1. SYSTEM

1.1. Description

The Wanco® Remote-Video Monitoring System provides information to the public on a variable message sign, while an integrated video camera lets you monitor activity around the sign from almost anywhere.

This intelligent transportation system (ITS) device links your Wanco message sign and your computer wirelessly via the Internet. The video camera is controlled remotely via a cellular router, and can be panned, tilted, and zoomed by operator. Camera is capable of limited onboard recording storage.

A telescoping tower lifts the camera high above the sign using an electric winch for quick and easy deployment. The camera and the display cabinet can be raised and operated independently, so you can use one without having to use the other.

The message sign features a full-matrix display for presenting messages as text, graphics, or a combination of both. Messages are programmed using a self-contained onboard computer, making a laptop or external controller unnecessary. A laptop can be connected if desired. Signs come configured with preprogrammed standard messages, and users can create custom messages easily. A quick-message function provides for display of selected messages with a single keystroke.

For optimal positioning, the sign rotates independent of the trailer and its height is fully adjustable. Jack-legs and outriggers add stability. The trailer is easy to maneuver and deploy, and can be towed by most vehicles.

The RVMS is portable and self-powered, requiring no permanent installation or wiring. Power is provided by batteries, which are charged by an automated solar charging system.

1.2. Model

WTMMBCA full-size matrix message sign with video camera system

1.3. Temperature limits

<table>
<thead>
<tr>
<th></th>
<th>Operating</th>
<th>Storage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range</td>
<td>–29 to 165°F (–34 to 74°C)</td>
<td>–40 to 185°F (–40°C to 85°C)</td>
</tr>
</tbody>
</table>

1.4. Standards

Message sign is compliant in accordance with:

- MUTCD, December 2009
- NTCIP Version 2
- NEMA TS 4-2005 Section 2 for ambient temperature, vibration, shock, electro-static discharge (ESD), and radio interference
2. **FEATURES**

2.1. Setup

- Hydraulic lift raises sign display on tower
- Electric winch raises camera above sign display with the flip of a switch
- Tower rotates 360 degrees for optimal positioning
- Single disk brake holds tower in place during operation, while a cradle supports and holds display in travel position
- Camera assembly nestles behind display in travel position

2.2. Remote control

- Monitor work zones, traffic flow and road conditions over live video feed
- Connect to system using a computer with an Internet connection
- Connect from an office, a central command center, or any Internet-enabled location
- High-speed cellular router provides reliable connection
- Multi-level password protection restricts access to control software
- Automatic encryption and authentication
- Access and control the video camera, message sign, and accessories
- Modify the message displayed on the sign
- Check power levels
- Pan, tilt and zoom the camera
- Monitor message sign health status in real time
- View traffic speed live with optional radar-based speed-monitoring package
- View sign location on Google® Maps (with GPS modem)

2.3. Video

- Domed, day/night, pan-tilt-zoom camera
- Live MPEG video and many other formats
- Full-color video in normal light, black & white in low light
- Can operate independent of the message sign

2.4. Message Sign

- Sign can operate independent of the camera system
- Self-contained onboard computer, no laptop required
- Preprogrammed text messages, symbols and graphics
- Easily center each line of text
- Internal clock facilitates built-in schedule programming
- Multiple alphanumeric fonts
- Quick-reference instructions, silkscreened on control panel, include most commonly performed tasks
- Standard QWERTY keyboard can be removed and replaced
- Control box can be locked to prevent unauthorized access
- Optical lenses and sunshades increase visibility and performance
- Cooling fans protect sign cabinet from overheating
- Wide footprint provides stability in high wind
- Meets MUTCD and NTCIP standards
2.5. Power system

- Battery powered and solar charging
- Energy-efficient operation results in long run times
- Solar panels charge batteries automatically without intervention
- Charging system shuts down when batteries are fully charged, preventing damage
- Power system allows battery charging with solar panels or commercial power
- Low-voltage-disconnect circuit shuts down power if battery voltage drops below setpoint, preventing damage to batteries and electronics
- Cooling fan protects battery charger from overheating
- Battery box can be locked to prevent unauthorized access

2.6. Maintenance

- Individual display modules can be replaced easily
- Standard trailer tires
- Heavy-duty bolt-on steel fenders can be replaced if damaged
- Durable powder-coat finish resists the elements

2.7. Application

Common applications include:

- Roadwork zones
- Traffic calming
- Traffic monitoring
- Road closures
- Emergency response
- Public events

3. DISPLAY

3.1. Cabinet

3.1.1. Description

Weather-resistant cabinet contains display modules and related electronics. Hinged door with full-size display window protects electronics and provides access for maintenance. Clasps hold door closed during operation and can be locked with user-supplied padlock. Cabinet face is tapered five degrees downward (it is wider at the top than at the bottom) to face traffic, reducing glare.

3.1.2. Size

138" x 75" x 12" (351 x 189 x 30cm)

3.1.3. Material

Aluminum sheet, 5052-H32, 0.062" (1.575mm) thick

3.1.4. Construction

Panels are riveted together, with internal ribs to add lateral strength

3.1.5. Door

Cabinet door is aluminum extruded frame with sheet metal corner brackets. Stainless steel butt hinges are bolted to top of cabinet and door.

