



OP SWAPPER



1. Features Overview

The Top Ten Devices Op Swapper (OS) is an accessory that allows a single antenna system to be shared between two transceivers, while providing protection to the non-transmitting radio's front end. Here are some of its features:

Positive Lockout The OS uses electrically interlocked relay contacts that prevent two transmitters from being active at the same time.

Ultra High Isolation Typical isolation to the non-transmitting radio vs frequency:

Frequency (MHz)	Isolation (dB)
1.8 to 7	100
14	95
21	85
28	80

Transceiver Inhibit The non-transmitting radio is held in an inhibited state to prevent inadvertent transmitting into an open

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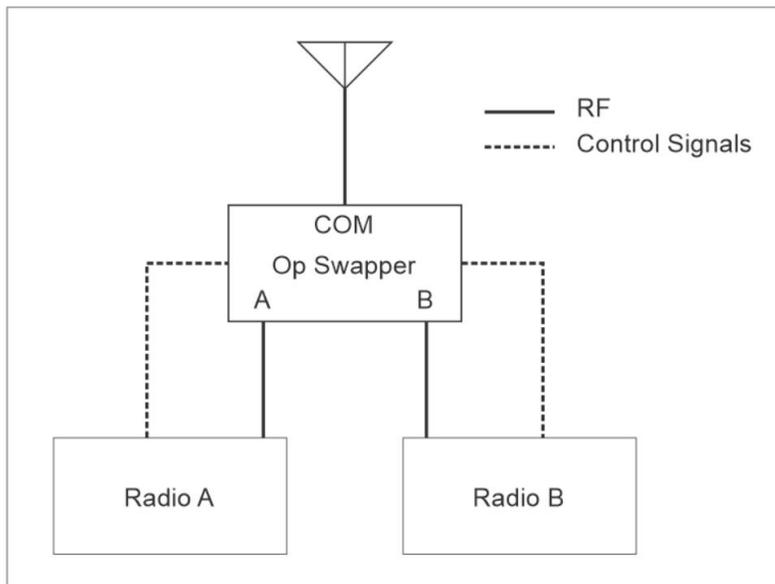
circuit. The inherent circuitry works directly with Yaesu and Elecraft K3/K3S (we will call them a K3 in this manual) radios. This functionality can be implemented for any radio pair by use of external relays. More on that in Section 3.

- | | |
|-------------------|---|
| High Power Rating | Rated at 200 Watts, allowing use with virtually all currently available transceivers. |
| Switched Outputs | Two 12Vdc, 1A switched outputs provide an easy way to control external circuitry such as LEDs or control relays. More on this feature in Section 6. |
| LED Indicators | Two LEDs are provided on the front panel to indicate which radio is transmitting. |

2. Simplified Connection Diagram

Figure 1 shows the overall concept of how two radios can share a single antenna.

Fig. 1 – Simplified Connection Diagram



In this manual, we refer to the two radios as “A” and “B,” as shown above.

3. Transmit Inhibit (TXINH) Setup

The only configuration possible with the OS is an internal jumper that configures the “transmit inhibit” (TXINH) signal associated with each radio.

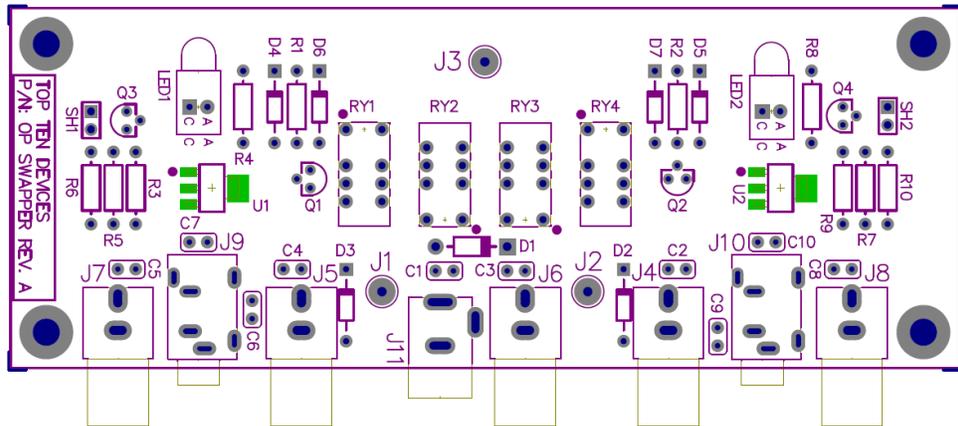
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Important Notes:

- Radios A and B can be of any type, and there is no requirement that they both be the same type.
- If one or both is a modern Yaesu or Elecraft K3, an internal jumper will need to be set to configure the transmit inhibit (TXINH). Said in another way, if neither radio is a Yaesu or K3, then there is no configuration to be done, and the “Setup” can be skipped.
- As described in Section 1, the non-transmitting radio is prevented from emitting RF by using the radio’s TXINH capability, if the radio is a Yaesu or K3. Other radios are prevented from transmitting using external relays, as described in Section 6.

The OS ships with the TXINH outputs for both radios configured for an Elecraft K3. If both A and B are a K3, then nothing has to be done. If either is a Yaesu, then follow the instructions below to configure TXINH for the Yaesu(s):

- a. Remove the cover by removing the 12 sheet metal screws. Note that the orientation of the internal shield, to make sure that the cover will be reinstalled in the correct orientation. Be sure to keep the lockwashers.
- b. Find jumpers labeled SH1 for Radio A and/or SH2 for Radio B:



Set the jumper plugs per Table 1. You can store the jumper in the “Off” position by placing it on just one of the pins of SH1 or SH2.

Table 1 – SH1 and SH2 Jumper Settings

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Radio A		Radio B	
Type	SH1	SH2	Type
K3	On	On	K3
Yaesu	Off	Off	Yaesu
Other	Doesn't Matter	Doesn't Matter	Other

If one or both of your transceivers is other than Yaesu or K3, then the setting of the SH1/SH2 jumper is immaterial, and can be left installed. More later in Section 6 on how to interface other manufacturers' radios to the OS.

- c. Reinstall the cover using previously removed screws and lockwashers. It is important to tighten the screws so that the enclosure pieces have good contact. Do not overtighten to strip out the hole!
- d. K3 Menu Setting – Go to the K3's Config Menu and set *TX INH* to *HI = Inh.*

4. RF, 12Vdc Power, and Amplifier Control Connections

- a. RF Connections – Connect Radio A's RF output to the A connector on the OS. Similarly, connect Radio B to the B connector. The amplifier/antenna is connected to the "COM" connector on the OS.
- b. 12Vdc Power – Use the provided 2.5mm dc power plug to connect to your 12V source at the OS rear panel connector. The OS does not derive power from the radio(s), so this is a mandatory connection, regardless of radio type.
- c. Amplifier Control – If an amplifier is being shared, connect the AMP connector to the amplifier's relay control input.

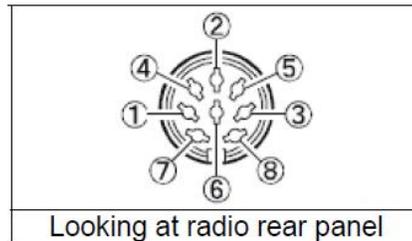
5. Yaesu or K3 Transceivers

- a. Radio TXG interface – Connect a cable from the radio's connector that provides a ground when the radio goes into transmit mode. This can either be a relay contact or an N-channel transistor. The voltage seen by the radio on this line is 12Vdc. The connector at the OS is an RCA.
- b. Radio transmit inhibit (TXINH) connections:
 - i. Yaesu FT-1000/2000/5000/9000 transceivers – The TXINH line is on the "Band Data" connector. The connector is a

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DIN 8-262 connector. This is a special connector for Yaesu radios, and is available from The RFConnection, and others. Do not attempt to plug a regular, DIN 8-270 into the Band Data jack on the radio, as you will damage the jack.

