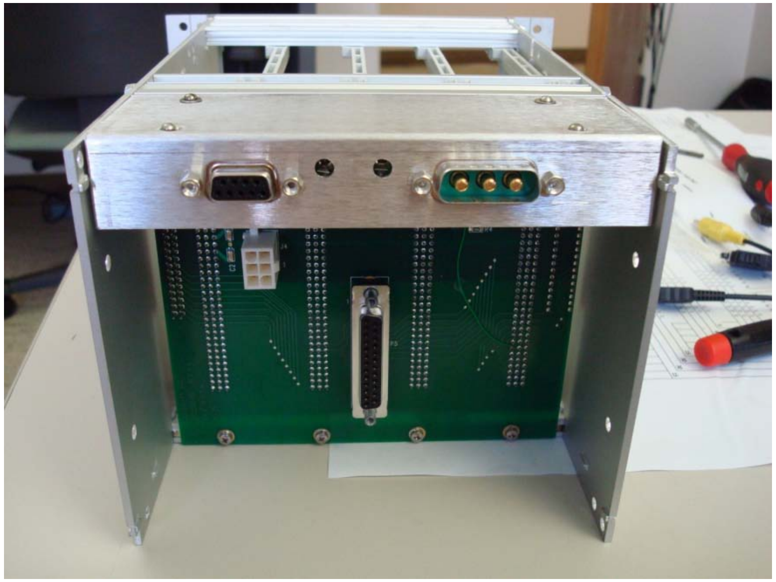
SEI CPS – Varieties and Terminology

MicroSense (aka ADE) GAUGES, PROBES, and RACKS, and [LIGO-provided] BOARDS, CABLES, and ASSEMBLIES all have terminology issues.



Capacitance Position Sensors RACK with LIGO ASSEMBLY - HAM version shown.

For both the HAM and BSC systems, the GAUGES are the same model numbers - 8800. However, the HAM PROBES have COAX cables and connectors while the BSC PROBES have TRIAX cables and connectors. NEED TO CHECK: Do the PROBES have different part numbers?

The BSC system has gauges that are scaled to two ranges: 0.5mm (+/-0.25mm) and 2.0mm (+/-1mm). The only external way to tell them apart is by serial number. Note: The gauges are labeled but the label is on the inside of the mounting rack and cannot be seen externally.

The HAM version of the PROBE has black COAX cables and requires that a braided shield be installed after cleaning. NEED TO FIND: DCC Number for Braiding Procedure (its an after-cleaning procedure)

Cleaning Procedure (see email dated 20110126) says immerse these in methanol and isopropanol. MicroSense says don't. NEED TO RESOLVE the warranty issues that our cleaning procedure may void.

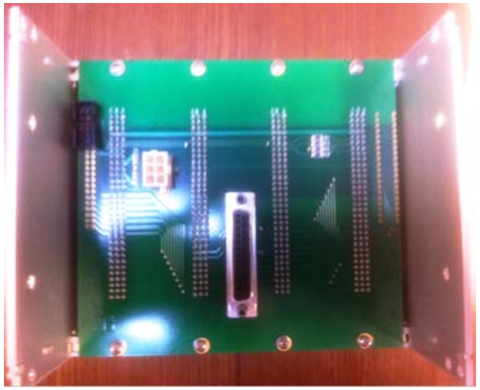
For both the HAM and BSC systems, the regulator BOARDS are the same model numbers (D1001474). However, the HAM RACKS have <type 1> connectors while the BSC PROBES have <type 2> connectors. Thus the HAM RACK interconnect CABLES are also different from the BSC RACK interconnect cables. NEED TO CHECK for CABLE part numbers.

Additionally, the regulator board ASSEMBLY has two flavors – one that has two DB-9 connectors (presumably for Rack 1) and one that only has one DB-9 connector. NEED TO RESOLVE: How to name and number these assemblies.

It is not blatantly obvious how these racks will be mounted on the interferometer. The cable lengths of the probes are fixed and seem to be too short to allow for placement of the racks together in one place. In addition, the fact that the HAM version has only two racks could be problematic, and the fact that the manufacturer is configuring the BSC racks to have 4 2mm in the first rack, 4 0.5mm in the second, and then a combination of 2 2mm and 2 0.5mm in the third rack is likewise problematic.

SEI BSC CPS Racks and Gauges

Rack – front view with
4 Gauges inserted



Rack – rear view
showing 3 connectors

Gauge – showing serial number
and calibration data

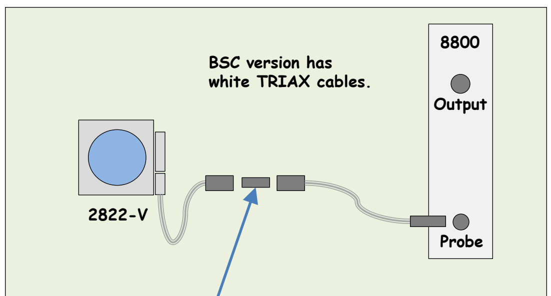
Probe – showing cable
and sensor

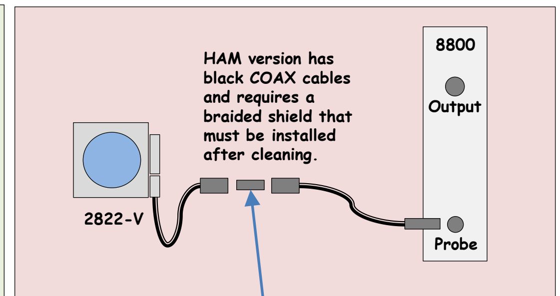
SEI CPS – HAM vs BSC Probes

Gauges, probes, and cables are used as a unit. The cables are part of the factory calibration and should be kept with their respective gauge – probe combination. However, the manufacturer did say that the cables are the same length by design, and interchanging them should have little effect.

For both the HAM and BSC systems, the GAUGES are the same model numbers - 8800. However, the HAM PROBES have COAX cables and connectors while the BSC PROBES have TRIAX cables and connectors.

The BSC system has gauges that are scaled to two ranges: 0.5mm (+/- 0.25mm) and 2.0mm (+/-1.0mm). The only external way to tell them apart is by serial number. Note: The gauges are labeled but the label is on the inside of the mounting rack and cannot be seen externally.





