



PPD / EED / Infrastructure Group / D0

**D0 Procedure / Hazard Analysis Document  
D0\_ELE\_SMT\_001**

**Remove and Replace CFT / SMT Sequencer Power Supply Chassis**

Date: 16-Nov-07

Latest revision:

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**Safety Approval By (date):** (as necessary)

**Personal Protective Equipment:** (Check protective equipment required for the job.)

- |  |                                       |   |
|--|---------------------------------------|---|
| <input type="checkbox"/> Safety glasses                            | <input type="checkbox"/> Side shields | <input type="checkbox"/> Chemical splash goggles              |
| <input type="checkbox"/> Hearing Protection                        |                                       | ● Hard Hats   |
| <input type="checkbox"/> 3.0 Braising goggles                      |                                       | <input type="checkbox"/> Impact goggles                       |
| <input type="checkbox"/> Face shield                               |                                       | <input type="checkbox"/> Rubber apron                         |
| <input type="checkbox"/> Leather gloves                            |                                       | <input type="checkbox"/> Hot/Cold thermal protective gloves   |
| <input type="checkbox"/> Chemical resistant gloves (specify type): |                                       | <input type="checkbox"/> Respirators                          |
| <input type="checkbox"/> Other required PPE (specify):             |                                       | <input type="checkbox"/> Fall protection equipment (specify): |

Proper radiation dosimetry required for collision hall access.

Log survey meter (LSM) required during controlled access to D0 collision hall.

**Work Plan History Information:** (List any lessons learned accidents from this job, tips from previous jobs)

The cables connecting the power supplies to Sequencer crates are rather long and not of consistent lengths. To compensate for variations in lengths, up to three resistors of specific values (dependent on the crate location) may need to be installed in the replacement power supply. Most often, this involves only one resistor, and it would be removed from the power supply being replaced. Be aware that this operation is likely to occur in the Platform Area of the D0 Detector just after the chassis is removed. The various resistor values are indicated in Table 1. The locations of these resistors are shown in Figure 1.

**Overview:**

Eight crates of Sequencers are located in the central region of the D0 Platform under the D0 Detector. Each crate of Sequencers requires two supply voltages ( $\pm 5V$ ) to operate.

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These voltages are supplied by compact Vicor PFC-Mini Power Supply Chassis located in aluminum chassis boxes found in the center of either the north or south ends of the Central Platform. Each Sequencer Power Supply Chassis contains two 5V Vicor modules wired to supply to required voltages. The Power Supply Chassis are slid into openings in the aluminum chassis box; no fasteners are used to secure them.

**Training Requirements:**

- Appropriate training to be issued a key to the D0 Collision Hall.
- Basic Electrical Safety (minimum) - FN000235/CR.
- D0 Hazard Awareness - PPDZ0001/CR.

**Important Information:**

The Sequencer Power Supply Chassis has dimensions of 3 x 6 x 14 inches and weighs about 10 pounds.

A matrix associating the values for components R1, J1 and J3 (important to match voltage trimming requirements) to specific Sequencer crate and Power Supply Chassis locations is shown in Table 1. Locations of these components on a Sequencer Power Supply Chassis are depicted in the image found in Figure 1. Connector locations on a Sequencer Power Supply Chassis are shown in Figure 2.

Cooling the chassis is always a concern. Above both the North and South chassis boxes a fan tray has been installed to provide additional airflow. Each time these chassis boxes are accessed, the operation of all fans in the fan tray should be verified.

CFT / SMT GUI Crate Info.	Crate Location	Power Supply Chassis Location	R1 Resistor Value	J1	J3
SMT 03-0	PC03-0 (top)	North	81 kΩ	1 Ω	1 Ω
SMT 03-1	PC03-1 (bottom)	North	81 kΩ	1 Ω	1 Ω
SMT 04-0	PC04-0 (top)	North	81 kΩ	1 Ω	1 Ω
CFT 04-1	PC04-1 (middle)	North	90.9 kΩ	1 Ω	1 Ω
SMT 19-0	PC19-0 (top)	South	81 kΩ	1 Ω	1 Ω
SMT 19-1	PC19-1 (bottom)	South	100 kΩ	leave open	1 Ω
SMT 20-0	PC20-0 (top)	South	37 kΩ	1 Ω	1 Ω
SMT 20-1	PC20-1 (bottom)	South	37 kΩ	1 Ω	1 Ω

