VER-ΜΛC

# PCMS Operations, Safety and Maintenance Manual



# **List of Revisions**

Date	Version	Revision	
2011/07/07	1.0	Original	
2014/04	1.1	New warranty statement	
2014/11	1.2	Suggested recharging times added	
2015-03	1.3	Outrigger maintenance added	
2015/01	2.0	SmartDocs started, hitches maintenance updated	
2016/10	2.1	New template, added info on sealed batteries.	
2017/07	3.0	RC models	
2018-02	3.1	Added appendix for telescopic camera.	

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#### Manual Change Information

Customers should note that this manual is up to date at time of issue, but is not subject to automatic update.

For additional information concerning the latest changes to this document,

please consult our website members section:

http://www.ver-mac.com/extranet/en/members

# We value your opinion!

Please leave any thought on our products in our feedback section of the support page, here http://www.ver-mac.com/extranet/en/feedback



# **Technical Support**

For help with any difficulties concerning PCMS units or this manual, please contact Ver-Mac Support: support@ver-mac.com

# Disclaimer

Failure to read and follow the instructions and procedures contained in this manual could result in failure of the equipment, damage and serious injury.

The owner is responsible for the proper use and maintenance of the equipment.

Failure to properly maintain equipment can also void all guarantees.

This manual contains a complete list of all scheduled maintenance intervals for all Ver-Mac PCMS units.

Please work safely. We also request that you notify us of any error or omission found in our publications.

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# **Warranty Statement**

#### (Updated February 2016)

Our warranty applies to all equipment newly-manufactured by Signalisation Ver-Mac Inc. subject to normal use for which the equipment and/or components were intended.

- Electronic components manufactured by Signalisation Ver-Mac Inc., are warranted for a period of twenty-four (24) months from the date of delivery to the original purchaser.
- All non-electronic components manufactured by Signalisation Ver-Mac Inc., are warranted for a period of twelve (12) months from the date of delivery to the original purchaser.

# Components not manufactured by Signalisation Ver-Mac Inc. are warranted following the terms of the component's manufacturer.

#### Limitations

The warranty is contingent on the following two conditions:

- Signalisation Ver-Mac Inc. does not warrant any of its equipment, or parts thereof, against any deterioration or damage caused by normal wear, lack of reasonable and proper maintenance, failure to follow operating instructions, misuse, lack of proper protection during storage, collisions, accidents, natural catastrophes or unforeseen events.
- The equipment has been connected to a power source of the correct voltage and amperage.

#### Exclusions

Under no circumstances shall this warranty extend to:

- Any of our products which have been modified, repaired, or altered in any way, in any establishment other than the Signalisation Ver-Mac Inc. factory without authorization from Signalisation Ver-Mac Inc.
- Replacement parts not supplied by Signalisation Ver-Mac Inc.
- The obligations of Signalisation Ver-Mac Inc. shall in no way exceed the initial cost of the equipment or part upon which such liability is based.

#### **Repair or Replacement**

Repair or replacement of any equipment or defective component shall always be at the discretion of Signalisation Ver-Mac and shall be carried out at its factory, unless otherwise agreed by prior arrangement with Signalisation Ver-Mac.

- Signalisation Ver-Mac shall not be held liable for any cost incurred by the owner in the execution of repairs.
- Signalisation Ver-Mac shall not be held liable for reimbursement of any indirect or incidental expenses incurred in either the removal of defective equipment or component, nor in the installation of replacement parts.
- The end user is responsible for the cost of shipping, duties and handling related to defective parts returned to Signalisation Ver-Mac Inc. Signalisation Ver-Mac Inc. will assume the return cost of shipping via regular service of replacement or repaired parts.

#### **Claim Procedure**

- In order to make a claim under the terms of this warranty, the owner of the equipment must first establish that the equipment has been installed, maintained and operated within the normal limits of its intended usage.
- Defective equipment or component parts for repair or replacement must always be returned to Signalisation Ver-Mac Inc. along with an RMA number obtained beforehand from Customer Service at Signalisation Ver-Mac Inc.

#### End User Responsibilities

- The end-user is responsible for the appropriate choice of product, for its proper usage and the results obtained by this product.
- This warranty applies only to products that have been paid in full according to the terms stipulated in the contract or on the invoice.

# For any repair or replacement, please complete the RMA request form at the following address:

http://www.ver-mac.com/extranet/en/rma-request

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#### 1 Overview

This manual is intended to guide owners and operators in the safe operation and maintenance of Ver-Mac trailer-mounted PCMS units.

The maintenance procedures and schedules described in this manual apply to Ver-Mac manufactured PCMS units in general.

It is important to know that PCMS units:

- Differ from one model to another.
- Contain component parts from manufacturers other than Ver-Mac.
- Vary according to optional additional components and devices that may have been added to the unit.
- May have been customized according to the original purchaser's specifications.

Please make sure that all personnel have read and understood this manual before putting your PCMS unit into operation.

Installation, operation and maintenance of PCMS units, as well as any necessary repair work, should only be carried out by qualified person.

# 1.1 About your Portable Changeable Message Sign Model

This manual covers operation, safety and maintenance for all trailer-mounted models of our Portable Changeable Message Sign. You will find your model in the controller box or on the vehicle identification number (VIN) plate. In **JamLogic**, our fleet management software, you will need to enter **pixel** numbers rather than a model. Here is a table describing the various models:

Model	Controller Box	Wi-Fi	Display size (in.)	Display Resolution (HxW, pixels)	Particularity
PCMS-4880	Yes	No	36x56	48x80	HD, Mini, full matrix
PCMS-4880RC	No	Yes	36x56	48x80	HD, Mini, full matrix
PCMS-548	Yes	No	45x80	30x56	Small, full matrix
PCMS-320	Yes	No	63x98	30x48	Mid-size, color, full matrix
PCMS-320RT	Yes	No	66x104	30x48	Mid-size, full matrix
PCMS-320RC	No	Yes	64x105	30x48	Mid-size, full matrix
PCMS-320RC RT	No	Yes	64x105	30x48	Mid-size, color, full matrix
PCMS-1210	Yes	No	71x133	8 characters/line	Full size, 3-line display
PCMS-1210QS	No	No	71x133	8 characters/line	Same as 1210 plus handheld controller
PCMS-1500	Yes	No	83x133	30x48	Full size, full matrix, older
PCMS-1500LP	Yes	No	76x131	28x48	Full size, full matrix, newer
PCMS-1500C	Yes	No	83x145	30x56	Extended size, full matrix

# **1.2 Safety and Warning Information**

Basic safety precautions and procedures as well as important points to remember during operation of the PCMS unit appear throughout this manual.

DANGER, WARNING, and CAUTION indications, as well as Notices, are posted in appropriate locations in this manual.

A chapter at the end of this manual contains illustrations and parts numbers for all the decals in use on Ver-Mac PCMS units.

In addition, safety and warning decals are displayed on the PCMS units themselves for the express purpose of alerting personnel to potential hazards.

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Indicates a high level of risk for serious personal injury.

# 

Indicates a moderate level of risk for personal injury and potential for damage to equipment.

# 

Indicates a potentially unsafe practice and risk for minor personal injury.

**Refers to an important feature that the operator should be aware of for maximum operating efficiency of the equipment or to help in completing a procedure.** 

# **1.3 Maintenance**

Maintenance is a guide to equipment care. Regular maintenance means:

- Less likelihood of equipment failure and down-time for repairs
- Greater reliability of operating
- Improved safety of personnel and public

As with all mechanical equipment, routine maintenance is best practice to preserve the life of the PCMS unit and to ensure that it is running safely and properly.

Because PCMS units are generally stationary for relatively long periods of time in tough worksite environments, maintenance tasks focus mainly on prevention and removal of rust and corrosion.

Maintenance tasks are recommended at least once a year. Thorough maintenance is especially recommended before the PCMS unit goes into long-term storage or after hard use.

#### **VALUATE** Lack of maintenance can invalidate any and all guarantee provisions.

Before undertaking any of the maintenance procedures in this manual please list the following:

- 1. Model of the PCMS unit.
- 2. Braking system (hydraulic, electric or none) on the trailer.
- 3. Type of hitch/coupler (*pintle/lunette ring* or *ball-type*) on the trailer.

- 4. Type of hoist (hydraulic lift or reversible hand winch) to raise the mast.
- 5. Peripheral devices attached to the PCMS unit.
- 6. PCMS unit components not manufactured by Ver-Mac.

**For detailed information on the maintenance requirements of any PCMS unit component assembled by, but** *not manufactured by Signalisation Ver-Mac***, please consult the relevant manufacturer's Maintenance manual.** 

#### **1.4 Troubleshooting**

When contacting support please make sure to have the following:

- Be at the unit when contacting support.
- ....... Make sure to bring a voltmeter.
- The serial number will be requiring for troubleshooting.

#### **1.5 About Replacement Parts**

Replacement parts for PCMS may vary according to models. To know the correct replacement part:

- See the PCMS *Parts Manual* for your unit or contact Ver-Mac Support for further information.
- Before calling Ver-Mac for assistance, please make sure you have the identification number of your PCMS in hand.
  - Vehicle Identification Number (VIN) is on the tongue of the trailer.
  - Serial number is on the PCMS panel or in the control box.

#### **1.6 About Maximum Speeds**

Ver-Mac recommends a maximum towing speed of 90 km/h (55 mph) for a trailermounted PCMS moving to or from worksites, **in transport mode only**.



Ver-Mac does not recommend the use of a trailer-mounted PCMS in mobile operations.

Vehicles with racks or other vehicle-mounted PCMS can be driven at these speeds:

- Up to 110 km/h (70 mph) with the sign in the transportation position.
- Up to 55 km/h (35 mph) with the sign deployed.

