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## T-25

### Portable Solar Charged Mast Trailer Specifications For use with AMSIG Changeable Message Signs & Integrated Traffic Management Solutions (ITMS) 0809-09

#### 1. SCOPE

This specification defines the characteristics and features of a portable solar charged trailer with a telescoping mast (T-25). This trailer is able to be used in conjunction with American Signal Company's Changeable Message Sign products in the Integrated Traffic Management Solution (ITMS) automated work zone system. This system is capable of monitoring traffic and relaying this data to the ITMS work zone system. In addition this unit may be used as an individual traffic monitor to record data for analytical use.

#### 2. 12 VDC POWER SOURCE

2.1. Description: A bank of batteries forming a 12 VDC system shall power the unit.

2.1.1. Battery Bank: The battery bank shall consist of 6VDC deep cycle heavy duty lead/acid batteries wired in parallel as to form a 12 VDC system. Warranty service for the power source batteries shall be locally available on a nationwide basis. Other battery options are available at the customer's request, including Gel-Cell or AGM.

2.2. Charging: The charging system for the 12 VDC power source shall be as follows:

2.2.1. Charging System: The charging system for a trailer mounted sign shall be solar, consisting of a photovoltaic array supplying electrical energy to the batteries through a solar regulator. The system shall provide "on demand" charging consistent with battery condition and with the ambient solar luminance at the photovoltaic array. The trailer shall also be equipped with a standard 110 VAC receptacle as well as a temperature-stable 110 VAC battery trickle charger and ammeter. The 110 VAC charging system shall initiate charging automatically when 110 VAC service is connected, and shall be capable of completely charging the battery pack within a 24 to 48 hour time period. The actual charging time will vary depending upon conditions and state of charge/discharge of the

batteries. Initiation of 110 VAC charging shall completely disconnect the solar charging capability from the charging circuit.

### 3. TRANSPORT VEHICLE

3.1. 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 dual lockable compartments, one housing batteries and the other housing for the electronics box for the 12 VDC power source batteries.

3.2. Rating: The axle shall be rated for 2000 pounds, the springs for 1300 pounds each set, and the wheels shall be 13 “ steel with 5 lugs bolts per wheel and fitted with 175-60-13 C rated tires. The removable tongue shall be fitted with a 2” ball coupler rated for 5000 pounds. Standard axle is leaf spring, customer may upgrade to a torsion suspension system if required.

3.3. Removable Tongue: The removable tongue shall be fabricated from 3” x 3” steel tube (ASTM A 500 Grade B) with 3/8” wall thickness, shall be affixed to the body of the trailer with a retaining pin, and shall have safety chains attached. The lighting lead shall be affixed permanently to the tongue and shall separate from the trailer wiring harness at a plug connector when the tongue is removed.

3.4. Stabilizing Outriggers: Each corner of the trailer shall be fitted with screw jacks to stabilize the trailer when in the display position. The screw jacks shall pivot to a horizontal position for transport. When all four jacks are engaged the trailer shall be able to withstand wind speeds of approximately 85MPH, independent of the mast and optional equipment being in deployed position.

### 4. TOWER ASSEMBLY

4.1 Description: The trailer utilizes a tower assembly comprised of multiple square tubes of a telespar like aluminum material. The total extension of the tower assembly shall be 30’ high. The mast is raised by using a hand crank system.

### 4. COMMUNICATIONS (OPTIONAL for ITMS):

4.1. Interface Communications Hardware: The unit shall be equipped so as to provide for system interaction through a wireless link. The wireless link may be accomplished via a pair of radio transceivers and radio modems or an integrated radio modem/transceiver. All communications shall be best suited for the area of deployment and offer an interference free environment.

4.1.1. Wireless Communications: The wireless system as mode of communications between the queue detector trailer and message sign shall operate with the following features:

4.1.2. General RF Modem Transceiver Specifications: The wireless radio transceiver either license free or licensed to the following specifications.

