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Mohawk 5B Amplifier Owner's Manual

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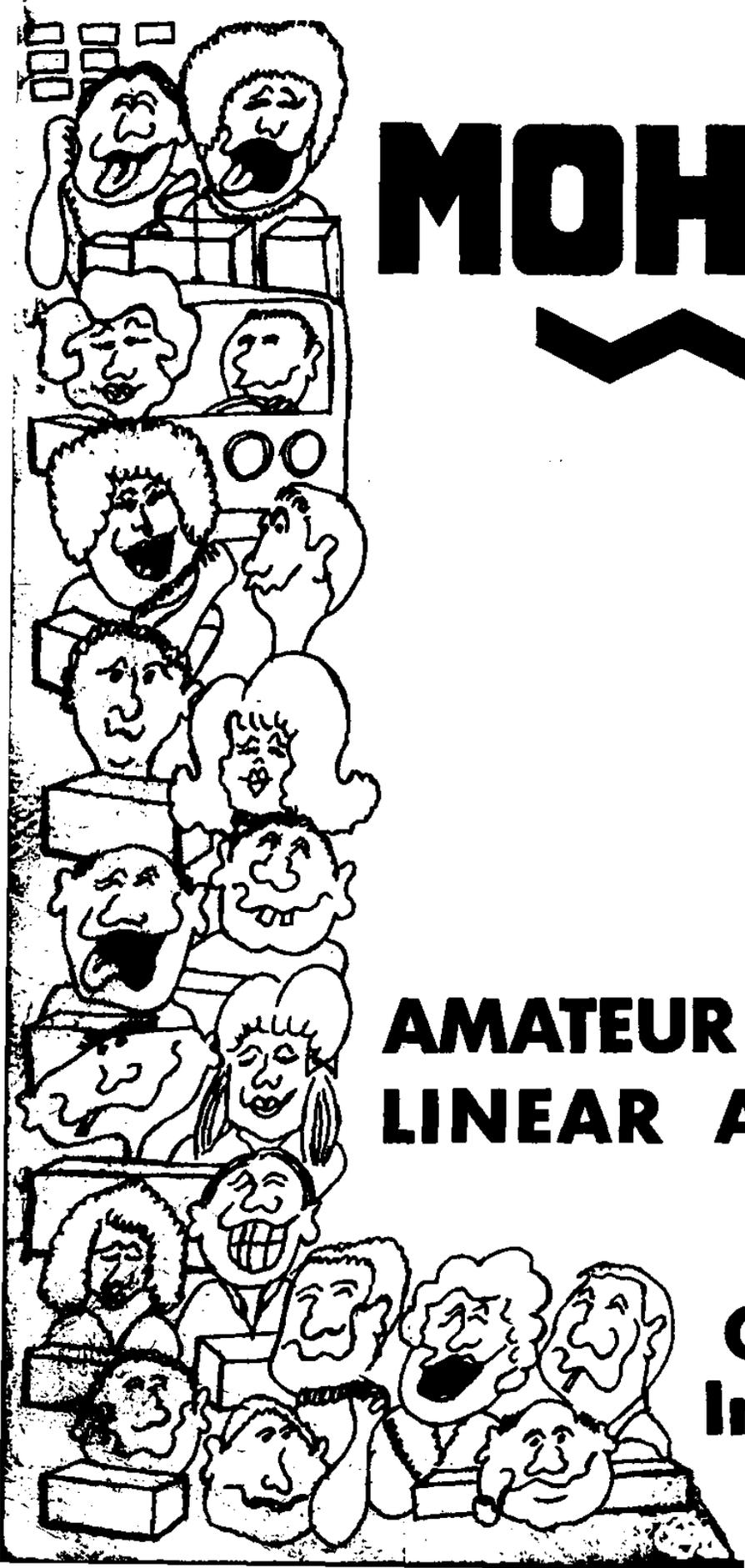
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MOHAWK



AMATEUR 10 METER LINEAR AMPLIFIER

Operating Instructions

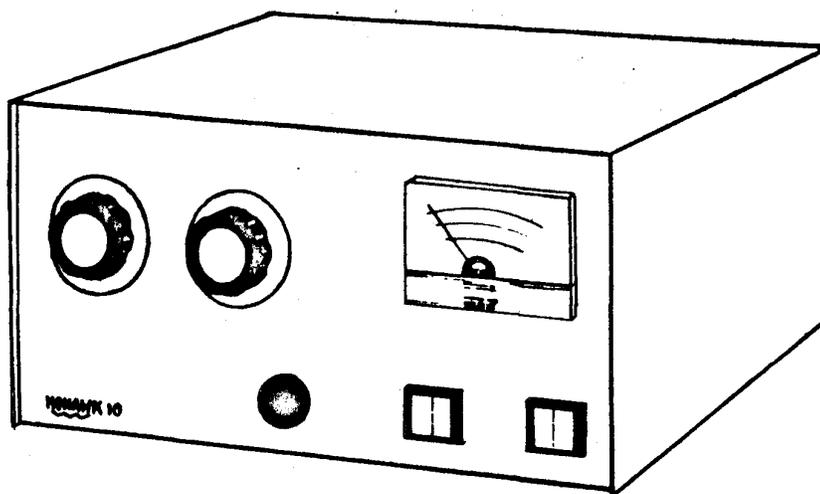
SPECIFICATIONS

MODEL 5B AMATEUR 10 METER LINEAR AMPLIFIER

Amateur Band Coverage	10 Meters [28.0 – 29.7 MHz]		
	SSB	CW – RTTY	AM
Total DC Input Power*	1200 Watts p.e.p.	650 Watts	600 Watts
RF Power Output*	800 Watts p.e.p.	400 Watts	300 Watts
Duty Cycle*	Continuous Voice Modulation	50 percent [5 minutes max.]	Continuous Voice Modulation
AC Power Requirement*	1000 Watts	1000 Watts	900 Watts
	* at 115 volts AC and with 4 Watts [8 Watts p.e.p.] RF drive		
RF Input Drive Power	Minimum Average		
	Maximum Continuous		
	Maximum Intermittent		
Front Panel Controls	TUNE		
	LOAD		
	Five position meter function switch		
	POWER		
	STANDBY		
Front Panel Meter	0 – 3000 volts final plate voltage		
	0 – 1000 volts driver plate voltage		
	0 – 500 milliamperes plate current		
	0 – 10 relative RF power output		
Rear Panel Connections	INPUT		
	DELAY		
	FUSE 15 AMP		
	115 V 60 Hz		
	OUTPUT		
Tube Complement	[2]		
	[1]		
	[1]		
Size	Height – 8.2 inches [208 millimeters]		
	Width – 14.1 inches [358 millimeters]		
	Depth – 11.5 inches [292 millimeters]		
Weight	35 pounds net [16 kilograms]		
	40 pounds shipping [18 kilograms]		

The Mohawk Model 5B Amateur 10 Meter Linear Amplifier is manufactured and sold for use only in conformance with all applicable Federal Laws and Regulations.

Model 5B



Amateur Linear Amplifier

OPERATING INSTRUCTIONS

General Description

The Mohawk 10 is an RF power amplifier that is specifically designed to linearly amplify a modulated RF signal approximately 20 db in the 10 meter Amateur band.

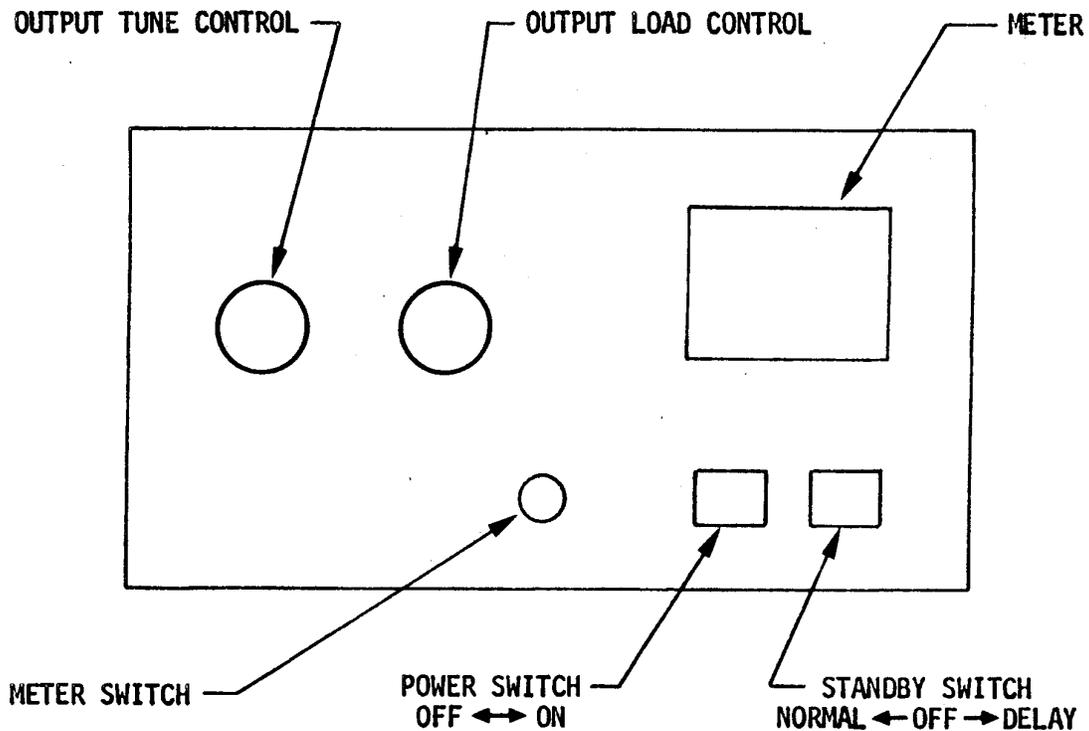
The Mohawk 10 is built for heavy usage and many of its features have been incorporated to make it a reliable and durable unit. The rugged final tubes, the industrial quality blower, and the generously rated components used in this amplifier all contribute to its ability to stand up to the most talkative ham.

An automatic antenna switching circuit is incorporated into the Mohawk 10 and allows the user to switch readily from just the power output of his exciter-transmitter to the amplified power output of the Mohawk 10. This feature also permits the user to operate a transceiver through the Mohawk 10, using the same antenna for transmit and receive.

To enhance its use in single sideband suppressed carrier operation (A3J), the Model 5B Mohawk is equipped with an adjustable delay in the automatic antenna switching circuit so that the relays will not open during short pauses in the user's speech. Up to about two seconds of delay is available and this can be adjusted to suit the user's own particular speech characteristics.

Front Panel Controls

The front panel of the Mohawk 10 has the final tuning controls, a multiple function meter, a meter function selector switch, a power on-off switch and a standby switch.



The final tuning controls are labeled TUNE and LOAD, and consist of the final plate tuning capacitor (labeled TUNE) and the output loading capacitor (labeled LOAD).

The front panel meter is a long scale instrument that is specially built for the Mohawk 10. It contains a D'Arsonval movement with ± 2 percent accuracy, and features four scales reading as follows:

- 0 - 3000 volts DC plate voltage
- 0 - 1000 volts DC plate voltage
- 0 - 500 milliamperes DC plate current
- 0 - 10 relative RF power output

The meter function switch is a five position selector switch that allows the operator to read the most significant operating voltages

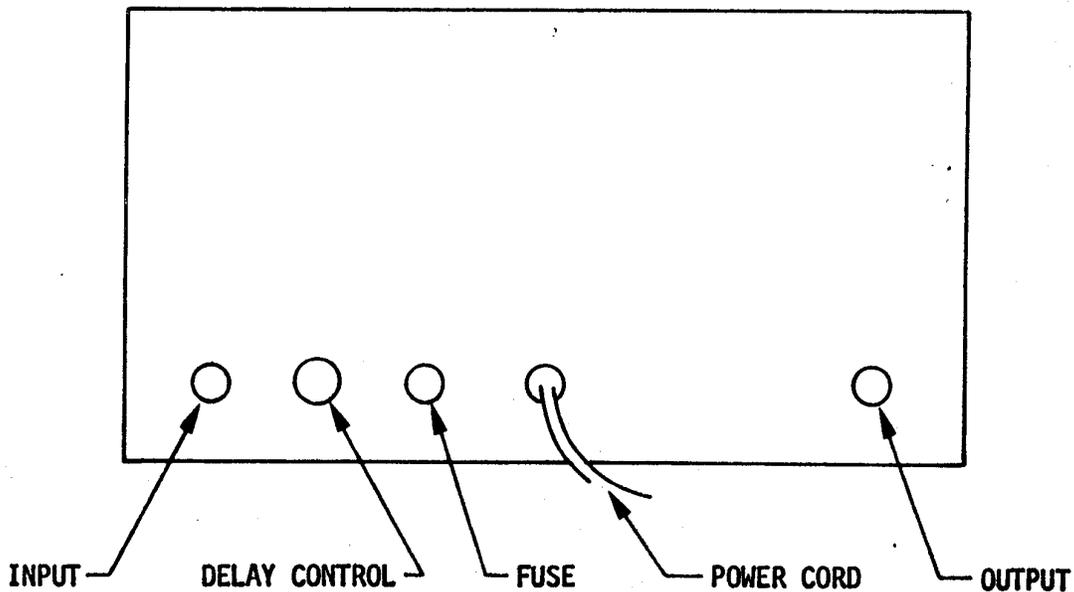
and currents in the Mohawk 10, as well as the relative RF power output as measured at the output terminal. The abbreviations used on the front panel and the proper meter scale to read for each function are explained in the following table:

Panel Marking	Measurement Function	Meter Scale
FIN. PL. V	Final Plate Voltage	0 - 3000 volts
DR. PL. V	Driver Plate Voltage	0 - 1000 volts
FIN. PL. I	Final Plate Current	0 - 500 milliamperes
DR. PL. I	Driver Plate Current	0 - 500 milliamperes
OUTPUT	Relative RF Power Output	0 - 10 (no units)

The POWER switch turns the complete amplifier on or off, and the STANDBY switch turns the automatic relay switching circuit on with no delay (NORMAL), off, or on with adjustable delay (DELAY).

Rear Panel Connections

The rear panel of the Mohawk 10 has the INPUT and OUTPUT connections to the amplifier, a fuse holder labeled FUSE 15 AMP, the AC power line cord, and the adjustment control for the variable delay relay switching circuit.



AC Power Requirements

The Mohawk 10 uses standard 60 Hz AC line power. It is designed for operation at 115 volts, although satisfactory performance will be obtained within the range from 105 volts to 130 volts.

Since the Mohawk 10 draws approximately 10 amperes of current during operation, the user should be sure that his source of power will safely handle this requirement. If an extension cord is used, it should be heavy duty, 3-wire, at least 16 AWG, and not over 25 feet in length.

The line cord of the Mohawk 10 is equipped with a grounding type plug. When properly used this type of plug connects the amplifier chassis to the ground in the electric power system. Its purpose is to minimize the possibility of shock hazard from the cabinet in power equipment of this type. It further insures proper grounding of the amplifier to permit full power to be delivered to the antenna while minimizing unwanted (and TVI causing) radiation from the chassis. The grounding plug of the Mohawk 10 should not be defeated by the use of adapters unless the ground connection of the adapter is properly grounded.

RF Input

The Mohawk 10 will accept an input signal of 1 watt minimum and 5 watts maximum continuous (15 watts maximum intermittent). The input impedance is a nominal 50 ohms and the input receptacle is a standard UHF coaxial connector (SO-239).

The Mohawk 10 uses a solid-state automatic switching circuit that serves the dual function of antenna switch-over and bias switching. This is accomplished by sensing the input RF signal within the amplifier and no relay switching connections to your exciter-transmitter are required.

When the Mohawk 10 is fed with an RF signal of at least 1 watt and with the front panel STANDBY switch in either of its two on positions (NORMAL or DELAY), the disabling bias is removed from the amplifier tubes, the input signal is fed to the grid of the 6146B driver tube and the output of the 572B/T160L final tubes is fed to the output connection.

When no such input signal is present, or when the STANDBY switch is turned off, the input and output connectors of the Mohawk 10 are connected together by an internal 50 ohm coaxial cable. This feature permits low power operation directly from the exciter-transmitter at the "flick of a switch" and is especially useful for local communications where excessive power would only create QRM for someone else.

RF Output

The output of the Mohawk 10 is designed to feed directly into a 50 ohm coaxial cable transmission line to the antenna. The output receptacle is a standard UHF coaxial connector (SO-239).

Because of the large power output of the Mohawk 10, it is extremely important that the transmission line and antenna be capable of accepting this power. Heavy duty coaxial cable, such as type RG-8/U or equivalent, is recommended to handle the power peaks that the Mohawk 10 will deliver.

Installation

When the Mohawk 10 is shipped long distances, packing material is included within the unit to prevent tube and component damage. Before the unit is plugged in, be sure and check that all packing material has been removed.

Plug the Mohawk 10 into a source of 115 volts 60 Hz AC power. Connect the antenna transmission line to the OUTPUT receptacle and connect the exciter-transmitter to the INPUT receptacle. Both these receptacles are standard SO-239 UHF connectors which take a PL-259 UHF plug, and both connections are designed for a nominal 50 ohm impedance match.

When placing the Mohawk 10 in operation, two precautions should be observed:

1. Allow sufficient room all around the unit to permit good air circulation for cooling. Especially do not place anything on top of the Mohawk 10 that will restrict the air flow.

2. Do not install the Mohawk 10 too close to the microphone -- the industrial type blower used to provide long-life cooling in the Mohawk 10 is noisier than many less expensive fans, and this noise will be picked up during operation if the microphone and amplifier are too close.

Operation

Turn the Mohawk 10 POWER switch on. The tubes will light and the cooling blower will come on.

Before proceeding further, check the various voltages and currents in the unit, using the front panel meter and its function

switch. The final plate voltage should be between 2500 and 3000 volts and the driver plate voltage should be between 750 and 1000 volts. With the STANDBY switch turned off, no reading should be observed on either current range or the relative output position.

Set the front panel tuning knobs (TUNE and LOAD) so that the pointers are straight up. This position has been pre-set at the factory as a starting point for the tuning procedure (although proper tuning can be accomplished starting with the knobs in any position -- it will just take a little longer).

Turn the STANDBY switch to either of its two "on" positions (NORMAL or DELAY) and activate the exciter-transmitter. A distinct click will be heard when an RF carrier is fed to the Mohawk 10, indicating that the change-over relays have closed. At this point, the final plate current, driver plate current and relative output positions of the meter switch should all show a reading on the meter, although the proper readings will not be obtained until after the tuning is complete.

It is not necessary to limit the excitation drive during the tuning procedure or to hurry through the tuning procedure with the Mohawk 10. The over-rated circuits and components in this amplifier will take a lot of abuse and the heavy currents normally encountered with untuned power amplifiers will not damage nor shorten the life of the Mohawk 10 unless left on for extremely long periods.

With the unit turned on and functioning, the operator should proceed to the proper tuning method described next for the mode of operation to be used.

CW, SSB, FM or RTTY Operation (A0, A1, A3J, F0, F1, F3 & F5)

Turn the exciter-transmitter on. With the STANDBY switch turned on (either NORMAL or DELAY) and the front panel TUNE and LOAD controls set with their pointers straight up, switch the meter function switch to the OUTPUT position and observe the meter.

Adjust the TUNE and LOAD controls alternately to obtain the maximum reading on the meter. Because of the interaction between these controls (and their effect on the impedance transformation of the output pi network), it will be necessary to go back and forth between these controls at least three and often six or more times to obtain maximum output.

When the pi network is tuned for maximum power output, as described above, check the final plate current and driver plate current; these should be approximately 300 and 40 milliamperes respectively.

This completes the tuning adjustments for CW and AM-SSB types of operation.

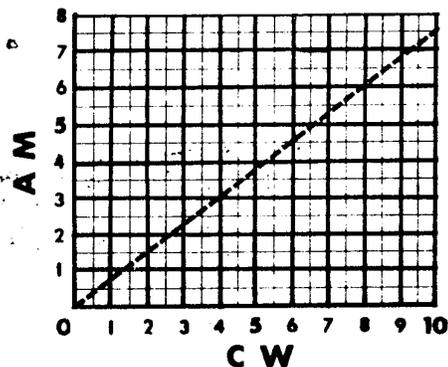
AM Operation (A3, A3A & A5)

For operation in modes requiring linear amplification of an amplitude modulated carrier, it is necessary to adjust the Mohawk 10 for linearity, as follows:

First, adjust the amplifier for maximum CW output as described in the preceding section.

Second, reduce the output (as indicated by the relative output meter) of the amplifier by 25 percent by turning the LOAD control clockwise. Readjust the TUNE control for maximum, then readjust the LOAD control in a clockwise direction to regain the 25 percent decrease. Repeat this procedure several times until no further change in output is obtained.

To aid you in this adjustment, the chart on the right shows the relationship between the relative output for CW operation and the relative output for linear AM operation. For example, if your initial tuning results in a maximum relative output of 8, the chart shows that this should be reduced to 6 for linearity. Turn the LOAD capacitor clockwise until the relative output reads 6, then adjust the TUNE capacitor for maximum output, then readjust the LOAD capacitor so that the output reads 6 again. Repeat this back and forth three or four times.



The unit is now completely adjusted for linear AM amplification of amplitude modulated signals.

Adjustable Relay Delay

The Model 5B Mohawk 10 is equipped with an adjustable turn-off delay in the automatic relay switching circuit. This feature enhances the operation of the amplifier when it is used in single sideband suppressed carrier operation by delaying the opening of the change-over relays so that they will not open during short pauses in the user's speech.

This delay feature is activated by the front panel STANDBY switch which has three positions. The center position is "off" and completely deactivates the relay circuits. The left hand position (marked NORMAL) activates the relay circuits without the delay feature for operation in services that contain a carrier. The right hand position of the STANDBY switch (marked DELAY) turns the relay keying circuits on with the adjustable delay activated for single sideband use.

Only the turn-off, or relay opening, is delayed; the relay closing is not delayed. The amount of delay is adjustable to suit the user's speech patterns and the delay adjustment control is located on the rear panel of the amplifier. A maximum delay of about two seconds is obtained with this control in the full clockwise position.

Maintenance & Troubleshooting

The Mohawk 10 has been designed to give years of trouble-free operation -- but it doesn't always turn out that way. If you do have trouble, the Mohawk 10 is built so that many repairs are easy. The input keying circuit, the output metering circuit, and both high voltage power supplies are assembled on replaceable printed circuit boards. In the event of trouble in these circuits, the complete boards may be removed and replaced. Rebuilt circuit boards, with all the parts assembled and tested, are available on an exchange basis.

WARNING

3000 VOLTS

While the Mohawk 10 is designed for safe operation, there are dangerously high voltages present inside the cabinet. If it ever becomes necessary to remove the top or bottom chassis covers, use extreme care and avoid the possibility of severe electrical shock. Unplug the unit before removing the covers and let the voltages bleed themselves off for two or three minutes. To be extra safe, discharge all high voltages to the chassis immediately after removing the covers (the high voltage wires are color-coded red for quick identification).

When testing the Mohawk 10 with the covers off, be very cautious of the B+ voltages, which are as high as a very dangerous 3000 volts and which are present at many uninsulated points within the cabinet.

The most prevalent trouble encountered with the Mohawk 10 by users has not been in the amplifier but in the user's antenna system. Many amateurs buy an amplifier to boost a weak signal to a strong signal -- and many antenna systems which worked perfectly well at low power give trouble when subjected to high power.

Antenna or transmission line trouble shows up quickly with two general symptoms: 1] the final tuning (TUNE and LOAD) will not be smooth but will be quite sharp and often erratic, and 2] the unit will exhibit significantly increased TVI. When these symptoms appear, the trouble is probably not in the exciter or the amplifier, but in the antenna or transmission line. Check and double-check all connections and cable!

