



**HEWLETT
PACKARD**

**TROUBLESHOOTING AND REPAIR MANUAL
VOLUME 1**

8566B SPECTRUM ANALYZER RF SECTION

SERIAL NUMBERS

This manual applies directly to RF sections with serial numbers prefixed 2410A.

**RF SECTION GENERAL INFORMATION
THROUGH
A8 RECTIFIER/A9 POWER LINE MODULE**

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1212 VALLEY HOUSE DRIVE, ROHNERT PARK, CALIFORNIA, 94928, U.S.A.**

**MANUAL PART NUMBER: 08566-90042
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SAFETY SYMBOLS

The following safety symbols are used throughout this manual and in the instrument. Familiarize yourself with each of the symbols and its meaning before operating this instrument.



Instruction manual symbol. The instrument will be marked with this symbol when it is necessary for the user to refer to the instruction manual in order to protect the instrument against damage. Location of pertinent information within the manual is indicated by use of this symbol in the table of contents.



Indicates dangerous voltages are present. Be extremely careful.

CAUTION

The CAUTION sign denotes a hazard. It calls attention to a procedure which, if not correctly performed or adhered to, could result in damage to or destruction of the instrument. Do not proceed beyond a CAUTION sign until the indicated conditions are fully understood and met.

WARNING

The WARNING sign denotes a hazard. It calls attention to a procedure which, if not correctly performed or adhered to, could result in injury or loss of life. Do not proceed beyond a WARNING sign until the indicated conditions are fully understood and met.

GENERAL SAFETY CONSIDERATIONS

WARNING

BEFORE THIS INSTRUMENT IS SWITCHED ON, make sure it has been properly grounded through the protective conductor of the ac power cable to a socket outlet provided with protective earth contact. Any interruption of the protective (grounding) conductor, inside or outside the instrument, or disconnection of the protective earth terminal can result in personal injury.

WARNING

There are voltages at many points in the instrument which can, if contacted, cause personal injury. Be extremely careful. Any adjustments or service procedures that require operation of the instrument with protective covers removed should be performed only by trained service personnel.

CAUTION

BEFORE THIS INSTRUMENT IS SWITCHED ON, make sure its primary power circuitry has been adapted to the voltage of the ac power source. Failure to set the ac power input to the correct voltage could cause damage to the instrument when the ac power cable is plugged in.

HP 8566B SPECTRUM ANALYZER DOCUMENTATION OUTLINE

Included with the HP Model 8566B Spectrum Analyzer are three manuals: the Operator's Handbook, the Operating and Programming Manual, and the Tests and Adjustments Manual. Not included with the instrument, but available at no charge upon return of the enclosed order card, is the two-volume Troubleshooting and Repair Manual.

OPERATOR'S HANDBOOK (HP Part Number 08566-90045)

Contents:

General Information, Installation, Quick Reference, Specifications, and Operation Verification. Available as separate publications are Specifications (HP Part Number 08566-90046), Operation Verification (HP Part Number 08566-60008), and a pocket-sized version of the Quick Reference Guide.

OPERATING AND PROGRAMMING MANUAL (HP Part Number 08566-90040)

Contents:

Manual and remote operation, including complete syntax and command description. Accompanying this manual is the separate, pocket-sized Quick Reference Guide (HP Part Number 5955-8970).

TESTS AND ADJUSTMENTS MANUAL (HP Part Number 08566-90051)

Contents:

Electrical performance testing and adjustment procedures.

TROUBLESHOOTING AND REPAIR MANUAL (HP Part Number 08566-90042)

Contents:

IF-Display Section and RF Section service information.

CONTENTS

Volume 1

Contents

RF Section	
General Information	General information on the contents of the manual, including storage, shipment, and packaging.
Signature Analysis	
Description	An explanation of the use of Signature Analysis diagrams for digital troubleshooting.
Spectrum Analyzer	
Overall Troubleshooting	Troubleshooting index, special messages, diagnostic functions, error correction routine, sweep system block diagram and troubleshooting, mnemonics listing, and Spectrum Analyzer Overall Block Diagram.
RF Section Analog	
Troubleshooting	Phase lock loop operation, start frequency tuning equations, and phase lock troubleshooting.
RF Section Digital	
Troubleshooting	Instrument preset checks, digital storage verification, and RF Digital Troubleshooting Block Diagram.
A5 Front Panel through A23 Motherboard	Service sheets containing circuit descriptions, troubleshooting information (if applicable), replacement procedures (if applicable), replaceable parts lists, parts identification (if applicable), signature analysis troubleshooting diagrams (if applicable), block diagrams, component locations, and schematic diagrams.
General Parts Listing	Replaceable parts information, reference designations and abbreviations, Manufacturer's Code List, RF Miscellaneous Parts List, RF Assemblies Parts List, and instrument parts identification.
Major Assembly and Component Locations	RF Section major assembly and component locations.

Volume 2

IF-Display Section	
General Information	General information on manual contents, instrument storage and shipment.
Signature Analysis	
Description	An explanation of the use of Signature Analysis diagrams for digital troubleshooting.
IF Overall Block Diagram	Mnemonic Table, Instrument Bus Pin Connection Table, and Overall IF Block Diagram.
A1 Display Section	
Block Diagram	A1 Display Section Troubleshooting information, Block Diagram, and A1A1 through A1A10 service sheets.

A3 Digital Storage Troubleshooting	A3 Digital Storage Troubleshooting information, Block Diagram, and A3A1 through A3A10 service sheets.
A4 IF Section Troubleshooting	A4 Section Block Diagram, and A4A1 through A4A10 service sheets.
General Parts Listing	Replaceable parts information, and parts identification figures.
Major Assembly and Component Locations	Major assembly identification figure.

RF SECTION GENERAL INFORMATION SERVICE

INTRODUCTION

This volume of the Troubleshooting and Repair Manual contains information for the troubleshooting and repair of the RF Section of the instrument. This information is combined in service sheets and indexed with tabs for quick reference. Also contained in this volume are overall troubleshooting information and illustrations of the instrument useful in isolating failures to the RF or IF-Display Section.

SERVICE SHEETS

The service sheets in this manual are organized in alphanumeric order and are indexed with tabs to make it easy to locate a specific service sheet. Each of the service sheets contain the following information:

- Circuit Description (where practical)
- Replacement Procedure (where practical)
- Troubleshooting Hints (where practical)
- Replaceable Parts List
- Component Location Illustration
- Parts Identification (where practical)
- Block Diagram (where practical)
- Schematic Diagram

Also included, where applicable, are Signature Analysis Diagrams for troubleshooting digital circuits.

REPLACEMENT PROCEDURES

Replacement procedures are included for use in removing and replacing assemblies for repair. They are located in the following sections:

- A5 Front Panel
 - Front Panel Removal and Repair
- A6 RF Module
 - A6 RF Module Replacement
 - A6A1 Coaxial Switch and A6A17 300 MHz BPF Replacement
 - A6A2 RF Attenuator Replacement
 - A6A4 Second Converter Replacement
 - A6A6 First Converter Replacement
 - A6A15 3.6 GHz BPF, A6A16 1.5 GHz LPF, and A6A18 LPF Replacement

- A6A3 Last Converter
 - A6A3 Last Converter Replacement

- A6A7 YTX Current Driver/A6A5 ACLU/A6A8 YTX
 - A6A5 Amplifier/Coupler/Load Unit (ACLU) Replacement
 - A6A7 YTX Current Driver Replacement
 - A6A8 YTX Replacement

- A7M/N-Reference/A22 10 MHz Frequency Standard
 - A7 M/N-Reference Replacement
 - A22 10 MHz Standard Replacement

- A8 Rectifier/A9 Power Line Module
 - RF Section Internal Fuse Replacement
 - Transformer Replacement
 - Power Transistor Replacement

- A11 YTO Loop
 - A11 YTO Loop and A11A3 YTO (2.0 – 6.2 GHz Oscillator) Replacement

- A17 Positive Regulator
 - RF Section Internal Fuse Replacement

- A18 Negative Regulator
 - RF Section Internal Fuse Replacement

MAJOR ASSEMBLY AND COMPONENT LOCATIONS

Major assembly and component location illustrations for the RF Section are located at the rear of both volumes.

TROUBLESHOOTING

Troubleshooting information for the RF Section is divided into three levels as follows:

- Instrument Level
 - Signature Analysis Description
 - Spectrum Analyzer Overall Troubleshooting

Section Level

RF Section Analog Troubleshooting
 RF Section Digital Troubleshooting
 A6 RF Module
 A7 M/N-Reference/A22 10 MHz Frequency
 Standard
 A10 20/30 Synthesizer
 A11 YTO Loop

Assembly Level

Most assemblies have troubleshooting hints immediately following circuit descriptions. Troubleshooting information is also located on assembly level block diagrams, notes, and schematics.

All assemblies are indexed by tab except for the ones listed below. The index tab they can be found under is also listed.

PRINTED CIRCUIT BOARD EDGE CONNECTOR CONTACT CLEANING

MATERIALS:

- Lint-free cloth or equivalent (HP Part Number 9310-0039, Check Digit 3).
- Solution of 80% electronics-grade isopropyl alcohol and 20% water.
- Static-free work station.

PROCEDURE:

1. Dampen the cloth with the alcohol and water solution and scrub the edge connector contacts vigorously, using a circular motion. Polish one side of the board at a time until the contacts shine, keeping the cloth damp to dissolve contaminants and reduce static electricity.
2. Using a clean cloth, dry the contacts by wiping from their inside to outside edge. This prevents particles from building up on the contact edges.

CAUTION

Do not use erasers to clean the edge connectors. They cause microscopic damage to the contact surface, removing the thin gold plating and exposing the nickel under-plating, which eventually corrodes. Erasers also leave a film on the contact and generate static electricity.

Do not use paper of any kind to clean the edge connector contacts. Paper or lint particles left on the edge contact surface can cause intermittent electrical connections.

Do not touch contact or trace surfaces with bare hands. Always handle the board by its edges.

SIGNATURE ANALYSIS

This instrument has been designed to incorporate signature analysis. Signature analysis diagrams are included in the appropriate sections. For explanation on the use of these diagrams, refer to the Signature Analysis Description Tab.

HP-IB ADDRESS SELECTION

The HP-IB address for the HP 8566B is preset at the factory by means of a five-segment binary switch located on the A15 Processor Assembly. This switch is set to the binary number 11111 which corresponds to a decimal equivalent of 31. The number 31 is a special instruction code that commands the instrument to use the last input address stored in memory. This stored HP-IB address is ASCII 2R (decimal 18) and determines the address to be used on "power up."

TABLE 1. ASSEMBLY LOCATIONS

Assembly	Location
A29	A15 Controller
A24	General Parts Listing
A10A9	General Parts Listing
T1	A8 Rectifier/A9 Power Line Module

The HP-IB address may be changed to any of the addresses listed in Table 2 by resetting the HP-IB address switch to correspond to the binary equivalent of the desired ASCII character or decimal value as

indicated in the table. The five-segment switch is illustrated in Figure 1 and is shown in its preset position (decimal 31).

TABLE 2. CROSS-REFERENCE BETWEEN ASCII, DECIMAL, AND BINARY ADDRESS CODES

ASCII CHARACTER		DECIMAL VALUE	5-BIT BINARY EQUIVALENT
@	SP	00	00000
A	!	01	00001
B	"	02	00010
C	#	03	00011
D	\$	04	00100
E	%	05	00101
F	&	06	00110
G	'	07	00111
H	(08	01000
I)	09	01001
J	*	10	01010
K	+	11	01011
L	,	12	01100
M	-	13	01101
N	.	14	01110
O	/	15	01111
P	0	16	10000
Q	1	17	10001
R	2	18	10010
S	3	19	10011
T	4	20	10100
U	5	21	10101
V	6	22	10110
W	7	23	10111
X	8	24	11000
Y	9	25	11001
Z	:	26	11010
[;	27	11011
\	<	28	11100
]	=	29	11101
(>	30	11110

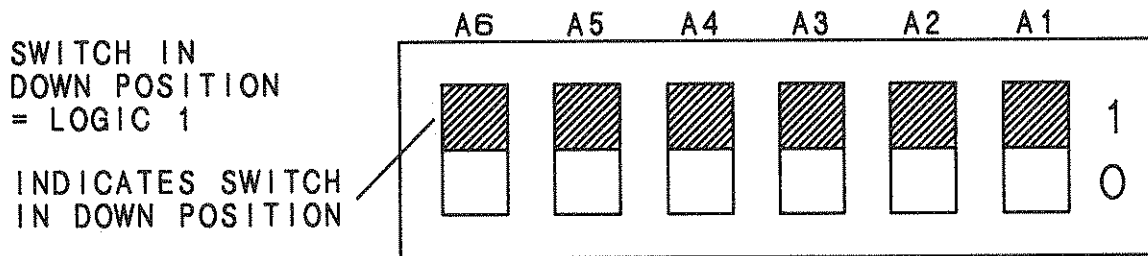


FIGURE 1. HP-IB ADDRESS SWITCH (SHOWN IN FACTORY PRESET POSITION)

The HP-IB address may also be changed from the front panel or programmed via a controller using a special shift key function (KSP). This address remains in effect as long as the instrument memory has power from either the ac line or the internal battery. However, if this stored address is lost, the default address is the factory preset decimal 18 (ASCII 2R). For additional information on the HP-IB address, refer to the Operating and Programming Manual.

STORAGE AND SHIPMENT

Environment

The instrument may be stored or shipped in environments within the following limits:

Temperature	-40°C to +75°C
Humidity	5% to 90% at 0° to 40°C
Altitude	Up to 15,240 meters (50,000 feet)

The instrument should be protected from temperature extremes which might cause condensation within the instrument.

Original Packaging

It is recommended that the original factory packaging materials be retained for use when shipping the instrument. If original packaging material cannot be retained, packaging materials identical to those used in factory packaging are available through the Hewlett-Packard offices. Part numbers and descriptions of the packaging materials are listed in Figure 2.

The combined weight of the two instrument sections is approximately 50 kg (112 lbs). Because of the weight involved, do not package the instrument sections fastened together as one unit. The instrument

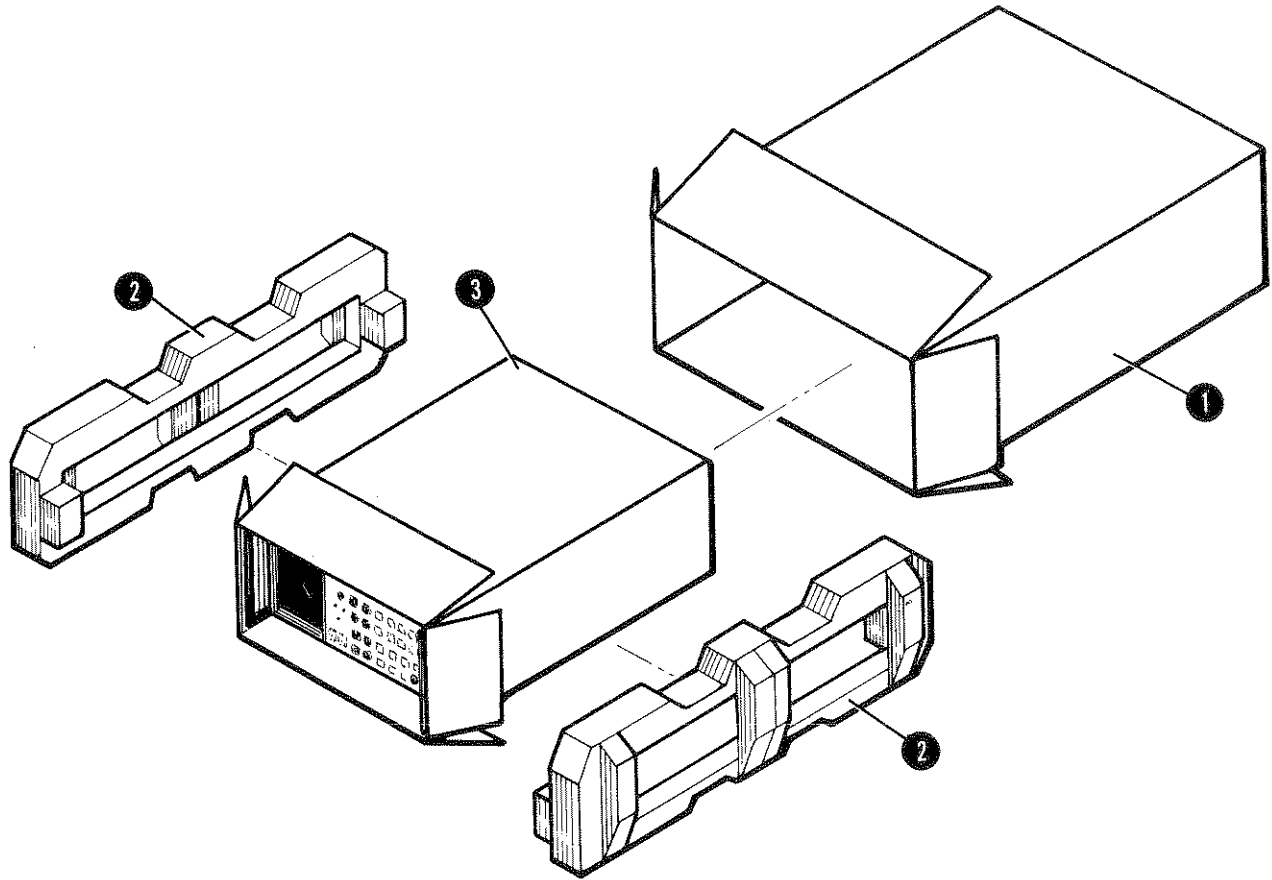
sections must be separated and packaged in separate containers. The quantity of packaging materials in Figure 2 is for only one instrument section.

If the instrument is being returned to Hewlett-Packard for servicing, attach a tag to each carton indicating the type of service required, return address, model number, and full serial number. For your convenience, a supply of tags is included at the end of this section. Also, mark each container FRAGILE to assure careful handling. In any correspondence, refer to the instrument by model number and full serial number.

Other Packaging

If it is necessary to use packaging materials other than the type used in original factory packaging, the following general instructions should be followed.

- a. Separate the two instrument sections and wrap each in heavy paper or plastic.
- b. Place the instrument sections in separate containers with 8 to 10 cm (3 to 4 inches) of shock-absorbing material around all sides to provide firm cushioning and prevent movement inside the container. Protect front panels with cardboard. Double-wall corrugated cartons of 125 kg (275 lb) bursting strength are sufficient for shipping containers.
- c. Seal each container securely and, if shipping to a Hewlett-Packard office or service center, attach a tag to each container indicating the type of service required, return address, model number and full serial number. For your convenience, a supply of tags is included at the end of this section.
- d. Mark each container FRAGILE to assure careful handling.



NOTE

FRONT HANDLES MUST BE MOUNTED FOR SHIPMENT.

Item	HP Part Number	C D	Qty	Description	Manufacturer Code	Mfr. Part Number
1	9211-4487	3	1	Outer Box	28480	9211-4487
2	5180-2319	5	2	Inner Foam Pad	28480	5180-2319
3	5180-2320	8	1	Inner Box	28480	5180-2320

FIGURE 2. PACKAGING FOR SHIPMENT USING FACTORY PACKAGING MATERIALS

TABLE 3. RECOMMENDED TEST EQUIPMENT (1 OF 3)

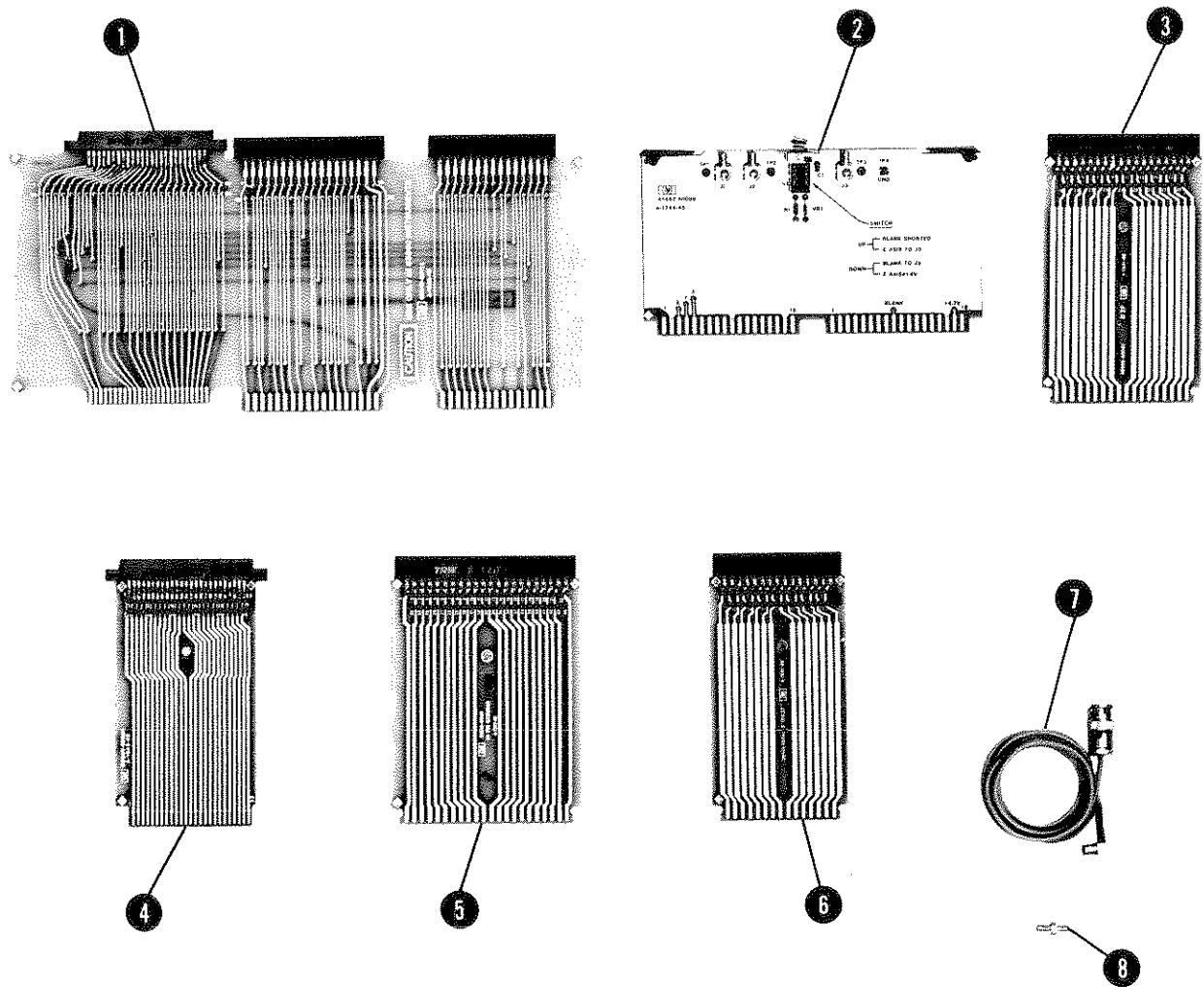
Instrument	Critical Specifications for Equipment Substitution	Recommended Model
SIGNAL SOURCES		
Synthesized Sweeper	Frequency: 10 MHz to 21 GHz Output Power: +10 dBm maximum (leveled <13.5 GHz) +3 dBm maximum (leveled) Aging Rate: <1 x 10 ⁻⁹ /day Spurious Signals: <-35 dBc (<7 GHz) <-25 dBc (<20 GHz) Amplitude Modulation: dc to 100 kHz Leveling: Internal, External Power Meter	HP 8340A
Signal Generator	Frequency: 20 – 800 MHz SSB Phase Noise: >130 dB below carrier at 20 kHz away Stability: <10 ppm/10 min. (HP 8340A may be substituted)	HP 8640B, Opt. 002
ANALYZERS		
Spectrum Analyzer	Frequency: 0.1 to 100 MHz Resolution Bandwidth: 10 Hz Frequency Span: 20 Hz	HP 8553B/8552B 141T
Spectrum Analyzer	Frequency: .04 to 325 MHz	HP 8557A/853A
Spectrum Analyzer	Frequency: 100 to 1500 MHz	HP 8558B/853A
Signature Analyzer	No known substitute. Provides preferred method for troubleshooting digital circuitry.	HP 5005A/B
COUNTERS		
Microwave Frequency Counter	Frequency: 10 Hz to 21 GHz Sensitivity: -33 dBm (<12 GHz) -23 dBm (<21 GHz)	HP 5343A
Frequency Counter	Frequency: .02 to 20 GHz Sensitivity: -30 dBm (HP 5343A may be substituted)	HP 5340A
OSCILLOSCOPE		
Oscilloscope	Frequency: 100 MHz Sensitivity: .005 V/Div Dual Channel: Third Channel Trigger View Display Storage	HP 1741A
Probe (2 required)	10:1 Divider, compatible with oscilloscope	HP 1004D

TABLE 3. RECOMMENDED TEST EQUIPMENT (2 OF 3)

Instrument	Critical Specifications for Equipment Substitution	Recommended Model
METERS		
Digital Voltmeter	Resolution: ± 0.1 mV Range: 0 to 100 Vdc Input Impedance 100V Range: 10 M Ω	HP 3456A
High Voltage Probe	1000:1 Divider Impedance: 10 M Ω	HP 34111A
Power Meter	Range: -20 to +10 dBm Accuracy: ± 0.02 dB HP-IB Compatible	HP 436A
Power Sensor	Frequency: .01 to 18 GHz Compatible with HP 436A Power Meter	HP 8481A
Power Sensor	Frequency: 50 MHz to 26.5 GHz with APC (m) Connector Compatible with HP 436A Power Meter	HP 8485A
Power Meter	Range: -20 to +10 dBm Accuracy: ± 0.02 dB	HP 432A
Thermistor Mount	Frequency: 18 to 22 GHz Compatible with HP 432A Power Meter	HP K486A
Thermistor Mount	Frequency: 10 MHz to 18 GHz Compatible with HP 432A Power Meter	HP 8478B
ATTENUATORS		
10 dB Step Attenuator	Steps: 10 dB from 0 to 90 dB Frequency: 5 to 100 MHz Calibrated to uncertainty error of $\pm(0.02$ dB + 0.01 dB/10 dB step) at 20 MHz from 0 dB to 90 dB	HP 355D-H89
1 dB Step Attenuator	Steps: 1 dB from 0 to 10 dB Frequency: 20 to 100 MHz Calibrated to uncertainty error of $\pm(0.02$ dB + 0.01 dB/10 dB step) at 20 MHz from 0 dB to 10 dB	HP 355C-H25
SPECIAL DEVICES		
Display Adjustment PC Board	Required for preliminary display adjustments	HP 85662-60088
CABLES		
Cable Assembly	Frequency Range: 200 Hz to 22 GHz SMA Male Connectors Length: 61 cm (24 inches) SWR: <1.4 at 22 GHz	HP 5061-1086

TABLE 3. RECOMMENDED TEST EQUIPMENT (3 OF 3)

Instrument	Critical Specifications for Equipment Substitution	Recommended Model
CABLES (Cont'd)		
Test Cable (2 required)	BNC (m) to SMB Snap-On (f)	HP 85680-60093
Test Cable	SMB Snap-On (f) to SMB Snap-On (f)	HP 85662-60042
ADAPTERS		
Adapter	Type N (f) to BNC (m)	HP 1250-0077
Adapter	SMB Snap-On (m) to SMB Snap-On (m)	HP 1250-0669
BOARD EXTENDERS		
Extender* (2 required)	PC Board: 36 contacts; 2 rows of 18	HP 08505-60042
Extender*	PC Board: 30 contacts; 2 rows of 15	HP 08505-60041
Extender	PC Board: 20 contacts; 2 rows of 10	HP 85680-60028
Extender	PC Board: 12 contacts; 2 rows of 6	HP 08505-60109
Extender*	A12 RF Section Interface Extender (for Signature Analysis)	HP 85660-60114
Extender* (2 required)	PC Board: 50 contacts; 2 rows of 25	HP 85680-60034
Extender* (2 required)	PC Board: 44 contacts; 2 rows of 22	HP 08565-60107
PC Board Extractor	PC Board extracting tool	HP 03950-4001
* Part of Service Accessories		



Item	Qty	Description	Mfr. Part Number	C D
1	1	Extender Board: A12 RF Section Interface	85660-60114	5
2	1	PC Board: Display Adjustment Test	85662-60088	4
3	2	Extender Board: 36 contacts; 2 rows of 18	08505-60042	8
4	2	Extender Board: 50 contacts; 2 rows of 25	85680-60034	2
5	2	Extender Board: 44 contacts; 2 rows of 22	08565-60107	8
6	1	Extender Board: 30 contacts; 2 rows of 15	08505-60041	7
7	2	Cable: 4-foot long; BNC to SMB snap-on	85680-60093	3
8	1	Adapter: SMB snap-on male to SMB snap-on male	1250-0669	9

FIGURE 3. SERVICE ACCESSORIES, HP PART NUMBER 08566-60001

BOARD ASSEMBLY
REFERENCE DESIGNATOR

BOARD ASSEMBLY
TITLE

SLIP ON COAXIAL
CONNECTOR

BOARD ASSEMBLY
PART NUMBER

BOARD ASSEMBLY
REFERENCE DESIGNATOR

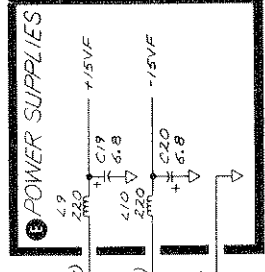
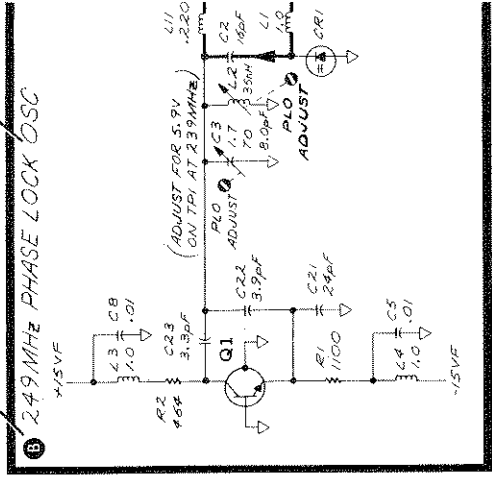
BOARD ASSEMBLY
TITLE

POWER SUPPLY
BLOCK DESIGNATOR

FUNCTIONAL
BLOCK DESIGNATOR

FUNCT
BLOCK

A7 249MHz PHASE LOCK OSCILLATOR
85680 - 60013



PIN	SIGNAL	TO / FROM	FUNCTION BLOCK
1	249 MHz	A/O	PI-2
7	NC		
2	+15V		E
8	+15V		E
3	-15V		E
9	-15V		E
4	GND		E
10	GND		E
5	GND		E
11	GND		E
6	GND		E
12	TUNE VOLTAGE	ABPI-6	E

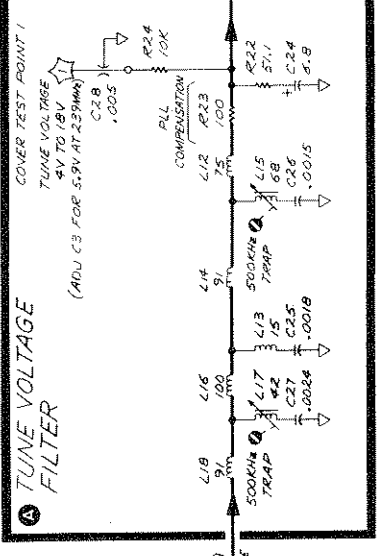
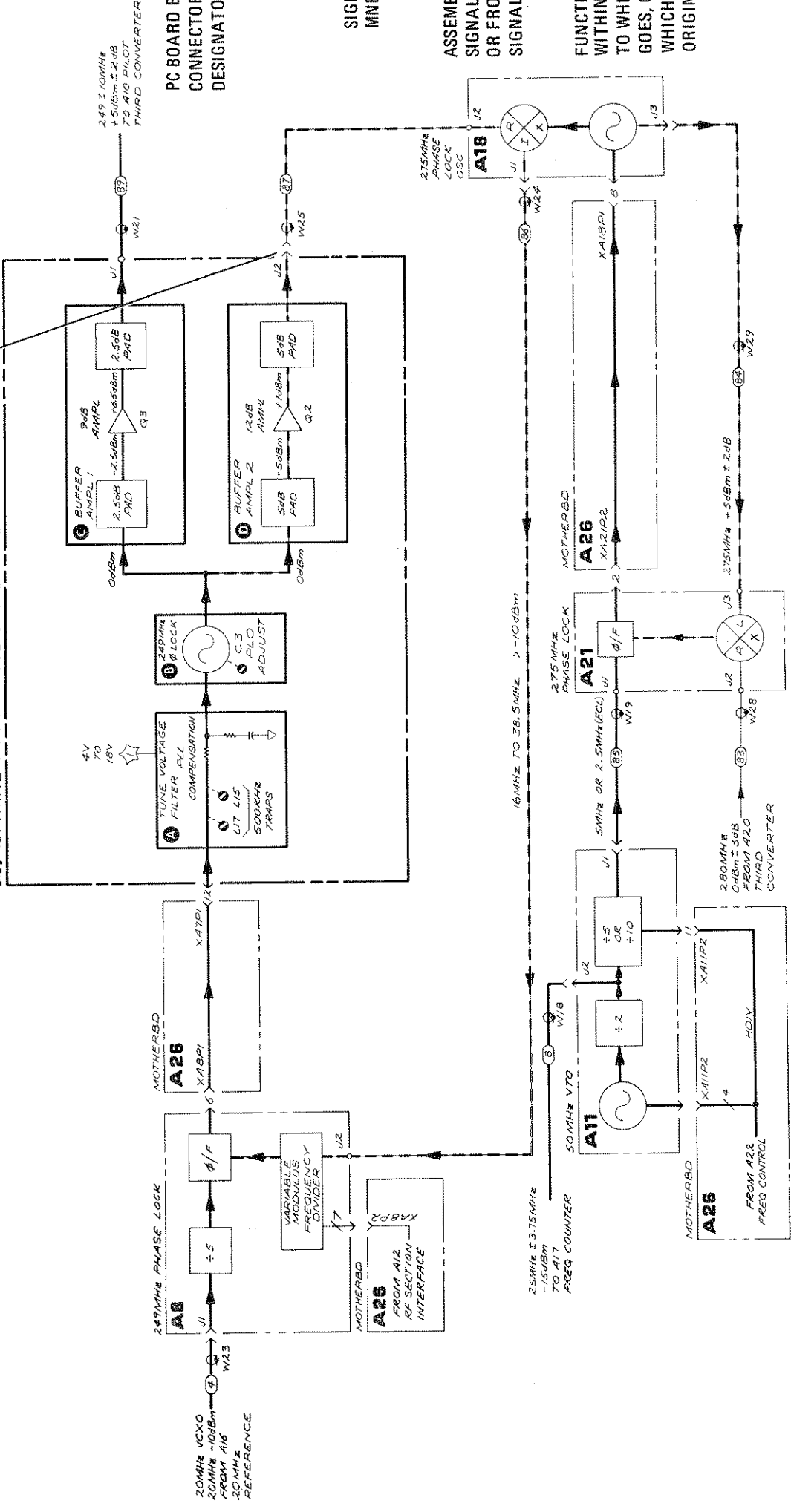
PC BOARD EDGE
CONNECTOR REFERENCE
DESIGNATOR

PIN NUMBERS

SIGNAL NAME OR
MNEEMONIC

ASSEMBLY TO WHICH
SIGNAL GOES
OR FROM WHICH
SIGNAL ORIGINATES

A7 249MHz PHASE LOCK OSCILLATOR

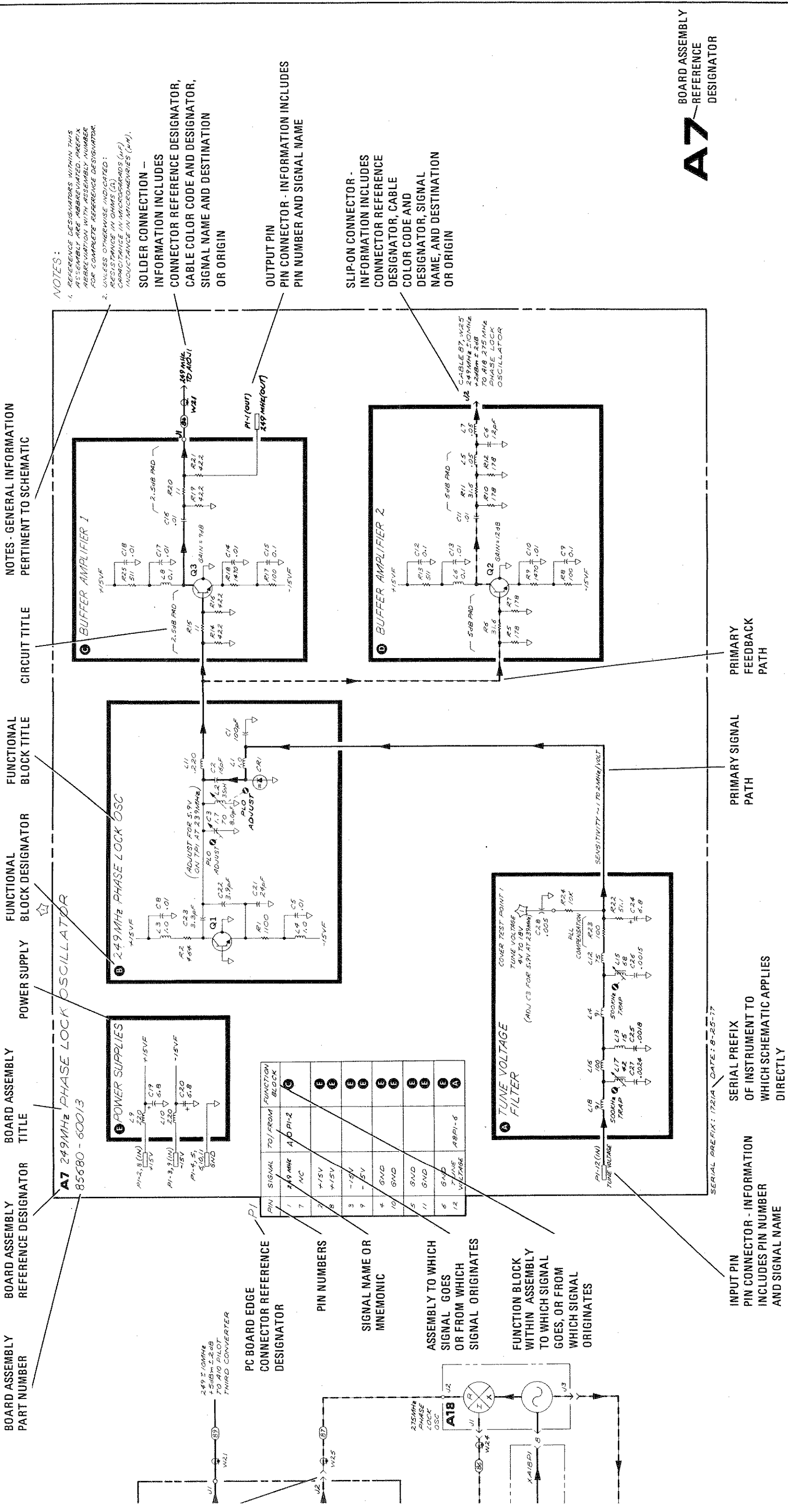


SERIAL PREFIX: 17214 DATE: 8-25-77

INPUT PIN
PIN CONNECTOR - INFORMATION
INCLUDES PIN NUMBER
AND SIGNAL NAME

SERIAL PREFIX
OF INSTRUMENT TO
WHICH SCHEMATIC APPLIES
DIRECTLY

PRIMARY
PATH



GRAPHIC SYMBOLS USED ON SCHEMATIC AND BLOCK DIAGRAMS

BASIC COMPONENT SYMBOLS









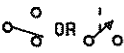



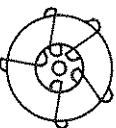

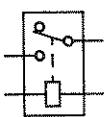





















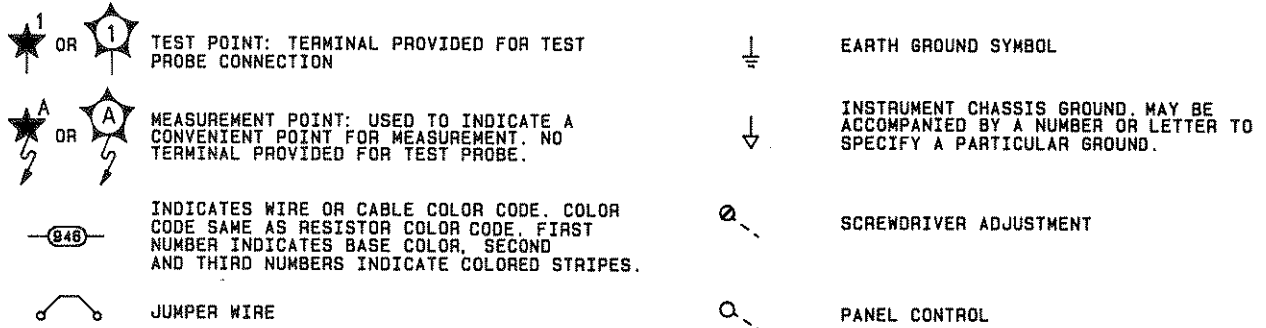
	VARIABLE RESISTOR: CW INDICATES CLOCKWISE ROTATION OF SHAFT MOVES WIPER TOWARDS LOCATION OF CW.		LIGHT-EMITTING DIODE
	THERMISTOR		PIN DIODE
	ELECTROLYTIC CAPACITOR		TRIAC
	VARIABLE CAPACITOR		STEP RECOVERY DIODE
	SLIDE, TOGGLE, OR ROCKER SWITCH		TEMPERATURE-COMPENSATED VOLTAGE-REFERENCE DIODE
	FEEDTHROUGH CAPACITOR		SCR (SILICON CONTROLLED RECTIFIER)
	TOROIDAL TRANSFORMER		TRANSISTOR, PNP
	RELAY		TRANSISTOR, NPN
	SURFACE ACOUSTIC WAVE (SAW)		JUNCTION-FET, N-CHANNEL
	FERRITE BEAD		JUNCTION-FET, P-CHANNEL
	PUSHBUTTON SWITCH		MOS-FET, N-CHANNEL
	CRYSTAL		MOS-FET, P-CHANNEL
	SPEAKER		INDICATES A FACTORY SELECTED COMPONENT
	GENERAL PURPOSE DIODE		INDICATES SHIELDING CONDUCTOR FOR CABLES
	BREAKDOWN DIODE: ZENER		INDICATES A PLUG-IN CONNECTION
	SCHOTTKY DIODE		INDICATES A SOLDERED OR MECHANICAL CONNECTION
	VARACTOR DIODE (VARICAP)		INDICATES A SINGLE PIN OF A PC BOARD EDGE CONNECTOR
			CONNECTION SYMBOL INDICATING A JACK (EXCEPT FOR PC BOARD EDGE CONNECTORS)
			CONNECTION SYMBOL INDICATING A PLUG (EXCEPT FOR PC BOARD EDGE CONNECTORS)

FIGURE 5. GRAPHIC SYMBOLS (1 OF 2)

GRAPHIC SYMBOLS USED ON SCHEMATIC AND BLOCK DIAGRAMS

BASIC COMPONENT SYMBOLS (CONT'D)



COMMONLY USED ASSEMBLY AND CIRCUIT SYMBOLS

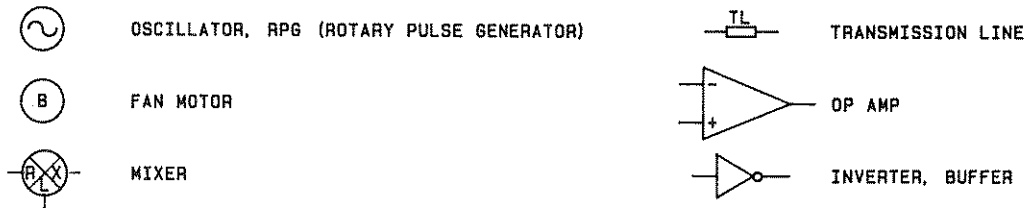


FIGURE 5. GRAPHIC SYMBOLS (2 OF 2)

SCHEMATIC SYMBOLS FOR DIGITAL INTEGRATED CIRCUITS

The following is a guide to the symbols used for digital or logic ICs in this manual. The symbology is based upon American National Standard ANSI Y32.14, *Graphic Symbols for Logic Diagrams (Two-State Devices)*, but does not strictly follow the standard. This figure should be consulted for the explanation of digital IC symbols used in Sections VIII and IX.

DEFINITIONS

Logic Element: The part or parts of a logic device symbol having a well-defined logic function (OR, AND, FLIP-FLOP, etc.) and one or more outputs. The inputs of a logic element may be data or control inputs; the outputs are data outputs.

Control Block: The part of a logic device symbol to which all logic lines common to a group of logic elements are connected. Lines connected to a control block are control lines.

Function Label: The notation within a logic device symbol that denotes its overall logic function (counter, shift register, multiplexer, etc.).

Line Label: The symbol or abbreviation associated with an output or input line that defines the action of the line.

Indicator Symbol: A symbol associated with an input or output line which defines the active state or special characteristics of the line.

BASIC LOGIC SYMBOLS

Distinctive-Shape Symbols

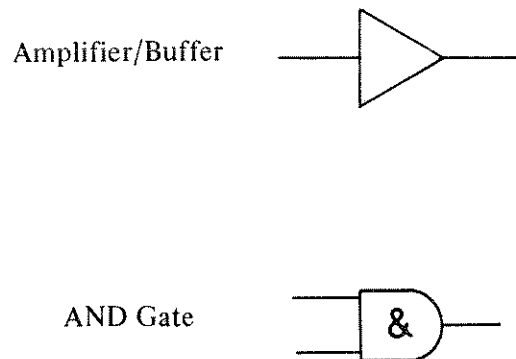
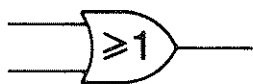


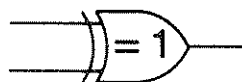
FIGURE 6. SCHEMATIC SYMBOLS FOR DIGITAL INTEGRATED CIRCUITS (1 OF 8)

SCHEMATIC SYMBOLS FOR DIGITAL INTEGRATED CIRCUITS (Cont'd)

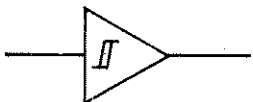
OR Gate



EXCLUSIVE OR Gate

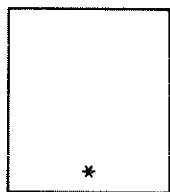


Schmitt Trigger



Rectangular Symbols

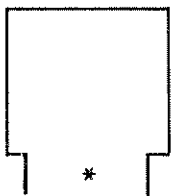
General Logic Element



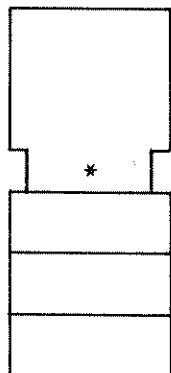
NOTE

The asterisk indicates where the function label is placed

Control Block



Logic Elements with Common Control Block



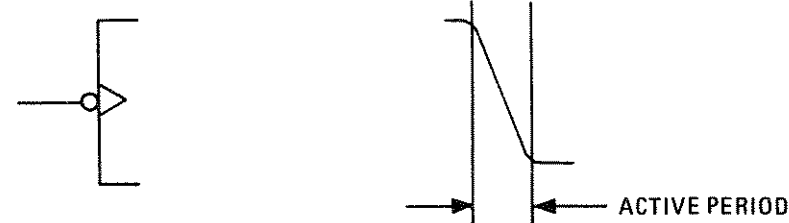
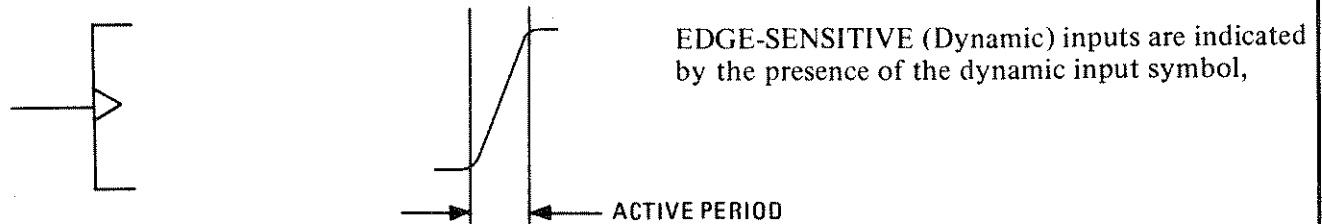
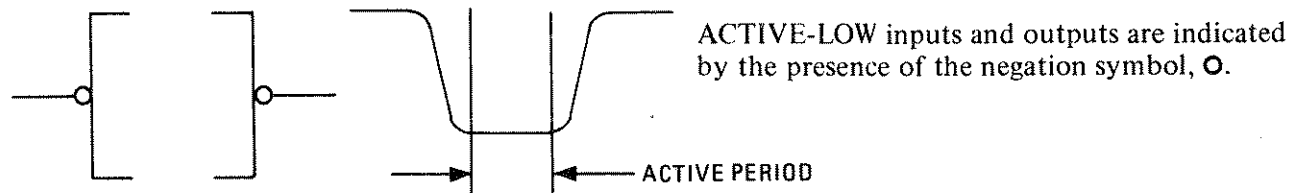
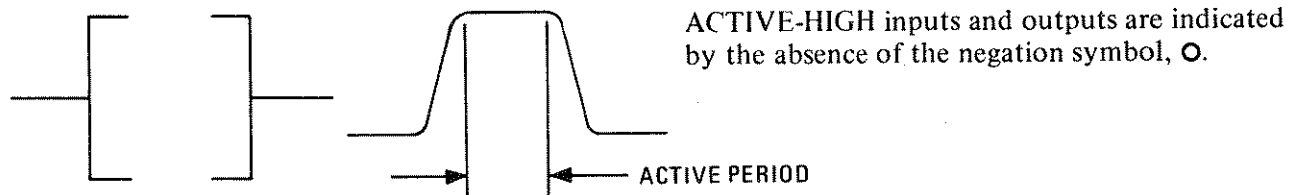
NOTE

If elements sharing control lines are widely separated, each element will have a control block.

FIGURE 6. SCHEMATIC SYMBOLS FOR DIGITAL INTEGRATED CIRCUITS (2 OF 8)

SCHEMATIC SYMBOLS FOR DIGITAL INTEGRATED CIRCUITS (Cont'd)

INDICATOR SYMBOLS (positive logic assumed)



These outputs become active when the signal that initiates the change returns to its original state (example: the outputs of a J-K master-slave flip-flop).

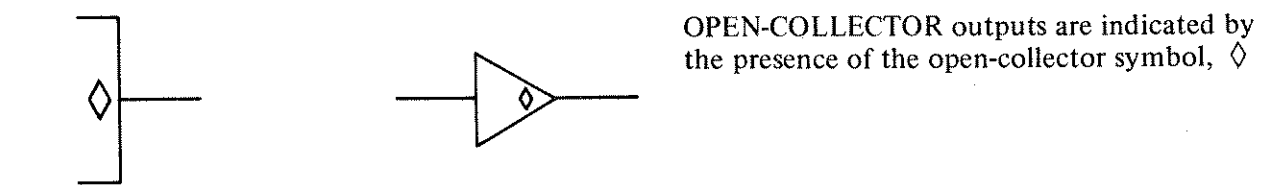


FIGURE 6. SCHEMATIC SYMBOLS FOR DIGITAL INTEGRATED CIRCUITS (3 OF 8)

SCHEMATIC SYMBOLS FOR DIGITAL INTEGRATED CIRCUITS (Cont'd)

NOTE

The logic negation symbol (○) alone gives no information about the actual voltage levels used in a digital circuit. For this reason the type of logic system (positive or negative) must be specified. In this manual, unless otherwise noted on the schematic, the logic system is positive; that is, the more positive voltage level is the HIGH or 1-state and the less positive level is the LOW or 0-state.

FUNCTION LABELS



Σ	ADDER
\triangleright	AMPLIFIER/BUFFER
1 	MONOSTABLE MULTIVIBRATOR (ONE-SHOT)
&	AND GATE
≥ 1	OR GATE
$= 1$	EXCLUSIVE OR GATE
X \rightarrow Y	ENCODER, DECODER
XMAX \rightarrow Y	PRIORITY ENCODER
	SCHMITT TRIGGER
ALU	ARITHMETIC AND LOGIC UNIT
CTR	COUNTER
DEMUX	DEMULTIPLEXER
FF	FLIP-FLOP
MUX	MULTIPLEXER
RAM	RANDOM-ACCESS MEMORY
REG	REGISTER
ROM	READ-ONLY MEMORY
SAR	SUCCESSIVE APPROXIMATION REGISTER
SR	SHIFT REGISTER

FIGURE 6. SCHEMATIC SYMBOLS FOR DIGITAL INTEGRATED CIRCUITS (4 OF 8)

SCHEMATIC SYMBOLS FOR DIGITAL INTEGRATED CIRCUITS (Cont'd)

LINE LABELS



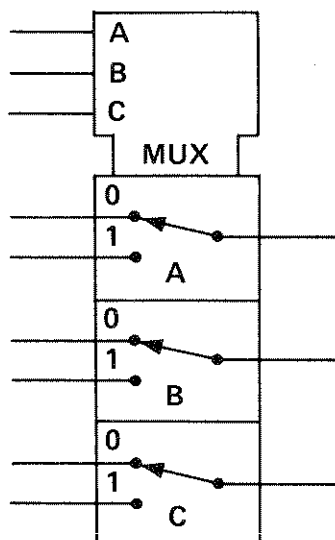
	SHIFT LEFT (OR UP)
	SHIFT RIGHT (OR DOWN)
+1	COUNT UP
-1	COUNT DOWN
=0,-1	BORROW OUTPUT
=9,+1	CARRY OUTPUT (DECIMAL COUNTER)
=15,+1	CARRY OUTPUT (BINARY COUNTER)
A _n	n TH ADDRESS BIT (ROM, RAM)
C	CLOCK INPUT
D	DATA OR DELAY INPUT (FLIP-FLOP)
D _n	n th DATA BIT INPUT
EN	ENABLE
F	3-STATE ENABLE INPUT (SEE "DEPENDENCY")
G	GATING INPUT (SEE "DEPENDENCY")
J	J-K FLIP-FLOP J INPUT
K	J-K FLIP-FLOP K INPUT
LD	LOAD ENABLE INPUT (SYNCHRONOUS)
PS	PRESET INPUT (ASYNCHRONOUS)
R	RESET OR CLEAR INPUT
RD	READ ENABLE INPUT (RAM, ROM)
S	SET INPUT
SEL	LINE OR FUNCTION SELECT INPUT
SER	SERIAL DATA INPUT (SHIFT REGISTER)
T	TRIGGER INPUT (MONOSTABLE)
WR	WRITE ENABLE INPUT (RAM)
Y _n	n th DATA BIT OUTPUT OR I/O
3-ST (placed by function label)	3-STATE

FIGURE 6. SCHEMATIC SYMBOLS FOR DIGITAL INTEGRATED CIRCUITS (5 OF 8)

SCHEMATIC SYMBOLS FOR DIGITAL INTEGRATED CIRCUITS (Cont'd)

NOTES

1. The suffix or subscript 0 denotes the least significant bit (LSB) of a data or address word.
2. Letters may be used to identify a line or logic element without indicating a specific logic function. For example:

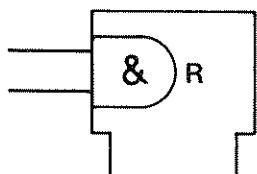


Triple 2-Channel Multiplexer

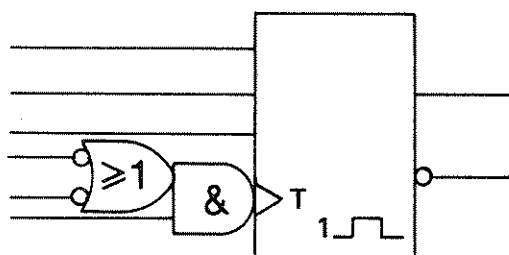
Letters are used to relate control inputs to logic elements. The numerals 0 and 1 indicate 0-state and 1-state, respectively, and relate the position of a "switch" to the logic state of the corresponding control line.