**Table 1. Voltage Sense Trimming Components by Crate Location.**

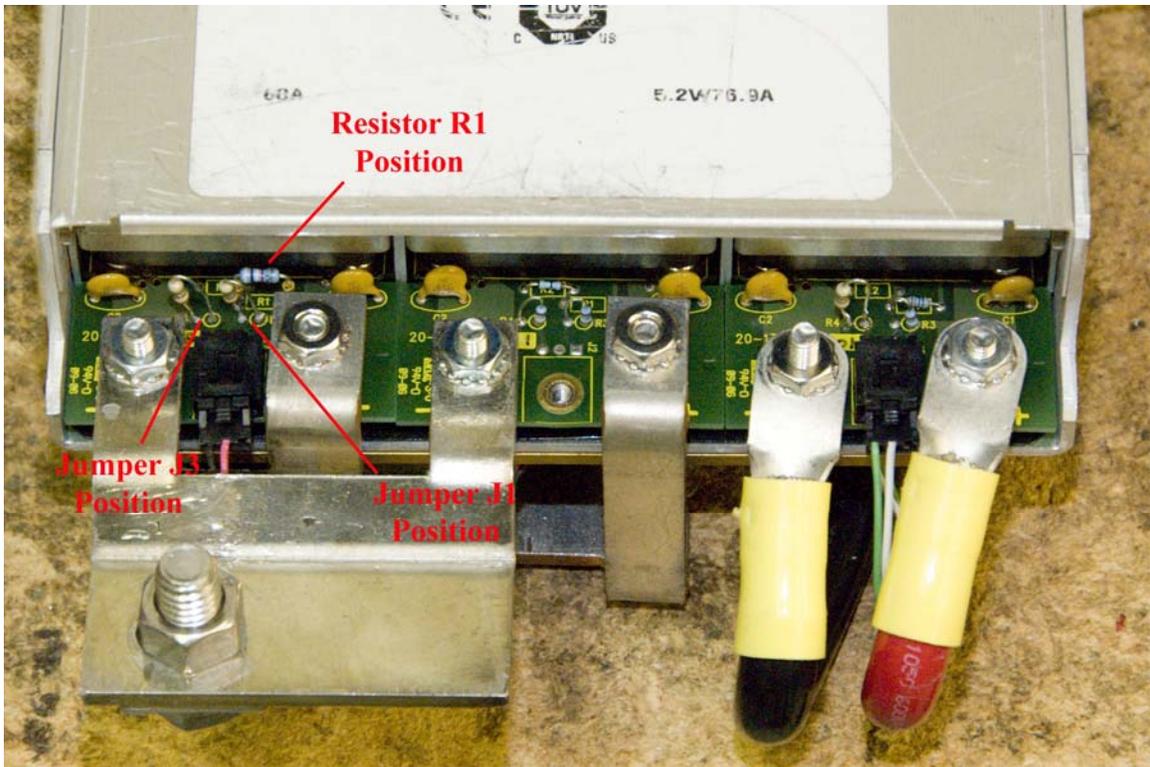


Figure 1. Location specific component locations on SMT Sequencer Power Supply Chassis.

