Building and Operating: The Keyall HV kit
from Jackson Harbor Press

Introduction:

The Keyall HV (for High Voltage) is an accessory for a keyer , hand key or bug which will allow operation with nearly any transmitter. The circuit is a solid state relay which will key solid state (nominal 12 V / 13.8V), cathode keyed tube rigs (high positive keying voltage) or grid block tube rigs (high negative keying voltage). The Keyall HV will even key transmitters like the original Tuna Tin 2 which requires a keying output which is isolated from ground. The Keyall HV output can be made fully optically isolated from the keyer input. The Keyall HV can even be used as a conventional solid state relay for DC or AC loads - appropriate protection devices such as an MOV and a series fuse should be added by the builder for these non-ham applications.

General notes on building the Keyall HV

The two MOSFET transistors should be handled as little as possible to prevent static damage. The builder should use a grounding strap and anti-static mat if available or at the very least, work on a grounded metal surface and be sure to touch ground prior to touching the MOSFETs.

One decision the builder should make before starting construction of the Keyall HV kit is how the project will be mounted in the case. Ideally, the Keyall HV should be mounted in an all metal case to minimize RF pickup - an Altoids tin will work fine. The circuit board can be mounted to the case with small standoffs fastened with 4-40 sized hardware. The holes for the two MOSFET transistors should NOT be used for mounting the board if the transistors are mounted horizontally because the transistor tabs are electrically connected to the drain of the transistor. The two diagonal mounting holes should be sufficient to mount the board to the case.

The components should be inserted a few at a time, soldered in place and then clip the leads. The pads and traces are small and delicate - a small tipped, low power (25 watts or less) soldering iron should be used.

Building the Keyall HV

Step 1) Get the parts together: All of the required board mounted components have been supplied but you will still have to provide off-board items to fully implement the kit. These items include:

Input connector, from keyer
Output connector, to transmitter, use a connector appropriate for the transmitter keying voltage
metal case, an Altoids or other candy tin will work fine
mounting hardware, 4-40 sized
a two cell battery holder, two AAA cells are fine.

Step 2) Identify and orient the components: Most of the components should be fairly easy to identify and place - see the parts list and the parts placement diagram for descriptions. The PVI chip cannot be inserted incorrectly as the pinout is keyed. The MOSFET transistors just need to be mounted with the tab side AWAY from the PVI chip (printed side towards the PVI).

Step 3) Place and solder the components on the main circuit board: Use the parts placement diagram for information on the placement and orientation of the parts. Clip the leads after soldering. I would recommend that the builder insert parts by their profile (or height) above the circuit board starting with the lowest and working up. Here is a suggested sequence:

a) form the leads of R1, the 120 ohm resistor (brown-red-brown-gold) – install as shown at the bottom center of the board – then solder and clip the leads

b) if the optional 6 pin DIP socket is being used, prepare the socket by clipping pin 5, also, insert the clipped pin (or some wire) in the hole of the pin socket to prevent accidentally installing the PVI incorrectly. Install the socket at the bottom left of the board as shown on the parts placement photo. Older versions of the board had 4 square shaped holes, they were used for the PVI in the original Keyall. Solder the leads.

If the socket is NOT being used, install the PVI as shown in the parts placement photo and solder the leads.

c) Install C1, the yellow .01 uF capacitor marked 103, as shown on the parts placement photo. Solder and clip the leads.

d) Q1 and Q2, the MOSFETs, can be inserted either horizontally or vertically. Install them as shown on the parts placement photo, then solder and clip the leads.

