SMT-A2 – Wireless Data Acquisition Unit

General Description

The SMT-A2 Wireless Data Acquisition unit is a high precision measurement device designed to interface with a variety of different building sensors.

Integrated Moisture Content, RH and temperature sensors make the SMT-A2 suitable for building monitoring applications.

External sensor inputs, LCD display, large memory capacity and extended wireless range gives the SMT-A2 flexibility in a wide range of applications.

The SMT-A2 unit communicates wireless sensor readings to the SMT Building Intelligence Gateway and then synchronizes with the cloud based Building Analytics software. Optional powered repeaters can be used to extend the wireless range.

Applications

- Remote sensor analysis and data collection
- High precision data acquisition
- Building science research
- Targeted repair monitoring
- Restoration monitoring

Features

- Integrated moisture content sensing elements (Restoration Version)
- Integrated relative humidity and temperature sensors.
- Two external resistance channels capable of reading wide moisture content ranges and precision thermistors.
- Sensor inputs use compact audio jacks for quick and simple connectivity.
- Internal memory capable of logging 340,000 data points.
- Auxiliary input for voltage measurement capable of reading low power 0-5V sensors.
- Wireless transceiver with 1000m line of sight communication.
- Communicates to SMT Building Intelligence Gateway (BiG) via USB to Wireless device; SMT-I2 or SMT-I3.
- Low power device suitable for long term battery operation.
- USB connectivity supports data downloads and firmware upgrades.
- Backlit LCD user interface for easy network and sensor verification
- Rechargeable batteries via USB port.

Data Acquisition (SMT-A2)

Repeater(SMT-I2) (optional)

Gateway (BiG) with USB Interface (SMT-I2)

Internet (Analytics)

Electrical Performance

Wireless	
Specification	IEEE 802.15.4
Working Frequency	2.4 GHz – 2.4835 GHz
Power	20dBm (100mW)
Output Range (free air)	1000m. Powered repeaters can be added to extend range.
Max Nodes per coordinator	32 (dependent on application density and acquisition speed)
Battery	
Life	1 year (hourly sampling) External battery packs available for 3 year sampling.
Type	2 AAA Ni-MH Rechargeable Eneloop HR-4UTGA
Max Voltage	3V
Capacity	Typical: 1600 mAh Minimum 1500 mAh
Self Discharge	75% after 3 years
Charging Cycles	Up to 1500
Charger	USB 5V
Memory and USB	
Memory	16 Mbit EEPROM for data storage Stores 340,000 data points.
USB	USB 1.0 Interface

Environmental

Operating Temperature	0° to 40°C / 32° to 104°F
Storage Temperature	-25° to 70°C / -13° to 158°F
Humidity	5% to 100% RH non-condensing
Electrostatic Discharge (ESD)	8kVdc air, 4 kVDC contact (exposed inputs)

Safety/Regulatory

Safety Requirements	SELV Separated Extra Low Voltage
Regulatory	Contains FCC ID: OA3MRF24J40MA

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Contains IC: 7693A-24J40MB

Measurement Specifications

Internal Temperature	
Sensor	Cantherm MF58104F3950 Beta 4390K
Range	-40°C to +70°C
Resolution	0.1°C
Accuracy	±1°C
Internal Relative Humidity	
Sensor	Honeywell HIH-4000-001
Interchangeability	0-59% RH ±5% 60-100% RH ±8%
Resolution	0.5% RH
Accuracy	±5% RH
Hysteresis	3% RH
Repeatability	±0.5% RH
Resistance	
Range	10Ω to 100Ω
Resolution	1Ω
Accuracy	±5%
Range	100Ω to 100KΩ
Resolution	10Ω
Accuracy	±1%
Range	100KΩ to 1GΩ
Resolution	1KΩ
Accuracy	±5%
Voltage	
Range	0V to 5V
Resolution	100mV
Accuracy	±5%
Gain Settings	2x (0 to 2.5V) Resolution 50mV 4x (0 to 1.25V) Resolution 25mV 8x (0 to 625mV) Resolution 12mV 16x (0 to 312mV) Resolution 6mV 32x (0 to 156mV) Resolution 3mV

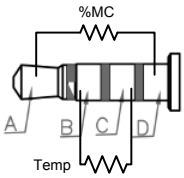
Mechanical

Standard Enclosure	
Dimensions	100mm (L) x 50 mm (W) x 24mm(H)
Weight	150g
Connections	
Resistance Port	Two channels Resistance 100Ω to 1GΩ
Voltage Port	5V, GND, Vin Or Differential voltage
Interface	
LCD	Network join/rejoin Display measurements
LEDs	Green – USB Power Red - Charging
Buttons	Menu/Select buttons

Specifications are subject to change without notice

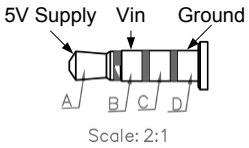
External Port Connectivity

Resistance based and voltage based sensors can be connected to the external audio jack ports:



Resistance Based Sensors

Plug resistance based sensors into the blue audio jack port (input 1/2)



0-5V Sensors

Plug 0-5V Sensors into the white audio jack port. (input 3/4)

On Restoration unit Thermistor or short must be connected between C and D to activate port.

