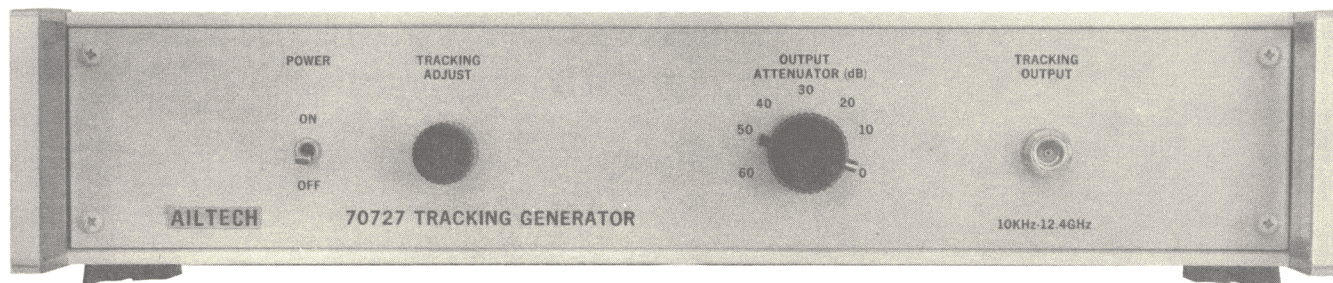


OPERATION AND MAINTENANCE MANUAL

AILTECH 70727 TRACKING GENERATOR



REVISED JUNE 1981

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Ronkonkoma, New York 11779

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70727 TRACKING GENERATOR

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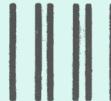
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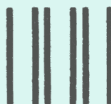
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FOREWORD

The AILTECH 70727 handbook is divided into two sections. These are: the operating section which contains general information relating to the operational characteristics of the instrument and the service section which contains the information required to service and maintain the instrument.

This section includes schematic diagrams, troubleshooting procedures, and a replaceable parts list.

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SECTION 1

GENERAL DESCRIPTION

1-1. INTRODUCTION

This manual provides all the information necessary to operate and maintain the AILTECH 70727 Tracking Generator.

The 70727 provides a signal in synchronism with any AILTECH Spectrum Analyzer over the entire frequency range of 10 kHz to 12.4 GHz. It may be used as a swept frequency source or a stable signal generator. Its dynamic range can be greater than 110 dB. A variable attenuator is provided as an integral part of the instrument.

1-2. DESCRIPTION

The AILTECH 70727 is shown pictorially in Figure 1-1.

This instrument is an accuracy item intended to be used with either the AILTECH 707 or 727 Spectrum Analyzers. It accepts the first LO of the analyzer and down converts it to a test signal that is in the frequency range of 10 kHz to 12.4 GHz and locked to the tuning frequency of the analyzer. The swept widths and rates are controlled by the analyzer, however; a 60 dB attenuator is provided as part of the Tracking Generator so that its output power may be easily controlled.

1-3. SAFETY PRECAUTIONS

The tracking generator is a low power instrument and should be completely safe, even for the untrained user. Power is obtained from an AILTECH analyzer via a special power cable and locking connector. No line voltage is required anywhere in the instrument, and all dc voltages are less than 24 volts absolute. The maximum RF power that could be present in the 70727 is +10 dBm, or 0.01 watts.

1-4. SPECIFICATIONS

The electrical and physical specifications for the 70727 Tracking Generator are given in Table 1-1.

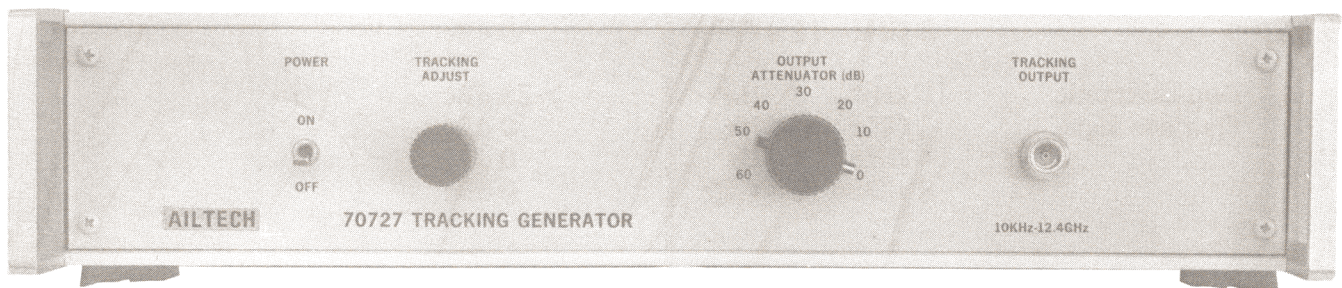


Figure 1-1. 70727 Tracking Generator

Table 1-1. Tracking Generator Specifications

Parameter	Specification
<p>Frequency Range</p> <p>Controlled by 707/727 Spectrum Analyzer</p>	<p>10 kHz to 12.4 GHz</p>
<p>Frequency Accuracy</p> <p>Function of 707/727. Can be substantially improved in 10 kHz – 2 GHz range by using external counter.</p>	<p>±.2%</p>
<p>Flatness</p> <p>(Across band with 10 dB attenuation) For narrow scans flatness is typically 2:1 better than specified.</p>	<p>10 kHz – 2 GHz ± .5 dB (Typical) 2 GHz – 4 GHz ± 1.0 dB 4 GHz – 8 GHz ± 2.0 dB 8 GHz – 12.4 GHz ± 3.0 dB</p>
<p>Output Power Maximum</p> <p>10 kHz – 2 GHz 2 GHz – 4 GHz 4 GHz – 8 GHz 8 GHz – 12.4 GHz</p>	<p>- 5 dBm - 5 dBm - 15 dBm - 25 dBm</p>
<p>Spectral Purity</p> <p>Residual FM</p> <p>Harmonic Distortion</p> <p>Non-Harmonic Spurious Signal</p>	<p>10 kHz – 2 GHz ± 10 kHz 2 GHz – 4 GHz ± 10 kHz 4 GHz – 8 GHz ± 20 kHz 8 GHz – 12.4 GHz ± 30 kHz</p> <p>10 kHz – 2 GHz > 25 dBc 2 GHz – 4 GHz 0 dBc 4 GHz – 8 GHz 0 dBc 8 GHz – 12.4 GHz 0 dBc</p> <p>10 kHz – 2 GHz > 35 dBc 2 GHz – 4 GHz 0 dBc 4 GHz – 8 GHz 0 dBc 8 GHz – 12.4 GHz 0 dBc</p>

Table 1-1. Tracking Generator Specifications (Continued)

Parameter	Specification
Specifications for Swept Frequency Response Measurements	
<p>Dynamic Range (Typical)</p> <p>Measured from Spectrum Analyzer 1 dB gain compression point to average noise level. (Spurious responses not displayed).</p> <p>10 kHz – 2 GHz 2 GHz – 4 GHz 4 GHz – 8 GHz 8 GHz – 12.4 GHz</p>	<p>100 dB 110 dB 85 dB 75 dB</p>
<p>Frequency Range</p>	<p>10 kHz to 12.4 GHz</p>
<p>Frequency Resolution</p> <p>Calibrated With variable vernier</p>	<p>1 MHz/Div < 1 MHz/Div</p>
<p>Amplitude Accuracy (Typical)</p> <p>System frequency response over full bands (with 10 dB attenuation). For narrower scans response is generally better.</p> <p>10 kHz – 2 GHz 2 GHz – 4 GHz 4 GHz – 8 GHz 8 GHz – 12.4 GHz</p>	<p>± 2 dB ± 3 dB ± 4 dB ± 6 dB</p>
<p>Power Requirements</p>	<p>Auxiliary power generated by the spectrum analyzer and received by Interface Cable P1/P25 and analyzer LO output (003 Option).</p>
<p>Dimensions</p>	<p>Height 3 1/2 inches (8.89 cm) Width 17 inches (43.18 cm) Depth 15 inches (38.10 cm) Weight Net 12.5 pounds (5.62 kg)</p>
<p>Temperature</p>	<p>Operating 0° to 55°C Storage -40° to 75°C</p>
<p>Humidity</p>	<p>95% RH @ 40°C</p>

SECTION 2

INSTALLATION

2-1. INITIAL INSPECTION

Inspect the shipping container prior to acceptance from the carrier. Note any damage to the container on the carrier's receipt. If possible, request the carrier's agent to witness the instrument being unpacked.

Inspect the instrument for damage. Check for dents, scratches, broken switches, connectors, etc.

Remove the top cover and inspect for broken components or loose hardware.

2-2. DAMAGE CLAIM

If physical damage is noted after the instrument has been accepted, file a claim for concealed damage with the carrier within 15 days after receipt. All packaging material must be kept for inspection by the carrier's agent, a copy of the claim should be forwarded to AILTECH.

2-3. PREPARATION FOR USE

The 70727 is designed to be used with an AILTECH Spectrum Analyzer which includes an 003 Option. This option brings out the analyzer's first LO to a rear panel type N connector.

Power for the 70727 is derived from the analyzer via a second rear panel connector. 707 analyzers having serial numbers 1800 and above, and 727 analyzers having serial numbers 800 and above, have this power connector as a standard part of the rear panel. For units with serial numbers below those mentioned above, a connector must be added or the existing connector modified.

SECTION 3

OPERATING INSTRUCTIONS

3-1. FRONT PANEL FEATURES See Figure 3-1.

- | | |
|-----------------------------------|--|
| 1. POWER ON/OFF Switch | Energizes the instrument by applying dc power from a 707/727 Spectrum Analyzer. |
| 2. TRACKING ADJUST Control | Corrects for any slight frequency deviation between the LO's of the analyzer and the Tracking Generator. |
| 3. OUTPUT ATTENUATOR (dB) Control | Controls the level of the output RF power. |
| 4. TRACKING OUTPUT Connector | "N" Connector which supplies 10 kHz to 12.4 GHz. |

3-2. REAR PANEL FEATURES See Figure 3-2.

- | | |
|--------------------------|--|
| 1. POWER INPUT Connector | A 24 pin panel connector that accepts dc power via Interface cable P1/P25. |
| 2. LO INPUT Connector | Type N connector through which the analyzer's LO is fed into the 70727. |

3-3. OPERATIONAL PROCEDURES

1. Interconnect the 70727 to the 707/727 analyzer using Interface Cable P1/P25 provided with the generator and a type N interconnection cable. The rear panel of the instrument is used for these interconnection points.
2. For wideband measurements where flatness is important, connect the output of the Tracking Generator to the input of the 707/727 using a good RF cable, for maximum flatness over the desired frequency range.
3. For narrowband operation, or when power is more important than flatness, peak the signal using the TRACKING ADJUST control of the generator and the Signal Center of the analyzer. Connect the output of the Tracking Generator to the device under test (DUT) and from the DUT to the analyzer. (See Figure 3-3).
4. Peak the response on the analyzer by adjusting the TRACKING ADJUST control. This is a minor adjustment and its effect is usually only seen for narrow bandwidth applications.

