ATLAS SCT/Pixel Grounding and Shielding Note

November 22, 1999, Ned Spencer, UCSC

The objective of a grounding and shielding configuration is to minimize the flow of externally induced currents in the small signal path of the SCT/Pixel detectors. For the SCT detector, the small signal path includes the detector strip, detector backplane, module backplane capacitor, module front analog ground bus, the small signal ground bus in the front chip, the first transistor in the amplifier channel, and the two chip bond wires for signal and ground. Generally, I call this path the small signal ground. This path is only a few centimeters in extent for the SCT and similar in length for the pixels. Figure 1 details the small signal path for the SCT.

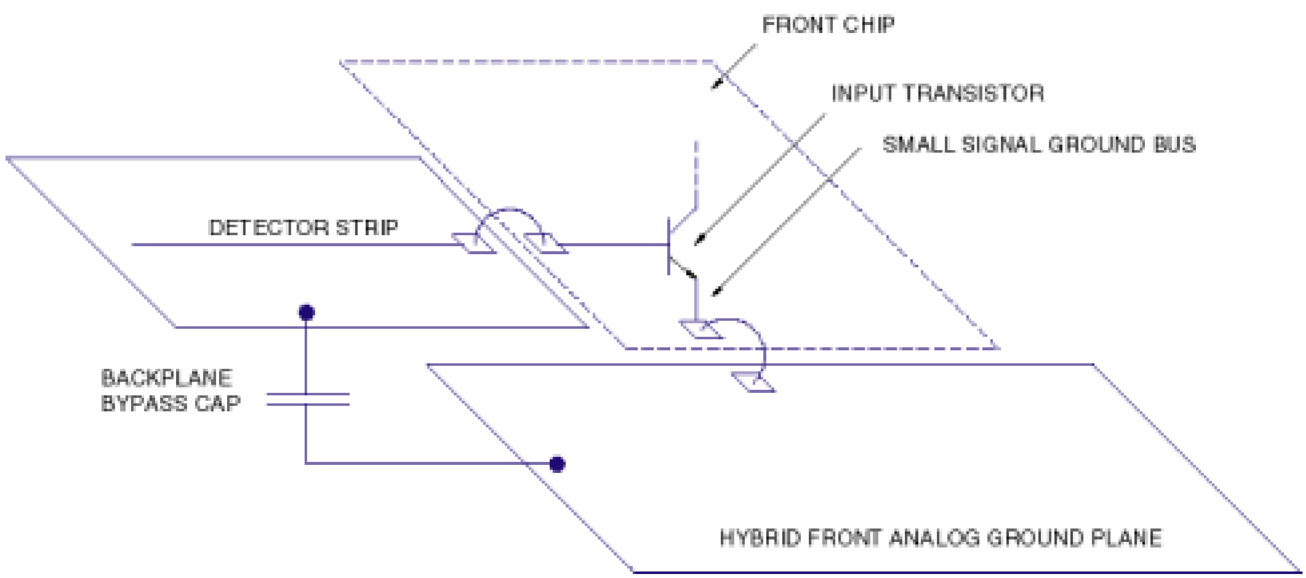


Figure 1. Small signal ground for SCT.

This proposal mostly connects existing mechanical and electrical conductive elements in a manner to provide this noise current minimization by design. A very unresolved area is the beam pipe shielding. An added element is a common-mode choke array at PP3, designed as part of the cable connector. In this document I will use “PP3” to inclusively refer to both PPB3 and PPF3; and likewise for PP1 and PP2.

The intent of this note is to further the grounding and shielding definition to eventually arrive at a common design. So view these proposals as inducements to productive discussion.

We can divide the detector system grounding and shielding issues into five main areas:

(1) The shield

(2) The beam pipe relation to the shield

(3) Connections to the shield

(4) Conductors inside the shield

(5) Conductors outside the shield

(6) Temperature monitoring

The Module Array Shield

The main purpose of the shield is to provide a common referencing point for all conductors inside the shield: the shield provides a conductive path for all the metal connecting to its surface. All conductors going inside the shield should short to its surface or have capacitor bypassing that is equivalent. The barrel outer heat shield (150 μm aluminum) is the main element of the shield.

The shield foils should be as continuous as possible with the connections between pieces, such as the outer barrel cylinder and the ends, done as seams and not as point contacts. The seams will tend to oxidize unpredictably, so some plating may be needed to maintain shield conductivity. The foil openings should be minimized, particularly where close to the beam pipe.

Figure 2 details the ground loop path without the shield used to shunt the power supply strays.

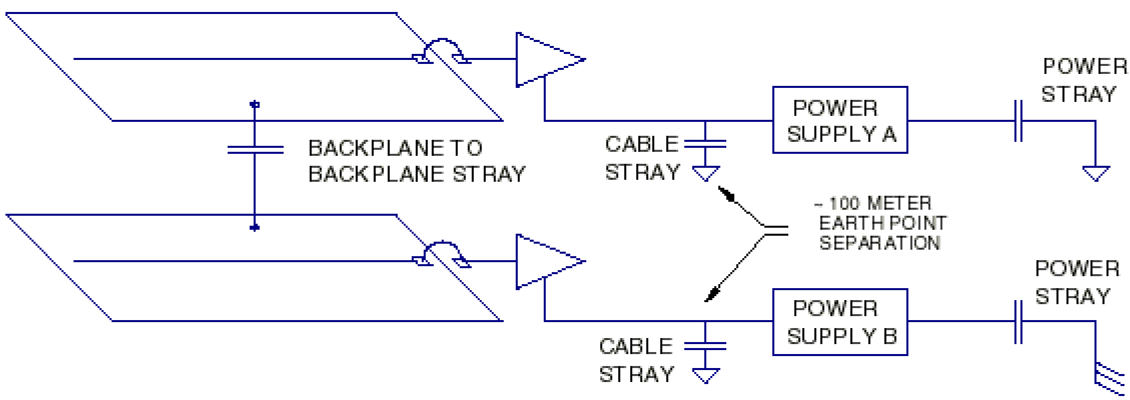


FIGURE 2: GROUND LOOP OF SEPARATED POWER CABLING INCLUDES DETECTOR SMALL SIGNAL GROUND

Figure 3 details the change in the ground loop by the introduction of the foil shield. This scheme illustrates the shunting of the problematic loop currents away from the small signal ground path and into the foil shield. The attenuation factor is the ratio of impedances through the detectors and the impedance of the path through the foil shield. Figure 2 indicates the risk of not using a shield: large loop currents could flow through the small signal ground.

The shield should be continuous around the beam pipe. I will discuss the beam shielding considerations in a later main section.

