STATE-200 Unit

Installation Manual

(P/N: 9423-06I0A-200)

This manual divides into the following sections:

TABLE OF CONTENTS

1. GENERAL SAFETY INFORMATION

1.1 Safety information

This manual contains information and warnings that must be observed to keep the instruments in a safe condition and ensure safe operation.

Warning - Danger messages identify conditions or practices that could cause bodily harm, and result in damage to this instrument and other equipment to which it is connected

Caution messages identify conditions or practices that could result in permanent loss of data.

Warning - Danger	Caution

- **To use VibroSystM instruments correctly and safely, read and follow all the safety instructions or warnings given throughout this manual.**
- **To avoid electric shock, personal injury, or death, carefully read the information under "Safety Information" before attempting to install, use, or service this instrument.**
- **In addition, follow all generally accepted safety practices and procedures required when working with and around electricity.**
- **For safe operation and to ensure that your system functions at its optimum capability, the installation and adjustment process should be handled only by VibroSystM trained service specialists.**

Safety Precautions

- Although most instruments and accessories are normally used at non-hazardous level voltages, hazardous conditions may be present in some situations.
- This product in intended for use by qualified operators and maintenance personnel who recognize shock hazards and are familiar with the safety precautions required to avoid possible injury. Read and follow all installation, operation, and maintenance information carefully before using the product.
- Install and use this instrument only as specified in this manual, or the protection provided by this instrument might be impaired.
- Do not use this instrument in wet environments.
- Whenever it is likely that safety protection has been impaired, make this instrument inoperative and secure it against any unintended operation.
- Have this instrument serviced only by qualified service personnel.
- To avoid shock hazard, connect the power supply to a properly grounded line power source. If a two-conductor power cord must be used, a protective grounding wire must be connected between the ground terminal and earth ground before connecting the power cord or operating the instrument.
- Never remove the cover or open the case of this instrument without first turning off the main power source.

- Never operate this instrument with the cover removed or the case open.
- Use caution when working with voltages above 30 V_{AC} rms, 42 V_{AC} peak, or 42 V_{DC}, as these voltages pose a shock hazard.
- Use only the replacement fuse(s) specified by the manual.
- Do not operate this instrument around explosive gas, vapor, or dust.

Safety and electrical symbols that appear in this manual and on this instrument:

	**Warning - Danger -** identify conditions or practices that could cause bodily harm, and result in damage to the measuring chain and other equipment to which it is connected. Conditions include a risk of electric shock (voltage > 30 V_{DC} or V_{AC} peak might be present).
	**Caution** - identify conditions or practices that could result in permanent loss of data.
	Important information
	IEC 5032 AC (Alternating Current)
	GND or earth ground
	Protective conductor terminal
	Electronics common - not linked to earth ground
	(Shield) cables shield-to-earth ground, frame or chassis terminal - linked to earth ground

2. GENERAL DESCRIPTION OF THE STATE-200 UNIT

The STATE-200 unit is an acquisition extension for the ZOOM Controller for measuring and monitoring slow-evolving signals. The ZOOM platform and ZOOM Look software plug-in must be installed on the ZOOM Controller to allow functionalities such as data acquisition, data storage, alarm processing, and notification of triggered alarm on the ZOOM Controller screen.

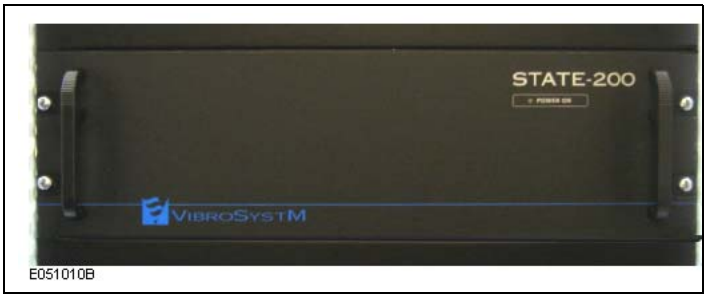
The STATE-200 is 3U in size, like other products offered by VibroSystM such as the ZPU-5000 and PCU-5000. The communication interface between the STATE-200 and ZOOM Controller uses an Ethernet 10/100Mbps standard transmission network. Cat 6 STP network cable must be used. This cable allows installation of the unit at a distance of up to 100m from its network switch. The STATE-200 and ZOOM Controller can share a network with other VibroSystM instruments also using Ethernet transmission. Each STATE-200 Unit has 16 input channels, and several STATE-200 units can be installed on a same network.

Several types of input modules are available, covering most of the parameters used in the surveillance of rotating machines (see below, Table 1: Summary of Available Modules for the STATE-200). The modularity of the instrument allows installation of several different types of modules on a single Unit. Measurements taken through this acquisition unit will be synchronized with measurements taken through other VibroSystM instruments, thus simplifying the analysis work. We can also use this data to assist in the interpretation of dynamic measurements (taken with ZPU-5000), or trigger measurements under various operation modes (conditional measurements).

Table 1: Summary of Available Modules for the STATE-200

Model	Module Type
AD2T	0 to 20 mA isolated
AD3	4 - 20 mA
AD3T	4 - 20 mA isolated
AD6	0 to 5 V_{DC}
AD6T	0 to 5 V_{DC} isolated
AD7	0 to +10 V_{DC}, or contact closure (switch, relay, or other)
AD9T	0 to 50 mV_{DC} isolated
AD10T2	3-wire RTD PT100Ω _ isolated / -50° to +350°C (-58° to + 662°F)
AD11	-5 to +5 V_{DC}
AD11T	-5 to +5 V_{DC} isolated
AD12	-10 to +10 V_{DC}
AD12T	-10 to +10 V_{DC} isolated
AD13T	0 to 100 mV_{DC} isolated
AD14T	4-wire RTD CU10Ω _ isolated / -55° to +150°C (-67° to + 302°F)
AD15T	28 to 140 V_{AC} isolated

2.1 Overview of the STATE-200 Unit main components



The unit is designed to be installed in a properly ventilated rack mount enclosure. Overall enclosure dimensions are:

483 W x 432 D x 133 H (mm)

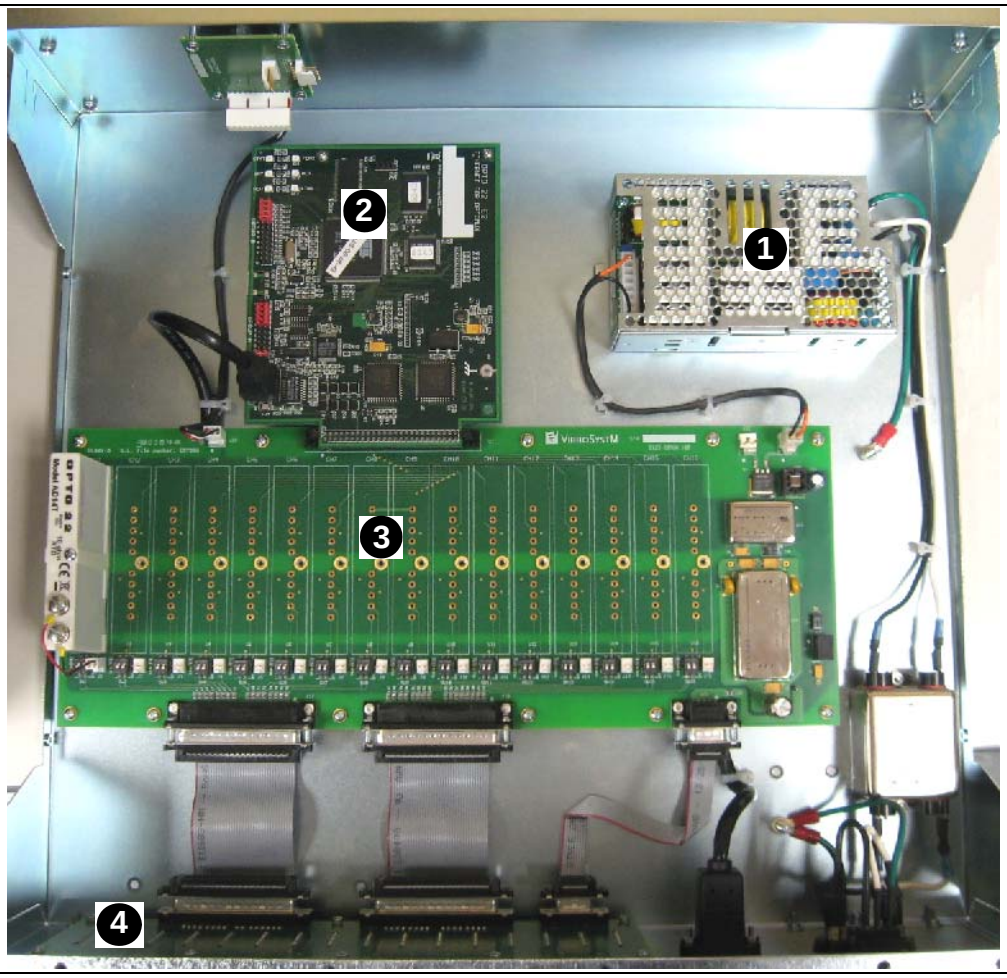
19" W x 17" D x 5.25" H (inches)

FRONT VIEW

1 Power On

A **POWER ON** LED indicator confirms the system is in operation.

INSIDE VIEW



1 Power Supply

The power supply accepts AC line input voltage (100 to 240 VAC, 50-60 Hz), and provides $24V_{DC}$ to the backplane for conversion and distribution to all the electronic components.

2 Brain Board

The brain board is an Internet-ready I/O and communication processor for analog I/O systems. This board is in communication with the ZOOM Controller, to which it transmits the data that has been collected and processed through the I/O modules.

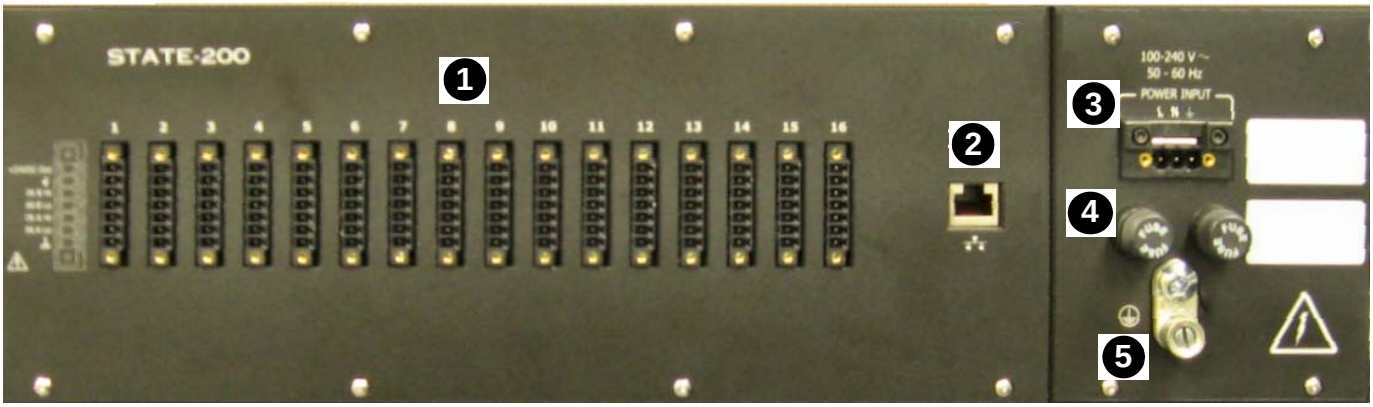
3 Backplane

The backplane is a board which supports up to 16 input modules, and is connected to the brain board. It also converts and distributes power to other components: +/- 15V or + 5V to the input modules, $24V_{DC}$ to the measuring chains, and +5V to the brain board.

4 I/O Interface Card

The I/O interface card provides 16 I/O ports for the interconnection of a sensor to its dedicated input module. Each port also provide +24V_{DC} power, available for the measuring chain, with an auto-reset polyswitch limiting the power output to 200 mA. The maximum total power output for all ports combined is limited to 1 A.

REAR VIEW



1 Analog Input Ports

Sixteen Analog Input ports are provided to receive signals from various remote sensors. Each port also features a $24V_{DC}$ power output available to the associated measuring chain.

Permanent wiring is done on 7-position removable mini screw terminals connectors

2 Ethernet port

An Ethernet network interface is provided to allow transmission of data to a ZOOM Controller.

3 Power Input

AC-input connection to power supply. A 3 position removable female screw terminal connector allows wiring of AC power input. The STATE-200 Unit should be installed in compliance with national and local electrical code.

4 Protection Fuses (2)

The unit relies on dual fuse protection. Replace only with same type of fuse: time-delay, 250V, 3.15A, 5x20 mm.

5 Protective conductor terminal ⏚

The protective conductor terminal on the rear panel must be connected to a grounding point in compliance with local regulations. Grounding through the protective conductor terminal is essential for safety purposes as well as to provide better efficiency against ESD and EMI perturbations.

3. INSTALLATION OF THE STATE-200 UNIT

Although it is normally delivered as part of a complete system, already installed and pre-cabled in a new rack or cabinet, STATE-200 Units can also be ordered separately, as an addition to an existing installation.

3.1 Preliminary considerations for installation in a 19” rack or cabinet

The following guidelines will help you plan your equipment rack configuration:

- Allow sufficient clearance around the rack or cabinet for maintenance.
- Enclosed racks must have adequate ventilation, as each component generates heat. An enclosed rack should have enough ventilation and air circulation with help of fans and exhaust at adequate locations to keep enclosed rack pressure.
- When mounting a unit in an enclosed rack, make sure that the unit’s frame will not block the intake or exhaust ports.
- Baffles can help to isolate exhaust air from intake air, which also helps to draw cooling air through the unit. The best placement of the baffles depends on the airflow patterns in the rack.
- Cabling must be kept away from sources of electrical noise, power lines and fluorescent lighting fixtures.
- The unit must be kept away from sources of electrically conductive dust, as well as water or moisture.
- Heat generated by equipment near the bottom of the rack can be drawn upward into the intake ports of the equipment above. When mounted in an enclosed 19” rack or cabinet, it is suggested to leave at a space of at least 3 1/2” (2U) above each component for ventilation.
- Side support angles are needed for the installation of the unit.

