

TELEPHOTOGRAPHY
TONE-OPERATED CONTROL CIRCUIT (SD-56524-01)
OUT-OF-SERVICE TESTS

1. GENERAL

1.01 This section describes a method of making an out-of-service test of the tone-operated control circuit (SD-56524-01), and a method of making potentiometer adjustments to correct for changes in the characteristics of some circuit elements.

Caution: Adjustments specified in this section should not be attempted during periods of power supply irregularities.

1.02 This section is reissued to include corrections according to Addendum Issue 2 of Section 314-715-104 Issue 1 and to generally update the section.

1.03 The tests covered are:

A. Tuning Filter to Carrier Frequency: This test permits the unit to select the telephotographic signal and reject speech.

B. Low-Level Sensitivity: This test checks the lower sensitivity level of the circuit.

C. High-Level Sensitivity: This test checks the difference in levels for differential operation.

D. Timing Cycle: This test checks the time it takes the SR relay to operate.

1.04 The transmission measuring set is referred to in this section as TMS.

1.05 The abbreviations cw and ccw, used herein, refer to clockwise and counterclockwise, respectively.

1.06 The tests must be performed in the order specified in this section.

2. APPARATUS

2.01 The apparatus required for each test is shown in Table A. The details of each item are covered in the paragraph indicated by the number in parentheses.

♦TABLE A♦

| APPARATUS | TESTS | | | |
|-------------------------------------|-------|---|---|---|
| | A | B | C | D |
| 21A TMS | 1 | 1 | 1 | 1 |
| KS-14510 Volt-Ohm-Milliammeter | - | 1 | 1 | 1 |
| 72A Frequency Meter | 1 | - | - | - |
| Oscilloscope (such as Dumont 304AR) | 1 | 1 | 1 | 1 |
| KS-19355, L5 Adjuster (2.02) | 1 | - | - | - |
| Stop Watch (2.03) | - | - | - | 1 |
| Cord (2.04) | 1 | 1 | 1 | 1 |
| Cord (2.05) | 1 | 1 | 1 | - |
| Cord (2.06) | - | 1 | 1 | 1 |
| Cord (2.07) | - | 1 | 1 | 1 |
| Cord (2.08) | 1 | 1 | 1 | 1 |
| Attenuator (2.09) | - | ✓ | - | - |
| Plug (2.10) | 1 | 1 | 1 | 1 |
| Screwdriver (2.11) | 1 | 1 | 1 | 1 |
| ✓As required. | | | | |

2.02 ♦KS-19355, L5 adjuster♦ (to be used in making fine frequency adjustments).

2.03 KS-3008 stop watch (or a watch with a second hand).

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2.04 P3N testing cord for 21A TMS, 6 feet long, equipped with one 310 plug and one 241A plug.

2.05 Two P3J patching cords, 6 feet long, equipped with two 241A-type plugs.

2.06 ♦KS-14510, List 2 lead consisting of:♦
BL-123234-1 testing cord, equipped with one KS-14530 connector and one hard rubber handle (red) with a brass terminal pin.

2.07 ♦KS-14510, List 2 lead consisting of:♦
BL-123234-2 testing cord, equipped with one KS-14530 connector and one hard rubber handle (black) with a brass terminal pin.

2.08 W2DW testing cord, equipped with one General Radio Co. No. 274-ND shielded plug and two phone plugs, red and black. Alligator clip attachments (one red, one black) and phone tips (one red, one black) are also furnished. (Cord is to be used in conjunction with Dumont 304AR oscilloscope.) The Tektronix Oscilloscope is provided with a Test Probe which may be used in these tests.

2.09 No. 5A attenuator, or equivalent (to be used if level settings are below -50 dBm).

2.10 258D (dummy) plug (to remove suppressor from service).

2.11 R-8210 screwdriver (to be used for potentiometer adjustments).

3. PREPARATION

| STEP | ACTION | VERIFICATION |
|------|--------|--------------|
|------|--------|--------------|

All Tests

- 1 Calibrate 21A TMS in accordance with Section 103-221-100.
- 2 Using 72A frequency meter—
Set oscillator output of 21A TMS to carrier frequency of telephotographic signal.
- 3 Remove tone-operated control circuit from service by inserting 258D plug in K test jack.