Trompeter TRIAX
bulkhead connector
(BJ3158)

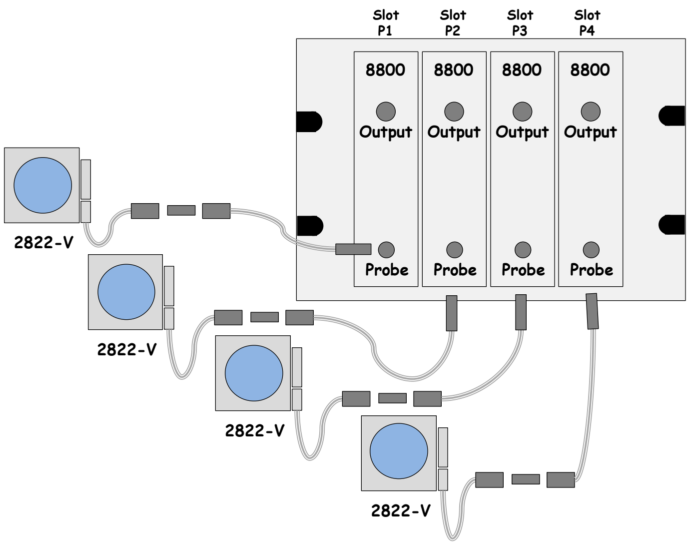
BNC connector F/F

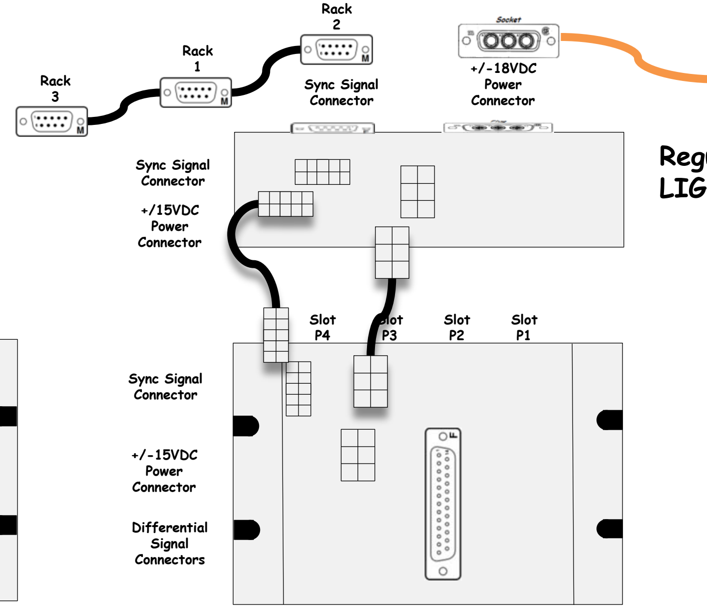
Feed-through adapter –
TEI 14949 305-755
BJ3158 Triax bulkhead

See Dxxxxxx for
instructions about
braid installation.

SEI CPS – HAM vs BSC Regulator Boards

For both the HAM and BSC systems, the regulator boards are the same model numbers. However, the HAM RACKS have <type 1> connectors while the BSC RACKS have <type 2> connectors. Thus the HAM RACK interconnect CABLES are also different from the BSC RACK interconnect cables.





