# SQUARE-WAVE GENERATOR TYPE 107

# INSTRUCTION MANUAL

TEKTRONIX, INC.
MANUFACTURERS OF CATHODE-RAY AND VIDEO TEST INSTRUMENTS

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IM-107-1

TYPE 107 · SERIAL NUMBER ________

# SPECIFICATIONS

The Tektronix Type 107 Square-Wave Generator is basically intended as a test accessory for the 540-Series oscilloscopes. For examination of transient response, a square wave having a risetime faster than that of the amplifier being tested is necessary. A 540-Series oscilloscope and a Type 53/54K Plug-In Unit have a combined risetime of 12 millimicroseconds. The Type 107, with its risetime of 3 millimicroseconds, provides a suitable square wave for checking and adjusting the transient response of this combination.

**Risetime**

Less than 3 millimicroseconds with the coaxial cable terminated in 52 ohms. (Measured from 10% to 90% of the total voltage excursion.)

**Frequency range**

Approximately 400 kc to 1 mc, uncalibrated.

**Square-wave output voltage**

Approximately 0.1 to 0.5 v, peak-to-peak, when the coaxial cable is terminated in 52 ohms.

**Trigger output voltage**

Approximately 1.5 volts, peak-to-peak, when the coaxial cable is terminated in 93 ohms. The negative-going portion is coincident with the positive-going portion of the square-wave output.

**Power requirements**

105-125 v or 210-250 v, 50-60 cycles, 100 watts.

**Mechanical**

Construction—Aluminum-alloy chassis and cabinet.

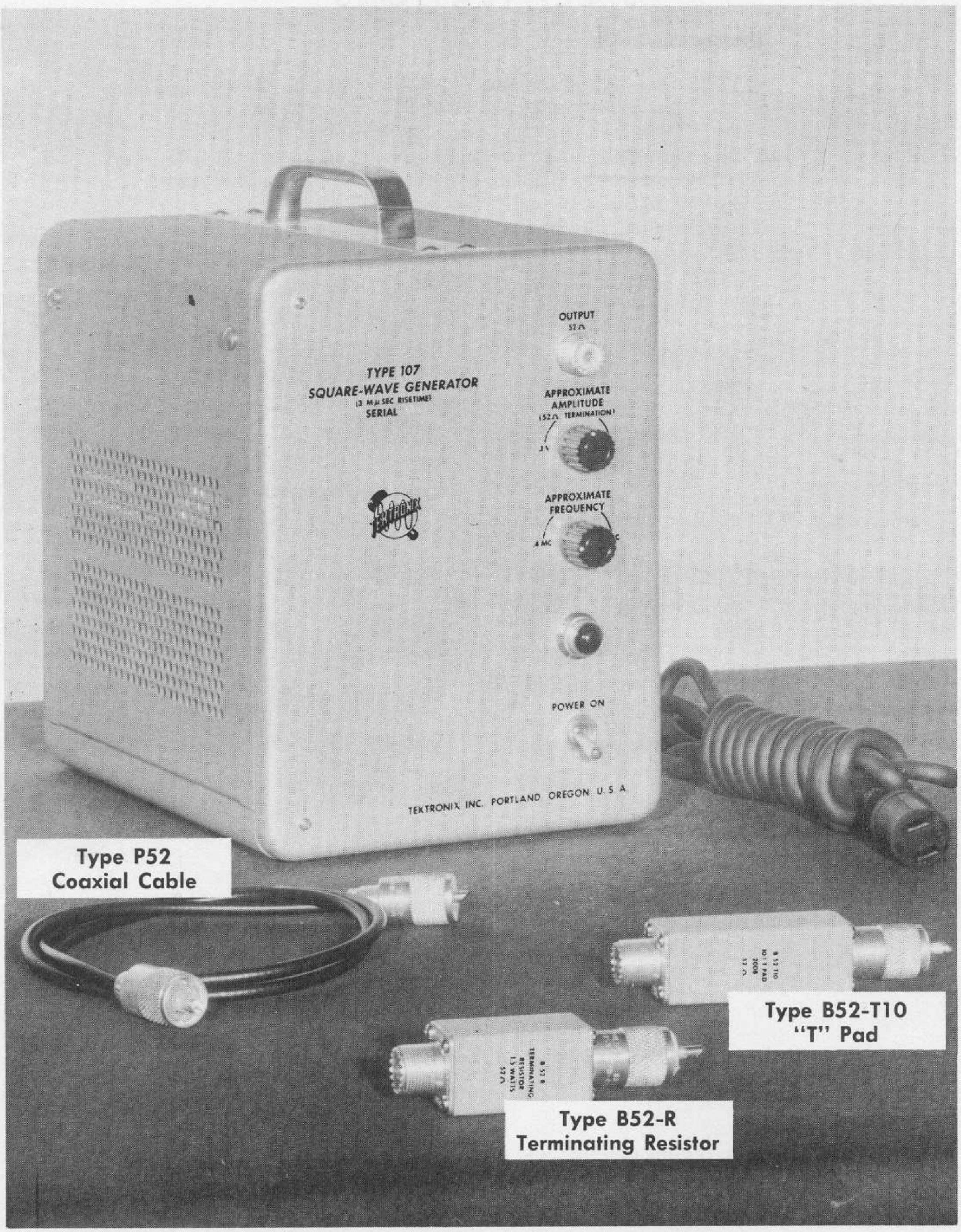
Dimensions—11" long, 6¾" wide, 10½" high.

Weight—13 pounds.