Window is anti-glare Lexan® solar-grade polycarbonate, 0.150" (3.81mm) thick. Bulb-type weather seal ensures tight fit and seal between window and door frame.

When sign is in stored position, door fully opens to service the sign cabinet interior. Telescoping prop-slides, one on each side of the cabinet, hold door open.
3.1.6. Finish
Cabinet and door are coated with oven-baked, flat-black, powder-coat finish to ensure durability and corrosion protection. Assemblies are high-pressure phosphate-washed prior to finish coat.

3.1.7. Wiring
Wiring service loop from control box to display cabinet is routed inside liquid-tight loom and P-clamped to trailer frame. Service loop length is designed to allow 360-degree sign rotation. All wiring connectors and procedures are per CSA standards.

3.1.8. Ventilation
Two cooling fans located at the top of the display cabinet circulate air into, through, and out of the cabinet to cool electrical components. A duct is located at the top of the cabinet to ensure even airflow.

It is proven that electronic components, including LEDs, degrade in conditions of extreme heat. Without the cooling fans the display cabinet can reach over 200 degrees Fahrenheit.

A temperature sensor is mounted on the photocell PC board inside the cabinet to control fan operation. Each fan has its own thermal settings, adjustable with the onboard computer, to optimize battery power usage.

3.1.9. Storage
When lowered for storage and transport, the display cabinet rests in two support cradles, parallel to the trailer length, no locking pins required.

3.2. Display matrix

3.2.1. Description
The display matrix is comprised of a series of display modules laid out in a grid across the inside of the display cabinet. Each module has a matrix of LEDs installed on its face, which light up to show a portion of the configured message. Each module features the necessary electronics and coatings to ensure outstanding performance and durability.

3.2.2. Display modules
Modular design
Allows any display module to be installed in any position in the matrix without repositioning DIP switches

Wiring
Modules have quick-connect electrical connectors for easy servicing. All wiring terminates at a single terminal strip inside the display cabinet.

Replacement
Each module can be exchanged in less than two minutes. The only tool needed is a 5/16-inch nut driver socket or slotted screwdriver

After a new module is installed, a one-step initialization process causes each module to sense its position in the full-matrix display. Initialization is accomplished using the sign’s controller.

Size
20.0" (50.8cm) wide by 22.5" (57.2cm) high, nominal

Material
FR4 glass-reinforced epoxy laminate, double-sided, black solder mask with white silkscreen

Board thickness, 0.094" (2.388mm)

Copper size, 1 oz. (28.4g)
3.2.3. Pixels

Four LEDs form a “pixel”

- **Pixel size**: 1.25" x 1.25" (32 x 32mm)
- **Full matrix**: 48 x 27 pixels (W x H), 1296 pixels total
- **Display module**: 8 x 9 pixels (W x H), 72 pixels total
- **Pixel pitch**: 66mm, horizontal and vertical

3.2.4. LEDs

Technology: AlInGaP II (aluminum indium gallium phosphide) technology, T-1¾ size, through-hole auto-insertion

- **Color range**: Amber, 589.5 to 592 nm
- **Current**: 100 mA peak-pulsed forward current

3.2.5. Lenses and visors

Each pixel has a snap-in optical lens over the LEDs, enhancing the brightness and angularity of each pixel while reducing power consumption. A polycarbonate visor shades each row of pixels to eliminate glare caused by direct sun exposure. The sunshades snap onto the display module without tools. The lenses snap into the sunshades.

These enhancements enable the message sign to operate with approximately half the power consumption of other message signs. As a result, the system is fully functional using fewer solar panels and batteries, while providing outstanding brightness and readability in all lighting conditions, and 30-day battery autonomy without sun. Reducing the number of solar panels and batteries also lowers the trailer weight and reduces maintenance costs.

3.2.6. Visibility

At least 1 mile (1.6km)

3.2.7. Legibility

Word recognition with default font, 814 to 962 ft. (248 to 293m)

3.2.8. Viewing angle

Total viewing area with optical lenses, 42.8 to 54.6 degrees

3.2.9. Brightness

Factory preset for optimal viewing and power consumption
3.2.10. Auto dimming

Two photocells detect ambient light on the message sign; the message sign computer adjusts the brightness of the LEDs accordingly, dimming display brightness in darkness, increasing to full brightness in daylight.

Photocells are mounted inside the sign cabinet, one facing rear and one facing front.

3.2.11. Software design

**Driver**
LEDs controlled through 30mA pulse-width modulation design.

**Addressing**
Each display module address is selected through a software command; no DIP switches are used. The address does not change until reprogrammed, preventing the message from shifting due to an individual module failure.

**Pixel test**
Each module is equipped with individual pixel failure notification.

3.2.12. Fonts

12 fonts

See Exhibit A for font samples and additional font information.

**Default size**
5 x 7 pixels (W x H), 12.80" x 18.00" (325 x 457mm)
3 lines of 8 characters per line, maximum

**Smallest size**
4 x 5 pixels (W x H)

**Largest size**
11 x 23 pixels (W x H)

**Other sizes**
See Exhibit A.

3.3. Standards

Meets MUTCD standards.

