Tektronix®
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TDC

TELEVISION DOWN CONVERTER

INSTRUCTION MANUAL

Tektronix, Inc.
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WARRANTY

Tektronix warrants that this product is free from defects in materials and workmanship. The warranty period is one (1) year from the date of shipment. Tektronix will, at its option, repair or replace the product if Tektronix determines it is defective within the warranty period and if it is returned, freight prepaid, to a service center designated by Tektronix.

Tektronix is not obligated to furnish service under this warranty

a. to repair damage resulting from attempts by personnel other than Tektronix representatives to install, repair, or service the product;
b. to repair damage resulting from improper use or from connecting the product to incompatible equipment;
c. if personnel other than Tektronix representatives modify the hardware or software.

There is no implied warranty of fitness for a particular purpose. Tektronix is not liable for consequential damages.

PREFACE

This manual documents the TEKTRONIX TDC (Television Down Converter). The TDC is a plug-in for the TEKTRONIX 1450 Television Demodulator. The 1450 Instruction Manual should also be consulted for information about operation of the TDC and 1450 as a system.

This Preface describes the contents of the manual, with a brief description of each section within the manual. The Operators Safety and the Servicing Safety Summary are also included here.

The Table of Contents is a detailed list of all important pieces of information and their location in the manual.

The manual is split into two parts, Operating Information and Service Information. All pertinent information regarding the operation of the instrument is located in the Operator's part. This will be of use to both the operator and the service technician. The Service part contains that information necessary to effectively service the instrument. This information should be used by only qualified service technicians.

The Operator's part includes Sections 1 and 2: Section 1—Introduction and Specifications includes a general description of the instrument, and the specifications.

Section 2—Operating Instructions, includes information on installation, connectors, and operator familiarization.

The Service part contains Sections 3 through 9:

Section 3—Theory of Operation, begins with a general overview of the instrument, followed by a detailed circuit description.

Section 4—Calibration, includes a Performance Check and an Adjustment Procedure, and an equipment list.

Section 5—Maintenance, covers the standard electrical and mechanical maintenance; plus any special tools, unusual components, and special handling.

Section 6—Options, documents any options available with the instrument.

Section 7—Replaceable Electrical Parts list, includes ordering information and part numbers for all replaceable electrical parts.

Section 8—Diagrams, includes a Block Diagram, Schematics, Circuit Board illustrations, component basing diagrams, waveforms, parts locating charts, and adjustment location illustrations.

Section 9—Replaceable Mechanical Parts list, refers to an exploded view drawing of the instrument, and lists ordering information for all replaceable mechanical parts.

Change and correction information after the manual has been printed is located behind a tabbed page at the rear of the manual.

The text and diagrams are in accord with, and based on, the following standards of the American National Standards Institute, Inc. (ANSI):

ANSI Y1.1-1972, Abbreviations

ANSI Y32.2-1975, Graphic Symbols

ANSI Y32.14-1973, Graphic Symbols (Logic)

ANSI Y32.16-1975, Reference Designators

TABLE OF CONTENTS

PART I—OPERATORS INFORMATION

PART II—SERVICE INFORMATION

WARNING

THE FOLLOWING SERVICING INSTRUCTIONS ARE FOR USE BY QUALIFIED PERSONNEL ONLY. TO AVOID PERSONAL INJURY, DO NOT PERFORM ANY SERVICING OTHER THAN THAT CONTAINED IN OPERATING INSTRUCTIONS UNLESS YOU ARE QUALIFIED TO DO SO.

TABLE OF CONTENTS (cont)

TABLE OF CONTENTS (cont)

LIST OF ILLUSTRATIONS

OPERATORS SAFETY SUMMARY

The general safety information in this part of the summary is for both operating and servicing personnel. Specific warnings and cautions will be found throughout the manual where they apply, but may not appear in this summary.

TERMS

In This Manual

CAUTION statements identify conditions or practices that could result in damage to the equipment or other property.

WARNING statements identify conditions or practices that could result in personal injury or loss of life.

As Marked on Equipment

CAUTION indicates a personal injury hazard not immediately accessible as one reads the marking, or a hazard to property including the equipment itself.

DANGER indicates a personal injury hazard immediately accessible as one reads the marking.

SYMBOLS

Power Source

This product is intended to operate from a power source that will not apply more than 250 volts rms between the supply conductors or between either supply conductor and ground. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.

Grounding the Product

This product is grounded through the grounding conductor of the power cord. To avoid electrical shock, plug the power cord into a properly wired receptacle before connecting to the product input or output terminals. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.

Use the Proper Power Cord

Use only the power cord and connector specified for your product.
Use only a power cord that is in good condition.

Refer cord and connector changes to qualified service personnel.

Use the Proper Fuse

To avoid fire hazard, use only the fuse specified in the parts list for your product, and which is identical in type, voltage rating, and current rating.

Refer fuse replacement to qualified service personnel.

Do Not Operate In Explosive Atmospheres

To avoid explosion, do not operate this product in an atmosphere of explosive gases unless it has been specifically certified for such operation.

Do Not Remove Covers or Panels

To avoid personal injury, do not remove the product covers or panels. Do not operate the product without the covers and panels properly installed.

SERVICING SAFETY SUMMARY

FOR QUALIFIED SERVICE PERSONNEL ONLY

Refer also to the preceding Operators Safety Summary.

Do Not Service Alone

Do not perform internal service or adjustment of this product unless another person capable of rendering first aid and resuscitation is present.

Use Care When Servicing With Power On

Dangerous voltages exist at several points in this product. To avoid personal injury, do not touch exposed connections and components while power is on.

Disconnect power before removing protective panels, soldering, or replacing components.

Power Source

This product is intended to operate from a power source that will not apply more than 250 volts rms between the supply conductors or between either supply conductor and ground. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.

Fig. 1-1. TDC Down Converter.

PART I
OPERATORS INFORMATION

INTRODUCTION AND SPECIFICATION

INTRODUCTION

The TEKTRONIX TDC (Television Down Converter) is a high performance plug-in front end for the TEKTRONIX 1450 Television Demodulator. The system provides an accurate means of analyzing a television transmitter.

TDCs are interchangeable to provide multi-channel operation of the 1450. Phase-lock-loop frequency-control circuitry allows the TDC to have crystal-controlled stability of the local oscillator. The TDC provides selectivity around the channel frequency, converts each channel to an IF frequency compatible with a 1450, and limits intermediate frequency (IF) feedthrough and image frequencies.

A wide AGC range accepts large signals from transmitter test points, or weak signals from an antenna for remote monitoring; all without affecting the bandpass characteristics of the demodulator.

SPECIFICATION

Table 1-1

ELECTRICAL CHARACTERISTICS

Characteristics	Performance Requirement	Supplemental Information
Down Converter		
RF IN		
Z_{in} and Connector		50 Ω SMA.
Return Loss	20 dB or greater.	30 dB or greater with 20 dB attenuation.
Frequency	Single channel ±20 kHz from nominal carrier frequencies.	
Input Signal Level Range	−69 dBm to −3 dBm.	
Image Rejection Ratio	60 dB or greater.	
IF Rejection Ratio	60 dB or greater.	
IF OUTput		
Z_o and Connector		50 Ω BNC.
Level	−64 dBm (with −69 dBm RF input level) to −20 dBm ±0.5 dB (with −25 dBm or greater RF input level).	

Table 1-1 (cont)

Characteristics	Performance Requirement	Supplemental Information
Frequency Visual IF	45.75 MHz ±120 kHz.	37.0 MHz if the TDC is specified to mate with a 1450 Opt. 1 mainframe. 38.9 MHz with a 1450 Opt. 2 mainframe.
Aural IF		4.5 MHz below the Visual IF.
LO OUTput		Used to drive an external test modulator.
Z_o and Connector		50 Ω SMA.
Frequency		Local Oscillator Frequency = Visual Carrier Frequency + Visual IF.
Level	At least −6 dBm	Frequency dependent. Higher levels for lower channels.
TDC J4 Interface		Pin No. / Description 1 −15 V 2 GND 3 +5 V 4 +15 V 5 6 7 8 PIN Driver Logic, A0 9 PIN Driver Logic, A1 10 PIN Driver Logic, A2 11 PIN Driver Logic, A3 12 PIN Driver Logic, A4
Variation in TDC Frequency Response as a function of AGC		
VHF	±0.05 dB or less.	
UHF	±0.1 dB or less.	
System		
RF Attenuator Range	30 dB in 10 dB steps.	Input level range shifts with attenuator. (See Fig. 2-3.)
Noise Figure		
VHF	10 dB or less.	
UHF	11 dB or less.	
AGC Range	66 dB.	
Adjacent Channel Cross-modulation	60 dB or greater down.	Adjacent channel signal less than or equal to the desired channel signal.
2nd Adjacent Channel Cross-modulation	60 dB or greater down.	2nd adjacent channel signal less than or equal to the desired channel signal.

Table 1-1 (cont)

Characteristics	Performance Requirement	Supplemental Information
Variation in System Frequency Response with AGC		
VHF	±0.1 dB or less.	
UHF	±0.15 dB or less.	
Chrominance/Aural Carrier/Visual Carrier Intermodulation	50 dB or greater down.	Standard 3-tone test. Peak-to-peak Video/peak-to-peak 920 kHz.
Readout Accuracy	±1 dB.	
Readout Resolution	±0.1 dB.	
Electromagnetic Susceptability	Up to 10 V/Meter.	
Damage Level at RF Input	1 W maximum.	At any attenuator setting.

Table 1-2

ENVIRONMENTAL CHARACTERISTICS

Characteristics	Information
Temperature	
Operating	0°C to 50°C.
Storage	−50°C to +65°C.
Altitude	
Operating	To 15,000 feet.
Storage	To 50,000 feet.

Table 1-3

PHYSICAL CHARACTERISTICS

Characteristics	Information
Dimensions	
Length	11.125" (28.3 cm)
Width	6.1" (15.5 cm)
Height	2.6" (6.6 cm)
Weight	5 lbs. (2.3 kg)

OPERATING INSTRUCTIONS

This section includes information on installation, and controls and connectors.

SHIPPING CARTON

At installation time, save the shipping carton and packing materials for repackaging in case reshipment becomes necessary. See the Maintenance section of this manual for repackaging instructions.

INSTALLATION

Slide the TDC (Television Down Converter) for the desired channel into the slot in the 1450 mainframe. Be sure that the TDC is firmly seated, then secure it in place with the two thumbscrews. (See Fig. 2-1).

Using the 50 Ω BNC and SMA cables from the 1450 accessories kit, connect the RF and IF signal lines between the mainframe and the TDC. The SMA connectors should be tightened at least finger tight, and preferably a little tighter using a 5/16 inch open-end wrench.

CONNECTORS

Refer to Fig. 2-2 for the location of the connectors.

RF IN—50 Ω SMA connector accepts the RF through from the 0 to 30 dB attenuator via the SMA-to-SMA double shielded cable and the front-panel RF OUT connector. Input range to this connector is −69 dBm to −3 dBm.

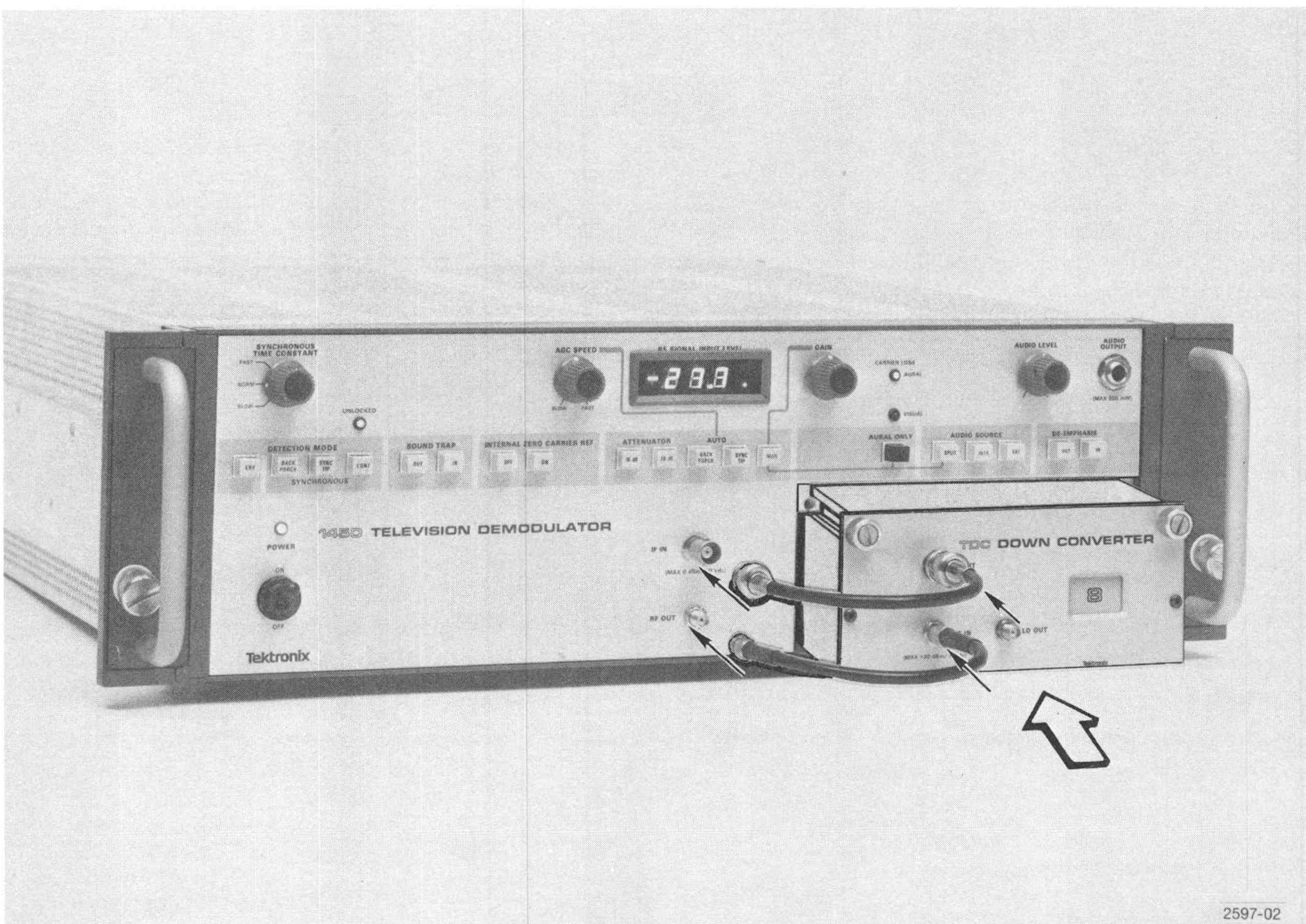

Fig. 2-1. Installing the TDC in a 1450 Television Demodulator mainframe.

IF OUT—50 Ω BNC output connected to the IF IN via a 50 Ω BNC-to-BNC cable. Output level is −20 dBm to −64 dBm depending upon the RF Input level and the 1450 AGC.

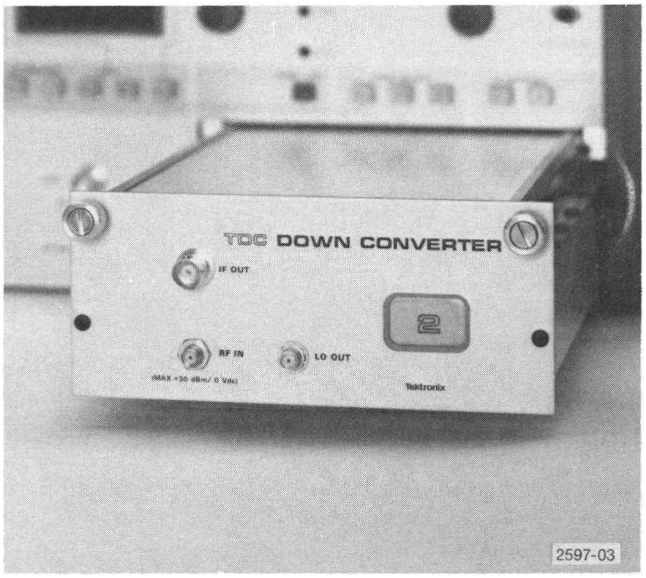

Fig. 2-2. Connectors.

LO OUT—50 Ω SMA output used to drive an external test modulator. The frequency is equal to the visual carrier frequency plus the visual intermediate frequency. Output level is −6 dBm or greater.

APPLYING A SIGNAL

The RF IN impedance to the TDC is 50 Ω. At high frequencies, impedance mismatches between the RF IN and the signal source can cause reflections in the transmission line, and degrade instrument performance. To reduce mismatch, use good quality 50 Ω coaxial cable to connect the signal source to the RF IN, and keep the cable as short as possible to reduce cable losses.

The TDC can be used with a 75 Ω signal source by using a 75 Ω-to-50 Ω minimum loss pad or matching transformer. If an antenna is used, its bandpass characteristics should be known. Most receiving antennas response characteristics are not as flat at the 1450/TDC combination; therefore, the antenna characteristics should be calculated for making over-the-air type measurements.

Sensitivity and power levels are often rated in dBm (dB with reference to 1 mW, regardless of impedance). Sensitivity and power levels for 75 Ω systems are usually rated in dBmV (dB with reference to 1 mV across 75 Ω). Figure 2-3 gives a convenient chart for converting volts to dBm to watts. To convert dBm to dBmV, add 48.75 to the dBm value.

Signals fed to the TDC should be between −69 dBm and −3 dBm. The 1450 front-panel 10 dB and 20 dB attenuators may be switched in to accept signals to +27 dBm. If signals larger than +27 dBm are encountered at transmitter test points, external pads should be inserted to bring the signal within the ADC range.

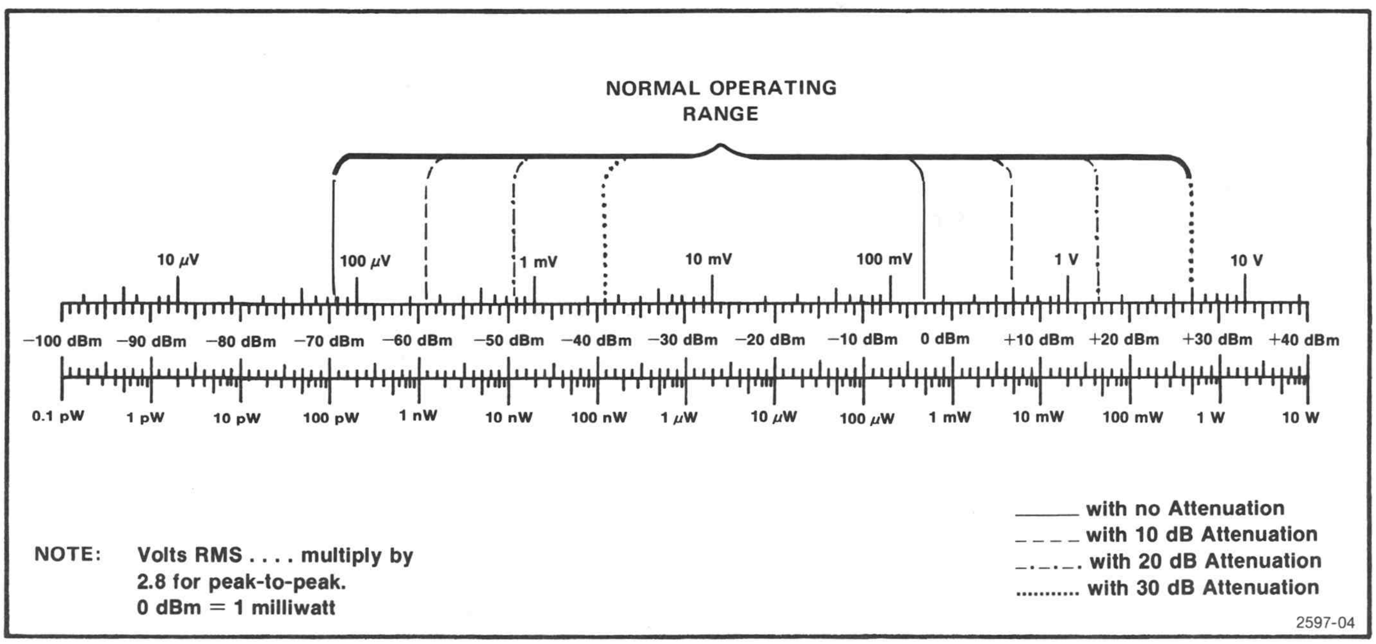

Fig. 2-3. Volts-dBm-Watts conversion chart for 50 Ω impedance.

WARNING

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PART II
SERVICE INFORMATION

THEORY OF OPERATION

This section includes a block diagram description and a detailed circuit description. The descriptions apply to all versions of the TDC. Separate descriptions are used where circuits change for different versions. Check the information on the serial number tag to determine the IF, CCIR system, and carrier frequencies for any particular TDC.

BLOCK DESCRIPTION

The TDC (Television Down Converter) provides the RF (radio frequency) to IF (intermediate frequency) conversion for the 1450 Television Demodulator. Each TDC covers a specified television channel and 1450 intermediate frequency. Separate TDCs are required for each channel. The TDC plugs into the 1450 mainframe, where power supply and control lines are connected to the mainframe via a circuit board connector. RF and IF signal lines are brought back via front-panel coaxial connectors. A detailed block diagram in the Diagrams section illustrates signal paths and functions of the major circuits. Refer to this diagram while reading the description.

The RF input signal is fed to the rear-panel of the 1450. A 10 dB and a 20 dB attenuator may be switched into the signal line for large signals. After the attenuator, the signal is fed by coaxial cable from the 1450 front panel to the TDC front panel.

Inside the TDC, circuits are isolated from each other by extensive shielding and decoupling. The signal is fed through a helical resonator type bandpass filter to reduce out-of-band signals. The filter is flat across the desired channel.

A variable PIN diode attenuator, controlled by the 1450 AGC circuit, follows the bandpass filter. The attenuator is one of three used in the 1450 system to provide a wide agc range. The one in the TDC is engaged only for large signals. This allows the front end to be operated at full gain for weak signals, maintaining a high signal-to-noise ratio. Control information for the AGC is fed from the 1450 mainframe to the TDC in digital form, corresponding to steps of attenuation. The PIN Driver circuit translates this digital information into analog currents to drive the PIN diodes in the attenuator circuit. The PIN Driver board is custom calibrated to match the specific set of PIN diodes.

The RF amplifier is a broadband type with 16 dB of gain. The amplifier feeds another bandpass filter for additional rejection of unwanted signals. This bandpass filter is identical to the first one. The signal is then fed to the RF Mixer.

The RF Mixer circuit converts the RF signal to the specified intermediate frequency. The local oscillator signal and the RF signal are mixed in a diode ring type mixer, and give the difference signal at the IF. The IF output from the mixer is attenuated with a variable PIN diode attenuator to accurately set the signal gain of the TDC.

The Local Oscillator signal is generated by the RF VCO (Voltage-Controlled Oscillator) circuit. The Local Oscillator Return Amplifier on the RF VCO Amp board amplifies the local oscillator and feeds it to the Sampling Phase Detector on the RF PLL board. The phase of the local oscillator signal is sampled at the crystal Reference Oscillator frequency. The crystal frequency is chosen so that the resulting local oscillator will produce an IF within 100 kHz of the designated 1450 IF input. The output of the phase detector is amplified and fed back to the VCO to bring the local oscillator frequency into phase lock with the crystal Reference Oscillator. A search oscillator initially causes the VCO to sweep through its frequency range. This brings the local oscillator frequency close enough to the multiple of the crystal oscillator for the phase lock circuit to work. After the initial sweep, the search oscillator acts as an amplifier for the vco control voltage.

The phase-locked local oscillator signal is fed through amplifiers on the RF VCO Amp board and on the RF Mixer board. This provides a high level signal to drive the mixer. The local oscillator also feeds the front panel LO OUT connector for driving an external test modulator.

GLOSSARY

There are several components and circuits used in the TDC that may be considered new or unusual by many technicians. To aid in understanding these circuits, this brief glossary is included.

Chip Components—Resistors, capacitors, and transistors designed for use in high-frequency circuits. They usually consist of very small ceramic bodies with short leads or terminals mounted on the body. They are used where stray reactances are to be kept to a minimum.

Helical Resonator—High Q, low loss, resonant section of helically wound transmission line. This electrically resembles a quarter-wave section of transmission line, but is physically much smaller. Constructed as a helically wound coil, mounted in a shield cavity. The coil is grounded on one end, and open on the other.

Microstrip—A section of etched circuit board designed to act as a transmission line between circuits on the board. Impedance of the microstrip is determined by the size and separation of the signal-carrying conductor and the ground-plane conductor.

PIN Diode—A diode with a large intrinsic layer between the p and n layers. At high frequencies, the PIN diode looks like a resistance, variable with the dc current through it. This makes the PIN diode very useful in attenuator applications.

PROM—Programmable Read Only Memory. The memory output for each address is programmable. This allows a custom program to be entered into permanent memory.

DETAILED CIRCUIT DESCRIPTION

RF SIGNAL PROCESSING 1V and 1U

Bandpass Filters (A2, A5)

The Bandpass Filters are used to reject out-of-band signals while providing flat response for the desired channel frequencies. They are two-section helical resonator filters. Each helical resonator electrically looks like a quarter-wavelength section of transmission line, shorted on one end, and open on the other. This provides a high unloaded Q in a small space. The filter input and output sees 50-ohm impedances (see Fig. 3-1), and the tap points are set to provide the loaded Q required for a flat bandpass response. At the lower VHF channels (2-6), the bandwidth/center frequency ratio is low, so T10 and T18, 4:1 autotransformers, are added to help lower the loaded Q, therefore widening the bandwidth.

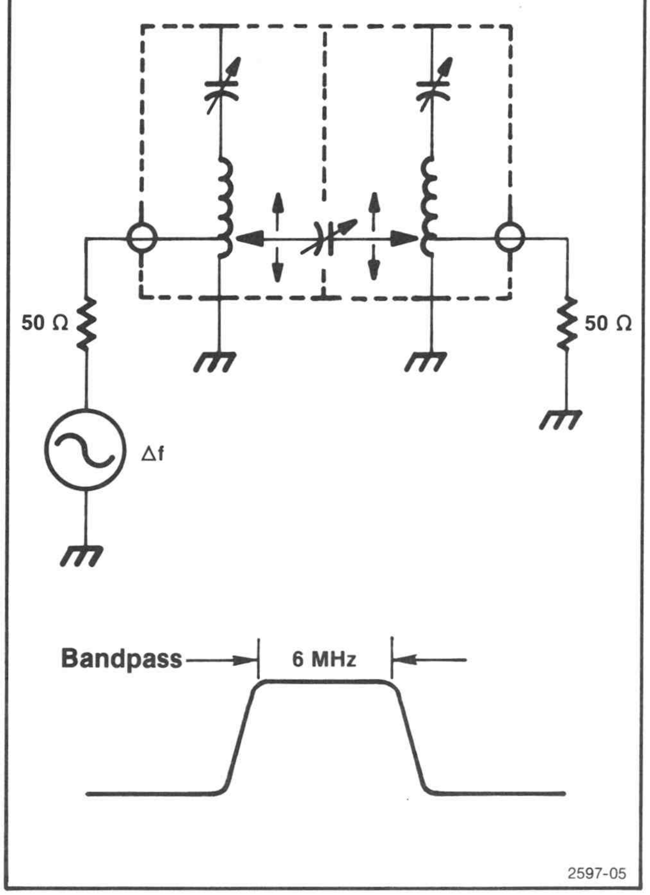


Fig. 3-1. Functional diagram of the Bandpass Filters.

The resonators are coupled by C55, a specially made capacitor consisting of spring-metal fingers, capacitively coupled to the resonator coils. In VHF TDCs, C55 has two fingers for each resonator coil (see Fig. 3-2). The total coupling to each resonator is increased or decreased as the combined distance from the two plates to the coil changes. As the fingers are adjusted up or down, they electrically resemble single capacitors, one in each of the resonators, with the points of coupling being moved along the axis of the coils, as the two plates in that resonator change their distance ratios above the coil. This helps cancel any non-symmetry of the two coils and input or output tap points, thus maintaining input and output impedance matching.

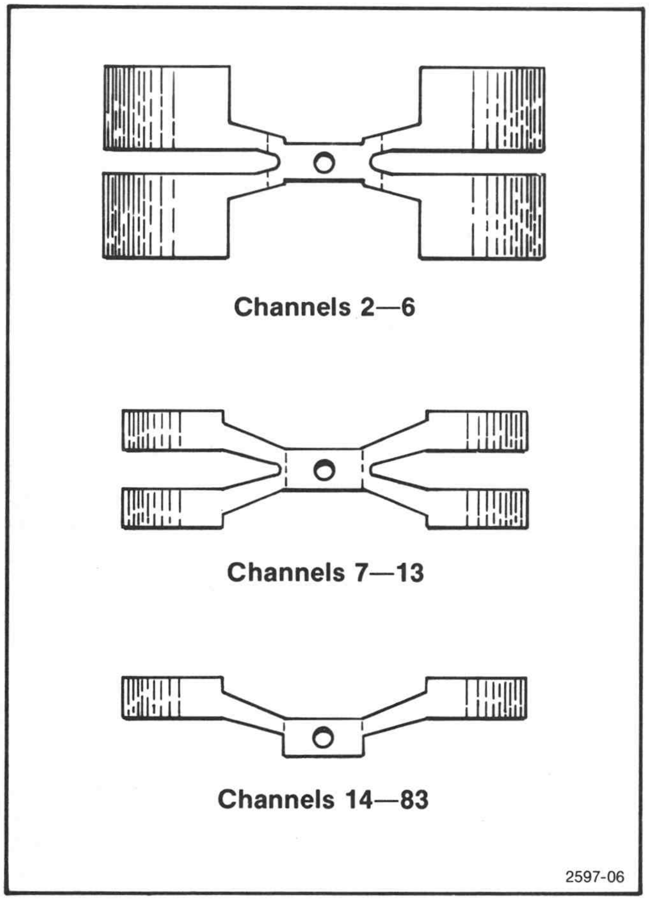


Fig. 3-2. Illustration of the Bandpass Filter coupling capacitor, C55.

In UHF TDCs, C55 has only a single finger for each coil because the symmetry can be obtained by rotating the coils in their cavities, and by moving the input and output tap points slightly. Also, less coupling capacitance is required at the higher frequencies (see Fig. 3-2).

RF PIN Attenuator (A3V and A3U)

The variable RF PIN Attenuator, A3, uses the RF resistance characteristics of PIN diodes to form an attenuator. The PIN Driver circuit, A10, controlled by the AGC circuit in the 1450 mainframe, determines the amount of attenuation, and compensates for the nonlinear resistance characteristic of the PIN diodes.

NOTE

To maintain accuracy, should a PIN diode in the attenuator or a PROM in the PIN Driver circuit fail, we recommend that the TDC be returned to Tektronix for repair and recalibration. (See the Maintenance section of this manual for further information.)

In the VHF PIN Attenuator, (A3V), CR66, and CR56 are the shunt-resistance elements; and CR63, R54, and R64 are the series elements of a bridged-tee attenuator circuit (see Fig. 3-3). The PIN Driver circuit supplies currents to the shunt and series PIN diodes so that the attenuation changes in 32 steps from 0 to 21.7 dB of attenuation, with 0.7 dB between the steps. Input and output impedances remain constant throughout the attenuation range.

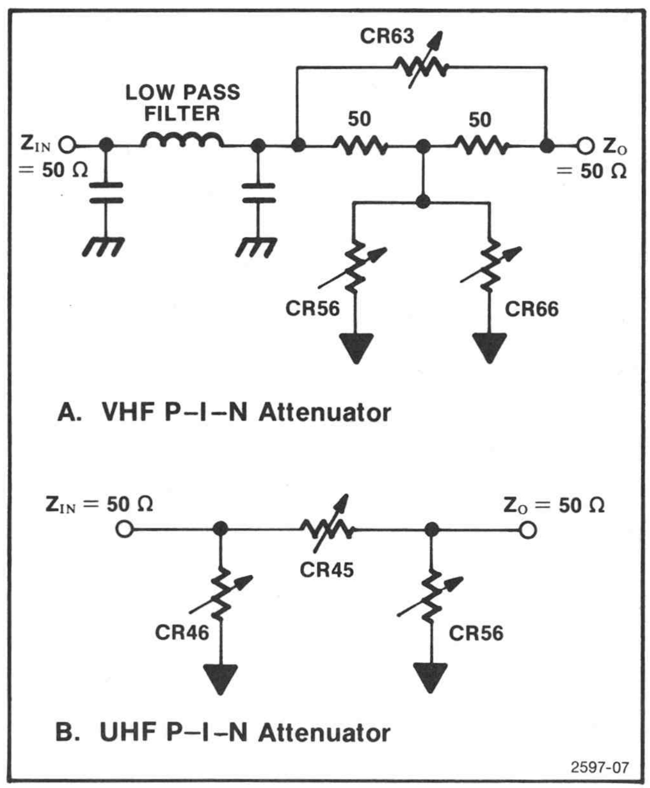


Fig. 3-3. PIN Attenuator simplified schematic.

A low-pass filter is placed in front of the VHF attenuator to increase rejection at the third harmonic of the channel frequency. This is required because the helical resonators look like quarter-wavelength transmission line sections; therefore they have similar bandpass type responses at the odd harmonics as well as at the fundamental.

The UHF PIN Attenuator, A3U, is a pi type attenuator. CR45 is the series element; and CR46 and CR56 are the shunt elements. The capacitors and inductors provide the rf and dc paths, respectively. A low-pass filter is not needed because the following amplifier stage will not respond to the third harmonics of such high channel frequencies. For example, the low end of channel 14 is at 470 MHz, and its third harmonic is at 1410 MHz; 520 MHz above the top of the UHF band, and well above the cutoff frequency of the RF Amp, A4.

Microstrip circuit-board transmission-line runs are used in both the VHF and UHF PIN Attenuators. Placed in the RF signal path, the microstrips maintain constant impedance to the signal.

RF Amp (A4)

The RF Amp, A4, provides 16 dB of power gain to the input signal. In addition, the amplifier provides reverse isolation to reduce interaction between the two helical filters. The reverse isolation also reduces possible reradiation of the local oscillator and intermediate frequency back out of the TDC input.

The amplifier has two stages. The first stage, Q36 and Q33, has 10 dB of power gain. Q33 sets the bias for Q36. Voltage divider R21 and R22 sets the base, and thus the emitter voltage of Q33. The constant voltage on the emitter of Q33 sets the current through R32. Almost all of this current flows through the collector of Q36, and the remainder flows through Q33 to the base of Q36. The individual transistor betas determine the actual division of current. Thus, Q33 regulates the collector current of Q36 by measuring the voltage drop across R32.

The gain for the first stage is determined by the values of emitter resistors R37 and R47, collector load resistor R56, feedback resistor R46, and the associated microstrip transmission lines.

The second stage consists of Q56 and Q52, and has 6 dB of power gain. It is biased much the same as the first stage, except that Q56 has twice the collector current of Q36. The gain of the second stage is determined by emitter resistors R55 and R58, collector load resistor R65, and the associated microstrip transmission lines.

Microstrip transmission-line circuit-board runs and chip components are used where appropriate to maintain constant impedance for the signal.

RF Mixer (A6)

The RF Mixer board (A6) contains a Local Oscillator Amplifier, the Mixer circuit and a limited range variable attenuator (see Fig. 3-4). The RF signal is mixed with a local oscillator (LO) signal, to produce the intermediate frequency (IF). The IF signal is equal to the difference between the local oscillator and the RF signal.

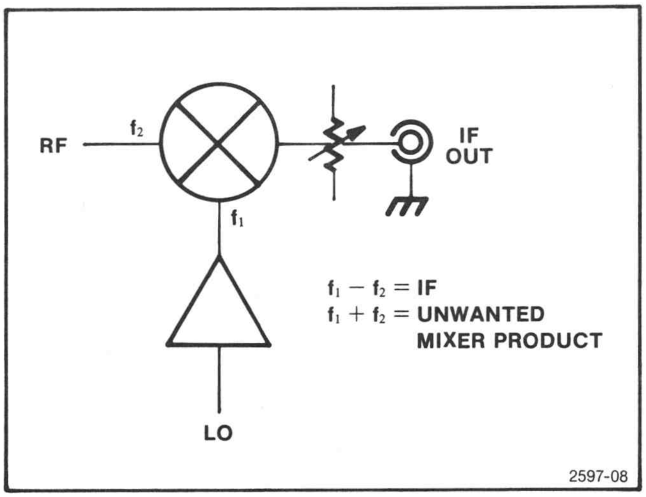


Fig. 3-4. Block diagram of the RF Mixer board, A6.

The RF signal is fed to the mixer at P88 on A6. The circuit at this input tunes the impedance of the RF signal port to make the mixer look like a 50-ohm load to the second Bandpass Filter (A5). L79, C69, and the primary of T78 tunes the input for channels 2 through 6. C79, L69, and the primary of T78 tunes the input for channels 7 through 13. L89, C79, C69, and the primary of T78 tunes the input for all UHF channel TDCs.

The Local Oscillator Amplifier is similar to those in the RF Amplifier (A4). The local oscillator input from the VCO Amp (A9) is at +10 dBm. The Local Oscillator Amp supplies 10 dB of power gain, so that a total of +20 dBm is available at the output of the Local Oscillator Amplifier. T33, a 4:1 impedance transformer, allows Q22 to reach higher signal levels before clipping, therefore allowing the high power level.

The output of the Local Oscillator Amplifier is attenuated by R35 and R54, then fed to the primary of T75. For channel 2 through 6 TDCs, a low-pass filter is inserted between the Local Oscillator Amplifier and the mixer to reduce any local oscillator harmonics. A notch at the second harmonic of the local oscillator is included. The second harmonic may cause a dc component to be developed at the mixer local oscillator port. If present, that dc component would unbalance the mixer.

The Local Oscillator Amplifier also provides the LO OUT signal. R15 and R05 attenuate the signal to make the local oscillator available at the LO OUTput without significantly reducing the local oscillator power to the mixer. This signal is intended to be used to drive a test modulator. The local oscillator signal, when mixed with a modulated IF signal, will produce a modulated RF signal. This modulated signal can be used to test the TDC.

The mixer is a diode-ring type, using two hot-carrier diodes in each of the four legs. The two diodes in each leg of the ring allow a higher RF signal to be applied because of the higher forward bias voltage of the series diodes. High local oscillator power gives a high mixer output intercept point, and therefore helps maintain a high dynamic range.

The mixer is driven by T75 with the local oscillator signal at a high power level. This switches the diodes on and off at the local oscillator rate. The RF signal is fed via T78. The diode-ring switches the secondary leads of T78 so that the difference between the local oscillator and RF is present at the center tap of T78's secondary. This is the IF. The RF and local oscillator components at the IF port will be reduced by the balanced mixer (see Fig. 3-5).

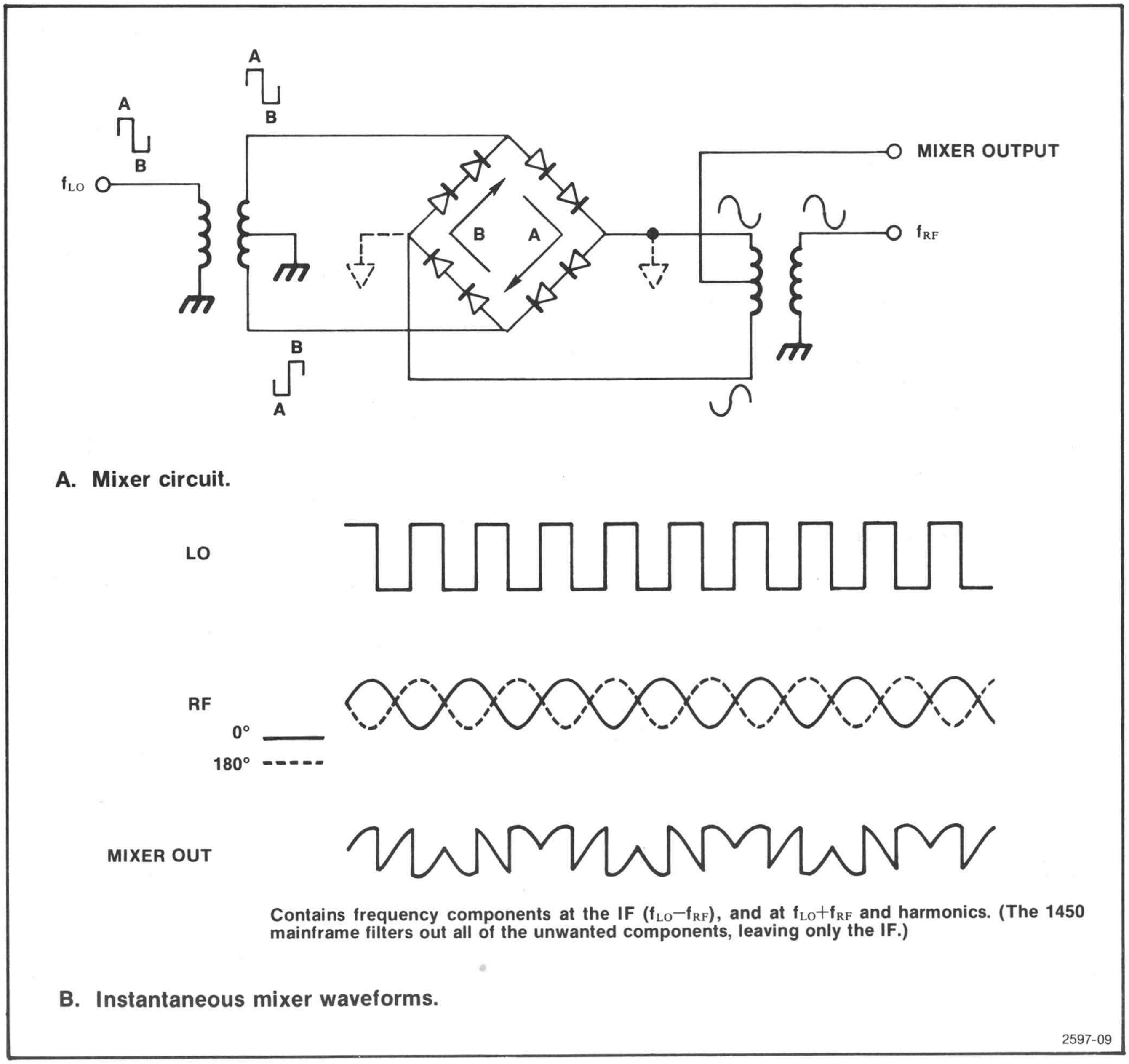


Fig. 3-5. Mixer operation.

For channels 2 through 6 TDCs, C87 and C88 help balance the mixer, thus reducing IF feedthrough.

The mixer output is adjusted by a variable PIN attenuator circuit. This allows the mixer to be properly terminated into 50 ohms, and accurately sets the IF OUTput level. The attenuator is a bridged-tee type, with PIN diode CR46 as the variable series element; and the shunt element selected by P48 (R49, R69, or R58). Current for CR46 is supplied by Q35, and varied by R17, Gain. P48 provides the coarse attenuation and R17 sets the fine attenuation (see Fig. 3-6).

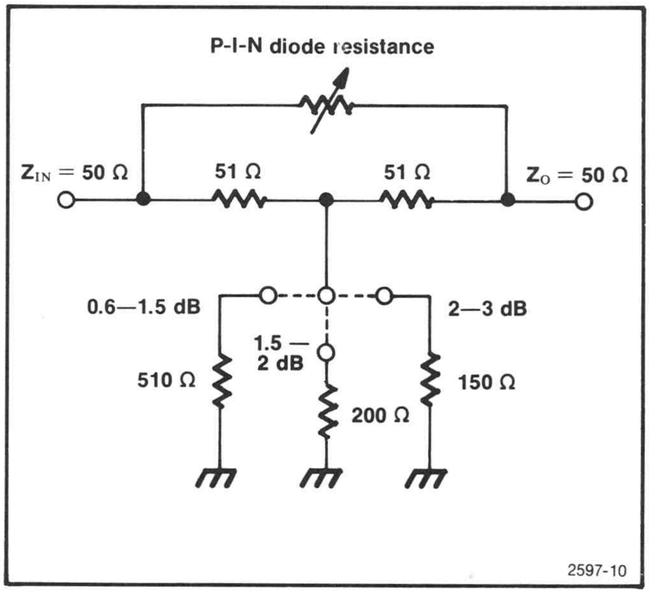


Fig. 3-6. Simplified schematic of the IF OUT attenuator.

LOCAL OSCILLATOR 2V and 2U

The Local Oscillator schematic shows the VCO (A8), VCO Amp (A9), and RF PLL (A7) boards. These circuits will be described separately for the VHF and UHF versions where applicable.

VHF VCO (A8V)

The VCO (Voltage Controlled Oscillator) is the local oscillator for the TDC. The VCO board is fitted over a helical resonator cavity. The helical resonator, L35 and C55, along with C37 and varactor CR38, form the resonant oscillator circuitry. C46, at the emitter of Q47, effectively produces a negative resistance in the base circuit. This cancels out the actual resistance of the reactive components in the base circuit, thus allowing the resonant circuit to maintain oscillation (see Fig. 3-7).

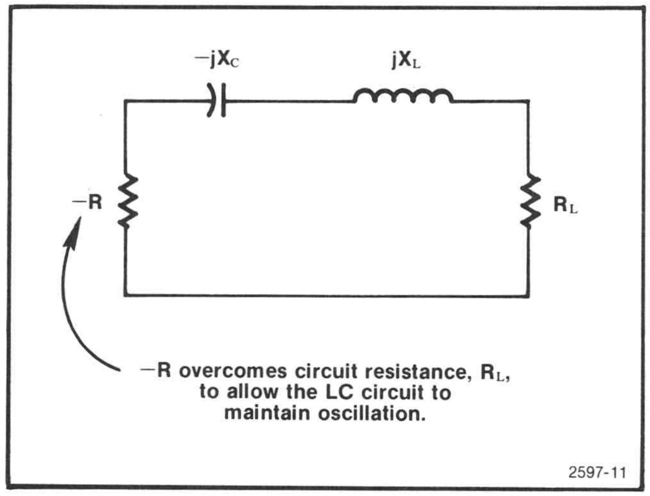


Fig. 3-7. Equivalent circuit of a negative resistance oscillator.

C55 is a course frequency adjustment. R38 (A7), Offset Voltage, provides the fine frequency adjustment for centering the PLL. The capacitance of CR38 is varied by the PLL correction voltage received at P81 on A8V. The output frequency remains stable because it is phase locked to the crystal-reference oscillator on the PLL board.

Q47 and Q67 are connected in cascode to reduce the Miller effect capacitance. This circuit supplies about −3 dBm of local oscillator power to the VCO Amp board (A9V). Power supply voltages of +5.7 V and −9.7 V are fed to the VCO Amp board at P86 and P83 respectively.

CAUTION

C37 and a wire to the base of Q47 are soldered directly to L35. To avoid damage to the coil, refer to the Corrective Maintenance portion of Section 5 in this instruction manual for detailed instructions on removal of the RF VCO (VHF) board (A8V).

UHF VCO (A8U)

This board contains the local oscillator for UHF TDCs. The UHF VCO board is fitted over a helical resonator cavity. The helical resonator, L55 and C55, along with C46 and varactor CR45, form the resonant oscillator circuitry. C33, on the emitter of Q33, produces a negative resistance in the base circuit of Q33. This cancels the actual resistance of the reactive components in the resonant circuit, thus allowing the circuit to maintain oscillation. (See Fig. 3-7).

C46 and C42 couple the helical resonator to components on the UHF VCO board. These capacitors are in the form of shaped metal plates near the resonator coil. C46 couples the varactor, CR45, to the helical resonator. C46 is mechanically supported by resistors R44, R45, R46, and R47. The parallel combination of these resistors has negligible effect on the circuit operation. C42 couples the base of Q33 to the helical resonator. Resistors R34, R35, R36, and R37 are the mechanical supports for C42. The parallel combination of R34 and R36 provides the base resistor for Q33. R35 and R37 have negligible electrical effect on the circuit.

The VCO control voltage from the PLL enters the UHF VCO board at P81. A low-pass filter eliminates any spurious signals or noise on the control voltage before it reaches the varactor, CR45. As the PLL changes the control voltage, the capacitance of CR45 changes, thus changing the VCO frequency until the VCO frequency is phase locked to the crystal reference oscillator on the RF PLL board.

L58, a one-turn loop mounted on the UHF VCO board, is located in the magnetic field of the helical resonator, and couples the oscillator signal to the UHF VCO Amp (A9U).

The dc power supplies for the UHF VCO are fed from the UHF VCO Amp board (A9U). The supplies are −9 V at P83 (A8U), and +15 V (decoupled) at P86 (A8U).

VHF VCO Amp (A9V)

The output of the VHF VCO (A8V) feeds the VHF VCO Amp board (A9V). Two amplifiers are located on this board, the Local Oscillator Amplifier and the Local Oscillator Return Amplifier. R54 provides a collector load for the VCO output transistor, Q67 (A8V). L54 and R34 provide broadband frequency compensation.

The Local Oscillator Amplifier has about 13 dB of power gain, and consists of amplifier Q46 and emitter follower Q57. C26-R27 and C25-R26 are for broadband frequency compensation.

The Local Oscillator Return Amplifier isolates the VCO from the unwanted signals produced by the phase sampler. The amplifier has about 7 dB of power gain, and consists of Q73 and Q62 connected as a cascode amplifier. R85-C84 and R95-C94 at the emitter of Q73, and L60-C71 at the collector of Q62, provide broadband frequency compensation. The Local Oscillator Return Amplifier feeds the VCO signal back to the Sampling Phase Detector on the RF PLL board (A7).

The VCO control voltage loops through the VHF VCO Amp board on its way to the VHF VCO board from the RF PLL board.

Power supply voltages for the VHF VCO board are generated on the VHF VCO Amp board. Zener diode VR24, temperature compensation diode CR14, and dropping resistor R17 form the +5.7 volt supply. VR32, CR30, and R31 form the −9.7 volt supply.

UHF VCO Amp (A9U)

The output of the UHF VCO (A8U) feeds the UHF VCO Amp board (A9U). Two amplifiers are located on this board, the Local Oscillator Amplifier and the Local Oscillator Return Amplifier. These amplifiers are similar to those described for the RF Amp (A4).

The Local Oscillator Amplifier provides about 13 dB of power gain for the local oscillator signal. The signal is amplified through Q34 and Q85. Q36 and Q46 provide bias and set the collector currents for the two stages. The amplifier output at P89 is fed to the RF Mixer board (A6) where the signal is further amplified before driving the mixer.

The Local Oscillator Return Amplifier isolates the VCO from the unwanted signals produced by the phase sampler. The amplifier has about 7 dB of power gain. The signal path is through Q23 and Q83. Q20 and Q70 provide bias, and regulate the collector currents in the signal transistors. The Local Oscillator Return Amplifier feeds the VCO signal back to the Sampling Phase Detector on the RF PLL board (A7).

Zener diode VR13 and dropping resistor R20 form the −9 volt power supply for the UHF VCO (A8U). C13 suppresses the zener noise.

RF PLL (A7)

The RF PLL board (A7) phase locks the VCO to a crystal-referenced oscillator. The board contains the crystal oscillator, a sampling phase detector, and a loop amplifier. (See Fig. 3-8.)

The crystal oscillator generates the reference frequency for the PLL. The oscillator is basically a Pierce, or crystal-type Colpitts, oscillator, with Y96 determining the

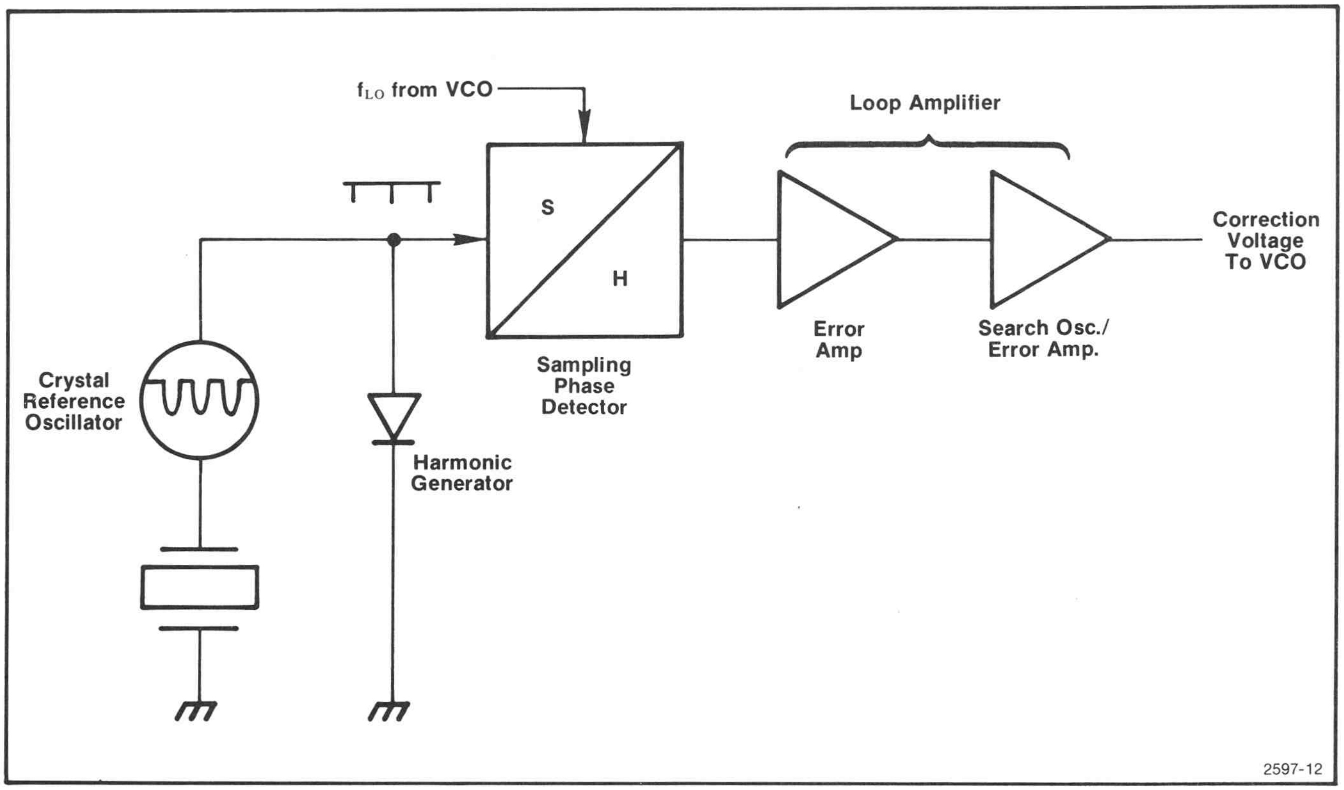


Fig. 3-8. Block diagram of the RF PLL board, A7.

frequency, and Q72 the active component. The crystal frequency is chosen so that a harmonic falls within 100 kHz of the desired local oscillator frequency. For example, a channel 2 TDC with 45.75 MHz visual IF has a crystal frequency of 5.944 MHz. The VCO is phase locked to the 17th harmonic of the crystal frequency, so the local oscillator frequency is 101.05 MHz. When mixed with the 55.25 MHz channel 2 visual carrier, this produces an IF output at 45.8 MHz. This is well within the 100 kHz tolerance allowed at the 1450 IF Input.

The crystal oscillator conducts for a small portion of each cycle, with Q72 turned off until the positive going cycle of the signal at the base causes the transistor to conduct. The output of the crystal oscillator is shaped by snap-off diode CR74. The snap-off diode holds the positive peak voltage of the crystal oscillator output constant by conducting current to ground from R65. This voltage remains unchanged until after Q72 starts to conduct. For a short time after Q72 turns on, the snap-off diode continues to conduct in a negative direction, then sharply turns off. This causes an abrupt voltage change at the negative transition. The fast negative-going edge of the signal is passed by C98 to the primary of T62. This looks like a differentiator or high-pass filter, so that only a negative-going pulse is applied to the transformer.

T62 provides differential drive to the double balun[1] transformer T52. The local oscillator signal is fed to the opposite end of the baluns. In VHF TDCs, L41 and C51 provide input tuning for the local oscillator. The baluns serve to isolate the local oscillator signal from T62, and provide a ground reference for the sampling pulses.

