Application Note

SYMMETRIC SUPPLY WITH R&S® POWER SUPPLIES

Products:

- R&S®NGE100B Power Supply Series
- R&S®NGC100 Power Supply Series
- R&S®NGA100 Power Supply Series
- R&S®HMP2000 Power Supply Series
- R&S®HMP4000 Power Supply Series
- R&S®NGP800 Power Supply Series
- R&S®NGL202 Power Supply
- R&S®NGM202 Power Supply

Thomas Lechner | 1GP144 | Version 0e | 07.2025

https://www.rohde-schwarz.com/appnote/1GP144

Contents

1 Overview

Analog circuits like operational amplifiers often require a symmetric supply with supply ground, positive rail and negative rail. The supply ground is the reference for analog signals in the circuit.

The channels in R&S® multi-channel power supplies are galvanically completely floating against each other as well as against safety earth. This provides the maximum flexibility for connecting channels in parallel or in series to provide increased current or voltage output, or for split or symmetric supply.

This application note describes how to configure two outputs for a symmetric supply, providing both positive and negative rails.

The instructions apply also to both discontinued and future multi-channel models of R&S® power supplies.

2 Connecting the channels

Choose two channels, preferably with the same current and voltage rating. Connect the positive output terminal of one channel (here Ch 2) to the negative output terminal of the other channel (here Ch 3). This is at the same time connected to the load as supply ground.

2.1 Two-wire connection

The free positive output terminal (here of Ch3) forms the positive rail, and the free negative output terminal (here of Ch 2) forms the negative rail of the symmetric supply.

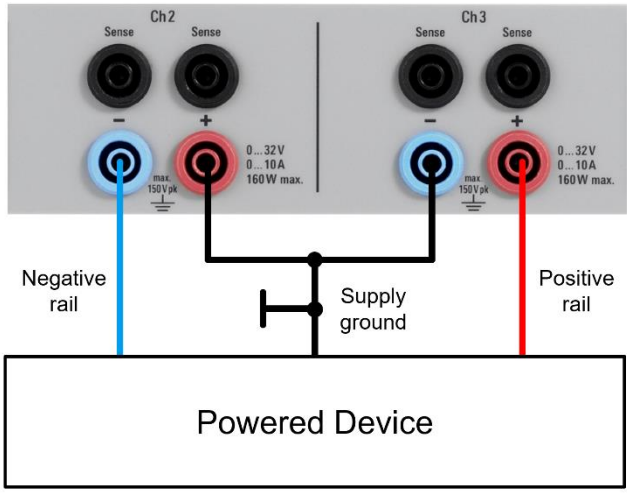

Figure 1 Two-wire connection with positive and negative rail

2.2 Four-wire connection

For a “four-wire” connection, the sense lines must be connected likewise. Connect each sense line to the corresponding force line (supply ground, negative rail or positive rail) as close as possible to the load.

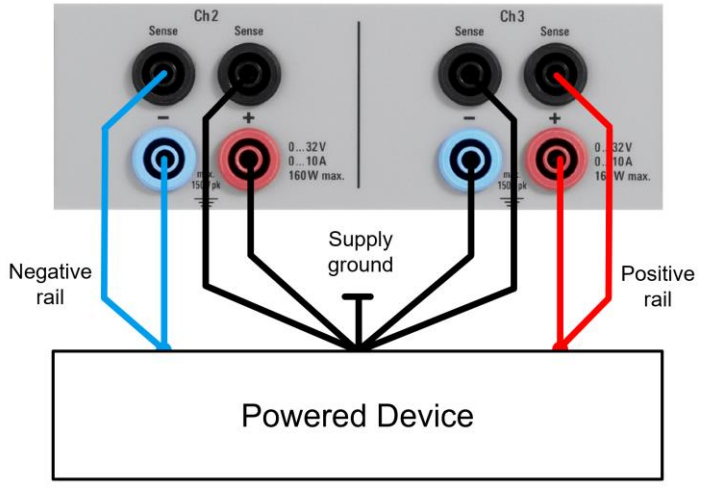

Figure 2 Four-wire connection with positive and negative rail

3 Configuring the channels

3.1 Voltage and current setting

Before enabling the output and before activating the tracking function (see below), set the voltage and current limit of both channels to the same value. Please refer to the manual of your power supply for instructions.

Note that the voltage for the negative rail is set with positive sign. The negative voltage is achieved by connecting the positive terminal to supply ground and using the negative terminal for the negative rail.

In remote control, the SCPI commands for setting voltage and current are commonly

VOLT <Voltage>

CURR <Current>

Both values can be set in one command

APPL <Voltage>,<Current>

Usually a channel must be selected before sending these commands, and they will be executed on the selected channel.

