QR-10 Series *R-Can:*

General-Purpose Pocket Programmable Resistance Substitution Box

Datasheet

QR-100/101 is an electronically controlled, portable, programmable resistance substitution box (can) specially designed for technicians, engineers and students. It provides up to 8.4 MΩ "true" resistance with 0.1 Ω steps and 1 mΩ (or 6 digits) resolution.

What You Set Is What You Get

Thanks to the compact keypad and 0.54'' OLED, user can set the desired values in the field directly; While the USB-COM port allows it to be controlled by a PC, laptop or other USB host device for automatic test.

Furthermore, with the tolerance as tight as ± 0.05% (T class) or ±0.01% (A class), rated power of 1.0 W and of modest price for all fans, QR-100/101 is supposed to be the ideal candidate to replace/upgrade the cumbersome conventional resistance substitution box.

Highlights

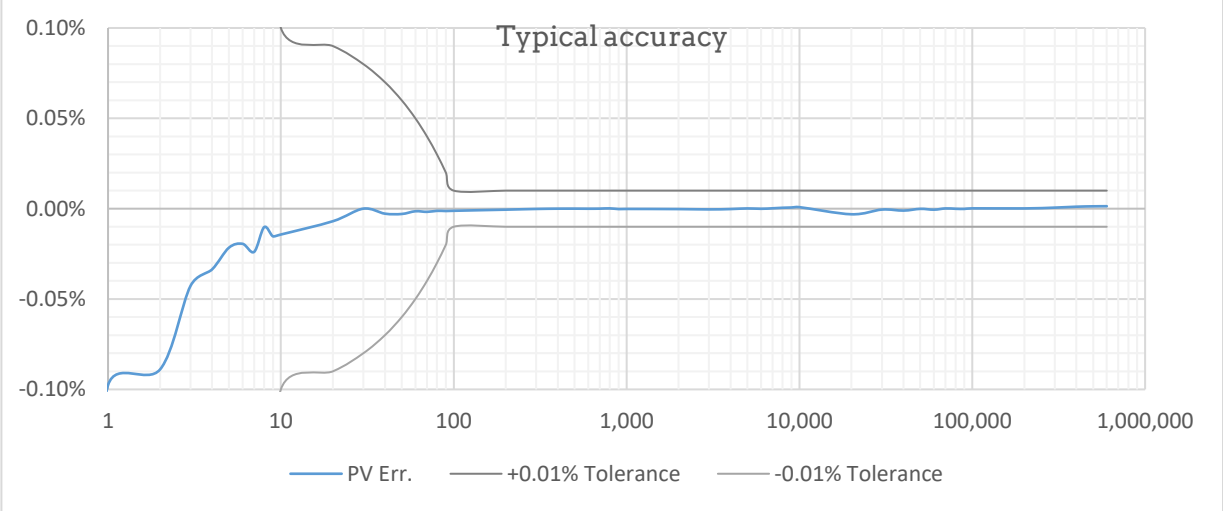
- Easy-to-use keypad
- USB-COM port interface with user-friendly AT commands style protocol
- Real resistance output generated by relay-resistor array
- High accuracy:
  Of ±0.05%(T class);
  Of ±0.01% (A class)
- Wide range:
  Of 1 Ω ~ 630 KΩ (QR-101, 0.1 Ω steps);
  Of 1 Ω ~ 8.4 MΩ (QR-101, 1.0 Ω steps)
- 1.0 W high power rating
- Safety output limit
- Latched output with ZERO power consumption
- Enabled user calibration
- Rechargeable battery
- Portable with small dimensions and solid housing

Designed for

- Labs
- Schools
- …

Applications

- Sensor simulation
- Sensor & multimeter calibration
- Precise op. amplifier gain control
- Wheatstone Bridge tuning
- Circuits on-line adjustment
- Resistive load
- Auto-test
- Physical law verification



Device type

Order code	QR100	□	-	□□-□□	
		A	: ±0.01%, <25 ppm, 1W	1K-R1	: 1 Ω ~870 Ω, 0.1 Ω step
		B	: ±0.02%, <50 ppm, 1W	2K-RX	: 1 Ω ~1.7 kΩ, 0.1 25Ω step
		T	: ±0.05%, <50 ppm, 1W	AK-1R	: 1 Ω ~11.5 kΩ, 1 Ω step
	QR101	□	-	□□-□□	
		A	: ±0.01%, <25 ppm, 1W	1M-R1	: 1 Ω ~630 kΩ, 0.1 Ω step
		B	: ±0.02%, <50 ppm, 1W	2M-RX	: 1 Ω ~1.2 MΩ, 0.125 Ω step
		T	: ±0.05%, <50 ppm, 1W	AM-1R	: 1 Ω ~8.4 MΩ, 1 Ω step

1 Class A/B: standard version
Class T: economical version or test samples
2 Output range may vary with each unit and/or different batch. In general, for the max output, the difference is within 5% of the given value; the minimum output is approximate 1.0 Ω.

