Taylor

OPERATING INSTRUCTIONS

MODEL 62A MK 2
AM/FM SIGNAL GENERATOR

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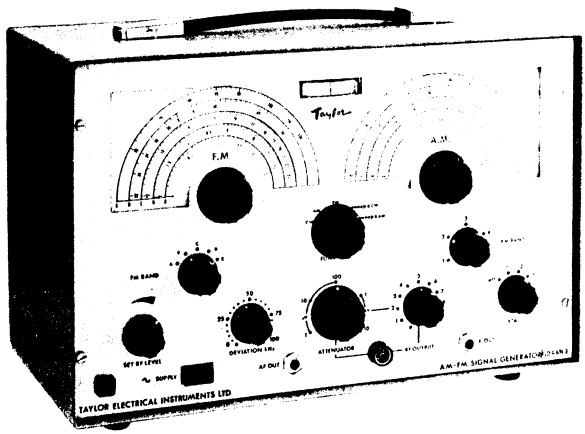

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INTRODUCTION

The instrument is designed mainly for the servicing of a.m. and f.m. high frequency receivers and the inter-carrier i.f. stages of television receivers, but has wide application in development laboratories and test rooms and can also be used in the field if a.c. mains is available. It provides, in conjunction with an oscilloscope, complete facilities for the sweep alignment of r.f., i.f. and discriminator or ratio detector stages of a.m. and f.m. receivers. The speedy and accurate method of ratio detector alignment, using simultaneous a.m. and sweep signals is available.

The a.m. generator covers the range 4-120 MHz in five bands, all on fundamentals. The modulation depth is approximately 30% at 400Hz. The 400Hz output from the audio oscillator is available as a separate output for audio frequency testing. The f.m. and sweep section also operates on fundamentals, thus overcoming the poor frequency accuracy inherent in the frequency-difference method. The f.m. and sweep bands cover the frequencies 4-23 MHz, 32-50 MHz and 70-120 MHz in five bands. The a.m. generator may be used as a marker during sweep alignment.

Deviation on f.m. is variable up to 100 kHz from the mean carrier frequency at a modulation rate of 400 Hz. The sweep covers a total bandwidth of 1 MHz at mains frequency 40-60 Hz. A crystal calibrator circuit, with switch selection of any one of three internally mounted crystals is incorporated. A 5 MHz crystal is normally supplied, but other crystals, which may be selected in the frequency range 1-11 MHz, can be easily fitted.

A feature of the equipment is the provision for the addition of the a.m. signal to the f.m. signal. Using the sweep the de-modulated output may be observed as an S-curve on a c.r.o. and the trace will show the amplitude modulation marking the S-curve and will indicate the exact division of the frequency scale.

All the available facilities are switch selected, no external cross connections are necessary. There is a choice of c.w., a.m., sweep plus c.w. or sweep plus a.m. by internal switching. When using the sweep facility, the marker amplitude may be continuously varied.

A five-section attenuator together with a non-inductive potentiometer ensures accurate attenuation over the whole frequency range. Radio frequency leakage has been reduced to a minimum by careful shielding of the attenuator sections and both oscillator sections.

SPECIFICATION

A.M. Generator	*R.F. Frequency Ranges:*	(1) 4– 8 MHz. (2) 8–16 MHz. (3) 16–32 MHz. (4) 32–60 MHz. (5) 60–120 MHz.
	Calibration Accuracy:	± 1%.
	Modulation:	Approx. 30% at 400 Hz.
	R.F. Output:	100 mV ± 1dB to 100 MHz. Unbalanced (coaxial) to ground.
	R.F. Attenuation:	Coarse : 5 steps of 20 dB. Fine : variable to zero.
	Audio:	Up to approx. 1 V r.m.s. at 400 Hz.
F.M. Generator	*Frequency Ranges:*	(A) 4– 7 MHz. (B) 7– 12 MHz. (C) 12– 23 MHz. (D) 32– 50 MHz. (E) 70–120 MHz.
	Calibration Accuracy:	± 2%.
	Deviation:	Variable from substantially zero to ± 100 kHz at 400 Hz.
	Deviation Accuracy:	± 10% ± 5 kHz.
	Noise:	Not greater than —40dB relative to 100 kHz deviation.
	Attendant A.M.:	Not greater than 1 dB at 100 kHz deviation.
	R.F. Output:	100 mV ± 1 dB to 100 MHz. Unbalanced to ground.
	R.F. Attenuation:	Coarse : 5 steps of 20 dB. Fine : Variable to zero.
Sweep Generator	*Frequency Ranges:*	(A) 4– 7 MHz. (B) 7– 12 MHz. (C) 12– 23 MHz. (D) 32– 50 MHz. (E) 70–120 MHz.
	Bandwidth:	Variable up to 1 MHz total at mains frequency.
	Carrier Shift:	Not greater than 2%.
	Blanking:	An internal switch is provided to allow blanked or unblanked operation. An internal phase control allows variation of external sweep phase over approximately 165° with an output level of 8V. peak-to-peak.
	Attendant A.M.:	Adds less than 2 dB.
	R.F. Output:	Adjustable to 100 mV. ± 3 dB to 100 MHz. Unbalanced to ground.
	R.F. Attenuation:	Coarse : 5 steps of 20 dB. Fine : Variable to zero.
Crystal Calibrator	Three sockets for mounting quartz crystals are provided within the instrument and selected by a front panel switch to allow the frequency of the a.m. or c.w. section to be monitored. A 5 MHz crystal is supplied.	

General	*Power Supply:*	105 to 125 V., 200 to 250 V., 40 to 60 Hz
	Weight:	9·5 kg. (21 lb.) approx.
	Dimensions:	359 × 232 × 178 mm. ($14\frac{1}{8}$" × $9\frac{1}{8}$" × 7
	Accessories Supplied:	1 jack plug. 1 moulded coaxial lead.
	Optional Accessories:	Model 480 minimum loss pad 75–300 o Model 481 standard all wave dummy ant

CONTROLS

All controls and sockets (except the blanking switch and phasing meter) are mounted on the front panel.

SUPPLY This push-button switches on the instrument and an adjacent neor illuminate. About five minutes warm-up period should be allowed.

A.F. OUT This is the 400 Hz output jack for general audio testing. The output i is approx. 100 ohms. and unbalanced.

X OUT A jack for mains frequency time base voltage for the oscilloscope.

SET R.F. LEVEL This control enables the voltage to be adjusted to a datum level in the meter.

DEVIATION This control enables the deviation to be set between zero and 100 f.m. mode.

ATTENUATOR This control varies the output voltage in five steps with a ratio of 1(dB each below 100 mV.

R.F. OUTPUT A continuously variable control, adjacent to the 75 ohm coaxial *R.F* socket, which provides fine adjustment of the output voltage. It marked in unit steps from 1 to 10.

XTAL This switch enables any one of three crystals to be selected to frequency of the a.m. and c.w. sections to be verified.

FUNCTION SELECTOR SWITCH Using this control the following functions may be selected :

(i) Continuous wave (*c.w.*)
(ii) Amplitude modulation (*a.m.*)
(iii) Frequency modulation (*f.m.*)
(iv) Sweep and continuous wave (*sweep and c.w.*)
(v) Sweep and amplitude modulation (*sweep and a.m.*)

F.M. BAND This control selects any one of five frequency bands for frequency m

A.M. BAND Any one of five bands of amplitude modulation can be selected control.

F.M. DIAL This dial indicates the frequency of the carrier for frequency modula

A.M. DIAL This dial indicates the frequency of the carrier for amplitude modula

OUTPUT LEVEL METER This meter indicates that the setting of the *SET R.F. LEVEL* contr datum voltage of 100 mV at the r.f. output.

PHASING POTENTIOMETER BLANKING SWITCH The phasing potentiometer and the blanking switch are located removable button plugs on the rear of the instrument. These are on Page 7

BLOCK DIAGRAM

The function of the individual units of the instrument can be more easily understood from the Block Diagram Fig. 2 and the brief description of each which is given below :

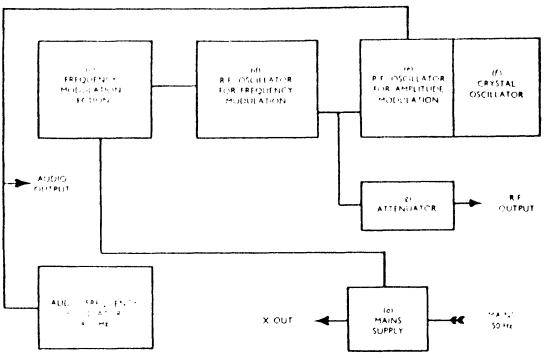


Fig. 2 Block diagram of Instrument.

