



**LED Dynamic Message Sign  
Full Color LED  
Sample Procurement Specification  
Messenger 6000 Series**



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SES AMERICA  
SAMPLE PROCUREMENT SPECIFICATION  
**INTELLIGENT TRANSPORTATION SYSTEM**  
**GRID POWERED DYNAMIC MESSAGE SIGNS**  
M6000 SERIES FULL COLOR

## **1 Introduction**

DMS equipment described in this document must comply with the latest versions of the following industry and project standards and requirements;

- NEMA TS4
- NTCIP 1203 Version 2.39
- DOT general specifications and requirements.

This document describes several LED Display board sizes (16x16 pixel 20mm and 9x10 pixel 33mm) in full color with several housing possibilities (Walk-in, Front Access, Rear Access). The exact types of DMS required for the project and their specific options are listed in Appendix A – Bid Item Configuration Sheet.

## **2 DMS Equipment**

### **2.1 DMS Sign Housing**

- 2.1.1** The DMS housing shall be constructed to have a neat, professional appearance. The housing shall be constructed of aluminum alloy 5052-H32 with a minimum thickness of 0.090 inch (2.29 mm). Where extrusion is used for DMS structural members such as frames or channel, the extrusions shall be constructed of either 6061-T6 or 6005 T-5 aluminum.
- 2.1.2** The DMS housing shall provide safe and convenient access to all sign equipment, components, assemblies and other materials located within the sign housing. Internal components shall be removable, transportable and capable of being installed by a single technician, and shall be modular in design so that it is not necessary to remove or replace discrete components in the field to analyze and/or correct a failure.
- 2.1.3** The housing shall protect internal components from rain, ice, dust and corrosion in accordance with NEMA enclosure Type 3R standards, as described in NEMA Standards Publication 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
- 2.1.4** The DMS housing shall contain small weep holes for draining any water that may accumulate due to condensation. Weep holes and ventilation/exhaust hoods shall be screened by a non-corrosive material to prevent the entrance of insects and small animals.
- 2.1.5** Housings shall be designed with an interior utilizing a non-corrosive mounting system in which to mount the display modules. The mounting process shall be designed to withstand and minimize effects from vibration to the display modules and/or electronics.



Structural members shall be constructed of aluminum alloy 6005-T6 or 6061-T6. External DMS component hardware shall be fabricated from hot dipped or mechanically galvanized steel, stainless steel, aluminum, nylon or other durable corrosion-resistant materials. Corrosion protection shall be provided between dissimilar metals.

- 2.1.6 Mounting Z-bars shall be provided at the rear of each housing in sufficient quantity to meet AASHTO requirements. For Rear Access DMS, the position of the Z-bars shall be adjustable as to not interfere with the rear opening doors.

## 2.2 Walk-In Housings

- 2.2.1 Walk-In DMS housings and all associated equipment and materials shall be designed and constructed so that all maintenance and repair is performed from within the housing with the exception of structural members and components.
- 2.2.2 Doors shall be installed on one side of the walk-in housing and shall open to the outside rear of the DMS housing. Housing doors shall be rain-tight, dust-tight doors with minimum doorway opening dimensions of 72 inches high by 24 inches wide as per NEMA TS4. Doors shall be provided with stainless steel hinges and hinge pins, and shall be fitted with a door stop and retainer capable of retaining the door open at the 90 degree open position and securing the door stop when not in use. The doors shall be reinforced to prevent bowing, twisting and flexing.
- 2.2.3 The DMS housing doors shall be furnished with a door latching and locking system which provides a rain-tight, dust-tight sealing action between the door gasket and door. The latching/locking mechanism shall include a handle on the interior of the housing to prevent entrapping an individual inside the housing. The door latch shall be three points and adjustable to correctly tension the door when closed. The three point latch shall be equipped with nylon/long lasting rollers that roll onto strike plates to hold the door securely against the gasketed surfaces when the door is closed.
- 2.2.4 A door switch shall be provided and wired to the DMS controller so that the position of the door (open or closed) can be monitored as required by NTCIP. This information shall be transmitted to the control center upon request.
- 2.2.5 A level, non-skid walkway surface shall be installed or adhered on the bottom floor of the housing on which maintenance personnel can walk. This walkway (which can be the horizontal bottom surface tray of the sign enclosure) shall be a minimum of 24 inches wide, and shall run the entire length of the sign. The sign and floor arrangement shall be designed to prevent water retention and not obstruct the maintenance of any drainage systems. No components of the sign chassis structure can protrude up through this flat level surface walkway.
- 2.2.6 The minimum height of the interior of the housing from the top of the walkway to the lowest framing member or other obstruction shall be 78 inches. The minimum distance from the interior rear wall of the DMS housing to the closest display components shall be 32 inches. This free space shall be maintained across the entire interior of the sign housing. Structural members shall be designed and positioned so as to not obstruct the free movement of maintenance technicians throughout the 78 inch height of the interior of the housing.



## **2.3 Front Access Housings**

**2.3.1** Front Access DMS housings and all associated equipment and materials shall be designed and constructed so that all maintenance and repair is performed from the outside through the front access door panels. Doors or panels required to be moved out of their normal closed position for maintenance or repair shall not impair the access of maintenance personnel to the internal components of the DMS.

**2.3.2** Front Access Door DMS shall be equipped with the following features;

- Multiple vertically hinged rigid door panels, each of which contains a full-height section of the LED display matrix and open from left to right as in “French Doors”.
- Each door is equipped with a retaining latch or slide that will hold the door open to a minimum of 90 degrees.
- Each door is equipped with a locking mechanism to ensure a water tight seal against the inner door opening gasket.
- Each door will seal against flat foam or other type gasket designed to seal the door to NEMA 3R standards through the life of the DMS. Gasket material will also conform to NEMA TS4 standards.
- Modular and easy access to all components without having to remove any item in the sign.
- Easy mounting on poles, truss or cantilevers.

**2.3.3** Back Surface of the Front Access DMS will utilize the following features;

- Rear panels will be bolted to the inner DMS frame and watertight sealed with a flat closed-cell foam gasket meeting NEMA TS4 environmental standards providing a NEMA 3R seal.
- Mounting of the DMS will be through Z-bars that run the entire length of the DMS.
- Each rear panel will be equipped with one or more enclosure vents to allow pressure buildup within the sign to escape.

## **2.4 Rear Access Housing**

**2.4.1** Rear Access DMS housings and all associated equipment and materials shall be designed and constructed so that all maintenance and repair is performed from the outside through the rear access door panels. Doors or panels required to be moved out of their normal closed position for maintenance or repair shall not impair the access of maintenance personnel to the internal components of the DMS.

**2.4.2** Rear Access Door DMS shall be equipped with the following features;

- Full opening of the sign from top to bottom.
- Rear doors will be hinged vertically and open from left to right as in “French doors”.
- Each door is equipped with a retaining latch or slide that will hold the door open to a minimum of 90 degrees.
- Each door is equipped with a locking mechanism to ensure a water tight seal against the inner door opening gasket.
- Each door will seal against a flat closed –cell foam or other type gasket designed to seal the door to NEMA 3R standards through the life of the DMS. Gasket material will also conform to NEMA TS4 standards.
- Modular and easy access to all components without having to remove any item in the sign.
- Easy mounting on poles, truss or cantilevers.
- Mounting of the DMS will be through Z-bars that run the entire length of the DMS. The Z-bar will be positioned in such a way as to not block the opening of the rear access doors.
- Each rear panel will be equipped with one or more enclosure vents to allow pressure buildup within the sign to escape.



## **2.5 Front Face Construction**

- 2.5.1** For all types of DMS access, the front face construction shall consist of a aluminum mask, with a layer of weather tight, ultraviolet protected, non-diffusing polycarbonate (non-matte finish) sheeting attached securely to the inside surface of an aluminum inner door panel.
- 2.5.2** The front of the sign housing shall be completely surrounded by an area designated as a contrast shield to improve legibility. This shield shall be bolted to the sign or be an integral part of the sign housing and front face design. Either design will not allow light leaks occur. The pixel apertures in both the mask and inner front door panels shall provide openings directly in front of each LED pixel grouping. Each opening shall be of sufficient size as to not interfere with LED light output from the road viewing angles stipulated for the display. The sign face shall be designed to minimize bowing and shall not distort in a manner that adversely affects LED message legibility.

## **2.6 Exterior Housing Finish**

- 2.6.1** The DMS housing shall have a maintenance free, natural mill-aluminum finish, with the exception of the front face and contrast shield, which shall be covered by 3M Scotchcal matte black adhesive film to increase contrast ratio and eliminate reflection or provide a painted or powder coated matte black finish to a minimum standard of AAMA 2604-05 specifications.
- 2.6.2** All welds shall be neatly formed and free of cracks, blow holes and other irregularities. The housing shall have a smooth, uniform finish.

## **2.7 Lifting Hardware**

Multiple galvanized steel lifting eyebolts shall be attached to the top of the DMS housing for moving and installation purposes. All mounting points for eyebolts shall be sealed to prevent water from entering the DMS housing. Lifting hardware, as well as the sign housing, shall be designed to prevent damage or undue stress to the DMS during shipping or temporary storage prior to installation on the DMS support structure.