CR44 and CR41 are forward biased by the peak of the sampling pulses. The level of the sampling pulses, plus the sampled local oscillator level, charges C32 positively, and C33 negatively. Since the sampling pulses are equal absolute amplitudes, the average level is simply the sampled level. C31 and the input capacitance of FET Q23A charge to the average level of the local oscillator at the time of the sampling pulse. If the VCO is phase locked, the sampling pulse will occur at the same level all of the time. If the VCO is not yet phase locked, the level will change from sample to sample, thus generating an ac signal whose frequency is equal to the difference of the local oscillator and the nearest harmonic of the crystal oscillator. This becomes the correction voltage to pull the VCO closer to phase locking. (See Fig. 3-9.)

The Loop Amplifier has three stages; the input buffer, operational amplifier, and the search oscillator. Q23A and B act as a high input impedance buffer for the control voltage. U47 is connected as an inverting operational amplifier, with a voltage gain of about 20 (R57/R55). R36, PLL Test, located at the output of U47 is normally set so that the wiper is at the amplifier end of the potentiometer. When testing or troubleshooting the PLL, the loop may be opened by setting the wiper of R36 to the ground end.

[1]**Balun is an acronym for BALanace-UNbalanced.**

@

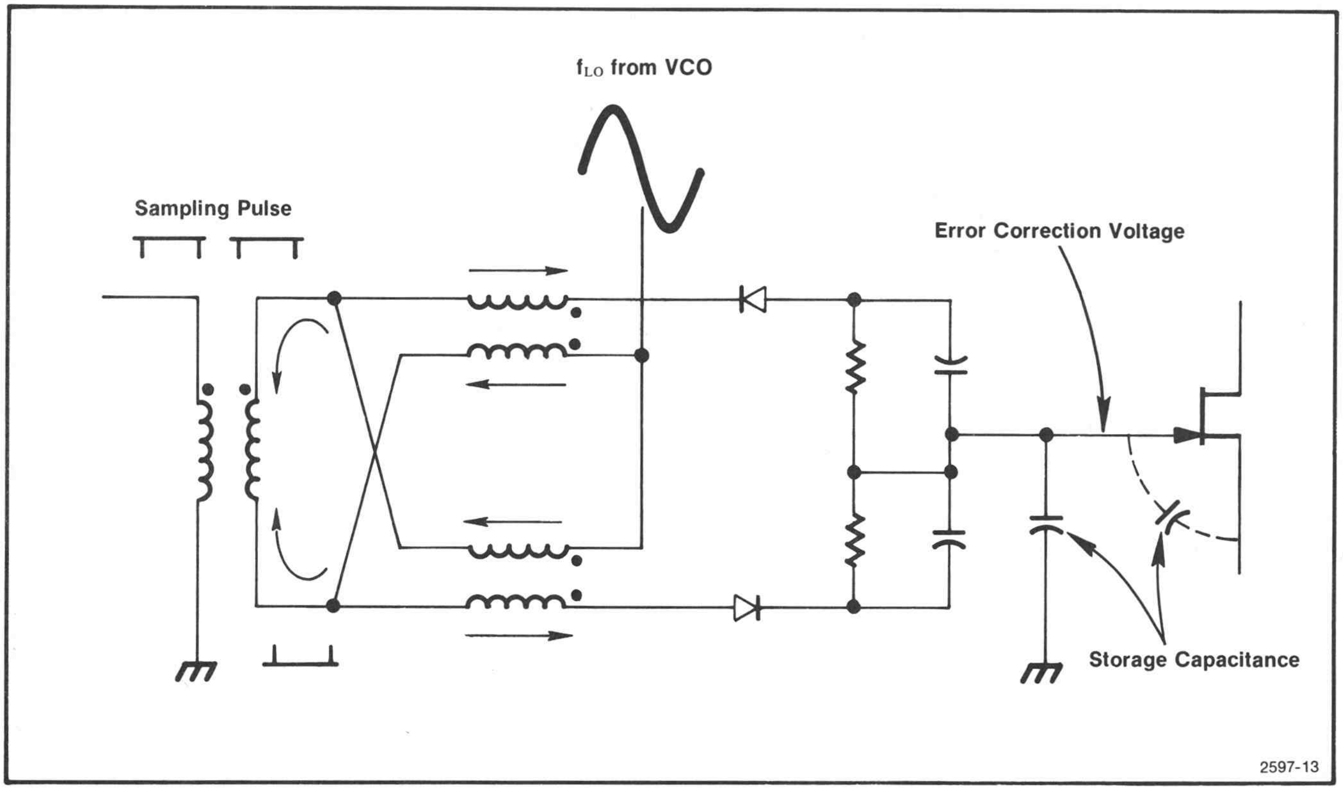


Fig. 3-9. Phase Sampler operation.

U17 is connected as a Wien-bridge oscillator, and acts as a search oscillator and part of the loop amplifier. When the TDC is first turned on, the search oscillator sweeps the VCO to bring the frequency within the range of the PLL. As the VCO approaches phase lock with the crystal-oscillator frequency, the search oscillator stops its sweep and operates as a unity-gain operational amplifier for the control voltage.

C06, R06, C12, and R11 set the search-oscillator frequency to about 7 Hz. CR03 and CR14 limit the output voltage swing to about plus and minus 3.5 volts. When the VCO frequency approaches phase locking, the negative feedback of the total loop overcomes the positive feedback of the search oscillator, stopping the search oscillator. It then acts as an output buffer for the loop amplifier. C28 and R18 act as a filter to limit the loop bandwidth to about 15 kHz. P15 can be removed during testing or troubleshooting to stop the search oscillator. R38, Offset Voltage, is set when P15 is removed, to center the VCO control voltage range. The output of U17 is the VCO control voltage, and is fed to the VHF or UHF VCO (A8V or A8U) through the VHF or UHF VCO Amp board (A9V or A9U)

PIN DRIVER 3

General

The PIN Driver circuit (A10) is controlled by the 1450 AGC circuit, and sets the currents that drive the RF PIN Attenuator (A3). (See Fig. 3-10.) The board input is a 5-bit parallel binary signal. Three Programmable Read Only Memories (PROMs) transform the 5-bit input code into two 12-bit parallel binary signals that switch two sets of binary-weighted current sources. The current sources drive the series and shunt diodes in the RF PIN Attenuator (A3).

The desired effect is to have the RF PIN Attenuator (A3) change its attenuation in equal steps when required by the 1450 AGC. Nonlinearity of the PIN diodes is compensated for by programming the PROM outputs to switch the correct amount of current from the current sources to the attenuator. This results in 32 levels of attenuation that are separated by 0.7 dB each, for a total of 21.7 dB of AGC range in the TDC. To achieve this accuracy, the PROMs must be specially programmed for the individual PIN diode characteristics. This is done by inserting a PROM simulator into the PROM sockets, determining the correct program for each step, and programming the PROMs. To maintain the accuracy should a PIN diode or PROM fail, we recommend that the TDC be returned to Tektronix for repair and recalibration of this circuit. (See the Maintenance section of this manual for further information.)

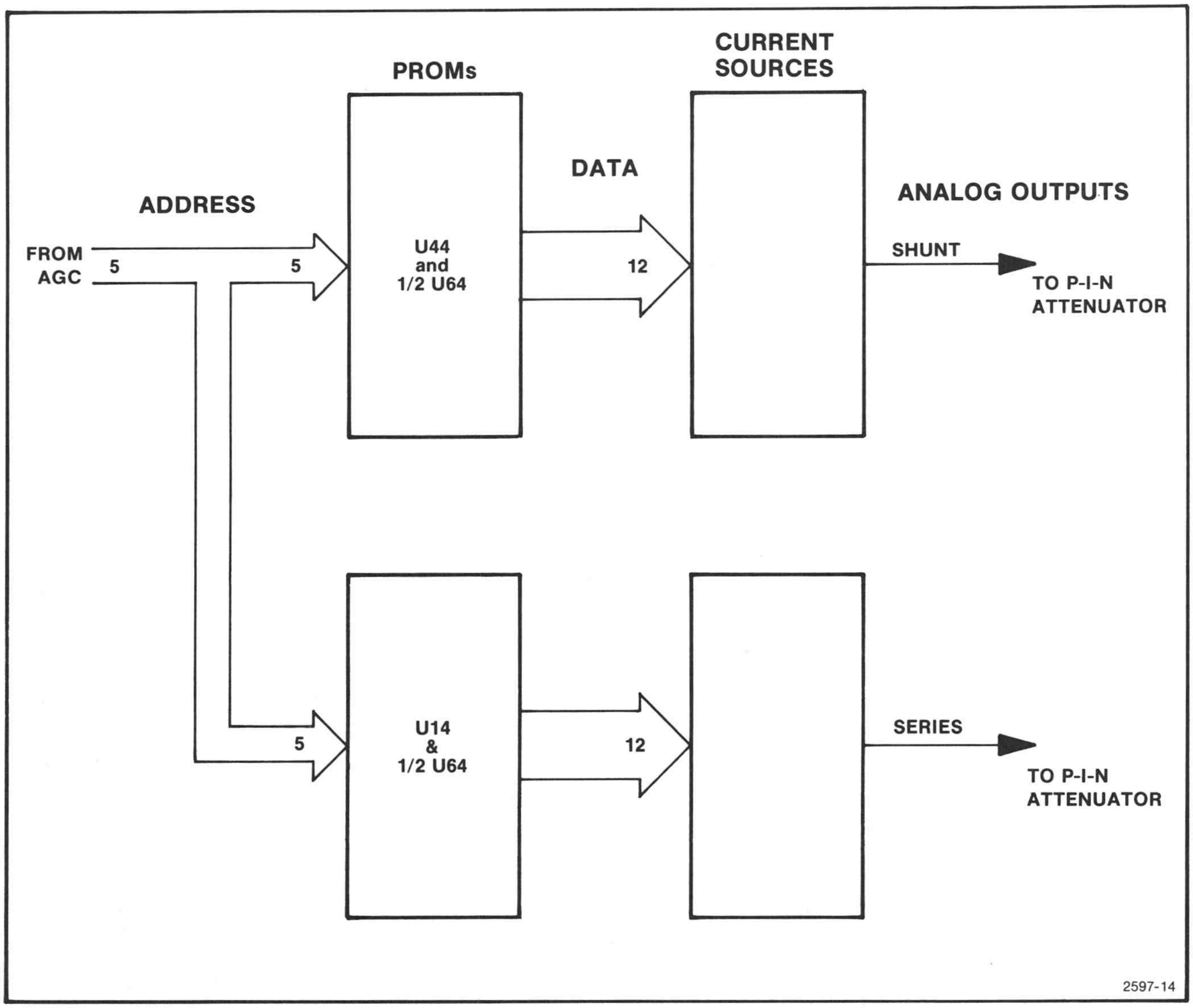


Fig. 3-10. PIN Driver block diagram.

PROMs

The PIN Driver PROMs (U44, U64, and U14) each have 256 memory locations. Each memory location may be programmed as a binary "1" or "0". The memory is formatted into 32 words (or bytes) of 8 bits of memory each. The 5-bit input to the board is fed to address lines A0 through A4 of each PROM. All combinations of the input signal (2 to the 5th power) account for the 32 input address locations.

The memory of U64 is shared between U44 and U14 to get the 12-bit binary output required to drive the current sources. The shunt memory output consists of U44 B0 through B7, and U64 B0 through B3. The series memory output consists of U64 B4 through B7, and U14 B0 through B7. This gives a possible 4096 (2 to the 12th power) output codes to choose from in programming the PROMs to drive each of the current sources.

Current Sources (see Fig. 3-11)

There are two sets of current sources. They provide shunt and series currents for the RF PIN Attenuator (A3). The shunt sources are the upper row of transistors and resistors shown in the schematic. The series sources are shown in the lower row.

Resistors R93 and R92 form a voltage divider at the base of Q81. Q81 provides temperature compensation, and sets the level at the bases of all the current source transistors. When a current source is switched on, its emitter voltage is the same as that at the base of Q81. This makes the current through the transistors dependent upon the value of the emitter resistors. The collectors of each set of current-source transistors are connected together, thus summing the currents at the outputs. The series-current output is at P08-1, and the shunt-current output is at P08-2.

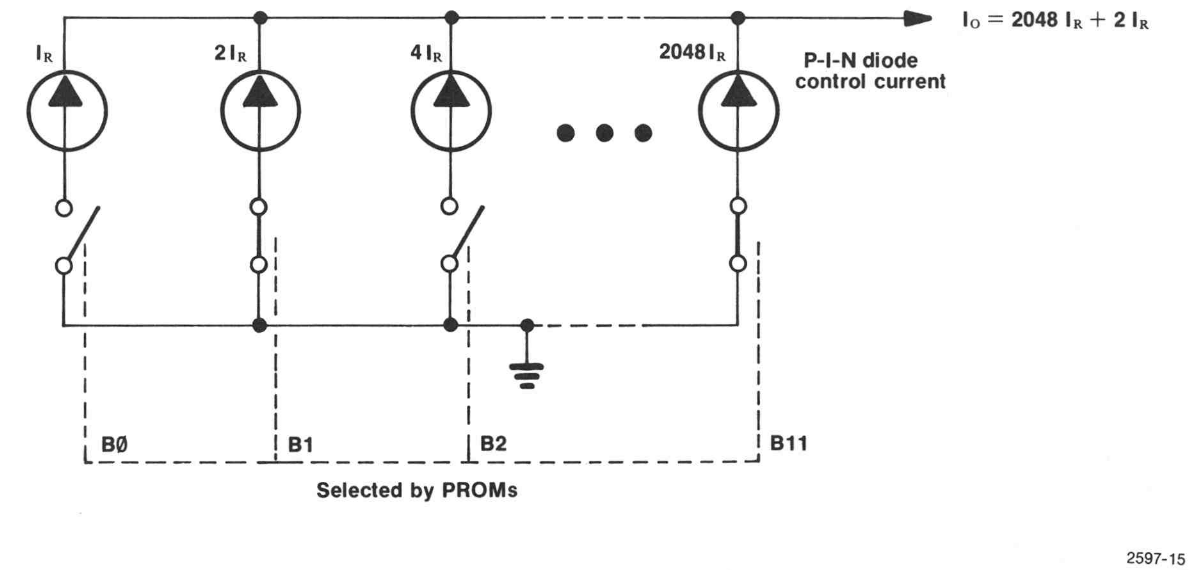


Fig. 3-11. Simplified schematic of Current Sources.

The current sources are binary weighted. The smallest current available is from Q19 in the shunt circuit, and Q80 in the series circuit. This can be considered as a reference current (I_r) for this description. The smallest current source then supplies I_r x 1. The next larger current source supplies I_r x 2, the next I_r x 4, and so on. This progression of powers of 2 continues for the twelve current sources, so that the largest current available from a single source is I_r x 2048. If all current sources in one set were on at once, the total current available would be I_r x 4095. Therefore, there are 4096 possible currents to choose from to drive the PIN Attenuator.

The current sources are switched on when the corresponding PROM outputs are high. The high-current sources, Q88 and Q10, are switched by transistors Q89 and Q00 respectively. When the PROM MSB (Most Significant Bit) is high, the current through the emitter resistor passes through the current-source transistor to the output. When the MSB is low, the source transistor is turned off, and the current is shunted by the switching transistor. This keeps a large amount of current from sinking in the PROMs if all outputs should be low. The smaller value current sources are switched by diodes connected between the PROMs and the current-source emitters.

CALIBRATION

Introduction

The procedures in this section serve as guides to perform the calibration steps necessary to ensure the proper operation of the TELEVISION DOWN CONVERTER (TDC). Limits, tolerances, and waveforms appearing in this section are not instrument specifications except as listed in Section 1, Specification.

The TDC front-panel names in the text are capitalized; e.g., RF IN. Control and connector names on test equipment and internal controls in the TDC have only the first letter capitalized; e.g., Time/Div.

The capabilities of the test equipment listed are the minimum required to calibrate the TDC. If alternative equipment is used, it must meet or exceed the specification of the listed equipment.

The following calibration is in an orderly manner, and will result in a calibrated instrument within the specification. Note that if an adjustable component is replaced in an LC filter, the filter may be severely misadjusted by the component replaced. In such a case, it is recommended that the adjustment step associated with the circuit board be performed, then the overall calibration performed.

The Calibration section is divided into two main parts: Performance Check and Adjustment Procedure. The Performance Check is preceded by an equipment table and a short-form performance check procedure, while the Adjustment Procedure is preceded by a short-form adjustment procedure.

The Table of Contents at the front of this manual lists the page numbers of all the performance checks and adjustment steps.

Refer to Table 4-2 for channel frequencies and other associated frequencies.

Refer to Table 4-1 for test equipment required for performance checks and calibration.

Table 4-1

TEST EQUIPMENT REQUIRED

Description	Minimum Specification	Use	Equipment Used
TEKTRONIX 1450-1	Same IF as TDC	SYSTEM Checks	1450-1
2 each VSWR Bridge	10 MHz to 1 GHz and 40 dB directivity	Return Loss Check/ Adjustment and as Directional Coupler	Wiltron Model 62N50
Oscilloscope	Wide band, at least 50 MHz	Performance Check and Adjustment	TEKTRONIX 7704 Oscilloscope
Oscilloscope Vertical Plug-in	At least 50 MHz bandwidth	SYSTEM Frequency Response	TEKTRONIX 7A13 Differential Comparator
Oscilloscope Vertical Plug-in	At least 50 μV sensitivity	SYSTEM Frequency Response	TEKTRONIX 7A22 Differential Amplifier
Spectrum Analyzer	At least 300 kHz and 3 MHz resolutions frequency range 1 kHz → 1000 MHz	Performance Check and Adjustment	TEKTRONIX 7L13 Spectrum Analyzer
Tracking Generator	Compatible with the Spectrum Analyzer	Performance Check and Adjustment	TEKTRONIX TR 502

Table 4-1 (cont)

Description	Minimum Specification	Use	Equipment Used
RF Signal Generator	Low phase-noise and stability in the order 10 ppm/10 min	Performance Check and Adjustment	HP 8640B
RF Signal Generator	2nd harmonic at least 25 dB down	Adjacent Channel Cross-modulation	TEKTRONIX FG 503 or FG 504
Power Meter	Range from −25 dBm to +20 dBm and ±1% of full range accuracy	Setting Power Levels	HP 435A
True RMS Voltmeter	10 Hz to at least 10 MHz	Performance Check and Calibration	HP 3400A
Waveform Monitor	Field rate and line rate display	SYSTEM Frequency Response and Noise Figure	TEKTRONIX 1480
Sweep Generator	100 kHz to 6 MHz sweep composite video	SYSTEM Frequency Response	TEKTRONIX TSG 6 in 1410 Mainframe
Frequency Doubler	50 MHz to 100 MHz input; 100 MHz to 1000 MHz output	Performance Check and Adjustment	HP 10515A
Frequency Counter	Compatible with TR 502	Performance Check and Adjustment	TEKTRONIX DC 508 Option 07
Power Supply Module	Drive several loads simultaneously	Performance Check and Adjustment	TEKTRONIX TM 503 Option 07
50 Ω Variable Attenuator	Must have units and tens steps	Bandpass Flatness and Variation in SYSTEM Frequency Response	TEKTRONIX 2701
Test Modulator[1]	0.1 dB flatness within channel limits	Performance Check and Adjustment	Tektronix Part No. 067-0886-00 (Estimated availability, summer 1980)
10X Attenuator	50 Ω	Performance Check and Adjustment	Tektronix Part No. 011-0059-02
2.5X Attenuator	50 Ω	Performance Check and Adjustment	Tektronix Part No. 011-0076-02
2X Attenuator	50 Ω	Performance Check and Adjustment	Tektronix Part No. 011-0069-01
Terminator	50 Ω	Performance Check and Adjustment	Tektronix Part No. 011-0123-00
Male N to Female BNC Adapter	6 each	Performance Check and Adjustment	Tektronix Part No. 103-0045-00
Female N to Male BNC Adapter	2 each	Performance Check and Adjustment	Tektronix Part No. 103-0058-00
Male SMA to Female BNC Adapter	4 each	Performance Check and Adjustment	Tektronix Part No. 015-1018-00

Table 4-1 (cont)

Description	Minimum Specification	Use	Equipment Used
2 each 10" long Cable	50 Ω	Performance Check and Adjustment	Tektronix Part No. 012-0208-00
2 each 20" long Cable	50 Ω	Performance Check and Adjustment	Tektronix Part No. 012-0076-00
4 each 43" long Cable	50 Ω	Performance Check and Adjustment	Tektronix Part No. 012-0057-00
Adapter Cable	Male BNC to male Peltola	Performance Check and Adjustment	Tektronix Part No. 175-0709-00

[1] **Contact your local Tektronix Field Engineer for further details on availability.**

Other Test Equipment Required

1. TDC Extender Fixture, Tektronix Part No. 067-0899-00.
2. Torx Screw Driver, Tektronix Part No. 003-0816-00.
3. Plug Driver, Tektronix Part No. 003-0842-00.
4. Modified Wrench, Tektronix Part No. 003-0843-00.
5. 3/32" Allen Wrench.

Table 4-2

FREQUENCIES ASSOCIATED WITH TELEVISION CHANNELS IN THE U.S. AND CANADA

Channel Frequencies (MHz)

Channel	Limits	Visual	Aural
2	54—60	55.25	59.75
3	60—66	61.25	65.75
4	66—72	67.25	71.75
5	76—82	77.25	81.75
6	82—88	83.25	87.75
7	174—180	175.25	179.75
8	180—186	181.25	185.75
9	186—192	187.25	191.75
10	192—198	193.25	197.75
11	198—204	199.25	203.75

Table 4-2 (cont)

Channel	Limits	Visual	Aural
12	204—210	205.25	209.75
13	210—216	211.25	215.75
14	470—476	471.25	475.75
15	476—482	477.25	481.75
16	482—488	483.25	487.75
17	488—494	489.25	493.75
18	494—500	495.25	499.75
19	500—506	501.25	505.75
20	506—512	507.25	511.75
21	512—518	513.25	517.75
22	518—524	519.25	523.75
23	524—530	525.25	529.75
24	530—536	531.25	535.75
25	536—542	537.25	541.75
26	542—548	543.25	547.75
27	548—554	549.25	553.75
28	554—560	555.25	559.75
29	560—566	561.25	565.75
30	566—572	567.25	571.75
31	572—578	573.25	577.75
32	578—584	579.25	583.75
33	584—590	585.25	589.75
34	590—596	591.25	595.75
35	596—602	597.25	601.75
36	602—608	603.25	607.75
37	608—614	609.25	613.75
38	614—620	615.25	619.75
39	620—626	621.25	625.75
40	626—632	627.25	631.75
41	632—638	633.25	637.75
42	638—644	639.25	643.75
43	644—650	645.25	649.75
44	650—656	651.25	655.75

Table 4-2 (cont)

Channel	Limits	Visual	Aural
45	656—662	657.25	661.75
46	662—668	663.25	667.75
47	668—674	669.25	673.75
48	674—680	675.25	679.75
49	680—686	681.25	685.75
50	686—692	687.25	691.75
51	692—698	693.25	697.75
52	698—704	699.25	703.75
53	704—710	705.25	709.75
54	710—716	711.25	715.75
55	716—722	717.25	721.75
56	722—728	723.25	727.75
57	728—734	729.25	733.75
58	734—740	735.25	739.75
59	740—746	741.25	745.75
60	746—752	747.25	751.75
61	752—758	753.25	757.75
62	758—764	759.25	763.75
63	764—770	765.25	769.75
64	770—776	771.25	775.75
65	776—782	777.25	781.75
66	782—788	783.25	787.75
67	788—794	789.25	793.75
68	794—800	795.25	799.75
69	800—806	801.25	805.75
70	806—812	807.25	811.75
71	812—818	813.25	817.75
72	818—824	819.25	823.75
73	824—830	825.25	829.75
74	830—836	831.25	835.75
75	836—842	837.25	841.75
76	842—848	843.25	847.75
77	848—854	849.25	853.75
78	854—860	855.25	859.75
79	860—866	861.25	865.75
80	866—872	867.25	871.75
81	872—878	873.25	877.75
82	878—884	879.25	883.75
83	884—890	885.25	889.75

NOTE

VISUAL IF

Option	IF Out	IF Out Bandpass
1	37 MHz	32.25 MHz to 38.25 MHz
2	38.9 MHz	34.15 MHz to 40.15 MHz
3	45.75 MHz	41 MHz to 47 MHz

Image Aural Carrier Frequency = 2 (Aural IF) + Aural RF

Image Visual Carrier Frequency = 2 (Visual IF) + Visual RF

LO Frequency = Visual Carrier Frequency + Visual IF Frequency

The IF OUT signal on the down converter front panel has a frequency bandpass orientation that is inverted from the **rf** *bandpass. That is, the visual* **if** *carrier frequency is above the aural* **if** *carrier frequency. Thus, for Option 3 (visual* **if** *carrier frequency = 45.75 MHz), the aural* **if** *carrier frequency is 41.25 MHz.*

Measurement Techniques used in Procedure

In the following procedure, the 1450-1 readout must be calibrated if a tunable down converter (TDC1 or TDC2) is installed in the 1450-1 as part of the SYSTEM. Frequency is measured in several steps, and the test oscilloscope must be calibrated for 0.2 dB/div to perform several tight-tolerance checks. The information that follows provides details on these techniques and must be referred to before starting the procedure.

NOTE

The Spectrum Analyzer (7L13) must be checked for calibration before any measurements are made. Refer to the 7L13 Instruction manual.

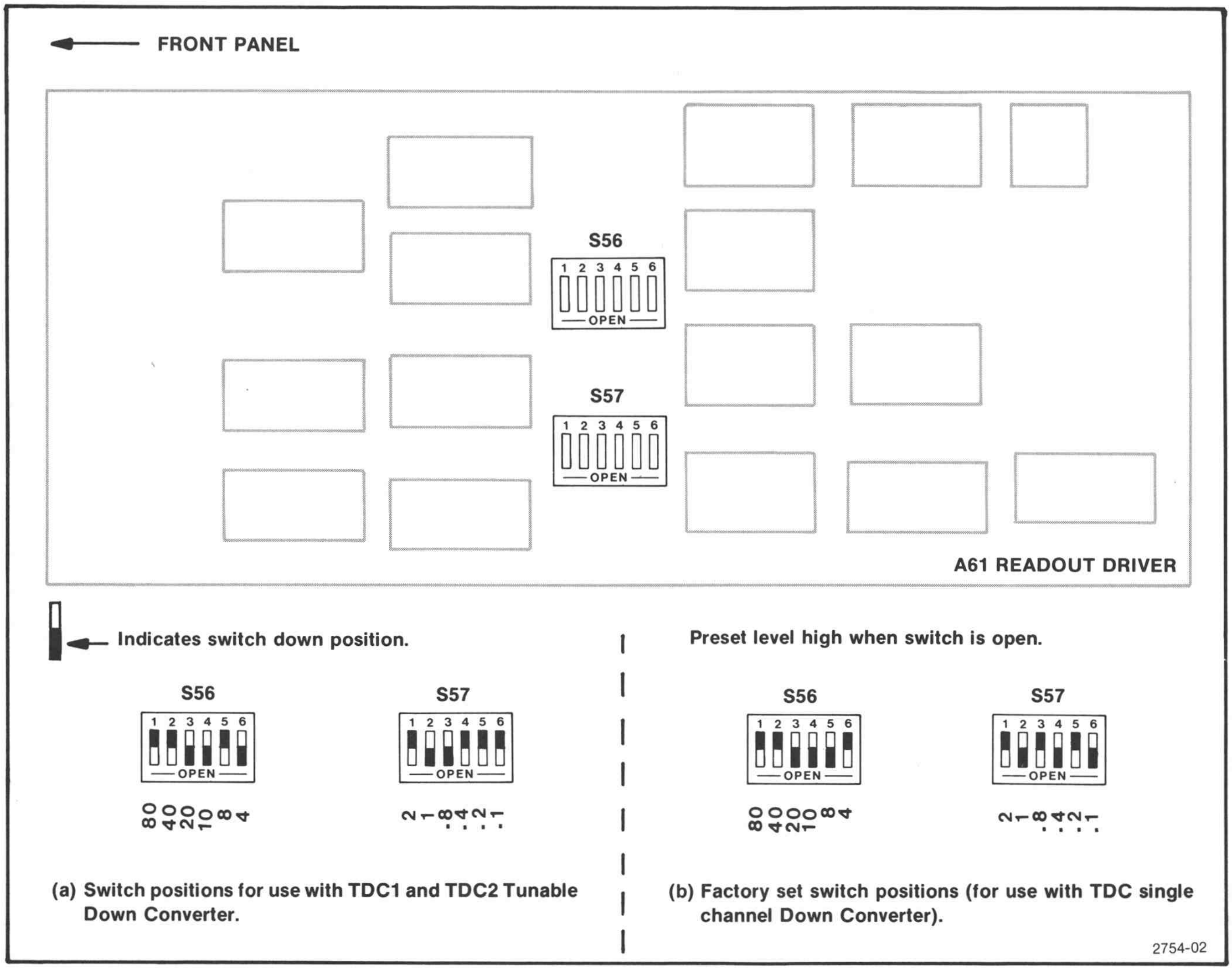
Check the directivity of the VSWR Bridge (at least 40 dB) before making any measurements.

Calibrating the 1450-1 Readout

The tunable down converters (TDC1 and TDC2) have an insertion gain of 1 dB, while the fixed-channel down converter (TDC) has an insertion gain of 4.7 dB. The difference in gain between the two instruments is 3.7 dB.

The 1450-1 readout is factory-set to operate with a fixed-channel down converter (4.7 dB offset). If a tunable down converter is to be installed in a 1450-1 to complete a SYSTEM, the 1450-1 must be reset to operate with the tunable down converter. Hence, the Readout Driver board, (A61) in the 1450-1, should be checked for correct settings of S56 and S57 (Readout Counter Presets—tenths and ones) before any TDC performance parameters are checked.

Refer to Fig. 4-1. S56 and S57 settings on the Readout Driver board on A61 should match Fig. 4-1. This compensates for insertion gain differences between the fixed-channel down converter and the tunable down converter.



(a) Switch positions for use with TDC1 and TDC2 Tunable Down Converter.

(b) Factory set switch positions (for use with TDC single channel Down Converter).

Fig. 4-1. Calibrating the 1450-1 Readout.

Measuring Frequency

The Option 07 feature in the TEKTRONIX DC 508 frequency counter and TM 503 power module in conjunction with the 7L13 spectrum analyzer, can be used to make accurate frequency measurements.

(a) Using the cables supplied with the accessories, connect the TR 502 tracking generator 1st and 2nd LO outputs to the 7L13 1st and 2nd LO inputs. Connect the spectrum analyzer Tracking Generator Logic output to the TR 502 Tracking Generator input. Figure 4-2 illustrates the test equipment setup.

(b) Connect the TR 502 Aux RF to the DC 508 input. An SMA-to-BNC adapter is required to complete the connection to the TR 502 Aux RF output connector. Set the TR 502 Dot Intensity control out of detent.

NOTE

The TR 502 features a sweep-stop operational mode that stops the sweep at the center of the screen, and instructs the frequency counter to take a frequency measurement, then allows the sweep to continue. When the analyzer is phase-locked, the accuracy of the count is to the nearest 10 Hz; and when the analyzer is not phase-locked, the accuracy is to the nearest 100 kHz. This sweep-stop mode can be turned off by the Dot Intensity control on the TR 502 front panel. Thus, when the 7L13 Center Frequency control is set such that the signal is centered about the intensified dot on the analyzer display, the DC 508 counter reads the frequency accurately.

Setting up 0.2 dB/Div Reference Flatness

Some checks and adjustments performed using a spectrum analyzer have tolerances of 1 dB or less.

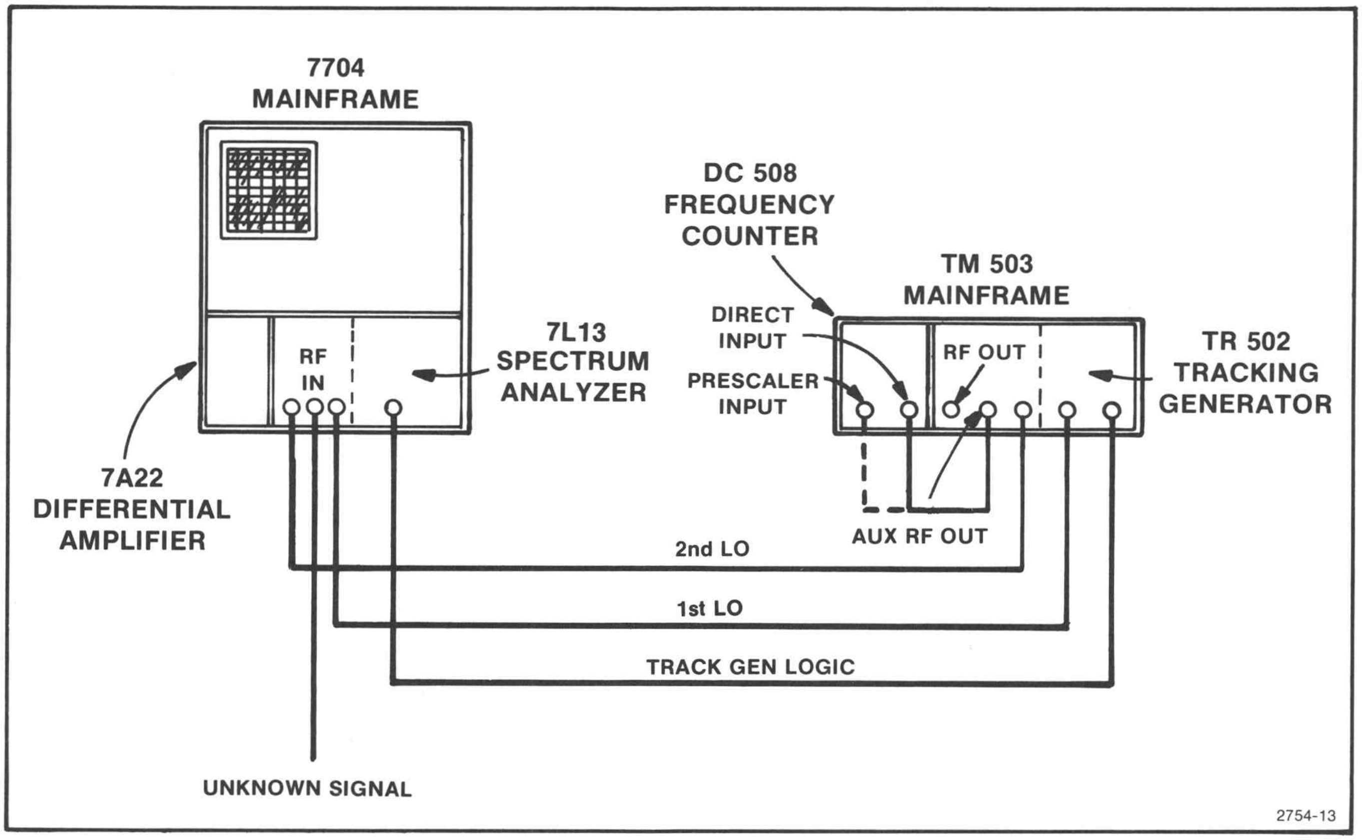


Fig. 4-2. Test Setup for Counting Frequency Using the Spectrum Analyzer/Tracking Generator/DC 508 Option 07.

Therefore, the test oscilloscope must be calibrated for 0.2 dB/div in order to perform these checks and adjustments. Performing the following steps will suffice.

(a) Connect the test equipment as shown in Fig. 4-3. Make the appropriate connections between the tracking generator and the spectrum analyzer [1st LO, 2nd LO, and Track Gen (LOGIC)].

(b) Set the spectrum analyzer Reference Level to locate the power level set with the tracking generator Output Level control, then push in the test oscilloscope mainframe Left Vertical Mode button.

(c) Use the differential amplifier DC Offset control to bring the trace within the viewing area.

(d) Use the Variable Volts/Div control on the differential amplifier to set up a 5-division excursion of the trace as 1 dB of attenuation is added and removed from the tracking generator signal.

(e) The test oscilloscope is now calibrated for 0.2 dB/div. A grease pen may be used to mark the trace on the implosion shield or graticule. This will be the reference flatness at 0.2 dB/div.

PERFORMANCE CHECK

Short-Form Procedure

The 1450-1 front-panel settings are as follows, except where otherwise noted:

Detection Mode	Synchronous (Cont)
Sound Trap	In
Internal Zero Carrier Ref	Off
Auto AGC	Sync Tip
Synchronous Time Constant	Norm
10 dB and 20 dB Buttons	Out

1. Check Return Loss

(20 dB, and 30 dB with 20 dB attenuation or more)

2. Check Input Frequency Range

(±20 kHz)

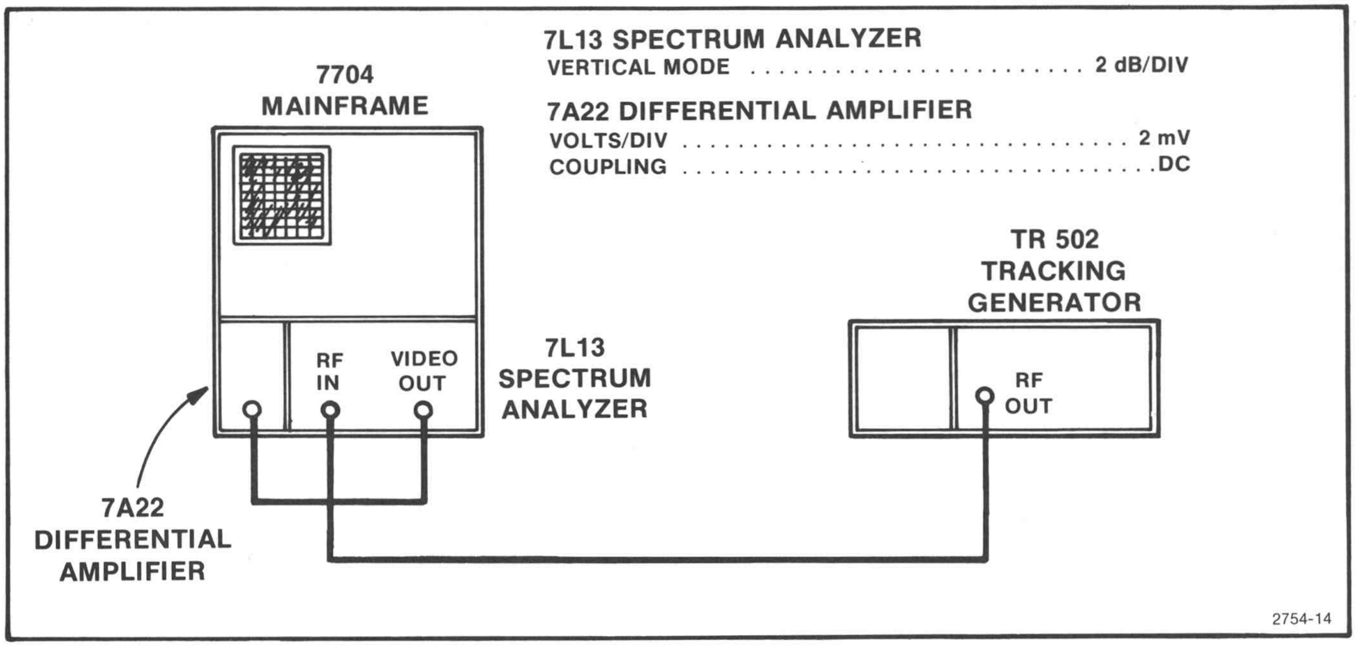


Fig. 4-3. Setting up 0.2 dB Reference Flatness.

3. Check Input Power Level Range and IF OUTput level

(−3 dBm to −24.7 dBm RF INput with −20 dBm IF OUTput)

4. Check Image Rejection

(60 dB or better)

5. Check IF Rejection Ratio

(60 dB or better)

6. Check Visual IF Frequency

(±120 kHz)

7. Check LO OUT Level

(At least −6 dBm)

8. Check Frequency Variation in Response as a Function of AGC

(±0.05 dB **vhf** and ±0.1 dB **uhf**)

9. Check RF Attenuator Range (SYSTEM)

(30 dB in 10 dB steps)

10. Check SYSTEM Signal-to-Noise Ratio and Noise Figure

(S/N = 60 dB or better)
(Noise Figure = 10 dB or less **vhf**)
(Noise Figure = 11 dB or less **uhf**)

11. Check SYSTEM AGC Range

(66 dB)

12. Check SYSTEM Adjacent Channel and 2nd Adjacent Channel Cross-modulation

(60 dB or less)

13. Check Variation in SYSTEM Frequency Response with AGC

(±0.1 dB or less VHF; ±0.15 dB or less UHF)

14. Check SYSTEM Chrominance Carrier/Aural Carrier/Visual Carrier Intermodulation (3-Tone Test)

(50 dB)

15. Check Readout Accuracy

(±2 dB)

16. Check Readout Resolution

(±0.1 dB)

Measurement Techniques used in Procedure

In the following procedure, the 1450-1 readout must be calibrated if a tunable down converter (TDC1 or TDC2) is installed in the 1450-1 as part of the SYSTEM. Frequency is measured in several steps, and test oscilloscope must be calibrated for 0.2 dB/div to perform several tight-tolerance checks. The information that follows provides details on these techniques and must be referred to before starting the procedure.

Detailed Procedure

1. Check Return Loss

(20 dB or better)
(30 dB or better with 20 dB attenuation)

(a) Connect the 1450-1 Television Demodulator and test equipment as shown in Fig. 4-4. Install the TELEVISION DOWN CONVERTER (TDC) to be tested into the 1450-1 and make the appropriate front-panel connections. Set the TR 502 Output Level at −20 dBm. Remove the **vswr** bridge from the 1450-1, and note the level on the spectrum analyzer. This level will be used as a reference level for measuring return loss.

(b) Check that return loss is at least 20 dB down from the reference level. Check return loss across the channel limits. Refer to Table 4-2 for channel limits.

(c) Push in the 20 dB Attenuator button on the 1450-1 front panel and check that return loss is at least 30 dB down from the reference level.

2. Check Input Frequency Range (±20 kHz)

(a) Connect the HP 8640B RF Output to the 1450-1 RF IN as shown in Fig. 4-5. Set the HP 8640B frequency to the visual carrier frequency of the TDC under test. The 1450-1 Unlocked light should be off.

NOTE

Connect the HP 8640B to the test setup through a Doubler (HP10510A) and a 2X attenuator when checking high channel number UHF TDC's.

(b) Check that the IF OUT frequency remains within 120 kHz of the specified visual carrier **if** as the HP 8640B is varied 20 kHz above and below the visual carrier frequency.

3. Check Input Power Level Range and IF OUTput Level (−3 dBm to −24.7 dBm)

(a) In this step, use the HP 435A Power Meter to set the Output Level on the HP 8640B Signal Generator each time its level is changed.

(b) Connect the signal generator (HP 8640B for **vhf** or SG 504 for **uhf**) to the SYSTEM RF In. Set the generator frequency at the visual carrier frequency of the TDC, and set the output level at −3 dBm. Push in the Man button on the 1450-1 front panel, and set the manual Gain control fully counterclockwise. Connect the TDC IF OUT to the spectrum analyzer **rf** input, and set the spectrum analyzer Center Frequency control for the visual **if** frequency of the TDC under test.

(c) Check that the IF OUT is −20 dBm ±0.5 dB.

(d) Change the generator output level to −24.7 dBm, and reset the 1450-1 manual Gain to fully clockwise.

(e) Check that the IF OUT is −20 dBm ±0.5 dB.

4. Check Image Rejection (60 dB or better)

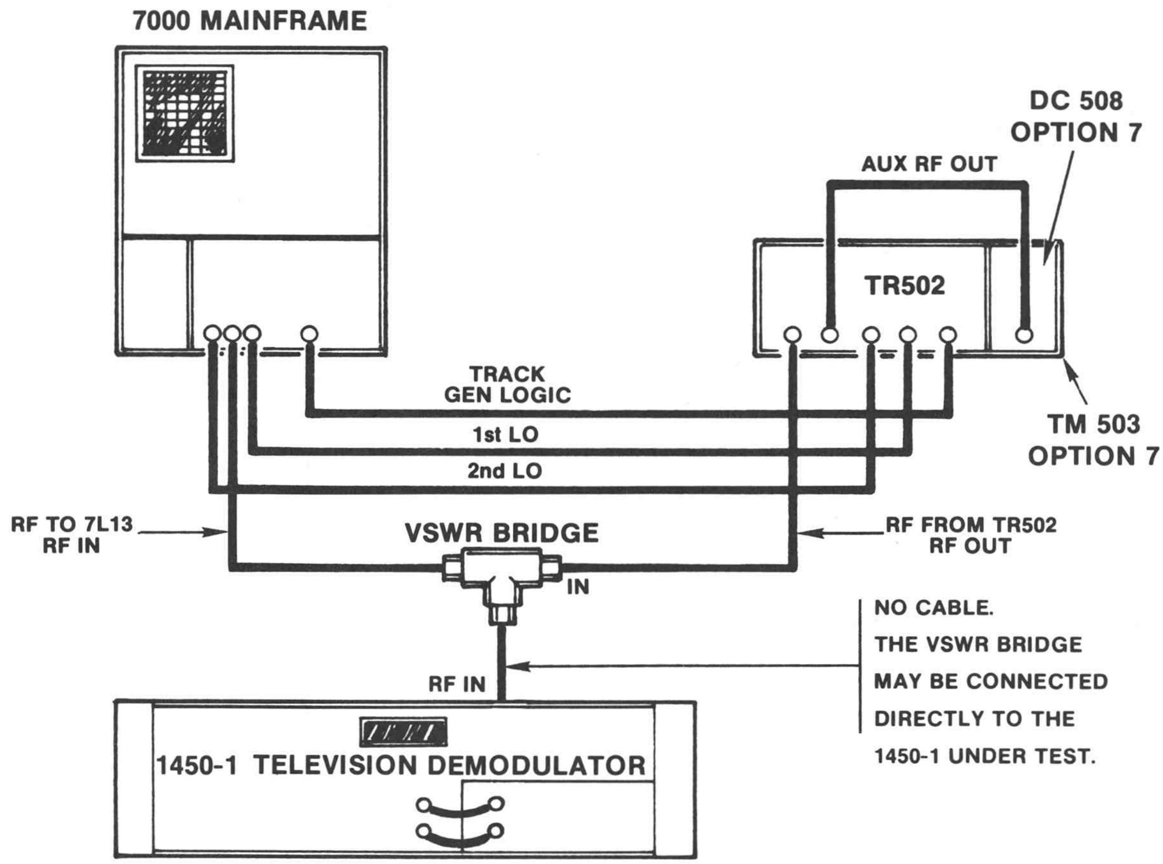
(a) Connect a signal generator (HP 8640B for **vhf** or SG 504 for **uhf**) to the SYSTEM RF In. Set the generator output level for −3 dBm at the visual carrier frequency of the TDC under test. Connect the TDC IF OUT to the spectrum analyzer. Set the 1450-1 manual Gain fully counterclockwise. Establish a reference level on the test spectrum analyzer, then increase the generator frequency by (2 X RF Visual Carrier + IF Visual Carrier).

(b) Check that the amplitude displayed on the spectrum analyzer is at least 60 dB below the established reference.

5. Check IF Rejection Ratio (60 dB or better)

(a) Connect a signal generator (HP 8640B for **vhf** or SG 504 for **uhf**) to the SYSTEM RF input. Set the generator frequency to the visual carrier frequency of the TDC under test, and set the output level at −20 dBm. Connect the TDC IF OUT to the spectrum analyzer, and set the spectrum analyzer Center Frequency to the visual **if** frequency of the TDC under test.

(b) Push in the Man button on the 1450-1 front panel and set the manual Gain control for a −20 dBm indicated input **rf** power to the 1450-1. Note that the spectrum analyzer displays approximately −20 dBm of IF OUT level.



7L13 FRONT PANEL SETTINGS

MODE............ 10 dB/DIV
REFERENCE
LEVEL........... −20 dBm
REF dB........... 10
RF IN .... −20 dBm
TRIGGERING..... SOURCE = INT
MODE = NORM
TIME/DIV......... 10 ms
FREQ SPAN/
DIV .... 5 MHz
RESOLUTION .... 3 MHz
CENTER
FREQUENCY .... CENTER FREQUENCY OF THE DOWN CONVERTER UNDER TEST.

TR 502 SETTINGS

OUTPUT
LEVEL........... −20 dBm
VAR dB 0

2597-50

Fig. 4-4. Test Setup for Checking Return Loss.

(c) Reset the generator frequency to the **if** frequency of the TDC under test.

(d) Check that the IF OUT amplitude on the spectrum analyzer is −80 dBm or less (60 dB down).

6. Check Visual IF Frequency (±120 kHz)

(a) Connect a signal generator (HP 8640B for **vhf** or SG 504 for **uhf**) to the SYSTEM RF Input. Set the generator frequency at the visual carrier frequency of the TDC under

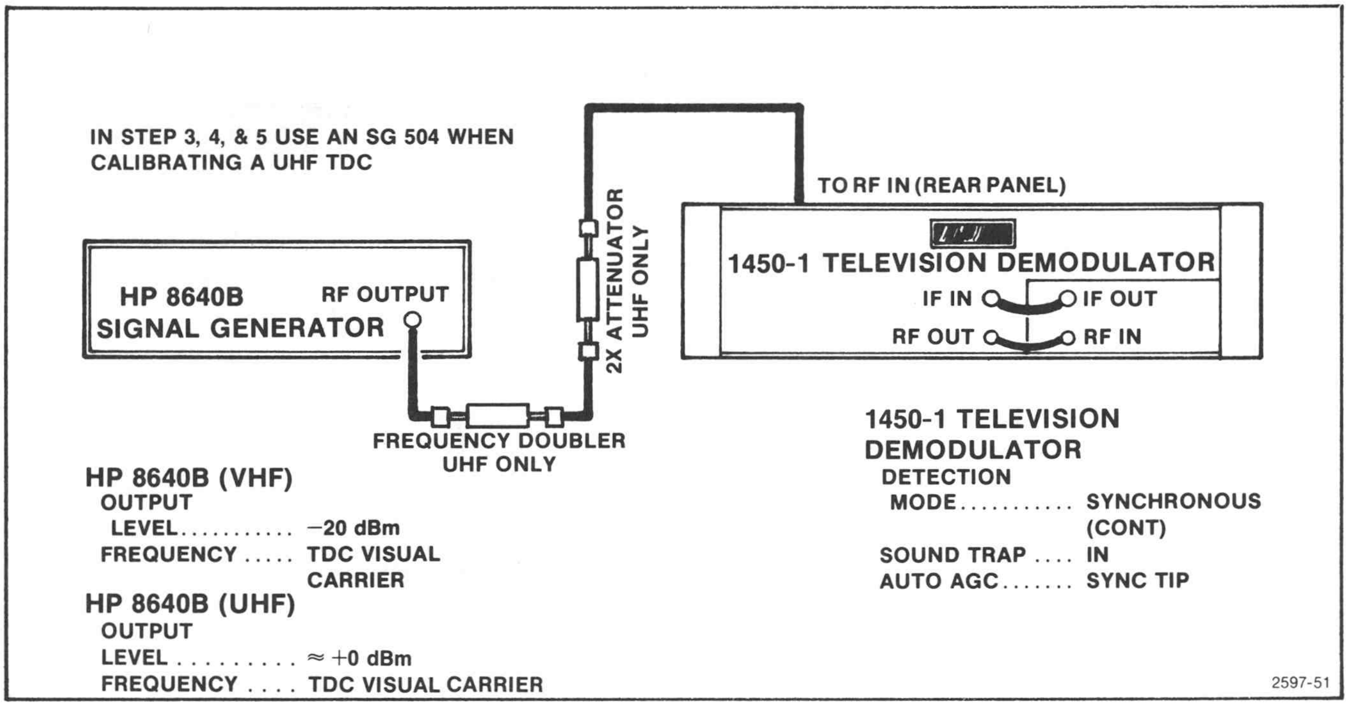


Fig. 4-5. Test Setup for Checking Input Frequency Range.

test and set the output level for −20 dBm. Connect the TDC IF OUT to the spectrum analyzer, and set the spectrum analyzer Center Frequency to the TDC **if** frequency.

(b) Check that the output frequency is within 100 kHz of the exact visual **if** frequency. This assures that with all valid RF inputs the ±120 kHz specification is met.

7. Check LO OUT Level (−6 dBm or greater)

(a) Connect the LO OUT to the spectrum analyzer and set the spectrum analyzer Center Frequency for the local oscillator (**lo**) of the TDC under test. (Note that the **lo** frequency will always be equal to Visual Carrier Frequency + Visual IF Carrier Frequency).

(b) Check that the displayed amplitude is −6 dBm or greater.

8. Check Variation in Frequency Response as a Function of AGC (±0.05 dB vhf; ±0.1 dB uhf)

(a) Connect the test equipment as shown in Fig. 4-6.

(b) Set the generator output level for −3 dBm at the SYSTEM center frequency. See Note 1.

(c) Set the spectrum analyzer Center Frequency at the SYSTEM IF center frequency. See Note 1.

(d) Set the 1450-1 manual Gain fully counterclockwise.

(e) Calibrate the vertical plug-in for 0.2 dB/div. See Note 2.

NOTE

(1) SYSTEM center frequency is the frequency at the center of the channel, that is 3 MHz above the lower channel limit and 3 MHz below the upper channel limit; for example, the channel 12 frequency limits are 204 MHz to 210 MHz, and thus center frequency is 207 MHz. The **if** *center frequency is 35.25 MHz for Option 1, 36.15 MHz for Option 2, and 44 MHz for Option 3.*

(2) Calibrate the vertical plug-in (7A22) for 0.2 dB/div by adding and removing 1 dB of attenuation to the input signal using the TEKTRONIX 2701, while adjusting the variable Volts/Div control on the 7A22 for a 5-division change as 1 dB of attenuation is added and removed.

Use the 7A22 dc offset to bring the trace within the **crt** *viewing area.*

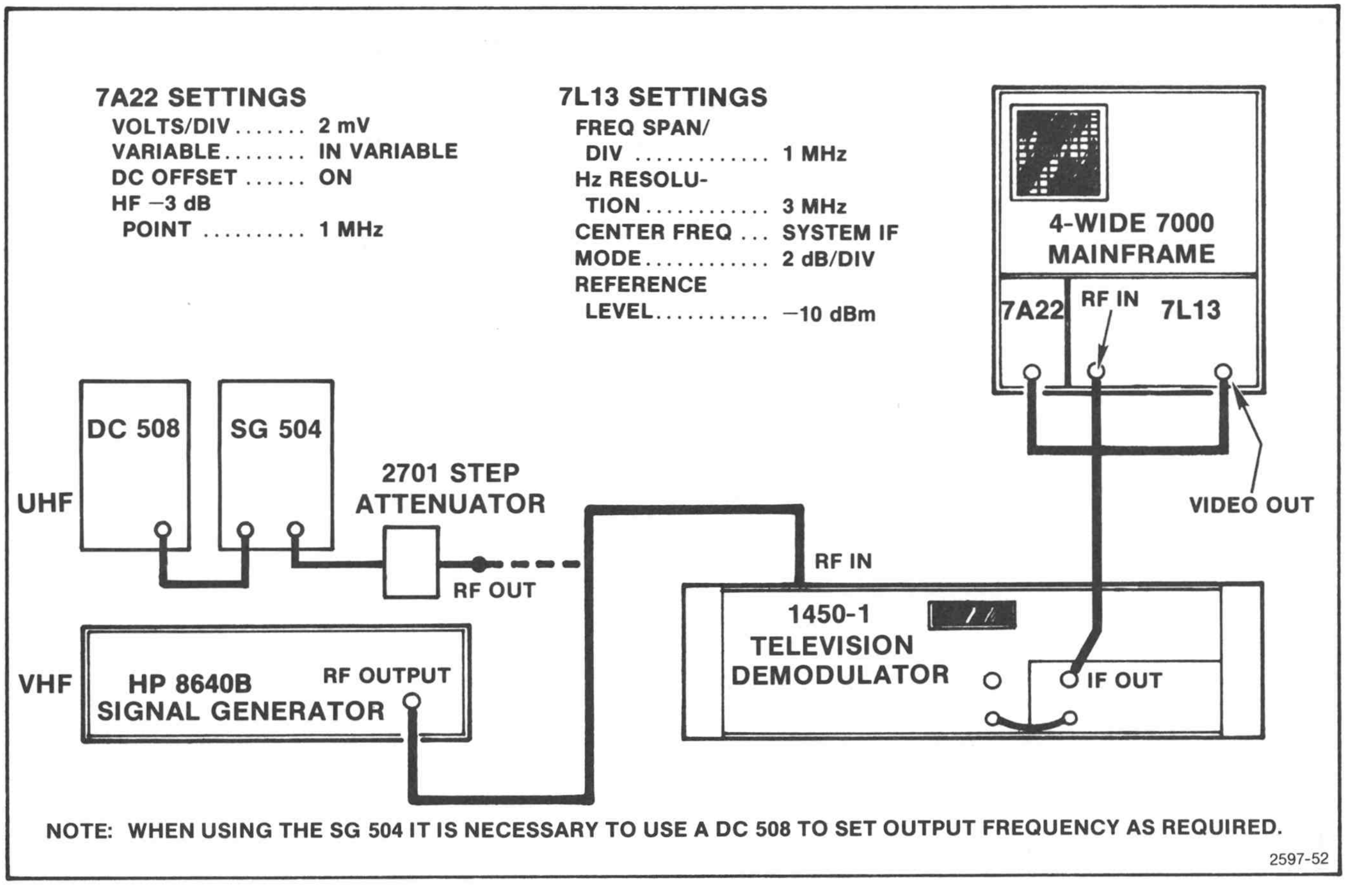


Fig. 4-6. Test Setup for Variation in Frequency Response as a Function of AGC.