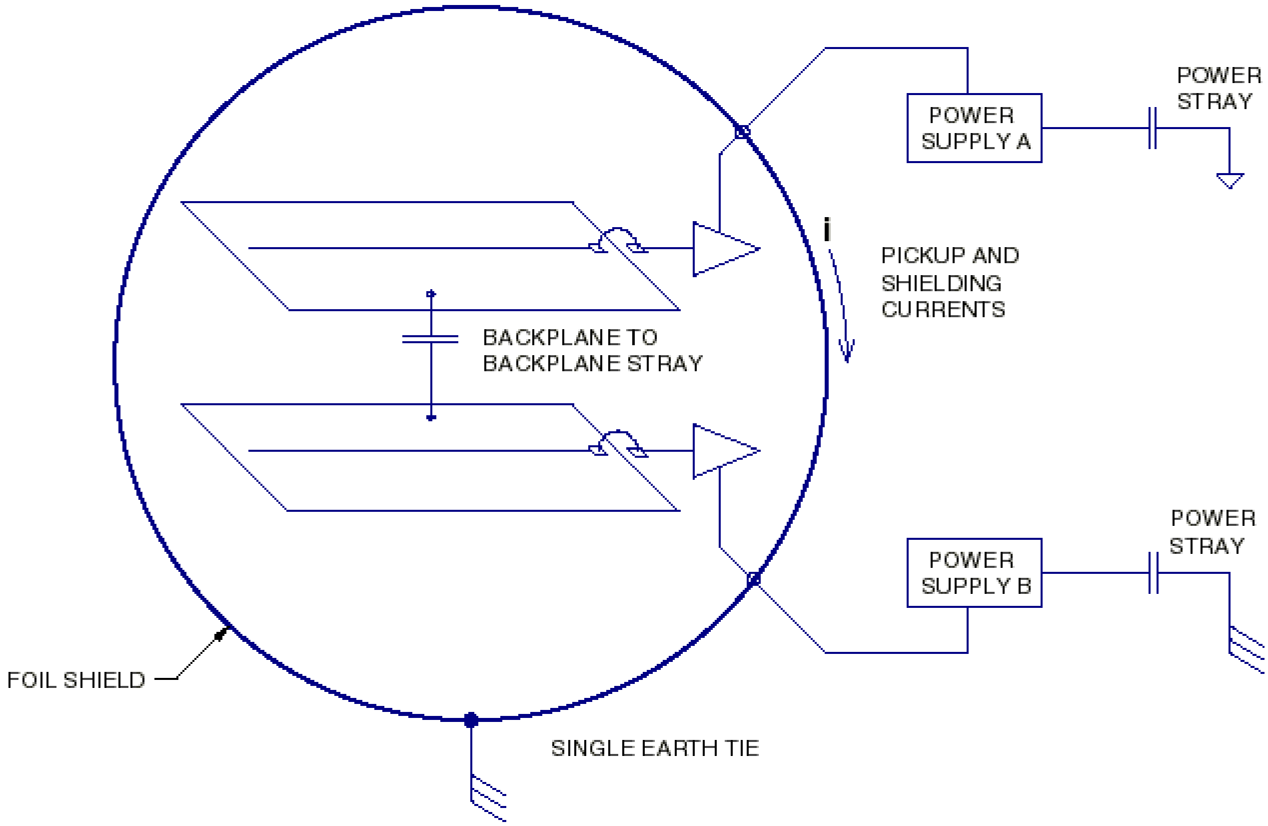


FIGURE 3: GROUND LOOP OF SEPARATED POWER ENTRY.

Barrel Shield Details

Some work has been done on the specific mechanical solution on the barrel grounding and shielding. As necessary, I will include simple term definitions. The 3 detector sections should have isolated shields, each section isolated from the others.

Heat spreader plate: Aluminum 125 μm thick disk around barrel SCT spanning from the barrel outer heat shield to PPB1, 60 cm wide. The disk is between the cryostat and outer heat shield.

The commoning of the power tape conductors will use the heat spreader plate. PPB1 PC board, Schematic 3 in Appendix A, provides trace connections. A good conductive tie is needed between PC board and heat spreader plate. The spreader plate needs a seam tie to the barrel outer heat shield. The spreader plate needs electrical isolation, since it becomes part of SCT shield. The forward, back, and barrel heat shield have aluminum skins and parts that will form the electric shields.

More Barrel Shield Parts

Barrel outer heat shield: Aluminum 150 μm thick cylinder with heater tapes and 600 μm CFRP (carbon fiber reinforced polymer)

Castellated thermal barrier penetration: Entry place for power tapes and module cooling tubes into thermal shield at ends of outer heat shield. Should be fabricated of aluminum to simplify electrical contact of cooling tubes with shield.

Heat shield bore: Cylinder around beam tube. 20 μm aluminum, 2 layers of 300 μm CFRP. Bore has ~25 cm diameter. Pixel B-layer mounts on bore, facing the beam pipe

Heat shield end plate: The heat shield disks that close the ends of the cylinder with 20 μm aluminum foil.

Module cooling tube: A module cooling tube will enter and exit at almost the same point in the same area of the outer heat shield. This may not be true of pixel tubes. No isolation from the outer heat shield is needed: the tube should short to the foil on both entry and exit if the points are close. If the exit point is remote from the entry, one of the penetrations should be isolated. Each SCT tube services 12 modules that form a row in the barrel.

Connection of Barrel Shield Parts

All conductors that enter into the volume enclosed by the foil shield should short to the foil. The shielding foils should have electrical isolation from the metallic mechanical supports that are outside the shield.

The six aluminum assemblies listed above need to be methodically connected electrically. Over 10 years lifetime, simple aluminum joints will tend to become resistive. If joints can be made reliably conductive over the entire face, rather than only at fasteners, we will get the most shielding from the available material: maximum shielding for minimum material. Plating over the aluminum at joints is probably needed.

The most important connection area is the outer heat shield rim, where the power tapes enter. The heat spreader plate, outer shield, end plate, castellated thermal barrier penetration, and cooling tubes all need broad, corrosion-proof contact with each other.

The aluminum seam between the bore and end plate should be continuous electrically.

Cabling Overview Schematic

Appendix A, Schematic 2 shows an overview of the module cabling structure. The mechanical terms in the schematic notes will be explained below. Four weights of cable types are used: the big conventional cable, the small conventional cable, the 100 μm aluminum low- mass cable, and the 50 μm aluminum low-mass cable. The schematic shows our best understanding of the cable layout. Note that the VISET pair,TEMP2, and PINBIAS_RET have been removed from the low-mass cables.

Note that the cabling from PP3 to the entry to the outer heat shield gets a wrap of 50 μm of aluminum foil. So there is a cotinuous cable shield, except for minor interruptions at the patch panels.

The SCT/pixel detector common is shown as unreferenced to earth. Some tie for safety considerations is needed. If possible, this tie will be a low-pass filter, below the 50 kHz lower end of the system bandpass. If possible the safety tie should be on the power supply side of the PP3 chokes.

Details for Conductors Outside the Shield

PPB1 printed circuit board: This circuit is detailed in Appendix A, Schematic 3. A bundle of six power tapes are commoned at this board. The pads for one tape are shown. AGND, DGND, and BIAS- tie together on the board, and a broad conductive tie is made from this node to the heat spreader plate. 4.75 μF bypass capacitors are used on all conductors not at ground, except for the 500 V BIAS line, and RESET, which will have a ~3 μs risetime edge on it.

Heat spreader foot: A cable bundle of 6 power tapes outside of PPB1 is coupled to a heat spreader foot serviced by a devoted power tape cooling tube. The cooling tube and spreader foot should tie electrically to the heat spreader plate. Where the spreader foot ends near PPB2, the tube should have an isolator. From this isolator to the heat spreader plate, the heat spreader foot and its cooling tube should be isolated from electrical contact with anything else.

Cable bundle foil wrap: The power tape bundles should have shielding wrap of at least 50 μm aluminum foil from the thermal shield to PPB2 which will contact the heat spreader foot. The foil wrap will gain continuity to common at PPB1 using the spreader foot/spreader plate tie. At PPB2 a reliable tie is needed to the shield of the cable from PPB2 to PPB3.

Isolation of cable runs: Contact between different power tape or power cable shields should be avoided outside of PPB1: shields should not regroup except for tapes or cables that are laid as a tight group, such as a power tape bundle.

PP2 PC board: this circuit is detailed in Appendix A, Schematic 4. The shield of the conventional cable from PP2 to PP3 has a tie to the heat spreader foot through this board.

