

Calibration Procedure for the Heathkit Antenna Tuner SA-2060 and SA2060A

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Antenna Tuner SA-2060 and SA2060A

Manufacturer: Heathkit
Models: SA-2060, SA-2060A

SPECIFICATIONS:

Frequency Range: Continuous 1.8-30 MHz

Input Power Capability: SSB-2000 watts (peak) CW-1000 watts

Input Impedance: 50ohms

Output Impedance: Wide Range, Coax, Long wire and,
Balanced to Unbalanced Transformation: 4:1 balun

Meter Functions: Forward average power
FWD Meter: (2 ranges): Low 0-200 watts High: 0-2000 watts

Reflected average power
REF Meter: (2 ranges): Low 0-50 watts High: 0-500 watts

Standing Wave Ratio
REF Meter: (1 range): SWR 1:1 to 3:1

Size (WDH) 14-1/2" x 13-7/8" x 5-3/4" (368 x 352 x 146 mm)

Weight 15-1/2 lbs

SA-2060 / SA-2060A Differences

1. The 2060A has knobs to match those on the SA1000 linear amplifier. The 2060 does not.
2. The 2060A fully disconnects the coax output when switching to long wire or balanced line.

On the 2060 the switching arrangement keeps both coax and wire switched together. This can necessitate manual connection/disconnection of feeders on the rear panel.

Antenna Tuner SA-2060 and SA2060A

CALIBRATION - EQUIPMENT

1. HF transmitter, 2000 watts CW output into 50 ohms at 2 to 29 MHz.

Reasonable calibration can be achieved with any CW transmitter of 100 watts or more. 400 watts CW performance is better.

2. 50 ohm dummy load. This should have an ICAS (Intermittent Commercial, Amateur Service) power rating that is suitable to adsorb the HF transmitter power.

3. A calibrated wattmeter. This may be a 'ThruLine' device or one that is built into the dummy load.

Note: The calibration of the meters in the SA-2060 relies on the calibration of this wattmeter. If you do not have a calibrated wattmeter then beg, borrow or loan one for a few hours.



SA-2060



SA-2060A



Antenna Tuner SA-2060 and SA2060A

CALIBRATION - PREPARATION

1. Select the 'BYPASS' position on the Aerial Selector switch.
2. Where the Sensor box has been modified to include 4 holes to allow access to the calibration variable resistors (see Modification section on page 8), then ignore step 3 of this Preparation procedure.
3. Remove the lid of the SA-2060.

Remove the Sensor box from the rear of the SA-2060 so that its internal variable resistors can be reached.

Sensor box removal requires the selector switch shaft to be decoupled. Saddle clips must also be removed to allow the multi-core cable in the spiral screening to move.

Unbolt the 3 straps and remove the 3 ceramic feed-through insulators.

Remove the 4 screws securing the Sensor box to the rear panel.

Ensure that the switch in the Sensor box does not move from the BYPASS position.

Only remove the Sensor box sufficient to allow adjustment of the 4 variable resistors within the Sensor box.

Having removed the Sensor box, you may choose to modify it to allow future access to the calibration variable resistors without needing to dismantle the unit. See page 8

4. R104, R105, R106 and R107 are the variable resistors within the Sensor box. The resistors are arranged in a line. R105 is nearest to the top of the Sensor box. Below that is R104. Below R104 is R107 and below that, and nearest to the bottom of the Sensor box is R106. R104 partially covers R105, and R107 partially covers R106 but a small screwdriver can fit to adjust each resistor.
5. For all tests only the Sensor box INPUT and the Sensor box BYPASS connectors will be used .
6. All tests and settings should be done within a few seconds of the Transmitter power being applied. Ensure a minute or two between each transmission to avoid Tx and/or load heating that may change measured power levels.

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CALIBRATION - PROCEDURE

SETUP 1 - SWR bridge null adjust

1. Connect the TX to the Sensor box BYPASS connector.

Where the load includes the calibrated wattmeter display, connect the Load to the Sensor box INPUT connector.

Where a calibrated ThruLine Wattmeter is being used, connect the Load to the input connector on the wattmeter and connect the wattmeter output connector to the Sensor box INPUT connector.

2. Ensure that the SA-2060 front panel pushbuttons are:

FWD/SET pushbutton is out.
REF/SWR pushbutton is out.
HIGH/LOW pushbutton is out (high).

