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Advanced Transportation Controller (ATC) Cabinet Specification

352i ATC Low Voltage (LV) Cabinet

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Section 1
ATC (LV) Cabinet Components

1.1 Model 2202-LV 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 indictors, 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.

1.2 Model 2212-LV 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.

1.3 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.

1.4 Model 2220 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.

1.5 Model 2216-24 Cabinet Power Supply (CPS)

The CPS shall install in a 1U height 19" rack space. The CPS shall be rated at 168 Watts, 48 Vdc @ 1 Amp and 24 Vdc @ 5 Amp. The CPS shall have power factor corrected features and shall ensure a full load power factor of 0.98 or better, reducing peak AC Line input current and associated stress on wiring. The CPS shall use modern switching technology and shall provide full output regulation across changes in AC Line voltage and output load over the full operating temperature range of -34C to +74C without the need for a fan. The CPS shall have separate green LED indicators that display AC input status, DC output status and associated fuse integrity. The CPS outputs shall be fused for over-current protection and shall be protected against voltage transients by a 1500 Watt suppressor.

1.6 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.

1.7 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.

1.8 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.

1.9 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.

1.10 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.

1.11 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.

1.12 Power Management Unit (PMU)

The PMU shall be 3U height with 17.4" wide x 10.25" depth. The chassis shall be aluminum and provide lockable connectors for all external cables.
It shall have a replaceable fan and filter. The PMU shall be able to operate from utility and generator Input. The PMU shall have built in power factor correction and use double conversion online topology, providing 120Vac, 48Vdc and 24Vdc output with 4% tolerance. The PMU shall monitor the Input voltage and switch over to battery in less than 10mSec should a power event occur. The PMU shall have built in battery management and a charger capable of recharging 100Ahr battery in less than 15 hours. The PMU shall have built in network connection with support for protocols such as SNMP v3, SNMP v1, TCPIP, FTP and UDP. The PMU shall indicate the status of relay outputs and shall have a 4 line multi-colored LCD user interface. When installed with the Service Bypass Unit, the PMU can be removed for service and intersection shall get power from bypass unit and operate in flash mode. The PMU shall meet VDE safety standards and comply with FCC rules.

Section 2
Model 352i ATC (LV) Cabinet General Requirements

2.1 General 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: Input Assembly, 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 “24 VDC BYPASS” and shall be located on the front of the Output Assembly.
- High-voltage components (over 50 V) shall be protected from incidental contact per NEC.
- All fuses, circuit breakers, switches (except police panel 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 fans shall be fastened to the cabinet via two thumb screws 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.

Section 3
Model 352i ATC (LV) Cabinet Specification

3.1 General

This specification describes the 48 Vdc Low High Voltage (LV) Model 352i Advanced Transportation Controller (ATC) Cabinet ("the cabinet"). The ATC (LV) 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), Input Assembly (IA), Output Assembly (OA), SB1/SB2 and DC/Clean Power Bus, Field Input Termination Assembly (FITA), and Field Output Termination Assembly (FOTA).

3.2 Cabinet Housing

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

- Enclosure
- Doors
- Gasketing
- Lifting Eyes & External Bolt Heads
- Latches & Locks
- Ventilation
- Hinges and Door Catches
- Police Panel
- Cage Supports and Mounting

3.2.1 Housing Construction

The housing shall be rainproof. It shall have front and rear doors, each equipped with a lock and handle. The enclosure top shall be crowned to prevent standing water. The cabinet shall be: 67" H x 24" W x 30" D (rounded to the nearest inch).

3.2.2 Material Thickness

The enclosure, doors, lifting eyes, gasket channels, police panel door, spacer supports and all supports welded to the enclosure and doors shall be fabricated of 0.125 inch minimum thickness aluminum sheet. The filter shell, filter trough, fan support and police panel enclosure shall be fabricated of 0.080 inch minimum thickness aluminum sheet. The spacer supports shall have the option to use 0.059 inch minimum stainless steel sheet.

3.2.3 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.

3.2.4 Aluminum Surface Protection

The aluminum surface protection shall be Natural Finish.

3.2.4.1 Anti-Graffiti Paint

If Anti-Graffiti Paint is requested, each stage in the process shall be as follows:

- Perform treatment with a moderately acidic, liquid cleaner concentrate for thorough cleaning.
- Clean water rinse from reverse osmosis system (< 2500 PPM).
- Clean water rinse from reverse osmosis system (< 500 PPM).
- Apply a conversion coating to form an excellent base for bonding powder to parts and producing good resistance to corrosion.
- Clean water rinse from reverse osmosis system (< 800 PPM).
- Clean water rinse from reverse osmosis system to decrease any solids on surfaces (< 100 PPM).
- Final seal rinse to enhance corrosion resistance.
- Convey through a dry-off oven at a cycle of 10 to 20 minutes at 380º F. This eliminates any trapped water and gases in the parts.
- Apply polyester dry powder at 90,000 volts for maximum mil transfer. Thickness of the powder coating shall nominally be 2 to 5 mils.
- Convey into the cure oven for a thermal setting [cure] cycle of 10 to 20 minutes at 380 - 425º F.

The City, at its option, may require the winning the Vendor to submit written certification of compliance to the requirements listed in this section of the specification.

3.2.5. Enclosure Door Frames and Door Seals

The enclosure door frames shall be double-flanged out on all four sides and shall have strikers to hold tension on, and to form a 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).

3.2.6 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 approved 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.

3.2.7 Lifting Eyes and Exterior Bolt Heads

The housing shall be provided with 2 lifting eyes for placing the cabinet on its foundation. Each eye opening shall have a minimum diameter of 0.75 inch. Each eye shall be able to support the weight load of 1000 lbs. All bolt heads shall be tamperproof type.