# 2 Pre-towing and Work Site Inspections

These preliminary inspections help to ensure that:

- the installation site is suitable
- the general condition of the PCMS unit structure is solid
- the unit components are all well secured
- the braking and lighting systems are operational

#### 2.1 Walk-Around Inspection of PCMS Unit

The walk-around inspection aims to catch any obviously out-of-place conditions that could potentially affect safety and unit operations.

Always carry out a walk-around inspection of your PCMS unit:

- Before moving the unit to the worksite.
- Before removing the unit from a work site.
- Periodically during long-term storage of the unit.

Make the walk-around inspection part of your pre-towing routine and have the defects fixed **BEFORE** going on the road.

**A** walk-around inspection only covers items that can be checked without getting under the trailer.

#### 2.1.1 Walk-Around Checklist

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#### Never crawl under a trailer supported by the jacks alone.

Walk-Around Checklist			
1. Inspect visually for	pr		
	obvious physical damage		
	flat tires		
	leaking fluids (under trailer axle, under mast)		
	broken or cracked reflectors		
	cracks in structure welding		
2. Test and check			
	functioning of stop (brake) lights		
	functioning of flashers left		
	functioning of flashers right		
	functioning of tail lights		
	functioning of all marker lights		
3. Verify			
	batteries fully charged (12.6V)		
	signboard & solar panels in cradles		
	sign hand brake & solar panel brake locked		
	if there is an adjustable hitch and there were changes to it, make sure that all bolts are tightened at 203 N.m (150 ft lbf). Replace worn bolts.		
4. If trailer is attack	ned to towing vehicle, verify		
	coupler attached correctly (snug on ball)		
	coupler locked to hitch & safety pin inserted		
	safety chains-crossed & hooked from underside		
	breakaway chain attached to both safety switch & tow vehicle		
	all jacks retracted & in horizontal position		
	trailer wiring connected to tow vehicle		
5. Before taking th	e unit on the road, field test		
	brakes		
	surge brake system operation		

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Failure to maintain hydraulic fluid in surge brake actuator at an adequate level can lead to brake failure.

#### 2.2 Work Site Inspection (before PCMS Unit Setup)

Site location and conditions affect the effectiveness of portable message signs in a work zone.

A work site inspection enables you to take every precaution to avoid all hazards in the work area prior to installation and operation of the unit.

#### 

Be safe. Stay alert and pay close attention to the surrounding traffic at all times.

	Site Verification Check List			
1.	Verify site location			
		as open and level as possible		
		good road base support		
		no overhead hazards or obstructions (electric lines, overpasses, etc)		
2.	Verify conditions for	or solar array		
		maximum exposure to direct sunlight		
		no shadows from nearby structures		
		no light towers in close proximity		

**NOTE** Even the smallest amount of shading reduces solar panel output significantly.

# 3 Unit Deployment and Removal

When you are working at the roadside you must always remain alert to your surroundings and the traffic behavior.

# 

Be safe. Stay alert and pay close attention to the surrounding traffic at all times.

#### 3.1 Trailer Deployment

Be very careful when attempting to maneuver trailer into position
for setting up.

- 1. Position the trailer as close as possible to the location with the tow vehicle
- 2. Set one (1) jack in position and block the trailer wheels before you start to disconnect the coupler from the tow vehicle hitch
- 3. Unplug the power connection to the tow vehicle and store plug in the optional holder, if available
- 4. Unhook breakaway cable (if trailer is equipped with brakes)
- 5. Detach the safety chains
- 6. Check the ground conditions and install *all* the jacks Make sure the wheels are off the ground and trailer is as level as possible Add blocks under the jack pads as needed.

# 3.2 Setup and Adjustment of Signboard and Solar Array

- 1. Raise the mast (Up/Down switch or manual hand winch). Make sure the sign clears all other equipment on the trailer.
- 2. Turn the signboard display to face the oncoming traffic. Fine tune the orientation with the site viewer. Lock the signboard in position with sign hand brake.
- 3. Lower the signboard enough to access the solar panel tilt and rotate system, but make sure sign casing does not collide with surrounding objects.
- 4. Wind the tilt arm adjustment knob until the solar array is at a 45 degree angle. You now have enough clearance to rotate the solar panel.
- 5. Release solar panel hand brake and rotate solar panels with the two side rotation handles.
- 6. Lock solar panel hand brake and keep the solar array in position. Adjust the solar panel handbrake for a firmer grip as needed.

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- 7. Raise the signboard fully.
- 8. Turn on sign (Power ON/Off switch) and controller.

#### 3.3 Ballast

Never use large loose items for ballast as they can become dangerous projectiles if the signboard is hit.

In static locations and under specific conditions (turbulence or extreme weather conditions) you may need to add ballast to stabilize the trailer.

The method used to stabilise the sign should be secure to avoid an additional potential hazard.

# 3.4 Messages

You can display messages on the PCMS either through JamLogic, providing you have a modem, or through the controller. There are two types of controllers: the wi-fi controller on RC models and the V-Touch touchscreen controller located in the controller box.

- If you have a V-Touch controller, please refer to MAN-44\_PCMS\_User\_manual\_V-Touch\_controller\_V3.
- If you have the RC model that uses wi-fi communication, please refer to MAN-68 MessageSigns\_RCControllervUsersManualv2.

# 3.5 Takedown of Signboard and Solar Array

- 1. Shut off the signboard (Power ON/OFF switch)
- 2. Unlock sign hand brake and turn the signboard until it is in position above the transportation cradle
- 3. Unlock the brake and rotate the array to the transportation position. Make sure the support bar on the back of the array is above the rubber stops
- 4. Wind the tilt arm adjustment knob until the solar panels are tight against the sign case for transport
- 5. Lock the solar panel handbrake

#### 3.6 Trailer Removal

# 

Be very careful when attempting to maneuver trailer into position to attach it to tow vehicle.

- 1. Make sure power is OFF, signboard and solar panels down and in their respective transportation cradles and the sign brake engaged
- 2. Back tow vehicle as close as possible to the trailer
- 3. Lower jacks till wheels are on the ground
- 4. Block the wheels and swivel all but one jack into horizontal travelling position
- 5. Attach the coupler/hitch securely to ball on tow vehicle(snug on the ball)
- 6. Cross the safety chains under the hitch and attach the hooks to the tow vehicle from the underside
- 7. Attach breakaway cable to tow vehicle if the trailer is equipped with brakes Make sure it is not taut, not around the ball or caught in the chains
- 8. Connect power plug to the tow vehicle having first removed it from the optional holder(if available)
- 9. Do the walk-around check before driving off

# **4** Trailer Maintenance

A general maintenance check ensures that potentially hazardous items are caught before they degenerate and the trailer requires a major overhaul.

Always carry out a general maintenance check of the trailer and unit components before towing and setting up the PCMS unit at a work site.

Repair, replace or correct any obvious deficiencies.

# 

Never crawl under the trailer unless it is resting on jack stands with additional support under the trailer tongue. Improperly supported PCMS trailers may fall unexpectedly resulting in serious injury or death. Do not lift or support trailer on any part of the axle or the suspension system.

#### 4.1 Safety and Instructions Stickers

All Ver-Mac PCMS trailers display safety and instructions decals prominently on certain parts of the units.

**If** your PCMS unit is an older model and has no decals, please contact Ver-Mac Support to receive decals and information concerning their placement on the PCMS unit.

All operators and personnel working on the units need to be aware of and pay close attention to all such indications.

- Make sure that all decals are whole, clean and visible.
- Replacement decals are available from Ver-Mac or your Ver-Mac distributor.

Please see Appendix B – Safety Warning and Instructions Stickers

#### 4.2 Pre-Maintenance Procedure

Never work under a trailer resting on jacks only. The trailer could slip off the jack or the jack could fail.

Before you start any work on the unit trailer, carry out the necessary procedure to stabilize the trailer.

#### **Pre-Maintenance Stabilization Procedure**

- 1. Lower signboard and solar panels into their respective transportation cradles.
- 2. Lower all jacks until trailer wheels are resting fully on the ground.
- 3. Chock the wheels tightly and reposition the jacks so trailer is as level as possible.
- 4. Add another jack on the trailer tongue for additional support.

#### 4.3 Trailer Structure

Ver-Mac produces two (2) different classes of trailer:

Class II - rated to 3,500 lbs (1,588 kg) and

Class III - rated to 5,000 lbs (2,268 kg)

Trailers can vary in shape and also in the size of the steel beams making up the frame.

#### 4.3.1 Trailer Structure Periodic Maintenance

ltem	Function Required	Before Each Use	3 Months	12 Months
	Trailer Structure			
Body	Wash underneath to remove build-up of corrosive material (road salt, gravel)			•
Frame Welds	Check for cracks and/or failures	•	•	•
All Links and Pivot Points	Lubricate to prevent rusting			•
Fenders	Inspect for cracks or impact damage Replace as needed			•
Mast	Tighten removable pole bolts that seem loose at 64 ft-lb (86.8 N.m.)		•	•

#### 4.4 Jacks

Four 2,000 lb tubular swivel jacks attached at each corners of trailer frame support the PCMS unit when it is not attached to a tow vehicle. These work in combination with four optional adjustable outriggers (stabilizer bars) to support the unit when it is not attached to a tow vehicle.

Use of the jacks allows you to safely raise and keep the trailer wheels off the ground while the PCMS unit is in operation on worksites or during long term storage.



