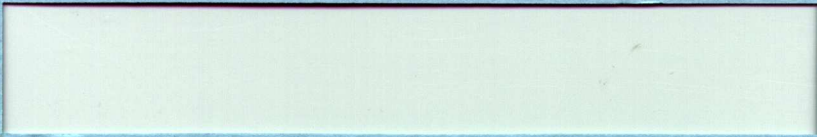


067-0532-01 CALIBRATION FIXTURE

Constant Amplitude Signal Generator



MANUFACTURERS OF CATHODE-RAY OSCILLOSCOPES



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067-0532-01 CALIBRATION FIXTURE

Constant Amplitude Signal Generator



The Tektronix Type 067-0532-01 Calibration Fixture is a constant amplitude signal generator whose output is a low-distortion sinewave. It is intended to provide a signal of known frequency and amplitude for measuring oscilloscope bandwidth. A 3 MHz sinewave is available as a reference amplitude from which a -3dB measurement can be made. The output connector, amplitude detector, and 50 ohm source resistor are at the end of a 42 inch cable. The amplitude is regulated at the end of the cable adjacent to the output connector. Cable loss and standing-wave errors are essentially eliminated.

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SECTION 1
CHARACTERISTICS

Frequency

Range	65 MHz to 500 MHz
Accuracy	Within 2% of indicated frequency
3 MHz frequency accuracy	Within 5%

Amplitude

Range	0.5 V P-P to 4 V P-P into 50 Ω in 0.5 V increments
Variable	Continuously variable between calibrated steps. Maximum output 4.2 V P-P
3MHz Amplitude accuracy	Within 2% of indicated amplitude
Constant amplitude accuracy	
65 MHz to 300 MHz	Within 2% of 3 MHz amplitude
300 MHz to 500 MHz	Within 5% of 3 MHz amplitude

Output Source Impedance 50 Ω within 1%

Temperature Range 0° C to 50° C

Altitude Range To 15,000 ft.

Height	7.3 inches	18.5 cm
Width	7.9 inches	20.1 cm
Length	15.5 inches	39.4 cm
Weight	13 lbs.	28.6 kg

Power Input

Voltage

115 V range	90 V to 136 V
230 V range	180 V to 272 V

Crest Factor At least 1.3

Power 60 W maximum

Frequency Range 50 Hz to 400 Hz

Line Fuse 0.7 A

The instrument is provided with a three-wire power cord with a three-terminal, polarized plug for connection to the power source. The grounding terminal of the plug is directly connected to the instrument frame as recommended by national and international safety codes. Color coding of cord conductors follows the National Electrical Code (USAS C-1 1968) which specifies: Line, black; Neutral, white; Safety Earth or Ground, green with a yellow stripe (or solid green).

The performance limits in this section are valid with the following conditions:

The instrument must have been calibrated at an ambient temperature between +20°C and +30°C.

The instrument must be in an environment whose limits are described in this section.

The instrument must have a warmup period of at least 30 minutes.

The instrument is intended to be operated from a single-phase power source which has one of its current-carrying conductors (the Neutral Conductor) at ground (earth) potential. Over-current (fuse) protection is provided only on the Line Conductor; operation from other power sources where both current-carrying conductors are live with respect to ground (such as phase-to-phase on a multi-phase system, or across the legs of a 117 - 234 V single-phase three-wire system) is not recommended.

SECTION 2

OPERATING INSTRUCTIONS

Functions of Controls and Connectors

Frequency Control

Provides continuously variable frequency adjustment; frequency indicated by calibrated dial.

FREQUENCY RANGE Switch 3 MHz, 65 MHz to 500 MHz

Selects either 3 MHz fixed reference frequency oscillator or variable 65 MHz to 500 MHz oscillator.

AMPLITUDE Switch

Selects 0.5 V P-P to 4.0 V P-P output amplitudes in 0.5 V increments. Amplitude calibrated into a 50 ohm load impedance.

VARIABLE Control

Selects calibrated mode or provides continuously variable output amplitude between calibrated positions. Variable increases output from the calibrated position.

LOW OUTPUT Indicator

Light indicates when output is lower than that selected by AMPLITUDE switch; when lit, circuit is not regulating the output, usually indicating weak tube (s). (When instrument is first turned on, the indicator will light and remain on until the tubes are warm and circuits functioning.)

Output Connector

Provides output of the sine-wave signal.

Rear Panel

115 V - 230 V switch selects 115 V or 230 V line operation.

Bandwidth Measurement

The Constant Amplitude Signal Generator provides a low distortion sinewave for measuring oscilloscope bandwidth. Bandwidth is defined as the frequency at which the voltage (or current) is -3dB of the response at a reference frequency. Since voltage is commonly displayed on an oscilloscope it is convenient to convert the -3dB amplitude to voltage amplitude.

$$-3\text{dB} = 20 \text{ LOG } \frac{E_1}{E_2}$$

Where E_1 is the reference voltage, 1, and E_2 is the voltage at the -3dB bandwidth

$$\frac{3}{20} = \text{LOG } \frac{1}{E_2}$$

$$1.414 = \frac{1}{E_2}$$

$$E_2 = 0.707$$

For voltage (or current), the bandwidth is the frequency at which the amplitude is 70.7% of the reference amplitude.

Assuming that the oscilloscope response has, essentially, a smooth roll-off characteristic, then the reference frequency should be about 1/20 (or less) of the bandwidth limit frequency. (This insures that the reference amplitude point is close to the center of the response characteristic. The Constant Amplitude Signal Generator reference frequency is 3 MHz, or about 1/20 of 65 MHz, the lowest of the variable frequency. The procedure for measuring bandwidth is:

1. Set FREQUENCY RANGE to 3 MHz.
2. Set AMPLITUDE for a convenient displayed amplitude.
3. Switch FREQUENCY RANGE to 65-500 MHz.
4. Adjust FREQUENCY until amplitude is 70.7% of 3 MHz amplitude.
5. Read bandwidth frequency, from frequency dial.

Table 2-1 provides -3dB (0.707) amplitude in displayed divisions for various reference amplitudes.

Reference Amplitude	-3dB (0.707) Amplitude
4 DIV	2.82 DIV
5 DIV	3.53 DIV
6 DIV	4.24 DIV
7 DIV	4.94 DIV
8 DIV	5.65 DIV

TABLE 2-1

Application Notes

The Constant Amplitude Signal Generator is designed to be as close to an ideal generator as possible. Figure 2-2 is the equivalent circuit of the generator. For the output amplitude to be calibrated, the generator must operate into a 50 ohm load impedance. Furthermore, its absolute output accuracy is directly related to the accuracy of the 50 ohm load. This suggests that a great deal of care must be exercised in connecting the generator to external cables, attenuators, and terminations to maintain its accuracy.

Cables can cause attenuation that is a function of frequency; the output and detector are at the end of an attached cable to eliminate the need of additional cables.

Attenuators can cause standing waves and create amplitude errors; the amplitude control should provide adequate attenuation facility. For example, an attenuator with a VSWR of 1.02 may cause up to 2% amplitude error. VSWR generally increases with frequency; errors due to standing waves, therefore, will affect the -3dB frequency.

Termination of the generator's output affects the absolute voltage accuracy; fortunately, in measuring bandpass, only relative amplitudes are used. However, terminations are subject to VSWR errors as are attenuators. If the VSWR is low, errors will only be a small percentage of the VSWR because the generator reverse terminates reflections. (The VSWR of an attenuator, however, may indicate deficiencies in high frequency attenuation ratio even though reflections are absorbed by the generator.)

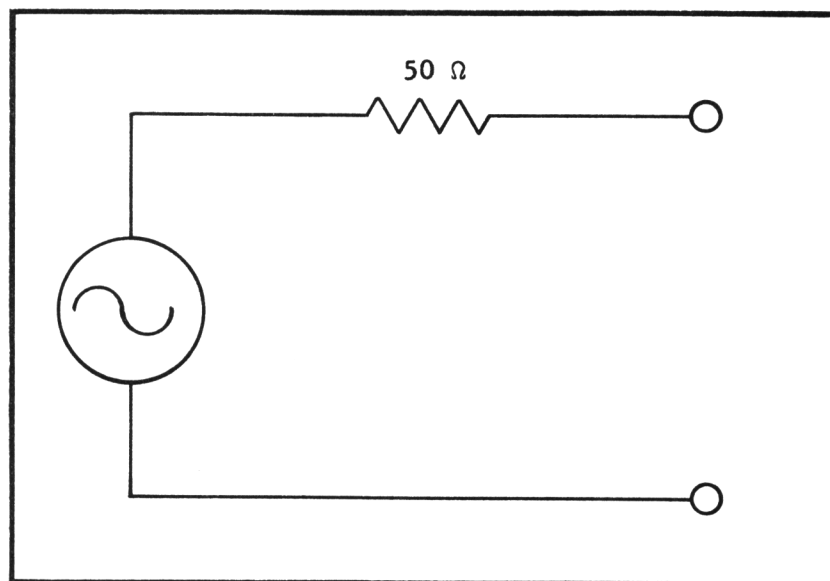


FIGURE 2-2

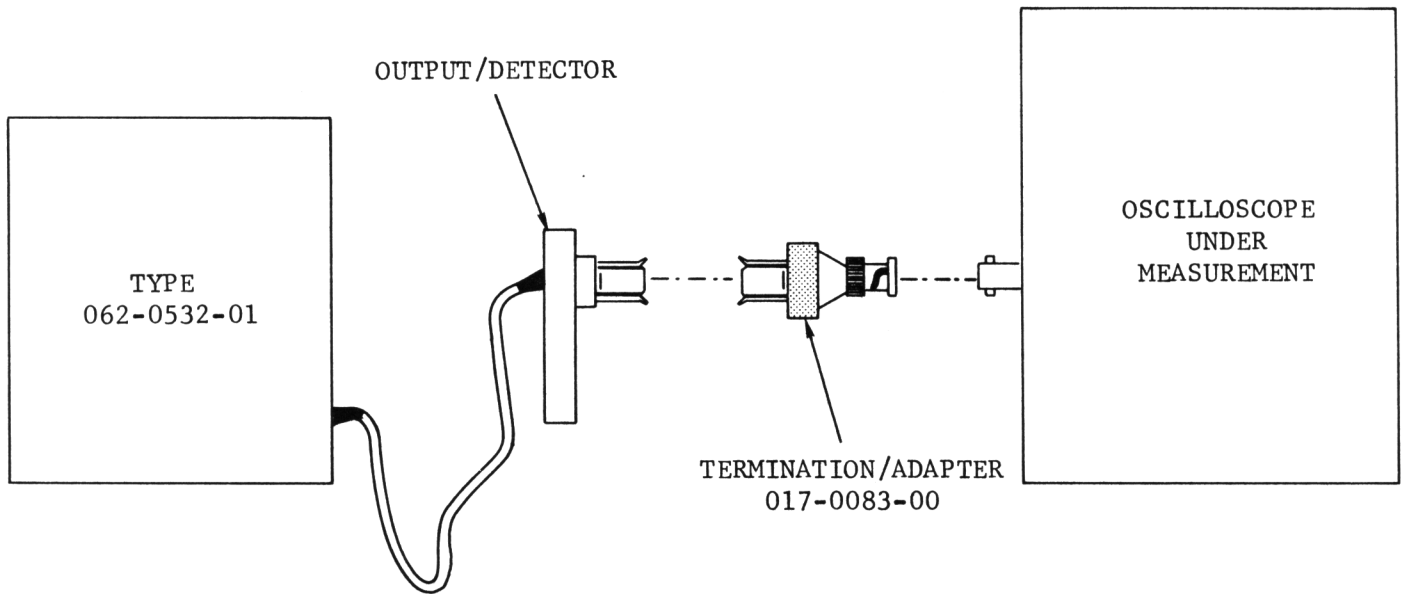


FIGURE 2-3

Bandwidth measurements should be made as illustrated in figure 2-3. Since transmission line lengths are very short compared with wavelength, errors due to cables, attenuators, and termination are minimized.