3.2.8 Door Latches & Locks

3.2.8.1 Latching Handles

The latching handles shall have provision for padlocking in the closed position. Each handle shall be 0.75 in minimum diameter stainless steel with a minimum 0.5 in shank. The padlocking attachment shall be placed at 4.0 in from the handle shank center to clear the lock and key. An additional 4.0 in minimum gripping length shall be provided.

3.2.8.2 Latching Mechanism

The latching mechanism shall be a three-point draw roller type. The pushrods shall be turned edgewise at the outward supports and have a cross section of 0.25 in thick by 0.75 in wide, minimum.

3.2.8.3 Locks and Handles

When the door is closed and latched, the door shall be locked. The locks and handles shall be on the right side of the front door and left side of the rear door. The lock and lock support shall be rigidly mounted on the door. In the locked position, the bolt throw shall extend a minimum of 0.25 ± 0.03125 in into the latch Cam area. A seal shall be provided to prevent dust or water entry through the lock opening.

3.2.8.4 Locks

The locks shall be Corbin 2 type, or approved equal. One key shall be supplied with each lock. The keys shall be removable in the locked position only.

3.2.8.5 Bolts

The locks shall have rectangular, spring-loaded bolts. The bolts shall have a 0.281 in throw and shall be 0.75 in wide by 0.75 in thick (tolerance is ±0.035 in).

3.2.8.6 Center Latch Cam

The center latch cam shall be fabricated of a minimum thickness 0.1875 in steel or aluminum. The bolt surface shall horizontally cover the cam thickness. The cam shall be structured to only allow the door to open when the handle is moved toward the center of the door.

3.2.8.7 Rollers

Rollers shall have a minimum diameter of 0.875 in with nylon wheels and steel ball bearings.

3.2.9 Hinges

Stainless steel hinges (two bolts per leaf) shall be provided to bolt the enclosure to the doors. Each door shall have four hinges per door. Each hinge shall be 3.5 inch minimum length and have a fixed pin. 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 devices are mounted on the door.

3.2.10 Door Catches

Front and rear doors shall be provided with catches to hold the door open at both 90 and 165 (+/-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.

3.2.11 Police Panel

A police panel assembly shall be provided to allow limited control access. The panel door shall be equipped with a lock and master police key. The front and back of the panel shall be enclosed with a rigid metal covering so that no parts having live voltage are exposed. The panel assembly shall have a drain to prevent water from collecting within the assembly. The drain shall be channeled to the outside. The cabinet shall have one switch provided and labeled "SIGNALS ON / OFF" and one switch provided and labeled "FLASH / AUTO". 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.

3.2.12 Rack Cage

A standard rack cage shall be installed inside the housing for mounting of the ATC and cabinet assemblies. The EIA rack portion of the cage shall consist of four continuous, adjustable equipment mounting angles. The mounting angle nominal thickness shall be 11- gauge plated steel. The mounting angles shall be tapped with 10-32 threads with EIA universal spacing. The mounting angle shall comply with standard EIA-310-B and shall be supported at the top and bottom by either welded or bolted support angles to form a cage. The mounting angles shall provide holes to mount the side panels.

3.2.12.1 Cage Connection

The cage shall be bolted to the cabinet at four points via the housing cage supports and four points via associated spacer brackets (top and bottom).

3.2.12.2 Cage Location

The cage shall be centered within the cabinet door opening(s).

3.2.12.3 Cage Mounting Supports

Cage mounting supports shall be provided on either side, level with the bottom edge of the door opening, for horizontal support and bolt attachment; side cage supports provided for the bracket cage supports; and bracket cage support attachments.

3.2.12.4 Clearance between Rails

Clearance between rails for mounting assemblies shall be 17.75 inch.

3.2.13 Housing Ventilation

Housing ventilation shall include intake, exhaust, filtration, fans and thermostat.

3.2.13.1 Intake & Filter

The louvered vent depth shall be a maximum of 0.25 inch. A removable and reusable air filter shall be housed behind the door vents. The filter filtration shall cover the vent opening area. A filter shell shall be provided that fits over the filter providing mechanical support for the filter. The shell shall be louvered to direct the incoming air downward. The shell sides and top shall be bent over a minimum of 0.25 inch to house the filter. The filter resident in its shell shall be held firmly in place with a bottom trough and spring loaded upper clamp. No incoming air shall bypass the filter. The bottom filter shall be formed into a waterproof sump with drain holes to the outside housing. The filter shall be 16 inch wide by 12 inch high by 0.875 inch thick. The filter shall be an ECO-AIR Product E35S or approved equal.

3.2.13.2 Fans

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. Two fans shall be mounted within the housing and protected with a finger guard. A Fan Test switch shall be provided.

3.2.13.3 Temperature Controlling

The fans shall be thermostatically controlled and shall be manually adjustable to turn on between 32 Fahrenheit and 140 Fahrenheit with a differential of not more than 20 Fahrenheit between automatic turn on and off. The fan circuit shall be protected at 125% of the fan motor ampacity. The manual adjustment shall be graded in 20 Fahrenheit increment scale. The Thermostat shall be an Omega KT01101141900 or approved equal.

3.2.14 Cabinet Lights

The cabinet shall be equipped with two LED lights activated by door switches and equipped with fuses.

3.3 Model 352i ATC (LV) Cabinet Assemblies

3.3.1 Output Assembly (16-Channel)

The Output Assembly shall be a 3U high rack mounted assembly. The Output Assembly shall accommodate eight Model 2202-LV High-Density Switch Pack / Flasher Units (HDSP/FU), providing 48 output circuits.
The Output Assembly shall accommodate one Model 2218 Serial Interface Unit (SIU) to provide interface and control via system SB1/SB2.
The Output Assembly shall accommodate one Model 2212-LV Cabinet Monitor Unit (CMUip), Main Contactor, Stop Time Switch, Flash / Auto Switch, four Circuit Breakers and Momentary 24 Vdc Bypass Switch.