(a) Mains Supply provides the supply voltages for all units including low voltage at mains frequency for the x-deflection voltage.

(b) Audio frequency oscillator at 400 Hz for amplitude modulating or frequency modulating the appropriate radio frequency oscillator.

(c) Frequency modulation unit in which a reactance is varied at 400 Hz or mains frequency and so controls the frequency modulation of a radio frequency oscillator.

(d) Radio frequency oscillator for frequency modulation the frequency of which is determined by pre-set tuned circuits, and the reactance circuit of (*c*) above.

(e) Radio frequency oscillator for amplitude modulation the frequency of which is determined by preset tuned circuits, with available amplitude modulation at 400 Hz.

(f) Crystal oscillator which verifies the frequency of the oscillator above.

(g) Attenuator comprises two sections, one continuously variable, the other in decade steps, the output being a known loss on an adjusted level set by reference to a meter.

CIRCUIT DESCRIPTION

The following description can be followed using the circuit diagrams Figs. 8 and 9 at the end of this manual.

Power Supply Single phase 40-60 Hz mains supply is connected via a three core cable to chokes L14, L15, capacitors C55 and C56 which form a high frequency filter. A double pole mains switch SF isolates both live and neutral. The live connection passes via a fused mains voltage selector to the mains transformer T2 which has an indicating neon lamp ILP1 connected across the primary winding. The h.t. output from T2 feeds a bridge/rectifier circuit MR4 to MR7 and a resistor/capacitor filter C52-R45-C51. The l.t. output is taken from the centre-tapped secondary, half the voltage A being fed to V1 and V2, the other half B, feeding V3.

Phasing Circuit

The phasing circuit comprises a resistor/capacitor network which alters the phase of the mains derived signal fed to the *X OUT* socket. The low voltage is taken from the AB secondary of the mains transformer. Phasing is controlled by the potentiometer RV8.

400 Hz Audio Oscillator

The pentode section of V2 sustains oscillations in a resistor/capacitor phase shift network with fine adjustment provided by capacitor C25. This network drives the pentode grid and the output from the anode drives the triode section through C28. Positive feedback for the network is taken from the triode cathode.

The anode of triode V2 drives the output transformer T1 which has two output windings. One winding is fed via switch SD and potentiometer RV1 to the *AF OUT* jack which can supply 400 Hz or 50 Hz dependant on the position of switch SD. The other output winding modulates the a.m. oscillator via SD2 and SB2.

Crystal Oscillator

The triode V1a is a Pierce type oscillator. Switch SA1 selects the crystal connected between the anode and grid of V1a. A 5 MHz crystal is provided and is inserted in No. 1 crystal holder.

The cathodes of V1a and V1b triodes are coupled through C4. The audio frequency is filtered from the high frequency components in the anode circuit by C9 and fed via C7 to the grid of V2a, which ceases to oscillate and forms, with the accompanying triode, an amplifier for the resulting beat frequency signal. This is connected via Transformer T1 to the *AF OUT* jack.

A.M. Oscillator

The triode V1b acts as a high frequency Colpitts oscillator, the frequency of which is determined by inductors L1, etc., and the preset capacitors C10, etc., selected by switch SB. The exact frequency of oscillation is determined by the variable split stator capacitor C10.

F.M. Oscillator

The triode V3a functions as a Colpitts oscillator, the frequency being determined by the preset inductors L8 etc., LV1, LV2 and the preset capacitors C35 etc., but exact frequency of oscillation is determined by the variable capacitor C40. Frequency modulation is effected by varying the inductance, by current variations (at 400 Hz) in the field coils of LV1 and LV2. Thus at constant amplitude, the frequency of oscillation is varied at 400 Hz about a steady value, which is indicated on the appropriate f.m. scale on the front panel. Preset permanent magnets linearise the performance of LV1 and LV2 and under no circumstances should any attempt be made to re-adjust them. The output from this oscillator is taken from the cathode resistor R30 via capacitor C43 to switch SD3.