#### 4.4.1 Jacks Periodic Maintenance

ltem	Function Required	Before Each Use	3 Months	12 Months
	Jacks			
Tubular Swivel (4)	Clean dirt, mud or tar from jack	•		•
	Extend jack as far as possible and lubricate entire outside length of inner ram with SAE 30 heavy oil			•
	Grease each jack (grease fitting at top of outer ram)			•
Outriggers	Remove any corrosion, rust and dirt	•		•
	Ensure safety pins are attached and in position	•		•

# 4.5 Trailer Lights and Reflectors

Trailer lights perform a valuable and necessary function, but they occasionally breakdown or malfunction. All Ver-Mac trailers come equipped with:

- brake lights
- tail lights
- turn signals (left and right)
- marker and clearance lights

Marker lights enhance the visibility of the trailer at night. They are positioned on the sides of the trailer frame (amber toward the front and red to the rear).

As well, three (3) red clearance lights are in the center of the back bar on trailers wider than 80" (203cm).

**EXAMPLE** Check that the plug on the tow vehicle matches the trailer wiring end plug on the trailer.

# 

Always test all trailer lights before towing. Make sure wiring is properly installed and secured to trailer to prevent it from hanging and catching on any road debris.

#### 4.5.1 Replacement Light Bulbs

Make sure that any replacement light bulbs are 12V DC.

# 4.5.2 Trailer Light and Reflector Periodic Maintenance

ltem	Function Required	Before Each Use	3 Months	12 Months
	Lights & Reflectors			
Brake Lights Turn Signals (L/R) Clearance Lights Tail Lights	Check connections, wires, plugs etc Test all lights in turn for functioning Replace any burned out light bulbs	•		•
Reflectors	Check condition Replace any broken, missing or cracked reflectors	•		•

# 4.6 PCMS Unit Hardware and Fasteners

Loose or incorrect hardware and fasteners can cause damage to
equipment and personal injury.

#### 4.6.1 Replacement Hardware and Fasteners

If you need to replace any hardware, make sure the replacement part is of equal size, grade and type.

See Parts Specifications in the User manual for the particular model of PCMS unit

#### 4.6.2 Hardware and Fastener Periodic Maintenance

ltem	Function Required	Before Each Use	3 Months	12 Months
	Hardware & Fasteners			
Nuts and Bolts	Double-check all nuts and bolts for tightness and condition Lubricate lightly			•
Cotter Pins	Make sure that all safety and locking pins are in place and solid Replace any missing			•

# 5 Tires and Rims

Each trailer has rims installed that are designed for stability requirements. Trailer stability is based on trailer width, tire pressure, and load capacity.

Size changes may result in an unsafe condition regarding stability.

The size of the trailer tires and also the rims fitted on the PCMS unit varies according to the gross **axle** weight **rating** (GAWR):

- GAWR 3500 lb = ST205/75D15 5 hole rim and 6ply trailer tires for the Class II trailers
- GAWR 5000lb = ST225/75R15 6 hole rim and 6ply trailer tires for the Class III trailers

Tire Safety Checklist				
	Check that tires are inflated to specified pressure (32 psi), especially before towing			
	Make sure the tire valves have valve caps and are not touching/rubbing the rim or wheel			
	Inspect tires for signs of wear, cracks or impact damage			
	Remove any foreign objects wedged in tread (bits of glass, etc.)			
	Tighten wheel bolts at 90-120 ft-lb (122-167 N.m.)			

# 5.1 Trailer Tire Wear Diagnostic Chart

# **CAUTION**Variations in tire pressure can adversely affect handling and stability of unit trailer.

Wear Pattern	Cause	Action
Center Wear	Over-inflated tire	Adjust pressure
Edge Wear	Under-inflated tire	Adjust pressure
Side Wear	Loss of camber or overloading	Make sure load does not exceed axle rating. Realign load or axle
Cupping	Out of balance	Check bearing adjustment and balance tires

#### 5.2 Replacement Tires and Rims

CAUTION Changes in wheel size can seriously affect trailer stability and safety.

Signalisation Ver-Mac recommends a replacement tire that is the same size, ply and brand as originally installed on the unit trailer.

Signalisation Ver-Mac recommends a replacement rim that is the same size and brand as was originally installed on the unit trailer.

#### 5.3 Lug Nuts on Wheel

Failure to torque wheel lug nuts to the specifications of the wheel manufacturer can provoke loss of wheel(s).

Proper torque is essential to prevent wobble and potential loss of wheel(s).Over or under-torqued lug nuts can cause the wheel to separate from the wheel mounting. Always check and re-torque wheel lug nuts *before towing*.

**NOTE** Keep lug nuts un-lubricated at all times.



# 5.4 Tire and Rim Periodic Maintenance

# 

When repacking wheel bearings, make sure that all the jacks are supporting the trailer and the opposite wheel is blocked.

ltem	Function Required	Before Each Use	3 Months	12 Months
	Tires			
Tire Inflation Pressure	Maintain inflation at manufacturer's specifications	•		•
Tire Condition	Check overall condition (adequate tread cuts, wear, bulging, etc.) Replace if necessary	•	•	•
	Wheels			
Wheels	Rotate to check that wheel moves freely	•	•	•
	Inspect for cracks, dents or distortion, or impact damage	•	•	•
Lug Nuts and Bolts	Tighten to manufacturer specified torque values	•	•	•
Wheel Bearings & Grease Cups	Inspect for corrosion or wear Remove cup and repack with grease (E-Z Lube)			•
Seals	Inspect for leakage Replace if removed			•
Hub/Drum	Inspect for abnormal wear or scoring			•

# 6 Axles and Suspension

#### 

Always use the jacks on the trailer frame. Do not jack up trailer on suspension components.

# 6.1 Axle Periodic Maintenance

ltem	Function Required	Before Each Use	3 Months	12 Months
	Axles			
Axle Beam	Visually check camber (upward bend)	•		•
Springs	Inspect for rust, loss of arch, or leaves sandwiched together Replace any sagging or broken springs			•
Suspension Parts	Visually inspect U-bolt connections for bending, elongation of bolt holes, excess wear	•		•
Hangers	Inspect welds for integrity			•

# 7 Brakes and Breakaway Systems

Proper braking is critical to the safe towing of any PCMS unit trailer. Ver-Mac PCMS unit trailers can have:

- An electric brake system (braking activated by an electrical connection to the brake pedal of the tow vehicle)
   or
- a hydraulic surge system (braking activated by a special trailer coupler-actuator with no control from the towing vehicle)
   or
- Manual brakes system for additional safety in stationary position.
- no independent trailer braking system (lightweight trailer models only)



# 7.1 Electric Brakes

**This component is an option on Ver-Mac PCMS. Please check that your PCMS has this component** *before* proceeding.

An electric brake system operates in conjunction with drum brakes on the trailer wheels.

Under normal conditions the tow vehicle supplies the power to the trailer's electric brakes. The amount of braking applied to the towing vehicle regulates the process.

All trailers with an electric braking system have a safety switch fixed to the trailer tongue. This switch automatically applies full power to the brakes if ever the trailer detaches from the tow vehicle during driving. The safety switch is connected to the 12V battery system for the PCMS and linked to the tow vehicle by the breakaway cable.

In a breakaway situation the cable pulls the plunger out of the safety switch and so completes the electrical circuit, allowing the battery to power the electric brakes and bring the trailer to a stop.



Do not use trailer breakaway system as a parking brake.

#### 7.1.1 Testing the Brakes

Testing the trailer braking system is always a two person operation.

#### **Testing Procedure**

- 1. Deploy the jacks and raise wheels off the ground
- 2. Check the condition of the wiring, electrical connectors (especially the main trailer connector), magnets and battery. Make sure the emergency battery in the battery box is fully charged (12.6V)
- 3. Pull on the emergency breakaway cable while your partner vigorously spins the trailer wheel, to see if it stops the wheels
- 4. If the brakes fail to apply, check wiring continuity, the trailer circuit breaker or fuse, ground connections and magnets

#### 7.1.2 Maintenance

#### 

Do not get grease or oil on the brake linings, drums or magnets (electric system).

#### Full Maintenance Procedure

- 1. Inspect all wiring (secure, attached in position)
- 2. Check connection plugs at the tow vehicle end and at the trailer end for corrosion. Spray with penetrating fluid or WD-40
- 3. If electrical system is not working properly, check the electrical ground
- 4. Remove the brake drums and clean inside the brakes. Check magnets, brake pads, shoes and related components. Replace as necessary
- 5. Pack wheel bearings with grease before the drum is installed
- 6. Adjust and test the brakes
- 7. Test drive the trailer behind a vehicle to confirm that brakes function

#### 7.2 Hydraulic Surge Brakes

**NOTE** This component is an option on Ver-Mac PCMS. Please check that your PCMS has this component *before* proceeding.

In a hydraulic surge brake system, an actuator responds to the braking signal from the tow vehicle and activates the trailer brakes. The braking process is automatic.

If separation of trailer and tow vehicle occurs, the breakaway cable pulls tight and triggers the actuator to apply the trailer brakes.

**When you replace components in the hydraulic braking system, or if there is a leak, you also have to bleed the brakes.** 

# 

Only qualified and experienced personnel should bleed brakes.

For details on how to bleed the brakes, refer to the manufacturer's manual for the braking system.

#### 7.2.1 Testing the Brakes

**VIE** Testing the trailer braking system is always a two person operation.

For safe driving, you need to check the brakes to be sure they fully release when the tow vehicle is in motion, and apply properly and evenly when the tow vehicle is braking.

#### **Testing Hydraulic Brakes**

- 1. Deploy the jacks and raise wheels off the ground
- Activate the brake actuator with the breakaway cable and hold for approx. 10 seconds while your partner vigorously spins the trailer wheel The wheel should come to an abrupt stop
- 3. Check both sides to confirm good hydraulic performance of the braking system
- 4. When you release the pressure on the master cylinder, the wheel should rotate freely. A slight drag of the shoe and drum is normal

Even if the brakes apply normally, the only way to know if the brakes are adjusted properly is to test drive the trailer behind a vehicle.