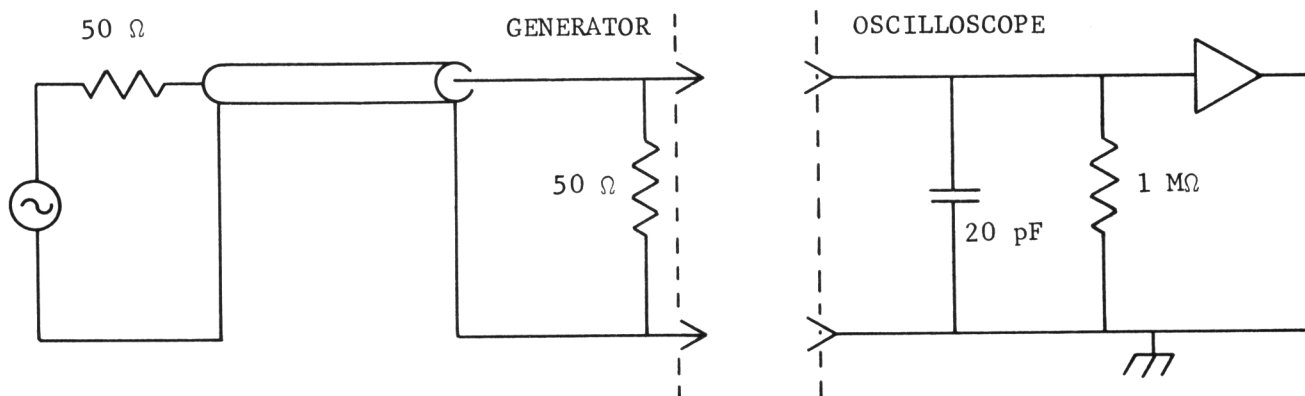


FIGURE 2-4a

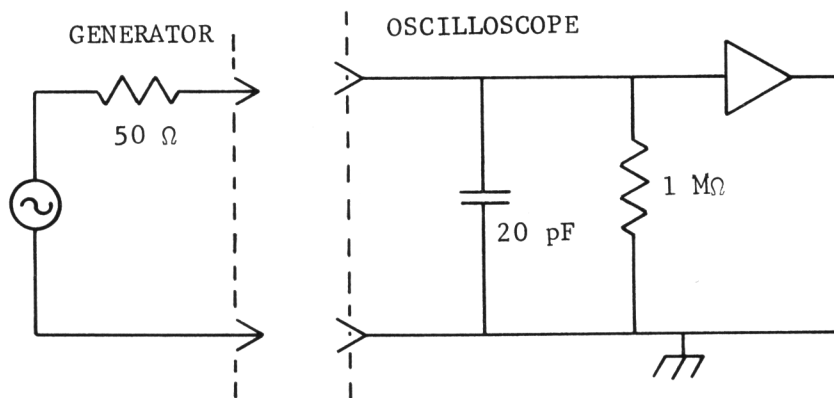


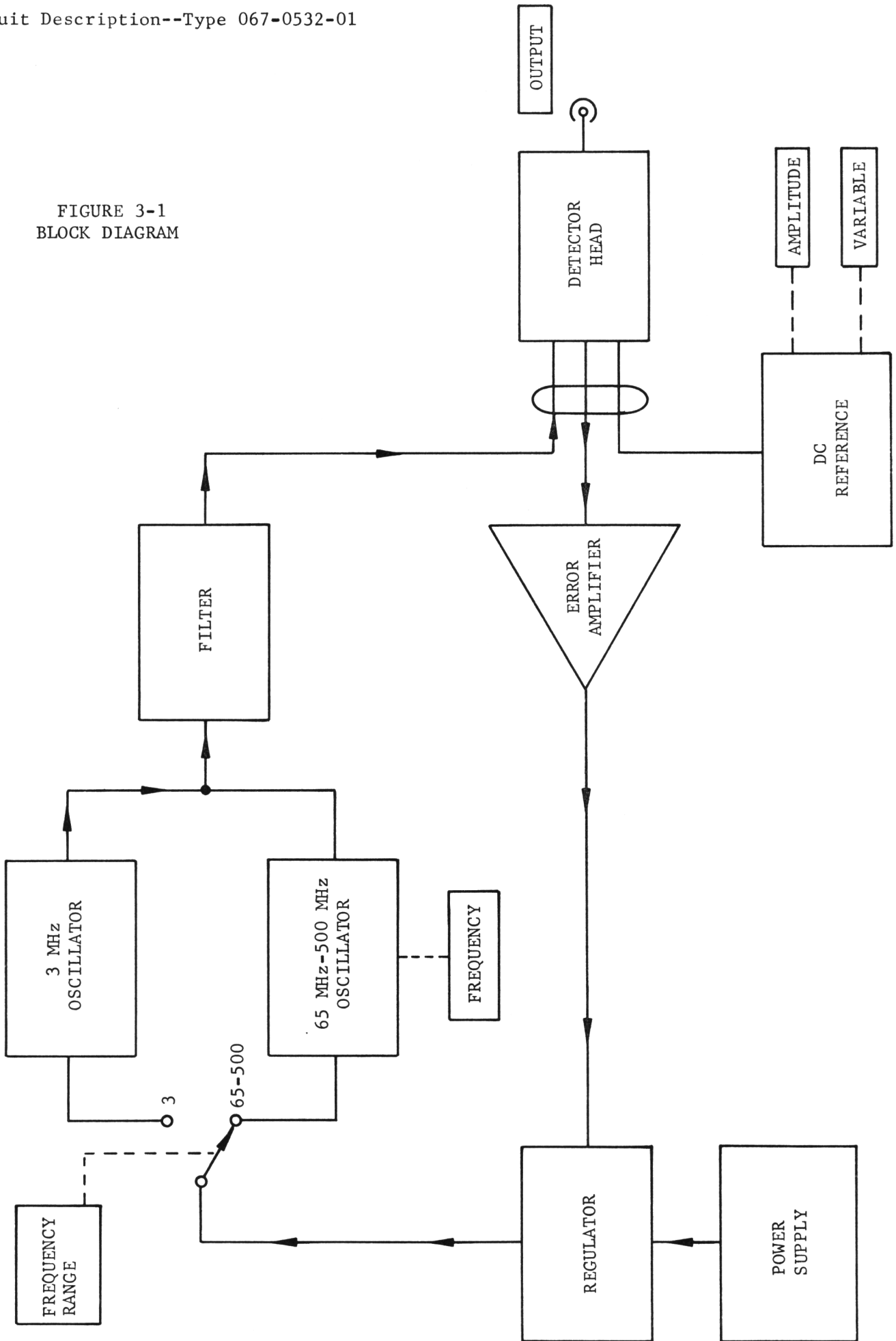
FIGURE 2-4b

Oscilloscope input capacitance is a real part of the oscilloscope and thus affects the bandwidth. Therefore, as the generator driving impedance increases, bandwidth will decrease. Figure 2-4 illustrates the effect of input capacitance.

In figure 2-4a, the equivalent generator impedance is 25 ohms. It is shunted by the input capacitance of the scope, 20 pF. The -3dB frequency of this parallel RC is 314 MHz. In figure 2-4b, the generator impedance is 50 ohms. The -3dB frequency of this parallel RC is 159 MHz. Generally, oscilloscope bandwidth is specified from a 25 ohm source.

The constant amplitude signal generator is suitable as either a 25 ohm generator (with external 50 ohm termination) or a 50 ohm generator (provided that no cable or attenuator is used between the output connector and the input terminals of the device under test).

FIGURE 3-1
BLOCK DIAGRAM



SECTION 3

CIRCUIT DESCRIPTION

The instrument consists of several major circuit blocks. There are two oscillators; one, a fixed, 3 MHz reference oscillator, and the other a 65 to 500 MHz variable frequency oscillator. A series of low-pass filters are used to limit the harmonic content to maintain a low distortion sinewave. The detector head contains the detector circuitry for maintaining the amplitude constant at the 50 ohm output resistor. A precision DC divider provides a reference for the detector. An error amplifier drives the series regulator circuit, which limits the oscillator supply voltage and sets the oscillator signal amplitude.

3 MHz Oscillator

The 3 MHz oscillator is a conventional Colpitts circuit. Power is from a negative supply to the cathode of V20. The oscillator output is filtered, then coupled to the low-pass filter network.

65-500 MHz Oscillator

The 65-500 MHz oscillator is manufactured by the General Radio Company. It is powered from a negative supply via the regulator. The oscillator output is capacitively coupled, C26, to the low-pass filter network. Section 8 describes this oscillator.

Low-Pass Filter Network

The low-pass filter network consists of four filters, three switched, and one always in series with the oscillator output. All four filters are normally in series. As the frequency is increased past 108 MHz, the first filter is switched out by relays K171A and K199A. The relays are energized by cam actuated switches on the oscillator dial. As the frequency is increased past 180 MHz, K141A and K169A switch the second filter out. As the frequency is increased past 300 MHz, K111A and K129A switch the third filter out. The fourth filter remains in the circuit.

Detector Head

The detector consists of peak-to-peak detector CR38, C38, CR36, and C36. C38 is charged to a negative value by the DC reference. This establishes the peak-to-peak voltage necessary to turn on CR36 and charge C36. The output of the detector is applied to the error amplifier U66. CR34 and CR35 provide temperature compensation for the peak-to-peak detector.

Error Amplifier

U66 is the error amplifier. It amplifies the signal difference between the temperature compensating diodes and the peak-to-peak detector. Its output drives Q70, the regulator circuit input amplifier.

Amplitude Regulator

The regulator input amplifier is common-emitter Q70. Capacitor C68 stabilizes the high frequency gain of U66 and Q70. The output of Q70 is DC coupled through zener diodes VR73 and VR74 to about a -450 V DC level with respect to ground, and is applied to the regulator current amplifier, Q79. The voltage regulator, V80, is a grounded-grid amplifier whose cathode voltage is determined by the collector voltage of Q79. The plate of V80 is connected to the appropriate oscillator through frequency range, S20, and regulates the voltage to maintain a constant oscillator signal output voltage.

At turn-on, the base of Q96 is held positive with respect to the emitter due to the charging of C93 through R96, R93 and R92. This holds Q79 off. C93 charges towards ground, but is "caught" by zener diode VR92 at -340 V, thus ending the RC charge and turning Q96 off to allow the regulator to turn on. When the power is turned off, diode CR91 discharges C93 to initialize the turn-on timing circuit.

Diode CR72 limits the maximum collector voltage seen by Q79 during turn-on. Transistor Q77 limits the maximum current from the -450 V supply to about 60 mA.

When the current through Q70 exceeds about 2 mA, Q99 turns on, lighting neon bulb DS98 to indicate low output (maximum voltage or current to the oscillator).

Preregulator

The preregulator circuit limits the peak-to-peak voltage across the transformer primary to maintain a constant output of the secondary winding. Bridge rectifier CR706 ascertains correct voltage polarity for operation of the regulating circuit, which consists of pass element Q716 and its control transistors, Q718 and Q725. Silicon Controlled Rectifier (SCR) Q707 operates only at instrument turn-on to handle the in-rush current and limit the voltage across Q716.

When the instrument is turned on, the line voltage initially appears across the transformer primary winding and bridge rectifier CR706. When the voltage across CR706 reaches approximately 30 volts, Q707 turns on. R707 is placed in series with the primary winding, and its resistance, together with the inductive reactance of the winding, limits the in-rush current. Also, the shunt path formed by R707 and Q707 limits the voltage across Q716.

As the secondary voltages build up, Q718 receives base drive and collector voltage from rectifiers CR726 and CR729. Q716, as it comes into conduction, starts to share the primary current with Q707. When the rectifier voltage from CR726 and CR729 reaches about 80% of its final value, Q711 receives base drive through R713 and VR713. The conduction of Q711 causes Q707 to turn off, transferring the total current load to Q716. The secondary voltages will continue to increase until the voltage reaches a level that turns on Q725.

Biasing conditions of Q725 require either pin 5 or 7 of the feedback winding to be driven sufficiently negative with respect to pin 6. When the current through the network consisting of R722, R723, R724, R725, CR723 and CR727-CR728 is sufficient to produce a voltage drop of 6.2 volts across R724 and part of R723 (to the CR723 cathode), Q725 will be forced into conduction. The required 6.2-volt drop is established by zener diode VR725. CR723 offsets the Q725 base-emitter voltage and provides thermal compensation for the transistor.

When Q725 turns on, the current forced into R720 reduces the Q716-Q718 base drive. This causes a voltage to be developed across Q716, thus limiting the voltage across the transformer. The degree of limiting, and hence control of the voltages across the secondary windings, is dependent upon the setting of R723. R723, the Reg Set control, provides an adjustment of the resistive network across the feedback winding, which changes the current requirements necessary to produce the 6.2-volt drop.

SECTION 4 MAINTENANCE

General Information

This section contains a complete calibration procedure for the calibration fixture. The instrument will not often require a complete, start-from-scratch calibration, but will need occasional adjustment as components age or are replaced.