4. METHOD

A. Tuning Filter to Carrier Frequency

- 4 Using W2DW cord—
Patch oscilloscope to TP1 and GND, using red and black leads, respectively.
- 5 Set oscillator output switch on 21A TMS to -40 dBm range.
- 6 Set detector switch on 21A TMS to -40 dBm range.
- 7 Using P3J cord—
Patch oscillator output into detector input.

| STEP | ACTION | VERIFICATION |
|------|--|---|
| 8 | Adjust oscillator output dial until -40 dBm is reached. | Meter will read zero. |
| 9 | Remove P3J cord. | |
| 10 | Set frequency range selector (FRS) switch (on TOCC) to telephotographic carrier frequency. | |
| 11 | Set LOW LEV potentiometer fully cw. | |
| 12 | Using P3N cord— Patch oscillator output of 21A TMS to TEST IN jack. | Sinusoidal waveform will appear on oscilloscope. |
| 13 | Using \blacklozenge KS-19355, L5 adjuster— \blacklozenge Adjust FINE FREQ 1 until a maximum is obtained at TP1. | Sine wave on oscilloscope will become a maximum. |
| 14 | Using \blacklozenge KS-19355, L5 adjuster— \blacklozenge Adjust FINE FREQ 2 until a maximum is obtained at TP1. | Sine wave will become larger and reach a maximum. |
| 15 | Recheck the adjustment of FINE FREQ 1. | <i>Note:</i> Any change in adjustment causes a decrease in the sine wave. |
| 16 | Remove patch cord P3N from TEST IN jack and oscillator output of 21A TMS. | |
| 17 | Remove W2DW cord from TP1 and GND jacks. | |

B. Low-Level Sensitivity

- 4 Set oscillator output range of 21A TMS to lower sensitivity setting of circuit (generally -40 dBm).
- Note 1:* Lower sensitivity setting is generally -40 dB below a zero TLP, that is, -40 dB when operating a TOCC at a zero TLP, -13.0 dB at a +7.0 dB point.
- Note 2:* If it is desired to set a level which is less than -50 dBm, the attenuator should be inserted in cascade with the oscillator output of the 21A TMS.
- 5 Set detector range switch of 21A TMS to sensitivity level selected in Step 4 (generally -40 dBm).

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| STEP | ACTION | VERIFICATION |
|-------------|--|--|
| 6 | Using P3J cord— Patch oscillator output to detector input. | |
| 7 | Adjust output control for desired level. | At -40 dBm setting, meter will read zero. |
| 8 | Remove P3J patch cord. | |
| 9 | Set dc voltmeter to 12V DC scale. | |
| 10 | Using BL-123234-2 test cord (black)— Place (+) terminal of voltmeter in GND test point. | |
| 11 | Using BL-123234-1 test cord (red)— Place (-) terminal of voltmeter in TP3. | ◆Meter will read positive, less than 1.0 volt.◆ |
| 12 | Set oscilloscope to dc range. | |
| 13 | Place alligator clip on black lead, and phone tip on red lead, of W2DW cord. | |
| 14 | Connect W2DW cord to oscilloscope. | |
| 15 | Connect alligator clip (black) of W2DW cord on frame. | |
| 16 | Plug phone tip (red) of W2DW cord into TP2. | Waveform on oscilloscope will be that of an astable multivibrator. (See Fig. 1.) |
| 17 | Using P3N cord— Patch oscillator output of 21A TMS to TEST IN jack. | Waveform on oscilloscope will drop and become a constant. (See Fig. 2.) |
| 18 | Adjust LOW LEV potentiometer ◆ ccw◆ until output at TP2 becomes astable. | Waveform on oscilloscope will become that of an astable multivibrator. (see Fig. 1.) |
| 19 | Slowly adjust LOW LEV potentiometer cw until output at TP2 just becomes a constant. | Waveform on oscilloscope will spread and finally drop to a constant level. (See Fig. 3.) |
| 20 | Check setting by removing 310 plug from TEST IN jack. | Waveform will become astable. |
| 21 | Lower output level control of 21A TMS by 0.5 dB. | |
| 22 | Plug 310 plug into TEST IN jack. | Waveform will not be affected. Output will be that of an astable multivibrator. |
| 23 | Increase output level control of 21A TMS until output at TP2 drops to a constant. | Waveform will drop to a constant level. (See Fig. 2.) |