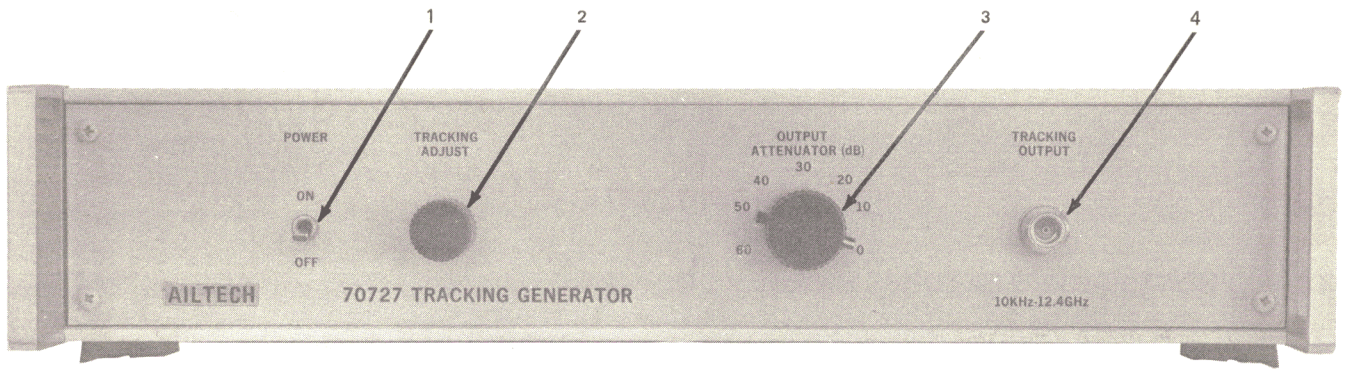


Figure 3-1. 70727 Tracking Generator, Front Panel Features

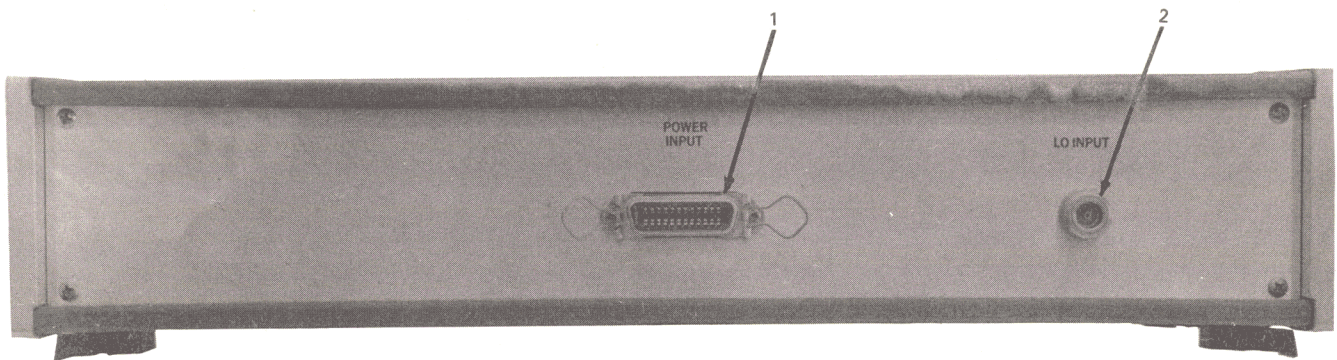


Figure 3-2. 70727 Tracking Generator, Rear Panel Features

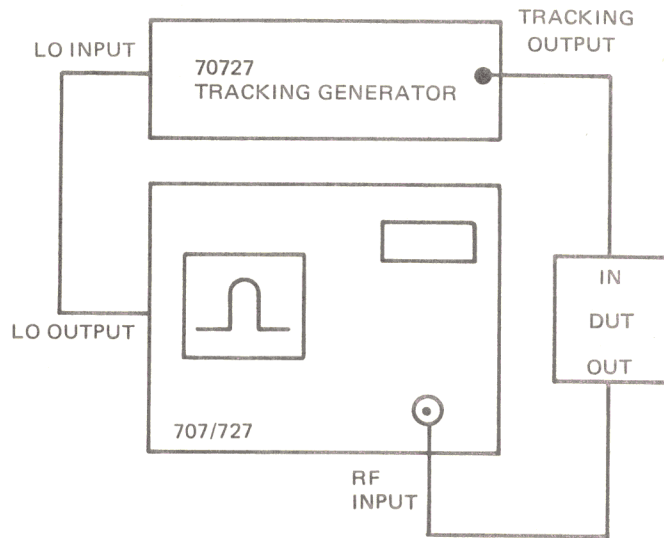


Figure 3-3. Narrowband Operation Test Connections

SECTION 4

THEORY OF OPERATION

4-1. GENERAL THEORY See Figure 4-1, Block Diagram

When the Spectrum Analyzer is operating in Band 1, its LO signal can sweep a maximum of 2 GHz from 2.3 to 4.3 GHz. This signal is processed by the Tracking Generator in the following manner.

The LO power which is approximately at +7 dBm, is passed through a 15 dB amplifier at 1.8 – 4.3 GHz. The levels are such that the amplifier becomes saturated so that the output is amplified and leveled. The amplifier is of sufficient transistor stages so that it has in the order of 40 dB of reverse isolation. This is to prevent any of the oscillator power from feeding back into the analyzer.

The leveled power from the amplifier is then applied to a mixer which is down converted by a 2287 MHz crystal oscillator. This lower frequency signal is passed through a 2 GHz low pass filter which suppresses all unwanted responses and finally passes through a 0 – 60 dB attenuator.

In band 2 and up, the mixing is accomplished in a different manner. The 2 – 4 GHz input is harmonically mixed with a 227 MHz oscillator giving the desired frequency response and offset as a function of analyzer band. In band 2, the unit works on fundamental mixing. In band 3, the unit is working on the second harmonic of the LO and in Band 4 on the third harmonic of the LO. Thus, for an incoming signal at $F_o = 7$ GHz, the LO would be at 2409. This can be seen by substituting into the equation $F_{LO} \times \text{Harmonic mixing mode} - 227 \text{ MHz} = F_o$. Where, the unit is operating in the third harmonic mode.

The mixer receives its bias from the 227 MHz oscillator bias assembly. This insures the flatness of the unit and the band to band compensation.

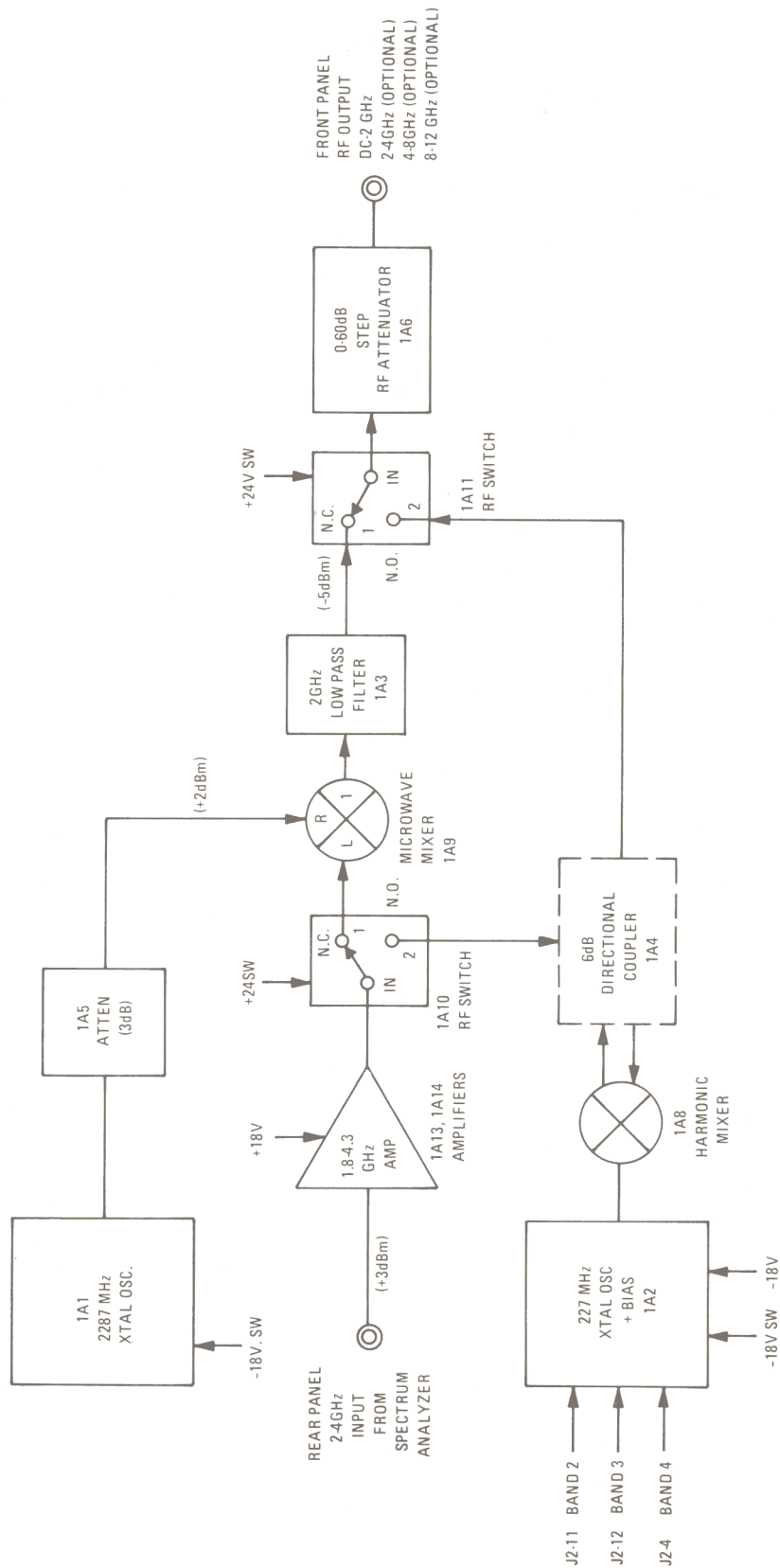


Figure 4-1. 70727 Tracking Generator, Block Diagram

SECTION 5

MAINTENANCE AND TROUBLESHOOTING

5-1. GENERAL

This section contains information pertaining to preventive and corrective maintenance.

The following schematics and diagrams in this manual will aid the technician when troubleshooting the 70727 Tracking Generator.

1. Figure 5-1. Tracking Generator Fixed and Adjustable Component Location Diagram
2. Figure 5-2. 70727 Tracking Generator Wiring Diagram
3. Figure 5-3. 2287 MHz Oscillator Assembly 1A1, Schematic Diagram
4. Figure 5-4. 227 MHz Oscillator Assembly 1A2, Schematic Diagram
5. Table 5-1. Adjustable Components

The following test equipment is required for proper maintenance and troubleshooting.

Test Equipment Required

DC Volt/Ohmmeter	Simpson Model 2795
Power Detector	Boonton Model 41-4E
RF Power Meter	Boonton Model 42B
Spectrum Analyzer	AILTECH 757
X10 Probe	Tektronix P6006

5-2. CORRECTIVE MAINTENANCE

The first step in troubleshooting the Tracking Generator is to isolate the fault into one of two areas, dc power or basic RF system checks.

5-3. DC POWER CHECKS

Using a dc volt/ohmmeter verify that the dc potentials are correct as indicated in the following table.

Connector Pin	Voltage (Dc)	Title
J1-1	Function of R3	LCVCO offset
J1-2	0 volt	Band 5 bias
J1-3	0 volt	Gnd
J1-4	0 volt	Gnd
J1-5	0 volt	Gnd
J1-6	Switched +18V in Band 2	Band 2 bias
J1-7	Switched +18V in Band 3	Band 3 bias
J1-8	Switched +18V in Band 4	Band 4 bias
J1-9	+5V	+5V dc
J1-10	+24V	+24V dc switched
J1-15	Sweep Voltage	Yig sweep (Not required)
J1-16	+18V	+18V dc
J1-20	-18V	-18V dc

1. If any potential is missing make continuity measurements from the output connector of the analyzer, through the interconnecting cable, to the point in question.
2. After verifying all dc voltages at connector J1, verify connections to the appropriate RF sub-assemblies.

5-4. SYSTEM CHECKS (See Figure 4-1.)

1. Using the RF power meter, measure the LO going into the Tracking Generator and verify that its power is typically 0 dBm.
2. Set the spectrum analyzer to band 2 and verify the integrity of the 2287 MHz Oscillator. A signal of +10 dBm should be seen with all spurs 55 to 60 dB down from the carrier.
3. If the oscillator is functioning properly, observe the output of the mixer on another spectrum analyzer. It should have a conversion loss of approximately 6 dB. It should be noted that this test cannot be made using the same analyzer that supplies the LO because the signal is synchronized with but offset from the internal yig preselector.

4. After completing steps 1 through 3 continue through the RF chain by checking the two RF switches 1A10 and 1A11.
5. If the RF switches are switching properly, verify that the 227 MHz Oscillator is working, and that bias is present on the 227 MHz Oscillator for the band in question. The 227 MHz Oscillator outputs a signal of +10 dBm at approximately 227 MHz. Adjust the BIAS BAND potentiometers 1A2A1R8, R9, R10 or R11 for best leveling or flatness for each of the respective bands when the entire unit is operating properly.