Specifications

Key features	QR100		QR101		Definitions
Output					
Initial accuracy	Class / Range	A class @Cali. Temp. ±2 °C	B class @Cali. Temp. ±3 °C	T class @Cali. Temp. ±4 °C	Load < 0.1 W and operation times < 10,000 for each relay
	< 500 Ω	±0.05 Ω	±0.1 Ω	±0.25 Ω	
	500 Ω ~ 2 MΩ	±0.01%	±0.02%	±0.05%	
	> 2 MΩ	±0.02%	±0.05%	±0.1%	
Step	Optional 0.1 Ω, 0.125 Ω or 1.0 Ω				
Difference of SP and PV	< 1 step, typical 0.6 step				SP: Set Point PV: Process Value
Rated power	1.0 W or 200 Vdc max.				
TCR[1]	A class: 25 ppm B/T class: 50 ppm				
Thermoelectric potential (EMF)	< 50 μV		< 80 μV		Estimated base on relay's specification
Relay type	Bi-stable signal relay				
Relay durability	1 x 10^5 min. operation with rated load. 1 x 10^7 min. operation without load.				
Relay settle time	55 ms max.		95 ms max.		
Output terminal	Default: φ2.0 mm female banana connectors				
User interface (UI)					
Keypad	Mechanical buttons with silicone rubber caps				non-waterproof
Display	0.54" OLED, monochrome				

Specifications (continued)

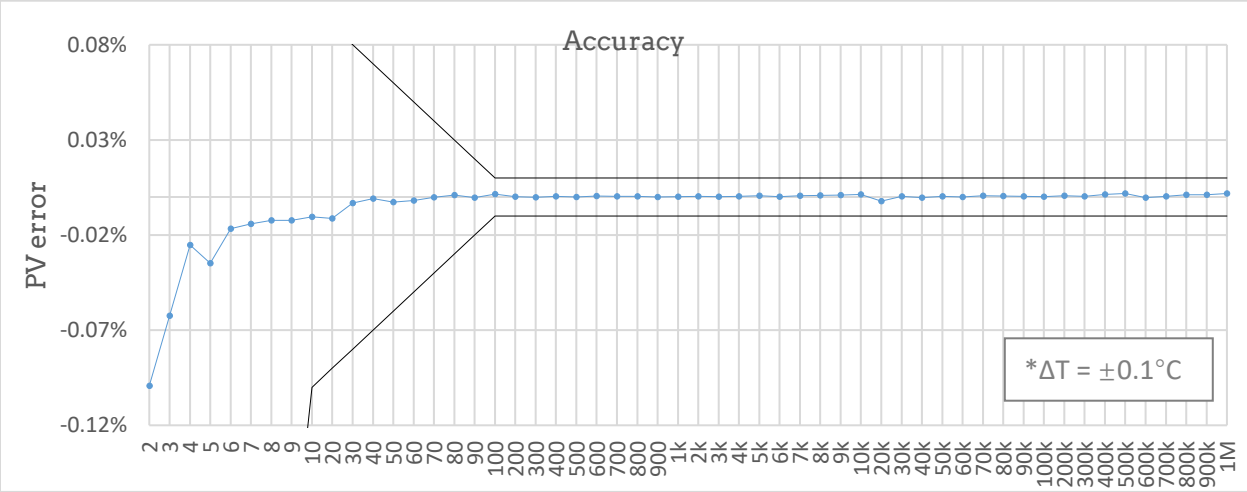
Main display items	Set Point (SP), Process Value (PV), Rated voltage of PV (U<), Output low limit (R>), Battery voltage (VB) and Device info.		
Resolution	SP: 0.1 Ω or 6 digits PV: 1 mΩ or 6 digits		
Power saving	Turn off display after 1 min of inactivity; Shut down after 1 h of inactivity		
Communication interface			
Interface	USB-to-serial COM port		
Driver IC	WCH CH340		*WIN driver link* *MAC driver link*
Baud rate	115,200 bps		
Protocol	Proprietary AT commands, user calibration is allowed		Please refer to *User Manual*
Connector[2]	USB type-C		
Battery			
Battery	Rechargeable Li-Polymer, 500+ charge/discharge cycles		
Battery life	About 12 hours @ 1Hz frequency operation		
Charging power supply	5 V ± 5%, 100 mA min.		Via USB type-C port
Charging time	3 hours		
Shelf life	10 month, Re-charge the battery every 8 month is recommended		
General Specifications			
Operating temperature	-10 ˚C to 40 ˚C		
Relative humidity	10 % to 95 % non-condensing		
Storage temperature	-20 ˚C to 35 ˚C		
Housing material	Brass (cup), Dioxide aluminum alloy (lid)		
Dimensions	5.5 cm (OD) x 4.6 cm (H)	5.5 cm (OD) x 6.1 cm (H)	
Weight	About 190 g	About 225 g	
Accessories	2 x ultra-stable 2 mm banana plug cable (0.5 m), 2 x alligator clip with 2 mm banana connector		
Warranty	A class: 2 year B/T class: 1 year		Indoor use only

