



Sensorsoft® Water/Flooding Sensor User Manual

Model SS6201J

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Overview

The SS6201J Sensorsoft Water/Flooding Sensor is an RS232 compatible serial device based on the Sensorsoft Device Protocol. This device uses an external water sensitive cable (purple colour) (P/N C5000) or spot detector (P/N C5001) to sense water leaks. It can detect water on floors, carpets, walls and other surfaces - caused by air conditioners, damaged pipes and leaking roofs.

It is intended for applications where the customer needs to be immediately informed of the presence of water in areas where it is not desired and could do damage or become a safety hazard. In such situations early detection is often critical to avoid extensive damage which can result in insurance claims, downtime and hazard to personnel. Alternately this solution can be used to sense the lack of water in areas where water is to be expected.

These devices use an electrical conductivity method to detect the presence of water. When a surface is moist or wet it exhibits high conductivity and when a surface is dry it exhibits low conductivity. The SS6201J electronic device and C5000 or C5001 was designed to detect these changes in conductivity. It can detect most types of water, including low-grade distilled water.

Sensorsoft Devices offer the following features and benefits over other RS232 serial devices:

- Powered from the serial port (no external power or battery required)
- CRC error detection (detects transmission errors and improves reliability)
- Virtually unlimited cable lengths (1000 ft)
- Plug and go operation (little or no user configuration required)

About this Manual

The Sensorsoft Water/Flooding Sensor may also be referred to as a Water/Flooding Sensor, Sensorsoft device, SSD (Sensorsoft Soft Device) or device throughout this manual.

Installing the Sensorsoft Water/Flooding Sensor

Installation of the Sensorsoft Water/Flooding Sensor and C5000/C5001 water sensing cable is composed of the following:

- Choosing a Location for Installation
- Connecting the Sensorsoft Water/Flooding Sensor to a serial port
- Starting the Sensorsoft software. Please refer to the specific software manual that applies to your installation.

Choosing a Location for Installation

Locate the SS6201J Sensorsoft Water/Flooding Sensor on a surface where it is away from water or heat.

Connect the C5000 (purple) water sensing cable or C5001 spot detector to the 10 ft gray cable on the SS6201J using its two pin connector.

Locate the C5000 water sensing cable or C5001 spot detector in a location where water is likely to collect during an event. An event is considered to be past or future occurrence of water damage. Keep the following in mind:

- An area or surface where a previous event occurred is the most likely place for a repeat event.
- Locate the water sensing cable below an air vent. In an event, air vents often carry water into that space from a leaking roof.
- If you have a ceiling tile that is stained or discolored, this is a likely place for another possible event.
- Do not place the water sensing cable on a conductive surface or it will produce false alarms.
- Locate the water sensing cable on a surface below a water sprinkler, facet or valve.
- Avoid locating the sensor device or water sensing cable where direct contact with sunlight or UV exposure is possible.
- Protect the water sensing cable from high traffic areas that could wear/damage the housing or cable.
- Never allow the water sensing cable housing to come into contact with harsh chemicals or cleaning agents. If it needs to be cleaned, do so with a damp cloth or better a vacuum cleaner.

Connecting the Sensorsoft Water/Flooding Sensor to a serial port

You can connect your SS6201J Sensorsoft Water/Flooding Sensor using a variety of cables that are shown on our web site. If you are connecting this sensor to a DB9 serial port use the C2000 cable.

If you are connecting a Sensorsoft Water/Flooding Sensor to a device server, please be sure to configure the device server port as follows:

- 1200 bps, 8 bits, no parity, 1 stop bit
- Turn off autobaud
- Flow control set to none
- Non-telnet binary (raw) transfer mode
- Assert RTS and DTR always

Refer to your device server's documentation for more details on the above.

Note the physical or COM port number where you plugged the cable into your computer or device server. If the Sensorsoft Water/Flooding Sensor is being plugged into a Windows based computer that has only one COM port, the port number is usually COM1.

SS6201J Sensorsoft Water/Flooding Sensor Specifications

Detection Capabilities: Can detect water present using a separate water detecting cable or spot detector (P/N C5000 or C5001). Provides a WET/DRY indication in software.