## **2.8 Ventilation**

- 2.8.1** For the Front and rear Access DMS, no ventilation shall be required for the electronic components. The sign shall operate without any exhaust or intake fans or positive pressure ventilation systems.
- 2.8.2** For Walk-in housing, a ventilation system controlled by a 2 hour-manual timer located near the access door shall be provided only for the safety of the maintenance personnel. No ventilation shall be required for the electronic components.
- 2.8.3** For Walk-in housing, the ventilation system shall be equipped with a filter to prevent dust and dirt from entering the DMS. Filters shall be easy to replace or to clean without any extra tools or specific equipment to remove or replace.



### 3 Display Properties

The optical system shall provide a uniform display across the sign, so that there is no visible difference in luminous intensity from any one pixel to another pixel, under any brightness level.

The LED display module consists of pixels created by utilizing one LED of each of the following colors: RED, GREEN and BLUE.

#### 3.1 Contrast Ratio

3.1.1 DMS shall be constructed in accordance with contrast ratio requirements as defined in NEMA TS4 Section 5.2.

3.1.2 Contrast Ratio is calculated as follows:

$$C_r = (L_{on} - L_{off}) / L_{off}$$

Where:

$C_r$  = contrast ratio

$L_{on}$  = measured luminance from the display with the pixels active or on, at the specified sign illuminance.

$L_{off}$  = measured luminance from the display with the pixels inactive or off, at the specified sign luminance.

3.1.3 Based on this formula, the DMS shall meet a contrast ratio of 12, when measured on-axis (0° horizontal and 0° vertical in relation to the center of the sign face) under any illumination lower or equal to 40,000 lux by a solar simulator. The contrast ratio shall be measured at the front of the sign in its final position with any component that could impede or otherwise affect the light output and background luminance (such as the front face, mask, and polycarbonate) in place.

3.1.4 The DMS manufacturer must submit a test certificate from an independent laboratory to certify compliance with this requirement.

#### 3.2 Cone of Vision

3.2.1 The cone of vision for the RED, GREEN, and BLUE LEDS must be 30 degrees as defined by NEMA TS4.

3.2.2 The DMS manufacturer must submit a test certificate from an independent laboratory to certify compliance with this requirement.

#### 3.3 Luminance Intensity Requirements

3.3.1 The luminance intensity shall be measured at the front of the sign in its final position with any component that could impede or otherwise affect the light output (such as the front face, mask, and polycarbonate) in place.

3.3.2 The DMS manufacturer must submit a test certificate from an independent laboratory to certify that the luminance intensity for the LED Display module illuminating the color WHITE is a minimum of 12,000 cd/m<sup>2</sup> under 40,000 Lux.





**3.4 Display Characteristics**

- 3.4.1 All provisions of NEMA TS 4 Section 5.6.1 and 5.6.2 shall apply for fonts and alphabets. Each sign shall be able to display a message composed of any combination of ASCII characters 20(hex) through 7E (hex) inclusive.
- 3.4.2 The sign display shall support text and graphic displays in accordance with the requirements of the NTCIP protocol specified.
- 3.4.3 The DMS must support additional fonts based on client requirements. At a minimum the following fonts should be available;
  - 6x9
  - 10x15
  - 15x25
- 3.4.4 For a Full Matrix requirement, the DMS display area shall conform to the following display characteristics and requirements:

**TABLE 2:**  
**DISPLAY CHARACTERISTICS**

Requirement	Full Color			
Pixel Pitch (max.)	33 mm		20 mm	
Character Height	18 in	12 in	18 in	12 in
Horizontal Spacing (pixels - min.)	2	2	4	3
Vertical Spacing (pixels - min.)	4	4	6	4
Default Font Array	14x10	9x6	23x15	15x10
Legibility Distance	1000 ft	700 ft	1000 ft	700 ft

**3.5 Display Change Time**

The time required to clear any display and post any new display shall not exceed 500 milliseconds.

**4 Optical Components**

**4.1 Display Module Design**

- 4.1.1 Each display module shall consist of only one electronic assembly that contains all of the LED's, LED drivers, memory, microcontroller and network elements to control the LED's.
- 4.1.2 All like-size modules shall be fully interchangeable within a sign or different types of signs of the same pitch from the same DMS manufacturer. The same type of display board must be used for either character matrix, line matrix or full matrix DMS in order to reduce spare part inventory and maintenance cost.
- 4.1.3 A dedicated DIP switch must be available at the rear of each display module to adjust the brightness for each display module independently of the other modules.



- 4.1.4 The replacement of a display module shall be possible without the use of any tools, drawings or diagnostic equipment.
- 4.1.5 All the connections between boards shall be made with rugged, positive locking, quick release, and coded connectors. Their size and shape shall be such that they are easy to manipulate.
- 4.1.6 Each display board shall contain one DC power, one data "IN" communication connector and one data "OUT" communication connector..
- 4.1.7 The full color LED display board must be automatically addressed and there will be no switches permitted to set the board address.

