THEORY OF OPERATION

Refer to the schematic diagrams for the QSK Board and the SB-1000 Linear Amplifier while you read the following paragraphs, which describe the circuit operation in detail.

The QSK Board contains no signal logic processing. It is an electronic equivalent of a DPDT relay, except it cannot tolerate high power in the bypass mode. The existing mechanical relay in the Linear Amplifier is used as a bypass switch during exciter-only operation. The QSK Board switches to the transmit mode when its Key terminal is lower than 1.5 volts DC (This can be TTL, CMOS, or open-collector logic, as long as it does not source more than 25 volts, and will sink 100 microamperes to ground).

When the Key input is at a logic high, resistor R116 holds the base of transistor Q105 high. Diode D114 makes sure that Q105 switches when the base voltage is 1.5 volts. The collector of Q105 drives integrated circuit U101 sections D and C through two RC (resistor-capacitor) circuits (formed by R114 and C114, and R118 and C115, respectively). These circuits ensure that switching occurs in the proper sequence to prevent the transmit and receive paths from turning on simultaneously.

Operational amplifier U101D forms an inverter that is referenced to half the supply voltage by the voltage divider formed by resistors R119 and R120. This inverter works with transistors Q101 and Q102 to control transmit diodes D101 and D106 through D109. Q102 discharges the normally high reverse bias on these diodes, while diode D110 provides the discharge path. Q101 is normally forward biased until Q102 turns on and grounds the base of Q101, which turns it off. Q101 forms a current multiplier for resistor R111 to provide rapid switching times without loading the high-voltage supply. Resistor R111 is the only high-voltage load in the transmitter circuit during transmission. The receive transition occurs rapidly due to the current gain of Q101, whose load impedance is 2 megohms during receive and 1 megohm during transmit.

Receive diodes D102 through D105 operate similarly to the transmit diodes with operation amplifier U101C driving transistors Q103 and Q104. The high-voltage loading in this path is about 500 kilohms during transmit and receive. Lamps A101 and A102 provide fuses for the receive diode path. These lamps protect the diodes and your transceiver from becoming damaged if RF is applied without a keying signal (a valid low signal at terminal D).

Operational amplifier U101A forms an interlock circuit that compares the states of the transmit and receive diodes. It prevents transistor Q107 from turning on the cathode circuit of the power amplifier, or Q106 from providing a valid "handshake" when the Q106s collector goes low, unless the receive diodes are off and the transmit diodes are on. This open-collector output is available at terminal K and is limited to 25 volts open circuit with 75 mA of sink current. Some transceivers require this interface during QSK operation to prevent RF from being applied until the switch is "ready". Refer to your transceiver manual for more information.

Transistor Q107 is a switch for the amplifier bias and reduces the plate current during standby. Terminal B must connect to the cathode (+) of the amplifier, while terminal C must connect to B- of the amplifier.

RD around

Typical operating requirements are 12 VDC at 500 mA at terminal B and 350 – 450 VDC at 1 mA at terminal E (negative ground). The ripple at each terminal should be less than 5%.