#### 7.2.2 Hydraulic Surge Brake Maintenance

#### 

Failure to properly and adequately grease and maintain the actuator could weaken it and may cause it to fail.

#### **Full Maintenance Procedure**

- 1. Check the brake fluid and change if sediment or water contamination
- 2. Check all lines and fittings for corrosion or leaks Replace as necessary
- 3. Remove the brake drums and clean inside the brakes Check brake pads, shoes and related parts. Replace as necessary
- 4. Pack the wheel bearings with grease before the drum is installed
- 5. Adjust and test the brakes

#### 7.3 Manual Brake on the Trailer

Some trailers are fitted with a manual handbrake for additional safety. It operates exactly like the mast brake. When the brake is pulled, it pulls a cable which is equally distributed on both sides and that locks the wheels in place.

- To engage the brake, pull handle until brake locks in a horizontal position, parallel frame.
- To disengage the sign brake, reverse the movement.
- To adjust the tension on the cable, adjust knob at the end of the brake handle; you must first loosen the screw that is perpendicular to the knob.
- If the brakes are still too loose, you can adjust the cable by loosening the clamp on the right-side wheel and moving the cable to get it tighter.



Break cable clamp

#### 7.4 No Independent Trailer Braking System

If the trailer has no independent braking system, the trailer relies exclusively on the application of the brakes on the tow vehicle to apply braking force to the trailer.

For safe and effective braking operations, it is *crucial* that the weight of the trailer does not exceed the gross vehicle weight rating (GVWR) of the tow vehicle.

The tow vehicle GVWR is generally found on a label inside the door frame of the vehicle.

The trailer GWR is on the trailer name plate at the front of the trailer.

### 

Proper synchronization of trailer brakes with tow vehicle brakes is essential to safety and overall handling. Allow for additional distance in braking and stopping of the tow vehicle.
In a breakaway situation the safety chains may prevent the trailer from breaking away completely from the tow vehicle. The trailer will not stop of its own accord.
Be sure you stay within the weight ratings of both your PCMS trailer and tow vehicle.

#### 7.5 Breakaway System

**NOTE** This component is an option on Ver-Mac PCMS. Please check that your PCMS has this component *before* proceeding.

Avoid accidental activation of breakaway mechanism. Do not coil breakaway cable around coupler or safety chains.

All PCMS trailers with an electric braking system or a hydraulic breaking system have a breakaway cable connecting the trailer to the tow vehicle. If separation occurs the breakaway cable pulls tight and automatically applies the trailer brakes according to the trailer breaking system.

On trailers with a hydraulic breaking system the breakaway cable serves to activate the actuator to apply the trailer brakes.

**NOTE** The breakaway cable attached to the tow vehicle is normally shorter than the safety chains but must never be taut.

- Always connect breakaway cable to towing vehicle
- Make sure breakaway cable has a direct free pull

You can test the breakaway system by pulling the breakaway cable. Your trailer brakes should immediately activate and lock up the wheels.

To disengage the breakaway system, replace the breakaway cable in the switch.

#### 7.5.1 Replacement Breakaway Cable

Replacement breakaway cable must be slack enough to prevent accidental activation of the breakaway mechanism.

#### 7.6 Safety Chains

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Do not let safety chains drag on ground.

Safety chains can prevent a runaway trailer in case the coupler or vehicle hitch fails.

Crossed safety chains can prevent the trailer coupler from striking the ground if uncoupling occurs. Make sure that the safety chains have enough slack to turn, but do not drag on the ground.

Review Always use safety chains when towing.

#### **Proper Rigging of Safety Chains**

- 1. Cross safety chains under coupling
- 2. Allow only enough slack for tight turns
- 3. Twist safety chains equally from hook ends to take up slack
- 4. Attach hooks from the underside to the tow vehicle

#### 7.6.1 Replacement Safety Chains

When replacing the safety chains, use safety chains rated equal to or greater than twice the maximum gross trailer weight rating (GWR) on the trailer nameplate.

# 7.7 Brakes and Breakaway System Periodic Maintenance

ltem	Function Required	Before Each Use	3 Months	12 Months
	Brakes ( <i>all systems</i> )			
Brakes	Rotate and listen to the wheel to check for wear, damage or corrosion Test that brakes are operational Adjust brakes	•		•
Brake Lines	Inspect for cracks, leaks, kinks	•		•
	Electric Brakes			
Brakes	Carry out full maintenance procedure.			•
Trailer Brake	Inspect wiring for bare spots, fraying, etc	•		•
	Hydraulic Brakes			
Brakes	Carry out full maintenance procedure			•
	Check fluid level Fill to with DOT 3 braking fluids, if low	•		•
Surge Brake Actuator	Bleed brakes if necessary			•
	Field test according to manufacturer's instructions			•
Breakaway System				
Breakaway System	Check battery charge and safety switch operation Synchronize			•
Breakaway Cable	Inspect for rust, fraying Replace as necessary	•		•
Safety Chains (2)	Make sure that the hooks are whole, not bent or rusted Lubricate lightly with grease			•

# 8 Coupler/Hitch

The coupler/hitch on most Ver-Mac PCMS units is a pintle hook and lunette ring combo. It provides a more secure coupling than a ball-type trailer hitch, especially over rough surfaces and on construction sites and is used in place of a ball coupler.

Some PCMS units are fitted with an optional 2" ball coupler.

# 8.1 Pintle Hook and Lunette Ring Combination



A 72 mm (3" I.D.) round metal lunette ring is fixed horizontally on the trailer. The pintle hook is a vertical ring that opens and has a jaw that attaches to a tow vehicle.



### 8.2 Ball Coupler/Hitch

**NOTE** This component is an option on Ver-Mac PCMS. Please check that your PCMS has this component *before* proceeding.



Make sure that the trailer ball is completely engaged in the coupler.

When you attach the trailer to the tow vehicle, make sure it is hitched securely.

- Use the trailer jacks to lower the coupler onto the ball
- Make sure the coupler is in the loose position and that the clamp in the coupler has dropped open

The trailer tongue should be snug on the ball when locked.

You have the proper adjustment when the coupler is as tight as possible on the ball and you can still open and close the locking lever.

**NOTE** If adjustment nut is too tight, handle does not lock.



- 1. Place coupler over the trailer ball on the tow vehicle
- 2. Raise the locking lever so that the coupler can drop fully onto the hitch ball
- 3. Press the locking lever down on the coupler to ensure the hitch ball fits snugly in the coupler with no play between the hitch ball and the coupler If there is play, tighten the adjustment nut until no play is present
- 4. To adjust coupler to ball, raise the locking lever, push up on the channel lock and turn nut to tighten or loosen the coupler

**NOTE** Make sure that ball-and-tongue has adequate capacity for the trailer and all safety (or locking) cotter pins are in place and in good condition.

# 8.3 Coupler/Hitch Periodic Maintenance

Item	Function Required	Before Each Use	3 Months	12 months
	Coupler/Hitch			
Pintle Hook & Draw Bar	Check capacity	•		
Lunette Ring	Inspect for wear Replace when badly worn	•		•
Coupler and Ball	Inspect for rust Clean and lubricate ball socket and clamp lightly with grease			•
Ball and Tongue	Check capacity	•		
Safety Pins	Verify that all are in place and properly inserted Replace weak or missing pins	•		•
Adjustable Hitch	Make sure bolts are tightened at 150 ft lb (203 N.m)	•	•	•
	Verify hardware to replace it if worn.	•	•	•

#### 8.3.1 Adjustable Hitches

Adjustable hitches provide great flexibility for trailer operators, but bolts must be safely tightened after performing adjustments to the trailer.

When you change the adjustments on a Ver-Mac adjustable hitch:

- Make sure that all bolts are tightened safely at a torque of 150 ft lbf (203 N.m).
- Replace any worn hardware.

**INOTE** Lubrication of the coupler/hitch stops corrosion and helps prevent binding during turns. It keeps moving parts inside the coupler operating smoothly. A film of clean heavy weight grease on the ball reduces friction between the coupler and hitch ball.

# 9 Mast Maintenance

The mast on the PCMS unit has the signboard and the solar panels attached. On most units a hydraulic pump system that is connected to the batteries in the battery box, raises and lowers the mast. However some smaller units rely on a manual hand winch to raise and lower the mast.

# 9.1 Mast Periodic Maintenance

ltem	Function Required	Before Each Use	3 Months	12 Months
	Mast			
Mast	Check for leaks (hydraulic fluid) on the ground under the mast.	•	•	•
	Raise mast to full height and check Nylatron runners and screws. Clean any build-up. Adjust for snug fit on mast.			•
	Check main bolt (top of mast) is tight.			•
	Check bolts at the bottom of the mast are tightened at 64 ftlb (86.8 N.m.)			•
	Check all metal parts for rust and corrosion. Lubricate lightly.			•
Frame Welds	Check for cracks and/or failures.	•	•	•

# 9.2 Hydraulic Lift System for Mast

**EXAMPLE** For safety during transport Ver-Mac disconnects power to the hydraulic pump. Make sure the power feed is connected to the battery terminals inside the battery compartment.

#### 9.2.1 Raising and Lowering the Mast

**EXAMPLE** Before raising or lowering the mast, open battery box and check that the hydraulic bypass valve is tight.

- 1. To raise mast, open control box, and flip switch to Sign Up. The mast rises automatically.
- 2. To lower mast, reverse the procedure.

The hydraulic system used to raise and lower the mast does not require any regularly scheduled maintenance beyond periodic checking of the fluid.