5-5. 2287 MHz OSCILLATOR 1A1. (Figure 5-3)

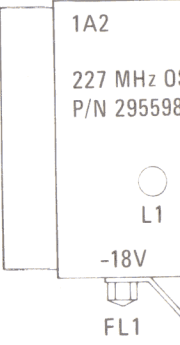
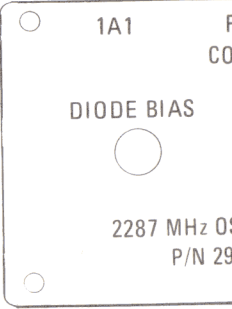
The oscillator multiplier assembly consists of a crystal oscillator operating at a frequency of 114.35 MHz. The output of the oscillator is applied to a X2 transistor multiplier followed by two stages of amplification. The output of the last amplifier is applied to an SRD multiplier where the 10th harmonic of 287 MHz is selected and coupled through a stripline filter to the output.

To align the 2287 MHz Oscillator proceed as follows:

1. Connect one end of the Tektronix X10 probe to the spectrum analyzer, and the other end to the junction of inductor 1A1A2L3 and base of transistor 1A1A2Q3.
2. Adjust variable inductor 1A1A2L1 and variable capacitor 1A1A2C8 for a maximum 228 MHz signal level. Turn off tracking generator.
3. Remove Tektronix X10 probe from junction of inductor 1A1A2L3 and base of transistor 1A1A2Q3 and connect it to the output of the final amplifier stage 1A1A2R11. Turn on tracking generator.
4. Adjust variable capacitors 1A1A2C13 and C15 for maximum signal level.
5. Readjust variable inductor 1A1A2L1 and variable capacitor 1A1A2C8 to obtain maximum signal level at the output. Turn off tracking generator.
6. Remove the Tektronix X10 probe from the output of the oscillator. Turn on tracking generator.
7. Connect the output of the oscillator multiplier assembly to the input of the spectrum analyzer. (Tune the spectrum analyzer to 2287 MHz.)
8. Adjust the DIODE BIAS potentiometer 1A1A1R2 and FILTER COUPLING capacitor 1A1A1C4 (Figure 5-1) for a maximum output signal level at 2287 MHz.
9. It may be necessary to readjust variable capacitor 1A1A2C15 on the amplifier PC board to improve the amplifier/multiplier match.
10. Disconnect the spectrum analyzer from the output and connect the output to an RF power meter. The output level shall be +3 to +8 dBm.
11. Spurious signals shall be < -70 dBc.
12. Harmonic signals shall be < -50 dBc.

Table 5-1. Adjustable Components

Adjustment	Reference Designation	Paragraph	Figure No.	Function
Tracking Adjust	1R3	3-1	5-1	Peaks output response.
FILTER COUPLING	1A1A1C4	5-5	5-3	Matching adjustment.
DIODE BIAS	1A1A1R2	5-5	5-3	Applies bias to diode.
Osc. Freq. Adj.	1A1A2C8	5-5	5-3	Adjusts oscillator frequency.
Gain	1A1A2C13	5-5	5-3	Adjusts gain.
Gain	1A1A2C15	5-5	5-3	Adjusts gain.
Osc. Freq. Adj.	1A1A2L1	5-5	5-3	Adjusts oscillator frequency.
Freq and Amp. Adj.	1A2A1C8	-	5-4	Adjusts for maximum gain.
Freq and Amp. Adj.	1A2A1L1	-	5-4	Adjusts for maximum gain.
Band 2 Bias Adj.	1A2A1R8	5-4	5-4	Adjusts flatness.
Band 3 Bias Adj.	1A2A1R9	5-4	5-4	Adjusts flatness.
Band 4 Bias Adj.	1A2A1R10	5-4	5-4	Adjusts flatness.
Band 5 Bias Adj.	1A2A1R11	5-4	5-4	Adjusts flatness.



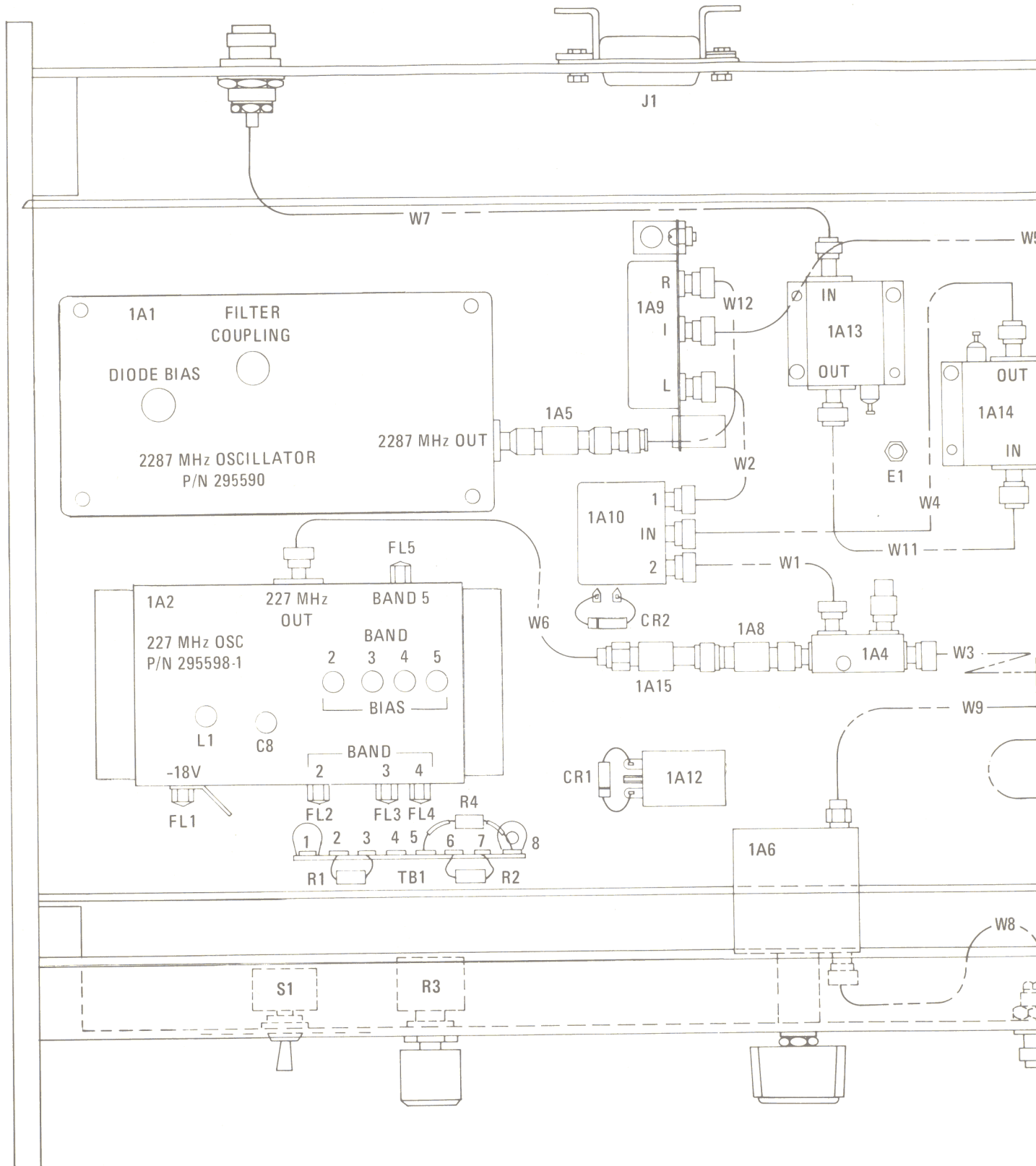


Figure 5-1. Tra
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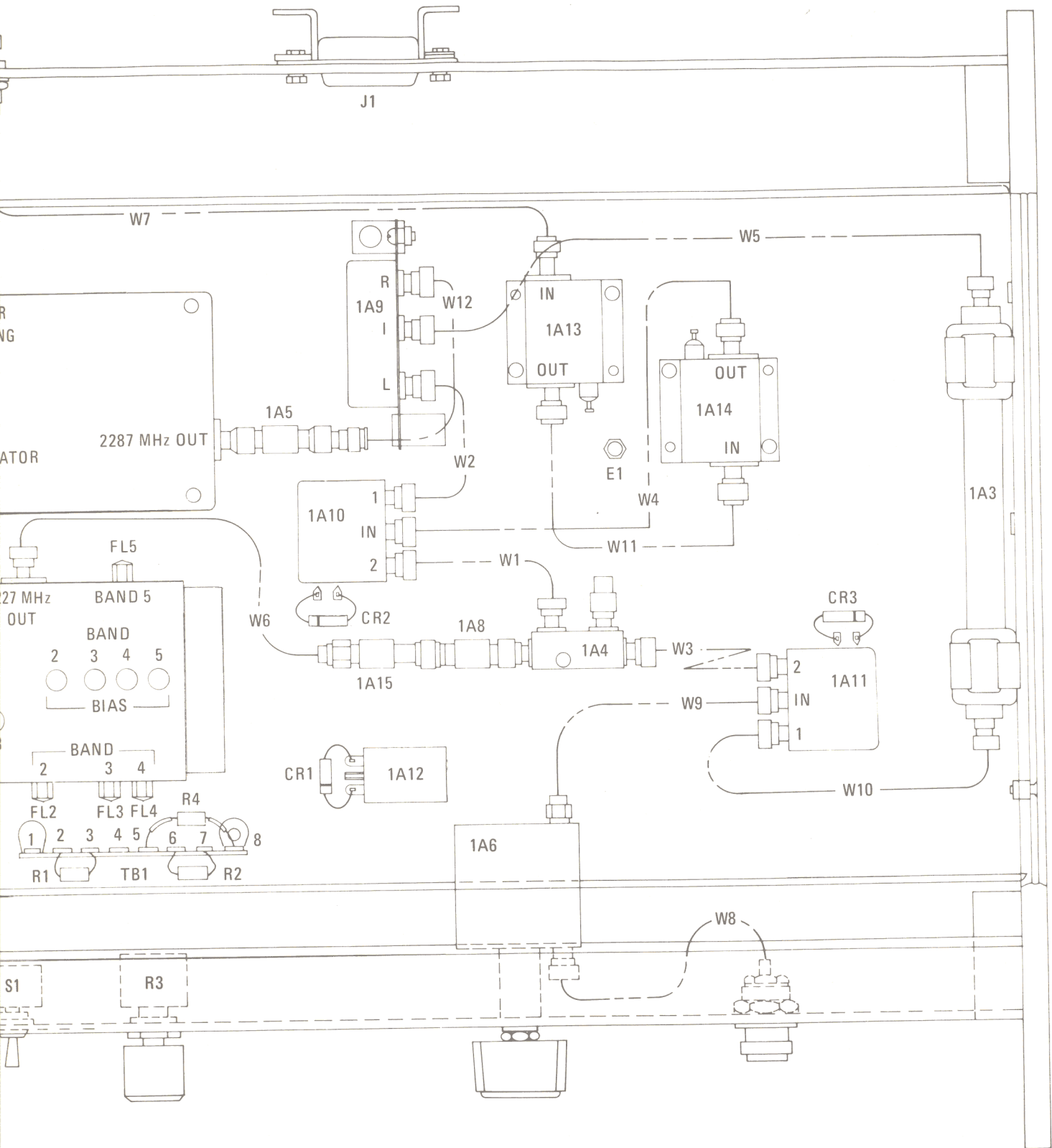


