

RF CONCEPTS

RFC 3-312

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220 MHZ POWER AMPLIFIER

RFC 3-312

Thank you for buying the RF CONCEPTS RFC 3-312. This amplifier represents the "fourth generation" of solid state power amplifiers built for amateurs. The RFC 3-312 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 3-312 is designed to work with all modes of transmissions including, FM, CW, and SSB.

SPECIFICATIONS

Frequency Range	220-225 MHz
Power	Input range: 200 MW to 40 W Output*: 120 W with 30 W in
Maximum Input	35 - 40 Watts
Duty Cycle	Intermittent
Modes	FM, SSB, and CW
GaAs-Fet Preamp	Noise Figure: 1.25db nominal Gain : 18db 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	20 Amps
Fuse	35 Amp
Size	11.5 x 6 x 3 inches
Weight	5 lbs

*output may vary by .75 db

WARNING

The RFC 3-312 was designed to work with radios having 25 to 40 Watts maximum output. More that 40 watts input to the amplifier may damage the RF Power transistors.

High power output also means high heatsink temperatures. Keep the heatsink clear of any obstructions and provide adequate ventilation.

INSTALLATION

The RFC 3-312 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 3-312 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 3-312 will boost the power of a 25 to 30 Watt radio to 120 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 3-312 has a special circuit that senses return power (SWR) from the antenna. If this returned power exceeds approximately 30 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 2 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 3-312 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".

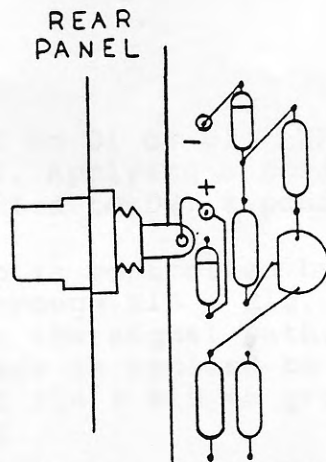
RADIO This coax connector is the input from the transmitter or transceiver.

ANTENNA This is connected to the antenna.

INTERNAL CONNECTIONS AND ADJUSTMENTS

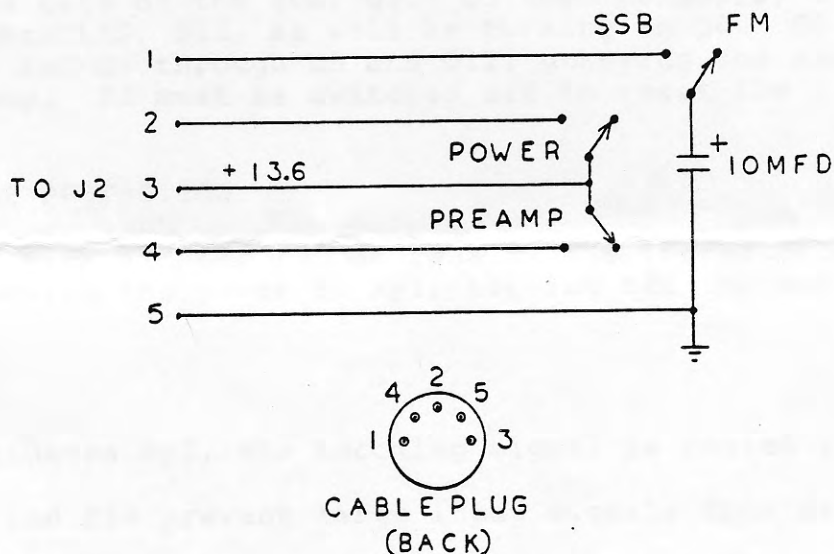
DELAY ADJUSTMENT . The "SSB delay" is varied by changing the potentiometer, accessible through the hole in the cover on the left side of the unit.

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 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 220 MHz 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 thru C18 and Ryla to C21 and C22 where it is divided equally and goes to Q9 and Q10. There it is amplified to 60 Watts, in each transistor.

C47 and C48 combine this into 120 Watts, which then goes to the filter, C52, L13 and C53 to remove any harmonics, before it is connected to the antenna.

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

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

C302 is adjusted for best input match and C49 is set for maximum output. C49 should be set 1/8 turn clockwise from maximum power output for best amplifier efficiency.

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WARRANTY

RF CONCEPTS warrants its products to be free from defects in material and workmanship for 5 years from date of purchase, with the exception of the RF power transistors, which are warranted for 6 months.

The unit must be returned to the factory, freight prepaid. The warranty card must have been submitted within the 15 days after purchase. Any unauthorized repair or changing of the internal adjustments may void this warranty.

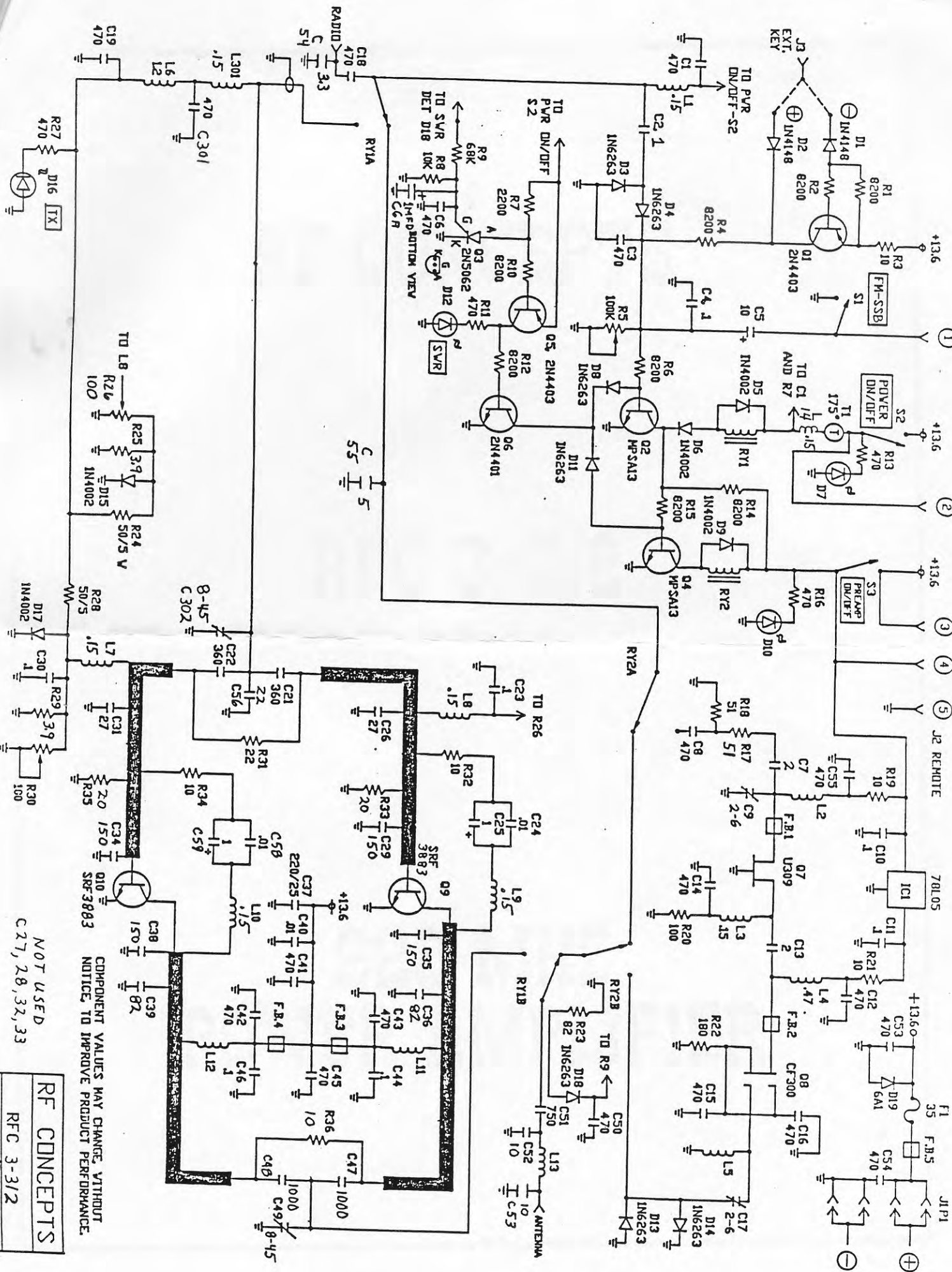
RF CONCEPTS will provide, free of charge, both parts and labor, as necessary, to correct any defect occurring within the warranty period.

This warranty applies to the original owner only.

This warranty applies only to those units that fail during normal operation. Any units that have been overdriven, overvoltaged, modified, accidentally damaged or misused will not be covered.

USE OF THIS UNIT IN REPEATER SERVICE WILL VOID THE WARRANTY. RF CONCEPTS will not assume any responsibility for damage to any antenna, radio, or accessory connected to this product.

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NOT USED
C27, 28, 32, 33

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RFC 3-3/2	
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C. HALDONEY	11/11/86