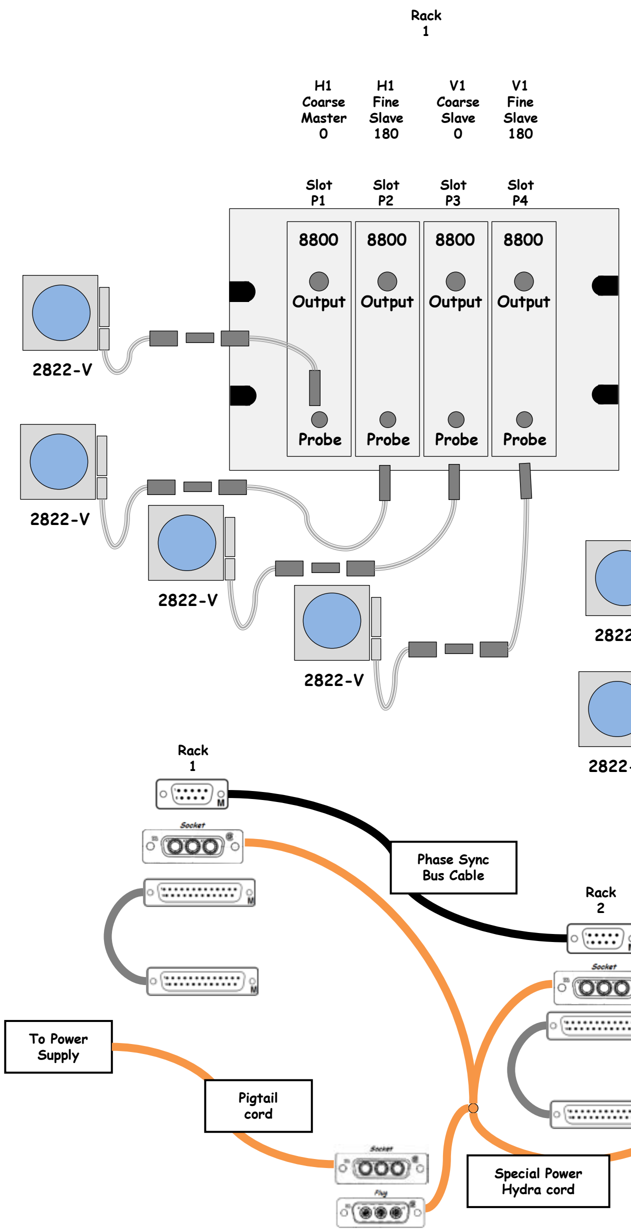
Regulator Boards – LIGO provided

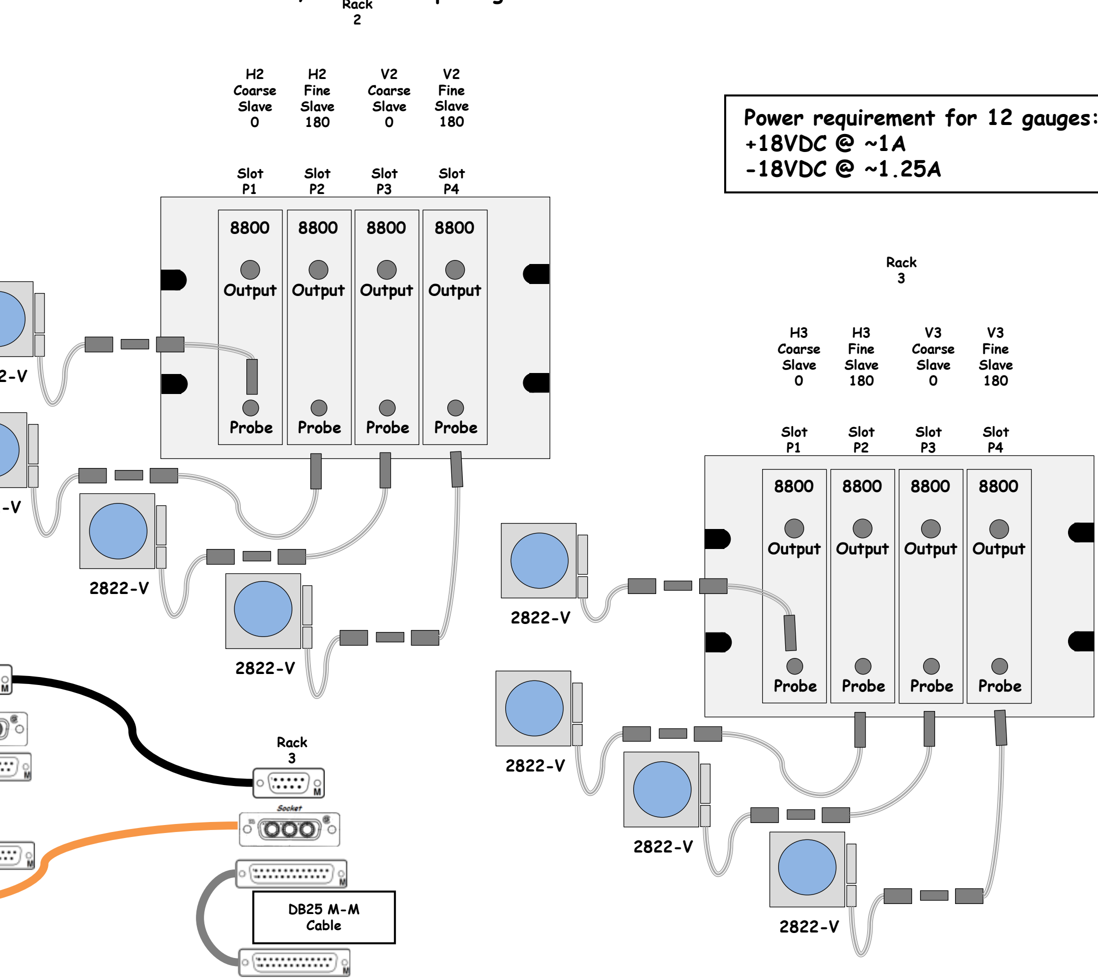
SEI CPS – HAM vs BSC Configurations

For HAM systems, a set of racks consists of only two (2) racks. Each set of racks must have one master gage and all the others must be slaves. (This may be a geometry problem later, requiring three racks instead.)

For BSC there are three (3) racks. Each rack must have +/-18VDC, and the racks must be interconnected for syncing of their phases. Each rack also has a 25 Pin Differential Signal cable which brings only 4 differential signals to the interface chassis. So the power and phase sync is daisy-chained, but the output signals are not.

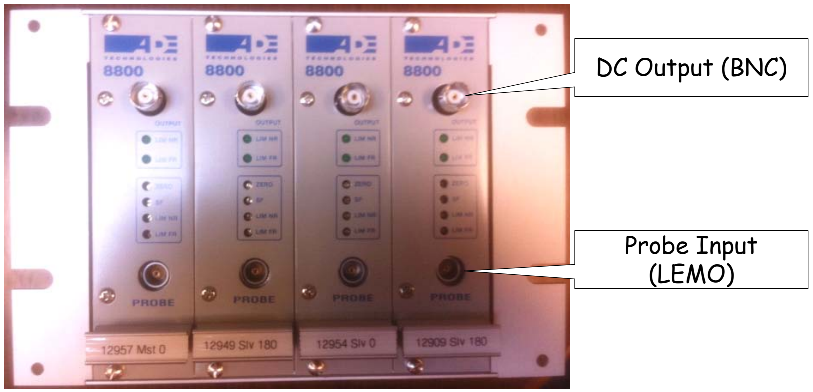
Power requirement for 12 gauges:
+18VDC @ ~1A
-18VDC @ ~1.25A



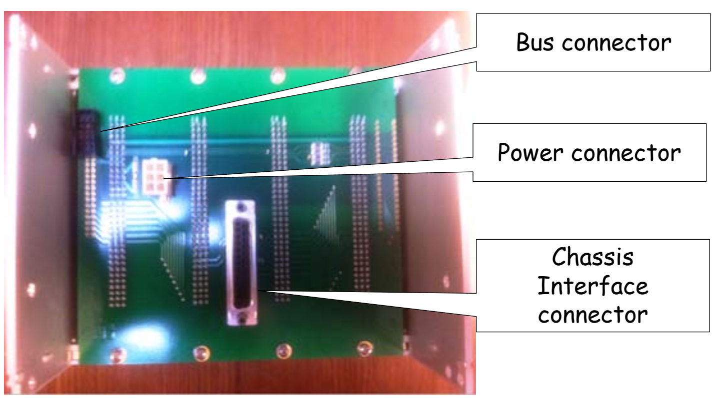


SEI BSC CPS Rack Connections

Rack – front view with 4 Gauges inserted



Rack – rear view showing 3 connectors



SEI BSC CPS Gauge, Sensor, and Cable

Probe – consisting of sensor and cable with Triax connector. The serial number is on the sensor.

Cable – non-serialized, but calibrated with a given probe-gage pair.

It is <u>designed</u> to be interchangeable between probes without too much effect, whatever that means.

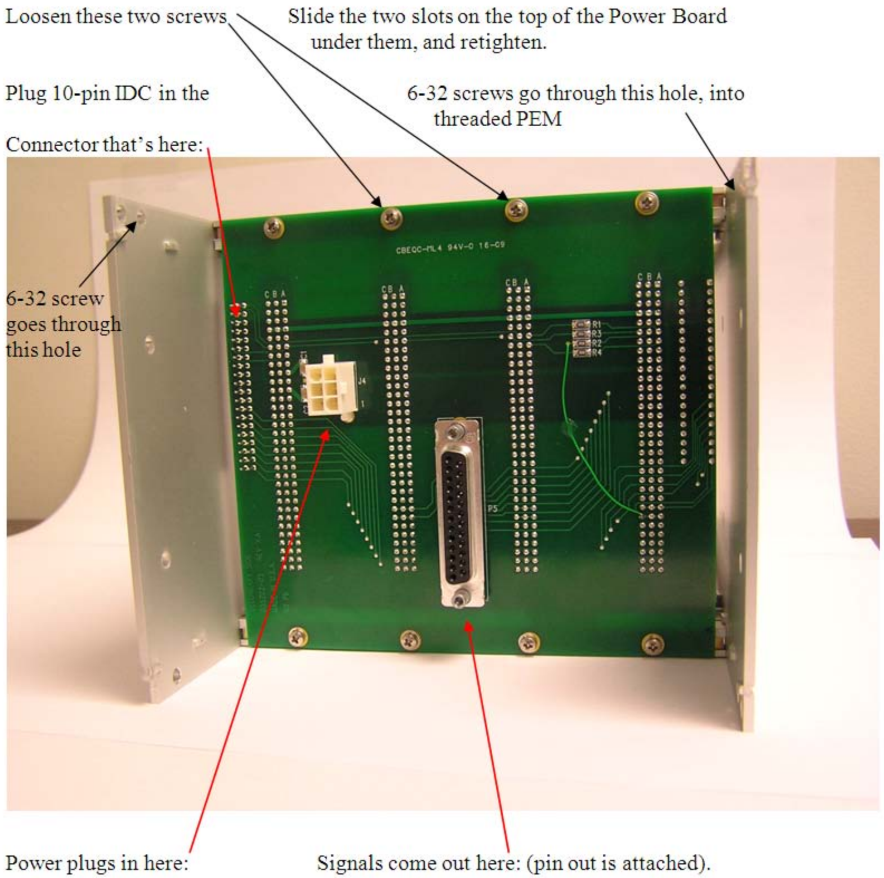
Gauge (gage) – showing serial number and calibration data.