(f) Once the vertical plug-in has been calibrated, manually sweep the generator, and mark the excursion of the top of the trace on the test oscilloscope with a grease pen. The generator must be manually swept at least 3 MHz above and below the SYSTEM center frequency. See Fig. 4-7 for a typical display. Reset the signal generator frequency to the SYSTEM center frequency.

(g) Add 22 dB of attenuation to the generator and reset the 1450-1 manual Gain to −25 dBm. Set the top of the new trace at the grease pen trace using the 7A22 DC Offset control.

(h) Vary the generator at least 3 MHz above and below the **rf** center frequency.

(i) Check that the excursion of the top of the trace is within 0.1 dB (±0.05 dB) of the grease pen trace in **vhf** SYSTEMs, and within 0.2 dB (±0.1 dB) in **uhf** SYSTEMs.

9. Check RF Attenuator Range (SYSTEM) (30 dB in 10 dB Steps)

(a) Connect a signal generator (HP 8640B for **vhf** or SG 504 for **uhf**) to the SYSTEM RF Input. Set the generator frequency to the visual carrier frequency of the TDC under test, and set the output level at −10 dBm. Connect the 1450-1 RF Out to the spectrum analyzer, and set the spectrum analyzer Center Frequency the same as the generator. Set the 1450-1 manual Gain at −10 dBm.

(b) Push in the 10 dB Attenuator button on the 1450-1 front panel.

(c) Check that the display on the spectrum analyzer decreases by 10 dBm (−20 dBm).

(d) Release the 10 dB button on the 1450-1 and push in the 20 dB button.

(e) Check that the spectrum analyzer display decreases by 20 dBm (−30 dBm).

(f) Push in both the 10 dB and 20 dB buttons on the 1450-1 front panel.

(g) Check that the spectrum analyzer display is down 30 dB from the original reference level (both attenuator buttons out = original reference level).

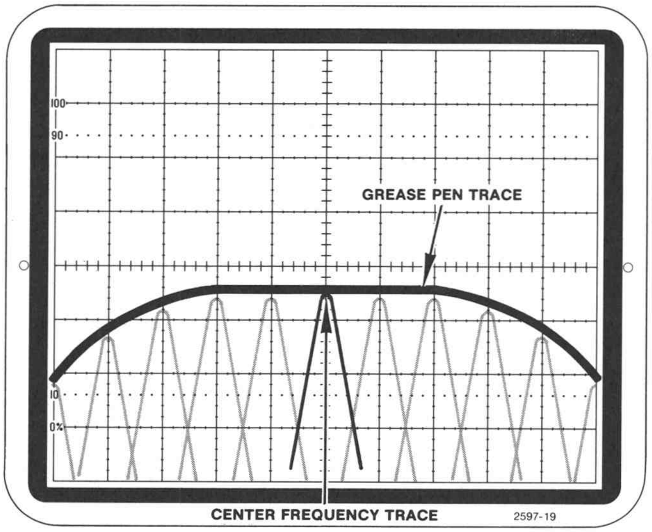


Fig. 4-7. Typical Vertical Plug-in Display When Checking Frequency Response.

NOTE

The switchable attenuator is a precision microwave subsystem, and its tolerances are much better than a spectrum analyzer can easily measure. Therefore, the preceding measurements are meant to detect gross failures of the attenuator subsystem only.

10. Check SYSTEM Signal-to-Noise Ratio and Noise Figure

(S/N = 60 dB or better)
(Noise Figure = 10 dB or less **vhf**)
(Noise Figure = 11 dB or less **uhf**)

NOTE

*Signal-to-Noise Ratio may be measured when the down converter is driven with **rf** signals between −3 dBm and −25 dBm; and Noise Figure measured when the down converter is driven with **rf** signals less than −25 dBm.*

(a) Install the down converter in the 1450-1 mainframe and make the appropriate front-panel connections to complete the SYSTEM. Remove the top dust cover from the 1450-1 to gain access to the Phase Lock Switch board (A58) located behind the front panel to the left. Move the jumper on P60 from pins 1 and 2 to pins 2 and 3. This puts the 1450-1 in "Forced" Synchronous Detection Mode. Push in one of the Synchronous Detection Mode buttons on the 1450-1 front panel.

(b) Connect the test equipment as shown in Fig. 4-8. Push in the 1450-1 Man button on the front panel and set the manual Gain control such that the RF Input Power Level readout indicates −20 dBm.

(c) Read the **rms** voltage directly on the **rms** voltmeter. This is the **rms** noise voltage.

NOTE

The specification for Signal-to-Noise Ratio expressed in dB is equal to:

*20 X Log (0.714 V p-p Video/0.714 mV **rms** Noise) =60 dB.*

*Replacing 0.714 mV **rms** in the preceding formula with the measured **rms** voltage will result in the signal-to-noise ratio.*

(d) Check that signal-to-noise ratio is at least 60 dB, or the measured **rms** voltage in part c is less than 0.714 mV **rms**.

(e) Reset the 1450-1 Manual Gain control to indicate any power level between −45 dBm and −66 dBm. Read the **rms** voltage indicated on the **rms** voltmeter and recalculate the signal-to-noise ratio for this new gain setting. This new signal-to-noise ratio value will be used to calculate the noise figure.

NOTE

*Noise Figure is equal to the absolute value of the KTB Thermal Noise Floor (−101 dBm for this system) minus the sum of the absolute values of the RF Input Signal Power and the Signal-to-Noise Ratio as measured by the above method at an **agc** setting to correspond to the **rf** input level used.*

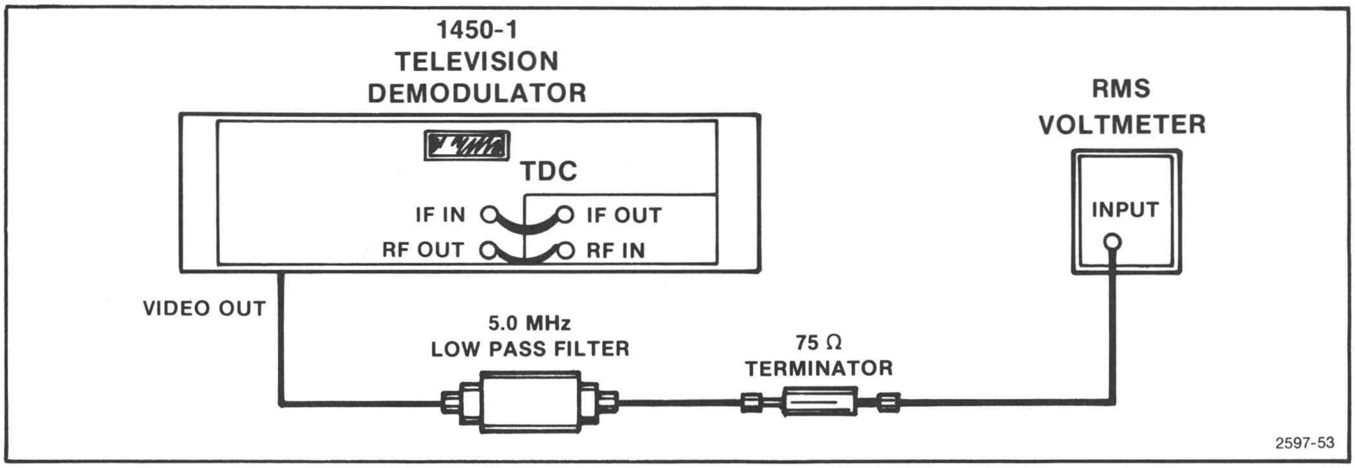


Fig. 4-8. Test Setup for Checking Signal-to-Noise Ratio and Noise Figure.

EXAMPLE

Set the 1450-1 manual Gain control to indicate −60 dBm on the RF Signal Input Level readout. If the measured signal-to-noise ratio for this manual ***agc*** *setting is 32 dB, then the noise figure would be:*

NF = 101 dB—(60 dB +32 dB) = 9 dB.

(f) Check that the Noise Figure is 10 dB or less in **vhf** SYSTEMs; 11 dB or less in **uhf** SYSTEMs.

11. Check SYSTEM AGC Range (66 dB)

(a) Connect a signal generator (HP 8640B for **vhf** or SG 504 for **uhf**) to the SYSTEM RF Input. Set the generator frequency at the TDC visual carrier frequency and the output level at −3 dBm. Push in the Sync Tip (Auto AGC) button on the 1450-1 front panel.

(b) Check that the 1450-1 readout indicates a −3 dBm ±1 dB input power level.

(c) Use an external attenuator to reset the generator output level to −69 dBm.

(d) Check that the 1450-1 readout indicates a −69 dBm ±1 dB input power level. Also check that the overrange lights on the readout panel remain off.

12. Check Adjacent Channel and 2nd Adjacent Channel Cross-modulation (60 dB or Less)

(a) Connect the test equipment as shown in Fig. 4-9, and tune the HP 8640B to your specific TDC channel. Use a spectrum analyzer such as a 7L13 to set the power levels at point "A" in Fig. 4-9 according to the following table:

HP 8640B CHANNEL CARRIER	SG 503/504 (1) ADJACENT CHANNEL CARRIER	SG 503/504 (2) ADJACENT CHANNEL CARRIER +1 MHz
−28 dBm[1]	−28 dBm[1]	−34 dBm[1]

[1] **These levels are approximate.**

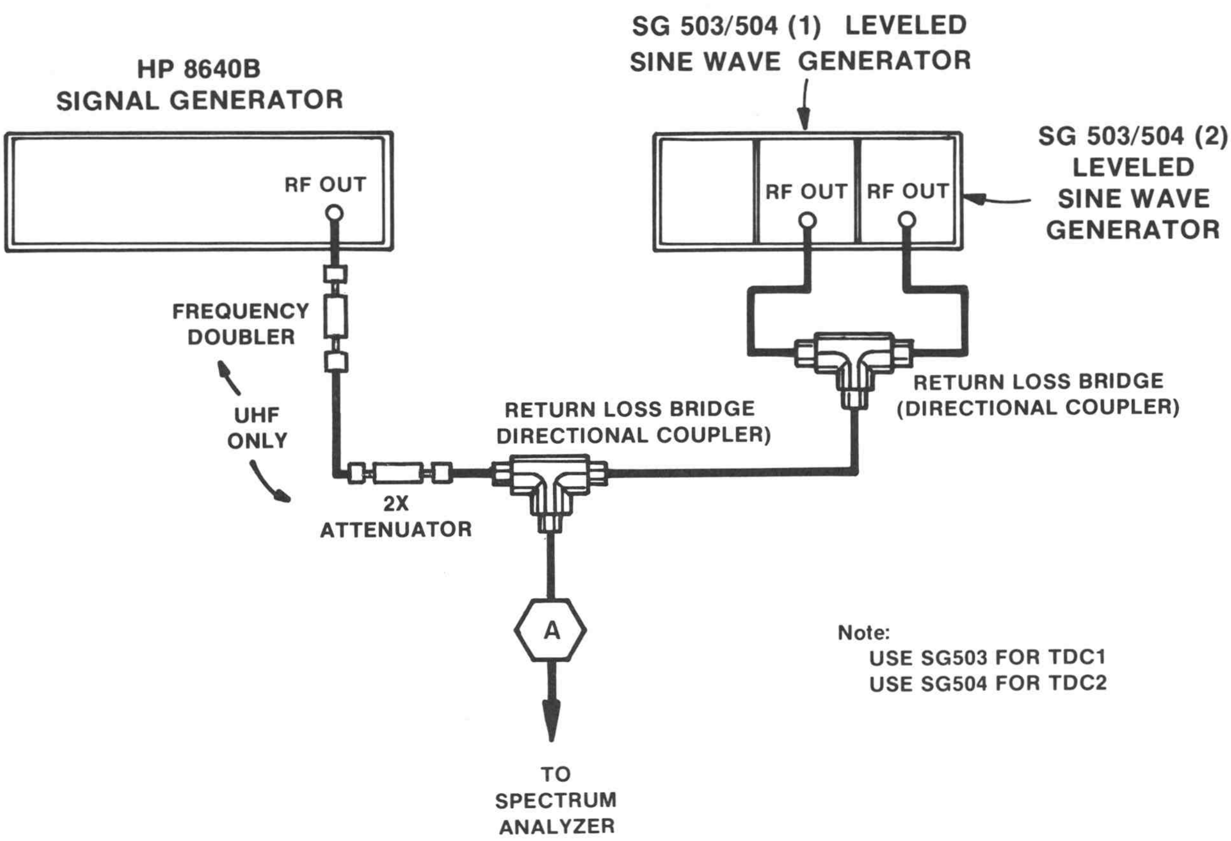
NOTE

Connect the HP 8640B to the test setup through a Doubler (HP 10510A) and a 2X attenuator when checking high number UHF channels.

(b) Now connect point "A" in Fig. 4-9 to the SYSTEM RF Input. Push in the 1450-1 Cont (Synchronous Detection Mode), Sound Trap In, and Man buttons. Set the 1450-1 manual Gain control for a −24.7 dBm indicated RF Signal Input Level on the 1450-1 readout.

(c) Use a dc-blocking capacitor to monitor the SYSTEM Video Output with the spectrum analyzer. Set the spectrum analyzer Center Frequency to view baseband video (0 to 10 MHz), and Freq Span/Div at 1 MHz.

(d) Tune the sine-wave generator (2) frequency to 1 MHz above the TDC visual carrier frequency. Set the spectrum analyzer for this 1 MHz sideband signal to be at the top of the **crt** display. This establishes the measurement reference. Now return the number 2 generator to its original frequency.



HP 8640B SIGNAL GENERATOR	SG 503/504 (1) LEVELED SINE WAVE GENERATOR	SG 503/504 (2) LEVELED SINE WAVE GENERATOR
CH CARRIER	ADJACENT CHANNEL CARRIER	ADJACENT CHANNEL CARRIER + 1 MHz
≈ −22 dBm	≈ −16 dBm	≈ −22 dBm

2597-54

Fig. 4-9. Test Setup for Checking Adjacent Channel Cross-Modulation.

(e) Locate the adjacent channel cross-modulation signal at 1 MHz on the spectrum analyzer display above the zero marker.

(f) Check that the adjacent channel cross-modulation signal is 60 dB down from the top of the screen; that is, from the reference established in part d (60 dB down from the adjacent channel sideband level).

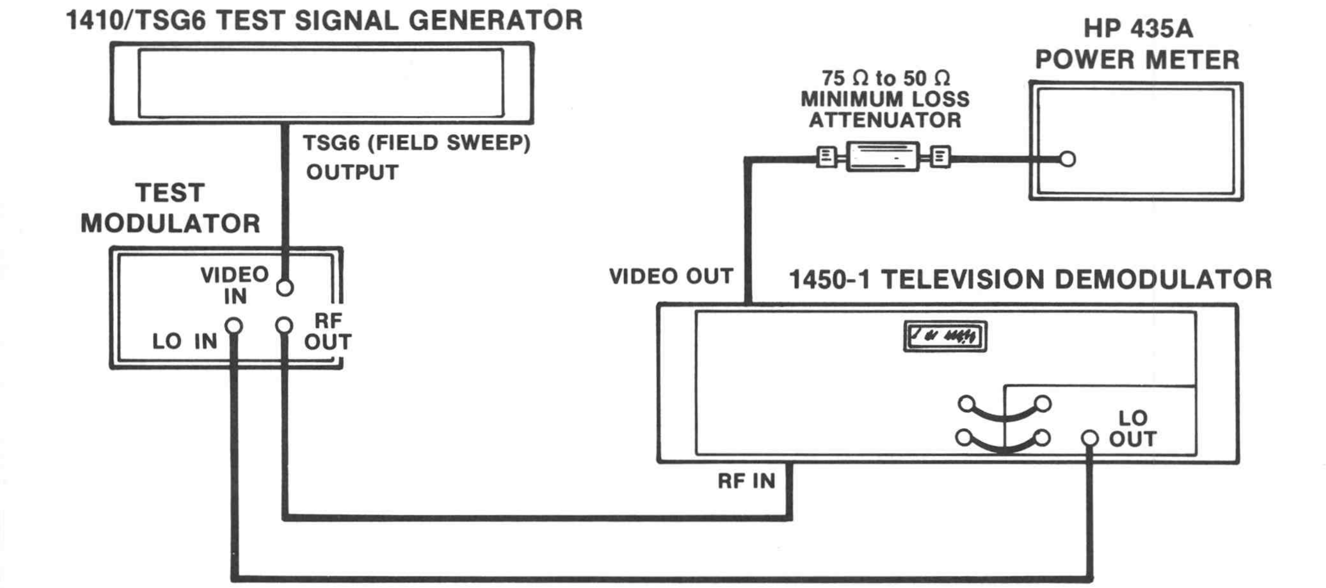
(g) Reset the Generator (1) and Generator (2) frequencies to the 2nd adjacent channel frequencies, and perform parts a through e.

(h) Check that the 2nd adjacent channel cross-modulation signal is 60 dB or better down from the top of the screen.

13. Check SYSTEM Variation in Frequency Response with AGC (±0.1 dB vhf; ±0.15 dB uhf)

(a) Connect the test equipment as shown in Fig. 4-10. Monitor the video output on the 1450-1 with a frequency counter such as a TEKTRONIX DC 508.

(b) Push in the 1450-1 Man button and set the Gain control such that the High/Low lights in the readout window are both out.



1410/TSG6 TEST SIGNAL GENERATOR

FREQ RANGE BUTTON	IN
MARKERS BUTTON	OUT
COMPOSITE/CONTINUOUS BUTTON	IN
MANUAL BUTTON	IN
AMPL BUTTON	IN
FREQUENCY DIAL	FULL COUNTER-CLOCKWISE

1450-1 TELEVISION DEMODULATOR

DETECTION MODE	BACK PORCH (SYNCHRONOUS)
SOUND TRAP	OUT
AUTO AGC	BACK PORCH

2597-55

Fig. 4-10. Test Setup for Checking SYSTEM Frequency Response with AGC.

(c) Set the sweep generator (TSG6) to Continuous (Composite/Continuous button out).

(d) Set the Frequency dial on the sweep generator for 100 kHz reading on the frequency counter and make a note of the power meter reading. Call this quantity "A". Now set the Frequency dial on the sweep generator for 4.5 MHz reading on the frequency counter and make a note of the power meter reading. Call this quantity "B".

(e) Insert a 20 dB pad (X10 attenuator) between the TDC IF OUTput and the 1450-1 IF Input. Set the 1450-1 Gain control such that the readout indicates 20 dB lower.

(f) Set the Frequency dial on the sweep generator for 100 kHz reading on the frequency counter and make a note of the power meter reading. Call this quantity "C". Now set the Frequency dial on the sweep generator for 4.5 MHz reading on the frequency counter and make a note of the power meter reading. Call this quantity "D".

(g) CHECK that the absolute value of the quantity:

$$[(A - B) - (C - D)]$$

is less than 0.1 dB in **vhf** SYSTEMs or less than 0.15 dB in **uhf** SYSTEMs.

Example: Suppose A = C = 0 dBm, B = 0.25 dBm, and D = 0.16 dBm, Then

$[(A - B) - (C - D)] = [(0 - 0.25) - (0 - 0.16)]$ dBm
$= (-0.25 + 0.16)$ dBm
$= -0.090$ dBm
$= 0.09$ dB flat

14. Check Chrominance Carrier/Aural Carrier/Visual Carrier Intermodulation (3-Tone Test) (50 dB)

(a) Connect the test equipment as shown in Fig. 4-11. Use a spectrum analyzer such as a 7L13 to set the power levels at point "A" in Fig. 4-8 according to the following table:

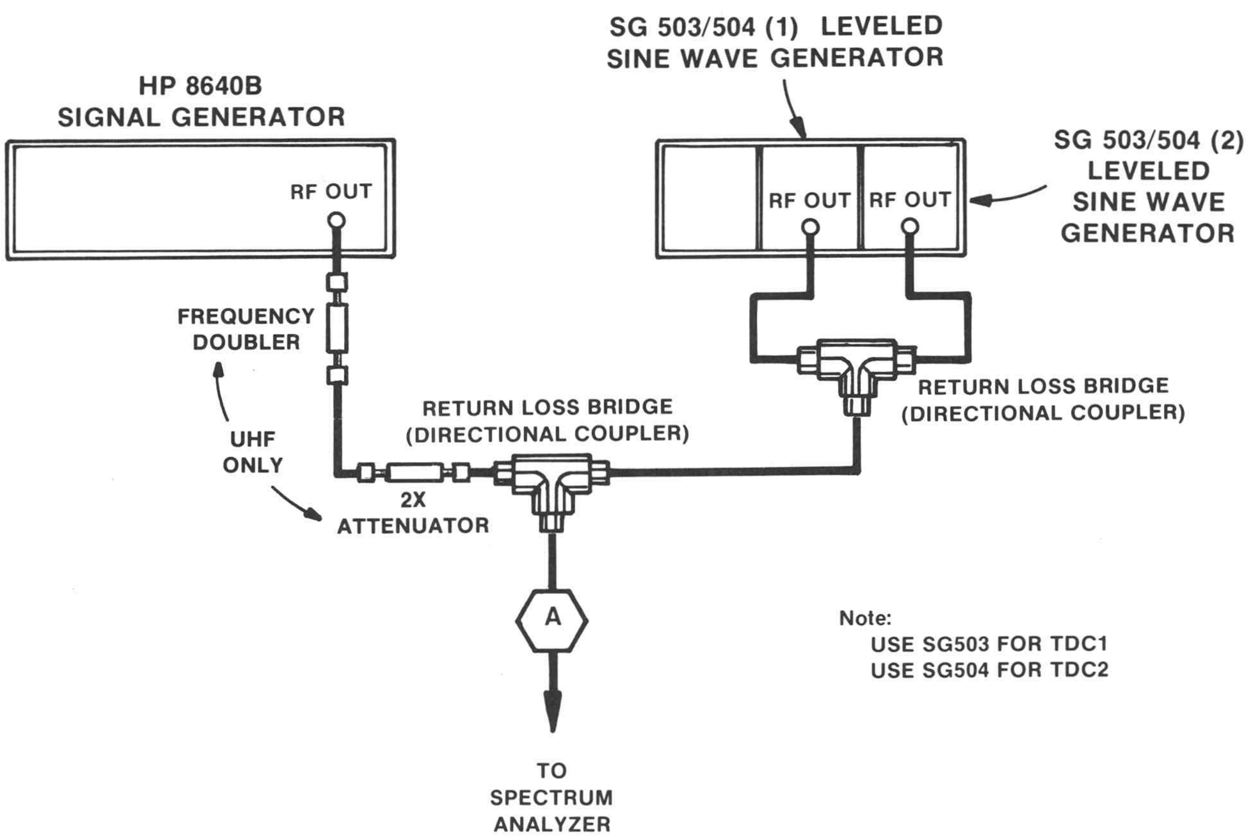
VISUAL CARRIER HP 8640B	CHROMINANCE CARRIER SG 503/504 (1)	AURAL CARRIER SG 503/504 (2)
−20 dBm[1]	−32.5 dBm[1]	−23.5 dBm[1]

[1] These levels are approximate.

NOTE

Connect the HP 8640B to the test setup through a Doubler (HP 10510A) and a 2X attenuator when checking high number UHF channels.

(b) Now connect point "A" in Fig. 4-11 to the SYSTEM RF Input. Push in the 1450-1 Cont (Synchronous Detection Mode), Sound Trap Out, and Sync Tip buttons. The 1450-1 Unlocked light should be "off". If the Unlocked light is "on", disconnect the aural carrier from the test setup momentarily. The 1450-1 Unlocked light should remain "off" throughout this step. Note the 1450-1 readout indication.



HP 8640B SIGNAL GENERATOR	SG 503/504 (1) LEVELED SINE WAVE GENERATOR	SG 503/504 (2) LEVELED SINE WAVE GENERATOR
CHANNEL VISUAL CARRIER	CHANNEL CHROMINANCE CARRIER	CHANNEL AURAL CARRIER
≈ −14 dBm	≈ −20.5 dBm	≈ −11.5 dBm

2597-56

Fig. 4-11. Test Setup for Checking Carrier Intermodulation (3-Tone Test).

(c) Push in the 1450-1 Man button and set the manual Gain control such that the readout indication is 3.5 dB higher than was noted in part b.

(d) Use a dc-blocking capacitor to monitor the SYSTEM Video Output with the spectrum analyzer. Set the spectrum analyzer Center Frequency at 1 MHz and Freq Span/Div at 1 MHz.

(e) Locate the carrier intermodulation signal and the aural signal at 920 kHz and 4.5 MHz respectively on the spectrum analyzer display.

(f) Use the spectrum analyzer attenuator and Variable gain controls to position the aural carrier at the top of the graticule area. Push in the 1450-1 Sound Trap In button.

(g) Check that the carrier intermodulation signal is at least 43 dB less than the aural signal as referenced on the spectrum analyzer with Sound Trap Out.

NOTE

The specification is referenced to the visual carrier at full power (full power being the carrier level when the 1450-1 is in Auto AGC). The visual carrier is now at −3.5 dB from full power and the aural carrier is at −7 dB from full power.

15. Check Readout Accuracy (±2 dB)

(a) Drive the SYSTEM **rf** input with known power levels from a signal generator (such as an HP 8640B or equivalent **cw** source generator). These power levels may be verified with a power meter (such as an HP 435A with the appropriate power sensor head). Verify these power levels at the 1450-1 input (at the cable end connecting to the SYSTEM **rf** input).

(b) Set the signal generator output frequency at the channel center frequency and set the output level at −3 dBm.

NOTE

SYSTEM center frequency is the frequency at the center of the channel that is 3 MHz above the lower channel limit and 3 MHz below the upper channel limit; for example, the channel 12 frequency limits are 204 MHz to 210 MHz and thus center frequency is 207 MHz.

(c) Check that the readout on the 1450-1 indicates −3.0 dBm ±2 dB.

(d) Increase the signal generator output level in 1 dB increments from −3 dBm to −69 dBm.

(e) Check that the 1450-1 readout tracks the signal generator output level within 2 dB.

16. Check Readout Resolution (±0.1 dB)

(a) With the 1450-1 Manual Gain button pushed in, vary the Manual Gain control from maximum (−3 dBm) to minimum (−69 dBm).

(b) Check that the readout increases smoothly in 0.1 dBm steps as the Manual Gain control is varied from maximum to minimum.

ADJUSTMENT PROCEDURE

Short-Form Procedure

1. Check/Adjust LO Frequency, Amplitude, and Phase-Lock Loop

(R36, R38, and C51 on A7 RF PLL board, and C55 on A8 RF VCO board)

2. Check/Adjust Return Loss

(C69 on A6 RF Mixer board channels 2 through 6)
(C82, C87, and C55 on A2 and A5 Bandpass Filters)
(C46 on A3 VHF Pin Attenuator)

3. Check/Adjust IF Rejection

(Channels 2 through 6 Only—C24, C87 on A6 RF Mixer board)

4. Check/Adjust TDC Overall Flatness

5. Check/Adjust IF OUT Level

(R17 and P48 on A6 RF Mixer board)

Detailed Procedure

Use the TDC Extender Cable (Tektronix Part No. 067-0899-00) to facilitate access to some adjustments. It will be necessary to remove the TDC front panel for access to C82 and C87 on A2 RF Bandpass Filter. Use the Torx screwdriver to remove the honeycomb covers over all the circuit boards except A6 VCO Amp board.

NOTE

GO THROUGH THE ENTIRE PERFORMANCE CHECK PROCEDURE FIRST BEFORE MAKING ANY ADJUSTMENTS. DO NOT MAKE ANY ADJUSTMENTS UNLESS IT IS ESSENTIAL TO SATISFY A PERFORMANCE PARAMETER.

1. Check/Adjust LO Frequency, Amplitude, and Phase-Lock Loop

(R36, R38, and C51 on A7 RF PLL board, and C55 on A8 RF VCO board)

NOTE

LO Frequency = Visual Carrier Frequency + Visual IF Frequency.

EXAMPLE

For an Option 3 Channel 8 TDC (IF = 45.75 MHz) **lo** frequency is the sum of 181.25 MHz and 45.75 MHz or 227 MHz.

(a) Check Mixer LO Level

(1) Remove the cable connected to P87 on A9 RF VCO Amp board and monitor P87 with the spectrum analyzer. Set the spectrum analyzer Center Frequency at the **lo** frequency of the TDC under test.

(2) Remove the cable connected to P82 on A9 RF VCO Amp board (P82 mounts through the Interface board) and remove P15 from A7 RF PLL board.

(3) Adjust R38 on A7 RF PLL board for a 4 V dc level at TP19.

(4) Adjust C55 on A8 VCO board until the signal at P87 on A9 RF VCO Amp board is at the required frequency ±100 kHz. Lock C55 in place.

(5) Check that the **lo** level at P87 is greater than +8 dBm (+10 dBm nominal).

(6) Replace the cable to P87. Monitor P82 with the spectrum analyzer.

(7) Check that the **lo** level at P82 is greater than +1 dBm (+3 dBm nominal) and replace the cable to P82. Reconnect P15 if not proceeding to step 1 part b.

(b) Check/Adjust LO Tuning (C51 VHF only)

(1) On A7 RF PLL board, set R36 fully clockwise and remove P15 jumper. See Fig. 8-1 for adjustment locations.

(2) Monitor TP24 with the test oscilloscope. Adjust R38 for approximately 500 kHz of difference signal at TP24.

(3) Check for the best shaped sine wave signal at TP24.

(4) Adjust C51 for the best shape and highest amplitude of sine-wave signal at TP24 (at least 200 mV peak).

(c) Adjust PLL Offset Voltage (R38)

(1) Monitor TP19 with the test oscilloscope.

(2) Check that the dc level at TP19 is 4.0 V.

(3) Adjust R38 for a 4.0 V dc level at TP19. Connect the LO OUT to the spectrum analyzer and note the frequency.

(4) By adjusting R38, slowly vary the voltage at TP19 from −0.8 V to +12 V (the full range of R38) and monitor the LO OUT on the TDC front panel with a spectrum analyzer. Note that the **lo** frequency varies from ±600 kHz to ±4 MHz about the frequency corresponding to the 4.0 V dc level at TP19, depending on the TDC channel (lower channels have smaller phase-lock loop ranges) without any discontinuities or multiple oscillations.

(5) Readjust R38 to set a 4.0 V dc level at TP19.

(6) Replace P15 and check that the voltage at TP19 oscillates around 4.0 V dc by at least plus and minus 3 V at about a 7 Hz rate.

(7) Remove P15 and P43 (P43 mounts through the Interface board) from A7 RF PLL board. Set R36 fully counterclockwise and, if necessary, readjust R38 for a 4 V dc level aat P19.

(8) Replace P43 and remove the cable connected to P87. Use a **bnc** to peltola adapter cable to connect P87 to the spectrum analyzer **rf** input. Remove P15 on A7 and adjust R38 on A7 until the

voltage-controlled oscillator (**vco**) is no longer phase-locked and is 400 kHz above the phase-locked position. Note this condition on the spectrum analyzer by observing the **vco** frequency spike and its two 400 kHz "sidebands". Adjust R38 on A7 to momentarily rephase-lock the **vco** in order to determine which "sideband" is at the final lock frequency; then readjust R38 on A7 to unlock the **vco** and set it 400 kHz above the phase-lock position.

(9) Adjust R36 on A7 to reduce the "sideband" at the final locking frequency to at least 55 dB down from the **vco** power on the spectrum analyzer. If the "sideband" is not more than 55 dB down, set R36 on A7 fully counterclockwise. R38 on A7 may be adjusted as needed to maintain the 400 kHz "sideband" while adjusting R36.

(10) Replace P15 and note that the search oscillator causes the phase-lock-loop to lock each time the 1450-1 power is turned "off" and "on".

(11) Note the **lo** frequency on the spectrum analyzer. If necessary, adjust C55 on A8 RF VCO assembly until the **lo** is at the correct frequency, stable, and TP19 on A7 (RF PLL board) is at 4.0 V. Lock C55 into place. Note that there is no periodic difference signal at TP24 on A7.

(d) Adjust LO Phaselock Range (C55)

(1) Monitor the LO OUTput with a frequency counter (DC 508) and monitor TP24 on A7 (RF PLL board) with a test oscilloscope.

(2) Remove the jumper from P15 on A7 RF PLL board.

(3) Adjust C55 on A8 RF VCO until a sine wave appears at TP24 (that is until the **lo** becomes unlocked). Now readjust C55 to the position where the **lo** is still unlocked but just on the verge of locking. (This may require several attempts.) Note the frequency on the DC 508. Now adjust C55 in the opposite direction until a sine wave appears at TP24. Adjust C55 to the point where the **lo** is just about to lock and note the frequency on the DC 508. Readjust C55 such that the dc level at TP19 is 4.0 V and check to see that the **lo** frequency is halfway between the two frequencies ±20%.

(4) Replace the jumper to P15 on A7.

(5) Temporarily install the shield cover over A8 (VCO board). A8 shield cover also covers A6, A7, and A9. Only a few screws through the cover will be necessary.

(6) Monitor the V_c signal at C15 on A11 (the Interface board) with a test oscilloscope. If necessary, adjust C55 on A8 RF VCO board to reset V_c to 4.0 V.

(e) Check LO OUT Power Level (Front Panel)

(1) Connect LO OUT to the spectrum analyzer and set the spectrum analyzer Center Frequency for the **lo** frequency of the TDC under test; LO Frequency = Visual Carrier Frequency + Visual IF Frequency. See Table 4-2 for channel (visual) carrier frequencies.

(2) Check that **lo** amplitude is −6 dBm or greater.

(3) Check that **lo** frequency is equal to the sum of the visual carrier and **if** visual carrier frequencies ±100 kHz.

2. Check/Adjust Return Loss

(C69 on A6 RF Mixer board channels 2 through 6)
(C82, C87, and C55 on A2 and A5 Bandpass Filters)
(C46 on A3 VHF Pin Attenuator)

(a) Connect the test setup as shown in Fig. 4-12. Set the TR 502 output level for a −20 dBm signal and set the spectrum analyzer at the channel center frequency of the TDC under test. Channel center frequency is defined as 3 MHz above the channel lower limit and 3 MHz below the channel upper limit. See Table 4-2 for channel limits. This TR 502 output level should remain the same through step 2. Establish a reference level on the test oscilloscope before any connections are made to the test arm of the **vswr** bridge. Disconnect the cable connected to P88 on A6 RF Mixer board and connect the **vswr** bridge test arm to P88. See Fig. 8-1 for circuit board locations.

(1) Check that return loss is at least 15 dB across the 6 MHz bandpass.

(2) Adjust C79 on A6 RF Mixer board for the best return loss across the 6 MHz bandpass. See Fig. 8-1 for adjustment locations.

(3) Disconnect the **vswr** bridge from P88 on A6 RF Mixer board and reconnect the cable from A5 RF Bandpass Filter to P88.

(b) Disconnect the cable connected to P84 on the output of A4 (RF Amp board) and connect it to the **vswr** bridge.

(1) Check that return loss is at least 10 dB across the 6 MHz bandpass.

(c) Remove the cable from the **vswr** bridge and connect the bridge to P84 on A4 RF Amp board.

(1) Check that return loss is at least 20 dB across the 6 MHz bandpass.

(2) Disconnect the **vswr** bridge from P84 and reconnect the cable from A5 to P84 on A4 RF Amp board.

(d) Disconnect the cable connected to P14 on the input of A4 RF Amp board and connect the **vswr** bridge to P14.

(1) Check that return loss is at least 24 dB across the 6 MHz bandpass.

(2) Remove the **vswr** bridge from P14 on A4 RF Amp board and reconnect the cable to P14.

(e) Disconnect the cable connected to P24 (P25 in **uhf** TDC) on A3 Pin Attenuator board and connect the **vswr** bridge to this plug. Push in the 1450-1 Man button.

(1) Check that return loss is at least 24 dB across the 6 MHz bandpass while varying the 1450-1 manual Gain control from fully clockwise to fully counterclockwise.

(2) Adjust C46 on A3 (**vhf** only) Pin Attenuator board for at least 24 dB return loss. See Fig. 8-1 for adjustment locations.

(3) Remove the **vswr** bridge from P24 (P25 in **uhf** TDC) on A3 Pin Attenuator board and reconnect the cable to P24 (P25 in **uhf** TDC).

(f) Connect the **vswr** bridge to the 1450-1 RF IN connector (rear panel). Make the appropriate front-panel connections between the 1450-1 and the TDC to complete the SYSTEM.

(1) Check that return loss in the channel bandpass is at least 20 dB, typically greater than 20 dB.

(g) Set the generator output level at −20 dBm and output frequency at the **if** frequency of the TDC under test.

(1) Connect the generator to the spectrum analyzer **rf** input.

(2) Calibrate the vertical plug-in for 0.2 dB/div. (See Measurement Techniques used in Procedure preceding the Detailed Procedure.)

(3) Remove the cable from P14 on A4 RF Amp board and connect the signal generator to P14. Set the generator frequency at the **rf** carrier center frequency of the TDC under test and output level at −25 dBm.

(4) Connect the down converter IF OUT to the spectrum analyzer **rf** input, and set the spectrum analyzer Center Frequency to the center of the **if** bandpass frequency.

(5) Check that bandpass flatness is within 0.1 dB across the 6 MHz bandpass.

(6) Adjust C82 and C87 on A5 RF Bandpass Filter to center the bandpass about the 6 MHz channel. See Fig. 8-1 for adjustment locations.

(7) Adjust C55 (A, B, C, and D) on A5 RF Bandpass Filter for bandpass (6 MHz) and bandpass flatness ±0.1 dB). Note that in UHF Down Converters there are only two adjustments for C55 (A and B) in A2 and A5 (Bandpass Filters).

(8) The preceding steps 6 and 7 are interactive. Therefore, it may be necessary to readjust C82, C87, and C55 in order to achieve a 6 MHz bandpass, bandpass centering, and bandpass flatness.

(9) Reconnect the cable from A3 to P14 (input of A4).

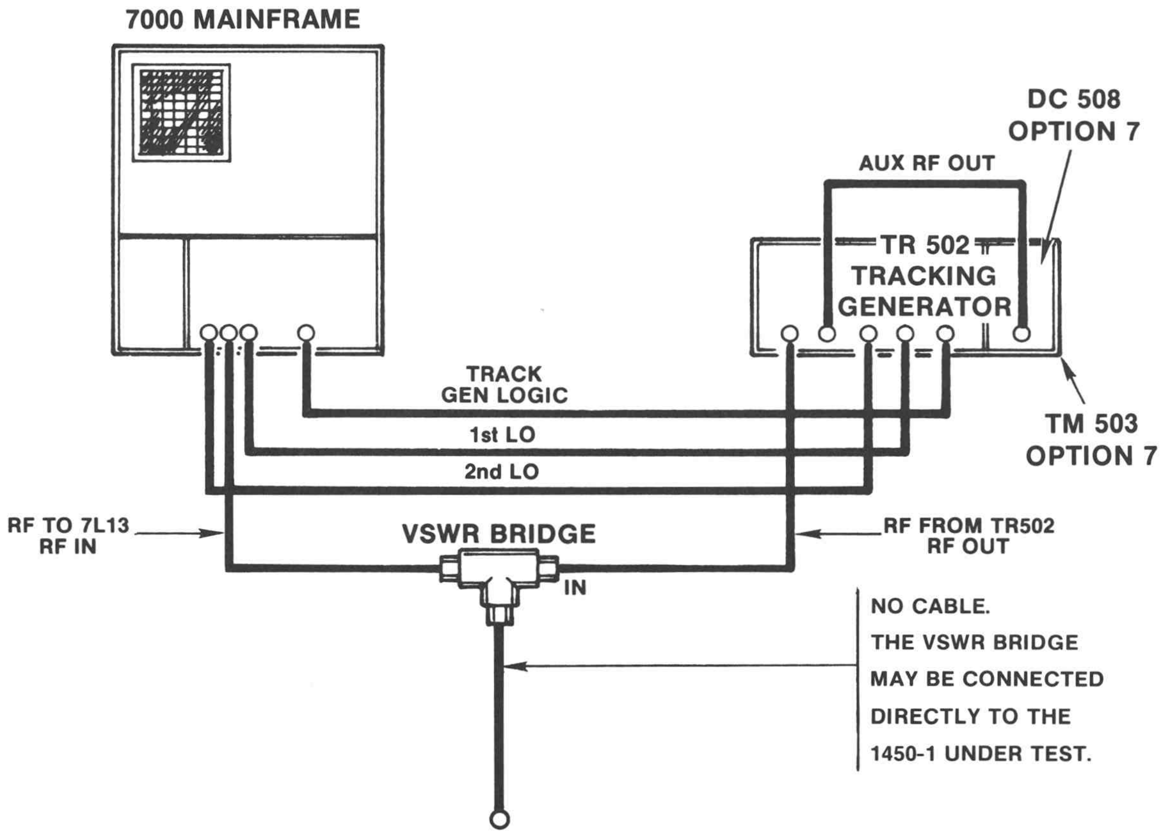
(10) Connect the signal generator to the SYSTEM (1450-1) RF INput and connect the 1450-1 RF OUTput to the TDC RF INput (RF IN).

(11) Adjust C82 and C87 on A2 RF Bandpass Filter to center the bandpass about the 6 MHz channel. See Fig. 8-1 for adjustment locations.

(12) Adjust C55 (A, B, C, and D) on A2 RF Bandpass Filter for bandpass (6 MHz) and bandpass flatness (±0.2 dB). Note that in UHF Down Converters there are only two adjustments for C55 (A and B) in A2 and A5 (Bandpass Filters).

(13) The preceding steps 11 and 12 are interactive. Therefore, it may be necessary to readjust C82, C87, and C55 in order to achieve a 6 MHz bandpass, bandpass centering, and bandpass flatness.

(14) Recheck the SYSTEM (1450-1) RF INput for a return loss of 20 dB or better using the test setup in Fig. 4-12.



7L13 FRONT PANEL SETTINGS

MODE	10 dB/DIV
REFERENCE LEVEL	−20 dBm
REF dB	10
RF IN	−20 dBm
TRIGGERING	SOURCE = INT MODE = NORM
TIME/DIV	10 ms
FREQ SPAN/ DIV	5 MHz
RESOLUTION	3 MHz
CENTER FREQUENCY	CENTER FREQUENCY OF THE DOWN CONVERTER UNDER TEST.

TR 502 SETTINGS

OUTPUT LEVEL	−20 dBm
VAR dB	0

2597-57

Fig. 4-12. Test Setup for Checking Return Loss.

3. Check/Adjust IF Rejection

(Channels 2 through 6 only—C24, C87 on A6 RF Mixer board)

(a) Connect the signal generator (HP 8640B) to the SYSTEM (1450-1) RF INput. Set the generator frequency to the visual carrier frequency of the TDC under test and set the output level at −20 dBm. Connect the TDC IF OUT to the spectrum analyzer **rf** input and set the spectrum analyzer Center Frequency to the **if** visual carrier frequency of the TDC.

(b) Push in the Man button on the 1450-1 front panel and set the manual Gain control for a −20 dBm indicated **rf** input.

(c) Check that the IF OUT amplitude is −20 dB ±1 dB.

(d) Reset the spectrum analyzer Center Frequency to the TDC **lo** second harmonic frequency.

NOTE

LO frequency = (visual carrier frequency + ***if*** *frequency)*
*LO second harmonic frequency = 2 X (****lo*** *frequency)*

(e) Adjust C24 on A6 for minimum **lo** second harmonic. See Fig. 8-1 for adjustment locations.

(f) Reset the generator frequency to the **if** frequency of the SYSTEM and set the spectrum analyzer Center Frequency to the same frequency.

(g) Check that the IF OUT amplitude is −80 dBm or less, that is 60 dB down.

(h) Adjust C87 on A6 for minimum IF OUT signal.

(i) Reset the generator frequency to the visual carrier frequency of the TDC under test.

(j) Check to make sure that the IF OUTput amplitude is still at −20 dBm ±1 dB.

4. Check/Adjust TDC Overall Flatness

(C82, C87, and C55 on A5 Bandpass Filter)

(a) Connect the test equipment as shown in Fig. 4-13. Calibrate the spectrum analyzer/test oscilloscope combination for 0.2 dB/div. Refer to Measurement Techniques used in Procedure preceding the Detailed Procedure.

(b) Push in the 1450-1 Man button and set the manual Gain control fully clockwise.

(c) Adjust C55 (A, B, C, and D), C82, and C87 on A5 for a response flat within 0.2 dB across the 6 MHz bandpass.

5. Check/Adjust IF OUT Level

(R17 and P48 on A6 RF Mixer board)

(a) Throughout step 5, use the HP 435A Power Meter to set the signal generator output levels.

(b) Connect the generator output to the SYSTEM (1450-1) **rf** input. Set the generator output level (HP 8640B for **vhf** or SG 504 for **uhf**) at −3 dBm.

(c) Push in the Man button on the 1450-1 front panel and set the manual Gain control fully counterclockwise.

(d) Connect the TDC IF OUT to the spectrum analyzer **rf** input and set the spectrum analyzer Center Frequency at the **if** visual carrier frequency of the TDC under test.

(e) Check that the IF OUT is −20 dBm ±0.5 dB on the spectrum analyzer. Stop here if the IF OUTput amplitude is within specification or proceed to part f if not.

(f) Set R17 on A6 fully clockwise and check that the IF OUT is at least −20 dBm with an **rf** input level of −24.7 dBm. See Fig. 8-1 for adjustment locations. P48 on A6 selects the point about which R17 can be adjusted to set the IF OUT level. Note how much higher than −20 dBm the IF OUT level is, then use P48 on A6 to select the point about which R17 can be adjusted to set the IF OUT level at −20 dBm ±0.5 dB. Refer to the table on A6 in schematic diagram 1 for P48 ranges.

(g) Adjust R17 to set the IF OUT level at −20 dBm ±0.5 dB.

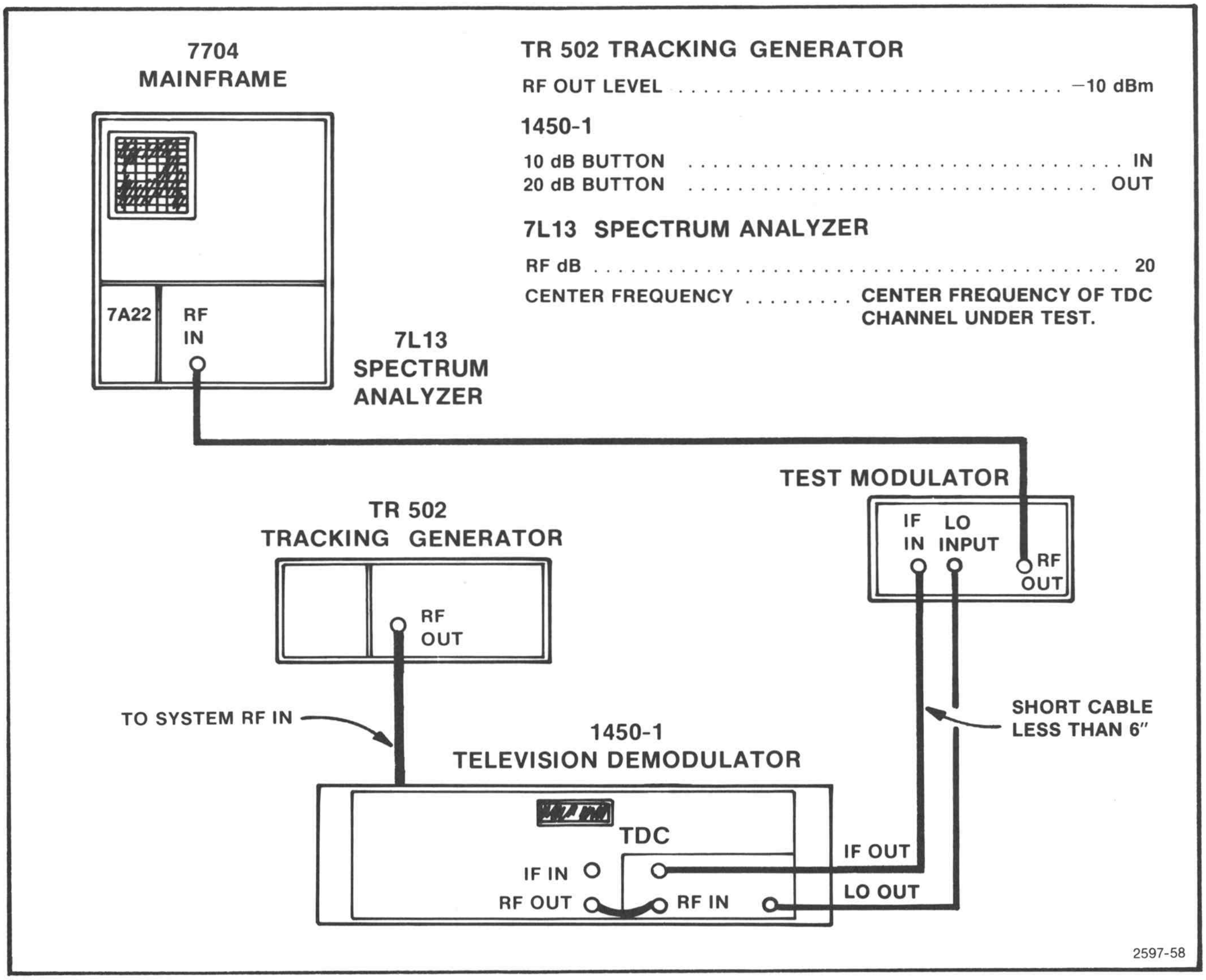


Fig. 4-13. Test Setup for Adjusting Overall TDC Flatness.

MAINTENANCE

Introduction

This section describes the procedure for reducing or preventing instrument malfunction, plus troubleshooting, and corrective maintenance. Preventive maintenance improves instrument reliability. Should the instrument fail to function properly, corrective measures should be taken immediately; otherwise, additional problems may develop within the instrument.

PREVENTIVE MAINTENANCE

Preventive maintenance consists of cleaning, visual inspection, performance check, and if needed, readjustment. The preventive maintenance schedule that is established for the instrument should be based on the environment in which the instrument is operated and the amount of use. Under average conditions a preventive maintenance check should be performed every 3000 hours of instrument operation.

Cleaning

Clean the instrument often enough to prevent dust or dirt from accumulating in or on it. Dirt acts as a thermal insulating blanket and prevents efficient heat dissipation. It also provides high-resistance electrical leakage paths between conductors or components in a humid environment.

Exterior. Clean the dust from the outside of the instrument by wiping or brushing the surface with a soft cloth or small brush. The brush will remove dust from around the front-panel knobs and selector buttons. Hardened dirt may be removed with a cloth dampened in water that contains a mild detergent. Abrasive cleaners should not be used.

Interior. Clean the interior by loosening accumulated dust with a dry soft brush, then remove the loosened dirt with low-pressure air to blow the dust clear. (High-velocity air can damage some components.) Hardened dirt or grease may be removed with a cotton-tipped applicator dampened with a solution of mild detergent in water. Abrasive cleaners should not be used. If the circuit-board assemblies need cleaning, remove the circuit board by referring to the instructions under Corrective Maintenance in this section.

After cleaning, allow the interior to thoroughly dry before applying power to the instrument.

CAUTION

Do not allow water to get inside any enclosed assembly or components. Do not clean any plastic materials with organic cleaning solvents such as benzene, toluene, xylene, acetone or similar compounds because they may damage the plastic.

Visual Inspection

After cleaning, carefully check the instrument for such defects as defective connections, damaged parts, and improperly seated transistors and integrated circuits. The remedy for most visible defects is obvious; however, if heat-damaged parts are discovered, try to determine the cause of overheating before the damaged part is replaced; otherwise the damage may be repeated.

Transistor and Integrated Circuit Checks

Periodic checks of the transistors and integrated circuits are not recommended. The best measure of performance is the actual operation of the component in the circuit. Performance of these components is thoroughly checked during the performance check or adjustment procedures, and any substandard transistors or integrated circuits will usually be detected at that time.

Performance Checks and Readjustment

The instrument performance should be checked after each 3000 hours of operation, or every six months if the instrument is used intermittently, to ensure maximum performance and assist in locating defects that may not be apparent during regular operation. Instructions for conducting a performance check are provided in the Performance Check and Adjustment section.

TROUBLESHOOTING

The following are a few aids and suggestions that may assist in locating a problem. After the defective assembly or component has been located, refer to the Corrective Maintenance part of this section for removal and replacement instructions.

NOTE

No repair should be attempted during the warranty period or by unqualified personnel.

Troubleshooting Aids

Foldout Pages. The foldout pages at the back of the manual contain significant information useful for troubleshooting the instrument. Block and schematic diagrams, waveforms, circuit-board illustrations, parts locating charts, and IC (Integrated Circuit) diagrams are located on foldout pages. See Fig. 5-1.

Diagrams. Block and circuit diagrams are the most often used aids to troubleshooting. The circuit number and electrical value of each component is shown on the diagrams (see the first page in the Diagrams section for definition of the reference symbology used to identify components in each circuit). Refer to the Replaceable Electrical Parts list for a complete description of each component. Those portions of the circuit that are mounted on circuit boards or assemblies are enclosed in a gray border, with the name and assembly number shown on the border.

NOTE

Check the Change Information section at the rear of the manual for inserts describing corrections and modifications to the instrument and manual.

Circuit-Board Illustrations. Electrical components, connectors, and test points are identified on circuit-board illustrations located on the inside fold of the corresponding circuit diagram, or the back of the preceding diagram.

Parts Locating Charts. The schematic diagrams and the circuit-board illustrations are assigned location grids. A parts locating chart for each assembly gives grid locations of components on both the circuit board and the schematic.

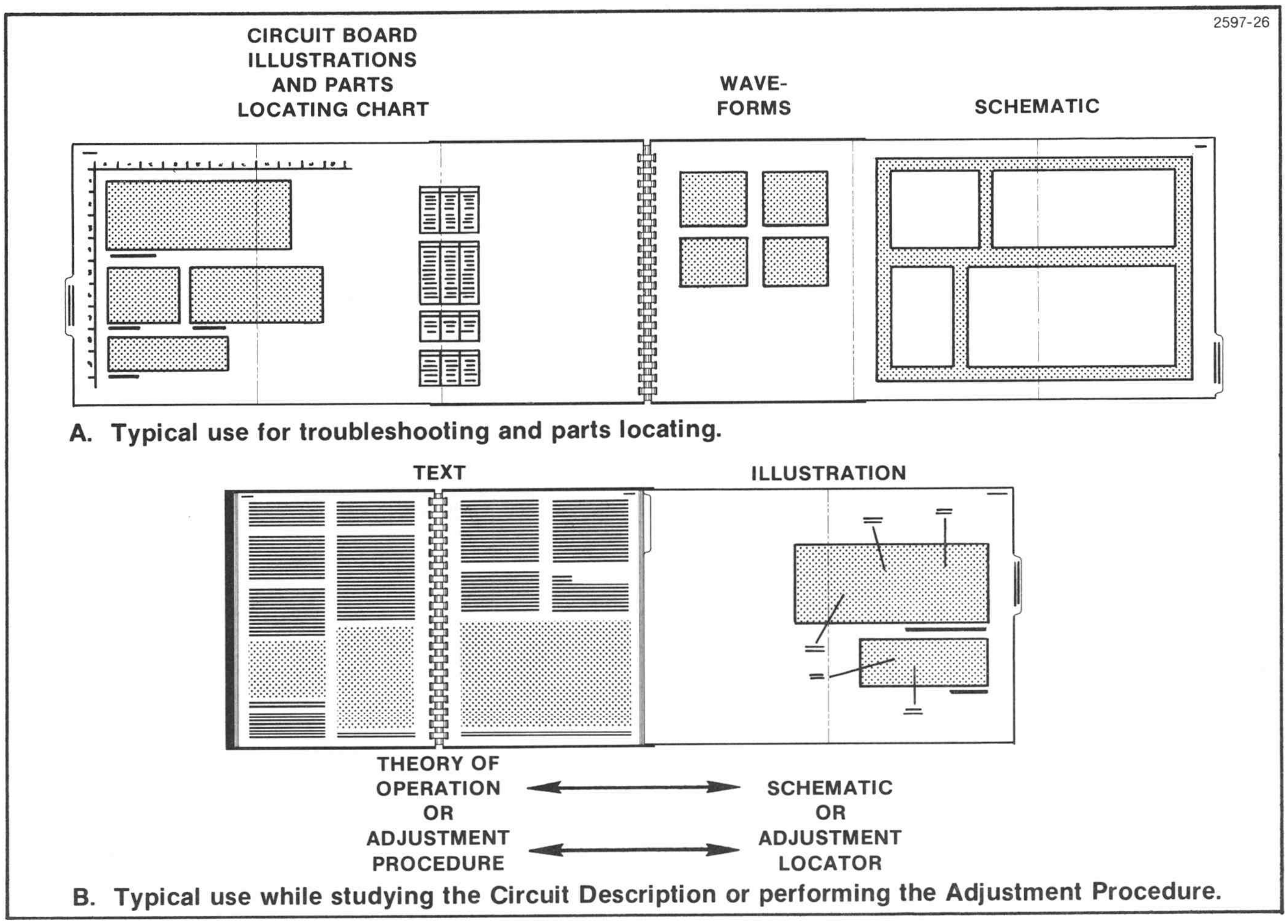


Fig. 5-1. Using the foldout pages.

