MEASURING OR MONITORING soil moisture content helps determine when to irrigate, how much water to apply, depth of wetting, patterns of soil moisture extraction by roots, and trends in soil moisture content with time. Soil moisture determines the transport and storage of dissolved nutrients and pollutants and the availability of water to plants. ECH2O soil moisture sensors are economical enough to provide information you need, where and when you need it.

Soil Water Content
ECH2O is a capacitance probe that measures dielectric permittivity of the surrounding medium. In soil, dielectric permittivity is directly related to the water content. The ECH2O probe outputs a voltage proportional to the dielectric permittivity, and therefore the water content of the soil.

Easy Radio Data Collection
The Em5 ECH2O™ Logger and Em5R ECH2O Radio Logger make low-cost soil moisture monitoring possible with highly precise, reliable data collection. Em5/Em5R Loggers connect with up to five ECH2O Probes, store 140 days of data in non-volatile memory and are powered by off-the-shelf AAA batteries. The Em5R Radio Logger is capable of up to 1.6km line-of-sight transmission with external antenna option.

SPECIFICATIONS

<table>
<thead>
<tr>
<th>Range</th>
<th>Zero-to-saturated volumetric water content.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement time</td>
<td>10ms.</td>
</tr>
<tr>
<td>Accuracy</td>
<td>3% typical. 1% with soil specific calibration.</td>
</tr>
<tr>
<td>Resolution</td>
<td>0.002 m/m.</td>
</tr>
<tr>
<td>Output range</td>
<td>ECH2O-20: 375mv (dry soil) to 1000mV (saturated). ECH2O-10: 200mV – 760mV Output voltages proportional to volumetric water content.</td>
</tr>
<tr>
<td>Power requirement</td>
<td>2.5VDC @ 3mA.</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>0–50 °C.</td>
</tr>
<tr>
<td>Dimensions</td>
<td>ECH2O-20: 25.4cm L x 3.2cm W (10&quot; L x 1.25&quot; W) ECH2O-10: 12.2cm L x 3.2cm W (6&quot; L x 1.25&quot; W)</td>
</tr>
<tr>
<td>Warranty</td>
<td>1 year.</td>
</tr>
</tbody>
</table>

BENEFITS
- High resolution allows daily or hourly tracking of water use.
- Voltage output proportional to water content.
- Low-cost dielectric water content sensor.
- Low sensitivity to salt and temperature.
- Very low power requirement.

FEATURES
- Easy to integrate.
- No knowledge of RF necessary.
- Simple networking protocol.
- Reliable data transfer performance.
- Small & battery powered.
ECH2O is a wireless networking technology. ECH2O offers complete technology solutions for data collection, radio modules for wireless data transfer and software for data visualization. ECH2O technology is used in agriculture and environmental monitoring, irrigation and water management.

ECH2O data acquisition stations are used for permanent monitoring and evaluation of time critical data.

Applications data, gathered by various sensors, is transmitted via radio to your computer, where visualization software processes the information. With highest reliability and precision, ECH2O systems monitor soil conditions and water usage.

Wireless capability offers more timeliness, affordability, and efficiency.

> **Extended Communication Range**

The new Em5R-EXT ECH2O Logger with external antenna connection extends the communication range between the logger and the Rm1 ECH2O Receiver. Up to 5-mile line-of-sight data transmission has been achieved using YAGI directional antennas. Combinations of directional and omni-directional antennas allow the user to optimize the range of the communication network. ECH2O field personnel can help design the best telemetry solution for your specific need.

> **Fixed Wireless Systems**

A fixed wireless system uses radio frequencies requiring a line of sight for connection using fixed antennas with narrowly focused beams. Technology has brought higher radio frequencies with broader bandwidth that can carry more information, and require smaller antennas, resulting in lower costs and easier to deploy systems.

> **How to mount YAGI-4 and YAGI-10 external antennas.**

**INSERT** a 6-foot T-Post (metal fence post) securely in the ground at the logger site. Cut 1.25in. schedule 40 PVC pipe to the desired length. Mount the antenna to the end of the PVC with the mounting bracket. Slide the PVC over the T-Post. Mount the Em5R-EX ECH2O Logger to the PVC and connect the antenna cable.

> **External Antennas**

- **Em5R-EXT**

  ECH2O Radio Logger with external antenna option.

- **YAGI-4**

  Four-element Yagi antenna 14in long (6dBd gain), 5ft cable for Em5R-EXT and Rm1.

- **YAGI-10**

  Ten-element Yagi antenna 42in long (12dBd gain), 5ft cable for Em5R-EXT and Rm1.

- **OMNI-5**

  Omni-directional basestation antenna 5dBd gain 23in long with 20ft cable.

- **MMANT**

  Mag mount mobile antenna for Rm1. (Use on vehicle for mobile data retrieval.)

**Advantages**

- Important information is available anytime, even from remote locations.
- License free and reliable radio technology.
- Networking capabilities.
- Easy to install, easy to maintain.
- Increased profitability.