Sensor – Cable assembly is in-vacuum.

Gauge – Cable pair is in-air.

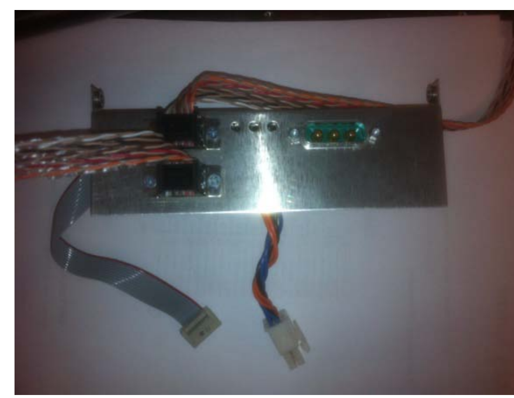
Vacuum flange is located here in the circuit. Thus the Triax bulkhead is located here for test purposes..

Joining the Power Regulator Assembly to the MicroSense Rack

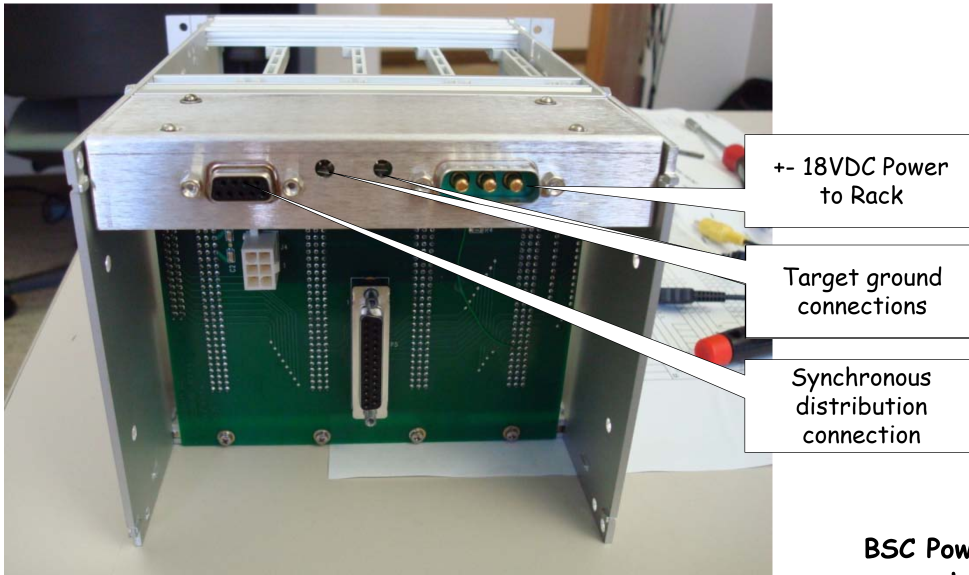


The Regulator Board Assembly is joined to a MicroSense Rack at some point in the assembly process, but it is unclear when.

In addition, there are two flavors of regulator assemblies: one has one DB9 connector, and the other has two DB9 connectors.



SEI BSC CPS Rack Connections



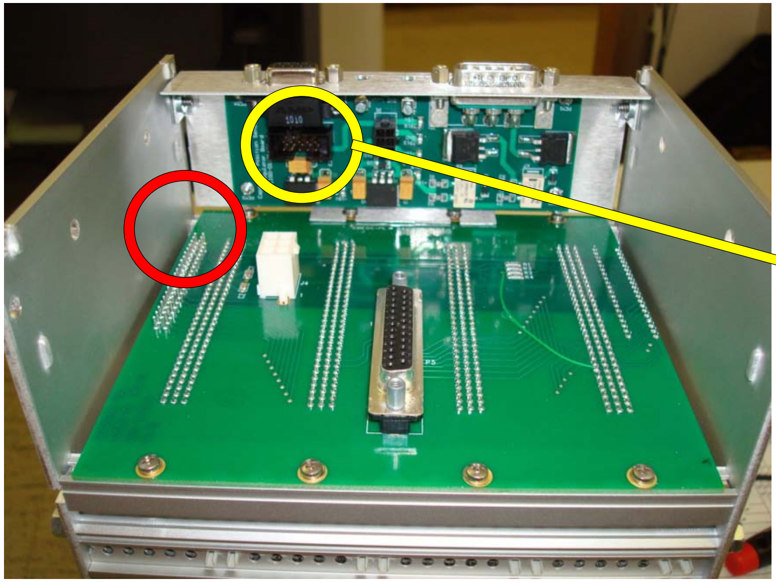
Prototype shows 2 holes for target ground. There are 3 holes on the production board.

The D1001474 Regulator Board is assembled together with its housing and jack sockets, but the housing seems to have no DocDB number yet.

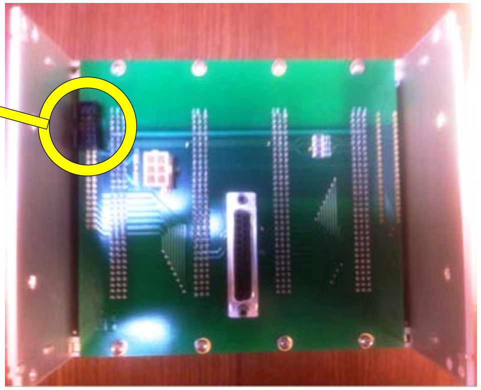
BSC Power Cable – used to connect DC Regulator Board to BSC Rack backplane.

BSC Bus Cable – used to connect DC Regulator Board to BSC Rack backplane.

Connecting the Power Regulator Assembly to the Rack (1)



(Prototype rack does NOT show connector…)

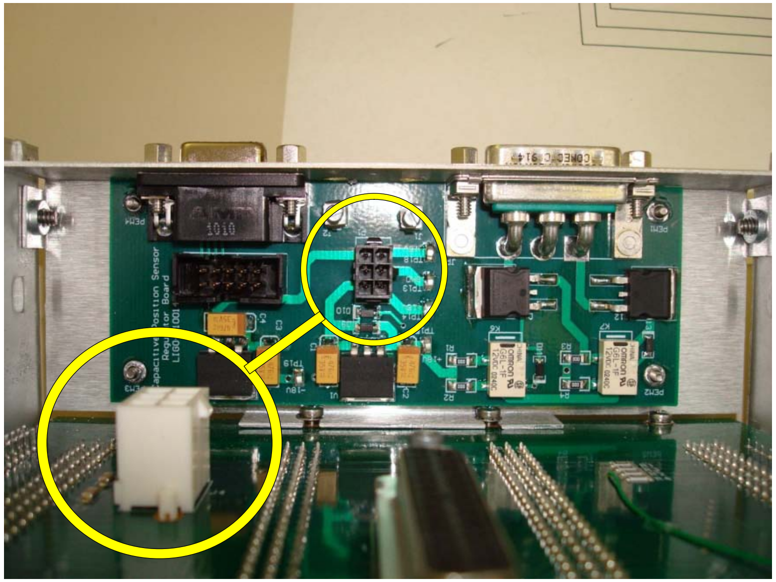


(Production rack shows connector…)

Bus Cable – used to connect DC Regulator Board to Rack backplane.

