



*Florida Department of Transportation*

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KEVIN J. THIBAUT, P.E.  
SECRETARY

June 29, 2020

Khoa Nguyen  
Director, Office of Technical Services  
Federal Highway Administration  
3500 Financial Plaza, Suite 400  
Tallahassee, Florida 32312

Re: State Specifications Office  
Section: **685**  
Proposed Specification: **6850000 Traffic Control System Auxiliaries.**

Dear Mr. Nguyen:

We are submitting, for your approval, two copies of the above referenced Supplemental Specification.

The changes are proposed by Derek Vollmer by the Traffic and Engineering Operations Office to update language on monitoring systems, including Remote Power Management Unit for approved use and purchases.

Please review and transmit your comments, if any, within two weeks. Comments should be sent via email to [daniel.strickland@dot.state.fl.us](mailto:daniel.strickland@dot.state.fl.us)

If you have any questions relating to this specification change, please call me at 414-4130.

Sincerely,

Signature on File

Daniel Strickland, P.E.  
State Specifications Engineer

DS/rf

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

## TRAFFIC CONTROL SYSTEM AUXILIARIES

(REV ~~64-2930~~-20)

SECTION 685 is deleted and the following substituted:

### 685-1 Description.

Furnish and install traffic control system auxiliaries as shown in the Plans.

### 685-2 Materials.

**685-2.1: General:** Use traffic control system auxiliaries listed on the Department's Approved Product List (APL). Equipment must be permanently marked with the manufacturer's name or trademark, model/part number and serial number or date of manufacture.

**685-2.2 Uninterruptible Power Supply (UPS):** Use a line interactive or online/double-conversion UPS as shown in the Plans. UPS assemblies must be designed for installation in a roadside NEMA 3R enclosure to provide battery backup functionality for traffic control systems, including traffic signal and intelligent transportation system (ITS) devices. UPS assemblies must include batteries provided by the UPS manufacturer or in accordance with manufacturer's requirements.

Loss of utility power, transfer from utility power to battery power, and transfer back to utility power must not interfere with normal operation of connected equipment. In the event of UPS failure or battery depletion, connected equipment must be energized automatically upon restoration of utility power.

The UPS must operate in hot standby mode with power transfer being accomplished in 40 milliseconds or less.

Removal and replacement of the UPS must not disrupt the operation of the equipment being protected.

All harnesses necessary to connect and operate the system must be included. All connectors must be keyed to prevent improper connection.

**685-2.2.1 Configuration and Management:** Provide a UPS that supports local and remote configuration and management, including access to all user-programmable features as well as alarm monitoring, event logging, and diagnostic utilities.

Configuration and management functions must be password protected.

Alarm function monitoring must include the following: loss of utility power, inverter failure, low battery, ~~and battery~~ temperature, ~~out of range and inverter active/utility fail~~. The UPS must include an event log that indicates the date and time of the following events: AC high, AC low, AC frequency ~~error high, AC frequency low~~, AC fail/blackout, ~~and overload~~, over temperature, ~~battery voltage high, battery voltage low, battery disconnected, battery temperature high, temperature probe disconnected, and short circuit~~. The UPS event log must be able to store a minimum of ~~60~~200 events.

The UPS must include a front panel display and controls that allows programming of configurable parameters, features, and functions without the need for another input device. The UPS must have visual indications for Power-On, Mode of Operation (utility power or inverter), Battery Status, Alarm Status, Load Levels, and AC Output Voltage.

**685-2.2.2 Communication Interfaces:** Provide ~~a serial data connection port and~~ an Ethernet port (RJ45) for local control using a laptop PC and remote control via a network connection.

**685-2.2.3 Batteries:** Use only ~~AGM or Gel type external batteries~~ batteries or other technologies recommended by the manufacturer. Batteries must be sealed and require no maintenance, cause no corrosion, and be capable of maintaining 80% of original capacity and performance for a minimum of five years.

The UPS must be supplied with a wiring harness for battery connections. The battery wiring harness must allow 6 feet of separation between the UPS and its battery bank. Battery terminals must include a protective covering to prevent accidental spark or shorting.

The UPS must include battery management functions that includes active or equalized balancing; monitoring of temperature, voltage, and amperage of charge and discharge; and temperature compensated automatic charging to maximize the life of the batteries.

