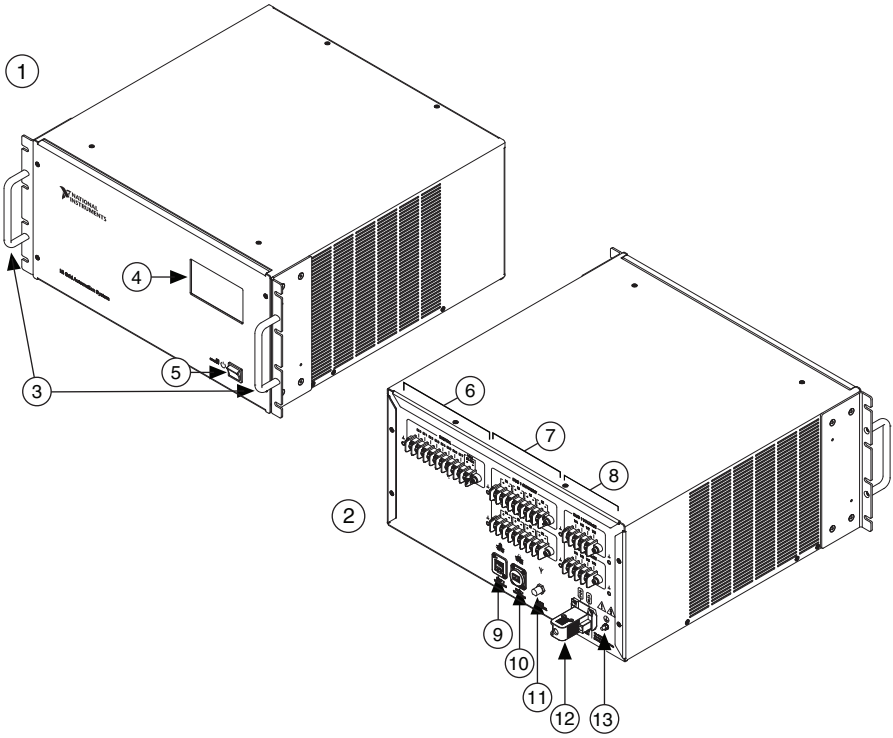
USER MANUAL AND SPECIFICATIONS

NI 9725

Grid Automation System

This document explains how to set up and install the National Instruments 9725 Grid Automation System.

Figure 1. NI 9725 Parts Locator Diagram



1	NI 9725 Front View	8	Voltage Connectors
2	NI 9725 Rear View	9	RJ-45 Ethernet Port
3	Front Handles	10	LC Fiber Ethernet Port
4	Touchscreen Display	11	GPS Connector (F-Type)
5	Standby Switch	12	Power Connector with Backshell
6	Digital Connector	13	Earth Ground Terminal (Protective Earth)
7	Current Connectors		

NATIONAL INSTRUMENTS

Safety Guidelines

Operate the NI 9725 only as described in this manual.

Hazardous Voltage This icon denotes a warning advising you to take precautions to avoid electrical shock.

Caution Do not operate or install the NI 9725 in a manner not specified in this guide. Product misuse can result in a hazard. You can compromise the safety protection built into the product if the product is damaged in any way. If the product is damaged, return it to National Instruments for repair.

Caution The NI 9725 requires a connection from the premises wire safety ground to the earth ground terminal (protective earth). The earth safety ground must be connected during use of this equipment to minimize shock hazards. Refer to the *Connecting Safety Ground* section for instructions on connecting safety ground.

Safety Guidelines for High Voltage

If hazardous voltages are connected to the device, take the following precautions. A hazardous voltage is a voltage greater than 42.4 Vpk or 60 VDC to earth ground.

Caution Ensure that installation is performed only by qualified personnel.

Caution The NI 9725 must be installed in a secure enclosure or a rack which is accessible only by the use of a tool, as shown in Figure 2.

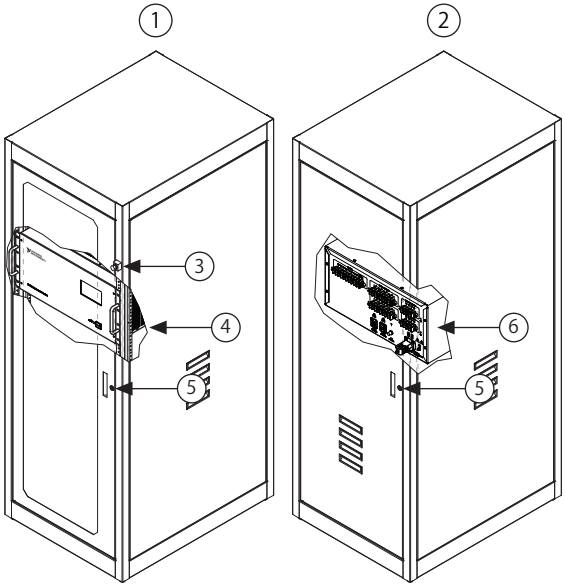
Caution Do not mix hazardous voltage circuits and human-accessible circuits on the same terminal block.

Caution Make sure that high-voltage devices and circuits connected to the NI 9725 are properly insulated from human contact.

Caution When module terminals are hazardous voltage LIVE (>42.4Vpk/ 60 VDC), you must ensure that all devices and circuits connected to the NI 9725 are properly insulated from human contact.

Caution A main input power switch or circuit-breaker must be included in the installation as shown in Figure 2. The switch/circuit-breaker must be suitably located and easily reached, and clearly marked as the power disconnect device for this product.

