 Model 2217 Cabinet Power Supply (CPS)

The CPS is a card style rack mounted high efficiency switching power supply. The CPS shall provide a regulated 24VDC output and a 48VDC output. The CPS shall provide output regulation across changes in AC Line voltage and output load over the full operating temperature range of -34C to +74C. The CPS 24VDC output shall be protected against voltage transients by a 1500 Watt suppressor. The CPS shall be equipped with a LED AC Line indicator to display input status and fuse integrity and two green LED indicators to display output status and fuse integrity for each DC output. The CPS shall be rated at 120 Watts, 48 Vdc @ 1 Amp and 24 Vdc @ 3 Amp

3.6 MonitorKey Programming Tool

The Programming Tool provides the capability to Read and Write data from the CMUip Datakey device. The MonitorKey software shall be compatible with the CMUip-2212.

3.7 Model 21H High-Density Flash Transfer Relay (HDFTR)

The HDFTR shall have a hermetically sealed cover and shall be moisture proof. The HDFTR shall be filled with dry nitrogen to protect contacts from corrosion and to prevent condensation. The HDFTR shall have a shock/impact resistant metal can cover with

solid and bend proof pins. The HDFTR contacts shall be rated at 120 Vac @ 5 Amp. The coil of the HDFTR shall be rated at 48 Vdc. The HDFTR shall have an LED indicator to display contact transfer position.

3.8 Main Contactor (MC)

The MC shall be mercury free and shall be rated at 120 Vac @ 60 Amp. The coil of the MC shall be rated at 48 Vdc. The MC shall be equipped with input indicator and shall have SPST- N.O. contacts.

3.9 Cabinet Suppressor-Filter

The cabinet shall be equipped with a Cabinet Suppressor–Filter. The unit shall incorporate the use of warning and failure indicators and shall have a dry relay contact remote sensing circuit. The unit shall be modular and pluggable with a 12-position Beau 5412 connector. The unit shall be rated at continuous service current of 15 Amp and maximum clamp voltage of 390 Vac. The unit shall filter noise and spike from 10 KHz to 25 MHz and shall have a peak surge current of 48 KA.

3.10 HDSP Suppressor

The HDSP Suppressor shall be modular and pluggable. The unit shall be epoxy encapsulated and equipped with 9-position 5.08 mm Phoenix Contact connector or approved equal. The unit shall be able to protect 6 circuits. The device operating voltage shall be 120 Vac and clamping voltage shall be 340 Vac. The unit dimensions shall be 2" H x 0.7" W x 2" D.

3.11 Detection Module Suppressor

The Detection Module Suppressor shall be modular and pluggable. The unit shall be epoxy encapsulated and equipped with 6-position 5.08 mm Phoenix Contact or approved equal connector. The unit shall be able to protect 6 circuits. The device operating voltage shall be 75 Vac and clamping voltage shall be 130 Vdc. The device dimensions shall be 2" H x 0.7" W x 1.2" D.

3.12 Cabinet Assembly Component Requirements

3.12.1 Combo Input and Output Assembly:

- (4 each) Model 2202-HV HDSP-FU
- (1 each) Model 2218 SIU
- (1 each) Model 2212-HV CMUip
- (1 each) 4-channel Half-Width Detector
- (1 each) Model 244L

3.12.2 Field Output Termination Assembly:

- (4 each) Model 21H HDFTR
- (2 each) HDSP Suppressor
- (8 each) Red Flash Program Blocks
- (2 each) Yellow Flash Program Blocks
- (2 each) White Flash Program Blocks

3.12.2 Field Input Termination Assembly:

- (4 each) Detection Module Suppressor

3.12.3 Service Assembly:

- (1 each) Model 2202-HV HDSP-FU
- (1 each) Model HE1750R or approved equal
- PS-2217 Cabinet Power Supply (CPS)

Section 4

Electrical, Environmental and Testing Requirements

4.1 General

The requirements called out in this specification dealing with equipment evaluation are a minimum guide and shall not limit the testing and inspection to ensure compliance.

4.2 Certification

These test procedures shall be followed by the manufacturers who shall certify that they have conducted inspection and testing in accordance with this specification.

4.3 Inspection

A visual and physical inspection shall include mechanical, dimensional and assembly conformance of all parts of this specification.