4. CAMERA SYSTEM

4.1. Camera

4.1.1. Model
Axis® P5624-E domed day/night, pan-tilt-zoom (PTZ) autofocus camera for outdoor use.

See “Options and Optional Equipment” for camera options.

4.1.2. Image sensor
1/2.9” progressive scan CMOS

4.1.3. Lens
Auto iris, f = 4.7 to 84.6mm
F1.6 to 2.8

Autofocus
Automatic day and night functionality
Horizontal angle of view: 59 to 4 degrees
Vertical angle of view: 35 to 2 degrees

4.1.4. Housing
IP66-, IK10-, and NEMA 4X-rated, metal casing (aluminum), clear dome (PC)

4.1.5. Mounting
Environmental pendant, 1½" NPT
4.1.6. Pan  360 degrees endless, 0.2 to 350°/s
4.1.7. Tilt  180 degrees, 0.2 to 350°/s
4.1.8. Zoom  18X optical zoom and 12X digital zoom, total 216X zoom
4.1.9. Resolution  1280x720 (HDTV 720) to 320x180
4.1.10. Minimum illumination  Color: 0.3 lux @ 30 IRE  
B&W: 0.01 lux @ 30 IRE
4.1.11. Power  Power over Ethernet Plus (PoE+) IEEE 802.3at Type 2 Class 4, 9W typical, 15W max.
4.1.12. Limits  Operating temperature: –4 to 122°F (~20 to 50°C)  
Humidity: 10 to 100% RH (condensing)
4.1.13. Local storage  SDHC UHS-I/SDXC UHS-I slot supporting memory card up to 64 GB (card not included)
4.2. Power inverter
4.2.1. Function  Provides 120Vac input power for camera PoE+ Midspan
4.2.2. Outlets  Two 15A
4.2.3. Output power  400W continuous output power (1 hr.)
4.2.4. Surge rating  800W (0.1 sec.)
4.2.5. Efficiency  Full load  > 83% @ 12Vdc  
1/2 load  > 88% @ 12Vdc, peak efficiency
4.2.6. Current draw  < 0.5A (12.6Vdc) @ no load
4.2.7. Output waveform  Modified sine wave (resistive load)
4.2.8. Output frequency  58 to 62Hz
4.2.9. Output voltage  109 to 120Vac
4.2.10. USB output  5Vdc
4.2.11. Input voltage  10.4 to 14.4Vdc
4.2.12. Alarm voltage  10.2 to 10.8Vdc (unload)
4.2.13. Shutdown voltage  9.2 to 9.8Vdc (unload)
4.2.14. Temperature limits  Operating  32 to 104°F (0 to 40°C)  
Storage  –40 to 185°F (~40 to 85°C)
4.2.15. Protection  Overload, short-circuit, overtemp, reverse polarity, under/over voltage
4.3. Remote communications

4.3.1. Software and apps

Wanco Remote NTCIP central control software for changing message sign messages, checking on trailer health status (such as battery voltages), viewing GPS locations, and setting message schedules

Wanco PWZ Logger for accessing and remote control of the message sign and camera system

Web-based remote control allows connection to an individual message sign, without software, using a standard Web browser

Wanco Fleet Manager for managing message sign fleets

4.3.2. Cellular plan

User obtains cellular data plan from, and makes monthly payments to, service provider. Wanco programs modem according to user-provided specifications at time of modem purchase. Wanco tests modem setup.

4.3.3. Modem

Compact industrial cellular gateway

For optional modems, contact factory

Model: Sierra Wireless® Airlink® GX450

Carriers: Approved for use on Verizon, AT&T®, Sprint®, Rogers™, Bell™, and Telus®

Wireless: 4G LTE with 3G fallback

Uplink speeds: Approx. 10 Mbps, 60 Mbps peak

GPS: Precision GPS with active antenna port

Ethernet: Three RF-45 Ethernet 10/100 auto-sensing

Serial interface: One RS-232 serial DB9 (for PWZ Logger access)

USB: USB On-the-Go (OTG)

I/O: One digital I/O port

Antenna: Three SMA connectors for primary, diversity, and GPS antennas

Temperature: Operating temperature: –22 to 158°F (–30 to 70°C)

Power: Input voltages range: 9 to 36Vdc

Typical power consumption: 234mA @ 12Vdc

Max. power draw while transmitting: 440mA

Security: Selectable, nine levels of protection
4.3.4. Antenna

- **Cellular** Installed at highest point on message sign
- **GPS L1 antenna** Installed on top of control box
  - 1575.42 ±3 MHz center frequency <15mA @ 3 to 5V
- **GSM antenna** Omni-directional, dual band, 700/2500 MHz
- **Connectors** SMA connectors for GSM and GPS antennas

5. **CONTROL CONSOLE**

5.1. Description
Self-contained onboard computer for programming and running sign display. No laptop computer required. Located inside a locking control box near front of trailer. Operator can sit on trailer frame while using the computer. A laptop with Wanco software can be connected if desired.

5.2. Control box

5.2.1. Rating
NEMA 4 (IP53) type, dust and weatherproof steel box

5.2.2. Size
32.0" x 16.0" x 10" (81.3 x 40.6 x 25.4cm) W x H x D

5.2.3. Material
14ga CRS

5.2.4. Door
Front-panel is a door, hinged at the bottom, which drops down when opened.

A bracket inside the door holds the computer operation manual, which has pages made of synthetic paper for resistance to wet weather conditions.

