4-10-00

Memorandum

To: K. Crady, R. Groves, A. R. Kerr, D. Koller, G. Lauria, S. -K. Pan

cc: J. Webber

From: J. Effland

Date: 10 April 2000

Subject: Work Schedules and Preparation for Sideband Separating, Balanced Mixer Measurements

Introduction

There is considerable interest in the performance of the sideband separating, balanced mixer design. Consequentially, it is essential that the measurement system be available as soon as the mixers are ready for testing. Careful planning is required over the next two months to ensure that this happens.

This memo presents information on the following effort:

1. Instrumentation and schedules required to test sideband separating, balanced mixer noise temperature measurements.
2. Schedule for the completion of the remaining two preamp bias supplies
3. Construction of the JT-1 Dewar, and
4. Software development for automated mixer performance.

Instrumentation and Schedules for Initial Testing of Sideband Separating, Balanced Mixers

Tony Kerr estimates that the wafer and mounting block for the first mixer assembly will be ready for testing around 1 June 2000. The following gives some details the preparation needed to test this mixer:

1. Interfaces required on the JT-2 Dewar are shown in Figure 1. Integrated IF preamps will not be used during initial mixer tests.
2. The IF system in the Dewar remains essentially unchanged, and will operate only at 1.5 GHz.
3. The Gantt chart showing the schedule of tasks along with resource requirements is shown in Figure 3. I have attempted to allocate 2 weeks for fabrication in the shop, and this forces many of the tasks to be completed at the beginning of the schedule.

4. The new mixer bias supply will not be ready for these tests, so four separate existing bias supplies will be used: Two that are mounted in the JT-2 rack, one from the JT-1 rack, and the fourth from the Mixer 1 rack.
5. Bias to the mixer block will be provided with a 15-pin Nanonics connector. Tony Kerr has some of these connectors. Only 15 pins are required for these initial measurements because some of the bias lines will be shared in the mixer.
6. Several bias cables that run between the thermal break headers in the Dewar and the mixer will be built to allow different mixers to be tested by simply unplugging the bias cable from the headers at the thermal break.

Construction of the Remaining Two Preamp Bias Supplies

Ralph is nearing completion of the remaining two preamp bias supplies. To save time, he is building the subsystems for both in parallel. The only significant assembly work remaining is to complete wiring of the front and back panels. He estimates that they will both be ready for testing in about two weeks.

Construction of the JT-1 Measurement System

The following points pertain to this task:

1. An interfacing summary is drawn in Figure 3.
2. This system will use a warm IF plate and controller identical to that employed in the JT-2 system.
3. Two 3-13 GHz amplifiers will be procured from the amplifier group and arranged in the Dewar in a balanced configuration between two 90° hybrids to provide a good wide-band impedance match.
4. Diode protection for all mixer and amplifier bias lines will be installed inside the Dewar on the room temperature walls. Back-to-back diodes arranged like those in the Preamp Bias supply should be used.

Software to Find the Optimum Mixer Bias

This effort will proceed in the following phases[1] to measure, record, and graph mixer noise temperature as a function:

1. bias voltage and magnet field,
2. IF frequency, and
3. LO power. The LO power will be controlled using a voltage-to-current converter to drive a waveguide modulator. (This will be built from the current design used in the Mixer 1 rack).
4. Routines will be developed to search the multidimensional space and find the optimum operating point.
5. After completion of the steps above, the only remaining parameter to be changed by the computer is LO frequency, and that will wait for a prototype from the LO group.

The schedule for this effort will be released by the end of this week.

[1] "Updates to SIS Mixer Data Acquisition Software to Include Noise Temperature Data", NRAO Memo to K. Crady *et. al*, from J. Effland, Dated 3 Mar 2000.

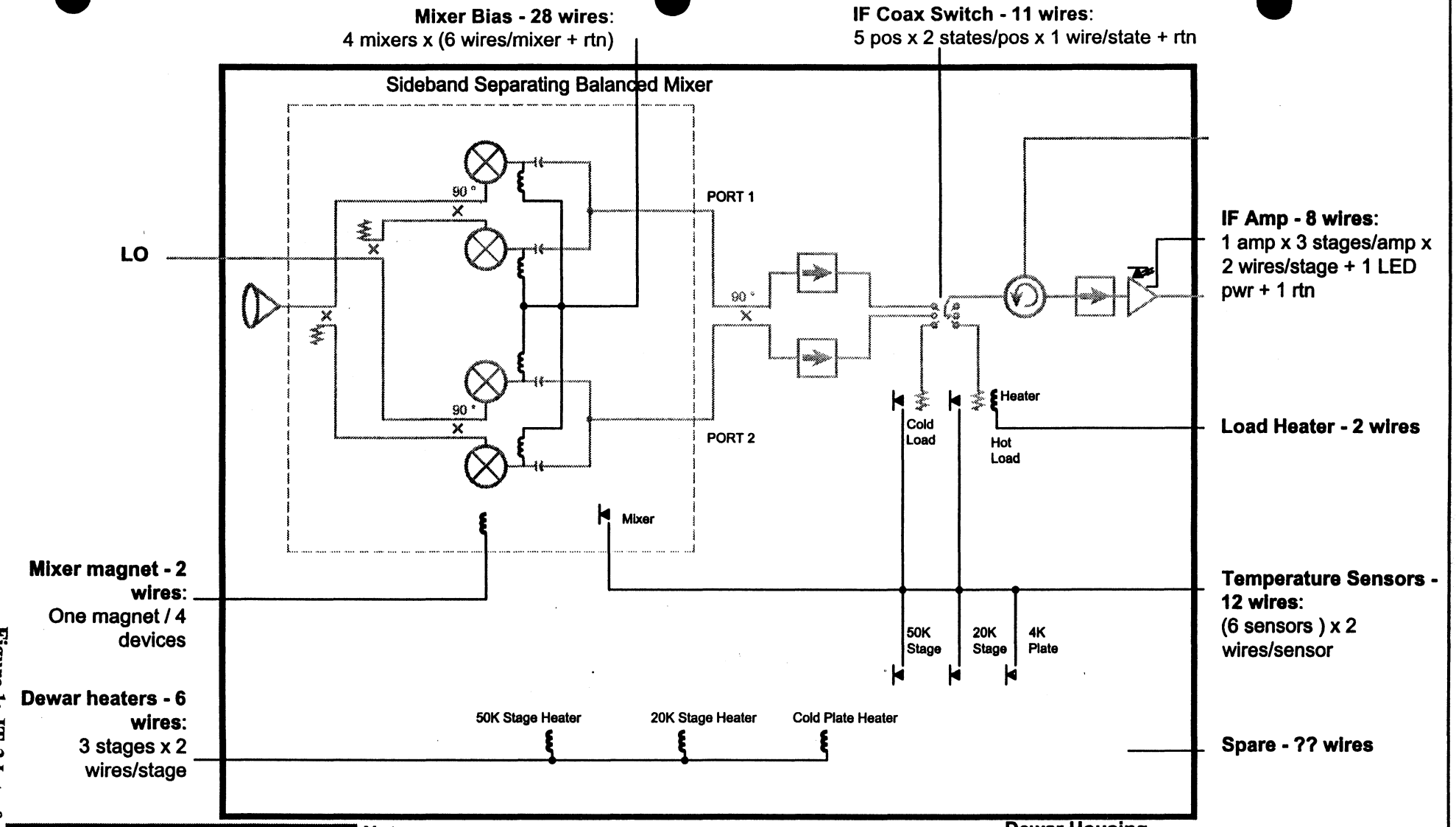
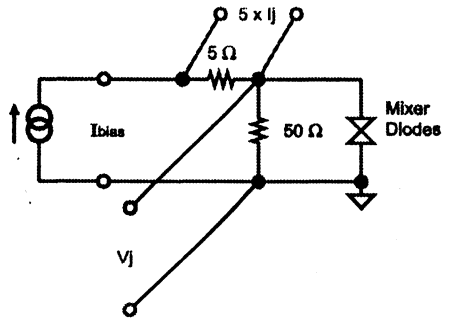


Figure 1: JT-2 Interfaces for Initial SS-BM Tests

Mixer 6-Wire Bias Detail (Each)



Notes:

1) For initial mixer tests using JT-2 Dewar.
2) Mixer block will share some bias lines to reduce number of wires required.
3) Dewar will be configured to support DB-SS Mixer/integrated amplifier tests.