# SPECIAL INSTRUCTIONS

**Make certain the air intake on the rear of the instrument is not obstructed.**

**Operate the instrument from a power-line voltage as nearly as possible in the middle of the range for which the transformer is connected (usually 105-125 volts, 50-60 cycles).**




Type 107 Square-Wave Generator and Accessories

# OPERATING INSTRUCTIONS

The Type 107 Square-Wave Generator was specifically designed for checking and adjusting the vertical amplifier and plug-in preamplifier of a 540-Series oscilloscope. The following instructions describe a method of operating the Type 107 for that purpose. This is not to suggest, however, that it cannot be used for other applications. If you do use the instrument for some other purpose, be sure to observe proper cable termination and keep in mind the waveform of the Type 107 output, as it is described below.

## Cable termination

The fast risetime of the Type 107 Square-Wave Generator will not be realized unless the inter-connecting coaxial cable, Type P52, is properly terminated in its characteristic impedance— 52 ohms. A 52-ohm terminating resistor, Type B52-R, is supplied for this purpose. A "T" pad, B52-T10, is also supplied with the Type 107. You can use it for attenuating the signal 20 db (10:1) by connecting it between the Type 107 output connector and the cable.

The diagram in Figure 1 shows the method of connecting the Type 107 to the 540-Series oscilloscope. A Type 53/54K Plug-In Unit is used for checking the vertical-amplifier transient response of the 540-Series oscilloscope. The "T" pad, B52-T10, is not used with the Type 53/54K Plug-In Unit. However, if you want to check the transient response of a high-gain preamplifier such as the Type 53/54L, you may find it necessary to attenuate the signal output from the Type 107. This can be done by connecting the "T" pad as shown in Fig. 1.

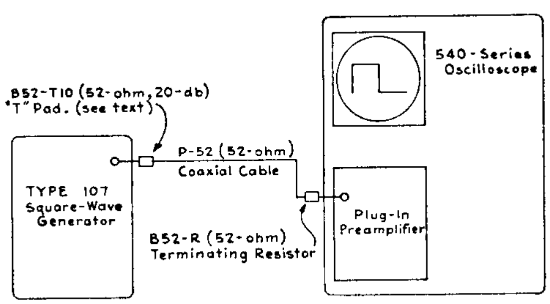



**Fig. 1. Type 107 output connections**
**This diagram shows a typical method of connecting the Type 107 to a 540-Series oscilloscope. The text explains the importance of proper cable termination.**

## Output waveform

An actual photograph of the output waveform of the Type 107 is shown in Fig. 2. This waveform was displayed on a 540-Series oscilloscope. The slight bump in the middle of the positive portion of the waveform is caused by the vertical amplifier of the oscilloscope and does not represent a characteristic of the Type 107 ouput waveform. The overshoot and wrinkle on the negative portion do come from the Type 107 and should be taken into consideration when using the instrument for testing purposes.

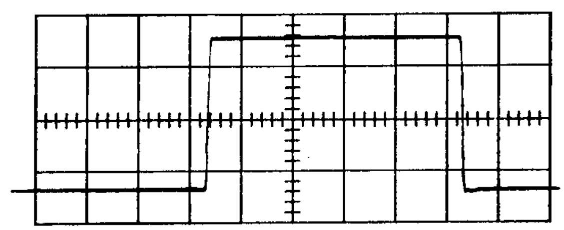


**Fig. 2. Type 107 output waveform**
**This actual photo shows the Type 107 output waveform displayed on a 540-Series oscilloscope. The irregularities in the waveform are explained in the text.**

## Trigger output

In some applications, it may be desirable to trigger equipment with a triggering signal that coincides with the positive-going edge of the square-wave output of the Type 107. This can be done with the triggering signal available at the rear-panel connection labeled TRIGGER OUT. This is a low-impedance trigger source. The trigger pulse has a peak amplitude of approximately 1.5 volts and has the waveform shown in Fig. 3. The negative-going portion of this waveform coincides with the positive-going portion of the square-wave output.

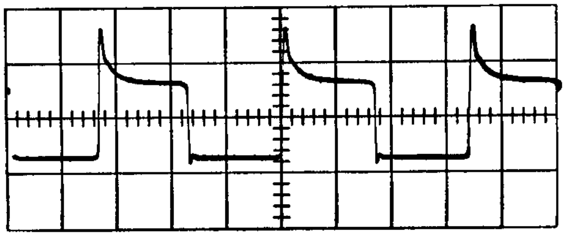


**Fig. 3. Type 107 triggering waveform**
**This actual photo shows the waveform of the triggering signal available at the Trigger Out connector at the rear of the instrument. The negative-going portion of this signal coincides with the positive-going portion of the square-wave output.**

## Front-panel controls

The Type 107 Square-Wave Generator is very simple to operate in that there are only three front-panel controls: (1) POWER ON switch, (2) APPROXIMATE AMPLITUDE control and (3) APPROXIMATE FREQUENCY control.

The POWER ON switch is connected in series with the primary winding of the power transformer, and, of course, provides a method of turning the instrument off and on.

The APPROXIMATE AMPLITUDE control provides a method of varying the output of the Type 107 from zero to approximately .5 volt, peak-to-peak.

The APPROXIMATE FREQUENCY control provides a method of varying the frequency of the square wave from approximately 400 kc to 1 mc.

# CIRCUIT DESCRIPTION

## The Multivibrator

The multivibrator (V26) generates a voltage waveform which is approximately square. V26A and V26B alternately conduct plate current, each conducting during one-half of each cycle of operation of the multivibrator. When V26B conducts, a voltage drop across R43 results from the flow of plate current. This variation in cathode voltage is the square-wave output waveform of the multivibrator.