5.2.5. Latch
Handle on front of control box door operates three-point latching mechanism to keep hinged door closed. Handle is keyed and can be locked.

5.2.6. Finish
Cabinet and door are coated with oven-baked, equipment-white, powder-coat finish to ensure durability and corrosion protection. Assemblies are high-pressure phosphate-washed prior to finish coat.

5.2.7. Serviceability
Entire console box is removable for service; all wiring has quick-connect plugs

5.2.8. Console light
A nightlight inside control box is controlled by magnetic reed switch on door, and illuminates the control panel and manual area for nighttime reading. Light shuts off automatically after a period of keyboard inactivity.

5.3. Control panel

5.3.1. Operation instructions
Easy-to-follow instructions are silkscreened on front of control panel for easy reference while using the computer. No stickers or decals, the silkscreen is durable and long-lasting.
5.3.2. Display

An LCD displays menus and status information, providing interactivity with the sign.

- Full matrix LCD, 160 pixels wide by 128 pixels high, 101 by 82mm viewing area
- Large pixel size with good angularity for better viewing, 0.56mm wide and high
- Rotary switch adjusts LCD brightness for optimum viewing
- LCD has green LED backlighting
- LCD automatically shuts off after a period of inactivity; pushbutton switch activates LCD

5.3.3. LED indicators

Indicates the status conditions. Depending on user-specified message sign options, may include one or more of the following:

- Active alarms
- Message sign power is on
- Solar charging system is charging batteries
- Programmed schedule is active
- Radar power is on
- Highway radio is on
- Low battery voltage detected, system power shutdown occurred

5.4. PC boards

5.4.1. Data ports

1 serial port, 2 USB ports, 1 Ethernet port

5.4.2. Coating

100% coated with military-spec, low-VOC, silicone conformal coating to provide long-term protection against moisture and other atmospheric contaminants. Resists corrosion and shorts due to high humidity.

5.4.3. Humidity limits

Conformal coating rated to 95% relative humidity

5.5. Keyboard

Detachable standard desktop-computer keyboard, IBM compatible, 101 USB connection

5.6. Controller software

5.6.1. Standards

Fully NTCIP-compliant

5.6.2. Security

Three levels of password protection

5.6.3. Message programming

Instant access to program new messages

Extremely easy to program

5.6.4. Message types

- Quick-messages: One-click quick-message activation using keyboard function keys
- Permanent: Over 90 preprogrammed permanent messages, including arrows and FHWA standards
  One-click activation using keyboard function keys
Changeable 150 changeable messages stored in NV flash
One-click activation using keyboard function keys

Temporary 10 temporary or volatile messages, for ITS systems

Blank One-click sign blanking/power off

5.6.5. Interface display WYSIWYG (What You See Is What You Get) while programming

5.6.6. Text alignment Selectable: left, center, or right; and top, middle, or bottom

5.6.7. Fonts Selectable: see Exhibit A

5.6.8. Blinking Each character can individually blink
Individual lines of a multi-line message can blink
The entire message can blink
Adjustable timing and duty cycle

5.6.9. Message pages Maximum 10 sequential “pages” per message, sequencing speed from 0.1 to 25.5 sec.

5.6.10. Scheduling Real-time clock and calendar with DST control

5.6.11. Arrow board functions Sign can display any of the following 12 full-size arrow functions
Modes
Flashing left or right arrow
Flashing double arrow
Flashing four-corner warning
Flashing caution-bar warning
Sequencing left or right stem arrow
Sequencing left or right walking arrow
Sequencing left or right chevron arrows
Alternating diamonds
(for samples, see Exhibit B)

Bold graphics Each arrow and bar is 5 pixels wide
One-click activation All modes can be activated using keyboard function keys

5.6.12. Configuration Menus provide access to all message sign configuration settings

5.6.13. Troubleshooting Status and diagnostic menus provide message sign information to assist in troubleshooting
6. **TRAILER**

6.1. Frame  
All welded structural steel

6.2. Fenders  
Rectangular Jeep-style fenders are bolted to the trailer frame  
Material: 16ga steel

6.3. Tie-downs  
One on each corner of frame

6.4. Finish  
Frame is coated with oven-baked, safety-orange powder-coat finish to ensure durability and corrosion protection. Assemblies are run through a five-stage, high-pressure phosphate-wash prior to finish coat.  
See “Options and Optional Equipment” for color options.

6.5. Traction tape  
Traction tape on top of frame, sign side only, prevents slipping when standing on the frame to service sign

6.6. Axle assembly  
3500 lb. (1588kg) capacity, 4" (10cm) drop-axle, 5 on 4.5" B.C. idler hub  
See “Options and Optional Equipment” for brake options

6.7. Springs  
Double-eye leaf springs

6.8. Tires  
ST205/75D15 steel-belted trailer tires, load rating B

6.9. Drawbar

6.9.1. Construction  
Telescopes inside receiver sleeve integrated into trailer frame. Removable for shipping and for added theft protection if needed. Secures with two 1/2-inch diameter bolts.