3.3.2 Output Assembly (32-Channel)

The Output Assembly shall be a 6U high rack mounted assembly. The Output Assembly shall house sixteen Model 2202-LV High-Density Switch Pack / Flasher Units (HDSP/FU) and shall provide ninety six output circuits.

The Output Assembly shall accommodate two Model 2218 Serial Interface Units (SIU) to provide interface and control via system SB1/SB2.
The Output Assembly shall house one model 2212-LV Cabinet Monitor Unit (CMUip), the Main Contactor, Stop Time Switch, Flash / Auto Switch, eight Circuit Breakers and Momentary 24 Vdc Bypass Switch.

3.3.3 Field Output Termination Assembly (16-Channel)

The 16-Channel Field Output Termination Assembly shall be coupled with the 16-Channel Output Assembly and shall house eight Model 21H High-Density Flash Transfer Relays (HDFTR). The HDFTRs and Flash Program Blocks (FPB) shall be provided to control and select the color (red, yellow, or dark) during ATC (LV) Cabinet flash mode. HDSP Suppressors shall be provided at the field terminals for the protection of the HDSP. Each HDFTR position shall be labeled with the number of its associated HDSP (1-16). Each FPB position shall be labeled with the number of its associated channel (1-16).
The Field Output Termination Assembly shall be provided with 16, 6-position Phoenix Contact terminal block model number 18-04-94-6 plugs and 18-61-19-6 sockets or approved equal.
Each Load Terminal Block receptacle shall be labeled with the number of its associated channel (1-16). 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).
One Field Output Termination Assembly shall be provided with each 16 channel cabinet, while two Field Output Termination Assemblies shall be provided with each 32 Channel Output Assembly.
The 16-Channel Field Output Termination Assembly shall be mounted across the EIA rails and it shall swing down to provide access to the HDSP Suppressors.

3.3.4 Input Assembly (24-Channel)

The Input Assembly shall be a 3U high rack mounted assembly providing twelve slots of 22/44 pin PCB sockets. One Model 2218 Serial Interface Unit (SIU) shall be provided and mated to a DIN 96-pin connector. The SIU shall provide interface and control between the Controller and the input devices via system SB1/SB2. The Input Assembly shall house either 2-channel or 4-channel detection modules. The Input Assembly shall house twelve 2-channel detection modules, or six 4-channel detection modules, or a combination of 2 & 4 channel detection modules up to 24 channels. The Input Assembly shall be equipped with an Opto Input Card. The Opto Input Card shall be equipped with four LED indicators and four toggle switches. Activation of the switch 1-4 shall place a call into SIU Opto 1-4 input respectively.

3.3.5 Input Assembly (48-Channel)

The Input Assembly shall be a 3U high rack mounted assembly providing twelve slots of 22/44 pin PCB sockets. Two Model 2218 Serial Interface Units (SIU) shall be provided and mated to two DIN 96-pin connectors. The SIU shall provide interface and control between the Controller and the detection modules via system SB1/SB2. The Input Assembly shall house either a 2-channel or a 4-channel half width device, up to twelve detection modules providing a maximum of 48 channels.

3.3.6 Field Input Termination Assembly (24-Channel)

The 24-Channel Field Input Termination Assembly shall be coupled with the 24-Channel Input Assembly and shall have positions for landing 24, two-wire inputs and their associated earth ground wires. The Field Input Termination Assembly shall have positions for 12 Detection Module Suppressors. The Detection Module Suppressors shall be supplied with the cabinet if procurement requires. The 24-Channel Field Input Termination Assembly shall be mounted across the EIA rails and it shall swing down to provide access to the back of the assemblies mounted in the opposite side.
Two 24-Channel Field Input Termination Assembly shall be coupled with the 48-Channel Input Assembly.

3.3.7 Service Assembly (1-HDFU)

The Service Assembly shall be modular and shall be mounted on the left of the EIA rail when viewed from the front. It shall house: one Model 2202-LV High-Density Switch Pack / Flasher Units (HDSP/FU), Cabinet Suppressor–Filter, BBS landing wire terminals, GFCI, one convenience outlet NEMA 15-5 format, four HDFU output fuses, five Circuit Breakers and a Raw AC+ terminal block having 5 screw terminals.

3.3.8 Service Assembly (2-HDFU)

The Service Assembly shall be modular and shall be mounted on the left of the EIA rail when viewed from the front. It shall house: two Model 2202-LV High-Density Switch Pack / Flasher Units (HDSP/FU), Cabinet Suppressor–Filter, BBS landing wire terminals, GFCI, one convenience outlet NEMA 15-5 format, eight HDFU output fuses, six Circuit Breakers and a Raw AC+ terminal block having 5 screw terminals.

3.3.9 SB1/SB2 and DC/Clean Power Bus

SB1/SB2 and DC/Clean Power Bus shall include eight DB25 d-submodular socket connectors to interconnect the SB1/SB2 communication ports of the assemblies and Controller. It shall include a termination circuit at the end of the connections (S8) to prevent radio frequency signal reflection. It shall include one Phoenix Contact plug block or approved equal to bring the DC power to the Bus; such power shall be distributed to the ATC (LV) Cabinet Assemblies through seven Phoenix Contact receptacle blocks or approved equal. The copper traces for the DC voltages shall support at least 10 Amp.
The AC Clean Power Bus shall also include eight NEMA 5-15 receptacles, to provide AC Clean Power to the ATC (LV) Cabinet Assemblies, the Controller and Cabinet Power Supply.
SB1/SB2 and DC/Clean Power Bus shall be mounted across the EIA rails and it shall swing down to provide access to the back of the assemblies mounted in the opposite side.

3.3.10 Drawer Shelf Unit

A telescopic slide out drawer to storage document shall be provided. The Drawer Shelf Unit shall be mounted across the EIA rails and shall have a non-conductive top, locking provision when fully extended and lip or handle for pulling.