Maintenance and calibration information for the General Radio Company oscillator is in Section 8.

Calibration is a valuable part of preventive maintenance, since many types of minor troubles may be discovered and corrected before they become serious enough to disable the instrument. Also, certain troubles can be isolated to a particular circuit by attempting calibration.

All front panel controls are in capital letters (AMPLITUDE). Internal adjustments are indentified by an R or C number, (R45), or control function beginning with capital letters (Ampl Cal).

The instrument should be visually inspected occasionally for such defects as damaged parts, improperly seated transistors or tubes, and heat-damaged parts. The remedy for some defects is not obvious; for example, a heat-damaged part is usually the symptom of some defect that is not obvious. The cause of damaged parts should be determined and corrected before the part is replaced, otherwise damage may be repeated.

To insure that the calibration fixture maintains its accuracy, check the calibration after each 500 hours of operation or every six months if used intermittantly.

Many of the components are standard electronic parts that may be purchased locally. However, all parts can be obtained from Tektronix through our field engineer or representative. Before ordering, consult the parts list of this manual to determine the value, tolerance and Tektronix part number.

Test Equipment

True RMS voltmeter to 10 V	HP 3400A
Oscilloscope 10 mv/DIV at least 20 MHz at -3dB	Tektronix Type 547 with Type W Plug-In Unit
DC voltmeter 0.25% to 11 V	Fluke 601D
Power Meter 1% to 500 MHz	HP 431B with HP 478A Thermister Mount
Attenuators 10 dB 10 x voltage (20 dB)	Tektronix 011-0085-00 Tektronix 017-0078-00
Terminations 50 Ω , GR to BNC	Tektronix 017-0083-00
Adapters GR to BNC GR to N	Tektronix 017-0064-00 Tektronix 017-0021-00
Counter 0.25% to 500 MHz	HP 5248L with HP 5253B Plug-In Unit
Peak-to-Peak Detector 50 Hz to 500 MHz	Tektronix 067-0625-00

Calibration Procedure

Power Supply

The power supply utilizes a pre-regulator circuit rather than separate regulation of the individual supplies. This is needed to maintain a constant AC voltage on the 65-500 MHz oscillator tube heater. The -11 V power supply is re-regulated and used as a reference for the error amplifier and regulator.

Reg Set, R723: Connect an AC voltmeter across the GR oscillator heater terminals. With 115 V RMS (or 230 V RMS) input, adjust Reg Set, R723, for 6.4 V RMS.

The power supply voltage should regulate over the line voltage range listed in the Characteristics Section. The ripple on the -11 V supply should be 5 mV or less. (The -11 V supply is adjusted as a part of amplitude calibration.)

Amplitude Calibration

The amplitude calibration consists of setting up a DC divider to provide the reference for the output signal. The amplitude is measured with an oscilloscope whose bandwidth is much greater than 3 MHz, the frequency at which the amplitude is set. The scope gain calibration should be checked and, if necessary, adjusted for minimum amplitude error. The calibrating signal should be sufficiently fast to assure essentially fast response through 3 MHz. Essentially, the scope is used to compare the 3 MHz amplitude with that of a known signal amplitude.

-11 Volts, R235: Connect the generator output, unterminated, to the scope input. Set AMPLITUDE for 4.0V. Adjust -11 Volts, R235, for 8.0 V P-P. (This control interacts with Ampl Cal, R45, and Tracking, R43.)

Ampl Cal, R45: Set AMPLITUDE for 0.5 V. Adjust Ampl Cal, R45 for 1.0 V P-P. Repeat -11 Volts adjust. (It may be necessary to re-adjust scope gain to compensate for attenuator errors.)

Tracking, R43: Connect the DC voltmeter across the VARIABLE amplitude control, R40. Adjust Tracking, R43, for 1.20 V DC. (Do not adjust Tracking with AMPLITUDE set for 4.0 V.) Repeat -11 Volts adjust, Ampl Cal adjust, and Tracking adjust.

The tracking should remain at 1.2 V throughout the range of the AMPLITUDE switch except for 4.0 V range. This assures overlap of the VARIABLE amplitude control between calibrated steps. The maximum output amplitude using the VARIABLE control (4.0 V amplitude range) should be at least 4.2 V P-P (8.4 V P-P open circuit).

The output amplitude should remain within 2% of indicated amplitude at each of the calibrated amplitudes.

Frequency Calibration

Frequency calibration consists of adjusting the inductance of the 3 MHz oscillator tank circuit. Frequency calibration of the GR 65-500 MHz oscillator is described in Section 8. All frequency measurements should be made with the generator output terminated in 50 ohms. (If the output load termination appears to be significantly different than 50 ohms due to the input loading of the frequency measuring device, then use a 50 ohm 10X attenuator between the generator and the termination.)

T20: Connect the generator output through a 50 ohm termination to the frequency counter. Place the bottom cover on the generator. Adjust T20 for 3.0 MHz within 0.15 MHz.

The output frequency changes slightly with output amplitude, but should remain within the limits described in Section 1. The frequency accuracy of the 65-500 MHz oscillator should be within the limits described in Section 1. Frequency calibration of the GR oscillator is described in Section 8.

Constant Amplitude Accuracy

65 MHz to 500 MHz Using Power Meter

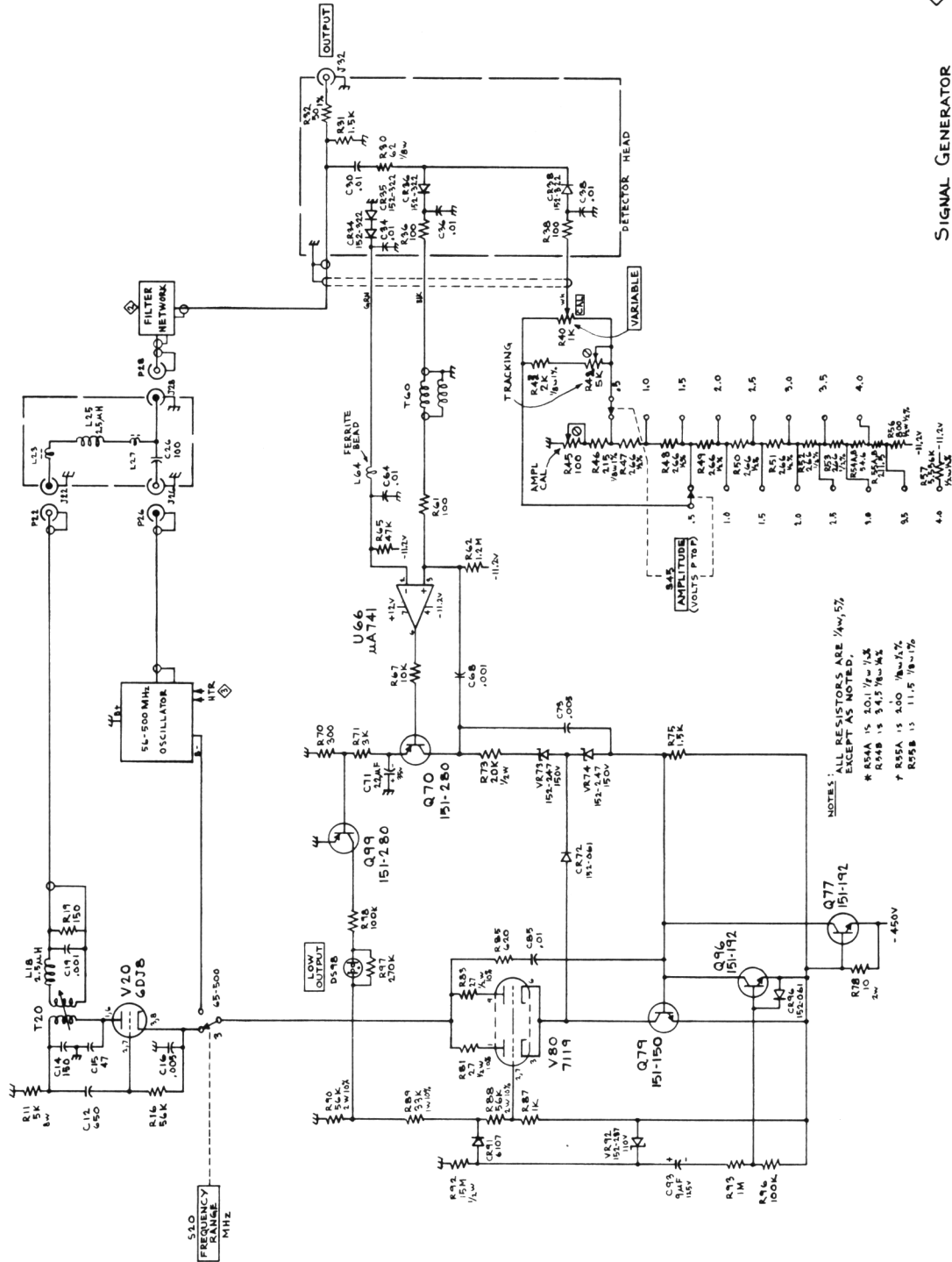
Connect the generator output through a 10 dB attenuator to the Power Meter input. Adjust the Power Meter zero to obtain a convenient on-scale reference amplitude. Vary the frequency from 65 MHz to 500 MHz. The output amplitude should remain constant within the limits described in Section 1 (2% power variations are equivalent to 1% voltage variations). Repeat for all output amplitudes.

3 MHz to 500 MHz Using Peak-to-Peak Detector

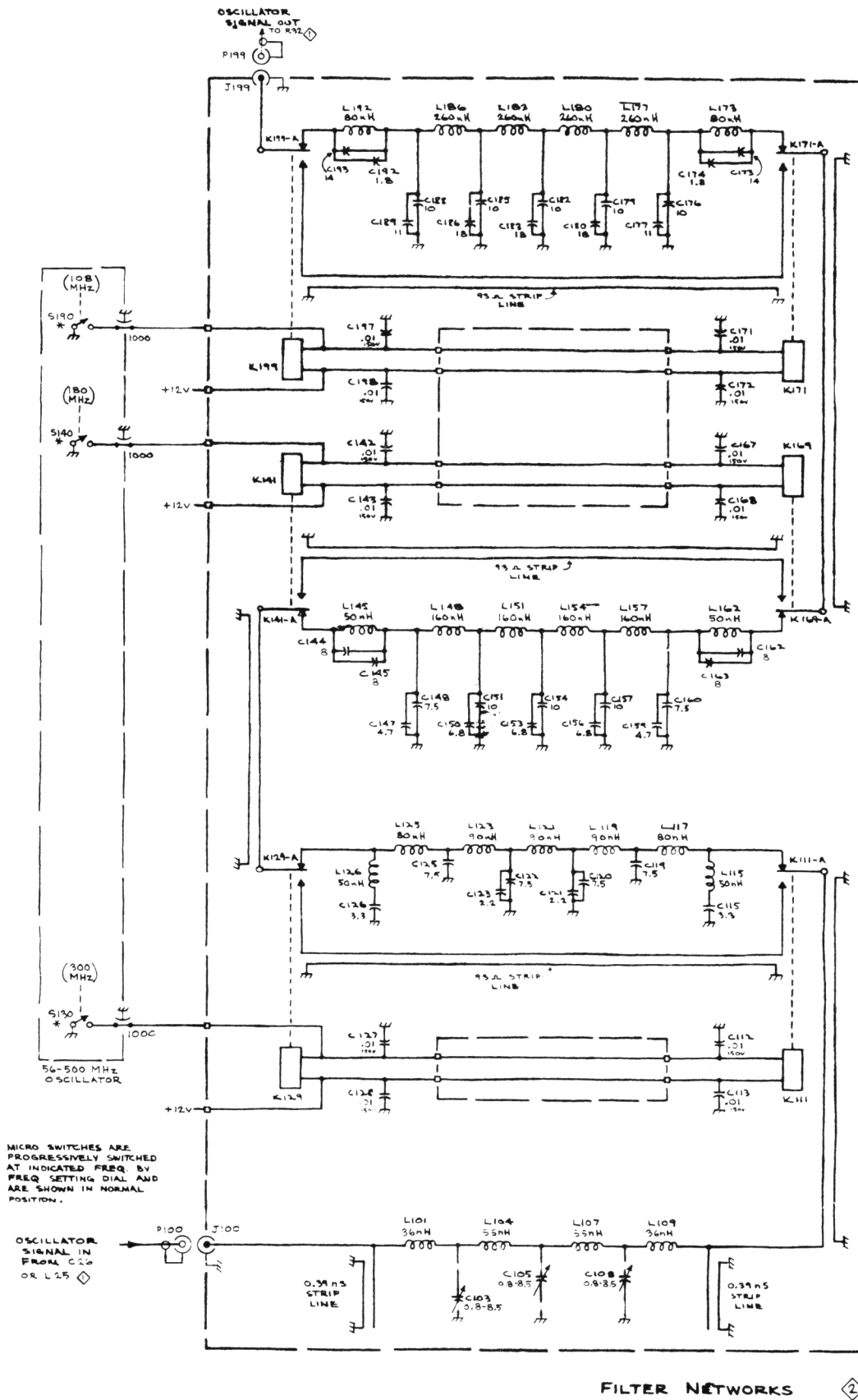
Use the Peak-to-Peak Detector to verify the 65 MHz to 500 MHz amplitude accuracy with respect to 3 MHz. Refer to the 067-625-00 Calibration Fixture Instruction Manual for operating procedures.

