Tube Applications & Suggestions

RECEIVING AND SPECIAL PURPOSE TUBES

The familiar tube manufacturers, Sylvania, ECG, RCA, General Electric, Raytheon, etc., ceased U.S. production of small TV and receiving type tubes in the early 1980's. Tubes you see offered today are either existing shelf stock or foreign imports.

We have found it necessary to fully test most receiving tubes to weed out the weak, gassy, or otherwise defective. RF PARTS selects the best audio, power and sweep tubes for matched sets. Matched tubes will operate in a balanced manner, yielding lower distortion, equal power dissipation, less tendency for parasitic oscillations, and improved tube life. "Out of spec" and marginal tubes are discarded. TV SWEEP TUBES are suited for SSB use, but caution must be used in AM use. High level compression, use of "Modulators", etc., cause excessive strain on final tubes in general. When operated in linear amplifiers, plate dissipation and cathode current are easily exceeded, which in turn will drastically reduce tube life. Approach high peak power with care. Reduced tube life due to "out of spec" operation, is not a reflection of tube quality, but of tube abuse.

SWEEP TUBE ratings — carrier level of 50w AM, 75w SSB output per tube willassure reasonable tube life for 6LQ6, 6LF6, 6JE6, 6HF5, 6JS6C, 6KG6/EL509, etc. Fan cooling is mandatory. Some amplifier model numbers are chosen for sales reasons and do not reflect the amplifier's true power capability. As with semiconductors, manufacturers of sweep tubes do not warrant their tubes after installation, as there is no way of knowing if there are problems in the equipment, method of operation, etc. If your equipment uses sweep tubes, it is best to reduce power and input level to lengthen tube life.

Kenwood/Heathkit/Yaesu/Etc: use only matched 6146B or 6146W. (Our Sylvania 6146W is a ruggedized premium grade 6146B which pass military quality specifications.) US manufactured 6JS6C in Yaesu requires simple neutral modification. This tube is in extremely short supply.

Swan Transceivers require special tube selection for ease of neutralization. You may call our Technical Department at (760) 744-0750 for details.

POWER HANDLING CAPABILITY

Our tests have shown that Graphite plate 3-500Z tubes safely handle up to 10-20% higher power levels over metal plate tubes. Graphite tubes will not "burn through" or melt at temperatures which destroy regular metal plate tubes.Additional air flow may be required for AM & RTTY.

TUBE BURN IN

Transmitting tubes generally require a "burn in" time to increase emission to its nominal value. In broadcast stations, 1-3 hours at rated filament voltage is allowed for burn in. This initial operation allows the getters, materials which absorb and hold residual gas, to finish the vacuum of the tube in its final operating environment. In an Amateur Radio amplifier, tubes will sometimes require 50-200 hours of accumulated "key down" transmit time to fully remove the residual gas and condition the filament for full emission. It is well advised to allow tubes to operate in standby mode (filaments on, no transmit) for 10 hours before tune-up.

The 811A, 572B, 3-500Z, 4-400, etc.utilize a thoriated tungsten filament, which is highly dependent upon sufficient filament temperature to provide adequate electron emission for normal operation. Emission increases as the thorium migrates towards the surface of the filament wire. This is why it is recommended to "burn in" these tubes before operation. 572B, 811A, & 3-500ZG tubes are assembled using the best U.S. filament wire to assure long tube life. Records show our 3-500ZG tubes returned for warranty from 1993-2008 to be less than 2%. This figure ranks up with the best of U.S. and European tubes, and allow RF PARTS to offer a full One Year Limited Warranty for TAYLOR against manufacturing defects in material and workmanship. The RFP (RF PARTS) brand carries our TWO YEAR limited warranty against manufacturing defects in material and workmanship (second year prorated).

