Sensorsoft ®

Sensorsoft ® Power Sensor
User Manual

Model SP6400J

Manual P/N 071-0033 Rev 5   October 24, 2014

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Overview

The SP6400J Sensorsoft Power Sensor is an RS232 compatible serial device based on the Sensorsoft Device Protocol. The SP6400J is intended for applications where the customer needs to be immediately informed of the loss or availability of AC power source. The SP6400J detects the loss or availability of AC power source using an AC-DC power adapter connected to its 2.1 mm power detector jack. The SP6400J provides a boolean state output indicating POWER FAIL or POWER OK.

The SP6400J monitors the voltage level on its 2.1 mm power detector jack using a threshold comparator. Using an external AC-DC power adapter, the SP6400J, can detect a power failure when AC line voltage drops to 50 percent of the normal line voltage. See specifications in this document for appropriate AC-DC power adapters to use with this device.

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

When other sections of this manual are referenced, italics are used.

Installing the Sensorsoft Power Sensor

Installation of the Sensorsoft Power Sensor is composed of the following:

- Choosing a Location for Installation
- Connecting the Sensorsoft Power 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 Power Sensor within 6 feet (2 m) of the AC power source you are monitoring. Please also keep the following points in mind:

- The Power Sensor can only be powered from the serial port through its RJ45 modular connector. The 2.1 mm power jack is for AC power detection only.
- The computer or device server where you connect the Power Sensor must always be backed up by a UPS (Uninterruptible Power Supply) in order for it to detect AC power loss.

Connecting the Sensorsoft Power Sensor to a serial port

Use the appropriate C200X cable to connect the Power Sensor to your computer or device server. Please refer to the Sensorsoft price list for the available types of cables.

Plug the AC plug of the AC-DC power adapter into the AC power source outlet that you wish to monitor. Plug DC plug (2.1 mm) of the AC-DC power adapter into the power jack of the Power Sensor.

If you intend to make your own custom cable for a J-Suffix Sensorsoft device, please refer to *Making communication cables for J-Suffix Sensorsoft Devices*.

If you are connecting the Power Sensor to a device server please be sure to configure the 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 documentation for more details on the above.

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

SP6400J Sensorsoft Power Sensor Specifications

Detection Capabilities: Can detect availability or loss of AC power source with boolean state output (PWR_FAIL/PWR_OK).

Maximum measurement 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

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

Power source: Port-powered (RTS and DTR, both asserted)

Power supply current drain: < 10 mA

Power detector connector: 2.1 mm power jack, accepts plug from AC-DC power adapters such as P/N PA6109, PA6209 or similar. The minimum voltage on this jack must be 7.8 volts DC for a PWR_OK reading. A voltage below this would give a PWR_FAIL reading.

Power detector method: threshold voltage comparator

Operating temperature range: 0 º C to +60 º C (32 º F to +140 º F)

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.

Communications Protocol: Sensorsoft Device Protocol, Version 2.0

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

Making communication cables for J-Suffix Sensorsoft Devices

In some applications it is not possible to use pre-assembled cables. When installing the Sensorsoft Power Sensor 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 cable lengths up to 305 m (1000 ft) long. The Sensorsoft device modular jack connector uses the same UTP wire map as 10-BASE-T and ISDN. It is therefore possible to use this type of cabling system for Sensorsoft devices.

PIN-OUT OF THE MODULAR 8 POSITION JACK/PLUG ON A SENSORSOFT DEVICE
Note: Terminal No. 1 is the terminal to the extreme left as you face the cable opening, latch tab down.

Terminal	Function	UTP wire color (solid-tracer)
1	ST Receive Data	white-green
2	Ground	green
3	ST Transmit Data	white-orange
4	Power +V	blue
5	Ground	white-blue
6	Ground	orange
7	Power +V	white-brown
8	Ground	brown

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

Hand Tools:
AMP Crimping Tool P/N 1-231652-0 or 2-231652-1, for modular plugs
AMP 8 position modular die set P/N 853400-1
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 8 position modular plug for round stranded wire cables, P/N 5-554169-3 (CAT4)
AMP 8 position modular plug for round stranded wire cables, P/N 5-557961-3 (CAT5)
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

Cable P/N C2000
9 pin Serial Port to Sensorsoft Device
DB-9F to RJ45 modular plug

9 pin Port   Sensorsoft Device

3	TX	white-green	RX	1
2	RX	white-orange	TX	3
4	DTR	white-brown	POWER +V	7
7	RTS	blue	POWER +V	4
5	SIGNAL GND	green	GND	2

P/N C2000 is for use with PC's and most other devices which have a 9 position serial port. F indicates female/socket type connector.

Cable P/N C2001 and C2002
DTE Serial Port to Sensorsoft Device
DB-25 to RJ45 modular plug

DTE Port   Sensorsoft Device

2	TX	white-green	RX	1
3	RX	white-orange	TX	3
20	DTR	white-brown	POWER +V	7
4	RTS	blue	POWER +V	4
7	SIGNAL GND	green	GND	2

P/N C2002 is for use with Sun SPARCstation or SPARCserver serial ports A or B. The DTE end of this cable uses a DB-25M connector. P/N C2001 is for use with PC's that have a DB-25 connector. The DTE end of this cable uses a DB-25F connector. M indicates male/pin type connector. F indicates female/socket type connector.

Cable P/N C2012
DCE Serial Port to Sensorsoft Device
DB-25M to RJ45 modular plug

DCE Port   Sensorsoft Device

3	TX	white-green	RX	1
2	RX	white-orange	TX	3
6	DSR	white-brown	POWER +V	7
5	CTS	blue	POWER +V	4
7	SIGNAL GND	green	GND	2

P/N C2012 is for use with some multiport cards and terminal servers that have a DCE pin-out. M indicates male/pin type connector.

Writing programs for the Sensorsoft Power Sensor

The following describes how to write your own programs for the Sensorsoft Power Sensor. 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).

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's 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 Power Sensor

Each command packet your host sends to the Sensorsoft Power Sensor 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 Power 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 Power 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 Power Sensor

Each response packet the Sensorsoft Power 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 **POWER OK** condition while a 01h indicates a **POWER FAIL** 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	Sensor 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; they are not used in the SP6400J.

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 SP6400J Sensorsoft Power Sensor

Byte	Contents
1	<90h>
2	<46h>
3	<00h>
4-9	<01h> <00h> <00h> <01h> <03h> <07h>
10	Sensorsoft (TM) Power Sensor <00h>
~	Sensorsoft Corp. <00h>
~	SP6400 <00h>
~	1.02 <00h>
~	<FFh>
~	<09Dh> <017h>

Getting Help

Limited Warranty

Sensorsoft Corporation warranties 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 water or 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 us 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.