INST OUT1

or

INST:NSEL 1

Some multi-channel power supplies support so-called channel lists appended to each command, which allow to execute settings simultaneously on all channels in the list. To set the same voltage on channels 1 and 2 the command would be

VOLT <Voltage> @1,2

Channel lists are supported in R&S® power supplies NGL202, NGM202 and NGP800 series.

3.2 Tracking function

In some of the power supplies, current and voltage settings can be modified synchronously using the tracking function. This ensures that both rails always have the same voltage, even if this is changed on the fly in active operation.

Channel tracking is supported in R&S® power supply series NGE100, NGC100, NGA100, HMP2000, HMP4000 and NGP800.

For using the tracking function, please consult the manual of your power supply.

3.3 Fuse linking

The set current value limits the output current by reducing the voltage of the output accordingly. This operation mode is called constant current (CC) mode.

By contrast, a fuse is a protection function which completely disables an output if the measured current exceeds the set limit value, similar to a hardware fuse being blown.

For symmetric supplies it is usually desirable to shut down both rails simultaneously in such a case.

The fuse linking function allows you to interlink two or even more channels with their electronic fuses logically. Please consult the manual of your power supply about configuring fuse and fuse linking.

Fuse linking is supported in R&S® power supply series NGE100, NGC100, NGA100, HMP2000, HMP4000 and NGP800 and in power supplies NGL202 and NGM202.

Some power supplies have digital inputs and outputs which can be configured to link protection between channels of multiple devices.

3.4 Switching the output

With symmetric supplies it is usually desirable to enable and disable both rails simultaneously. All multi-channel power supplies from Rohde & Schwarz have an “Output” key which switches all activated channels simultaneously, as well as channel keys for activating individual channels for this common output control.

4 Conclusion

Power supplies with (at least) two isolated channels are perfect for symmetric supply with positive and negative rails.

Compared to internally connected supplies, they offer better sense-line performance and greater versatility. Sense lines can be routed separately and joined close to the load. Isolated channels can alternatively be operated in parallel or completely independent.

5 Literature

[1] Rohde & Schwarz, "R&S®HMP Series Power Supplies User Manual," 2022. [Online]. Available: https://www.rohde-schwarz.com/manual/hmp.

[2] Rohde & Schwarz, "R&S®NGE100B Power Supply Series User Manual," 2023. [Online]. Available: https://www.rohde-schwarz.com/manual/nge100b.

[3] Rohde & Schwarz, "R&S®NGA100 Power Supply Series User Manual," 2023. [Online]. Available: https://www.rohde-schwarz.com/manual/nga100.

[4] Rohde & Schwarz, "R&S®NGP800 Power Supply Series User Manual," 2024. [Online]. Available: https://www.rohde-schwarz.com/manual/ngp800.

[5] Rohde & Schwarz, "R&S®NGC100 Power Supply Series User Manual," 2024. [Online]. Available: https://www.rohde-schwarz.com/manual/ngc100.

[6] Rohde & Schwarz, "R&S®NGM200 Power Supply Series User Manual," 2022. [Online]. Available: https://www.rohde-schwarz.com/manual/ngm200.

[7] Rohde & Schwarz, "R&S®NGL200 Power Supply Series User Manual," 2022. [Online]. Available: https://www.rohde-schwarz.com/manual/ngl200.

6 Ordering information

Designation	Type	Order No.
Power Supply	R&S®NGE102B	5601.3800.02
Power Supply	R&S®NGE103B	5601.3800.03
Power Supply	R&S®NGC102	3657.2359.02
Power Supply	R&S®NGC102-G	3657.2359.03
Power Supply	R&S®NGC103	3657.2413.02
Power Supply	R&S®NGC103-G	3657.2413.03
Power Supply	R&S®NGA102	5601.8002.04
Power Supply	R&S®NGA142	5601.8002.05
Power Supply	R&S®HMP2020	3629.6718.02
Power Supply	R&S®HMP2030	3629.6718.03
Power Supply	R&S®HMP4030	3629.6776.03
Power Supply	R&S®HMP4040	3629.6776.04
Power Supply	R&S®NGP802	5601.4007.05
Power Supply	R&S®NGP804	5601.4007.02
Power Supply	R&S®NGP814	5601.4007.04
Power Supply	R&S®NGP822	5601.4007.06
Power Supply	R&S®NGP824	5601.4007.03
Power Supply	R&S®NGL202	3638.3376.03
Power Supply	R&S®NGM202	3638.4472.03

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