#### **Maintenance Procedure**

- 1. Check the hydraulic fluid in the reservoir is approximately <sup>3</sup>/<sub>4</sub> full
- 2. Add Dexron II ATF hydraulic fluid as necessary to maintain level
- 3. Replace the cap on the reservoir tightly to prevent loss or contamination of the hydraulic fluid

# 9.2.2 Lowering the Mast with Hydraulic Bypass Valve

#### 

Turning the hydraulic bypass valve too quickly may cause the sudden and rapid descent of the signboard. To avoid possible injury, make sure you are well clear and out of the way.

If the hydraulic system fails to function, gradually turn the hydraulic bypass valve counterclockwise  $\circlearrowleft$  to release the pressure so the fluid flows back into the reservoir and lowers the mast.

Once the mast is down, retighten the hydraulic bypass valve.

**I NOTE** This procedure only lowers the mast. It does not enable you to raise the mast.

#### 9.2.3 Raising the Mast with Optional Manual Hand Pump

- 1. Open battery box and check that the safety release valve is tight.
- 2. Remove the handle from its holder in the battery box and insert it into the pump.
- 3. Commence pumping and continue until mast rises to full height.

# 9.3 Reversible Hand Winch System for Mast

**NOTE** This component is an option on Ver-Mac PCMS. Please check that your PCMS has this component *before* proceeding.

Manual hand winches require your physical strength to crank and raise and lower the mast. When working with a manual winch stay alert, watch what you are doing and use common sense.

Proper footing and balance enables better control of the winch in unexpected situations.

#### CAUTION Do not over reach. Maintain proper footing and balance all the time. Do not stand on trailer to raise or lower mast. Loose clothing and long hair can be caught in moving parts.

#### 9.3.1 Raising Mast

- 1. Disengage the locking pin on the mast
- 2. Slowly and evenly turn the crank handle clockwise U and raise the mast to its full height

This action produces an audible clicking sound from inside the winch mechanism

- 3. Release the handle slowly to lock the mast in position
- 4. Make sure the locking pin on the mast is fully inserted and locking the mast in position



Keep hands and fingers clear of the drum and cable area of the winch when operating. Do *not* attempt to guide cable by hand.

Never continue turning the handle counter-clockwise if the cable does not keep moving out. This disengages the winch brake mechanism and can create an unsafe or hazardous condition.

#### 9.3.2 Lowering Mast

- 1. Disengage the locking pin on the mast
- 2. Slowly and evenly turn crank handle counter-clockwise and lower the mast until the signboard is resting in the transportation cradle
- 3. Reverse the movement and turn crank handle clockwise 🖱 approx. 20 cm/8". This action locks the mast in position.
- 4. Pull and turn the locking pin on the mast to the locked position.

**NOTE** The winch brake prevents the handle from spinning rapidly backwards if ever your hand slips off the winch handle while lowering the mast.

# 

The winch brake is not fully locked until you hear at least *two* (2) clicks of the ratchet. Only then do you release the handle.

#### 9.3.3 Replacement Winch Cable

vays replace winch cable with one that is identical in diameter and load limit.

Replacement Procedure for Winch Cable

CAUTION



- 1. Unwind the cable from the drum. Remove completely and dispose of it
- 2. Insert the new cable on the drum, making sure you insert it correctly Secure it tightly

#### 9.3.4 Reversible Hand Winch Periodic Maintenance

ltem	Function Required	Before Every Use	3 Months	12 Months
	Hand Winch			
Winch Cable	Inspect for dirt buildup, breaks, frays Make sure that the cable is pulling straight off the winch	•	•	•
All Gears	Clean and lubricate (auto-type grease)		•	•
All Shafts, Bushings and Ratchet Parts	Clean and wet with oil (auto-type 10W-30)		•	•
Brake Disc	Remove handle retainer assembly, handle and brake disc cover and inspect for wear Replace if less than 1/16" thick or cracked or broken		•	•
Brake Ratchet Mechanism	Check operation (turn handle clockwise ひ to reel cable in and listen for <i>clicking sound</i> )		•	•
Brake Ratchet Parts	Remove handle and retainer assembly, handle and disc cover Inspect for wear and unsafe condition		•	•
Winch Mounting	Check that winch is properly installed on mast Check welds		•	•

# **I**f winch brake disc mechanism operates intermittently or erratically, you need to carry out a winch brake disc inspection as per the manufacturer's manual.

During reassembly make sure that all parts are installed correctly.

# **10 Signboard**

The exterior face of the signboard should be cleaned periodically to maintain optimum visibility of the display.

**Ammonia-based detergents or petroleum-based solvents can damage the** polycarbonate face (Lexan) of sign and should not be used to clean the sign face.

#### Care and Cleaning Procedure for Signboard Face

- 1. Use plenty of water to minimize scratching of the surface by any abrasive dust and debris accumulation
- 2. Use mild detergent to remove any accumulated oil or grease deposits
- 3. Rinse surface thoroughly to completely remove the dirt and detergent residue

#### 10.1 Sign Brake

#### 

Always make sure that the sign brake is engaged before towing. Disengage the sign brake before lowering, or raising the sign.

The sign brake is a heavy-duty band brake attached on the mast below the signboard. It holds the signboard in position.

- To engage the sign brake, pull handle until brake locks in a horizontal position, parallel to the bottom of the sign
- To disengage the sign brake, reverse the movement
- To apply or adjust the tension on the band, adjust the small knob on the end of the brake with a screwdriver

If this is not enough use the proper size socket wrench and tighten the nut

**In high wind areas or unusually windy conditions, the sign brake may not be enough to prevent the signboard from turning. Under these circumstances, it may be advisable to increase the tension on the band.** 

#### **10.2 Photocells**



Photocells detect the ambient light conditions and the brightness of the sign display adjusts in consequence.

External photocells are located on the junction box underneath the solar panels or on the left outside side wall of the sign case.



A speed radar device is attached directly to the underside of the sign case.

#### **10.4 Sign Display**

Before putting your PCMS into operation, it can be a good idea to run a pixel text and verify that all display cards for the signboard are functioning.

Accessing the pixel test varies, depending on the software that controls the signboard.

Unit software	Steps
Quickstep	Login $\rightarrow$ [F4] Utilities $\rightarrow$ [F3] Brightness $\rightarrow$ [F5] Test
Signcore	Login $\rightarrow$ [4] Setup $\rightarrow$ [4] Tests $\rightarrow$ [1] Chessboard
Touchscreen	Login $\rightarrow$ Toggle Menu $\rightarrow$ Option $\rightarrow$ Pixel Test $\rightarrow$ Chessboard

# **10.5 Signboard Exterior Periodic Maintenance**

ltem	Function Required	Before Every Use	3 Months	12 Months
	Signboard Exterior			
Main Harness	Crank the signboard up a little and check main harness cables for wear Make sure the cable lies loosely on the battery boxes (not squeezed between sign case and battery box, not caught in anything or dragging on the ground)			•
Sign Case <i>(Outside)</i>	Check all reflectors at top of case (in place, unbroken) Replace as needed Check door (closed and undamaged)	•		•
	Check functioning of dashpot door closers that hold the face open Replace if broken			•
	Check condition of all rubber T-latch clamps (tight, not cracked or loose)	•		•
	Verify all welds at corners of sign case			•
	Check condition of rubber bungee strap (not dry or brittle) Replace as needed <i>before</i> towing	•	•	•
	Check condition of any external photocells Clean as needed			•

#### Signboard

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ltem	Function Required	Before Every Use	3 Months	12 Months
Signboard Face	Remove dust and debris with a sponge or soft cloth Wash and rinse off accumulated grime with lukewarm water In winter, remove snow and ice accumulation To remove tough stains, use the following products: Joy <sup>1</sup> , Palmolive <sup>2</sup> , Naphtha VM&P Grade or Isopropyl Alcohol To remove adhesive residues, use the following products: Naphtha VM&P Grade, Kerosene or Isopropyl Alcohol To remove paint, use the following products:	•	•	•
	Naphtha VM&P Grade, Isopropyl Alcohol			
Transport Cradles	Inspect for proper support Replace cushions as needed Adjust height if necessary			•
Sign Brake	Check for rust and corrosion Lubricate lightly Adjust tension screw		•	•
Photocells Under Solar Panels	Check and clean photocell(s) Test photocell function (cover sensor with dark tape Check sign brightness)	•	•	•
Peripheral Devices	Inspect support (securely attached, undamaged)			•
(Example: Radar, Beacons)	Check wiring and connectors (secure)			•

® Registered Trademarks of <sup>1</sup>Procter & Gamble and <sup>2</sup>Colgate Palmolive.

#### 

The use of abrasive or high alkaline cleaners or of gasoline may cause permanent damage to the signboard face. Never scrape the signboard face with squeegees, razor blades or any other sharp instrument. Do not clean the signboard face in direct sunlight or at high

temperatures as this can lead to staining.

#### Signboard

# **10.6 Signboard Interior Periodic Maintenance**

ltem	Function Required	Before Every Use	3 Months	12 Months
	Signboard Interior			
Sign Coso Eleor	Check for signs of water infiltration	•		•
Sign Case Floor	Check drainage holes are unblocked			•
	Run Chessboard test and visually check all pixels are operational			•
	Check there is no corrosion on the cards			•
Display Cards	Check all hoods are secured above each pixel			•
	Check all display cards are screwed in place			•
	Check harness cable. Make sure it is not loose, frayed, or worn	•		•
Wiring	Check cables between cards Make sure connections are inserted correctly			•
Electronics	Check the Communication Card/Relay Bracket for water damage and corrosion and connection			•
Liectionics	Check the GPS for water damage and corrosion and connection			•
Photocell	Check photocell functionality on communication card Test functioning (cover sensor with dark tape Check sign brightness)		•	•

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Red light ON (on communications card in the interior of sign case) indicates a problem with electronics. Contact Ver-Mac Support for assistance.

