Errata

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HP References in this Manual

This manual may contain references to HP or Hewlett-Packard. Please note that Hewlett-Packard's former test and measurement, semiconductor products and chemical analysis businesses are now part of Agilent Technologies. We have made no changes to this manual copy. The HP XXXX referred to in this document is now the Agilent XXXX. For example, model number HP8648A is now model number Agilent 8648A.

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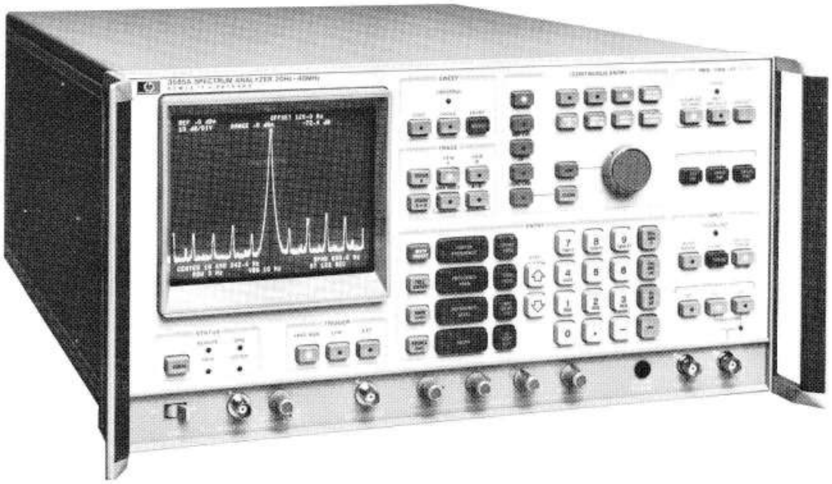
SERVICE MANUAL

SPECTRUM ANALYZER

3585A

VOLUME I



General Information
Installation
Operation Overview
Performance Test
Adjustments
Circuit Descriptions
Backdating

HEWLETT PACKARD

-hp- 3585A

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HP MANUAL SCANS

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Thanks

Dave & Lynn Henderson

Dave & Lynn Henderson
Artek Media

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HEWLETT PACKARD

CATHODE-RAY TUBE WARRANTY AND INSTRUCTIONS

The cathode-ray tube (CRT) supplied in your Hewlett-Packard Instrument and replacement CRT's purchased from -hp- are warranted by the Hewlett-Packard Company against electrical failure for a period of one year from the date of shipment from Colorado Springs. Broken tubes and tubes with phosphor or mesh burns are not included under this warranty. No other warranty is expressed or implied.

INSTRUCTION TO CUSTOMERS

If the CRT is broken when received, a claim should be made with the responsible carrier. All warranty claims with Hewlett-Packard should be processed through your nearest Hewlett-Packard Sales/Service Office (listed at rear of instrument manual).

INSTRUCTIONS TO SALES/SERVICE OFFICE

Return defective CRT in the replacement CRT packaging material. If packaging material is not available, contact CRT Customer Service in Colorado Springs. The Colorado Springs Division must evaluate all CRT claims for customer warranty, Material Failure Report (MFR) credit, and Heart System credit. A CRT Failure Report form (see reverse side of this page) must be completely filled out and sent with the defective CRT to the following address:

HEWLETT-PACKARD COMPANY
1900 Garden of the Gods Road
Colorado Springs, Colorado 80907

Parcel Post Address:
P.O. Box 2197
Colorado Springs, Colorado 80901

Attention: CRT Customer Service

Defective CRT's not covered by warranty may be returned to Colorado Springs for disposition. These CRT's, in some instances, will be inspected and evaluated for reliability information by our engineering staff to facilitate product improvements. The Colorado Springs Division is equipped to safely dispose of CRT's without the risks involved in disposal by customers or field offices. If the CRT is returned to Colorado Springs for disposal and no warranty claim is involved, write "Returned for Disposal Only" in item No. 5 on the form.

Do not use this form to accomplish CRT repairs. In order to have a CRT repaired, it must be accompanied by a customer service order (repair order) and the shipping container must be marked "Repair" on the exterior.

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SAFETY SYMBOLS

General Definitions of Safety Symbols Used On Equipment or In Manuals.

⚠ Instruction manual symbol: the product will be marked with this symbol when it is necessary for the user to refer to the instruction manual in order to protect against damage to the instrument.

ϟ Indicates dangerous voltage (terminals fed from the interior by voltage exceeding 1000 volts must be so marked).

⏚ OR (⏚) Protective conductor terminal. For protection against electrical shock in case of a fault. Used with field wiring terminals to indicate the terminal which must be connected to ground before operating equipment.

(⏚) Low-noise or noiseless, clean ground (earth) terminal. Used for a signal common, as well as providing protection against electrical shock in case of a fault. A terminal marked with this symbol must be connected to ground in the manner described in the installation (operating) manual, and before operating the equipment.

⏛ OR ⊥ Frame or chassis terminal. A connection to the frame (chassis) of the equipment which normally includes all exposed metal structures.

∼ Alternating current (power line).

⎓ Direct current (power line).

≂ Alternating or direct current (power line).

WARNING The WARNING sign denotes a hazard. It calls attention to a procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in injury or death to personnel.

CAUTION The CAUTION sign denotes a hazard. It calls attention to an operating procedure, practice, condition or the like, which,if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product.

NOTE: The NOTE sign denotes important information. It calls attention to procedure, practice, condition or the like, which is essential to highlight.

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SAFETY SUMMARY

The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. Hewlett-Packard Company assumes no liability for the customer's failure to comply with these requirements. This is a Safety Class 1 instrument.

GROUND THE INSTRUMENT

To minimize shock hazard, the instrument chassis and cabinet must be connected to an electrical ground. The instrument is equipped with a three-conductor ac power cable. The power cable must either be plugged into an approved three-contact electrical outlet or used with a three-contact to two-contact adapter with the grounding wire (green) firmly connected to an electrical ground (safety ground) at the power outlet. The power jack and mating plug of the power cable meet International Electrotechnical Commission (IEC) safety standards.

DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE

Do not operate the instrument in the presence of flammable gases or fumes. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.

KEEP AWAY FROM LIVE CIRCUITS

Operating personnel must not remove instrument covers. Component replacement and internal adjustments must be made by qualified maintenance personnel. Do not replace components with power cable connected. Under certain conditions, dangerous voltages may exist even with the power cable removed. To avoid injuries, always disconnect power and discharge circuits before touching them.

DO NOT SERVICE OR ADJUST ALONE

Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.

USE CAUTION WHEN EXPOSING OR HANDLING THE CRT

Breakage of the Cathode-ray Tube (CRT) causes a high-velocity scattering of glass fragments (implosion). To prevent CRT implosion, avoid rough handling or jarring of the instrument. Handling of the CRT shall be done only by qualified maintenance personnel using approved safety mask and gloves.

DO NOT SUBSTITUTE PARTS OR MODIFY INSTRUMENT

Because of the danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modification to the instrument. Return the instrument to a Hewlett-Packard Sales and Service Office for service and repair to ensure that safety features are maintained.

DANGEROUS PROCEDURE WARNINGS

Warnings, such as the example below, precede potentially dangerous procedures throughout this manual. Instructions contained in the warnings must be followed.

WARNING

Dangerous voltages, capable of causing death, are present in this instrument. Use extreme caution when handling, testing, and adjusting.

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SECTION I
GENERAL INFORMATION

1-1. INTRODUCTION

This manual volume contains information necessary to install, operate, test, and understand the operation of the Hewlett-Packard Model 3585A Spectrum Analyzer. Complete operating and programing information can be found in the 3585A Operating Manual.

This manual volume is divided into seven sections, each covering a specific topic or aspect of servicing the instrument:

Section	Topic
I	General Information
II	Installation and Interfacing
III	Operation Overview
IV	Performance Tests
V	Adjustments
VI	Circuit Functional Descriptions
VIII	Backdating

This section of the manual contains the performance specifications and general operating characteristics of the 3585A. Also listed are available options and accessories, and instrument and manual identification information.

1-2. SPECIFICATIONS

Operating specifications for the 3585A are listed in Table 1-1. These specifications are the performance standards or limits against which the instrument is tested. Any changes in specifications due to manufacturing, design or traceability to the U.S. National Bureau of Standards are included in Table 1-1 of this manual. Specifications listed in this manual supersede all previous specifications for the Model 3585A.

1-3. INSTRUMENT AND MANUAL IDENTIFICATION

The instrument identification serial number is located on the rear panel. Hewlett-Packard uses a two-section serial number consisting of a four-digit prefix and a five-digit suffix separated by a letter designating the country in which the instrument was manufactured. (A = U.S.A.; G = West Germany; J = Japan; U = United Kingdom.) The prefix is the same for all identical instruments and changes only when a major instrument change is made. The suffix, however, is assigned sequentially and is unique to each instrument.

This manual applies to instruments with serial numbers indicated on the title page. If changes have been made in the instrument since this manual was printed, a yellow "Manual Changes" supplement supplied with the manual will define these changes and explain how to adapt the manual to the newer instruments. In addition, backdating information contained in Section VII adapts the manual to instruments with serial numbers lower than those listed on the title page.

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On the title page of this manual is a Microfiche part number. This number can be used to order 4 x 6 inch microfilm transparencies of these publications. The Microfiche package includes the latest Manual Changes supplement and all pertinent Service Notes.

1-4. DESCRIPTION

The 3585A is a 20 Hz to 40.1 MHz, microcomputer controlled spectrum analyzer. It may be utilized for spectrum analysis or network analysis (amplitude only) applications. As a spectrum analyzer, the 3585A provides a graphic display of the spectral components of the input signal. For network analysis measurements, the 3585A Tracking Generator can be used as a drive signal for the network under test. The network's output can then be applied to the 3585A input to obtain a graphic display of the network's amplitude versus frequency response.

The 3585A is structured as a conventional triple-conversion, swept super-heterodyne spectrum analyzer. The addition of microcomputer hardware control and data manipulation greatly enhances the analytical power of the 3585A. Flexible control of the displayed trace is obtained through dedicated key subroutines that produce optimum displayed results in a minimum amount of time.

Microcomputer control gives the 3585A several unique features. The most obvious feature is the keyboard entry of parameters which replaces more conventional knobs. The input attenuation and mixer levels are automatically set by the 3585A's Auto Range feature to maintain the specified dynamic range. Other microcomputer controlled features include: coupling of Frequency Span, Bandwidth and Sweep Time; centering of signals; moving signals to the Reference Level and storage and measurement of frequency and amplitude Offsets. Microcomputer control further allows the operator to override the automatic features of the 3585A.

The 3585A's Local Oscillator is fully synthesized using -hp-'s patented Fractional N technique. This provides frequency settability of 0.1 Hz over the 20 Hz to 40.1 MHz range. Beyond the advantage of high system resolution, the 3585A's Synthesized Local Oscillator allows stable, repeatable frequency measurements. The advanced design of the 3585A's Fractional N synthesized Local Oscillator also results in phase-continuous, linear sweeps with low spurious sidebands.

The amplitude accuracy of the 3585A is enhanced by an Automatic Calibration system, through which internal analog offsets and errors are removed using the internal 10 MHz reference as a level and frequency standard and the Tracking Generator with an internal calibrator as a flatness standard. The calibration system measures and corrects errors caused by IF frequency and gain shifts, and input gain and flatness deviations. It also corrects the Tracking Generator frequency.

The trace information displayed on the 3585A CRT is digitally stored in memory. As a result, flicker-free, non-blooming displays are maintained independent of sweep time. Marker information and Entry parameters are displayed above and below the CRT graticule to give the operator the present instrument status. Prefaced parameters are intensified for easy data entry.

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The 3585A keyboard controls are completely HP-IB programmable. In addition, commands are available to output information such as: active or stored keyboard settings, instrument status, A or B trace in marker amplitudes or normalized binary data, marker amplitude and frequency and CRT alphanumerics. A 50-character line of annotation or six 50-character lines of instructional messages can be displayed on the 3585A using the HP-IB. Finally, the keyboard may be configured as a limited data input terminal, with each key having a unique, numeric code. When coupled with the instructional message capability, this can provide a calculator based system where operator decisions can be entered on the 3585A keyboard. When used in this manner, the operator is not required to understand the calculator language, only answer the questions on the 3585A display.

1-5. OPTIONS

The following options are available for use with the Model 3585A:

	-hp- Part Number
Option 907: Front Handle Kit	5061-0091
Option 908: Rack Mounting Kit	5061-0079
Option 909: Front Handle and Rack Mounting Kit	5061-0085
Option 910: Additional Set of Manuals	
Service Manual	03585-90006
Operating Manual	03585-90003

1-6. Accessories Supplied

The following is a list of accessories included with the 3585A:

Item	Quantity	-hp- Part Number
Accessory Kit	1 each	03585-84401
Includes the following:		
Cable Assembly Extender	5 each	03585-61601
Cable Assembly Adapter	1 each	03585-61616
Jack to Jack Adapter	3 each	1250-0669
PC Extender Boards:		
43-pin	1 each	03585-66591
36-pin	1 each	03585-66590
18-pin	1 each	03585-66592
15-pin	1 each	03585-66595
15-pin	1 each	03585-66596
10-pin	1 each	03585-66593
6-pin	1 each	03585-66594

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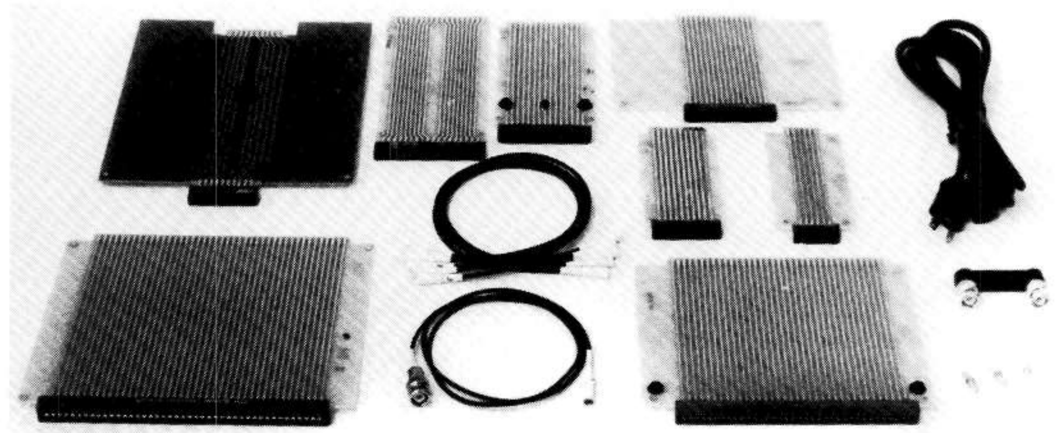

Figure 1-1. Accessories Supplied

1-7. ACCESSORIES AVAILABLE

The following is a list of accessories available for use with the Model 3585A.

a. Input Probes.

1. 1120A 1:1 active probe provides 100 kΩ shunted by 3 pf.
2. 10021A 1:1 passive probe for 50 Ω or 1 MΩ shunted by 70 pf.
3. 10040A 10:1 passive probe provides 1 MΩ shunted by 9 pf.

b. Balancing Transformers.

1. 11473A 75 Ω to 600 Ω WECO 310.
2. 11473B 75 Ω to 600 Ω Siemens 9 REL STP-6AC.
3. 11474A 75 Ω WECO 241.
4. 11475A 75 Ω to 150 Ω Siemens 9 REL STP-6AC.
5. 11476A 75 Ω to 124 Ω WECO 408A.

c. Preamplifiers.

1. 461A 20 dB or 40 dB gain 1 kHz to 150 MHz.
2. 465A 20 dB or 40 dB gain 5 Hz to 1 MHz.

d. VHF Switch.

1. 59307A provides one pair of single throw 4-pole switches.

e. Permanent Records.

1. CRT Camera.
   197A Option 006 provides 3 1/4'' x 4 1/4'' Polaroid photographs.
2. X-Y Recorder
   7044A provides permanent 11'' x 17'' plots.

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1-8. Recommended Test Equipment

Equipment required to maintain the Model 3585A is listed in Table 1-2. Other equipment may be substituted if it meets the requirements listed in the table.

Table 1-1. Specifications

NOTE

Specifications are guaranteed only when the Auto Calibration is on, the OVEN REF OUT is connected to the EXT REF IN and the instrument has warmed up at least 20 minutes at the ambient temperature.

FREQUENCY:

Measurement Range:

20 Hz to 40.1 MHz

Displayed Range:

Frequency Span:

0 Hz to 40.1 MHz Settable with 0.1 Hz resolution
10 Hz to 40 MHz in 1, 2, 5 steps

Accuracy:

-0% +0.2% of Frequency Span setting

Marker:

Readout Accuracy:

±0.2% of Frequency Span ± Resolution Bandwidth

Counter Accuracy:

±0.3 Hz ± 1 x 10^{-7}/month of counted frequency for a signal 20 dB greater than other signals and noise in the resolution bandwidth setting.

Manual Frequency Accuracy:

±0.1 Hz ± 1 x 10^{-7}/month using the internal reference.

Resolution:

Resolution Bandwidths

3 dB bandwidths of 3 Hz to 30 kHz in a 1, 3, 10 sequence

Accuracy

±20% at the 3 dB points

Selectivity (Shape Factor)

60 dB/3dB < 11:1

AMPLITUDE:

Measurement Range:

Terminated (50/75Ω) input

-137 dBm to +30 dBm or equivalent level in dBV or volts

High Impedance (1 MΩ) input

31 nV to 22V

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Table 1-1. Specifications (Cont'd)

Displayed Range:

Vertical Scale:

10 division CRT settable to 10, 5, 2 and 1 dB/division relative to the Reference Level (which is represented by the top graticule line)

Input Range:

-25 dBm to +30 dBm in 5 dB steps

Reference Level (relative to Input Range):

Settability
-100 dB to +10 dB; 0.1 dB resolution

Accuracy (at Center Frequency, for Sweep Time ≥ 2 steps above auto setting at Manual Frequency, 1 or 2 dB/Div.)
Add 0.1 dB for auto sweep setting
Add 0.1 dB for 5 or 10 dB/Div.

Terminated (50/75Ω) input

+10 dB   -50 dB   -70 dB   -90 dB

±0.4 dB	±0.7 dB	±1.5 dB

High Impedance(1 MΩ) input—add to above

20 Hz   10 MHz   40.1 MHz

±0.7 dB	±1.5 dB

Amplitude Linearity (referred to Reference Level):

0 dB   -20 dB   -50 dB   -80 dB   -95 dB

±0.3 dB	±0.6 dB	±1.0 dB	±2.0 dB

Frequency Response (referred to center of span):

Terminated (50/75Ω) input ±.5 dB

High Impedance (1 MΩ) input

20Hz   10 MHz   40.1 MHz

±0.7 dB	±1.5 dB

Marker:

Amplitude Accuracy:

Center Frequency or Manual frequency at the Reference Level: Use Reference Level accuracy from +30 dBm to -115 dBm, add Amplitude Linearity below -115 dBm.

To Calculate Marker Accuracy:

Terminated (50/75Ω) input

At the Center or Manual Frequency and at the Reference Level - use Reference Level Accuracy.

At the Center or Manual Frequency and NOT at the Reference Level - add Reference Level Accuracy and Amplitude Linearity.

NOT at the Center or Manual Frequency and NOT at the Reference Level - add Reference Level Accuracy, Amplitude Linearity and Frequency Response.

High Impedance (1 MΩ) input

Calculate the Marker Accuracy according to the Terminated Input rules above, *then* add 1 MΩ Reference Level Accuracy.

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Table 1-1. Specifications (Cont'd)

INPUT:

Signal Inputs:

Terminated (50/75Ω) input; >26 dB return loss, DC coupled, BNC connector. Applied dc voltage must be ≤ ten times the RANGE setting in volts for full specification compliance.

High Impedance (1 MΩ) Input; ±3% shunted by <30 pf, BNC connector

Maximum Input Level:

Terminated (50/75Ω) input; 13 V peak ac plus dc, relay protected against overloads to 42 V peak.

High Impedance (1 MΩ) input; 42 V peak ac plus dc (derate ac by a factor of two for each octave above 5 MHz).

External Reference Input:

10 MHz (or subharmonic to 1 MHz), 0 dBm to +15 dBm/50Ω

Required frequency accuracy, $\pm 5 \times 10^{-6}$. When an external reference is used the $\pm 1 \times 10^{-7}$/month specification on the Counter and Manual frequency accuracy is replaced by the accuracy of the external reference.

OUTPUT:

Tracking Generator:

Level
0 dBm to -11 dBm/50Ω with a single turn knob, continously variable

Frequency Accuracy
±1 Hz relative to analyzer tuning

Frequency Response
±0.7 dB

Impedance
50Ω; > 14 dB return loss

Probe Power:

+15 Vdc, -12.6 Vdc; 150 ma max.
Suitable for powering HP 1120A Active Probe

External Display

X, Y:1 volt full deflection;
Z: < 0V to > 2.4 V.

Recorder:

X Axis: minimum of +10 Vdc full scale
Y Axis: +10 Vdc full scale
Z—penlift output (TTL levels)

IF:

350 kHz, -11 dBV to -15 dBV at the reference level

Video:

+10 Vdc at the reference level

Frequency Reference:

10.000 MHz $\pm 1 \times 10^{-7}$/mo., > +5 dBm into 50Ω

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Table 1-1. Specifications (Cont'd)

DYNAMIC RANGE:

Spurious Responses: (which includes image, out of band and harmonic distortion) referred to a single signal whose amplitude is ≤ RANGE setting and whose frequency is ≥ ten times the Resolution Bandwidth.

Terminated (50/75Ω) input

< -80 dB

High Impedance (1 MΩ) input

< -80 dB; except second harmonic distortion, < -70 dB

Intermodulation Distortion: for two signals, each at least 6 dB below the RANGE setting and separated in frequency by at least 100 Hz, referred to the larger of the two signals.

Terminated (50/75Ω) input

< -80 dB; except 2nd order IM with one or both of the input signals within the range of 10 MHz to 40 MHz, < -70 dB

High Impedance (1 MΩ) input

< -70 dB

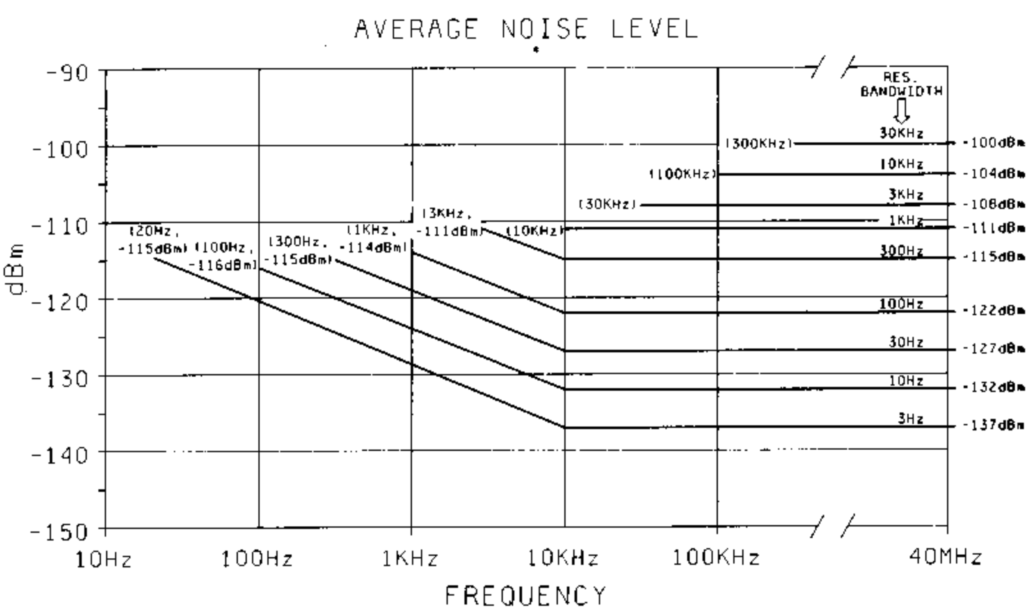
Residual Responses (no signal at input, -25 dBm Range)

< -120 dBm

Lo Feed Through:

< -15 dB with respect to Range

Average Noise Level (-25 dBm Range), 50/75Ω input)



1 MΩ input: Below 500 kHz add 12 dB to above.

Average Noise Level at 40 Hz (3 Hz Res. BW) using the Noise Level Key -123 dBm (1 Hz)

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Table 1-1. Specifications (Cont'd)

DISPLAY:

Trace:

Two memories, A and B, each 1001 data points horizontally by 1024 data points vertically are displayed on the CRT at a flicker free rate.

Memory A - updated at the rate of the analyzer sweep time.

Memory B - updated by transfer from A (Store A→B).

Max Hold - retains in Memory A the largest signal level at each horizontal point over successive sweeps.

A-B - updates Memory A with sweep data minus Memory B data at each corresponding horizontal point.

Trace Detection:

A linear envelope detector is used to obtain video information from the IF signal. Peak signal excursions between horizontal sweep data points are retained and displayed at the left-hand data point. This assures that no signal responses are missed.

SWEEP:

Modes:

Continuous, Single or Manual

Trigger:

Free Run, Line, or External

Time:

Resolution: 0.2 sec
Minimum: 0.2 sec
Maximum: Frequency Span/minimum sweep rate limit

The minimum sweep rate limit is:

$\geq$ 10 kHz Res BW - 10 sec/Hz of Frequency Span or 0.1 Hz/sec
$\leq$ 3 kHz Res BW - 200 sec/Hz of Frequency Span or 0.005 Hz/sec

GENERAL:

Environmental:

Temperature:

Operating 0°C to 55°C

Humidity:

< 95% RH except 300 Hz Res. BW, < 40% RH

Warm-up Time:

20 minutes at ambient temperature

Power Requirements:

115 V (+11% - 25%), 48-440 Hz
230 V (+11% - 18%), 48-66Hz
< 180 watts, 3A max.

Weight:

39.9 kg (88 lb)

Dimensions:

22.9 cm (9 in) H x 42.6 cm (16.75 in) W x 63.5 cm (25 in) D

Remote Operation:

Compatible with IEEE Standard 488-1975 "Standard Digital Interface for Programmable Instrumentation"

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Table 1-2. Recommended Test Equipment

Instrument	Required Characteristics	Usage: Semi-Automatic Performance Test	Usage: Operational Verification Tests	Recommended Model
Audio Oscillator	Frequency: 1kHz Distortion: ≤ -90dB Amplitude: 0.1Vrms	x	x	-hp- 339 or -hp- 239
Attenuator: Variable 10dB/Step Variable 1dB/Step See Note 1	 Range: 0 - 120dB Range: 0 - 12dB	 x x	 x x	 -hp- 355D -hp- 355C
Bridge: Directional 50Ω 75Ω See Note 2, 3	 Frequency: 0.1 - 40 MHz Return Loss > 30dB Directivity > 40dB	 x x	 x x	 -hp- 8721A -hp- 8721A Option 008
Calculator	Compatible with -hp- 9825A Software and I/O	x		-hp- 9825
Calculator ROM's	HP-IB* and -hp- 9825A Compatible	x		-hp- 98210A and -hp- 98213A
Filter: 9MHz Low Pass	See Figure 4-14	x	x	
Frequency Counter	Range: 5 to 10 MHz Resolution: 0.1 Hz Accuracy: ±1 count, $\pm 5 \times 10^{-10}$/day	x	x	-hp- 5328A Option 010
Frequency Synthesizer	Freq. Range: 200 Hz to 40.1 MHz Amp. Range: +10 to -85 dBm Amplitude Accuracy: ±0.25 dBm	x	x	-hp- 3335A
Frequency Synthesizer	Freq. Range: 1 kHz to 33 MHz Amplitude Range: -25 dBm Amplitude Accuracy: ±0.4 dB	x	x	-hp- 3330B
Function Generator See Note 3	Frequency: 1.2kHz Square Wave: 100ns rise time dc Offset: ±1V	x		-hp- 3311A
HP-IB* Interconnection Cables		x		-hp- 10631
HP-IB* Interface Cable	-hp- 9825A Compatible	x		-hp- 98034A
Impedance Matching Network (50Ω to 75Ω Minimum Loss Pad)	Frequency: 0.1 to 40 MHz VSWR < 1.05	x	x	-hp- 8542B
Mixer: Double Balanced See Note 3	Frequency: 0.1 - 40MHz	x		-hp- 10534
Oscilloscope See Note 2	Vertical Scale: ≥ 5 mV/Div. Horizontal Scale: ≥ 50 nsec/Div.		x	-hp- 1740A
Power Supply: DC See Note 4	Voltage range: 0 - 10 V DC	x		-hp- 6213A
Printer: Impact	Plotter Capability	x		-hp- 9871A
Summer	See Figure 4-15	x	x	
Termination: Feedthrough 50Ω 75Ω	 ±0.1 ohm, 1 Watt	 x x	 x x	 -hp- 11048C -hp- 11094C
Thermal Voltage Converter: 50Ω,0.5 V See Note 4	Frequency: 0.1 - 60MHz Calibration Data	x		-hp- 11051A Option 01
Voltage Divider: 10 to 1 Terminated in 50Ω See Note 4	 See Figure 4-7	 x		
Voltmeter: Digital See Note 4	Full Scale Range: 1Vdc Accuracy: ±0.004% Resolution: 6 Digits Input Resistance: > 1 MΩ	x		-hp- 3455A

NOTES

1. *Attenuator must be calibrated by standards lab. Correction factors are required for the Operational Verification Tests.*
2. *Required for the Operation Verification Return Loss Test.*
3. *Required for the Semi Automatic Performance Test Return Loss procedure.*
4. *Required to run the calibrator accuracy program.*

*Hewlett-Packard Interface Bus.

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SECTION II

INSTALLATION AND INTERFACING

2-1. INTRODUCTION

This section contains instructions for installing and interfacing the Model 3585A Spectrum Analyzer. Included are initial inspection procedures, power and grounding requirements, environmental requirements, installation instructions, turn-on and interfacing procedures and instructions for repackaging for shipment.

2-2. INITIAL INSPECTION

This instrument was carefully inspected both mechanically and electrically before shipment. It should be free of mars or scratches and in perfect electrical order upon receipt. To confirm this, carefully inspect the instrument for signs of physical damage incurred in transit, check for supplied accessories (Paragraph 1-6) and test the electrical performance using the Performance Test procedures given in Section IV. If there is physical damage, if the contents are incomplete or if the instrument does not pass the Performance Tests, notify the nearest -hp- Sales and Service Office. If the shipping container is damaged or the cushioning material shows signs of stress, notify the carrier as well as the Hewlett-Packard Office. Keep the shipping materials for the carrier's inspection.

WARNING

To avoid the possibility of dangerous electrical shock, do not apply ac line power to the 3585A if there are signs of shipping damage to any portion of the outer enclosure.

2-3. POWER REQUIREMENTS

The Model 3585A requires a single-phase ac power source of:

86V to 127V, 48Hz to 440Hz (115V Voltage Selector Setting)
189V to 255V, 48Hz to 66Hz (230V Voltage Selector Setting)

Maximum power consumption is less than 180 watts; maximum line current is 3 amperes. Refer to Paragraph 2-15 for the Instrument Turn On procedure.

CAUTION

Before applying ac line power to the 3585A, be sure that the VOLTAGE SELECTOR switch is set for the proper line voltage and the correct line fuse is installed in the rear-panel line FUSE holder. (See Paragraph 2-15.)

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2-4. Power Cables

Figure 2-1 illustrates the standard power-plug configurations that are used for -hp-power cables. The -hp- part number directly below each drawing is the part number for a power cable equipped with a power plug of that configuration. The type of power cable that is shipped with each instrument is determined by the country of destination. If the appropriate power cable is not included with your instrument, contact the nearest -hp- Sales and Service Office and the proper cable will be provided.

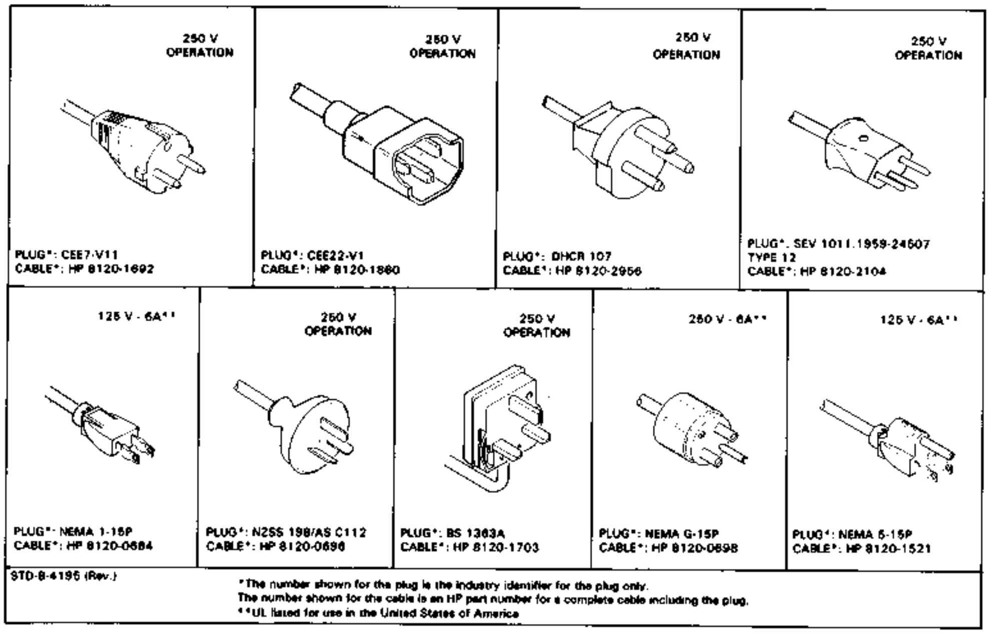

Figure 2-1. Power Cables

2-5. GROUNDING REQUIREMENTS

To protect operating personnel, the instrument's panel and cabinet must be grounded. The Model 3585A is equipped with a three-wire power cord which, when plugged into an appropriate receptacle, grounds the instrument. The offset pin on the power plug is the ground connection.

2-6. ENVIRONMENTAL REQUIREMENTS

WARNING

To prevent potential electrical or fire hazard, do not expose equipment to rain or moisture.

2-7. Operating Environment

In order for the 3585A to meet the specifications listed in Table 1-1, the operating environment must be within the following limits:

Temperature...............0°C to +55°C (+32°F to +131°F)
Relative Humidity.................................≤ 95%*
Altitude.....................................≤ 15,000 feet
Magnetic Field Strength.........................≤ 0.1 gauss

*Except 300 Hz Res. BW, 40%.

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2-8. Storage and Shipping Environment

The 3585A should be stored in a clean, dry environment. The following environmental limitations apply to both storage and shipment:

Temperature............ −40°C to +75°C (−40°F to +158°F)
Relative Humidity................................. ≤ 95%
Altitude.................................... ≤ 25,000 feet

In high-humidity environments, the instrument must be protected from temperature variations that could cause internal condensation.

2-9. Cooling System

The 3585A uses a forced-air cooling system to maintain the proper internal operating temperature. The cooling fan is located on the rear panel. Air, drawn through the rear-panel fan filter, is circulated through the instrument and exhausted through holes in the side panels. The instrument should be mounted to permit as much air circulation as possible, with at least one inch of clearance at the rear and on each side. The filter for the cooling fan should be removed and cleaned at least once every 30 days. To clean the fan filter, simply flush it with soapy water, rinse and then air dry.

2-10. Thermal Cutout

The 3585A is equipped with a thermal cutout switch which automatically disables the power supplies when the internal temperature exceeds +65°C (external termperature approximately +55°C). To reset the thermal cutout, set the LINE switch to OFF, allow time for the instrument to cool and then set the LINE switch to ON. (The thermal cutout will *not* reset automatically; the LINE switch must be turned off and then back on.) If a thermal cutout occurs, check for fan stoppage, clogged fan ports and other conditions that could obstruct air flow or cause excessive heating.

2-11. INSTALLATION

2-12. Bench Mounting

The 3585A is shipped with plastic feet attached to the bottom panel, ready for use as a bench instrument. The feet are shaped to make full-width modular instruments self align when they are staked. Because of its weight, the 3585A is not equipped with a tilt stand. It is recommend that a Front Handle Kit (Option 907, -hp- Part No. 5061-0091) be installed for ease of handling the instrument on the bench.

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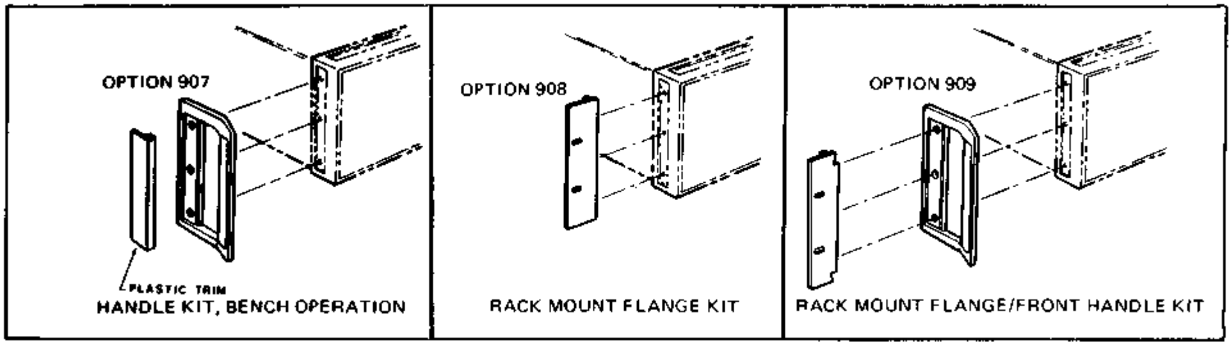

Figure 2-2. Rack Mount and Handle Kits

2-13. Rack Mounting Without Slides

a. Remove the plastic trim (Figure 2-2) and front handles from the 3585A if it is so equipped.

b. Remove the plastic feet from the bottom of the 3585A.

c. Install the Rack Flange Kit with or without handles according to the instructions included in the kit:

Rack Flange Kit (no handles)..........Option 908, -hp- Part Number 5061-0079
Rack Flange & Front Handle Kit.......Option 909, -hp- Part Number 5061-0085

d. Install an Instrument Support Rail on each side of the instrument rack. (The Instrument Support Rails, used to support the weight of the instrument, are included with -hp- rack-mount cabinets.)

WARNING

1. The weight of the 3585A must be supported by Instrument support Rails inside the instrument rack. Do not under any circumstances attempt to rack mount the 3585A using only the front flanges.

2. The 3585A is heavy for its size (approximately 88 lbs, 40 kg.). Use extreme care when lifting it to avoid personal injury.

e. Using *two* people, lift the 3585A to its position in the rack on *top* of the Instrument Support Rails.

f. Using the appropriate screws, fasten the 3585A's Rack-Mount Flanges to the front of the instrument rack.

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2-14. Rack Mounting With Slides

NOTE

To rack mount the 3585A with slides, the following items are required:

Quantity	*Description*
1	*Rack Flange Kit (Option 908, -hp- 5061-0079)* *OR* *Rack Flange & Handle Kit (Option 909, -hp- 5061-0085)*
1	*Heavy-Duty Slide Kit (-hp- Part No. 1494-0016)*
2	*Side Covers (-hp- Part No. 5060-9948)*

a. Perform Steps a through d of the previous procedure (Paragraph 2-13).

NOTE

Instrument Support Rails are not absolutely necessary when rack mounting with slides. However, they do relieve a considerable amount of strain from the slides and provide an extra measure of safety.

b. Remove the 3585A side covers and replace them with the side covers listed at the beginning of this procedure.

c. Attach a slide inner-member bracket to each side of the 3585A.

d. Attach the slide's outer members to the instrument rack according to the instructions included with the slides.

e. If your instrument rack has extension legs on the front, *be sure* that they are extended at this time.

WARNING

1. The weight of the 3585A can overturn your instrument rack when the mounting slides are fully extended. Physical injury can result.

2. The 3585A is heavy for its size (approximately 88 lbs., 40 kg.). Use extreme care when lifting it to avoid personal injury.

f. Using *two* people, lift the 3585A to its position in the rack and mate the two sections of the slides together. *Do not* rest the full weight of the 3585A on the extended slides until you are *sure* the instrument rack will not overturn.

g. Slide the 3585A into the rack. Using the appropriate screws, fasten the 3585A's Rack-Mount Flanges to the front of the rack.

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2-15. Instrument Turn On

a. Before connecting ac power to the 3585A:

1. Set the rear-panel VOLTAGE SELECTOR switch to the position that corresponds to the power-line voltage to be used:

Voltage Selector	Line Voltage
115V	86V to 127V (48-440Hz)
230V	189V to 255V (48-66Hz)

WARNING

To avoid serious injury, be sure that the ac power cord is disconnected before removing or installing the ac line fuse.

2. Verify that the proper line fuse is installed in the rear-panel FUSE holder:

Voltage Selector	Fuse Type	-hp- Part No.
115V	3A, 250V Normal Blo	2110-0003
230V	1.5A, 250V Normal Blo	2110-0043

WARNING

To protect operating personnel, the 3585A chassis and cabinet must be grounded. The 3585A is equipped with a three-wire power cord which, when plugged into an appropriate receptacle, grounds the instrument. The offset pin on the power plug is the ground connection. To preserve this protection feature, the power plug shall only be inserted in a three-terminal receptacle having a protective earth ground contact. The protective action must not be negated by the use of an extension cord or adapter that does not have the required earth ground connection. Grounding one conductor of a two-conductor outlet is not sufficient protection.

Ensure that all devices connected to the 3585A are also connected to the protective earth ground.

b. Verify that the BNC-to-BNC jumper (supplied with the instrument) is connected between the rear-panel OVEN REF OUT and EXT REF IN connectors. (For information concerning the use of an external frequency reference, see the 3585A Operating Manual.)

c. Set the front-panel LINE switch to the OFF position.

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d. Connect the ac power cord to the rear-panel LINE connector. Plug the other end of the power cord into a three-terminal *grounded* power outlet.

e. Set the front-panel INTENSITY control to the OFF (fully CCW) position.

f. Set the LINE switch to the ON position.

NOTE

The instrument's beeper will sometimes sound as a result of the local oscillator initially being unlocked during the turn-on sequence. This initial "beep" may be ignored.

g. Things to check:

1. Verify that the cooling fan (located on the rear panel) is operating.

2. Verify that the activated front-panel functions on your instrument correspond to those shown in Figure 2-3.

3. Verify that the front-panel SWEEPING light is flashing.

If any of the above conditions is not met, turn the instrument off immediately and contact the nearest -hp- Sales and Service Office or a qualified service technician.

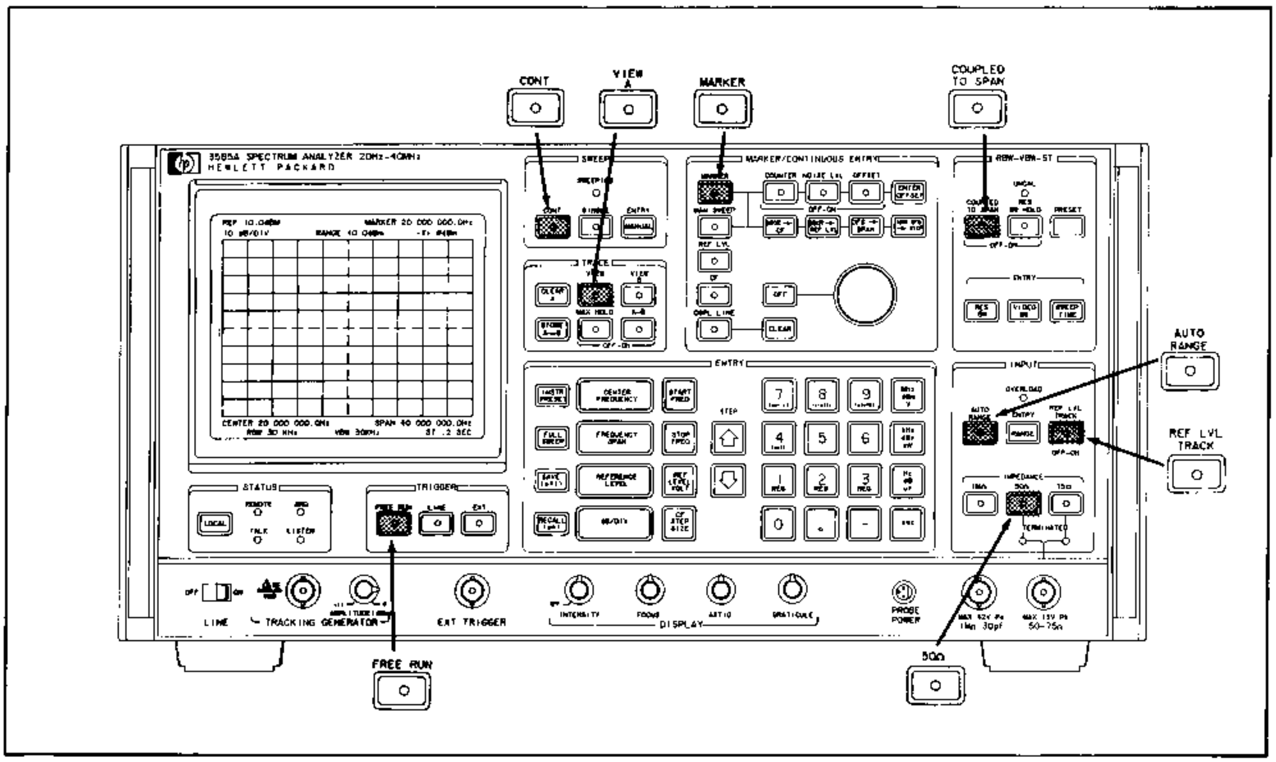

Figure 2-3. Front-Panel Functions Activated At Turn-On

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h. Adjust the front-panel INTENSITY control to obtain the desired intensity on the CRT screen. Adjust the FOCUS and ASTIG controls as follows:

1. Set the FOCUS control to midrange.

2. Adjust the ASTIG (Astigmatism) control for the sharpest trace possible.

3. Adjust the FOCUS control for the sharpest and clearest trace possible.

4. Repeat Steps 2 and 3 until optimum adjustment is obtained. If, after several iterations a sharp, clear presentation cannot be obtained, internal adjustments are probably required. These adjustments must be performed by a qualified service technician.

i. The CRT display should now appear as shown in Figure 2-4.

Verify that the Zero Response is present and is aligned with the first vertical line on the left-hand side of the CRT graticule.

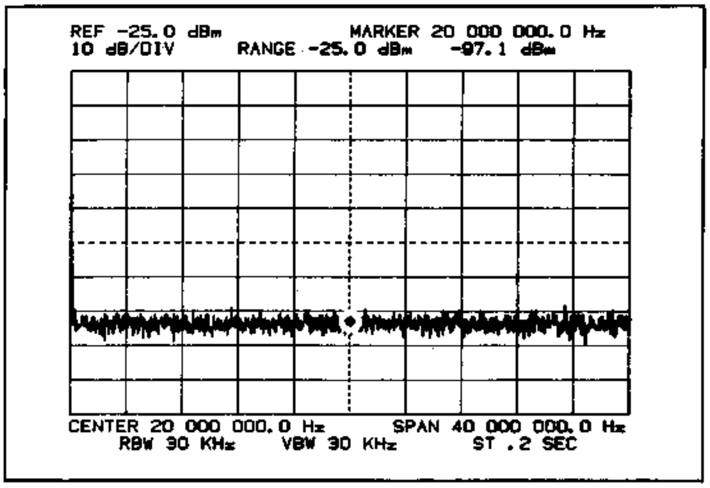

Figure 2-4. Turn-On Display

j. Press the front-panel [INSTR PRESET] key. (This will force an internal verification test and Automatic Calibration. The "CALIBRATING" message will appear on the CRT screen.)

If the beeper sounds and/or a Calibration Error Code (e.g., "CALIBRATION ERROR 03") appears on the CRT screen, the instrument is either defective or in need of adjustment. Turn the instrument off and see the Fault Isolation information in Volume Two or the Preliminary Troubleshooting procedures in Volume Three.

k. The 3585A's specifications are met after a 20-minute warmup at the ambient operating temperature.

NOTE

When the internal Oven Reference is enabled (about ten minutes after turn on), the beeper will sound and the "LOCAL OSC. UNLOCKED" message will momentarily appear on the CRT screen.

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2-16. HP-IB CONNECTIONS AND INTERFACING*

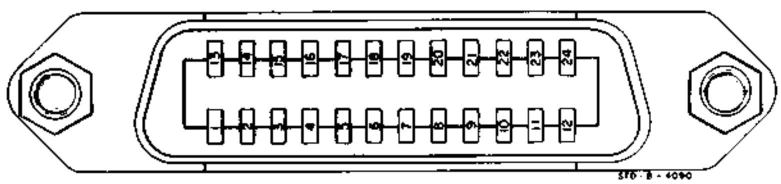
The 3585A HP-IB connector (Figure 2-5) is compatible with the -hp- 10631 (A, B, C or D) HP-IB Cables. The 3585A uses all of the HP-IB lines. The HP-IB system allows you to interconnect up to fourteen HP-IB compatible instruments (including the controller). The HP-IB Cables have identical "piggyback" connectors on both ends so that several cables can be connected to a single source without special adapters or switch boxes. You can interconnect system components and devices in virtually any configuration you desire. There must, of course, be a path from the calculator (or other controller) to every device operating on the bus. As a practical matter, avoid stacking more than three or four cables on any one connector. If the stack gets too long, the force on the stack can produce sufficient leverage to damage the connector mounting. Be sure that each connector is firmly screwed in place to keep it from working loose (see CAUTION in Figure 2-5).

2-17. Cable Length Restrictions

To achieve design performance with the HP-IB, proper voltage levels and timing relationships must be maintained. If the system cables are too long, the lines cannot be driven properly and consequently, the system will fail to perform. When interconnecting an HP-IB system, observe the following rules:

a. The total cable length for the system must be less than or equal to 20 meters (65 feet).

b. The total cable length for the system must be less than or equal to 2 meters (6 feet) times the total number of devices connected to the bus.



PIN	LINE	
1	DI01	
2	DI02	
3	DI03	
4	DI04	
13	DI05	
14	DI06	
15	DI07	
16	DI08	
5	EOI	
17	REN	
6	DAV	
7	NRFD	
8	NDAC	
9	IFC	
10	SRQ	
11	ATN	
12	SHIELD–CHASSIS GROUND	
18	P/O TWISTED PAIR WITH PIN 6	THESE PINS ARE INTERNALLY GROUNDED
19	P/O TWISTED PAIR WITH PIN 7	
20	P/O TWISTED PAIR WITH PIN 8	
21	P/O TWISTED PAIR WITH PIN 9	
22	P/O TWISTED PAIR WITH PIN 10	
23	P/O TWISTED PAIR WITH PIN 11	
24	ISOLATED DIGITAL GROUND	

CAUTION

The 3585A contains metric threaded HP-IB cable mounting studs as opposed to English threads. Metric threaded -hp- 10631A, B, or C HP-IB cable lockscrews must be used to secure the cable to the instrument. Identification of the two types of mounting studs and lockscrews is made by their color. English threaded fasteners are colored silver and metric threaded fasteners are colored black. DO NOT mate silver and black fasteners to each other or the threads of either or both will be destroyed. Metric threaded HP-IB cable hardware illustrations and part numbers follow.

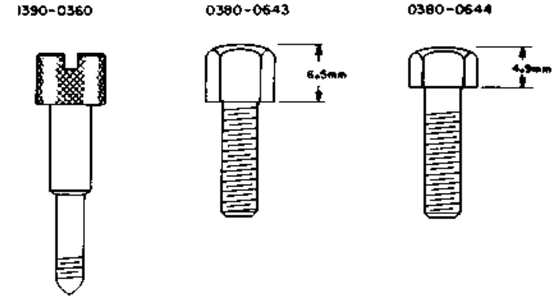


Figure 2-5. HP-IB Connector

*Hewlett-Packard Interface Bus (HP-IB) is -hp-'s implementation of IEEE Standard 488-1975, "Digital Interface for Programmable Instrumentation".

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2-18. Calculator Interfacing

Instructions for interfacing the 3585A to -hp- calculators are included in the following HP-IB Users Guides:

a. For -hp- Model 9820A/9821A Calculators:

HP-IB Users Guide, -hp- Stock Number 59300-90001

b. For -hp- Model 9825A Calculators:

-hp- 9825A Calculator General I/O Programming, -hp- Stock Number 09825-90024.

c. For -hp- Model 9830A Calculators:

HP-IB Users Guide, -hp- Stock Number 59300-90002

These users guides can be ordered from the nearest -hp- Sales and Service Office.

2-19. HP-IB Address Selection

The 3585A is shipped from the factory with an ASCII listen address of "+" and a talk address of "K". This corresponds to a Select Code of eleven. You will probably want to leave the addresses as they are; but they can be changed if the need arises. The procedure is as follows:

WARNING

Address changes require access to the interior of the instrument where hazardous voltages are present and must, therefore, be performed by a qualified service technician. Do not remove the instrument's outer covers unless you are qualified to do so.

a. Disconnect ac line power from the 3585A.

b. Remove the top cover.

c. Locate the A44 board (Figure 2-6).

d. Using a pen or pencil, change the Address Switch setting according to the table in Figure 2-6 to select the desired address.

e. Replace the top cover and restore power.

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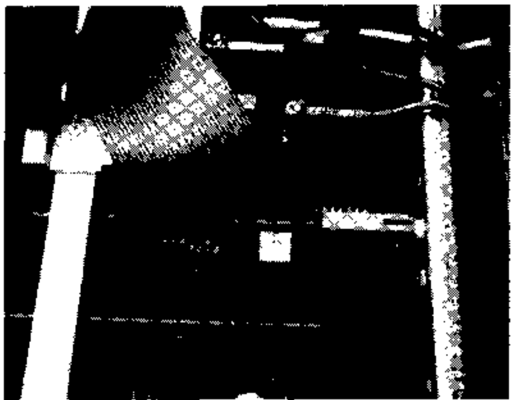
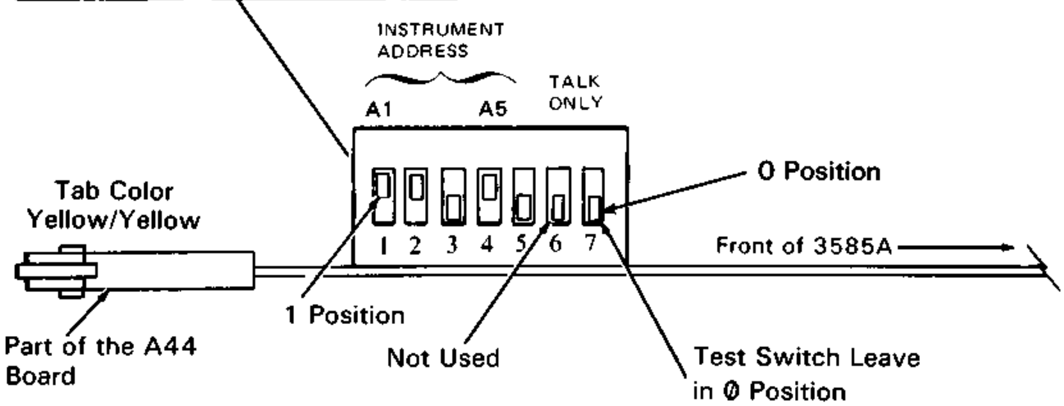
Top View of 3585A Showing Location of A44 Board.



NOTE

When changing the HP-IB address **do not** *change the switches on the A45 board (tab color yellow/ green.) The HP-IB Address Switch is under the gray ribbon cable.*



ASCII Code Character		Address Switches					5-bit Decimal Code
Listen	Talk	A5	A4	A3	A2	A1	
SP	@	0	0	0	0	0	00
!	A	0	0	0	0	1	01
"	B	0	0	0	1	0	02
#	C	0	0	0	1	1	03
$	D	0	0	1	0	0	04
%	E	0	0	1	0	1	05
&	F	0	0	1	1	0	06
'	G	0	0	1	1	1	07
(	H	0	1	0	0	0	08
)	I	0	1	0	0	1	09
*	J	0	1	0	1	0	10
+	K	0	1	0	1	1	11 FACTORY SETTING
,	L	0	1	1	0	0	12
–	M	0	1	1	0	1	13
.	N	0	1	1	1	0	14
/	O	0	1	1	1	1	15
0	P	1	0	0	0	0	16
1	Q	1	0	0	0	1	17
2	R	1	0	0	1	0	18
3	S	1	0	0	1	1	19
4	T	1	0	1	0	0	20
5	U	1	0	1	0	1	21
6	V	1	0	1	1	0	22
7	W	1	0	1	1	1	23
8	X	1	1	0	0	0	24
9	Y	1	1	0	0	1	25
:	Z	1	1	0	1	0	26
;	[	1	1	0	1	1	27
<	\	1	1	1	0	0	28
=	]	1	1	1	0	1	29
>	~	1	1	1	1	0	30

Figure 2-6. Address Selection.

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2-20. REPACKAGING FOR SHIPMENT

2-21. Original Packaging

If at all possible, repackage the instrument in the original container, which is specially designed to accommodate the weight of the 3585A. Containers and materials equivalent to those used in factory packaging are available through -hp- Sales and Service Offices. Place the instrument in the container with appropriate (3 to 4 inches) packing material and seal well with strong tape or metal bands. Also mark the container "FRAGILE" to insure careful handling.

NOTE

If the instrument is to be returned to -hp- for service, attach a tag indicating the type of service required. Include any symptoms or details that may be of help to the service technician. Also include your return address, the instrument's model number and full serial number. In any correspondence, identify the instrument by model number and full serial number.

2-22. Other Packaging

The following general instructions should be used for repackaging with commerically-available materials:

a. Wrap the instrument in heavy paper or plastic. (If shipping to a Hewlett-Packard office or service center, attached a tag indicating the type of service required, return address, model number, and full serial number.)

b. Use a strong shipping container. A doublewall carton made of 250-pound test material is adequate.

c. Use enough shock-absorbing material (3-to-4 inch layer) around all sides of the instrument to provide firm cushion and prevent movement inside the container. Protect the control panel with cardboard.

d. Seal the shipping container securely.

e. Mark the shipping container FRAGILE to assure careful handling.

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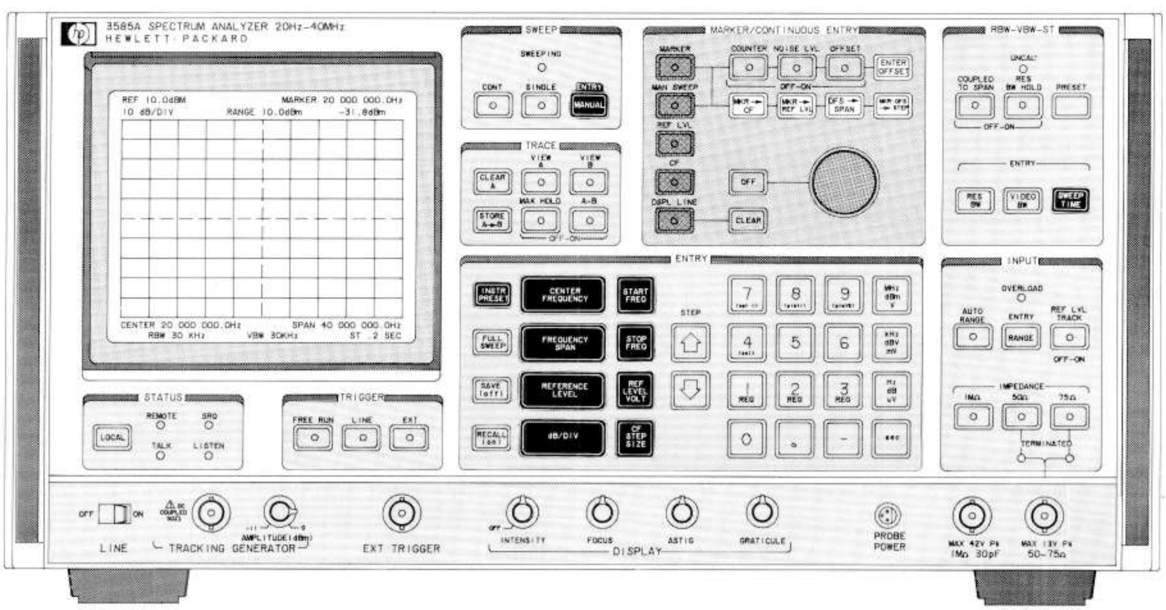
SECTION III

OPERATION OVERVIEW

This section provides an overview of the 3585A and general information concerning its major performance capabilities and operating features. Full details concerning -hp- 3585A operation can be found in the Operating Manual. Contents of the overview are as follows:



The 3585A Front Panel

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3-1. PERFORMANCE SUMMARY AND DESCRIPTION

The Model 3585A is a high-performance, easy-to-use spectrum analyzer, covering the 20 Hz to 40.1 MHz frequency range. It can be used as a stand-alone bench instrument for signal-analysis and network-analysis applications; or, through its HP-IB interface, it can be linked to a computing controller and up to thirteen other HP-IB instruments to form a powerful automatic measurement system.*

3585A PERFORMANCE SUMMARY

FREQUENCY:

Measurement Range:

20 Hz to 40.1 MHz

Displayed Range:

0 Hz to 40.1 MHz full span

Resolution:

3 dB bandwidths of 3 Hz to 30 kHz in a 1, 3, 10 sequence

Manual Frequency Accuracy:

± 0.1 Hz $\pm$ 1 x 10^{-7}/mo.

Marker Accuracy:

Normal ± 0.2% of Frequency Span ± Resolution Bandwidth

Counter ± 0.3 Hz ± 1 x 10^{-7}/mo.

AMPLITUDE:

Measurement Range:

− 137 dBm to + 30 dBm (50Ω or 75Ω)

Displayed Range:

10, 5, 2, 1 dB/DIV over a 10 division scale

Dynamic Range:

Harmonic distortion and third order intermodulation distortion > 80 dB below signal ≤ to the Range Setting.

Average Noise Level:

< − 137 dBm in the 3 Hz Resolution Bandwidth

Accuracy:

Best achievable accuracy over the measurement range is ± 0.4 dB to ± 1.3 dB depending on the level.

SWEEP:

Time:

0.2 sec. to 59,652 hrs.

INPUT:

Signal Inputs:

Terminated 50/75Ω; return loss > 26 dB

High-Impedance 1 MΩ; ± 3% shunted by < 30 pf

Max. Input Level:

50/75Ω; + 30 dBm (1 watt)

1 MΩ; 42 V Peak

OUTPUTS:

Tracking Generator:

0 dBm to − 11 dBm (50 ohms)

Display:

X, Y, and Z outputs for auxiliary CRT display

Plotter:

Horizontal sweep output (x), video output (y), and penlift/blanking output to drive an X-Y recorder.

INSTRUMENT STATE STORAGE:

Up to three sets of user-defined control settings may be saved and recalled.

REMOTE OPERATION:

All analyzer control settings (with the exception of line, tracking generator amplitude and display) can be programmed via the Hewlett-Packard Interface Bus (HP-IB).*

*Hewlett-Packard Interface Bus (HP-IB) is -hp-'s implementation of IEEE Standard 488-1975 and identical ANSI Standard MC1.1, "Digital Interface for Programmable Instrumentation".

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3-2. TURN ON AND WARMUP

Before applying ac line power to the 3585A, make certain that the rear-panel VOLTAGE SELECTOR switch is in the position that corresponds to the voltage and frequency of the ac power source. Also verify that the proper line fuse is installed in the rear-panel fuse holder (see Section II).

The 3585A specifications are met after a 20-minute warmup at the ambient operating temperature.

3-3. Frequency Reference

The 3585A can be operated using its own internal Oven Reference or an external frequency reference. The internal or external frequency reference must be connected to the rear-panel EXT REF IN connector.

3-4. Internal Oven Reference

The 3585A is equipped with a temperature-stabilized, crystal-controlled 10 MHz reference oscillator, whose output is available at the rear-panel OVEN REF OUT connector. The frequency accuracy of this internal Oven Reference is expressed as a time coefficient of 10 MHz $\pm$ 1 x 10^{-7} per month, relative to the time the instrument is shipped from the factory or the reference frequency is adjusted using the procedure outlined in Volume One of the Service Manual. The Oven Reference time coefficient is included in the Counter and Manual frequency accuracy specifications.

To use the internal Oven Reference, connect the BNC to BNC jumper (supplied with the instrument) between the rear-panel OVEN REF OUT and EXTERNAL REF IN connectors.

NOTES

1. Power is applied to the internal reference oven only when the LINE switch is in the ON position. The 3585A does not have a "standby" mode.

2. The output of the internal Oven Reference is **disabled** *until the oven reaches the proper operating temperature. During the oven warmup cycle, there is no signal applied to the EXT REF IN connector; so the 3585A's master oscillator runs in the open-loop mode in which the frequency accuracy is unspecified. When the oven reaches the proper operating temperature (about ten minutes after turn on), the Oven Reference is automatically enabled. At that time, the beeper sounds and the message, "L.O. UNLOCKED" momentarily appears on the CRT screen. The message disappears as soon as the master oscillator is phase-locked to the Oven Reference.*

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3-5. External Reference

For applications requiring optimum frequency accuracy, the 3585A can be phase locked to an external frequency standard. The external reference frequency must be 10 MHz or any subharmonic down to 1MHz (±5 ppm); and the amplitude must be within the range of 0 dBm to + 15 dBm (50 ohms). The frequency accuracy of the external reference may be substituted for the Oven Reference time coefficient in the Counter and Manual frequency-accuracy specifications. To avoid performance degradation, the phase noise and spurious content of the external reference signal must be at least −110 dBc (1 Hz) relative to 10 MHz) at a 20 Hz to 1 kHz offset. •

To use an external reference:

1. Remove the jumper from between the rear-panel OVEN REF OUT and EXTERNAL REF IN connectors.

   (To keep from losing the jumper, you may connect one end of it to any unused rear-panel connector.)

2. Using a shielded cable equipped with BNC connectors, connect your external reference to the EXTERNAL REF IN connector.

   (When the reference is initially connected, the beeper will sound and the "L.O. UNLOCKED" message will appear on the screen. The message will continue to be displayed until the master oscillator is properly phase-locked to the external reference.)

3-6. Operational Verification

The 3585A automatically performs an internal operational verification test and calibration during its turn-on sequence and also when the [INSTR PRESET] key is pressed. This internal test verifies that most of the analog and digital circuitry is operating properly; but it does not verify that the 3585A meets its published specifications. In the event of a test failure, the instrument's beeper will sound and, in most cases, a Calibration Error Code or failure message will appear on the CRT screen.

NOTE

The beeper will sometimes sound as a result of the local oscillator being unlocked during the instrument's turn-on sequence; but this initial "beep" does not constitute a test failure. To perform the verification test, allow the instrument to warmup for about two minutes and then press [INSTR PRESET] *. If this causes the beeper to sound, the instrument is either defective or in need of adjustment. Contact a qualified service technician or return the 3585A to -hp- for service.*

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3-7. FRONT PANEL FEATURES

Even a casual glance at the front panel reveals that the 3585A is more than just an ordinary spectrum analyzer. One of the first things you will observe is that the front panel is almost completely devoid of the normal "analog" controls and dials found on traditional instruments. In place of these controls are pushbutton keys which are used to activate the various instrument functions and change the values of the operating parameters. The keys are conveniently arranged in functional groups called "control blocks". Each control block is labeled to assist the operator in locating the keys that are related to a specific parameter or function.

With its vast array of front-panel functions, the 3585A may at first appear to be quite complicated and difficult to operate. It is, of course, a very compact and sophisticated piece of equipment, having 70 keys, one knob and a large CRT screen in about 124 square inches of front panel. Despite its appearance, you will quickly discover that the 3585A is very easy to operate. It is actually easier to use than most oscilloscopes and almost as straightforward as an auto-ranging digital voltmeter.

You will have no trouble learning to operate the 3585A regardless of your range of experience with spectrum analyzers. By taking full advantage of the 3585A's automatic features, the inexperienced user can confidently make almost any type of signal-analysis measurement using a simple six-step procedure outlined in Chapter 2 of the Operating Manual.

If you are experienced in the use of traditional spectrum analyzers, you will immediately recognize most of the 3585A's operating parameters. While you may have some initial reservations about automatic features and the keyboard control over what is actually an "analog" instrument, your reservations will soon diminish as you discover the ease with which you can make sophisticated measurements and, at the same time, have complete flexibility and finger-tip control over every operating parameter and function. You will also appreciate the "human engineering" aspects that have carefully been incorporated in the design of the 3585A.

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THE GREEN BUTTON [INSTR PRESET]

If there is any one key that stands out among all the rest, it is the green INSTR PRESET (Instrument Preset) key, located in the ENTRY control block. This key represents one of the most important aspects of operation and is probably the key that is most frequently used. It is neither a "panic button" nor a device to reset the processors, although it could perform these functions if they were required. Its primary purpose is simply to provide a convenient starting point for almost any type of measurement that you wish to perform. Even the most experienced operators (including the instrument's designers) normally begin their measurements with [INSTR PRESET].

The [INSTR PRESET] key performs the following functions:*

a. Forces all parameters and functions to their turn-on states.

b. Restores a full 0 Hz to 40 MHz Frequency Span, with Resolution and Video Bandwidths of 30 kHz and a 0.2-second continuous sweep.

c. Activates all automatic and coupled functions.

d. Optimizes the Reference Level coupling and the Bandwidth/Sweep-Time coupling.

e. Activates the Terminated input and selects the 50-ohm IMPEDANCE setting.

f. Initiates an internal test sequence and an Automatic Calibration.

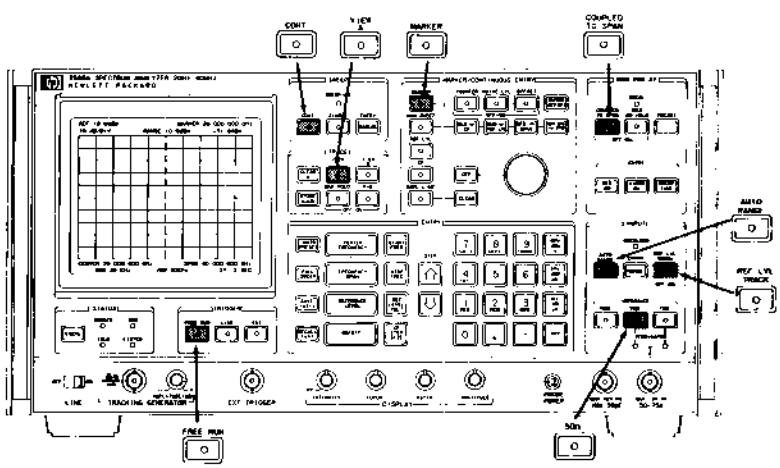
Presetting does not destroy the trace that is stored in Trace Memory "B"; and it does not erase the instrument-state storage registers in which control settings may have previously been stored.

Parameters

Range	+30 dBm*
Reference Level (REF)	+30 dBm
Vertical Scale (dB/DIV)	10 dB/DIV
Frequency Span (SPAN)	40 MHz
Center Frequency (CENTER or CF)	20 MHz
Start Frequency (START)	0.0 Hz
Stop Frequency (STOP)	40 MHz
Resolution Bandwidth (RBW)	30 kHz
Video Bandwidth (VBW)	30 kHz
Sweep Time (ST)	0.2 SEC.
Marker Frequency	20 MHz
Offset Register	0 Hz; 0 dBV

*With no input signal, the instrument automatically downranges to -25 dBm. With REF LVL TRACK activated, the Reference Level changes along with the Range setting.

Functions



Parameters and Functions Selected By [INSTR PRESET]

*The [INSTR PRESET] function is also used to activate instrument Test Modes and "pop" the instrument's Central Processor for certain types of diagnostic tests. These functions are fully described in Volume Two of the Service Manual.

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FULL SWEEP PRESET [FULL SWEEP]

After completing a measurement with a narrow Frequency Span, it is sometimes desirable to return to a full 0 Hz to 40 MHz Span to locate the next signal to be measured without presetting the entire instrument. This can be done by pressing [FULL SWEEP]. The FULL SWEEP function does nothing but set the Center Frequency to 20 MHz and the Frequency Span to 40 MHz. It does not change the Marker position, erase Offsets, activate or deactivate any front-panel functions or change the values of the operating parameters.(With [COUPLED TO SPAN 0] activated, the RBW, VBW and Sweep Time parameters are coupled to Frequency Span and may, therefore, change when [FULL SWEEP] is pressed. The change in Center Frequency and/or Resolution Bandwidth caused by pressing [FULL SWEEP] initiates an Automatic Calibration.)

THE BEEPER

The 3585A communicates with the operator via alphanumeric messages that appear on the CRT screen. To call the operator's attention to these messages, it is equipped with an audible alerting device, called the "beeper", which produces a gentle (yet penetrating) high-pitched "beep" tone. The beeper sounds a single "beep" whenever a message of importance initially appears on the screen; and "beeps" again whenever the condition that produces the message is repeated. The beeper also sounds whenever an error is detected in the internal test routine that is performed during the turn-on sequence and each time the instrument is preset.

The beeper is automatically enabled by [INSTR PRESET]. It can be disabled by entering [SAVE (off)] [5]; and reenabled by entering [RECALL (on)] [5].

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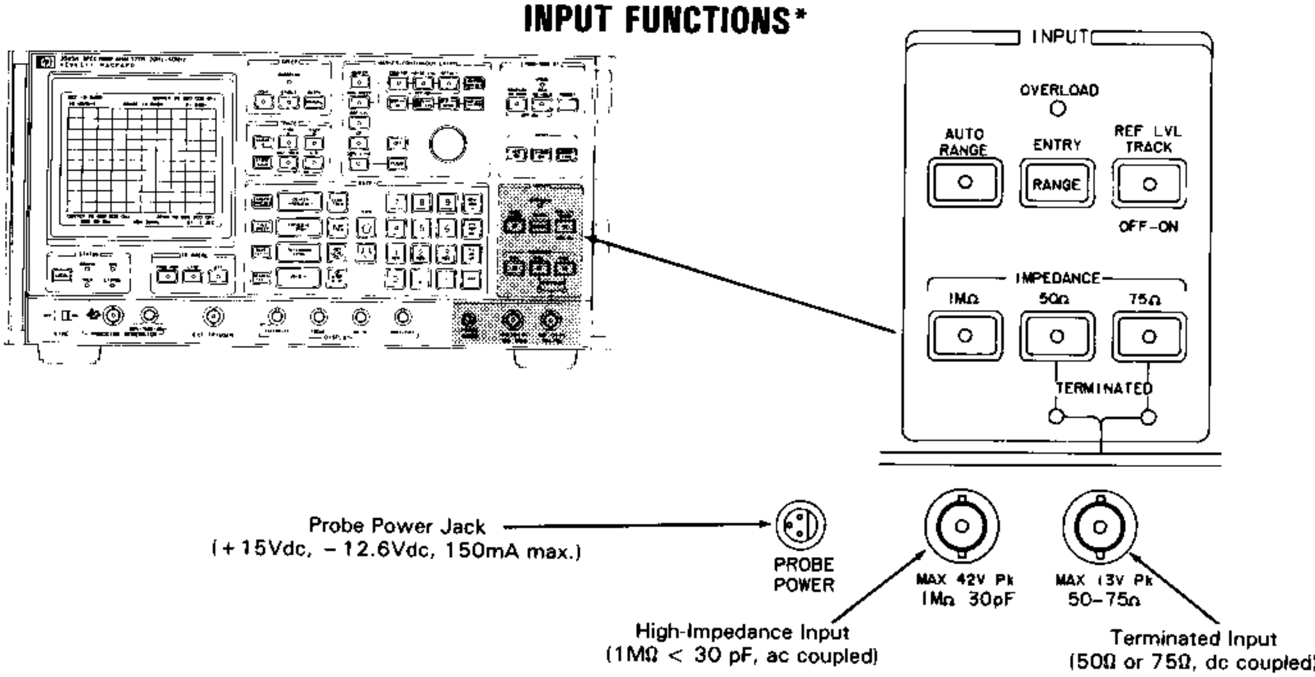
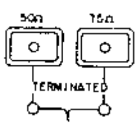
INPUT FUNCTIONS*



CAUTION

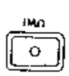
1. The Terminated input is dc coupled. Peak (combined ac/dc input) levels exceeding ±13 volts will "trip" the internal protection circuit causing the input to open, but such levels may also damage the input circuitry.

2. RF input levels exceeding ±5.25 volts peak may damage the High-Impedance input circuitry. The combined ac/dc input level applied to the High-Impedance input must not exceed ±42 volts peak.



Activate Terminated input and select 50Ω or 75Ω dc-coupled termination. Also used to select 50Ω or 75Ω calibration impedance for dBm measurements at the High-Impedance input.

Lights indicate that Terminated input is terminated in 50Ω or 75Ω, and also indicate the calibration impedance.



Activates High-Impedance input; deactivates Terminated input.

Sets RANGE automatically as a function of the composite ac input-signal level.

Deactivates AUTO RANGE; prefaces RANGE, enabling it to be changed with STEP keys.

OVERLOAD Lights when ac input-signal level exceeds RANGE setting.

Couples Reference Level (amplitude of top graticule line) to RANGE. Initially sets Reference Level equal to RANGE to maintain on-screen display. The Reference Level can be set equal to RANGE at any time by turning REF LVL TRACK off and then back on.

*See Operating Manual (Chapter 4) for additional information.

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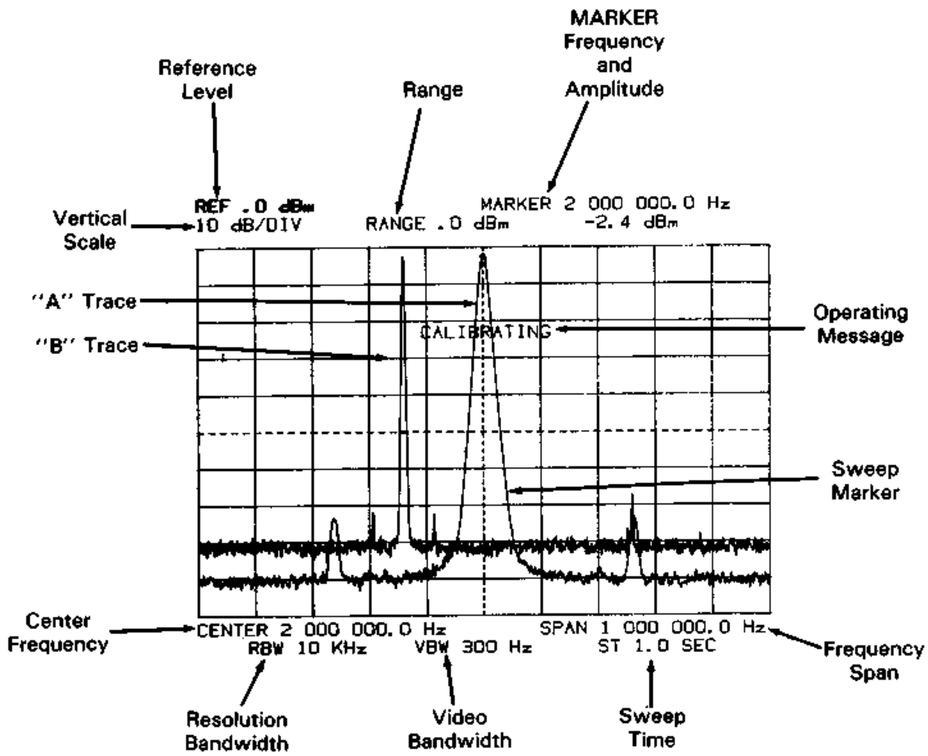
CRT DISPLAY OVERVIEW*



The CRT (Cathode Ray Tube) displays:

a. Graphic traces of amplitude-versus-frequency:

Two digitally-stored graphic traces, read out of Trace Memories "A" and/or "B", are written onto the CRT screen at a rapid, flicker-free rate. Each trace is a point-by-point plot, consisting of 1,001 equally-spaced points, connected by straight lines. Trace Memory "A", containing the Current ("A" or "A-B") Trace, is updated by the frequency sweep or at the Manual measurement point by real-time video samples taken at the Manual frequency. Trace Memory "B" is updated only by transfer from Trace Memory "A" with [STORE A→B] .

*See Operating Manual (Chapter 6) for additional information.

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b. Markers:

1. Tunable Marker:

Positioned with [MARKER] ◯, [MAN SWEEP] ◯, or by otherwise changing the Manual frequency. Used for direct measurement of on-screen responses or for real-time measurements in the Manual mode.

2. Stationary (Offset) Marker

With [OFFSET] activated, the stationary marker appears at the point on the CRT trace that represents the Offset reference frequency.

3. Sweep Marker:

Displayed, when Sweep Time is ≥ 1 second, to indicate the position of the frequency sweep.

c. Display Line:

When the [DSPL LINE] function if activated, a horizontal Display Line appears on the CRT screen. The Display-Line amplitude can be adjusted with [DSPL LINE] ◯ to measure the trace amplitude in "dB" relative to the Reference Level (top graticule line).

d. Measurement Data:

The Frequency/Amplitude readout, in the top-right corner of the CRT screen, displays the Marker, Counter, Manual or Offset frequency and amplitude or the Display-Line amplitude, depending on which MARKER/CONTINUOUS ENTRY functions are activated.

e. Current values of all pertinent operating parameters.

f. Operating Messages:

1. Status Messages; e.g., "CALIBRATING"

2. Entry Requests; e.g., "ENTER REG. NUMBER"

3. Operator Error Messages; e.g., "OUT OF RANGE"

4. Calibration Error Codes; e.g., "CALIBRATION ERROR 01"

g. Externally-generated graphics and alphanumerics, remotely entered via the HP-IB.

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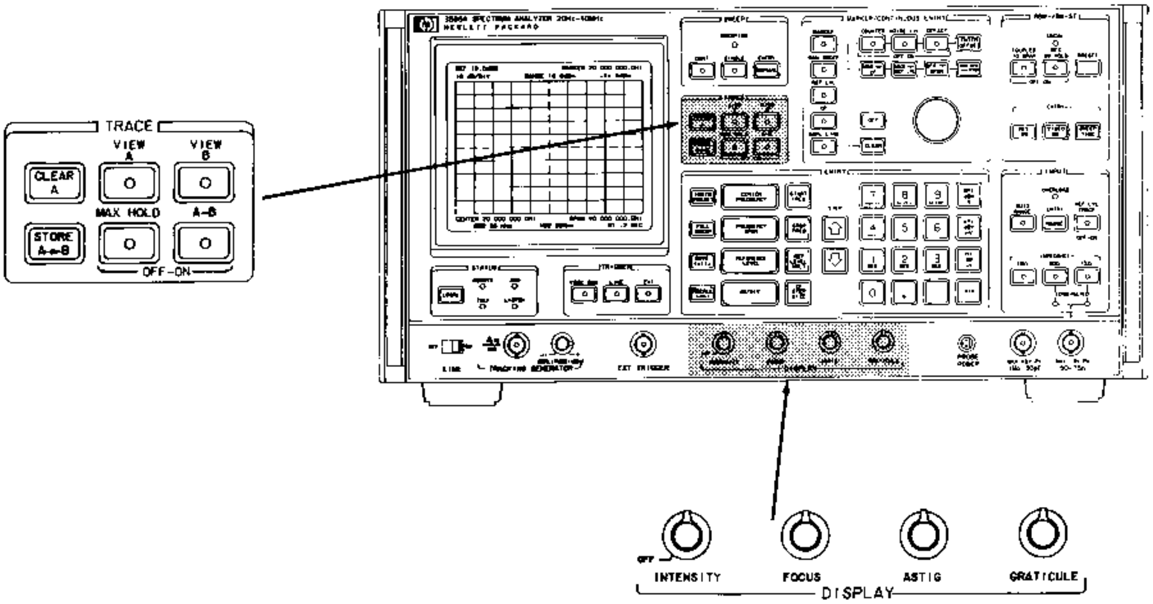
DISPLAY ADJUSTMENTS AND TRACE FUNCTIONS*



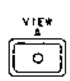
Display Adjustments:

Controls the intensity of all CRT writing. Minimum intensity (OFF) blanks the CRT.

Adjust for optimum sharpness and clarity of CRT image.

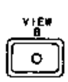
Controls background illumination.

Trace Functions:



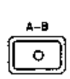
Displays Current ("A" or "A-B") Trace stored in Trace Memory "A".

Nondestructively transfers the Current Trace to Trace Memory "B" where it is safely kept until a different trace is stored or the instrument is turned off.



Displays trace that is stored in Trace Memory "B".

Erases Trace Memory "A". Resets and automatically rearms Continuous sweep; terminates Single sweep.



Subtracts "B" Trace from current "A" Trace and writes the difference into Trace Memory "A" to produce the "A-B" Trace.

Causes the Current Trace to retain the maximum positive video amplitude that occurs over succesive frequency sweeps or at the Manual measurement point.

*See Operating Manual (Chapter 6) for additional information.

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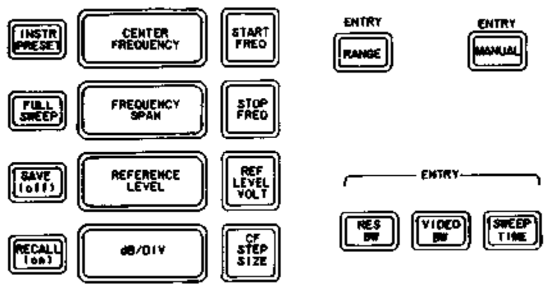
KEYBOARD ENTRY FUNCTIONS*



Entry Keys

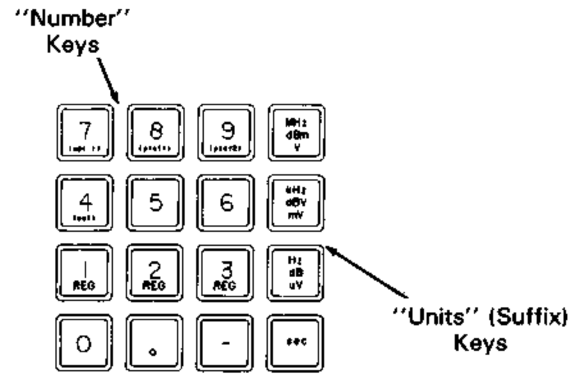
Each of the 3585A's major operating parameters has a dark brown ENTRY key which, when pressed, prefaces that parameter. The prefaced parameter is highlighted on the CRT screen to indicate that its value can be changed using the STEP keys or the Number/Units keyboard.

Step Keys

The STEP keys increment or decrement the value of the prefaced parameter. Each press of a STEP key produces a single step; multiple step changes can be made without reprefacing. Step sizes for all parameters except Center Frequency and Manual frequency are internally defined to either produce an appropriate amount of change or select the next available setting. Center and Manual frequency steps are equal to the Center-Frequency Step Size which can be set to any value within the range of 0 Hz to 40.1 MHz with 0.1 Hz resolution. Steps that would exceed the upper or lower limit of a parameter are not accepted.

Number/Units Keyboard

The value of any prefaced parameter (except RANGE) can be set exactly using the Number/Units keyboard. To numerically change the value of a prefaced parameter, simply enter the desired number using the "Number" keys and then terminate the entry by pressing the appropriate suffix (Units) key. The 3585A's free-entry format allows you to make your entries in the units that are the most convenient. Entries that exceed the limits of a parameter or attempt to select unavailable settings are not accepted.



*See Operating Manual (Chapter 5) for additional information.

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SAVE (off)/RECALL (on) FUNCTIONS [SAVE (off)] [RECALL (on)]

[SAVE (off)] or [RECALL (on)] followed by [1 REG], [2 REG] or [3 REG], saves or recalls instrument state in Register 1, 2 or 3.

[SAVE (off)] [4] disables Auto. Cal.*

[RECALL (on)] [4] enables Auto. Cal. and forces Auto. Cal. cycle.

[SAVE (off)] [5] disables beeper.*

[RECALL (on)] [5] enables beeper and causes beeper to sound.

[RECALL (on)] [6] initiates Instrument Test Mode entry sequence. (See Volume Two of the Service Manual.)

[SAVE (off)] [6] does nothing.

[SAVE (off)] [RECALL (on)] [7], [8] and [9] are plotter functions (see Operating Manual).

*Auto. Cal. and beeper are automatically enabled by [INSTR PRESET].

Instrument-State Storage

To save time when making a series of measurements requiring different control settings, the SAVE key can be used to store the current operating parameters and states of the front-panel functions in Register 1, 2 or 3. The stored parameters and functions can then be recalled at any time using the RECALL key. The contents of the Instrument-State Storage Registers are retained until different settings are stored or the instrument is turned off.

Example:

Save the current instrument state in Register 1 by pressing [SAVE (off)] [1 REG].

Press [INSTR PRESET] or otherwise change the instrument state.

Recall the stored settings by pressing [RECALL (on)] [1 REG].

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Things That Are Saved:

a. Operating Parameters:

Range (if [AUTO RANGE] deactivated)
Reference Level (and amplitude display units)
Vertical Scale (dB/DIV)

Frequency Span
Center Frequency
Manual frequency (if in Manual mode)
Center-Frequency Step Size

Resolution Bandwidth
Video Bandwidth
Sweep Time

b. States of all front-panel functions having LED indicators.

c. Marker position

d. Display-Line amplitude

e. Offset reference frequency and amplitude (whether or not [OFFSET] on)

Things That Are Not Saved:

a. CRT traces

b. "On" states of momentary-contact functions; e.g., [MKR → CF] .

d. Other [SAVE (off)] / [RECALL (on)] functions:

Calibration disabled
Beeper disabled
Test modes
Plotter functions

e. Prefaced parameter

f. HP-IB Status (as indicated by STATUS lights)

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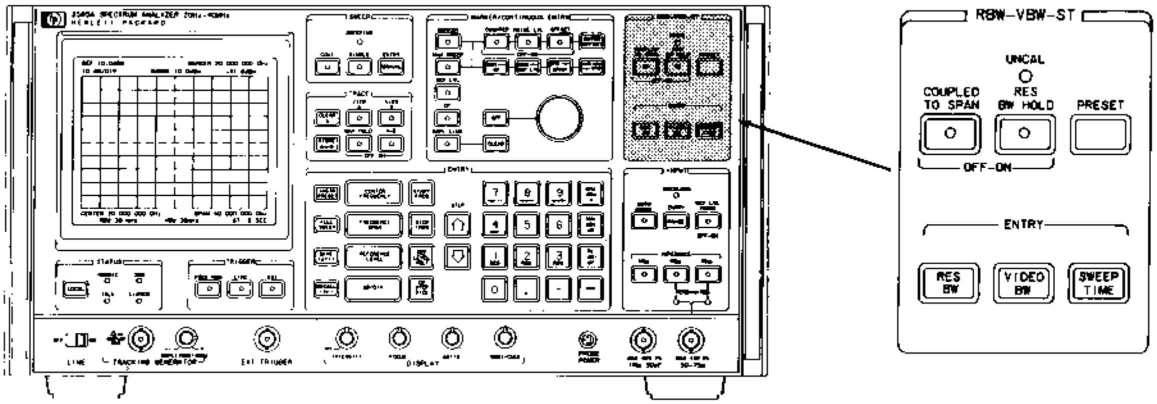
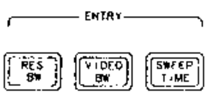
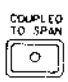
BANDWIDTH AND SWEEP TIME FUNCTIONS*





The ENTRY keys preface the Resolution Bandwidth (RBW), Video Bandwidth (VBW) or Sweep Time (ST) parameter. The prefaced parameter can be changed by Step Entry or Numeric Entry.



Couples RBW to Frequency Span; couples VBW to RBW; automatically adjusts Sweep Time according to RBW, VBW and Frequency Span. (The [INSTR PRESET] function activates [COUPLED TO SPAN], deactivates [RES BW HOLD] and optimizes the RBW, VBW ST coupling.)

Prevents the RBW *and* VBW from changing as a function of Frequency Span. It also prevents RBW (but not VBW) from changing when the PRESET key is pressed. (Does not prevent Step or Numeric RBW/VBW changes.)

Restores optimum RBW, VBW and Sweep Time settings. (If [RES BW HOLD] is activated, the PRESET key restores the optimum VBW and Sweep time; but does not affect the RBW).