The operation of this circuit is such that V26A is held cut off during an interval controlled by the discharge time of C28. Following this, V26B is held cut off for an interval controlled by the discharge time of C27. The sum of these two cutoff times is the time needed for a complete cycle of the square-wave output of the multivibrator. But the time needed for these capacitors to discharge a given amount is affected by the value of the positive potential toward which the capacitors discharge. This potential is controlled by the **APPROXIMATE FREQUENCY** control R31, so that this control is able to vary the repetition rate of the multivibrator output waveform.

Slight differences in tubes and circuit components could make the cutoff time of one of the triodes longer than the cutoff time of the other. This would result in an asymmetrical output waveform in which the positive portion would have a duration different from that of the negative portion. To compensate for these changes, you can use the SYMMETRY control to make the plate voltages on the triodes unequal, thus making the output waveform symmetrical.

## The First Shaper

The output of the multivibrator is an approximate square wave; this is the waveform shown at the cathode of V26B on the circuit diagram. This waveform, with an overall peak-to-peak amplitude of about 12 volts, has a pronounced positive overshoot of approximately 5 volts. The waveform is coupled through C47 to the grid circuit of V45. The amplitude of the input signal, developed across R47, is sufficient to overdrive this stage; that is, the positive portion of the grid-input signal drives the tube into heavy conduction, and the negative portion of the grid-input signal drives the grid below cutoff. When the grid is driven positive, grid current flows and develops a bias voltage across R46 which "clamps" the signal and attenuates the positive overshoot. By limiting the positive overshoot, R46 elevates the remainder of the waveform so that a more usuable portion of the wave appears above cutoff. By this action, the tube conducts more of the square-wave portion of the waveform. C46 is a high-frequency compensating capacitor to preserve the risetime or leading edge of the waveform.

## The Second Shaper

A waveform of approximately 40 volts peak-to-peak appears at the plate of V45. This signal is coupled through C57 to the grid circuit of V55. The amplitude of the signal developed across R57 is sufficient to overdrive this stage. The grid is driven slightly positive, during which time it draws current through R57 to bias the stage. The large negative overshoot drives the grid far below cutoff; thus the tube does not conduct for this portion of the wave. By this action, only the most positive portion of the wave is amplified.

## The Third Shaper

A 20-volt peak-to-peak waveform, not including the small negative overshoot, appears at the plate of V55. This waveform is coupled through C67 to the grid of V65. This stage is also overdriven, and is biased in the same manner as V55. Only the most positive portion of the waveform, therefore, drives the tube into conduction. A waveform of approximately 16 volts, peak-to-peak, appears at the plate of V65.

The high-frequency compensation circuit consists of R88, C88 and the LR83 network. R88 and C88 provide a time constant of approximately 10 millimicroseconds (depending on the setting of C88), and the LR83 network provides a time constant of approximately 20 millimicroseconds. These two networks alter the plate-load impedance of V65 slightly, during and immediately following the rise of the pulse, so that an extremely fast leading edge with minimum overshoot is produced.

C82, which bypasses R82 for high-frequency components of the square wave, also overcompensates the square wave for low-frequency components. To decrease the amount of compensation, R89, the LOW FREQ. COMP. control, is added to the circuit. By properly adjusting the resistance of R89, a flat top is produced in the square wave at the grid of V85.

### The Output Amplifier

Like the previous amplifiers, V85 is over-driven and biased so that only the very top portion of its input waveform causes the tube to conduct. This action produces a square wave at the output terminals having a risetime of less than three millimicroseconds. This stage works into a 52-ohm load resistance. Due to the low load resistance, the output voltage is quite small, being in the range from 0.2 to 0.5 volt, peak-to-peak. The exact value of the output voltage depends on the setting of the APPROXIMATE AMPLITUDE control, which varies the screen voltage, and hence the transconductance, of V85.

### The Power Supply

The power supply is a conventional full-wave rectifier system, employing a capacitor input filter. The voltage dividing network in the filter system provides plate and screen voltages of 225, 200, 180 and 120 volts. In addition, a regulated source of 150 volts for the screen of V85 is provided. This regulated screen voltage is provided to insure that the output remain constant with a given setting of the APPROXIMATE AMPLITUDE control.

The primary of the power transformer may be connected for operation on either a 105- to 120-volt line, or a 210- to 240-volt line (see Fig. 5).

# MAINTENANCE

## ORDERING AND REPLACING PARTS

### Standard components

Replacement components can be obtained from Tektronix at current net prices. However, since most of the components are standard electronic and radio parts, you can probably obtain them locally faster than we can ship them to you from the factory. Be sure to consult the instruction manual to see what tolerances are required.

### Selected components

We specially select some of the components, whose values must fall within prescribed limits, by sorting through our regular stocks. The components so selected have standard RETMA color-coding showing the value and tolerance of the stock they were selected from, but they are not, in general, replaceable from dealer's stocks.

### Checked tubes

To obtain maximum reliability and performance, we check some of the electron tubes used in our instruments for such characteristics as microphonics, balance, transconductance, etc. We age other tubes to stabilize their characteristics. Since there are no well-defined standards in certain areas of tube performance, we have established our own standards and have developed equipment to do this checking. These checked tubes can be purchased through your local Tektronix Field Engineering Office or directly from the factory.

### Tektronix-manufactured parts

Tektronix manufactures almost all of the mechanical parts, and some of the electronic components, used in your instrument. If you order a mechanical part be sure to describe the part completely to prevent delay in filling your order. When you have questions about mechanical parts or about Tektronix-manufactured components, contact your nearest Field Engineering office or write to the Field Engineering department at the factory.