DEPENDENCY (G and F)

The dependency of inputs or outputs on an input is indicated with gate symbols or the G line label. Gate symbols are often used when the dependency exists between inputs. Two examples are:



Two inputs
ANDed to
produce a
reset



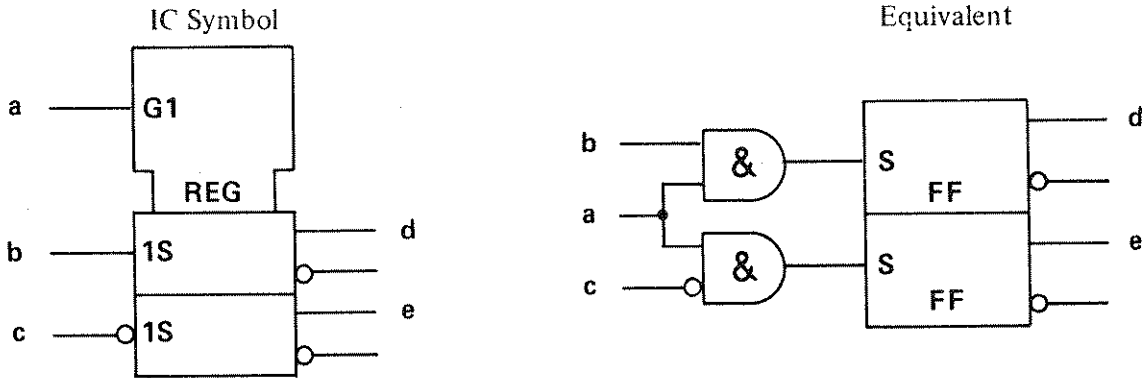
Three inputs
gated to
produce a
trigger

FIGURE 6. SCHEMATIC SYMBOLS FOR DIGITAL INTEGRATED CIRCUITS (6 OF 8)

SCHEMATIC SYMBOLS FOR DIGITAL INTEGRATED CIRCUITS (Cont'd)

When the G label is used, the gating input is labelled with a G followed by a numeral or letter. The line labels of the gated inputs or outputs are prefixed with the same numeral or letter. Two examples are:

2-Bit Register



2-to-4-Line Decoder

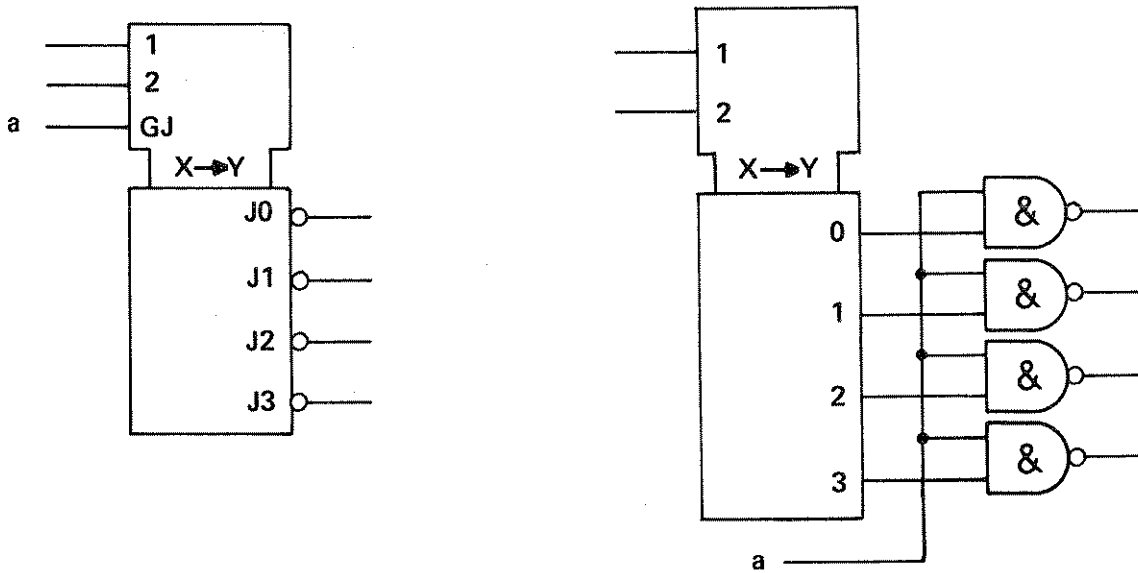
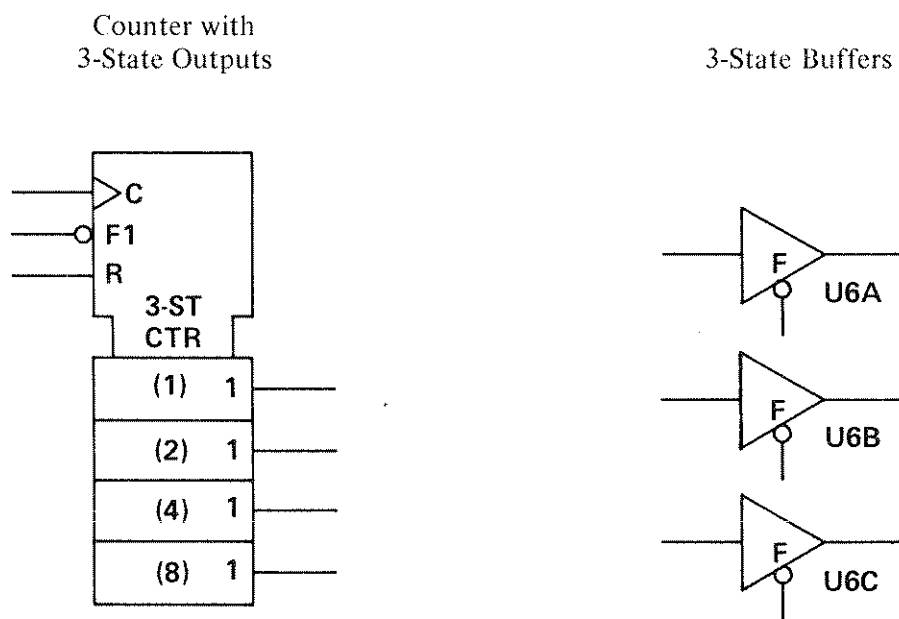


FIGURE 6. SCHEMATIC SYMBOLS FOR DIGITAL INTEGRATED CIRCUITS (7 OF 8)

SCHEMATIC SYMBOLS FOR DIGITAL INTEGRATED CIRCUITS (Cont'd)

The F line label is used to indicate 3-state logic. The 3-state enable input is labelled with an F and numerals or letters are used as with the G label:



WEIGHTING OF INPUT AND OUTPUT LINES

The coding of multiplexers, demultiplexers, encoders, and decoders is shown by decimal weighting. An example is the 2-to-4-line decoder shown on the previous page.

WEIGHTING OF FLIP-FLOPS

When the position of a flip-flop in an array is significant (as in counters and shift registers), the flip-flop is labelled with its decimal weight. An example is the "Counter with 3-State Outputs" shown above.

FIGURE 6. SCHEMATIC SYMBOLS FOR DIGITAL INTEGRATED CIRCUITS (8 OF 8)

SIGNATURE ANALYSIS DESCRIPTION

GENERAL DESCRIPTION

This instrument has been designed to incorporate signature analysis. Troubleshooting the instrument using signature analysis requires the use of an HP Model 5005A, 5005B, or 5006B Signature Analyzer. The signature analyzer is a service tool that receives signals via a probe from the circuit under test, compresses them, and displays the result in the form of a digital signature that corresponds to specific data nodes in the circuit under test. For a complete description of signature analyzer operation, refer to the HP 5005A, 5005B, or 5006B Signature Analyzer Operating and Service Manual.

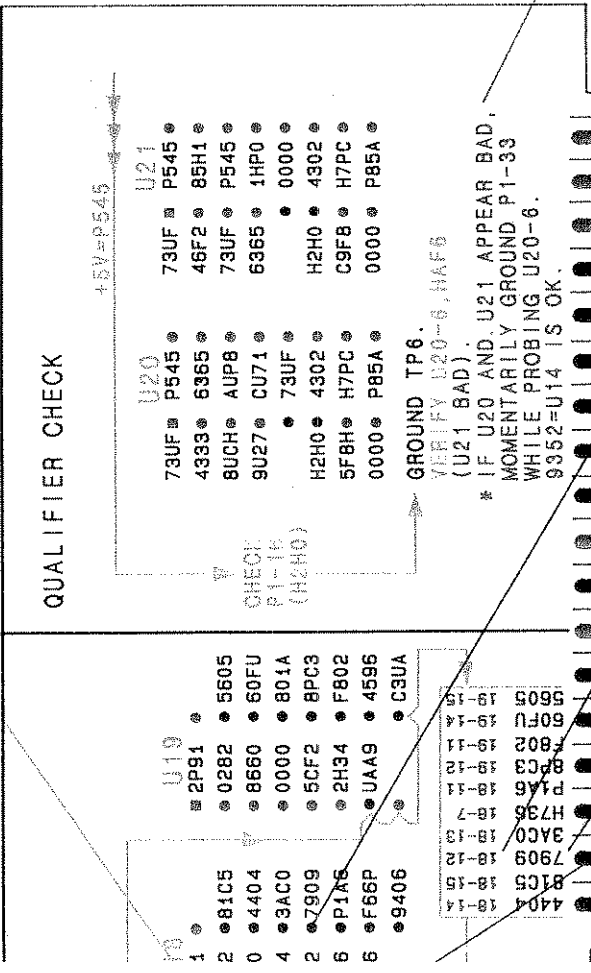
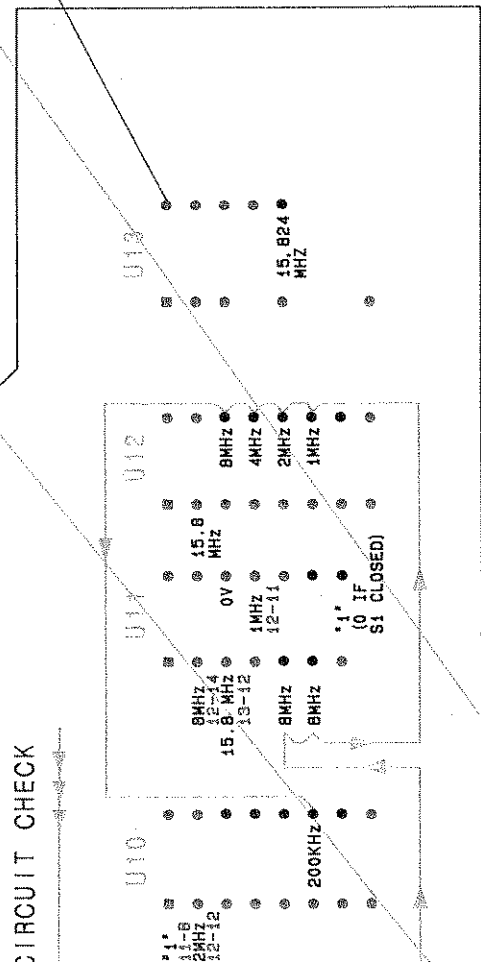
Signature Analysis Troubleshooting Diagrams are included with the service sheets for the A12 Front-Panel Interface and A15 Controller assemblies. Refer to the following Signature Analysis Troubleshooting Instructions as a guide for the use of the Signature Analysis Troubleshooting Diagram.

SIGNATURE ANALYSIS TROUBLESHOOTING

1. Connect signature analyzer and set controls according to diagram instructions.
2. Set up test configuration as indicated in the diagram, such as jumpering test points or removing test jumpers.
3. Verify the +5Vdc signature for the test being performed as indicated in green lettering on the main verification path (GREEN LINE). This signature can be verified by probing the +5Vdc supply. If +5Vdc signature is incorrect, check equipment settings and connections. Then check for activity at CLOCK, START, and STOP connections using signature analyzer probe. If there is no activity, refer to assembly schematic for troubleshooting.
4. Begin probing the printed circuit board at the beginning of the green line on the diagram. (Point A in the sample.)
5. Probe every point indicated by the green line.
6. If a bad signature is located (Point B in sample), the location is suspected bad. Information printed in red on the troubleshooting diagram (Point C) can help to trace the problem by indicating the source of the signal. For example, "18-12" indicates that the signature originates at U18 pin 12.
7. Check signature at its origin (D). If signature is still bad, go to input pin(s) related to that output (E). A red line connecting the input to the output indicates that the output is affected by only that input. A black line indicates an electrical connection between IC pins. If any input signature is bad, refer to assembly schematic to determine the origin of the input pin (F in sample).
8. Verify signatures to inputs/outputs connected to a suspected bad location. If signatures are good, the printed circuit board, connectors, and solder joints should be checked for faults. After locating the faulty source, proceed with conventional troubleshooting.
9. Before replacing any suspected defective component, follow instructions printed in red and referenced by an asterisk(*) on the signature analysis troubleshooting diagram.

INFORMATION AND INSTRUCTIONS FOR MAIN VERIFICATION PATH

INPUT



SPECIAL INSTRUCTIONS OR TROUBLESHOOTING INFORMATION

SIGNATURE ANALYSIS TROUBLESHOOTING DIAGRAMS

THE SIGNATURE ANALYSIS TROUBLESHOOTING DIAGRAMS ARE PRINTED IN THREE COLORS WITH EACH COLOR HAVING A PARTICULAR SIGNIFICANCE. IN GENERAL, BLACK IS USED FOR GENERAL INFORMATION SUCH AS TEST TITLES AND EQUIPMENT CONNECTIONS, GREEN IS USED TO SHOW THE MAIN VERIFICATION PATH, AND RED IS USED FOR INSTRUCTIONS AND PATHS TO FOLLOW WHEN A BAD SIGNATURE HAS BEEN LOCATED ON THE MAIN VERIFICATION PATH. A MORE DETAILED DESCRIPTION FOLLOWS:

BLACK

- PAD IC OUTPUT PIN
- DIAMOND IC OPEN COLLECTOR (3-STATE) OUTPUT PIN
- LINE INDICATES PHYSICAL CONNECTION BETWEEN IC PINS; ALSO, INDICATES BORDER BETWEEN TESTS
- LETTERING GENERAL INFORMATION AND INSTRUCTIONS FOR THE TEST
- ASTERISK UNSTABLE OR UNRELIABLE SIGNATURE

GREEN

- LINE MAIN VERIFICATION PATH
- LETTERING INFORMATION AND INSTRUCTIONS FOR MAIN VERIFICATION PATH

RED

- PAD IC INPUT PIN
- LINE USED BETWEEN INPUT AND OUTPUT OF IC TO INDICATE THAT INPUT EFFECTS ONLY THE OUTPUT TO WHICH THE RED LINE IS CONNECTED; USED BETWEEN ICs TO INDICATE PATH TO FOLLOW WHEN A BAD SIGNATURE HAS BEEN LOCATED
- LETTERING TROUBLESHOOTING INFORMATION AND INSTRUCTIONS TO FOLLOW WHEN BAD SIGNATURE HAS BEEN LOCATED

FIGURE 1. SIGNATURE ANALYSIS TROUBLESHOOTING DIAGRAM FORMAT 3/4

TABLE 1. TROUBLESHOOTING INDEX(1 OF 2)

Troubleshooting Information	Tab Title and/or Location	Vol.
Start Frequency Tuning Equations and Phase Lock	RF Section Analog Troubleshooting Block Diagram	1
Diagnostic Functions	Spectrum Analyzer Overall Troubleshooting	1
Digital Storage	A3 Digital Storage Block Diagram	2
Display System	Spectrum Analyzer Overall Troubleshooting A1 Display Section Block Diagram	1 2
Error Correction Routine	Spectrum Analyzer Overall Troubleshooting	1
RF Section Digital (includes INSTR CHECK LEDs)	A3 Digital Storage Block Diagram RF Section Digital Troubleshooting Block Diagram A15 Controller	2 1 1
Special Messages	Spectrum Analyzer Overall Troubleshooting	1
Sweep System	Spectrum Analyzer Overall Troubleshooting	1
A1A1 Keyboard	A12 Front-Panel Interface	1
A3 Digital Storage	Spectrum Analyzer Overall Troubleshooting A3 Digital Storage Block Diagram	1 2
A3A1 Trigger*	Spectrum Analyzer Overall Troubleshooting (Sweep System) A3 Digital Storage Block Diagram	1 2
A3A2 Intensity Control*	A1 Display Section Block Diagram A3 Digital Storage Block Diagram	2 2
A3A3 Line Generator*	A1 Display Section Block Diagram A3 Digital Storage Block Diagram	2 2
A3A4 Memory	A1 Display Section Block Diagram A3 Digital Storage Block Diagram	2 2
A3A5 Data Manipulator A3A6 Main Control A3A7 Interface	A3 Digital Storage Block Diagram	2
A3A8 Analog-Digital Converter*	Spectrum Analyzer Overall Troubleshooting (Sweep System) A1 Display Section Block Diagram A3 Digital Storage Block Diagram	1 2 2
A3A9 Track and Hold*	Spectrum Analyzer Overall Troubleshooting (Diagnostic Functions) A1 Display Section Block Diagram A3 Digital Storage Block Diagram	1 2 2

TABLE 1. TROUBLESHOOTING INDEX (2 OF 2)

Troubleshooting Information	Tab Title and/or Location	Vol.
A4A1 Video Processor* A4A2 Log Amplifier-Detector* A4A3 Log Amplifier-Filter* A4A4 Bandwidth Filter A4A5 Step Gain* A4A6 Down/Up Converter* A4A7 3 MHz Bandwidth Filter A4A8 Attenuator-Bandwidth Filter* A4A9 IF Control*	Spectrum Analyzer Overall Troubleshooting (Error Correction Routine)	1
A5 Front Panel	A12 Front-Panel Interface A15 Controller	1 1
A6 RF Module A7 M/N Loop A10 20/30 Synthesizer A11 YTO Loop	Spectrum Analyzer Overall Troubleshooting (Diagnostic Functions)	1
A12 Front-Panel Interface*	Spectrum Analyzer Overall Troubleshooting (Sweep System) A15 Controller	1 1
A15 Controller*	Spectrum Analyzer Overall Troubleshooting (Sweep System)	1
A16 Scan Generator*	Spectrum Analyzer Overall Troubleshooting (Sweep System)	1
*Troubleshooting information is also located behind the tab having the same title as that listed in this table.		

SPECTRUM ANALYZER OVERALL TROUBLESHOOTING

SPECIAL MESSAGES

As a convenience to the operator and as an aid in servicing, eleven messages can appear in the upper right corner of the CRT display. (Ten of these messages are shown in Figure 1.) Five of the messages inform the operator of possible erroneous data from improper instrument operation. The other six provide warnings of instrument malfunctions that must be repaired for proper instrument operation.

A brief description of each message follows. The troubleshooting information listed is not meant to be exhaustive. Refer to the appropriate Troubleshooting Block Diagram and Troubleshooting Hints for more detailed information.

EXT REF

Indication to operator that the external frequency reference is selected.

MEAS UNCAL

A warning to the operator that the amplitude/frequency data on the CRT is invalid because the analyzer's sweep speed is too fast for the selected bandwidth.

*

A warning to the operator that the analyzer settings displayed on the CRT have been changed but the trace data has not been updated. This would occur, for example, when Trace A view is selected and then Center Frequency is changed.

OVEN COLD

Indication that the frequency reference oven temperature is too low. There will be an oven cold indication normally for about 10 minutes after the line power is initially applied to the instrument. (The oven is powered and should stay warm as long as the instrument is in STANDBY.) The time base HOVC (High = Oven Cold) signal is routed to the A12 Front-Panel Interface for generation of this message.

BATTERY

A warning to the operator that the CMOS memory on the A15 Controller has probably lost the stored instrument states. The warning can only appear at instrument turn on. If it appears, the instrument automatically reinitializes all the instrument states to the instrument preset condition. The battery warning can be caused by too low a voltage from the A10A9 Battery Pack or a problem with the A15 CMOS memory power supply circuit. Performing the "long POP" instrument check (see RF Section Digital Troubleshooting) erases the stored instrument states and causes a battery warning to appear at instrument turn on. The HP-IB address is also lost. The battery warning can be removed by pressing $\boxed{2-22}$ and the HP-IB address restored by keying in

$\boxed{\text{SHIFT}}$ $\boxed{\text{ZOOM}}$ (desired address) $\boxed{\begin{matrix} \text{Hz} \\ \mu\text{V} \\ \mu\text{SEC} \end{matrix}}$.

PL1

The PLL1 Phase Lock Loop is unlocked. Items to check are:

- A10A1 – Check signal out at A10A1J3.
- A10A2 – Check signal in at A10A2J2.

- A10A3 – Check signal out at A10A3J3.
- A10A4 – Check signal out at A10A4J2 and in at A10A4J4.

PL2

The PLL2 Phase Lock Loop is unlocked. Items to check are:

- A10A5 – Check signal out at A10A5J3.
- A10A6 – Check ϕ Det Out voltage at A10A6TP7.
- A10A7 – Check 500 kHz Reference at A10A7TP5 and divided output at A10A7TP1.
- A10A8 – Check VCO Tune output current at A10A8J2.

REF UNLOCK

The 10 MHz Reference Loop is unlocked. Items to check are:

- OVEN COLD indicator on – this is normal operation.
- Cable W15 connected to rear-panel FREQ REFERENCE IN and OUT connectors.
- Rear-Panel FREQ REFERENCE EXT/INT switch in proper position.
- A7A1 and A7A2 – Check 10 MHz out at A7A1J4.

YTO UNLOCK

The YTO Phase Lock Loop is unlocked. Items to check are:

- A19 D/A Converter
- A20 Main Coil Driver
- A21 FM Coil Driver
- A11 YTO Loop
- A16 Scan Generator

M/N UNLOCK

The M/N Phase Lock Loop is unlocked. Items to check are:


- A7A3 – Check output at A7A3J1.
- A7A4 – Check output at A7A4J1.

HET UNLOCK





The RF Module Phase lock Loop is unlocked. Items to check are:

- CAL OUTPUT

DIAGNOSTIC FUNCTIONS

The Diagnostic Functions are accessible through the blue  key on the front panel. Through their use it is possible to trace many instrument malfunctions back to the functional block without removing any assemblies. They are also used in Performance Tests and Adjustments as an aid in performing necessary adjustments. A summary of the Diagnostic Functions follows. More information on their use can be found in the troubleshooting procedures.

Frequency Diagnostics (KSR)

This function displays many of the internal frequency control parameters in the upper left corner of the CRT display. (See Figure 1.) These parameters are the programmed values determined by the A15 Controller. For example, following an , a    (KSR) might display the following values:

- (1) 2.321 400 000
- (2) 30.000 000
- (3) 1 17 11
- (4) 184.545 455
- (5) 150.000 000
- (6) 160.300 000

Line 1 is the setting of the YTO Frequency for the selected START frequency.

Line 2 is the setting of the 20/30 SYNTHESIZER for the selected START frequency.

Line 3 contains three different numbers. The first is the Band code number. The setting varies from 0 for center frequencies below 2.5 GHz to 4 for center frequencies above 18.6 GHz. The second number is the M number of the M/N loop. The third number is the N number of the M/N Loop.

Line 4 indicates the frequency output of the M/N loop.

Line 5 indicates the frequency to which the PLL2 VCO has been tuned.

Line 6 shows the frequency to which the Controller has programmed the PLL3 VCO.

Lock Indicator Disable A12TP2 Jumpered to A12TP3

This function permits the analyzer to sweep at normal sweep rates ignoring any phase lock flag indications. For example, if a YTO UNLOCK problem exists, the analyzer will sweep slower since it spends most of its time trying to lock the YTO at center frequency during retrace. By performing the phase lock inhibit, the analyzer does not waste time trying to lock the YTO, so the front panel keys and display can be used as in normal operation. Note, of course, that the displayed frequencies will probably not be accurate.

Trace Detection

Three different sampling modes are used by the analyzer in converting the video signal; these are positive peak, negative peak, and sample. Normally the analyzer selects the proper mode for each measurement, but these can be manually selected to verify proper operation. The mode selected is indicated on the upper left side of the CRT display when under manual control. (See Figure 1.) For example, a signal could be expanded to 2 dB/div to eliminate the noise floor, and then by comparing a positive peak trace measurement, it can be determined if the gains and offsets of the three modes are properly aligned. All three should appear the same on a stable, noise-free signal. When in the noise, the positive peak should display the highest noise peaks, negative peak mode should display the lowest noise levels, and sample mode should display values between the positive and negative peaks.

Trace A ^b (KSb) displays positive peaks.

Trace A ^d (KSd) displays negative peaks.

Trace A ^e (KSe) displays sampled data.

Trace A ^a (KSa) returns to the normal automatic detection modes and removes the CRT indication.

ERROR CORRECTION ROUTINE

The internal Error Correction Routine available by pressing **SHIFT** **W** **FREQUENCY SPAN** (KSW) is also useful as a diagnostic aid. If a malfunction causes the routine to stop, restart it and note the control settings (RES BW, ATTN, REF LEVEL, LOG/LIN, etc.) when the failure occurred. If the routine runs, the correction factors can be displayed by pressing **SHIFT** **W** **LINE** (KSw). Figure 2 displays the data for a typical instrument. Table 2 gives the parametric information, specifications and a place to start the troubleshooting procedure.

Caution must be exercised in interpreting the correction factor data. Wrong conclusions can be reached by not understanding how the internal program runs. The program assumes that the input signal level is -10.0 dBm. Any error in this level translates to the correction factors; therefore, the Amplitude Accuracy test **RECALL** 8 should be performed first. The internal program runs in the LIN mode while **RECALL** 8 is in 1 dB/LOG mode. Large offsets in LOG/LIN offset (lines 1 and 14) will cause errors in the data.

```

hp REF -7.0 dBm ATTN 10 dB
1 dB/  0.32 dB
      -0.20 dB
      -0.15 dB
      -0.12 dB
      -0.09 dB
      0.05 dB -320.000 kHz
      0.00 dB -60.000 kHz
      -0.06 dB  4.000 kHz
      -0.40 dB 12.000 kHz
      0.67 dB -5.100 kHz
      0.60 dB -600 Hz
      0.74 dB  100 Hz
      0.06 dB -20 Hz
      0.67 dB -20 Hz
      0.60 dB -11 Hz
      0.70 dB -7 Hz
      1.06 dB -1 Hz
      -0.35 dB
      -0.23 dB
      0.00 dB
      0.12 dB
      0.11 dB
CORR'D 0.11 dB
        0.21 dB
        0.24 dB
        -0.02 dB
        -0.02 dB
        -0.02 dB
        -0.02 dB
        -0.02 dB
START 100.000 000 MHz STOP 100.000 000 MHz
RES BW 30 Hz VSW 100 Hz SWP 10.0 sec

```

FIGURE 2. ERROR CORRECTION ROUTINE DATA

TABLE 2. ERROR CORRECTION ROUTINE PARAMETERS

Line	Parameter	Specification	Troubleshooting Information		
1	LOG and LIN scale, BW <100 kHz	±1 dB typical	A4A3/A4A2		
2	LOG 10 dB/	} ±(0.5 dB—1 dB reading)	} A4A1		
3	LOG 5 dB/				
4	LOG 2 dB/				
5	LOG 1 dB/				
6	RES BW = 3 MHz				
7	1 MHz	} ±0.5 dB ±1 dB* * ±0.5 dB* ±1 dB* ±1.0 dB ±1.0 dB typical ±0.2 dB typical	} A4A8/A4A4/A4A6		
8	300 kHz				
9	100 kHz				
10	30 kHz				
11	10 kHz				
12	3 kHz				
13	1 kHz				
14	300 Hz				
15	100 Hz				
16	30 Hz				
17	10 Hz				
18	LOG and LIN scale, BW ≥100 kHz			±1 dB typical	A4A3/A4A2
19	Step Gains = A20			} ±0.6 dB	} A4A8
20	A10				
21	SG20-2			} ±1.0 dB	} A4A5
22	SG20-1				
23	SG10				
24	LG20				
25	LG10	} ±1.0 dB typical	} A4A3		
26	RF ATTENUATOR = 20 dB				
27	30 dB				
28	40 dB				
29	50 dB				
30	60 dB				
31	70 dB	} ±0.2 dB typical	} A6A10 A12U8		

*Specifications for all Resolution Bandwidths are referenced to the 1 MHz Resolution Bandwidth. The frequency error terms are for error correction only.

SWEEP SYSTEM BLOCK DIAGRAM DESCRIPTION

The 8566B Spectrum Analyzer sweep system consists of the following modes:

Continuous Sweep; Free Run Trigger

Several different assemblies are involved in the 8566B sweep system. The A16 Scan Generator generates the 0 to 10V sweep ramp. The ramp converter on the A3A8 Analog-Digital Converter and the Digital Storage Processor Section digitize this ramp into a 10-bit sweep address. When the sweep address reaches the marker address, the Digital Storage Processor Section outputs a RSHS (Low = Reset High Sweep) pulse. This signal resets the High Sweep flip-flop on the A3A1 Trigger assembly. HSWP (High Sweep) goes low and the current source charging the sweep capacitor on A16 is shunted to ground, stopping the sweep ramp at its present value. The negative transition on the HSWP line generates a Service Request on A12 Front-Panel Interface forcing LSRQ low which sets LSTP (Low Stop) high. This "wakes up" the A15 Controller. The Controller then reads the sweep address from the Digital Storage Processor Section. If it corresponds to the end of the sweep, the A15 Controller outputs a sweep reset command to the A16 Scan Generator, resetting the sweep ramp to 0V. After all Service Requests have been handled (LSRQ is high), the A15 Controller starts the sweep by issuing a set HSWP command to the A3A1 Trigger. The A15 Controller then issues a stop command to the A12 Front-Panel Interface assembly that forces LSTP low, stopping the Controller. After a 500 μ sec delay on A3A1 Trigger, HSWP goes high, the sweep ramp starts, the Digital Storage Processor Section starts digitizing the ramp, and the front panel SWEEP LED lights indicating a sweep is in progress.

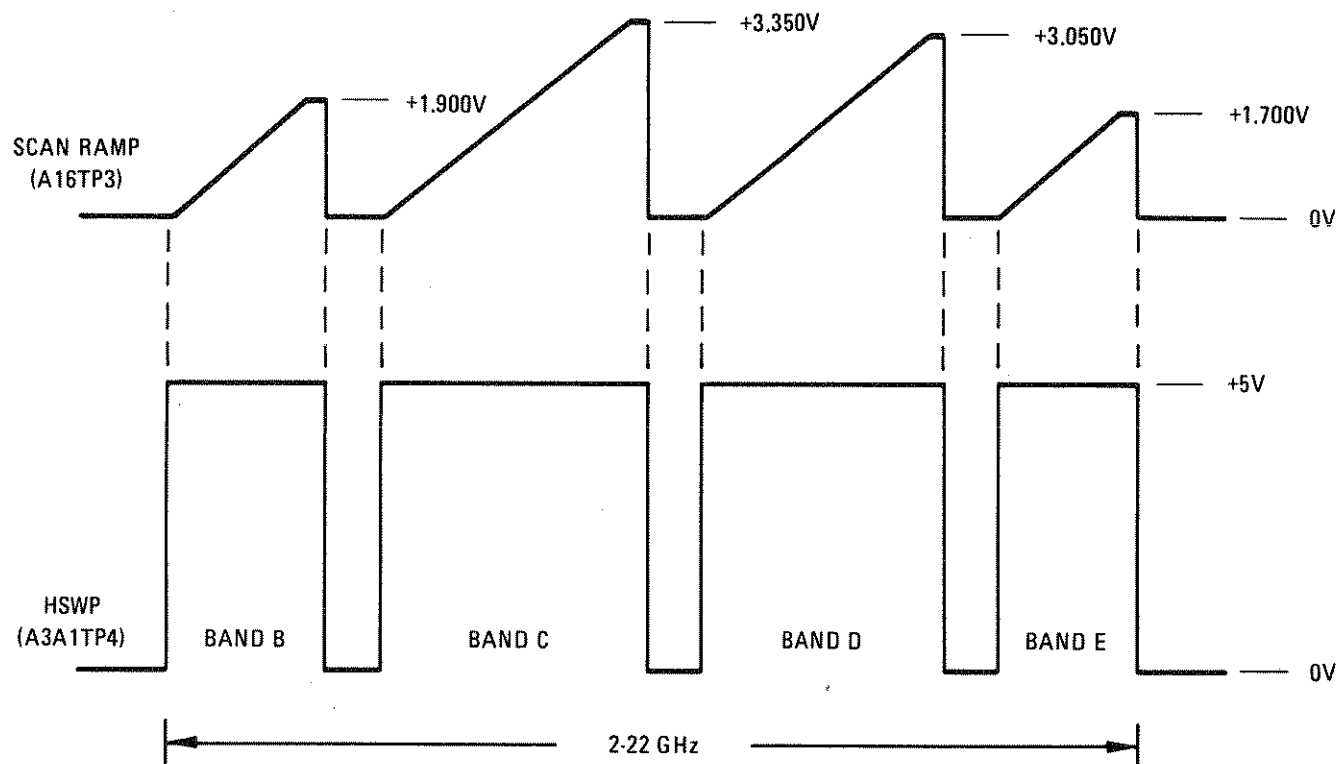


FIGURE 3. SWEEP SYSTEM TIMING EXAMPLE

Triggered Sweep

The triggered sweep modes are very similar to free run operation except that instead of the A15 Controller outputting a set HSWP command to the A3A1 Trigger assembly, it outputs a trigger enable command. The output of the trigger select circuit (line, external, or video) then clocks the HSWP line high.

Single Sweep

The single sweep mode is useful in troubleshooting the sweep system because it does not rely on feedback from Digital Storage before resetting the sweep generator. Whenever the SWEEP SINGLE key is pressed, the A15 Controller resets the sweep generator and then sets HSWP high through the A3A1 Trigger assembly. Digital Storage then stops the sweep when it has reached the end and the ramp resets to 0V.

Fast Sweep

Fast sweep is enabled only for 0 Hz frequency spans and sweep times less than 20 msec. HSWP is forced low, and the A16 Sweep Generator is not used. See A3A1 Trigger for a description of the fast sweep operation.

Service Requests

Any of the Service Requests on the A12 Front-Panel Interface will force LSRQ low which forces HSWP low. For example, when a front-panel key is depressed, a keyboard Service Request is generated. LSRQ goes low, LSTP goes high, and HSWP goes low stopping the sweep. Depending on which key was pressed, the A15 Controller will either continue the sweep or reset it and start a new sweep. Note that the analyzer cannot sweep if any Service Requests are present.

SWEEP SYSTEM TROUBLESHOOTING

The following procedure is an aid to rapidly isolate sweep system malfunctions. When the malfunction has been traced to a single assembly, check the Service Sheets for that assembly for a more thorough troubleshooting procedure.

Isolate the Scan Sweep

Disconnect the ramp from A3A8J1 and jumper A3A8TP1 to A3A8TP2. This forces the ramp comparator output high. The Digital Storage Processor Section should continue to process data and increment the sweep address. The HSWP light should be flashing and HSWP should have an approximately 16 msec pulse width. (Note that the instrument preset state may appear to be functioning properly but will become distorted as the sweep time is slowed down.) If this works, the Digital Storage Processor Section and A15 Controller, A12 Front-Panel Interface, and A3A1 Trigger assemblies are operating properly. Suspect the ramp generator or A16 Scan Generator or ramp converter on the A3A8 Analog-Digital Converter. To further isolate the scan generator, reconnect the sweep ramp to A3A8J1 and remove the jumper. Set the sweep time to 1 second and press the SWEEP key. The ramp waveform will start at greater than 10V, go to 0V when the SWEEP key is pressed, and ramp back up to greater than 10V. If the ramp waveform is correct, check the A3A8 ramp converter. Otherwise check the ramp generator on A16.

Isolate Digital Storage Processor Section If HSWP Stays High (SWEEP LED ON)

With the sweep ramp disconnected from A3A8J1 and A3A8TP1 jumpered to A3A8TP2, check RSHS output for the presence of 60 nsec low pulses. (The logic probe of the HP 5005A Signature Analyzer can be used to detect them.) If present, check A3A1 Trigger. If not, check the Digital Storage Processor Section.

Isolate A12 Front-Panel Interface If HSWP Stays Low (SWEEP LED OFF)

Troubleshoot A12 Front-Panel Interface using the Signature Analysis Troubleshooting Diagrams.

See A3A1 Trigger Troubleshooting Procedure

Note that the A3A1 Trigger assembly also generates and controls the fast sweep timing (sweeps less than 10 msec).

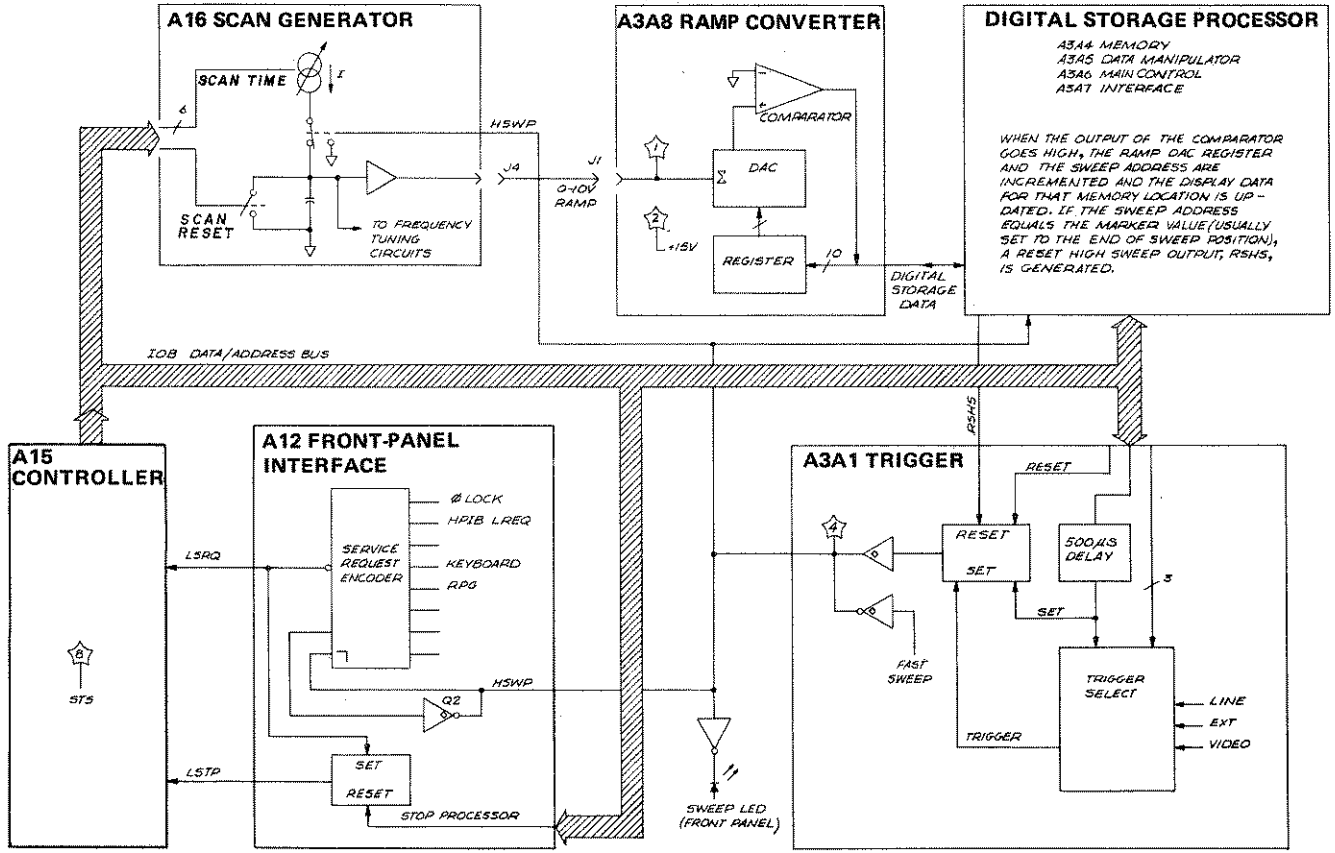
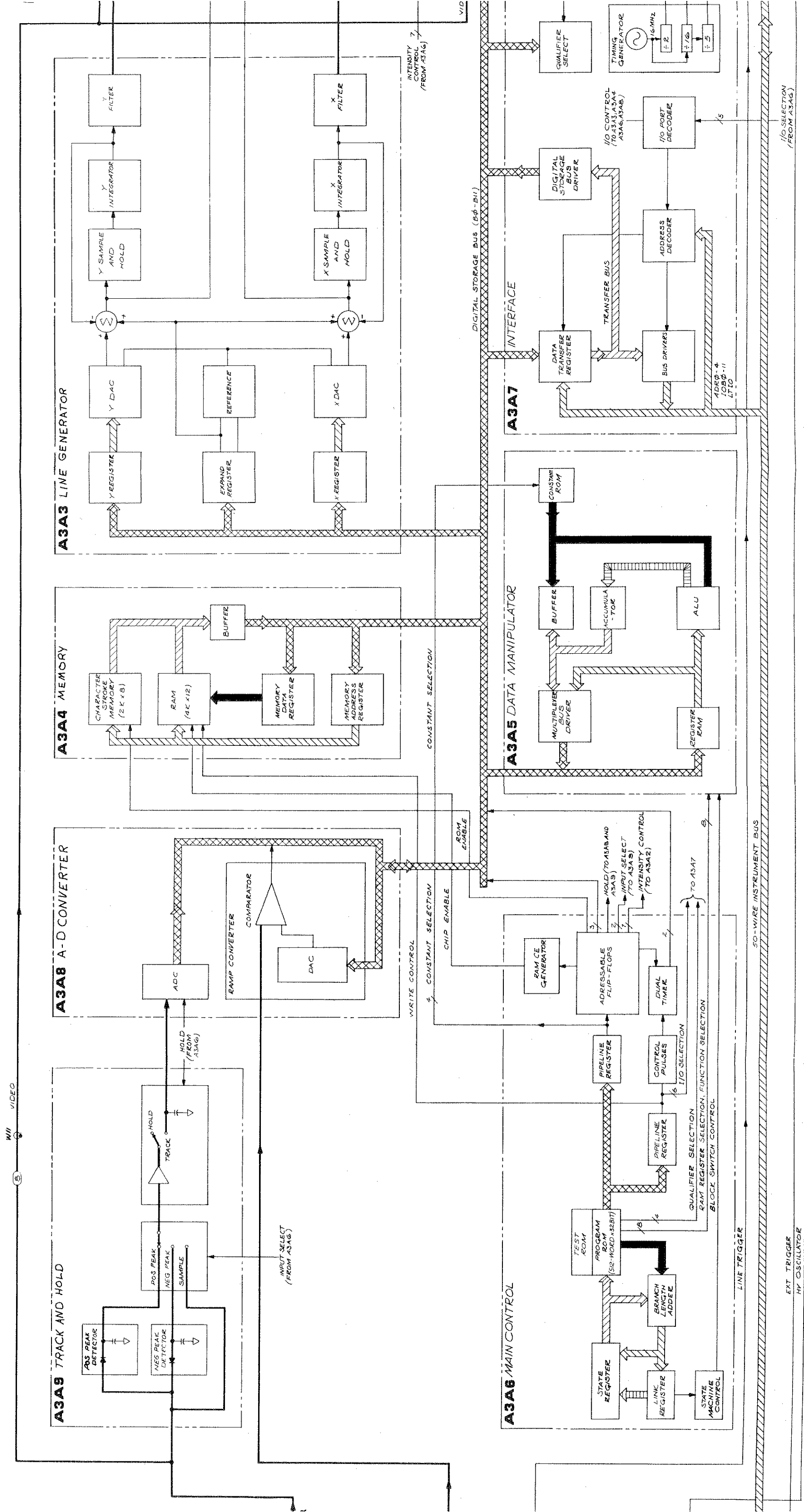


FIGURE 4. SWEEP SYSTEM BLOCK DIAGRAM

TABLE 3. MNEMONICS LISTING FOR RF SECTION

Mnemonic	Active State	Description	Mnemonic	Active State	Description
ADR \emptyset - 4		Address Bits \emptyset through 4	LDAS	LOW	DAC Strobe
ATN*	LOW	Attention True	LDSR	LOW	Digital Storage Ready
BATT		Battery	LHBZ	LOW	HP-IB Input Buffer from Main Processor Full
BFC ON		Filter Capacitor IN	LIDA \emptyset - 15	LOW	Instruction, Data and Address Bus Bits
DAV*	LOW	Data Valid	LIPS	LOW	Instrument Preset
DIO1 - 8	LOW	HP-IB Data Input/Output Bits	LLED	LOW	LED Strobe
DS \emptyset - 3	HIGH	μ Processor Inputs/Output Device Select Bits	LMNE	LOW	M/N Output Enable
EOI*	LOW	End or Identify	LREQ	LOW	Word Ready from HP-IB Processor
HLE2	HIGH	Phase Lock Loop 2 Lock Enable	LRMT	LOW	Remove (High = Local)
HLEY	HIGH	YTO Lock Enable	LROM1 - 3	LOW	Enable ROM 3-State Outputs
HOVH	HIGH	Oven Cold	LRTL	LOW	Local Button Pushed
HPON	HIGH	Power ON to IF-Display Section	LSAS	LOW	Scan Attenuator Strobe
HPUP	HIGH	Power Up	LSBY	HIGH	Standby
HS1, 2		Handshake 1, 2	LSOB	LOW	Stay Off Bus
HSTD	HIGH	10 MHz Standard ON	LSRQ	LOW	Service Request
HSTM	HIGH	START Memory	LSTP	LOW	Stop A15 Controller
HSWP	HIGH	Sweeping	LSTS	LOW	Scan Time Strobe
HUL1	HIGH	Phase Lock Loop 1 or 3 Unlocked	LTGR	LOW	Tracking Generator Request
HUL2	HIGH	Phase Lock Loop 2 Unlocked	LTIO	LOW	IF-Display Section I/O Strobe
HULH	HIGH	Heterodyne Oscillator Unlocked	LWRT	LOW	Write Memory
HULM	HIGH	M/N Unlocked	LYSP	LOW	YTO Span
HULR	HIGH	REF Unlocked	M1 - 5		M/N Loop-M Inputs
HULY	HIGH	YTO Unlocked	MAR \emptyset - 1 \emptyset		Memory Address Bits
HXRF	HIGH	External Reference	N1 - 6		M/N Loop-N Inputs
HYGH	HIGH	YTO Loop Gain High	NDAC*	HIGH	Data Accepted
IFC*	LOW	Interface Clear	NRFD*	HIGH	Ready for Data
IOB \emptyset - 15	HIGH	Instrument Bus Data Bits	PDB \emptyset - 7	HIGH	μ Processor Data Bits
KC \emptyset - 7		Key Columns \emptyset through 7	REN*	LOW	Remote Enable
KR \emptyset - 11		Key Rows \emptyset through 11	RPG1		Rotary Pulse
LADR	LOW	Address LED ON	RPG2		Generator Lines
LANR	LOW	Analog Reset	SAT1		Scan Integer
LAOS	LOW	Aux Out Strobe	SAT2		Attenuator
LBIO	LOW	RF Section I/O Strobe	SRQ*	LOW	Service Request
LCK1 - 5	LOW	Strobes for PLL1, 2, 3	SW1		Switch 1
LCS1 - 8	LOW	Chip Select for ROMs	SW2		Switch 2

* HP-IB Mnemonics



NOTE
 UNLESS OTHERWISE INDICATED, POWER LEVELS ARE MEASURED UNDER THE FOLLOWING CONDITIONS: USING AN ACTIVE PROBE AND THE SPECTRUM ANALYZER.
 INSTRUMENT PRESET
 CENTER FREQUENCY 20 MHz
 FREQUENCY SPAN 0 Hz
 ATTENUATION 0 dB
 RESOLUTION BANDWIDTH 3 kHz

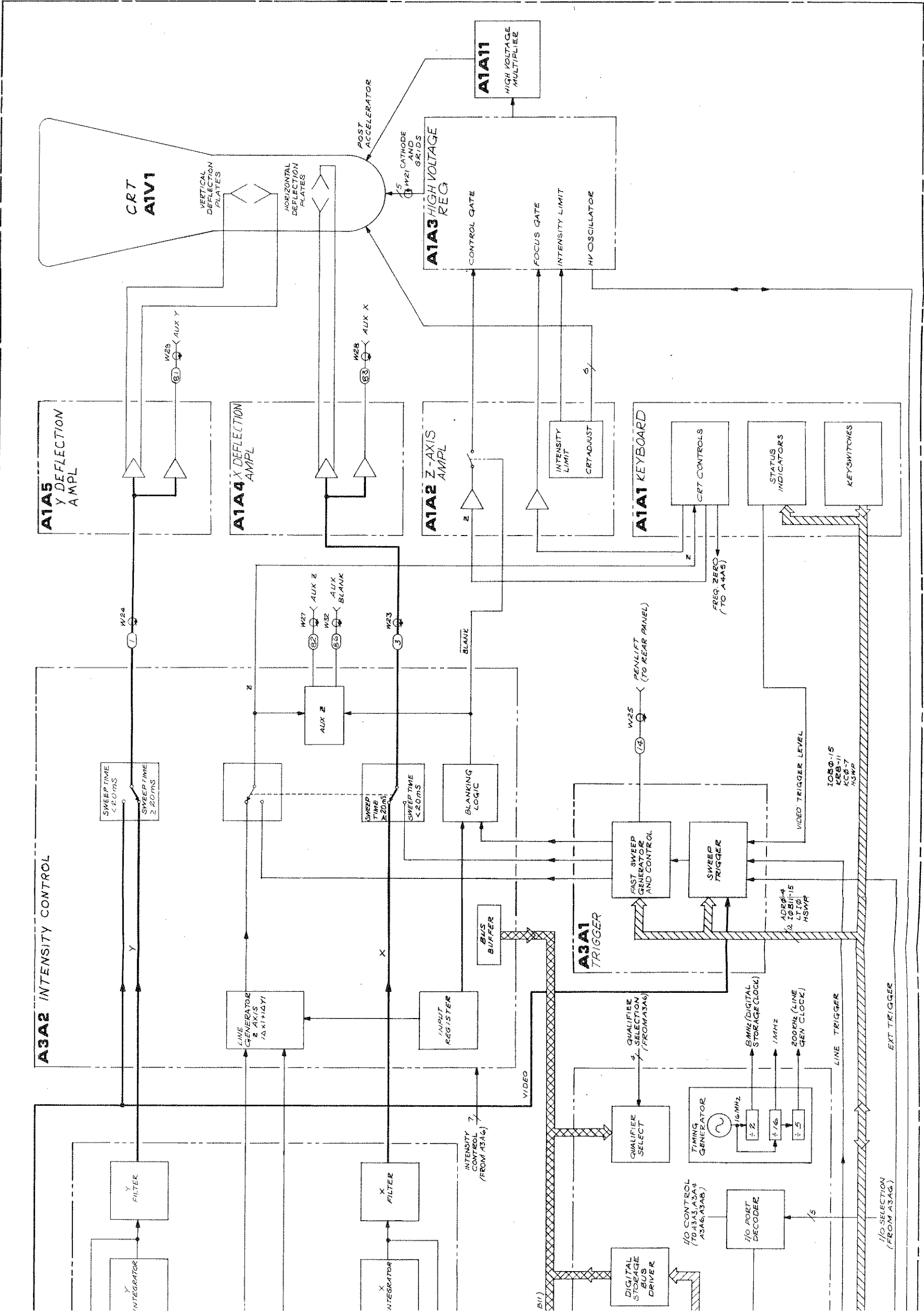
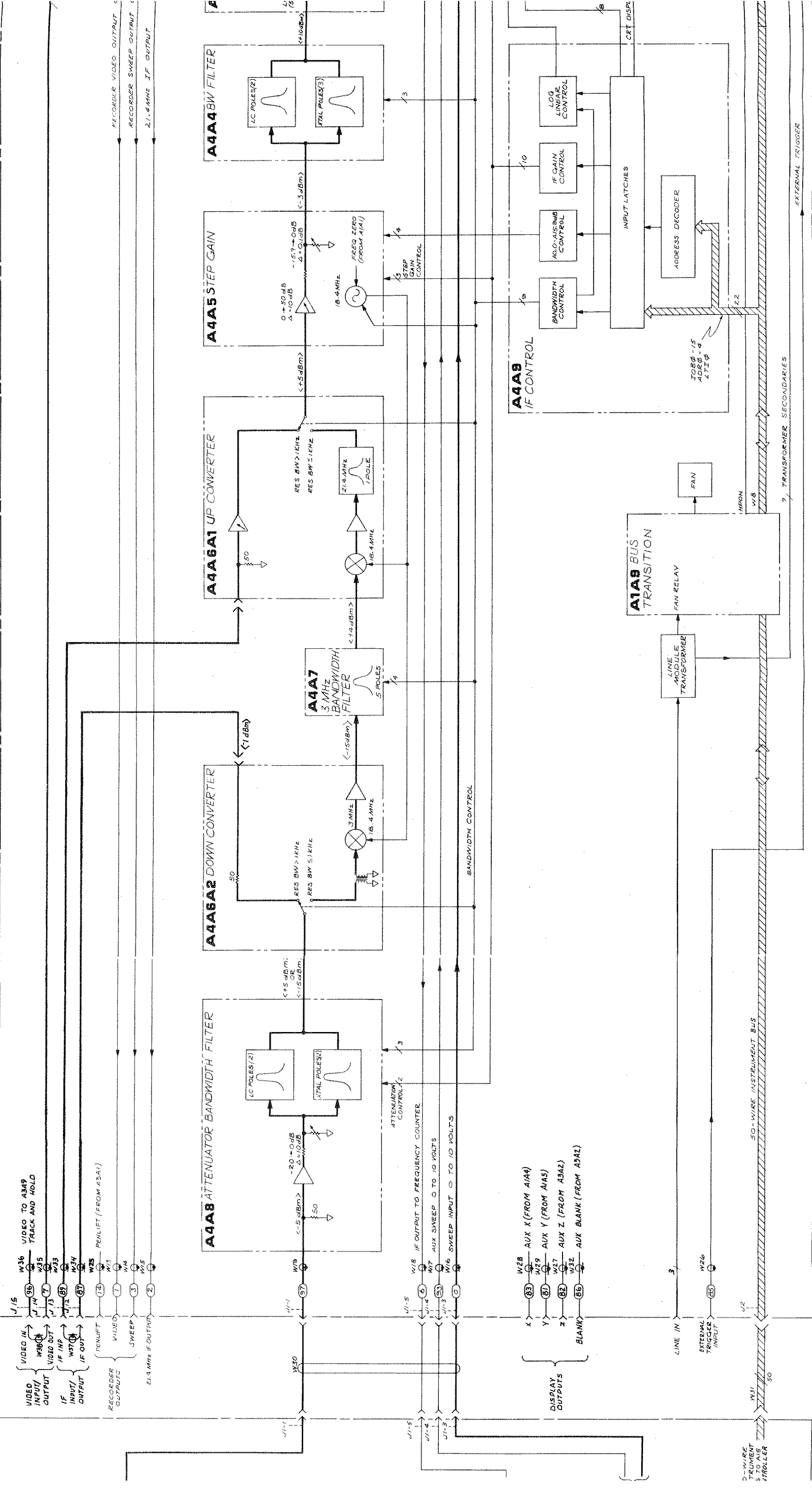


FIGURE 5. SPECTRUM ANALYZER OVERALL BLOCK DIAGRAM (2 OF 3)

IF-DISPLAY SECTION

SECTION



NOTE

1. UNLESS OTHERWISE INDICATED, POWER LEVELS ARE MEASURED UNDER THE FOLLOWING CONDITIONS USING AN ACTIVE PROBE AND THE SPECTRUM ANALYZER.
 INSTRUMENT PRESET
 CENTER FREQUENCY CAL. OUT FREQ.
 FREQUENCY SPAN 0 Hz
 ATTENUATION 0 dB
 RESOLUTION BANDWIDTH 3 KHz

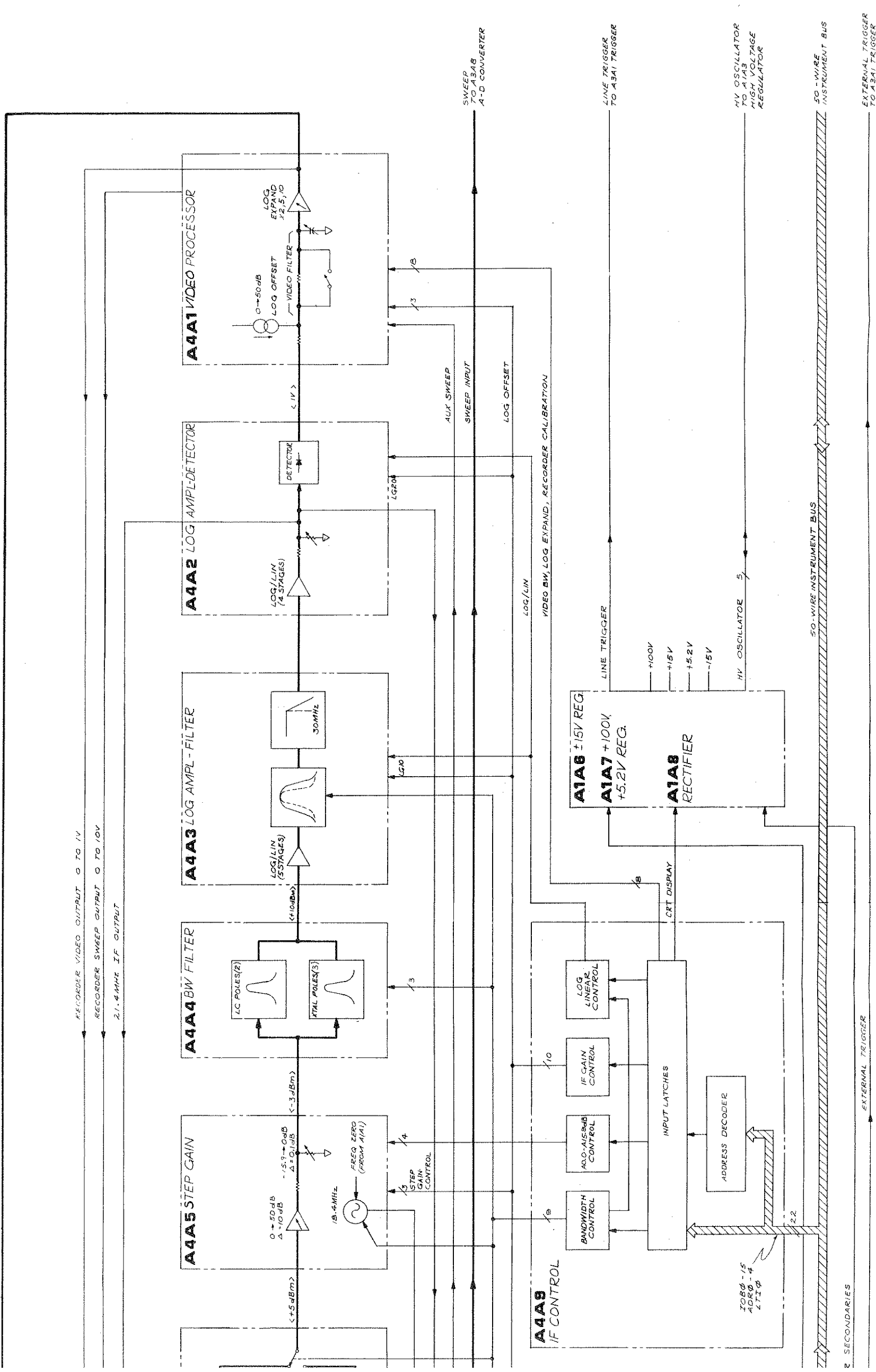


FIGURE 5. SPECTRUM ANALYZER OVERALL BLOCK DIAGRAM (3 OF 3)
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RF SECTION ANALOG TROUBLESHOOTING

PHASE LOCK LOOPS PRINCIPLES OF OPERATION

General Description

The fundamental RF signal input to the A6 RF Module (2-6.2 GHz) is generated by the A11A3 YTO (YIG-Tuned Oscillator). This signal is phase-locked, through other phase-lock loops, to the A22 10 MHz Standard (internal crystal oscillator). The YTO Loop pretunes and locks the YTO signal to the output of the M/N Loop (part of A7) and the A10 20/30 Loop. The M/N and 20/30 Loops serve two basic functions. First, they phase-lock the YTO Loop to the 10 MHz Standard through the Reference Loop (part of A7). They also provide the stepped tuning of the YTO output signal. The M/N Loop provides the larger steps (2000 to 6199 MHz in 10 MHz steps) while the 20/30 Loop provides the smaller (1 MHz to 1 Hz) steps.

All phase lock loops are referenced, either directly or indirectly, to the A22 10 MHz Standard. Figure 1 shows the relationship between the various loops as well as defining the assemblies associated with the loops.

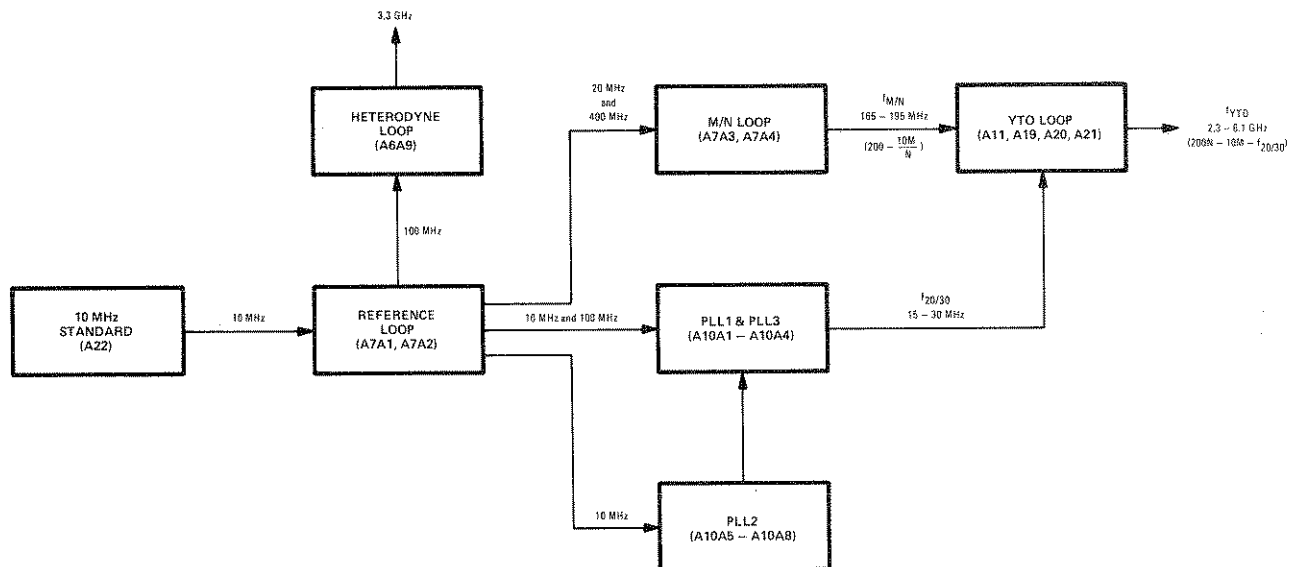


FIGURE 1. PHASE LOCK LOOPS (SYNTHESIZER), BLOCK DIAGRAM

Reference Loop (Part of A7)

The Reference Loop is phase-locked to the A22 10 MHz Standard and its phase-locked outputs (10, 20, 100, and 400 MHz) are used as references for the 20/30 Loop, the M/N Loop, and the Heterodyne Loop (part of A6). The 10 MHz signal is also used as an auxiliary rear-panel output.