Lights when manually-selected sweep rate too fast to maintain calibration. (Accuracy specifications are met *only* when this light is out.)

*See Operating Manual (Chapter 7) for additional information.

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OPERATION WITH BANDWIDTH/SWEEP TIME COUPLING:

To begin a measurement, the operator normally presses INSTR PRESET. This activates COUPLED TO SPAN, deactivates RES BW HOLD and sets the Frequency Span to 40 MHz. It also sets the RBW and VBW to 30 kHz and the Sweep Time to 0.2 seconds. These are the preferred or "optimum" settings for the full 40 MHz Span.

After connecting the signal source, the operator adjusts the Center Frequency and Frequency Span (or Start and Stop Frequencies) to display the signals of interest. During this process, the Resolution Bandwidth is automatically narrowed as a function of Frequency Span to maintain a good aspect ratio and provide an appropriate amount of frequency resolution. Since the Video Bandwidth is coupled to Resolution Bandwidth, it changes along with the RBW to maintain proportional display smoothing. The Sweep Time is mathematically calculated according to the RBW, VBW and Frequency Span, and is automatically adjusted to maintain the maximum-calibrated sweep rate or the analyzer's minimum Sweep Time of 0.2 seconds.

Once the frequency parameters have been set, the operator can freely adjust the RBW and/or VBW settings to obtain the required resolution, sensitivity and display smoothing. With optimized Sweep Time coupling, the Sweep Time is automatically adjusted to maintain the optimum sweep rate. If desired, the Sweep Time can be increased from the optimum setting to minimize the effects of sweep dynamics; or it can be decreased (at the cost of calibration) to quickly survey the spectrum of interest.

The coupling system is very flexible and will allow the operator to select any available RBW, VBW, Sweep Time combination. It will then remember and, where possible, maintain the relationships established by the operator. The optimum settings can be restored by pressing the PRESET key.

For applications such as horizontal expansion, it is desirable to maintain a specific RBW setting and adjust the Frequency Span, while allowing the coupling system to automatically adjust the Sweep Time. This can be done by activating the RES BW HOLD function.

If the operator does not wish to use the coupling system, it can be completely disabled by deactivating the COUPLED TO SPAN function. (The UNCAL indicator and PRESET key are operative whether or not the COUPLED TO SPAN function is activated.)

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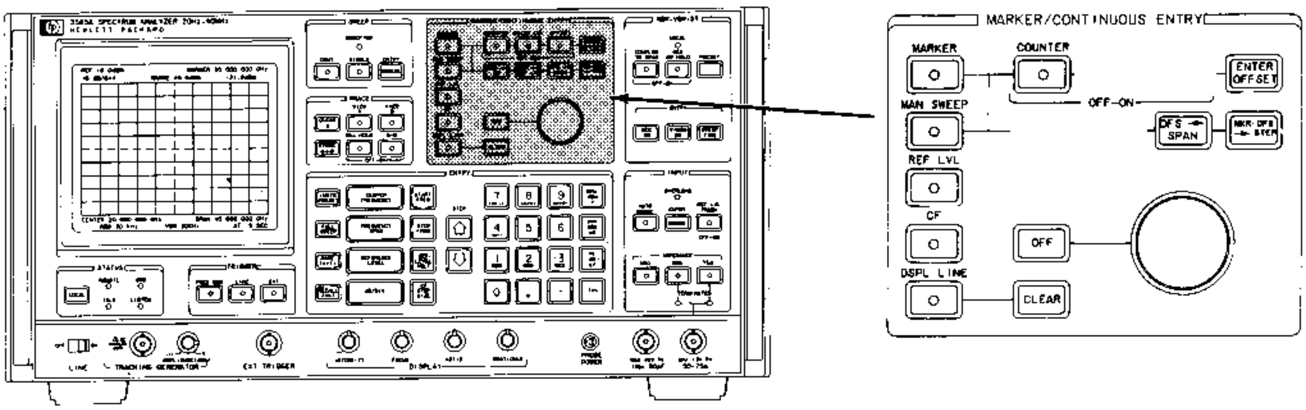
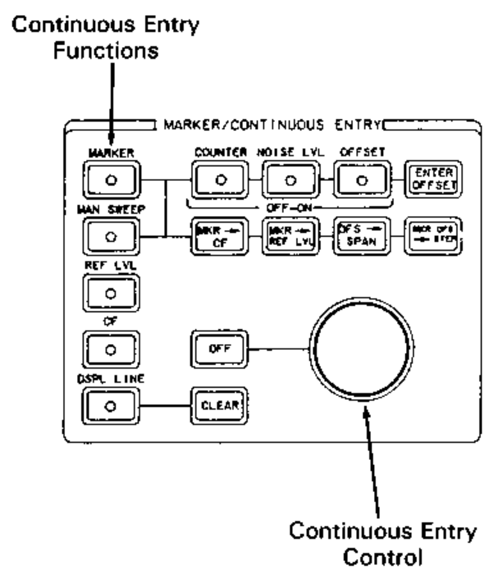
MARKER/CONTINUOUS ENTRY FUNCTIONS*



Continuous Entry Functions

The Continuous Entry control is a multi-purpose "digital potentiometer" whose function is selected using the Continuous Entry keys. (Only one Continuous Entry Function can be activated at a time.) It can be used with:

- MARKER: to position the tunable Marker for measurement of on-screen responses.
- MAN SWEEP: to tune the Manual frequency.
- REF LVL: to adjust the Reference Level.
- CF: to adjust the Center Frequency.
- DSPL LINE: to adjust the Display-Line amplitude.



*See Operating Manual (Chapter 8) for additional information.

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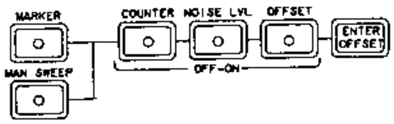
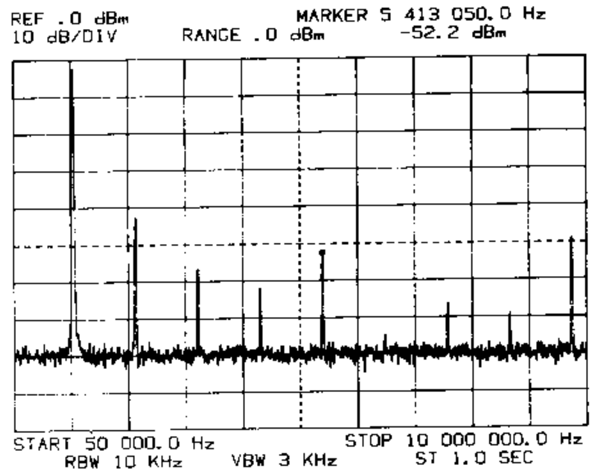
Marker/Manual Measurement Functions



Marker

Measure absolute frequency and amplitude of on-screen responses with MARKER [key] ○

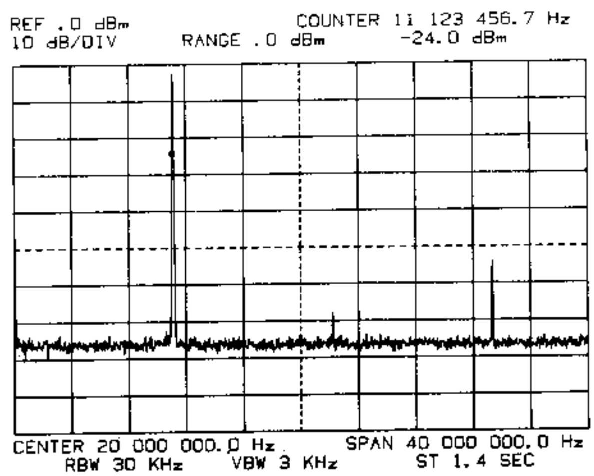
(The Marker amplitude can be displayed in dBm (50Ω or 75Ω), dBV or rms volts. The Marker's frequency resolution and accuracy is limited by the point-by-point display and sweep dynamics.)



Counter

Use the COUNTER [key] function to precisely measure the frequency of the signal that is producing the response on which the Marker is positioned.

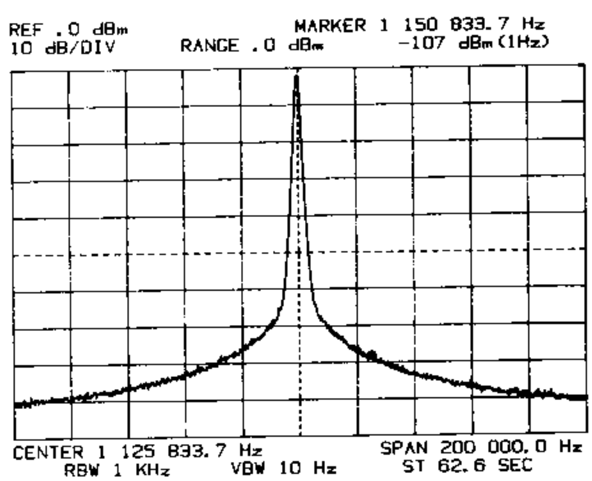
(The Counter, unaffected by display resolution and sweep dynamics, displays the true frequency at the peak of the response. The Marker does not need to be at the peak of the response, but it must be at least 20 dB above the noise and 20 dB above any unresolved signal.)



Noise Level

The NOISE LVL [key] function provides a direct real-time reading of the rms random noise spectral density at the Marker or Manual frequency, normalized to a 1 Hz noise power bandwidth. All correction factors are included in the internal noise-measurement routine.

(Absolute noise level readings are displayed in "dBm (1 Hz)", "dBV (1 Hz)" or "V Hz". Relative (Offset) noise readings are displayed in "dB (1 Hz)". Noise measurement times range from 0.3 seconds to 33 seconds, depending on the Resolution Bandwidth setting.)



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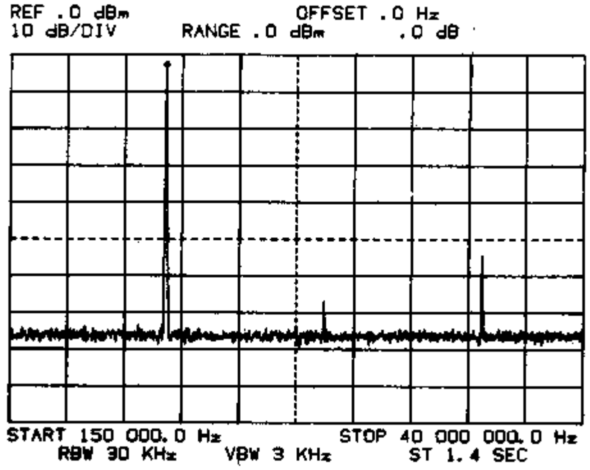
Offset Function

The [OFFSET] function allows you to quickly and easily measure the relative frequency and amplitude between two signals of interest or between any two points within the measurement range of the instrument. It can be used in conjunction with the [MARKER] or [MAN SWEEP] function to make relative measurements at the Marker or Manual frequency; it will operate with the [COUNTER] function to count the frequency difference between two signals; and it will also operate in conjunction with the [NOISE LVL] function to measure signal-to-noise ratio.

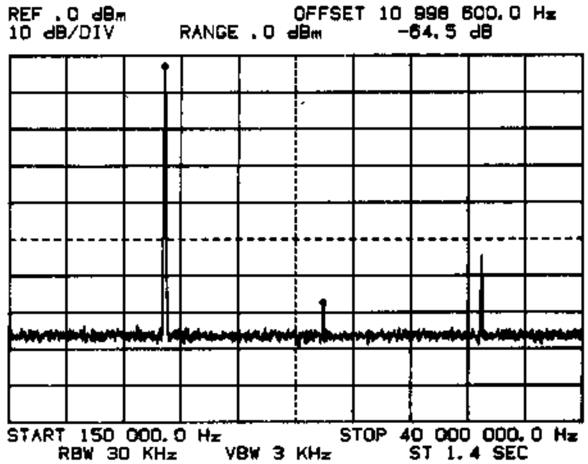
For example, to measure the frequency and amplitude of a harmonic relative to the fundamental:

a. Set the Marker to the peak of the fundamental response with [MARKER] ◯, activate [OFFSET] and then press [ENTER OFFSET].



b. Set the Marker to the peak of the harmonic response with ◯; observe the "OFFSET" reading.

(Offset amplitude readings are displayed only in "dB". A stationary marker remains at the point on the CRT trace that represents the Offset reference frequency.)



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Marker/Offset Entry Functions [MKR → CF] [MKR → REF LVL] [OFS → SPAN] [MKR-OFS → STEP]

The Marker/Offset entry functions are time saving, single-key operating aids which allow the operator to quickly perform frequently used manipulations such as centering a signal and moving it to the top of the screen. They also make it easy to enter an arbitrary Frequency Span, "zoom-in" on a signal of interest or enter the Center-Frequency Step size:

[MKR → CF] Sets the Center-Frequency equal to the current Marker, Counter or Manual frequency, and moves Marker to the Center-Frequency point on the CRT trace.

(To quickly move a response to the center of the screen, set the Marker to the peak of the response with MARKER [O] and then press [MKR → CF] .)

[MKR → REF LVL] Sets Reference Level equal to Marker amplitude.

(To move a response to the top of the screen, simply set the Marker to the peak of the response and press [MKR → REF LVL] .)

[OFS → SPAN] Sets Frequency Span equal to displayed "Offset" frequency. Operates only when OFFSET function is activated.

(Set the Marker to the desired Start Frequency, activate OFFSET [O] , press [ENTER OFFSET] ; move the Marker to the desired Stop Frequency and press [OFS → SPAN] .)

[MKR-OFS → STEP] Sets the Center-Frequency Step Size (also Manual frequency step size) equal to the Marker, Counter, Manual or Offset frequency, whichever is being displayed.

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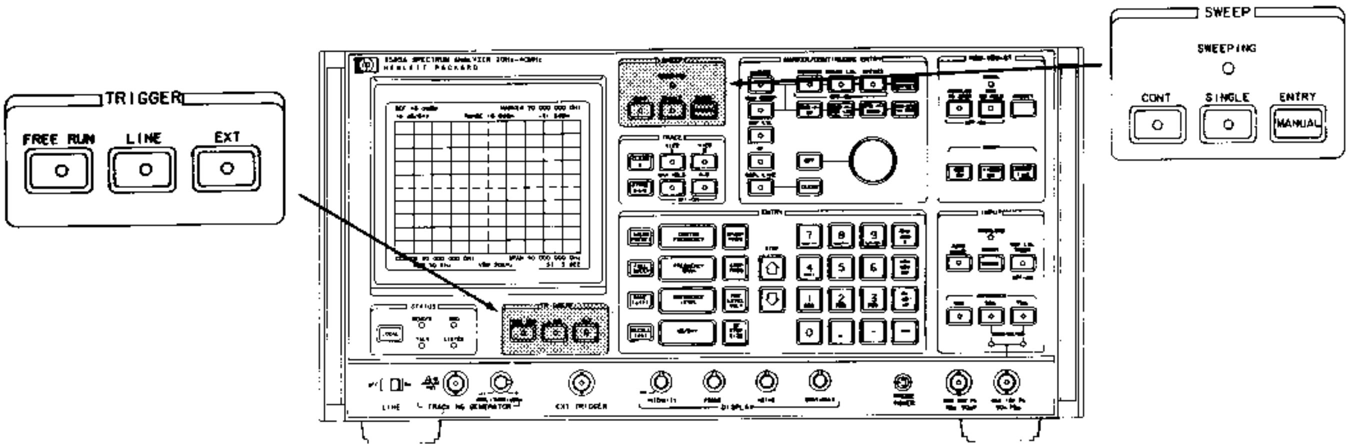
SWEEP AND TRIGGER FUNCTIONS



Sweep Functions:

SWEEPING — Lights to indicate that a frequency sweep is in progress. Goes out between sweeps and during mid-sweep interruptions.

CONT — Repetitive frequency sweeps synchronized by sweep trigger. Upon completion of each sweep, the sweep is automatically rearmed and a new sweep is initiated on receipt of a sweep trigger. Pressing [CONT] resets the sweep that is currently in progress (except when switching from Single).

SINGLE — Single frequency sweep initiated by sweep trigger. Once a Single sweep has terminated, it resets to the Start Frequency to await rearming. Pressing [SINGLE] (except when switching from Cont.) resets and/or rearms the sweep, enabling a new sweep to be initiated by a sweep trigger.*

ENTRY MANUAL — Selects Manual mode; automatically activates [MAN SWEEP] ; sets Manual frequency equal to current Marker frequency; prefaces Manual frequency, enabling it to be changed by Step or Numeric Entry.

Trigger Functions:

FREE RUN — Sweep automatically triggered after rearming.

LINE — Sweep internally triggered at power-line frequency (48 Hz to 440 Hz).

EXT — Sweep triggered by High-to-Low transition or contact closure at EXT TRIG input.*

EXT TRIGGER — High = open or +2.0V to +35V; Low = short to ground (outer shell) or +1.3V to −35V. Sweep triggered by High-to-Low transition; triggers are accepted only after the sweep has been rearmed. (Rearming time ranges from about 25 milliseconds to 2.4 seconds, depending on RBW/VBW settings.) Triggers applied during a sweep or during rearming are ignored.

*Sweep rearming and triggering operations are inhibited during Automatic Calibrations and also while operating parameters are being changed.

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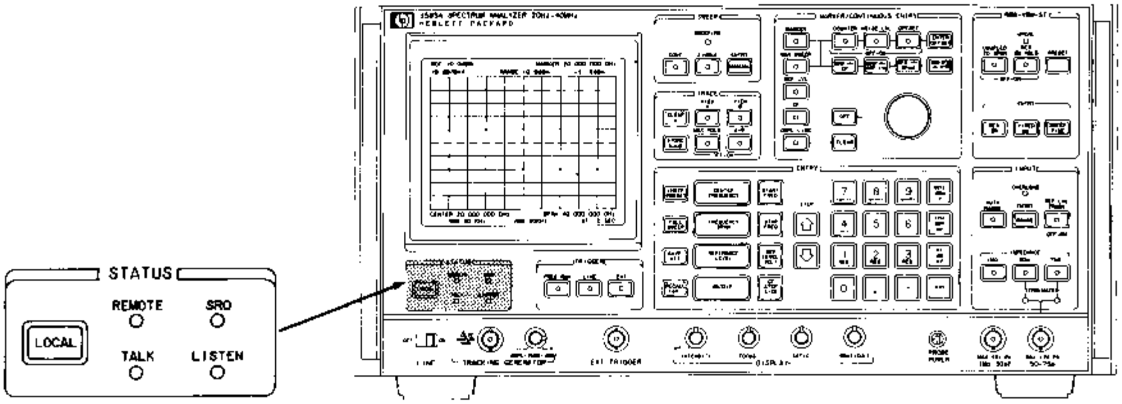
HP-IB STATUS FUNCTIONS*



REMOTE — Lights to indicate that the 3585A is in the Remote control mode. This mode can be entered only via the HP-IB.

(When the 3585A is in Remote, all front-panel functions except the LINE switch, the DISPLAY controls, the Tracking Generator AMPLITUDE control and the LOCAL key are disabled. Pressing any key (except [LOCAL] or [INSTR PRESET]) or rotating the Continuous Entry control will cause the beeper to sound and the message, "HP-IB REMOTE SET" to appear on the CRT screen.).

[LOCAL] — Returns the 3585A to Local and reenables all front-panel functions. An HP-IB Local Lockout will disable [LOCAL] until a remote Return To Local command is given, or the LINE switch is turned off and then back on.

(Pressing [LOCAL] during an HP-IB Local Lockout causes the beeper to sound and the message, "HP-IB LOCAL LOCKOUT" to appear on the CRT screen.)

LISTEN — Lights to indicate that the 3585A is addressed to listen.**

TALK — Lights to indicate that 3585A is addressed to talk.

Lights to indicate that the 3585A is generating an HP-IB Service Request.

*HP-IB operation is fully described in the Operating Manual.

**The LISTEN or TALK light will remain on (even in Local) until the 3585A is unaddressed via the HP-IB or is turned off and then back on.

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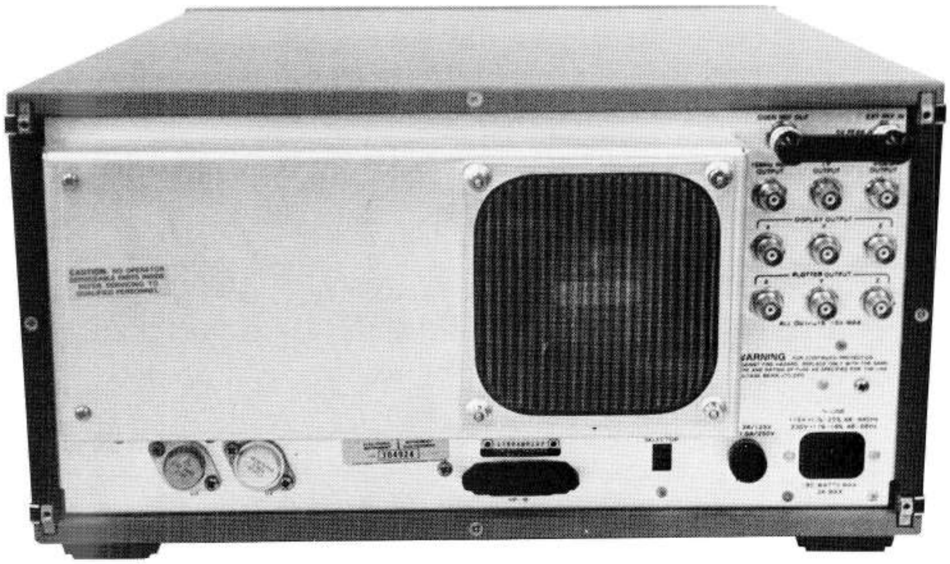
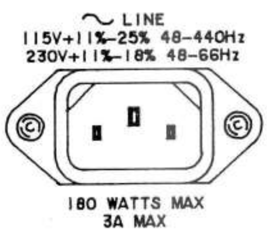
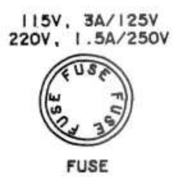
3-8. REAR-PANEL FEATURES



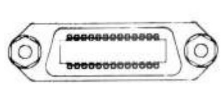


AC Line Input Connector: Accepts power cord supplied with instrument.



AC Line Fuseholder.

Line Voltage Selector Switch.



HP-IB Connector: Used to interface the instrument with the Hewlett-Packard Interface Bus (HP-IB) for remote operation. Remote operation is described in the Operating Manual.

The OVEN REF OUT supplies a 10 MHz $\pm$ 1 x 10^{-7} per month sinusoidal frequency reference from an internal crystal oscillator, located in a temperature-controlled oven. The output is ac coupled and the output impedance is 50 ohms. The nominal output level is +10 dBm/50 ohms. The output is disabled during the oven's warmup cycle. To use the internal Oven Reference, this output must be connected to the EXT REF IN jack.

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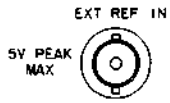
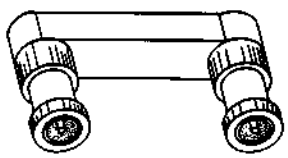
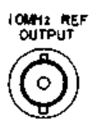


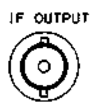
The EXT REF IN input allows the 3585A's master oscillator to be phase locked to the internal Oven Reference or an external frequency standard. The input is ac coupled and the input impedance is 50 ohms. The frequency of the reference signal applied to this input must be 10 MHz or any subharmonic down to 1 MHz (± 5 ppm), and the amplitude must be within the range of 0 dBm to +15 dBm (50 ohms). Dynamic range performance will be degraded unless the phase noise and spurious content of the reference signal is $\leq$ −110dBc (1 Hz) referred to 10 MHz at a 20 Hz to 1 kHz offset.



To use the internal Oven Reference, connect this BNC-to-BNC jumper between the OVEN REF OUT connector and the EXTERNAL REF IN connector.



The 10 MHz REF OUTPUT supplies a 10 MHz square wave that is phase locked to the reference frequency applied to the EXTERNAL REF IN connector. When the internal Oven Reference is used, the frequency accuracy is 10 MHz $\pm$ 1 x 10^{-7} per month. The output is transformer coupled, the output impedance is 50 ohms and the nominal output level is +20 dBm/50 ohms. This reference output can be used to phase lock an external signal source or another analyzer to the 3585A's frequency reference.



The IF OUTPUT is taken from a voltage divider which connects directly to the output of the 3585A's final IF filter. The output signal is a 350 kHz (nominal) sine wave, whose amplitude is linearily proportional to the amplitude of the input-signal component to which the 3585A is tuned. The output is ac coupled and the output impedance is approximately 450 ohms. When the signal amplitude is equal to the Reference Level and the Reference Level is +10 dB to −56 dB relative to the Range setting, the full-scale IF output level ranges from approximately 247 mV rms (−12.0 dBV) to 157 mV rms(−16.0 dBV), depending on the internal IF gain setting. The IF gain settability is limited to 4 dB steps and, because of the variable offsets that are introduced by the Automatic Calibration system, the IF gain and full-scale IF output level is not always the same for a given Reference Level setting. The full-scale IF output level will vary (over a 4 dB range) as a function of Reference Level, Range, Impedance and Resolution Bandwidth. Before using the IF Output in a critical measurement application, select the required operating parameters, force an Automatic Calibration and then *measure* the full-scale IF output level.

The IF Output can be used to drive an external detector (e.g., a voltmeter or wave analyzer) to obtain a linear video output which, in turn, can be used for audio monitoring in radio surveillance applications, or applied to the vertical input of a storage 'scope or X-Y Recorder for applications requiring a linear amplitude scale. The IF Output can also be connected to a true rms voltmeter, such as the -hp- Model 3403C, for making rms noise-level measurements.

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(The 3585A's equivalent noise bandwidth is approximately 1.2 times the 3 dB bandwidth established by the Resolution Bandwidth setting. The 3 dB bandwidth has a specified tolerance of ±20% and must, therefore, be measured to obtain accurate results.)

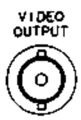
NOTES

1. The IF Output goes to its full-scale level (270 mV to 190 mV) during Automatic Calibration cycles.

2. The Video Output level is +10 Vdc during Automatic calibrations.

3. If the video amplitude is more than ten divisions below the Reference Level, the Video Output will go negative. Maximum negative output levels are typically as follows:

dB/DIV	*Maximum Negative Output*
10	*− 0.5 Vdc*
5	*−10.5 Vdc*
2 or 1	*−13.5 Vdc*



The VIDEO OUTPUT supplies a dc output voltage (prior to peak detection and digitizing) that is proportional to the "A" Trace video amplitude on the CRT screen. The Video Output is scaled to one volt per division, and the nominal output level ranges from +10.0 Vdc at the Reference Level to 0.0 Vdc at ten divisions below the Reference Level. The output resistance is 1 kilohm, nominal. The output is diode clamped to ±15 Vdc and is internally fused at 62 mA, N.B.

The Video Output can be applied to an external analog-to-digital converter or digital voltmeter to obtain higher amplitude resolution than is provided by the CRT readouts; it can be used in conjunction with the "X" and "Z" PLOTTER outputs to make oscilloscope plots or X-Y recordings of the non peak-detected video signal; and, when connected to a high-impedance headset or amplifier through a coupling capacitor, it can be used to monitor the audio on an amplitude-modulated carrier. (Since the video amplitude is logarithmic, the audio obtained from the Video Output is quite distorted although intelligible enough for monitoring purposes.)

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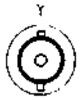
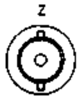
DISPLAY OUTPUTS

The DISPLAY outputs allow all of the CRT information to be displayed on an auxiliary CRT monitor, such as the -hp- Model 1310A Large Screen Display:

	Output Level (nominal)	Output Resistance (nominal)	Protection
X 			
Y 	OV to +1 Vdc	1 kilohm	diode clamped to ±15 Vdc; internally fused at 62 mA, N.B.
Z 	Beam Off: −0.5 Vdc* Beam On: +4.3 Vdc	47 ohms	diode clamped to ground and +5 Vdc; internally fused at 62 mA, N.B.

*The "Z" output is strictly a beam off/on function; there is no intensity modulation.

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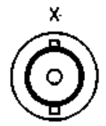
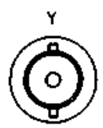
PLOTTER OUTPUTS

The PLOTTER outputs operate in conjunction with the 3585A's Plotter functions (described in the Operating Manual) to allow the CRT traces to be plotted with an external X-Y recorder or storage scope:



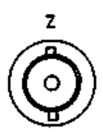
PLOTTER OUTPUT 'X' supplies a dc voltage that corresponds to the position of the 3585A's special Plotter sweep or the frequency sweep, depending on which Plotter function is being used. The output voltage ranges from 0 Vdc for the left edge to approximately +10 Vdc for the right edge. The maximum slew rate is about 0.6 volts per second, corresponding to a minimum Sweep Time of 17 seconds.

The output resistance is 1 kilohm, nominal. The output is diode clamped to ±15 Vdc and is internally fused at 62 mA, N.B.



PLOTTER OUTPUT 'Y' supplies a dc voltage that is proportional to the peak-detected CRT trace data read out of Trace Memory "A" or "B". The output voltage ranges from 0 Vdc at the bottom of the screen, to approximately +10.4 Vdc at the Reference Level, or about +10.64 Vdc at the upper limit of the vertical scale.

The output resistance is 1 kilohm, nominal. The output is diode clamped to ±15 Vdc and is internally fused at 62 mA, N.B.



PLOTTER OUTPUT 'Z' or pen down drive output supplies a polarized closure to ground (outer shell) through a silicon NPN transistor. The output is TTL compatible and is also capable of directly driving penlift coils that require a closure to ground for pen down.

Pen Down Output: +0.2 Vdc; 225 mA into +42 Vdc, maximum.
Pen Up Output: +4.4 Vdc, nominal.

(The output is internally pulled up to +5 Vdc through an isolation diode and a 4.7 kilohm resistor. Positive input voltages greater than +4.4 Vdc will reverse bias the isolation diode, causing the output to appear as an open circuit.)

The "Z" Output is protected by a 54-volt Zener diode to ground and is internally fused at 225 mA, N.B. Input voltages exceeding -0.6 Vdc or +54 Vdc will blow the fuse.

The X-Y recorder pen, connected to the "Z" Output, will go down approximately two seconds after the Plot 1 or Plot 2 function is activated, and will remain down until the end of the plot. If both traces are to be plotted (Plot 1 function) the pen goes up during retrace.

NOTE

The pen is not lifted during Automatic Calibration cycles. If you are plotting with the VIDEO OUTPUT or IF OUTPUT (externally detected) where the output goes to full-scale during Automatic Calibrations, it will be necessary to deactivate the Auto. Cal. to prevent your plot from being defaced when an Auto. Cal. occurs. The PLOTTER outputs are not affected by the Auto. Cal.

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SECTION IV
PERFORMANCE TESTS

4-1. INTRODUCTION

This section contains the procedures for the performance tests which verify that the 3585A will meet its published specifications as listed in Table 1-1. Access to the interior of the instrument is not needed to perform any of the tests. Two different types of tests are included in this section: Operation Verification Tests and Semi-Automatic Performance Tests. The Operational Verification Tests will give you a good indication that the 3585A is working as specified; however, they do not verify that the 3585A meets all its specifications. The Semi-Automatic Performance Tests will verify that the 3585A meets all of its published specifications.

4-2. CALIBRATION CYCLE

The 3585A requires verification of its specified performance every 12 months. The Semi-Automatic Performance Tests should be used when verifying performance specifications. The Operational Verification Tests can be used as part of an incoming inspection or after a repair is made to the instrument. The filter screen on the fan should be cleaned each time the instruments performance is tested or verified.

4-3. PERFORMANCE TEST RECORD

An Operational Verification Test Card is provided at the end of this section for your convenience to record the performance of the 3585A during the Operational Verification Tests. This card can be removed from the manual and used as a permanent record of the incoming inspection or of a routine performance verification. The Operational Verification Test Card may be reproduced without the written permission of Hewlett-Packard. When performing Semi-Automatic Performance Tests, it is not necessary to complete the test card because the semi-automatic tests will generate a printout for you with all test results. The printout will be very similar to that of the Operational Verification Test Card; however, in some cases the printout generated by the Semi-Automatic Performance Tests will actually plot measurement data results.

4-4. RECOMMENDED TEST EQUIPMENT

The equipment that is recommended for testing the 3585A is listed in Table 4-1. If the recommended model is not available, use a substitute that meets the "Required Characteristics" given in the table. When using the Semi-Automatic Performance Tests, see Paragraph 4-33 for details concerning program compatible instruments required by the semi-automatic tests.

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Table 4-1. Recommended Test Equipment

Instrument	Required Characteristics	Usage: Semi-Automatic Performance Test	Usage: Operational Verification Tests	Recommended Model
Audio Oscillator	Frequency: 1kHz Distortion: ≤ -90dB Amplitude: 0.1Vrms	x	x	-hp- 339 or -hp- 239
Attenuator: Variable 10dB/Step	Range: 0 - 120dB	x	x	-hp- 355D
Variable 1dB/Step See Note 1	Range: 0 - 12dB	x	x	-hp- 355C
Bridge: Directional 50Ω	Frequency: 0.1 - 40 MHz	x	x	-hp- 8721A
75Ω See Note 2, 3	Return Loss > 30dB Directivity >40dB	x	x	-hp- 8721A Option 008
Calculator	Compatible with -hp- 9825A Software and I/O	x		-hp- 9825
Calculator ROM's	HP-IB* and -hp- 9825A Compatible	x		-hp- 98210A and -hp- 98213A
Filter: 9MHz Low Pass	See Figure 4-21	x	x	
Frequency Counter	Range: 5 to 10 MHz Resolution: 0.1 Hz Accuracy: ±1 count, $\pm 5 \times 10^{-10}$/day	x	x	-hp- 5328A Option 010
Frequency Synthesizer	Freq. Range: 200 Hz to 40.1 MHz Amp. Range: +10 to -85 dBm Amplitude Accuracy: ±0.25 dBm	x	x	-hp- 3335A
Frequency Synthesizer	Freq. Range: 1 kHz to 33 MHz Amplitude Range: -25 dBm Amplitude Accuracy: ±0.4 dB	x	x	-hp- 3330B
Function Generator See Note 3	Frequency: 1.2kHz Square Wave: 100ns rise time dc Offset: ±1V	x		-hp- 3311A
HP-IB* Interconnection Cables		x		-hp- 10631
HP-IB* Interface Cable	-hp- 9825A Compatible	x		-hp- 98034A
Impedance Matching Network (50Ω to 75Ω Minimum Loss Pad)	Frequency: 0.1 to 40 MHz VSWR <1.05	x	x	-hp- 8542B
Mixer: Double Balanced See Note 3	Frequency: 0.1 - 40MHz	x		-hp- 10534
Oscilloscope See Note 2	Vertical Scale: ≥ 5 mV/Div. Horizontal Scale: ≥ 50 nsec/Div.		x	-hp- 1740A
Power Supply: DC See Note 4	Voltage range: 0 - 10 V DC	x		-hp- 6213A
Printer: Impact	Plotter Capability	x		-hp- 9871A
Summer	See Figure 4-20	x	x	
Termination: Feedthrough 50Ω	±0.1 ohm, 1 Watt	x	x	-hp- 11048C
75Ω		x	x	-hp- 11094C
Thermal Voltage Converter: 50Ω,0.5 V See Note 4	Frequency: 0.1 - 60MHz Calibration Data	x		-hp- 11051A Option 01
Voltage Divider: 10 to 1 Terminated in 50Ω See Note 4	See Figure 4-11	x		
Voltmeter: Digital See Note 4	Full Scale Range: 1Vdc Accuracy: ±0.004% Resolution: 6 Digits Input Resistance: >1 MΩ	x		-hp- 3455A

NOTES

1. Attenuator must be calibrated by standards lab. Correction factors are required for the Operational Verification Tests.

2. Required for the Operation Verification Return Loss Test.

3. Required for the Semi-Automatic Performance Test Return Loss procedure.

4. Required to run the calibrator accuracy program.

*Hewlett-Packard Interface Bus.

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4-5. OPERATIONAL VERIFICATION TESTS OVERVIEW

The Operational Verification Tests are done manually for the 3585A and are designed to be run with a minimum amount of equipment. A comparison of the required test equipment is presented in Table 4-1. These tests give the user a good indication of the overal condition of the 3585A. Using this method of testing a 90% level of confidence that the 3585A meets all its specifications is obtained. The Operational Verification tests take about 3 hours to run (as compared to 2 1/4 hours for a complete semi-automatic characterization).

4-6. SEMI-AUTOMATIC PERFORMANCE TESTS OVERVIEW

Due to the vast number of features incorporated in the 3585A, Semi-Automatic Performance testing is a highly desirable alternative to the Operational Verification tests. The function of Semi-Automatic Performance testing is to free the operator from the time consuming data gathering and documentation normally associated with Performance Tests. Semi-Automatic Performance Tests will check all of the specifications and do so in a much more detailed manner than the Operational Verification Tests. The Semi-Automatic Performance Tests give you a confidence level of 99% and take approximately 2 1/4 hours to complete.

The Semi-Automatic Performance Tests and associated instructions are contained on the cassette tape (Part Number 03585-10001) included with the 3585A. In order to run the Performance Tests automatically, the program contained on the cassette tape is loaded into the -hp- 9825A calculator memory and run. Once the program is started, instructions for running the Performance Tests are printed by the calculator or displayed on the 3585A CRT. After the instructions have been completed, the calculator will procede to execute the present test and document the data. This process gives the operator a neatly typed summary of the performance of the 3585A in a minimum amount of time.

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4-7. OPERATIONAL VERIFICATION TESTS

This portion of Section IV contains the following Operational Verification Tests:

4-8. Synthesizer Reference Connections

Unless otherwise specified the synthesizer reference oscillator input (40/N MHz input for the 3335A) should be connected to the 3585A 10 MHz REF OUTPUT. This will assure accurate frequency measurements during the Operation Verification Tests.

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4-9. Frequency Accuracy

This test verifies the frequency accuracy of the 3585A by using an external counter to check the internal frequency reference. It is important that the frequency counter used to do this test has a reference which is more accurate than that of the 3585A.

Specification: Counter Accuracy, ± 0.3Hz $\pm$ 1×10^{-7}/month

Equipment Required:

Frequency Counter.................-hp- 5328A
Frequency Synthesizer...............-hp- 3335A

Procedure:

a. Allow the instruments used in this test to warm up for 15 to 20 minutes before beginning this test.

b. Set the 3585A controls for:

INSTRUMENT PRESET
MANUAL ENTRY.....................9 MHz
COUNTER...............................on

c. Set the synthesizer controls for:

FREQUENCY.........................9 MHz
AMPLITUDE.........................0 dBM

d. Using a BNC "T" connector, connect 50Ω output of the synthesizer to the frequency counter and the 50 ohm input of the 3585A.

NOTE

Be sure that the synthesizer and the 3585A are operating on their own internal references. Disconnect any reference connection common to both instruments.

e. Record the frequency difference between the frequency counter and the 3585A counter reading. Difference frequency equals _____ Hz.

f. If the frequency accuracy derived from this test is not in accordance with your requirements, turn to Section 5 of this manual for the Reference Oscillator Adjustment procedure.

g. This completes the Frequency Accuracy Test, reconnect the references as outlined in Paragraph 4-8.

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4-10. Calibrator Test (Optional)

This test makes a two point test of the calibrator flatness to check for any high frequency roll-off.

Specification: At 100kHz, -25dBm ±0.25dB
At 40MHz, the 100kHz reading ±0.25dB

Equipment Required:

Frequency Synthesizer . . . . -hp- 3335A

Procedure:

a. Set the 3585A controls for:

INSTRUMENT PRESET
dB/DIV . . . . 1 dB
CENTER FREQUENCY . . . . 100 kHz
MANUAL SWEEP . . . . on

b. Set the synthesizer for:

FREQUENCY . . . . 100 kHz
AMPLITUDE . . . . -25 dBm

c. Connect the 50Ω output of the synthesizer to the 50Ω input of the 3585A.

d. The marker amplitude reading should be -25 dBm ±0.25 dB to verify proper operation of the calibrator.

e. Set the 3585A controls for:

OFFSET . . . . on
ENTER OFFSET
CENTER FREQUENCY . . . . 40 MHz

f. Set the synthesizer controls for:

FREQUENCY . . . . 40 MHz

g. The marker amplitude reading should be less than ± 0.25 dB verifying that the high frequency roll-off of the calibrator is not excessive.

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4-11. Cal Offset Test (Optional)

This test is a check of the amplitude and frequency offsets within the 3585A when the calibration system is turned off. It's purpose is to check the adjustment of the 3585A IF section for large errors which the calibration system may mask. A failure in this test indicates a need to adjust the IF section.

Specification:

Res. BW	Freq. Span	Freq. Test Limit	Amplitude Test Limit
30 kHz	50 kHz	±3.5 kHz	±3.5 dB
10 kHz	20 kHz	±3.5 kHz	±3.5 dB
3 kHz	5 kHz	±3.5 kHz	±3.5 dB
1 kHz	2 kHz	±3 kHz	±3.5 dB
300 Hz	500 Hz	±900 Hz	±3.5 dB
100 Hz	200 Hz	±300 Hz	±3.5 dB
30 Hz	50 Hz	±90 Hz	±3.5 dB
10 Hz	20 Hz	±30 Hz	±3.5 dB
3 Hz	7 Hz	±15 Hz	±3.5 dB

Equipment Required:

Frequency Synthesizer...............-hp- 3335A

Procedure:

a. Set the 3585A controls for:

RECALL 602
INSTRUMENT PRESET
RES. BW HOLD..........................on
CENTER FREQUENCY...............10 MHz
FREQUENCY SPAN..................50 kHz
REFERENCE LEVEL.................-22 dBm
dB/DIV................................1 dB
SWEEP TIME........................0.8 sec

b. Set the synthesizer controls for:

FREQUENCY........................10 MHz
AMPLITUDE.......................-25 dBM

c. Connect the 50Ω output of the synthesizer to the 50Ω input of the 3585A.

d. Set the 3585A controls for:

OFFSET.................................on
ENTER OFFSET
SAVE 1
RECALL 601
INSTRUMENT PRESET
RECALL 1

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e. Place the marker on the most positive point of the CRT trace. The marker reading in the upper right of the CRT will assist you in finding this point.

f. Enter the Offset and Marker reading on the Operational Verification Test Card.

g. Repeat Steps e and g for each of the Resolution Bandwidths listed in the Operational Verification Test Card.

4-12. Range Calibration

This test verifies that the Range Calibration system is working as specified.

Specification:

± 0.7dB (Equals the Reference Level Accuracy (±0.4dB) for a -25dBm signal plus the Amplitude Linearity spec (0.3dB) for a signal 5dB below the Reference Level)

Equipment Required:

Frequency Synthesizer...............-hp- 3335A

Procedure:

a. Set the 3585A controls for:

INSTRUMENT PRESET
CENTER FREQUENCY...............150 kHz
REFERENCE LEVEL.................-20 dBm
1 dB/DIV
RES BW..............................10 Hz
MANUAL SWEEP.......................on
REF LEVEL TRACK.....................off

b. Set the synthesizer controls for:

FREQUENCY......................150 kHz
AMPLITUDE.......................-25 dBm

c. Connect the 50Ω output of the synthesizer to the 50Ω input of the 3585A.

d. Set the 3585A controls for:

OFFSET.................................on
ENTER OFFSET
RANGE UP............................[⇧]

e. Check the marker reading for all ranges, it should be less than ±0.7 dB to verify that the RANGE selected is within specification. Enter Marker readings on the Operational Verification Test Card.

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4-13. Amplitude Linearity Test

This test confirms that the 3585A will read the amplitude of the input signal correctly within the limits of the specification.

Specification:

Amplitude Linearity

0dB – -20dB	-20dB – -50dB	-50dB – -80dB	-80dB – -95dB
±0.3dB	±0.6dB	±1 dB	±2 dB

Equipment Required:

10dB/step Attenuator................-hp-355D

Procedures:

a. Set the 3585A controls for:

INSTRUMENT PRESET
CENTER FREQUENCY................1 MHz
RES. BW..............................3 Hz
VIDEO BW............................3 Hz
RANGE..............................0 dBm
MANUAL SWEEP........................on

b. Set the attenuator to 0 dB of attenuation.

c. Connect the 3585A Tracking Generator output to the input of the attenuator. Connect the output of the attenuator to the 50Ω input of the 3585A.

d. Adjust the AMPLITUDE of the 3585A Tracking Generator so that the marker amlitude reads .0 dBm.

e. Set the Variable Attenuator for one of the settings listed in Column A, of the Amplitude Linearity Test portion of the Operational Verification Test Form.

f. Add the Correction Factor (Column B) to the Ideal reading (Column C) and enter this value in Column D.

g. Record the 3585A Marker Reading in Column E.

h. Subtraction of Column D from Column E should yield a value within the Test Tolerance of Column F, thereby verifying the Amplitude Linearity specification.

i. Repeat Steps e thru h until all the Variable Attenuator settings have been checked.

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4-14. Reference Level Accuracy

This test verifies that the 3585A meets the specification for Reference Level Accuracy.

Specifications:

Reference Level Accuracy, Terminated Input

+10dB to -50dB	-50dB to -70dB	-70dB to -90dB
±0.4dB	±0.7dB	±1.5dB

Equipment Required:

Frequency Synthesizer .... -hp- 3335A

Procedure:

a. Set the 3585A controls for:

INSTRUMENT PRESET
RANGE .... 0 dBm
REFERENCE LEVEL .... 10 dBm
REF LVL TRACK .... off
1 dB/DIV
RES BW .... 100 Hz
VIDEO BW .... 1 Hz
MANUAL SWEEP .... on

b. Set the synthesizer controls for:

FREQUENCY .... 20 MHz
AMPLITUDE .... 10 dBm
AMPLITUDE INCR .... 10 dBm

c. Connect the 50Ω output of the synthesizer to the 50Ω input of the 3585A.

d. Using the Reference Level Accuracy Test portion of the Operational Verification Test Card, enter the marker amplitude reading into Column (C). Subtract the value in Column (C) from that in Column (A) and enter this value in Column (D). The value in Column (D) should not exceed the Test Tolerance of Column (E). This will confirm that the 3585A meets its Reference Level Accuracy specifications.

e. Set the Synthesizer Level to the next value in Column (A) and the 3585A REFERENCE LEVEL for the next value in Column (B) as shown on the Operational Verification Test Card.

f. Repeat Steps d and e until all values on the card have been checked.

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4-15. 50/75Ω Frequency Response Test

In this test the 50Ω and 75Ω flatness of the instrument is checked against the output of the internal calibrator. The display shows the Tracking Generator switched through the internal calibrator, which is assumed to be flat, sweeping across the frequency range of the instrument. The maximum and minimum points of the sweep are measured. This gives the total deviation of the 3585A 50 or 75Ω input relative to the flatness of the calibrator.

Specification:

Frequency Response, Terminated Input: ± 0.5 dB referenced to 20.1 MHz

Procedure:

a. Set the 3585A controls for:

RECALL 604
INSTRUMENT PRESET
START FREQUENCY................0.1 MHz
STOP FREQUENCY................40.1 MHz
REFERENCE LEVEL.................-20 dBm
dB/DIV..............................1 dB
REF LVL TRACK.........................off
RANGE............................-25 dBm
VIDEO BW..........................300Hz

b. Press the SINGLE SWEEP button on the 3585A.

c. Wait until the sweep is completed. The trace you now see is the flatness of the 50Ω input.

d. Move the marker to the center of the trace.

e. Set the 3585A controls for OFFSET on and ENTER OFFSET.

f. Using the marker, find the point on the trace which gives the greatest positive or negative deviation as shown by the marker amplitude reading.

g. The marker amplitude reading displayed is the greatest deviation from the calibrator flatness for the range shown. Record this value under Maximum Amplitude Deviation on the Operational Verification Test Card.

h. Set the 3585A controls for RANGE......STEP UP.

i. Repeat Steps b thru h until all ranges have been tested.

j. Set the 3585A controls for:

RANGE............................-25 dBm
INPUT IMPEDANCE...................75Ω
SINGLE SWEEP

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k. Wait until the sweep is completed. The trace you now see is the flatness of the 75Ω input.

l. Repeat Steps d thru f and enter the results on the Operational Verification Test Card.

4-16. 1 Ohm Frequency Response Test

This test checks the frequency response of the 1 MΩ input relative to the flatness of the 50Ω input. Ideally the difference between the two signals would be zero.

Specification:

High Impedance Frequency Response

20Hz	10MHz	40MHz
±0.7dB	±1.5dB	

Equipment Required:

50Ω Feed Thru Termination.........-hp- 11048C

Procedure:

a. Set the 3585A controls for:

INSTRUMENT PRESET
STOP FREQUENCY..................10 MHz
dB/DIV...............................1 dB
RANGE.............................0 dBm
RES. BW............................3 kHz
RES. BW HOLD.........................on
RECALL.................................4

b. Connect the 3585A Tracking Generator output to the 3585A 50Ω input.

c. Adjust the Tracking Generator Amplitude control for the center of its range.

d. Allow one complete sweep to occur. Press the STORE A → B key of the 3585A.

e. Connect a 50Ω termination to the 1 MΩ input of the 3585A. Connect the output of the Tracking Generator to the input of this termination.

f. Set the 3585A controls for:

INPUT...............................1 MΩ
B TRACE...............................off
A-B....................................on

g. Move the marker to the most negative point on the displayed trace. (Ignore the LO feedthrough point at 0 Hz)

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h. Set the 3585A controls for:

OFFSET.................................. on
ENTER OFFSET

i. Move the marker to the most positive point on the displayed trace. (Ignore the LO feed-through point at 0 Hz)

j. Record the marker amplitude on the Performance Test Card as the 1 MΩ unflatness for the 0 to 10 MHz band. The marker amplitude should be less than ± 0.7 dB to verify the specification.

k. Set the 3585A controls for:

START FREQUENCY................10 MHz
STOP FREQUENCY..................40 MHz
INPUT................................50Ω
A-B ....off

l. Repeat Steps b thru i.

m. Record the marker amplitude on the Performance Test Card as the 1 MΩ unflatness for the 10 MHz to 40 MHz band. The marker amplitude reading should be less than ± 1.5 dB to verify the specification.

4-17. Return Loss Tests

These tests verify that the 3585A meets the Return Loss specification for the 50Ω, 75Ω and Terminated inputs.

Specification:

Return Loss, 50Ω or 75Ω Terminated Input............. > 26 dB
50Ω or 75Ω Dummy Load................... > 14 dB(Optional)

Equipment Required:

100 MHz Oscilloscope............................-hp- 1740A
50Ω Return Loss Bridge...........................-hp- 8721A
75Ω Return Loss Bridge..................-hp- 8721 Option 008
50Ω Feed Thru Termination......................-hp- 11048C
75Ω Feed Thru Termination.......................-hp- 11094B
50/75Ω Min. Loss Pad...........................-hp-85428B
(2) 12" 75Ω Cables (8120-2103)....................-hp- 11170E
Male BNC/BNC Adapter..............-hp- Part No. 1250-0216
Frequency Synthesizer...........................-hp-3335A

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Procedure:

a. Set the 3585A controls for:

INSTRUMENT PRESET
MANUAL SWEEP....................40 MHz
RANGE..............................5 dBm

b. Set the synthesizer controls for:

FREQUENCY........................40 MHz
AMPLITUDE.......................10.5 dBm

c. Set the oscilloscope controls for:

VERTICAL SCALE.....0.1 V/DIV (ac coupled)
HORIZONTAL SCALE..........0.05μ sec/DIV

d. Connect the equipment as shown in Figure 4-1. 50Ω Return Loss Test.

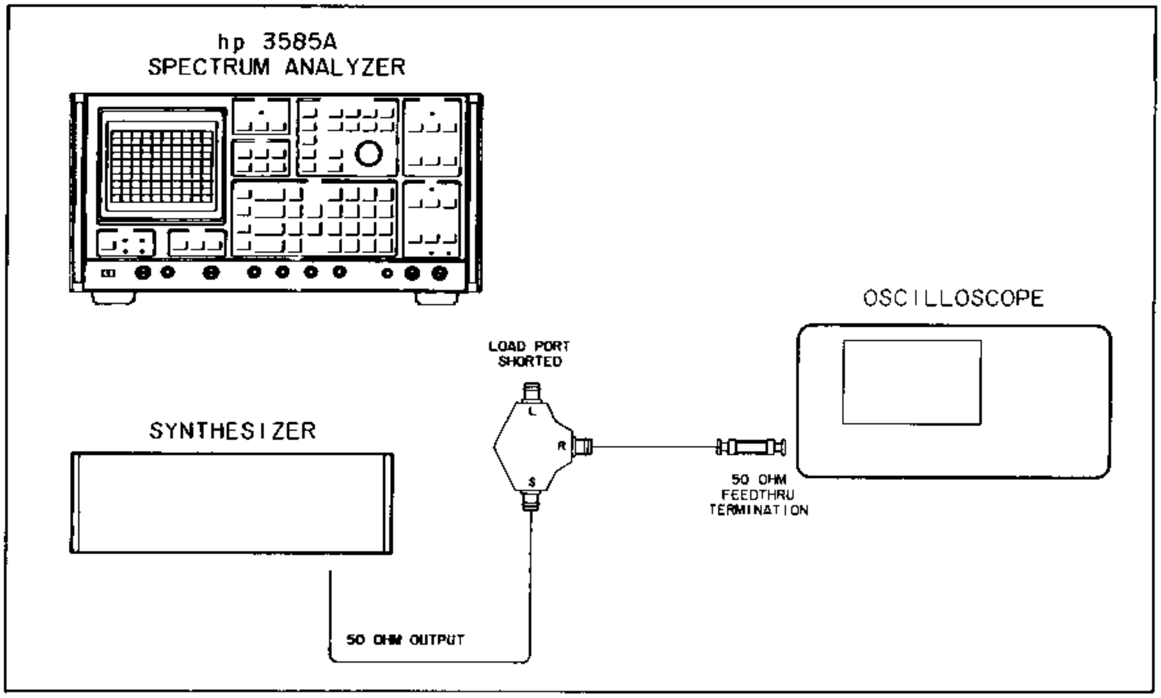

Figure 4-1. 50Ω Return Loss Test (Operational Verification)

e. Check the waveform amplitude displayed on the scope. The amplitude displayed should equal 0.35 V p-p. Adjust the synthesizer as necessary to obtain this amplitude.

f. Remove the shorting connection from the Load port of the Return Loss Bridge.

g. Connect the Return Loss Bridge Load part to the 50Ω input of the 3585A.

h. Read the amplitude of the waveform on the scope display. It should be less than 0.0175 V p-p. This confirms that the 50Ω (75Ω) Return Loss of the 3585A is greater than 26 dB.

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i. Press the 1 MΩ input impedance key on the 3585A.

j. Again check the amplitude of the scope waveform. It should be less than 0.07 V p-p. This will confirm that the Return Loss of the Terminated input is greater than 14 dB.

k. Connect the equipment as shown in Figure 4-2. 75Ω Return Loss Test.

l. Press the 75Ω input impedance key on the 3585A.

m. Repeat Steps e thru i for the values in parenthesis.

n. Change the synthesizer frequency to 15 MHz.

o. Set the 3585A controls for MANUAL SWEEP 15 MHz.

p. Repeat Steps c thru m.

q. This completes the Return Loss Tests. Disconnect the test equipment.

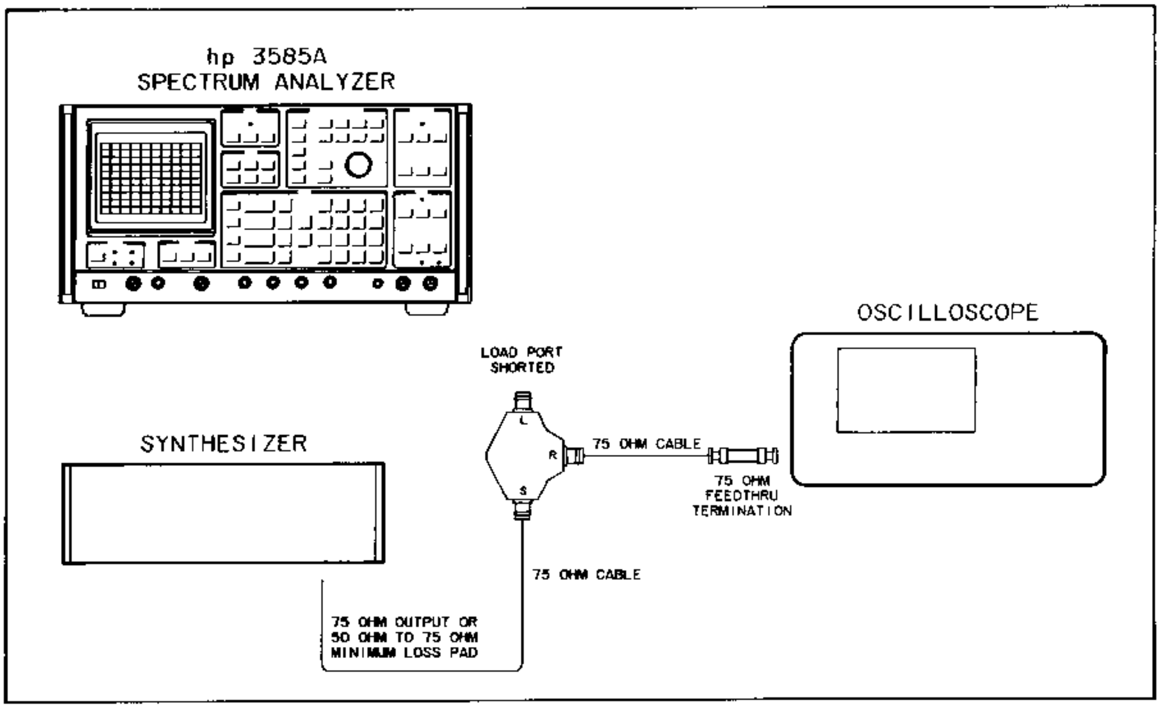

Figure 4-2. 75Ω Return Loss Test (Operational Verification)

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4-18. 1 M ohm Input Impedance Test

These tests verify that the 3585A meets the Input Impedance specifications for the 1 MΩ, 30 pf Input Impedance setting.

Specification:

1 MΩ ± 3%, < 30 pf

Equipment Required:

Resistor:
1 MΩ ± 1%, 1/8W Film.............-hp- Part No. 0757-0344
50Ω Feed Thru Termination......................-hp- 11048C
Synthesizer...................................-hp- 3335A

Procedure:

a. Set the 3585A controls as follows:

INSTRUMENT PRESET
CENTER FREQUENCY.............................1 kHz
MANUAL SWEEP...................................on
RES. BW.......................................100 Hz
RANGE...0 dBm
INPUT IMPEDANCE...............................1 MΩ

b. Connect the 50Ω termination to the 3585A 1 MΩ input. Connect the synthesizer output to the termination input.

c. Set the synthesizer controls for:

FREQUENCY......................................1 kHz
AMPLITUDE.....................................0 dBm

d. Set the 3585A controls for OFFSET on. Allow time for the marker reading to stablize,then press the ENTER OFFSET button.

e. Using short clip leads, insert the 1 MΩ resistor between the output of the termination and the 3585A 1 MΩ input as shown in Figure 4-3. 1M Ohm Input Impedance Test.

f. The 3585A marker amplitude reading should be -6.0 dB ± 0.44 dB, verifying that the input resistance is 1 MΩ ± 5%.

g. Press the 3585A ENTER OFFSET button.

h. Set the synthesizer frequency to 10 kHz.

i. Set the 3585A for a CENTER FREQUENCY of 10 kHz.

j. The 3585A marker reading should be between -2 dB and -3 dB, verifying that the shunt capacitance is less than 30 pf.

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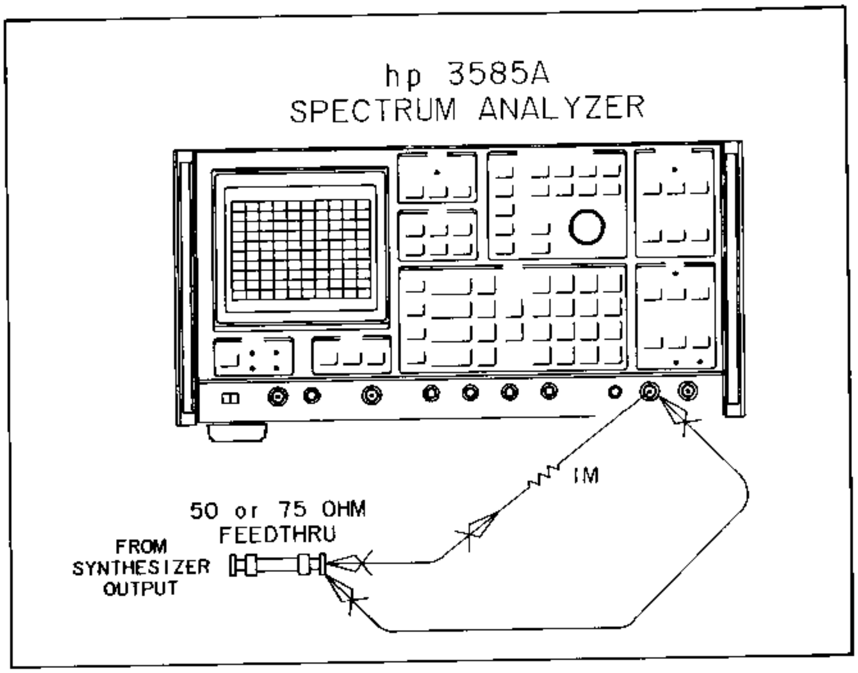

Figure 4-3. 1 M ohm Input Impedance Test

4-19. Marker Accuracy

This test verifies that the 3585A meets its marker accuracy specification.

Specification:

± 0.2% of frequency span ± Resolution Bandwidth Setting

Procedure:

a. Set the 3585A controls for:

INSTRUMENT PRESET

b. Set the synthesizer controls for:

FREQUENCY....................................20.8 MHz
AMPLITUDE.....................................-25 dBm

c. Connect the 50Ω output of the synthesizer to the 50Ω input of the 3585A.

d. Put the marker at the peak of the response shown on the 3585A CRT.

e. The marker frequency should read between 20.00 MHz and 20.16 MHz thereby verifying that the 3585A marker reads within ± 0.2% of the input frequency.

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4-20. Noise

This test is used to determine the average noise level in each of the resolution bandwidths.

Specification:

50/75Ω input, -25dBm Range

Res. BW	Specification
30 kHz	-100 dBm
10 kHz	-104 dBm
3 kHz	-108 dBm
1 kHz	-111 dBm
300 Hz	-115 dBm
100 Hz	-122 dBm
30 Hz	-127 dBm
10 Hz	-132 dBm
3 Hz	-137 dBm

Procedure:

a. Disconnect all inputs to the 3585A.

b. Set the 3585A controls for:

INSTRUMENT PRESET
CENTER FREQUENCY.............9.35 MHz
REFERENCE LEVEL.................-75 dBm
RES. BW............................30 kHz
VIDEO BW...........................30 Hz
MANUAL SWEEP.......................on

c. Read the marker amplitude. Take an average of the readings displayed. This average value should be below the test tolerance shown by the specifications listed.

d. Record the average noise reading, across from the BW displayed, on the Operational Verification Test Card.

e. Set the 3585A controls for:

RES. BW..............................[⇩]

f. Repeat Steps c thru e until all Resolution Bandwidths have been measured for their average noise level.

4-21. Zero Response

This test measures the amplitude of the local oscillator feedthrough. This response occurs at 0 Hz due to the local oscillator passing directly through the IF section.

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Specification:

LO Feed Through < -15 dB below range

Procedure:

a. Disconnect all inputs to the 3585A.

b. Set the 3585A controls for:

INSTRUMENT PRESET
RANGE..............................0 dBm
MANUAL SWEEP......................0 Hz

c. Read the marker amplitude. The reading should be less than -15 dB.

d. Record the marker amplitude reading under zero response on the Operational Verification Test Card.

4-22. Low Frequency Responses

Within the 3585A there are several frequencies which may be picked up by the sensitive analog circuits. These frequencies include:

60 Hz* Power Line
5 kHz A/D clock
20 kHz (approx) Power Supply Switching Oscillator
25 kHz (approx) CRT High Voltage Oscillator
100 kHz Fractional N Clock
1 MHz Fractional N Step Loop Clock
10 MHz Internal Reference

*or other power line frequency.

These frequencies and their harmonics will be used to verify that all Low Frequency Responses are less than -120 dBm.

Specification:

Residual Responses < -120 dBm

Procedure:

a. Disconnect all inputs to the 3585A.

b. Set the 3585A controls for:

INSTRUMENT PRESET
REFERENCE LEVEL.................-75 dBm
RES. BW..............................3 Hz
VIDEO BW............................1 Hz
MANUAL SWEEP........................on

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c. Set the 3585A controls for:

CENTER FREQUENCY....................*
CF STEP SIZE............................*

*One of the frequencies for Low Frequency Responses on the Operational Verification Test Card.

d. The marker is now displaying the amplitude of the frequency chosen in Step c. Record the marker reading across from the frequency chosen in Step c on the Operational Verification Test Card.

e. Set the 3585A controls for CENTER FREQUENCY....STEP UP. This will increment the marker to the next harmonic component of the frequency chosen in Step c.

f. Take an average reading of the marker amplitude. On the Operational Verification Test Card, record the reading across from the frequency chosen in Step c and under the harmonic presently being measured.

g. Repeat Steps e and f until the fifth harmonic of the frequency entered in Step c has been measured.

h. Repeat Steps c thru g until all frequencies on the test card have been checked.

i. Set the 3585A controls for:

INSTRUMENT PRESET
CENTER FREQUENCY................20 kHz
FREQUENCY SPAN...................2 kHz
AUTO RANGE..........................off
RANGE............................-25 dBm
INPUT IMPEDANCE..................1 MΩ

j. Connect a coaxial cable between the EXT TRIGGER input and the 1 MΩ input of the 3585A. You are now looking at the Power Supply Switching frequency and possibly the fourth harmonic of the 5 kHz A/D clock.

k. Set the marker on the most positive point of the largest response. This will be at 20 kHz ± 20 Hz.

l. Set the 3585A controls for COUNTER on. Wait for the counter reading to stabilize before proceding.

m. Set the 3585A controls for:

MKR → CF
COUNTER...............................off
REFERENCE LEVEL.................-75 dBm
FREQUENCY SPAN...................1 MHz
RES. BW............................10 Hz
VIDEO BW............................3 Hz
INPUT IMPEDANCE...................50Ω
MANUAL SWEEP.......................on

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n. Enter the displayed CENTER FREQUENCY value as a CF STEP SIZE.

o. Enter the CENTER FREQUENCY reading under the correct frequency heading (Power Supply or CRT Oscillator) on the Operational Verification Test Card.

p. Read the 3585A marker amplitude and enter the value as the first harmonic on the Operational Verification Test Card.

q. Set the 3585A controls for CENTER FREQUENCY - STEP UP. This increments the marker to the next harmonic of the original CENTER FREQUENCY reading.

r. Read the marker amplitude. Record the reading under the correct harmonic on the Operational Verification Test Card.

s. Repeat Steps q and r up through the fifth harmonic of the original CENTER FREQUENCY.

t. Set the 3585A controls for:

INSTRUMENT PRESET
CENTER FREQUENCY................28 kHz
FREQUENCY SPAN..................15 kHz
AUTO RANGE..........................off
RANGE............................-25 dBm
INPUT IMPEDANCE..................1 MΩ

u. Disconnect the cable from the EXT TRIGGER input and hold the end of the cable on the CRT display. You are now observing the CRT High Voltage Oscillator Frequency.

v. Set the marker on the most positive point of the response.

w. Repeat Steps l thru s.

4-23. Local Oscillator Sidebands

The OVEN REF output on the rear panel of the 3585A is a source relatively free of Local Oscillator Sidebands. The OVEN REF output is used as the input for this test. This test checks to what extent internal frequencies are mixing with the input signal in the Local Oscillator and appearing on the output.

Specification:

Spurious Responses > 80 dB below signal

Procedure:

a. Disconnect the OVEN REF OUT from the EXT REF IN. Both of these connectors are found on the rear panel of the 3585A.

b. Connect the OVEN REF OUT to the front panel 50Ω input.

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c. Set the 3585A controls for:

INSTRUMENT PRESET
CENTER FREQUENCY . . . . 10 MHz
COUNTER . . . . on

d. When the counter reading is stable, set the 3585A controls for:

MARKER → CF
COUNTER . . . . off
OFFSET . . . . on
ENTER OFFSET
REFERENCE LEVEL . . . . -50 dBm
RES. BW . . . . 3 Hz
VIDEO BW . . . . 3 Hz
MANUAL SWEEP . . . . on
SAVE 1

e. Set the 3585A controls for a CF STEP SIZE equal to one of the frequencies listed for the Local Oscillator Sideband test on the Operational Verification Test Card.

f. Set the 3585A controls for MANUAL ENTRY - STEP DOWN. this puts the marker one CF STEP SIZE lower in frequency.

g. Take an average reading of the marker amplitude. Enter this number on the Operational Verification Test Card under the correct sideband frequency.

h. Repeat Steps f and g two more times.

i. Press the STEP UP key four times. This puts the marker on the first upper sideband frequency (+1).

j. Take an average reading of the marker amplitude. Enter this number on the Operational Verification Test Card under the correct sideband harmonic frequency.

k. Press the STEP UP key on the 3585A. This puts the marker one CF STEP SIZE higher in frequency.

l. Repeat Steps j and k two more times.

m. Set the 3585A controls for RECALL 1. This returns you to the original Center Frequency.

n. Repeat Steps f thru n until all the frequencies on the test card have been tested.

o. Reconnect the OVEN REF OUT and the EXT REF IN on the rear panel. This completes the Local Oscillator Sideband Test.

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4-24. Residual Spurs

This test checks for mixing product harmonics of the 90 MHz and 10 MHz internal reference frequencies. Due to frequency offsets in the IF the exact frequency of these mixing products is not known; therefore, a 1 kHz span is used to account for any frequency offsets.

Specification:

Residual Responses < -120 dBm

Procedure:

a. Disconnect all inputs to the 3585A.

b. Set the 3585A controls for:

INSTRUMENT PRESET
REFERENCE LEVEL . . . . -75 dBm
RES. BW . . . . 30 Hz
VIDEO BW . . . . 1 Hz
RANGE . . . . -25 dBm
MANUAL SWEEP . . . . on
FREQUENCY SPAN . . . . 1 kHz

c. Set the 3585A CENTER FREQUENCY for each of the frequencies listed in the Operational Verification Test Card for the Residual Spurs test. The average value of the marker reading, when placed on the most positive point, should be less than -120 dBm verifying that the 3585A meets its Residual Spur specification. Record all resultant measurements on the test card.

4-25. Harmonic Distortion

This test verifies that the harmonic distortion produced by the 3585A is less than -80 dB below signal. The filter shown for this test removes the harmonic distortion of the sources. This leaves only the distortion of the 3585A.

Specification:

Spurious Responses < -80 dB below signal

Equipment Required:

9 MHz Low Pass Filter . . . . (see Figure 4-21)
Frequency Synthesizer . . . . -hp- 3335A

Procedure:

a. Connect the output of the 3585A Tracking Generator to the input of the 9 MHz Low Pass Filter. Connect the output of the filter to the 3585A 50Ω input. (See Figure 4-21 for the 9 MHz Low Pass Filter Schematic.)

b. Compare the displayed trace with that of Figure 4-21. This will confirm that the filter is operating properly.

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c. Disconnect the filter.

d. Set the 3585A controls for:

INSTRUMENT PRESET
CENTER FREQUENCY . . . . 9 MHz
CENTER FREQUENCY STEP . . . . 9 MHz
RES. BW . . . . 10 Hz
RANGE . . . . -25 dBm
MANUAL SWEEP . . . . on

e. Set the synthesizer frequency at 9 MHz, -25 dBm.

f. Connect the 50Ω output of the synthesizer to the input of the filter. connect the output of the filter to the 50Ω input of the 3585A (see Figure 4-4).

g. Set the 3585A controls for:

OFFSET . . . . on
ENTER OFFSET
REFERENCE LEVEL . . . . -50 dBm

h. Set the 3585A for CENTER FREQUENCY UP. Read the marker amplitude and record it on the Performance Test Card.

i. Repeat Step h until the fourth harmonic has been checked. All values should be less than -80 dB verifying that the instrument meets its Harmonic Distortion specification.

j. Disconnect the synthesizer and filter from the 3585A.

k. Set the 3585A controls for:

OFFSET . . . . off
RANGE . . . . -20 dBm
REFERENCE LEVEL . . . . -20 dBm
CENTER FREQUENCY . . . . 1 kHz
COUNTER . . . . on

l. Set the Audio Oscillator for:

FREQUENCY . . . . 1 kHz
OUTPUT LEVEL . . . . 0.1 V

m. Connect the output of the low distortion Audio Oscillator to the 50Ω input of the 3585A.

n. When the counter reading is stable, enter these commands on the 3585A:

MARKER → CF
MARKER OFS→STEP
COUNTER . . . . off

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o. Repeat Steps g thru i.

p. Disconnect the Audio Oscillator. This completes the Harmonic Distortion Test.

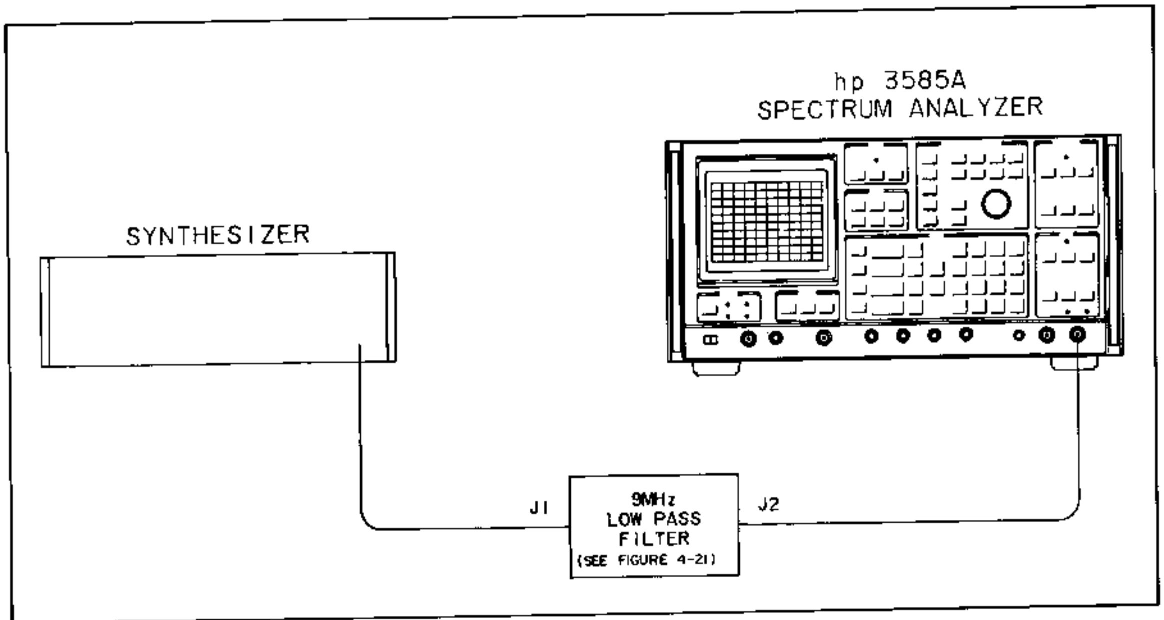

Figure 4-4. Harmonic Distortion Test

4-26. Intermodulation Distortion Test

This test places two signals 100 Hz apart at the input of the 3585A. The second and third order IM products are then checked against the specification.

Specification:

Intermodulation Distortion:
For two signals, each at least 6 dB below the RANGE setting and separated in frequency by at least 100 Hz, referred to the larger in frequency of the two signals.

< -80 dB; except 2nd order IM with one or both of the input signals within the range of 10 MHz to 40 MHz, < -70 dB

Equipment Required:

Frequency Synthesizer. . . . . -hp- 3335A
Frequency Synthesizer. . . . . -hp- 3330B
10 dB/Step Attenuator. . . . . -hp-355D
1 dB/Step Attenuator. . . . . -hp- 355C
Frequency Summer. . . . . (See Figure 4-20)

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Procedure:

a. Set the 3585A controls for:

INSTRUMENT PRESET
CENTER FREQUENCY..............1.65 kHz
FREQUENCY SPAN....................350 Hz
OFFSET..................................on

b. Connect synthesizer #1 and #2 to the summer as shown in Figure 4-5. Connect the output of the summer to the 50Ω input of the 3585A. Set the attenuators for 0 dB of attenuation. (See Figure 4-20 for the Summer Schematic.)

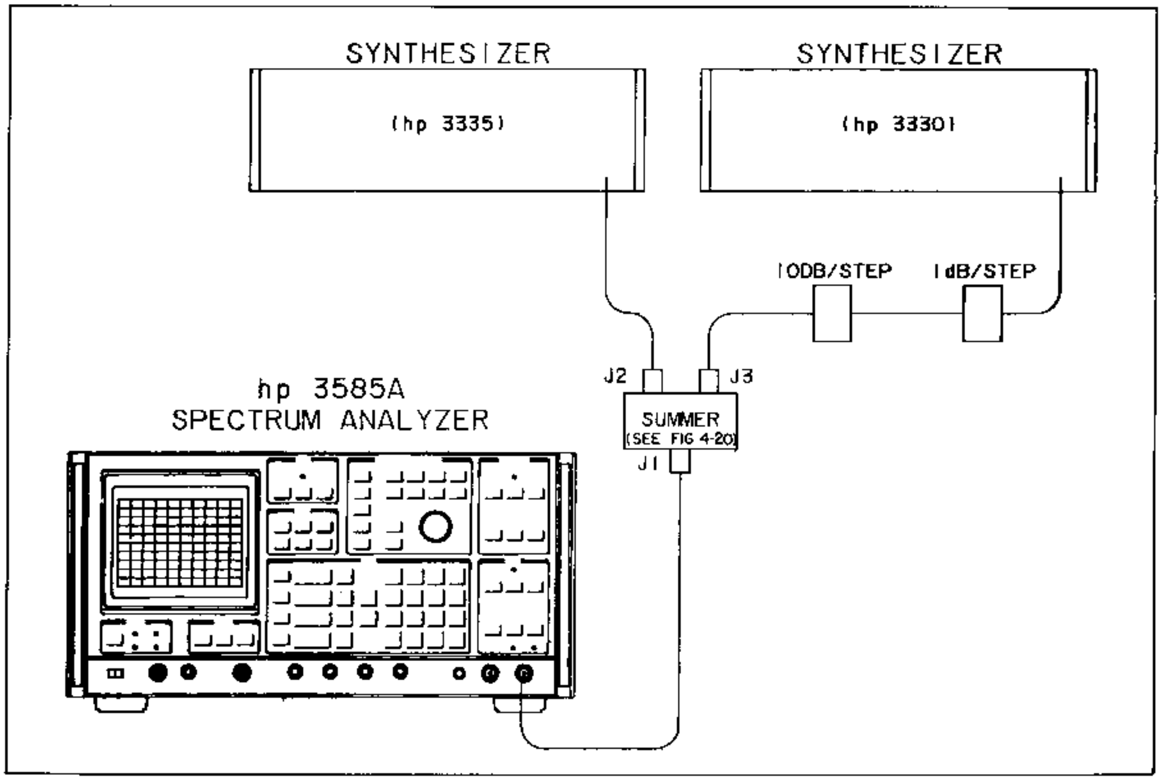

Figure 4-5. Intermodulation Distortion Test

c. Set the controls of synthesizer #1 for:

FREQUENCY........................1.6 kHz
AMPLITUDE........................-25 dBm

d. Set the controls of synthesizer #2 for:

FREQUENCY ....1.7 kHz
AMPLITUDE........................-25 dBm

e. Set the 3585A controls for:

SWEEP...............................single

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f. Move the marker to the maximum point on the 1.6 kHz (33 MHz) response.

g. Press ENTER OFFSET on the 3585A.

h. Watching the offset frequency in the upper right-hand corner of the 3585A display, move the marker until the frequency reads -100 Hz ± 1 Hz (see Figure 4-6).

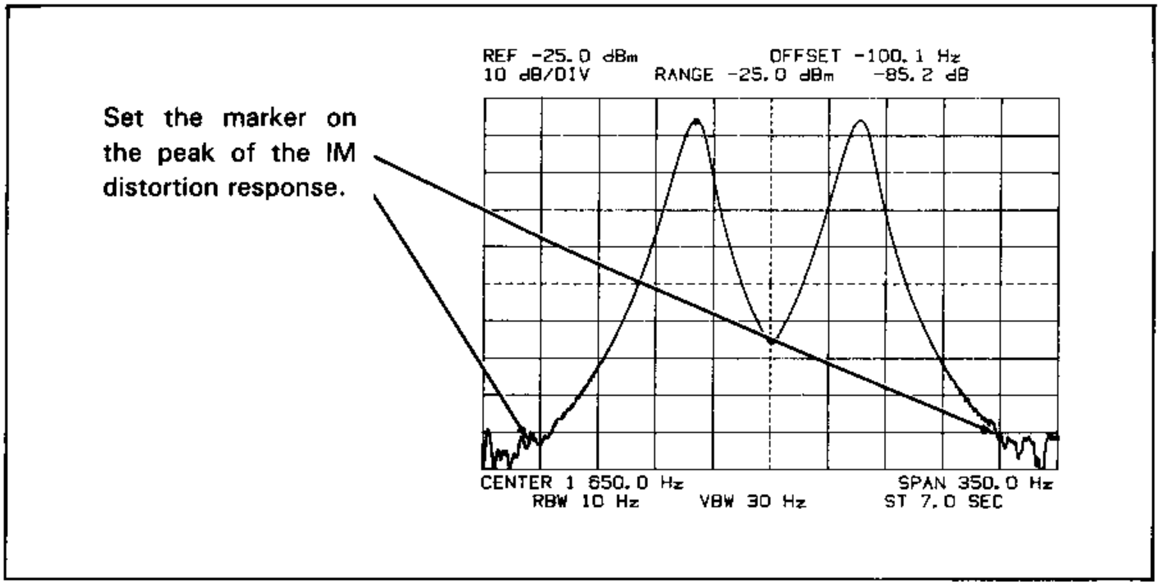

Figure 4-6. IM Distortion Response

i. The marker amplitude reading should be less than -80 dB to verify that the 3585A meets its Intermodulation Distortion specification.

j. Move the marker until the offset frequency reads 200 Hz ± 1 Hz.

k. The marker amplitude reading should be less than -80 dB to verify that the 3585A meets its Intermodulation Distortion specification.

l. Set the 3585A controls for:

MARKER → CF
MANUAL SWEEP
CLEAR A
CENTER FREQUENCY................100 Hz

m. The marker reading is the second order IM distortion product and should be less than -80 dB (-70 dB) verifying that the 3585A meets its IM Distortion specification.

n. Set the controls of synthesizer #1 for:

FREQUENCY........................33 MHz
(13 MHz for the -hp- 3330B)
AMPLITUDE........................-25 dBm

For the 3330B this requires using the rear panel output and an attenuator to get the required frequency and level.

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o. Set the controls of synthesizer #2 for:

FREQUENCY . . . . 33.0001 MHz
AMPLITUDE . . . . -25 dBm

p. Set the 3585A controls for:

CENTER FREQUENCY . . . . 33.00005 MHz
CONT. SWEEP

q. Adjust attenuators for a −31 dBm level on the 3585A.

r. Repeat Steps e thru m using the values in parenthesis.

s. This completes the test, disconnect all inputs to the 3585A.

4-27. Bandwidth Tests

These tests will verify that the 3585A meets its 3 dB, Bandwidth and Shape Factor specifications.

Specification:

Resolution Bandwidth Accuracy
3 dB Bandwidth . . . . ± 20% of BW setting at the 3dB points
Selectivity (Shape Factor) . . . . < 11:1

Procedure:

a. Set the 3585A controls for:

RECALL 602
INSTRUMENT PRESET
CENTER FREQUENCY . . . . 10 MHz
FREQUENCY SPAN . . . . 10 Hz
REFERENCE LEVEL . . . . -24.5 dBm
dB/DIV . . . . 1 dB.
RES. BW . . . . 3 Hz
RES. BW HOLD . . . . on

b. Initially this test checks the 3 dB points of each Resolution Bandwidth; therefore, ignore the values in parenthesis until instructed otherwise.

c. Allow one complete sweep to occur. Now put the marker on the most positive point of the trace, using the marker amplitude reading as your guide.

d. Set the 3585A controls for:

OFFSET . . . . on
ENTER OFFSET

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e. Check the readings in the upper right-hand corner. They should read:

OFFSET .... 0 Hz
.00 dB (0.dB)

If the readings are not correct, set the OFFSET control OFF and continue at Step d.

f. Move the marker down the left side of the trace until a marker amplitude reading of -3.00 dB ± 0.02 dB (-60.0 dB ± 0.4 dB) is obtained.

g. Press ENTER OFFSET.

h. Move the marker to the right side of the trace until a reading of 0.00 dB ± 0.02 dB (0.0 dB ± 0.4 dB) is obtained.

i. Read the value displayed as OFFSET. This value represents the frequency span between the 3 dB (60 dB) points of the IF filter. The value obtained should be within ± 20% of the chosen bandwidth.

j. Record the OFFSET value in the 3 dB (60 dB) column, across from the appropriate bandwidth, on the Operational Verification Test Card.

k. Set the 3585A controls for:

OFFSET .... off
RES. BW .... *
FREQUENCY SPAN .... *

*Next value on test card.

l. Repeat Steps c thru k until all the 3 dB (60 dB) all bandwidth measurements listed on the test card have been completed.

m. Now the 60 dB bandwidth measurements will be made. For the remainder of the bandwidth tests use the values in parenthesis wherever they occur.

n. Set the 3585A controls for:

FREQUENCY SPAN .... 100 Hz
dB/DIV .... 10 dB
RES. BW .... 3 Hz

o. Repeat Steps c thru k.

p. Set the 3585A controls for VIDEO BW 10 Hz.

q. Repeat Steps c thru l for the remaining 60 dB bandwidth measurements listed on the test card.

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4-28. Fractional N API Spur Test

This test checks that the Fractional N API circuitry is operating properly by checking the spurious response level.

Specification:

Spurious Responses < -80 dB below signal

Equipment Required:

FREQUENCY SYNTHESIZER......-hp- 3335A

Procedure:

a. Set the 3585A controls for:

INSTRUMENT PRESET
CENTER FREQUENCY.........37,650,055 Hz
FREQUENCY SPAN...................200 Hz
REFERENCE LEVEL.................-30 dBm
RANGE..............................0 dBm
VIDEO BW............................10 Hz

b. Set the synthesizer controls for:

FREQUENCY..................37,648,955 Hz
AMPLITUDE...................... +10 dBm

c. Connect the 50Ω output of the synthesizer to the 50Ω input of the 3585A.

d. Allow one complete sweep to occur.

e. All points on the display should read less than -80 dB, verifying that the 3585A passes this Fractional N API Spur test.

4-29. Tracking Generator Flatness Test

This test compares the output of the calibrator to the output of the Tracking Generator. Any unflatness contributed by the input section is subtracted out.

Specification:

Tracking Generator Frequency Response ± 0.7 dB

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Procedure:

a. Set the 3585A controls for:

RECALL 604
INSTRUMENT PRESET
dB/DIV................................1 dB
REFERENCE LEVEL............... −20 dBm
RANGE......................... −20 dBm

b. Allow a complete sweep to occur, then enter these commands:

STORE A → B
INSTRUMENT PRESET
dB/DIV................................1 dB
RANGE.............................0 dBm

c. Connect the Tracking Generator output to the 3585A 50Ω input.

d. Adjust the Tracking Generator Amplitude control so that the displayed trace is in the middle of the CRT display.

e. Turn the A-B function on.

f. Move the marker to the most negative point on the trace.

g. Set the 3585A controls for:

OFFSET..................................on
ENTER OFFSET

h. Move the marker to the most positive point on the trace. The marker amplitude should read less than 1.5 dB thereby verifying that the 3585A Tracking Generator meets its flatness specification.

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4-30. HP-IB Check (Optional)

Up to this point the 3585A has been checked only as a bench operated instrument. If the instrument is to be used with a controller, the HP-IB interface should be checked. The program shown in Figure 4-7 will check the HP-IB operation of the instrument to a high level of confidence. This program is flow charted using controller independent language so that it may be adapted to your controller. If you have a -hp- 9825A calculator, a listing of this program appears in Table 4-3. the program is also contained on File 26, Track Ø of the Semi-Automatic Performance Test tape (P.N. 03585-10001). If an error is detected in the HP-IB interface of the 3585A, an error number will be printed out. The error definitions are contained in Table 4-2 and may be used to help locate problems on the 3585A HP-IB board.

To run the HP-IB check with the -hp- 9825A calculator, insert the Semi-Automatic Performance Test tape in the calculator tape slot and press the following keys:

[LOAD] [2] [6] [EXECUTE]

When the lazy "T" (⊢) has reappeared on the 9825A display, press the [RUN] key. To complete the test, follow the instructions on the calculator display. If no HP-IB errors are found by the test, "HP-IB OK" will be printed by the calculator. This ends the HP-IB check program.