Conductors Inside the Shield

The power tape for a module has a single point commoning tie: a module and power tape inside the module array shield is isolated from other conductors. This forces shielding currents to flow on the module array shield and not flow through the modules. The power tapes have no shielding inside the module array shield.

The detector cooling tubes travel very close to the detectors, with large capacitance to detector backplanes, so noise currents on the tubes require minimization. Mechanical supports inside the foil shield, like the cooling tubes, should tie to the foil at one point. Multiple point ties to the foil would bring the shielding currents inside the detector array.

Stray capacitance between a cooling tube and a SCT detector backplane can be as great as 100 pF. This is the largest contributor to the ground loop indicated in Figures 2 and 3. Since a cooling tube serves modules with power tapes entering the shield at very different points, the strays create a shunt path for the shield currents that include the detector backplanes. The ground loop would include a cooling tube, its modules from different power supply groups and their backplanes, and the portion of the shield between the two power supply entry points as shown in Figure 3. A module shunt shield between the cooling tube and the detector backplane is needed.

The shunt shield is created by an additional conductive layer in the module mounting block between the cooling tube and the detector. This layer should have a low AC impedance tie only to the power tape AGND entry point at the module connector. Most of the currents in this ground loop now flow through the power tape only, leaving the backplane more isolated from stray currents. The stray capacitance from the tube to backplane should be reduced to 1 pF or less.

The cooling tubes short to the outer heat shield at significantly different locations than the respective power tapes. Additionally, the tubes will have some capacity to the detectors even with a shunt shield. The conservative approach is to leave the tubes with no other ties, so minimizing stray currents on them. The kapton dogleg redundant arm could have an analog ground conductor included in it that commons the AGND between

2 modules. This would more closely reference one module to another using the power entry reference point for each module without involving the cooling tubes. For a half-row of 6 modules, there is a neglible ground loop, since the power tapes are bundled. The kapton dogleg with AGND option has not been prototyped, but should be.

Modules in a row of 12 have power tapes that enter and reference at opposite ends of the barrel, servicing each half-row of 6 modules. At the z =0 plane in the center of the barrel, capacitive strays between modules form a ground loop including 2 power tapes and the outer heat shield. This could be shorted across using the redundant arm AGND above, but this is shorting across an obvious ground loop, and puts shielding currents through the power tapes. Almost no shielding currents would flow on the outer heat shield, since in aggregate the power tapes are much lower resistance than the outer heat shield.

A more structured approach is to route the redundant arms so that the midplane modules have an open between them. This would result in 12 modules forming a redundant chain, instead of 24 as currently planned: the redundant arm would connect two half-rows of modules at the midplane (z =0). In this case the midplane modules might need 2 shunt shields between them, each shield tied to the module power entry reference point. This will shield the detectors themselves from stray loop currents. Prototyping is needed to find the soundest approach.

Beam Pipe Shielding

There are many configurations being considered for the beam pipe, the heat shield, and the detector array shielding. I will list five of the many choices that will develop the grounding and shielding considerations:

(1) Single wall beam pipe exposed to detector array, unreferenced to array

(2) Single wall beam pipe exposed to detector array, referenced to array

(3) Double wall beam pipe exposed to detector array, outer wall referenced to array

(4) Double wall beam pipe exposed to detector array, outer wall unreferenced to array

(5) Heat shield foil completely around beam pipe connected as shield

In the first approach, Case 1, the single wall beam pipe would be inside the foil shield with no shielding, and the shield would not be tied to the beam pipe: the single ground tie would be independent of the beam pipe earth referencing. If the relative AC potentials and currents on the beam pipe prove to be large, then the detectors could have pickup, since they are attempting to reference to a different ground than the beam pipe. This does not appear to be a workable path, because estimating pickup accurately is too difficult.

The second approach would reference the whole detector to the beam pipe. The shield would tie hard to the beam pipe as its single earth tie. Electrically, this is a workable procedure. This probably cannot be done for many reasons. One shielding issue is that the TRT would have to deal with the beam pipe fields, rather than use SCT as a shield from the beam pipe.

In the third approach, Case (3), the outer beam pipe could be used as part of the module array shield. If there are large AC currents on the inner pipe, the least pickup will occur if the outer pipe is allowed to drive the whole shield, rather than attempt to isolate the foil shield from it. The outer pipe would need two isolators, one at each end of the module array shield near the pipe entry point. The shield foil should connect in a continuous fashion to the pipe, since the pipe might have substantial current density.

Case (4) looks similar to Case (1) with less uncertainty. It is still too difficult to estimate beam pickup accurately.

Case (5) places a complete foil shield around the beam pipe, integral to the end pieces of the heat shield with attention paid to conductive seam connections. Electrically, this is the simplest configuration, since a complete shield with its own single point tie provides the most pickup rejection. Case (3) and Case (5) are very similar, and show the best possibility of low beam pickup. These two configurations do not necessarily meet the mechanical, cooling, installation, or material cross-section requirements.

Conductors Outside the Shield: Ferrite Common-mode Chokes at PP3

The power supplies are in very different locations at the ends of ~110 meter cables. This forms a ground loop with the path including the two or more cable bundles running to different supply locations, the aggregate capacitive strays to earth of the cables, the strays of the floating supplies, the foil shield, and the detector backplanes. This loop is shown schematically in Figures 2 and 3. The detector backplanes are in the loop because the foil is thin and the cooling pipes create a secondary shield shunt through the backplanes as detailed above.

Ferrite common-mode chokes on all the power cables can break this ground loop. Appendix A, Schematic 5 details the PP3 board. A choke introduces a series impedance, on the common-mode current on a differential conductor pair that is wrapped on the choke. The differential signal on a pair is unaffected. For ferrites to function, they need shielding from the DC magnetic fields. The ferrites used have been tested to filter in an ambient magnetic field up to 60 gauss. At UCSC we have designed a PP3 common-mode ferrite choke with cable connector and magnetic shield. The mechanical design was done by Max Wilder. A shielding factor of 20 is needed for a possible maximum ambient field of 1 kilogauss.

The magnetic shielding shown has two layers separated by isolators. Each layer is a length of standard low-carbon steel tube with 0.25” thick steel discs plugging each end. A single-layer tube should give sufficient shielding. The detailing herein will be useful if sufficient shielding proves problematic to achieve with a single layer of tubing or if an open-ended tube shields less than needed, in which a end-disc assembly as detailed might be useful.

The estimate of the steel shielding effectiveness in its magnetic saturation region uses the techniques in “Magnetic Shielding of an Accelerator Beam using Passive Ferromagnetic Material”, IEEE Transactions on Magnetics, 32-4, 1996, page 2663. For a soft iron cylinder of interior diameter 40 mm with 10 mm wall, the attenuation factor at 1 kilogauss is over 100.

Figures 4 and 5 detail the PP3 mechanical design for the unlikely case of double-walled magnetic shielding. The estimated weight of the steel in this case is 900 grams for one module cable, using the double wall and double discs as shown.

The ferrite filter components used are from Pulse Electronics, and are packaged in a reliable surface-mount package. The chokes will introduce a kohm or so series impedance down to 100 kiloHerz for common-mode signals on their conductors. Strays that create ground loops are effectively cut off from small signal interaction for the system beyond PP3. These design areas can have loosened specifications by using the filters:

(1) Cable tray isolation and grounding.

(2) Cable shielding outside PP3.

(3) Conductor twisted pair requirement outside PP3.

(4) Power supply strays.