6.9.2. Material  
Straight square tubular steel, 3" x 3/16" wall (7.62cm x 0.476cm wall)

6.9.3. Jack  
Top-wind swivel, 800-lb. (363kg) capacity with caster wheel to make moving trailer easier

6.9.4. Tow hitch  
Standard 2-inch ball coupler tow-hitch, SAE Class 2, 3500-lb. (1588kg) capacity. Bolts to drawbar, removable and replaceable.  
See “Options and Optional Equipment” for tow-hitch options.

6.9.5. Tow chains  
Two high-test proof coil chain assemblies, with “latching” S-hooks for towing. Chains attached to drawbar with quick connectors.  
Material diameter  
0.406" (10.3mm)

Working load limit  
5400 lbs. (2450kg)

Breaking force  
16,200 lbs. (72kN)
6.10. **Stabilizer jacks**  
Four swivel jacks, each with 2000-lb. (907kg) capacity, mounted to outriggers at corners of trailer frame.

- Outriggers telescope outward from trailer frame for added stability when camera tower is deployed or if needed when message sign is deployed.
- Outriggers lock in place with spring-loaded locking pin that engages automatically when outriggers are fully extended or fully retracted.

6.11. **Taillights**  
Two oval-shaped, sealed, combination stop, turn and taillights.

- No screws used for mounting; bracket is welded to trailer frame; each light held in place and sealed with snap-in rubber grommet.

6.12. **License plate**  
Lighted license plate light holder.

6.13. **Reflectors**  
Sides of trailer have amber reflectors near front and red reflectors near rear.

See “Options and Optional Equipment” for reflective tape.

6.14. **Wiring**

6.14.1. **Trailer plug**  
A sealed, molded, 4-square connector plugs into harness under trailer.

6.14.2. **Tow-vehicle plug**  
Two-piece assembly with 4-flat molded connector on harness plugs into tow vehicle.

- Meets SAE J1239.
- See “Options and Optional Equipment” for tow-vehicle plug options.

6.14.3. **Protection**  
All trailer wiring encased in UV protective loom, and attached with P-clamp riveted to trailer frame; no exposed wires.

6.15. **Message sign tower**

6.15.1. **Function**  
Sign cabinet is raised and lowered on a telescoping tower.

6.15.2. **Tower construction**  
Two sections of square steel tubing with the inner section telescoping inside the outer section.

- Nylon guide blocks keep the sections tight, eliminating the need for greasing the tower and preventing dirt from building up on the inner tower section. Dirt would cause performance problems and maintenance issues.

6.15.3. **Swivel base**  
A steel tubular weldment is bolted to the trailer frame. The outer tower section rotates on a thrust bearing and washers inside the swivel base, reducing rotating friction.

6.15.4. **Finish**  
Winch model  
Tower sections and swivel base are treated for corrosion resistance.

- Hydraulic lift model  
Tower sections and swivel base are fully galvanized.

6.15.5. **Height**  
At fully deployed height, 84” (213cm) from ground to bottom of display cabinet.
6.15.6. Height lock
Locking pin inserted through the tower in the up position prevents the tower from falling if the hydraulics were to fail.

6.15.7. Hydraulic lift
Raises display cabinet with a hydraulic power unit that pressurizes a cylinder; lowered by controlled gravity return. Control switch for hydraulic lift is located inside control box.

6.15.8. Hydraulic cylinder
Single stage hydraulic, rated to 1500 psi, bottom end cap is keyed to prevent cylinder from rotating.

6.15.9. Hydraulic power unit
Type: Electric motor driven
See “Options and Optional Equipment” for hand pump.
Voltage: 12Vdc
Flow rate: 1.5 gpm
Pressure rating: Factory set to 950 psi
Mounting: Installed vertically on bracket that is mounted to swivel base
Fluid: AW-32 hydraulic oil
Tank capacity: 1.2 gal. total, 0.766 gal. usable capacity
Cover: Sheet metal cover protects power unit from vandalism and environmental contaminants. Security screws are used fasten cover to power unit.

6.15.10. Rotation
Sign rotates by hand, pivoting 360 degrees on tower.

6.15.11. Rotation lock
Sign rotation is locked with an adjustable lever that operates a mechanical friction caliper and disk brake. The ½-inch thick, round, zinc-plated brake disk is bolted to the outer tower section.

6.15.12. Sight tube
A sight tube for aiming the message sign in desired direction is mounted to tower mast.

6.16. Video camera tower

6.16.1. Function
Video camera is raised and lowered on a telescoping tower by an electric winch. Control switch for winch is located inside control box. Can operate independent of the message sign tower.

6.16.2. Tower construction
Three sections of square steel tubing with the inner section telescoping inside the outer section. The inner section is zinc plated to prevent corrosion.
Nylon guide blocks keep the sections tight, eliminating the need for greasing the tower and preventing dirt from building up on the inner tower section. Dirt would cause performance problems and maintenance issues.

