

# CS475, CS476, CS477

## Radar Ranging Sensors



The CS475, CS476, and CS477 are radar ranging sensors typically used for water-level applications. They emit short microwave pulses and then measure the elapsed time between the emission and return of the pulses. The elapsed time measurement is used to calculate the distance between the sensor and the target (e.g., water, grain, slurry). The distance value can then be used to determine depth.

The sensors differ in their measurement range and accuracy. The CS475 can measure distances up to 65 feet with an accuracy of  $\pm 0.2$  inches; the CS476 can measure up to 98 feet with an accuracy of  $\pm 0.1$  inches; and the CS477 can measure up to 230 feet with an accuracy of  $\pm 0.6$  inches.

These radar sensors output a digital SDI-12 signal to indicate distance and stage. This output is acceptable for recording devices with SDI-12 capability including Campbell Scientific dataloggers.

### Features

- Ideal for areas where submersed sensors can be damaged due to corrosion, contamination, or flood-related debris
- Low maintenance—no moving parts significantly reduces maintenance cost and time
- Compatible with our CR200-series, CR510, CR10X, CR800-series, CR1000, CR3000, and CR5000 dataloggers
- Recalibration not needed
- Low current drain (4.7 mA sleep, 14 mA during measurement)
- Rugged NEMA 4x enclosure suitable for outdoor installations
- Wide operating temperature range ( $-40^{\circ}$  to  $+80^{\circ}\text{C}$ )
- No FCC license required



## Ordering Information

### Radar Ranging Sensors

- CS475-L** Radar Water Level Sensor with 65-ft Maximum Distance. Enter cable length, in feet, after the -L. Must choose a cable termination option (see below).
- CS476-L** Radar Water Level Sensor with 98-ft Maximum Distance. Enter cable length, in feet, after the -L. Must choose a cable termination option (see below).
- CS477-L** Radar Water Level Sensor with 230-ft Maximum distance. Enter cable length, in feet, after the -L. Must choose a cable termination option (see below).

### Cable Termination Options (choose one)

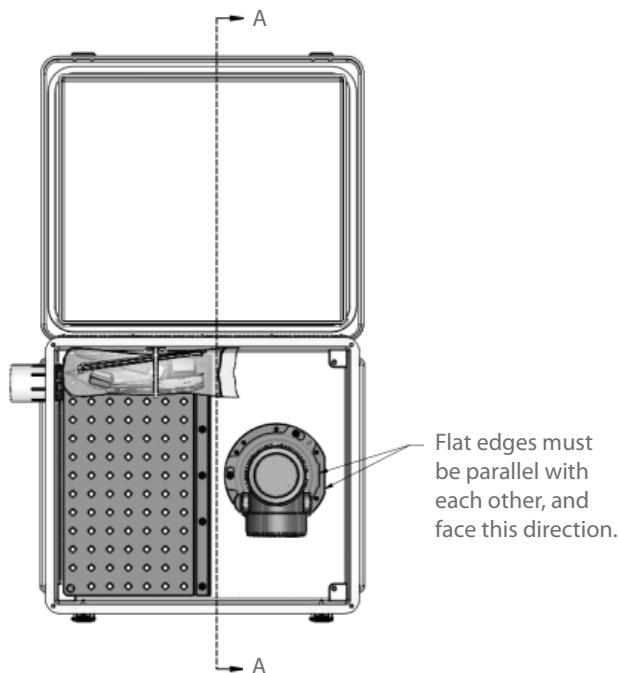
- PT** Cable terminates in stripped and tinned leads for direct connection to a datalogger's terminals.
- PW** Cable terminates in connector for attachment to a prewired enclosure.

### Enclosure Options for CS476 and CS477

- NE** No Field Enclosure.
- FE** Field enclosure that houses a CS476 or CS477 head. Typically the 27162 Enclosure Mounting Kit is also ordered (see Common Accessories).

### Common Accessories

- 25619** Bubble level that helps align the radar sensor in a vertical position, which prevents measurement errors.
- 25616** Adjustment/Display Module used for changing settings, testing, and diagnostics. A cap is available for this display (see below).
- 25654** Cap with window for use with the 25616 display.
- 27162** CS476 and CS476 Enclosure Mounting Kit.



## Specifications

### Measurement Range (distance from horn to water surface)

- CS475:** 2 in. to 65 ft (50 mm to 20 m)  
**CS476:** 2 in. to 98 ft (50 mm to 30 m)  
**CS477:** 16 in. to 229 ft  
 (400 mm to 70 m)

### Accuracy

- CS475 (20 in. to 65 ft):** ±0.2 in. (±5 mm)  
**CS476 (20 in. to 98 ft):** ±0.1 in. (±3 mm)  
**CS477 (20 in. to 230 ft):** ±0.6 in. (±15 mm)

### Resolution:

0.0033 ft (1 mm)

### Output Protocol:

SDI-12

### Radar Unit

#### Frequency:

~26 GHz

#### Electromagnetic Compatibility:

Emission to EN 61326;  
 Electrical Equipment Class B

#### Pulse Energy:

1 mW maximum

#### Beam angle

- CS475:** 10° (3-in dia horn)  
**CS476, CS477:** 8° (4-in dia horn)

### Power Requirements

#### Input Voltage:

9.6 to 16 Vdc

#### Surge Protection:

1.5 KVA

#### Typical Current Drain with 12 V power supply

- Sleeps:** 4.7 mA  
**Measurement:** 14 mA

### Environmental

#### Temperature Range

- Operating:** -40° to +80°C  
**Storage:** -40° to +80°C

#### Temperature Sensitivity:

average  $T_K$ : 2 mm/10 K,  
 max 5 mm over the entire  
 temperature range of  
 -40° to +80° C

#### Vibration Resistance:

Mechanical vibrations with 4 g  
 and 5 to 100Hz

### Mechanical

#### Rating:

NEMA 4x

#### Housing:

Aluminum, coated IP66/68

#### Face Diameter:

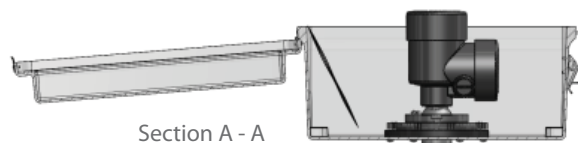
0.625 inches (16 mm)

#### Horn Length

- CS475:** 5.4 in. (137 mm)  
**CS476, CS477:** 16.9 in. (430 mm)

#### Horn Material:

316L stainless steel



At left is a top view of the field enclosure showing the sensor placement and backplate for mounting a datalogger. At right is a cut away view of the field enclosure showing sensor placement. The horn fastens to the sensor on the outside of the enclosure (not shown).