Blanking

When switch SD is in either of the two sweep positions and SE is closed, h.t. is applied to V3b. Low mains voltage from B is applied to the grid of V3b, the resulting positive half cycle of which is short circuited to earth by rectifier MR3, whilst the negative pulse results in a large positive pulse on the anode of V3b. In V3a, the grid is held negative by grid oscillatory current integrated by C42, so that MR2 is ineffective until a pulse is passed to C44. The grid of V3a becomes so negative that the valve ceases to maintain oscillation. On alternate half cycles therefore, there is no oscillator output and a horizontal line is displayed on a c.r.o. It follows, therefore, that closing of the blanking switch SE permits oscillation only during alternate half cycles of the mains supply, there is correspondingly no deflection vertically on the cathode ray oscilloscope display but a horizontal *zero* or *reference line*, to which the vertical deflection, effective during the alternate half cycles, can be referred. See Figs. 7.1 and 7.2.

Meter

A red calibration mark at mid scale is used for setting a reference level to be applied to the attenuator. The r.f. signal is rectified by MR1, integrated by capacitor C27 and fed to the meter.

Attenuator

This comprises two sections, a potentiometer RV3 and a number of fixed decades which can be switched by SF.

The potentiometer is continuously variable which reduces the datum maximum of ten down to nearly zero. The resistors diminish the datum maximum in the ratio of ten (20 dB) through each step, as clearly marked on the scale.

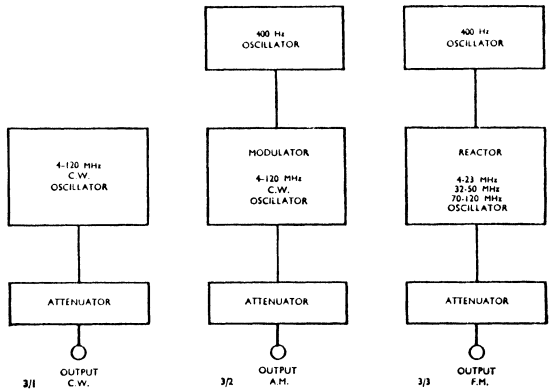


Fig. 3 Functions without sweep

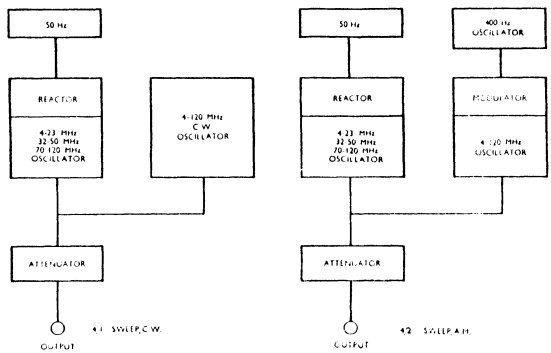


Fig. 4 Functions with sweep

OPERATION

The instrument can be used for a wide variety of tests as follows :

Continuous Wave (Fig. 3.1)

The instrument can be used as a simple source of known voltage, which can be attenuated in known steps, for determining sensitivity and high frequency responses of radio receivers, filters, transformers, antennae, etc. This should be carried out as follows :

(a) Set the *FUNCTION* control to *C.W.*
(b) Select the frequency range to be covered on the *A.M. BAND* switch.
(c) Set the frequency on the *A.M. DIAL*.
(d) Adjust the *R.F. LEVEL* control so as to bring the pointer on the output level meter to the red line ; full output voltage is then 100 mV at 75 ohms impedance level.
(e) Adjust the output voltage range on the *ATTENUATOR*.
(f) Adjust the output voltage on the *R.F. OUTPUT* control.
(g) Take the signal output from the *R.F. OUTPUT* socket.

Amplitude Modulated Wave

The continuous wave is amplitude modulated with 400 Hz which is useful in determining the overall sensitivity of receivers, up to a loud-speaker or other load, the audio output power being measured by any suitable means. The adjustments are as follows :

(a) Set the *FUNCTION* control to *A.M.*
(b) Select the frequency range on the *A.M. BAND* switch.
(c) Set the frequency on the *A.M. DIAL*.
(d) Adjust the *SET R.F. LEVEL* control as described in *(d)* under *Continuous Wave*.
(e) Adjust the output voltage as described in *(e)* and *(f)* under *Continuous Wave*.
(f) Take the signal output from the *R.F. OUTPUT* socket.

Note: The *XTAL* control must be set to the *off* position while the A.M. facility is being used. If the control is set to another position, the audio oscillator ceases to function and there is no a.m. output.