6.16.3. Location
Mounted to the back of the message sign support frame; tower goes up and down with the message sign tower.
6.16.4. Storage
When fully lowered, the camera is protected behind the message sign display cabinet, just below the solar panels

6.16.5. Height
22 ft. (6.7m), telescoping tower rises to 122 inches (310cm) above top of message sign display cabinet

For taller camera tower, contact the factory

6.16.6. Winch
Electric 12Vdc winch
Friction safety brake allows camera tower to be set at any height
Operated with a heavy-duty momentary switch, located inside the control box (cannot be operated by remote control)
Capacity: 1500 lbs. (680kg)

7. POWER SYSTEM

7.1. Description
Electronics powered by batteries, which are charged automatically with integrated solar charging system

7.2. Battery box

7.2.1. Function
Holds batteries and remote charger
See “Options and Optional Equipment” for heavy-duty secure battery box

7.2.2. Construction
Riveted all-steel construction
All parts powder-coated before assembly
Divider panel inside box separates batteries from electronics
Louvers provide ventilation
Latches keep cover closed and can accept customer-supplied padlocks

7.2.3. Location
Centered over axle on left side of trailer, bolted to trailer frame

7.3. Batteries

7.3.1. Description
Six deep-cycle GC2 batteries, wired in parallel and series for a 12-volt system
See “Options and Optional Equipment” for battery options

7.3.2. Voltage
6Vdc each

7.3.3. Weight
Approx. 60 lbs. (26kg) each

7.3.4. Capacity
630 Ah @ 12Vdc
7.4. Remote charger

7.4.1. Function  Plugs into a standard commercial power source to recharge batteries if battery voltage drops due to lack of sun for automated solar charging system.

7.4.2. Type  12-volt battery charger

7.4.3. Location  Inside battery box, mounted to divider panel on opposite side from batteries.

7.4.4. Output capacity  45A

7.4.5. Output voltage  13.4Vdc @ full load
13.6Vdc standard float voltage
14.2Vdc with dual-voltage jack installed

7.4.6. Input voltage  108 to 132Vac, standard three-prong plug

7.4.7. Input frequency  50 to 60 Hz

7.4.8. Cooling  Automatic fan cooling

7.5. Solar

7.5.1. Panels  Two high-efficiency multi-crystal photovoltaic solar module

7.5.2. Location  Behind message sign, over tower. Solar panel array lies flat; rises and rotates with message sign. No shadowing effect on any trailer component.

7.5.3. Power output  130W each
260W total
See “Options and Optional Equipment” for solar options

7.5.4. Current  9.5A max. system current
10.3A open short-circuit current

7.5.5. Voltage  17.9Vdc max.
21.8Vdc open short-circuit voltage

7.5.6. Regulation  Solar panels regulated by message sign control system

7.5.7. Security  Solar panel array bolted to message sign frame with security screws and special security nut. Tool for security screws mounted inside control box.

7.6. Low-voltage disconnect

7.6.1. Function  Provides power management control for the camera system. Shuts down power when battery voltage drops below setpoint, preventing damage to batteries and electronics.

7.6.2. Location  Inside the message sign control box, on the same panel as the electric-winch switch.
7.6.3. Operation  
A toggle switch turns the LVD module on and off.

7.6.4. Serial interface  
Provides battery voltage and temperature readings for remote viewing; can also be used for remotely turning on and off auxiliary equipment (such as radar and GPS). 
Voltage and temperature settings can be adjusted remotely.

7.6.5. Rated power input  
60A max.

7.6.6. Protection  
60A maxi-type fuse

7.6.7. Triggers  
Disconnect at 10.5Vdc, reconnect at 12.6Vdc

7.6.8. Alarm indication  
LEDs on the control panel indicates operation, low-voltage shutdown and out of low-temperature start range.
8. DIMENSIONS & WEIGHT

8.1. Dimensions

<table>
<thead>
<tr>
<th>Travel position</th>
<th>Deployed</th>
</tr>
</thead>
<tbody>
<tr>
<td>190 (482)</td>
<td>190 (482)</td>
</tr>
<tr>
<td>105 (265)</td>
<td>104 (265)</td>
</tr>
<tr>
<td>96 (243)</td>
<td>138 (351)</td>
</tr>
<tr>
<td>63 (160)</td>
<td>66 (168)</td>
</tr>
<tr>
<td>159 (404)</td>
<td>84 (213)</td>
</tr>
</tbody>
</table>

8.2. Weight

Approx. 3450 lbs. (1565 kg)
9. OPTIONS AND OPTIONAL EQUIPMENT

9.1. Integral drawbar
Integrated into trailer frame, with added “A-frame” supports that extend from corners of trailer frame to end of drawbar
Replaces removable drawbar, uses same tow hitch and swivel jack as removable drawbar
Message sign weight with A-frame: approx. 2640 lbs. (1193 kg)

9.2. Tow hitch

9.2.1. Combo hitch
Combo-hitch for pintle hook and 2-inch ball hitch
Heavy-duty lunette ring, 3” ID x 1¼” cross-section

9.2.2. Lunette ring
Heavy-duty lunette ring for pintle hook, 3” ID x 1¼” cross-section

9.3. Tow-vehicle plug
Many types of plugs available, prewired at the factory; contact factory for details

9.4. Brakes

9.4.1. Hydraulic
Hydraulic surge brakes

9.4.2. Electric
Electric brakes

9.5. Hand pump
A mechanical hand pump can raise and lower the message sign display cabinet if batteries go dead and hydraulic lift fails to operate. Pump handle is stored inside battery box.