3.2 Required tools and supplies

- wire cutters
- wire strippers
- set of screwdrivers
- removable connector extractor
- pre-assembled ethernet patch cables, or tools and supplies (cable and connectors) for field assembly
- cable for main power input
- ground wire
- input/output signal cables
- mounting brackets to support the STATE-200 unit
- cage nuts and screws

3.3 Unit installation in a 19” rack or cabinet


E020606A

Install side mounting brackets and adjust at the correct height.


E020606B

In a rack with square 3/8” windows, cage nuts are used.

E150910A

Slide the unit in the rack and use four screws on the front plate to hold it in place.

3.4 Cabling the STATE-200 Unit

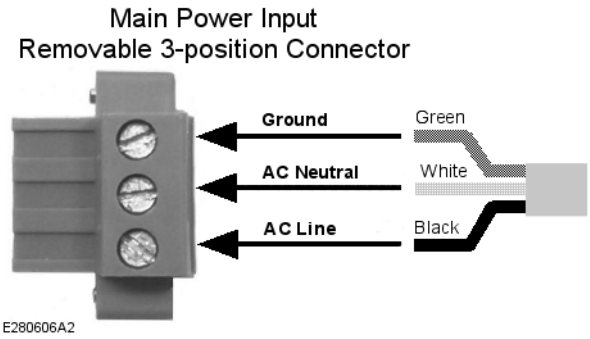
Warning - Danger **Caution**

- **The STATE-200 Unit power supply and grounding connection should be installed in accordance with national and local electrical code.**
- **To ensure protection, the chassis grounding wire must be of a heavier gauge than the grounding wire associated with the AC input.**

3.4.1 Power Input

The most common method of connecting the AC-input to the power supply connector is through the use of a three-wire electrical grounding-type cord (not supplied) fitting into a grounding-type power outlet, the socket-outlet combination serving as the main disconnect device.

For safety purposes, a 15A circuit breaker should also be included in the AC-input wiring. Several instruments may be connected to a circuit protected by a circuit breaker. Each instrument must however have its own disconnect device.



Note: In cabinets housing several instruments, it is common practice to connect only Line and Neutral. To prevent ground loops, only the protective conductor terminal gets connected to ground.

- Mechanical characteristics

Recommended wire size: 1,5 mm^2 *[16 AWG]* (600V rating)

3.4.2 Protective Conductor Terminal

The protective conductor terminal must be connected to a grounding point in compliance with local regulations. Grounding is essential for safety purposes.

Mechanical characteristics

Wire size: at least 1,5 mm^2 *[16 AWG],* up to 6 mm^2 *[10AWG]*

3.4.3 Ethernet Port

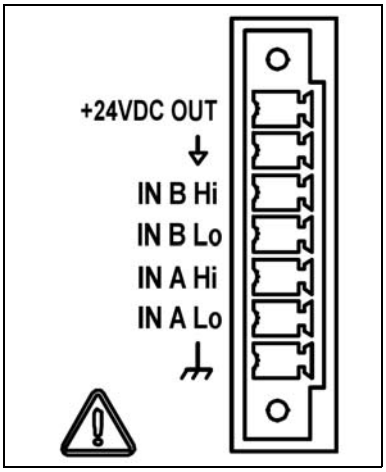
ETHERNET Port: 100 Mpbs port for communication with ZOOM System through a CAT6-E cable (recommended).

Mechanical characteristics

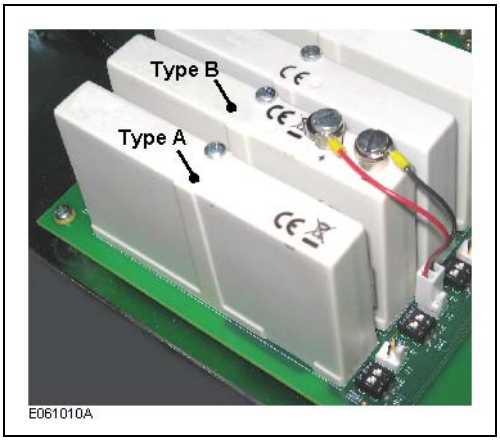
- socket: RJ-45 LAN

3.5 Input Modules

Input modules are single channel electronic components for reception and processing of signals from various types of sensors. Input modules convert analog signals into a digital format, the resulting signal is then sent to the brain board for transmission to the ZOOM controler. Fifteen different types of modules are available for processing distinct types of signals. A STATE-200 unit can accept up to 16 I/O modules.

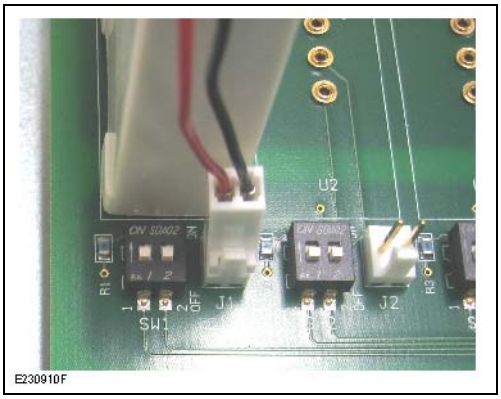


Each port is wired through a 7-position removable mini-connector which allows connection of signal input, shield, and +24VDC output for powering the measuring chain.



- Modules with a Type A casing do not use input signals **IN B Hi** or **IN B Lo**, and have only the head of the retaining screw on top.
- Modules with a Type B casing have a small connector cable attached to two additional screws on top for connection of input signals **IN B Hi** and **IN B Lo.**

Refer to *Table 1: "Input Modules Available,"* on page 31 to see the type of casing for each model of input module.



On the backplane, a small DIP switch and two pins are assigned to each module location.

- The DIP switch must be set according to the model of the module present at that location.

  Refer to section *"3.5.1 Input wiring and DIP switch setting"* on page 18 for details.

- The two pins are used with some types of input modules for connection of input signals **IN B Hi** and **IN B Lo**.

3.5.1 Input wiring and DIP switch setting

The following diagrams show the input wiring and the internal DIP switch settings for each model of input module.

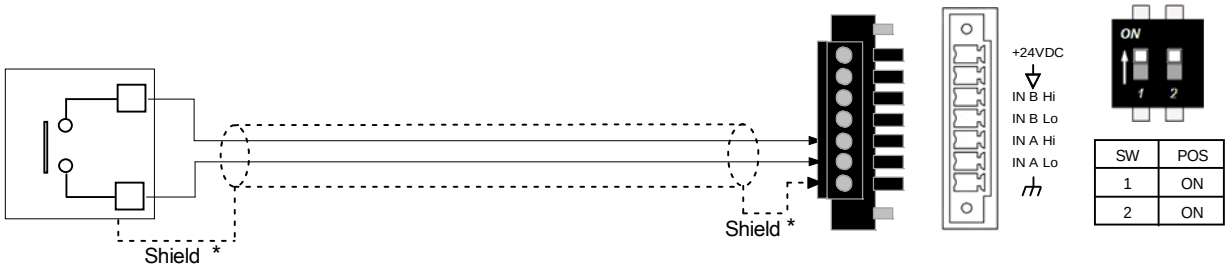
⚠ Caution

On each diagram, the dotted line representing the cable shield is shown as being connected at both ends. However, to avoid ground loops problems, the shield must be connected at one end only.