## 4.2 LEDs

All RED, GREEN, and BLUE LEDs provided for the manufacture of the DMS shall conform to the following requirements:

### 4.2.1 Color LEDs

- 4.2.1.1 LED package style shall be surface-mount LEDs. Through-hole flush-mount and through-hole standoff LEDs will not be accepted.
- 4.2.1.2 Red LEDs shall utilize AllnGaP semiconductor technology and shall emit red light that has a peak wavelength of 618-630nm.
- 4.2.1.3 Green LEDs shall utilize InGaN semiconductor technology and shall emit green light that has a peak wavelength of 519-539nm.
- 4.2.1.4 Blue LEDs shall utilize InGaN semiconductor technology and shall emit a true blue light that has a peak wavelength of 460-480nm.
- 4.2.1.5 The DMS manufacturer will assure color uniformity and consistency by requiring the display boards be manufactured using only LEDs from 2 adjacent color bins and two adjacent intensity bins. LEDs shall be nominally rated for 100,000 hours of operation under 100% intensity (at manufacturer's stated current) under NEMA TS-4 environmental conditions (-34°F / +165°F). (-34°C / +74°C).
- 4.2.1.6 LEDs shall have a nominal viewing angle of 30 degrees (15° measured from the longitudinal axis of the LED). The use of optical enhancing lenses to achieve the specified viewing angle is not allowed and will be cause for rejection.
- 4.2.1.7 Each display module shall include a label indicating the intensity bin and color bin of the LEDs used.
- 4.2.1.8 The hardware design of the LED driver circuitry shall be such that the LED current shall be hardware restricted so it can never exceed 75 % of Maximum Forward Current as defined by the LED Manufacturer. These criteria must be met even if there is a software failure in the system.
- 4.2.1.9 The change of brightness must occur simultaneously on all display modules in the sign.



### **4.3 Pixel Sizing and Spacing**

- 4.3.1** Each color LED module shall contain a minimum of one red, one green, and one blue surface mounted LED for each pixel.
- 4.3.2** The pixel array shall be a minimum of sixteen (16) pixels high by sixteen (16) pixels wide for display modules with 20mm pixel pitch.
- 4.3.3** The pixel array shall be a minimum of nine (9) pixels high by ten (10) pixels wide for display modules with a 33mm pixel pitch.
- 4.3.4** The design of the module using surface mount LEDs and the front face arrangement must be such that no cooling fans or ventilation are required to maintain normal operation of the DMS within the NEMA TS4 environmental operating range of -34° C through 74°C.
- 4.3.5** Each pixel shall contain the quantity of discrete LEDs needed to output white colored light at a minimum luminous intensity of 12,000 candelas per square meter when measured using a photometric meter through the DMS front face panel assembly.
- 4.3.6** Each pixel shall also be capable of displaying amber colored light with a minimum luminous intensity of 9,000 candelas per square meter when measured using a photometric meter through the DMS front face panel assembly.

## **5 Main Power Supply and Distribution**

### **5.1 Power Supplies**

- 5.1.1** Power supplies shall operate from 120 VAC 60 Hz . The LED displays shall be operated at a low internal DC voltage not exceeding 24 VDC. Sign components that operate on DC voltages shall have power connections that are unique and keyed.
- 5.1.2** Power supplies shall be solid state electronic with regulated outputs.
- 5.1.3** Optional additional power supplies shall provide N+1 redundancy. Power supplies shall be rated such that if one supply fails, the other(s) can operate the entire DMS under nominal load conditions. Failure of a single power supply shall not cause a failure of the other power supplies. Power supplies shall meet NEMA TS-4 temperature requirements operating from -30°F to +165°F (-34°C to +74°C). Power supplies shall have over-voltage protection devices that supplement the DMS assembly over voltage, surge and transient voltage protection devices. This option is mandatory if specified in the bid item configuration sheet at the end of this document.
- 5.1.4** Power supplies shall be short circuit protected by turning the DC power off and shall reset automatically.
- 5.1.5** Power supplies shall be UL listed and RoHS compliant.
- 5.1.6** Power supplies shall be installed with the terminals/connectors unobstructed by hardware or mounting brackets. The operator shall be able to read the terminal designations and measure voltages without removing the power supply or obstructions.
- 5.1.7** Power supplies shall have a visible means of determining power status of individual supplies via the DMS controller and on the supplies themselves. Indicators shall identify whether the supplies are functioning properly. The DMS controller shall indicate that a power supply has failed and provide an identifier that indicates which specific power supply that has failed.
- 5.1.8** The regulated DC power supplies shall conform to the following specifications:
  - 5.1.8.1** Nominal maximum output power rating of 600 watts.
  - 5.1.8.2** Operating input voltage range shall be a minimum of 90 to 264 VAC.
  - 5.1.8.3** Operating temperature range shall be a minimum of -30°F to +165°F (-34°C to +74°C).



- 5.1.8.4 Maximum output power rating shall be maintained over a minimum temperature range of – 30°F to +140°F (-34°C to +60°C).
- 5.1.8.5 Power supply efficiency shall be a minimum of 80%.
- 5.1.8.6 Power factor rating shall be a minimum of 0.95.
- 5.1.8.7 Automatic output shut down and restart shall occur if one of the following faults occurs; over temperature, over-voltage, short circuit, or over-current.

## 5.2 Energy Efficiency

DMS shall be designed to be energy efficient and to consume the minimum amount of power in order to save operation costs. The maximum power consumption of the sign shall be as follow:

- Controller = 5 Watts
- 16x16 pixel 20mm RGB Display board nominal = 15 W, at maximum brightness = 50 W
- 9x10 pixel 33mm RGB Display board nominal = 12 W, at maximum brightness = 34 W
- The supplier must provide calculation to justify the power consumption of each DMS, based on the following:
  - Display at daily brightness (40% of pixels - ON)
  - Ventilation ON if required by the manufacturer
  - Controller and other system devices i.e. light sensors, driver boards - ON

## 5.3 Surge Protection

- 5.3.1 DMS equipment shall be protected by a double-pole, thermal-magnetic breaker. Additional protection shall be provided for overvoltage and lightning on both the AC and communication circuits.

## 5.4 Electrical Panel

- 5.4.1 Circuit breakers of the appropriate size shall be provided with each panel and wiring shall be rated and in accordance with the NEC and the anticipated loads that will be experienced by equipment, interior lighting, and power receptacles within the DMS housing and the branch circuit feeding the sign case.

## 6 DMS Controller

General Requirements:

- 6.1.1 DMS shall be controlled by a microprocessor based sign controller capable of operating and monitoring all sign functions.
- 6.1.2 The controller must allow the user to operate the sign via 3 different interfaces namely from the front panel touchscreen, web-based interface, and NTCIP central software.
- 6.1.3 The sign controller shall be housed in a durable enclosure and shall be 19 inch EAI rack mountable. Controllers shall be capable of driving all sign components via a RS485 network and be fully NTCIP compliant.
- 6.1.4 The DMS controller must be capable of operating multiple DMS simultaneously.



## **6.1.5** Physical requirements are;

### **6.1.5.1** Front Panel Indicators

The controller shall provide LEDs to indicate the status of the following items:

- AC Power,
- DC Power,
- Battery Status,
- CPU Status,
- CPU Fault Status,
- Ethernet Link and Activity Status,
- RS232 Receive and Transmit Activity,
- RS485 Receive and Transmit Activity,
- Digital Input Status,
- Digital Output status.

### **6.1.5.2** The front panel shall provide the following:

- Two (2) Ethernet 10/100 full-duplex ports,
- Two (2) RS-232 serial ports,
- Two (2) RS-485 serial ports,
- Four (4) digital outputs,
- Four (4) digital inputs,
- One (1) reset push button,
- Power On/Off switch,
- Full Color Touch Screen WYSIWYG display.

## **6.2** Mechanical and Electrical

**6.2.1** All electrical connections between the controller and subassemblies located within the Controller Cabinet and the DMS are provided on the front panel to avoid maintenance access problems associated with connectors located at the rear of the controller.

**6.2.2** Rugged, keyed connectors must be used to prevent misplacement of the connectors.

## **6.3** Digital I/O

The controller must be equipped with a minimum of 4 Digital inputs capable of accepting dry contact closures. These digital inputs can provide status inputs from items such as door switches. These inputs can also trigger software functions such as displaying preprogrammed messages. The controller shall provide a minimum of 4 Digital Outputs capable of driving relays or commands to external devices.

## **6.4** Clock

**6.4.1** The DMS controller shall contain a computer-readable time-of-year clock with a lithium battery or equivalent backup capable of operating the clock properly without external power.

**6.4.2** The clock shall be set by the DMS controller microprocessor and shall be accurate to within 1 minute per month.



## **6.5 Front Panel User Interface**

- 6.5.1** The DMS controller shall be equipped with a full color, front panel touch screen graphical LCD display. This user interface shall be capable of:
  - 6.5.1.1 Display sign current message in WYSIWIG format including blinking function, multi-page messages, flashers, etc.
  - 6.5.1.2 Allow display of all available DMS display test patterns.
  - 6.5.1.3 Perform all diagnostics testing of various system components, including pixels, power systems, sensors, etc.
  - 6.5.1.4 Activate a blank message or other messages stored in non-volatile memory of the DMS Controller.
  - 6.5.1.5 Control mode selection (Remote or Local).
  - 6.5.1.6 Select automatic or manual brightness mode of operation.

