BaBar SVT Multi-source Power Supply Specifications

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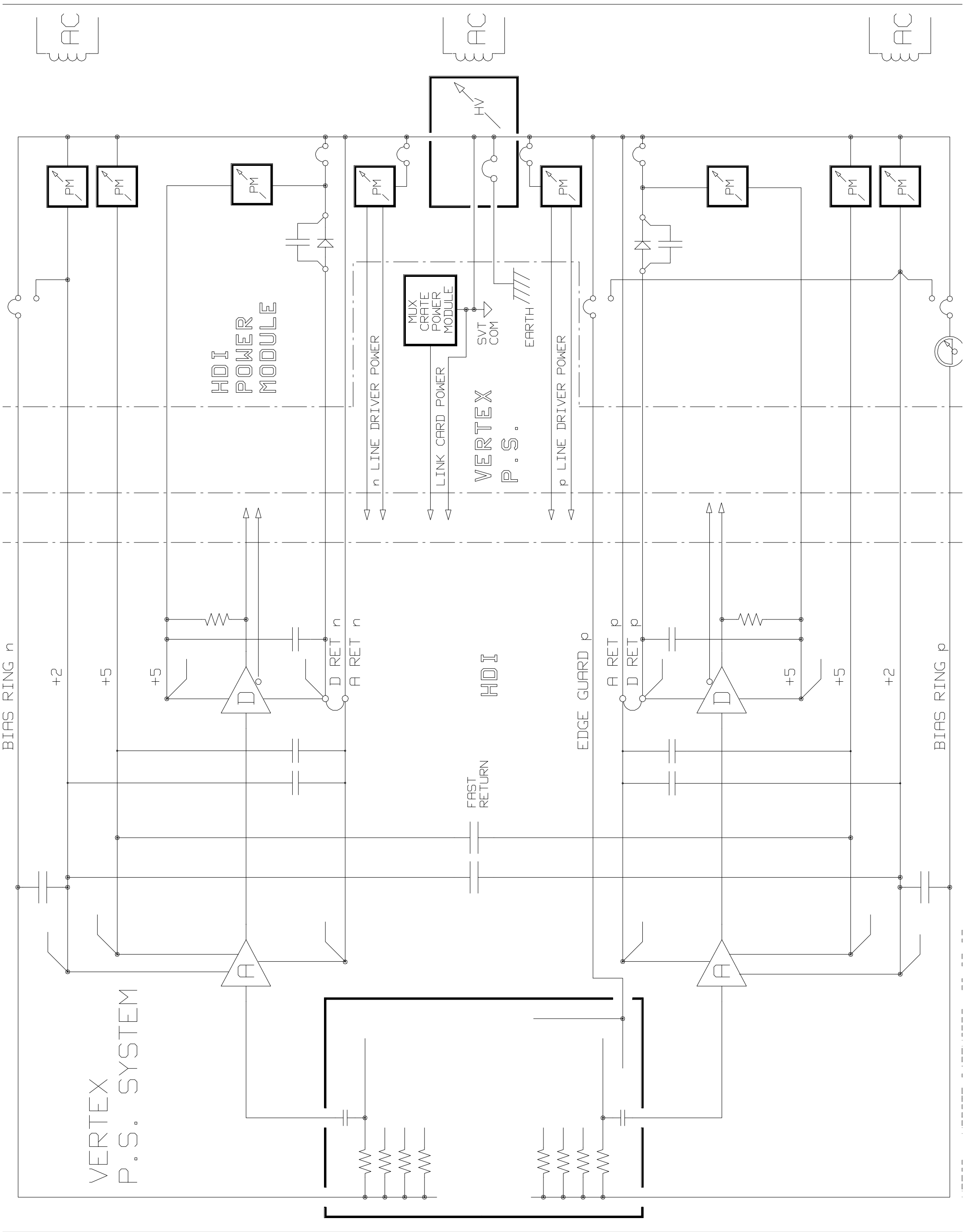
July 2, 1997

The BaBar Silicon Vertex Tracker (SVT) requires 104 independent fully fl multi-source power supply modules. Power is derived from 120vac @ 60hz.