Figure 2. Secure Rack



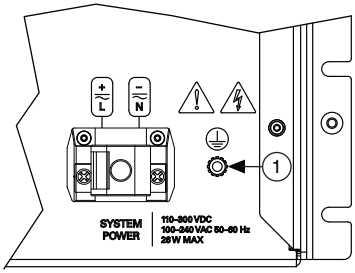
1	Front view of secure rack	4	NI 9725 inside a secure rack (front view)
2	Rear view of secure rack	5	Lock securing the rack
3	Main input power switch	6	NI 9725 inside a secure rack (rear view)

Connecting Safety Ground

NI requires that you connect the NI 9725 to earth ground (protective earth) using the following steps. Refer to Figure 3 for a diagram of the NI 9725 safety ground terminal.

SAFETY GROUND CAUTION **Connecting Safety Ground (Protective Earth)**
The NI 9725 must have a safety ground (protective earth), which is connected by the installer to the premises safety ground system for safe operation. The installer must use a green or green/yellow wire for this purpose. The safety ground method shall be reliable and meet applicable safety codes.

Figure 3. Safety Ground Terminal



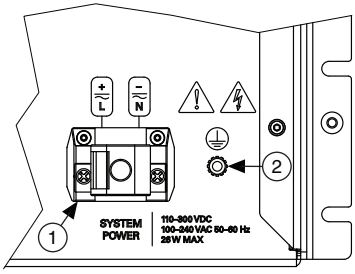
1 Safety ground terminal

1. Attach a ring lug to a green or green/yellow wire that is 5.26 mm^2 (10 AWG) or larger.
2. Remove the grounding nut from the safety ground terminal on the rear panel of the NI 9725.
3. Attach the ring lug to the safety ground terminal.
4. Tighten the grounding nut to 1.4 N · m (12 lb · in.) of torque.
5. Attach the other end of the green or green/yellow wire to the grounding electrode system of your facility using a method appropriate for the application.

Wiring Power Connections to the NI 9725

The NI 9725 provides a power connector with backshell and a safety ground terminal, as shown in Figure 4. Connect neutral and line to the N (DC-) and L (DC+) terminals on the power connector and the ground to the safety ground terminal. When using DC power, connect the negative line to the DC- terminal and the positive line to DC+. You must use the connector backshell to ensure that the terminals are not accessible.

Figure 4. Power Connector and Ground Terminal



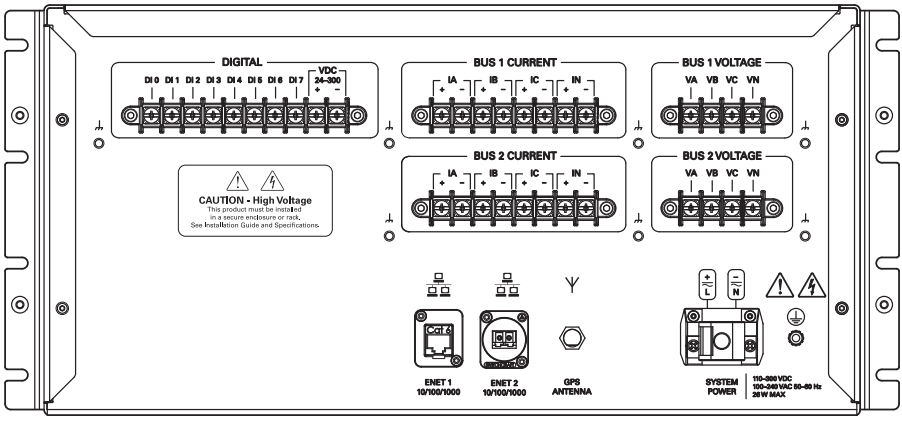
1 Power connector with backshell
2 Safety ground terminal

Connecting Cables to the NI 9725

The NI 9725 has one ten-position, two eight-position, and two four-position barrier strip connectors on the rear panel for I/O connections.

When connecting cables to the barrier strips, use ring or spade lugs to connect to the #8 studs for outside connections. Terminate the cable shields to the chassis ground terminal adjacent to the barrier strip connector. The NI 9725 includes 7 chassis ground terminals, as shown in Figure 5.

Figure 5. NI 9725 Back Panel



Connecting to the Voltage Bus

You can connect three-phase and single-phase measurement configurations to the NI 9725. The NI 9725 supports standard service levels up to 250 Vrms Line-to-Neutral (L-N) and 400 Vrms Line-to-Line (L-L). You can also connect standard potential transformers to the NI 9725.

NI recommends using the following phase measurement configurations for typical power distribution networks. Other valid configurations are possible if the connections do not exceed the safety rating of the NI 9725.

Connecting Three-Phase Measurement Configurations

You can connect WYE or delta measurement configurations to the NI 9725.

Figure 6. Connecting a 4-Wire WYE Measurement Configuration

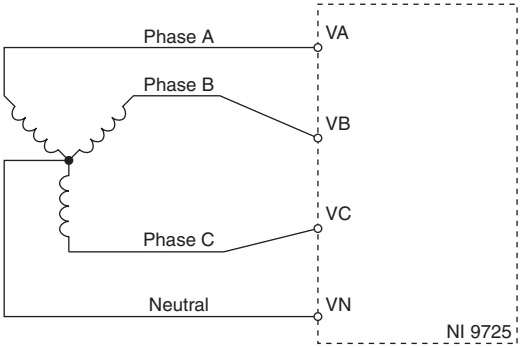


Figure 7. Connecting a High-Leg Delta Measurement Configuration

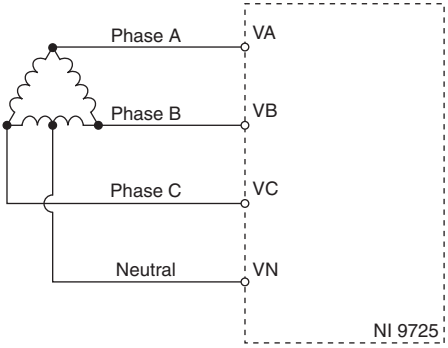


Figure 8. Connecting a 3-Wire Delta Measurement Configuration

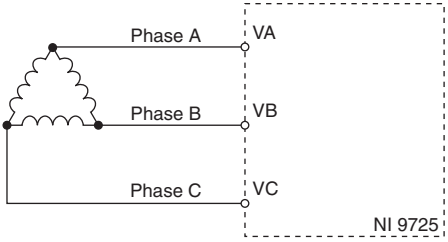
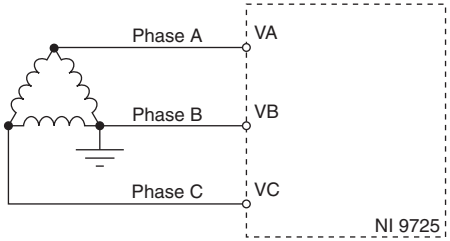


Figure 9. Connecting a Corner Grounded 2-Wire Delta Measurement Configuration



Note Corner grounded 2-wire delta measurement configurations support only standard service levels up to 240 Vrms L-L.

Connecting Single-Phase Measurement Configurations

You can connect 3-wire or 2-wire single-phase measurement configurations to the NI 9725.

Figure 10. Connecting a 3-Wire Measurement (Split Phase) Configuration

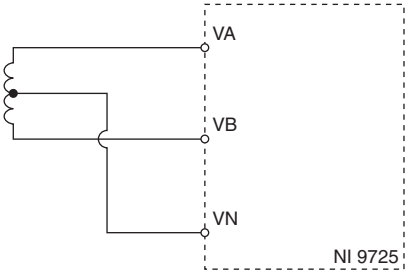
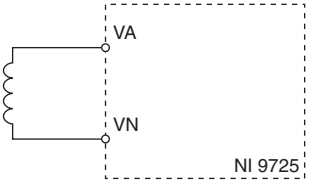


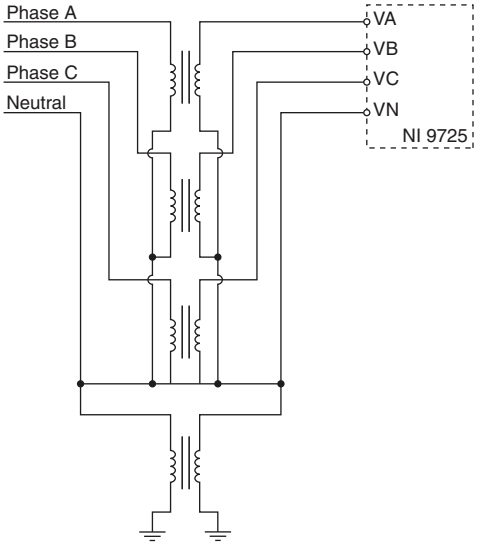
Figure 11. Connecting a 2-Wire Measurement



Connecting Potential Transformers

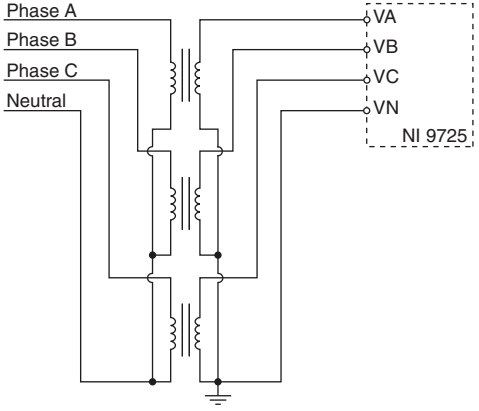
You can connect potential transformers to the NI 9725.

Figure 12. 4-Wire WYE-to-WYE (Full)



In a 4-wire WYE-to-WYE (full) configuration, the VN terminal on the NI 9725 measures the neutral-to-ground voltage through the bottom transformer. You can use a lower ratio transformer due to the typically low voltages on the VN terminal. Ensure that you scale each NI 9725 channel reading with the corresponding transformer ratio.

Figure 13. 4-Wire WYE-to-WYE (Partial)

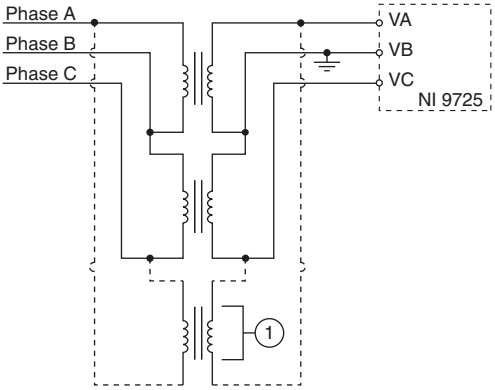


For 4-wire WYE-to-WYE (partial) configurations, follow these guidelines for the best accuracy results.

- Connect the VN terminal of the NI 9725 to the isolated ground of the potential transformer to reduce noise between the potential transformer ground and the chassis ground.
- Connect the VN terminal of the NI 9725 as close as possible to the isolated ground of the potential transformer.
- Use the L-N voltage measurements the NI 9725 returns as the default value.

Tip You can convert L-N voltage measurements to channel-to-earth ground by adding the Neutral terminal measurement to each of the V channels.