# **11 Solar Array**

#### **11.1 Solar Panels**

#### Never attempt to work on solar array in wet or damp conditions. Electrical current is always present.

ar panels can produce an electrical shock or burn unless care is taken.

Solar panels are a live electrical power source. Current and power increase with light intensity. Panels continue to produce nearly full voltage even in overcast conditions. They produce DC voltage even when not connected to an electrical circuit.

Solar panels have no ON/OFF switch. Before commencing any maintenance on the electrical connections on the unit

- disconnect power supply at junction boxes
- disconnect red solar regulator lead

**Even** when you have taken every precaution, be aware that the solar panels continue to generate current.

# **11.2 Orientation and Tilt**

Correct orientation and tilt (angle to horizon) of the solar array is most important. For optimum power generation, solar panels need to face the midday sun at an angle roughly equal to the latitude of your location.

The rotation mechanism and pivoting jack enable you to orient and tilt the solar array.

# Proper Orientation and Tilt Procedure Release the solar panel handbrake (upward thrust) and make sure solar cable is out of the way Pull down and turn handle on the pivoting jack until panels are facing up into the sky at approximately 45° or the angle that you require Using the handles above the panel brake, turn the solar array and orient it toward the South (in southern hemisphere, towards North) Pull down on panel brake and lock the panels into position At the same time, make sure the metal L clamp is gripping the rotation plate firmly Tighten the adjustment screw (use Phillips head screwdriver) if the panel brake appears loose

To prepare the solar array for transportation, reverse the procedure.

Make sure you turn the panels in the opposite direction so that the power cable does not become tangled in the rotate and tilt mechanism.

# **11.3 Care and Cleaning of Solar Panels**

While solar panels generally require little maintenance beyond thorough cleaning, lack of maintenance eventually affects the batteries and the performance of the PCMS unit.

**NOTE** Do not rely exclusively on the rain to clean the panel.

#### **Cleaning Procedure for Solar Panels**

- 1. Remove all accumulated dust and debris (in winter any heavy snow)
- 2. Use mild detergent to remove any oil or grease deposits
- 3. Rinse surface thoroughly. Be sure to remove all dirt and detergent residue

#### **11.4 Replacement Solar Panels**

Replacement solar panels for the solar array must be *the same wattage* and ideally, from the same manufacturer as the rest of the array.

# **11.5 Solar Array Periodic Maintenance**

ltem	Function Required	Before Every Use	3 Months	12 Months
	Solar panels			
Glass Surface	Tilt and clean upper glass surface using plenty of water		•	•
	In winter remove excess snow or ice build- up as soon as possible Sunlight usually melts any light snow or ice	•		•
	Tilt and inspect for damage	•	•	•
	Support Structure			
Panel Frame	Check for corrosion, loose connections			•
Pivoting Jack	Check for rust and corrosion Lubricate inner ram and turn mechanism			•
Panel Brake	Check for rust and corrosion Lubricate lightly		•	•
	Make sure cotter safety pin is in position	•		•
Adjustment Screw	Adjust when necessary			•
Transport Cradles	Inspect for proper support Replace cushions as needed	•		•

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ltem	Function Required	Before Every Use	3 Months	12 Months
	Electrical			
Junction Boxes	Open and use a volt meter to test and monitor output			•
Connectors	Check for tightness			•
Cables or	Check for wear, frays, breakages			•
Wiring	Verify connection to communications card (inside sign case)			•



Ver-Mac sells 3 types of batteries: deep-cycle, sealed and AGM sealed batteries. The deep-cycle battery maintenance follows.

You will also find, in this chapter, general information on battery charges, time of charging and use of the smart charger.

For sealed batteries, there is a section to determine their state of charge.



# **12.1 First Aid Procedures First Aid Procedure Battery Electrolyte** (sulphuric acid) *Flush immediately and thoroughly with water* any area of your body that is contacted by battery acid Eye contact: Immediately flush the contaminated eye(s) with clean, lukewarm, gently flowing water for at least 30 minutes, by the clock, while holding the eyelid(s) open If irritation persists, repeat flushing. Neutral saline solution may be used as soon as it is available DO NOT INTERRUPT FLUSHING If needs be, keep emergency vehicle waiting Be careful not to rinse contaminated water into the unaffected eve or onto the face First aiders should avoid direct contact. Wear chemical protective gloves, if necessary Quickly transport the person affected to an emergency care facility Skin splashed with acid: As quickly as possible, flush the contaminated area with lukewarm, gently flowing water for at least 30 minutes, by the clock If irritation persists, repeat flushing DO NOT INTERRUPT FLUSHING If necessary, keep emergency vehicle waiting Under running water, remove contaminated clothing, shoes and leather goods (e.g. watchbands, belts) Transport the person affected to an emergency care facility immediately Discard all contaminated clothing, shoes and leather goods

# 12.2 Deep-cycle Battery Maintenance

A deep cycle battery generally requires only preventive maintenance:

- maintaining electrolyte levels
- tightening any loose terminals
- removing corrosion
- maintaining the correct state-of-charge while in storage

Regular battery maintenance and correct charging procedures can prolong battery life.



Loss of capacity and leakage are the main things that can go wrong with batteries.

Check your batteries on a regular basis to be sure they are getting charged.

The quickest way to ruin lead-acid batteries is to discharge them deeply and leave them stand uncharged for an extended period of time.

#### **Battery Periodic Maintenance**

- 1. Check battery fluid level every three months in temperate climates (every 30 days during the summer and in hot climates)
- 2. Check that the clips holding the cables on the battery terminals are tight and that cables themselves are not frayed or broken
- 3. Clean any dirty battery terminals and the insides of cable clamps with a post and clamp cleaner. Spray the clamps with a battery terminal protector
- 4. Remove any fluid or residue build-up on the tops of the batteries. Use a 50/50 solution of baking soda and water. Rinse with clean water

# 

Never over tighten the battery terminals. This can result in broken battery posts, post meltdown and / or fire.

#### 12.2.1 Battery Fluid Level

Maintaining the fluid level in the battery cells is the most effective way of optimizing the service life of the battery bank.

Fill the batteries after extended charging.

Be sure to check the electrolyte level after charging. Keep below the bottom of the fill well in the cell cover.

Never fill or overfill the battery cells. When the battery charges, the electrolyte can overflow, causing corrosion and other damage.

**In warm climates and during the summer, check the battery fluid levels every 30 days.** 

#### **Battery Fluid Procedure**

- 1. Remove the vent caps
- 2. Look inside and check the electrolyte levels. Minimum level required for charging the battery is at the top of the plates
- If level is below the plates add enough distilled water to cover the plates before charging the battery

Fully charge the battery before adding more distilled water

3. When the battery is charged remove the vent caps and check the electrolyte levels again

Add distilled water until electrolyte level is 1/8 inch (30 cm) below the top Replace and tighten all vent caps

#### 12.2.2 Battery Charging and Testing

Visual inspections of batteries are important, but they do not tell you the actual condition of the batteries. You need to test the batteries to determine their state of charge and overall condition. Then you can determine whether or not the battery bank needs replacing.

#### 12.2.2.1 Check Battery Voltage

Take real voltage readings when the batteries are neither charging nor discharging; nothing connected and turned on. Also make sure that the batteries have been resting, and not charging for at least 30 minutes before taking the reading.

<b>EXAMPLE</b> Be absolutely certain that the solar panels and the charger are disconnected before taking your reading.	
---	--

- Digital voltmeters should read as the voltage shown on the state of charge (SOC) chart
- Voltage readings in the 10.5 V range on a charged battery typically indicates an internal short in a battery cell

#### **Battery Bank**



State of Charge (SOC) Chart				
% of Charge	Charging	At Rest*	Discharging	
100	14.75	12.70	12.50	
90	13.75	12.58	12.40	
80	13.45	12.46	12.30	
70	13.30	12.36	12.25	
60	13.20	12.28	12.15	
50	13.10	12.20	12.00	
40	12.95	12.12	11.90	
30	12.75	12.02	11.70	
20	12.55	11.88	11.50	
10	12.25	11.72	11.25	

# 

Voltage and state of charge is an approximate, not a specific number. It can vary depending on battery type, manufacturer, battery quality, current temp and the age of the battery. The voltages shown are taken at 25°C (77° F).

Immediately after either charging or discharging the battery voltage may not have stabilized. Because the battery is chemical in nature, the voltage normally settles down about 30 minutes after charging or discharging has discontinued.

#### 12.2.2.2 Hydrometer Test

A hydrometer measures the specific gravity (or relative density) of liquids. In a

battery it measures the proportion of the battery electrolyte (sulphuric acid) to the density of water.

Using a glass-float Hydrometer:

- Check the electrolyte level, to be sure that it is above the plates in all cells. If it is below the plates, you cannot do the test
- 2. Draw the acid into the hydrometer, so that the float is lifted free and not



touching the top or the bottom. Hold the barrel upright and your eye level with the surface of the liquid. Disregard the curvature of the liquid against the glass and take your reading from the bottom of the curve

 For accurate readings apply cell temperature corrections; add or subtract 0.004 points for each 5°C (9°F) +/- variation from 25°C (77°F) **NOTE** Hydrometer readings should not vary more than 0.05 between cells.