Each multi-source power supply module has two sets of low voltage supp collectively referenced above and below ground by a center tapped high voltag The positive HV supply is brought out with the other voltages and called "Bias The negative HV supply is brought out twice and called "Bias Ring p" and "Edg p". The HV center tap is the supply common, isolated from the chassis and bro two parallel connectors on the rear panel for tying all the modules together. O of the HV supply, the two analog sources may be derived from a common tran winding, but the two digital sources must each be derived independently using transformer windings.
See Fig. 1.

Each of 104 multi-source power supply modules must provide the follow voltages at the specified steady state current.
The DVDD5n and DVDD5p must be able to source 1000mA for one second afte turned on.

Name	Voltage		Current	Common connection
DVDD5n	5 volts	@	750 mA	Floating (HVn optional)
LVDD5n	5 volts	@	750 mA	Floating (HVn optional)
AVDD5n	5 volts	@	500 mA	HVn
AVDD2n	2 volts	@	500 mA	HVn
HVn	+40 volts	@	1 mA	SVT Common connector
HVp	-40 volts	@	1 mA	SVT Common connector
DVDD5p	5 volts	@	750 mA	Floating (HVp optional)
LVDD5p	5 volts	@	750 mA	Floating (HVp optional)
AVDD5p	5 volts	@	500 mA	HVp
AVDD2p	2 volts	@	500 mA	HVp



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[1] Fig. 1 Muli-source PS and load

Power System Configuration

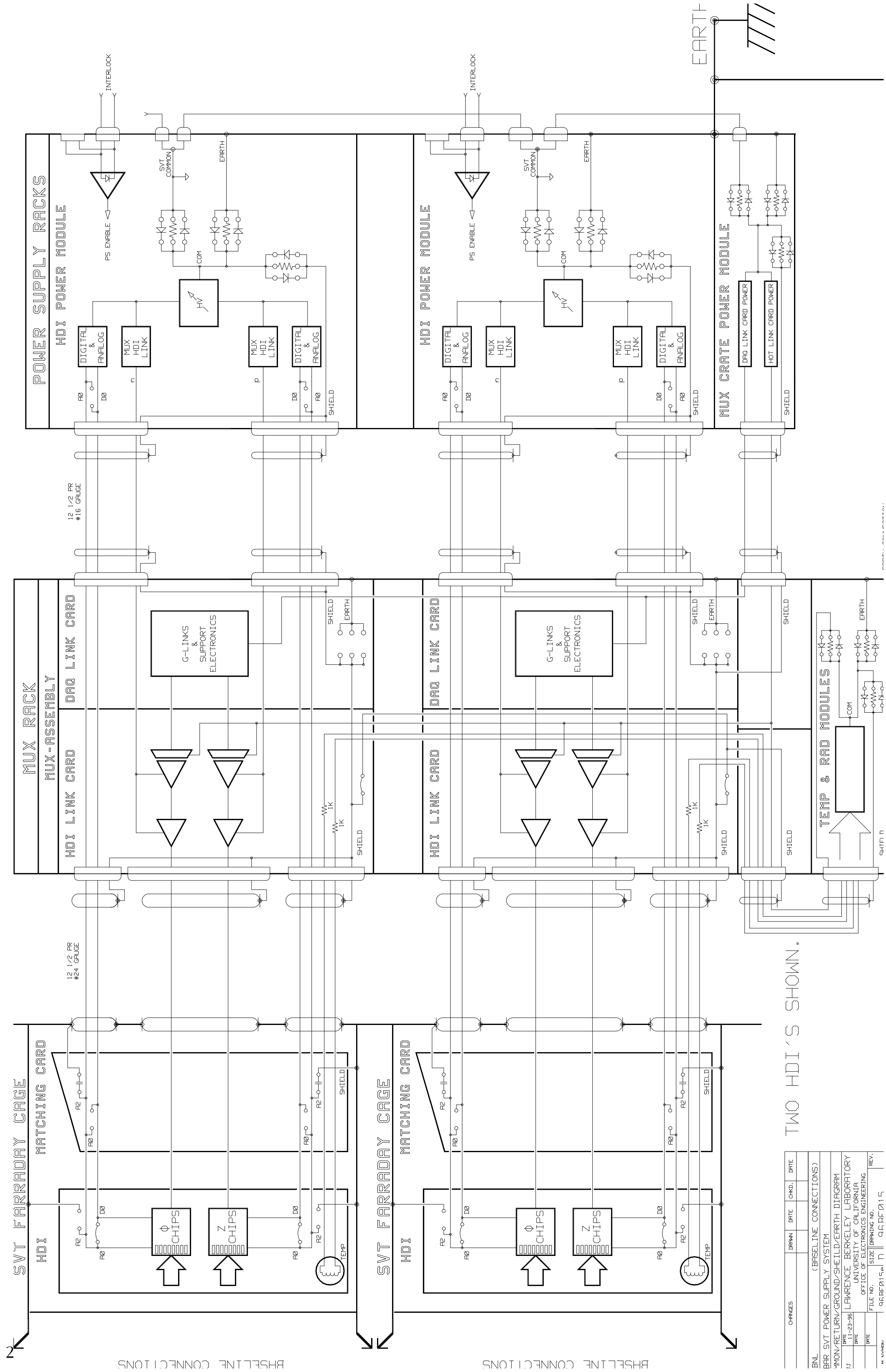
The power system for the BaBar Silicon Vertex Tracker consists of 104 independent fully floating multi-source power supply modules, and 16 fully fl source power supply modules not specified in this document. The cases of the modules are mechanically connected to the power supply racks which are conn Earth.