3.4. Components Requirements

3.4.1 Service Assembly Components Requirements

- Service Assembly (1-HDFU)
  (1 each) Model 2202-LV HDFU
  (1 each) Cabinet Suppressor–Filter
- Service Assembly (2-HDFU)
  (2 each) Model 2202-LV HDFU
  (1 each) Cabinet Suppressor–Filter

3.4.2 Output Assembly Components Requirements

- Output Assembly (16-Channel)
  (TBD *) Model 2202-LV HDSP
  (1 each) Model 2218 SIU
  (1 each) Model 2212-LV CMUip
- Output Assembly (32-Channel)
  (TBD*) Model 2202-LV HDSP
  (2 each) Model 2218 SIU
  (1 each) Model 2212-LV CMUip

3.4.3 Field Output Termination Assembly Components Requirements

- Field Output Termination Assembly (16-Channel)
  (8 each) Model 21H HDFTR
  (8 each) HDSP Suppressor
  (16 each) Red Flash Program Block
  (4 each) Yellow Flash Program Block
  (4 each) White Flash Program Block

3.4.4 Input Assembly Components Requirements

- Input Assembly (24-Channel)
  (1 each) Model 2218 SIU
  (TBD*) Detection Module
  (TBD*) Isolation Module (242L)
  Input Assembly (48-Channel)
  (2 each) Model 2218 SIU
  (TBD*) Detection Module
    - (TBD*) Isolation Module (244L)

3.4.5 Field Input Termination Assembly Components Requirements

Field Input Termination Assembly Components Requirements
(12 each) Detection Module Suppressor

3.4.6 Cabinet Components Requirements

- (1 each) Model 2220 ADU

- (1 each) Model 2216-24 CPS

* Quantity per each procurement requirement

3.5 Model 352i ATC (LV) Cabinet Configuration Example

The ATC (LV) Cabinet shall consist of Assemblies and Components needed to carry out a specific application. ATC (LV) Cabinet version provided here is an EXAMPLE of many possible configurations.

Item #	Modules / Assemblies	Quantity
1	352i Housing / 352i Cage / (2) 352i Side Panels	1
2a	Service Assembly (1 - HDFU)	1
2b	Service Assembly (2 - HDFU)	1
3a	Output Assembly (16 - Channel)	1
	Field Output Termination Assembly (16 - Channel)	1
3b	Output Assembly (32 - Channel)	1
	Field Output Termination Assembly (16 - Channel)	2
4a	Input Assembly (24 - Channel)	1-3
	Field Input Termination Assembly (24 - Channel)	1-3
4b	Input Assembly (48 - Channel)	1
	Field Input Termination Assembly (24 - Channel)	2
5	SB1/SB2 and DC/Clean Power Bus	1
6	Model 2216-24 Cabinet Power Supply	1
7	CMU Auxiliary Display Unit	1
8	LED - Cabinet Light Assembly	2
9	Drawer Shelf Unit	1

Model 352i ATC (LV) Cabinet Configuration Example

3.6 Model 352i ATC (LV) Cabinet Default Configuration

The ATC (LV) Cabinet shall consist of following Assemblies and Components.

(9 each) Model 2202-LV (HDSP-FU) or approved equal
(2 each) Model 2218 SIU or approved equal
(1 each) Model 2212-LV CMUip or approved equal
(8 each) Model 21H HDFTR or approved equal
(1 each) Model 2220 ADU or approved equal
(1 each) Model 2216-24 CPS or approved equal
(16 each) Red Flash Program Block
(4 each) Yellow Flash Program Block

(4 each) White Flash Program Block
(1 each) Cabinet Suppressor–Filter
(12 each) Detection Module Suppressor
(8 each) HDSP Suppressor

Item #	Modules / Assemblies	Quantity
1	352i Housing / 352i Cage / (2) 352i Side Panels	1
2a	Service Assembly (1 - HDFU)	1
3a	Output Assembly (16 - Channel)	1
	Field Output Termination Assembly (16 - Channel)	1
4a	Input Assembly (24 - Channel)	1
	Field Input Termination Assembly (24 - Channel)	1
5	SB1/SB2 and DC/Clean Power Bus	1
6	Model 2216-24 Cabinet Power Supply	1
7	CMU Auxiliary Display Unit	1
8	LED - Cabinet Light Assembly	2
9	Drawer Shelf Unit	1

Model 352i ATC (LV) Cabinet Default Configuration

3.7 Model 352i ATC (LV) Cabinet I/O Assignments

ATC Cabinet 16-Channel (Ch) Output Assembly

Controller Phase/Overlap/Pedestrian Assignments

Ch1/2	Ch3/4	Ch5/6	Ch7/8	Ch9/10	Ch11/12	Ch13/14	Ch15/16	
HDSP1	HDSP2	HDSP3	HDSP4	HDSP5	HDSP6	HDSP7	HDSP8	
R	R	R	R	R	R	R	R	
Y	Y	Y	Y	Y	Y	Y	Y	
G	G	G	G	G	G	G	G	SIU 1
R	R	R	R	R	R	R	R	
Y	Y	Y	Y	Y	Y	Y	Y	
G	G	G	G	G	G	G	G	

CMU Channel (Ch) Assignments

HDSP1	HDSP2	HDSP3	HDSP4	HDSP5	HDSP6	HDSP7	HDSP8	
Ch-1	Ch-3	Ch-5	Ch-7	Ch-9	Ch-11	Ch-13	Ch-15	
Ch-1	Ch-3	Ch-5	Ch-7	Ch-9	Ch-11	Ch-13	Ch-15	
Ch-1	Ch-3	Ch-5	Ch-7	Ch-9	Ch-11	Ch-13	Ch-15	SIU 1
Ch-2	Ch-4	Ch-6	Ch-8	Ch-10	Ch-12	Ch-14	Ch-16	
Ch-2	Ch-4	Ch-6	Ch-8	Ch-10	Ch-12	Ch-14	Ch-16	
Ch-2	Ch-4	Ch-6	Ch-8	Ch-10	Ch-12	Ch-14	Ch-16	

