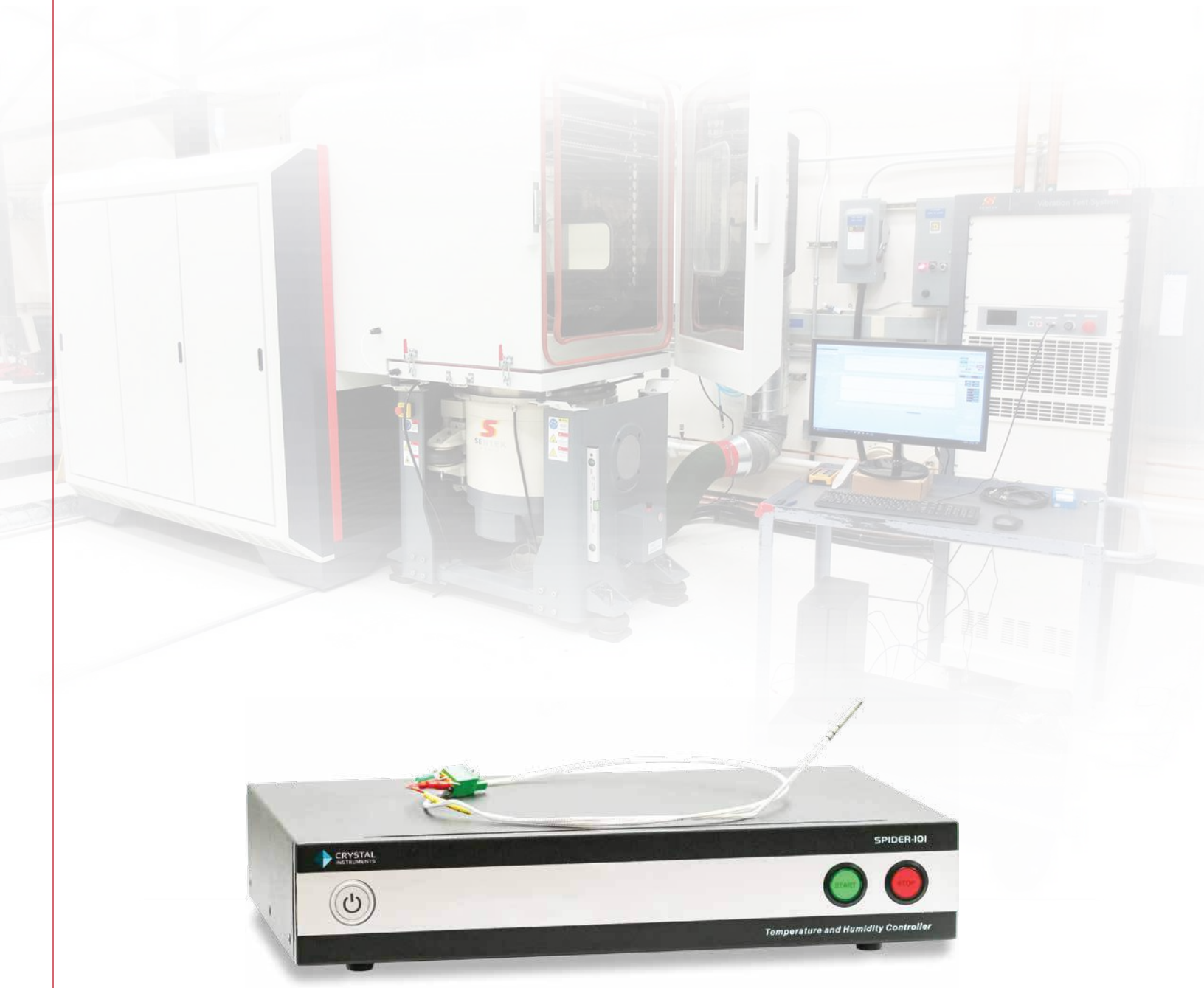
CRYSTAL INSTRUMENTS

SPIDER-101
HARDWARE SPECIFICATIONS (v7.7)

Temperature and Humidity Controller (TH Controller for Combined Test)



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Introduction

Designed and produced by Crystal Instruments, the Spider-101 controller is a key element of the THV chamber system from Sentek Dynamics. THV stands for Temperature, Humidity and Vibration. Temperature, humidity and vibration are controlled with high accuracy and at synchronized levels to simulate the actual physical environment. The EDM software provides an integrated user interface to access and control all parameter setup, schedule, and test operation.