Maximum reading rate: one reading every second

Housing Dimensions: 8 cm (3.1") x 4 cm (1.6") x 2 cm (0.8")

Housing Material: injection molded ABS thermoplastic

Housing Colour: light gray

Sensor type: Requires separate C5000 water detecting cable (purple) or C5001 spot detector. These attach to this device through its 10 ft cable terminated with a two-pin molex connector.

Electronics Operating temperature range: -40 ° C to +60 ° C (-40 ° F to +140 ° F)

Communications connector: 8 position modular jack, (accepts 8 position plug RJ45)

Power source: Port-powered (RTS and DTR, both asserted) or via External DC power connector

Power supply current drain: < 10 mA

External DC power connector: 2.1 mm power jack, automatic polarity correction and over-voltage protection.

External power supply voltage: 6.0 - 12.0 VDC

Communications Interface: RS232C using TX,RX,RTS,DTR and GND. One device per serial port.

Maximum communications cable length: 305 m (1000 ft.) using recommended cable type. Low capacitance shielded cable or UTP is recommended.

Firmware Version: 2.01

Communications Protocol: Sensorsoft Device Protocol (SSDP) Version 2.0 and Version 3.0.

For software that supports only Version 2 of the protocol a polling method is used. For software that supports Version 3 of the protocol a real-time method is used.

Error control: 16 bit CRC (cyclic redundancy checking) for detection of communication errors between the device and host computer.

Making extension cables for the Water/Flooding Sensor

In some applications it is not possible to use pre-assembled cables. When installing the Sensorsoft device at a remote location it may be necessary to run cables through walls, ceiling or conduits where connectors would get jammed. In this situation it makes sense to run the cables and then terminate them, on-site, using hand tools. Further, if your host serial port is of the DCE type (some multi-port serial cards) it will be necessary to make your own cables. The following details will assist you in doing that.

A properly made cable will allow your Sensorsoft device to operate reliably over long distances.

PIN-OUT OF THE DB-9F CONNECTOR ON A C-SUFFIX SENSORSOFT DEVICE

Note: Only positions used in Sensorsoft device application are shown

Position	Function
2	TX (data to computer)
3	RX (data from computer)
4	POWER (connects to DTR on computer)
5	Ground
7	POWER (connects to RTS on computer)

The following are suggested specialized tools and parts needed to make good quality extension cables:

Hand Tools:

AMP Crimping Tool P/N 90312-1 or 90302-1, for subminiature D pin or socket contacts

AMP PROCRIMPER P/N 58448-2, for subminiature D pin or socket contacts

AMP Insertion/Extraction Tool P/N 91285-1, for subminiature D connector contacts

Materials:

Berk-Tek UTP (Unshielded Twisted Pair) round stranded cable, P/N 540036--TP

(4 pair, 8-#24 AWG wires, category 4 or better, 75 C)

AMP DB-9 receptacle subminiature D connector (crimp-snap-in), P/N 205203-1 or -3

AMP DB-25 receptacle subminiature D connector (crimp-snap-in), P/N 205207-1 or 207463-1

AMP socket crimp contact for subminiature D connectors, P/N 1-66504-0

AMP pin crimp contact for subminiature D connectors, P/N 1-66506-0

Writing programs for the Sensorsoft Water/Flooding Sensor

The following describes how to write your own programs for the Sensorsoft Water/Flooding Sensor using a polling method. The real-time method is only available with our free Sensorsoft .NET component. This Sensorsoft device uses a binary, packet-formatted, master-slave protocol. All data is represented in the **little endian format** - least significant byte is first and the most significant byte is last. Your host computer (master) must send commands to and receive responses back from the Sensorsoft device (slave) device.

Use the following parameters when programming the serial port where the Sensorsoft device is connected:

Bit rate: 1200 bps
Bits: 8
Parity: none
Stop bits: 1
Flow control: none
Null discard: do not strip NULL bytes

In order to make use of the port powered feature of the Sensorsoft device you must enable serial port lines DTR and RTS when the port is opened. A delay of 1-2 seconds is required after opening the serial port before any commands are sent to the Sensorsoft device. This delay allows the Sensorsoft device to power-up correctly before it receives any commands and prevents incorrect readings.