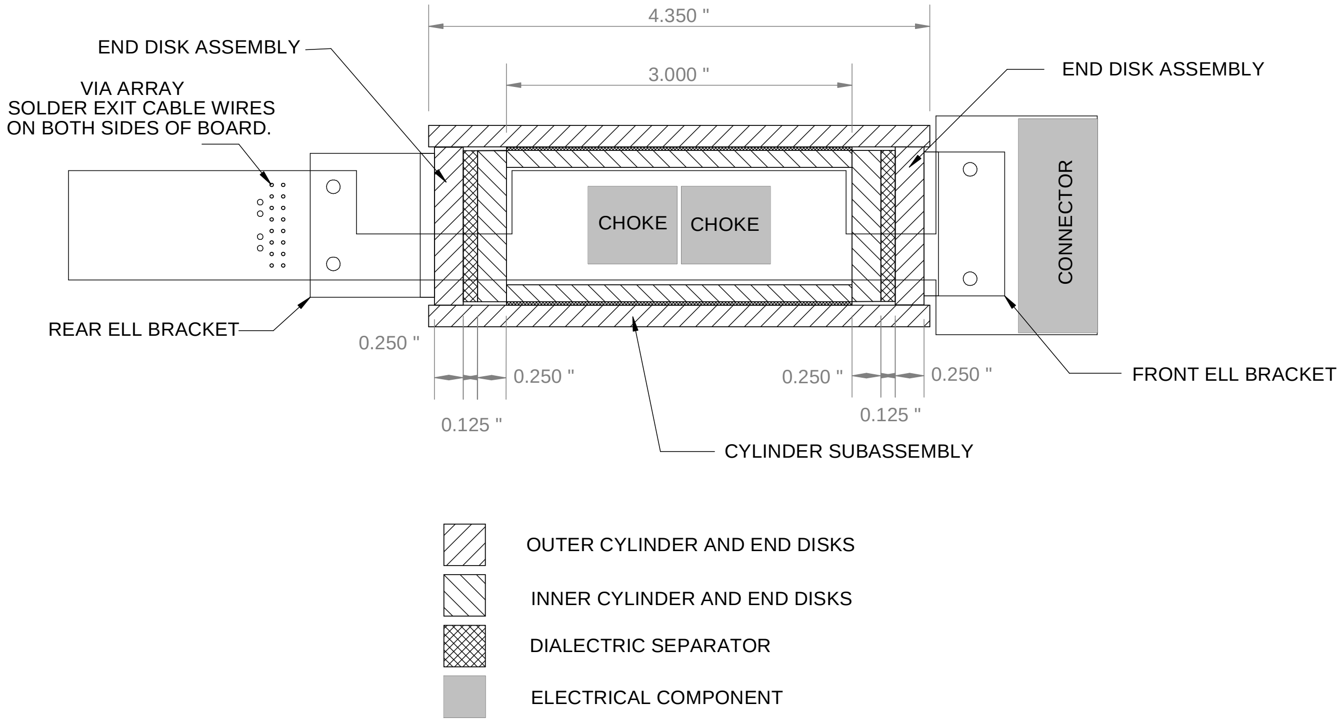
(5) Pickup from other systems of all types onto the power supplies and cabling.

(6) Safety grounds type and construction outside PP3.

(7) Power supply locations.

(8) Relationship of earthing points in different buildings and caverns.

SCT/PIXEL PP3 FILTER ASSEMBLY



PP3 PC BOARD DETAIL DRAWING

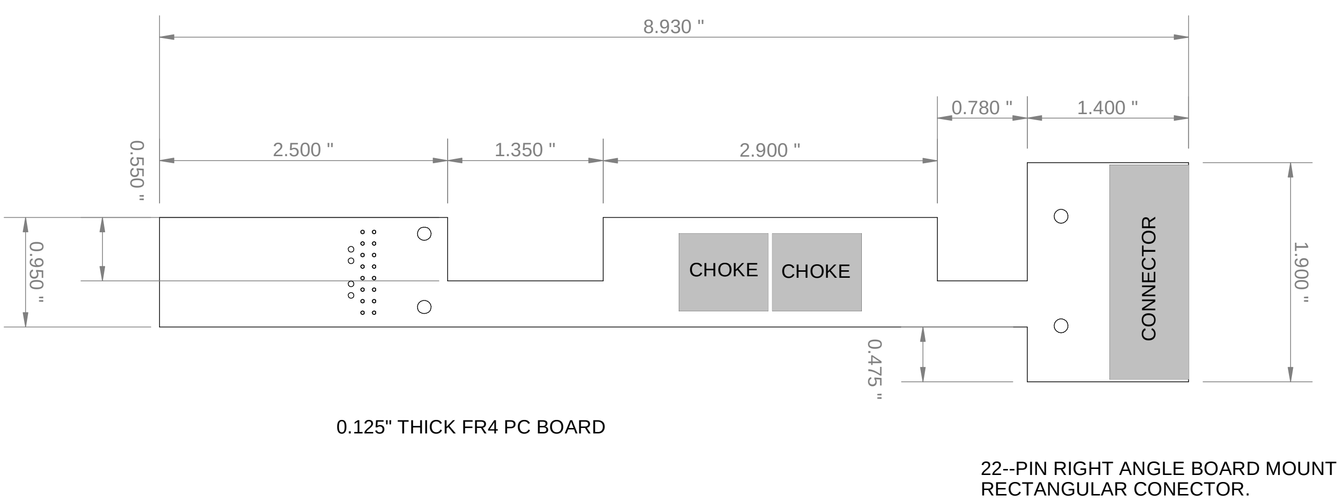
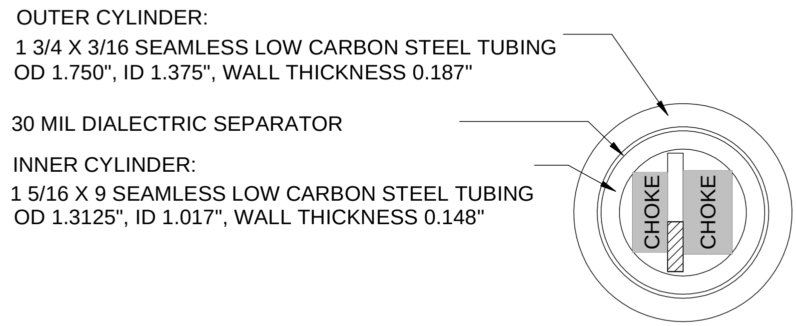
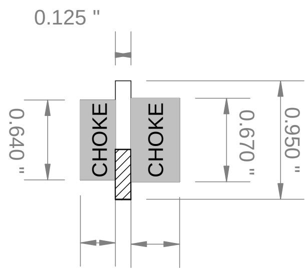


Figure 4.

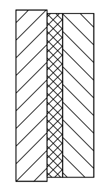
CROSS SECTION OF CYLINDER SUBASSEMBLY WITH PC BOARD INSTALLED



PC BOARD CROSS SECTION

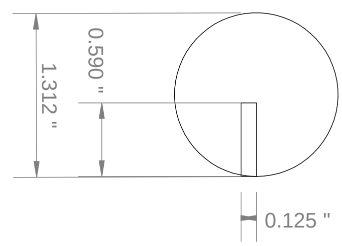


SIDE VIEW OF DISK ASSEMBLY



INNER DISK DETAIL DRAWING

0.250" THICK LOW CARBON STEEL PLATE



OUTER DISK DETAIL DRAWING

0.250" THICK LOW CARBON STEEL PLATE
DISK DIAMETER IS 3 MILS LESS
THAN ID OF OUTER CYLINDER
FOR GOOD FLUX RETURN

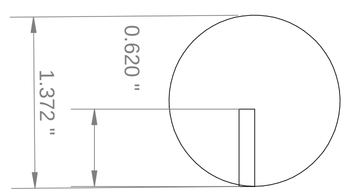


Figure 5. Cross-sections and steel disk details

Temperature Monitoring

The module thermistor conductors need to be AC referenced to the respective module power supplies. Appendix A, Schematic 1 shows a reduced conductor proposal for the thermistor wiring, which references and uses DGND.