3. Where the variable resistors (R104, R105, R106 and R107) have never been set, then adjust each to approx. mid travel, else leave them at their current setting.

4. Set the transmitter to CW output.

Set the transmitter frequency to $F = 14.0$ MHz.
Adjust the RF output to POWER = 500 watts on the calibrated wattmeter.

5. Using a non-metallic tuning tool, adjust the SWR bridge trimmer capacitor, C105 through the access hole on the end of the Sensor box.

Adjust C105 for the setting (minimum reading).
METER = the FWD meter, and
SETTING = 0.

6. Repeat step 4 with $F = 2.0$ MHz and with $F = 29.0$ MHz.

Confirm that the FWD meter indicates '0' at 2MHz and 29MHz. Where there is a difference, adjust C105 for the minimum reading across the HF band.

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CALIBRATION - PROCEDURE

SETUP 2 - Reverse power meter, 500 watts range

1. Repeat steps 1 and 2 in SETUP 1.
2. Set the transmitter to CW output.

Set the transmitter frequency to $F = 14.0$ MHz.

Adjust the RF output to $POWER = 500$ watts on the calibrated wattmeter.

3. Adjust R105 (white) for the setting.

METER = the REV meter, and
SCALE = 0-500, and
SETTING = 500 watts.

4. Repeat step 2 with $F = 2.0$ MHz and with $F = 29.0$ MHz.

Confirm that the meter indicates the same power at 2 and 29 MHz. Where there is a difference, adjust R105 for the best reading across the HF band.

SETUP 3 - Reverse power meter, 50 watts range

1. Repeat all steps in SETUP 2 with $POWER = 50$ watts, and HIGH/LOW pushbutton is in (low),

Adjust POT = R104 (green) for the setting.

METER = the REV meter, and
SCALE = 0-50, and
SETTING = 50 watts.

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CALIBRATION - PROCEDURE

SETUP 4 - Forward power meter, 200 watts range

1. Connect the TX to the Sensor box INPUT connector.

Where the load includes the calibrated wattmeter display, connect the Load to the Sensor box BYPASS connector.

Where a calibrated ThruLine Wattmeter is being used, connect the Load to the input connector on the wattmeter and connect the wattmeter output connector to the Sensor box BYPASS connector.

2. Ensure that the SA-2060 front panel pushbuttons are:
FWD/SET pushbutton is out.
REF/SWR pushbutton is out.
HIGH/LOW pushbutton is in (low).
3. Repeat steps 2-5 in SETUP 2 with POWER = 200 watts.

Adjust POT = R107 (red) for the setting.

METER = the FWD meter, and
SCALE = 0-200, and
SETTING = 200 watts.

SETUP 5 - Forward power meter, 2000 watts range

1. Repeat all steps in SETUP 4 with POWER = 2000 watts.
HIGH/LOW pushbutton is out (high),

Adjust POT = R106 (brown) for the setting.

METER = the FWD meter, and
SCALE = 0-2000, and
SETTING = 2000 watts.

Where the Sensor box was removed as part of the Preparation procedure, reassemble the Sensor Box and its switch shaft. Replace the SA-2060 lid.

Calibration complete.

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SENSOR BOX MODIFICATION FOR EASE OF CALIBRATION

To calibrate the SA-2060, it is necessary to gain access to the four variable resistors within the Sensor box. This requires removal of the Sensor box from the rear of the SA-2060.

Calibration is an easier task after four holes have been drilled in the Sensor box to allow screwdriver access to the four variable resistors. Once this is done, future calibration requires no dismantling of the equipment.

A hole on the side of the Sensor box already exists to allow a non-metallic tuning tool access to the variable capacitor, C105. See picture below.

This modification may prove easier with the Sensor box removed from the SA-2060. Refer to the PREPARATION section for removal instructions. See page 4.

1. Drill 4 holes approx 3-4mm dia next to the INPUT connector on the Sensor box as shown in the diagram below. Check that a small flat-blade terminal screwdriver will fit through the holes that you drill.

When drilling the holes **TAKE GREAT CARE** that the drill goes **NO FURTHER THAN 5mm** into the Sensor box. Otherwise, permanent damage will be done to the internal components.

Ensure that no drilling swarf enters or remains within the Sensor box.

2. Access for a small flat-blade terminal screwdriver to R105 is via the top hole. Below that is R104. Below R104 is R107 and below that, and via the bottom hole is R106.