- If the shield on the sensor end of the cable is in contact with earth ground, do not connect the cable shield to the 7-position connector.
- If the shield on the sensor end of the cable is isolated from earth ground, connect the cable shield to the ground position on the 7-position connector.

1 **Contact closure (switch, relay, or other)**

Model: AD7
Module casing: Type A

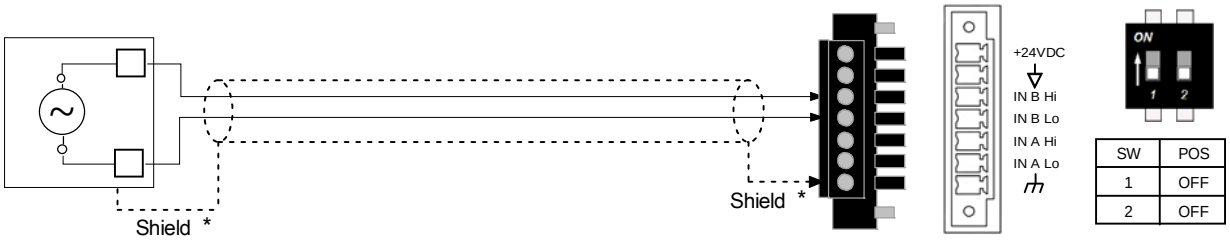


SW	POS
1	ON
2	ON

Note* : To avoid ground loop problems, connect shield to earth ground on one end of the cable only.

2 **Sensor with AC voltage output (28-120VAC)**

Model: AD15T
Module casing: Type B

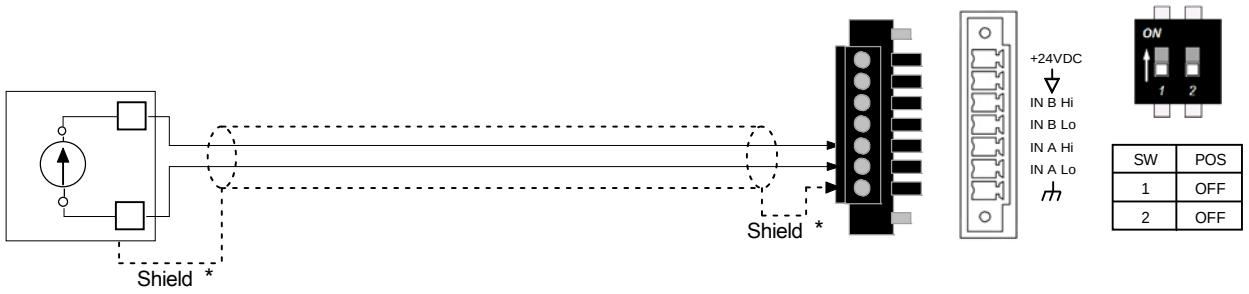


SW	POS
1	OFF
2	OFF

Note* : To avoid ground loop problems, connect shield to earth ground on one end of the cable only.

3 Sensor with current (mA) output

Model: AD2T, AD3, AD3T
Module casing: Type A

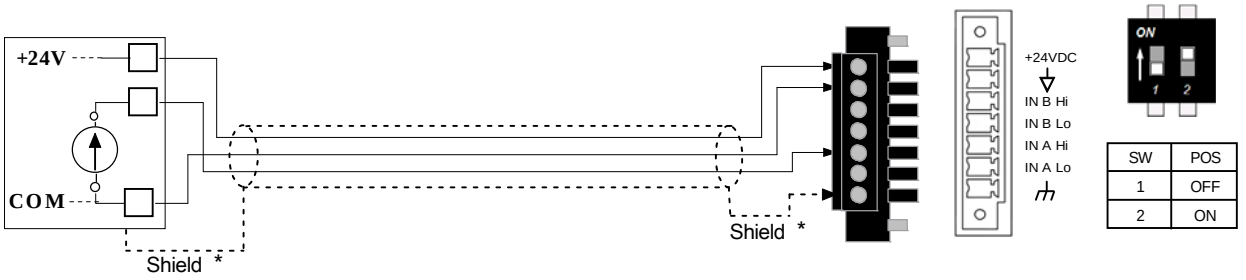


SW	POS
1	OFF
2	OFF

Note* : To avoid ground loop problems, connect shield to earth ground on one end of the cable only.

4 Sensor with current (mA) output and 24VDC input

Model: AD2T, AD3, AD3T
Module casing: Type A

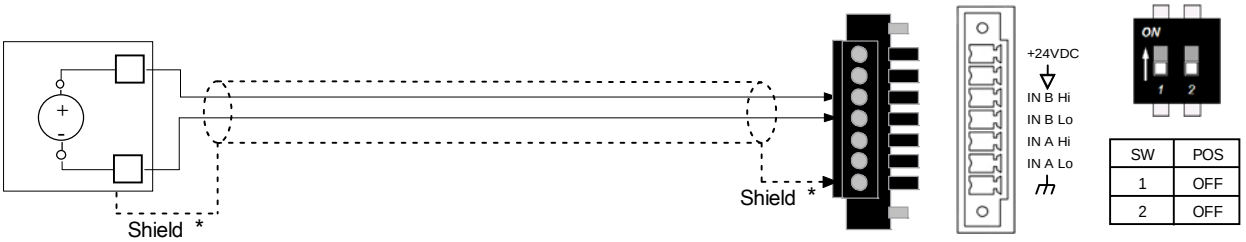


SW	POS
1	OFF
2	ON

Note* : To avoid ground loop problems, connect shield to earth ground on one end of the cable only.

5 Sensor with low voltage (mV_{DC}) output

Model: AD9T, AD13T
Module casing: Type B

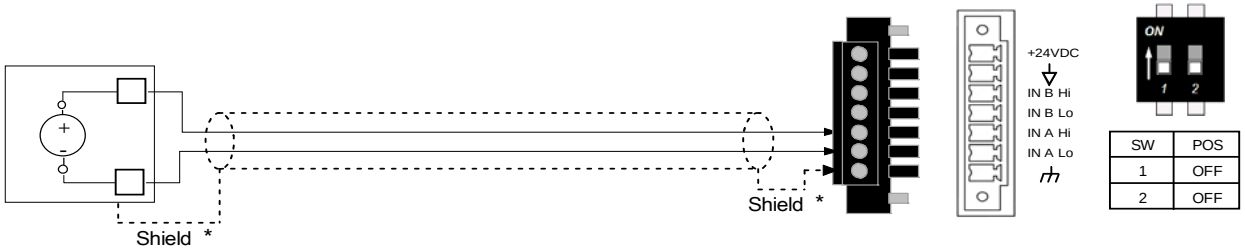


SW	POS
1	OFF
2	OFF

Note* : To avoid ground loop problems, connect shield to earth ground on one end of the cable only.