BiG and Analytics Input Configuration

Inputs appear in the Building Intelligence Gateway (BiG) as *New SMT-A2* with default values in resistance (Ω) or voltage (mV) depending on the sensor. Select the appropriate sensor type and temperature sensor for compensation (if applicable) to have the desired unit of measurement displayed.

Refer to the BiG User Manual for further instructions on programming the sensor inputs.

Building Intelligence Gateway

Name	Node	Input	Type	Last Reading	Reading Date
Temperature Sensor	5006	1	Temper...	23.54 °C	12/01/04-20:03:32
Reed Switch	5006	2	Other	0.00	12/01/04-20:03:32
Temperature Sensor	5006	3	Temper...	22.18 °C	12/01/04-20:03:32
Differential Pressure	5006	4	Custom	-0.55	12/01/04-20:03:32
Internal Temperature	5006	5	Temper...	23.99 °C	12/01/04-20:03:32
RH	5006	6	Custom	41.61	12/01/04-20:03:32
Battery	5006	7	Power	2.83 V	12/01/04-20:03:32
Diagnostic Codes	5006	256		5,863.00	12/01/04-19:28:47

Restoration A2:

Input	Function	Sensor Type
1	Internal Temperature	1-04JT (ºC)
2 Probes	Moisture Content	Moisture (%)
3 White	External Temperature (on RH sensor)	Temperature HTM2500 (ºC)
4 White	External RH (%RH)	HTM2500
5	Internal Temperature	1-04JT (ºC)
6	Integrated RH (%RH)	HIH-4000
7	Battery	Battery (V)

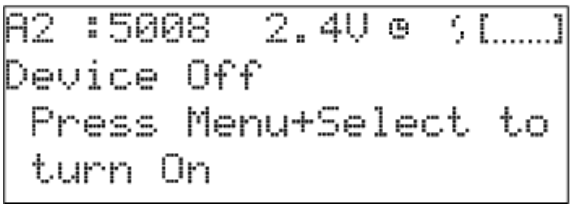
Research A2:

Input	Function	Sensor Type
1 Blue	Resistance (ohms)	User Selectable
2 Blue	Resistance (ohms)	User Selectable
3 White	Resistance (ohms)	User Selectable
4 White	Voltage (mV)	User Selectable
5	Integrated Temperature	1-04JT (ºC)
6	Integrated RH (%RH)	HIH-4000
7	Battery	Battery (V)

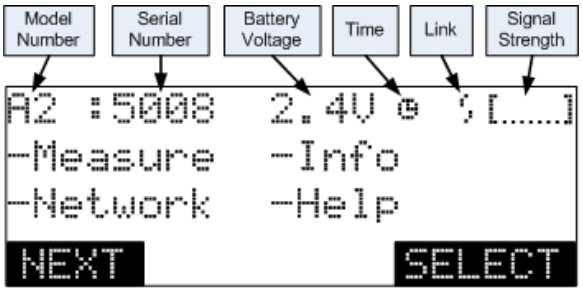
User Interface

If the A2 is OFF, hold Menu and press Select to turn the unit ON. You will be prompted to turn the unit ON.

To turn the unit OFF at anytime, press Menu followed by Select.



The main menu contains links to the submenus as shown below. The first line reports the immediate status of the unit.

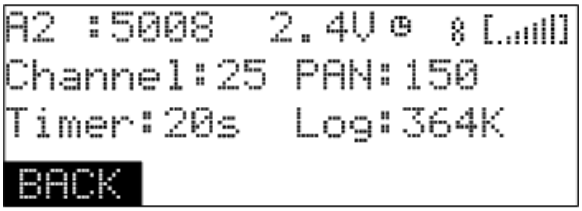


Status Menu	Description
Serial Number	Unique identifier of this unit used in BiG and Analytics
Battery Voltage	Unit should be recharged or batteries changed at 2.2V (discharge time is dependent on sample frequency and type of sensors connected).
Time	Indicates A2 has time Indicates A2 does not have time. Join network with BiG to establish time. A2 will NOT data log if it does not have time.
Link	No link established Link established. Message transmit successful
Signal Strength	[.....] No signal. Ensure connectivity to network. [..ıllı] Full signal strength

To join the network, ensure BiG is running with an SMT-I2 USB to Wireless interface and select Network.

Joining network will be displayed, if joining was successful Joining Network on 25 will be displayed where 25 is the wireless channel, otherwise *No Network* will be displayed.

To rejoin the network, select Join. To see the status of the network select Info from the main menu.