In each floating multi-source power supply module, the SVT Common is "center tap" of the HV supply and is insulated from their case.

SVT Common may be optionally strapped via a jumper, or a resistor with protection diodes to Earth (module case). The SVT Common may also be optio strapped via a jumper, or a resistor with protection diodes to two parallel conn back panel.

The shields exit the power modules via a pin in the connector and are iso the module case. Within each module, the shield may be strapped via a jumpe with protection diodes to SVT Common.

The cables between the multi-source power supply modules and their loa meters long. The first ~40 meters from the power supply have either .0051uh/ .0077uh/m of inductance and the last ~20 meters have either .28uh/m or .19 inductance. There is approximately 50uf of power decoupling at the load and of power decoupling between the two types of cable, 20 meters from the load. across the loads are remotely sensed and returned to the power supplies for al voltages, DVDD5, LVDD5, AVDD5, and AVDD2.



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[2] Fig. 2 Power System Configuration

Power Adjustment and Regulation

Each voltage must be computer adjustable with a resolution and accurac
or better. The maximum command and output value for the 5 volt sources is 8
maximum command and output value for the 2 volt sources is 5 volts. The ma
command and output value for the HV supply is as stated in the table.

For each voltage, fast local (at the power supply) regulation is provided
optimized to handle both the long cable propagation delay and the LC resonan
cable-load network. The fast regulation loop must provide optimum high frequ
response without oscillating at the propagation time scale. The loop gain and/
the fast loop must not oscillate with the characteristic resonance of the LC netw

In addition, the digital and analog voltages LVDD5, DVDD5, AVDD5, and
AVDD2, are remotely sensed for slow voltage regulation, to compensate for the
IR voltage drop. The remote sense lines must be terminated with a series resist
across the sense lines at the power supplies, and received differentially, by an
impedance of at least 1k ohm. There will be 50 ohm series termination in each
load. Inadvertent disconnection of the sense lines can cause no more than .1 v
output from the local regulation point.

The regulation of each supply must insure that the output voltage ripple
less than 10mv peak to peak, and not vary faster then 100mv/second at all fre
During power up and power down, the ripple compliance on top of the linear
relaxed by a factor of 10.

Controls and Monitoring

Communications with the power system consist of electrically isolated co commands and returned status. Computer communications is supported by a EPICS based driver via a VME module.

