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The following describes the common installation methods, and a listing of the components that are required for each method of installing SpeedCheck fixed mount displays. All items listed as “end user supplied components” are readily available from electrical or traffic control equipment suppliers.

Components Supplied with SpeedCheck System

Display System

- Display unit
- Mounting brackets and fasteners ¼-20x1/2” BH Cap screws (mounted to sign rails for shipping)
- Flexible conduit, ½” liquid-tight

Solar Package (if purchased with SpeedCheck System)

- Solar panel(s) (usually drop-shipped from a solar panel distributor)
- Solar panel mounting bracket(s); top mount bracket is standard – side mount is available for light, telephone or other existing tall poles (may be drop-shipped or sent directly from IDC)
- Pole-mounted battery box (including solar battery) with charge controller.
- Conduit end fittings, ring terminals for connecting power cable to battery (included in battery box)
- Wiring cable (to be cut and used between solar panel, battery box, and display)

End user supplied components

AC Powered System –Recommendations for Overhead Drop

- 3” diameter or larger pole recommended for sign warranty
- Frangible or break-away base & hardware if required by local regulations
- Footing materials for frangible or break-away base if required
- ½” weather head or pole cap
- Sign strapping and strap installation tool (see chart on p. 6 for strap size recommendations), heavy-duty tamper proof band clamps, or appropriate size U-bolts with back plates. Consult your local regulations for appropriate attachment methods.
- Hose clamps of the proper diameter for the pole size. These are used to determine best display alignment and radar detection range, before permanently attaching the display to the pole.

Power feed options

Wiring Internal to pole (recommended)

The cleanest installation method is to use internal wiring with an entrance fitting going through the side of the pole a foot or two above the display housing location, on the side of the pole facing the display. To do this you will also need the following items:

- 1 length ¾” conduit for burial as lead-in to pole base
- Pole cap
- ¾” entrance elbow to be mounted to the pole
- Fittings to go from this entrance elbow to the entrance elbow on the display – liquid-tight conduit is supplied

Wiring External to pole

The simplest installation uses external conduit strapped to the pole. To do this you will also need these items in addition to those listed above:

- 1 length of ½” conduit suitable for the application (recommended IMC)
- 3 additional bands to attach the conduit to the pole

Solar Powered System

Pole

- For solar powered installations, use a 4” pipe size pole to provide a solid platform that will withstand heavy wind loads with solar panels mounted. For your specific installation, number and size of solar panels, regional minimum wind design requirements, etc., a traffic engineer or traffic control equipment specialist may suggest another approach.
- Frangible or break-away base & hardware, if required
- Footing materials, if required
- If power is run on outside of pole (as is typically done when installing to existing poles, or in the case of direct burial of pole), 2 lengths of ½” conduit suitable for application (recommended IMC or Rigid)
- Sign attachment banding and installation tool (see chart on p. 6 for strap size recommendations) or heavy-duty tamper proof band clamps; U-bolts cannot be used with pole mounted battery box or SpeedCheck solar racks.

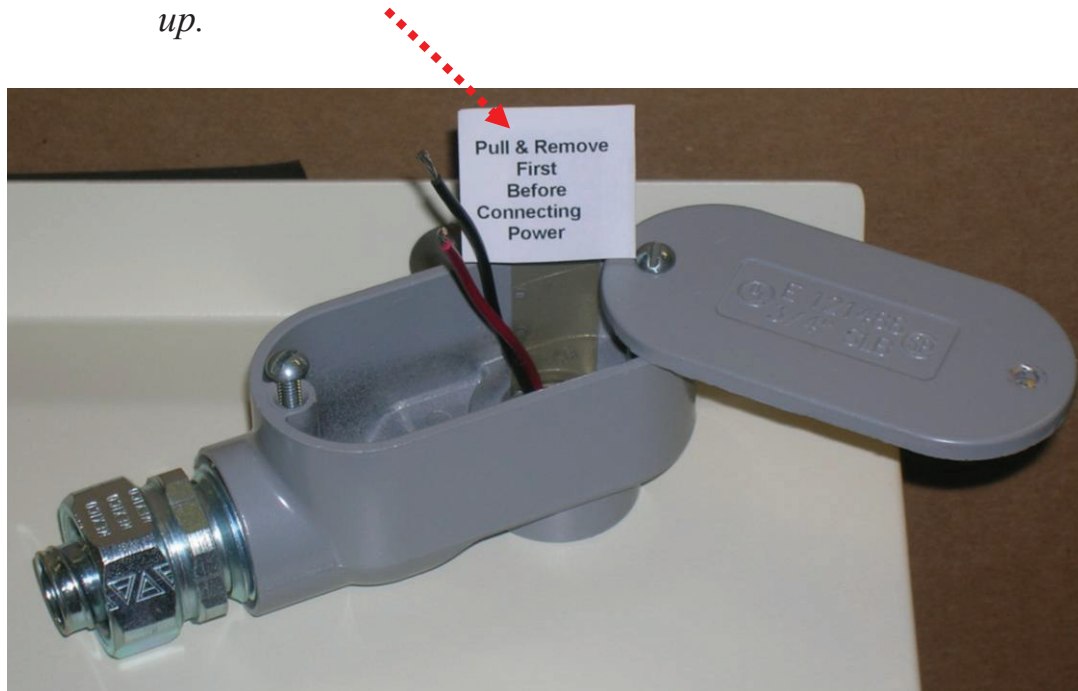
Hose clamps of the proper diameter for the pole size. These are used to determine best display alignment and radar detection range, before permanently banding display to pole.