The A7A2 100 MHz VCXO (Voltage-Controlled Crystal Oscillator) is the heart of this loop. The 100 MHz output signal is 1) routed to the A6A9 Phase Lock assembly to be used as a reference for the Heterodyne Loop and as the front-panel CAL OUTPUT signal, 2) routed to the A10A3 PLL3 Up Converter to be used as a reference for that phase-lock loop, 3) multiplied by four to produce the reference signal for the M/N Loop (A7A3 M/N Phase Detector), and 4) divided by five to produce a 20 MHz reference signal also used by the M/N Loop. The 20 MHz signal is divided by two to produce a 10 MHz signal which is used as a reference for the PLL1 and PLL2 phase-lock loops in the 20/30 Loop and also as the rear-panel auxiliary output. The 10 MHz signal is also phase compared to the output of the A22 10 MHz Standard. The resulting error signal is used to tune the 100 MHz VCXO to phase-lock the Reference Loop.

M/N Loop (Part of A7)

The frequency output of the M/N Loop is dependent on the front-panel Start Frequency/Center Frequency and in part, controls the YTO output frequency. This signal is disabled during sweeps when the frequency span is greater than 5 MHz (fundamental mixing). An encoded equivalent of the front-panel frequency's most significant digits are input to the M/N Loop as M and N numbers. The ratio of the M and N numbers determines the M/N OUT ($f_{M/N}$) frequency and are chosen such that the Nth harmonic (same as the divider number) of $f_{M/N}$ tunes in exactly 10 MHz increments as M is changed. There is one 10 MHz step for each valid $f_{M/N}$ frequency (M/N ratio) and Nth harmonic (N number). Refer to Table 2 for a complete list of M and N numbers and resulting $f_{M/N}$ frequencies. This 10 MHz step complements the 20/30 Loop whose tuning range is 10 MHz and step size is 1 Hz. Together, the M/N loop, YTO pretuning, and 20/30 Loop are able to tune the A11A3 YTO from 2000.000 000 to 6199.999 999 MHz in 1 Hz steps.

YTO Loop (A11)

Whenever a change is made to the Start Frequency/Center Frequency (from the front panel or remote controller), the YTO is pretuned near the desired new frequency. This is done by encoded information being sent from the A12 Front-Panel Interface to the A19 DAC (Digital-to-Analog Converter) which generates and routes an analog voltage to the A20 Main Coil Driver. The Main Coil Driver, in turn, generates a tuning current to tune the YTO. This places the YTO frequency 20 to 30 MHz below the Nth harmonic of the M/N Loop output ($f_{M/N}$). For frequency spans greater than 5 MHz, the YTO frequency is locked at the start of each sweep with the M/N loop and the 20/30 loop to a 1 Hz resolution. The YTO signal (f_{YTO}) and the M/N Loop output signal ($f_{M/N}$) are mixed in the A11A5 Sampler (harmonic mixer) to produce the YTO IF (f_{YTOIF}) signal. This 20 to 30 MHz signal is phase compared to the 20/30 Loop output signal ($f_{20/30}$) in the A11A4 YTO Phase Detector producing a dc error voltage. It should be noted that f_{YTOIF} and $f_{20/30}$ are equal when the YTO Loop is phase-locked. This error voltage is stored in a capacitor, the loop (YTO) opened, and a sweep taken. The loop is relocked at the start of each sweep. If the frequency span is less than 5 MHz, the YTO Loop is always locked and is forced to sweep by following the swept oscillator reference ($f_{20/30}$) from PLL2 in the 20/30 Loop which is either applied directly to the YTO or divided down and summed into PLL2 and PLL1 and then applied to the YTO.

When the frequency span is less than 25 kHz, the loop gain of the YTO Loop is increased by approximately 10 dB to provide better performance. This is performed by control signal HYGH (High = YTO Loop Gain High) being placed in a High state.

20/30 Loop (A10)

The 20/30 Loop translates tuning data for the seven least significant digits of the YTO frequency (2 to 6.2 GHz) into frequencies from 30 to 20.000 001 MHz. This translation is quite straightforward and the resulting output frequency can be calculated by the following equation:

$$f_{20/30} = 30 - x.xxx\ xxx \text{ MHz}$$

where x.xxx xxx is the seven least significant digits of the YTO frequency.

This process of frequency translation is used to tune the YTO over a 10 MHz range in 1 Hz steps (1 Hz steps in zero frequency span) and uses three complete phase-lock loops (PLL1, PLL2, and PLL3) to achieve this.

Phase Lock Loop 2 (PLL2) provides a low-frequency (20 to 30 MHz) reference ($f_{20/30}$) to the YTO Loop for frequency spans between approximately 100 kHz and 5 KHz. This loop is locked at the start of each sweep, the error voltage stored in a capacitor, the loop unlocked, and a sweep taken. For frequency spans of less than approximately 100 kHz and greater than 5 kHz, the 20 to 30 MHz output is divided by 5 and applied as an input to Phase Lock Loop 3 (PLL3) and Phase Lock Loop 1 (PLL1). The output of PLL1/PLL3 then serves as the reference input ($f_{20/30}$) to the YTO Loop. If the frequency span is 5 kHz or smaller, the output of PLL2 is divided by 100 and applied to PLL3.

Heterodyne Loop (Part of A6)

The Heterodyne Loop (A6A9) consists of a 3.3 GHz oscillator located in the A6A4 Second Converter that is locked to the 100 MHz VCXO in the A7A2 assembly. The 100 MHz signal drives the Sampler in the A6A9 Phase Lock assembly which produces a dc output proportional to the phase difference between the 33rd harmonic of 100 MHz and the 3.3 GHz oscillator output signal being sampled. This dc output is amplified and used to drive the 3.3 GHz oscillator to achieve phase lock. If the loop is unlocked, a search oscillator (in the A6A9) turns on and sweeps the 3.3 GHz VCO until phase-lock is again achieved. The Heterodyne loop is used only for start frequencies of less than 2 GHz.

TROUBLESHOOTING INFORMATION

Troubleshooting Table

Table 1 correlates CRT phase-lock error messages with the probable faulty phase-lock loop and associated assemblies. This is especially helpful in determining the faulty loop when more than one phase-lock error message is displayed.

TABLE 1. TROUBLESHOOTING USING CRT UNLOCK MESSAGES

Message(s) (UNLOCK)	Probable Faulty Loop	Associated Assemblies
PL1	Phase Lock Loop 1	A10A1 – A10A4
PL2	Phase Lock Loop 2	A10A5 – A10A8
REF	Reference Loop	A7A1, A7A2, A22
YTO	YTO Loop	A19, A20, A21, A11
M/N	M/N Loop	A7A3, A7A4
HET	Heterodyne Loop	A6A9, A6A4
PL1, PL2	Phase Lock Loop 2	A10A5 – A10A8
PL1, YTO	Phase Lock Loop 1	A10A1 – A10A4
PL1, PL2, YTO	Phase Lock Loop 2	A10A5 – A10A8
REF, PL1, PL2	Reference Loop	A7A1, A7A2, A22
REF, M/N, YTO	Reference Loop	A7A1, A7A2, A22
M/N, YTO	M/N Loop	A7A3, A7A4
HET, REF	Reference Loop	A7A1, A7A2, A22

START FREQUENCY TUNING EQUATIONS AND PHASE LOCK TROUBLESHOOTING

General

Phase-lock loop troubleshooting is much easier if it is understood how the start frequency is derived. The Diagnostic Functions of the spectrum analyzer can also be used to simplify troubleshooting of the phase-lock loop.

Figure 2 shows a simplified block diagram of the assemblies involved in setting the start frequency. The 8566B has two tuning modes. For frequency spans greater than 5MHz, a method called lock and roll is used. This basically involves phase locking the analyzer start frequency during the retrace period prior to the beginning of a new scan. For frequency spans of 5 MHz and less, the analyzer is phase-locked during all of a sweep.

The equation for start frequency is:

$$f_{SF} = (B \cdot (N \cdot f_{M/N} - f_{20/30})) + f_{IF}$$

where

f_{SF} = Start Frequency

B = band number. KSR displays the value of B which varies from 0 to 4. When the displayed value is 0 (low band), use 1 as a multiplier.

N = N number for M/N Loop. KSR displays the value of N which varies from 11 to 32.

$f_{M/N}$ = M/N loop frequency in MHz. KSR displays the value which ranges from 177 to 197 MHz.

$f_{20/30}$ = Synthesizer frequency in MHz. KSR displays the value which ranges from 20 to 30 MHz.

f_{IF} = Signal IF frequency. The value is 3621.4 MHz for band 0, -321.4 MHz for band 1, and +321.4 MHz for bands 2, 3, and 4.

NOTE

For a detailed explanation of the Frequency Diagnostic Function (KSR), see Diagnostic Functions in the Spectrum Analyzer Overall Troubleshooting Section of this manual.

As an example, these values are used following an INSTR PRESET ( pressed) to determine the start frequency.

$$B = 1 \quad N = 13$$

$$f_{M/N} = 180.769231 \text{ MHz}$$

$$f_{20/30} = 28.600000$$

$$f_{IF} = -321.4 \text{ MHz}$$

Substitute these values into the equation.

$$f_{SF} = (1 \cdot (13 \cdot 180.769231 \text{ MHz}) - 28.600000 \text{ MHz}) - 321.4 \text{ MHz} = 2000.0 \text{ MHz}$$

M/N Loop Tuning

The frequency output of the M/N Loop is dependent on the ratio of M and N numbers. These numbers are input in the form of digital tuning information to the M/N Loop Phase Detector. The following equation shows the relationship between the output frequency and the M and N numbers.

$$f_{M/N} = (200 - 10 (M/N)) \text{ MHz}$$

where

$$f_{M/N} = \text{M/N output frequency}$$

M = M number which varies from 8 – 27. KSR displays the value of M.

N = N number which varies from 11 – 32. KSR displays the value of N.

The M and N numbers are selected such that the M/N Loop output pretunes the YTO frequency in 10 MHz steps. For a listing of the M and N numbers, M/N output frequencies ($f_{M/N}$), and the YTO frequencies, refer to Table 2, M and N Numbers and Resulting Frequencies.

20/30 Synthesizer Tuning

When a start frequency change occurs, the YTO is pretuned near the new desired frequency by the A19 Digital-Analog Converter and A20 Main Coil Driver. This places the YTO frequency 20 to 30 MHz below the Nth harmonic of the M/N Loop output. (The Nth harmonic is the same as the M/N Loop's N number.) The YTO frequency and the M/N Loop harmonic are mixed in the A11A5 Sampler. The YTO IF (20 – 30 MHz) is phase compared with the 20/30 Synthesizer output. The A11A4 Phase Detector's error voltage is then used to tune the YTO through the A21 FM Coil Driver and the A20 Main Coil Driver to achieve phase-lock.

The 20/30 Synthesizer is used to pretune the YTO in 1 Hz steps (in zero frequency span) through a 10 MHz range. The following formula expresses the relationship between the frequencies found in the YTO Loop.

$$f_{20/30} = (N \cdot f_{M/N}) - f_o = f_{YTOIF}$$

where

$$f_{20/30} = \text{20/30 Synthesizer frequency. (Displayed with KSR.)}$$

N = N number, varies from 11 – 32. (KSR displays value of N.)

$$f_{M/N} = \text{M/N Loop frequency}$$

$$f_o = \text{YTO frequency}$$

$$f_{YTOIF} = \text{YTO IF frequency}$$

The 20/30 Synthesizer frequency can also be determined by using the YTO frequency set. This frequency is available by using KSR. In this case,

$$f_{20/30} = (30.000000 - D_7 \cdot D_6 D_5 D_4 D_3 D_2 D_1)$$

where

D_1 to D_7 is the YTO frequency displayed with D_1 being the least significant digit (1 Hz).

Marker Mode

When the MARKER mode is selected, the analyzer does the following. First, the center frequency is determined. Because the marker is a display marker, after the center frequency is calculated, the position of the marker on the display is determined. By knowing that the display consists of 1000 points and the programmed frequency span, the processor calculates the offset between the center frequency and the marker. The frequency span accuracy is the major cause of error in the readout accuracy of the MARKER mode.

Phase Lock Loop Troubleshooting

If one of the phase-lock error messages appears, a loop has failed. Start the troubleshooting procedure by determining if the malfunction is dependent on Center Frequency, Frequency Span, etc. Next, break the suspected loop and measure the power levels as indicated on the RF Section Analog Block Diagram. Even with the oscillators at the extremes of their ranges, the power levels must be within the limits indicated. The loop frequencies can be counted and compared with the programmed frequencies listed by KSR by inserting a tee connector into the loop.

The Lock Indicator Disable jumper (A12TP2 to A12TP3) may be necessary if the keyboard is locked out. Use the information from the Diagnostic Function and the Start Frequency Tuning Equations to narrow the fault to a single assembly.

TABLE 2. M AND N NUMBERS AND RESULTING FREQUENCIES (1 OF 5)

YTO START FREQ. MHz	M	N	M/N MHz	YTO START FREQ. MHz	M	N	M/N MHz
2000	17	11	184.545455	2540	23	14	183.571429
2010	16	11	185.454545	2550	22	14	184.285714
2020	15	11	186.363636	2560	21	14	185.000000
2030	14	11	187.272727	2570	20	14	185.714286
2040	13	11	188.181818	2580	19	14	186.428571
2050	12	11	189.090909	2590	18	14	187.142857
2060	11	11	190.000000	2600	17	14	187.857143
2070	10	11	190.909091	2610	16	14	188.571429
2080	9	11	191.818182	2620	15	14	189.285714
2090	8	11	192.727273	2630	14	14	190.000000
2100	27	12	177.500000	2640	13	14	190.714286
2110	26	12	178.333333	2650	12	14	191.428571
2120	25	12	179.166667	2660	11	14	192.142857
2130	24	12	180.000000	2670	10	14	192.857143
2140	23	12	180.833333	2680	9	14	193.571429
2150	22	12	181.666667	2690	8	14	194.285714
2160	21	12	182.500000	2700	27	15	182.000000
2170	20	12	183.333333	2710	26	15	182.666667
2180	19	12	184.166667	2720	25	15	183.333333
2190	18	12	185.000000	2730	24	15	184.000000
2200	17	12	185.833333	2740	23	15	184.666667
2210	16	12	186.666667	2750	22	15	185.333333
2220	15	12	187.500000	2760	21	15	186.000000
2230	14	12	188.333333	2770	20	15	186.666667
2240	13	12	189.166667	2780	19	15	187.333333
2250	12	12	190.000000	2790	18	15	188.000000
2260	11	12	190.833333	2800	17	15	188.666667
2270	10	12	191.666667	2810	16	15	189.333333
2280	9	12	192.500000	2820	15	15	190.000000
2290	8	12	193.333333	2830	14	15	190.666667
2300	27	13	179.230769	2840	13	15	191.333333
2310	26	13	180.000000	2850	12	15	192.000000
2320	25	13	180.769231	2860	11	15	192.666667
2330	24	13	181.538462	2870	10	15	193.333333
2340	23	13	182.307692	2880	9	15	194.000000
2350	22	13	183.076923	2890	8	15	194.666667
2360	21	13	183.846154	2900	27	16	183.125000
2370	20	13	184.615385	2910	26	16	183.750000
2380	19	13	185.384615	2920	25	16	184.375000
2390	18	13	186.153846	2930	24	16	185.000000
2400	17	13	186.923077	2940	23	16	185.625000
2410	16	13	187.692308	2950	22	16	186.250000
2420	15	13	188.461538	2960	21	16	186.875000
2430	14	13	189.230769	2970	20	16	187.500000
2440	13	13	190.000000	2980	19	16	188.125000
2450	12	13	190.769231	2990	18	16	188.750000
2460	11	13	191.538462	3000	17	16	189.375000
2470	10	13	192.307692	3010	16	16	190.000000
2480	9	13	193.076923	3020	15	16	190.625000
2490	8	13	193.846154	3030	14	16	191.250000
2500	27	14	180.714286	3040	13	16	191.875000
2510	26	14	181.428571	3050	12	16	192.500000
2520	25	14	182.142857	3060	11	16	193.125000
2530	24	14	182.857143	3070	10	16	193.750000

TABLE 2. M AND N NUMBERS AND RESULTING FREQUENCIES (2 OF 5)

YTO START FREQ. MHz	M	N	M/N MHz	YTO START FREQ. MHz	M	N	M/N MHz
3080	9	16	194.375000	3620	15	19	192.105263
3090	8	16	195.000000	3630	14	19	192.631579
3100	27	17	184.117647	3640	13	19	193.157895
3110	26	17	184.705882	3650	12	19	193.684211
3120	25	17	185.294118	3660	11	19	194.210526
3130	24	17	185.882353	3670	10	19	194.736842
3140	23	17	186.470588	3680	9	19	195.263158
3150	22	17	187.058824	3690	8	19	195.789474
3160	21	17	187.647059	3700	27	20	186.500000
3170	20	17	188.235294	3710	26	20	187.000000
3180	19	17	188.823529	3720	25	20	187.500000
3190	18	17	189.411765	3730	24	20	188.000000
3200	17	17	190.000000	3740	23	20	188.500000
3210	16	17	190.588235	3750	22	20	189.000000
3220	15	17	191.176471	3760	21	20	189.500000
3230	14	17	191.764706	3770	20	20	190.000000
3240	13	17	192.352941	3780	19	20	190.500000
3250	12	17	192.941176	3790	18	20	191.000000
3260	11	17	193.529412	3800	17	20	191.500000
3270	10	17	194.117647	3810	16	20	192.000000
3280	9	17	194.705882	3820	15	20	192.500000
3290	8	17	195.294118	3830	14	20	193.000000
3300	27	18	185.000000	3840	13	20	193.500000
3310	26	18	185.555556	3850	12	20	194.000000
3320	25	18	186.111111	3860	11	20	194.500000
3330	24	18	186.666667	3870	10	20	195.000000
3340	23	18	187.222222	3880	9	20	195.500000
3350	22	18	187.777778	3890	8	20	196.000000
3360	21	18	188.333333	3900	27	21	187.142857
3370	20	18	188.888889	3910	26	21	187.619048
3380	19	18	189.444444	3920	25	21	188.095238
3390	18	18	190.000000	3930	24	21	188.571429
3400	17	18	190.555556	3940	23	21	189.047619
3410	16	18	191.111111	3950	22	21	189.523810
3420	15	18	191.666667	3960	21	21	190.000000
3430	14	18	192.222222	3970	20	21	190.476190
3440	13	18	192.777778	3980	19	21	190.952381
3450	12	18	193.333333	3990	18	21	191.428571
3460	11	18	193.888889	4000	17	21	191.904762
3470	10	18	194.444444	4010	16	21	192.380952
3480	9	18	195.000000	4020	15	21	192.857143
3490	8	18	195.555556	4030	14	21	193.333333
3500	27	19	185.789474	4040	13	21	193.809524
3510	26	19	186.315789	4050	12	21	194.285714
3520	25	19	186.842105	4060	11	21	194.761905
3530	24	19	187.368421	4070	10	21	195.238095
3540	23	19	187.894737	4080	9	21	195.714286
3550	22	19	188.421053	4090	8	21	196.190476
3560	21	19	188.947368	4100	27	22	187.727273
3570	20	19	189.473684	4110	26	22	188.181818
3580	19	19	190.000000	4120	25	22	188.636364
3590	18	19	190.526316	4130	24	22	189.090909
3600	17	19	191.052632	4140	23	22	189.545455
3610	16	19	191.578947	4150	22	22	190.000000

TABLE 2. M AND N NUMBERS AND RESULTING FREQUENCIES (3 OF 5)

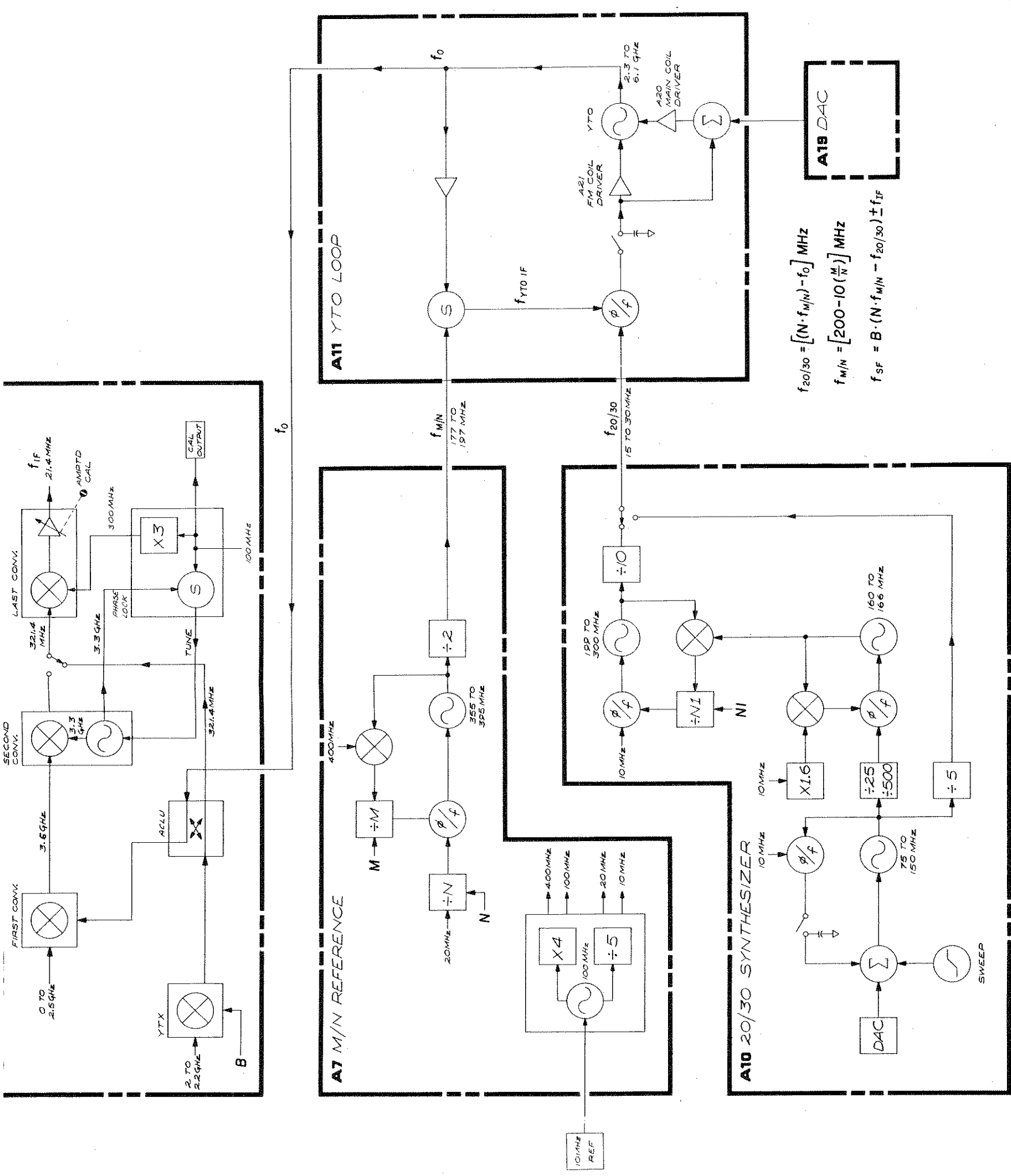
YTO START FREQ. MHz	M	N	M/N MHz	YTO START FREQ. MHz	M	N	M/N MHz
4160	21	22	190.454545	4700	27	25	189.200000
4170	20	22	190.909091	4710	26	25	189.600000
4180	19	22	191.363636	4720	25	25	190.000000
4190	18	22	191.818182	4730	24	25	190.400000
4200	17	22	192.272727	4740	23	25	190.800000
4210	16	22	192.727273	4750	22	25	191.200000
4220	15	22	193.181818	4760	21	25	191.600000
4230	14	22	193.636364	4770	20	25	192.000000
4240	13	22	194.090909	4780	19	25	192.400000
4250	12	22	194.545455	4790	18	25	192.800000
4260	11	22	195.000000	4800	17	25	193.200000
4270	10	22	195.454545	4810	16	25	193.600000
4280	9	22	195.909091	4820	15	25	194.000000
4290	8	22	196.363636	4830	14	25	194.400000
4300	27	23	188.260870	4840	13	25	194.800000
4310	26	23	188.695652	4850	12	25	195.200000
4320	25	23	189.130435	4860	11	25	195.600000
4330	24	23	189.565217	4870	10	25	196.000000
4340	23	23	190.000000	4880	9	25	196.400000
4350	22	23	190.434783	4890	8	25	196.800000
4360	21	23	190.869565	4900	27	26	189.615385
4370	20	23	191.304348	4910	26	26	190.000000
4380	19	23	191.739130	4920	25	26	190.384615
4390	18	23	192.173913	4930	24	26	190.769231
4400	17	23	192.608696	4940	23	26	191.153846
4410	16	23	193.043478	4950	22	26	191.538462
4420	15	23	193.478261	4960	21	26	191.923077
4430	14	23	193.913043	4970	20	26	192.307692
4440	13	23	194.347826	4980	19	26	192.692308
4450	12	23	194.782609	4990	18	26	193.076923
4460	11	23	195.217391	5000	17	26	193.461538
4470	10	23	195.652174	5010	16	26	193.846154
4480	9	23	196.086957	5020	15	26	194.230769
4490	8	23	196.521739	5030	14	26	194.615385
4500	27	24	188.750000	5040	13	26	195.000000
4510	26	24	189.166667	5050	12	26	195.384615
4520	25	24	189.583333	5060	11	26	195.769231
4530	24	24	190.000000	5070	10	26	196.153846
4540	23	24	190.416667	5080	9	26	196.538462
4550	22	24	190.833333	5090	8	26	196.923077
4560	21	24	191.250000	5100	27	27	190.000000
4570	20	24	191.666667	5110	26	27	190.370370
4580	19	24	192.083333	5120	25	27	190.740741
4590	18	24	192.500000	5130	24	27	191.111111
4600	17	24	192.916667	5140	23	27	191.481481
4610	16	24	193.333333	5150	22	27	191.851852
4620	15	24	193.750000	5160	21	27	192.222222
4630	14	24	194.166667	5170	20	27	192.592593
4640	13	24	194.583333	5180	19	27	192.962963
4650	12	24	195.000000	5190	18	27	193.333333
4660	11	24	195.416667	5200	17	27	193.703704
4670	10	24	195.833333	5210	16	27	194.074074
4680	9	24	196.250000	5220	15	27	194.444444
4690	8	24	196.666667	5230	14	27	194.814815

TABLE 2. M AND N NUMBERS AND RESULTING FREQUENCIES (4 OF 5)

YTO START FREQ. MHz	M	N	M/N MHz	YTO START FREQ. MHz	M	N	M/N MHz
5240	13	27	195.185185	5720	25	30	191.666667
5250	12	27	195.555556	5730	24	30	192.000000
5260	11	27	195.925926	5740	23	30	192.333333
5270	10	27	196.296296	5750	22	30	192.666667
5280	9	27	196.666667	5760	21	30	193.000000
5290	8	27	197.037037	5770	20	30	193.333333
5300	27	28	190.357143	5780	19	30	193.666667
5310	26	28	190.714286	5790	18	30	194.000000
5320	25	28	191.071429	5800	17	30	194.333333
5330	24	28	191.428571	5810	16	30	194.666667
5340	23	28	191.785714	5820	15	30	195.000000
5350	22	28	192.142857	5830	14	30	195.333333
5360	21	28	192.500000	5840	13	30	195.666667
5370	20	28	192.857143	5850	12	30	196.000000
5380	19	28	193.214286	5860	11	30	196.333333
5390	18	28	193.571429	5870	10	30	196.666667
5400	17	28	193.928571	5880	9	30	197.000000
5410	16	28	194.285714	5890	8	30	197.333333
5420	15	28	194.642857	5900	27	31	191.290323
5430	14	28	195.000000	5910	26	31	191.612903
5440	13	28	195.357143	5920	25	31	191.935484
5450	12	28	195.714286	5930	24	31	192.258065
5460	11	28	196.071429	5940	23	31	192.580645
5470	10	28	196.428571	5950	22	31	192.903226
5480	9	28	196.785714	5960	21	31	193.225806
5490	8	28	197.142857	5970	20	31	193.548387
5500	27	29	190.689655	5980	19	31	193.870968
5510	26	29	191.034483	5990	18	31	194.193548
5520	25	29	191.379310	6000	17	31	194.516129
5530	24	29	191.724138	6010	16	31	194.838710
5540	23	29	192.068966	6020	15	31	195.161290
5550	22	29	192.413793	6030	14	31	195.483871
5560	21	29	192.758621	6040	13	31	195.806452
5570	20	29	193.103448	6050	12	31	196.129032
5580	19	29	193.448276	6060	11	31	196.451613
5590	18	29	193.793103	6070	10	31	196.774194
5600	17	29	194.137931	6080	9	31	197.096774
5610	16	29	194.482759	6090	8	31	197.419355
5620	15	29	194.827586	6100	27	32	191.562500
5630	14	29	195.172414	6110	26	32	191.875000
5640	13	29	195.517241	6120	25	32	192.187500
5650	12	29	195.862069	6130	24	32	192.500000
5660	11	29	196.206897	6140	23	32	192.812500
5670	10	29	196.551724	6150	22	32	193.125000
5680	9	29	196.896552	6160	21	32	193.437500
5690	8	29	197.241379	6170	20	32	193.750000
5700	27	30	191.000000	6180	19	32	194.062500
5710	26	30	191.333333	6190	18	32	194.375000

TABLE 2. M AND N NUMBERS AND RESULTING FREQUENCIES (5 OF 5)

YTO START FREQ. MHz	M	N	M/N MHz
6000	17	31	194.516129
6010	16	31	194.838710
6020	15	31	195.161290
6030	14	31	195.483871
6040	13	31	195.806452
6050	12	31	196.129032
6060	11	31	196.451613
6070	10	31	196.774194
6080	9	31	197.096774
6090	8	31	197.419355
6100	27	32	191.562500
6110	26	32	191.875000
6120	25	32	192.187500
6130	24	32	192.500000
6140	23	32	192.812500
6150	22	32	193.125000
6160	21	32	193.437500
6170	20	32	193.750000
6180	19	32	194.062500
6190	18	32	194.375000

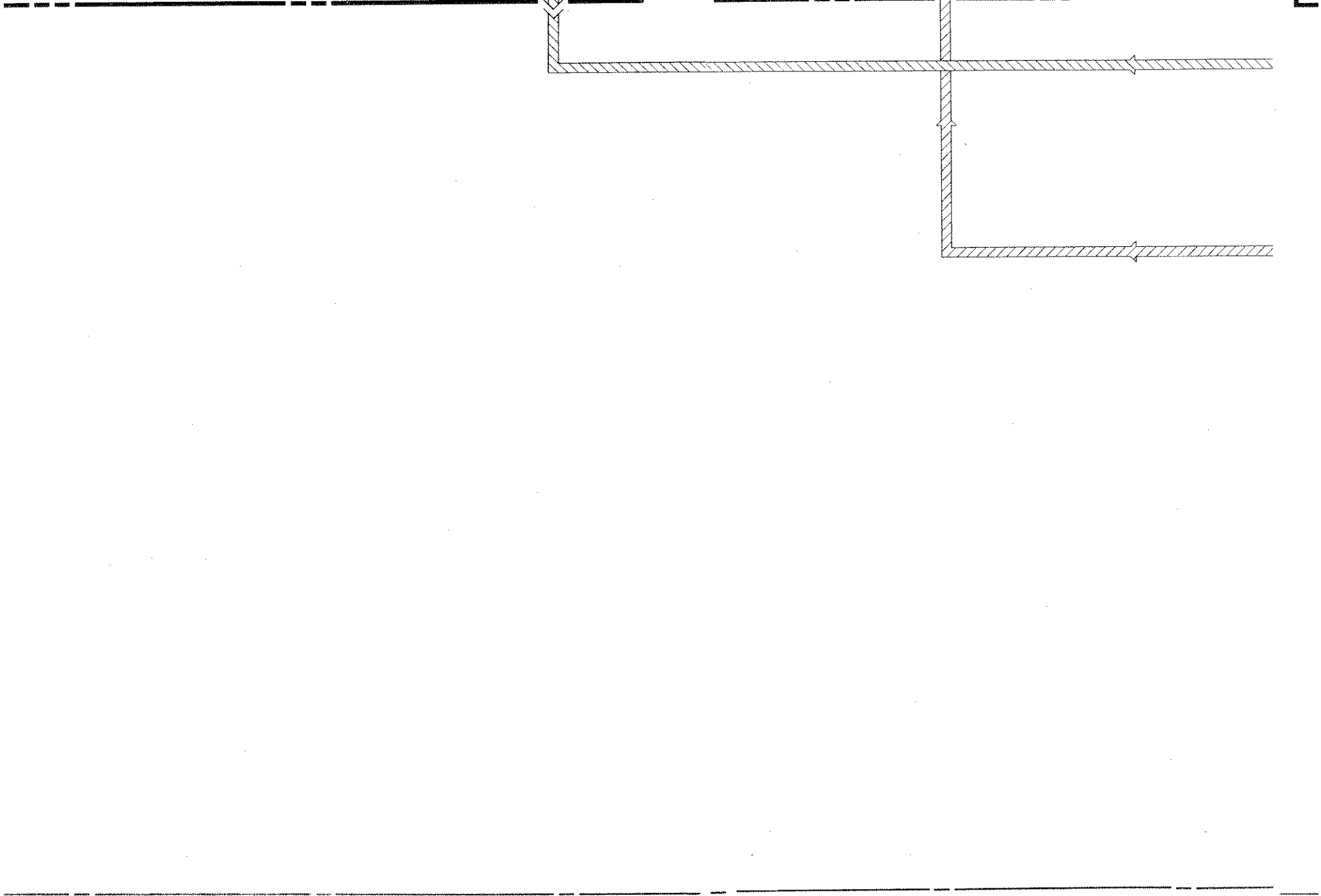
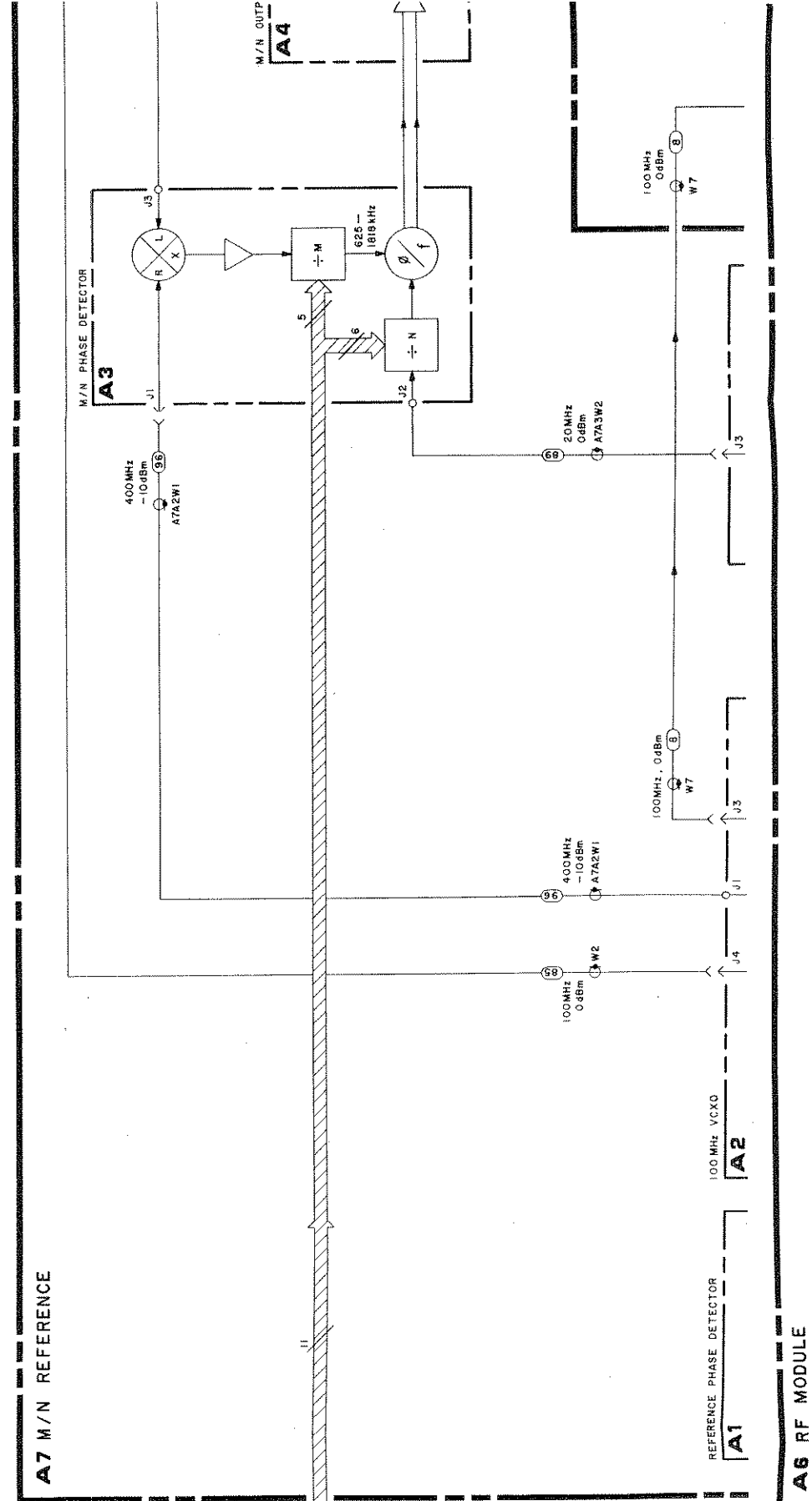
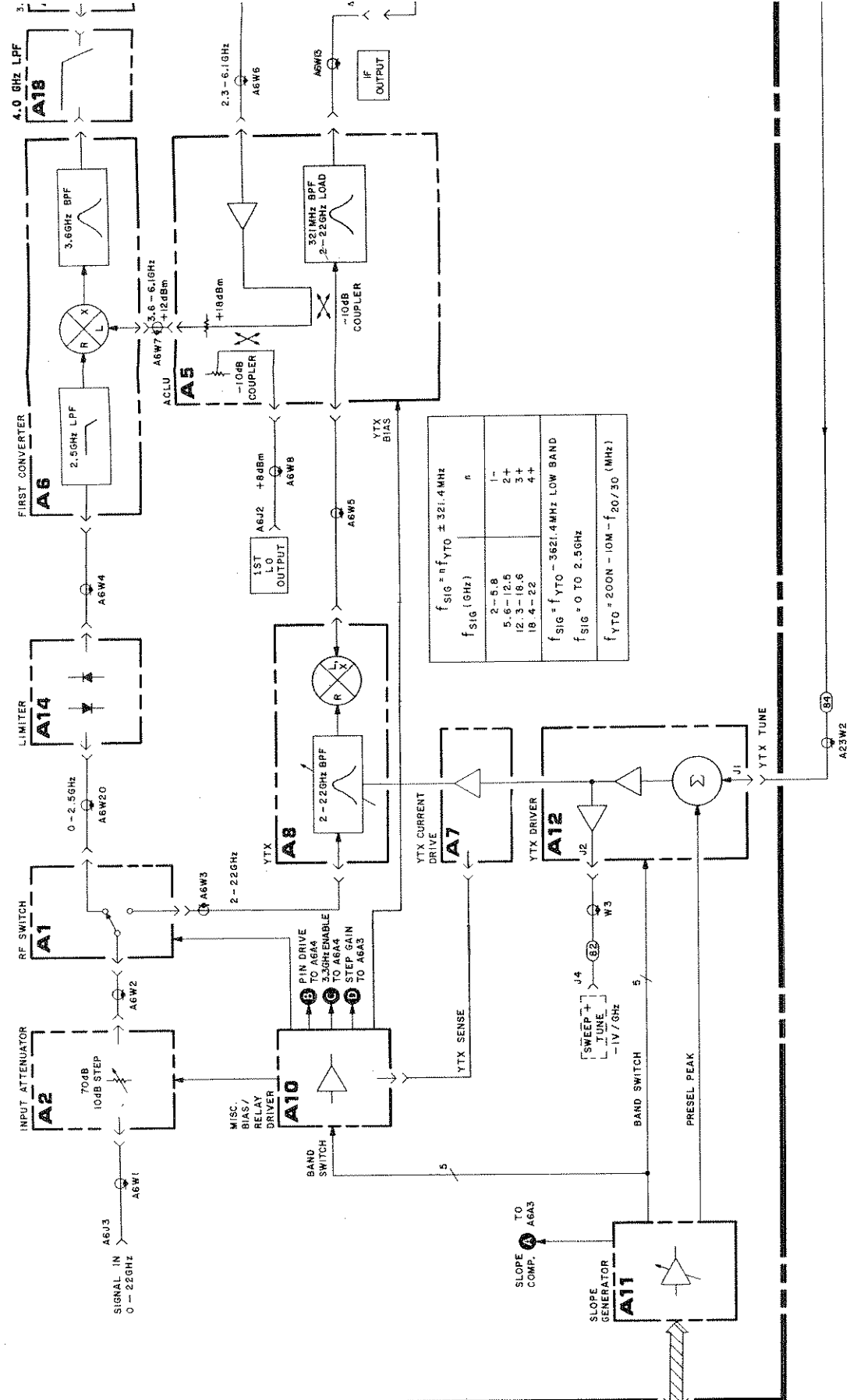


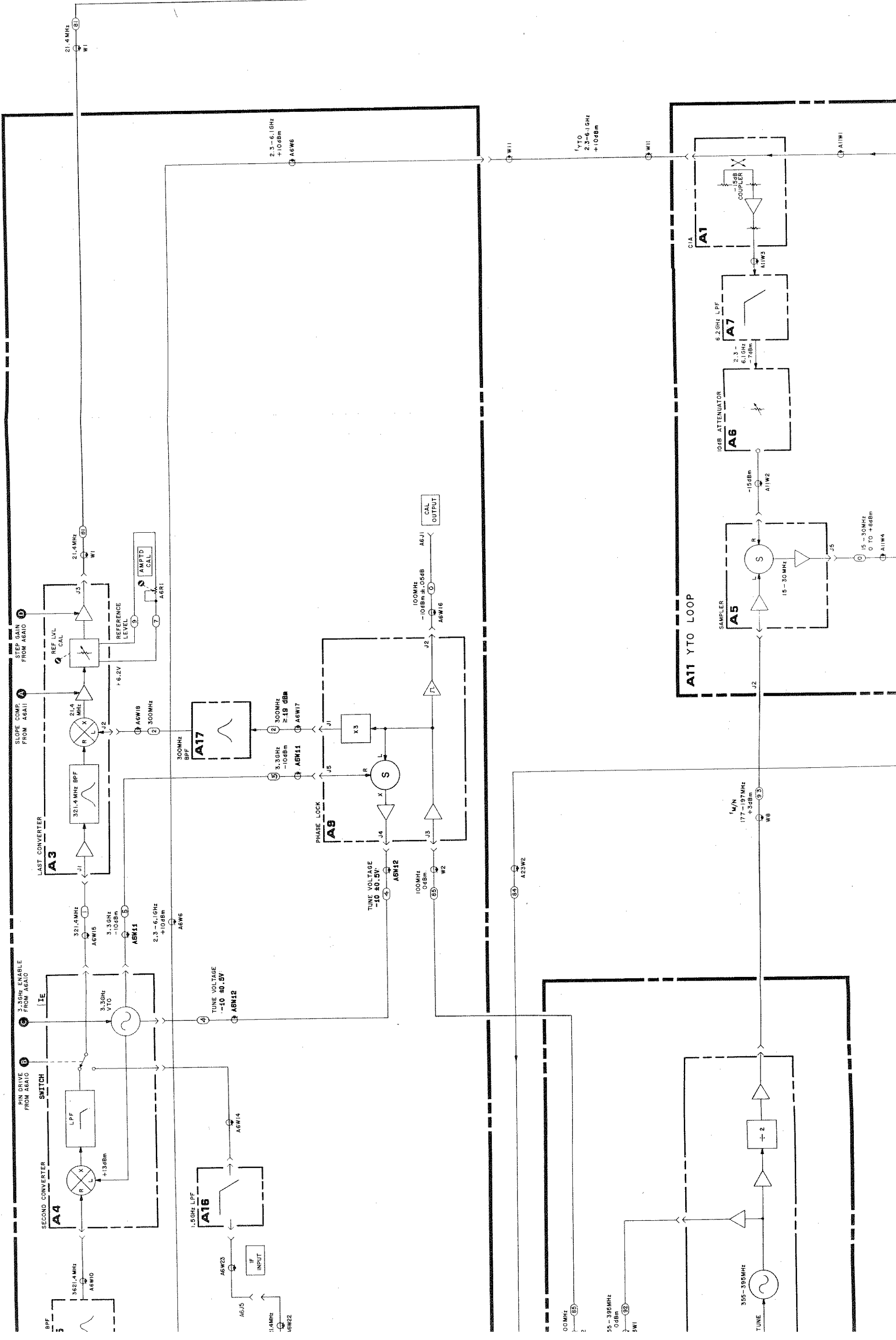
$$f_{20/30} = [N \cdot f_{M/N} - f_0] \text{ MHz}$$

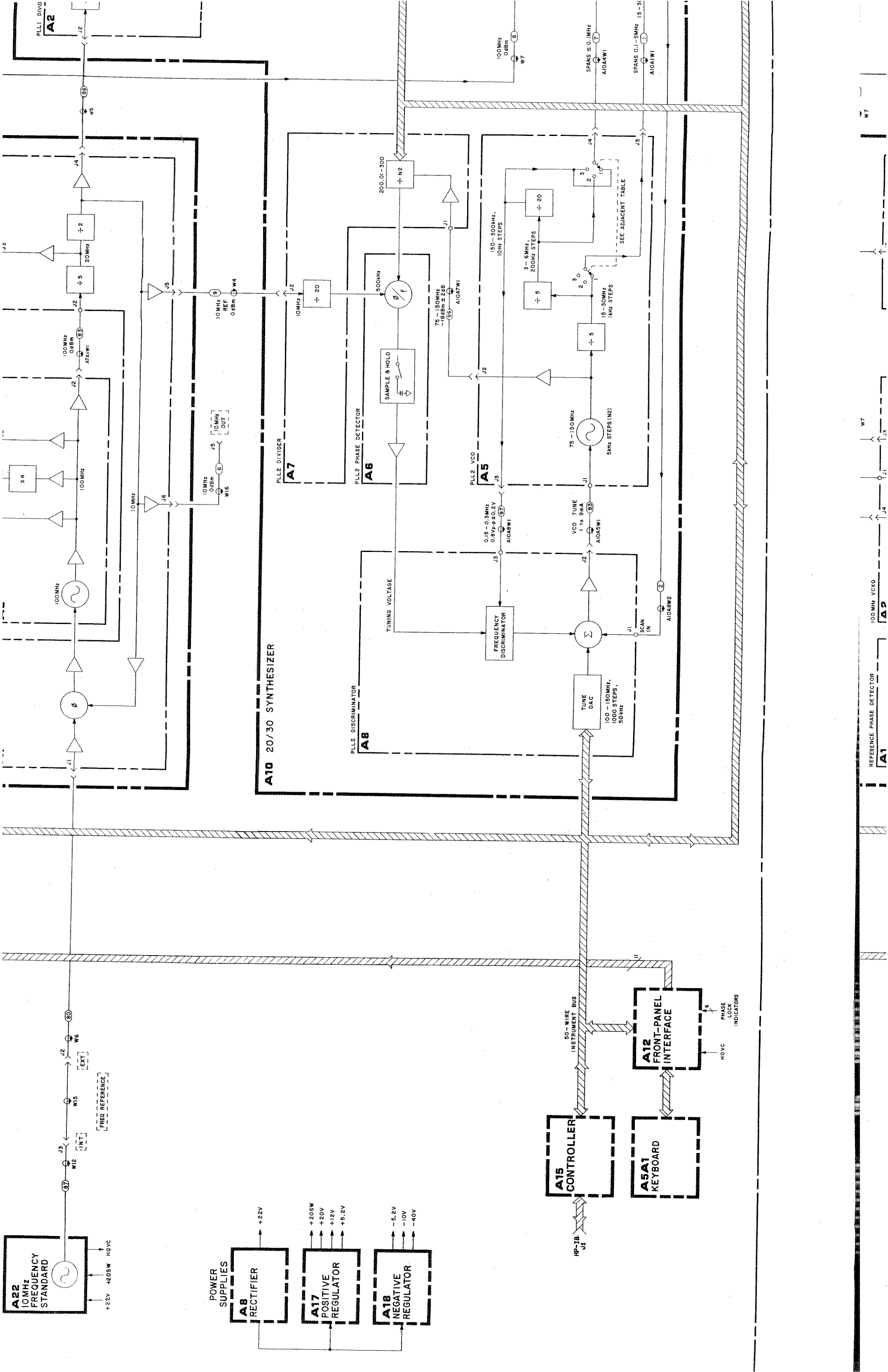
$$f_{M/N} = [200 - 10(\frac{M}{N})] \text{ MHz}$$

$$f_{SF} = B \cdot (N \cdot f_{M/N} - f_{20/30}) \pm f_{IF}$$

FIGURE 2. SIMPLIFIED RF BLOCK DIAGRAM
Analog Troubleshooting 13/14







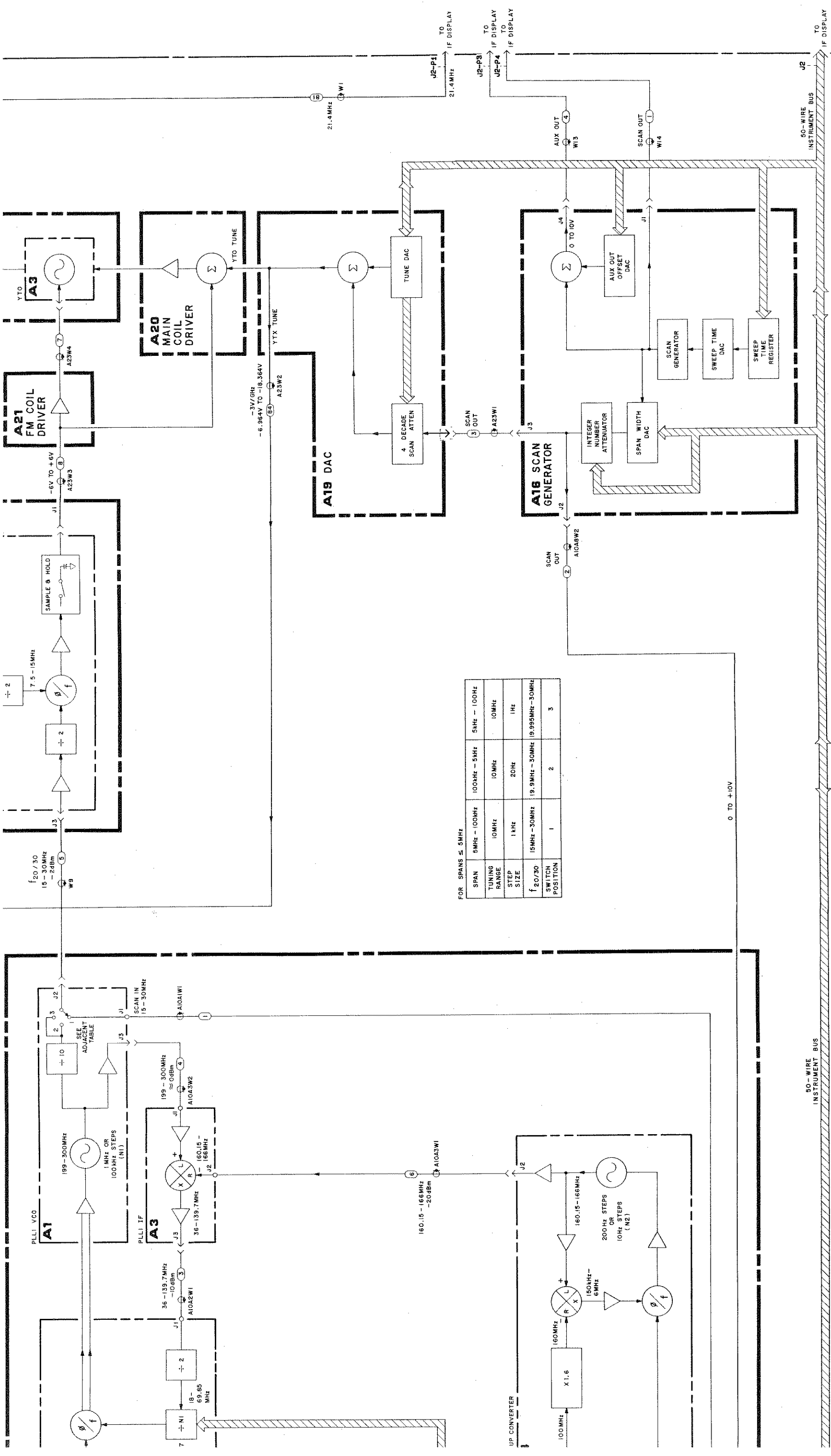


FIGURE 5. SPECTRUM ANALYZER OVERALL BLOCK DIAGRAM (1 OF 3)

Overall Troubleshooting 15/16

RF SECTION DIGITAL TROUBLESHOOTING

PRELIMINARY CHECKS

Instrument Preset Check

The two red INSTR CHECK LEDs light whenever the instrument is turned on or when $\overline{\text{2-22}}_{\text{GHz}}$ is pushed. The main processor then performs a check of itself, a checksum verification of all ROMs on the A15 Controller, a partial check of the Instrument Bus (50-wire bus), and a read-write check of the RAMs and A3A4 Memory in the IF-Display Section.

If all the checks pass, both INSTR CHECK LEDs turn off.

If any check fails, one or both INSTR CHECK LEDs remain on.

- a. **Both INSTR CHECK LEDs on** indicates a problem with the A15 Controller. First, remove the Controller and make sure that the 50-wire ribbon cable and HP-IB ribbon cable are pressed all the way onto A15J1 and A15J2 connectors. Reinstall the A15 Controller. If both front panel INSTR CHECK LEDs still remain on when the instrument is turned on, follow procedure under A15 Controller Self Test.
- b. **Left LED (INSTR CHECK I) on** indicates a failure occurred when checking the Digital Storage Memory (A3A4). First, check to ensure that a LINE power cord is connected to the IF-Display Section. Also check to see that the rear-panel Analyzer Bus Interconnect Cable, W31, is properly connected. If INSTR CHECK I still remains on when the instrument is turned on, troubleshoot the A3 Digital Storage in the IF-Display Section.
- c. **Right LED (INSTR CHECK II) on** indicates a failure occurred during the partial check of the Instrument Bus.

NOTE

The partial interface check reads the key column lines (KCO through KC7) from the A1 and A5 front panels. If any front panel key is shorted or stuck closed, INSTR CHECK II LED should remain on after the Self Test is completed. This part of the Self Test can easily be verified by pushing any key, except $\overline{\text{LOC}}$, and holding the key in while pushing $\overline{\text{2-22}}_{\text{GHz}}$. If the I/O interface check routine is working, INSTR CHECK II LED will stay on.

- d. **Suspected digital failure but no INSTR CHECK LEDs on** may indicate a RAM or I/O bus failure which is not checked in the normal Self Check or "POP" (Power-On Preset). If the two front panel INSTR CHECK LEDs turn on when the LINE switch is set to ON, and turn off again within a few seconds (indicating no digital problems), but symptoms persist (such as improper CRT display or improper response to particular commands) indicating that the problem is in the digital area, a "LONG POP" can be performed.

"LONG POP" Instrument Preset Check (Jumper A15TP4[STS] to A15TP1-7[T3])

This check is very similar to the normal Instrument Preset Check: an additional processor check is performed, all of the RAM locations in Digital Storage (A3A4 Memory) are checked, and the RAM memory on the A15 Controller is verified.

Since these more extensive checks require altering information that has been stored in RAM, LONG POP requires an internal jumper from A15TP4 (STS) to A15TP1-7 (T3). To perform a LONG POP, set LINE switch

to STANDBY and jumper A15TP4 to A15TP1-7. (Refer to A15 component locations diagram for location of test points). When LINE switch is set to ON, the two red INSTR CHECK LEDs are forced on and the main processor steps through the Self Test routine, expanding the normal POP with the additional tests mentioned above. The expected results for a LONG POP are exactly the same as for the normal POP of Instrument Preset as described above in the Instrument Preset Check (paragraphs a, b, and c).

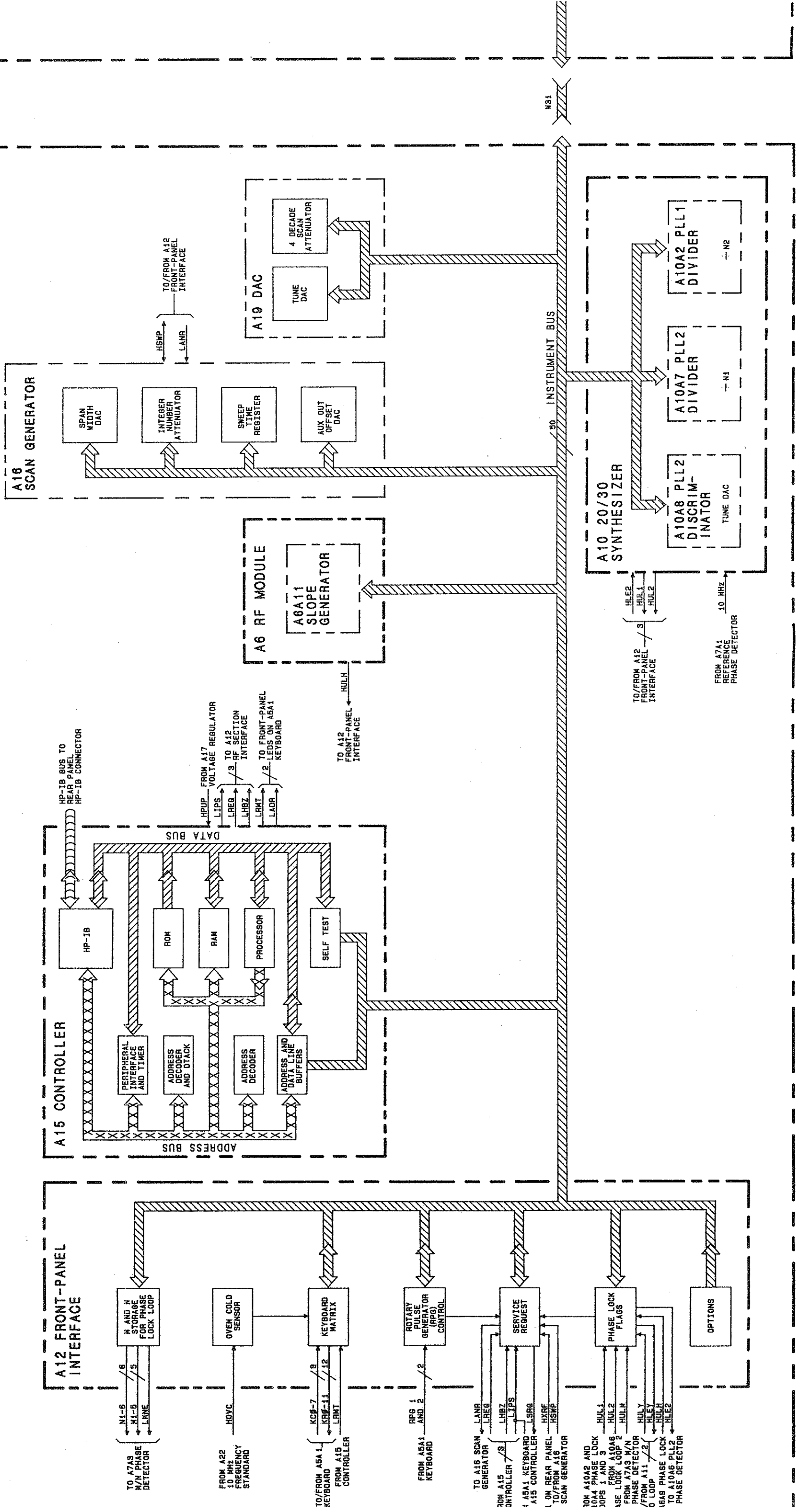
Because LONG POP is a “destructive test” (it alters any information that has been stored in RAM), it should be performed only as a last resort effort in troubleshooting what appears to be a memory or processor related problem.