The thermistor current bias pair is DGND/TEMP1. TEMP1 would be tapped at PP2 by TEMP2, as shown in Appendix A, Schematic 4. This tap would provide data on the temperature variation of the resistance of the TEMP1 path. DG_SENSE would be loaded by 2 high input impedance instrumentation amplifiers at the power supply end. With co-ordination between the temperature and power supply module designs, this should not be a problem. If carefully done, this path senses the low thermistor potential with neglible error, independent of temperature.

SUMMARY

(1) The foil shield can be used to shunt possible system ground loops away from the small signal area.

(2) A shunt shield on the SVT cooling tube connection will attenuate possible ground loops.

(3) The foil shield will work best when following a connection protocol to it for conductors both inside and outside the shield.

(4) A supply-cable ferrite choke at PP3 is possible, and it greatly reduces the area of concern and complexity of the system grounding and shielding.

Appendix A
SCT/PIXEL Grounding and Shielding Schematics

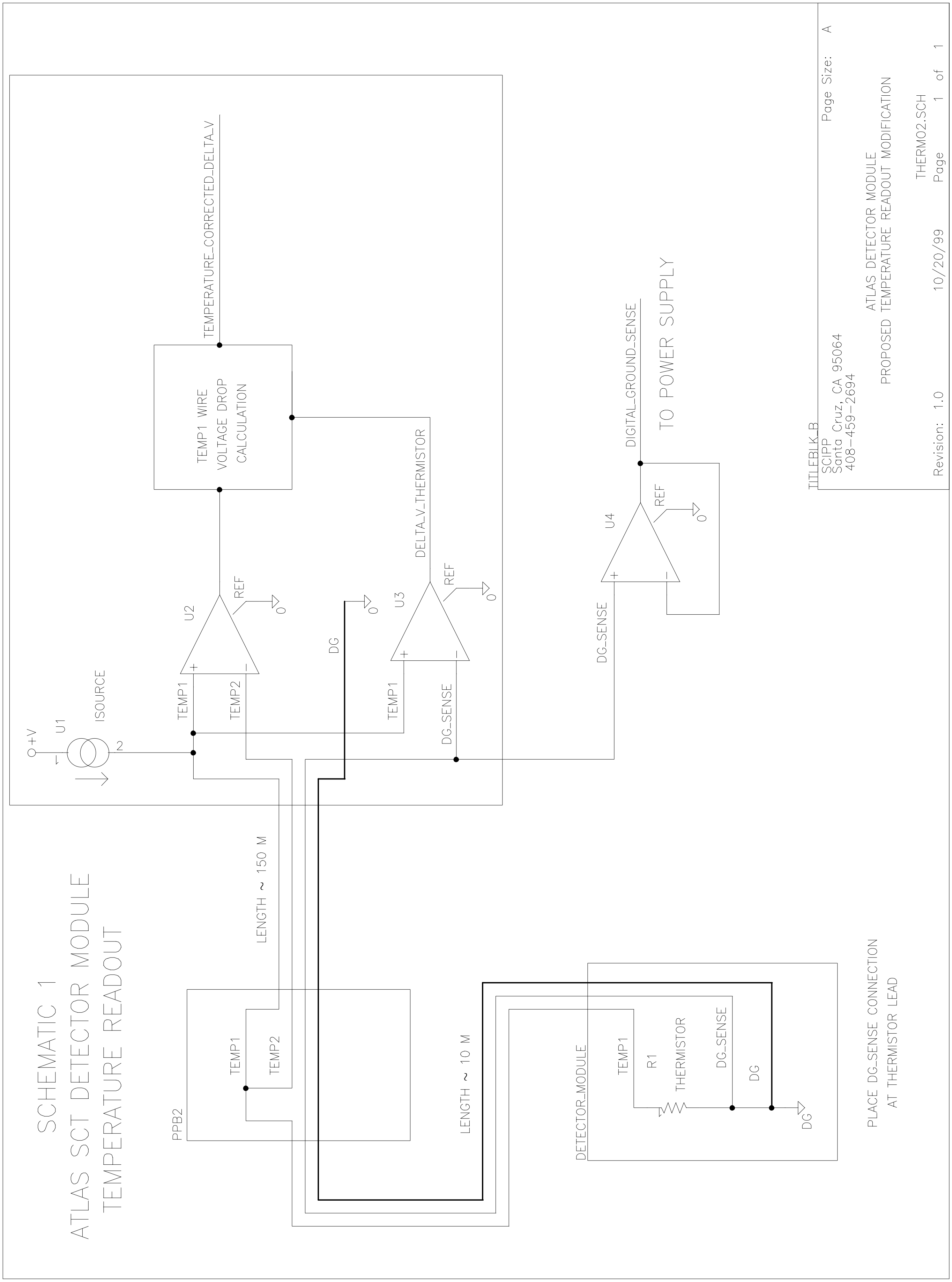
Schematic 1: ATLAS SCT Detector Module Temperature Readout

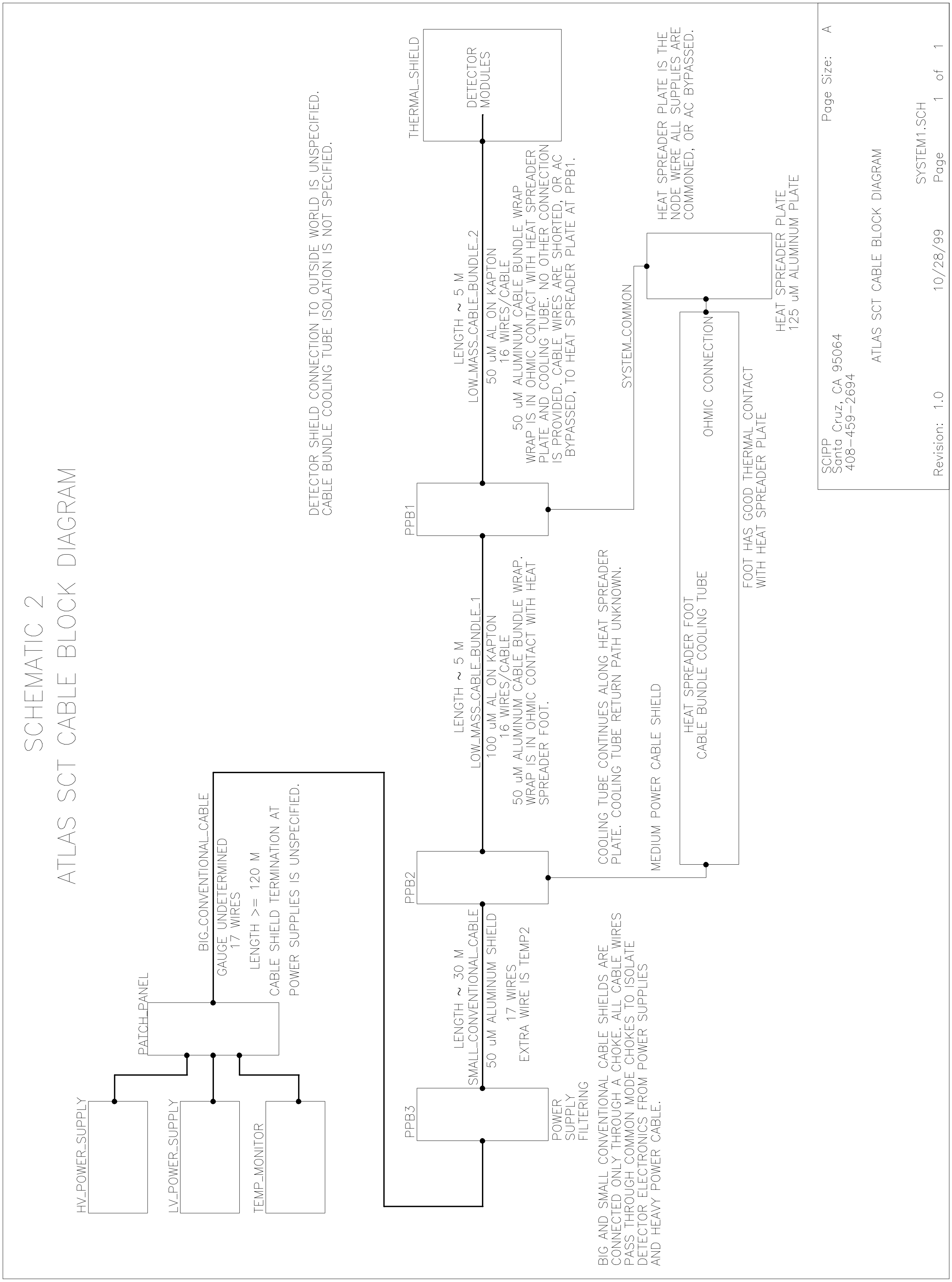
Schematic 2: ATLAS SCT Cable Block Diagram