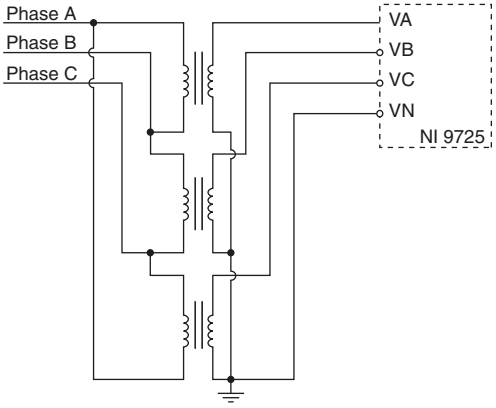
Figure 14. Delta-to-Delta



1 Optional

Tip You can use the Neutral channel for any other measurement if the measurement does not exceed the Neutral-to-Earth and L-N input range.

Figure 15. Delta-to-WYE

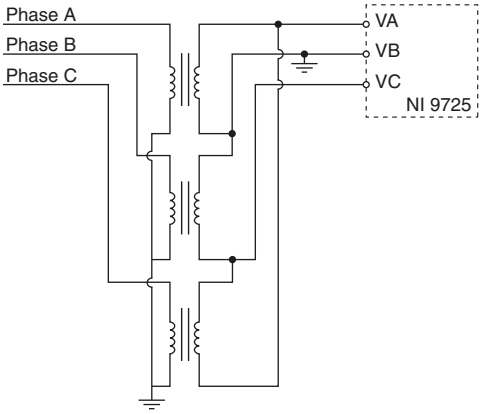


For delta-to-WYE configurations, follow these guidelines for the best accuracy results.

- Connect the VN terminal of the NI 9725 to the isolated ground of the potential transformer to reduce noise between the potential transformer ground and the chassis ground.
- Connect the VN terminal of the NI 9725 as close as possible to the isloated ground of the potential transformer.
- Use the L-N voltage measurements the NI 9725 returns as the default value

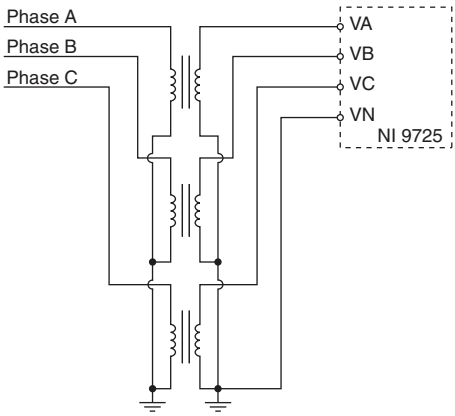
Tip You can convert L-N voltage measurements to channel-to-earth ground by adding the Neutral terminal measurement to each of the V channels.

Figure 16. 3-Wire WYE-to-Delta



Tip You can use the Neutral channel for any other measurement if the measurement does not exceed the Neutral-to-Earth and L-N input range.

Figure 17. 3-Wire WYE-to-WYE



For 3-wire WYE-to-WYE configurations, follow these guidelines for best accuracy results.

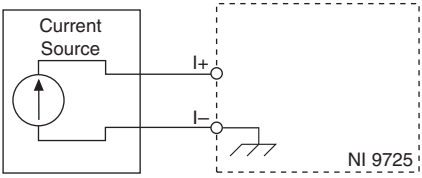
- Connect the VN terminal of the NI 9725 to the isolated ground of the potential transformer to reduce noise between the potential transformer ground and the chassis ground.
- Connec the VN terminal of the NI 9725 as close as possible to the isolated ground of the potential transformer.
- Use the L-N voltage measurements the NI 9725 returns as the default value.

Tip You can convert L-N voltage measurements to channel-to-earth ground by adding the Neutral terminal measurement to each of the V channels.

Connecting to the Current Bus

You can connect floating current sources to the NI 9725. The negative terminal of each current input channel is internally connected to the chassis ground of the NI 9725.

Figure 18. Connecting a Floating Current Source

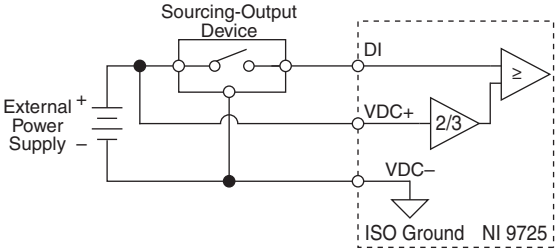


Connecting to the Digital Bus

You can connect sourcing-output devices to the NI 9725. You must connect a supply voltage to VDC+ on the NI 9725. Input channels on the NI 9725 read ON or OFF depending on the threshold set by VDC+. The threshold is approximately 2/3 of the supply voltage on VDC+.

Caution Electrostatic Discharge (ESD) can damage the digital inputs. To prevent damage, use industry-standard ESD prevention measures during installation, maintenance, and operation.

Figure 19. Connecting a Sourcing-Output Device



Output devices that you connect to the NI 9725 must be able to source enough current to overcome the NI 9725 input load (burden). The NI 9725 burden is dynamic and varies depending on the input voltage.