The connector P2 connects between a customized MicroSense connector that is located on the backplane to distribute the sync signal in/out via the D9 connector.

Connecting the Power Regulator Assembly to the Rack (2)



Power Cable – used to connect DC Regulator Board to Rack backplane.

Questions regarding complete documentation

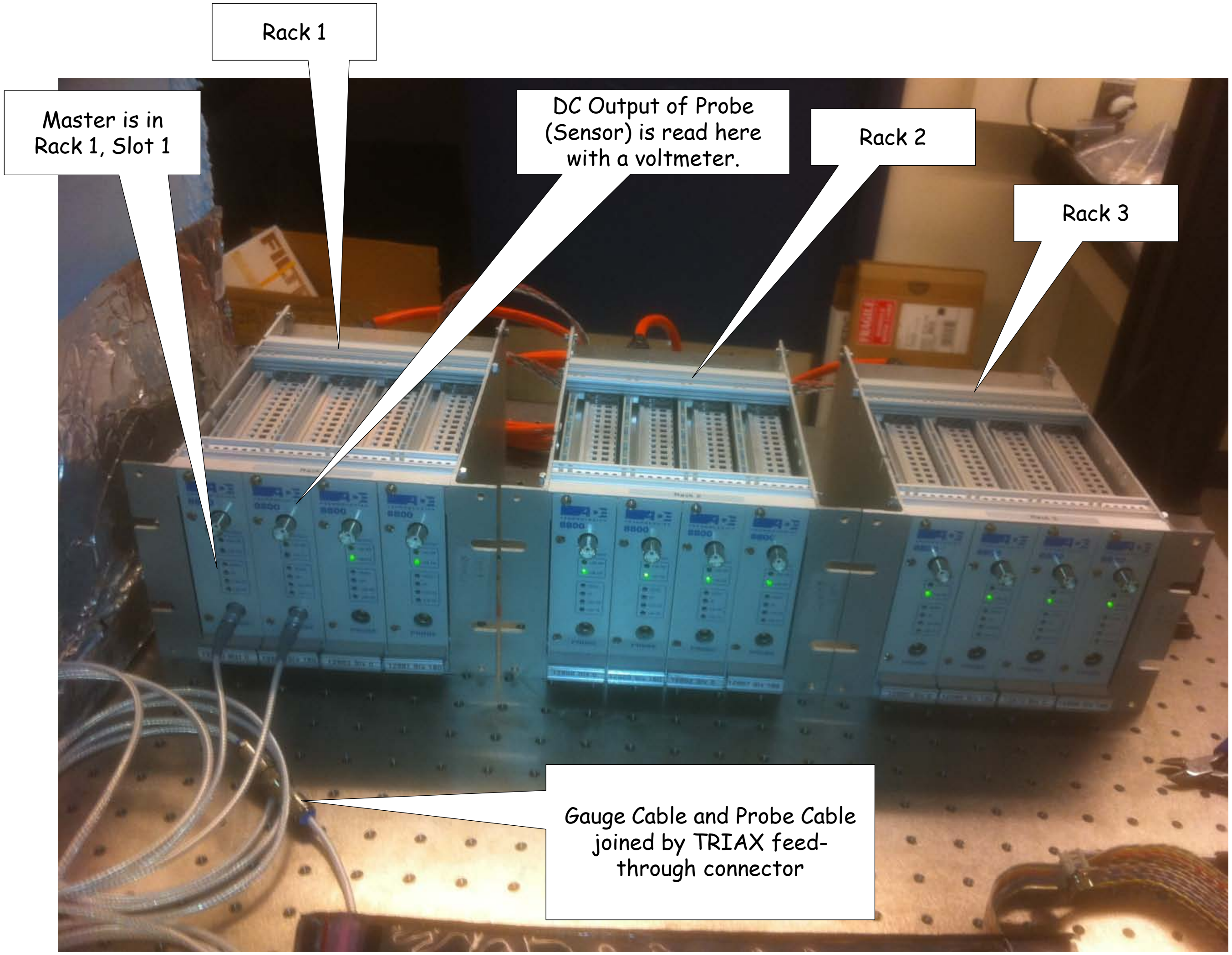
1) **Does the HAM version get tested with the braid or without? How does that affect the results?**

2) **Should the manufacturer's concerns about cleaning be recorded in this document?**

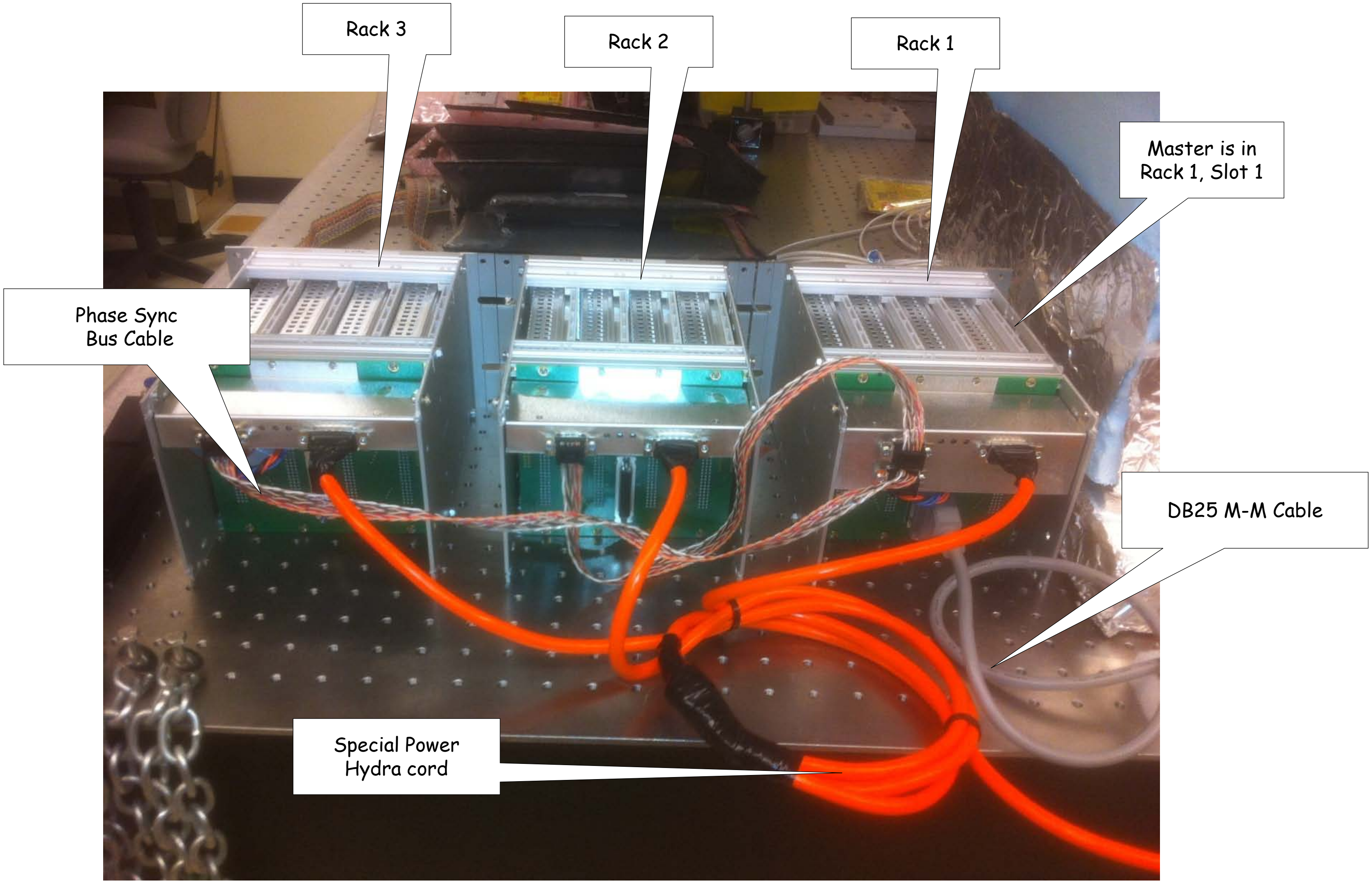
3) **There need to be Top Level Assembly documents for**
    a) **HAM racks**
    b) **HAM gauges**
    c) **HAM probes**
    d) **HAM gauge cables**
    e) **HAM regulator boards**
    f) **HAM regulator board assemblies**
    g) **HAM regulator board cables**
    h) **HAM rack assemblies**

4) **There need to be Top Level Assembly documents for**
    a) **BSC racks**
    b) **BSC gauges**
    c) **BSC probes**
    d) **BSC gauge cables**
    e) **BSC regulator boards**
    f) **BSC regulator board assemblies**
    g) **BSC regulator board cables**
    h) **BSC rack assemblies**

