

Submillimeter Array Technical Memorandum

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From: Bill Bruckman *WRB*

Subject: Receiver cabin equipment baseline

On 4/18/90 Colin, Ray, Eric B., and I met to try to establish a baseline for the equipment contained in the receiver cabin. A functional block diagram for the equipment is attached along with a list of the equipment and a description of each item. All numbers for size, weight, and power consumption are best guesses at this time. The diagram and list will be updated as required to reflect better estimates as they become available or any changes in the configuration of the equipment.

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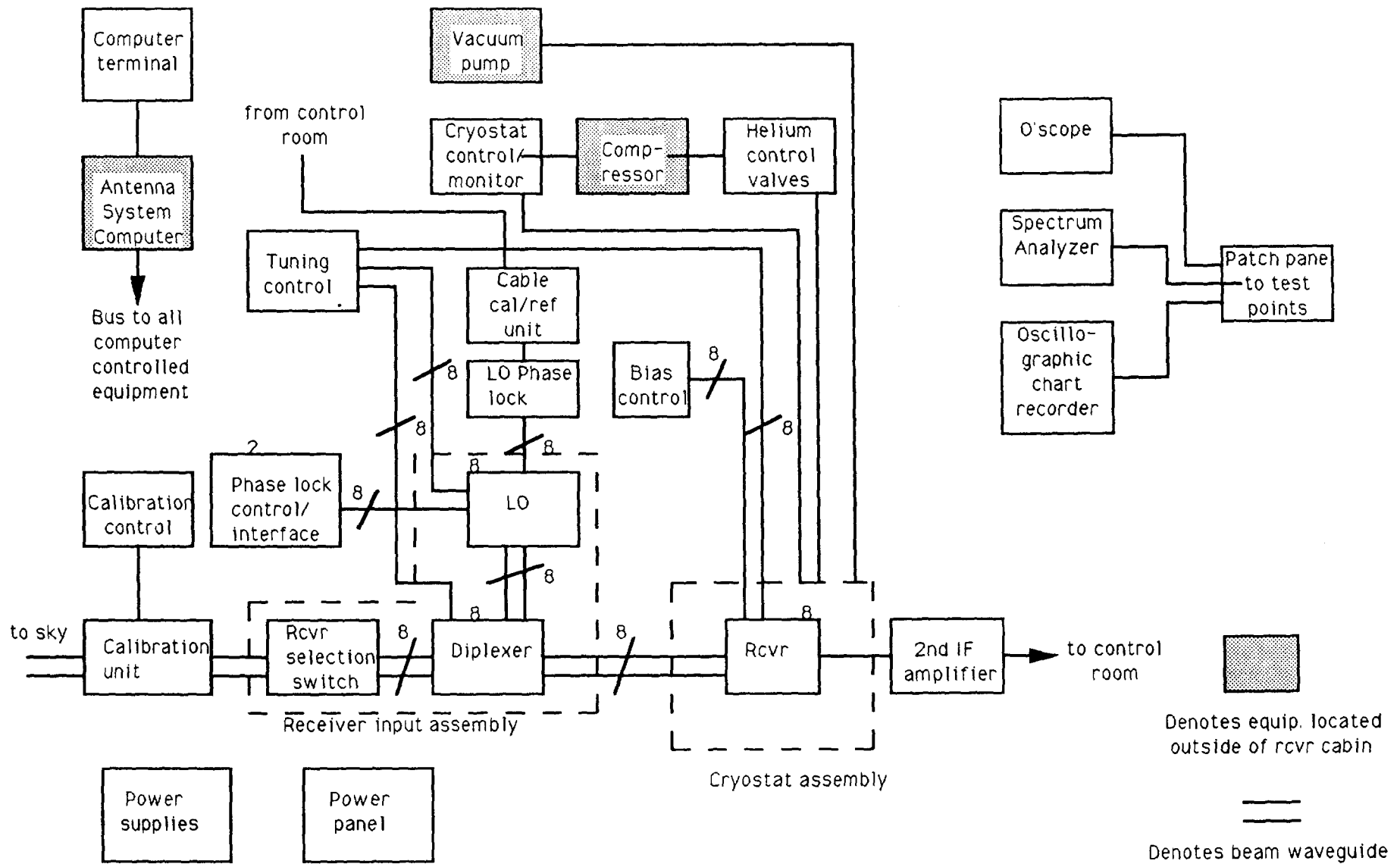
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Block Diagram for Receiver Cabin Electronics

Receiver Cabin Equipment List

Calibration unit

This assembly contains optical elements to perform chopping to the sky, a hot plate calibration source, and a cold plate calibration source. The calibration sources are part of the assembly.

Size: 12 in. high x 30 in. wide x 30 in. deep

Weight: 60 lbs.

Power: 50 watts

Receiver input assembly:

This assembly is mounted to the top of the dewar and contains the following:

Eight diplexers arranged in a circle.

A central, rotatable, polarization splitter which splits the incoming beam into horizontal and vertical polarizations and directs the two resulting beams to two diplexers located opposite to one another on the circle. (Rotation of this splitter switches between receiver pairs.)

Eight local oscillators mounted in a ring outside the diplexers.

