AM400-6/2 INSTALLATION INSTRUCTIONS
Revision 3

WARNINGS:

IF NOT ORIENTED CORRECTLY, BATTERIES MAY BURST CAUSING SERIOUS EYE INJURY. TAKE CARE TO ORIENT BATTERIES AS INDICATED.

THE AM400 CAN BE SUBJECT TO LIGHTNING STRIKES. STAY AWAY FROM THE UNIT DURING ELECTRICAL STORMS.

THE AM400 MAY CATCH FIRE DURING ELECTRICAL STORMS. DO NOT INSTALL THE UNIT ON OR IN BUILDINGS OR OTHER VALUABLE STRUCTURES.

REQUIRED FCC NOTICE

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules.
These limits are designed to provide a reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

STEP 1 - GATHER REQUIRED TOOLS AND MATERIALS

The following tools and materials are required to install the AM400:

REQUIRED TOOLS

Shovel
Level
Battery powered drill
3/32 pilot drill bit
Tape measure
Bar, soil auger or soil probe
Small sledge hammer
4 foot length of 7/8 inch steel bar stock
4 foot length of 1/2 inch PVC pipe
3 foot length of 1/4 inch wood dowel
Water bucket
Razor blade knife
Fine wire stripper (for 18 and 24 gauge wire)
Wire cutter
Fine standard screwdriver
Small (#1) phillips head screwdriver
Medium (#2) standard blade screwdriver

REQUIRED MATERIALS

Qty 1	8 foot, 4x4 inch treated wood post
Qty 16	Wire nut
Qty 1	Tube silicone sealant
Qty 5	#8 x 3/4 inch wood screw
Qty 3	Plastic cable clamp (to fasten cables to post)
Qty 10	Plastic tie wrap
Qty 6	Watermark soil moisture sensor
Qty 2	AA alkaline battery
1000 Ft	3 or 4 pair, CAT3 indoor telephone cable

STEP 2 - PLAN THE INSTALLATION

The Watermark^{tm} soil moisture sensors are typically installed in two locations at three depths as shown in Figure 1. In this configuration, the shallow sensors are installed at the top of the active root zone but not less than 6 inches below the surface. The intermediate and deep sensors are installed at the middle and bottom of the active root zone respectively.