@

Assembly and Circuit Numbering

The circuit boards and other assemblies (except for the chassis and the front- and rear-panel connectors) are assigned assembly numbers that generally follow the signal path through the instrument. See Fig. 5-2.

Each component is assigned a circuit number according to its geographic location within an assembly.

The Replaceable Electrical Parts list is arranged in assembly-by-assembly order, as designated by ANSI Standard Y32.16-1975. The circuit number in the parts list is made up by combining the assembly number and the circuit number.

EXAMPLE: R25 on A61 would be listed in the parts list as A61R25.

In the case of chassis, and front- and rear-panel mounted parts, which have no assembly number, the parts list number is the same as shown on the schematic. Any one or two digit circuit number in the parts list is a part mounted on the front or rear panel, or the chassis.

NOTE

The parts list number should be used when ordering replacement parts.

Components

Connectors. Most signal connections are made through Peltola or Conhex coaxial connectors.

NOTE

When reconnecting a Peltola connector, be careful to avoid bending the coaxial center conductor.

Most other intercircuit connections are made through pin connectors to the Interface board (A11). The VCO Amp board (A9V and A9U) also connects to the VCO board (A9V and A9U). Many pin connectors on the Interface board (A11) are part of feedthrough capacitors.

All connectors are identified on the schematic and board with "P" numbers.

Resistors. Composition (brown body), metal-film (gray or light blue body), and chip resistors are used in this instrument. The resistance values of composition and metal film resistors are color coded on the component with EIA color code (some metal film resistors may have the value printed on the body). Chip resistors are generally too small to be marked, and therefore should be handled cautiously to avoid mixing resistors of different values if replacing more than one.

Capacitors. The capacitance value of common disc capacitors or small electrolytics are marked in microfarads or picofarads on the side of the component body. The white ceramic capacitors and tantalum electrolytics are color coded. Chip capacitors are generally too small to be marked, and so again, care should be taken against mixing more than one value of chip component at a time.

Diodes. The cathode of each glass encased diode is indicated by a stripe, a series of stripes, or a dot. Some diodes have a diode symbol printed on one side.

Most diodes can be checked in the circuit by taking measurements across the diode and comparing these with voltages listed on the diagram. Forward-to-back resistance ratios can usually be taken by referring to the schematic and pulling appropriate transistors and pin connectors to remove low-resistance loops around the diode.

CAUTION

Do not use an ohmmeter scale with a high external current to check the diode junction.

Transistors. Lead identification for the transistors and IC is shown in Fig. 5-3.

Semiconductor failures account for the majority of electronic equipment failures. Substitution is often the most practical means for checking their performance. The following guidelines should be followed when substituting these components:

a. First determine that circuit voltages are safe for the substituted component, so the replacement will not be damaged.

b. Use only components known to be good for substitution.

c. Turn the power off before a component is substituted.

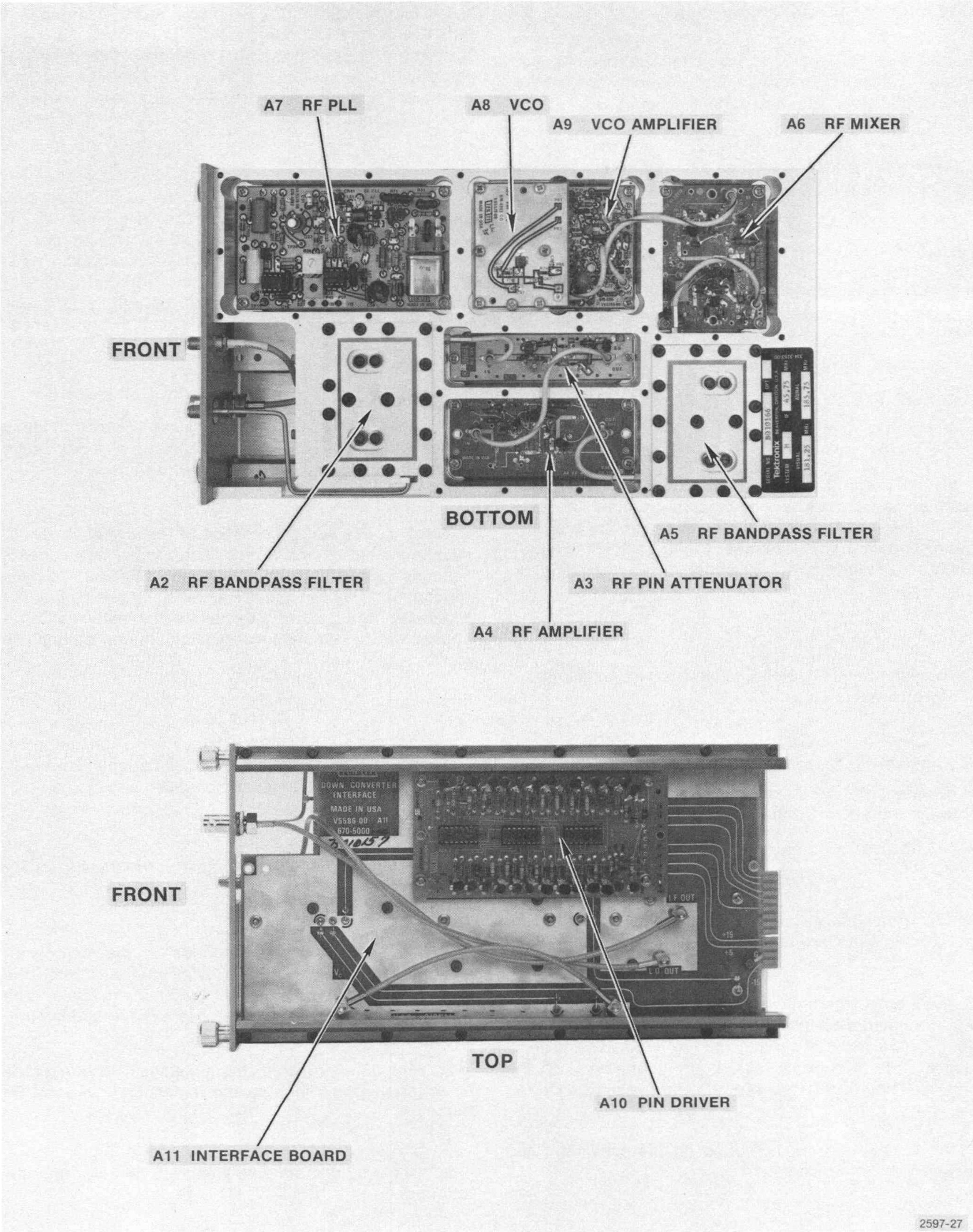


Fig. 5-2. TDC assembly numbers and locations.

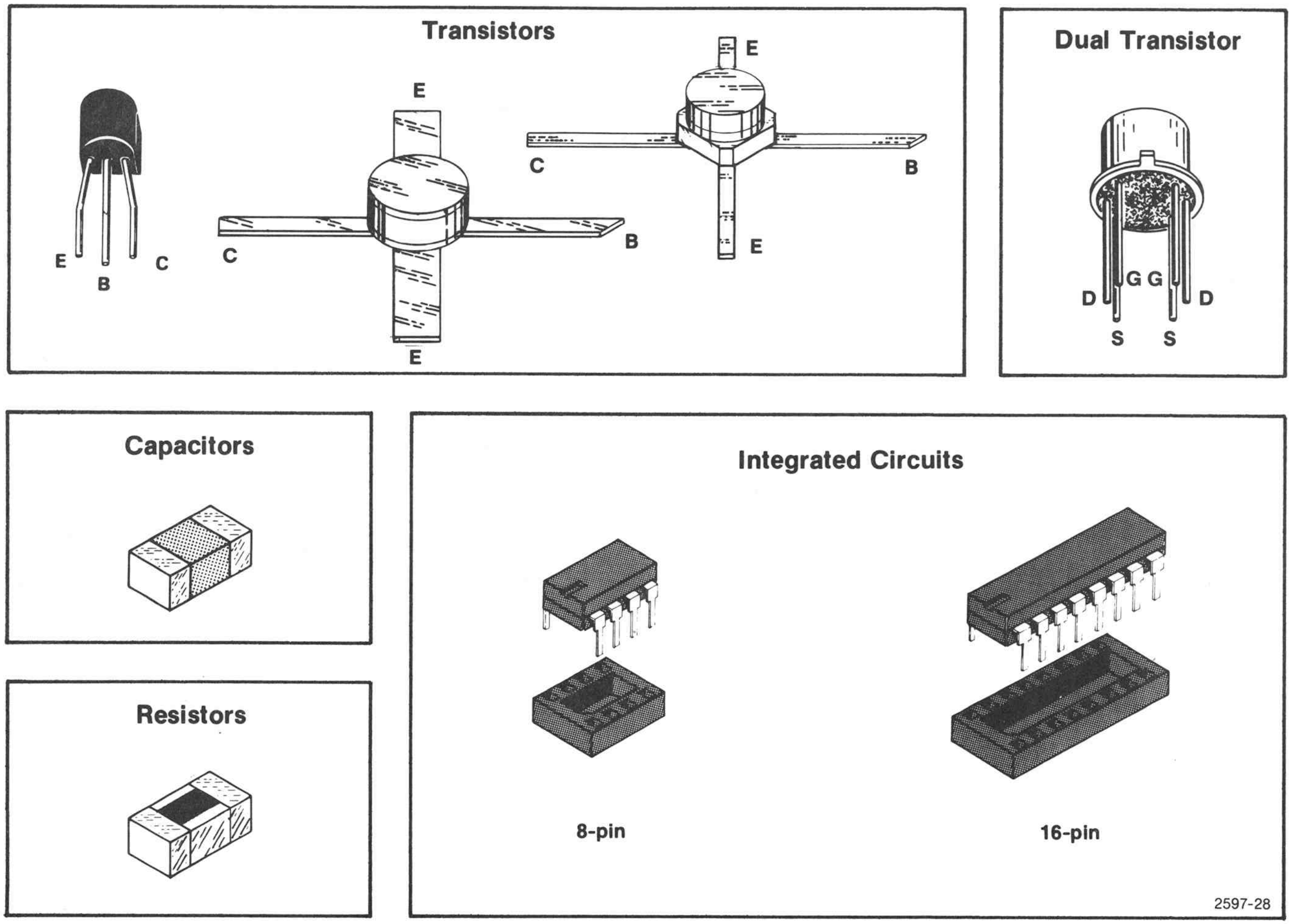


Fig. 5-3. Component basing diagrams.

d. Be sure the component is inserted properly in its socket (see Fig. 5-3 or the manufacturer's data sheet).

e. After the operational check, return the good components to their original sockets to reduce calibration time and burn-in period.

NOTE

If a substitute is not available, check the transistor with a dynamic tester, such as the TEKTRONIX Type 577 Curve Tracer. Static type testers, such as an ohmmeter, can be used to check the resistance ratio across some semiconductor junctions if no other method is available. Use the high-resistance ranges (R X 1k or higher) so the external test current is limited to less than 6 mA. If uncertain, measure the external test current with an ammeter. Resistance ratios across base-to-emitter or base-to-collector junctions usually run 100:1 or higher. The ratio is measured by connecting the meter leads across the terminals, noting the reading, then reversing the leads and noting the second reading.

Integrated Circuits (IC). Integrated circuits are most easily checked by direct replacement. When substitution is impossible, check input and output signal states as described in the circuit description and on the diagram. Lead configurations for the IC used in this instrument are provided on the inside fold of the schematic or the back of the previous schematic.

Check calibration and performance after a faulty component has been replaced.

If the above procedure fails to locate the trouble, a more detailed analysis must be performed. The Theory of Operation section describes the operational theory of each circuit, and may aid to further evaluate the problem.

GENERAL TROUBLESHOOTING TECHNIQUES

The following procedure is recommended to isolate a problem and expedite repairs.

1. Ensure that the malfunction exists in the instrument. Check the operation of associated equipment and the operating procedure of the instrument (see Operating Instructions).

2. Determine and evaluate all trouble symptoms. Try to isolate the problem to a circuit or assembly. The block diagram in the Diagrams section can aid in signal tracing and circuit isolation. The circuit boards are generally connected by coaxial cables, so the stages can be checked stage by stage. A spectrum analyzer and tracking generator are convenient tools for these checks.

CAUTION

When measuring voltages and waveforms, use extreme care in placing meter leads or probes. Because of high component density and limited access within the instrument, an inadvertant movement of the leads or probe could cause a short circuit. This may produce transient voltages that can destroy many components.

3. Make an educated guess as to the nature of the problem, such as component failure or calibration, and the functional area most likely at fault.

4. Visually inspect the area or the assembly for such defects as broken or loose connections, improperly seated components, overheated or burned components, chafed insulation, etc. Use a magnifying glass or a jewelers eye loupe to inspect chip parts. Repair or replace all obvious defects. In the case of overheated components, try to determine the cause of the overheated condition and correct before reapplying power.

5. By successive electrical checks, locate the problem. At this time an oscilloscope and spectrum analyzer are valuable test items for evaluating circuit performance. If applicable, check the calibration adjustments. Before changing an adjustment, note its position so it can be returned to the original setting. This will facilitate recalibration after the trouble has been located and repaired.

6. Determine the extent of the repair needed; if complex, we recommend contacting your local Tektronix Field Office or representative. If minor, such as a simple component replacement, see the Parts List for replacement information. Removal and replacement procedure of the assemblies is described under Corrective Maintenance.

CORRECTIVE MAINTENANCE

Corrective maintenance consists of component replacement and instrument repair. Special techniques and procedures, required to replace components in this instrument, are described here.

Obtaining Replacement Parts

All electrical and mechanical parts are available through your local Tektronix Field Office or representative. The parts list sections contain information on how to order these replacement parts. Many standard electronic components can be obtained locally in less time than that required to order from Tektronix, Inc. It is best to duplicate the original component as closely as possible. Parts orientation and lead dress should be duplicated because some components are oriented to reduce interaction or control circuit characteristics.

If a part you have ordered has been replaced with a new or improved part, your local Field Office or representative will contact you concerning any change in the part number. After repair, the circuits may need recalibration.

Soldering Chip Components (see Fig. 5-4)

Many circuit boards in this instrument have chip components. The contacts on chip resistors and capacitors are usually plated with silver. These components should be soldered with a 3% silver-bearing solder (Tektronix Part No. 006-0064-00).

Remove excess solder from the circuit-board pads before soldering so the component will lie flat. If the first solder joint is made with the component at an angle, soldering the second joint will cause pressure to be applied to the first, possibly breaking it. Use solder wick or other solder removers to remove the excess solder and clean the surface.

CAUTION

Do not apply a soldering iron directly to the chip component contacts. This will burn the silver plating.

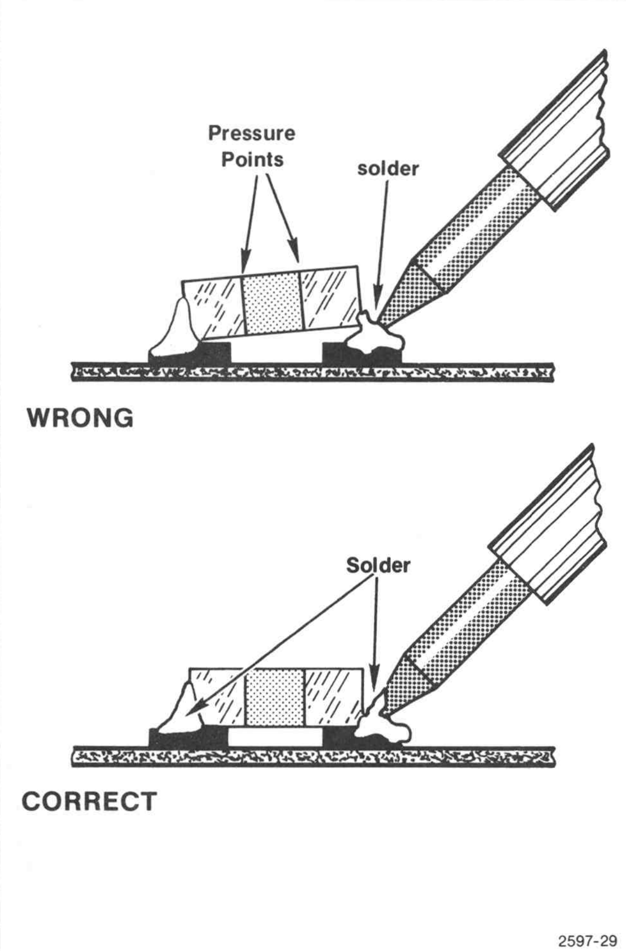


Fig. 5-4. Soldering chip components.

Parts Not Replaceable

There are several components and circuits in the TDC that are not directly replaceable. We recommend that you contact your local Tektronix Field Office or representative concerning servicing of these parts.

PIN Driver and PIN Attenuators. New Programmable Read Only Memories (PROMs) must be programmed if one of the old PROMs or precision resistors on the PIN Driver board, or a PIN diode in the PIN Attenuator circuit needs to be replaced. Because each PROM program is unique, the PROMs and PIN diodes are not directly replaceable. The affected boards are A3 and A10.

TORX[1] Screws

This instrument uses self-tapping TORX head screws. A TORX screwdriver is supplied in the accessories kit for the 1450. Also, a tip for magentic-tip or air-driven screwdrivers is available (Tektronix Part No. 003-0814-00).

[1]TORX is a registered trademark of Camcar Screw & Mfg.

Do not use more than about 8 to 10 inch-pounds of torque when tightening the TORX screws. If a screw head breaks off, leaving the screw body in the metal, the screw should be replaced using the following procedure:

1. Remove any other screws holding down the shield cover, and lift the cover off. This will expose part of the screw stud.

2. Use a pair of pliers or vise-grips to remove the screw.

3. Using a .109-inch (7/64-inch) drill bit, drill the hole about 0.5 inch deeper.

4. Replace the shield cover, and insert a 3 mm X 20 mm TORX screw (Tektronix Part No. 213-0812-00).

Replacing Assemblies

The following procedures give detailed replacement information for those assemblies that require special instructions.

Removing the RF Mixer Board (A6) (see Fig. 5-5).

1. Remove the cover from over the Interface board (A11).

2. Disconnect the coaxial cables from the Interface board at the points labelled IF Out and LO Out.

3. Remove the nuts and washers from these connectors.

4. Turn the TDC over, and remove the shield cover over the compartments containing A6, A7, A8, and A9.

5. Disconnect the coaxial cables from P60 and P88 on A6.

6. Remove the four screws from the corners of the board, and lift the board out of the compartment.

To replace, reverse the procedure.

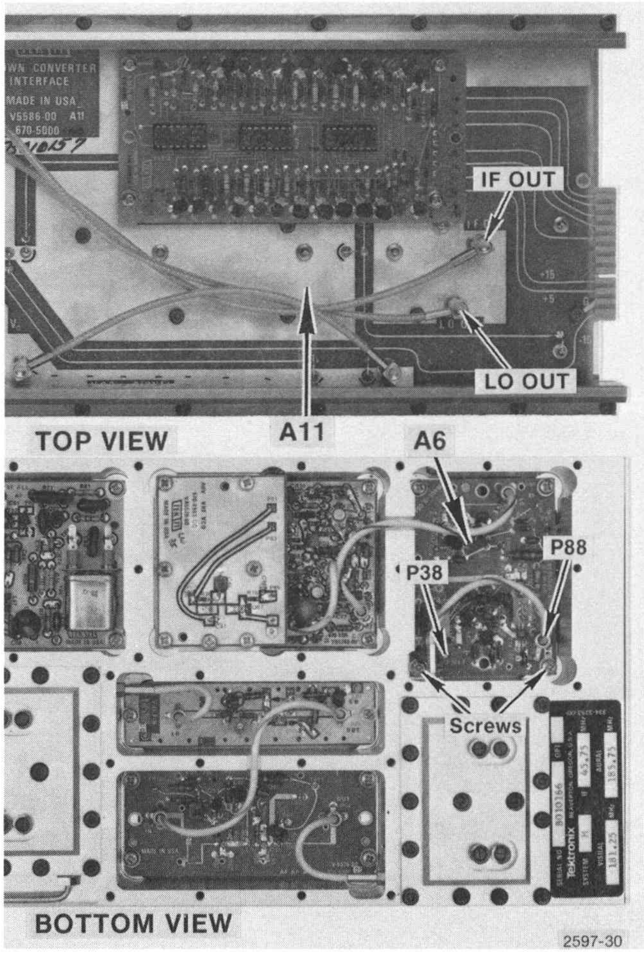


Fig. 5-5. Removing the RF Mixer board, A6.

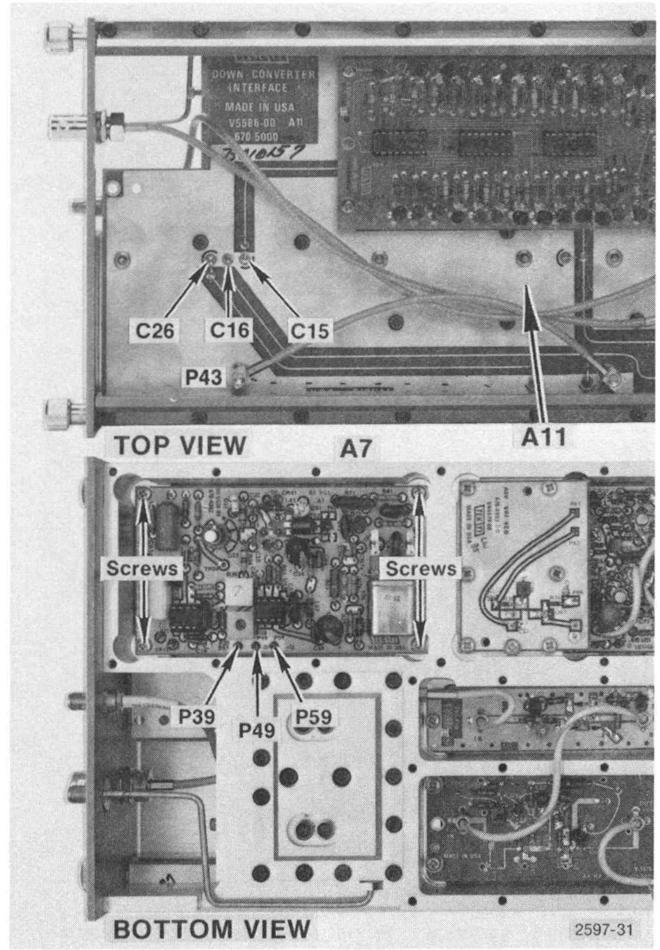


Fig. 5-6. Removing the RF PLL board, A7.

Removing the RF PLL Board (A7) (see Fig. 5-6).

1. Remove the cover from over the Interface board (A11).

2. Disconnect the coaxial cable from the position shown in Fig. 5-6.

3. Remove the nut and washer from this connector.

4. Turn the TDC over, and remove the shield cover over the compartments containing A6, A7, A8, and A9.

5. Remove the four screws from the corners of the RF PLL board (A7).

6. Carefully lift the board straight out of the shield cavity to avoid bending the three pin connectors.

To replace, reverse the procedure.

Removing the VHF VCO Board (A8V) (see Fig. 5-7).

1. Remove the shield cover from the compartment containing A6, A7, A8, and A9.

2. Disconnect the coaxial cable at P55 on A9V, the VHF VCO Amp board.

3. Remove the screws from the VCO board (A8V).

4. Carefully unsolder the two circuit-board pads shown in Fig. 5-7. Do not touch the chip capacitor, C47, with the iron.

5. Carefully lift the board straight out of the shield compartment.

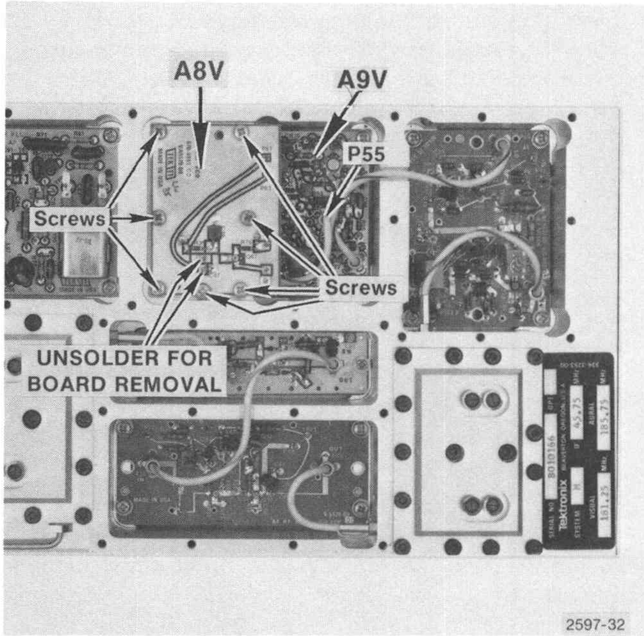


Fig. 5-7. Removing the VHF VCO board, A8V.

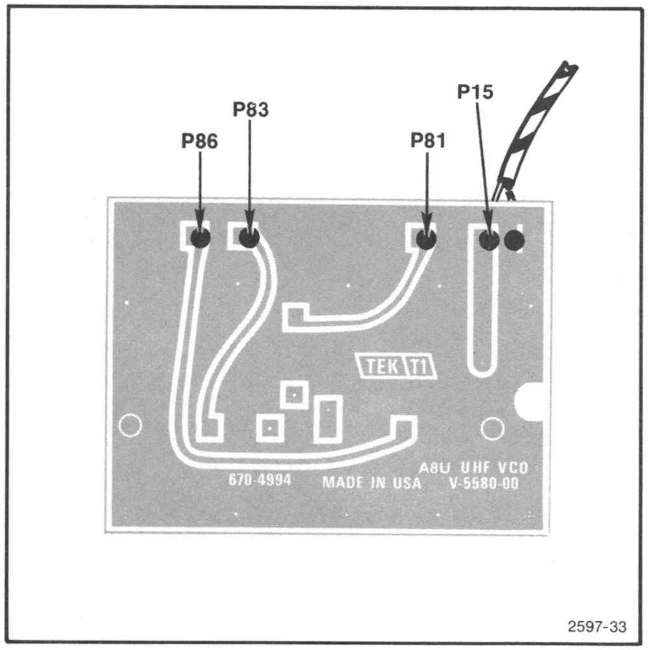


Fig. 5-8. Removing the UHF VCO board, A8U.

CAUTION

If any opposition is felt, check that the wires are completely unsoldered and free.

To replace the VCO board, reverse the procedure.

CAUTION

Check to see that components on the rear side of the board are still adequately soldered before replacing the board.

NOTE

It is easier to align the three pin connectors to the VCO Amp board first, then try to feed the component leads through the board for resoldering.

Removing the UHF VCO Board (A8U) (see Fig. 5-8).

1. Remove the shield cover from the compartments containing A6, A7, A8, and A9.

2. Disconnect P15 on the UHF VCO Amp board (A9U).

3. Remove the screws from the VCO board (A8U).

4. Carefully lift the board straight out of the shield compartment.

To replace the UHF VCO board, first line up the three pin connectors on the UHF VCO Amp board, then reverse the removal procedure.

Removing the VHF and UHF VCO Amp Boards (A9V and A9U) (see Fig. 5-9).

1. Remove the cover from the Interface board (A11).

2. Disconnect the LO Return coaxial cable from the Interface board behind the VCO Amp board. (See Fig. 5-9.)

3. Remove the nut and washer from the coaxial connector.

4. Turn the TDC over, and remove the shield cover from A6, A7, A8, and A9.

5. Remove the VHF or UHF VCO board (see previous procedure).

6. Disconnect P87 on A9V or P89 on A9U.

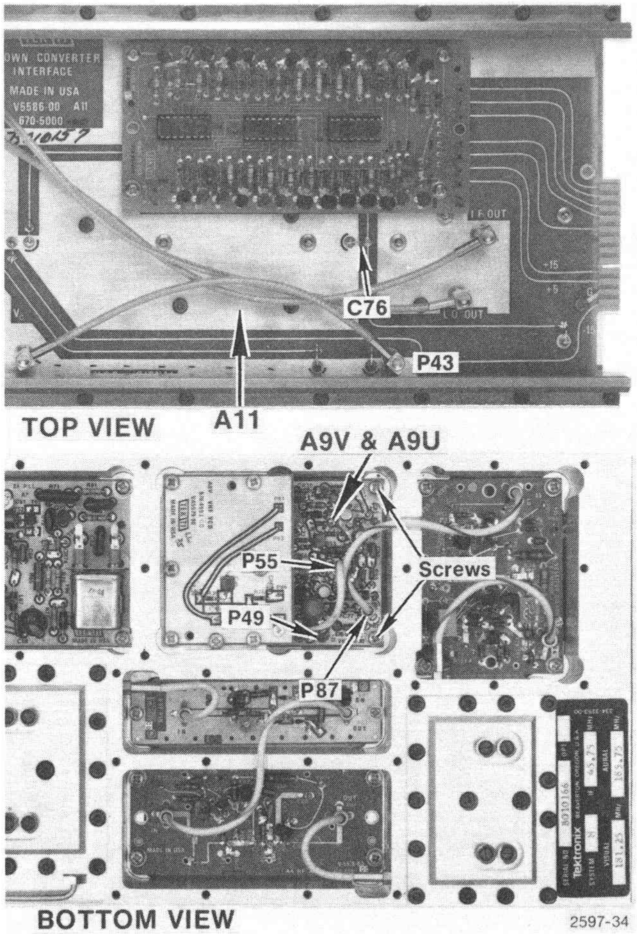


Fig. 5-9. Removing the VHF and UHF VCO Amp boards, A9V and A9U.

7. Remove the four screws from the corner of the board, and lift the board out of the shield compartment.

To replace, reverse the procedure.

Removing Helical Resonator Coils (see Fig. 5-10).

NOTE

We do not recommend replacing the helical resonator coils unless you are equipped to recalibrate the circuits involved. Study the Adjustment Procedure regarding these circuits to determine if you have the necessary equipment and experience to perform this recalibration. Contact your local Tektronix Field Office or representative concerning returning the instrument for repair.

1. Remove the shield cover from the compartment containing the helical resonator coil.

2. Remove the outer external threaded ring, using an extracting tool (Tektronix Part No. 003-0842-00).

3. Remove the inner external threaded ring, supporting the coil form, to prevent it slipping and jamming against the ring.

4. Set the lockwasher aside, and remove the coil.

To replace, reverse the procedure.

Ordering Replacement Helical Resonator Coils.

If a replacement helical resonator coil is needed, order using the following information:

a. Circuit Number

b. TDC serial number

c. Visual Carrier frequency

d. Visual Intermediate Frequency

e. CCIR TV System (i.e., 525/60 System M for USA.)

f. Country of use

g. Channel Number

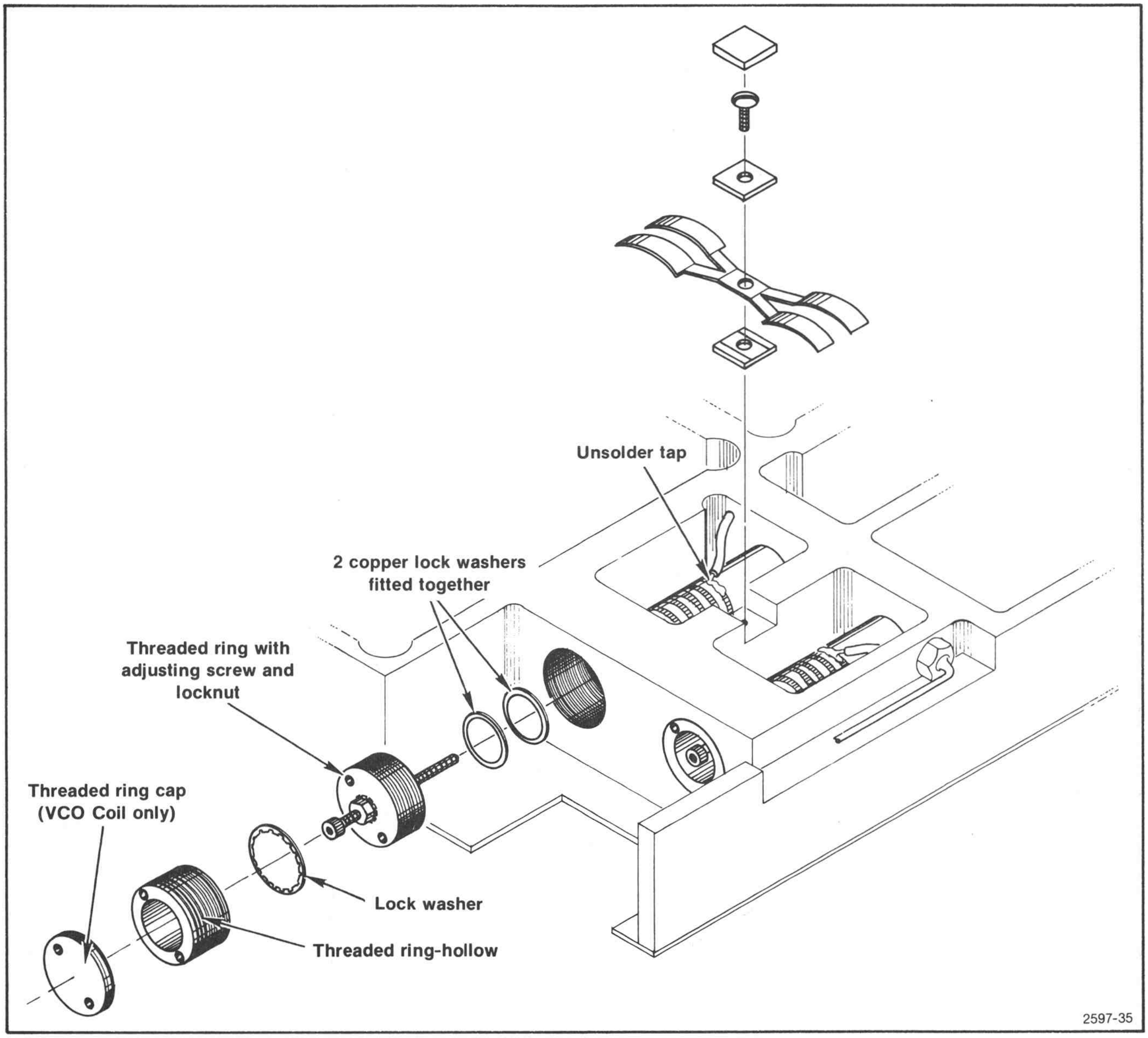
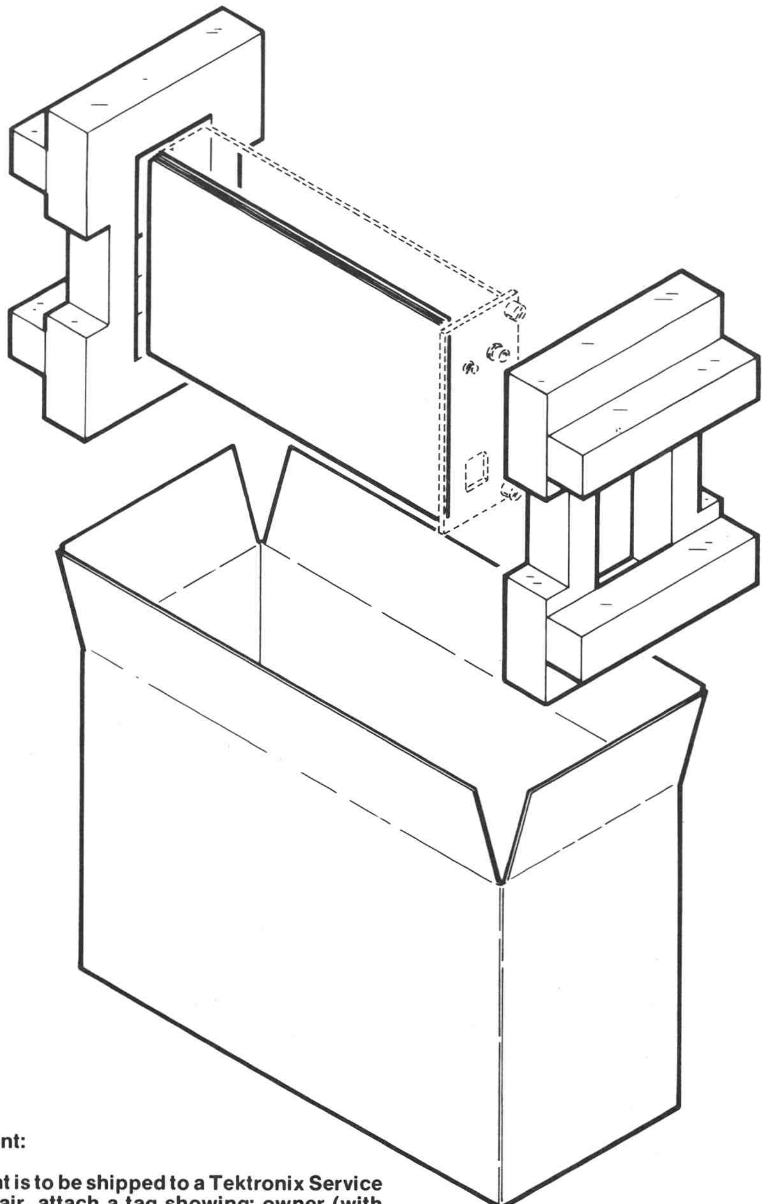


Fig. 5-10. Removing Helical Resonator coils.



Repackaging for Shipment:

If the Tektronix instrument is to be shipped to a Tektronix Service Center for service or repair, attach a tag showing: owner (with address) and the name of an individual at your firm that can be contacted, complete instrument serial number and a description of the service required.

Save and re-use the package in which your instrument was shipped. If the original packaging is unfit for use or not available, repackage the instrument as follows:

1. Obtain a carton of corrugated cardboard having inside dimensions of no less than six inches more than the instrument dimensions; this will allow for cushioning. Refer to Table 1 for carton test strength requirements.

2. Surround the instrument with polyethylene sheeting to protect the finish of the instrument.

3. Cushion the instrument on all sides by tightly packing dunnage or urethane foam between carton and instrument, allowing three inches on all sides.

4. Seal carton with shipping tape or industrial stapler.

Table 1
Shipping Carton Test Strength

Gross Weight (lb.)	Carton Test Strength (lb.)
0 — 10	200
10 — 30	275
30 — 120	375
120 — 140	500
140 — 160	600

2597-36

Fig. 5-11. Repackaging Instructions.

OPTIONS

As of this printing there are no catalog options for the TDC. However, each TDC is produced to meet the special requirements of IF and channel frequencies for individual users. This results in many possible versions of the TDC. This manual documents all currently available versions in the regular manual sections. Refer to the appropriate section for information regarding your TDC.

REPLACEABLE ELECTRICAL PARTS

PARTS ORDERING INFORMATION

Replacement parts are available from or through your local Tektronix, Inc. Field Office or representative.

Changes to Tektronix instruments are sometimes made to accommodate improved components as they become available, and to give you the benefit of the latest circuit improvements developed in our engineering department. It is therefore important, when ordering parts, to include the following information in your order: Part number, instrument type or number, serial number, and modification number if applicable.

If a part you have ordered has been replaced with a new or improved part, your local Tektronix, Inc. Field Office or representative will contact you concerning any change in part number.

Change information, if any, is located at the rear of this manual.

LIST OF ASSEMBLIES

A list of assemblies can be found at the beginning of the Electrical Parts List. The assemblies are listed in numerical order. When the complete component number of a part is known, this list will identify the assembly in which the part is located.

CROSS INDEX-MFR. CODE NUMBER TO MANUFACTURER

The Mfr. Code Number to Manufacturer index for the Electrical Parts List is located immediately after this page. The Cross Index provides codes, names and addresses of manufacturers of components listed in the Electrical Parts List.

ABBREVIATIONS

Abbreviations conform to American National Standard Y1.1.

COMPONENT NUMBER (column one of the Electrical Parts List)

A numbering method has been used to identify assemblies, subassemblies and parts. Examples of this numbering method and typical expansions are illustrated by the following:

Example a.

component number: A23 R1234

A23R1234 — A23 = Assembly number; R1234 = Circuit number

Read: Resistor 1234 of Assembly 23

Example b.

component number: A23 A2 R1234

A23A2R1234 — A23 = Assembly number; A2 = Subassembly number; R1234 = Circuit number

Read: Resistor 1234 of Subassembly 2 of Assembly 23

Only the circuit number will appear on the diagrams and circuit board illustrations. Each diagram and circuit board illustration is clearly marked with the assembly number. Assembly numbers are also marked on the mechanical exploded views located in the Mechanical Parts List. The component number is obtained by adding the assembly number prefix to the circuit number.

The Electrical Parts List is divided and arranged by assemblies in numerical sequence (e.g., assembly A1 with its subassemblies and parts, precedes assembly A2 with its subassemblies and parts).

Chassis-mounted parts have no assembly number prefix and are located at the end of the Electrical Parts List.

TEKTRONIX PART NO. (column two of the Electrical Parts List)

Indicates part number to be used when ordering replacement part from Tektronix.

SERIAL/MODEL NO. (columns three and four of the Electrical Parts List)

Column three (3) indicates the serial number at which the part was first used. Column four (4) indicates the serial number at which the part was removed. No serial number entered indicates part is good for all serial numbers.

NAME & DESCRIPTION (column five of the Electrical Parts List)

In the Parts List, an Item Name is separated from the description by a colon (:). Because of space limitations, an Item Name may sometimes appear as incomplete. For further Item Name identification, the U.S. Federal Cataloging Handbook H6-1 can be utilized where possible.

MFR. CODE (column six of the Electrical Parts List)

Indicates the code number of the actual manufacturer of the part. (Code to name and address cross reference can be found immediately after this page.)

MFR. PART NUMBER (column seven of the Electrical Parts List)

Indicates actual manufacturers part number.

CROSS INDEX—MFR. CODE NUMBER TO MANUFACTURER

Mfr. Code	Manufacturer	Address	City, State, Zip
000BK	STAUFFER SUPPLY	105 SE TAYLOR	PORTLAND, OR 97214
00853	SANGAMO ELECTRIC CO., S. CAROLINA DIV.	P O BOX 128	PICKENS, SC 29671
01121	ALLEN-BRADLEY COMPANY	1201 2ND STREET SOUTH	MILWAUKEE, WI 53204
04222	AVX CERAMICS, DIVISION OF AVX CORP.	P O BOX 867, 19TH AVE. SOUTH	MYRTLE BEACH, SC 29577
05397	UNION CARBIDE CORPORATION, MATERIALS SYSTEMS DIVISION	11901 MADISON AVENUE	CLEVELAND, OH 44101
09023	CORNELL-DUBILIER ELECTRONIC DIVISION FEDERAL PACIFIC ELECTRIC CO.	2652 DALRYMPLE ST.	SANFORD, NC 27330
27851	FILM MICROELECTRONICS, INC.	17 A STREET	BURLINGTON, MA 01803
28480	HEWLETT-PACKARD CO., CORPORATE HQ.	1501 PAGE MILL RD.	PALO ALTO, CA 94304
32997	BOURNS, INC., TRIMPOT PRODUCTS DIV.	1200 COLUMBIA AVE.	RIVERSIDE, CA 92507
51642	CENTRE ENGINEERING INC.	2820 E COLLEGE AVENUE	STATE COLLEGE, PA 16801
52262	B AND H ELECTRONICS, INC., DBA MICRO COMPONENTS ASSOCIATES	202 E STEVENS ST., SUITE 6	SANTA ANA, CA 92707
56289	SPRAGUE ELECTRIC CO.		NORTH ADAMS, MA 01247
72982	ERIE TECHNOLOGICAL PRODUCTS, INC.	644 W. 12TH ST.	ERIE, PA 16512
75378	CTS KNIGHTS, INC.	400 REIMANN AVE.	SANDWICH, IL 60548
80009	TEKTRONIX, INC.	P O BOX 500	BEAVERTON, OR 97077
91293	JOHANSON MFG. COMPANY	P O BOX 329	BOONTON, NJ 07005
91637	DALE ELECTRONICS, INC.	P. O. BOX 609	COLUMBUS, NE 68601
95275	VITRAMON, INC.	P O BOX 544	BRIDGEPORT, CT 06601

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A2	----- -----			BAND PASS FILTER:		
	----- -----			(FOR REPLACEMENT PARTS RETURN THE ASSY TO		
	----- -----			THE SERVICE CENTER)		
A3	----- -----			CKT BOARD ASSY:PIN ATTENUATOR,CH14-83		
	----- -----			(FURNISHED AS A UNIT WITH 672-0640-00)		
A3	----- -----			CKT BOARD ASSY:PIN ATTENUATOR,CH. 5-6		
	----- -----			(FURNISHED AS A UNIT WITH 672-0667-00)		
A3	----- -----			CKT BOARD ASSY:PIN ATTENUATOR,CH. 7-13		
	----- -----			(FURNISHED AS A UNIT WITH 672-0668-00)		
A3	----- -----			CKT BOARD ASSY:PIN ATTENUATOR,CH. 2-4		
	----- -----			(FURNISHED AS A UNIT WITH 672-0641-00)		
A4	----- -----			CKT BOARD ASSY:R.F. AMP		
	----- -----			(FURN AS A UNIT W/672-0640-00,672-0641-00,		
	----- -----			672-0667-00 AND 672-0068-00)		
A5	----- -----			BAND PASS FILTER:		
	----- -----			(FOR REPLACEMENT PARTS RETURN INSTRUMENT TO		
	----- -----			THE SERVICE CENTER)		
A6	670-4991-01			CKT BOARD ASSY:R.F. MIXER,CH2-6	80009	670-4991-01
A6	670-4991-02			CKT BOARD ASSY:R.F. MIXER,CH7-13	80009	670-4991-02
A6	670-4991-03			CKT BOARD ASSY:R.F. MIXER,CH14-83	80009	670-4991-03
A7	670-4992-01			CKT BOARD ASSY:R.F. PLL,CH5-6,45.75MHZ IF	80009	670-4992-01
A7	670-4992-02			CKT BOARD ASSY:R.F. PLL,CH7-13,45.75MHZ IF	80009	670-4992-02
A7	670-4992-03			CKT BOARD ASSY:R.F. PLL,CH14-27,45.75MHZ IF	80009	670-4992-03
A7	670-4992-04			CKT BOARD ASSY:R.F. PLL,CH28-43,45.75MHZ IF	80009	670-4992-04
A7	670-4992-05			CKT BOARD ASSY:R.F. PLL,CH44-62,45.75MHZ IF	80009	670-4992-05
A7	670-4992-06			CKT BOARD ASSY:R.F. PLL,CH63-83,45.75MHZ IF	80009	670-4992-06
A7	670-4992-07			CKT BOARD ASSY:R.F. PLL,CH2-4,45.75MHZ IF	80009	670-4992-07
A7	670-4992-08			CKT BOARD ASSY:R.F. PLL,CH2-3,37.0 MHZ IF	80009	670-4992-08
	----- -----			(OPTION 1 ONLY)		
A7	670-4992-09			CKT BOARD ASSY:R.F. PLL,CH4,37.0 MHZ IF	80009	670-4992-09
	----- -----			(OPTION 1 ONLY)		
A7	670-4992-10			CKT BOARD ASSY:R.F. PLL,CH5-6,37.0 MHZ IF	80009	670-4992-10
	----- -----			(OPTION 1 ONLY)		
A7	670-4992-11			CKT BOARD ASSY:R.F. PLL,CH7-9,37.0 MHZ IF	80009	670-4992-11
	----- -----			(OPTION 1 ONLY)		
A7	670-4992-12			CKT BOARD ASSY:R.F. PLL,CH10-13,37.0 MHZ IF	80009	670-4992-12
	----- -----			(OPTION 1 ONLY)		
A7	670-4992-13			CKT BOARD ASSY:R.F. PLL,CH14-22,37.0 MHZ IF	80009	670-4992-13
	----- -----			(OPTION 1 ONLY)		
A7	670-4992-14			CKT BOARD ASSY:R.F. PLL,CH23-31,37.0 MHZ IF	80009	670-4992-14
	----- -----			(OPTION 1 ONLY)		
A7	670-4992-15			CKT BOARD ASSY:R.F. PLL,CH32-35,37.0 MHZ IF	80009	670-4992-15
	----- -----			(OPTION 1 ONLY)		
A7	670-4992-16			CKT BOARD ASSY:R.F. PLL,CH56-83,37.0 MHZ IF	80009	670-4992-16
	----- -----			(OPTION 1 ONLY)		
A7	670-4992-17			CKT BOARD ASSY:R.F. PLL,CH2-3,38.9MHZ	80009	670-4992-17
	----- -----			(OPTION 2 ONLY)		
A7	670-4992-18			CKT BOARD ASSY:R.F.PLL,CH4,38.9MHZ	80009	670-4992-18
	----- -----			(OPTION 2 ONLY)		
A7	670-4992-19			CKT BOARD ASSY:R.F.PLL,CH5-6,38.9MHZ	80009	670-4992-19
	----- -----			(OPTION 2 ONLY)		
A7	670-4992-20			CKT BOARD ASSY:R.F.,PLL,CH7-9,38.9MHZ	80009	670-4992-20
	----- -----			(OPTION 2 ONLY)		
A7	670-4992-21			CKT BOARD ASSY:R.F.,PLL,CH10-13,38.9MHZ	80009	670-4992-21
	----- -----			(OPTION 2 ONLY)		
A7	670-4992-22			CKT BOARD ASSY:R.F.,PLL,CH14-83,38.9MHZ	80009	670-4992-22
	----- -----			(OPTION 2 ONLY)		

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A8	670-4993-00			CKT BOARD ASSY:VCO,VHF	80009	670-4993-00
A8	670-4994-00			CKT BOARD ASSY:VCO,UHF	80009	670-4994-00
A9	670-5191-00			CKT BOARD ASSY:VCO AMP,VHF	80009	670-5191-00
A9	670-5192-00			CKT BOARD ASSY:VCO AMP,UHF	80009	670-5192-00
A10	----- -----			CKT BOARD ASSY:PIN DRIVER		
	----- -----			(REPLACED AS A UNIT WITH PIN ATTENUATOR CKT		
	----- -----			BOARD ASSEMBLIES)		
A11	670-5000-00			CKT BOARD ASSY:DOWN CONVERTER INTERFACE	80009	670-5000-00
				BAND PASS FILTER		
A2	----- -----			BAND PASS FILTER:		
	----- -----			(FOR REPLACEMENT PARTS RETURN INSTRUMENT TO		
	----- -----			THE SERVICE CENTER)		
A2C55	214-2560-00			TUNING DVC,COIL:2.5 L X 0.925W,CU BE	80009	214-2560-00
	----- -----			(CH2-6)		
A2C55	214-2561-00			TUNING DVC,COIL:2.3 L X 0.58 W,CU BE	80009	214-2561-00
	----- -----			(CH7-13)		
A2C55	214-2559-00			TUNING DVC,COIL:2.3 L X 0.399W,CU BE	80009	214-2559-00
A2C82	211-0255-00			SCREW,MACHINE:4-40 X 1.0 L,HEX SKT,STEEL	000BK	OBD
A2C87	211-0255-00			SCREW,MACHINE:4-40 X 1.0 L,HEX SKT,STEEL	000BK	OBD
A2L52	108-0883-02			COIL,RF:FIXED,3.4MH	80009	108-0883-02
	----- -----			(CH2-6)		
A2L52	108-0884-02			COIL,RF:FIXED,490NH	80009	108-0884-02
	----- -----			(CH7-13)		
A2L55	108-0883-02			COIL,RF:FIXED,3.4MH	80009	108-0883-02
A2L55	108-0884-02			COIL,RF:FIXED,490NH	80009	108-0884-02
A2L57	108-0883-02			COIL,RF:FIXED,3.4MH	80009	108-0883-02
	----- -----			(CH2-6)		
A2L57	108-0884-02			COIL,RF:FIXED,490NH	80009	108-0884-02
	----- -----			(CH7-13)		
A2T10	120-1176-00			TRANSFORMER,RF:TOROID,3 WINDINGS	80009	120-1176-00
	----- -----			(CH2-6)		
A2T18	120-1176-00			TRANSFORMER,RF:TOROID,3 WINDINGS	80009	120-1176-00
	----- -----			(CH2-6)		

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
				CKT BOARD ASSY:PIN ATTENUATOR		
A3	----- -----			CKT BOARD ASSY:PIN ATTENUATOR		
A3	----- -----			(FURNISHED AS A UNIT WITH 672-0640-00)		
A3	----- -----			(FURNISHED AS A UNIT WITH 672-0667-00)		
A3	----- -----			(FURNISHED AS A UNIT WITH 672-0668-00)		
A3	----- -----			(FURNISHED AS A UNIT WITH 672-0641-00)		
A3	----- -----	XB010264		(FURNISHED AS A UNIT WITH 672-0834-00)		
A3C42	283-0315-00 ----- -----			CAP.,FXD,CER DI:470PF,10%,100V (UHF)	72982	A02BL9A4LW5R471K
A3C45	283-0252-00 ----- -----			CAP.,FXD,CER DI:1000PF,10%,50V (UHF)	72982	A01AL0A2LW5R102K
A3C45	283-0411-00 ----- -----			CAP.,FXD,CER DI:37PF,5%,100V (CH5-6)	72982	A02CL4A4LC1G370J
A3C45	283-0416-00 ----- -----			CAP.,FXD,CER DI:47PF,5%,100V (CH2-4)	05397	C1005C470J1GAH
A3C45	283-0313-00 ----- -----			CAP.,FXD,CER DI:15PF,10%,100V (CH7-13)	72982	A02AL4A4LC1G0150
A3C45	283-0407-00 ----- -----	XB010264		CAP.,FXD,CER DI:27PF,5%,500V (CH1-3)	72982	A0102C0G270J
A3C46	281-0158-01 ----- -----	XB010120		CAP.,VAR,CER DI:7-45PF,25V (CH2-4,7-13)	72982	518-006G7-45
A3C47	283-0315-00 ----- -----			CAP.,FXD,CER DI:470PF,10%,100V (UHF)	72982	A02BL9A4LW5R471K
A3C47	283-0411-00 ----- -----			CAP.,FXD,CER DI:37PF,5%,100V (CH5-6)	72982	A02CL4A4LC1G370J
A3C47	283-0411-00 ----- -----	XB010264		CAP.,FXD,CER DI:37PF,5%,100V (CH1-3)	72982	A02CL4A4LC1G370J
A3C51	283-0252-00 ----- -----			CAP.,FXD,CER DI:1000PF,10%,50V (CH2-4,5-6,17-13)	72982	A01AL0A2LW5R102K
A3C54	283-0324-00 ----- -----			CAP.,FXD,CER DI:0.01UF,+80-20%,50V (CH2-4,5-6,17-13)	72982	A01AA9AZLW5R103Z
A3C55	283-0252-00 ----- -----			CAP.,FXD,CER DI:1000PF,10%,50V (UHF)	72982	A01AL0A2LW5R102K
A3C55	283-0411-00 ----- -----			CAP.,FXD,CER DI:37PF,5%,100V (CH5-6)	72982	A02CL4A4LC1G370J
A3C55	283-0313-00 ----- -----			CAP.,FXD,CER DI:15PF,10%,100V (CH7-13)	72982	A02AL4A4LC1G0150
A3C55	283-0416-00 ----- -----			CAP.,FXD,CER DI:47PF,5%,100V (CH2-4)	05397	C1005C470J1GAH
A3C57	283-0315-00 ----- -----			CAP.,FXD,CER DI:470PF,10%,100V (UHF)	72982	A02BL9A4LW5R471K
A3C63	283-0315-00 ----- -----			CAP.,FXD,CER DI:470PF,10%,100V (UHF)	72982	A02BL9A4LW5R471K
A3C64	283-0324-00 ----- -----			CAP.,FXD,CER DI:0.01UF,+80-20%,50V (CH2-4,5-6,7-13)	72982	A01AA9AZLW5R103Z
A3C65	283-0252-00 ----- -----			CAP.,FXD,CER DI:1000PF,10%,50V (UHF)	72982	A01AL0A2LW5R102K
A3C66	283-0324-00 ----- -----			CAP.,FXD,CER DI:0.01UF,+80-20%,50V (CH2-4,5-6,7-13)	72982	A01AA9AZLW5R103Z
A3C71	283-0252-00 ----- -----			CAP.,FXD,CER DI:1000PF,10%,50V (CH2-4,5-6,7-13)	72982	A01AL0A2LW5R102K
A3C78	283-0252-00 ----- -----	B000100	B010359	CAP.,FXD,CER DI:1000PF,10%,50V (CH2-4,5-6,7-13)	72982	A01AL0A2LW5R102K
A3C78	283-0324-00 ----- -----	B010360		CAP.,FXD,CER DI:0.01UF,+80-20%,50V (CH2-4,5-6,7-13)	72982	A01AA9AZLW5R103Z
A3CR45	----- ----- ----- -----			SEMICOND DEVICE:SW,SI,100V,2.5A,UM6601B,UHF **(REPLACED AS A UNIT WITH 672-0640-00)**		

