Wanco® Arrow Boards

Smart Connected Trailer Models

Owner's Manual

March 2024

WANCO® The industry leader.

Smart Connected Arrow Boards and Wanco Fleet Manager

Wanco Arrow Board Trailers are "connected" models that send data wirelessly to the Wanco Fleet Manager service. Fleet Manager provides remote access to, and remote control of, Wanco traffic safety equipment. It is an optional service that may not be included with your arrow board.

To learn more about connected arrow boards, see page 34.

To learn more about Wanco Fleet Manager or to subscribe, contact Wanco Sales at 1-800-972-0755 or visit wanco.com.

Contents

List of Figures

List of Tables

1 Introduction

1.1 Read before using

This is the operator's manual for Wanco® Folding-Frame Arrow Boards and Wanco Vertical-Mast Arrow Boards. Models with custom options may require additional information that is not provided in this document.

For your safety and protection from injury, carefully read, understand, and observe all instructions in this manual. Always read all instructions before performing a procedure.

Keep a copy of this manual with the arrow board. Additional and replacement manuals are available from the factory (see Section 1.4, "Where to obtain service," page 2).

If you have questions regarding this product, please contact Wanco Service or Sales using the information in Section 1.4.

1.2 Arrow board models

All standard models of Wanco Arrow Board Trailers are covered by this manual. All models are operationally similar. Differences between models are:

- Number of display lights—15 or 25
- Choice of display patterns—7 or 12 (see Figure 1-1, page 2)
- Trailer design—folding frame or vertical mast
- Optional devices and auxiliary equipment

All Wanco Arrow Board Trailers are "connected" arrow boards, or CABs. They send digital alerts to connected systems, notifying drivers of work zone hazards in advance and helping to improve roadway safety. For more about CABs, see Section 4.6, page 34.

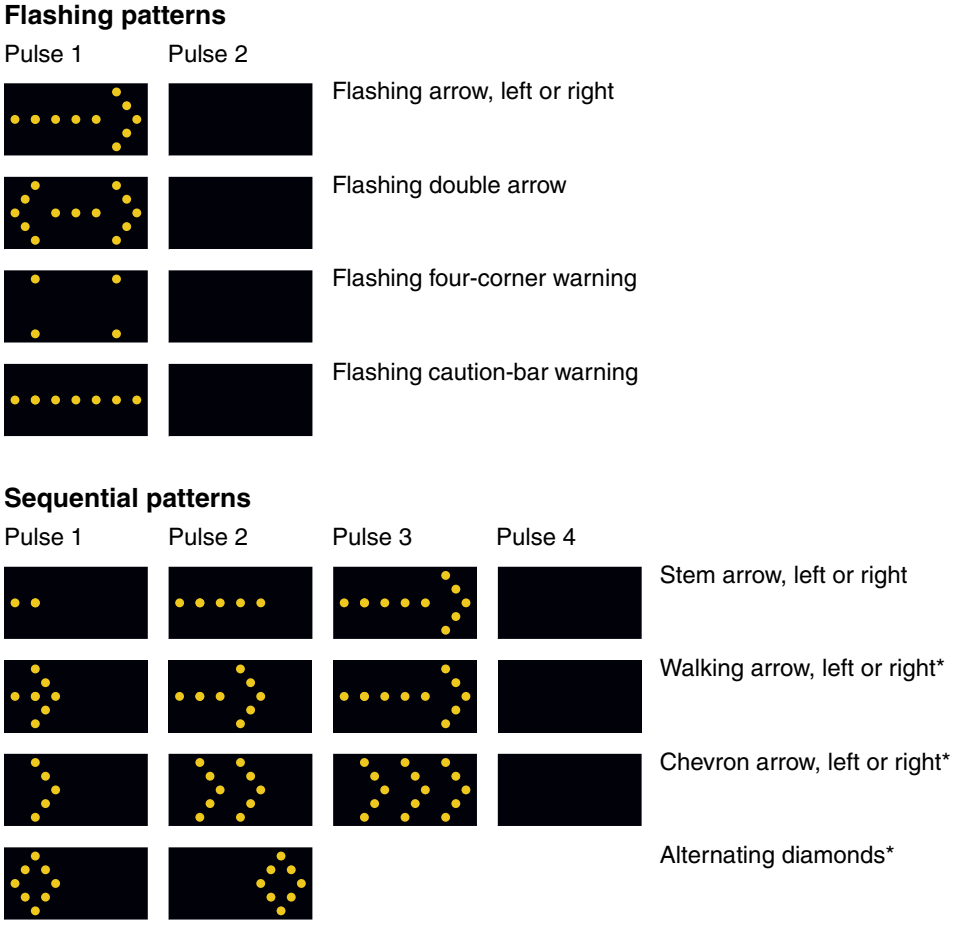
1.3 Applications

Wanco Arrow Boards are widely used for temporary work zones. They feature bright lights that are highly visible and legible from a great distance, and W|ECO® technology, an energy efficient and eco-friendly system that can provide virtually unlimited autonomous operation.

Common applications include:

- Roadwork zones
- Lane, road, and bridge closures
- Public events

Figure 1-1. Display patterns



**Available only on 25-light models*

1.4 Where to obtain service

Before calling for service, please have the unit's model number and VIN ready. This information is displayed on the vehicle identification tag (see Figure 1-2).

Contact our service department using the following information:

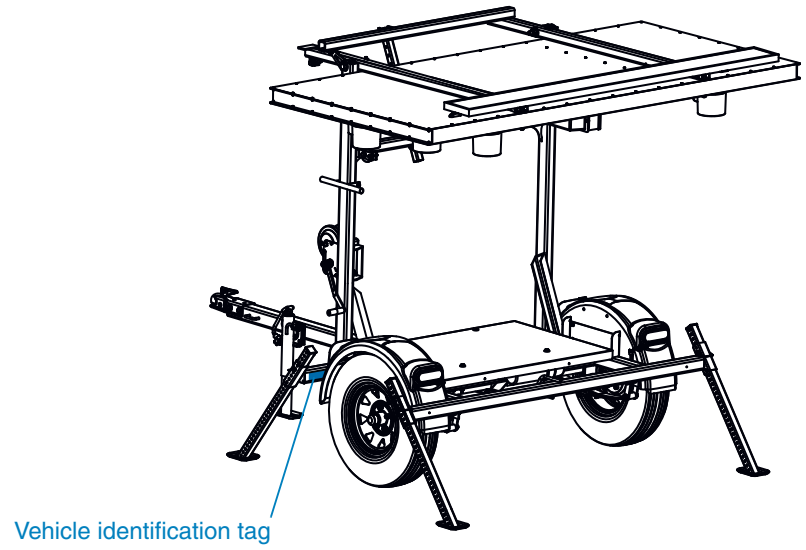
Wanco Inc.
5870 Tennyson Street
Arvada, Colorado 80003 USA

303-427-5700
fax 303-427-5725

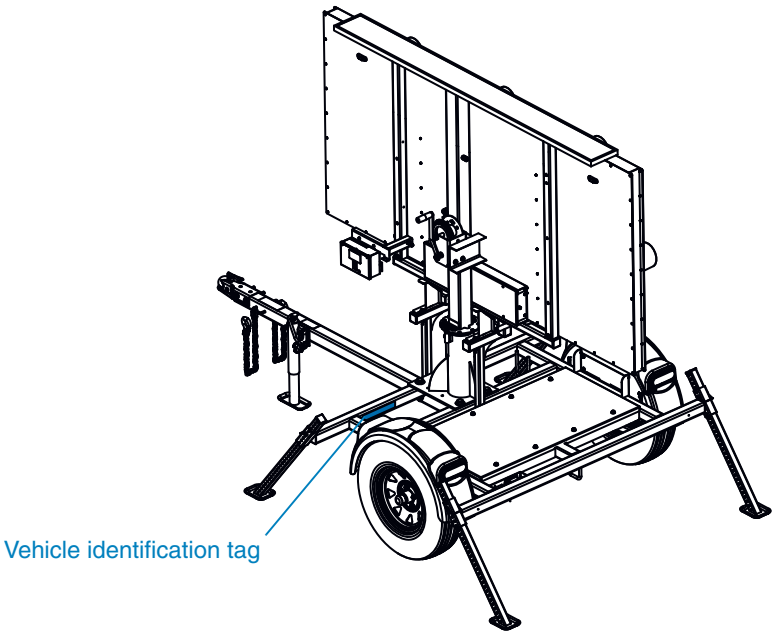
www.wanco.com
info@wanco.com

Figure 1-2. Vehicle identification tag

Folding-frame arrow boards



Vertical-mast arrow boards



2 Safety

2.1 Safety statements in this manual

This manual contains the following types of callouts, which must be followed to reduce the possibility of personal injury, damage to the equipment, or improper service. Each alert has a specific meaning, as described below:

⚠ The safety alert symbol alerts you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER

Indicates an imminently hazardous situation which, if not avoided, WILL result in death or serious injury.

⚠ WARNING

Indicates an imminently hazardous situation which, if not avoided, COULD result in death or serious injury.

⚠ CAUTION

Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.

CAUTION

Used without the safety alert symbol, indicates a potentially hazardous situation which, if not avoided, could result in property damage.

IMPORTANT!

Indicates information that is of particular importance when transporting, operating, or servicing the equipment.

2.2 General safety

⚠ WARNING

Improper use of equipment could cause serious injury or death.

Prior to using this product, carefully read, understand, and observe all instructions in this manual.

⚠ WARNING

Crush hazard.

When operating or working on the equipment, keep hands and body parts clear of pinch points.

2.3 Operating safety

2.3.1 Before using

- To reduce the risk of personal injury, ensure the surrounding area is in good order and free of debris.
- To reduce the risk of shifting, rolling, or overturning, locate the arrow board on a firm, level surface.

⚠ WARNING

Falling equipment could cause serious injury or death.

Before raising the arrow board, stabilize and level the trailer.

- Always stabilize and level the trailer before raising the arrow board display panel.
- Ensure the arrow board is in good operating condition. Never use any equipment that is damaged or in need of repair.

2.3.2 During operation

⚠ WARNING

Improper display could cause a traffic accident resulting in severe injury or death.

Visually inspect arrow board to ensure correct arrow pattern is displayed.

⚠ WARNING

High winds can topple the trailer, resulting in severe injury or death.

Do not deploy arrow board in winds over 60 miles per hour (100 kilometers per hour).

- Always visually inspect the arrow board display to ensure it is operating as expected.
- Always fix or replace lights that are not functioning properly.
- The arrow board is susceptible to wind blowing on the face of the display. The trailer may move or fall in a wind gust of 75 mph (120 km/h), or in sustained winds of 60 mph (100 km/h) or greater.
- Always extend and lock all four stabilizer legs during operation. Legs should be extended far enough to lift the tires off the ground.
- Use industry best practices to prevent the trailer from shifting, rolling, or overturning by using anchors, sandbags, or other added weight.
- Do not stand on the trailer unless all stabilizer legs are extended and locked.
- Do not move the trailer while the arrow board display panel raised.
- Do not allow water to accumulate around the base of the trailer or stabilizer legs.
- When the display panel is raised, verify the snapper pin is engaged (inserted through both the slide-bar and pivot bracket) and locked in position.

2.3.3 Service safety

⚠ DANGER

Explosion hazard.

When charging batteries:

- Do not overcharge.
- Do not use a fleet charger.
- Limit input current to 5 amps maximum.

⚠ WARNING

Fire hazard.

When working with the arrow board batteries, never allow positive wiring to short to ground.

⚠ CAUTION

Adverse weather conditions can result in equipment damage and injury.

Whenever possible, perform maintenance indoors.

- When working with batteries, never allow positive wiring to short to ground.
- Always take precautions to ensure the safety of service personnel. Whenever possible, perform maintenance indoors, out of weather, and away from traffic.
- Never perform any service unless all electrical components are shut down.
- The solar charging system is always active when exposed to daylight. Disconnect battery power and then solar power before servicing electrical components.
- If disconnecting the arrow board battery cables, always disconnect the positive (+) cable first.*
- If the ground under or around the trailer is damp or wet, move the trailer to a dry location and allow it to dry before servicing.
- Do not service the trailer if your clothing or skin is wet.
- Always be aware of traffic when performing roadside maintenance.

**Removing the positive cable first is a requirement for negative-ground systems.*

2.4 California Proposition 65

⚠ WARNING

Batteries and battery components can expose you to lead and lead compounds, which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.

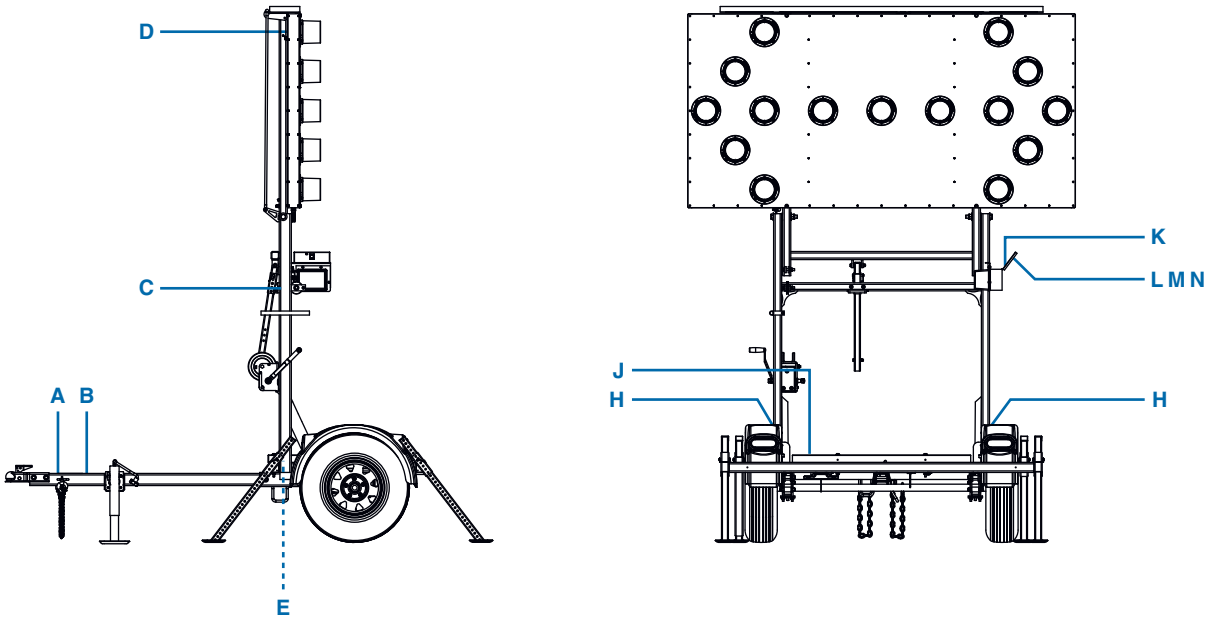
2.5 Labels

Labels provide instructions and information. They also warn of hazards. For convenience and safety, keep all labels in legible condition, replacing them when damaged or missing. Replacement labels are available from the factory.

Label locations are shown in Figure 2-1. Samples of labels and their descriptions are provided in Table 2-1.

Figure 2-1. Label locations

Folding-frame arrow boards



Vertical-mast arrow boards

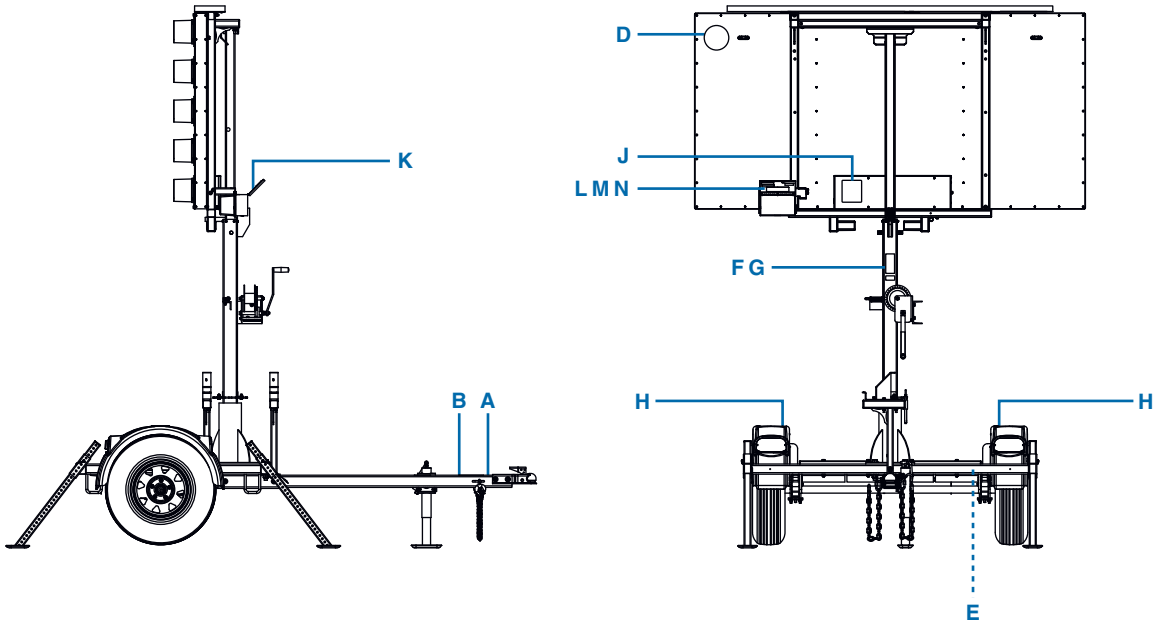
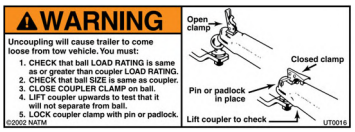
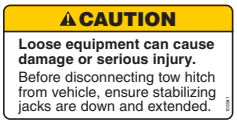
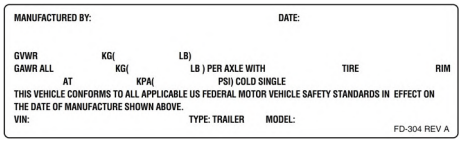
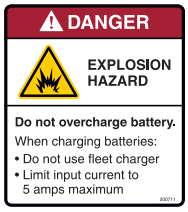


Table 2-1. Label samples and descriptions

Ref.*	Label (not to scale)	Description
A		Warning: towing connection
B		Caution: extend stabilizing jacks
C		Caution: insert locking pin
D		Connected equipment
E		Vehicle identification tag
F		Release locking pin
G		Warning: falling equipment
H		Recommended tire pressure
J		Danger: explosion hazard
K		Warning: visually inspect display

*Reference Figure 2-1 for label location.

Table 2-1. Label samples and descriptions *(continued)*

Ref.*	Label (not to scale)	Description
L		Product support QR code
M		LED arrow board only
N		Unauthorized repair

*Reference Figure 2-1 for label location.

3 Assembly

3.1 Drawbar

Before using your Wanco Arrow Board for the first time, it might be necessary to install the drawbar. The drawbar may be removed before shipment from the factory.

To install the drawbar, follow these steps:

1. The drawbar includes wiring for the trailer lights. Before installing the drawbar, ensure the wiring cable is hanging out of the drawbar, as indicated in Figure 3-1.
2. Refer to Figure 3-2 and install the drawbar and wiring:
   a. Locate the receiving sleeve, centered under the trailer frame.
   b. Carefully insert the cable into the sleeve, followed by the drawbar.
   c. Align the holes in the sleeve and drawbar.
   d. Attach the drawbar to the trailer with two sets of bolts, washers, and nuts. Tighten the nuts fully.
   e. Connect the trailer plug (Figure 3-1) to the receptacle under the trailer frame. Before towing, ensure the trailer brake lights, taillights, and directional/turn indicators are functioning properly.

Figure 3-1. Wiring cable and trailer plug

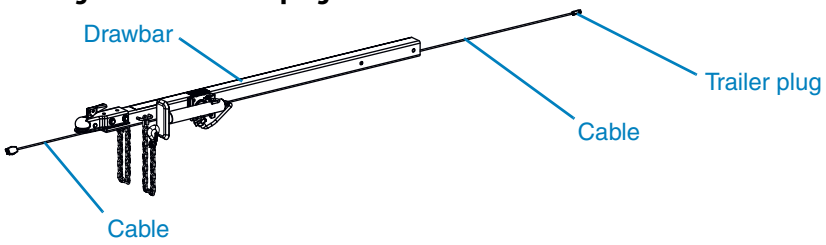
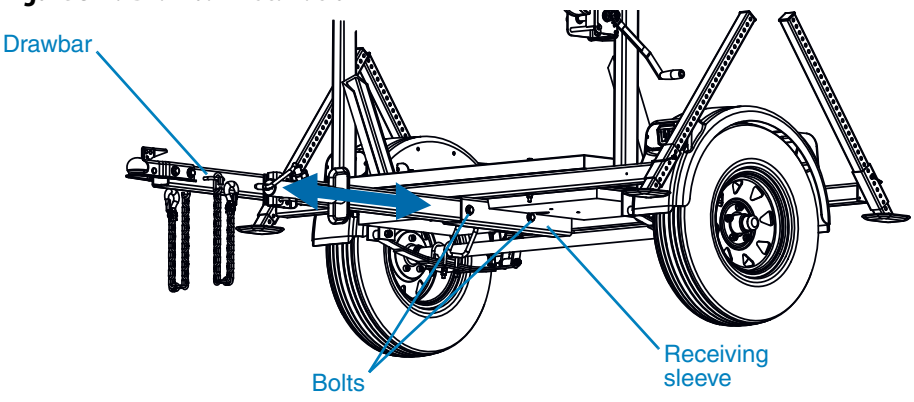


Figure 3-2. Drawbar installation



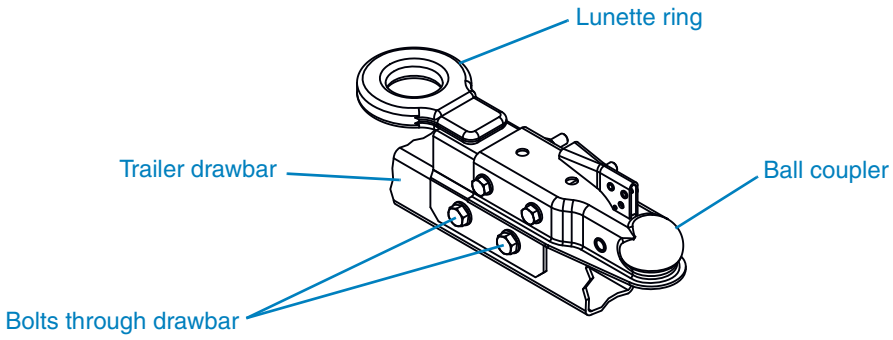
3.2 Optional tow hitch

A reversible combination hitch for a 2-inch-ball and 2½-inch pintle hook is optional.

