THEORY OF OPERATION

The 6M-1K2 designation, indicates the amp works on the 6 meter Amateur Band and is capable of at least 1.25 kW of RF output.

A single MRFE6VP61K25H Freescale™ LDMOSFET solid state device is the heart of the amplifier. Because most modern Amateur transceivers have a 50 to 100W output on 6M, the gain of the device must be reduced 15 dB or less per part 97 FCC rules. The input level is dropped to 4 to 5 watts so the device is not overdriven as fatal damage will occur. In "bypass mode" or with the Ready switch off and the green LED un lit, the input RF passes through an input relay and then through a high power vacuum relay, through the internal SWR bridge and out to the antenna. When the Ready/power switch is activated and the green LED is lit, the Amplifier can be keyed and when driven with the rated RF drive, will amplify to at least 1200 Watts into 50 Ohms.

The Keying circuit requires a path to ground or near ground through the RCA connector on the rear of the amplifier. This is usually accomplished by the transceiver but can also be keyed with a foot switch. A built in 15 to 20 millisecond delay allows the relays to close before a +2.8 VDC bias voltage is applied to the gates of the device.

When "keyed up", with no drive applied to the device, it will idle at approximately 2 amps. This condition puts the device in a class AB1 state. It is linear at this point so a drive of 5W will cause the amp to produce 100+Watts. On 6M, 100W of drive, in SSB or CW mode will allow the amplifier to produce 1200 Watts minimum. If the drive power is continuous such as with AM, FM or any JT mode, the amplifier will sense this continuous drive level and after about 5 seconds, the bias voltage is reduced pulling the amplifier closer to class C. This reduces the drain current typically from 36 amps down to about 30 Amps and reduces the output slightly to 950 to 1050 Watt output.

When driven in the Single Sideband mode SSB or CW, the amplifier runs in the linear mode and delivers 1250W+peak to the antenna. At full drive level the amp is at about the 1 dB compression point. Further drive will not cause much more output, just more compression, possible distortion and less efficient operation.

A temperature sensor mounted next to the device, monitors the Celsius temperature of the huge copper "heat spreader" the device is attached to. When the device temperature reaches about 40 degrees C, the two large but very quiet fans on the top cover come on to push the warm air transferred to the aluminum fins out the rear of the amp. Another slightly smaller, quiet bottom fan comes on and pushes cool outside air into and over the device and other RF components. This warm air vents out the multiple rectangular openings at the rear of the main chassis. Over temperature occurs at 90 deg. C and the amber LED will light. Cycling the **READY** switch re-sets the system.

A complete 1500W+ VSWR bridge is located just inside the RF output connector hear the rear panel. Forward and reflected power is monitored and if the SWR reaches 2.5:1, the control system de-activates the amplifier and the AMBER LED on the front panel will light. This "fault" condition can be "reset" easily by cycling the "Ready" switch or removing the 50 VDC powering the unit.

Operation in the fault condition is possible by turning off the ready switch and running in the "amp bypass" mode at the drive level of your transceiver.

When 50 VDC enters the amplifier, it is split and one part passes through a 3 Amp fuse on the rear panel. this 50V DC is sent to the regulator board and accompanying power dropping resistors for fans and two voltage regulators where 13.6 volts is produced for the control board functions and other relay operation. The 50 VDC is also sent through 0.005 ohm resistor in the drain lead of the device. The voltage drop across the 0.005R is sensed and conditioned to provide a linear voltage related directly to the device current in a 1/10 ratio. 10 Amps of drain current reads out as 1.00 volts and 30 Amps of drain current reads out as 3.00 volts. This circuit allows accurate **FACTORY ADJUSTMENT** of Idle current, and secondary bias control for JT, AM, or FM mode of operation.

The RF drive power from a transceiver enters through an "N" female connector on the rear panel and jumpers through a

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small 50 Ohm coax to a medium power relay followed by the 100W power attenuator. Then the RF passes through an impedance matching network and coaxial transformer and on to the gates of the device. Bias voltage also passes through the transformer. The emitter of the device is grounded to its flange base (header) which in turn is attached to the copper heat spreader. There is a common ground then in the system between the chassis, the PC board and the heat sink system. This ground connection is very important for heat transfer and also for total device stability and current flow.

On the output side of the device, large PC board traces provide high power, high current connections to two cross-connected 10 ohm coax line sections. These line sections form a 9:1 Impedance step and transform the very low drain impedance up to about 25 ohms, balanced. A high current dc ferrite choke brings the 50 VDC to the drain sides of the device. Various tuning, blocking and bypassing capacitors aid in the balanced tank circuits transition through a coax line to a 50 ohms, unbalanced point. Following the tank circuit is a seven section low pass filter. The filter is followed by a high power vacuum relay, the VSWR bridge and finally the output 'N' female connector.

6M-1K2 BLOCK DIAGRAM