State of Charge	Specific Gravity	
100% Charged	1.265	
75% Charged	1.239	
50% Charged	1.200	
25% Charged	1.170	
Fully Discharged	1.110	
These readings are correct at 25°C (75°F)		

Sulphation of batteries starts when specific gravity falls below 1.225 or voltage measures less than 12.4 for a 12V battery, or 6.2 for a 6V battery. Sulphation hardens on the battery plates. It reduces and eventually destroys the power generating ability of the battery.

# **12.3 Sealed Battery Maintenance**

#### 12.3.1 Validating Battery State of Charge (SOC)

To check battery level:

- 1. Bring the trailer inside.
- 2. Put the trailer in full operation mode, at the highest brightness, and let it in operation for at least five (5) minutes, but no more than 15 minutes.
- 3. From the terminal strip inside the plastic battery box, measure the voltage:
  - a. Put the positive lead on any of the screws that has a cable identified 12 V.
  - b. Put the negative lead on any of the screws that has a cable identified GND.
- 4. Use Table 1 to find out if the batteries are fully charged.

Note that gravity measurement is not possible with sealed batteries. See next section for the battery charging procedure.

Percentage of Charge	Open Circuit Voltage (V)
100	12.73
90	12.62
80	12.50
70	12.37
60	12.24
50	12.10
40	11.96
30	11.81
20	11.66
10	11.51

Table 1 - State of charge for a 12 V sealed battery

# **12.4 Suggested Recharging Times**

Ver-Mac units use two models of IOTA chargers. The recharge time guidelines suggested below apply to IOTA 30 and IOTA 55 chargers only.



- · · · · · · · · · · · · · · · · · · ·			
30 Amp Model			
Number of batteries	Total Capacity (Amp Hour)	Time to recharge (hours)	
2	220	8	
4	440	16	
6	660	24	

55 Amp Model			
Number of batteries	Total Capacity (Amp Hour)	Time to recharge (hours)	
8	880	18	
10	1100	22	
12	1320	26	
14	1540	31	
16	1760	35	

	Unsupervised, incompatible, or damaged batteries can explode if used with a charger. Do not attempt to charge damaged or frozen batteries. Use charger only with batteries or recommended voltage. Operate the charger in well-ventilated areas only. If one battery has to be replaced, replace them all because they do not recharge at the same rate.		

# 12.5 Charging with an External Charger

**NOTE** Batteries in PCMS units are 6 volt. The batteries are wired in series to create a 12V system (2 x 6V batteries linked together). Additional batteries (2 x 6V) are then connected in parallel to increase capacity. Most battery chargers are 12 V and need to be connected correctly.

Most garage and consumer automotive battery chargers only offer a Bulk Charge.

These units have little (if any) voltage regulation and are fine for a quick boost to low batteries. Do not leave on for long periods as you risk overcharging and damaging your batteries

Refer to Suggested Charging Time table



DO NOT connect your charger to a single battery as it damages the battery.

To use an external charger please make sure you use a minimum 30 Amp charger.

#### 12.6 Charging the Batteries with the Onboard Charger

- Locate the charger on unit. The charger is normally located within the control unit. Open the lid of the control unit and lift the white or black face. The optional charger should be located inside
- 2. Locate the AC outlet for the charger. Some installations will have the power cord wired into the charger. Other installations will be wired to an external weather resistant power connector
- 3. Connect the AC outlet to an extension lead. Connect other end of the lead into an 110V power socket
- 4. Change the charger switch to the ON position. This switch is generally located inside the control box on the black or white face
- 5. Charge for the recommended time as specified in the *Suggested Recharging Time* tables. The LED Indicator on the IQ4 shows the charging state and the battery charge status
- 6. Disconnect the extension and turn charger switch OFF. This ensures the charger is powered off

**NOTE** The IQ4 module allows the charger to charge in Bulk and Absorption modes for a 24 hour period only. This time limit is to prevent damage to the batteries from overcharging; As a result, when the battery level is too low, the charger may not be able to fully recharge the battery pack in a single 24 hour period. When the 24 hour time limit is up, the IQ4 LED (small green light) stays ON continuously and the IQ4 needs to be reset.

For full details, see Battery Charging Procedures on the Support section of the Ver-Mac web site

#### **12.7 Replacement Batteries**

Although batteries in good condition normally stay charged for months, as batteries get older and do more charge/discharge cycles, capacity gradually reduces. If any battery loses more than half its capacity in a month it is probably time to replace your **entire** battery bank.

Please look up the state of charge for your type of battery to see how a battery is at half of its charge.

# **12.8 Battery Bank Periodic Maintenance**

ltem	Function Required	Before Each Use	3 Months	12 Months
	Batteries			
Battery Bank	Inspect outside of battery (damage, cracking and leaking fluid) Replace any leaking battery <i>immediately</i>	•	•	•
	Inspect water level* Fill as needed	•	•	•
	Test with voltmeter (fully charged 12.7 V or higher) Charge as needed	•	•	•
	Test with Hydrometer*. Check specific gravity does not vary more than 0.05 units between cells		•	•
	Inspect terminals for corrosion, tightness of connections Clean as necessary		•	•
Boxes	Inspect for damage, water infiltration			•
	Check that cover closes and locks securely	•		•

\*Deep-charge batteries only.

# **13 Controller Cabinet**

The heavy-duty lockable metal control box contains all the connections for the mechanical and display functions of the signboard. The controller devices for on-site programming are located inside the box as well, as is the solar regulator.

Checking the connections generally requires you to open the control box and lift the panel covering the various connections.

# 13.1 Solar Regulator

**EXAMPLE** Before starting test, make sure the solar array is in full sunlight.

Solar regulators require very little maintenance. All you need to do is regularly check the wired in connections to see that they are tight and corrosion free.

For more information on your solar regulator, please visit the Ver-Mac support site to get the solar regulator guide that covers all 3 possible models.

Definition	LED status	Explanation
	Green LED L3 flashing 2x/sec	<ul> <li>Solar regulator recharges the batteries with the maximum current available from the solar panels</li> </ul>
Bulk Mode		<ul> <li>Regulator stays in Bulk mode as long as battery voltage is less than the charge limit</li> </ul>
		<ul> <li>Once battery voltage reaches charge limit, regulator moves into Float mode</li> </ul>
Float Mode	Yellow LED L2 flashing	<ul> <li>Solar regulator maintains battery voltage (approx.13.7V at 25°Celsius)</li> </ul>
		<ul> <li>If unable to maintain battery voltage, regulator returns to <b>Bulk</b> mode</li> </ul>
	Green LED L3 flashing 1x/sec	Solar regulator <i>does not charge</i> the batteries
Standby Mode		<ul> <li>Standby mode usually means too little solar panel voltage output (less than Battery voltage +1volt)</li> </ul>
LVD (low Voltage	Red LED L1 flashing	<ul> <li>Battery voltage is too low (10.4V at 25°Celsius), so solar regulator disconnected the output Load and extinguished signboard display</li> </ul>
Disconnect)		<ul> <li>LVD condition stops when the batteries are sufficiently recharged (12.6V at 25°Celsius)</li> </ul>
Regulator Defect	L2 and L3 flashing simultaneously	<ul> <li>Indicates a regulator hardware defect</li> </ul>

Mode	Condition	Possible cause
Standby	No solar voltage reading on the controller	Serial communication defective or incorrectly connected
		Solar array disconnected
Standby	Over voltage from batteries (greater than 15.15V)	Batteries incorrectly connected Example: 12V batteries in series
	,	Defective solar regulator (U101, Q102)
Float	Battery voltage around • 14.45V at -25°C • 13.70V at 25°C • 12.95V at 50°C	OK
Bulk	No solar voltage reading on the controller	Serial communication defective or incorrectly connected
Bulk	Controller displays solar voltage (Example: 20.00V) but no solar current	One or more solar panels may be incorrectly connected
Bulk		Defective solar regulator (U101)
	Solar current (entering current) is less	Solar regulator is OK but there is not enough
Bulk	than the battery current (outgoing current)	Check orientation of the solar array
		Solar regulator is OK but the system is drawing too much current
Bulk	Solar current (entering current) is greater than the battery current (outgoing current)	ОК
LVD	Low Voltage Disconnect	Battery voltage too low
	System OFF and no LEDs lit on regulator	Defective jumper switch or wire in J5
Off		Fuse F2 blown
UI		Ground disconnected
		Check J2-2

# **13.2 Controller Cabinet Periodic Maintenance**

ltem	Function Required	Before Each Use	3 Months	12 Months
	Controller Cabinet			
	Verify condition			•
All Connections	Check for proper functioning	•		•
All Cables	Visually check cabling for signs of damage			•
Controller	Verify condition (clean, undamaged)			•
Devices	Check for proper functioning	•		•
Peripherals	Check for proper functioning	•		•
Manual & Stickers	Check condition (complete, clean and readable)	•		•
Weatherproof Seal	Inspect for tight seal Replace as needed			•
Optional Devices (Example: Data Loggers, Bluetooth)	Check that all connections for peripheral devices are firmly attached	•		•

# **14 Appendix A – Full Brake Maintenance**

# 14.1 Full Brake Maintenance (Hydraulic and Electric Systems)

This procedure is for trailers with either electric or hydraulic braking systems. As a minimum requirement, full brake maintenance should be carried out once a year.

**NOTE** These components are an option on Ver-Mac PCMS. Please check that your PCMS has this component *before* proceeding.

	Annual Brake Maintenance Procedure
1.	Park your trailer on asphalt or cement and stabilize. Inspect all wheel and brake
	lines for leaks and cracks
2.	Undo the lug nuts, remove the wheel and the drum cover
3.	Wash brake pads with brake cleaner if necessary. Replace as needed.
	Check brake shoes. Replace if worn
4.	Repack hub drums and check for grease leaking on brake shoes
	Check fluid in actuator ( <i>hydraulic</i> ). Change if dirty
	Lightly lubricate moving parts of brake coupler (electric)
5.	Adjust brakes

	Adjusting the brakes is important. As brake shoes wear down, the clearance increases and the actuating mechanism must travel further to effectively apply
· ····	the brakes. At a certain point the mechanism is no longer effective.