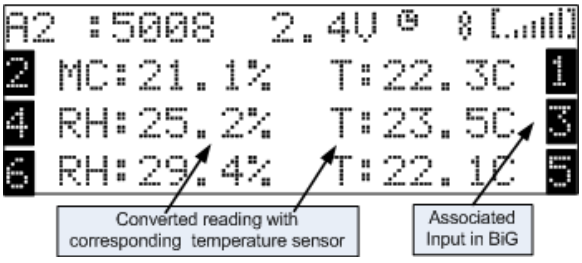


Function	Description
Channel	Channel is autoset by the SMT-A2
PAN	Personalized Area Network (PAN) is specific to all A2 and I2 devices on the network.
Timer	Sample/Log frequency. This is inherited from the SMT-I2 setting in BiG. All units on the network will have the same timer.
Log	Number of samples in memory.
Nwk ID	Unique network ID identifier

Measurements can be taken at anytime regardless of the network status. If a network is available, a reading will be displayed and transmitted. If not, the readings will be logged and transmitted later when the network becomes available.

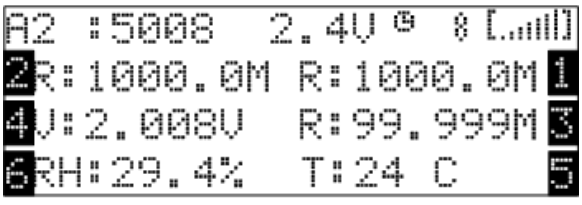
Measure Display - Restoration:

Values are converted to moisture content, temperature and relative humidity. The associated temperature sensor used for temperature compensation is displayed next to each reading.



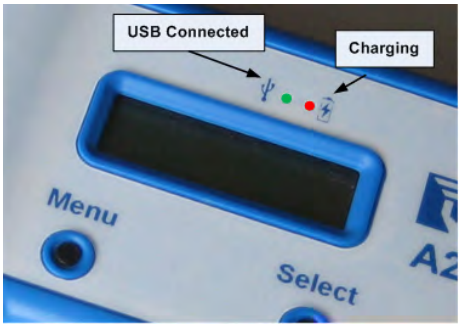
Measure Display - Research:

Resistance is in ohms and voltage in volts. Range will be adjusted automatically. Full values will be transmitted and stored in BiG.



The display will time out after 10 seconds. Press *SELECT* to keep it from timing out.

Battery Charging



The SMT-A2 is equipped with a rechargeable battery. To recharge the battery, power the unit using a USB 2.0 A Male to Mini-B Male cable from a standard computer USB port or wall adaptor.

The *USB Connected* (Green LED) indicates that USB power is available and that charging circuitry is enabled.

The *Charging* (Red LED) indicates that the batteries are being charged. The Red LED will turn off when charging is complete. A flashing LED indicates that USB power is insufficient.

The SMT-A2 will continue to take readings when powered over USB. If it is plugged into a USB port on a computer with BiG running data will be communicated via USB to BiG.

Depending on the application, different batteries may be used and charging may not be available.

Installation

The SMT-A3 is used for permanent mounted solutions in double gang junction boxes. Refer to the SMT-A3 datasheet for more information.

Waterproof enclosures with external plug in jacks are available. No routing through cinch connectors required.

Data collection and analysis

Data is collected by the *Building Intelligence Gateway* (BiG) and forwarded to the *Building Analytics* server database for further analysis and user access. See the BiG and Analytics user manuals for sensor configuration and data analysis capabilities.

Troubleshooting

Unit appears to be frozen or has difficulty turning on:

- Battery power may be too low. Charge the batteries until the Charge LED is off.
- If the screen appears to be frozen or the buttons are unresponsive wait 10 seconds and then reattempt. The A2 periodically handles critical tasks and could take up to 10 seconds to timeout or complete the task.
- Reset the unit: Hold down Menu and Select for 5+ seconds. Do not do this while USB is plugged in.

RH readings are not accurate:

- RH sensor may have been wet and requires recalibration. The unit will need to be sent back to SMT for recalibration.
- Make sure audio jacks are firmly plugged in.

SMT-A2 does not appear in BiG

- Ensure the I2 and A2 are on the same PAN. The PAN on the I2 can be queried by double clicking on the serial number in BiG located under the Devices tab. Select *Get* under the heading labeled PAN. Also, make sure the channel mask is set to 25 by selecting *Get* next to Channel Mask. To query the PAN on the A2 select *Info* from the main screen on the unit.

SMT-A2 does not log data

- Clear log by performing the following:
- Enter Diagnostics by holding Menu and pressing Select 5 times. Screen should blink every time.
- Select Erase Log
- Select Back

Ordering Information	
Restoration A2 w/ moisture probes, RH/T	A2-M12-R21-L
Research A2 External sensors inputs, RH/T	A2-M12-H21-L
External RH Sensor	HTM2500-01-006
Point Moisture Measurement w/ thermistor	PMM-02-006
Thermistor	104JT-01-006