SIU Output (IO) Assignments

HDSP1	HDSP2	HDSP3	HDSP4	HDSP5	HDSP6	HDSP7	HDSP8	
IO 0	IO 6	IO 12	IO 18	IO 24	IO 30	IO 36	IO 42	
IO 1	IO 7	IO 13	IO 19	IO 25	IO 31	IO 37	IO 43	
IO 2	IO 8	IO 14	IO 20	IO 26	IO 32	IO 38	IO 44	SIU 1
IO 3	IO 9	IO 15	IO 21	IO 27	IO 33	IO 39	IO 47	
IO 4	IO 10	IO 16	IO 22	IO 28	IO 34	IO 40	IO 48	
IO 5	IO 11	IO 17	IO 23	IO 29	IO 35	IO 41	IO 49	

HDSP Addresses

HDSP1	HDSP2	HDSP3	HDSP4	HDSP5	HDSP6	HDSP7	HDSP8	
0 (00000)	1 (00001)	2 (00010)	3 (00011)	4 (00100)	5 (00101)	6 (00110)	7 (00111)	SIU 1

Model 352i ATC (LV) Cabinet I/O Assignments (Output Assembly)

ATC Cabinet 24-Channel Input Assembly #1 (7/15/2016)

SIU Input (IO) Assignments

2-Ch Card	2-Ch Card	2-Ch Card	2-Ch Card	2-Ch Card	2-Ch Card	2-Ch Card	2-Ch Card	2-Ch Card	2-Ch Card	2-Ch Card	2-Ch Card	
IO 6	IO 8	IO 10	IO 12	IO 14	IO 16	IO 18	IO 20	IO 22	IO 24	IO 26	IO 28	SIU 9
IO 7	IO 9	IO 11	IO 13	IO 15	IO 17	IO 19	IO 21	IO 23	IO 25	IO 27	IO 29	
	*IO 6	*IO 8	*IO 10	*IO 12	*IO 14	*IO 16	*IO 18	*IO 20	*IO 22	*IO 24	*IO 26	
	*IO 7	*IO 9	*IO 11	*IO 13	*IO 15	*IO 17	*IO 19	*IO 21	*IO 23	*IO 25	*IO 27	

SIU Input (Ch) Assignments

2-Ch Card	2-Ch Card	2-Ch Card	2-Ch Card	2-Ch Card	2-Ch Card	2-Ch Card	2-Ch Card	2-Ch Card	2-Ch Card	2-Ch Card	2-Ch Card	
Ch-1	Ch-3	Ch-5	Ch-7	Ch-9	Ch-11	Ch-13	Ch-15	Ch-17	Ch-19	Ch-21	Ch-23	SIU 9
Ch-2	Ch-4	Ch-6	Ch-8	Ch-10	Ch-12	Ch-14	Ch-16	Ch-18	Ch-20	Ch-22	Ch-24	
	*Ch-1	*Ch-3	*Ch-5	*Ch-7	*Ch-9	*Ch-11	*Ch-13	*Ch-15	*Ch-17	*Ch-19	*Ch-21	
	*Ch-2	*Ch-4	*Ch-6	*Ch-8	*Ch-10	*Ch-12	*Ch-14	*Ch-16	*Ch-18	*Ch-20	*Ch-22	

* If 4-ch device being used

ATC Cabinet 24-Channel Input Assembly #2

SIU Input (IO) Assignments

2-Ch Card	2-Ch Card	2-Ch Card	2-Ch Card	2-Ch Card	2-Ch Card	2-Ch Card	2-Ch Card	2-Ch Card	2-Ch Card	2-Ch Card	2-Ch Card	
IO 6	IO 8	IO 10	IO 12	IO 14	IO 16	IO 18	IO 20	IO 22	IO 24	IO 26	IO 28	SIU 10
IO 7	IO 9	IO 11	IO 13	IO 15	IO 17	IO 19	IO 21	IO 23	IO 25	IO 27	IO 29	
	*IO 6	*IO 8	*IO 10	*IO 12	*IO 14	*IO 16	*IO 18	*IO 20	*IO 22	*IO 24	*IO 26	
	*IO 7	*IO 9	*IO 11	*IO 13	*IO 15	*IO 17	*IO 19	*IO 21	*IO 23	*IO 25	*IO 27	

SIU Input (Ch) Assignments

2-Ch Card	2-Ch Card	2-Ch Card	2-Ch Card	2-Ch Card	2-Ch Card	2-Ch Card	2-Ch Card	2-Ch Card	2-Ch Card	2-Ch Card	2-Ch Card	
Ch-1	Ch-3	Ch-5	Ch-7	Ch-9	Ch-11	Ch-13	Ch-15	Ch-17	Ch-19	Ch-21	Ch-23	SIU 10
Ch-2	Ch-4	Ch-6	Ch-8	Ch-10	Ch-12	Ch-14	Ch-16	Ch-18	Ch-20	Ch-22	Ch-24	
	*Ch-1	*Ch-3	*Ch-5	*Ch-7	*Ch-9	*Ch-11	*Ch-13	*Ch-15	*Ch-17	*Ch-19	*Ch-21	
	*Ch-2	*Ch-4	*Ch-6	*Ch-8	*Ch-10	*Ch-12	*Ch-14	*Ch-16	*Ch-18	*Ch-20	*Ch-22	

Model 352i ATC (LV) Cabinet I/O Assignments (Input Assembly)

Section 4
ATC (LV) Cabinet 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 ±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/ 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

Ambient Temperature versus Relative Humidity @ Barometric Pressure (29.92 In. Hg.)

4.11 QC / Final Test

A complete QC / final test report shall be supplied with the Model 352i 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

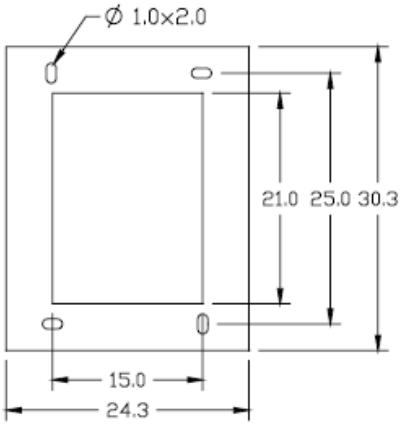
Wiring diagram sheets for the cabinet shall be furnished in a weatherproof plastic pouch placed in the cabinet. Cabinet wiring diagrams shall be on non-fading.

4.14 Manual

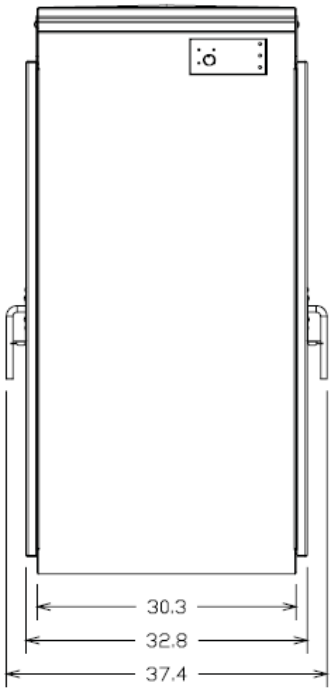
One copy of manual documentation shall be supplied for each item purchased. The manual shall be printed on 8.5 in by 11 in paper, with the exception that schematics, layouts, parts lists and plan details may be on 11 in by 17 in sheets, with each sheet neatly folded to 8.5 in by 11 in size. The manual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

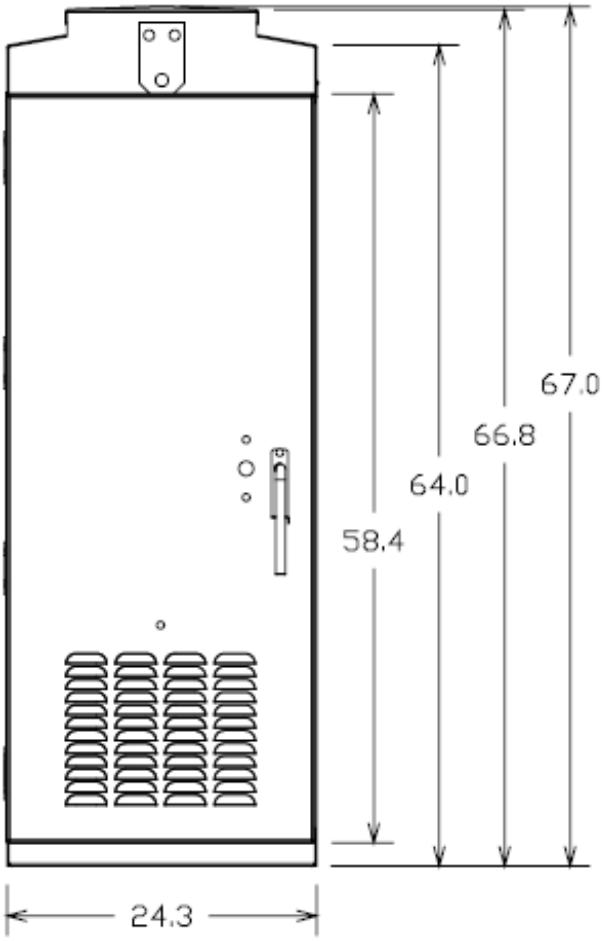
Section 5
Drawings



5.1 - 352i ATC (LV) Cabinet Housing Base



5.2 - 352i ATC (LV) Cabinet Housing Side View



5.3 - 352i ATC (LV) Cabinet Housing Front View

Pin #	Function	Pin #	Function
A1	+24VDC Monitor	B1	Reserved
A2	+12VDC Monitor	B2	External Test Reset
A3	VDC Ground	B3	Serial Bus #1 Disable
A4	Monitor Interlock	B4	Reserved
A5	Address 0	B5	Address 1
A6	Reserved	B6	Reserved
A7	SB1 TxData +	B7	SB1 TxData -
A8	SB1 RxData +	B8	SB1 RxData -
A9	SB1 TxClock +	B9	SB1 TxClock -
A10	SB1 RxClock +	B10	SB1 RxClock -
A11	Reserved	B11	Reserved
A12	Reserved	B12	Reserved
A13	Reserved	B13	Reserved
A14	Reserved	B14	Reserved
A15	Line Sync +	B15	Line Sync -
A16	Nreset +	B16	Nreset -
A17	PowerDown +	B17	PowerDown -
A18	SB3 TxData +	B18	SB3 TxData -
A19	SB3 RxData +	B19	SB3 RxData -
A20	SB3 Clock+	B20	SB3 Clock-
A21	LF Status	B21	LF Status
A22	Output Relay NO	B22	Output Relay NO
A23	CB Trip Status	B23	Reserved
A24	MC Coil Status	B24	Reserved
A25	MC Secondary Status	B25	Reserved
A26	FTR Coil Drive Status	B26	Reserved
A27	Door Switch Front	B27	Reserved
A28	Door Switch Rear	B28	Reserved
A29	Reserved	B29	Reserved
A30	Reserved	B30	MAINS Power
A31	Equipment Ground	B31	Reserved
A32	Reserved	B32	MAINS Ground (Neutral)

