

PLEASE READ THIS MANUAL BEFORE ATTEMPTING TO OPERATE EQUIPMENT!!

UNPACKING INSTRUCTIONS

1. Carefully lift the amplifier by the bottom cabinet edge out of the shipping carton. Place the amplifier on a firm, level surface and carefully inspect it for shipping damage. Contact the shipper immediately if any damage exists. Save the carton and packing material for possible shipping in the future.
2. Remove the twelve screws holding the cover on with a number 2 phillips screwdriver. Carefully lift the cover off the amplifier. Save the screws to rescrew the cover. Note that the AL811H is shipped with the fuses and fuse caps inside the amplifier.
3. Locate the fuse pack with the two 12 ampere fuses and fuse caps. If additional screws are needed, they will be in the fuse pack also. **NOTE: Fuses supplied are for 120/110/100V operation (Models AL-811H/HY). If you are rewiring the AL-811H for 240/230/220V operation, you must use 8 ampere fuses.** The AL-811HX export model is pre-wired for 240V operation and is supplied with 8 ampere fuses.
4. Remove the foam packing material (around the tubes) that secures the 811A tubes during transit. Carefully unwrap the tubes. Do not dislodge or break the shaft that is connected to the rear input bandswitch wafer.
5. To install the tubes in the sockets, be sure the large diameter pins line up with the two large diameter holes in each socket. Do NOT rock or twist the tubes excessively during the installation. If the tubes are already installed, check them for proper seating. If necessary, press the tubes down into their sockets with gentle force. Do not rock or twist the tubes excessively. Also, check that the anode caps are secure and that they did not come loose during the unwrapping process.
6. The white ceramic anode connector will have to be removed from the top metal cap of each tube if it ever becomes necessary to remove the tubes from the amplifier. This can be a difficult procedure because the high clamping force of the internal springs in the anode connector may hold it to the cap very tightly. The tube will break if direct upward or rocking pressure is applied in an attempt to remove the connector. The safest way to remove the ceramic connector is to lift the tube out of its socket. A twisting or spinning pulling motion can then be applied while holding the ceramic connector firmly until the tube and connector are separated. Repeat the procedure with each tube.
7. Install the cover with the vent holes to the left (near the tubes) by installing the back screws first. Install all the screws loosely and tighten them only after all the screws are in place.
8. Install the fuses and fuse caps on the back of the unit. Read the manual to become familiar with the operation of the AL-811H amplifier.

AL-811H LINEAR AMPLIFIER

FEATURES

The AL-811H is a grounded grid linear amplifier developed by Ameritron using low cost 811A power triodes. It operates in class AB2 for SSB and CW.

1. **Fast Warm Up Time:** The 811A tubes take approximately 10 seconds to warm-up.
2. **Long Tube Life:** The 811A tubes are long life, reliable transmitting tubes. 811A tubes offer rugged, reliable operation even on RTTY and SSTV.
3. **Tuned Input:** A Pi-Network tuned input matches the 811A tubes to 50 ohm exciters.
4. **Two Illuminated Panel Meters:** The AL-811H has two illuminated panel meters. The Grid Current meter provides a continuous reading of the 811A grid current to indicate proper loading of the amplifier. The other meter switches between high Voltage (HV) and Plate Current (Ip).
5. **Multi-voltage Heavy Duty Transformer:** A unique "buck-boost" winding allows adjustment of primary voltages to match a wide range of line voltages centered on 110 and 230 volts. This versatile Ameritron feature allows the user to maintain optimum voltages on the tubes and other components to obtain maximum performance and life.
6. **Vernier Plate and Load Adjustments:** Both tuning controls have vernier 6:1 reduction drives for smooth tuning logging scales for accurate and rapid tune-up.
7. **Safety interlock:** AC input power is removed from the transformer when the cover is removed. **Never attempt to defeat this switch.**
8. **Operate/Standby Switch:** Used to remove the amplifier from the RF line while filament and plate voltages are maintained during "barefoot" operation.
9. **XMT Indicator LED:** Provides a front panel indication of proper amplifier keying by the exciter.
10. **ALC:** The drive level is detected to provide a control voltage for the exciter. **ALC** prevents over-driving of the linear and reduces distortion from excessive drive power.
11. **Neutralization Circuit:** Reduces unwanted feedback to improve performance.

CAUTION: This amplifier must be disconnected from the power mains before removing the cover. See the precaution on page 7.

Domestic model(AL-811H): 160, 80, 40, 30, 20, 17 and 15 meter bands
Export model(AL-811HX/HY): 160, 80, 40, 30, 20, 17, 15, 12, and 10 meter bands.

