XP Power

XPerts in Power - Module 11
Signals & Interfacing
Les Chant

Module contents

- Why have signal and control interfaces on power supplies
- Differentiation between signal and control interfaces
- Commonly used signal and control interfaces at PSU´s
- Which topologies are common for signals and interfaces
- How to use signals on PSU´s connected in series / parallel
- Practical demonstration of different signals

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1. Why have signal and control interfaces on power supplies?

- To monitor the condition of the input voltage
- To monitor the condition of the output voltage
- To monitor the internal temperature
- To control the power supply
- To adjust the output voltage / output current limitation

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2. Differentiation between signal and control interfaces

Signals
- The signals monitor the condition of the input voltage, output voltage, internal temperature via signal connections to control application, they have no influence to the function of the AC/DC or DC/DC converter.

Control
- The control interface allows a change of parameters - output voltage, output current or ON / OFF.
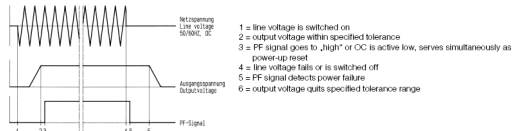
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3. Commonly used signal and control interfaces at PSU´s

- AC OK / Power Fail Signal
- DC OK / Power Good Signal / PFD (Power Fail Detect Signal)
- System Reset Signal (VME signal)
- Remote ON/OFF / Remote Control / Inhibit / Enable
- Output voltage adjustment
- Output current adjustment
- Output Marginate
- Power Sharing / Current Sharing

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AC OK / Power Fail Signal

- This signal indicate the condition of the input voltage. ACOK change from low to high after AC is switched on. The PF change to low level before the output voltage leave the tolerance range. This signal only detect if the input voltage is in the specified range.

Darstellung der Zeitabläufe
Time Characteristics

Netzspannung
Line voltage
50/60HZ, DC

Ausgangsspannung
Output voltage

PF-Signal

1 = line voltage is switched on
2 = output voltage within specified tolerance
3 = PF signal goes to „high" or OC is active low, serves simultaneously as power-up reset
4 = line voltage fails or is switched off
5 = PF signal detects power failure
6 = output voltage quits specified tolerance range

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## DC OK / Power Good Signal / PFD (Power Fail Detect)

This signal provide notification that the output voltage is within regulation.

- 100 – 500msec after the output voltage has rise over 90% of nominal voltage the DCOK / PG change to high level, min. 1msec before the output voltage fall below 90% of the nominal voltage the signal change back to low level.
- The PFD monitors additionally the presence of the input voltage. This signal is able to detect a failure of one unit when units used in parallel without de coupling diode.

OP
90%

Power Good

100-500msec   >1msec

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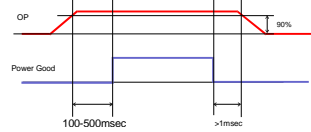
System Reset Signal (VME signal)

- SRS signal indicate that the system voltage is ok. It is a combination of AC Fail signal and DC OK signal. Only when ACF and DC OK are high, and after a delay of between 100 and 300msec the SRS signal will change to high. When one or both go low, this signal change to low.

AC
OP   90%
AC Fail
DC OK
System Reset

100-300msec   >10msec

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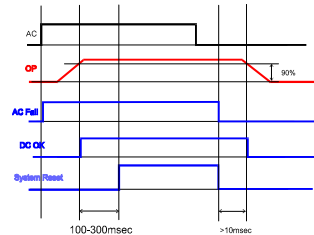
Remote ON / OFF / Remote Control / Inhibit / Enable

With the Remote ON/OFF signal it is possible to switch the output of a converter ON/OFF without touching the input voltage. The Remote ON/OFF function could be used for sequencing output voltages in systems multi outputs (e.g. LP / MP series). There are usually three types of Remote ON/OFF / Enable.

- Active Low Remote ON/ OFF

Through the connection of the Remote ON/OFF input with the output low the unit is switched off. Opening this connection, the unit start working.

OUTPUTS ON
5 V
OR
FLOATING
PIN 5

0 V
OUTPUTS OFF
PIN 2

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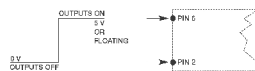
- Active High Remote ON/ OFF

With a low signal or open circuit at the remote ON/OFF the unit work normally, to stop the unit working it is necessary to connect a high signal to the Remote ON/OFF.
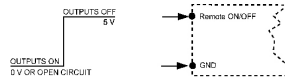

- Enable

There are two versions to enable a PSU. At one, it is necessary to connect a high signal to the enable input to start up the unit (JPM series). At the other version the enable input have to be connected to low (minus output) to start the unit (GFR series)

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Output voltage adjustment

- Output voltage adjustment will normally be done via internal potentiometer. The adjustment range is mostly +-5% or +-10%. An other possibility is that the voltage adjustment could be done by an external potentiometer.