# **Every 5 years approximately, check the brake drum and apply a thin layer of zinc grease.**

# 15 Appendix B – Safety Warning and Instructions Stickers

This appendix contains representations of the safety warning and instructions decals used on Ver-Mac PCMS units. You PCMS might not have them all. Please refer to these representations and their corresponding numbers, if ordering replacements.

Never put a PCMS unit into operation on a work site with known defects or missing instructions or decals. Always replace any safety and instruction decals that are damaged, dirty or illegible in any way.

#	PART №:	Sticker	
1	E-9361	<b>Set trailer so it is leveled on all axes and wheels do not touch the ground.</b>	
		Location: Near one of the jacks.	
2	E-9835	CAUTION BEFORE WORKING ON A BATTERY:	
	Location: Outside the battery boxes.		
3	E-9836	Image: Approximate bound of the systemImage: Approximate bound o	
		Location: Outside the battery boxes.	
4	E-9441	DANGER         PINCH         POINT         KEEP HANDS         AND FINGERS         CLEAR	
		Location: Near the transport cradle.	

#	PART №:	Sticker
5	E-9473	DANGER DO NOT INSTALL THIS EQUIPMENT NEAR POWER LINES
		Location: Near the winch or up switch if hydraulic.
6	E-9793	<b>CAUTION</b> Do not operate door with winds in excess of 25 mi/h (40 km/h) E-9793
		Location: Near door latch
7	E-3499	Image: Constraint of the stand on trailer when raising or lowering arrowboard or sign.         Beware of moving parts.
	Location: On rear of trailer.	
8	E-7730	Maximum transport speed is         90 km/h (55 mph).
		Location: On the bumper.

# 16 Appendix C – Setup and Takedown for a Telescopic Camera

This appendix contains the setup operation as well as takedown operations for a system with a telescopic camera.

When you are working at the roadside you must always remain alert to your surroundings and the traffic behavior.

# 

Be safe. Stay alert and pay close attention to the surrounding traffic at all times.

#### **16.1 Trailer Deployment**

#### WARNING

Be very careful when attempting to maneuver trailer into position for setting up.

- 1. Check ground slope; cannot exceed 15°.
- 2. Pull out all outriggers (if present).
- 3. Stabilize all jacks.
- 4. Unplug trailer lights/brakes.
- 5. Disconnect hitch assembly from vehicle by raising
- 6. Front jacks (lower rear jacks if necessary).
- 7. Undo safety chains.
- 8. Adjust jacks to make sure trailer is leveled.

# 16.2 .Solar Panels and Camera Setup

# WARNING

# Follow this procedure step by step to prevent damage to the camera. If not done in proper order the solar panels and the camera could collide.

- 1. Disengage solar panels brake.
  - 2. Fully raise and rotate solar panels so it is pointing south when deployed (suggested position).
  - 3. Make sure solar panels position will not interfere with camera mast.
  - 4. Engage solar panels brake.
  - 5. Make sure solar panels will not interfere with camera mast.
  - 6. Use manual winch #1 to fully raise camera mast.

# 16.3 Sign Case Setup

- 1. Unlock pin #1.
- 2. Locate "sign up" switch in control cabinet.
- 3. Raise the sign case at eye level.

- 4. Disengage sign case brake.
- 5. Align the sign case pointing towards the traffic with the viewfinder.
- 6. Engage sign case brake.
- 7. Readjust solar panels if required.

**EXAMPLE** Always turn the solar panels so they face of due south. (In the southern hemisphere, due north.) Use a compass. Please keep in mind that large metal objects can affect the calibration of a compass, so stand away from any metal object when taking coordinates.

- 8. Fully raise the mast.
- 9. Lock pin #1.
- 10. Turn on sign (Power ON/Off switch) and controller.

#### 16.4 Sign Case Takedown

- 1. Unlock pin #1
- 2. Locate "sign down" switch in control cabinet.
- 3. Lower sign case until at eye level.
- 4. Disengage sign case brake.
- 5. Align the sign case in transport position.
- 6. Engage sign case brake.
- 7. Fully lower the sign case on cradles.
- 8. Lock pin #1.

### 16.5 Solar Panels and Camera Takedown

#### 

# Follow this procedure step by step to prevent damage to the camera. If not done in proper order the solar panels and the camera could collide.

- 1. Make sure solar panels will not interfere with camera mast.
- 2. Use manual winch #1 to fully lower camera mast.
- 3. Disengage solar panels brake.
- 4. Rotate and lower solar panels to its transport position.
- 5. Engage solar panels brake.

# **16.6 Positioning Unit for Transport**

- 1. Connect hitch assembly to vehicle by raising front jacks (lower rear jacks if necessary).
- 2. Secure safety chains.
- 3. Plug trailer lights/brakes.
- 4. Bring jacks up in transport position.
- 5. Secure outriggers in transport position (if present).

# 16.7 Safety Stickers for the Camera Option

#	PART №:	Sticker	
1	E-8144	<b>EXARNING</b> Keep hands and fingers clear of the drum and cable when operating. <b>Do Not</b> attempt to guide cable by hand	
	Location: Near the winch.		
2	E-9473	DANGER DO NOT INSTALL THIS EQUIPMENT NEAR POWER LINES	
		Location: Near the winch.	
3	E-9017	CAUTION         AVOID CAMERA DAMAGE:         BE AWARE OF CAMERA WHILE         POSITIONING SOLAR ARRAY         E9017	
	Location: Near tilt and rotate mechanism, near winch.		
4	E-9796	WINCH #1	
		Location: Near the winch.	
5	E-9802	PIN #1	
	Location: Near the trailer mast pin.		
6	E-3499	WARNING     Do not stand on trailer when raising     or lowering arrowboard or sign.     Beware of moving parts.     metage	
		Location: Near the winch.	

#### Appendix C – Setup and Takedown for a Telescopic Camera

Give us your thoughts

#	PART №:	Sticker
7	E-8152	SETUP         1. POSITIONING UNIT FOR SETUP:         i. CHECK GROUND SLOPE; CANNOT EXCEED 15".         ii. PULL OUT ALL OUTRIGGERS (IF PRESENT).         iii. STABILZE ALL JACKS.         iv. UNPLUG TRALIER LIGHTS/BRAKES.         v. DISCONNECT HITCH ASSEMBLY FROM VEHICLE BY RAISING FRONT JACKS (LOWER REAR JACKS IF NECESSARY).         vi. UNDO SAFETY CHAINS.         vi. DIDO SAFETY CHAINS.         vi. ADUST JACKS TO MAKE SURE TRAILER IS LEVELED.         2. SOLAR PAMELS SETUP:         i. DISENGAGE SOLAR PANELS BRAKE.         ii. FULLY RAISE AND ROTATE SOLAR PANELS SO IT IS POINTING SOUTH WHEN DEPLOYED (SUGGESTED POSITION).         iii. MAKE SURE SOLAR PANELS POSITION WILL NOT INTERFERE WITH CAMERA MAST.         iv. ENGAGE SOLAR PANELS BRAKE.         3. CAMERA SETUP:         i. USE MANUAL WINCH #1 TO FULLY RAISE CAMERA MAST.         ii. USE MANUAL WINCH #1 TO FULLY RAISE CAMERA MAST.         iii. BUSENGAGES SIGN CASE BRAKE.         vincock PH #1.         iii. LOCATE "SIGN LASE POINTING TOWARDS THE TRAFFIC WITH THE VIEWFINDER.         iv. DISCON RASE SETUP:         vincock PIN #1.         iii. DISENGAGES SIGN CASE BRAKE.         vin LOCK PIN #1.         vincock PIN #1.         vincock PIN #1.         vincock PIN #1.         vin HE SIGN CASE BRAKE.
	E-8153	TAKEDOWN         1. OPEN CONTROL CABINET AND SWITCH MAIN POWER OFF.         2. SIGN CASE TAKEDOWN:         i. UNLOCK PIN #1         ii. LOCATE "SIGN DOWN" SWITCH IN CONTROL CABINET.         iii. LOCATE "SIGN CASE UNTIL AT EYE LEVEL.         iv. DISENGAGE SIGN CASE BRAKE.         v. ALIGN THE SIGN CASE IN TRANSPORT POSITION.         vi. ENGAGE SIGN CASE BRAKE.         vii. FULLY LOWER THE SIGN CASE ON CRADLES.         viii. LOCK PIN #1.         3. CAMERA TAKEDOWN:         i. MAKE SURE SOLAR PANELS WILL NOT INTERFERE WITH
8		CAMERA MAST. ii. USE MANUAL WINCH #1 TO FULLY LOWER CAMERA MAST. 4. SOLAR PANELS TAKEDOWN: i. DISENGAGE SOLAR PANELS BRAKE. ii. ROTATE AND LOWER SOLAR PANELS TO ITS TRANSPORT POSITION. iii. ENGAGE SOLAR PANELS BRAKE. 5. POSITIONING UNIT FOR TRANSPORT i. CONNECT HITCH ASSEMBLY TO VEHICLE BY RAISING FRONT JACKS (LOWER REAR JACKS IF NECESSARY). ii. SECURE SAFETY CHAINS. iii. PLUG TRAILER LIGHTS/BRAKES. iv. BRING JACKS UP IN TRANSPORT POSITION. v. SECURE OUTRIGGERS IN TRANSPORT POSITION. (IF PRESENT).
		Location: Inside the controller box, on door.