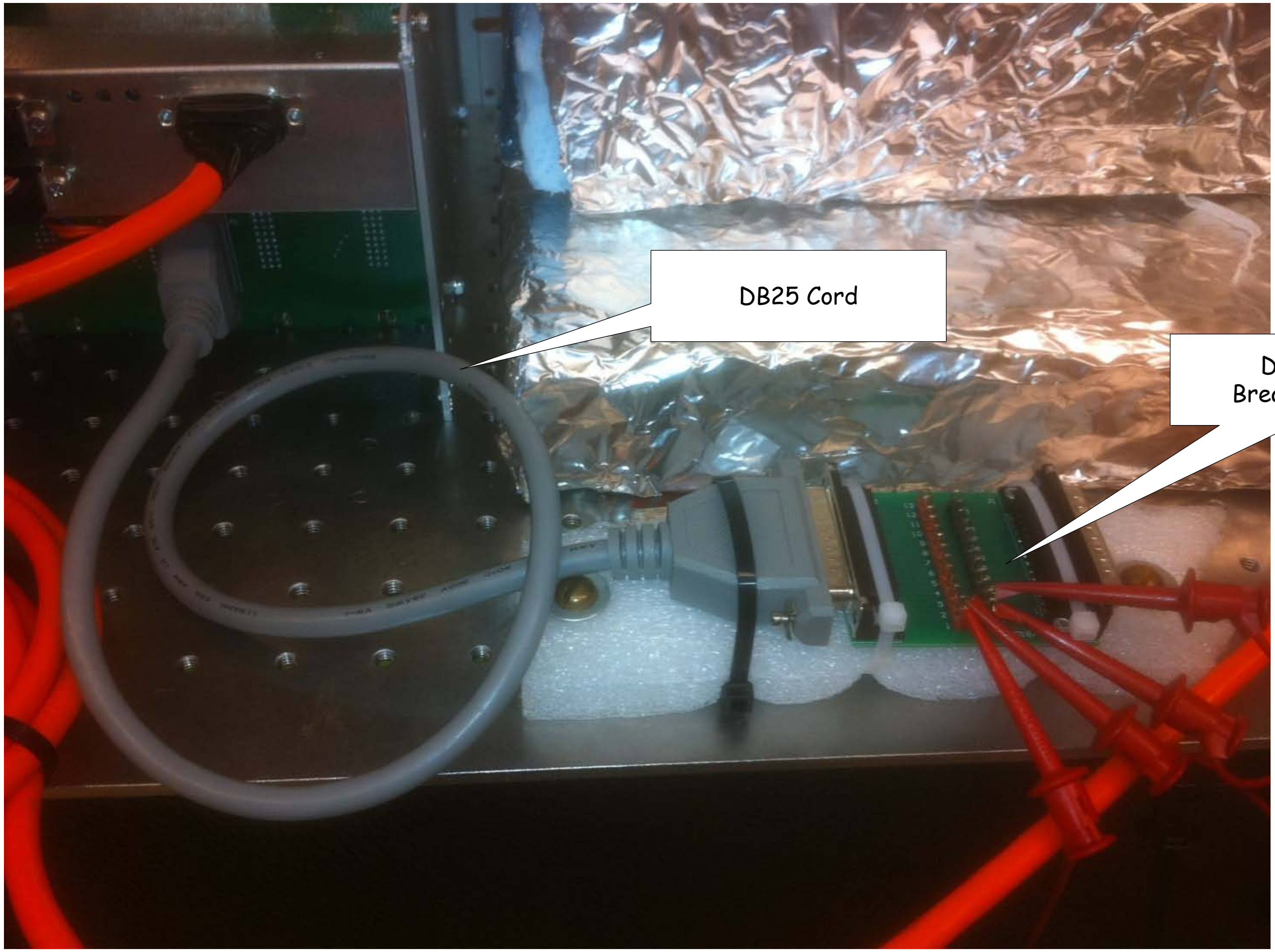
3-Rack Test Setup - Front



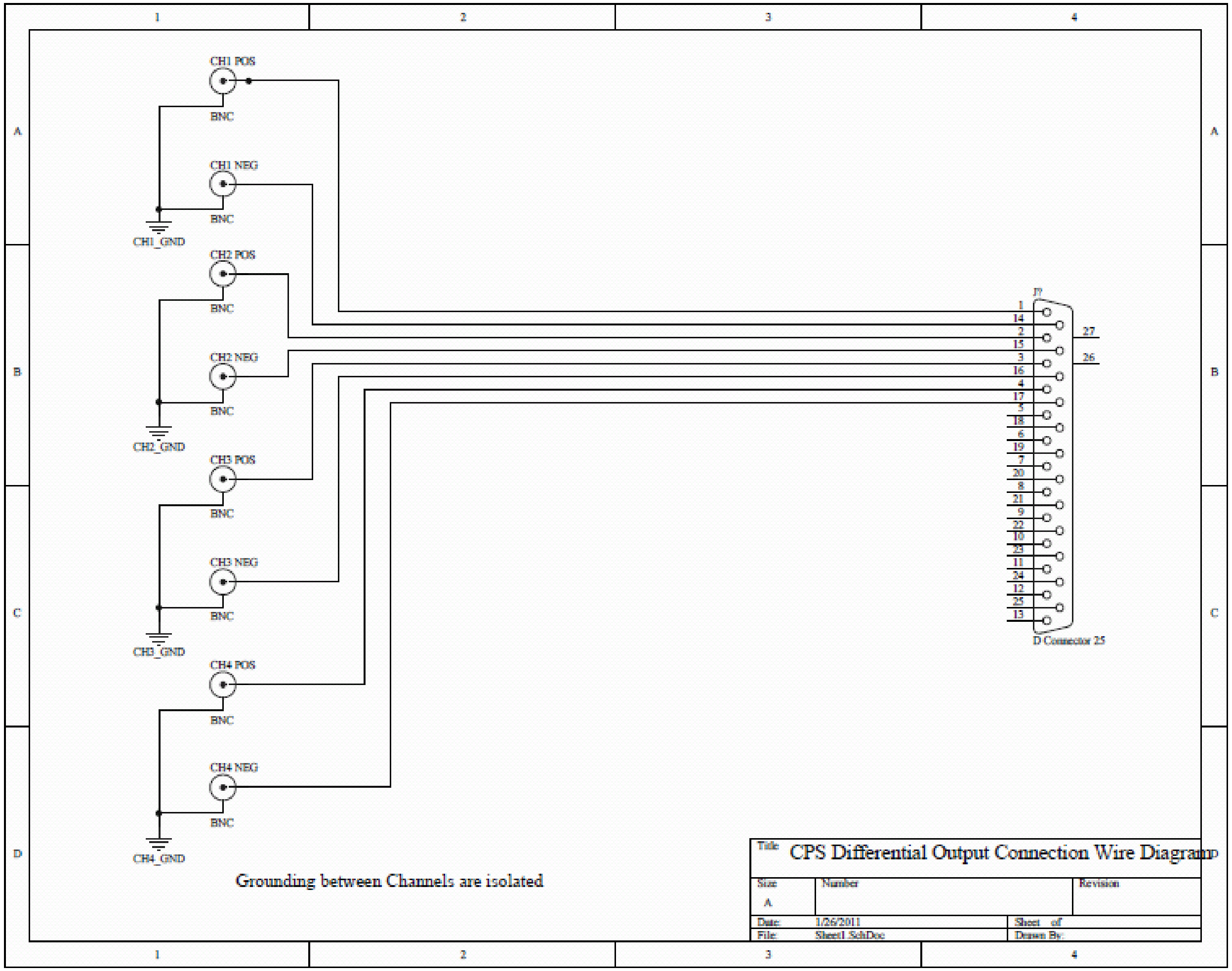
BSC 3-Rack Test Setup - Rear



Differential Signals Are Picked Off Here

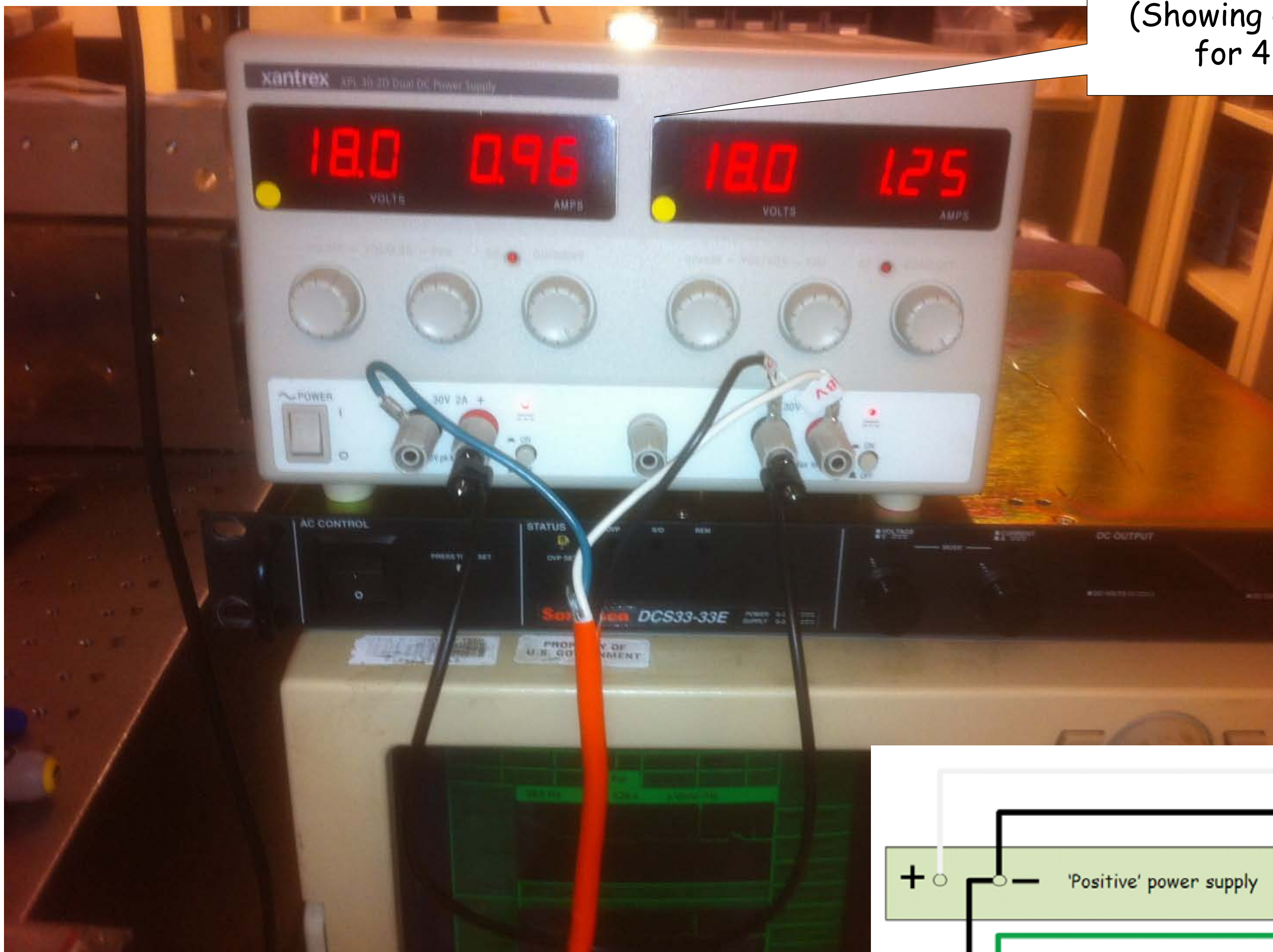


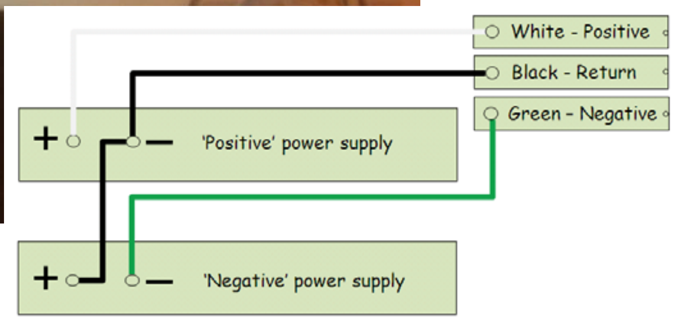
Differential Output Connector Pin-out Diagram



DC Power Supply Setup

(Showing Current Usage for 4 Channels)





Note on Cleaning Procedure for CPS Probes

This procedure is euphemistically called “22.
It probably has a real name.

Subject: Re: Fwd: MicroSense capacitive position sensor information
From: Jodi Fauver <fauver_j@ligo-wa.caltech.edu>
Date: Wed, 26 Jan 2011 16:05:53 -0800
To: Celine Ramet <cramet@ligo-la.caltech.edu>
CC: David kinzel <dkinzel@ligo-la.caltech.edu>, Hugh Radkins <radkins_h@ligowa.
caltech.edu>
Celine-
Sorry to take so long getting back to you.
The "22 states:
12.25.5. SEI position sensor probes (ADE-made probes) with kapton coated wire (for actuator assemblies)
• Ultrasonic clean in methanol for 10 minutes.
• Soak in isopropyl alcohol for 10 minutes agitating regularly.
• Dry under heat lamp for at least 48 hours.
• Air bake at 100 deg C for 48 hours (max temp of 100C per ADC, supplier of probes)
• Bake in vacuum at 100oC for 48 hours. (max temp of 100C per ADE, supplier of probes)
This IS the procedure we follow. It is fairly tedious but seems to work. The original procedure included the methanol and isopropanol cleaning followed by the heat lamp drying then vacuum bake. We added the 48 hour air bake after the first set of sensors failed RGA.
J

Steps (1)

1) **Assemble the probes and gauges in their racks.**
    1) **Racks**
    2) **Gauges**
    3) **Gauge cables**
    4) **Probes**

2) **Gather the test equipment and supporting cables and tools.**
    1) **SR785 Spectrum Analyzer**
    2) **DC Power Supplies (+18VDC @ ~1A and -18VDC @ ~1.25A)**
    3) **DC Voltmeter (Multi-meter)**
    4) **DC Power Pigtail**
    5) **TRIAX feed-through connectors**
    6) **Special Power Hydra cord**
    7) **Phase Sync cables**
    8) **5 BNC-BNC cables (one for DC Voltmeter, 4 for SR785)**
    9) **4 BNC – mini-clips (for SR785)**
    10) **M-M DB-25 cables**
    11) **D09 01870 25 Pin Breakout Board**
    12) **Precision Gap Measurement Jig**
    13) **Screws**
    14) **Screwdriver**
    15) **Aluminum foil covered Styrofoam box**

3) **Prepare the test equipment.**
    1) **The SR785 must be warmed up.**
    2) **The DC Power Supplies must be able to source enough current.**
    3) **The jig should fit inside the Styrofoam box**
    4) **The area in which the measurements are being made should be relatively thermally stable, though that is one of the purposes of the Styrofoam box.**

Steps (2)

4) Measure and store data for each probe – gauge serial number.

   1) Both hardware and software must be set up. Two frequency ranges are measured. There are two .S78 files that are setup files for the SR785. They are named SETUP1.S78 and SETUP2.S78. SETUP1 measures up to 6Hz, and takes about 30 minutes to run. SETUP2 measures up to 100Hz and takes about 2 minutes to run. The measurements from these setups will later be concatenated in a single plot. Two probes are measured at a time. Differential measurements are made in both channels (A and B) of the SR785, and a specific channel should be used for both measurements of a specific probe, though it does not matter which.