**685-2.2.4 Electrical:** UPS assemblies used to provide backup power in an ITS cabinet must provide a minimum of 350 watts (at 120 V<sub>AC</sub>) of continuous backup power for a minimum of two hours unless otherwise shown in the Plans.

UPS assemblies used to provide backup power in a traffic signal controller cabinet must provide a minimum 400 watts (at 120 V<sub>AC</sub>) of continuous power for a minimum of 6.5 hours unless otherwise shown in the Plans.

Frequency must be regulated to 60 Hz, plus or minus 0.5 Hz, while the UPS is supplying power. The UPS must operate on 85 to ~~140~~<sup>54</sup> V<sub>AC</sub> without requiring assistance from the batteries.

The UPS must be listed to the requirements of UL 1778. Upstream back feed voltage from the UPS must be less than 1 V<sub>AC</sub>

Double-conversion UPS must be capable of simultaneously producing fully regenerated and regulated, conditioned, True Sine Wave power and hot standby AC output, and have a minimum operating efficiency of 90%. ~~Ensure the UPS is listed to the requirements of UL 1778. Upstream back feed voltage from the UPS must be less than 1 V<sub>AC</sub>.~~

**685-2.2.5 Traffic Signal UPS Cabinet:** Cabinets used to house traffic signal UPS assemblies must be designed to be mounted to the side of a traffic cabinet or base mounted. Cabinets must meet the requirements of Section 676 and must include shelves and rack rails to house all UPS system components including the UPS, batteries, harnesses, switches, surge protective device, power terminal block and a generator hookup with transfer switch. The UPS cabinet must allow a maintenance technician to safely insert power for traffic signal operation while the UPS or associated equipment is serviced or replaced.

A surge protective device must be installed where the supply circuit enters the cabinet in accordance with 620-2.7.1.

The cabinet must include a 20 A, 120 volt, 60 Hz GFCI receptacle. The receptacle must be wired to utility power and not regulated by the UPS module. The cabinet must include a main breaker and a breaker for the technician GFCI outlet.

**685-2.2.5.1 Transfer Switch and Generator Access Panel:** The cabinet must include an automatic manual transfer switch and generator access panel in accordance with Section 676-2.6.3. The generator access door must not protrude more than 1 inch when closed.

**685-2.2.6 Mechanical:** All parts must be made of corrosion-resistant materials such as plastic, stainless steel, anodized aluminum, brass, or gold-plated metal. All fasteners exposed to the elements must be Type 304 or 316 passivated stainless steel.

**685-2.2.7 Environmental:** UPS assemblies, including batteries, must provide continuous power with specified wattage and operate properly during and after being subjected

to the environmental testing procedures described in NEMA TS 2, Sections 2.2.7, 2.2.8, and 2.2.9.

**685-2.3 Remote Power Management Unit (RPMU):** Use a RPMU as shown in the Plans. The RPMU must be designed for installation in a roadside Traffic Cabinet to provide remote control of electrical receptacles.

**685-2.3.1 Configuration and Management:** Provide a RPMU that supports local and remote configuration and management, including access to all user-programmable features as well as alarm monitoring, event logging, and diagnostic utilities.

Configuration and management functions must be password protected.

The RPMU must include an event scheduler that can store a minimum of 60 events.

The RPMU must include LED indicators for relay inputs and outlet status.

Upon loss of communications the RPMU must maintain each receptacle and relay in its currently stored state of operation.

Upon restoration of electrical power after an outage the RPMU automatically restores each receptacle and relay to its previously stored state of operation and all configurable parameters are retained.

The unit must support SNMP v2c, including trap notifications of receptacle state changes.

**685-2.3.2 Communication Interfaces:** Provide an Ethernet port (RJ45) for local control using a laptop PC and remote control via a network connection.

**685-2.3.3 Electrical:** Provide a minimum of 4 NEMA 5-15R receptacles, nominal 120 V<sub>AC</sub>. Provide a minimum current capacity of 12 amperes (amps).

**685-2.3.4 Mechanical:** All parts must be made of corrosion-resistant materials such as plastic, stainless steel, anodized aluminum, brass, or gold-plated metal. All fasteners exposed to the elements must be Type 304 or 316 passivated stainless steel.