To reverse the coupler and ring, refer to Figure 3-3 and follow these steps:

1. Remove the lower two bolts that hold the combination hitch to the drawbar.
2. Lift the combination hitch off the drawbar and rotate the hitch end-to-end.
3. Using care not to pinch your fingers, return the hitch to the drawbar and align the bolt holes.
4. Reinstall the bolts and tighten the nuts fully.

Figure 3-3. Combination tow hitch



4 Operation

4.1 Overview

A typical deployment of the Wanco Arrow Board includes the following steps:

1. Towing the trailer to its destination (Section 4.3)
2. Deploying the arrow board, which includes:
   a. Locating the trailer (Section 4.4.1, page 24)
   b. Positioning the trailer (Section 4.4.2, page 24)
   c. Leveling the trailer (Section 4.4.3, page 26)
   d. Setup and configuration (Section 4.4.4, page 28)

4.2 Before using

Before using the arrow board:

- Read and follow all safety instructions. See Section 2, page 5.
- Ensure the arrow board batteries are fully charged. See Section 6.4, page 47.
- Connected arrow boards have additional requirements. See Section 4.6, page 34.

4.3 Towing

4.3.1 Towing two arrow boards

For Wanco Arrow Board Trailers equipped with the optional tandem tow package, you can tow two arrow boards with one tow vehicle.

⚠ WARNING

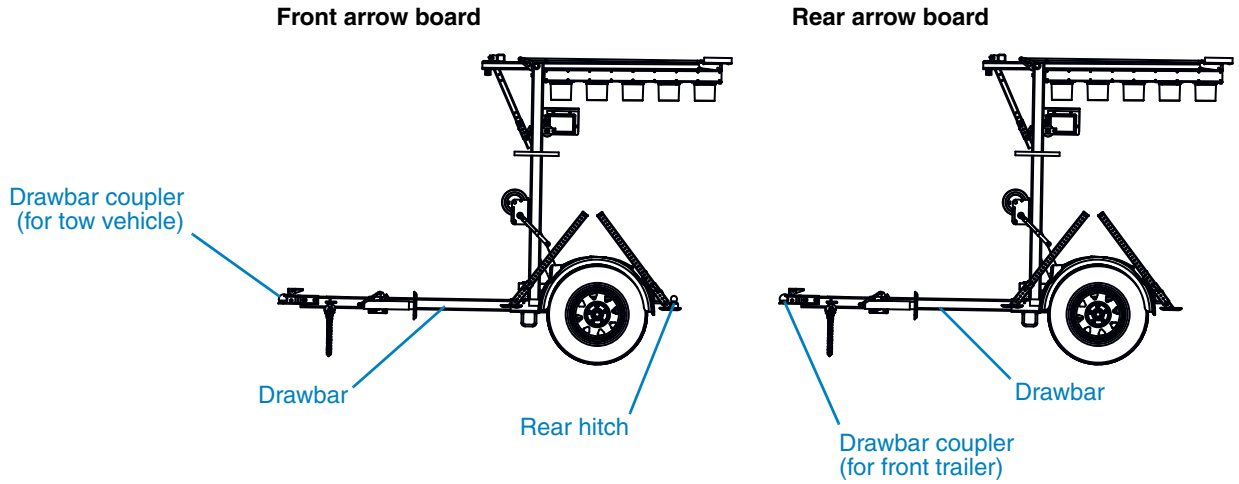
Tandem towing poses risks that could cause a traffic accident, resulting in severe injury or death.

- Read and follow all tandem towing requirements before towing.
- Follow all regulatory requirements for tandem towing.
- When tandem towing, tow only similar trailers. Never tandem tow different equipment.

When tandem towing two Wanco Arrow Board Trailers, refer to Figure 4-1 and follow these requirements:

- The front trailer must have the optional rear tow hitch installed at the back, for hooking up and tandem towing the rear trailer.
- Each trailer uses a full-length drawbar. One drawbar's coupler must be compatible with the tow hitch on the tow vehicle. The other drawbar's coupler must be compatible with the rear hitch on the front trailer.
- Tandem tow only where allowed by local regulations. Many locations do not allow tandem towing.
- Follow the procedure in Section 4.3.2 for both trailers.

Figure 4-1. Tandem towing



4.3.2 Before towing

Before towing, prepare the arrow board as described below.

1. If tandem towing two arrow boards, follow the instructions in Section 4.3.1 before continuing with this procedure. Follow all steps below for both arrow boards.
2. Depending on the trailer model, lower the arrow board display panel into the travel position as follows.

- For a folding-frame trailer, refer to Figure 4-2 and follow these steps:

  a. Remove the snapper pin from the slide-bar and pivot bracket.

  b. Use the hand-operated winch to lower the arrow board display panel to nearly horizontal (travel position).

  c. Reinsert the snapper pin through the pivot bracket and slide-bar, and lock it in place.

- For a vertical-mast trailer, refer to Figure 4-3 and follow these steps:

  d. Pull and hold the height locking-pin to release the mast so that it can be lowered.

⚠ WARNING

Falling equipment could cause severe injury or death.

If height locking-pin is stuck, removing the pin may cause the display panel to fall.

- Do not force pin.
- Contact factory for assistance.

  e. While holding the pin, use the hand-operated winch to start lowering the mast and display panel. As they begin to come down, release the pin.

  f. Lower the mast until the bottom edge of the display panel is within easy reach. Do not lower it all the way yet.

  g. Pull the rotation locking-pin to release the mast so that it can be turned.

⚠ WARNING

Loose equipment can cause severe injury.

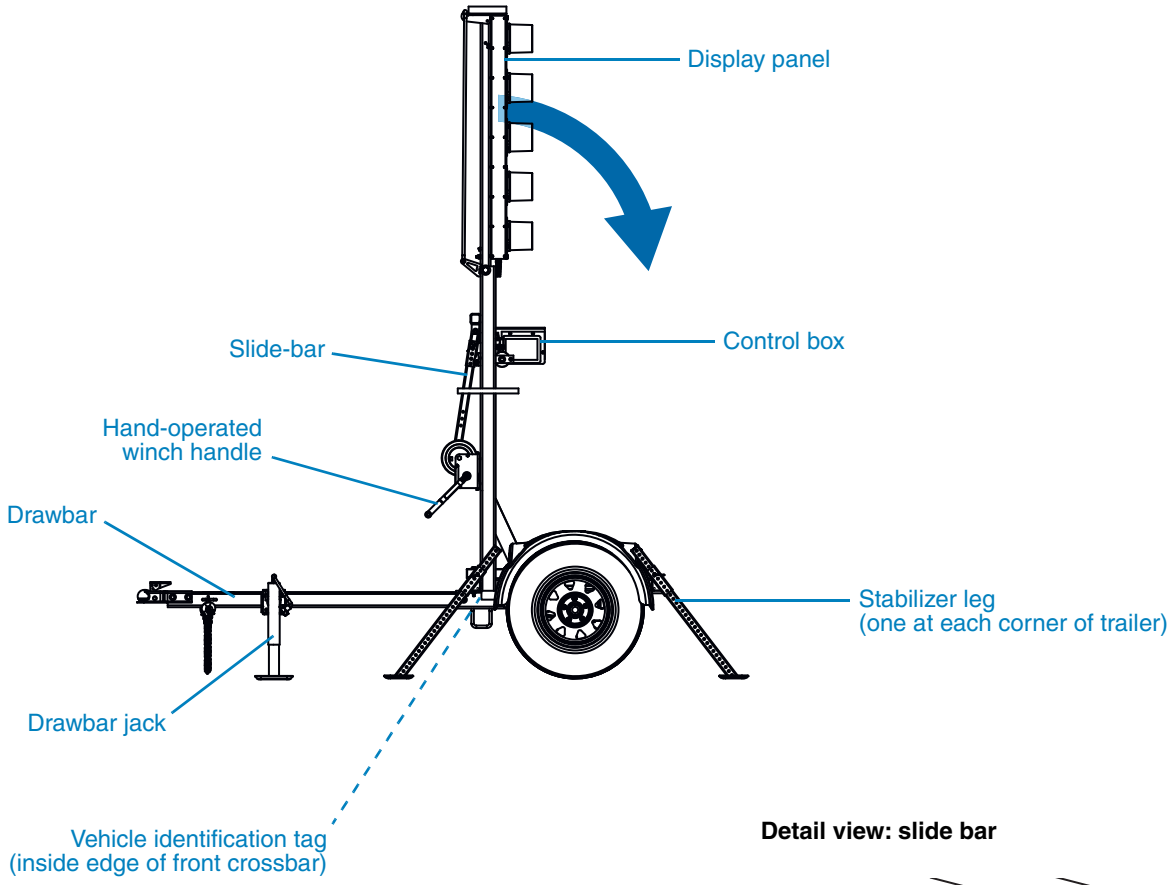
Ensure wind does not catch and unexpectedly rotate unlocked display panel.

  h. Rotate the panel so that the support legs are over the travel cradles.

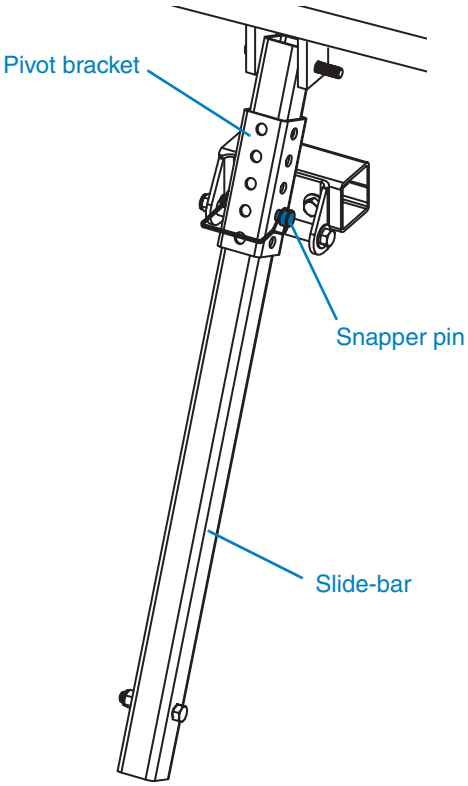
  i. Use the winch to lower the panel support legs into the travel cradles. When the panel is lowered all the way, the height locking-pin snaps into place with an audible “click,” locking the panel in the down position.

  j. Reinsert the rotation locking-pin.

Figure 4-2. Before towing: folding-frame trailers



Detail view: slide bar



Detail view: stabilizer leg

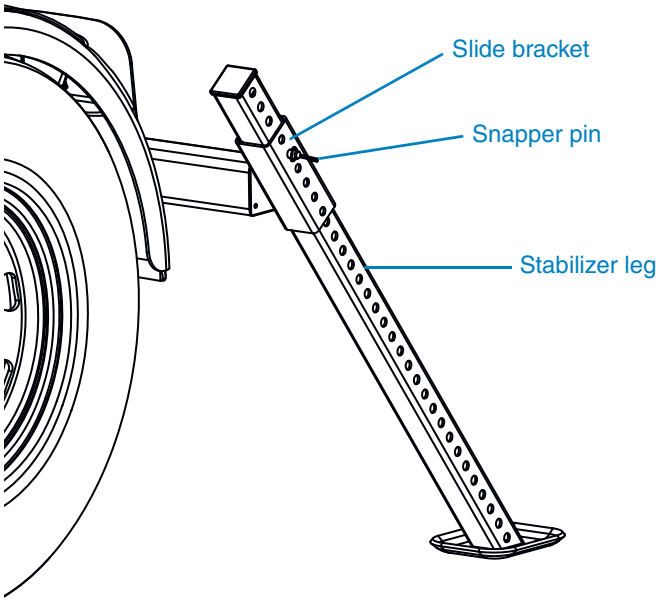
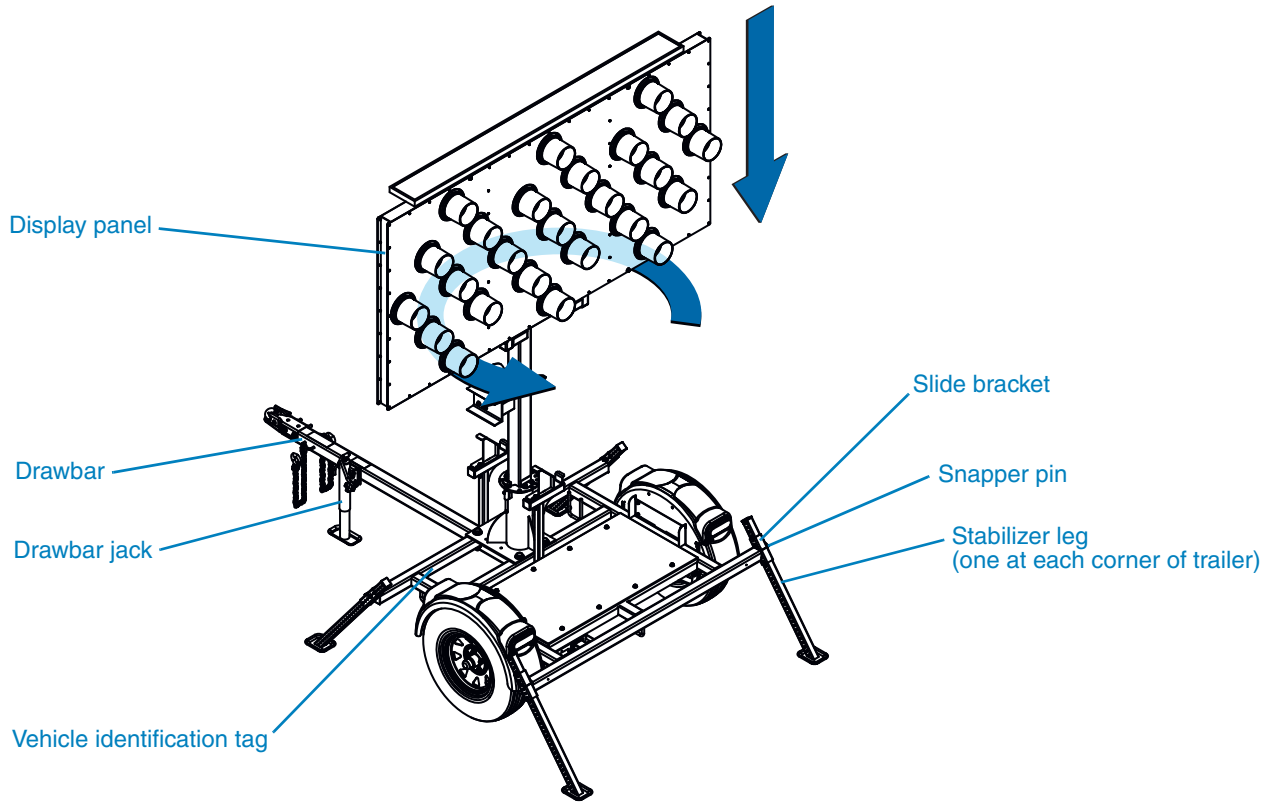
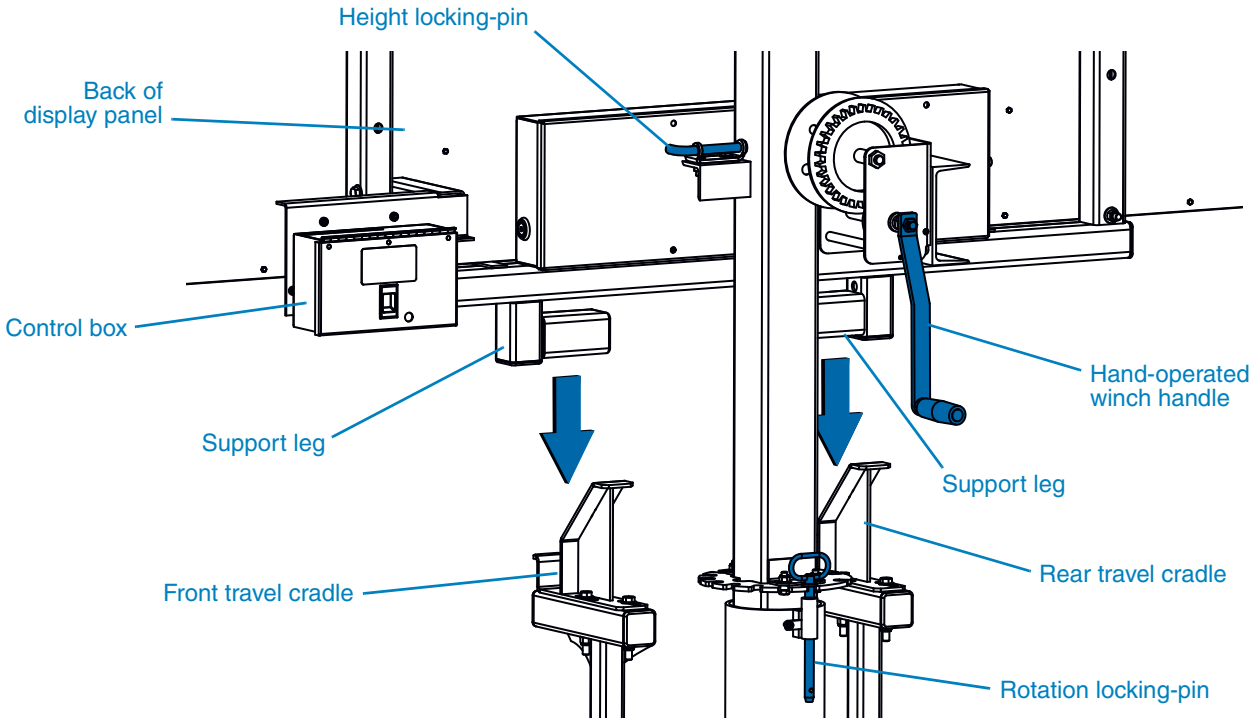


Figure 4-3. Before towing: vertical-mast trailers



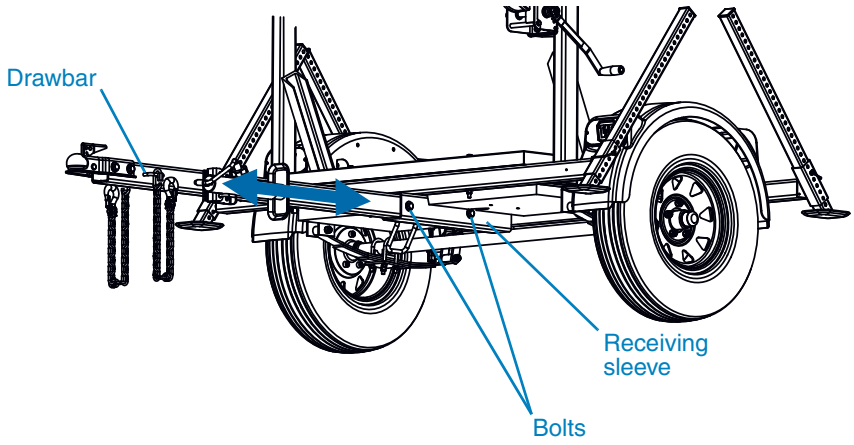
Detail view: locking pins and winch



3. Access the control panel inside the control box and toggle the display switch to the off (O) position.
4. Close and latch the control box cover.
5. Check tires, wheels, and axle lock:
    a. Check tires for wear. Replace worn tires.
    b. Ensure tires are inflated to the proper pressure.
    c. Verify all wheel lugs are in place and tightened. Do not tow the trailer if a wheel lug is missing.
6. Check the drawbar and tow hitch:
    a. Ensure the tow hitch and coupling on the tow vehicle are rated for weight equal to or greater than the trailer's gross vehicle weight rating (GVWR). The GVWR is listed on the arrow board trailer vehicle identification tag (depending on the trailer model, see Figure 4-2 or Figure 4-3).