Input

Circuit type: Pi-network, slug tuned coils
Maximum VSWR at resonance: 1.3:1
Minimum 2:1 VSWR bandwidth: 15%
Maximum drive power permissible: 85 watts
Typical drive for rated output: 65 watts

Output (7MHz)

Typical SSB PEP voice operation: over 800 watts continuous
Typical CW continuous operation: 600 watts
1/2 hour PEP two tone: 650 watts
1/2 hour continuous carrier: 400 watts

ALC

Negative going, 0-12V, adjustable, phono jack

Power Supply

Circuit type: full wave bridge rectifier
No load voltage: 1700V
Full load voltage: 1500V
Full load current: 700mA
Regulation: 15%
Maximum draw at rated output: 10A (120V)
AC Input: 120V, 50/60 Hz (AL-811H/HY)
240V, 50/60 Hz (AL-811HX)

Metering

Multimeter: reads HV and plate current
Grid meter: reads PA grid current

Connectors

Relay: keys amplifier when grounded. Sources +12 VDC open circuit and supplies 100mA when grounded. A built-in pulse canceling diode protects the exciter.
RF input: SO-239, 50 ohm input.
RF output: SO-239, 50 ohms with full power, into any SWR below 3:1.
Power: NEMA 5-15P 120V grounded style.
ALC: Phono Jack. Supplies up to 12 volts of negative voltage for ALC control of exciters.

Physical

Dimensions: 15.5" D x 13.75"W x 8.25"
Weight: 30 lbs.

*Specifications are subject to change without notice or obligation.
Exact performance measurements may vary due to the accuracy of the test equipment and the measurement methods used.

TECHNICAL SPECIFICATION AL-811H*

Frequency Coverage

GENERAL INFORMATION

SAFETY INTERLOCK

The interlock switch stays closed to allow AC line voltage to reach the power transformer as long as the AL-811H's top cover is in place. When the top cover is removed, the interlock opens and disconnects the input 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.

WARNING: never remove the cover of this amplifier with the unit plugged into the power line.

DRIVING POWER

This amplifier is designed to operate at full ratings when it is driven by an exciter that has approximately 70 watts of RF output. You can use an exciter that has lower output power, but the amplifier's output may be less. If you use an exciter that delivers more than 70 watts, carefully adjust the driving power to avoid "over drive" and the creation of spurious signals, which could create needless interference to other operators. We highly recommend that you use a monitor scope for continuous output monitoring. The display on an oscilloscope is the best readily available way of determining the amplitude of the voice peaks which, if excessive, can cause "flat topping" and splatter.

IMPORTANT: Do not increase the drive power unless the amplifier output power also increases. Grid current climbs rapidly and the plate current meter and output power will barely increase with excessive drive. This condition indicates the amplifier LOAD control needs to be advanced to a higher number. Excessive plate current indicates the drive power limit has been reached. Non-linear operation, splatter, and excessive grid current will occur if the "LOAD" setting is too low.

FILAMENT SUPPLY

The filament circuit of this amplifier satisfies all requirements of the tube manufacturer related to tube performance and life. Inrush current is controlled by the transformer's internal resistance and impedance, filament choke resistance, and filament wiring resistance. To insure maximum life of the tube, never replace any circuit components or wiring with substitute parts.

ALC CIRCUIT

The ALC circuit converts a portion of the RF drive voltage at the exciter end of the tuned input circuit to a negative going control voltage. This voltage should be used to limit the exciter drive to safe drive levels for the AL-811H for exciters that develop more than 70 watts of output power.

A capacitive divider consisting of C27 and C28 is used to reduce the RF voltage and drive a rectifier circuit consisting of D17 and D18. The resulting voltage is filtered by C29 and R12 and is applied to the ALC potentiometer R14. R13 provides RF and DC isolation for the ALC jack. The DC isolation prevents loading of the exciter ALC input line by the ALC potentiometer. The ALC circuit can be adjusted by loading the AL-811H slightly beyond the recommended maximum values with the

ALC line disconnected. The ALC line can then be connected and the ALC control on the amplifier can be adjusted to a point just before the drive begins to decrease.

NOTE: The primary use of the ALC function is the prevention of excessive drive levels. This circuit will not prevent small changes in output power from occurring on different bands. Under most conditions destructive levels of drive power are those above 100 watts. Slight changes may occur in maximum output power on different frequencies with the ALC connected. A compromise in ALC adjustment may be necessary to achieve acceptable performance on all bands.

PLATE SUPPLY

The power supply in this amplifier uses a combination plate, filament and control transformer. A buck boost winding is provided to allow the user to compensate for low, medium or high power line voltage. This amplifier is normally supplied wired for the highest power line voltage setting. Never change this setting unless you are positive that performance is suffering due to low filament and plate voltages. The life of components will be shortened drastically if the high voltage exceeds 1800 volts at rest. The diagram on page 4 shows proper wiring for each voltage. **Never attempt to rewire this amplifier while it is connected to power.**

EXPORT MODIFICATIONS

A simple modification will allow operation on frequencies above 15 meters. Instructions for this modification are available by sending a written request for "Export Modification Instructions" along with a copy of a valid amateur license. There is no charge for this information. Export models are shipped with this modification and have either "X" or "Y" following the serial number. Standard frequency coverage is indicated in the chart on page 7.

TECHNICAL ASSISTANCE

Technical assistance is available during our normal business hours on weekdays. The following information is required to assist you with operational problems:

1. Model and Serial Number
2. Date of purchase and dealer
3. An accurate description of the problem

Meter readings at all stages of the tuning procedure are very important along with a complete description of the other equipment used with our product.

Written assistance is also available. Due to time delays in processing mail, please allow at least three weeks for a written reply.

AMERITRON
116 Willow Road
Starkville, MS 39759
Telephone: (601) 323-8211
Fax: (601) 323-6551

METERING FUNCTIONS

The AL-811H has two illuminated panel meters. The right meter reads PA grid current up to 200mA. The normal current with a single tone (carrier) signal will be 150mA to 175mA. If the current is too high during full power operation, the loading control should be advanced to a higher setting.

If the current is too low, the loading control should be turned to a lower setting. The left meter reads PA high voltage up to 2000 volts and plate current up to 750mA. The normal readings are 1400-1600 volts HV and 650mA of current at full rated output with a single tone signal.

INSTALLATION

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. Provide an unobstructed air inlet for the blower. Do NOT place any books, magazines or equipment that will impede the free flow of air near the sides of the cabinet.

VENTILATION

The AL-811H ventilation system has been designed and tested to maintain the 811A tube temperature safely below the tube manufacturer's rating at 500 watts output with a 100% duty cycle. To insure proper ventilation in your installation, observe the following:

1. Do not block or restrict the ventilation holes in the cover.
2. The exhaust air flow is over 20 CFM. Do not "assist" the air flow unless the fan exceeds the AL-811H fan CFM by a factor of 2:1.
3. Do not mount additional fans on the AL-811H cabinet.
4. The exhaust air will become warm at high power levels. Do not place any heat sensitive objects in the exhaust air stream.

GROUNDING

Connect a good earth or water pipe ground to the ground post on the rear panel of the amplifier. Use the heaviest and shortest connection possible.

Before you use a water pipe ground, inspect the connections around the water meter and make sure that no plastic or rubber hose connections are used. These connections interrupt electrical continuity to the water supply line. Install a jumper around any insulating water connections 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.

POWER CONNECTIONS

The AL-811H is supplied with a NEMA 5-15P plug for 120V operation. The power required to operate the AL-811H/HY is not high enough to warrant 240V operation unless 120V is not available. The fuses should be 12 ampere fuses for 120V and they must be changed to 8 amperes for 240V operation. The diagram to the right shows the proper wiring for 120V operation.

Operation on a voltage of 240V is not required, nor will it necessarily improve performance. The power transformer will

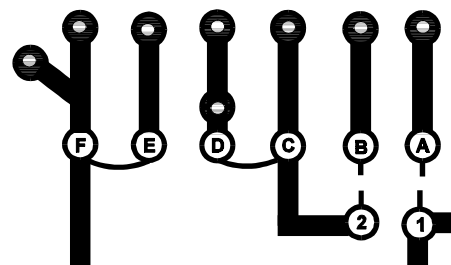
perform equally well with a power line frequency of 50 Hz or 60 Hz. The Transformer Connections chart at the bottom of this page shows proper connections for various line voltages.

WARNING: The green wire connects to the chassis of the amplifier and it must connect to the safety ground of the outlet.

The AL-811HX (export model) is wired for 240V, 50/60 Hz operation. The appropriate plug is not provided for this model. You must wire the proper plug on the end of the power cord supplied. Simply cut the existing plug off and wire the appropriate plug in its place. If the line voltage in your country is not 240V, then you must change the transformer to the appropriate setting indicated by the chart below. **Note:** the AL-811H transformer allows operation on 100V line voltage in countries such as Japan.

NEVER REWIRE THE POWER SUPPLY TO BOOST THE HIGH VOLTAGE ABOVE 1800 VOLTS. ALSO, DO NOT ATTEMPT TO REWIRE THIS AMPLIFIER WHILE IT IS CONNECTED TO POWER.

The wiring between the fuse box and the amplifier AC outlet must be 14 gauge or larger in order to supply the operating current required (10 amperes) without a significant drop in the line voltage. The outlet should be fused for the wire gauge used.



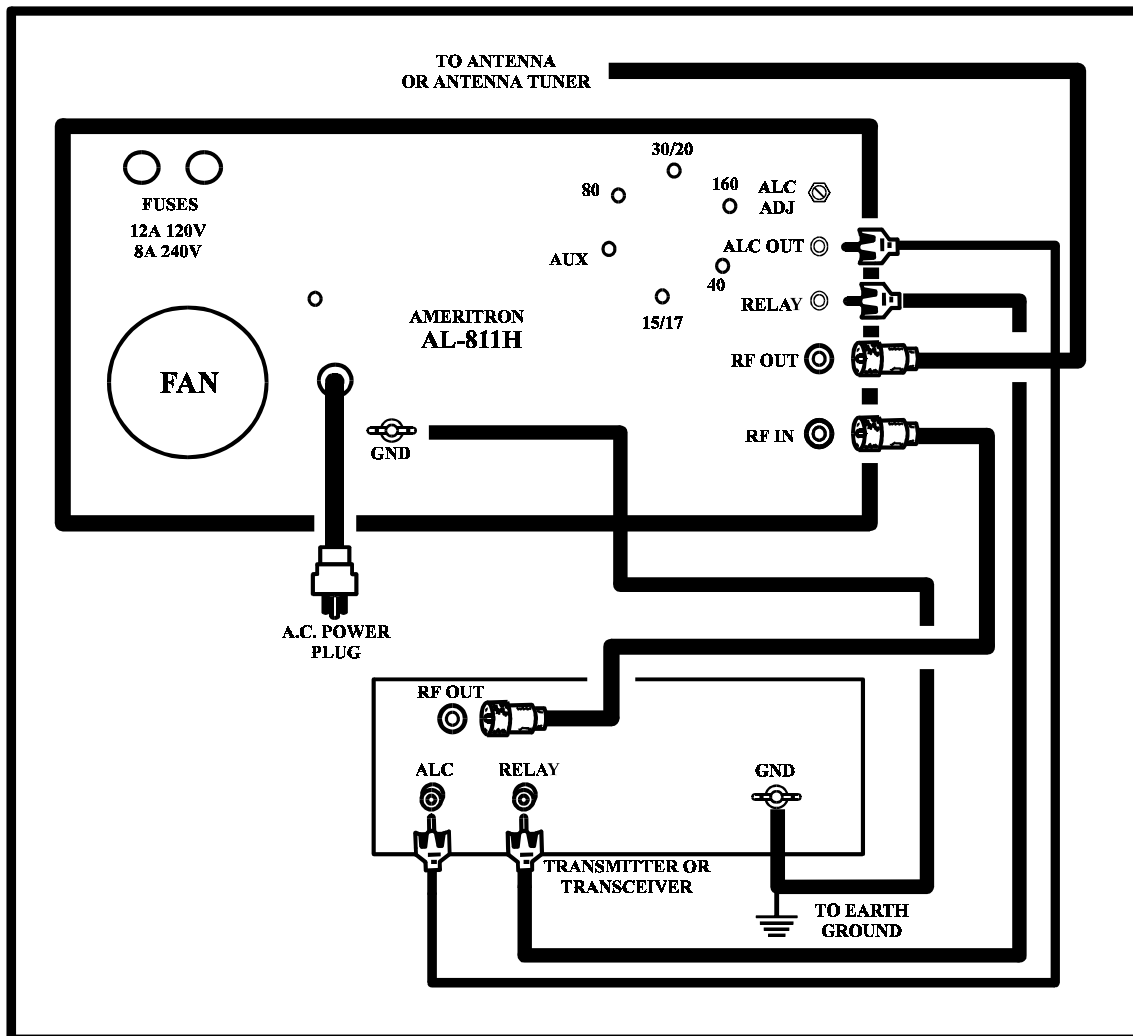
*Factory wired operation for the AL-811H

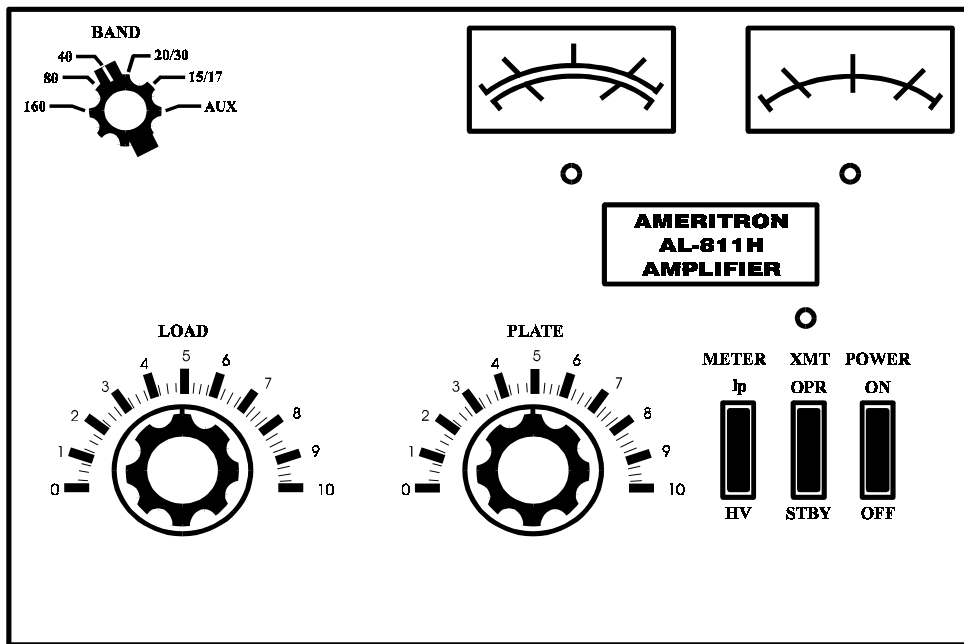
**Factory wired operation for the AL-811HX

VOLTAGE	BUCK BOOST	PRIMARY
*120	A to 1, B TO 2	C to D, E to F
110	1 to 2, (A,B OPEN)	C to D, E to F
100	A to 2, B to 1	C to D, E to F
For 240, 230, 220 all three primary conditions apply ↓		
**240	A to 1, B to 2	no connection C to D D to E
230	1 to 2, (A,B OPEN)	
220	A to 2, B to 1	no connection E to F

INTERCONNECTIONS

1. Connect the RF output of the transmitter or transceiver to the **RF IN** connector on the rear of the AL-811H with 50 ohm coax. Use any 50 ohm cable (RG-58 is fine) with PL-259 plugs.
2. Connect the existing station antenna system to the **RF OUT** connector on the AL-811H with any 50 ohm coaxial cable capable of carrying 650 watts.
3. Use shielded audio type cable with standard male phono plugs to connect the **RELAY** jack on the AL-811H to the exciter's normally-open amplifier keying circuit. The keying circuit in the AL-811H has a positive 12 VDC open circuit and it provides 100mA of current when connected to ground. The AL-811H has an internal back-pulse canceling diode across the relay coil.
4. Connect the shortest possible ground lead from a good earth ground to the **GND** terminal. The best leads are solid (instead of stranded or braided) copper. It is also best to use a common ground point for all the equipment in the station.
5. Use a shielded audio cable with standard male phono plugs to connect the ALC out jack on the back of the amplifier to the negative going **ALC** input jack on the exciter. *Do not connect this line until you have read and understand the function of the ALC circuit.* Exciters with output powers below 70 watts do not normally require this connection. If this jack is connected without adjusting the **ALC** control, the exciter may not develop any drive power.





TUNE-UP

CW PROCEDURE

Follow the instructions in numerical order. If the various meter readings are different than those indicated in the instructions, check the connections from the exciter to the amplifier and make sure they are correct. Consult the manual for the exciter, if necessary. Be sure the transformer is correctly wired for your line voltage. See the **POWER CONNECTIONS** instructions on page 4 for wiring details.

- Set the AL-811H front panel switches as follows:
POWER/OFF-ON to **OFF**
XMT/OPR-STBY to **STBY**
METER/Ip-HV to **HV**
- Plug the line cord into a proper voltage outlet.
- Set the **POWER** switch to the **ON** position. The meter lamps should light and the fan should start. Read the 2000 volt scale on the multimeter. It should indicate 1700 volts nominally and no more than 1800 volts.
- With the amplifier XTM switch still on **STBY**, tune the exciter into the normal 50 ohm load according to the manufacturer's instructions. Turn the exciter drive fully down after tuning.
- Place the amplifier bandswitch on the same band as the exciter, the **PLATE** control in the dial range for the band selected, and the **LOAD** control as indicated:

MHz	Plate	Load	MHz	Plate	Load
1.80	1 1/2	6 1/2	10.1	7 1/2	0
1.90	3	7 1/2	14.0	9	3
3.5	5	2	18.1	9	2 1/2
3.7	6	3	21.0	9 1/2	4
4.0	6 1/2	5 1/2	24.9	9 1/2	4 1/2
7.0	8	3	28.5	9 1/2	5
7.3	8	3 1/2			

- With the exciter drive still at zero, place the **METER/HV-Ip** switch in the **Ip** position. Observe the 750mA scale. It should read zero. Place the **XMT/STBY-OPR** switch in the **OPR** position.
- Key the exciter (no drive). The Transmit (**XMT**) LED should light. Observe the plate current on the 750mA scale. It should be 125mA.

NOTE: The no drive current will vary up to 25% due to component and line voltage tolerances.

- Apply only enough drive to indicate a grid current of 100mA, or an Ip of no more than 450mA. Tune the **PLATE** control for maximum output power. It is normal for the plate current to dip at this point. If the grid current goes over 200mA, reduce the drive at once. Unkey the exciter.
- Observe the output on an external RF wattmeter. Increase the drive until full exciter power (never to exceed 80 watts) or 200mA of grid current, is achieved. Quickly adjust the **PLATE** and **LOAD** controls for maximum output power.
- Reduce the drive until the desired output levels are obtained.

NOTE: Rotating the LOAD control clockwise reduces grid current for a given amount of drive. If the LOAD control is set at too low a numerical setting, a severe stress on tank components may occur. The PLATE control should always be peaked for maximum grid current or output power. Do not exceed 750mA of plate current during tune-up.

OPERATION OF OTHER MODES

SSB:

Tune up the exciter and amplifier as described in **TUNE UP** section and switch the exciter to SSB. Normal ranges of meter readings on SSB are between 20 and 50 percent of the CW carrier readings. This is due to the different peak-to-average power ratios in the operator's speech waveform. The only true way to measure peak output power is with a good peak reading wattmeter or monitor scope. A whistle should produce the same values obtained on CW. Any effort to run more than these values will produce splatter and distortion.

FM, RTTY, PACKET, AMTOR:

The plate current should be limited to 400mA maximum. The grid current should be limited to 120mA and the amplifier should be tuned for peak output power with the drive reduced to hold the grid and plate currents below the ratings given.

NOTE: Some exciters put out short duration high power RF pulses when first keyed. Exciter power output peaks may reach or exceed full output level settings even if the exciter's power control is adjusted to deliver a fraction of full power under "keydown" conditions.

The amplifier loading control must be set high enough (clockwise) to prevent extremely high energy levels from developing in the plate and grid circuits of the amplifier. **DO NOT "UNDERLOAD" THE AMPLIFIER TO REDUCE POWER.** Never "retune" the amplifier to produce higher efficiency with reduced drive except under the FM, RTTY, PACKET, and AMTOR section. Poor linearity, splatter, or even damage to components, may result from failure to follow instructions.

QSK OPERATION

The open frame relay in the AL-811H takes approximately 15ms to switch states. This precludes using the standard internal relay for QSK CW operation. Commonly available vacuum relays are very marginal for high speed QSK operation. At 60 WPM less than 50% of the available receive time can be used due to the slow speed of vacuum relays.

On PACKET, AMTOR and other modes delay can be added to the transmit and receive changeover to use either vacuum or our standard conventional relay effectively. Ameritron offers a high

speed switching option for operators who require high speed switching between receive and transmit. The system switches in one mS. Therefore, these systems are several times faster than available vacuum tube relay systems and they allow over 90% of the available receive time to be used at 60 WPM.

The QSK-5 stand alone PIN diode switch can be used with almost all types of amplifiers and transmitters. No modifications are required to the amplifier with the QSK-5. Contact Ameritron for details on the QSK-5.

The AL-811H will operate with full output on all WARC bands except 24.5 MHz
The AL-811HX/HY will operate with full output on all WARC bands

STANDARD FREQUENCY COVERAGE

AL-811H		AL-811HX/HY	
160 meters	1.8 - 2.0 MHz	160 meters	1.8 - 2.0 MHz
80 meters	3.5 - 4.0 MHz	80 meters	3.5 - 4.0 MHz
40 meters	7 - 7.3 MHz	40 meters	7 - 7.3 MHz
30 meters	10.1 - 10.15 MHz	30 meters	10.1 - 10.15 MHz
20 meters	10.4 - 14.35 MHz	20 meters	14.0 - 14.35 MHz
17 meters	18.1 - 18.2 MHz	17/15 meters	18.1 - 21.45 MHz
15 meters	21.0 - 21.45 MHz	12/10 meters	24.9 - 29.7 MHz

WARNING!!

