



Radiant Technical Note 11.6.2025

Using Panel Turn Coordinator (2 ¼” 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:
 $V_R = 0.16 \times 100 = 16.0 \text{ V}$
- Pre-reg input:
 $V_{\text{pre-in}} = 28.5 - 16.0 = 12.5 \text{ V}$
- Pre-reg dissipation:
 $P_{\text{pre}} = (12.5 - 9.5) \times 0.16 = 0.48 \text{ W}$

- Resistor dissipation:
 $PR=0.162 \times 100=2.56 \text{ W}$

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
 - Good thermal margin on internal regulators
- At **lower bus voltages** (e.g. 24–26 V, weak bus / alternator offline):
 - The series resistor reduces headroom; charge current may taper or stop.
 - SafePanel/RTCC can continue from the Li-Ion pack, as intended.
 - This is expected and acceptable for abnormal conditions.
- At **brief higher inputs within device ratings**:
 - 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**:
 - Radiant Panel Turn Coordinators (2 1/4" and 3 1/8" cutout) (experimental installations)
-  This recommendation **does not apply to**:
 - **SafeTurn** portable units
 - Certified aircraft or TSO/STC applications (this is **not** approved data)