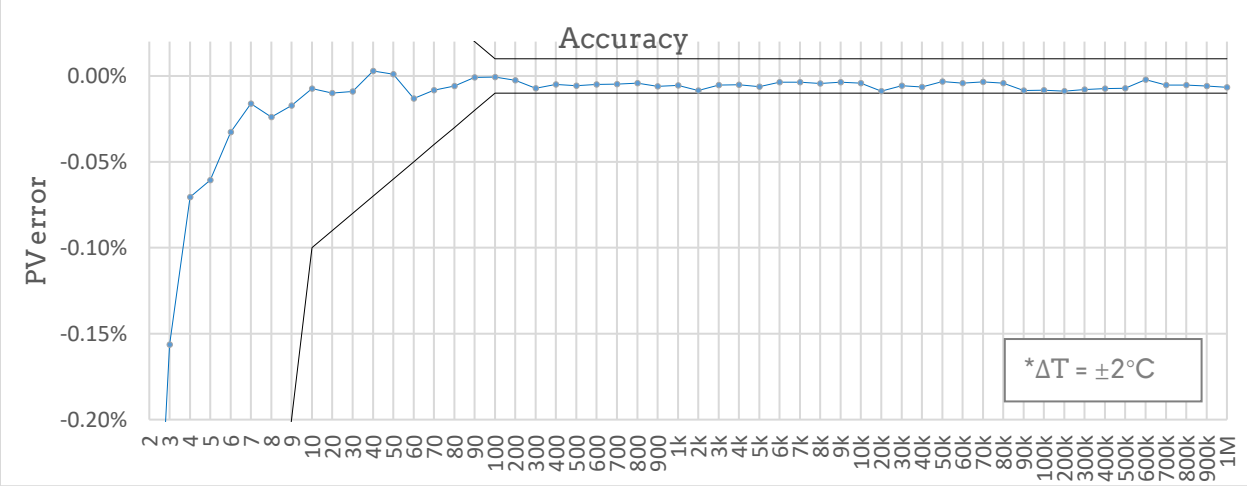
1 For the output >100 Ω. Actual TCR may slightly higher especially for the low range values (<100Ω). However, on the other hand, since base resistors that with opposite TCRs can cancel each other out, actual TCR of some points may be very much lower.

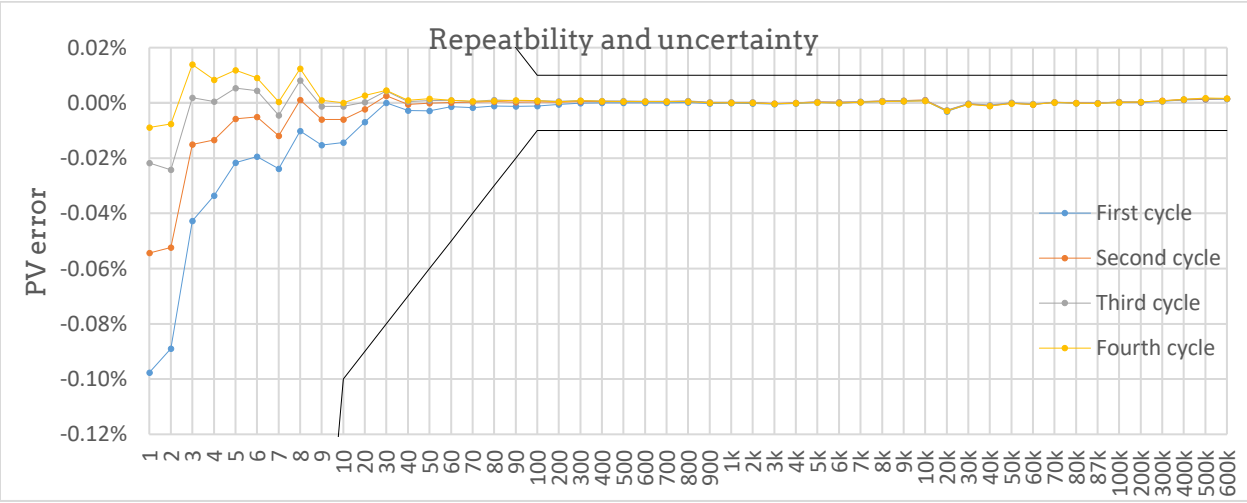
2 A common USB type-C cable for Android smart phones probably also works well on this device.