DO NOT ATTEMPT TO PUT THIS AMPLIFIER IN SERVICE WITH THE COVER REMOVED! CONTACT WITH VOLTAGES INSIDE THIS AMPLIFIER CAN BE FATAL! ALWAYS DISCONNECT THE AMPLIFIER FROM THE POWER MAINS AND WAIT FOR THE FILTER CAPACITORS TO DISCHARGE BEFORE REMOVING THE COVER.

PERIODIC MAINTENANCE

The high voltage present on the plate choke and air variable capacitors attract dust and dirt out of the air stream. It is particularly important that the high voltage areas at the bottom of the of the plate choke and the insulator on the air variable capacitors be dust free. These areas should be inspected every few months if the amplifier is operated in a dusty environment.

Unplug the line cord, and wait at least 90 seconds until the power supply capacitors discharge. Remove the cover and

connect a jumper wire from ground to the anode connection of the tubes. **NOTE: This is a safety wire that must be installed when beginning service work and must be removed when work is finished.**

Use a soft bristle brush dipped in alcohol to clean previously mentioned areas.

Amplifier Tuning Chart Log

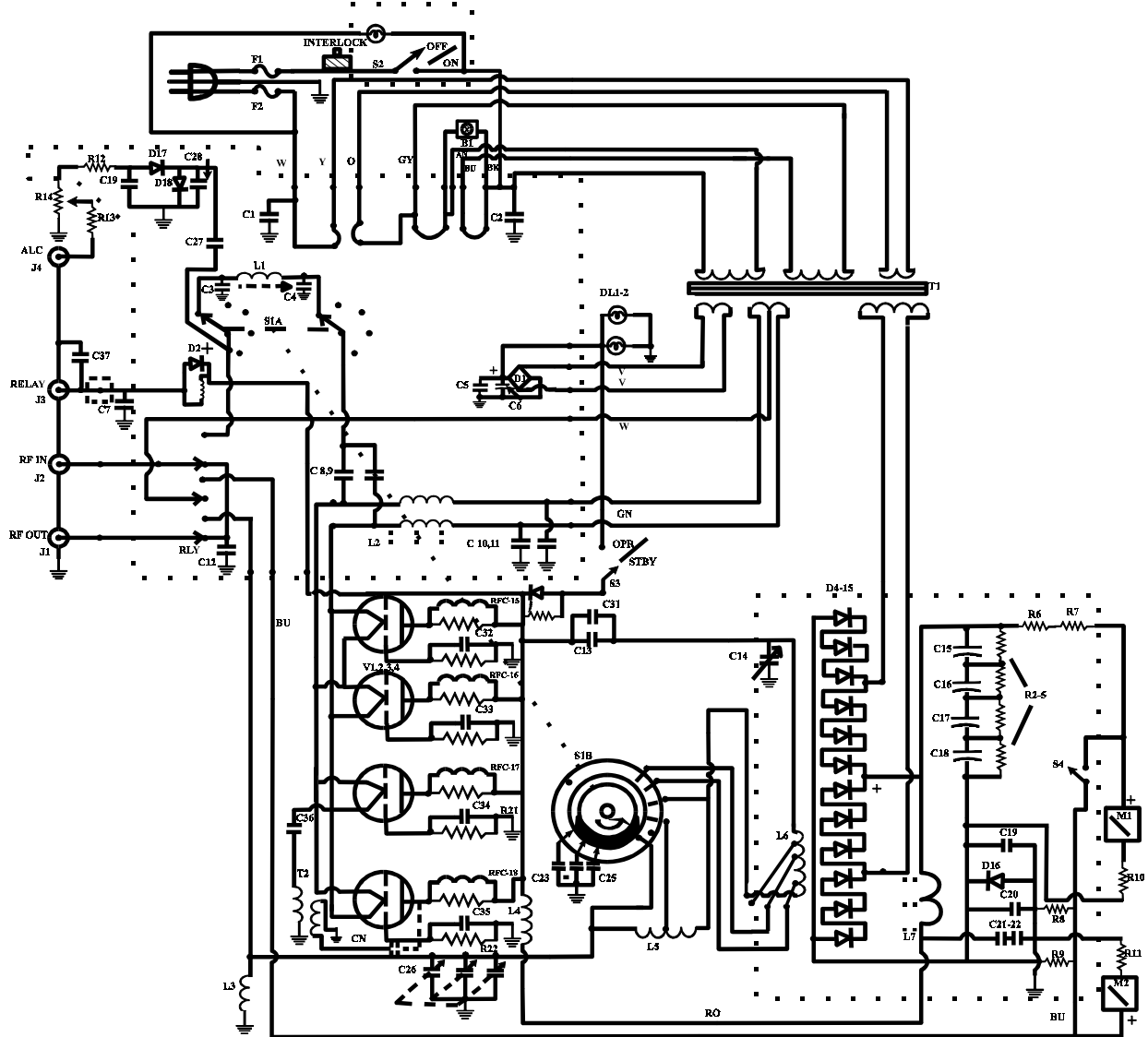
BAND	LOAD	PLATE
160 CW		
160 SSB		
80 CW		
75 SSB		
40 CW		
40 SSB		
30 CW		
20 CW		
20 SSB		
17 CW		
17 SSB		
15 CW		
15 SSB		