This is the world's first controller (hardware) that is supported by two sets of software: EDM to control the combined THV environment and EDC (Embedded Device Controller) to control only the temperature and humidity.

EDM (a PC-based software developed by Crystal Instruments) is used when vibration control is required to be combined with temperature and humidity control. Parameter and schedule setup between all combined physical quantities are fully integrated in one user interface. Vibration tests such as Random, Sine, Shock, SoR, RoR, and other types can be executed together with various cycle settings of temperature and humidity.

The Spider-101 can also operate in an independent climatic chamber for temperature and/or humidity without participating in vibration testing. The EDC software developed by the Crystal Instruments is a touch screen application software that runs on any Windows 10 platform.

The Spider-101 provides ten input channels using either RTD or K-type thermocouple for temperature measurement, eight 4-20mA input channels for humidity sensors. There are 32 configurable relay control outputs to control compressors and other mechanical systems, as well as digital I/O channels for alarm/status monitoring.

The Spider-101 controller can connect to the control PC or tablet via Ethernet ports or wirelessly for test setup and/or test monitoring. When a THV test type is required, the Spider-101 can combine with any vibration controller (Spider-81/81B, Spider-80Xi, etc.) from Crystal Instruments through a network switch for synchronized, accurate THV testing.

Temperature Input Channel

- **Number of Channels:** 10
- **Connector Type:** Three-pin Terminal
- **Input Type:** three wire RTD, K type thermocouple
- **Input Range:** RTD: -200C ---+850C; K type thermocouple: -200C -- +1250C
- **Sensor Accuracy:** RTD: +/-0.2C; Thermocouple: +/-0.5 C
- **Maximum Sampling Rate:** 1 kHz

4-20mA Analog Input

- **Number of Channels:** 8
- **Connector Type:** 2-Pin Terminal
- **Input Type:** 4-20mA
- **ADC Resolution:** 16 bits
- **Maximum Sampling Rate:** 833Hz
- **Accuracy:** 1mV offset error, 0.01% gain error

4-20mA Analog Output

- **Number of Channels:** 2
- **Connector Type:** 4-pin Terminal
- **Output Type:** 4-20mA
- **DAC Resolution:** 16 bits
- **Accuracy:** 1%
- **DC24V/50mA for every channel**

Relay Control Channel Output

- **Number of Relay Control Output Channel:** 32
- **Output Type:** TTL +3.3V compatible control signals and internal +DC3.3V/1.5A power
- **Connector Type:** 37 pins D-SUB

Digital IO

- **Number of Digital Input:** 30
- **Digital Input Type:**
  - **Input Resistance:** 6.1 kΩ
  - **Input On Current:** 2.0 mA or more
  - **Input Off Current:** 0.16 mA or less

Digital Output

- **Number of Digital Output:** 10
- **Connector Type:** 37 pins D-Sub and 15 pins D-Sub.
- **37pin D-Sub:** 22 bit Input and 8 bits Output
- **15Pin D-Sun:** 8 bits Input and 2 bit Output.

System Specifications

- **On-Board Memory:** 4 GB non-volatile flash memory, the maximum can be up to 32GB , 32 MB DRAM
- **Ethernet:** 100Base-T, RJ45 female connector
- **Internal Clock:** maintains date and time
- **Cooling:** no cooling fan required

