

## TU-50 CALIBRATION PROCEDURE

### TIME MARK GENERATOR 180A

#### Recommended equipment:

Type 541 or 543 Oscilloscope  
 Standard 180A  
 Plug-in

#### 1. POWER SUPPLY ADJUSTMENT.

Adjust the -150V supply.

Check the 225; this voltage should be within 2% of 225.

Check the 350; this voltage should be within 3% of 350.

Check the -17; this voltage should be within  $-15 \frac{1}{2}$  and  $-17 \frac{1}{2}$ .

Check the -8; this voltage should be within  $\pm 1/2$  volt of 8 volts.

#### 2. POWER SUPPLY RIPPLE AND REGULATION CHECK.

The ripple on the supplies should not exceed: -150 25 millivolts, 225 80 millivolts, 350 100 millivolts.

NOTE: When checking supplies for ripple have signal selector on 50Mc.

#### 3. ADJUSTMENT OF TIME MARKER.

Use 10X probe. Be sure probe is compensated before using. Connect the probe to the marker out jack of the 180A.

Feed in 1 $\mu$ sec and 5 $\mu$ sec markers. Adjust the 5 $\mu$ sec pot on the TU-50.

Adjust C so that the 1 $\mu$ sec markers are approximately the same amplitude as the 5 $\mu$ sec markers when viewed alone.

| 180A              | Test Scope Sweep | Adjust        |
|-------------------|------------------|---------------|
| 1&5 $\mu$ sec     | 1 $\mu$ sec      | 5 $\mu$ sec   |
| 5&10 $\mu$ sec    | 1 $\mu$ sec      | 10 $\mu$ sec  |
| 10&50 $\mu$ sec   | 10 $\mu$ sec     | 50 $\mu$ sec  |
| 50&100 $\mu$ sec  | 50 $\mu$ sec     | 100 $\mu$ sec |
| 100&500 $\mu$ sec | 100 $\mu$ sec    | 500 $\mu$ sec |
| 500 $\mu$ sec&1ms | 500 $\mu$ sec    | 1ms           |

#### 4. CHECK MARKER AMPLITUDE

The amplitude of the markers at the output should be 3 volts or more.

#### 5. SET FREQUENCY & AMPLITUDE OF THE 5, 10, & 50 Mc. MARKERS

Trigger the scope externally from the 180 trigger at the 10 $\mu$ sec rate.

Connect the 52 $\Omega$  terminator to the output jack of the 180. Use 10X probe.

5. (cont.)

Set C123 & C129 for maximum output at 5Mc.

Set C133 & C139 for maximum output at 10Mc.

Set C143 & C147 for maximum output at 50 Mc.

To check the frequency of the 5,10, and 50Mc output: for 5Mc with the scope sweep set at 0.2 $\mu$ sec/CM. There should be 1 cycle per CM.

For 10Mc set the scope sweep to 0.1 $\mu$ sec/CM and there should be 1 cycle per CM.

With the scope still triggered externally at 10 $\mu$ sec switch to 5X magnifier with the main sweep control set 0.1 $\mu$ sec/CM. There should be one cycle per centimeter if the frequency is properly set at 50Mc. The minimum output of all sine-wave outputs is 3 volts. On the 50Mc range the output will be an indicated 1.4volts, due to the bandpass of the 540 series scope. If there are double traces on the 50Mc waveform (trigger pulling) generally a slight readjustment of the 5 $\mu$ sec and 10 $\mu$ sec markers will cure this, although there might be other reasons for this occurrence. There should be no appreciable trigger pulling at any trigger rate. The 1Mc modulation on the 5Mc sinewave should not exceed 0.2 volts.

6. SET CRYSTAL FREQUENCY.

With the scope triggered externally from the 180 under calibration connect the 10X probe from the plug-in to another calibrated 180 or a source of accurate frequency. Set the scope sweep to 1 $\mu$ sec/CM and stop the drift to one side or the other by adjusting C105. There should be enough range left at either side of the adjustment to make the signal drift at the rate of 3CM/sec which corresponds to 3cps at 1Mc.

7. CHECK TRIGGER AMPLITUDE AND FREQUENCY

Connect the 10X probe to the trigger output and check the amplitude. The amplitude of the triggers must be at least 8 volts. The trigger rates must correspond to the switch label on the front panel.

# SQUARE WAVE GENERATOR

## Recommended Equipment:

Type 540 series oscilloscope  
Type K plug-in  
52Ω cable & (2) 52Ω terminators  
D.C. voltmeter

### 1. POWER SUPPLY ADJUSTMENT

Check the -150V (check between A to A-150)

Check and adjust -160V (check from A to ground)

NOTE: Have FREQ. RANGE in the 1-10KC position.

Check output amplitude while maintaining the FREQ. RANGE in the same position, full amplitude should read at least 80 volts peak to peak. ~~44/8/78/7/07/13/07/78/~~

### 2. POWER SUPPLY RIPPLE AND REGULATION CHECK.

The -150V should read approximately 25 millivolts.

The -160V should read approximately 20 millivolts.

### 3. CALIBRATE FREQUENCY RANGES & CHECK SYMMETRY.

FREQ. RANGE 1-10KC

Amplitude 3CM

K Unit .5V/DIV., terminate cable with 52Ω at both ends.

FREQ. POT. centered

Check and adjust symmetry pot. ~~44/8/78/~~

Check Freq. Scope

1-10KC .1 milliseC/CM

100-1000CPS 1 milliseC/CM

10-100CPS 10 milliseC/CM

50-500KC 2 μsec/CM

check for a 10 to 1 ratio by rotating the freq. pot.

Adjust C14&C15 for frequency and symmetry.

Throw the FREQ. RANGE to the FAST RISE (50-500KC), and remove the 52Ω terminations.

Check Freq. Scope Trigger slope to -Int and observe

50-500KC .2μsec/CM square wave for proper shape.

### 4. UPPER & LOWER CORNER ADJUSTMENT.

FREQ. RANGE 50-500KC. Adjust L25 for square corner on top half of square wave.

Adjust L34 ~~to~~ to remove spike from the lower half of the square wave.

Adjust L74 for square corner on the lower half of the square wave.

For upper half adjustment hang probe on junction of C25&R31, R32.

↓ PW  
.5 - .55 μS  
5 - .5 μS  
5 - .005 μS  
.01 - .001 μS

CONSTANT AMPLITUDE SIGNAL GENERATOR.

Recommended Equipment:

- Type 540 series oscilloscope
- Type E & K Plug-in
- 180 Time Mark Generator
- Headphones

1. POWER SUPPLY ADJUSTMENT.

Check the +105 volts.

Check the +550 volts.

2. POWER SUPPLY RIPPLE & REGULATION

The ripple on the +105V should be approximately 50 millivolts.

3. CALIBRATE FREQUENCY

Hook up the 190, the 180, and the E unit through a T connector; check for freq. drift.

190 180 E unit amplitude control centered.

50KC 100µsec Adjust E unit for stable display.

The purpose of this check is to measure the difference between the 180 and the 190; the use of the E unit allows us to vary the frequency response thus allowing us to reject the high frequency component of the mixture.

| 190  | 180   | E Unit                 |
|------|-------|------------------------|
| 5MC  | 1µsec | Adjust for stab. disp. |
| 10MC | 5µsec | "                      |
| 15MC | "     | "                      |
| 20MC | "     | "                      |
| 25MC | "     | "                      |
| 30MC | "     | "                      |

If after checking for drift, some is found, adjust the following coils 50KC through 30MC for zero drift. After the zeroing process insert the K-unit and check for proper frequencies.