This completes the calibration of the generator. If the General Radio Oscillator requires calibration, refer to Section 8.

SECTION 5
SCHEMATIC DIAGRAMS



① SIGNAL GENERATOR



SECTION 6
ELECTRICAL PARTS LIST

Values are fixed unless marked Variable.

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
CHASSIS				
Bulbs				
DS98	150-0019-00		Neon	EG3-CC-B NE-2E
DS209	150-0068-00		Incandescent	10 V, 40 mA
Capacitors				
Tolerance $\pm 20\%$ unless otherwise indicated.				
C12	281-0623-00		650 pF	Cer 500 V 5%
C14	281-0524-00		150 pF	Cer 500 V
C15	281-0519-00		47 pF	Cer 500 V 10%
C16	283-0001-00		0.005 μ F	Cer 500 V
C19	283-0078-00		0.001 μ F	Cer 500 V
C26	281-0523-00		100 pF	Cer 350 V
C30	283-0072-01		0.01 μ F	Cer
C34	283-0238-00		0.01 μ F	Cer 50 V 10%
C36	283-0072-01		0.01 μ F	Cer
C38	283-0072-01		0.01 μ F	Cer
C64	283-0003-00		0.01 μ F	Cer 150 V
C68	283-0078-00		0.001 μ F	Cer 500 V
C71	290-0162-00		22 μ F	Elect. 35 V
C73	283-0001-00		0.005 μ F	Cer 500 V
C85	283-0002-00		0.01 μ F	Cer 500 V
C93	290-0271-00		9 μ F	Elect. 125 V +20%-15%
C201	283-0078-00		0.001 μ F	Cer 500 V
C202	283-0078-00		0.001 μ F	Cer 500 V
C223A,B	290-0262-00		2 x 40 μ F	Elect. 500 V
C233	290-0278-00		550 μ F	Elect. 50 V
C237	281-0523-00		100 pF	Cer 350 V
C239	290-0309-00		100 μ F	Elect. 35 V
C243	290-0369-00		800 μ F	Elect. 15 V +75%-10%

Electrical Parts List--Type 067-0532-01

Values are fixed unless marked Variable.

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
Semiconductor Device, Diodes				
CR34	*152-0322-00		Silicon	Tek Spec
CR35	*152-0322-00		Silicon	Tek Spec
CR36	*152-0322-00		Silicon	Tek Spec
CR38	*152-0322-00		Silicon	Tek Spec
CR72	*152-0061-00		Silicon	Tek Spec
VR73	152-0247-00		Zener	1N989B 400 mW, 150 V, 5%
VR74	152-0247-00		Zener	1N989B 400 mW, 150 V, 5%
CR91	*152-0107-00		Silicon	Replaceable by 1N647
VR92	152-0287-00		Zener	1N986B 400 mW, 110 V, 5%
CR96	*152-0061-00		Silicon	Tek Spec
CR223A, B C, D	152-0040-00		Rectifier	1A, 400 V
CR233A, B C, D	*152-0107-00		Silicon	Replaceable by 1N647
CR243	152-0199-00		Rectifier bridge	MDA 962-3
Fuse				
F201	159-0040-00		0.7 A	3 AG Slo-Blo
Connectors				
J22	131-0372-00		Coax	
J26	131-0126-00		BNC, single contact	
J28	131-0372-00		Coax	
J32	*175-0434-00		Cable assembly	
J201	131-0102-02		Receptacle, electrical, male, 3 contact	
P22	131-0375-00		Right angle	
P28	131-0375-00		Right angle	
P100	131-0375-00		Right angle	
P199	131-0375-00		Right angle	

Values are fixed unless marked Variable.

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
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Inductors

L18	*108-0103-00		2.5 μ H	
L23	276-0507-00		Core, ferramic suppressor	
L25	*108-0103-00		2.5 μ H	
L27	276-0507-00		Core, ferramic suppressor	
L64	276-0526-00		Core, powdered iron	

Transistors

Q70	151-0280-00	Silicon	PNP	TO-39 MM4003
Q77	*151-0192-00	Silicon	NPN	TO-92 Replaceable by MPS 6521
Q79	*151-0150-00	Silicon	NPN	Selected from 2N3440
Q96	151-0192-00	Silicon	NPN	TO-92 Replaceable by MPS 6521
Q99	151-0280-00	Silicon	PNP	TO-39 MM4003

Resistors

Resistors are fixed, composition, $\pm 10\%$ unless otherwise indicated.

R11	308-0234-00	5 k Ω	8 W	WW	5%
R16	315-0563-00	56 k Ω	1/4 W		5%
R19	315-0151-00	150 Ω	1/4 W		5%
R30	317-0620-00	62 Ω	1/8 W		5%
R31	315-0152-00	1.5 k Ω	1/4 W		5%
R32	307-0079-00	50 Ω			
R36	315-0101-00	100 Ω	1/4 W		5%
R38	315-0101-00	100 Ω	1/4 W		5%
R40	311-0586-00	1 k Ω , Var			
R42	311-0458-00	5 k Ω , Var			
R43	321-0222-00	2 k Ω	1/8 W	Prec	1%
R45	311-0344-00	100 Ω , Var			
R46	321-0129-00	215 Ω	1/8 W	Prec	1%
R47	322-0649-00	266 Ω	1/4 W	Prec	1/2%
R48	322-0649-00	266 Ω	1/4 W	Prec	1/2%
R49	322-0649-00	266 Ω	1/4 W	Prec	1/2%

Electrical Parts List--Type 067-0532-01

Values are fixed unless marked Variable.

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description		
Resistors (cont)						
R50	322-0649-00		266 Ω	1/4 W	Prec	1/2%
R51	322-0649-00		266 Ω	1/4 W	Prec	1/2%
R52	322-0649-00		266 Ω	1/4 W	Prec	1/2%
R53	322-0649-00		266 Ω	1/4 W	Prec	1/2%
R54A	321-0762-01		20.1 Ω	1/8 W	Prec	1/2%
R54B	321-0806-06		34.5 Ω	1/8 W	Prec	1/4%
R55A	321-0126-00		200 Ω	1/8 W	Prec	1%
R55B	321-0007-00		11.5 Ω	1/8 W	Prec	1%
R56	323-0706-01		800 Ω	1/2 W	Prec	1/2%
R57	323-0720-01		5.56 k Ω	1/2 W	Prec	1/2%
R61	315-0101-00		100 Ω	1/4 W		5%
R62	315-0125-00		1.2 M Ω	1/4 W		5%
R65	315-0473-00		47 k Ω	1/4 W		5%
R67	315-0103-00		10 k Ω	1/4 W		5%
R70	315-0301-00		300 Ω	1/4 W		5%
R71	315-0302-00		3 k Ω	1/4 W		5%
R73	315-0203-00		20 k Ω	1/4 W		5%
R75	315-0152-00		1.5 k Ω	1/4 W		5%
R78	308-0532-00		10 Ω	2 W	WW	$\pm 3\%$
R81	302-0270-00		27 Ω	1/2 W		
R83	302-0270-00		27 Ω	1/2 W		
R85	315-0621-00		620 Ω	1/4 W		5%
R87	315-0102-00		1 k Ω	1/4 W		5%
R88	306-0563-00		56 k Ω	2 W		
R89	304-0333-00		33 k Ω	1 W		

Values are fixed unless marked Variable.

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff Disc	Description
Resistors (cont)			
R90	306-0563-00	56 k Ω	2 W
R92	301-0156-00	15 M Ω	1/2 W 5%
R93	315-0105-00	1 M Ω	1/4 W 5%
R96	315-0104-00	100 k Ω	1/4 W 5%
R97	315-0274-00	270 k Ω	1/4 W 5%
R98	315-0104-00	100 k Ω	1/4 W 5%
R209	301-0104-00	100 k Ω	1/2 W 5%
R212	301-0104-00	100 k Ω	1/2 W 5%
R215	301-0104-00	100 k Ω	1/2 W 5%
R220	302-0100-00	10 Ω	1/2 W
R222	302-0100-00	10 Ω	1/2 W
R224	304-0271-00	270 Ω	1 W
R226	306-0184-00	180 k Ω	2 W
R230	315-0100-00	10 Ω	1/4 W 5%
R232	315-0100-00	10 Ω	1/4 W 5%
R234	315-0102-00	1 k Ω	1/4 W 5%
R235	311-0404-00	1 k Ω , Var	
R236	321-0198-00	1.13 k Ω	1/8 W Prec 1%
R237	321-0239-00	3.01 k Ω	1/8 W Prec 1%
R239	315-0100-00	10 Ω	1/4 W 5%
R240	307-0025-00	3.3 Ω	1/2 W
R242	307-0025-00	3.3 Ω	1/2 W

Electrical Parts List--Type 067-0532-01

Values are fixed unless marked Variable.

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
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Switches

Wired or Unwired

Wired

S20	*262-0745-01		Rotary	FREQUENCY RANGE
S20	260-0462-00		Rotary	FREQUENCY RANGE
S130	260-0516-00		Push	300 MHz
S140	260-0516-00		Push	180 MHz
S190	260-0516-00		Push	108 MHz

S201	260-0014-00		Toggle	POWER ON
S202	260-0675-00		Slide	

Wired

S45	*262-0901-00		Rotary	AMPLITUDE
S45	260-1134-00		Rotary	AMPLITUDE

Transformers

T20	*114-0061-00		70-99 μ H, Var	Core 276-0508-00
T60	276-0525-00		Core, ferrite	
T201	*120-0656-00		Power	

Integrated Circuits

U66	156-0049-00		Op. ampl. TO-99	Replaceable by Fairchild μ A741
U235	156-0053-00		Volt. reg. TO-100	Replaceable by Fairchild μ A723C

Electron Tubes

V20	154-0187-00		6DJ8	
V80	154-0340-00		7119	

Values are fixed unless marked Variable.

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
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PRE-REGULATOR Circuit Board Assembly

*670-1228-00

Complete Board

Capacitors

Tolerance $\pm 20\%$ unless otherwise indicated.

C706	283-0092-00	0.03 μF	Cer	200 V	+80%-20%
C714	283-0119-00	2200 pF	Cer	200 V	5%
C719	283-0067-00	0.001 μF	Cer	200 V	10%
C725	283-0003-00	0.01 μF	Cer	150 V	
C727	290-0134-00	22 μF	Elect.	15 V	

Semiconductor Device, Diodes

CR706A,B C,D	152-0462-00	Rectifier bridge		200 V	2.5 A
VR708	152-0299-00	Zener	1N3820B	1.5 W,	200 V, 5%
VR713	152-0280-00	Zener	1N753A	400 mW,	6.2 V, 5%
CR714	*152-0185-00	Silicon	Replaceable by 1N4152		
CR723	*152-0185-00	Silicon	Replaceable by 1N4152		
VR725	152-0166-00	Zener	1N753A	400 mW,	6.2 V, 5%
CR726	*152-0185-00	Silicon	Replaceable by 1N4152		
CR727	*152-0185-00	Silicon	Replaceable by 1N4152		
CR728	*152-0185-00	Silicon	Replaceable by 1N4152		
CR729	*152-0185-00	Silicon	Replaceable by 1N4152		

Transistors

Q707	151-0509-00	SCR	TO-5	400 V,	1.6 A
Q711	*151-0195-00	Silicon	NPN	TO-92	Replaceable by MPS 6515
Q716	*151-0315-00	Silicon	NPN	TO-3	Replaceable by 2N5239
Q718	151-0207-00	Silicon	NPN	TO-98	2N3415
Q725	*151-0195-00	Silicon	NPN	TO-92	Replaceable by MPS 6515

Values are fixed unless marked Variable.