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A3CR46	----- -----			SEMICOND DEVICE:SW,SI,100V,2.5A,UM6601B,UHF		
	----- -----			(REPLACED AS A UNIT WITH 672-0640-00)		
A3CR56	----- -----			SEMICOND DEVICE:SW,SI,100V,2.5A,UM6601B		
	----- -----			(REPLACED AS A UNIT WITH 672-0067-00,		
	----- -----			672-0668-00,672-0641-00 ONLY)		
A3CR63	----- -----			SEMICOND DEVICE:SW,SI,100V,2.5A,UM6601B		
	----- -----			(REPLACED AS A UNIT WITH 672-0067-00,		
	----- -----			672-0668-00,672-0641-00 ONLY)		
A3CR66	----- -----			SEMICOND DEVICE:SW,SI,100V,2.5A,UM6601B		
	----- -----			(REPLACED AS A UNIT WITH 672-0067-00,		
	----- -----			672-0668-00,672-0641-00 ONLY)		
A3L35	108-0954-02	XB010264		COIL,RF:FIXED,2.1UH	80009	108-0954-02
	----- -----			(CH5-6,1-3)		
A3L36	108-0436-00			COIL,RF:FIXED,240NH	80009	108-0436-00
	----- -----			(UHF)		
A3L43	108-0896-00			COIL,RF:FIXED,30MH,TOROIDAL INDUCTOR	80009	108-0896-00
	----- -----			(CH2-4,5-6,7-13)		
A3L44	108-0436-00			COIL,RF:FIXED,240NH	80009	108-0436-00
	----- -----			(UHF)		
A3L44	108-0907-00			COIL,RF:FIXED,143NH	80009	108-0907-00
	----- -----			(CH2-4)		
A3L44	108-0733-00			COIL,RF:113NH	80009	108-0733-00
	----- -----			(CH5-6)		
A3L44	108-0643-00	B000100	B010249	COIL,RF:FIXED,54NH	80009	108-0643-00
	----- -----			(CH7-13)		
A3L44	108-0947-00	B010250	B010409	COIL,RF:50NH	80009	108-0947-00
	----- -----			(CH7-13)		
A3L44	108-0435-00	B010410		COIL,RF:FIXED,160NH	80009	108-0435-00
	----- -----			(CH7-13)		
A3L44	108-0550-00	XB010264		COIL,RF:110NH	80009	108-0550-00
	----- -----			(CH1-3)		
A3L52	108-0509-00			COIL,RF:2.45UH	80009	108-0509-00
	----- -----			(CH2-4,5-6,7-13)		
A3L52	108-0954-02	XB010264		COIL,RF:FIXED,2.1UH	80009	108-0954-02
	----- -----			(CH5-6,1-3)		
A3L54	108-0907-00			COIL,RF:FIXED,143NH	80009	108-0907-00
	----- -----			(CH2-4)		
A3L54	108-0733-00			COIL,RF:113NH	80009	108-0733-00
	----- -----			(CH5-6)		
A3L54	108-0643-00	B000100	B010249	COIL,RF:FIXED,54NH	80009	108-0643-00
	----- -----			(CH7-13)		
A3L54	108-0947-00	B010250	B010409	COIL,RF:50NH	80009	108-0947-00
	----- -----			(CH7-13)		
A3L54	108-0435-00	B010410		COIL,RF:FIXED,160NH	80009	108-0435-00
	----- -----			(CH7-13)		
A3L54	108-0550-00	XB010264		COIL,RF:110NH	80009	108-0550-00
	----- -----			(CH1-3)		
A3L55	108-0407-00	XB010264		COIL,RF:FIXED,37NH	80009	108-0407-00
	----- -----			(CH1-3)		
A3L57	108-0436-00			COIL,RF:FIXED,240NH	80009	108-0436-00
	----- -----			(UHF)		
A3L57	108-0954-02	XB010264		COIL,RF:FIXED,2.1UH	80009	108-0954-02
	----- -----			(CH5-6,1-3)		
A3L64	108-0436-00			COIL,RF:FIXED,240NH	80009	108-0436-00
	----- -----			(UHF)		
A3L71	108-0509-00			COIL,RF:2.45UH	80009	108-0509-00
	----- -----			(CH2-4,5-6,7-13)		

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A3L75	108-0509-00 ----- -----			COIL,RF:2.45UH (CH2-4,5-6,7-13)	80009	108-0509-00
A3L81	108-0896-00 ----- -----			COIL,RF:FIXED,30MH,TOROIDAL INDUCTOR (CH2-4,5-6,7-13	80009	108-0896-00
A3R54	307-0336-00 ----- -----			RES.,FXD,FILM:50 OHM,1%,0.105W (CH2-4,5-6,7-13)	152262	MCRA 500 FYZ
A3R64	307-0336-00 ----- -----			RES.,FXD,FILM:50 OHM,1%,0.105W (CH2-4,5-6,7-13)	152262	MCRA 500 FYZ

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
				CKT BOARD ASSY:R.F. AMP		
A4	670-4990-00			CKT BOARD ASSY:R.F. AMP	80009	670-4990-00
A4C21	283-0204-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N061Z5U0103M
A4C23	283-0321-00			CAP.,FXD,CER DI:1.8PF,0.25PF,50V	95275	VJ0805A1R8C-H
A4C26	283-0324-00			CAP.,FXD,CER DI:0.01UF,+80-20%,50V	72982	A01AA9AZLW5R103Z
A4C33	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	72982	8131N039 E 105Z
A4C34	283-0324-00			CAP.,FXD,CER DI:0.01UF,+80-20%,50V	72982	A01AA9AZLW5R103Z
A4C42	283-0324-00			CAP.,FXD,CER DI:0.01UF,+80-20%,50V	72982	A01AA9AZLW5R103Z
A4C43	283-0324-00			CAP.,FXD,CER DI:0.01UF,+80-20%,50V	72982	A01AA9AZLW5R103Z
A4C46	283-0324-00			CAP.,FXD,CER DI:0.01UF,+80-20%,50V	72982	A01AA9AZLW5R103Z
A4C53	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	72982	8131N039 E 105Z
A4C54	283-0324-00			CAP.,FXD,CER DI:0.01UF,+80-20%,50V	72982	A01AA9AZLW5R103Z
A4C55	283-0321-00			CAP.,FXD,CER DI:1.8PF,0.25PF,50V	95275	VJ0805A1R8C-H
A4C57	283-0324-00			CAP.,FXD,CER DI:0.01UF,+80-20%,50V	72982	A01AA9AZLW5R103Z
A4C58	283-0321-00			CAP.,FXD,CER DI:1.8PF,0.25PF,50V	95275	VJ0805A1R8C-H
A4C62	283-0324-00			CAP.,FXD,CER DI:0.01UF,+80-20%,50V	72982	A01AA9AZLW5R103Z
A4C64	283-0324-00			CAP.,FXD,CER DI:0.01UF,+80-20%,50V	72982	A01AA9AZLW5R103Z
A4C66	283-0324-00			CAP.,FXD,CER DI:0.01UF,+80-20%,50V	72982	A01AA9AZLW5R103Z
A4L42	108-0896-00			COIL,RF:FIXED,30MH,TOROIDAL INDUCTOR	80009	108-0896-00
A4L55	108-0896-00			COIL,RF:FIXED,30MH,TOROIDAL INDUCTOR	80009	108-0896-00
A4Q33	151-0216-00			TRANSISTOR:SILICON,PNP	80009	151-0216-00
A4Q36	151-0630-00			TRANSISTOR:SILICON,NPN	80009	151-0630-00
A4Q52	151-0216-00			TRANSISTOR:SILICON,PNP	80009	151-0216-00
A4Q56	151-0630-00			TRANSISTOR:SILICON,NPN	80009	151-0630-00
A4R21	315-0242-00			RES.,FXD,CMPSN:2.4K OHM,5%,0.25W	01121	CB2425
A4R22	315-0302-00			RES.,FXD,CMPSN:3K OHM,5%,0.25W	01121	CB3025
A4R32	315-0361-00			RES.,FXD,CMPSN:360 OHM,5%,0.25W	01121	CB3615
A4R36	317-0332-00			RES.,FXD,CMPSN:3.3K OHM,5%,0.125W	01121	BB3325
A4R37	307-0278-00			RES.,FXD,FILM:20 OHM,5%,100MW	52262	MCRA200JZ
A4R46	307-1103-00			RES.,FXD,FILM:225 OHM,1%,0.125W	52262	MCRA225FZ
A4R47	307-0278-00			RES.,FXD,FILM:20 OHM,5%,100MW	52262	MCRA200JZ
A4R51	301-0181-00			RES.,FXD,CMPSN:180 OHM,5%,0.50W	01121	EB1815
A4R54	317-0332-00			RES.,FXD,CMPSN:3.3K OHM,5%,0.125W	01121	BB3325
A4R55	307-0278-00			RES.,FXD,FILM:20 OHM,5%,100MW	52262	MCRA200JZ
A4R56	307-0336-00			RES.,FXD,FILM:50 OHM,1%,0.105W	52262	MCRA 500 FYZ
A4R58	307-0278-00			RES.,FXD,FILM:20 OHM,5%,100MW	52262	MCRA200JZ
A4R65	307-0571-00			RES.,FXD,FILM:57 OHM,1%,0.125W	52262	MCRA570FZ

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
				BAND PASS FILTER		
A5	----- -----			BAND PASS FILTER:		
	----- -----			(FOR REPLACEMENT PARTS RETURN THE ASSY TO		
	----- -----			THE SERVICE CENTER)		
A5C55	214-2559-00			TUNING DVC,COIL:2.3 L X 0.399W,CU BE	80009	214-2559-00
A5C55	214-2560-00			TUNING DVC,COIL:2.5 L X 0.925W,CU BE	80009	214-2560-00
	----- -----			(CH2-6)		
A5C55	214-2561-00			TUNING DVC,COIL:2.3 L X 0.58 W,CU BE	80009	214-2561-00
	----- -----			(CH7-13)		
A5C82	211-0255-00			SCREW,MACHINE:4-40 X 1.0 L,HEX SKT,STEEL	000BK	OBD
A5C87	211-0255-00			SCREW,MACHINE:4-40 X 1.0 L,HEX SKT,STEEL	000BK	OBD
A5L52	108-0885-02			COIL,RF:FIXED,60NH	80009	108-0885-02
	----- -----			(CH14-46)		
A5L52	108-0886-02			COIL,RF:FIXED,16NH	80009	108-0886-02
	----- -----			(CH47-83)		
A5L55	108-0885-02			COIL,RF:FIXED,60NH	80009	108-0885-02
A5L55	108-0886-02			COIL,RF:FIXED,16NH	80009	108-0886-02
A5L57	108-0885-02			COIL,RF:FIXED,60NH	80009	108-0885-02
	----- -----			(CH2-6)		
A5L57	108-0886-02			COIL,RF:FIXED,16NH	80009	108-0886-02
	----- -----			(CH7-13)		
A5T10	120-1176-00			TRANSFORMER,RF:TOROID,3 WINDINGS	80009	120-1176-00
	----- -----			(CH2-6)		
A5T18	120-1176-00			TRANSFORMER,RF:TOROID,3 WINDINGS	80009	120-1176-00
	----- -----			(CH2-6)		

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
				CKT BOARD ASSY:R.F. MIXER		
A6	670-4991-01			CKT BOARD ASSY:R.F. MIXER	80009	670-4991-01
A6	670-4991-02			CKT BOARD ASSY:R.F. MIXER	80009	670-4991-02
A6	670-4991-03			CKT BOARD ASSY:R.F. MIXER	80009	670-4991-03
A6C05	283-0310-00			CAP.,FXD,CER DI:2.5PF,+/-0.25PF,100V	72982	A01AL4A4LC0G0259
A6C12	283-0324-00			CAP.,FXD,CER DI:0.01UF,+80-20%,50V	72982	A01AA9AZLW5R103Z
A6C13	283-0324-00			CAP.,FXD,CER DI:0.01UF,+80-20%,50V	72982	A01AA9AZLW5R103Z
A6C18	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	72982	8131N039 E 105Z
A6C19	283-0204-00	XB010120	B010242X	CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N061Z5U0103M
A6C21	283-0324-00			CAP.,FXD,CER DI:0.01UF,+80-20%,50V	72982	A01AA9AZLW5R103Z
A6C23	283-0310-00			CAP.,FXD,CER DI:2.5PF,+/-0.25PF,100V	72982	A01AL4A4LC0G0259
A6C24	281-0122-00			CAP.,VAR,CER DI:2.5-9PF,100V	72982	518-000A2.5-9
	----- -----			(CH2-6)		
A6C25	283-0312-00			CAP.,FXD,CER DI:22PF,10%,100V	72982	A02AL9A4LC1G220K
	----- -----			(CH2-6)		
A6C32	283-0310-00			CAP.,FXD,CER DI:2.5PF,+/-0.25PF,100V	72982	A01AL4A4LC0G0259
A6C34	283-0204-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N061Z5U0103M
A6C35	283-0416-00			CAP.,FXD,CER DI:47PF,5%,100V	05397	C1005C470J1GAH
	----- -----			(CH2-6)		
A6C41	283-0204-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N061Z5U0103M
A6C42	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	72982	8131N039 E 105Z
A6C45	283-0312-00			CAP.,FXD,CER DI:22PF,10%,100V	72982	A02AL9A4LC1G220K
	----- -----			(CH2-6)		
A6C47	283-0204-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N061Z5U0103M
A6C55	283-0204-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N061Z5U0103M
A6C61	283-0310-00			CAP.,FXD,CER DI:2.5PF,+/-0.25PF,100V	72982	A01AL4A4LC0G0259
A6C67	283-0204-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N061Z5U0103M
	----- -----			(UHF)		
A6C69	283-0413-00	B000100	B000119X	CAP.,FXD,CER DI:91PF,5%,100V	04222	ULA151A910J2T60
	----- -----			(CH7-13)		
A6C69	281-0123-00	XB010120		CAP.,VAR,CER DI:5-25PF,100V	72982	518-000A5-25
	----- -----			(CH2-6)		
A6C69	283-0321-00	XB010120		CAP.,FXD,CER DI:1.8PF,0.25PF,50V	95275	VJ0805A1R8C-H
	----- -----			(CH14-83)		
A6C74	283-0321-00			CAP.,FXD,CER DI:1.8PF,0.25PF,50V	95275	VJ0805A1R8C-H
A6C79	281-0123-00	B000100	B000119X	CAP.,VAR,CER DI:5-25PF,100V	72982	518-000A5-25
	----- -----			(CH2-6)		
A6C79	283-0321-00	B000100	B000119X	CAP.,FXD,CER DI:1.8PF,0.25PF,50V	95275	VJ0805A1R8C-H
	----- -----			(CH14-83)		
A6C79	283-0413-00	XB010120		CAP.,FXD,CER DI:91PF,5%,100V	04222	ULA151A910J2T60
	----- -----			(CH7-13)		
A6C79	281-0221-00	XB010120		CAP.,VAR,CER DI:2-10PF,100V	72982	0513013A 2.0-10
	----- -----			(CH14-83)		
A6C79	283-0321-00	B000100	B000119X	CAP.,FXD,CER DI:1.8PF,0.25PF,50V	95275	VJ0805A1R8C-H
	----- -----			(CH14-83)		
A6C82	283-0204-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N061Z5U0103M
A6C87	281-0064-00			CAP.,VAR,PLSTC:0.25-1.5PF,600V	72982	530-002
	----- -----			(CH2-6)		
A6C88	283-0158-00			CAP.,FXD,CER DI:1PF,10%,50V	72982	8101B057C0K0109B
	----- -----			(CH2-6, NOMINAL VALUE SELECTED)		
A6C88	283-0348-00			CAP.,FXD,CER DI:0.5PF,+/-0.1PF,100V	51642	100-100-NPO-508B
	----- -----			(CH2-6, NOMINAL VALUE SELECTED)		
A6C89	281-0221-00	B000100	B000119X	CAP.,VAR,CER DI:2-10PF,100V	72982	0513013A 2.0-10
	----- -----			(CH14-83)		
A6CR46	----- -----			SEMICOND DVC,DI:SW,SI,100V,2.5A,UM6601B		
	----- -----			(REPLACEABLE AS A UNIT WITH A6)		

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A6CR76	152-0457-00			SEMICOND DEVICE:SILICON,25V	28480	5082-2068
A6CR77	152-0457-00			SEMICOND DEVICE:SILICON,25V	28480	5082-2068
A6CR78	152-0457-00			SEMICOND DEVICE:SILICON,25V	28480	5082-2068
A6CR79	152-0457-00			SEMICOND DEVICE:SILICON,25V	28480	5082-2068
A6CR80	152-0457-00			SEMICOND DEVICE:SILICON,25V	28480	5082-2068
A6CR81	152-0457-00			SEMICOND DEVICE:SILICON,25V	28480	5082-2068
A6CR82	152-0457-00			SEMICOND DEVICE:SILICON,25V	28480	5082-2068
A6CR83	152-0457-00			SEMICOND DEVICE:SILICON,25V	28480	5082-2068
A6L25	108-0260-00			COIL,RF:98NH	80009	108-0260-00
	----- -----			(CH2-6)		
A6L35	108-0260-00			COIL,RF:98NH	80009	108-0260-00
	----- -----			(CH2-6)		
A6L45	108-0895-00			COIL,RF:FIXED,245UH	80009	108-0895-00
A6L65	108-0895-00			COIL,RF:FIXED,245UH	80009	108-0895-00
A6L69	108-0643-00	B000100	B000119X	COIL,RF:FIXED,54NH	80009	108-0643-00
	----- -----			(CH2-6)		
A6L69	108-0908-00	B000100	B000119X	COIL,RF:FIXED,16NH,AIR COIL	80009	108-0908-00
	----- -----			(CH14-83)		
A6L69	108-0912-00	XB010120		COIL,RF:FIXED,83NH	80009	108-0912-00
	----- -----			(CH7-13)		
A6L79	108-0912-00	B000100	B000119X	COIL,RF:FIXED,83NH	80009	108-0912-00
	----- -----			(CH7-13)		
A6L79	108-0643-00	XB010120		COIL,RF:FIXED,54NH	80009	108-0643-00
	----- -----			(CH2-6)		
A6L89	108-0908-00	XB010120		COIL,RF:FIXED,16NH,AIR COIL	80009	108-0908-00
	----- -----			(CH14-83)		
A6Q22	151-0658-00			TRANSISTOR:SILICON,NPN	80009	151-0658-00
A6Q35	151-0216-00			TRANSISTOR:SILICON,PNP	80009	151-0216-00
A6Q43	151-0216-00			TRANSISTOR:SILICON,PNP	80009	151-0216-00
A6R05	307-0336-00			RES.,FXD,FILM:50 OHM,1%,0.105W	52262	MCRA 500 FYZ
A6R07	321-0208-00			RES.,FXD,FILM:1.43K OHM,1%,0.125W	91637	MFF1816G14300F
A6R11	307-0276-00			RES.,FXD,FILM:300 OHM,10%,100MW	27851	3C301K
A6R15	307-0276-00			RES.,FXD,FILM:300 OHM,10%,100MW	27851	3C301K
A6R17	311-1896-00			RES.,VAR,NONWIR:5K OHM,10%,0.50W	32997	3299W-1-502
A6R31	317-0332-00			RES.,FXD,CMPSN:3.3K OHM,5%,0.125W	01121	BB3325
A6R32	307-0570-00			RES.,FXD,FILM:18 OHM,2%,0.12KW	52262	MCRA180FZ
A6R35	307-0279-00			RES.,FXD,FILM:10 OHM,10%,100 MW	27851	3C301K
A6R47	317-0510-00			RES.,FXD,CMPSN:51 OHM,5%,0.125W	01121	BB5105
A6R49	317-0511-00			RES.,FXD,CMPSN:510 OHM,5%,0.125W	01121	BB5115
A6R54	307-0276-00			RES.,FXD,FILM:300 OHM,10%,100MW	27851	3C301K
A6R57	317-0510-00			RES.,FXD,CMPSN:51 OHM,5%,0.125W	01121	BB5105
A6R58	317-0201-00			RES.,FXD,CMPSN:200 OHM,5%,0.125W	01121	BB2015
A6R69	317-0151-00			RES.,FXD,CMPSN:150 OHM,5%,0.125W	01121	BB1515
A6R71	317-0202-00			RES.,FXD,CMPSN:2K OHM,5%,0.125W	01121	BB2025
A6R72	317-0122-00			RES.,FXD,CMPSN:1.2K OHM,5%,0.125W	01121	BB1225
A6R73	301-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.50W	01121	EB1015
A6R75	315-0512-00	XB010120	B010242	RES.,FXD,CMPSN:5.1K OHM,5%,0.25W	01121	CB5125
A6R75	315-0102-00	B010143		RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A6T33	120-1152-00			XFMR,RF:TOROID,2T BIFILAR	80009	120-1152-00
A6T75	120-1153-00			XFMR,RF:BALUN	80009	120-1153-00
A6T78	120-1153-00			XFMR,RF:BALUN	80009	120-1153-00

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
				CKT BOARD ASSY:R.F. PLL		
A7	670-4992-01			CKT BOARD ASSY:R.F. PLL,CH5-6,45.75MHZ IF	80009	670-4992-01
A7	670-4992-02			CKT BOARD ASSY:R.F. PLL,CH7-13,45.75MHZ IF	80009	670-4992-02
A7	670-4992-03			CKT BOARD ASSY:R.F. PLL,CH14-27,45.75MHZ IF	80009	670-4992-03
A7	670-4992-04			CKT BOARD ASSY:R.F. PLL,CH28-43,45.75MHZ IF	80009	670-4992-04
A7	670-4992-05			CKT BOARD ASSY:R.F. PLL,CH44-62,45.75MHZ IF	80009	670-4992-05
A7	670-4992-06			CKT BOARD ASSY:R.F. PLL,CH63-83,45.75MHZ IF	80009	670-4992-06
A7	670-4992-07			CKT BOARD ASSY:R.F. PLL,CH2-4,45.75MHZ IF	80009	670-4992-07
A7	670-4992-08			CKT BOARD ASSY:R.F. PLL,CH2-3,37.0 MHZ IF	80009	670-4992-08
	----- -----			(OPTION 1 ONLY)		
A7	670-4992-09			CKT BOARD ASSY:R.F. PLL,CH4,37.0 MHZ IF	80009	670-4992-09
	----- -----			(OPTION 1 ONLY)		
A7	670-4992-10			CKT BOARD ASSY:R.F. PLL,CH5-6,37.0 MHZ IF	80009	670-4992-10
	----- -----			(OPTION 1 ONLY)		
A7	670-4992-11			CKT BOARD ASSY:R.F. PLL,CH7-9,37.0 MHZ IF	80009	670-4992-11
	----- -----			(OPTION 1 ONLY)		
A7	670-4992-12			CKT BOARD ASSY:R.F. PLL,CH10-13,37.0 MHZ IF	80009	670-4992-12
	----- -----			(OPTION 1 ONLY)		
A7	670-4992-13			CKT BOARD ASSY:R.F. PLL,CH14-22,37.0 MHZ IF	80009	670-4992-13
	----- -----			(OPTION 1 ONLY)		
A7	670-4992-14			CKT BOARD ASSY:R.F. PLL,CH23-31,37.0 MHZ IF	80009	670-4992-14
	----- -----			(OPTION 1 ONLY)		
A7	670-4992-15			CKT BOARD ASSY:R.F. PLL,CH32-35,37.0 MHZ IF	80009	670-4992-15
	----- -----			(OPTION 1 ONLY)		
A7	670-4992-16			CKT BOARD ASSY:R.F. PLL,CH56-83,37.0 MHZ IF	80009	670-4992-16
	----- -----			(OPTION 1 ONLY)		
A7	670-4992-17			CKT BOARD ASSY:R.F. PLL,CH2-3,38.9MHZ	80009	670-4992-17
	----- -----			(OPTION 2 ONLY)		
A7	670-4992-18			CKT BOARD ASSY:R.F. PLL,CH4,38.9MHZ	80009	670-4992-18
	----- -----			(OPTION 2 ONLY)		
A7	670-4992-19			CKT BOARD ASSY:R.F PLL,CH 5-6,38.9MHZ	80009	670-4992-19
	----- -----			(OPTION 2 ONLY)		
A7	670-4992-20			CKT BOARD ASSY:R.F. PLL,CH7-9,38.9MHZ	80009	670-4992-20
	----- -----			(OPTION 2 ONLY)		
A7	670-4992-21			CKT BOARD ASSY:R.F. PLL,CH10-13,38.9MHZ	80009	670-4992-21
	----- -----			(OPTION 2 ONLY)		
A7	670-4992-22			CKT BOARD ASSY:R.F. PLL,CH14-83,38.9MHZ	80009	670-4992-22
	----- -----			(OPTION 2 ONLY)		
A7C06	285-0898-00			CAP.,FXD,PLSTC:0.47UF,10%,100V	56289	LP66A1B474K
A7C12	285-1098-00			CAP.,FXD,PLSTC:0.22UF,10%,80V	56289	192P2249R8
A7C19	283-0204-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N061Z5U0103M
A7C27	283-0615-00			CAP.,FXD,MICA D:33PF,5%,500V	00853	D155E330J0
A7C28	283-0203-00			CAP.,FXD,CER DI:0.47UF,20%,50V	72982	8131N075 E474M
A7C31	281-0611-00			CAP.,FXD,CER DI:2.7PF,+/-0.25PF,200V	72982	374001C0J279C
A7C32	283-0204-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N061Z5U0103M
A7C33	283-0204-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N061Z5U0103M
A7C45	283-0204-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N061Z5U0103M
A7C51	281-0122-00			CAP.,VAR,CER DI:2.5-9PF,100V	172982	518-000A2.5-9
	----- -----			(CH5-6,7-13,10-13)		
A7C51	281-0123-00			CAP.,VAR,CER DI:5-25PF,100V	72982	518-000A5-25
	----- -----			(CH2-3,2-4,4,7-9)		
A7C54	290-0721-00			CAP.,FXD,ELCTLT:100UF,20%,20V	56289	196D107X0020TE3
A7C57	283-0615-00			CAP.,FXD,MICA D:33PF,5%,500V	00853	D155E330J0
A7C58	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A7C64	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A7C68	290-0721-00			CAP.,FXD,ELCTLT:100UF,20%,20V	56289	196D107X0020TE3
A7C71	283-0626-00			CAP.,FXD,MICA D:1800PF,5%,500V	00853	D195E182J0
A7C72	283-0599-00			CAP.,FXD,MICA D:98PF,5%,500V	00853	D105E980J0
A7C74	283-0204-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N061Z5U0103M
A7C81	283-0698-00			CAP.,FXD,MICA D:390PF,1%,500V	09023	CD15ED391F03
A7C83	281-0158-01			CAP.,VAR,CER DI:7-45PF,25V	72982	518-006G7-45
	----- -----			(CH56-83, OPTION 1 ONLY)		
A7C83	283-0636-00			CAP.,FXD,MICA D:36PF,1.4%,100V	00853	D155F360G0
A7CR03	152-0333-00			SEMICOND DEVICE:SILICON,55V,200MA	80009	152-0333-00
A7CR14	152-0333-00			SEMICOND DEVICE:SILICON,55V,200MA	80009	152-0333-00
A7CR41	152-0536-00	B000100	B010125	SEMICOND DEVICE:SILICON,HOT CARRIER,4V	80009	152-0536-00
A7CR41	152-0322-00	B010126		SEMICOND DEVICE:SILICON,15V,HOT CARRIER	80009	152-0322-00
A7CR44	152-0536-00	B000100	B010125	SEMICOND DEVICE:SILICON,HOT CARRIER,4V	80009	152-0536-00
A7CR44	152-0322-00	B010126		SEMICOND DEVICE:SILICON,15V,HOT CARRIER	80009	152-0322-00
A7CR74	152-0335-01			SEMICOND DEVICE:SILICON,SNAP-OFF,40V	80009	152-0335-01
A7L41	108-0260-00			COIL,RF:98NH	80009	108-0260-00
	----- -----			(CH2-6,7-9 OPT 1,7-13,10-13 OPT 1)		
A7L41	108-0262-00			COIL,RF:FIXED,50MH	80009	108-0262-00
	----- -----			(CH2-3 OPT 1,2-4,2-4 OPT 1,5-6,5-6 OPT 1)		
A7L67	108-0509-00			COIL,RF:2.45UH	80009	108-0509-00
A7L78	108-0509-00			COIL,RF:2.45UH	80009	108-0509-00
A7Q23	151-1054-00			TRANSISTOR:SILICON,JFE,N-CHANNEL,DUAL	80009	151-1054-00
A7Q72	151-0472-00			TRANSISTOR:SILICON,NPN	80009	151-0472-00
A7R02	315-0513-00			RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135
A7R06	315-0513-00	B000100	B010355	RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135
A7R06	315-0433-00	B010356		RES.,FXD,CMPSN:43K OHM,5%,0.25W	01121	CB4335
A7R11	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
A7R18	315-0151-00			RES.,FXD,CMPSN:150 OHM,5%,0.25W	01121	CB1515
A7R21	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	91637	MFF1816G10000F
A7R24	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	91637	MFF1816G10000F
A7R25	315-0223-00			RES.,FXD,CMPSN:22K OHM,5%,0.25W	01121	CB2235
A7R26	315-0223-00			RES.,FXD,CMPSN:22K OHM,5%,0.25W	01121	CB2235
A7R28	315-0223-00			RES.,FXD,CMPSN:22K OHM,5%,0.25W	01121	CB2235
A7R32	321-0481-00			RES.,FXD,FILM:1M OHM,1%,0.125W	91637	MFF1816G10003F
A7R34	321-0481-00			RES.,FXD,FILM:1M OHM,1%,0.125W	91637	MFF1816G10003F
A7R36	311-1466-00			RES.,VAR,NONWIR:2K OHM,20%,0.50W	01121	E2B202
A7R38	311-1228-00			RES.,VAR,NONWIR:10K OHM,20%,0.50W	32997	3386F-T04-103
A7R41	317-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.125W	01121	BB1005
	----- -----			(CH14-22 OPT 1,14-27,23-31 OPT 1,28-43,		
	----- -----			32-55 OPT 1,44-62,56-83 OPT 1,63-83)		
A7R42	317-0200-00			RES.,FXD,CMPSN:20 OHM,5%,0.125W	01121	BB2005
	----- -----			(OPT 1,44-62,56-83 OPT 1,63-83)		
A7R45	315-0512-00			RES.,FXD,CMPSN:5.1K OHM,5%,0.25W	01121	CB5125
A7R53	317-0510-00			RES.,FXD,CMPSN:51 OHM,5%,0.125W	01121	BB5105
	----- -----			(CH23-31 OPT 1, 32-55 OPT 1,56-83)		
A7R55	315-0512-00			RES.,FXD,CMPSN:5.1K OHM,5%,0.25W	01121	CB5125
A7R57	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
A7R64	315-0750-00			RES.,FXD,CMPSN:75 OHM,5%,0.25W	01121	CB7505
A7R65	301-0151-00			RES.,FXD,CMPSN:150 OHM,5%,0.50W	01121	EB1515
A7R71	315-0201-00			RES.,FXD,CMPSN:200 OHM,5%,0.25W	01121	CB2015
A7R75	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A7R76	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A7R77	315-0390-00			RES.,FXD,CMPSN:39 OHM,5%,0.25W	01121	CB3905
A7R81	315-0332-00			RES.,FXD,CMPSN:3.3K OHM,5%,0.25W	01121	CB3325
A7R82	315-0510-00			RES.,FXD,CMPSN:51 OHM,5%,0.25W	01121	CB5105

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A7T52	120-1154-00			XFMR,RF:BALUN	80009	120-1154-00
A7T62	120-1147-00			XFMR,RF:TOROID,2T BIFILAR	80009	120-1147-00
A7U17	156-0105-00			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	80009	156-0105-00
A7U47	156-0105-00			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	80009	156-0105-00
A7Y96	158-0140-00	-----	-----	XTAL UNIT,QTZ:5.9444MHZ,0.005%,PARALLEL (CH2-4)	75378	TX-404
A7Y96	158-0141-00	-----	-----	XTAL UNIT,QTZ:5.9750MHZ,0.005%,PARALLEL (CH7-13)	75378	TX-405
A7Y96	158-0142-00	-----	-----	XTAL UNIT,QTZ:6.008MHZ,0.0025%,PARALLEL (CH47-62)	75378	TX-402
A7Y96	158-0143-00	-----	-----	XTAL UNIT,QTZ:6.0093MHZ,0.005%,PARALLEL (CH28-46)	75378	TX-450
A7Y96	158-0144-00	-----	-----	XTAL UNIT,QTZ:6.0069MHZ,0.0025%,PARALLEL (CH63-83)	75378	TX-451
A7Y96	158-0145-00	-----	-----	XTAL UNIT,QTZ:6.0108MHZ,0.005%,PARALLEL (CH14-27,5-6 OPT 1)	75378	TX-452
A7Y96	158-0146-00	-----	-----	XTAL UNIT,QTZ:6.1465MHZ,0.005%,PARALLEL (CH5-6,2-3 OPT 1)	75378	TX-453
A7Y96	158-0157-00	-----	-----	XTAL UNIT,QTZ:5.9804MHZ,0.0025%,PARALLEL (CH 14-22 OPT 1)	75378	TX-501
A7Y96	158-0158-00	-----	-----	XTAL UNIT,QTZ:5.98224MHZ,0.0025%,PARALLEL (CH23-31 OPT 1)	75378	TX-502
A7Y96	158-0159-00	-----	-----	XTAL UNIT,QTZ:5.98471MHZ,0.0025%,PARALLEL (CH32-55 OPT 1)	75378	TX-503
A7Y96	158-0160-00	-----	-----	XTAL UNIT,QTZ:5.98746MHZ,0.0025%,PARALLEL (CH56-83 OPT 1)	75378	TX-504
A7Y96	158-0161-00	-----	-----	XTAL UNIT,QTZ:6.0570MHZ,0.0025%,PARALLEL (CH10-13 OPT 1)	75378	TX-505
A7Y96	158-0162-00	-----	-----	XTAL UNIT,QTZ:6.0625MHZ,0.01%,PARALLEL (CH7-9 OPT 1)	75378	TX-506
A7Y96	158-0163-00	-----	-----	XTAL UNIT,QTZ:6.1324MHZ,0.01%,PARALLEL (CH4 OPT 1)	75378	TX-507
A7Y96	158-0179-00	-----	-----	XTAL UNIT,QTZ:5.888MHZ,0.01%,PARALLEL (CH2-3 OPT 2)	75378	OBD
A7Y96	158-0180-00	-----	-----	XTAL UNIT,QTZ:5.8972MHZ,0.01%,PARALLEL (CH4 OPT 2)	75378	OBD
A7Y96	158-0184-00	-----	-----	XTAL UNIT,QTZ:6.1100MHZ,0.01%,PARALLEL (CH5-6 OPT 2)	75378	OBD
A7Y96	158-0181-00	-----	-----	XTAL UNIT,QTZ:5.950MHZ,0.01%,PARALLEL (CH7-9 OPT 2)	75378	OBD
A7Y96	158-0182-00	-----	-----	XTAL UNIT,QTZ:5.954MHZ,0.01%,PARALLEL (CH10-13 OPT 2)	75378	OBD
A7Y96	158-0183-00	-----	-----	XTAL UNIT,QTZ:6.001MHZ,0.01%,PARALLEL (CH14-83 OPT 2)	75378	OBD

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
				CKT BOARD ASSY:VCO		
A8	670-4993-00			CKT BOARD ASSY:VCO,VHF	80009	670-4993-00
A8	670-4994-00			CKT BOARD ASSY:VCO,UHF	80009	670-4994-00
A8C22	283-0324-00 ----- -----			CAP.,FXD,CER DI:0.01UF,+80-20%,50V (UHF)	72982	A01AA9AZLW5R103Z
A8C26	283-0324-00 ----- -----			CAP.,FXD,CER DI:0.01UF,+80-20%,50V (VHF)	72982	A01AA9AZLW5R103Z
A8C33	283-0265-00 ----- -----			CAP.,FXD,CER DI:3.35PF,+/-1.5PF (UHF)	72982	A02BL9A4LC0G339B
A8C34	283-0252-00 ----- -----	B000100	B000119	CAP.,FXD,CER DI:1000PF,10%,50V (UHF)	72982	A01AL0A2LW5R102K
A8C34	283-0324-00 ----- -----	B010120		CAP.,FXD,CER DI:0.01UF,+80-20%,50V (UHF)	72982	A01AA9AZLW5R103Z
A8C36	283-0252-00 ----- -----			CAP.,FXD,CER DI:1000PF,10%,50V (UHF)	72982	A01AL0A2LW5R102K
A8C37	283-0260-00 ----- -----			CAP.,FXD,CER DI:5.6PF,5%,200V (UHF)	72982	8111B200C0G569C
A8C42	386-3860-00 ----- -----			PLATE,COUPLING:VOLTAGE CONTROL OSCILLATOR (UHF)	80009	386-3860-00
A8C43	283-0324-00 ----- -----	B000100	B000119	CAP.,FXD,CER DI:0.01UF,+80-20%,50V (UHF)	72982	A01AA9AZLW5R103Z
A8C43	283-0252-00 ----- -----	B010120		CAP.,FXD,CER DI:1000PF,10%,50V (UHF)	72982	A01AL0A2LW5R102K
A8C44	283-0252-00 ----- -----			CAP.,FXD,CER DI:1000PF,10%,50V (UHF)	72982	A01AL0A2LW5R102K
A8C46	283-0070-00 ----- -----			CAP.,FXD,CER DI:30PF,10%,50V (VHF)	72982	8121-060C0G0300K
A8C46	386-3861-00 ----- -----			PLATE,COUPLING:VOLTAGE CONTROL OSCILLATOR (UHF)	80009	386-3861-00
A8C47	283-0324-00 ----- -----			CAP.,FXD,CER DI:0.01UF,+80-20%,50V (VHF)	72982	A01AA9AZLW5R103Z
A8C54	283-0252-00 ----- -----	B000100	B000119	CAP.,FXD,CER DI:1000PF,10%,50V (UHF)	72982	A01AL0A2LW5R102K
A8C54	283-0324-00 ----- -----	B010120		CAP.,FXD,CER DI:0.01UF,+80-20%,50V (UHF)	72982	A01AA9AZLW5R103Z
A8C55	211-0255-00			SCREW,MACHINE:4-40 X 1.0 L,HEX SKT,STEEL	000BK	OBD
A8C58	283-0322-00 ----- -----	B000100	B010144	CAP.,FXD,CER DI:12PF,5%,50V (UHF)	91293	50R11N120JPT
A8C58	283-0322-00 ----- -----	B010145		CAP.,FXD,CER DI:12PF,(NOMINAL VALUE SEL) (UHF)	91293	50R11N120JPT
A8C64	283-0252-00 ----- -----			CAP.,FXD,CER DI:1000PF,10%,50V (UHF)	72982	A01AL0A2LW5R102K
A8C86	283-0324-00 ----- -----			CAP.,FXD,CER DI:0.01UF,+80-20%,50V (VHF)	72982	A01AA9AZLW5R103Z
A8CR38	152-0650-00 ----- -----			SEMICOND DEVICE:VVC,11.5PF NOM -3V,30 PIV (VHF)	80009	152-0650-00
A8CR45	152-0650-00 ----- -----			SEMICOND DEVICE:VVC,11.5PF NOM -3V,30 PIV (UHF)	80009	152-0650-00
A8L35	108-0262-00 ----- -----			COIL,RF:FIXED,50MH (UHF)	80009	108-0262-00
A8L35	108-0884-02 ----- -----			COIL,RF:FIXED,490NH (VHF,CH7-13)	80009	108-0884-02
A8L35	108-0883-02 ----- -----			COIL,RF:FIXED,3.4MH (VHF,CH2-6)	80009	108-0883-02
A8L37	108-0509-00 ----- -----			COIL,RF:2.45UH (VHF)	80009	108-0509-00

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A8L44	108-0907-00 ----- -----			COIL,RF:FIXED,143NH (UHF)	80009	108-0907-00
A8L45	108-0907-00 ----- -----			COIL,RF:FIXED,143NH (UHF)	80009	108-0907-00
A8L55	108-0886-02 ----- -----			COIL,RF:FIXED,16NH (UHF,CH47-83)	80009	108-0886-02
A8L55	108-0885-02 ----- -----			COIL,RF:FIXED,60NH (UHF,CH14-46)	80009	108-0885-02
A8Q33	151-0630-00 ----- -----			TRANSISTOR:SILICON,NPN (UHF)	80009	151-0630-00
A8Q47	151-0631-00 ----- -----			TRANSISTOR:SILICON,NPN (VHF)	80009	151-0631-00
A8Q67	151-0631-00 ----- -----			TRANSISTOR:SILICON,NPN (VHF)	80009	151-0631-00
A8R27	317-0182-00 ----- -----			RES.,FXD,CMPSN:1.8K OHM,5%,0.125W (VHF)	01121	BB1825
A8R33	317-0911-00 ----- -----			RES.,FXD,CMPSN:910 OHM,5%,0.125W (UHF)	01121	BB9115
A8R34	317-0362-00 ----- -----	B000100	B000119	RES.,FXD,CMPSN:3.6K OHM,5%,0.125W (UHF)	01121	BB3625
A8R34	317-0752-00 ----- -----	B010120		RES.,FXD,CMPSN:7.5K OHM,5%,0.125W (UHF)	01121	BB7525
A8R35	317-0205-00 ----- -----			RES.,FXD,CMPSN:2M OHM,5%,0.125W (UHF)	01121	BB2055
A8R36	317-0362-00 ----- -----	B000100	B000119	RES.,FXD,CMPSN:3.6K OHM,5%,0.125W (UHF)	01121	BB3625
A8R36	317-0752-00 ----- -----	B010120		RES.,FXD,CMPSN:7.5K OHM,5%,0.125W (UHF)	01121	BB7525
A8R37	317-0205-00 ----- -----			RES.,FXD,CMPSN:2M OHM,5%,0.125W (UHF)	01121	BB2055
A8R44	317-0205-00 ----- -----			RES.,FXD,CMPSN:2M OHM,5%,0.125W (UHF)	01121	BB2055
A8R45	317-0205-00 ----- -----			RES.,FXD,CMPSN:2M OHM,5%,0.125W (UHF)	01121	BB2055
A8R46	317-0205-00 ----- -----			RES.,FXD,CMPSN:2M OHM,5%,0.125W (UHF)	01121	BB2055
A8R47	317-0205-00 ----- -----			RES.,FXD,CMPSN:2M OHM,5%,0.125W (UHF)	01121	BB2055
A8R76	317-0750-00 ----- -----			RES.,FXD,CMPSN:75 OHM,5%,0.125W (VHF)	01121	BB7505

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
				CKT BOARD ASSY:VCO AMP		
A9	670-5191-00			CKT BOARD ASSY:VCO AMP,VHF	80009	670-5191-00
A9	670-5192-00			CKT BOARD ASSY:VCO AMP,UHF	80009	670-5192-00
A9C03	283-0220-00 ----- -----			CAP.,FXD,CER DI:0.01UF,20%,50V (VHF)	72982	8121N075X7R0103M
A9C10	290-0534-00 ----- -----			CAP.,FXD,ELCTLT:1UF,20%,35V (UHF)	56289	196D105X0035HA1
A9C12	283-0324-00 ----- -----			CAP.,FXD,CER DI:0.01UF,+80-20%,50V (UHF)	72982	A01AA9AZLW5R103Z
A9C13	290-0720-00 ----- -----			CAP.,FXD,ELCTLT:68UF,20%,15V (UHF)	56289	196D686X0015PE3
A9C14	283-0324-00 ----- -----			CAP.,FXD,CER DI:0.01UF,+80-20%,50V (UHF)	72982	A01AA9AZLW5R103Z
A9C16	290-0534-00 ----- -----			CAP.,FXD,ELCTLT:1UF,20%,35V (UHF)	56289	196D105X0035HA1
A9C17	283-0024-00 ----- -----			CAP.,FXD,CER DI:0.1UF,+80-20%,50V (VHF)	72982	8121N083Z5U0104Z
A9C21	283-0065-00 ----- -----			CAP.,FXD,CER DI:0.001UF,5%,100V (VHF)	72982	805-518-Z5D0102J
A9C22	290-0720-00 ----- -----			CAP.,FXD,ELCTLT:68UF,20%,15V (VHF)	56289	196D686X0015PE3
A9C23	283-0220-00 ----- -----			CAP.,FXD,CER DI:0.01UF,20%,50V (VHF)	72982	8121N075X7R0103M
A9C23	283-0324-00 ----- -----			CAP.,FXD,CER DI:0.01UF,+80-20%,50V (UHF)	72982	A01AA9AZLW5R103Z
A9C25	283-0154-00 ----- -----			CAP.,FXD,CER DI:22PF,5%,50V (VHF)	72982	8111B061C0G220J
A9C26	283-0398-00 ----- -----			CAP.,FXD,CER DI:680PF,2%,100V,VHF (VHF)	72982	8121N155C0G0681G
A9C28	290-0720-00 ----- -----			CAP.,FXD,ELCTLT:68UF,20%,15V (VHF)	56289	196D686X0015PE3
A9C29	283-0220-00 ----- -----			CAP.,FXD,CER DI:0.01UF,20%,50V (VHF)	72982	8121N075X7R0103M
A9C29	290-0534-00 ----- -----			CAP.,FXD,ELCTLT:1UF,20%,35V (UHF)	56289	196D105X0035HA1
A9C32	283-0324-00 ----- -----			CAP.,FXD,CER DI:0.01UF,+80-20%,50V (UHF)	72982	A01AA9AZLW5R103Z
A9C33	283-0324-00 ----- -----			CAP.,FXD,CER DI:0.01UF,+80-20%,50V (UHF)	72982	A01AA9AZLW5R103Z
A9C34	283-0311-00 ----- -----			CAP.,FXD,CER DI:4.7PF,+/-0.25PF,100V (UHF)	72982	A02AL4AALC0G479C
A9C35	283-0311-00 ----- -----			CAP.,FXD,CER DI:4.7PF,+/-0.25PF,100V (UHF)	72982	A02AL4AALC0G479C
A9C37	283-0220-00 ----- -----			CAP.,FXD,CER DI:0.01UF,20%,50V (VHF)	72982	8121N075X7R0103M
A9C38	283-0204-00 ----- -----			CAP.,FXD,CER DI:0.01UF,20%,50V (UHF)	72982	8121N061Z5U0103M
A9C43	283-0220-00 ----- -----			CAP.,FXD,CER DI:0.01UF,20%,50V (UHF)	72982	8121N075X7R0103M
A9C43	283-0324-00 ----- -----			CAP.,FXD,CER DI:0.01UF,+80-20%,50V (UHF)	72982	A01AA9AZLW5R103Z
A9C44	283-0324-00 ----- -----			CAP.,FXD,CER DI:0.01UF,+80-20%,50V (UHF)	72982	A01AA9AZLW5R103Z
A9C45	283-0204-00 ----- -----			CAP.,FXD,CER DI:0.01UF,20%,50V (UHF)	72982	8121N061Z5U0103M

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A9C65	290-0534-00 ----- -----			CAP.,FXD,ELCTLT:1UF,20%,35V (UHF)	56289	196D105X0035HA1
A9C66	283-0204-00 ----- -----			CAP.,FXD,CER DI:0.01UF,20%,50V (UHF)	72982	8121N061Z5U0103M
A9C71	283-0260-00 ----- -----			CAP.,FXD,CER DI:5.6PF,5%,200V (VHF)	72982	8111B200C0G569C
A9C72	283-0324-00 ----- -----			CAP.,FXD,CER DI:0.01UF,+80-20%,50V (UHF)	72982	A01AA9AZLW5R103Z
A9C73	283-0310-00 ----- -----			CAP.,FXD,CER DI:2.5PF,+/-0.25PF,100V (UHF)	72982	A01AL4A4LC0G0259
A9C74	283-0324-00 ----- -----			CAP.,FXD,CER DI:0.01UF,+80-20%,50V (UHF)	72982	A01AA9AZLW5R103Z
A9C75	283-0220-00 ----- -----			CAP.,FXD,CER DI:0.01UF,20%,50V (VHF)	72982	8121N075X7R0103M
A9C75	283-0310-00 ----- -----			CAP.,FXD,CER DI:2.5PF,+/-0.25PF,100V (UHF)	72982	A01AL4A4LC0G0259
A9C77	283-0220-00 ----- -----			CAP.,FXD,CER DI:0.01UF,20%,50V (VHF)	72982	8121N075X7R0103M
A9C81	290-0534-00 ----- -----			CAP.,FXD,ELCTLT:1UF,20%,35V (UHF)	56289	196D105X0035HA1
A9C82	283-0324-00 ----- -----			CAP.,FXD,CER DI:0.01UF,+80-20%,50V (UHF)	72982	A01AA9AZLW5R103Z
A9C83	283-0324-00 ----- -----			CAP.,FXD,CER DI:0.01UF,+80-20%,50V (UHF)	72982	A01AA9AZLW5R103Z
A9C84	283-0107-00 ----- -----			CAP.,FXD,CER DI:51PF,5%,200V (VHF)	72982	8121B232C0G0510J
A9C85	283-0311-00 ----- -----			CAP.,FXD,CER DI:4.7PF,+/-0.25PF,100V (UHF)	72982	A02AL4AALC0G479C
A9C86	283-0311-00 ----- -----			CAP.,FXD,CER DI:4.7PF,+/-0.25PF,100V (UHF)	72982	A02AL4AALC0G479C
A9C87	283-0324-00 ----- -----			CAP.,FXD,CER DI:0.01UF,+80-20%,50V (UHF)	72982	A01AA9AZLW5R103Z
A9C94	283-0220-00 ----- -----			CAP.,FXD,CER DI:0.01UF,20%,50V (VHF)	72982	8121N075X7R0103M
A9C94	283-0324-00 ----- -----	B000100	B000119X	CAP.,FXD,CER DI:0.01UF,+80-20%,50V (UHF)	72982	A01AA9AZLW5R103Z
A9CR14	152-0141-02 ----- -----			SEMICOND DEVICE:SILICON,30V,50NA (VHF)	80009	152-0141-02
A9CR30	152-0141-02 ----- -----			SEMICOND DEVICE:SILICON,30V,50NA (VHF)	80009	152-0141-02
A9L32	108-0262-00 ----- -----			COIL,RF:FIXED,50MH (UHF)	80009	108-0262-00
A9L35	108-0262-00 ----- -----			COIL,RF:FIXED,50MH (UHF)	80009	108-0262-00
A9L54	108-0260-00 ----- -----			COIL,RF:98NH (VHF)	80009	108-0260-00
A9L60	108-0260-00 ----- -----			COIL,RF:98NH (VHF)	80009	108-0260-00
A9L73	108-0262-00 ----- -----			COIL,RF:FIXED,50MH (UHF)	80009	108-0262-00
A9L76	108-0262-00 ----- -----			COIL,RF:FIXED,50MH (UHF)	80009	108-0262-00
A9L85	108-0682-00 ----- -----			COIL,RF:66NH (UHF)	80009	108-0682-00
A9Q20	151-0216-00 ----- -----			TRANSISTOR:SILICON,PNP (UHF)	80009	151-0216-00

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A9Q23	151-0630-00 ----- -----			TRANSISTOR:SILICON,NPN (UHF)	80009	151-0630-00
A9Q34	151-0630-00 ----- -----			TRANSISTOR:SILICON,NPN (UHF)	80009	151-0630-00
A9Q36	151-0216-00 ----- -----			TRANSISTOR:SILICON,PNP (UHF)	80009	151-0216-00
A9Q46	151-0216-00 ----- -----			TRANSISTOR:SILICON,PNP (UHF)	80009	151-0216-00
A9Q46	151-0434-00 ----- -----			TRANSISTOR:SILICON,PNP (VHF)	80009	151-0434-00
A9Q57	151-0472-00 ----- -----			TRANSISTOR:SILICON,NPN (VHF)	80009	151-0472-00
A9Q62	151-0434-00 ----- -----			TRANSISTOR:SILICON,PNP (VHF)	80009	151-0434-00
A9Q70	151-0216-00 ----- -----			TRANSISTOR:SILICON,PNP (UHF)	80009	151-0216-00
A9Q73	151-0434-00 ----- -----			TRANSISTOR:SILICON,PNP (VHF)	80009	151-0434-00
A9Q83	151-0630-00 ----- -----			TRANSISTOR:SILICON,NPN (UHF)	80009	151-0630-00
A9Q85	151-0630-00 ----- -----			TRANSISTOR:SILICON,NPN (UHF)	80009	151-0630-00
A9R11	317-0332-00 ----- -----			RES.,FXD,CMPSN:3.3K OHM,5%,0.125W (UHF)	01121	BB3325
A9R13	307-0336-00 ----- -----			RES.,FXD,FILM:50 OHM,1%,0.105W (UHF)	52262	MCRA 500 FYZ
A9R17	317-0152-00 ----- -----			RES.,FXD,CMPSN:1.5K OHM,5%,0.125W (VHF)	01121	BB1525
A9R20	315-0241-00 ----- -----			RES.,FXD,CMPSN:240 OHM,5%,0.25W (UHF)	01121	CB2415
A9R21	307-0278-00 ----- -----			RES.,FXD,FILM:20 OHM,5%,100MW (UHF)	52262	MCRA200JZ
A9R23	317-0242-00 ----- -----			RES.,FXD,CMPSN:2.4K OHM,5%,0.125W (VHF)	01121	BB2425
A9R24	307-0278-00 ----- -----			RES.,FXD,FILM:20 OHM,5%,100MW (UHF)	52262	MCRA200JZ
A9R25	315-0101-00 ----- -----			RES.,FXD,CMPSN:100 OHM,5%,0.25W (VHF)	01121	CB1015
A9R25	317-0332-00 ----- -----			RES.,FXD,CMPSN:3.3K OHM,5%,0.125W (UHF)	01121	BB3325
A9R26	317-0100-00 ----- -----			RES.,FXD,CMPSN:10 OHM,5%,0.125W (VHF)	01121	BB1005
A9R27	317-0750-00 ----- -----			RES.,FXD,CMPSN:75 OHM,5%,0.125W (VHF)	01121	BB7505
A9R30	315-0241-00 ----- -----			RES.,FXD,CMPSN:240 OHM,5%,0.25W (UHF)	01121	CB2415
A9R31	315-0241-00 ----- -----			RES.,FXD,CMPSN:240 OHM,5%,0.25W (VHF)	01121	CB2415
A9R33	307-0571-00 ----- -----			RES.,FXD,FILM:57 OHM,1%,0.125W (UHF)	52262	MCRA570FZ
A9R34	307-0278-00 ----- -----			RES.,FXD,FILM:20 OHM,5%,100MW (UHF)	52262	MCRA200JZ
A9R34	317-0560-00 ----- -----			RES.,FXD,CMPSN:56 OHM,5%,0.125W (VHF)	01121	BB5605
A9R35	307-0278-00 ----- -----			RES.,FXD,FILM:20 OHM,5%,100MW (UHF)	52262	MCRA200JZ

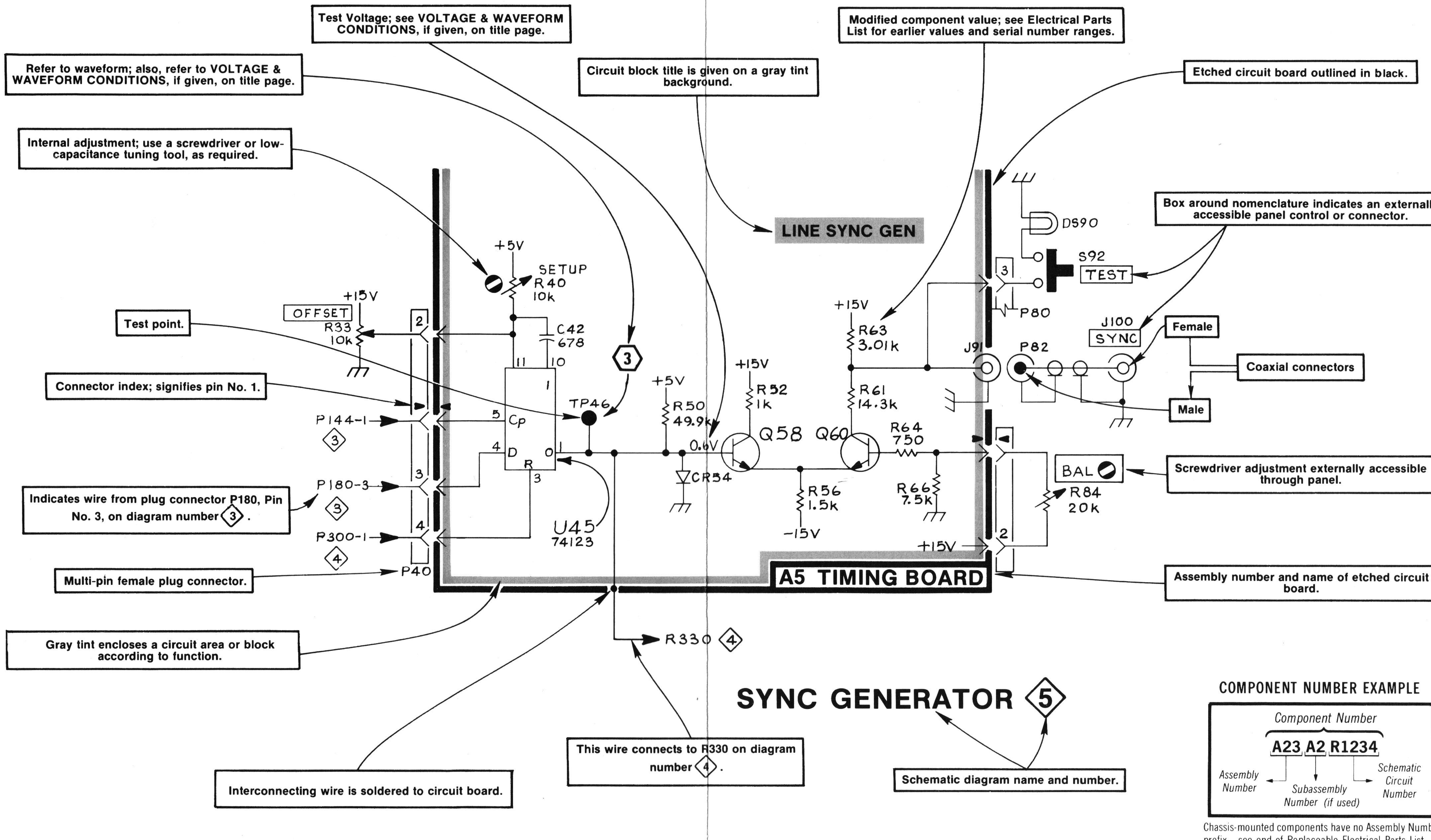
Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A9R38	315-0150-00 ----- -----			RES.,FXD,CMPSN:15 OHM,5%,0.25W (VHF)	01121	CB1505
A9R38	317-0152-00 ----- -----			RES.,FXD,CMPSN:1.5K OHM,5%,0.125W (UHF)	01121	BB1525
A9R41	317-0560-00 ----- -----			RES.,FXD,CMPSN:56 OHM,5%,0.125W (VHF)	01121	BB5605
A9R42	317-0750-00 ----- -----			RES.,FXD,CMPSN:75 OHM,5%,0.125W (VHF)	01121	BB7505
A9R44	307-0571-00 ----- -----			RES.,FXD,FILM:57 OHM,1%,0.125W (UHF)	52262	MCRA570FZ
A9R45	307-0336-00 ----- -----			RES.,FXD,FILM:50 OHM,1%,0.105W (UHF)	52262	MCRA 500 FYZ
A9R50	315-0241-00 ----- -----			RES.,FXD,CMPSN:240 OHM,5%,0.25W (UHF)	01121	CB2415
A9R52	317-0332-00 ----- -----			RES.,FXD,CMPSN:3.3K OHM,5%,0.125W (UHF)	01121	BB3325
A9R53	317-0472-00 ----- -----			RES.,FXD,CMPSN:4.7K OHM,5%,0.125W (VHF)	01121	BB4725
A9R54	317-0301-00 ----- -----			RES.,FXD,CMPSN:300 OHM,5%,0.125W (VHF)	01121	BB3015
A9R57	301-0181-00 ----- -----			RES.,FXD,CMPSN:180 OHM,5%,0.50W (UHF)	01121	EB1815
A9R65	317-0332-00 ----- -----			RES.,FXD,CMPSN:3.3K OHM,5%,0.125W (UHF)	01121	BB3325
A9R67	315-0241-00 ----- -----			RES.,FXD,CMPSN:240 OHM,5%,0.25W (UHF)	01121	CB2415
A9R68	317-0122-00 ----- -----			RES.,FXD,CMPSN:1.2K OHM,5%,0.125W (UHF)	01121	BB1225
A9R69	315-0390-00 ----- -----			RES.,FXD,CMPSN:39 OHM,5%,0.25W (UHF)	01121	CB3905
A9R73	307-0278-00 ----- -----			RES.,FXD,FILM:20 OHM,5%,100MW (UHF)	52262	MCRA200JZ
A9R74	317-0431-00 ----- -----			RES.,FXD,CMPSN:430 OHM,5%,0.125W (VHF)	01121	BB4315
A9R75	307-0278-00 ----- -----			RES.,FXD,FILM:20 OHM,5%,100MW (UHF)	52262	MCRA200JZ
A9R76	301-0241-00 ----- -----			RES.,FXD,CMPSN:240 OHM,5%,0.50W (VHF)	01121	EB2415
A9R78	315-0301-00 ----- -----			RES.,FXD,CMPSN:300 OHM,5%,0.25W (VHF)	01121	CB3015
A9R82	307-0571-00 ----- -----			RES.,FXD,FILM:57 OHM,1%,0.125W (UHF)	52262	MCRA570FZ
A9R84	307-0277-00 ----- -----			RES.,FXD,FILM:200 OHM,5%,100MW (UHF)	52262	MCRA22JZ
A9R85	307-0279-00 ----- -----			RES.,FXD,FILM:10 OHM,10%,100 MW (UHF)	27851	3C301K
A9R85	317-0027-00 ----- -----			RES.,FXD,CMPSN:2.7 OHM,5%,0.125W (VHF)	01121	BB2R705
A9R86	307-0278-00 ----- -----			RES.,FXD,FILM:20 OHM,5%,100MW (UHF)	52262	MCRA200JZ
A9R95	317-0047-00 ----- -----			RES.,FXD,CMPSN:4.7 OHM,5%,0.125W (VHF)	01121	BB47G5
A9VR13	152-0168-00 ----- -----	B000100	B010129	SEMICOND DEVICE:ZENER,0.4W,12V,5% (UHF)	80009	152-0168-00
A9VR13	152-0212-00 ----- -----	B010130		SEMICOND DEVICE:ZENER,0.5W,9V,5% (UHF)	80009	152-0212-00

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A9VR24	152-0195-00 ----- -----			SEMICOND DEVICE:ZENER,0.4W,5.1V,5% (VHF)	80009	152-0195-00
A9VR32	152-0212-00 ----- -----			SEMICOND DEVICE:ZENER,0.5W,9V,5% (VHF)	80009	152-0212-00

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
				CKT BOARD ASSY:PIN DRIVER		
A10	----- -----			CKT BOARD ASSY:PIN DRIVER		
	----- -----			(REPLACED AS A UNIT WITH PIN ATTENUATOR		
	----- -----			CKT BOARD ASSEMBLIES)		
A10C87	290-0573-00			CAP.,FXD,ELCTLT:2.7UF,20%,50V	56289	196D275X0050JA1
A10C88	290-0512-00			CAP.,FXD,ELCTLT:22UF,20%,15V	56289	196D226X0015KA1
A10CR17	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	80009	152-0141-02
A10CR21	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	80009	152-0141-02
A10CR22	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	80009	152-0141-02
A10CR27	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	80009	152-0141-02
A10CR28	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	80009	152-0141-02
A10CR31	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	80009	152-0141-02
A10CR32	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	80009	152-0141-02
A10CR37	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	80009	152-0141-02
A10CR38	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	80009	152-0141-02
A10CR41	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	80009	152-0141-02
A10CR47	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	80009	152-0141-02
A10CR51	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	80009	152-0141-02
A10CR52	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	80009	152-0141-02
A10CR57	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	80009	152-0141-02
A10CR58	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	80009	152-0141-02
A10CR61	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	80009	152-0141-02
A10CR62	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	80009	152-0141-02
A10CR67	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	80009	152-0141-02
A10CR68	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	80009	152-0141-02
A10CR71	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	80009	152-0141-02
A10CR77	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	80009	152-0141-02
A10CR81	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	80009	152-0141-02
A10Q00	151-0219-00			TRANSISTOR:SILICON,PNP	80009	151-0219-00
A10Q10	151-0219-00			TRANSISTOR:SILICON,PNP	80009	151-0219-00
A10Q19	151-0219-00			TRANSISTOR:SILICON,PNP	80009	151-0219-00
A10Q20	151-0219-00			TRANSISTOR:SILICON,PNP	80009	151-0219-00
A10Q21	151-0219-00			TRANSISTOR:SILICON,PNP	80009	151-0219-00
A10Q28	151-0219-00			TRANSISTOR:SILICON,PNP	80009	151-0219-00
A10Q29	151-0219-00			TRANSISTOR:SILICON,PNP	80009	151-0219-00
A10Q30	151-0219-00			TRANSISTOR:SILICON,PNP	80009	151-0219-00
A10Q31	151-0219-00			TRANSISTOR:SILICON,PNP	80009	151-0219-00
A10Q38	151-0219-00			TRANSISTOR:SILICON,PNP	80009	151-0219-00
A10Q39	151-0219-00			TRANSISTOR:SILICON,PNP	80009	151-0219-00
A10Q40	151-0219-00			TRANSISTOR:SILICON,PNP	80009	151-0219-00
A10Q48	151-0219-00			TRANSISTOR:SILICON,PNP	80009	151-0219-00
A10Q50	151-0219-00			TRANSISTOR:SILICON,PNP	80009	151-0219-00
A10Q51	151-0219-00			TRANSISTOR:SILICON,PNP	80009	151-0219-00
A10Q58	151-0219-00			TRANSISTOR:SILICON,PNP	80009	151-0219-00
A10Q59	151-0219-00			TRANSISTOR:SILICON,PNP	80009	151-0219-00
A10Q60	151-0219-00			TRANSISTOR:SILICON,PNP	80009	151-0219-00
A10Q61	151-0219-00			TRANSISTOR:SILICON,PNP	80009	151-0219-00
A10Q68	151-0219-00			TRANSISTOR:SILICON,PNP	80009	151-0219-00
A10Q69	151-0219-00			TRANSISTOR:SILICON,PNP	80009	151-0219-00
A10Q70	151-0219-00			TRANSISTOR:SILICON,PNP	80009	151-0219-00
A10Q79	151-0219-00			TRANSISTOR:SILICON,PNP	80009	151-0219-00
A10Q80	151-0219-00			TRANSISTOR:SILICON,PNP	80009	151-0219-00
A10Q81	151-0195-00			TRANSISTOR:SILICON,NPN	80009	151-0195-00
A10Q88	151-0219-00			TRANSISTOR:SILICON,PNP	80009	151-0219-00

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A10Q89	151-0219-00			TRANSISTOR:SILICON,PNP	80009	151-0219-00
A10R02	321-0932-03			RES.,FXD,FILM:2.5K OHM,0.25%,0.125W	91637	MFF1816D25000C
A10R12	321-0932-03			RES.,FXD,FILM:2.5K OHM,0.25%,0.125W	91637	MFF1816D25000C
A10R17	315-0275-00			RES.,FXD,CMPSN:2.7M OHM,5%,0.25W	01121	CB2755
A10R21	321-0932-03			RES.,FXD,FILM:2.5K OHM,0.25%,0.125W	91637	MFF1816D25000C
A10R22	321-0816-07			RES.,FXD,FILM:5K OHM,0.1%,0.125W	91637	MFF1816C50000B
A10R27	315-0135-00			RES.,FXD,CMPSN:1.3M OHM,5%,0.25W	01121	CB1355
A10428	321-0463-00			RES.,FXD,FILM:649K OHM,1%,0.125W	91637	MFF1816G64902F
A10R31	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
A10432	321-0318-00			RES.,FXD,FILM:20K OHM,1%,0.125W	91637	MFF1816G20001F
A10R37	321-0434-00			RES.,FXD,FILM:324K OHM,1%,0.125W	91637	MFF1816G32402F
A10R38	321-0405-00			RES.,FXD,FILM:162K OHM,1%,0.125W	91637	MFF1816G16202F
A10R41	321-0924-07			RES.,FXD,FILM:40K OHM,0.1%,0.125W	91637	MFF1816C40001B
A10R47	321-0376-00			RES.,FXD,FILM:80.6K OHM,1%,0.125W	91637	MFF1816G80601F
A10R51	321-0376-00			RES.,FXD,FILM:80.6K OHM,1%,0.125W	91637	MFF1816G80601F
A10R52	321-0405-00			RES.,FXD,FILM:162K OHM,1%,0.125W	91637	MFF1816G16202F
A10R57	321-0924-07			RES.,FXD,FILM:40K OHM,0.1%,0.125W	91637	MFF1816C40001B
A10R58	321-0318-00			RES.,FXD,FILM:20K OHM,1%,0.125W	91637	MFF1816G20001F
A10R61	321-0434-00			RES.,FXD,FILM:324K OHM,1%,0.125W	91637	MFF1816G32402F
A10R62	321-0463-00			RES.,FXD,FILM:649K OHM,1%,0.125W	91637	MFF1816G64902F
A10R67	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
A10R68	321-0816-07			RES.,FXD,FILM:5K OHM,0.1%,0.125W	91637	MFF1816C50000B
A10R71	315-0135-00			RES.,FXD,CMPSN:1.3M OHM,5%,0.25W	01121	CB1355
A10R77	321-0932-03			RES.,FXD,FILM:2.5K OHM,0.25%,0.125W	91637	MFF1816D25000C
A10R81	315-0275-00			RES.,FXD,CMPSN:2.7M OHM,5%,0.25W	01121	CB2755
A10R82	315-0161-00			RES.,FXD,CMPSN:160 OHM,5%,0.25W	01121	CB1615
A10R87	321-0932-03			RES.,FXD,FILM:2.5K OHM,0.25%,0.125W	91637	MFF1816D25000C
A10R88	321-0932-03			RES.,FXD,FILM:2.5K OHM,0.25%,0.125W	91637	MFF1816D25000C
A10R92	321-0227-00			RES.,FXD,FILM:2.26K OHM,1%,0.125W	91637	MFF1816G22600F
A10R93	321-0299-00			RES.,FXD,FILM:12.7K OHM,1%,0.125W	91637	MFF1816G12701F
A10U14	----- -----			MICROCIRCUIT,DI:256 BIT PROM,W/3 STATE OUT		
	----- -----			(REPLACED AS A UNIT UNDER 672-0640-00,		
	----- -----			672-0641-00,672-0667-00,672-0668-00)		
A10U44	----- -----			MICROCIRCUIT,DI:256 BIT PROM,W/3 STATE OUT		
	----- -----			(REPLACED AS A UNIT UNDER 672-0640-00,		
	----- -----			672-0641-00,672-0667-00,672-0668-00)		
A10U64	----- -----			MICROCIRCUIT,DI:256 BIT PROM,W/3 STATE OUT		
	----- -----			(REPLACED AS A UNIT UNDER 672-0640-00,		
	----- -----			672-0641-00,672-0667-00,672-0668-00)		

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
				CKT BOARD ASSY:DOWN CONVERTER INTERFACE		
A11	670-5000-00			CKT BOARD ASSY:DOWN CONVERTER INTERFACE	80009	670-5000-00
A11C15	281-0752-00			CAP.,FXD,CER DI:0.00175UF,10A	72982	1214-007
A11C16	281-0752-00			CAP.,FXD,CER DI:0.00175UF,10A	72982	1214-007
A11C26	281-0752-00			CAP.,FXD,CER DI:0.00175UF,10A	72982	1214-007
A11C53	281-0752-00			CAP.,FXD,CER DI:0.00175UF,10A	72982	1214-007
A11C55	281-0752-00			CAP.,FXD,CER DI:0.00175UF,10A	72982	1214-007
A11C65	281-0752-00			CAP.,FXD,CER DI:0.00175UF,10A	72982	1214-007
A11C69	281-0752-00			CAP.,FXD,CER DI:0.00175UF,10A	72982	1214-007
A11C76	281-0752-00			CAP.,FXD,CER DI:0.00175UF,10A	72982	1214-007
A11C79	281-0752-00			CAP.,FXD,CER DI:0.00175UF,10A	72982	1214-007
A11C98	281-0752-00			CAP.,FXD,CER DI:0.00175UF,10A	72982	1214-007
A10W1	175-2080-00			CABLE ASSY,RF:50 OHM COAX,6.375 L	80009	175-2080-00



SCHEMATIC EXAMPLE

2597-37

DIAGRAMS & CIRCUIT BOARD ILLUSTRATIONS

This section of the manual contains block and schematic diagrams with waveforms, and etched circuit board illustrations.

Symbols

Symbols used on the diagrams are based on ANSI Y32.2-1970 and IEEE No. 315 March 1971. Logic symbology is based on ANSI Y32.14-1973 (IEEE Std. 91-1973). Logic symbols depict the logic function performed and may differ from the manufacturer's data.

Component Values

Electrical components shown on the diagrams are in the following units unless noted otherwise:

Capacitors = Values one or greater are in picofarads (pF).
Values less than one are in micofarads (μF).

Resistors = Ohms (Ω).

Semiconductor Types

Refer to the Electrical Parts List.

Reference Designators

The following letters are used as reference designators to identify components or assemblies on Tektronix, Inc. schematic diagrams.

A	Assembly, separable or repairable (circuit board, etc.)
AT	Attenuator, fixed or variable
B	Motor
BT	Battery
C	Capacitor, fixed or variable
CR	Diode, signal or rectifier
DH	Decoupling Hybrid
DL	Delay Line
DS	Indicating device (lamp)
E	Spark Gap
F	Fuse
FL	Filter
H	Heat dissipating device (heat sink, heat radiator, etc.)
HR	Heater
J	Connector, stationary portion
K	Relay
L	Inductor, fixed or variable
LR	Inductor/resistor combination
M	Meter
P	Connector, movable portion
Q	Transistor, silicon-controlled rectifier, or programmable unijunction transistor
R	Resistor, fixed or variable
RT	Thermistors
S	Switch
T	Transformer
TC	Thermocouple
TP	Test Point
U	Assembly, inseparable or non-repairable (integrated circuit, etc.)
V	Electron tube
VR	Voltage regulator (zener diode, etc.)
Y	Crystal

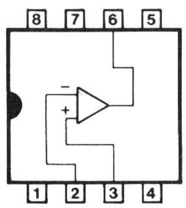
Partial Schematic Diagram With Explanations

The partial diagram at the left is an example of the various symbols and other information provided on Tektronix, Inc. diagrams.

WAVEFORM CONDITIONS

Synchronous Detection—CONT
Sound Trap—IN
Internal Zero Carrier Ref—OFF
Auto AGC Speed—SYNC TIP

I.C. BASING DIAGRAMS



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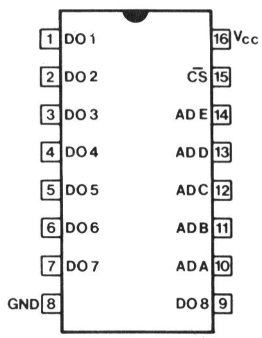

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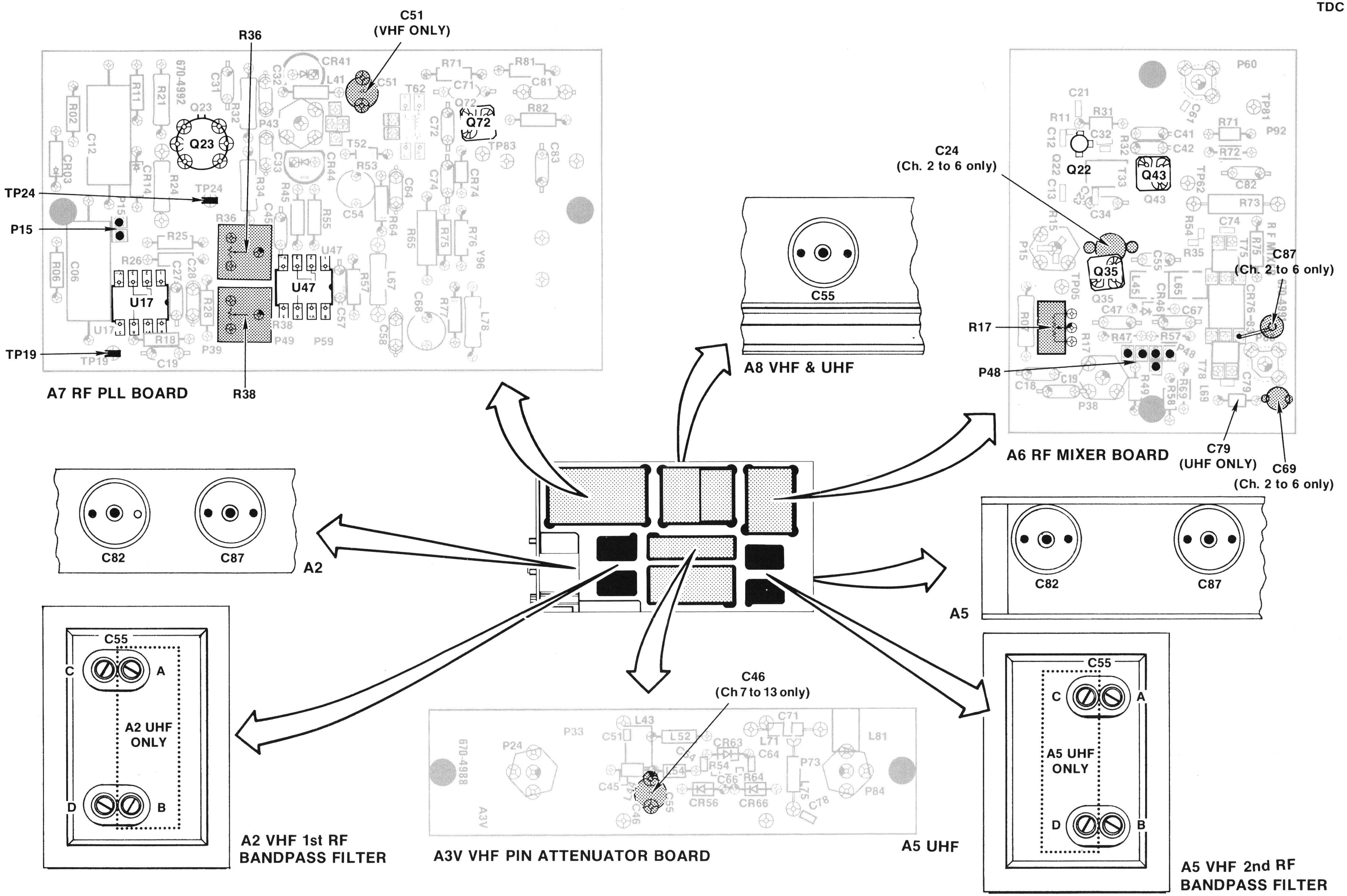
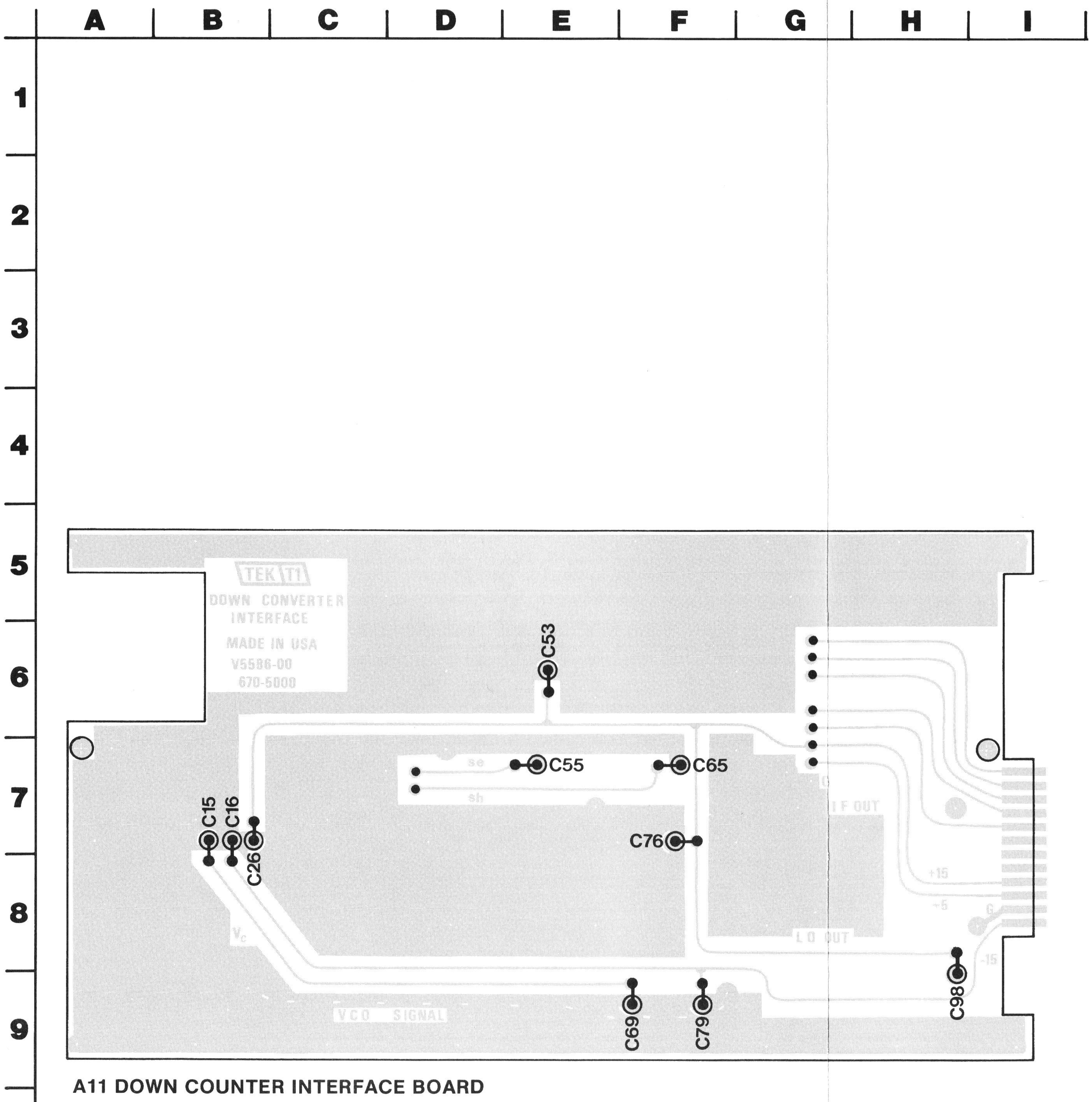
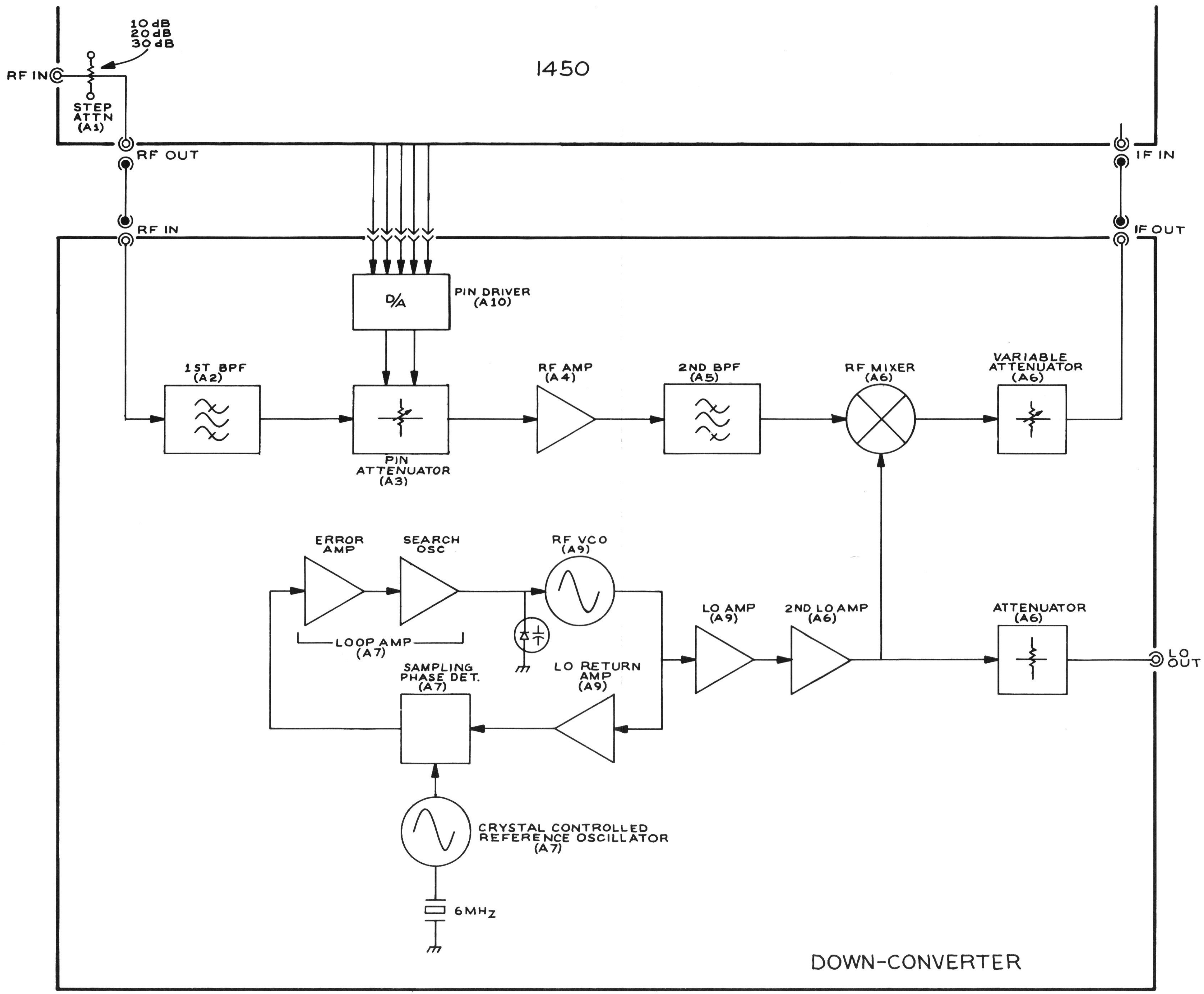


Fig. 8-1. VHF & UHF CIRCUIT BOARDS ADJUSTMENTS AND JUMPER LOCATIONS. 2597-38



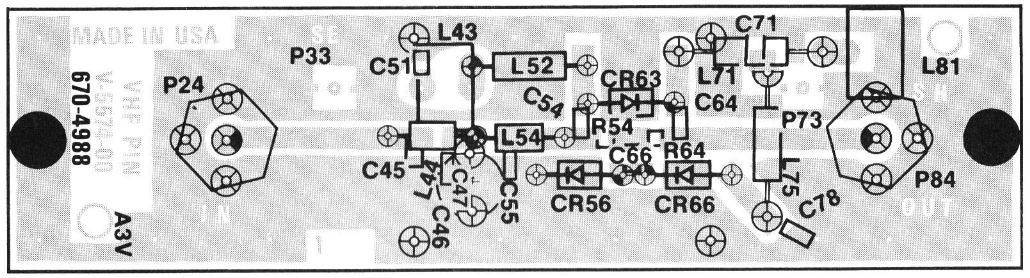
A11 DOWN COUNTER INTERFACE BOARD

2597-39

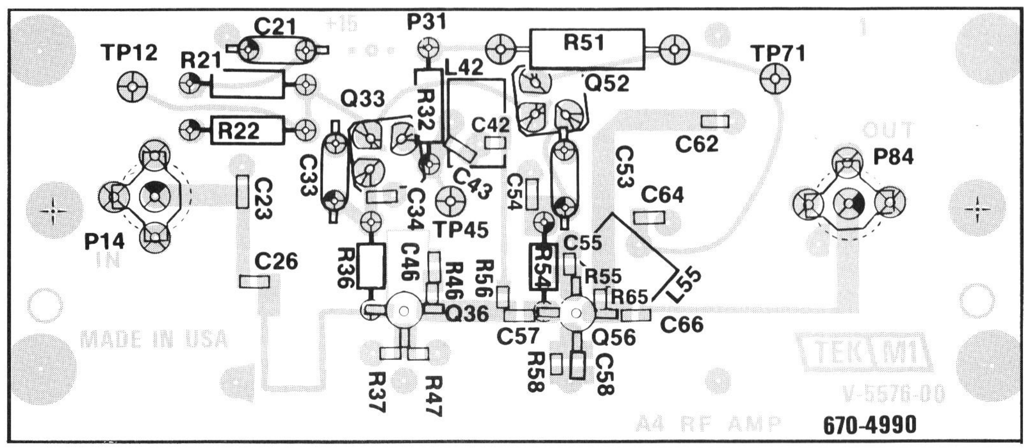

1450
RF IN
10 dB
20 dB
30 dB
STEP ATTN (A1)
RF OUT
RF IN
IF IN
IF OUT
PIN DRIVER (A10)
D/A
1ST BPF (A2)
PIN ATTENUATOR (A3)
RF AMP (A4)
2ND BPF (A5)
RF MIXER (A6)
VARIABLE ATTENUATOR (A6)
ERROR AMP
SEARCH OSC
RF VCO (A9)
LOOP AMP (A7)
LO AMP (A9)
2ND LO AMP (A6)
ATTENUATOR (A6)
LO OUT
SAMPLING PHASE DET. (A7)
LO RETURN AMP (A9)
CRYSTAL CONTROLLED REFERENCE OSCILLATOR (A7)
6MHz
DOWN-CONVERTER

TDC

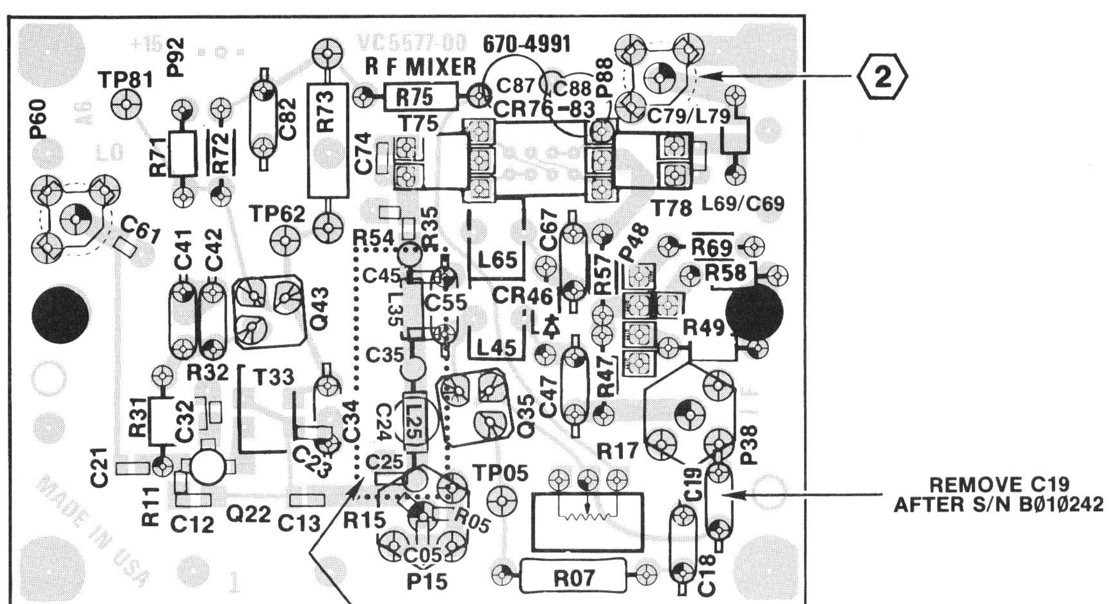
COMPONENT LOCATIONS
A2 & A5, A3V, A4, A6



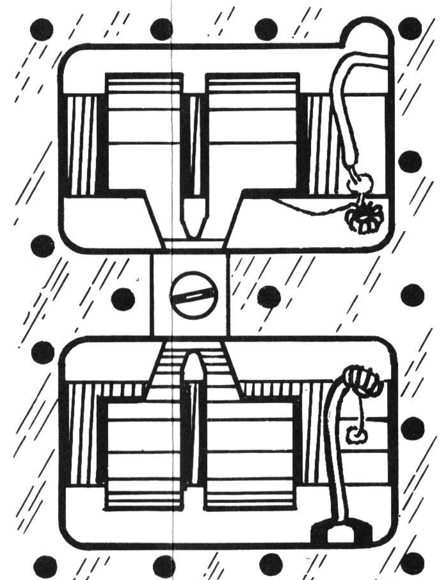
A3V VHF PIN ATTENUATOR BOARD



A4 RF AMP BOARD



A6 RF MIXER BOARD



A2 1st RF BANDPASS FILTER
A5 2nd RF BANDPASS FILTER

COMPONENT NUMBER EXAMPLE

Component Number
A23 A2 R1234
Assembly Number — Subassembly Number (if used) — Schematic Circuit Number

Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

VHF RF Signal Processor ⟨1⟩

Circuit Number	Schematic Location	Board Location
ASSY A2		
C55	B2	Chassis
C82	B2	Chassis
C87	B2	Chassis
L52	B2	Chassis
L57	B2	Chassis
T10	D2	Chassis
T18	D2	Chassis
ASSY A3		
C45	B2	C2
C46	B3	C2
C47	B3	C2
C51	B2	C1
C54	B3	D1
C55	B3	C2
C64	B3	D1
C66	B3	D1
C71	B3	E1
C78	B3	E2
CR56	B3	D2
CR63	A3	D1
CR66	B3	D2
L43	A2	C1
L44	B3	C2
L52	A3	C1
L54	B3	C1
L71	A3	E1
L75	B3	E2
L81	A3	E1
P24	B2	B1
P84	B3	E1
R54	B3	D1
R64	B3	D1
ASSY A4		
C21	A4	B3
C23	B4	B4
C26	B4	B4
C33	A4	B4
C34	B4	C4
C42	A4	C3
C43	A4	C4
C46	B4	C4
C53	A4	D4
C54	A4	C4
C55	B4	D4
C57	A4	C4
C58	B5	D5
C62	B5	D3
C64	A4	D4
C66	A5	D4
L42	A4	C3
L55	A4	D4
P14	B3	A4
P84	A5	E4
Q33	A4	C3
Q36	B4	C4
Q52	A4	D3
Q56	A4	D4

Circuit Number	Schematic Location	Board Location
R21	A4	B3
R22	A4	B3
R32	A4	C3
R36	B4	C4
R37	B4	C5
R46	B4	C4
R47	B4	C5
R51	A4	D3
R54	A4	D4
R55	B4	D4
R56	A4	C4
R58	B5	D5
R65	A5	D4
TP12	A4	A3
TP45	A4	C4
TP71	A5	E3
ASSY A5		
C55	B5	Chassis
C82	A5	Chassis
C87	A5	Chassis
L52	A5	Chassis
L57	A5	Chassis
T10	D2	Chassis
T18	D2	Chassis
ASSY A6		
C05	D5	C8
C12	C4	B8
C13	C4	B8
C18	C5	D8
C19	C5	D8
C21	C3	A8
C23	C4	B8
C24	D3	C8
C25	D4	C8
C32	C4	B8
C34	C4	B8
C35	D3	C7
C41	C4	B7
C42	C4	B7
C45	D3	C7
C47	C5	D8
C55	C5	C7
C61	C3	A7
C67	C5	D7
C69	C5	E6
C74	C4	C6
C79	C5	D6
C82	B3	B6
C87	D5	D6
C88	C5	D6
CR46	C5	D7
CR76	C4	C6
CR77	C4	C6
CR78	C4	C6
CR79	C4	C6
CR80	C4	C6
CR81	C4	C6
CR82	C4	C6
CR83	C4	C6

Circuit Number	Sc
L25	
L35	
L45	
L65	
L69	
L79	
P15	
P38	
P48	
P60	
P88	
Q22	
Q35	
Q43	
R05	
R07	
R11	
R15	
R17	
R31	
R32	
R35	
R47	
R49	
R54	
R57	
R58	
R69	
R71	
R72	
R73	
R75	
T33	
T75	
T78	
TP05	
TP62	
TP81	
P/O ASSY A11	
C53	
C55	
C65	
C98	

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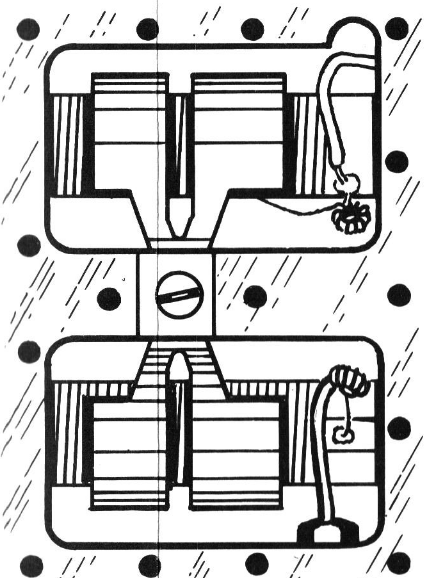
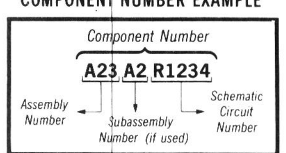


2 1st RF BANDPASS FILTER
5 2nd RF BANDPASS FILTER

COMPONENT NUMBER EXAMPLE



Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

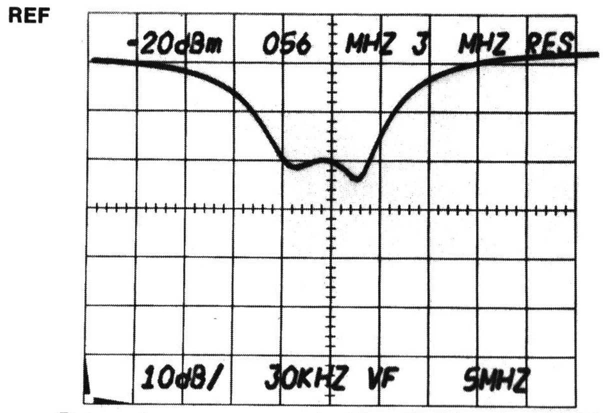
VHF RF Signal Processor ⟨1⟩

Circuit Number	Schematic Location	Board Location
ASSY A2		
C55	B2	Chassis
C82	B2	Chassis
C87	B2	Chassis
L52	B2	Chassis
L57	B2	Chassis
T10	D2	Chassis
T18	D2	Chassis
ASSY A3		
C45	B2	C2
C46	B3	C2
C47	B3	C2
C51	B2	C1
C54	B3	D1
C55	B3	C2
C64	B3	D1
C66	B3	D1
C71	B3	E1
C78	B3	E2
CR56	B3	D2
CR63	A3	D1
CR66	B3	D2
L43	A2	C1
L44	B3	C2
L52	A3	C1
L54	B3	C1
L71	A3	E1
L75	B3	E2
L81	A3	E1
P24	B2	B1
P84	B3	E1
R54	B3	D1
R64	B3	D1
ASSY A4		
C21	A4	B3
C23	B4	B4
C26	B4	B4
C33	A4	B4
C34	B4	C4
C42	A4	C3
C43	A4	C4
C46	B4	C4
C53	A4	D4
C54	A4	C4
C55	B4	D4
C57	A4	C4
C58	B5	D5
C62	B5	D3
C64	A4	D4
C66	A5	D4
L42	A4	C3
L55	A4	D4
P14	B3	A4
P84	A5	E4
Q33	A4	C3
Q36	B4	C4
Q52	A4	D3
Q56	A4	D4

Circuit Number	Schematic Location	Board Location
R21	A4	B3
R22	A4	B3
R32	A4	C3
R36	B4	C4
R37	B4	C5
R46	B4	C4
R47	B4	C5
R51	A4	D3
R54	A4	D4
R55	B4	D4
R56	A4	C4
R58	B5	D5
R65	A5	D4
TP12	A4	A3
TP45	A4	C4
TP71	A5	E3
ASSY A5		
C55	B5	Chassis
C82	A5	Chassis
C87	A5	Chassis
L52	A5	Chassis
L57	A5	Chassis
T10	D2	Chassis
T18	D2	Chassis
ASSY A6		
C05	D5	C8
C12	C4	B8
C13	C4	B8
C18	C5	D8
C19	C5	D8
C21	C3	A8
C23	C4	B8
C24	D3	C8
C25	D4	C8
C32	C4	B8
C34	C4	B8
C35	D3	C7
C41	C4	B7
C42	C4	B7
C45	D3	C7
C47	C5	D8
C55	C5	C7
C61	C3	A7
C67	C5	D7
C69	C5	E6
C74	C4	C6
C79	C5	D6
C82	B3	B6
C87	D5	D6
C88	C5	D6
CR46	C5	D7
CR76	C4	C6
CR77	C4	C6
CR78	C4	C6
CR79	C4	C6
CR80	C4	C6
CR81	C4	C6
CR82	C4	C6
CR83	C4	C6

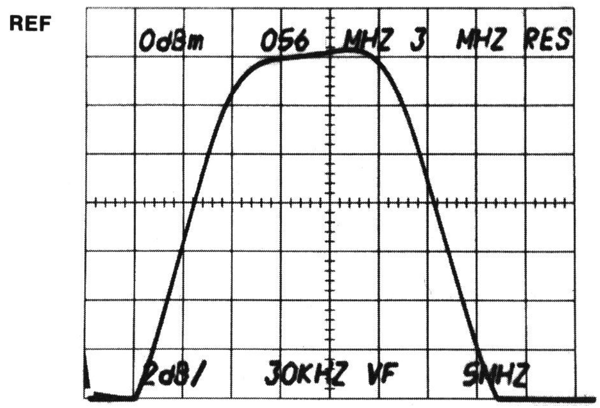
Circuit Number	Schematic Location	Board Location
L25	D3	C8
L35	D3	C7
L45	C5	C7
L65	C5	C7
L69	C5	E6
L79	C5	D6
P15	D5	C8
P38	C5	D8
P48	C5	D7
P60	C3	A7
P88	B5	D6
Q22	C4	B8
Q35	C5	C8
Q43	C3	B7
R05	D5	C8
R07	C5	D9
R11	C4	B8
R15	D5	C8
R17	C5	D8
R31	C3	B8
R32	C4	B8
R35	C4	C7
R47	C5	D8
R49	C5	D7
R54	C4	C7
R57	C5	D7
R58	D5	D7
R69	D5	D7
R71	C3	B6
R72	C3	B6
R73	C4	B6
R75	C5	C6
T33	C4	B8
T75	C4	C6
T78	C5	D6
TP05	C5	C8
TP62	C4	B7
TP81	C3	A6
P/O ASSY A11		
C53	A3	E6
C55	A2	E7
C65	B2	F6
C98	C5	H9

⟨1⟩ V



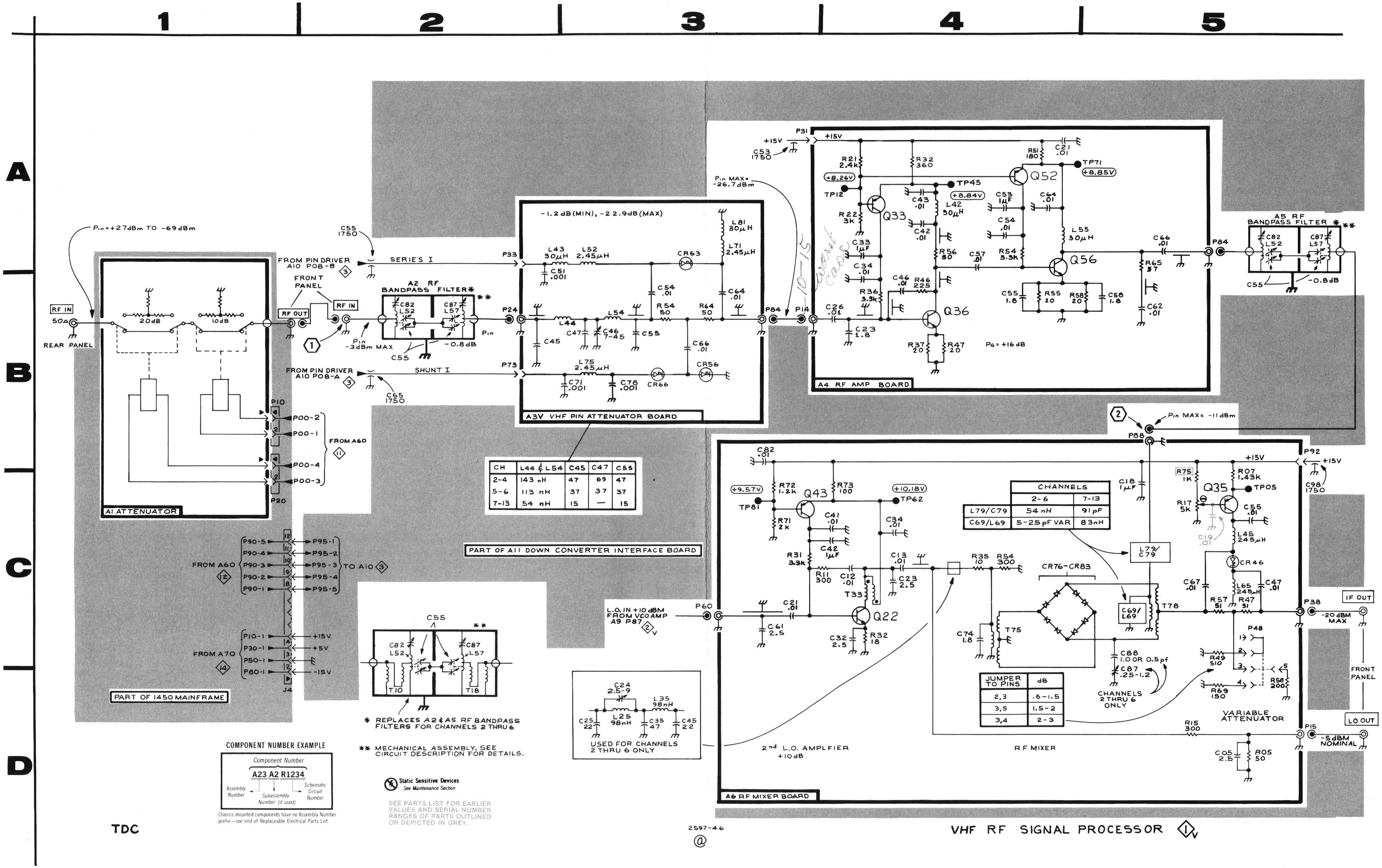
⟨1⟩

Return Loss as measured with a 7L13 and a VSWR Bridge. The VSWR Bridge driven with 0 dBm from a TR 502.



⟨2⟩

Bandpass response as measured with a 7L13. The TDC driven with 0 dBm from a TR 502.



CH	L44 & L54	C45	C47	C55
2-4	143 nH	47	69	47
5-6	113 nH	37	37	37
7-13	54 nH	15	—	15

	CHANNELS	
	2-6	7-13
L79/C79	54 nH	91pF
C69/L69	5-25pF VAR	83nH

JUMPER TO PINS	dB
2,3	.6-1.5
3,5	1.5-2
3,4	2-3

COMPONENT NUMBER EXAMPLE

Component Number: A23 A2 R1234 — Assembly Number; Subassembly Number (if used); Schematic Circuit Number

Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List

Static Sensitive Devices
See Maintenance Section

SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES OF PARTS OUTLINED OR DEPICTED IN GREY.

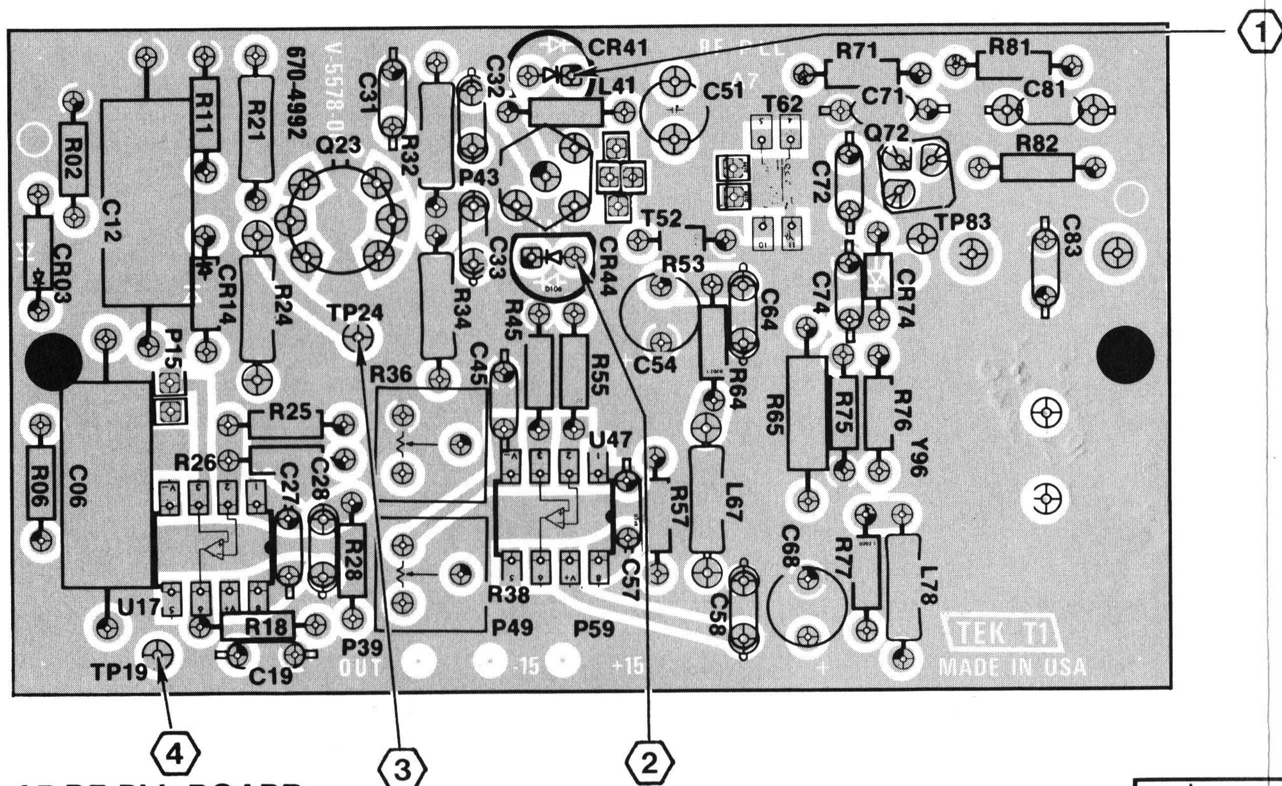
TDC

2597-46

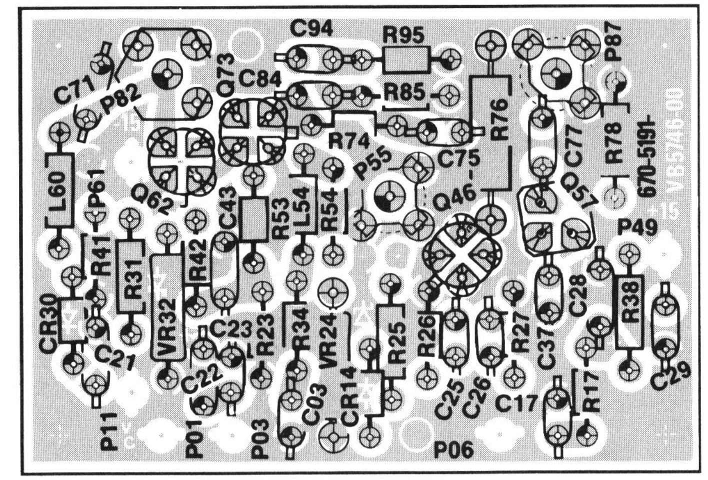
VHF RF SIGNAL PROCESSOR

TDC

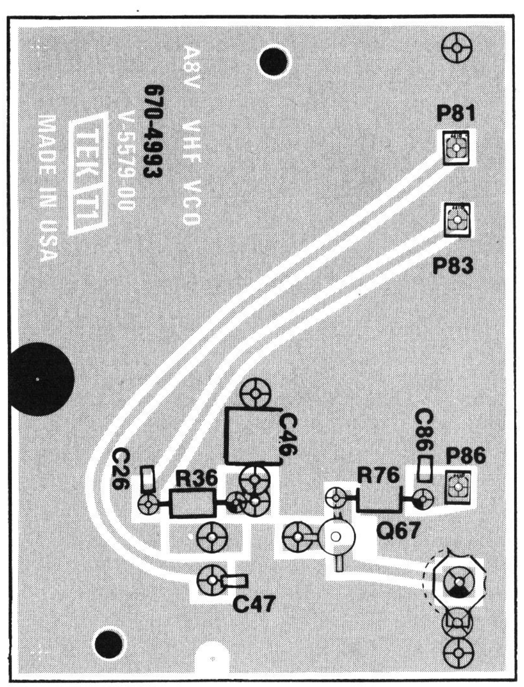
A	B	C	D	E	F	G	H	I	J	K



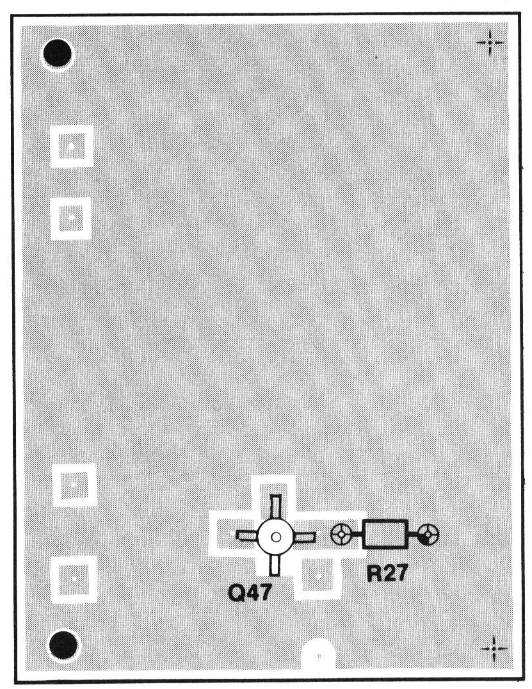
A7 RF PLL BOARD



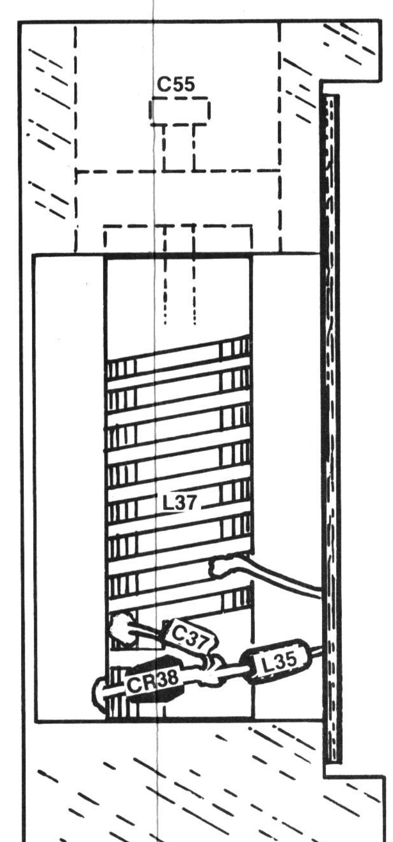
A9V VHF VCO AMP BOARD



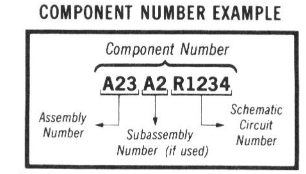
A8V VHF VCO BOARD (TOP)



A8V (BOTTOM)



A8V (CAVITY)



Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

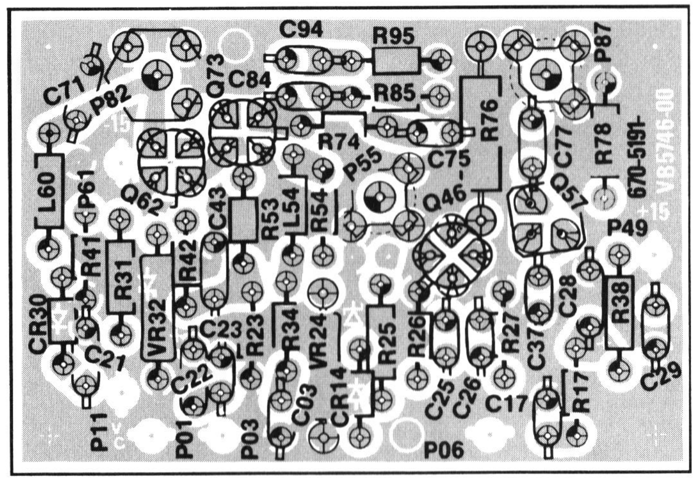
2597-41

VHF Local O

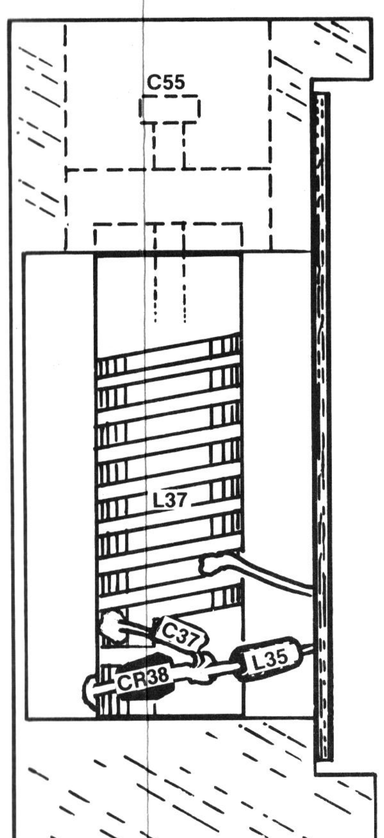
Circuit Number	Schematic Location	Board Location
ASSY A7		
C06	D3	A3
C12	D3	A2
C19	D3	B4
C27	C3	B3
C28	C3	B3
C31	C2	C1
C32	C2	C1
C33	C2	C2
C45	D3	C3
C51	C2	D1
C54	D1	D2
C57	C3	D3
C58	D1	E4
C64	D1	E2
C68	D1	E4
C71	C1	E1
C72	C2	E2
C74	C2	E2
C81	C1	F1
C83	C1	F2
CR03	D3	A2
CR14	D3	B2
CR41	C2	D1
CR44	C2	D2
CR74	C2	E2
L41	C2	D1
L67	D1	D3
L78	D1	E4
P15	D3	B3
P43	C4	C2
Q23A	C3	B2
Q23B	C3	B2
Q72	C1	E1
R02	D3	A1
R06	D3	A3
R11	D3	B1
R18	C3	B4
R21	C3	B1
R24	C3	B2
R25	C3	B3
R26	C3	B3
R28	C3	C4
R32	C2	C1
R34	C2	C2
R36	C3	C3
R38	C3	C4
R45	C3	C2
R53	C2	D2
R55	C3	D3
R57	C3	D3
R64	D1	E3
R65	C1	E3
R71	C1	E1
R75	C1	E3
R76	C1	E3
R77	D1	E4
R81	C1	F1
R82	C1	F1

Circuit Number	Sc… Lo…
T52	
T62	
TP19	
TP24	
TP83	
U17	
U47	
Y96	
ASSY A8	
C26	
C37	
C46	
C47	
C55	
C86	
CR38	
L35	
L37	
Q47	
Q67	
R27	
R36	
R76	
ASSY A9	
C03	
C17	
C21	
C22	
C23	
C25	
C26	
C28	
C29	
C37	
C43	
C71	
C75	
C77	
C84	
C94	
CR14	
CR30	
L54	
L60	
P55	
P82	
P87	

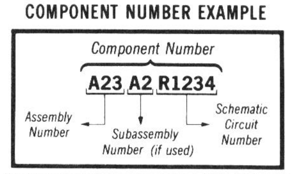
G | H | I | J | K



A9V VHF VCO AMP BOARD



A8V (CAVITY)



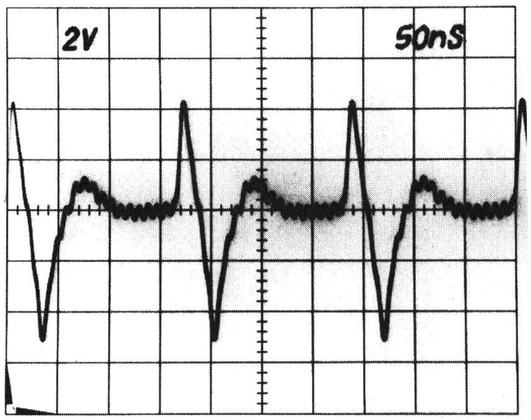
Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

2597-41

VHF Local Oscillator ⟨2⟩ v

Circuit Number	Schematic Location	Board Location
ASSY A7		
C06	D3	A3
C12	D3	A2
C19	D3	B4
C27	C3	B3
C28	C3	B3
C31	C2	C1
C32	C2	C1
C33	C2	C2
C45	D3	C3
C51	C2	D1
C54	D1	D2
C57	C3	D3
C58	D1	E4
C64	D1	E2
C68	D1	E4
C71	C1	E1
C72	C2	E2
C74	C2	E2
C81	C1	F1
C83	C1	F2
CR03	D3	A2
CR14	D3	B2
CR41	C2	D1
CR44	C2	D2
CR74	C2	E2
L41	C2	D1
L67	D1	D3
L78	D1	E4
P15	D3	B3
P43	C4	C2
Q23A	C3	B2
Q23B	C3	B2
Q72	C1	E1
R02	D3	A1
R06	D3	A3
R11	D3	B1
R18	C3	B4
R21	C3	B1
R24	C3	B2
R25	C3	B3
R26	C3	B3
R28	C3	C4
R32	C2	C1
R34	C2	C2
R36	C3	C3
R38	C3	C4
R45	C3	C2
R53	C2	D2
R55	C3	D3
R57	C3	D3
R64	D1	E3
R65	C1	E3
R71	C1	E1
R75	C1	E3
R76	C1	E3
R77	D1	E4
R81	C1	F1
R82	C1	F1
T52	C2	D2
T62	C2	E1
TP19	C3	A4
TP24	C2	C2
TP83	C2	F2
U17	C3	B4
U47	C3	D3
Y96	C1	F3
ASSY A8		
C26	B3	A8
C37	A3	G8
C46	B3	B8
C47	A3	B8
C55	A3	G5
C86	A3	C8
CR38	B3	G8
L35	A3	G7
L37	A3	H8
Q47	A3	E8
Q67	A3	B8
R27	A3	E8
R36	B3	B8
R76	A3	C8
ASSY A9		
C03	C4	I3
C17	A4	K3
C21	A4	H3
C22	B4	I3
C23	B4	I3
C25	A5	J3
C26	A5	J3
C28	A5	K2
C29	A5	K3
C37	A5	J2
C43	C4	I2
C71	C4	H1
C75	A5	J1
C77	A5	J1
C84	B4	I1
C94	B4	I1
CR14	A4	J3
CR30	B4	H2
L54	C4	I2
L60	C4	H2
P55	A4	J2
P82	C4	H1
P87	A5	K1
Q46	A5	J2
Q57	A5	K2
Q62	C4	I2
Q73	C4	I1
R17	A4	K3
R23	C4	I3
R25	A5	J3
R26	A5	J3
R27	A5	J3
R31	B5	H2
R34	C4	I2
R38	A5	K2
R41	C4	H2
R42	C4	I2
R53	C4	I2
R54	B4	I2
R74	B4	I1
R76	A5	J1
R78	B5	K2
R85	B4	J1
R95	B4	J1
VR24	A4	I3
VR32	B4	H3
P/O ASSY A11		
C15	D4	B8
C16	D1	B8
C26	D1	B8
C69	D4	F9
C76	A5	F8
C79	B5	F9

2 V

0 

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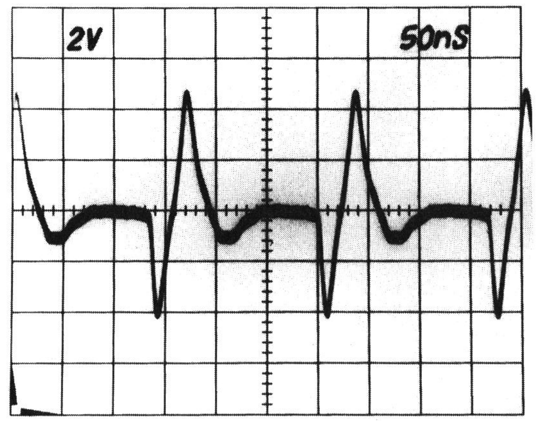
0 

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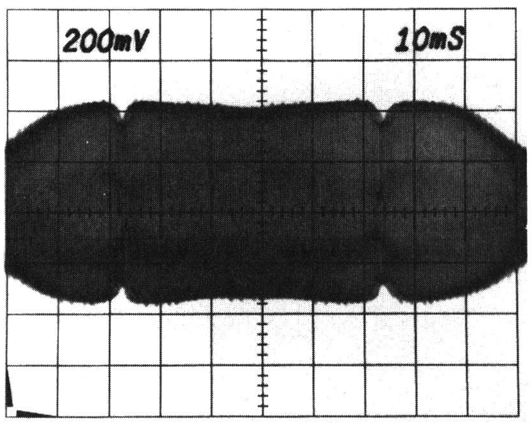
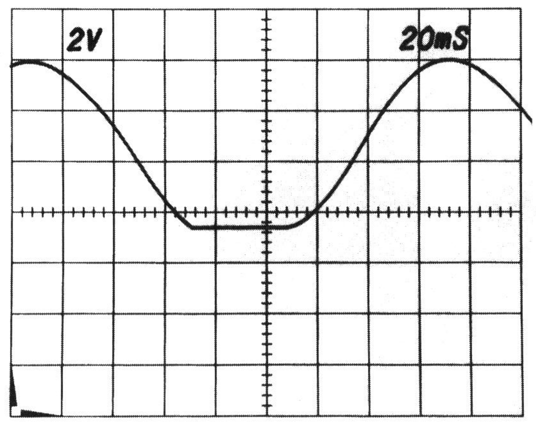
0 

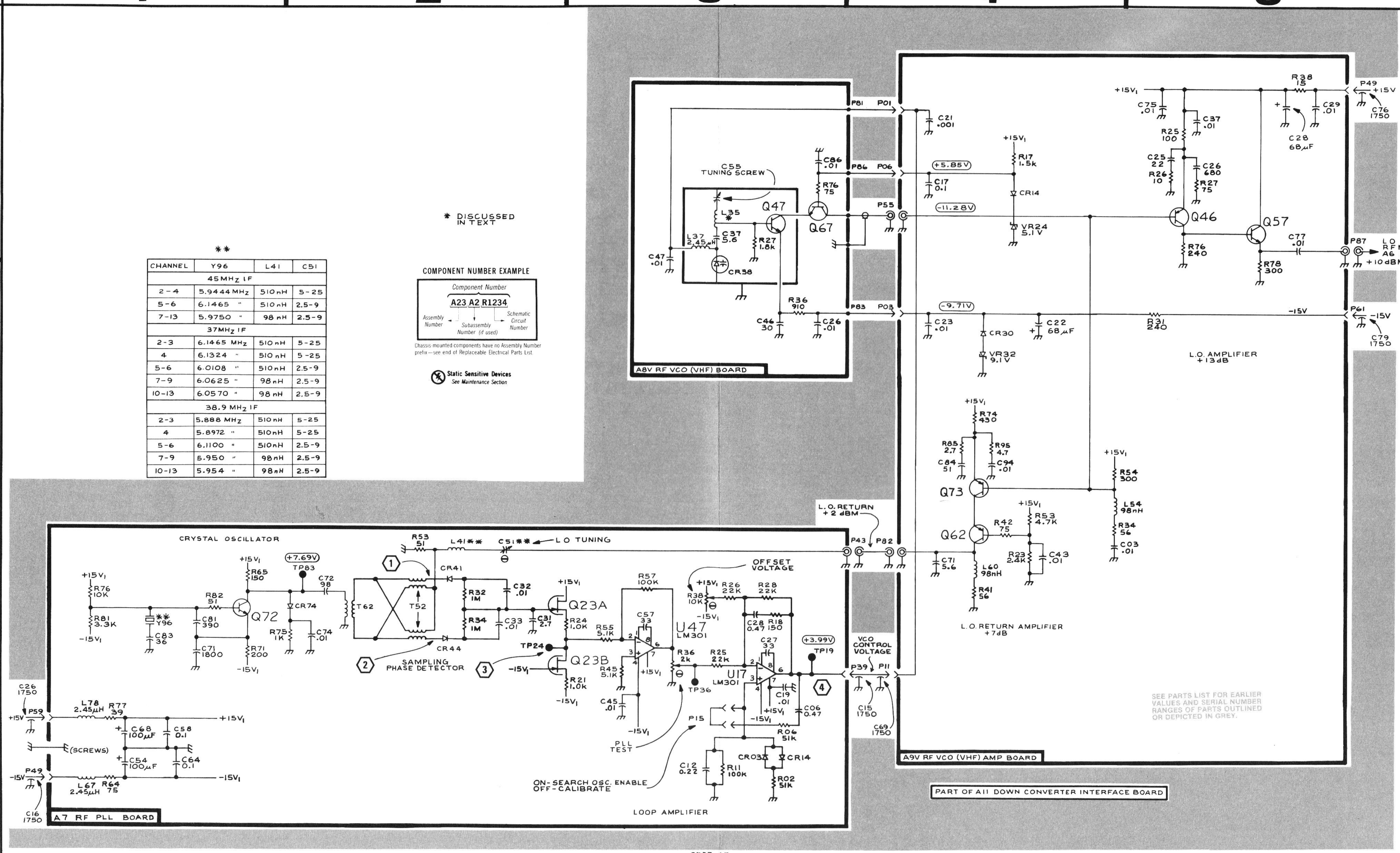
3

R36, PLL Test on A7 RF PLL Board, fully clockwise for this waveform.

0 

4

R36, PLL Test on A7 RF PLL Board, fully clockwise for this waveform.



* DISCUSSED IN TEXT

**

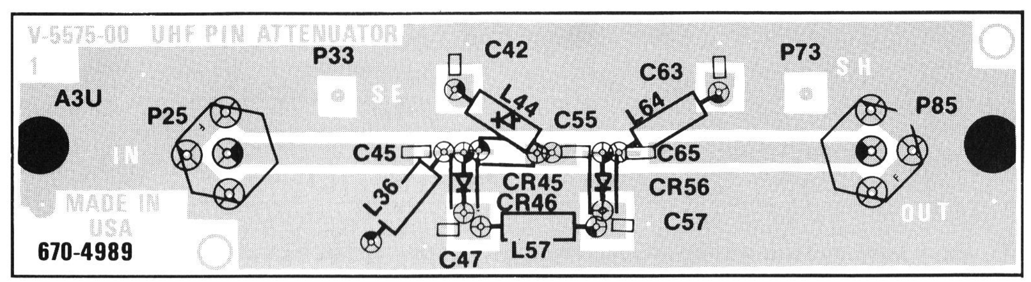
CHANNEL	Y96	L41	C51
45MHz IF			
2-4	5.9444 MHz	510 nH	5-25
5-6	6.1465 "	510 nH	2.5-9
7-13	5.9750 "	98 nH	2.5-9
37MHz IF			
2-3	6.1465 MHz	510 nH	5-25
4	6.1324 "	510 nH	5-25
5-6	6.0108 "	510 nH	2.5-9
7-9	6.0625 "	98 nH	2.5-9
10-13	6.0570 "	98 nH	2.5-9
38.9 MHz IF			
2-3	5.888 MHz	510 nH	5-25
4	5.8972 "	510 nH	5-25
5-6	6.1100 "	510 nH	2.5-9
7-9	5.950 "	98 nH	2.5-9
10-13	5.954 "	98 nH	2.5-9

COMPONENT NUMBER EXAMPLE

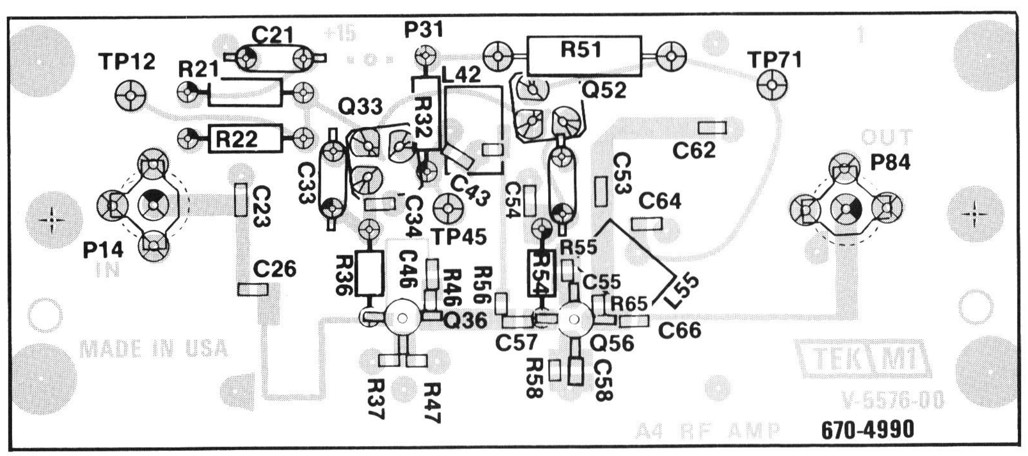
Component Number: A23 A2 R1234 — Assembly Number / Subassembly Number (if used) / Schematic Circuit Number

Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

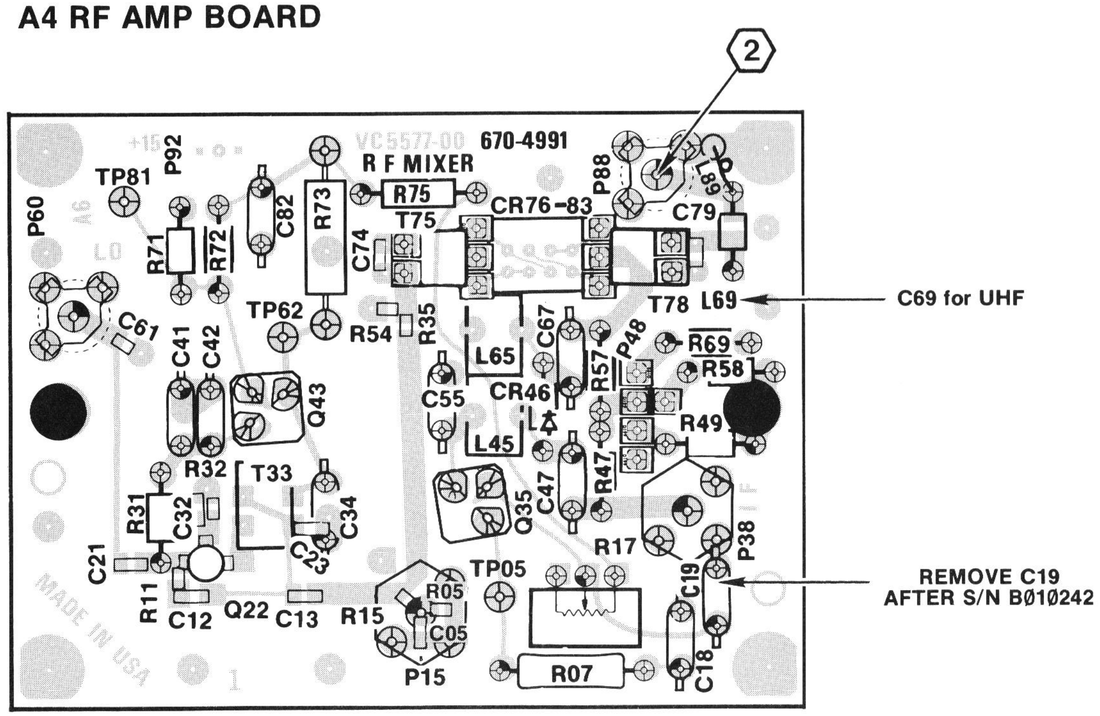
Static Sensitive Devices — See Maintenance Section



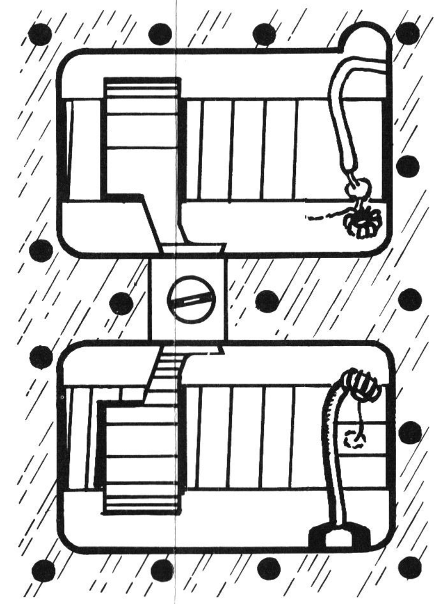
A3U UHF PIN ATTENUATOR BOARD



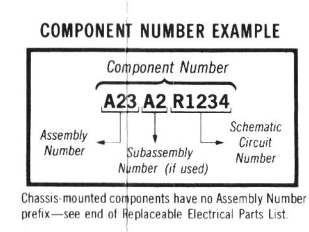
A4 RF AMP BOARD



A6 RF MIXER BOARD



A2 1st RF BANDPASS FILTER
A5 2nd RF BANDPASS FILTER

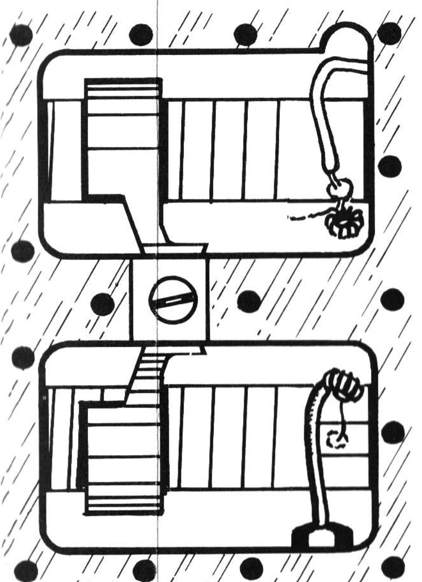


UHF RF Signal Processor ⟨1⟩ U

Circuit Number	Schematic Location	Board Location
ASSY A2		
C55	B2	Chassis
C82	B2	Chassis
C87	B2	Chassis
L52	B2	Chassis
L57	B2	Chassis
ASSY A3		
C42	B3	C1
C45	B3	C1
C47	B3	C2
C55	B3	D1
C57	B3	D2
C63	A3	D1
C65	B3	D1
CR45	B3	C2
CR46	B3	C2
CR56	B3	D2
L36	B3	C2
L44	A3	C1
L57	B3	C2
L64	A3	D1
P25	B2	B1
P85	B3	E1
ASSY A4		
C21	A4	B3
C23	B4	B4
C26	B4	B4
C33	A4	B4
C34	B4	C4
C42	A4	C3
C43	A4	C4
C46	B4	C4
C53	A4	D4
C54	A4	C4
C55	B4	D4
C57	A4	C4
C58	B4	D5
C62	B5	D3
C64	A4	D4
C66	A5	D4
L42	A4	C3
L55	A4	D4
P14	B3	A4
P84	A5	E4
Q33	A4	C3
Q36	B4	C4
Q52	A4	D3
Q56	A4	D4
R21	A4	B3
R22	A4	B3
R32	A4	C3
R36	B4	C4
R37	B4	C5
R46	B4	C4
R47	B4	C5
R51	A4	D3
R54	A4	D4
R55	B4	D4
R56	A4	C4
R58	B4	D5
R65	A5	D4
TP12	A4	A3
TP45	A4	C4
TP71	A5	E3
ASSY A5		
C55	A5	Chassis
C82	A5	Chassis
C87	A5	Chassis
L52	A5	Chassis
L57	A5	Chassis
ASSY A6		
C05	D5	C8
C12	C4	B8
C13	C4	B8
C18	C5	D8
C19	C5	D8
C21	C3	A8
C23	C4	B8
C32	C4	B8
C34	C4	B8
C41	C4	B7
C42	C4	B7
C47	C5	D8
C55	C5	C7
C61	C3	A7
C67	C5	D7
C69	C5	D7
C74	C4	C6
C79	C5	E6
C82	B3	B6
CR46	C5	D7
CR76	C4	C6
CR77	C4	C6
CR78	C4	C6
CR79	C4	C6
CR80	C4	C6
CR81	C4	C6
CR82	C4	C6
CR83	C4	C6
L45	C5	
L65	C5	
L69	C5	
L89	C5	
P15	D5	
P38	C5	
P48	C5	
P60	C3	
P88	B5	
Q22	C4	
Q35	C5	
Q43	C4	
R05	D5	
R07	C5	
R11	C4	
R15	D5	
R17	C5	
R31	C3	
R32	C4	
R35	C4	
R47	C5	
R49	C5	
R54	C4	
R57	C5	
R58	D5	
R69	D5	
R71	C3	
R72	C3	
R73	C4	
R75	C5	
T33	C4	
T75	C4	
T78	C5	
TP05	C5	
TP62	C4	
TP81	C3	
P/O ASSY A11		
C53	A3	
C55	A2	
C65	A2	
C98	C5	

2597-42

G



2 1st RF BANDPASS FILTER
5 2nd RF BANDPASS FILTER

COMPONENT NUMBER EXAMPLE

Component Number: A23 A2 R1234 — Assembly Number / Subassembly Number (if used) / Schematic Circuit Number

Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List

UHF RF Signal Processor ⟨1⟩

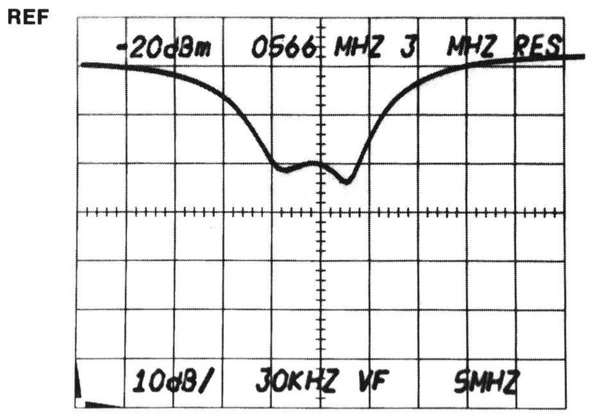
Circuit Number	Schematic Location	Board Location
ASSY A2		
C55	B2	Chassis
C82	B2	Chassis
C87	B2	Chassis
L52	B2	Chassis
L57	B2	Chassis
ASSY A3		
C42	B3	C1
C45	B3	C1
C47	B3	C2
C55	B3	D1
C57	B3	D2
C63	A3	D1
C65	B3	D1
CR45	B3	C2
CR46	B3	C2
CR56	B3	D2
L36	B3	C2
L44	A3	C1
L57	B3	C2
L64	A3	D1
P25	B2	B1
P85	B3	E1
ASSY A4		
C21	A4	B3
C23	B4	B4
C26	B4	B4
C33	A4	B4
C34	B4	C4
C42	A4	C3
C43	A4	C4
C46	B4	C4
C53	A4	D4
C54	A4	C4
C55	B4	D4
C57	A4	C4
C58	B4	D5
C62	B5	D3
C64	A4	D4
C66	A5	D4
L42	A4	C3
L55	A4	D4
P14	B3	A4
P84	A5	E4
Q33	A4	C3
Q36	B4	C4
Q52	A4	D3
Q56	A4	D4

Circuit Number	Schematic Location	Board Location
R21	A4	B3
R22	A4	B3
R32	A4	C3
R36	B4	C4
R37	B4	C5
R46	B4	C4
R47	B4	C5
R51	A4	D3
R54	A4	D4
R55	B4	D4
R56	A4	C4
R58	B4	D5
R65	A5	D4
TP12	A4	A3
TP45	A4	C4
TP71	A5	E3
ASSY A5		
C55	A5	Chassis
C82	A5	Chassis
C87	A5	Chassis
L52	A5	Chassis
L57	A5	Chassis
ASSY A6		
C05	D5	C8
C12	C4	B8
C13	C4	B8
C18	C5	D8
C19	C5	D8
C21	C3	A8
C23	C4	B8
C32	C4	B8
C34	C4	B8
C41	C4	B7
C42	C4	B7
C47	C5	D8
C55	C5	C7
C61	C3	A7
C67	C5	D7
C69	C5	D7
C74	C4	C6
C79	C5	E6
C82	B3	B6
CR46	C5	D7
CR76	C4	C6
CR77	C4	C6
CR78	C4	C6
CR79	C4	C6
CR80	C4	C6
CR81	C4	C6
CR82	C4	C6
CR83	C4	C6

Circuit Number	Schematic Location	Board Location
L45	C5	C7
L65	C5	C7
L69	C5	D7
L89	C5	E6
P15	D5	C8
P38	C5	D8
P48	C5	D7
P60	C3	A7
P88	B5	D6
Q22	C4	B8
Q35	C5	C8
Q43	C4	B7
R05	D5	C8
R07	C5	D9
R11	C4	B8
R15	D5	C8
R17	C5	D8
R31	C3	B8
R32	C4	B8
R35	C4	C7
R47	C5	D8
R49	C5	D7
R54	C4	C7
R57	C5	D7
R58	D5	D7
R69	D5	D7
R71	C3	B6
R72	C3	B6
R73	C4	B6
R75	C5	C6
T33	C4	B8
T75	C4	C6
T78	C5	D6
TP05	C5	C8
TP62	C4	B7
TP81	C3	A6
P/O ASSY A11		
C53	A3	E6
C55	A2	E7
C65	A2	F7
C98	C5	H9

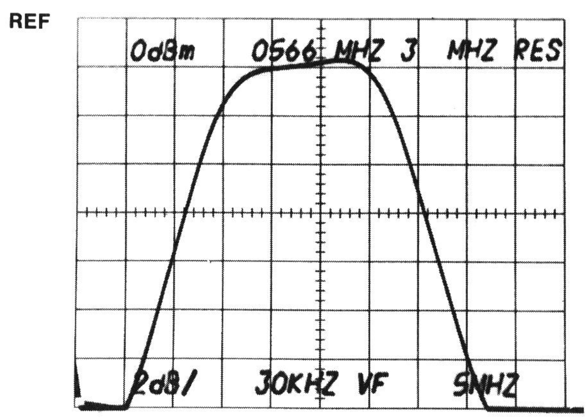
2597-42

<1>u



<1>

Return Loss as measured with a 7L13 and a VSWR Bridge. The VSWR Bridge driven with 0 dBm from a TR 502.

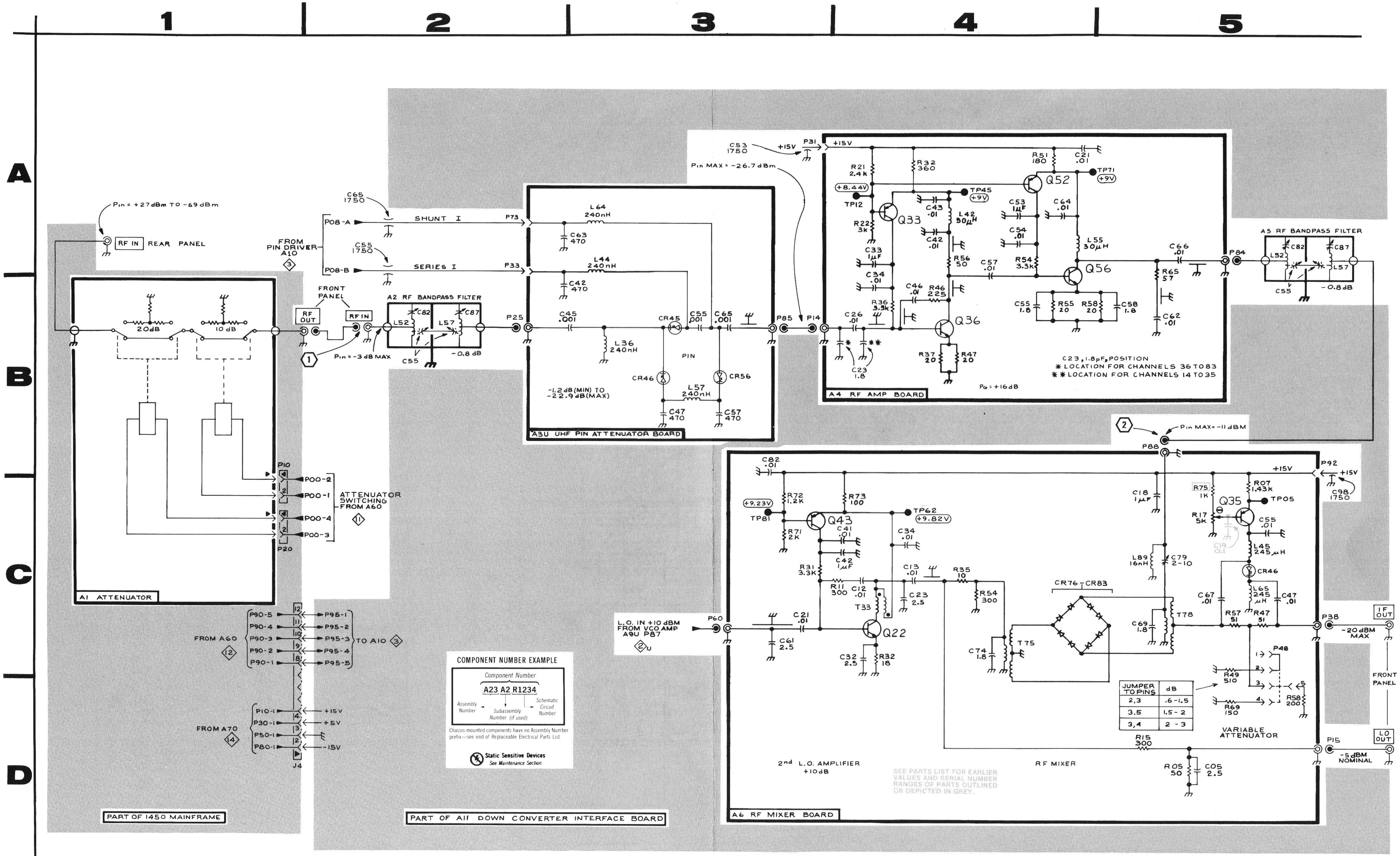


<2>

Bandpass response as measured with a 7L13. The TDC driven with 0 dBm from a TR 502.

UHF RF SIGNAL PROC.

<1>u



TDC

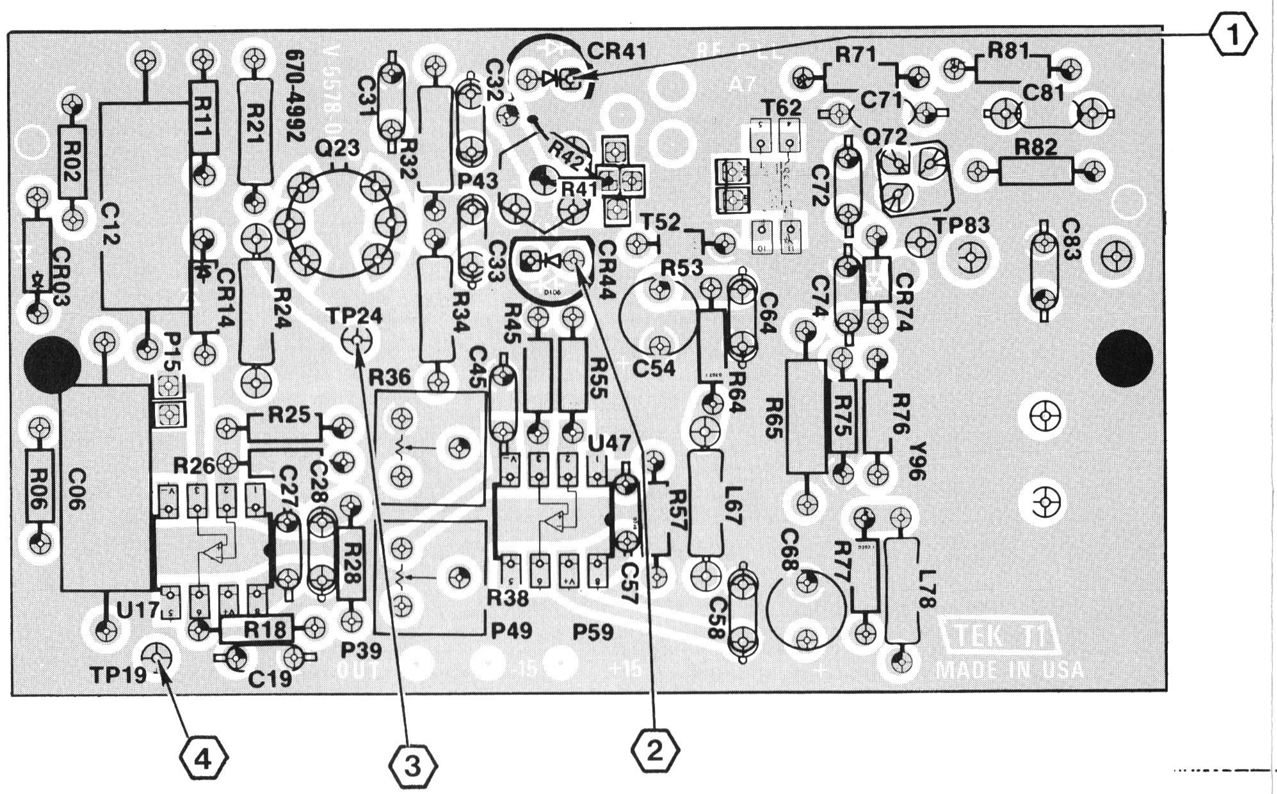
2597-48

UHF RF SIGNAL PROCESSOR

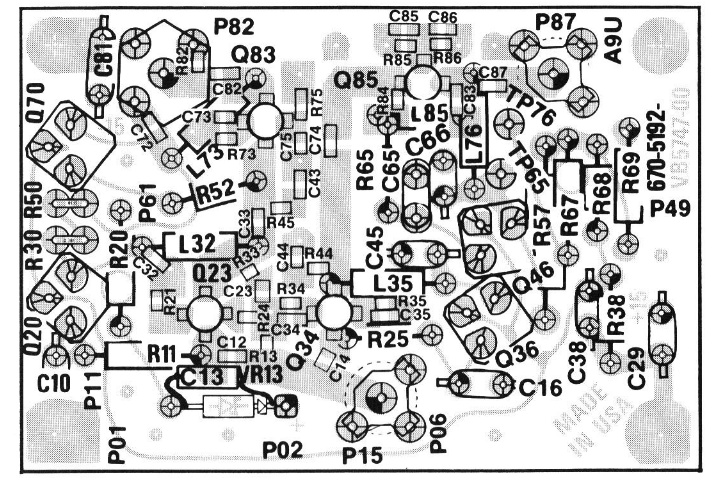
UHF RF SIGNAL PROC.

TDC

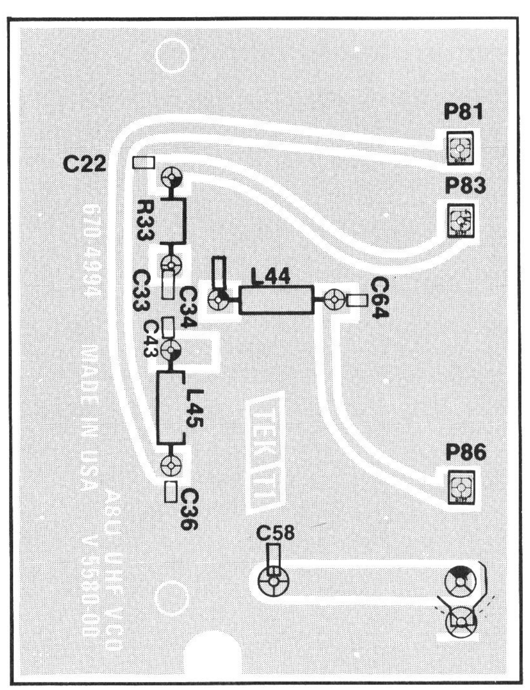
	A	B	C	D	E	F	G	H	I	J	K
1											
2											
3											
4											
5											
6											
7											
8											
9											



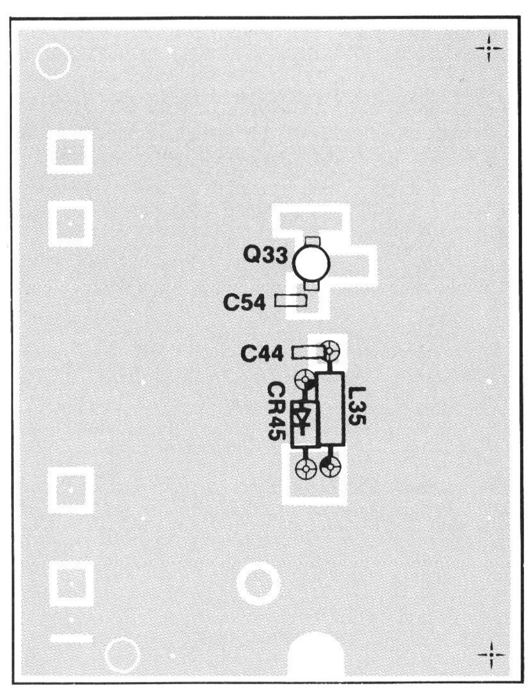
A7 RF PLL BOARD



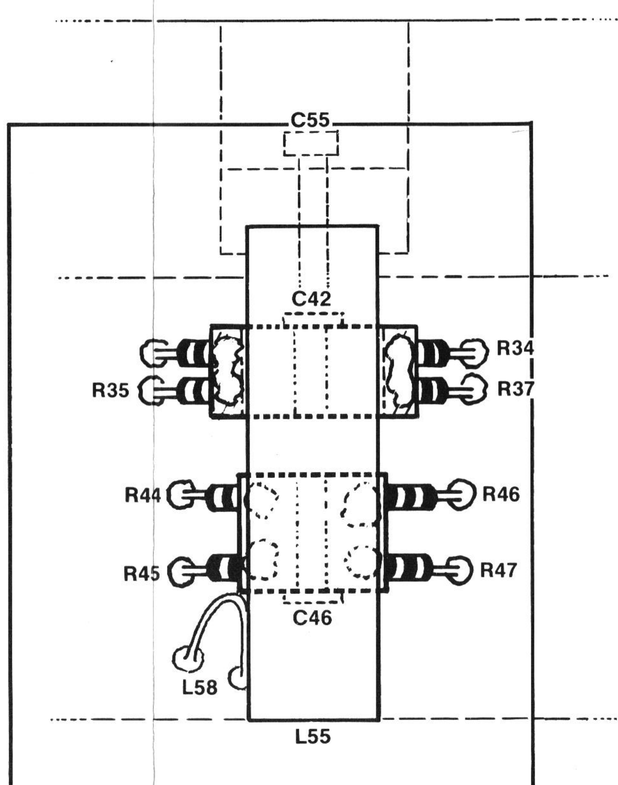
A9U UHF VCO AMP BOARD



A8U UHF VCO BOARD (TOP)

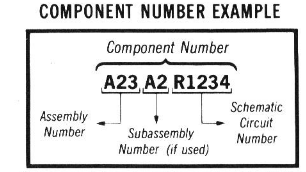


A8U (BOTTOM)



A8U (BOTTOM WITH COIL, CAPS, AND RESISTORS)

COMPONENT NUMBER EXAMPLE



Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List

2597-43

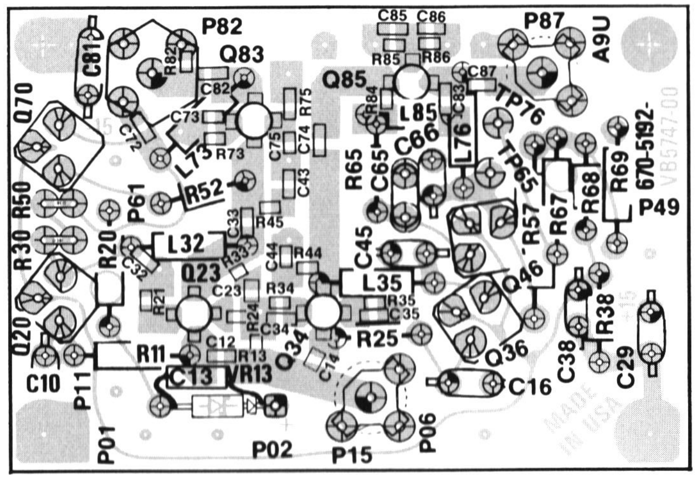
UHF Lo

Circuit Number	Schematic Location	Board Location
ASSY A7		
C06	C3	A3
C12	D3	A2
C19	C6	B4
C27	C3	B3
C28	C3	B3
C31	C2	C1
C32	C2	C1
C33	C2	C2
C45	C3	C3
C54	D1	D2
C57	C3	D3
C58	C1	E4
C64	D1	E2
C68	D1	E4
C71	C1	E1
C72	C2	E2
C74	C1	E2
C81	C1	F1
C83	C1	F2
CR03	D3	A2
CR14	D3	B2
CR41	C2	D1
CR44	C2	D2
CR71	C1	E2
L67	D1	D3
L78	C1	E4
P15	C3	C2
P43	D2	C2
Q23A	C2	B2
Q23B	C2	B2
Q72	C1	E1
R02	D3	A1
R06	C3	A3
R11	D3	B1
R18	C2	B4
R21	C2	B1
R24	C2	B2
R25	C3	B3
R26	C3	B3
R28	C3	B4
R32	C2	C1
R34	C2	C2
R36	C3	C3
R38	C3	C4
R41	D2	D2
R42	D2	D2
R45	C3	C2
R55	C2	D3
R57	C3	D3
R64	D1	D2
R65	C1	E3
R71	C1	E1
R75	C1	E3
R76	C1	E3
R77	C1	E4
R81	C1	F1
R82	C1	F1
T52	C2	D2
T62	C2	E1
TP19	C3	A4
TP24	C2	C2
TP83	C1	F2
U17	C3	B4
U47	C3	D3
Y96	C1	F3

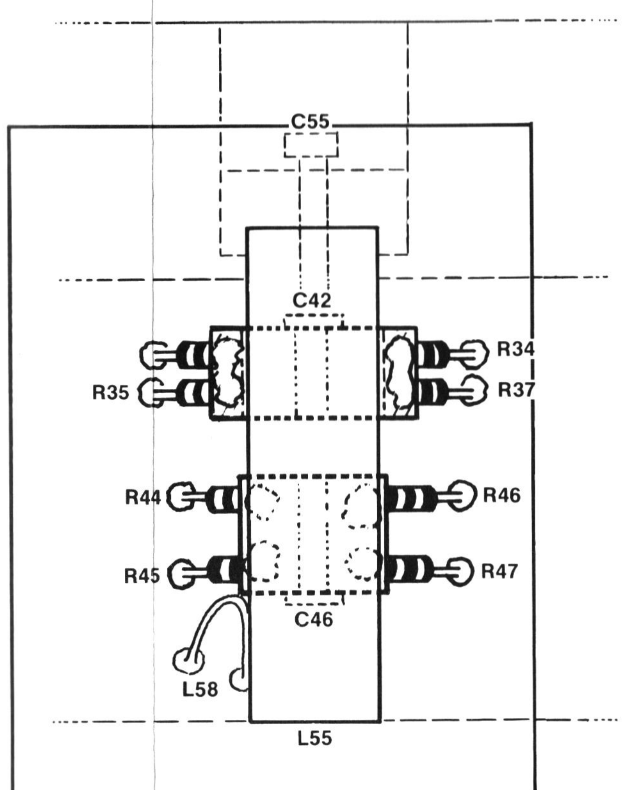
Circuit Number
ASSY A8
C22
C33
C34
C36
C42
C43
C44
C46
C54
C55
C58
C64
CR45
L35
L44
L45
L55
L58
Q33
R33
R34
R35
R36
R37
R44
R45
R46
R47
ASSY A9
C10
C12
C13
C14
C16
C23
C29
C32
C33
C34
C35
C38
C43
C44
C45
C65
C66
C72
C73
C74
C75
C81
C82
C83
C85
C86
C87
L32
L35
L73
L76
L85
P15
P82
P87

G	H	I	J	K

(1)

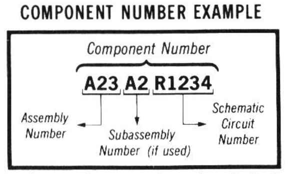


A9U UHF VCO AMP BOARD



A8U (BOTTOM WITH COIL, CAPS, AND RESISTORS)

COMPONENT NUMBER EXAMPLE



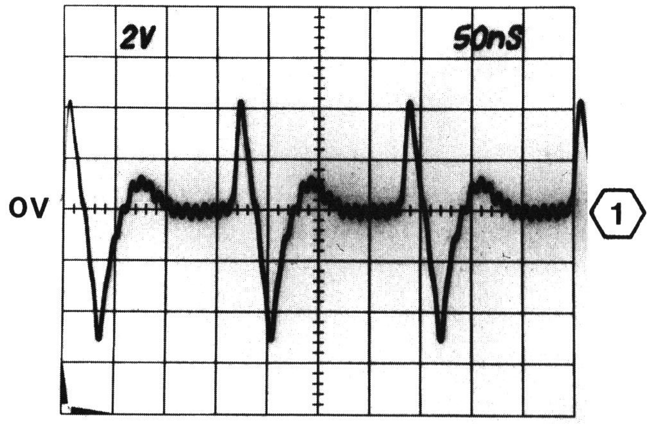
Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List