        If towing two arrow boards with one tow vehicle, ensure the tow hitch on the tow vehicle is rated for weight equal to or greater than double the arrow board's GVWR.
    b. Ensure the tow hitch on the tow vehicle and the drawbar hitch on the arrow board trailer are compatible.
    c. Inspect the tow hitch and coupling for wear and damage. Replace or repair if necessary.
    d. Ensure the trailer's detachable drawbar is attached securely to the trailer frame with two sets of bolts and nuts (see Figure 4-4). The bolts should engage the drawbar and the nuts should be tight. (For drawbar installation instructions, see Section 3.1, page 13.)

Figure 4-4. Drawbar installation



7. Depending on the trailer model, raise the stabilizer legs or leveling jacks as follows.

■ For a trailer with stabilizer legs, refer to Figure 4-2 or Figure 4-3, and follow these steps:

   a. Remove any anchors, sandbags, or other added weight from the stabilizer legs.

   b. Lower the drawbar jack by pulling the jack locking pin and rotating the jack downward. Use the hand-crank to lower the jack foot until it touches the ground, then lower it a little more to raise the two front stabilizer legs (at the front corners of the trailer) just off the ground.

   c. Using care not to pinch your fingers, raise and secure both front stabilizer legs. To raise a stabilizer leg, remove its snapper pin and slide the leg upward. Align the holes in the leg with the holes in the slide bracket, then reinsert the snapper pin and lock it in place.

   d. Use the drawbar jack to lower the front of the trailer until the two rear stabilizer legs (at the rear corners of the trailer) are just off the ground, then raise and secure both rear stabilizer legs.

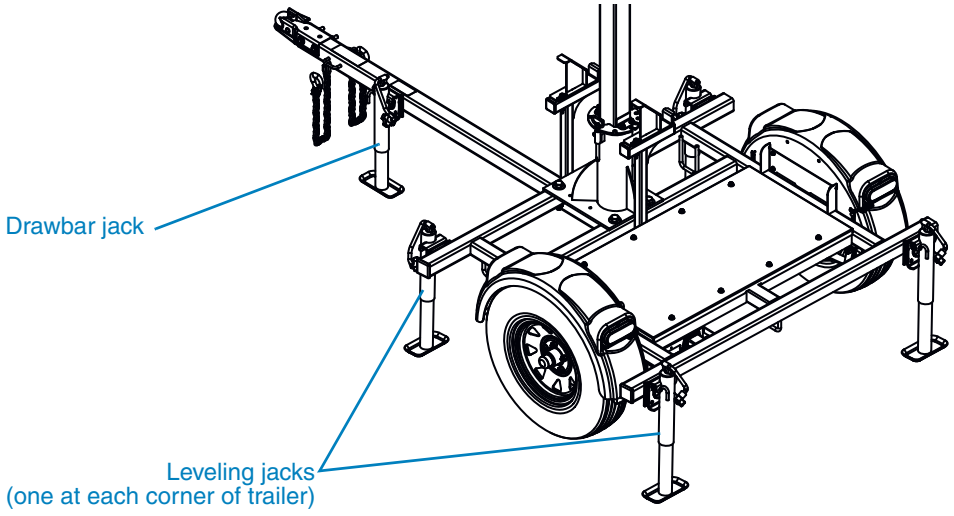
■ For a trailer with leveling jacks, refer to Figure 4-5 and follow these steps:

   a. Remove any anchors, sandbags, or other added weight from the leveling jacks.

   b. Lower the drawbar jack into the down position by pulling the jack locking pin and rotating the jack downward. Release the pin and continue rotating the jack until it is vertical. When the jack is properly set, the locking pin snaps into position with an audible "click." Use the hand-crank on the jack to lower the jack foot to the ground.

   c. Raise and secure the trailer's four corner leveling jacks in the up position. To raise the jacks, use the hand-crank on each jack to raise the jack foot off the ground, then pull the jack locking pin and rotate the jack upward. Release the pin and continue rotating the jack until it is horizontal and the pin re-engages with an audible "click."

Figure 4-5. Leveling jacks



8. Couple the trailer and tow vehicle:

    a. Use the drawbar jack to raise the front of the trailer and set the drawbar hitch on the tow vehicle hitch. Ensure the coupling is properly engaged and locked.

    b. Ensure the drawbar is within five degrees (±5°) of parallel with the ground. A greater angle will change the tongue weight and may cause the trailer to whip or sway while towing.

    c. If tandem towing two arrow boards, ensure their tow hitches are compatible, then follow the same steps to set the rear arrow board's drawbar hitch on the tow hitch at the rear of the front arrow board.

    d. Raise, rotate, and lock the drawbar-mounted jack in the up position.

    e. Verify approved safety chains are attached properly to both the trailer and tow vehicle, as illustrated in Figure 4-6. The chains should cross underneath the tow hitch.

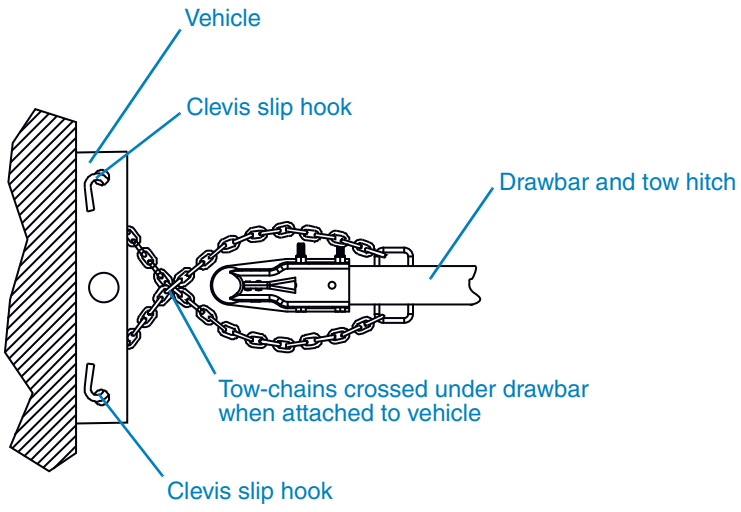
    If towing two arrow boards, you must also use safety chains between the trailers. Verify they are attached properly to both trailers and that they cross under the rear tow hitch.

9. Ensure the trailer brake lights, taillights, and directional/turn indicators are hooked up and functioning properly.

10. Remove blocks or chocks from wheels, if present.

11. Follow the towing requirements in Section 4.3.3.

Figure 4-6. Tow-chain hook-up



4.3.3 During towing

- Do not tow the trailer with any people, parts, supplies, or additional equipment attached to the trailer or loaded onto it.
- Do not tow additional trailers or other equipment in tandem with the arrow board. For towing two arrow board trailers, see Section 4.3.1, page 16.
- The recommended maximum speed for highway towing is 65 mph (105 km/h). For off-road towing, the recommended maximum speed is 15 mph (25 km/h) or less, depending on terrain.
- Adhere to applicable transportation department regulations when towing the trailer.
- If whipping or swaying occurs, do not attempt to correct it by turning the steering wheel, do not apply the brakes, and DO NOT speed up. Instead, release the gas pedal and hold the steering wheel in a straight-ahead position until the whipping or swaying stops. Whipping and swaying can be caused by excessive speed, crosswinds, and many other conditions.

4.3.4 After towing

After tandem towing two arrow boards

Detach the rear arrow board from the front arrow board:

1. Unhook the tow chains and taillight plug from the back of the front arrow board
2. Use the rear arrow board's drawbar-mounted jack to raise the drawbar and release the drawbar hitch from the front arrow board.
3. Pull the vehicle and front arrow board away from the rear arrow board when ready.

After towing a single arrow board

Detach the arrow board from the tow vehicle:

1. Unhook the tow chains and taillight plug from the tow vehicle.
2. Use the drawbar-mounted jack to raise the drawbar and release the drawbar hitch from the tow vehicle.
3. Pull the vehicle away from the arrow board when ready.

Remove drawbar

The drawbar may be removed from the trailer if desired:

- Before removing the drawbar, locate and level the trailer as instructed in Section 4.4. It may be difficult to position and level the trailer without the drawbar.
- To remove the drawbar, disconnect the trailer taillight plug from underneath the trailer, loosen and remove the two bolts that connect the drawbar to the trailer, then remove the drawbar by sliding it forward.
- To prevent the nuts and bolts from becoming lost, insert the bolts into the holes on the trailer and secure them in place with the nuts.

4.4 Deployment

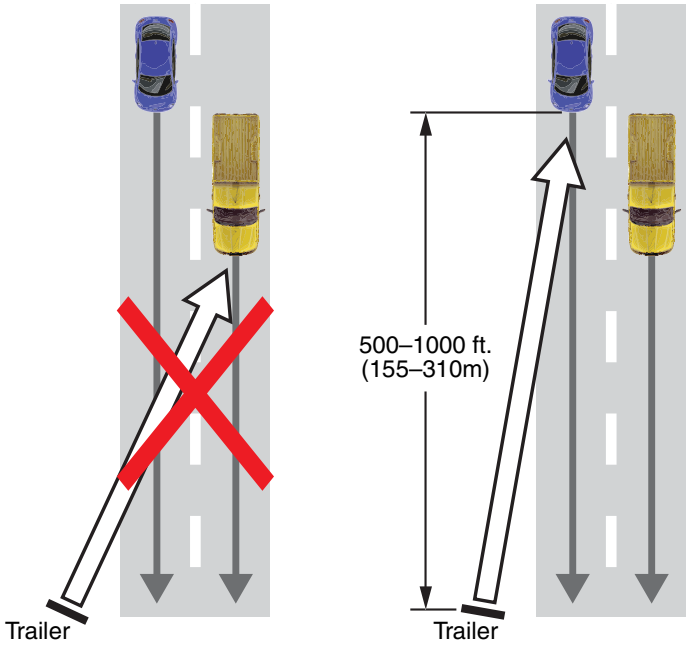
4.4.1 Locating the trailer

- When deployed, the arrow board display panel rises to a height of 11 feet (3.4 meters). When choosing a location, ensure the area above the trailer is clear of overhead wires and other obstructions.
- To reduce the risk of shifting, rolling, or overturning, locate the arrow board trailer on a firm, level surface.
- Depending on vehicle speed, optimal positioning provides a line-of-sight from 500 to 1000 feet (155 to 310 meters), which allows ample time for drivers to view the arrow board and change lanes.
- Fog, rain, snow, and blowing dust can reduce the viewing distance from drivers to the arrow board. Allow for possible weather conditions when selecting a location.
- For the arrow board's solar charging system to function properly, locate the trailer where it will be exposed to full sunlight during daylight hours.
  - ☐ The solar panel is significantly affected by shadows. Avoid locating the trailer where the sun will be obstructed, such as under a tree or in the shadow of a building.
  - ☐ Ensure the solar panel is clean (see Section 6.3, page 46).

4.4.2 Positioning the trailer

- Position the arrow board so the rear of the trailer faces oncoming traffic.
- For a folding-frame arrow board, if the arrow board is positioned on the roadway shoulder, angle the trailer slightly toward the roadway, as illustrated in Figure 4-7.
  - ☐ Too great an angle creates a short viewing distance, and does not allow drivers enough time to see the arrow board display.
  - ☐ A slight angle provides a long viewing distance, and gives drivers plenty of time to see the arrow board display.
  - ☐ Look toward traffic through the sight-tube (Figure 4-8) and angle the trailer appropriately. Do not put your eye up against the sight-tube.
- For a vertical-mast arrow board, the angle of the display panel rotates and can be adjusted later in the deployment procedure, during arrow board setup.

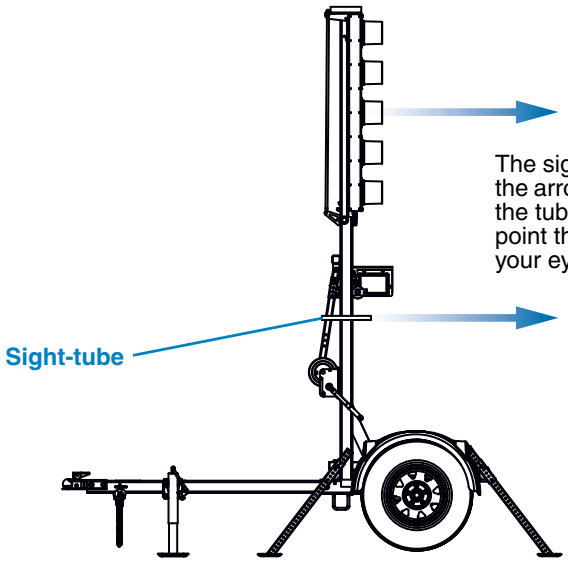
Figure 4-7. Positioning a trailer on the shoulder



Incorrect Positioning
Angled too greatly toward the roadway, motorists have a short viewing distance.

Proper Positioning
Angled slightly toward the roadway, motorists have a long viewing distance.

Figure 4-8. Sight-tube on folding-frame models



The sight-tube points the same direction as the arrow board display panel. Look through the tube and adjust the trailer position to point the display toward traffic. Do not put your eye up against the sight-tube.

4.4.3 Leveling the trailer

Prior to raising the arrow board display panel, the trailer must be level.

⚠ WARNING

Falling equipment could cause serious injury or death.

Before raising the arrow board, stabilize and level the trailer.

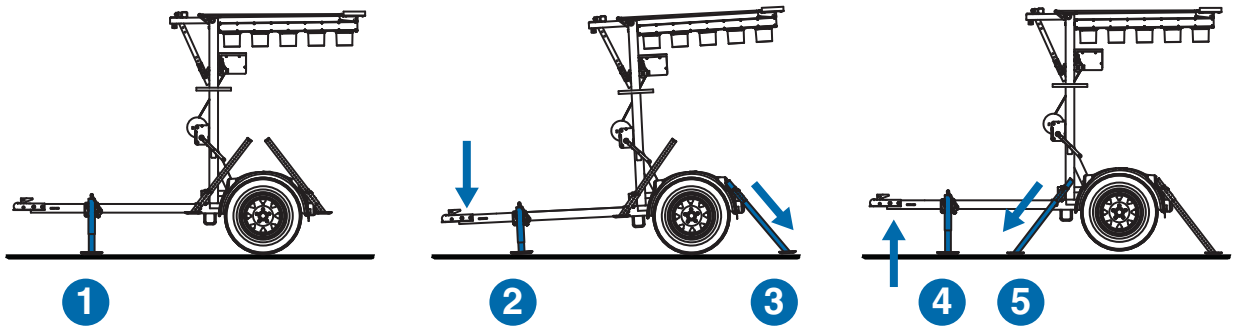
When leveling the trailer, it may be necessary to make adjustments to account for variations in grade under the trailer. For example, the ground under the trailer may not be level. It is important for the trailer to be level before raising the display panel to its full height. If the trailer is not level, it could topple.

Trailer with stabilizer legs

To level a trailer with stabilizer legs, refer to Figure 4-9 and follow these steps:

1. Lower the drawbar jack by pulling the jack locking pin and rotating the jack downward. Use the hand-crank to lower the jack foot until the trailer is level. At this stage, the trailer should be balanced on the tires and drawbar jack.
2. Use the drawbar jack to lower the drawbar toward the ground, until the trailer tilts forward slightly.
3. Using care not to pinch your fingers, lower the two rear stabilizer legs (at the rear corners of the trailer) until they touch the ground. To lower a stabilizer leg, remove its snapper pin and slide the stabilizer downward. Align the holes in the stabilizer with the holes in its slide bracket, then reinsert the snapper pin and lock it in place.
4. Use the drawbar jack to raise the drawbar until the trailer is level. At this stage, the trailer should be balanced on the rear stabilizers and the drawbar jack, and the tires should be off the ground.
5. Using care not to pinch your fingers, lower the two front stabilizer legs (at the front corners of the trailer) until they touch the ground, then lock them in place with their snapper pins. For each stabilizer leg, align the holes in the stabilizer with the holes in the slide bracket, then reinsert the snapper pin and lock it in place.

Figure 4-9. Leveling a trailer with stabilizer legs

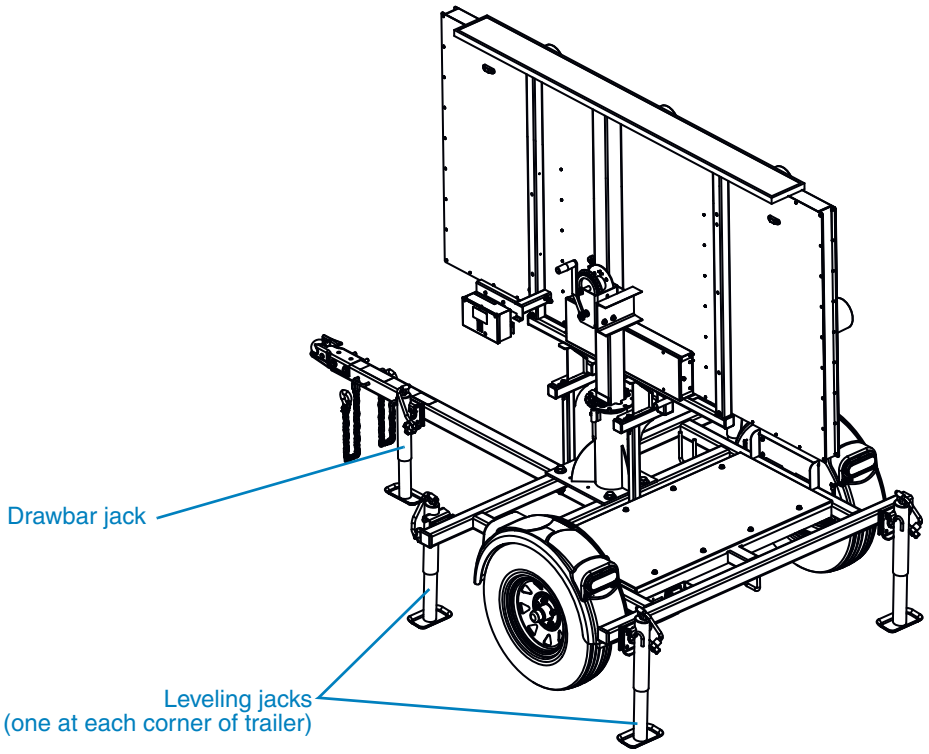


Trailer with leveling jacks

To level a trailer with leveling jacks, refer to Figure 4-10 and follow these steps:

1. For each of the four leveling jacks at the corners of the trailer, pull the jack locking pin and rotate the jack downward. Release the pin and continue rotating the jack until it is vertical. When the jack is properly set, the locking pin snaps into position with an audible "click."
2. Determine which corner of the trailer is highest, and extend the jack foot on that corner downward until it rests firmly on the ground. Then, level the trailer with the remaining three corner jacks.
3. For added stability, extend the drawbar jack to the ground.

Figure 4-10. Leveling jacks



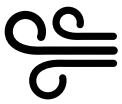
4.4.4 Setting up the arrow board

After positioning and leveling the trailer (Sections 4.4.2 and 4.4.3), set up the arrow board by following these steps:

⚠ WARNING

Falling equipment could cause severe injury or death.

Before raising display cabinet, stabilize and level the trailer.



⚠ WARNING

High winds can topple the trailer, resulting in severe injury or death.

Do not deploy trailer in winds over 60 miles per hour (100 kilometers per hour).

1. Use industry best practices to prevent the trailer from shifting, rolling, or overturning by using anchors, sandbags, or other added weight.
2. Depending on the trailer model, raise the arrow board display panel as follows.

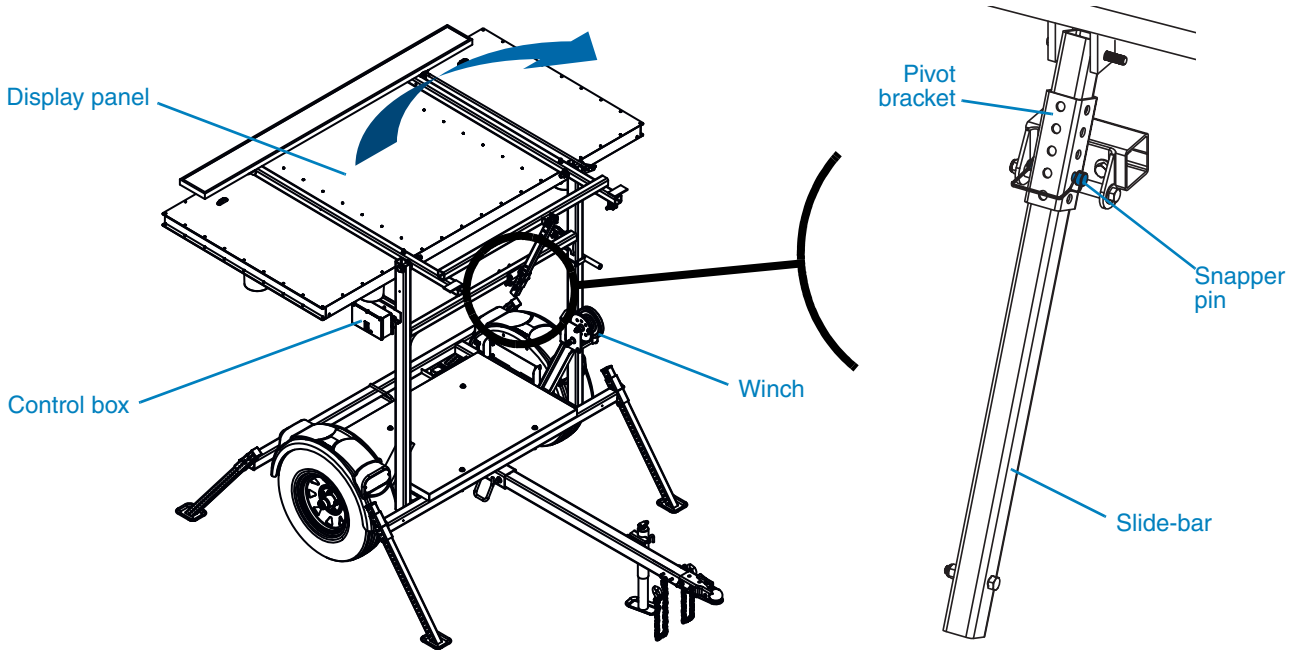
■ For a folding-frame arrow board, refer to Figure 4-11 and follow these steps:

a. Remove the snapper pin from the slide-bar and pivot bracket.

b. Use the hand-operated winch to raise the frame to the vertical (deployed) position.

c. Reinsert the snapper pin through the pivot bracket and slide-bar, and lock them in place.