TUBE LIFE

A number of factors can aid maximum tube life in your transmitter. Are the maximum ratings given on the tube manufacturer's data sheet being exceeded? Is there adequate forced air cooling? Is the final power tube capable of delivering power in excess if the desired operating level? 3-500Z, 4-400A, 3CX3000A7, and similar tubes of directly heated cathode design have thoriated tungsten filaments. During operation, the thorium migrates to the surface of the filament and increases emission (electron flow capability) of tungsten.

FILAMENT VOLTAGE

Proper filament voltage has a radical affect on filament life. When a tube is new, there is plenty of emission available to sustain rated operating current. Normally the tubes of broadcast stations will be run for a short period of time at the rated filament voltage. Then filament voltage is reduced to a point just above that which allows necessary emission. It is checked from time to time and readjusted as required. Operating at the lower filament voltage and adjusting in the manner noted improves tube life substantially. Note that the above guideline should be used for tungsten emitters only, and does not apply to oxide cathode-type tubes. Additional information on this subject will be found in CPI/Eimac technical bulletin EXTENDING TRANSMITTER TUBE LIFE. A reprint is available from RFP for $1.00.

Sweep Tube Comparison

TUBE	Plate Dissipation Watts	Screen Dissipation Watts	Transconductance Micromhos	Heater	Capacitances			RF Operation (Up to 30 MHz)								
				(6.3V) Amperes	Cin pF	Cgp pF	Cout pF	Class of Service	Plate Voltage	Screen Voltage	Grid Voltage	Plate Current mA	Screen Current mA	Grid Current mA	Approximate Driving Power Watts	Approximate Output Power Watts
6DQ5	24	3.2	10.5k	2.5	23	0.5	11	C	400	200	-40	100	12	1.5	0.1	25
6DQ6B	18	3.6	7.3k	1.2	15	0.5	7	C	400	200	-40	100	12	1.5	0.1	25
6FH6	17	3.6	6k	1.2	33	0.4	8	C	400	200	-40	100	12	1.5	0.1	25
6GC6	17.5	4.5	6.6k	1.2	15	0.55	7	C	400	200	-40	100	12	1.5	0.1	25
6GJ5	17.5	3.5	7.1k	1.2	15	0.26	6.5	C	500	200	-75	180	15	5	0.43	63
"	17.5	3.5	7.1k	1.2	15	0.26	6.5	AB1	500	200	-43	85	4			35
6HF5	28	5.5	11.3k	2.25	24	0.56	10	C	500	140	-85	232	12.5	8	0.76	77
"	28	5.5	11.3k	2.25	24	0.56	10	AB1	500	140	-46	133	4.5			58
6JB6	17.5	3.5	7.1k	1.2	15	0.2	6	C	500	200	-75	180	13.3	5	0.43	63
"	17.5	3.5	7.1k	1.2	15	0.2	6	AB1	500	200	-42	85	4.2			35
6JE6	30	5	10.5k	2.5	24.3		14.5	C	500	125	-85	222	17	8	0.82	76
"	30	5	10.5k	2.5	24.3		14.5	AB1	500	125	-44	110	3.9			47
6JG6A	17	3.5	10k	1.6	22	0.7	9	C	450	150	-80	202	20	8	0.75	63
"	17	3.5	10k	1.6	22	0.7	9	AB1	450	150	-35	98	4.5			38
6JM6	17.5	3.5	7.3k	1.2	16	0.6	7	C	500	200	-75	190	13.7	4	0.32	61
"	17.5	3.5	7.3k	1.2	16	0.6	7	AB1	500	200	-42	85	4.4			37
6JN6	17.5	3.5	7.3k	1.2	16	0.34	7									
6JS6C	30	5.5		2.25	24	0.7	10									
6KD6	33	5	14k	2.85	40	0.8	16	GG	800	0	-11	150			12.5	82
6LB6	30	5	13.4k	2.25	33	0.4	18									
6LG6	28	5	11.5k	2	25	0.8	13									
6LQ6	30	5	9.6k	2.5	22	0.46	11									
6MH6	38.5	7	14k	2.65	40	1.0	20									