If using the Keyall HV as a relay, the builder should mount the transistors horizontally (form the leads carefully, a “rounded” right angle, so that the transistor holes match the holes on the board) and then connect the load to the transistor tabs (which are connected internally to the drain pin) making the connections by using the holes and 4-40 hardware. An MOV could also be put across the output instead of C1 if the Keyall HV is used as a conventional solid state relay. A fuse should also be added to the Keyall HV (for conventional solid state relay service) in series with the output to prevent damage under overload conditions

Step 4) Check the board: Before proceeding, take the time to check the bottom of the board for solder bridges. Use the bottom view photo as a guide to visually check for these shorts. It may help to clean the flux from the board and then use a strong light in conjunction with a magnifying glass to see these problems. Also, double check the orientation of the components.

Step 5) Solder the battery holder wires, input and output jacks to the board at the places indicated on the parts placement photo and also on the hookup diagram.

Operation:

The batteries should be inserted in the holder - a VOM can then be connected (in current measuring mode) across the input to measure the active current - this current should be at least 5 mA and less than 25 mA. The prototype measured 13.5 mA at 3 V.

Connect the input (keyer, key, bug) device to the Keyall HV input and the output to the transmitter. The polarity of the output isn’t important, either one can be grounded and the other will switch positive, negative or AC voltages. Note that the drain of Q2 is designated as ground on the parts placement photo and the hookup diagram, a choice had to be made ! :)

Modifications:

If the builder wants to completely isolate the keyer from the transmitter, do NOT ground either of the Keyall HV outputs to the case. Instead, use either a stereo 1/4 inch or 1/8 inch jack (connecting the Keyall HV outputs to tip and ring) OR use another output connector such as two insulated binding posts and connect the two Keyall HV outputs to the binding posts. An appropriate cable will then need to be made for this isolated output configuration. This type of isolated output is useful for transmitters like the original Tuna Tin 2 which has the key connection between the positive supply voltage and the transmitter power supply input. If the voltages being switched are for a tube rig, be sure to use a jack and plug that can operate safely at the high (greater than the common 13.8 volts) voltage.

It is possible to key two different cathode keyed (positive) rigs with the same kit. One ham did this with the original Keyall to key both a transmitter and the VFO at the same time. He connected the common rig/VFO ground to the common source connection on the Keyall board, the source pin of the MOSFETs have small S on the circuit board. Then one drain (small out on the circuit board) was connected to the transmitter and the other drain was connected to the VFO. The capacitor, C1, should either be omitted or connected from the common source ground to the transmitter key input. Another capacitor can be connected to the VFO if desired.

One thing that can be done is to use a different power source than the specified 2 AAA cells. The value of R1 will have to be changed to limit the current used by the PVI. For 5V, use a 240 ohm resistor. For 13.8V, use an 820 or 910 ohm resistor.

To calculate your own resistor use this formula: R1 = (V - 1.4) / .015

The voltage across the LEDs is about 1.4 Volts, the current through the LEDs is 15 mA.

Don’t exceed 25 mA - the minimum PVI current required is 5 mA.

Please feel free to email with any questions, comments, suggestion or problems with this kit. My email address is:

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Thanks for choosing the Keyall HV kit and
Best Regards,

Chuck Olson, WB9KZY

List of parts included with the Keyall HV kit

Ref	marking	Description
C1	103	.01 uf disc ceramic capacitor, yellow, 1000V
R1	brown red brown gold	120 ohm 1/4 watt resistor
PVI	TLP591B	5 pin DIP, PVI (Photo Voltaic Isolator)
Q1, Q2	IRFBG30	1000V, 3A, n-channel MOSFET for Keyall HV & Keyall HV socket
	OR	
Q1, Q2	IRF820	500V, 2.5A, n-channel MOSFET for Keyall HV 500 circuit board
	6 pin socket	optional 6 pin socket for PVI modified to 5 pins by builder

Items you'll need to provide to complete the Keyall HV kit

Metal case (an Altoids tin is fine)
4-40 sized mounting hardware
output jack to transmitter, high voltage
input jack from keyer, key or bug
3V battery holder
solder, wire

Optionally, for solid state relay service:

MOV of appropriate voltage rating and lead spacing
series fuse of appropriate current rating

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