5.4 - Model 2212-LV Cabinet Monitor Unit (CMUip) Connector
(DIN 4161264 Header Type)

PIN#	AT THE CONTROLLER	AT THE SIU	PIN#	AT THE CONTROLLER	AT THE SIU
1	SB1 TXD+	SB1 RXD+	14	SB1 TXD-	SB1 RXD-
2	SB1 RXD+	SB1 TXD+	15	SB1 RXD-	SB1 TXD-
3	SB1 TXC+	SB1 RXC+	16	SB1 TXC-	SB1 RXC-
4	SB1 RXC+	SB1 TXC+	17	SB1 RXC-	SB1 TXC-
5	SB2 TXD+	SB2 RXD+	18	SB2 TXD-	SB2 RXD-
6	SB2 RXD+	SB2 TXD+	19	SB2 RXD-	SB2 TXD-
7	SB2 TXC+	SB2 RXC+	20	SB2 TXC-	SB2 RXC-
8	SB2 RXC+	SB2 TXC+	21	SB2 RXC-	SB2 TXC-
9	LINE SYNC+	LINE SYNC+	22	LINE SYNC-	LINE SYNC+
10	NRESET+	NRESET+	23	NRESET-	NRESET-
11	PWR DWN+		24	PWR DWN-	
12	+5VDC ISO		25	EQ GND	
13	ISO GND	DC GND			

5.5 - SB1/SB2 Connector (DB 25)

Pin	Function
1	Reserved
2	Reserved
3	Neutral (AC- Raw)
4	RxDATA +
5	RxDATA -
6	Neutral (AC- Raw)
7	TxDATA +
8	TxDATA -

5.6 - Serial Bus 3 (RJ-45) Connector

Pin	A (Bottom Row)	C (Middle Row)	E (Top Row)
2	Ch 1 Red In	Ch 1 Yellow In	Ch 1 Green In
4	Ch 2 Red In	Ch 2 Yellow In	Ch 2 Green In
6	+24VDC	DC Ground	Address 4
8	Equipment Ground	Neutral	Neutral
10	SB #3 Rx+	SB #3 Tx+	Address Common
12	SB #3 Rx-	SB #3 Tx-	Address 3
14	Address 0	Address 1	Address 2
16	Ch 1 Red Sense	Ch 1 Red Out	Ch 1 Red Out
18	Ch 1 Yellow Sense	Ch 1 Yellow Out	Ch 1 Yellow Out
20	Ch 1 Green Sense	Ch 1 Green Out	Ch 1 Green Out
22	Ch 2 Red Sense	Ch 2 Red Out	Ch 2 Red Out
24	Ch 2 Yellow Sense	Ch 2 Yellow Out	Ch 2 Yellow Out
26	Ch 2 Green Sense	Ch 2 Green Out	Ch 2 Green Out
28	LV+ Signal	LV+ Signal	LV+ Signal
30	HV+ Signal	HV+ Signal	HV+ Signal
32	LV+ MAINS	Neutral	HV+ MAINS

5.7 - Model 2202-LV High-Density Switch Pack (HDSP) Connector
(DIN 41612 Type E series, 48-pin connector)

Pin	A (Bottom Row)	C (Middle Row)	E (Top Row)
2	Reserved	Reserved	Ch 1 Aux In
4	Ch 2 Aux In	Reserved	Reserved
6	+24VDC	DC Ground	Address 4
8	Equipment Ground	Neutral	Neutral
10	SB #3 Rx+	SB #3 Tx+	Address Common
12	SB #3 Rx-	SB #3 Tx-	Address 3
14	Address 0	Address 1	Address 2
16	FL#1-1 Sense	FL#1-1 Out	FL#1-1 Out
18	FL#1-2 Sense	FL#1-2 Out	FL#1-2 Out
20	Ch 1 Aux Sense	Ch 1 Aux Out	Ch 1 Aux Out
22	Ch 2 Aux Sense	Ch 2 Aux Out	Ch 2 Aux Out
24	FL#2-1 Sense	FL#2-1 Out	FL#2-1 Out
26	FL#2-2 Sense	FL#2-2 Out	FL#2-2 Out
28	LV+ Signal	LV+ Signal	LV+ Signal
30	HV+ Signal	HV+ Signal	HV+ Signal
32	LV+ MAINS	Neutral	HV+ MAINS

5.8 - Model 2202-LV High-Density Flasher Unit (HDFU) Connector
(DIN 41612 Type E series, 48-pin connector)

Pin	Description	Pin	Description	Pin	Description
A1	+24 VDC in	B1	+24 VDC in	C1	Input / Output 47
A2	Input / Output 0	B2	Input / Output 1	C2	Input / Output 48
A3	Input / Output 2	B3	Input / Output 3	C3	Input / Output 49
A4	Input / Output 4	B4	Input / Output 5	C4	Input / Output 50
A5	Input / Output 6	B5	Input / Output 7	C5	Input / Output 51
A6	Input / Output 8	B6	Input / Output 9	C6	Input / Output 52
A7	Input / Output 10	B7	Input / Output 11	C7	Input / Output 53
A8	Input / Output 12	B8	Input / Output 13	C8	SB1 TxD +
A9	Input / Output 14	B9	Input / Output 15	C9	SB1 TxD -
A10	Input / Output 16	B10	Input / Output 17	C10	SB1 RxD +
A11	Input / Output 18	B11	Input / Output 19	C11	SB1 RxD -
A12	Input / Output 20	B12	Input / Output 21	C12	SB1 TxC +
A13	Input / Output 22	B13	Input / Output 23	C13	SB1 TxC -
A14	Input / Output 24	B14	Input / Output 25	C14	SB1 RxC +
A15	Input / Output 26	B15	Input / Output 27	C15	SB1 RxC -
A16	Input / Output 28	B16	Input / Output 29	C16	LINESYNC +
A17	Input / Output 30	B17	Input / Output 31	C17	LINESYNC -
A18	Input / Output 32	B18	Input / Output 33	C18	NRESET +
A19	Input / Output 34	B19	Input / Output 35	C19	NRESET -
A20	Input / Output 36	B20	Input / Output 37	C20	ASSEMBLY ADR
A21	Input / Output 38	B21	Input / Output 39	C21	INBUS RTS
A22	Input / Output 40	B22	Input / Output 41	C22	SB2 TxD +
A23	Input / Output 42	B23	Input / Output 43	C23	SB2 TxD -
A24	Input / Output 44	B24	Input / Output 45	C24	SB2 RxD +
A25	Input / Output 46	B25	Opto Input 1	C25	SB2 RxD -
A26	Opto Input 2	B26	Opto Input 3	C26	SB2 TxC +
A27	Opto Input 4	B27	Opto Input Ground	C27	SB2 TxC -
A28	Address – 0	B28	Address – 1	C28	SB2 RxC +
A29	Address – 2	B29	Address – 3	C29	SB2 RxC -
A30	INBUS TxD	B30	INBUS RxD	C30	INBUS TxC
A31	Equipment Ground	B31	AC Line Reference	C31	INBUS RxC
A32	24 VDC Ground	B32	24 VDC Ground	C32	SIU/BIU