Figure 4-11. Pivot bracket and slide bar



- For a vertical-mast arrow board, refer to Figure 4-12 and follow these steps:

  d. Pull the height locking-pin to release the display panel so it can be raised. While holding the pin, use the hand-operated winch to start raising the panel. As it begins to rise, release the pin.

  e. Raise the panel until the support legs are clear of the travel cradles. Do not raise it all the way yet.

  f. Remove the rotation locking-pin to release the mast so the panel can be turned.

> **⚠ WARNING**
>
> **Loose equipment can cause severe injury.**
>
> Ensure wind does not catch and unexpectedly rotate unlocked display panel.

  g. Rotate the display panel clockwise, so that the front of the panel faces oncoming traffic (see Figure 4-13).

  h. Look toward traffic through the sight-tube (see Figure 4-14) and point the display panel toward traffic.

  - Do not put your eye up against the sight-tube.
  - If the arrow board is positioned on the roadway shoulder, angle the display slightly toward the roadway, as illustrated in Figure 4-15.

  i. Insert the rotation locking-pin to lock the display panel rotation.

Figure 4-12. Locking pins and support legs

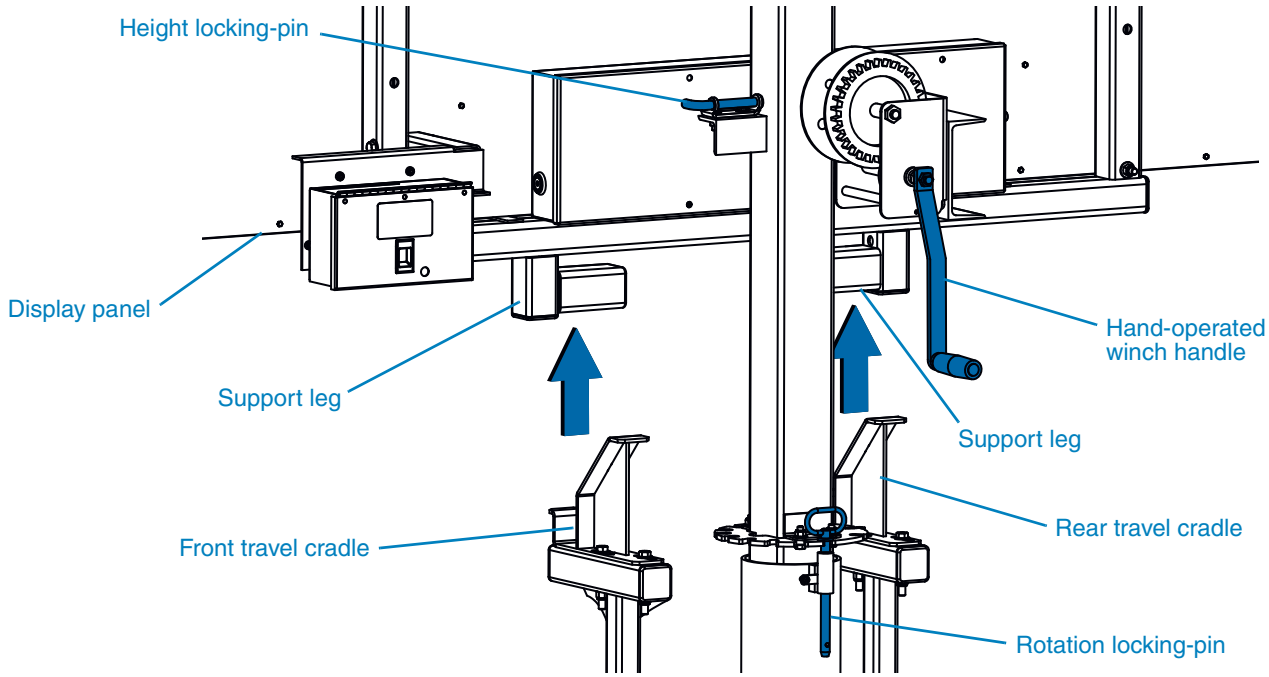


Figure 4-13. Raise and rotate display

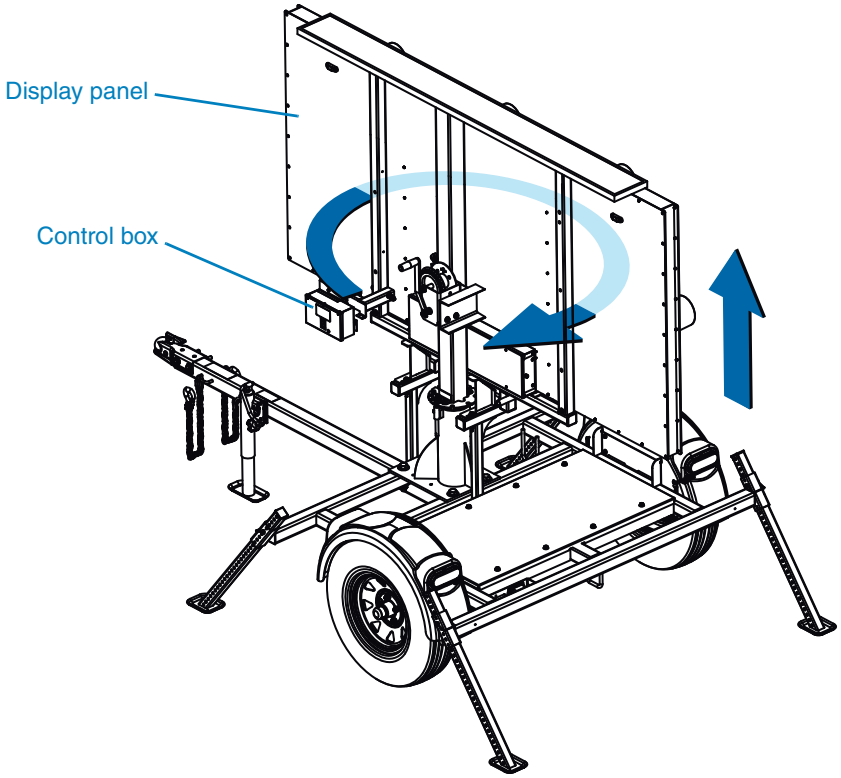
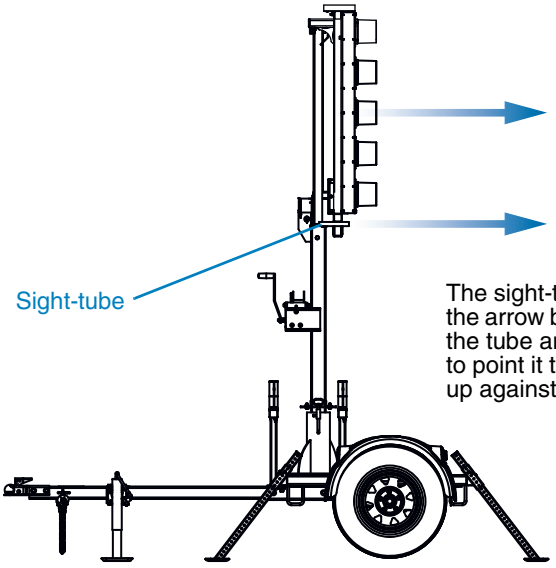
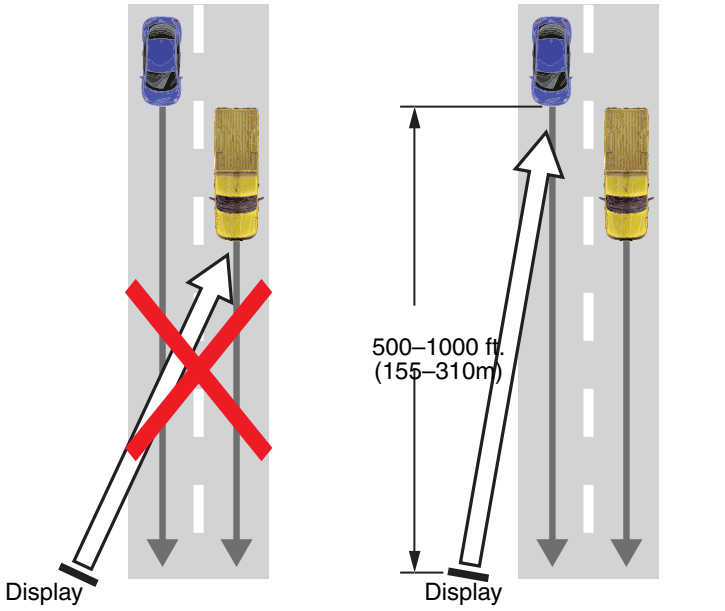


Figure 4-14. Sight-tube on vertical-mast models



The sight-tube points the same direction as the arrow board display panel. Look through the tube and adjust the display panel angle to point it toward traffic. Do not put your eye up against the sight-tube.

Figure 4-15. Angling a vertical-mast display panel on the shoulder



Incorrect Positioning
Angled too greatly toward the roadway, motorists have a short viewing distance.

Proper Positioning
Angled slightly toward the roadway, motorists have a long viewing distance.

3. Set the display pattern and toggle power on (see Section 4.5, page 32):
   a. Access the control panel inside the control box.
   b. Set the desired pattern using the rotary switch.
   c. Toggle the display switch to on (▮).
4. Visually inspect the arrow board display panel to ensure the correct arrow pattern is displayed.

⚠ WARNING

Improper display could cause a traffic accident resulting in severe injury or death.

Visually inspect arrow board to ensure correct arrow pattern is displayed.

5. If the display pattern is correct, close and latch the control box cover. If the display pattern is incorrect, repeat Steps 3 and 4. Contact the factory if a display problem continues (see Section 1.4, "Where to obtain service," page 2).
6. For a vertical-mast arrow board, raise the cabinet all the way up. When raised to its full height, the height locking-pin snaps into place with an audible "click," locking the cabinet in the up position.
7. Observe safety precautions (see Section 2, page 5).

4.5 Control panel

The arrow board control panel is located inside a control box—on the right side of a folding-frame trailer; behind the display panel on a vertical-mast arrow board.

The control box cover is hinged at the top and has a sliding latch. To open the cover, slide the latch up and lift the cover.

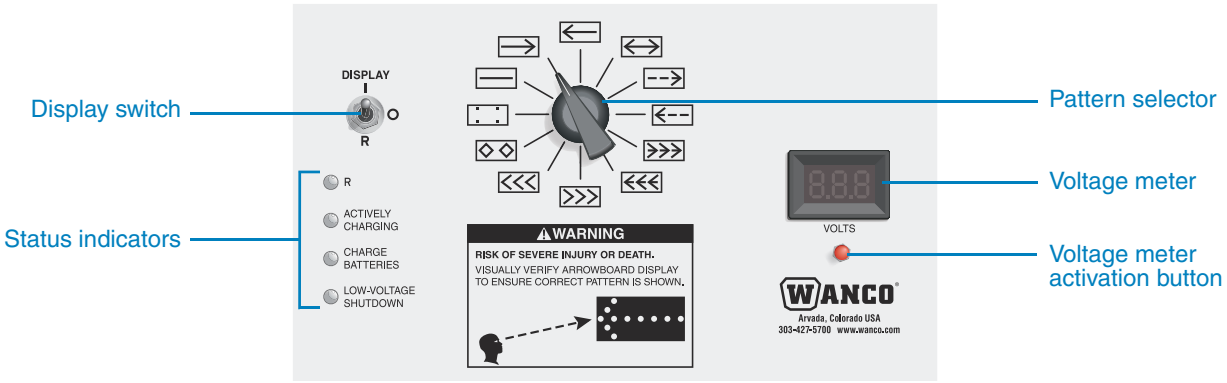
The control panel (Figure 4-16) includes:

- A toggle switch for turning the arrow board display on or off
- LED status indicators for various operating conditions
- A rotary switch for selecting the arrow board display pattern
- A voltage meter and activation button for viewing the battery charge level

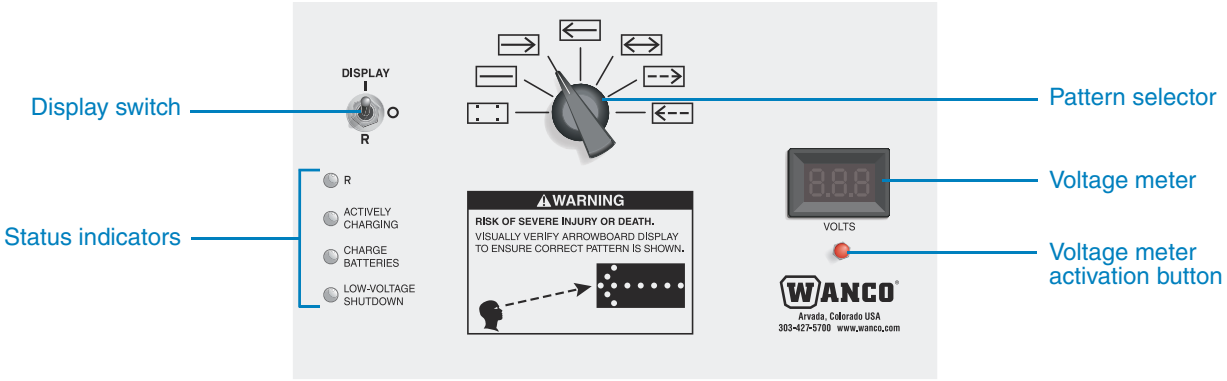
After using the control panel, ensure the control panel cover is closed and latched.

Figure 4-16. Control panels

25-light controller: 12 display patterns



15-light controller: 7 display patterns



4.5.1 Display switch

The display toggle switch has three positions:

- In the up or on (**I**) position, the arrow board display has power and shows the selected display pattern.
- In the center or off (**O**) position, the arrow board display is blank.
- In the down or reserved (**R**) position, the arrow board display is blank and can be controlled remotely (with limited functionality) using Wanco Fleet Manager. For more information, see Section 4.6.4, page 34.

After setting the switch to on or reserved, always visually inspect the arrow board display panel to ensure the correct arrow pattern is displayed.

⚠ WARNING

Improper display could cause a traffic accident resulting in severe injury or death.

Visually inspect arrow board to ensure correct arrow pattern is displayed.

4.5.2 Pattern selector

To choose a display pattern for the arrow board, rotate the pattern selector switch to the desired pattern. For examples of all available patterns, see Figure 1-1, page 2.

You should always visually inspect the arrow board after selecting a pattern.

Regardless of the selected pattern, the display will be blank when the display switch is set to off (**O**) or reserved (**R**).

4.5.3 Status LEDs

Status LEDs on the control panel indicate a variety of operating conditions:

R	Blue LED indicates the arrow board is in a reserved operating mode with Fleet Manager control enabled (see Section 4.6.4, page 34)
ACTIVELY CHARGING	Yellow LED indicates solar charging system is actively charging the arrow board batteries
CHARGE BATTERIES	Red LED indicates battery charge is low and batteries must be charged immediately to prevent automatic shutdown
LOW-VOLTAGE SHUTDOWN	Red LED indicates the low-voltage-disconnect circuit detected low battery voltage and automatically shut down system power

4.5.4 Voltage meter

The voltage meter displays the voltage level of the battery bank. The voltage meter is typically a reference tool and is used for diagnostics.

To activate the voltage meter, press and hold the activation button.

4.6 Connected arrow boards

4.6.1 Overview

A “connected” arrow board sends data wirelessly to the cloud, in real time and without human interaction. The data may be shared among other connected devices, such as satellite navigation systems on smartphones and in cars and trucks. The primary purpose is to improve work zone safety.

For example, just as an arrow board might direct motorists to merge by displaying a flashing arrow, a connected arrow board may provide the same information wirelessly to a vehicle’s navigation system, alerting the driver to slow down and move over.

Wanco Connected Arrow Boards communicate information about their status, including the arrow board location, the pattern being displayed, the compass bearing of the display, and more.

Many transportation departments require the use of connected arrow boards on all interstate and state highway projects.

To learn more, visit the U.S. Department of Transportation website for Work Zone Data Exchange (WZDx).

4.6.2 What you should know

- All new trailer-mounted Wanco arrow boards are connected. Other models, such as skid- and truck-mounted models may also be connected.
- Wanco provides a retrofit kit for converting older arrow boards to become connected, so some older models may also be connected.
- Connectivity uses a wireless, cellular connection. As with a mobile phone, signal strength can vary depending on the arrow board location, weather conditions, and many other factors.
- As long as the arrow board has power, it is always sending data to the cloud.

4.6.3 What you should do

There are two actions you should take to ensure proper effectiveness of a Wanco Connected Arrow Board:

- Blank the arrow board display when it is not in use. On the control panel, toggle the display switch to the off (**O**) position.
- Calibrate the compass if needed. See Section 6.6, page 53.

4.6.4 Wanco Fleet Manager

Wanco Fleet Manager is a fleet tracking and management service that provides remote access to, and remote control of, Wanco traffic safety equipment. It is an optional service that may not be included with your arrow board.

Fleet Manager provides status information for connected arrow boards and may also allow limited remote control of the arrow board display. For more information, contact Wanco Sales or Service (see Section 1.4, page 2).

5 Troubleshooting

5.1 Before troubleshooting

Before performing any troubleshooting or servicing on the arrow board, observe all safety precautions in Section 2, page 5.

5.2 Status LEDs

Status LEDs on the control panel indicate a variety of operating conditions:

R	Blue LED indicates arrow board is in a reserved operating mode and Wanco Fleet Manager control is enabled (see Section 4.6.4, page 34) In reserved mode, the arrow board display is blank unless a pattern is set remotely from Fleet Manager
ACTIVELY CHARGING	Yellow LED indicates solar charging system is actively charging the arrow board batteries (see Section 5.3.2, page 36)
CHARGE BATTERIES	Red LED indicates battery charge is low, and batteries must be charged immediately to prevent automatic shutdown (see Section 5.3.3, page 36)
LOW-VOLTAGE SHUTDOWN	Red LED indicates the low-voltage-disconnect circuit detected low battery voltage and automatically shut down system power (see Section 5.3.7, page 42)

5.3 Power system

5.3.1 Overview

The arrow board is powered by batteries, which are charged using a solar panel and automated charging system. The default system uses maintenance-free 12-volt VRLA batteries. No regular maintenance is necessary for the batteries to function properly and for long battery life.

The charging system runs continuously, keeping the batteries charged. The system automatically detects when the batteries are fully charged and will not overcharge them. The batteries are fully charged when their voltage is 13.0 volts.

Under optimal conditions, the batteries will remain charged and the arrow board can operate indefinitely without intervention.

The low-voltage-disconnect circuit detects when the battery charge falls below 11.2 volts, and shuts down power to the arrow board display. If a shutdown occurs, the arrow board will not function and the batteries must be fully charged.

5.3.2 Solar charging

For the solar charging system to function properly, the solar panel must be exposed to sunlight during daylight hours. The solar panel must be kept clean and unobstructed.

When the solar charging system is functioning properly, the batteries should power the arrow board indefinitely. If the battery charge drops, one or more of the following conditions may be true:

- The solar panel is not receiving enough sunlight to charge the batteries to full capacity. Ensure the trailer is located where the solar panel is fully exposed to sunlight.
- The solar panel is dirty. When necessary, clean the solar panel with a soft cloth or sponge and a cleaning solution of mild detergent and warm water.
- The solar panel is broken. Check the solar panel for damage. If there is no visible damage, check the diodes inside the junction box on the underside of the panel.
- One or more batteries need replacing. See Section 5.3.3.

5.3.3 Batteries

When the red CHARGE BATTERIES status indicator on the control panel is lit, complete power failure is about to happen and the batteries should be charged immediately.

Causes of a low battery warning can include:

- The solar charging system is not charging the batteries. See Section 5.3.2.
- The batteries have not been charged for a long enough time. Ensure the yellow ACTIVELY CHARGING status indicator on control panel is lit, which indicates solar charging is taking place. Wait and check the status indicators again.
- The batteries are new and have not been charged yet.
- A cable connection is loose. Check battery terminals. (To access the batteries, see the procedure in Section 6.4.3, page 48.)
- One or more batteries need to be replaced. Batteries that are more than five years old should be replaced.
  - ☐ To perform battery life testing, see Section 5.3.6, page 40.
  - ☐ To replace batteries, see Section 6.4.3, page 48.

5.3.4 Battery safety

⚠ DANGER

Explosive gases can cause blindness and severe injury.

When working on or near batteries:

- Wear eye protection
- Prevent sparks and open flames
- No smoking anywhere in the vicinity
- Keep children clear of the area

⚠ DANGER

Sulfuric acid can cause blindness and severe burns.

