Programmable Impedance Decade Substituter

PRS • PCS • PLS • PRTD • Series

Broad range of laboratory grade decade substituters for applications requiring a cost effective programmable-impedance unit controlled manually and by a computer.

RESISTANCE • RTD • CAPACITANCE • INDUCTANCE

- Multiple control mode:
  - Thumbwheel switch
  - IEEE-488.1
  - IEEE-488.2 (w/SCPI)
  - RS232C (w/SCPI)
- National Instruments LabVIEW hardware and software tools available
- Special RTD and custom configurations
- High power versions
- Programmable "open circuit" and "short circuit" states optional

IEEE-488 SCPI

Dual PZS Resistance and Capacitance Substituter

OPTIONS AND CONFIGURATIONS

Model PRS-201 Resistance Substituter

Choice of Performance:
PRS-200 Series - economical 1% accuracy
PRS-201 Series - laboratory 0.1% accuracy
PRS-202 Series - high accuracy to 0.01%
PRTD Series - programmable RTD simulation.

Package Configuration: Convenient standard 19" rack mounting or more portable benchtop versions are available. Both single and dual units are available.

Low thermal emf: Specially selected relays along with tellurium copper binding posts insure minimum thermal emf drift.

High Power: Power up to 100's of watts and high current options are available.

Combinations: Dual or combination resistance-capacitance-inductance models may be configured.

Special Requirements: High voltage nonstandard values, ultra low tempco or special programming needs can be accommodated.

Rear Outputs: Single or dual front and rear outputs are available with option RO.

Wide choice of impedance ranges: resistance, capacitance and inductance of up to 10 decades may be specified. Resistance may range from 1 mΩ to 100 MΩ.

PRTD: Low resistance versions with a fixed minimum resistance setting (4 Ω or specified by customer) are suitable for RTD (Resistance Temperature Detector) simulations. This design virtually eliminates the effect of zero resistance and relay contact resistance, providing the specified absolute accuracy over its entire range.

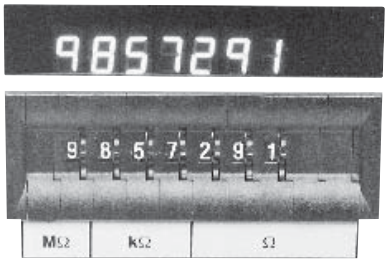
High Power Options: Power dissipation requirements of up to tens of Watts can be accommodated.

Short-Circuit (SC) and Open-Circuit (OC) Options: Optional short-circuit and open-circuit modes of operation. These states are controlled only in the REMOTE programming mode.

OC or Open Circuit operation gives the user an open circuit immediately in series with the HI binding post. SC or Short Circuit operation gives the user a short circuit across the HI and the LO binding posts The short circuit impedance is very small, <20 mΩ or as low as 5 mΩ. This is lower than the regular zero resistance setting. In both these cases, the underlying resistance setting is unaffected and may still be controlled.

Programmable Resistance Temperature Detector (PRTD) Substituter

Digital Display



D-Option: Shows the commanded value - either thumbwheel or remote setting on a matching LED display above the thumbwheel switches. This is useful for confirming or monitoring the selected command value, remote or local. This option requires the Rack Mount RM option.

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REMOTE CONTROL AND PROGRAMMING

Control Options:

Thumbwheel: Standard feature on all models.

BCD: (Binary Coded Decimal): Use external digital I/O lines to set decade values individually. Requires 4 TTL lines per decade. The user provides his own control circuitry

IEEE.1: Our original computer interface which supports the IEEE-488.1 or IEEE-1978 protocol is still available to allow you to maintain compatibility with your legacy hardware / software investment. This may also be a more economical solution for your control needs

NEW! IEEE: This is the most popular, worldwide interface standard for test and measurement equipment. With this option, the PRS is compliant with IEEE-488.2 and SCPI 1994.0. Features *IDN and cal date query, allowing you to improve your instrument and calibration tracking capabilities. GPIB addressing is controlled via DIP switches or commands on the GPIB bus.

NEW! RS232: This interface conforms to EIA-STD-RS-530; with a 25 pin DTE interface. Choose from factory configurable RS232 or RS422/RS485 differential modes.

The PRS is a standard DTE device in RS232 mode. Typical connection to a controlling computer is made via a null-modem cable. This is the default mode if not specified.

