DAR remote power feeding

Digital ADSL Regenerator: remote power feeding specification

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Strowger Inc.

Contents

Figures

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1 General

The DAR is a remotely installed active unit which is able to regenerate an ADSL signal and makes the traditional ADSL coverage longer. The unit can be used for bandwidth increase on fixed exchange subscriber loops (pe.: IPTV range extension).
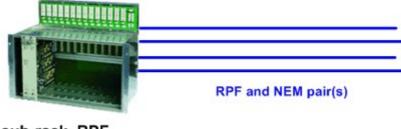
The unit is powered remotely from the central office over the copper pairs by a Remote Power Feeding (RPF) card. The RPF is a rack-type version where the SBR sub-rack provides the connection facilities and the 48/60 Vdc local power to the unit. One card has 4 separate power interfaces towards the remote areas.

The target application of this device is to provide power remotely to those areas where solving the local power source is difficult. The unit is universal and can be used with Strowger's product or other third party equipment which require this range of power .

Possible applications:

- powering and supervising DAR units (*see document GenDesc DAR v3.1*),

- powering Wi-Feeder including the xDSL data link (*see document GenDesc WF v1.0)*,

- general power source to any third party device.

The basic configuration of the system is shown below:

Figure 1. – Basic configuration

This is installed in Strowger's sub-rack at the telephone Exchange (48 Vdc, external power lines, xDSL lines).

Note: The available ADSL filtering and the monitoring EOC channels are optional features, generally this is not needed for simple remote powering applications.

2 Remote power

All remote power feeding sources meet the safety requirements of EN 60950-1 and EN 60950-21 with the following specification:

circuit category:	RFT-V (optional RFT-C)
remote feeding voltage:	max ± 160 Vdc, software selectable
output capacity:	≤ 20 µF line to line
current limiting:	57 ± 1 mA
unbalance shut-down:	1.5 mA to ground

During the remote power feeding period the sub-rack continuously measures the output voltage and the unbalance of the line to the ground.

In the case an unbalance is detected for more than 100 ms or an overload or line interruption for more than 100 ms the sub-rack switches off the power. After 10 sec from switching off, the system re-starts with the initialization phase.

The remote power feeding rack is permanently switched off within 200 ms in the case an internal hardware fault is detected (over voltage, over current).

The RPF card supports a voltage level safety test when no connected items are at the end of the lines. This test voltage level is 50 Vdc to protect the technicians during installation (WAKE UP feature).

Inversion of the voltage polarity of the power lines has no impact on the operation of the system.

3 Power consumption

The RPF module requires nominal 48/60 Vdc power supply input voltage. The power supply interfaces are built according to ETSI EN 300 132-2 standard with the following parameters:

input voltage:	40 .. 76 Vdc
max. power consumption:	50 W
max. power dissipation:	20 W

The above parameters are measured in the worst case scenario when the system has been connected over 4x 1300 Ω loops and the output powers are at the maximum level.

4 Harmonizing with standards

The remote power feeding solution used in the RPF-DAR system fulfills these standards:

IEC-60950-1 (2001, 2006)	Information Technology Equipment – Safety / General
IEC-60950-21 (2002-12, 2003)	Information Technology Equipment – Safety / Remote Power Feeding
ITU-T K.50 (02/2000)	Safe limits of operating voltages and currents for telecommunication systems powered over the network.
GR-1089, Issue 6 – Electromagnetic Compatibility and Electrical Safety – Generic Criteria for Network telecommunications Equipment (05/2011) published by Telcordia	Operator must reduce the operating voltage to +/- 140 Vdc to comply with this standard.

The above internationally accepted standards recognize an RFT-C power architecture with a 60 mA current limit as being safe and can be handled (installed, operated) without special precautions. To meet the GR-1089, some configuration is needed.

GR-1089 defines 3 different levels for the remote power feeding based on the access of the voltage and current levels:

- Class A1 is the most stringent and applies to areas which may be contacted by the general public, which is assumed to be unfamiliar with electrical hazards.

- Class A2 permits higher limits and covers those areas where non-specialized telephone company employees may have contact.

- Class A3 is the highest allowable level for voltages which may be contacted barehanded. It applies to those areas available only to telephone company technical personel familiar with the appropriate precautions, and applies to HDSL circuits and equipment.

The RPF-DAR system due to its application purposes should be handled by Class A2 personel. The specification on paragraph 7.2.1.3 sets limits on both voltage and current. At 140 Vdc or less there is no limit on current. Between 140 and 200 Vdc current may not exceed 10 mA. All the voltages are measured with respect to the ground.

GR-1089 allows two separate compliant voltages, one at -140 Vdc, the other at +140 Vdc, providing twice the voltage for powering the loop. This voltage level is already enough to power remote equipment on longer loops.

In RPF-DAR system the voltage level is adjustable up to +/-160 Vdc. To meet the GR-1089 Class A2 requirements simply reduce the voltage level to +/-140 Vdc.

Because the current is always limited to less than 60 mA in accordance with IEC and ITU-T recommendations, the RPF-DAR power architecture meets international safety standards for telecom technicians to handle at the default power levels. If you feel you must comply with the more restrictive GR-1089 Class A2, please be sure to reduce the power levels to +/-140V.

5 User interface

The RPF card provides 4 independent power interfaces.

Status LEDs

STATUS/green	ON	power on – normal state
	OFF	channel is OFF
	flash/1 Hz	wakeup state

System LEDs

CPU/green	ON	power on – normal state
	OFF	power problem

ERR/red	ON	power problem
	OFF	normal state

6 Mechanical parameters

The mechanical properties of the units are as follows:

Dimension (H x W x D):	262 x 30 x 225 mm
Weights:	550 g
Installation:	SBR-14 sub-rack designed by Strowger

7 Environmental conditions

The RPF module was designed and tested to meet the following environmental requirements of ETSI standards:

Operation:	ETSI ETS 300 019-1-3 class 3.1
Storage:	ETSI ETS 300 019-1-1 class 1.2
Transport:	ETSI ETS 300 019-1-2 class 2.2
Operational temperature:	+5 .. +40 °C

Relative humidity: 0 .. 95 % non-condensing

Protection: IP20

8 Device reference

The RPF unit is a plug-in module to the available sub-racks. 14 modules can be installed in the sub-rack. The solution yields up to 56 remote power interfaces on one SBR-14.

Figure 2. – RPF