Typical characteristics*

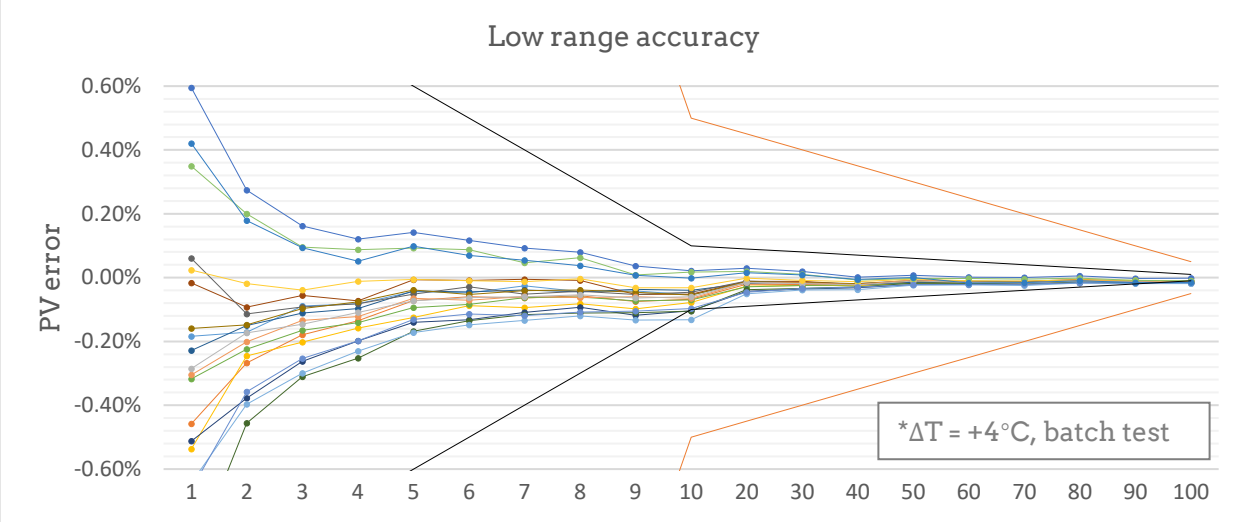
*All tests based on T class samples (unless otherwise noted)
Definition: ΔT = test temperature - calibration temperature.

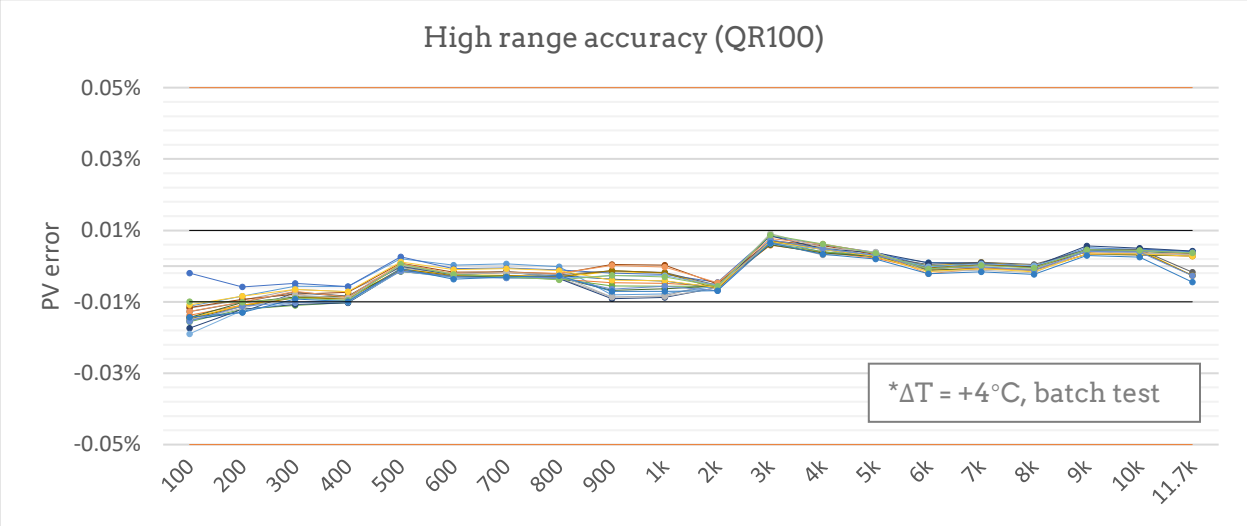


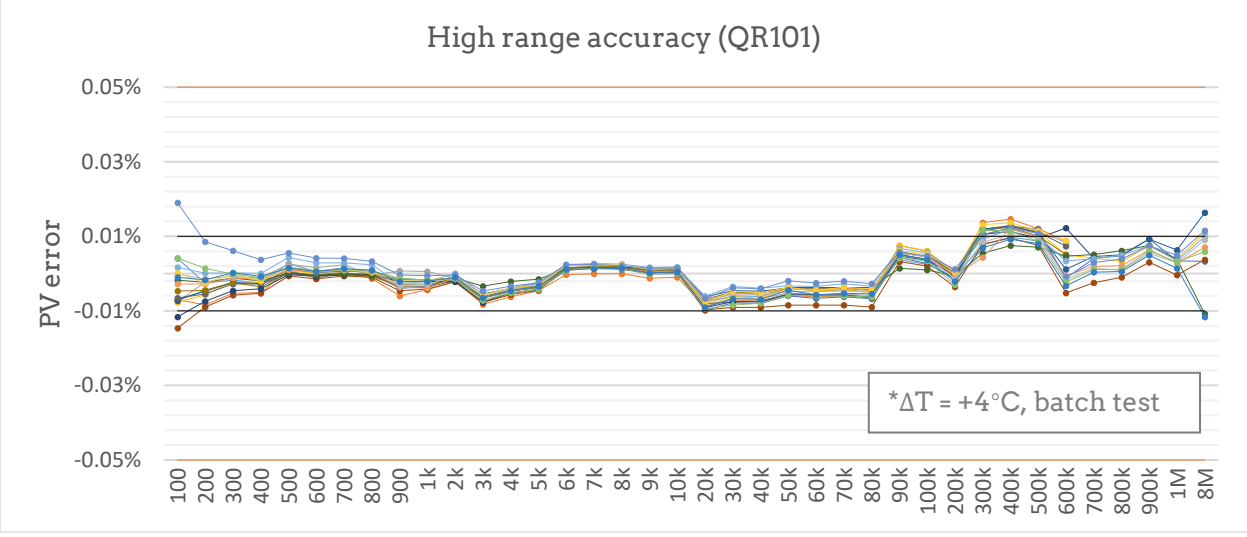




Typical characteristics (continued)







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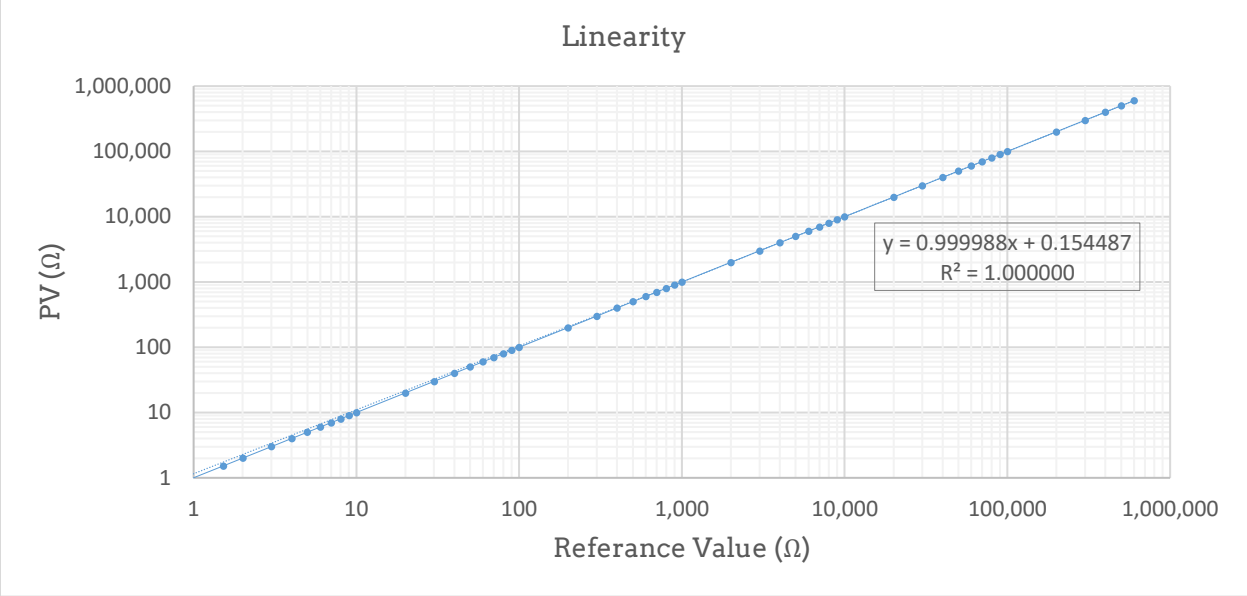

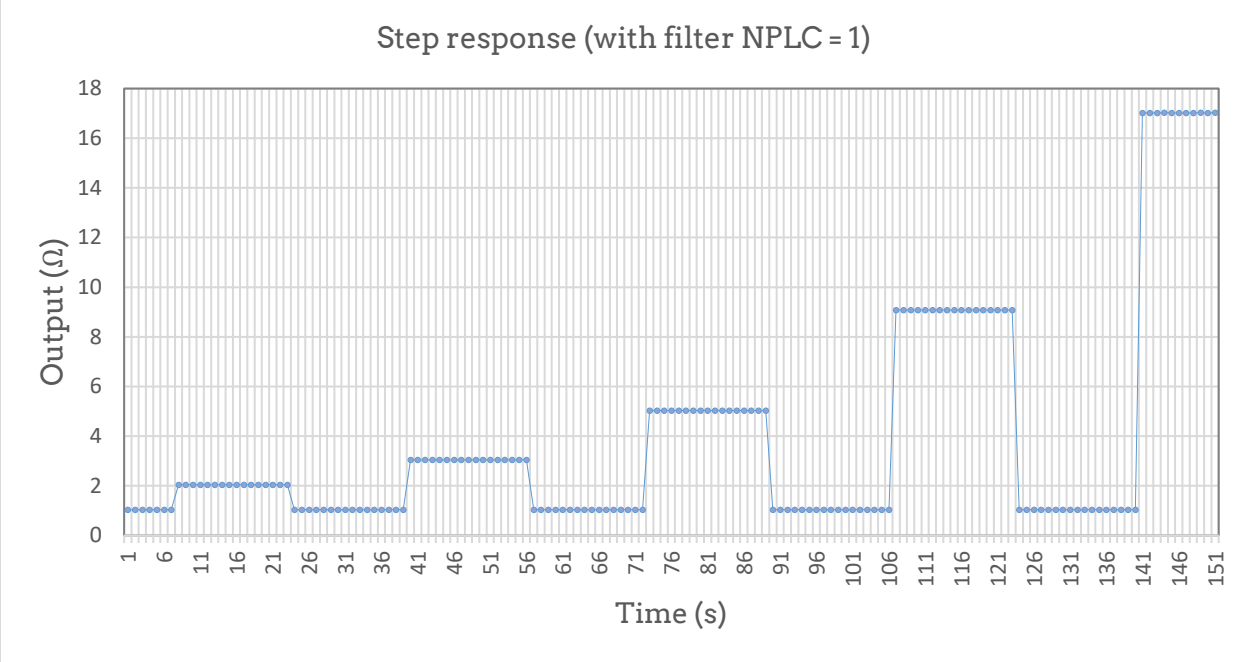

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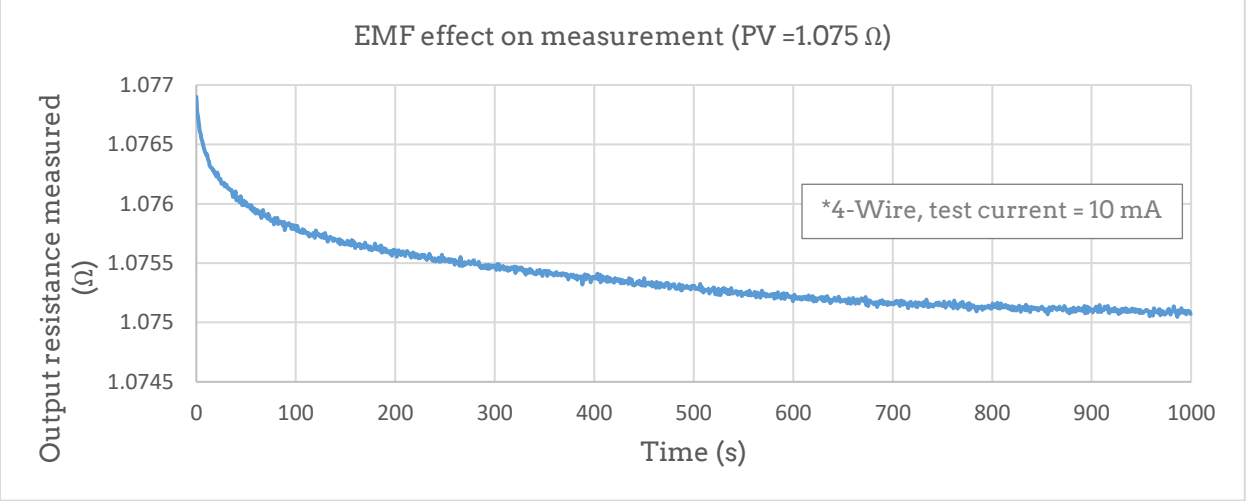

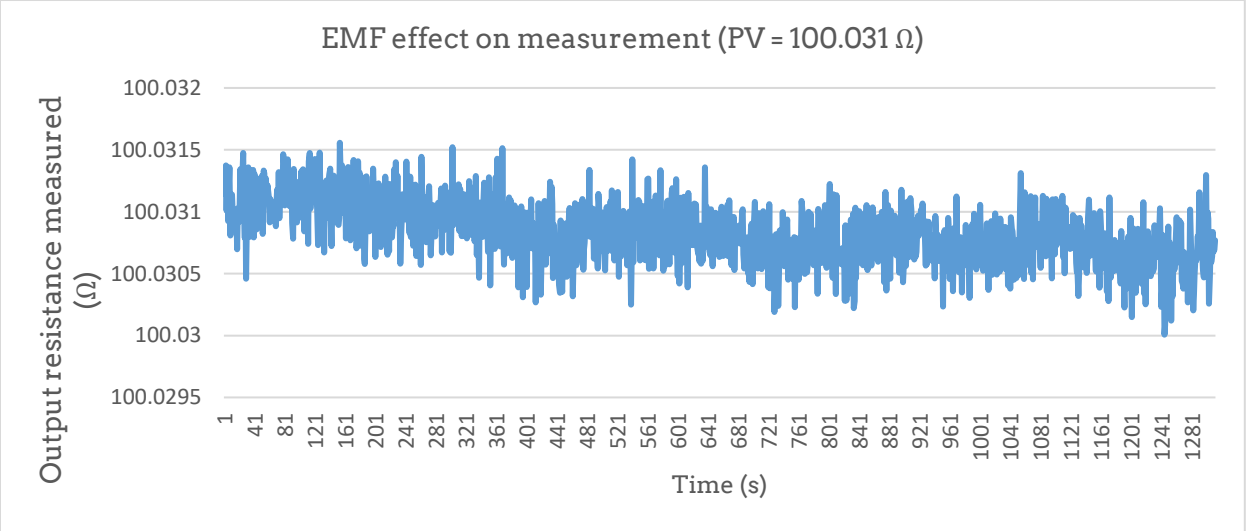

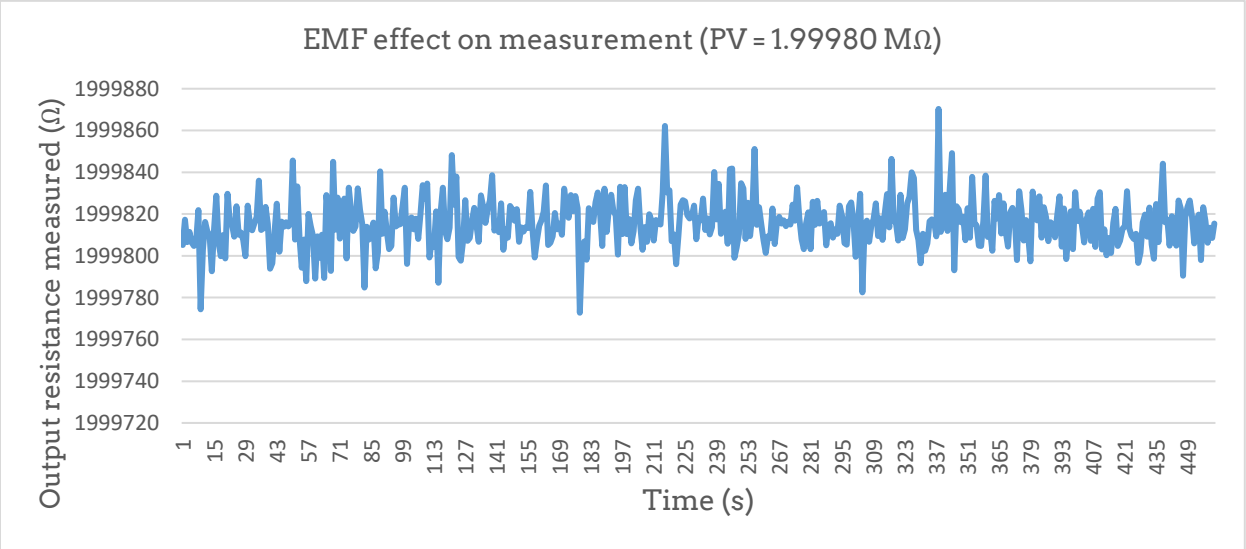

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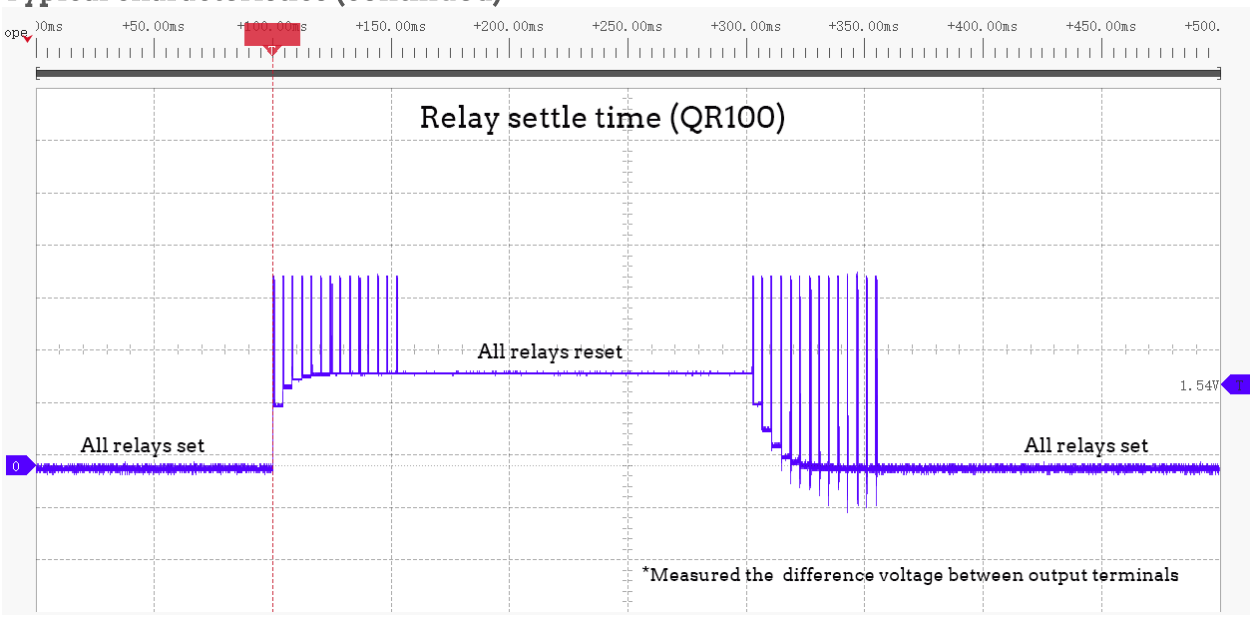

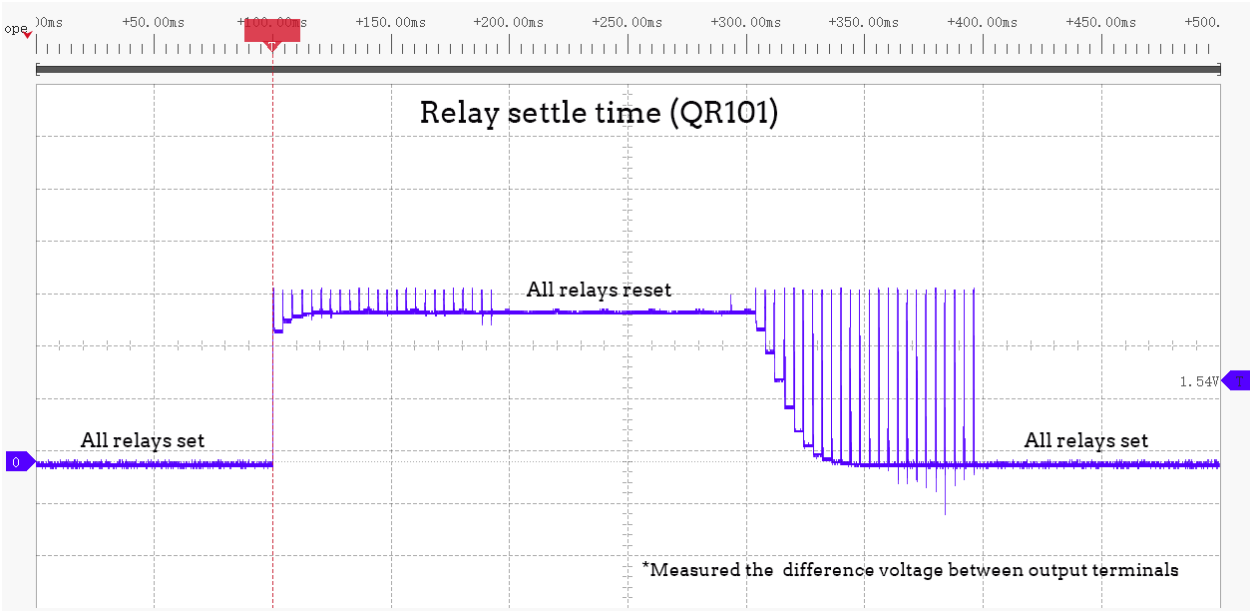

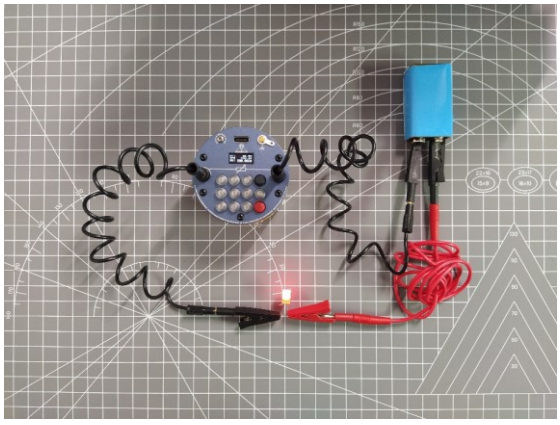

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