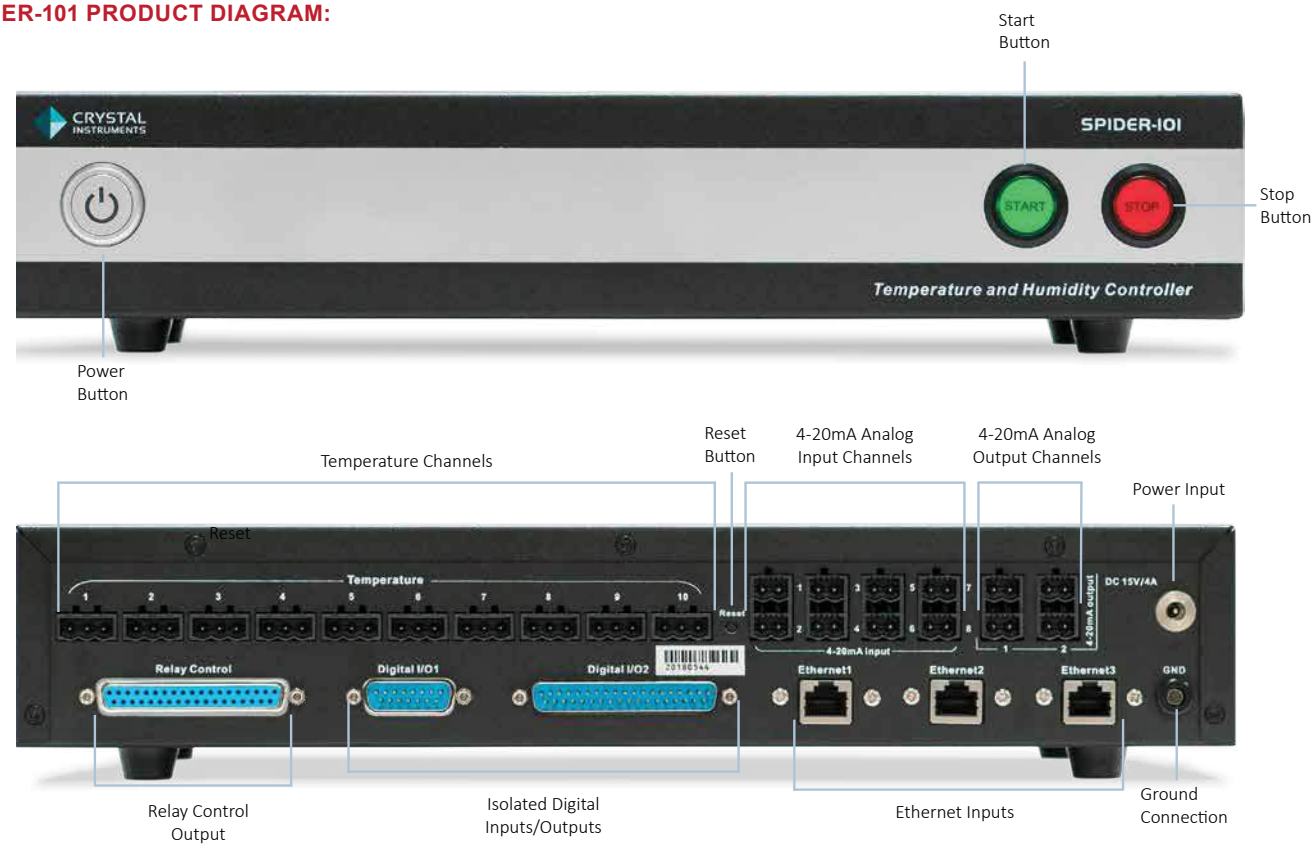
Power Specifications

- **Power Supply:** external DC power
- **External DC Power:** AC adaptor accepts 100 to 240 VAC (50/60 Hz), DC power 15 V (±10%)/4A
- **Power Consumption:** 15 watts

Environmental and General Specifications

- **Enclosure:** metal box compliant with CE electrical safety and EMI shielding standards.
- **Dimension (in):** 14 ½ by 8 ½ by 2 ¾ inches (W x D x H)
- **Weight:** ~8 lb
- **Safety Standards:** electromagnetic compatibility and sensitivity: EN 61326:1997+A1:1998+A2:2001, EN61000-3-2: 2000, EN61000-3-3: 1995+A1:2001
- **Operating Temperature:** -10 °C to +55 °C
- **Storage Temperature:** -20 °C to +70 °C
- **Shock:** 50 g's, 315 in/sec, tested at 6 sides, non-operational test
- **Vibration:** 5 – 500 Hz, 0.3 g, tested at 3 sides, operational test
- **Vibration:** 5 – 500 Hz, 2.42 g, tested at 3 sides, non-operational test

