

QRO HF-3KDX LINEAR AMPLIFIER INSTRUCTION MANUAL



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SPECIFICATIONS

Band Coverage:	160, 80, 40, 20, 17, 15, 12, and 10 (export only) meter amateur bands. 10 meter also useable in USA with proof of license and user modification.
WARC Band Coverage:	The HF-3KDX will give you some output on 17 & 12 Meters. You operate 17 meters by tuning up on the 15 meter band position, and you operate on 12 meters by tuning up on the 10 meter position. In addition, you will need to use the antenna tuner on your transceiver to achieve an input match for these two bands. Efficiency and output will not be optimal compared to the normal bands. You will typically see 800-900 watts output
Drive Power Required:	50 to 80 watts nominal for rated output
Maximum Output Power:	1,500 watts peak all modes including SSB, CW, and continuous carrier or modulated carrier. Carrier operation (RTTY, FM, or SSTV) for more than 30 minutes requires use of auxiliary cooling
Power Gain:	Nominally 14 db
Automatic Limiting Control (ALC):	0 to -20 Volts negative going, adjustable from Front Panel
Harmonic Suppression:	Meets F.C.C. Requirements
Keying:	Requires relay contact closure or sink of 80 ma @ 12 VDC or +15 VDC on transmit supplied by transceiver
Input Impedance:	50 ohms unbalanced, VSWR <1.5:1
Output Impedance:	50 ohms unbalanced with SWR 2:1 or less
Tube Requirement (1):	8877/3CX1500 Triode
Power Line Requirement:	220/240 VAC, 60 Hz at 25 amperes maximum
Front Panel:	Multimeter Plate Voltage & Plate Current Screen Grid Current Meter Multimeter Function Switch Transmit LED Indicator Power LED Indicator Power On/Off Switch Tune & Load Controls with 6-1 Reduction Drives Bandswitch Fan High/Fan Low Switch Grid Trip Fault Switch
Rear Panel: (See Rear Panel Pictorial)	RF Input (SO-239) RF Output (SO-239) Transmit Keying Line (RCA Phono Socket) +15 V Supplied by Transceiver on Transmit (RCA Phono Socket) ALC Output (RCA Phono Socket) Ground Post Fuses (two 20 ampere for 220/240 VAC)
Dimensions:	19-3/4"W X 16-1/2"D X 9"H
Net Weight:	80 lbs. (Chassis 36 lbs. plus Transformer 44 lbs.)

TABLE OF CONTENTS

Warranty	4
Proprietary Notice	4
Safety Notification	5
Unpacking & Inspection	6
Reshipment Instructions	6
Top Cover Removal	6
Transformer & Tube Installation	6, 7
Introduction	7
Location	7
AC Power Line Considerations	7, 8
Antenna	8
Grounding	8
Equipment Interconnections	9
Safety Interlock Switch	9
Driving Power	9, 10
Tube Precaution	10
Reading the Meters	10
Front Panel Switches & Controls	10, 11
Initial Power Up	11
Tune-Up Procedure	12, 13
Using the ALC Adjust Control	14
Periodic Maintenance	14
Troubleshooting Chart	14, 15
Schematics, PCB Layouts, Parts Lists	16

WARRANTY

The HF-3KDX is warranted against defects in material and workmanship for a period of two years for the original date of sale. ***This warranty does not cover the 8877/3CX1500 tube which carries a separate one year warranty issued by the tube manufacturer/distributor.*** During the warranty period, QRO Technologies, Inc. will repair or replace the amplifier at our option if it is defective in any way in material and workmanship. **The warranty does not cover any defects resulting from improper use by the buyer or inadequate maintenance.** In such cases the repair will be billed at prevailing service rates.

For warranty service or repair, the amplifier must be returned to the factory for authorized service. ***The buyer shall prepay shipping and insurance charges.*** QRO Technologies, Inc. will pay shipping and insurance charges to return the amplifier to the buyer. Please call the factory at ***1-419-913-1821*** for shipping instructions. Make sure when returning the amplifier you have insured the instrument for the full replacement cost. QRO Technologies, Inc. is not liable for any damage incurred during return shipments.