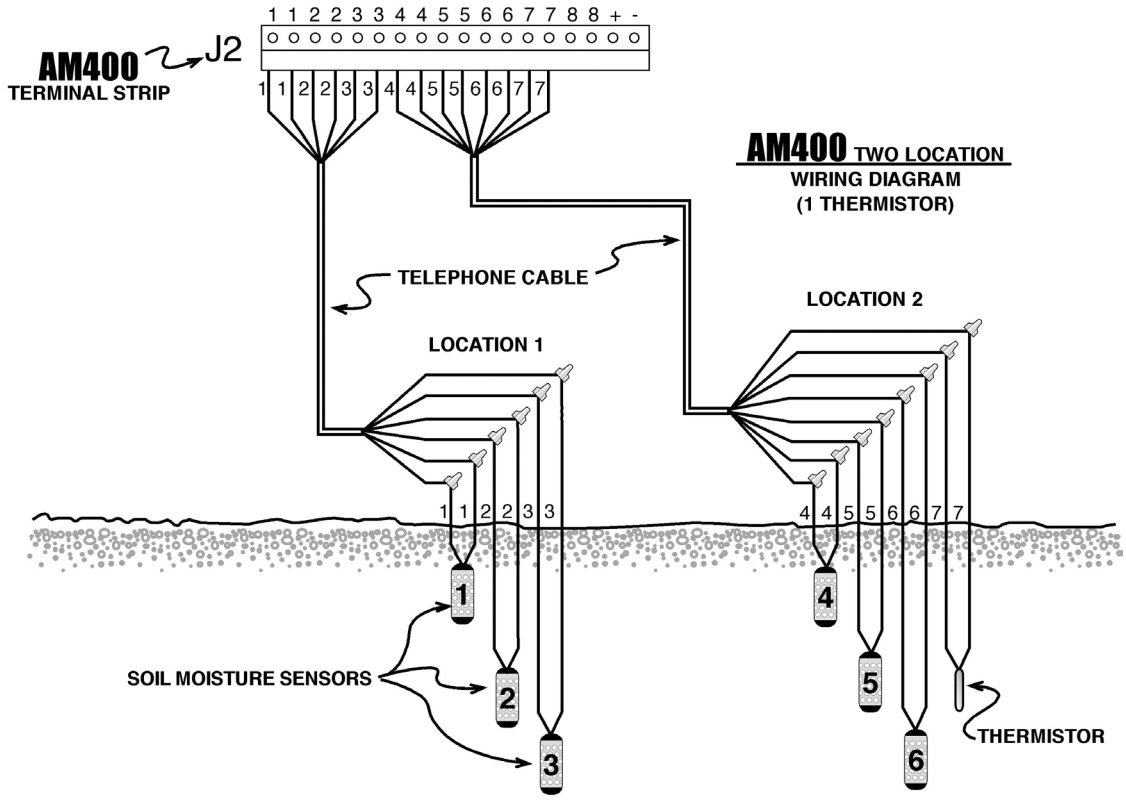

Figure 1 - Two location wiring diagram

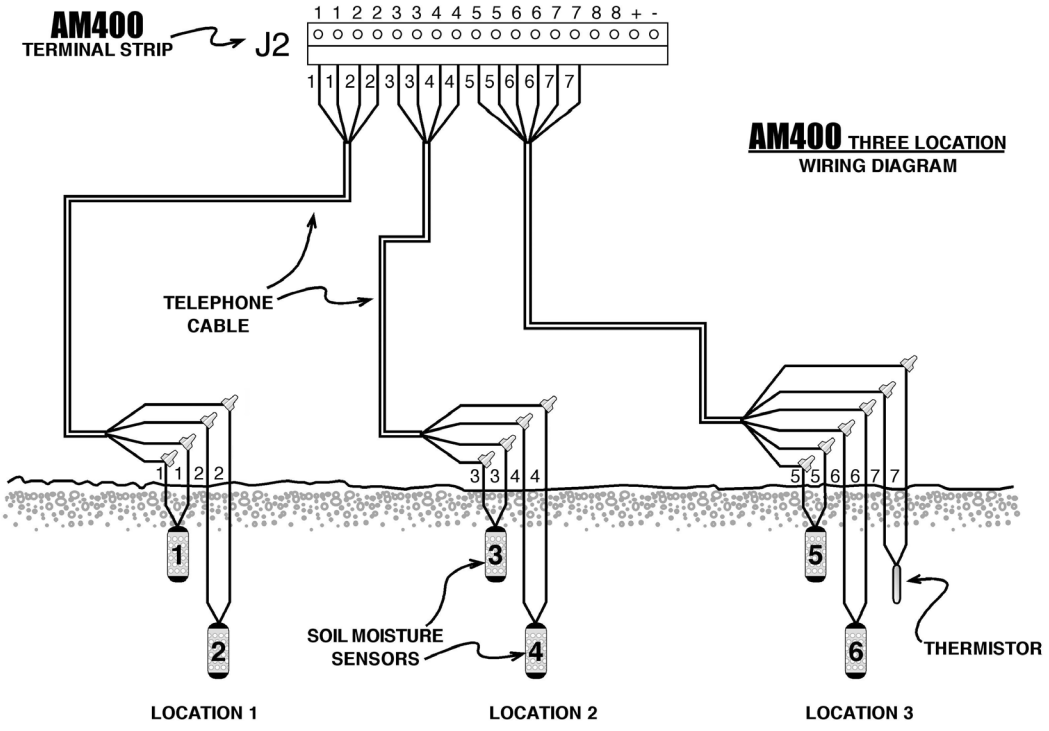

Figure 2 - Three location wiring diagram

Where topsoil is shallow or for shallow-rooted crops, the soil moisture sensors may be installed in three locations at two depths as shown in Figure 2. In this configuration, the upper sensors are installed in the middle of the active root zone and the lower sensors are installed at the bottom of the active root zone.