Figure 5-1. Tracking Generator Fixed and Adjustable Component Location Diagram

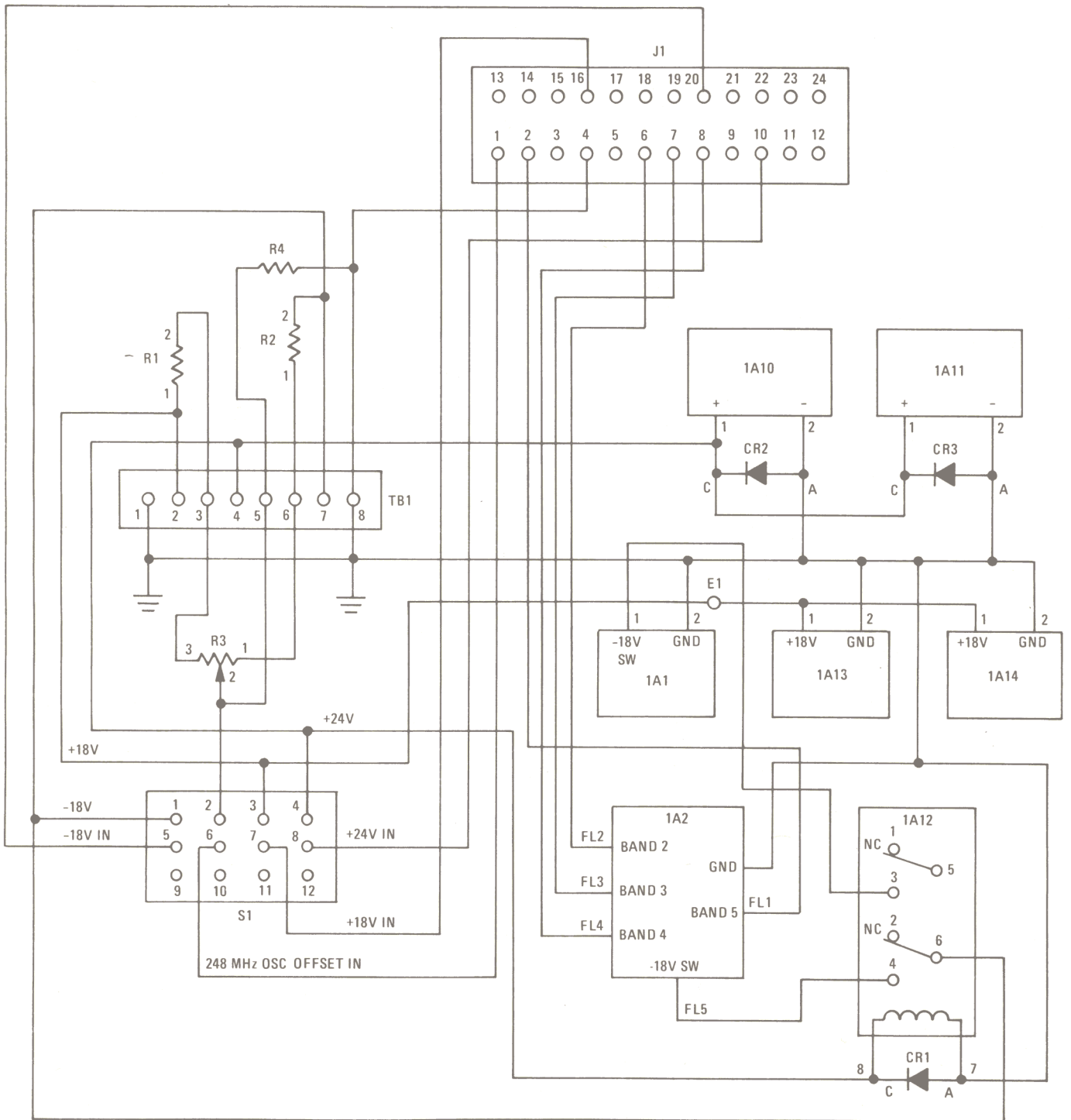
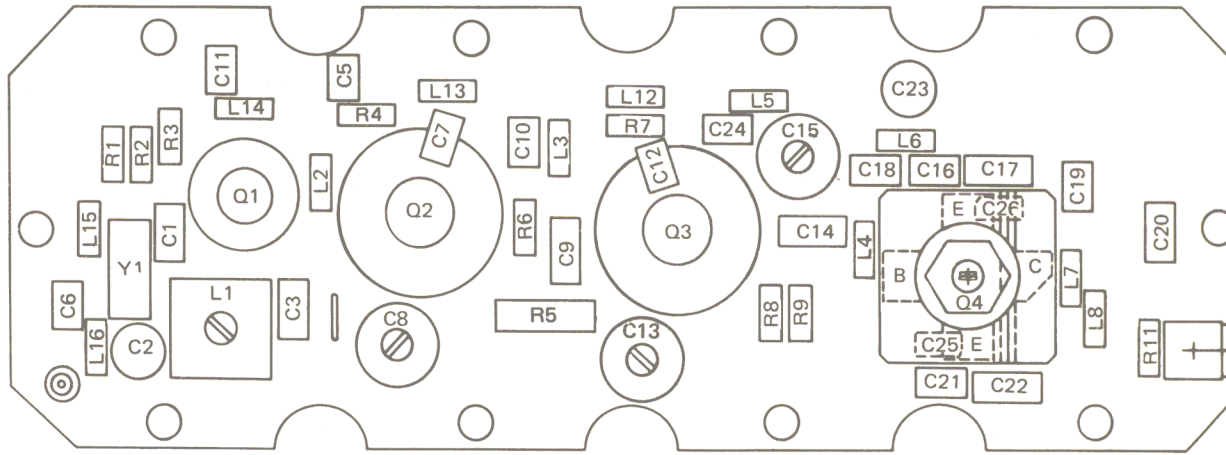
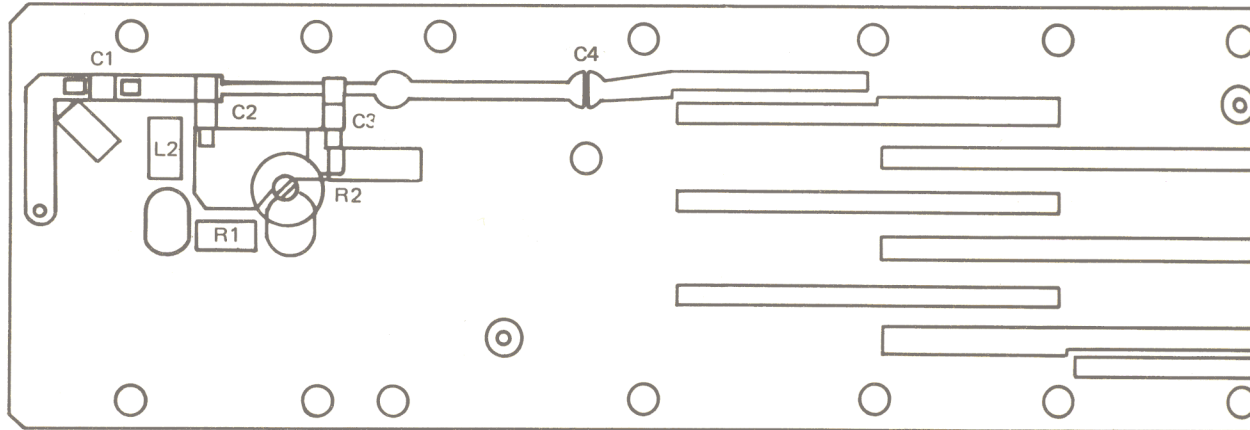


Figure 5-2. 70727 Tracking Generator, Wiring Diagram



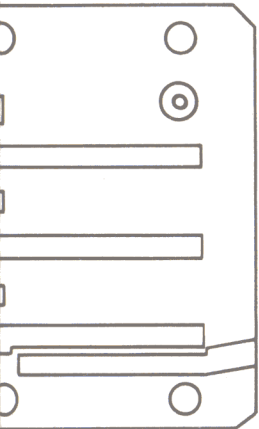
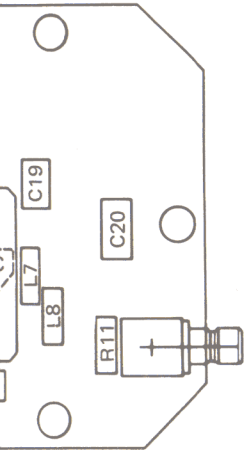
1A1A2 OSCILLATOR/DRIVER PC BOARD



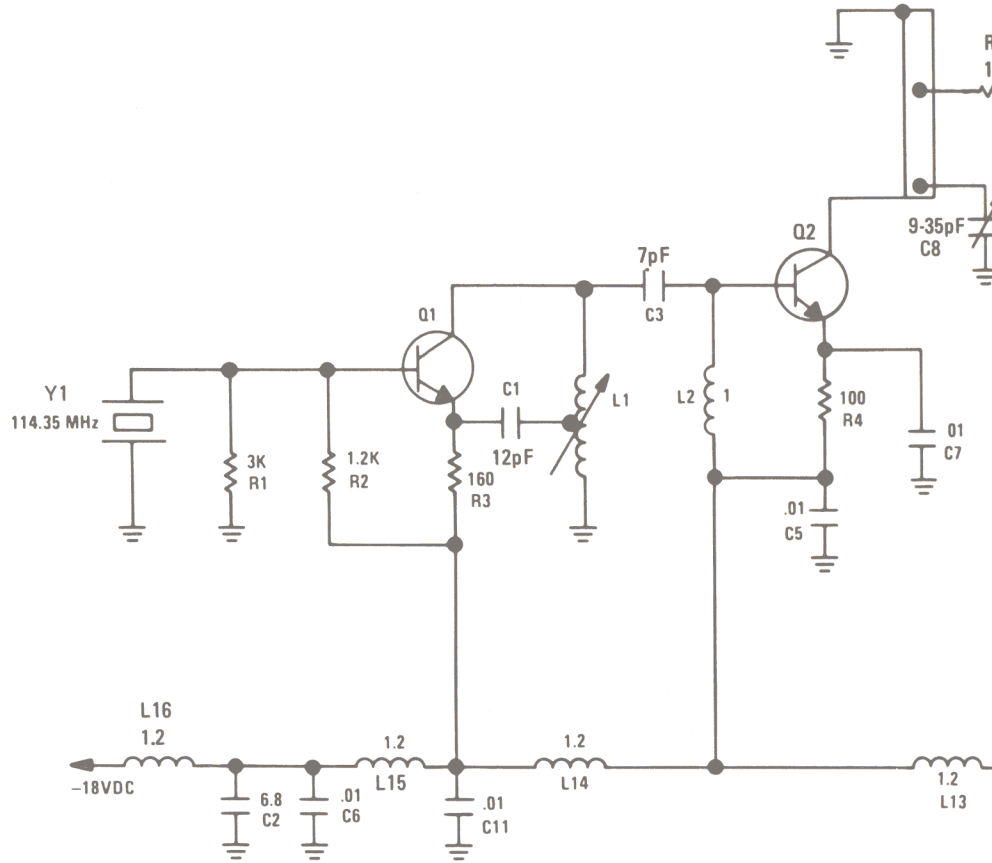
1A1A1 MULTIPLIER/FILTER PC BOARD

NOTES:
 Unless otherwise specified
 Resistor values are in ohms
 Capacitor values are in microfarads
 Inductor values are in millihenries