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff Disc	Description
Resistors			
Resistors are fixed, composition, $\pm 10\%$ unless otherwise indicated.			
R707	307-0060-00	6.8 Ω	1/2 W 5%
R710	316-0333-00	33 k Ω	1/4 W
R712	316-0152-00	1.5 k Ω	1/4 W
R713	315-0271-00	270 Ω	1/4 W
R714	315-0134-00	130 k Ω	1/4 W 5%
R715	315-0753-00	75 k Ω	1/4 W 5%
R717	316-0101-00	100 Ω	1/4 W
R718	316-0150-00	15 Ω	1/4 W
R719	316-0121-00	120 Ω	1/4 W
R720	316-0392-00	3.9 k Ω	1/4 W
R722	321-0210-00	1.5 k Ω	1/8 W Prec 1%
R723	311-0480-00	500 Ω , Var	
R724	321-0226-00	2.21 k Ω	1/8 W Prec 1%
R725	317-0103-00	10 k Ω	1/8 W 5%

FILTER Circuit Board Assembly

*670-1245-00

Complete Board

CapacitorsTolerance $\pm 20\%$ unless otherwise indicated.

C102	281-0610-00	2.2 pF	Cer	200 V	± 0.1 pF
C103	281-0105-00	0.8-8.5 pF, Var	Cer		
C105	281-0105-00	0.8-8.5 pF, Var	Cer		
C108	281-0105-00	0.8-8.5 pF, Var	Cer		

Values are fixed unless marked Variable.

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	No. Disc	Description	
Capacitors (cont)					
C112	283-0003-00		0.01 μ F	Cer	150 V
C113	283-0003-00		0.01 μ F	Cer	150 V
C115	281-0626-00		3.3 pF	Cer	500 V 5%
C119	281-0601-00		7.5 pF	Cer	500 V ± 0.5 pF
C120	281-0601-00		7.5 pF	Cer	500 V ± 0.5 pF
C121	281-0610-00		2.2 pF	Cer	200 V ± 0.1 pF
C122	281-0601-00		7.5 pF	Cer	500 V ± 0.5 pF
C123	281-0610-00		2.2 pF	Cer	200 V ± 0.1 pF
C125	281-0601-00		7.5 pF	Cer	500 V ± 0.5 pF
C126	281-0626-00		3.3 pF	Cer	500 V 5%
C127	283-0003-00		0.01 μ F	Cer	150 V
C128	283-0003-00		0.01 μ F	Cer	150 V
C142	283-0003-00		0.01 μ F	Cer	150 V
C143	283-0003-00		0.01 μ F	Cer	150 V
C144	281-0503-00		8 pF	Cer	500 V ± 0.5 pF
C145	281-0503-00		8 pF	Cer	500 V ± 0.5 pF
C147	281-0592-00		4.7 pF	Cer	500 V ± 0.5 pF
C148	281-0601-00		7.5 pF	Cer	500 V ± 0.5 pF
C150	281-0572-00		6.8 pF	Cer	500 V ± 0.5 pF
C151	281-0504-00		10 pF	Cer	500 V 10%
C153	281-0572-00		6.8 pF	Cer	500 V ± 0.5 pF
C154	281-0504-00		10 pF	Cer	500 V 10%
C156	281-0572-00		6.8 pF	Cer	500 V ± 0.5 pF
C157	281-0504-00		10 pF	Cer	500 V 10%

Electrical Parts List--Type 067-0532-01

Values are fixed unless marked Variable.

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
Capacitors (cont)				
C159	281-0592-00		4.7 pF	Cer 500 V ±0.5 pF
C160	281-0601-00		7.5 pF	Cer 500 V ±0.5 pF
C162	281-0503-00		8 pF	Cer 500 V ±0.5 pF
C163	281-0503-00		8 pF	Cer 500 V ±0.5 pF
C167	283-0003-00		0.01 μF	Cer 150 V
C168	283-0003-00		0.01 μF	Cer 150 V
C171	283-0003-00		0.01 μF	Cer 150 V
C172	283-0003-00		0.01 μF	Cer 150 V
C173	281-0577-00		14 pF	Cer 500 V 5%
C174	281-0557-00		1.8 pF	Cer 500 V
C176	281-0504-00		10 pF	Cer 500 V 10%
C177	281-0576-00		11 pF	Cer 500 V 5%
C179	281-0504-00		10 pF	Cer 500 V 10%
C180	281-0578-00		18 pF	Cer 500 V 5%
C182	281-0504-00		10 pF	Cer 500 V 10%
C183	281-0578-00		18 pF	Cer 500 V 5%
C185	281-0504-00		10 pF	Cer 500 V 10%
C186	281-0578-00		18 pF	Cer 500 V 5%
C188	281-0504-00		10 pF	Cer 500 V 10%
C189	281-0576-00		11 pF	Cer 500 V 5%
C192	281-0557-00		1.8 pF	Cer 500 V
C193	281-0577-00		14 pF	Cer 500 V 5%
C197	283-0003-00		0.01 μF	Cer 150 V
C198	283-0003-00		0.01 μF	Cer 150 V

Connectors

J100	131-0391-00		Receptacle, electrical, 50 Ω
J199	131-0391-00		Receptacle, electrical, 50 Ω

Values are fixed unless marked Variable.

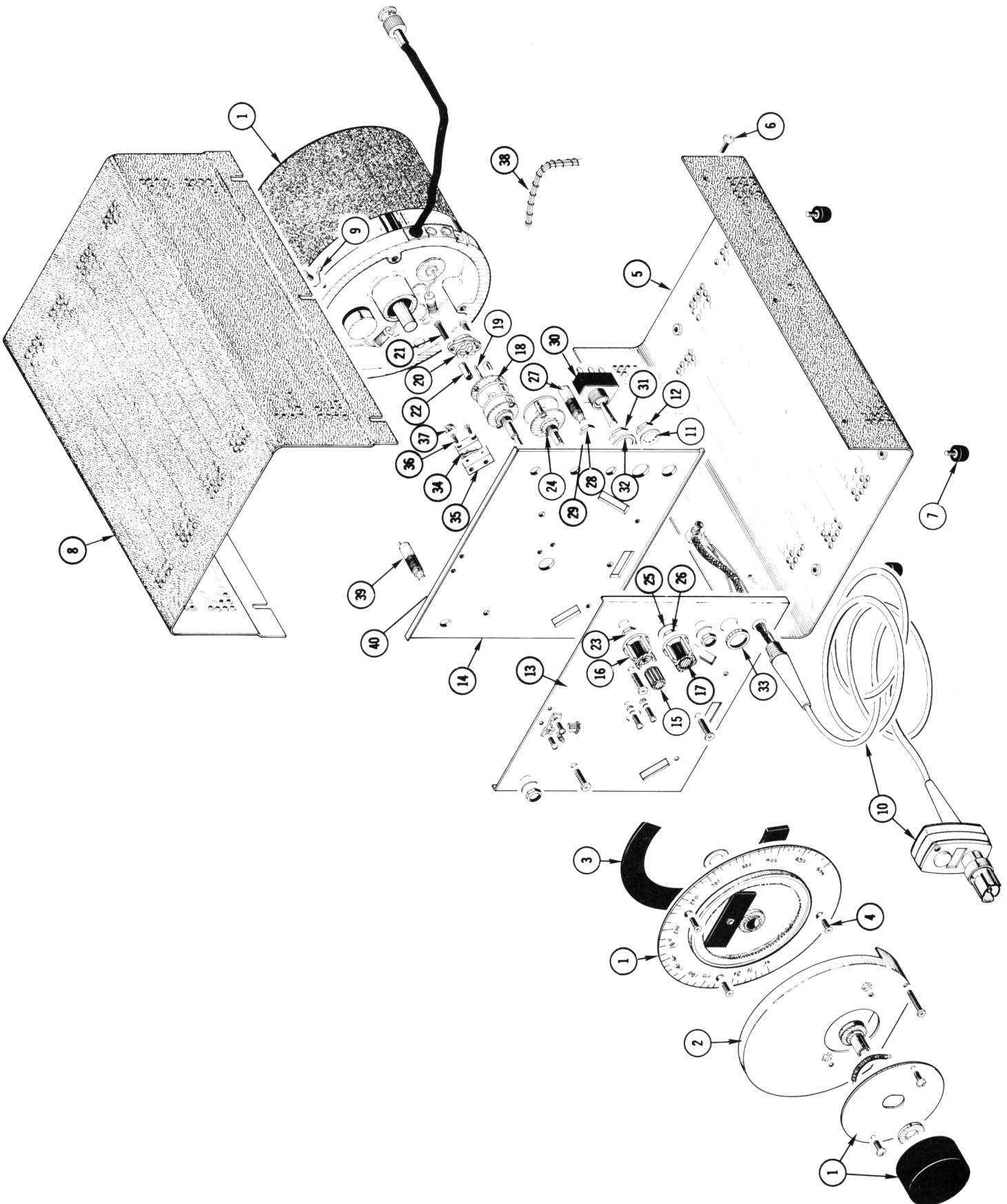
Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
Inductors				
L101	*108-0381-00			36 nH
L104	*108-0374-00			55 nH
L107	*108-0374-00			55 nH
L109	*108-0381-00			36 nH
L115	*108-0313-00			0.05 μ H
L117	*108-0319-00			0.08 μ H
L119	*108-0433-00			0.09 μ H
L121	*108-0433-00			0.09 μ H
L123	*108-0433-00			0.09 μ H
L125	*108-0319-00			0.08 μ H
L126	*108-0313-00			0.05 μ H
L145	*108-0313-00			0.05 μ H
L148	*108-0435-00			0.16 μ H
L151	*108-0435-00			0.16 μ H
L154	*108-0435-00			0.16 μ H
L157	*108-0435-00			0.16 μ H
L162	*108-0313-00			0.05 μ H
L173	*108-0319-00			0.08 μ H
L177	*108-0436-00			0.26 μ H
L180	*108-0436-00			0.26 μ H
L183	*108-0436-00			0.26 μ H
L186	*108-0436-00			0.26 μ H
L192	*108-0319-00			0.08 μ H
Relays				
K111	108-0358-00			Coil, Reed Drive
K111A	260-0721-00			Reed, spdt
K129	108-0358-00			Coil, Reed Drive
K129A	260-0721-00			Reed, spdt
K141	108-0358-00			Coil, Reed Drive

Electrical Parts List--Type 067-0532-01

Values are fixed unless marked Variable.

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
Relays (cont)				
K141A	260-0721-00			Reed, spdt
K169	108-0358-00			Coil, Reed Drive
K169A	260-0721-00			Reed, spdt
K171	108-0358-00			Coil, Reed Drive
K171A	260-0721-00			Reed, spdt
K199	108-0358-00			Coil, Reed Drive
K199A	260-0721-00			Reed, spdt

FIGURE 1 FRONT



SECTION 7

MECHANICAL PARTS LIST

FIGURE 1 FRONT

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	No. Disc	Q					Description
				t	y	1	2	3	
1-1	119-0132-01			1					OSCILLATOR, RF, 64 to 500 MHz
	- - - - -			-					oscillator includes:
-2	132-0132-01			1					COVER, oscillator dial
-3	214-1362-00			1					ACTUATOR, switch, plastic
	- - - - -			-					mounting hardware: (not included w/actuator)
-4	211-0105-00			3					SCREW, 4-40 x 0.188 inch, 100° csk, FHS
-5	386-1216-00			1					CABINET, bottom
-6	211-0565-00			6					SCREW, 6-32 x 0.25 inch, THS
-7	348-0048-00			4					FOOT, black, plastic
-8	386-1217-00			1					CABINET, top
-9	210-0202-00			1					LUG, solder, #6
-10	175-0434-00			1					CABLE ASSEMBLY, special purpose, output
	- - - - -			-					mounting hardware: (not included w/
	- - - - -			-					cable assembly)
-11	210-0021-00			1					WASHER, lock, internal, 0.472 ID x
	- - - - -			-					0.593 inch OD
-12	210-0559-00			1					NUT, hex., 0.438-28 x 0.563 inch
-13	333-1317-00			1					PANEL, front
-14	386-1762-00			1					SUBPANEL, front
-15	366-0189-00			1					KNOB, red--VARIABLE
	- - - - -			-					knob includes:
	213-0020-00			1					SETSCREW, 6-32 x 0.125 inch, HSS
-16	366-0322-00			1					KNOB, charcoal--AMPLITUDE
	- - - - -			-					knob includes:
	213-0004-00			1					SETSCREW, 6-32 x 0.188 inch, HSS
-17	366-0322-01			1					KNOB, charcoal--FREQUENCY RANGE
	- - - - -			-					knob includes:
	213-0020-00			1					SETSCREW, 6-32 x 0.125 inch, HSS
-18	262-0901-00			1					SWITCH, rotary--AMPLITUDE, wired
	- - - - -			-					switch includes:
	260-1134-00			1					SWITCH, rotary, unwired