Figure 20. Burden Current Per Channel

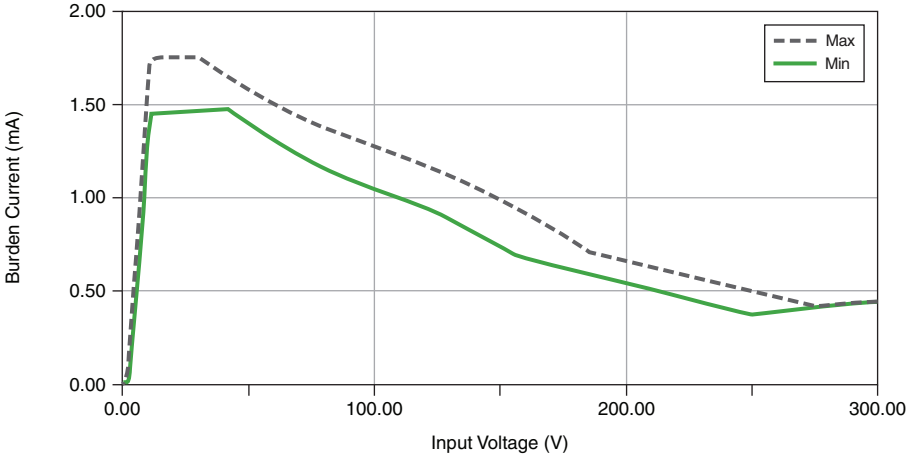
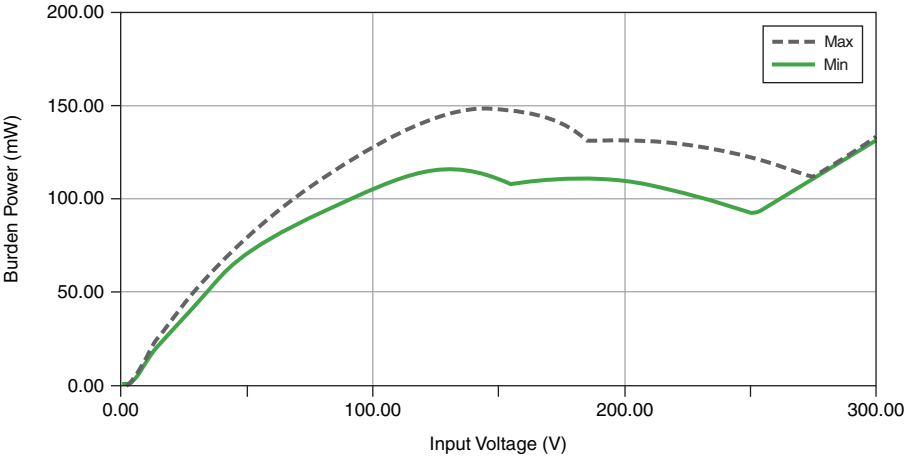
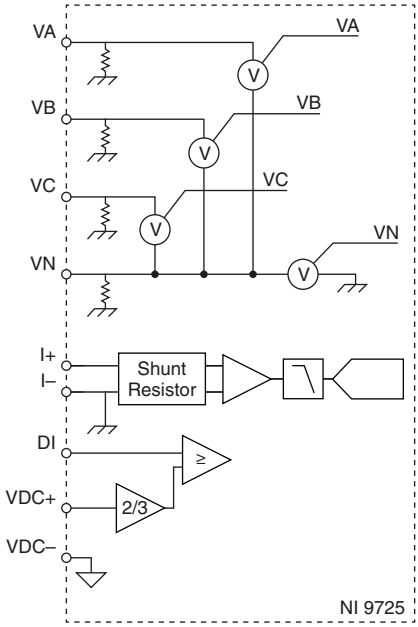


Figure 21. Burden Power Per Channel



Circuitry



VOLTAGE BUS

Each voltage channel provides an independent signal path and ADC. Each terminal has the same input impedance to ground. The NI 9725 returns the voltage between each VA, VB, and VC terminal and the VN terminal as well as the voltage between the VN terminal and the chassis ground.

CURRENT BUS

Each current channel provides an independent signal path and ADC, enabling you to sample all four channels simultaneously.

DIGITAL BUS

Each digital channel uses an adjustable threshold that is determined by the supply voltage on the VDC+ terminal. The threshold is nominally 2/3 of the supply voltage and the NI 9725 reads ON or OFF if the input voltage on the channel is above or below the threshold voltage.

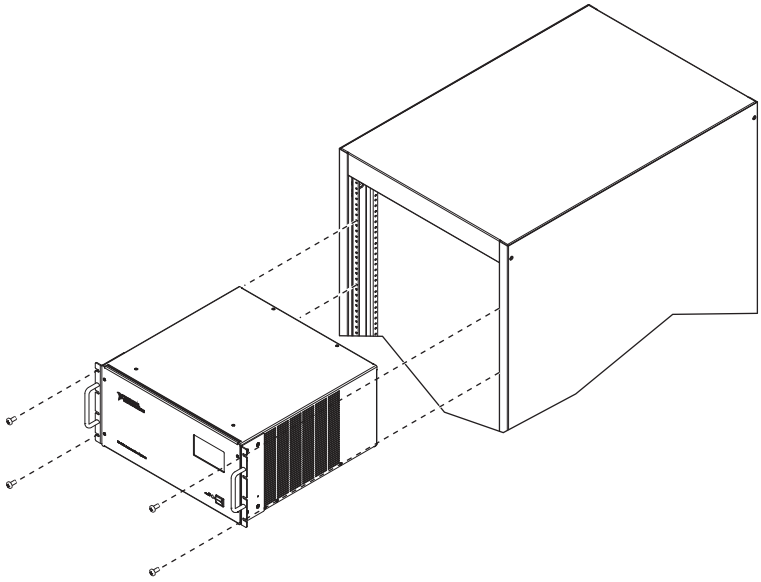
Rack Mounting the NI 9725

The NI 9725 supports rack mounting. Secure the NI 9725 to the rack posts using four mounting screws appropriate for your rack and the top and bottom mounting positions on the rack mount rails as shown in Figure 22. Using the middle mounting positions on the rack mount rails is optional.

When placing the NI 9725 in a rack, avoid placing the enclosure above a heat source, as rising heat can affect the operating temperature.

Caution You must install the NI 9725 in a rack prior to use.