PROPRIETARY NOTICE

This instruction manual, schematic diagrams, printed circuit board layouts, and technical data herein disclosed, are proprietary to QRO Technologies, Inc. and shall not, without express written permission of QRO Technologies, Inc., be used, in whole or part to solicit quotations from a competitive source or used for manufacturing by anyone other than QRO Technologies, Inc. The information herein has been developed at private expense, and may only be used for operation and maintenance reference purposes or for purposes of engineering evaluation and incorporation into technical specifications and other documents which specify procurement of products from QRO Technologies, Inc. This amplifier is covered by copyrights both in the United States of America and throughout the world.

ALWAYS THINK SAFETY

THIS LINEAR AMPLIFIER DESCRIBED IN THIS MANUAL CONTAINS VOLTAGE HAZARDOUS TO HUMAN LIFE AND SAFETY WHICH IS CAPABLE OF INFLICTING PERSONAL INJURY. NEVER OPERATE THE AMPLIFIER WITH THE TOP COVER REMOVED AND THE TOP COVER SAFETY SWITCH DEFEATED. BEFORE REMOVING THE TOP COVER MAKE SURE THE AC LINE POWER CORD HAS BEEN DISCONNECTED FROM THE AC POWER SOURCE. ALLOW A MINIMUM OF 5 MINUTES TO ELAPSE BEFORE REMOVING THE TOP COVER AFTER POWER HAS BEEN REMOVED. THIS IS NECESSARY TO ALLOW THE PLATE VOLTAGE FILTER CAPACITORS TO BLEED DOWN TO A SAFE LEVEL.

If this amplifier is to be powered from the AC line (mains) through an autotransformer (such as a Variac or equivalent) ensure that the common connector is connected to the neutral (earth pole) of the power supply.

Before operating this unit ensure that the protection conductor (green wire) is connected to the ground (earth) protective conductor of the power outlet. Do not defeat the protective features of the third protective conductor in the power cord by using a two conductor extension cord or a three-prong/two-prong adapter.

Before operating this unit:

1. Ensure that the instrument is configured to operate on the voltage available at the power source.
2. Ensure that the proper fuses are in place in the amplifier's AC line fuse holders located on the rear panel.
3. Ensure that all other devices connected to or in proximity to this amplifier are properly grounded or connected to the protective third-wire earth ground.

If at any time the amplifier shows visible damage, has sustained stress, emits a foul smell, fails to operate satisfactorily, it should not be used until its performance has been checked by qualified service personnel.

UNPACKING AND INSPECTION

The amplifier is shipped in three cartons: amplifier, plate transformer, tube. Before unpacking each carton, check the exterior of the shipping carton for any sign of damage. All irregularities should be noted. Unpack and remove each component carefully from its carton, preserving the factory packaging as much as possible. Inspect each component for any noticeable defect or damage. Notify QRO Technologies if any defect or damage is apparent. ***It is a good idea to keep all the shipping cartons and materials in the event the amplifier needs to be reshipped.***

RESHIPMENT INSTRUCTIONS

Use the original packaging if it is necessary to return the amplifier, transformer, or tube to QRO for servicing. The original shipping carton and the interior corner pads are designed to provide the necessary support for safe shipment or reshipment. If the original carton along with the internal packaging is not available, contact the factory and a new carton will be shipped to you at a nominal cost. Always insure the package for the full replacement value and ship via UPS ground service. **QRO Technologies, Inc. will not be responsible for any damage or loss during return shipment.**

TOP & BOTTOM COVER REMOVAL

Remove the Amplifier's top cover by removing the fifteen 6-32 x 3/8 Phillips Head machine screws and their associated flat washers.

TRANSFORMER AND TUBE INSTALLATION

Before performing any of the following installation procedures, make sure that the amplifier has not been plugged into the AC supply line.

As part of the installation process, you must install the tube and transformer.

PLATE TRANSFORMER: Remove the plate transformer from its shipping carton. You will notice two indexed connectors. Position the transformer so the connector with the red leads is on the left and the connector with the black and white leads is on the right side when viewed from the front of the amplifier. Carefully place the plate transformer into the power supply compartment cavity between the blower and the front panel meters. Align the transformer with the chassis mounting holes and secure it to the chassis with four 1/4-20 x 5/8 mounting screws and nuts. Locate the two amplifier's matching index connectors. Connect the two matching connectors. There is only one way the two connectors can go together. When the two connectors are locked together, you should hear a snap sound.

TUBE: The tube socket is located on the left side of the amplifier. The tube socket has seven contacts which match the seven pins on the 8877/3CX1500 Triode. Remove the tube from its shipping carton, and insert the tube into the socket making sure that the pins align with the socket contacts. The tube should seat without too much pressure applied. If you have to use a lot of pressure, you most likely have the wrong pin alignment. If the tube pins and socket contacts are not aligned, the amplifier will not function properly and damage to the tube may result. Once the

tube has been properly seated in its socket, slip the anode connector coming from the plate choke over the tube anode.

REINSTALL TOP & BOTTOM COVER.

Reinstall the top and bottom painted covers. Each cover has slotted holes to help with proper alignment. Use the fifteen 6-32 x 3/8 Phillips Head machine screws and their associated flat washers.

INTRODUCTION

The QRO Model HF-2500DX Linear Amplifier is a completely self-contained, grounded grid linear amplifier. It is designed to at 1,500 watts peak all modes including SSB, CW, and continuous or modulated carrier (e.g., RTTY, FM, SSTV). **Continuous or modulated carrier operation for more than 30 minutes at or near maximum rated output power requires use of auxiliary cooling.** The HF-3KDX is designed to be used with any transceiver which can deliver adjustable output power from 0 to 100 watts. A tuned input circuit feeds the tube which is connected in a grounded grid configuration. An ALC circuit develops negative voltage that can be fed back to the transceiver to reduce its gain when the amplifier is overdriven. The antenna transmit-receive (T/R) relay is normally actuated by relay contacts, or an electronic switch, in the transceiver to place the amplifier in the transmit mode.

LOCATION

Do not operate the Amplifier in excessively warm locations or near heating vents or radiators. Be sure air can circulate freely around and through the Amplifier cabinet, and can provide an unobstructed air inlet for the internal cooling fan. Do not place any books, magazines, manuals, or equipment that will impede the free flow of air near the sides and the hot air exhaust holes located on the top of the cabinet. The internal fan allows an air flow of approximately 50 CFM. Do not use an external auxiliary cooling fan with less than 50 CFM capacity. The exhaust air becomes quite warm at high power levels. Do not position any heat-sensitive objects in the exhaust airflow path.

AC LINE POWER CONSIDERATIONS

Verify that the rating of the line fuses located in the rear panel fuse holders is suitable for the AC line voltage you will be using. The fuses should be the ceramic cartridge slo-blow type. The rating should be 20 - 25 Ampere.

Use only AC power outlets having a protective ground for connection to the amplifier. **DO NOT USE** 2 conductor extension cords or 3 prong to 2 prong adapters that do not provide a protective ground connection. Connection of the power cord to the power outlet must be made in accordance with the following standard color code:

<u>American</u>	<u>European</u>	
Live	Black	Brown
Neutral	White	Blue
Ground (Earth)	Green	Green/Yellow

Use the following NEMA plug configuration: 200/240 VAC 20 Ampere 6-15P or 6-20P

Due to the power involved, this Amplifier should have its own 240 VAC electric service line. This line should have three 12-gauge conductors, and 20 ampere fuses in each "hot" wire. If a single 240 VAC line serves the entire station, make an effort to connect your equipment so the load is balanced between the two "hot" wires. **DO NOT** use this Amplifier at its full ratings on a regular house wiring circuit, as the ratings of the wire will almost certainly be exceeded. Avoid excessively long runs of wire between your service entrance and the Amplifier. A heavy flow of current in such a line results in a voltage drop which can affect the performance of your equipment. No plug is supplied with the line cord. Use a plug that matches your 240 VAC receptacle (NEMA 6-15P or 6-20P). Your power connection must conform to section 210-21 (b) of the National Electric Code, which reads, in part:

"Receptacles connected to circuits having different voltage, frequencies, or types of current (AC or DC) on the same premises shall be of such circuits are not interchangeable."