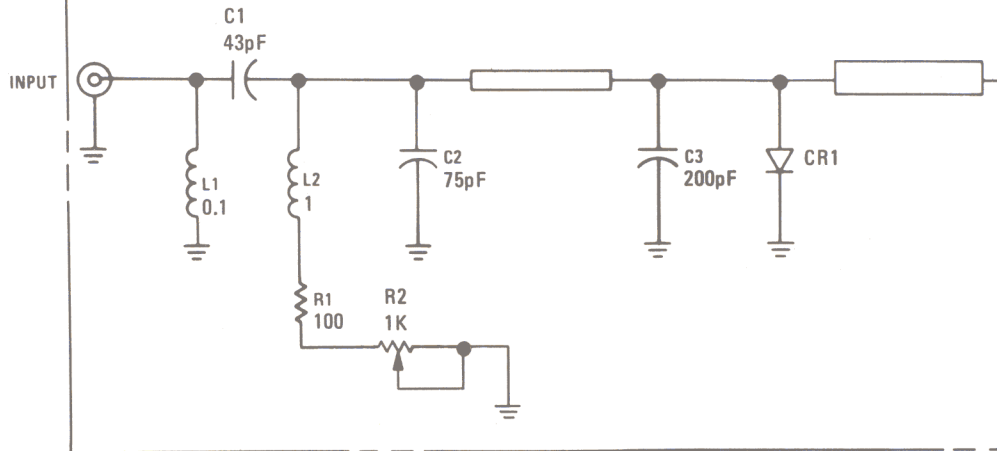
1A1 2287 MHz OSCILLATOR ASSEMBLY



1A1A2 OSCILLATOR/DRIVER PC BOARD

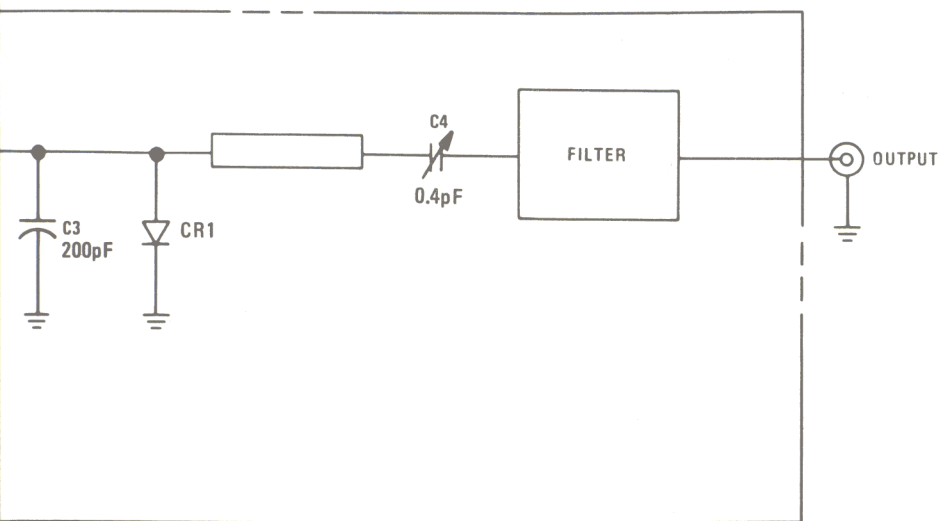
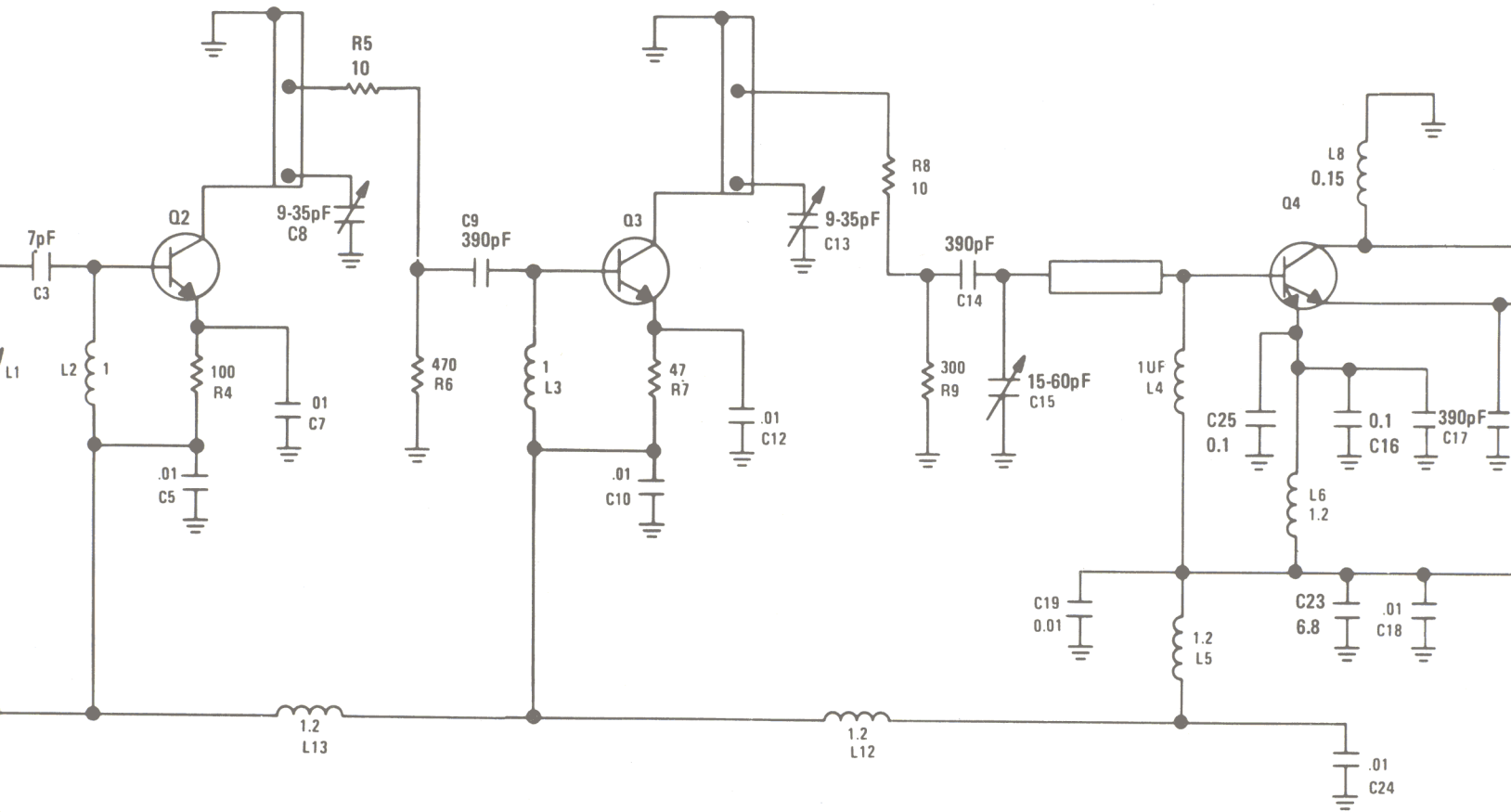


1A1A1 MULTIPLIER/FILTER PC BOARD



NOTES:

Unless otherwise specified:
Resistor values are in ohms
Capacitor values are in μF
Inductor values are in μH



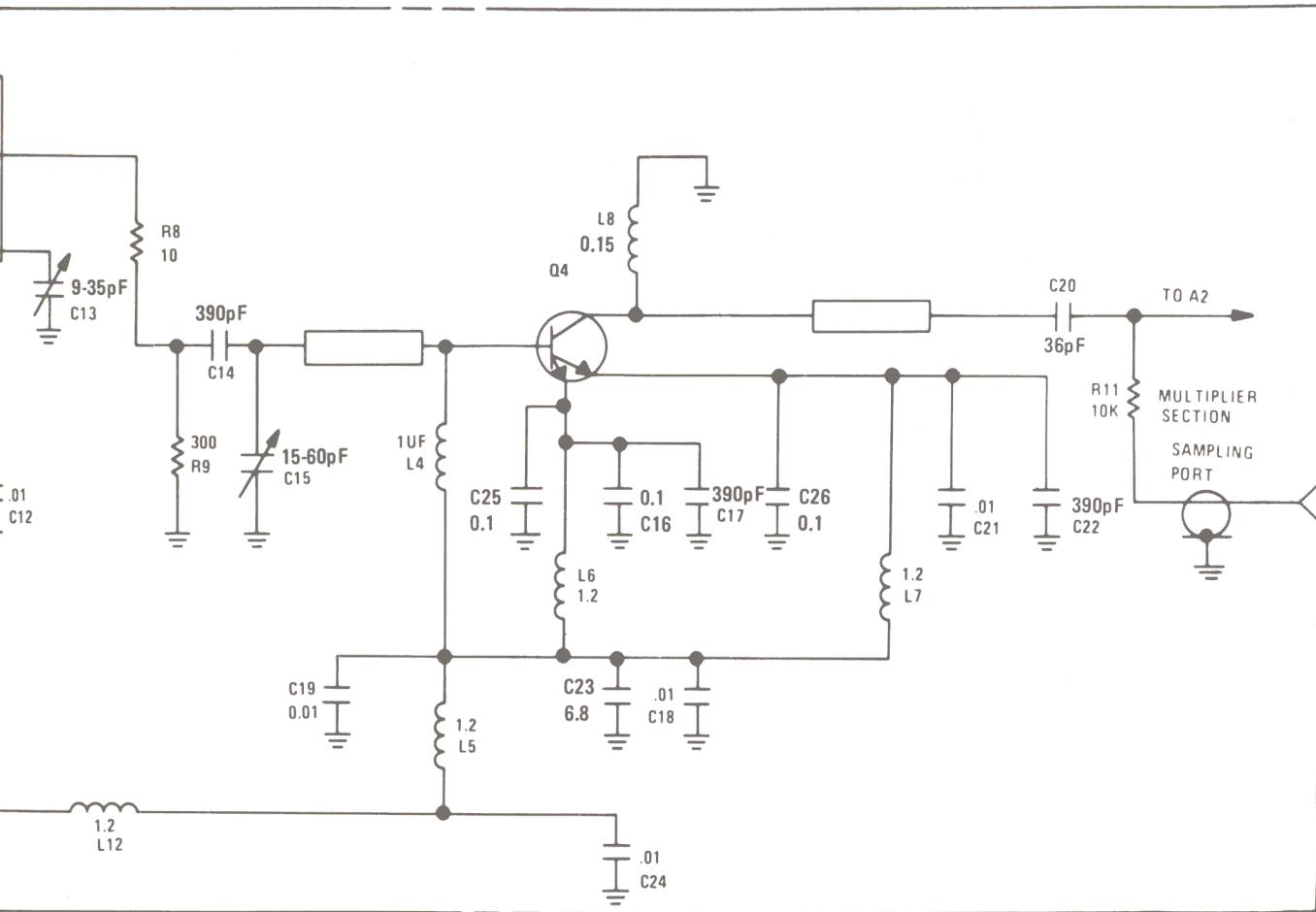
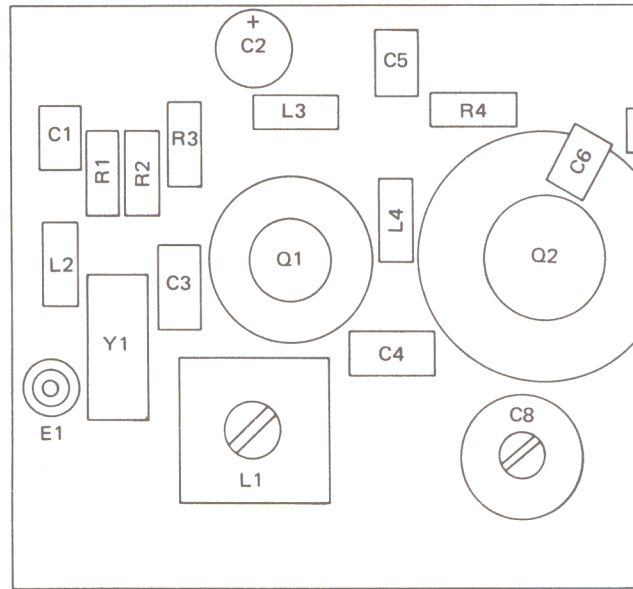