Figure 22. Rack Mounting the NI 9725



Specifications

This section provides performance specifications for the NI 9725.

The following specifications are typical for the range -20 °C to 55 °C unless otherwise noted.

Power Consumption

Input voltage range and frequency ..... 100 to 240 VAC, 50 to 60 Hz;
110 to 300 VDC

Maximum power consumption ..... 26 W

Analog Inputs

ADC resolution ..... 24 bits

Type of ADC ..... Delta-Sigma
(with analog prefiltering)

Sampling mode ..... Simultaneous

Internal master timebase (f_M)

- Frequency ..... 12.8 MHz
- Accuracy ..... ±100 ppm max

Data rate range (f_s) using internal master timebase

- Minimum ..... 1.613 kS/s
- Maximum ..... 50 kS/s

Data rates (f_s) ..... $\frac{f_M \div 256}{n}$, n = 1, 2, …, 31

Digital Inputs

Number of channels ..... 8 digital input channels

Input type ..... Sinking

Input voltage thresholds

- OFF state
  - 24 V to 250 V ..... 65% * Vsup - 4 V
- ON state
  - 24 V to 250 V ..... 73% * Vsup - 0.75 V

Input current (10 V ≤ V_{IN} ≤ 60 V)[1]

- Maximum ..... 1.8 mA
- Minimum ..... 1.3 mA

[1] With input voltages between 10 V and 60 V, the input load (burden) is an approximately constant current. With input voltages between 60 V and 300 V, the input load is an approximately constant power.

Input power (60 V ≤ V_{IN} ≤ 300 V)[1]

Maximum ..... 150 mW

Minimum ..... 75 mW

Input delay time ..... 1 µs max[1]

Voltage Inputs

Input voltage range (AI*x* and Neutral-to-GND, AI*x*-to-Neutral)

Typical ..... 500 Vpk

Minimum ..... 497 V

Overvoltage withstand ..... 500 Vrms continuous,
600 Vrms for 10 s

Input coupling ..... DC

Input impedance, AI*x*-to-Ground
and Neutral-to-GND ..... 1 MΩ

Table 1. DC and AC Accuracy

Measurement Conditions	Percent of Reading (Gain Error)	Percent of Range* (Offset Error)
Max (-20 °C to 55 °C)	0.26%	0.14%
Typ (23 °C ±5 °C)	0.05%	0.022%
* Range equals 354 V (250 Vrms × √2)		

Note Accuracy specifications are valid for L-L, L-N and L-Earth measurements.

Input noise over full bandwidth at 50 kS/s

N-Earth and L-Earth ..... 2.12 mVrms

L-N and L-L ..... 3 mVrms

Input noise over 60 Hz bandwidth at 50 kS/s

N-Earth and L-Earth ..... 73.5 uVrms

L-N and L-L ..... 104 uVrms

[1] For specified type test performance use a debounce time of at least 1 ms.

Current Inputs

Input current range

Typical.....500 Apk

Nominal .....1 Arms/5 Arms

Overcurrent withstand.....20 Arms continuous,
500 Arms for 1 s
1250 Arms for one power cycle

Input coupling.....DC

Input impedance, I*x*+ to-I*x*- .....5 mΩ

Note The negative terminals are internally connected to the chassis ground.

Table 2. AC Accuracy

Measurement Conditions	Percent of Reading (Gain Error)
Max (-20 °C to 55 °C)	0.62%
Typ (23 °C ±5 °C)	0.16%

Table 3. DC Accuracy

Measurement Conditions	Percent of Reading (Gain Error)	Percent of Range* (Offset Error)
Max (-20 °C to 55 °C)	0.8%	6.3%
Typ (23 °C ±5 °C)	0.3%	1%
* Range equals 5A		

Input noise over full bandwidth at 50 kS/s .....3.9 mArms

Input noise over 60 Hz bandwidth at 50 kS/S ..135 uVrms

Network Port 1 (Copper Ethernet)

Connector.....RJ45

Network interface .....10/100/1000 BaseT

Communications rates.....10 Mbps, 100 Mbps, 1000 Mbps auto-negotiated

Network Port 2 (Fiber Ethernet)

Connector..... LC duplex

Cabling..... 50-62.5/125µm, 50/125µm recommended to minimize internal transmission losses

Network interface ..... 1000 BaseSX, multimode, full duplex

Communication rate ..... 1000 Mbit/s

GPS Input

Pulse per second (PPS) accuracy..... ±100 ns, >99% typical

Connector..... F-Type

Torque ..... 1.4 N · m (12 lb · in.)

Physical Characteristics

If you need to clean the NI 9725, wipe it with a dry towel or a soft-bristle brush. The display should be cleaned with a microfiber cloth.

Weight..... 9.34 kg (20.6 lb)

Dimensions ..... 481.1 mm × 513.4 mm × 221.2 mm (18.94 in. × 20.21 in. × 8.71 in.)

Note Visit ni.com/dimensions to find two-dimensional drawings and three-dimensional models for the NI 9725.

Torque for shield points..... 1.4 N · m (12 lb · in.)

Stud size for shield points..... M4 (#8)

Torque for safety ground terminal ..... 1.4 N · m (12 lb · in.)

Current, Digital, and Voltage Connector Characteristics

Bare wire..... 5.26 mm^2 cross-section diameter (10 AWG) to 0.33 mm^2 cross-section diameter (22 AWG) copper conductor wire with 8 mm (0.3 in.) of insulation stripped from the end

Ring/spade terminals

- Stud size..... M4 (#8)
- Maximum width ..... 9.40 mm (0.370 in.)

Torque for barrier strip terminals..... 1.4 N · m (12 lb · in.)