Fill in this chart with your actual settings and you can quickly change bands in the future.
We suggest you use a pencil as settings may change as you alter your antennas.

NOTES:

AL-811H SCHEMATIC

Power supply shown wired for 120V operation *



AL-811H INPUT CHART

BAND	C3 (pF)	L1	C4 (pF)
160		28.75T (405-1287)	1300 (208-5177)
80	100 (208-5174)	23.75T (405-1237)	500 (208-5691)
40	750 (208-5668)	13.75T (405-1137)	500 (208-5691) 120 (208-5606)
20/30	330 (208-5331)	9.75T (405-1097)	270 (208-5775)
15/17	120 (208-5606)	6.75T (405-1067)	150 (208-5396)
10/12	180 (208-5605)	4.75T (405-1047)	100 (208-5174)

PARTS LIST

Designation	Description	Ameritron Part #
B1	Fan	410-3583
C1, 2, 21, 22	0.01 uF, 250VAC/1.4KVDC Dis.	200-2122
C3, 4	See Input Chart	
C5, 7, 19, 37	0.01 uF, 50V Disc	200-0416
C6	2200 uF, 25V Elec.	203-0207
C8-11, 29, 30, 32-36	0.01 uF, 1kV Disc	200-2121
C12, 27	27 pF, 500V DM10	208-5404
C13, 31	0.001 uF, 7.5kV, Disc	200-7224
C14	Air Variable	204-2572-1
C15, 16, 17, 18	210 uF, 450V	203-0578
C20	0.1 uF, 50V Disc	200-0754
C23, 25	360 pF, 1000V DM19	208-6688
C24	500 pF, 1000V DM15	208-6691
C26	Air Variable	204-2113
C28	150 pF, 500V DM15	208-5396
D1	Bridge Rectifier	300-9646
D2, 16	1N4007	300-0266
D3	MV6753 Red LED	320-0522-1
D4 - 15	1N5408	300-0145
D17, 18	1N34A	300-0346
DL1, 2	Meter Lamp	420-0320
J1, 2	SO-239	610-2126
J3, 4	Single Phone Jack	600-1225
L1	See Input Chart	
L2	Choke Filament	10-15115
L3	2.5mH Choke	402-1162
L4	5 1/2 inch Plate Choke	10-15197
L5	#16 Air Coil	404-0811
L6	HF Coil	10-13140
M1	Plate HV/IC Meter	400-2601
M2	Grid Current Meter	400-2600
R1	33 ohm, 1/4 Watt	100-1330
R2, 3, 4, 5	50k, 7 Watt, Type 170S	103-7580
R6, 7	1 Meg 3 Watt	103-2223
R8	1.5 Ohm 3Watt, Type 135	103-3400
R9	.6 Ohm, 3 Watt, Type 135	103-3399
R10	330 Ohm 1/4 Watt	100-2330
R11	180 Ohm 1/4 Watt	100-2180
R12	3.3k Ohms 1/4 Watt	100-3330
R13	10k Ohm 1/2 Watt	101-4100
R14	100k Ohm, Potentiometer	105-1341
R19-22	51 Ohm, 2 Watt,	103-2151-1
PC 15-18	100 Ohm, 2 Watt	103-2180
RL1	12 VDC Relay	408-6140
S1A	Wafer Switch	500-4811
S1B	Band Switch	500-2811
S2	Rocker Switch w/Light	507-1157
S3, 4	SPST Switch	507-1147
S5	Safety Interlock Switch	504-3247
T1	Power Transformer	406-1532
T2	Neutralizing Transformer	10-14194-H
V1, 2, 3, 4	811A Tube	350-0811C
F1	12 Amp (120 Vac Operation)	755-1412

F2	8 Amp (240 Vac Operation)	755-1432
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