Digital Storage Verification

The Instrument Preset Check does a fairly complete verification of the Digital Storage controller and memory. An additional check can be done, independent of the RF section, by jumpering A3A6TP3 to A3A6TP6 and pushing A3A7S1 momentarily. A test pattern should appear on the display. Refer to the A3 Digital Storage Troubleshooting Section in Volume 2 of this manual for a more detailed description of this procedure. Note that when the jumper is connected, the left check LED always stays on following an INSTR PRESET, since in the test pattern mode, Digital Storage ignores all instructions from the A15 Controller.

SECTION INSTRUMENT BUS STRUCTURE

IF-DI:



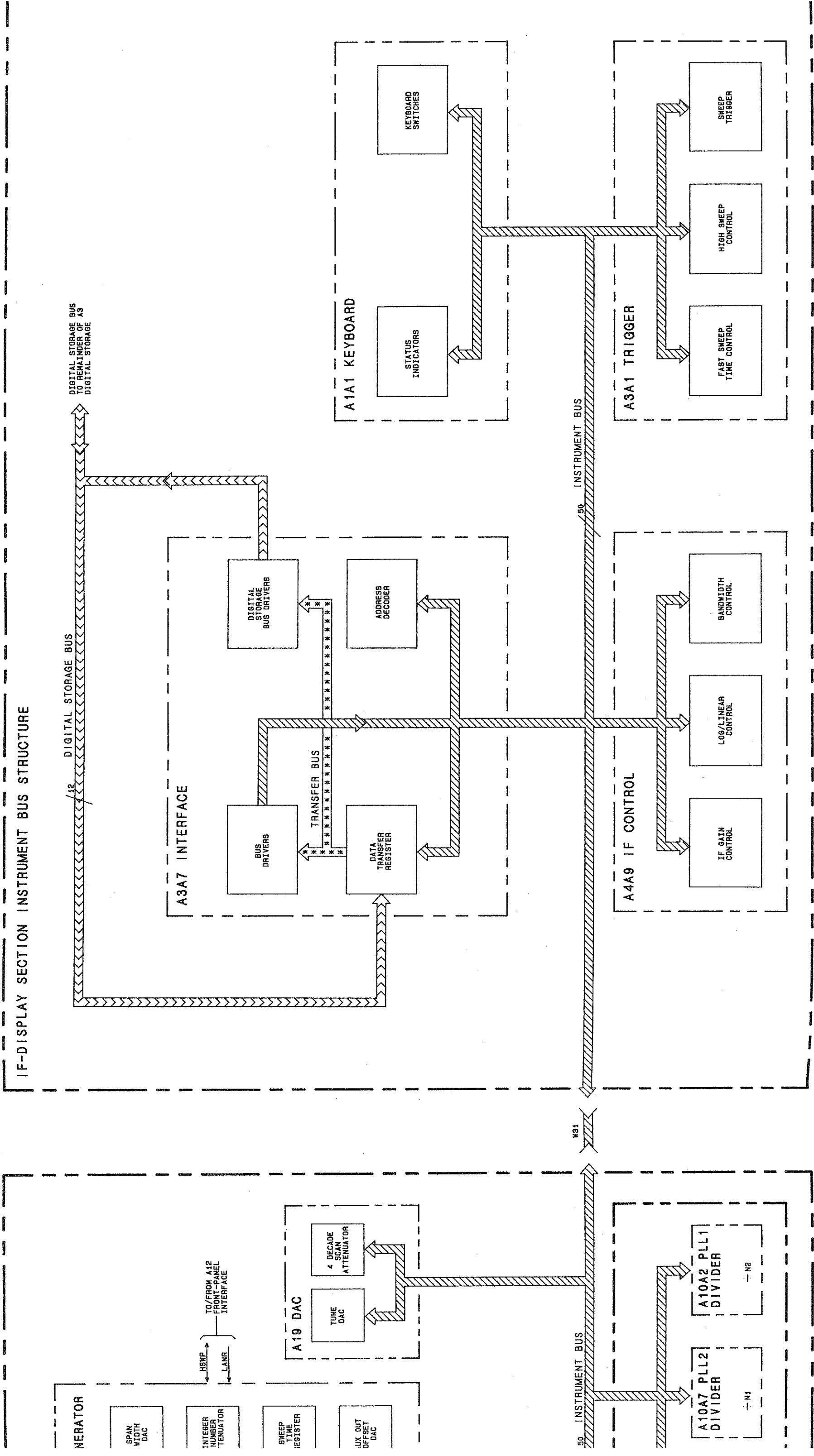


FIGURE 1. RF DIGITAL TROUBLESHOOTING, BLOCK DIAGRA
Digital Troubleshooting 3


A5 FRONT PANEL, CIRCUIT DESCRIPTION

A5 Front Panel comprises the A5A1 Keyboard, A5A2 Rotary Pulse Generator (RPG), Instrument Check indicators, and LINE power switch.

A5A1 Keyboard

A5A1 Keyboard includes all the front-panel pushbutton key-switches and their indicator LEDs. (Refer to A12 Front-Panel Interface for a description of the key-switch circuitry.) The LEDs, which are driven by A12, indicate the status of pushbuttons, except for INSTR CHECK indicators I (DS2) and II (DS3).

Instrument Check Indicators

The INSTR CHECK indicators are used with a self-test routine that is run whenever the LINE switch is turned on or the  key is pressed. The self-test routine checks the digital circuitry in A15 Controller, portions of A12 Front-Panel Interface, and A3 Digital Storage in the IF-Display Section. Both LEDs are lit until the self-test routine is completed. If both LEDs remain on, the problem is probably on the A15 Controller. INSTR CHECK II indicates a problem on the A12 Front-Panel Interface assembly or the Instrument Bus, and INSTR CHECK I indicates a problem in the A3 Digital Storage area of the IF-Display Section (A3A4 Memory.)

A5A2 Rotary Pulse Generator

A5A2 Rotary Pulse Generator (RPG) is operated by the DATA knob on the front panel. The rate and direction of rotation of the knob are transmitted to A12 Front-Panel Interface on the RPG 1 and RPG 2 lines.

LINE Power Switch

When the LINE switch is in STANDBY, a circuit is completed to light STANDBY indicator LED DS1. The LED is lit when the instrument is in STANDBY.

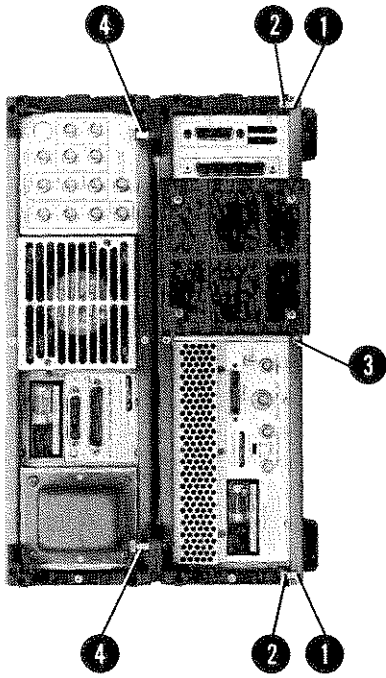
Connectors and AMPTD CAL Adjustment

The RF INPUT, CAL OUTPUT, and 1ST LO OUTPUT connectors and the AMPTD CAL adjustment are physically part of the A6 RF Module and explanations of these components are located with the A6 information.

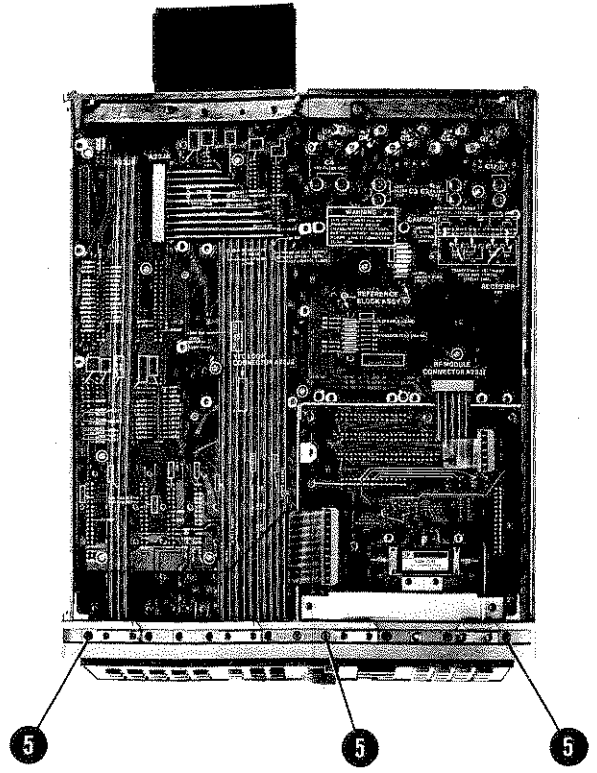
FRONT PANEL REMOVAL AND REPAIR

With ac line cords removed, proceed as follows.

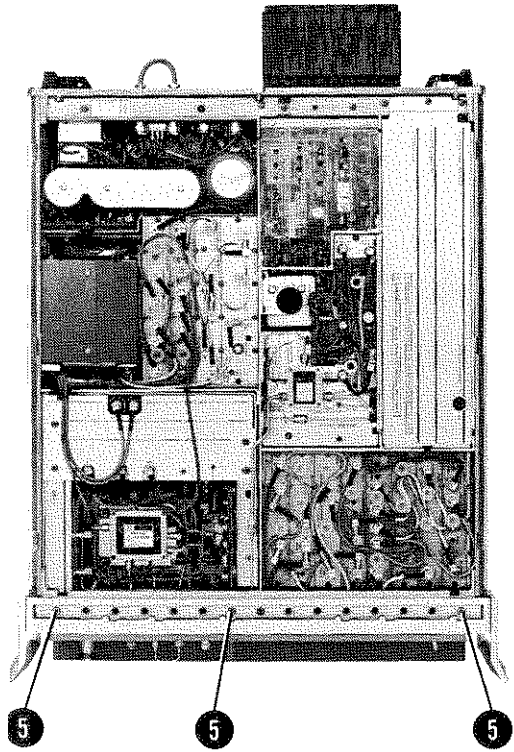
1. Remove interconnecting cables between instruments.
2. Position instrument on right side as shown in View A.
3. Remove feet **1** from rear of RF Section by removing screws **2** shown in View A.
4. Loosen bottom cover screw **3** and remove cover.
5. Loosen thumbscrews **4** and separate instruments by holding IF-Display Section in place while pushing the RF Section at the front panel.
6. After separating instruments, slide RF Section away from IF-Display Section far enough to remove screws **5** holding front panel to frame. (Refer to View B.)
7. Remove screws **5** from other side of instrument. (Refer to View C.)
8. Pull front-panel out of frame as shown in View D.
9. Disconnect cable **6** from connector **7**. Disconnect cable **8** from connector **9**. (Refer to View D.)
10. To replace INSTR CHECK and STANDBY LEDs proceed as follows:
 - a. Unsolder the wires from the LED leads and push on the leads with a soldering aid to force the LED out of the socket and through the front panel.
 - b. Insert a new LED and resolder as shown in View E.
 - c. Trim excess lead length.



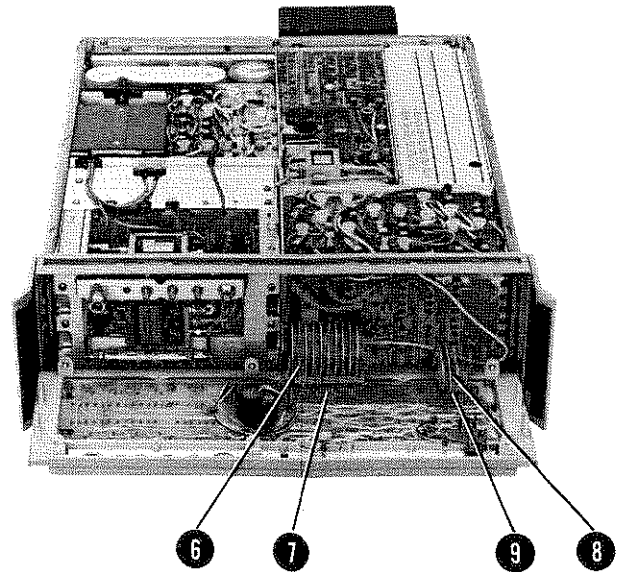
VIEW A



VIEW B

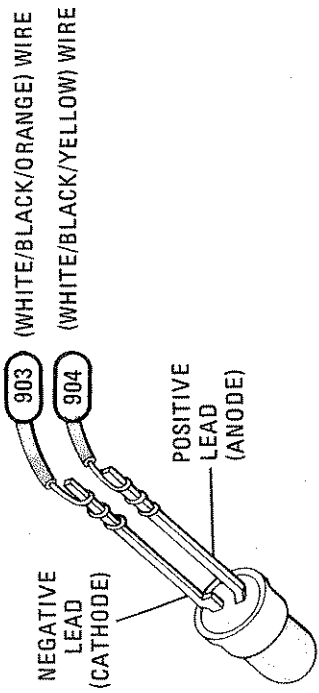


VIEW C

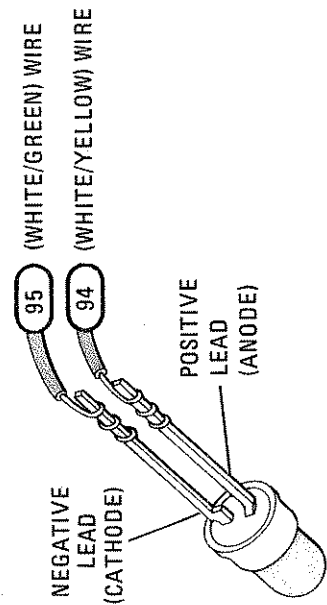


VIEW D

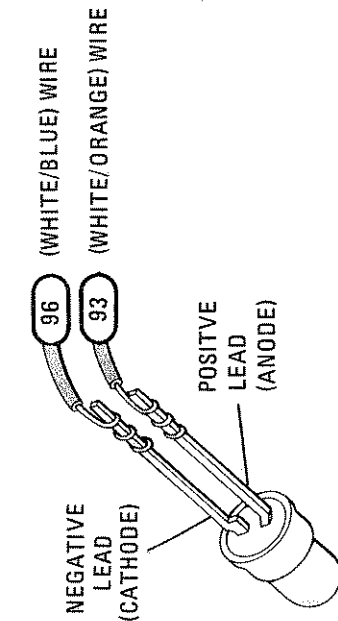
STANDBY



NSTR CHECK



I

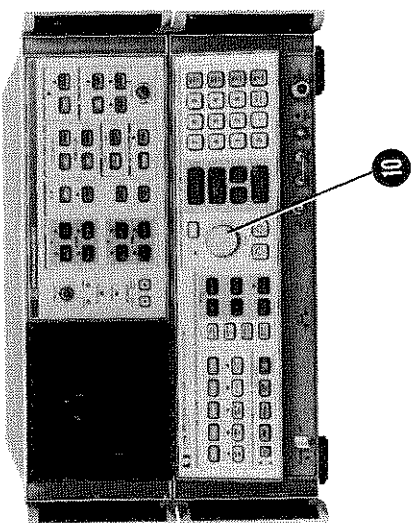


II

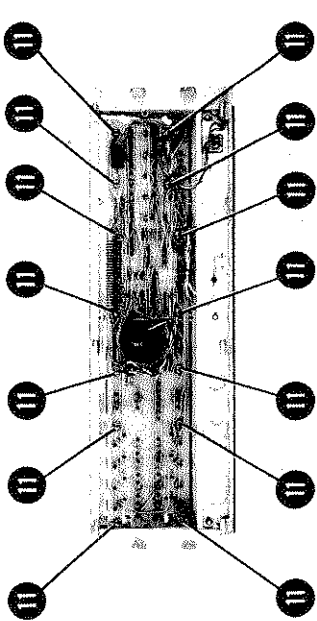
VIEW E

FRONT PANEL REMOVAL AND REPAIR (Cont'd)

11. To replace SIGNAL INPUT LEDs, SWITCHES, or KEYS, proceed as follows:
 - a. Loosen set screw in DATA control knob (RPG) 10 using a No. 4 allen wrench (HP Part No. 8710-0857) and remove knob. (Refer to View F.)
 - b. Remove nut from DATA control using a 7/16-inch wrench.
 - c. Remove fourteen (14) screws 11 and lift printed circuit board away from front panel. (Refer to View G.)
 - d. Pull defective LED out of socket with fingers (it may be necessary to pry slightly with a pointed instrument such as a soldering aid), trim both leads on new LED to 3/8-inch (1 cm) and insert new LED in socket with negative (cathode) lead to square pad on printed circuit board. (Refer to LED lead identification below.)
 - e. To remove defective switch, remove key from switch, melt plastic pins holding switch to printed circuit board using a soldering iron, and remove switch from printed circuit board.
 - f. To replace switch, insert plastic pins of new switch through printed circuit board and melt the pins with a soldering iron on the rear side of the printed circuit board enough to secure switch. Replace key.
 - g. Reassemble printed circuit board to front panel and connect cables.
12. Reconnect connectors removed in Step 9.
13. Secure front panel to RF section by tightening six screws 5. (Refer to views B and C.)
14. Secure IF-Display Section to RF Section, LED LEAD IDENTIFICATION replace bottom cover, and reconnect ac line cords.



VIEW F



VIEW G

LED LEAD IDENTIFICATION

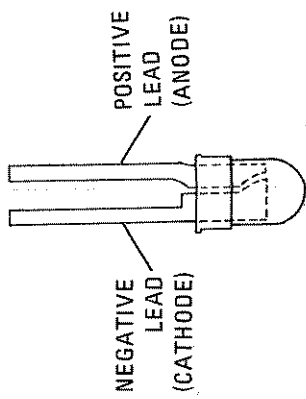


TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A5	85660-60005	3	1	FRONT PANEL ASSEMBLY (INCLUDES A5A1 AND A5A2)	28480	85660-60005
A5DS1	1990-0487	7	10	LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4584
A5DS2	1990-0486	6	2	LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4684
A5DS3	1990-0486	6		LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4684
A5S1	3101-2193	5	1	SWITCH-TGL SUBMIN SPDT 2A 250VAC	28480	3101-2193
A5A1	85660-60210	2	1	BOARD ASSEMBLY, KEYBOARD	28480	85660-60210
A5A1C1	0160-2055	9	1	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A5A1C2	0160-4832	4	1	CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A5A1DS1	1990-0487	7		LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4584
A5A1DS2	1990-0487	7		LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4584
A5A1DS3	1990-0487	7		LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4584
A5A1DS4	1990-0487	7		LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4584
A5A1DS5	1990-0487	7		LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4584
A5A1DS6	1990-0487	7		LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4584
A5A1DS7	1990-0487	7		LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4584
A5A1DS8	1990-0487	7		LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4584
A5A1DS9	1990-0487	7		LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4584
A5A1E1	1251-0600	0	11	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A5A1E2	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A5A1E3	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A5A1E4	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A5A1E5	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A5A1E6	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A5A1E7	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A5A1E8	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A5A1E9	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A5A1E10	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A5A1E11	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A5A1J1	1200-0507	9	1	SOCKET-IC 16-CONT DIP-SLDR	28480	1200-0507
A5A1P1	1251-5549	6	1	CONNECTOR 50-PIN M POST TYPE	28480	1251-5549
A5A1Q1	1854-0477	7	1	TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A5A1R1	0757-0438	3	1	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A5A1R2	0698-3152	8	1	RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A5A1R3	0698-3150	6	1	RESISTOR 2.37K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2371-F
A5A1R4	0698-7242	5	1	RESISTOR 1.78K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1781-F
A5A1S1- A5A1S49	5060-9436	7	49	PUSHBUTTON SWITCH P.C. MOUNT	28480	5060-9436
A5A1U1	1810-0229	5	2	NETWORK-RES 8-SIP330.0 OHM X 7	01121	208A331
A5A1U2	1820-1196	8	2	IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS174N
A5A1U3	1820-1196	8		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS174N
A5A1U4	1810-0229	5		NETWORK-RES 8-SIP330.0 OHM X 7	01121	208A331
A5A1W1*	8159-0005	0	3	RESISTOR-ZERO OHMS 22 AWG LEAD DIA	28480	8159-0005
A5A1W2*	8159-0005	0		RESISTOR-ZERO OHMS 22 AWG LEAD DIA	28480	8159-0005
A5A1W3*	8159-0005	0		RESISTOR-ZERO OHMS 22 AWG LEAD DIA	28480	8159-0005
				MISCELLANEOUS PARTS		
	0380-1233	9	9	SPACER-SPECIALTY .450 IN LG; .175 IN OD	00000	ORDER BY DESCRIPTION
A5A2	0960-0684	2	1	ROTARY PULSE GENERATOR	28480	0960-0684

*Indicates Factory Selected Value

A5A1
KEYBOARD
85660-60210

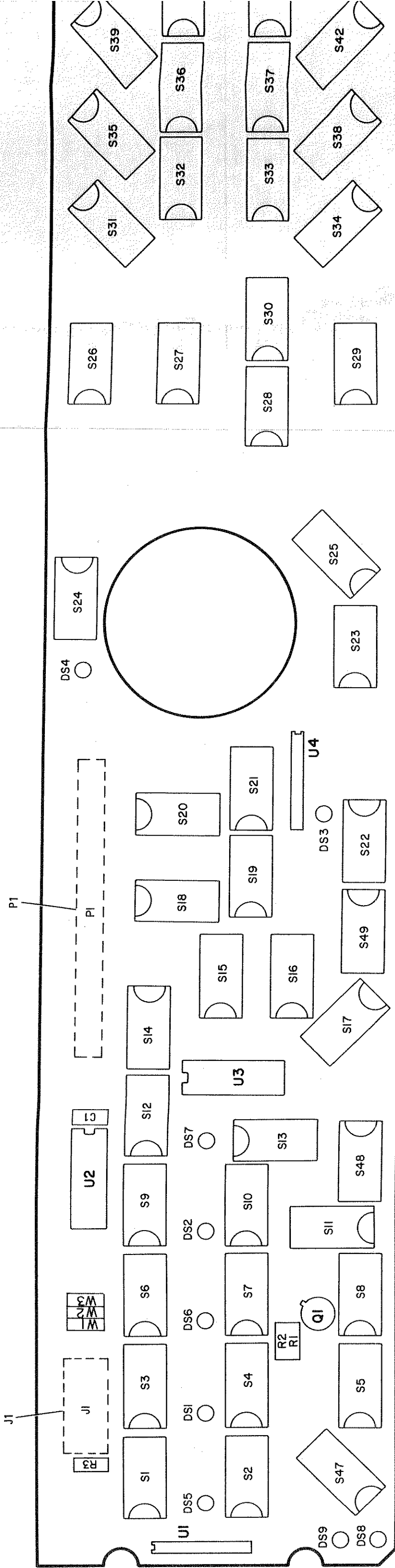


FIGURE 2.

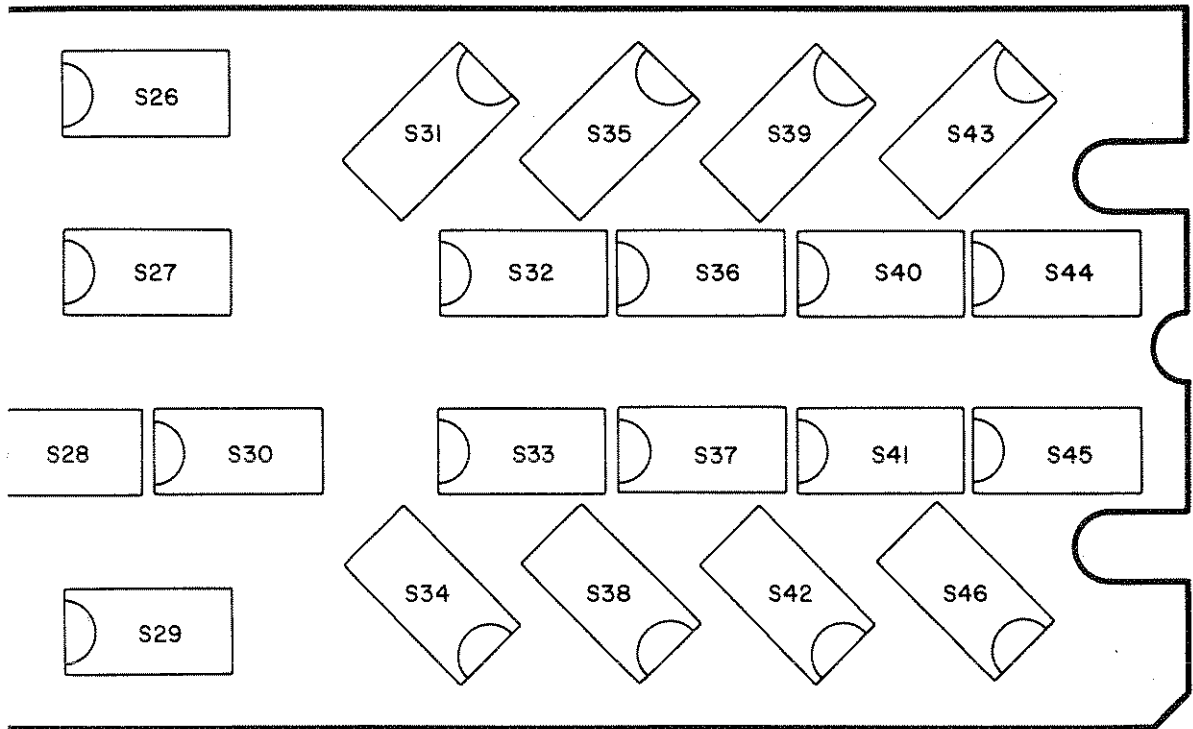
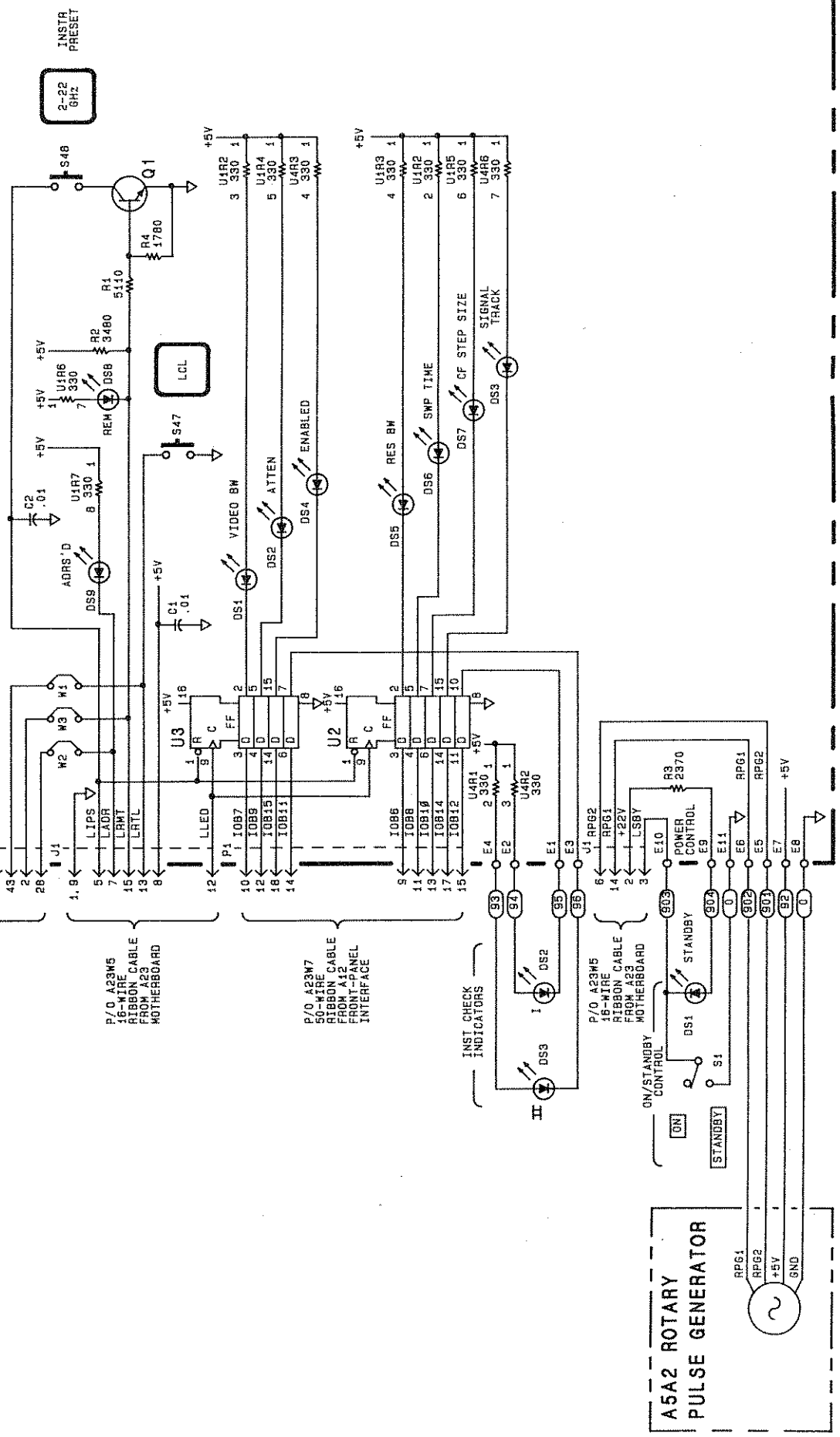
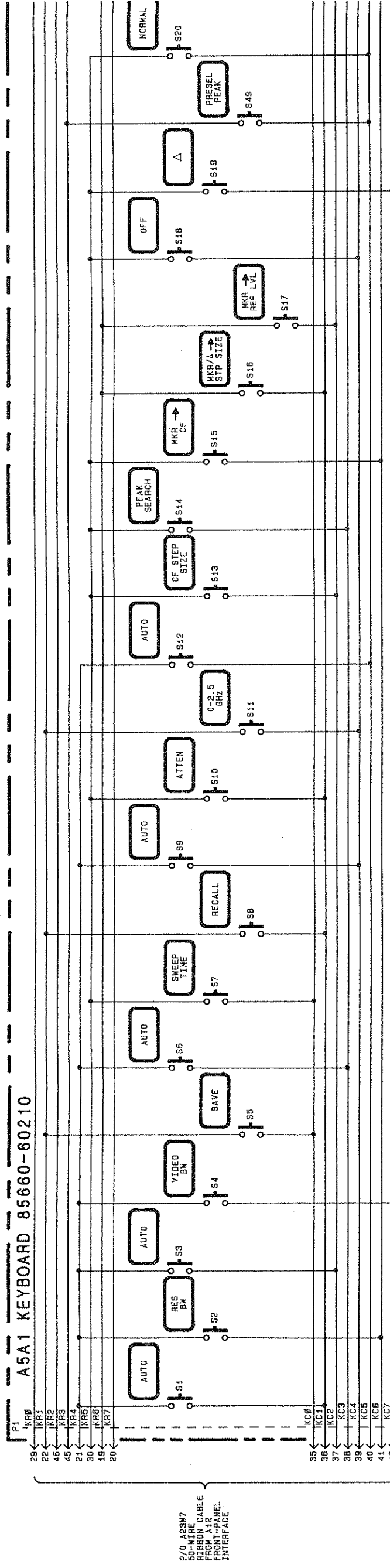


FIGURE 2. A5A1 KEYBOARD, COMPONENT LOCATIONS

A5A1 KEYBOARD 85660-60210



NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATION, PREFIX ABBREVIATION WITH ASSEMBLY DESIGNATION.
2. UNLESS OTHERWISE INDICATED:
RESISTANCE IS IN OHMS (Ω)
CAPACITANCE IS IN MICROFARADS (μ F)
INDUCTANCE IS IN MICROHENRIES (μ H)

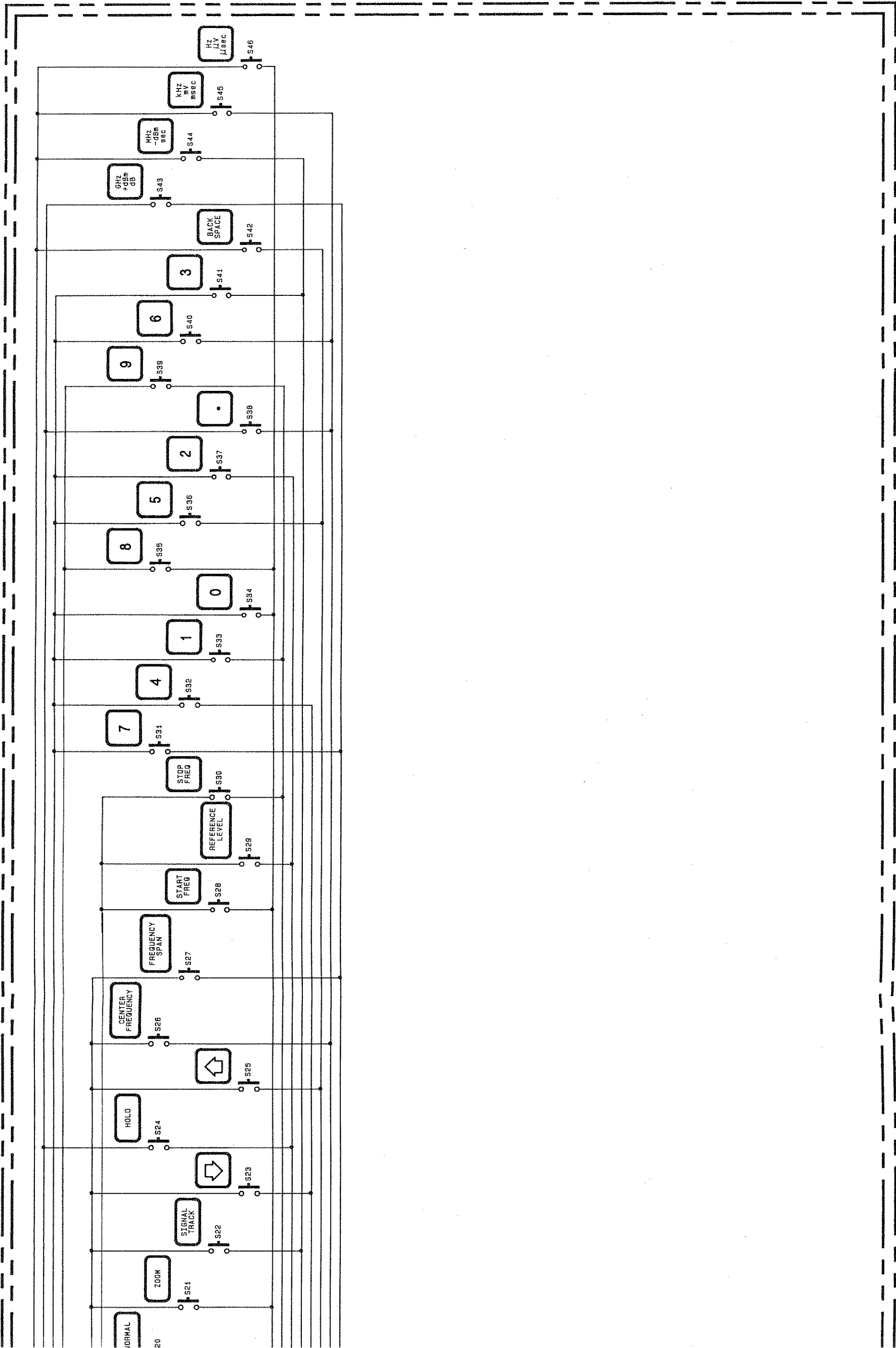


FIGURE 3. A5 FRONT PANEL, SCHEMATIC DIAGRAM
A5 9/10

A5

A6 RF MODULE

A6 RF MODULE REPLACEMENT

NOTE

For location of hardware and cables referred to in this procedure, see Figure 1.

Removal

1. Remove ac line cords, separate instrument sections, and remove top, bottom, and right side covers from RF Section.
2. Remove RF front panel. (See A5 Front Panel Removal procedure in A5 Front Panel section.)
3. Remove two clips (1) by removing four screws (2).
4. Remove five cables (3) from A6 PC boards.
5. Remove A6 RF Module PC cover plate by removing six screws (4).
6. Disconnect coaxial cable (5) at point shown.
7. Disconnect two ribbon cables (6) from motherboard.
8. Remove five screws (7).
9. Slide RF Module out from mainframe.

Installation

10. Slide RF Module into the mainframe; push coaxial cable (5) in slightly so that it does not get caught on mainframe.
11. Replace five screws (7).
12. Reconnect two ribbon cables (6) to motherboard.
13. Reconnect coaxial cable (5).
14. Replace A6 RF Module PC cover plate by replacing six screws (4).
15. Reconnect five cables (3) to A6 PC boards.
16. Replace two clips (1) by replacing four screws (2).
17. Replace front panel.
18. Replace top, bottom, and side covers, reconnect IF and RF Sections, and reconnect ac line cords.

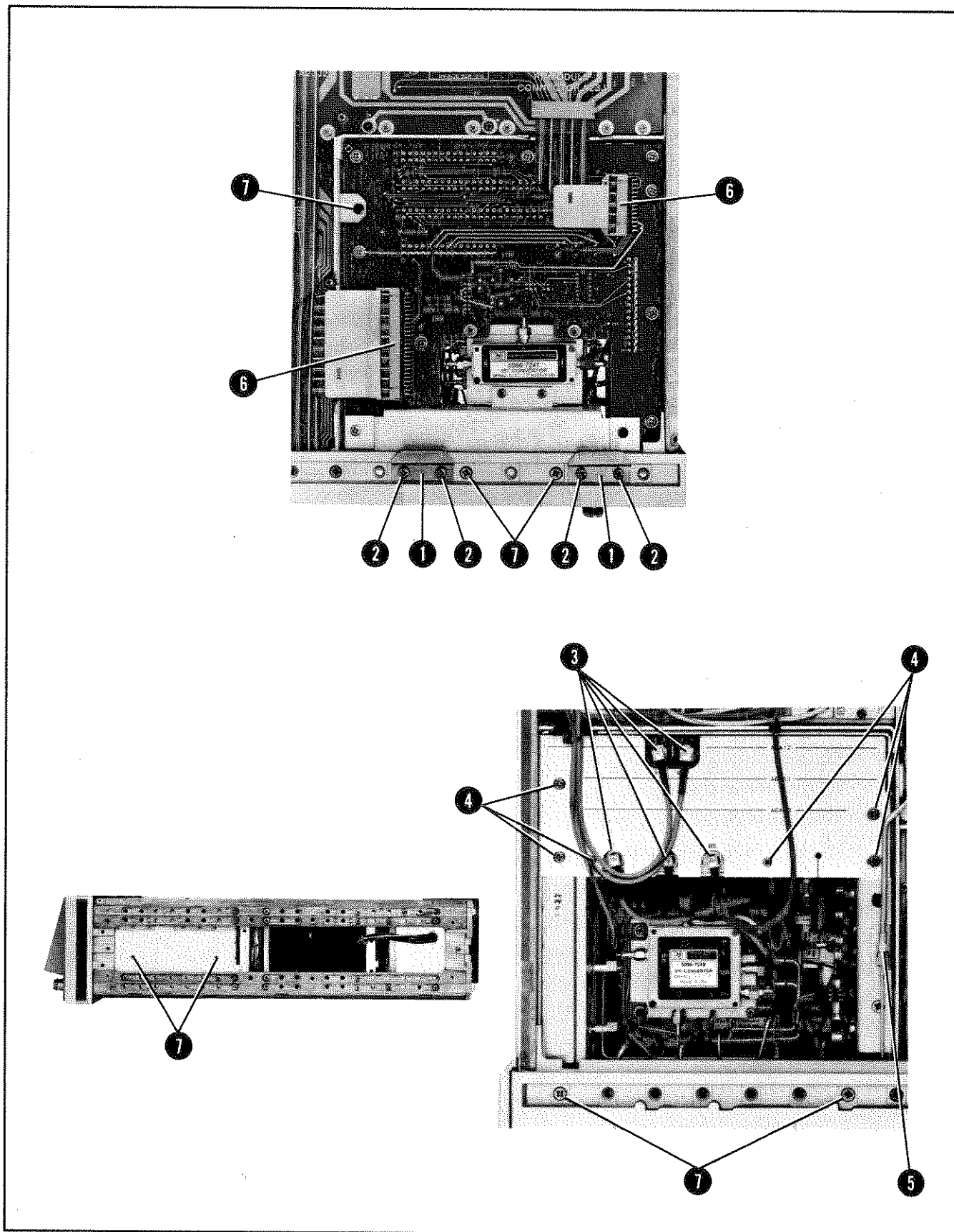


FIGURE 1. A6 RF MODULE REPLACEMENT

A6A1 COAXIAL SWITCH AND A6A17 300 MHz BPF REPLACEMENT

NOTE

For location of hardware and cables referred to in this procedure, see Figure 2.

1. Remove front panel from RF Section. (See A5 Front Panel Section for front panel removal procedure.)
2. A6A1 Replacement:
 - a. Disconnect connectors (1), (2), and (3).
 - b. Unsolder wires from the Coaxial Switch:
 - 1 (brown) wire from input (1)
 - 3 (orange) wire from input (c +)
 - 2 (red) wire from input (2)
 - c. Release Coaxial Switch (5) by removing two screws (4).
 - d. Fasten new Coaxial Switch to RF Module with two screws (4).
 - e. Resolder wires and reconnect connectors.
3. A6A17 Replacement:
 - a. Disconnect connectors (6) and (7) and remove A6A17 BPF from mounting clips.
 - b. Install new A6A17 BPF in mounting clips and reconnect connectors.
4. Replace front panel. (See A5 Front Panel Section for front panel replacement procedure.)

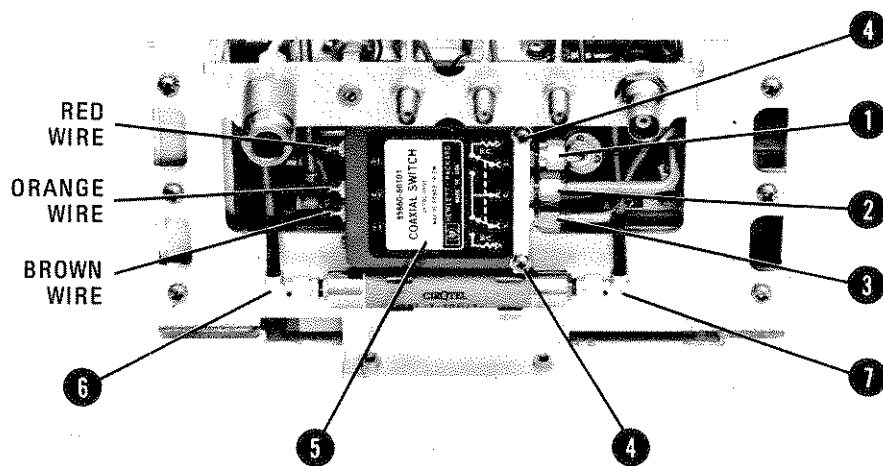


FIGURE 2. A6A1 COAXIAL SWITCH AND A6A17 300 MHz BPF REPLACEMENT

A6A2 RF ATTENUATOR REPLACEMENT**NOTE**

For location of hardware and cables referred to in this procedure, see Figure 3.

Removal

1. Remove front panel from RF Section. (See A5 Front Panel Section for front panel removal procedure.)
2. Remove top and bottom covers from RF Section.
3. Disconnect attenuator cables **(1)**.
4. Remove two screws **(2)** used to attach attenuator bracket to motherboard.
5. Remove two screws **(3)** used to attach attenuator bracket to “totem pole” assembly.
6. Remove RF Module PC board cover by removing six screws **(4)** and five cables **(5)** (three from A6A9 and two from A6A12).
7. Remove A6A9 leaving remaining cables attached.
8. Disconnect attenuator ribbon cable connector **(6)** from motherboard.
9. Attenuator (attached to bracket) is now free. Remove from RF Module.
10. Remove attenuator bracket from attenuator by removing two screws **(7)**.

Installation

11. Attach attenuator bracket to attenuator by replacing two screws **(7)**.
12. Place attenuator (attached to bracket) in RF Module.
13. Connect attenuator ribbon cable connector **(6)** to motherboard connector.
14. Align attenuator connectors **(1)** with cable connectors and tighten cable connectors.
15. Replace two screws **(3)** used to attach attenuator bracket to “totem pole” assembly.
16. Replace two screws **(2)** used to attach attenuator bracket to motherboard.
17. Replace A6A9 Phase Lock assembly.
18. Install PC board cover and replace six screws **(4)**.
19. Reconnect five cables **(5)** (three to A6A9 and two to A6A12). Cables are color-coded and color codes are marked on PC board cover.
20. Replace top and bottom covers on RF Section.
21. Replace front panel. (See A5 Front Panel Section for front panel replacement procedure.)

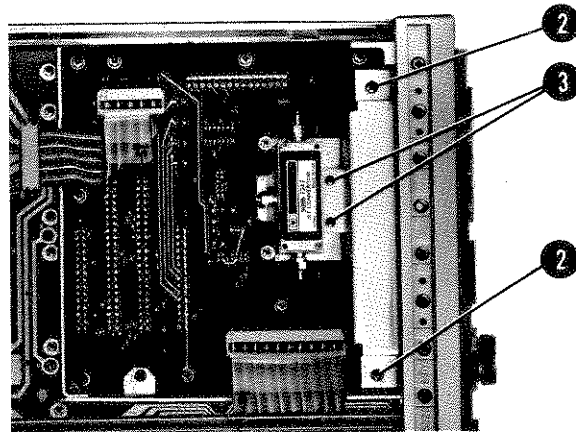
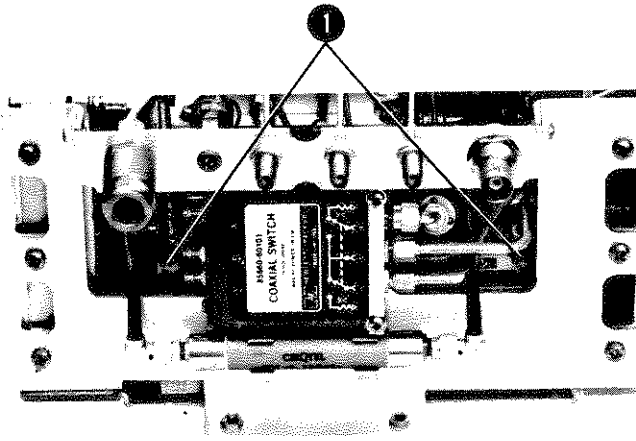


FIGURE 3. REPLACEMENT OF A6A2 RF ATTENUATOR (1 OF 2)

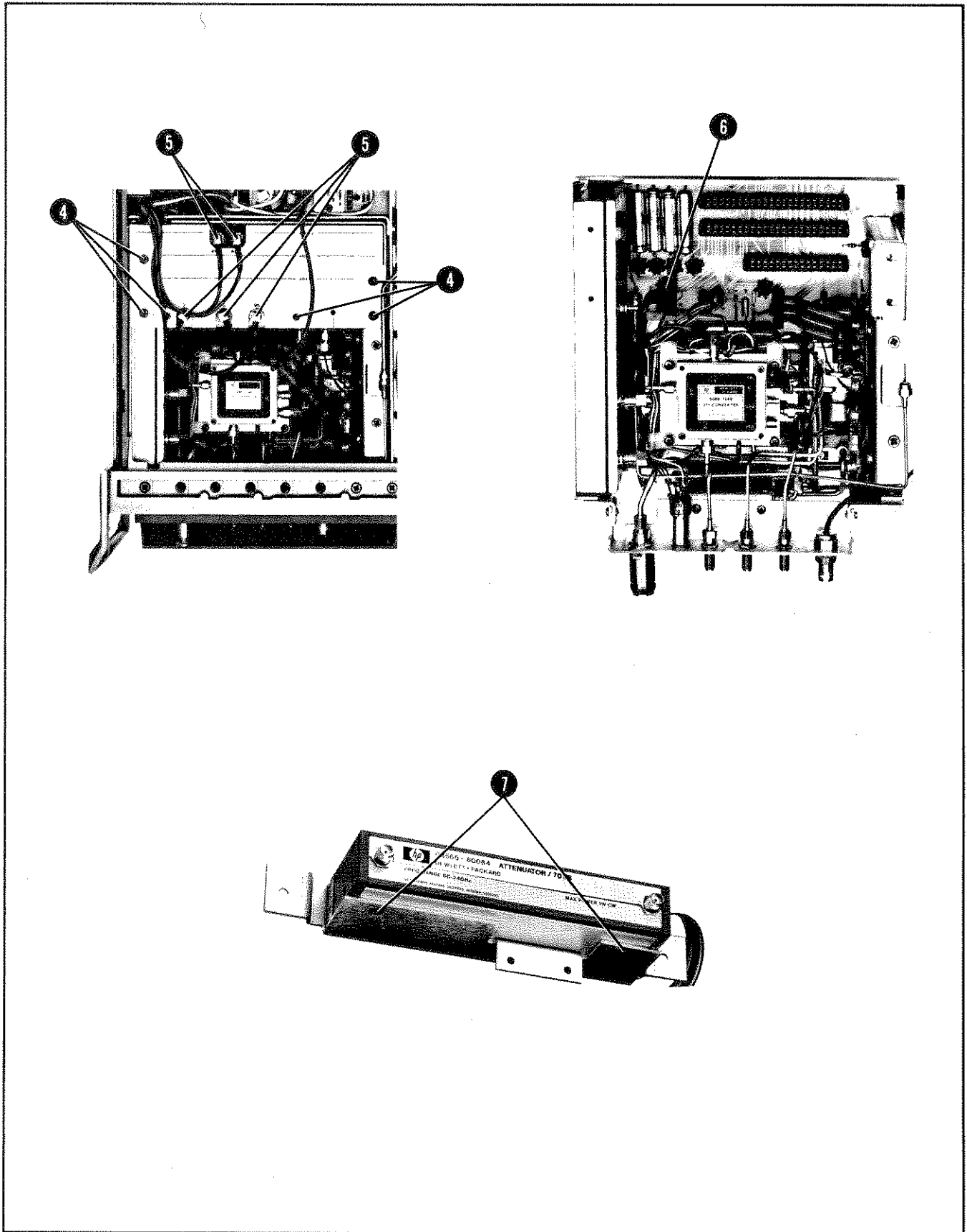


FIGURE 3. REPLACEMENT OF A6A2 RF ATTENUATOR (2 OF 2)

A6A4 SECOND CONVERTER REPLACEMENT

NOTE

For location of hardware and cables referred to in this procedure, see Figure 4.

Removal

1. Remove ac line cords and RF Section bottom cover.
2. Disconnect connectors (4) and (8), single-pin connector (2), and double-pin connector (3) from Second Converter.
3. Disconnect the remaining cables from Second Converter:
 - 1 (brown) cable from .321 OUT (7)
 - 4 (yellow) cable from TUNE (9)
4. Remove two screws (6) to remove Second Converter from A6 RF Module.

Installation

5. Position new Second Converter on mounting bracket. Secure with two screws.
6. Reconnect connector (1), 5 (green) cable, connector (4), single-pin connector (2), and double-pin connector (3) to Second Converter.
7. Reconnect the following cables to Second Converter.
 - 1 (brown) cable to .321 OUT (7)
 - 1 (brown) cable to .321 IN (8)
 - 4 (yellow) cable to TUNE (9)
8. Replace bottom cover and ac line cords.

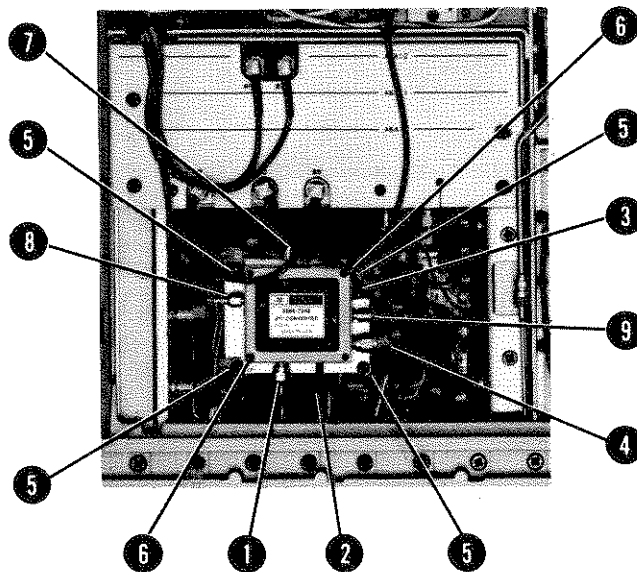


FIGURE 4. A6A4 SECOND CONVERTER REPLACEMENT

A6A6 FIRST CONVERTER REPLACEMENT**NOTE**

For location of hardware and cables referred to in this procedure, see Figure 5.

Removal

1. Remove ac line cords, IF-Display Section, and RF Section top cover.
2. Remove two screws (2) to release A6A6 First Converter from A6 RF Module. Disconnect connectors (1) from A6A6 First Converter.

Installation

3. Position new A6A6 First Converter in RF Module and reconnect connectors (1). Reinstall two screws (2).
4. Replace RF Section top cover. Attach IF-Display Section to RF Section. Reconnect ac line cords.

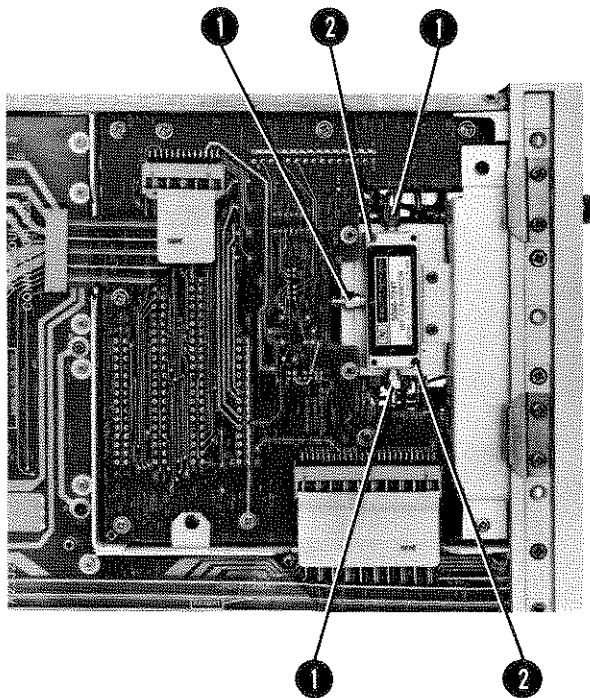


FIGURE 5. A6A6 FIRST CONVERTER REPLACEMENT

A6A15 3.6 GHz BPF, A6A16 1.5 GHz LPF, AND A6A18 LPF REPLACEMENT**NOTE**

For location of hardware and cables referred to in this procedure, see Figure 6.

Removal

1. Remove ac line cords, separate instrument sections, and remove top and bottom covers from RF Section.
2. Remove five cables **(1)** from A6 PC boards; three from A6A9 and two from A6A12.
3. Remove RF Module PC board cover by removing six screws **(2)**.
4. Remove A6A9 assembly and A6A10, A6A11, and A6A12 PC boards.
5. Disconnect 4 (yellow) cable and 5 (green) cable from 2nd Converter to release A6A9 assembly.
6. Disconnect coaxial cable **(3)** between A11 YTO Loop and A6A5 ACLU at the ACLU.
7. Disconnect cable between A6A8 YTX and A6A5 ACLU at the YTX.
8. Disconnect cable between front-panel 1ST LO OUTPUT connector and A6A5 ACLU at the ACLU.
9. Disconnect 1 (brown) cable from A6A4 2nd Converter .321 OUT.
10. Disconnect cable between A6A14 Limiter and A6A1 RF Switch at the RF Switch.
11. Remove three screws **(4)** used to attach ACLU cover plate one at a time removing cable clamp and reinstalling the screws.
12. Disconnect wire harness connectors from ACLU and 2nd Converter to release wire harness from “totem pole” assembly.
13. Disconnect cable between front-panel IF OUTPUT connector and A6A5 ACLU at the ACLU.
14. Disconnect cable between front-panel IF INPUT connector and A6A16 1.5 GHz LPF at the 1.5 GHz LPF.
15. Disconnect wire harness plug from motherboard and position wire harness such that “totem pole” assembly can be removed.
16. Remove two screws **(5)** attaching “totem pole” assembly to motherboard and two screws **(6)** attaching “totem pole” assembly to attenuator bracket.
17. Remove “totem pole” assembly from RF Module.
18. A6A15, A6A16, or A6A18 can now be replaced by disconnecting attached cables.