**Note**

Always include the instrument **TYPE AND SERIAL NUMBER** in any correspondence regarding the instrument.

## TROUBLE SHOOTING

### Procedure

If any trouble should develop in your instrument, we suggest that you localize the difficulty as well as possible before testing individual components: Here is a general plan you can follow:

1. Check for open fuses. Note that for proper operation there must be a purple glow inside the voltage-regulator tube V77. (The voltage at Pin 5 of V77, as measured with a voltmeter, should be about 150 volts.)

2. Look for burned-out tube heaters or filaments, and for signs of overheating such as discolored resistors or insulation.

3. Replace the tubes, one by one, with tubes known to be in good condition. When you find that the original tube in a given position is good, return the tube to its so socket.

4. With an accurate voltmeter, check the voltages shown in blue on your schematic diagram.

5. You can check waveforms developed in your Type 107 with a Type 541 or a Type 545 Oscilloscope, using a Type 53/54K Plug-In Preamplifier and a Type P410 probe. Connect the ground clip of the probe to the chassis of the Type 107 at a point close to the point of measurement. The waveforms shown in blue on your schematic diagram are reproduced from unretouched photographs. You can first check that the multivibrator V26 is generating the waveform shown. Then, you can observe whether or not the indicated waveforms appear in turn at the grids and at the plates of V45, V55, V65 and V85.

**Soldering precaution**

In the production of Tektronix instruments, a special silver-bearing solder is used to establish a bond to the ceramic terminal strips. This bond may be broken by repeated use of ordinary tin-lead solder or by the application of too much heat. However, occasional use of ordinary solder will not break the bond if you are careful not to apply too much heat. In a large maintenance shop where Tektronix instruments are frequently repaired, it is advisable to have a stock of solder containing about 3% silver. This type of solder is used frequently in printed circuits and should be readily available. The solder can be purchased directly from Tektronix in one-pound rolls (order by part number 251-514).

## *ADJUSTMENT PROCEDURE*

**Preliminary procedure**

To adjust the Type 107 Square-Wave Generator, we recommend the following items of test equipment:

1. Type 541 or Type 545 Oscilloscope with a Type 53/54K Plug-In Preamplifier.
2. A Type P52 52-ohm Coaxial Cable and a Type B52-R 52-ohm Terminating Resistor.

To prepare the equipment for adjustment:

1. Connect the Type P52 Coaxial Cable to the **OUTPUT** connector of the Type 107. Connect the other end of the cable to the Type B52-R Terminating Resistor, and connect the resistor to the **INPUT** connector of the test oscilloscope.
2. Set the **APPROXIMATE FREQUENCY** and **APPROXIMATE AMPLITUDE** controls of the Type 107 to mid-range.
3. Set the front-panel controls of the oscilloscope and plug-in preamplifier as follows:

Type 541 or Type 545:

| | |
|---|---|
| HORIZONTAL DISPLAY | INTERNAL SWEEP (Type 541) |
| | MAIN SWEEP NORMAL (Type 545) |
| STABILITY | full right |
| TRIGGERING MODE | AUTO. or AUTOMATIC |
| TRIGGER SLOPE | +INT. |
| TIME/CM | .1 MICROSEC |
| MULTIPLIER | 5 |
| 5X MAGNIFIER | OFF |
| POWER | ON |

Type 53/54K:

| | |
|---|---|
| AC-DC | AC |
| VOLTS/CM | .1 |
| VARIABLE | CALIBRATED |

If the **TRIGGERING MODE** switch on your oscilloscope has a position marked **AUTOMATIC** (rather than **AUTO.**), the above settings will result in a stable display of the Type 107 output waveform. If the **TRIGGERING MODE** switch has a position marked **AUTO.** (rather than **AUTOMATIC**), it will be necessary to slowly turn the **STABILITY** control toward the left until the display is stable.

The control settings listed above will result in a display of 4 or 5 cycles of the output waveform of the Type 107.

**Symmetry**

If the output waveform of the Type 107, when displayed on an oscilloscope, appears asymetrical as shown in Fig. 4(*a*), this indicates that you should readjust the SYMMETRY control. Whenever you change the mulivibrator tube V26 you should check this adjustment by looking at the waveform on an oscilloscope.

To adjust the SYMMETRY control, proceed as follows:

1. Connect the Type 107 to your test oscilloscope and set the front-panel controls of the Type 107 and of the oscilloscope as described in the "preliminary procedure" above.
2. Adjust the SYMMETRY control of the Type 107 so that the horizontal length of the positive portion of the displayed waveform (region *A* in Fig. 4(*a*)) is equal to the horizontal length of the negative portion (region *B* in Fig. 4 (*a*)). Fig. 4(*d*) shows the output waveform obtained when the SYMMETRY control is correctly adjusted.

**Low-frequency compensation**

If the negative portion of the output waveform of the Type 107, when displayed on an oscilloscope, has a tilted appearance as shown in Fig. 4(*b*), this indicates that you should readjust the low-frequency compensation control R89.

