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Advantage Series, Model 4260

Solar Charged, Battery Powered All LED
NTCIP Compliant Portable Changeable Message Sign
Specifications rev 1229

1.0 SCOPE

This specification defines the characteristics and features of a portable changeable message sign. This system allows the user to display an illuminated message to inform motorists and the traveling public of oncoming road conditions or advisories. The display format is full matrix. The sign is battery powered with both solar and 110 VAC charging systems. These portable signs can also be used as a platform and power source for many Intelligent Transportation System (ITS) devices.

2.0 GENERAL

2.1 MESSAGE SIGN DISPLAY

Description: The display for all Advantage units available is Full Matrix. Each sign format shall be configured of all light emitting diode (LED) with each having an operational characteristic of Amber 590nm LEDs with a 30° cone of angularity. The display shall consist of three (3) rows and eight (8) columns of identical LED panels forming a full matrix of LED panels. The total matrix shall be 42 pixels by 60 pixels for a total of 2520 LED pixels.

2.2 ELECTRICAL

2.2.1 Display Panels: Each display panel shall be nominally 15.65” in height and 11.15” in width. Display panels shall be 100% solid state with no moving parts and shall be identical to, and mutually interchangeable with, all other panels; no field hardware or programming modifications shall be required to exchange or replace individual display panels. The pixels on each display panel shall be arranged in a matrix of 10 columns by 14 rows with the pixels spaced on 2.25” centers vertically by 1.13” centers horizontally. Each panel shall be able to monitor and determine pixel failure. Pixel failure will be represented on host software and local control system identifying location of failed pixel. Controller display will be in WYSIWYG format, (What You See Is What You Get.).

2.2.2 Pixel: An individual pixel shall consist of four LED’s spaced on 1.0” centers both vertically and horizontally. The LED’s shall be ITE amber wide angle providing for both daylight and nighttime legibility and shall be rated for a service life of 100,000 hours, and shall have an operating temperature range of – 40° F. to + 165° F.



General Characteristics:

Number of Pixels: 140 standard, 14 pixels rows, 10 pixel columns
 Number of LED's per pixel: 2, 4, or 8 depending on selected font
 Operating Voltage: 12VDC nominal
 Brightness Control: Pulse width modulation
 Current Limiting: One external resistor per driver
 Pixel Feedback: Differential amplifier per pixel (where provided)
 Feedback Logic: CPLD on-board
 Column Decoding: CPLD on-board
 LED Driver: Power shift register technology with programmable current limit
 Temperature Range: -40° F to +165° F
 Brightness: 16,160 cd/m²

2.2.3 STANDARD FONT TABLE

| Font | Nominal Height | Lines | Characters | Legibility Distance |
|------|-----------------------------|-------|------------|---------------------|
| 1 | 8" / 200mm | 4 | 8 | 400' / 121m |
| 2 | 10" / 240mm | 3 | 6 | 500' / 152m |
| 3 | 12.5" / 320mm | 2 | 5 | 650' / 198m |
| 4 | 16" / 400mm | 2 | 4 | 800' / 259m |
| 5 | 8" / 200*mm | 4 | 9 | 400' / 121m |
| 6 | 10" / 240*mm | 4 | 8 | 500' / 152m |
| 7 | 12.5" / 320*mm | 3 | 6 | 650' / 198m |
| 8 | 16" / 400*mm | 2 | 5 | 800' / 259m |
| 9 | 8" / 200*mm (single stroke) | 4 | 8 | 400' / 121m |

* Modified spacing between characters

2.3 CPU: The CPU shall consist of a single printed circuit board which shall contain all of the sign message memory as well as the sign operating software. The CPU shall be a conformal coated 100% solid state unit with no moving parts or switches, shall be operable in 0-95% non-condensing humidity conditions at temperatures from -30 degrees F to +165 degrees F, and shall include provision(s) for protection against damage should the 12 VDC power source be incorrectly connected with the leads reversed. The CPU shall have sufficient capacity to store 199 manufacturer-selected, pre-stored messages (180 provided) and up to 199 operator-defined, keyboard generated messages. Message memory shall be retained during power interruptions or failures, and the CPU shall be capable of operating the sign system in the event that the keyboard controller is disconnected. The CPU shall be located within the sign case behind the display panels and shall be mounted on the display panel support structure. For ease of maintenance, the CPU shall contain all of the terminal connectors for the display panel wiring harnesses and the keyboard terminal harness.

