SENSOR HANDLING PROCEDURES

The dc SQUID sensors from STAR Cryoelectronics usually are provided in a hermetically sealed cryogenic package that protects the SQUID during normal handling and installation. Nevertheless, dc SQUIDs are sensitive electronic components, and to avoid damaging the SQUID it is essential that the user observe the following safe handling procedures.

PLEASE READ THE FOLLOWING HANDLING PROCEDURES BEFORE INSTALLING YOUR SENSOR – FAILURE TO OBSERVE THESE PROCEDURES MAY RESULT IN PERMANENT DAMAGE TO THE SENSOR AND VOID THE WARRANTY.

SQUID PACKAGE

The packaged dc SQUIDs are mounted on FR-4 printed circuit boards using cryogenic epoxy. Electrical connections to the SQUID are made using gold ribbon and an ultrasonic wire bonding technique, while connections to the SQUID input (LTS SQUIDs, if applicable) are made using niobium ribbon. A surface mount device (SMD) resistor typically is mounted on the SQUID printed circuit board as well, which may be used to heat the SQUID above T_c if necessary.

The SQUID is hermetically sealed using an FR-4 cover assembly that is glued to the printed circuit board using cryogenic epoxy. The SQUID sensor is shipped in a box that is fabricated from anti-static materials. When the sensor is not in use, STAR recommends that the sensor be kept in the original shipping box in a dry area, such as a dessicator.

The SQUID pc board includes several solder pads for attaching electrical leads to the sensor and optional filter resistors or other circuit elements. The locations and assignments of the solder pads are shown in the installation drawing for the particular sensor. Before installing the sensor, please consult the installation drawing.

INSTALLATION

The dc SQUID sensor is a sensitive electronic component and should be handled with the same precautions used to handle sensitive semiconductor components. In environments where static electrical discharges are frequent, it is advisable to wear grounded wriststraps and use anti-static tools and workstations when handling the SQUID packages. Before making any resistance measurements on the sensor package, please review the section on troubleshooting.

The SQUID package may be provided with clearance or tapped holes for mounting purposes. Nylon or other non-metallic screws should be used for button-type sensors, while brass screws may be used with sensors having a metallic mounting flange. Since many plastics shrink considerably when cooled to cryogenic temperatures, the screws should not be overly tightened in order to avoid screw breakage or possible damage to the sensor.

WARNING: The use of ac-powered soldering irons to make solder connections to or on the SQUID package is not recommended. An ac-powered soldering iron may inject large voltage transients across the SQUID and damage the Josephson junctions.

STAR Cryoelectronicsstrongly recommends that a battery-powered soldering iron be used to make solder connections to the package or on the SQUID printed circuit board, as well as to terminals inside the room-temperature electronics or elsewhere if they are directly connected to the sensor. The use of an ac-powered soldering iron may inject voltage transients across the SQUID and damage the Josephson junctions. Suitable battery powered soldering irons are available from STAR Cryo-electronics.

WARNING: Do not use excessive heat when making solder connections to the terminals on the SQUID package. Excessive heat may damage the hermetic seal of the package.

The solder pads on the SQUID package or printed circuit board are pre-tinned. Avoid applying excessive heat to the solder pads, as this may damage the hermetic seal or the solder pad. Pre-heat the iron and position the lead to be soldered on the pad, then flow the joint using the soldering iron. The iron should be in contact with the pad only to flow the solder, usually one second or less.

TROUBLESHOOTING

WARNING: Do not use a DMM or any type of meter to check continuity across the SQUID or across other terminals on the SQUID package unless the meter sense current is less than 50 µA.

Electrical connections to the SQUID may be checked using a hand-held DMM or analog meter *if the meter is set to a resistance range such that the sense current used for that range is not more than 50 µA*. This is especially important if resistance measurements are made while the sensor is superconducting – sense currents higher than the recommended maximum may blow out the Josephson junctions. Note that this can happen inadvertently if the meter is set to autorange. For this reason, it is highly recommended that a known fixed range with low sense current be used for all resistance measurements.

Note that the voltage leads for packages equipped with a cooled matching transformer are not connected to the SQUID (they are connected to the transformer secondary in the package). In this case, one may check continuity across the SQUID using the current leads, but the resistance of any filter resistors in the package must be taken into account.