When you install a new plug, make sure it is connected according to your local electrical code. Keep in mind that the green line cord wire is connected to the Amplifier chassis.

ANTENNA

The output circuit of the Amplifier is designed to be connected to an unbalanced transmission line that has a 50 ohm characteristic impedance. Lines of other characteristic impedance may be used providing the SWR (standing-wave-ratio) does not exceed 2:1.

The RF OUT connector is a UHF type SO-239. You will need a mating PL-259 plug for your transmission line.

Use coaxial cables like RG-8U, RF-11U, or similar types, for the transmission line. Due to the power level, the smaller types RG-58U and RG59/U are not recommended.

The "A.R.R.L. Antenna Book" is readily available and includes comprehensive reference work on transmission lines and antennas. Other similar handbooks for the radio amateur are offered for sale and can often be found in a public library.

GROUNDING

Connect a good earth or water pipe ground to the ground post on the rear of the Amplifier. Use the heaviest and shortest connection possible. Before you use a water pipe ground, inspect the connections around your water meter and make sure that no plastic or rubber hose connections are used. These connections interrupt the continuity to the water supply line. Install a jumper around any insulating water connectors you may find. Use heavy copper wire and pipe clamps. It is best to ground all equipment to one point at the operating position and then ground this point as described above.

EQUIPMENT INTERCONNECTIONS

Interconnection between the Amplifier and a typical transceiver is shown in the "Interconnection Diagram" located inside your transceiver owner's manual. Many brands of equipment usually follow the same general pattern. Please refer to this diagram plus the amplifier's Rear Panel Pictorial while reading the following:

RF IN Connect this socket to the RF output connector of your transceiver.

RF OUT Connect this socket to the cable coming from your antenna.

Note: *Use shielded cable, such as audio-type cable, for the following connections.*

KEY XMT Connect this socket to the T/R relay socket on your transceiver. This connector requires contacts that are normally open in the receive mode and closed in the transmit mode. **This contact sinks 12 VDC to ground at 80 mA.**

+15 V XMT If your transceiver has a provision for +15 VDC on transmit for keying external devices, such as linear amplifiers, connect this socket to the appropriate socket on your transceiver.

Note: If your transceiver has neither of the above keying methods, you will have to use some other means. For instance, you could use a shorted RCA phono plug by placing it in the Key XMT socket. Then, you would have to manually turn off and on the Operate/Standby switch located on the front panel.

ALC OUTPUT Connect this socket to the ALC input of your transceiver. A 0 to 20 V negative ALC voltage is present at this socket. Refer to your transceiver manual for proper connection information. Whenever the Amplifier is overdriven, the ALC circuitry creates a negative voltage that is fed back to the transceiver to reduce its gain and help prevent "flat-topping". Protective circuitry of this nature is a valuable circuit element

SAFETY INTERLOCK SWITCH

While the Amplifier's top cover is in place, the interlock switch closes to allow AC line voltage to reach the power transformer. When the top cover is removed, the interlock switch opens and disconnects the line voltage. This does not discharge the bank of power supply filter capacitors. Be sure to allow the filter capacitors to discharge before you touch anything inside the Amplifier. You can select the High Voltage function of the Multimeter to check the high voltage potential.

DRIVING POWER

This Amplifier is designed to operate at full ratings when it is driven by a transceiver that has approximately 60 – 100 watts of RF output. If you use a transceiver that delivers more than 100 watts, carefully adjust the driving power to avoid "overdrive" and the creation of spurious signals, which create needless interference to other operators.

IMPORTANT: In no case should you advance the power output control of your transceiver

beyond the point where the Amplifier's power output ceases to increase. If you turn the control past this point, nonlinear operation may occur.

TUBE PRECAUTION

After prolonged operation, let the Amplifier run for several minutes without drive applied so the fan will cool the tubes before you turn the Amplifier off.