NATIONAL RADIO ASTRONOMY OBSERVATORY CHARLOTTESVILLE, VA. 22903			
TITLE: DEWAR INTERFACES: DOUBLE BALANCED SIDEBAND SEPARATING MIXER TESTS			
PROJECT: SIS MIXER MEASUREMENT SYSTEM			
DESIGN			
DRAWN: JEE 2000-04-07		MATERIAL	
SHEET		FINISH	
COMPUTER DRAWING: \\Eagle\cv-cdl-sis\docs\rack\Dewar\DB-SSInterfaces.dwg			
SCALE: None	DWG. NO.		REV: 00

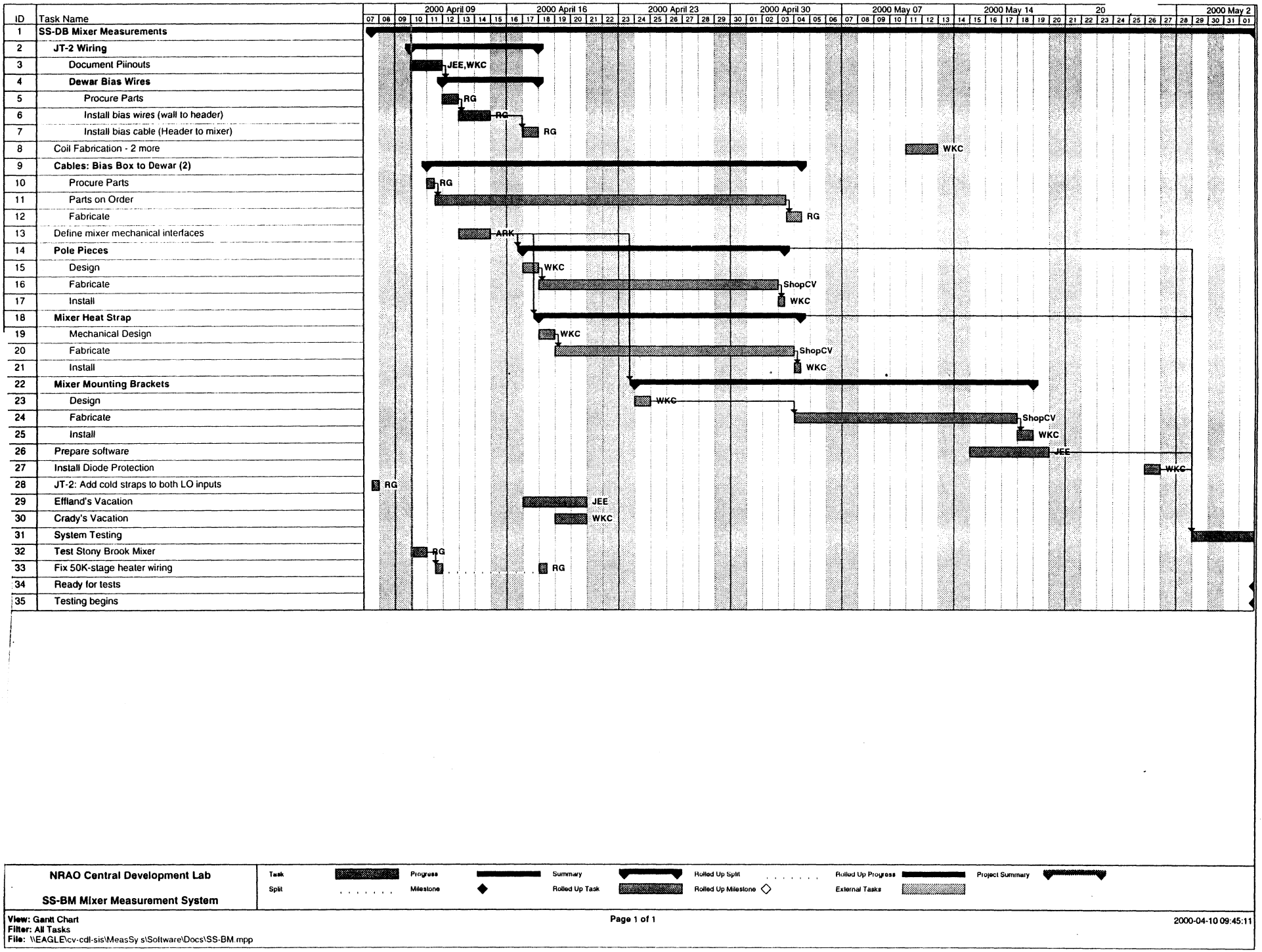


Figure 2: Gantt Chart for SS-DB Mixer Measurement System

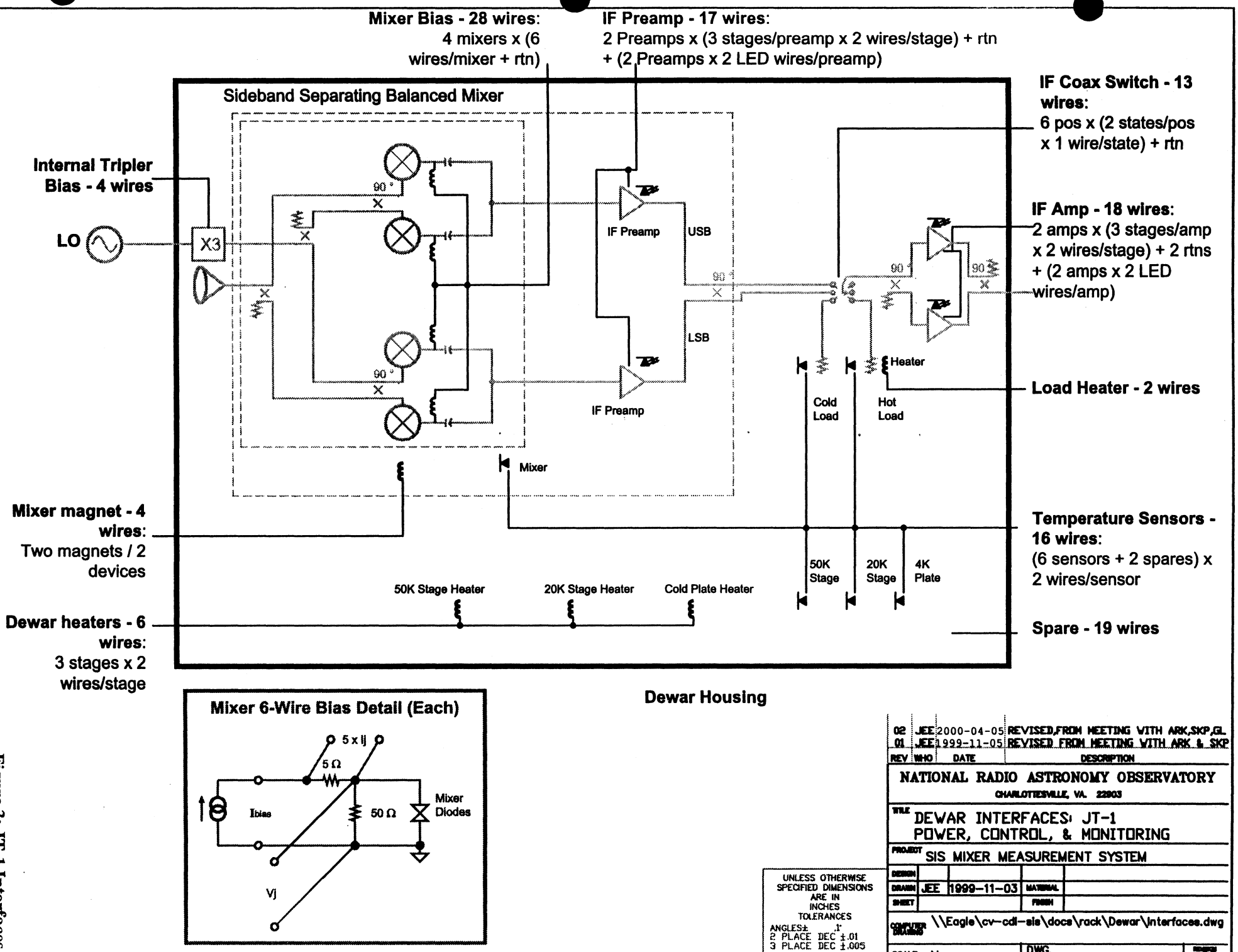


Figure 3: JT-1 Interfaces

REV	WHO	DATE	DESCRIPTION
02	JEE	2000-04-05	REVISED,FROM MEETING WITH ARK,SKP,GL
01	JEE	1999-11-05	REVISED FROM MEETING WITH ARK & SKP

NATIONAL RADIO ASTRONOMY OBSERVATORY
CHARLOTTESVILLE, VA. 22903

TITLE: DEWAR INTERFACES: JT-1 POWER, CONTROL, & MONITORING

PROJECT: SIS MIXER MEASUREMENT SYSTEM

DESIGN:
DRAWN: JEE 1999-11-03
MATERIAL:
SHEET:
FINISH:

COMPUTER DRAWING: \\Eagle\cv-cdl-sis\docs\rack\Dewar\Interfaces.dwg

SCALE: None
DWG. NO.
REVISION: 02

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES
ANGLES± .1°
2 PLACE DEC ±.01
3 PLACE DEC ±.005
4 PLACE DEC ±.001