- Use caution when working on or near batteries
- Avoid contact with skin, face, and eyes
- Upon contact, seek medical help immediately
- Keep out of reach of children

⚠ WARNING

Fire hazard.

When working with the arrow board trailer batteries, never allow positive wiring to short to ground.

- Even when the batteries are not in operation, self-discharge generates hydrogen gas that can explode. Always store and work on batteries in a well-ventilated area.
- Always wear proper eye, face, and hand protection when working on or near batteries.
- Keep all sparks, flames, and cigarettes away from batteries at all times.
- When working with the arrow board batteries, never allow positive wiring to short to ground.
- To prevent short circuits and sparks, exercise caution when working with metallic tools or conductors near batteries. Do not wear metal jewelry while working near batteries.
- To reduce the risk of sparks, ensure connectors make good contact with battery terminals.
- Always disconnect power cables from control box before disconnecting battery cables (see the procedure in Section 6.4.3, page 48).
- If disconnecting arrow board battery cables, always disconnect positive (+) cable first.* Do not allow positive power cable to short to ground.
- Replace cables that you suspect might be worn or damaged. Replace cables that have visible fraying, cracks, or bare wires.
- Always replace damaged batteries immediately. Dispose of old batteries in accordance with local regulatory codes.
- Do not remove the battery cover panel unless you are inspecting or replacing the batteries.

**Removing the positive cable first is a requirement for negative-ground systems.*

5.3.5 Charging batteries manually

The arrow board uses maintenance-free 12-volt VRLA batteries. Under normal conditions, manual charging is not necessary.

When the batteries need charging:

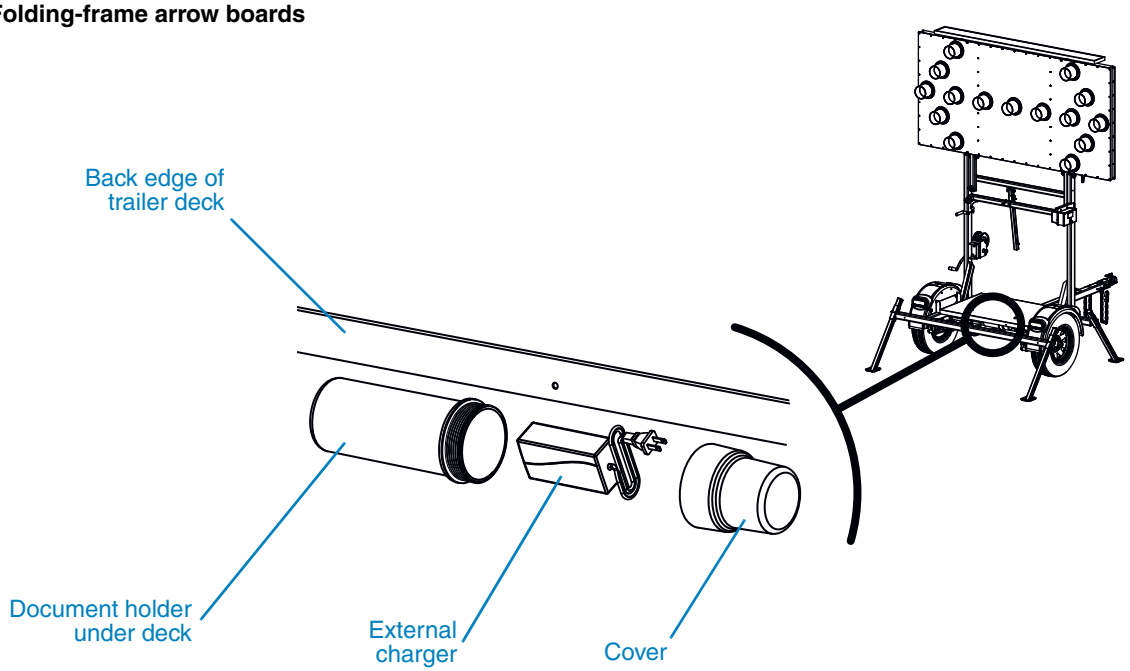
- If the battery voltage is low because the solar charging system is not able to charge the batteries, use the optional AC-powered charger or a user supplied external charger.
- If the battery voltage is very low or one or more batteries are dead, use the optional AC charger or an external charger. The solar charging system cannot charge a dead battery.
- The AC charger is optional, auxiliary equipment that may not be included with your arrow board.
- For charging instructions, see below or page 40.

Charging with the optional AC-powered charger

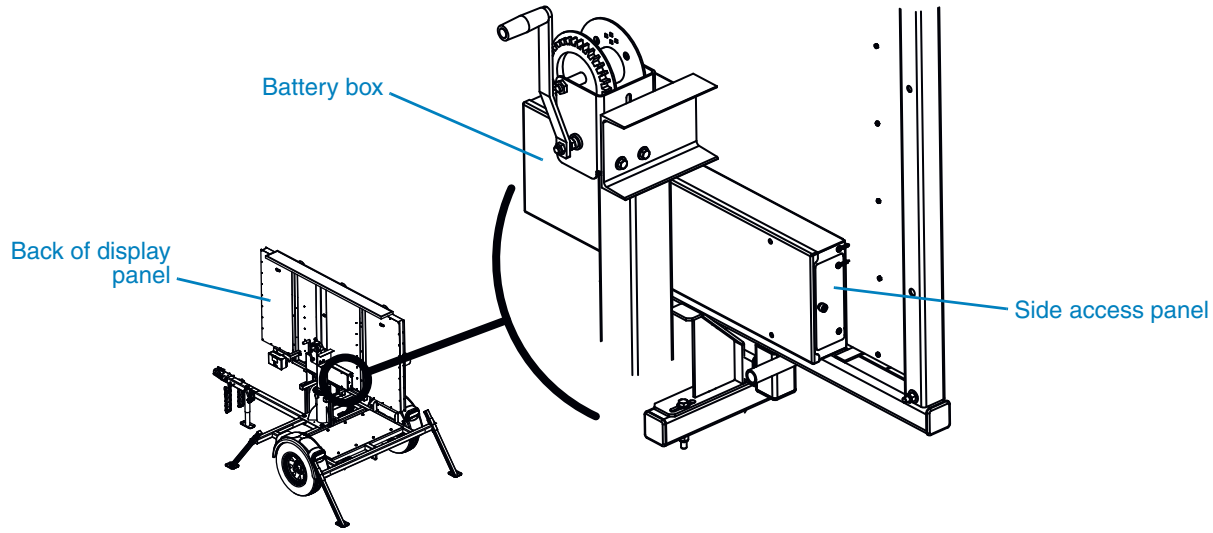
1. Observe battery safety precautions (see Section 5.3.4, page 36).
2. Observe the following charging requirements:
   - Avoid charging batteries if their temperature is above 120°F (49°C).
   - Never charge frozen batteries. Thaw batteries completely before charging.
   - Always charge batteries fully. Undercharging causes stratification and may result in the arrow board shutting down unexpectedly.
3. Depending on the trailer model, refer to Figure 5-1, to access the optional AC charger:
   - For a folding-frame arrow board, the charger is located inside the document tube under the trailer deck. Unscrew the cover from the tube to access the charger.
   - For a vertical-mast arrow board, the charger is located inside the battery box, behind the side access panel. Unscrew the captive knob and open the side panel to access the charger.
4. Plug the charger power cord into a standard 110/120 VAC power outlet (shore power or a portable generator). If the charger appears not to be working, the fuse on the charger may be blown, or the power outlet may not be switched on.
5. Charge the batteries until they reach 13.0 VDC. Depending on battery condition and voltage, a full charge can take from 12 to 24 hours. The charger will not overcharge the batteries, even if left unattended for an extended period.
6. After charging is complete, see “After manually charging” on page 40.
7. Disconnect the charger from the power outlet and stow the charger and power cord inside the document tube or battery box.
8. Close the document tube cover or close and secure the battery box side panel.

Figure 5-1. External AC-powered charger location

Folding-frame arrow boards



Vertical-mast arrow boards



Charging with an external AC-powered charger

1. Observe battery safety precautions (see Section 5.3.4, page 36).
2. Observe the following charging requirements:
   - Do not overcharge batteries.
   - Do not use a fleet charger.
   - Limit input current to 5 amps maximum.
   - Avoid charging batteries if their temperature is above 120°F (49°C).
   - Never charge a frozen battery. Thaw batteries completely before charging.
   - Always charge batteries fully. Undercharging causes stratification and may result in the arrow board shutting down unexpectedly.
3. Access the batteries using the procedure in Section 6.4.3, page 48.
4. Charge the batteries as follows:
   a. Connect the charger cables to the batteries.
   b. Plug the charger into an AC power source (shore power or a portable generator).
   c. Turn the charger on, and adjust any charger settings as needed.
   d. Charge the batteries until they reach 13.0 VDC. Depending on the charger and condition of the batteries, a full charge can take from 6 to 24 hours.
5. After charging is complete, see "After manually charging" below.

After manually charging

After charging is complete, check the battery bank voltage (see Section 6.4.2, page 47).

- If the battery bank voltage is below 13 volts, the batteries may not have been charged for long enough. Continue charging if necessary.
- After charging for 24 hours or more, if the voltage is significantly lower than 13 volts, one or more batteries may have reached their end of life. Either test the batteries individually (see Section 5.3.6) or replace all the batteries (see Section 6.4.3, page 48).

5.3.6 Life-testing AGM batteries

Perform a voltage test on each battery as described below.

1. Observe battery safety precautions (see Section 5.3.4, page 36).
2. On the arrow board control panel, toggle the display switch to off (O).
3. Charge the entire battery bank for at least 24 hours. Use the optional AC charger if equipped (see "Charging with the optional AC-powered charger" on page 38); otherwise, use the solar charging system (see Section 5.3.2 on page 36).

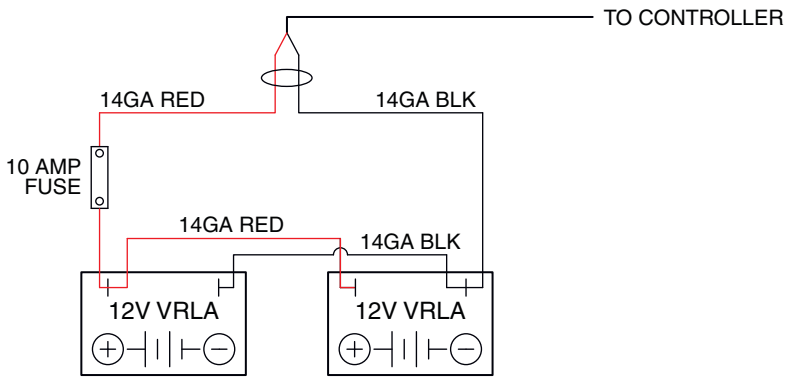
   Follow the next steps immediately after charging is complete.

4. On the control panel, select a display pattern, then toggle the display switch to on (**I**).
5. Visually inspect the arrow board display panel to ensure it is displaying a pattern.
6. Use the voltage meter on the control panel to view the battery voltage.
   - If the voltage drops significantly while you are viewing it, then one or more batteries have reached their end of life. Go to Step 7.
   - If the voltage is below 13 volts, then the batteries are not fully charged. Repeat Steps 2 through 6, or continue on to Step 7.
7. Using the procedure in Section 6.4.3, page 48:
   a. Disconnect the power cables from the control box, starting with the battery power connector. This halts battery charging from the solar panels, protects the control system electronics from damage, and isolates the batteries.
   b. Access the batteries.
8. If you have a smartphone or camera, take pictures of the battery wiring before disconnecting the cables from the batteries. This can help when reattaching the cables later in this procedure.
9. Disconnect the black cables from the negative battery terminals, which isolates each battery. Ensure cables are disconnected and terminals are clean.
10. For each battery, use a DC voltmeter or multimeter to measure the DC voltage across the positive and negative battery terminals. Record the voltage, making note of which battery it belongs to. Repeat the procedure until you have recorded the voltages for all batteries in the battery bank.
11. Evaluate the results:
    - If the voltages are very different from each other, the batteries with very low voltages should be replaced. If all the battery voltages are low, replace all of the batteries.
    - Refer to Table 5-1 to determine the battery charge level. If the charge level is 70% or above, no charging is needed. If the charge level is 10% or lower, replace the battery.
    - To replace a battery, see Section 6.4.3, page 48.
    - If no batteries need to be replaced, reconnect the battery cables, taking care not to over-tighten the cable clamps. See Figure 5-2 and refer to your pictures from Step 8, if needed.

Table 5-1. Battery charge

Voltage, VDC	Charge level, %	Charging requirement
13.00	100	No charge required
12.75	90	
12.50	80	
12.30	70	
12.15	60	Charge required
12.05	50	
11.95	40	
11.81	30	
11.66	20	
11.51	10	Replace battery
10.50	0	

Figure 5-2. Battery wiring



5.3.7 Power failure

When the LOW-VOLTAGE SHUTDOWN indicator on the control panel is lit, a complete power failure has occurred and the arrow board has stopped functioning. A power failure can occur for any of the reasons described on page 36.

5.4 Control system

If the arrow board is not working, no lights are lit on the control panel, and the arrow board does not respond when you use the controller:

- The batteries may need to be charged. See Section 5.3, page 35.
- The control system may have failed. Contact the Wanco Service Department for assistance (see Section 1.4, page 2).

5.5 Display panel

5.5.1 Display patterns not showing

If the arrow board display panel does not show the selected display pattern:

- Toggle the display switch on the control panel to the on (I) position.
- Check LED status indicators on control panel (see Section 5.2, page 35).

5.5.2 Display lights not working

If any lights on the front or back of the arrow board display panel do not light up as expected, the most likely cause is faulty wiring or a bad wiring connection.

To check the wiring of any light on the display panel:

1. On the front of the display, remove the visor from the light (see Section 6.5, page 52).
2. Carefully remove the light from the cabinet.
3. Check its wiring connections to ensure they are proper and secure. Check wiring for wear and damage.
4. Replace wiring if necessary or contact the Wanco Service Department for assistance (see Section 1.4, "Where to obtain service," page 2).

5.6 Connected systems

5.6.1 Communications failure

A Wanco Connected Arrow Board (CAB) is always sending data to the cloud as long as it has power. For more information, see Section 4.6, page 34.

Connected systems are aware of the CAB location and status at all times except when a communications failure occurs. A comm failure can be caused by:

- CAB power shutdown (see Section 5.3, page 35)
- CAB cellular connection issue

If the arrow board has power and a comm failure has occurred, contact the Wanco Service Department for assistance (see Section 1.4, "Where to obtain service," page 2).

5.6.2 Incorrect arrow board status

A Wanco Connected Arrow Board (CAB) is always sending data to the cloud as long as it has power. For more information, see Section 4.6, page 34.

Connected systems indicate the CAB is deployed when all of the following are true:

- The CAB has power and a cellular connection to the cloud
- The CAB is on the road or alongside the road
- The CAB display panel is in the upright position
- The CAB display panel is on and displaying a pattern

If a connected system, mapping app, or navigation system shows information that is different than expected, see Table 5-2.

Table 5-2. Troubleshooting CAB status errors

Connected system indicates...	Possible cause	Solution
Arrow board is showing a display pattern	Arrow board display panel is upright and showing a pattern	If the arrow board is not deployed, toggle the display switch to the off (O) position (see Section 4.5, page 32)
Arrow board is facing the wrong direction	Arrow board compass is out of calibration	Calibrate the compass (see Section 6.6, page 53)
Arrow board is not shown or arrow board notifications are not shown	Arrow board display is blank	If the arrow board is deployed, use the controller to select a display pattern, then toggle the display switch to the on (I) position (see Section 4.5, page 32)
	Arrow board is in travel or stowed position	Deploy the arrow board (see Section 4.4, page 24)
	GPS location is off road or geofencing is in place	Check the actual location of the arrow board in person and compare with the indicated GPS location; move the arrow board if needed Check for geofencing in Wanco Fleet Manager*
	System power shutdown	See Section 5.3, page 35
	Arrow board is not a connected model (CAB)	Replace the non-connected arrow board with a CAB model or install a CAB retrofit kit
	Communications failure	Contact the factory (see Section 1.4, page 2)
	Arrow board toppled or defective sensor	Confirm whether the arrow board has tipped over by viewing the arrow board in person or using Wanco Fleet Manager* remotely Take appropriate measures to correct the arrow board stance

**Wanco Fleet Manager is an optional service that may not be included with your arrow board. See Section 4.6.4, page 34.*

6 Maintenance

6.1 General maintenance

When performing any maintenance on the system, follow the safety requirements in Section 2, page 5.

⚠ WARNING

If the arrow board is not working properly, a traffic accident could occur, resulting in serious injury or death.

After maintenance, before sending the arrow board back into service, verify all display lights are functioning properly.

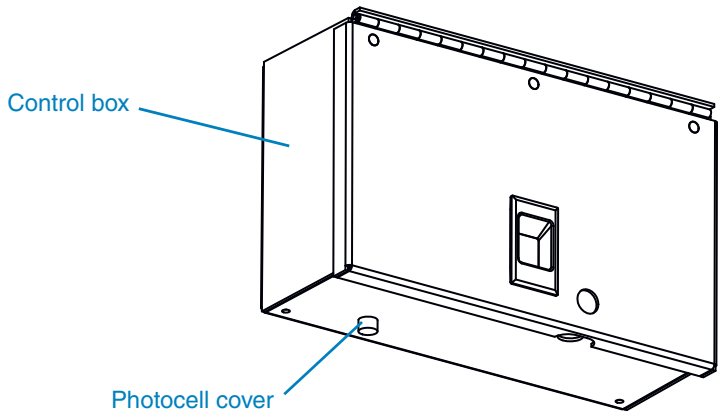
⚠ CAUTION

During maintenance, adverse weather conditions can cause equipment damage and injury.

Whenever possible, perform maintenance indoors or in calm dry weather, and away from traffic.

- Always be aware of traffic when performing roadside maintenance.
- Repair or replace worn and damaged components immediately. Never use any equipment that is damaged or in need of repair.
- For reliable performance, keep the arrow board and all its components clean.
- Keep the arrow board photocell cover clean (see Figure 6-1). Use a soft, damp cloth.

Figure 6-1. Photocell cover



6.2 Periodic maintenance

The following items should be checked regularly:

- Inspect winch cable for wear and damage
- Check pivot points and moving parts for wear and damage. Repair or replace parts as needed.
- Inspect display cabinet for damage.
- Check the display panel lights for proper operation. Check both the front and back of the panel.
  - ☐ If one or more lights are not working, see Section 5.5.2, page 43.
  - ☐ To replace a light, see Section 6.5, page 52.
- Check all visors on arrow board display panel.
  - ☐ Ensure visors are securely fastened.
  - ☐ Wanco's twist-lock visors do not require screws to hold them in place.
  - ☐ For visors that are attached with screws: the screws can loosen over time. Tighten when necessary.
- If status LEDs on the control panel are lit, see Section 5.2, page 35.
- Check battery voltage once a week to ensure the solar charging system is keeping the batteries charged. Check battery voltage more often when sunlight is less intense—during winter and in locations that are far from the Equator. See Section 6.4.2.

6.3 Solar panel

For the solar charging system to function properly, the solar panel must be exposed to sunlight during daylight hours.

The solar panel must be kept clean and unobstructed:

- When necessary, clean the solar panel with a soft cloth or sponge and a cleaning solution of mild detergent and warm water.
- If a shadow or any obstruction fully or partially blocks the solar panel, charging will be negatively affected and a longer charge time will be necessary.

6.4 Batteries

6.4.1 Battery health

The arrow board uses maintenance-free VRLA batteries. No regular maintenance is necessary for the batteries to function properly and for long battery life.

To optimize battery health and longevity, follow these guidelines:

- Ensure batteries are fully charged before using the arrow board.
- Ensure batteries are fully charged after each period of use, and before putting the arrow board into temporary or long-term storage. For battery storage, see Section 6.4.4, page 52.
- Do not allow batteries to fully discharge.
- To lengthen battery life and prevent freezing, always keep batteries fully charged.

Replace batteries that are more than five years old. For replacement instructions, see Section 6.4.3, page 48.

6.4.2 Checking battery voltage

A voltage meter on the control panel provides a quick—though sometimes not completely accurate—indication of the battery bank state of charge (SoC).

IMPORTANT!

If the arrow board display is off and the solar charging system is actively charging, the voltage meter will register a surface charge, which is not an accurate measure of the battery bank SoC.

You should use the voltage meter when arrow board display is showing a pattern, or when the solar charging system is not active (such as after sunset and before sunrise, or when the arrow board is inside for servicing). This measure will be closer to the actual SoC.

To activate the voltage meter, press and hold the activation button below the meter.

The batteries are fully charged when the voltage meter reads 13.0 VDC. If a battery's voltage falls below 11.8 volts and remains low, the battery may lose some capacity permanently. See Table 6-1 for charge levels and charging requirements.

If the voltage is low:

- The solar charging system may not able to fully charge the batteries. See Section 5.3.2 on page 36 for troubleshooting, then charge the batteries manually if necessary (see Section 5.3.5, page 38).
- The batteries may have reached their end of life. To check each battery and determine whether any need to be replaced, follow the procedure in Section 5.3.6, page 40. Batteries that are five years old or older should be replaced.

Table 6-1. Battery charging requirement

Voltage, VDC	Charge level, %	Charging requirement
13.00	100	No charge required
12.75	90	
12.50	80	
12.30	70	
12.15	60	Charge required
12.05	50	
11.95	40	
11.81	30	
11.66	20	
11.51	10	Replace battery
10.50	0	

6.4.3 Replacing batteries

To replace a battery, follow these steps:

1. Observe battery safety precautions (see Section 5.3.4, page 36).
2. Access the back of the control box by removing the four screws that hold the plastic cover in place (see Figure 6-2).
3. Refer to Figure 6-3 to identify the two power connectors and disconnect them from the control box in the following order:
   a. Disconnect the battery power connector first. Slide the white latch out, away from the control box, until it stops. Then, while pressing down on the top tab, pull the connector straight out and away from the control box.
   b. Disconnect the solar power connector second. Slide the white latch out, then press down on the top tab and pull the connector away from the control box.
4. Depending on the trailer model, refer to Figure 6-4 to access the batteries as follows.

■ For a folding-frame trailer, follow these steps:

   a. The four bolts that hold the cover panel in place are secured with washers and nuts under the trailer. Loosen the nuts and remove the four bolts.
   b. Grip the cover on either side near the fenders. Then, using care not to injure your back or your fingers, lift the cover panel off the trailer deck and set it aside. Because the panel is large and unwieldy, you might want assistance to lift it.

■ For a vertical-mast trailer, follow these steps:

   c. Access the battery box on back of the display panel, behind the winch and tower.
   d. Loosen and remove the four bolts that secure the front cover panel, then remove the cover and set it aside.

5. If you have a smartphone or camera, take pictures of the battery wiring before disconnecting the cables. This can help when reattaching the cables later in this procedure.

Figure 6-2. Control box cable cover

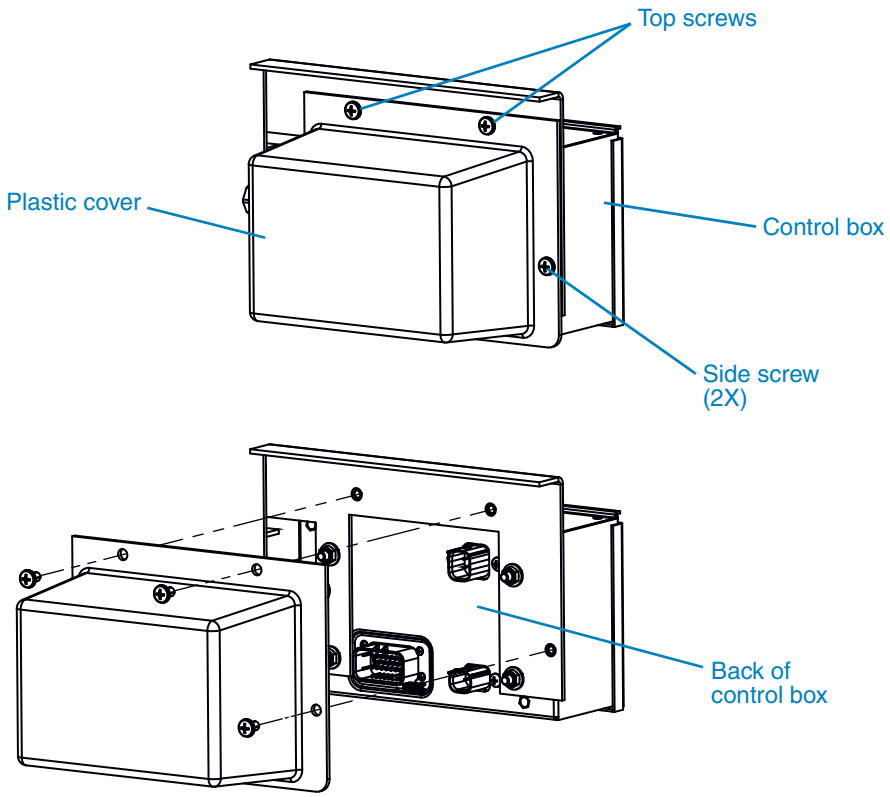
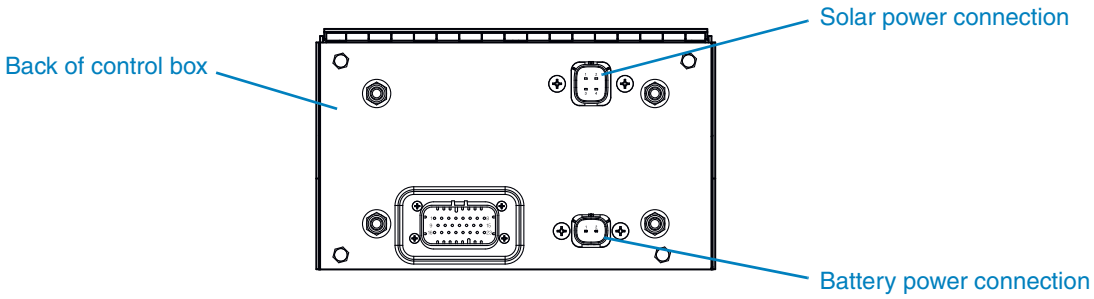


Figure 6-3. Control box power connections



Detail view: disconnecting the power connectors

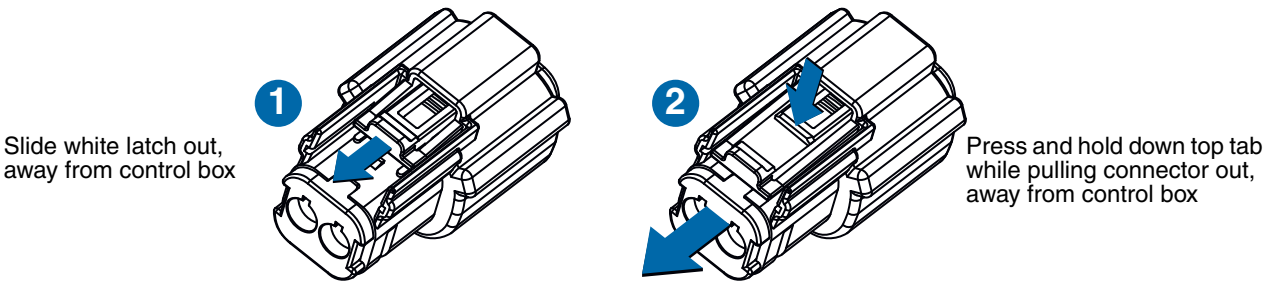
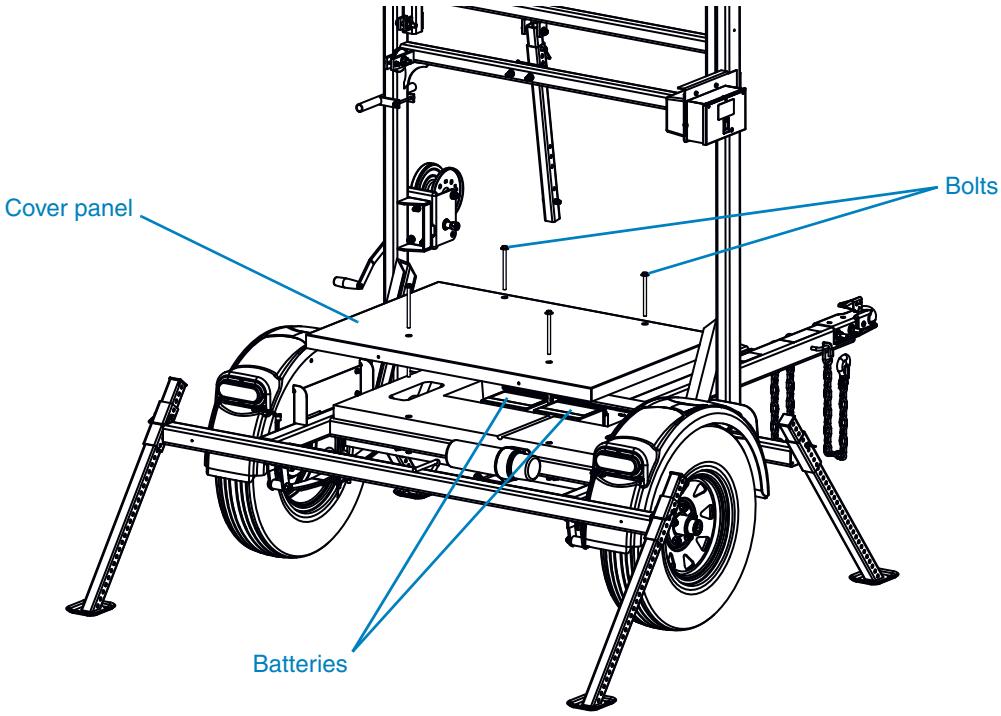
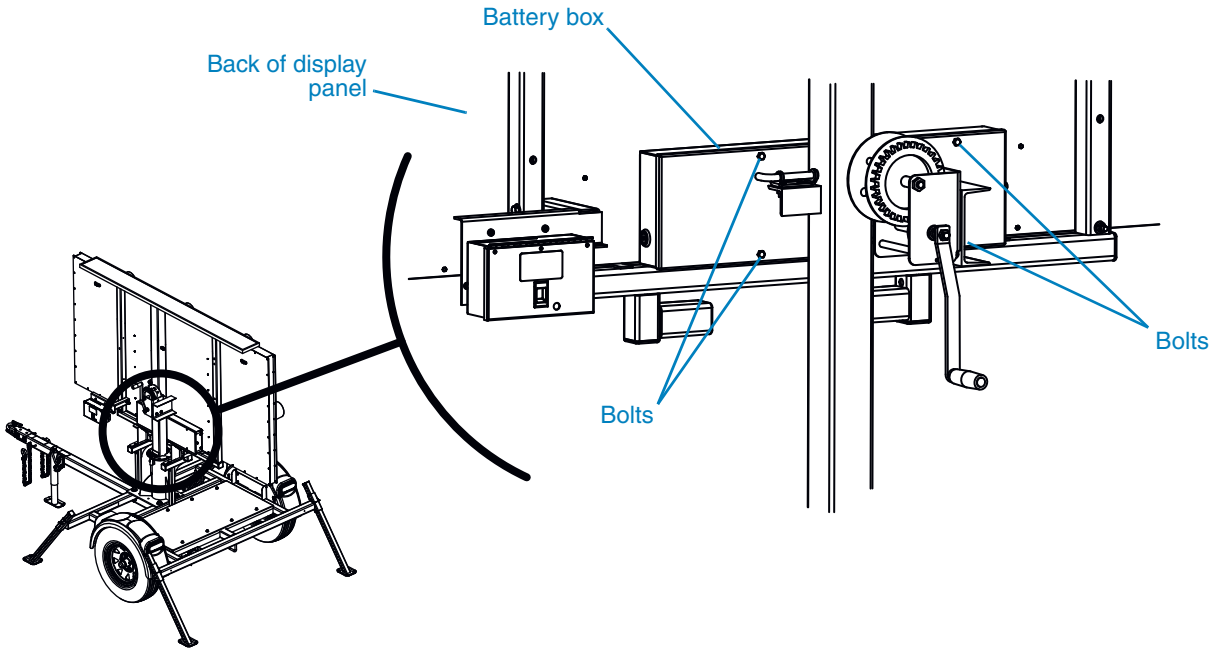


Figure 6-4. Battery location

Folding-frame arrow boards

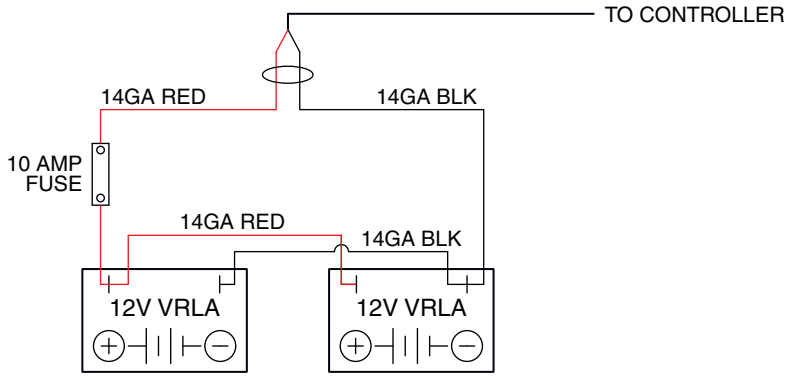


Vertical-mast arrow boards



6. Disconnect the positive (+) cable from the battery.*
7. Disconnect the negative (–) cable from the battery.
8. Remove the battery from the battery compartment.
9. Inspect the battery compartment and clean out any debris.
10. Inspect the battery cables for corrosion, wear, and damage. Clean or replace the cables as necessary for ensuring a good connection.
11. Replace the old battery with a new battery of the same type.
12. Reconnect battery cables, taking care not to over-tighten the cable clamps. See Figure 6-5, and refer to your pictures from Step 5:
    a. Connect the negative (–) cable to the replacement battery.
    b. Connect the positive (+) cable to the replacement battery.
13. Reconnect power cables to the back of the control box in the following order:
    a. Reconnect the solar power connector first. Install the solar cable connector onto the upper receptacle on the control box. Apply gentle pressure to ensure it is fully engaged, then slide the white latch in, toward the control box, to secure the connector in place.
    b. Reconnect the battery power connector second. Install the battery cable connector onto the lower receptacle on the control box. Apply gentle pressure to ensure it is fully engaged, then slide the white latch in, toward the control box, to secure the connector in place.
    c. Ensure both connectors are properly secured.
14. Check the battery voltage (see Section 6.4.2, page 47). The batteries are fully charged when their voltage is 13.0 VDC. If the voltage is less than 13.0 VDC, charge the batteries (see Section 5.3.5, page 38). New batteries typically need to be charged. Always charge batteries fully.

Figure 6-5. Battery wiring



**Removing the positive cable first is a requirement for negative-ground systems.*

15. After the batteries are charged, use the controller to put a display pattern on the arrow board, then visually check the pattern and ensure the arrow board is functioning properly.
16. If the arrow board is functioning properly, reinstall the black plastic cover on the back of the control box, then reinstall the cover panel on the battery compartment or battery box. Ensure the cover panel is properly secured in place with the bolts, washers, and (for a folding-frame trailer) nuts.
17. If the arrow board is not functioning properly, check the power connections on the back of the control box, then check the battery cable connections. Make sure all connections are proper and secure. If the issue continues, see Section 5, page 35.

6.4.4 Storing batteries

- Observe battery safety precautions (see Section 5.3.4, page 36).
- Ensure batteries are fully charged before putting them into storage.
- Do not allow batteries to fully discharge while stored. Check battery voltage regularly.
- Store batteries in a cool, dry, well-ventilated location.
- Store batteries safely out of reach of children and pets.
- If storing the arrow board trailer for more than a month without active solar charging, access the battery compartment (see Figure 6-4, page 50) and remove the in-line fuse.

6.5 Replacing a light or visor

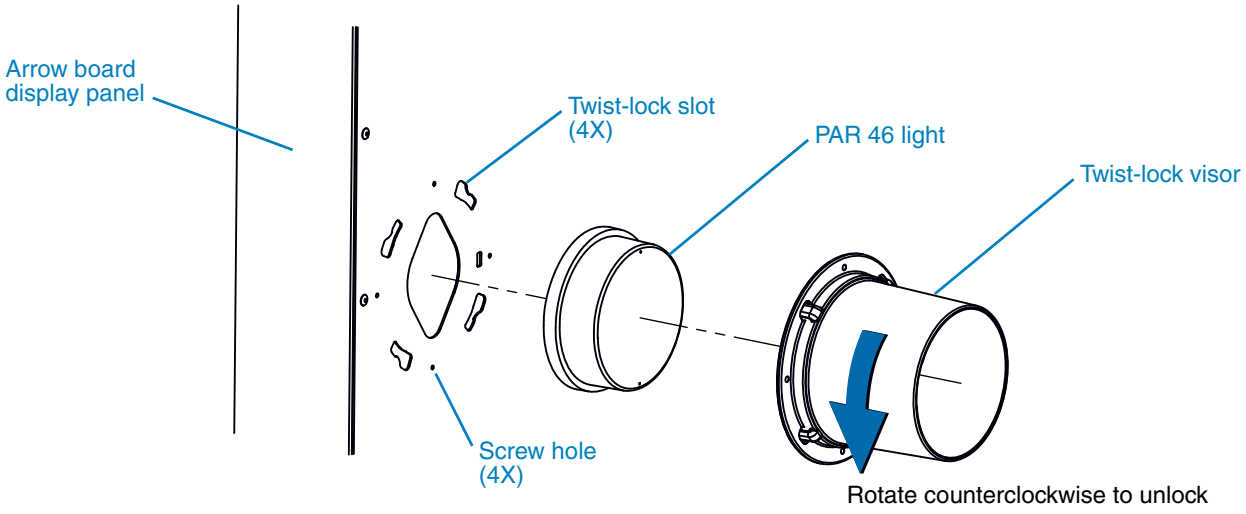
Visors secure the PAR 46 lights to the front of the arrow board display panel.

- To replace a light, you must first remove its visor.
- Wanco's twist-lock visors do not require screws to hold them in place, but screws may be used if desired.

To replace a light or visor on the arrow board display, refer to Figure 6-6 and follow these steps:

1. On the control panel, set the display switch to the off (O) position.
2. If screws are holding the visor in place, loosen and remove the screws. Retain the screws for reinstalling the visor or installing a new visor.
3. Either by grasping the visor tightly or using a standard strap wrench, rotate the visor counterclockwise about an inch (2.5cm) to unlock it. Avoid pulling the visor out from the display panel while rotating.
4. When the visor is unlocked, gently pull it away from the panel. The light will be loose when you remove the visor. Hold the light in place and use care not to let it fall.
5. If replacing a light, gently pull the light away from the display panel and disconnect its wiring, then reverse the procedure to install the new light and its visor.
6. If replacing a visor, reverse the procedure to install a replacement. When installing a new Wanco twist-lock visor, screws are not necessary but may be used if desired.

Figure 6-6. Twist-lock visor detail



6.6 Compass calibration

6.6.1 Overview

Wanco Connected Arrow Boards include a built-in electronic compass, which they use to pass their compass bearing (i.e., the direction they are facing) to connected systems, such as Waze® app and other mapping apps. (For more about connected arrow boards, see Section 4.6, page 34.)

Connected systems use the arrow board compass bearing—north, south, east, west, and points between—to communicate the direction the arrow board is facing. This enables receiving devices, such as a phone or car, to accurately represent the arrow board location and orientation for mapping, navigation, and vehicle alert systems.

- The compass is calibrated at the factory and does not normally require field calibration.
- The compass can come out of calibration, in which case field calibration is necessary.

6.6.2 Determining whether calibration is required

You can verify whether the compass is properly calibrated:

- First, view the arrow board in person and determine which direction it is facing. Then check the compass bearing virtually by viewing the arrow board location either on a compatible connected system or in Wanco Fleet Manager. (Wanco Fleet Manager is an optional service that may not be included with your arrow board. See Section 4.6.4, page 34.)
- If the connected system or Fleet Manager indicates the arrow board is facing a different direction than it is actually facing, then the compass requires calibration.

IMPORTANT!

You should calibrate the compass if it is out of calibration.

6.6.3 Calibration procedure

To calibrate the compass, refer to Figure 6-7 and follow these steps:

1. Position the arrow board display panel so that it faces due north (zero degrees). For accuracy, use an analog or digital compass, or a smartphone app.
   - For a folding-frame trailer, rotate the trailer to point the display panel north. (It is not necessary for the arrow board display to be in the deployed position. If the display is down, then just point the rear of the trailer due north.)
   - For a vertical-mast trailer, you can raise and rotate the display without moving the trailer.
2. On the arrow board control panel, toggle the display switch to the off (**O**) position and set the pattern selector switch to the four corner caution pattern ( ).
3. Toggle the display switch between the reserved (**R**) and off (**O**) positions as follows:

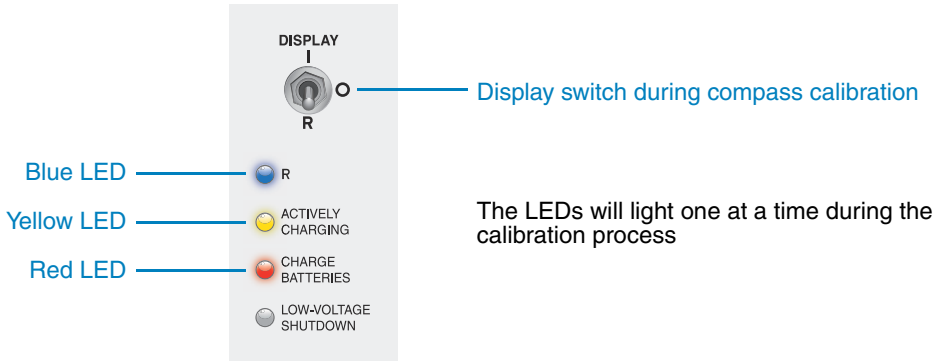
   R → O → R

   The blue and yellow status LEDs flash together once, indicating the system has started calibrating for north.

   The blue LED flashes slowly, indicating calibration is in progress.

   When the north calibration is complete, the blue, yellow, and red LEDs flash sequentially, one at a time, in a "waterfall" pattern.
4. Close the control box cover.
5. Position the arrow board display panel so that it faces due south (180 degrees). For accuracy, use an analog or digital compass, or a smartphone app.