Power Connector Characteristics

Screw-terminal wiring ..... 5.26 mm^2 cross-section diameter (10 AWG) to 0.21 mm^2 cross-section diameter (24 AWG) copper conductor wire with 7 mm (0.3 in.) of insulation stripped from the end

Torque for screw terminal ..... 0.5 N · m to 0.6 N · m (4 lb · in. to 5 lb · in.)

Connector Securement

- Securement type ..... Screw flanges provided
- Torque for screw flanges ..... 0.5 N · m to 0.6 N · m (4 lb · in. to 5 lb · in.)

Ferrules ..... 0.25 mm^2 to 4 mm^2

Backshell

- Torque for strain-relief screws ..... 0.31 N · m (2.7 lb · in)
- Torque for captive screws ..... 0.56 N · m (5.0 lb · in)

Type Tests

Table 4. NI 9725 Type Tests

Description	Standards	Ports	Levels
Radiated Emission	CISPR 22	Enclosure	Class A
Conducted Emission	CISPR 22	Enclosure	Class A
1 MHz Damped Oscillatory Wave	IEC 61000-4-18	Power, Digital Inputs, Analog Inputs	2.5 kV common mode, 1 kV transverse mode
	C37.90.1	Ethernet, GPS	2.5 kV common mode
100 kHz Damped Oscillatory Wave	IEC 61000-4-18	Power, Analog Inputs	4 kV common mode, 2 kV transverse mode
		Digital Inputs	4 kV common mode, 1 kV transverse mode
		GPS	2 kV common mode

Table 4. NI 9725 Type Tests (Continued)

Description	Standards	Ports	Levels
Fast Transients	IEC 61000-4-4	Power, Analog Inputs	4 kV common mode and transverse mode
	C37.90.1	Digital Inputs	4 kV common mode, 2 kV transverse mode
		Ethernet, GPS, Functional Earth	4 kV common mode
Surge	IEC 61000-4-5	Power, Analog Inputs	0.5 kV, 1 kV, 2 kV, 4 kV common mode; 0.5 kV, 1 kV, 2 kV transverse mode
		Digital Inputs	0.5 kV, 1 kV, 2 kV, 4 kV common mode, 0.5 kV, 1 kV, 2 kV transverse mode
		GPS	0.5 kV, 1 kV, 2 kV common mode
Electrostatic Discharge	IEC 61000-4-2	Enclosure*	8 kV contact discharge, 15 kV air discharge
	C37.90.3		
Radiated Electromagnetic Field Immunity	IEC 61000-4-3	Enclosure	20 V/m 80 MHz to 1000 MHz
	C37.90.2		10 V/m 1.4 GHz to 2.7 GHz
			20 V/m 80 MHz, 160 MHz, 450 MHz, 900 MHz
			10 V/m 380 MHz, 1850 MHz, 2150 MHz
Conducted Immunity	IEC 61000-4-6	Power, Digital Inputs, Analog Inputs, Ethernet, GPS	10 V 0.15 MHz to 80 MHz
			10 V 27 MHz, 68 MHz
Power Frequency Voltage Immunity	IEC 61000-4-16	Power, Digital Inputs, Analog Inputs, Ethernet	30 V continuous
			300 V for 1 s
DC Voltage Dips	IEC 61000-4-29	Power	0% 10 ms to 1000 ms
			40% 200 ms
			70% 500 ms

Table 4. NI 9725 Type Tests (Continued)

Description	Standards	Ports	Levels
AC Voltage Dips	IEC 61000-4-29	Power	0% 0.5 to 25 cycles (50/60 Hz)
			40% 10 cycles at 50 Hz
			40% 12 cycles at 60 Hz
			70% 25 cycles at 50 Hz
			70% 30 cycles at 60 Hz
DC Voltage Interruptions	IEC 61000-4-29	Power	0% for 5s
AC Voltage Interruptions	IEC 61000-4-11	Power	0% for 250 cycles at 50 Hz
			0% for 300 cycles at 60 Hz
Ripple on DC Power	IEC 61000-4-17	Power	15% at 100 Hz and 120 Hz
Power Frequency Magnetic Field	IEC 61000-4-8	Enclosure	100 A/m continuous
			300 A/m for 3 s
Damped Oscillatory Magnetic Field	IEC 61000-4-10	Enclosure	30 A/m at 1 MHz
* Parts accessible in normal use when rack mounted.			

Safety

Voltage Bus

Maximum working voltage, channel-to-earth ground

Continuous ..... 250 Vrms/250 VDC, Measurement Category III

Withstand ..... 2400 Vrms/2400 VDC
Verified by 2s dielectric withstand test

Measurement Category III is for measurements performed in the building installation at the distribution level. This category refers to measurements on hard-wired hardware such as hardware in fixed installations, distribution boards, and circuit breakers. Other examples are wiring, including cables, bus bars, junction boxes, switches, socket outlets in the fixed installation, and stationary motors with permanent connections to fixed installations.

Caution Do *not* connect the NI 9725 voltage bus to signals or use for measurements within Measurement Categories IV.

Digital Bus

Maximum working voltage, channel-to-COM . 300 VDC max

Isolation

Channel-to-channel..... None

Channel-to-earth ground

Continuous..... 300 Vrms/300 VDC, Measurement Category II

Withstand..... 2400 Vrms/2400 VDC
Verified by 2s dielectric withstand test

Measurement Category II is for measurements performed on circuits directly connected to the electrical distribution system. This category refers to local-level electrical distribution, such as that provided by a standard wall outlet, for example, 115 V for U.S. or 230 V for Europe.

Caution Do *not* connect the NI 9725 digital bus to signals or use for measurements within Measurement Categories III or IV.