There are two internal adjustments in the Mohawk 10. Because both of these internal adjustments have been pre-set, satisfactory operation will be obtained without touching them further. However, to perfectly adjust the Mohawk 10 to your exciter-transmitter, these adjustments can be made after the front panel adjustments have been completed. Once set, these internal adjustments need not be touched again unless the exciter is changed.

One internal adjustment is the input coil to the driver circuit and this requires an insulated 3/32" hex tool. The other adjustment is the tuning capacitor of the interstage pi network and this requires an insulated screwdriver.

Being very careful to use insulated tools, since high voltages are present inside the chassis, adjust both the coil and the capacitor for either maximum output or, if the proper equipment is available, minimum SWR between the exciter and the amplifier. This adjustment can be made with an unmodulated carrier.

Routine maintenance with the Mohawk 10 is minimal. The blower will often pick up dirt and dust, and cleaning this out every six months is about all that is required. Sooner or later, of course, the tubes will fail and will need to be replaced, but this will probably not occur in the first year. Be sure to replace these tubes with the proper types.

After extended use the relay contacts may need cleaning, which can be done using a paper saturated with contact cleaner. Always provide adequate ventilation when using volatile fluids, such as contact cleaner and always be sure to discharge the high voltage circuits when removing the cabinet covers.

In the event of serious operating difficulties with your Mohawk 10, contact your dealer or write directly to the factory. If it becomes necessary to contact the factory, please be as complete and detailed as possible in describing the problem.

Parts List

When ordering replacement parts, specify both the Model Number and the Serial Number of the amplifier, and specify the part by both its Part Number and Description (for example - "P/N 47-0085-470K, Resistor, 470K 10% 1/2W").

Prices shown on this schedule are effective December 1, 1971, and are subject to change without notice. Prices shown are FOB Madison Heights, Michigan, and do not include shipping charges or sales tax.

Symbol	Part Number	Part Description	Price
C1-C2	15-0018-U001	Capacitor, 0.001 uF Disc	\$.43
C3-C8, C21, C23	15-0016-U01	Capacitor, 0.01 uF Disc	.40
C9-C16	15-0012-100U	Capacitor, 100 uF 450 v Electrolytic	4.00
C17	15-0019-U001	Capacitor, 0.001 uF 6 kv Disc	1.25
C18-20, 22, 24	15-0016-U02	Capacitor, 0.02 uF Disc	.32
C25	15-0015-U001	Capacitor, 0.001 uF Ceramic	5.63
C26	15-0008-38P	Capacitor, 38 pF Air Variable	13.90
C27	15-0009-780P	Capacitor, 2 x 365 pF Air Variable	8.90
C28, C34-C35	15-0016-U02	Capacitor, 0.02 uF Disc	.32
C29	15-0016-5P	Capacitor, 5 pF Disc	.25
C30-C31	15-0012-60U	Capacitor, 60 uF 450 v Electrolytic	2.93
C32-C33	15-0020-U0047	Capacitor, 0.0047 uF Disc	.57
C36	15-0020-U001	Capacitor, 0.001 uF Disc	.57
C37	15-0010-32P	Capacitor, 32 pF Air Variable	2.16
C38	15-0021-200P	Capacitor, 200 pF Mica	.53
C39 & C46	15-0016-U02	Capacitor, 0.02 uF Disc	.32
C40	15-0013-25U	Capacitor, 25 uF 100 v Electrolytic	2.00
C41	15-0013-10U	Capacitor, 10 uF 100 v Electrolytic	1.75
C42-C43	15-0017-47P	Capacitor, 47 pF NPO Disc	.30
C44-C45	15-0111-2U	Capacitor, 2 uF 25 v Electrolytic	.95
C47	15-0021-27P	Capacitor, 27 pF Mica	.43
	17-0033-SUB	Output Circuit Board, Assembled	9.83
	17-0033-SUBEX	Output Ckt Board, Assembled, Exchange	5.00
	17-0066-SUB	Input Circuit Board, Assembled	26.25
	17-0066-SUBEX	Input Ckt Board, Assembled, Exchange	8.50
	17-0077-SUB	Intermediate Circuit Bd, Assembled	20.42
	17-0077-SUBEX	Intermediate Ckt Bd, Assembled, Exch	8.50
	17-0088-SUB	High Voltage Circuit Bd, Assembled	58.33
	17-0088-SUBEX	High Voltage Ckt Bd, Assembled, Exch	20.00
L1-L2	18-0025	Line Choke	.50
L3	18-0034	50 uH Choke	.93
L4-L5	18-0026	Parasitic Choke (incl. 47 ohm res.)	.48
L6	18-0029	Final Output Coil	1.00
L7	18-0028	Filament Choke	1.05
L8	18-0118	25 uH Choke	.50