Installation

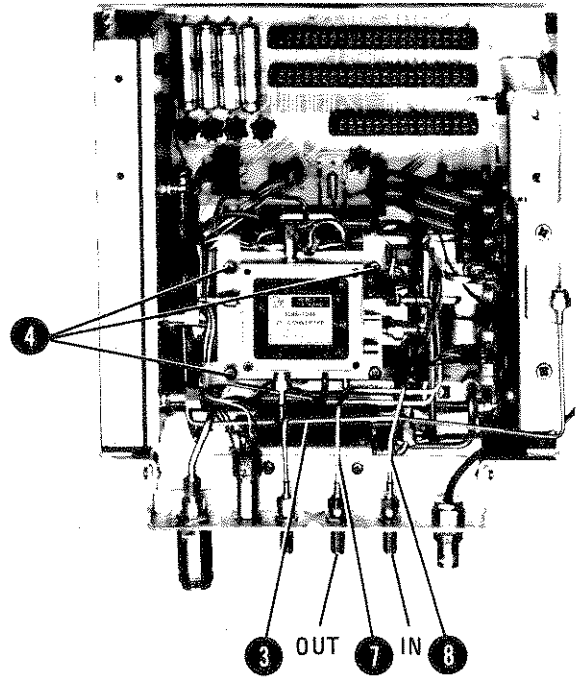
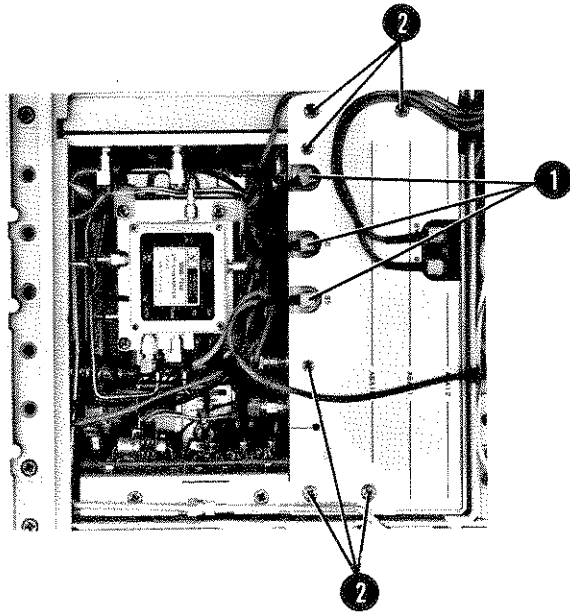
19. Replace A6A15, A6A16, or A6A18 in “totem pole” assembly and reconnect cables.
20. Place “totem pole” assembly in RF Module.

21. Replace two screws (5) to attach “totem pole” assembly to motherboard and two screws (6) to attach “totem pole” assembly to attenuator bracket.

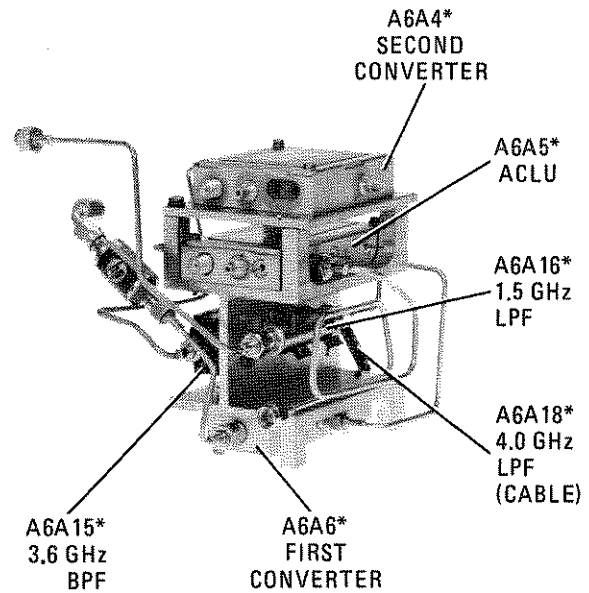
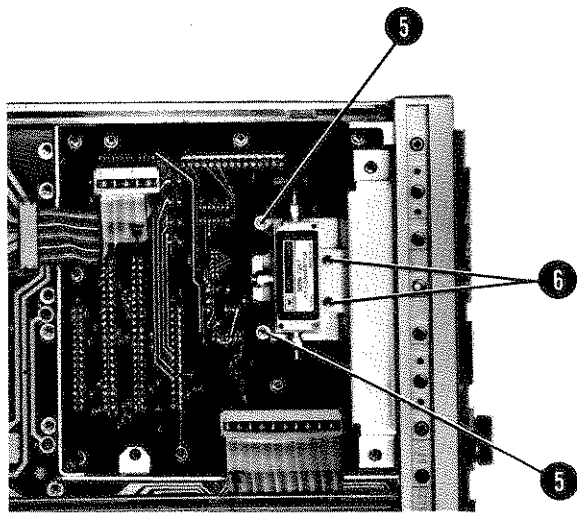
CAUTION

The YIG-Tuned Mixer (YTX) contains an extremely small and sensitive diode. A reverse voltage in excess of 3 volts may damage it. It is connected directly to the center conductor of the LO/IF connector, and is especially susceptible to blowout from electrostatic discharge. Before connecting any cable to this connector, first discharge the cable by connecting the center conductor to ground. It is recommended that the other end of the cable be connected first. Once the cable is properly installed (from the YTX to the ACLU), the BIAS pin of the ACLU is connected to the YTX diode and must also be treated with caution. A general rule is to connect all devices to ground before connecting them to the BIAS pin on the ACLU.

22. Reconnect cable to A6A8 YTX.
23. Reconnect cable to A6A1 RF Switch.
24. Reconnect cable from front-panel 1ST LO OUTPUT to A6A5 ACLU.
25. Reconnect cable from front-panel IF OUTPUT to A6A5 ACLU.
26. Reconnect cable from front-panel IF INPUT to A6A16 1.5 GHz LPE.
27. Reconnect cable (3) between A11 YTO Loop and A6A5 ACLU.
28. Reconnect 1 (brown) cable to 2nd Converter .321 OUT.
29. Remove three screws (4) from A6A5 ACLU cover plate one at a time replacing cable clamps then replacing screws.
30. Reconnect all wire harness connectors to A6A5 ACLU and A6A4 2nd Converter as follows:
- A6A4 2nd Converter
 Green (5) wire to I_E
 White/Brown (91) wire to V_c
 White/Black (90) wire to SW
- A6A5 ACLU
 Gray (8) wire to BIAS
 White/Red (92) wires to + 5VDC (three pins)
31. Reconnect wire harness to motherboard.
32. Replace A6A9 assembly and A6A10, A6A11, and A6A12 PC boards.
33. Replace PC board cover and install six screws (2).
34. Reconnect 4 (yellow) cable and 5 (green) cable to 2nd Converter.
35. Reconnect five cables (1) to A6 PC boards; three to A6A9 and two to A6A12.
36. Replace top and bottom covers on RF Section, recombine instrument sections, and reconnect ac line cords.



**"TOTEM POLE"
ASSEMBLY**



*REFER TO INDIVIDUAL TABS FOR PART NUMBERS.

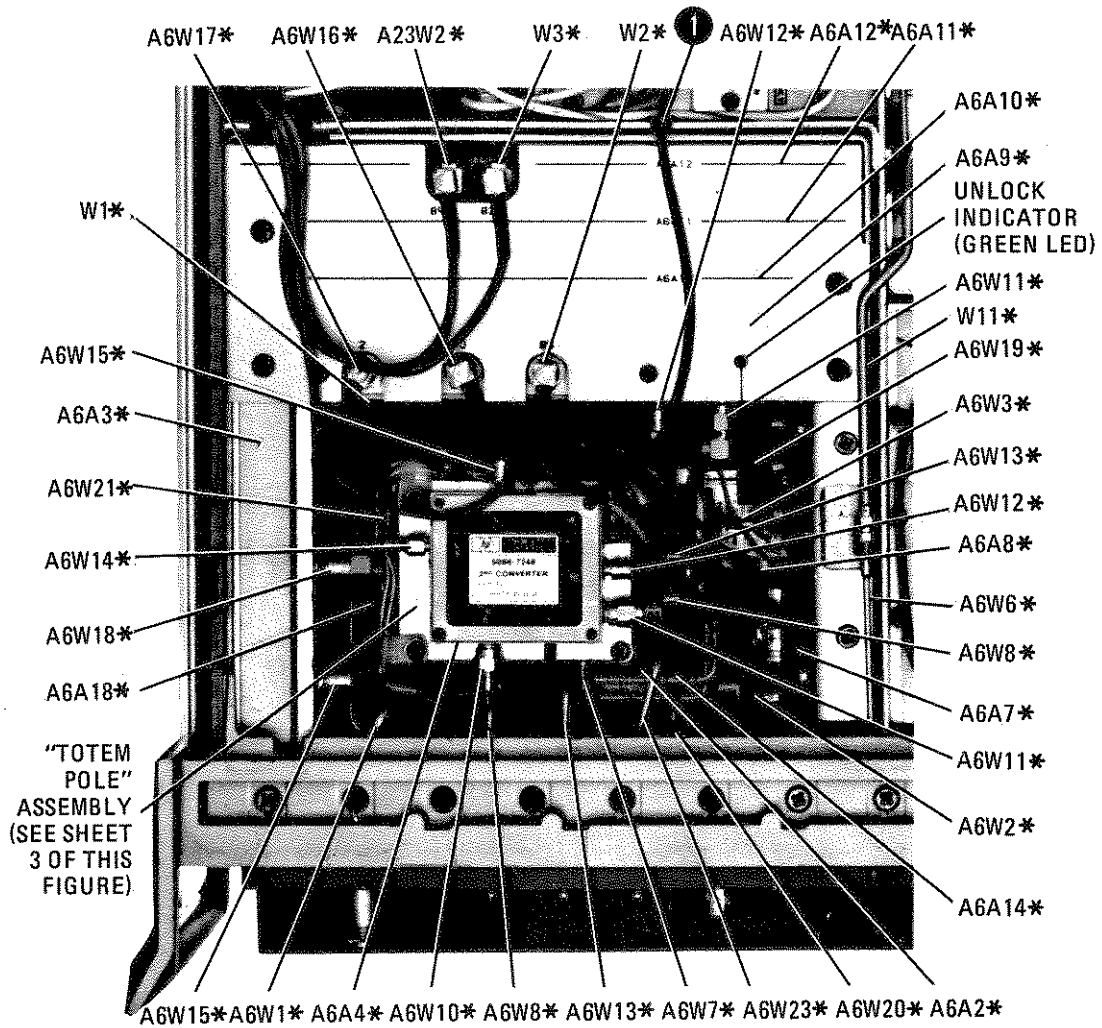
FIGURE 6. A6A15 BPF, A6A16 LPF, AND A6A18 LPF REPLACEMENT

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A6				RF MODULE		
A6A1	85660-60101	0	1	RF SWITCH	28480	85660-60101
A6A2	85660-60121	4	1	RF ATTENUATOR/ERROR CORRECTION ROM (INCLUDES A12UB)	28480	85660-60121
A6A3	85660-60003	1	1	LAST CONVERTER ASSEMBLY	28480	85660-60003
A6A4	5086-7248	9	1	SECOND CONVERTER	28480	5086-7248
A6A5	5086-7133	1	1	AMPLIFIER/COUPLER/LOAD UNIT (ACLU)	28480	5086-7133
A6A6	5086-7247	8	1	FIRST CONVERTER	28480	5086-7247
A6A7	85660-60128	1	1	BOARD ASSEMBLY, YIG-TUNED MIXER CURRENT DRIVER	28480	85660-60128
A6A8	5086-7226	3	1	YIG-TUNED MIXER (YTX) (NEW)	28480	5086-7226
A6A8	5086-6226	1	1	YIG-TUNED MIXER (YTX) (RE- STORED 5086-7226)	28480	5086-6226
A6A9	85660-60226	0	1	PHASE LOCK ASSEMBLY	28480	85660-60226
A6A10	85660-60180	5	1	BOARD ASSEMBLY, MISCELLANEOUS BIAS/RELAY DRIVER	28480	85660-60180
A6A11	85660-60126	9	1	BOARD ASSEMBLY, SLOPE GENERATOR	28480	85660-60126
A6A12	85660-60013	3	3	BOARD ASSEMBLY, YTX DRIVER	28480	85660-60013
A6A13	85660-60014	4	1	BOARD ASSEMBLY, RF MODULE MOTHERBOARD	28480	85660-60014
A6A14	5086-7261	6	1	LIMITER, 0-2.5 GHZ	28480	5086-7261
A6A15	9135-0067	5	1	BANDPASS FILTER, 3.6 GHZ, SMA CONNECTORS	28480	9135-0067
A6A16	5086-7299	0	1	LOW PASS FILTER, 1.5 GHZ	28480	5086-7299
A6A17	0955-0117	5	1	BANDPASS FILTER, 300 MHZ	28480	0955-0117
A6A18	9135-0108	5	1	FILTER, LOW PASS, 26 GHZ	28480	9135-0108
A6J1				PART OF A6W16 (CAL OUTPUT)		
A6J2	1250-1251	7	1	ADAPTER-COAX STR F-SMA F-SMA	28480	1250-1251
A6J3	86290-60005	7	1	CONNECTOR, TYPE N (RF INPUT) (SEE FIGURE 8 IN GENERAL PARTS LISTING SECTION FOR PARTS BREAKDOWN)	28480	86290-60005
A6R1	2100-1717	4	1	RESISTOR-VAR CONTROL CDP 50K 20% LIN	28480	2100-1717
A6W1	85660-20073	1	1	CABLE ASSEMBLY, J1 (RF INPUT) TO A6A2 (RF ATTENUATOR)	28480	85660-20073
A6W2	85660-20074	2	1	CABLE ASSEMBLY, A6A2 (RF ATTENUATOR) TO A6A1 (RF SWITCH)	28480	85660-20074
A6W3	85660-20075	3	1	CABLE ASSEMBLY, A6A1 (RF SWITCH) TO A6A8 (YTX)	28480	85660-20075
A6W4	85660-20079	7	1	CABLE ASSEMBLY, A6A14 (LIMITER) TO A6A6 (FIRST CONVERTER)	28480	85660-20079
A6W5	85660-20076	4	1	CABLE ASSEMBLY, A6A8 (YTX) TO A6A5(ACLU)	28480	85660-20076
A6W6	85660-20077	5	1	CABLE ASSEMBLY, A6A5 (ACLU LD IN) TO W11 CABLE ASSEMBLY FROM A11A1	28480	85660-20077
A6W7	85660-20082	2	1	CABLE ASSEMBLY, A6A5 (ACLU) TO A6A6 (FIRST CONVERTER)	28480	85660-20082
A6W8	85660-20104	9	1	CABLE ASSEMBLY, 1ST LD OUTPUT NOT ASSIGNED	28480	85660-20104
A6W9						
A6W10	85660-20081	1	1	CABLE ASSEMBLY, A6A15 (306 GHZ BPF) TO A6A4 (SECOND CONVERTER)	28480	85660-20081
A6W11	85660-60055	3	1	CABLE ASSEMBLY, GREEN, A6A9 (PHASE LOCK) TO A6A4 (SECOND CONVERTER) VTO	28480	85660-60055
A6W12	85660-60097	3	1	CABLE ASSEMBLY, YELLOW, A6A4 (SECOND CONV- ERTER) TO A6A9U1 (SAMPLER)	28480	85660-60097
A6W13	85660-20113	0	1	CABLE ASSEMBLY, A6A5 (ACLU) TO A6A16 (1.5 GHZ LPF)	28480	85660-20113
A6W14	85660-20112	9	1	CABLE ASSEMBLY, A6A16 (1.5 GHZ LPF) TO A6A4 (SECOND CONVERTER)	28480	85660-20112
A6W15	85660-60057	5	1	CABLE ASSEMBLY, BROWN, A6A4 (SECOND CONVERTER) TO A6A3 (LAST CONVERTER)	28480	85660-60057
A6W16	85660-60058	6	1	CABLE ASSEMBLY, BLACK, CAL OUTPUT	28480	85660-60058
A6W17	85660-60056	4	1	CABLE ASSEMBLY, RED, A6A9 (PHASE LOCK) TO A6A17 (300 MHZ BPF)	28480	85660-60056
A6W18	85660-60054	2	1	CABLE ASSEMBLY, RED, A6A17 (300 MHZ BPF) TO A6A3 (LAST CONVERTER)	28480	85660-60054
A6W19	8120-2847	1	1	CABLE ASSEMBLY, RIBBON, A6A12 (YTX DRIVER) TO A6A7(YTX CURRENT DRIVER)	28480	8120-2847
A6W20	1250-1397	2	1	ADAPTER-COAX RTANG M-SMA M-SMA (RF SWITCH) TO A6A14 (LIMITER)	28480	1250-1397
A6W21	85660-60060	0	1	CABLE ASSEMBLY, WIRE HARNESS (A6R1, A6A1, A6A4 AND A6A5 TO A6A13J4)	28480	85660-60060

*Indicates Factory Selected Value

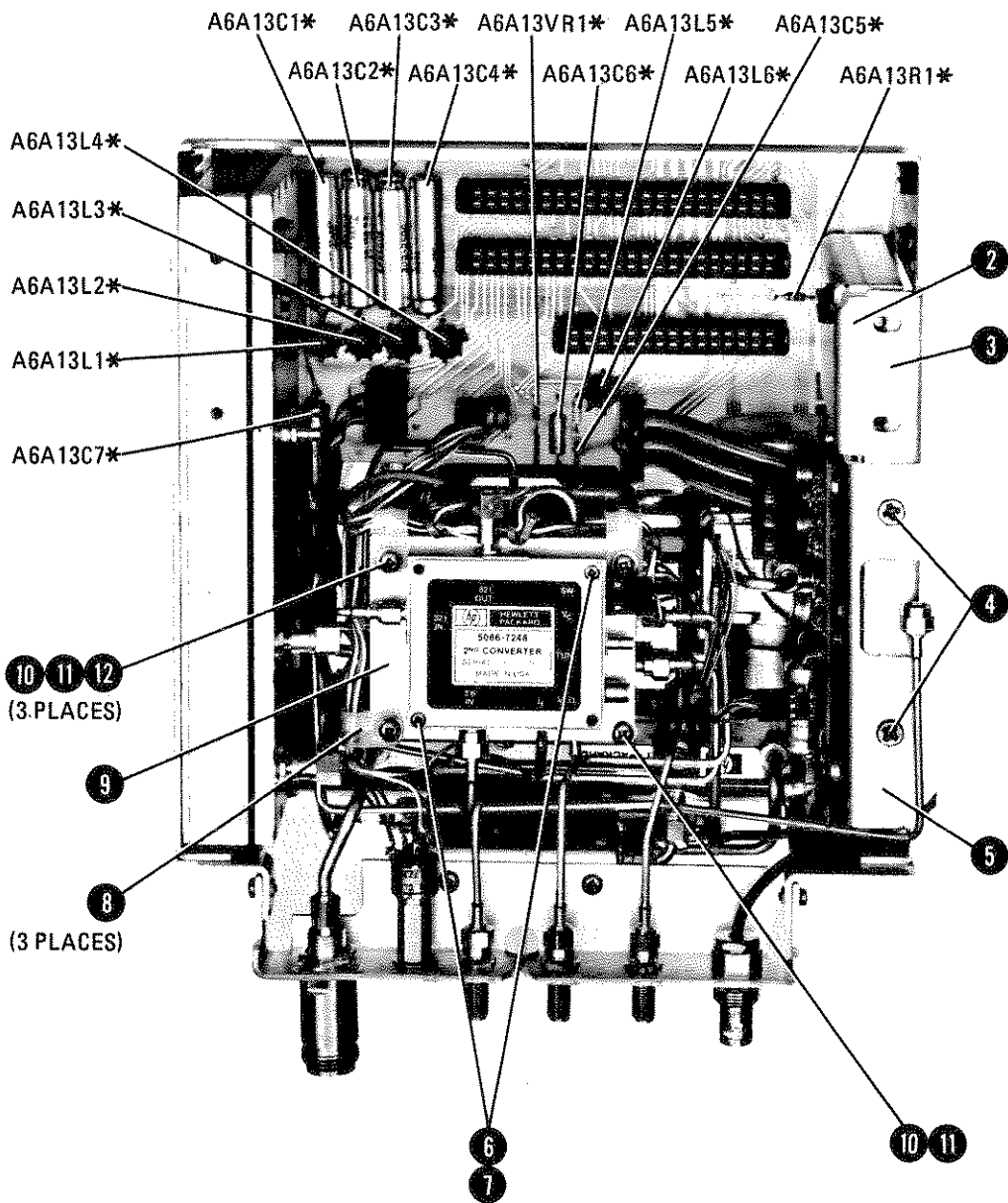
A6 RF MODULE



*REFER TO INDIVIDUAL TABS FOR PART NUMBERS.

FIGURE 7. A6 RF MODULE, PARTS IDENTIFICATION (1 OF 7)

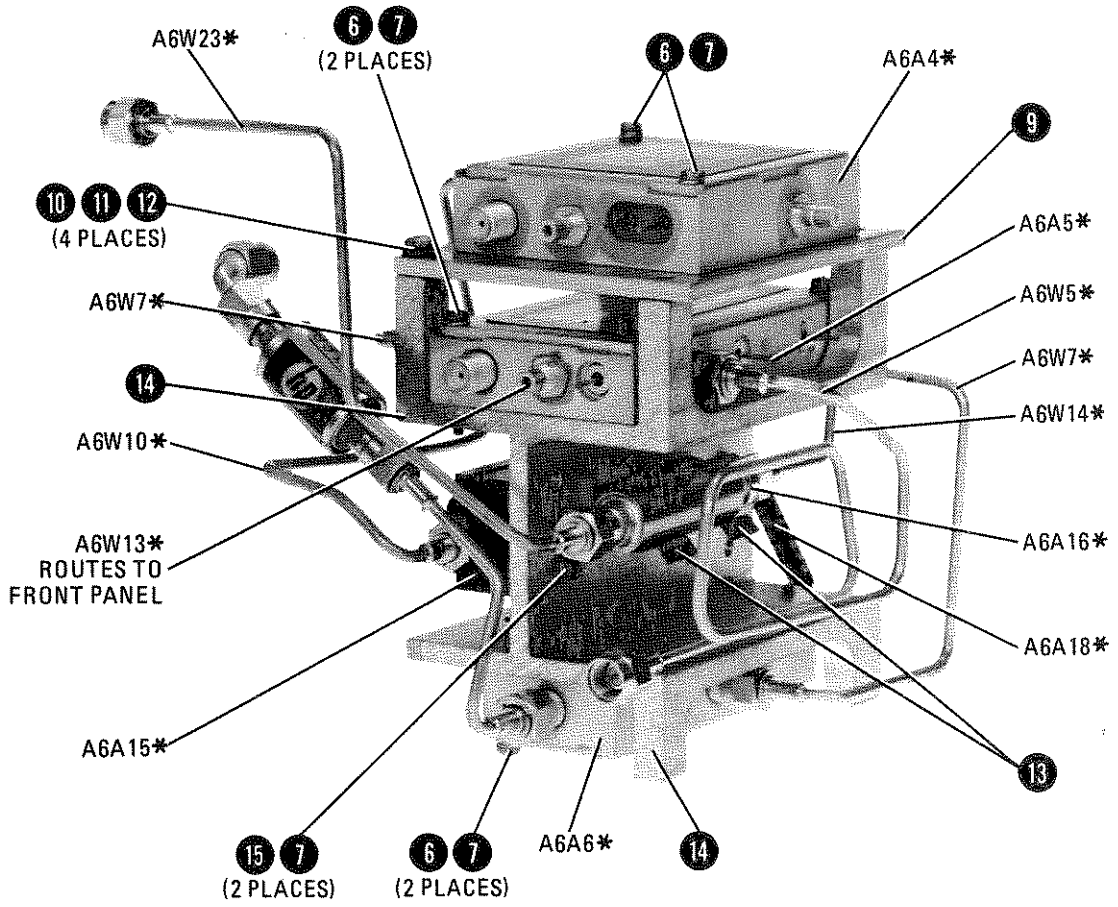
A6 RF MODULE



*REFER TO INDIVIDUAL TABS FOR PART NUMBERS.

FIGURE 7. A6 RF MODULE, PARTS IDENTIFICATION (2 OF 7)

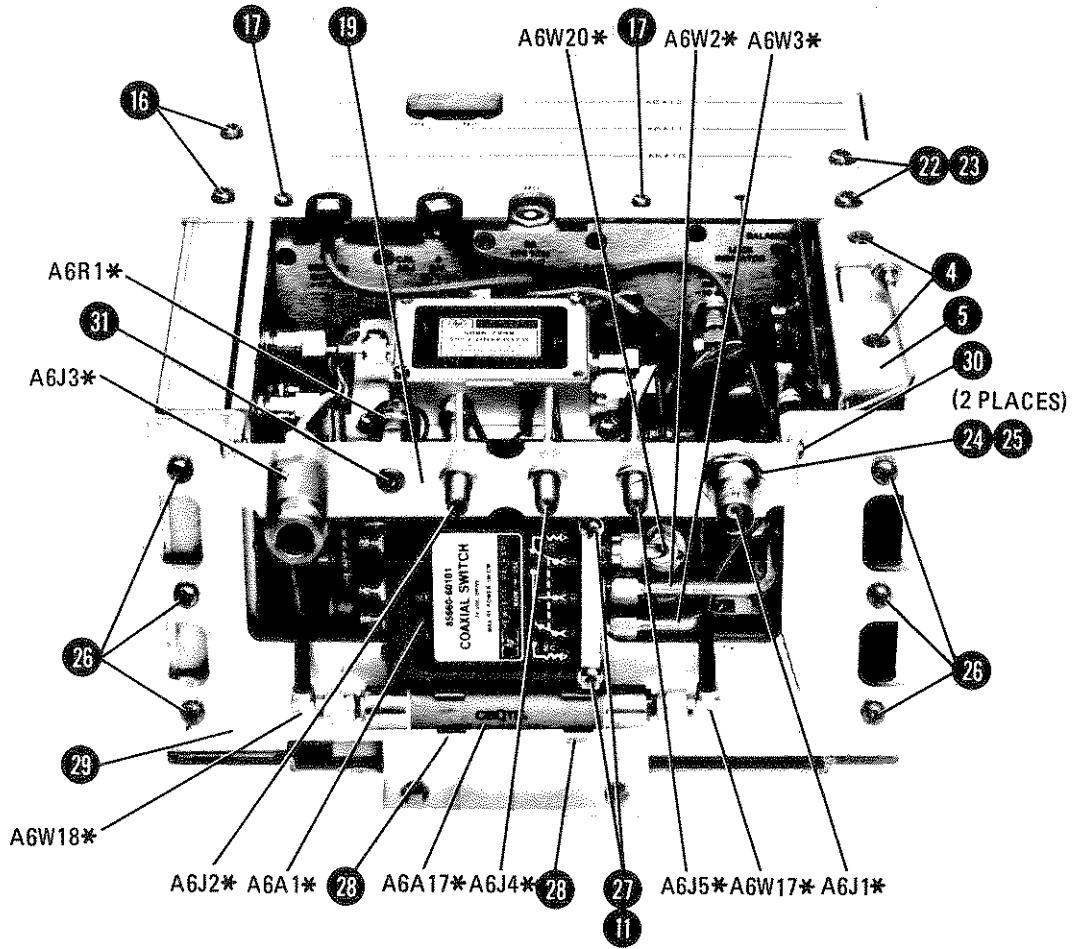
A6 RF MODULE



*REFER TO INDIVIDUAL TABS FOR PART NUMBERS.

FIGURE 7. A6 RF MODULE, PARTS IDENTIFICATION (3 OF 7)

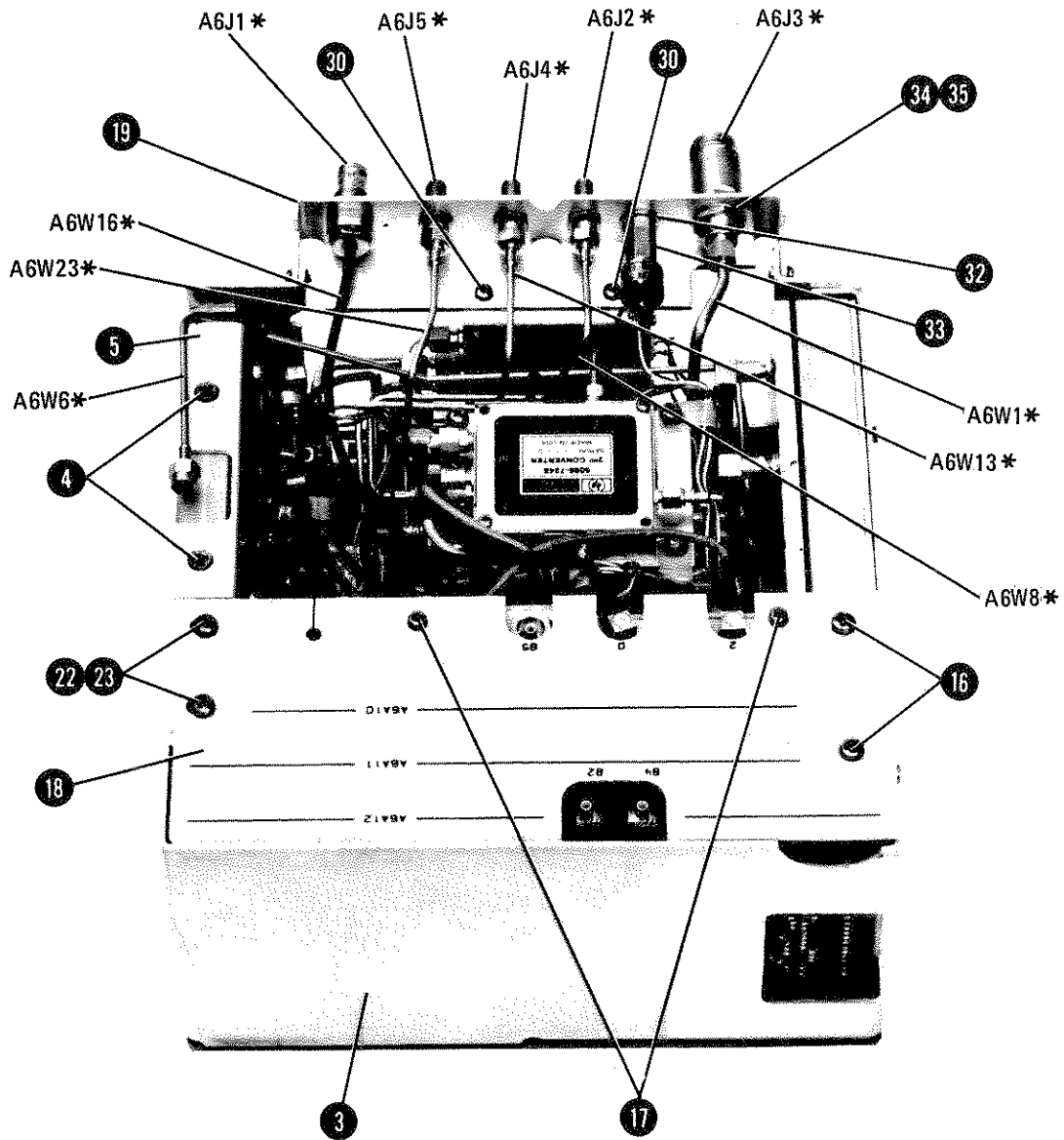
A6 RF MODULE



*REFER TO INDIVIDUAL TABS FOR PART NUMBERS.

FIGURE 7. A6 RF MODULE, PARTS IDENTIFICATION (4 OF 7)

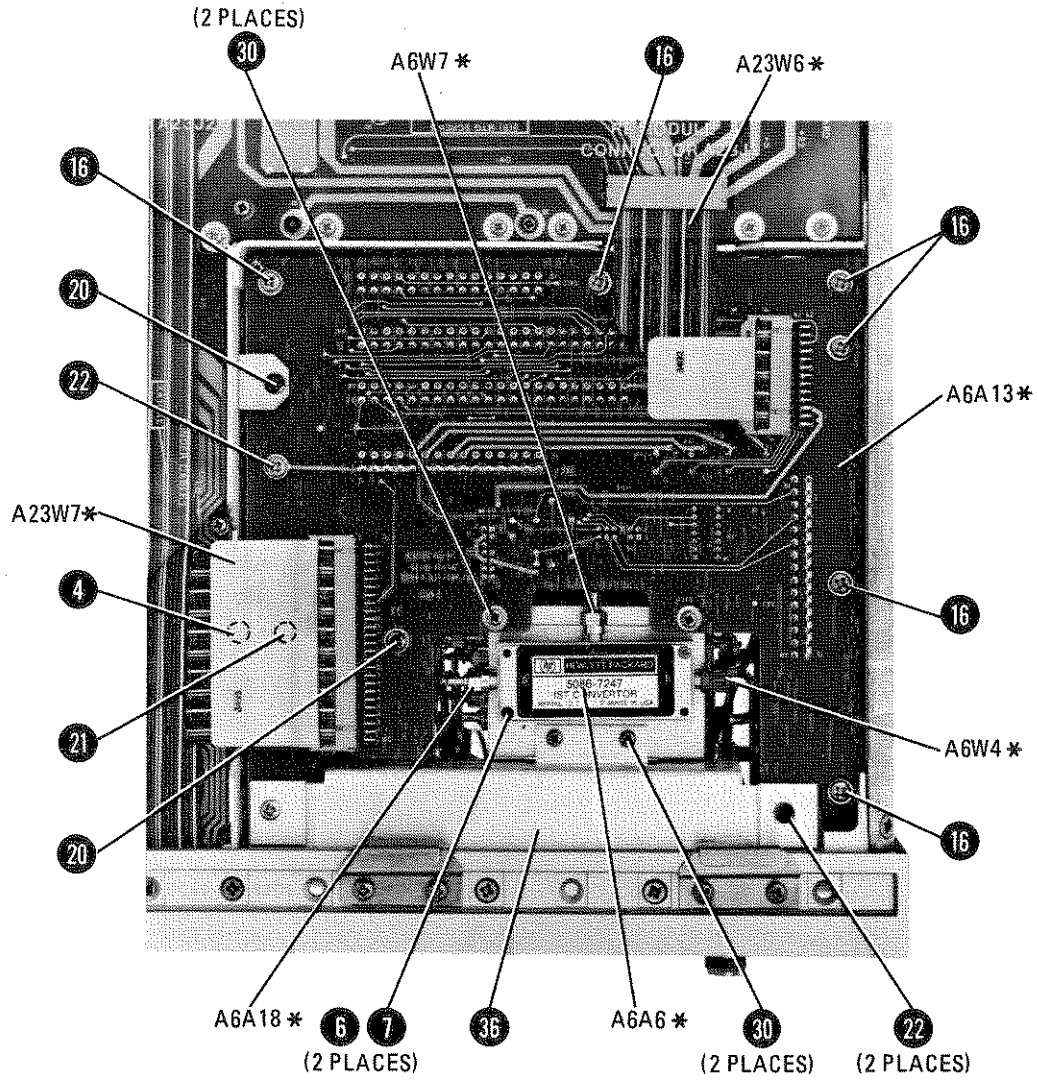
A6 RF MODULE



*REFER TO INDIVIDUAL TABS FOR PART NUMBERS.

FIGURE 7. A6 RF MODULE, PARTS IDENTIFICATION (5 OF 7)

A6 RF MODULE

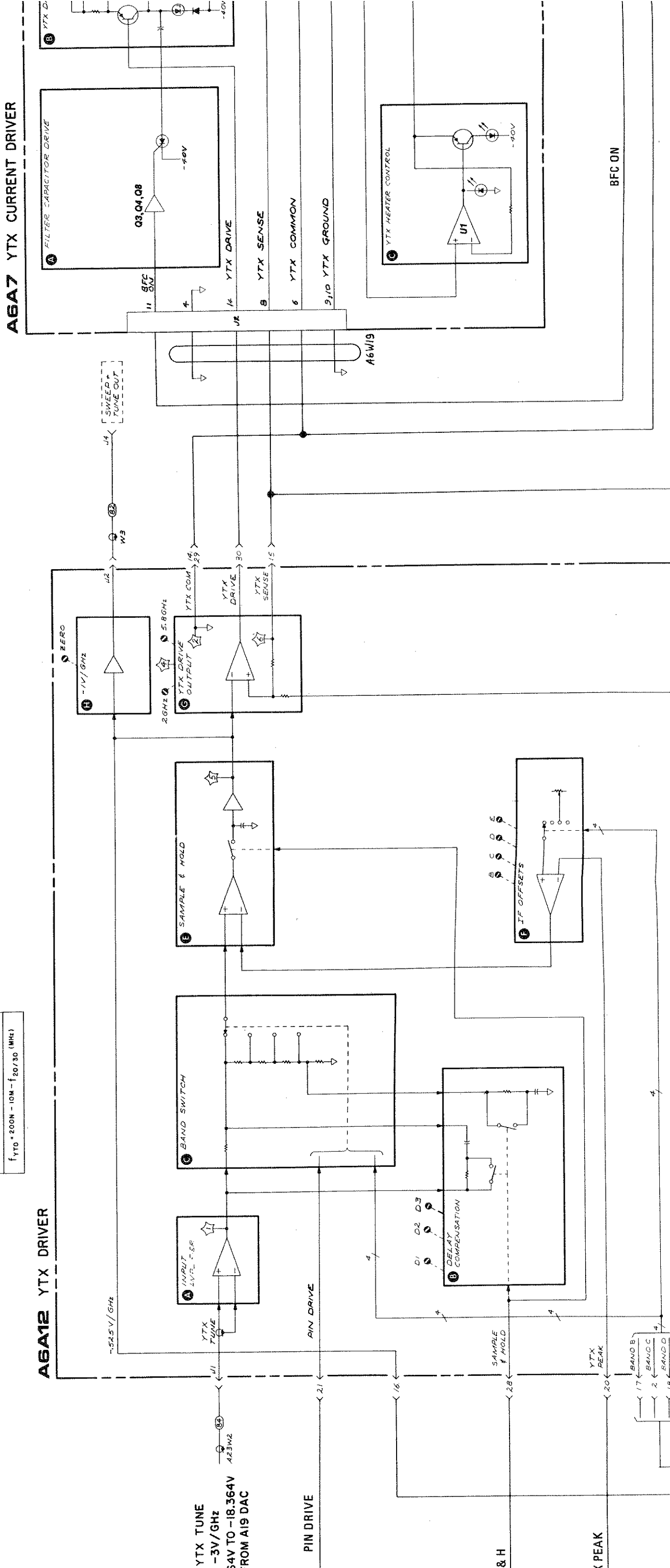
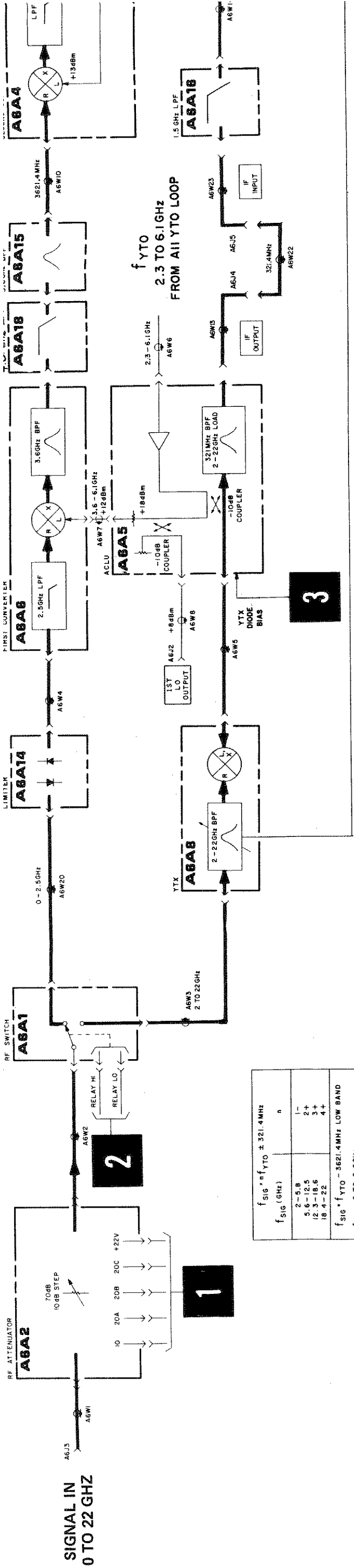


*REFER TO INDIVIDUAL TABS FOR PART NUMBERS.

FIGURE 7. A6 RF MODULE, PARTS IDENTIFICATION (6 OF 7)

Item	HP Part Number	C D	Description	Mfr. Code	Manufacturer's Part Number
1	0400-0009	9	Grommet, Rubber (For W2)	28480	0400-0009
2	85660-00020	6	Air Duct, RF Module	28480	85660-00020
3	85660-00015	9	Bracket, Main, RF Module	28480	85660-00015
4	2360-0116	5	Screw, Mach, 6-32, .312-IN LG, FLAT HD	28480	2360-0116
5	85660-00023	9	Heat Sink, YTX Current Driver	28480	85660-00023
6	0520-0137	8	Screw, Mach, 2-56, .75-IN LG, PAN HD	28480	0520-0137
7	2190-0890	1	Washer, Split, 2-56 (For screws (6) & (15))	28480	2190-0890
8	1400-0053	4	Cable Clamp (For Screw (10))	28480	1400-0053
9	85660-00021	7	Mounting Plate, 2nd Converter	28480	85660-00021
10	2200-0145	2	Screw, Mach, 4-40, .438-IN LG, PAN HD	28480	2200-0145
11	2190-0003	8	Washer, Split, 4-40 (For screws (10) & (27))	28480	2190-0003
12	3050-0105	6	Washer, Flat, 4-40 (For screw (10))	28480	3050-0105
13	1400-0942	0	Component Clip (For A6A16)	28480	1400-0942
14	85660-20072	0	Mount, Microcircuit, "Totem Pole"	28480	85660-20072
15	0520-0130	1	Screw, Mach, 2-56, .375-IN LG, PAN HD	28480	0520-0130
16	2360-0115	4	Screw, Mach, 6-32, .312-IN LG, PAN HD	28480	2360-0115
17	2200-0105	4	Screw, Mach, 4-40, .312-IN LG, PAN HD	28480	2200-0105
18	85660-00073	0	Cover, RF Module PC Board	28480	85660-00073
19	85660-00055	1	Bracket, Connector, RF Module	28480	85660-00055
20	2360-0119	8	Screw, Mach, 6-32, .438-IN LG, PAN HD	28480	2360-0119
21	2360-0122	3	Screw, Mach, 6-32, .5-IN LG, FLAT HD	28480	2360-0122
22	2360-0117	6	Screw, Mach, 6-32, .375-IN LG, PAN HD	28480	2360-0117
23	3050-0010	2	Washer, Flat, 6-32 (For screw (22))	28480	3050-0010
24	2950-0154	2	Nut, Hex, 1/2 IN (For A6J1)	28480	2950-0154
25	2190-0054	9	Washer, Lock, 1/2 IN (For A6J1)	28480	2190-0054
26	2360-0113	2	Screw, Mach, 6-32, .25-IN LG, PAN HD	28480	2360-0113
27	2200-0151	0	Screw, Mach, 4-40, .75-IN LG, PAN HD	28480	2200-0151
28	1400-0937	3	Component Clip (For A6A17)	28480	1400-0937
29	85660-00014	8	Bracket, Front, RF Module	28480	85660-00014
30	2200-0103	2	Screw, Mach, 4-40, .25-IN LG, PAN HD	28480	2200-0103
31	1490-0968	9	Panel Bushing (For A6R1)	28480	1490-0968
32	2190-0027	6	Washer, Lock, .256 ID (For A6R1)	28480	2190-0027
33	0590-0061	4	Nut, Hex, 1/4 IN (For A6R1)	28480	0590-0061
34	2950-0132	6	Nut, Hex, 7/16 IN (For A6J3)	28480	2950-0132
35	2190-0104	0	Washer, Lock, 7/16 IN (For A6J3)	28480	2190-0104
36	85660-00019	3	Bracket, Attenuator, RF Module	28480	85660-00019

FIGURE 7. A6 RF MODULE, PARTS IDENTIFICATION (7 OF 7)



$f_{SIG} \cdot n$ (GHz)	n
2-5.8	1-
5.5-12.5	2+
12.3-15.5	3+
18.4-22	4+
$f_{SIG} \cdot f_{YTO}$ - 3621.4 MHz	LOW BAND
$f_{SIG} \cdot 0$ TO 2.5 GHz	
f_{YTO} * 200N - 10N - $f_{20/30}$	(MHz)

SIGNAL IN
0 TO 22 GHz

RF ATTENUATOR
A6A2

REF SWITCH
A6A1

LIMITER
A6A14

FIRST CONVERTER
A6A8

A6A4

A6A15

A6A18

A6A5

A6A8

A6A14

A6A1

A6A2

A6A1

A6A12

A6A12

A6A12

A6A12

A6A12

A6A12

A6A12

A6A7 YTX CURRENT DRIVER

A6A12 YTX DRIVER

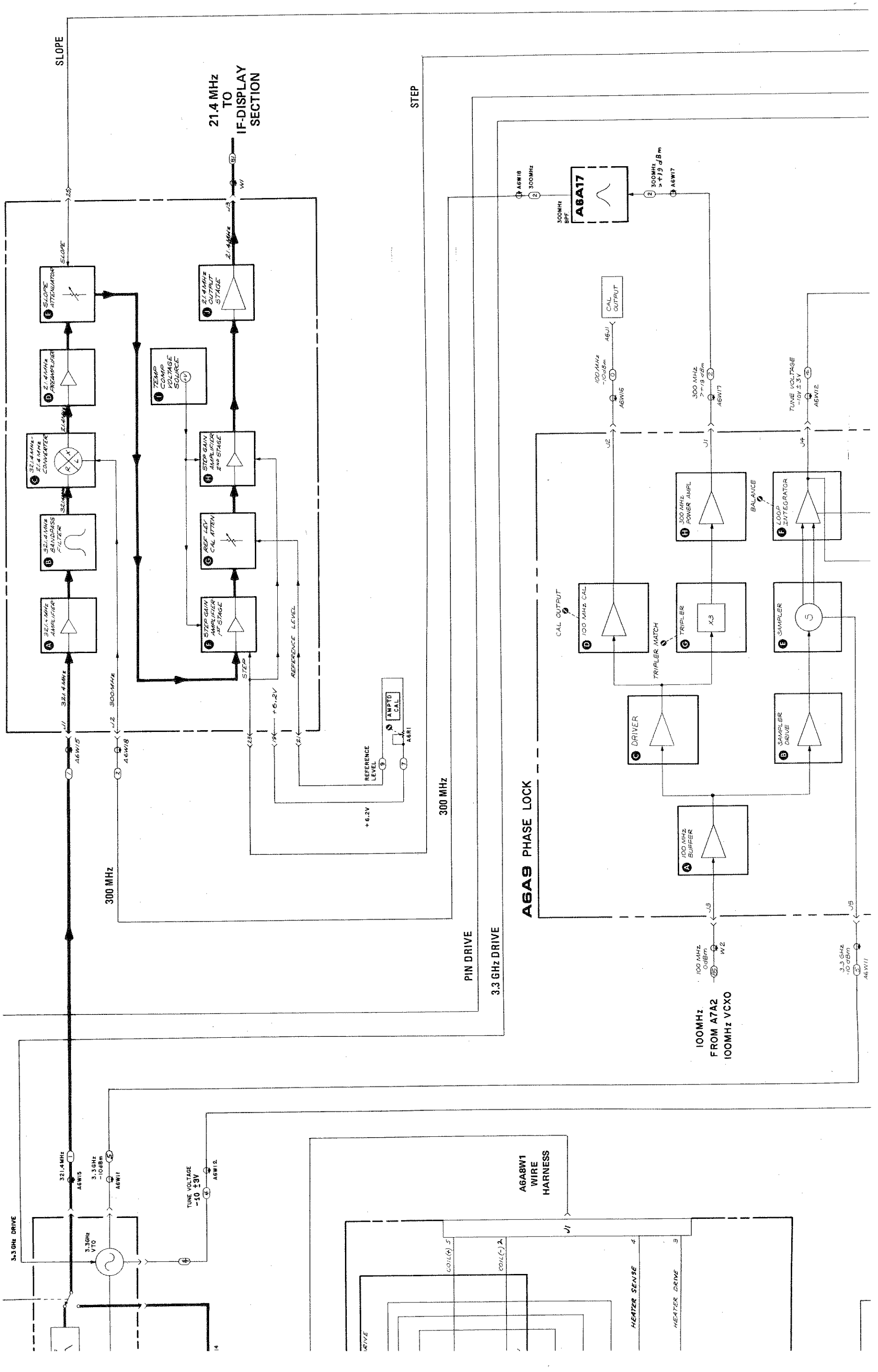
YTX TUNE
-3V/GHz
-6.964V TO -18.364V
FROM A19 DAC

PIN DRIVE

S & H

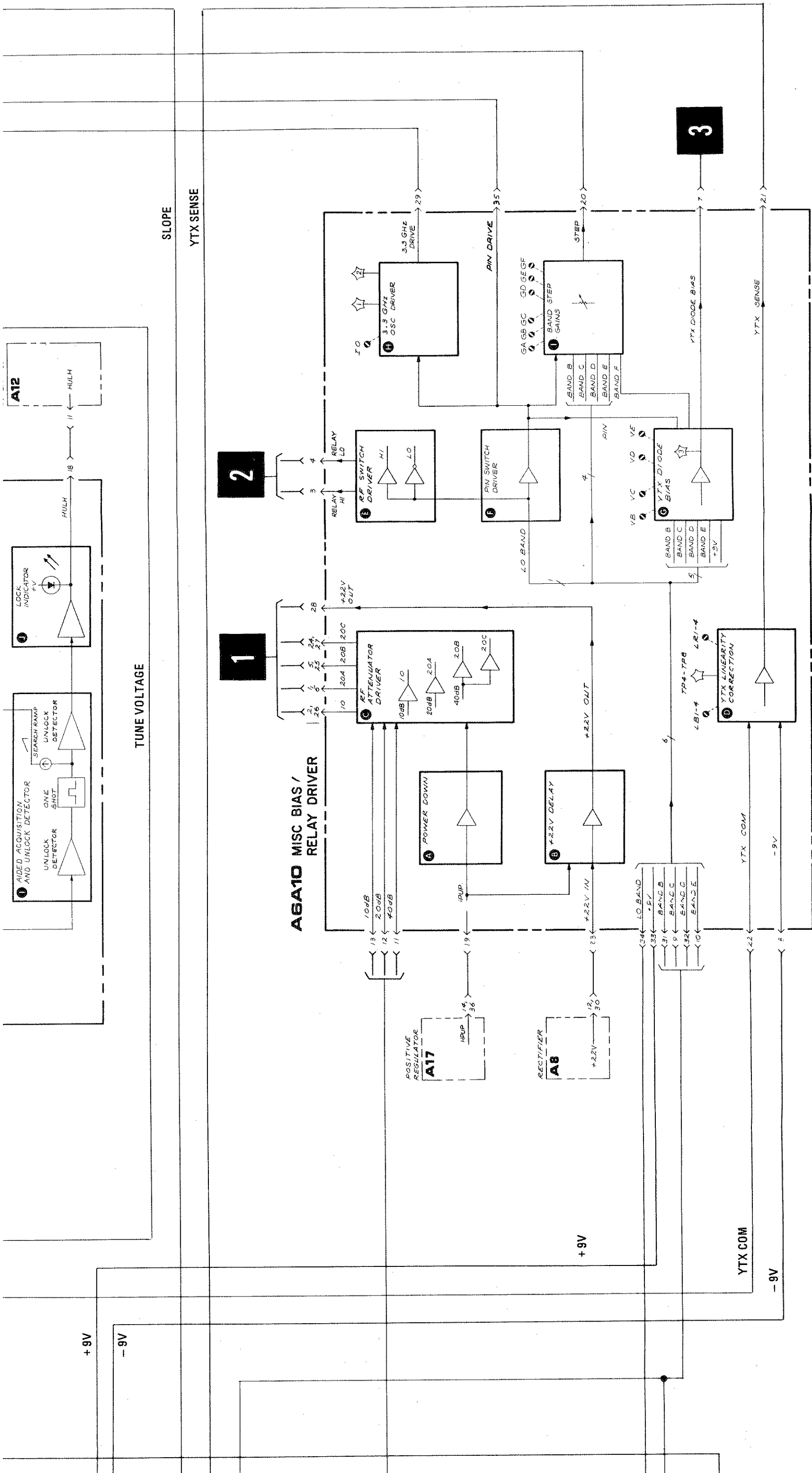
YTX PEAK

BFC ON



A6A3 LAST CONVERTER

PIN DRIVE



A6

FIGURE 8. A6 RF MODULE, TROUBLESHOOTING BLOCK DIAGRAM
A6 21/22

YTX COM

46/01/1

FRONT-PANEL
INTERFACE

A6A3 LAST CONVERTER, CIRCUIT DESCRIPTION

The Last Converter has two main purposes: 1) to convert the 321.4 MHz IF signal from the A6 RF Module down to 21.4 MHz for processing by the IF-Display Section, and 2) to provide the means for correcting for variations in conversion loss versus frequency in the input circuitry.

The Last Converter consists of 11 basic elements. They are a 321.4 MHz amplifier, a 321.4 MHz bandpass filter, a 321.4 to 21.4 MHz converter, a 21.4 MHz preamp, two pin diode attenuators, two pin diode controlled variable gain amplifiers, an output stage, a temperature compensation circuit, and power supply filtering.

Power Supplies (K)

The power supply filtering consists of series inductors and shunt capacitors (L21 – 24 and C49 – 53). In addition to this, R38 and VR1 provide a 6.2V source used for biasing transistors.

321.4 MHz Amplifier (A)

The 321.4 MHz amplifier consists of Q8 and its associated circuitry. Q7 provides bias for Q8 by setting the base current.

321.4 MHz Bandpass Filter (B)

The 321.4 MHz amplifier drives the 321.4 MHz bandpass filter which consists of L4 – L8 and C8 – C12. This filter is made up of five LC tank circuits coupled magnetically and capacitively. Capacitive coupling occurs through PC board traces on the circuit side of the PC board. Coupling into and out of the filter is done with tapped inductors L4 and L8. The filter is tuned by means of C8 – C12.

321.4 – 21.4 MHz Converter (C)

The 321.4 MHz filter drives the 321.4 – 21.4 MHz converter. This converter consists of a packaged double balanced mixer, U1. The 300 MHz LO for this converter comes from the A6A9 Phase Lock.

21.4 MHz Preamplifier (D)

The 321.4 – 21.4 MHz converter drives the 21.4 MHz preamp which consists of Q6 and its associated components. Q5 provides bias for Q6 by setting the base current. L10, C22, and C23 form a series resonant circuit producing a notch in the frequency response of this amplifier at 10.7 MHz. This is to prevent the second harmonic of 10.7 MHz from causing a spurious response.

Slope Attenuator (E)

The 8566 is a harmonic mixing spectrum analyzer, and as such has five bands of frequencies to cover the range 0 – 22 GHz. When changing from band to band, the conversion loss of the input mixer changes. Also within each band there are variations of conversion loss with frequency.

The variations of conversion loss within each band are compensated by pin diodes CR1 – CR4 and associated circuitry. Pin diodes have a property of changing RF impedance as their dc current is varied. Thus CR1/CR2 and CR3/CR4 form the two elements of a voltage divider. The current through CR1/CR2 is fixed by R10 and R11. The current through CR3/CR4 is determined by circuitry on the A6A11 Slope Generator. This forms a current controlled variable attenuator. Pin diodes CR1/CR2 are used in place of a fixed resistor to provide temperature tracking with CR3/CR4.

Step Gain Amplifier #1 (F) and Step Gain Amplifier #2 (H)

The variations of conversion loss from band to band are compensated for by two identical variable gain amplifiers made up of Q3 and Q10 and associated circuitry (Q4 and Q9 are emitter follower buffers). A simplified circuit of one of these stages is shown in Figure 1. The gain of this amplifier is determined approximately by

$$\text{Gain} \approx \frac{\text{Impedance (CR8, CR9, and CR10)}}{\text{Impedance (CR5, CR6, and CR7)}}$$

The impedance of CR8, CR9, and CR10 is determined by R23 and temperature compensation circuitry (Q1).

Impedance of CR5, CR6, and CR7 is determined by current from the step gain circuit on the A6A10 Relay Driver.

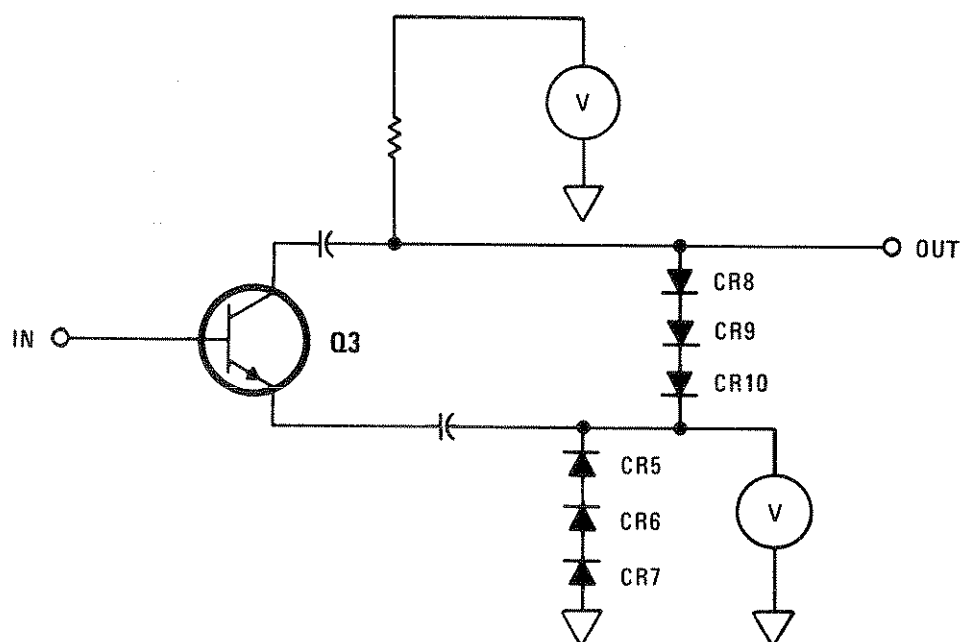


FIGURE 1. STEP GAIN AMPLIFIER, SIMPLIFIED SCHEMATIC

Amplitude Calibration Attenuator (G)

Q2 is an emitter follower buffer driving a second pin attenuator, CR11 – CR14. The current through CR11 and CR12 is determined by the front-panel control A6R1, AMPTD CAL. The current through CR13 and CR14 is fixed by R27. This circuit provides for amplitude calibration of the instrument.

21.4 MHz Output (J)

Q11 and Q12 form the output stage for the Last Converter. Q11 is an emitter follower driving common emitter amplifier Q12.

Temperature Compensation Voltage Source (I)

Q1 provides a voltage to set the current in CR8 – CR10 and CR15 – CR17. This voltage varies with temperature, changing the gain of the two step gain amplifiers to compensate for gain changes with temperature elsewhere in the Last Converter.

A6A3 LAST CONVERTER REPLACEMENT

NOTE

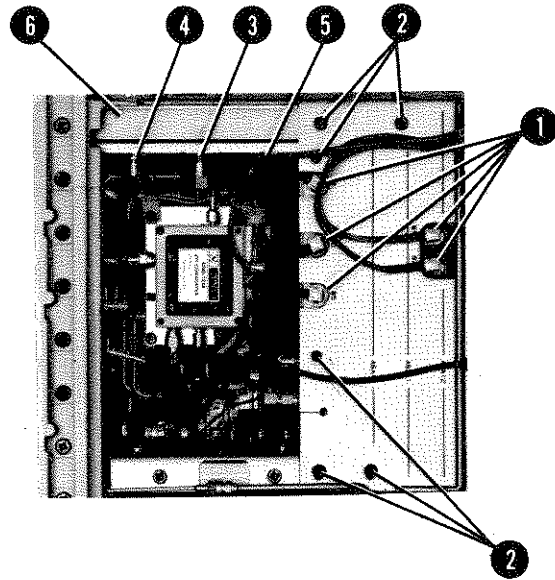
For location of hardware and cables referred to in this procedure, see Figure 2.