6 Sensor with voltage (V_{DC}) output

Model: AD6, AD6T, AD7, AD11, AD11T, AD12, AD12T
Module casing: Type A

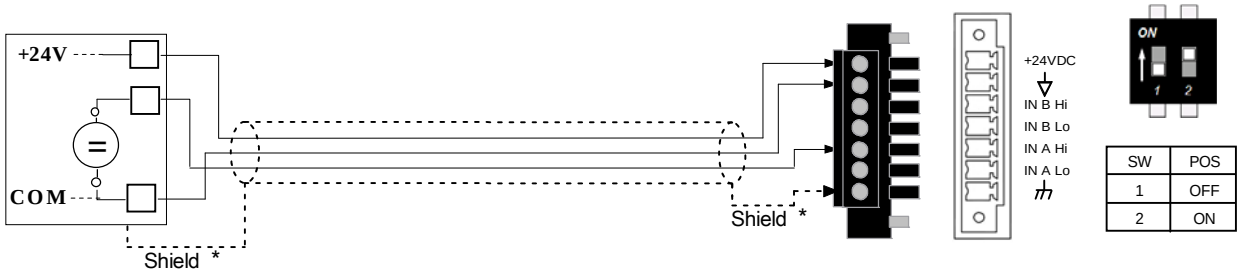


SW	POS
1	OFF
2	OFF

Note* : To avoid ground loop problems, connect shield to earth ground on one end of the cable only.

7 Sensor with voltage (V_{DC}) output and 24VDC input

Model: AD6, AD6T, AD7, AD11, AD11T, AD12, AD12T
Module casing: Type A

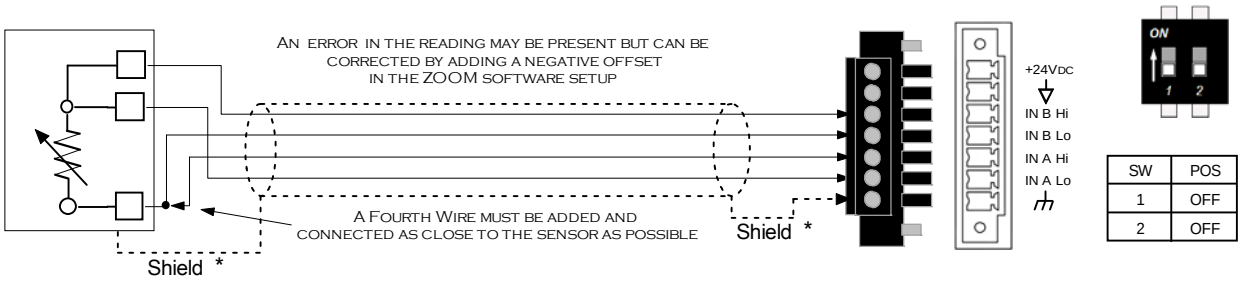


SW	POS
1	OFF
2	ON

Note* : To avoid ground loop problems, connect shield to earth ground on one end of the cable only.

8 3-wire 10Ω (CU10) RTD

Model: AD14T
Module casing: Type B

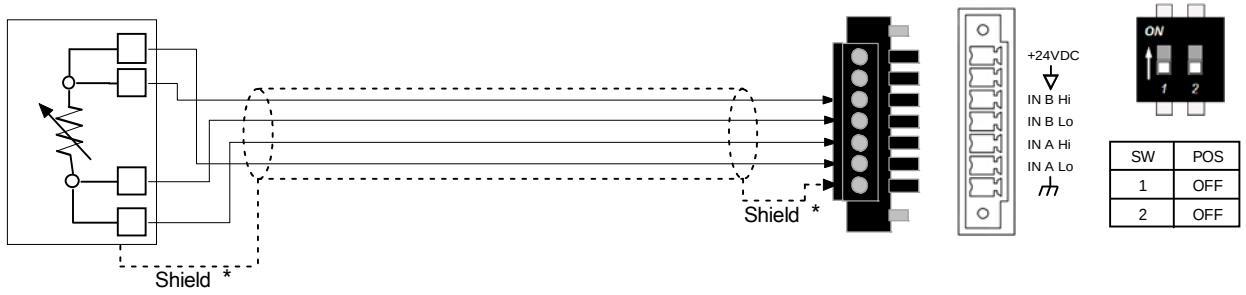


SW	POS
1	OFF
2	OFF

Note* : To avoid ground loop problems, connect shield to earth ground on one end of the cable only.

9 4-wire 10Ω (CU10) RTD

Model: AD14T
Module casing: Type B

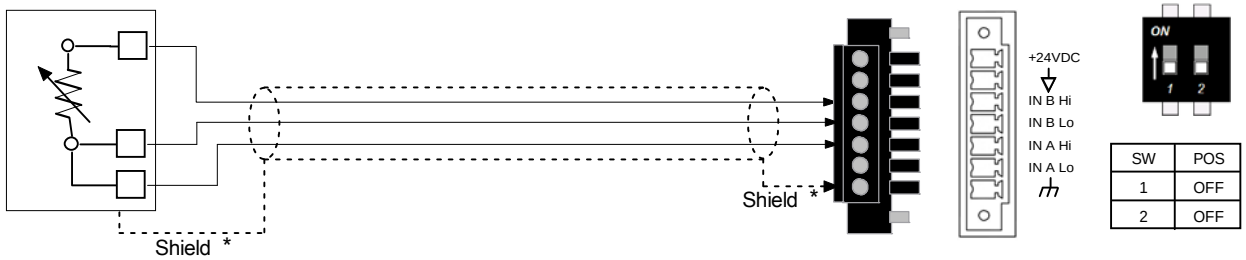


SW	POS
1	OFF
2	OFF

Note* : To avoid ground loop problems, connect shield to earth ground on one end of the cable only.

10 3-wire 100Ω (PT100) RTD

Model: AD10T2
Module casing: Type B

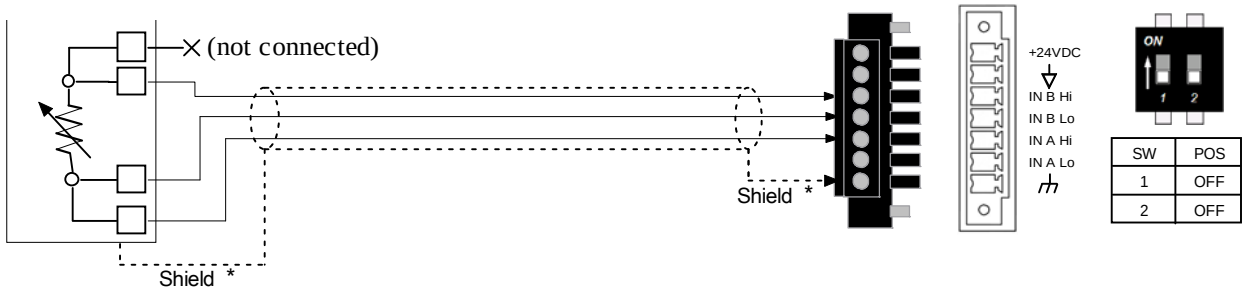


SW	POS
1	OFF
2	OFF

Note* : To avoid ground loop problems, connect shield to earth ground on one end of the cable only.