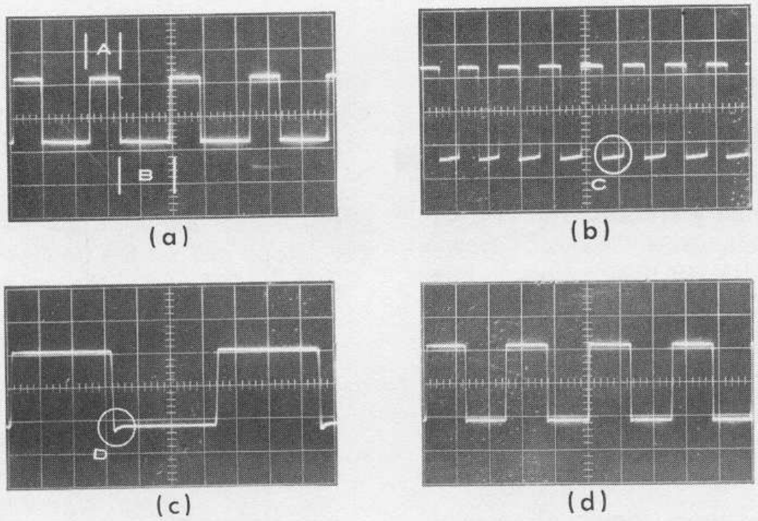



**Fig. 4. Typical output waveforms.**

Waveforms (a), (b) and (c) are typical of what you may expect when the Type 107 is improperly adjusted. The text describes the kinds of misadjustments that may result in such waveforms. Waveform (d) is typical of a properly adjusted instrument.

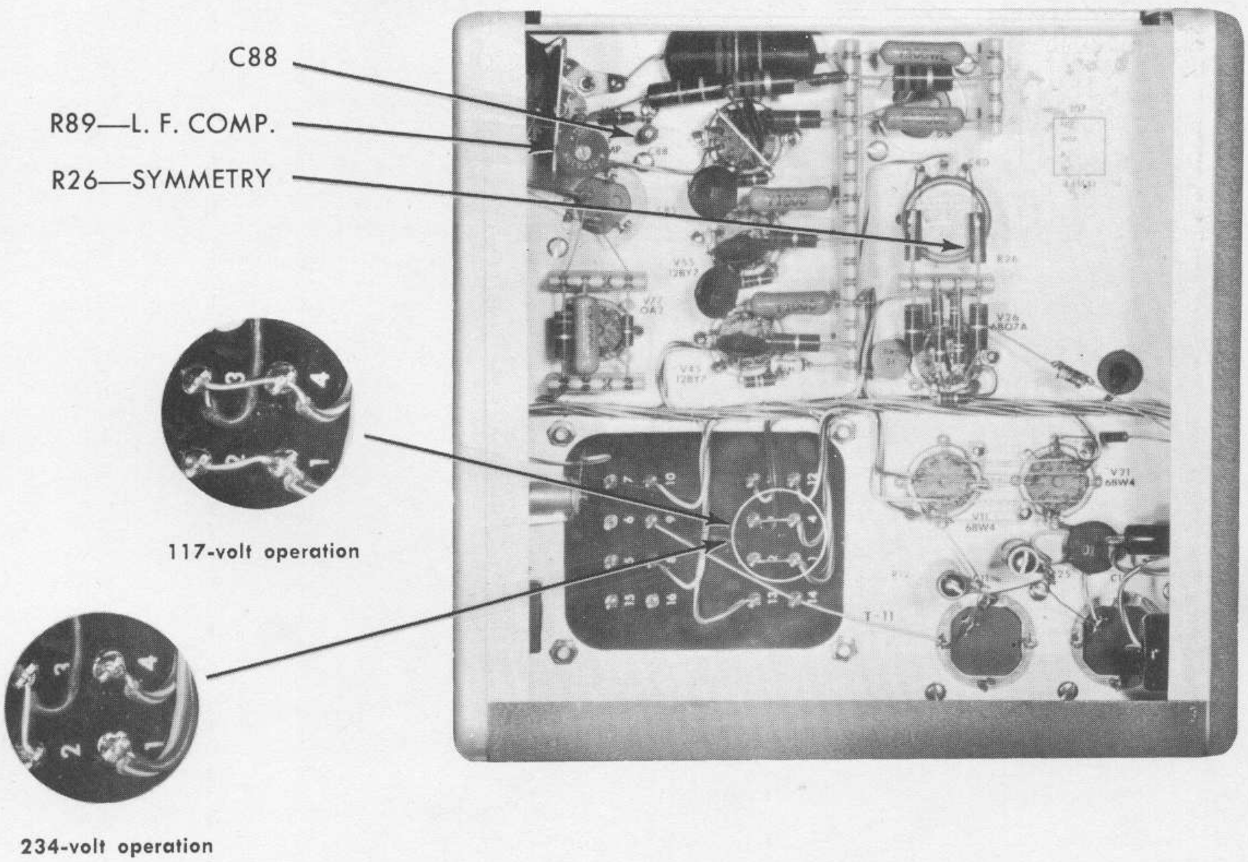



**Fig. 5. Locations of internal adjustments.**

To adjust this control, proceed as follows:

1. Connect the Type 107 to your test oscilloscope and set the front-panel controls of the Type 107 and of the oscilloscope as described in the Preliminary Procedure above, except for the settings of the oscilloscope **TIME/CM** and **MULTIPLIER** controls and the Type 107 **APPROXIMATE FREQUENCY** control. Set the latter controls as follows:

| | |
|---|---|
| TIME/CM | 1 MICROSEC |
| MULTIPLIER | 2 |
| APPROXIMATE FREQUENCY | .4 MC (full left) |

2. Adjust the LOW-FREQ. COMP. control so that the negative portion of the square-wave display (region C in Fig. 4(*b*)) is level. The output waveform of a correctly compensated instrument is shown in Fig. 4(*d*).