Table 4-2. HP-IB Error Definitions

Error #	Explanation
1 2 3	Large HP-IB Problem; DSA Required
4 5 6 7	Data Line Problem
8 9 10 11	Front Panel Light or Interface Problem; otherwise use DSA

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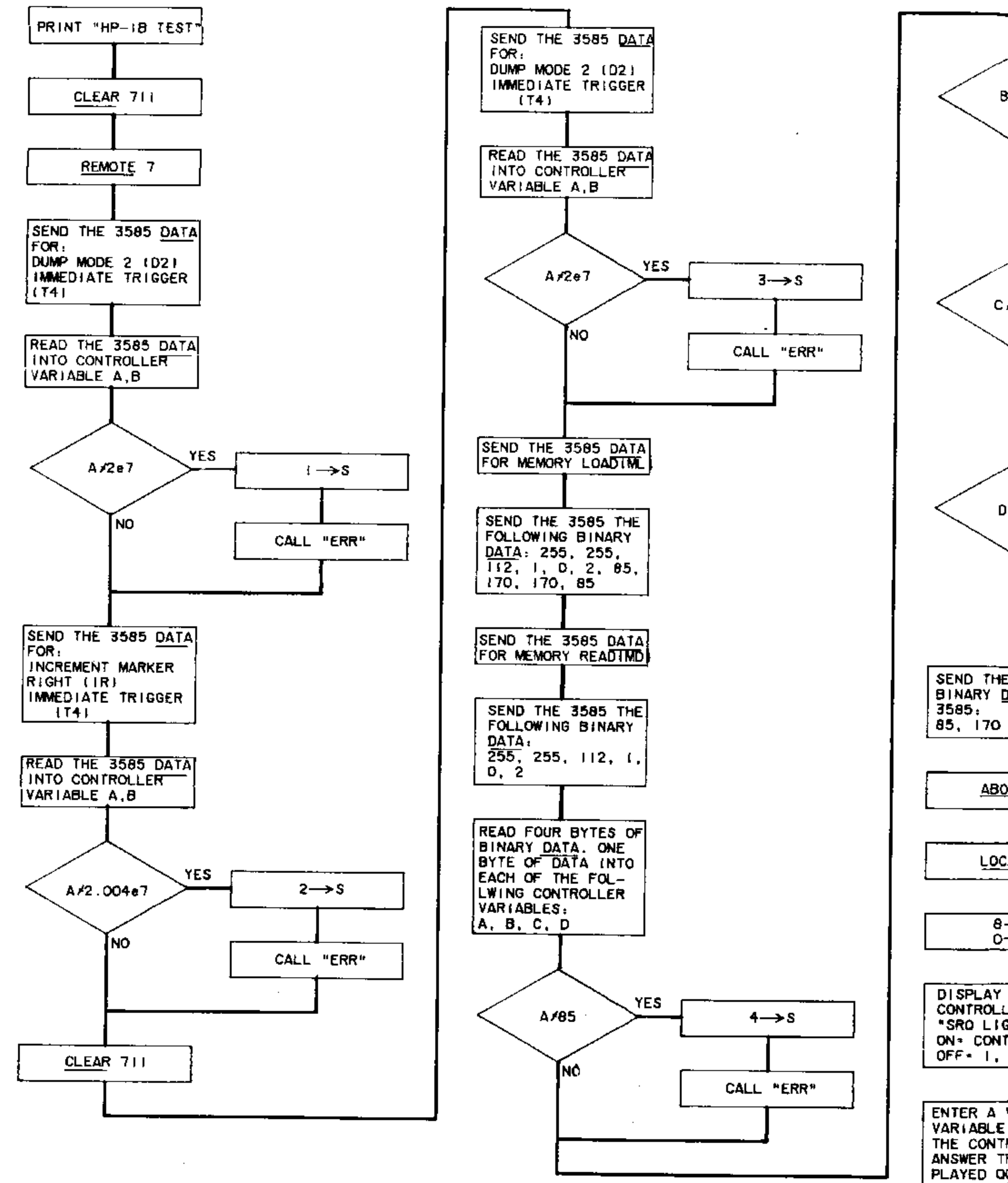
Table 4-3. HP-IB Check Program Listing For The 9825A Calculator

```
0: "HP-IB Test for Op. Verification 3/08/78":
1: spc 2;prt "HPIB Test";spc 2;0→Q
2: clr 711
3: rem 7
4: wrt 711,"D2T4"
5: red 711,A,B
6: if A#2e7;1→S;gsb "ERR"
7: wrt 711,"IRT4"
8: red 711,A,B
9: if A#2.004e7;2→S;gsb "ERR"
10: clr 711
11: wrt 711,"D2T4"
12: red 711,A,B
13: if A#2e7;3→S;gsb "ERR"
14: wrt 711,"ML"
15: wtb 731,255,255,112,1,0,2,85,170,170,85
16: wrt 711,"MD"
17: wtb 731,255,255,112,1,0,2
18: rdb(711)→A;rdb(711)→B;rdb(711)→C;rdb(711)→D
19: if A#85;4→S;gsb "ERR"
20: if B#170;5→S;gsb "ERR"
21: if C#170;6→S;gsb "ERR"
22: if D#85;7→S;gsb "ERR"
23: wtb 711,85,170
24: cli 7
25: lcl 7;8→S
26: 0→R;beep;ent "SRQ Light on=cont;off=1,cont",R;if R=1;gsb "ERR"
27: rds(711)→A
28: red 711;9→S
29: 0→R;beep;ent "Talk Light on=cont;off=1,cont",R;if R=1;gsb "ERR"
30: wrt 711
31: lcl 7;10→S
32: 0→R;beep;ent "Listen Light on=cont;off=1,cont",R;if R=1;gsb "ERR"
33: rem 7
34: wrt 711
35: cli 7;11→S
36: 0→R;beep;ent "Remote Light on=cont;off=1,cont",R;if R=1;gsb "ERR"
37: if Q=0;prt "HPIB OK";spc 2
38: end
39: "ERR":prt "HPIB Failure    Test #",S;spc 2;1→Q
40: ret
*6082
```



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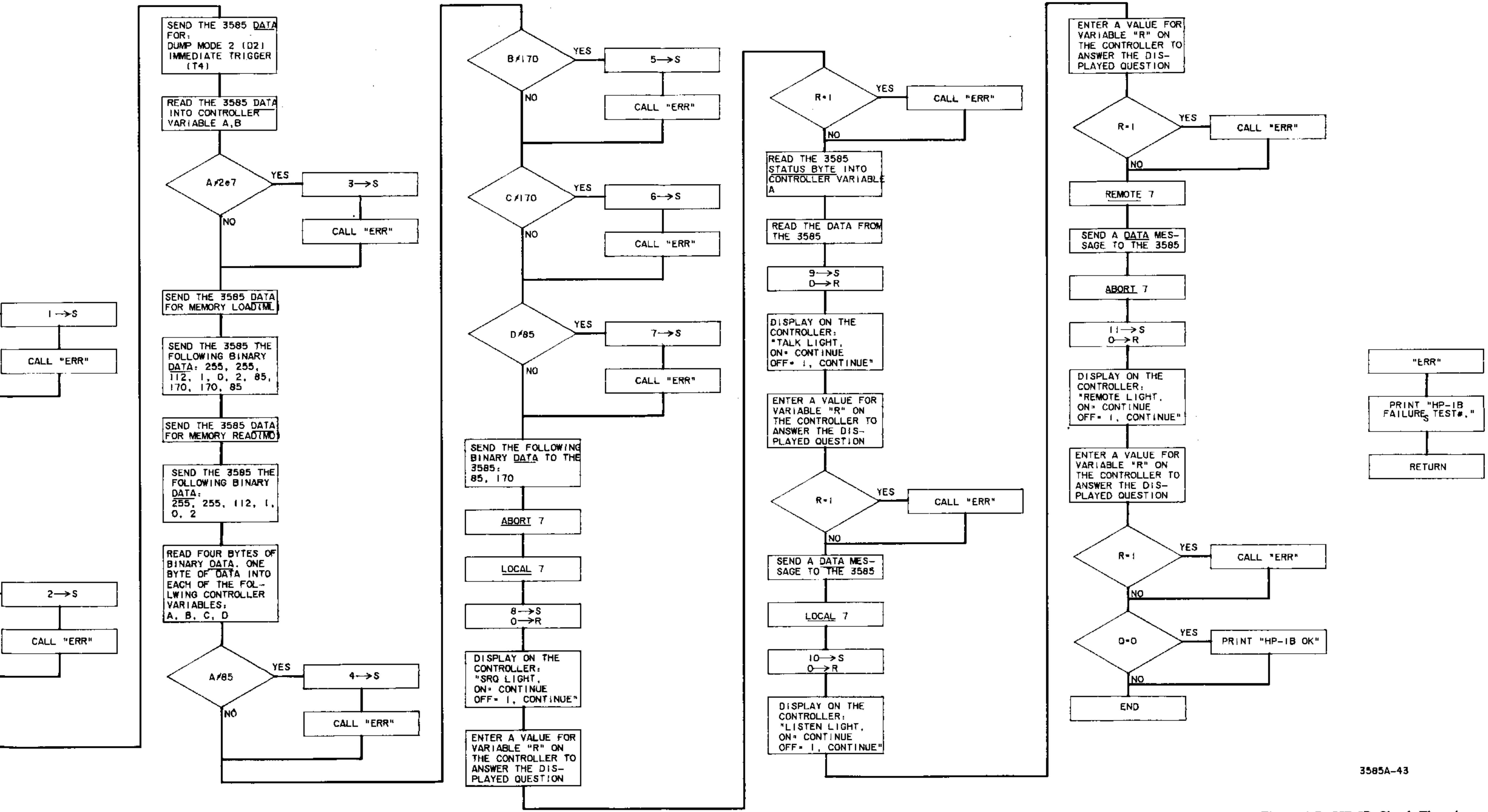

Figure 4-7. HP-IB Check Flowchart

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4-31. SEMI-AUTOMATIC PERFORMANCE TESTS

This portion of Section IV contains information necessary to run the Semi-Automatic Performance Tests listed in Table 4-5. These tests may be run from start to finish as listed or as individually selected tests.

4-32. HP-IB Address Switch Settings

The HP-IB Address switch settings for the instruments used in the Semi-Automatic Performance Tests are listed in Table 4-4. The procedure for changing the 3585A HP-IB address can be found in Paragraph 2-19 of this volume of the Service Manual. For instructions on changing the other instruments HP-IB addresses, refer to the applicable instrument Service Manual.

Table 4-4. HP-IB Address Switch Settings

Instrument	HP-IB Listen Address (5-Bit Decimal Code)
-hp- 3585A Spectrum Analyzer	11
-hp- 9871A Impact Printer, Opt. 01	1
-hp- 3335A Frequency Synthesizer	5
-hp- 3330B Frequency Synthesizer	4
-hp- 3455A Digital Voltmeter	22

WARNING

HP-IB Address switches which require access to the interior of the instrument should be changed only by qualified service personnel.

4-33. Semi-Automatic Performance Test Equipment

The Semi-Automatic Performance Test software is designed to be run with a particular set of HP-IB compatible instruments. These instruments are denoted by an asterisk (*) in Table 4-6. Critical specifications for this equipment may be found in Table 4-1. For usage of equipment other than that listed in Table 4-6, refer to Paragraph 4-34.

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Table 4-5. Summary of Programs Used For Semi-Automatic Performance Testing

File	Test Title
0	GRIND
1	Instrument interconnect test & Header
2	Turn on/Cal Offset
3	Source Accuracy
4	Calibrator Accuracy (Optional)
5	Range Calibration
6	Amplitude Linearity
7	Ref Level Set Accuracy
8	Flatness, 50 ohm, no cal, 10 Hz to 40 M
9	Flatness, 1 M, 20 Hz to 40 MHz
10	RETURN LOSS
11	Noise vs. BANDWIDTH
12	1 M Input Noise, open circuit
13	Marker Accuracy
14	Low Freq. Response/LO sidebands
15	Residual Spurs
16	Conv/Input Spurs and Image
17	IF Harmonic Distortion
18	Harmonic Distortion
19	IM Distortion
20	BW MEAS
21	Tracking Generator Flatness
22	Step IF, Fraction N Spurs
23	API Spurs in Multiple Loop
24	End of Perf. Test message:
25	Dynamic Range Chart
26	HP-IB Test for Op. Verification

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Table 4-6. Semi-Automatic Performance Test Equipment List

-hp- 03585-10001 Semi-Automatic Performance Test Cartridge	
*-hp- 9825A Programmable Calculator	
*-hp- 9871A Character Impact Printer, Option 01	
*-hp- 3335A Frequency Synthesizer	
*-hp- 3330B Frequency Synthesizer	
*-hp- 3455A Digital Voltmeter	
*-hp- 98034A HP-IB Interface	
Frequency Counter	-hp- 5328A
Function Generator	-hp- 3311A
Audio Oscillator	-hp- 339A
50Ω Return Loss Bridge	-hp- 8721A
75Ω Return Loss Bridge	-hp- 8721A Option 008
50Ω Feed Thru Termination	-hp- 11048C
75Ω Feed Thru Termination	-hp- 11094B
10dB/Step Attenuator	-hp- 355D
1dB/Step Attenuator	-hp- 355C
0.5V Thermal Voltage Converter	-hp- 11051A Option 01
Double Balanced Mixer	-hp- 10534A
HP-IB Cables	-hp- 10631
10:1 Voltage Divider Terminated in 50Ω	(See Figure 4-11)
Frequency Summer	(See Figure 4-20)
9MHz Low Pass Filter	(See Figure 4-21)
DC Power Supply	-hp- 6213A
50/75Ω Minimum Loss Pad	-hp- 85428B

4-34. Test Equipment Substitutions

The included Semi-Automatic Performance Test software is designed to be used with the calculator, printer and frequency synthesizers listed under Recommended Test Equipment, Table 4-6. Other HP-IB compatible controllers and instruments may be used for the tests; however, the user must write his own software to be compatible with his particular equipment. Substitute test equipment must meet the critical specifications listed in Table 4-1.

NOTE

HP-IB is Hewlett-Packard's implementation of IEEE std 488-1975, "standard digital interface for programmable instrumentation".

4-35. Manual Tests

Before proceding with the calculator controlled portion of the semi-automatic performance tests, two manual tests must be performed. The first of these tests is for frequency accuracy, and the second test checks the 1 M ohm input impedance and capacitance.

4-36. Frequency Accuracy

This test verifies the frequency accuracy of the 3585A by using an external counter to check the internal frequency reference. It is important that the frequency counter used to do this test has a reference which is more accurate than that of the 3585A.

Specification: Counter Accuracy, ±0.3Hz ± 1×10^{-7}/month

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Procedure:

a. Allow the instruments used in this test to warm up for 15 to 20 minutes before beginning this test.

b. Set the synthesizer controls for:

FREQUENCY . . . . 9 MHz
AMPLITUDE . . . . 0 dBm

c. Set the 3585A controls for:

INSTRUMENT PRESET
MANUAL SWEEP . . . . 9 MHz
COUNTER . . . . on

d. Using a BNC "T" contector, connect the synthesizer's 50 ohm output to the frequency counter and the 3585A 50 ohm input.

NOTE

Be sure that the synthesizer and the 3585A are operating on their own internal references. disconnect any reference connection common to both instruments.

e. Record the frequency difference between the frequency counter and the 3585A counter reading. Difference frequency equals ______Hz.

f. The 3585A frequency accuracy is specified in terms of frequency drift; therefore, if the frequency accuracy derived from this test is not in accordance with your requirements, turn to Section 5 of this manual for the Reference Oscillator Adjustment procedure.

g. This completes the Frequency Accuracy Test, reconnect any necessary references.

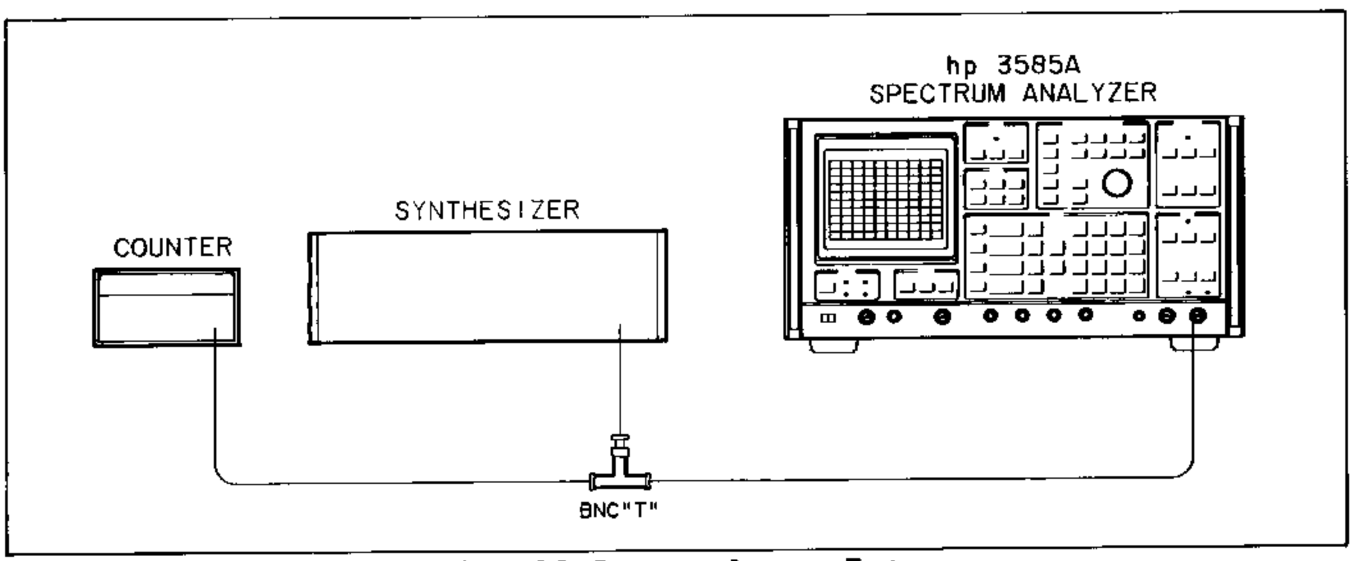

Figure 4-8. Frequency Accuracy Test

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4-37. 1 M Ohm Input Impedance Test

These tests verify that the 3585A meets the Input Impedance specifications for the 1 MΩ, 30 pf Input Impedance setting.

Specification: 1MΩ ± 3%, < 30 pf

Equipment Required:

Resistor: 1MΩ ± 1%, 1/8W film........-hp- Part No. 0757-0344
50Ω Feed Thru Termination......................-hp- 11048C
Synthesizer..................................-hp- 3335A

Procedure:

a. Set the 3585A controls as follows:

INSTRUMENT PRESET
CENTER FREQUENCY.................1 kHz
MANUAL SWEEP.......................on
RES. BW............................100 Hz
dB/DIV..............................2 dB
RANGE..............................0 dBm
INPUT IMPEDANCE...................1 MΩ

b. Set the synthesizer controls for:

FREQUENCY.........................1 kHz
AMPLITUDE.........................0 dBm

c. Connect the 50Ω termination to the 3585A 1 MΩ input. Connect the synthesizer output to the termination input.

d. Set the 3585A controls for OFFSET on. Allow time for the marker reading to stablize and press the ENTER OFFSET button.

e. Using short clip leads, insert the 1 MΩ resistor between the output of the termination and the 3585A 1 MΩ input as shown in Figure 4-9.

f. The 3585A marker amplitude reading should be -6.0 dB ± 0.44 dB, verifying that the input resistance is 1 MΩ ± 5%.

g. Press the 3585A ENTER OFFSET button.

h. Set the synthesizer frequency to 10 kHz.

i. Set the 3585A for a CENTER FREQUENCY of 10 kHz.

j. The 3585A marker reading should be between -1 dB and -3 dB, verifying that the shunt capacitance is less than 30 pf.

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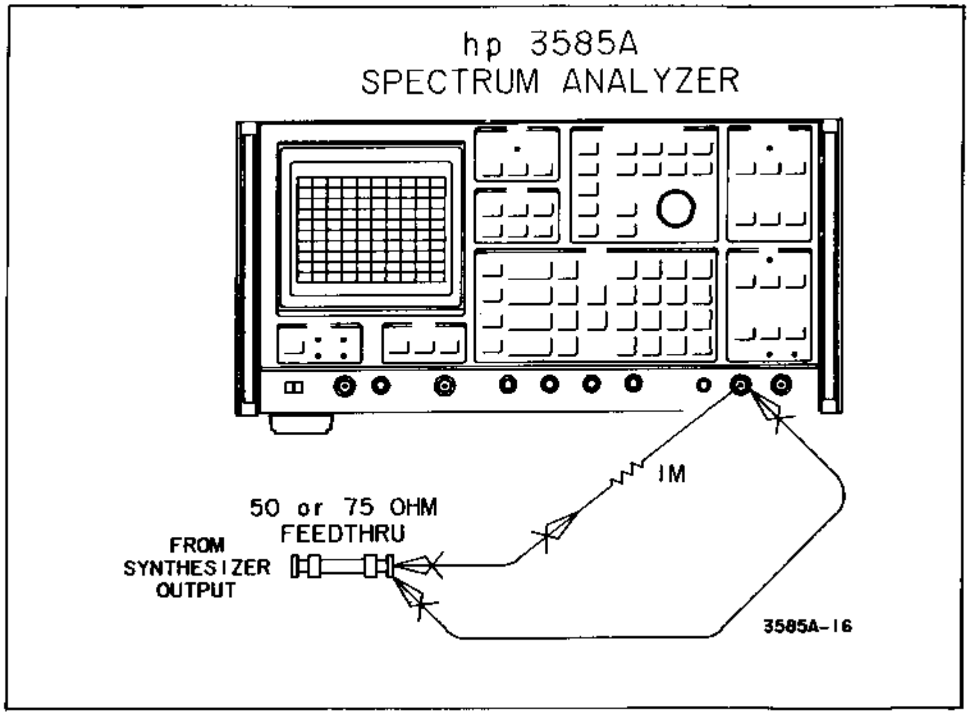

Figure 4-9. 1 M Ohm Input Impedance Test

4-38. Semi-Automatic Performance Test Equipment Set-up

To run the Semi-Automatic Performance Tests, the -hp- 9825A Calculator, -hp- 9871 Printer, -hp- 3335A Frequency Synthesizer, -hp- 3330 Frequency Synthesizer and -hp-3585A Spectrum Analyzer must be connected together as shown in Figure 4-3 and remain so for all of the performance tests unless otherwise noted. Some test require special equipment and equipment set-ups. See Table 4-7, Equipment Set-up for a reference.

Table 4-7. Equipment Set-up

Semi-Automatic Performance Tests Equipment Set-up	Figure Number
Master Test Set-up	Figure 4-10
Thermal Converter Output Calibration	Figure 4-11
Measurement of Frequency Synthesizer for Calibration Data	Figure 4-12
50 ohm Return Loss Test	Figure 4-13
75 ohm Return Loss Test	Figure 4-14
Tracking Generator Return Loss Test	Figure 4-15
Terminated Input Return Loss Test	Figure 4-16
Harmonic Distortion Test	Figure 4-17
Intermodulation Distortion Test	Figure 4-18

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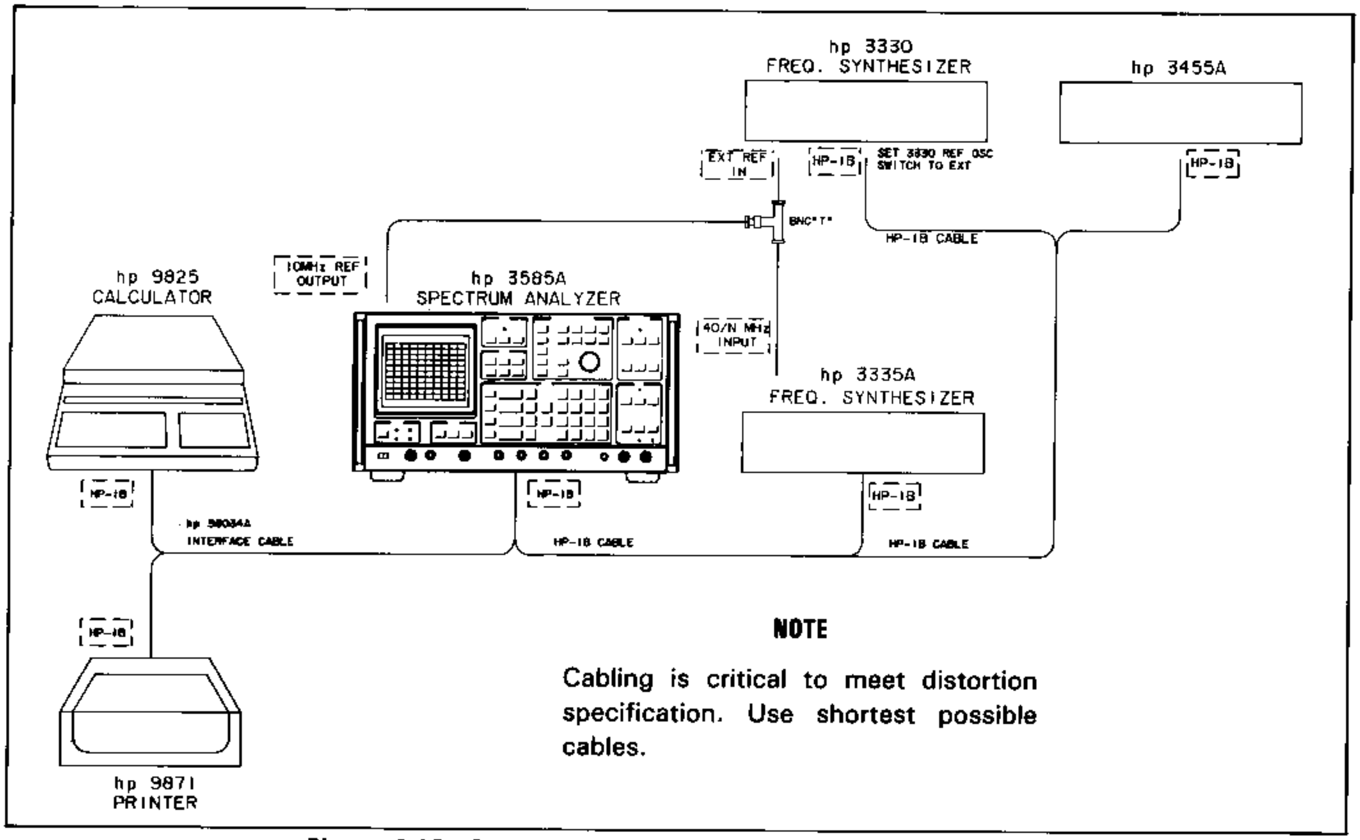

NOTE

Cabling is critical to meet distortion specification. Use shortest possible cables.

Figure 4-10. Semi-Automatic Performance Test Equipment Set-up

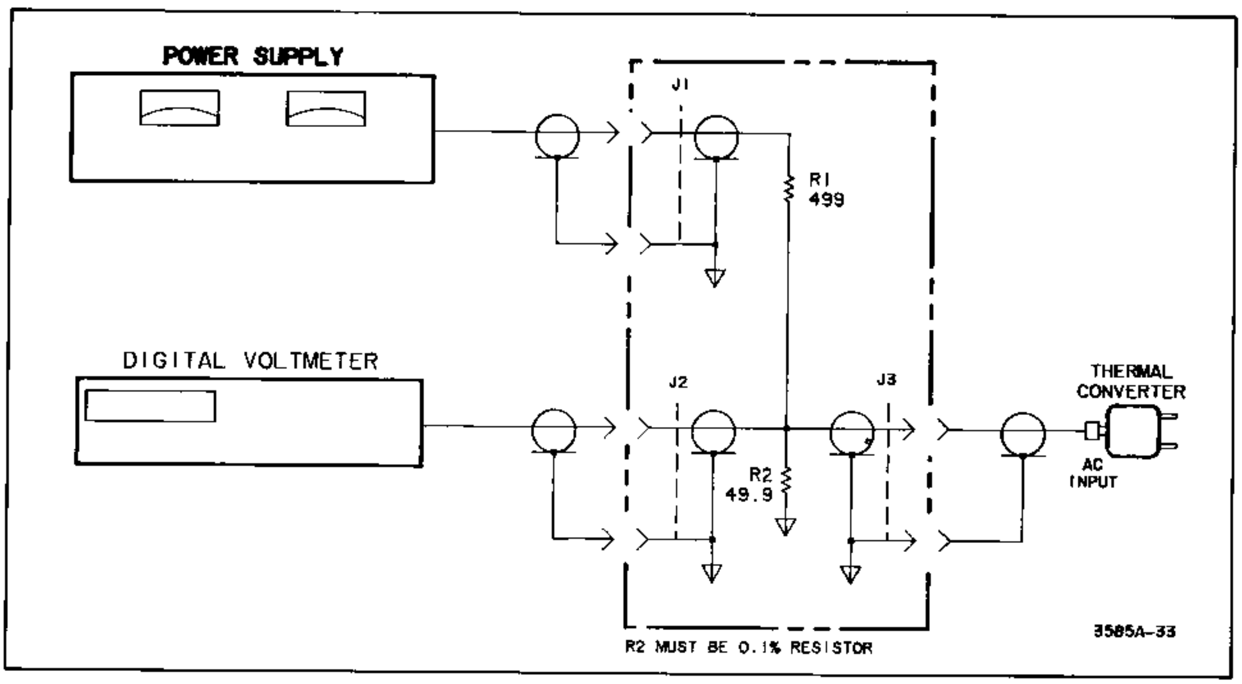

Figure 4-11. Thermal Converter Output Calibration

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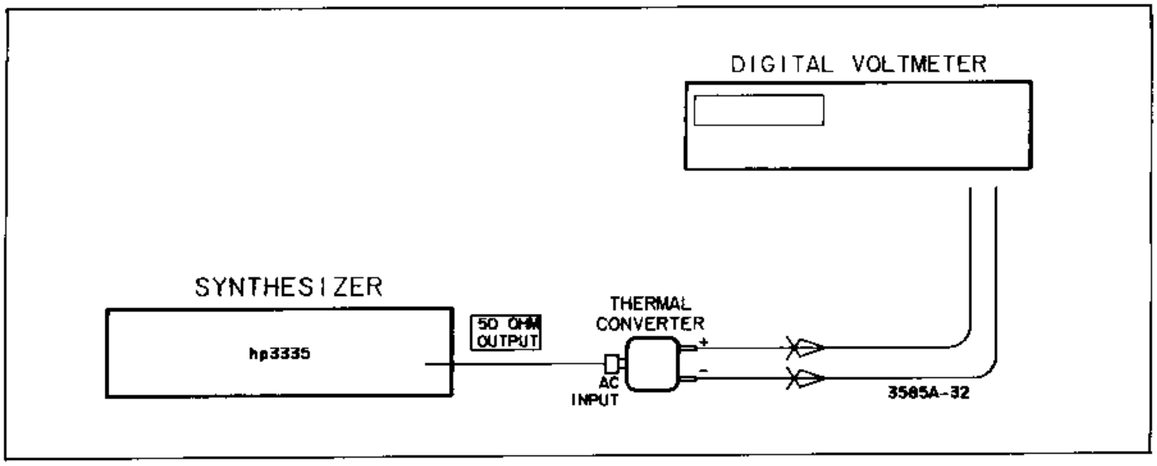

Figure 4-12. Measurement of Frequency Synthesizer For Calibration Data

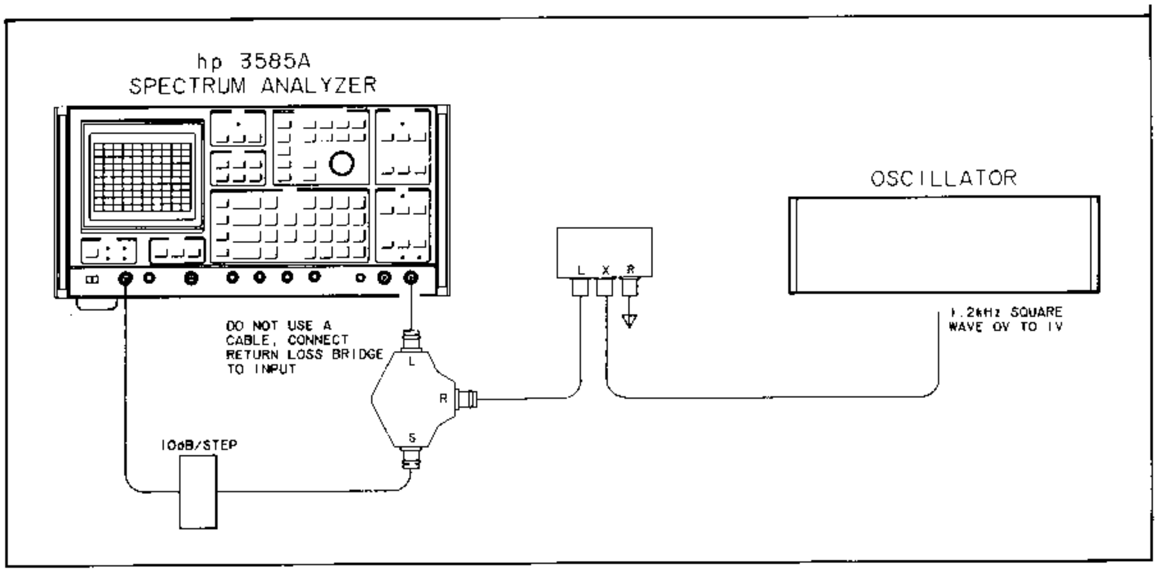

Figure 4-13. 50 ohm Return Loss Test (Automatic Tests)

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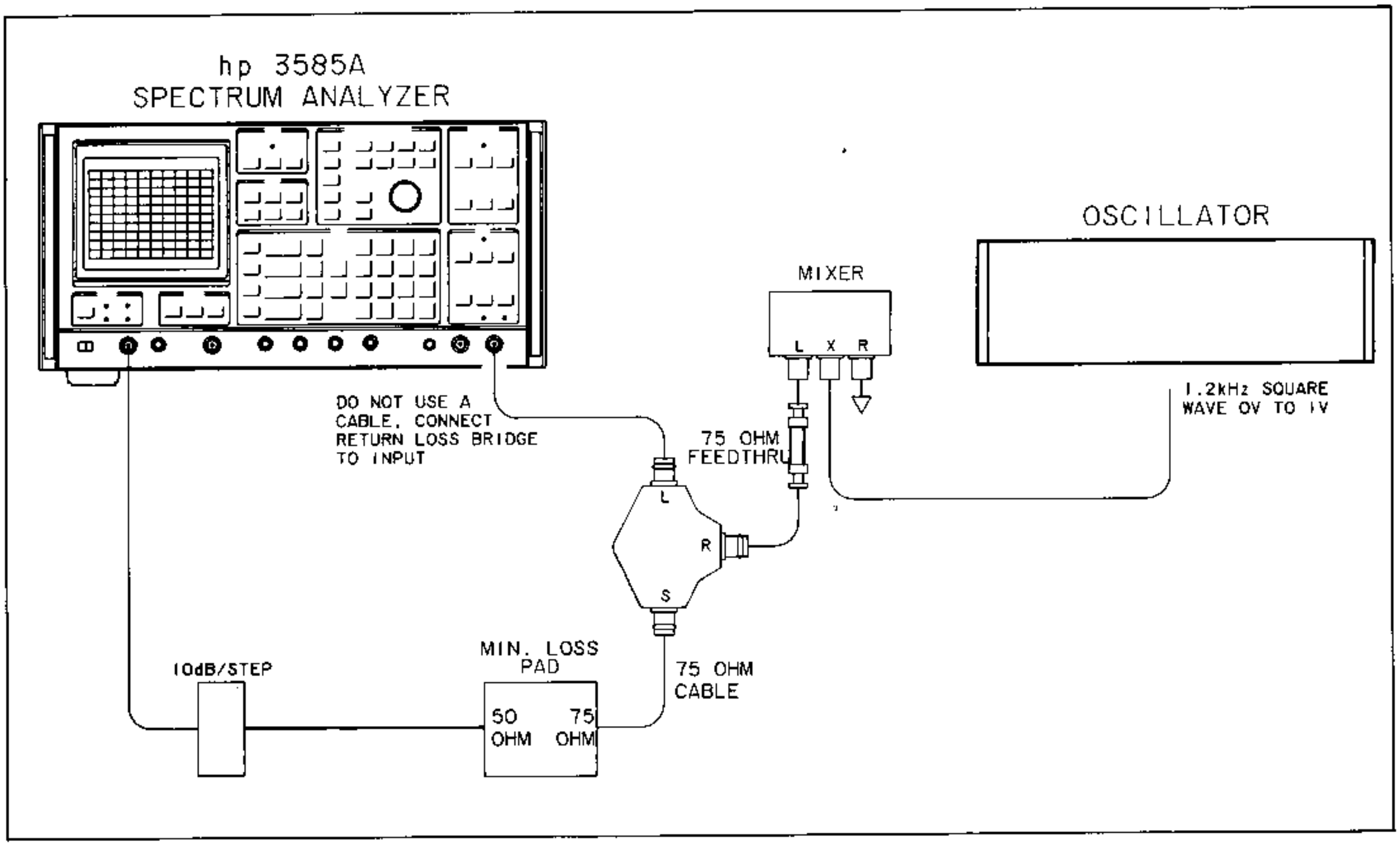

Figure 4-14. 75 ohm Return Loss Test (Automatic Tests)

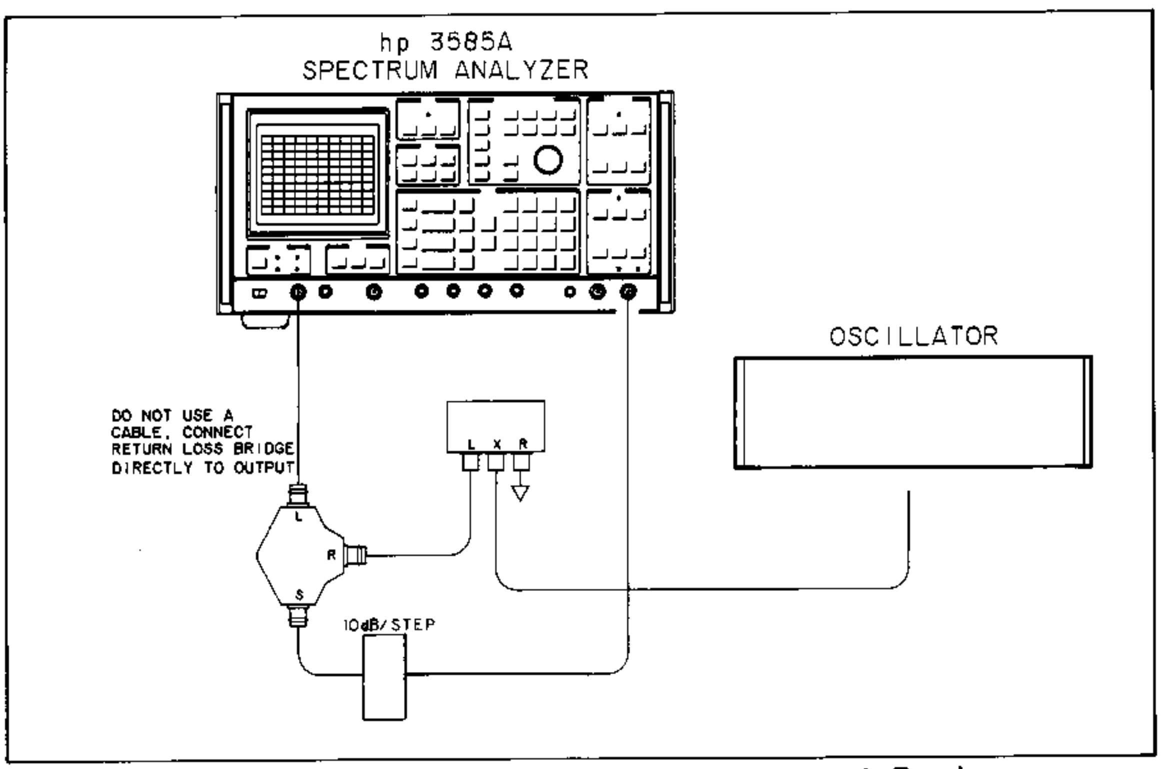

Figure 4-15. Tracking Generator Return Loss Test (Automatic Tests)

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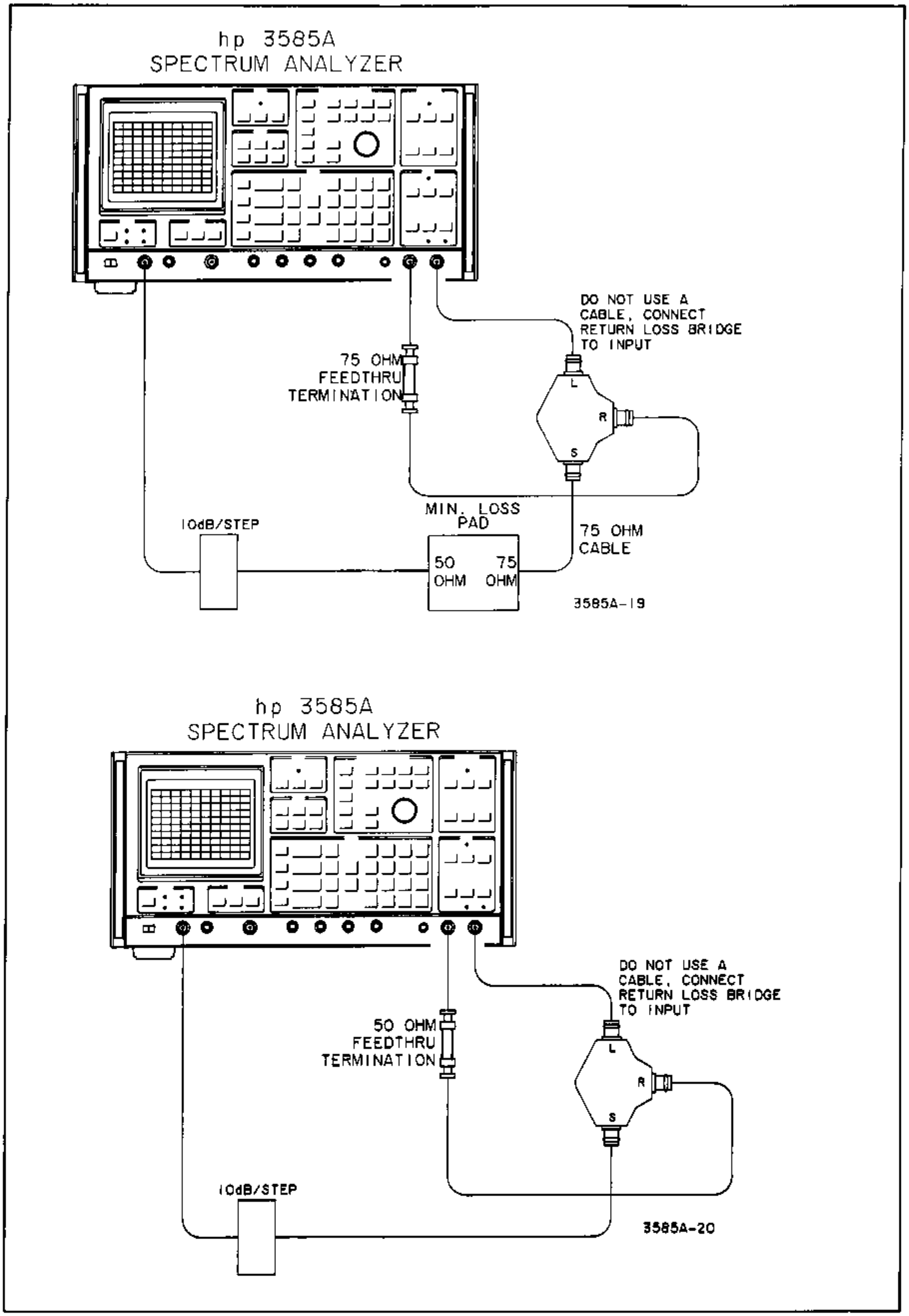

Figure 4-16. Terminated Input Return Loss Test (Automatic Tests)

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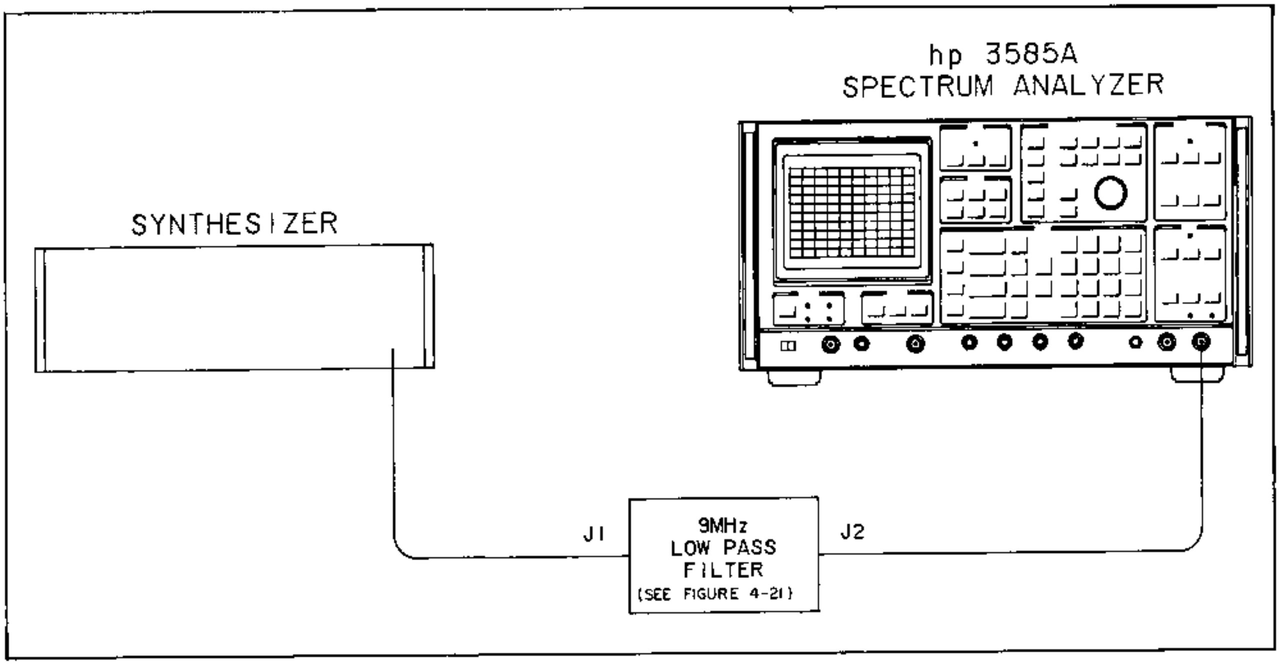

Figure 4-17. Harmonic Distortion Test

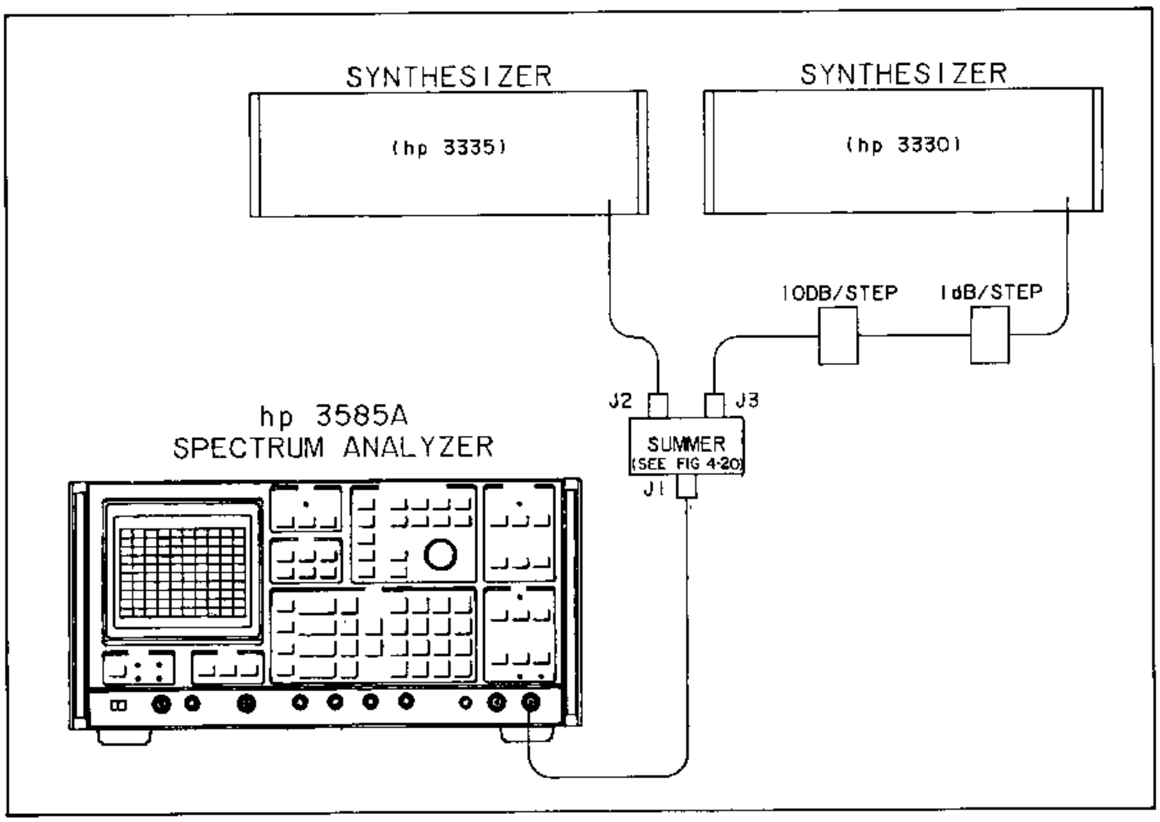

Figure 4-18. Intermodulation Distortion Test

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4-39. Semi-Automatic Performance Test Procedure

a. Turn the calculator power off.

b. Insert the calculator ROM's described in the Recommended Test Equipment list, Table 4-1, and into the slots under the calculator keyboard (see Figure 4-4).

c. Check the rotary switch setting (Figure 4-19) on the HP-IB interface cable. The pointer should be on "7". If the pointer is at some other setting, use a small screwdriver to set it on "7".

d. Turn the calculator, printer, synthesizer and spectrum analyzer power on.

e. Load the supplied performance test cassette tape (Part Number 03585-10001) into the cassette tape slot.

f. Press [LOAD] [0] on the calculator keyboard.

g. Press [EXECUTE]

h. After the run light has gone out, press [RUN] on the calculator keyboard.

i. From this point on, the calculator will give instructions for what to do next. The manual does contain equipment set-ups for some of the tests. As these tests are encountered, the calculator will refer you to the equipment set-up diagram in the manual.

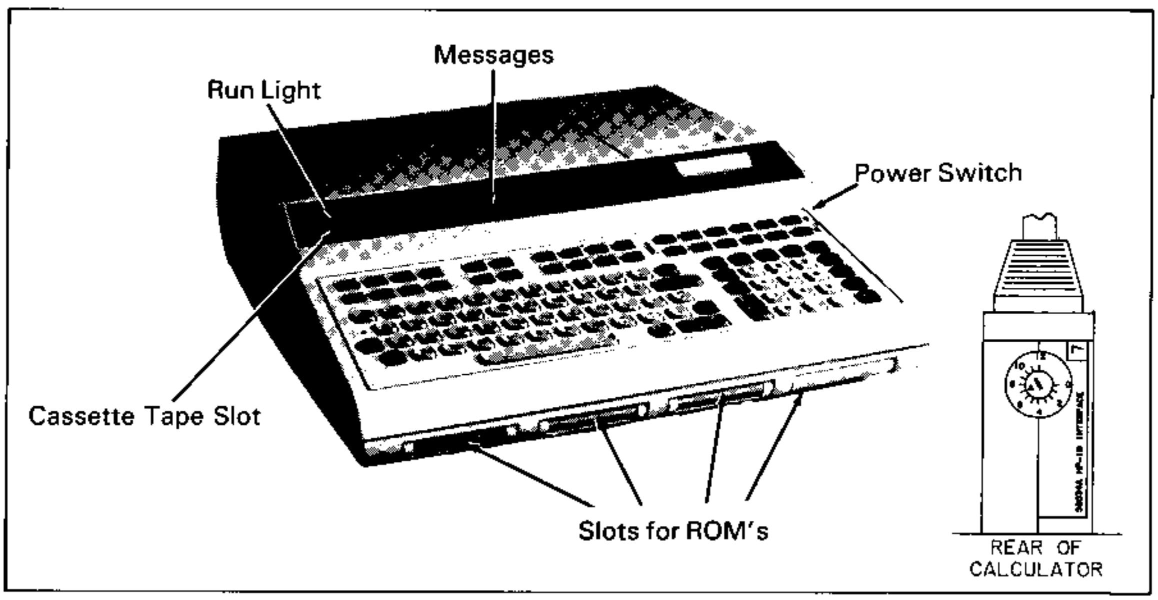

Figure 4-19. HP 9825A Calculator

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4-40. Program Failures

If, while running a program everything comes to a grinding halt, you are sure the program is gathering false data or an error message is displayed on the calculator, the following steps should be taken:

a. Press RESET

b. Check the equipment set-up to be sure all connections and control settings are correct.

c. Press RUN

If this procedure fails to correct the problem, then try this procedure:

a. Press RESET

b. Find out which program you are trying to run. The 9871A printout should be useful in finding this information.

c. Using the Performance Test title (or the previous test title) go to Table 4-5 and find the file number for the program that you are trying to run.

d. Enter these commands on the 9825A calculator:

LOAD ______, 1 2 1 EXECUTE

File No. From Step c.

e. Press RUN

4-41. Running Individual Semi-Automatic Performance Tests

To run one of the individual programs shown in Table 4-5 the following command sequence should be entered on the 9825A calculator:

a. LOAD 0 EXECUTE

b. LOAD ______, 1 2 1 EXECUTE

Chosen File No.

c. RUN

NOTE

When individual programs are run it is assumed that all the needed equipment has been correctly connected and checked with the Instrument Interconnect Test in File No. 1.

If more than one Program is to be run, only Steps b and c need to be executed after all three steps have been executed once.

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Table 4-8. Performance Test Failure To Service Group Cross Reference

NOTE

This table is only meant to be a reference. It is still recommended that you use the Volume Two or Volume Three to locate the problem. Problems related to distortion or spurs should be further analyzed using Service Group J.

File	Test Title	Service Group Reference
0	GRIND	NA
1	Instrument interconnect test & Header	NA
2	Turn on/Cal Offset	F,A-5,E,A-1
3	Source Accuracy	NA
4	Calibrator Accuracy (optional)	A-1
5	Range Calibration	A-1
6	Amplitude Linearity	A-4
7	Ref Level Set Accuracy	A-3,A-5
8	Flatness, 50 ohm, no cal, 10Hz to 40M	A-1
9	Flatness, 1M, 20Hz to 40MHz	A-1
10	RETURN LOSS	A-1
11	Noise vs. BANDWIDTH	A-1,A-2
12	1M Input Noise, open circuit	A-1
13	Marker Accuracy:	C
14	Low Freq. Response/LO sidebands	A-2,B
15	Residual Spurs	B,J
16	Conv/Input Spurs and Image	A-2,J
17	IF Harmonic Distortion	J
18	Harmonic Distortion	J
19	IM Distortion	J
20	BW MEAS	A-3
21	Tracking Generator Flatness	E
22	Step IF, Fraction N Spurs	J
23	API Spurs in Multiple Loop	J
24	End of Perf. Test message	NA
25	Dynamic Range Chart	NA
26	HP-IB Test for Op. Verification	NA

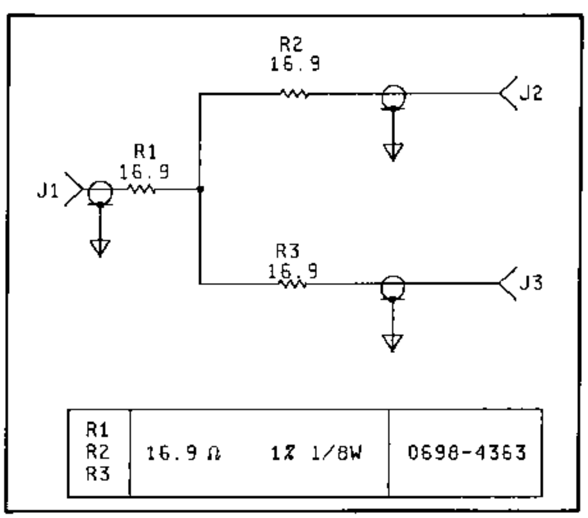

Figure 4-20. Frequency Summer

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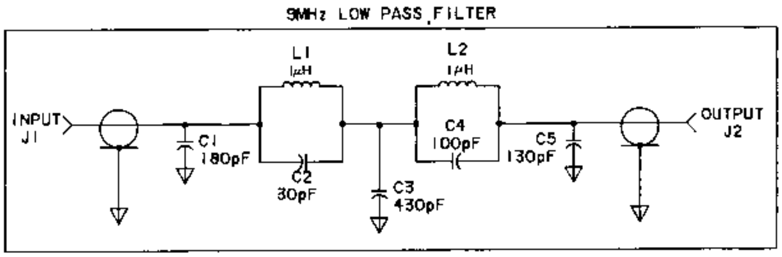
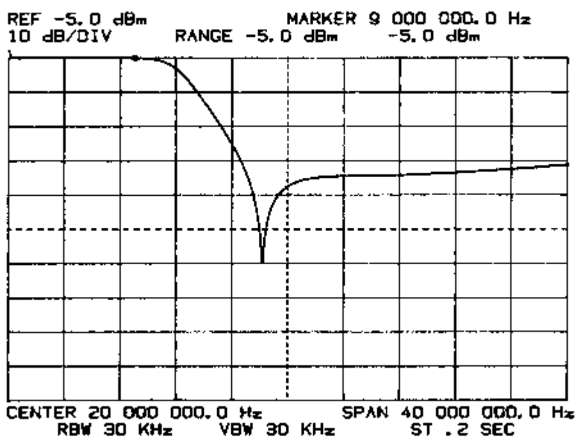


		-hp- Part No.
C1	180pf 5%, 300V	0140-0197
C2	30pf 5%, 300V	0160-2199
C3	430pf 5%, 300V	0160-0939
C4	100pf 5%, 300V	0160-2204
C5	130pf 5%, 300V	0140-0985
L1,2	1μH adjustable, 10%	9100-3312

- Adjust L1 and L2 until the approximate filter response shown below is acquired.



Approximate Filter Response

Figure 4-21. 9 MHz Low Pass Filter

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OPERATIONAL VERIFICATION TEST CARD

Hewlett-Packard Model 3585A

Spectrum Analyzer

Serial No.______________

Tests Performed By______________

Date____________________

FREQUENCY ACCURACY TEST

Frequency difference from reference_______Hz

CALIBRATOR TEST

Frequency	3585A Marker Reading
100 kHz	______________ dBm
40 MHz	______________ dB

CAL OFFSET TEST

Res. BW	Freq. Span	3585A Offset Frequency Reading	Frequency Test Limit	3585A Amplitude Reading	Amplitude Test Limit
300 Hz	50 kHz	__________Hz	±3.5 kHz	_____ dB	±3.5 dB
10 kHz	20 kHz	__________Hz	±3.5 kHz	_____ dB	±3.5 dB
3 kHz	5 kHz	__________Hz	±3.5 kHz	_____ dB	±3.5 dB
1 kHz	2 kHz	__________Hz	±3 kHz	_____ dB	±3.5 dB
300 Hz	500 Hz	__________Hz	±900 Hz	_______	±3.5 dB
100 Hz	200 Hz	__________Hz	±300 Hz	_____ dB	±3.5 dB
30 Hz	50 Hz	__________Hz	±90 Hz	_____ dB	±3.5 dB
10 Hz	20 Hz	__________Hz	±30 Hz	_____ dB	±3.5 dB
3 Hz	7 Hz	__________Hz	±15 Hz	_____ dB	±3.5 dB

RANGE CALIBRATION TEST

Test Limit ± .7 dB

Range	Marker Reading
-25 dBm	_________0 dB
-20 dBm	_________ dB
-15 dBm	_________ dB
-10 dBm	_________ dB
- 5 dBm	_________ dB
0 dBm	_________ dB
5 dBm	_________ dB
10 dBm	_________ dB
15 dBm	_________ dB
20 dBm	_________ dB
25 dBm	_________ dB
30 dBm	_________ dB

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AMPLITUDE LINEARITY TEST

(A) Variable Attenuator	(B) Correction Factor*	(C) Ideal Reading	(D) Correct Reading	(E) 3585A Marker Reading**	(F) Test Tolerance
0 dB	- - - -	00.0 dB	00.0 dB	00.0 dB	- - - -
-10 dB	______	-10.0 dB	______ dB	______ dB	±0.3 dB
-20 dB	______	-20.0 dB	______ dB	______ dB	±0.3 dB
-30 dB	______	-30.0 dB	______ dB	______ dB	±0.6 dB
-40 dB	______	-40.0 dB	______ dB	______ dB	±0.6 dB
-50 dB	______	-50.0 dB	______ dB	______ dB	±1.0 dB
-60 dB	______	-60.0 dB	______ dB	______ dB	±1.0 dB
-70 dB	______	-70.0 dB	______ dB	______ dB	±1.0 dB
-80 dB	______	-80.0 dB	______ dB	______ dB	±2.0 dB
-90 dB	______	-90.0 dB	______ dB	______ dB	±2.0 dB

*Correction factor must be obtained from attenuator calibration data.
**If noise jitter is present, use average marker reading.

REFERENCE LEVEL ACCURACY TESTS

(A) Synthesizer Level	(B) 3585A Reference Level	(C) 3585A Marker Reading	(D) Synthesizer Level Minus The 3585A Marker Reading	(E) Test Tolerance
+10 dBm	+10 dBm	____ dBm	______ dB	±0.4 dB
0 dBm	0 dBm	____ dBm	______ dB	±0.4 dB
−10 dBm	−10 dBm	____ dBm	______ dB	±0.4 dB
−20 dBm	−20 dBm	____ dBm	______ dB	±0.4 dB
−30 dBm	−30 dBm	____ dBm	______ dB	±0.4 dB
−40 dBm	−40 dBm	____ dBm	______ dB	±0.4 dB
−50 dBm	−50 dBm	____ dBm	______ dB	±0.7 dB
−60 dBm	−60 dBm	____ dBm	______ dB	±0.7 dB
−70 dBm	−70 dBm	____ dBm	______ dB	±1.5 dB
−80 dBm	−80 dBm	____ dBm	______ dB	±1.5 dB

50Ω FREQUENCY RESPONSE TEST

Test Limit ± .5 dB

Range	Maximum Amplitude Deviation
−25 dBm	______ dB
−20 dBm	______ dB
−15 dBm	______ dB
−10 dBm	______ dB
− 5 dBm	______ dB
0 dBm	______ dB
5 dBm	______ dB
10 dBm	______ dB
15 dBm	______ dB
20 dBm	______ dB
25 dBm	______ dB
30 dBm	______ dB

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75Ω FREQUENCY RESPONSE TEST

Test Limit ± .5 dB

Range	Maximum Unflatness
−25 dBm	________ dB

1 MΩ FREQUENCY RESPONSE TEST

Frequency	Maximum Unflatness	Test Limit
0 to 10 MHz	________ dB	±0.7 dB
10 MHz to 40 MHz	________ dB	±1.5 dB

RETURN LOSS TESTS

Test Limit < 17.5 mV p-p

Input	40 MHz	15 MHz	Test Limit
50Ω	______	______	17.5 mV
Terminated (50Ω)	______		70 mV
75Ω	______	______	17.5 mV
Terminated (75Ω)	______		70 mV

1 MΩ INPUT IMPEDANCE TEST

Frequency	3585A Reading	Test Limit
0 kHz	______ dB	-5.56 to -6.44 dB
10 kHz	______ dB	-2 to -3 dB

MARKER ACCURACY TEST

Test Limit < ±0.2% Of Span

Ideal Reading	3585A Reading	Test Limit
20.08 MHz	______ MHz	20-20.16 MHz

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NOISE

3585A Res. BW	9.36 MHz Average Noise Reading	Test Limit
30 kHz	______ dBm	-100
10 kHz	______ dBm	-104
3 kHz	______ dBm	-108
1 kHz	______ dBm	-111
300 Hz	______ dBm	-115
100 Hz	______ dBm	-122
30 Hz	______ dBm	-127
10 Hz	______ dBm	-132
3 Hz	______ dBm	-137

ZERO RESPONSE TEST

Test Limit < -15 dB Below Range

3585A reading = __________ dB

LOW FREQUENCY RESPONSES

Description	Frequency	Harmonics *1	*2	*3	*4	*5
Line Frequency	60 Hz	____	____	____	____	____
A/D Clock	5 kHz	____	____	____	____	____
Fractional N Clock	100 kHz	____	____	____	____	____
Step Loop Clock	1 MHz	____	____	____	____	____
Internal Reference	10 MHz	____	____	____	____	____
Power Supply	______	____	____	____	____	____
CRT Oscillator	______	____	____	____	____	____

LOCAL OSCILLATOR SIDEBANDS

Test Limit > -80 dB Down From Signal

Frequency	Sideband Harmonics -3	-2	-1	+1	+2	+3
60 Hz	____	____	____	____	____	____
5 kHz	____	____	____	____	____	____
100 kHz	____	____	____	____	____	____
1 MHz	____	____	____	____	____	____
Power Supply ______ Hz	____	____	____	____	____	____
CRT Oscillator ______ Hz	____	____	____	____	____	____

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RESIDUAL SPURS

Test Limit < -120 dBm

Frequency	3585A Reading
39.825 MHz	________ dBm
29.475 MHz	________ dBm
23.1 MHz	________ dBm
16.2 MHz	________ dBm
14.7375 MHz	________ dBm
9.5625 MHz	________ dBm
37.2375 MHz	________ dBm
32.0625 MHz	________ dBm
9.72 MHz	________ dBm
5.58 MHz	________ dBm
27.72 MHz	________ dBm

HARMONIC DISTORTION TEST

Test Limit < -80 dB Down From Signal

Fundamental Frequency	Harmonics 2	3	4
1 kHz	___ dB	___ dB	___ dB
9 MHz	___ dB	___ dB	___ dB

INTERMODULATION DISTORTION TEST

Synthesizer #1 Frequency	100 Hz Below Frequency Shown ($2F_1$-F_2)	200 Hz Above Frequency Shown ($2F_2$-F_1)	100 Hz (F_2-F_1)
1 kHz	________ dB	________ dB	_____ dB
33 MHz	________ dB	________ dB	_____ dB

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OPERATIONAL VERIFICATION TEST CARD (Cont'd)

BANDWIDTH TESTS

3585A	3 dB Bandwidth			60 dB Bandwidth		Shape Factor Test Limit < 11:1
Res. BW	Freq. Span	Measurement	Test Limit	Freq. Span	Measurement	(SF=60 dB BW÷30 dB BW)
3 Hz	10 Hz	______Hz	3 Hz ± 6 Hz	100 Hz	______Hz	______
10 Hz	30 Hz	______Hz	10 Hz ± 2 Hz	200 Hz	______Hz	______
30 Hz	100 Hz	______Hz	30 Hz ± 6 Hz	500 Hz	______Hz	______
100 Hz	200 Hz	______Hz	100 Hz ± 20 Hz	2 KHz	______Hz	______
300 Hz	1 KHz	______Hz	300 Hz ± 60 Hz	5 KHz	______KHz	______
1 KHz	2 KHz	______KHz	1 KHz ± 200 Hz	20 KHz	______KHz	______
3 KHz	10 KHz	______KHz	3 KHz ± 600 Hz	50 KHz	______KHz	______
10 KHz	20 KHz	______KHz	10 KHz ± 2 KHz	100 KHz	______KHz	______
30 KHz	100 KHz	______KHz	30 KHz ± 6 KHz	500 KHz	______KHz	______

FRACTIONAL N API SPUR TEST

Maximum Point On Displayed Trace__________dB

TRACKING GENERATOR FLATNESS TEST

Test Limit < ±0.7 dB

3585A Maximum Unflatness Reading __________dB

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SECTION V
ADJUSTMENTS

5-1. INTRODUCTION

This section contains complete adjustment procedures for the Model 3585A Spectrum Analyzer. Table 5-1 lists the adjustments and their affected components. Figures 5-45 and 5-46 are foldout drawings found at the end of this section. These drawings show adjustment locations throughout the instrument.

Table 5-1. Adjustment Locations

Adjustment	Paragraph Location	Affected Components	Service Group
Low Voltage Power Supplies (A71-75)	5-6	A75R9,R15, A72R31, R19	I
90MHz Reference Board (A21)	5-7	A21R125	B-1
10MHz Oven Oscillator (A81)	5-8	A81R2	B - 1
Oven Output Shutdown	5-9	A81R9	B - 1
CRT Control and High Voltage Power Supply (A63,65,67)	5-10	A67R46,R6,R105,R116, A65R13,A63R4,R1-6,R38	D-2,4
CRT Graphics (A64,67)	5-11	A67R59,R85,R54,R80, R3,R2,R1	D-4
CRT Alphanumerics (A64)	5-12	A64R72,C23,R48,R62, R14,R16,R1	D-3
Fractional N (A31-34)	5-13	A34R32,A31L3, A32R49,R56	B-4,5
L.O. Step Loop (A23-26)	5-14	A23L1	B-3
First L.O. VTO and Sum Loop	5-15	A27R2,R11	B-2
Video Filter and A/D (A15,16)	5-16	A16R21,R19,A15R4	A-5,6
Log Amp and 30kHz Filter (A14)	5-17	A14L5,L7,R57,R53 A17R105,A15R7	A-3,4,5
Log Amp Slope Adjustment (A14)	5-18	A14R43,R17,R7,R8, R14,R21,R26	A-4
Reference Level DC Offset (A15)	5-19	A15R9,R7	A-5

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Table 5-1. Adjustment Locations (Cont'd)

Adjustment	Paragraph Location	Affected Components	Service Group
IF Filters (A17-19)	5-20	A19C39,C41	A-3
Fifth Crystal Stage	5-21	A19L7,C41	
Fourth Crystal Stage	5-22	A19L6,C30	
Fourth LC Stage	5-23	A19L5,R28	
Fifth LC Stage	5-24	A19L4,R20	
Third Crystal Stage	5-25	A18L6,C24,L4	
Third LC Stage	5-26	A18L5,R15	
Second Crystal Stage	5-27	A17L7,C39	
First Crystal Stage	5-28	A17L6,C29,L8	
Second LC Stage	5-29	A17L4,R12	
First LC Stage	5-30	A17L5,R20	
Final IF Filter Adjustments (A17)	5-31	A17C27,C37,C22,C28, C39,R26,R28,R30,R32, R34	A-3
16dB Amplifiers (A18)	5-32	A18R77,R71,R65	A-3
Conversion Section	5-33	A2C3,L7,L8,L11,L12, A3L1,L3,L5,L7,C8, A4L7,C2,C3,A5L1-6,T3, T4	A - 2
Input Section	5-34	A-1	
Calibrator Symmetry	5-35	A1R52	A - 1
Flatness	5-36	A1R131,C83,L18,C86, L19,C89,L21,C92	
Range Up Detector	5-37	A1R173	
Range Down Detector	5-38	A1R174	
Top Of Screen Amplitude	5-39	A17R105	
Calibrator Level	5-40	A1R39	
1MΩ Amplitude	5-41	A1R108	
1MΩ Flatness	5-42	A1C21,C27	
1MΩ Input Capacitance	5-43	A1C18	
Local Oscillator Feedthrough	5-44	A1R170	
Electrical Isolation	5-45		
Tracking Generator	5-46	A52R68,C50,C16	E
HP-IB	5-47	A44R9	F
X-Y Plotter	5-48	A62R4	H

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5-2. Equipment Required

Table 5-2 lists the equipment required to perform the adjustments on the 3585A. Equipment that meets or exceeds the required characteristics given in the table may be substituted for the recommended models.

Table 5-2. Recommended Adjustment Equipment

Equipment	Required Characteristics	Recommended Model
Digital Volt/Ohmmeter	DC Volts: 2V,20V,200V range Accuracy: ±0.04% Input Impedance 10MΩ Ohms: 200 Accuracy: ±0.07%	-hp- 3466A
High Frequency AC Voltmeter	AC Volts: 0.3V,3V range Frequency Response: 100Hz to 1MHz Input Impedance: 10MΩ Accuracy: ±1%	-hp- 400E
Oscilloscope	Bandwidth: dc to 100MHz Vertical Range: 5mV/div to 20V/div Horizontal Range: 50nsec/div to 100msec/div	-hp- 1740A
High Voltage Probe	Accuracy: ≤1% Input Impedance: ≥ 10^9 Ohms Measurement Range: ≥6kV	-hp- 3440A-K05
Frequency Counter	Frequency Range: 10Hz to 150MHz Accuracy: ±1 count ± time base error Resolution: 0.1Hz	-hp- 5382A
Frequency Synthesizer	Frequency Range: 200Hz to 40MHz Amplitude Accuracy: ±0.27dB	-hp- 3335A
Attenuator 1dB/Step	Attenuation Range: 0 to 12dB Accuracy: ±0.2dB Frequency Range: dc to 40MHz	-hp- 355C
Attenuator 10dB/Step	Attenuator Range: 0 to 100dB Accuracy: ±0.5dB Frequency Range: dc to 40MHz	-hp- 355D
9MHz Low Pass Filter	(See Figure 4-21)	
10kΩ Resistor	±1%, 1/8 Watt	-hp- P.N. 0757-0442
BNC-To-Sealectro Adapter Cable	Supplied with instrument	-hp- P.N. 03585-61616
Optional Spectrum Analyzer	Frequency Range: 100kHz to 150MHz Amplitude Accuracy: ±3dB	-hp- 8558B
Resistor Probe	20:1Resistive Divider 1kΩ Input Resistance	-hp- 10020A

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5-3. Test Point And Adjustment Locations

Test point and adjustment location are shown on PC board component location diagrams in the Adjustment Procedures. The adjustment locations for the Input and Conversion Section as well as other adjustments are at the end of this section. For many of the adjustments it is necessary to remove the PC board from the card nest. *Always set the 3585A LINE switch to off before removing or replacing a PC board unless instructed to do otherwise.* Some adjustments require power to be left on to retain the control settings. When instructed to leave the power on while removing or replacing a PC board be careful to keep the PC edge connector properly aligned. Misalignment of the PC edge connector during insertion can short the power supplies.

5-4. ADJUSTMENT SEQUENCE

The adjustment procedures are presented in a logical sequence that will minimize interaction between adjustments. Although the performance tests might indicate that only one or two adjustments are needed, we recommend that you perform all adjustments for any particular instrument section i.e. input, LO, IF. There are three exceptions to this rule: 1) The display section and 2)Oven Oscillator may be done independent of all other adjustments: 3) the IF Filter adjustments are very time consuming and may be omitted if the instrument passes the Bandwidth Measurement Test. The Final IF Adjustment procedure should be done whether or not the IF Filter adjustments are omitted.

5-5. Synthesizer Connections

Unless otherwise noted the synthesizer used to perform the adjustments must be frequency locked to the 3585A's 10MHz REF OUTPUT. Failure to make this connection will degrade the accuracy of the adjustments.

5-6. Low Voltage Power Supply Adjustments (A71-75)

These adjustments set the 18V reference voltage, 20KHz oscillator and 5V supply associated with the Low Voltage Power supplies.

a. Remove the plastic cover from the Low Voltage Power Supply Section.

b. Remove the metal PC board hold-down bar.

c. Connect a DVM to A75TP1.

d. Adjust A75R9 for a voltage reading of +18.2V ± 0.02V.

e. Remove the DVM.

f. Using a 10:1 scope probe, connect a Frequency Counter to A75TP2.

g. Adjust A75R15 for a frequency reading of 20KHz ± 10Hz.

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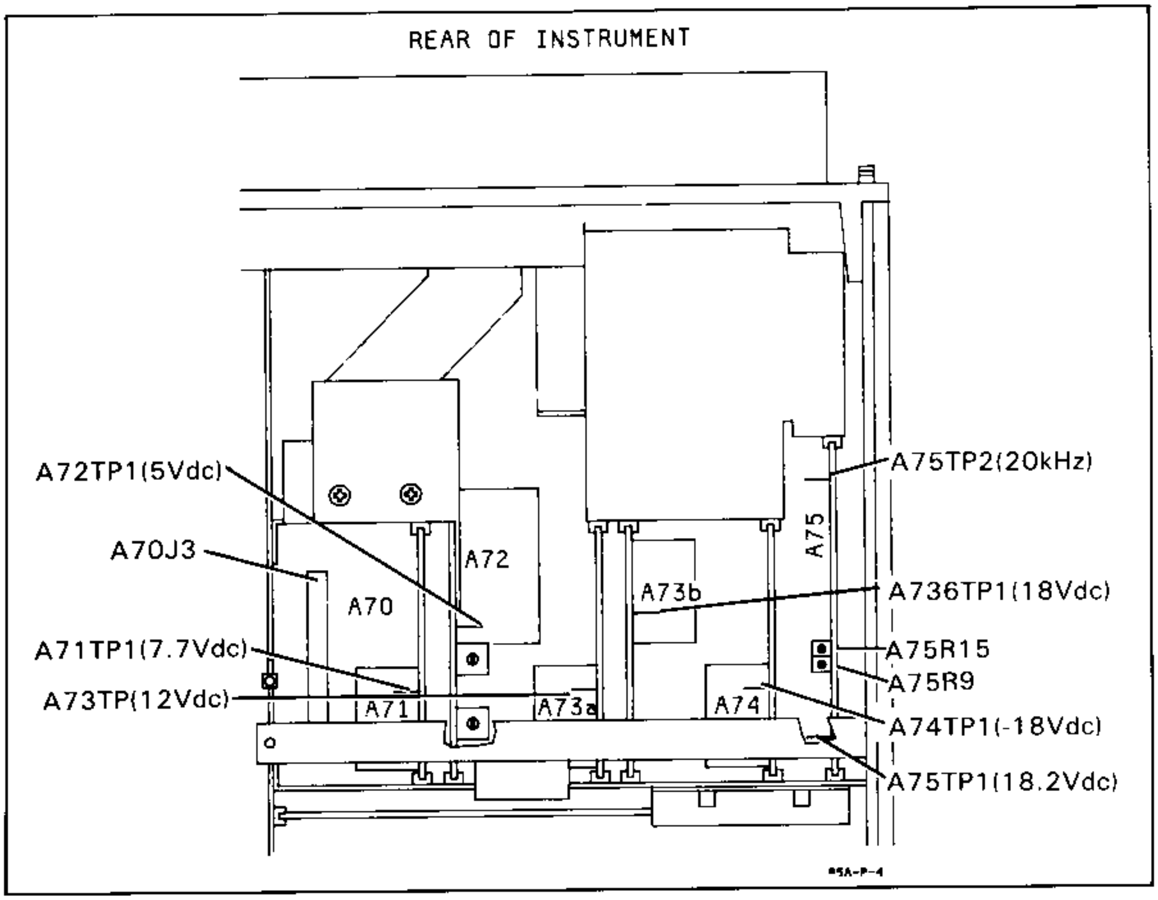

Figure 5-1. Power Supply Adjustment Locations

h. Using a 10:1 probe, connect an oscilloscope to A75TP2. Set the Oscilloscope controls as follows:

VERTICAL .... 0.2V/Div.
HORIZONTAL .... 10μsec/Div.
INPUT................................DC coupled

i. Verify that the observed waveform is within ± 10% of that shown in Figure 5-2.

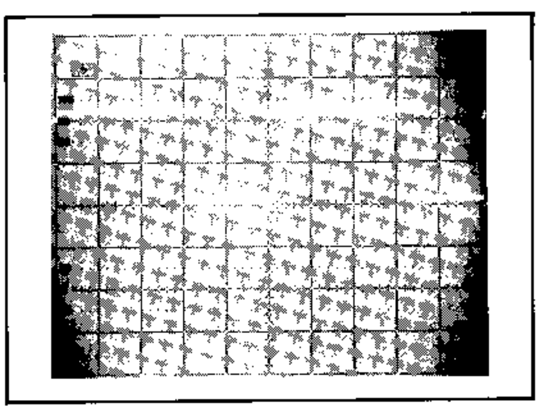

Figure 5-2. Power Supply Clock Output.

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j. Connect the DVM to A72TP1. Adjust A72R31 for 5.4V ± 0.05V.

k. Turn the 3585A power off. Remove PC boards A71 and A72.

l. Disconnect the cable from A70J3. Replace PC boards A71 and A72.

m. Connect a 1Ω, 25W resistor from A72TP1 to chassis ground.

WARNING

The 1Ω resistor used for this adjustment can reach a temperature that will cause burns. Handle this resistor with caution.

n. Turn the 3585A power on. Adjust A72R19 so that the yellow current limit indicator just goes out.

o. Turn the 3585A power off. Disconnect the resistor from A72.

p. Remove the A71 and A72 board. Reconnect the cable associated with A70J3. Replace the A71 and A72 boards.

q. Using a DVM, check each of the voltages below to verify that the various power supplies are working properly.

A74TP1	−18V ± 0.9V
A73bTP1	+18V ± 0.9V
A73aTP1	+12V ±0.6V
A71TP1	+7.7V ± 0.6V

r. Disconnect the DVM. Replace the PC board Hold-down bar and the plastic cover for the power supplies. This completes the Low Voltage Power Supply Adjustments.

5-7. 90MHz Reference Board Adjustments (A21)

NOTE

The same frequency counter and reference should be used for all reference oscillator adjustments.

This adjustment sets the frequency of the 90MHz crystal oscillator on the A21 board. This crystal oscillator is used during warm-up and in the absence of an EXT REF INPUT.

a. Disconnect the cables from A21J1 and A21J7.

b. Connect a frequency counter to A21J1.

c. Adjust A21R125 (see Figure 5-46) for a frequency reading of 90MHz ± 20Hz.

d. Reconnect the A21J7 cable if continuing with Oven Output Shutdown Adjustments. Reconnect the A21J1 and A21J7 cables if not continuing.

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5-8. Oven Output Shutdown Adjustment

This adjustment sets the point where the Oven Oscillator will begin to be used as the 3585A's reference. During warm-up the Oven Oscillator's frequency is locked to the 90 MHz ref. oscillator. This adjustment causes the OVEN REF OUT to be shut-off during this warm-up period.

NOTE

With the OVEN power cable disconnected, allow the instrument to warm up 20 minutes or more before beginning this adjustment.

a. Connect OVEN Power Cable. (A81J2)

b. Remove the jumper between the OVEN REF OUT and the EXT REF IN on the 3585A.

c. Connect the OVEN REF OUT to the 3585A 50Ω input.

d. After the 3585A has completed Autoranging, turn the AUTORANGE function off.

e. Adjust A81R9 (SHUT) to the point where the 10MHz signal level just turns off (on ≈ +7 dBm off ≈ -35dBm).

f. Adjust A81R9 one eighth turn counter-clockwise.

g. Replace the jumper between the OVEN REF OUT and the EXT REF IN.

h. Disconnect all inputs to the counter and the 3585A. Connect the 3585A 10MHz. Ref Output to the 3335 40/N Ref Input.

i. This completes the Reference Oscillator Adjustments.

5-9. 10MHz Oven Oscillator Adjustments

This adjustment sets the frequency of the 3585A oven oscillator. It is important that a frequency counter with greater accuracy and stability than that of the 3585A reference be used for this adjustment.

NOTE

All instruments used for this adjustment should be turned on for at least 20 minutes (preferably longer) prior to beginning adjustments.

a. Remove any connections between the synthesizer reference connectors and the 3585A rear panel reference connectors.

b. Connect both the 3585A and the synthesizer to their own internal references. For the 3585A, use the supplied BNC shorting bar to connect the OVEN REF OUT to the EXT REF IN.

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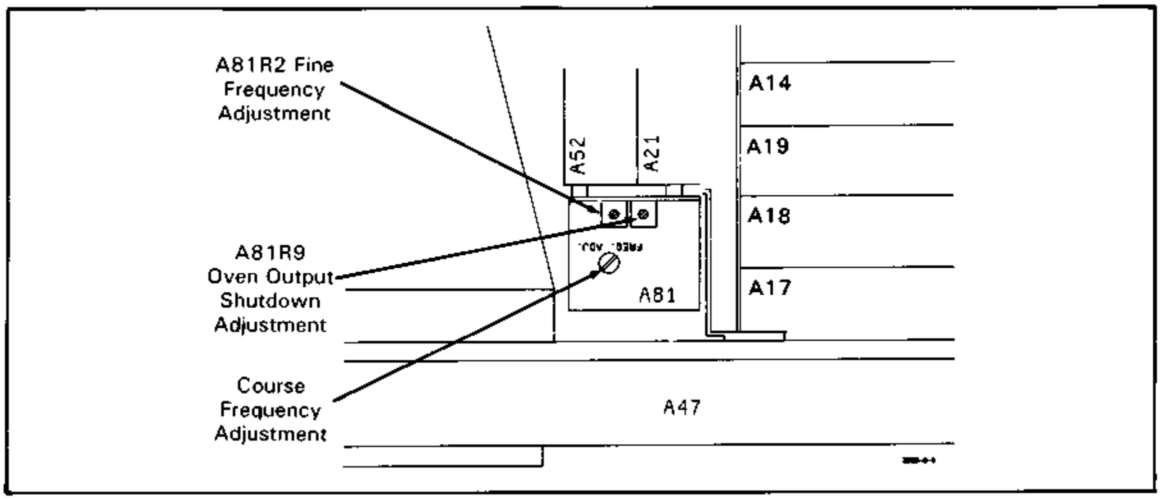

Figure 5-3. Oven Oscillator Adjustment Locations

c. Connect the Frequency counter to A21J1.

d. Remove the screw on the A81 Oven assembly that covers the course frequency adjustment.

e. Adjust A81R2 to the center of its range.

f. Adjust the Course Frequency control on the A81 board so that the frequency counter reads 90MHz ± 1Hz. Allow time for the oven oscillator to stabilize after each adjustment.

g. Disconnect the frequency counter from A21J1. Reconnect the proper cable to A21J1.

h. Set the synthesizer for:

FREQUENCY 9MHz
AMPLITUDE 0dBm

i. Set the 3585A controls for:

INSTRUMENT PRESET
CENTER FREQUENCY 9MHz
COUNTER .... on
MANUAL SWEEP .... on

j. Using a BNC "Tee", connect the synthesizer output to the 3585A 50Ω input and the external Frequency Counter input.

k. Adjust the fine frequency adjustment, A81R2, (and the course frequency adjustment if necessary) so that the 3585A counter frequency matches the external Frequency Counter reading. Again, allow 5-10 minutes between adjustments so that the oven oscillator will stabilize.

l. Replace the screw that covers the course Frequency Adjustment.

m. If other adjustments are to be made, reconnect the 3585A 10MHz REF OUTPUT to the synthesizer reference input.

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5-10. CRT Control And High Voltage Power Supply Adjustments

a. Turn the 3585A power off. Place the 3585A on its left side and remove the bottom cover.

b. Place the XYZ board (A67) on a PC extender board. The PC extender should be screwed in place for stability. Leave all cables connected to A67. (Support the A67 board if necessary.)

c. Unplug the cables from the "Xin" and "Yin" connectors. Using clip leads, short the "Xin" pins together. Now short the "Yin" pins together.

d. Move A67J11 to the "T" position and disconnect A67J6.

e. Set the oscilloscope controls for:

VERTICAL. . . . . 1V/Div (DC coupled)
HORIZONTAL. 10μs/Div

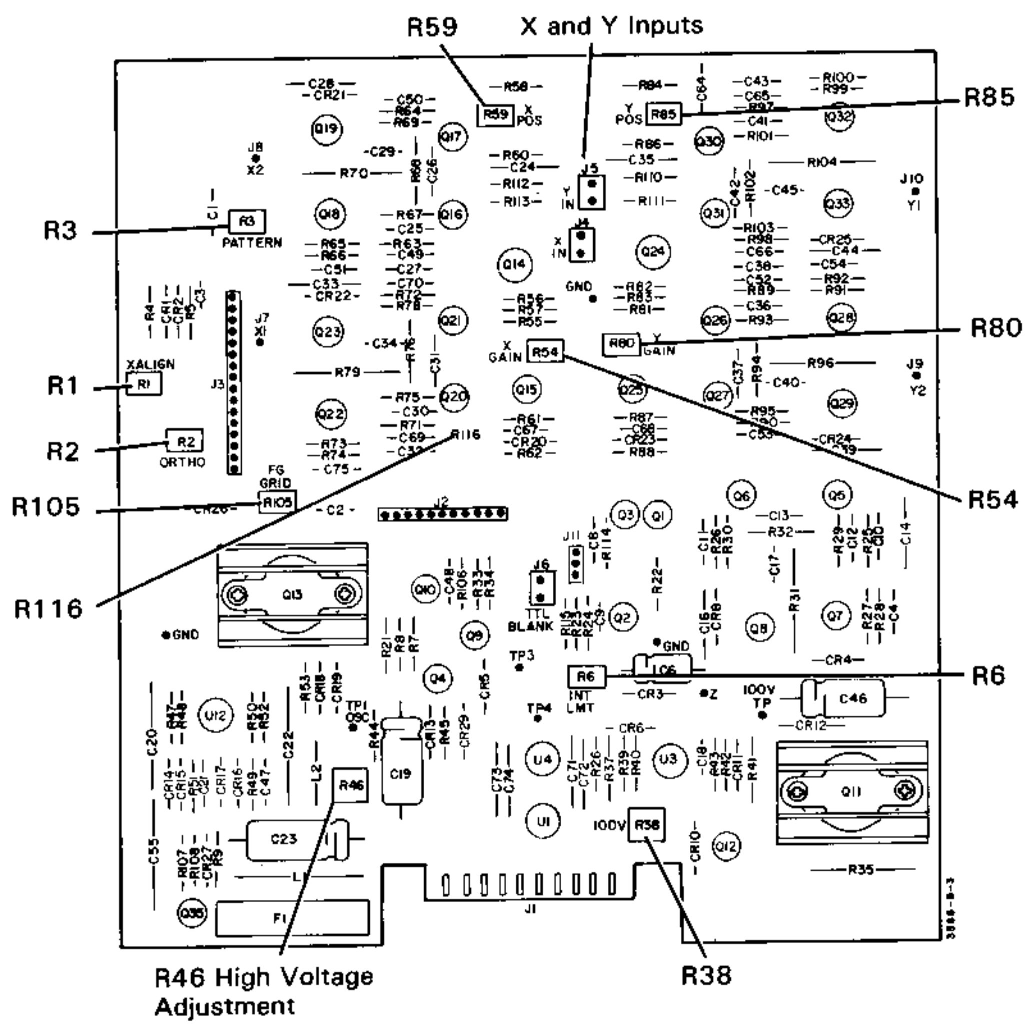

Figure 5-4. XYZ Board (A67)

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f. Using a 10:1 probe, connect the oscilloscope to the "OSC" test point (A67TP1).

WARNING

The voltages involved in the following measurements may cause serious injury or death. USE EXTREME CAUTION.

g. Turn the 3585A power on. Turn the front panel intensity control fully C.W. Verify that A67TP1 measures approximately 26Vp-p centered +18V above ground potential.

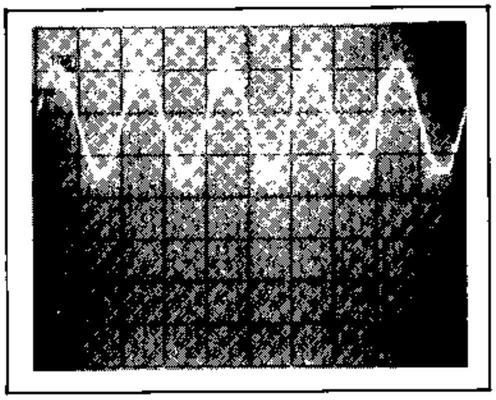

Figure 5-5. High Voltage Oscillator Output

h. Turn the front panel intensity control fully off and verify that the A67TP1 output is +18V DC.

i. Disconnect the scope probe.

j. Connect a DVM (200V range) to the 100V A67TP2. Adjust A67R38 for a reading of 100V ± 0.25V.

k. Turn the 3585A power off. Disconnect DVM.

WARNING

The voltages present inside the high voltage power supply box can cause serious injury or death. **Never** *place an uninsulated conductive tool or object inside this box.*

l. Set the intensity control to the "9 o'clock" position.

m. Remove the aluminum cover from high voltage section (see Figure 5-6 for screw locations) on the bottom side of the 3585A.

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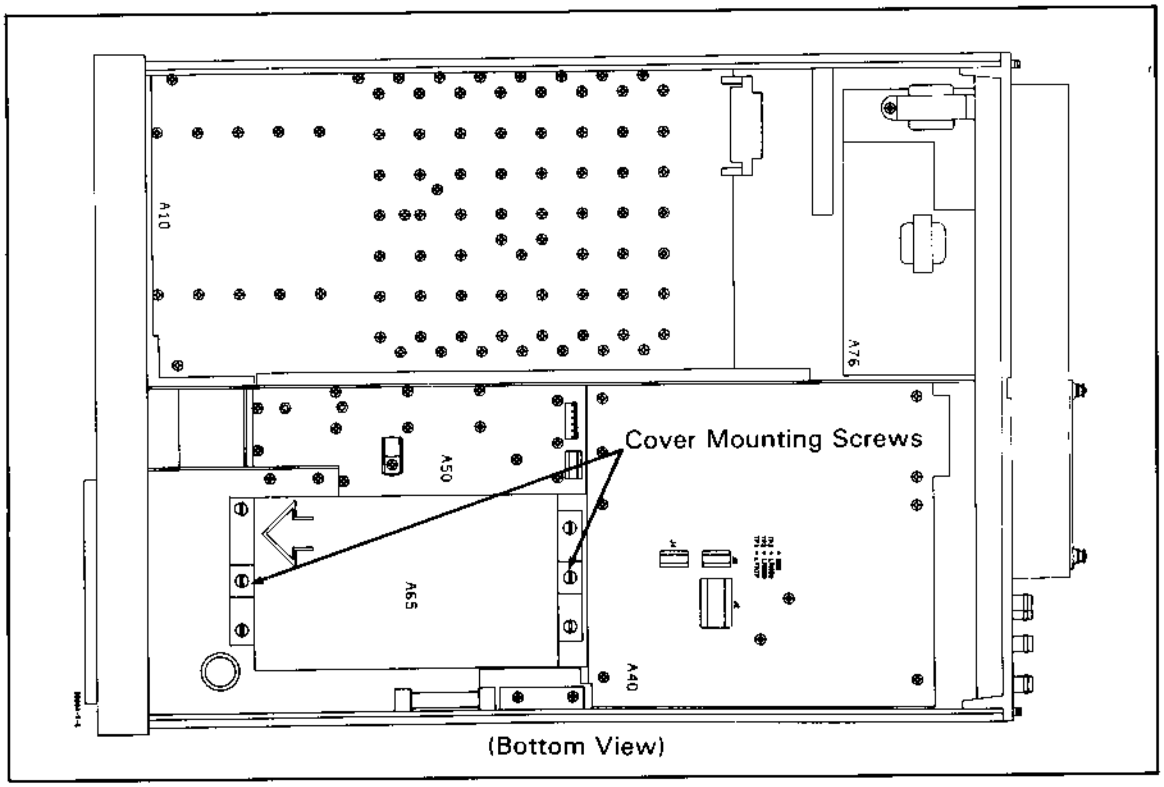

Figure 5-6. High Voltage Cover Mounting Locations

WARNING

Extremely dangerous voltages can remain on the High Voltage board (A65) even when the instrument is turned off. Injury or death may result if an uninsulated tool or object is placed on the board.

n. Connect the calibrated, high voltage probe to A65TP1 (plated through hole in PC board).

WARNING

4kV will be measured when the instrument is turned on. USE EXTREME CAUTION to avoid serious injury or death.

o. Turn the 3585A power on.

p. Adjust A67R46 for a voltage reading equal to the voltage marked on the high voltage sticker ±10V. See Figure 5-7 for the location of this sticker.

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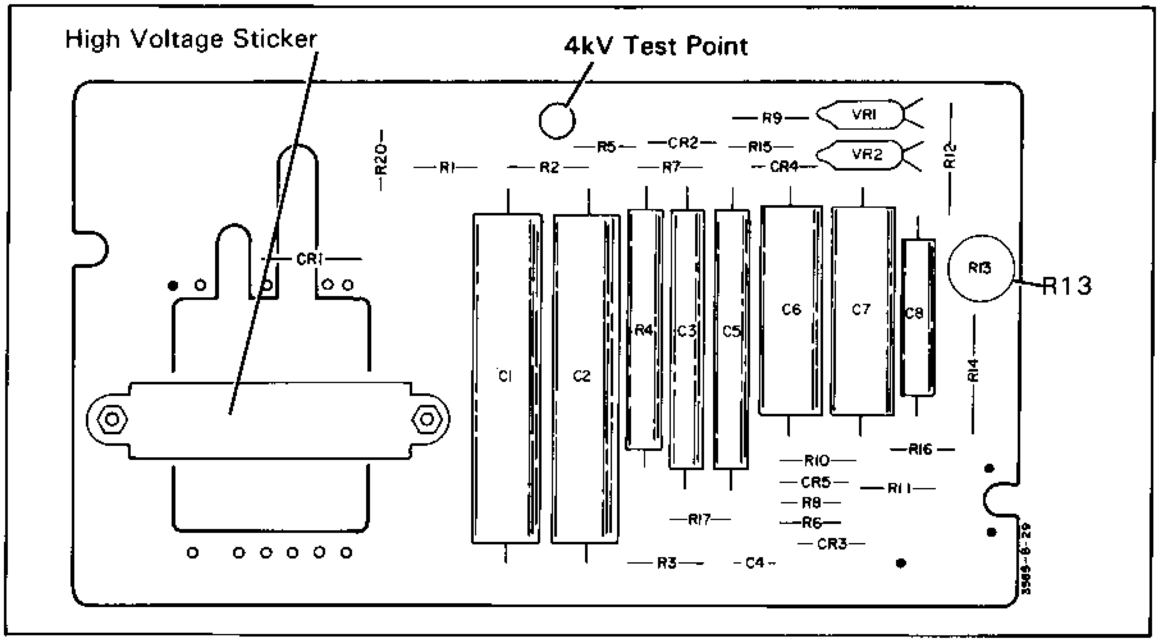

Figure 5-7. High Voltage Board (A65)

q. Remove the high voltage probe from the test point.

r. Using the front panel focus control, focus the 3585A CRT display. If the round dot on the instrument's CRT can be focused with the focus control between the 10 o'clock and 2 o'clock positions, proceed at step v, if not, continue with next step.

s. Set the focus control and astigmatism control to the 12 o'clock position.

t. Adjust the focus limit pot (A65R13) for the smallest, most symmetrical round dot on the 3585A CRT.

u. Turn the 3585A power off. Replace the high voltage cover and the instruments bottom cover. Set the 3585A back in a normal upright position.

v. Remove the shorts from the "Xin" and "Yin" inputs on the A67 board. Reconnect the proper cables to these inputs.

w. Move the test jumper A63J3 to the "T" position (see Figure 5-8). Turn 3585A power on.

x. Set the oscilloscope for:

Vertical Scale . . . . 0.2V/Div (DC coupled)
Horizontal Scale 0.05μsec/Div

y. Connect a 10:1 scope probe to A63TP1. Verify that the signal amplitude is ≤0.7V to ≥3.5V minimum.

z. Verify that the rise and fall time of the waveform is between 10 and 70 nsec between the 10% and 90% points (see Figure 5-9).

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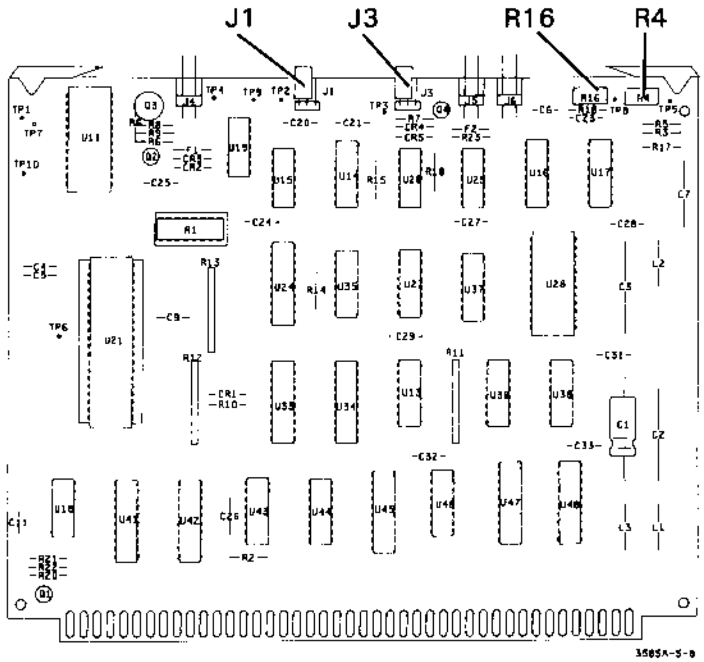

Figure 5-8. Display Processor Board (A63)

aa. Connect a DVM to A63TP5 and adjust A63R4 for the voltage stamped on the A63U21 nanoprocessor ±0.2V. (Instruments with serial number 1750A00976 and greater will not have this adjustment.)

bb. Connect a 10:1 scope probe to A63TP3 and adjust A63R16 for a pulse width of 250 nsec between the centers of the rising and falling edges. (See Figure 5-10)

NOTE

If no pulse is observed on the oscilloscope, move A63J1 to the "T" position for a moment and then back to the "N" position.

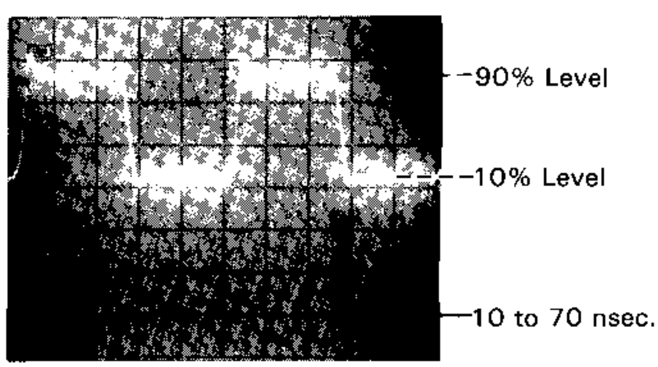

Figure 5-9. Display Processor Clock Output

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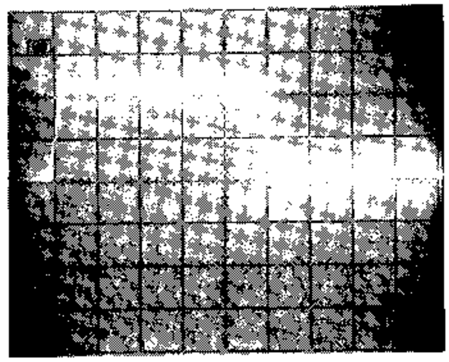


250 nsec

Figure 5-10. Sample Pulse Generator Output

cc. Turn the front panel intensity control fully C.W.

dd. Move jumpers A67J11 and A63J3 to the normal position.

ee. Adjust A67R6 so that there are no extra dots on the screen. Move jumpers A67J11 and A63J3 to the test position.

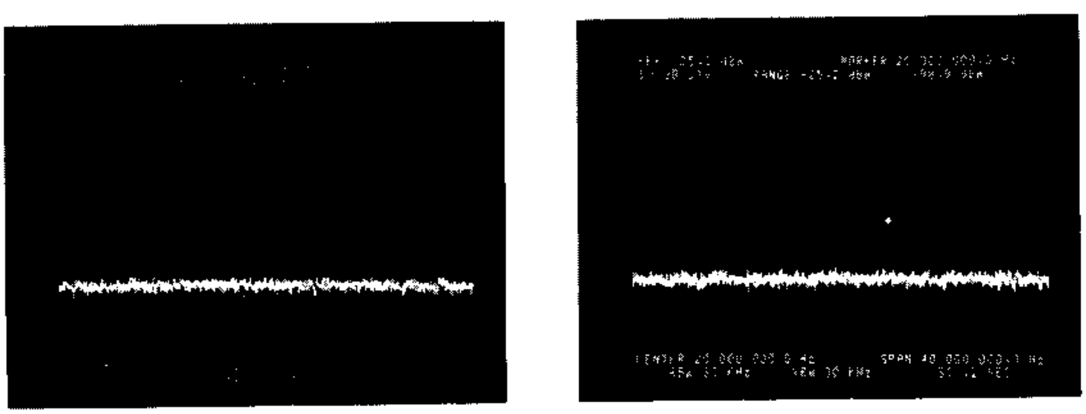
ff. Connect a DVM set for DC volts to A67TP6. Record the reading ________V.

gg. Connect the DVM to A67TP5. Record the reading ________V.

hh. Subtract the reading in step ff from those taken in step gg. The difference should be 8V or greater. If the difference is less than 8V, turn A67R6 slightly C.C.W. and continue at step ff. (Typically the voltage difference will be 20V or greater.)

NOTE

When A67R6 is adjusted properly, the display will blank out when the front panel intensity control is counterclockwise from the 10 o'clock position.



Intensity Limit Set Correctly

Intensity Limit Set Incorrectly

Figure 5-11. Location Of Extra CRT Dots

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ii. Adjust the front panel intensity control so that the trace is just visible.

jj. Turn the front panel graticule control fully C.W.

kk. Adjust A67R105 for uniform brightness across the CRT display by moving the bright bar off the screen to the left.

ll. Set the front panel intensity and graticule illumination controls fully clockwise. Adjust A67R116 until the CRT display begins to shrink.

mm. Turn the 3585A power off. Move test jumper A67J11 to the "N" position.

nn. Replace the A67 board. Replace the screws that hold the board to the chassis and the protective plastic cover over the board.

oo. This completes the CRT control and high voltage power supply adjustments.

5-11. CRT Graphics Adjustment

a. Place the XYZ board (A67) on a PC extender board. The PC extender should be screwed in place for stability. Leave all cables connected to A67.

b. Attach a DVM to A64TP8. Adjust A64R72 for 5.00Vdc ± .005V. Disconnect DVM.

c. Move the test jumper A63J3 to the "T" position.

d. The display should now appear roughly similar to Figure 5-12 (foldout).

NOTE

Refer to Figure 5-12 and 5-13 (foldout) for pictures of the effect of each Graphic Adjustment.

e. Adjust A67R59 (X position), A67R85 (Y position), A67R54 (X gain) and A67R80 (Y gain) so that the displayed pattern is vertically and horizontally aligned with the CRT graticule. (Preliminary adjustment.) See Figure 5-14 for adjustment locations.

f. Adjust A67R3 (pattern) for the best vertical alignment.

g. Adjust A67R2 (orthoganality) for the best vertical alignment.

h. Adjust A67R1 (X align) for the best alignment along the X axis.

i. Repeat Steps e thru h until alignment matches that of Figure 5-12.

j. Observe the retrace line very carefully. If the line is wiggly as shown in Figure 5-12, adjust A64C23 (comp) for a straight retrace line.

k. Move test jumper A64J1 to the "T" position.

l. Adjust A64R48 (LD OFS) so that any bumps on the retrace line are gone. A straight retrace line should be the resulting display.

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m. Move test jumper A64J1 to the "N" position.

n. Adjust A64R62 (LD gain) for an overshoot condition (see Figure 5-13).

o. Adjust A64R62 so that the overshoot condition just disappears.

p. Adjust A67R59 (X position) and A67R54 (X gain) so that the ends of the retrace line and bottom pattern line are aligned with the vertical lines of the CRT graticule (see Figure 5-12).

q. Adjust A67R85 (Y position) and A67R80 (Y gain) so that the CRT graticule lines cut through the upper and lower lines of the displayed pattern (see Figure 5-12).

r. Replace the A67 board. Replace the screws that hold the board to the chassis and the protective plastic cover over the board.

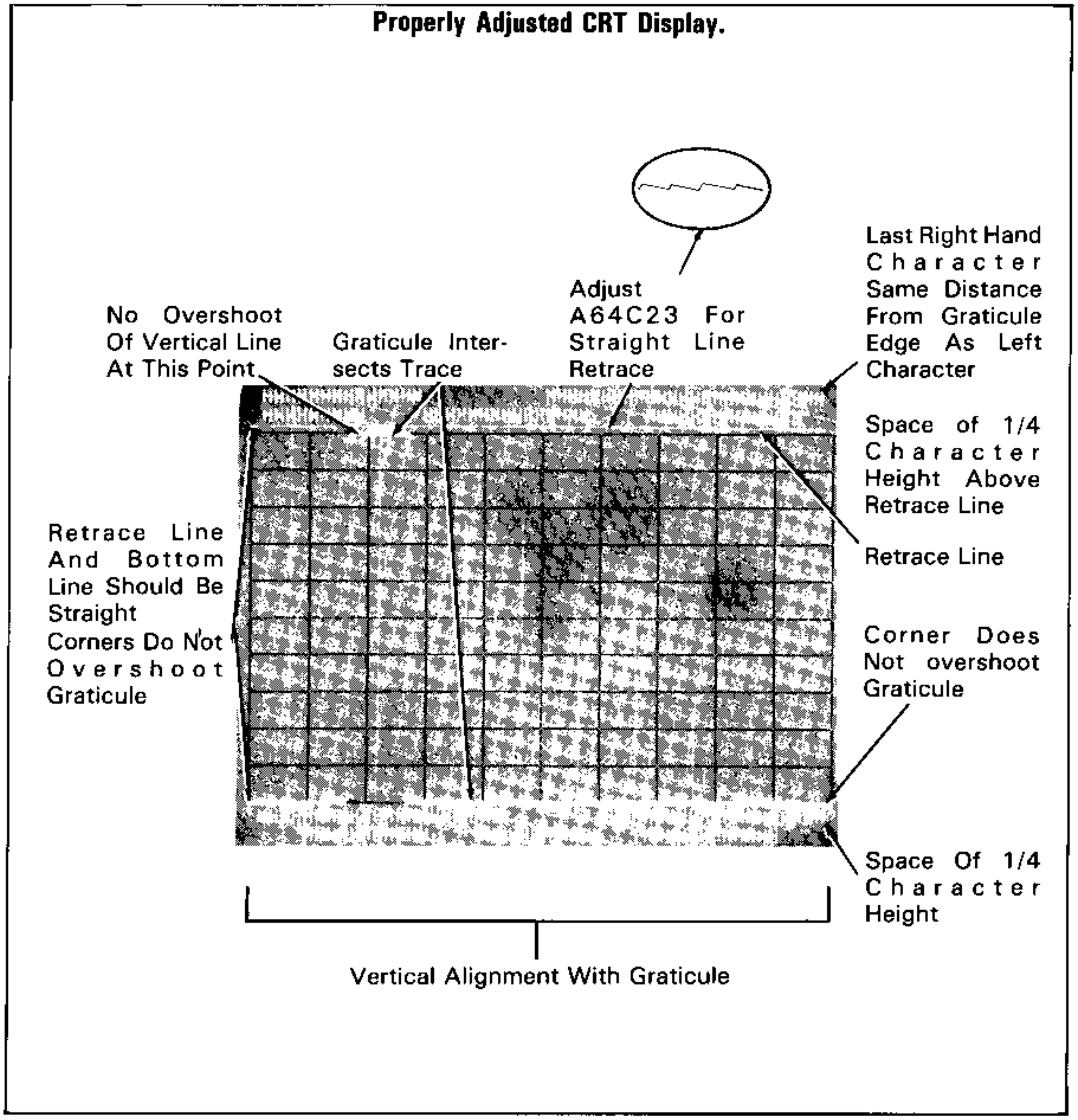

Figure 5-12. CRT Test Pattern

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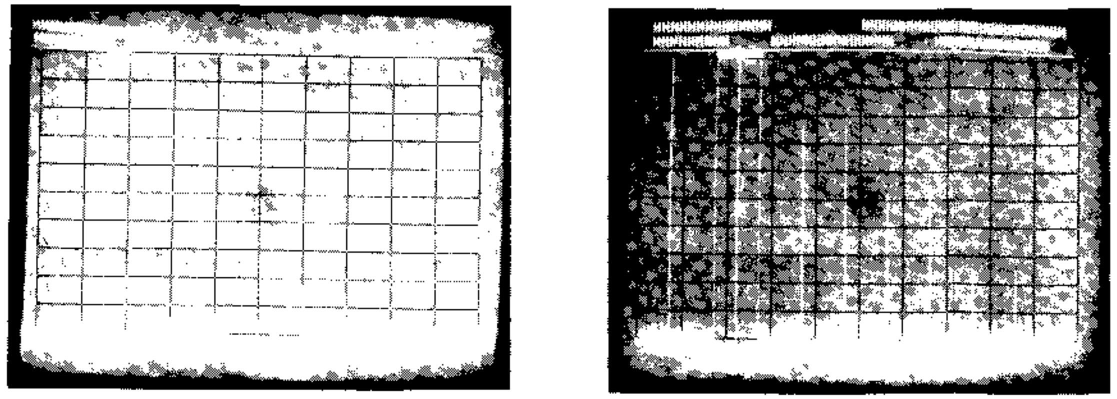
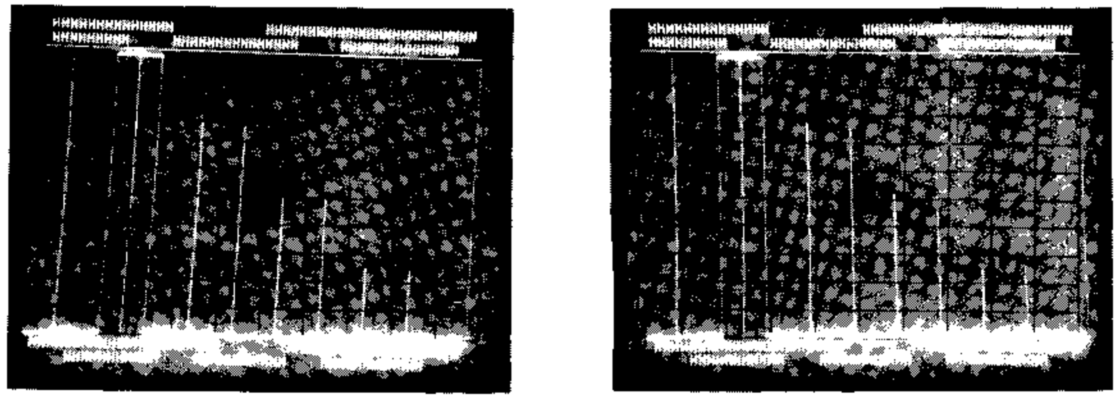
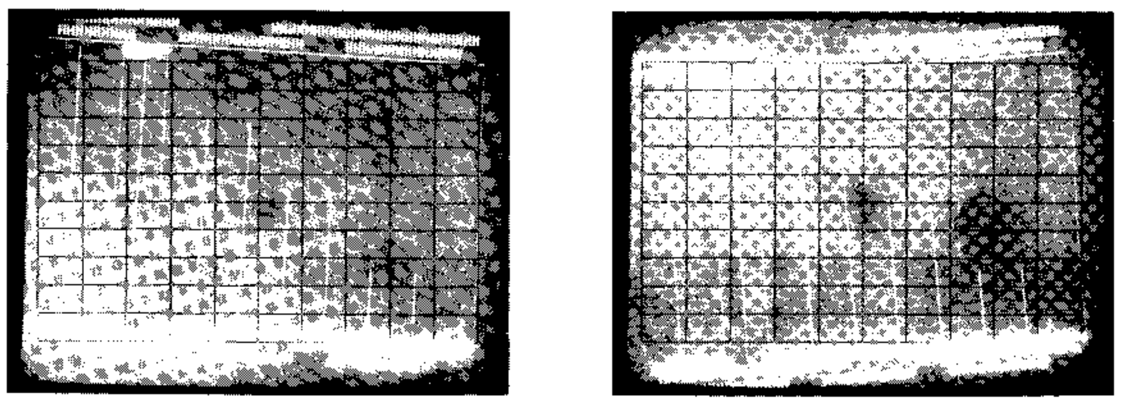


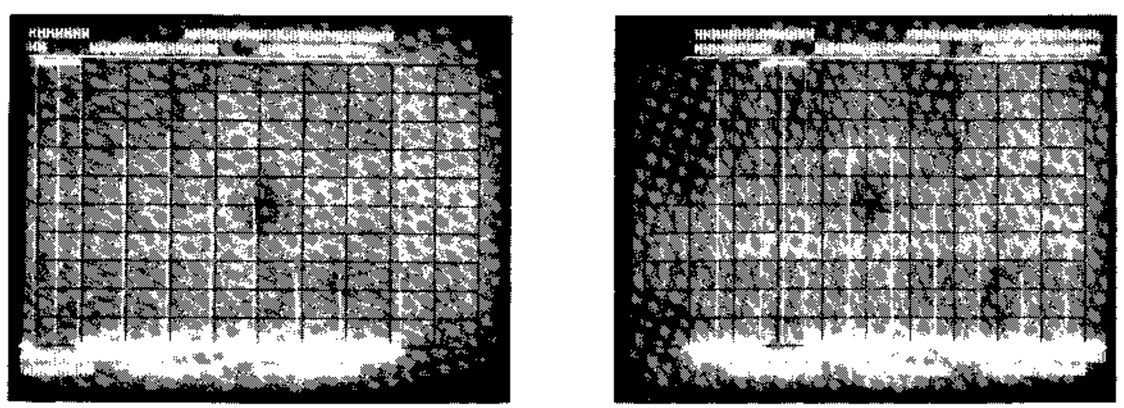
Pattern Control · A67R3.



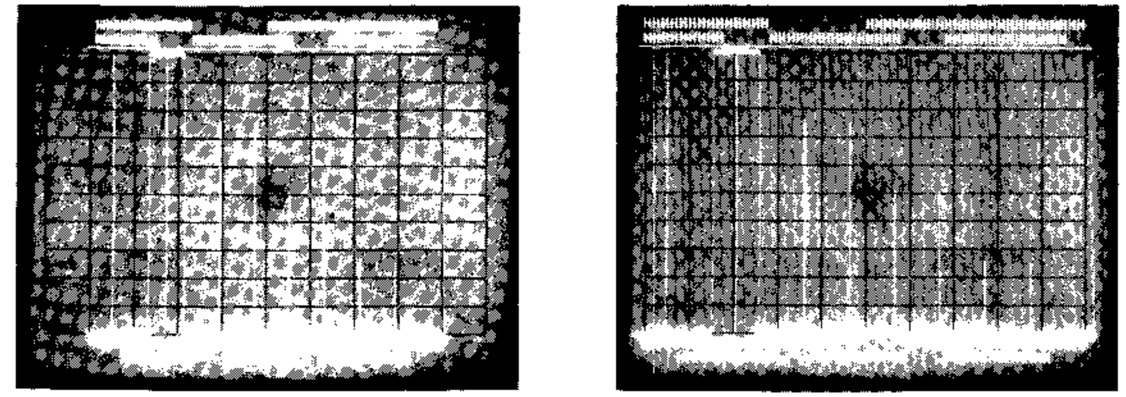
Orthogonality Control · A67R2.



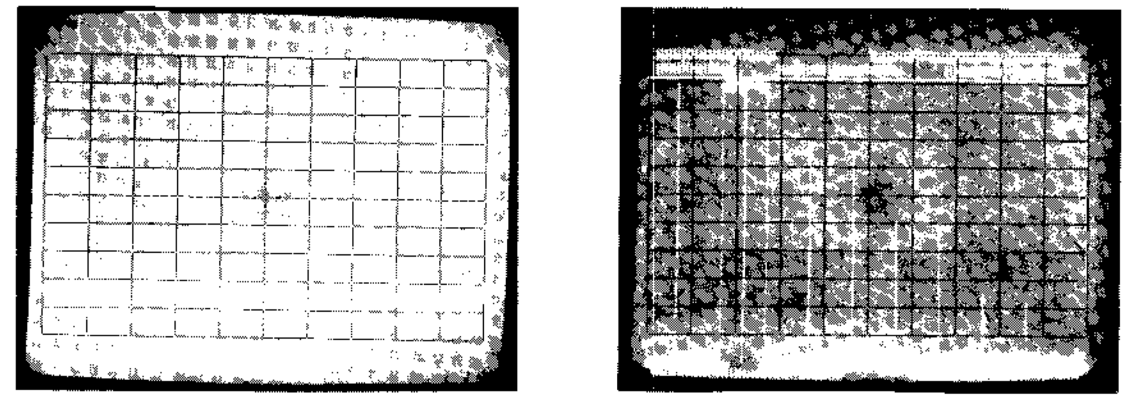
X Alignment · A67R1.



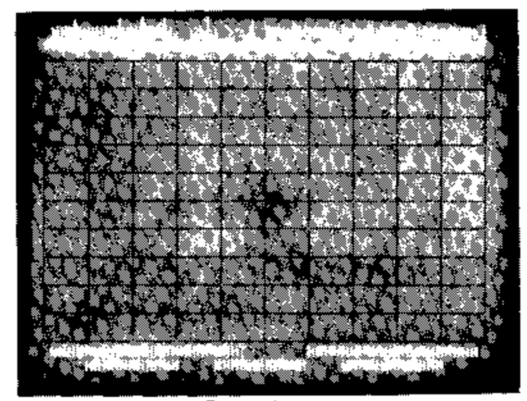
X Position · A67R59.



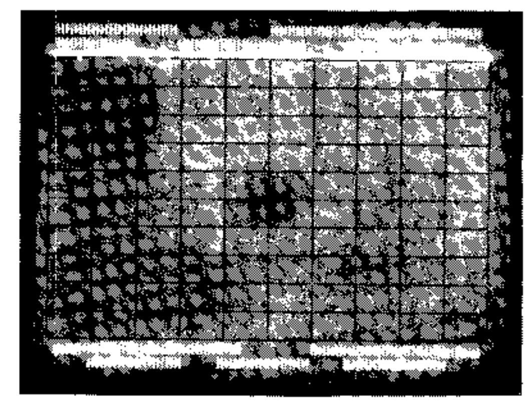
X Gain · A67R54.



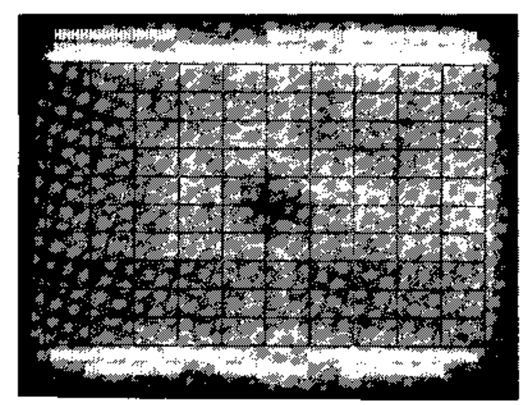
Y Position · A67R85.



Overshoot



Undershoot

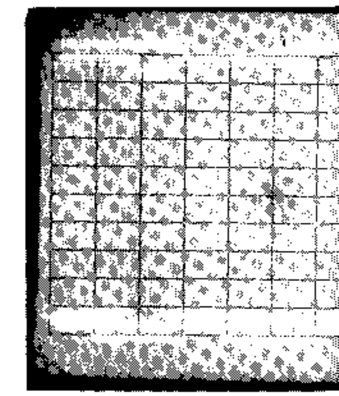


Proper Adjustment

Line Drawer Offset · A64R48.

Overshoot Condition

Line Drawer Gain · A64R62.



Y Gain · A67R80.

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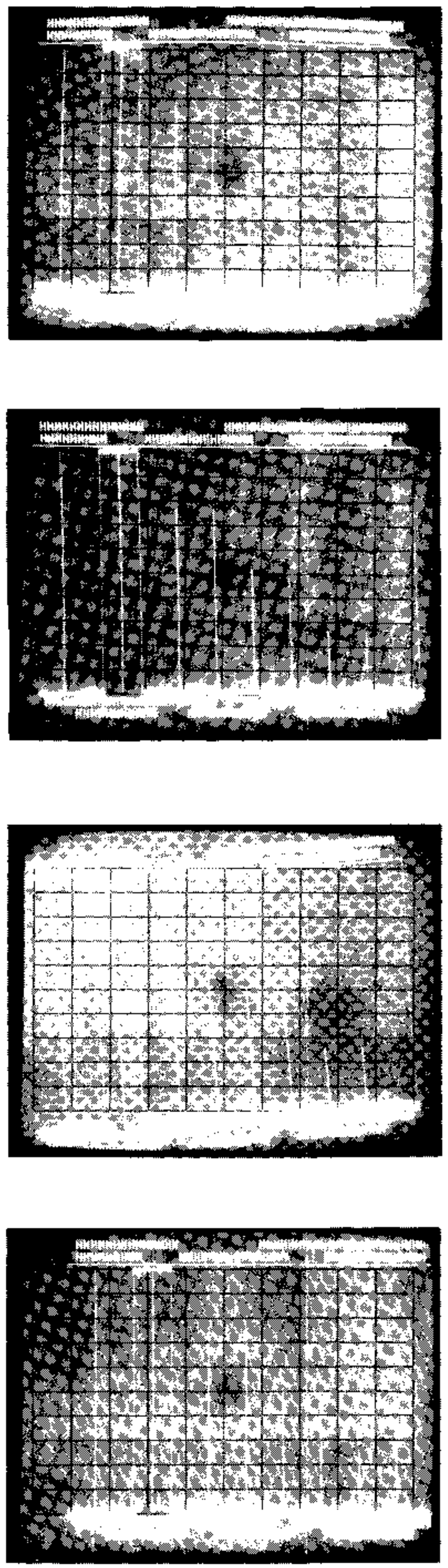
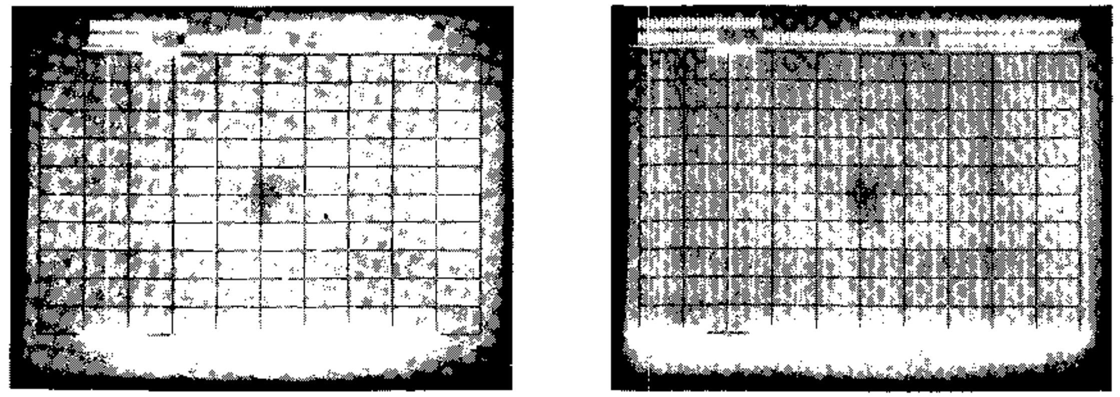
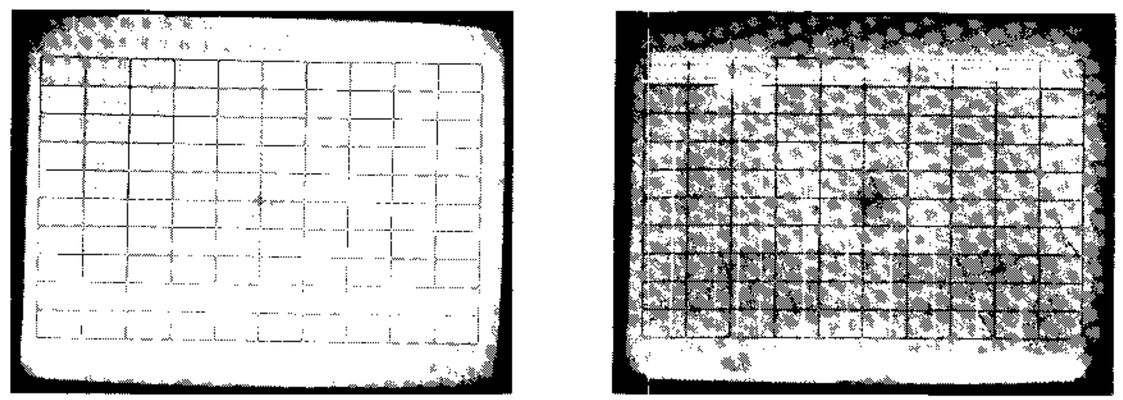
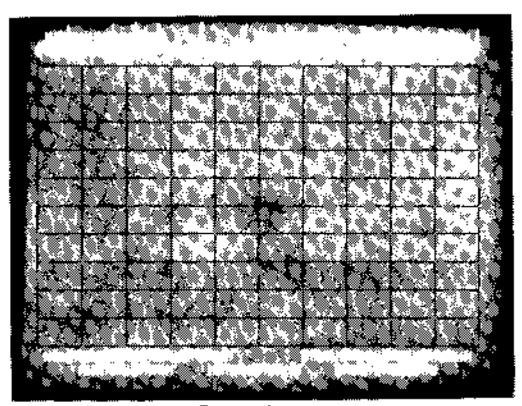




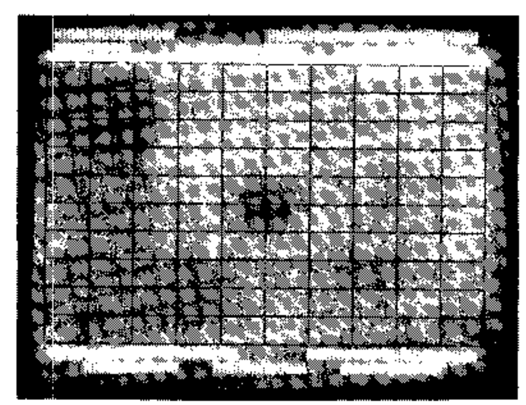
X Gain - A67R54.



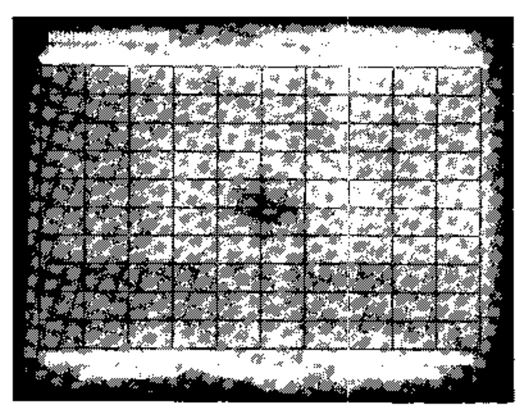
Y Position - A67R85.



Overshoot

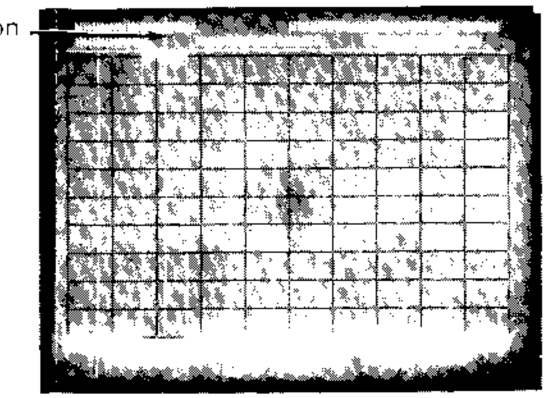


Undershoot

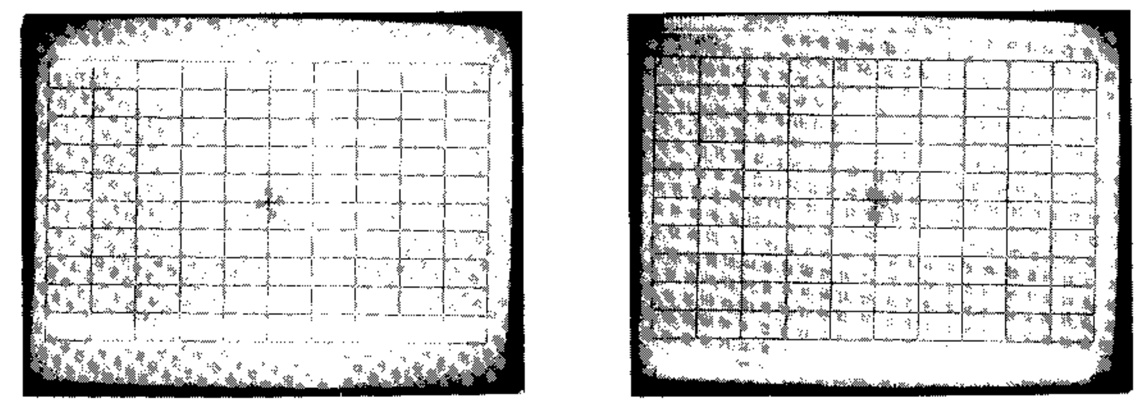


Proper Adjustment

Line Drawer Offset - A64R48.



Line Drawer Gain - A64R62.



Y Gain - A67R80.

Figure 5-13. Graphics Adjustments.

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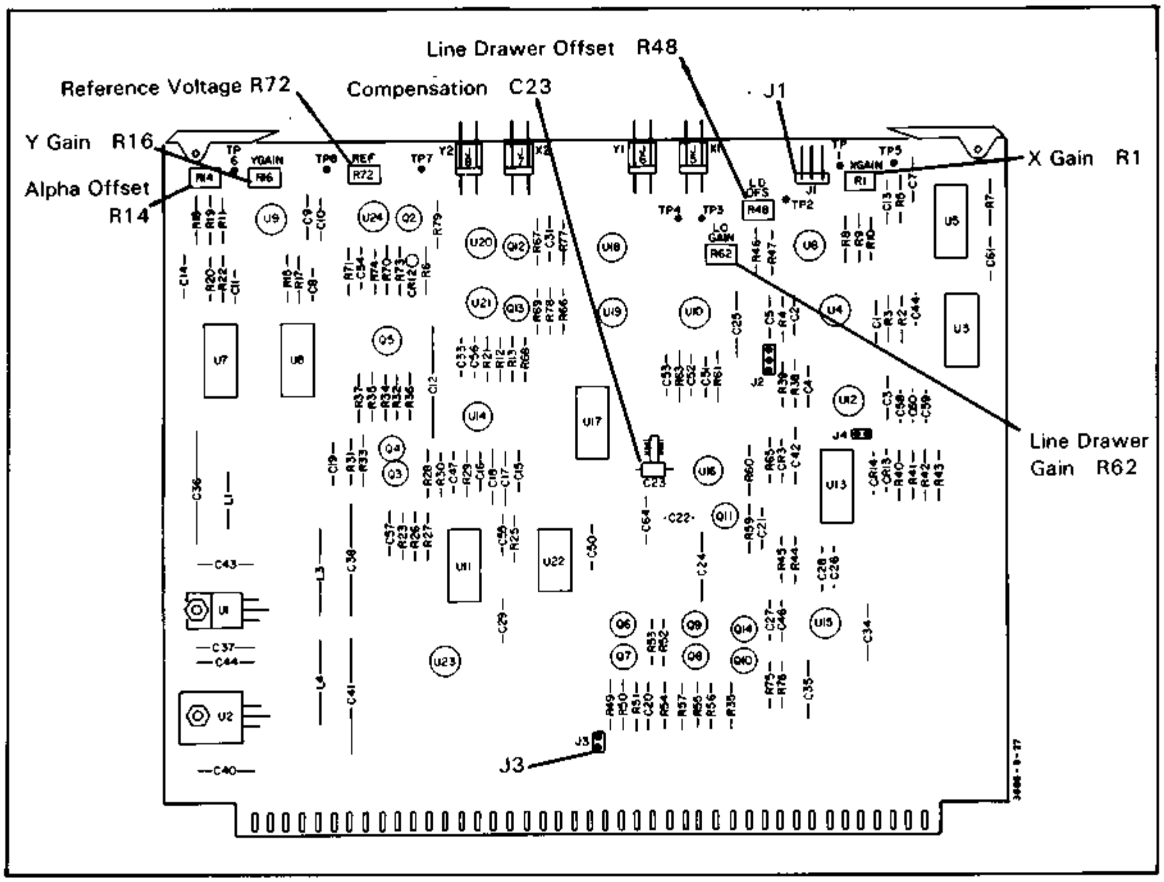


Figure 5-14. Analog Display Driver Board (A64)

5-12. CRT Alphanumeric Alignment

a. Be sure test jumper A63J3 is in the "T" position.

NOTE

Refer to Figure 5-15 for pictures of the effect of Alphanumeric Adjustment.

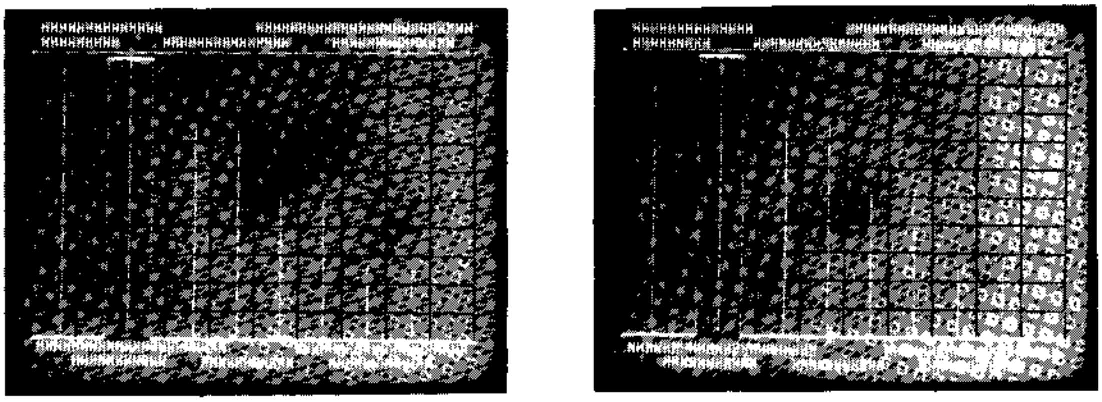
b. Adjust A64R14 (A OFS) so that the second line of alphanumeric characters is about 1/4 of one character height above the top graticule line.

c. Adjust A64R16 (Y gain) so that the third line of alphanumeric characters is 1/4 of one character height below the bottom graticule line.

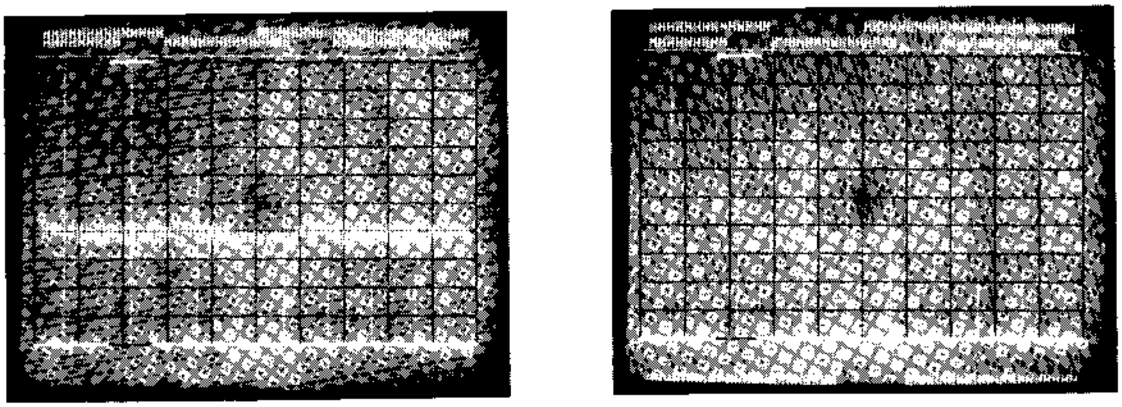
d. Adjust A64R1 (X gain) so that the last alphanumeric character is the same distance from the right-hand edge of the trace as the first alphanumeric character is from the left-hand edge of the trace.

e. Move the test jumper A63J3 to the "N" position. This completes the graphics and alphanumeric adjustments.

Alpha Offset - A64R14.



Y Gain - A64R16.



X Gain - A64R1.

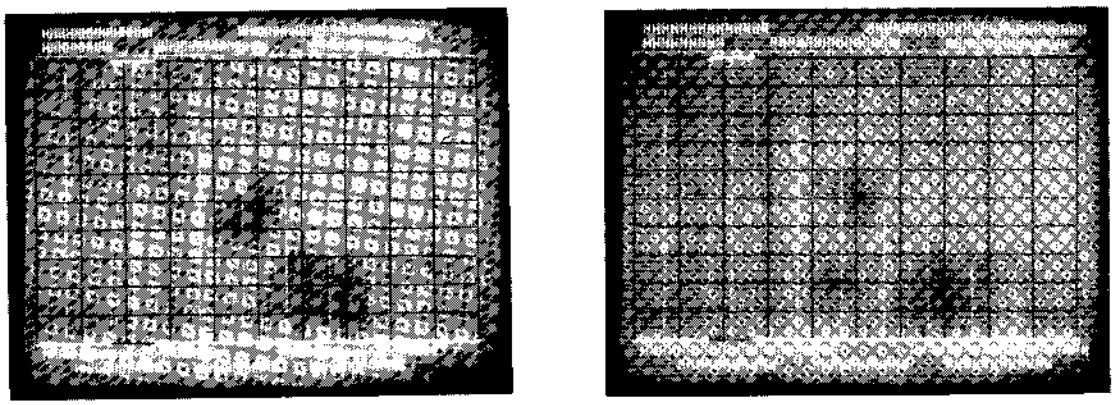


Figure 5-15. CRT Alphanumeric Adjustments.

5-13. Fractional N Adjustments

a. Connect a DVM set for DC volts to A34TP5. Adjust A34R32 for 5.3Vdc ± 0.05V.

b. Verify that A34TP6 measures +15.0Vdc ± 0.8V and that A34TP8 measures -15.0Vdc± 0.8V.

c. Disconnect the DVM.

d. Turn the 3585A power off. Place the A31 board on a PC board extender. Turn the 3585A power on.

e. Set the 3585A controls for:

RECALL 601
INSTRUMENT PRESET
RES. BW.................................3KHz
RES. BW HOLD..............................on
START FREQUENCY....................0.4MHz
STOP FREQUENCY....................1.65MHz
MANUAL ENTRY.......................0.4MHz

f. Connect the DVM to A31TP1 and adjust A31L3 for +7.70Vdc ± 0.05V.

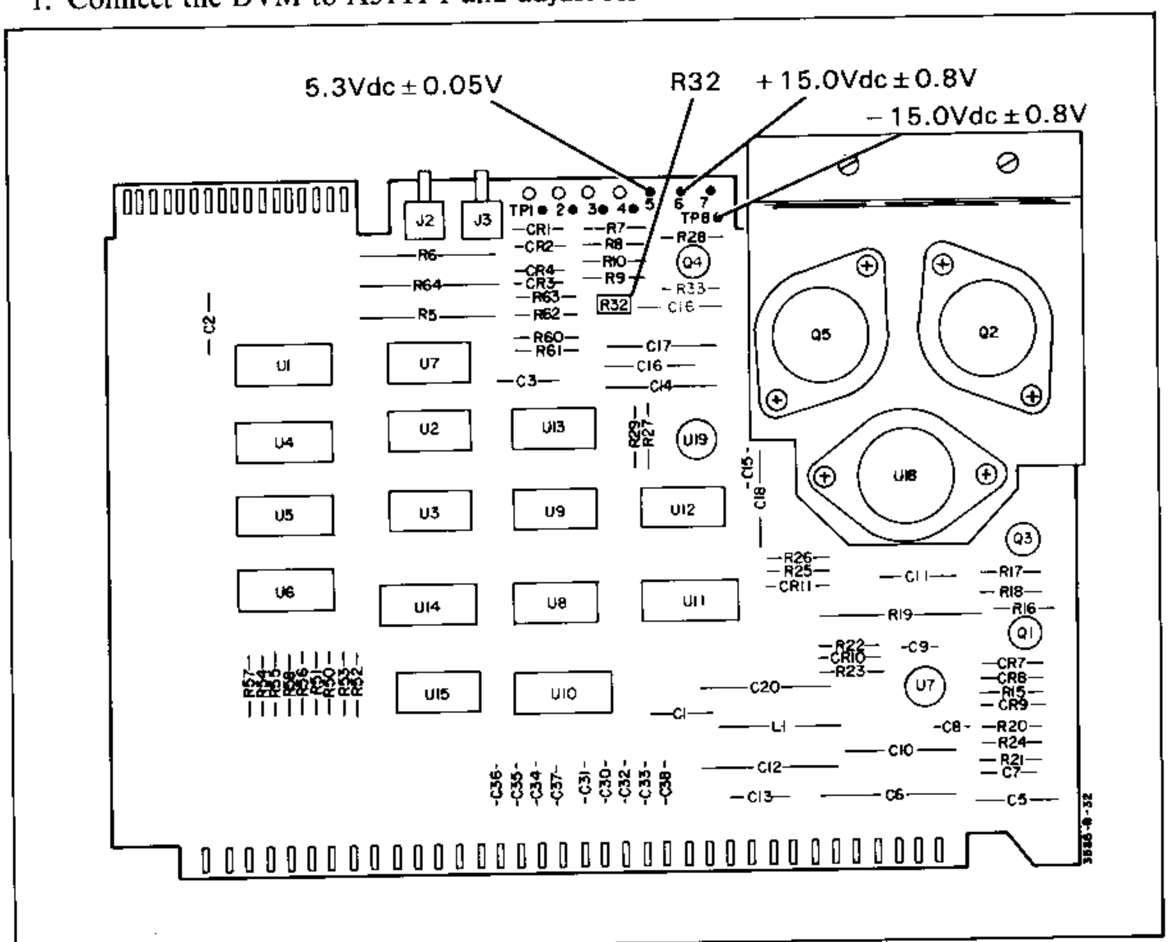


Figure 5-16. LO Control Board (A34)

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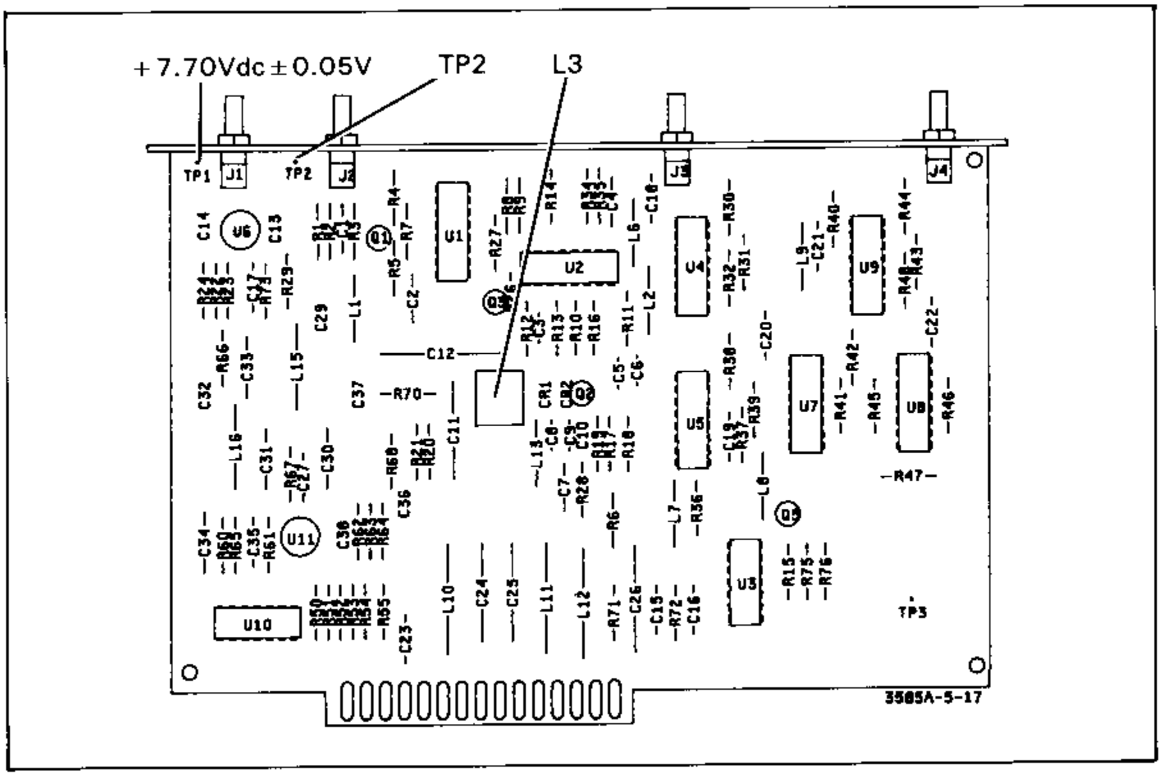

Figure 5-17. Fractional N VTO (A31)

g. Disconnect the DVM.

h. Turn the 3585A power off. Return the A31 board to its proper place in the card nest. Turn the 3585A power on.

i. Set the 3585A controls for:

RECALL 601
INSTRUMENT PRESET
RES. BW.................................3KHz
MANUAL ENTRY.........................1MHz
CF STEP SIZE............................500Hz
MANUAL FREQUENCY.....................⇧

j. Verify that the MANUAL frequency reads 1,000,500Hz on the CRT display.

k. Set your oscilloscope controls for:

Vertical Scale..............0.01V/Div. (AC coupled)
Horizontal Scale......................50μsec/Div.
Trigger..................................external

l. Connect a 10:1 probe to the input of the scope. Connect the scope probe to A31TP2.

m. Connect a second 10:1 probe to the External Trigger input. Connect this probe to A33TP1.

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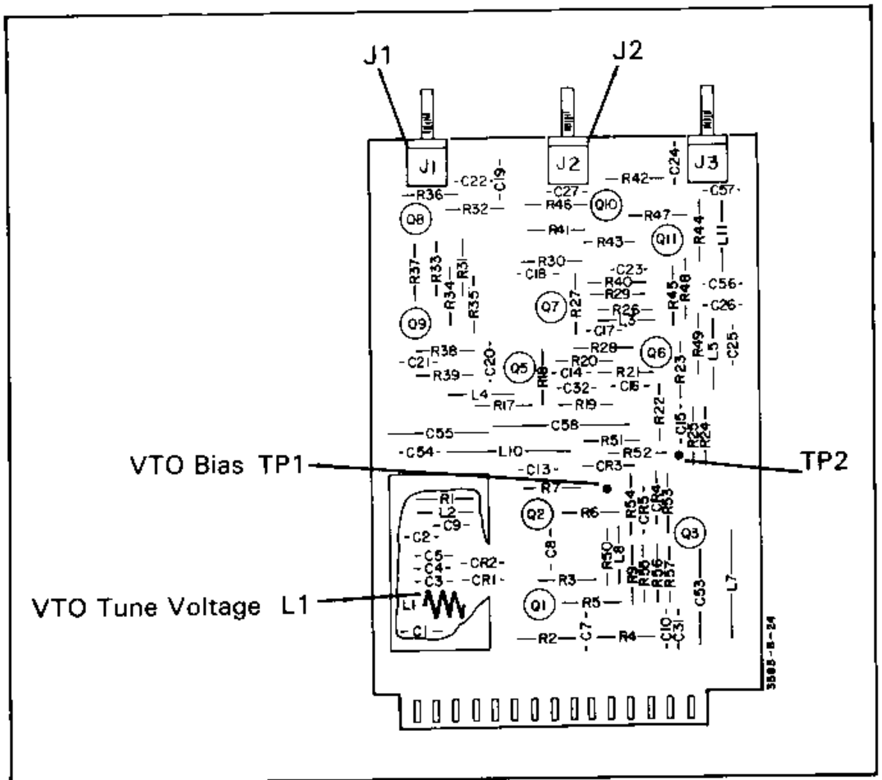

Figure 5-19. Step Loop VTO Board (A23)

NOTE

Steps b. thru g. are functional checks. If a Spectrum Analyzer is not available these steps may be omitted.

b. Set the 3585A controls as follows:

RECALL 601
INSTRUMENT PRESET
CENTER FREQUENCY.....................0Hz
FREQUENCY SPAN.........................0Hz
CF STEP SIZE...........................40MHz
RES. BW..................................3KHz
RES. BW HOLD............................ON

c. Disconnect the cable at A23J2. Connect a spectrum analyzer to A23J2 and verify that the signal (98MHz) level is approximately -6dBm or greater (typically -4dBm).

d. Remove the test spectrum analyzer from A23J2.

e. Disconnect the cable at A23J1 and connect it at A23J2.

f. Connect the spectrum analyzer to A23J1 and verify that the signal (≈98MHz) level is approximately -10dBm or greater (typically -7dBm).

g. Remove the spectrum analyzer from A23J1. Connect the proper cables to A23J1 and A23J2 (A23J1 to A26J2; A23J2 to A25J3)

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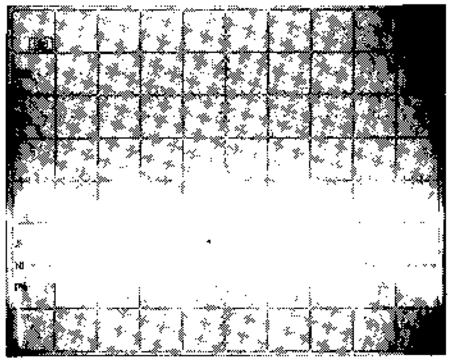
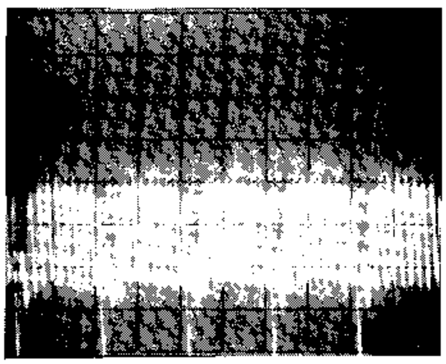
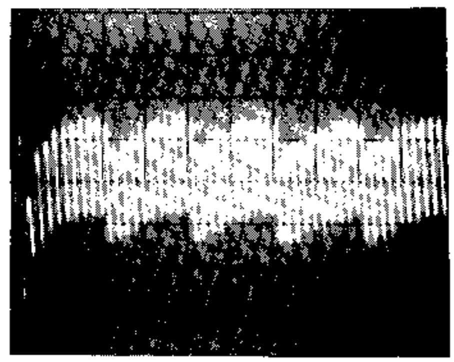


Incorrectly Adjusted API 1



Correctly Adjusted API 1



Incorrectly Adjusted API 2

Figure 5-18. API Adjustment Waveforms

n. Adjust A32R49 (API1, see Figure 5-46) for a minimum amount of ripple on the scope waveform. (See Figure 5-18.)

o. Set the 3585A controls for:

MANUAL FREQUENCY......................[⇩]
CF STEP SIZE............................50Hz
MANUAL FREQUENCY......................[⇧]

p. Verify that the MANUAL frequency now reads 1,000,050 Hz on the CRT display.

q. Adjust A32R56 (API2, see Figure 5-46) for a minimum amount of ripple on the scope waveform. (See Figure 5-18.)

r. Disconnect the oscilloscope connections. This completes the Fractional N adjustments.

5-14. L.O. Step Loop Adjustments

a. Turn the 3585A power off. Place the Step VTO board (A23) on a PC extender. Turn the power back on.

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h. Using a DVM, check the Bias voltage at A23TP1. This test point should read -4.6Vdc ± 0.2V.

i. Move the DVM to A23TP2. Squeeze or expand the oscillator coil (A23L1) to obtain a voltage of -2.0Vdc ± 0.1V.

j. Press "CENTER FREQUENCY. . . . ⇧ " on the 3585A and verify that the voltage at A23TP2 is ≥ +5.0Vdc.

k. Turn the 3585A power off. Remove the Step VTO (A23) board from its PC extender and return it to the card nest. Turn the 3585A power on.

l. Set the 3585A controls for:

RECALL 601
INSTRUMENT PRESET
CENTER FREQUENCY....................0Hz
FREQUENCY SPAN........................0Hz
RES. BW.................................3KHz
CF STEP SIZE..........................40MHz
RES. BW HOLD...........................ON

m. Connect a frequency counter to A23J2. The frequency reading should be 98MHz ± 10Hz.

n. Enter:

Center Frequency ⇧

o. The Frequency Counter reading should be 138MHz ± 10Hz.

p. Disconnect the cable at A23J1. If the frequency counter now reads 144MHz ± 0.5MHz, continue at step u.

q. If the frequency counter reading is not within the limits of 144MHz ± 0.5MHz, turn the 3585A power off. Place the Step Phase Detector board (A26) on a PC extender. Turn the 3585A power back on.

r. Set the 3585A controls for:

RECALL 601
INSTRUMENT PRESET
CENTER FREQUENCY....................0Hz
FREQUENCY SPAN........................0Hz

s. With the cable at A23J1 still disconnected, adjust A26R75 so that the frequency counter reads 144MHz ± 0.5 MHz (see Figure 5-20).

t. Turn the 3585A power off. Replace the A26 board in the card nest and restore power to the 3585A.

u. Verify that the "STEP" light on the A34 board goes on when the A23J1 cable is disconnected.

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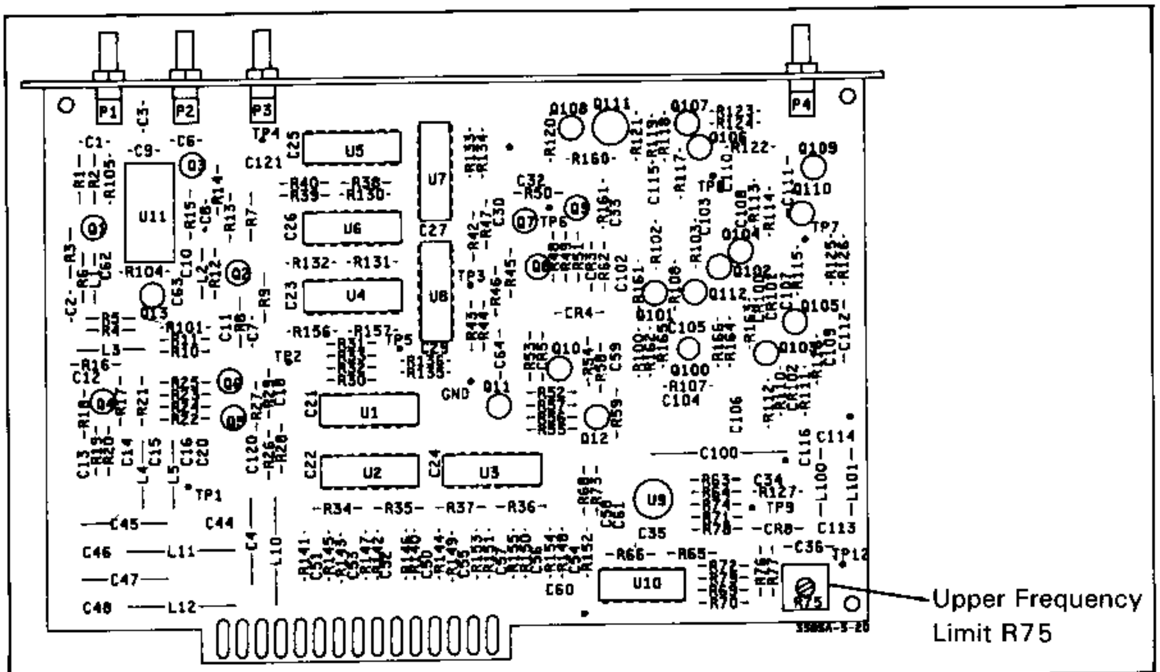

Figure 5-20. Step Phase Detector Board (A26)

v. Reconnect the proper cable to A23J1 (A23J1 to A26J2).

w. Verify that the "STEP" and "SUM" lights on the A34 board go on when the A26J3 cable is disconnected.

x. Reconnect the proper cable to A26J3 (A26J3 to A21J6).

y. Set the 3585A controls for:

INSTRUMENT PRESET
RES. BW 3KHz
SWEEP TIME .... 36 sec.

z. Verify that the frequency counter is now changing in 1MHz increments from 98MHz to 138MHz.

aa. Reconnect the proper cable to A23J2 (A23J2 to A25J3). This completes the L.O. Step Loop Adjustments.

5-15. First L.O. VTO And Sum Loop Adjustments

a. Turn the 3585A power off. Place the First L.O. VTO (A22) on a PC extender board and turn the power back on.

b. Set the 3585A controls for:

RES. BW HOLD .... ON
CENTER FREQUENCY 0Hz
FREQUENCY SPAN 0Hz
CF STEP SIZE 40MHz
RES. BW 30KHz

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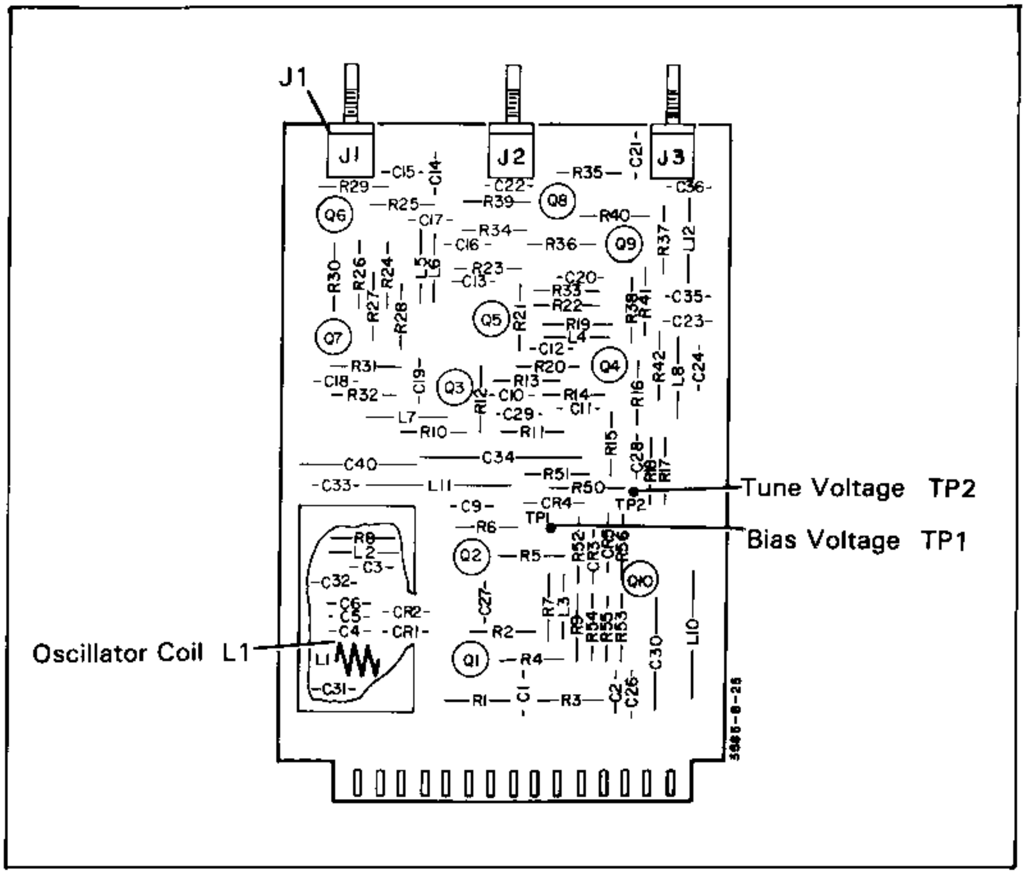

Figure 5-21. First LO VTO Board (A22)

c. Connect a frequency counter to A22J1.

d. Verify that the frequency counter now reads 100.35MHz.

e. Using a DVM, check that the voltage at A22TP1 measures -5.0Vdc ± 0.1V.

f. Adjust the voltage at A22TP2 by squeezing or expanding oscillator coil A22L1. The voltage reading should be -2.0Vdc ± 0.1V. Be sure to remove any tools from A22L1 before making your voltage reading.

g. Enter CENTER FREQUENCY . . . STEP [⇧] on the 3585A keyboard.

h. The frequency counter should now read 140.35MHz.

i. Turn the 3585A power off. Replace the A22 board in the card nest and turn the 3585A power back on.

j. Set the 3585A controls for:

RES. BW HOLD.............................ON
CENTER FREQUENCY......................0Hz
FREQUENCY SPAN.........................0Hz
CF STEP SIZE...........................40MHz
RES. BW.................................3KHz
MANUAL FREQUENCY.....................0Hz

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k. Adjust your oscilloscope controls for:

Vertical Scale...............0.01V/Div. (dc coupled)
Horizontal Scale.......0.5msec/Div. (internal trigger)
(Adjust scope for 0 volts dc at center of screen)

l. Connect the scope probe to A28TP4 (Σ Loop Error).

m. Adjust A27R2 (Offset, see Figure 5-46) for an average value of 0 Vdc on the oscilloscope.

n. Press CENTER FREQUENCY . . . STEP [⇧] on the 3585A keyboard.

o. Adjust A27R11 (slope, see Figure 5-46) for an average value of 0 Vdc on the oscilloscope.

p. Press CENTER FREQUENCY . . . STEP [⇩] . Repeat steps m thru p until the voltage displayed on the oscilloscope at this time equals 0 Vdc ± 0.05V (half of one vertical division with a 10:1 probe).

q. Set the 3585A controls for:

START FREQUENCY.......................0Hz
STOP FREQUENCY......................40MHz

r. Adjust A27R2 (offset) so that the waveform of the small band displayed on the scope varies less than 150mVp-p.

s. Verify that the "FRN" and "SUM" lights on the A34 board are blinking.

t. Verify that the "SUM" light on the A34 board stays on when the cable connected to A23J2 is removed.

u. Reconnect the proper cable to A23J2 (A23J2 to A25J3).

v. This completes the First L.O. and Sum Loop Adjustments.

5-16. Video Filter And A/D Converter Adjustments

a. Set the 3585A controls for:

RECALL 601
INSTRUMENT PRESET
RANGE .... +30dBm

b. Using short clip leads, connect A16TP1 to ground. Adjust A16R21 for a 3585A marker reading of -69.9dBm. Now adjust A16R21 so that the marker reading is -70.0dBm, which will be *just slightly* below the -69.9dBm adjustment point.

c. Remove the clip lead from A16TP1.

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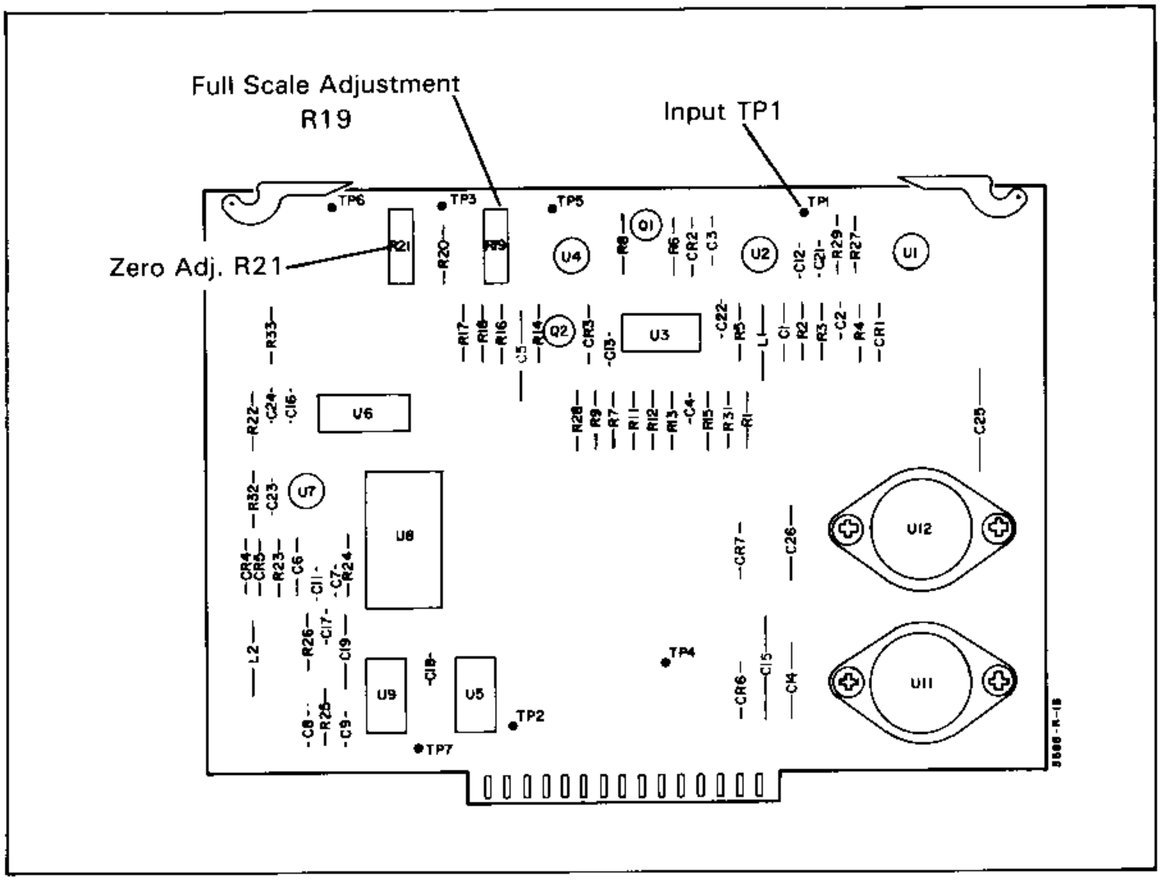

Figure 5- 22. A/D Converter Board (A16)

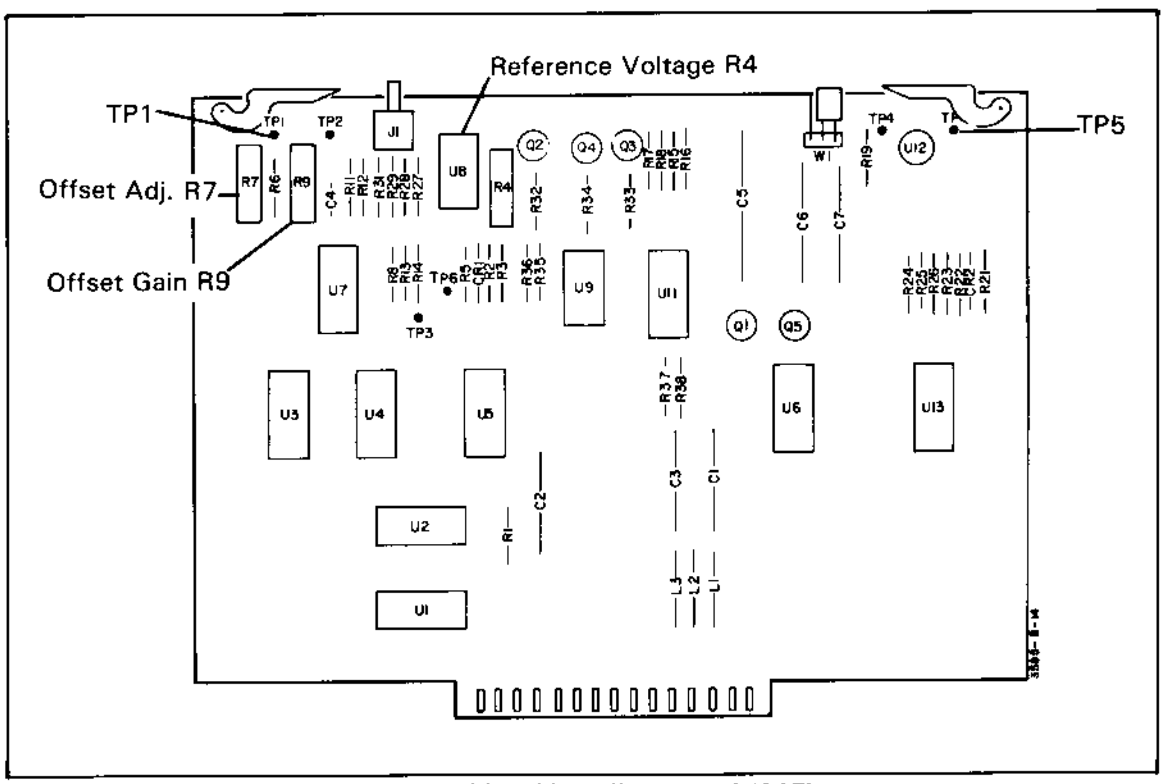

Figure 5-23. Video Filter Board (A15)

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d. Connect A15TP1 to A15TP5 using a short clip lead.

e. Connect A DVM to A15TP1. Adjust A15R4 for a reading of 5.000V ± 0.001V.

f. Set the 3585A controls for:

dB/DIV 1dB

g. Adjust A16R19 for a 3585A marker reading of +30.00dBm.

h. Remove the shorting clip between A15TP1 and A15TP5. This completes the Video Filter and A/D Converter Adjustments.

5-17. Log Amp And 30KHz Filter Adjustments

a. Turn the 3585A power off. Remove the metal covers on the A14 thru A19 boards.

b. Place the A14 board on a PC extender. Restore power to the 3585A. Reconnect all cables.

c. Set the 3585A controls for:

RECALL 601
INSTRUMENT PRESET
CENTER FREQUENCY................... 350KHz
FREQUENCY SPAN...................... 100KHz
RES BW.................................. 30KHz
dB/DIV 1dB
MANUAL SWEEP............................ on

d. Terminate the Tracking Generator output with a 50Ω feedthrough termination. Using the BNC to Sealectro adapter cable, connect the termination output to A17J1.

e. Adjust the Tracking Generator Amplitude control so that the peak of the trace is near the top of the screen.

f. Turn the 3585A COUNTER on. Once the Counter reading has stabilized press the MKR → CF key. Turn the COUNTER function off. Press CONT sweep key.

g. Adjust A14L5 and L7 for a maximum marker amplitude reading. Continue adjusting these inductors until no further improvement can be obtained. Look for a symmetrical wave shape and maximum amplitude when adjusting.

h. Disconnect the cable from the Tracking Generator to A17J1, and reconnect the green cable to A17J1.

i. Set the Synthesizer controls for:

FREQUENCY 350KHz
AMPLITUDE .... -28dBm

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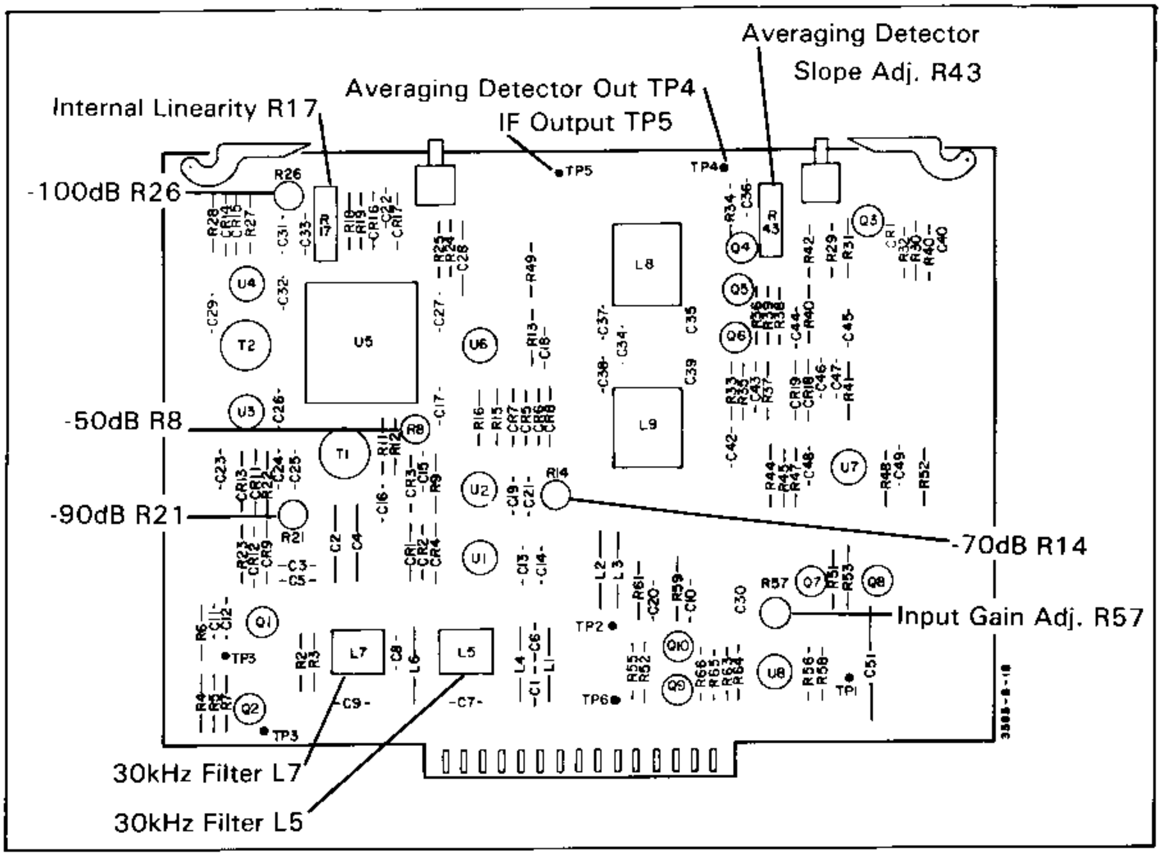

Figure 5-24. Log Amp Board (A14)

j. Set the 3585A controls for:

RECALL 601
INSTRUMENT PRESET
CENTER FREQUENCY..................350KHz
RANGE .... −25dBm
AUTORANGE...................................off
REFERENCE LEVEL.................... −28dBm
dB/DIV 5dB
MANUAL SWEEP.............................on
CLEAR A

k. Connect the 50Ω output of the synthesizer to a 50Ω input of the 3585A.

l. Using a 1:1 probe connect a high frequency ac voltmeter to A17TP2 and adjust A17R105 for a reading of 280mV RMS ± 3mV.

m. Again using the high frequency ac voltmeter, adjust A14R57 for a reading of 270mV RMS ± 2mV at A14TP5.

n. Disconnect the high frequency voltmeter.

o. Measure the dc voltage at A14TP4 and adjust A14R53 for a voltage reading of -5.7Vdc ± 0.3V.

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p. Adjust A15R7 for a marker reading of −28.0dBm.

q. Set the 3585A controls for 1dB/DIV.

r. Again adjust A15R7 for a marker reading of −28.00dBm.

5-18. Log Amp Slope Adjustment

a. Place the A14 board in the card nest.

NOTE

The Log amp linearity is affected by the card nest shielding. Therefore, the procedure for adjusting the A14 board is as follows:

1. Take a reading according to the instructions.

2. Remove the A14 board (power should remain on).

3. Make a slight adjustment of the specified resistor. (R43,R17,R8,R14,R21,R26)

4. Replace the A14 board.

5. Repeat until the required reading is obtained.

b. Set the 3585A controls for:

RECALL 601
INSTRUMENT PRESET
CENTER FREQUENCY....................350KHz
RANGE................................+30dBm
REFERENCE LEVEL......................+27dBm
dB/DIV....................................5dB
MANUAL SWEEP...............................on

Set the synthesizer controls for:

FREQUENCY.............................350KHz
AMPLITUDE............................-20.0dBm

c. Connect the 50Ω output of the Synthesizer to a 10dB/step attenuator. Connect the output of the attenuator to a 50Ω termination and the output of the 50Ω termination to A17J1 using the BNC to Sealectro adapter cable. Set the attenuator for ØdB of attenuation. Increase the amplitude of the synthesizer output until the Marker reading equals the Reference Level (=27dBm).

d. Set 3585A controls for:

OFFSET..on
ENTER OFFSET

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e. Check that the marker amplitude now reads .00dB. If it does not read this value, again press ENTER OFFSET.

f. Set the attenuator for 30dB of attenuation.

g. Calculate the following:

(marker reading + 30) X 3 = correction adjustment

h. Set the attenuator for ØdB of attenuation.

i. Adjust A14R43 for the correction factor calculated in step g.

j. Set the 3585A controls for:

dB/DIV 2dB
ENTER OFFSET

k. Set the attenuator for 10dB of attenuation.

l. Calculate the following:

−(marker reading + 10) x 10 = correction factor

m. Set the attenuator for ØdB of attenuation.

n. Adjust A14R17 for the correction factor calculated in step l.

o. Repeat steps e thru n until the 3585A marker amplitude readings are -30dB ± 0.05dB when the attenuator is set for 30dB and -10dB ± 0.02dB when the attenuator is set for 10dB.

p. Set the attenuator for Ø dB of attenuation.

q. Turn the 3585A OFFSET function off.

Table 5-3. Log Amplifier Adjustments

(A) Variable Attenuator	(B) Correction Factor*	(C) Ideal Reading	(D) Correct Reading	(E) Adjustment Tolerance
-30dB	________	-30.00dB	______dB	±0.05
-10dB	________	-10.00dB	______dB	±0.02
0dB**	________	-50.0dB	______dB	±0.1
-20dB**	________	-70.0dB	______dB	±0.1
-40dB**	________	-90.0dB	______dB	±0.1
-50dB**	________	-100.0dB	______dB	±0.5

*Correction factor must be obtained from attenuator calibration data.

**For these adjustments, the synthesizer amplitude is lowered to give the proper input level.

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r. Enter: 1dB/Div.

s. Adjust A15R7 for a marker amplitude reading of +27.00dBm.

t. When adjusting the -50, -70, -90 and -100dB points on the Log Linearity curve it is important to have the A14 board in the card nest. To do the required adjustments simply remove the A14 board, adjust the variable resistor and replace the board in the card nest to check the results of the adjustment.

u. Set the 3585A controls for:

RBW..3Hz
VIDEO BW..................................1Hz
dB/DIV.....................................10dB
OFFSET......................................on
ENTER OFFSET

v. Verify that the marker amplitude reading is 0dB.

w. Set the Synthesizer controls for:

AMPLITUDE INCREMENT..................50dB
AMPLITUDE...............................[⇩]

x. Adjust A14R8 for a 3585A marker amplitude reading of -50.0dB ± 0.1dB. Turn CCW for increase.

y. Set the external attenuator for 20dB of attenuation.

z. Adjust A14R14 for a 3585A marker amplitude reading of -70.0dB ± 0.1dB. Turn CCW for decrease.

aa. Set the external attenuator for 40dB of attenuation.

bb. Adjust A14R21 for a 3585A marker amplitude reading of -90.0dB ± 0.1dB. Turn CCW for decrease.

cc. Set the external attenuator for 50dB of attenuation.

dd. Adjust A14R26 for a 3585A marker amplitude reading of -100.0dB ± 0.1dB. This will be *just slightly* below the -99.9dB point.

ee. Set the external attenuator for Ø dB of attenuation. Enter AMPLITUDE . . .STEP UP on the frequency Synthesizer.

ff. Verify that the marker amplitude reading is 0.0dB ± 0.1dB. If it is outside of the stated limits, press ENTER OFFSET and continue at step v.

gg. Verify that the voltage at A14TP4 measures -5.7Vdc ± 0.1V.

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5-19. Reference Level DC Offset Adjustment

a. Set the 3585A controls for:

RECALL 601
INSTRUMENT PRESET
CENTER FREQUENCY 350KHz
RANGE .... +30dBm
REFERENCE LEVEL.................... +27dBm
dB/DIV 5dB
MANUAL SWEEP........................... on

Set the synthesizer controls for:

FREQUENCY 350KHz
AMPLITUDE .... −20.0dBm

b. Connect the 50Ω output of the Synthesizer to A17J1 using a BNC to Sealectro adapter cable. Increase the amplitude of the synthesizer output until the Marker reading equals the Reference Level (=27dBm).

c. Using short clip leads, short A14TP4 to ground.

d. Set the 3585A controls for:

RECALL 601
INSTRUMENT PRESENT
CENTER FREQUENCY.................. 350KHz
RANGE .... +30dBm
REFERENCE LEVEL.................... −25dBm
SAVE 1
REFERENCE LEVEL.................... −24dBm
SAVE 2

e. Using a DVM measure the dc voltage at A15TP5. Record the voltage reading: ___V.

f. Enter RECALL 1 on the 3585A keyboard.

g. Measure the dc voltage at A15TP5. Record the reading: ___V.

h. Subtract the first reading from the second reading. The difference should be 195mV. If the difference voltage is not 195mV, set the 3585A controls for:

RECALL 2

Adjust A15R9 slightly.

i. Repeat steps e thru h until the difference voltage reads 195mV.

j. Remove the shorting lead from A14TP4 to ground.

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k. Set the 3585A controls for:

RECALL 601
INSTRUMENT PRESET
RANGE .... +30dBm
REFERENCE LEVEL.................... +27dBm
dB/DIV 1dB
MANUAL ENTRY........................ 350KHz

l. Adjust A15R7 for a marker amplitude reading of +27.00dBm.

m. Replace the metal cover on the A14 thru A16 boards and tighten down the associated screws.

5-20. I.F. Filter Adjustments

NOTE

Use a non-metallic adjusting tool for all I.F. Filter adjustments.

a. Turn the 3585A power off. Remove the aluminum cover on the A17, A18 and A19 boards.

b. Place the A19 board on a PC extender. Restore power to the 3585A.

c. Move the test jumper A19J1 to the "T" position.

NOTE

The component locators for the IF boards (A17-A19) are contained on Figure 5-34.

d. Set the synthesizer for a Frequency of 350KHz and an Amplitude of -2.0dBm.

e. Remove the cable from the A17J1 connector.

f. Set the 3585A controls for:

RECALL 609
INSTRUMENT PRESET
CENTER FREQUENCY................... 350KHz
CF STEP SIZE.............................. 1.3Hz
RES. BW.................................. ⇩ ⇧
RES. BW...................................... 3Hz
dB/DIV 1dB
MANUAL SWEEP.............................. on
CLEAR A

g. Connect the output of the synthesizer to a 50Ω termination. Connect the output of the termination to the A17J1 connector. Adjust synthesizer output level until it is ≈ 1dB below 3585A Reference Level.

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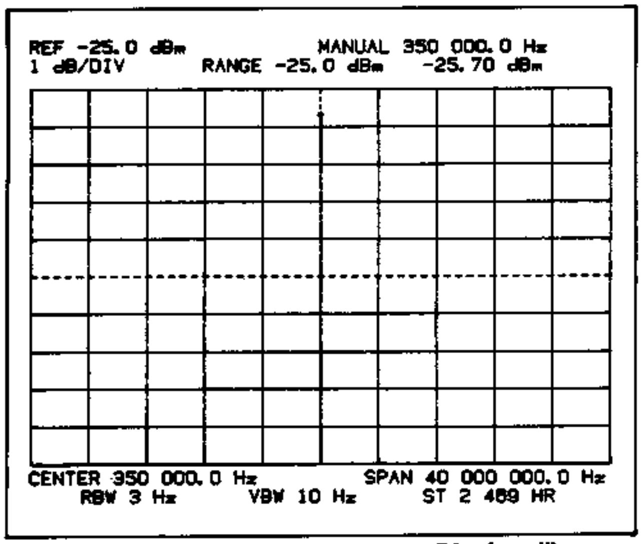

Figure 5-25. IF Adjustment Display #l

h. Adjust A19C39 for a maximum marker amplitude reading. Adjust the REF LEVEL as necessary to keep the marker within the graticule area. (See Figure 5-25.)

i. Press the 3585A STORE A → B key.

j. Disconnect the synthesizer.

k. Connect the output of the Tracking Generator to a 50Ω termination. Connect the output of the 50Ω termination to the A17J1 connector. Set Tracking Generator output control fully CCW.

l. Set the 3585A controls for:

FREQUENCY SPAN........................50KHz
RES BW..................................300Hz
SWEEP.....................................cont
dB/DIV.....................................10dB
B TRACE..................................OFF

m. Move the marker to the peak of the trace and press MKR → CF.

n. Adjust A19C41 so that the displayed trace is symmetrical about the marker.

o. Using the STEP keys, start narrowing the FREQUENCY SPAN. As you narrow the span the peak of the response will move to the left or the right. When this occurs, move the marker to the peak of the response and press MKR → CF. continue narrowing the span until a frequency span of 10Hz is reached.

p. Set the 3585A controls for:

dB/DIV.....................................1dB
SWEEP TIME..............................9.6sec
B Trace.......................................on

q. Move the marker to the most positive point on the trace and press MKR → CF.

r. Adjust the Tracking Generator amplitude control so that the peak of the A trace and the peak of the B trace are of equal amplitude.

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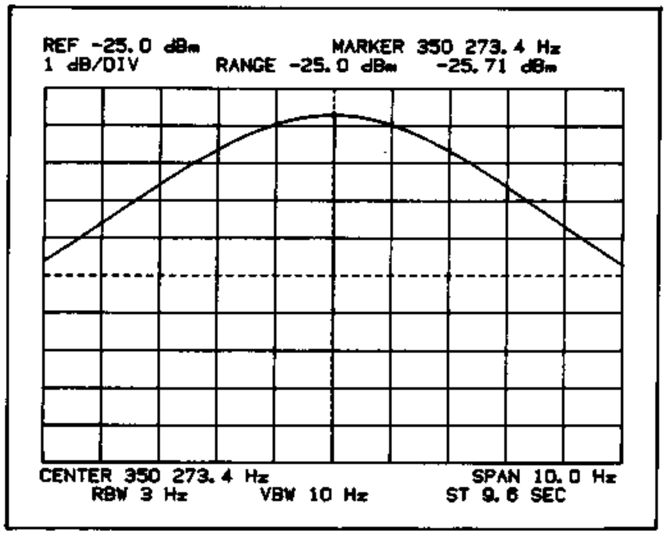

Figure 5-26. IF Adjustment Display #2

s. Repeat the previous two steps until the A trace is symmetrical and equal to the amplitude of the B trace. (See Figure 5-26.)

t. Press the STORE A → B key of the 3585A. The stored trace will now serve as the reference trace for the rest of the I.F. Filter adjustments.

5-21. Fifth Crystal Stage Adjustment

a. DO NOT TURN THE 3585A POWER OFF. Remove the PC extender and place the A19 board in the card nest.

b. Make the following keyboard entries on the 3585A:

RES BW....................................300Hz
RES BW HOLD...............................on
FREQUENCY SPAN........................1KHz

c. Both the A and B traces should now be displayed as in Figure 5-27.

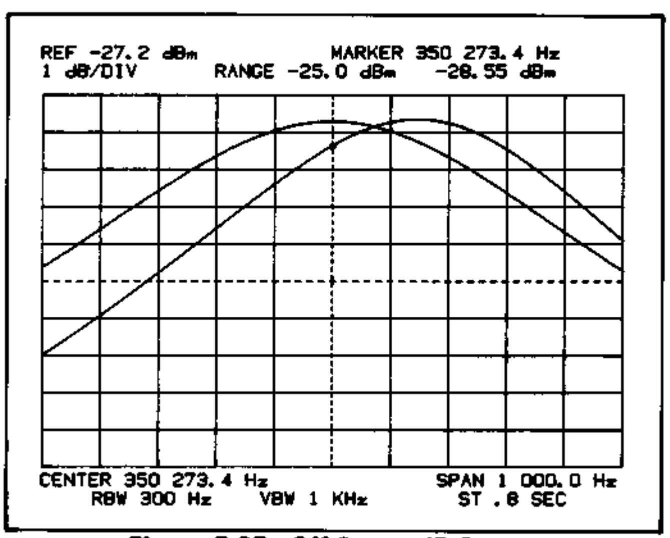

Figure 5-27. Off-Center IF Stage

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d. Press the REF LVL key of the Marker/Continuous Entry group. Using the Continuous Entry control, adjust the reference level until the peak of the A trace is equal in amplitude to the peak of the B trace.

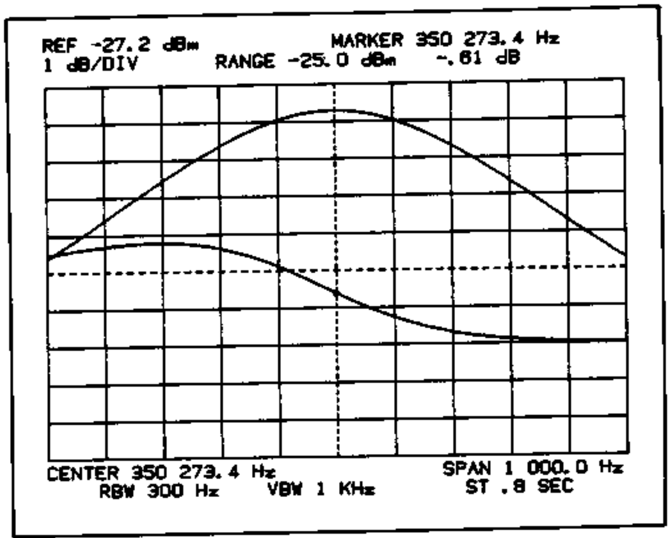

Figure 5-28. Off-Center IF Stage, A-B Mode

e. Set the 3585A controls for:

MARKER .... on
A-B .... on
SWEEP .... cont
dB/DIV 1dB

f. Adjust A19C67 so that the A trace approximates a straight, horizontal line.

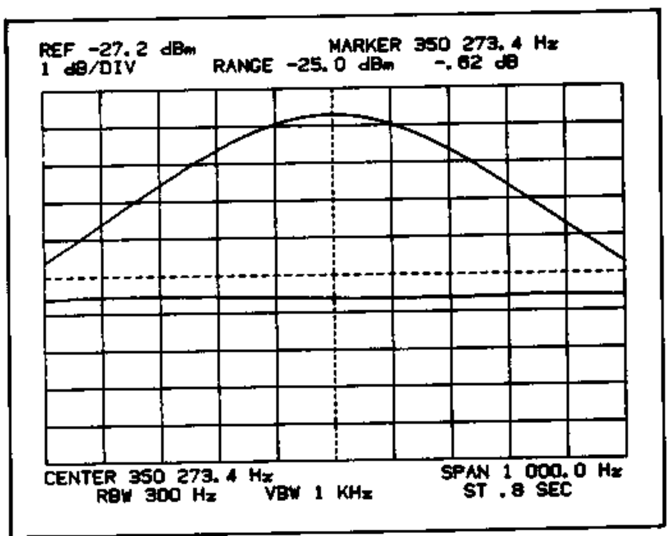

Figure 5-29. Correctly Adjusted IF Stage, A-B Mode

g. On the 3585A keyboard enter the following commands:

A-B .... off
FREQUENCY SPAN 50KHz
dB/Div 10dB

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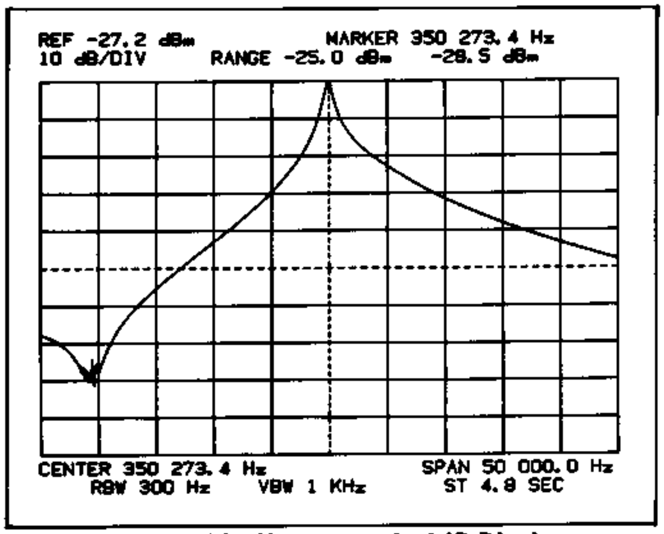

Figure 5-30. Unsymmetrical IF Display

h. Adjust A19C41 for the best possible trace symmetry.

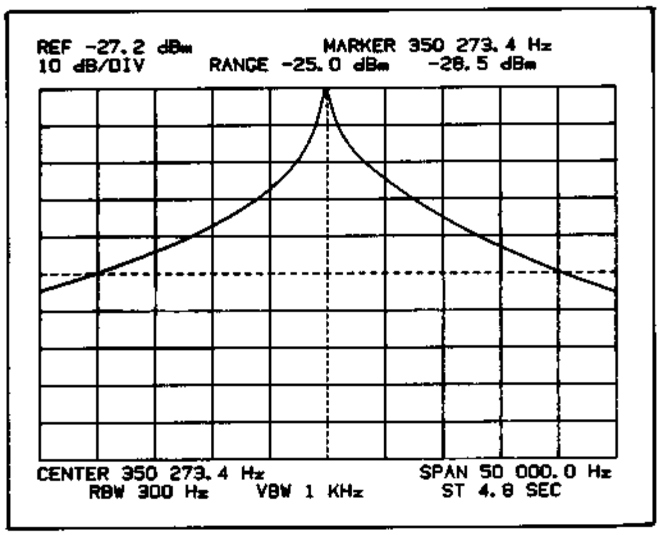

Figure 5-31. Symmetrical IF Display

5-22. Fourth Crystal Stage Adjustment

a. DO NOT TURN THE 3585A POWER OFF. Remove the A19 board. Move test jumper A19J1 to the "OP" position and test jumper A19J2 to the "T" position. Reinstall A19 Board in instrument.

b. Set the 3585A controls for:

FREQUENCY SPAN	1KHz
RES BW	300Hz
dB/DIV	1dB
A-B	on

c. Adjust A19C66 so that the A trace approximates a straight, horizontal line.

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d. Set the 3585A controls for:

A-B . . . . off
FREQUENCY SPAN 50KHz
dB/DIV 10dB

e. Adjust A19C30 for the best possible trace symmetry.

5-23. Fourth LC Stage Adjustment

a. DO NOT TURN THE 3585A POWER OFF. Place the A19 board on a PC extender.

b. Move test jumper A19J2 to the "OP" position and test jumper A19J3 to the "T" position. Check that A19J4 is in the "OP" position.

c. Enter the following 3585A keyboard settings:

RES BW 1KHz
FREQUENCY SPAN 3.3KHz
dB/DIV 1dB
A-B . . . . on

d. Adjust A19L5 so that the A trace approximates a straight, horizontal line.

e. Set the 3585A controls for:

A-B . . . . off
RES BW 30KHz
OFFSET . . . . on

f. Allow a complete sweep to occur, then press ENTER OFFSET.

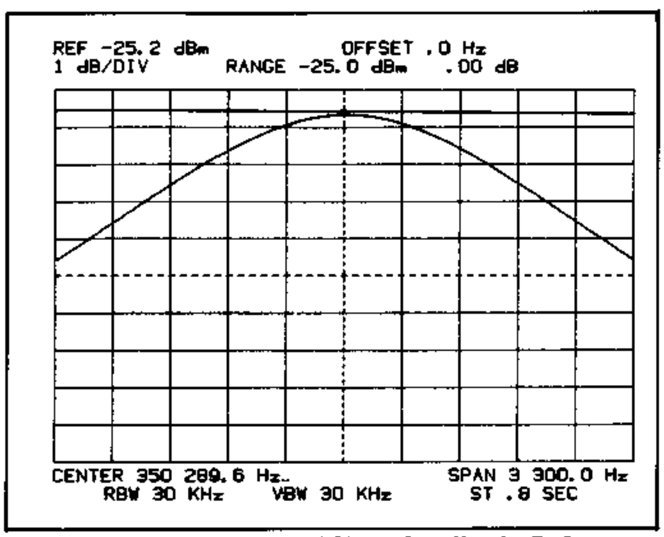

Figure 5-32. LC Stage, 30kHz Amplitude Reference

g. Enter a RES BW of 1KHz on the 3585A.

h. Adjust A19R28 so that the marker amplitude reading equals .00dB.

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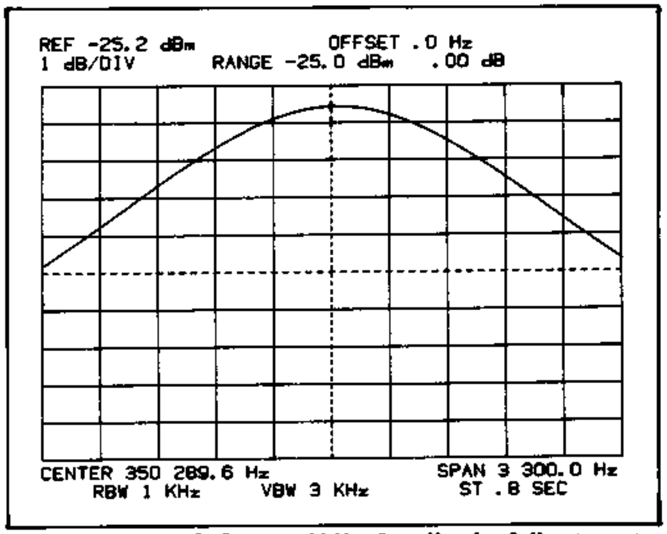

Figure 5-33. LC Stage, 1kHz Amplitude Adjustment

5-24. Fifth LC Stage Adjustment

a. Move test jumper A19J3 to the "OP" position and test jumper A19J4 to the "T" position.

b. Enter the following 3585A keyboard settings:

OFFSET .... off
FREQUENCY SPAN...................... 3.3KHz
A-B .... on

c. Adjust A19L4 so that the A trace approximates a straight, horizontal line.

d. Set the 3585A controls for:

A-B.. off
RES BW................................ 30KHz
OFFSET .... on

e. Allow a complete sweep to occur, then press ENTER OFFSET.

f. Set the 3585A controls for a RES BW of 1KHz.

g. Adjust A19R20 for a marker amplitude reading of .00dB.

h. Move test jumper A19J4 to the "OP" position.

5-25. Third Crystal Stage Adjustment

a. DO NOT TURN THE 3585A POWER OFF. The stored trace and center frequency information must not be lost when the A17 or A18 boards are placed on PC extenders.

b. Leaving the 3585A power on, remove the A18 board, A19 board and the PC extender from the instrument.

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c. CAREFULLY put the A19 board back in the correct slot of the card nest.

d. Being careful not to short the PC connector pins together, insert the PC extender in the A18 board position of the card nest.

e. Place the A18 board on the PC extender.

f. Check that the B trace is still intact. The A trace may have glitches on it, but this does not cause a problem. If the B trace information is good, procede with the adjustments. If the B trace has been lost or altered, go back to the beginning of the I.F. filter adjustment and complete all the adjustments up to Fifth Crystal Filter Adjustment. This will re-establish your reference trace. You may then continue at the Third Crystal Stage Adjustment.

g. Enter the following 3585A keyboard settings:

OFFSET .... off
CF STEP SIZE........................... 1.2Hz
RES BW................................ ⇧ ⇩
RES BW.................................. 300Hz
FREQUENCY SPAN...................... 1KHz
dB/DIV 1dB

h. Adjust A18L6 for the maximum possible marker amplitude reading.

i. Enter the following 3585A keyboard setting:

A-B .... on

j. Adjust A18L4 so that the A trace approximates a straight, horizontal line.

k. Set the 3585A controls for:

A-B...off
FREQUENCY SPAN...................... 50KHz
dB/DIV 10dB

l. Adjust A18C24 for the best possible trace symmetry.

5-26. Third LC Stage Adjustment

a. Set the 3585A controls for:

RES. BW.................................. ⇧ ⇩
SWEEP .... Cont
RES BW.................................. 1KHz
FREQUENCY SPAN.................... 3.3KHz
A-B .... on

b. Adjust A18L5 so that the A trace approximates a straight, horizontal line.

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c. Enter the following 3585A keyboard settings:

A-B .... off
RES BW 30KHz
OFFSET .... on

d. Allow time for a complete sweep to occur, then press ENTER OFFSET.

e. Set the 3585A controls for a RES BW of 1KHz.

f. Adjust A18R15 for a marker amplitude reading of .00dB.

5-27. Second Crystal Stage Adjustment

a. DO NOT TURN THE 3585A POWER OFF.

b. Remove the A17 board, A18 board and the PC extender from the instrument.

c. CAREFULLY put the A18 board back in the correct slot of the card nest.

d. Move test jumper A17J4 to the "T" position and place the A17 board on the PC extender.

e. Check that the B trace is still intact. The A trace may have glitches on it, but this does not cause a problem. If the B trace information is good, procede with the adjustments. If it has been lost or altered, go back to the beginning of the I.F. Filter Adjustments and complete all the adjustments up to the Fifth Crystal Stage Adjustment. This will re-establish your reference trace. You may then continue at the Second Crystal Stage Adjustment.

f. Set the 3585A controls for:

OFFSET .... OFF
CF STEP SIZE 1.1Hz
RES BW .... ⇧ ⇩
RES BW 300Hz
FREQUENCY SPAN 1KHz
dB/DIV 1dB
A-B .... on

g. Adjust A17C71 so that the A trace approximates a straight, horizontal line.

h. Enter the following 3585A keyboard settings:

A-B .... off
FREQUENCY SPAN 50KHz
dB/DIV 10dB

i. Adjust A17C39 for the best possible trace symmetry.

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j. Enter:

RES. BW.................................. ⇧ ⇩
dB/DIV 1dB
FREQUENCY SPAN........................1kHz

k. Adjust A17L8 for the maximum possible marker amplitude.

5-28. First Crystal Stage Adjustment

a. DO NOT TURN THE 3585A POWER OFF. Move test jumper A17J4 to the "OP" position and test jumber A17J5 to the "T" position. Remove the PC extender and replace the A17 board back in the card nest.

b. Set the 3585A controls for:

RES. BW.................................. ⇧ ⇩
FREQUENCY SPAN........................1KHz
dB/DIV 1dB
A-B ....on

c. Adjust A17C70 so that the A trace approximates a straight, horizontal line.

d. Set the 3585A controls for:

A-B...off
FREQUENCY SPAN.......................50KHz
dB/DIV 10dB

e. Adjust A17C29 for the best possible trace symmetry.

5-29. Second LC Stage Adjustment

a. DO NOT TURN THE 3585A POWER OFF. Remove the A17 board and place it on a PC extender. Move test jumper A17J5 to the "OP" positon and test jumper A17J2 to the "T" position.

b. Set the 3585A controls for:

RES BW.................................. ⇧ ⇩
RES BW......................................1KHz
FREQUENCY SPAN......................3.3KHz
dB/DIV 1dB
A-B ....on

c. Adjust A17L5 so that the A trace approximates a straight, horizontal line.

d. Set the 3585A controls for:

A-B...off
RES BW...................................30KHz
OFFSET ....on

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e. Allow a complete sweep to occur, then enter:

ENTER OFFSET
RES BW....................................1KHz

f. Adjust A17R20 for a marker amplitude reading of .00dB.

5-30. First LC Stage Adjustment

a. Move test jumper A17J2 to the "OP" position and test jumper A17J3 to the "T" position.

b. Set the 3585A controls for:

OFFSET....................................OFF
FREQUENCY SPAN......................3.3KHz
dB/DIV.....................................1dB
A-B...on

c. Adjust A17L4 so that the A trace approximates a straight, horizontal line.

d. Set the 3585A controls for:

A-B...off
RES BW..................................30KHz
OFFSET....................................on

e. Allow a complete sweep to occur, then enter:

ENTER OFFSET
RES BW....................................1KHz

f. Adjust A17R12 for a marker amplitude reading of .00dB.

g. Move test jumper A17J3 to the "OP" position. Check that all test jumpers on the A17 board are in the "OP" position.

h. Turn the 3585A power off. Remove the A17 board from the PC extender and replace it in the card nest.

i. Replace the metal cover over the A17 - A19 boards. Insert and tighten down all screws that hold down the cover. Restore power to the 3585A.

NOTE

If continuing DO NOT reconnect green cable at this time.

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5-31. Final I.F. Filter Adjustments

NOTE

Make the following I.F. adjustments only after the I.F. board cover is properly screwed down.

a. Set the synthesizer controls for:

FREQUENCY 350KHz
AMPLITUDE .... -2.0dBm

b. Connect the output of the synthesizer to a 50Ω termination. Connect the output of the termination to the A17J1 connector.

c. Set the 3585A controls for:

RECALL 609
INSTRUMENT PRESET
CF STEP SIZE 1.1Hz
RES BW 3Hz
MANUAL SWEEP .... on
dB/DIV 1dB
CLEAR A

d. Adjust A17C27 for the maximum possible marker amplitude reading. Adjust the REF LEVEL as necessary to keep the marker below the top of the screen.

e. Adjust A17C37 for the maximum possible marker amplitude reading.

f. Set the 3585A controls for:

CF STEP SIZE 1.2Hz
RES BW .... [⇧] [⇩]

g. Adjust A18C22 for the maximum possible marker amplitude reading.

h. Set the 3585A controls for:

CF STEP SIZE 1.3Hz
RES BW .... [⇧] [⇩]

i. Adjust A19C28 and A19C39 for the maximum possible marker amplitude reading.

j. Set the 3585A controls for:

RECALL 601
INSTRUMENT PRESET
MANUAL SWEEP .... on
dB/DIV 1dB
CLEAR A
OFFSET .... on
ENTER OFFSET
RES BW 300Hz

k. Adjust the REF LEVEL as necessary to keep the marker below the top of the screen.

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l. Adjust A17R26 for a .00dB marker reading.

m. Enter RES BW Step ⇩ on the 3585A keyboard.

n. Adjust A17R28 for a .00dB marker reading.

o. Enter RES BW Step ⇩ on the 3585A keyboard.

p. Adjust A17R30 for a .00dB marker reading.

q. Enter RES BW Step ⇩ on the 3585A keyboard.

r. Adjust A17R32 for a .00dB marker reading.

s. Enter RES BW Step ⇩ on the 3585A keyboard.

t. Adjust A17R34 for a .00dB marker reading.

5-32. 16dB Amplifier Adjustment

a. Disconnect the synthesizer from the A17J1 connector.

b. Connect the Tracking Generator output to a 10dB/step attenuator. Connect the 10dB/step attenuator to a 1dB/step attenuator and place a 50Ω termination on the output of the 1dB/step attenuator. Connect the output of the termination to the A17J1 connector.

c. Set the 3585A controls for:

RECALL 601
INSTRUMENT PRESET
CENTER FREQUENCY..................350KHz
FREQUENCY SPAN.....................100KHz
RES BW...............................10KHz
dB/DIV..................................2dB
MANUAL SWEEP..........................on
RANGE................................-25dBm
REFERENCE LEVEL....................-28dBm

d. Adjust the Tracking Generator amplitude for a marker amplitude reading of -28.00dBm.

e. Set the 3585A controls for:

OFFSET....................................on
ENTER OFFSET

f. Set the external attenuators for 16dB of attenuation.

g. Set the 3585A REFERENCE LEVEL to -44dBm.

h. Adjust A18R77 for an offset marker amplitude reading of -16.00dB.

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i. Set the external attenuators for 32dB of attenuation.

j. Set the 3585A REFERENCE LEVEL to -60dBm.

k. Adjust A18R71 for an offset marker amplitude reading of -32.00dBm.

l. Set the external attenuators for 48dB of attenuation.

m. Set the 3585A REFERENCE LEVEL to -76dBm.

n. Adjust A18R65 for an offset marker amplitude reading of -48.00dB.

o. Disconnect the Tracking Generator from A17J1. Reconnect the cable from A6CJ1 to A17J1.

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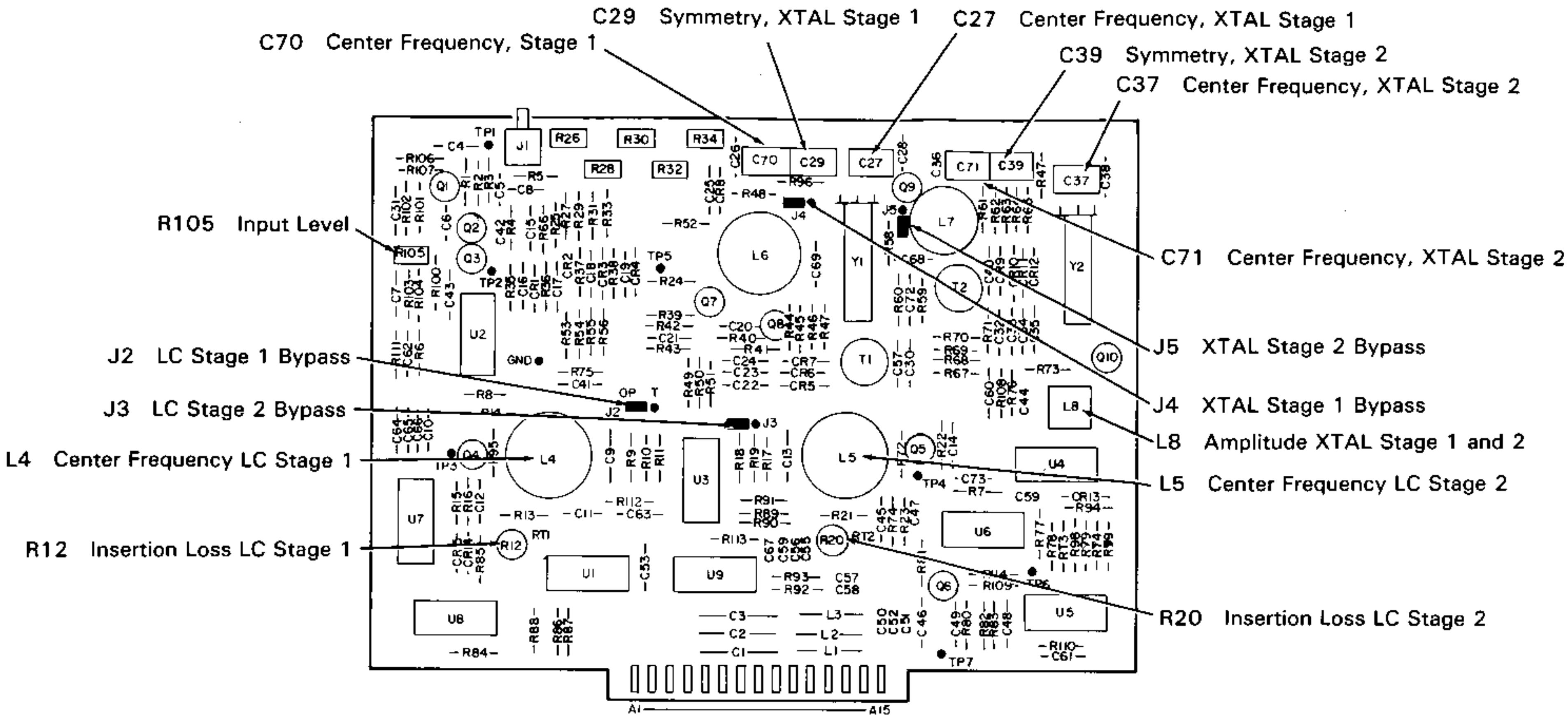
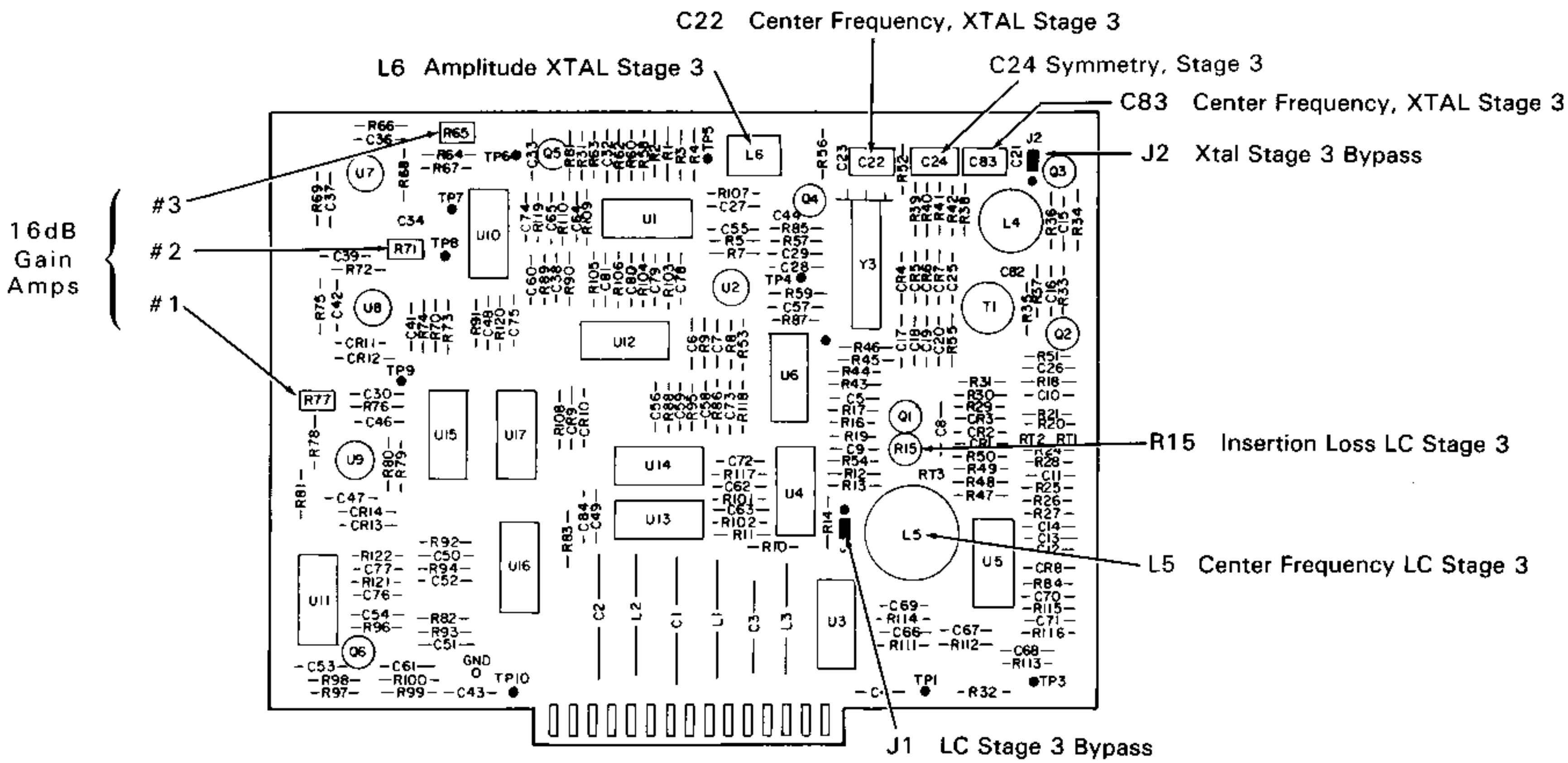


A17



A18

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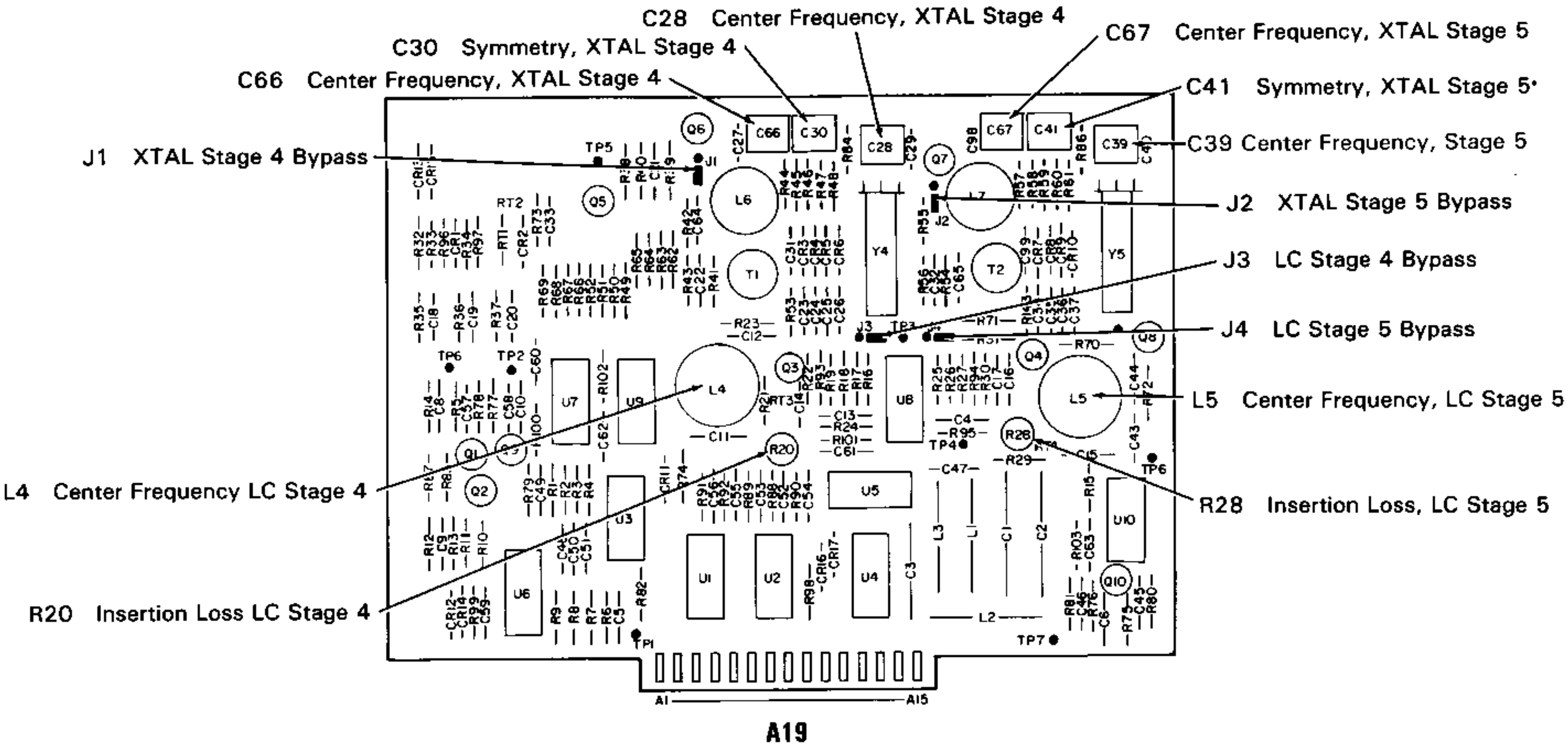

Figure 5-34. IF Boards (A17-A19).

5-33. CONVERSION SECTION ADJUSTMENTS

This section adjusts the filters associated with the first, second and third mixers. These filters are of two basic types, peak and notch. Peak filters will be adjusted for a maximum amplitude and notch filters for a minimum.

NOTE

The Source used for these adjustments must be frequency locked to the 3585A with the 10MHz REF OUTPUT.

NOTE

All *top, bottom and side screws on the input section* **must** *be in place and tight before making these adjustments.*

a. Turn the 3585A power off.

b. Set the 3585A on its left side and remove the bottom cover.

c. Adjustment of the Conversion Section requires its removal from the instrument; therefore, disconnect all cables connected to the Input/Conversion Section.

d. Collect a stack of books approximately eight inches high. This stack of books will be used as a support for the Input/Conversion Section.

e. Place the stack of books in the position shown in Figure 5-35. Be careful not to touch the high voltage section.

f. Remove the seven screws which hold the Input/Conversion Section in the instrument.

g. Carefully remove the input section by moving it toward the rear of the instrument until the input connectors clear the front panel. Ensure that the BNC connectors do not damage the front panel trim.

h. Place the Input/Conversion Section on the stack of books, bottom side down (Conversion side up).

i. Connect a Spectrum Analyzer to the A50J1 90MHz output with the BNC-to-Sealectro adapter cable. This output is located on the bottom side of the Tracking Generator Motherboard.

j. Turn 3585A power on.

k. Verify that the 90MHz output level is +15dBm ±3dB.

l. Connect the Spectrum Analyzer to the A50J2 10MHz output. This output is also located on the bottom of the Tracking Generator Motherboard.

m. Verify that the 10MHz output level is +18dBm ±3dB.

n. Reconnect all cables to the Input/Conversion Section.

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o. Check that the instrument down ranges to the -25dBm Range with no input signal.

p. Press the INSTRUMENT PRESET key of the 3585A.

q. Connect an Ohmmeter to the 50Ω input. Ground lead to the outer shell of the 50Ω input connector and the ohms lead to the center pin of the input connector.

r. The Ohmmeter should now read 50Ω ± 2Ω.

s. Press the 1MΩ Impedance key. This action terminates the input with a 50Ω load.

t. The Ohmmeter should now read 50Ω ± 2Ω. (This reading should be slightly different than the previous 50Ω reading.)

u. Press the 75Ω Impedance key on the 3585A.

v. The Ohmmeter should now read 75Ω ± 2Ω.

w. Press the 1MΩ Impedance key. This action terminates the input with a 75Ω load.

x. The Ohmmeter should now read 75Ω ± 2Ω. (This reading should be slightly different then the previous 75Ω reading.)

y. Set the 3585A controls for:

RECALL 601
INSTRUMENT PRESET
MANUAL ENTRY........................9MHz
dB/DIV.................................1dB
SAVE 1

z. Set the synthesizer controls for:

FREQUENCY............................9MHz
AMPLITUDE............................0dBm

aa. Connect the synthesizer output to the 3585A 50Ω input.

NOTE

Use a non-metalic adjusting tool for all Conversion section adjustments.

NOTE

When more than one component is called out for adjustment in any given step, adjust them in the order listed.

NOTE

Figure 5-45 shows the location of the Input/Conversion section adjustments.

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bb. Adjust the REF LEVEL as necessary to keep the marker near the center of the screen.

cc. Adjust the 100.35MHz Passband Filter using A3L7, L5, L3 and L1. Adjust for the maximum marker amplitude possible.

dd. Adjust the 10.35MHz Passband Filter using A5L6, L4, L2 and A4L7. Adjust these controls for a peak display of signal.

ee. Set the 3585A controls for:

MANUAL FREQUENCY..................8.3MHz
RANGE...................................-10dBm
dB/DIV...................................10dB
RES BW...................................3Hz
VIDEO BW.................................1Hz
SAVE 2

NOTE

Disregard Input Overload indicator.

ff. Adjust the Stopband of the 10.35MHz Filter using A5L5, L3 and L1. Adjust for a *minimum* marker amplitude reading. Adjustment should yield a marker amplitude reading less than -95dBm.

gg. Using RECALL 1, repeat step dd; and using RECALL 2 repeat step ff. Repeat until no further improvements can be made.

hh. Set the 3585A controls for:

PRESET (RBW-VBW-ST)
MANUAL FREQUENCY....................9MHz
RANGE....................................0dBm
dB/DIV...................................1dB
CLEAR A

ii. Adjust the 350kHz filter using A5T3 and T4. Adjust for a maximum marker amplitude reading.

jj. Move test jumper A2J5 to the "TEST" position.

kk. Adjust the REFERENCE LEVEL as necessary to keep the marker near midscreen.

ll. Adjustment of the first half of the 100.35MHz Passband Filter is accomplished using A2L7, L8, L11 and L12. Adjust these components for a maximum marker amplitude reading. A2L7 and L8 are bendable wire inductor adjustments.

mm. Move test jumper A2J5 back to the "NORM" position.

nn. Adjust the REFERENCE LEVEL as necessary to keep the marker near midscreen.

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oo. Set the synthesizer for a FREQUENCY of 33MHz.

pp. Set the 3585A controls for:

MANUAL ENTRY........................12.3MHz
dB/DIV.....................................10dB
RES BW.....................................3Hz
VIDEO BW.................................1Hz
RANGE....................................-10dBm
SAVE 1

qq. Adjust A3L2 and C8 for a minimum marker amplitude reading. Proper adjustment will yield a marker amplitude reading of less than -95dBm.

rr. Set the 3585A controls for:

PRESET (RBW-VBW-ST)
CENTER FREQUENCY....................33MHz
MANUAL.....................................ON
RANGE......................................0dBm
dB/DIV.....................................1dB

ss. Adjust the REFERENCE LEVEL as necessary to keep the marker near midscreen.

SAVE 2

tt. Adjust A3L1, L3, L2 and L7 for a maximum marker amplitude reading. Adjust this group of inductors several times to insure that the peak of the 100.35MHz filter has been obtained. (If necessary adjust the Reference Level to keep the marker on screen.)

uu. Using RECALL 1, repeat step qq; using RECAL 2, repeat step tt. Repeat until no further improvements can be made.

NOTE

Do not *adjust A4C2 and C3 (steps tt thru xx) unless repairs have been made on the A4 board.*

vv. Using a 20:1, 1KΩ resistive probe (-hp- 10020A) and a Spectrum Analyzer, place the probe tip on the exposed portion of A4C3. The 90MHz IF signal is available on this portion of C3.

ww. Adjust A4C2 for a maximum amplitude on the Spectrum Analyzer.

xx. Observe the amplitude on the Spectrum Analyzer. Remove the probe from A4C3.

yy. Adjust A4C3 slightly. Place the probe tip on A4C3 and check the amplitude. Continue adjusting A4C3 until a maximum amplitude response is obtained. Repeat A4C2, and A4C3 adjustments until no further improvements can be made.

zz. This complete the Conversion Section Adjustments.

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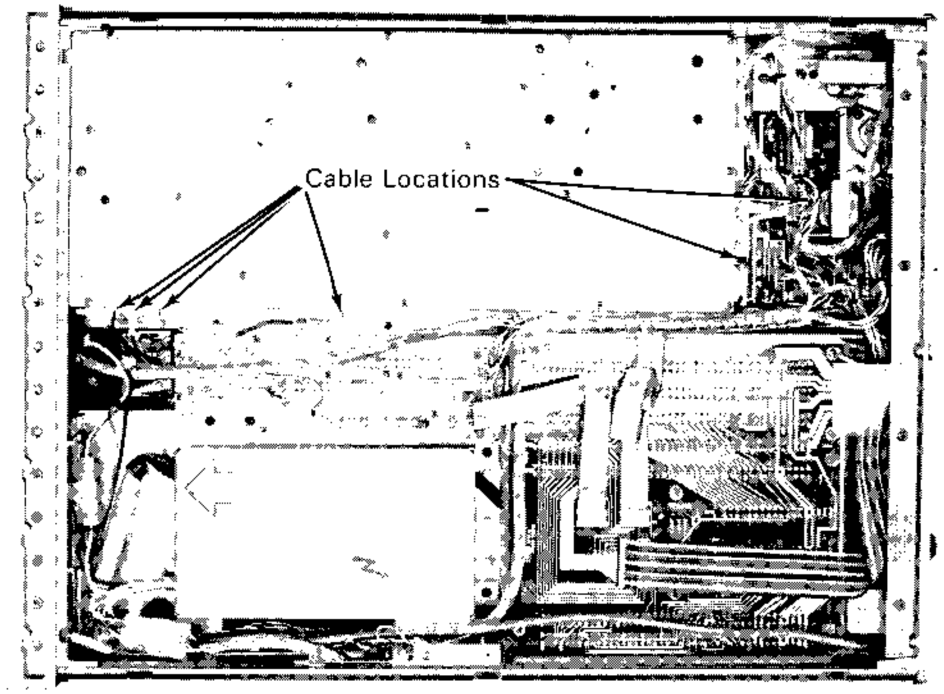
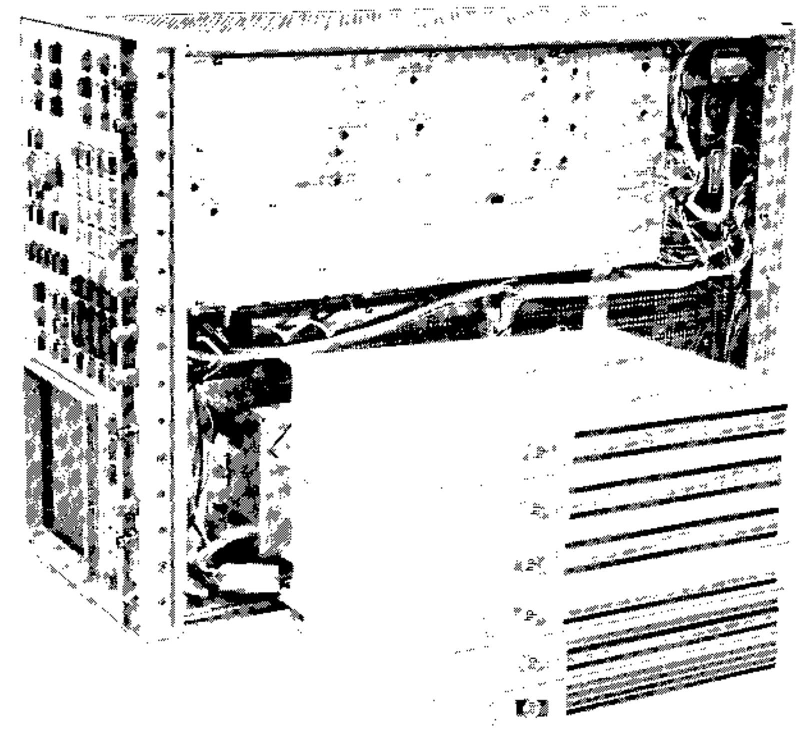
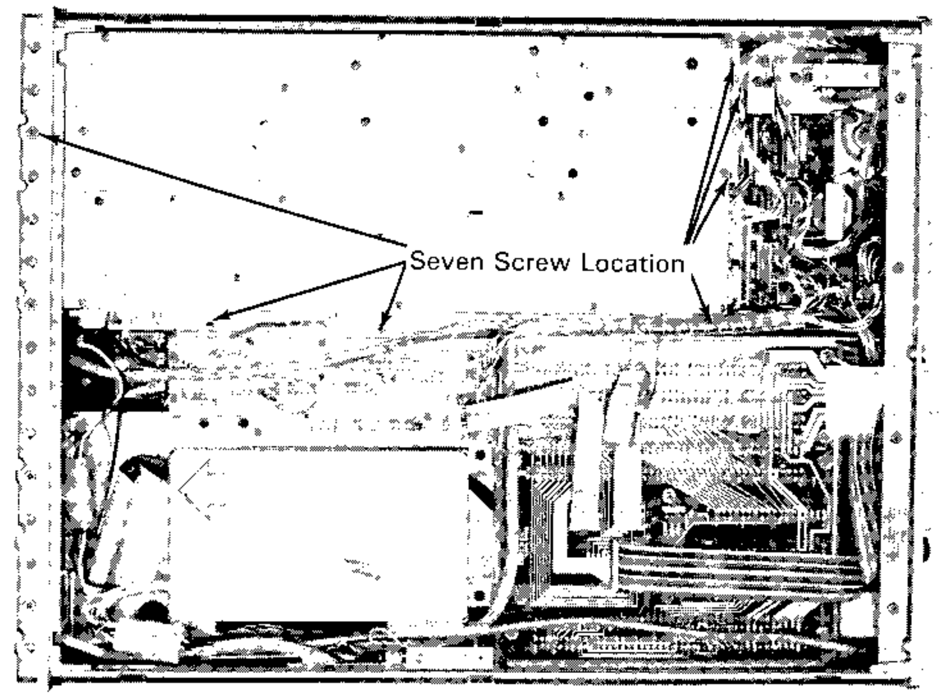


Book Placement





Conversion Section In Position For Adjustment

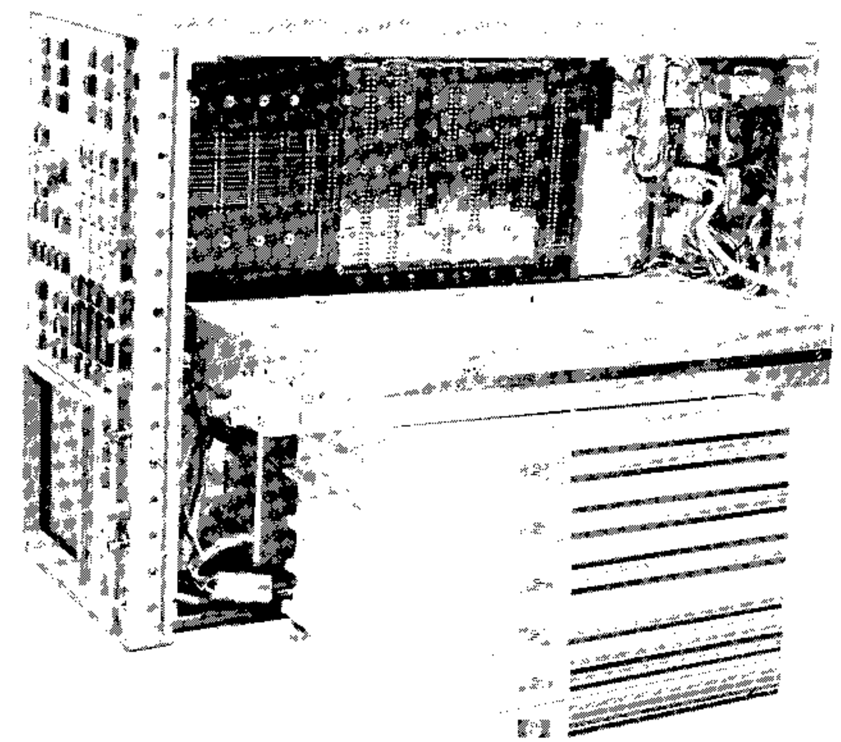


Figure 5-35. Removal Of The Input/Conversion Section

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5-34. INPUT SECTION

This section contains procedures to make the required adjustments on the Input board. These adjustments include Calibrator Symmetry, Input flatness, Autorange trip points, Calibrator Output Level, 1MΩ flatness, Amplitude and Input capacitance, LO Feedthrough and Harmonic Distortion.

a. Being careful not to harm any of the cables connected to the Input/Conversion Section, turn the Input box on its side so that the bottom (Input Section, A1 board) is accessable (see Figure 5-36.).

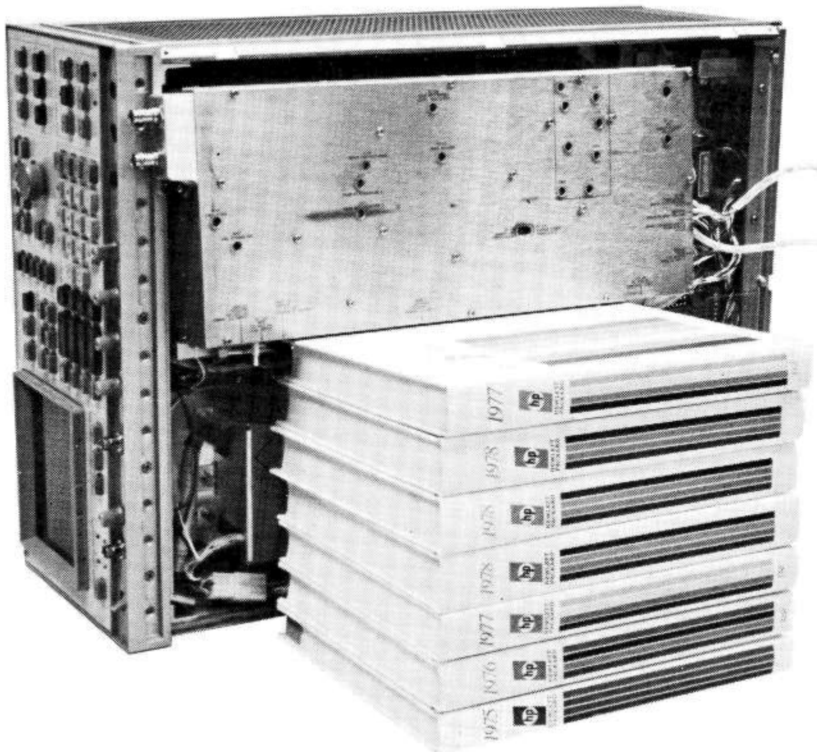

Figure 5-36. Input/Conversion Box Positioning For Adjustment

5-35. Calibrator Symmetry Adjustment.

a. Set the 3585A controls for:

RECALL 605
INSTRUMENT PRESET
RANGE .... -25dBm
AUTORANGE .... off
CENTER FREQUENCY 20.1MHz

b. Remove the cable from A1J3.

c. Slowly replace the cable until a display similar to figure 5-37 is obtained. When this display is obtained, do not push the cable in any further.

d. Adjust the CAL SYMMETRY control, R52, for the maximum possible marker amplitude.

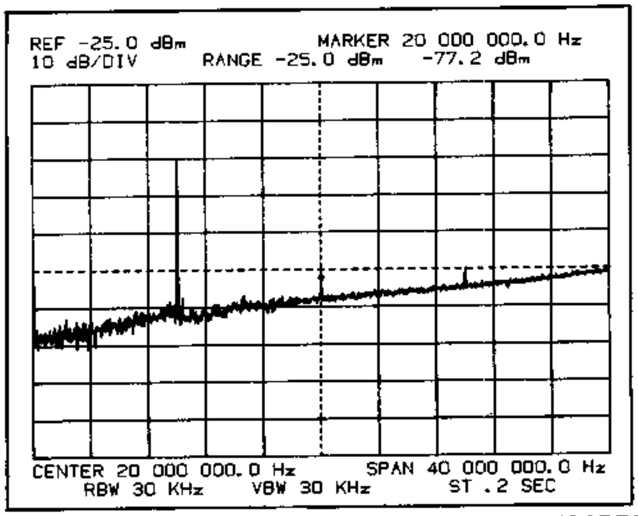

Figure 5-37. Calibrator Symmetry Adjustment (A1R52)

e. Push the cable completely onto A1J3. check that a display similar to Figure 5-38 is obtained.

NOTE

If the instrument passes the Calibrator Accuracy test in the Performance Test section, go on to paragraph 5-36. Only if the Calibrator Accuracy Test has failed and you are certain your source is not at fault should you perform the following steps.

f. Using the results of the Calibrator Accuracy Test, determine if the 40MHz point is higher or lower than the 10MHz point.

g. Select a new A1C50* from the list below. Choose a smaller value to raise the 40MHz point and a larger value to lower the 40MHz point. (This capacitor affects the Calibrator's frequency response above 20MHz.)

Capacitor Value	-hp- Part Number
10pf	0160-2257
12pf	0160-2259
16pf	0160-2262

h. Remove the Input/Conversion box from the 3585.

i. Remove the cover on the Input board side.

j. Replace A1C50*.

k. Replace the cover and all screws.

l. Replace the Input/Conversion box in the instrument.

m. Retest the Calibrator Flatness with the Calibrator Accuracy Test.

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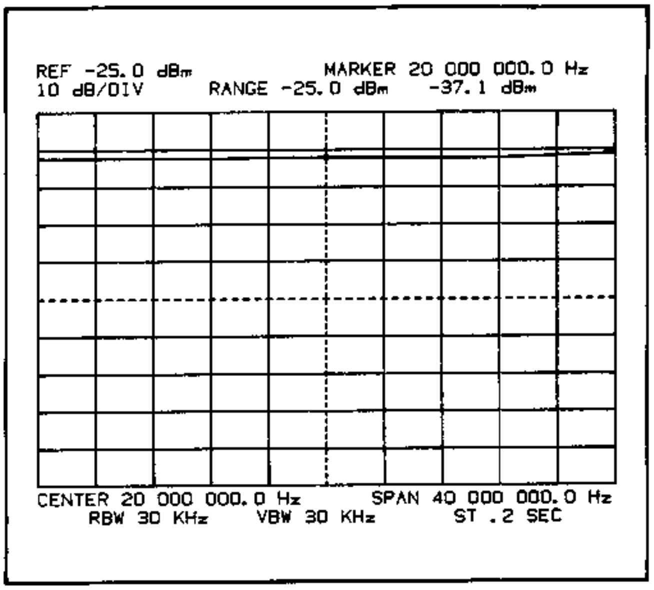

Figure 5-38. Normal Display For Test Mode 05

5-36. Flatness Adjustment

a. Move test jumper A15W1 to the "TEST" position.

b. Set the 3585A controls for:

RECALL 605	
INSTRUMENT PRESET	
CENTER FREQUENCY	20.1MHz
dB/DIV	2dB
RANGE	−25dBm
AUTORANGE	off

c. Using the Continuous Entry control, adjust the REF LVL so that the trace is centered on the CRT.

d. The 3585A is now in its 0.2dB/DIV mode. This allows very fine adjustment of the instruments flatness.

e. Adjust the input flatness with the following components in the order shown.

A1R131, C83, L18, C86, L19, C89, L21, C92

The input flatness of the instrument should resemble Figure 5-39 when completely adjusted. The effect of each adjustment is shown in Figure 5-40 (foldout). Continue adjustment of the instrument flatness until the peak to peak variation of the trace is less than 0.2dB (1 division).

f. Move test jumper A15W1 to the "NORM" position.

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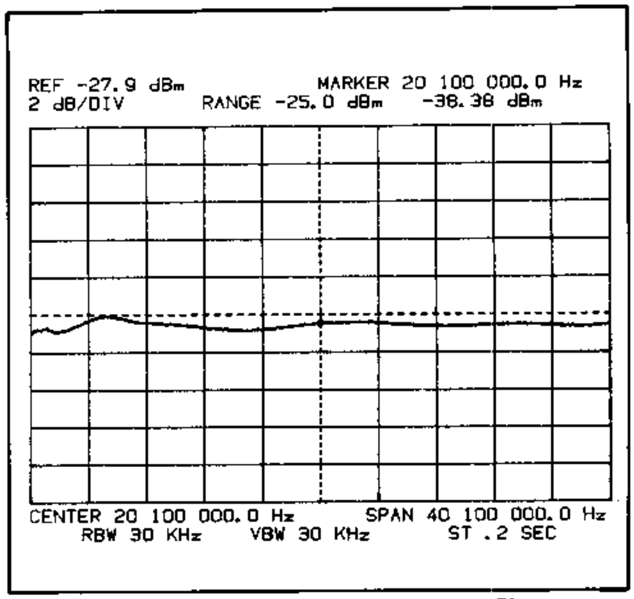

Figure 5-39. Properly Adjusted Input Flatness

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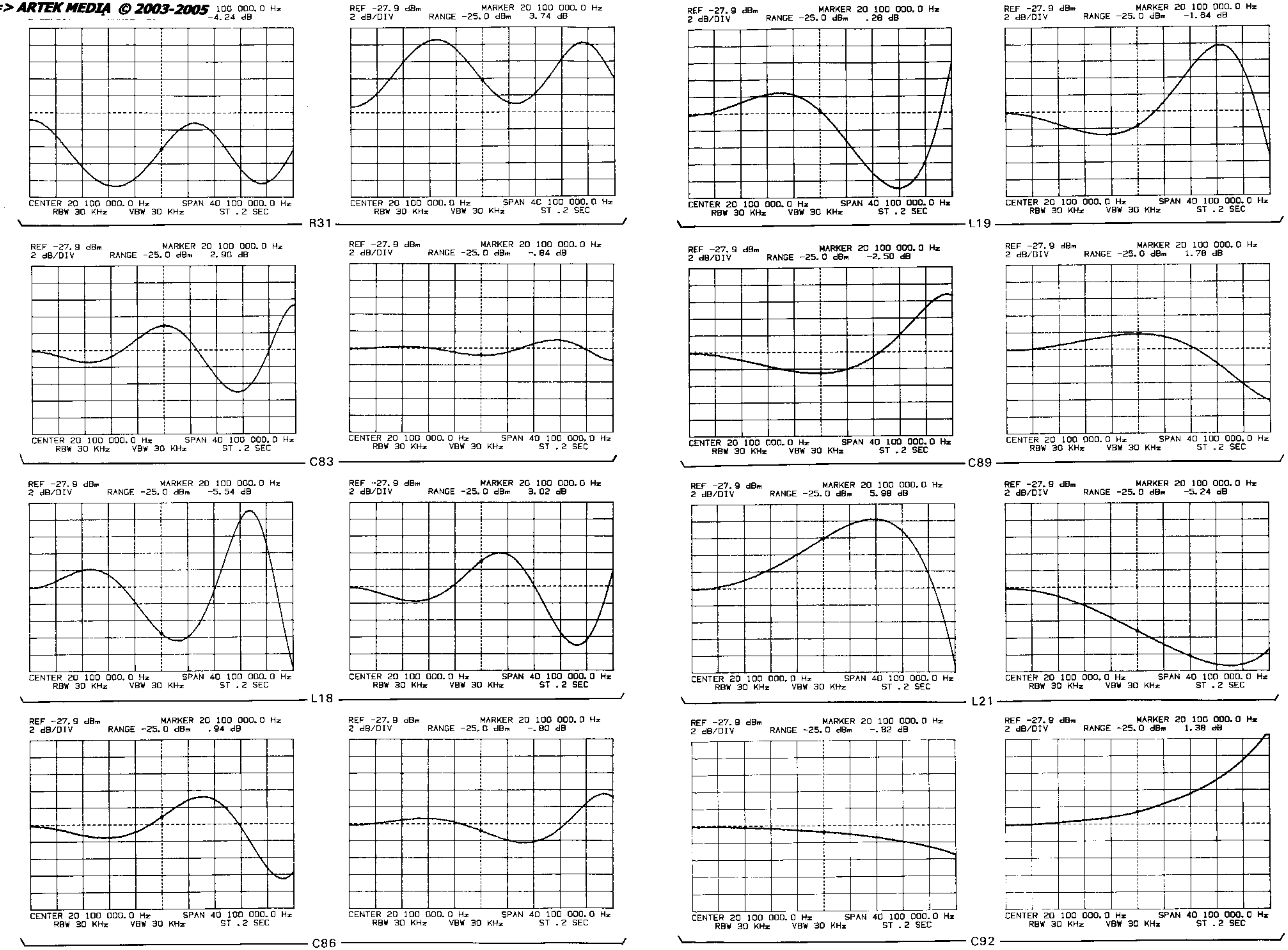

Figure 5-40. Input Flatness Adjustments.

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5-37. Range Up Detector Adjustment

a. Set the synthesizer controls for:

FREQUENCY 30kHz
AMPLITUDE .... -24dBm

b. Set the 3585A controls for:

RECALL 601
INSTRUMENT PRESET
RANGE.................................. -25dBm
AUTORANGE.............................. off

c. Adjust the RANGE UP THRESHOLD, A1R173, so that the front panel OVERLOAD light is lit. Now adjust A1R173 so that the OVERLOAD light just goes out.

5-38. Range Down Detector Adjustment

a. Set the 3585A to the 0dBm RANGE.

b. Set the synthesizer for an AMPLITUDE of -6dBm.

c. Connect a dc voltmeter (10V range) to the Digital motherboard, pin A45B19 or A40TP2 ('L' RNGD). This is accessable from the bottom of the instrument as shown in Figure 5-41.

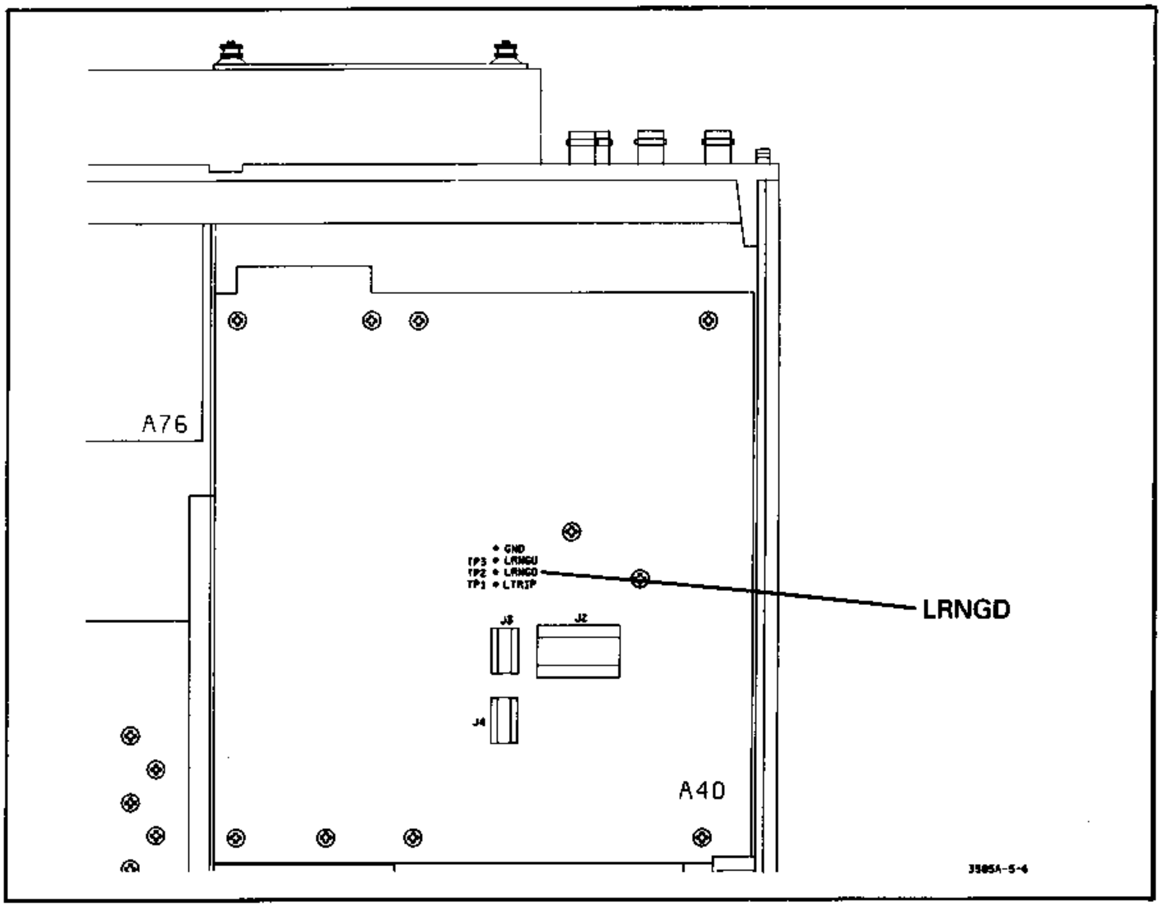

Figure 5-41. Range Down Monitor Point (LRNGD)

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d. Adjust the Range Down Threshold, A1R174, so that the voltmeter reading just goes to a low logic level (<0.5V).

e. Remove the voltmeter.

5-39. Top Of Screen Amplitude Adjustment

a. Set the synthesizer controls for:

FREQUENCY 150kHz
AMPLITUDE .... -25dBm

b. Set the 3585A controls for:

RECALL 601
INSTRUMENT PRESET
CENTER FREQUENCY.................. 150kHz
RANGE.................................. -25dBm
AUTORANGE............................. off
RES BW.................................. 30kHz
dB/DIV 1dB
MANUAL SWEEP........................... on

c. Adjust A17R105 for a marker amplitude reading of -25.00dBm.

d. Enter SAVE 1 on the 3585A.

5-40. Calibrator Level Adjustment

NOTE

It is important that the amplitude accuracy of the source used for this adjustment is excellent. The amplitude accuracy of the 3585A depends on the amplitude accuracy of this source.

a. Set the 3585A control for:

INSTRUMENT PRESET
RECALL 1 (same settings as in top of Screen Amplitude Adjustments)

b. Adjust A1R39 so that the marker amplitude reads exactly -25.00dBm. The results of this adjustment can only be analyzed after performing the next two steps.

c. Enter RECALL 4 on the 3585A keyboard.

d. View the results of your adjustment. Repeat the two previous steps until a marker reading of exactly -25.00dBm is obtained after a calibration (RECALL 4).

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5-41. 1MΩ Amplitude Adjustment

a. Terminate the 1MΩ 3585A input with a 50Ω feedthrough termination. Move the synthesizer output from the 3585A 50Ω input to the 50Ω termination on the 1MΩ input.

b. Press the 1MΩ IMPEDANCE key on the 3585A.

c. Adjust A1R108 for a marker amplitude reading of -25.20dBm.

5-42. 1MΩ Flatness Adjustment

a. Connect a 10dB/step attenuator to the output of the Tracking Generator. Connect the output of the Attenuator to the 50Ω termination on the 1MΩ input.

b. Set the attenuator for 40dB of attenuation.

c. Turn the Tracking Generator Amplitude control fully clockwise.

d. Set the 3585A controls for:

INSTRUMENT PRESET
1MΩ IMPEDANCE
START FREQUENCY........................1kHz
STOP FREQUENCY......................100kHz
RANGE..................................-25dBm
AUTORANGE................................off
dB/DIV.....................................2dB

e. Move test jumper A15W1 to the "TEST" position.

f. Using the Continuous Entry Control, adjust the REF LVL so that the trace is centered on the display.

g. Press STORE A → B on the 3585A.

h. Set the 3585A to the -5dBm RANGE.

i. Set the external attenuator for 20dB.

j. Adjust A1C21 so that the A trace overlaps the B trace as closely as possible (see Figure 5-42).

k. Set the 3585A for the +15dBm RANGE.

l. Set the external attenuator for 0dB.

m. Adjust A1C27 so that the A trace overlaps the B trace as closely as possible.

n. Move test jumper A15W1 back to the "NORM" position.

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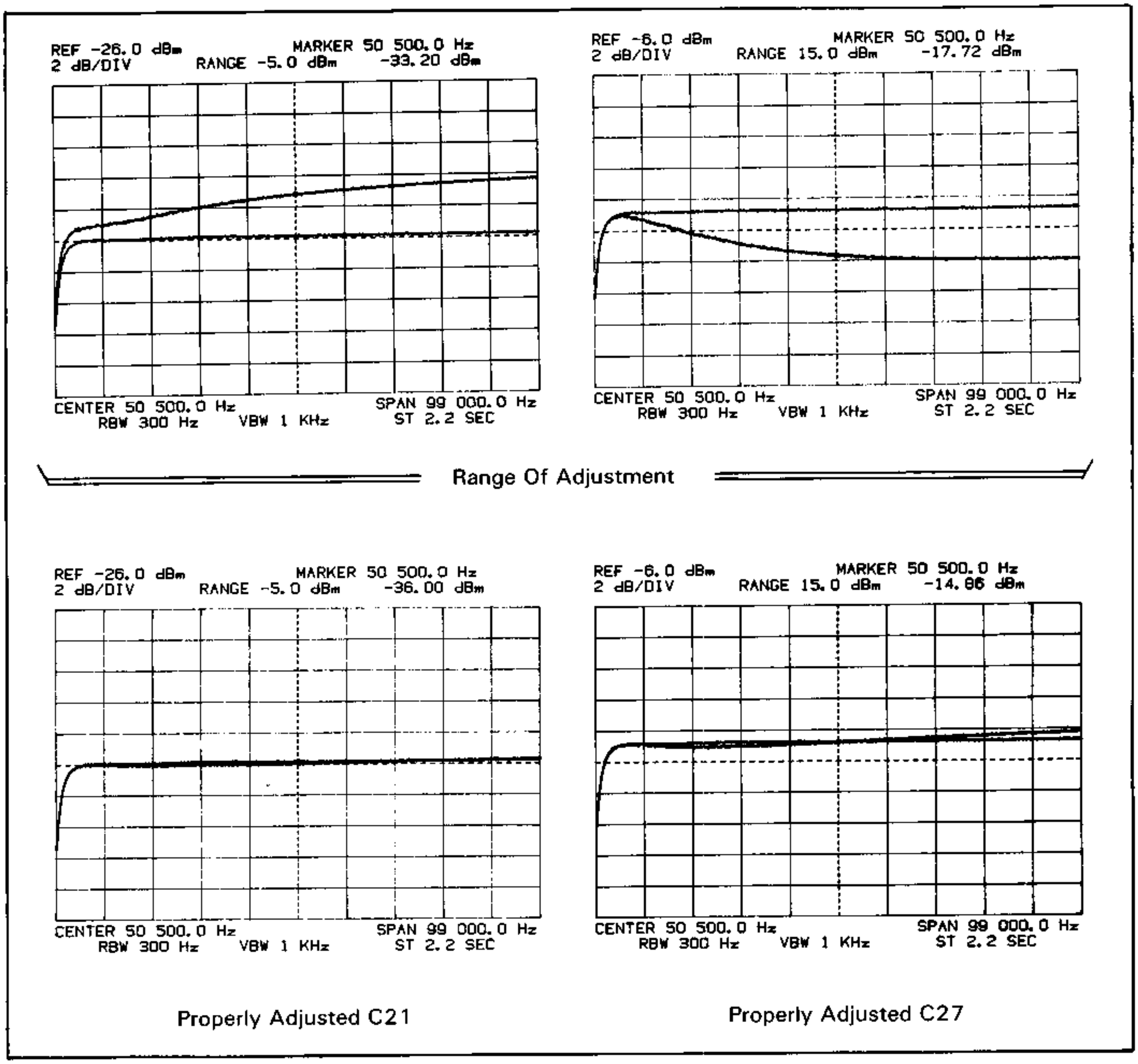

Figure 5-42. 1MΩ Low Frequency Flatness Adjustment

5-43. 1MΩ Input Capacitance Adjustment

a. Using the same connections as before, set the external attenuator for 40dB of attenuation.

b. Replace the 50Ω termination with a 10kΩ series resistor (±1%, 1/8W, -hp- Part Number 0757-0442). This resistor should be connected as shown in Figure 5-43. Use short clip leads to connect the resistor to the attenuator and the 3585A 1MΩ input.

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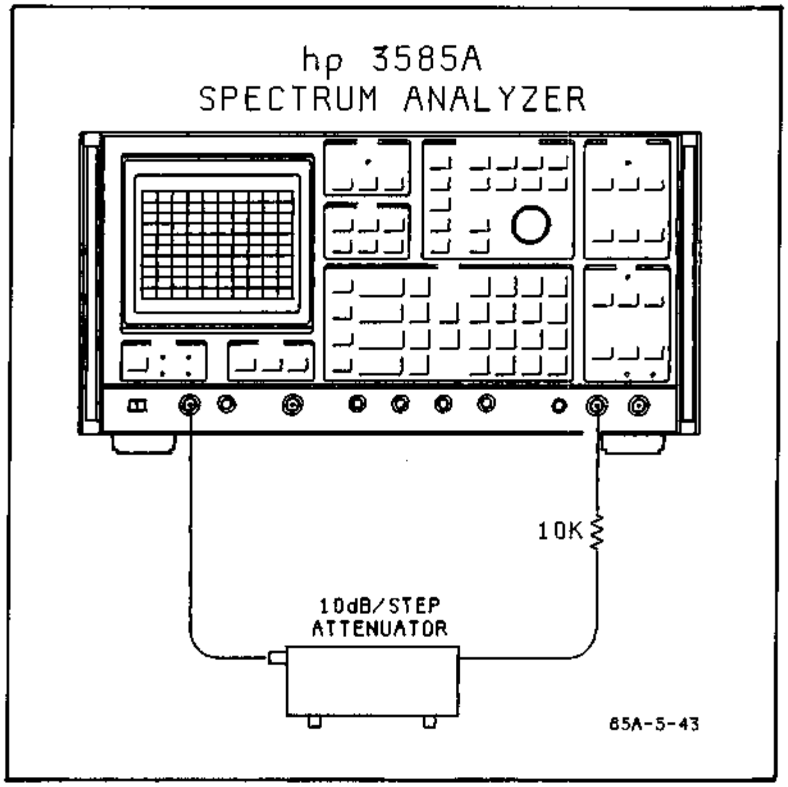

Figure 5-43. 1MΩ Input Capacitance Adjustment Set-Up

c. Set the 3585A controls for:

RANGE .... -25dBm
START FREQUENCY 100Hz
STOP FREQUENCY 1MHz
dB/DIV 1dB

d. Using the Continuous entry Control, adjust the REF LVL so that the trace is centered on the display.

e. Press the STORE A → B key on the 3585A.

f. Set the 3585A for a RANGE of -5dBm.

g. Adjust the attenuator for 20dB.

h. Adjust A1C18 so that the A trace overlaps the B trace as closely as possible (see Figure 5-44).

i. Remove all inputs to the 3585A.

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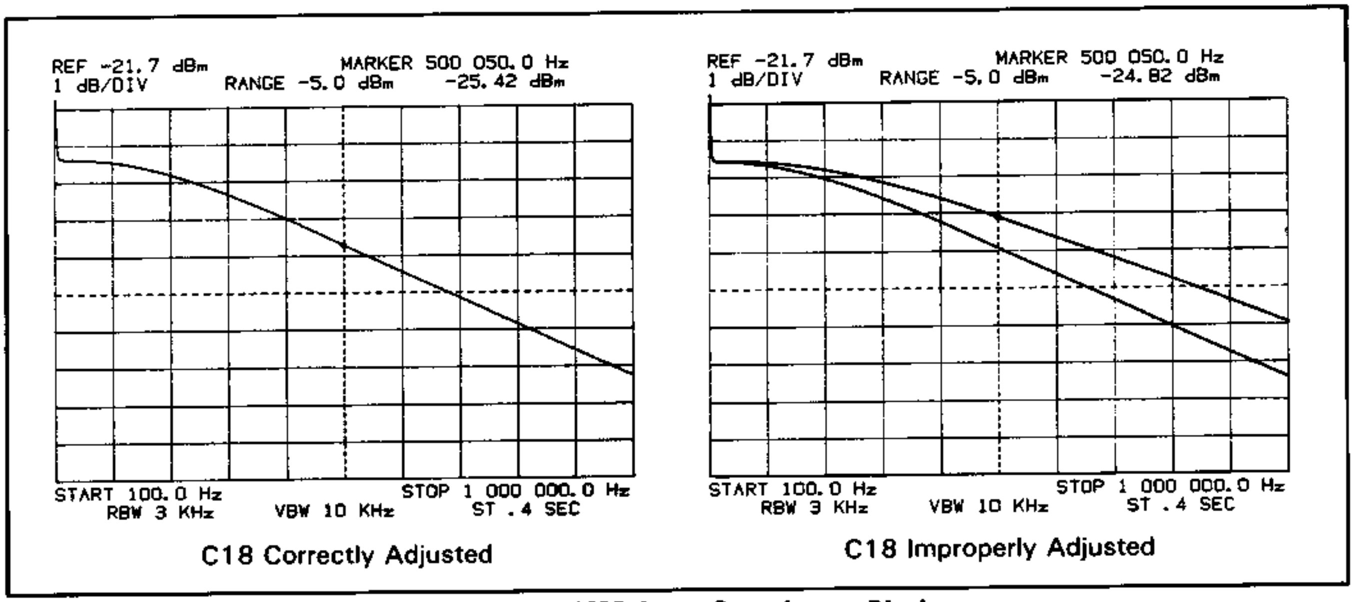

Figure 5-44. 1MΩ Input Capacitance Display

5-44. Local Oscillator Feedthrough Adjustment

a. Enter:

INSTRUMENT PRESET
RANGE 0dBm
MANUAL ENTRY 0Hz

b. Adjust A1R170 for a minimum marker reading (minimum LO feedthrough). Verify that the marker reads ≤ -15dBm.

5-45. Electrical Isolation Test

a. Turn the 3585A power off.

b. Carefully replace the Input/Conversion Section in the 3585A mainframe. Replace and tighten the seven mounting screws.

c. Connect all the *coaxial* cables to the Input/Conversion Section.

d. Before connecting the power supply cable, connect an ohmmeter between the 3585A frame and the screw closest to A1R108.

e. The ohmmeter should read infinite resistance. This indicates that the Input/Conversion Section is properly isolated from dc ground loops. If the ohmmeter shows a shorted condition, check the capacitors on A6a,b,c or d.

f. Remove the ohmmeter.

g. Connect the power supply cable to the Input/Conversion Section.

h. Turn the 3585A power on.

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i. Press INSTRUMENT PRESET and check that the instrument calibrates. If it does not, recheck all cable connections to the Input/Conversion Section.

j. Turn the 3585A power off and replace the bottom cover.

5-46. Tracking Generator Adjustments

a. Connect a Digital Voltmeter to A51TP2.

b. Adjust A52C50 for +4Vdc ±0.5V.

c. Disconnect the Digital Voltmeter.

d. Using a short length of shielded cable, connect the Tracking Generator output to the Terminated (50Ω) input.

e. Set the Tracking Generator Amplitude control fully clockwise to the detent position (0dBm).

f. Enter:

INSTRUMENT PRESET
RANGE 0dBm
dB/DIV 1dB
REFERENCE LEVEL....................... 2dBm

g. Adjust A52C16 for the flattest amplitude response of the Tracking Generator output.

h. Enter:

REFERENCE LEVEL....................... 0dBm
RECALL 4

i. Adjust A52R68 for a marker reading of .00dBm.

j. Disconnect the cable connecting the Tracking Generator to the input. This completes the Tracking Generator Adjustments.

5-47. HP-IB Adjustment

NOTE

Instruments with serial numbers 1750A00976 and greater do not require this adjustment.)

a. Turn the 3585A power off.

b. Remove the HP-IB board (A44, tabs = yellow, yellow) from the card nest.

c. Note the voltage stamped on the Processor (U16), ________Vdc.

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d. Replace the HP-IB board back in the card nest.

e. Turn the 3585A power on.

f. Connect a DVM to A44TP5. Set the DVM for the 20Vdc range.

g. Adjust A44R9 (see Figure 5-46) for the voltage stamped on A44U16 ±0.2V.

h. Disconnect the DVM. This completes the HP-IB Adjustments.

5-48. X-Y Plotter Adjustment

a. Connect a DVM to A62TP1 (REF). Set the DVM to the 20Vdc range.

b. Adjust A62R4 (see Figure 5-46) for a dc voltage reading of −10.24Vdc ±0.02V.

c. Disconnect the DVM. This completes the X-Y Plotter Adjustments.

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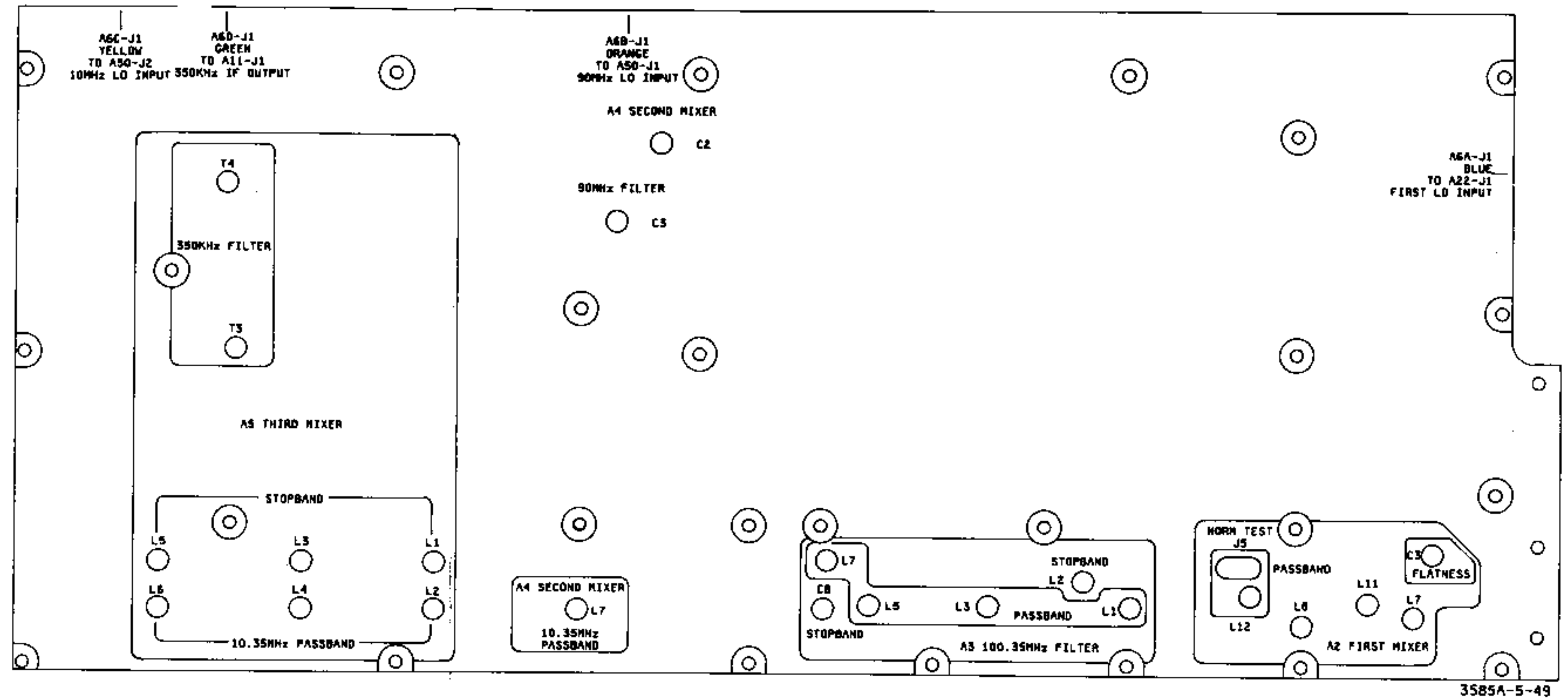
Conversion Side (A2-A5)



Input Side (A1)

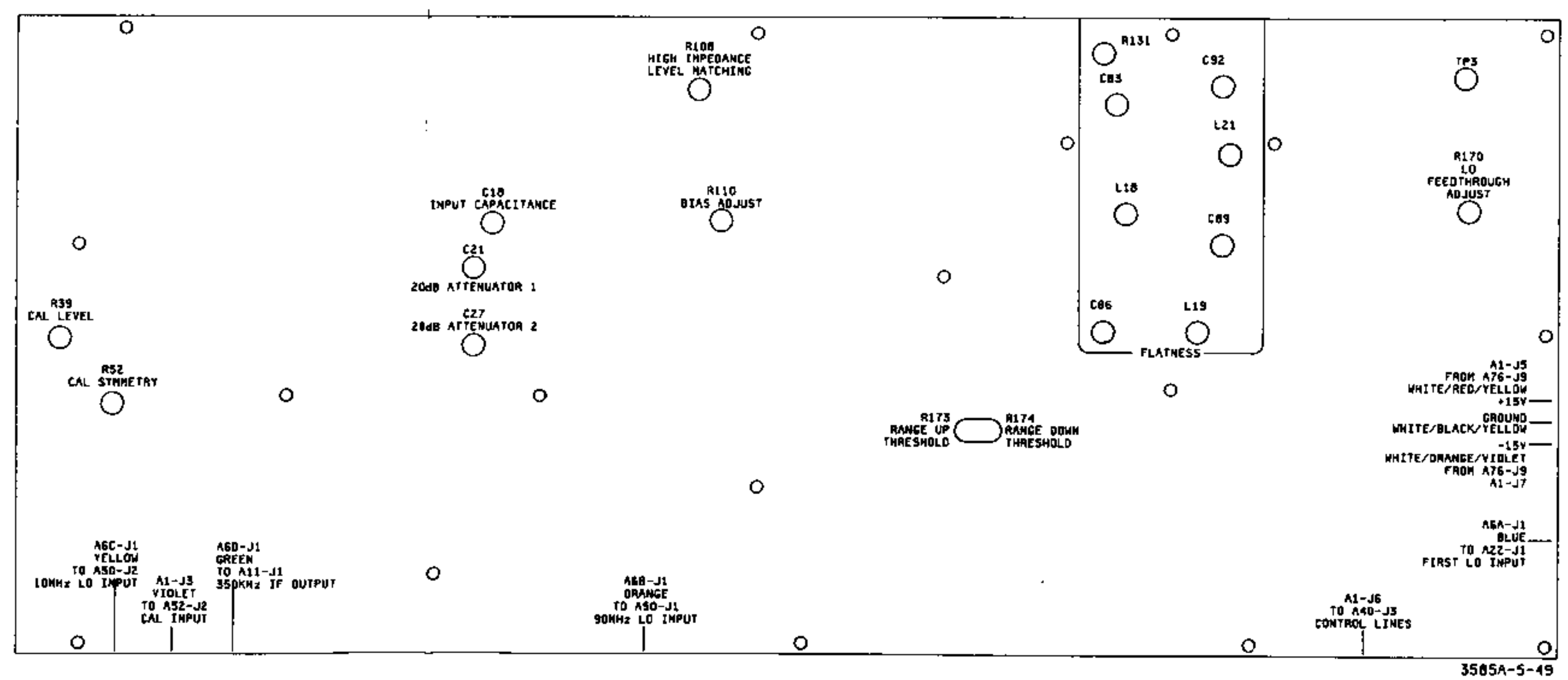


Figure 5-45. Input/Conversion Section Adjustment Locations

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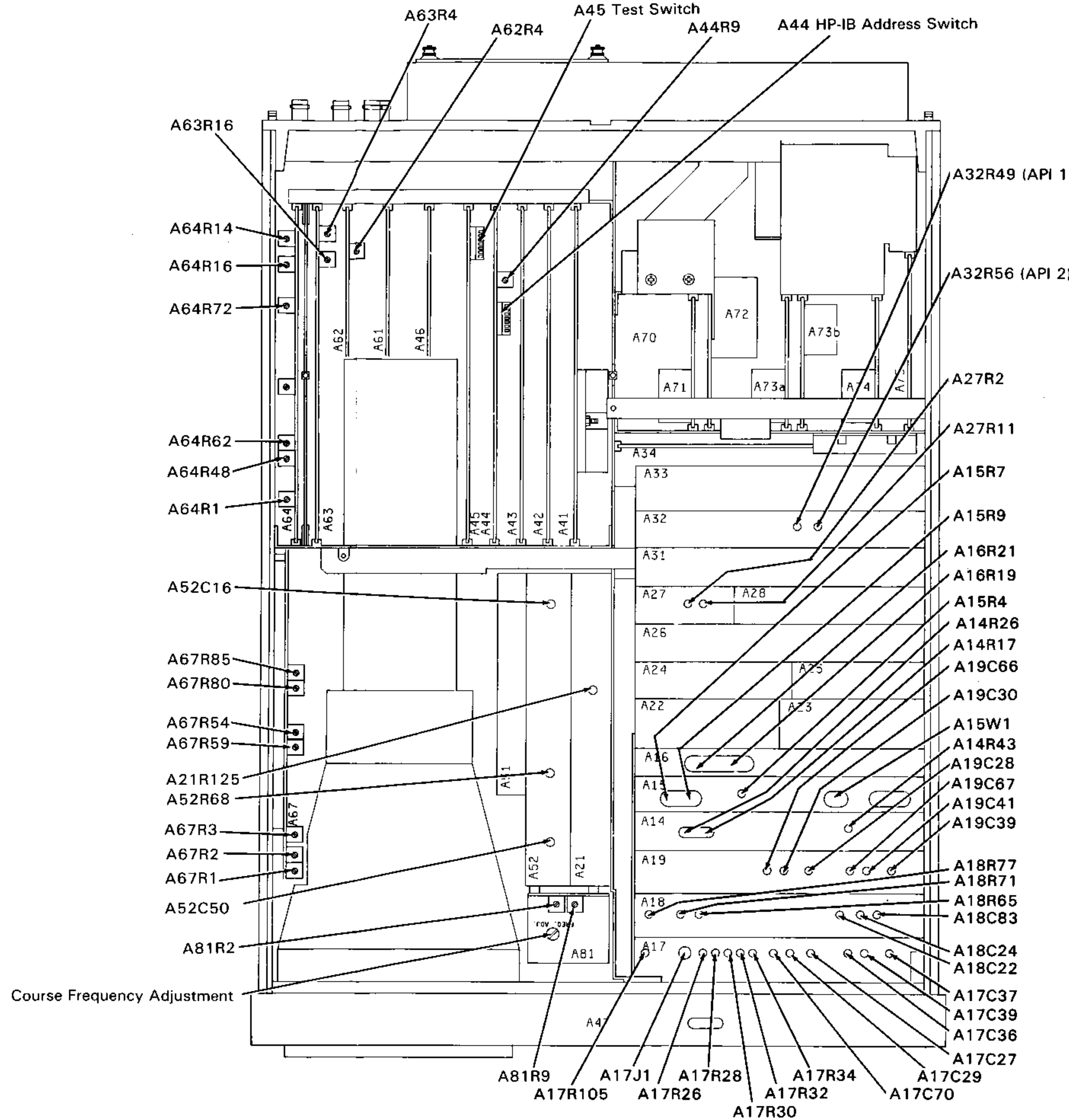

Figure 5-46. Top Of Instrument Adjustment Locations

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SECTION VI
CIRCUIT FUNCTIONAL DESCRIPTIONS

6-1. INTRODUCTION

Fourier showed that any real electrical signal that is periodic may be express as the sum of amplitude-weighted, phase-shifted sinusoids. What this means is that square waves, triangles waves, ramps, and the like are composed of an addition of pure sine waves. Yet looking at a square wave in the time domain yields no apparent clue as to what these spectral components are. A spectrum analyzer is designed to perform this transformation from "time domain" to "frequency domain".

Swept analysis is one way of extracting frequency domain data from a time domain signal. The concept behind swept spectrum analysis is to take a filter with a bandwidth that is small relative to the frequency range of interest and "sweep" the filter across that frequency range. In this way the filter allows you to pick out individual frequency components, or "spectral lines" as they are often called.

In reality, it is more effective to have a stationary intermediate frequency (IF) filter and to sweep the input signal past the filter by mixing the input with a sweeping voltage controlled oscillator. This process is exactly what the -hp- 3585A Spectrum Analyzer does.

6-2. CIRCUITRY OVERVIEW

Figure 6-1 is a circuit functional block diagram of the -hp- 3585A Spectrum Analyzer. Each block shown represents a group of circuity known as a Service Group(SG). Service Groups represent a logical division of the instrument's ciruitry into areas of related operation. This section on Circuit Functional Descriptions, and Volumes Two and Three will be organized around the Service Groups shown in Figure 6-1. Circuit Functional Block Diagram. Figure 6-20. 3585A Detailed Block Diagram contains much more detail and can be found at the end of this manual section.

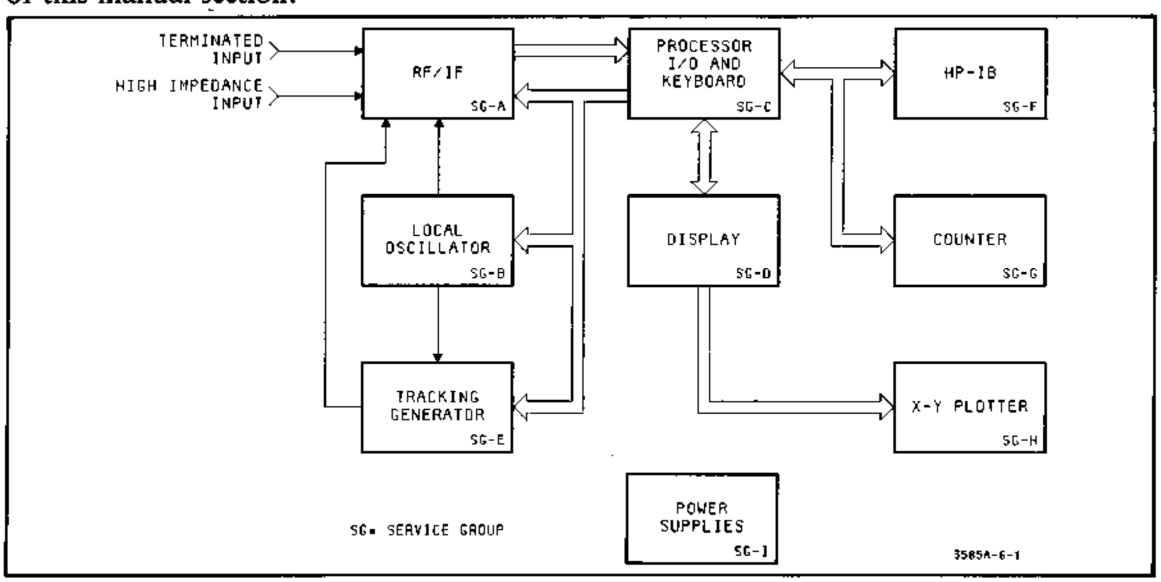

Figure 6-1. Circuit Functional Block Diagram

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6-3. RF/IF (SG-A)

The RF/IF section of the -hp- 3585A allows the instrument to accommodate a wide variety of signal sources and a wide dynamic range of input signals. Input impedances of 50Ω, 75Ω and 1 MΩ are available. The input signal is processed by a series of attenuators and amplifiers so that it comes within the level range required by the instrument.

After the input signal is at the proper level, it is mixed down to a frequency that is at the center of the intermediate frequency filter. This is accomplished through a series of mixers that mix the input signal with a sweeping signal from the Local Oscillator such that the entire frequency range of interest will, piece by piece, be allowed to pass through the intermediate frequency filters and subsequently be detected.

Once the signal is mixed down it goes through the intermediate frequency filters. This series of multiple selective filters allow only a relatively small band of frequencies through, allowing individual frequency components to be measured.

The filtered signal is then compressed by the Log Amplifier so that the wide analog amplitude range of the filtered signal is converted to a more usable logarithmic scale.

To aid in the display of the frequency domain information, a Video Filter is added. This filter basically smooths out the display.

Finally, the completely processed input signal is analog-to-digital (A/D) converted and sent to the processor for processing and subsequent display.

6-4. Local Oscillator (SG-B)

The Local Oscillator section is centered around a very stable 10 MHz temperature controlled crystal oscillator reference and a Fractional N Synthesizer. The synthesizer loop operation is a function of resolution bandwidth as selected from the instrument front panel. Full loop operation will be discussed later in this manual section.

Essentially, the Local Oscillator section produces the sweeping LO signal, and two fixed LO signals used in the mixing process of the RF/IF section of the instrument. Also generated is a reference signal and a sweeping signal used by the Tracking Generator section of the instrument.

6-5. Processor, I/O and Keyboard (SG-C)

This section of the instrument performs all calculations and controlling functions necessary for the operation of the instrument. Included within this section is ROM, RAM, input/ output (I/O) control, keyboard, and the central processor.

The heart of the central processor is a hybrid device used in many desktop computers and larger computer systems. ROM provides a complete operating system to the processor-controlled instrument. RAM is used by the processor as needed, and can also be used to store up to three front panel configurations.

The I/O portion of this section controls all interfacing between the processor and other portions of the instrument. All display functions, keyboard monitoring, RF/IF controlling,

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plotter output functions and local oscillator control is handled through the I/O portion of the processor. Devices that are not controlled via the I/O are ROM, RAM, Counter and HP-IB.

The keyboard is constantly monitored by the processor via the I/O. Pressing a switch on the keyboard generates a priority interrupt to the processor and the keyboard is serviced as required.

6-6. Display (SG-D)

The Display section of the instrument has its own processor and is interfaced to the central processor via the I/O. The display processor controls all display operations as well as display and plotter output functions.

A master clock is generated as part of the Display section. This clock is used by the central processor, HP-IB interface, and the display processor.

6-7. Tracking Generator (SG-E)

The Tracking Generator's primary purpose is to generate a sweeping 0 to 40 MHz signal that tracks the sweeping LO signal. The Tracking Generator output is found on the instrument front panel.

The Tracking Generator section also controls the signal that goes into the calibrator circuitry of the RF/IF section. The signal to the calibrator is either a 10 MHz reference signal or the Tracking Generator output.

6-8. HP-IB (SG-F)

The instrument central processor is interfaced to the "outside world" via the HP-IB section. The HP-IB section has its own processor and is directly connected to the instrument main processor via the IOD bus.

An HP-IB connector is provided at the rear panel of the instrument. This connector is used to connect the instrument to other instruments and controllers which have HP-IB (IEEE 488) capability.

6-9. Counter (SG-G)

The Counter is a 24-bit counter that measures the frequency of the signal that is producing the response on which the marker is positioned. Counter input is from the IF section and the 10 MHz reference. Counter output is via bus to the processor.

6-10. X-Y Plotter (SG-H)

The X-Y Plotter section provides plotter outputs on the rear panel of the instrument. Digital data from the Display section is digital-to-analog (D/A) converted, filtered, and made available at the plotter output connectors.

6-11. Power Supplies (SG-I)

The Power Supply section generates all dc voltages and controls their distribution. The dc voltages generated are +7.7V, +5V, +12V, +18V, and -18V.

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6-12. RF/IF DESCRIPTION (Service Group A)

The RF/IF section is the second largest section in the instrument. It performs signal conditioning on the input signal from the time a signal enters the instrument until it is A/D converted for the processor. This section can be divided into six subsections. They are:

INPUT	LOG AMPLIFIER
CONVERSION	VIDEO FILTER
IF	A/D CONVERTER

Each of these subsections will be discussed in more detail. For the discussions that follow, you should refer to Figure 6-3. RF/IF Block Diagram in this manual section and the schematic drawings found in Service Group A of Volume Two.

6-13. Input (A1)

The Input provides two major signal paths. One is the 50Ω/75Ω terminated input and the other is the 1 MΩ input. Signals entering at the terminated input are monitored by an overload detector. If an overload is detected, an interrupt flag is set high and signals the processor. When the flag line is set high, it also causes a "dummy load" to be switched into the input path to prevent circuitry damage. The impedance switching determines the input termination impedance as selected on the front panel or via HP-IB programming.

Attenuator selection is made in accordance with the range setting. Attenuator control is from the processor via a series of opto-isolators to the relay coils. For example: A Range setting of -25 dBm removes all attenuators from the signal path. A Range setting of -20 dBm attenuates the input signal by 5 dBm.

In the 1 MΩ signal path, the attenuators operate in an identical manor and simultaneously with the 50Ω/75Ω attenuators. The 1 MΩ Buffer provides impedance matching for the 1 MΩ input. This buffer is also used to insure a O Vdc offset on the signal path. This is required because of dc coupling used later on in the circuitry.

Relay K14 selects which signal path is input to the 11 dBm amplifier. The amplifier provides the necessary gain to improve the signal-to-noise characteristics of the instrument. The input signal then passes through a 41 MHz low pass filter and on to the output buffer.

The Autorange Detector monitors the signal level out of the 11 dB amplifier. The detector is a comparitor circuit that compares the input signal to a range up and a range down threshold. The results of this comparison is monitored by the processor and the input attenuators are set such that the largest frequency component is at or very near the top of the display screen.

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6-14. Conversion (A2 thru A5)

The Conversion section of the instrument provides all the mixing required to process the input signal to a frequency of 350 kHz as required by the IF section. The conversion process includes three mixing processes. First the input signal is mixed with a sweeping local oscillator (LO) signal, then two additional times with fixed LO signals.

Mixing begins on the A2 First Mixer board by mixing the 0 to 40 MHz input signal with a local oscillator that sweeps from 100.35 MHz to 140.35 MHz. Prior to entering the ring-diode mixer, the sweeping LO is processed by a limiter to ensure that it is at the proper level required by the mixer. It can be seen that as the LO sweeps from 100.35 MHz to 140.35 Mhz, the entire frequency range of interest (0 to 40 MHz) will at some time be mixed to 100.35 MHz and be allowed through by the 100.35 MHz passband filter. Note that the passband filter is located on both the A2 board and the A3 board.

The A3 100.35 MHz IF Filter board provides filtering and buffering for the first IF frequency. The 79.65 MHz notch filter eliminates any 79.65 MHz signal being generated by the first mixer stage. The buffer provides isolation between the first mixer and subsequent circuits.

The A4 Second Mixer board provides the second phase in the conversion process. The first IF frequency signal is mixed with a limited and filtered 90 MHz LO signal to produce the second IF frequency of 10.35 MHz. Before mixing, the 90 MHz LO signal is filtered to eliminate any 10 MHz sidebands that may exist. The 10.35 MHz second IF frequency is then bandpass filtered before going to the third mixer stage. A 9.65 MHz notch filter eliminates any 9.65 MHz signal being generated by the second mixer stage.

The A5 Third Mixer board provides the final phase of conversion. A 10 MHz LO signal enters the A5 board and is filtered and limited before reaching the final mixer. The 10 MHz LO signal and the 10.35 MHz second IF frequency signal are mixed to get the final IF frequency of 350 kHz. The final IF frequency is bandpass filtered and then goes to the IF section of the instrument.

6-15. IF (A17 thru A19)

The IF section has two primary purposes. The first is to filter the input signal, which is now at 350 kHz, to the desired resolution bandwidth (RBW), and the second is to provide the necessary gain and attenuation for proper leveling of the input signal. This is accomplished using three circuit boards consisting of five filter stages, an input amplifier, and 8 dB amplifier, three 16 dB amplifiers and an attenuator settable in 4 dB steps from O dB to 12 dB.

Due to the wide range of resolution bandwidths (RBW) available, three filter paths are used. They is a straight through path for the 30 kHz RBW; a path containing five LC filter stages for RBWs of 10 kHz, 3 kHz, and 1 kHz; and a path containing five crystal filter stages for RBWs of 300 Hz, 100 Hz, 30 Hz, 10 Hz and 3 Hz.

The input signal, now at 350 kHz, enters that IF section of the instrument at the A17, IF Filter No.1, board. Here the signal goes through an input amplifier with a gain of approximately 2.5 dB. Then a path is chosen depending on the resolution bandwidth (RBW) selected. The voltage to current (V to I) and current to voltage (I to V) converters in the crystal filter path simply convert the input voltage signal to the current signal required by the

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crystal stages, and then back to a voltage signal again. The bandwidths of the crystal filter stages are determined by the loop resistance. For example, in the first crystal stage different combinations of resistance are switched into the circuit to determine the bandwidth. Since the resistance switched into the circuit for a narrow RBW is small, an appreciable amount of signal current is lost through that resistor and does not flow through the crystal (the series R the crystal is about 150Ω). This insertion loss is compensated for by selecting different emitter resistors in the V to I converter in such a way that the correct amount of current is always transferred through the crystal. The signal, after passing through the first two filter stages, is buffered and continues onto the A18, IF Gain, board.

The LC and crystal filter stages on the A18 board are essentially the same as those on the A17 board. After the signal is filtered on the A18 board, it passes through the 8 dB fixed gain amplifier, the step attenuator (0, 4, 8, or 12dB of attenuation) and a series of three 16dB amplifiers (0, 16, 32, or 48dB of amplification). This set of amplifiers and attenuators determine the reference level relative to the range.

To help in understanding the attenuator and amplifier operation on the A18 board, consider the following:

RANGE = REF LVL = input signal = -25 dBm

This condition will result in the signal appearing at the top of the display screen. Looking at the graph in Figure 6-2, you can see that there is 8 dB of attenuation switched into the circuit. This nullifies the gain provided by the 8 dB amplifier. The net result is no gain or attenuation of the signal as it passes through the A18 board. Now change the input signal to -45 dBm. As you can see in the graph, 16 dB of gain and -4 dB of attenuation are switched into the signal path. If you recall the 8 dB fixed gain amplifier, you can see that 20 dB of gain has been provided. Thus the input signal continues to appear at the top of the screen.

Finally, the input signal is buffered and is sent onto the A19, IF FIlter No.2, board for final IF filtering and processing.

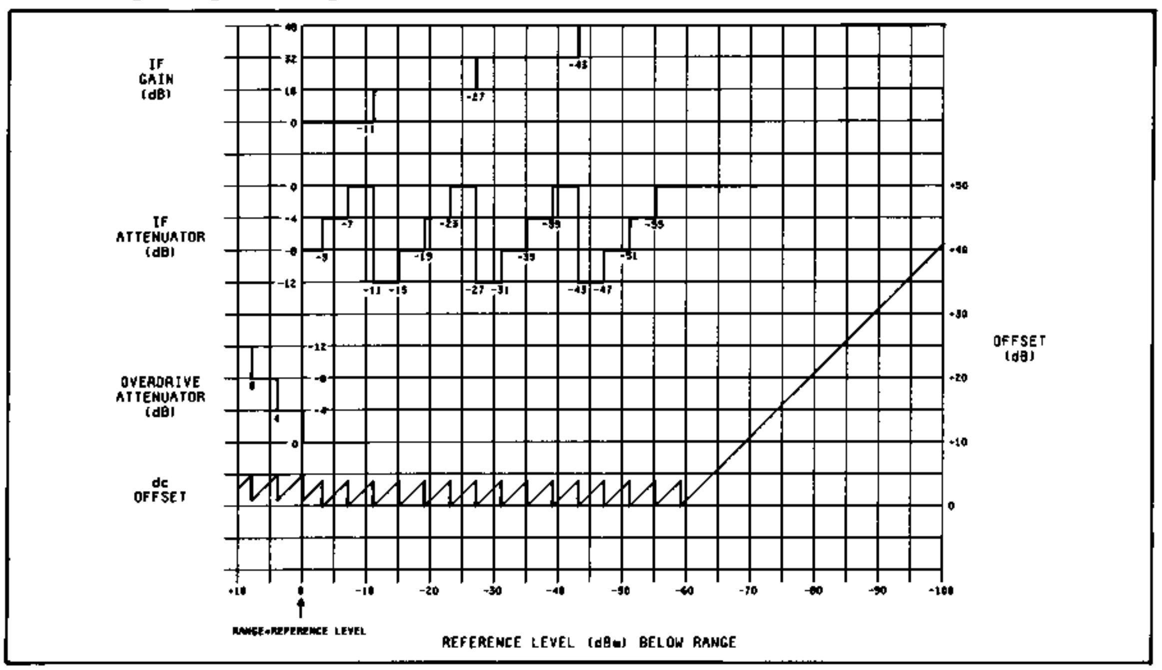

Figure 6-2. IF Gain and Attenuation Graph

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As the input signal enters the A19 IF Filter No. 2 board, it passes through the Overdrive Attenuator. During normal operation this circuitry acts as a unity gain amplifier. An overdrive condition exists when the reference level (REF LVL) is greater than the Range. Since gain was needed when the reference level was greater than the Range, attenuation is needed in the overdrive condition. This attenuation is provided by the Overdrive Attenuator (0, 4, 8, or 12 dB of attenuation is available). After overdrive attenuation the signal enters the Overdrive Limiter so that the amount of overdrive is limited to a fixed limit. The remainder of the A19 board functions like the filter stages of the A17 board.

6-16. Log Amplifier (A14)

The A14, Log Amplifier, board's primary function is to convert the linear IF signal to a log signal. The signal input level to the log amplifier is critical; therefore, as the IF signal enters the A14 board, it passes through a variable gain amplifier. This amplifier is adjusted to provide the signal level required by the log amplifier. After amplification, the signal passes through a 350 kHz bandpass filter (30 kHz RBW filter) before entering the log amplifier. Once the linear signal is converted to a log signal, it passes through a 600 kHz low pass filter (LPF) to rid it of any harmonic content. Finally, there is an averaging detector which actually rectifies the log signal and capacitively stores it. The output of the log amplifier is a rectified log version of the input signal.

The linear IF signal after passband filtering goes to the IF Output on the rear panel of the instrument, and the ac log signal goes to the A46, Counter, board.

6-17. Video Filter (A15)

The A15, Video Filter, board performs three functions: adds required dc offset, provides video filtering, and generates dB/DIV amplification as needed.

Before discussing the circuitry of this board, an explanation of dc offset is needed. If you will recall, the gain and attenuation stages in the IF Section provided only a 4 dB resolution in input signal processing. The instrument, however, is capable of reference level resolution to tenths of a dB. The dc offset gives this additional resolution. For example, consider a reference level of -25 dBm and an input of -26 dBm. Now change the reference level to -26 dBm. Somehow the signal has now got to appear at the top of the screen. What happens is that 1 dB of gain is programmed into the dc offset D/A converter and is presented to the summing amplifier to be added to the signal coming from the A14 board. The various amounts of dc offset are illustrated by the bottom plot of the graph in Figure 6-2.

The input signal comes into the Video Amplifier board from the A14 Log Amplifier. This signal is then summed with the required dc offset. The output of the summing amplifier is 5 volts for a full scale input and varies 50 mV/dB. Thus a signal that is 100 dB down from full scale would yield 0 volts at TP3 using a 10 dB/DIV front panel setting.

The signal then goes through the video filter. This filter is a single pole RC network with different resistance and capacitance switched into the circuit for the different video bandwidths (VBW). Finally the signal goes through the dB/DIV amplifier that provides the gain corresponding to the display scale selected. A Video Output to the back panel of the instrument is also made available.

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6-18. A/D Converter (A16)

The signal enters the A16, A/D Converter, board and is peak detected. Basically, this detector allows the peak holding capacitor to be charged up through a diode. Should the input signal decrease during the sample period, the diode does not allow the capacitor to discharge, thus the peak is retained and passed on to the sample and hold circuit. The output of the sample and hold circuit is amplified and then passed on to the A/D converter.

The A/D converter uses a successive approximation technique for the conversion. The output of the A/D converter is a 10-bit approximation of the input analog signal to the A/D converter. The digital data goes to the A45, I/O, board and from there to the instrument central processor.

Each A/D conversion cycle begins when the IADC (initiate A/D conversion) line goes low. Each conversion cycle takes approximately 200 usec. The cycle begins by allowing the peak detector to sample the input signal. This peak value is then read by the sample and hold circuit. The peak detector is then reset to prepare for the next peak. The voltage held by the sample and hold circuit is amplified and sent to the A/D converter for conversion.

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Circuit Board Designator
To
Schematic Drawing Number
CROSS REFERENCE

Circuit Board Designator	Schematic Drawing Number*
A1	A-1a, A-1b
A2	A-2
A3	A-2
A4	A-2
A5	A-2
A14	A-4
A15	A-5
A16	A-6
A17	A-3a
A18	A-3b
A19	A-3c

*See Volume Two for schematic drawings.

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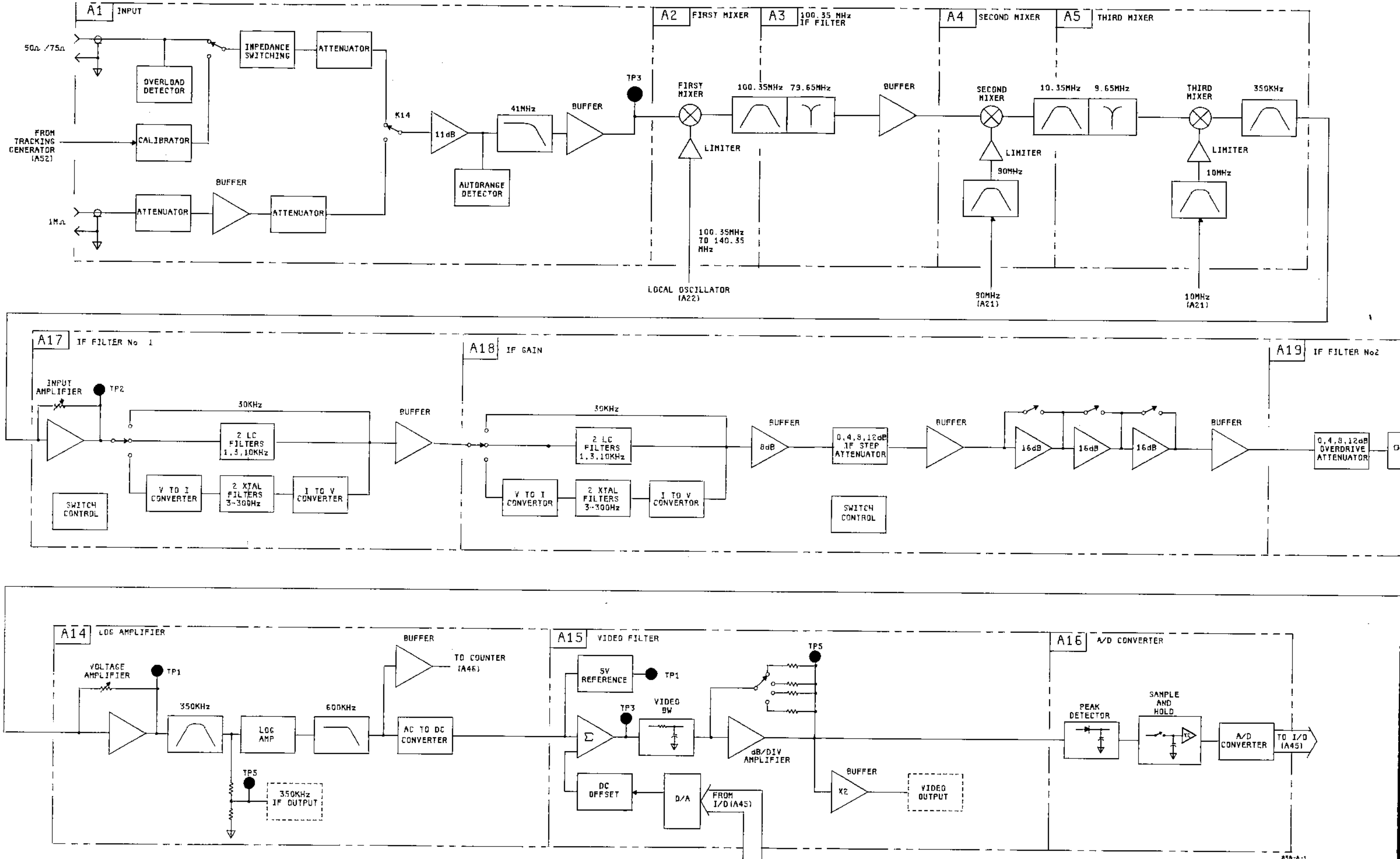

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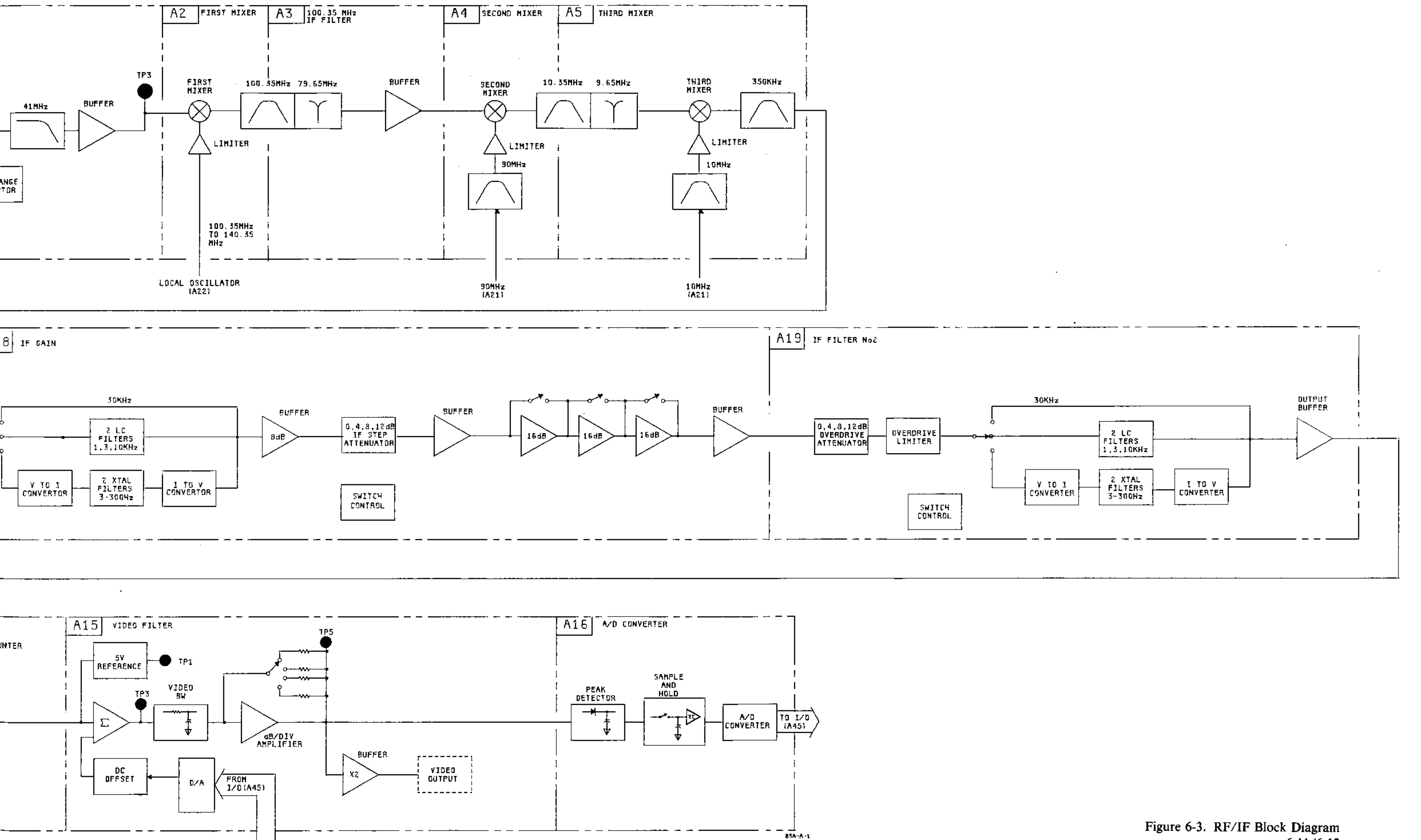

Figure 6-3. RF/IF Block Diagram

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6-19. LOCAL OSCILLATOR DESCRIPTION (Service Group B)

The Local Oscillator section is the largest single operating section within the instrument. It provides all fixed reference signals used for mixing in the IF conversion section and for clocks in other portions of the instrument. It also provides sweeping signals for the Tracking Generator and for mixing in the IF conversion section. This section is divided into five subsections. They are:

REFERENCE	FRACTIONAL N LOOP
SUM LOOP	LO CONTROL
STEP LOOP	

Each of these subsections will be discussed in more detail. For the discussions that follow, you should refer to Figure 6-12. Local Oscillator Block Diagram in this manual section and the schematic drawings found in Service Group B of Volume Two.

There are two modes of operation for the local oscillator. The actual mode of operation is dependent on the selected resolution bandwidth (RBW). For resolution bandwidths of 10 kHz and 30 kHz, the local oscillator operates in the single loop (SL) mode. For all other resolution bandwidths, the local oscillator operates in the multiple loop (ML) mode. The reason for this is that there is more noise on the LO signal in the single loop mode and while this is allowable for the large resolution bandwidths, it is too much noise for the smaller resolution bandwidths. The multiple loop is constructed such that the local oscillator noise is minimal.

Before discussing each subsection of the local oscillator, let's examine the LO section as a whole. Since the local oscillator is based on phase lock loop (PLL) operation, a short review of PLL will be given first. Figure 6-4. Basic PLL shows the traditional PLL configuration. The voltage controlled oscillator (VCO) output is compared with a reference frequency by using a phase detector. The phase detector generates an output pulse proportional to the the phase difference between the reference frequency and the VCO frequency. This output pulse is low pass filtered and integrated to become the dc correction voltage for the VCO.

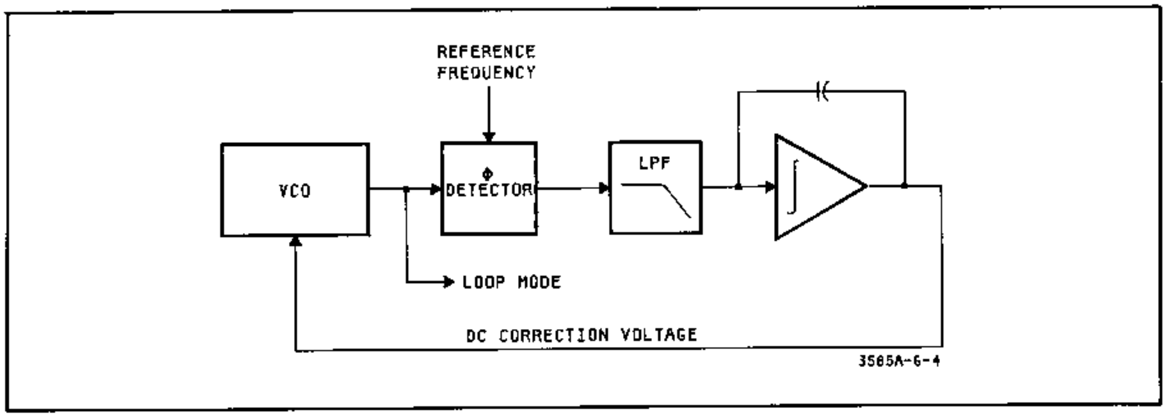

Figure 6-4. Basic PLL

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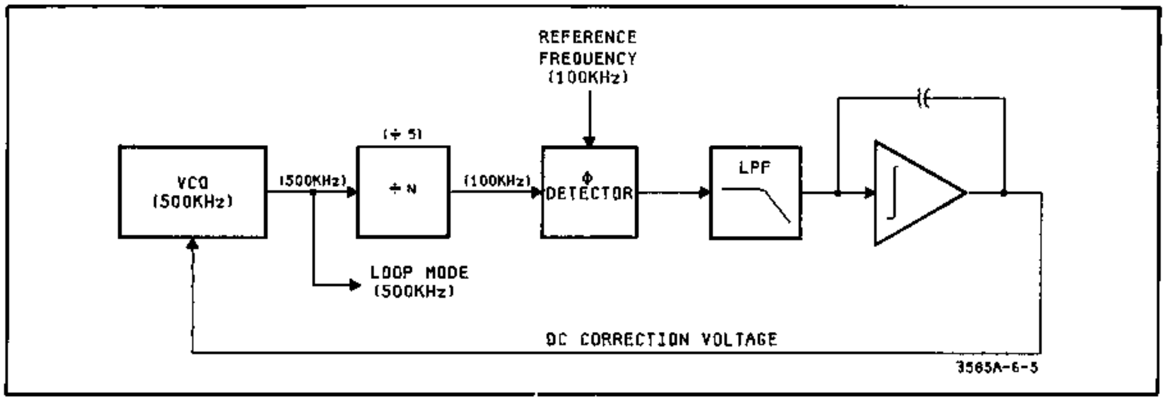

Figure 6-5. ÷N PLL

In order to generate different frequencies from a single loop, a divide by N (÷N) stage is inserted at the input to the phase detector. See Figure 6-5. ÷N PLL. By programming N properly, one can generate various frequencies from the VCO. For example: If the reference frequency is 100 kHz and you want the VCO to run at 500 kHz, a ÷5 circuit is added just before the phase detector to produce a 100 kHz input signal to the phase detector. With both inputs to the phase detector at 100 kHz, the dc correction voltage will remain stable and therefore the VCO output will remain fixed at 500 kHz.

Fractional N (FRAC N) is an extension of this ÷N Phase Lock Loop concept and will be developed more fully later. For now, think of FRAC N as a high resolution ÷N PLL.

With these concepts in mind, let's examine the block diagrams of the two operating modes of the local oscillator. Single loop operation of the LO is shown in Figure 6-6. Single Loop Block Diagram. As you can see, it is fairly simple and conforms to the basic ÷N type phase lock loop. Again, this simple loop is capable of generating all the necessary frequencies but the output is too noisy to be used with the small resolution bandwidths.

Multiple Loop is slightly more complex and will be presented in two forms. Figure 6-7. Multiple Loop Block Diagram (basic) shows that multiple loop operation is actually three interacting PLL's. Using the numbers in parentheses as a guide, a discussion of the multiple loop operation, assuming a local oscillator output of 100 Mhz, will be given.

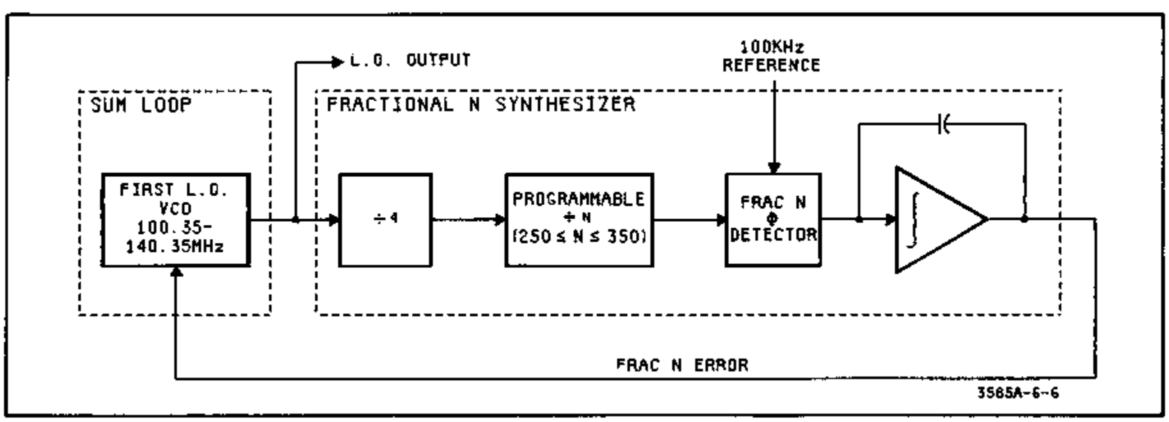

Figure 6-6. Single Loop Block Diagram

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The main phase detector in this circuit will only compare frequencies of 1.75 MHz to 3.00 MHz, so a Step Loop frequency is mixed with the LO output to bring it down into the proper range for the phase detector. For our example, the Step Loop frequency is 98 MHz so the mixer output is 2 MHz. The Fractional N Loop, while operating in multiple loop, will generate a variable reference frequency with a range of 1.75 MHz to 3.00 MHz (after being divided by 20). The phase detector then compares the phases of the two 2 MHz inputs and outputs a voltage proportional to any difference that may exist in their frequencies. This dc correction voltage is summed with the dc correction voltage from the Step Loop (since the 98 MHz from the Step Loop had been subtracted from the 100 MHz LO frequency) and with the Fractional N Loop error voltage (this is normally zero but will correct for an unsettled Fractional N VCO output) to form the dc tuning voltage to control the First LO VCO.

Figure 6-8. Multiple Loop Block Diagram (detailed) shows all the loops involved in greater detail. The three PLL's shown in the two figures comprise three of the groups into which we will split the local oscillator: Sum Loop, Step Loop and Fractional N Loop. The discussions that follow will be concerned with the three individual loops rather than the entire local oscillator. It is suggested that you review the basic block diagrams once again to make certain that you understand how the blocks fit together.

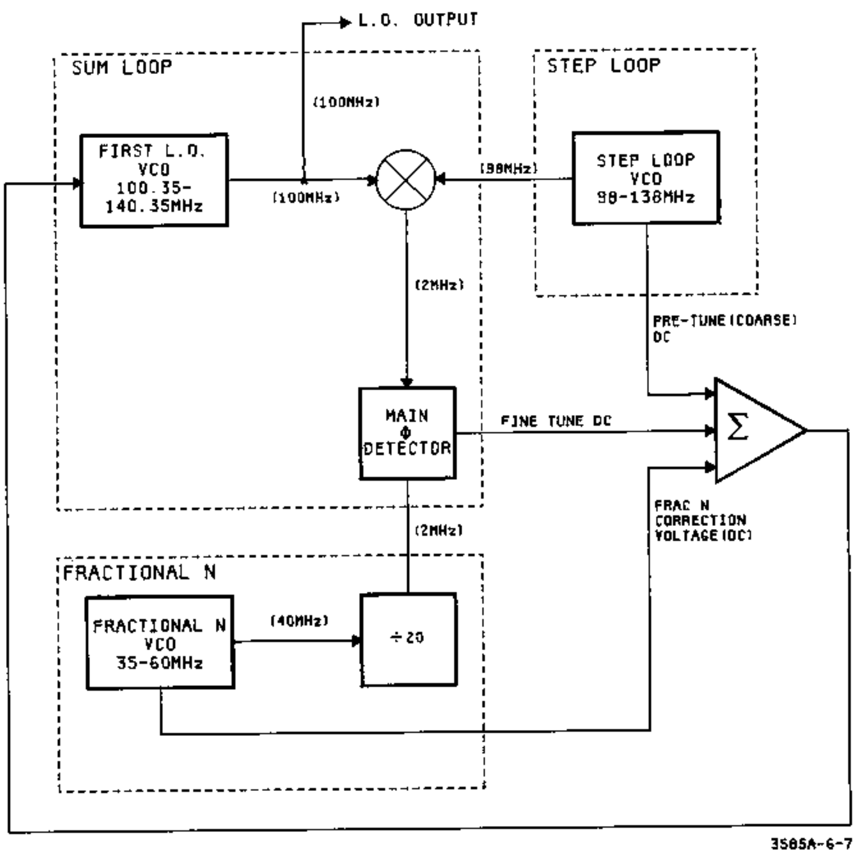

Figure 6-7. Multiple Loop Block Diagram (basic)

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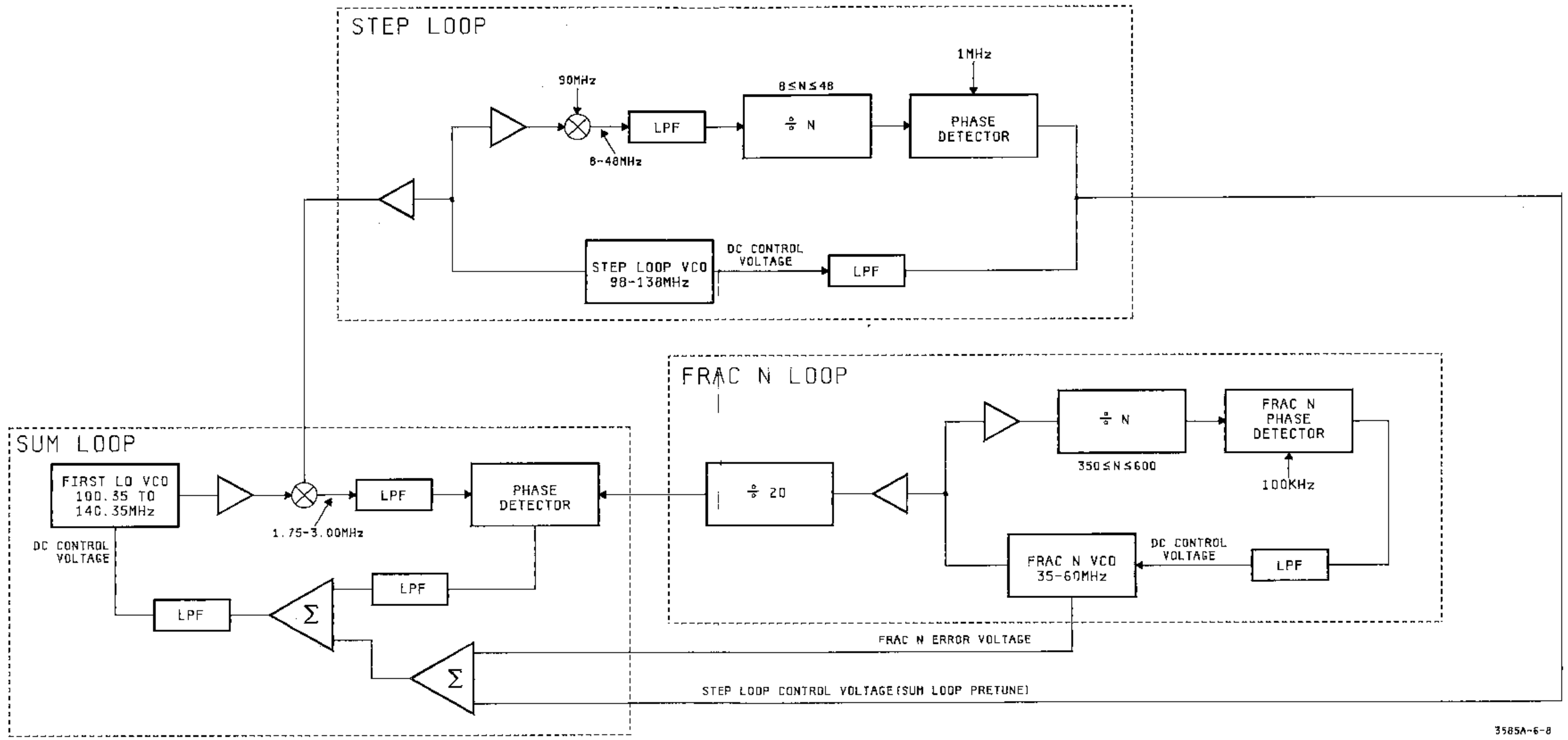

Figure 6-8. Multiple Loop Block Diagram (detailed)

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6-20. Reference Section (A21 and A81)

The A81 boad is simply an oven oscillator that produces a stable 10 MHz reference for use internal to the instrument. The main part of this circuit is the oven oscillator. The oscillator output is controlled by a "switch" that, when properly adjusted, allows time for the oven to heat up before allowing the 10 MHz signal off the board. When the instrument is first turned on, the heater in the oven oscillator draws a very high current from the 15V1 source, pulling its voltage to something below 15 volts. A comparator circuit then switches the 10 MHz output off. When the heater reaches proper operating temperature, it draws less current thus allowing the comparator to close the switch.

It was stated eariler that the local oscillator section contains three PLL's. In fact, a fourth PLL exist in the Reference Section on the A21 board. The basis of this board is a simple PLL with a fixed ÷9. The VCO is a 90 MHz crystal oscillator. Its output is divided by nine and then fed into a phase detector where it is compared with an external 10 MHz signal, which usually comes from the A81 via a connector on the rear panel. The remaining circuitry on this board is gating and level adjustment circuitry used to achieve the signals required elsewhere in the instrument. There is also a ÷100 to get a 100 kHz output.

6-21. Sum Loop (A22, A24, A25, A27 and A28)

The Sum Loop provides the local oscillator output frequency of 100.35 to 140.35 MHz by bringing together all three loops involved in mulitple loop operation. Thus the name, Sum Loop. You should note that the Sum Loop is not operational during single loop operation, with the exception of the A22 board which is the first LO VCO during single loop operation.

A22 begins with an oscillator whose frequency is determined by the First LO VTO Tune In. This tuning voltage determines the value of the vari-caps, which in turn determine the frequency of the oscillation. The oscillator output then goes through a gain amplifier (approximately 7 dB) and through two buffers. One output then goes to the Input Section (A1) and the other goes to the next board in the Sum Loop, A24, First LO Buffer.

A24 is the First LO Buffer and its purpose is to buffer the LO signal and split it into three outputs. One buffered output (top buffer on the schematic) goes to the ÷4 circuit on A31 of the Fractional N Loop. Notice that this buffered output can be switched on for single loop and off for multiple loop. The other two buffered outputs are always on. One of them provides a signal for the Tracking Generator (A52) and the other for the next board in the Sum Loop, A25, Sum Loop Mixer.

The A25, Sum Loop Mixer, board receives the 100.35 to 140.35 MHz LO signal from the A24 board and the 98 to 138 MHz Step Loop signal as inputs. It buffers each input signal and them mixes them to get a 1.75 to 3.00 MHz result. It then runs the resultant signal through a low pass filter and gain amplifier before it sends it on to the next board in the Sum Loop, A28, Sum Loop Phase Detector.

The A28, Sum Loop Phase Detector, board receives the 1.75 to 3.00 MHz signal from the A25 board and the 1.75 to 3.00 MHz signal from the Fractional N Loop as inputs. The input from the A25 board is squared up in the shaper. The two inputs are then compared in a phase detector whose output is a pulse with a width proportional to the difference in phase between the two inputs. This pulse train then goes through a low pass filter and a buffer/limiter to the next and last board in the Sum Loop, A27, First LO VTO Control.

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A28 also has a lock detector circuit which checks the tuning voltage to see that it falls within ±0.27 volts. A tuning voltage outside of this range indicates an unlocked condition in the Sum Loop. Finally, the (H)SLSCN signal (Single Loop Scan, high for single loop (SL) and low for multiple loop (ML)) is converted from SL = +3.8V and ML = 0V to SL = -15V and ML = +14V for mode switch control.

The A27, First LO VTO Control, board is where all of the tuning voltages from the various loops are summed together in order to generate a single tuning voltage for the First LO VCO. When in single loop, the tuning voltage is determined by the Fractional N Loop error tuning voltage alone. The Step and Sum Loops are not involved as such. In this case (SL), the Fractional N Loop error voltage enters the board, passes through a buffer , some scaling and a unity gain amplifier. In single loop, Q8 acts as a closed switch (whereas Q7 is open) and allows the tuning voltage to pass to the VTO (A22) of the Sum Loop.

In multiple loop, Q7 is closed and Q8 is open. The Sum Loop Pretune (which is the tuning voltage from the Step Loop) and a scaled down Fractional N Error voltage are summed together and filtered to smooth the result and rid it of its high frequency components. The filtered result is then summed with the Sum Loop Error voltage from A28. Q7 allows this final result to pass on to the First LO VTO (A22).

6-22. Step Loop (A23 and A26)

The Step Loop provides a signal from 98 to 138 MHz in 1 MHz steps. It is based on a simple ÷N PLL and much of it is very similar to what we have already seen. In fact, A23 is almost identical to the A22 board in the Sum Loop. The only difference is some biasing. A23 is an oscillator, gain amplifier, and a pair of buffered outputs. One output goes to the Sum Loop and the other goes to the next board in the Step Loop, A26, Step Phase Detector.

The A26, Step/Phase Detector, board has three inputs. One is from the A23 board (98 to 138 MHz), a second from the A21 Reference board (90 MHz). These two inputs are buffered, then mixed to get a resultant output frequency from 8 to 48 MHz. This signal is then low pass filtered to rid it of its high frequency components and is shaped to get more of a square wave. This square wave then enters a programmable ÷N counter. N is an integer from 8 to 48 and is programmed to always yield an output of 1 MHz. This 1 MHz signal is then phase-compared with the third input to this board. The third input signal is a 10 MHz reference, from the A21 board, that has gone through a ÷10 counter to yield 1 MHz.

The phase detector outputs a pulse whose width is determined by the difference in phase of the two input signals. This pulse then enters an integrator and sample and hold circuit. The output from the sample and hold circuit is buffered, exits the board and feeds back to A23 to tune the Step Loop VCO. Another output goes to the Sum Loop A27 board where it becomes part of the tuning voltage for the First LO VTO on the A22 board. That same output is also checked by a comparator to make sure that the tune voltage is not too high or low, indicating an unlocked situation.

6-23. Fractional N Loop (A31, A32 and A33)

Fractional N technology gives the -hp- 3585A the additional frequency accuracy that ÷N does not give. Before going into the implementation of Fractional N in the -hp- 3585A, we will briefly discuss the concept of fractional N synthesis. We will begin with our basic ÷N PLL. See Figure 6-9. Standard Phase Lock Loop.

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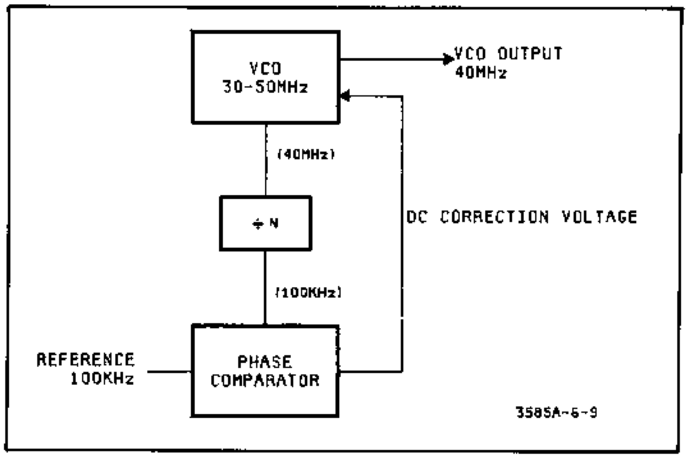

Figure 6-9. Standard Phase Lock Loop

The frequency of the VCO is controlled by the dc correction voltage out of the phase detector. In this example, the phase detector "sees" no difference in the phase of the inputs, thus the dc correction voltage has no effect on the VCO frequency. To change the frequency, the N need only be changed. If it were set to 500, the phase detector input would change to 80 kHz. Compared to the 100 kHz reference frequency, this shows a constantly changing phase. The dc correction voltage output of the phase detector will change, which will vary the VCO frequency in the proper direction. It will "lock in" at a frequency of 50 kHz which divided by 500 leaves 100 kHz at the phase detector input.

Figure 6-10 shows a PLL with a sample and hold circuit added. The circuit operation is as follows:

1. The phase detector/comparator output is a current source which charges up the integrator's capacitor for a specific amount of time

2. The sample/hold switch transfers the integrator voltage to the sample/hold circuit.

3. This voltage is stored on the sample/hold capacitor and it is amplified and used for the dc correction voltage.

4. The bias current source is then turned on to discharge the integrator because the voltage would continue to build up.

5. The cycle then repeats itself.

Suppose we desire a frequency which requires a ÷N more than three digits. An output frequency of 40.04 MHz would require a divide by N of 400.4. This is referred to as divide by N fractional. The existing circuit would not allow the fractional part. The pulse remove command and Analog Phase Interpolator (API) control are required to accomplish the desired divide by N fractional. See Figure 6-11. Fractional N Phase Lock Loop.

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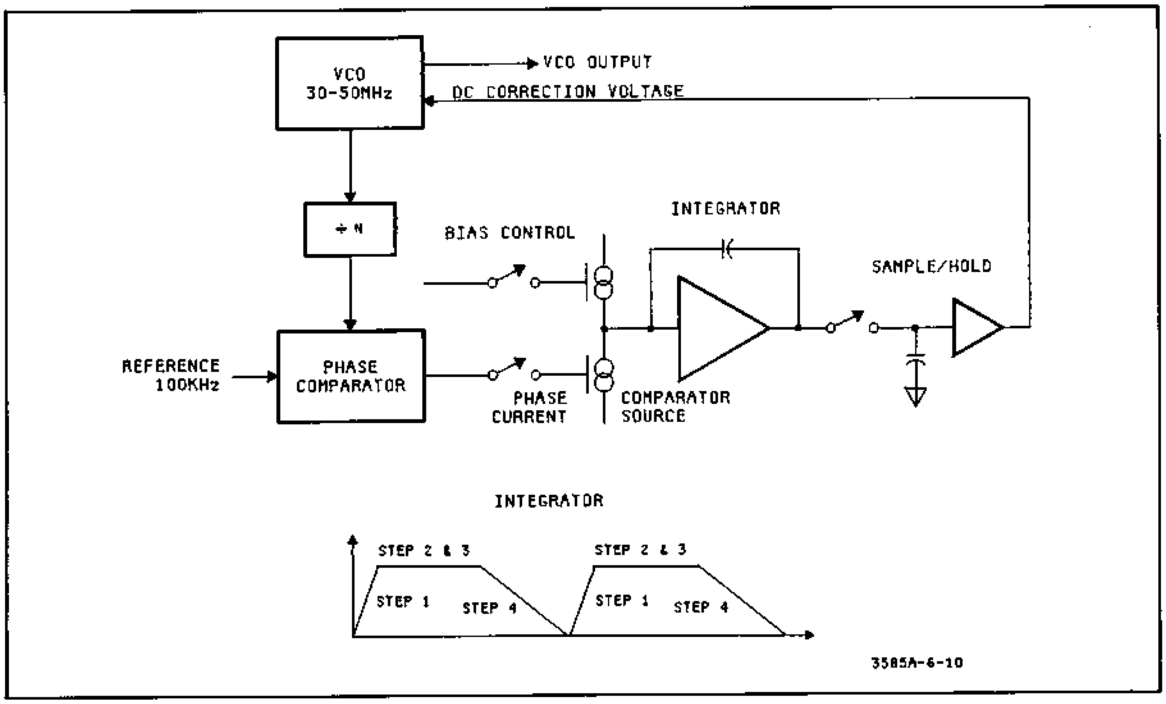

Figure 6-10. PLL With Sample/Hold

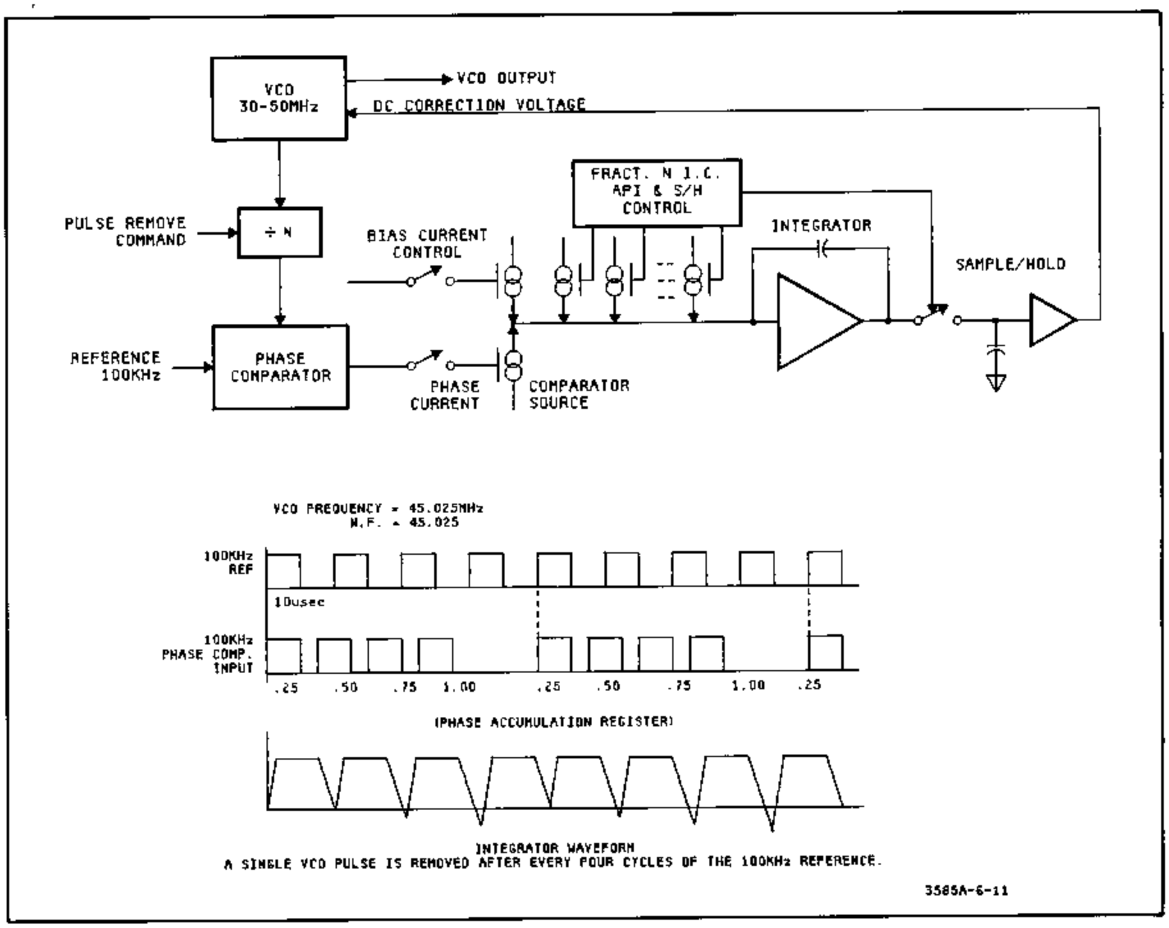

Figure 6-11. Fractional N Phase Lock Loop

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To understand the pulse removal portion of Fractional N, the ÷N block must first be fully understood. To divide the VCO frequency by an integer number (N = 400 for example), the VCO will set to 40 MHz. An output of 100 kHz from the ÷N block is desired. When N is chosen as 400, a counter is set to count to 400. The counter's input is the VCO frequency. Its output will be a pulse which occurs once for each 400 input pulses. The frequency has then been divided by that integer.

If fractional N is desired, the counter which effectively divides the VCO frequency will have a changing value. For example, let the output frequency be 40.04 MHz. To get a phase detector input of 100 kHz, the effective N is 40.04 MHz divide by 100 kHz or 400.4. To accomplish dividing by 400.4, the counter is first set to ÷400 for 60% of the time and it will ÷401 for 40% of the time. The ÷401 is referred to as pulse removal since the counter has to receive one more VCO cycle before it outputs a pulse.

The pulse removal command is controlled by the phase accumulation register. This register contains the total fractional part which has been accumulated at any given time. An example will show how the frational part of N is added to the register and the overflow is used to control the pulse remove command.

Example: Let the output frequency equal 40.04 MHz and the phase detector input is 100 kHz; therefore, the ÷N fractional must be 40.04 MHz divided by 100 kHz or 400.4.

Phase Accumulation Register:

	.0000	initially set to zero
+	.4000	
	.4000	first cycle (10 usec)
+	.4000	
	.8000	second cycle (20 usec)
+	.4000	
	1.2000	third cycle (30 usec) a pulse remove is initiated because of the carry
+	.4000	digit
	.6000	fourth cycle (40 usec) no pulse remove because no carry was initiated
+	.4000	
	1.0000	fifth cycle - pulse remove is generated because of the carry
+	.4000	
	.4000	cycles repeat

To get an overall idea of how Fractional N is implemented in the -hp- 3585A, look at the Fractional N Loop portion of Figure 6-12. Local Oscillator Block Diagram. Circuit boards will be discussed in the order appearing in the block diagram: A33, A32 and A31. (Refering to the applicable board schematic may be helpful in understanding circuit operation.)

The A33, Divide By N Counter, board contains the Fractional N Control chip through which the API's and counters are programmed. This chip and its associated circuitry also generate many clocks and control logic signals. For the most part, the remaining circuitry on the board is a programmable ÷N counter. U4 and U5 are a ÷2 (or ÷3 during pulse swallow), U12 and U13 are a ÷N where N = 1 to 5, and U14 and U15 are both programmable ÷10. Together they form a ÷N circuit where N = 250 to 600. This divided-down

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pulse train becomes the Cycle Start (CS) signal that enters the Frac N chip. U6 and U7 take the input signal after it has been divided by 2 or 3 and divides it by 5 to form the Chip Clock (CC) for the Frac N chip. U2B and U3 are to ensure synchronization of the pulse train that will go to the phase detector. Since the accuracy of the entire section is based on measuring the phase difference between this pulse train and the 100 kHz reference, it is crucial that the timing of this pulse be tightly controlled. A latch clock is also generated for the API hex latch on A32.

The A32, Analog, board begins with a phase detector whose output is determined by the phase difference between the signal from A33 and a 100 kHz reference from A21. This pulsed output charges C9 of the integrator. Q32 and Q34 act as sample switches, transferring the voltage on C9 first to C13 and then to C14 and through a unity gain buffer to A31 as the dc tuning voltage. Two FET switches are used to reduce spurs due to a single switch acting as a capacitor.

The remainder of the A32 board is the bias and API circuitry. The duration of the individual API's is programmed by the Frac N chip and is latched onto the board by U1. API1 is 1/100 of the phase detect current. Each successive API is 1/10 of the preceding one. The bias and API currents are summed and form the current that discharges C9 in the integrator, readying it for the next phase detector current pulse. The rest of this board is timing and switching for the various currents and the sample/hold.

The Frac N VTO tune voltage from A32 enters A31 and is buffered (gain = 1.5) and then low pass filtered. From this point the Frac N Error voltage goes to the Sum Loop (A27). In the multiple loop mode, this voltage also tunes the 35-60 MHz VTO on the A31 board, which is then buffered and goes back to the A33 board to close the loop. The 35-60 MHz signal is also ÷ 20 to achieve the 1.75-3.00 MHz signal necessary as a reference on the A28 board. Notice that in single loop, the 100-140 MHz signal from A24 enters A31 and is divided by four to attain the 25-35 MHz used to close the loop when in single loop.

6-24. LO Control (A34)

This board controls the LO and, therefore, the sweep. LODA lines 0 thru 4 enter the board and are directed, via gates and flip-flops, to the trigger circuitry, the fractional N section, the Step Loop and/or the A/D.

This board contains the trigger circuitry, with a choice of external or line (60 Hz) trigger. Unlock indications from the various loops all enter this board and light LED's to indicate an unlock situation. These are also OR'ed together to signal an "LO Unlocked" on the display.

This board also contains a voltage regulator and additional circuitry for providing power supplies to other boards. Finally, a 200 usec clock is generated for signaling A/D conversions.

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Circuit Board Designator
To
Schematic Drawing Number
CROSS REFERENCE

Circuit Board Designator	Schematic Drawing Number*
A21	B-1a
A22	B-2a
A23	B-3a
A24	B-2b
A25	B-2c
A26	B-3b
A27	B-2d
A28	B-2e
A31	B-4a
A32	B-4b
A33	B-4c
A34	B-5
A81	B-16

*See Volume Two for schematic drawings.

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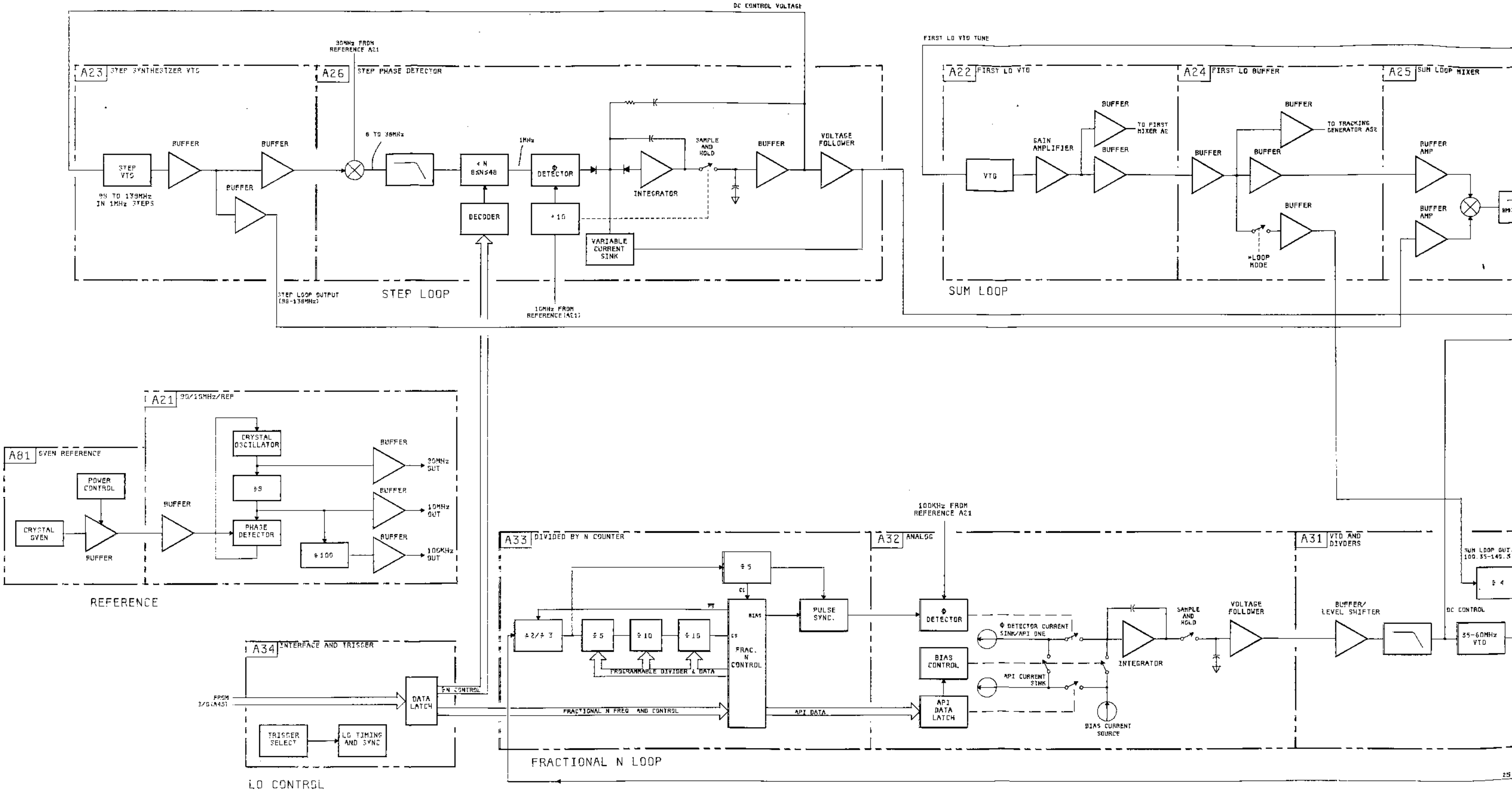

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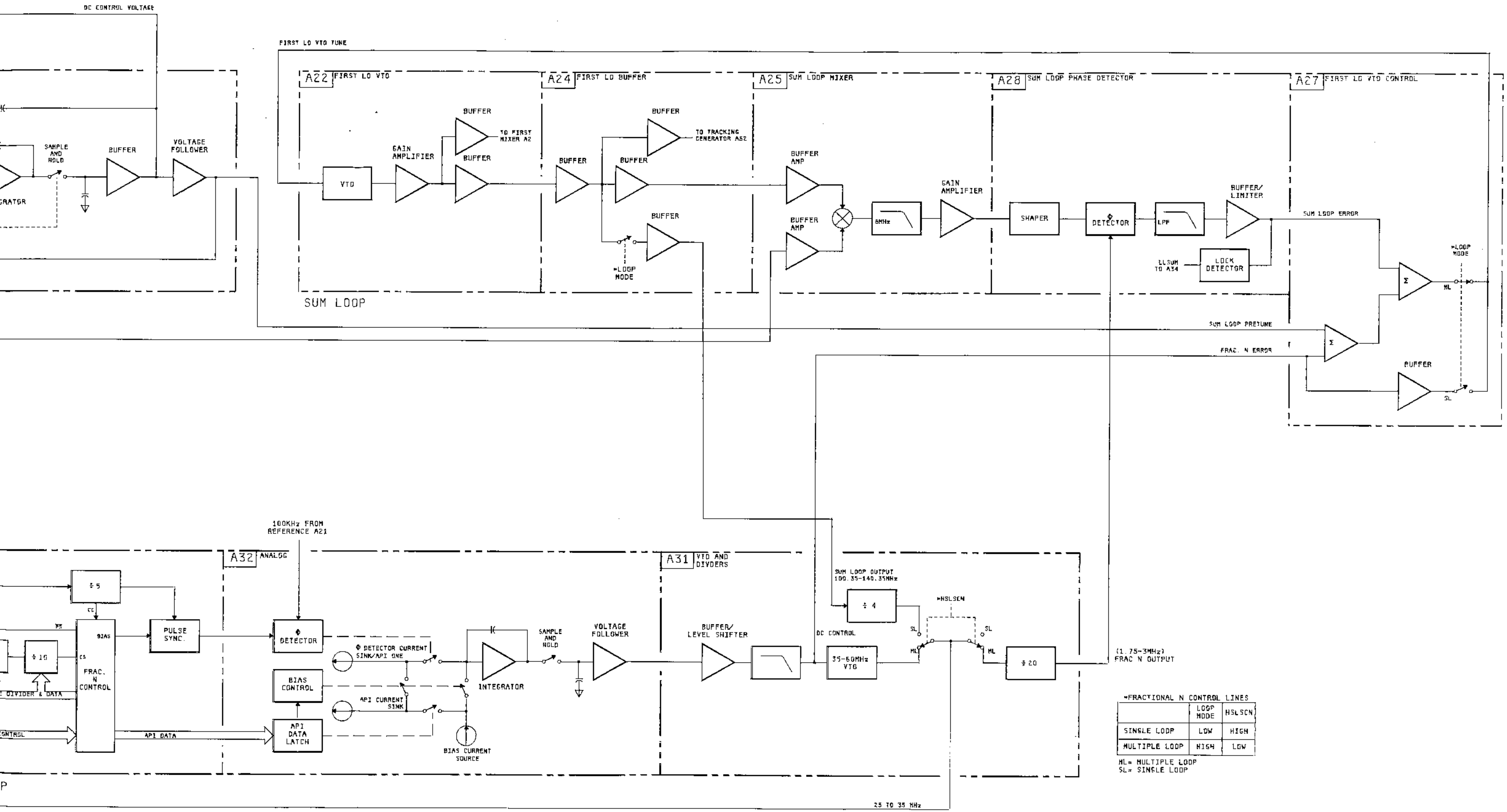

Figure 6-12. Local Oscillator Block Diagram

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6-25. PROCESSOR DESCRIPTION (Service Group C)

The Processor section of the -hp- 3585A is best understood through the use of a block diagram. The IDA bus (Instruction, Data and Address Bus) carries communication between the Central Processor (A41), the ROM (A43) and the RAM (A42). The memory control bus carries the handshake control protocol, choosing ROM or RAM, indicating that RAM is busy being refreshed, etc. The IOD Bus (I/O Data Bus) carries data from the Central Processor to the I/O (A45) interface board, to the HP-IB (SG F) board, and to the Counter (SG G) board. An I/O control bus and an I/O status bus conduct the same function with the I/O board as does the memory control bus with the Central Processor and memory.

The ROM size is 16k by 16, while the RAM size is 4k by 16. Direct Memory Access (DMA) exists between the display processor and RAM. The Display Processor pulls the DMA line low, causing the Central Processor to address RAM and transfer the required information through the central processor, through the I/O interface and to the Display Processor much faster than would normally be possible (the entire process takes about 2.5 usec). The A/D interrupts the Central Processor and gives it information every 200 usec (5000 times/second).

One final note of general information, most of the buses in this section are Low = True.

A41 is the Central Processor board. The block diagram shows what is included on this board. The processor chip is identical to the chip used in the -hp- 9825 Desktop Computer. You will also notice that the "beeper" is located on the A41 board.

The A42 board contains the RAM and its associated circuitry, including refresh circuitry. The A43 board contains ROM and its suport circuitry.

The A45 is the I/O board. This board contains the tri-state buses, decoders, latches, and gate and timing circuitry necessary for directing data to various I/O sections. Finally, A47 is the keyboard. An 8 by 9 matrix system is used to monitor the front panel keys. The rest of this board is LED's and their drive circuitry and the RPG (Rotary Pulse Generator) circuitry.

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Circuit Board Designator
To
Schematic Drawing Number
CROSS REFERENCE

Circuit Board Designator	Schematic Drawing Number*
A41	C-1
A42	C-2
A43	C-3
A45	C-4,C-5
A47	C-6

*See Volume Two for schematic drawings.

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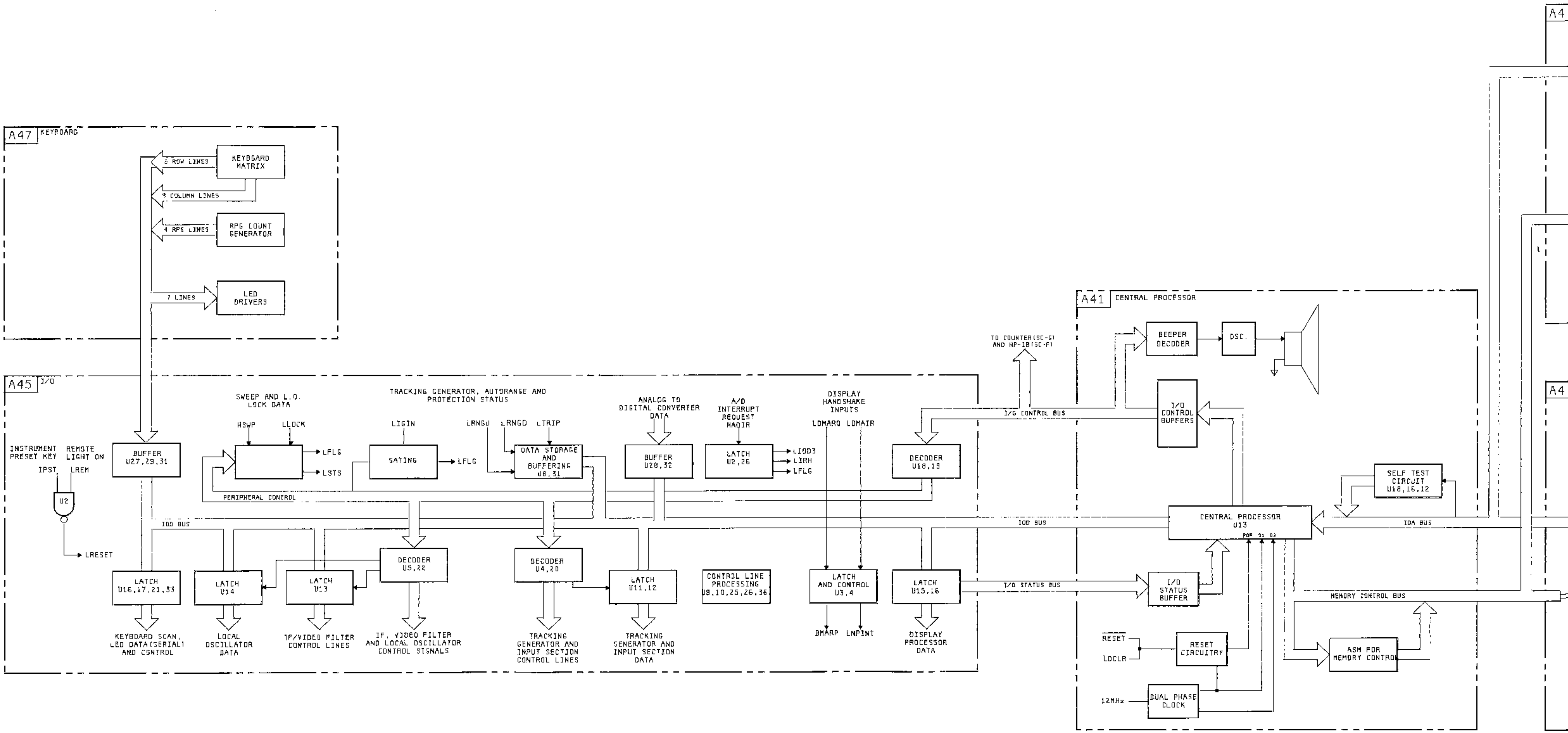

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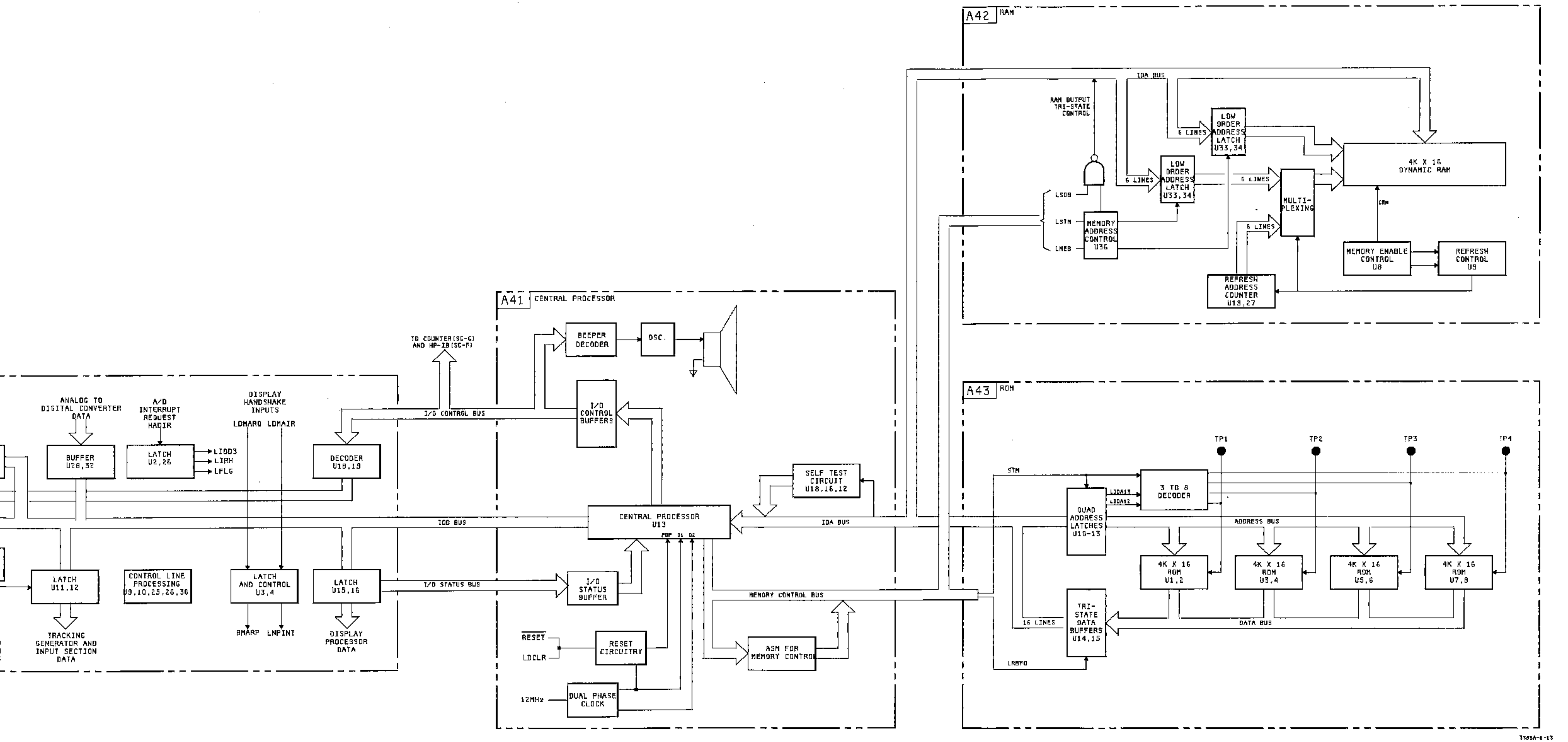

Figure 6-13. Processor, I/O and Keyboard Block Diagram

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6-26. DISPLAY DESCRIPTION (Service Group D)

The Display Section Block Diagram gives a very good idea of of how the Display Section works. As each board of the Display is discussed, refer to Figure 6-14. Display Block Diagram in this manual section and the schematic drawings found in Service Group D of Volume Two.

The A61, Clock Generator, board takes a 10 MHz reference from the A21 Reference board, limits it, squares it up and sends it on to the A46 Counter board. The A61 board takes the same 10 MHz signal and divides it by ten to get a 1 MHz reference signal. This 1 MHz signal then follows two separate paths. One is a ÷12 PLL that produces a 12 MHz signal for the central processor. The other is a ÷8 PLL that produces an 8 MHz signal for the A63 Display Processor board. The 8 MHz signal is also ÷2 to get a 4 MHz signal for the A44 HP-IB board.

The A63, Digital Display Driver, board has many functions. An Active Clock Pull-up circuit creates a fast rise time, 4 MHz master clock. Input Latches are used to latch the DMA information onto the board. A display processor along with its own ROM and instruction set controls the display operation. A timer refreshes the display once every 17 msec. The alphanumeric generator along with the alphanumeric ROM generate all alphanumeric characters. An octal latch for y-axis alphanumerics and a 10 bit multiplexer/latch are used to latch the y-axis and x-axis alphanumerics, respectively. The 10 bit multiplexer also latches the y-axis graphics. U36 and U47 determine the vertical length of the line to be drawn and, subsequently, supply the appropriate control logic to the programmable amplifier on the A64 board is controlled by the line length controller. This board also generates external plotter controls, control signals for sampling, sweeping, and ramping.

The A64 board is the Analog Display Driver. This board takes the digital data from the A63 board and converts it into analog signals usable by the display. Consider the graphics first. A 10-bit DAC receives the y-axis data from the A63 board and converts the incoming data to an analog current. This current is then converted into a voltage. The voltage is then amplified by a programmable amplifier. A programmable amplifier is used so that longer lines appearing on the display appear with the same intensity as shorter lines. To explain further, if all lengths of lines were drawn in the same amount of time, the long lines would not be as bright as the short ones; therefore, the programmable amplifier in conjunction with the variable drawing time create comparably bright lines of the correct length.

The output of the programmable amplifier is buffered and then goes to a sample and hold circuit. A follower/buffer then transfers the voltage to an integrator that controls the vertical line drawn on the display.

The x-axis graphics is a ramp that causes a sweep from left to right. (L)RAMP ENABLE signals the ramp current source to cause the ramp generator integrator to charge, thereby causing a sweep. (H)SWP signals the retrace from right to left to prepare for the next ramp. This signal causes the sweep integrator capacitor to discharge. The ramp remains on for 5 usec for each y-axis sample. For lines that take longer than 5 usec to draw, the ramp turns on for 5 usec then off for the remaining time necessary to draw that particular vertical line.

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Now for the alphanumerics. An 8-bit DAC receives information that determines the y-axis point about which the character will be formed. A 3-bit DAC receives the dot matrix information for the y-axis. The y-axis Graphics DAC receives the information for determining the x-axis position of the character and the X Matrix DAC determines the x-axis dot matrix position.

All of the display information reaches the analog switch where the analog signals are controlled so that the proper information reaches the display at the correct time. This information is buffered and sent on to the A67, XYZ board. These signals also go to the rear panel for an external display.

The A67 board is the XYZ board and is basically the amplifiers necessary to raise the signals from the A64 board to the levels needed by the CRT. A 100 volt regulator power supply provides voltage necessary for the deflection amplifiers. The x-axis and y-axis amplifiers are identical. A differiential circuit provides complementary outputs which are amplified to levels necessary for the CRT deflection plates.

Since the line intensity is controlled on the A64 board, the z-axis signal is an on/off signal. That is, blanking occurs during retraces and between dots of the matrix when the character is being drawn. The z-axis signal enters the A67 board, is amplified, and then is sent to the A65 board where it causes blanking and unblanking.

The high voltage oscillator consists of the A65, A66 and part of the A67 boards. The HV oscillator stimulates the primary of the HV transformer with a 20 to 30 kHz signal. The highly stepped up signal from the secondary of the HV transformer is rectified and filtered by the Pi network filter thus providing a -4000 Vdc cathode voltage. This voltage is sampled by the feedback network to regulate the dc level of the base winding of the HV transformer thus maintaining a cathode voltage of -4000 Vdc.

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Cricuit Board Designator
To
Schematic Drawing Number
CROSS REFERENCE

Circuit Board Designator	Schematic Drawing Number*
A61	D-1
A63	D-2
A64	D-3
A65	D-4b
A66	D-4b
A67	D-4a

*See Volume Two for schematic drawings.

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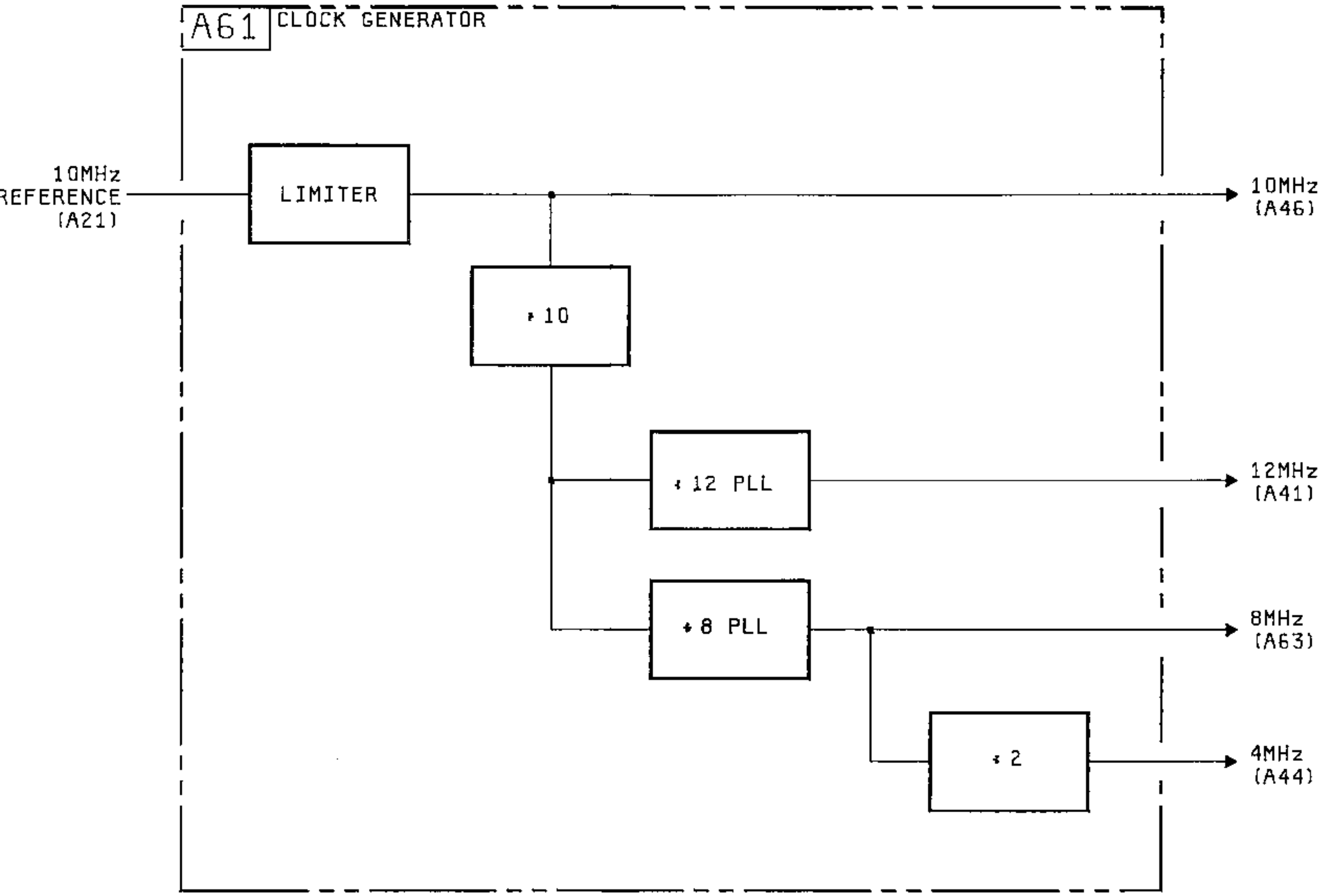

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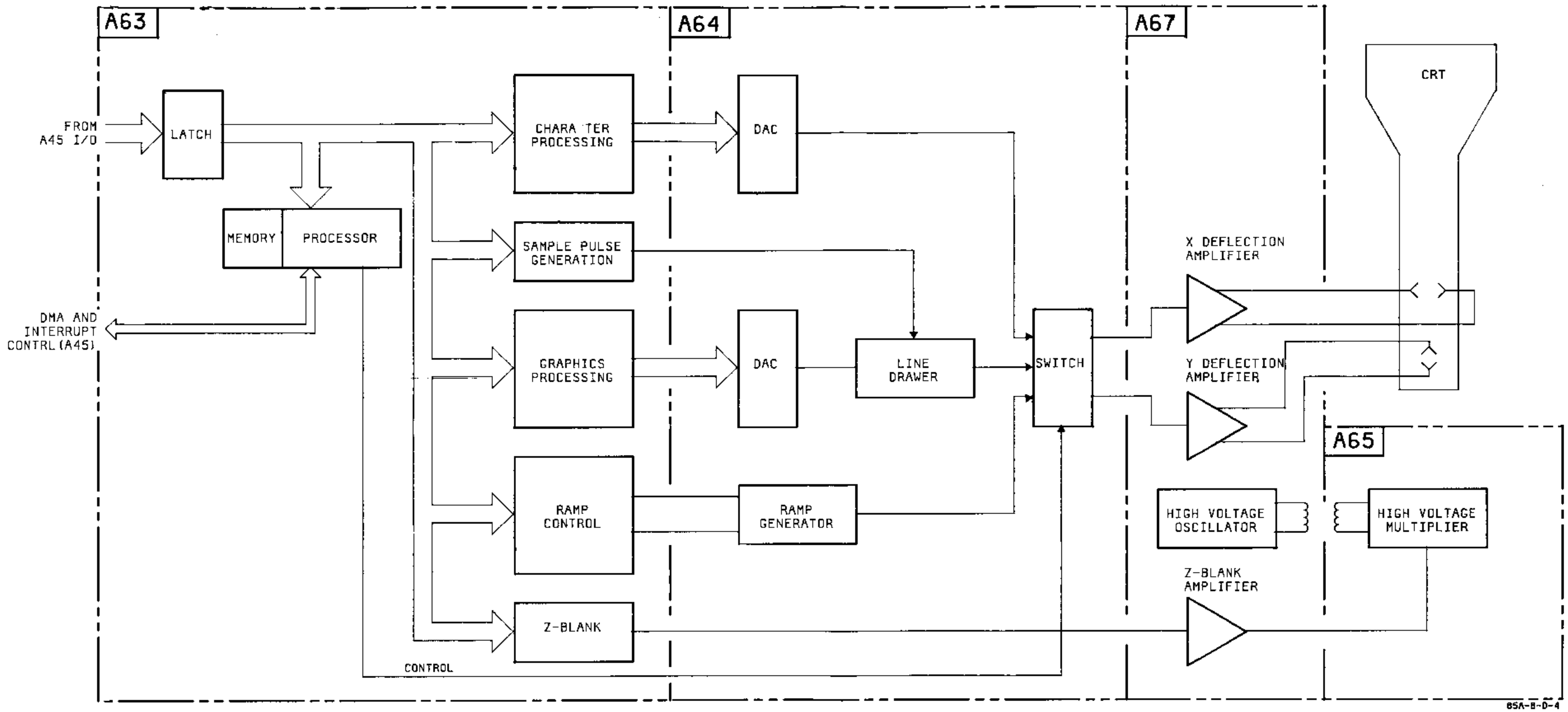

Figure 6-14. Display Block Diagram

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6-27. TRACKING GENERATOR DESCRIPTION (Service Group E)

The Tracking Generator simply produces a sine wave at the frequency at which the -hp-3585 is tuned. In other words, the Tracking Generator produces frequencies from 0 to 40 MHz. The obvious way to do this is to simply take the LO signal of 100.35 to 140.35 MHz and subtract (mix) a 100.35 MHz from it. This is in fact what is done; however, the circuit is slightly more complex than what we have implied. Because the IF section of the -hp-3585 drifts very slightly with time, the calibration system takes this into account by adjusting the LO slightly so that it matches up with the IF section. If the LO was then used by the Tracking Generator, the results would be erroneous. What happens is that during the calibration cycle, the Tracking Generator is offset slightly to match up with the IF section and the LO.

The A51 board begins with two latches and two DAC's through which the 10.35 MHz VCXO reference can be controlled during the calibration cycle. This is done so that the Tracking Generator will truly follow the -hp- 3585's frequency. The DAC is separated into two parts, a coarse tune and a fine tune. During the calibration cycle, the bits of the two DACs are set one at a time until the Tracking Generator is matched up with the IF peak. A ÷100 circuit causes the actual fine tune signal path.

The DAC output voltages are summed to control the frequency of oscillation of the 10.35 MHz VCXO. A 90 MHz signal from A21 and a 100.35 MHz signal from A52 are mixed to produce a 10.35 MHz signal. The two 10.35 MHz signals are then phase detected, their phase difference causing a pulse which is integrated to form the VCO Control Voltage Out signal.

The VCO control voltage enters the A52 board and then the A53 board where it becomes the tuning voltage for the 100.35 MHz VTO. An amplifier stage provides amplitude control for the Tracking Generator output. The LO signal enters the A52 board and is mixed with the 100.35 MHz signal from the A53 to yield a signal from 0 to 40 MHz. This signal is low pass filtered and then given 20 dB of gain before being output to the front panel.

During the calibration cycle, both the Tracking Generator signal and a 10 MHz signal are needed at different times. The A52 board, therefore, contains an active switch network which allows one or the other through when needed. An output amplifier with a gain of about three is included as the final stage. Note that when the (L)CAL goes high, the output amplifier is turned off allowing neither of the signals throught to the input section (A1).

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Circuit Board Designator
To
Schematic Drawing Number
CROSS REFERENCE

Circuit Board Designator	Schematic Drawing Number*
A51	E-1
A52	E-2
A53	E-2

*See Volume Two for schematic drawings.

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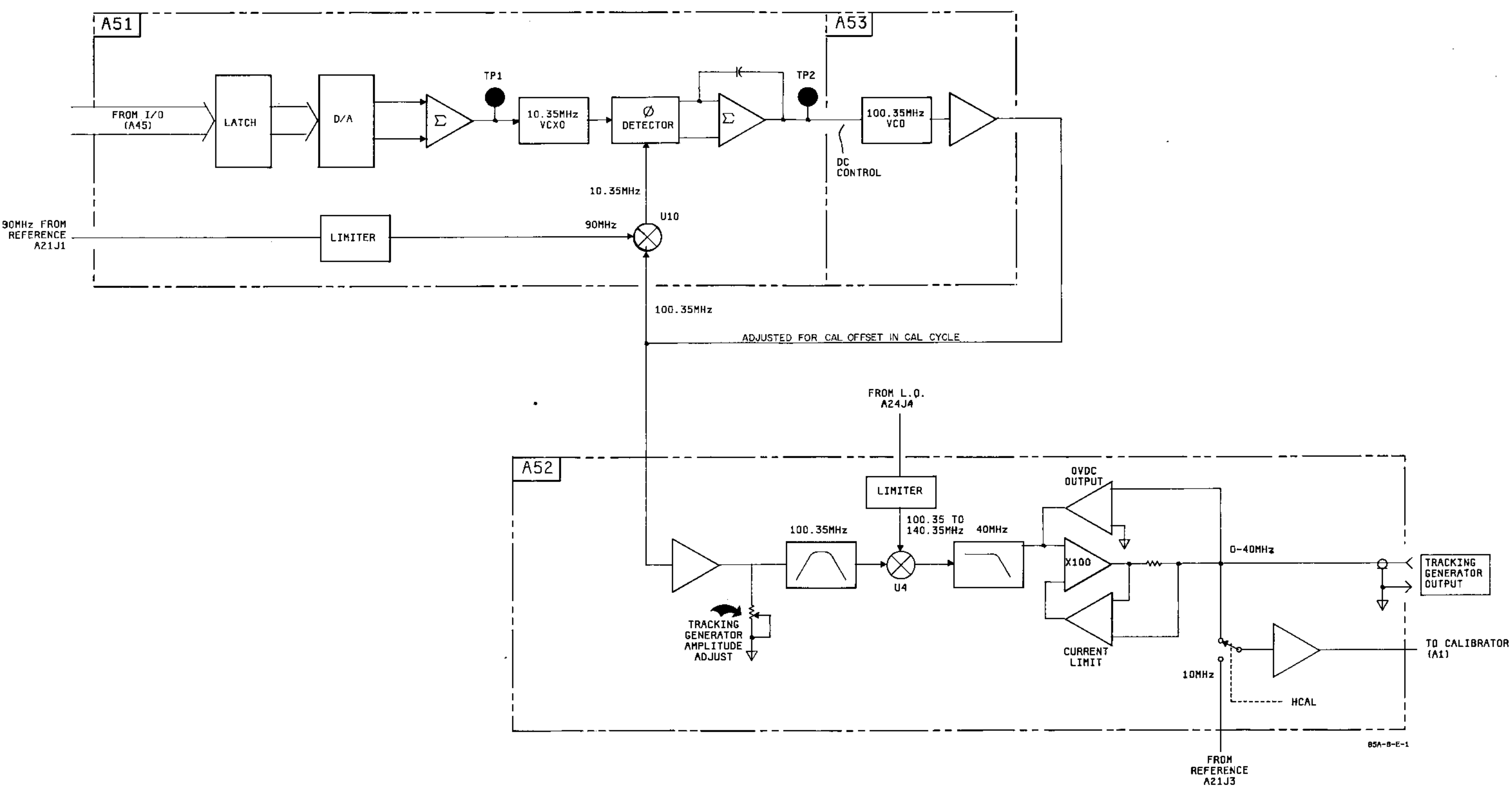

Figure 6-15. Tracking Generator Block Diagram

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6-28. HP-IB DESCRIPTION (Service Group F)

The HP-IB board provides an isolated link between the Central Processor and the HP-IB connector. Bus protocol is handled by a nanoprocessor which also sequences the operation of devices and circuits on the board through the data/instruction bus, device select and direct control outputs. The HP-IB board communicates with the Central Processor using an interrupt scheme. The Central Processor (A41) controls the HP-IB board by entering commands through the command register.

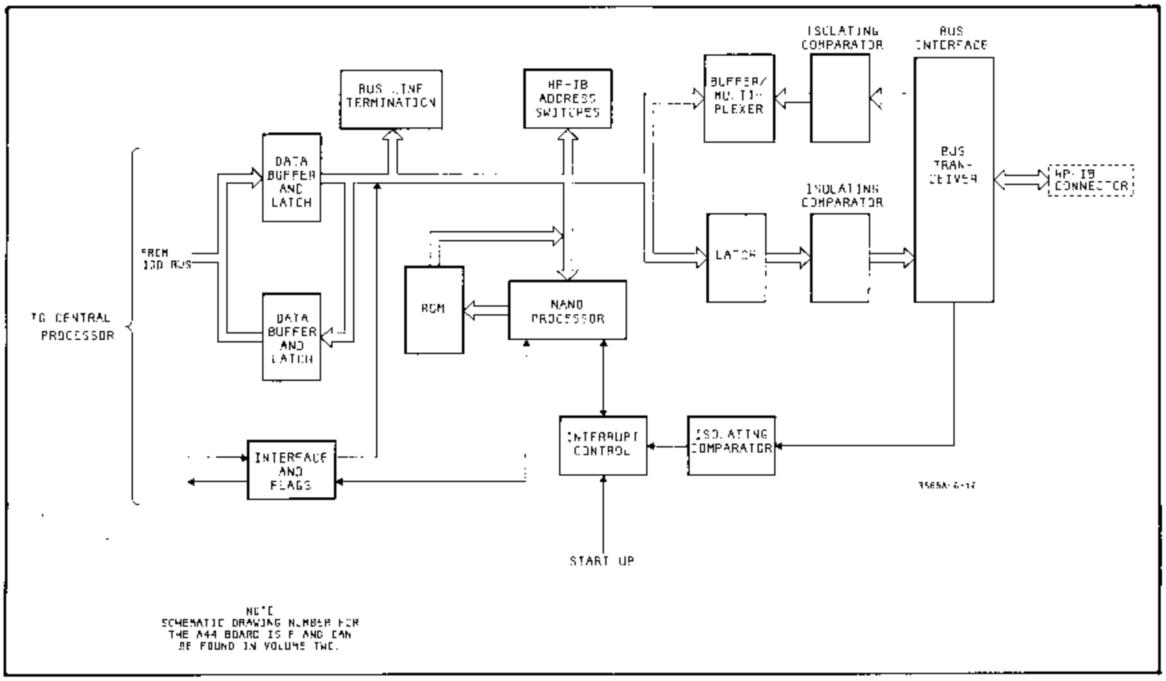

Figure 6-16. HP-IB Block Diagram

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6-29. COUNTER DESCRIPTION (Service Group G)

The A46, Counter, board is made up of a ripple counter whose output (carry) sets bits of the 24-bit counter. When the counting is through, the results in the 24-bit counter is latched onto the IOD bus by a set of data latches. The remaining circuits on this board are for the control logic and for signal conditioning.

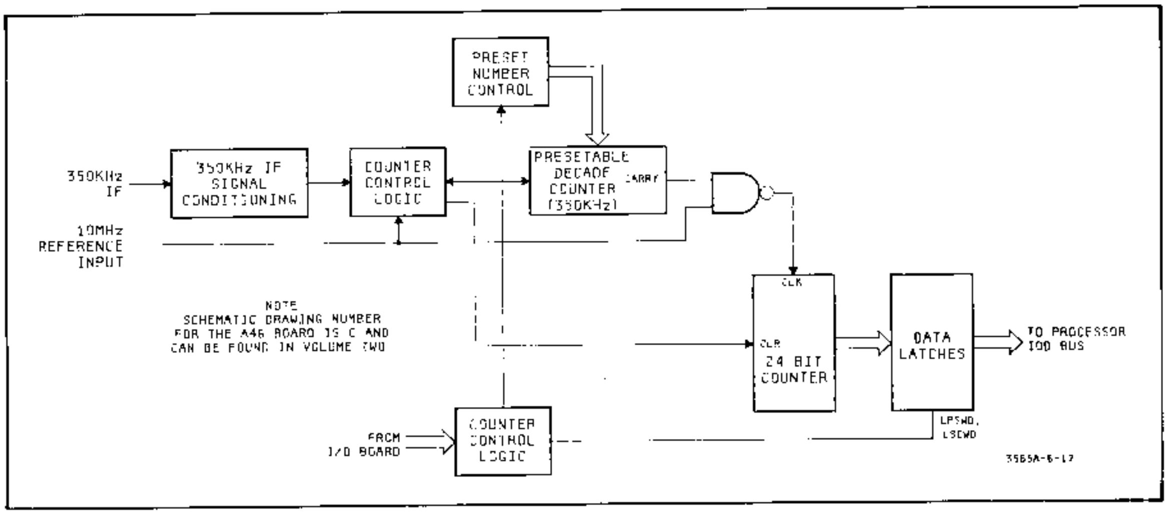

Figure 6-17. Counter Block Diagram

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6-30. X-Y PLOTTER DESCRIPTION (Service Group H)

The A62, X-Y Plotter, board provides the rear panel outputs for an X-Y Plotter. Y-axis information enters the board from the Digital Display Driver board (A63). It is the latched onto the board and is then digital to analog converted. The analog signal is low passed filtered and goes to the output.

X-axis information also enters the board from the Digital Display Driver board. It takes four forms: UP X is a count up signal incrementing a 10-bit cascade counter and therefore the X-axis plotter output. DWN X similarly decrements the counter. LOAD X loads the counter causing an output that would move the pen to the far right. CLR X resets the counter causing an output that would move the pen to the far left. The output of the counter is converted to analog signal and is the low pass filtered.

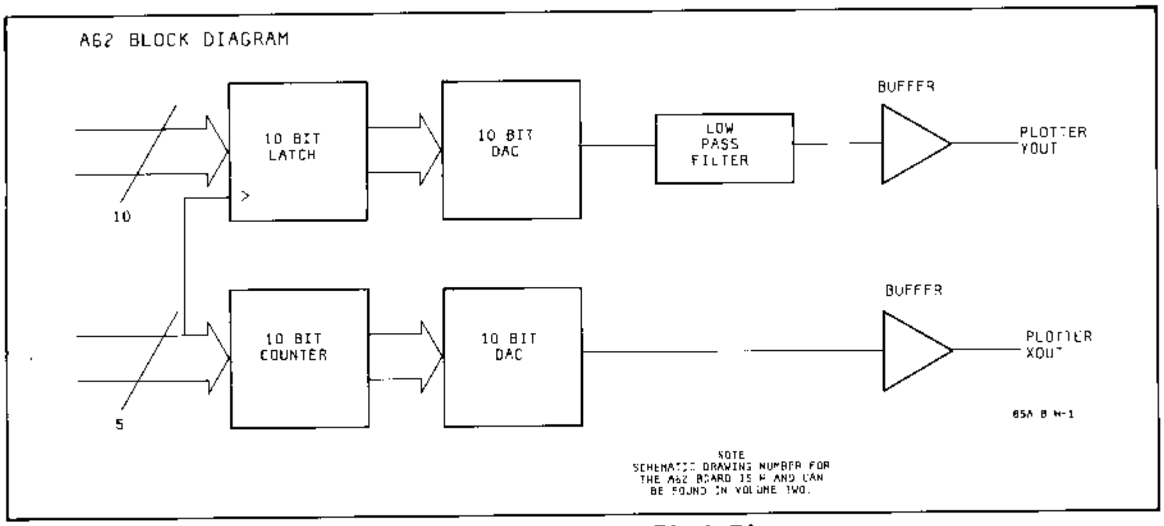

Figure 6-18. X-Y Plotter Block Diagram

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6-31. POWER SUPPLY DESCRIPTION (Service Group I)

A70 is the motherboard with some rectification circuitry mounted on it. A75 is the Power Supply Control board. It provides a 150 V supply, 5V and 24V supplies for use as raw supplies and 18V reference for use on other boards. It provides the 60 Hz trigger and finally, it provides the 20 MHz clock used on the switching regulators.

A76 is the Power Distribution board which routes the various supplies to where they are needed. Also on this board are 5V, -15V and 15V regulators.

The A71-74 are Switching Power supplies and operate the same. The switching power supply provides a very efficient means for regulating the voltage associated with high current demand. The principal component involved is the switching regulator which, when provided with the proper drive signal, switches between two states. When the switching regulator is turned on, the resistance between the input and output is very low. This low resistance dissipates very little power, even with high current flow. When the switching regulator is turned off, the resistance between the input and output is very high. This results in complete current cutoff and no power is dissipated by the device. With this in mind, it can be easily realized that any prolonged delay in switching between the two states will result in high power dissipation and failure of the device. Therefore, the switching drive current and voltages must be of the proper magnitude to assure complete state change of the switching regulator. The drive signals to the switching regulator are developed from a 20 kHz clock signal modified by the current and voltage regulator sense circuits.

The output from the switching regulator consist of pulses of high voltage and current. These pulses are filtered by a low pass network formed by a series inductor and a parallel capacitor. The voltage output is monitored by the voltage sense circuit which compares the monitored voltage to a known reference. If voltage output is low, the drive pulse remains on for a greater period of time. The current output is monitored across a low resistance series resistor located between the inductor and capacitor. The voltage drop across the resistor signals the current sense detector which turns off the switching hybrid. If the current demand is too great, such as in the case of a short circuit, the current detector will signal the current sence latch causing a yellow indicator (current limit LED) to light and the output current to fold back.

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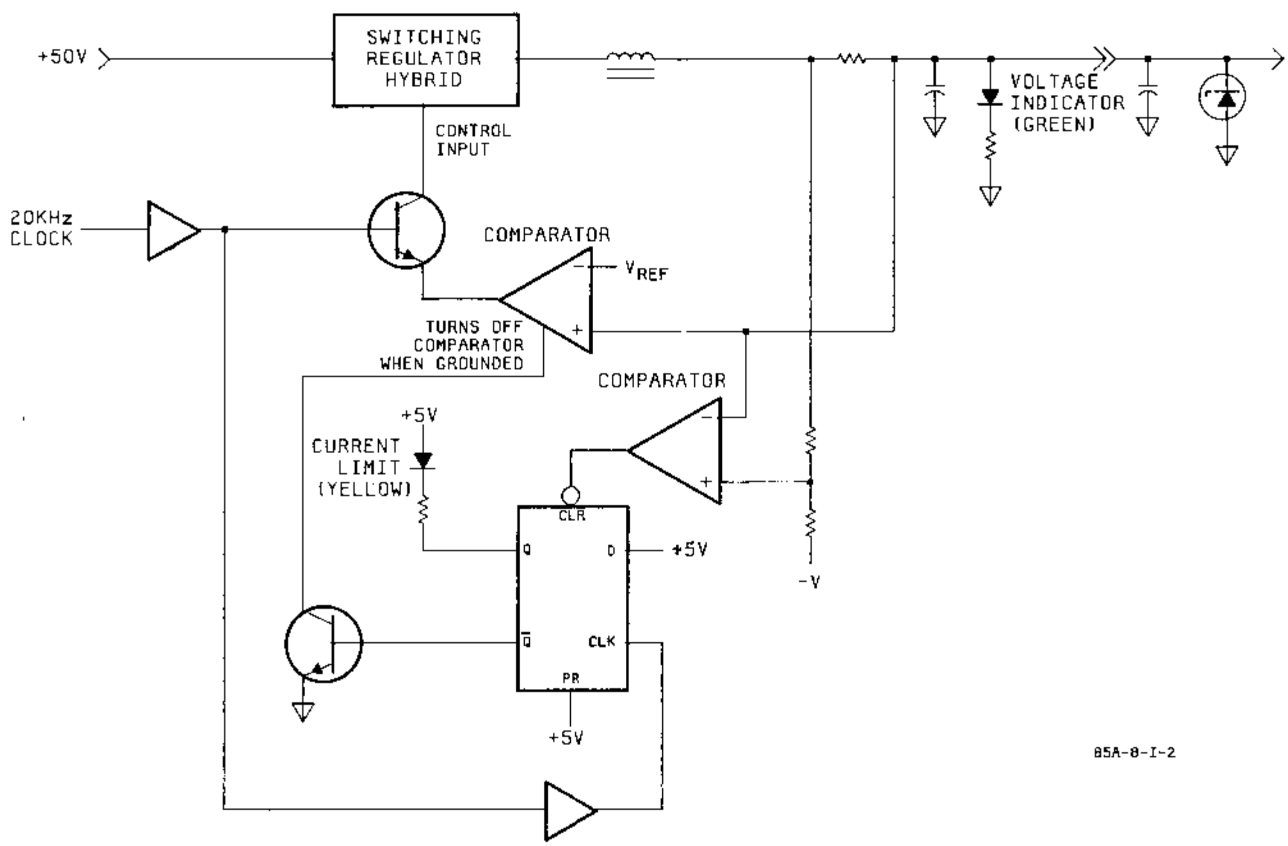

Figure 6-19. Switching Power Supply Block Diagram

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Circuit Board Designator
To
Schematic Drawing Number
CROSS REFERENCE

Circuit Board Designator	Schematic Drawing Number*
A70	I-1a,I-2a,I-2b,I-2c,I-2d
A71	I-2a
A72	I-2b
A73	I-2c
A74	I-2d
A75	I-1a
A76	I-1b

*See Volume Two for schematic drawings.

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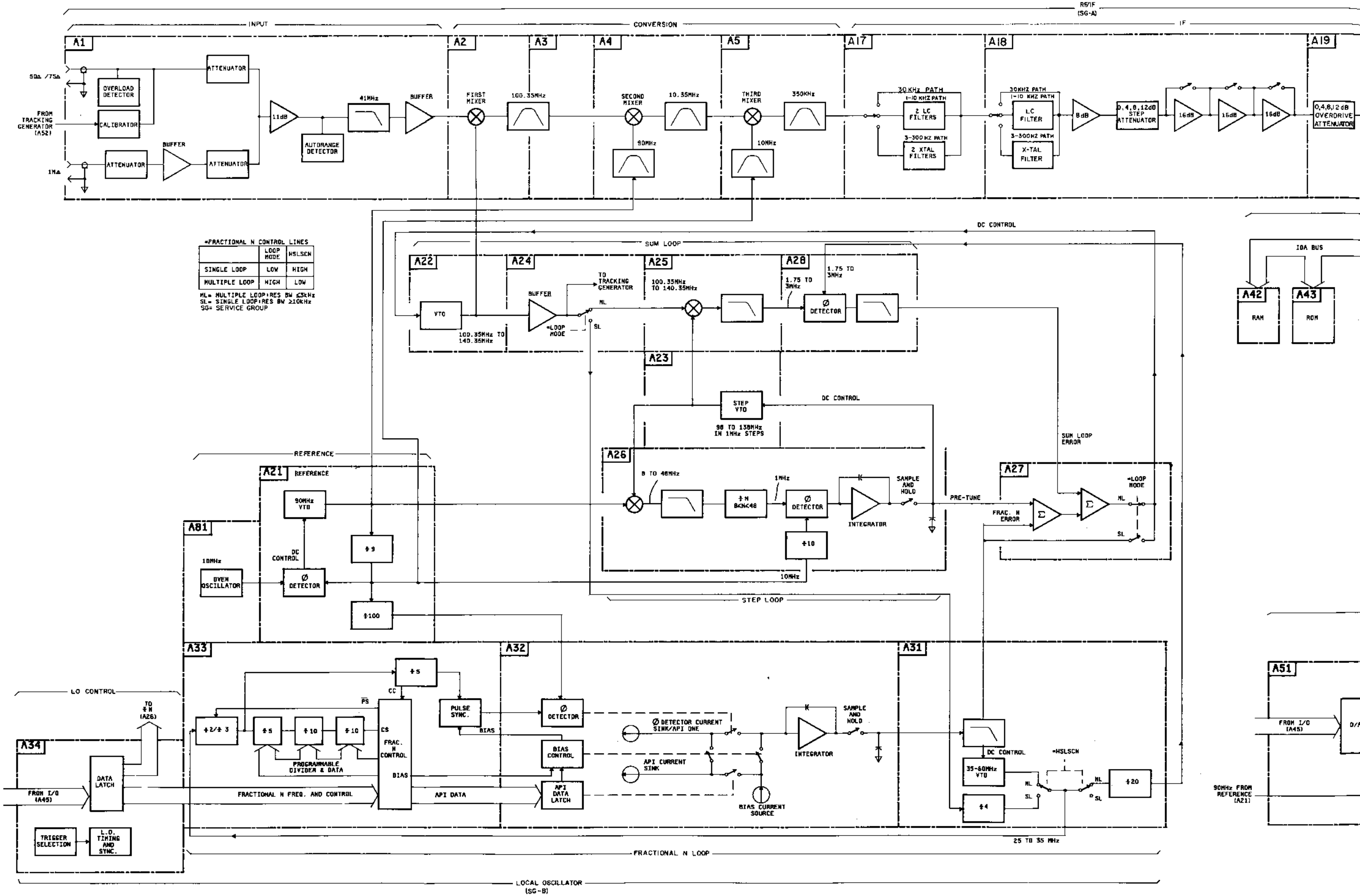

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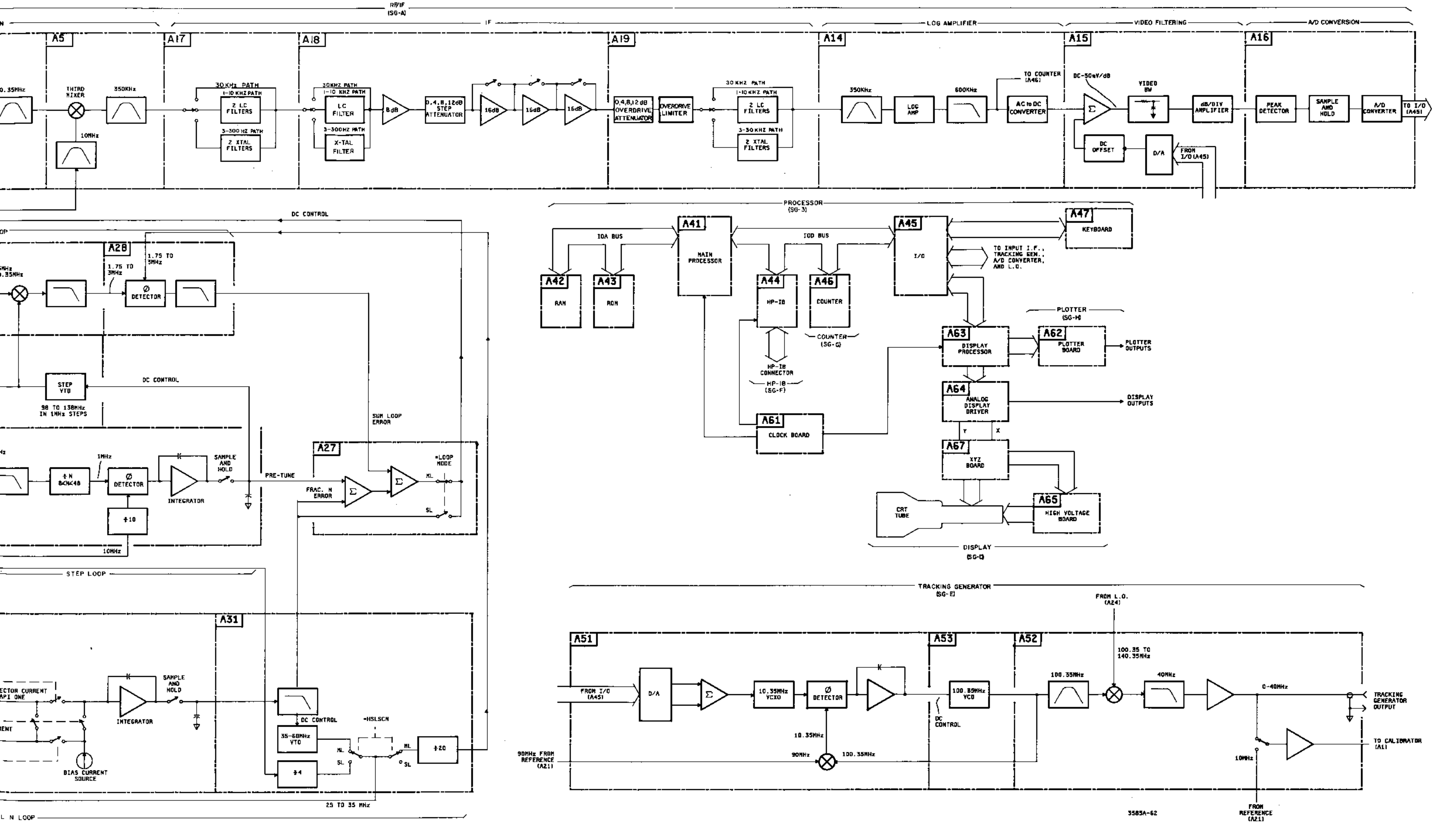

Figure 6-20. 3585A Detailed Block Diagram

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SECTION VII
BACKDATING

7-1. INTRODUCTION

This manual section contains information on instruments which are older than the instruments documented in other manual sections. These backdating changes are referenced throughout the manual by a numbered delta (Δ#). The number indicates the number of the corresponding backdating change.

7-2. Δ1—90MHz FILTER CIRCUIT

7-3. Applicable Serial Numbers

- Information not available at this time.

7-4. Affected Manual Areas

- Conversion Section Adjustments, Paragraph 5-43 tt/xx.
- 1750A 00230 and below.
- SG A2—Conversion Section, Schematic A-2.
- Replaceable Parts, Table 6-3.

7-5. Description of Change

Models with serial numbers listed above have no adjustments for the 2nd Mixer Board (A-4), 90MHz Filter Circuit. Schematic Drawing 7-1 and Replaceable Parts Table 7-1 show the circuit and part differences respectively. Schematics and parts tables are located at the end of this manual section.

7-6. Δ2—IF FILTER CIRCUITS

7-7. Applicable Serial Numbers

- ________ and below.

7-8. Affected Manual Areas

- IF Filter Adjustments, Paragraphs 5-29/5-40.
- 16 dB Amplifier Adjustments, Paragraph 5-41.
- SG A3—Final IF Section, Schematics A-3a/b/c.
- Replaceable Parts, Table 6-3.

7-9. Description of Change

Models with serial numbers listed above use an A-11, A-12, and A-13 Board as the IF circuit instead of the A-17, A-18, and A-19 Boards. The differences in these boards do not affect the IF adjustment principles; however, some of the adjusting components have changed.

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Schematic Drawings 7-2a/b/c and Replaceable Parts Table 7-2 show the circuit and part differences respectively. Schematics and parts tables are located at the end of this manual section.

7-10. Procedures

For the serial numbers listed, these IF Adjustment procedures should be followed.

NOTE

Before performing these adjustments, check that the IF Input Level adjustment (A11R105) is properly set. See Paragraphs 5-26i/1.

7-11. Preliminary IF Filter Adjustment

These procedures establish a reference that must be used for the IF Filter Adjustments. The reference signal will be stored in Display Register B.

Note

Do NOT turn the instrument power off during IF Filter Adjustment procedures. To do so will cause the adjustment reference to be lost.

The preliminary procedures must be performed prior to adjusting any IF stage.

a. Turn the -hp- 3585A power off and remove the A-11, A-12, and A-13 aluminum cover. Place the A-13 Board on a PC Extender.

b. Turn the -hp- 3585A power on.

c. Place jumper A13J1 to the "T" position.

NOTE

Component locators for the IF Filter Boards (A-11/A-13) are in Drawings 7-2a/b/c.

d. Set the synthesizer to:

FREQUENCY 350kHz
AMPLITUDE .... −2.0dBm

e. Disconnect the cable connector from A11J1.

f. Connect the synthesizer output through a 50Ω termination to A11J1.

g. Set the -hp- 3585A to:

RECALL 609
INSTRUMENT PRESET
CENTER FREQUENCY............................350kHz
CF STEP SIZE....................................1.3Hz
RES BW.. [⇩][⇧]
RES BW..3Hz
dB/DIV...1dB
MANUAL SWEEP................................on
CLEAR A

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h. Adjust A13C39 for a maximum marker amplitude. If necessary, set the REf LEVEL so that the marker remains within the graticule area.

i. Press the STOR A → B key.

j. Disconnect the synthesizer.

k. Connect the Tracking Generator output through a 50Ω termination to A11J1.

l. Set the -hp- 3585A to:

FREQUENCY SPAN 50kHz
RES BW 300Hz
SWEEP .... cont
dB/DIV 10dB
B TRACE .... off

m. Move the marker to the peak of the trace and press MKR → CF.

n. Adjust A13C41 so that the trace is symmetrical about the marker.

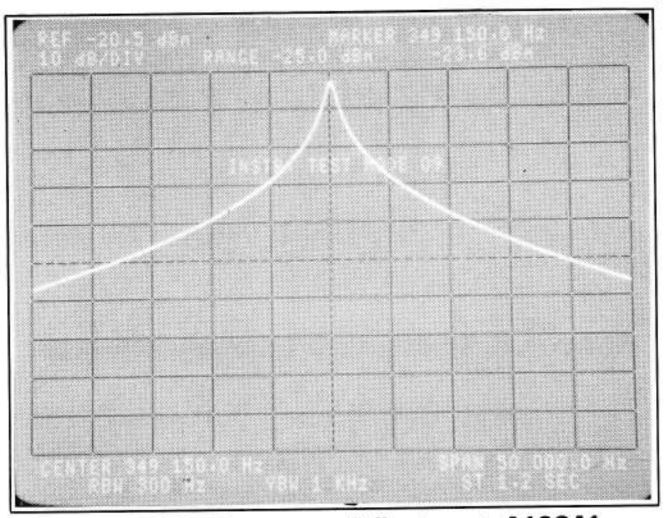

Figure 7-1. Symmetry Adjustment, A13C41

o. Narrow the FREQUENCY SPAN to 10Hz by using the STEP keys. As you narrow the span, the peak of the trace will move to the left or right. When this occurs, move the marker to the peak of the trace and press the MKR CF key.

p. Set the -hp- 3585A to:

dB/DIV 1dB
SWEEP TIME .... 9.6 sec
B TRACE .... on

q. Move the marker to the peak of the trace and press MKR → CF.

r. Adjust the Tracking Generator amplitude control so that the peak of the A trace and peak of the B trace are equal in amplitude.

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s. Repeat steps ‘q’ and ‘r’ until the A trace is symmetrical and equal to the amplitude of the B trace.

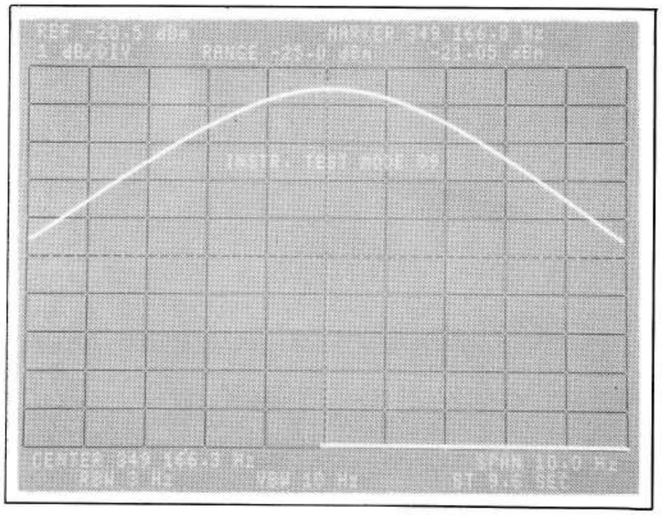

Figure 7-2. Preliminary Adjustment

t. Press the STORE A → B key.

NOTE

The stored trace in B serves as a reference for the remaining IF Filter Adjustments. Do NOT turn the -hp- 3585A power off unless told to do so.

NOTE

Figures 7-3 and 7-4 will be referred to throughout the remaining IF Adjustment procedures.

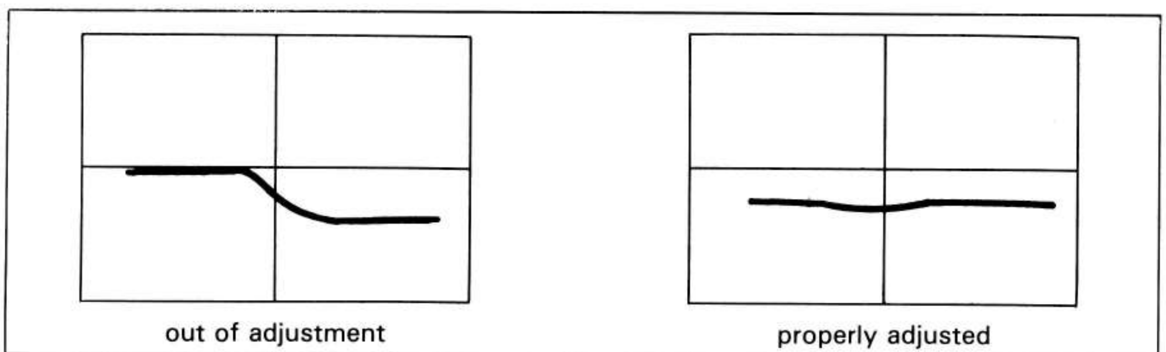

Figure 7-3. Symmetry Adjustment

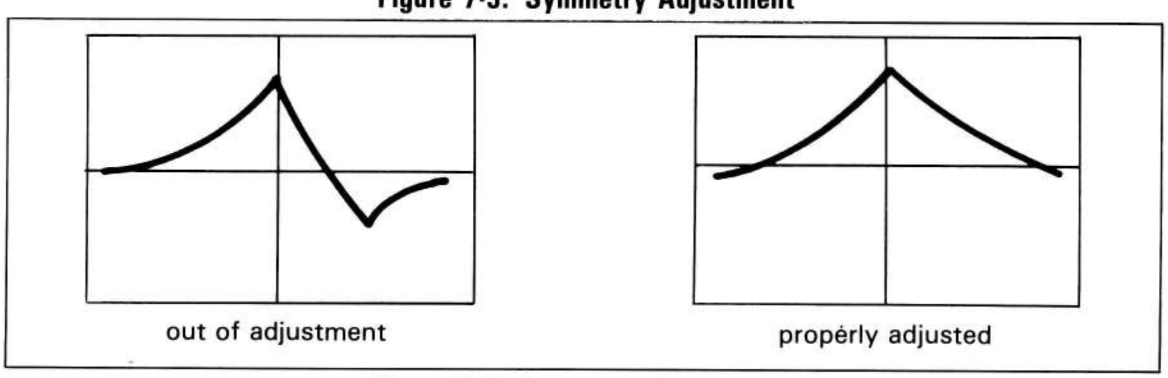

Figure 7-4. Symmetry Adjustment

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7-12. Fifth Crystal State Adjustment (A-13: L7 and C31)

a. Set the -hp- 3585A to:

RES BW 300Hz
RES BW HOLD . . . . on
FREQUENCY SPAN 1kHz
REF LVL . . . . on

b. Adjust the reference level, using the Continuous Entry Control, until the A trace peak is equal in amplitude to the B trace peak.

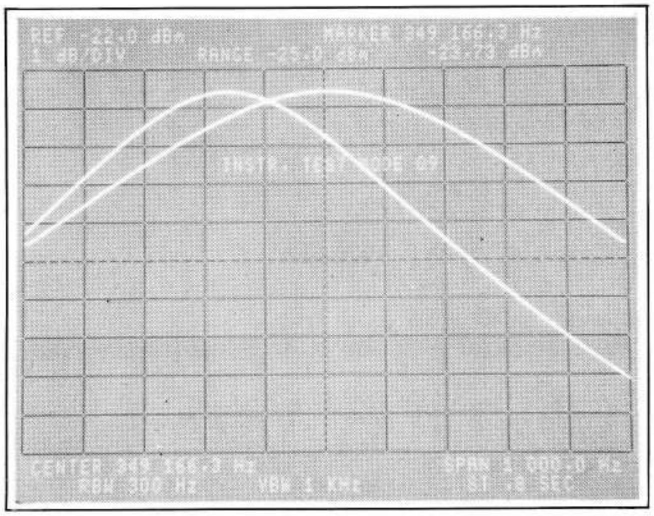

Figure 7-5. Reference Level Set-up

c. Set the -hp- 3585A to:

B TRACE . . . . off
MARKER . . . . on
A-B . . . . on
SWEEP . . . . cont
dB/DIV 1dB

d. Adjust A13L7 so that the trace approximates a straight, horizontal line. (See Figure 7-3.)

e. Set the -hp- 3585A to:

A-B . . . . off
FREQUENCY 50kHz
dB/DIV 10dB

f. Adjust A13C41 so that the trace is symmetrical about the marker. (See Figure 7-4.)

g. Place jumper A13J1 to the "OP" position.

7-13. Fourth Crystal Stage Adjustment (A-13: L6 and C30)

a. Place jumper A13J2 to the "T" position.

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b. Set the -hp- 3585A to:

FREQUENCY SPAN.................................1kHz
RES BW...300Hz
dB/DIV...1dB
A-B..on

c. Adjust A13L6 so that the trace approximates a straight, horizontal line. (See Figure 7-3.)

d. Set the -hp- 3585A to:

A-B..off
FREQUENCY SPAN.................................50kHz
dB/DIV...10dB

e. Adjust A13C30 so that the trace is symmetrical about the marker. (See Figure 7-4.)

f. Place jumper A13J2 to the "OP" position.

7-14. Fifth LC Stage Adjustment (A13: L5 and R28)

a. Place jumper A13J3 to the "T" position.

b. Set the -hp- 3585A to:

RES BW...1kHz
FREQUENCY SPAN.................................3.3kHz
dB/DIV...1dB
A-B..on

c. Adjust A13L5 so that the trace approximates a straight, horizontal line. (See Figure 7-3.)

d. Set the -hp- 3585A to:

A-B..off
RES BW...30kHz
OFFSET...on

(allow one complete sweep)

ENTER OFFSET
RES BW...1kHz

e. Adjust A13R28 for a .00dB marker amplitude.

f. Place jumper A13J3 to the "OP" position.

7-15. Fourth LC Stage Adjustment (A13: L4 and R20)

a. Place jumper A13J4 to the "T" position.

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b. Set the -hp- 3585A to:

OFFSET .... off
FREQUENCY SPAN 3.3kHz
dB/DIV 1dB
A-B .... on

c. Adjust A13L4 so that the trace approximates a straight, horizontal line. (See Figure 7-3.)

d. Set the -hp- 3585A to:

A-B .... off
RES BW 30kHz
OFFSET .... on

(allow one complete sweep)

ENTER OFFSET
RES BW 1kHz

e. Adjust A13R20 for a .00dB marker amplitude.

f. Place jumper A13J4 to the "OP" position.

g. DO NOT TURN POWER OFF. Remove the A-13 Board and the PC Extender. Install the A-13 Board into the card nest.

7-16. Third Crystal Stage Adjustment (A-12: L6, L4, and C24)

a. DO NOT TURN POWER OFF. Place th A-12 board on PC Extender.

NOTE

If the B trace has been lost or altered, repeat the Preliminary Adjustment procedures to re-establish the reference trace.

b. Check that the B trace is still intact.

c. Set the -hp- 3585A to:

OFFSET .... off
CF STEP SIZE 1.2Hz
RES BW .... [⇧] [⇩]
RES BW 300Hz
FREQUENCY SPAN 1kHz
dB/DIV 1dB

d. Adjust A12L6 for a maximum marker amplitude.

e. Set the -hp- 3585A to:

A-B .... on

Scans by ARTEK MEDIA =>

f. Adjust A12L4 so that the trace approximates a straight, horizontal line. (Figure 7-3.)

g. Set the -hp- 3585A to:

A-B..off
FREQUENCY SPAN........................50kHz
dB/DIV....................................10dB

h. Adjust A12C24 so that the trace is symmetrical about the marker. (See Figure 7-4.)

7-17. Third LC Stage Adjustment (A12: L5 and R15)

a. Set the -hp- 3585A to:

SWEEP....................................Cont
RES BW....................................1kHz
FREQUENCY SPAN........................3.3kHz
dB/DIV......................................1dB
A-B..on

b. Adjust A12L5 so that the trace approximates a straight, horizontal line. (See Figure 7-3.)

c. Set the -hp- 3585A to:

A-B..off
RES BW...................................30kHz
OFFSET.....................................on

(allow one complete sweep)

ENTER OFFSET
RES BW....................................1kHz

d. Adjust A12R15 for a .00dB marker amplitude.

e. DO NOT TURN POWER OFF. Remove the A-12 Board and PC Extender. Install the A-12 board into the card nest.

7-18. Second Crystal Stage Adjustment (A-11: L7, C39, and L8)

a. DO NOT TURN POWER OFF. Place the A-11 Board on a PC Extender.

b. Place jumper A11J4 to the "T" position.

NOTE

If the B trace has been lost or altered, repeat the Preliminary Adjustment procedures to re-establish the reference trace.

c. Check that the B trace is still intact.

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d. Set the -hp- 3585A to:

OFFSET .... off
CF STEP SIZE 1.1Hz
RES BW .... [⇧] [⇩]
RES BW 300Hz
FREQUENCY SPAN 1kHz
dB/DIV 1dB
A-B .... on

e. Adjust A11L7 so that the trace approximates a straight, horizontal line. (See Figure 7-3.)

f. Set the -hp- 3585A to:

A-B .... off
FREQUENCY SPAN 50kHz
dB/DIV 10dB

g. Adjust A11C39 so that the trace is symmetrical about the marker. (See Figure 7-4.)

h. Set the -hp- 3585A to:

dB/DIV 1dB
FREQUENCY SPAN 1kHz

i. Adjust A11L8 for a maximum marker amplitude.

j. Place jumper A11J4 to the "OP" position.

7-19. First Crystal Stage Adjustment (A-11: L6 and C29)

a. DO NOT TURN POWER OFF. Place jumper A11J5 to the "T" position.

b. Set the -hp- 3585A to:

FREQUENCY SPAN 1kHz
dB/DIV 1dB
A-B .... on

c. Adjust A11L6 so that the trace approximates a straight, horizontal line. (See Figure 7-3.)

d. Set the -hp- 3585A to:

A-B .... off
FREQUENCY SPAN 50kHz
dB/DIV 10dB

e. Adjust A11C29 so that the trasce is symmetrical about the marker. (See Figure 7-4.)

f. Place jumper A11J5 to the "OP" position.

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7-20. Second LC Stage Adjustment (A-11: L5 and R20)

a. Place jumper A11J2 to the "T" position.

b. Set the -hp- 3585A to:

RES BW 1kHz
FREQUENCY SPAN 3.3kHz
dB/DIV 1dB
A-B .... on

c. Adjust A11L5 so that the trace approximates a straight, horizontal line. (See Figure 7-3.)

d. Set the -hp- 3585A to:

A-B .... off
RES BW 30kHz
OFFSET .... on

(allow one complete sweep)

ENTER OFFSET
RES BW 1kHz

e. Adjust A11R20 for a .00dB marker amplitude.

f. Place jumper A11J2 to the "OP" position.

7-21. First LC Stage Adjustment (A-11: L4 and R12)

a. Place jumper A11J3 to the "T" position.

b. Set the -hp- 3585A to:

OFFSET .... off
FREQUENCY SPAN 3.3kHz
dB/DIV 1dB
A-B .... on

c. Adjust A11J4 so that the trace approximates a straight, horizontal line. (See Figure 7-3.)

d. Set the -hp- 3585A to:

A-B .... off
RES BW 30kHz
OFFSET .... on

(allow one complete sweep)

ENTER OFFSET
RES BW 1kHz

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e. Adjust A11R12 for a .00dB marker amplitude.

f. Place jumper A11J3 to the "OP" position.

g. Turn the -hp- 3585A power off. Remove the A-11 Board and the PC Extender. Reinstall the A-11 Board into the card nest.

7-22. Final IF Filter Adjustments

a. Ensure that all jumpers on the A-11, A-12, and A-13 Boards are in the "OP" position.

b. Install the metal cover over the IF Boards (A-11/A-13).

c. Set the synthesizer to:

FREQUENCY 350kHz
AMPLITUDE .... −2.0dBm

d. Connect the synthesizer output through a 50Ω termination to A11J1.

NOTE
Disregard any calibration error messages.

e. Turn the -hp- 3585A power on.

f. Set the -hp- 3585A to:

RECALL 609
INSTRUMENT PRESET
CF STEP SIZE 1.1Hz
RES BW 3Hz
MANUAL SWEEP .... on
dB/DIV 1dB
REF LEVEL .... −35dBm
CLEAR A

g. Adjust A11C27 for a maximum marker amplitude. If necessary, set the REF LEVEL so that the marker remains within the graticule area.

h. Adjust A11C37 for a maximum marker amplitude.

i. Set the -hp- 3585A to:

CF STEP SIZE 1.2Hz
RES BW .... ⇧ ⇩

j. Adjust A12C22 for a maximum marker amplitude.

k. Set the -hp- 3585A to:

CF STEP SIZE 1.3Hz
RES BW .... ⇧ ⇩

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l. Adjust A13C28 for a maximum marker amplitude.

m. Adjust A13C39 for a maximum marker amplitude.

n. Set the -hp- 3585A to:

RECALL 601
INSTRUMENT PRESET
MANUAL SWEEP....................................on
dB/DIV..1dB
CLEAR A
OFFSET..on
ENTER OFFSET
RES BW..300Hz

o. Adjust the REF LEVEL as necessary to keep the marker within the graticule area.

p. Adjust A11R26 for a .00dB marker reading.

q. Set the -hp- 3585A to:

RES BW..[⇩]

r. Adjust A11R28 for a .00dB marker reading.

s. Set the -hp- 3585A to:

RES BW..[⇩]

t. Adjust A11R30 for a .00dB marker reading.

u. Set the -hp- 3585A to:

RES BW..[⇩]

v. Adjust A11R32 for a .00dB marker reading.

w. Set the -hp- 3585A to:

RES BW..[⇩]

x. Adjust A11R34 for a .00dB marker reading.

y. Disconnect the synthesizer from connector A11J1.

7-23. 16dB Amplifier Adjustment

a. Connect the Tracking Generator output to a 10dB/step attenuator. Connect the 10dB/step attenuator to a 1dB/step attenuator and place a 50 ohm termination on the output of the 1dB/step attenuator. Connect the output of the 50 ohm termination to -hp-3585A connector A11J1.

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NOTE

Disregard any calibration error messages.

b. Set the -hp- 3585A to:

INSTRUMENT PRESET
CENTER FREQUENCY............................350kHz
FREQUENCY SPAN...............................10kHz
RES BW..10kHz
dB/DIV..2dB
MANUAL SWEEP.....................................on
RANGE... −25dBm
REFERENCE LEVEL........................... −28dBm
CLEAR A

c. Adjust the Tracking Generator amplitude for a −28.00dBm marker amplitude.

d. Set the -hp- 3585A to:

OFFSET...on
ENTER OFFSET

e. Set the external attenuators for 16dB of attenuation.

f. Set the -hp- 3585A to:

REFERENCE LEVEL........................... −44dBm

g. Adjust A12R77 for an offset marker amplitude of −16.00dBm.

h. Set the external attenuators for 32dB of attenuations.

i. Set the -hp- 3585A to:

REFERENCE LEVEL........................... −60dBm

j. Adjust A12R71 for an offset marker amplitude of −32.00dBm.

k. Set the external attenuators for 48dB of attenuation.

l. Set the -hp- 3585A to:

REFERENCE LEVEL........................... −76dBm

m. Adjust A12R65 for an offset marker amplitude of −48.00dBm.

n. Disconnect the Tracking Generator from A11J1 and reconnect the cable from A6CJ1 to A11J1.

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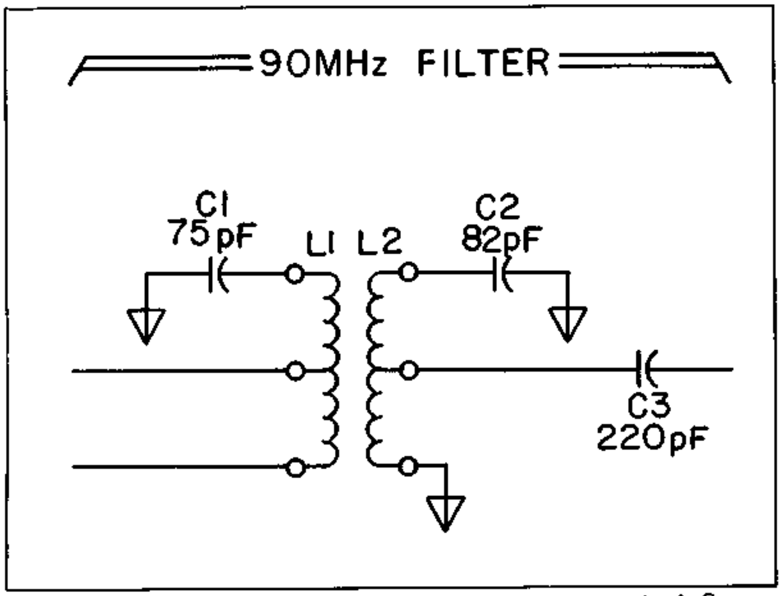
Table 7-1. Δ1 Replaceable Parts, 90MHz Filter.

Reference Designator	-hp- Part Number	Qty	Description	Mfr Code	Mfr Part Number
A4C1	0160-3691	1	C:FXD 75 pF 100V		
A4C2	0160-0145	1	C:FXD 82 pF 100V		
A4C3	0160-0952	1	C:FXD 220 pF 300V		
A4L1	none		trace on circuit board		
A4L2	none		trace on circuit board		



Drawing 7-1. Δ1 90MHz Filter, p/o Schematic A-2

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Table 7-2. Δ2 Replaceable Parts, IF Filter Circuits.

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A11	03585-66511	4	1	FILTER BOARD NO. 1	28480	03585-66511
A11C1	0180-0116	1	2	CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A11C2	0180-0116	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A11C3	0180-0229	7	3	CAPACITOR-FXD 33UF+-10% 10VDC TA	56289	150D336X9010B2
A11C4	0160-3622	8	174	CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A11C5	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A11C6	0160-2257	3	1	CAPACITOR-FXD 10PF +-5% 500VDC CER 0+-60	28480	0160-2257
A11C7	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A11C8	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A11C9	0140-0180	9	5	CAPACITOR-FXD 8200PF +-1% 100VDC MICA	72136	DM20F822F0100WV1CR
A11C10	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A11C11	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A11C12	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A11C13	0140-0184	9		CAPACITOR-FXD 8200PF +-1% 100VDC MICA	72136	DM20F822F0100WV1CR
A11C14	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A11C15	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A11C16	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A11C17	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A11C18	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A11C19	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A11C20	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A11C21	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A11C22	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A11C23	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A11C24	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A11C25	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A11C26	0140-0196	3	4	CAPACITOR-FXD 150PF +-5% 300VDC MICA	72136	DM15F151J0300WV1CR
A11C27	0121-0142	9	5	CAPACITOR-V TRMR-MICA 16-150PF 175V	72136	T51417-5 REV. B
A11C28	0160-0376	3	5	CAPACITOR-FXD 68PF +-5% 500VDC MICA	28480	0160-0376
A11C29	0121-0131	6	5	CAPACITOR-V TRMR-AIR 1.2-4.2PF 350V	74970	189-0501-005
A11C30	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A11C31	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A11C32	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A11C33	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A11C34	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A11C35	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A11C36	0140-0217	9	1	CAPACITOR-FXD 140PF +-2% 300VDC MICA	72136	DM15F141G0300WV1CR
A11C37	0121-0142	9		CAPACITOR-V TRMR-MICA 16-150PF 175V	72136	T51417-5 REV. B
A11C38	0160-0376	3		CAPACITOR-FXD 68PF +-5% 500VDC MICA	28480	0160-0376
A11C39	0121-0131	6		CAPACITOR-V TRMR-AIR 1.2-4.2PF 350V	74970	189-0501-005
A11C40	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A11C41	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A11C42	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A11C43	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A11C44	0140-0198	5	2	CAPACITOR-FXD 200PF +-5% 300VDC MICA	72136	DM15F201J0300WV1CR
A11C45	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A11C46	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A11C47	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A11C48	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A11C49	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A11C50	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A11C51	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A11C52	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A11C53	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A11C54	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A11C55	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A11C56	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A11C57	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A11C58	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A11C59	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A11C60	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A11C61	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A11C62	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A11C63	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A11C64	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A11C65	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A11C66	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A11C67	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A11C68	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A11C69	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A11C70*	0160-2247	1	4	CAPACITOR-FXD 3.9PF +-.25PF 500VDC CER	28480	0160-2247
A11C70*	0160-2250	6	5	CAPACITOR-FXD 5.1PF +-.25PF 500VDC CER	28480	0160-2250

See Section VI for ordering information
*Indicates factory selected value

Scans by ARTEK MEDIA =>

Table 7-2. Δ2 Replaceable Parts, IF Filter Circuits (Cont'd).

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A11C71*	0160-2250	6		CAPACITOR-FXD 5.1PF +-.25PF 500VDC CER	28480	0160-2250
A11C71*	0160-2252	8	1	CAPACITOR-FXD 6.2PF +-.25PF 500VDC CER	28480	0160-2252
A11C71*	0160-2254	0	1	CAPACITOR-FXD 7.5PF +-.25PF 500VDC CER	28480	0160-2254
A11CR1	1901-0376	6	33	DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A11CR2	1901-0376	6		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A11CR3	1901-0376	6		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A11CR4	1901-0376	6		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A11CR5	1901-0376	6		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A11CR6	1901-0376	6		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A11CR7	1901-0376	6		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A11CR8	1901-0376	6		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A11CR9	1901-0376	6		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A11CR10	1901-0376	6		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A11CR11	1901-0376	6		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A11CR12	1901-0376	6		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A11CR13	1902-3149	9	3	DIODE-ZNR 9.09V 5% DO-7 PD=.4W TC=+.057%	28480	1902-3149
A11CR14	1901-0518	8	6	DIODE-SCHOTTKY	28480	1901-0518
A11CR15	1901-0518	8		DIODE-SCHOTTKY	28480	1901-0518
A11J1	1250-1368	7	1	CONNECTOR-RF SMB M PC 50-OHM	28480	1250-1368
A11J2	1251-4822	6	10	CONNECTOR 3-PIN M POST TYPE	28480	1251-4822
A11J2	1258-0141	8			28480	1258-0141
A11J3	1251-4822	6		CONNECTOR 3-PIN M POST TYPE	28480	1251-4822
A11J3	1258-0141	8			28480	1258-0141
A11J4	1251-4822	6		CONNECTOR 3-PIN M POST TYPE	28480	1251-4822
A11J4	1258-0141	8			28480	1258-0141
A11J5	1251-4822	6		CONNECTOR 3-PIN M POST TYPE	28480	1251-4822
A11J5	1258-0141	8			28480	1258-0141
A11L1	9140-0210	1	2	COIL-MLD 100UH 5% Q=50 .155DX.375LG-NOM	28480	9140-0210
A11L2	9140-0210	1		COIL-MLD 100UH 5% Q=50 .155DX.375LG-NOM	28480	9140-0210
A11L3	9100-1618	1	1	COIL-MLD 5.6UH 10% Q=45 .155DX.375LG-NOM	28480	9100-1618
A11L4	9140-0289	4	5	COIL-VAR 23UH-27UH Q=200 PC-MTG	28480	9140-0289
A11L5	9140-0289	4		COIL-VAR 23UH-27UH Q=200 PC-MTG	28480	9140-0289
A11L6	9140-0288	3	1	COIL-VAR 920UH-1.08MH Q=500 PC-MTG	28480	9140-0288
A11L7	9140-0287	2	4	COIL-VAR 920UH-1.08MH Q=300 PC-MTG	28480	9140-0287
A11L8	9100-0543	9	2	COIL-VAR 900UH-1.1MH Q=112 PC-MTG	28480	9100-0543
A11Q1	1854-0215	1	3	TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A11Q2	1853-0089	5	1	TRANSISTOR PNP 2N4917 SI PD=200MW	07263	2N4917
A11Q3	1854-0351	6	1	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0351
A11Q4	1854-0071	7	17	TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A11Q5	1854-0071	7		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A11Q6	1854-0071	7		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A11Q7	1853-0010	2	3	TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0010
A11Q8	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A11Q9	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A11Q10	1854-0071	7		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A11R1	0683-3925	2	1	RESISTOR 3.9K 5% .25W FC TC=-400/+700	01121	CB3925
A11R2	0683-2205	9	1	RESISTOR 22 5% .25W FC TC=-400/+500	01121	CB2205
A11R3	0683-1525	4	2	RESISTOR 1.5K 5% .25W FC TC=-400/+700	01121	CB1525
A11R4	0683-2215	1	1	RESISTOR 220 5% .25W FC TC=-400/+600	01121	CB2215
A11R5	0683-1015	7	71	RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A11R6	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A11R7	0683-2035	3	15	RESISTOR 20K 5% .25W FC TC=-400/+800	01121	CB2035
A11R8	0683-2035	3		RESISTOR 20K 5% .25W FC TC=-400/+800	01121	CB2035
A11R9	0698-3518	0	5	RESISTOR 7.32K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7321-F
A11R10	0757-0279	0	3	RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A11R11	0698-4451	2	3	RESISTOR 340 1% .125W F TC=0+-100	24546	C4-1/8-T0-340R-F
A11R12	2100-2497	9	5	RESISTOR-TRMR 2K 10% C TOP-ADJ 1-TRN	73138	82PR2K
A11R13	0757-0283	6		RESISTOR 2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2001-F
A11R14	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A11R15	0683-3325	6	5	RESISTOR 3.3K 5% .25W FC TC=-400/+700	01121	CB3325
A11R16	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A11R17	0698-3518	0		RESISTOR 7.32K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7321-F
A11R18	0698-3496	3	2	RESISTOR 3.57K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3571-F
A11R19	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A11R20	2100-2497	9		RESISTOR-TRMR 2K 10% C TOP-ADJ 1-TRN	73138	82PR2K
A11R21	0757-0283	6		RESISTOR 2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2001-F
A11R22	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A11R23	0683-3325	6		RESISTOR 3.3K 5% .25W FC TC=-400/+700	01121	CB3325
A11R24	0683-2035	3		RESISTOR 20K 5% .25W FC TC=-400/+800	01121	CB2035
A11R25	0757-0442	9	2	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A11R26	2100-3274	2	1	RESISTOR-TRMR 10K 10% C SIDE-ADJ 1-TRN	28480	2100-3274
A11R27	0757-0200	7	3	RESISTOR 5.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5621-F
A11R28	2100-3207	1	2	RESISTOR-TRMR 5K 10% C SIDE-ADJ 1-TRN	28480	2100-3207
A11R29	0757-0283	6		RESISTOR 2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2001-F
A11R30	2100-3273	1	3	RESISTOR-TRMR 2K 10% C SIDE-ADJ 1-TRN	28480	2100-3273

See Section VI for ordering information
*Indicates factory selected value

Scans by ARTEK MEDIA =>

Table 7-2. Δ2 Replaceable Parts, IF Filter Circuits (Cont'd).

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A11R31	0757-0428	1	2	RESISTOR 1.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1621-F
A11R32	2100-3273	1		RESISTOR-TRMR 2K 10% C SIDE-ADJ 1-TRN	28480	2100-3273
A11R33	0757-0426	9	2	RESISTOR 1.3K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1301-F
A11R34	2100-3273	1		RESISTOR-TRMR 2K 10% C SIDE-ADJ 1-TRN	28480	2100-3273
A11R35	0683-1025	9	39	RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A11R36	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A11R37	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A11R38	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A11R39	0683-2225	3	1	RESISTOR 2.2K 5% .25W FC TC=-400/+700	01121	CB2225
A11R40	0683-3315	4	1	RESISTOR 330 5% .25W FC TC=-400/+600	01121	CB3315
A11R41	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A11R42	0683-3025	3	6	RESISTOR 3K 5% .25W FC TC=-400/+700	01121	CB3025
A11R43	0683-1235	3	4	RESISTOR 12K 5% .25W FC TC=-400/+800	01121	CB1235
A11R44*	0698-3158	4	1	RESISTOR 23.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2372-F
A11R44*	0757-0199	3	1	RESISTOR 21.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2152-F
A11R44*	0757-0349	5	1	RESISTOR 22.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2262-F
A11R45*	0698-4473	8	1	RESISTOR 8.06K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8061-F
A11R45*	0698-4476	1	1	RESISTOR 10.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1022-F
A11R45*	0757-0288	1	1	RESISTOR 9.09K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-9091-F
A11R46*	0698-3202	9	1	RESISTOR 1.74K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1741-F
A11R46*	0698-4429	4	1	RESISTOR 1.87K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1871-F
A11R46*	0698-4431	8	1	RESISTOR 2.05K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2051-F
A11R47*	0698-4123	5	1	RESISTOR 499 1% .125W F TC=0+-100	24546	C4-1/8-T0-499R-F
A11R47*	0698-4455	6	1	RESISTOR 536 1% .125W F TC=0+-100	24546	C4-1/8-T0-536R-F
A11R47*	0698-4457	8	1	RESISTOR 576 1% .125W F TC=0+-100	28480	0698-4457
A11R48*	0698-0088	3	2	RESISTOR 215 1% .25W F TC=0+-100	24546	C5-1/4-T0-2150-F
A11R48*	0698-3178	8	3	RESISTOR 487 1% .125W F TC=0+-100	24546	C4-1/8-T0-487R-F
A11R48*	0698-3447	4	5	RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A11R48*	0698-3448	5	1		28480	0698-3448
A11R48*	0698-4453	4	5	RESISTOR 402 1% .125W F TC=0+-100	24546	C4-1/8-T0-402R-F
A11R48*	0757-0416	7	4	RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A11R49	0683-2025	1		RESISTOR 2K 5% .25W FC TC=-400/+700	01121	CB2025
A11R50	0683-2025	1		RESISTOR 2K 5% .25W FC TC=-400/+700	01121	CB2025
A11R51	0683-2025	1		RESISTOR 2K 5% .25W FC TC=-400/+700	01121	CB2025
A11R52	0683-2025	1		RESISTOR 2K 5% .25W FC TC=-400/+700	01121	CB2025
A11R53	0683-1045	3	15	RESISTOR 100K 5% .25W FC TC=-400/+800	01121	CB1045
A11R54	0683-1045	3		RESISTOR 100K 5% .25W FC TC=-400/+800	01121	CB1045
A11R55	0683-1045	3		RESISTOR 100K 5% .25W FC TC=-400/+800	01121	CB1045
A11R56	0683-1045	3		RESISTOR 100K 5% .25W FC TC=-400/+800	01121	CB1045
A11R57	0683-1225	1	2	RESISTOR 1.2K 5% .25W FC TC=-400/+700	01121	CB1225
A11R58	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A11R59	0683-3025	3		RESISTOR 3K 5% .25W FC TC=-400/+700	01121	CB3025
A11R60	0683-1235	3		RESISTOR 12K 5% .25W FC TC=-400/+800	01121	CB1235
A11R61*	0698-4511	5	4	RESISTOR 86.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8662-F
A11R61*	0757-0464	5	4	RESISTOR 90.9K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9092-F
A11R61*	0757-0978	6	4	RESISTOR 95.3K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9532-F
A11R62*	0698-3161	9	4	RESISTOR 38.3K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3832-F
A11R62*	0698-4492	1	4	RESISTOR 32.4K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3242-F
A11R62*	0698-4493	2	4	RESISTOR 34K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3402-F
A11R62*	0757-0455	4	4	RESISTOR 36.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3652-F
A11R63*	0698-4470	5	4	RESISTOR 6.98K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6981-F
A11R63*	0757-0440	7	4	RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A11R63*	0757-0441	8	4	RESISTOR 8.25K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8251-F
A11R64*	0698-4432	9	4	RESISTOR 2.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2101-F
A11R64*	0698-4433	0	4	RESISTOR 2.26K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2261-F
A11R64*	0757-0283	6	11	RESISTOR 2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2001-F
A11R64*	0757-0431	6	4	RESISTOR 2.43K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2431-F
A11R65*	0698-0088	3		RESISTOR 215 1% .25W F TC=0+-100	24546	C5-1/4-T0-2150-F
A11R65*	0698-3178	8		RESISTOR 487 1% .125W F TC=0+-100	24546	C4-1/8-T0-487R-F
A11R65*	0698-3447	4		RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A11R65*	0698-3488	3	4	RESISTOR 442 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A11R65*	0698-4453	4		RESISTOR 402 1% .125W F TC=0+-100	24546	C4-1/8-T0-402R-F
A11R65*	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A11R66	0683-2025	1		RESISTOR 2K 5% .25W FC TC=-400/+700	01121	CB2025
A11R67	0683-2025	1		RESISTOR 2K 5% .25W FC TC=-400/+700	01121	CB2025
A11R68	0683-2025	1		RESISTOR 2K 5% .25W FC TC=-400/+700	01121	CB2025
	0683-2025	1	18	RESISTOR 2K 5% .25W FC TC=-400/+700	01121	CB2025
	0683-2025	1		RESISTOR 2K 5% .25W FC TC=-400/+700	01121	CB2025
A11R71	0683-7525	6	2	RESISTOR 7.5K 5% .25W FC TC=-400/+700	01121	CB7525
A11R72	0683-4705	8	9	RESISTOR 47 5% .25W FC TC=-400/+500	01121	CB4705
A11R73	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A11R74	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A11R75	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A11R76	0698-4500	2	1	RESISTOR 57.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5762-F
A11R77	0757-0200	7		RESISTOR 5.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5621-F
A11R78	0757-0200	7		RESISTOR 5.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5621-F
A11R79	0698-3382	6	1	RESISTOR 5.49K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5491-F
A11R80	0683-1045	3		RESISTOR 100K 5% .25W FC TC=-400/+800	01121	CB1045

See Section VI for ordering information
*Indicates factory selected value

Scans by ARTEK MEDIA =>

Table 7-2. Δ2 Replaceable Parts, IF Filter Circuits (Cont'd).

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A11R81	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A11R82	0683-5125	8	5	RESISTOR 5.1K 5% .25W FC TC=-400/+700	01121	CB5125
A11R83	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A11R84	0683-2025	1		RESISTOR 2K 5% .25W FC TC=-400/+700	01121	CB2025
A11R85	0683-1035	1	5	RESISTOR 10K 5% .25W FC TC=-400/+700	01121	CB1035
A11R86	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A11R87	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A11R88	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A11R89	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A11R90	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A11R91	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A11R92	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A11R93	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A11R94	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A11R95	0683-4705	8		RESISTOR 47 5% .25W FC TC=-400/+500	01121	CB4705
A11R96*	0698-3262	1	5	RESISTOR 40.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-4022-F
A11R96*	0698-4387	3	5	RESISTOR 60.4 1% .125W F TC=0+-100	24546	C4-1/8-T0-60R4-F
A11R96*	0757-0277	8	5	RESISTOR 49.9 1% .125W F TC=0+-100	24546	C4-1/8-T0-4992-F
A11R96*	0757-0346	2	5	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A11R96*	0757-0384	8	5	RESISTOR 20 1% .125W F TC=0+-100	19701	MF4C1/8-T0-20R0-F
A11R96*	0757-0388	2	5	RESISTOR 30.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-30R1-F
A11R97*	0698-3262	1		RESISTOR 40.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-4022-F
A11R97*	0698-4387	3		RESISTOR 60.4 1% .125W F TC=0+-100	24546	C4-1/8-T0-60R4-F
A11R97*	0757-0277	8		RESISTOR 49.9 1% .125W F TC=0+-100	24546	C4-1/8-T0-4992-F
A11R97*	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A11R97*	0757-0384	8		RESISTOR 20 1% .125W F TC=0+-100	19701	MF4C1/8-T0-20R0-F
A11R97*	0757-0388	2		RESISTOR 30.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-30R1-F
A11R98	0698-4467	0	1	RESISTOR 1.05K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1051-F
A11R99	0698-4471	6	1	RESISTOR 7.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7151-F
A11R100	0683-4705	8		RESISTOR 47 5% .25W FC TC=-400/+500	01121	CB4705
A11R101	0757-0283	6		RESISTOR 2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2001-F
A11R102	0683-5125	8		RESISTOR 5.1K 5% .25W FC TC=-400/+700	01121	CB5125
A11R103	0683-3025	3		RESISTOR 3K 5% .25W FC TC=-400/+700	01121	CB3025
A11R104	0683-1525	4		RESISTOR 1.5K 5% .25W FC TC=-400/+700	01121	CB1525
A11R105	2100-3207	1		RESISTOR-TRMR 5K 10% C SIDE-ADJ 1-TRN	28480	2100-3207
A11R106	0757-0439	4	2	RESISTOR 6.81K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6811-F
A11R107	0683-4705	8		RESISTOR 47 5% .25W FC TC=-400/+500	01121	CB4705
A11R108	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A11R109	0683-4705	8		RESISTOR 47 5% .25W FC TC=-400/+500	01121	CB4705
A11R110	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A11R111	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A11R112	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A11R113	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A11R114	0757-0446	3	1	RESISTOR 15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1502-F
A11RT1	0837-0086	7	7	THERMISTOR DISC 200-OHM TC=-4.4%/C-DEG	28480	0837-0086
A11RT2	0837-0086	7		THERMISTOR DISC 200-OHM TC=-4.4%/C-DEG	28480	0837-0086
A11RT3	0837-0085	6	1	THERMISTOR ROD 680-OHM TC=+.7%/C-DEG	28480	0837-0085
A11RT4	0837-0119	7	1	THERMISTOR ROD 5K-OHM TC=+.7%/C-DEG	28480	0837-0119
A11T1	9100-3262	5	5	TRANSFORMER TRANSFORMER; TOROIDAL PULSE	28480	9100-3262
A11T2	9100-3262	5		TRANSFORMER TRANSFORMER; TOROIDAL PULSE	28480	9100-3262
A11U1	1820-1196	8	9	IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS174N
A11U2	1826-0510	0	16	IC SWITCH ANLG QUAD 16-DIP-P	27014	LF13332N
A11U3	1826-0510	0		IC SWITCH ANLG QUAD 16-DIP-P	27014	LF13332N
A11U4	1826-0510	0		IC SWITCH ANLG QUAD 16-DIP-P	27014	LF13332N
A11U5	1826-0510	0		IC SWITCH ANLG QUAD 16-DIP-P	27014	LF13332N
A11U6	1826-0510	0		IC SWITCH ANLG QUAD 16-DIP-P	27014	LF13332N
A11U7	1820-1216	3	3	IC DCDR TTL LS 3-TO-8-LINE 3-INP	01295	SN74LS138N
A11U8	1820-1195	7	3	IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS175N
A11U9	1820-1196	8		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS174N
A11Y1				PART OF MATCHED SET		
A11Y2				PART OF MATCHED SET		
A11Y3-5	03585-82501	6	1	CRYSTALS, IF FILTER (MATCHED SET OF 5)	28480	03585-82501
				A11 MISCELLANEOUS PARTS		
	1400-0249	0	5	CABLE TIE .062-.625-DIA .091-WD NYL	28480	1400-0249
	1480-0116	8	6	PIN-GRV .062-IN-DIA .25-IN-LG STL	28480	1480-0116
	0403-0211	1	4	EXTR-PC BD BRN POLYC .062-BD-THKNS	28480	0403-0211
	0360-1653	5	20	CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1653
A12	03585-66512	5	1	IF GAIN BOARD	28480	03585-66512
A12C1	0180-1974	1	4	CAPACITOR-FXD 10UF+-10% 35VDC TA	56289	150D106X9035R2
A12C2	0180-1974	1		CAPACITOR-FXD 10UF+-10% 35VDC TA	56289	150D106X9035R2
A12C3	0180-0229	7		CAPACITOR-FXD 33UF+-10% 10VDC TA	56289	150D336X9010B2
A12C4	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C5	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z

See Section VI for ordering information
*Indicates factory selected value

Scans by ARTEK MEDIA =>

Table 7-2. A2 Replaceable Parts, IF Filter Circuits (Cont'd).

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A12C6	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C7	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C8	0140-0184	9		CAPACITOR-FXD 8200PF +-1% 100VDC MICA	72136	DM20F822F0100WV1CR
A12C9	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C10	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C11	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C12	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C13	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C14	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C15	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C16	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C17	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C18	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C19	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C20	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C21	0140-0196	3		CAPACITOR-FXD 150PF +-5% 300VDC MICA	72136	DM15F151J0300WV1CR
A12C22	0121-0142	9		CAPACITOR-V TRMR-MICA 16-150PF 175V	72136	T51417-5 REV. B
A12C23	0160-0376	3		CAPACITOR-FXD 68PF +-5% 500VDC MICA	28480	0160-0376
A12C24	0121-0131	6		CAPACITOR-V TRMR-AIR 1.2-4.2PF 350V	74970	189-0501-005
A12C25	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C26	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C27	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C28	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C29	0160-0127	2	1	CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-0127
A12C30	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C31	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C32	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C33	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C34	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C36	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C37	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C38	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C39	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C41	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C42	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C43	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C44	0140-0198	5		CAPACITOR-FXD 200PF +-5% 300VDC MICA	72136	DM15F201J0300WV1CR
A12C46	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C47	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C48	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C49	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C50	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C51	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C52	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C53	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C54	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C55	0160-2253	9	1	CAPACITOR-FXD 6.8PF +-.25PF 500VDC CER	28480	0160-2253
A12C56	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C57	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C58	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C59	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C60	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C61	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C62	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C63	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C64	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C65	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C66	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C67	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C68	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C69	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C70	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C71	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C72	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C73	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C74	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C75	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C76	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C77	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C78	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C79	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C80	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C81	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C82	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12C83*	0160-2247	1		CAPACITOR-FXD 3.9PF +-.25PF 500VDC CER	28480	0160-2247
A12C83*	0160-2250	6		CAPACITOR-FXD 5.1PF +-.25PF 500VDC CER	28480	0160-2250

See Section VI for ordering information
*Indicates factory selected value

Scans by ARTEK MEDIA =>

Table 7-2. A2 Replaceable Parts, IF Filter Circuits (Cont'd).

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A12C84	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A12CR1	1901-0376	6		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A12CR2	1901-0376	6		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A12CR3	1901-0376	6		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A12CR4	1901-0376	6		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A12CR5	1901-0376	6		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A12CR6	1901-0376	6		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A12CR7	1901-0376	6		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A12CR8	1902-3149	9		DIODE-ZNR 9.09V 5% DO-7 PD=.4W TC=+.057%	28480	1902-3149
A12CR9	1901-0518	8		DIODE-SCHOTTKY	28480	1901-0518
A12CR10	1901-0518	8		DIODE-SCHOTTKY	28480	1901-0518
A12CR11	1901-0050	3	4	DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A12CR12	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A12CR13	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A12CR14	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A12HU2	1205-0011	0	4	HEAT SINK TO-5/TO-39-CS	28480	1205-0011
A12HU7	1205-0011	0		HEAT SINK TO-5/TO-39-CS	28480	1205-0011
A12HU8	1205-0011	0		HEAT SINK TO-5/TO-39-CS	28480	1205-0011
A12HU9	1205-0011	0		HEAT SINK TO-5/TO-39-CS	28480	1205-0011
A12J1	1251-4822	6		CONNECTOR 3-PIN M POST TYPE	28480	1251-4822
	1258-0141	8	10		28480	1258-0141
A12J2	1251-4822	6		CONNECTOR 3-PIN M POST TYPE	28480	1251-4822
	1258-0141	8			28480	1258-0141
A12L1	9100-0541	7	6	COIL-MLD 250UH 10% Q=3 .25DX.5LG-NOM	28480	9100-0541
A12L2	9100-0541	7		COIL-MLD 250UH 10% Q=3 .25DX.5LG-NOM	28480	9100-0541
A12L3	9100-0541	7		COIL-MLD 250UH 10% Q=3 .25DX.5LG-NOM	28480	9100-0541
A12L4	9140-0287	2		COIL-VAR 920UH-1.08MH Q=300 PC-MTG	28480	9140-0287
A12L5	9140-0289	4		COIL-VAR 23UH-27UH Q=200 PC-MTG	28480	9140-0289
A12L6	9100-0543	9		COIL-VAR 900UH-1.1MH Q=112 PC-MTG	28480	9100-0543
A12Q1	1854-0071	7		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A12Q2	1853-0010	2		TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0010
A12Q3	1854-0071	7		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A12Q4	1854-0071	7		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A12Q5	1854-0071	7		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A12Q6	1854-0071	7		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A12R1	0699-0164	8	2	RESISTOR 738.5 .1% .125W F TC=0+-25	28480	0699-0164
A12R2	0699-0163	7	2	RESISTOR 466 .1% .125W F TC=0+-25	28480	0699-0163
A12R3	0698-8499	6	2	RESISTOR 294 .1% .125W F TC=0+-25	28480	0698-8499
A12R4	0699-0162	6	2	RESISTOR 502.7 .1% .125W F TC=0+-25	28480	0699-0162
A12R5	0757-0421	4	1	RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
A12R7	0757-0426	9		RESISTOR 1.3K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1301-F
A12R8	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A12R9	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A12R10	0683-2035	3		RESISTOR 20K 5% .25W FC TC=-400/+800	01121	CB2035
A12R11	0683-2035	3		RESISTOR 20K 5% .25W FC TC=-400/+800	01121	CB2035
A12R12	0698-3518	0		RESISTOR 7.32K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7321-F
A12R13	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A12R14	0698-4451	2		RESISTOR 340 1% .125W F TC=0+-100	24546	C4-1/8-T0-340R-F
A12R15	2100-2497	9		RESISTOR-TRMR 2K 10% C TOP-ADJ 1-TRN	73138	82PR2K
A12R16	0757-0283	6		RESISTOR 2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2001-F
A12R17	0683-3325	6		RESISTOR 3.3K 5% .25W FC TC=-400/+700	01121	CB3325
A12R18	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A12R19	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A12R20	0698-4393	1	1	RESISTOR 73.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-73R2-F
A12R21	0698-3439	4	1	RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A12R24	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A12R25	0757-0281	4	1	RESISTOR 2.74K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2741-F
A12R26	0698-3150	6	1	RESISTOR 2.37K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2371-F
A12R27	0757-0428	1		RESISTOR 1.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1621-F
A12R28	0683-1335	4	1	RESISTOR 13K 5% .25W FC TC=-400/+800	01121	CB1335
A12R29	0683-4325	8	2	RESISTOR 4.3K 5% .25W FC TC=-400/+700	01121	CB4325
A12R30	0683-2425	5	3	RESISTOR 2.4K 5% .25W FC TC=-400/+700	01121	CB2425
A12R31	0683-2425	5		RESISTOR 2.4K 5% .25W FC TC=-400/+700	01121	CB2425
A12R32	0683-2035	3		RESISTOR 20K 5% .25W FC TC=-400/+800	01121	CB2035
A12R33	0683-4325	8		RESISTOR 4.3K 5% .25W FC TC=-400/+700	01121	CB4325
A12R34	0683-1225	1		RESISTOR 1.2K 5% .25W FC TC=-400/+700	01121	CB1225
A12R35	0683-3025	3		RESISTOR 3K 5% .25W FC TC=-400/+700	01121	CB3025
A12R36	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A12R37	0683-1235	3		RESISTOR 12K 5% .25W FC TC=-400/+800	01121	CB1235
A12R38*	0698-4511	5		RESISTOR 86.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8662-F
A12R38*	0757-0464	5		RESISTOR 90.9K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9092-F
A12R38*	0757-0978	6		RESISTOR 95.3K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9532-F

See Section VI for ordering information
*Indicates factory selected value

Scans by ARTEK MEDIA =>

Table 7-2. Δ2 Replaceable Parts, IF Filter Circuits (Cont'd).

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A12R39*	0698-3161	9		RESISTOR 38.3K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3832-F
A12R39*	0698-4492	1		RESISTOR 32.4K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3242-F
A12R39*	0698-4493	2		RESISTOR 34K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3402-F
A12R39*	0757-0455	4		RESISTOR 36.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3652-F
A12R40*	0698-4470	5		RESISTOR 6.98K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6981-F
A12R40*	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A12R40*	0757-0441	8		RESISTOR 8.25K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8251-F
A12R41*	0698-4432	9		RESISTOR 2.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2101-F
A12R41*	0698-4433	0		RESISTOR 2.26K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2261-F
A12R41*	0757-0283	6		RESISTOR 2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2001-F
A12R41*	0757-0431	6		RESISTOR 2.43K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2431-F
A12R42*	0698-0082	7	1	RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
A12R42*	0698-3178	8		RESISTOR 487 1% .125W F TC=0+-100	24546	C4-1/8-T0-487R-F
A12R42*	0698-3447	4		RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A12R42*	0698-3488	3		RESISTOR 442 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A12R42*	0698-4453	4		RESISTOR 402 1% .125W F TC=0+-100	24546	C4-1/8-T0-402R-F
A12R43	0683-2025	1		RESISTOR 2K 5% .25W FC TC=-400/+700	01121	CB2025
A12R44	0683-2025	1		RESISTOR 2K 5% .25W FC TC=-400/+700	01121	CB2025
A12R45	0683-3625	9	3	RESISTOR 3.6K 5% .25W FC TC=-400/+700	01121	CB3625
A12R46	0683-6225	1	1	RESISTOR 6.2K 5% .25W FC TC=-400/+700	01121	CB6225
A12R47	0683-1045	3		RESISTOR 100K 5% .25W FC TC=-400/+800	01121	CB1045
A12R48	0683-1045	3		RESISTOR 100K 5% .25W FC TC=-400/+800	01121	CB1045
A12R49	0683-1045	3		RESISTOR 100K 5% .25W FC TC=-400/+800	01121	CB1045
A12R50	0683-1045	3		RESISTOR 100K 5% .25W FC TC=-400/+800	01121	CB1045
A12R51	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A12R52*	0698-3262	1		RESISTOR 40.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-4022-F
A12R52*	0698-4387	3		RESISTOR 60.4 1% .125W F TC=0+-100	24546	C4-1/8-T0-60R4-F
A12R52*	0757-0277	8		RESISTOR 49.9 1% .125W F TC=0+-100	24546	C4-1/8-T0-4992-F
A12R52*	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A12R52*	0757-0384	8		RESISTOR 20 1% .125W F TC=0+-100	19701	MF4C1/8-T0-20R0-F
A12R52*	0757-0388	2		RESISTOR 30.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-30R1-F
A12R53	0683-2035	3		RESISTOR 20K 5% .25W FC TC=-400/+800	01121	CB2035
A12R54	0683-4705	8		RESISTOR 47 5% .25W FC TC=-400/+500	01121	CB4705
A12R55	0683-1035	1		RESISTOR 10K 5% .25W FC TC=-400/+700	01121	CB1035
A12R56	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A12R57	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A12R58	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A12R59	0698-3492	9	1	RESISTOR 2.67K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2671-F
A12R60	0683-1045	3		RESISTOR 100K 5% .25W FC TC=-400/+800	01121	CB1045
A12R61	0683-5125	8		RESISTOR 5.1K 5% .25W FC TC=-400/+700	01121	CB5125
A12R62	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A12R63	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A12R64	0698-4446	5	3	RESISTOR 267 1% .125W F TC=0+-100	24546	C4-1/8-T0-267R-F
A12R65	2100-3349	2	3	RESISTOR-TRMR 100 10% C SIDE-ADJ 1-TRN	28480	2100-3349
A12R66	0698-4427	2	3	RESISTOR 1.65K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1651-F
A12R67	0683-2035	3		RESISTOR 20K 5% .25W FC TC=-400/+800	01121	CB2035
A12R68	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A12R69	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A12R70	0698-4446	5		RESISTOR 267 1% .125W F TC=0+-100	24546	C4-1/8-T0-267R-F
A12R71	2100-3349	2		RESISTOR-TRMR 100 10% C SIDE-ADJ 1-TRN	28480	2100-3349
A12R72	0698-4427	2		RESISTOR 1.65K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1651-F
A12R73	0683-2035	3		RESISTOR 20K 5% .25W FC TC=-400/+800	01121	CB2035
A12R74	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A12R75	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A12R76	0698-4446	5		RESISTOR 267 1% .125W F TC=0+-100	24546	C4-1/8-T0-267R-F
A12R77	2100-3349	2		RESISTOR-TRMR 100 10% C SIDE-ADJ 1-TRN	28480	2100-3349
A12R78	0698-4427	2		RESISTOR 1.65K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1651-F
A12R79	0683-2035	3		RESISTOR 20K 5% .25W FC TC=-400/+800	01121	CB2035
A12R80	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A12R81	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A12R82	0683-2035	3		RESISTOR 20K 5% .25W FC TC=-400/+800	01121	CB2035
A12R83	0683-2025	1		RESISTOR 2K 5% .25W FC TC=-400/+700	01121	CB2025
A12R84	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A12R85	0698-4484	1	1	RESISTOR 19.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1912-F
A12R86	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A12R87	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A12R88	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A12R89	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A12R90	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A12R91	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A12R92	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A12R93	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A12R94	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A12R95	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A12R96	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A12R97	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015

See Section VI for ordering information
*Indicates factory selected value

Scans by ARTEK MEDIA =>

Table 7-2. Δ2 Replaceable Parts, IF Filter Circuits (Cont'd).

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A12R98	0683-1045	3		RESISTOR 100K 5% .25W FC TC=-400/+800	01121	CB1045
A12R99	0683-5125	8		RESISTOR 5.1K 5% .25W FC TC=-400/+700	01121	CB5125
A12R100	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A12R101	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A12R102	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A12R103	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A12R104	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A12R105	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A12R106	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A12R107	0757-0415	6	1	RESISTOR 475 1% .125W F TC=0+-100	24546	C4-1/8-T0-475R-F
A12R108	0683-1035	1		RESISTOR 10K 5% .25W FC TC=-400/+700	01121	CB1035
A12R109	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A12R110	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A12R111	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A12R112	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A12R113	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A12R114	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A12R115	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A12R116	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A12R117	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A12R118	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A12R119	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A12R120	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A12R121	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A12R122	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A12RT1	0837-0086	7		THERMISTOR DISC 200-OHM TC=-4.4%/C-DEG	28480	0837-0086
A12RT2	0837-0086	7		THERMISTOR DISC 200-OHM TC=-4.4%/C-DEG	28480	0837-0086
A12RT3	0837-0086	7		THERMISTOR DISC 200-OHM TC=-4.4%/C-DEG	28480	0837-0086
A12T1	9100-3262	5		TRANSFORMER TRANSFORMER, TOROIDAL PULSE	28480	9100-3262
A12U1	1826-0510	0		IC SWITCH ANLG QUAD 16-DIP-P	27014	LF13332N
A12U2	1826-0089	8	1	IC OP AMP WB TO-99	29832	1322
A12U3	1826-0510	0		IC SWITCH ANLG QUAD 16-DIP-P	27014	LF13332N
A12U4	1826-0510	0		IC SWITCH ANLG QUAD 16-DIP-P	27014	LF13332N
A12U5	1826-0510	0		IC SWITCH ANLG QUAD 16-DIP-P	27014	LF13332N
A12U6	1826-0510	0		IC SWITCH ANLG QUAD 16-DIP-P	27014	LF13332N
A12U7	1826-0109	3	3	IC OP AMP WB TO-99	34371	HA2-2625-80593
A12U8	1826-0109	3		IC OP AMP WB TO-99	34371	HA2-2625-80593
A12U9	1826-0109	3		IC OP AMP WB TO-99	34371	HA2-2625-80593
A12U10	1826-0510	0		IC SWITCH ANLG QUAD 16-DIP-P	27014	LF13332N
A12U11	1826-0510	0		IC SWITCH ANLG QUAD 16-DIP-P	27014	LF13332N
A12U12	1820-1196	8		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS174N
A12U13	1820-1196	8		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS174N
A12U14	1820-1196	8		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS174N
A12U15	1820-1196	8		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS174N
A12U16	1820-1195	7		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS175N
A12U17	1820-1216	3		IC DCDR TTL LS 3-TO-8-LINE 3-INP	01295	SN74LS138N
A12Y1				NOT ASSIGNED		
A12Y2				NOT ASSIGNED		
A12Y3				PART OF MATCHED SET (SEE A11 PARTS LIST)		
				A12 MISCELLANEOUS PARTS		
	1480-0116	8		PIN-GRV .062-IN-DIA .25-IN-LG STL	28480	1480-0116
	0403-0211	1		EXTR-PC BD BRN POLYC .062-BD-THKNS	28480	0403-0211
	0403-0212	2	1	EXTR-PC BD RED POLYC .062-BD-THKNS	28480	0403-0212
	0360-1653	5		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1653
	6960-0080	8	1	PLUG-HOLE FL-HD FOR .185-D-HOLE TFE	28480	6960-0080
	1400-0249	0		CABLE TIE .062-.625-DIA .091-WD NYL	28480	1400-0249
A13	03585-66513	6	1	FILTER BOARD NO. 2	28480	03585-66513
A13C1	0180-1974	1		CAPACITOR-FXD 10UF+-10% 35VDC TA	56289	150D106X9035R2
A13C2	0180-1974	1		CAPACITOR-FXD 10UF+-10% 35VDC TA	56289	150D106X9035R2
A13C3	0180-0229	7		CAPACITOR-FXD 33UF+-10% 10VDC TA	56289	150D336X9010B2
A13C4	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A13C5	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A13C6	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A13C8	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A13C9	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A13C10	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A13C11	0140-0184	9		CAPACITOR-FXD 8200PF +-1% 100VDC MICA	72136	DM20F822F0100WV1CR
A13C12	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A13C13	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A13C14	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A13C15	0140-0184	9		CAPACITOR-FXD 8200PF +-1% 100VDC MICA	72136	DM20F822F0100WV1CR
A13C16	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z

See Section VI for ordering information
*Indicates factory selected value

Scans by ARTEK MEDIA =>

Table 7-2. Δ2 Replaceable Parts, IF Filter Circuits (Cont'd).

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A13C17	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A13C18	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A13C19	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A13C20	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A13C21	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A13C22	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A13C23	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A13C24	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A13C25	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A13C26	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A13C27	0140-0196	3		CAPACITOR-FXD 150PF +-5% 300VDC MICA	72136	DM15F151J0300WV1CR
A13C28	0121-0142	9		CAPACITOR-V TRMR-MICA 16-150PF 175V	72136	T51417-5 REV. B
A13C29	0160-0376	3		CAPACITOR-FXD 68PF +-5% 500VDC MICA	28480	0160-0376
A13C30	0121-0131	6		CAPACITOR-V TRMR-AIR 1.2-4.2PF 350V	74970	189-0501-005
A13C31	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A13C32	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A13C33	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A13C34	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A13C35	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A13C36	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A13C37	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A13C38	0140-0196	3		CAPACITOR-FXD 150PF +-5% 300VDC MICA	72136	DM15F151J0300WV1CR
A13C39	0121-0142	9		CAPACITOR-V TRMR-MICA 16-150PF 175V	72136	T51417-5 REV. B
A13C40	0160-0376	3		CAPACITOR-FXD 68PF +-5% 500VDC MICA	28480	0160-0376
A13C41	0121-0131	6		CAPACITOR-V TRMR-AIR 1.2-4.2PF 350V	74970	189-0501-005
A13C42	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A13C43	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A13C44	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A13C45	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A13C46	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A13C47	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A13C48	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A13C49	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A13C50	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A13C51	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A13C52	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A13C53	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A13C54	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A13C55	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A13C56	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A13C57	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A13C58	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A13C59	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A13C60	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A13C61	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A13C62	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A13C63	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A13C64	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A13C65	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A13C66*	0160-2247	1		CAPACITOR-FXD 3.9PF +-.25PF 500VDC CER	28480	0160-2247
A13C66*	0160-2250	6		CAPACITOR-FXD 5.1PF +-.25PF 500VDC CER	28480	0160-2250
A13C67*	0160-2247	1		CAPACITOR-FXD 3.9PF +-.25PF 500VDC CER	28480	0160-2247
A13C67*	0160-2250	6		CAPACITOR-FXD 5.1PF +-.25PF 500VDC CER	28480	0160-2250
A13CR1	1901-0376	6		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A13CR2	1901-0376	6		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A13CR3	1901-0376	6		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A13CR4	1901-0376	6		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A13CR5	1901-0376	6		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A13CR6	1901-0376	6		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A13CR7	1901-0376	6		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A13CR8	1901-0376	6		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A13CR9	1901-0376	6		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A13CR10	1901-0376	6		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A13CR11	1902-3149	9		DIODE-ZNR 9.09V 5% DO-7 PD=.4W TC=+.057%	28480	1902-3149
A13CR12	1901-0376	6		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A13CR13	1901-0376	6		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A13CR14	1901-0376	6		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A13CR15	1901-0376	6		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A13CR16	1901-0518	8		DIODE-SCHOTTKY	28480	1901-0518
A13CR17	1901-0518	8		DIODE-SCHOTTKY	28480	1901-0518
A13J1	1251-4822	6		CONNECTOR 3-PIN M POST TYPE	28480	1251-4822
	1258-0141	8			28480	1258-0141
A13J2	1251-4822	6		CONNECTOR 3-PIN M POST TYPE	28480	1251-4822
	1258-0141	8			28480	1258-0141
A13J3	1251-4822	6		CONNECTOR 3-PIN M POST TYPE	28480	1251-4822
	1258-0141	8			28480	1258-0141

See Section VI for ordering information
*Indicates factory selected value

Scans by ARTEK MEDIA =>

Table 7-2. Δ2 Replaceable Parts, IF Filter Circuits (Cont'd).

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A13J4	1251-4822	6		CONNECTOR 3-PIN M POST TYPE	28480	1251-4822
	1258-0141	8			28480	1258-0141
A13L1	9100-0541	7		COIL-MLD 250UH 10% Q=3 .25DX.5LG-NOM	28480	9100-0541
A13L2	9100-0541	7		COIL-MLD 250UH 10% Q=3 .25DX.5LG-NOM	28480	9100-0541
A13L3	9100-0541	7		COIL-MLD 250UH 10% Q=3 .25DX.5LG-NOM	28480	9100-0541
A13L4	9140-0289	4		COIL-VAR 23UH-27UH Q=200 PC-MTG	28480	9140-0289
A13L5	9140-0289	4		COIL-VAR 23UH-27UH Q=200 PC-MTG	28480	9140-0289
A13L6	9140-0287	2		COIL-VAR 920UH-1.08MH Q=300 PC-MTG	28480	9140-0287
A13L7	9140-0287	2		COIL-VAR 920UH-1.08MH Q=300 PC-MTG	28480	9140-0287
A13Q1	1854-0071	7		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A13Q2	1854-0071	7		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A13Q3	1854-0071	7		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A13Q4	1854-0071	7		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A13Q5	1853-0010	2		TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0010
A13Q6	1854-0071	7		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A13Q7	1854-0071	7		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A13Q8	1854-0071	7		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A13Q9	1854-0071	7		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A13Q10	1855-0081	1	1	TRANSISTOR J-FET N-CHAN D-MODE SI	01295	2N5245
A13R1	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A13R2	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A13R3	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A13R4	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A13R5	0683-5625	3	1	RESISTOR 5.6K 5% .25W FC TC=-400/+700	01121	CB5625
A13R6	0699-0164	8		RESISTOR 738.5 .1% .125W F TC=0+-25	28480	0699-0164
A13R7	0699-0163	7		RESISTOR 466 .1% .125W F TC=0+-25	28480	0699-0163
A13R8	0698-8499	6		RESISTOR 294 .1% .125W F TC=0+-25	28480	0698-8499
A13R9	0699-0162	6		RESISTOR 502.7 .1% .125W F TC=0+-25	28480	0699-0162
A13R10	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A13R11	0683-4705	8		RESISTOR 47 5% .25W FC TC=-400/+500	01121	CB4705
A13R12	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A13R13	0757-0439	4		RESISTOR 6.81K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6811-F
A13R14	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A13R15	0683-2035	3		RESISTOR 20K 5% .25W FC TC=-400/+800	01121	CB2035
A13R16	0683-2035	3		RESISTOR 20K 5% .25W FC TC=-400/+800	01121	CB2035
A13R17	0698-3518	0		RESISTOR 7.32K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7321-F
A13R18	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A13R19	0698-4451	2		RESISTOR 340 1% .125W F TC=0+-100	24546	C4-1/8-T0-340R-F
A13R20	2100-2497	9		RESISTOR-TRMR 2K 10% C TOP-ADJ 1-TRN	73138	82PR2K
A13R21	0757-0283	6		RESISTOR 2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2001-F
A13R22	0683-3325	6		RESISTOR 3.3K 5% .25W FC TC=-400/+700	01121	CB3325
A13R23	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A13R24	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A13R25	0698-3518	0		RESISTOR 7.32K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7321-F
A13R26	0698-3496	3		RESISTOR 3.57K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3571-F
A13R27	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A13R28	2100-2497	9		RESISTOR-TRMR 2K 10% C TOP-ADJ 1-TRN	73138	82PR2K
A13R29	0757-0283	6		RESISTOR 2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2001-F
A13R30	0683-3325	6		RESISTOR 3.3K 5% .25W FC TC=-400/+700	01121	CB3325
A13R31	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A13R32	0698-3558	8	1	RESISTOR 4.02K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4021-F
A13R33	0698-3540	8	1	RESISTOR 15.4K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1542-F
A13R34	0698-4436	3	1	RESISTOR 2.8K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2801-F
A13R35	0683-3935	4	1	RESISTOR 39K 5% .25W FC TC=-400/+800	01121	CB3935
A13R36	0683-1345	6	1	RESISTOR 130K 5% .25W FC TC=-800/+900	01121	CB1345
A13R37	0683-2235	5	1	RESISTOR 22K 5% .25W FC TC=-400/+800	01121	CB2235
A13R38	0683-2035	3		RESISTOR 20K 5% .25W FC TC=-400/+800	01121	CB2035
A13R39	0683-7525	6		RESISTOR 7.5K 5% .25W FC TC=-400/+700	01121	CB7525
A13R40	0683-2035	3		RESISTOR 20K 5% .25W FC TC=-400/+800	01121	CB2035
A13R41	0683-3025	3		RESISTOR 3K 5% .25W FC TC=-400/+700	01121	CB3025
A13R42	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A13R43	0683-1235	3		RESISTOR 12K 5% .25W FC TC=-400/+800	01121	CB1235
A13R44*	0698-4511	5		RESISTOR 86.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8662-F
A13R44*	0757-0464	5		RESISTOR 90.9K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9092-F
A13R44*	0757-0978	6		RESISTOR 95.3K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9532-F
A13R45*	0698-3161	9		RESISTOR 38.3K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3832-F
A13R45*	0698-4492	1		RESISTOR 32.4K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3242-F
A13R45*	0698-4493	2		RESISTOR 34K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3402-F
A13R45*	0757-0455	4		RESISTOR 36.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3652-F
A13R46*	0698-4470	5		RESISTOR 6.98K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6981-F
A13R46*	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A13R46*	0757-0441	8		RESISTOR 8.25K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8251-F
A13R47*	0698-4432	9		RESISTOR 2.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2101-F
A13R47*	0698-4433	0		RESISTOR 2.26K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2261-F
A13R47*	0757-0283	6		RESISTOR 2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2001-F
A13R47*	0757-0431	6		RESISTOR 2.43K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2431-F
A13R48*	0698-3447	4		RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A13R48*	0696-3488	3		RESISTOR 442 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A13R48*	0698-4453	4		RESISTOR 402 1% .125W F TC=0+-100	24546	C4-1/8-T0-402R-F

See Section VI for ordering information
*Indicates factory selected value

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Table 7-2. Δ2 Replaceable Parts, IF Filter Circuits (Cont'd).

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A13R49	0683-2025	1		RESISTOR 2K 5% .25W FC TC=-400/+700	01121	CB2025
A13R50	0683-2025	1		RESISTOR 2K 5% .25W FC TC=-400/+700	01121	CB2025
A13R51	0683-3625	9		RESISTOR 3.6K 5% .25W FC TC=-400/+700	01121	CB3625
A13R52	0683-6225	1		RESISTOR 6.2K 5% .25W FC TC=-400/+700	01121	CB6225
A13R53	0683-2425	5		RESISTOR 2.4K 5% .25W FC TC=-400/+700	01121	CB2425
A13R54	0683-5125	8		RESISTOR 5.1K 5% .25W FC TC=-400/+700	01121	CB5125
A13R55	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A13R56	0683-1035	1		RESISTOR 10K 5% .25W FC TC=-400/+700	01121	CB1035
A13R57*	0698-4511	5		RESISTOR 86.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8662-F
A13R57*	0757-0464	5		RESISTOR 90.9K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9092-F
A13R57*	0757-0978	6		RESISTOR 95.3K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9532-F
A13R58*	0698-3161	9		RESISTOR 38.3K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3832-F
A13R58*	0698-4492	1		RESISTOR 32.4K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3242-F
A13R58*	0698-4493	2		RESISTOR 34K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3402-F
A13R59*	0757-0455	4		RESISTOR 36.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3652-F
A13R59*	0698-4470	5		RESISTOR 6.98K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6981-F
A13R59*	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A13R59*	0757-0441	8		RESISTOR 8.25K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8251-F
A13R60*	0698-4432	9		RESISTOR 2.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2101-F
A13R60*	0698-4433	0		RESISTOR 2.26K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2261-F
A13R60*	0757-0283	6		RESISTOR 2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2001-F
A13R60*	0757-0431	6		RESISTOR 2.43K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2431-F
A13R61*	0698-3447	4		RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A13R61*	0698-3488	3		RESISTOR 442 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A13R61*	0698-4453	4		RESISTOR 402 1% .125W F TC=0+-100	24546	C4-1/8-T0-402R-F
A13R62	0683-2025	1		RESISTOR 2K 5% .25W FC TC=-400/+700	01121	CB2025
A13R63	0683-2025	1		RESISTOR 2K 5% .25W FC TC=-400/+700	01121	CB2025
A13R64	0683-3625	9		RESISTOR 3.6K 5% .25W FC TC=-400/+700	01121	CB3625
A13R65	0683-6225	1		RESISTOR 6.2K 5% .25W FC TC=-400/+700	01121	CB6225
A13R66	0683-1045	3		RESISTOR 100K 5% .25W FC TC=-400/+800	01121	CB1045
A13R67	0683-1045	3		RESISTOR 100K 5% .25W FC TC=-400/+800	01121	CB1045
A13R68	0683-1045	3		RESISTOR 100K 5% .25W FC TC=-400/+800	01121	CB1045
A13R69	0683-1045	3		RESISTOR 100K 5% .25W FC TC=-400/+800	01121	CB1045
A13R70	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A13R71	0698-4443	2	1	RESISTOR 4.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4531-F
A13R72	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A13R73	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A13R74	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A13R75	0683-4745	6	1	RESISTOR 470K 5% .25W FC TC=-800/+900	01121	CB4745
A13R76	0683-3025	3		RESISTOR 3K 5% .25W FC TC=-400/+700	01121	CB3025
A13R77	0683-4715	0	1	RESISTOR 470 5% .25W FC TC=-400/+600	01121	CB4715
A13R78	0757-0280	3	1	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A13R79	0683-6825	7	1	RESISTOR 6.8K 5% .25W FC TC=-400/+700	01121	CB6825
A13R80	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A13R81	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A13R82	0683-2025	1		RESISTOR 2K 5% .25W FC TC=-400/+700	01121	CB2025
A13R83	0683-1835	9	1	RESISTOR 18K 5% .25W FC TC=-400/+800	01121	CB1835
A13R84*	0698-3262	1		RESISTOR 40.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-4022-F
A13R84*	0698-4387	3		RESISTOR 60.4 1% .125W F TC=0+-100	24546	C4-1/8-T0-60R4-F
A13R84*	0757-0277	8		RESISTOR 49.9 1% .125W F TC=0+-100	24546	C4-1/8-T0-4992-F
A13R84*	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A13R84*	0757-0384	8		RESISTOR 20 1% .125W F TC=0+-100	19701	MF4C1/8-T0-20R0-F
A13R84*	0757-0388	2		RESISTOR 30.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-30R1-F
A13R85	0698-3510	2	2	RESISTOR 453 1% .125W F TC=0+-100	24546	C4-1/8-T0-453R-F
A13R86*	0698-3262	1		RESISTOR 40.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-4022-F
A13R86*	0698-4387	3		RESISTOR 60.4 1% .125W F TC=0+-100	24546	C4-1/8-T0-60R4-F
A13R86*	0757-0277	8		RESISTOR 49.9 1% .125W F TC=0+-100	24546	C4-1/8-T0-4992-F
A13R86*	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A13R86*	0757-0384	8		RESISTOR 20 1% .125W F TC=0+-100	19701	MF4C1/8-T0-20R0-F
A13R86*	0757-0388	2		RESISTOR 30.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-30R1-F
A13R87	0698-3510	2		RESISTOR 453 1% .125W F TC=0+-100	24546	C4-1/8-T0-453R-F
A13R88	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A13R89	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A13R90	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A13R91	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A13R92	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A13R93	0683-4705	8		RESISTOR 47 5% .25W FC TC=-400/+500	01121	CB4705
A13R94	0683-4705	8		RESISTOR 47 5% .25W FC TC=-400/+500	01121	CB4705
A13R95	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A13R96	0757-0436	1	1	RESISTOR 4.32K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4321-F
A13R97	0698-4464	7	1	RESISTOR 887 1% .125W F TC=0+-100	24546	C4-1/8-T0-887R-F
A13R98	0683-1035	1		RESISTOR 10K 5% .25W FC TC=-400/+700	01121	CB1035
A13R99	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A13R100	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A13R101	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A13R102	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A13R103	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015

See Section VI for ordering information
*Indicates factory selected value

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Table 7-2. Δ2 Replaceable Parts, IF Filter Circuits (Cont'd).

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A13RT1	0839-0026	9	1	THERMISTOR DISC 10K-OHM TC=-4.4%/C-DEG	28480	0839-0026
A13RT2	0837-0050	5	1	THERMISTOR DISC 1K-OHM TC=-4.4%/C-DEG	28480	0837-0050
A13RT3	0837-0086	7		THERMISTOR DISC 200-OHM TC=-4.4%/C-DEG	28480	0837-0086
A13RT4	0837-0086	7		THERMISTOR DISC 200-OHM TC=-4.4%/C-DEG	28480	0837-0086
A13T1	9100-3262	5		TRANSFORMER TRANSFORMER; TOROIDAL PULSE	28480	9100-3262
A13T2	9100-3262	5		TRANSFORMER TRANSFORMER; TOROIDAL PULSE	28480	9100-3262
A13U1	1820-1196	8		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS174N
A13U2	1820-1196	8		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS174N
A13U3	1820-1196	8		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS174N
A13U4	1820-1216	3		IC DCDR TTL LS 3-TO-8-LINE 3-INP	01295	SN74LS138N
A13U5	1820-1195	7		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS175N
A13U6	1826-0510	0		IC SWITCH ANLG QUAD 16-DIP-P	27014	LF13332N
A13U7	1826-0510	0		IC SWITCH ANLG QUAD 16-DIP-P	27014	LF13332N
A13U8	1826-0510	0		IC SWITCH ANLG QUAD 16-DIP-P	27014	LF13332N
A13U9	1826-0510	0		IC SWITCH ANLG QUAD 16-DIP-P	27014	LF13332N
A13U10	1820-1971	7	1	IC SWITCH ANLG QUAD 16-DIP-P	17856	DG201CJ
A13Y1-A13Y3				NOT ASSIGNED		
A13Y4				PART OF MATCHED SET(SEE A11 PARTS LIST)		
A13Y5				PART OF MATCHED SET(SEE A11 PARTS LIST)		
				A13 MISCELLANEOUS PARTS		
	1400-0249	0		CABLE TIE .062-.625-DIA .091-WD NYL	28480	1400-0249
	1480-0116	8		PIN-GRV .062-IN-DIA .25-IN-LG STL	28480	1480-0116
	0403-0211	1		EXTR-PC BD BRN POLYC .062-BD-THKNS	28480	0403-0211
	0403-0213	3	1	EXTR-PC BD ORN POLYC .062-BD-THKNS	28480	0403-0213
	1251-0600	0	9	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600

See Section VI for ordering information
*Indicates factory selected value

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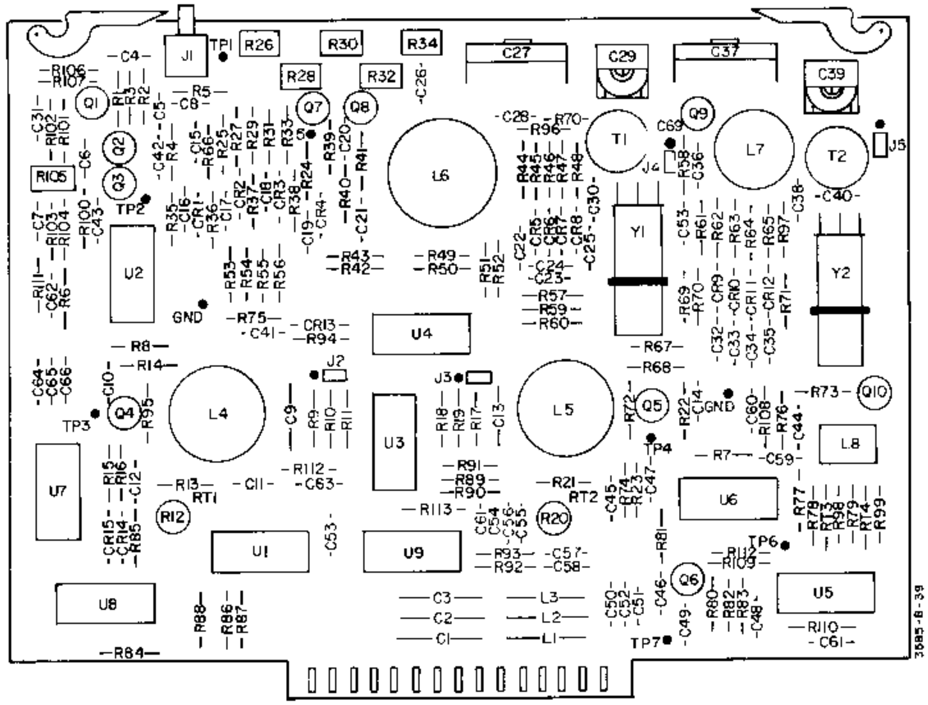
J1
TP1
R26
R30
R34
R28
R32
C27
C29
C37
C39
Q1
Q2
Q3
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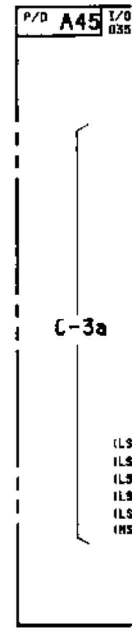
Q5
Q6
Q7
Q8
Q9
Q10
L4
L5
L6
L7
L8
T1
T2
Y1
Y2
U1
U2
U3
U4
U5
U6
U7
U8
U9
R105
R12
R20
TP2
TP3
TP4
TP6
TP7
GND
J2
J3
J4
J5
RT1
RT2

A11


P/D A45
C-3a

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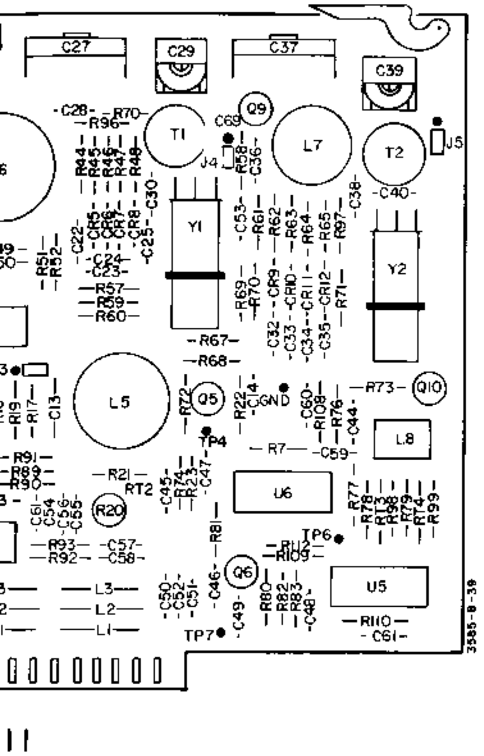

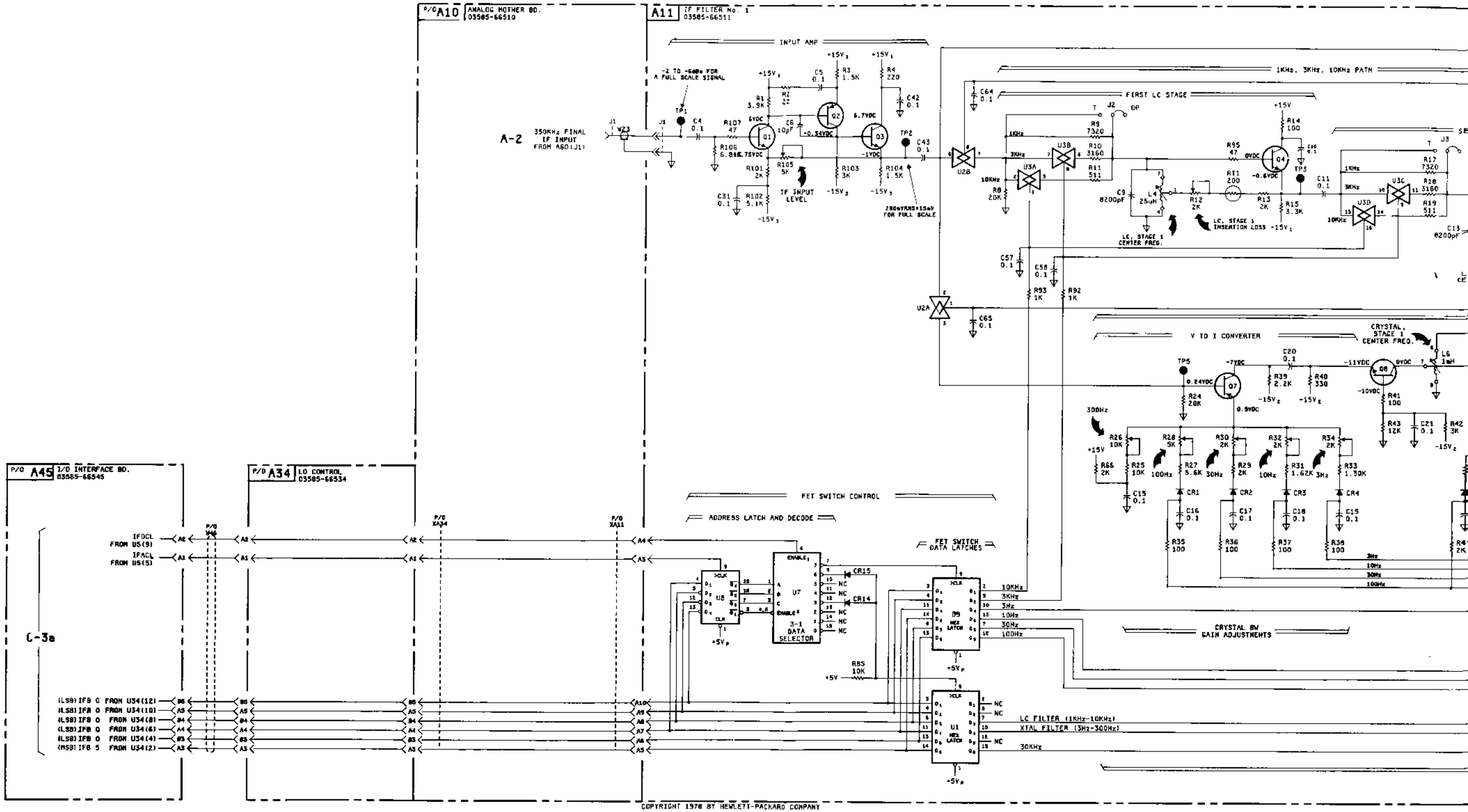

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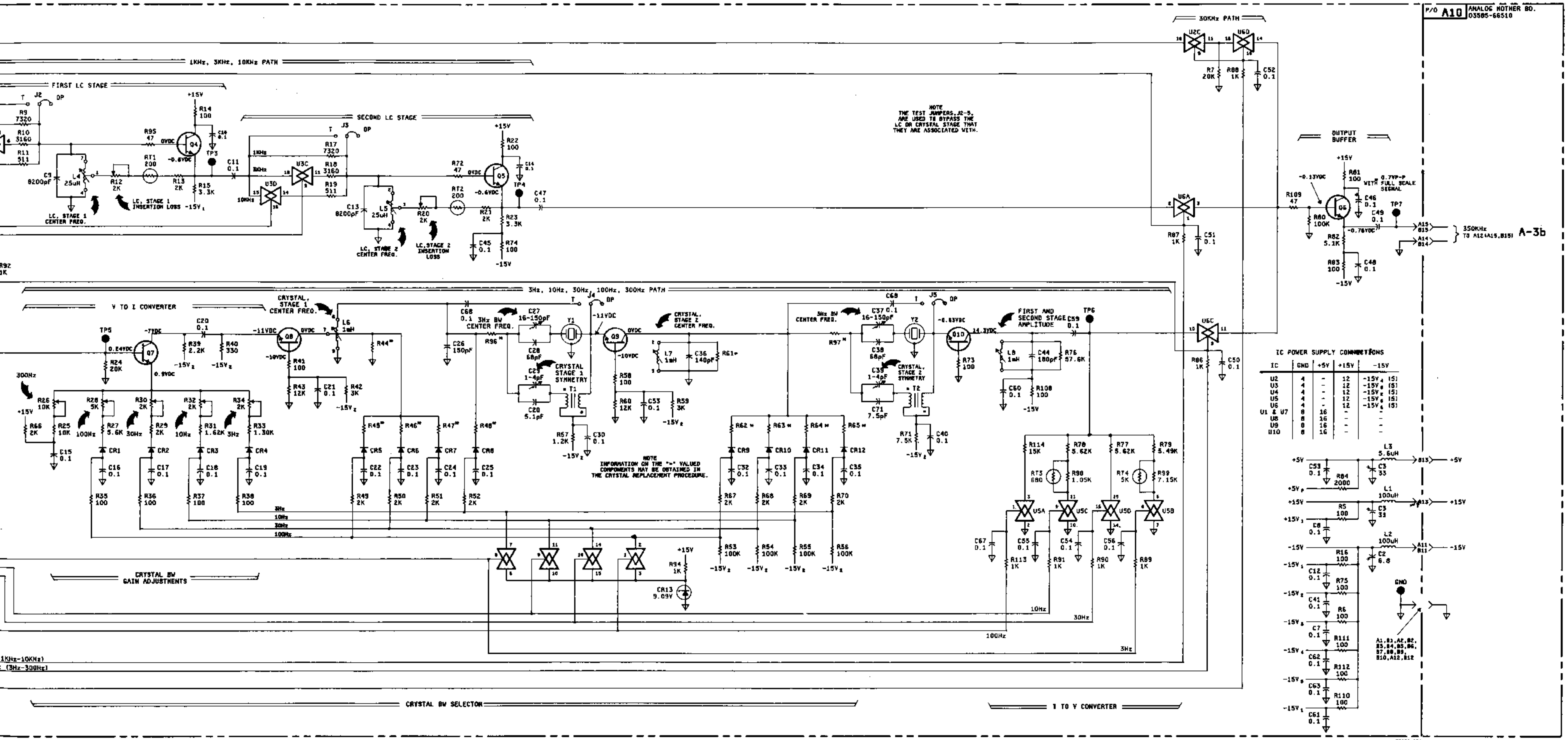

Drawing 7-2a. IF Filter No. 1 (66511)

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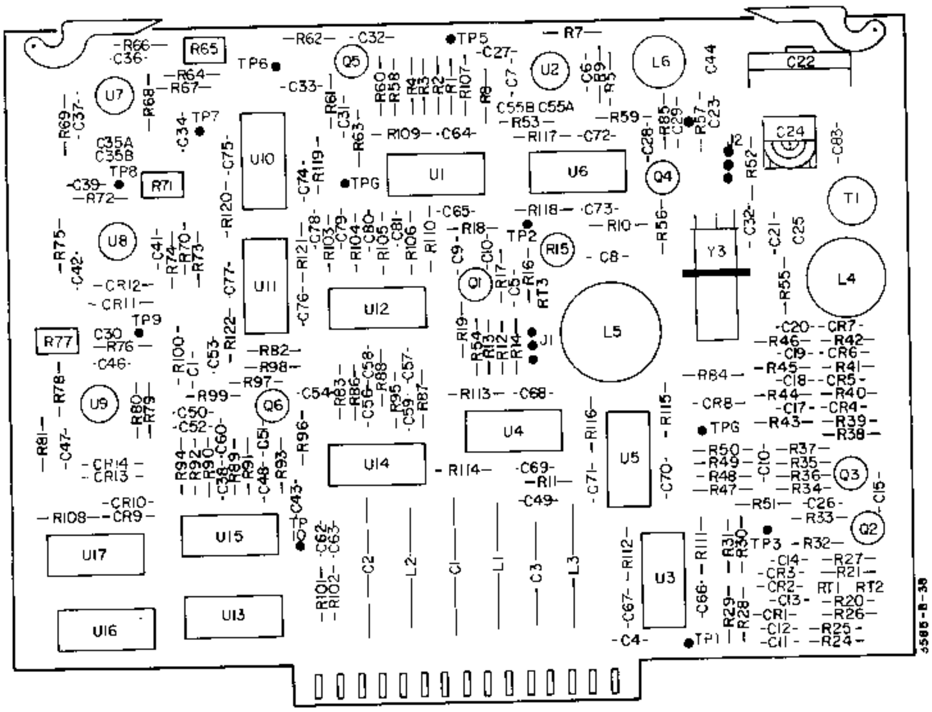

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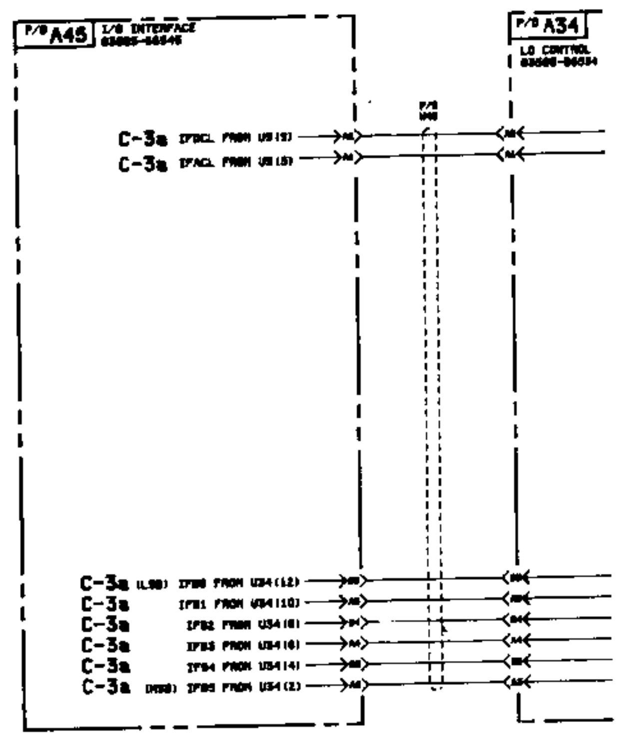

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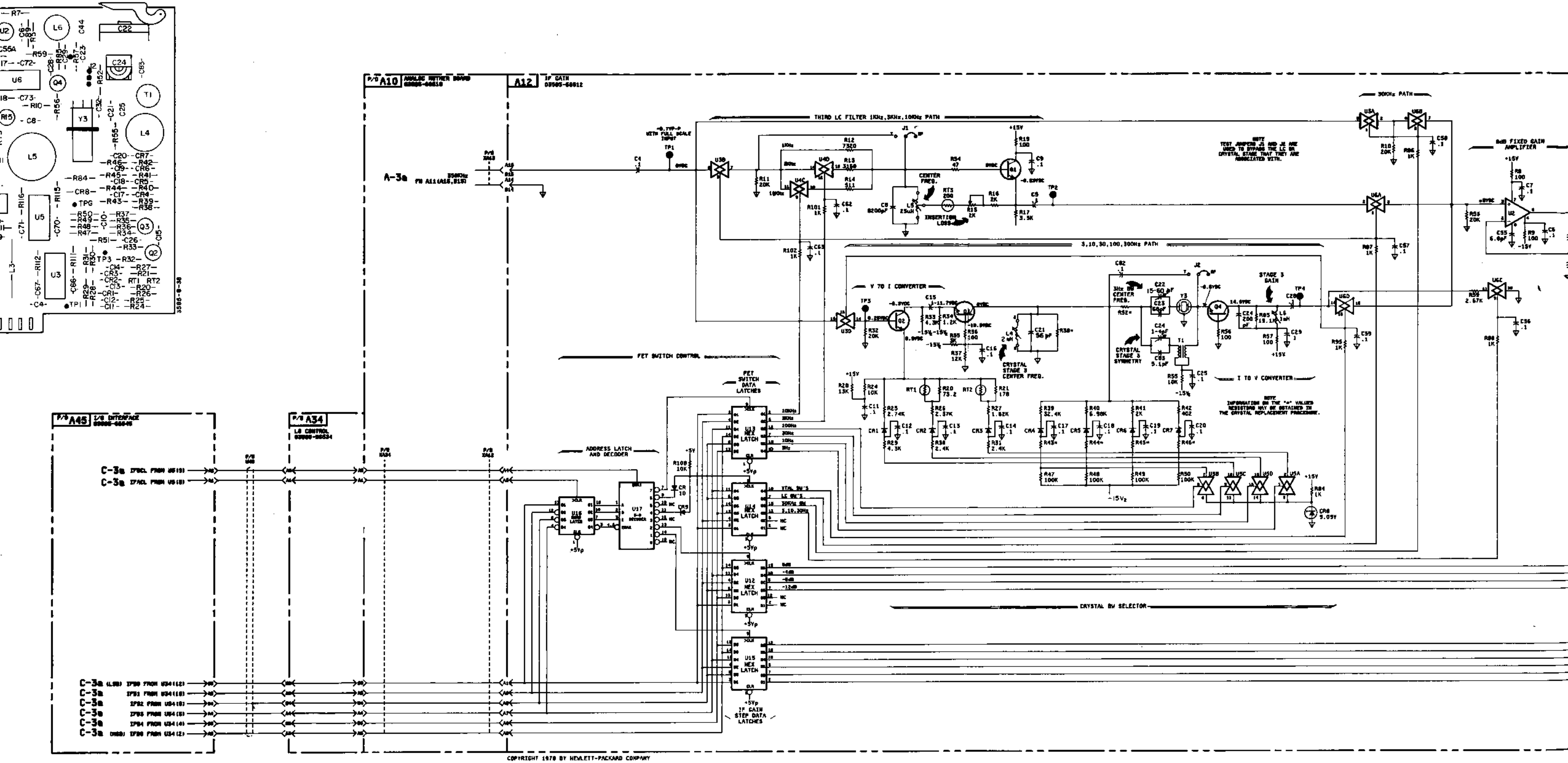

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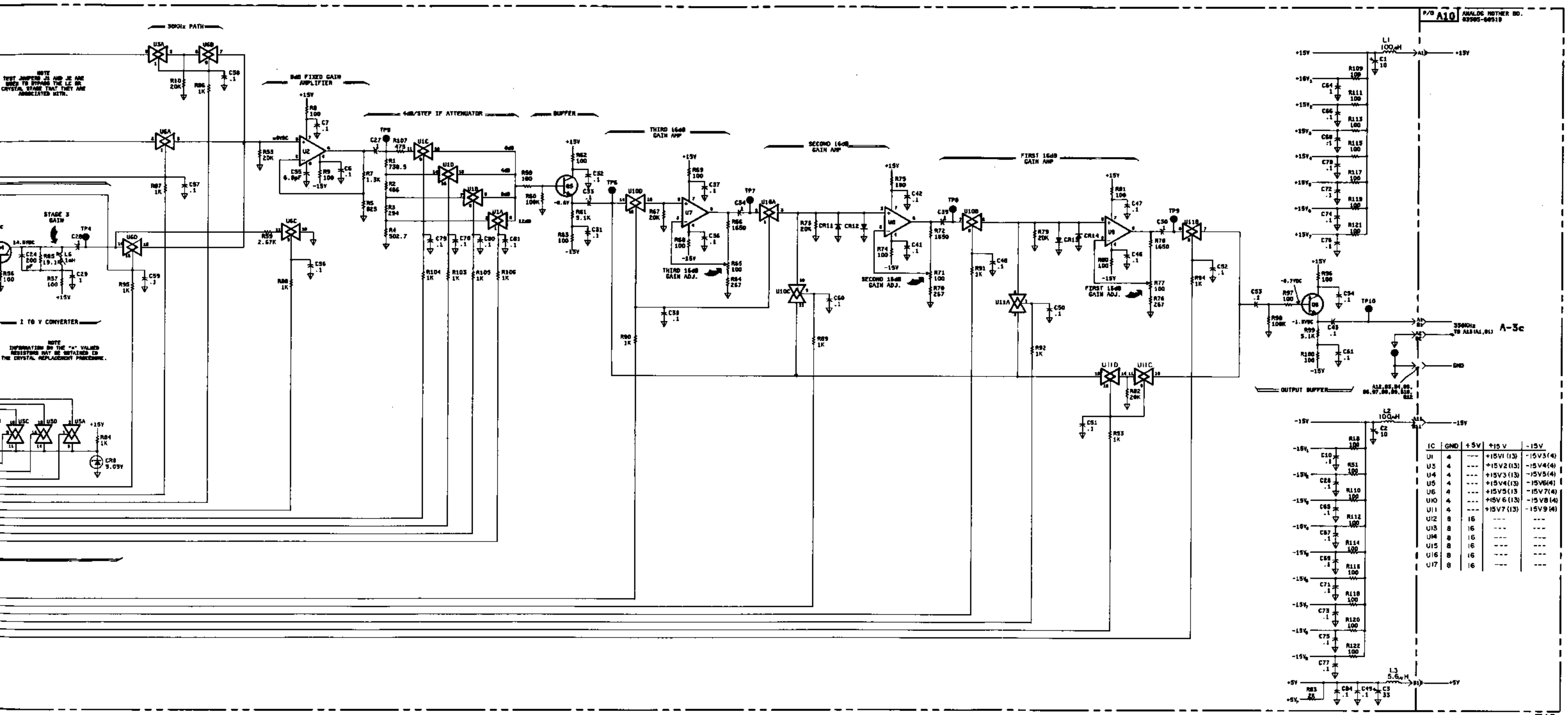

IC	GND	+5V	+15 V	-15V
U1	4	---	+15V1 (13)	-15V3 (4)
U3	4	---	+15V2 (13)	-15V4 (4)
U4	4	---	+15V3 (13)	-15V5 (4)
U5	4	---	+15V4 (13)	-15V6 (4)
U6	4	---	+15V5 (13	-15V7 (4)
U10	4	---	+15V 6 (13)	-15V8 (4)
U11	4	---	+15V7 (13)	-15V9 (4)
U12	8	16	---	---
U13	8	16	---	---
U14	8	16	---	---
U15	8	16	---	---
U16	8	16	---	---
U17	8	16	---	---

Drawing 7-2b. IF Gain (66512)

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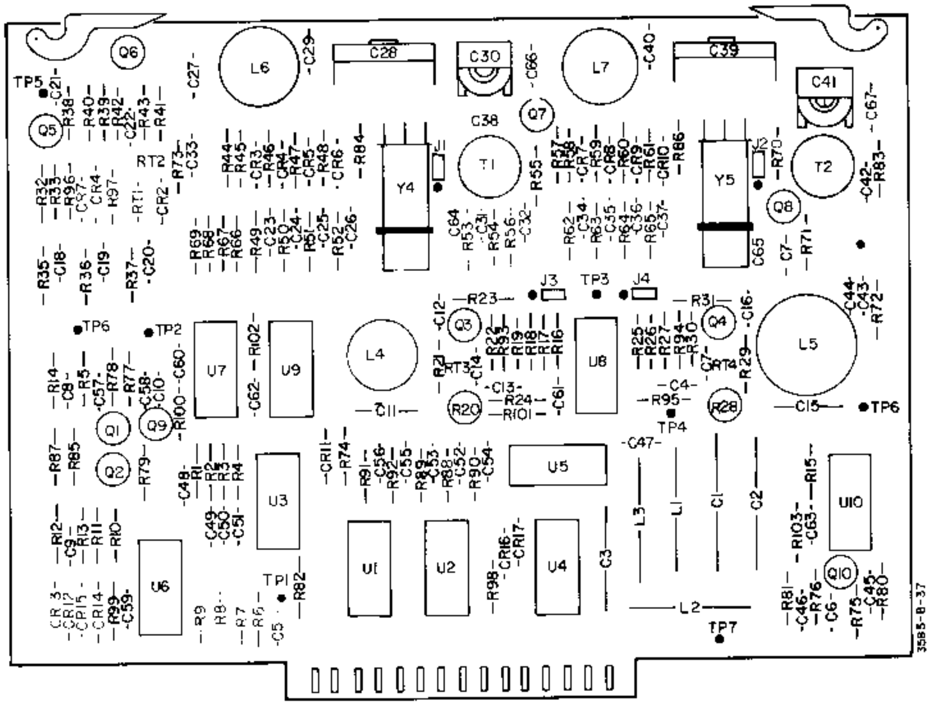
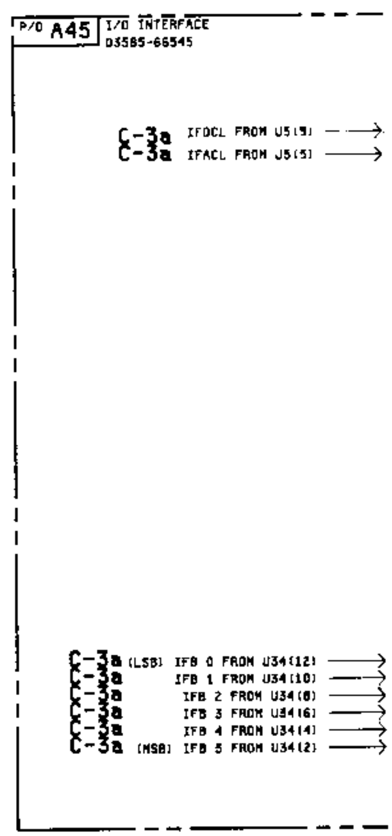


A13



Scans by ARTEK MEDIA =>

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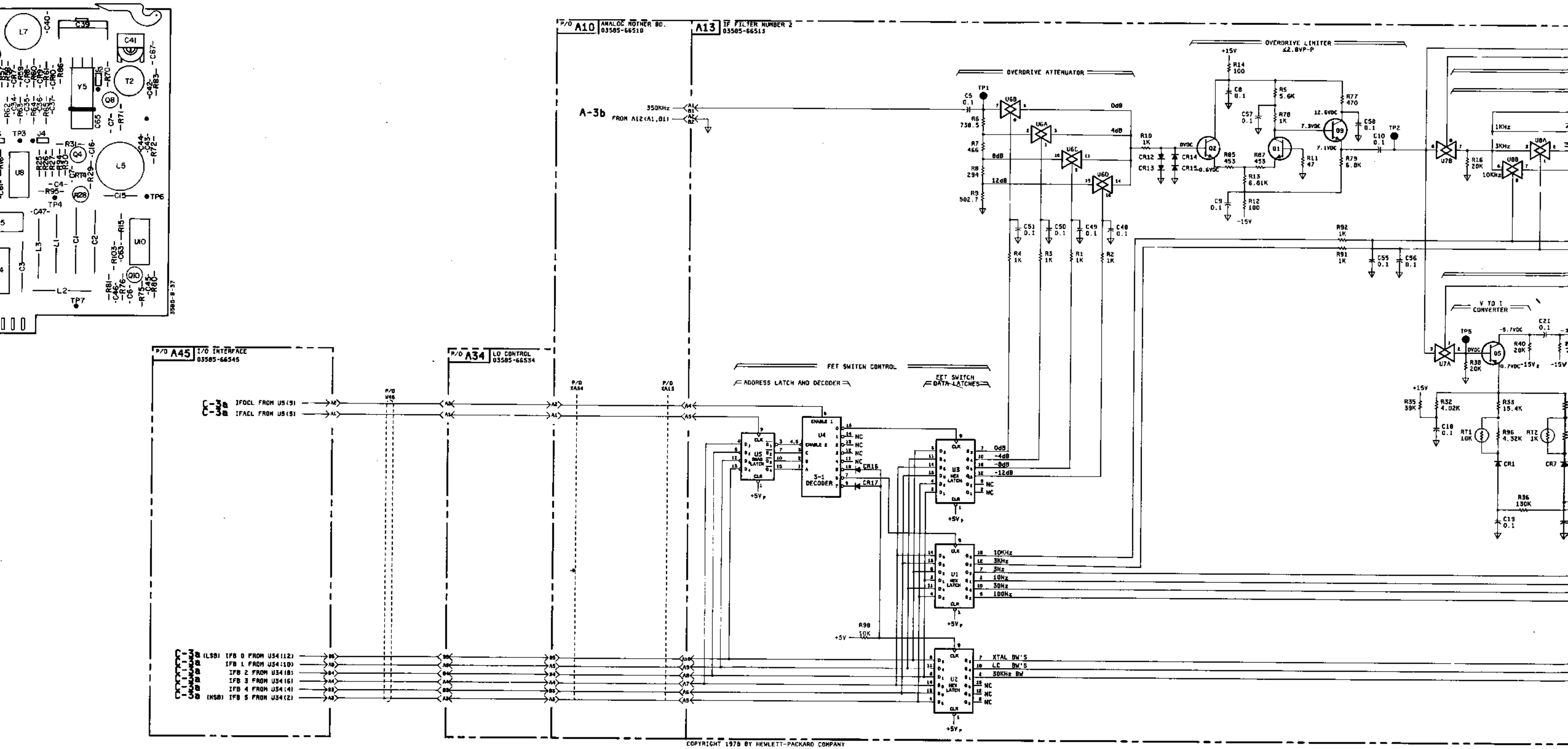

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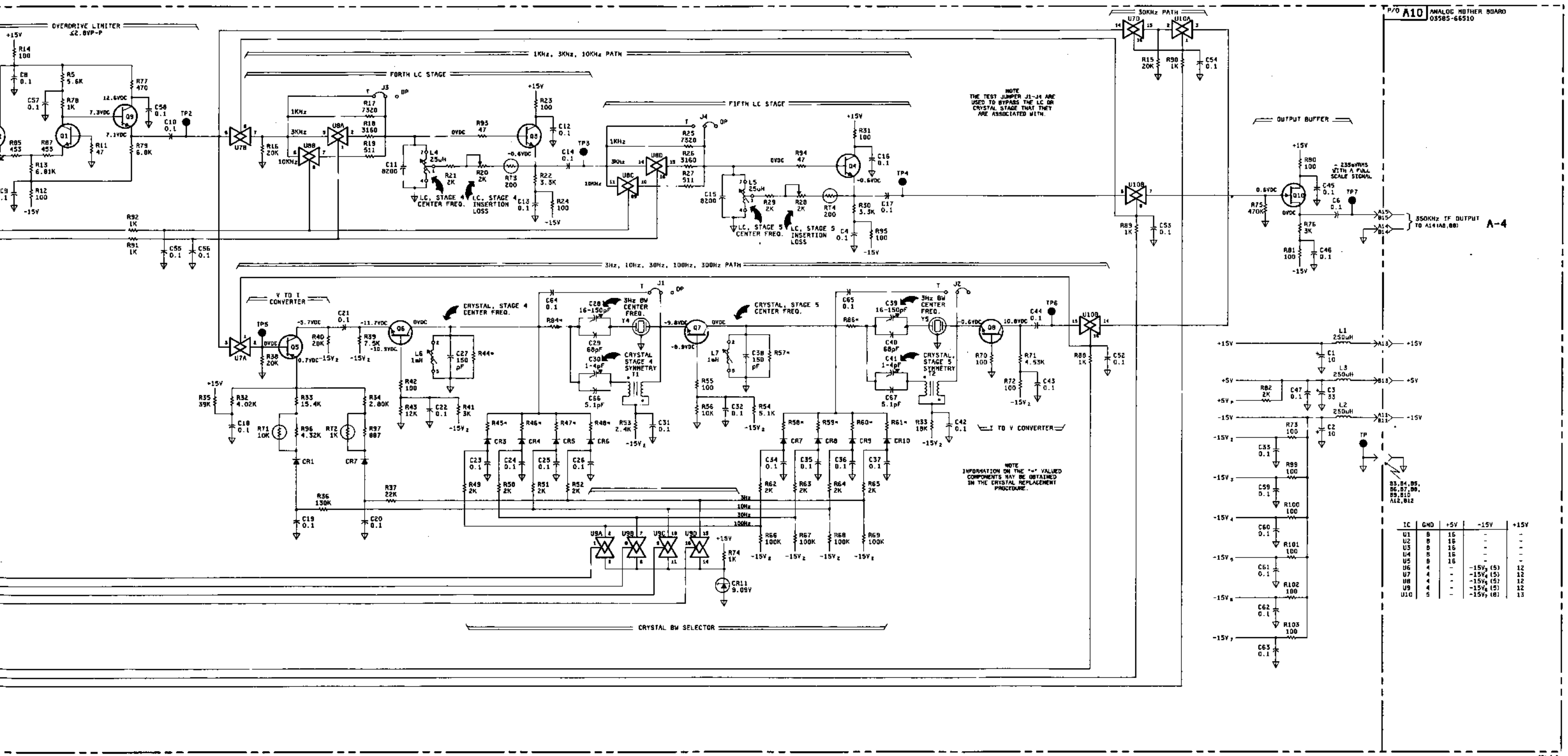

IC	GND	+5V	-15V	+15V
U1	8	16	-	-
U2	8	16	-	-
U3	8	16	-	-
U4	8	16	-	-
U5	8	16	-	-
U6	4	-	$-15V_3$ (5)	12
U7	4	-	$-15V_4$ (5)	12
U8	4	-	$-15V_5$ (5)	12
U9	4	-	$-15V_6$ (5)	12
U10	5	-	$-15V_7$ (8)	13

Drawing 7-2c. IF Filter No. 2 (66513)

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7-24. Δ3 - A2 LIMITER CIRCUIT

7-25. Applicable Serial Number

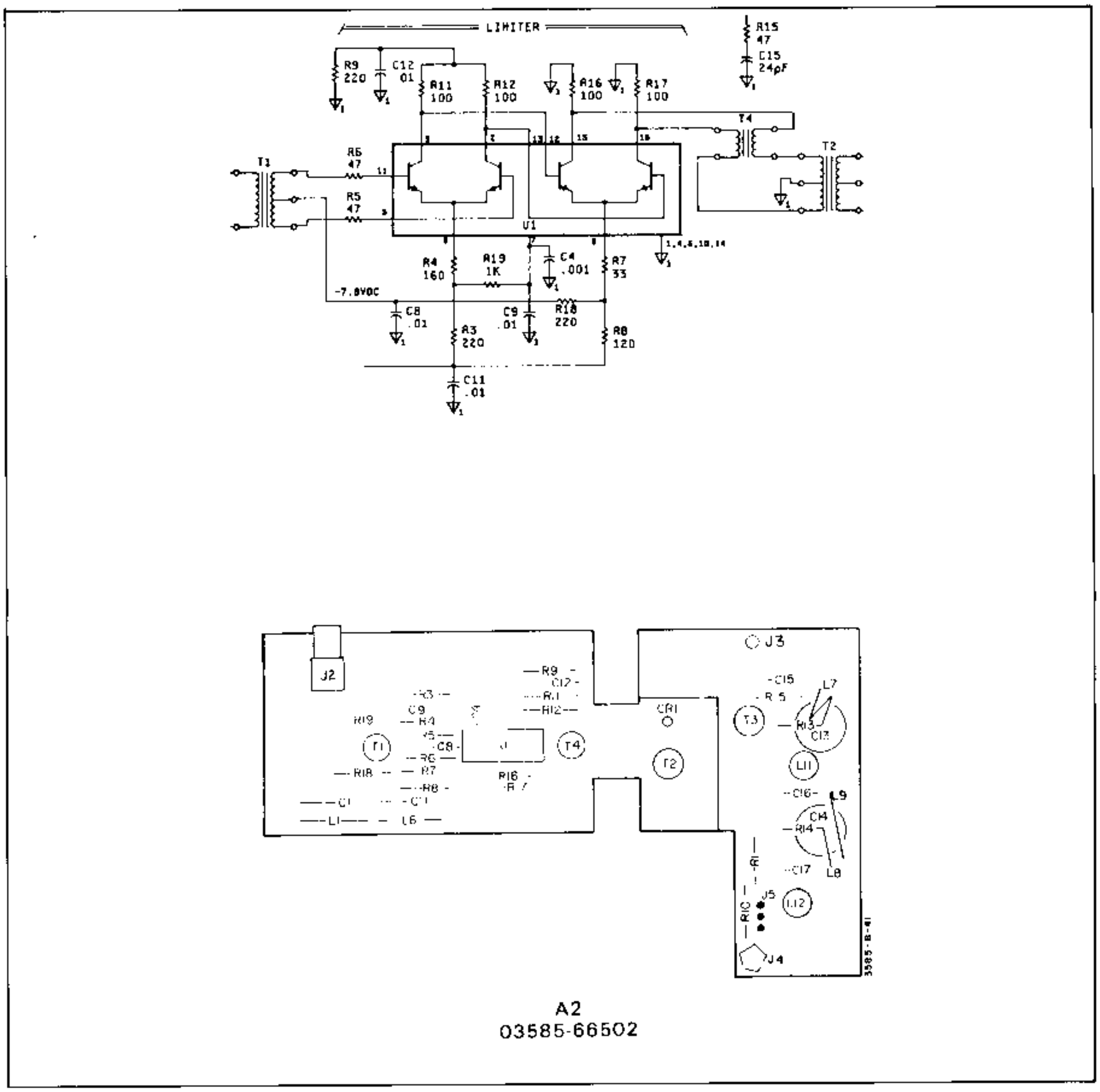
- 1750A00765 and below

7-26. Affected Manual Areas

- SG A-2 - First Mixer, Schematic A-2.
- Replaceable Parts, Table 6-3.

7-27. Description of Change

Models with serial numbers listed above have a different First Mixer limiter circuit than shown in the main schematics of this manual. Drawing 7-3 shows the limiter schematic and Table 7-3 shows the parts list for instruments with the above listed serial numbers.



Drawing 7-3. A3 Limiter Circuit

Scans by ARTEK MEDIA =>

Table 7-3. Replaceable Parts, A3 Limiter Circuit

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
C4,C8,C12	0160-3879	7	3	CAPACITOR-FXD .01UF +/-20% 100VDC CER	28480	0160-3879
C9,C11	0160-2055	9	2	CAPACITOR-FXD .01UF +80 -20% 100VDC CER	28480	0160-2055
R3	0683-2215	1	1	RESISTOR 220 5% .25W	01121	CB2215
R4	0683-1615	3	1	RESISTOR 160 5% .25W	01121	CB1615
R5,R6	0683-4705	8	2	RESISTOR 47 5% .25W	01121	CB4705
R7	0683 3305	2	1	RESISTOR 33 5% .25W	01121	CB3305
R8	0686-1215	5	1	RESISTOR 120 5% .5W	01121	EB1215
R9	0683-2715	1	1	RESISTOR 220 5% .25W	01121	CB2215
R11,R12,R16,R17	0683-1015	7	4	RESISTOR 100 5% .25W	01121	CB1015
R19	0683 1025	9		RESISTOR 1K 5% .25W	01121	CB1025
U1	1858-0015	7	1	TRANSISTOR ARRAY, SPECIAL	28480	1858-0015

See introduction to this section for ordering information
*Indicates factory selected value

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7-28. Δ4 - A51 PHASE DETECTOR

7-29. Applicable Serial Numbers

- 1750A00715 and below.

7-30. Affected Manual Areas

- SG E-1 - Phase Detector, Schematic E-1
- Replaceable Parts, Table 6-3.

7-31. Description of Change

Models with serial numbers listed above have several circuits different from the Phase Detector shown in the main schematics of this manual. Drawing 7-4 shows the Phase Detector schematic and Table 7-4 shows the parts list for instruments with the above listed serial numbers.

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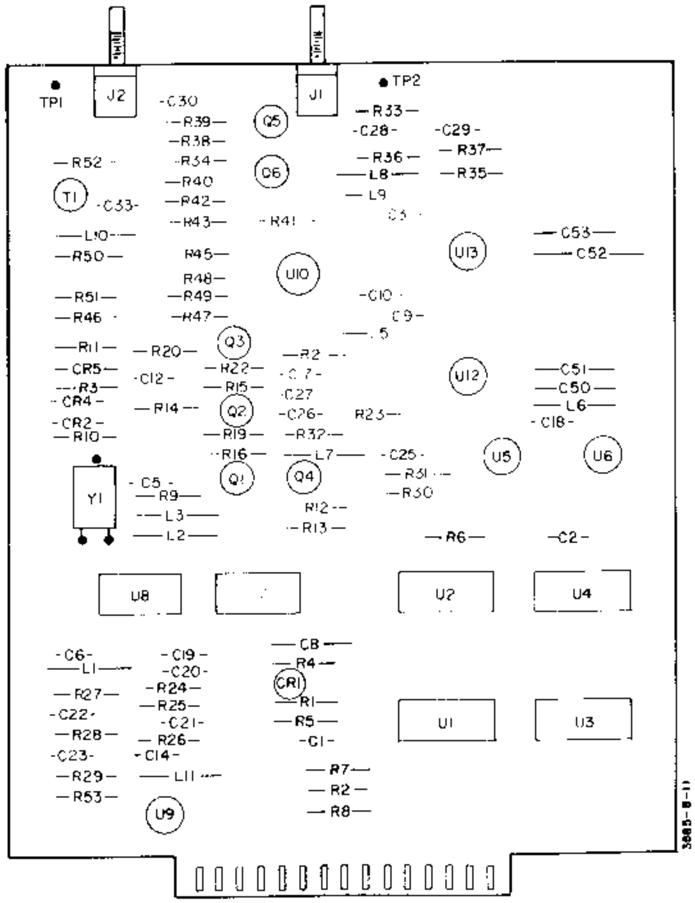

A51
03585-66551

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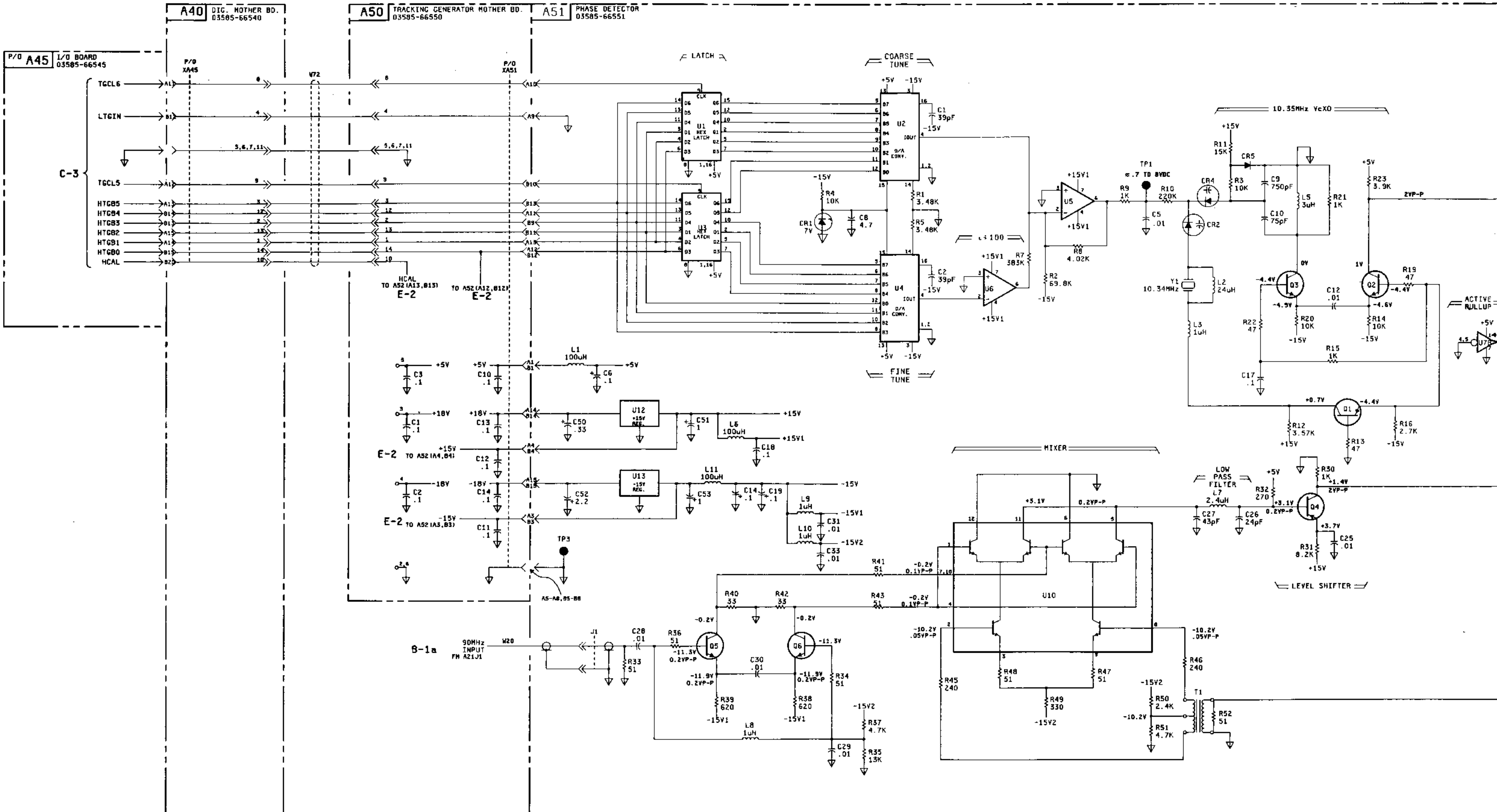

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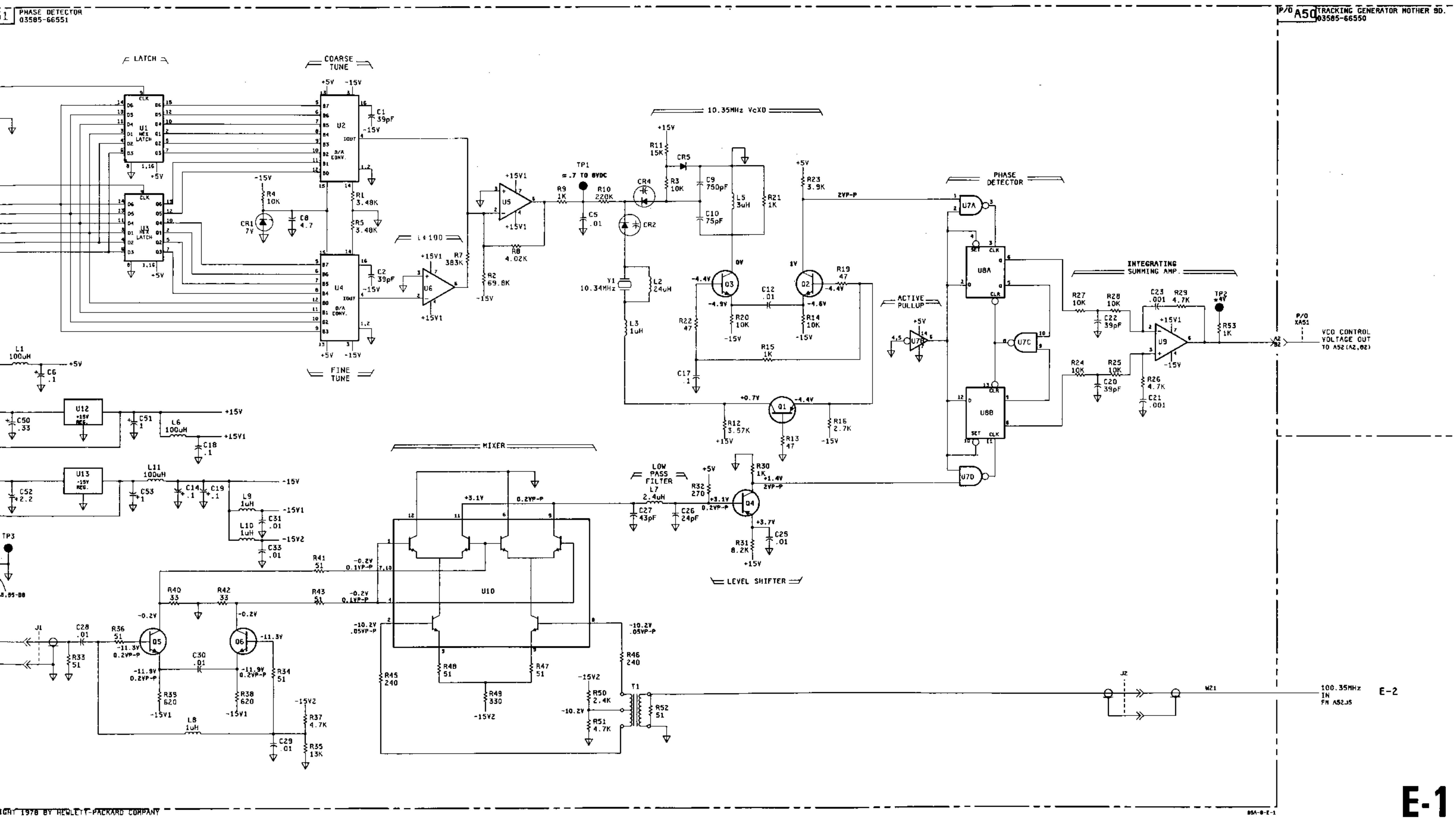

E-1

Drawing 7-4. Phase Detector (66550 & 66551)

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Table 7-4. Replaceable Parts, A51 Phase Detector

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A51	03585-66551	2	1	TRACKING GENERATOR O/A	28480	03585-66551
A51C1	0140-0190	7		CAPACITOR-FXD 39PF +-5% 300VDC MICA	72136	DM15E390J0300WV1CR
A51C2	0140-0190	7		CAPACITOR-FXD 39PF +-5% 300VDC MICA	72136	DM15E390J0300WV1CR
A51C5	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A51C6	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A51C8	0180-0309	4		CAPACITOR-FXD 4.7UF+-20% 10VDC TA	56289	150D475X0010A2
A51C9	0160-3538	5		CAPACITOR-FXD 750PF +-5% 100VDC MICA	28480	0160-3538
A51C10	0160-2202	8		CAPACITOR-FXD 75PF +-5% 300VDC MICA	28480	0160-2202
A51C12	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A51C14	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A51C17	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A51C18	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A51C19	0160-3622	8		CAPACITOR-FXD .1UF +80-20% 100VDC CER	26654	2130Y5V100R104Z
A51C20	0140-0190	7		CAPACITOR-FXD 39PF +-5% 300VDC MICA	72136	DM15E390J0300WV1CR
A51C21	0150-0050	9		CAPACITOR-FXD 1000PF +80-20% 1KVDC CER	28480	0150-0050
A51C22	0140-0190	7		CAPACITOR-FXD 39PF +-5% 300VDC MICA	72136	DM15E390J0300WV1CR
A51C23	0150-0050	9		CAPACITOR-FXD 1000PF +80-20% 1KVDC CER	28480	0150-0050
A51C25	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A51C26	0160-0196	5		CAPACITOR-FXD 24PF +-5% 300VDC MICA	28480	0160-0196
A51C27	0160-2200	6		CAPACITOR-FXD 43PF +-5% 300VDC MICA	28480	0160-2200
A51C28	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A51C29	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A51C30	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A51C31	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A51C33	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A51C50	0180-0195	6	3	CAPACITOR-FXD .33UF+-20% 35VDC TA	56289	150D334X0035A2
A51C51	0180-0291	3		CAPACITOR-FXD 1UF+-10% 35VDC TA	56289	150D105X9035A2
A51C52	0180-1846	6		CAPACITOR-FXD 2.2UF+-10% 35VDC TA	56289	150D225X9035B2
A51C53	0180-0291	3		CAPACITOR-FXD 1UF+-10% 35VDC TA	56289	150D105X9035A2
A51CR1	1902-1329	3	3	DIODE-ZNR 6.6V	28480	1902-1329
A51CR2	0122-0089	5		DIODE-VVC 29PF 10% C3/C25-MIN=5 BVR=30V	04713	MV109
A51CR4	0122-0089	5		DIODE-VVC 29PF 10% C3/C25-MIN=5 BVR=30V	04713	MV109
A51CR5	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A51J1	1250-1512	3		CONNECTOR-RF SMB M PC 50-OHM	28480	1250-1512
A51J2	1250-1512	3		CONNECTOR-RF SMB M PC 50-OHM	28480	1250-1512
A51L1	9140-0210	1		COIL-MLD 100UH 5% Q=50 .155DX.375LG-NOM	28480	9140-0210
A51L2	9100-1622	7	3	COIL-MLD 24UH 5% Q=60 .155DX.375LG-NOM	28480	9100-1622
A51L3	9100-3551	5		COIL-MLD 1UH 5% Q=50 .155DX.375LG-NOM	28480	9100-3551
A51L5	9140-0285	0	1	COIL-MLD 3UH 5% Q=33 .155DX.375LG-NOM	28480	9140-0285
A51L6	9140-0210	1		COIL-MLD 100UH 5% Q=50 .155DX.375LG-NOM	28480	9140-0210
A51L7	9140-0284	9	1	COIL-MLD 2.4UH 5% Q=33 .155DX.375LG-NOM	28480	9140-0284
A51L8	9100-3551	5		COIL-MLD 1UH 5% Q=50 .155DX.375LG-NOM	28480	9100-3551
A51L9	9100-3551	5		COIL-MLD 1UH 5% Q=50 .155DX.375LG-NOM	28480	9100-3551
A51L10	9100-3551	5		COIL-MLD 1UH 5% Q=50 .155DX.375LG-NOM	28480	9100-3551
A51L11	9140-0210	1		COIL-MLD 100UH 5% Q=50 .155DX.375LG-NOM	28480	9140-0210
A51Q1	1853-0010	2		TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0010
A51Q2	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A51Q3	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A51Q4	1853-0089	5		TRANSISTOR PNP 2N4917 SI PD=200MW	07263	2N4917
A51Q5	1854-0485	7		TRANSISTOR NPN SI TO-104 PD=175MW	28480	1854-0485
A51Q6	1854-0485	7		TRANSISTOR NPN SI TO-104 PD=175MW	28480	1854-0485
A51R1	0698-6801	0	3	RESISTOR 3.48K 1% .125W F TC=0+-25	28480	0698-6801
A51R2	0698-4504	6	1	RESISTOR 69.8K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6982-F
A51R3	0683-1035	1		RESISTOR 10K 5% .25W FC TC=-400/+700	01121	CB1035
A51R4	0683-1035	1		RESISTOR 10K 5% .25W FC TC=-400/+700	01121	CB1035
A51R5	0698-6801	0		RESISTOR 3.48K 1% .125W F TC=0+-25	28480	0698-6801
A51R6	0698-6801	0		RESISTOR 3.48K 1% .125W F TC=0+-25	28480	0698-6801
A51R7	0698-3459	8	1	RESISTOR 383K 1% .125W F TC=0+-100	28480	0698-3459
A51R8	0698-3558	8		RESISTOR 4.02K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4021-F
A51R9	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A51R10	0683-2245	7		RESISTOR 220K 5% .25W FC TC=-800/+900	01121	CB2245
A51R11	0683-1535	6		RESISTOR 15K 5% .25W FC TC=-400/+800	01121	CB1535
A51R12	0698-3496	3		RESISTOR 3.57K 1% .125W F TC=0+-100	24546	C4-1/8-T0-357R-F
A51R13	0683-4705	8		RESISTOR 47 5% .25W FC TC=-400/+500	01121	CB4705
A51R14	0683-1035	1		RESISTOR 10K 5% .25W FC TC=-400/+700	01121	CB1035
A51R15	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A51R16	0683-2725	8		RESISTOR 2.7K 5% .25W FC TC=-400/+700	01121	CB2725
A51R19	0683-4705	8		RESISTOR 47 5% .25W FC TC=-400/+500	01121	CB4705
A51R20	0683-1035	1		RESISTOR 10K 5% .25W FC TC=-400/+700	01121	CB1035
A51R21	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A51R22	0683-4705	8		RESISTOR 47 5% .25W FC TC=-400/+500	01121	CB4705
A51R23	0683-3925	2		RESISTOR 3.9K 5% .25W FC TC=-400/+700	01121	CB3925
A51R24	0683-1035	1		RESISTOR 10K 5% .25W FC TC=-400/+700	01121	CB1035
A51R25	0683-1035	1		RESISTOR 10K 5% .25W FC TC=-400/+700	01121	CB1035
A51R26	0683-4725	2		RESISTOR 4.7K 5% .25W FC TC=-400/+700	01121	CB4725
A51R27	0683-1035	1		RESISTOR 10K 5% .25W FC TC=-400/+700	01121	CB1035

See introduction to this section for ordering information
*Indicates factory selected value

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Table 7-4. Replaceable Parts, A51 Phase Detector (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A51R28	0683-1035	1		RESISTOR 10K 5% .25W FC TC=-400/+700	01121	CB1035
A51R29	0683-4725	2		RESISTOR 4.7K 5% .25W FC TC=-400/+700	01121	CB4725
A51R30	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A51R31	0683-8225	5	1	RESISTOR 8.2K 5% .25W FC TC=-400/+700	01121	CB8225
A51R32	0683-2715	6		RESISTOR 270 5% .25W FC TC=-400/+600	01121	CB2715
A51R33	0683-5105	4		RESISTOR 51 5% .25W FC TC=-400/+500	01121	CB5105
A51R34	0683-5105	4		RESISTOR 51 5% .25W FC TC=-400/+500	01121	CB5105
A51R35	0683-1335	4	2	RESISTOR 13K 5% .25W FC TC=-400/+800	01121	CB1335
A51R36	0683-5105	4		RESISTOR 51 5% .25W FC TC=-400/+500	01121	CB5105
A51R37	0683-4725	2		RESISTOR 4.7K 5% .25W FC TC=-400/+700	01121	CB4725
A51R38	0683-6215	9		RESISTOR 620 5% .25W FC TC=-400/+600	01121	CB6215
A51R39	0683-6215	9		RESISTOR 620 5% .25W FC TC=-400/+600	01121	CB6215
A51R40	0683-3305	2		RESISTOR 33 5% .25W FC TC=-400/+500	01121	CB3305
A51R41	0683-5105	4		RESISTOR 51 5% .25W FC TC=-400/+500	01121	CB5105
A51R42	0683-3305	2		RESISTOR 33 5% .25W FC TC=-400/+500	01121	CB3305
A51R43	0683-5105	4		RESISTOR 51 5% .25W FC TC=-400/+500	01121	CB5105
A51R45	0683-2415	3		RESISTOR 240 5% .25W FC TC=-400/+600	01121	CB2415
A51R46	0683-2415	3		RESISTOR 240 5% .25W FC TC=-400/+600	01121	CB2415
A51R47	0683-5105	4		RESISTOR 51 5% .25W FC TC=-400/+500	01121	CB5105
A51R48	0683-5105	4		RESISTOR 51 5% .25W FC TC=-400/+500	01121	CB5105
A51R49	0683-3315	4		RESISTOR 330 5% .25W FC TC=-400/+600	01121	CB3315
A51R50	0683-2425	5		RESISTOR 2.4K 5% .25W FC TC=-400/+700	01121	CB2425
A51R51	0683-4725	2		RESISTOR 4.7K 5% .25W FC TC=-400/+700	01121	CB4725
A51R52	0683-5105	4		RESISTOR 51 5% .25W FC TC=-400/+500	01121	CB5105
A51R53	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A51T1	08552-6044	1		TRANSFORMER, 6-TURNS	28480	08552-6044
A51TP1	0360-1653	5	3	CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1653
A51TP2	0360-1653	5		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1653
A51TP3	0360-1653	5		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1653
A51U1	1820-1196	8		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS174N
A51U2	1826-0188	8	5	CONV 8-B-D/A 16-DIP-C	04713	MC1408L-8
A51U3	1820-1196	8		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS174N
A51U4	1826-0188	8		CONV 8-B-D/A 16-DIP-C	04713	MC1408L-8
A51U5	1826-0043	4		OP AMP GP TO-99	01928	CA307T
A51U6	1826-0043	4		OP AMP GP TO-99	01928	CA307T
A51U7	1820-1197	9		IC GATE TTL LS NAND QUAD 2-INP	01295	SN74LS00N
A51U8	1820-0693	8		IC FF TTL S D-TYPE POS-EDGE-TRIG	01295	SN74S74N
A51U9	1826-0309	5	1	OP AMP WB TO-99	24355	AD518J
A51U10	1858-0004	4		TRANSISTOR ARRAY	01928	CA3049
A51U12	1826-0512	2	2	IC 78M15C V RGLTR TO-39	04713	MC78M15CG
A51U13	1826-0511	1	2	IC 79M15A V RGLTR TO-39	01295	UA79M15CLA
A51X1	0410-1137	7	1	CRYSTAL 10.340 MHZ	28480	0410-1137
				A51 MISCELLANEOUS PARTS		
	03585-04109	6	1	COVER, A51	28480	03585-04109
	0370-2583	3		KNOB	28480	0370-2583
	1205-0011	0	4	HEAT SINK TO-5/TO-39-PKG	28480	1205-0011
	2950-0078	9		NUT-HEX-DBL-CHAM 10-32-THD .067-IN-THK	28480	2950-0078
	2190-0124	4		WASHER-LK INTL T NO. 10 .195-IN-ID	28480	2190-0124
	1200-0185	9	2	INSULATOR-XSTR NYLON	28480	1200-0185

See introduction to this section for ordering information
*Indicates factory selected value

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7-32. Δ4—CRYSTAL REPLACEMENT PROCEDURE

a. The five crystals used in the IF section (A11-13 boards) are a matched set. If a defective crystal is discovered all five crystals must be replaced with a new matched set (-hp- Part Number 03585-82501).

b. When you receive your new set of crystals you will also receive a sheet similar to the one below:

Comprise Set #184		
XTAL Number	**Pad Value (Ω)**	**-hp- Part Number**
219A	97.6	0698-4402
111B	73.2	0698-4395
214A	73.2	0698-4395
76A	73.2	0698-4395
12A	84.5	0698-4397

Figure 8-A-3-4. Crystal Data Sheet Example

c. Each set is given a number. Each crystal is also identified with a small, numbered sticker on the crystal body. This number corresponds with the "XTAL Number" column in Figure 8-A-3-4.

d. Select a crystal from the new set. Using the sheet which you received with your crystal set, find the listed value of resistance required for that crystal. Table 8-A-3-5 lists the -hp-part numbers for the padding resistors used for the crystals.

Table 8-A-3-5. Crystal Padding Resistors

Resistor Value ±1%	-hp- Part Number
0	8150-3375
12.1	0757-0379
24.3	0757-0386
36.5	0757-0390
48.7	0698-4381
60.4	0698-4387
73.2	0698-4393
84.5	0698-4397
97.6	0698-4402
110.0	0757-0402

e. When you have obtained the correct padding resistor for the new crystal, replace the old crystal and associated padding resistor. The crystals and their associated padding resistors are listed in Table 8-A-3-6.

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Table 8-A-3-6. Crystal and Padding Resistor Numbers

Crystal	Padding Resistor
Y1	A11R96
Y2	A11R97
Y3	A12R52
Y4	A13R84
Y5	A13R86

f. Once the new set of crystals are installed they must be adjusted in the manner outlined in Paragraph 5-9 Volume 2.

NOTE

If the symmetry adjustment on one of the individual stages does not have enough range, execute the following procedure.

1. Attempt to adjust the symmetry. Leave the symmetry adjusting capacitor in the position which gives the best symmetry.

2. If the plates of the symmetry capacitor are fully meshed, choose a larger capacitor from the padding list. If the plates of the symmetry capacitor are fully unmeshed, choose a smaller value capacitor from the padding list (see Table 8-A-3-7 for symmetry capacitor padding lists).

Table 8-A-3-7. Symmetry Capactor Padding List

Board Number	Component Number	Component Value	-hp- Part Number
A11	C70*	3.9pF 5.1pF	0160-2247 0160-2250
A11	C71*	5.1pF 6.2pF 7.5pF	0160-2250 0160-2252 0160-2254
A12	C83*	3.9pF 5.1pF	0160-2247 0160-2250
A13	C66*,C67*	3.9pF 5.1pF	0160-2247 0160-2250

g. After adjusting the IF Filters, check the 3dB Bandwidth and Shape Factor of each Resolution BW.

1. If the 3dB Banddwidth and Shape Factor are within spec (3dB Bandwidth = Resolution Bandwidth ±20%, Shape Factor = 60dB BW/3dB BW ≤ 11:1) then you have successfully installed a new set of IF crystals.

2. If the 3dB Bandwidth or Shape Factor is out of spec, then the width of some of the filter stages may need to be changed. Generally, the bandwidth will be too wide if there is a problem.

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To check which filter stage is causing the problem, use Test Mode 09 and the jumpers on the board for each crystal stage. For example, to check the first crystal stage:

- Input the rear panel 10MHz to the 50Ω input.
- Place A11J5 in the test position.
- Enter:

RECALL 609	
INSTRUMENT PRESET	
CF STEP SIZE	1.1Hz (selects the A11 board)
FREQUENCY SPAN	50kHz*
RES. BW	300Hz*

- Check the 60dB points using the Offset function. The 60 dB points should be approximately ≤ (Res. BW* x 11). (The actual limit depends on the 3dB Bandwidth)

Each crystal stage may be checked in this manner by selecting the correct CF Step Size (1.2Hz for the A12 board, 1.3Hz for the A13 board) and the appropriate jumper.

When you find the crystal stage whose Shape Factor is too large, go to Table 8-A-3-8 and select the next smaller resistor from the padding list. One resistor is used per stage per bandwidth to determine the bandwidth (see Figure 8-A-3-5).

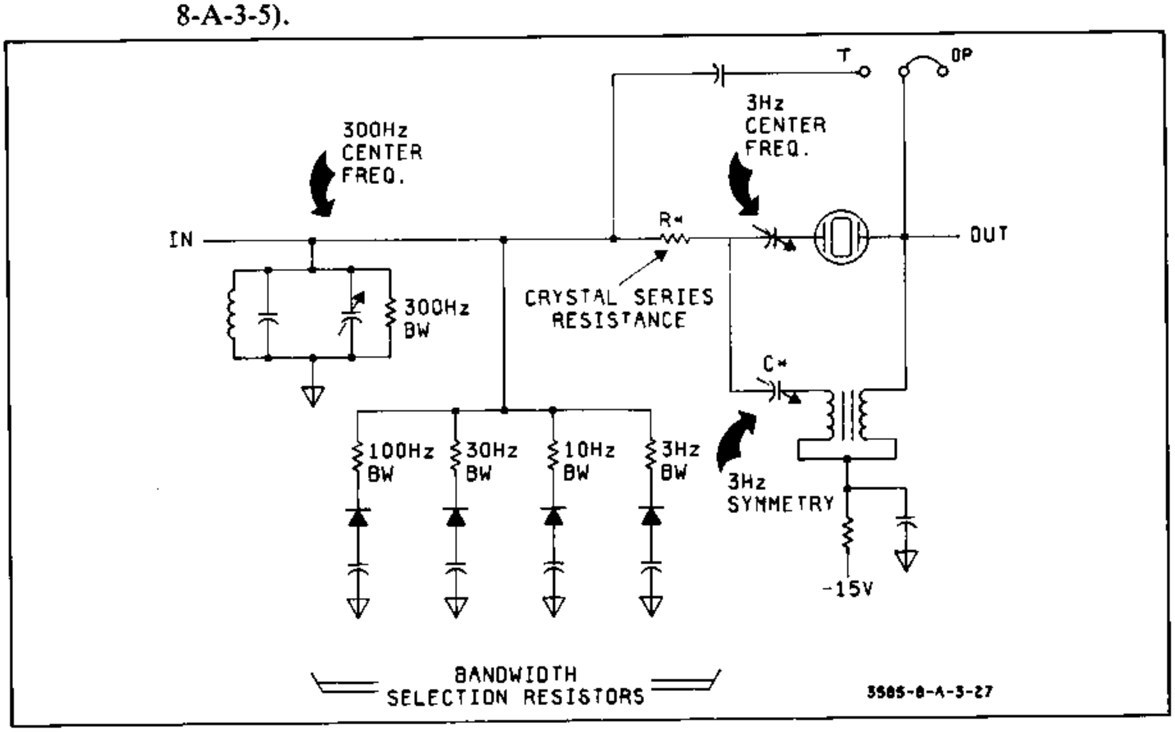

Figure 8-A-3-5. Crystal Stage

*Other Res. BW's and Frequency Spans may be used if the Shape Factor of another Crystal BW (3Hz - 300Hz) is in error.

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Table 8-A-3-8. Bandwidth Resistor Padding List

Board #	Bandwidth 300Hz	100Hz	30Hz	10Hz	3Hz
A11, Stage 1 Resistor #	R44*	R45*	R46*	R47*	R48*
Resistor Value	21.5k 22.6k 23.7k	8.06k 9.09k 10.2k	1.74k 1.87k 2.05k	499 536 576	402 422 442 464 487 511
A11, Stage 2 Resistor #	R61*	R62*	R63*	R64*	R65*
	86.6k 90.9k 95.3k	32.4k 34k 36.5k 38.3k	6.98k 7.5k 8.25k	2k 2.1k 2.26k 2.43k	402 422 442 464 487 511
A12, Stage 3 Resistor #	R38*	R39*	R40*	R41*	R42*
	86.6k 90.9k 95.3k	32.4k 34k 36.5k 38.3k	6.98k 7.5k 8.25k	2k 2.1k 2.26k 2.43k	402 422 442 464 487 511
A13, Stage 4,5 Resistor #	R44*,R57*	R45*,R58*	R46*,R59*	R47*,R60*	R48*,R61*
	86.6k 90.9k 95.3k	32.4k 34k 36.5k 38.3k	6.98k 7.5k 8.25k	2k 2.1k 2.26k 2.43k	402 422 442 464 487 511

Part Numbers for Padding Resistors.

Value	Part No.	Value	Part No.	Value	Part No.
402	0698-4453	1.87k	0698-4429	9.09k	0757-0288
422	0698-3447	2k	0757-0283	10.2k	0698-4476
442	0698-3488	2.05k	0698-4431	21.5k	0757-0199
464	0698-0082	2.1k	0698-4432	22.6k	0757-0349
487	0698-3178	2.26k	0698-4433	23.7k	0698-3158
499	0698-4123	2.43k	0757-0431	32.4k	0698-4492
511	0757-0416	6.98k	0698-4470	34k	0698-4493
536	0698-4455	7.5k	0757-0440	36.5k	0757-0455
576	0698-4457	8.06k	0698-4473	38.3k	0698-3161
1.74k	0698-3202	8.25k	0757-0441	86.6k	0698-4511
				90.9k	0757-0464
				95.3k	0757-0978

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CATHODE-RAY TUBE FAILURE REPORT

(This form must accompany all warranty claims and MFR/HEART credit claims.)

Date ____________

Submitted By (Name) ____________________________

Name of Company ____________________________

Address ____________________________

1. Hewlett-Packard Instrument Model No. ____________________
2. Hewlett-Packard Instrument Serial No. ____________________
3. Defective CRT Serial No. ______________ Part No. ______________
4. Replacement (New) CRT Serial No. ____________________
5. Please describe the failure and, if possible, show the trouble on the appropriate CRT face below.

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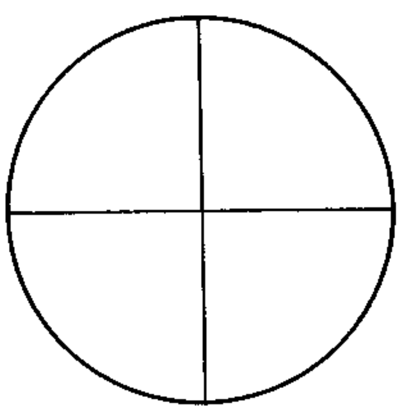

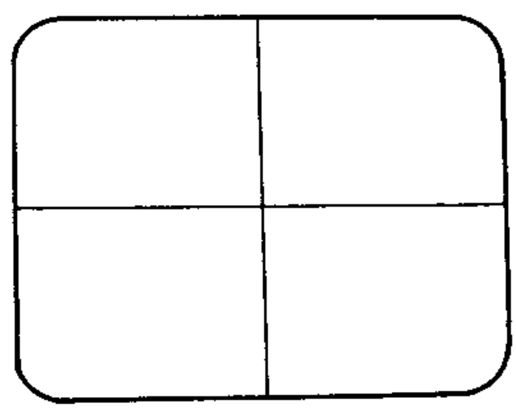

6. Is a warranty claim being made? ____________________
7. Hewlett-Packard Sales/Service Office ____________________
8. MFR, HEART or Customer Service Order Number ____________________

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