Figure 6-7. Status LEDs on control panel



6. Open the control box cover.
7. On the arrow board control panel, toggle the display switch between the off (**O**) and reserved (**R**) positions as follows:

   O → R → O → R.

   The blue and yellow status LEDs flash together once, indicating the system has started calibrating for south.

   The blue LED flashes slowly, indicating calibration is in progress.

   When the south calibration is complete, the blue, yellow, and red LEDs flash sequentially, one at a time, in a "waterfall" pattern.
8. If storing the arrow board or taking it out of service, toggle the display switch to off (**O**).
9. If returning the arrow board to service:
   a. Select the desired display pattern and toggle the display switch to the on (**I**) position.
   b. Visually inspect the arrow board display panel to ensure the correct arrow pattern is displayed.

⚠ WARNING

Improper display could cause a traffic accident resulting in severe injury or death.

Visually inspect arrow board to ensure correct arrow pattern is displayed.

10. Close and latch the control box.

6.7 Storing the arrow board

When storing the arrow board, follow the battery storage guidelines in Section 6.4.4, page 52.

When storing multiple folding-frame trailers, the trailers can be "nested" by removing their drawbars and lowering their displays approximately 45 degrees.

Nesting the trailers also lets you transport more trailers on a flatbed truck. To avoid damaging nested arrow boards during transport, use padding between the trailers and ensure the trailers and padding are well secured to the bed.

6.8 Winch cable

Under normal use, the winch cable will last the life of the arrow board. If the cable is worn or damaged, it must be replaced.

To order a cable replacement kit, contact the Wanco Service Department (see Section 1.4, "Where to obtain service," page 2).

6.9 Wiring

Before performing any type of service or maintenance, read and observe all safety instructions. See Section 2, page 5.

For wiring diagrams, contact the Wanco Service Department (see Section 1.4, "Where to obtain service," page 2).

6.10 Replacement parts

Before performing any type of service or maintenance, read and observe all safety instructions. See Section 2, page 5.

For replacement parts, see Table 6-2 or contact the Wanco Service Department (see Section 1.4, "Where to obtain service," page 2).

Table 6-2. Replacement parts

Description	Folding-frame models	Vertical-mast models
Trailer assembly	page 58	page 62
Folding frame assembly	page 60	—
Vertical tower assembly	—	page 64
Display panel assembly	page 65	page 65
Drawbar assembly	page 66	page 66
Controller assembly	page 67	page 67
Batteries	page 68	page 70

This page intentionally left blank.

Figure 6-8. Replacement parts: Folding-frame trailer assembly

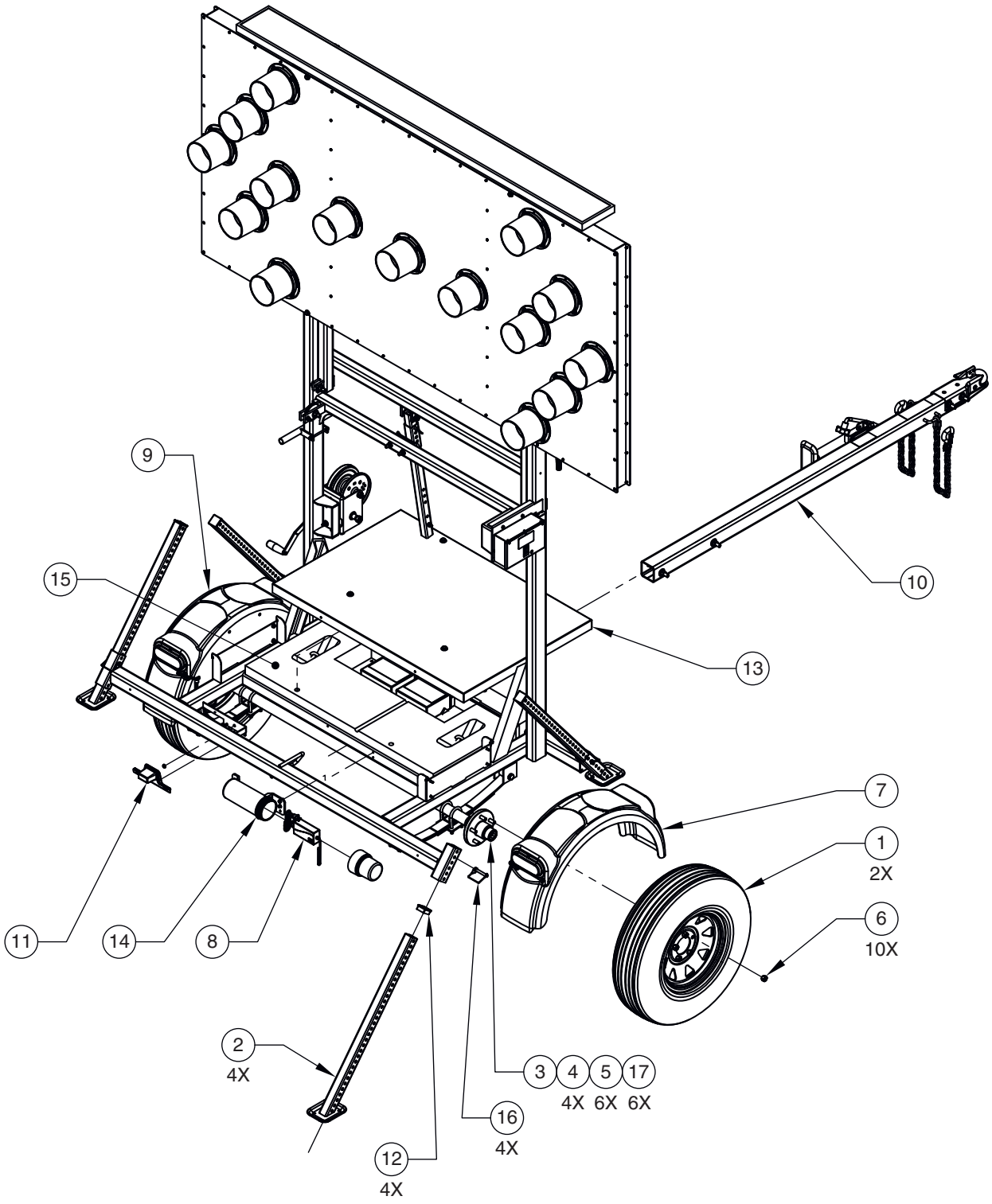


Table 6-3. Parts list: Folding-frame trailer assembly

Item No.	Part No.	Description	Qty.
1	238158	Trailer tire with wheel, ST205/75D15 load range C	2
2	219744-Z2	Stabilizer leg, 37.5 deg.	4
3	201839	Axle assembly, 2000-lb. cap., 60" track	1
4	200108	Axle shackle strap, 3500 lb cap.	4
5	200109	Axle shackle bolt, 9/16"-18 × 3"	6
6	101323	Hex nut, 1/2"-20 × 60° cone	10
7	227132-C	Fender assembly, right	1
8	205329	Battery charger, 2A 12VDC (optional)	1
9	227133-C	Fender assembly, left	1
10	108797-C	Drawbar assembly	1
11	100783	License plate holder with light	1
12	104773	Square plug, 1 3/4"	4
13	218077-	Cover panel	1
14	220261	Document holder	1
15	219737	Concrete weight	1
16	100079	Wire-pin lock, 3/8" × 2 1/2" x 1 1/2" with 9" steel lanyard	4
17	200110	Stover lock nut, 9/16"-18	6

Figure 6-9. Replacement parts: Folding frame assembly

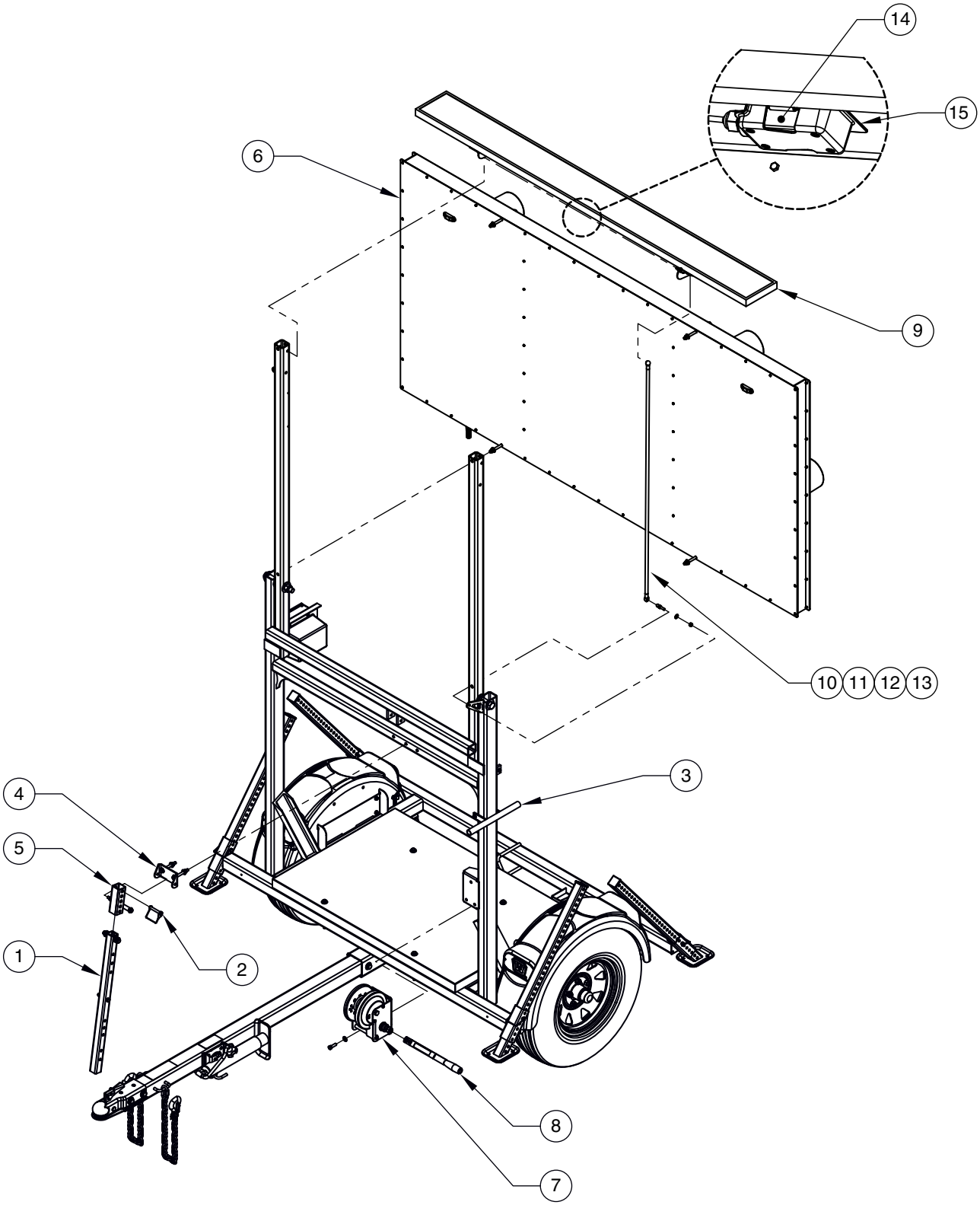


Table 6-4. Parts list: Folding frame assembly

Item No.	Part No.	Description	Qty.
1	100069-	Slide bar tube	1
2	100079	Wire-pin lock, 3/8" × 2 1/2" × 1 1/2" with 9" steel lanyard	1
3	103223-	Scope sight tube	1
4	103310-	Pivot bracket	1
5	103311-	Slide-lock receiver tube	1
6	200276-C	15-light arrow board display panel assembly, 48" × 96"	1
	200277-C	25-light arrow board display panel assembly, 48" × 96"	
7	220788	Hand-operated winch, 1500 lb cap.	1
8	220789	Winch handle, 11"	1
9	235342-C	Narrow solar panel, 55 watts	1
10	235768-	Push rod, 49 1/4"	1
11	104312	Ball stud, 0.51" dia. 5/16"-18 × 1"	1
12	100237	Flat washer, 3/4"	1
13	100239	Hex nut, nylon insert lock 5/16-18	1
14	237393	Asset tracker, Suntech	1
15	236113	Asset tracker mounting cradle	1

Figure 6-10. Replacement parts: Vertical-mast trailer assembly

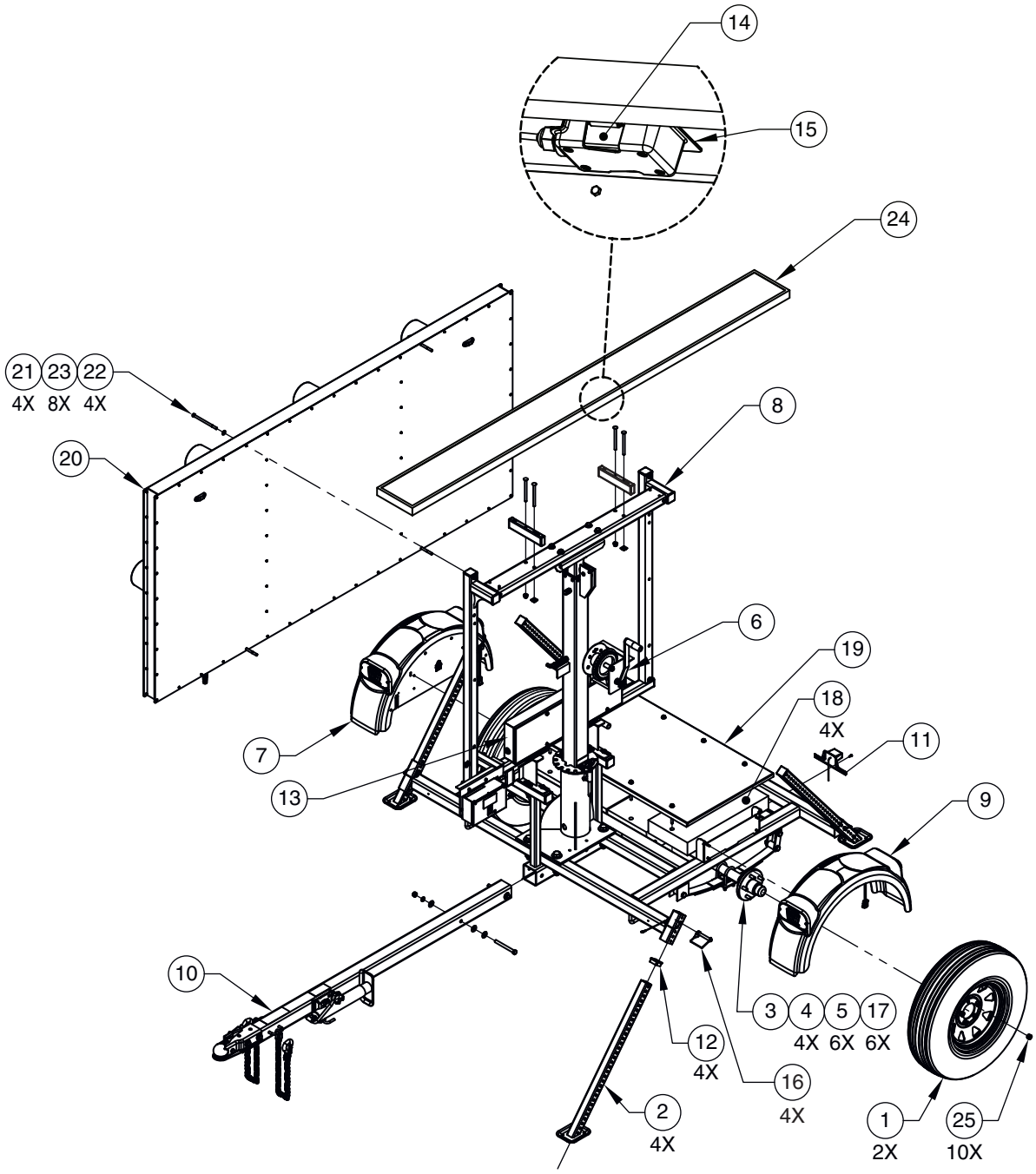


Table 6-5. Parts list: Vertical-mast trailer assembly

Item No.	Part No.	Description	Qty.
1	238158	Trailer tire with wheel, ST205/75D15 load range C	2
2	219744-Z2	Stabilizer leg, 37.5 deg.	4
3	201839	Axle assembly, 2000-lb. cap., 60" track	1
4	200108	Axle shackle strap, 3500 lb cap.	4
5	200109	Axle shackle bolt, 9/16"-18 × 3"	6
6	226774-C	Tower assembly	1
7	227132-C	Fender assembly, right	1
8	236772-	Cabinet frame assembly (includes sight tube)	1
9	227133-C	Fender assembly, left	1
10	108797-C	Drawbar assembly	1
11	100783	License plate holder with light	1
12	104773	Square plug, 1 3/4"	4
13	221019-C	Battery box assembly, two batteries without charger	1
	221020-C	Battery box assembly, two batteries with charger	
	221017-C	Battery box assembly, three batteries without charger	
	221018-C	Battery box assembly, three batteries with charger	
14	237393	Asset tracker, Suntech	1
15	236113	Asset tracker mounting cradle	1
16	100079	Wire-pin lock, 3/8" × 2 1/2" x 1 1/2" with 9" steel lanyard	4
17	200110	Stover lock nut, 9/16"-18	6
18	204873	Concrete weight	4
19	204483-	Cover panel	1
20	200276-C	15-light arrow board display panel assembly, 48" × 96"	1
	200277-C	25-light arrow board display panel assembly, 48" × 96"	
21	104179	Hex nut, nylon insert lock 3/8"-16	4
22	227239	Hex screw, 3/8"-16 × 6"	4
23	100234	Flat washer, 13/32"	8
24	235342-C	Narrow solar panel, 55 watts	1
25	101323	Hex nut, 1/2"-20 × 60° cone	10

Figure 6-11. Replacement parts: Vertical mast assembly

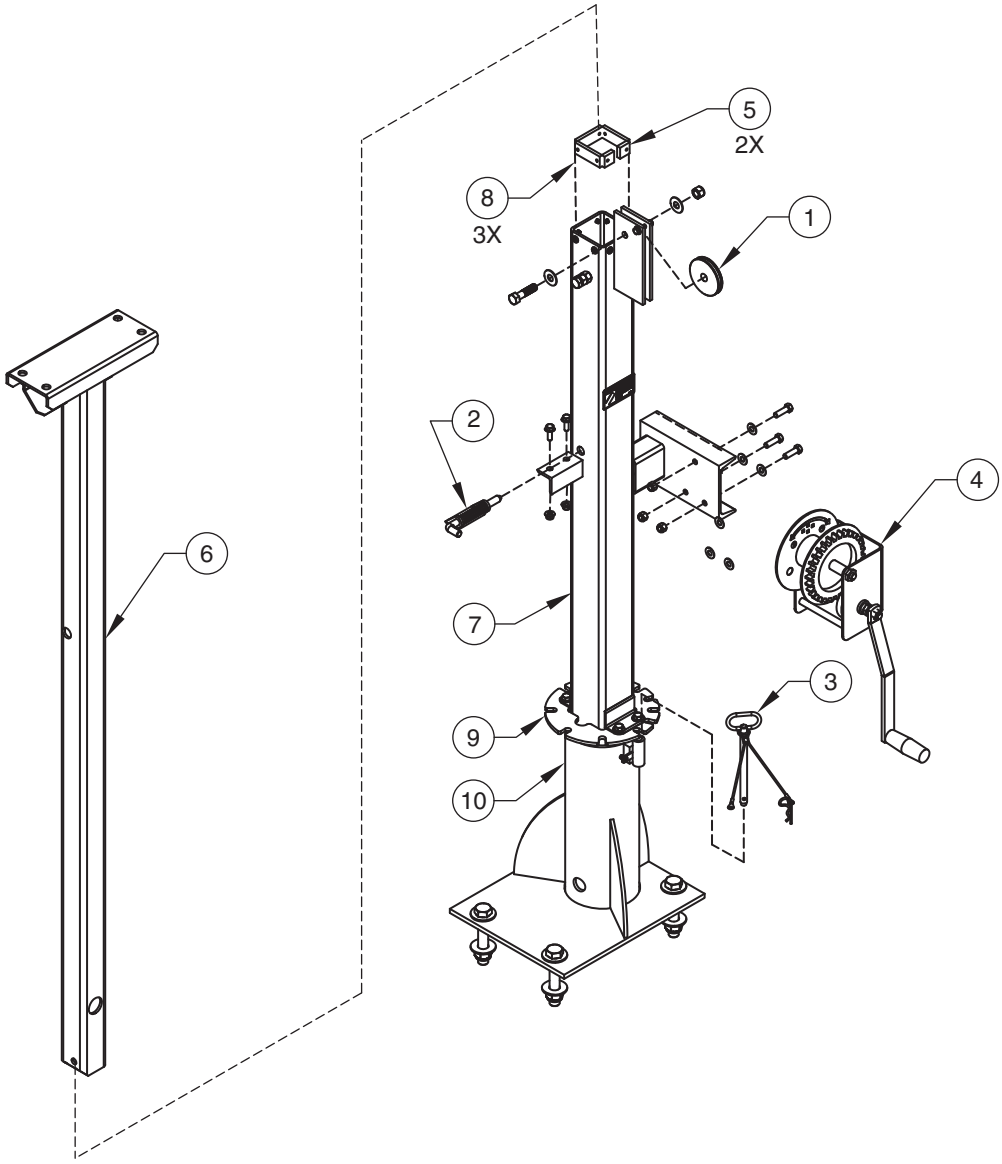


Table 6-6. Parts list: Vertical mast assembly

Item No.	Part No.	Description	Qty.
1	220709	Single-groove pulley, 3"	1
2	100394	Spring-latch	1
3	103830	Vertical-lock-pin assembly	1
4	101007	Hand-operated winch, 1500-lb. cap.	1
5	106015	Nylon guide block, 1"	2
6	225069-	Top tower section	1
7	225054-	Bottom tower section	1
8	218780	Nylon guide block, 2.6"	3
9	213219-Z	Rotation-lock plate	1
10	225076-	Swivel base	1