FIGURE 1 FRONT (cont)

Fig. & Index No.	Tektronix Part No.	Serial/Model Eff	No. Disc	Q † y						Description
					1	2	3	4	5	
1-19	384-0358-01			1						ROD, extension
-20	- - - - -			1						RESISTOR, variable
	- - - - -			-						mounting hardware: (not included
	- - - - -			-						w/resistor)
-21	211-0016-00			2						SCREW, 4-40 x 0.625 inch, RHS
-22	166-0026-00			2						TUBE, spacer, 0.375 inch long
	- - - - -			-						mounting hardware: (not included w/switch)
-23	210-0413-00			1						NUT, hex., 0.375-32 x 0.50
	210-0012-00			1						WASHER, lock, internal, 0.325 ID x 0.50
	- - - - -			-						inch OD
	210-0840-00			1						WASHER, flat, 0.39 ID x 0.562 inch OD
-24	262-0745-01			1						SWITCH, rotary--FREQUENCY RANGE, wired
	- - - - -			-						switch includes:
	260-0462-00			1						SWITCH, rotary, unwired
	- - - - -			-						mounting hardware: (not included w/switch)
-25	210-0840-00			1						WASHER, flat, 0.39 ID x 0.562 inch OD
	210-0012-00			1						WASHER, lock, internal, 0.325 ID x 0.50
	- - - - -			-						inch OD (not shown)
-26	210-0413-00			1						NUT, hex., 0.375-32 x 0.50 inch
-27	136-0164-00			1						SOCKET, lamp
	- - - - -			-						mounting hardware: (not included w/socket)
-28	210-0413-00			2						NUT, hex., 0.375-32 x 0.50 inch
-29	210-0840-00			1						WASHER, flat, 0.39 ID x 0.562 inch OD
-30	260-0014-00			1						SWITCH, toggle--POWER ON
	- - - - -			-						mounting hardware: (not included w/switch)
-31	210-0414-00			1						NUT, hex., 0.469-32 x 0.562 inch
-32	354-0055-00			1						RING, locking
-33	210-0473-00			1						NUT, 12 sided, 0.469-32 x 0.634 inch
	210-0902-00			1						WASHER, flat, 0.470 ID x 0.656 inch OD
-34	260-0516-00			3						SWITCH, push (Micro Type)
	- - - - -			-						mounting hardware for each: (not included
	- - - - -			-						w/switch)
-35	407-0759-00			1						BRACKET, switch
-36	211-0159-00			2						SCREW, 2-56 x 0.375 inch, PHS
-37	210-0586-00			2						NUT, keps, 6-32 x 0.313 inch
	210-0801-00			4						WASHER, flat, 5s x 0.281 inch
-38	179-1497-00			1						WIRING HARNESS, oscillator
-39	- - - - -			1						LAMP (See Electrical Parts List)
	- - - - -			-						mounting hardware: (not included w/lamp)
-40	210-0413-00			1						NUT, hex., 0.375-32 x 0.50 inch
-41	210-0012-00			1						WASHER, lock, internal, 0.325 ID x 0.50 [®]
	- - - - -			-						inch OD (not shown)

FIGURE 2 REAR

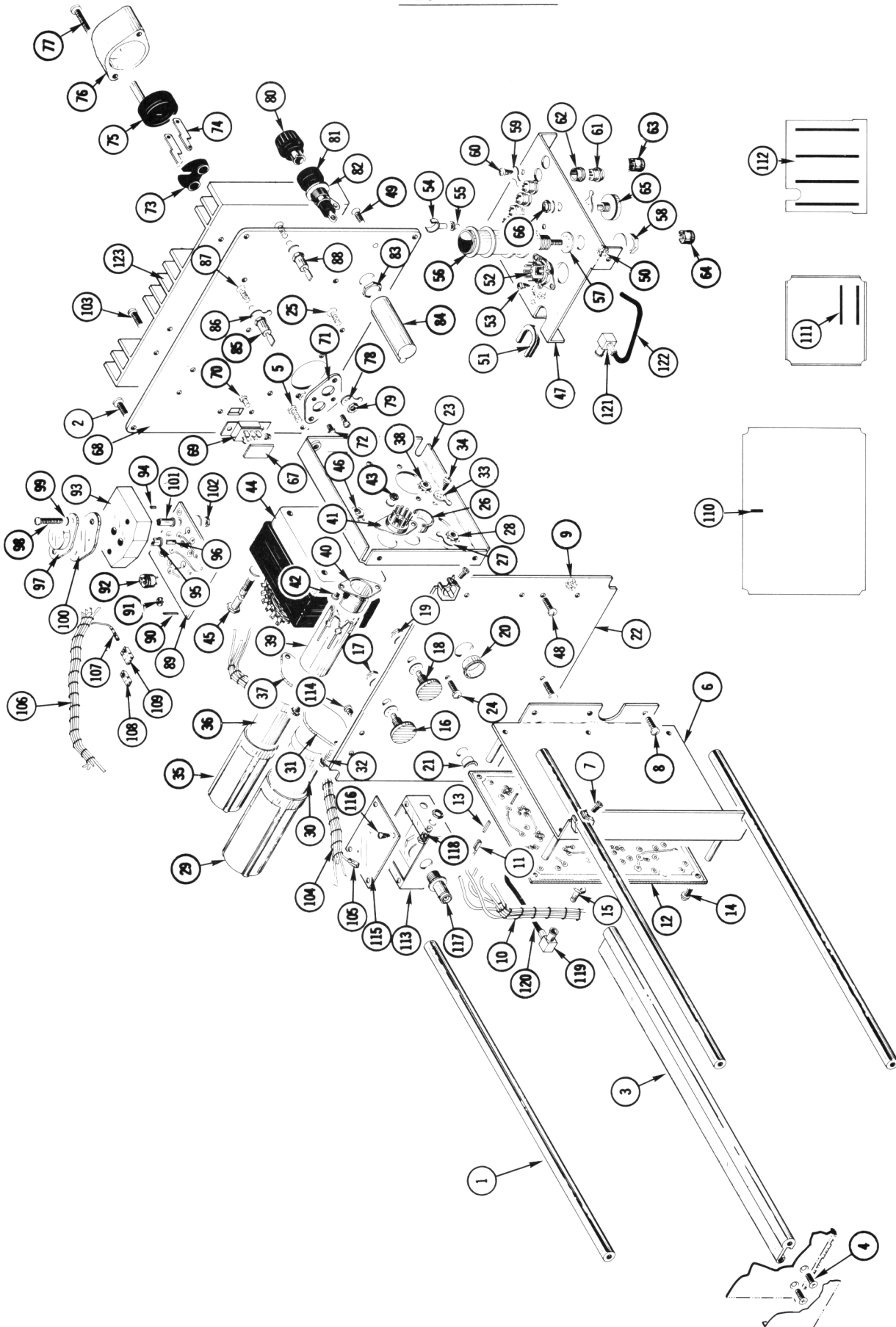


FIGURE 2 REAR

Fig. & Index No.	Tektronix Part No.	Serial/Model Eff	No. Disc	Q					Description
				Y	1	2	3	4	
2-1	384-0615-00			3					ROD, spacer
	- - - - -			-					mounting hardware for each:
	- - - - -			-					(not included w/rod)
-2	212-0023-00			1					SCREW, 8-32 x 0.375 inch, PHS
-3	351-0096-00			1					GUIDE, rail
	- - - - -			-					mounting hardware: (not included w/guide)
-4	211-0538-00			2					SCREW, 6-32 x 0.312 inch, 100° csk, FHS
-5	212-0023-00			2					SCREW, 8-32 x 0.375 inch, PHS
-6	441-0726-00			1					CHASSIS, circuit board
	- - - - -			-					chassis includes:
-7	211-0014-00			2					SCREW, 4-40 x 0.50 inch, PHS
	- - - - -			-					mounting hardware: (not included w/chassis)
-8	211-0507-00			3					SCREW, 6-32 x 0.312 inch, PHS
-9	210-0457-00			3					NUT, 6-32 x 0.312 inch
-10	179-1496-00			1					CABLE HARNESS, filter
	- - - - -			-					cable harness includes:
-11	131-0371-00			18					CONNECTOR, terminal
-12	670-1245-01			1					CIRCUIT BOARD ASSEMBLY--FILTER
	- - - - -			-					assembly includes:
	388-0850-01			1					CIRCUIT BOARD
+13	131-0633-00			18					TERMINAL, pin, 0.385 inch long
	- - - - -			-					mounting hardware: (not included w/assembly)
-14	211-0116-00			5					SCREW, sems, 4-40 x 0.312 inch, PHB
-15	131-0391-00			2					CONNECTOR, receptacle
-16	- - - - -			1					RESISTOR, variable
	- - - - -			-					mounting hardware: (not included w/resistor)
	210-0223-00			1					LUG, solder, 0.25 ID x 0.438 inch OD, SE
	210-0940-00			1					WASHER, flat, 0.25 ID x 0.375 inch OD
-17	210-0583-0			1					NUT, hex., 0.25-32 x 0.312 inch
-18	- - - - -			1					RESISTOR, variable
	- - - - -			-					mounting hardware: (not included w/resistor)
	210-0012-00			1					WASHER, lock, internal, 0.375 ID x
	- - - - -			-					0.50 inch OD
	210-0940-00			1					WASHER, flat, 0.25 ID x 0.375 inch OD
-19	210-0583-00			1					NUT, hex., 0.25-32 x 0.312 inch

FIGURE 2 REAR (cont)

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	No. Disc	Q					Description
				Y	1	2	3	4	
2-20	348-0067-00			1					GROMMET, plastic, 0.312 inch diameter
-21	348-0063-00			1					GROMMET, plastic, 0.50 inch diameter
-22	386-1760-00			1					PLATE, chassis support
	- - - - -			-					plate includes:
	211-0014-00			4					SCREW, 4-40 x 0.50 inch, PHS
-23	441-0929-00			1					CHASSIS, power supply
	- - - - -			-					mounting hardware: (not included w/chassis)
-24	211-0507-00			3					SCREW, 6-32 x 0.312 inch, PHS
-25	211-0538-00			1					SCREW, 6-32 x 0.312 inch, 100° csk, FHS
-26	348-0063-00			1					GROMMET, plastic, 0.50 inch diameter
-27	210-0201-00			2					LUG, solder, SE #4
	- - - - -			-					mounting hardware for each: (not included
	- - - - -			-					w/lug)
-28	213-0044-00			1					SCREW, thread forming, 5-32 x
	- - - - -			-					0.188 inch, PHS
-29	200-0258-00			1					COVER, capacitor, plastic, 3.031 inches long
-30	- - - - -			1					CAPACITOR
	- - - - -			-					mounting hardware: (not included
	- - - - -			-					w/capacitor)
-31	386-0254-00			1					PLATE, fiber, large
-32	211-0543-00			2					SCREW, 6-32 x 0.312 inch, RHS
-33	210-0202-00			1					LUG, solder, SE #6
-34	210-0457-00			2					NUT, keps, 6-32 x 0.312 inch
-35	200-0256-00			1					COVER, capacitor, plastic, 2.031 inches long
-36	- - - - -			1					CAPACITOR
	- - - - -			-					mounting hardware: (not included
	- - - - -			-					w/capacitor)
-37	386-0252-00			1					PLATE, fiber, small
	211-0543-00			2					SCREW, 6-32 x 0.312 inch, RHS
-38	210-0457-00			2					NUT, keps, 6-32 x 0.312 inch
-39	337-0810-00			1					SHIELD, tube
-40	337-0005-00			1					SHIELD, socket
-41	136-0015-00			1					SOCKET, tube, 9 pin, w/ground lugs)
	- - - - -			-					mounting hardware: (not included w/socket)
-42	211-0008-00			2					SCREW, 4-40 x 0.25 inch, PHS
	210-0004-00			2					WASHER, lock, internal, #4
-43	210-0406-00			2					NUT, hex., 4-40 x 0.187 inch

FIGURE 2 REAR (cont)