Schematic 3: ATLAS SCT Power Supply Patch Panel 1 (PPB1)

Schematic 4: ATLAS SCT Power Supply Patch Panel 2 (PPB2)

Schematic 5: ATLAS SCT Power Supply Patch Panel 3 (PPB3)


SCHEMATIC 1
ATLAS SCT DETECTOR MODULE
TEMPERATURE READOUT
TEMPERATURE_CORRECTED_DELTA_V
TEMP1 WIRE
VOLTAGE DROP
CALCULATION
DELTA_V_THERMISTOR
DIGITAL_GROUND_SENSE
TO POWER SUPPLY
U1
ISOURCE
+V
U2
U3
U4
REF
TEMP1
TEMP2
DG
DG_SENSE
LENGTH ~ 150 M
LENGTH ~ 10 M
PPB2
DETECTOR_MODULE
R1
THERMISTOR
PLACE DG_SENSE CONNECTION
AT THERMISTOR LEAD
TITLEBLK_B
SCIPP
Santa Cruz, CA 95064
408-459-2694
ATLAS DETECTOR MODULE
PROPOSED TEMPERATURE READOUT MODIFICATION
THERM02.SCH
Page Size: A
Revision: 1.0
10/20/99
Page 1 of 1



SCHEMATIC 2
ATLAS SCT CABLE BLOCK DIAGRAM
DETECTOR SHIELD CONNECTION TO OUTSIDE WORLD IS UNSPECIFIED.
CABLE BUNDLE COOLING TUBE ISOLATION IS NOT SPECIFIED.
THERMAL_SHIELD
DETECTOR MODULES
HEAT SPREADER PLATE IS THE NODE WERE ALL SUPPLIES ARE COMMONED, OR AC BYPASSED.
LENGTH ~ 5 M
LOW_MASS_CABLE_BUNDLE_2
50 uM AL ON KAPTON
16 WIRES/CABLE
50 uM ALUMINUM CABLE BUNDLE WRAP
WRAP IS IN OHMIC CONTACT WITH HEAT SPREADER PLATE AND COOLING TUBE. NO OTHER CONNECTION IS PROVIDED. CABLE WIRES ARE SHORTED, OR AC BYPASSED, TO HEAT SPREADER PLATE AT PPB1.
SYSTEM_COMMON
HEAT SPREADER PLATE
125 uM ALUMINUM PLATE
OHMIC CONNECTION
FOOT HAS GOOD THERMAL CONTACT WITH HEAT SPREADER PLATE
PPB1
LENGTH ~ 5 M
LOW_MASS_CABLE_BUNDLE_1
100 uM AL ON KAPTON
16 WIRES/CABLE
50 uM ALUMINUM CABLE BUNDLE WRAP.
WRAP IS IN OHMIC CONTACT WITH HEAT SPREADER FOOT.
COOLING TUBE CONTINUES ALONG HEAT SPREADER PLATE. COOLING TUBE RETURN PATH UNKNOWN.
MEDIUM POWER CABLE SHIELD
HEAT SPREADER FOOT
CABLE BUNDLE COOLING TUBE
PPB2
BIG_CONVENTIONAL_CABLE
GAUGE UNDETERMINED
17 WIRES
LENGTH >= 120 M
CABLE SHIELD TERMINATION AT POWER SUPPLIES IS UNSPECIFIED.
PATCH_PANEL
LENGTH ~ 30 M
SMALL_CONVENTIONAL_CABLE
50 uM ALUMINUM SHIELD
17 WIRES
EXTRA WIRE IS TEMP2
PPB3
POWER SUPPLY FILTERING
HV_POWER_SUPPLY
LV_POWER_SUPPLY
TEMP_MONITOR
BIG AND SMALL CONVENTIONAL CABLE SHIELDS ARE CONNECTED ONLY THROUGH A CHOKE. ALL CABLE WIRES PASS THROUGH COMMON MODE CHOKES TO ISOLATE DETECTOR ELECTRONICS FROM POWER SUPPLIES AND HEAVY POWER CABLE.