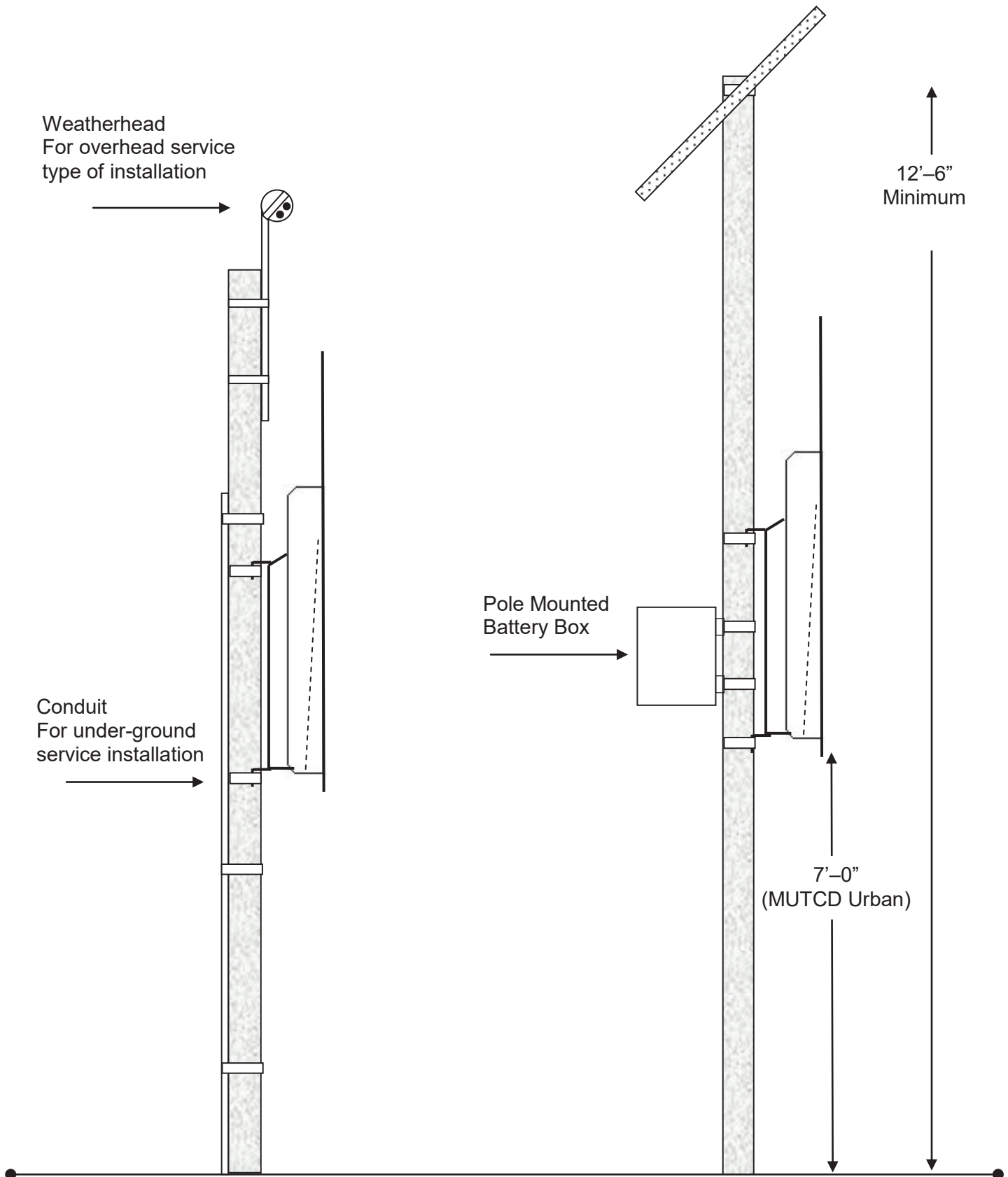
Overall pole length is not given, as it will vary depending upon footing, frangible base use, etc. Additional pole-mounted signage or devices may require higher and stronger poles. Select pole length to achieve minimum height above ground as shown in the drawing.

For square posts, use the IDC Flat Surface Mounting Bracket. If such square post mounting is used with a solar-powered installation, remove the battery box banding brackets and bolt the box directly to the square post. Attach a section of round pipe to the top of the post for mounting the solar panel to allow correct panel orientation due (true) south.

Prior to connecting the input power, pull and remove the battery tape (see below).

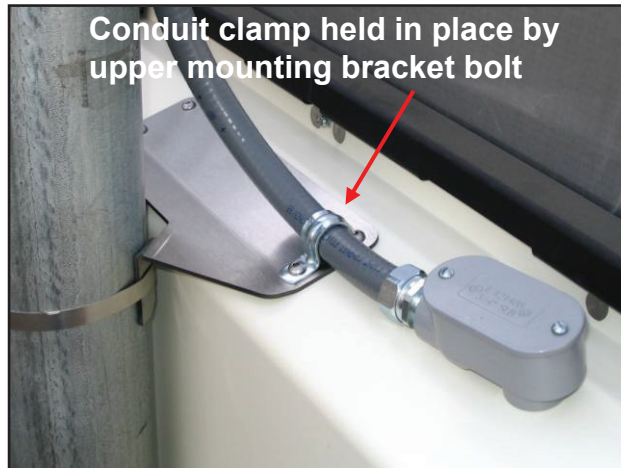
Important: *If the battery tape is not removed first, the sign will not power up.*





Use hose clamps for initial setup and alignment of the display to determine proper radar detection of oncoming vehicles. Adjust as necessary before permanently attaching the display to the pole with strapping or U-bolts.

These photos illustrate the mounting of the display and battery box to a pole. Sign and battery box brackets are best attached to the pole using standard stainless steel strapping equipment. The chart on p. 6 lists the strapping requirements.



Note: Strapping provides the most secure and vandal-resistant mounting. If strapping equipment is not available, U-bolts can be used for most applications.

Strapping Recommendations

Strapping size recommendations for 15" displays	
90 MPH wind loading	
3/4" x .030" band	Single wrap provides adequate strength for 90 MPH wind loading
5/8" x .030" band	Single wrap provides adequate strength for 90 MPH wind loading.
1/2" x .030" band	Single wrap provides adequate strength for 90 MPH wind loading. However double wrap is preferred on upper mounting bracket to prevent rotational slippage.

Avoid These Common Installation Mistakes

- Installing immediately after a sharp curve, as radar might not pick up approaching traffic. Sign needs to be aimed correctly at approaching traffic
- Installing on a steep incline or decline without using grade tilt brackets
- Mounting a solar powered system in the shade of trees or large structures
- Installing where large trucks may park and obscure the sign
- Installation where the radar beam does not have a clear view of oncoming traffic because of obstructions, such as trees, foliage, signs, buildings, etc.
- Installing the sign too far from the roadside. Typically, the SpeedCheck display is mounted between 5 feet and 12 feet from the roadside.
- Permanently banding display to pole without using hose clamps first to determine best display alignment and radar detection range.