Sensors should be installed at locations that are typical of the field. They should not be located in dry or wet spots. Sensors can be located up to 1000 feet from the AM400 data logger although cable runs of less than 600 feet are recommended. It is generally a good idea to consult with your local extension agent when determining sensor placement. In drip irrigated fields, the system designer should be consulted to determine optimal sensor placement.

When multiple AM400s are installed, the same configuration should be used for each. This makes it easier to interpret the displayed data. For example, if the standard two location configuration shown in Figure 1 is used for one unit, the same configuration should be used for all other installed units.

Choose a location for the AM400 data logger that is easy to get to. The AM400 can generally tolerate being impacted by water from sprinkler heads, but it is best to locate it outside the sprinkled area. **DO NOT** locate the AM400 in the following areas:

1) On or in a building or other valuable structure (the unit may catch fire during lightning storms).

2) Under power lines.

3) On high ground where it might be exposed to lightning strikes.

STEP 3 - MOUNT THE ENCLOSURE

Remove the snap-on protective cover and the enclosure front cover which is attached to the back cover with four #6 screws. Then, remove the printed circuit board (PCB) which is attached to the back cover by four #4 screws. Place the PCB in pink anti-static bag provided.

Figure 3 - Mounting the enclosure

Mount the AM400 back cover on a 4x4 treated wooden post using two 3/4 inch #8 wood screws as shown in Figure 3. Drill pilot holes for the screws using a battery powered drill. The AM400 should be mounted near eye level.

STEP 4 - INSTALL THE MOISTURE SENSORS

There are a number of different methods for installing Watermark soil moisture sensors. One method is to use a bar or a soil sampling auger to create a hole at least 1 1/2 inches in diameter down to within a few inches of the desired depth. A piece of 7/8 inch diameter (the diameter of the Watermark sensor) bar stock is then hammered down the remaining distance. The Watermark sensor is inserted into the 7/8 inch hole using a piece of 1/2 inch PVC

pipe. The Watermark sensor should be soaked in water before it is inserted. After the Watermark is inserted, the PVC pipe is removed and a small amount of water is poured into the hole to create good contact. The remaining hole is then filled with a slurry of soil and water. A stick should be used to work any bubbles out of the slurry.

Whatever method is used to install the Watermark sensors, the important point is to produce good contact with the soil. If tight contact is not established during installation, the soil may pull away from the sensor when it dries out. If this happens, the readings will be in error until the soil moisture level rises to the point where contact is re-established. For more information about the proper installation of the Watermark sensor, consult your local Irrometer dealer or see the Irrometer web site at www.irrometer.com.

STEP 5 - INSTALL THE THERMISTOR

In most applications a single thermistor is used to correct soil moisture readings for errors due to changes in soil temperature. When one thermistor is used, it should be buried at a depth where soil temperature is expected to be near the average soil temperature that all the soil moisture sensors will see. For example, if soil moisture sensors are placed at depths of 6, 18 and 30 inches, the thermistor should be buried at a depth of about 18 inches. Generally, the thermistor is located near soil moisture sensors so that the same extension cable can be used. It is assumed that soil temperature at a given depth is the same throughout a field.

In some applications two soil temperature correction thermistors are used. One thermistor is used to measure deep soil temperature and a second is used to measure shallow soil temperature. In most cases, the slight increase in accuracy that can be achieved through the use of two thermistors is not worthwhile. Consult the factory for more information about installing two thermistors.

STEP 6 - LAY THE EXTENSION CABLES

Lay extension cables between the AM400 and the sensors. The least expensive and easiest to use extension cable is either a 4 pair or a 3 pair CAT3 indoor telephone cable. Each thermistor and each soil moisture sensor requires two separate conductors. Thermistors and moisture sensors can be

connected to the AM400 through the same cable. When initially cutting the extension cables, make sure that an excess of 5 or 6 feet remains at the AM400 end. Tag the cables at the AM400 end so that they can be identified.