## **6.6 Controller Software**

- 6.6.1** The DMS controller software at minimum shall support NTCIP 1203 V2.39 and be backward compatible as noted in Section 9 of this specification.
- 6.6.2** The DMS controller shall be configurable by the user to define the number of LED display elements (pixels) faults before the controller blanks the sign.
- 6.6.3** Provide a remote capable web-server interface that will allow remote interface of all front panel user functions.

## **6.7 Display Presentation**

- 6.7.1** The sign controller shall control the display modules to create the desired message on the sign. At a minimum, the signs shall be able to display the characters as described in NEMA sections 5.6.1 and 5.6.2.

## **7 Dimming System:**

- 7.1.1** Each DMS shall be provided with a display intensity control system.
- 7.1.2** The system shall contain a minimum of two ambient light sensors to measure light levels and report the levels to the display control system. The sensors shall be positioned so that one sensor shall monitor the light levels on the front of the DMS, a second sensor shall monitor the light striking the back of the DMS.
- 7.1.3** The levels reported to the sign controller shall be processed so that the highest light level sensed will be considered the controlling level and shall be compared against a table containing a minimum of 6 configurable intensity levels.
- 7.1.4** The intensity levels shall be user configurable.
- 7.1.5** Each intensity level shall consist of an entry and exit value that allows the overlapping of levels to prevent display fluctuation with minor ambient light changes and flickering of the display during intensity level changes.



**7.1.6** The dimming system shall conform to the following requirements:

- The photocells shall be enclosed within the sign case with transparent covered windows that allow light to pass from the exterior of the sign case to the surface of the photocell. The sensors shall be capable of being continually exposed to direct sunlight without impairment of performance.
- Dimming Levels - Manual and automatic dimming modes shall be provided enabling the user to select the desired mode of operation.

## **8 Diagnostics and System Failure**

### **8.1 Failure Reports**

**8.1.1** The sign controller shall implement the status reporting objects required by NTCIP and have them available from a poll from central or the Local Connection. Sign controller shall log error conditions and make them available for future reporting.

### **8.2 Power Interruptions**

**8.2.1** The controller's configuration and controller state must be saved in non-volatile memory. In the event of a power interrupt, the controller must resume operation once power is restored.

**8.2.2** Upon recovering from a power interruption, the controller shall report to the central computer that it has recovered from a power-interruption.



## 9 NTCIP Communication Requirements

Each NTCIP Component covered by these specifications shall implement the most recent versions of the standard. At a minimum, the following MIB Object definitions shall be followed for each NTCIP section required for compliance to this specification. When viewing the tables, supported items are required.

### 9.1 Overall NTCIP Compliance

Standard	Name	Recommended version	Supported version	Comments
<b>Base standards</b>				
1102	OER	1.15	1.15	
1103	TMP	2.16	2.16	
8004	SMI	2.12	2.12	
<b>Device Data Dictionaries</b>				
1201	Global object definition	2.32	2.32	
1203	DMS	2.35	2.35	
<b>Subnetwork profiles</b>				
2101	PMPP/RS232	1.19	1.19	-
2102	PMPP/FSK	1.09	1.09	-
2103	PPP/RS232	1.09	1.09	-
2104	Ethernet	1.11	1.11	-
<b>Transport profiles</b>				
2201	Transportation	1.15	1.15	-
2202	Internet	1.05	1.05	-
<b>Application profiles</b>				
2301	STMF	1.08	2.12	1.08 refers to obsolete standards

### 9.2 NTCIP 1101:1996 (V01.12) Simple Transportation Management Framework, December, 2001 with Amendment 1 v08

- Must be supported (replaced by NTCIP 1102, 1103 and 8004).

### 9.3 NTCIP 1102:2004 (V01.15) Octet Encoding Rules (OER) Base Protocol, October, 2005

- Must be supported (replaced by NTCIP 1102, 1103 and 8004).





**9.4 NTCIP 1103: 2009 (V02.16) Transportation Management Protocols (TMP), March, 2009**

NTCIP 1103: 2009 (V02.16) Transportation Management Protocols (TMP), March, 2009			
Object group/Section	Support	Comment	
		MIB Detail	
<b>Section 3: SNMP</b>	<b>Supported</b>		
<b>Section 4: SFMP</b>	<b>Not Supported</b>		
<b>Section 5: STMP</b>	<b>Not Supported</b>		
<b>Section 7: Logical names</b>	<b>Not Supported</b>		<b>Center to Center communication</b>
<b>Section 8: Security</b>	<b>Supported</b>		
<b>A.2: Objects for SFMP</b>	<b>Not Supported</b>		
<b>A.3-A.5: Objects for STMP</b>	<b>Not Supported</b>		
<b>A.6: Logical names</b>	<b>Not Supported</b>		
<b>A.7: Report parameters</b>	<b>Supported</b>		
		maxEventClasses	Max = 65
		maxEventLogConfig	Max = 255
		maxEventLogSize	Max = 1024
<b>A.8: Security objects</b>	<b>Supported</b>		
		communityNameMax	Max = 16

**9.5 NTCIP 8004: 2008 (V01) Structure and Identification of Management Information (SMI), May, 2008**

- Must be supported.



