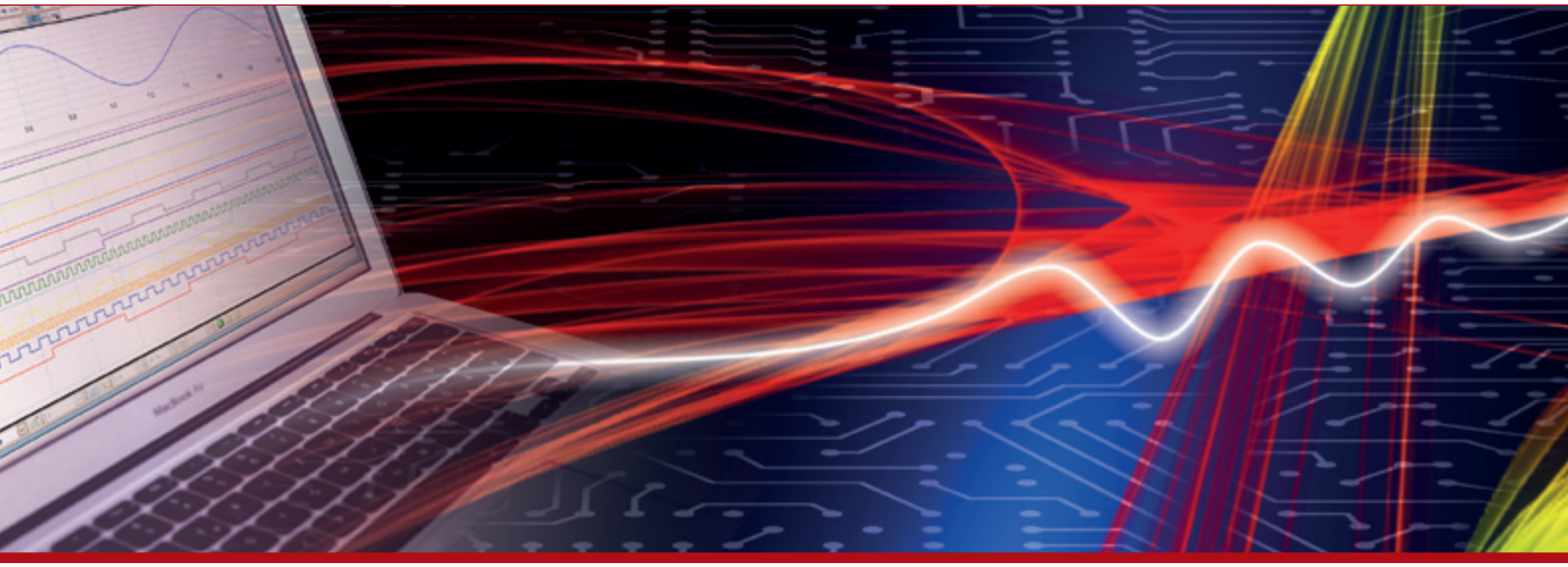
Product Datasheet - Technical Specifications



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Data Sheet

Triple Output Multi-Range DC Power Supplies
9140 Series

USB | LAN | GPIB model option | LXI

The 9140 Series triple output multi-range DC power supplies combine industry-leading power density and performance with an extensive set of features in a compact 2U form factor. Three isolated output channels each produce 100 W of clean power with low ripple and noise characteristics. Combining all three channels increases the maximum power output to 300 W. Multiple outputs paired with advanced list mode programming, data logging, and protection features make these power supplies suitable for a wide range of benchtop or test system applications.

Powerful list mode programming functions enable users to set up and execute complex test sequences directly from the front panel. Individual list programs can be assigned to one or multiple output channels and executed simultaneously or sequentially. Additional list mode features include triggering capabilities for synchronizing outputs or external instruments, and the ability to save/recall list programs using an external flash drive connected to the USB host port. The USB host port is also used for logging voltage and current data to a flash drive at adjustable sampling intervals.

This series provides system integrators with a LXI compliant LAN, USB (USBTMC-compliant), and optional GPIB interface for remote control and programming. The provided LabVIEW™, IVI-C, and IVI.NET drivers further simplify system development and integration. In addition to OVP, OCP, and OTP protections, these power supplies support remote inhibit and voltage fault features to protect both the device under test (DUT) and the power supply.