Fig. 3 – Yaesu Radio Band Data Jack

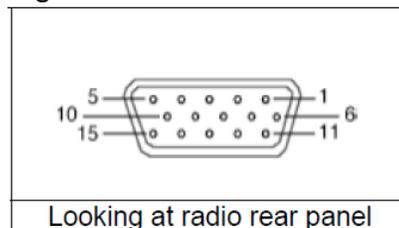


Connect the TXINH line to pin 8 and ground (shield) to pin 3.

NOTE: Other Yaesu models, such as the FT-1200 and FT-3000 have a different style jack. Consult your manual for TX INH connection details.

- ii. Elecraft K3 – The TXINH line is on Pin 7 of the ACC jack. The ACC jack is a DE-15, otherwise known as a VGA connector.

Fig. 4 – Elecraft K3 AUX Connector



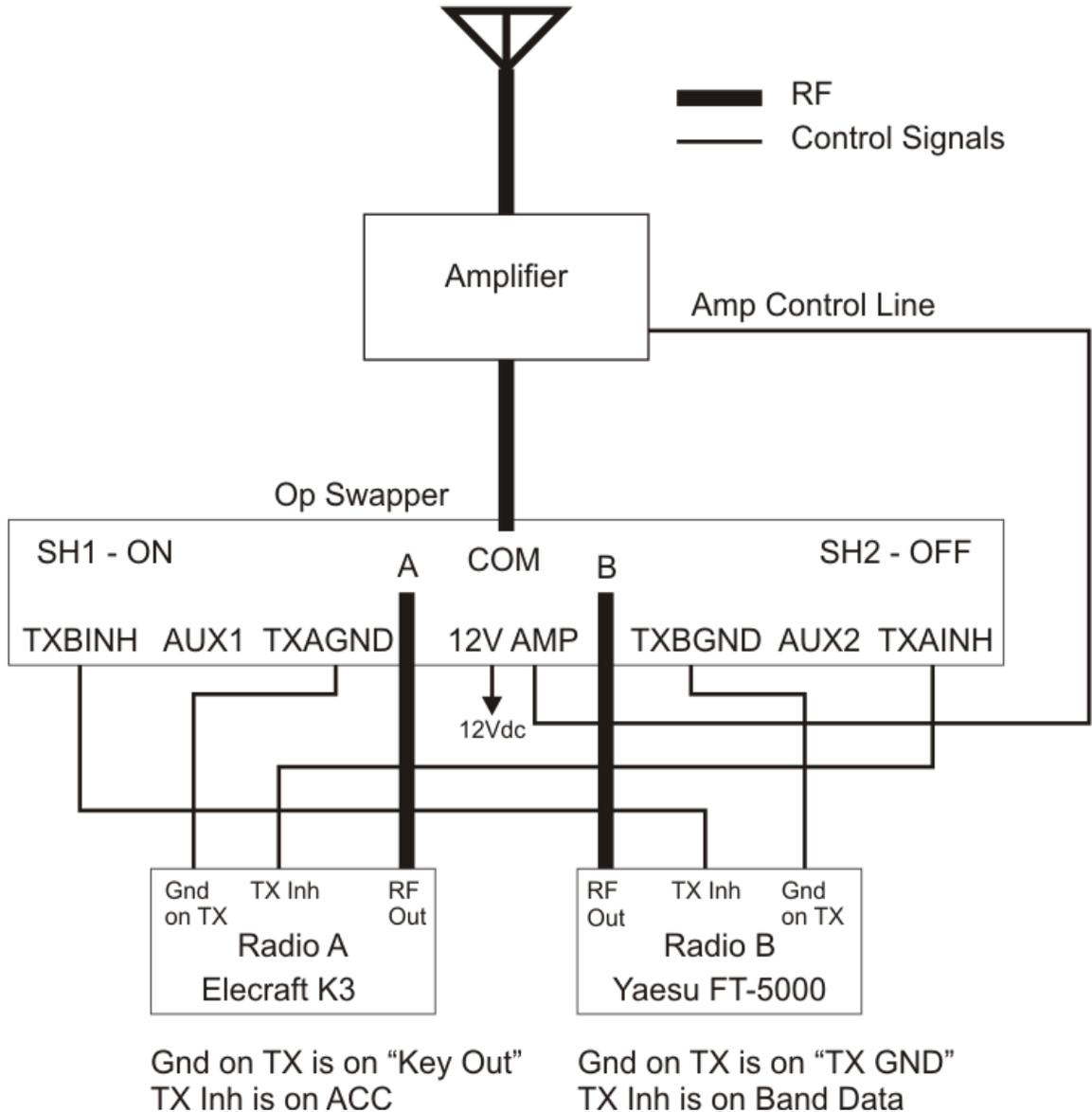
Connect the TXINH line to Pin 7 and cable shield to Pin 5.

- iii. Access to these pins – If the K3 AUX or Yaesu Band Data Jack are already being used for other purposes, a means to access the TXINH pins will need to be devised.

The following is a connection diagram illustrating the above connections, assuming one Yaesu and one K3:

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Figure 5 – RF and Control Interconnections – K3 with FT-5000



6. Radios other than Yaesu or K3

The OS can be used with other radio types. The difference in the interconnections is that Yaesus and Elecraft K3s are the only radios that allow the transmitter to be held in a TX-inhibit mode using an external signal. As long as that signal is present, there is no way to force the radio to transmit RF at any level. For other radios, since there is no TX-inhibit capability, the radio is prevented from transmitting by opening the key and microphone input lines using external relays, as described below.

When Radio A transmits, Radio B's mic and key must be interrupted, and

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vice versa. Aux 1 and Aux 2 provide switched 12Vdc signals that power external relays to do that job. Each connector is an 1/8" stereo jack. Here's how they work:

Connector	Radio that is Transmitting		
	Neither	A	B
Aux 1 Tip	0V		12V
Aux 1 Ring	0V	12V	
Aux 2 Tip	0V	12V	
Aux 2 Ring	0V		12V

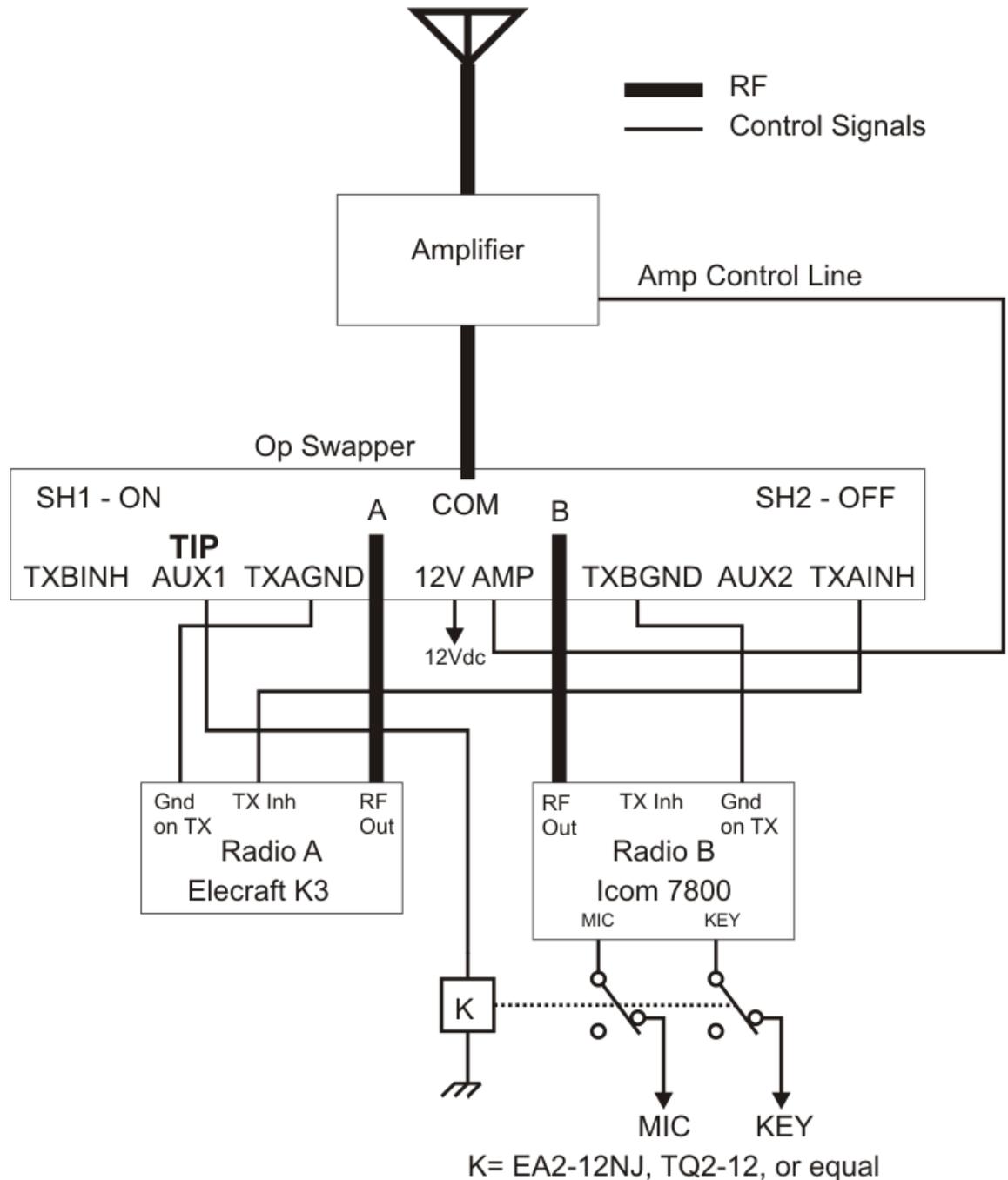
CAUTION: You must use a stereo plug, even if you are only planning to connect to the tip. Failure to do so may result in damage to the OS.



The following diagram shows how to wire an auxiliary relay to prevent transmitting on an IC-7800 when the other radio, a K3, transmits:

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Figure 6 – RF and Control Interconnections – K3 with IC-7800



How it works – OS connector Aux1 tip goes to 12Vdc when Radio 1 goes into transmit mode. External relay K's contacts open to prevent transmit audio (from microphone, computer, etc.) and CW key line (from keyer, computer, etc.) from reaching Radio 2, which will prevent SSB or CW RF energy from being transmitted by Radio 2.

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IMPORTANT WARNINGS:

- This approach does not prevent the radio from going into “transmit mode.” While Radio 1 in the above example is transmitting, Radio 2 can be put into transmit mode by closing a foot switch, pushing the TX button on the front of the radio, etc. This is acceptable as long as the audio and cw inputs to the radio are interrupted.
- This approach does not prevent the operator of Radio 2 from activating either stored audio or cw messages inside the radio. If the radio has this capability, it is highly recommended that these features be disabled.

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7. Specifications

Voltage Requirement 12 Vdc (nominal)
Current Requirement 100 mA plus external devices
Switched External Devices 12 Vdc at Max. 1A per each of AUX1 and AUX2
Isolation Between Ports A and B (one active):

Frequency (MHz)	Isolation (dB)
1.8 to 7	100
14	95
21	85
28	80

Insertion Loss 0.1db
VSWR <1.2 at 30 MHz
Operating Time 3 mS
Frequency Range 1.8-30 MHz
Power Rating 200W ICS
Dimensions (HWD) 2 x 5 x 2.25 inches