READING THE METERS

Refer to Front Panel Pictorial while you read the following information:

Multi-meter: The Multi-meter switch on the front panel of the amplifier directly below the two panel meters selects the right-hand meter functions. Read the meter scale which corresponds to the setting of the Multi-meter switch as shown in Table A.

Table A

Multi-meter Switch Position	Measures	Scale Indication
Plate Voltage (PV)	Plate Voltage	Bottom scale indicates 0 to 7.0 KV (normal operating range is 3.0 – 4.0 KV volts) Each division represents .2 KV (200 volts).
Plate Current (PC)	Plate Current	Top meter scale indicates 0 to 1.4 amperes. Each division represents .4 amperes (400 milliamperes).

Grid Current Meter: The left-hand meter always indicates grid current between 0 and 300 milliamperes. Each Division indicates 10 milliamperes.

FRONT PANEL SWITCHES & CONTROLS

On/Off Switch: Rocker type switch which turn the amplifier on or off

Operate/Standby Switch: Rocker type switch used to place the amplifier in a transmit mode

Fan High/Low Switch: Rocker type switch which control blower speed

ALC Control: Varies the negative feedback voltage to your transceiver. A clockwise rotation increases this voltage which reduces the drive power delivered to the amplifier from the transceiver. The ALC line between the transceiver and the amplifier must be properly connected for this feature to operate.

Fault Light/Switch: If you amplifier is operated in such a manner to produce excessive grid current, a protection circuit will place the amplifier in a standby mode. A red light will light in the fault switch. The amplifier can be reset into a transmit mode by pushing the red switch. A successful reset will be indicated when the fault light turns off.

Tune Control: A 6-1 vernier drive control used to adjust the input capacitor of the pi output tank circuit during tune up. 0 - 100 logging scales provide a means to record your tune up settings for future reference.

Load Control: A 6-1 vernier drive control used to adjust the output capacitor of the pi output tank circuit during tune up. 0 - 100 logging scales provide a means to record your tune up settings for future reference.

Band Selector Switch: Selects the desired band of operation

Red LED: When lit, the amplifier has been turned on, and it has gone through its warm up cycle.

Green LED: When lit, the amplifier has been keyed and amplifying the power supplied by the transceiver.

INITIAL POWER UP

Preset the amplifier's front panel controls as follows:

On/Off	Off
Operate/Standby	Standby
Multi-meter	PV (Plate Voltage)
Fan	Fan High
ALC Adjust	Full counter clockwise
Tune Control	Zero
Load Control	Zero
Band	Desired Band

Turn the amplifier on by placing the On/Off switch in the on position. The meter lights and blower should immediately come on. The amplifier is now in its three minute warm up cycle. During this warm--up period, check for the following readings:

Grid Current:	Zero
PV (Plate Voltage):	4.0 KV
PC (Plate Current):	Zero

OBSERVE THE PLATE CURRENT (IP) DURING THE WARM-UP PERIOD. IF IT STARTS TO RISE, IMMEDIATELY TURN THE AMPLIFIER OFF. THE PLATE CURRENT SHOLD NOT RISE DURING THE WARM-UP PERIOD. CALL QRO TECHNOLOGIES FOR INSTRUCTIONS.

Place your transceiver in the CW mode or any mode that will provide a continuous carrier for tune-up. **At this time make sure that your transceivers output power level has been set to zero.**

TUNE UP PROCEDURE

Before making any tune up procedures, make sure your amplifier is connected to an appropriate load capable of handling at least 1,500 watts of power. Failure to do so may result in serious damage to your amplifier.

When the three minute warm-up cycle has been completed, the red power light will turn on. The amplifier is now ready for tune up. At this point, place your transceiver in the SSB mode with the microphone gain at zero. Put the amplifier's Operate/Standby switch in the operate position. Key your transceiver and you should notice the green transmit LED on the amplifier lite. You should also hear the amplifier's internal relays latch. With the transceiver keyed and the amplifier's Multi-meter switch in the PC position, observe the plate current (PC). ***It should be in the neighborhood of .200 amperes more or less.*** Un-key your transceiver, and place the amplifier in the standby mode.