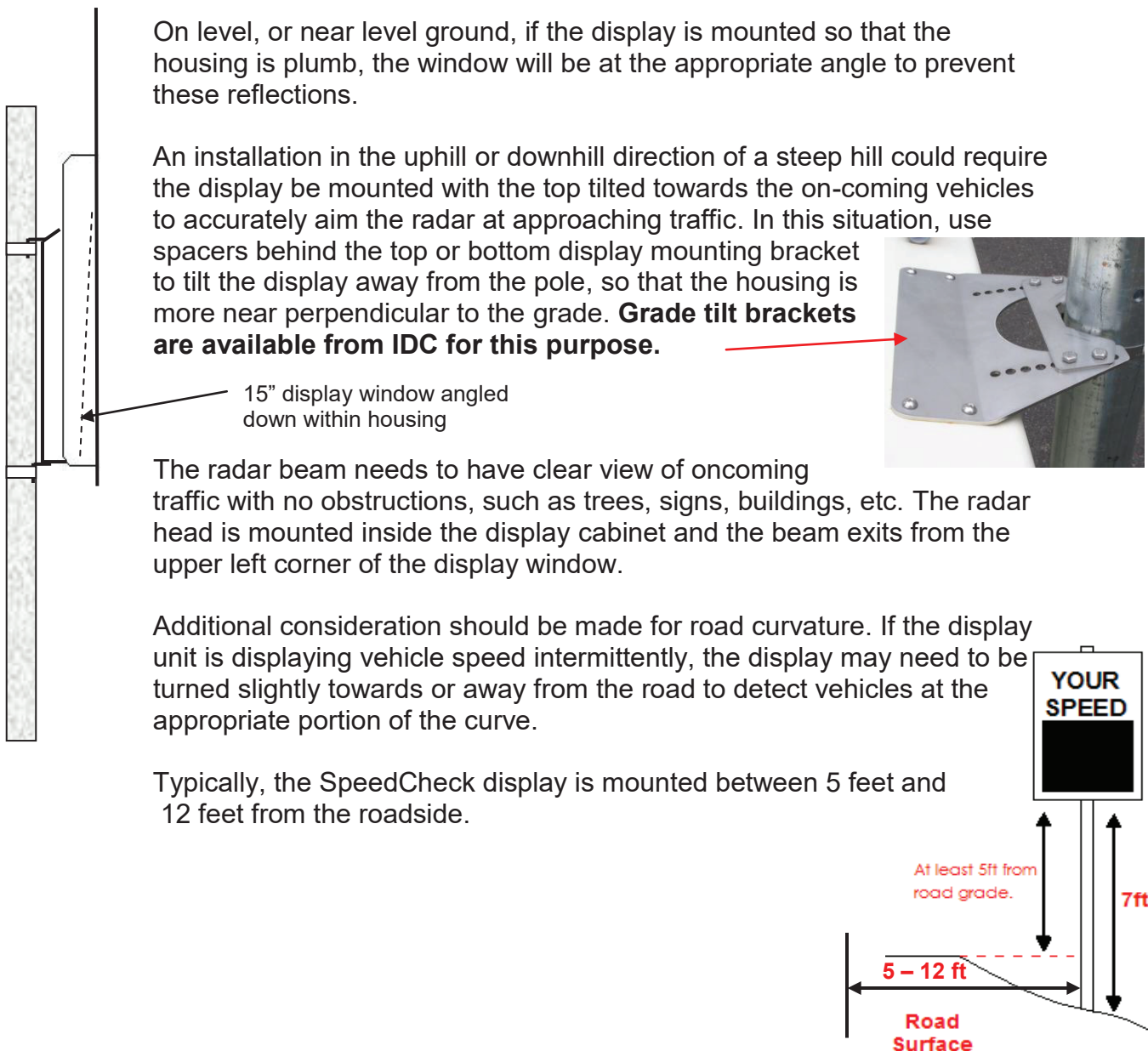
Display Alignment

The 15" series display systems are designed to maximize the contrast of the display and minimize the glare from the window. For these systems to function properly, the display must be aligned properly in relation to the roadway.

There are two main potential sources of severe glare from the display: 1) sun and sky, 2) headlights of oncoming vehicles.

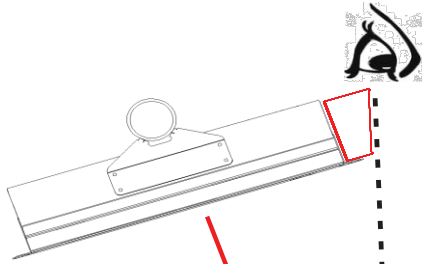
Sky Reflections:

The 15" display is designed with a substantial downward tilt to the display window, which prevents sun or sky reflections from being seen from a vehicle.

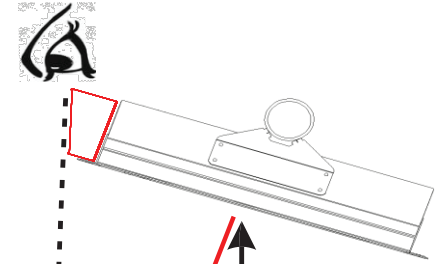


This procedure shows proper alignment for most cases; your site may need additional adjustments. Use hose clamps for temporary installation to test radar detection range before permanently banding display to pole. Adjust display as necessary by rotating it slightly left or right if detection range is short. Normal detection range is 300 to 700 feet.

Left side of roadway sign mounting:

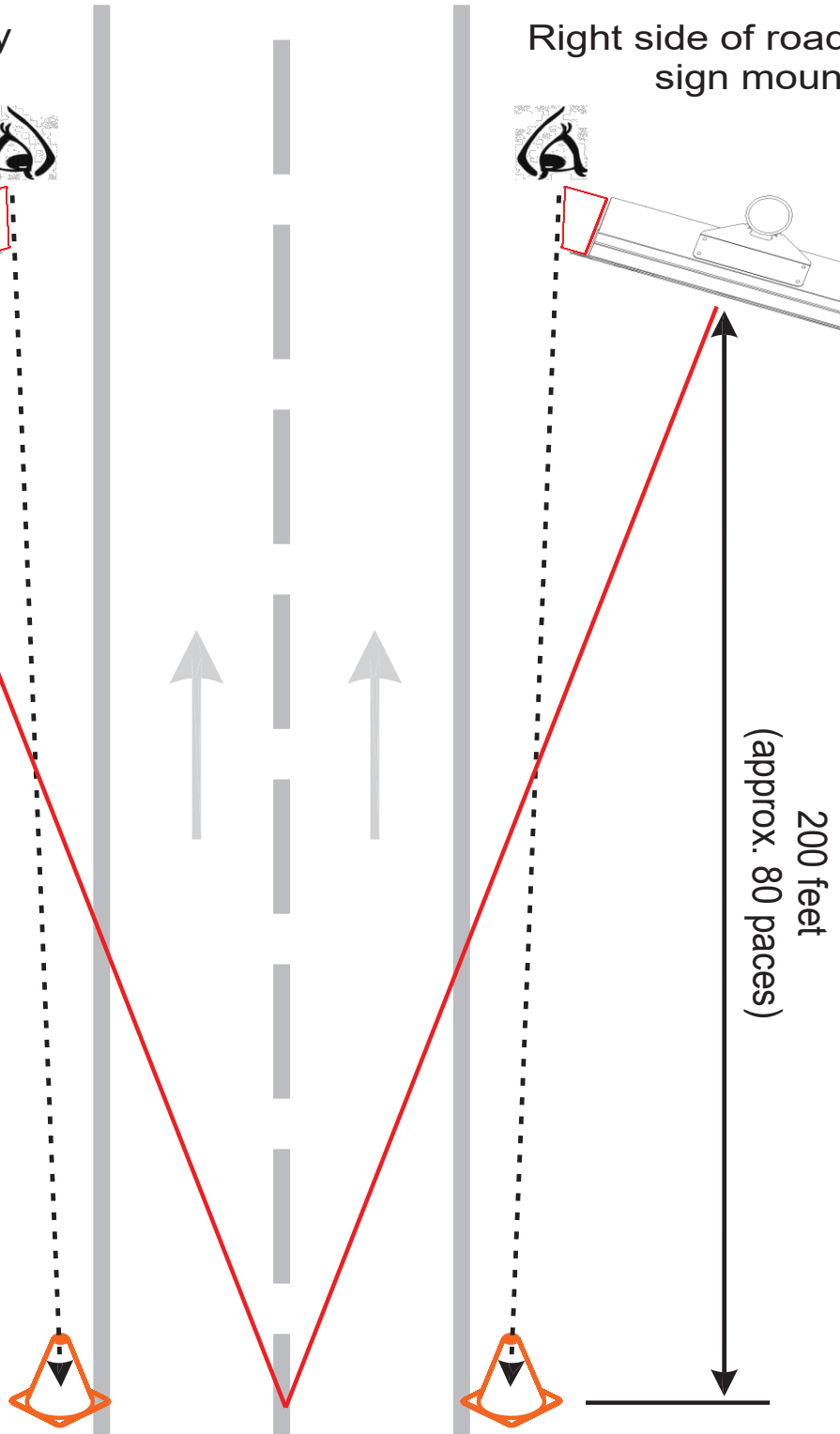


Right side of roadway sign mounting:



Rotational sign alignment

1. Position the SpeedCheck sign at the correct height, and attach clamping devices loosely to allow rotation of the sign
2. Place the orange cone at the edge of the road (next to the fog line) 200 feet (about 80 paces) from the display, towards the direction of traffic.
3. Hold the aiming guide flange against the roadway side of the sign, with the narrow end of the guide to the front as shown.
4. Rotate the SpeedCheck display on the pole until the two points on the aiming guide visually line up with the orange cone as shown here.
5. If done correctly, the sign face is now aimed at a point in the roadway approximately 200 feet from the sign and 12 feet in from the fog line as shown by the red line.
6. Tighten attachment devices.