Removal

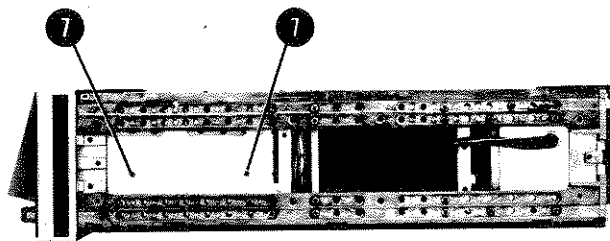
1. Remove ac line cords and RF Section bottom and right side covers.
2. Disconnect cables **(1)**: three from top of A6A9 Phase Lock assembly and two from A6A12 YTX Driver board.
3. Remove A6 RF Module PC cover plate by removing six screws **(2)**.
4. Remove A6A9 assembly and A6A10, A6A11, and A6A12 PC boards from the A6 RF Module. It is not necessary to disconnect the two cables (green and yellow) from the front side of the A6A9 Phase Lock assembly.
5. Disconnect the following cables from the A6A3 Last Converter:
 - 2 (red) cable **(3)**
 - 1 (brown) cable **(4)**
 - 81 (gray/brown) cable **(5)**
6. Remove two screws **(7)** and remove A6A3 Last Converter **(6)** from RF Module.

Installation

7. When installing the A6A3 Last Converter, push Last Converter board into A6A13 Motherboard PC connector, replace two screws **(7)** and reconnect cables disconnected in step 5.
8. Replace PC boards removed in step 4. Reconnect 5 (green) and 4 (yellow) cables to A6A9 Phase Lock if they were removed during removal of A6A3.
9. Replace and secure A6 RF Module PC board cover with six screws **(2)**.
10. Reconnect cables **(1)** to A6A9 Phase Lock and A6A12 YTX Driver. Cables are color-coded and color codes are marked on PC board cover.
11. Replace bottom and right side covers on RF Section. Reconnect ac line cords.



VIEW A



VIEW B

FIGURE 2. A6A3 LAST CONVERTER REPLACEMENT

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A6A3	85660-60003	1	1	LAST CONVERTER ASSEMBLY	28480	85660-60003
A6A3L1	9135-0002	8	5	FILTER-LOW PASS SOLDER-TERMS	33095	51-744-018
A6A3L2	9135-0002	8		FILTER-LOW PASS SOLDER-TERMS	33095	51-744-018
A6A3L3	9135-0002	8		FILTER-LOW PASS SOLDER-TERMS	33095	51-744-018
A6A3L4	9135-0002	8		FILTER-LOW PASS SOLDER-TERMS	33095	51-744-018
A6A3L5	9135-0002	8		FILTER-LOW PASS SOLDER-TERMS	33095	51-744-018
MISCELLANEOUS PARTS						
	2190-0557	7	3	WASHER-LK INTL T NO. 10 .195-IN-ID	28480	2190-0557
	2200-0140	7	34	SCREW-MACH 4-40 .25-IN-LG 100 DEG	28480	2200-0140
	2200-0144	1	34	SCREW-MACH 4-40 .375-IN-LG 100 DEG	28480	2200-0144
	2950-0078	9	3	NUT-HEX-DBL-CHAM 10-32-THD .067-IN-THK	28480	2950-0078
	85660-00009	1	1	COVER TOP	28480	85660-00009
	85660-20065	1	1	COVER BOTTOM	28480	85660-20065
	85660-20066	2	1	HOUSING	28480	85660-20066
A6A3A1	85660-60002	0	1	BOARD ASSEMBLY, LAST CONVERTER	28480	85660-60002
A6A3A1C1	0160-3877	5	2	CAPACITOR-FXD 100PF +-20% 200VDC CER	28480	0160-3877
A6A3A1C2	0160-3878	6	8	CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A6A3A1C3	0160-3877	5		CAPACITOR-FXD 100PF +-20% 200VDC CER	28480	0160-3877
A6A3A1C4	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A6A3A1C5	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A6A3A1C6	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A6A3A1C7	0160-2246	0	1	CAPACITOR-FXD 3.6PF +- .25PF 500VDC CER	28480	0160-2246
A6A3A1C8	0121-0452	4	5	CAPACITOR-V TRMR-AIR 1.3-5.4PF 175V	74970	187-0103-028
A6A3A1C9	0121-0452	4		CAPACITOR-V TRMR-AIR 1.3-5.4PF 175V	74970	187-0103-028
A6A3A1C10	0121-0452	4		CAPACITOR-V TRMR-AIR 1.3-5.4PF 175V	74970	187-0103-028
A6A3A1C11	0121-0452	4		CAPACITOR-V TRMR-AIR 1.3-5.4PF 175V	74970	187-0103-028
A6A3A1C12	0121-0452	4		CAPACITOR-V TRMR-AIR 1.3-5.4PF 175V	74970	187-0103-028
A6A3A1C13	0160-0572	1	1	CAPACITOR-FXD 2200PF +-20% 100VDC CER	28480	0160-0572
A6A3A1C14	0160-3879	7	31	CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A3A1C15	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A3A1C16	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A3A1C17	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A6A3A1C18	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A3A1C19	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A3A1C20	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A3A1C21	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A3A1C22	0160-3653	5	1	CAPACITOR-FXD 33PF +-5% 200VDC CER 0+-30	28480	0160-3653
A6A3A1C23	0121-0946	2	1	CAPACITOR-V TRMR-CER 9-35PF 200V PC-MTG	52763	304322 9/35PF N650
A6A3A1C24	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A3A1C25	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A3A1C26	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A3A1C27	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A3A1C28	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A3A1C29	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A3A1C30	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A6A3A1C31	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A6A3A1C32	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A3A1C33	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A3A1C34	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A3A1C35	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A3A1C36	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A3A1C37	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A3A1C38	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A3A1C39	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A3A1C40	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A3A1C41	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A3A1C42	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A3A1C43	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A6A3A1C44	0160-3456	6	1	CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A6A3A1C45	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A3A1C46	0160-4892	6	2	CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-4892
A6A3A1C47	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A3A1C48	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A3A1C49	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A3A1C50	0160-4892	6		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-4892
A6A3A1C51	0160-4084	8	1	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A6A3A1C52	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A3A1C53	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A3A1C54	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879

*Indicates Factory Selected Value

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A6A3A1CR1- A6A3A1CR20	1901-1070	9	20	DIODE-PIN 110V	28480	1901-1070
A6A3A1E1	0360-0124	3	10	CONNECTOR-SGL CONT PIN .04-IN-BSC-SZ RND	28480	0360-0124
A6A3A1E2	0360-0124	3		CONNECTOR-SGL CONT PIN .04-IN-BSC-SZ RND	28480	0360-0124
A6A3A1E3	0360-0124	3		CONNECTOR-SGL CONT PIN .04-IN-BSC-SZ RND	28480	0360-0124
A6A3A1E4	0360-0124	3		CONNECTOR-SGL CONT PIN .04-IN-BSC-SZ RND	28480	0360-0124
A6A3A1E5	0360-0124	3		CONNECTOR-SGL CONT PIN .04-IN-BSC-SZ RND	28480	0360-0124
A6A3A1E6	0360-0124	3		CONNECTOR-SGL CONT PIN .04-IN-BSC-SZ RND	28480	0360-0124
A6A3A1E7	0360-0124	3		CONNECTOR-SGL CONT PIN .04-IN-BSC-SZ RND	28480	0360-0124
A6A3A1E8	0360-0124	3		CONNECTOR-SGL CONT PIN .04-IN-BSC-SZ RND	28480	0360-0124
A6A3A1E9	0360-0124	3		CONNECTOR-SGL CONT PIN .04-IN-BSC-SZ RND	28480	0360-0124
A6A3A1E10	0360-0124	3		CONNECTOR-SGL CONT PIN .04-IN-BSC-SZ RND	28480	0360-0124
A6A3A1E11	9170-0029	3	6	CORE-SHIELDING BEAD	28480	9170-0029
A6A3A1E12	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A6A3A1E13	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A6A3A1E14	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A6A3A1E15	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A6A3A1E16	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A6A3A1J1	1250-1611	3	3	CONNECTOR-RF SMB M PC 50-OHM	28480	1250-1611
A6A3A1J2	1250-1611	3		CONNECTOR-RF SMB M PC 50-OHM	28480	1250-1611
A6A3A1J3	1250-1611	3		CONNECTOR-RF SMB M PC 50-OHM	28480	1250-1611
A6A3A1L1	9100-2255	4	2	INDUCTOR RF-CH-MLD 470NH 10% .105DX.26LG	28480	9100-2255
A6A3A1L2	9100-2291	4	1	INDUCTOR RF-CH-MLD 50NH 10% .105DX.26LG	28480	9100-2291
A6A3A1L3	9100-2255	4	4	INDUCTOR RF-CH-MLD 470NH 10% .105DX.26LG	28480	9100-2255
A6A3A1L4	85660-80002	2	2	COIL TAPPED	28480	85660-80002
A6A3A1L5	85660-80001	1	3	COIL FILTER	28480	85660-80001
A6A3A1L6	85660-80001	1		COIL FILTER	28480	85660-80001
A6A3A1L7	85660-80001	1		COIL FILTER	28480	85660-80001
A6A3A1L8	85660-80002	2		COIL TAPPED	28480	85660-80002
A6A3A1L9	9100-2247	4	1	INDUCTOR RF-CH-MLD 100NH 10% .105DX.26LG	28480	9100-2247
A6A3A1L10	9140-0144	0	1	INDUCTOR RF-CH-MLD 4.7UH 10% .105DX.26LG	28480	9140-0144
A6A3A1L11				NOT ASSIGNED		
A6A3A1L12	9100-1623	8	8	INDUCTOR RF-CH-MLD 27UH 5% .166DX.385LG	28480	9100-1623
A6A3A1L13	9100-1623	8		INDUCTOR RF-CH-MLD 27UH 5% .166DX.385LG	28480	9100-1623
A6A3A1L14	9100-1623	8		INDUCTOR RF-CH-MLD 27UH 5% .166DX.385LG	28480	9100-1623
A6A3A1L15	9100-1623	8		INDUCTOR RF-CH-MLD 27UH 5% .166DX.385LG	28480	9100-1623
A6A3A1L16				NOT ASSIGNED		
A6A3A1L17				NOT ASSIGNED		
A6A3A1L18	9100-1623	8		INDUCTOR RF-CH-MLD 27UH 5% .166DX.385LG	28480	9100-1623
A6A3A1L19	9100-1623	8		INDUCTOR RF-CH-MLD 27UH 5% .166DX.385LG	28480	9100-1623
A6A3A1L20				NOT ASSIGNED		
A6A3A1L21	9100-1623	8		INDUCTOR RF-CH-MLD 27UH 5% .166DX.385LG	28480	9100-1623
A6A3A1L22	9100-1623	8		INDUCTOR RF-CH-MLD 27UH 5% .166DX.385LG	28480	9100-1623
A6A3A1L23	9100-1623	8		INDUCTOR RF-CH-MLD 27UH 5% .166DX.385LG	28480	9100-1623
A6A3A1L24	9100-1623	8		INDUCTOR RF-CH-MLD 27UH 5% .166DX.385LG	28480	9100-1623
A6A3A1Q1	1854-0477	7	1	TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A6A3A1Q2	1854-0345	8	6	TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A6A3A1Q3	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A6A3A1Q4	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A6A3A1Q5	1853-0281	9	2	TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A6A3A1Q6	1854-0247	9	2	TRANSISTOR NPN SI TO-39 PD=1W FT=800MHZ	28480	1854-0247
A6A3A1Q7	1853-0281	9		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A6A3A1Q8	1854-0686	0	1	TRANSISTOR NPN SI TO-72 PD=200MW FT=4GHZ	28480	1854-0686
A6A3A1Q9	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A6A3A1Q10	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A6A3A1Q11	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A6A3A1Q12	1854-0247	9		TRANSISTOR NPN SI TO-39 PD=1W FT=800MHZ	28480	1854-0247
A6A3A1R1	0757-0438	3	6	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A6A3A1R2	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A6A3A1R3	0757-0418	9	3	RESISTOR 619 1% .125W F TC=0+-100	24546	C4-1/8-T0-619R-F
A6A3A1R4	0698-3154	0	1	RESISTOR 4.22K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4221-F
A6A3A1R5	0698-8818	3	1	RESISTOR 3.16 1% .125W F TC=0+-100	28480	0698-8818
A6A3A1R6	0698-0885	0	1	RESISTOR 2.61K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2611-F
A6A3A1R7	0757-0440	7	1	RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A6A3A1R8	0698-3431	6	1	RESISTOR 23.7 1% .125W F TC=0+-100	03088	PME55-1/8-T0-23R7-F
A6A3A1R9	0757-0198	2	1	RESISTOR 100 1% .5W F TC=0+-100	28480	0757-0198
A6A3A1R10	0757-0419	0	1	RESISTOR 681 1% .125W F TC=0+-100	24546	C4-1/8-T0-681R-F
A6A3A1R11	0757-0428	1	1	RESISTOR 1.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1621-F
A6A3A1R12	0757-0278	9	2	RESISTOR 1.78K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1781-F
A6A3A1R13	0757-0280	3	3	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6A3A1R14	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A6A3A1R15	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A6A3A1R16	0757-0208	7	1	RESISTOR 5.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5621-F
A6A3A1R17	0757-0447	4	1	RESISTOR 16.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1621-F
A6A3A1R18	0757-0418	9		RESISTOR 619 1% .125W F TC=0+-100	24546	C4-1/8-T0-619R-F
A6A3A1R19	0698-3441	8	1	RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A6A3A1R20	0698-3132	4	2	RESISTOR 261 1% .125W F TC=0+-100	24546	C4-1/8-T0-2610-F

*Indicates Factory Selected Value

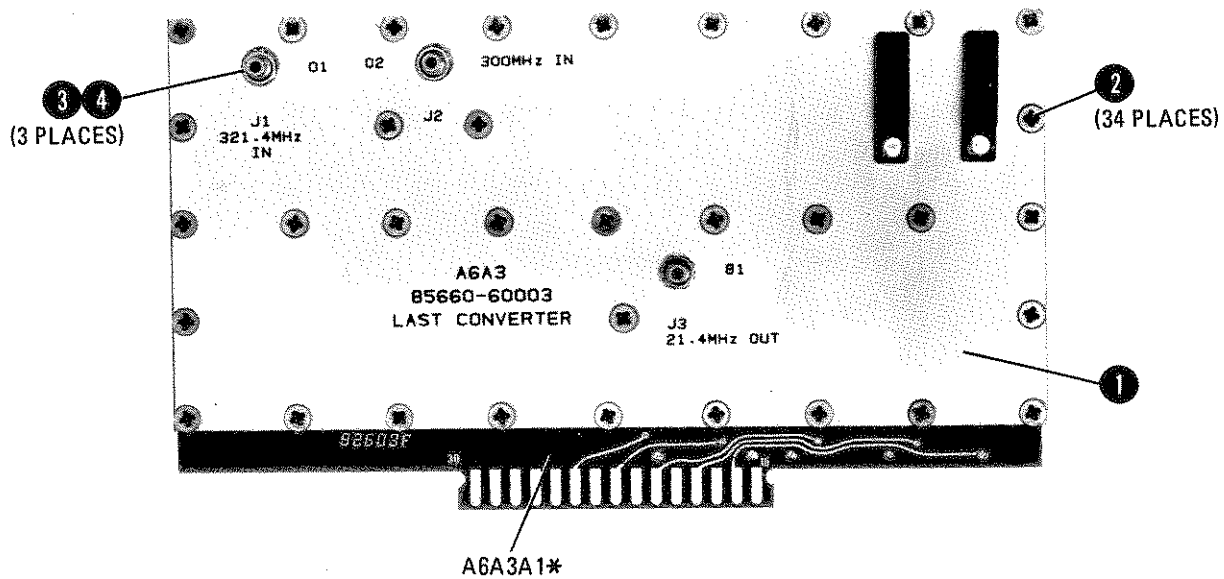
TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A6A3A1R21	0698-3155	1	2	RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A6A3A1R22	0698-3446	3	1	RESISTOR 383 1% .125W F TC=0+-100	24546	C4-1/8-T0-383R-F
A6A3A1R23	0698-3162	0	2	RESISTOR 46.4K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4642-F
A6A3A1R24	0757-0416	7	2	RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A6A3A1R25	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A6A3A1R26	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A6A3A1R27	0698-3449	6	1	RESISTOR 28.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2872-F
A6A3A1R28	0757-0278	9		RESISTOR 1.78K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1781-F
A6A3A1R29	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6A3A1R30	0698-3132	4		RESISTOR 261 1% .125W F TC=0+-100	24546	C4-1/8-T0-2610-F
A6A3A1R31	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A6A3A1R32	0698-3449	9		RESISTOR 28.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2872-F
A6A3A1R33	0698-3162	0		RESISTOR 46.4K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4642-F
A6A3A1R34	0757-0417	0	1	RESISTOR 562 1% .125W F TC=0+-100	24546	C4-1/8-T0-562R-F
A6A3A1R35	0698-0083	8	1	RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A6A3A1R36	0698-3439	4	1	RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A6A3A1R37	0757-0394	0	2	RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A6A3A1R38	0757-0814	9	1	RESISTOR 511 1% .5W F TC=0+-100	28480	0757-0814
A6A3A1R39	0757-0442	9	3	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A3A1R40	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A3A1R41	0757-0798	8	1	RESISTOR 110 1% .5W F TC=0+-100	28480	0757-0798
A6A3A1R42	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A6A3A1R43	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6A3A1R44	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A3A1R45	0698-4037	0	1	RESISTOR 46.4 1% .125W F TC=0+-100	24546	C4-1/8-T0-46R4-F
A6A3A1R46	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A6A3A1U1	0955-0004	5	1	MIXER DBL BAL S BARR DIODE; P=200MW MAX	28480	0955-0004
A6A3A1VR1	1902-0625	0	1	DIODE ZNR 1N829 6.2V 5% DD -7 PD=.125W	04713	1N829
				MISCELLANEOUS PARTS		
	1205-0226	9	2	HEAT SINK SGL TO-5/TO-39-CS	28480	1205-0226

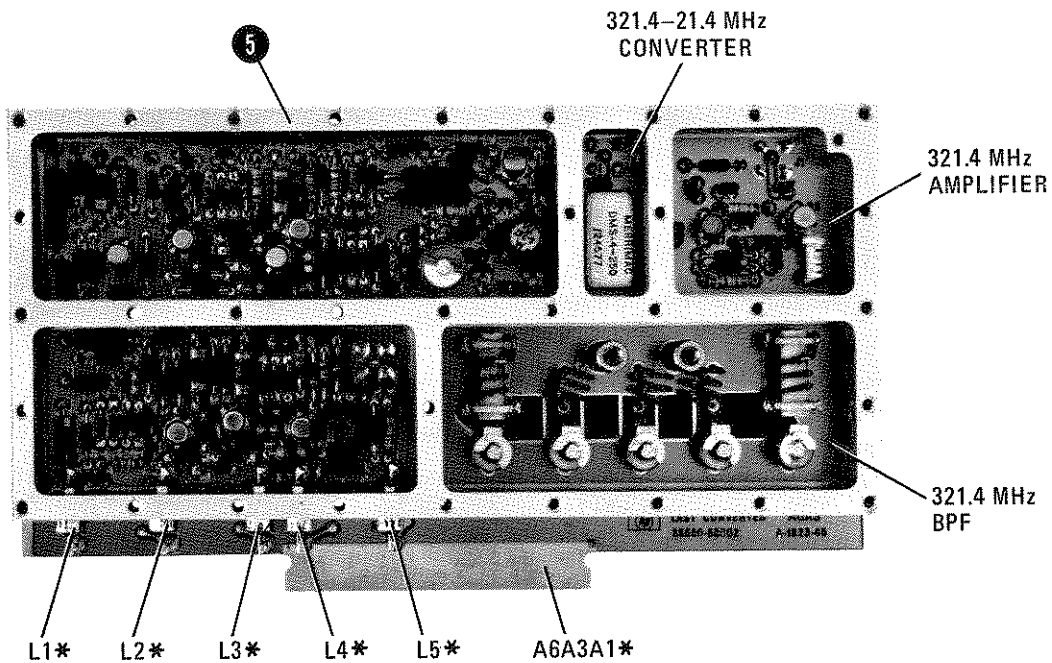
*Indicates Factory Selected Value

A6A3 LAST CONVERTER ASSEMBLY

FRONT



INTERNAL

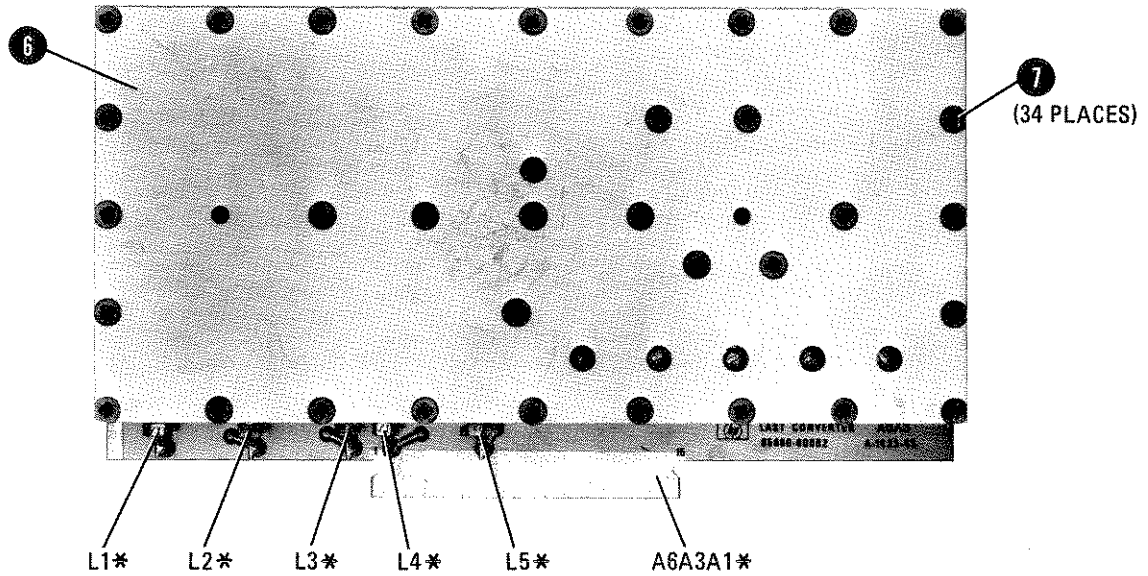


*REFER TO INDIVIDUAL TABS FOR PART NUMBERS.

FIGURE 3. A6A3 LAST CONVERTER ASSEMBLY, PARTS IDENTIFICATION (1 OF 2)

**A6A3
LAST CONVERTER ASSEMBLY**

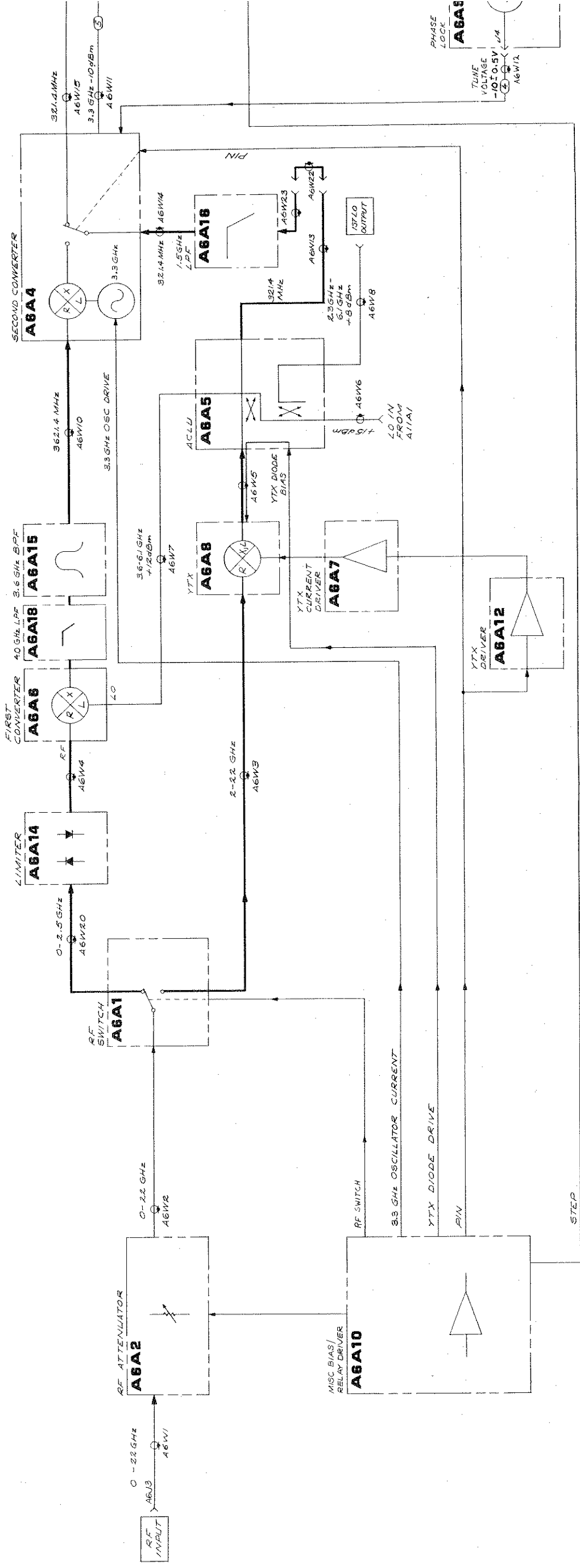
REAR

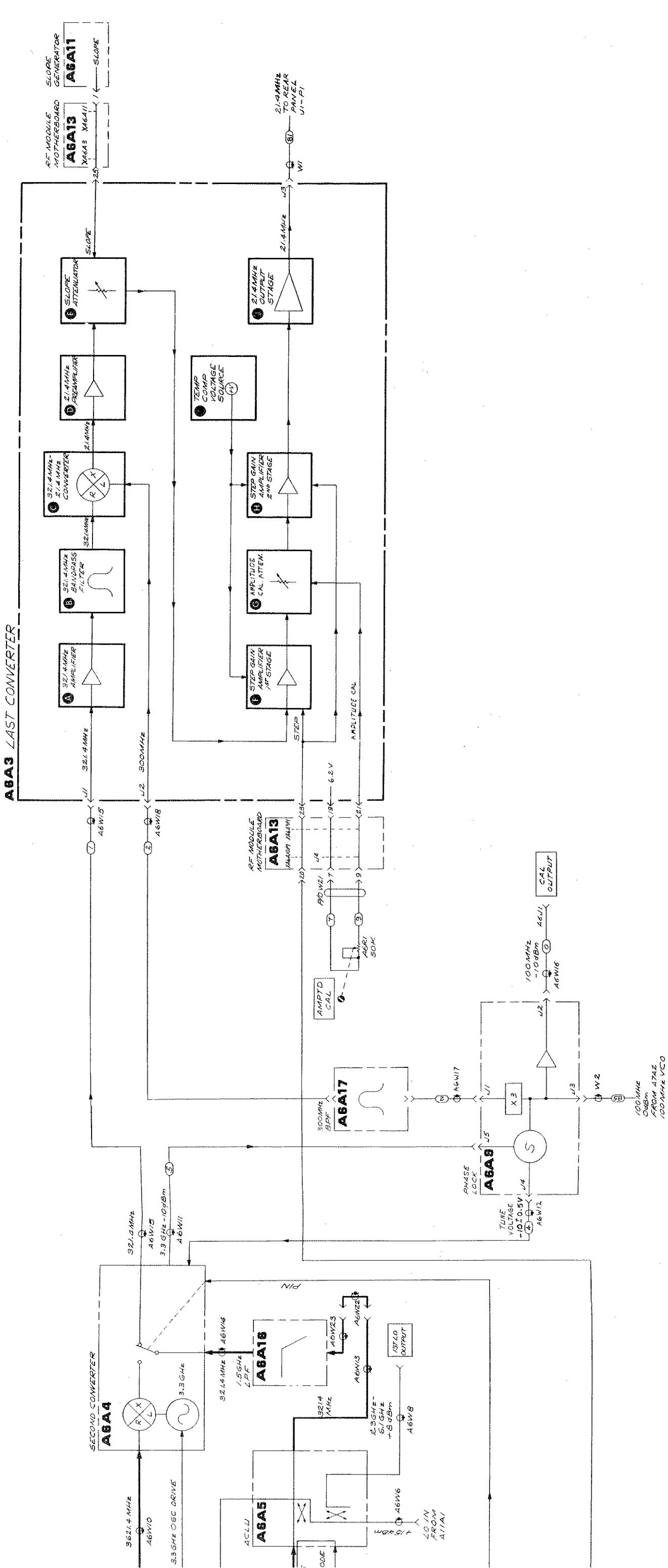


*REFER TO INDIVIDUAL TABS FOR PART NUMBERS.

Item	HP Part Number	C D	Description	Mfr. Code	Manufacturer's Part Number
1	85660-20065	1	Cover, Bottom, Last Converter	28480	85660-20065
2	2200-0144	1	Screw, Mach, 4-40, .375-IN LG, FLAT HD	28480	2200-0144
3	2950-0078	9	Nut, Hex, 10-32 (For J1, J2, and J3)	28480	2950-0078
4	2190-0124	4	Washer, Lock, 10-32 (For J1, J2, and J3)	28480	2190-0124
5	85660-20066	2	Housing, Last Converter	28480	85660-20066
6	85660-00009	1	Cover, Top, Last Converter	28480	85660-00009
7	2200-0138	3	Screw, Mach, 4-40, .188-IN LG, FLAT HD	28480	2200-0138

FIGURE 3. A6A3 LAST CONVERTER ASSEMBLY, PARTS IDENTIFICATION (2 OF 2)





A6A3

FIGURE 4. A6A3 LAST CONVERTER, BLOCK DIAGRAM
A6A3 11/12



A6A3A1
LAST CONVERTER
85660-60002

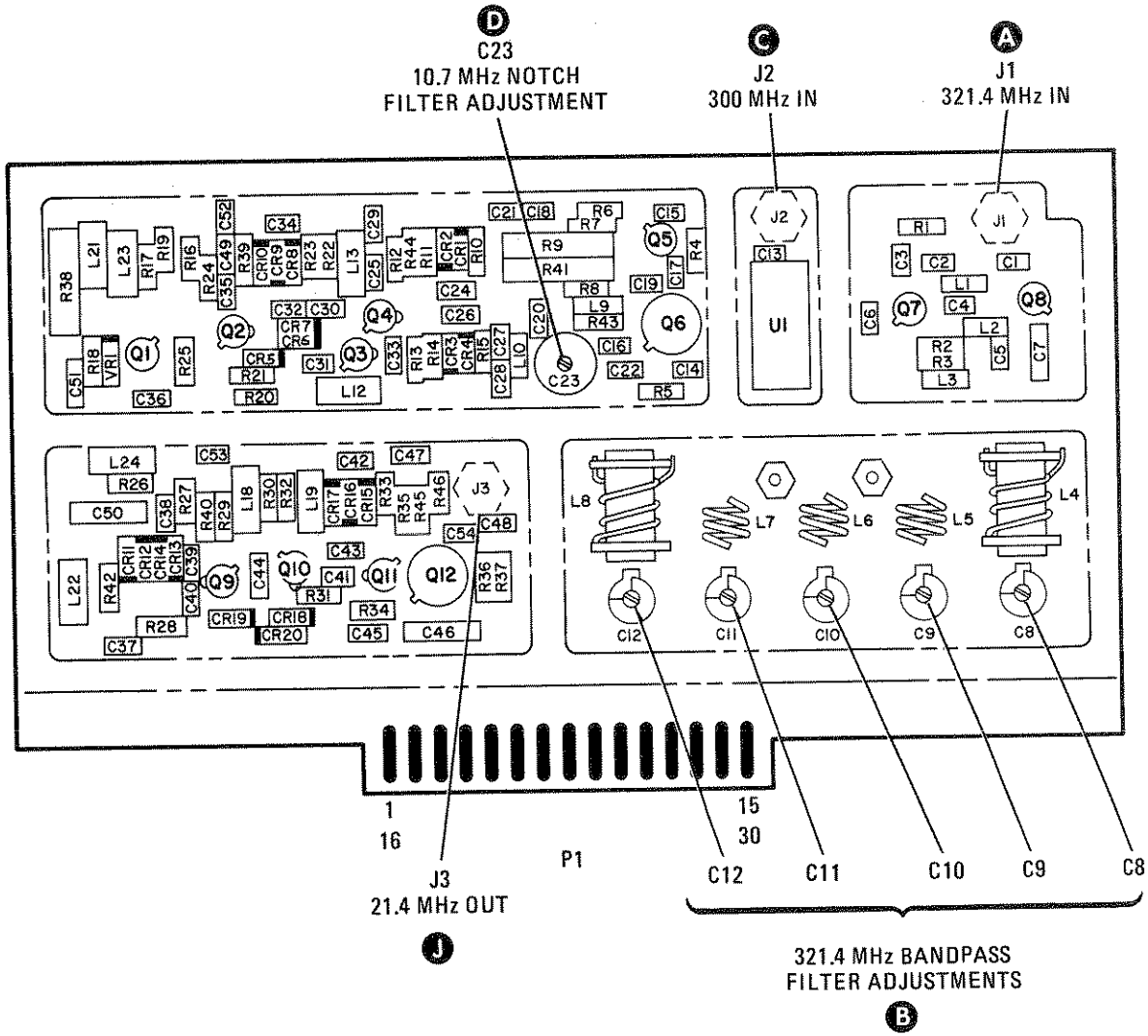


FIGURE 5. A6A3A1 LAST CONVERTER BOARD, COMPONENT LOCATIONS



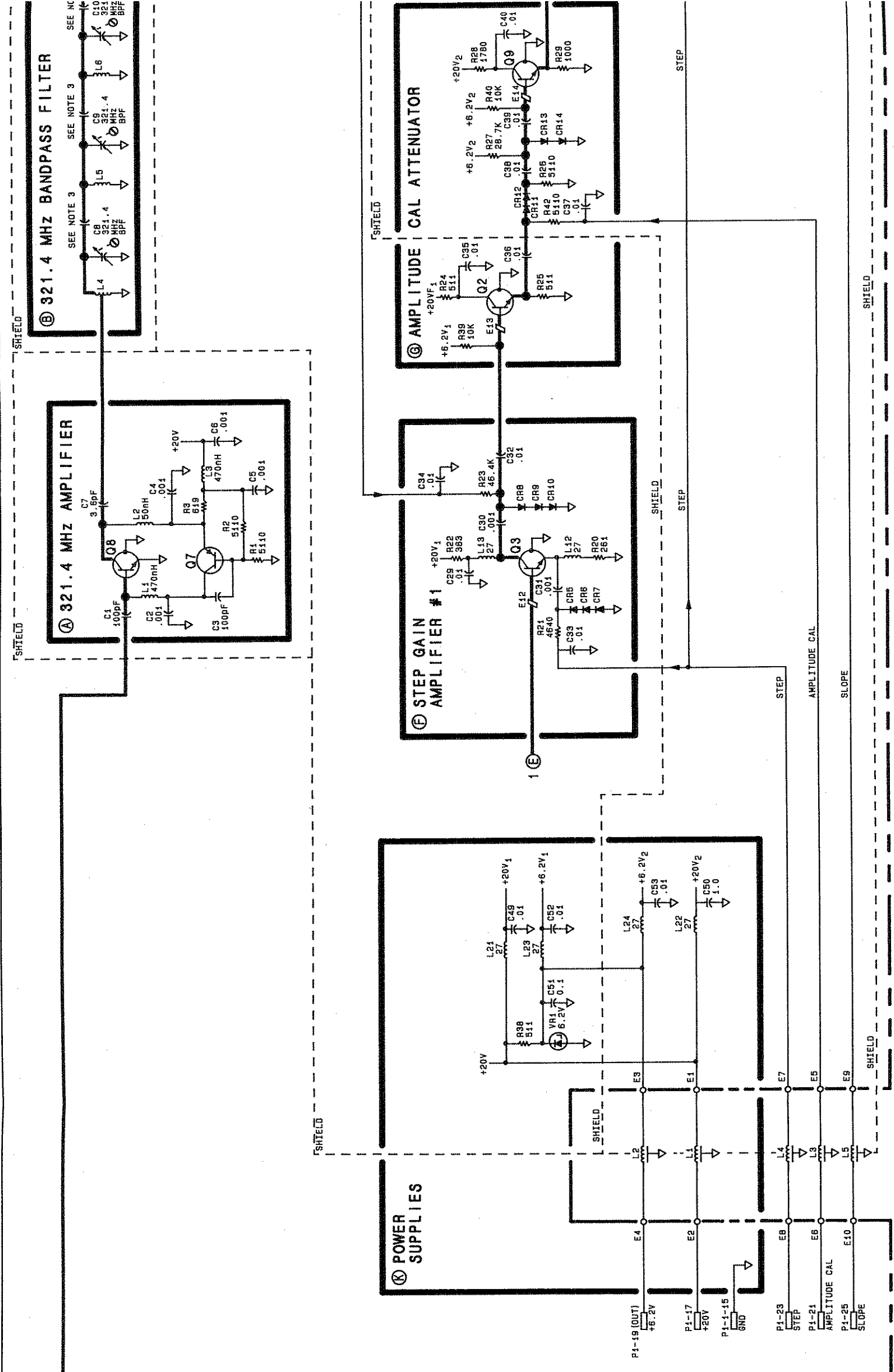
13 LAST CONVERTER ASSEMBLY
160-60003

A1 LAST CONVERTER BOARD
85660-60002

CABLE 2, A6M18
300 MHZ FROM
AGA17 300 MHZ
BPF

CABLE 1, A6M15
321.4 MHZ FROM
AGA4 SECOND
CONVERTER

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	GND		K
16	NC		
2	GND		K
17	+20V		K
3	GND		K
18	NC		
4	GND		K
19	+6.2V	ABR1	K
5	GND		K
20	NC		
6	GND		K
21	AMPLITUDE CAL	ABR1	G
7	GND		K
22	NC		
8	GND		K
23	STEP	ABA10P1-20	F H
9	GND		K
24	NC		
10	GND		K
25	SLOPE	ABA11P1-1	E
11	GND		K
26	NC		
12	GND		K
27	NC		
13	GND		K
28	NC		
14	GND		K
29	NC		
15	GND		K
30	NC		

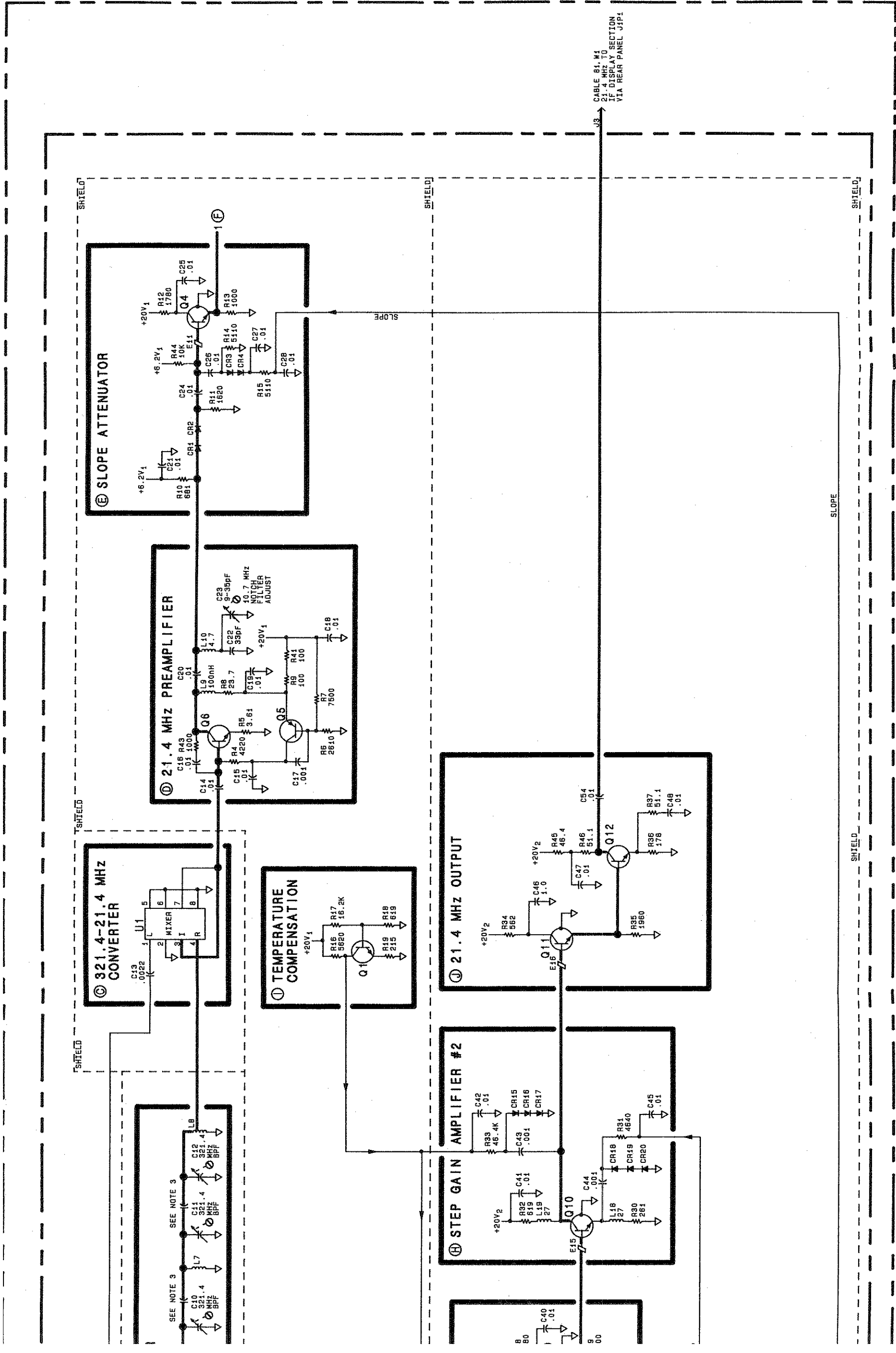


NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATION, PREFIX ABBREVIATION WITH ASSEMBLY DESIGNATION.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IS IN OHMS (Ω), CAPACITANCE IS IN MICROFARADS (μF), INDUCTANCE IS IN MICROHENRIES (μH)
3. CAPACITORS FORMED BY PC BOARD TRACES.
4. UNLESS OTHERWISE INDICATED: SIGNALS ENTER AT LEFT SIDE AND EXIT AT RIGHT SIDE OF FUNCTION BLOCKS.

A6A3

FIGURE 6. A6A3 LAST CONVERTER, SCHEMATIC DIAGRAM
A6A3 15/16



A6A7 YIG-TUNED MIXER (YTX) CURRENT DRIVER, CIRCUIT DESCRIPTION

The YTX Current Driver has three functions: 1) to provide the output stage for the A6A8 YTX coil, 2) to provide filter circuitry for the YTX, and 3) to provide control circuitry for the YTX heater.

YTX Drive Output (B)

The YTX drive output consists of Q5, Q6, R14 – R17, VR4, and CR3. Q5 and Q6 form a darlington transistor driven by the A6A12 YTX Driver. R14 – R17 are four 100-ohm ten-watt resistors connected in parallel to form a 25-ohm resistor which is used to sense the current in the YTX coil. This sense signal is fed back to the YTX Driver. Four resistors are used for power handling capability and temperature stability. VR4 and CR3 limit the flyback voltage produced across the YTX coil during scan reset and prevent breakdown of Q5 and Q6.

Filter Capacitor Drive (A)

When the spectrum analyzer is set to narrow spans and narrow resolution bandwidths, hum and noise in the YTX drive circuitry which FMs the YTX can introduce phase noise and line frequency sidebands onto a displayed signal. To prevent this occurrence, a large filter capacitor, A6A7C1, is connected across the YTX coil by switch Q8 whenever the resolution bandwidth is 100 Hz or less.

Q8 is controlled from A6A11 Slope Generator through Q2, Q3, and Q4. When the resolution bandwidth is 100 Hz or less, the filter capacitor is connected before the start of a scan and disconnected at the end of a scan so that the scan reset and hysteresis correction can be performed.

YTX Heater Control (C)

The YTX heater control is a feedback circuit designed to maintain the center support of the YTX at a constant 75°C, as the ambient temperature ranges from 0° to 55°C. The green LED, DS1, indicates that current is flowing properly in the heater. Red LED, DS2, indicates the circuit is saturated, putting maximum power into the heater.

The heater ring of the YTX has a 450-ohm thin-film heater resistor, and a thermal sensor with a positive temperature coefficient. The resistance versus temperature characteristics of the thermal sensor are shown in Figure 1.

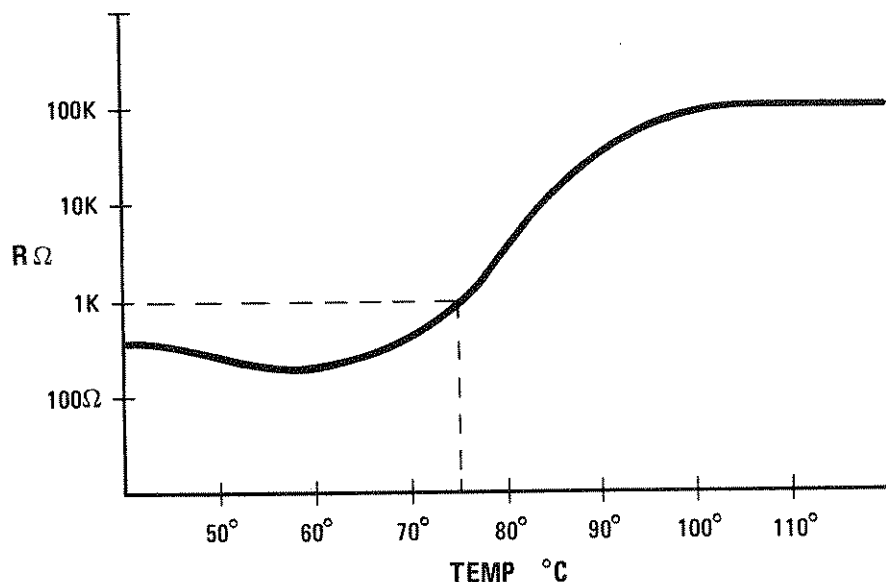


FIGURE 1. YTX THERMAL SENSOR RESISTANCE VS. TEMPERATURE CHARACTERISTICS

Op-amp U1, with R2, R3, R4, Q1, and Q7 becomes an amplifier with a gain of about 127. In addition, R2 and R3 set a reference voltage at the negative input of the amplifier. Darlington Q1 and Q7 is able to provide the large currents required to heat the heater resistor to 75°C. VR2 and R5 offset the op-amp output voltage to be within range of the output stage (0 to -40 volts). CR1 protects the op-amp input.

The circuit operates as follows: If the heater ring is cool (as at turn-on, etc.), the divider formed by R1 and the sensor (described above) outputs a voltage that is less than the reference at the minus input to the amplifier. This causes the amplifier output to swing negative, thus drawing more current through the heater resistor, heating up the sensor, causing it to increase its resistance. This raises the voltage at the R1/sensor divider output until it exactly equals that of the reference divider R2/R3. In general, small temperature errors are manifested as a small voltage between pins 2 and 3 of the op-amp (its input). This error is amplified and applied to the heater resistor with the appropriate sign to eliminate the error.

A6A8 YIG-TUNED MIXER (YTX), A6A5 AMPLIFIER/COUPLER/LOAD UNIT (ACLU), CIRCUIT DESCRIPTION

The YTX consists of a three-pole tunable bandpass filter and a single diode microwave harmonic mixer. The 2 to 6 GHz local oscillator (LO) signal enters the ACLU, and is amplified and coupled into the YTX to turn its diode on and off at the LO rate. The diode conduction angle is adjusted with DC diode bias to be optimum for the harmonic of the LO being used. The incoming microwave signal passes through the bandpass filter, through the mixer diode, as it switches on and off, and into the precision 50Ω load of the ACLU. The IF signal at 321.4 MHz travels down the same line as the LO, but at 321.4 MHz the parallel LC below the 50Ω resistor resonates to transform the YTX diode's IF impedance down to match the 50Ω load presented to the ACLU output.

The purpose of the three-pole filter is twofold: to reject the image response of the mixer 642.8 MHz away from the desired signal; and to reject the LO signal that would otherwise come out the mixer's microwave input port, and thus out the instrument front panel.

HANDLING THE YIG-TUNED MIXER

CAUTION

The YIG Tuned Mixer (YTX) contains an extremely small and sensitive diode. A reverse voltage in excess of 3 volts may damage it. It is connected directly to the center conductor of the LO/IF connector, and is especially susceptible to blowout from electrostatic discharge. Before connecting any coaxial cable to the YTX, connect the YTX BIAS pin to ground, discharge the coaxial cable by connecting the center conductor to ground (YTX body), then simultaneously touch both to chassis ground and/or the YTX package. It is recommended that the other end of the cable be connected first before going through this procedure.

Once the cable from the YTX to the ACLU is properly installed, the BIAS pin of the ACLU is directly connected to the YTX diode. Therefore, treat the BIAS pin with extreme caution, especially avoiding electrostatic discharge. As a general rule, connect all devices to the chassis before connecting to or touching the BIAS pin on the ACLU.

A6A5 AMPLIFIER/COUPLER/LOAD UNIT (ACLU) REPLACEMENT**NOTE**

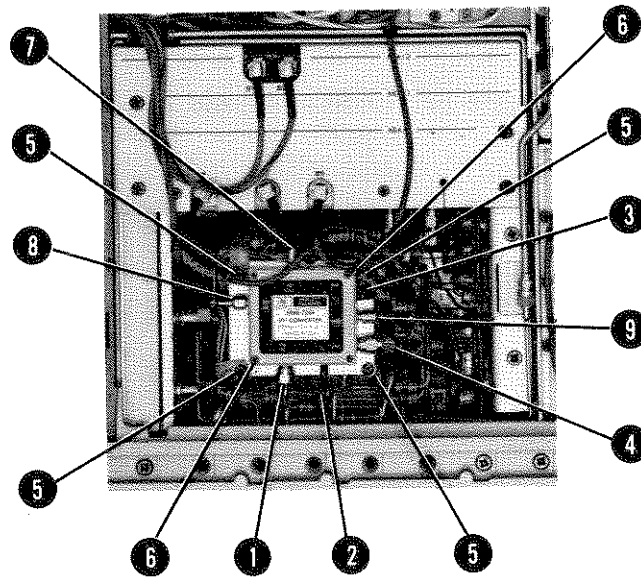
For location of hardware and cables referred to in this procedure, see Figure 2.

Removal

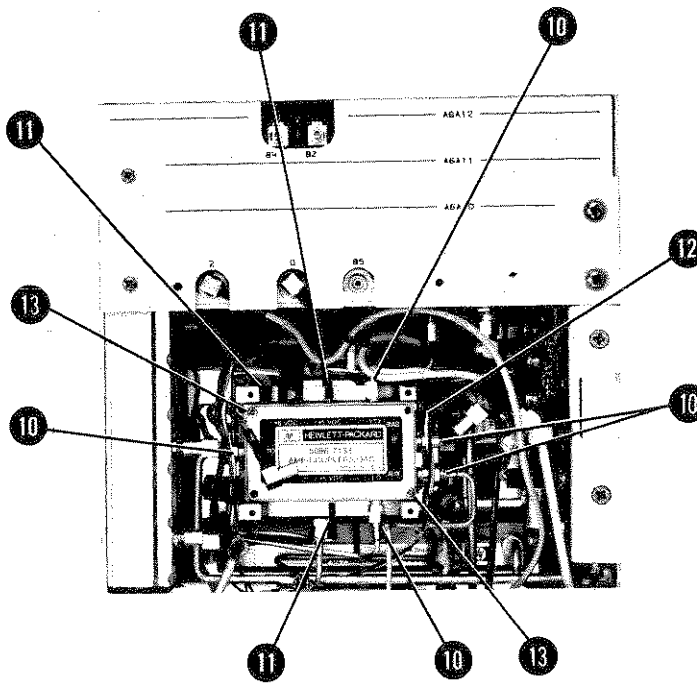
1. Remove ac line cords and RF Section bottom cover.
2. Disconnect connectors **(4)** and **(8)**, single-pin connector **(2)**, and double-pin connector **(3)** from Second Converter.
3. Disconnect the remaining cables from Second Converter:
 - 1 (brown) cable from .321 OUT **(7)**
 - 4 (yellow) cable from TUNE **(9)**
4. Remove ACLU cover-plate by removing four screws **(5)** as shown in View A.
5. Disconnect five connectors **(10)**, three 92 (white/red) single-pin connectors **(11)**, and one 8 (gray) single-pin connector **(12)**. (Refer to View B.)
6. Release ACLU by removing two screws **(13)** shown in View B.

Installation

7. Secure new ACLU on mounting bracket with two screws **(13)**, and reconnect the cables and wires removed in step 5.
8. Replace ACLU cover-plate with four screws **(5)** shown in View A.
9. Reconnect connector **(1)**, 5 (green) cable, connector **(4)**, single-pin connector **(2)**, and double-pin connector **(3)** to Second Converter.
10. Reconnect the following cables to Second Converter: (Refer to View A.)
 - 1 (brown) cable to .321 OUT **(7)**
 - 1 (brown) cable to .321 IN **(8)**
 - 4 (yellow) cable to TUNE **(9)**
11. Replace bottom cover and ac line cords.



VIEW A



VIEW B

FIGURE 2. A6A5 ACLU REPLACEMENT

A6A7 YTX CURRENT DRIVER REPLACEMENT

NOTE

For location of hardware and cables referred to in this procedure, see Figure 3.

Removal

1. Remove ac line cords and RF Section bottom cover.
2. Disconnect cable (1) between A11 YTO Loop and RF Module.
3. Disconnect 5-pin connector (2) and ribbon cable (3) from A6A7.
4. Remove two screws (4) and remove A6A7 from RF Module.

Installation

5. Place A6A7 in RF Module and replace two screws (4).
6. Reconnect 5-pin connector (2) and ribbon cable (3) to A6A7.
7. Reconnect cable (1) between A11 YTO Loop and A6 RF Module.
8. Replace bottom cover on RF Section and reconnect ac line cords.

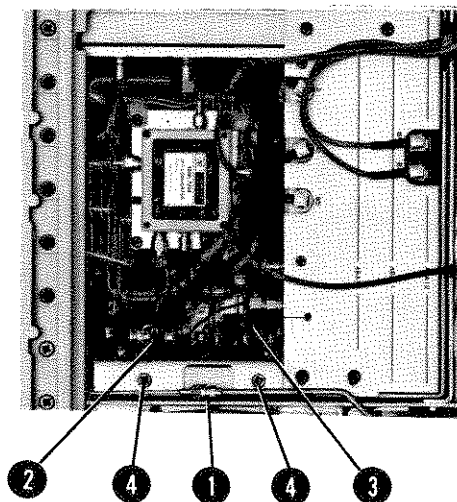


FIGURE 3. A6A7 YTX CURRENT DRIVER REPLACEMENT

A6A8 YTX REPLACEMENT**NOTE**

For location of hardware and cables referred to in this procedure, see Figure 4.

Removal

1. Remove ac line cords, separate instrument sections, and remove top and bottom covers from RF Section.
2. Disconnect cable **(1)** between A11 YTO Loop and RF Module.
3. Remove five cables from RF Module PC boards; three from A6A9 Phase Lock and two from A6A12 YTX Driver.
4. Remove RF Module PC board cover by removing six screws **(2)**.
5. Remove A6A9 assembly and A6A10, A6A11, and A6A12 PC boards.
6. Disconnect 4 (yellow) cable and 5 (green) cable from 2nd Converter to release A6A9 assembly.
7. Remove ribbon cable **(3)** between A6A7 YTX Current Driver and motherboard.
8. Disconnect 5-pin connector **(4)** from A6A7 and remove A6A7 by removing two screws **(5)**.

CAUTION

The A6A8 YTX contains an extremely sensitive diode located inside the LO/IF connector. This diode is highly susceptible to blow-out from static discharge. Be very careful when handling the YTX to avoid damaging this diode.

9. Disconnect all cables from A6A8 YTX.
10. Disconnect bus cable **(6)** from motherboard.
11. Remove two screws **(7)** holding YTX to motherboard.
12. Remove YTX from RF Module.

Installation

13. Place YTX in RF Module. Be sure insulator is properly installed between YTX and motherboard.
14. Replace two screws **(7)** to attach YTX to motherboard.
15. Reconnect bus cable **(6)** to motherboard.

CAUTION

The A6A8 YTX contains an extremely sensitive diode located inside the LO/IF connector. This diode is highly susceptible to blow-out from static discharge. Be very careful when connecting cables to the YTX to avoid damaging this diode. Ground (discharge) all cables before connecting them to the YTX.

16. Reconnect coaxial cables to YTX.
17. Place A6A7 YTX Current Driver in RF Module and secure with two screws (5).
18. Reconnect 5-pin connector (4) to A6A7.
19. Replace ribbon cable (5) between A6A7 and motherboard.
20. Replace A6A9 assembly and A6A10, A6A11, and A6A12 PC boards.
21. Reconnect 4 (yellow) cable and 5 (green) cable to 2nd Converter.
22. Replace RF Module PC board cover and secure with six screws (2).
23. Reconnect five cables to RF Module PC boards; three to A6A9 Phase Lock and two to A6A12 YTX Driver. Cables are color-coded and color codes are labeled on PC board cover.
24. Reconnect cable (1) between A11 YTO Loop and RF Module.
25. Replace top and bottom covers on RF Section, recombine instrument sections, and reconnect ac line cords.