Symbol	Part Number	Part Description	Price
L9 & L12	18-0035	1 mH Choke	.47
L10	18-0027	Parasitic Choke (incl. 100 ohm res.)	.48
L11	18-0030	Driver Output Coil	.88
L13	18-0031	Input Coil	.75
J1 & J2	21-0045	UHF Receptacle, S0-289	1.00
B1	26-0132	Blower	10.00
M1	29-0074	Panel Meter	15.88
K1 & K2	45-0119	Relay	7.20
R1 & R5	47-0081-20R	Resistor, 20 ohm 11 W	1.32
R2-R4 & R6-R8	47-0085-470K	Resistor, 470K 10% 1/2 W	.20
R9-R16 & R29	47-0083-100K	Resistor, 100K 10% 2 W	.40
R17	47-0082-1R	Resistor, 1 ohm 8 W	1.18
R18-R19	47-0083-1M5	Resistor, 1.5 Meg 10% 2 W	.40
R20	47-0085-15K	Resistor, 15K 10% 1/2 W	.20
R21 & R31	47-0086-390R	Resistor, 390 ohm 5% 1/2 W	.40
R22-R25	47-0083-47R	Resistor, 47 ohm 10% 2 W	.40
R26	47-0085-18K	Resistor, 18K 10% 1/2 W	.20
R27	47-0085-100R	Resistor, 100 ohm 10% 1/2 W	.20
R28	47-0080-25K	Resistor, 25K 20 W	2.08
R30	47-0086-1R	Resistor, 1 ohm 5% 1/2 W	.43
R32	47-0084-1M	Resistor, 1 Meg 10% 1 W	.30
R34	47-0084-68K	Resistor, 68K 10% 1 W	.30
R35 & R40	47-0085-1K5	Resistor, 1.5K 10% 1/2 W	.20
R36	47-0085-68K	Resistor, 68K 10% 1/2 W	.20
R37-R38	47-0083-2K2	Resistor, 2.2K 10% 2 W	.40
R39	47-0085-10K	Resistor, 10K 10% 1/2 W	.20
R41	47-0085-3K3	Resistor, 3.3K 10% 1/2 W	.20
R42 & R45-R46	47-0085-1K	Resistor, 1K 10% 1/2 W	.20
R43	47-0085-47K	Resistor, 47K 10% 1/2 W	.20
R44	47-0114-500K	Resistor, 500K Variable	2.50
Q1	48-0087	Transistor, Type MJE340	1.77
Q2	48-0115	Transistor, Type 2N5172 or MPS5172	.35
CR1-CR3	48-0092	Rectifier, 1A 1500 PIV	.88
CR4	48-0090	Rectifier, 1A 200 PIV	.28
CR5-CR6	48-0141	Diode, Type 1N4454	.40
S1	51-0120	Power Switch	1.69
S2	51-0121	Standby Switch	2.65
S3	51-0095	Meter Function Switch	3.82
F1	51-0100-15A	Fuse, Type 8AG, 15 Ampere	.10
T1	56-0097	Power Transformer	71.88
V1-V2	57-0099	Final Tube, Type 572B/T160L	30.00
V3	57-0098	Driver Tube, Type 6146B/8298A	10.00
V4	57-0101	Regulator Tube, Type 0A2	2.68
V5	57-0102	Regulator Tube, Type 0C2	3.28
	60-0103	AC Line Cord	1.42