Fig. & Index No.	Tektronix Part No.	Serial/Model Eff	No. Disc	Q † y	Description				
					1	2	3	4	5
2-44	- - - - -			-	TRANSFORMER				
	- - - - -			-	transformer includes:				
	212-0515-00			4	SCREW, 10-32 x 2.25 inches, HHS				
-45	210-0812-00			4	WASHER, fiber, #10				
	- - - - -			-	mounting hardware: (not included				
	- - - - -			-	w/transformer)				
-46	220-0410-00			4	NUT, keps, 10-32 x 0.375 inch				
-47	441-0930-00			1	CHASSIS, amplifier				
	- - - - -			-	mounting hardware: (not included w/chassis)				
-48	211-0507-00			1	SCREW, 6-32 x 0.312 inch, PHS				
-49	211-0538-00			1	SCREW, 6-32 x 0.312 inch, 100° csk, FHS				
-50	210-0457-00			2	NUT, 6-32 x 0.312 inch				
-51	358-0215-00			1	BUSHING, plastic				
-52	136-0015-00			1	SOCKET, tube, 9 pin, w/ground lugs				
	- - - - -			-	mounting hardware: (not included w/socket)				
-53	213-0044-00			2	SCREW, thread forming, 5-32 x 0.187 inch, PHS				
-54	426-0121-00			1	HOLDER, toroid				
	- - - - -			-	mounting hardware: (not included w/holder)				
-55	361-0007-00			1	SPACER, plastic, 0.062 inch long				
-56	- - - - -			1	COIL				
	- - - - -			-	mounting hardware: (not included w/coil)				
-57	210-0012-00			1	WASHER, lock, internal, 0.375 ID x				
	- - - - -			-	0.50 inch OD				
	210-0840-00			1	WASHER, flat, 0.39 ID x 0.562 inch OD				
-58	210-0413-00			1	NUT, hex., 0.375-32 x 0.50 inch				
-59	210-0201-00			2	LUG, solder, SE #4				
	- - - - -			-	mounting hardware for each: (not included				
	- - - - -			-	w/lug)				
-60	213-0044-00			1	SCREW, thread forming, 5-32 x				
	- - - - -			-	0.187 inch, PHS				

FIGURE 2 REAR (cont)

Fig. & Index No.	Tektronix Part No.	Serial/Model Eff	No. Disc	Q					Description
				Y	1	2	3	4	
2-61	136-0181-00			5					SOCKET, transistor, 3 pin
	- - - - -			-					mounting hardware for each: (not included
	- - - - -			-					w/socket)
-62	354-0234-00			1					RING, socket mounting
-63	136-0377-00			1					SOCKET, transistor, 10 pin
-64	136-0378-00			1					SOCKET, transistor, 8 pin
-65	- - - - -			-					RESISTOR, variable
	- - - - -			-					mounting hardware: (not included w/resistor)
	210-0223-00			1					LUG, solder, 0.25 ID x 0.473 inch OD, SE
	210-0940-00			1					WASHER, flat, 0.25 ID x 0.375 inch OD
-66	210-0583-00			1					NUT, hex., 0.25-32 x 0.312 inch
-67	337-1036-00			1					SHIELD, solder
-68	386-1761-00			1					PLATE, rear
-69	260-0675-00			1					SWITCH, slide
	- - - - -			-					mounting hardware: (not included w/switch)
-70	211-0008-00			2					SCREW, 4-40 x 0.25 inch, PHS
	210-0406-00			2					NUT, hex., 4-40 x 0.188 inch
	210-0004-00			2					WASHER, lock, internal, #4
	131-0102-02			1					CONNECTOR, power, male, 3 contact
	- - - - -			-					connector includes:
-71	386-1356-01			1					PLATE, connector mounting
-72	211-0534-00			1					SCREW, sems, 6-32 x 0.312 inch, PHS
	213-0146-00			1					SCREW, thread forming, #6 x
	- - - - -			-					0.312 inch, PHS
-73	214-1016-01			1					INSULATOR, connector
-74	214-0078-00			2					PIN, connecting
-75	204-0335-00			1					CONTACT ASSEMBLY
	- - - - -			-					mounting hardware: (not included
	- - - - -			-					w/connector)
-76	337-0955-00			1					SHIELD, plastic
-77	211-0514-00			2					SCREW, 6-32 x 0.75 inch, PHS
-78	210-0202-00			2					LUG, solder, SE #6
-79	210-0457-00			2					NUT, keps, 6-32 x 0.312 inch

FIGURE 2 REAR (cont)

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Disc	Q					Description
			Y	1	2	3	4	
2-	352-0002-00		1					ASSEMBLY, fuse holder
	- - - - -		-					assembly includes:
-80	200-0582-00		1					CAP, fuse
-81	352-0010-00		1					HOLDER, fuse
-82	210-0873-00		1					WASHER, rubber, 0.25 ID x 0.687 inch OD
-83	- - - - -		1					NUT
-84	200-0237-00		1					COVER, fuse holder
-85	131-0761-00		1					TERMINAL POST, 6 hole
	- - - - -		-					mounting hardware: (not included w/
	- - - - -		-					terminal post)
-86	210-0202-00		1					LUG, solder, SE #6
-87	211-0541-00		1					SCREW, 6-32 x 0.25 inch, 100° csk, FHS
-88	131-0761-00		1					TERMINAL POST, 6 hole
	- - - - -		-					mounting hardware: (not included w/
	- - - - -		-					terminal post)
	210-0006-00		1					WASHER, lock, internal, #6
	211-0541-00		1					SCREW, 6-32 x 0.25 inch, 100° csk, FHS
-89	670-1228-00		1					CIRCUIT BOARD ASSEMBLY--PRE REG
	- - - - -		-					assembly includes:
	388-1350-01		1					CIRCUIT BOARD
-90	131-0589-00		7					TERMINAL, pin, 0.46 inch long
-91	136-0350-00		3					SOCKET, transistor, 3 pin, small
-92	136-0183-00		1					SOCKET, transistor, 3 pin
-93	391-0079-01		1					BLOCK, transistor mounting
	- - - - -		-					block includes:
-94	214-0273-00		2					PIN, roll, 0.437 inch long
-95	342-0003-00		2					INSULATOR, plate
-96	136-0262-00		2					SOCKET, connector pin
-97	- - - - -		1					TRANSISTOR
	- - - - -		-					mounting hardware: (not included w/
	- - - - -		-					transistor)
-98	211-0003-00		2					SCREW, 2-56 x 0.875 inch, RHS
-99	210-0001-00		2					WASHER, lock, internal, #2
-100	214-1213-00		2					HEAT SINK
-101	342-0004-00		1					INSULATOR, plate
	210-1104-00		4					WASHER, flat, 0.093 ID x 0.344 inch OD
-102	210-0405-00		2					NUT, hex., 2-56 x 0.187 inch
	200-0692-00		1					COVER, insulating
	- - - - -		-					mounting hardware: (not included w/
	- - - - -		-					assembly)
-103	211-0510-00		2					SCREW, 6-32 x 0.375 inch, PHS

FIGURE 2 REAR (cont)

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Disc	Q					Description
			t	y	1	2	3	
2-104	179-1494-00		1					CABLE HARNESS, main
	- - - - -		-					cable harness includes:
-105	131-0371-00		1					CONNECTOR, terminal
-106	179-1495-00		1					CABLE HARNESS, AC
	- - - - -		-					cable harness includes:
-107	131-0621-00		5					CONNECTOR, terminal
-108	352-0198-00		2					HOLDER, terminal connector, 2 wire
-109	352-0199-00		1					HOLDER, terminal connector, 3 wire
-110	124-0162-00		1					STRIP, ceramic, 0.437 inch high, w/4 notches
	- - - - -		-					strip includes:
	355-0046-00		1					STUD, plastic
	- - - - -		-					mounting hardware: (not included w/strip)
	361-0007-00		1					SPACER, plastic, 0.437 inch long
-111	124-0146-00		2					STRIP, ceramic, 0.437 inch high, w/6 notches
	- - - - -		-					each strip includes:
	355-0046-00		2					STUD, plastic
	- - - - -		-					mounting hardware: (not included w/strip)
	361-0009-00		2					SPACER, plastic, 0.281 inch long
-112	124-0145-00		4					STRIP, ceramic, 0.437 inch, w/20 notches
	- - - - -		-					each strip includes:
	355-0046-00		2					STUD, plastic
	- - - - -		-					mounting hardware for each: (not included
	- - - - -		-					w/strip)
	361-0009-00		2					SPACER, plastic, 0.281 inch long
-113	380-0201-00		1					HOUSING, matching network
	- - - - -		-					mounting hardware: (not included w/housing)
-114	213-0124-00		2					SCREW, thread forming, 6-32 x 0.25 inch, PHS
-115	337-1008-00		1					SHIELD, electrical, cover
	- - - - -		-					mounting hardware: (not included w/shield)
-116	211-0079-00		4					SCREW, 2-56 x 0.187 inch, PHS
-117	131-0126-00		1					CONNECTOR, coaxial, BNC, w/hardware
	- - - - -		-					mounting hardware: (not included
	- - - - -		-					w/connector)
	210-0012-00		1					WASHER, lock, internal, 0.384 ID x
	- - - - -		-					0.50 inch OD

FIGURE 2 REAR (cont)

Fig. & Index No.	Tektronix Part No.	Serial/Model Eff	No. Disc	Q					Description	
				†	Y	1	2	3		4
2-118	131-0372-00			2						CONNECTOR, coaxial, w/hardware
-119	131-0375-00			2						CONNECTOR, right angle, 50 Ω
-120	175-0055-00			ft						CABLE, coaxila, 6 inches
-121	131-0375-00			1						CONNECTOR, right angle, 50 Ω
-122	175-0055-00			ft						CABLE, coaxial, 16 inches
-123	214-1364-00			1						HEAT SINK
	- - - - -			-						mounting hardware: (not included
	- - - - -			-						w/heat sink)
	211-0510-00			3						SCREW, 6-32 x 0.375 inch, PHS

STANDARD ACCESSORIES

070-1058-00	1	MANUAL, instruction (not shown)
161-0024-03	1	CABLE ASSEMBLY, power (not shown)
017-0083-00	1	TERMINATION, 50 Ω (not shown)

SECTION 8

GENERAL RADIO TYPE 1363-9000 UHF OSCILLATOR*

The 1363 UHF oscillator is a vacuum-tube oscillator RF source. The 1363 UHF oscillator uses a planar triode tube in a contact type tuned circuit that combines a variable air capacitor and a variable inductor in a single unit. Its frequency range, which extends from 64-500 MHz, is tuned with a single control, without band switching. The tuning shaft is directly driven through 250 degrees by the main dial that is in turn driven by a vernier drive. Frequency setting is indicated on a large, easy-to-read, engraved dial, individually calibrated to give $\pm 2\%$ accuracy.

When the oscillator is turned on for use, a warmup frequency drift (0.8% typical total) will occur until the circuit stabilizes at the set frequency. Figure 8-1 shows typical warmup frequency drift curves.

The oscillator is capable of delivering RF power in excess of 180 mW into 100 Ω over its frequency range.

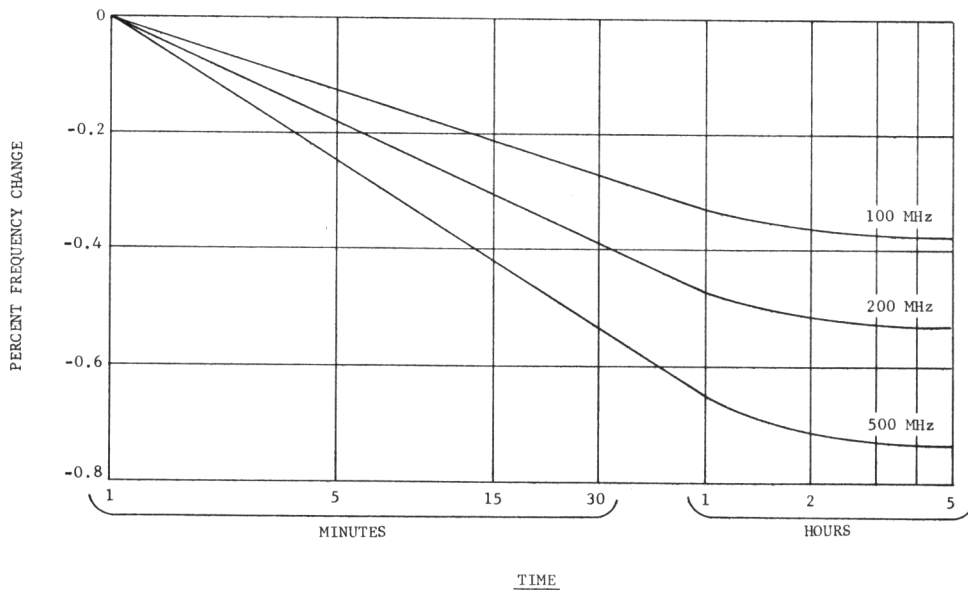


Figure 8-1. Typical warmup frequency-drift characteristics for the 1363 VHF Oscillator with a Type 1267 Regulated Power Supply.