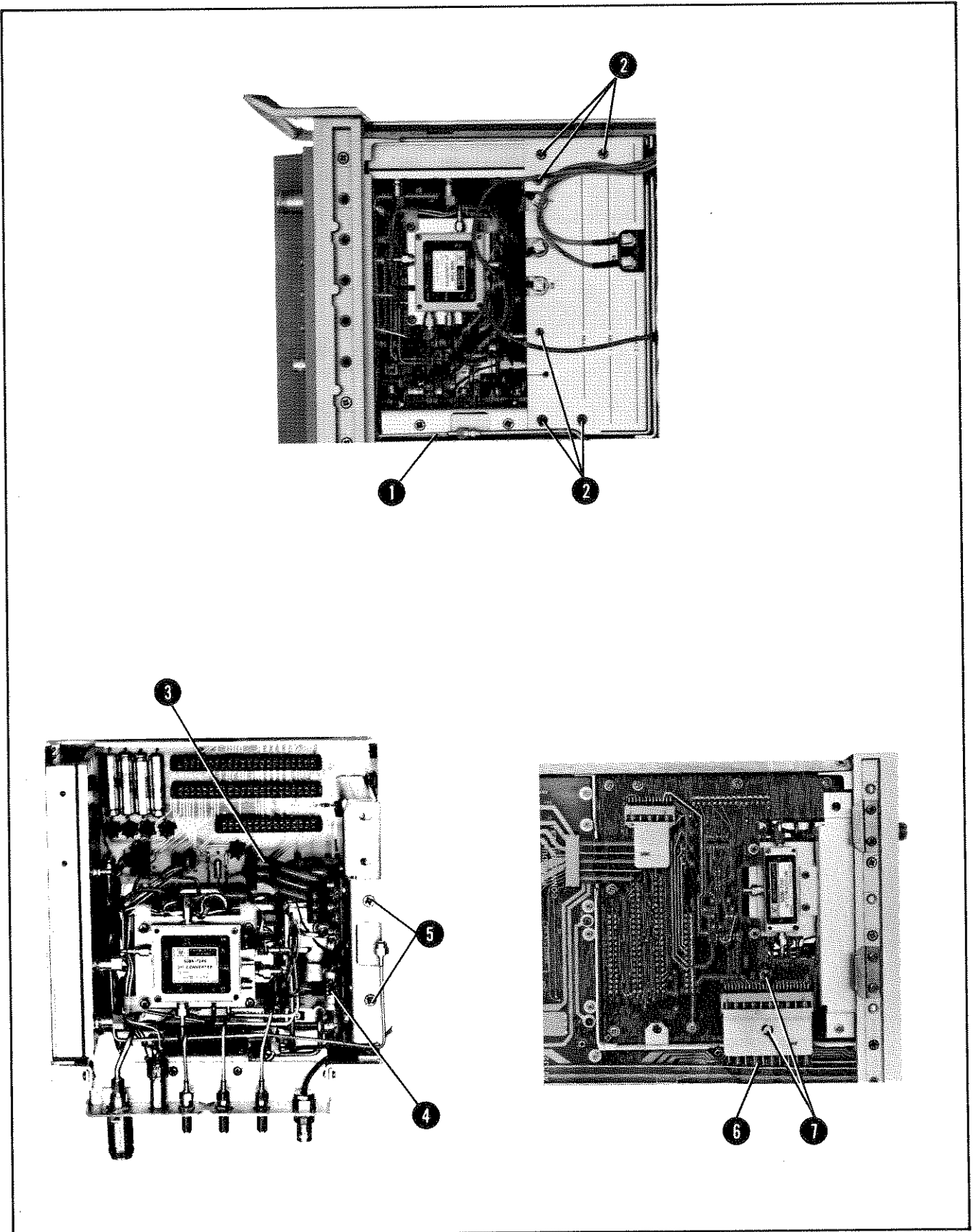


FIGURE 4. A6A8 YTX REPLACEMENT

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A6A7	85660-60128	1	1	BOARD ASSEMBLY, YIG-TUNED MIXER (YTX) CURRENT DRIVER)	28480	85660-60128
A6A7C1	0180-0094	4	1	CAPACITOR-FXD 100UF+75-10% 25VDC AL	56289	30D107G025DD2
A6A7CR1	1901-1067	4	3	DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A7CR2	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A7CR3	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A7DS1	1990-0485	5	1	LED-LAMP LUM-INT=800UCD IF=30MA-MAX	28480	5082-4984
A6A7DS2	1990-0486	6	1	LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4684
A6A7J1	1251-5146	9	1	CONNECTOR 6-PIN M POST TYPE	28480	1251-5146
A6A7J2	1251-5144	7	1	CONNECTOR 14-PIN M POST TYPE	28480	1251-5144
A6A7Q1	1853-0281	9	2	TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A6A7Q2	1853-0281	9		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A6A7Q3	1054-0477	7	1	TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A6A7Q4	1853-0038	4	2	TRANSISTOR PNP SI TO-39 PD=1W FT=100MHZ	28480	1853-0038
A6A7Q5	1853-0038	4		TRANSISTOR PNP SI TO-39 PD=1W FT=100MHZ	28480	1853-0038
A6A7Q6	1853-0391	2	1	TRANSISTOR PNP 2N6051 SI DARL TO-3	04713	2N6051
A6A7Q7	1853-0413	9	1	TRANSISTOR PNP 2N6049 SI TO-66 PD=75W	28480	1853-0413
A6A7Q8	1884-0282	5	1	THYRISTOR-TRIAC 2N6073	04713	2N6073
A6A7R1	0698-3157	3	2	RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A6A7R2	0757-0447	4	1	RESISTOR 16.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1622-F
A6A7R3	0657-0421	4	1	RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
A6A7R4	0757-0465	6	1	RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6A7R5	0698-3157	3		RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A6A7R6	0698-3438	3	1	RESISTOR 147 1% .125W F TC=0+-100	24546	C4-1/8-T0-147R-F
A6A7R7	0757-0416	7	2	RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A6A7R8	0757-0458	7	2	RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A6A7R9	0757-0442	9	2	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A7R10	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A6A7R11	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A7R12	0698-3635	2	1	RESISTOR 680 5% 2W MO TC=0+-200	28480	0698-3635
A6A7R13	0757-0438	3	1	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A6A7R14	0811-0653	0	4	RESISTOR 100 1% 12W PW TC=0+-5	28480	0811-0653
A6A7R15	0811-0653	0		RESISTOR 100 1% 12W PW TC=0+-5	28480	0811-0653
A6A7R16	0811-0653	0		RESISTOR 100 1% 12W PW TC=0+-5	28480	0811-0653
A6A7R17	0811-0653	0		RESISTOR 100 1% 12W PW TC=0+-5	28480	0811-0653
A6A7R18	0757-0401	0	1	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A6A7R19	0698-0082	7	1	RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
A6A7R20	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A6A7R21	0698-3395	1	1	RESISTOR 34.8 1% .5W F TC=0+-100	28480	0698-3395
A6A7U1	1826-1058	3	1	IC OP AMP GP 8-T0-99 PKG	28480	1826-1058
A6A7VR1				NOT ASSIGNED		
A6A7VR2	1902-3279	6	1	DIODE-ZNR 28.7V 5% DO-35 PD=.4W	28480	1902-3279
A6A7VR3				NOT ASSIGNED		
A6A7VR4	1902-0644	3	1	DIODE-ZNR 1N5363B 30V 5% PD=.5W TC=+29MV	28480	1902-0644
MISCELLANEOUS PARTS						
	0340-0162	7	1	INSULATOR-XSTR ALUMINUM	28480	0340-0162
	2190-0014	1	0	WASHER-LK INTL T NO. 2 .089-IN-ID	28480	2190-0014
	0340-1064	0	4	INSULATOR-FLG-BSHG NYLON	28480	0340-1064
	2200-0109	8	4	SCREW-MACH 4-40 .438-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
	0380-1602	6	4	STANDOFF-RVT-ON .1-IN-LG 4-40-THD	28480	0380-1602
	85660-00023	9	1	HEAT SINK CR DR	28480	85660-00023
	0520-0128	7	8	SCREW-MACH 2-56 .25-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
	0610-0001	6	8	NUT-HEX-DBL-CHAM 2-56-THD .062-IN-THK	00000	ORDER BY DESCRIPTION
	1200-0043	0	1	INSULATOR-XSTR ALUMINUM	28480	1200-0043
	1200-0081	4	2	INSULATOR-FLG-BSHG NYLON	28480	1200-0081

*Indicates Factory Selected Value

A6A7 YTX CURRENT DRIVER

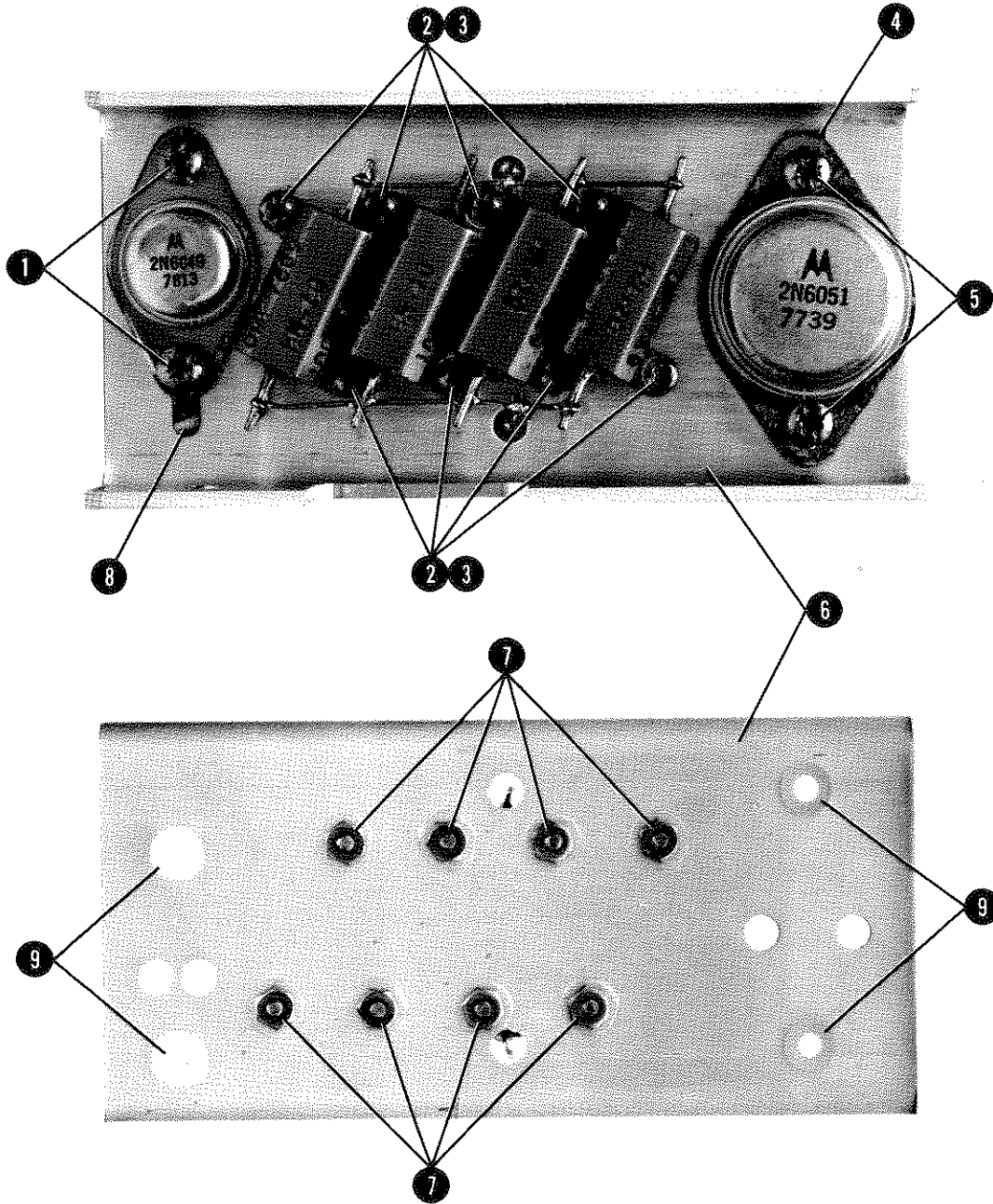
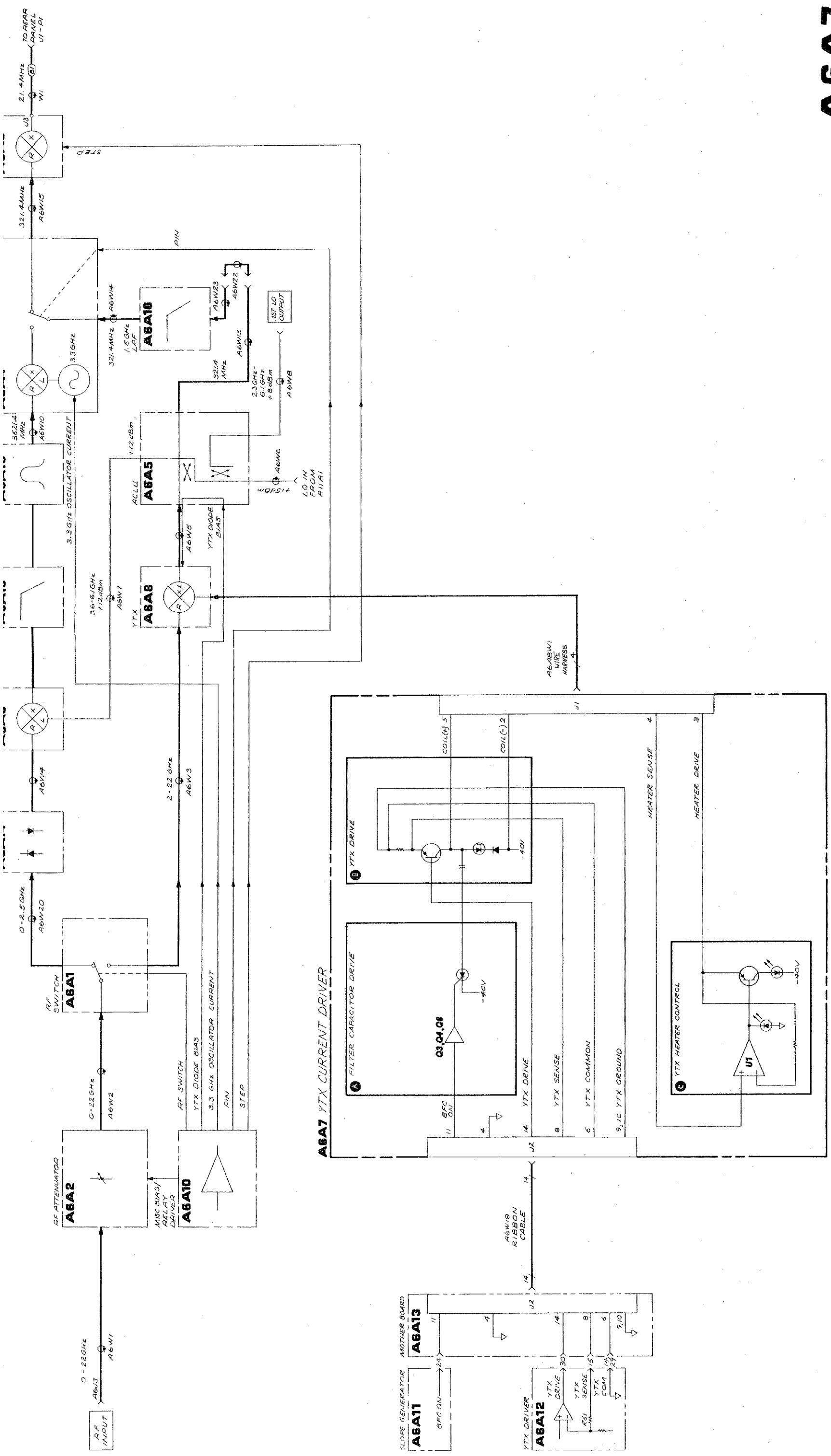


FIGURE 5. A6A7 YTX CURRENT DRIVER, PARTS IDENTIFICATION (1 OF 2)

Item	HP Part Number	C D	Description	Mfr. Code	Manufacturer's Part Number
1	2200-0107	6	Screw, Mach, 4-40, .375-IN LG, PAN HD	28480	2200-0107
2	0520-0128	7	Screw, Mach, 2-56, .25-IN LG, PAN HD	28480	0520-0128
3	2190-0014	1	Washer, Lock, 2-56, (For screw (2))	28480	2190-0014
4	1200-0043	8	Insulator, Transistor (For Q6)	28480	1200-0043
5	2200-0109	8	Screw, Mach, 4-40, .438-IN LG, PAN HD	28480	2200-0109
6	85660-00023	9	Heat Sink, YTX Current Driver	28480	85660-00023
7	0610-0001	6	Nut, Hex, 2-56 (For screw (2))	28480	0610-0001
8	0340-0162	7	Insulator, Transistor (For Q7)	28480	0340-0162
9	0340-1064	0	Insulator, Bushing (For Q6 & Q7)	28480	0340-1064

FIGURE 5. A6A7 YTX CURRENT DRIVER, PARTS IDENTIFICATION (2 OF 2)



A6A7

FIGURE 6. A6A7 YTX CURRENT DRIVER, BLOCK DIAGRAM
A6A7/A6A5/A6A8 13/14

A6A7
YTX CURRENT DRIVER
85660-60128

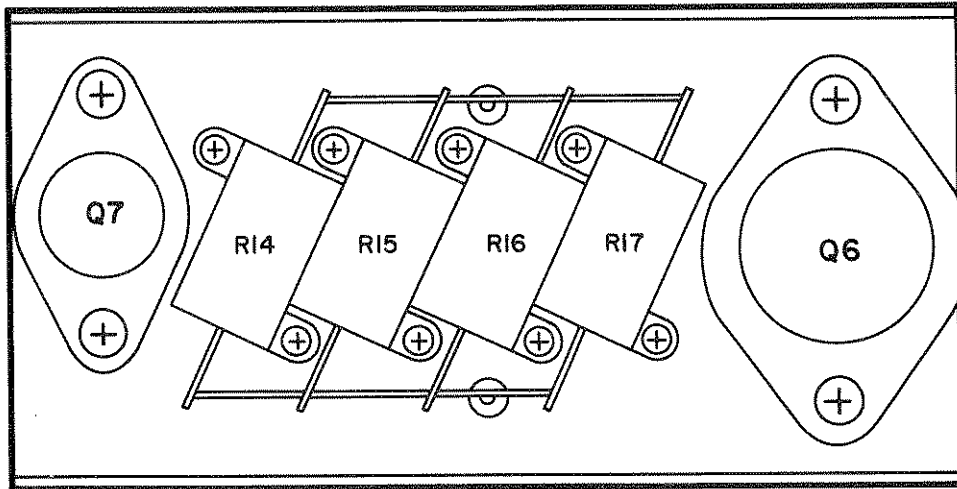
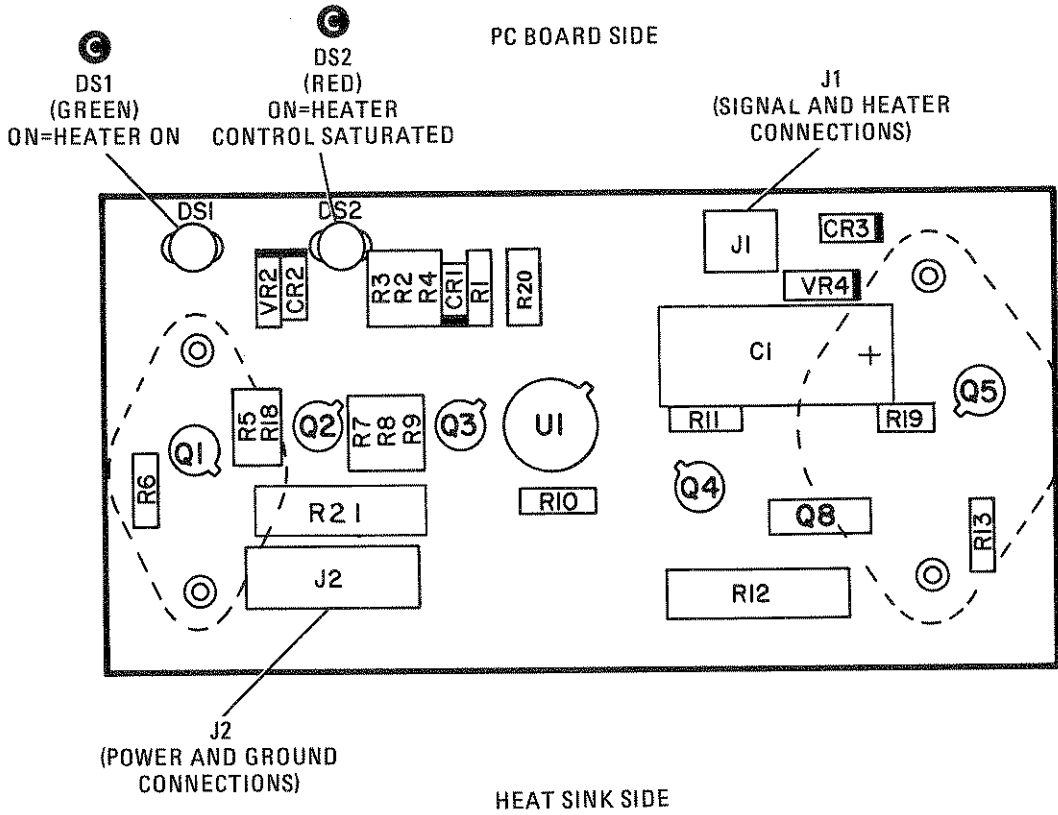
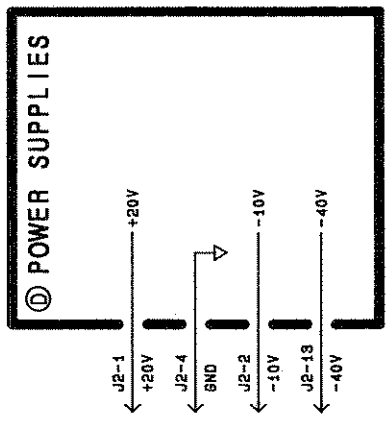


FIGURE 7. A6A7 YTX CURRENT DRIVER, COMPONENT LOCATIONS

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATION, PREFIX ABBREVIATION WITH ASSEMBLY DESIGNATION.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IS IN OHMS (Ω) CAPACITANCE IS IN MICROFARADS (μF) INDUCTANCE IS IN MICROHENRIES (μH)
3. UNLESS OTHERWISE INDICATED: SIGNALS ENTER AT LEFT SIDE AND EXIT AT RIGHT SIDE OF FUNCTION BLOCKS.
4. MNEMONICS TABLE:

MNEMONIC	DESCRIPTION
BFC ON	FILTER CAPACITOR ENABLE

J1	PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
	1	NC		
	2	COIL (-)	AGA8P1-1	B
	3	HEATER DRIVE	AGA8P1-4	C
	4	HEATER SENSE	AGA8P1-3	C
	5	COIL (+)	AGA8P1-5	B
	6	NC		



J2	PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
	1	+20V		D
	2	-10V		D
	3	NC		
	4	GND		D
	5	NC		
	6	YTX COM	AGA12P1-14, 28	B
	7	NC		
	8	YTX SENSE	AGA10P1-21	B
	9	YTX GND	AGA13	B
	10	YTX GND	AGA13	B
	11	BFC ON	AGA11P1-24	A
	12	NC		
	13	-40V		D
	14	YTX DRIVE	AGA12P1-30	B

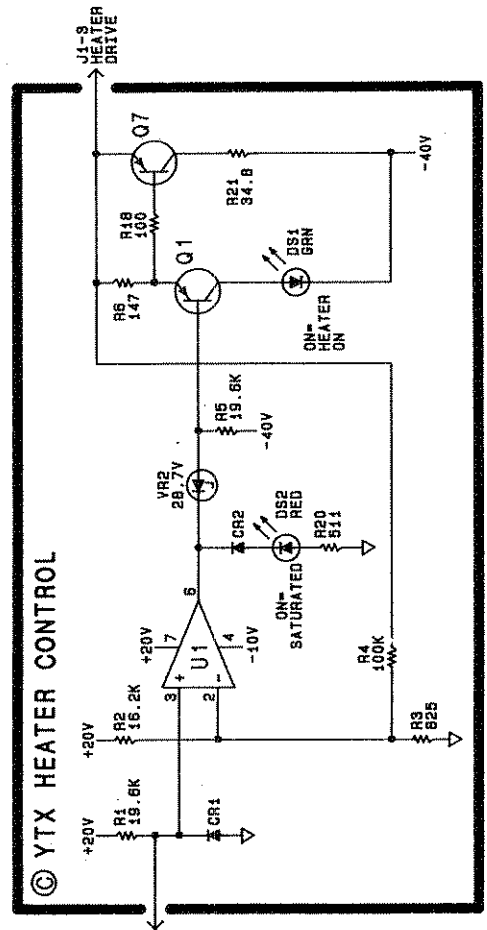
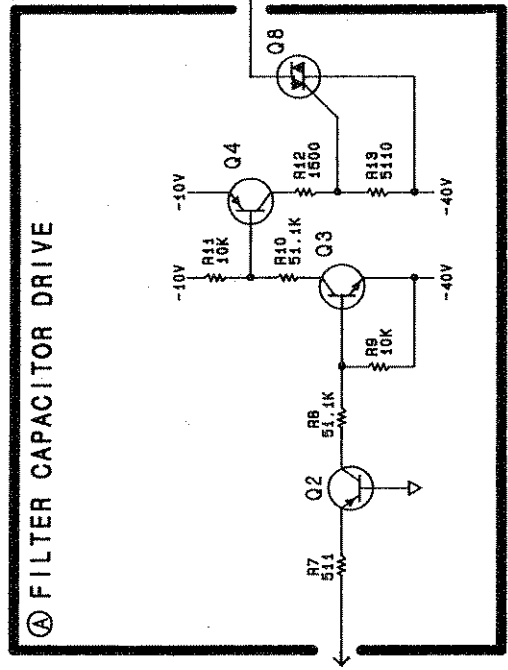
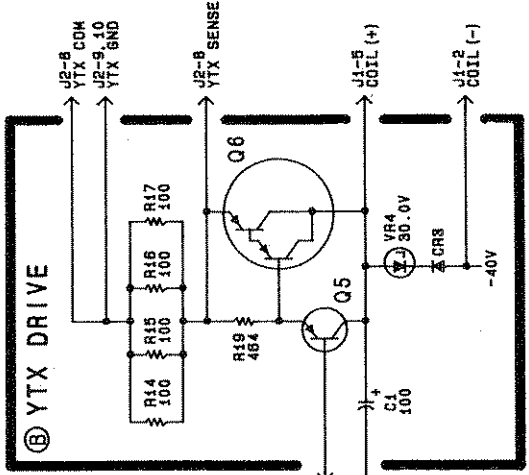


FIGURE 8. A6A7 YIG-TUNED MIXER (YTX) CURRENT DRIVER, SCHEMATIC DIAGRAM

A6A7

A6A7/A6A5/A6A8 17/18

A6A9 PHASE LOCK, CIRCUIT DESCRIPTION

The A6A9 Phase Lock has three major functions: 1) to provide the 100 MHz calibrator signal to the instrument front panel, 2) to provide a 300 MHz local oscillator to the Last Converter, and 3) to phase-lock the second converter local oscillator to the 100 MHz internal reference.

100 MHz Buffer Amplifier (A)

The 100 MHz buffer amplifier Q1 amplifies the frequency reference from the A7A2 VCXO assembly. Low-pass matching network, L1 and C4, provides a 50-ohm input impedance. Transformer T1 acts as a power divider, supplying the 100 MHz signal to both the Driver circuit and the Phase Lock circuit.

Driver (C)

Transistor Q2 amplifies the 100 MHz from the Buffer Amplifier. Power divider T2 drives both the 100 MHz Calibrator and the 300 MHz LO circuit.

100 MHz Calibrator (D)

The Calibrator circuit consists of a differential amplifier, Q3A and Q3B, followed by a low-pass filter. Low-pass filter C19, L8, C20, L9, and C22, eliminates higher order harmonics on the front panel calibrator output. Potentiometer R11 sets the gain of Q3.

Tripler (G)

With the 100 MHz input from the Driver circuit, the Tripler produces a 300 MHz output. Inductor L10 and C24 are used for impedance matching. The output tank circuit, formed by L11 and the output capacitance of transistor Q4, resonates at 300 MHz. Capacitor C29 adjusts the loading of the stage and couples the output to the Power Amplifier.

300 MHz Power Amplifier (H)

The output of the 300 MHz Power Amplifier, approximately +20 dBm, is the local oscillator for the A6A3 Last Converter. Capacitor C30 reduces the sub-harmonic content of the output. The output filter C52, L21, and C53, reduces higher order harmonics while maintaining a 50-ohm output impedance.

Sampler Driver (B)

Amplifier U2 drives the sampler step recovery diode in function block E with the 100 MHz frequency reference. Capacitors C8, C9, and L4 match the forward biased impedance of the diode to U2. Resistor R5 loads the output of U2 during the diode's reverse biased condition.

Sampler (E) and Loop Integrator (F)

The output of the sampler is a dc voltage proportional to the phase difference between the 33rd harmonic of the 100 MHz reference and the 3.3 GHz output of the second converter local oscillator (A6A4). Integrator U3 supplies a tune voltage to the second converter local oscillator. This phase locks the oscillator to the 100 MHz frequency reference. Potentiometer R38 adjusts the output balance of the sampler. Capacitor C46 is the integrator capacitor for U3.

Aided Acquisition and Unlock Detector (I)

The output tune voltage from the Loop Integrator (function block F) becomes -25V when the second converter local oscillator is unlocked (A6A4). The Aided Acquisition circuitry detects this condition and retunes the oscillator within the capture range of the phase-lock loop. The Aided Acquisition circuitry also controls the Lock Indicator (function block J).

Negative Rail Detector and One Shot: The Negative Rail Detector U4A is an inverting comparator. The threshold voltage at pin 5 is set at -23.5V . During unlock, the input of U4A becomes more negative than the threshold voltage and the comparator output becomes positive. Resistor R21 provides positive feedback, stabilizing the circuit. Resistors R25 and R26 form a voltage divider reducing the input to U4B below the value of the power supplies. The positive output of U4A triggers One Shot multivibrator U4B. The negative output of U4B forward biases diodes CR1 and CR2. The diodes become a constant current source for integrator capacitor C46 (function block F), causing a positive direction search ramp of voltage at the output of U3. This search ramp tunes the second converter local oscillator through the capture range of the phase-lock loop.

If the loop does not phase-lock on the search ramp, the tune voltage will remain positive until the One Shot recovers, reverse biasing CR1 and CR2. The output of U3 then becomes negative (unlock condition), causing the Aided Acquisition circuitry to repeat the search cycle until phase-lock occurs. This results in a sawtooth tune waveform with a period of approximately 4 msec.

The One Shot on time, controlled by R24 and C38, is approximately 1 msec. This is the time it takes for the voltage on pin 7 to decay to -25V to less than -20V . During this time, the input to U4C has become -20V due to the positive tune voltage ramp. In high band, the PIN signal goes negative, which disables the search ramp and unlock detector through CR3.

Switch and Unlock Detector: When unlock occurs, the output of U4B becomes low, causing U4C to have a low output. The output of U4D becomes positive, turning off Q5. If no lock occurs on the search ramp, capacitor C37 keeps Q5 off until the next search cycle begins.

Lock Indicator (J)

In the locked condition, Q5 is forward biased, grounding the HULH line and turning on DS1. During an unlock condition, the output of U4D is $+5\text{V}$, which turns off Q5. This turns off Lock Indicator DS1 and raises HULH, indicating to the processor that an HET unlock has occurred.

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A6A9	85660-60226	0	1	PHASE LOCK ASSEMBLY	28480	85660-60226
A6A9DS1	1990-0485	5	1	LED-LAMP 1UM-INT-800UCD IF-30MA-MAX	28480	5082-4984
A6A9J1	1250-0544	9	3	CONNECTOR-RF SM-SNP M SGL-HOLE-FR 50-OHM	28480	1250-0544
A6A9J2	1250-0544	9		CONNECTOR-RF SM-SNP M SGL-HOLE-FR 50-OHM	28480	1250-0544
A6A9J3	1250-0544	9		CONNECTOR-RF SM-SNP M SGL-HOLE-FR 50-OHM	28480	1250-0544
A6A9L1-				NOT ASSIGNED		
A6A9L13	9135-0002	8	5	FILTER-LOW PASS SOLDER-TERMS	33095	51-744-018
A6A9L14	9135-0002	8		FILTER-LOW PASS SOLDER-TERMS	33095	51-744-018
A6A9L15	9135-0002	8		FILTER-LOW PASS SOLDER-TERMS	33095	51-744-018
A6A9L16	9135-0002	8		FILTER-LOW PASS SOLDER-TERMS	33095	51-744-018
A6A9L17	9135-0002	8		FILTER-LOW PASS SOLDER-TERMS	33095	51-744-018
A6A9L18	9135-0002	8		FILTER-LOW PASS SOLDER-TERMS	33095	51-744-018
A6A9U1	1813-0213	3	2	1C WIDEBAND AMPL TO-39 PKG	04713	MWA130
A6A9U2	1813-0213	3		1C WIDEBAND AMPL TO-39 PKG	04713	MWA130
A6A9TB1	85660-60008	6	1	BOARD ASSEMBLY, SAMPLER	28480	85660-60008
A6A9TB1U1	5086-7097	6	1	SAMPLER 2-6.5 GHZ (PREFERRED)	28480	5086-7097
A6A9TB1U1	5086-7292	3	1	SAMPLER 2-6.0 GHZ (ALTERNATE FOR 5086-7097)	28480	5086-7292
A6A9 MISCELLANEOUS PARTS						
	85660-00070	6	1	COVER, PHASE LOCK ASSEMBLY	28480	85660-00070
	85660-20205	1	1	COVER, BOTTOM, PHASE LOCK ASSEMBLY	28480	85660-20205
	85660-20204	0	1	HOUSING, PHASE LOCK ASSEMBLY	28480	85660-20204
	85660-80061	3	1	INSULATOR MYLAR CLEAR	28480	85660-80061
	86701-00054	8	1	SPACER, SAMPLER	28480	86701-00054
	2200-0148	5	20	SCREW-MACH 4-40 .5-IN-LG 100 DEG	28480	2200-0148
	2200-0140	7	20	SCREW-MACH 4-40 .25-IN-LG 100 DEG	28480	2200-0140
	2200-0107	8	2	SCREW-MACH 4-40 .438-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
	2190-0559	7	1	WASHER-LK INTL T NO. 10 .195-IN-ID	28480	2190-0557
	2950-0078	9	1	NUT-HEX DBL-CHAM 10-32-THD .067-IN-THK	28480	2950-0078
	2190-0067	4	1	WASHER-LK INTL T 1/4 IN .256-IN-ID	28480	2190-0067
	2950-0177	9	1	NUT-HEX-DBL-CHAM 1/4-36-THD .05-IN-THK	28480	2950-0177
A6A9A1	85660-60202	2	1	BOARD ASSEMBLY, PHASE LOCK	28480	85660-60202
A6A9A1C1	0160-4835	7	2	CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A6A9A1C2	0160-4574	1	5	CAPACITOR-FXD 1000PF +-10% 100VDC CER	28480	0160-4574
A6A9A1C3	0160-4574	2	1	CAPACITOR-FXD 1000PF +-10% 100VDC CER	28480	0160-4574
A6A9A1C4	0160-3874	1	1	CAPACITOR-FXD 10PF +-5PF 200 VDC CER	28480	0160-3874
A6A9A1C5	0160-3878	5	16	CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A6A9A1C6	0160-4084	8	7	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A6A9A1C7	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A6A9A1C8	0160-4494	4	2	CAPACITOR-FXD 39PF +-5% 200VDC CER 0+-30	28480	0160-4494
A6A9A1C9	0160-4494	4		CAPACITOR-FXD 39PF +-5% 200VDC CER 0+-30	28480	0160-4494
A6A9A1C10	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A6A9A1C11	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100 VDC CER	28480	0160-3878
A6A9A1C12	0160-4385	2	1	CAPACITOR-FXD 15PF +-5% 200VDC CER 0+-30	28480	0160-4385
A6A9A1C13	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A6A9A1C14	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A6A9A1C15	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A6A9A1C16	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A6A9A1C17	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A6A9A1C18	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A6A9A1C19	0160-4387	4	2	CAPACITOR-FXD 47PF +-5% 200VDC CER 0+-30	28480	0160-4387
A6A9A1C20	0160-4350	1	1	CAPACITOR-FXD 68PF +-5% 200VDC CER 0+-30	28480	0160-4350
A6A9A1C21	0180-0500	7	2	CAPACITOR-FXD 47UF+-20% 20VDC TA	28480	0180-0500
A6A9A1C22	0160-4387	4		CAPACITOR-FXD 47PF +-5% 200VDC CER 0+-30	28480	0160-4387
A6A9A1C23	0160-4574	1		CAPACITOR-FXD 1000PF +-10% 100VDC CER	28480	0160-4574
A6A9A1C24	0160-3875	3	1	CAPACITOR-FXD 22PF +-5% 200VDC CER 0+-30	28480	0160-3875
A6A9A1C25	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A6A9A1C26	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A6A9A1C27	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A6A9A1C28				NOT ASSIGNED		
A6A9A1C29	0121-0452	4	1	CAPACITOR-V TRMR-AIR 1.3-5.4PF 175V	74970	187-0103-028
A6A9A1C30	0160-4492	2	3	CAPACITOR-FXD 18PF +-5% 200VDC CER 0+-30	28480	0160-4492
A6A9A1C31	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A6A9A1C32	0160-4389	6	1	CAPACITOR-FXD 100PF +-5PF 200VDC CER	28480	0160-4389
A6A9A1C33	0160-4383	0	1	CAPACITOR-FXD 6.8PF +-5PF 200VDC CER	20932	502E0200R0689D
A6A9A1C34	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A6A9A1C35	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A6A9A1C36	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A6A9A1C37	0160-4441	1	1	CAPACITOR-FXD .47UF +-10% 50VDC CER	28480	0160-4441
A6A9A1C38	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A6A9A1C39	0180-2139	2	1	CAPACITOR-FXD 10UF +-20% 60VDC TA	06001	69F177G7
A6A9A1C40	0180-0500	7		CAPACITOR-FXD 47UF+-20% 20VDC TA	28480	0180-0500

*Indicates Factory Selected Value

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A6A9A1C41	0180-0197	8	1	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A6A9A1C42	0160-4574	1		CAPACITOR-FXD 1000PF +-10% 100VDC CER	28480	0160-4574
A6A9A1C43	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A6A9A1C44	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A6A9A1C45	0160-4574	1		CAPACITOR-FXD 1000PF +-10% 100VDC CER	28480	0160-4574
A6A9A1C46	0160-0158	9	1	CAPACITOR-FXD 5600PF +-10% 200VDC POLYE NOT ASSIGNED	28480	0160-0158
A6A9A1C47						
A6A9A1C48	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A6A9A1C49	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A6A9A1C50	0160-4801	7	2	CAPACITOR-FXD 100PF +-5% 100VDC CER	28480	0160-4801
A6A9A1C51	0160-4801	7		CAPACITOR-FXD 100PF +-5% 100VDC CER	28480	0160-4801
A6A9A1C52	0160-4492	2		CAPACITOR-FXD 18PF +-5% 200VDC CER 0+-30	28480	0160-4492
A6A9A1C53	0160-4492	2		CAPACITOR-FXD 18PF +-5% 200VDC CER 0+-30	28480	0160-4492
A6A9A1C54	0160-3878	5		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A6A9A1CR1	1901-0954	6	1	DIODE-CUR RGLTR 1N5285 270UA D0-7	28480	1901-0954
A6A9A1CR2	1901-0050	3	2	DIODE-SWITCHING 80V 200MA 2NS D0-35	28480	1901-0050
A6A9A1CR3	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS D0-35	28480	1901-0050
A6A9A1CR4	1901-0518	8	1	DIODE-SM SIG SCHOTTKY	28480	1901-0518
A6A9A1DS1				SEE A6A9D51		
A6A9A1E1				NOT ASSIGNED		
A6A9A1E2				NOT ASSIGNED		
A6A9A1E3	1251-0600	0	4	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A6A9A1E4	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A6A9A1E5	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A6A9A1E6	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A6A9A1J1-						
A6A9A1J3				NOT ASSIGNED		
A6A9A1J4	1250-1538	3	1	CONNECTOR-RF SMB M PC 50-OHM	28480	1250-1538
A6A9A1L1	9135-0073	3	2	INDUCTOR RF-CH-MLD 51NH 6% .102DX.26LG	28480	9135-0073
A6A9A1L2	9140-0158	6	3	INDUCTOR RF-CH-MLD 1UH 10% .106DX.26LG	28480	9140-0158
A6A9A1L3	9140-0158	6		INDUCTOR RF-CH-MLD 1UH 10% .106DX.26LG	28480	9140-0158
A6A9A1L4	9135-0073	3		INDUCTOR RF-CH-MLD 51NH 6% .102DX.26LG	28480	9135-0073
A6A9A1L5	9100-2248	5	1	INDUCTOR RF-CH-MLD 120NH 10% .105DX.26LG	28480	9100-2248
A6A9A1L6	9140-0158	6		INDUCTOR RF-CH-MLD 1UH 10% .105DX.26LG	28480	9140-0158
A6A9A1L7				NOT ASSIGNED		
A6A9A1L8	9100-2247	4	2	INDUCTOR RF-CH-MLD 100NH 10% .105DX.26LG	28480	9100-2247
A6A9A1L9	9100-2247	4		INDUCTOR RF-CH-MLD 100NH 10% .105DX.26LG	28480	9100-2247
A6A9A1L10	9100-2251	0	1	INDUCTOR RF-CH-MLD 220NH 10% .105DX.26LG	28480	9100-2251
A6A9A1L11	85660-80012	4	1	COIL 24NH	28480	85660-80012
A6A9A1L12	9135-0068	6	2	INDUCTOR RF-CH-MLD 33NH 6% .102DX.26LG	28480	9135-0068
A6A9A1L13	9100-2250	9	1	INDUCTOR RF-CH-MLD 180NH 10% .105DX.26LG	28480	9100-2250
A6A9A1L14				NOT ASSIGNED		
A6A9A1L15				NOT ASSIGNED		
A6A9A1L16				NOT ASSIGNED		
A6A9A1L17				NOT ASSIGNED		
A6A9A1L18				NOT ASSIGNED		
A6A9A1L19	9140-0142	8	2	INDUCTOR RF-CH-MLD 2.2UH 10% .105DX.26LG	28480	9140-0142
A6A9A1L20	9140-0142	8		INDUCTOR RF-CH-MLD 2.2UH 10% .105DX.26LG	28480	9140-0142
A6A9A1L21	9135-0068	6		INDUCTOR RF-CH-MLD 33NH 6% .102DX.26LG	28480	9135-0068
A6A9A1Q1	1854-0696	2	1	TRANSISTOR NPN SI T0-72 PD=200MW	28480	1854-0696
A6A9A1Q2	1854-0247	9	1	TRANSISTOR NPN SI T0-39 PD=1W FT=800MHZ	28480	1854-0247
A6A9A1Q3	1854-0295	7	1	TRANSISTOR-DUAL NPN PD=400MW	28480	1854-0295
A6A9A1Q4	1854-0632	6	1	TRANSISTOR NPN SI PD=180MW FT=4GHZ	25403	BFR-91
A6A9A1Q5	1853-0007	7	2	TRANSISTOR PNP 2N3251 SI T0-18 PD=360MW	04713	2N3251
A6A9A1Q6	1853-0007	7		TRANSISTOR PNP 2N3251 SI T0-18 PD=360MW	04713	2N3251
A6A9A1R1	0698-3447	4	1	RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A6A9A1R2	0698-3437	2	1	RESISTOR 133 1% .125W F TC=0+-100	24546	C4-1/8-T0-133R-F
A6A9A1R3	0698-3431	6	2	RESISTOR 23.7 1% .125W F TC=0+-100	03888	PME55-1/8-T0-23R7-F
A6A9A1R4	0757-0394	0	3	RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A6A9A1R5*	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A6A9A1R6	0757-0421	4	1	RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
A6A9A1R7	0757-0402	1	2	RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A6A9A1R8	0698-3431	6		RESISTOR 23.7 1% .125W F TC=0+-100	03888	PME55-1/8-T0-23R7-F
A6A9A1R9	0757-0401	0	2	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A6A9A1R10*	0757-0280	3	1	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6A9A1R11	2100-2574	3	1	RESISTOR-TRMR 500 10% C SIDE-ADJ 1-TRN	30983	ET50X501
A6A9A1R12	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A6A9A1R13	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A6A9A1R14	0757-0402	1		RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A6A9A1R15	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F

*Indicates Factory Selected Value

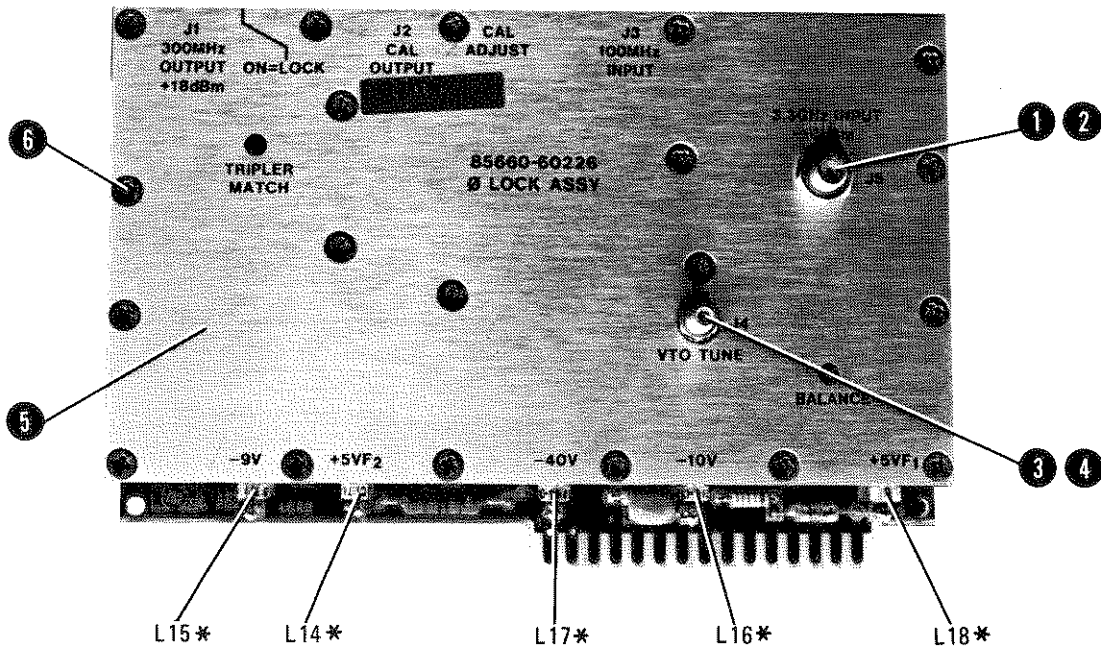
TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A6A9A1R16	0698-3136	8	2	RESISTOR 17.8K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1782-F
A6A9A1R17	0698-3136	8		RESISTOR 17.8K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1782-F
A6A9A1R18	0757-0416	7	1	RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A6A9A1R19	0757-0417	8	1	RESISTOR 562 1% .125W F TC=0+-100	24546	C4-1/8-T0-562R-F
A6A9A1R20	0757-0438	3	2	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A6A9A1R21	0698-3452	1	1	RESISTOR 147K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1473-F
A6A9A1R22	0757-0442	9	5	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A9A1R23	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A9A1R24	0698-3162	0	1	RESISTOR 46.4 1% .125W F TC=0+-100	24546	C4-1/8-T0-4642-F
A6A9A1R25	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A9A1R26	0698-7421	2	1	RESISTOR 40K .25% .125W F TC=0+-100	19701	MF4C1-9-T0-4002-C
A6A9A1R27	0757-0459	8	1	RESISTOR 56.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5622-F
A6A9A1R28	0698-3459	8	1	RESISTOR 383K 1% .125W F TC=0+-100	28480	0698-3459
A6A9A1R29	0757-0465	6	1	RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6A9A1R30	0757-0463	4	1	RESISTOR 82.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8252-F
A6A9A1R31	0757-0418	9	1	RESISTOR 619K 1% .125W F TC=0+-100	24546	C4-1/8-T0-619R-F
A6A9A1R32	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A6A9A1R33	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A9A1R34	0757-0278	9	2	RESISTOR 1.78K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1781-F
A6A9A1R35	0757-0278	9		RESISTOR 1.78K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1781-F
A6A9A1R36	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A9A1R37	0757-0816	1	1	RESISTOR 681 1% .5W F TC=0+-100	28480	0757-0816
A6A9A1R38	2100-1738	9	1	RESISTOR-TRMR 10K 10% C TOP-ADJ 1-TRN	73138	82PR10K
A6A9A1R39	0757-0470	3	1	RESISTOR 162K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1623-F
A6A9A1R40	0757-0419	0	2	RESISTOR 681 1% .125W F TC=0+-100	24546	C4-1/8-T0-681R-F
A6A9A1R41	0757-0419	0		RESISTOR 681 1% .125W F TC=0+-100	24546	C4-1/8-T0-681R-F
A6A9A1T1	08552-6044	1	2	TRANSFORMER, RF 5-PIN	28480	08552-6044
A6A9A1T2	08552-6044	1		TRANSFORMER, RF 5-PIN	28480	08552-6044
A6A9A1U1				SEE A6A9U1		
A6A9A1U2				SEE A6A9U2		
A6A9A1U3	1826-0987	5	1	IC OP AMP PRCN 8-DIP-C PKG	28480	1826-0987
A6A9A1U4	1826-0306	2	1	IC COMPARTOR GP QUAD 14-DIP-C PKG	27014	LM339AJ
A6A9A1VR1	1902-0041	4	1	DIODE-ZNR 5.11V 5% D0-35 PD=.4W	28480	1902-0041
A6A9A1W1	1460-1489	8	1	WIREFORM BE CU AG	28480	1460-1489

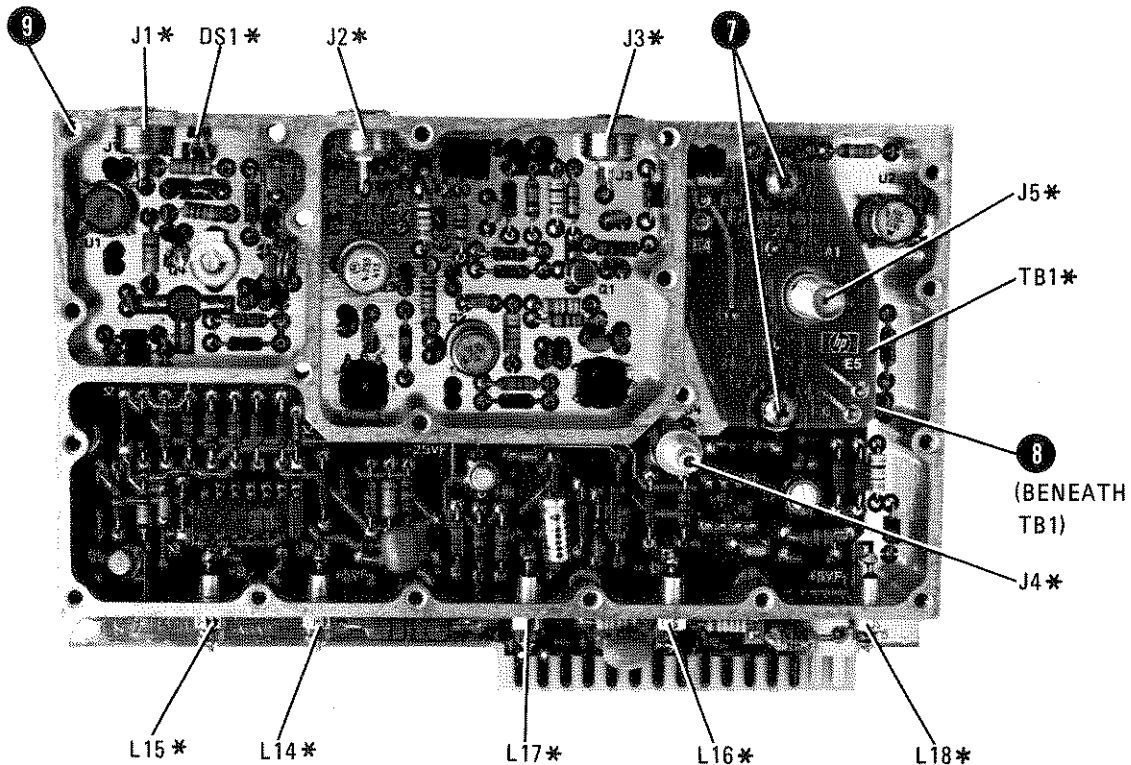
*Indicates Factory Selected Value

A6A9 PHASE LOCK ASSEMBLY

FRONT



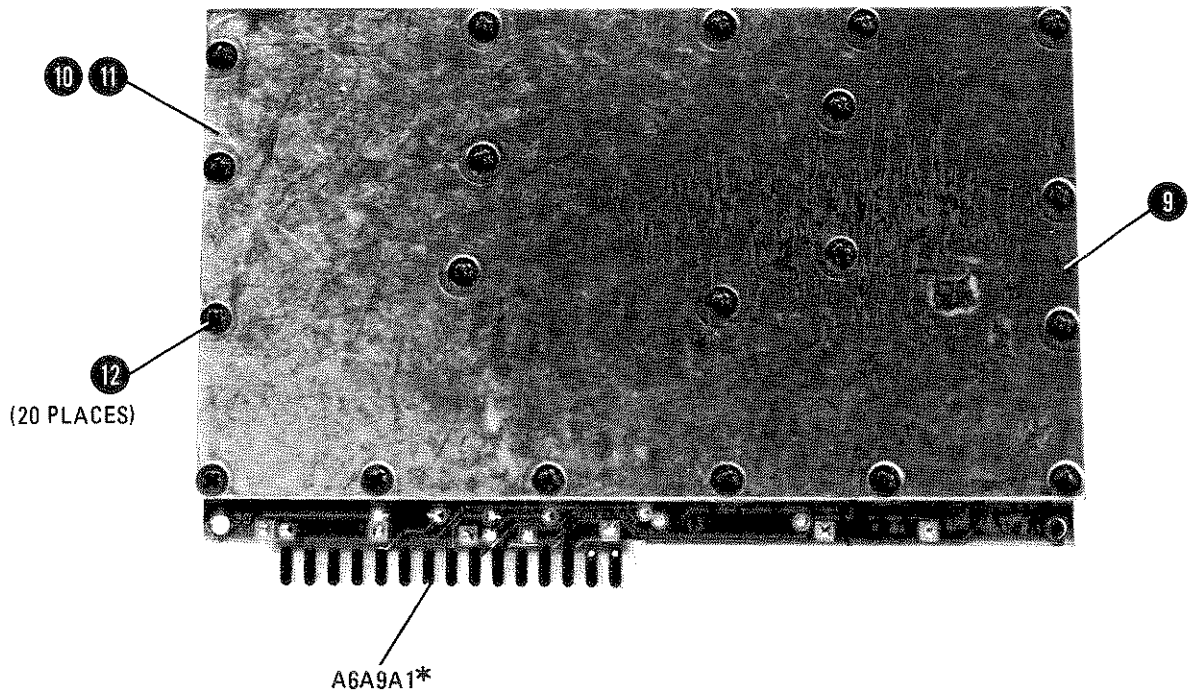
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*REFER TO INDIVIDUAL TABS FOR PART NUMBERS.

FIGURE 1. A6A9 PHASE LOCK ASSEMBLY, PARTS IDENTIFICATION (1 OF 2)

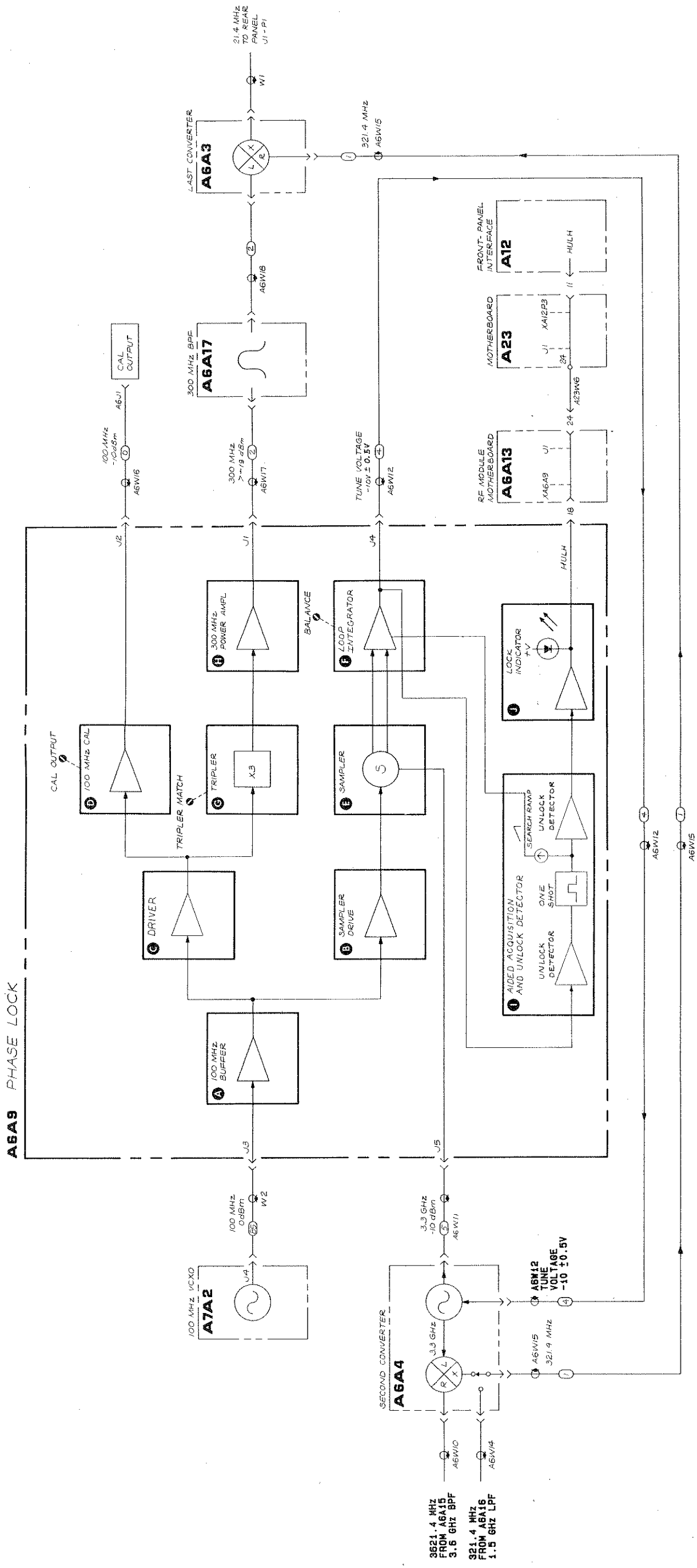
A6A9
PHASE LOCK ASSEMBLY
REAR



*REFER TO INDIVIDUAL TABS FOR PART NUMBERS.