## High-frequency compensation

If the negative portion of the square-wave output of the Type 107 has a marked overshoot or wrinkle, this indicates that you should readjust C88. Fig. 4(c) shows a waveform having excessive negative overshoot. To adjust C88, proceed as follows:

1. Connect the Type 107 to your test oscilloscope and set the front-panel controls of the Type 107 and of the oscilloscope as described in the Preliminary Procedure above, except for the settings of the oscilloscope **TIME/CM** and **MULTIPLIER** controls and the Type 107 **APPROXIMATE FREQUENCY** control. Set the latter control as follows:

| | |
|---|---|
| TIME/CM | .1 MICROSEC |
| MULTIPLIER | 1 |
| APPROXIMATE FREQUENCY | 1 MC (full right) |

2. Adjust C88 for minimum overshoot and wrinkle on the negative portion of the output waveform of the Type 107 (region *D* in Fig. Fig. 4(c)). Fig. 4(*d*) shows the waveform of the Type 107 adjusted for optimum high-frequency response.

# TYPE 107
# SQUARE-WAVE GENERATOR
# PARTS LIST

For an explanation of the abbreviations used in this parts list, see the indexed sheet marked **ABBREVIATIONS**.

## Lamps

| | | Order parts by number |
|---|---|---|
| B11 | Incandescent, Type 47 | 150001 |

## Capacitors

| | | | | | | |
|---|---|---|---|---|---|---|
| C11 | 125 μf | EMC | Fixed | 350 v | | 290052 |
| C12 | 125 μf | EMC | Fixed | 350 v | | 290052 |
| C25 | .01 μf | Cer. | Fixed | 500 v | GMV | 283002 |
| C27 | 47 μμf | Cer. | Fixed | 500 v | ±9.4 μμf | 281518 |
| C28 | 47 μμf | Cer. | Fixed | 500 v | ±9.4 μμf | 281518 |
| C41 | 51 μμf | Cer. | Fixed | 500 v | ±5% | 281540 |
| C46 | 22 μμf | Cer. | Fixed | 500 v | ±4.4 μμf | 281510 |
| C47 | .005 μf | Cer. | Fixed | 500 v | GMV | 283001 |
| C49 | .01 μf | Cer. | Fixed | 500 v | GMV | 283002 |
| C57 | .01 μf | Cer. | Fixed | 500 v | GMV | 283002 |
| C59 | .01 μf | Cer. | Fixed | 500 v | GMV | 283002 |
| C67 | .01 μf | Cer. | Fixed | 500 v | GMV | 283002 |
| C69 | .01 μf | Cer. | Fixed | 500 v | GMV | 283002 |
| C80 | 2x40 μf | EMC | Fixed | 250 v | | 290041 |
| C82 | .22 μf | PT | Fixed | 400 v | | 285533 |
| C85 | 2x40 μf | EMC | Fixed | 250 v | | 290041 |
| C87 | .01 μf | PT | Fixed | 400 v | | 285510 |
| C88 | 0.7–3 μμf | Tub. | Var. | | HIGH FREQ. COMP. | 281027 |
| C90 | .01 μf | Cer. | Fixed | 500 v | GMV | 283002 |
| C94 | .1 μf | Cer. | Fixed | 250 v | GMV | 283007 |

## Fuses

| | | | | |
|---|---|---|---|---|
| F11 | 1.6 amp | 3 AG | Slo-Blo | 159003 |

## Inductors

| | | | |
|---|---|---|---|
| L27 | 29 μh | Fixed | 108016 |
| L28 | 29 μh | Fixed | 108016 |
| LR83 | 0.20 μh, 6 turns #33 wire wound on 10 Ω ½ w resistor. | | 108115 |

## Resistors

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| R12 | 333 Ω | 10 w | Fixed | WW | 5% | | 308049 |
| R25 | 4.5 k | 5 w | Fixed | WW | 5% | | 308066 |
| R26 | 1 k | 2 w | Var. | Comp. | 20% | SYMMETRY | 311006 |
| R27 | 1.2 k | 1 w | Fixed | Comp. | 10% | | 304122 |
| R28 | 1.2 k | 1 w | Fixed | Comp. | 10% | | 304122 |

## Resistors *(continued)*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| R31 | 100 k | 2 w | Var. | Comp. | 20% | APPROXIMATE FREQUENCY | 311026 |
| R32 | 1.5 meg | ½ w | Fixed | Comp. | 10% | | 302155 |
| R33 | 150 k | ½ w | Fixed | Comp. | 10% | | 302154 |
| R34 | 150 k | ½ w | Fixed | Comp. | 10% | | 302154 |
| R35 | 1.5 meg | ½ w | Fixed | Comp. | 10% | | 302155 |
| R41 | 390 Ω | ½ w | Fixed | Comp. | 10% | | 302391 |
| R42 | 91 Ω | ½ w | Fixed | Comp. | 5% | | 301910 |
| R43 | 470 Ω | ½ w | Fixed | Comp. | 10% | | 302471 |
| R45 | 1 k | 5 w | Fixed | WW | 1% | | 308072 |
| R46 | 47 k | ½ w | Fixed | Comp. | 10% | | 302473 |
| R47 | 150 k | ½ w | Fixed | Comp. | 10% | | 302154 |
| R49 | 2.2 k | 1 w | Fixed | Comp. | 10% | | 304222 |
| R55 | 1 k | 5 w | Fixed | WW | 1% | | 308072 |
| R57 | 4.7 k | ½ w | Fixed | Comp. | 10% | | 302472 |
| R59 | 2.2 k | 1 w | Fixed | Comp. | 10% | | 304222 |
| R65 | 180 Ω | 2 w | Fixed | Comp. | 10% | | 306181 |
| R67 | 1 k | ½ w | Fixed | Comp. | 10% | | 302102 |
| R69 | 2.2 k | 1 w | Fixed | Comp. | 10% | | 304222 |
| R76 | 3.3 k | 1 w | Fixed | Comp. | 10% | | 304332 |
| R77 | 4 k | 5 w | Fixed | WW | 5% | | 308051 |
| R78 | 220 Ω | ½ w | Fixed | Comp. | 10% | | 302221 |
| R80 | 300 Ω | 5 w | Fixed | WW | 1% | | 308070 |
| R81 | 3 k | 5 w | Fixed | WW | 5% | | 308062 |
| R82 | 270 Ω | 2 w | Fixed | Comp. | 10% | | 306271 |
| R85 | 5.6 k | 2 w | Fixed | Comp. | 10% | | 306562 |
| R87 | 4.7 k | ½ w | Fixed | Comp. | 10% | | 302472 |
| R88 | 8.2 k | ½ w | Fixed | Comp. | 10% | | 302822 |
| R89 | 10 k | 1/10 w | Var. | Comp. | 10% | LOW FREQ. COMP. | 311017 |
| R90 | 2.2 k | ½ w | Fixed | Comp. | 10% | | 302222 |
| R91 | 50 k | 2 w | Var. | Comp. | 20% | APPROXIMATE AMPLITUDE | 311023 |
| R92 | 2.2 k | ½ w | Fixed | Comp. | 10% | | 302222 |
| R94 | 110 Ω | ½ w | Fixed | Comp. | 5% | | 301111 |
| R95 | 100 Ω | ½ w | Fixed | Comp. | 5% | | 301101 |

