



**Screwdriver Antenna Memory**

---

## **Sensor and Wiring Installation Guide**

---

Version 2.4 (SAM-G)

**Do NOT open sealed Sam unit yet.**

**READ THIS FIRST**

---

### **Important**

---

Prior to opening the sealed SAM control unit, read these sensor installation instructions. Once the SAM unit is opened, you will not be able to return it for refund. We understand that there may be cases where you may be unable or unwilling to install the sensor assembly into your antenna thus making the SAM unusable. For this reason, we packaged the sensor assembly separately so you can install it and verify it's operation prior to opening the SAM control unit.

---

### Warranty

1. KO6YD Designs warrants to the original owner of this product that this product to be free from defects in material and workmanship for a period of 90 days from the date of purchase. If the unit fails within the warranty period, KO6YD Designs will repair or replace (at KO6YD Designs' option) a malfunctioning unit.
2. If purchased from an authorized dealer, warranty claims should first be reported to that same dealer. KO6YD Designs will work with the dealer to repair or replace (at KO6YD Designs' option) a malfunctioning unit.
3. KO6YD Designs assumes no responsibility for damage caused by the improper installation or operation of the SAM unit.
4. Installation and use of the Screwdriver Antenna Memory is at the user's own risk.
5. Under no circumstances is KO6YD Designs liable for consequential damages to person or property by the use of any KO6YD Designs products.
6. This warrant is given in lieu of any other warranty expressed or implied.
7. Opening the sealed SAM unit indicates your acceptance of this warranty.
8. Any modifications will void warranty.

If you do not agree to these terms, you can return the unopened SAM unit for a refund less shipping.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

## Introduction

This document will help you with the first phase of your Screwdriver Antenna Memory (SAM) installation. Before the SAM can operate, you will need to install and wire the SAM sensor assembly into your current antenna. If you have purchased an antenna with the SAM sensor installed or have had it installed, you should still read this to understand the overall setup and operation of the system.

On your current antenna you may have marked various locations on the antenna to indicate the approximate location for each band. The SAM will replace the need for these markings by replacing them with an electronic version. The SAM replaces your current “Up/Down” toggle switch with the SAM control unit. The SAM control unit is (2”H X 4”W X 4”D) and contains a 2 digit LED display, a mode button and a VFO style tuning knob with integrated push button.

The SAM operates by counting the turns of the central screw shaft using a magnet and reed switch combination. By counting the turns and knowing the direction you are moving (Up or Down), the SAM can maintain the current position and save it for later recall. The magnet needs to be attached onto the internal turning shaft. Many antenna manufacturers can pre-install the sensor into a new antenna. If you are installing a SAM on an existing antenna, you have to install this yourself or check with your manufacturer to see if they can install the magnet and sensor for you.

The sensor is a small sealed reed switch that is attached inside or to the outer tube of the antenna. Inside the antenna there is a magnet that is attached to the central screw shaft. The sensor must be attached in such a way that when the antenna motor is turning, this sensor is activated (“pulsed”) once per turn. This sensor is connected to the SAM control unit and since the processor is controlling the motor, it will know the direction the antenna is moving and be able to count the turns properly.

## Sensor Installation

The first thing you need to do before using the SAM is to install the magnet and sensor on your antenna. You will need to disassemble your antenna to gain access to the inside of the antenna. The sensor and magnet are small ¼” round by 1” long. The sensor will have two wires from one end.

Installation of the magnet may take some ingenuity. Because there are many different antenna designs, I cannot describe what is the best option for your antenna. [Check Appendix A](#) for some mounting ideas. You may want to talk your antenna manufacturer and see if they can offer help. For many installations you can attach the magnet directly to the screwdriver motor shaft with RTV silicone. I would not recommend epoxy (JB Weld) since it can become brittle and has a hard time binding to smooth surfaces. If you do use it, rough up the spot on the shaft first with a file to give the epoxy something to “grab” onto. One option is to use a standard paper binder clip. These are available at an office supply store (See Appendix A). This clip will attach well to the screwdriver shaft and has a flat side that you can attach the magnet.

When you install the magnet and sensor, you need to make sure that when the motor is turning, it will trigger the sensor only once per turn. Try to keep the trigger angle under 90 degrees (See figure A3 in Appendix A). You will notice that of the 360 degree rotation of the shaft, the magnet should trigger the sensor for no more than 90 degrees.

Attaching the sensor and magnet will vary on different antenna designs. The main goal is that you find a place inside the antenna that rotates and attach the magnet. And then find a location on the outside or inside that will sense this magnet while the antenna is turning. The sensor switch will make and break as the antenna motor turns. You can verify this with an analog ohm meter or a battery and small light.

The SAM can have problems seeing the sensor if the pulse generated while the motor is turning is too short or long. The best way to position the sensor (assuming you are placing it along the outside of the antenna) is to power the coil motor and connect the sensor to an ohm meter. Then, start with the sensor well above the location of the internal magnet and move it downward. Once you see the sensor closures on your meter, note the position on the antenna. Continue to slide the sensor down until it the “pulses” stop. After noting this position, attach the sensor between these two positions.

## Connection to the Antenna

The SAM requires a 4 wire connection to the antenna. The first 2 are the standard motor power lines as are currently used with a manual switch. A second pair is required that connect to the sensor. These four wires from the antenna will connect to the rear of the SAM unit.

The current ratings of the wire should be the same as required by your antenna. A good choice is a 4 conductor shielded cable with 18 gauge conductors. If you are just running a new pair for the sensor, a 24 gauge pair is all that is needed.

## Wiring the SAM

The SAM will require a 12VDC and ground connections which will be used to operate the SAM electronics as well as drive the antenna motor. On the back of the unit, you will find a 6 pin MOLEX connector. You should have also received a matching connector with “pigtail” wires attached. There are three pairs of wires colored (RED/BLACK, 2 WHITE and ORANGE/YELLOW). **Although the SAM has internal fuse protection, you should provide external fuse protection for the system.**

SAM wiring harness. Connect as follows.

| Wire Color | Use / Description  |
|------------|--|
| RED        | Connect to 12VDC (Remember to supply external fuse)  |
| BLACK      | Connect to GROUND  |
| WHITE      | Connect the WHITE PAIR of wires to the sensor.<br>Polarity is not important.   |
| WHITE      |  |
| ORANGE     | Connect to Antenna Motor.<br>This wire provides +12V when the SAM is moving the antenna UP<br>UP=12V / DN=GND  |
| YELLOW     | Connect to Antenna Motor<br>This is connected to the 2 <sup>nd</sup> lead from the antenna motor.<br>Provides +12V with the SAM is moving the antenna DOWN.<br>UP=GND / DN=12V |

You will need to determine the polarity of the antenna motor. The ORANGE wire is the “12 Volt / UP” wire. That is, it will supply +12V when the antenna coil should be moving UP. So, prior to connecting the SAM, check which antenna motor wire needs to be positive to move the coil up and connect this to the ORANGE wire.

**ICOM 706 Auto Tune Control.**

The Screwdriver Antenna Memory (SAM) has an additional option. This option is the Auto Tune Option that will help automate the fine tuning of the antenna system. The detailed instructions and operation are in the SAM User Guide. You may wish to pre-install for this option at the same time you are wiring for the SAM. This option will require a 3 wire connection from the SAM to the back of your ICOM 706. This option is primarily designed for connection to an ICOM 706. However, the TKEY output line is a signal that is pulled to ground through a 4.7K resistor. In theory, this can be used to key another model of radio via the CW key or PTT signals.

The wire for this should be a 24 Ga.3 conductor cable. Also, depending on the length of this control cable you may need to install an RF choke on the wires. You will need to run the cable from the back of your ICOM 706 to the location you are planning to mount the SAM control unit.

## Appendix A

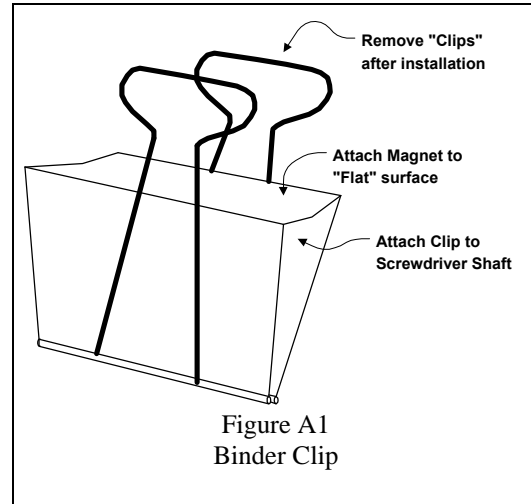
### Sensor Mounting Ideas.

This section describes some various magnet / sensor mounting ideas. Since antenna designs vary greatly, this section should give you some ideas on how to mount the magnet and sensor assembly.

Remember, these diagrams are only a suggestion of mounting options. The inside of your antenna may not be able to accommodate these suggestions.