Frequency Modulated Wave (Figs. 3.3 and 7.7 to 7.9)

The continuous wave may be frequency modulated at 400 Hz. The deviation may be adjusted to the desired value up to ± 100 kHz. The accompanying amplitude modulation is very low, being less than 1 dB relative to the f.m. wave. To obtain this f.m. facility :

(a) Set the *FUNCTION* control to *F.M.*
(b) Select the frequency range on the *F.M. BAND* switch.
(c) Set the frequency on the *F.M. DIAL*.
(d) Adjust the *R.F. LEVEL* control as described in *(d)* under *Continuous Wave*.
(e) Adjust the output voltage as described in *(e)* and *(f)* under *Continuous Wave*.
(f) Set the deviation on the *DEVIATION* control which is marked in steps of 5 kHz up to a maximum of 100 kHz.
(g) Take the signal from the *R.F. OUTPUT* socket.

Sweep with Continuous Wave (Figs. 4.1 and 7.1 to 7.6)

Here 50 Hz from the *x out* jack is used to provide an oscilloscope time base, and the frequency modulated output has an adjustable amplitude of continuous wave added. The purpose is to give marking blips on the c.r.o. display, so that the latter can be interpreted in terms of frequency. In this setting the carrier signal is frequency modulated at 50 Hz with a deviation up to ± 500 kHz, i.e. a sweep of 1 MHz and the c.w. oscillator imposes a marker pip on to any part of the S-curve (Fig. 7.3 and 7.4), this provides an accurate calibration of the frequency to which the receiver i.f. amplifiers are tuned. To do this :

(a) Set the *FUNCTION* control to *Sweep and C.W.*
(b) Select the frequency range on the *F.M. BAND* switch.
(c) Set the frequency on the *F.M. DIAL*.
(d) Any indication on the *OUTPUT LEVEL* meter is to be disregarded.
(e) Adjust the output voltage as described in *(e)* and *(f)* under *Continuous Wave*.
(f) Set the sweep on the *DEVIATION* control which now provides a sweep

of up to 1 MHz and is therefore marked in steps of 50 kHz

(g) Take the signal output from the *R.F. OUTPUT* socket.

(h) Connect the *X OUT* socket of the instrument to the horizontal deflecti input of the c.r.o.

The phase of the X deflection voltage can be adjusted to display two close positioned traces; this control is accessible through the rear panel of the instr ment. A further control on the rear panel, the pushbutton *BLANKING* contr is then depressed to eliminate one of these two traces. (Figs. 7.2 and 7.3).

Sweep with Amplitude Modulation (Figs. 4.2 and 7.5)

This is the same as described under *Sweep with Continuous Wave*, but wi the steady carrier amplitude modulated with 400 Hz, the purpose being observe the effectiveness of the limiter in reducing to a minimum any spurio amplitude modulation in the output of the equipment being tested. To effect thi

(a) Set the *FUNCTION* control to *Sweep and A.M.*

(b) Select the frequency range on the *F.M. BAND* switch.

(c) Set the frequency on the *F.M. DIAL*.

(d) Any indication in the output level meter is to be disregarded.

(e) Adjust the output voltage as described in *(e)* and *(f)* under *Continuo Wave*.

(f) Set the sweep on the *DEVIATION* control as described under *(f) Sweep* with *Continuous Wave*.

(g) Take the signal output from the *R.F. OUTPUT* socket.

(h) Connect the *X OUT* socket to the c.r.o. as described in *(h)* under *Swe with Continuous Wave*.

Note: The *XTAL* control must be in the *off* position.

Crystal Verification (Fig. 5)

For this check the crystal oscillator and the high frequency continuous wa oscillator are coupled. The audio oscillator of V2 does not oscillate but is us as an amplifier, the low frequency beat note being available from the *AF OU* socket J1.

This crystal calibration should be made regularly. When checking receive verification of the calibration, using reception of known carriers from lo transmitting stations, can be routine. The calibration using the crystal is carri out as follows:

(a) Set the *FUNCTION* switch to *C.W.*

(b) Select the crystal using the *XTAL* switch.

(c) Set the *A.M. DIAL* and the *A.M. BAND* switch to select frequencies the region of the fundamental or the harmonics of the crystal. The aud beat note is taken from the *A.F. OUT* socket and by adjustment of th *A.M. DIAL*, the frequency calibration of the *A.M. DIAL* can be accurate verified.