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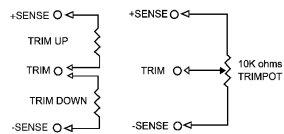
- The output adjustment via an external control voltage or control current (0 – 5VDC / 0 – 10VDC or 0 – 40mA) step in the regulation loop of the output voltage regulation. The J modules of the MP series feature this as an option.
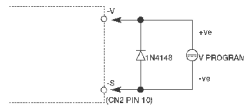

Output current adjustment

- The output current adjustment is not a commonly used control type. It is usually done with a external control voltage or control current (0 – 5VDC / 0 – 10VDC or 0 – 40mA). The range of output current adjustment is mostly from 10% to 110% of the nominal value.

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Output Marginate

- To connect the output margin pin to plus output increase the output by 5% -10%. The connection of this pin to minus output decrease the output by 5% -10%

This function is usually used at rectifiers and Compact PCI units in parallel use or in battery stand by systems. The approach is to shift the load to the unit with the higher output voltage.

By activating this function in a battery stand by system it is controllable if the used units or the battery work properly without risk of loosing the output voltage.

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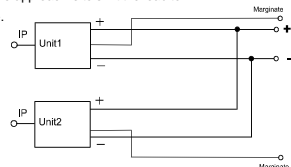
Power Sharing / Current Sharing

By connection two or more units in parallel together with this function, they communicate with each other to share the output current even.

When operating units in parallel the system power cables should be connected in a star configuration with the load being the star centre.

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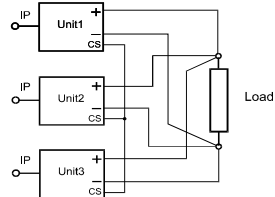
4. Which topologies are common for signal and control interfaces

TTL compatible signals:
- By TTL circuits
- By standard transistors

Open collector signals:
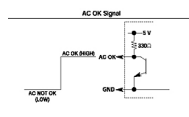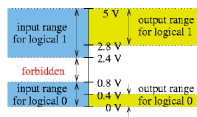- Connected to the output
- Isolated from the output

Volt free signals:
- Isolated signal created with opto coupler
- Isolated signal created with relays contacts

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TTL compatible signals:

TTL describe a interface with defined voltage levels and currents. The levels are:


A TTL circuit is able to deliver a maximum current of 16mA.

In the logic output of power supplies is normally a small signal transistor with internal pull up resistor used. The pull up resistor is connected to a internal 5V auxiliary voltage.

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Open collector signals

The signals are realised by using an internal small signal transistor where the collector is linked to the connector. The customer is able to connect this output to his application as he need. The limit is only the voltage and current value of the used transistor.

- One type is that the signal is connected to the output of the unit. Normally the emitter of the transistor is connected to minus output.
- An other type is the isolated version. In that case the signal is isolated by using an opto coupler. The transistor of the opto coupler is isolated from the input and output of the converter. The user is able to connect the transistor to positive or negative level of his system.

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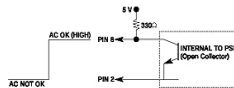
Volt free signals

Volt free signals are recommended when a galvanic connection between the signal outputs and the following control circuits in case of ground loops isn`t desired.

- One possibility is to use a opto coupler is described at the last sheet.
- Relays could also be used for each signal. The relay contacts allow easy connection at the application control circuits e.g. Remote ON / OFF control of downstream DC/DC converters.


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NO

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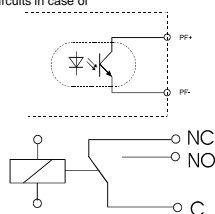
5. How to use signals on PSU´s connected in series / parallel

The way of using signals when power supplies or DC/DC converters connected in parallel

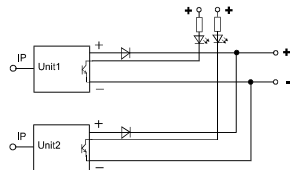depends on the indication the user will want.

- If the user will want the indication that one of the used units failed, he have to connect the TTL signals with a TTL gate in a AND connection, or connect the volt free signals (e.g. relay contacts) in series.
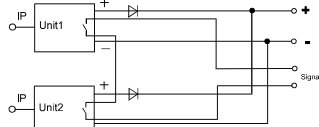
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- If it is necessary to indicate each unit individually and units have TTL signals, he have to use a OR diode (or a unit with internal diode) for de coupling the outputs. Now he could fit an LED between the output and minus. If an open collector signal is available he have to connect between a positive voltage and

the signal output an LED and

a resistor with the correct value.

As well as the LED are also

other indicating components

possible.

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