You should also be aware that the Sensorsoft device has an inter-packet retry time-out delay. This delay is one (1) second and is encoded into the Sensorsoft device firmware. If your program sends a command to the Sensorsoft device and it receives no response, your program must wait at least one (1) second before re-sending that command. Possible reasons that a Sensorsoft device may ignore your commands can be due to data transmission (CRC) errors or improper power-up delay during hot plugging.

Sending commands to the Sensorsoft Water/Flooding Sensor

Each command packet your host sends to the Sensorsoft device must be in the following format:

<CMD-byte> <PACKETlength-bytes> <ADDRESS-bytes> <ARGUMENT-byte> <CRC-bytes>

CMD-byte

A single byte command indicating the desired action the Sensorsoft Water/Flooding Sensor device should carry out.

PACKETlength-bytes

Two bytes indicating the total length of the packet from start to finish (includes CRC bytes).

ADDRESS-bytes

The six-byte (48-bit) address of the device you are sending the command to. For RS232 Sensorsoft devices this is always decimal 1.

ARGUMENT-byte

The number of the Sensorsoft Water/Flooding Sensor's internal register you want to read or write. This byte must be 01h (register 1) to read the Boolean state of the sensor. This byte is not required for the status command.

CRC-bytes

A two byte (16 bit) Cyclic Redundancy Check that is calculated on the entire packet from the CMD byte to the last ARGUMENT byte or ADDRESS byte.

Send the following bytes to request a status reading:

Hex C1 0B 00 01 00 00 00 00 00 47 98

Send the following bytes to request the Boolean state of the sensor:

Hex C5 0C 00 01 00 00 00 00 00 01 0E 49

Note: In the above examples the last two bytes are CRC bytes that were pre-calculated.

Receiving responses from the Sensorsoft Water/Flooding Sensor

Each response packet the Sensorsoft Water/Flooding Sensor returns is in the following format:

<RESPONSE-byte> <PACKETlength-bytes> <DATA-byte(s)> <CRC-bytes>

RESPONSE-byte

A single byte response code indicating the type of response. Valid codes are 90 hex or 94 hex.

PACKETlength-bytes

Two bytes indicating the total length of the packet from start to finish (includes CRC bytes).

DATA-byte(s)

Most responses return additional data in the form of byte(s). In response to a command to read the sensor's Boolean state, one byte is returned for DATA-byte(s). Receiving a 00h byte in this placeholder indicates a **DRY** condition while a 01h indicates a **WET** condition. In response to a status command, one byte is returned for DATA-byte(s). See *SENSORSOFT DEVICE STATUS BYTE FORMAT* chart.

CRC-bytes

A two byte (16 bit) Cyclic Redundancy Check. This placeholder is filled with CRC bytes calculated by the Sensorsoft device on the entire packet from the RESPONSE byte to the last DATA-byte. These bytes allow the host to verify the integrity of the response packet. You may choose to use or ignore these bytes depending on your programming skill or application.

The Sensorsoft device returns a normal RESPONSE-byte (**90 hex**) in acknowledgement that the previous host command was received and executed without errors. The Sensorsoft device only acknowledges correctly received commands that have no CRC errors. If the Sensorsoft device detects a CRC error in a received command packet, it does not respond to the command. It is considered the job of the host to time-out and re-transmit that command packet.

When an internal problem occurs inside the Sensorsoft device it sends out an abnormal response byte (**94 hex**) in response to any command from the host. If the host receives this response byte, it must immediately read and interpret the Sensorsoft device's status to determine the problem. See *SENSORSOFT DEVICE STATUS BYTE FORMAT* chart.