F.M. Receiver Alignment (Fig. 6)

This instrument has been primarily designed for this application, using a c.r. display. The r.f. output socket is connected to the aerial input of the f.m receiver under test and the discriminator output of this is applied to the Y amplifier of the oscilloscope. The *X-OUT* socket of the instrument gives the tim base voltage and is therefore applied to the X amplifier of the oscilloscop Curves similar to those in Fig. 7.1. and 7.2 can then be obtained.

The feature is the marking of the displayed response curve by the *a.f.* oscillator and the blanking of the amplitude during the return sweep, so that reference or base line is given for the accurate measurement of the trace, a indicated in Fig. 7.3 to 7.5.

General Audio Testing

A 400 Hz signal is available at the *AF OUT* jack socket for general audi testing. The output impedance is approximately 100 ohms unbalanced and th maximum output voltage is approximately 1 V r.m.s. To use this facility set up as follows:

(a) Set the *FUNCTION* switch to *C.W.* or *A.M.*

(b) Set the *XTAL* switch to the *off* position.

(c) Adjust the output voltage by means of the *DEVIATION* control.

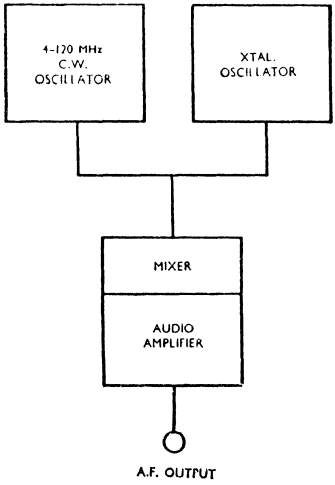


Fig. 5 Crystal Calibration

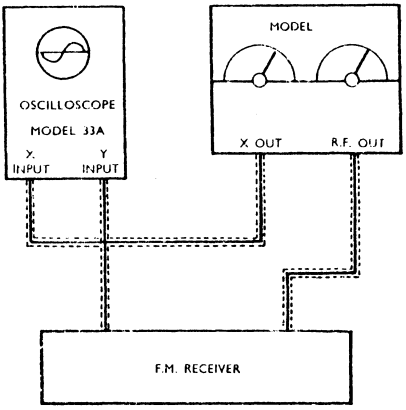


Fig. 6 Testing F.M. Receiver

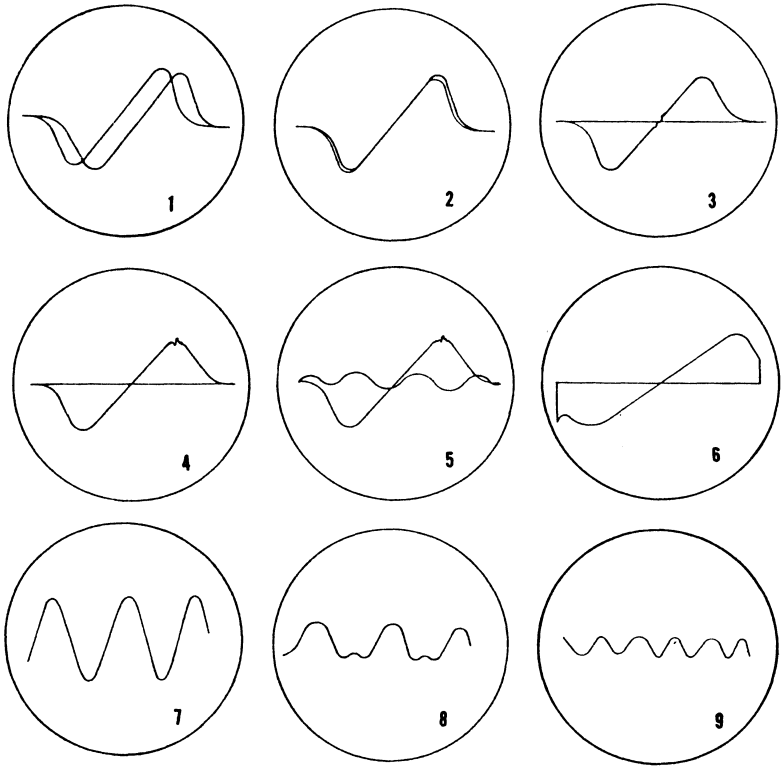
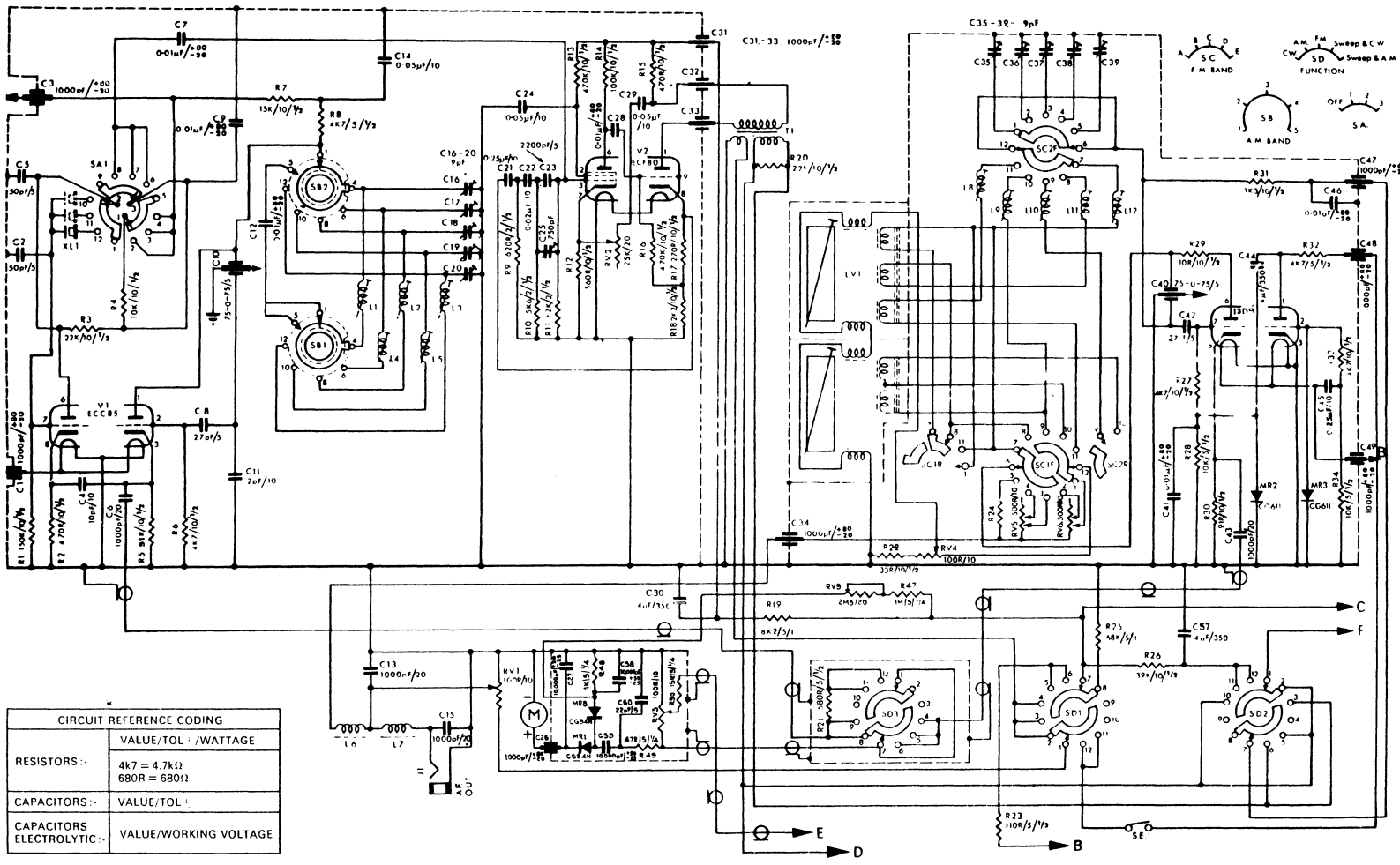


Fig. 7 Typical oscilloscope displays

KEY

1. S-curve unblanked and X-sweep out of phase.
2. S-curve unblanked and X-sweep in phase.
3. S-curve with blanking and marker in centre of curve.
4. S-curve with blanking and marker on top of curve.
5. S-curve with blanking with marker modulated at top of curve.
6. S-curve with deviation reduced to 0.05 MHz.
7. 400 Hz f.m. signal correctly tuned.
8. f.m. signal slightly out of tune.
9. 400 Hz f.m. signal incorrectly tuned.