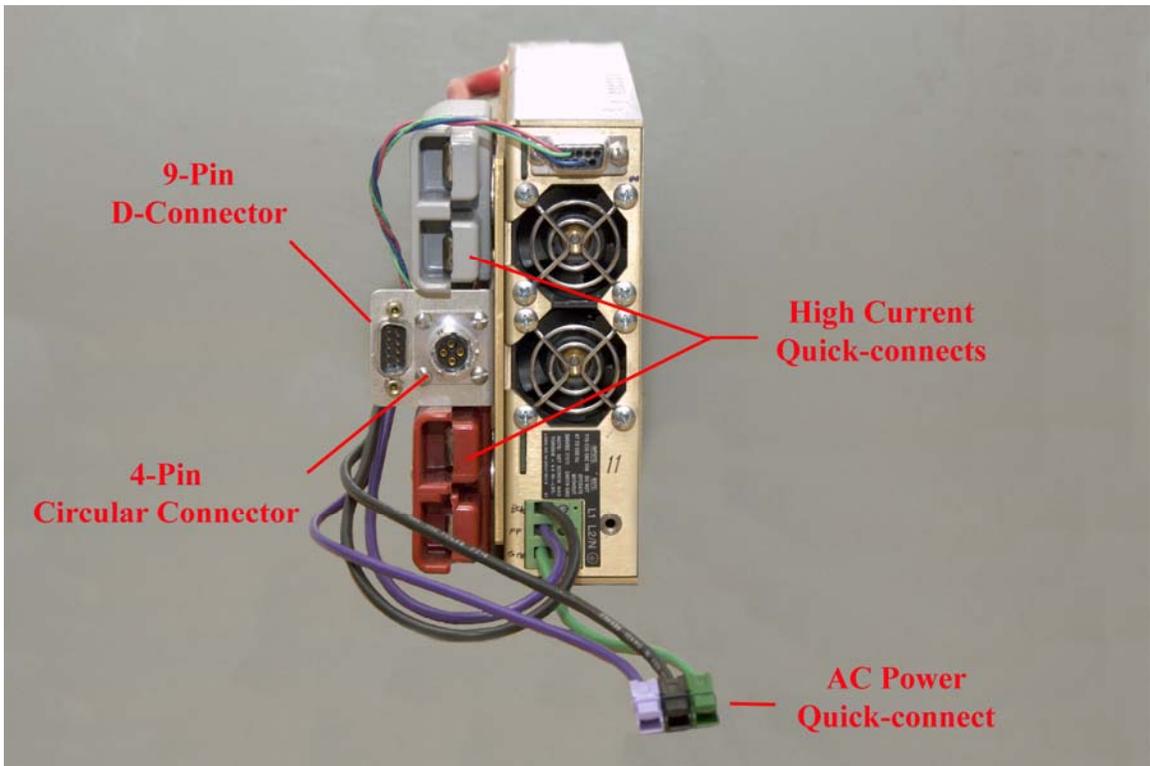


Figure 2. Front of Sequencer Power Supply Chassis

**Required Tools:**

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- Working flashlight.
- Paper and pen / pencil.
- Collection of Sequencer Power Supply Chassis Failed tags.
- Digital Volt Meter (DVM)
- Needle-nose pliers.

**Procedure:**

Ensure that the D0 Control Room personnel responsible for SMT Detector operation are aware of replacement prior to entering D0 Collision Hall.

Preparation:

- Spare Sequencer Power Supply Chassis are typically located in the “Spares” area located in Room 312 in the D0 Assembly Building. Obtain a chassis marked “Good”
- Using the CFT / SMT G.U.I. crate information provided by CFT personnel, identify the crate affected by and the location of the failed Sequencer Power Supply Chassis using the matrix found in Table 1. Note the component values associated with R1, J1 and J3 for the chassis to be replaced.
- If the chart shown in Table 1 indicates that the chassis to be replaced is for SMT 19-1 (PC19-1) then perform the following steps before proceeding.
  - If a resistor is installed in the J1 location (right when viewing the components on the Vicor module), remove the resistor in the following manner. For each of the two leads on the resistor:
    1. Apply the clean, hot tip of a small diameter soldering iron simultaneously to the lead and the corresponding pad on the printed circuit board.
    2. Once the solder flows, extract the lead from the pad by gently pulling on the resistor lead with a needle-nose pliers.
  - If the chart shown in Table 1 indicates that the chassis to be replaced is for a location other than SMT 19-1, verify that a resistor is installed in the J1 location. If it is not, perform the following steps before proceeding:
    1. Obtain a 1Ω ¼W leaded resistor.
    2. Bend resistor leads to obtain a tight U shape (see Figure 1 for example).
    3. With the clean, hot tip of a small diameter soldering iron, apply a dollop of solder to the pads associated with component J1.

4. Holding the resistor with needle-nose pliers, insert each of the leads into the printed circuit board pads associated with component J1 while heating the solder / pad / lead with the tip of the soldering iron.
  5. After resistor has been installed, reflow the solder joints to relieve any stress induced by the installation process.
- Carefully carry the Sequencer Power Supply Chassis and required tools to the D0 Platform area. Leave chassis and tools on the archway at the entrance to the Central Platform Area.

Observe the fans in the fan-tray located above the chassis box. All fans should be operating. Report any non-functioning fans to D0 Electrical Support Group personnel.

Removal Procedure:

- Disconnect the AC Power Quick-connect, make note of time of day.
- Disconnect the 9-Pin D-Connector.
- Disconnect the 4-Pin Circular Connector.
- After waiting approximately 5 minutes after disconnecting AC power, disconnect the two High Current Quick-connects.
- Carefully slide the chassis out of the chassis box and bring to the archway at the entrance to the Central Platform Area.
- Note failure(s) on Sequencer Power Supply Chassis Failed tag.

<p style="font-size: 2em; color: red; margin: 0;"><b>FAILED</b></p> <p style="margin: 0;">SMT Sequencer Power Supply Chassis</p> <p style="margin: 0;">Date: _____</p> <p style="margin: 0;">Initials: _____</p>	<p>Comments / suspected problems:</p>
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**Figure 3. Sequencer Power Supply Chassis Failed tag.**

Resistor Replacement:

- Resistor R1 is held onto the Vicor power supply module with a pair of printed circuit board mounted sockets. Using the needle-nose pliers, carefully remove the resistor from the replacement Power Supply Chassis and set it aside.
- Using needle-nose pliers, carefully remove resistor R1 from the removed Power Supply Chassis. Still using the needle-nose pliers carefully insert this resistor into the R1 sockets on the replacement chassis.

- Using needle-nose pliers carefully insert the resistor, initially removed and set aside from the replacement chassis into the R1 sockets on the removed chassis.

Replacement Procedure:

- Carry the replacement Power Supply Chassis from the archway at the entrance to the Platform Area to the appropriate chassis box.
- Carefully slide the replacement chassis into the vacated slot in the chassis box. Orient the chassis to match the rotation of other chassis in the box.
- Connect the two High Current Quick-connects.
- Connect the 4-Pin Circular Connector.
- Connect the 9-Pin D-Connector.
- Connect the AC Power Quick-connect.

Return removed Sequencer Power Supply Chassis to technician's area on 3<sup>rd</sup> floor of Fixed Counting House in D0 Assembly Building.