One circular polarizer which can be switched in or out of the optical path for the two 345 ghz receivers. (may be part of calibration unit)

Lens and/or mirrors required to direct the beams into the dewar.

Size: 30 inches dia. x 10 inches high

Weight: 80 lbs.

Power: 100 watts

Phase lock control/interface units

Two, standard 19-inch, rack-mount chassis which contain electronics to phase lock the LO and the LO reference.

Size: 19 in. wide x 8.75 in. high x 20 in. deep

Weight: 35 lbs.

Power: 100 watts

Calibration control unit

One, standard 19-inch rack-mount chassis which contains electronics to control the calibration optics and calibration sources.

Size: 19 in. wide x 8.75 in. high x 20 in. deep

Weight: 35 lbs.

Power: 100 watts

Computer terminal

One, standard 19-inch rack-mount terminal with keyboard connected to the antenna system computer.

Size: 19 in. wide x 15.75 in. high x 20 in. deep

Weight: 35 lbs.

Power: 80 watts

LO phase lock unit

These two units generate phase lock references and lock the LO signals (one per active receiver). The units should be mounted on or very near the receiver input assembly and the cable lengths running from the LO phase lock units to the LO's should be minimized.

Size: 19 in wide x 7 in high x 20 in deep

Weight: 30 lbs.

Power: 75 watts

Cryostat monitor and control unit

One, standard 19-inch rack-mount chassis which contains electronics to monitor and control the refrigeration of the cryostat.

Size: 19 in. wide x 5.25 in. high x 20 in. deep

Weight: 25 lbs.

Power: 50 watts

Bias control unit

One, standard 19-inch rack-mount chassis which contains electronics to monitor and control the bias voltages within the receiver.

Size: 19 in. wide x 8.75 in. high x 20 in. deep

Weight: 35 lbs.

Power: 100 watts

Tuning control unit

Two, standard 19-inch rack-mount chassis which contain electronics to tune the receivers.

Size: 19 in. wide x 8.75 in. high x 20 in. deep

Weight: 35 lbs.

Power: 100 watts

Helium control valves

Several valves will be needed to control/direct the flow of helium. Number and type is TBD.

Size: 18 in. wide x 18 in. high x 6 in. deep

Weight: 25 lb

Power: 0

Cryostat assembly

The cryostat will be TBD part number manufactured by TBD. The cryostat will house eight receivers arranged in a circle. The receivers will be modular, so that one receiver can be pulled out the bottom of the cryostat without disturbing the other seven. The baseline full complement of receivers will be three 230 ghz receivers, two 345 ghz receivers with opposite polarizations, one each 490 ghz , 690 ghz, and 840 ghz receivers. The two 345 ghz receivers will be located opposite one another on the circle and a 230 ghz receiver will be located opposite each 490, 690, and 840 ghz receiver. This gives the following operational receiver pairs:

230 ghz with 490 ghz
230 ghz with 690 ghz
230 ghz with 840 ghz
345 ghz hor. polarization with 345 ghz vert. polarization

Size: 36 in. high x 24 in dia.

Weight: 180 lbs.

Power: 50 watts

2nd IF amplifier unit

One, standard 19-inch rack-mount chassis which contains electronics to amplify and condition the 2nd IF outputs of the receivers for transmission back to the control room.

Size: 8.75 in. high x 19 in. wide x 20 in. deep

Weight: 35 lbs.

Power: 100 watts

Cable length calibration unit and reference generator

This unit needs to be mounted near the receivers. It receives the LO reference from the control room, calibrates for cable length, and sends a reference signal to the LO phase lock unit.

Size: 7 in. high x 19 in. wide x 20 in. deep

Weight: 35 lbs.

Power: 100 watts

Oscilloscope

One, standard 19-inch rack-mount commercial oscilloscope for use in testing.

Size: 8.75 in. high x 19 in. wide x 20 in. deep

Weight: 35 lbs.

Power: 100 watts

Spectrum analyzer

One, standard 19-inch rack-mount commercial spectrum analyzer for use in testing.
(May be only a display which shows display of a spectrum analyzer located in the control room.)

Size: 8.75 in. high x 19 in. wide x 20 in. deep

Weight: 35 lbs.

Power: 100 watts

Oscillographic chart recorder

One, standard 19-inch rack-mount commercial oscillographic chart recorder for recording test data.

Size: 10.5 in. high x 19 in. wide x 20 in. deep

Weight: 35 lbs

Power: 200 watts

Patch panel

One, standard 19-inch rack-mount patch panel for routing test signals.

Size: 10.5 in. high x 19 in. wide x 8 in. deep

Weight: 35 lbs.

Power: 0

Power supplies

Three, standard 19-inch rack-mount power supplies.

Size: 8.75 in. high x 19 in. wide x 8 in. deep

Weight: 50 lbs.

Power: 100 watts

Power panel

An enclosure to house circuit breakers and distribute AC power.

Size: 16 in. high x 12 in. wide x 6 in. deep

Weight: 25 watts

Power: 0

Environmental control unit

Unit to monitor and control temperatures within the receiver cabin. Includes air distribution/ventilation ducts, refrigeration unit (if required), sensors and control electronics.

Size: 20 in. high x 16 in. wide x 20 in. deep

Weight: 80 lbs

Power: 500 watts