Applications
Benchtop or rackmount applications requiring multiple outputs, precise test sequence generation, and other applications benefiting from a flexible power range delivered in a lightweight, compact package.

Model*	9140	9141
Voltage per Channel	0 to 32 V	0 to 60 V
Current per Channel	0 to 8 A	0 to 4 A
Maximum Output Power per Channel	100 W	
Maximum Combined Output Power	300 W	

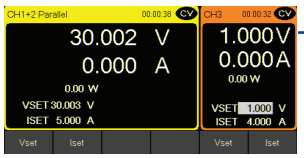
* GPIB models: 9140-GPIB and 9141-GPIB

Features and benefits
- Three independent galvanically isolated, floating output channels providing up to 100 W per channel or 300 W total
- High power density, compact 2U half-rack form factor
- Multi-ranging operation delivers rated power at multiple voltage/current combinations
- Low output ripple and noise down to 1 mVrms
- Combine outputs to increase voltage or current up to 180 V or 24 A (depending on model)
- Advanced list mode programming with internal storage for 10 list mode programs
- Channel coupling and tracking functions with configurable output on/off delays
- Direct data logging to a USB flash drive
- Thermostatically-controlled fans for quiet operation
- Adjustable voltage and current slew rates
- Built-in web server for control of basic power supply settings
- Oscilloscope-like display mode to graphically monitor voltage and current readings
- Rear output and remote sense terminals for each channel
- Digital I/O terminal offers external triggering, voltage fault and remote inhibit capabilities
- Overvoltage (OVP), overcurrent (OCP), overtemperature (OTP) protection, and key-lock function
- NISPOM-compliant sanitization to securely restore factory settings
- USB (USBTMC-compliant) and LXI compliant LAN interfaces standard, GPIB optional
- LabVIEW™, IVI-C, and IVI.NET drivers provided
- Remote PC control software available
- Convenient front-panel user calibration
- cTUVus certification mark fulfills CSA and UL safety standards

Front panel

Multiple display modes
On-screen data changes with different channel configurations

Single channel view



Channel 1+2 parallel view

USB host
Save/Recall instrument settings and list mode programs, log data directly to an external flash drive

4.3-inch LCD
View voltage, current, power, and other parameters for all three channels

Intuitive control
Numeric keypad and rotary knob for precise control

Mechanical power button
Gives tactical feel and prevents standby power draw

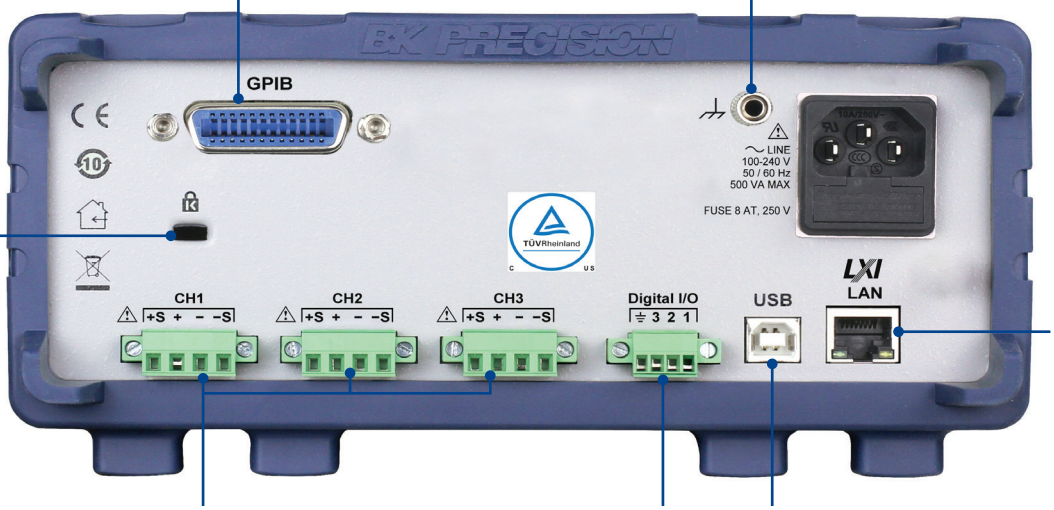
Unique multi-type output terminals
Three galvanically isolated, floating output channels support sheathed banana plugs and spade lug type connectors

Output control
Dedicated button to synchronously switch all output channels on/off

Rear panel

Optional GPIB interface

Chassis ground



Kensington security slot

LXI compliant LAN interface

Individual channel outputs with remote sense
Internal relays switch between local and remote sensing, eliminating the need for jumpers

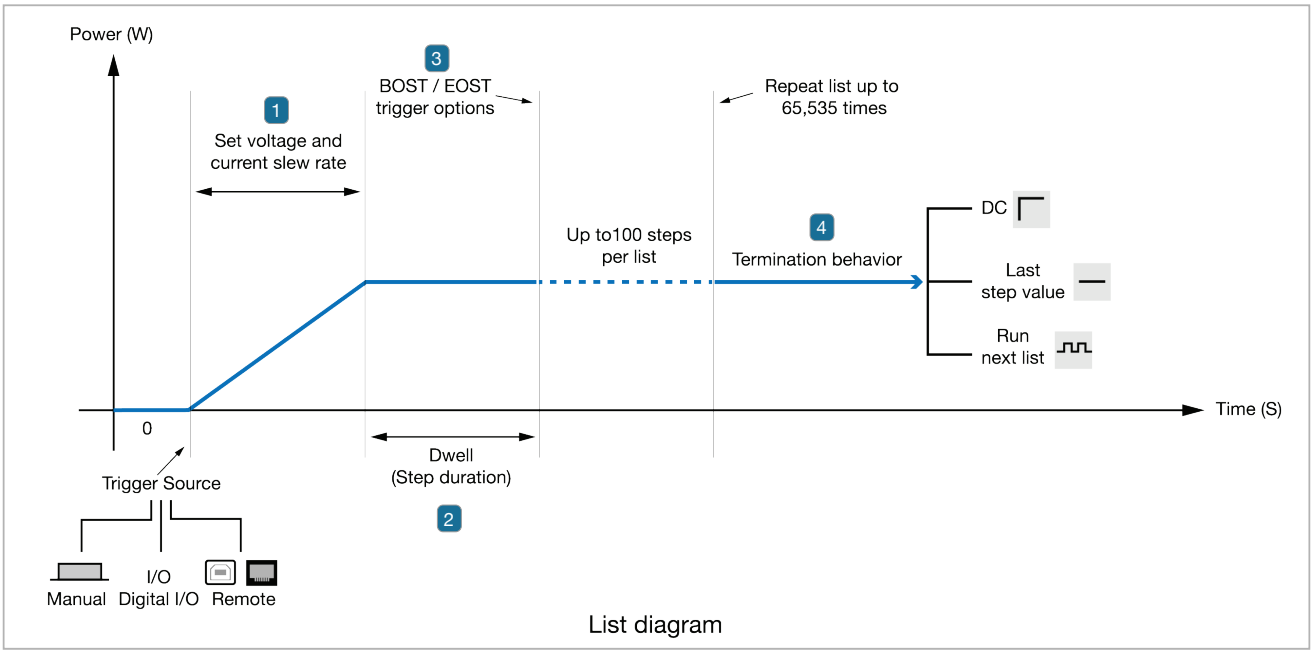
Digital I/O terminal
Assign pins for input/output trigger, remote inhibit, or voltage fault conditions

USB interface
USB (USBTMC-compliant) or USBVCP (Virtual COM Port) selectable

Highly Configurable Test Sequence Generation

Advanced list mode

The 9140 series list mode programming features are useful for repetitive testing or other applications requiring a specific sequence of voltage and current settings. Further expanding test sequence capabilities, list mode programs work with channel combine, coupling, and on/off delay features for highly configurable and customizable testing sequences. The illustration below highlights some of the configurable options for setting up a list mode program.



List diagram

1 To help control inrush current, the voltage slew rate is adjustable from 0.005 V/ms to 3.2 V/ms. The current slew rate is also adjustable from I mA/ms to 1000 mA/ms.

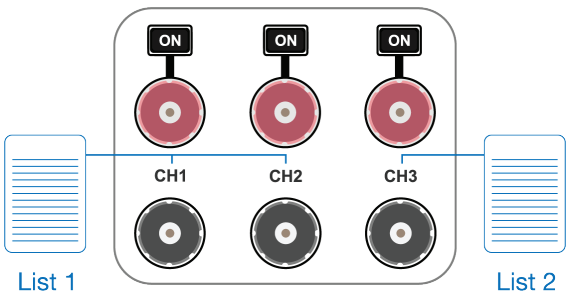
2 Dwell or step duration can be set from 0.1 s to 9999 s.

3 BOST / EOST (Beginning / End of Step Trigger) can be enabled for any step in the list to generate output triggers for synchronizing events with other externally connected instruments.

4 At the end of a list program, the termination behavior can be set to a constant DC value, remain at the last programmed list step value, or run another user-configurable list program.

Extended list mode functionality

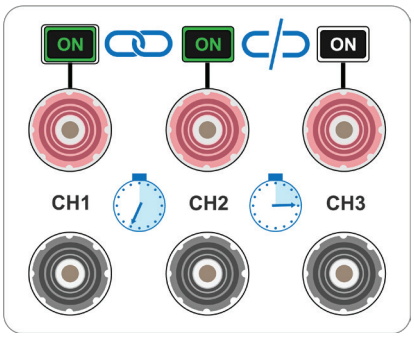
Each list mode program contains up to 100 steps each. Step parameters can be configured from the front panel or on a computer and loaded into the power supply's internal memory.



List memory is shared across all three channels, providing the capability to reference and run the same list or different lists simultaneously.

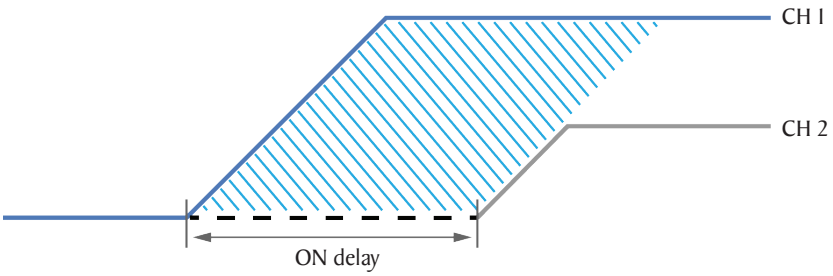
Operation highlights

Channel coupling



Channel coupling links the output states between multiple channels. ON/OFF output delays for each channel can be set from zero delay to 1 hour in 0.1 s increments

Output sequencing

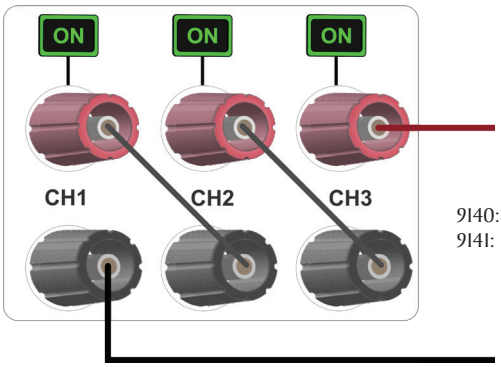


Microcontrollers and other processing devices often require specific startup power sequences in order to function properly. The 9140 Series' coupling mode, output delays, and slew rate can be configured to produce power up sequences for microcontroller testing applications.

Series and parallel operation

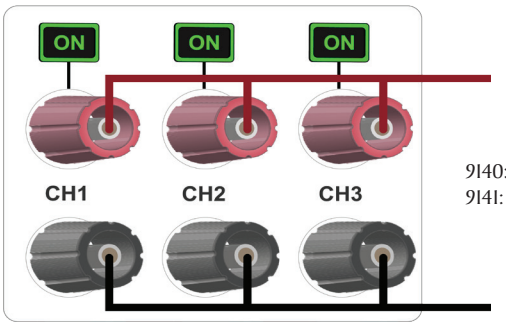
Combine two or all three channels in series or parallel to increase voltage or current.

Series mode increases voltage



9140: up to 96 V
9141: up to 180 V

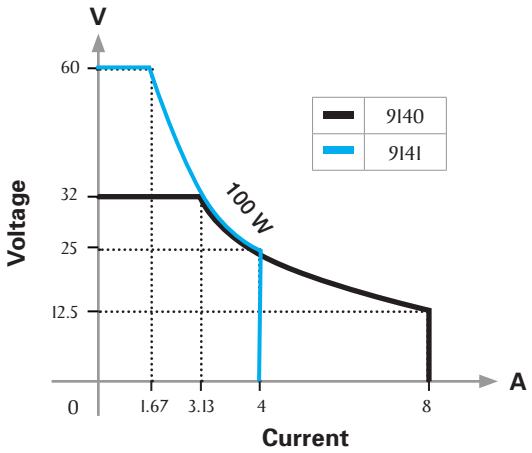
Parallel mode increases current



9140: up to 24 A
9141: up to 12 A

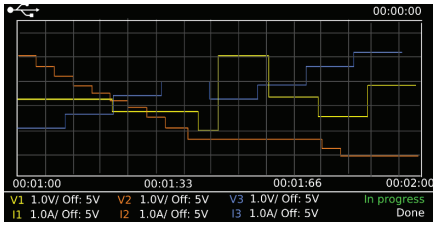
Multi-range operation

Traditional power supplies only output their rated power at one voltage/current point. The 9140 Series multi-range power supplies extend rated power from one point to a curve, delivering 100 W per channel across a wider range of voltage/current combinations.



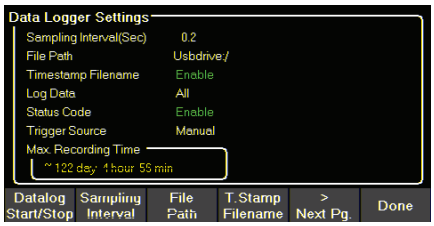
The tools you need: on the bench or in the rack

Output monitoring



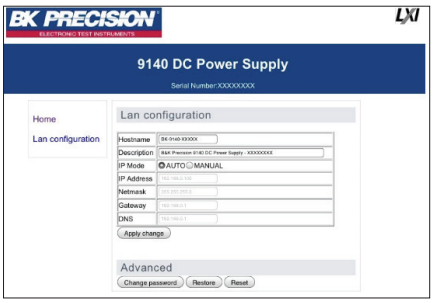
These power supplies offer a graphical display mode display mode to visually monitor and observe measured voltage and current data on all three channels.

Direct data logging



Log voltage, current, or both at a user-defined sampling interval adjustable from 0.2 seconds to 5 minutes directly to an external USB flash drive. Data points for all three channels are saved as a CSV file with date and time stamp.

Web server interface



The 9140 Series provides a built-in web server that allows users to configure, monitor, and control basic settings of the power supply from a web browser on a computer connected to the same local area network.

Test system integration

- Provides three individual and isolated power supplies in one compact, space-saving form factor
- LXI compliant LAN, USBTMC-compliant/USB Virtual COM Port selectable, and optional GPIB interface
- LabVIEW™, IVI-C, and IVI.NET drivers simplify system development and integration
- Digital I/O terminal with remote inhibit and voltage fault protection capabilities
- Rear panel output terminals with remote sense for each channel

NISPOM compliance

The 9140 Series sanitization procedure complies with the NISPOM (National Industrial Security Program Operating Manual) requirements regarding classified information. NISPOM compliance is a common requirement for test equipment used in government contracted work and is supported by agencies such as the U.S. Department of Defense.

Comprehensive protection and security

Overvoltage (OVP), overcurrent (OCP), overtemperature (OTW/OTP) features help protect the power supply and DUT. The overtemperature warning (OTW) provides an additional layer of safety before the protection is triggered and the output is disabled. Other protection features include key-lock protection and remote inhibit, allowing the output to be disabled if fault conditions are met. The Kensington security slot in the rear panel helps prevent theft.

Output safety

The output terminals are uniquely designed to accept sheathed banana plugs for increased safety, as well as spade lug connectors, preferred in many industrial settings. The use of sheathed banana plugs is often required by educational institutions.

4 mm sheathed banana plug

Spade lug connector

Specifications

Note: All specifications apply to the unit after a temperature stabilization time of 15 minutes over an ambient temperature range of 23 °C ± 5 °C. Specifications are valid for single unit operation only.

Model		9140	9141
Output Rating			
Voltage		32 V	60 V
Current		8 A	4 A
Maximum Output Power per Channel		100 W	
Total Output Power		300 W	
Load Regulation [1] ± (% output + offset)			
Voltage		≤ 0.01% + 3 mV	
Current		≤ 0.1% + 3 mA	
Line Regulation ± (% output + offset)			
Voltage		≤ 0.01% + 3 mV	
Current		≤ 0.1% + 3 mA	
Ripple and Noise (20 Hz to 20 MHz)			
Normal Mode Voltage p-p		≤ 5 mV	≤ 10 mV
Normal Mode Voltage rms		≤ 1 mV	≤ 2 mV
Normal Mode Current rms		≤ 3 mA	
Programming / Readback Resolution			
Voltage		1 mV	
Current		1 mA	
Programming / Readback Accuracy ± (% output + offset)			
Voltage		0.03% + 4 mV	0.03% + 8 mV
Current		0.1% + 5 mA	0.1% + 3 mA
Series Accuracy (combined mode)			
Voltage		0.03% + 12 mV	0.03% + 24 mV
Current		0.1% + 5 mA	0.1% + 3 mA
Parallel Accuracy (combined mode)			
Voltage		0.03% + 4 mV	0.03% + 8 mV
Current		0.1% + 15 mA	0.1% + 9 mA
Temperature Coefficient per °C			
Voltage		6.4 mV / °C	12 mV / °C
Current		1.6 mA / °C	0.8 mA / °C
Output Response Time [2]			
Rise Time	Full load	10 ms	20 ms
	No load	10 ms	20 ms
Fall Time	Full load	10 ms	20 ms
	No load	250 ms	250 ms
Transient Response [3]			
Time		0.5 ms	
Protection			
OVP	Range	35.2 V	66 V
	Accuracy	320 mV	600 mV
OCP	Range	8.8 A	4.4 A
	Accuracy	80 mA	40 mA

General		
Remote Sense Compensation		1 V
Command Response Time [4]		10 ms
Power Factor		0.98 / 115 VAC 0.94 / 230 VAC
I/O Interfaces		USB (USBTMC-compliant and virtual COM), LAN (1.5 LXI device specification 2016), GPIB (optional)
AC Line Input		100 VAC to 240 VAC ± 10%, 47 Hz to 63 Hz
Maximum Rated Input Power		500 VA
Temperature Ratings	Operation	32 °F to 104 °F (0 °C to 40 °C)
	Storage	14 °F to 158 °F (-10 °C to 70 °C)
Dimensions (W x H x D)		8.4" x 3.5" x 13" (213 x 88 x 330 mm)
Weight		11 lbs (5 kg)
Warranty		3 Years
Standard Accessories		Power cord, test report & certificate of calibration
Optional Accessories		Rack mount kit (RK2US)

Regulatory Compliance	
Safety	Low Voltage Directive (LVD) 2014/35/EU, EN61010-1:2010, cTUVus certification mark[5] fulfills US (UL 61010-1:2012) and Canadian (CAN/CSA-C22.2 NO. 61010-1-12) safety standards
Electromagnetic Compatibility	EMC Directive 2014/30/EU, EN61326-1:2013

(1) With remote sense terminal connected.
(2) From 10% to 90% or from 90% to 10% of total voltage excursion.
(3) Time for output voltage to recover within 0.5% of its rated output for a load change 50-100% of full load.
(4) Typical time required for output to begin to change following receipt of command data.
(5) Tested and certified by a Nationally Recognized Testing Laboratory (NRTL), accredited by OSHA.

Ordering Information

9140 Series Power Supplies

Model	Description
9140	32 V / 8 A, 300 W
9140-GPIB	32 V / 8 A, 300 W with GPIB
9141	60 V / 4 A, 300 W
9141-GPIB	60 V / 4 A, 300 W with GPIB