9.6 NTCIP1203:2007 (V2.35) Object Definitions for Dynamic Message Signs (DMS), March 2007

NTCIP1203:2007 (V2.35) Object Definitions for Dynamic Message Signs (DMS), March 2007			
Object group	Support		Comment
<b>5.2 Sign configuration and capability</b>	<b>Supported</b>		
<b>5.3 VMS configuration</b>	<b>Supported</b>		
<b>5.4 Font definition</b>	<b>Supported</b>		
		numFont	Max = 16
		maxFontCharacters	Max = 255
		fontMaxCharacterSize	Max = 64
<b>5.5 MULTI Configuration</b>	<b>Partial</b>		
		defaultJustificationLine	Supported values: 2..4
		defaultCharacterSet	Support value 2 (height bits)
		dmsMaxNumberPages	Max = 10
		dmsMaxMultiStringLength	Max = 1024
<b>5.6 Messages</b>	<b>Supported</b>		
		dmsNumPermanentMsg	Max = 255
		dmsMaxChangeableMsg	Max = 255
		dmsMaxVolatileMsg	Max = 255
		dmsMaxMultiStringLength	Max = 1024
<b>5.7 Sign Control</b>	<b>Supported</b>		
<b>5.8 Illumination/Brightness</b>	<b>Supported</b>		
		dmsIllumControl	timer (value 3) not required. V1 modes still supported if required
<b>5.9 Scheduling Action</b>	<b>Supported</b>		
		numActionTableEntries	Max = 255
<b>5.10 Auxiliary I/O</b>			<b>See NTCIP 1201</b>
<b>5.11.1 Sign Status: Core Status</b>	<b>Partial</b>		
		dmsCurrentSpeed	Not required
		dmsCurrentSpeedLimit	Not required
<b>5.11.2 Sign Status: Status Error</b>	<b>Partial</b>		
		Climate status objects	Not required
		pixelStatusTable	
		Lamp status objects	Not required

		Drum status objects	Not required
<b>5.11.3 Sign Status: Power Status</b>	<b>Partial</b>		
		Fuel and engine status objects	Not required
<b>5.11.4 Sign Status: Temperature Status</b>	<b>Supported</b>		
<b>5.12 Graphic definition</b>	<b>Partial</b>		
		Transparent color	
		dmsGraphicMaxEntries	Max = 255
<b>Section 3 MULTI TAGS</b>			
<b>6.4.1 Color background [cb]</b>	<b>Supported</b>		
<b>6.4.2 Page background color [pb]</b>	<b>Supported</b>		
<b>6.4.3 Color foreground [cf]</b>	<b>Supported</b>		
<b>6.4.4 color rectangle [cr]</b>	<b>Supported</b>		
<b>6.4.5 Field [fx,y]</b>	<b>Partial</b>		
		<b>Speed (ID 5 and ID 6)</b>	<b>Not required</b>
<b>6.4.6 Flash time [fl]</b>	<b>Supported</b>		
<b>6.4.7 Font [fo]</b>	<b>Supported</b>		
<b>6.4.8 Graphic [g]</b>	<b>Supported</b>		
<b>6.4.9 Hexadecimal Character [hc]</b>	<b>Supported</b>		
<b>6.4.10 Justification Line [jl]</b>	<b>Partial</b>		
		<b>[jl5] (full justification)</b>	
<b>6.4.11 Justification Page [jp]</b>	<b>Supported</b>		
<b>6.4.12 Manufacturer specific [ms]</b>	<b>Not supported</b>		
<b>6.4.13 Moving text [mv]</b>	<b>Supported</b>		
<b>6.4.14 New Line [nl]</b>	<b>Supported</b>		
<b>6.4.15 New Page [np]</b>	<b>Supported</b>		
<b>6.4.16 Page time [pt]</b>	<b>Supported</b>		
<b>6.4.17 Spacing character [sc]</b>	<b>Supported</b>		
<b>6.4.18 Text Rectangle</b>	<b>Not supported</b>		



9.7 NTCIP 1201:2005 (V02.32) Global Object (GO) Definitions - Version 02, October 2005

Object group	Supported or Not-Supported	Detail	Comment
<b>2.2 Global configuration</b>	<b>Supported</b>		
		globalModuleTable	1 entry for controller's software 1 entry for controller's hardware
<b>2.3 Global Database management</b>	<b>Not supported</b>		
<b>2.4 Global Time Management</b>	<b>Supported</b>		
		globalDaylightSaving	Supported values: 2..6
		maxTimeBaseScheduleEntries	Max = 255
		maxDayPlan	max = 128
		maxDayPlanEvents	max = 96
		globalLocalTimeDifferential	Supported from v1
<b>2.5 Report Parameter</b>			<b>See NTCIP 1103</b>
<b>2.6 PMPP Object</b>	<b>Supported</b>		
		maxGroupAddresses	Max = 16
<b>2.7 SECURITY</b>			<b>See NTCIP 1103</b>
<b>2.8 Auxiliary I/O</b>	<b>Not supported</b>		



**9.8 NTCIP 2101:2001 (V01.19) Point to Multi-Point Protocol Using RS-232 Subnetwork Profile, November, 2001**

Object group/Section	Supported or Not-Supported	Detail	
<b>Sections 2.1 - 2.4</b>	<b>Partial</b>	Section 2.2.1: T2 counter	Not changeable
		Section 2.2.4: IPI	IPI supported = 0xC1. IPI 0x21 (IP) not supported
		Section 2.2.8: Frame type	Test Command not supported
<b>Sections 2.5.1, HDLC group</b>	<b>Partial</b>	LapBAdmnTransmitN1FrameSize	Not supported
		LapBAdmnReceiveN1FrameSize	Not supported
		LapBAdmnT1AckTimer	Not supported
		LapBAdmnT2AckDelayTimer	Not supported
<b>Sections 2.5.2, RS232 group</b>	<b>Supported</b>		
<b>Sections 2.5.3, RS232 Async. group</b>	<b>Supported</b>		
<b>Sections 2.5.4, HDLC group addr.</b>	<b>Supported</b>		<b>See NTCIP 1201</b>

**9.9 NTCIP 2103 (V02.07) Point-to-Point Protocol over RS-232 Subnetwork Profile, December, 2008**

- Not required to be supported.

**9.10 NTCIP 2104:2003 (V01.11) Ethernet Subnetwork Profile, September, 2005**

- Not required to be supported.



## **10 References, Support, and Quality Assurances**

It is the intention of this specification for the End-User to receive a reliable DMS system that is proven by a record of low maintenance requirements, low power consumption and overall reliable service at actual field installations elsewhere.

It is also the intention of this specification for the End-User to be reasonably assured that the high level of support mentioned throughout this document, shall continue to be available for the equipment throughout the equipment's normal life cycle. This support shall include, but not be limited to, prompt in-house spare and replacement parts availability; in-house field services for repairs, modifications, and paid upgrades; and in-house software support for any custom software supplied by the DMS Supplier or DMS Manufacturer.

The Bidder shall furnish a letter from the DMS Manufacturer or DMS Supplier listing the compliance to the provisions of this Section, with a toll free phone number that the End-User may use for telephone technical support during the term of this contract.

The Bidder shall furnish a compliance matrix listing each paragraph of this entire specification with an appropriate statement indicating whether the Bidder will comply with that part of the specification. In cases where the Bidder does not intend to comply with the specification, the Bidder shall indicate clearly how his equipment and/or work differs from the requirements listed herein, and what his intentions are to satisfy the requirements.

The Bidder shall include a certification from the DMS Manufacturer that the manufacturer has: a) at least five (5) years' experience in manufacturing, supplying, and supporting fully assembled DMS systems, and b) that in-house field service staff, phone support, and sufficient stocked spare parts are available from a USA location.

The Bidder shall furnish a list of five (5) US transportation agencies that have operated and maintained the DMS Supplier's systems, for no fewer than three (3) years. This list shall include the names, addresses, and telephone numbers of the agency's responsible contact person.

The Bidder shall identify any projects or circumstances where the Bidder and/or the DMS Supplier were required to pay liquidated damages, or defend themselves against liquidated damages in the last five years. Failure to supply this information shall be cause for rejection.



**11 Appendix A - Bid Item Configuration Sheet**

<b><u>SPECIFIC SIGN CONFIGURATION</u></b>	<b><u>TYPE I</u></b>	<b><u>TYPE II</u></b>	<b><u>TYPE III</u></b>	<b><u>TYPE IV</u></b>
<b>Number of Signs</b>				
<b>Full Color Display Pitch</b> 20 mm or 33mm				
<b>For Full Matrix</b> <b>Number of Pixels per Sign</b>	___ x ___	___ x ___	___ x ___	___ x ___
<b>Rear or Walk-in Access or Front</b> (R or W or F)				
<b>Sign dimensions</b> (length x height )				
<b>Max Sign weight (Lbs.)</b>				
<b>Sign maximum power consumption</b>				
<b>Electrical Service to Controller</b> (120 or 240 VAC)				
<b>Flashing Beacons on Signs</b> <b>8” or 12” Amber LED</b> (Qty. = 0, 2 or 4)				
<b>Sign Heaters</b> (Yes or No)				
<b>Cabinet Mounting</b> (Pole, Ground or Sign (for walk-in))				
<b>Redundant Power Supplies</b> (Yes or No)				