4.4 Environmental and Electrical

All components shall properly operate within the following limits unless otherwise noted:

- Applied Line Voltage: 90 to 135 Vac
- Frequency: 60 (+/-3.0) Hertz
- Humidity: 5% to 95%
- Ambient Temperature: -34.6 °F to +165.2 °F
- Shock - Test per Specification MIL-STD-810G Method 516.6
- Vibration - per Specification MIL-STD-810G Method 514.6

4.5 Commencement Operation

All circuits, unless otherwise noted, shall commence operation at or below 90 Vac as the applied voltage is raised from 50 to 90 Vac at a rate of 2 (+/-0.5) volts / second.

4.6 Equipment Compliance

All equipment shall be unaffected by transient voltages normally experienced on commercial power lines. Where applicable, equipment purchased separately from the cabinet (which normally is resident) will be tested for compliance.

4.7 Power Line Surge Protection

The power line surge protection shall enable the equipment being tested to withstand (Non-destructive) and operate normally following the discharge of a 25 µF capacitor charged to ± 2,000 volts, applied directly across the incoming AC line at a rate of once every 10 seconds for a maximum of 50 occurrences per test. The unit under test will be operated at 68 °F ± 41 °F and at 120 (±12) Vac.

4.8 Operating

The equipment shall withstand (Non-destructive) and operate normally when one discharge pulse of plus or minus 300 volts is synchronously added to its incoming AC power line and moved uniformly over the full wave across 360 degrees or stay at any point of Line Cycle once every second. Peak noise power shall be 5 kilowatts with a

pulse rise time of 500 ns. The unit under test will be operated at 68 °F \pm 41 °F and at 120 (+/-12) Vac.

4.9 UL Requirements

Equipment shall comply only with the requirements of UL Bulletin of Research No. 23, "Rain Tests of Electrical Equipment."

4.10 Normal Operation

All equipment shall continue normal operation when subjected to the following:

4.10.1 Low Temperature Test

With the item functioning at a line voltage over Electrical Range the Device in its intended operation, the ambient temperature shall be lowered from 68 °F to 34.6 °F at a rate of not more than 64.4 °F per hour. The item shall be cycled at -34.6 °F for a minimum of 5 hours and then returned to 68 °F at the same rate.

4.10.2 High Temperature Test

With the item functioning at a line voltage over Electrical Range the Device in its intended operation, the ambient temperature shall be raised from 68 °F to 165.2 °F at a rate of not more than 64.4 °F per hour. The item shall be cycled at 165.2 °F for 5 hours and then returned to 68 °F at the same rate. The test shall be repeated with the line voltage at 135 Vac.

4.10.3 Normal Operation

All equipment shall resume normal operation following a period of at least 5 hours at -34.6 °F and less than 10 percent humidity and at least 5 hours at 165.2 °F and 22% humidity, when 90 Vac is applied to the incoming AC.

4.10.4 Humidity and Ambient Temperature

The relative humidity and ambient temperature values in the following table shall not be exceeded.

**AMBIENT TEMPERATURE VERSUS RELATIVE HUMIDITY
AT BAROMETRIC PRESSURES (29.92 In. Hg.)**

Ambient Temperature/ Dry Bulb (in 0F)	Relative Humidity (in percent)	Ambient Temperature/ Wet Bulb (in 0F)
-34.6 to 33.98	10	1.04 to 108.86
33.98 to 114.8	95	108.86
119.84	70	108.86
129.92	50	108.86
140	38	108.86
149.72	28	108.86
160.16	21	108.86
165.2	18	108.86

4.11 QC / Final Test

A complete QC / final test report shall be supplied with the Model 356i ATC Cabinet. The test report shall indicate the name of the tester and shall be signed by a responsible manager.

4.12 Quality Control Procedure & Test Report

The quality control procedure and test report format shall be supplied to the Engineer or approval within 15 days following the award of the contract. The quality control procedure shall include the following:

- Acceptance testing of all supplied components.
- Physical and functional testing of all modules and items.
- A minimum 100-hour burn-in of all equipment.
- Physical and functional testing of all items.

4.13 Cabinet Print

Wiring Diagram Sheets for the Cabinet shall be furnished in a weatherproof plastic pouch placed in the cabinet. Cabinet Wiring Diagrams shall be on non-fading.