SCIPP
Santa Cruz, CA 95064
408-459-2694
ATLAS SCT CABLE BLOCK DIAGRAM
Page Size: A
SYSTEM1.SCH
Revision: 1.0
10/28/99
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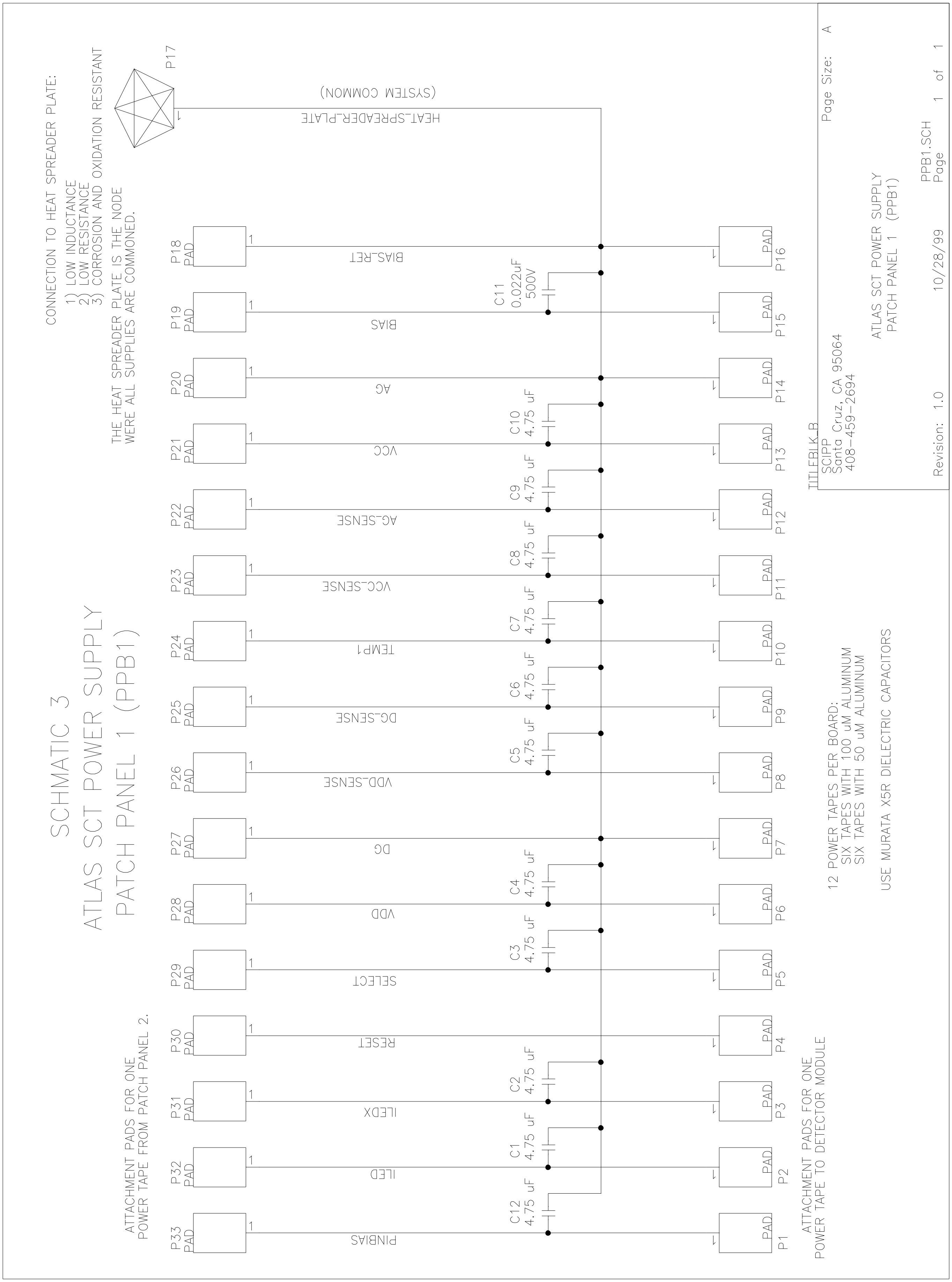
SCHMATIC 3
ATLAS SCT POWER SUPPLY
PATCH PANEL 1 (PPB1)
CONNECTION TO HEAT SPREADER PLATE:
1) LOW INDUCTANCE
2) LOW RESISTANCE
3) CORROSION AND OXIDATION RESISTANT
THE HEAT SPREADER PLATE IS THE NODE
WERE ALL SUPPLIES ARE COMMONED.
P17
HEAT_SPREADER_PLATE
(SYSTEM COMMON)
ATTACHMENT PADS FOR ONE
POWER TAPE FROM PATCH PANEL 2.
ATTACHMENT PADS FOR ONE
POWER TAPE TO DETECTOR MODULE
BIAS_RET
BIAS
AG
VCC
AG_SENSE
VCC_SENSE
TEMP1
DG_SENSE
VDD_SENSE
DG
VDD
SELECT
RESET
ILEDX
ILED
PINBIAS
C11 0.022uF 500V
C10 4.75 uF
C9 4.75 uF
C8 4.75 uF
C7 4.75 uF
C6 4.75 uF
C5 4.75 uF
C4 4.75 uF
C3 4.75 uF
C2 4.75 uF
C1 4.75 uF
C12 4.75 uF
P18 PAD
P19 PAD
P20 PAD
P21 PAD
P22 PAD
P23 PAD
P24 PAD
P25 PAD
P26 PAD
P27 PAD
P28 PAD
P29 PAD
P30 PAD
P31 PAD
P32 PAD
P33 PAD
P16 PAD
P15 PAD
P14 PAD
P13 PAD
P12 PAD
P11 PAD
P10 PAD
P9 PAD
P8 PAD
P7 PAD
P6 PAD
P5 PAD
P4 PAD
P3 PAD
P2 PAD
P1 PAD
12 POWER TAPES PER BOARD:
SIX TAPES WITH 100 uM ALUMINUM
SIX TAPES WITH 50 uM ALUMINUM
USE MURATA X5R DIELECTRIC CAPACITORS
TITLEBLK_B
SCIPP
Santa Cruz, CA 95064
408-459-2694
ATLAS SCT POWER SUPPLY
PATCH PANEL 1 (PPB1)
Revision: 1.0
10/28/99
PPB1.SCH
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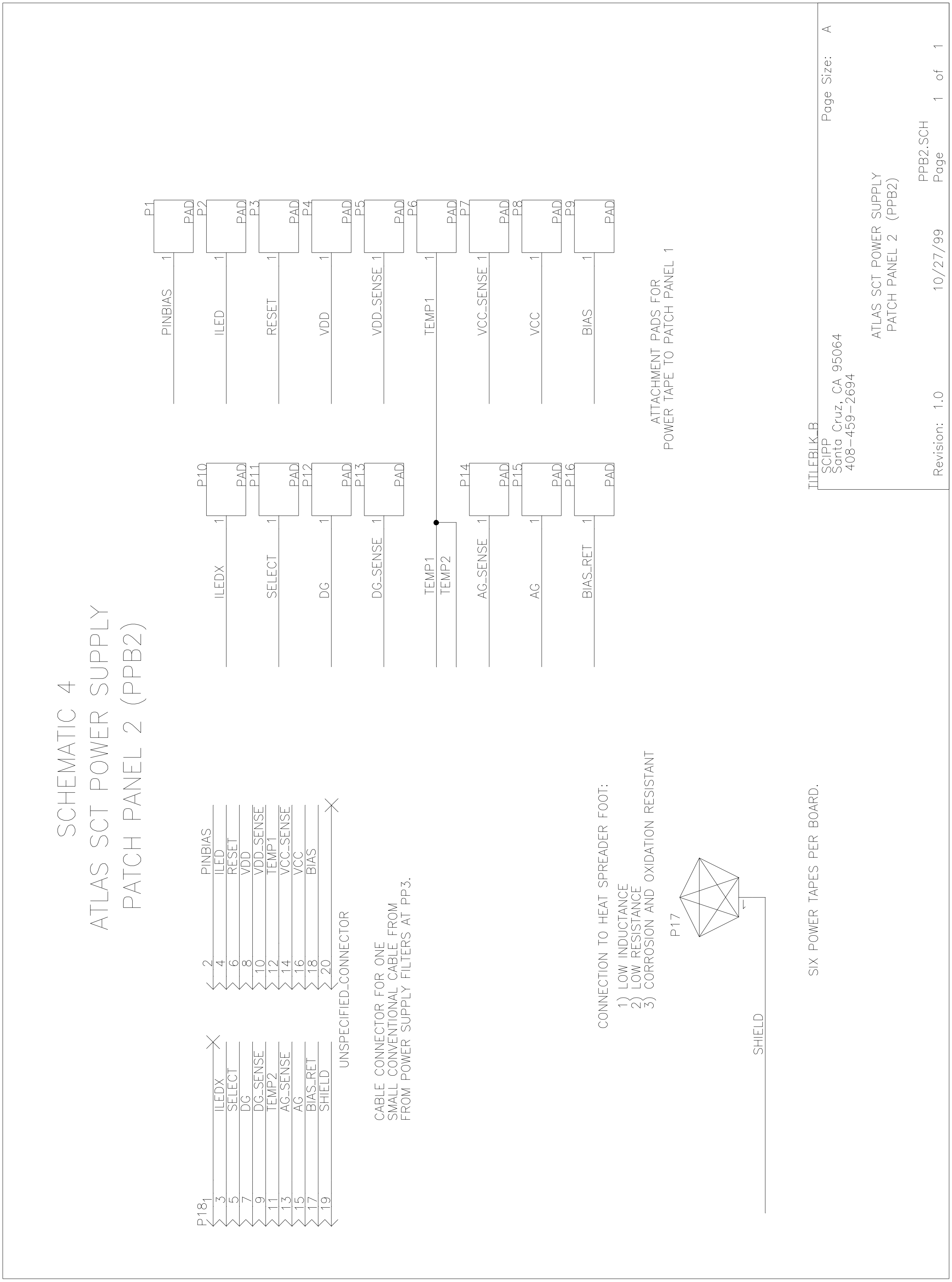
SCHEMATIC 4
ATLAS SCT POWER SUPPLY
PATCH PANEL 2 (PPB2)
PINBIAS
ILED
RESET
VDD
VDD_SENSE
TEMP1
VCC_SENSE
VCC
BIAS
ILEDX
SELECT
DG
DG_SENSE
TEMP2
AG_SENSE
AG
BIAS_RET
ATTACHMENT PADS FOR
POWER TAPE TO PATCH PANEL 1
P18
SHIELD
UNSPECIFIED_CONNECTOR
CABLE CONNECTOR FOR ONE
SMALL CONVENTIONAL CABLE FROM
FROM POWER SUPPLY FILTERS AT PP3.
CONNECTION TO HEAT SPREADER FOOT:
1) LOW INDUCTANCE
2) LOW RESISTANCE
3) CORROSION AND OXIDATION RESISTANT
P17
SIX POWER TAPES PER BOARD.
TITLEBLK_B
SCIPP
Santa Cruz, CA 95064
408-459-2694
ATLAS SCT POWER SUPPLY
PATCH PANEL 2 (PPB2)
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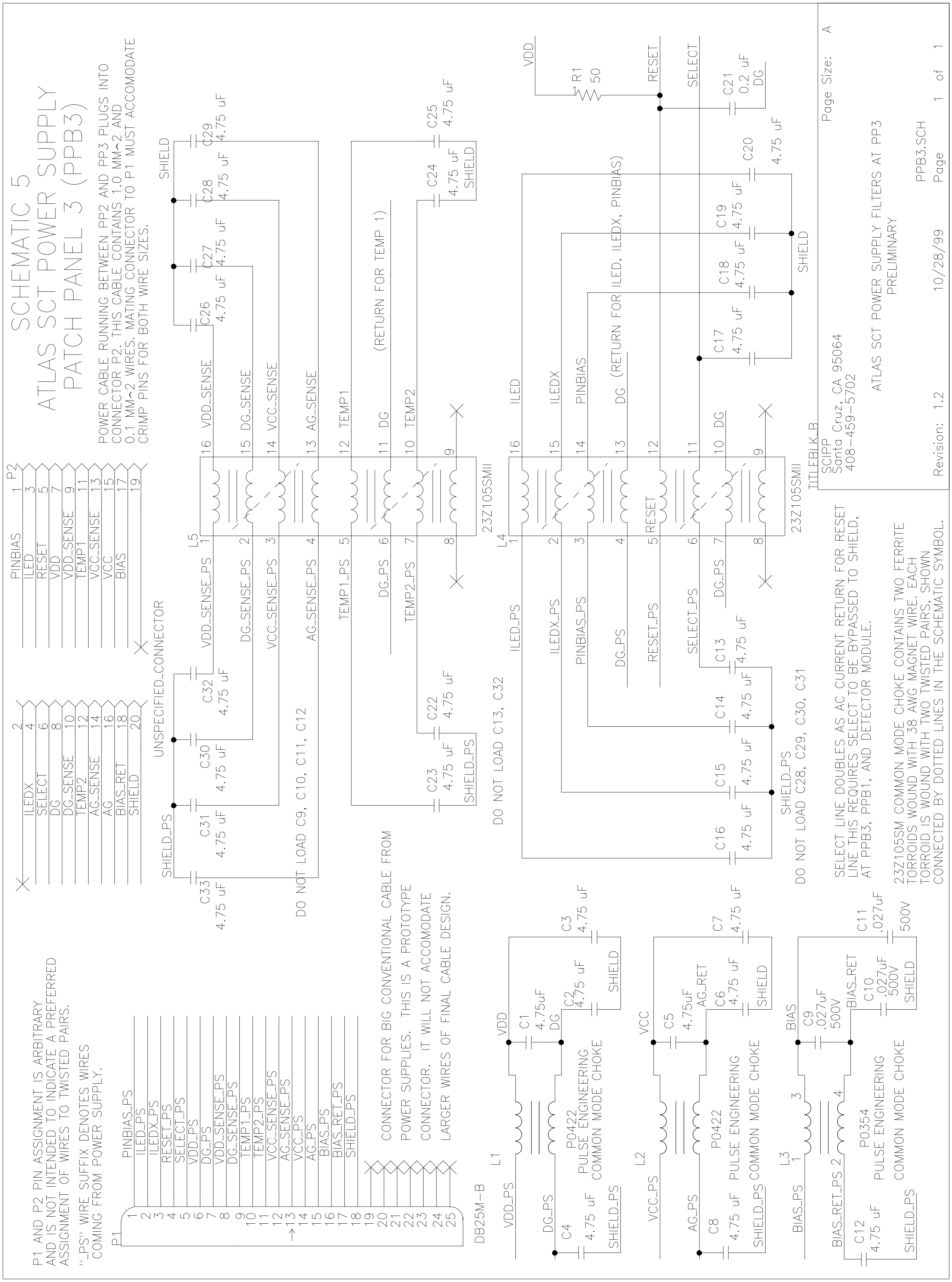
Revision: 1.0