TUNEUP OBJECTIVE: The objective of the tune-up procedure is to bring the amplifier to resonance by adjusting the tune & load controls desired maximum output power.

1. Place your transceiver in CW mode, and set its output power level to 60 watts.
2. Select your desired band using the amplifier's bandswitch.
3. Put the Multi-meter switch in the PC position.
4. Place the amplifier in the operate position.
5. Set the Tune Control to 0.
6. Set the Load Control to 50 for 160 thru 40 meters. Set the Load Control to 30 for 20 thru 10 meters.
7. Key your transceiver and advance the Tune Control clockwise looking for a dip in the plate current. Note: If the amplifier faults rotate the load control counterclockwise, and reset the Fault Switch. If the amplifier still faults, turn to load control counterclockwise some more.
8. Continue advancing the Tune Control clockwise until the dip in plate current reverses and starts to rise.
9. Adjust the Loading Control for maximum output power.
10. Redip the plate current using the Tune Control and readjust for maximum power using the Load Control. Repeat this step as needed.

The amplifier should now be tuned for maximum output power with 60 watts of input power. If you desire lower or higher output power decrease or increase input power and retune for maximum desired output power.

LOADING AMPLIFIER HEAVY: One technique for operating an amplifier at various output power levels is to load it “heavy”. This procedure requires you to tune the amplifier for the maximum output power you desire. Then, simply reduce your input drive power to the desired output power level. If you wish to change your output power, simply increase or decrease your input drive power to the new level of output power desired.

To facilitate your initial tune up, we have included a tune up chart. These settings and readings are into a 50 ohm dummy load. Your actual reading may vary do to any reactance in your antenna. Record your settings for future reference. You can control the power level of your voice peaks on SSB by advancing the ALC Control clockwise assuming you have the ALC line connected between your transceiver and amplifier.

TUNE-UP TABLE

Frequency (MHZ)	Power Input	Tune	Load	Grid Current	(PC) Plate Current	Power Output
1.80						
1.90						
3.60						
3.90						
7.20						
14.20						
18.10*						
21.30						
24.90*						
28.50						

***Transceiver Tuner Used**

WARC BAND OPERATION: The HF-3KDX has not been designed to operate on the WARC Bands. This occurs because there are not enough bandswitch positions to accommodate these bands. You can get some amplification on 17 & 12 meters. You will have to use your transceiver’s internal antenna tuner .This will get you a proper input match to the amplifier. Also, you will have to set the bandswitch to 15 meters for 17 meter operation or set the bandswitch to 10 meters for 12 meter operation. However, you will not get amplification on 30 meters.

A Word About Wattmeters: The most reliable and accurate Wattmeters are either the Bird or Coaxial Dynamics thru feed. Wattmeters which use a ferrite core for r.f. sampling can be unreliable at high power levels. If you are using such a wattmeter and you observe an output level less than 1,500 watts for the values listed above, your wattmeter is probably not giving you an

accurate reading.

Input SWR: The input SWR has been set for at least 1.5:1 on each band. You can make slight adjustments using the tuned input access holes to adjust the mica trimmer capacitors for each band.

USING THE FRONT PANEL ALC CONTROL TO ADJUST AMPLIFIER OUTPUT POWER.

You may want to utilize an alternative to adjusting the drive power at the transceiver. The Front Panel ALC Adjustment Control allows you to adjust the ALC for the amount of output power you desire. Using this procedure, you would set the ALC Control to minimum (fully counter-clockwise). Tune the amplifier for maximum output. Then advance the ALC Control (clockwise) for the amount of output power you want. The ALC circuit of the amplifier supplies negative feedback voltage to the transceiver which reduces the amount of drive coming into the amplifier. **Only use this feature after your Amplifier has been properly tuned.**

PERIODIC MAINTENANCE

Before you do any maintenance, make sure the amplifier has been disconnected for the A.C. power source and the high voltage filter capacitors have bled down to zero.