9.6. Power

9.6.1. Additional batteries
For geographic locations with less solar charging potential or colder weather, and for applications that require year-round charging, add batteries for greater capacity
Add two 6Vdc deep-cycle batteries, 210Ah additional capacity

9.6.2. AGM batteries
Replace deep-cycle batteries with top-of-the-line absorbed glass mat (AGM) batteries
Features
100% maintenance-free
Sealed and spill-proof
Faster recharge and greater freeze resistance than conventional batteries
Contains less lead than conventional batteries
Details
Number of batteries: three
Size: Group 4D
Weight: Approx. 160 lbs. (72kg) each
Capacity: 200Ah per battery, 600Ah total
Voltage: 12Vdc
9.6.3. Remote charger  When required for added battery charging capacity, replace standard remote charger with 75-amp charger

9.6.4. Solar  For geographic locations with less solar charging potential or colder weather, and for applications that require year-round charging, a 390W solar array is available

9.7. Secure battery box  High-security battery box features heavy-gauge steel lid, hidden hinges, and heavy-duty hidden-shackle padlocks. Replaces standard battery box.

9.8. Taillights

9.8.1. Dual sealed-bulb  Dual sealed-bulb taillights replace standard sealed-bulb taillights

Requires SAE J560 7-pole round-pin trailer plug to replace standard trailer plug

9.8.2. Single LED  Single LED taillights replace standard sealed-bulb taillights

9.8.3. Dual LED  Dual LED taillights replace standard sealed-bulb taillights

Requires SAE J560 7-pole round-pin trailer plug to replace standard trailer plug

9.9. Reflective tape  Reflective red-and-white conspicuity tape across rear trailer frame for increased visibility

9.10. Finish color  Specify power-coat color and, if applicable, color scheme

9.11. Camera

9.11.1. Model  Axis Q6042-E domed day/night, pan-tilt-zoom (PTZ) autofocus camera for outdoor use

Replaces standard camera

9.11.2. Image sensor  1/4” ExView HAD progressive scan CCD

9.11.3. Lens  f3.3, 119mm; f1.4, 4.2mm, autofocus

Horizontal angle of view: 57.2 to 1.7 degrees

9.11.4. Day and night  Automatically removable infrared-cut filter

9.11.5. Housing  IP66-, NEMA 4X-, and IK10-rated metal casing (aluminum), acrylic (PMMA) clear dome, sunshield (PC/ASA)

9.11.6. Mounting  Environmental pendant, 1½” NPT

9.11.7. Pan  360 degrees, endless, 0.05 to 450°/s

9.11.8. Tilt  220 degrees, 0.05 to 450°/s

9.11.9. Zoom  36X optical zoom and 12X digital zoom, total 432X zoom

9.11.10. Resolution  Extended D1 752 x 480 pixels max. @ 60Hz (Extended D1 736 x 576 pixels max. @ 50Hz)

9.11.11. Minimum illumination  Color: 0.5 lux @ 30 IRE f1.4

B&W: 0.008 lux @ 30 IRE f1.4
9.11.12. Power  High Power over Ethernet (High PoE), 60W max.
Axis High PoE 60W Midspan 1-port: 100–240Vac, 74W max.

9.11.13. Limits  Operating temperature: −58 to 122°F (−50 to 50°C)
Humidity: 10 to 100% RH (condensing)

9.11.14. Local storage  SD/SDHC/SDXC slot supporting memory card up to 64 GB (card not included)

9.12. Radar-based speed monitoring system

9.12.1. Description  Radar senses the largest, nearest mass moving toward it. The message sign conveys a user-selected message to the motorist.

9.12.2. Sensor  Microwave K-band, approach-only

9.12.3. Location  Radar head located on the bottom of the message sign display cabinet, just off-center, for maximum effectiveness regardless of which side of the road the trailer is being used

9.12.4. Enclosure  Radar head is sealed to withstand the elements, while an aluminum cover goes over the head unit for impact resistance

9.12.5. Standards compliance  FCC approved
CE compliant

9.12.6. Distance range  1000 ft. (305 m)

9.12.7. Speed range  5 to 138 mph (8 to 222 km/h)

9.12.8. Accuracy  

mph  ±1 mph from 5 to 40 mph
    ±2 mph from >40 to 100 mph

km/h  ±1.6 km/h from 8 to 64 km/h
    ±3.2 km/h from >64 to 161 km/h

9.12.9. Temperature limits  −40 to 185 °F (−40 to 85 °C)

9.12.10. Electrical protection  Fused and reverse-polarity protected

9.12.11. Calibration  Calibration not required

9.13. Traffic Data Classifier System

9.13.1. Design  Radar-based, nonintrusive, does not require loops or hoses, no disturbance of traffic flow during installation or use