Figure 5-3. 2287 MHz Oscillator Assembly 1A1, Schematic Diagram

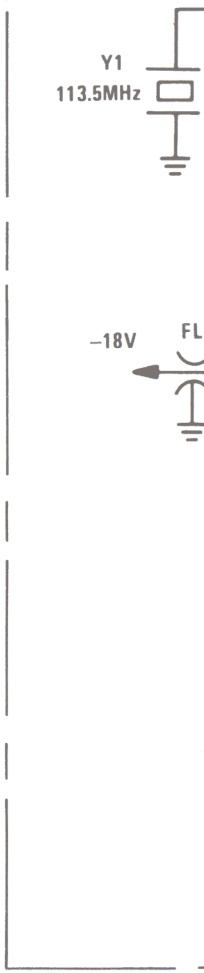
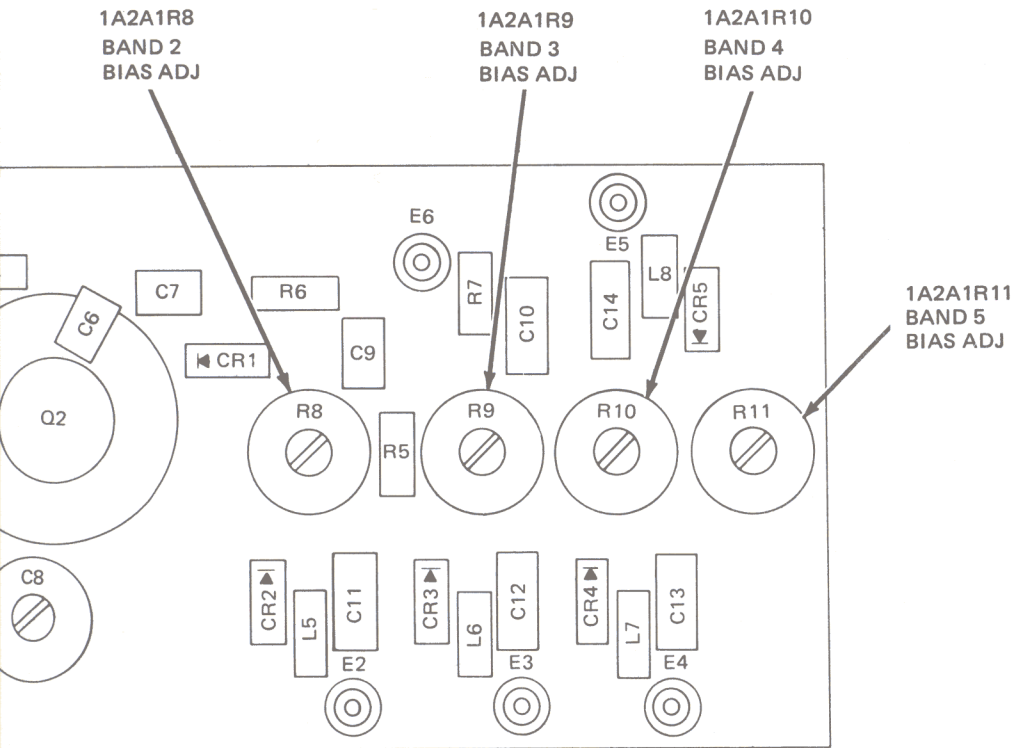
1A2
BAN
BIA



NOTES:
Unless otherwise
Resistor values
Capacitor values
Inductor values

1A2 227 MHz OSCILLATOR ASS

1A2A1 227 MHz O



NOTES:
Unless otherwise specified:
Resistor values are in ohms
Capacitor values are in μ F
Inductor values are in μ H

1A2 227 MHz OSCILLATOR ASSEMBLY

1A2A1 227 MHz OSCILLATOR PC BOARD

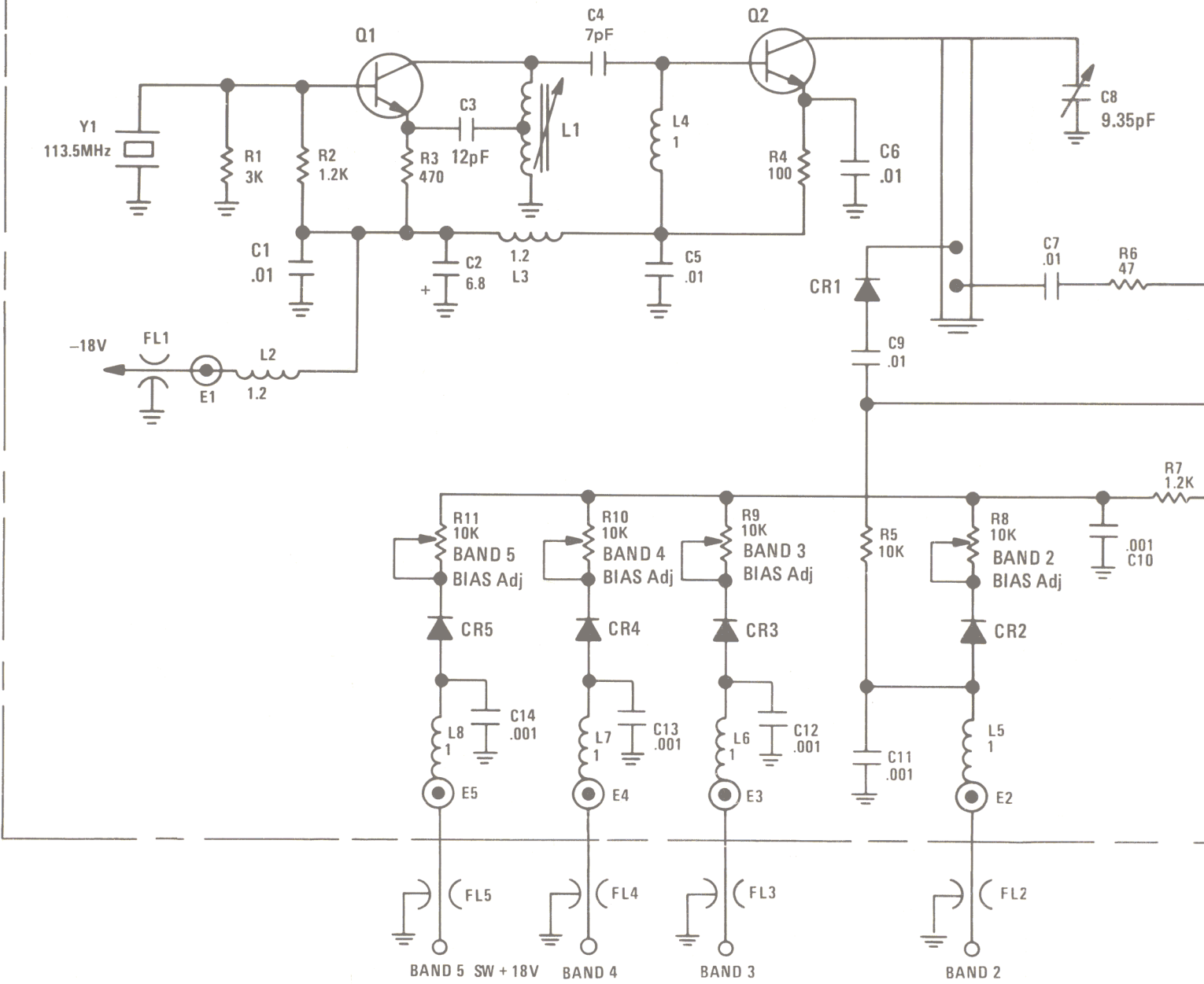


Figure 5-4. 2

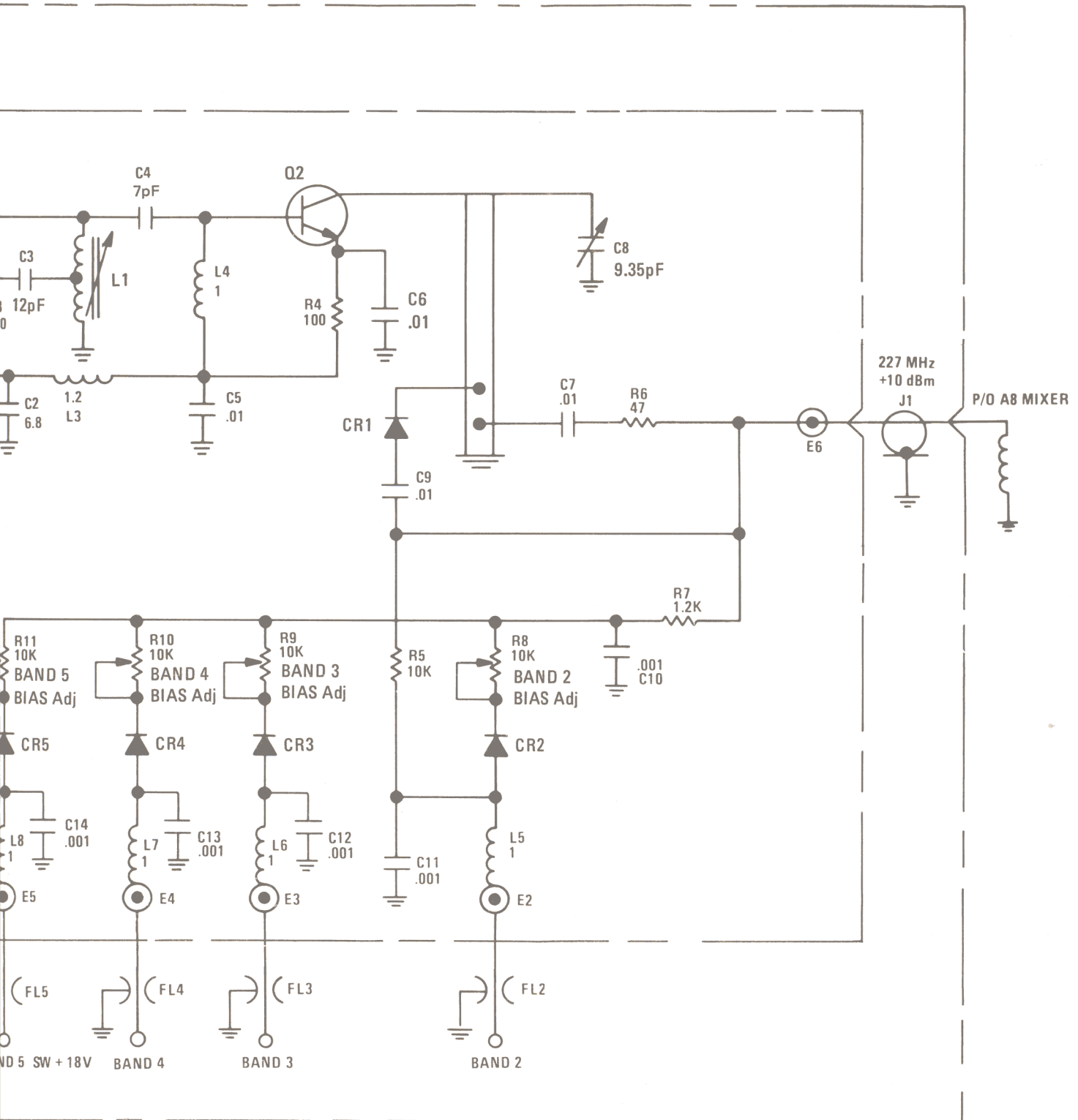


Figure 5-4. 227 MHz Oscillator Assembly 1A2, Schematic Diagram

SECTION 6

APPLICATIONS

The following represent the block diagrams for some of the tests that can be run using the AILTECH 70727 Tracking Generator.