4.14 Manual

One copy of Manual Documentation shall be supplied for each item purchased. The manual shall be printed on 8.5 in by 11 in paper, with the exception that schematics, layouts, parts lists and plan details may be on 11 in by 17 in sheets, with each sheet neatly folded to 8.5 in by 11 in size. The manual shall formatted per the following table:

Section	Description	
N/A	Table of Contents	
1	Glossary	
2	General Description	
3	General Characteristics	
4	Installation	
5	Adjustments	
6	Theory of Operation	6a. Systems Description (include block diagram) 6b. Detailed Description of Circuit Operation
7	Maintenance	7a. Preventive Maintenance 7b. Trouble Analysis 7c. Trouble Shooting Sequence Chart 7d. Wave Forms 7e. Voltage Measurements 7f. Alignment Procedures
8	Parts List (include circuit and board designation, part type and class, power rating, component manufacturer, mechanical part manufacturer, data specification sheets for special design components and original manufacturer's part number)	
9	Electrical Interconnection Details & Drawings	
10	Schematic and Logic Diagram	
11	Assembly Drawings and a pictorial diagram showing physical locations and identification of each component or part	

Section 5 Backpack Cabinet I/O Assignments

Backpack Combo Input and Output Assembly (2/15/2017)									
Components and Modules									
Switch Panel & Access Door	CMU	HDSP	HDSP	HDSP OR 4-Ch Detection Module	HDSP OR 4-Ch Detection Module	4-Ch Detection Module	4-Ch Detection Module	SIU 1	
				* Can be assigned to any phase, ped and overlap					
SIU 1 Output (IO) Assignments									
Switch Panel & Access Door	CMU	HDSP1	HDSP2	HDSP3	HDSP4	4-Ch Detection Module	4-Ch Detection Module	SIU 1	
		IO 0	IO 6	IO 12	IO 18				
		IO 1	IO 7	IO 13	IO 19				
		IO 2	IO 8	IO 14	IO 20				
		IO 3	IO 9	IO 15	IO 21				
		IO 4	IO 10	IO 16	IO 22				
		IO 5	IO 11	IO 17	IO 23				
SIU 1 Input (IO) Assignments									
Switch Panel & Access Door	CMU	HDSP	HDSP	4-Ch Detection Module	4-Ch Detection Module	4-Ch Detection Module	4-Ch Detection Module	SIU 1	
				IO 28	IO 32	IO 36	IO 40		
				IO 29	IO 33	IO 37	IO 41		
				IO 30	IO 34	IO 38	IO 42		
				IO 31	IO 35	IO 39	IO 43		
Controller Phase/Overlap/Pedestrian Assignments									
Switch Panel & Access Door	CMU	HDSP1	HDSP2	HDSP3	HDSP4	4-Ch Detection Module	4-Ch Detection Module	SIU 1	
		R*	R	R	R				
		Y	Y	Y	Y				
		G	G	G	G				
		R	R	R	R				
		Y	Y	Y	Y				
G	G	G	G						
* Can be assigned to any phase, ped and overlap									

Section 6

Glossary of Terms

A	Ampere
AC	120 Volts AC, 60 Hertz
AC-	120 Volts AC, 60 Hertz grounded return to the power source
AC+	120 Volts AC, 60 Hertz ungrounded power source
ADU	Auxiliary Display Unit
ATC	Advanced Transportation Controller
AWG	American wire Gauge
C	Celsius
Ch	Channel
CMU	Cabinet Monitor Unit
CMUip	Cabinet Monitor Unit - Internet Protocol
CPS	Cabinet Power Supply
D	Depth
DIN	Deutsche Industrie Norm
DOT	Department of Transportation
EIA	Electronic Industries Association
F	Fahrenheit
FITA	Field Input Termination Assembly
FOTA	Field Output Termination Assembly
H	Height
HDFTR	High-Density Flash Transfer Relay
HDSP-FU	High-Density Switch Pack-Flasher Unit
HV	High-Voltage
I/O	Input /Output
IA	Input Assembly
iP	Internet Protocol
LED	Light Emitting Diode
LED	Light Emitting Diode
mA	milliampere
N.C.	Normally Closed
N.O.	Normally Open
NA	Not Assigned
NEC	National Electric Code
OA	Output Assembly
OVA	Overlap A
OVB	Overlap B
OVC	Overlap C
OVD	Overlap D

PCB	Printed Circuit Board
Ped	Pedestrian
Ph	Phase
QC	Quality Control
SA	Service Assembly
SB	Serial Bus
SIU	Serial Interface Unit
SPST	Single Pole Single Throw
TBD	To Be Determined
U	Rack Unit
UL	Underwriter's Laboratories, Inc.
V	Voltage
Vac	Voltage Alternate Current
Vdc	Voltage Direct current
W	Width