5.9 - Model 2218 Serial Interface Unit (SIU) Connector

Pin	Function
1	+48VDC
2	48VDC Ground**
3	+24VDC
4	+12VDC (PS-2216-2412 only)
5	24/12 VDC Ground
6	Chassis Ground

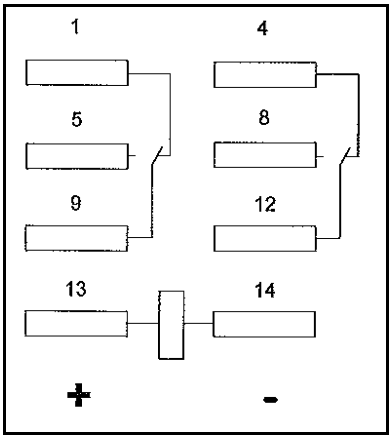
5.10 - Model 2216-24 Cabinet Power Supply (CPS) Connector
(Phoenix Contact #1825161)

Switches Definitions:
Manual Control Enable (MCE) switch places call into the CU and activates stop time
Interval Adv. switch advances the CU when MCE is on
FDS (Front Door Switch) 1 or 2 to notify the CMU when Front Door is open
RDS (Rear Door Switch) 1 or 2 to notify the CMU when Rear Door is open
FLS (Front Light Switch) 1 or 2 to turn on the Front cabinet Light
RLS (Rear Light Switch) 1 or 2 to turn on the Rear cabinet Light
Fan Test 1 or 2 to verify if the Fans work
Opto 1-4 place calls into Input Assembly SIU Opto Input 1-4

5.11 - Switches Definitions

Circuit Breakers Definitions:
Service Assembly (SA) MAIN Circuit Breaker (CB) controls power to the entire ATCC
SA CLEAN POWER CB controls power to PMU
SA RAW PWR/GFCI/FAN/LIGHTS CB controls power to outlets, GFCI, fans and lights
SA HDFU1 CB controls power to SA HDSP-FU1
SA HDFU2 CB controls power to SA HDSP-FU2
SA OUTPUT ASSEMBLY (OA) CB controls power to OA
OA CB1 controls power to HDSP1 & 2
OA CB2 controls power to HDSP3 & 4
OA CB3 controls power to HDSP5 & 6
OA CB4 controls power to HDSP7 & 8
OA CB5 controls power to HDSP9 & 10
OA CB6 controls power to HDSP11 & 12
OA CB7 controls power to HDSP13 & 14
OA CB8 controls power to HDSP15 & 16

5.12 - Circuit Breakers Definitions



5.13 - Model 21H High-Density Flash Transfer Relay (HDFTR) Pin-outs

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
CB	Circuit Breaker
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
EG	Equipment Ground
EIA	Electronic Industries Association
F	Fahrenheit
FITA	Field Input Termination Assembly
FOTA	Field Output Termination Assembly
FPB	Flash Program Block
GFCI	Ground Fault Circuit Interrupter
H	Height
HDFTR	High-Density Flash Transfer Relay
HDSP	High-Density Switch Pack
HDSP/FU	High-Density Switch Pack / Flasher Unit
HDFU	High-Density Flasher Unit
HV	High-Voltage
I/O	Input /Output
IA	Input Assembly
In	Inch
iP	Internet Protocol
K	Kilo
KA	Kilo Ampere
Kbs	kilobit per Second
KHz	Kilo Hertz
lbs	Pounds
LED	Light Emitting Diode
LV	Low-Voltage

M	Mega
mA	milliampere
MHz	Mega Hertz
mm	millimeter
mph	mile per hour
ms	millisecond
N.C.	Normally Closed
N.O.	Normally Open
NA	Not Assigned
NEC	National Electric Code
OA	Output Assembly
Opto	Opto Isolator
OVA	Overlap A
OVB	Overlap B
OVC	Overlap C
OVD	Overlap D
PCB	Printed Circuit Board
Ped	Pedestrian
Ph	Phase
QC	Quality Control
RMS	Root Mean Square
Rx	Received
RYG	Red Yellow Green
SA	Service Assembly
SB	Serial Bus
SB1	Serial Bus 1
SB2	Serial Bus 2
SB3	Serial Bus 3
SDLC	Synchronous Data Link Control
SIU	Serial Interface Unit
SPST	Single Pole Single Throw
TBD	To Be Determined
Tx	Transmit
U	Rack Unit
UL	Underwriter's Laboratories, Inc.
V	Voltage
Vac	Voltage Alternate Current
Vdc	Voltage Direct Current
W	Width