In row crops, cables are generally laid on the surface along the rows. Cables laid on the surface should be flagged periodically to prevent damage during cultivation. In orchards, vineyards, alfalfa and other permanent crops, it is a good idea to bury the cable to keep it from getting snagged in machinery. However, cables should never be buried until after the system is tested.

Do not lay the extension cables under high voltage transmission lines. Do not lay the cables during an electrical storm. To avoid lightning strikes, extension cables should not be run above the ground.

STEP 7 - CONNECT THE EXTENSION CABLES TO THE SENSORS

Use the appropriate size wire nuts to fasten the thermistor and soil moisture sensor leads to the extension cable wire. The wire nuts should be filled with silicone sealant prior to inserting the wires. Tie wraps should be used to prevent the connections from being pulled apart. Bare wire should not be exposed if the connections will be buried.

For a picture showing the recommended method for connecting the extension cables to the sensors, go to the M. K. Hansen Company web site at www.mkhansen.com. The image, along with others,can be accessed by clicking on MORE INFORMATION.

Individual wires within a multi-conductor cable are color-coded. Record the wire colors connected to each soil moisture sensor and the thermistor. This information can then be used to make the correct connections to the AM400 data logger. Typical wiring diagrams are provided in Figure 1 and Figure 2.

STEP 8 – ADJUST THE EXTENSION CABLES

Straighten the cable runs once the extension cables have been connected to the soil moisture sensors and thermistor. Leave a small loop of excess cable at the sensor end and another at the base of the 4x4 mounting post. The loops can be buried to keep them out of the way. Fasten the cables at two or three points on the mounting post with wire clamps.

Then, slide the ends of the cables through the adjustable bushing at the bottom of the AM400 enclosure.

Cut the ends of the cables so that they extend into the enclosure approximately 3 1/2 inches. Make sure the marks or tags identifying the cables are still visible. After the cables are cut, pull the cables back out of the enclosure and strip the outer insulation back approximately 2 1/2 inches. In most cases, the cable will have a fiberglass thread that can be used to strip the outer insulation. Once the outer insulation has been stripped, push the cables back into the enclosure as shown in Fig 3.