   2) Set up two probes on the jig by screwing them down on appropriately chosen fixture ports. Fixture ports are chosen for their depth and for the calibrated full-range of the serial number of the probe being measured.

   3) Cable the probes to their mating gauges using the gauge cable that they were shipped with. The LEMO connector of that gauge cable connects to the gauge. The TRIAX connector of that cable connects to the TRIAX feed-through adapter, and the probe cable TRIAX connector connects to the other side of the TRIAX fed-through adapter.

   4) Check that the probe is at approximately 0.0VDC (the center of its range) by measuring the DC output at the BNC port of the gauge.

   5) If it is not connected already, connect the DB25-F of the rack that hold the gauges to the D0901870 25 Pin Breakout using a DB25 M-M cable. The Differential Output Connector Pin-out Wiring Diagram defines which pin-out will provide the differential signals that are to be fed into the SR785. It does not matter in which SR785 channel a probe is measured, but it must be remembered long enough to be sure that both frequency range measurements are saved.

   6) Connect the center clip (red) of one BNC-mini-clip connector to the breakout board pin-out of the designated differential channel. Connect the center clip (red) of another BNC-clip connector to the corresponding pin-out of the same designated channel. Connect the black clips of these BNC-clip connectors to each other.

   7) Recall one of the setup files and run that measurement.

   8) Data Storage is done to floppy disks, first. There are two measurements made per probe serial number. Some sort of naming scheme should be followed, but there are only 8 characters allowed for a filename. Thus there will be a need to abbreviate, encode, of just list the filenames and the serial numbers of the probe that they reference, differentiating as well between the frequency setup that was measured.

   9) Save the measurement from the first setup for channel A and then for channel B. (You will be saving two files.)

   10) Recall the other setup file and run that measurement.

   11) Save the measurement from the second setup for channel A and then for channel B. (You will be saving two files.)

Steps (3)

5) Process and report the data.
    1) Each floppy disk holds a limited number of measurements. The data must be uploaded to a computer that
        1) Has access to SRT785.EXE, a program provided by Stanford Research that converts .78D (measurement) files to MATLAB-readable files, and
        2) Has access to MATLAB, the program that reads those converted files in pairs, and produces the overloaded (concatenated) plot files.

    2) The MATLAB script file that reads and plots is "sr785_gains_ade.m". It may need modification to support file naming schemes of your own creation.

6) Specs for each probe are based on its full-range calibration, and are derived in the technical report T0900450.

Sample Measurement Data