CIRCUIT REFERENCE CODING	
RESISTORS :-	VALUE/TOL :- /WATTAGE 4k7 = 4.7kΩ 680R = 680Ω
CAPACITORS :-	VALUE/TOL :-
CAPACITORS ELECTROLYTIC :-	VALUE/WORKING VOLTAGE

Fig. 8 Circuit Diagram of Taylor Signal Generator Model 62A Mark 2

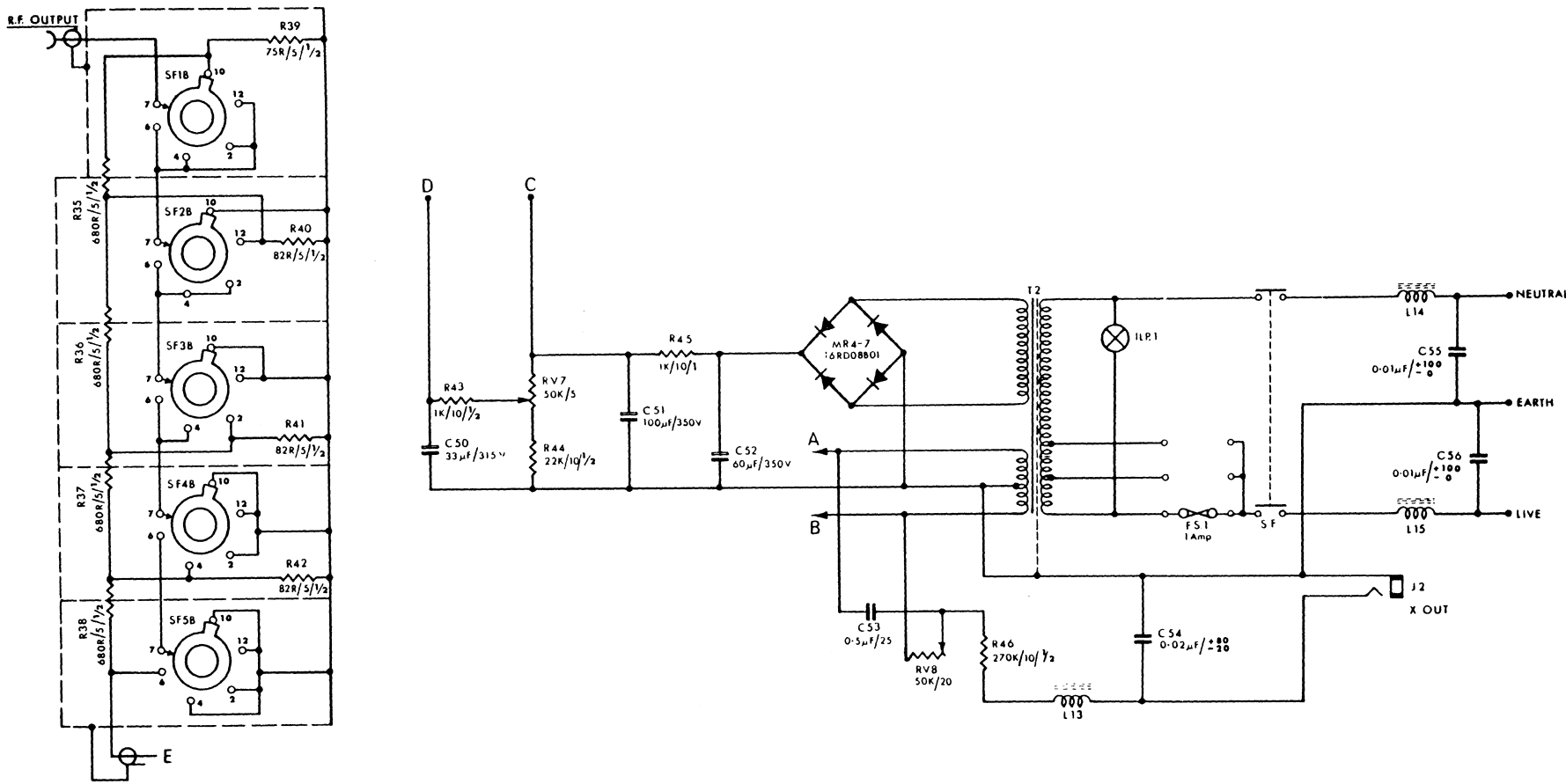


Fig. 9 Circuit Diagram of Power Supply and R.F. Attenuator