Remove the top cover from the Amplifier at least once a year and remove any dust accumulation on the blades of the blower. Any large accumulation of dust on the blades will impede proper cooling air to the tube.

TROUBLESHOOTING CHART

The following charts lists specific difficulties that could occur in your Linear Amplifier. Several possible causes may be listed for each difficulty. Refer to the Printed Circuit Board diagrams (PCB) and the Schematic Diagrams to locate and identify the parts listed in this chart. If a particular part is mentioned as a possible cause, check that part and other components connected to it to see if they are defective. **AS ALWAYS, BE SURE THE AMPLIFIER POWER CORD HAS BEEN REMOVED FROM THE AC LINE RECEPTACLE AND THE HIGH VOLTAGE FILTER CAPACITORS HAVE BLED DOWN TO ZERO VOLTS BEFORE REMOVING THE TOP COVER FOR YOUR INSPECTION.**

DIFFICULTY	POSSIBLE CAUSE
No AC power	1. Fuse F1 or F2 rear panel 2. Jumpers missing on Terminal Block TB1 3. Transformer T1 4. On/Off Switch SW2A or SW2B 5. Interlock Safety Switch SW1 6. Solid State Relays SR1 or SR2 or related circuitry

Multi-meter inoperative in High Voltage Function	<ol style="list-style-type: none"> 1. Resistors R101 – R 109 High Voltage Diode PCB 2. Multi-meter Switch SW1 Meter Switch PCB 3. M-1 Multi-meter 4. Transformer T-1 Secondary 5. Component failure on HV Diode or HV Capacitor PCB
Multi-meter inoperative in Plate Current Function	<ol style="list-style-type: none"> 1. Resistors R310 & R311 LV & Bias PCB 2. Switch SW1 Meter Switch PCB 3. M-1 Multi-meter 4. F305 1-1/2 Ampere Fuse
Plate idle current over 200 mA	<ol style="list-style-type: none"> 1. Components on LV & Bias PCB <ol style="list-style-type: none"> a. Zener Diodes ZD301 b. Relay K4
Plate Current does not read zero in standby mode	<ol style="list-style-type: none"> 1. Components on LV & Bias PCB <ol style="list-style-type: none"> a. Q303 Transistor b. Diodes D309 – D324 c. Relay RY304 d. Resistors R308 & R309
No Plate idle current	<ol style="list-style-type: none"> 1. Components on LV & Bias PCB <ol style="list-style-type: none"> a. Fuse 305 1-1/2 Ampere b. Diodes D309 – D324 c. Relay RY304 d. Resistors R308 & R309
Meter Lamps do not light	<ol style="list-style-type: none"> 1. Components on LV & Bias PCB <ol style="list-style-type: none"> a. Fuse F301, F302 b. Bridge Rectifier D301 c. Reg 301 2. Meter Lamps PL1 - PL4 Meter Switch
Amplifier will not key when transceiver is keyed to transmit	<ol style="list-style-type: none"> 1. Components on LV & Bias PCB <ol style="list-style-type: none"> a. Fuse F301, F304 b. Bridge Rectifier D303 2. Operate Standby SW5 Front Panel
ALC Inoperative	<ol style="list-style-type: none"> 1. Improper connection between transceiver and amplifier 2. POT R13 (ALC Adjust) on front panel
No RF Output	<ol style="list-style-type: none"> 1. Improper connections between transceiver, amplifier, and antenna 2. Transceiver and amplifier are set to different bands
Grid Trip Circuit Inoperative	<ol style="list-style-type: none"> 1. Defective Trip Reset Switch SW6 2. Components on LV & Bias PCB
Red Power LED not functioning	<ol style="list-style-type: none"> 1. +12 VDC supply located on LV & Bias PCB

	2. LED defective
Three minute warm-up cycle not functioning	Components on LV & Bias PCB 1. U701 555 Timer and related components 2. Transistor Q301

SCHEMATICS, PCB LAYOUTS, & PARTS LISTS

Schematic diagrams, printed circuit board layouts, and parts lists can be downloaded from our website (qrotec.com).