- Frequency Coverage: 400-430 MHz #01; 450-470 MHz #02; 470-490 MHz #03; 490-512 MHz #04; Mode: 16K0F3E or 8K0F3E

- Number of memory channels: 32 (standard), 160 (optional)
- Channel spacing: 25 kHz, 30 kHz, 12.5 kHz, 15 kHz
- Modulation:  $\pm 5.0$  kHz,  $\pm 2.5$  kHz (wide or narrow, selectable per channel)
- Power Supply Requirement: 13.6 V DC  $\pm 15\%$  (negative ground)
- Current drain (at 13.6 V DC; typical):
- High: 8 A
- Low: 4 A
- Squelched: 700 mA
- Max. audio power: 1.2 A
- Usable Temperature Range:  $-30^{\circ}\text{C}$  to  $+60^{\circ}\text{C}$ ;  $-22^{\circ}\text{F}$  to  $+140^{\circ}\text{F}$
- Frequency stability:  $\pm 0.00005\%$  (5ppm)
- Dimensions (projections not included): 150(W) x 50(H) x 180(D) mm; 5.91(W) x 1.97(H) x 7.09(D) in
- Weight: 1.5 kg; 3 lb 5 oz

#### 4.1.2.1. Transmitter:

- Output power:
- High: 35 W
- Low: 2 W
- Max. frequency deviation:  $\pm 5.0$  kHz,  $\pm 2.5$  kHz narrow
- Spurious emissions: 70 dB minimum
- Harmonic emissions: 70 dB minimum
- Hum and noise: 45 dB typical

#### 4.1.2.2. Receiver:

- Sensitivity (for 12 dB SINAD):  $0.25 \mu\text{V}$
- Adjacent channel selectivity: 75 dB typical
- Intermodulation rejection: 70 dB typical
- Spurious response rejection: 80 dB typical
- Hum and noise: 45 dB typical
- Audio Output Power: 4 W typical at 5% distortion with a 4 ohms load

4.1.3. Radio Modem Specifications: The radio modem shall be paired to operate together with the radio transceiver to send and receive data packets to and from the components within the work zone system.

#### 4.1.3.1. Data Interface

- Data Rates 300, 1200, 2400, 4800, 9600 baud
- Data Format Asynchronous, 8 or 9 bit words
- Signal Levels RS-232 or TTL
- Handshake Protocols Full Handshake: Supports RTS, CTS, DCD, DSR, DTR
- Data Only (3 wire): Requires only TD, RD and SG
- Data Only Time Out 1 to 500 character periods

- CTS Control Line Buffer, Channel, Data PTT or RTS Driven
- DCD Control Line Data and/or Channel Driven
- DSR Control Line Active when Operational, Transmitting or Receiving
- DTR Control Line Enabled or Disabled (receive data flow control)
- Data Connector 9 pin D, female, DCE

#### 4.1.3.2. Radio Interface

- Data Rate (Modulation) 1200 bps or 2400 bps (Continuous Phase MSK)
- Sensitivity (typical)  $1 \times 10^{-5}$  BER (Bit Error Rate) for 14 dB SINAD, Uncoded
- Receive Signal Level 0.3 to 6.0 V peak-peak (single ended or differential)
- (100 K. input impedance)
- Transmit Signal Level 0 to 300 mV peak-peak (low setting)
- (into 600 . impedance) 0 to 5.0 V peak-peak (high setting)
- Data PTT Open Drain with Selectable Polarity
- Tx Attack Time Fixed: 1 to 9999 milliseconds
- Channel driven: Static or Pulsed Channel Grant with Selectable Polarity
- Tx Time Out Timer Disabled or 1 to 500 seconds
- Carrier Detect Disabled or Enabled with Selectable Polarity
- Radio Connector 25 pin D, male

#### 4.1.3.3. Channel Options

- Duplex: Half or Full
- Data Security: 254 Selectable Scrambling Codes
- FEC (Coding): None or 12,8 Hamming code with 16 bit Interleaving
- Shared Voice Operation: Input Controls: Voice PTT Detect, Voice Reception Detect  
Output Controls: Speaker Mute, Microphone Mute, Channel/Group Select
- Data protocol: Transparent or Packet