Figure 6-12. Replacement parts: Display panel assembly

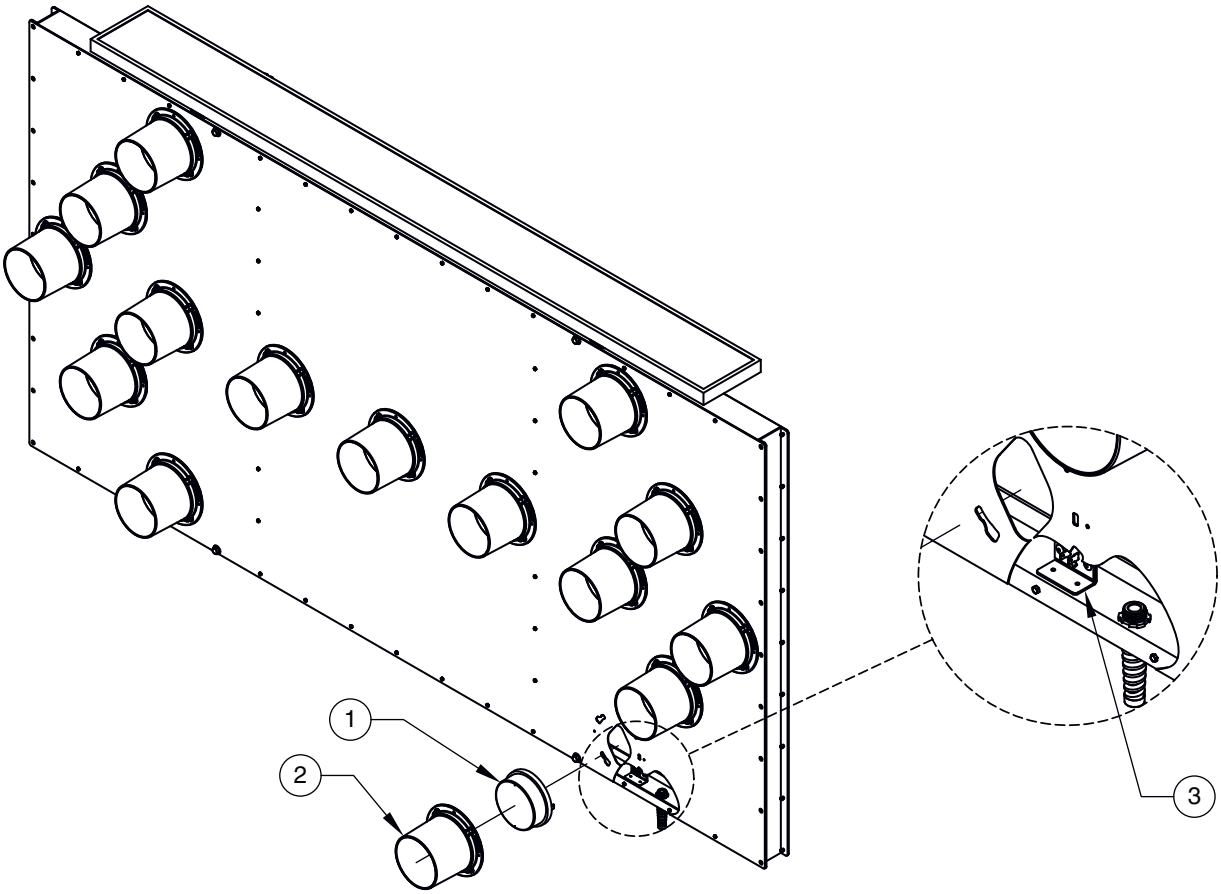


Table 6-7. Parts list: Display panel assembly

Item No.	Part No.	Description	Qty.
1	207265	PAR 46 light, amber LED	15 or 25
2	236115	Visor with auto-lock tabs	15 or 25
3	227438-C	Tilt sensor assembly	1

Figure 6-13. Replacement parts: Drawbar assembly

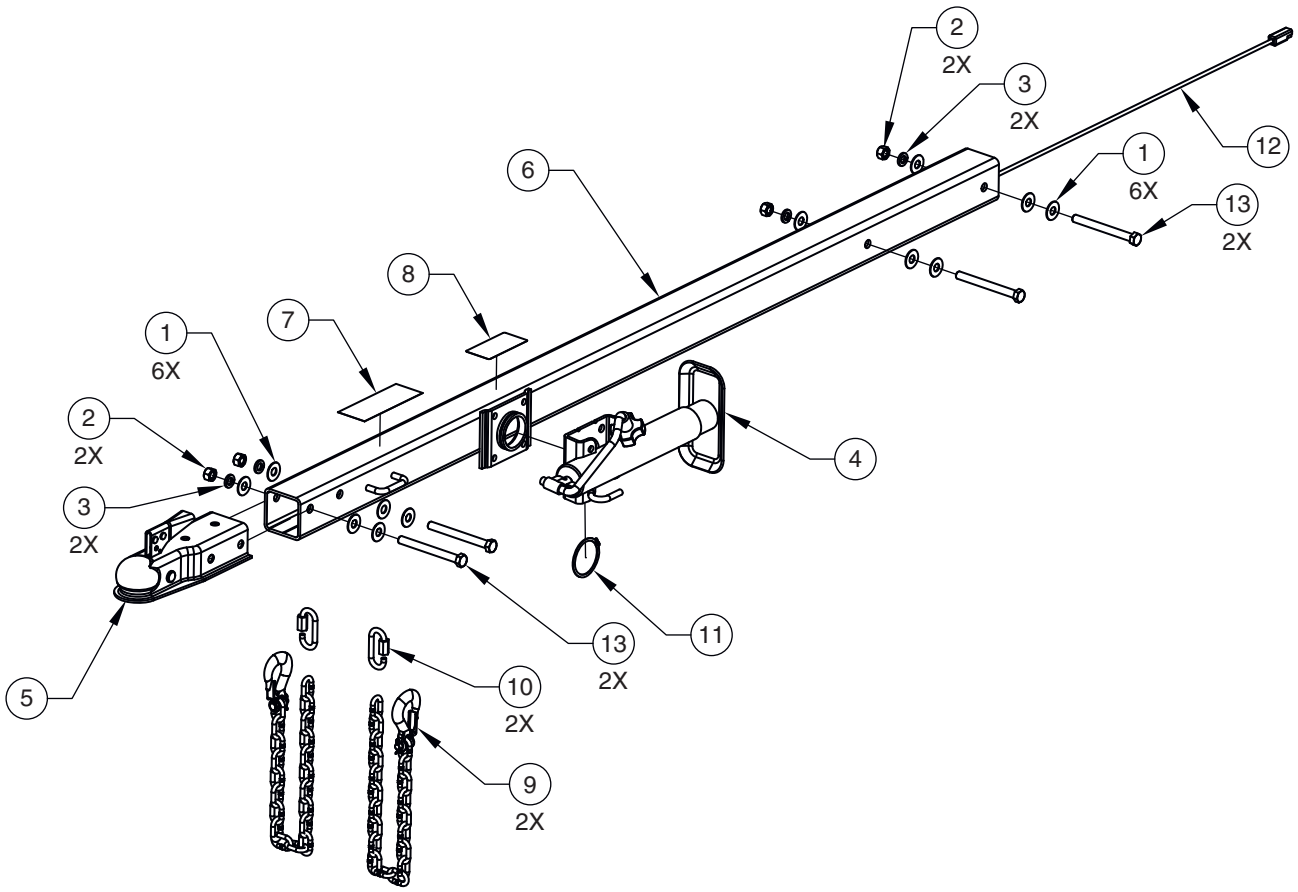


Table 6-8. Parts list: Drawbar assembly

Item No.	Part No.	Description	Qty.
1	100233	Flat washer, 1/2"	12
2	100652	Hex nut, 1/2"-13	4
3	100713	Split lock washer, 1/2"	4
4	100943	Top-wind swivel jack with pad foot	1
5	101677	Tow hitch, 2" ball 2000 lb cap.	1
6	103409-	Arrow board drawbar	1
7	103939	Decal, safe towing instructions	1
8	103941	Decal, caution tow-hitch connection	1
9	104859	Tow chain with clevis slip hook	2
10	201432	Quick-link for tow chain, 1540 lb cap.	2
11	215874	Swivel jack snap ring, 2 1/2"	1
12	215875	Trailer lights cable with flat-four plug	1
13	217814	Hex screw, 1/2"-13 × 5"	4

Figure 6-14. Replacement parts: Controller assembly

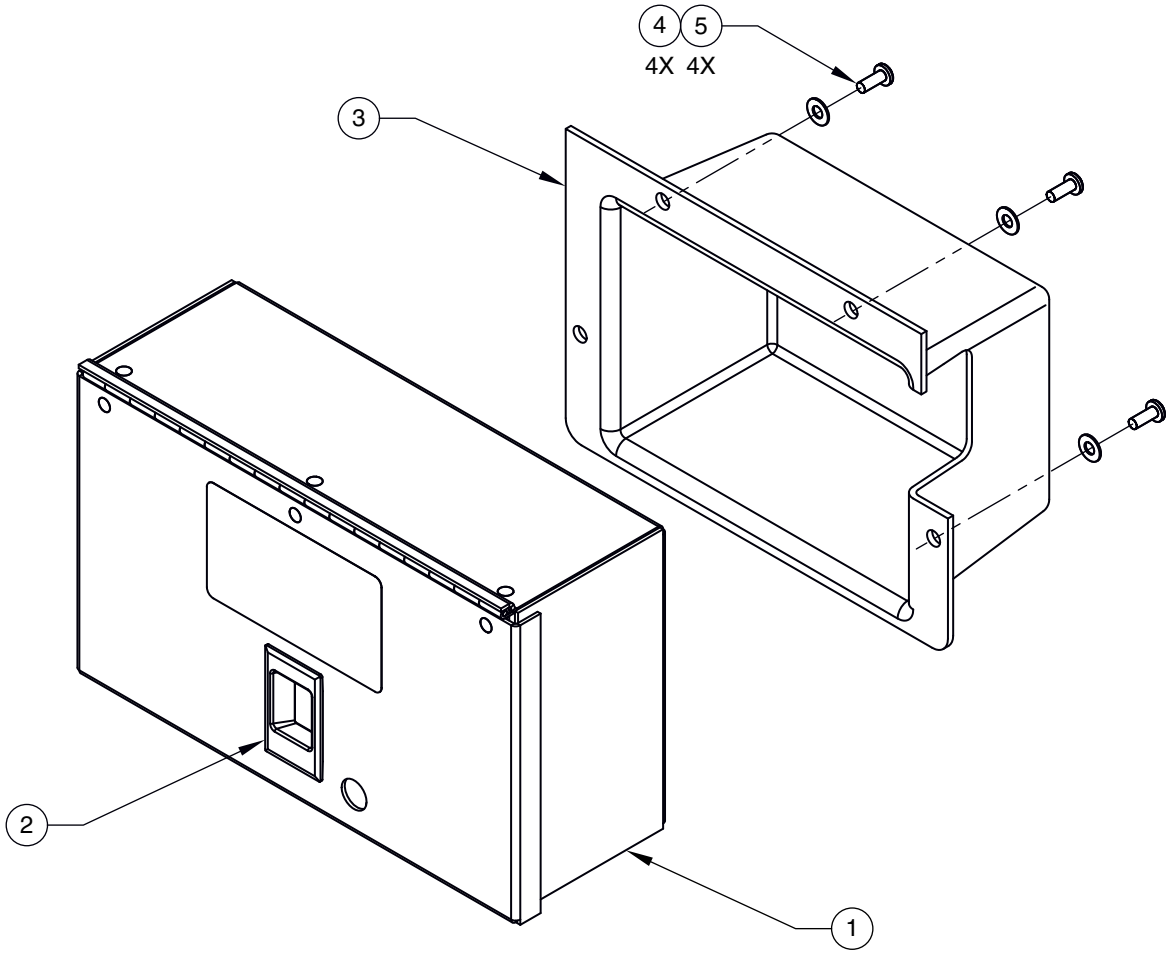


Table 6-9. Parts list: Controller assembly

Item No.	Part No.	Description	Qty.
1	227568	15-light arrow board control box assembly with voltage meter	1
	227566	15-light arrow board control box assembly with voltage and hour meters	
	227569	25-light arrow board control box assembly with voltage meter	
	227567	25-light arrow board control box assembly with voltage and hour meters	
2	104075	Slide latch	1
3	104161	Plastic cover	1
4	106313	Pan-head screw, 1/4"-20 x 3/8"	4
5	100236	Flat washer, 5/8"	4

Figure 6-15. Replacement parts: Folding-frame trailer batteries

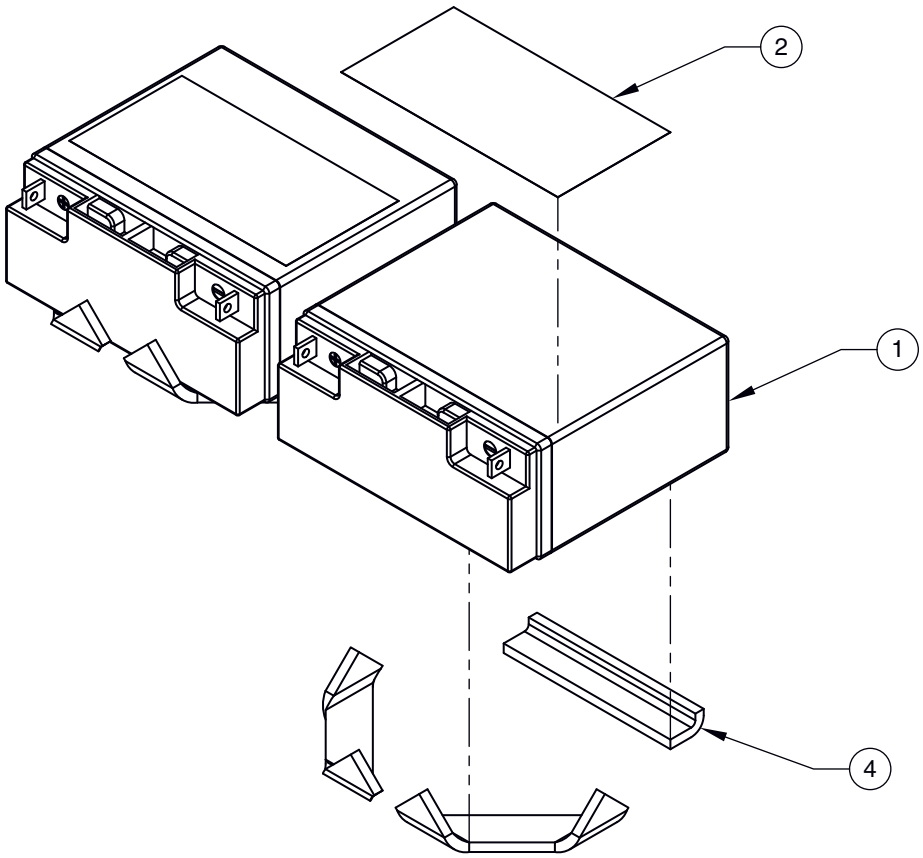


Table 6-10. Parts list: Folding-frame trailer batteries

Item No.	Part No.	Description	Qty.
1	238602	Battery, VRLA AGM 12V 22Ah	2 or 3
2	239383	Battery label	2 or 3
3	220786	Wiring kit, 2-battery positive fused jumper (not shown)	1
	220787	Wiring kit, 3-battery positive fused jumper (not shown)	
4	106348	Weather strip, 1/4" × 1"	30"

This page intentionally left blank.

Figure 6-16. Replacement parts: Vertical-mast trailer battery box

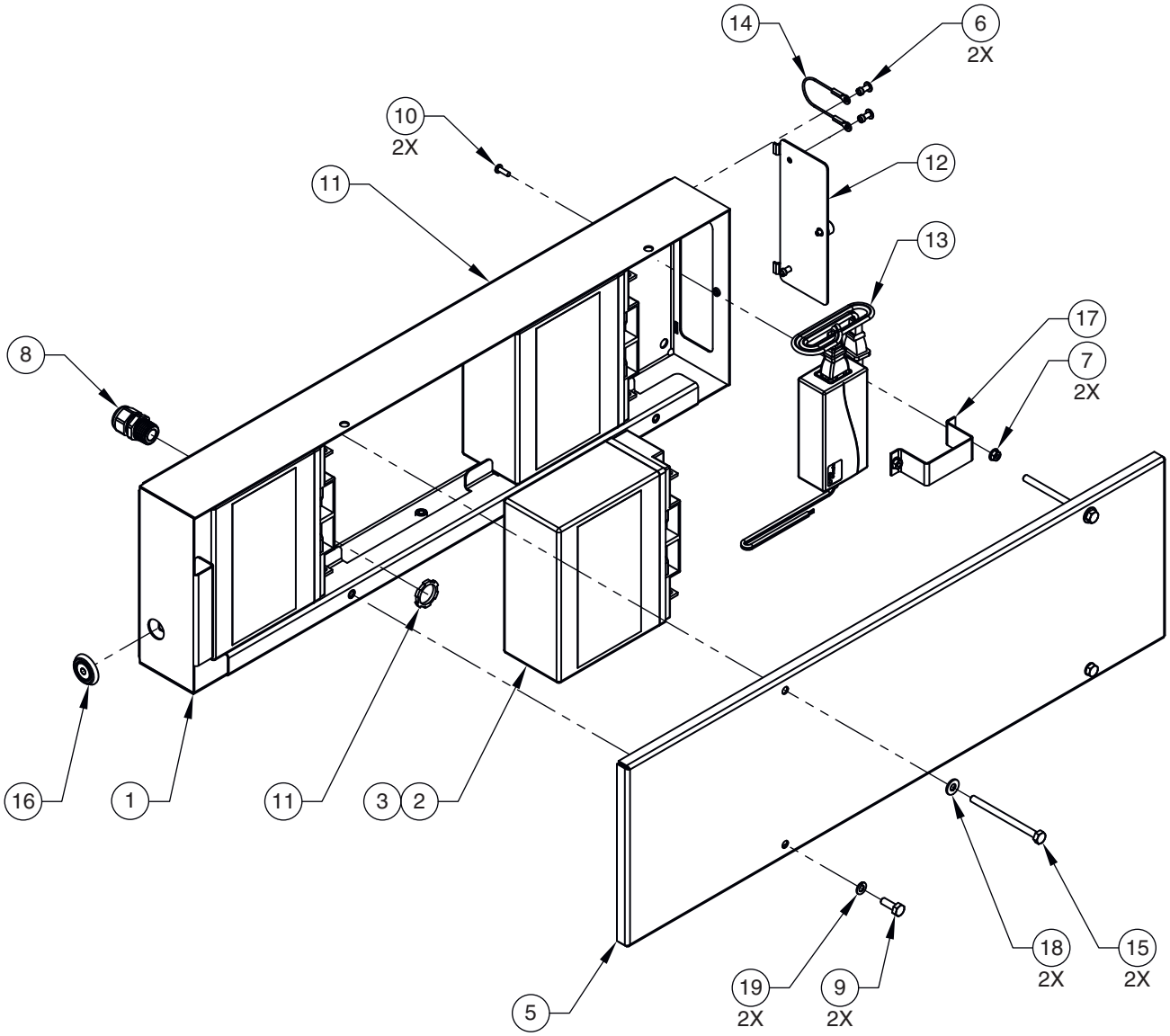


Table 6-11. Parts list: Vertical-mast trailer battery box

Item No.	Part No.	Description	Qty.
1	205013-	Battery box enclosure	1
2	238602	Battery, VRLA AGM 12V 22Ah	2 or 3
3	239383	Battery label	2 or 3
4	211373-H1	Wiring kit, 2 batteries (not shown)	1
	220790	Wiring kit, 3 batteries (not shown)	
5	205012-	Battery box enclosure cover	1
6	104463	Avex button-head rivet, 3/16" × 1/16" – 1/4"	2
7	105559	Hex flange nut, #8-32	2
8	100137	Cord grip, 1/2" NPT	1
9	203682	Hex screw, 1/4"-20 × 3/4"	2
10	103377	Pan-head screw, #8-32 × 1/2"	2
11	100133	Conduit nut, 1/2"-14 NPT	1
12	205014-	Side access panel	1
13	205329	Battery charger, 2A 12VDC (optional)	1
14	205454	Side acess panel lanyard	1
15	216270	Hex screw, 1/4"-20 × 3 1/2" × 1"	2
16	218518	Nylon plug, 21mm	1
17	219030-	Charger bracket	1
18	100236	Flat washer, 9/32	2
19	100208	Split lockwasher, 1/4"	2

WANCO INC.
5870 Tennyson Street
Arvada, Colorado 80003
800-972-0755
303-427-5700
303-427-5725 fax
www.wanco.com