11 4-wire 100Ω (PT100) RTD

Model: AD10T2
Module casing: Type B

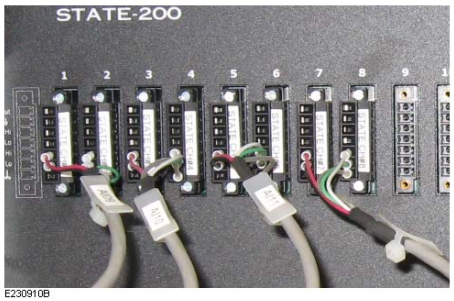


SW	POS
1	OFF
2	OFF

Note* : To avoid ground loop problems, connect shield to earth ground on one end of the cable only.

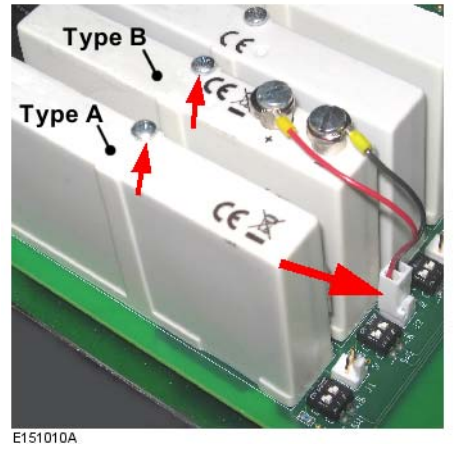
3.5.2 Module Installation or Replacement

To replace or add a new module, the STATE-200 must be turned off, all connectors unplugged, and the casing extracted from the instrument rack and opened.



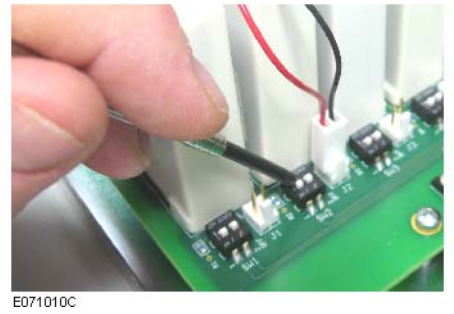
1. To remove a connector from an input port or the power input port, loosen the two screws securing the connector to the socket. If needed, use an extractor tool to pull a cabled connector off its socket. Do not pull on the wires.

2. Open the casing of the STATE-200 unit by removing the 2 screws on each side holding down the cover.



3. To remove a module:
   - loosen the screw on top of the module;
   - on Type B module, also unplug the small connector cable;
   - gently pull out the module.

   Refer to *Table 1: "Input Modules Available,"* on page 31 to see the type of casing for each model of input module.



4. Insert the new module, tighten the screw on top of the module, and in the case of a Type B module, also plug the small connector cable to the connection pins of the corresponding location.
5. Adjust the DIP-switches configuration according to type of the module (refer to *"3.5.1 Input wiring and DIP switch setting"* on page 18).
6. Place the cover back and reinstall the screws on each side.

4. USING THE STATE-200 UNIT

4.1 Front Panel LED Indicator

The POWER ON light turns Green when the system is powered up.

4.2 Maintenance

4.2.1 Cleaning

Periodically wipe the case with a damp cloth and mild water-based detergent. Do not use abrasives or solvent. Clean the exterior of the STATE-200 unit only. Do not apply cleaner directly to unit, or allow liquids to enter or spill on the unit.

5. TROUBLESHOOTING

This section contains procedures to verify that your STATE-200 unit is responding and operating as expected. These tips will help you resolve most common issues.

5.1 STATE-200 Hardware Troubleshooting

If the Power ON LED indicator on the front of the unit fails to light up, verify the power supply.

5.1.1 Power Supply Verification

First, read the tension at the back of the unit with a portable meter. Make sure that the unit receives power from an AC source within the prescribed range (100 to 240 VAC, 50-60 Hz).

- If the unit does not receive power, verify the source wiring, starting with the external circuit breakers protecting the unit.
- If the unit receives power, verify the fuses in the fuse-holders (back of the unit).

If the unit still fails to respond, contact VibroSystM for further assistance.

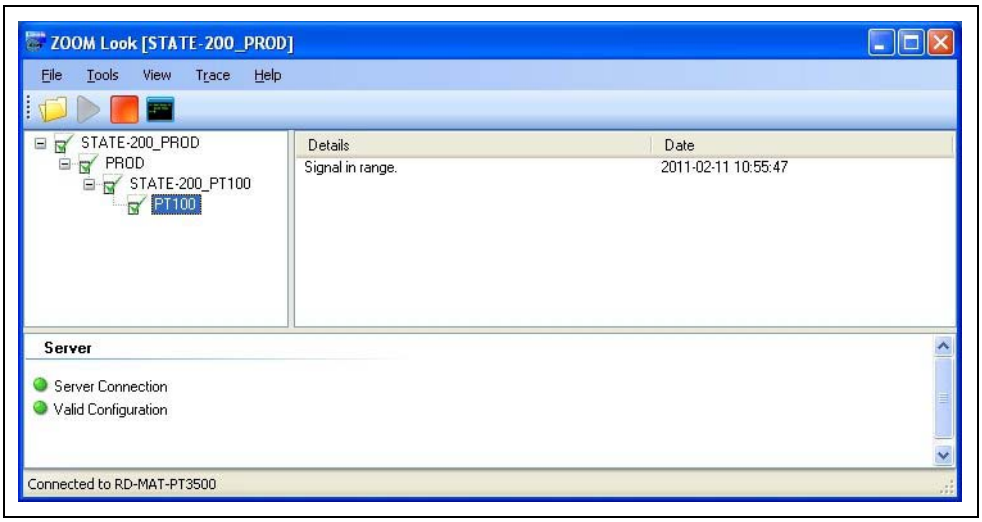
5.2 STATE-200 Software Verification

To fully validate the operation of a STATE-200 unit, you must first start the ZOOM Suite software and create a configuration according to the specifics of the current installation. Refer to the ZOOM Suite Software User Manual.

5.2.1 Troubleshooting Ethernet

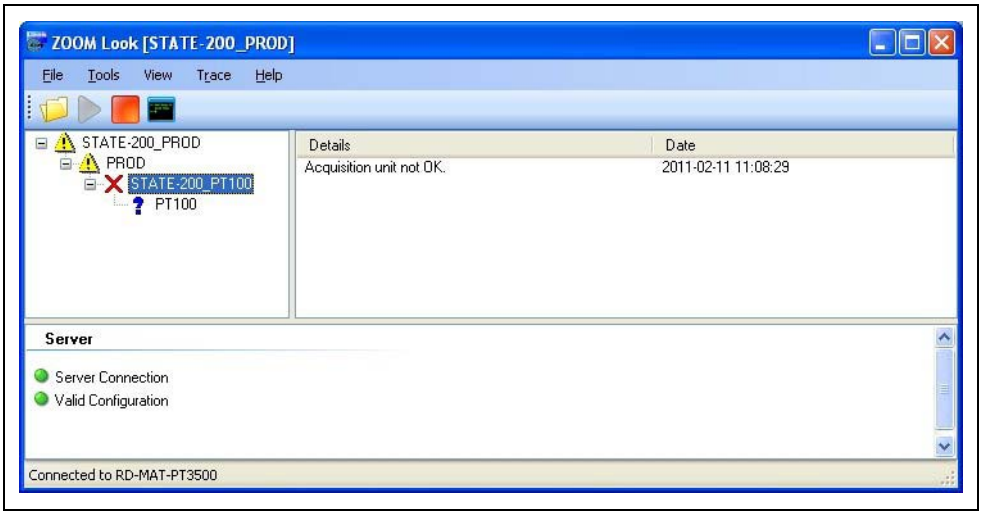
With the ZOOM Suite software in operation, open the STATE-200 user interface by double-clicking on the ZOOM Look icon. The ZOOM Look user interface displays the status of all STATE-200 elements.