#### 4.1.3.4. Optional Packet Protocol

- Channel Access: Master-Slave or Carrier Sense Multiple Access (CSMA) with Programmable Attempt Rate
- Protocol: Automatic Repeat reQuest (ARQ) with Sliding Window Selective Repeat
- Packet Size: 1 to 5000 characters
- Retries: 0 to 50 (per packet)
- Address Space: 999 Individual Addresses per Group  
up to 60 Groups
- Transfers: Individual with Acknowledgment (to any address)  
Individual without Acknowledgment (to any address)  
Group Broadcast (to all addresses in a single group)  
Network Broadcast (to all addresses in all groups)  
Multicast Reception (from up to 10 other groups)

Relay Operation: Store and Forward Data Repeating with Address Filtering

#### 4.1.3.5. General

- Supply Voltage: 6 to 18 VDC
- Supply Current: 200 mA max, 150 mA Transmit or Receive (typ), 90 mA Standby (typ)
- Data Buffer: 32 KByte SRAM
- Program Storage: 128 KByte FLASH ROM (allows for in field firmware upgrades)
- Indicator LEDs: Transmit, Receive, Power
- Dimensions: 4.0" x 2.9" x 1.3" (102 mm x 74 mm x 33 mm)
- Weight: 7 ounces (198 grams)
- Temperature: -22 to +158 °F (-30 to +70 °C)
- Humidity: 0 to 95% (non-condensing)

### 5. MICROWAVE RADAR SENSOR:

5.1. Description: The RTMS (Remote Traffic Microwave Sensor) shall be utilized to monitor up to eight (8) lanes of traffic for volume, occupancy, and speed. This sensor is programmed to be able to monitor altering traffic patterns and transmit the data to the work zone system allowing for changes to occur.

5.1.1. Hardware: The mounted microwave radar transducer shall have the following characteristics:

#### RF Transmission:

Frequency Range	10.525 GHz
Instantaneous Bandwidth	45 MHz
Transmitter Power	10 mW

#### Coverage Area:

Elevation Beam Width	45-degree
Azimuth Beam Width	15-degree
Range	10-200'

#### Measurement Resolution:

Detection Zones	Up to twelve, user definable
Zone Length	7-30'
Zone Width	7'
Time (contact closure)	10 mSec resolution
Extension Time Delay	Programmable 30 mSec to 3 seconds
Message Time	Up to 600 seconds in 10 seconds resolution

#### Measurement Accuracy

Presence	98% accuracy
Direction	Less than 5% error
Magnitude of Transverse Speed	Less than 5% error
Magnitude of Transverse Speed	Less than 10% error

Volume per zone	Less than 5% error
Occupancy per zone	Less than 5% error
Long Vehicle Volume	Less than 5% error

Power Requirements:

Power	12 to 24 volts AC/DC @ 6 watts
Surge Protection	IEEE Standard 587-1980 Category C
Power Failure Recovery	Automatic within 5 seconds

Interface:

Contact Closure Sinking	Eight isolated contact pairs up to 100 mA AC or DC up to 350 volts
RS 232	9600,N,8,I
Timer	Dip switch settable
Timer Range	1 to 15 seconds on delay 1 to 75 seconds off delay

Mechanical:

Sensor Housing	NEMA 3, 4X, and IP65
Dimensions	6" x 9" x 5"
Weight	5 pounds
Mount	Universal Ball Joint

Environmental:

Temperature Range	-37C to +74C
Humidity	Up to 95%
Vibration	2g up to 200 Hz Sinusoidal
Shock	5g 10 mSec half sine wave
Precipitation	Rain or snow up to a rate of 100 mm/hr
Wind	Up to 160 Kph will not degrade
Reliability	Mean time between failures 90,000 hours (10 years)

**6. OPTIONAL EQUIPMENT:**

Additional Equipment may be utilized in conjunction with this trailer to enhance performance. CCTV, Cellular Modems, GPS, etc... Additional information for these options is available from your sales agent.