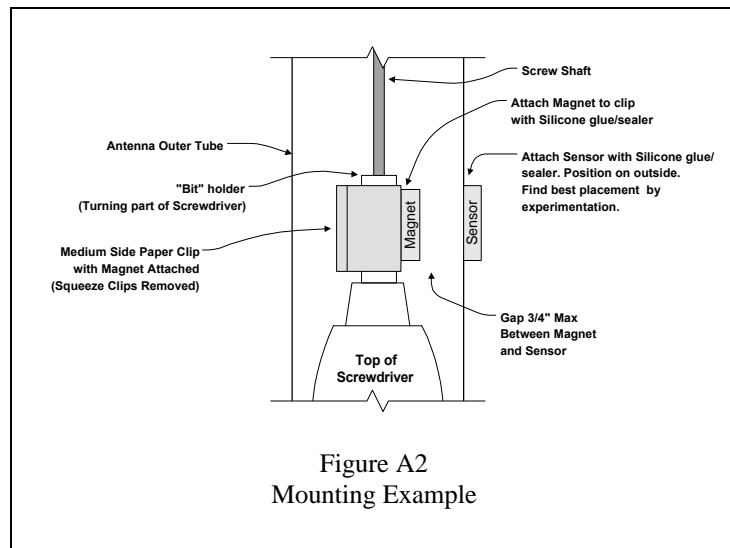
### Binder Clip Mount

One option is to use a standard binder clip available at any office supply store. Shown in Figure A1, you can attach the magnet to the flat surface of the clip. Then, it can be clipped to the screw shaft or directly to the screwdriver motor shaft.



### Binder Clip Installation

Figure A2 depicts the clip mounted inside an antenna attached to the screwdriver motor shaft. Note the location of the sensor on the outside of the antenna.



**Sensor Active Region**

Figure A3 depicts the inside of the antenna showing the magnet (M) and sensor (S). The active region of the sensor should be about 90 degrees. That is, when the magnet is within the shaded area, the sensor should be active.

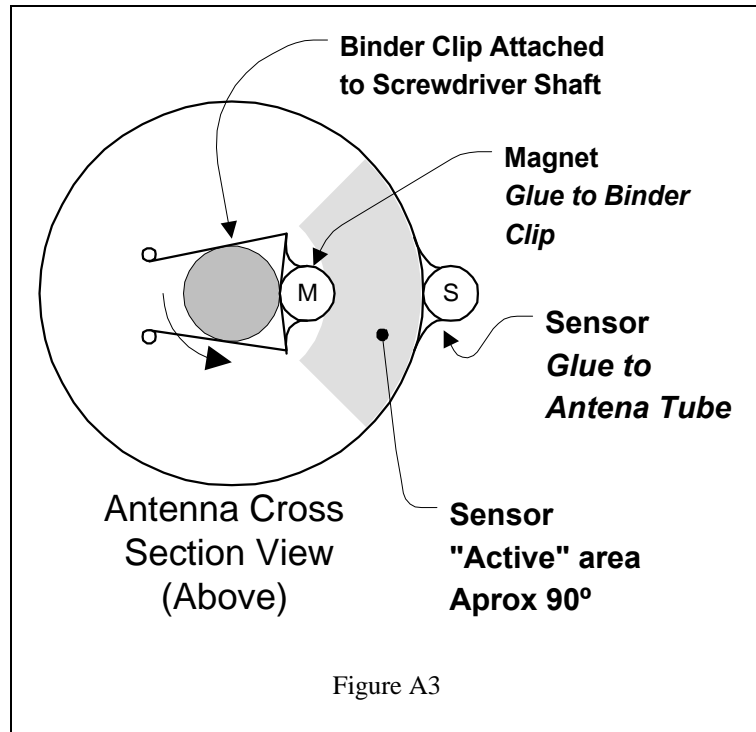


Figure A3

**Small Sensor Option**

Optionally, you can purchase a smaller sensor. This sensor has a smaller “gap” (Distance allowed between the magnet and the sensor). However, the small size may work well for internal mounting. You can purchase a smaller sensor for a nominal fee plus shipping and try it. Sorry, but we cannot offer a refund for the larger sensor.

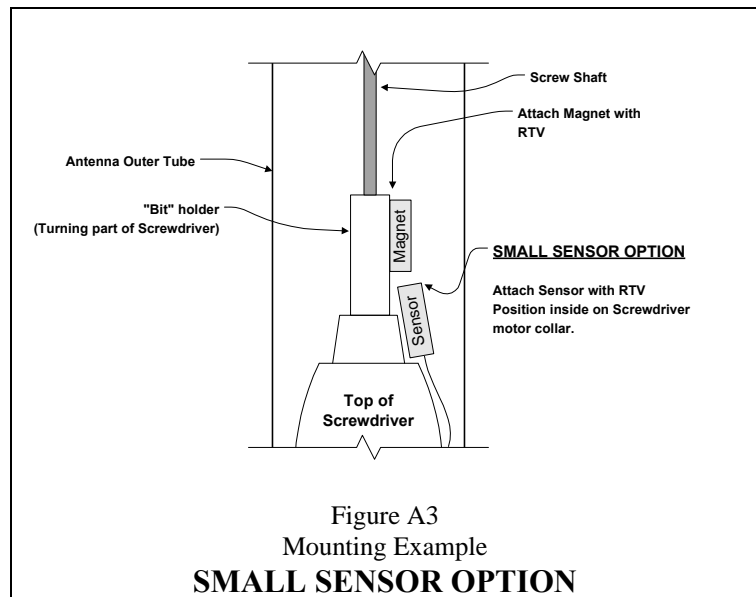


Figure A3  
Mounting Example  
**SMALL SENSOR OPTION**