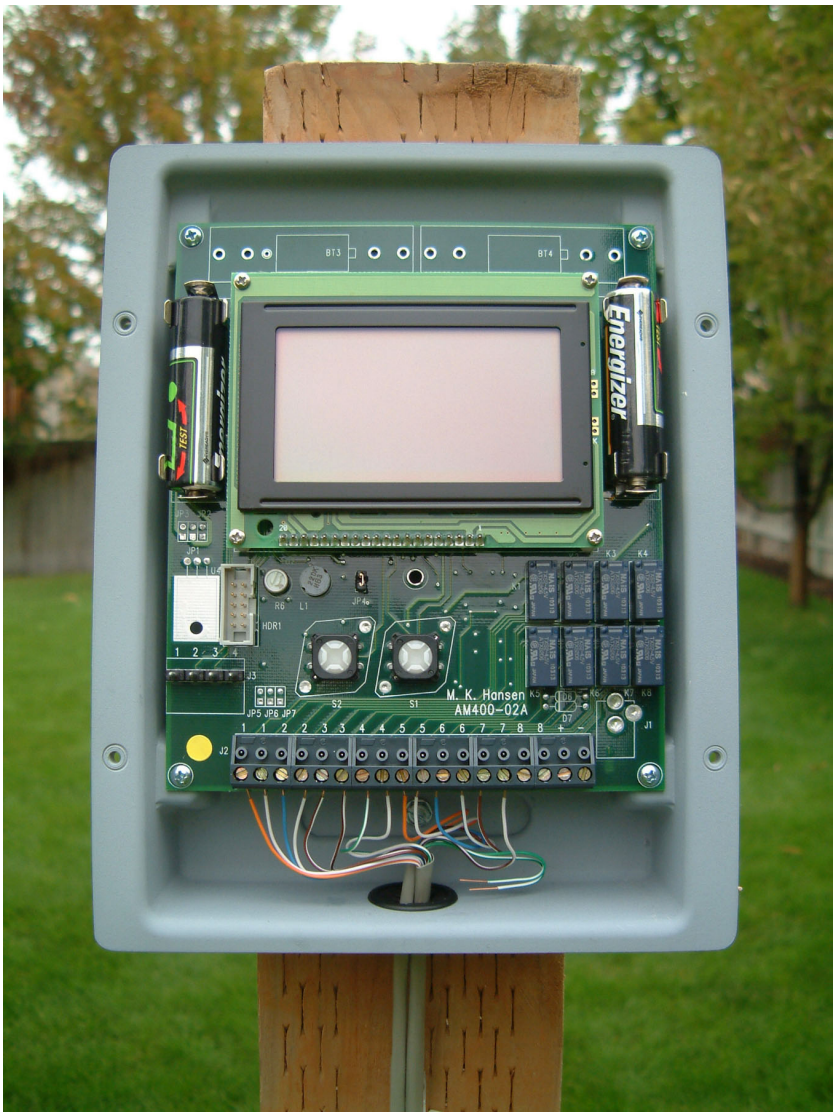

Figure 4 - Wired AM400 with cover removed

STEP 9 - CONNECT THE EXTENSION CABLES TO THE AM400

Reinstall the printed circuit board in the enclosure. Save the anti-static bag to be used in case the printed circuit board needs to be shipped back to the factory for repair or reprogramming. Strip the individual wires back about 5/16 inch. Use the wire color information recorded previously to connect the wires to terminal strip J2 as per the wiring diagram in Figure 1 or Figure 2. Figure 4 shows the mounted printed circuit board with the extension cables connected.

STEP 10 - INSTALL THE BATTERIES

Install two alkaline AA batteries in holders marked BT1 and BT2. Make sure that the batteries are oriented as indicated on the printed circuit board. Do not mix old and new batteries.

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STEP 11 - ADJUST THE DISPLAY CONTRAST

Press pushbutton S1 to turn on the display. Adjust the display contrast if necessary by turning trim pot R6 with a fine screwdriver. In most cases, the contrast should not require adjustment in the field. Contrast adjustment should only be required if the unit is used at temperatures below 0C.

STEP 12 - TEST THE INSTALLATION

Use push-button S1 on the AM400 printed circuit board (See Figure 5) to cycle through the soil moisture displays. Since the soil moisture sensors are installed wet, the soil moisture readings in the upper right hand corner of the display should be between 5 and 0. If a soil moisture sensor is not attached when the unit is first powered up, the first point on the associated graph will not be displayed for 8 hours.

The soil temperature reading displayed in the center of the screen above the graph should also be checked to see if it is reasonable. If no thermistor is connected, this field will default to 25C (77F). If 25C is displayed, check to make sure that the soil temperature thermistor is installed correctly. In

most locations, soil temperatures only reach 25C in mid-summer.

STEP 13 - SEAL THE CABLE ENTRY

Tighten the cable clamps on the mounting post and then use silicone sealant to seal around the cables where they enter through the adjustable black bushing. This will keep insects from nesting in the enclosure.

STEP 14 - REPLACE THE COVER

Install the AM400 front cover and the protective snap-on cover. For pictures showing an installed AM400 both with and without the protective cover, go to the M. K. Hansen Company web site at www.mkhansen.com. The images can be accessed by clicking on MORE INFORMATION.

STEP 15 - BURY THE EXTENSION CABLES

This is an optional step. Extension cables are typically only buried in permanent crops.

FOR TECHNICAL ASSISTANCE CALL 509 884-1396

AM400 MAINTENANCE

Under normal circumstances the AM400 requires no maintenance other than battery replacement. If the protective viewing window becomes dirty, it can be washed with glass cleaner and a soft cloth or tissue. Because the window is made of acrylic plastic, care must be taken not to scratch it.

When the cable entrance is not sealed properly, dust and insects can enter the enclosure. If this happens, the printed circuit board can be washed with tap water and a toothbrush. When washing the printed circuit board, avoid getting excess water on the LCD display. Do not use the toothbrush on the LCD display. The LCD display can be cleaned with glass cleaner and a soft cloth or tissue.
After the printed circuit board is washed, it must be allowed to dry thoroughly before it is re-installed.