

TR SET CAPACITOR TEST PLAN

PURPOSE:

The purpose of this test plan is to define the process for LCR and Hi-potential testing of the APS-RF TR Set 1uF capacitor.

HAZARDS: Electrical and stored capacitor energy.

HAZARD CONTROLS:

All personnel performing the Hi-potential work described in this Test Plan shall wear proper PPE, which include a flash/flare –resistant apparel meeting NFPA70E standard, 17kV rated high-voltage gloves, safety glasses and safety shoes.

All capacitor Hi-Pot testing shall be performed within the High Voltage Test Cage (HVTC) with all personnel removed from within.

Use of a calibrated power safety voltmeter rated for the task; such as the Ross Engineering Corporation, Hi-Z Voltmeter, model VM50DE-BDL-6L-T or equivalent.

A safety watch is required.

Results of Shock Hazard Analysis (NFPA-70E 2004 130.2)		
Maximum Voltage: 50kVdc	Glove Voltage Rating: 2	(Inspect gloves before use, check certification date)
Limited Approach Boundary: 8 ft 0 in	Restricted Approach Boundary: 3 ft 2 in	Prohibited Approach Boundary: 2 ft 1 in
Results of Arc Flash Hazard Analysis (NFPA-70E 2004 130.3)		
Risk Category: 0	Flash Protection Boundary: 1.5(ft.)	Incident Energy at 18" (cal/cm ²) 0.7
<input checked="" type="checkbox"/> All Natural Fiber Outerwear (minimal 4.5 oz/yd ² long sleeve shirt and pants)		
<input type="checkbox"/> Fire Retardant Clothing	ATPV Rating: (cal/cm ²)	
<input checked="" type="checkbox"/> Required Additional PPE: safety glasses and safety shoes		

The stored energy of one TR Set capacitor charged to 50kV is 2500 joules or 597 calories. For a contained source spreading in a cone of 102 degrees at a distance of 18", the arc energy is $597 \text{ cal}/10260\text{cm}^2 = 0.058 \text{ cal/cm}^2$. Note extreme conservatism in the spread (more likely 150 degrees) and voltage - distance would be at the end of the ground stick (more like 60"). **The arc flash hazard is minimal and the boundary is set by the shock hazard.**

WORK PLAN:

- Locate the capacitor unit under test within the HVTC.
- Record the following:
Manufacturer: _____
Model #: _____
Serial #: _____
Personnel performing test: _____
Personnel performing test: _____
Date: _____
- Using a calibrated LCR meter measure and record the following:
Terminal 1 (T1) to case capacitance _____
T1 to case dissipation factor _____
Terminal 2 (T2) to case capacitance _____
T2 to case dissipation factor _____
T1 to T2 capacitance _____
T1 to T2 dissipation factor _____
- Verify all above measurements are within tolerance:
Pass _____ Fail _____ Sign _____ Date _____
- Bond the capacitor case to the HVTC ground.
- Connect T2 to case.
- Remove the T1 to case bond.
- Apply the Hi-Pot tester's ground connector to the capacitor case.
- Connect the Hi-Pot tester's negative potential voltage output lead to T1.
- Remove all personnel from the HVTC and clear all HVTC interlocks.
- Using the Hi-Pot tester, apply -50kVdc to T1 and hold this value for 1 minute.
- Sign and verify the above test:
Pass _____ Fail _____ Sign _____ Date _____
- De-energize the Hi-Pot tester and wait 5 minutes.
- Disconnect the AC power from the Hi-Pot Tester, and remove its interlock key.
- Using proper PPE and the Hi-Z Voltmeter, verify the all voltage has been removed from T1.
- Using the HVTC ground stick, ground T1.
- Connect T1 to case.
- Remove the T2 to case bond.
- Connect the Hi-Pot tester's negative potential voltage output lead to T2.
- Remove all personnel from the HVTC and clear all HVTC interlocks.
- Using the Hi-Pot tester, apply -50kVdc to T2 and hold this value for 1 minute.
- Sign and verify the above test:
Pass _____ Fail _____ Sign _____ Date _____
- De-energize the Hi-Pot tester and wait 5 minutes.
- Disconnect the AC power from the Hi-Pot Tester, and remove its interlock key.
- Using proper PPE and the Hi-Z Voltmeter, verify that all voltage has been removed from T2.
- Using the HVTC ground stick, ground T2.
- Remove all Hi-Pot test cables from the capacitor unit under test.

- Connect T2 to case.
- Verify T1 and T2 has been bonded to the capacitor case.
- Remove the T1 and T2 to case bond.
- Using a calibrated LCR meter measure and record the following:
 Terminal 1 (T1) to case capacitance _____
 T1 to case dissipation factor _____
 Terminal 2 (T2) to case capacitance _____
 T2 to case dissipation factor _____
 T1 to T2 capacitance _____
 T1 to T2 dissipation factor _____
- Verify all above measurements are within tolerance:
 Pass _____ Fail _____ Sign _____ Date _____
- Bond T1 and T2 to the capacitor case.

DOCUMENTATION:

- Record all activities within the respective HVTC Logbook.

Description of Document/Record (include ID number, if applicable)	Custodian	Storage Location and Medium	Retention Requirement
HVTC logbook	RF Group	Building 420 HVTC operator point	5 years

CONSTRUCTIVE FEEDBACK: