

# **RF CONCEPTS**

**RFC 2-217**

**2 METER  
POWER AMPLIFIER**

## RFC 2-217

Thank you for buying the RF CONCEPTS RFC 2-217. This amplifier represents the "fourth generation" of solid state power amplifiers built for amateurs. The RFC 2-217 features a "state of the art" GaAs-Fet preamp, variable SSB delay, "High SWR" protection, over temperature protection, automatic or remote keying and remote control capabilities. The RFC 2-217 is designed to work with all modes of transmissions including, FM, CW, and SSB.

### SPECIFICATIONS

Frequency Range .....	143-149 MHz
Power .....	Input range: 200 mw to 5 w Output*: 170 W with 2 w in
Maximum Input .....	5 Watts
Duty Cycle .....	Intermittent
Modes .....	FM, SSB, and CW
GaAs-Fet Preamp .....	Noise Figure: 1db nominal Gain : 20db nominal
SWR Protection .....	Automatic shut down with approximately 3:1 SWR
Temperature Protection .....	175 degrees F
Keying .....	1. Automatic - RF sensing 2. External - Ground or Plus 3-12 Vdc at J3 - user option - unit supplied with "plus voltage" keying
Input-Output Impedance .....	50 Ohms
Voltage Requirement .....	13.8 VDC
Current Requirement .....	25 Amps
Fuse .....	35 Amp
Size .....	11.5 x 6 x 3 inches
Weight .....	5 lbs

\*output may vary by .75 db

### WARNING

The RFC 2-217 was designed to work with radios having 5 Watts maximum output. If your radio puts out more than 5 Watts you should use an RF CONCEPTS amplifier designed for a higher input power.

HIGH POWER output also means HIGH HEATSINK TEMPERATURES. Keep the heatsink clear of any obstructions and provide adequate ventilation.

## INSTALLATION

The RFC 2-217 can be mounted with the "L" brackets, supplied. It should be placed to provide maximum ventilation around the heat sink.

Heavy gauge wire should be used to connect the RFC 2-217 to the battery or power supply. For medium distances use #10 wire and for longer distances use #8 wire. To connect the amplifier to the antenna, RG-8A/U or equivalent coax is recommended.

For best performance, the antenna should be adjusted for an SWR of less than 1.5:1.

## OPERATION

The power amplifier is connected between the radio and the antenna. The RFC 2-217 will boost the power of a 2 watt radio to 170 Watts or more. The GaAs-Fet receiver preamp will improve copy on weak or marginal signals. When either the power amplifier or the preamp are "on" they automatically switch in and out of the circuit, by sensing the RF from the radio. The "TX" LED will light during transmit.

The automatic switching is ok for FM, but on SSB the relays may drop out during pauses. Therefore, it is highly recommended that the external keying feature be used with SSB. Please see the "EXTERNAL KEYING" section.

## FAULT CONDITIONS

During normal operation the "TX" LED will light when the power amplifier is activated.

The RFC 2-217 has a special circuit that senses return power (SWR) from the antenna. If this returned power exceeds approximately 40 Watts, the amplifier automatically shuts off, lighting the "SWR" LED and turning off the "TX" LED. In order to reset the amplifier, the power on-off switch must be switched off for 5 seconds then turned back on. **WARNING! CHECK OUT THE ANTENNA SYSTEM BEFORE OPERATING THE AMPLIFIER AGAIN.**

If the heat sink temperature exceeds 175 degrees F. the internal thermostat will open, shutting down the power amplifier. The "TX" LED will go out. The thermostat will automatically reset when the heatsink cools down.

## FUNCTIONS

The functions of the RFC 2-217 are controlled by the three front panel switches.

POWER ..... This switch activates the power amplifier section, as well as resetting the SWR protection circuit.

FM-SSB ..... In FM, the amplifier has a fast dropout when the carrier is removed. In SSB, this dropout is

delayed, so the relays do not "chatter" while on SSB. (see "DELAY ADJUST")

PREAMP ..... This switch turns on the GaAs-Fet preamp. It can be used even when the power amp section is off.

#### REAR PANEL CONNECTIONS

4 PIN "JONES".. Power is supplied thru this connector. This allows quick removal of the amplifier, if needed.

FUSE ..... A 35 Amp fuse provides protection in case of an internal short circuit.

PHONE JACK .... This jack is the external keying input. By changing a jumper inside the amplifier, keying may be accomplished by either a ground or a positive voltage of +3 to +15 at 1 MA or less. See "EXTERNAL KEYING".

NOTE: The unit is factory set for "plus voltage" keying.

5 PIN DIN ..... This jack is used for remote control of the amplifier. See the diagram "REMOTE CONTROL".

RADIO ..... This coax connector is the input from the transmitter or transceiver.

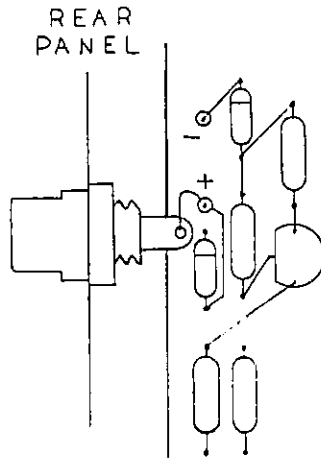
ANTENNA ..... This is connected to the antenna.

#### INTERNAL CONNECTIONS AND ADJUSTMENTS

DELAY ADJUSTMENT . The "SSB delay" is varied by changing the potentiometer, accessible through the hole in the cover on the left side of the unit.

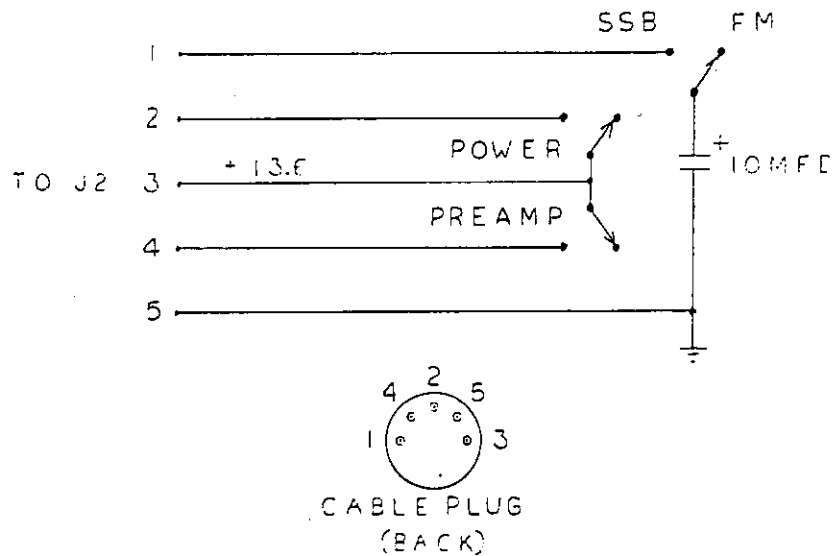
EXTERNAL KEYING .. The amplifier is factory set for "plus voltage" keying. Most transmitters do not provide a "ground" during transmit, but most do have a positive voltage available at their back panel. You must consult your instruction manual, for your particular radio, to locate this voltage. This is then connected to the phono jack on the amplifier.

To change the amplifier from "plus" keying to "ground" keying you must remove the cover and move the wire connected to the phono jack from the "+" pad to the "-" pad. (see sketch page 4)



EXTERNAL KEYING - "JUMPER" POSITION

REMOTE CONTROL ... The 5 pin DIN connector allows remote control of any of the functions of the amplifier. Below is a diagram of a typical remote control hook up. This can be built from commonly available parts, to fit your own needs.



CIRCUIT DESCRIPTION

KEYING CIRCUIT

When the power switch, S2, is "off" the signal passes straight through, without amplification. When S2 is "on", a small amount of RF is detected by D3 and D4, causing Q2 to activate Ryl. This switches the amplifier into operation. In order to keep the relay from "chattering" when using SSB, the FM-SSB switch, S1, increases the dropout delay time by switching in C5. The combination of C5 and R5 sets the drop out delay time of Ryl.

J3 can be connected to D1 or D2. When connected to D1, a ground at J3 turns on Q1, applying a positive voltage to Q2, keying Ryl. When connected to D2, a positive voltage will turn on Q2, keying Ryl.

The receive preamp is controlled by Q4 and Ry2. When S3 is "on", Q4 is turned on, through R14 + R15, actuating Ry2. This connects the preamp into the signal path.

When a keying voltage is applied to Q2, its collector switches the junction of R14 + R15 to ground. This turns off Q4, switching the preamp off.

## PROTECTION CIRCUITRY

### SWR DETECTOR

The output trace passes by a "strip line" coupler which senses if the SWR is too high. A high SWR produces a voltage that is detected and it actuates the protection circuit.

If the antenna SWR is approximately 3:1 or greater, D18 provides a voltage to the gate of the SCR, Q3. Q3 then conducts, turning on Q5, which lights LED, D12, as well as turning on Q6. Q6 grounds the bases of Q2 and Q4 through D8 and D11, unkeying the amplifier and/or the preamp. S2 must be switched off to reset the circuit.

### OVER TEMPERATURE PROTECTION

If the heat sink exceeds 175 degrees F, the thermostat, T1 opens, disconnecting the power to Ryl, turning off the amplifier section.

### PREAMP

When S3 actuates Ry2, the incoming signal is routed to the preamp.

Diode D13 and D14 prevent large input signals from damaging Q8.

C17 and L5 are tuned to 2 Meters and provide matching to Q8. Q8 is a Gallium arsenide field-effect transistor (GaAs-Fet). It amplifies the signal with a minimal addition of its own noise. The signal then goes to Q7. Q7 acts as a buffer amplifier, providing additional frequency selectivity. R17 + R18 provide a constant matching impedance for Q7, as well as for the station receiver.

### POWER AMPLIFIER

The signal from the radio passes through C18, Ryl and C201 to an attenuator. R201-R202 reduce the signal before it gets to Q201, to prevent over driving the amplifier. The values of

R201-202 may vary, depending on the gain of the various transistors used. The signal then goes to a tuning network, consisting of the Micro-Strip line on the PC board, C203, C206 and 207 to the base of Q201. Here it is amplified to 30 Watts. The output of Q201 goes to another tuning network C210, C211, and the Micro-Strip on the PC board to C20 where it is divided equally and connected to the bases of Q9 and Q10. Q9 and Q10 each amplify the signal to 85 Watts.

C47 and C48 combine this into 170 Watts, which then goes to the filter, C52, L13 and FL1 to remove any harmonics, before it is connected to the antenna.

Q201, Q9 and Q10 have a resistor, capacitor and coil, connected from collector to base. This provides stability at low frequencies.

Bias is applied thru L203, L7 and L8 and adjusted by R207, R26 and R30. The bias voltage is switched on when Ryl is activated.

C203 is adjusted for best input match and C211 and C49 are set for maximum output. C49 should be set 1/8 turn clockwise from maximum power output for best amplifier efficiency.

## WARRANTY

To be sure you will receive notice of future updates or new product information, please take a moment to complete the warranty registration card and return it to us.

Kantronics Inc. warrants each unit to be free from defects in material and workmanship under normal use and service for a period of one year after delivery to the ultimate user. For RF Concepts division power amplifiers the final transistors are warranted for six months. Kantronics will repair or replace the unit at our option, at no charge, should it become defective and should our examination disclose the unit to be defective under warranty.

This warranty shall not apply to any unit that has been subject to misuse, neglect, accident due to wiring not of our own installation, or to use in violation of instructions furnished by Kantronics. This warranty will not be extended to units that have been repaired or altered outside our facilities.

This warranty does not cover broken or cracked cases or any accessory used in connection with the unit. This warranty is in lieu of all other warranties expressed or implied, and no representative or person is authorized to assume for Kantronics any other liability in connection with the sale of its products. For RF Concepts amplifiers, use of the amplifier in repeater service will void the warranty.

### RETURN/REPAIR PROCEDURES

Consult the limited warranty policy in this manual for the service provisions offered by Kantronics at no charge. This warranty is considered to be in force only when the customer has submitted his completed warranty registration within 10 days of purchase, and when the stipulations of the warranty have been met. Violations of warranty clauses will automatically void the warranty and service or repairs will be charged to the owner.

Service outside the warranty will be charged at the cost of parts, labor, and return shipping. Repaired units will be returned via UPS C.O.D. These C.O.D. charges can be avoided by including your VISA or MC number with your unit to be repaired. Shipping and repair may then be charged.

When service or repairs appear necessary, it may be wise to call or write Kantronics to determine if the problem can be solved without returning the unit.

When calling, report the product name and ask for the Amateur Radio Service Department. Should you find it necessary to call for assistance, please have the following information available:

1. The unit name and serial number (the serial number is found on the rear panel.)

THE SERVICE DEPARTMENT TELEPHONE HOURS ARE 9 AM - NOON AND 1 PM - 5 PM CENTRAL TIME 913-842-4476, MONDAY THROUGH FRIDAY.

Returns to the factory for refund or exchange are strictly regulated. Any return for refund or exchange must be approved by the service department.

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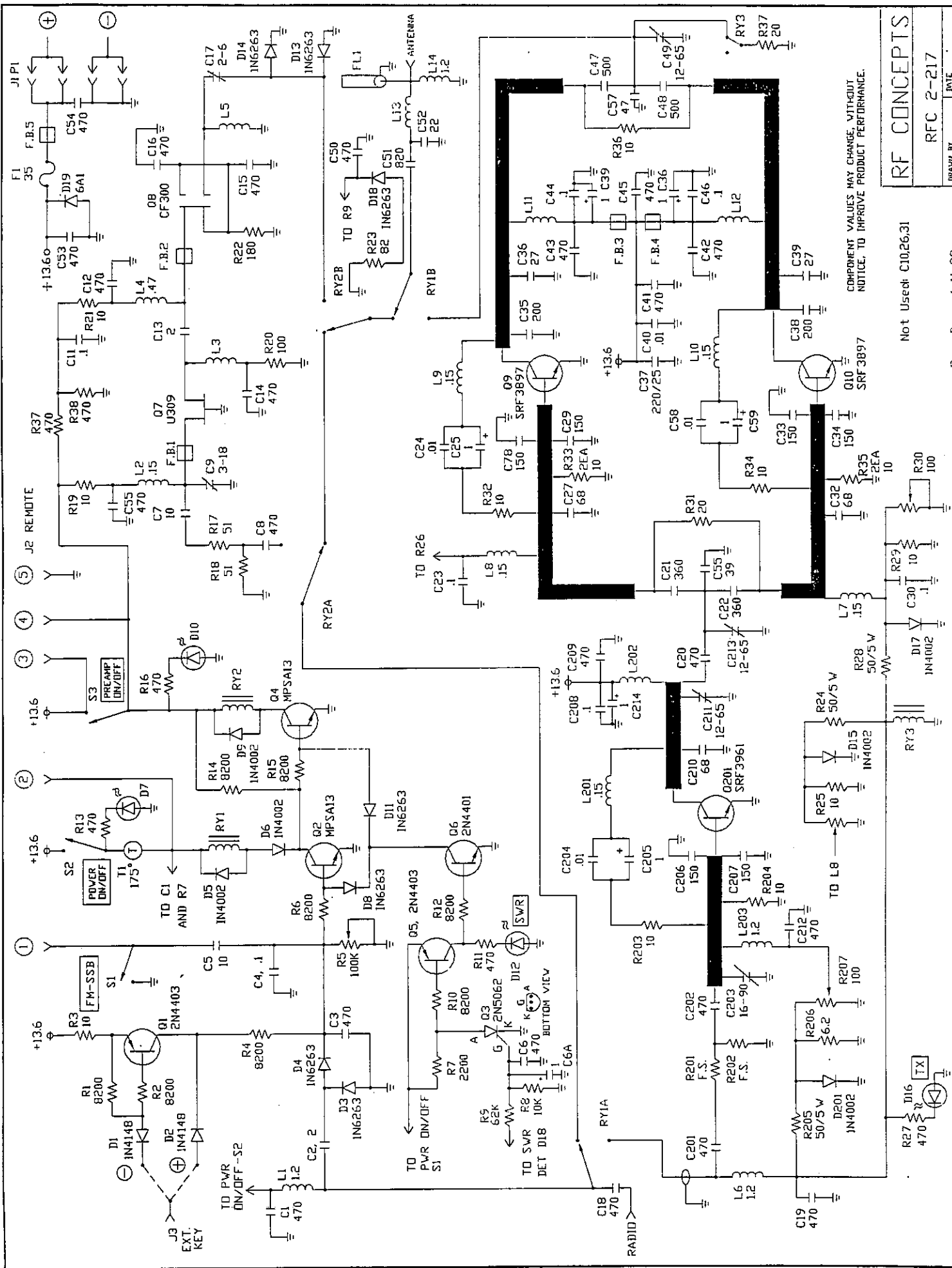


# Installation of the remote control jack (spider)

1. Disconnect all cables from the amplifier.
2. Remove the eight screws holding the bottom cover in place (four screws on each side of case).
3. Remove the bottom cover and place the unit on a soft cloth with the circuit board facing up. Position the unit so the back panel is to your left, the front panel is to your right, and the side faces you.
4. Remove the snap-in plug covering the large hole in the center of the back panel. This will be the mounting location for the remote control jack.

**WHEN SOLDERING THE FOLLOWING CONNECTIONS, BE CAREFUL THAT THE WIRES DO NOT PROTRUDE THROUGH THE CIRCUIT BOARD FAR ENOUGH TO CONTACT THE CHASSIS.**

5. Solder the brown wire (pin 1) from the jack to the junction of R4, R5 and R6 at point "A" on the circuit board. (See diagram.)
6. Solder the orange wire (pin 2) from the jack to the right side of the Thermostat (the side nearest the front). See diagram point "B".
7. Solder the yellow wire (pin 3) from the jack to the rear of the fuse holder at same point the large red wire is currently connected.
8. Solder the red wire (pin 4) from the jack to the input side of the pre-amp voltage regulator at point "C" on the circuit board. (See diagram.)
9. Solder the green wire (pin 5) from the jack to the large ground area on the circuit board, located under the fuse holder at point "D" on the circuit board. (See diagram.)
10. Mount the remote control jack to the chassis using the two screws and nuts provided.
11. Re-install the bottom cover on the unit, and replace the eight screws to secure the cover.



COMPONENT VALUES MAY CHANGE, WITHOUT NOTICE, TO IMPROVE PRODUCT PERFORMANCE.