SCHEMATIC 5
ATLAS SCT POWER SUPPLY
PATCH PANEL 3 (PPB3)
POWER CABLE RUNNING BETWEEN PP2 AND PP3 PLUGS INTO CONNECTOR P2. THIS CABLE CONTAINS 1.0 MM^2 AND 0.1 MM^2 WIRES. MATING CONNECTOR TO P1 MUST ACCOMODATE CRIMP PINS FOR BOTH WIRE SIZES.
P1 AND P2 PIN ASSIGNMENT IS ARBITRARY AND IS NOT INTENDED TO INDICATE A PREFERRED ASSIGNMENT OF WIRES TO TWISTED PAIRS.
"_PS" WIRE SUFFIX DENOTES WIRES COMING FROM POWER SUPPLY.
CONNECTOR FOR BIG CONVENTIONAL CABLE FROM POWER SUPPLIES. THIS IS A PROTOTYPE CONNECTOR. IT WILL NOT ACCOMODATE LARGER WIRES OF FINAL CABLE DESIGN.
UNSPECIFIED CONNECTOR
DO NOT LOAD C9, C10, C11, C12
DO NOT LOAD C13, C32
DO NOT LOAD C28, C29, C30, C31
SELECT LINE DOUBLES AS AC CURRENT RETURN FOR RESET LINE THIS REQUIRES SELECT TO BE BYPASSED TO SHIELD, AT PPB3, PPB1, AND DETECTOR MODULE.
23Z105SM COMMON MODE CHOKE CONTAINS TWO FERRITE TORROIDS WOUND WITH 38 AWG MAGNET WIRE. EACH TORROID IS WOUND WITH TWO TWISTED PAIRS, SHOWN CONNECTED BY DOTTED LINES IN THE SCHEMATIC SYMBOL.
P0422 PULSE ENGINEERING COMMON MODE CHOKE
P0354 PULSE ENGINEERING COMMON MODE CHOKE
DB25M-B
23Z105SMII
TITLEBLK_B
SCIPP
Santa Cruz, CA 95064
408-459-5702
ATLAS SCT POWER SUPPLY FILTERS AT PP3
PRELIMINARY
PPB3.SCH
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