The generator polynomial used for the CRC is hexadecimal 1021. The following references provide information for readers who wish to use the CRC capability;

- Calculating CRC's by Bits and Bytes, Greg Morse, Byte Magazine, September 1986, Pg. 115-124
- Implementing CRC's, Jack Crenshaw, Embedded Systems Programming Magazine, January 1992, Pg. 18-45
- Technical Aspects of Data Communication, John McNamara, Digital Equipment Press 1982, Pg. 110-122
- Data and Computer Communications, 2nd edition, William Stallings, Macmillan Publishing, Pg. 107-112

- The modem reference: the complete guide to selection, installation, and applications, 2nd edition, Michael A Banks, Brady Publishing 1991, Pg. 27-42

SENSORSOFT DEVICE STATUS BYTE FORMAT

BIT	NAME	DESCRIPTION
0	Low power supply	Voltage is unacceptable for reliable operation
1	IRQ enable	N/A
2	IRQ pending	N/A
3	Power-up	Sensorsoft device has just powered-up
4	Tamper	N/A
5	NV option	N/A
6	EEPROM fail	N/A
7	Future use	N/A

A logic one condition on any of these bits indicates the condition is set or active. Otherwise they are reset to logic zero. It is a good practice for the host to check the status of the Sensorsoft device on a regular basis in case a bit changes state.

If bit 0 is set, this indicates that the Sensorsoft device power supply voltage is too low.

When bit 3 is set, this indicates that the Sensorsoft device has just powered-up. This bit gets reset after the status is read.

Bits 1,2,4,5,6 and 7 can be ignored.

Reading the Sensorsoft ID Record

Every Sensorsoft device (SSD) accepts an identification (ID) command, whose response can be used to uniquely identify the type of SSD currently connected. Specifically, the model number and description can be extracted from the SSD's ID response, allowing application software to determine the specific model of the SSD connected and to configure itself appropriately.

The format of the ID command is identical to the format of all other commands, described earlier.

Send the following bytes to the SSD to request the ID:

Hex <C3h> <0Bh> <00h> <01h> <00h> <00h> <00h> <00h> <00h> <20h> <5Eh>

The ID response contains four variable-length null-terminated strings. The sequence of four strings begins at the 10th byte in the response packet.

To read the SSD's description, count to the 10th byte in the ID response and extract the following ASCII null-terminated string.

Following this is the manufacturer's name; also a null-terminated string.

The third null-terminated string is the SSD's model number. The model number can be used to uniquely identify the type of SSD, so that your software can configure itself appropriately for different models of SSDs.

The fourth and final null-terminated string is the SSD's firmware version.

Structure of the ID response packet

Byte	Description of field
1	Response byte
2-3	Packet length
4-9	Not used
10	Device name or description (null-terminated)
~	Manufacturer (null-terminated)
~	Model Number (null-terminated)
~	Firmware Version (null-terminated)
~	Record Terminator (FFh)
~	CRC bytes (2)

Sample ID response packet from a SS6201J Sensorsoft Water Sensor

Byte	Contents
1	<90h>
2	<48h>
3	<00h>
4-9	<01h> <00h> <00h> <02h> <04h> <07h>
10	Sensorsoft (R) Water Detector<00h>
~	Sensorsoft Corp.<00h>
~	SS6201J<00h>
~	2.01<00h>
~	<FFh>
~	<BBh> <01h>

Getting Help

Limited Warranty

Sensorsoft Corporation warrants Sensorsoft products to be free from manufacturing defects for a period of two years. This includes parts and labor. All shipping and brokerage fees are your responsibility when returning a Sensorsoft product for warranty claims. The following will void the warranty and 30 day money back guarantee:

- signs of chemical damage
- cracks to the housing
- signs of tampering or reverse engineering

Technical Support

If in the unlikely event you should have problems installing or using your Sensorsoft product and the previous sections of this manual have failed to provide a solution, we offer technical support to help you overcome your difficulties (see web site address below). No-charge installation and configuration support is provided for 90 days, after that there is a per-incident fee. Sensorsoft Corporation **does not** provide free support to those wishing to write their own software; this is available on a charge-per-incident basis only. Please contact support for current rates.

World Wide Web: <http://www.sensorsoft.com>

E-mail: support@sensorsoft.com

30 Day Money Back Guarantee

If for any reason you want to return a Sensorsoft product for a refund, you can do so within 30 days (calendar days) of your purchase. The refund does not include shipping or brokerage fees you may have incurred or paid.

Returns

If returning a product or item, please keep in mind the follow guidelines:

- Contact Sensorsoft for an RMA number (Return Material Authorization).
- Provide a detailed explanation or reason for returning the product.
- Return shipments that bear no RMA number (on the outside of the package) or are not prepaid for shipping/clearing charges, will be refused.