

2/29/65

# MFJ

## MODEL 249/259 BOX TEST PROCEDURES

### BOX APPEARANCE

1. Check appearance of box in the following areas:
  - a. Missing or partly missing letters and numbers.
  - b. Scratches.
  - c. Deformed bends.
  - d. Missing pin nuts
  - e. Bad paint.
  - f. Uneven cuts of impressions
  - g. SWR and Resistance indicators for correctness and scratches.
  - h. UTC 150 Counter Module for scratches.

### Tightness Check

1. Check the following for tightness.
  - a. Seven (7) screws on the box face.
  - b. Six (6) screws on back of circuit board.
  - c. Four (4) screws on back of UTC 150 Counter Module, (under main circuit board)
  - d. Antenna SO239 bolts and nuts (2), and nuts on the two (2) "Input" & "Gate" push button switches.
  - e. Knobs (Check for alignment, proper height, and tightness).
  - f. SWR & Resistance indicators bracket screws.

### Circuit Board inspection

1. Check circuit board for the following:
  - a. Excess flux.
  - b. Bridged solder joints.
  - c. Cold solder joints.
  - d. Loose wiring.
  - e. Ball type solder joints.
  - f. Unsoldered joints.
2. Inspect Antenna jack and push button switches solder connections.

### Adjusting Counter Module.

1. Make sure unit is Off and insert power plug into power jack.  
(Power = 12 vdc, Plug center is positive)
2. Set Frequency switch to 113 - 170 range and tuner to maximum clockwise position.
3. Turn unit on. Display should show some frequency. Usually around 170 to 174 MHz. Tough a hole in the back of the board adjust R32 until display reads it highest frequency, (will vary according to how L6 is set).
4. Hook up an external frequency counter to the antenna jack.
5. Check to see if the module frequency matches the external frequency counter frequency. Module frequency should be stable to within .00 digits.

### Setting the A.G.C. voltage.

1. Range switch should be in the 113 - 170 range.
2. Tune display to read 165 - 166 MHz.
3. On back side of board measure the voltage on pin 2 of IC1. It should be 300 - 400 mV.
4. Check voltage on pin 3 of IC1 and adjust R18 till voltage matches pin 2 or is within .003 mV of it. Voltage on pin 3 shouldn't drop below that of pin 2 because unit may become unstable.

### Setting Ranges

1. Set range 113 - 170 by adjusting L6. You must spread or close L6 to obtain frequency. Ideal range would be: 112 - 174 MHz.
2. Set range 62.5 - 113 by adjusting L5. You must spread or close the coils on L5 to obtain frequency. Ideal frequency would be: 61.8 - 114.8 MHz.
3. Set range 26.2 - 62.5 by adjusting L4. You must use a alignment tool for this inductor. Ideal range would be: 25.5 - 63.25 MHz.
4. Set range 10 - 26.2 by adjusting L3. You must use a alignment tool for this inductor. Ideal range would be: 9.97 - 27.00 MHz.
5. Set range 4 - 10 by adjusting L2. You must use a alignment tool for this inductor. Ideal range would be: 3.97 - 10.12 MHz.
6. Set range 1.8 - 4 by adjusting L1. You must use a alignment tool for this inductor. Ideal range would be: 1.76 - 4.12 MHz.
7. Recheck both top and bottom of all ranges.

**Note:** When the back is put on the box all top ranges will drop in frequency and also battery lead placement will change frequencies due to added inductance of the metal and wire. If any doubt, mark box with a sticker and have unit returned to you for inspection when back is put on. Each unit has a different spread in ranges. The top of the ranges has the biggest drop when the back cover is put on.

### SWR & Resistance meters adjustment

1. Set range switch to 1.8 - 4.00 MHz range. Plug a 100 ohm dummy load into the antenna jack.
2. Adjust R17 for a "2" reading on the SWR meter. Exact reading should be obtained. Meter should be stable.
3. Replace the 100 ohm dummy load with a 50 ohm dummy load.
4. Adjust R31 till resistance meter reads 50 ohms. Exact reading should be obtained. Meter should be stable.
5. Replace 50 ohm dummy load with the 100 ohm dummy load again and check to see if resistance meter reads close to 100 ohms.

**Note:** The upper scale of the resistance meter is less accurate then the lower end of the scale. Getting the 50 ohm reading when the 50 ohm load is in place is more important. Most Hams use 50 ohm loads more often and will notice any variation.

### Checking "Input & Gates"

1. Check Input to unit by inputting a signal from another 249/259 Analyzer into the Frequency Input BNC. Press input button till a "B" appears in the upper right corner of the display module. This is the input mode and the display should display the input frequency from the external frequency generator. Leave in the mode for about 15 seconds to be sure it doesn't fade out or disappear.

**Warning:** The frequency counter has a CMOS input device that can be easily damaged. To avoid damage, observe the following:

Never exceed 5 volts peak input voltage.