## Switches

| | | | |
|---|---|---|---|
| SW11 | Single-pole, double-throw toggle | POWER ON | 260134 |

## Transformer

| | | |
|---|---|---|
| T11 | Power Transformer | 120008 |

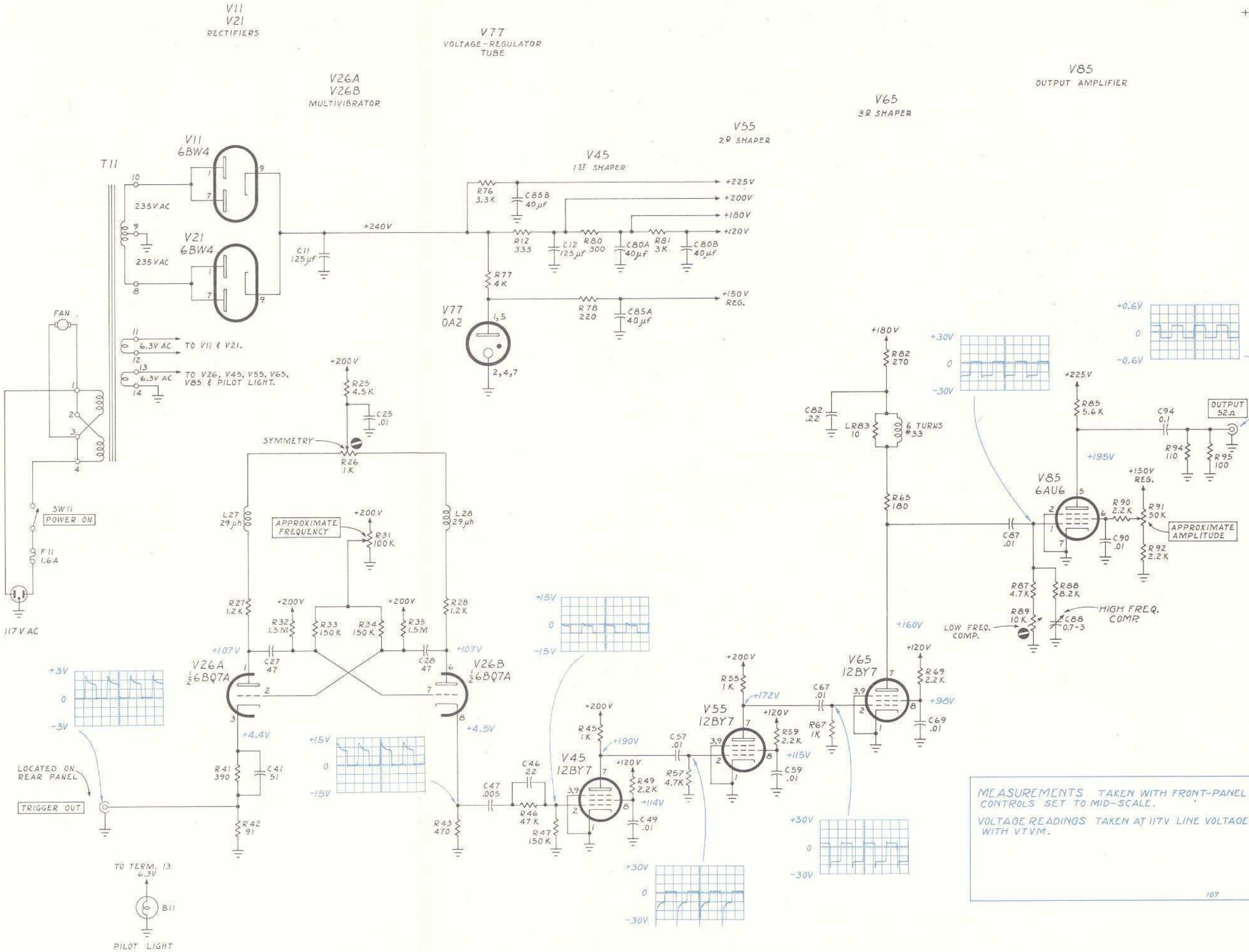
## Vacuum Tubes

| | | | |
|---|---|---|---|
| V11 | 6BW4 | Rectifier | 154119 |
| V21 | 6BW4 | Rectifier | 154119 |
| V26 | 6BQ7A | Multivibrator | 154028 |
| V45 | 12BY7 | First Shaper | 154047 |
| V55 | 12BY7 | Second Shaper | 154047 |
| V65 | 12BY7 | Third Shaper | 154047 |
| V77 | OA2 | Voltage Regulator | 154001 |
| V85 | 6AU6 | Output | 154022 |

## NOTE

Unless otherwise specified, all of the voltage readings were taken with a dc vacuum-tube voltmeter having an input resistance of 11 megohms. The waveforms shown were reproduced from actual photographs. There will be considerable variation between instruments because of normal manufacturing tolerances and vacuum-tube characteristics. Therefore, the significance of any discrepancies observed should be determined by referring to the circuit diagram.