When operation is optimal, all status indicators appear as , and the message indicates **Signal in range**, as on the following screen capture.

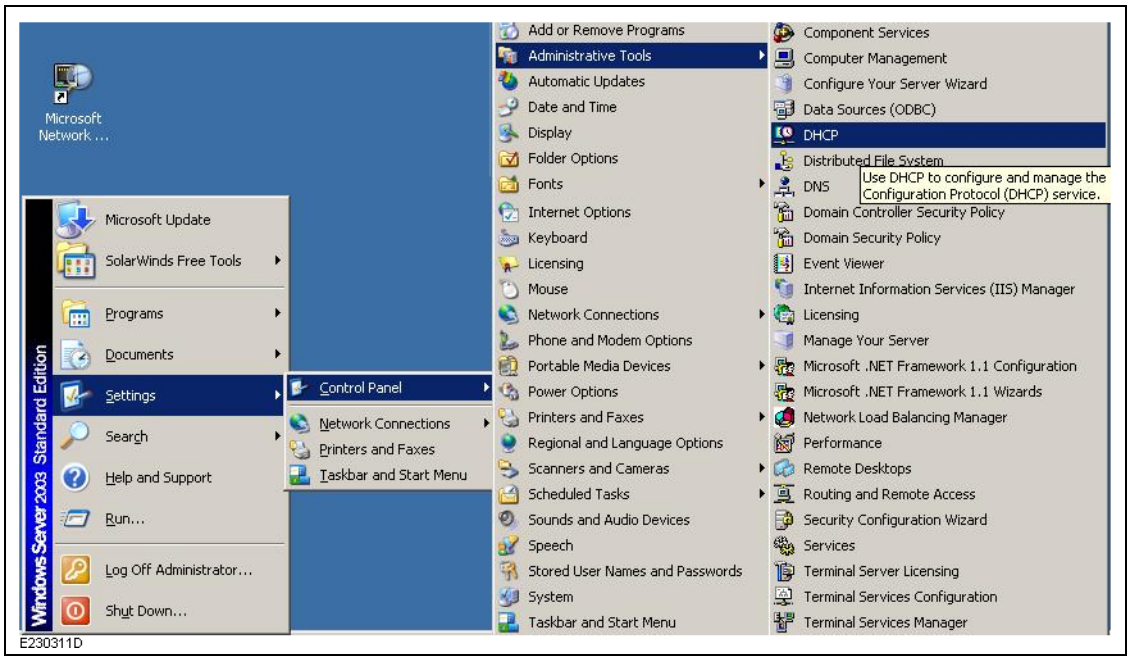


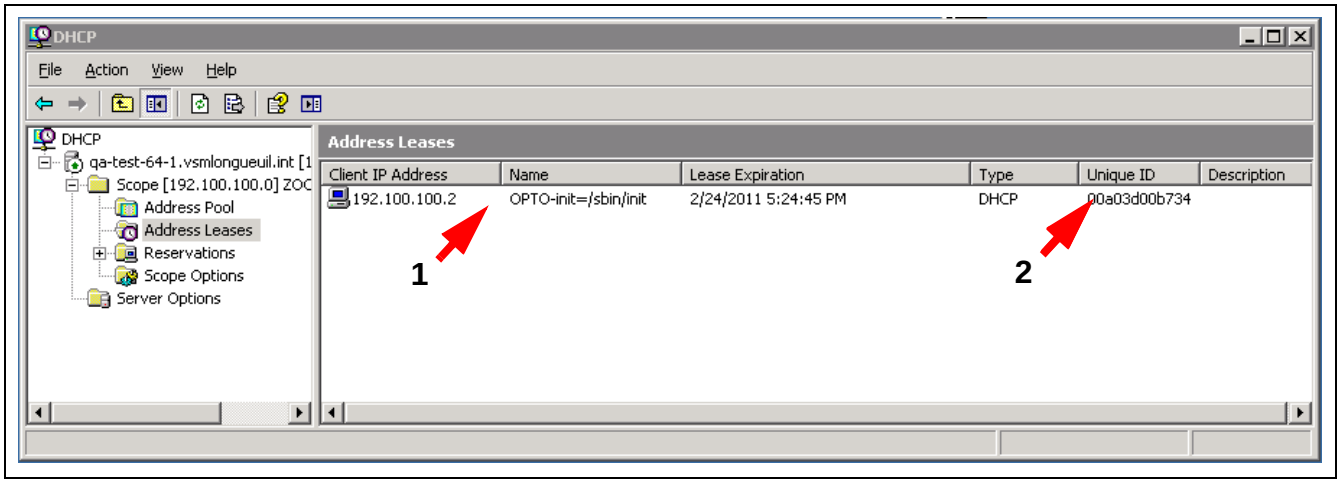
If the ZOOM Look service shows the status associated to the STATE-200 unit, with the message **Acquisition Unit Not OK**, one of the following problems may have occured:

- the configuration does not contains the correct IP address
- the DHCP server has changed the STATE-200 address



To solve the problem, you first need to find the STATE-200 address in the DHCP. As an example, we used the Windows Server 2003 DHCP server. Select Control Panel -> Administrative Tools->DHCP:





In the example above, only one address is assigned to a STATE-200 unit. However, in a longer list, a combination of elements is used for identification;

1. **Name**

   All State-200 units are listed with the name «OPTO-init=sbin/init»

2. **Unique ID**

   This is the MAC (Media Access Control) address, which is unique to each machine connected to the network.

This address is printed at the back of the STATE-200 unit, on the label next to the power input socket.