| STEP | ACTION | VERIFICATION |
|----------------------------------|---|---|
| | | Note: Increase in output level control of 21A TMS should bring dial setting up by 0.5 \pm 0.2 dB. |
| 24 | Observe output level control of 21A TMS. | New dial setting should be \pm 0.2 dB from the setting established in Step 7. |
| 25 | Remove patch P3N cord from 21A TMS and TEST IN jack. | |
| C. High-Level Sensitivity | | |
| 4 | Set oscillator output switch of 21A TMS to a reading of 20 dB greater than the low-level setting (generally -20 dBm). | |
| | Note: High level sensitivity setting is generally -20 dB below a zero TLP, that is, -20 dB when operating TOCC at a zero point; -13 dB at a +7.0 dB point. | |
| 5 | Set detector range to correspond with setting in Step 4. | |
| 6 | Using P3J cord— Patch oscillator output to detector input. | |
| 7 | Adjust oscillator output dial for desired level. | At -20 dBm setting, meter will read zero. |
| 8 | Remove P3J patch cord. | |
| 9 | Set HI LEV potentiometer fully cw. | Meter at TP3 will read positive, less than 1.0 volt. |
| 10 | Using P3N cord— Patch oscillator output of 21A TMS to TEST IN jack. | Waveform at TP2 will drop to a constant. (See Fig. 2.) Meter at TP3 will continue to read less than 1.0 volt as measured in Step 9. |
| 11 | Adjust HI LEV potentiometer slowly ccw until voltage at TP3 jumps to -8 \pm 1 volts. | Meter at TP3 will read 8 \pm 1 volts. |
| 12 | Decrease output switch of oscillator by 1 dB. | Meter at TP3 drops to a positive reading of less than 1.0 volt. |
| 13a | If reading in Step 12 is not obtained— Repeat Steps 9 through 12. | Desired reading is obtained. |
| 14 | Remove P3N patch cord from TEST IN jack and 21A TMS. | |

STEP ACTION VERIFICATION

D. Timing Cycle

- 4 Set oscillator output dial on 21A TMS to 10 dB greater than low-level setting (generally -30 dBm).
- 5 Connect 241A plug on P3N cord to oscillator output of 21A TMS.

Note: The timing cycle is measured from the time the 310 plug is inserted in the TEST IN jack until the SR relay operates (as indicated by LP1).
- 6 Insert 310 plug in TEST IN jack and measure time for SR relay to operate.
- 7 Remove 310 plug from TEST IN jack.
- 8 Slowly adjust TIM potentiometer cw to increase, or ccw to decrease, the timing cycle and repeat Steps 6 and 7 until desired setting is obtained (generally 6 seconds).
- 9 Set oscillator output dial to 10 dB greater than high-level setting (generally -10 dBm).
- 10 Plug 310 plug into TEST IN jack and measure time for SR relay to operate.
- 11 Disconnect all test equipment from circuit.
- 12 Remove 258D plug from K TEST jack.

◆ Waveform at TP2 drops to a constant. Output at TP3 remains the same as that obtained in Step 12 of Test C. Lamp LP1 lights.◆

SR relay will release.

Relay will operate from 2 to 5 seconds faster than in Step 8 (generally will operate in $3 \pm 1/2$ seconds). Voltage at TP3 will drop to -8 ± 1 volts.

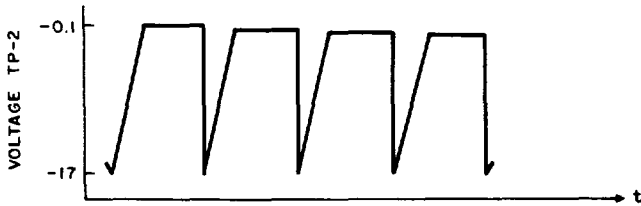


Fig. 1—No Signal Output of Multivibrator

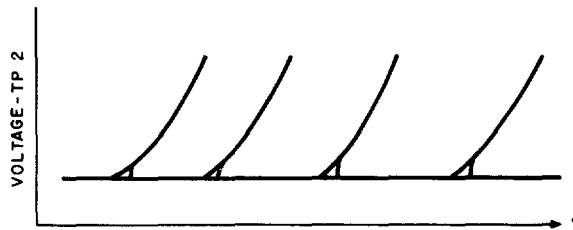


Fig. 3—Output of Multivibrator Just Before It Becomes Monostable



Fig. 2—Operated Condition