9.13.2. Direction  Registers both approaching and receding vehicles

9.13.3. Traffic lanes  Most effective for 2-lane roads

9.13.4. Traffic count  Can record data for up to 5 million vehicles in internal memory
<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.13.5. Data format</td>
<td>Speed, date, time, direction, length for each vehicle</td>
</tr>
<tr>
<td>9.13.6. Units</td>
<td>English or metric</td>
</tr>
<tr>
<td>9.13.7. Time stamp</td>
<td>Year, Month, Day, Hour, Minute, Second</td>
</tr>
<tr>
<td>9.13.8. Speed range</td>
<td>5 to 138 mph (8 to 222 km/h)</td>
</tr>
<tr>
<td>9.13.10. Power supply</td>
<td>Message sign batteries</td>
</tr>
<tr>
<td>9.13.11. Power output</td>
<td>20 dbm (EIRP)</td>
</tr>
<tr>
<td>9.13.12. Current</td>
<td>110 mA</td>
</tr>
<tr>
<td>9.13.13. Internal memory</td>
<td>16GB</td>
</tr>
<tr>
<td>9.13.15. Calibration</td>
<td>Calibration not required</td>
</tr>
<tr>
<td>9.13.16. Regulatory rating</td>
<td>FCC part 15 class A, Canadian RSS-210</td>
</tr>
<tr>
<td>9.13.17. Installation</td>
<td>Automatically positioned horizontally when trailer is level; adjustable bracket allows user to point toward traffic at a 45-degree angle</td>
</tr>
<tr>
<td>9.13.18. Analytic software</td>
<td>Wanco Traffic Analyzer</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Feature</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.14.1. Description</td>
<td>The Wanco RemoteUI program allows operators to control the message board using a laptop computer or touchscreen device. The computer must be connected to the message sign; wireless access is not recommended.</td>
</tr>
<tr>
<td>9.14.2. Fleet limits</td>
<td>Connects to one sign at a time; maximum number of signs is unlimited</td>
</tr>
<tr>
<td>9.14.4. System requirements</td>
<td>Microsoft Windows (most versions) or Unix® operating system</td>
</tr>
</tbody>
</table>
EXHIBIT A: MESSAGE FONTS

Font 1
5 x 7 pixels
Equivalent size: 12.80" x 18.00" (325 x 457mm)
Physical size: 11.64" x 16.84" (296 x 428mm)
Standard fixed-width font with lower-case letters
3 lines of 8 characters, maximum

Font 2
5 x 7 pixels
Equivalent size: 12.80" x 18.00" (325 x 457mm)
Physical size: 11.64" x 16.84" (296 x 428mm)
Standard fixed-width font with lower-case letters and increased horizontal spacing
3 lines of 6 characters, maximum

Font 3
6 x 9 pixels
Equivalent size: 15.40" x 23.20" (391 x 589mm)
Physical size: 14.24" x 22.04" (362 x 560mm)
Bold proportional font with 4x9-pixel capitals for lower-case letters
2 lines of 7 characters, typical

Font 4
6 x 11 pixels
Equivalent size: 15.40" x 28.39" (391 x 721mm)
Physical size: 14.24" x 27.23" (362 x 692mm)
Bold proportional font with lower-case letters and accented characters
2 lines of 6 characters, typical

Font 5
6 x 11 pixels
Equivalent size: 15.40" x 28.39" (391 x 721mm)
Physical size: 14.24" x 27.23" (362 x 692mm)
Bold proportional font with lower-case letters, accented characters, and increased spacing
2 lines of 6 characters, typical

Font 6
5 x 12 pixels
Equivalent size: 12.80" x 30.99" (325 x 787mm)
Physical size: 11.64" x 29.83" (296 x 758mm)
Tall fixed-width font with 5x8-pixel capitals for lower-case letters
2 lines of 8 characters, maximum
Font 7
7 x 12 pixels
Equivalent size: 18.00" x 30.99" (457 x 787mm)
Physical size: 16.84" x 29.83" (428 x 758mm)
Bold fixed-width font with 6x8-pixel capitals for lower-case letters
2 lines of 6 characters, maximum

Font 8
7 x 23 pixels
Equivalent size: 18.00" x 59.57" (457 x 1513mm)
Physical size: 16.84" x 58.42" (428 x 1484mm)
Large fixed-width font with 6x14-pixel capitals for lower-case letters
1 line of 6 characters, maximum

Font 9
11 x 23 pixels
Equivalent size: 28.39" x 59.57" (721 x 1513mm)
Physical size: 27.23" x 58.42" (692 x 1484mm)
Large bold fixed-width font, capitals only (no lower-case letters)
1 line of 4 characters, maximum

Font 10
4 x 5 pixels
Equivalent size: 10.20" x 12.80" (259 x 325mm)
Physical size: 9.05" x 11.64" (230 x 296mm)
Mini proportional font with limited lower-case
4 lines of 9 characters, typical
12 characters per line, maximum

Font 11
7 x 10 pixels
Equivalent size: 18.00" x 25.80" (457 x 655mm)
Physical size: 16.84" x 24.64" (428 x 626mm)
Large fixed-width font, capitals only (no lower-case letters)
2 lines of 5 characters, maximum

Font 12
9 x 14 pixels
Equivalent size: 23.20" x 36.19" (589 x 919mm)
Physical size: 22.04" x 35.03" (560 x 890mm)
Large bold fixed-width font, capitals only (no lower-case letters)
1 line of 4 characters, maximum
EXHIBIT B: ARROW BOARD FUNCTIONS

Flashing patterns

- Flashing left or right arrow
- Flashing double arrow
- Flashing four-corner warning
- Flashing caution-bar warning

Sequential patterns

- Sequencing left or right stem arrow
- Sequencing left or right walking arrow
- Sequencing left or right chevron arrows
- Alternating diamonds