*From General Radio Company instruction manual form 1363-0100-A. Used with permission.

Circuit Description

The oscillator uses the General Electric Type 2C43 metal-and-ceramic planar, triode tube. The tube is designed to operate with 6.3 V and 0.9 A on the heater and a maximum plate voltage of 500 V. The tube is used in a Colpitts circuit (Figure 8-3) with the plate and grid connected to the tuned circuit LC101. The cathode is grounded for rf. The feedback is determined by the inter-electrode capacitance of the tube, and capacitance associated with the tuning element structure.

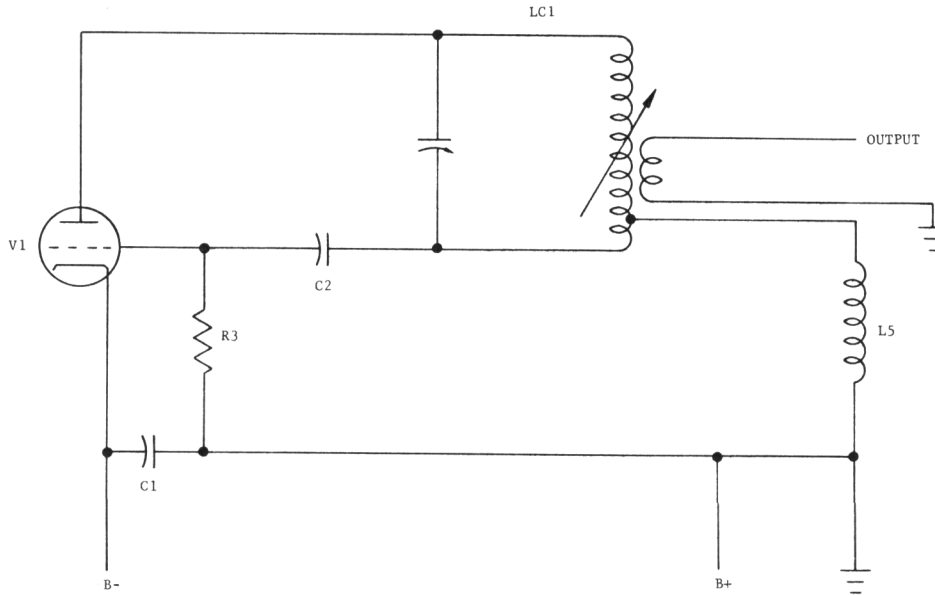


FIGURE 8-3. Elementary schematic of the 1363 VHF Oscillator.

The biasing used is a combination of cathode and grid leak, resulting in a high output and good leveling of the output versus frequency.

At high oscillator levels, the resistance in the grid-leak circuit is that R3. Grid current flowing through R3 drops the voltage on C1 and the R6, which is in turn cut off. The greater grid leak bias now developed keeps the grid current, and thus the output power, within safe limits.

The 1363 VHF Oscillator uses a "contact-type" circuit, which combines a variable air capacitor and a variable inductor in a single unit. Inductance varies from 0.06 μH at the low-frequency end to 0.01 μH at the high-frequency end, and capacitance varies from 130 pF to 9 pF. Rotor and stator plates are shaped so that frequency varies logarithmically with dial rotation. Special damping elements are used to overcome undesired resonances in the inactive portion of the tank circuit (C3, C11, R2, R4, and R5).

Radio-frequency power is coupled from the oscillator tank circuit by means of a loop located near the oscillator tube. The loop is connected by means of a 93- Ω coaxial cable.

Maintenance

When the cover of the 1363 is removed, some connections have as much as -450 V dc on them.

If the oscillator is weak, and the analysis shows no defects except low plate current, the tube has a defective (worn-out) cathode.

If oscillation ceases and restarts very abruptly as the tuning dial is rotated, inspect the tuning capacity visually for possible short circuits. If there is a short-circuit caused by a loose piece of material between rotor and stator, its behavior may be erratic and difficult to analyze. If a short-circuit is the result of bent plates, the malfunction will be repeatable.

If measurements are attempted on this oscillator with power on and the rf shield removed, one may expect the instrument in good repair to oscillate over most of its tuning range but to deviate appreciably from specified frequency calibration and output power level.

When the oscillator is being serviced and repaired, a visual inspection is appropriate. All soldered joints should be secure, mechanical fasteners tight and dial-drive mechanism operating smoothly without backlash.

To remove the rf shield cover proceed as follows:

- a. Unscrew the two captive No. 10-32 Phillips-head screws on opposite sides of the shield cover. Unscrew several turns at a time, alternating between screws.
- b. Slide the rf shield cover off.

The positions of parts in the rf section are critical. Do not move any part unless it is defective. When a part must be replaced, install the new one in the same position, orientation, with the same lengths of leads and lead dress.

Proper lubrication consists of occasional application of a light coat of silver-bearing grease to the contact surface on the inductance ring of LC1.

When it is necessary to replace the Type 2C43 tube, proceed as follows:

Turn all power off.

Remove the covers.

Remove the tube socket assembly and withdraw the tube from the socket. (Grasp the pin end of the tube and pull.)

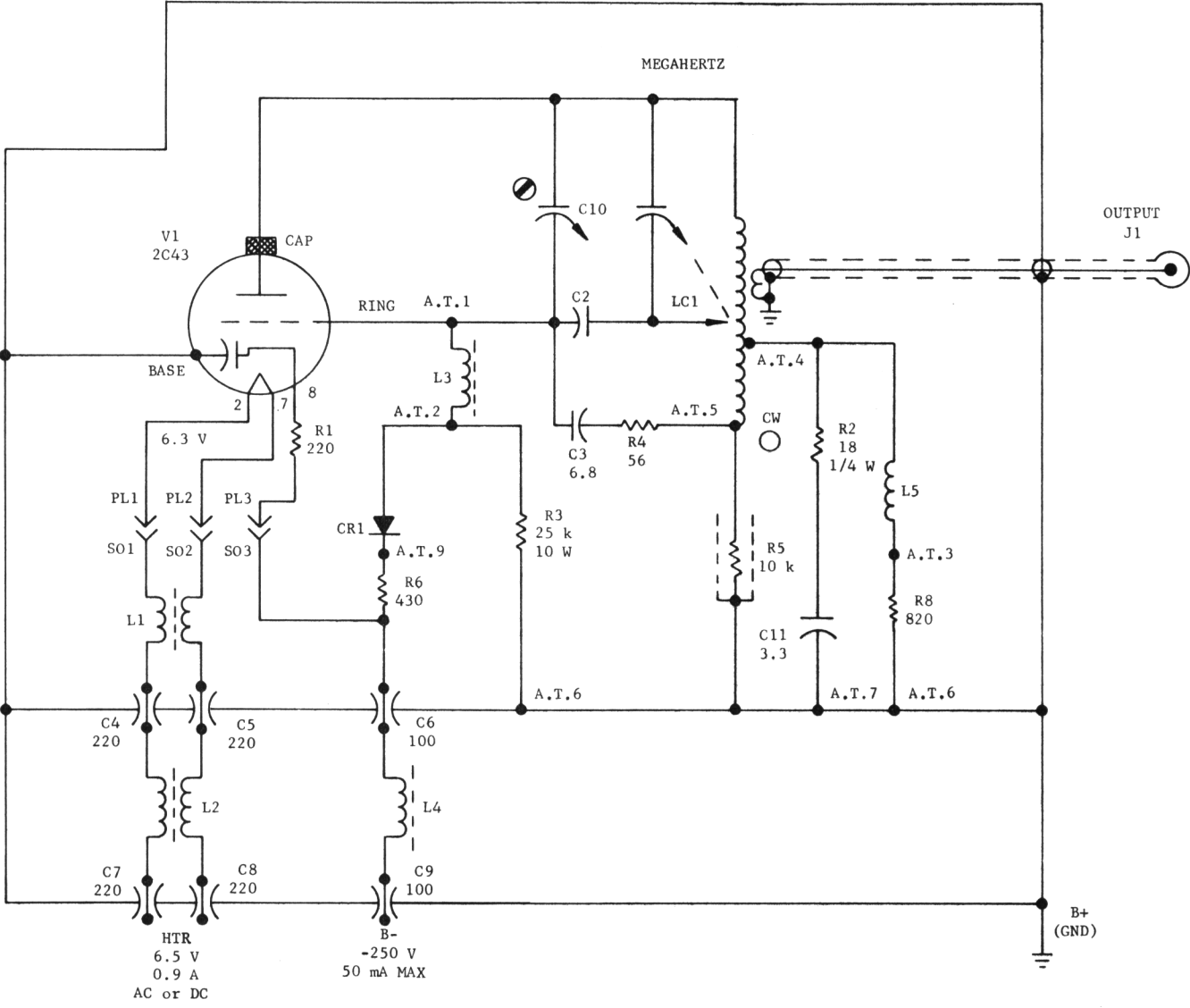
Plug replacement tube into socket and plug into oscillator, using care not to snag the grid fingers on the smaller (plate) flange of the tube. Be sure that the tube is fully seated, and that the grid fingers are making contact.

Replace the rf shield cover; tighten the two clamping screws alternately to insure that the cover is seated squarely.

Restore frequency calibration if necessary.

Frequency Calibration

Replacement of the oscillator tube can affect frequency calibration. If necessary, remove the shield cover and set the trimmer capacitor C10 by rotation to make the output signal frequency agree with the dial calibration at 500 MHz. To free C10, temporarily loosen the screw slightly.



SCHMATIC DIAGRAM FOR 1363-9000

VHF OSCILLATOR 64-500 MHz

PARTS LIST--ELECTRICAL

Ref. No.	Description	GR Part No.	Tektronix Part No.
CAPACITORS			
C1	100 pF, Part of V1		
C2	28pF, Part of LC1		
C3	Ceramic, 6.8 pF $\pm 10\%$ 500 V	4400-0800	NOT AVAILABLE
C4	Ceramic, 220 pF $\pm 20\%$ 500 V	4400-1950	"
C5	Ceramic, 220 pF $\pm 20\%$ 500 V	4400-1950	"
C6	Ceramic, 100 pF $\pm 20\%$ 500 V	4400-1700	"
C7	Ceramic, 220 pF $\pm 20\%$ 500 V	4400-1950	"
C8	Ceramic, 2200 pF $\pm 20\%$ 500 V	4400-1950	"
C9	Ceramic, 100 pF $\pm 20\%$ 500 V	4400-1700	"
C10	Special	1363-1530	"
C11	Ceramic, 3.3 pF $\pm 5\%$ 500 V	4400-0330	"
RESISTORS			
R1	Composition, 220 Ω $\pm 5\%$ 1/2W	6100-1225	301-0221-00
R2	Composition, 18 Ω $\pm 5\%$ 1/4W		315-0180-00
R3	Power, 25 k Ω $\pm 5\%$ 10 W	6670-3255	NOT AVAILABLE
R4	Composition, 56 Ω $\pm 5\%$ 1/2 W	6100-0565	301-0560-00
R5	Composition, 10 k Ω $\pm 5\%$ 1/2 W	6100-3105	NOT AVAILABLE
R6	Composition, 430 Ω $\pm 5\%$ 1/2 W		301-0431-00
R8	Composition, 820 Ω $\pm 10\%$ 2 W	6120-1829	306-0821-00
TUBE			
V1	Vacuum, 2C43	8320-0200	NOT AVAILABLE
DIODES			
CR1	Semiconductor, Type 1N625	6082-1012	152-0095-00
INDUCTORS			
L1	Toroid core coil assembly	1363-2560	NOT AVAILABLE
L2	Toroid core coil assembly	1363-2561	"
L3	Toroid core coil assembly	1363-2570	"
L4	Toroid core coil assembly	1363-2570	"
L5	Choke	4290-1300	"

067-0532-01 EFF SN 1170-up

ELECTRICAL PARTS LIST AND SCHEMATIC CORRECTION

CHANGE TO:

CR243	152-0488-00	Silicon	Rectifier bridge
R240	308-0433-00	1 Ω	1/4 W WW
R242	REPLACE WITH #22 BARE WIRE STRAP		