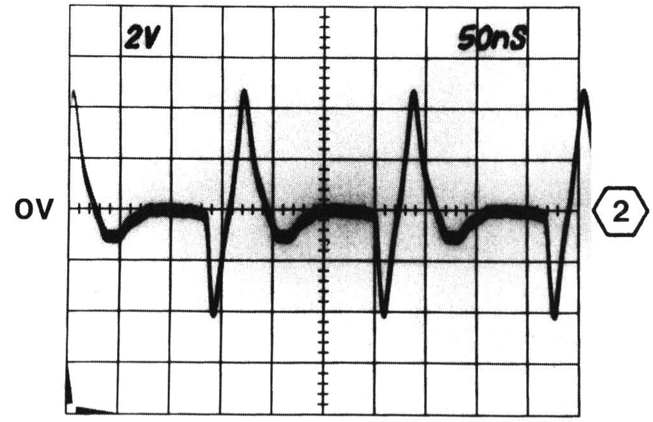
2597-43

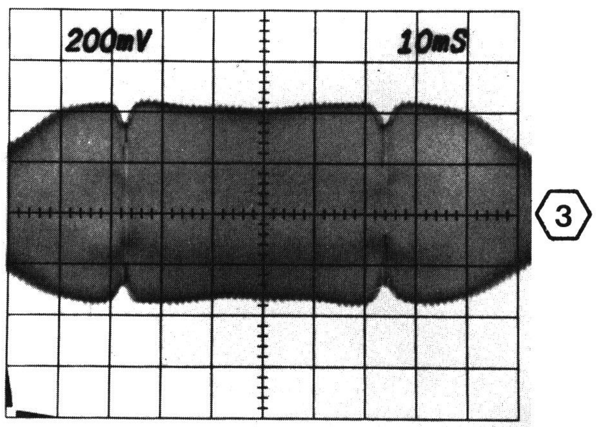
UHF Local Oscillator ⟨2⟩ U

Circuit Number	Schematic Location	Board Location
ASSY A7		
C06	C3	A3
C12	D3	A2
C19	C6	B4
C27	C3	B3
C28	C3	B3
C31	C2	C1
C32	C2	C1
C33	C2	C2
C45	C3	C3
C54	D1	D2
C57	C3	D3
C58	C1	E4
C64	D1	E2
C68	D1	E4
C71	C1	E1
C72	C2	E2
C74	C1	E2
C81	C1	F1
C83	C1	F2
CR03	D3	A2
CR14	D3	B2
CR41	C2	D1
CR44	C2	D2
CR71	C1	E2
L67	D1	D3
L78	C1	E4
P15	C3	C2
P43	D2	C2
Q23A	C2	B2
Q23B	C2	B2
Q72	C1	E1
R02	D3	A1
R06	C3	A3
R11	D3	B1
R18	C2	B4
R21	C2	B1
R24	C2	B2
R25	C3	B3
R26	C3	B3
R28	C3	B4
R32	C2	C1
R34	C2	C2
R36	C3	C3
R38	C3	C4
R41	D2	D2
R42	D2	D2
R45	C3	C2
R55	C2	D3
R57	C3	D3
R64	D1	D2
R65	C1	E3
R71	C1	E1
R75	C1	E3
R76	C1	E3
R77	C1	E4
R81	C1	F1
R82	C1	F1
T52	C2	D2
T62	C2	E1
TP19	C3	A4
TP24	C2	C2
TP83	C1	F2
U17	C3	B4
U47	C3	D3
Y96	C1	F3
ASSY A8		
C22	B3	A6
C33	B3	B7
C34	B3	B7
C36	B2	B8
C42	A3	H6
C43	B2	B7
C44	B2	E7
C46	A2	H8
C54	B3	E7
C55	B2	H5
C58	B3	B8
C64	B3	C7
CR45	B2	E7
L35	B2	E7
L44	B3	B7
L45	B2	B7
L55	B2	H8
L58	B3	G8
Q33	B3	E6
R33	B3	B6
R34	B2	I6
R35	B3	G7
R36	B3	G6
R37	B3	I7
R44	B2	G7
R45	B2	G8
R46	B2	I7
R47	B2	I8
ASSY A9		
C10	C4	H3
C12	C4	I3
C13	B5	I3
C14	B4	I3
C16	A4	J3
C23	C4	I2
C29	B5	K3
C32	C4	H2
C33	C4	I2
C34	B4	I2
C35	B4	J2
C38	A4	K2
C43	C4	I2
C44	B4	I2
C45	A5	J2
C65	A5	J2
C66	A5	J2
C72	C5	H1
C73	C5	I1
C74	B4	I1
C75	C5	I1
C81	C5	H1
C82	C5	I1
C83	A5	J1
C85	B5	J1
C86	B5	J1
C87	A5	J1
L32	C4	I2
L35	A4	J2
L73	C5	I1
L76	A5	J1
L85	A5	J1
P15	B4	J3
P82	C5	I1
P87	A5	K1
Q20	C4	H2
Q23	C4	I2
Q34	B4	I2
Q36	A4	J2
Q46	A5	J2
Q70	C5	H1
Q83	C5	I1
Q85	B5	J1
R11	C4	H1
R13	C4	I3
R20	B5	H2
R21	C4	H2
R24	C4	I2
R25	B4	J2
R30	C4	H2
R33	C4	I2
R34	B4	I2
R35	B4	J2
R38	A4	K2
R44	B4	I2
R45	C4	I2
R50	C5	H2
R52	C5	I2
R57	A5	J2
R65	A5	J2
R67	A4	K2
R68	A4	K2
R69	B5	K2
R73	C5	I1
R75	C5	I1
R82	C5	I1
R84	A5	J1
R85	B5	J1
R86	B5	J1
TP65	A5	J2
TP76	A4	J1
VR13	B5	I3
P/O ASSY A11		
C15	C3	B8
C16	D1	B8
C26	C1	B8
C69	C3	F9
C76	B5	F8
C79	B5	F9

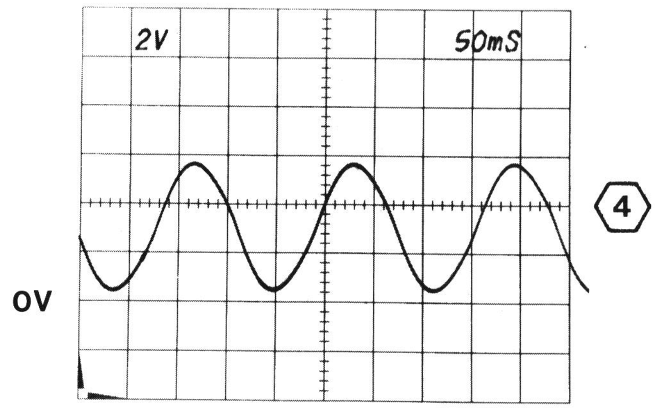
2 u



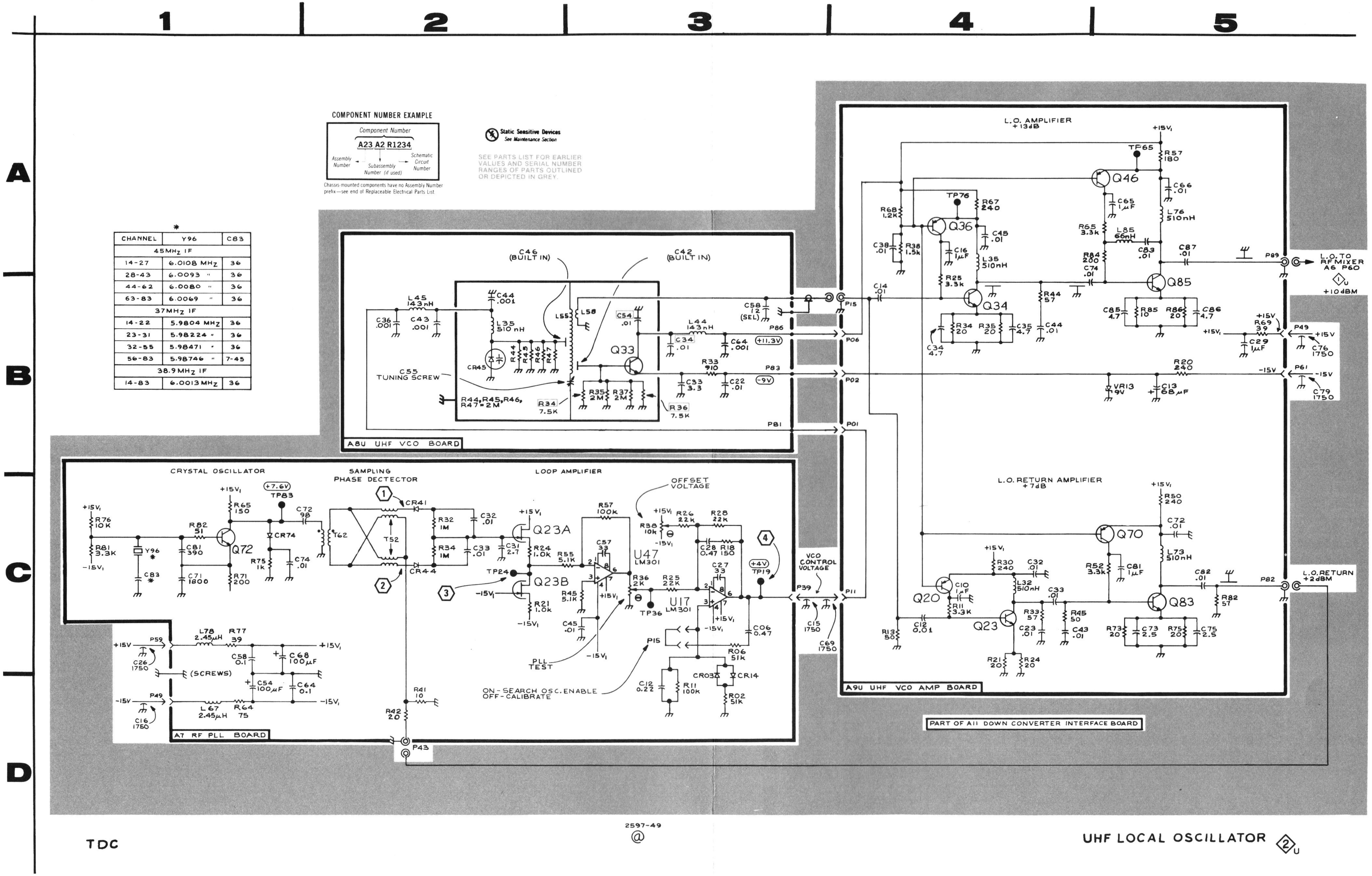




R36, PLL Test on A7 RF PLL Board, fully clockwise for this waveform.



R36, PLL Test on A7 RF PLL Board, fully clockwise for this waveform.

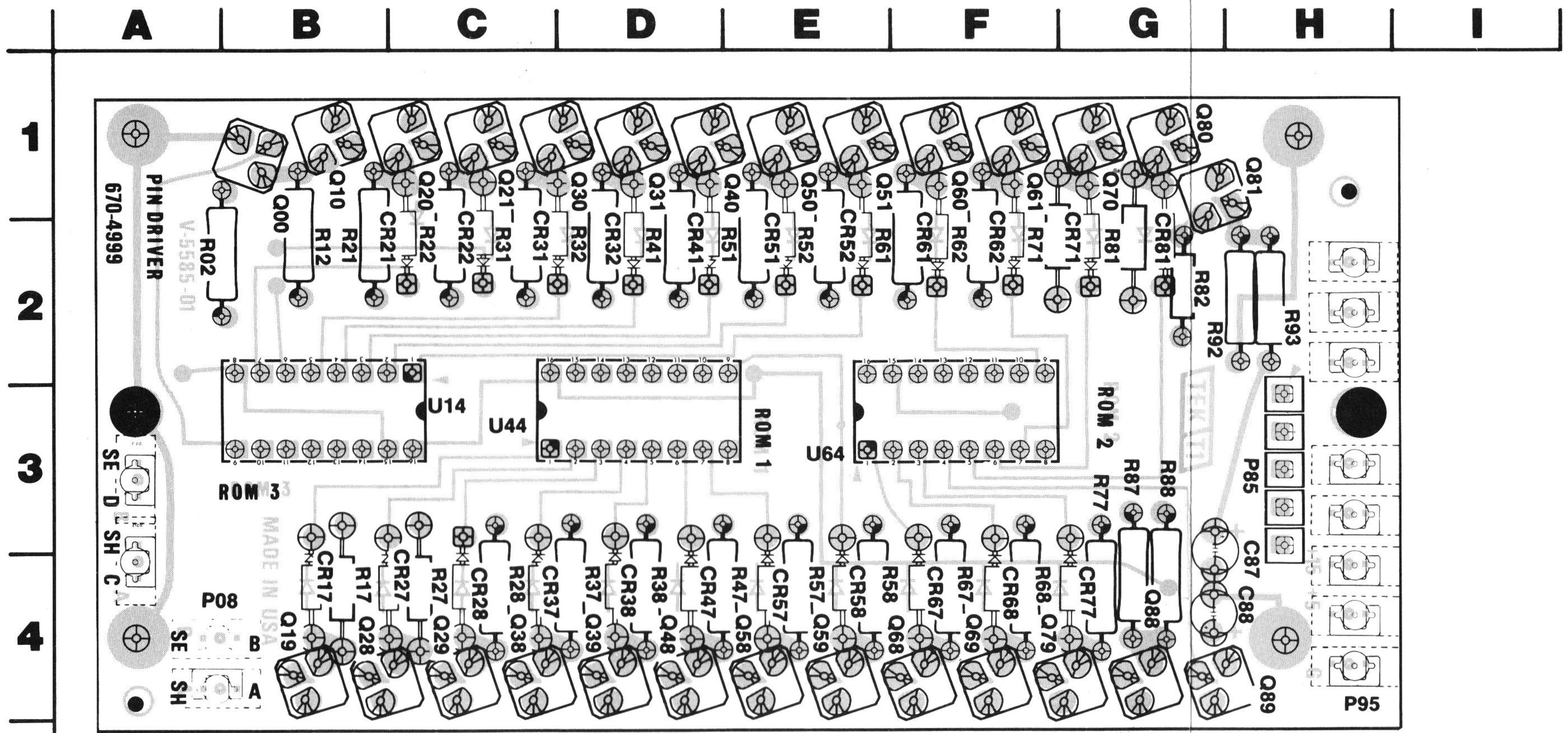


CHANNEL	Y96 *	C83
45MHz IF		
14-27	6.0108 MHz	36
28-43	6.0093 "	36
44-62	6.0080 "	36
63-83	6.0069 "	36
37MHz IF		
14-22	5.9804 MHz	36
23-31	5.98224 "	36
32-55	5.98471 "	36
56-83	5.98746 "	7-45
38.9MHz IF		
14-83	6.0013 MHz	36

TDC

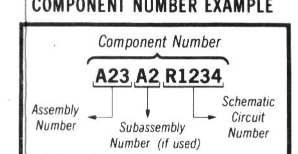
2597-49

UHF LOCAL OSCILLATOR ②U



A10 PIN DRIVER BOARD

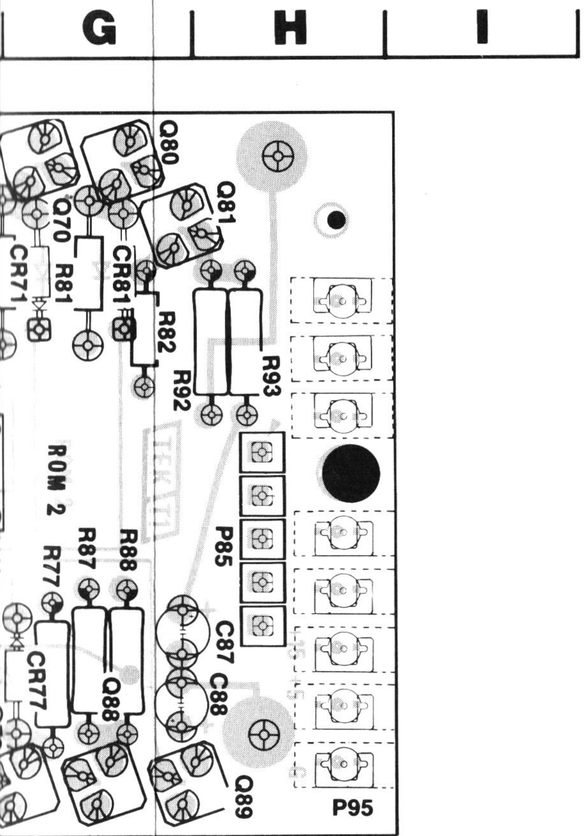
COMPONENT NUMBER EXAMPLE



Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

Pin Driver ⟨3⟩

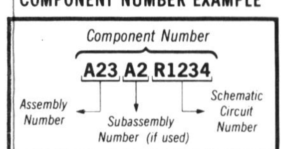
Circuit Number	Schematic Location	Board Location	Circuit Number	Schematic Location	Board Location
ASSY A10			Q59	A4	E4
			Q60	D4	F1
C87	A1	H4	Q61	D5	F1
C88	A1	H4	Q68	A4	F4
			Q69	A4	F4
CR17	A2	B4	Q70	D5	G1
CR21	D2	B2	Q79	A5	F4
CR22	D2	C2	Q80	D5	G1
CR27	A2	C4	Q88	A5	G4
CR28	A2	C4	Q89	A5	H1
CR31	D3	C2			
CR32	D3	D2	R02	D2	A2
CR37	A3	C4	R12	D2	B2
CR38	A3	D4	R17	A2	B4
CR41	D3	D2	R21	D2	B2
CR47	A3	D4	R22	D2	C2
CR51	D4	E2	R27	A2	C4
CR52	D4	E2	R28	A2	C4
CR57	A4	E4	R31	D3	C2
CR58	A4	E4	R32	D3	D2
CR61	D4	F2	R37	A3	D4
CR62	D5	F2	R38	A3	D4
CR67	A4	F4	R41	D3	D2
CR68	A4	F4	R47	A3	E4
CR71	D5	G2	R51	D4	E2
CR77	A5	G4	R52	D4	E2
CR81	D5	G2	R57	A3	E4
			R58	A4	E4
Q00	D2	B1	R61	D4	F2
Q10	D2	B1	R62	D5	F2
Q19	A2	B4	R67	A4	F4
Q20	D2	C1	R68	A4	F4
Q21	D2	C1	R71	D5	F2
Q28	A2	B4	R77	A5	G4
Q29	A2	B4	R81	D5	G2
Q30	D3	D1	R82	A1	G2
Q31	D3	D1	R87	A5	G4
Q38	A3	C4	R88	A5	G4
Q39	A3	D4	R92	A1	H2
Q40	D3	E1	R93	A1	H2
Q48	A3	D4			
Q50	D4	E1	U14	C1	B3
Q51	D4	E1	U44	B1	D3
Q58	A3	E4	U64	B1	F3



Pin Driver 3

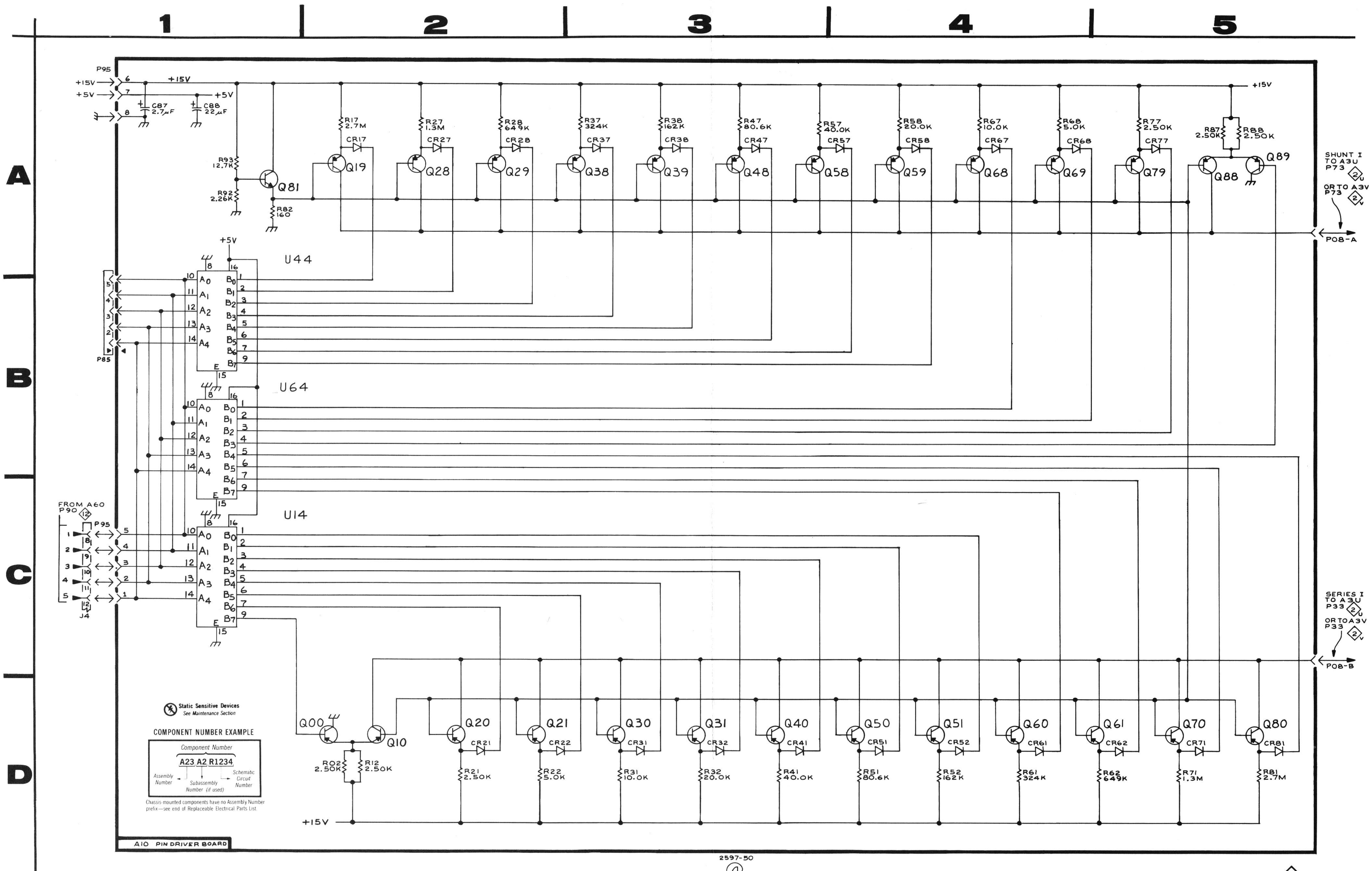
Circuit Number	Schematic Location	Board Location	Circuit Number	Schematic Location	Board Location
ASSY A10					
C87	A1	H4	Q59	A4	E4
C88	A1	H4	Q60	D4	F1
CR17	A2	B4	Q61	D5	F1
CR21	D2	B2	Q68	A4	F4
CR22	D2	C2	Q69	A4	F4
CR27	A2	C4	Q70	D5	G1
CR28	A2	C4	Q79	A5	F4
CR31	D3	C2	Q80	D5	G1
CR32	D3	D2	Q88	A5	G4
CR37	A3	C4	Q89	A5	H1
CR38	A3	D4	R02	D2	A2
CR41	D3	D2	R12	D2	B2
CR47	A3	D4	R17	A2	B4
CR51	D4	E2	R21	D2	B2
CR52	D4	E2	R22	D2	C2
CR57	A4	E4	R27	A2	C4
CR58	A4	E4	R28	A2	C4
CR61	D4	F2	R31	D3	C2
CR62	D5	F2	R32	D3	D2
CR67	A4	F4	R37	A3	D4
CR68	A4	F4	R38	A3	D4
CR71	D5	G2	R41	D3	D2
CR77	A5	G4	R47	A3	E4
CR81	D5	G2	R51	D4	E2
Q00	D2	B1	R52	D4	E2
Q10	D2	B1	R57	A3	E4
Q19	A2	B4	R58	A4	E4
Q20	D2	C1	R61	D4	F2
Q21	D2	C1	R62	D5	F2
Q28	A2	B4	R67	A4	F4
Q29	A2	B4	R68	A4	F4
Q30	D3	D1	R71	D5	F2
Q31	D3	D1	R77	A5	G4
Q38	A3	C4	R81	D5	G2
Q39	A3	D4	R82	A1	G2
Q40	D3	E1	R87	A5	G4
Q48	A3	D4	R88	A5	G4
Q50	D4	E1	R92	A1	H2
Q51	D4	E1	R93	A1	H2
Q58	A3	E4	U14	C1	B3
			U44	B1	D3
			U64	B1	F3

COMPONENT NUMBER EXAMPLE



Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

2597-44


U44
U64
U14
Q81
Q00
Q10
P95
P85
J4
FROM A60 P90
SHUNT I TO A3U P73
OR TO A3V P73
SERIES I TO A3U P33
OR TO A3V P33
P08-A
P08-B
+15V
+5V
Static Sensitive Devices
See Maintenance Section
COMPONENT NUMBER EXAMPLE
A23 A2 R1234
A10 PIN DRIVER BOARD

REPLACEABLE MECHANICAL PARTS

PARTS ORDERING INFORMATION

Replacement parts are available from or through your local Tektronix, Inc. Field Office or representative.

Changes to Tektronix instruments are sometimes made to accommodate improved components as they become available, and to give you the benefit of the latest circuit improvements developed in our engineering department. It is therefore important, when ordering parts, to include the following information in your order: Part number, instrument type or number, serial number, and modification number if applicable.

If a part you have ordered has been replaced with a new or improved part, your local Tektronix, Inc. Field Office or representative will contact you concerning any change in part number.

Change information, if any, is located at the rear of this manual.

SPECIAL NOTES AND SYMBOLS

X000 Part first added at this serial number

00X Part removed after this serial number

FIGURE AND INDEX NUMBERS

Items in this section are referenced by figure and index numbers to the illustrations.

INDENTATION SYSTEM

This mechanical parts list is indented to indicate item relationships. Following is an example of the indentation system used in the description column.

1 2 3 4 5 Name & Description

Assembly and/or Component
Attaching parts for Assembly and/or Component
--- * ---
Detail Part of Assembly and/or Component
Attaching parts for Detail Part
--- * ---
Parts of Detail Part
Attaching parts for Parts of Detail Part
--- * ---

Attaching Parts always appear in the same indentation as the item it mounts, while the detail parts are indented to the right. Indented items are part of, and included with, the next higher indentation. The separation symbol --- * --- indicates the end of attaching parts.

Attaching parts must be purchased separately, unless otherwise specified.

ITEM NAME

In the Parts List, an Item Name is separated from the description by a colon (:). Because of space limitations, an Item Name may sometimes appear as incomplete. For further Item Name identification, the U.S. Federal Cataloging Handbook H6-1 can be utilized where possible.

ABBREVIATIONS

"	INCH
#	NUMBER SIZE
ACTR	ACTUATOR
ADPTR	ADAPTER
ALIGN	ALIGNMENT
AL	ALUMINUM
ASSEM	ASSEMBLED
ASSY	ASSEMBLY
ATTEN	ATTENUATOR
AWG	AMERICAN WIRE GAGE
BD	BOARD
BRKT	BRACKET
BRS	BRASS
BRZ	BRONZE
BSHG	BUSHING
CAB	CABINET
CAP	CAPACITOR
CER	CERAMIC
CHAS	CHASSIS
CKT	CIRCUIT
COMP	COMPOSITION
CONN	CONNECTOR
COV	COVER
CPLG	COUPLING
CRT	CATHODE RAY TUBE
DEG	DEGREE
DWR	DRAWER
ELCTRN	ELECTRON
ELEC	ELECTRICAL
ELCTLT	ELECTROLYTIC
ELEM	ELEMENT
EPL	ELECTRICAL PARTS LIST
EQPT	EQUIPMENT
EXT	EXTERNAL
FIL	FILLISTER HEAD
FLEX	FLEXIBLE
FLH	FLAT HEAD
FLTR	FILTER
FR	FRAME or FRONT
FSTNR	FASTENER
FT	FOOT
FXD	FIXED
GSKT	GASKET
HDL	HANDLE
HEX	HEXAGON
HEX HD	HEXAGONAL HEAD
HEX SOC	HEXAGONAL SOCKET
HLCPS	HELICAL COMPRESSION
HLEXT	HELICAL EXTENSION
HV	HIGH VOLTAGE
IC	INTEGRATED CIRCUIT
ID	INSIDE DIAMETER
IDENT	IDENTIFICATION
IMPLR	IMPELLER
IN	INCH
INCAND	INCANDESCENT
INSUL	INSULATOR
INTL	INTERNAL
LPHLDR	LAMPHOLDER
MACH	MACHINE
MECH	MECHANICAL
MTG	MOUNTING
NIP	NIPPLE
NON WIRE	NOT WIRE WOUND
OBD	ORDER BY DESCRIPTION
OD	OUTSIDE DIAMETER
OVH	OVAL HEAD
PH BRZ	PHOSPHOR BRONZE
PL	PLAIN or PLATE
PLSTC	PLASTIC
PN	PART NUMBER
PNH	PAN HEAD
PWR	POWER
RCPT	RECEPTACLE
RES	RESISTOR
RGD	RIGID
RLF	RELIEF
RTNR	RETAINER
SCH	SOCKET HEAD
SCOPE	OSCILLOSCOPE
SCR	SCREW
SE	SINGLE END
SECT	SECTION
SEMICOND	SEMICONDUCTOR
SHLD	SHIELD
SHLDR	SHOULDERED
SKT	SOCKET
SL	SLIDE
SLFLKG	SELF-LOCKING
SLVG	SLEEVING
SPR	SPRING
SQ	SQUARE
SST	STAINLESS STEEL
STL	STEEL
SW	SWITCH
T	TUBE
TERM	TERMINAL
THD	THREAD
THK	THICK
TNSN	TENSION
TPG	TAPPING
TRH	TRUSS HEAD
V	VOLTAGE
VAR	VARIABLE
W/	WITH
WSHR	WASHER
XFMR	TRANSFORMER
XSTR	TRANSISTOR

CROSS INDEX—MFR. CODE NUMBER TO MANUFACTURER

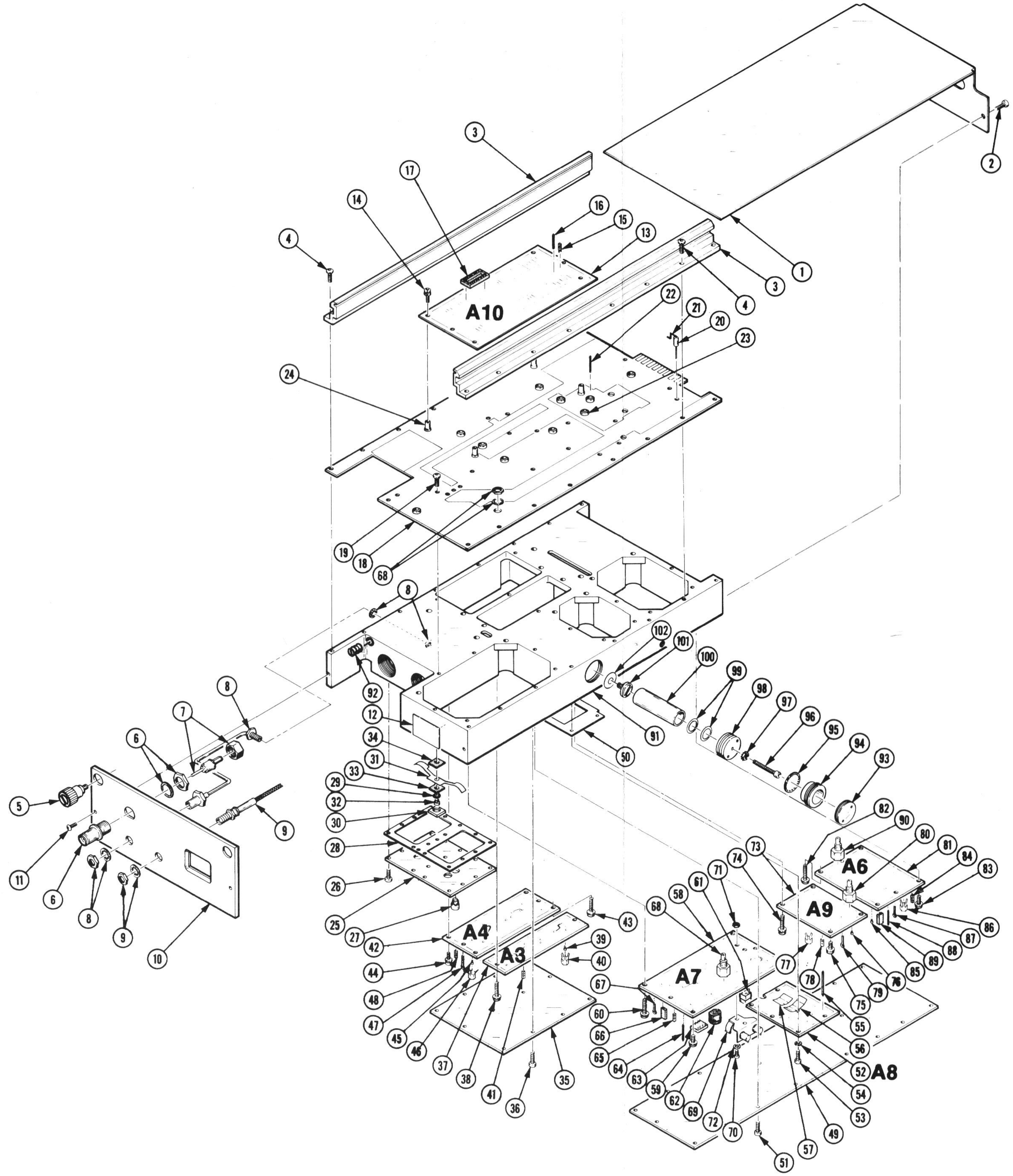
Mfr. Code	Manufacturer	Address	City, State, Zip
000AH	STANDARD PRESSED STEEL CO., UNBRAKO DIV.	8535 DICE ROAD	SANTA FE SPRINGS, CA 90670
000BK	STAUFFER SUPPLY	105 SE TAYLOR	PORTLAND, OR 97214
000CY	NORTHWEST FASTENER SALES, INC.	7923 SW CIRRUS DRIVE	BEAVERTON, OREGON 97005
00779	AMP, INC.	P O BOX 3608	HARRISBURG, PA 17105
22526	BERG ELECTRONICS, INC.	YOUK EXPRESSWAY	NEW CUMBERLAND, PA 17070
22670	G.M. NAMEPLATE, INC.	2040 15TH AVENUE WEST	SEATTLE, WA 98119
23050	PRODUCT COMPONENTS CORP	30 LORRAINE AVE.	MT VERNON, NY 10553
24931	SPECIALTY CONNECTOR CO., INC.	3560 MADISON AVE.	INDIANAPOLIS, IN 46227
71785	TRW, CINCH CONNECTORS	1501 MORSE AVENUE	ELK GROVE VILLAGE, IL 60007
73743	FISCHER SPECIAL MFG. CO.	446 MORGAN ST.	CINCINNATI, OH 45206
73803	TEXAS INSTRUMENTS, INC., METALLURGICAL MATERIALS DIV.	34 FOREST STREET	ATTLEBORO, MA 02703
78189	ILLINOIS TOOL WORKS, INC. SHAKEPROOF DIVISION	ST. CHARLES ROAD	ELGIN, IL 60120
78471	TILLEY MFG. CO.	900 INDUSTRIAL RD.	SAN CARLOS, CA 94070
80009	TEKTRONIX, INC.	P O BOX 500	BEAVERTON, OR 97077
82647	TEXAS INSTRUMENTS, INC., CONTROL PRODUCTS DIV.	34 FOREST ST.	ATTLEBORO, MA 02703
83385	CENTRAL SCREW CO.	2530 CRESCENT DR.	BROADVIEW, IL 60153
91293	JOHANSON MFG. COMPANY	P O BOX 329	BOONTON, NJ 07005
91506	AUGAT, INC.	33 PERRY AVE.	ATTLEBORO, MA 02703
91836	KINGS ELECTRONICS CO., INC.	40 MARBLEDALE ROAD	TUCKAHOE, NY 10707
93907	CAMCAR SCREW AND MFG. CO.	600 18TH AVE.	ROCKFORD, IL 61101
94222	SOUTHCO, INC.		LESTER, PA 19113
98291	SEALECTRO CORP.	225 HOYT	MAMARONECK, NY 10544

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5 Name & Description	Mfr Code	Mfr Part Number
1-1	200-2120-00			1	COVER,PLUG-IN:ALUMINUM	80009	200-2120-00
					(ATTACHING PARTS)		
-2	213-0774-00			2	SCREW,TPG,TF:M3-0.5 X 10 MM L,PNH,TAPTITE	93907	OBD
					- - - * - - -		
-3	351-0533-00			2	GUIDE,PLUG-IN:	80009	351-0533-00
					(ATTACHING PARTS FOR EACH)		
-4	213-0774-00			8	SCREW,TPG,TF:M3-0.5 X 10 MM L,PNH,TAPTITE	93907	OBD
					- - - * - - -		
-5	214-2667-00	XB010120		2	THUMBSCREW ASSY:10-32 THREAD	94222	47-10-504-10
-6	131-0818-00			1	CONNECTOR,RCPT,:BNC,FEMALE	91836	KC19-153BNC
-7	131-2136-00			1	. CONN,RCPT,ELEC:3MM SRM,FEMALE	80009	131-2136-00
-8	175-2080-00			1	CABLE ASSY,RF:50 OHM COAX,6.375 L	80009	175-2080-00
-9	198-3699-00			1	WIRE SET,ELEC:	80009	198-3699-00
-10	333-2346-00			1	PANEL,FRONT:	80009	333-2346-00
					(ATTACHING PARTS)		
-11	211-0177-00	B000100	B000119	2	SCREW,MACHINE:4-40 X 0.312"PNH,STL,BK OXD	83385	OBD
	211-0098-00	B010120		2	SCR,CAP,SOC HD:4-40 X 0.375 INCH,STL	000AH	OBD
					- - - * - - -		
-12	334-3229-00			1	MKR SET,IDENT:MKD CHANNEL 2THRU 13	80009	334-3229-00
	334-3230-00			1	MKR SET,IDENT:MKD CHANNEL 14 THRU 38	22670	OBD
	334-3231-00			1	MKR SET,IDENT:MKD CHANNEL 39 THRU 62	22670	OBD
	334-3232-00			1	MKR SET,IDENT:MKD CHANNEL 63 THRU 83	22670	OBD
-13	----- -----			1	CKT BOARD ASSY:PIN DRIVER(SEE A10 EPL)	80009	
					(ATTACHING PARTS)		
-14	211-0116-00			4	SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH BRS	83385	OBD
					- - - * - - -		
	----- -----			-	CKT BOARD ASSY INCLUDES:		
-15	136-0263-04			10	. SOCKET,PIN TERM:FOR 0.025 INCH SQUARE PIN	22526	48059
-16	131-0589-00			5	. TERM,PIN:0.46 L X 0.025 SQ.PH BRZ GL	22526	47350
-17	136-0260-02			3	. SOCKET,PLUG-IN:16 CONTACT,LOW CLEARANCE	82647	C9316-18
-18	----- -----			1	CKT BOARD ASSY:DOWN CONV INTFC(SEE A11 EPL)		
					(ATTACHING PARTS)		
-19	213-0774-00			8	SCREW,TPG,TF:M3-0.5 X 10 MM L,PNH,TAPTITE	93907	OBD
	----- -----			-	CKT BOARD ASSY INCLUDES:		
-20	----- -----			10	. CAP.,FXD:(SEE C15,C16,C26,C53,C55,C65,C69,C76,		
	----- -----			-	. C79,C98 EPL)		
-21	131-0593-00			10	. . CONTACT,ELEC:1.15 INCH LONG	22526	47354
-22	131-0590-00			10	. CONTACT,ELEC:0.71 INCH LONG	22526	47351
-23	129-0461-00			10	. POST,PRESSMOUNT:0.163 L,W/4-40 THRU BRASS	80009	129-0461-00
-24	129-0160-00			4	. SPACER,POST:0.25 L X 0.2188 TO MT SEAT	80009	129-0160-00
-25	337-2415-00			1	SHIELD,ELEC:FILTER	80009	337-2415-00
	337-2415-01			1	SHIELD,ELEC:FILTER	80009	337-2415-01
					(ATTACHING PARTS)		
-26	213-0774-00			14	SCREW,TPG,TF:M3-0.5 X 10 MM L,PNH,TAPTITE	93907	OBD
					- - - * - - -		
-27	213-0787-00			4	SCREW,TUNING:0.234-64 X 0.36,DIELECTRIC(UHF)	91293	6935-0
	213-0787-00			8	SCREW,TUNING:0.234-64 X 0.36,DIELECTRIC(VHF)	91293	6935-0
-28	348-0539-00			2	GASKET:SHIELD & FILTER HOUSING	80009	348-0539-00
-29	210-1035-00	XB010120		4	WASHER,SPR TNSN:0.195 ID X 0.006 THK,STL NP		
-30	361-0841-00			2	SPACER,BLOCK:0.4 L X 0.365W X 0.078 THK	80009	361-0841-00
-31	214-2559-00			2	TUNING DVC,COIL:2.3 L X 0.399W,CU BE(UHF,C55)	80009	214-2559-00
	214-2560-00			2	TUNING DVC,COIL:2.5 L X 0.925W,CU BE	80009	214-2560-00
	214-2561-00			2	TUNING DVC,COIL:2.3 L X 0.58 W,CU BE	80009	214-2561-00
					(ATTACHING PARTS)		
-32	211-0213-00			2	SCREW,MACHINE:4-40 X 0.312 INCH,PNH NYLON	23050	OBD
-33	342-0373-00			2	INSULATOR,PLATE:TUNER,TOP,PLASTIC	80009	342-0373-00
-34	342-0374-00			2	INSULATOR,PLATE:TUNER,BOTTOM,PLASTIC	80009	342-0374-00
					- - - * - - -		
-35	337-2413-00			1	SHIELD,ELEC:CIRCUIT BOARD	80009	337-2413-00
					(ATTACHING PARTS)		
-36	213-0774-00			12	SCREW,TPG,TF:M3-0.5 X 10 MM L,PNH,TAPTITE	93907	OBD
					- - - * - - -		
-37	----- -----			1	CKT BOARD ASSY:PIN ATTENUATOR(SEE A3 EPL)		
					(ATTACHING PARTS)		
-38	211-0152-00			2	SCR,ASSEM WSHR:4-40 X 0.625 INCH,PNH BRS	83385	OBD
					- - - * - - -		

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5 Name & Description	Mfr Code	Mfr Part Number
	----- -----			-	CKT BOARD INCLUDES:		
1-39	136-0252-04			2	. SOCKET,PIN TERM:U/W 0.016-0.018 DIA PINS	22526	75060-007
-40	131-1003-00			2	. CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00
-41	136-0263-04			2	. SOCKET,PIN TERM:FOR 0.025 INCH SQUARE PIN	22526	48059
-42	----- -----			1	CKT BOARD ASSY:R.F. AMP(SEE A4 EPL)		
					(ATTACHING PARTS)		
-43	211-0116-00			2	SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH BRS	83385	OBD
-44	211-0152-00			2	SCR,ASSEM WSHR:4-40 X 0.625 INCH,PNH BRS	83385	OBD
					- - - * - - -		
	----- -----			-	CKT BOARD ASSY INCLUDES:		
-45	136-0252-04			2	. SOCKET,PIN TERM:U/W 0.016-0.018 DIA PINS	22526	75060-007
-46	131-1003-00			2	. CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00
-47	214-0579-00			3	. TERM,TEST POINT:BRS CD PL	80009	214-0579-00
-48	136-0263-04			1	. SOCKET,PIN TERM:FOR 0.025 INCH SQUARE PIN	22526	48059
-49	337-2412-00			1	SHIELD,ELEC:CIRCUIT BOARD	80009	337-2412-00
-50	348-0540-00			1	GASKET:CKT CARD & VCO HOUSING	80009	348-0540-00
					(ATTACHING PARTS)		
-51	213-0774-00			20	SCREW,TPG,TF:M3-0.5 X 10 MM L,PNH,TAPTITE	93907	OBD
					- - - * - - -		
-52	----- -----			1	CKT BOARD ASSY:VCO,VHF(SEE A8 EPL)		
	----- -----			1	CKT BOARD ASSY:VCO,UHF(SEE A8 EPL)		
					(ATTACHING PARTS)		
-53	211-0008-00			7	SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
-54	210-0054-00	XB010120		7	WASHER,LOCK:SPLIT,0.118 ID X 0.212"OD STL(UHF)	83385	OBD
	210-0054-00	XB010200		7	WASHER,LOCK:SPLIT,0.118 ID X 0.212"OD STL(VHF)	83385	OBD
					- - - * - - -		
	----- -----			-	CKT BOARD INCLUDES:		
-55	131-0592-00			3	. CONTACT,ELEC:0.885 INCH LONG	22526	47353
-56	386-3860-00			1	. PLATE,COUPLING:VOLTAGE CONTROL OSCILLATOR	80009	386-3860-00
-57	386-3861-00			1	. PLATE,COUPLING:VOLTAGE CONTROL OSCILLATOR	80009	386-3861-00
-58	----- -----			1	CKT BOARD ASSY:R.F. PLL(SEE A7 EPL) OSCILLATOR		
	----- -----			1	CKT BOARD ASSY:R.F. PLL(SEE A7 EPL)		
	----- -----			1	CKT BOARD ASSY:R.F. PLL(SEE A7 EPL)		
	----- -----			1	CKT BOARD ASSY:R.F. PLL(SEE A7 EPL)		
	----- -----			1	CKT BOARD ASSY:R.F. PLL(SEE A7 EPL)		
	----- -----			1	CKT BOARD ASSY:R.F. PLL(SEE A7 EPL)		
	----- -----			1	CKT BOARD ASSY:R.F. PLL(SEE A7 EPL)		
	----- -----			1	CKT BOARD ASSY:R.F. PLL(SEE A7 EPL)		
	----- -----			1	CKT BOARD ASSY:R.F. PLL(SEE A7 EPL)		
	----- -----			1	CKT BOARD ASSY:R.F. PLL(SEE A7 EPL)		
	----- -----			1	CKT BOARD ASSY:R.F. PLL(SEE A7 EPL)		
	----- -----			1	CKT BOARD ASSY:R.F. PLL(SEE A7 EPL)		
	----- -----			1	CKT BOARD ASSY:R.F. PLL(SEE A7 EPL)		
	----- -----			1	CKT BOARD ASSY:R.F. PLL(SEE A7 EPL)		
	----- -----			1	CKT BOARD ASSY:R.F. PLL(SEE A7 EPL)		
	----- -----			1	CKT BOARD ASSY:R.F. PLL(SEE A7 EPL)		
	----- -----			1	CKT BOARD ASSY:R.F. PLL(SEE A7 EPL)		
					(ATTACHING PARTS)		
-59	211-0152-00			2	SCR,ASSEM WSHR:4-40 X 0.625 INCH,PNH BRS	83385	OBD
-60	211-0116-00			2	SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH BRS	83385	OBD
					- - - * - - -		
	----- -----			-	. CKT BOARD ASSY INCLUDES:		
-61	136-0220-00	B000100	B000119X	1	. SKT,PL-IN ELEK:TRANSISTOR 3 CONTACT,PCB MT	71785	133-23-11-034
-62	136-0235-00	B000100	B010466X	1	. SOCKET,PLUG-IN:6 CONTACT,ROUND	71785	133-96-12-062
-63	136-0514-00	B000100	B010466X	2	. SKT,PL-IN ELEC:MICROCIRCUIT,8 DIP	73803	CS9002-8
-64	131-0589-00			2	. TERM,PIN:0.46 L X 0.025 SQ.PH BRZ GL	22526	47350
-65	136-0263-04			3	. SOCKET,PIN TERM:FOR 0.025 INCH SQUARE PIN	22526	48059
-66	131-0993-00			1	. BUS,CONDUCTOR:2 WIRE BLACK	00779	530153-2
-67	214-0579-00	B000100	B010379	3	. TERM,TEST POINT:BRS CD PL	80009	214-0579-00
	214-0579-00	B010380		4	. TERM,TEST POINT:BRS CD PL	80009	214-0579-00
-68	131-0951-00			1	. CONNECTOR,RCPT,:SNAP-ON MALE	98291	051-051-0159-220
-69	136-0153-00			1	. SOCKET,PLUG-IN:2 PIN	91506	8000AG6
					(ATTACHING PARTS)		
-70	211-0022-00			2	. SCREW,MACHINE:2-56 X 0.188 INCH,PNH STL	83385	OBD
-71	210-0405-00			2	. NUT,PLAIN,HEX.:2-56 X 0.188 INCH,BRS	73743	2X12157-402
-72	210-0001-00			2	. WASHER,LOCK:INTL,0.092 ID X 0.18"OD,STL	78189	1202-00-00-0541C
					- - - * - - -		

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5 Name & Description	Mfr Code	Mfr Part Number
1-73	----- -----			1	CKT BOARD ASSY:VCO AMP,VHF(SEE A9 EPL)		
	----- -----			1	CKT BOARD ASSY:VCO AMP,UHF(SEE A9 EPL)		
					(ATTACHING PARTS)		
-74	211-0008-00			2	SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
-75	211-0116-00			1	SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH BRS	83385	OBD
					- - - * - - -		
	----- -----			-	. CKT BOARD ASSY INCLUDES:		
-76	136-0252-04	B000100	B000119	14	. SOCKET,PIN TERM:U/W 0.016-0.018 DIA PINS	22526	75060-007
	136-0252-04	B010120		2	. SOCKET,PIN TERM:U/W 0.016-0.018 DIA PINS	22526	75060-007
-77	131-1003-00			2	. CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00
-78	136-0263-04			6	. SOCKET,PIN TERM:FOR 0.025 INCH SQUARE PIN	22526	48059
-79	214-0579-00			2	. TERM,TEST POINT:BRS CD PL	80009	214-0579-00
-80	131-0951-00			1	. CONNECTOR,RCPT,:SNAP-ON MALE	98291	051-051-0159-220
-81	----- -----			1	CKT BOARD ASSY:R.F. MIXER(SEE A6 EPL)		
					(ATTACHING PARTS)		
-82	211-0152-00			2	SCR,ASSEM WSHR:4-40 X 0.625 INCH,PNH BRS	83385	OBD
-83	211-0016-00			2	SCREW,MACHINE:4-40 X 0.625 INCH,PNH STL	83385	OBD
					- - - * - - -		
	----- -----			-	CKT BOARD INCLUDES:		
-84	136-0263-00			1	. SOCKET,PIN TERM:U/W 0.025 SQ PIN	00779	85861-3
-85	136-0252-04			8	. SOCKET,PIN TERM:U/W 0.016-0.018 DIA PINS	22526	75060-007
-86	131-1003-00			1	. CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00
-87	214-0579-00			3	. TERM,TEST POINT:BRS CD PL	80009	214-0579-00
-88	131-0589-00			5	. TERM,PIN:0.46 L X 0.025 SQ.PH BRZ GL	22526	47350
-89	131-0993-00			1	. BUS,CONDUCTOR:2 WIRE BLACK	00779	530153-2
-90	131-0951-00			2	. CONNECTOR,RCPT,:SNAP-ON MALE	98291	051-051-0159-220
-91	441-1376-00			1	CHASSIS,PLUG-IN:	80009	441-1376-00
-92	213-0786-00			3	SETSCREW:10-32 X 0.25,SST,HEX SOC	000CY	OBD
-93	214-2639-00			1	PLUG,COIL HSG:SHIELDING & TUNING	80009	214-2639-00
-94	354-0564-00			5	RING,EXT THD:0.75-27 X 0.4L,SST	80009	354-0564-00
-95	210-1039-00			5	WASHER,LOCK:INT,0.521 ID X 0.625 INCH OD	24931	OBD
-96	211-0255-00			5	SCREW,MACHINE:4-40 X 1.0 L,HEX SKT,STEEL	000BK	OBD
-97	210-0586-00			5	NUT,PLAIN,EXT W:4-40 X 0.25 INCH,STL	78189	211-041800-00
-98	214-2542-00			5	PLUG,COIL HSG:SHIELD AND TUNING	80009	214-2542-00
-99	210-0914-00	B000100	B010359X	10	WASHER,SPR TNSN:0.32 FT ID X 0.007 THK,PH BRZ	80009	210-0914-00
	210-0978-00	XB010360		5	WASHER,FLAT:0.375 ID X 0.50 INCH OD,STL	78471	OBD
	210-1015-00	XB010360		5	WASHER,SPR TNSN:0.254 ID X 0.01 THK,STL,0.5 OD	78189	3502-14-47
-100	108-0883-02			5	COIL,RF:FIXED,3.4MH(VHF)	80009	108-0883-02
	108-0884-02			5	COIL,RF:FIXED,490NH(VHF)	80009	108-0884-02
	108-0885-02			5	COIL,RF:FIXED,60NH(UHF)	80009	108-0885-02
	108-0886-02			5	COIL,RF:FIXED,16NH(UHF)	80009	108-0886-02
-101	212-0629-00			5	. SCREW,MACHINE:10-32 X 0.35 L BDGH,SLTD,AL	80009	212-0629-00
-102	354-0567-00			5	. RING,GROUNDING:0.55 OD X 0.42 ID	80009	354-0567-00

FIG. 1 EXPLODED



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TELEVISION DOWN CONVERTER

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
	070-2597-00			1	MANUAL,TECH:SERVICE		80009	070-2597-00

MANUAL CHANGE INFORMATION

At Tektronix, we continually strive to keep up with latest electronic developments by adding circuit and component improvements to our instruments as soon as they are developed and tested.

Sometimes, due to printing and shipping requirements, we can't get these changes immediately into printed manuals. Hence, your manual may contain new change information on following pages.

A single change may affect several sections. Since the change information sheets are carried in the manual until all changes are permanently entered, some duplication may occur. If no such change pages appear following this page, your manual is correct as printed.

SERVICE NOTE

Because of the universal parts procurement problem, some electrical parts in your instrument may be different from those described in the Replaceable Electrical Parts List. The parts used will in no way alter or compromise the performance or reliability of this instrument. They are installed when necessary to ensure prompt delivery to the customer. Order replacement parts from the Replaceable Electrical Parts List.

CALIBRATION TEST EQUIPMENT REPLACEMENT

Calibration Test Equipment Chart

This chart compares TM 500 product performance to that of older Tektronix equipment. Only those characteristics where significant specification differences occur, are listed. In some cases the new instrument may not be a total functional replacement. Additional support instrumentation may be needed or a change in calibration procedure may be necessary.

Comparison of Main Characteristics

DM 501 replaces 7D13		
PG 501 replaces 107	PG 501 - Risetime less than 3.5 ns into 50 Ω.	107 - Risetime less than 3.0 ns into 50 Ω.
108	PG 501 - 5 V output pulse; 3.5 ns Risetime	108 - 10 V output pulse 1 ns Risetime
PG 502 replaces 107		
108	PG 502 - 5 V output	108 - 10 V output
111	PG 502 - Risetime less than 1 ns; 10 ns Pretrigger pulse delay	111 - Risetime 0.5 ns; 30 to 250 ns Pretrigger pulse delay
PG 508 replaces 114		
115	Performance of replacement equipment is the same or better than equipment being replaced.	
2101		
PG 506 replaces 106	PG 506 - Positive-going trigger output signal at least 1 V; High Amplitude output, 60 V.	106 - Positive and Negative-going trigger output signal, 50 ns and 1 V; High Amplitude output, 100 V.
067-0502-01	PG 506 - Does not have chopped feature.	0502-01 - Comparator output can be alternately chopped to a reference voltage.
SG 503 replaces 190, 190A, 190B	SG 503 - Amplitude range 5 mV to 5.5 V p-p.	190B - Amplitude range 40 mV to 10 V p-p.
191		
067-0532-01	SG 503 - Frequency range 250 kHz to 250 MHz.	0532-01 - Frequency range 65 MHz to 500 MHz.
SG 504 replaces 067-0532-01	SG 504 - Frequency range 245 MHz to 1050 MHz.	0532-01 - Frequency range 65 MHz to 500 MHz.
067-0650-00		
TG 501 replaces 180, 180A	TG 501 - Trigger output-slaved to marker output from 5 sec through 100 ns. One time-mark can be generated at a time.	180A - Trigger pulses 1, 10, 100 Hz; 1, 10, and 100 kHz. Multiple time-marks can be generated simultaneously.
181		181 - Multiple time-marks
184	TG 501 - Trigger output-slaved to market output from 5 sec through 100 ns. One time-mark can be generated at a time.	184 - Separate trigger pulses of 1 and 0.1 sec; 10, 1, and 0.1 ms; 10 and 1 μs.
2901	TG 501 - Trigger output-slaved to marker output from 5 sec through 100 ns. One time-mark can be generated at a time.	2901 - Separate trigger pulses, from 5 sec to 0.1 μs. Multiple time-marks can be generated simultaneously.

NOTE: All TM 500 generator outputs are short-proof. All TM 500 plug-in instruments require TM 500-Series Power Module.

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MANUAL CHANGE INFORMATION

PRODUCT: TDC 070-2597-00

CHANGE REFERENCE: C1/179

DATE: 1-24-79

CHANGE:	DESCRIPTION

TEXT CORRECTIONS

Page 2-2 — On the last line of the second column of text, change ADC to AGC.

Page 4-1 — Test Equipment Required list: change the second RF signal generator listed from FG503 or FG504 to SG503 or SG504.

Page 4-9 — On Fig. 4-5, a connection between the LO OUT on the TDC and the LO IN on the test modulator should be shown.

Page 4-11 — In Step 13b and 13c change the lower frequency limit from 100 Hz to 100 kHz.