The multi-source power supply modules have electrically isolated enable/ inputs which ramp the supplies down in the same sequence and rates as a com off (see Functional Specifications). The opto enable/disable inputs must accept logic TTL level signals of 5ma. The enable/disable inputs must be two parallele lemo connectors.

Computer commands include turning each power module on or off, and voltage and the current limit for each module. The status available to the comp the voltage and current of each power source to an accuracy of 12 bits or bett is on or off, and the history of what it was last tripped by.

In addition, the “Bias Ring p” current returning to the negative HV suppl measured and read independently from the other currents. Note that the direc current is into the supply.

The voltages and current status of each channel must be scaled to the ful the possible output. The “Bias Ring p” current status must be scaled for 250uA

Functional Specifications

Turning on or off the multi-source power supply modules by command r sequence and ramp the voltages in a controlled manner. The turn on sequence programmable, with the turn off sequence being the opposite of the turn on se voltages must always ramp linearly to within 100mv of the final value.

The nominal sequence is the HV source must always be on before the DV LVDD5, AVDD5, and AVDD2 is turned on, and turned off after the DVDD5, LVD AVDD5, and AVDD2 is off.

The voltage ramp rates for the multi-source power supply sources must b programmable between 1 and 20 volts per second. The nominal ramp rate is 2 supplies.

The turn off sequence due to a Trip or Disable is to begin ramping all sou together.

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All multi-source power supply modules have a screw driver settable volta which has the same effect as an enable/disable. The maximum time allowed ov 10msec

All multi-source power supply modules have a computer settable curren which has the same effect as an enable/disable. The maximum time allowed ov 10msec.

Hardware Limits

All multi-source supplies have a voltage limit zener or active circuit, set s above the maximum output voltage.

All multi-source supplies have hardwired current regulation set to the ma steady state supply current.

Special Features

Each power module must have two parallel Lemo SVT Common connecto back panel.

Each multi-source power supply module must have two parallel enable/d connectors on the back panel.

The “Bias Ring p” current returning to the negative HV supply must be m and read independently from the other currents with 12 bit full range set to 2

Except for the 120vac and SVT Common connectors, all connectors incor pin to bring through the cable shield which is isolated from the supply case. Ir shield may be tied with a jumper, or a resistor with protection diodes to the su Common. All unused pins are also used to carry the shield.
See third item below. Also see Fig 2.

Jumper Options

In each multi-source power module, the SVT Common is the "center tap' HV supply and may be optionally strapped via a jumper, or a resistor with pro diodes to the two parallel SVT Common connectors on the back panel.

In each multi-source power module, the SVT Common may be optionally via a jumper, or a resistor with protection diodes to the module case (Earth).

In each multi-source power module, the SVT Common may be optionally via a jumper, or a resistor with protection diodes to the shield.

In each multi-source power supply module, both Bias Rings and Edge Gu outputs must have jumper options to their respective high voltage or their ass AVDD2 supply.

In each multi-source power supply module, the floating DVDD5 common optionally connected to their respective high voltage via a jumper or a germani .3v) in parallel with a fast 4.7uf X5R capacitor or a resistor with protection di

In each multi-source power supply module, the floating LVDD5 common optionally connected to their respective high voltage or to the DVDD5 common or a resistor with protection diodes.

Baseline Connections

Installed during fabrication

The Supply Common in each multi-source power module, are tied via a 1 with protection diodes to the shield.

The Supply Common in each multi-source power module, are tied via a 1 with protection diodes to the “SVT Common” back panel connectors.

The Supply Common in each multi-source power module, are tied via a 1 with protection diodes to Earth via their case which is in contact with the racks

The DVDD5 commons are tied via a 10k resistor with protection diodes t associated HV

The LVDD5 commons are tied via a 10k resistor with protection diodes tc associated HV

The “Bias Rings” and “Edge Guard p” are tied to their associated AVDD2 s commons.

Connector Specifications

The power source connector must be compatible with standard 120VAC : the United States.

The power supply output must be compatible with stranded 16 gage (1.52mm dia.) wire in a single 24 pair cable

24 pair cable Belden 1074A 31 mm total dia.