All readings are in volts unless otherwise specified. Where two voltage readings are given, they represent the voltage as read by a voltmeter under two sets of conditions, and, as such, do not indicate the peak-to-peak excursion of voltage at the point.

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TYPE 107 SQUARE-WAVE GENERATOR

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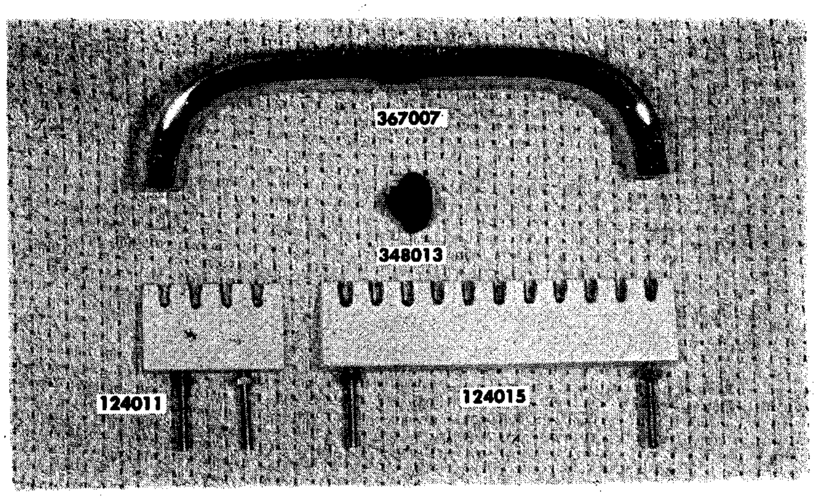
## MISCELLANEOUS HARDWARE PARTS LIST

| | Order parts by number |
|---|---|
| Light socket with red jewel | 136025 |
| Knob: APPROXIMATE AMPLITUDE, APPROXIMATE FREQUENCY | 366033 |
| Coaxial connector, Type UHF: OUTPUT, TRIGGER OUT | 131051 |
| Receptacle, power | 131011 |
| Fuse holder, Type 3AG | 352010 |
| Fan motor | 147008 |
| Fan blade | 369008 |
| Handle | 367007 |
| 4-notch ceramic strip | 124011 |
| 11-notch ceramic strip | 124015 |
| Rubber foot, black ½" (order singly) | 348013 |
| Tube shield, 1 11/16" x 1 11/16" | 337154 |
| Tube shield, 1" x 1", slotted | 337158 |




Carrying handle, rubber foot and ceramic strips used in the Type 107. When ordering parts, be sure to include the part description, Tektronix part number and the instrument serial number.

### *ABBREVIATIONS USED IN OUR PARTS LISTS*

| | | | |
|---|---|---|---|
| Cer. | ceramic | m | milli |
| Comp. | composition | Ω | ohm |
| EMC | electrolytic, metal cased | Poly. | polystyrene |
| EMT | electrolytic, metal tubular | Prec. | precision |
| f | farad | PT | paper tubular |
| h | henry | Tub. | tubular |
| k | thousands of ohms | v | working volts dc |
| meg | megohms | Var. | variable |
| $\mu$ | micro | w | watt |
| $\mu\mu$ | micromicro | WW | wire wound |
| GMV | guaranteed minimum value | | |

### *ABBREVIATIONS USED IN OUR CIRCUIT DIAGRAMS*

Resistance values are in ohms. The symbol k stands for thousands. A resistor marked 2.7 k has a resistance of 2,700 ohms. The symbol M stands for million. For example, a resistor marked 5.6 M has a resistance of 5.6 megohms.

Unless otherwise specified on the circuit diagram, capacitance values marked with the number 1 and numbers greater than 1 are in $\mu\mu$f. For example, a capacitor marked 3.3 would have a capacitance of 3.3 micromicrofarads. Capacitance values marked with a number less than 1 are in $\mu$f. For example, a capacitor marked .47 would have a capacitance of .47 microfarads.

Inductance values marked in mh are in millihenrys. Inductance values marked in $\mu$h are in microhenrys.

Your instrument **WARRANTY** appears on the reverse side of this sheet.

SERIAL NO. ________

## IMPORTANT

Include the INSTRUMENT TYPE and the above SERIAL NUMBER in any correspondence regarding this instrument. The above serial number must match the instrument serial number if parts are to be ordered from the manual. Your help in this will enable us to answer your questions or fill your order with the least delay possible.

## WARRANTY

All Tektronix instruments are fully guaranteed against defective materials and workmanship for one year. Should replacement parts be required, whether at no charge under warranty or at established net prices, notify us promptly, including sufficient details to identify the required parts. We will ship them prepaid (via air if requested) as soon as possible, usually within 24 hours.

Tektronix transformers, manufactured in our own plant, carry an indefinite warranty.