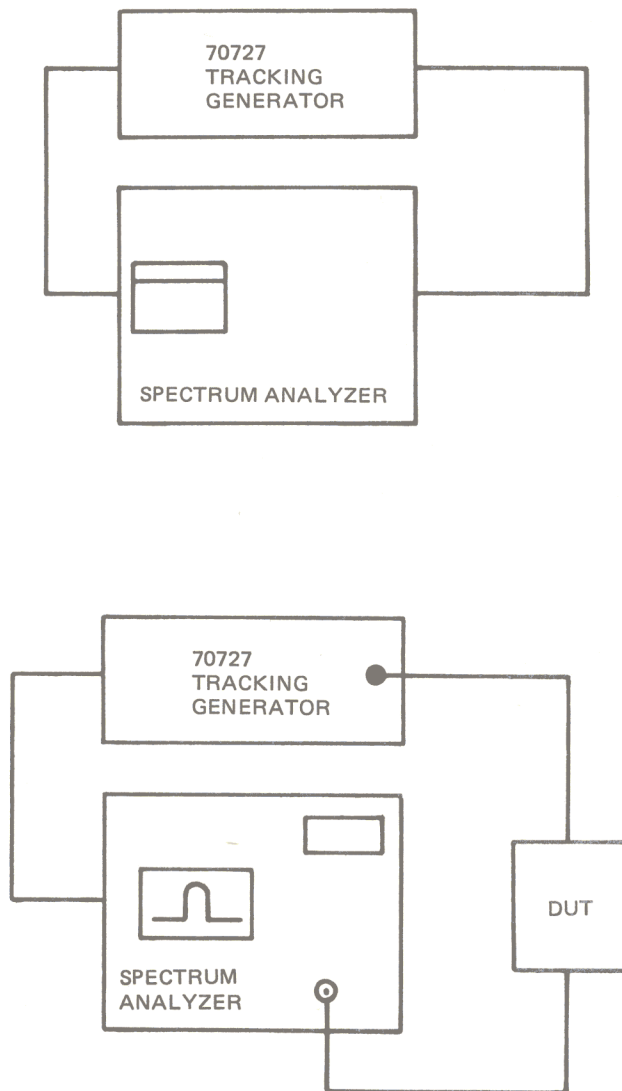
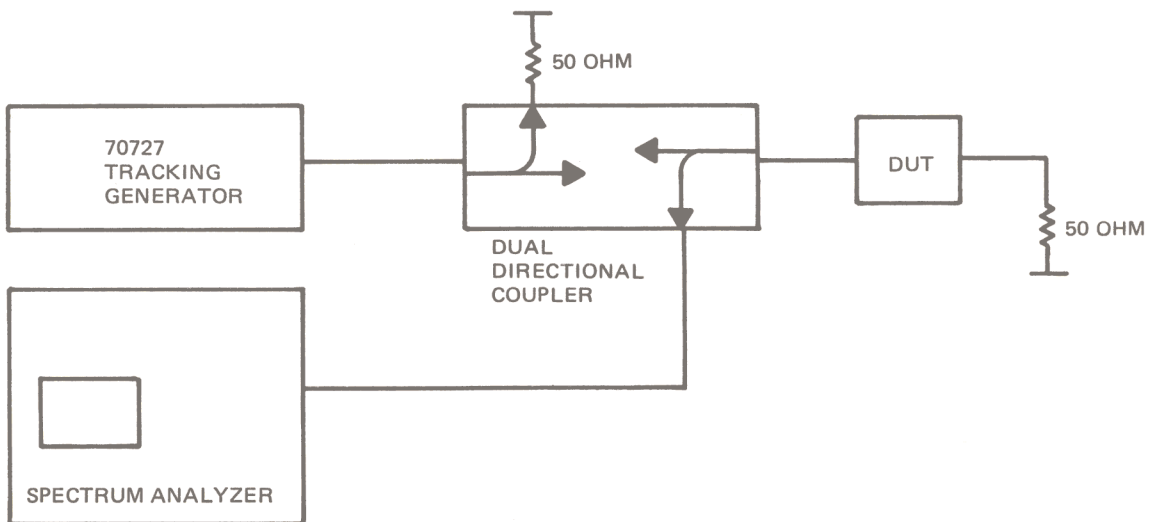
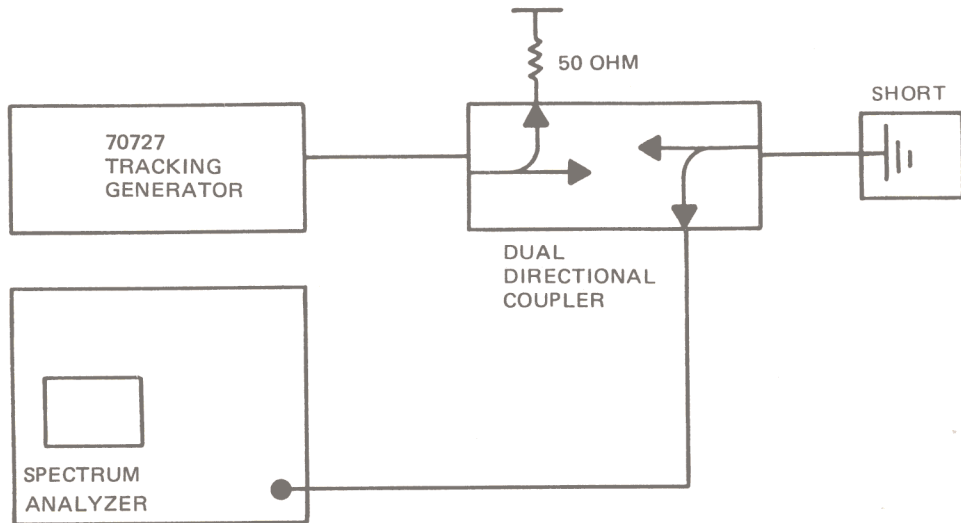


Figure 6-1. Insertion Loss Test Setup



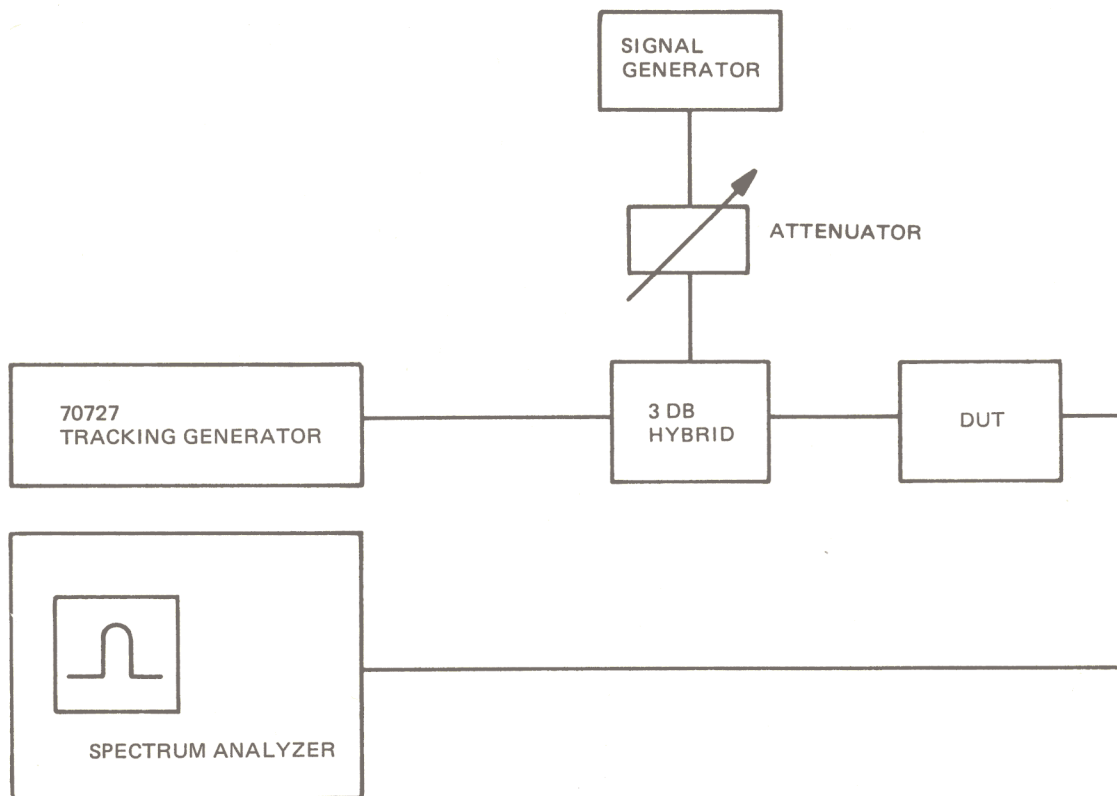


Figure 6-3. Gain With Frequency Markers Test Setup

SECTION 7

REPLACEABLE PARTS LIST

7-1. INTRODUCTION

This section contains the replaceable parts list for the AILTECH 70727 Tracking Generator. The parts list is in reference designation order. The parts list (Table 7-1) contains the reference designation, AILTECH part number, quantity, description, manufacturers code, and manufacturers part number. Table 7-2 lists the manufacturers code and the manufacturers name and address. Table 7-3 contains a listing of recommended spare parts that should be maintained in case of a failure of the AILTECH 70727 Tracking Generator.

Table 7-1. Replaceable Parts List

Reference Designation	AILTECH Part Number	Qty	Description	Mfr. Code	Mfr Part Number
1	295600-2	1	TRACKING GENERATOR ASSEMBLY 70727	56872	295600-2
CR1	299251-1	3	DIODE	72314	1N4009
CR2	299251-1		DIODE	72314	1N4009
CR3	299251-1		DIODE	72314	1N4009
E1	990308-1	1	TERMINAL, STAND OFF	56872	990308-1
J1	294349	1	CONNECTOR, POWER INPUT	02660	57-40240
P1/P25	298638	1	INTERFACE CABLE	56872	298638
R1	299701-103	2	RESISTOR, 10K, 1/4W	01121	RC07GF103J
R2	299701-103		RESISTOR, 10K, 1/4W	01121	RC07GF103J
R3	294753-1	1	RESISTOR VARIABLE, 5K	53110	8136-5K
R4	299701-152	1	RESISTOR, 1.5K, 1/4W	01121	RC07GF152J
S1	294532	1	SWITCH, POWER	09353	7401-PY-PZ-BE
TB1	293972	1	TERMINAL, STRIP	56872	293972
W1	230633-49	2	CABLE ASSEMBLY	56872	230633-49
W2	298505-3	1	CABLE ASSEMBLY	56872	298505-3
W3	298505-16	1	CABLE ASSEMBLY	56872	298505-16
W4	298052-1	2	CABLE ASSEMBLY	56872	298052-1
W5	298052-1		CABLE ASSEMBLY	56872	298052-1
W6	298505-52	1	CABLE ASSEMBLY	56872	298505-52
W7	298505-69	1	CABLE ASSEMBLY	56872	298505-69
W8	298505-70	1	CABLE ASSEMBLY	56872	298505-70
W9	298505-71	1	CABLE ASSEMBLY	56872	298505-71
W10	298505-72	1	CABLE ASSEMBLY	56872	298505-72
W11	298505-13	1	CABLE ASSEMBLY	56872	298505-13
W12	298505-78	1	CABLE ASSEMBLY	56872	298505-78
1A1	295590	1	2287 MHz OSCILLATOR ASSEMBLY	56872	295590
FL1	293609	1	CAPACITOR, FILTER	72982	1201-082
	295393	1	CONNECTOR	56872	295393
1A1A1	295592	1	MULTIPLIER/FILTER PC BOARD ASSEMBLY	56872	295592
C1	294225-3	1	CAPACITOR, 43pF	29990	100B-430-F-MS
C2	294225-2	1	CAPACITOR, 75pF	29990	100B-750-F-MS
C3	294225-1	1	CAPACITOR, 200pF	29990	100B-201-F-MS
C4	295265	1	TUNING SCREW ASSEMBLY 0.4pF	56872	295265
CR1	295394	1	STEP RECOVERY DIODE	21847	A45360

Table 7-1. Replaceable Parts List (Continued)

Reference Designation	AILTECH Part Number	Qty	Description	Mfr. Code	Mfr Part Number
1A1A1L1	299237-94	1	INDUCTOR, .1 μ H	99800	1025-94
L2	299237-20	1	INDUCTOR, 1.0 μ H	99800	1025-20
R1	299701-101	1	RESISTOR, 100 Ω	01121	RC07GF101J
R2	294747	1	RESISTOR, VARIABLE, 1K	80294	3339P-1-102
1A1A2	295310-2	1	OSCILLATOR/DRIVER PC BOARD ASSEMBLY	56872	295310-2
C1	299241-120	1	CAPACITOR, 12pF	72136	DM5CC-120J
C2	299240-1	2	CAPACITOR, 6.8 μ F	31433	T368B685M035AS
C3	299241-070	1	CAPACITOR, 7pF	72136	DM5CC-070D
C4		1	NOT USED		
C5	299245-2	11	CAPACITOR, .01 μ F	72982	8121-M058-651-103M
C6	299245-2		CAPACITOR, .01 μ F	72982	8121-M058-651-103M
C7	299245-2		CAPACITOR, .01 μ F	72982	8121-M058-651-103M
C8	293747-2	2	CAPACITOR, VARIABLE, 9-35pF	72982	538-011-D9-35
C9	299250-391	4	CAPACITOR, 390pF	14655	CM04FA391J03
C10	299245-2		CAPACITOR, .01 μ F	72982	8121-M058-651-103M
C11	299245-2		CAPACITOR, .01 μ F	72982	8121-M058-651-103M
C12	299245-2		CAPACITOR, .01 μ F	72982	8121-M058-651-103M
C13	293747-2		CAPACITOR, VARIABLE, 9-35pF	72982	538-011-D9-35
C14	299250-391		CAPACITOR, 390pF	14655	CM04FA391J03
C15	293747-1	1	CAPACITOR, VARIABLE, 15-60pF	72982	538-011-F15-60
C16	299245-2		CAPACITOR, .01 μ F	72982	8121-M058-651-103M
C17	299250-391		CAPACITOR, 390pF	14655	CM04FA391J03
C18	299245-2		CAPACITOR, .01 μ F	72982	8121-M058-651-103M
C19	299245-2		CAPACITOR, .01 μ F	72982	8121-M058-651-103M
C20	299241-360	1	CAPACITOR, 36pF	72136	DM5EC-360J
C21	299245-2		CAPACITOR, .01 μ F	72982	8121-M058-651-103M
C22	299250-391		CAPACITOR, 390pF	14655	CM04FA391J03
C23	299240-1		CAPACITOR, 6.8 μ F	31433	T368B685M035AS
C24	299245-2		CAPACITOR, .01 μ F	72982	8121-M058-651-103M
C25	299245-1	2	CAPACITOR, 0.1 μ F, 50V	72982	8121-050-651-104M
C26	299245-1		CAPACITOR, 0.1 μ F, 50V	72982	8121-050-651-104M
E1	293310	1	TERMINAL	71279	1597-2-01
L1	298749-23	1	INDUCTOR, VARIABLE	56872	298749-23
L2	299237-20	3	INDUCTOR, VARIABLE, 1.0 μ H	99800	1025-20
L3	299237-20		INDUCTOR, VARIABLE, 1.0 μ H	99800	1025-20
L4	299237-20		INDUCTOR, VARIABLE, 1.0 μ H	99800	1025-20
L5	299237-22	8	INDUCTOR, 1.2 μ H	99800	1025-22
L6	299237-22		INDUCTOR, 1.2 μ H	99800	1025-22
L7	299237-22		INDUCTOR, 1.2 μ H	99800	1025-22
L8	294278-2		26GA WIRE, NYLESE	56872	294278-2
L9			NOT USED		
L10			NOT USED		
L11			NOT USED		
L12	299237-22		INDUCTOR, 1.2 μ H	99800	1025-22
L13	299237-22		INDUCTOR, 1.2 μ H	99800	1025-22
L14	299237-22		INDUCTOR, 1.2 μ H	99800	1025-22
L15	299237-22		INDUCTOR, 1.2 μ H	99800	1025-22
L16	299237-22		INDUCTOR, 1.2 μ H	99800	1025-22
Q1	294177	1	TRANSISTOR	04713	2N4072
Q2	230541-2	2	TRANSISTOR	73445	A210
Q3	230541-2		TRANSISTOR	73445	A210
Q4	294178	1	TRANSISTOR	04713	2N6080
R1	299701-302	1	RESISTOR, 3K, 1/4W	01121	RC07GF302J
R2	299701-122	1	RESISTOR, 1.2K, 1/4W	01121	RC07GF122J
R3	299701-161	1	RESISTOR, 160 Ω , 1/4W	01121	RC07GF161J

Table 7-1. Replaceable Parts List (Continued)

Reference Designation	AILTECH Part Number	Qty	Description	Mfr. Code	Mfr Part Number
1A1A2R4	299701-101	1	RESISTOR, 100Ω, 1/4W	01121	RC07GF101J
R5	299701-100	2	RESISTOR, 10Ω, 1/4W	01121	RC07GF100J
R6	299701-471	1	RESISTOR, 470Ω, 1/4W	01121	RC07GF471J
R7	299701-470	1	RESISTOR, 47Ω, 1/4W	01121	RC07GF470J
R8	299701-100		RESISTOR, 10Ω, 1/4W	01121	RC07GF100J
R9	299701-201		RESISTOR, 300Ω, 1/4W	01121	RC07GF301J
R10			NOT USED		
R11	299701-103		RESISTOR, 10K, 1/4W	01121	RC07GF103J
Y1	230479-8	1	CRYSTAL, 114.35 MHz	56872	230479-8
	299235-1		CONNECTOR, RIGHT ANGLE	98291	51-353-0000
1A2	295598-1	1	227 MHz OSCILLATOR ASSEMBLY	56872	295598-1
FL1	293608	5	FILTER, CAPACITOR	72982	1201-066
FL2	293608		FILTER, CAPACITOR	72982	1201-066
FL3	293608		FILTER, CAPACITOR	72982	1201-066
FL4	293608		FILTER, CAPACITOR	72982	1201-066
FL5	293608		FILTER, CAPACITOR	72982	1201-066
J1	294344	1	CONNECTOR, 3MM	98291	50-645-4524-31
1A2A1	295575	1	227 MHz OSCILLATOR PC BOARD	56872	295575
C1	299245-2	5	CAPACITOR, .01μF	72982	8121-M058-651-103M
C2	299240-1	1	CAPACITOR, 6.8μF	31433	T368B685M035AS
C3	299241-120	1	CAPACITOR, 12pF, 5%	72136	DM5CC-120J
C4	299241-070	1	CAPACITOR, 7pF, 5%	72136	DM5CC-070D
C5	299245-2		CAPACITOR, .01μF	72982	8121-M058-651-103M
C6	299245-2		CAPACITOR, .01μF	72982	8121-M058-651-103M
C7	299245-2		CAPACITOR, .01μF	72982	8121-M058-651-103M
C8	293747-2	1	CAPACITOR, VARIABLE, 9-35pF	72982	538-011-D9-35
C9	299245-2		CAPACITOR, .01μF	72982	8121-M058-651-103M
C10	299243	5	CAPACITOR, .001μF	56289	CK60AW102M
C11	299243		CAPACITOR, .001μF	56289	CK60AW102M
C12	299243		CAPACITOR, .001μF	56289	CK60AW102M
C13	299243		CAPACITOR, .001μF	56289	CK60AW102M
C14	299243		CAPACITOR, .001μF	56289	CK60AW102M
CR1	299251-1	5	DIODE	72314	1N4009
CR2	299251-1		DIODE	72314	1N4009
CR3	299251-1		DIODE	72314	1N4009
CR4	299251-1		DIODE	72314	1N4009
CR5	299251-1		DIODE	72314	1N4009
E1	293310	6	TERMINAL	71279	1597-2-01
E2	293310		TERMINAL	71279	1597-2-01
E3	293310		TERMINAL	71279	1597-2-01
E4	293310		TERMINAL	71279	1597-2-01
E5	293310		TERMINAL	71279	1597-2-01
E6	293310		TERMINAL	71279	1597-2-01
L1	298749-23	1	INDUCTOR, VARIABLE	56872	298749-23
L2	299237-22	2	INDUCTOR, 1.2μH	99800	1025-22
L3	299237-22		INDUCTOR, 1.2μH	99800	1025-22
L4	299237-20	5	INDUCTOR, 1.0μH	99800	1025-20
L5	299237-20		INDUCTOR, 1.0μH	99800	1025-20
L6	299237-20		INDUCTOR, 1.0μH	99800	1025-20
L7	299237-20		INDUCTOR, 1.0μH	99800	1025-20
L8	299237-20		INDUCTOR, 1.0μH	99800	1025-20
Q1	294177	1	TRANSISTOR	04713	2N4072
Q2	294147	1	TRANSISTOR	04713	2N3866
R1	299701-302	1	RESISTOR, 3K, 1/4W	01121	RC07GF302J
R2	299701-122	2	RESISTOR, 1.2K, 1/4W	01121	RC07GF122J
R3	299701-471	1	RESISTOR, 470Ω, 1/4W	01121	RC07GF471J

Table 7-1. Replaceable Parts List (Continued)

Reference Designation	AILTECH Part Number	Qty	Description	Mfr. Code	Mfr Part Number
1A2A1R4	299701-101	1	RESISTOR, 100Ω, 1/4W	01121	RC07GF101J
R5	299701-103	1	RESISTOR, 10K, 1/4W	01121	RC07GF103J
R6	299701-470	1	RESISTOR, 47Ω, 1/4W	01121	RC07GF470J
R7	299701-122	1	RESISTOR, 1.2K, 1/4W	01121	RC07GF122J
R8	294748	4	RESISTOR, VARIABLE, 10K	80294	3339P-1-103
R9	294748		RESISTOR, VARIABLE, 10K	80294	3339P-1-103
R10	294748		RESISTOR, VARIABLE, 10K	80294	3339P-1-103
R11	294748		RESISTOR, VARIABLE, 10K	80294	3339P-1-103
Y1	230479-7	1	CRYSTAL, 113.5 MHz	56872	230479-7
1A3	230191	1	2 GHz LOW PASS FILTER	56872	230191
1A4	230194	1	DIRECTIONAL COUPLER	56872	230194
1A5	230195-1	2	3dB FIXED ATTENUATOR	56872	230195-1
1A6	230212	1	RF ATTENUATOR	93459	9029-60
1A7			NOT USED		
1A8	230478	1	HARMONIC MIXER	56872	230478
1A9	230567-1	1	MICROWAVE MIXER	56872	230567-1
1A10	231079	2	RF SWITCH	56872	231079
1A11	231079		RF SWITCH	56872	231079
1A12	294777	1	RELAY	73949	IR1335-2C-24D
1A13	297036-2	2	AMPLIFIER	56872	297036-2
1A14	297036-2		AMPLIFIER	56872	297036-2
1A15	230195-1		3dB FIXED ATTENUATOR	56872	230195-1

Table 7-2. Federal Supply Code Manufacturers

Vendor Code	Manufacturer	Address
01121	Allen-Bradley Company	1201 South Second Street, Milwaukee, WI 53204
02660	Bunker-Ramo Corporation Amphenol Connector Division	2122 York Road, Oak Brook, IL 60521
04713	Motorola Semi-Conductor Products	P.O. Box 20912 Phoenix, AZ 85036
09353	C&K Components Inc.,	15 Riverdale Avenue, Newton, MA 02158
14655	Cornell-Dubilier Electronics	150 Avenue L, Newark, NJ 07105
21847	Aertech Industries,	825 Stewart Drive, Sunnyvale, CA 94086
29990	American Technical Ceramics	1 Norden Lane, Huntington Station, NY 11746
31433	Kemet, Union Carbide Corporation	P.O. Box 5928 Greenville, SC 29606
53110	Beckman Instruments	1630 South State College, Anaheim, CA
56872	Eaton Corporation Electronic Instrumentation Division	2070 Fifth Avenue Ronkonkoma, NY 11779
71279	Cambridge Thermionic Corporation	445 Concord Avenue, Cambridge, MA 02138
72136	Electro-Motive Mfg., Company	Williamatic, CT 06226
72314	Fairchild Camera Instrument Corporation	464 Ellis Street Mountain View, CA 94042
72982	Erie Technological Products	P.O. Box 961, Erie, Pa 16512
73445	Amperex Electronic Corporation	Providence Pike, Slatersville, RI 02876

Table 7-2. Federal Supply Code Manufacturers (Continued)

Vendor Code	Manufacturer	Address
73949	Guardian Electric Company	1550 West Carroll Avenue, Chicago, IL 60607
80294	Bourns Incorporated	1200 Columbia Avenue Riverside, CA 92507
93459	Weinschel Engrg., Company	One Weinschel Lane, Gaithersberg, MD 20760
98291	Sealectro Corporation	225 Hoyt Street, Mamaroneck, NY 10543
99800	Delevan Division American Precision Inds.	270 Quaker Road East Aurora, NY 14052

Table 7-3. Recommended Spare Parts

Name	Part Number
RF Switch	231079
Harmonic Mixer	230478
2287 MHz Oscillator	295590
Amplifier	297036-2
Microwave Mixer	230567-1

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