Current Bus

The negative terminal of each current input channel is tied internally to the chassis ground.

Power Input

Isolation

Line and neutral-to-earth ground

Continuous..... 250 Vrms Overvoltage Category II

Withstand..... 2400 Vrms/2400 VDC
Verified by 2s dielectric withstand test

Overvoltage Category II is for measurements performed on circuits directly connected to the electrical distribution system. This category refers to local-level electrical distribution, such as that provided by a standard wall outlet, for example, 115 V for U.S. or 230 V for Europe.

Caution Do *not* connect the NI 9725 digital bus to signals or use for measurements within Measurement Categories III or IV.

Safety Standards

This product meets the requirements of the following standards of safety for electrical equipment for measurement, control, and laboratory use:

- IEC 61010-1, EN 61010-1
- UL 61010-1, CSA 61010-1

Note For UL and other safety certifications, refer to the product label or the *Online Product Certification* section.

Electromagnetic Compatibility

This product meets the requirements of the following EMC standards for electrical equipment for measurement, control, and laboratory use:

- EN 61326-1 (IEC 61326-1): Class A emissions; Industrial immunity
- EN 55011 (CISPR 11): Group 1, Class A emissions
- EN 55022 (CISPR 22): Class A emissions
- EN 55024 (CISPR 24): Immunity
- AS/NZS CISPR 11: Group 1, Class A emissions
- AS/NZS CISPR 22: Class A emissions
- FCC 47 CFR Part 15B: Class A emissions
- ICES-001: Class A emissions

Note In the United States (per FCC 47 CFR), Class A equipment is intended for use in commercial, light-industrial, and heavy-industrial locations. In Europe, Canada, Australia and New Zealand (per CISPR 11) Class A equipment is intended for use only in heavy-industrial locations.

Note Group 1 equipment (per CISPR 11) is any industrial, scientific, or medical equipment that does not intentionally generate radio frequency energy for the treatment of material or inspection/analysis purposes.

Note For EMC eclarations and certifications, and additional information, refer to the *Online Product Certification* section.

CE Compliance CE

This product meets the essential requirements of applicable European Directives as follows:

- 2006/95/EC; Low-Voltage Directive (safety)
- 2004/108/EC; Electromagnetic Compatibility Directive (EMC)

Online Product Certification

To obtain product certifications and the Declaration of Conformity (DoC) for this product, visit `ni.com/certification`, search by module number or product line, and click the appropriate link in the Certification column.

Shock and Vibration

This product meets the requirements of the following standards for shock and vibration.

- IEC 60255-21-1: 1988 Electrical relays, Part 21:Section One: Vibration tests (sinusoidal), Class 1
- IEC 60255-21-2: 1988 Electrical relays, Part 21: Section Two: Shock and Bump tests, Class 1
- IEC 60255-21-3: 1993 Electrical relays, Part 21: Section Three: Seismic tests, Class 1

Environmental

Operating temperature
(IEC 60068-2-1, IEC 60068-2-2) ..... -20 °C to 55 °C

Storage temperature
(IEC 60068-2-1, IEC 60068-2-2) ..... -40 °C to 85 °C

Ingress protection ..... IP 30

Operating humidity (IEC 60068-2-78) ..... 10% RH to 90% RH, noncondensing

Storage humidity (IEC 60068-2-78) ..... 5% RH to 95% RH, noncondensing

Pollution Degree (IEC 60664) 2

Maximum altitude ..... 2,000 m

Indoor use only.

Environmental Management

NI is committed to designing and manufacturing products in an environmentally responsible manner. NI recognizes that eliminating certain hazardous substances from our products is beneficial to the environment and to NI customers.

For additional environmental information, refer to the *Minimize Our Environmental Impact* web page at `ni.com/environment`. This page contains the environmental regulations and directives with which NI complies, as well as other environmental information not included in this document.

Waste Electrical and Electronic Equipment (WEEE)

EU Customers At the end of the product life cycle, all products *must* be sent to a WEEE recycling center. For more information about WEEE recycling centers, National Instruments WEEE initiatives, and compliance with WEEE Directive 2002/96/EC on Waste and Electronic Equipment, visit `ni.com/environment/weee`.

电子信息产品污染控制管理办法 （中国 RoHS）

中国客户 National Instruments 符合中国电子信息产品中限制使用某些有害物质指令 (RoHS)。关于 National Instruments 中国 RoHS 合规性信息，请登录 `ni.com/environment/rohs_china`。(For information about China RoHS compliance, go to `ni.com/environment/rohs_china`.)

Worldwide Support and Services

The NI website is your complete resource for technical support. At ni.com/support you have access to everything from troubleshooting and application development self-help resources to email and phone assistance from NI Application Engineers.

Visit ni.com/services for NI Factory Installation Services, repairs, extended warranty, and other services.

Visit ni.com/register to register your NI product. Product registration facilitates technical support and ensures that you receive important information updates from NI.

A Declaration of Conformity (DoC) is our claim of compliance with the Council of the European Communities using the manufacturer's declaration of conformity. This system affords the user protection for electromagnetic compatibility (EMC) and product safety. You can obtain the DoC for your product by visiting ni.com/certification. If your product supports calibration, you can obtain the calibration certificate for your product at ni.com/calibration.

NI corporate headquarters is located at 11500 North Mopac Expressway, Austin, Texas, 78759-3504. NI also has offices located around the world. For telephone support in the United States, create your service request at ni.com/support or dial 1 866 ASK MYNI (275 6964). For telephone support outside the United States, visit the Worldwide Offices section of ni.com/niglobal to access the branch office websites, which provide up-to-date contact information, support phone numbers, email addresses, and current events.

376972A-01 Aug15