2.4 Data Distributor: The data distributor board formats and renders messages based on the incoming packets from the CPU. The data distributor also reads the pixel information from the display boards and sends that information to the CPU. The pixel feedback enables any host application that communicates with the CPU to generate a WYSIWYG interface. If a pixel has failed, the user will know it, since the host display will show the failed pixel.



3.0 CONTROL & OPERATION

3.1 MESSAGE SIGN CONTROLLER TERMINAL

3.1.1 Controller Description: The sign controller shall utilize industry standard VT 100 cursor control commands, shall be nominally 4.8" x 9.9" x 2.0", shall be removable, and shall be mounted within the control cabinet utilizing easily removable retainers. Removing the keyboard and disconnecting the electrical connections shall not interrupt the fully operational status of the sign display. The keyboard terminal shall consist of a standard keyboard and a backlit 4 line x 20 character /line liquid crystal display. The LCD characters shall be nominally 0.2" in height. The terminal shall be weather-tight, shall be manufactured with conformal-coated circuit boards capable of operation in 0-95% non-condensing humidity conditions, and shall be rated for operation from -30 degrees F to +165 degrees F.

3.1.2 Location: The keyboard terminal shall be located in the control cabinet, mounted with easily removed retainers, and detachable from the electrical umbilical connector while maintaining sign operation.

3.2 MESSAGE SIGN OPERATING SYSTEM

3.2.1 Description: The sign operates through a menu driven system which allows the user to input commands using standard keystrokes to generate messages, message pages, review diagnostics, and generate operation schedules. The sign operating system shall perform the minimum items:

- Password Protected: Multi-levels, User, Maintenance / Factory Diagnostic
- NTCIP Compliant V1203 standard objects
- Sign Diagnostics
- Battery Voltage
- Charging Voltage (Landline & Solar)
- Individual Pixel Feedback
- Component Failure Status
- Adjust Brightness levels
- Message Scheduling
- Additional component use (e.g. Radar, Cellular, GPS)

4.0 SYSTEM POWER SOURCE

4.1 Description: The 12 VDC power source for the system shall be a battery pack charged primarily by a solar array that provides virtual autonomy for the system. A 110 VAC charging system is also standard on all units and available for landline operation of the system. Control of the sign power supply shall be provided by a power management system that shall regulate the charging of the batteries by the solar charging system, and shall provide for temperature compensation, regulation, and distribution of power to the various sign functions. The charging of the 12 VDC power source batteries shall be independent of the position of any switch on the control panel.



4.2 Battery Pack: The battery pack shall consist of 6VDC deep cycle golf cart type lead /acid batteries (BCI Group GC-2) that when in a fully charged condition provide sufficient electrical energy for the continuous and proper operation of the sign system. Autonomous runtime shall be based on the size of the battery bank. Most units are configured for a minimum period of twelve to fifteen days without the necessity of recharging. Warranty service for the batteries shall be locally available on a nationwide basis from the batteries manufacturer.

4.3 Charging: The sign system shall be equipped to provide for the charging of the 12 VDC power source batteries by either a solar charging system, or alternatively, by a 110 VAC charging system.

4.3.1 Solar Charging System: The solar charging system shall consist of a photovoltaic array mounted at the top of the sign case and a power management system. The system shall provide regulated, “on demand” charging consistent with battery condition, with the ambient solar luminance at the photovoltaic array, and with net power consumption within the sign system. Charging of the batteries shall be independent of the position of any switch on the control panel. Initiation of 110 VAC charging service shall completely disconnect the solar array from the charging circuit.

4.3.2 110 VAC Charging System: The 110 VAC charging system, supplied as standard equipment, shall consist of a temperature compensating, 110 VAC input battery trickle charger, an ammeter for monitoring the charging process, and an electrical receptacle mounted on the control pedestal. The system shall be configured so as to initiate charging of the power supply batteries when the 110 VAC service is connected without the necessity of operator intervention, and shall be capable of completely charging the battery pack within a 24 to 72 hour time period. The actual charging time will vary depending upon conditions and state of charge/discharge of the batteries.

5.0 PHYSICAL SIGN & TRAILER CHARACTERISTICS

5.1 Description: The sign case and trailer frame shall be completely designed and fabricated from an all-metal construction. The sign case shall be aluminum and the trailer frame shall be steel. An electric hydraulic mast is supplied to raise the display from travel mode into display mode. A backup hand pump for the hydraulic mast is required. The display shall have a polycarbonate lens system.

5.2 Sign Case: The sign case shall be of all aluminum construction fabricated utilizing ASTM B 209 6063-T5 and 6061-T6 aluminum extrusions and 3003-H14 aluminum sheet material with aluminum and/or stainless steel fasteners.

| Sign Model | Case Height | Case Width |
|------------|--------------|------------|
| 4260 | 55.4” (1.4m) | 75” (1.9m) |

5.3 Lens: Polycarbonate lenses shall serve as the front of the sign case. The lenses shall be 3/16 “ in thickness per accepted plastics industry convention, shall be suitably stabilized to resist degradation due to exposure to ultraviolet (UV) radiation.



5.4 Mounting: The mounting post shall support the sign case in a vertical position and serve as an integral part of a system facilitating the vertical and rotational movement of the sign case. The post assembly shall consist of two concentric round steel tubes, the inner (lower) being 5 1/2" OD x 3/8" wall steel (ASTM A 513), and the outer (upper) 6" OD x 3/16" wall. The post assembly and attendant hydraulic cylinder shall enable the operator to raise the bottom of the sign case to a minimum height of 7 feet above the surface of the roadway, and to rotate the sign case through 360 degrees. A positive brake assembly shall be provided to prevent unwanted movement once the sign case is in the desired display position. A mast safety pin shall be provided to prevent the sign case from falling in the event of a hydraulic system failure.

5.5 Hydraulic System: A hydraulic cylinder shall be encased within the inner (lower) portion of the post assembly and shall be used to raise the outer (upper) portion and attached sign case. The cylinder shall be driven by an electrically powered hydraulic pump (with attached fluid reservoir) controlled by the UP/DOWN toggle switch on the control panel. The hydraulic system shall include an auxiliary manual pump with release for emergency use.

5.6 TRAILER

5.6.1 Description: The trailer shall be 137" in length with the removable tongue in place and 72" in width, shall be constructed of 3" x 3" steel tube (ASTM A 500 Grade B) with 1/8" wall thickness and shall be welded in accordance with applicable American Welding Society (AWS) standards. The trailer shall have a lockable, weatherproof control cabinet housing the keyboard terminal, control panel, and a lockable battery box for the 12 VDC power source batteries.

5.6.2 Rating: The trailer and springs and axle shall be rated for 3500 pounds. The removable tongue assembly with hydraulic surge brakes shall be constructed from 3" x 3" steel tube (ASTM A 36) with 3/8" wall thickness, rated for 6000 pounds, and fitted with a 2" ball hitch. Wheels shall be 15" steel with 5 lug bolts per wheel and fitted with P 205-75-15 B rated tires.

5.6.3 Removable Tongue: The removable tongue shall have safety chains attached. No tools shall be required for removal or remounting of the tongue; it shall not be necessary to disconnect any hydraulic brake lines to effect complete removal, and it shall not be necessary to bleed the brake system upon re-installation of the tongue.

5.6.4 Leveling Jacks: The trailer chassis shall have at each corner a 2000 pound leveling jack affixed in such a manner that the jacks may be readily placed and locked in a horizontal position for traveling without necessitating the use of any tools. The trailer and sign assembly, when stationary and supported properly with the leveling jacks shall withstand AASHTO rated 100 MPH wind gusts.

6.0 OPTIONAL EQUIPMENT

6.1 Description: The sign may be equipped with any of the following devices for communications, data acquisition, and/or information dissemination.

6.2 Remote Communications: The sign system shall be equipped so as to provide for host computer/remote sign interaction through a landline telecommunication / modem link, or digital cellular transceiver. In addition to using NTCIP-compliant software-based interfaces, the sign may be controlled via website provided it has remote communications with static IP Based cellular link.



6.3 Radar Transducer: A Doppler-effect microwave radar transducer can be outfitted to the message sign to provide the sign with added traffic calming capabilities. These abilities include: Instantaneous speeds of front most and fastest target or activation of an overspeed sequence, which automatically interrupts current sequence.

6.4 Queue Detection: American Signal Changeable Message Signs are able to be paired with an American Signal Queue Detection Trailer and connected wirelessly to be able to instantly display a condition responsive sequence of messages pre-set by the user.

6.5 Aimstar™: This option outfits the signs with an adjustable solar assembly. Through positioning the solar assembly aimed toward the southern hemisphere, the unit is able to receive an increased rate of charge for the battery bank.

6.6 Radar Data Logging Capability: Sign used in conjunction with Radar Option and Cellular Communications Software Option can be utilized to collect traffic data such as average speeds, 85th percentile, 50th percentile, and average # of cars. All data is presented in graph format accessed within the software.