SPIDER-101 PRODUCT DIAGRAM:



Major Benefits of the Spider-101 Platform

- A controller fully integrated with any shaker controller from CI
  - One integrated setup
  - One clock and schedule
  - One user interface
  - One testing report
  - One vendor to provide the support
- Two user interfaces
  - EDC: Embedded Device Control, a touch screen user interface running on Windows 10 tablet
  - EDM, the PC software to control T, H and V

Hardware Interface Connections

	10-ch RTD or Thermocouple input for Temperature control/measurements
8-ch 4-20mA analog input for humidity sensors input	**2-ch 4-20mA output**
30 inputs + 10 outputs Digital I/O for alarm/status	**30bits TTL output used for external relay control**

SPIDER-101 TH CONTROLLER COMBINES WITH ANY CRYSTAL INSTRUMENTS VIBRATION CONTROLLER

Ethernet connections makes system integration easier.

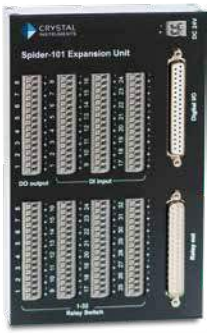
Spider-80X
Modular DAQ/DSA/VCS

Spider-80SG
Modular DAQ/DSA/VCS

Spider-80Xi
Modular DAQ/DSA/VCS

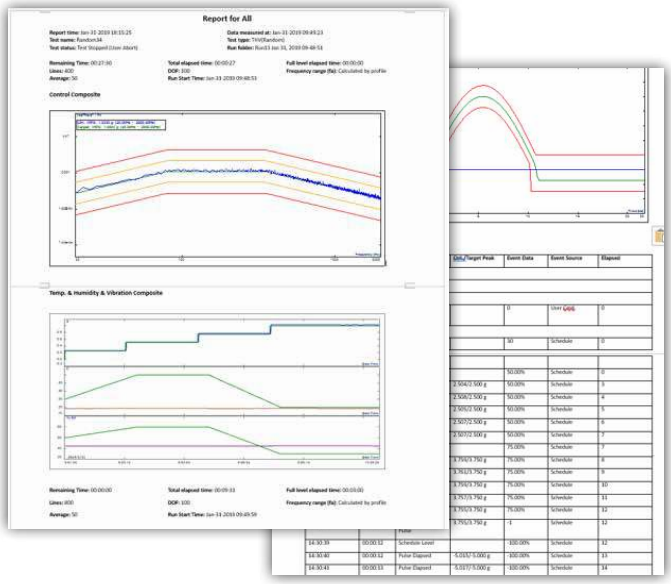
Spider-81
Premium Vibration Controller

Spider-81B
Basic Vibration Controller



Spider-101 Expansion Unit

EDM THV Control: One Testing Report for all Measurement Results



Solutions from other vendors usually generate vibration test reports and temperature/humidity testing reports separately. Time clock and schedules are often off, unlike the highly accurate report generated by EDM THV Software.

All vibration control functions are available with a combined Spider-101 and Crystal Instruments Controller system:

- Random
  - Multi-Resolution Control
  - Kurtosis Control
  - Random on Random
  - Sine on Random
- MSC, Multi-Shaker Control
- Sine (Swept/Dwell)
  - Total Harmonic Distortion (THD)
  - Phase Track Dwell
  - Resonance Search and Tracked Dwell (RSTD)
  - Multi-Sine
  - Step Sine, Sine Oscillator
- Classic Shock
- Transient Time History Control (TTH).
- Shock Response Spectrum (SRS)
- Earthquake testing
- Time Waveform Replication (TWR)

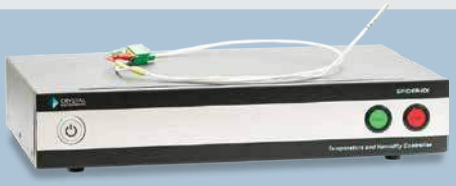
TYPICAL CONFIGURATIONS:

SPIDER-101 TYPICAL CONFIGURATION 1: TH CONTROL WITH EDC

EDC running on a touch screen terminal

Ethernet Connection

Chamber



Spider-101 Controller

Temperature Measurement & Control

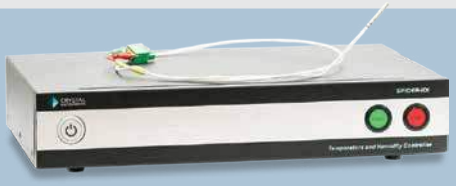
Humidity Measurement & Control

SPIDER-101 TYPICAL CONFIGURATION 2: TH CONTROL WITH EDM ON A PC

EDM running on PC

Ethernet Connection

Chamber

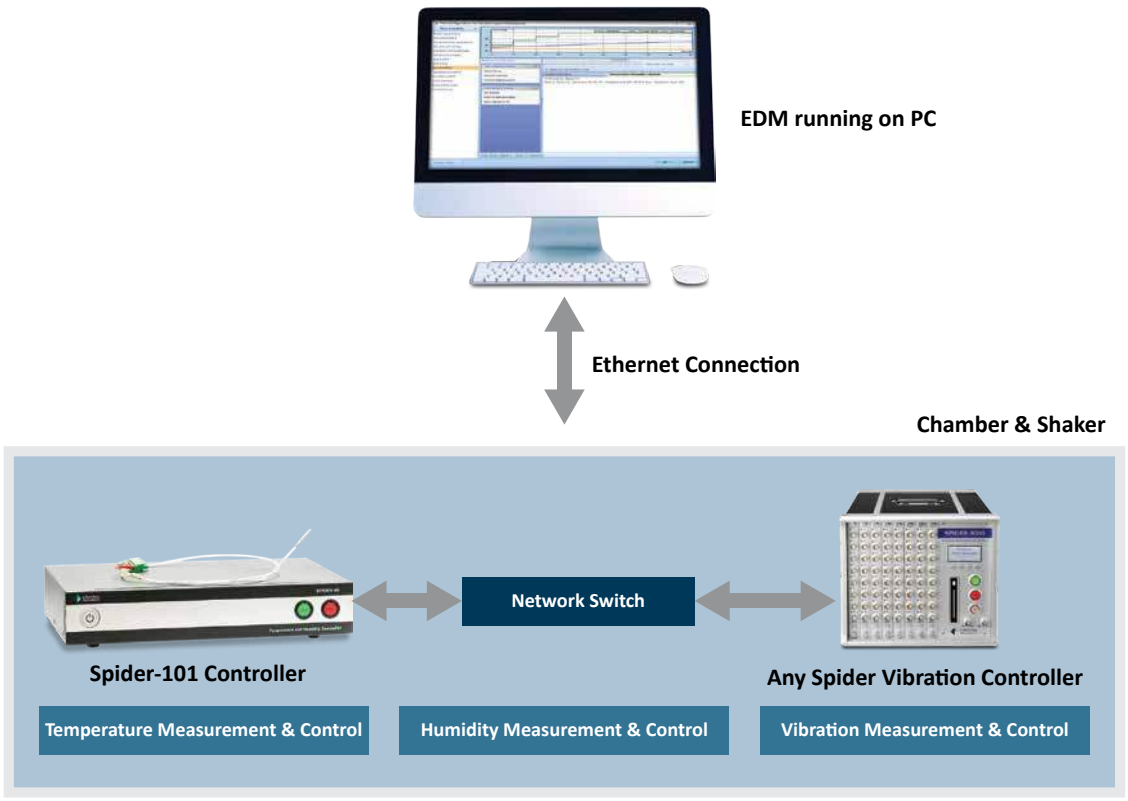


Spider-101 Controller

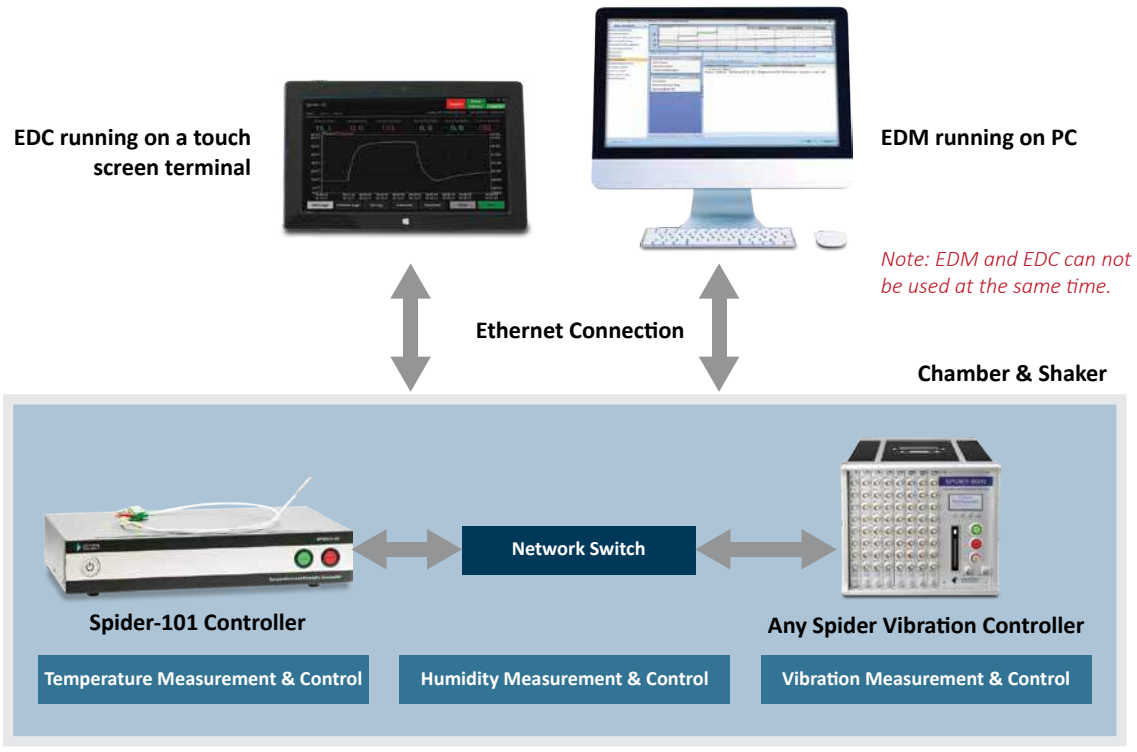
Temperature Measurement & Control

Humidity Measurement & Control

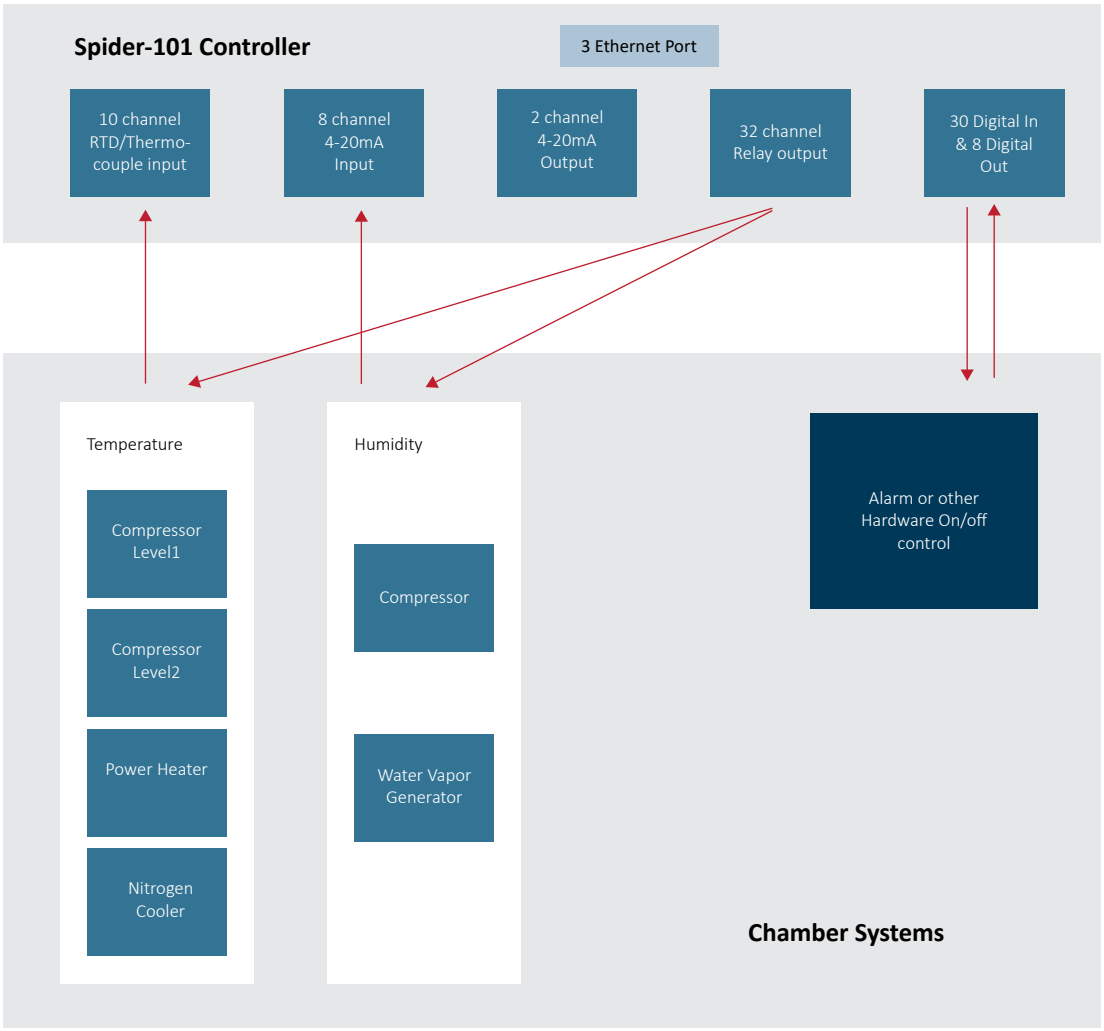
SPIDER-101 TYPICAL CONFIGURATION 3: THV CONTROL WITH EDM ON A PC