Never input a signal with unit off.

2. Test "Gate" button to be sure they change in order. The following should be displayed as button is depressed; 0.01, 0.1, 1.0, 10. In that order. Make sure they don't skip order.

### Battery Leads Test

1. Place a short across one of battery connectors.
2. Touch your power plug to the other battery connector by placing the tip of your power plug to the large female socket and resting the outside contact of your power plug against the small male connector. Unit should come on.
3. Check other battery connector in the same manner.

### Finial Step

1. Turn unit power switch off before sending to back installation step.

Note: While not real important, it's good to leave the range switch and tuner in the same position on each unit. I place the range switch in the 113 - 170 position and the tuner fully clockwise, and power switch off.

## MFJ 249/259 TEST & CALIBRATION PROCEDURE

### 1. INTRODUCTION: REFER TO ANOTHER 249/259 BOXTESTER FOR SETUP INSTRUCTIONS.

The box can be tested completely after assembling. The operations indicated in the procedure can be followed under normal conditions (getting oscillations resistance and SWR detector working), otherwise some troubleshooting can be required. A multimeter, a scope (optional), a frequency counter, a tuning tool, a coax cable, BNC connectors, Quick connectors, SWR indicator battery and another analyzer will all be required.

### 2. PROCEDURE

#### 2.1 OPERATIONS AFTER ASSEMBLY:

- Check appearance of box; if any defects inform the assembly persons.
- Check that the unit is able to oscillate before performing any other operation.

##### 2.1.1 ADJUSTING THE BIAS IN THE COUNTER MODULE

- Set the spread S-circuit.
- Set the maximum frequency (rotary switch all the way at the left and plates of the capacitor completely open). *113-170MHz*
- Read the frequency on an external counter.
- Adjust R32 until the reading in the internal module match fairly the obtained previously.
- The unit will oscillate somewhere around 174 to 170 MHz. IF the frequency is lower, check the right length of the leads in the .01uF cap. placed below SW1, if higher check L6.

##### 2.1.2 SETTING THE AGC

- Set 170 to 165 MHz using the rotary switch (all the way at the left) and the variable capacitor.
- Shortcircuit the antenna output to ground (use the "special jumper").
- Adjust measure the DC voltage obtained in the pin 2 of IC1 (Vf). It has to be a value around 320-400 mV.
- Adjust R18 until the DC voltage in IC1 pin 3 is equal to Vf. *PIN 3*
- Set the lowest frequency band using the rotary switch (all the way at the right). Using the variable capacitor, cover slowly the band looking for a consistent frequency reading in the counter module. Notify, if any erratic behavior is observed.
- Repeat the above operation for all the bands.



## 2. PROCEDURE CONT.

### 2.1.2a BAND OVERLAPPING

- The unit has to cover continuously from 170 to 1.8 MHz.
- Set the minimum frequency in the highest band (b6) and read. Turn cap all the way to the left.
- Set the maximum frequency at (b5); adjust L5 until the reading exceed 300 KHz to the previous one. Turn cap to the right.
- Set the minimum frequency at (b5) and read.
- Set the maximum frequency at (b4); adjust L4 until the reading exceed 300 KHz to the previous one.
- Continue the adjustment of b3, b2 and b1 in a similar way to the above indicated.
- If the frequency overlapping is not possible for b1 or b2 at the end of the process, restart the process from b5 being less selective for the overlapping (200 KHz instead of 300 KHz).

### 2.1.3 SWR RESISTANCE AND METER

- Set the unit to the 1.8-4 MHz band 4MHz.
- Use the "100 ohms dummy load" over the antenna output.
- Adjust R17 until a 2SWR is read.
- Use the "50 ohms dummy load" over the antenna output.
- Adjust R31 until a 50 resistance is read.
- If none of the following functions work refer to schematics for troubleshooting.

### 2.1.4 FREQUENCY COUNTER

- Check the gate function of the unit by pressing the gate button located at the top of the unit; the frequency should change gates.
- Connect the cable running from the test station analyzer to the frequency input of the unit being tested.
- Check the input function by pressing the input button.
- If the units read the B input turn the test station analyzer tuning knob and see if the frequency changes on the B input.
- Disconnect cable from unit.

### 2.1.5 BATTERY LEADS TEST

- Take one of the battery leads and short it together.
- Apply 12V Vcc to the other one.
  - Turn unit on and off to test battery power.

Pins 10411  
1000NF Inductor

R17 SWR ADJUST

R32  
COUNTER  
MODULE

R18  
AGC ADJUST

R31  
RESISTANCE  
ADJUST

113-170 MHz  
L6

62.5-113 MHz  
L5

26.2-62.5 MHz  
L4

L3  
10-26.2 MHz

L2  
4-10 MHz

L1  
1.8-4 MHz

M249\_C  
11/5/92

113-170 MHz - Controlled by height of L6  
62.5-113 MHz - Controlled by spacing between  
turns of L5.