Specify RS422/485 mode when the PRS is in a remote location or when communications port capacity is at a premium. The RS422/485 specification uses differential signalling to increase transmission distances and to reduce communications errors in noisy environments. When in 485 mode, the PRS is a listen-only device and configurable to addresses 0-15. The internal 422/485 mode eliminates the need for external signal adapters on the PRS.

When equipped with any remote control functionality, the PRS front panel switch determines if REMOTE mode is enabled. Regardless of remote control type, setting the front panel switch to the LOCAL position always disables the remote control "set" value. Use of the IEEE GTL (go-to-local) command message returns the PRS to LOCAL mode and the PRS output value to the thumbwheel setting. GTL is an IEEE specific function and not applicable to Serial or BCD equipped units.

Supported commands include: *IDN?, *CLS, *ESE, *ESE?, *ESR?, *IDN?, *OPC, *OPC?, *PSC, *PSC?, *RCL, *RST, *SAV, *SRE, *SRE?, *STB, *TRG, *TST? and *WAI.

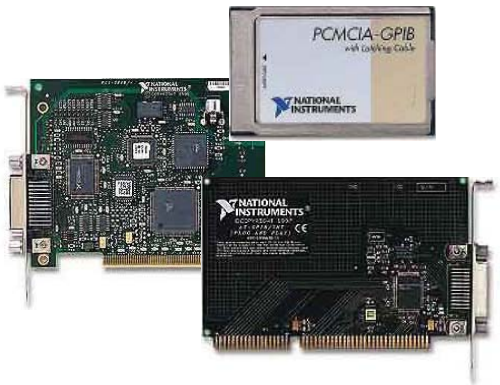
When using the PRS in an environment where traceability is required, test software can query the '*IDN' and 'CALibrate:DATe' registers at the beginning of each test sequence to record equipment serial numbers and check the calibration date against the current date.

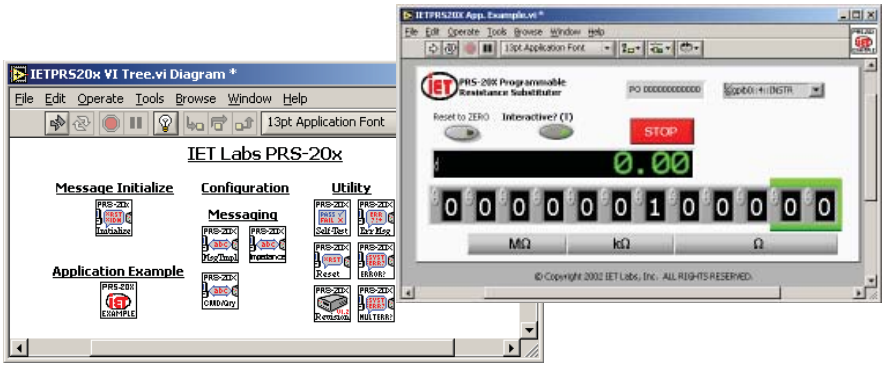
A typical test sequence might include:

Init the instrument	*RST
retrieve S/N & caldate	*IDN?;CAL:DATE?
Loop Begin	
set PRS value	SOURCe:DATA 000050000000
check for errors	SYST:ERR? or *STB?
make test meas….	
Loop End	
Return to known state	SOURCe:DATA 000000000000
Send Go-To-Local cmd	

NATIONAL INSTRUMENTS SOFTWARE AND HARDWARE TOOLS

GPIB instruments are the most popular, worldwide standard for test and measurement systems. To close the loop for your remote control system needs, IET Labs can supply National Instruments hardware and software GPIB solutions for almost every desktop, laptop, industrial PC, workstation, and interface bus including PCI, CompactPCI, PCMCIA, USB, serial, 1394 and Ethernet.





LabVIEW instrument drivers are available for units equipped with GPIB or RS232C options. These drivers are written based on the National Instruments instrument template, using VISA handles and standard initialize, config and query functions.

Contact us if you need help creating more complex test and/or measurement solutions based on interconnecting multiple/different IET Labs instruments.

The remote output value is set by sending a 'SOURCe:DATA' command followed by a string that represents the digits as they would be selected using the thumbwheels. Leading and trailing zeros are required to set each decade properly; the decimal point is not used.

For example; the PRS-202 has a least significant digit value of 0.01 Ohms and a remote logic maximum of 12 command decades. To set a value of 500,000.45 Ohms, the command string would be:

SOURCe:DATA 000050000045

The PRS-201 has a least significant digit value of 0.1 Ohms and a remote logic maximum of 10 command decades. To set a value of 2,500.8 Ohms, the command string would be:

SOURCe:DATA 0000025008

Request the LabVIEW drivers to quickly integrate the PRS into your test environment. These drivers are built based on the NI driver template, and include a virtual front panel application. The LabVIEW runtime engine is included with the drivers for simple remote control operation.

SPECIFICATIONS

Accuracy: The accuracy, indicated in the chart below, applies after subtraction of the "zero setting" residual impedance.

Accuracy (PRTD): Absolute accuracy, indicated below, applies without requiring subtraction of "zero setting" residual impedance.

Min. Setting (PRTD): 4 Ω or customer specified.

Thermal emf: < 15 µV; < 10 µV, typical.

Terminals:
Four low emf gold plated tellurium copper 5-way binding posts are used for HI and LO terminal pairs for CURRENT and SENSE. GND binding post is connected to the case, to the chassis ground and to the earth ground. Rear outputs are available with RO option.

Switching time: <4 ms per change; <7 ms for ≤0.05% units.

Power Requirements: 105-125 V or 210-250 V (internally switchable for PRS 202 series) 50-60 Hz; 10 W nominal; battery pack available; see BP-511 Series.

Remote Control Input Options:

IEEE.1: Original GPIB interface; standard 24 pin connector conforms to IEEE-488.1-1978; configurable address from 0 to 30

IEEE: GPIB standard 24 pin connector, conforms to IEEE-488.2; SCPI 1994.0 command set; Hardware or software configurable addressing range of 0 to 30. Default IEEE option if ".1" or ".2" choice not specifically noted.

RS232: NEW - 25 pin male DTE interface conforms to EIA-STD-RS-530; SCPI 1994.0 command set; data rates from 300 to 115200 bps.

BCD: Parallel, CMOS positive true logic

Dimensions: Bench model: 22 cm W x 12 cm H x 24 cm D (8.5" x 4.44" x 9.25") Rack model: Panel: 48.3 cm W x 13.2 cm H (19" x 5.2"); behind panel: 42.7 cm W x 12.4 cm H x 31.5 cm D (16.8" x 5.2" x 12.4"); in front of panel: 3.8 cm (1.5").

Weight: Bench model: 2.0 kg (4.5 lb); Rack model: 4.5 kg (10 lb); Dual rack mount model: 6.4 kg (14 lb); weight specifications are nominal.

Interface: IEEE-488-1978, or parallel BCD interface; front panel switch selects REMOTE (digital interface) or LOCAL (front panel thumbwheel) operation. See pp. 46-49 for IEEE-488 interface software and hardware, check for 2 intervals.

Improved specifications

STANDARD MODELS

Model	PRS-200	PRS-201	PRS-200W	PRS-201W	PRS-202	PRS-202W	PRTD	PCS-300	PCS-301	PLS-400	PLS400A
Type	Resistance	Precision Resistance	Wide Range Resistance	Wide Range Precision Resistance	High Precision Resistance	Wide Range High Precision Resistance	Precision Absolute Value Resistance	Precision Capacitance	Wide Range Capacitance	Range	Inductance
Accuracy	1% +70 mΩ	0.1%+ 30 mΩ	1%+ 70 mΩ	0.1%+ 30 mΩ	0.05% + 15 mΩ (0.01% available)		.02-.05% + 10 mΩ	4% + 5 pF	1% + 3 pF	2%	
Decades	7		9		7	9	6 or more	6		4	3
Range	0 - 9,999,999 Ω		0 - 99,999,999.9 Ω		0 - 9,999,999 Ω	0 - 99,999,999.9 Ω	4-10,003.99 Ω	0 - 99.999 9 µF		0 - 9.999 H	0 - 999 mH
Resolution	1 Ω		0.1 Ω		1 Ω	0.1 Ω	0.01 or 0.001 Ω	100 pF		1 mH	1 mH
Type of Components	Resistance wire for 0.1 Ω steps and under; metal film for 1 Ω steps and over.				Resistance wire for 0.1 Ω steps and under; wirewound, sealed non-inductive resistors for 1 Ω steps and over.			100-900 pF: Mica 0.001-0.009 µF: Polystyrene 0.01-0.9 µF: Polycarbonate 1-9 µF: Polyester 10-90 µF: Polarized tantalum		Toroidal inductors See inductance Substituters (page 9) for specifications	
Max. Load*	0.5 A, 200 V (dc + ac peak), 0.2 W/step, 2 W unit, whichever applies first.*				3 A, 200 V (dc + ac peak), 0.5 W/step, 4.5W/unit, whichever applies first.*			100 V (20 V for 10-100 µF)		See page 12	
Residual Impedance	<450 mΩ See page 12		<600 mΩ		<100 mΩ	<140 mΩ typically <100 mΩ	Absolute Value	7 pF, typical; higher w/ Rear Output			

* These specifications are dynamic switching limits. The maximum voltage, power, or current which may be applied at any particular resistance setting may be higher as long as the setting is unchanged, or the unit is switched dry.

ORDERING INFORMATION

STANDARD MODELS

PRS-200	Programmable Resistance Substituter
PRS-201	Programmable Precision Resistance Substituter
PRS-200W	Programmable Wide Range Resistance Substituter
PRS-201W	Programmable Wide Range Precision Resistance Sub
PRS-202	Programmable High Precision Resistance Substituter
PRS-202W	Programmable Wide Range High Precision Resistance Sub
PCS-300	Programmable Capacitance Substituter
PCS-301	Programmable Precision Capacitance Substituter
PLS-400	Programmable Wide Range Inductance Substituter
PLS-400A	Programmable Inductance Substituter
PRTD Models	Programmable RTD Simulator

INTERFACE OPTIONS

-IEEE.1 Option	IEEE-488.1 Interface
-IEEE Option	IEEE-488.2 Interface
-RS232 Option	Serial interface
-BCD Option	BCD Interface

OTHER OPTIONS

-RM Option	Rack mount
-RO Option	Rear output
-D Option	Digital display of command
-SC Option	Short circuit option
-OC Option	Open circuit option
-220V	220 V Operation
BP-511	Battery pack, AC source, 115 V, 60 Hz, 40 W

National Instruments/LabVIEW Related

PZS-LV61	PZS Series LabVIEW 6.1 driver

CONTROLLER OPTIONS

NI-778032-01	GPIB controller for PCI for Windows 2000/XP
NI-777073-01	GPIB controller for PCI for Windows NT
NI-777158-01	GPIB controller for PCI for Windows Me/9x
NI-778034-02	GPIB controller for PCMCIA for Windows 2000/XP, with 2 m GPIB cable
NI-777332-02	GPIB controller for PCMCIA for Windows NT, with 2 m GPIB cable
NI-777332-02	GPIB controller for PCMCIA for Windows Me/9x, with 2 m GPIB cable
NI-778416-01	GPIB-USB-B, NI-488.2 for Windows 2000/XP/Me/ 98(English&Japan)
NI-777641-02	PCI-485/2, Enhanced COM Driver for Windows 2000/NT/9x, 2 Ports (use with RS232 option)
NI-777387-01	PCI-DIO-96 Digital I/O Board and NI-DAQ for Win 2000/NT/9x/MAC (use with BCD option)

For other computers or Operating Systems Consult IET

LabVIEW Software Systems Consult National Instruments

GPIB CABLES

CBL-488-1	1 meter IEEE-488 cable
CBL-488-2	2 meter IEEE-488 cable
CBL-488-4	4 meter IEEE-488 cable
CBL-488-X	Custom cables any length

OPTIONAL MODELS

In order to satisfy any unique requirements for programmable substituters, generate a part number from the table below.

PRS - B - 5 - .1 - RM -IEEE.1 - -RO-SC-220V-D

No. of Units
NIL: Single
2: Dual

Type of Substituter
RS: Resistance
CS: Capacitance
LS: Inductance
RTD: RTD Simulator

Tolerance
X: 0.01%
Q: 0.02%
A: 0.05%
B: 0.1%
C: 0.5%
F: 1%
G: 2%
H: 4%

No. of Decades
1 to 10

Impedance per Step for Lowest Decade
0.001 Ω to 10 MΩ (in ohms)
1 pF to 100 µF
1 µH to 10 H

Packaging
WC: Packaged in a standard case with binding posts
RM: Rack mount option

Rating
Blank: Standard rating
OTHER: Specify

Interface Options
Blank: Standard
BCD: External TTL
IEEE.1: IEEE-488.1
IEEE: IEEE-488.2
RS232: Serial 232/485

Other Options
RO: Rear outputs
D: Digital Display
SC: Short Circuit
OC: Open Circuit
220V: 220 V Operation
BC511: Battery Pack

(i.e.: 0 - 9,999.9 Ω, 1%, 0.1 Ω steps, rack mounted PRS with IEEE-488.1 control, rear outputs, short circuit operation, 220 V AC operating voltage and digital display)

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