

Radiant Technical Note 11.6.2025

Using Panel Turn Coordinator (2 1/4" and 3 1/8" cutouts) on 28 V Aircraft Electrical Systems

(Not applicable to SafeTurn portable units)

Applies to:

Radiant **Panel Turn Coordinator** products, when operated from 24–28 V class aircraft electrical systems ("28 V" systems).

Does not apply to:

Radiant **SafeTurn** portable units (self-powered; do **not** add this resistor).

1. Background

Panel Turn Coordinators use a robust linear power chain:

External Bus → 9.5 V Pre-Regulator → 5.0 V Regulator → Li-Ion Charger → Li-Ion Pack → Internal Loads

The internal pre-regulator is rated to **30 V** (with high transient tolerance), and downstream devices are selected for harsh environments. Electrically, these units can be tied to many aircraft buses.

However, a "28 V" aircraft system normally operates:

- In flight: about 27.5–28.5 V
- With real-world variation and hot regulators near the top of that range

Feeding a 9.5 V linear pre-regulator directly from this range at charging current forces it to burn significant power as heat. That's survivable but unnecessary—and over time, unwanted.

Radiant's testing supports a simple external addition that:

- Reduces internal thermal stress
- Improves reliability margin
- Requires **no changes** inside Panel Turn Coordinator



2. Recommended Solution for 28 V Systems

For experimental aircraft with 24–28 V systems, Radiant recommends adding a **single external series resistor** in the power feed to SafePanel or RTCC.

Use a 100 Ω , 5 W (or higher) resistor in series with the +28 V supply line feeding the unit.

Radiant does **not** supply this resistor; it is a standard, easily sourced component.

How it works (conceptual)

- At a configured internal load/charge of about **160 mA**, the resistor drops part of the voltage before the 9.5 V pre-regulator.
- The **external resistor** now dissipates a significant portion of the waste heat instead of the pre-regulator IC.
- The pre-regulator runs cooler while maintaining proper operation over the typical 28 V range.

Example (worst nominal: 28.5 V bus)

Assumptions:

Bus: 28.5 V

• R EXT: 100 Ω

I: 0.16 A

• Pre-reg target: 9.5 V

Then:

- Drop across R_EXT: VR=0.16×100=16.0 V
- Pre-reg input: Vpre-in=28.5-16.0=12.5 V
- Pre-reg dissipation:
 Ppre=(12.5-9.5)×0.16=0.48 W



 Resistor dissipation: PR=0.162×100=2.56 W

Conclusion: the resistor (properly rated) runs warm and happy; the pre-regulator is kept in a comfortable power range instead of being pushed hard.

At typical in-flight voltages (27.5–28.0 V), numbers improve slightly further.

3. Behavior at Lower / Abnormal Voltages

This recommendation targets **normal** 28 V operation and thermal robustness:

- At 27.5-28.5 V (normal regulated):
 - Full functionality
 - o Good thermal margin on internal regulators
- At **lower bus voltages** (e.g. 24–26 V, weak bus / alternator offline):
 - o The series resistor reduces headroom; charge current may taper or stop.
 - SafePanel/RTCC can continue from the Li-lon pack, as intended.
 - o This is expected and acceptable for abnormal conditions.
- At brief higher inputs within device ratings:
 - \circ The series resistor further limits stress on the pre-regulator.

Installers should treat this as **good practice for experimental 28 V aircraft**, not as certified data.

4. Installation Guidance (Experimental Use)

For Panel Turn Coordinators only (not applicable to SafeTurn Portable Panel Turn Coordinator)

Basic wiring:

- 1. Aircraft 24–28 V bus → appropriate breaker or fuse
- 2. Breaker/fuse output → 100 Ω, ≥5 W series resistor



- 3. Resistor output →Panel Turn Coordinator +V input
- 4. Panel Turn Coordinator ground → aircraft ground

Notes:

- Mount the resistor so it has airflow and is mechanically secure.
- Keep it clear of plastics and harnesses sensitive to elevated temperature.
- Use aviation-appropriate wiring, terminations, and strain relief.
- Verify operation at your aircraft's actual bus voltages after installation.

5. Example Orderable Part (Installer Convenience)

Radiant does **not** supply the resistor. A typical suitable example:

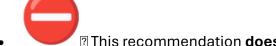
- 100 Ω , 5 W flameproof or wirewound resistor, axial or chassis mount
- Example (one of many acceptable choices): a 5 W, 100 Ω wirewound resistor from a major brand via Digi-Key / Mouser / equivalent.

Any equivalent 100 Ω , ≥ 5 W resistor from a reputable manufacturer, installed correctly, is acceptable.

6. Scope Clarification



- This recommendation supports and applies to:
- o Radiant Panel Turn Coordinators (2 1/4" and 3 1/8" cutout) (experimental installations)



- 2 This recommendation does not apply to:
- SafeTurn portable units
- Certified aircraft or TSO/STC applications (this is **not** approved data)