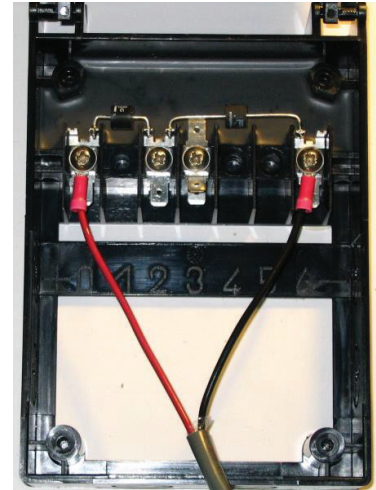


Solar Panel Installation

When installing solar panel(s) always refer to manufacturer specifications for that particular panel(s), or feel free to call *Carmanah* for technical assistance. *Always use a volt meter to determine proper terminal connection. Open solar panel circuit voltage should be between 17 – 22 volts. Actual terminal connections may vary depending upon the solar panel purchased*

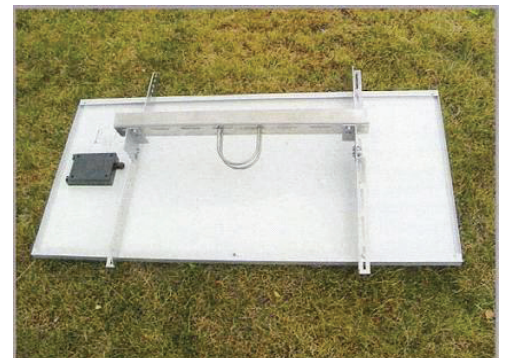


When attaching conduit to the junction box, use caution to put a minimum amount of strain on the box. A broken junction box cannot be repaired.



When a typical pole top mount is used, fully assemble the mounting bracket as shown in the assembly instructions that come with the bracket.

Adjust the mounting bracket to fit the solar panel mounting holes. Do not mount to panel yet.



After the mounting bracket is assembled and properly set up for your specific solar panels, mount the bracket to the pole without the solar panel(s).

It is easier to install the bracket first, and then simply lay the solar panel atop the mounting bracket. With the mounting bracket holding most of the weight of the solar panel, attach the mounting bolts to hold the panel in place. This is also safer, in that there is less chance of damaging the solar panel.



The solar panels supplied have been selected to provide adequate power to the system under the worst-case situation, which will typically be during the period of time following the winter solstice. The solar panels must be oriented for maximum efficiency at that time.

It is also important to know the location and hours of operation the system was designed for. If a solar powered display is operated in a manner not compatible with the original solar sizing design, or is operated more hours per day than it was designed for, then the solar power components may be overly stressed and could fail to power your display as intended.

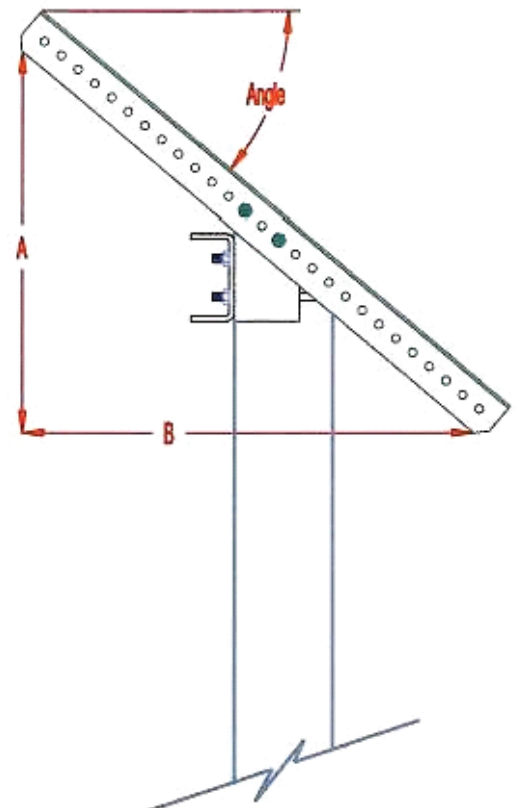
The mounting bracket allows the panel to be tilted towards the sun at the appropriate angle. Determine the correct angle for your location using the table below, and adjust the bracket to the approximate angle shown (accuracy within 5 degrees is close enough).



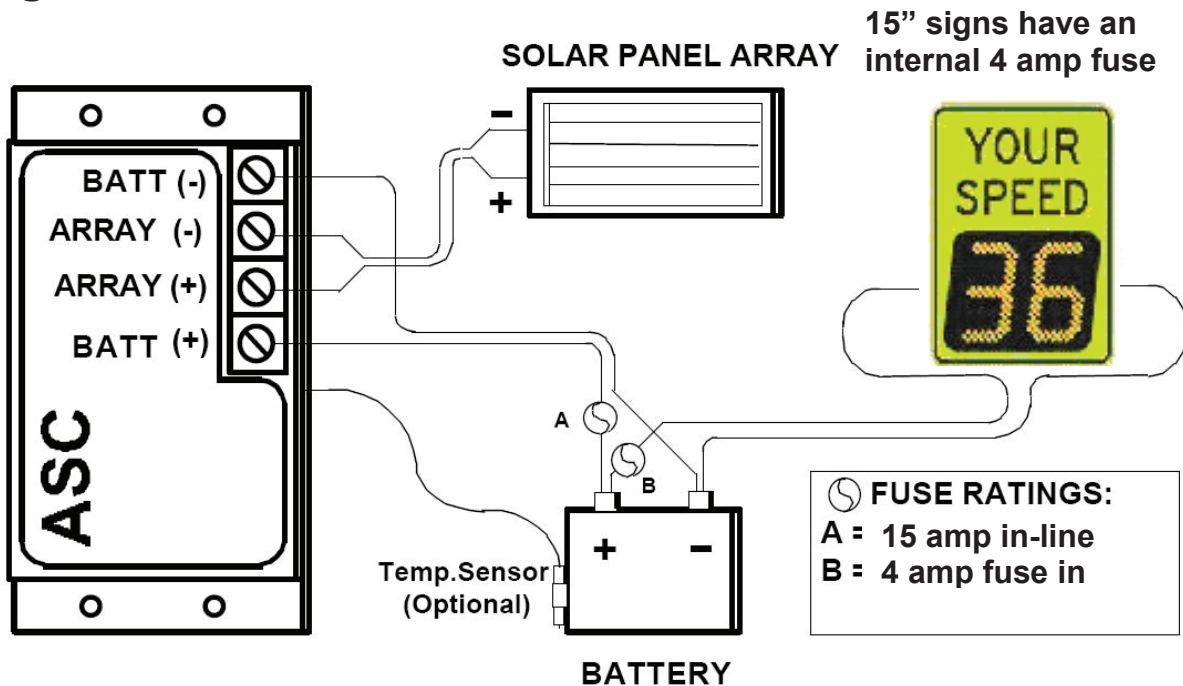
Locate the panel rotationally on the pole so that it is directed due (true) south. Note that true south may be different from magnetic south in your area.

Solar Panel Mounting Angle

Your Latitude	Angle From Horizontal	Rise / Run (A/B)
60	77	4.33
55	72	3.08
50	67	2.36
45	62	1.88
40	57	1.54
35	52	1.28
30	47	1.07
25	42	0.90
20	37	0.75



Connecting Solar Panel, Solar Controller, Battery and Sign



At the Solar Panel

Using a voltmeter, check for voltage (17v – 22v) at the junction box on the back of the solar panel.

- Connect the red 16 gauge wire to the positive voltage terminal
- Connect the black 16 gauge wire to the negative voltage terminal

In the Battery Box

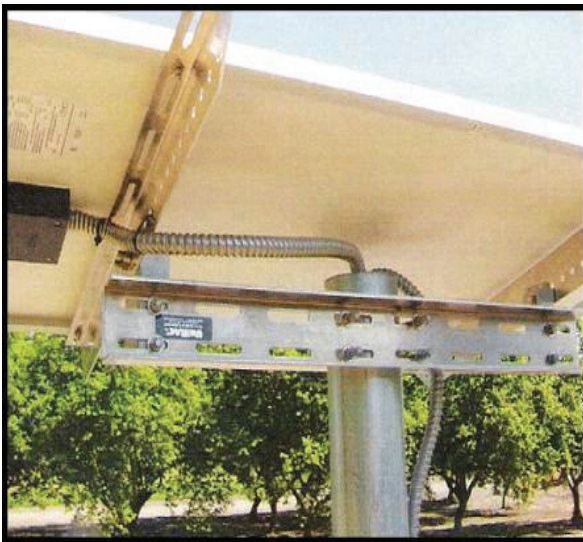
1. Ensure you have solar panel voltage at the panel cable terminals; if not, re-check the step above.
2. Connect the battery to the ASC Controller *before* connecting the solar panel.
3. The 16 gauge cable connects from the sign directly to the battery terminals. **DO NOT** yet connect the power cable from the sign to the solar controller.
4. Connect the 16 gauge cable from the solar panel to the solar controller.
 Double check voltage polarity: Red = 12-17 volts positive, Black = negative
 Red wire connects to the **ARRAY (+)**
 Black wire connects to the **ARRAY (-)**
5. If included, place the temperature sensor against the battery, half-way up the side, and hold in place with supplied adhesive insulating foam.

Caution! If the cable is cut or the sensor damaged, the controller will not function.

The following photos show installation details and options. The top photos show an installation where the power cables are run inside the pole. The display conduit is run up to the top of the pole and down the inside.

On existing poles, or new installations of buried poles, external conduit strapped to the outside of the pole is the easiest method to route wiring.

In areas that are well away from the reach of pedestrians, stainless steel hose clamps are a simple, quick, and reliable way to attach the conduit to the pole and brackets.



Accessing Internal Components

Before working on an AC-powered display, disconnect power at the source. On solar powered units, disconnect power at the battery box. Wait 30 seconds for the power capacitor to discharge before handling and removing the LED display boards.

Be very careful not to touch or move the LEDs, they have been factory aligned for optimal visibility.



Remove the two fasteners, one on each side.



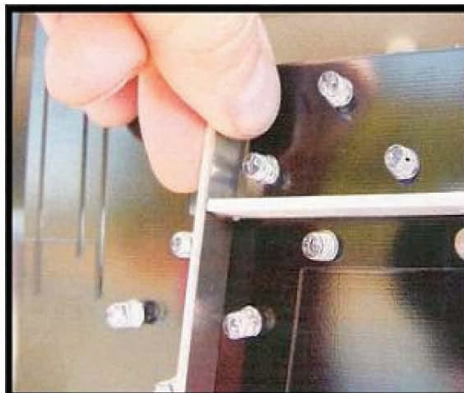
Tilt sign to rear and lift to remove.



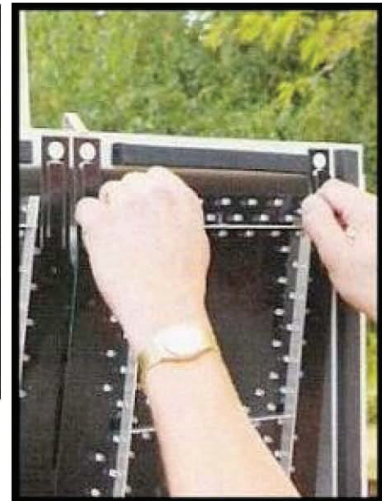
Lift window retainer clip.



Tilt window forward & lift to remove.



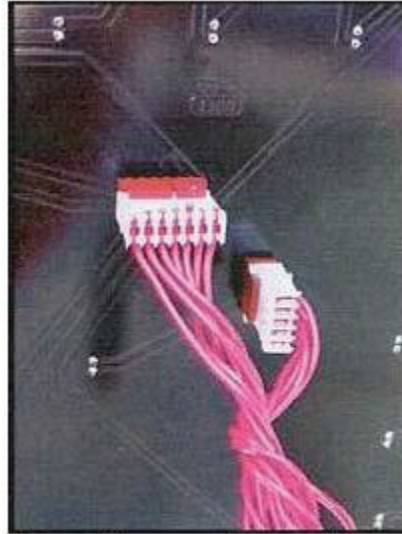
Being VERY careful not to touch the LED lamps... grasp the circuit board stiffeners at the top.



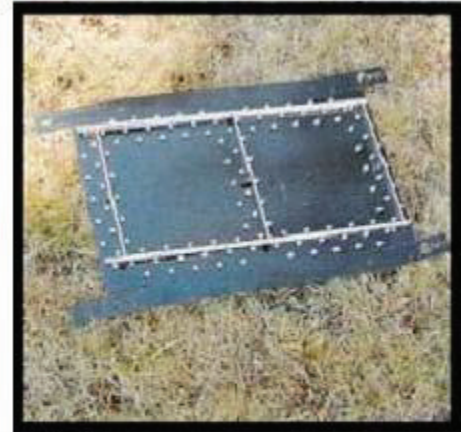
Pull the circuit board toward you about 1/4". When the retainer tabs clear the hanger pins, slide the circuit board upwards.



When the top part of the circuit board releases from the upper hanger pins, lower the board to where the cut-outs slip off the lower hanger pins.



Remove the connectors from the display board.



Place the display somewhere that it will not be in danger of damage. The LEDs are easily bent and misaligned. Nothing should be allowed to touch the individual LED's.

LED Boards can be left plugged into their cables and temporarily hung from the window tray, using the two 1/4-20 bolts removed from the side rails temporarily installed in the left half of the window tray.

15" Classic Board Display Cable Connections

If your display uses a non-programmable driver board (socketed processor chip and no coin cell battery holder), proceed as follows:

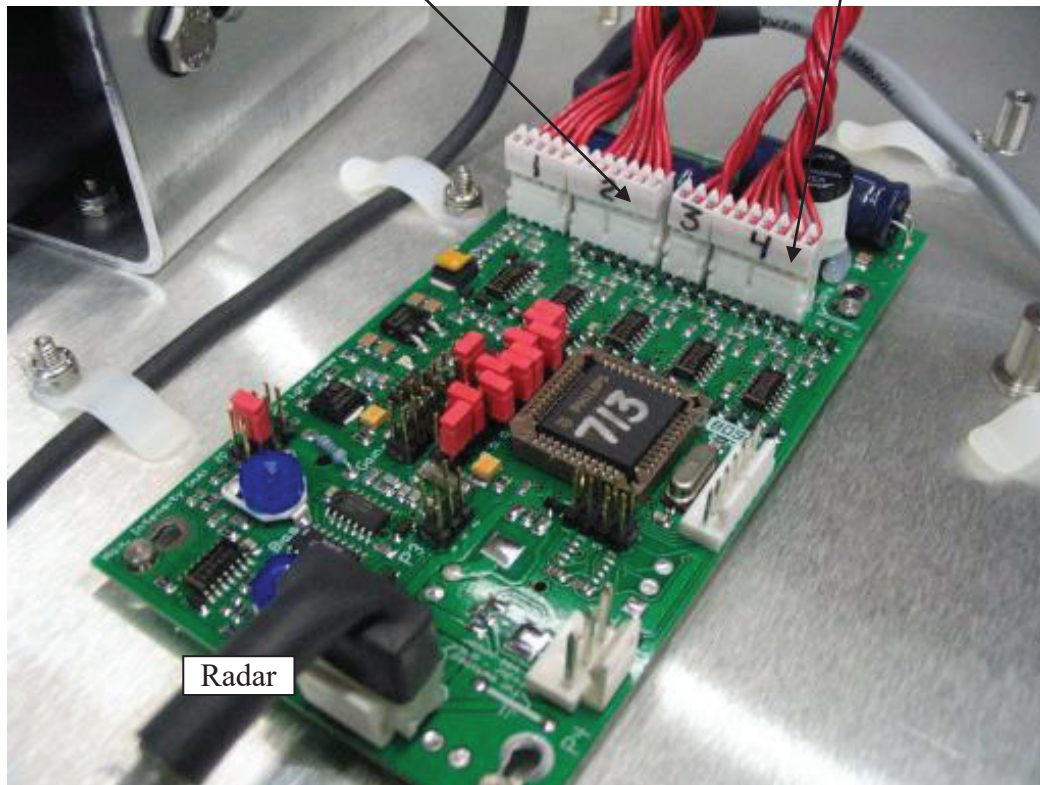
IMPORTANT! *Connect the display cables before connecting the power cable.*

The 5 pin & 7 pin (1 & 2) connectors go the right LED display.

The 3 pin & 7 (3 & 4) pin connector go to the left LED display.

Right LED Display

Left LED Display



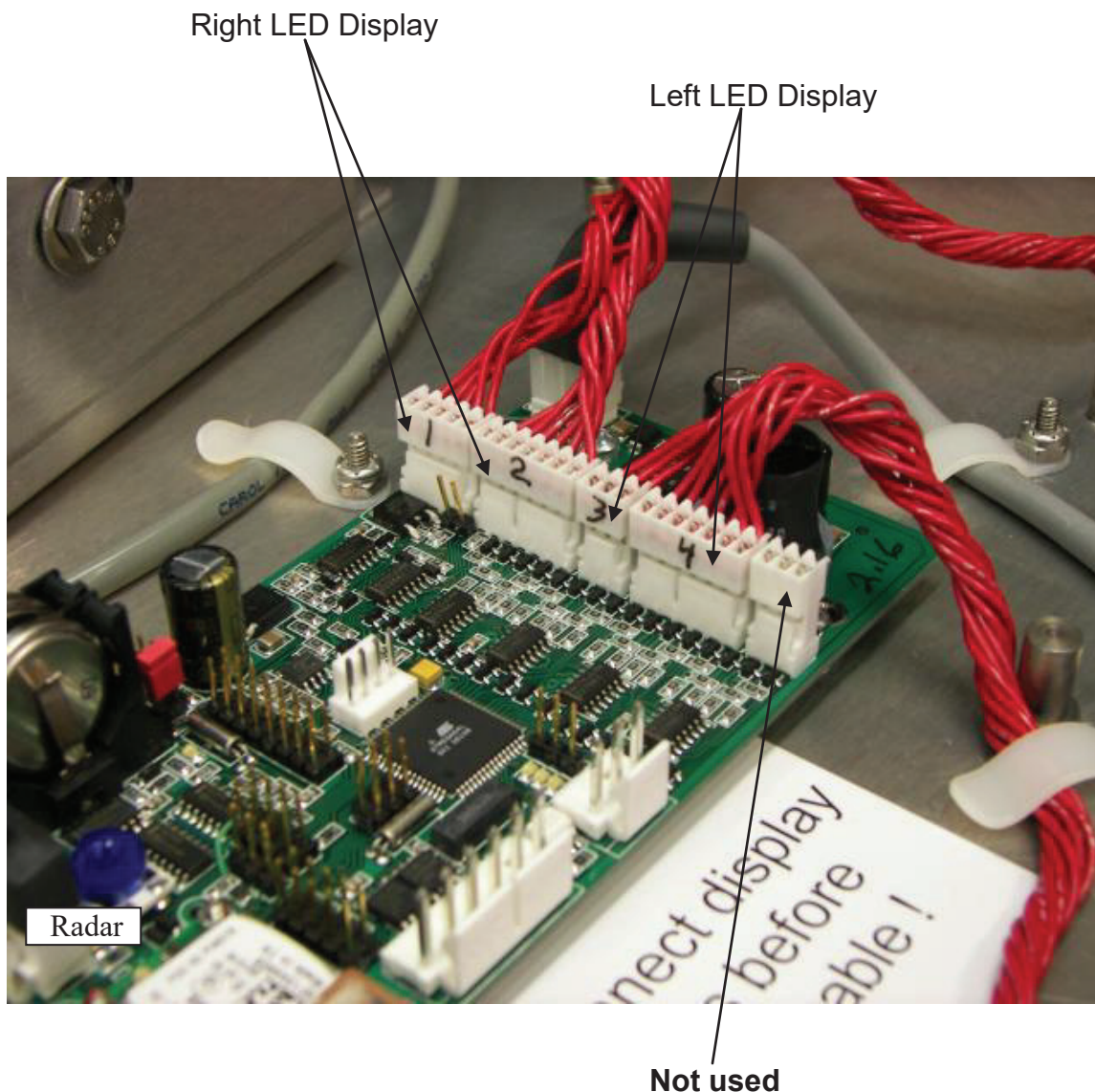
Caution! *Do not power up display with cables disconnected. This will damage the circuit board.*

15" Programmable Board Display Cable Connections (Without Slow Down Display)

If your display has the programmable driver board (with coin cell holder) note the following cable connections.

Connect the display cables before connecting the power cable.

- The 5 pin & 7 pin connectors (1 & 2) go the right LED display.
- The 3 pin & 7 pin connectors (3 & 4) go to the left LED display.



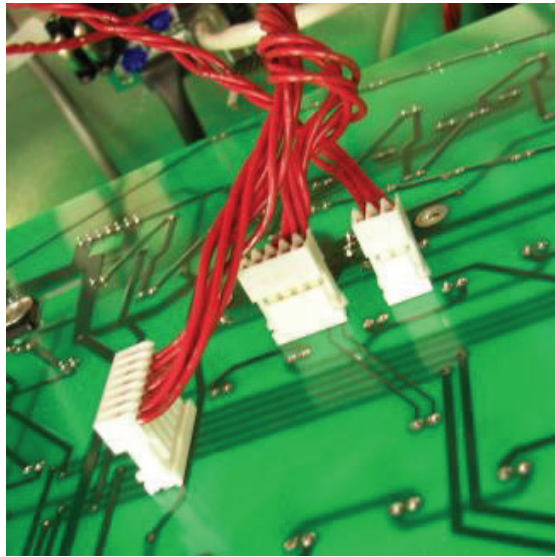
Caution! Do not power up the display with the cables disconnected. This will damage the circuit board.

Slow Down Cable Connections

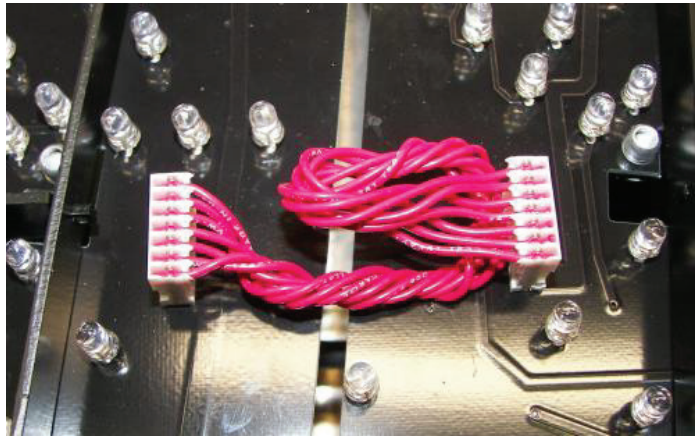
If your display includes the Slow Down Display option, note the following cable connections.

Important: Connect Display Cables before connecting the Power Cable.

1. The Right Side display connection cables are bundled together. Note the orientation of the wires – the index pins on the cable socket fit into notches in the board plug.

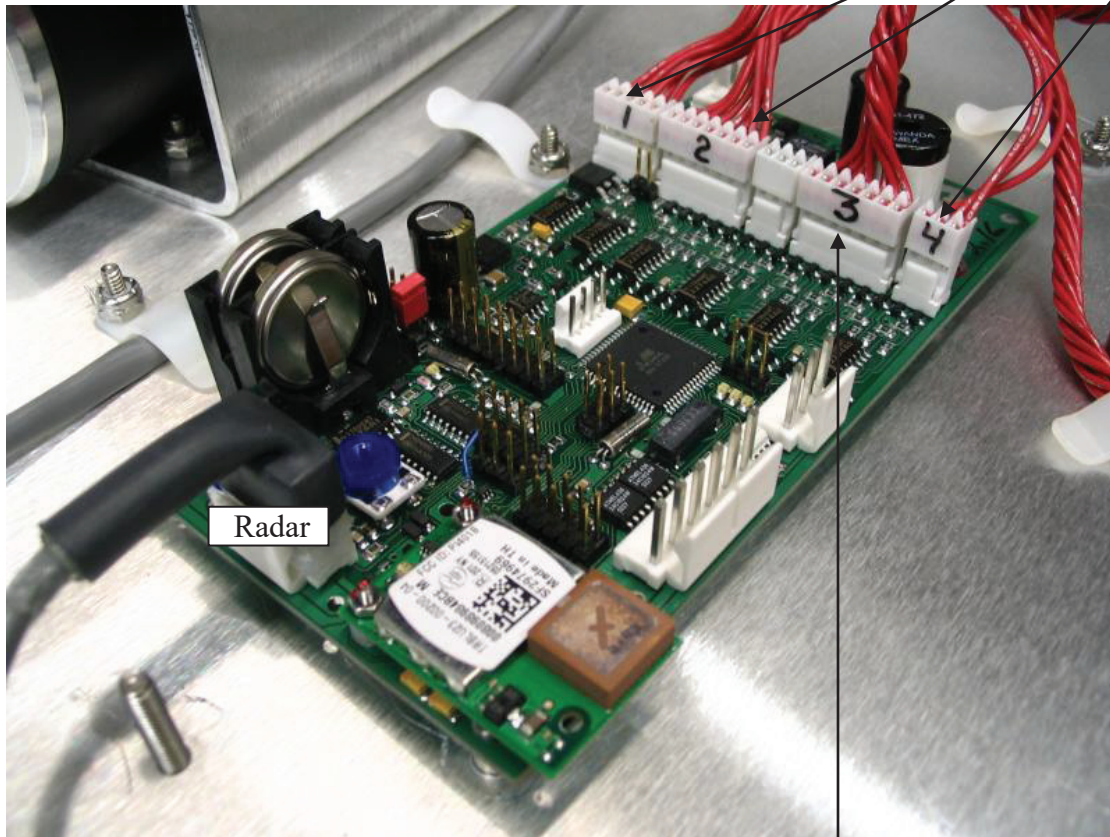


2. Left Side display connection is a single cable with a 7-pin connector. Note the orientation of the wire – the index pins on the cable socket fit into notches in the board plug.
3. Jumper connection between left & right display. The cables exit the connector towards the opposite display board. The board plug pins may be on either the front or the back, but the cable installs the same way.



4. Cable connections to the Driver Board consist of four cables connected as shown in the photo below:

Right LED Display (1, 2, & 4)



Left LED Display (3)

Caution! Do not power up the display with the cables disconnected. This will damage the circuit board.

Maintenance

Sign Face

Ensure that debris and soil are removed from the face of the display and sign, as you would with any road sign. Do NOT use oil based solvents on the polycarbonate window or the sign face, as this can cause permanent fogging. The securing bolts on the sign face should be checked for tightness, as well as the securing mounting (banding, clamps, or U-bolts) that attaches the display to the pole or other mounting structure.

Solar Panels

For solar applications, ensure that the solar panels are free from undue debris or obstructions that may reduce the sunlight available to the panel. Solar batteries typically will last five to ten years before replacement is necessary.

Internal Components

All internal components are replaceable at the module level except the display boards, which are generally provided in pairs to match the brightness and color batches of the high-output LEDs. On 18" displays, the display cabinet should be returned to SpeedCheck for servicing and proper alignment of the LED display boards. On 15" displays, the display boards are replaceable in the field.

Yearly Maintenance

Check the following items yearly, more often in harsher environments:

- Clean and check the radar and mount
- Clean and check the reflector (left edge should be approx. 4" from back of cabinet)
- Clean both sides of the window
- Blow out the LEDs, cabinet and internal components with compressed air
- Visually inspect LEDs for alignment
- Visually inspect for corrosion, rust or worn insulation
- As a preventive measure, if desired on programmable boards, replace the two 2032 coin cells for on-board clock backup.

Troubleshooting

No Operation, or Erratic Operation

- Verify voltage supply connections are correct and tight.
- Verify fuses in the fuse blocks and inline fuse holder are of the correct rating:
 - Solar battery fuse: 15A
 - Sign 12VDC supply fuse: 4A SB
 - Sign 110VAC supply fuse: 1/2A SB
 - Sign 220VAC supply fuse: 1/4A SB or 1/2A SB
- On programmable boards, ensure the coin cells show at least 2.7V each, are replaced, or the Battery Bypass pins are jumpered (see Page 23).

Not All Vehicle Speeds Displayed

- Verify the display has correct alignment with the roadway (see p. 7 above)
- Check high-speed blanking setting, which may be set too low for the prevailing traffic speed.
- Check minimum display speed setting. It may be set too high for the prevailing traffic speed.
- Note that SpeedCheck is designed to detect moving vehicles, including trucks and golf carts. It is designed to ignore people or small targets.
- The Radar unit can be factory-set for longer or shorter detection range, or the display may be angled slightly towards the centerline of the road to focus on vehicles closer to the display. The factory setting is a detection range between 400 to 600 feet from the display, depending somewhat upon target size (truck vs. compact car, etc.).

Sign Displays Test Sequence Only

- Timer or scheduler has been set to collect data but not display speeds. Set the program as desired.
- Radar is not sending data. Contact Carmanah for further diagnostics.

No Test Sequence and No Speeds Displayed

- Key switch (if used) in the OFF position (fully CCW).
- Coin cell batteries are dead (on programmable boards). Below the batteries, and to the left of a shiny silver cylinder, is a very small LED indicator light that blinks continuously when power is disconnected or off. If the small LED is not blinking (when power is off), replace with 2 Lithium 2032 batteries. Remember to reset time and date and check all sign programming.
- Controller board may have a jumper on the power bypass pins just to the left of display cables 1 and 2 which enables operation without coin cells.
- Power to display is OFF.
- Test sequence is disabled.
- Operating Modes settings set for “Display OFF”
- Timer or scheduler has scheduled the sign to be off.
- GPS time synchronization is taking longer than normal due to display not being powered up for a few weeks. Allow up to 30 minutes in this case.

Numbers Displayed with No Vehicles Passing

- “06” or “08” displayed – display is picking up noise from such items as fluorescent light ballast or fan blower motors. Eliminate the source of the noise or insulate the radar head from the display cabinet. Call Carmanah for further information.
- “88” displayed – display is programmed for the SLOW DOWN message but the SLOW DOWN message boards are not installed. Disable the SLOW DOWN message operation in the Setup menu using your laptop computer.

Too High a Number Displayed Relative to Traffic Speed

- Display may be set to read KM/Hr instead of MPH. Contact Carmanah for a radar unit set to the appropriate units.

Sign Displays Speed for Vehicles Going Away From the Sign

- One of the radars we use will operate in bidirectional for about the first three minutes after power up. After about three minutes the unit should go into directional mode.

Detection Range Too Short

- Sign alignment is incorrect. See p. 7 above.
- Sign has metallic or plant obstructions between display and the vehicles.

- Sign is aligned properly but road curve or grade is affecting detection zone. Try aligning the sign face towards or away from center line, and/or more towards the grade of the road (up or down) as required.
- Internal metal radar reflector bent or missing. Check inside the display cabinet.
- Radar unit can be factory-set for longer or shorter detection range, or the display may be angled slightly towards the centerline of the road to focus on vehicles closer to the display. The factory setting is a detection range of 400 to 600 feet from the display. This range is affected by target size (truck vs. compact car, etc). Contact Carmanah for more information.

Bluetooth™ Communications Erratic or Not Working

- Display not powered, or key switch set to OFF.
- PC laptop computer not fully charged. You may get a timeout error if there is insufficient power to maintain a wireless connection.
- PC laptop too far away. It must be located within 50 feet *in front of the sign*.
- Mismatched software and firmware is loaded on the laptop or controller board. Contact Carmanah for the latest versions.

Speedcheck Application Not Downloading Data Properly

- Invalid display name. Make sure display name programmed with your laptop computer is valid and does not include special characters or punctuation.
- PC laptop computer not fully charged. You may get a timeout error if there is insufficient power to maintain a wireless connection.
- Make sure display date/time is set properly with the DisplayManager Setup menu.

Programmable Board Green LED's Indicator Functions

Standby Battery LED

Upper left corner to the lower right of the coin cell batteries. This LED should blink once per second indicating standby mode when no power is supplied to the board. (Coin cells must be in place with voltages above 2.5V each. When power is applied (the power LED will be lit), the Battery LED should light momentarily, then go off. If this light stays on solid, perform a hard reset to the board by momentarily shorting the two left hand pins next to the processor chip.

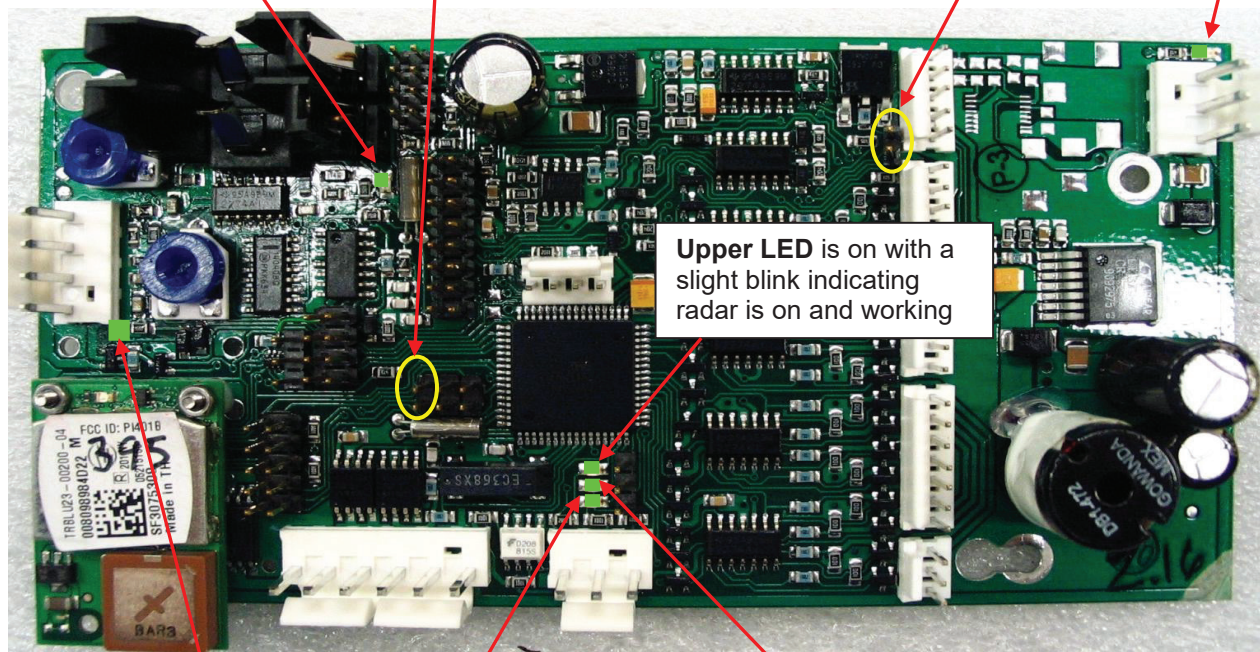
Power LED

Upper right hand corner next to power plug. This LED should be lit when voltage is present.

Battery Bypass –

These pins should have a jumper in place; this allows the board to run with depleted or missing

Reset Pins – Momentarily short pins together to do a hard reset of the board when powered on.



Upper LED is on with a slight blink indicating radar is on and working

BlueTooth LED

On when connected via BlueTooth

Operational LED's

Vertical row of 3 LEDs.

Lower LED indicates the display is on and in operational mode, should remain solid

Center LED will blink whenever radar records vehicle detection. Or, if equipped with GPS, will come on when time is being updated.

If the display is on with power LED lit, and the lower Operational LED is lit, but the radar will not detect and display vehicles, unplug the radar for minimum 10 seconds, then plug back in. The upper radar LED should come on and start displaying vehicle speeds. If not, the radar is not functioning properly.

Customer Service and Warranty

This product is covered by a limited warranty for the product excluding batteries, and a separate limited warranty for the batteries.

Visit www.carmanahtraffic.com for additional information or contact the customer service department.

Before contacting Carmanah's customer service department, please have the serial number of your system available, a brief description of the problem, as well as all details of the installation (location, pole type, type and quantity of fixtures, etc.)

To contact Carmanah's customer service department:

Mail: Carmanah Technologies Corporation
250 Bay Street
Victoria, BC V9A 3K5, Canada

Phone: 1.250.380.0052
1.877.722.8877 (Toll Free in U.S. and Canada)

Fax: 1.250.380.0062

Email: customersupport@carmanah.com

Website: carmanahtraffic.com