**685-2.3.5 Environmental:** Operate properly during and after being subjected to the environmental testing procedures described in NEMA TS 2 2016, Sections 2.2.7, 2.2.8, and 2.2.9.

### **685-3 Installation.**

Install UPS assemblies in accordance with the manufacturer's recommendations. All equipment used to keep the intersection signalized must be backed up and protected by the UPS. Include a UPS operation and maintenance manual in the cabinet where the UPS is installed that includes cabinet wiring schematics, electrical interconnection drawings, parts layout and parts lists.

Install the RPMU in accordance with the manufacturer's recommendations. Include a RPMU operation and maintenance manual in the cabinet where the RPMU is installed that includes cabinet wiring schematics, electrical interconnection drawings, parts layout and parts lists.

### **685-4 Testing.**

Provide a field acceptance test plan to the Engineer for approval at least 14 days prior to commencement of testing. After approval of the acceptance test plan, perform testing of the installed UPS and RPMU equipment. Furnish all equipment, software, and supplies necessary for conducting the test.

**685-5 Warranty.**

Ensure the UPS includes a manufacturer's warranty covering defects for a minimum of three years (5 years for the external batteries in accordance with 685-2.2.3) from the date of final acceptance in accordance with 5-11 and Section 608. The warranty must include provisions for providing a replacement UPS within 10 calendar days of notification for any UPS found to be defective during the warranty period at no cost to the FDOT or the maintaining agency.

Ensure the RPMU includes a manufacturer's warranty covering defects for a minimum of three years from the date of final acceptance in accordance with 5-11 and Section 608.

**685-6 Method of Measurement.**

The Contract unit price for each UPS or RPMU, ~~furnished and installed~~, will include furnishing, placement, and testing of all equipment and materials as specified in the Contract Documents, and all tools, labor, operational software packages and firmware, supplies, support, ~~personnel training, shop drawings~~, documentation (including the field acceptance test plan), and incidentals necessary for a complete and accepted installation.

**685-7 Basis of Payment.**

Price and payment will be full compensation for all work specified in this Section.

Payment will be made under:

Item No. 685- 1- Uninterruptible Power Supply - each

Item No. 685- 2- Remote Power Management Unit - each

## **TRAFFIC CONTROL SYSTEM AUXILIARIES (REV 6-29-20)**

SECTION 685 is deleted and the following substituted:

### **685-1 Description.**

Furnish and install traffic control system auxiliaries as shown in the Plans.

### **685-2 Materials.**

**685-2.1: General:** Use traffic control system auxiliaries listed on the Department's Approved Product List (APL). Equipment must be permanently marked with the manufacturer's name or trademark, model/part number and serial number or date of manufacture.

**685-2.2 Uninterruptible Power Supply (UPS):** Use a line interactive or online/double-conversion UPS as shown in the Plans. UPS assemblies must be designed for installation in a roadside NEMA 3R enclosure to provide battery backup functionality for traffic control systems, including traffic signal and intelligent transportation system (ITS) devices. UPS assemblies must include batteries provided by the UPS manufacturer or in accordance with manufacturer's requirements.

Loss of utility power, transfer from utility power to battery power, and transfer back to utility power must not interfere with normal operation of connected equipment. In the event of UPS failure or battery depletion, connected equipment must be energized automatically upon restoration of utility power.

The UPS must operate in hot standby mode with power transfer being accomplished in 40 milliseconds or less.

Removal and replacement of the UPS must not disrupt the operation of the equipment being protected.

All harnesses necessary to connect and operate the system must be included. All connectors must be keyed to prevent improper connection.

**685-2.2.1 Configuration and Management:** Provide a UPS that supports local and remote configuration and management, including access to all user-programmable features as well as alarm monitoring, event logging, and diagnostic utilities.

Configuration and management functions must be password protected.

Alarm function monitoring must include the following: loss of utility power, inverter failure, low battery, and temperature out of range. The UPS must include an event log that indicates the date and time of the following events: AC high, AC low, AC frequency error, AC fail/blackout, and over temperature. The UPS event log must be able to store a minimum of 60 events.

The UPS must include a front panel display and controls that allows programming of configurable parameters, features, and functions without the need for another input device. The UPS must have visual indications for Power-On, Mode of Operation (utility power or inverter), Battery Status, Alarm Status, Load Levels, and AC Output Voltage.

**685-2.2.2 Communication Interfaces:** Provide an Ethernet port (RJ45) for local control using a laptop PC and remote control via a network connection.

**685-2.2.3 Batteries:** Use only batteries or other technologies recommended by the manufacturer. Batteries must be sealed and require no maintenance, cause no corrosion, and

be capable of maintaining 80% of original capacity and performance for a minimum of five years.

The UPS must be supplied with a wiring harness for battery connections. The battery wiring harness must allow 6 feet of separation between the UPS and its battery bank. Battery terminals must include a protective covering to prevent accidental spark or shorting.

The UPS must include battery management functions that includes active or equalized balancing; monitoring of temperature, voltage, and amperage of charge and discharge; and temperature compensated automatic charging to maximize the life of the batteries.

**685-2.2.4 Electrical:** UPS assemblies used to provide backup power in an ITS cabinet must provide a minimum of 350 watts (at 120 V<sub>AC</sub>) of continuous backup power for a minimum of two hours unless otherwise shown in the Plans.

UPS assemblies used to provide backup power in a traffic signal controller cabinet must provide a minimum 400 watts (at 120 V<sub>AC</sub>) of continuous power for a minimum of 6.5 hours unless otherwise shown in the Plans.

Frequency must be regulated to 60 Hz, plus or minus 0.5 Hz, while the UPS is supplying power. The UPS must operate on 85 to 140 V<sub>AC</sub> without requiring assistance from the batteries.

The UPS must be listed to the requirements of UL 1778. Upstream back feed voltage from the UPS must be less than 1 V<sub>AC</sub>

Double-conversion UPS must be capable of simultaneously producing fully regenerated and regulated, conditioned, True Sine Wave power and hot standby AC output, and have a minimum operating efficiency of 90%.

**685-2.2.5 Traffic Signal UPS Cabinet:** Cabinets used to house traffic signal UPS assemblies must be designed to be mounted to the side of a traffic cabinet or base mounted. Cabinets must meet the requirements of Section 676 and must include shelves and rack rails to house all UPS system components including the UPS, batteries, harnesses, switches, surge protective device, power terminal block and a generator hookup with transfer switch. The UPS cabinet must allow a maintenance technician to safely insert power for traffic signal operation while the UPS or associated equipment is serviced or replaced.

A surge protective device must be installed where the supply circuit enters the cabinet in accordance with 620-2.7.1.

The cabinet must include a 20 A, 120 volt, 60 Hz GFCI receptacle. The receptacle must be wired to utility power and not regulated by the UPS module. The cabinet must include a main breaker and a breaker for the technician GFCI outlet.

**685-2.2.5.1 Transfer Switch and Generator Access Panel:** The cabinet must include an automatic transfer switch and generator access panel in accordance with Section 676. The generator access door must not protrude more than 1 inch when closed.

**685-2.2.6 Mechanical:** All parts must be made of corrosion-resistant materials such as plastic, stainless steel, anodized aluminum, brass, or gold-plated metal. All fasteners exposed to the elements must be Type 304 or 316 passivated stainless steel.

**685-2.2.7 Environmental:** UPS assemblies, including batteries, must provide continuous power with specified wattage and operate properly during and after being subjected to the environmental testing procedures described in NEMA TS 2, Sections 2.2.7, 2.2.8, and 2.2.9.

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**685-2.3.1 Configuration and Management:** Provide a RPMU that supports local and remote configuration and management, including access to all user-programmable features as well as alarm monitoring, event logging, and diagnostic utilities.

Configuration and management functions must be password protected.

The RPMU must include an event scheduler that can store a minimum of 60 events.

The RPMU must include LED indicators for relay inputs and outlet status. Upon loss of communications the RPMU must maintain each receptacle and relay in its currently stored state of operation.

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Install the RPMU in accordance with the manufacturer's recommendations. Include a RPMU operation and maintenance manual in the cabinet where the RPMU is installed that includes cabinet wiring schematics, electrical interconnection drawings, parts layout and parts lists.

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Ensure the RPMU includes a manufacturer's warranty covering defects for a minimum of three years from the date of final acceptance in accordance with 5-11 and Section 608.

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