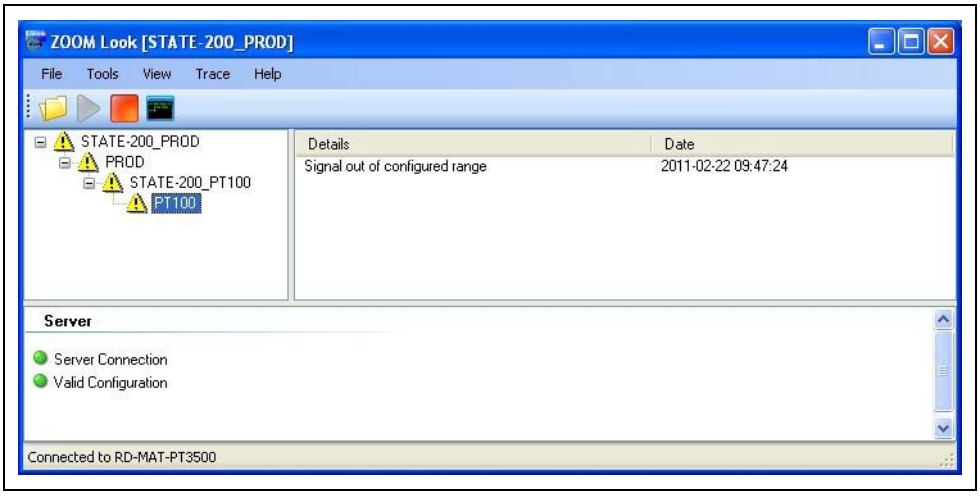
Once the IP address assigned to the STATE-200 unit has been located in the list of all the addresses assigned by the DHCP server, use the ZOOM Configuration program to verify the ZOOM configuration. Refer to the *ZOOM 6 Look Plug-in User's Guide*.

5.2.2 Configuration Troubleshooting

In the following cases, the STATE-200 unit is connected to the network and is recognized by the ZOOM Look service, but a problem is detected at the level of a sensor.

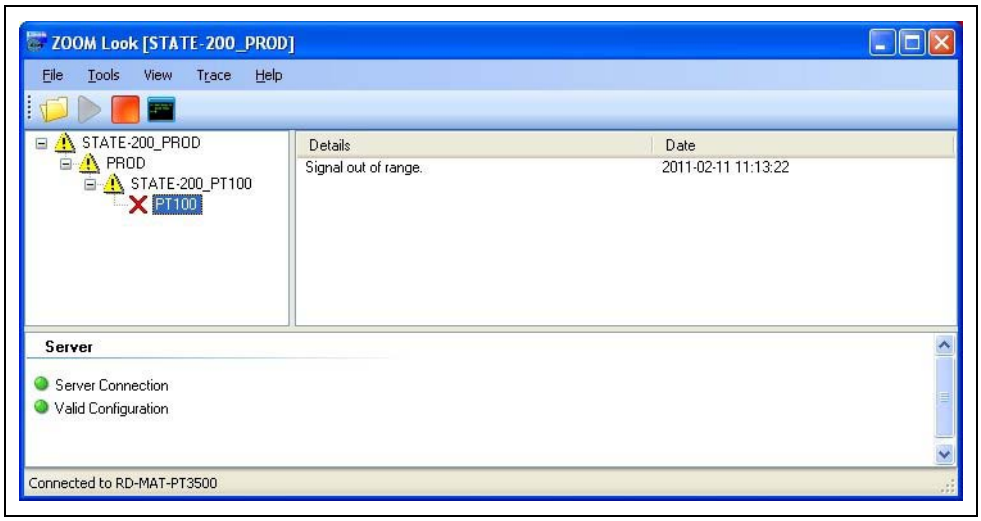
5.2.2.1 Disconnected sensor

If the ZOOM Look service shows the ⚠ status associated to a sensor, along with the message **Signal out of configured range**, the problem is a disconnected sensor.



5.2.2.2 Incorrect sensor configuration

If the ZOOM Look service shows the ✗ status associated to a sensor, the configuration is incorrect for the type of sensor physically connected to the unit. To correct the configuration, use the ZOOM Configuration user interface, and change the type of module. Consult the STATE-200 hardware configuration form delivered with the unit.



6. STATE-200 Unit - General Specifications

6.1 Electrical Characteristics

COMMUNICATION PORT

- Type — Ethernet
- Connector — RJ-45
- Protocol — TCP/IP
- Speed — 100 Mbps (10/100 Base T Standard)
- Maximum cable length — 100 m (328 ft.) with 6 STP Category cable

ANALOG INPUT MODULES

- External input connectors — 16 removable 7-position mini screw terminals
- $24V_{DC}$ Power Output (1 per channel):
  - I_{Out} max. (per channel) — 200 mA
  - I_{Out} max. (16 channels) — 1,0 A

Table 1: Input Modules Available

Input Range		Model	Wiring Diagram *(Section 3.7 - Input Modules)*	Type
Voltage DC — Input-to-output isolation: 4000Vrms; Input-to-analog supply (T models): 4000Vrms; 60 % of scale change in 165ms				
0 to 50 mV_{DC} isolated		AD9T	5	B
0 to 100 mV_{DC} isolated		AD13T	5	B
0 to 5 V_{DC}		AD6	6 & 7	A
0 to 5 V_{DC} isolated		AD6T	6 & 7	A
-5 to +5 V_{DC}		AD11	6 & 7	A
-5 to +5 V_{DC} isolated		AD11T	6 & 7	A
0 to +10 V_{DC}		AD7	6 & 7	A
-10 to +10 V_{DC}		AD12	6 & 7	A
-10 to +10 V_{DC} isolated		AD12T	6 & 7	A
Voltage AC — Input to logic output isolation: 4000Vrms ; Module-to-Module isolation: 1500Vrms; Full scale change in 1.5sec				
28 to 140 V_{AC} isolated		AD15T	2	B
Current — Input-to-output isolation: 4000Vrms; Input-to-analog supply (T models): 4000Vrms; Full scale change in 3ms				
0 to 20 mA isolated		AD2T	3 & 4	A
4 - 20 mA		AD3	3 & 4	A
4 - 20 mA isolated		AD3T	3 & 4	A
Temperature (RTD) —Isolation transient: Input-to-output : 4000Vrms; Input-to-analog supply: 4000Vrms; Full scale step change in 100ms				
3-wire 100Ω RTD PT100 _ isolated	-50° to +350°C (-58° to + 662°F)	AD10T2	10 & 11	B
4-wire 10Ω RTD CU10_ isolated	-55° to +150°C (-67° to + 302°F)	AD14T	8 & 9	B
Contact Closure (switch, relay or other) — contact closure shorting logic input to ground ;				
0 to +10 V_{DC} (5V input bias through internal pull-up resistor)		AD7	1	A

POWER SUPPLY

- Input voltage — 100-240 VAC
- Input frequency — 50-60 Hz
- Power Consumption — 60 W (with16 isolated Input Modules and providing maximum 24V output)
  30 W (with 16 isolated Input Modules, not providing any 24V output)
  5 W (without modules, not providing any 24V output)
- Fuse — Two (2) fuses 250V, 3.15A, slow-blow (one on Line, one on Neutral)

6.2 Environmental Characteristics

- Temperature range
  - Operation — 0° to 50°C *[32° to 120°F]*
  - Storage — -40° to 80°C *[-40° to 175°F]*
- Humidity — Up to 95%, non condensing
- Max. altitude — 2000 m

6.3 Physical Characteristics (Overall)

- Casing — 3U high 19” rack-mount, NEMA1 (IP20)
- Dimensions:
  - A - Height — 13.34 mm *[5.25 in.]*
  - B - Width (front) — 48.26 mm *[19.00 in.]*
  - C - Width (back) — 44.25 mm *[17.42 in.]*
  - D - Depth — 45.72 mm *[18.0 in.]*