6.7 Highway Advisory Radio (HAR): The Highway Advisory Radio option allows the user to record an audible message to a locally mounted AM band transmitter (tuned to State specific frequency). Up to 8 messages can be played in continuous loop, while providing for storage of other messages with respect to size of digital recorder/player.

6.8 Video/Imaging Equipment: Camera and recording equipment for any number of applications can be mounted, installed, and integrated with American Signal message signs. Common applications include work zone safety surveillance, property/facility security recordings, traffic enforcement via LPR technology, and most often, general traffic surveillance.

6.9 ITS Related Options: The Advantage Series message signs can be outfitted with most of the common ITS elements. The items include; CCTV, RWIS, RTMS, etc... American Signal is also able to provide custom integration solutions for products not mentioned.

6.10 Miscellaneous: American Signal is able to meet the user's needs for additional hardware items. We are able to provide any hitch type (Ball, Pintle or Lunette Eye, Bulldog, Adjusting Height, etc...), axle type, lift requirements, color specifications, alarms, etc.

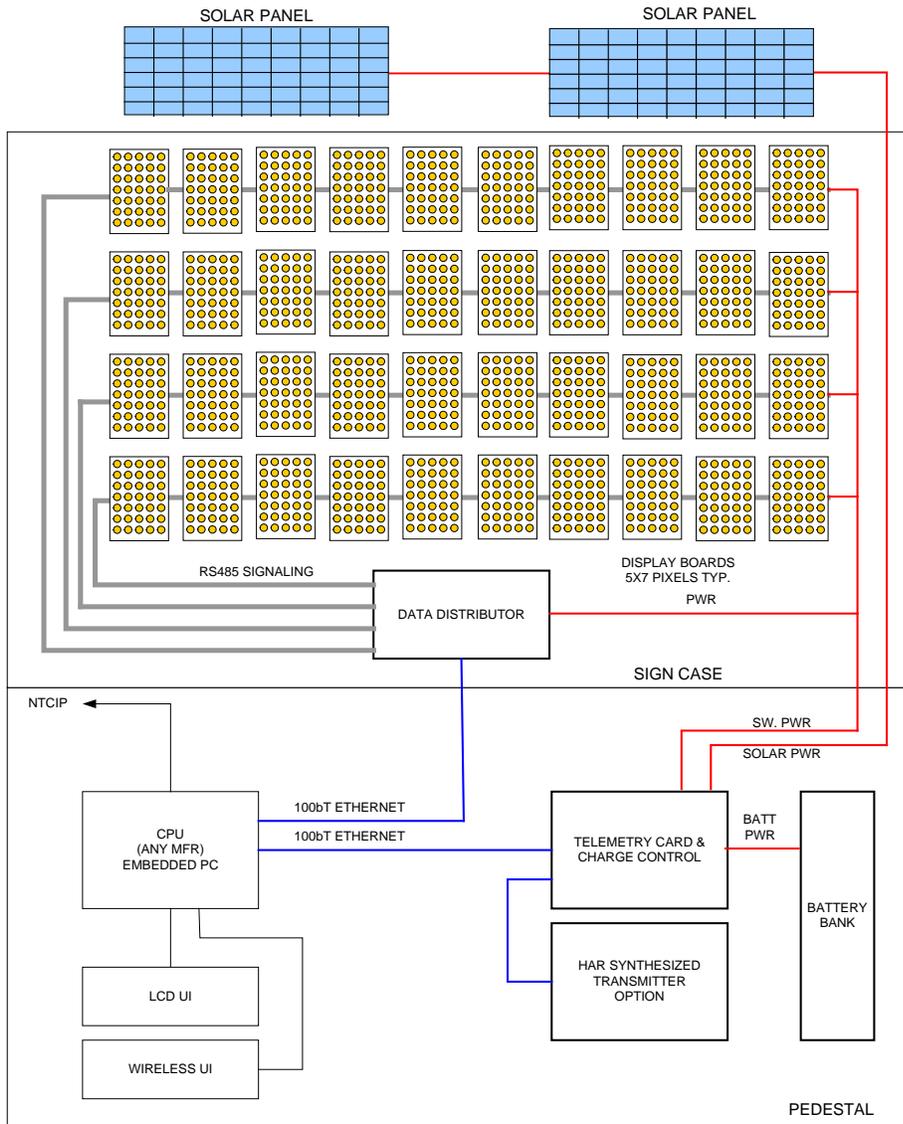


FIGURE #3 - REVISED TRAILER ARCHITECTURE BLOCK DIAGRAM