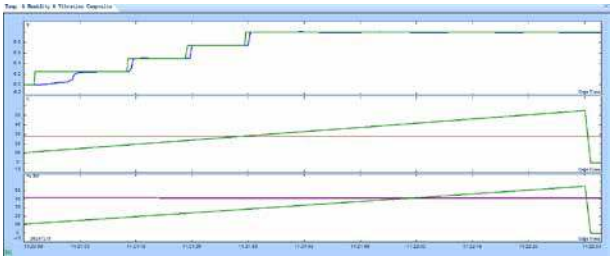
SPIDER-101 TYPICAL CONFIGURATION 4: THV CONTROL WITH EDM (ON PC) & EDC (ON TOUCH SCREEN TERMINAL)

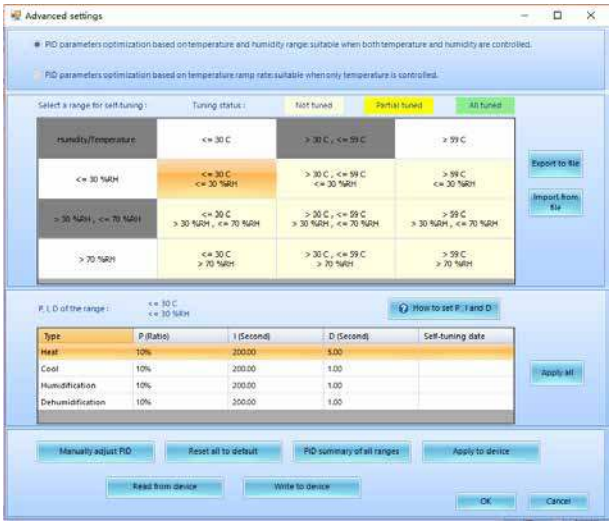


SPIDER-101 DIAGRAM: CONTROLLER AND CHAMBER SYSTEMS



Typical User Interface of EDM THV Control:





Typical User Interface of EDC TH Control: