1. Parts list

- CS475A
- Mounting bracket

2. Wiring

| Table 2-1: Wire color, function, and RTU connection |
|---------------------------------|----------|----------------|
| Wire color | Wire function | RTU terminal |
| White     | SDI-12 signal | SDI-12 Data |
| Clear     | Shield        | (analog ground) |
| Red       | Power         | 12V |
| Black     | Power ground  | G |

3. Test radar

Verify sensor operation in the lab or office before installing in the field. Connect the CS475A to an SDI-12 device (Table 2-1). Wait approximately 1 minute to allow the CS475A to initialize then send the following SDI-12 commands. These examples use an SDI-12 address of 0.

Identify sensor (aI!)

Command: 0I!
Response: 0I014CampbellCS475A003SN=35964965

The sensor response includes the sensor address (0), SDI-12 version (14), manufacturer (Campbell), model (CS475A), operating system (003), and serial number (SN=35964965).

Make measurement (aM!)

Command: 0M!
Response: 00014

Command: 0D0!
Response: 0+50.000+60.781+13.4263+0

The sensor response to the 0M! command includes the address (0), time (in seconds) to respond (001), and the number of values to return (4). The sensor response to the 0D0! command includes the sensor address (0) + stage (50.000) + distance (60.781) + voltage (13.4263) + error code (0).

4. Mounting

1. Center the sensor beam a minimum of 2.5 m (8.2 ft) from any obstruction (both above and under water) in the measurement range.

<p>| Table 4-1: Radiation beam spread (10° beam angle) |
|-----------------|----------------|</p>
<table>
<thead>
<tr>
<th>Distance (m)</th>
<th>Footprint diameter (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.18</td>
</tr>
<tr>
<td>5</td>
<td>0.87</td>
</tr>
<tr>
<td>10</td>
<td>1.76</td>
</tr>
<tr>
<td>15</td>
<td>2.64</td>
</tr>
<tr>
<td>20</td>
<td>3.53</td>
</tr>
<tr>
<td>25</td>
<td>4.37</td>
</tr>
<tr>
<td>30</td>
<td>5.25</td>
</tr>
<tr>
<td>35</td>
<td>6.12</td>
</tr>
</tbody>
</table>

2. Don’t mount in the middle of bridge spans. This minimizes the effects of vibration and road noise.

3. Securely mount the sensor. Mounting hardware is included with the sensor. Use a bubble level to make certain the antenna horn is aligned within 1° of vertical. A measurement error will be introduced if the antenna is not perpendicular to the water surface.

4. Consider mounting options to minimize vandalism while remaining easy to access.
5. Site specific configuration

1. Read system units by using the aXRSU! command (feet = 0, meters = 1, and user defined = 2). In the following example, the address is 0 and the system units are meters:

   Command: 0XRSU!
   Response: 00022
   Command: 0D0!
   Response: 0+1+0

   The sensor response to the 0XRSU! command includes the address (0), time (in seconds) to respond (002), and the number of values to return (2). The sensor response to the 0D0! includes the sensor address (0) + system units (1) + error code (0).

2. Set the Current or Reference Stage by using the aXWSR=sss.ss! command, where sss.ss is the stage reference in configured units. For example, to set the stage to 50:

   Command: 0XWSR=50! (where 50 is the reference stage)
   Response: 00022
   Command: 0D0!
   Response: 0+50.000+0

   The sensor response to the aXWSR=sss.ss! command includes the address (0), time (in seconds) to respond (002), and the number of values to return (2). The sensor response to the 0D0! includes the sensor address (0) + system units (50.000) + error code (0).

3. Use the aM! command to make a measurement and ensure the stage value is correct.

   Command: 0M!
   Response: 00014
   Command: 0D0!
   Response: 0+50.000+60.781+13.4263+0

   The sensor response to the 0M! command includes the address (0), time (in seconds) to respond (001), and the number of values to return (4). The sensor response to the 0D0! command includes the sensor address (0) + stage (50.000) + distance (60.781) + voltage (13.4263) + error code (0).

Commands to improve the CS475A performance:

1. Issue a False Echo Suppress command if obstacles may create false echos, such as a bridge girder or pier. With the False Echo Suppression command, enter a distance that is 0.5 m (1.5 ft) short of the distance to the water surface. Wait 41 seconds before sending the aD0! command.

   Command: 0XFES=18.5! (where 18.5 is the distance to water surface minus 1.5)
   Response: 00412
   Command: 0D0!
   Response: 0+18.5+0

   The sensor response to the 0XFES=18.5! command includes the address (0), time (in seconds) to respond (041), and the number of values to return (2). The sensor response to the 0D0! command includes the sensor address (0) + distance to suppress (18.5) + error code (0).

2. Change the sensor integration time based on the water surface conditions. Integration time of 2 s is recommended for smooth conditions, 10 s for medium conditions, and 30 s for rough conditions. The default integration time is 10 s.

   Command: 0XWIT=2!
   Response: 00022
   Command: 0D0!
   Response: 0+2+0

   The sensor response to the 0XWIT=2! command includes the address (0), time (in seconds) to respond (002), and the number of values to return (2). The sensor response to the 0D0! command includes the sensor address (0) + new integration time (2) + error code (0).