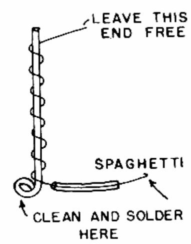
Special adjustments are required on all instruments where accuracy is desired. This is not peculiar to kit construction, but is an integral part of actual production line procedure. The adjustments are normally quite simple to perform, but should be done with care after all construction and lead dress is completed. Moving wires or changing tubes afterwards could actually "throw off" the calibration.

NOTE: LETHAL VOLTAGES ARE PRESENT - BE EXTREMELY CAREFUL ESPECIALLY AROUND THE CR TUBE SOCKET AND THE LOWER SECTIONS OF THE REAR CHASSIS. VERY HIGH VOLTAGES ARE ALSO ON THE PINS OF THE POTENTIOMETERS AROUND THE CR TUBE LOCATED ON THE FRONT PANEL. THESE VOLTAGES ARE LITERALLY CAPABLE OF CAUSING SERIOUS INJURY OR DEATH. PRECISE CAN ASSUME NO RESPONSIBILITY FOR INJURIES DURING CONSTRUCTION, USE OR CALIBRATION, ETC.

GIMMICKS

In many electronic circuits, a very small variable capacitor is needed for balancing the wiring or distributed capacity of the circuit. These capacitors may take on many forms: Ceramic discs; tubular ceramics; air variables; compression; gimmicks. The least cumbersome and least expensive which does an excellent job, when operating at very low values is the gimmick. This consists of literally twisting two pieces of insulated wire together until the proper capacity is achieved. Capacities as low as a fraction of a uufd may be obtained.

The construction of the gimmick is shown below:



1. Cut off a one inch piece of thick enamel wire.
2. Clean the insulation off one end about $\frac{1}{4}$ inch.
3. Form the same end in a small tight circle and solder a small globule of solder to it.
4. Clean off about $\frac{1}{4}$ inch of insulation from one end of thin enamel wire. Form into tight circle and solder small globule of solder to it.
5. Solder tinned end of thin enamel wire to one side of part gimmick is to be placed across. (Note: If one side is to be connected to ground, solder thin wire to ground side).
6. Solder tinned end of thick wire to other side of part gimmick is to be placed across.
7. Wrap the thin wire around the thicker about 20 turns. If the thin wire requires a long lead to reach the thick wire, use a piece of spaghetti over it. Do not place spaghetti over the part to be wrapped around the thick wire.
8. Make certain a short circuit does not exist between the thick and thin wires.
9. In actual use, the capacity may be reduced by unwrapping turns. Capacity may be added by using more turns. When a gimmick is being used to compensate a pattern, make certain the adjusting tool or your hands are not in contact with the gimmick when observations are being made. If they are, there is a strong possibility of too much capacity being added to the circuit.
10. Once the value of the capacity has been reached, cut off all excess wire.

SAWTOOTH WAVEFORM

Low Frequencies:

The low frequency ranges do not normally require any further adjustment unless frequencies below 10 cycles are to be observed.

High Frequencies: (1 KC sweep and above)

High frequency distortion may be caused by under or over compensation in the Horizontal Step Attenuator comprised of resistors R38 and R38A.

2. Over compensation is normally manifest as an extreme widening on the left side of the screen.
This may be rectified by placing a gimmick across resistor R38A and adjusting it until the pattern is proper. The reverse is true of under compensation which may be corrected by placing a gimmick across resistor R38.

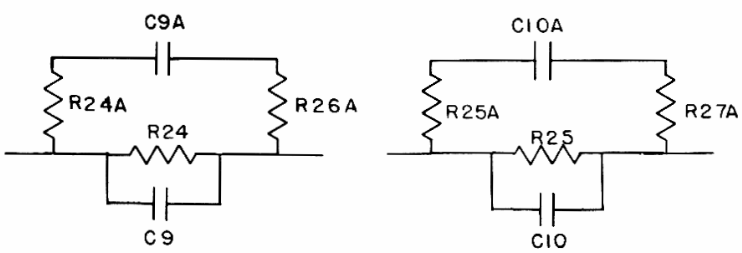
Widening the Horizontal Width

1. The horizontal width is normally adjusted for approximately 6 to 8 inches. Larger expansion was not considered necessary since the Magnifier virtually expands the sweep width many times. If an application exists, however, where greater widths are required, it may be accomplished by lowering the value of R38. Two factors should be noted: First - Re-compensation may be necessary; Second - The ratio of the horizontal step attenuator will be changed according to the change in R38.

VERTICAL ADJUSTMENTS

Low Frequencies

1. When the vertical attenuator is switched to the DC side, no further adjustment of the instrument should be required for good low frequency response. If phase shift, at very low frequencies, is a problem however, the following circuit may be added across resistor R24 and a similar circuit across R25. This is shown in the schematic diagram.



SQUARE WAVE CALIBRATION

Place a 220K resistor R80 from S4A#6* to Ground*. This is the Calibration voltage adjustment. If the output voltage is greater than 1 volt rms (2.83 volts p-p), lowering the value of R80 will also lower the voltage. The converse is also true. Since this voltage is dependant upon the AC line, accurate measurements should be taken only when an accurate high Z AC meter is connected between the 60 cycle & CALIB Jack and ground. Calibration may be ascertained by noting the reading on the CALIB & ϕ potentiometer and multiplying it by: 1 for the 100 position of the VERT ATTEN; 10 for the 10 position; 100 for the 1 position.

Note: No particular effort has been made to create an extremely good square wave, since it is not necessary for calibration purposes. The waveform is normally fairly flat on top and rounded slightly on the bottom. We feel that the increased cost would not be commensurate with circuit improvement.

CHECKING TRANSIENT LINE VOLTAGE VARIATIONS

The AC power line transient voltage variations may readily be seen and measured by switching to the CALIB position on the VERT ATTEN switch and then switching the BLANKING CALIB switch to any position other than the CALIB position. To measure the voltage variation, switch the latter to the CALIB position and adjust the CALIB potentiometer for the same variation. The potentiometer is then read directly in rms volts.

The leads from R24A and R26A to R24 should be very short; the leads from R25A and R27A to R25 should likewise be very short. Resistors R24A, R25A, R26A and R27A are decoupling resistors to maintain the high frequency response.

High Frequencies (coil adjustment)

1. The high frequency adjustment is made by feeding an unmodulated 4.8 megacycle signal into the vertical input #1 (gain at maximum; vertical attenuator at 100 on the AC side) and adjusting the slugs in the four series peaking coils (no dot) for maximum output signal on the cathode ray tube. If possible, use an insulated screw driver for these adjustments. Repeat until no further adjustment is necessary.

2. Set the signal generator to 3.5 megacycles and align the four black dot coils as above.

3. Repeat step 1 and 2 until no further adjustments are required.

4. The alignment listed above completes what may be called a "Flat Frequency Alignment." The frequency response of the instrument should be within 3 db of center frequency. If it is not, further adjustment may be made by aligning at slightly above or below the frequencies listed above. Use constant signal input for db measurements.

5. Square wave alignment - it is often found that overshoot results in observing square waves when an instrument is purely aligned for a flat frequency response. To overcome this, a square wave, in the neighborhood of 100KC, is fed into the input and the alignment "touched up" for the flatest possible waveform. This may result in a greater than 3db drop but is desirable for square wave analysis. The tendency toward overshoot will appear at the leading edges of the wave. Note: Even if the oscilloscope is not re-aligned, the pattern developed should be more than ample for most TV service work.

Note:- If greater peaking is desired at 4.8MC, 27K resistors across series peaking coils may be made slightly larger.

Input Stepping Attenuator

There are several methods of adjusting this section. Two are listed below.

1. Square wave: The simplest method of adjusting the input stepping attenuator is to feed a square wave of about 1000 cycles into the Input #1. Adjust the horizontal

sweep until 2 cycles appear. If a square wave generator is not available, a television signal or one from a TV set may be used for the alignment. Observe waveform when attenuator is in the x100 position. Switch to the x10 position. Increase output of square wave generator to same height as previously observed. Solder gimmick (C2) across R1 (from S1A#5 to S1A#12). Adjust C2 until waveform is approximately the same as in the x100 position. If waveform is peaked before C2 is inserted, place C2 across resistor R2 (from S1A#5 to ground). Adjust for proper waveform. Switch to x1 position and adjust output of square wave generator for approximately same height as in the x100 position. Place gimmick (C3) across resistor R3 (S1A#12 to S1A#8) if waveform requires peaking. Place thin wire to S1A#12.

2. A less accurate and more difficult method of compensating the vertical attenuator is to feed a low frequency signal (about 1000 cycles) into the Vertical when the switch is in the 100 position. The switch is then rotated to the 10 position and the attenuation height noted. Repeating with a high frequency signal (about 100,000 cycles) will show whether over or under peaking exists. Viz: If the High Frequency signal was attenuated more than the 1000 cycle signal, underpeaking exists. If the high frequency signal was not attenuated as much as the 1000 cycle signal, overpeaking exists. The method of adjustment is the same as listed in the square wave adjustment section #1. Once the 10 position has been adjusted, repeat by switching to the 1 position.

The instrument may now be placed in its cabinet by laying it on its face (panel) and slipping the cabinet over it. The line cord should be threaded through its hole in back. Secure with 3 each #H55 acorn nuts onto the spade bolts protruding in back.