Item	HP Part Number	C D	Description	Mfr. Code	Manufacturer's Part Number
1	2950-0177	9	Nut, Hex, RF Connector (For J5)	28480	2950-0177
2	2190-0067	4	Washer, Lock, RF Connector (For J5)	28480	2190-0067
3	2950-0078	9	Nut, Hex, 10-32 (For J4)	28480	2950-0078
4	2190-0557	7	Washer, Lock, .195-IN ID (For J4)	28480	2190-0557
5	85660-00070	6	Cover, Front, Phase Lock Assembly	28480	85660-00070
6	2200-0140	7	Screw, Mach, 4-40, .250-IN LG, FL HD	28480	2200-0140
7	2200-0109	8	Screw, Mach, 4-40, .438-IN LG, PAN HD	28480	2200-0109
8	86701-00054	8	Spacer-Sampler (Between TB1 and U1)	28480	86701-00054
9	85660-20204	0	Housing, Phase Lock Assembly	28480	85660-20204
10	85660-20205	1	Cover, Rear, Phase Lock Assembly	28480	85660-20205
11	85660-80061	3	Insulating Shield, Plastic	28480	85660-80061
12	2200-0148	5	Screw, Mach, 4-40, .500-IN LG, FL HD	28480	2200-0148

FIGURE 1. A6A9 PHASE LOCK ASSEMBLY, PARTS IDENTIFICATION (2 OF 2)



A6A9

FIGURE 2. A6A9 PHASE LOCK, BLOCK DIAGRAM

A6A9A1
PHASE LOCK
85660-60202

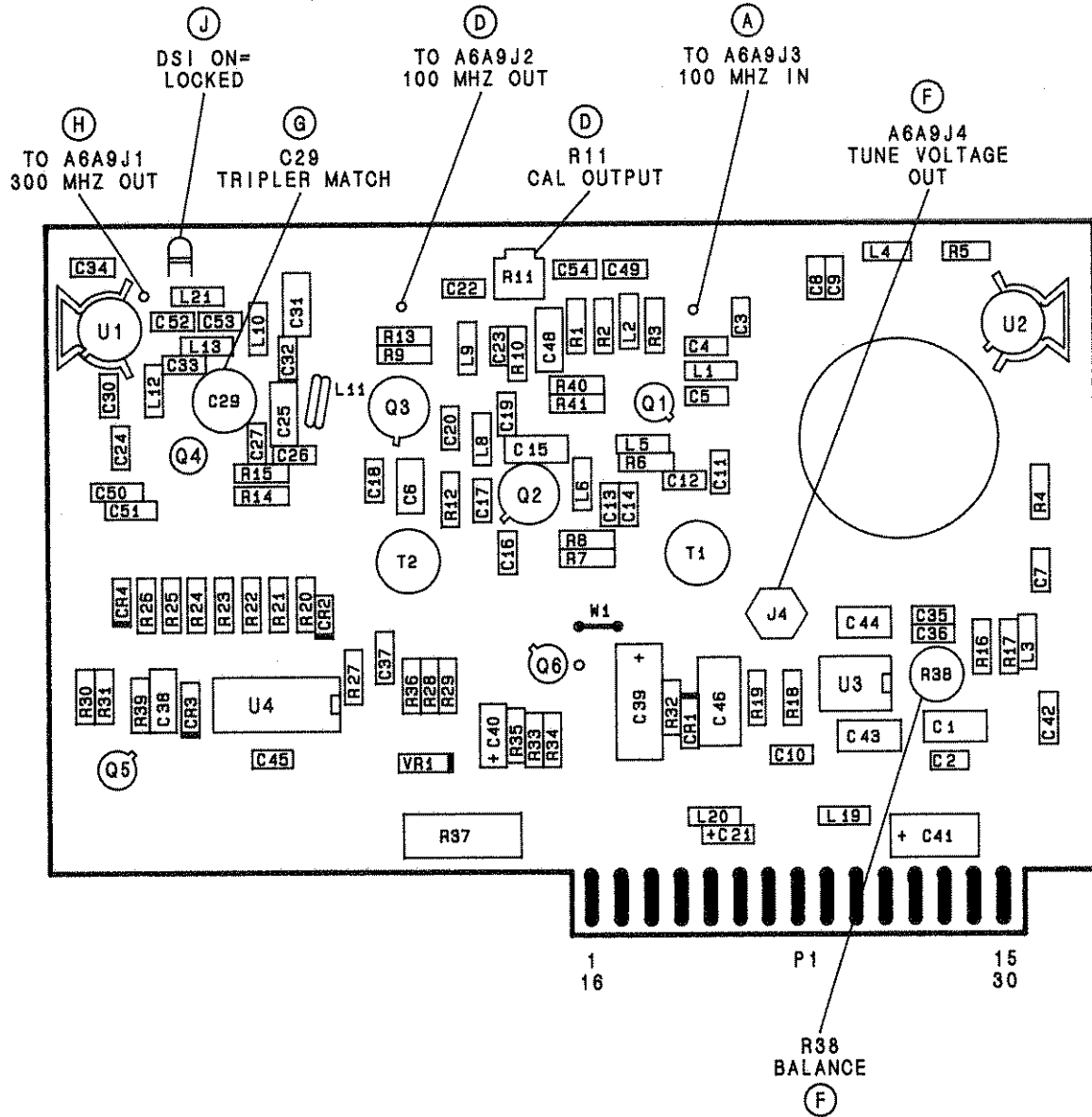
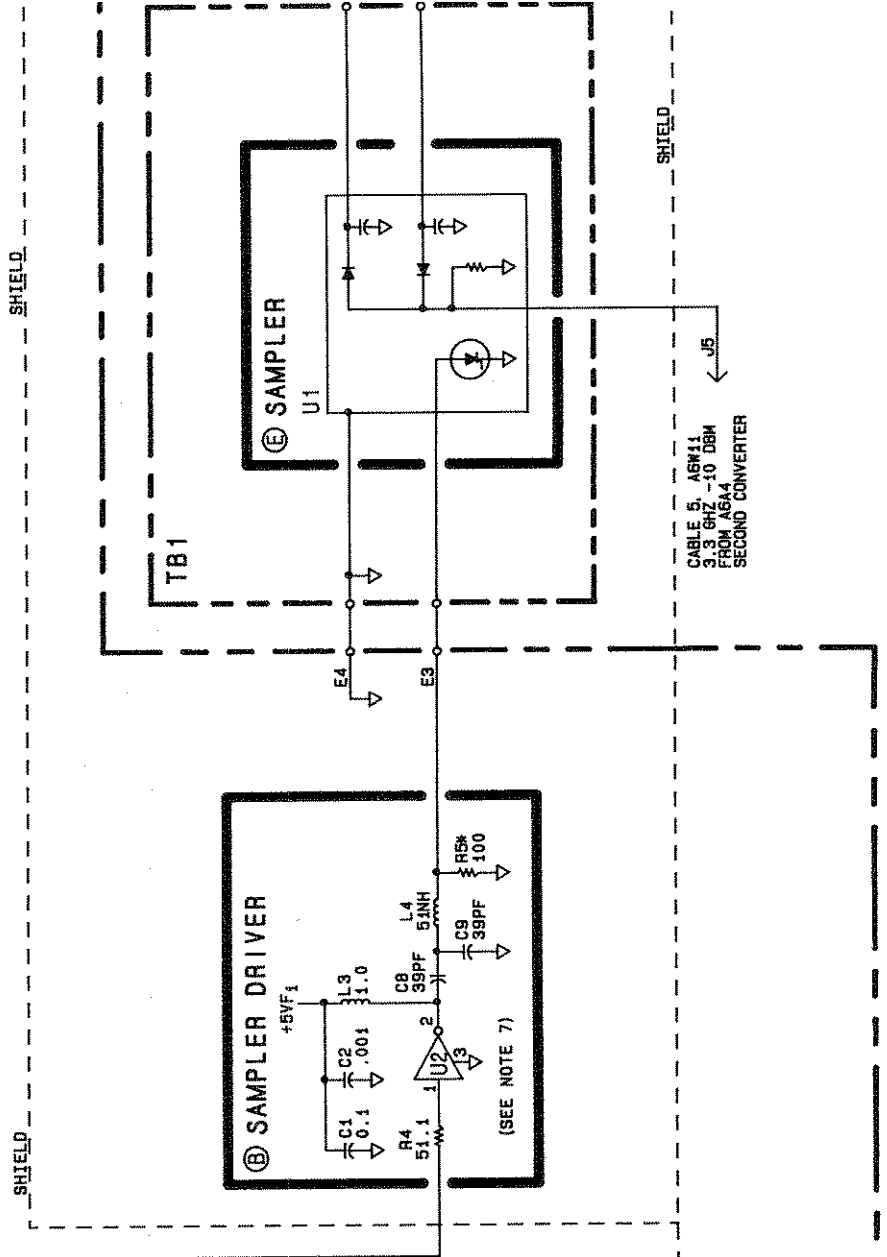
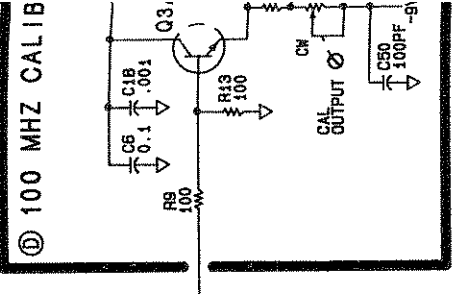
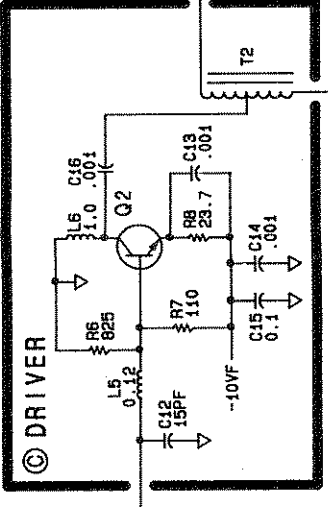
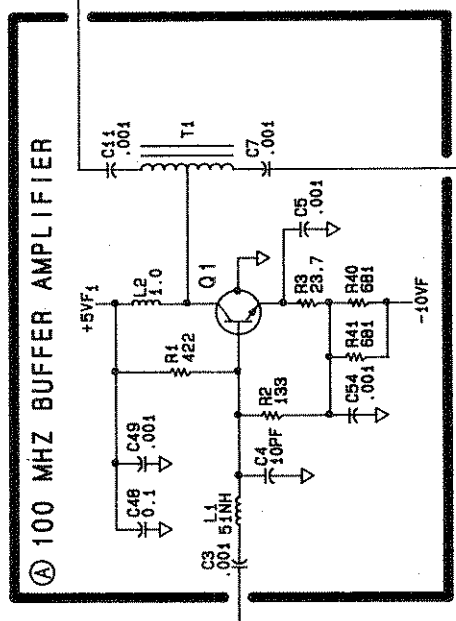
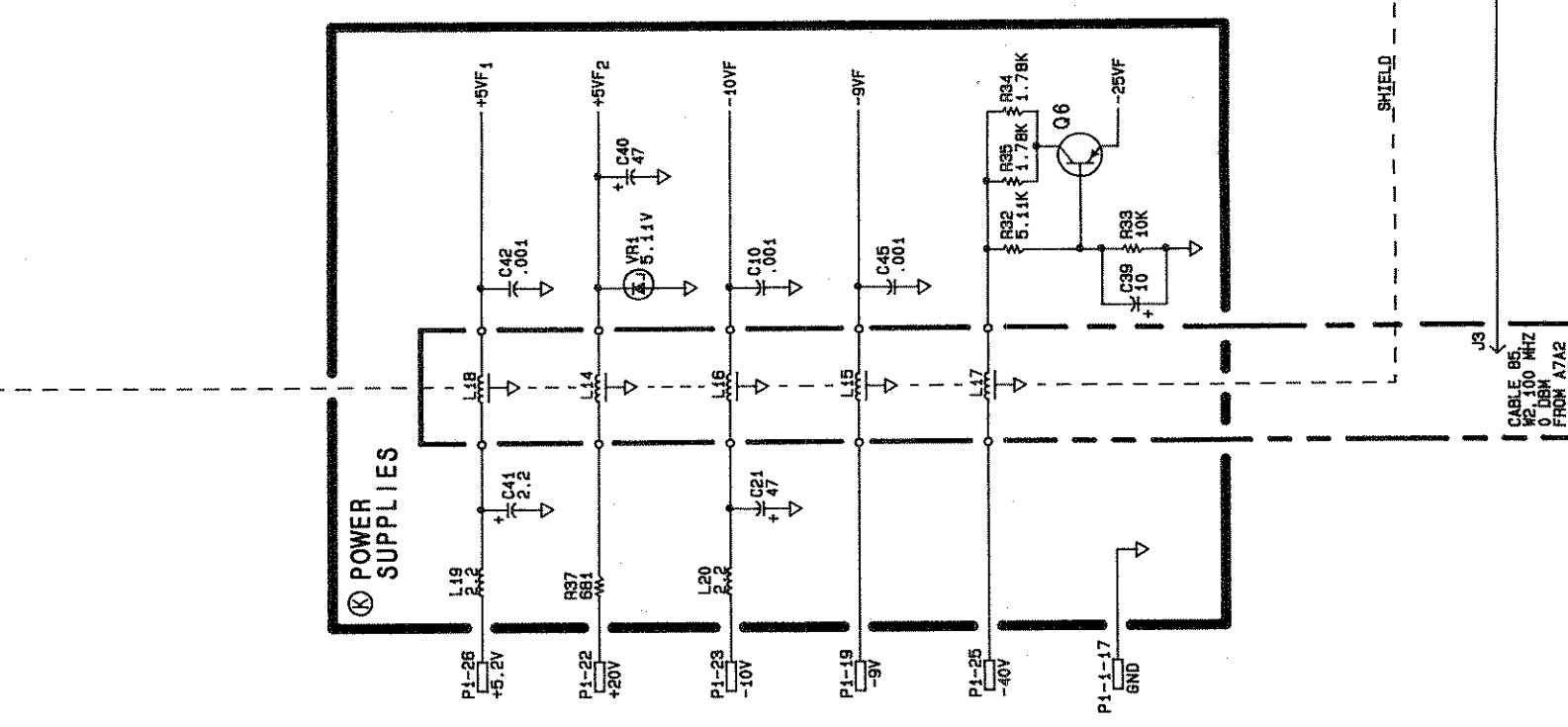


FIGURE 3. A6A9A1 PHASE LOCK BOARD, COMPONENT LOCATIONS

A9 PHASE LOCK
660-60226

A1 PHASE LOCK
85660-60202

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	GND		K
16	GND		K
2	GND		K
17	GND		K
3	GND		K
18	HULH	A12P3-11	J
4	GND		K
19	-9V	AG12P1-4	K
5	GND		K
20	NC		K
6	GND		K
21	PIN	AG10P1-35	I
7	GND		K
22	+20V		K
8	GND		K
23	-10V		K
9	GND		K
24	NC		K
10	GND		K
25	-40V		K
11	GND		K
26	+5.2V		K
12	GND		K
27	NC		K
13	GND		K
28	NC		K
14	GND		K
29	NC		K
15	GND		K
30	NC		K

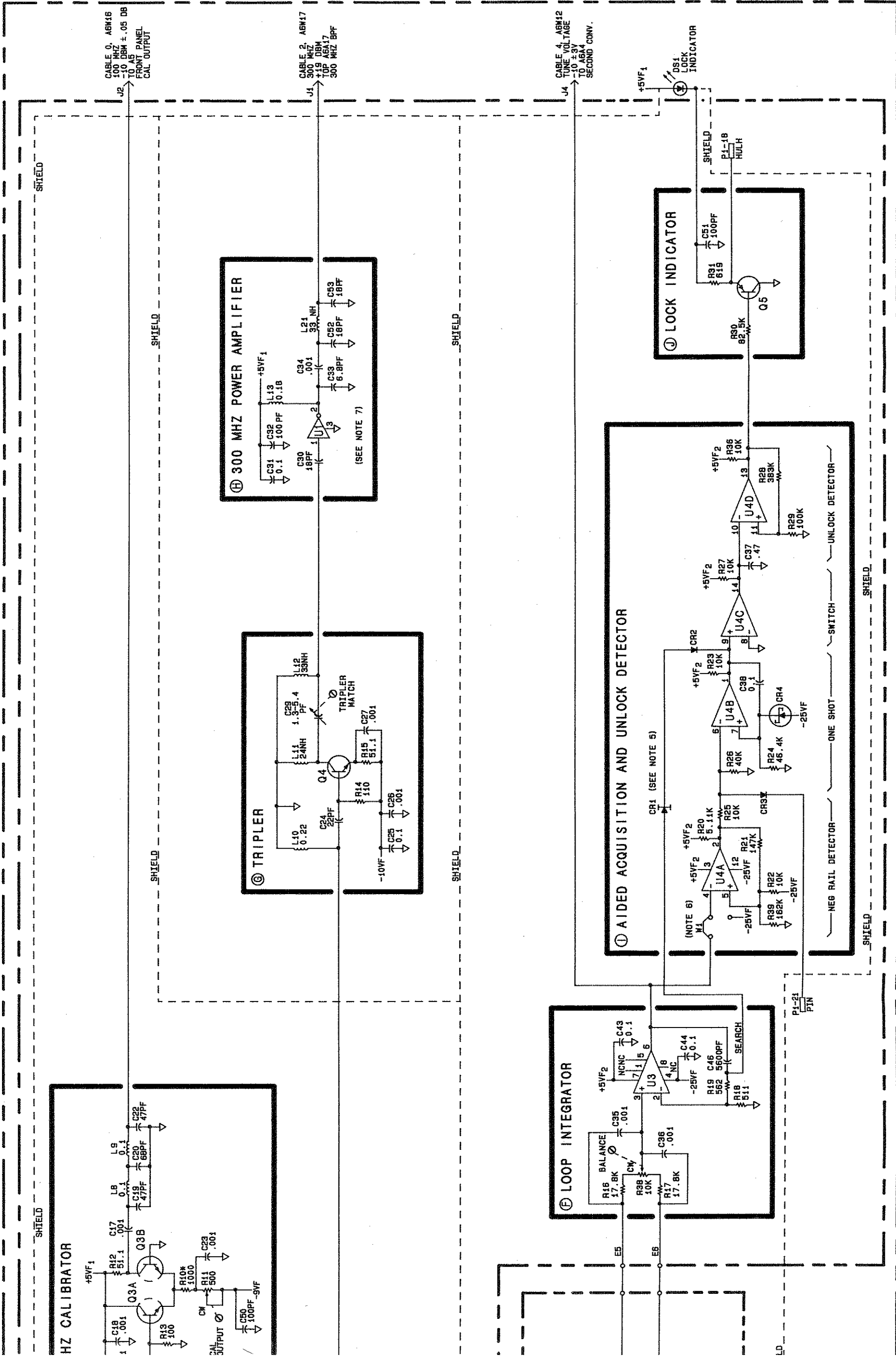


CABLE BE
K2 100 MHz
0 DBM
FROM A7A2
100 MHz
VCXO

CABLE 5, ABW11
3.3 GHz -10 DBM
FROM AGA4
SECOND CONVERTER

NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATION, PREcede ABBREVIATION WITH ASSEMBLY DESIGNATION.
 2. UNLESS OTHERWISE INDICATED, RESISTANCE IS IN OHMS, CAPACITANCE IS IN MICROFARADS (UF) AND INDUCTANCE IS IN MICROHENRIES (UH).
 3. UNLESS OTHERWISE INDICATED, SYSTEMS CENTER LEFT SIDE, RIGHT SIDE OF FUNCTION BLOCKS.
 4. MNEMONIC TABLE:
- | MNEMONIC | DESCRIPTION |
|----------|-------------------------------------|
| HULH | HIGH-HETERODYNE OSCILLATOR UNLOCKED |
5. CR1 IS A CURRENT REGULATOR DIODE IN FUNCTIONS AS A CONSTANT CURRENT SOURCE.
 6. M1 IS USED TO JUMPER PIN 4 OF U1 AND U2 ARE NOT SUPPLIED WHEN A IS REPLACEMENT 85660-60202 ASSEMBLY IS ORDERED. THEY MUST BE ORDERED SEPARATELY.
 7. U1 AND U2 ARE NOT SUPPLIED WHEN A IS REPLACEMENT 85660-60202 ASSEMBLY IS ORDERED. THEY MUST BE ORDERED SEPARATELY.



A6A9

FIGURE 4. A6A9 PHASE LOCK, SCHEMATIC DIAGRAM

A6A10 MISCELLANEOUS BIAS/RELAY DRIVER, CIRCUIT DESCRIPTION

This assembly is a collection of circuits necessary for proper operation of other assemblies in the A6 RF Module. It contains nine circuits: 1) YTX Diode Bias; 2) YTX Linearity Correction, 3) 3.3 GHz Oscillator Driver, 4) PIN Switch Driver, 5) Band Step Gains, 6) RF Switch Driver, 7) RF Attenuator Driver, 8) +22V Delay, and 9) Power Down.

YTX Diode Bias (G)

To maintain the precise diode bias across the mixer diode, the effects of series resistance between the bias circuit and the diode must be eliminated. To do this, a negative impedance voltage source U2 is used.

Voltage bias to the YTX diode is adjusted from band to band via R9, R12, R15, and R18. This voltage is applied to U2 via FET switches Q6, Q7, Q8, and Q10. U2 has both positive and negative feedback. The positive feedback is controlled by R43, R46, and R47, while the negative feedback is via R45. The fact that the positive feedback and the negative feedback are picked off across R44 causes a negative impedance at pin P1-7 proportional to the amplifier gain and R44.

YTX Linearity Correction (D)

Due to nonlinearities in the YTX magnet structure, some linearity correction must be made. This is accomplished by placing resistors in parallel with the current sense resistor in the YTX coil driver circuit. These parallel resistors increase the coil current slightly. For current compensation, both the point of compensation and the magnitude of compensation must be varied.

This is accomplished in the following manner using U7D as a typical circuit: U7D is an ideal zener circuit, that is, as long as the YTX linearity voltage is less negative than the voltage on U7 pin 12 (the positive op amp input) diode CR5 is reverse biased. In this state, the YTX linearity line sees a high impedance and no compensation occurs. When the YTX linearity voltage goes more negative than the bias on U7 pin 12, diode CR5 is forward biased and U7D becomes a voltage follower maintaining the voltage at the cathode of CR5 at the same voltage as on U7 pin 12. In this situation, R32 and R31 are effectively in parallel with the current sense resistor of the coil driver circuit. R31 is used to adjust the magnitude of compensation, while R40 is used to adjust the frequency at which the compensation occurs. In a similar manner, U7A, B, C are used to correct for higher frequency nonlinearity.

PIN Switch Driver (F)

The PIN switch driver converts the TTL logic level LO-Band signal to the +20V/-10V signal required by the Second Converter. The TTL level at P1-34 is input to the base of Q21. A high at the base of Q21 turns Q21 on, turning on Q4, which pulls the collector of Q4 to approximately +20V. This turns on Q3, providing the +20V signal to the PIN drive output, P1-35. A low input on the LO-Band TTL input turns Q21 off, which turns Q4 off. The collector of Q4 then goes low, turning on Q2, and pulling the PIN drive line to -10V.

3.3 GHz Oscillator Driver (H)

The PIN drive signal is also used to turn the 3.3 GHz oscillator on in LO-Band, off in the HI-Band mode. When the PIN drive goes high, Q1 is turned on which pulls its collector to -10V. The -10V is the negative bias for the 3.3 GHz oscillator. When the PIN drive goes low, Q1 is turned off, dropping the oscillator bias current to zero, which turns off the 3.3 GHz oscillator. In the on state, resistor R1 is used to adjust the oscillator bias current.

RF Switch Driver (E)

The YTX LO-Band RF switch is driven by darlington amplifiers U5E, and U5F. A high input on the LO-Band line drives the outputs of U5F low, and U5E high. A low output at U5F drives the LO-HI Band relay to the LO-

Band position. The reverse occurs with a low input which drives U5E's output low which forces the RF relay to the HI-Band position.

Band Step Gains (I)

To correct for different conversion efficiencies and gains in the individual frequency bands, the IF gain is changed. This is done in the A6A3 Last Converter by varying the current through PIN attenuator diodes in the 21.4 MHz amplifier. This current is controlled by Q12, Q14–Q17, and Q19. In LO-Band, the high output on the PIN drive line breaks down zener VR1 and turns on Q12. This applies –40V to the potentiometer R21. Adjusting R21 varies the current in the step gain in LO-Band.

The gain of A6A3 Last Converter is adjusted in each band as each transistor, Q12, Q14–Q17, and Q19, is turned on for each individual band.

RF Attenuator Driver (C)

The RF attenuator driver is similar to the LO-HI Band relay driver. The major difference is the logic decoding to the inputs of the darlington switch drivers. The input to the logic circuit is the standard 10, 20, 40 dB attenuation logic levels. The logic circuit U1 decodes this to the 10, 20, 20, 20, dB attenuation logic levels required to drive the RF attenuator. The output drivers consist of darlington amplifiers driven by the outputs of U1 or the inverted outputs of U1, via U3. A low output of a darlington turns that line on. That is, a low at U5D pin 13, coupled with high at U4F pin 11, enables the 10 dB attenuation position, and so forth.

Power Down (A)

The power down circuit switches the RF attenuator into a 40 dB attenuation position to prevent accidental damage to A6A8 YTX or A6A4 Second Converter from an input signal when the instrument is off. When the power up signal goes low, U3 pin 10 is driven high which turns on Q9 and Q13, forcing U1 pins 5, 6, and 9, U4 pin 7, and U3 pin 5 high. This forces at least the last two 20 dB attenuation stages in the attenuator on.

+22V Delay (B)

On power up, the instrument goes through a self-check program. To prevent the RF relays and the attenuator from chattering during this time, the +22 volt bias to the attenuator and RF switch is delayed for about 2.5 seconds after the power up signal goes high. This delay is caused by R59 and C10. When power up goes high, it takes approximately 2.5 seconds for the voltage across C10 to charge up enough to turn on U3E. U3E output is inverted twice by the darlington amplifiers U4B and U4A so that when U3E output drops, U4A output also drops turning on Q11 which applies the +22V to the relay circuits.

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A6A10	85660-60180	5	1	BOARD ASSEMBLY, MISCELLANEOUS BIAS/RELAY DRIVER	28480	85660-60180
A6A10C1	0160-2055	9	2	CAPACITOR-FXD .01UF +00-20% 100VDC CER	28480	0160-2055
A6A10C2	0180-2208	4	1	CAPACITOR-FXD 60UF+-10% 6VDC TA	56289	150D606X006B2
A6A10C3	0180-2208	6	1	CAPACITOR-FXD 220UF+-10% 10VDC TA	56289	150D227X9018B2
A6A10C4	0180-0116	1	2	CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A6A10C5	0160-2055	9		CAPACITOR-FXD .01UF +00-20% 100VDC CER	28480	0160-2055
A6A10C6	0160-4441	1	2	CAPACITOR-FXD .47UF +-10% 50VDC CER	28480	0160-4441
A6A10C7	0160-3879	7	2	CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A10C8	0180-0997	7	1	CAPACITOR-FXD 47UF+-10% 35VDC TA	56289	150D476X9035B2
A6A10C9	0160-4441	1		CAPACITOR-FXD .47UF +-10% 50VDC CER	28480	0160-4441
A6A10C10	0180-0228	6	3	CAPACITOR-FXD 22UF+-10% 15VDC TA	56289	150D226X9015B2
A6A10C11	0180-0116	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A6A10C12	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A10C13	0180-0228	6		CAPACITOR-FXD 22UF+-10% 15VDC TA	56289	150D226X9015B2
A6A10C14				NOT ASSIGNED		
A6A10C15	0180-0228	6		CAPACITOR-FXD 22UF+-10% 15VDC TA	56289	150D226X9015B2
A6A10CR1	1901-1067	4	20	DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A10CR2	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A10CR3	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A10CR4	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A10CR5	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A10CR6	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A10CR7	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A10CR8	1901-0535	9	8	DIODE-SM SIG SCHOTTKY	28480	1901-0535
A6A10CR9	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A6A10CR10	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A10CR11	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A6A10CR12	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A6A10CR13	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A6A10CR14	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A6A10CR15	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A10CR16	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A6A10CR17	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A6A10CR18	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A10CR19	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A10CR20	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A10CR21	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A10CR22	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A10CR23	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A10CR24	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A10CR25	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A10CR26	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A10CR27	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A10CR28	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A10Q1	1854-0477	7	12	TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A6A10Q2	1853-0281	9	3	TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A6A10Q3	1854-0477	7		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A6A10Q4	1853-0281	9		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A6A10Q5	1854-0477	7		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A6A10Q6	1855-0420	2	4	TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A6A10Q7	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A6A10Q8	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A6A10Q9	1854-0477	7		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A6A10Q10	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A6A10Q11	1853-0213	7	1	TRANSISTOR PNP 2N4236 SI TO-5 PD=1W	04713	2N4236
A6A10Q12	1854-0477	7		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A6A10Q13	1853-0281	9		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A6A10Q14	1854-0477	7		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A6A10Q15	1854-0477	7		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A6A10Q16	1854-0477	7		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A6A10Q17	1854-0477	7		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A6A10Q18	1854-0477	7		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A6A10Q19	1854-0477	7		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A6A10Q20	1854-0477	7		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A6A10Q21	1854-0472	2	1	TRANSISTOR NPN SI DARL PD=500MW	04713	MPS-A14
A6A10R1	2100-2574	3	1	RESISTOR-TRMR 500 10% C SIDE-ADJ 1-TRN	30983	ET50X501
A6A10R2	0698-7260	7	17	RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-F
A6A10R3	0698-7260	7		RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-F
A6A10R4	0698-7277	6	5	RESISTOR 51.1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-5112-F
A6A10R5	0698-7260	7		RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-F

*Indicates Factory Selected Value

TABLE 1. REPLACEABLE PARTS

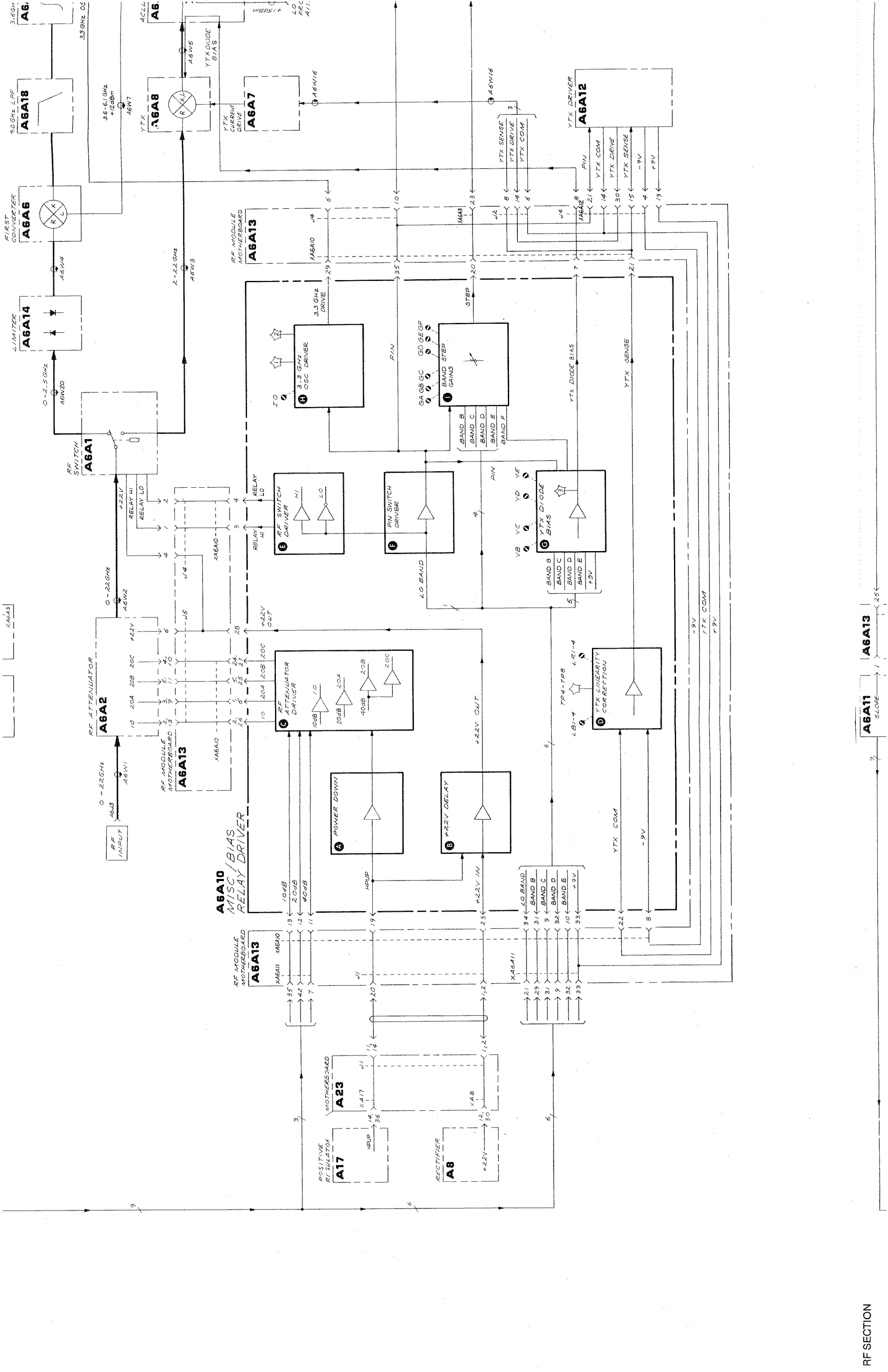
Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A6A10R6	0757-0346	2	5	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A6A10R7	0698-7243	3	5	RESISTOR 1.96K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1961-F
A6A10R8	0698-7266	6	1	RESISTOR 17.8K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1782-F
A6A10R9	2100-0545	4	4	RESISTOR-TRMR 1K 10% C SIDE-ADJ 17-TRN	32997	3292X-1-102
A6A10R10	0698-7201	2	4	RESISTOR 75K 2% .05W F TC=0+-100	24546	C3-1/8-T0-7502-G
A6A10R11	0699-0127	3	4	RESISTOR 464K 1% .05W F TC=0+-100	28480	0699-0127
A6A10R12	2100-0545	4	3	RESISTOR-TRMR 1K 10% C SIDE-ADJ 17-TRN	32997	3292X-1-102
A6A10R13	0698-7281	2	3	RESISTOR 75K 2% .05W F TC=0+-100	24546	C3-1/8-T0-7502-G
A6A10R14	0699-0127	3	2	RESISTOR 464K 1% .05W F TC=0+-100	28480	0699-0127
A6A10R15	2100-0545	4	4	RESISTOR-TRMR 1K 10% C SIDE-ADJ 17-TRN	32997	3292X-1-102
A6A10R16	0698-7281	2	3	RESISTOR 75K 2% .05W F TC=0+-100	24546	C3-1/8-T0-7502-G
A6A10R17	0699-0127	3	2	RESISTOR 464K 1% .05W F TC=0+-100	28480	0699-0127
A6A10R18	2100-0545	4	2	RESISTOR-TRMR 1K 10% C SIDE-ADJ 17-TRN	32997	3292X-1-102
A6A10R19	0698-7281	2	4	RESISTOR 75K 2% .05W F TC=0+-100	24546	C3-1/8-T0-7502-G
A6A10R20	0699-0127	3	3	RESISTOR 464K 1% .05W F TC=0+-100	28480	0699-0127
A6A10R21	2100-3611	1	6	RESISTOR-TRMR 50K 10% C SIDE-ADJ 17-TRN	32997	3292X-1-503
A6A10R22	0698-7260	7	1	RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-F
A6A10R23	2100-3611	1	7	RESISTOR-TRMR 50K 10% C SIDE-ADJ 17-TRN	32997	3292X-1-503
A6A10R24	0698-7260	7	1	RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-F
A6A10R25	2100-3611	1	1	RESISTOR-TRMR 50K 10% C SIDE-ADJ 17-TRN	32997	3292X-1-503
A6A10R26	0698-7260	7	1	RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-F
A6A10R27	2100-3611	1	7	RESISTOR-TRMR 50K 10% C SIDE-ADJ 17-TRN	32997	3292X-1-503
A6A10R28	0698-7260	7	1	RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-F
A6A10R29	2100-3611	1	7	RESISTOR-TRMR 50K 10% C SIDE-ADJ 17-TRN	32997	3292X-1-503
A6A10R30	0698-7260	7	7	RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-F
A6A10R31	2100-1661	7	0	RESISTOR-TRMR 20K 5% WW SIDE-ADJ 22-TRN	32997	3057P-1-203
A6A10R32	0757-0416	7	3	RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A6A10R33	0698-3260	9	4	RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A6A10R34	2100-1661	7	7	RESISTOR-TRMR 20K 5% WW SIDE-ADJ 22-TRN	32997	3057P-1-203
A6A10R35	0757-0416	7	7	RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A6A10R36	0698-3260	9	9	RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A6A10R37	2100-1661	7	7	RESISTOR-TRMR 20K 5% WW SIDE-ADJ 22-TRN	32997	3057P-1-203
A6A10R38	0757-0416	7	7	RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A6A10R39	0698-3260	9	9	RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A6A10R40	2100-1661	7	7	RESISTOR-TRMR 20K 5% WW SIDE-ADJ 22-TRN	32997	3057P-1-203
A6A10R41	2100-1661	7	7	RESISTOR-TRMR 20K 5% WW SIDE-ADJ 22-TRN	32997	3057P-1-203
A6A10R42	2100-1661	7	7	RESISTOR-TRMR 20K 5% WW SIDE-ADJ 22-TRN	32997	3057P-1-203
A6A10R43	0698-7277	6	6	RESISTOR 51.1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-5112-F
A6A10R44	0757-0316	6	1	RESISTOR 42.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-42R2-F
A6A10R45	0698-7243	6	6	RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C3-1/8-T0-1961-F
A6A10R46	0698-7277	6	6	RESISTOR 51.1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-5112-F
A6A10R47	0698-7258	3	1	RESISTOR 8.25K 1% .05W F TC=0+-100	24546	C3-1/8-T0-8251-F
A6A10R48	0698-7243	6	6	RESISTOR 1.96K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1961-F
A6A10R49	0698-7242	5	1	RESISTOR 1.78K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1781-F
A6A10R50	0698-7260	7	7	RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-F
A6A10R51	0698-7260	7	7	RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-F
A6A10R52	0757-1078	9	1	RESISTOR 1.47K 1% .5W F TC=0+-100	28480	0757-1078
A6A10R53	0698-7212	9	3	RESISTOR 100 1% .05W F TC=0+-100	24546	C3-1/8-T0-100R-F
A6A10R54	0757-0442	9	1	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A10R55				NOT ASSIGNED		
A6A10R56	0698-7246	9	1	RESISTOR 2.61K 1% .05W F TC=0+-100	24546	C3-1/8-T0-2611-F
A6A10R57	0698-7238	9	2	RESISTOR 1.21K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1211-F
A6A10R58	0698-7260	7	3	RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-F
A6A10R59	0698-3454	3	1	RESISTOR 215K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2153-F
A6A10R60	0757-0416	7	7	RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A6A10R61	0698-7243	6	2	RESISTOR 1.96K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1961-F
A6A10R62	0757-0346	6	2	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A6A10R63	0698-7212	9	6	RESISTOR 100 1% .05W F TC=0+-100	24546	C3-1/8-T0-100R-F
A6A10R64	0698-7243	6	9	RESISTOR 1.96K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1961-F
A6A10R65	0757-0346	2	2	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A6A10R66	0757-0346	2	4	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A6A10R67	0757-0398	7	1	RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A6A10R68	0757-0346	2	2	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A6A10R69	0698-7212	9	2	RESISTOR 100 1% .05W F TC=0+-100	24546	C3-1/8-T0-100R-F
A6A10R70	2100-1661	7	7	RESISTOR-TRMR 20K 5% WW SIDE-ADJ 22-TRN	32997	3057P-1-203
A6A10R71	0698-3260	9	7	RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A6A10R72	0757-0416	7	2	RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A6A10R73	0698-7260	7	9	RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-F
A6A10R74	0698-7238	9	7	RESISTOR 1.21K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1211-F
A6A10R75	0698-7260	7	7	RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-F
A6A10R76	2100-1661	7	7	RESISTOR-TRMR 20K 5% WW SIDE-ADJ 22-TRN	32997	3057P-1-203
A6A10R77	0698-7277	6	2	RESISTOR 51.1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-5112-F
A6A10R78	0698-7260	7	7	RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-F
A6A10R79	0698-7260	7	7	RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-F
A6A10R80	0698-7277	6	6	RESISTOR 51.1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-5112-F

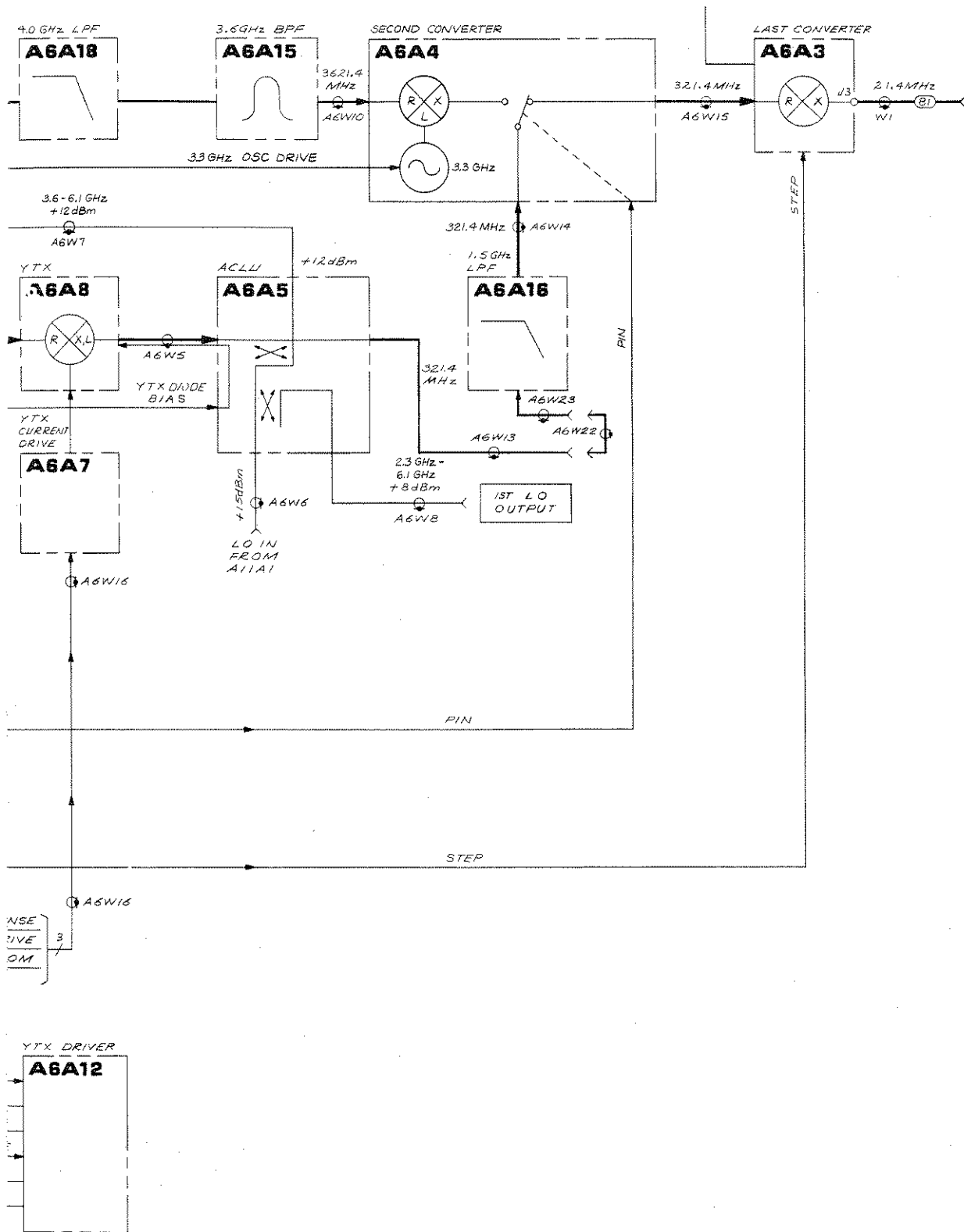
*Indicates Factory Selected Value

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A6A10R81	2190-3611	1		RESISTOR-TRMR 50K 10% C SIDE-ADJ 17-TRN	32797	3292X-1-503
A6A10R82	0698-3153	9	1	RESISTOR 3.83K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3831-F
A6A10R83	0698-7260	7		RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-F
A6A10R84	0698-7260	7		RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-F
A6A10TP1	1251-0600	0	8	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A6A10TP2	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A6A10TP3	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A6A10TP4	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A6A10TP5	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A6A10TP6	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A6A10TP7	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A6A10TP8	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A6A10U1	1820-1538	2	1	IC GATE CMOS NAND QUAD 2-INP	3L585	CD4011AF
A6A10U2	1826-1058	3	1	IC OP AMP GP 8-T0-99 PKG	28480	1826-1058
A6A10U3	1820-1542	8	1	IC BFR CMOS INV HEX 1-INP	3L585	CD4049AF
A6A10U4	1858-0847	5	2	TRANSISTOR ARRAY 16-PIN PLSTC DIP	13606	ULN-2003A
A6A10U5	1858-0847	5		TRANSISTOR ARRAY 16-PIN PLSTC DIP	13606	ULN-2003A
A6A10U6	1810-0206	8	1	NETWORK-RES 8-SIP10.0K OHM X 7	01121	288A103
A6A10U7	1826-0161	7	1	IC OP AMP GP QUAD 14-DIP-P PKG	04713	MLM324P
A6A10VR1	1902-3323	1	1	DIODE-ZNR 42.2V 5% DO-35 PD=.4W TC=+.08%	28480	1902-3323
A6A10VR2	1902-3301	5	4	DIODE-ZNR 34.8V 5% DO-35 PD=.4W	28480	1902-3301
A6A10VR3	1902-3301	5		DIODE-ZNR 34.8V 5% DO-35 PD=.4W	28480	1902-3301
A6A10VR4	1902-3301	5		DIODE-ZNR 34.8V 5% DO-35 PD=.4W	28480	1902-3301
A6A10VR5	1902-3301	5		DIODE-ZNR 34.8V 5% DO-35 PD=.4W	28480	1902-3301
A6A10VR6	1902-3203	6	1	DIODE-ZNR 14.7V 5% DO-35 PD=.4W	28480	1902-3203
A6A10VR7	1902-3345	7	1	DIODE-ZNR 51.1V 5% DO-35 PD=.4W	28480	1902-3345
A6A10VR8	1902-0025	4	1	DIODE-ZNR 10V 5% DO-35 PD=.4W TC=+.06%	28480	1902-0025
A6A10VR9	1902-3234	3	1	DIODE-ZNR 19.6V 5% DO-35 PD=.4W	28480	1902-3234
MISCELLANEOUS PARTS						
	4040-0748	3	1	EXTR PC BD BLK	28480	4040-0748
	4040-0749	4	1	EXTR PC BD BRN	28480	4040-0749

*Indicates Factory Selected Value





A6A10

FIGURE 1. A6A10 MISCELLANEOUS BIAS/RELAY DRIVER, BLOCK DIAGRAM

A6A10 7/8

A6A10
 MISCELLANEOUS BIAS/RELAY DRIVER
 85660-60180

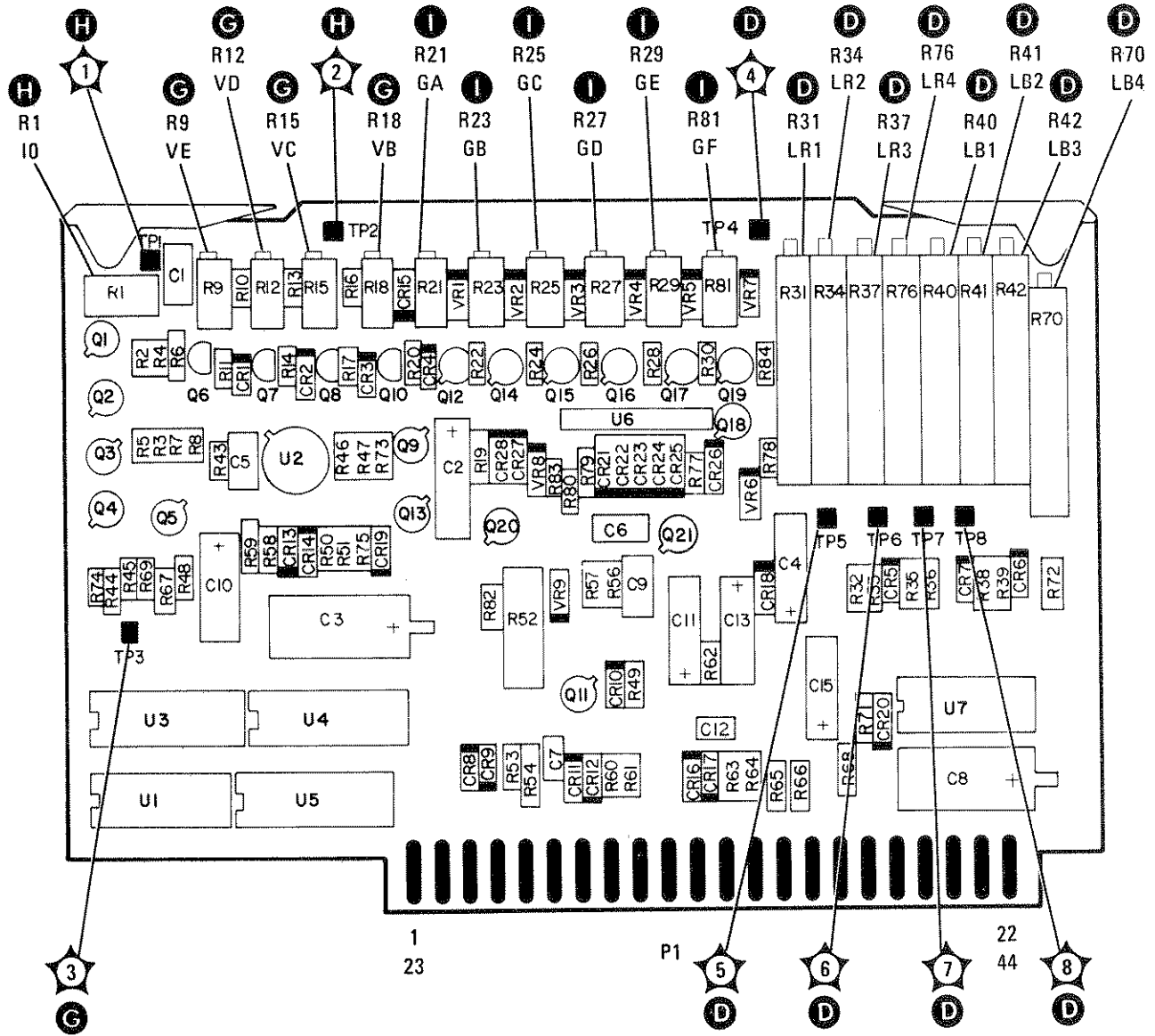
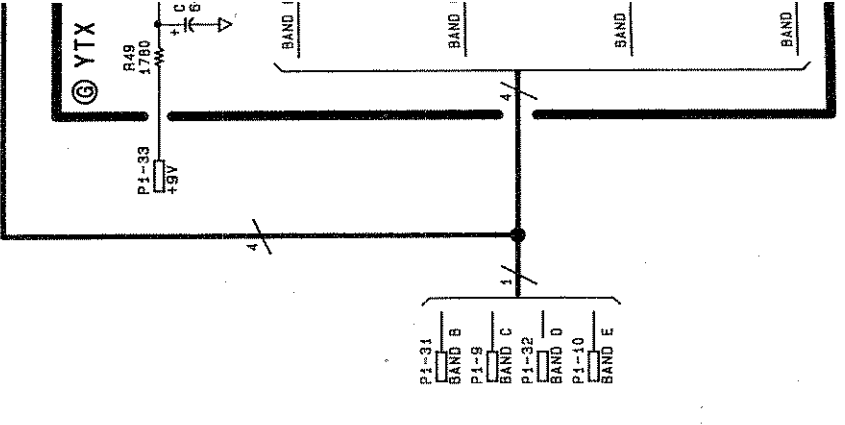
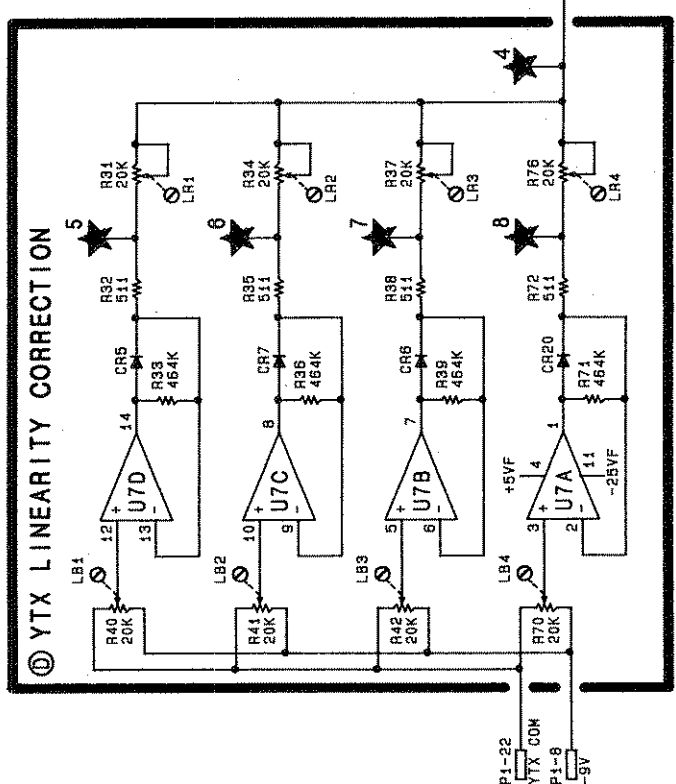
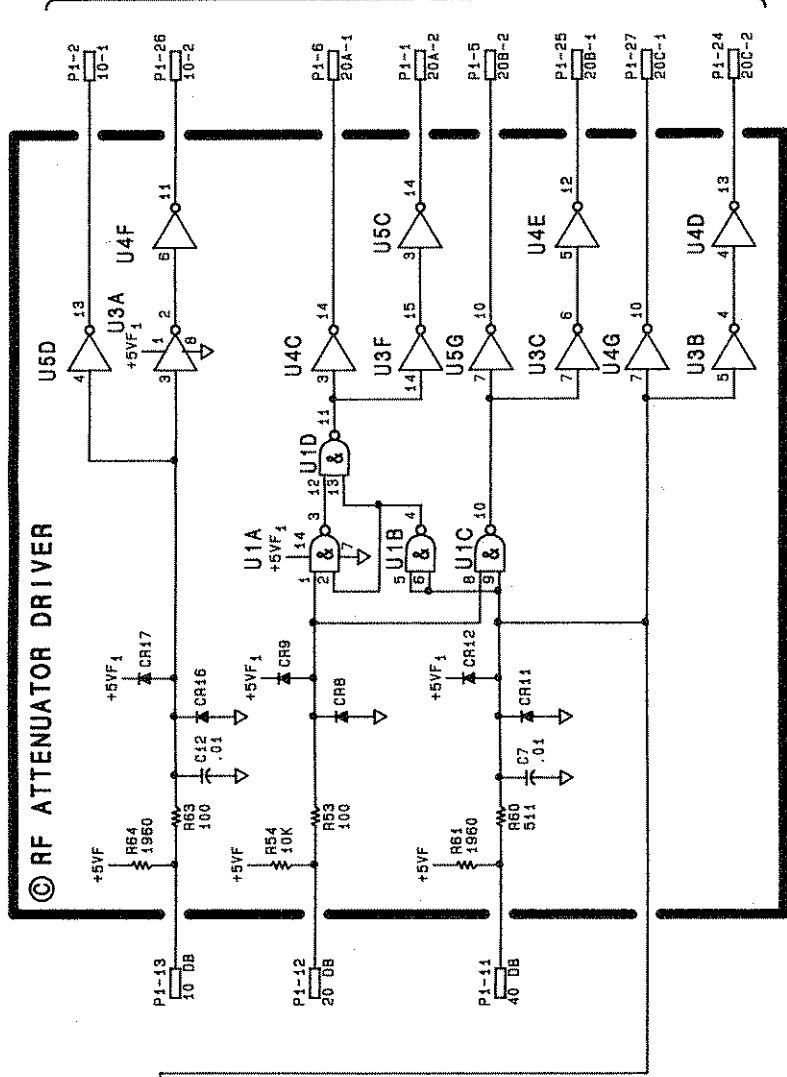
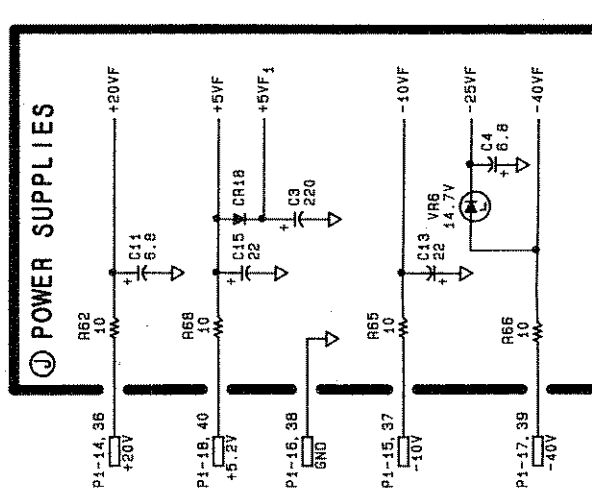
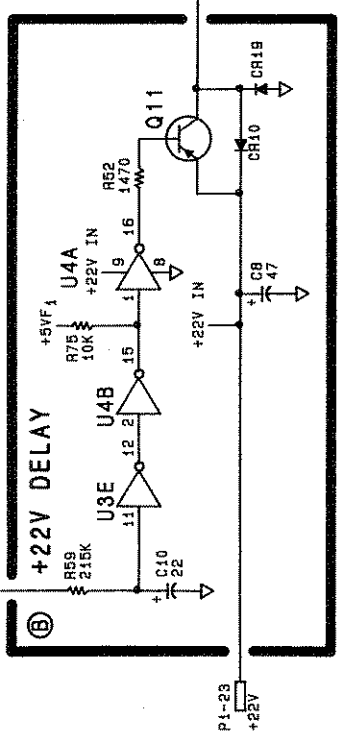
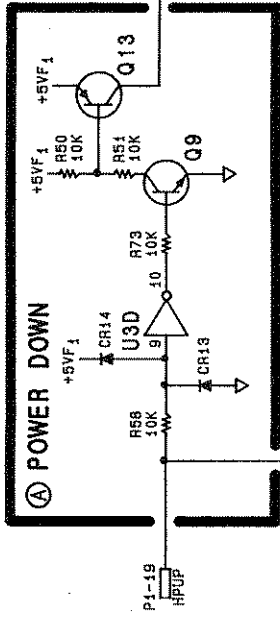


FIGURE 2. A6A10 MISCELLANEOUS BIAS/RELAY DRIVER, COMPONENT LOCATIONS

A6A10 MISCELLANEOUS BIAS/RELAY DRIVER
85660-60180

P1

PIN	SIGNAL	T0/FROM	FUNCTION BLOCK
1	20A-2	A6A2	C
23	+22V IN	ABP1-12, 30	B
2	10-1	A6A2	C
24	20C-2	A6A2	C
3	RELAY HI	A6A1	E
25	20B-1	A6A2	C
4	RELAY LO	A6A1	E
26	10-2	A6A2	C
5	20B-2	A6A2	C
27	20C-1	A6A2	C
6	20A-1	A6A2	C
28	+22V OUT	A6A2	B
7	YTX BIAS	A6A5	G
29	3.3 GHZ DRIVE	A6A4	H
8	-9V	A6A12P1-4	D
30	NC		
9	BAND C	A6A11P1-31	G
31	BAND B	A6A11P1-29	G
10	BAND E	A6A11P1-32	G
32	BAND D	A6A11P1-9	G
11	40 DB	A6A11P1-7	C
33	49V	A6A12P1-19	G
12	20 DB	A6A11P1-42	C
34	LO BAND	A6A11P1-21	F
13	10 DB	A6A11P1-35	C
35	PIN	A6A4 A6A9A1P1-24 A6A12P1-21	F
14	+20V		J
36	+20V		J
15	-10V		J
37	-10V		J
16	GND		J
38	GND		J
17	-40V		J
39	-40V		J
18	+5.2V		J
40	+5.2V		J
19	HPUP	A6A13J1-20	A
41	NC		
20	STEP	A6A3A1P1-23	I
42	NC		
21	YTX SENSE	A6A7J2-8	D
43	NC		
22	YTX CCOM	A6A12P1-14	D
44	NC		

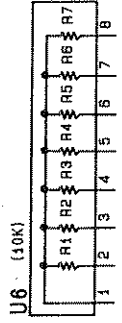


SERIAL NUMBER PREFIX: 2410A

RF SECTION

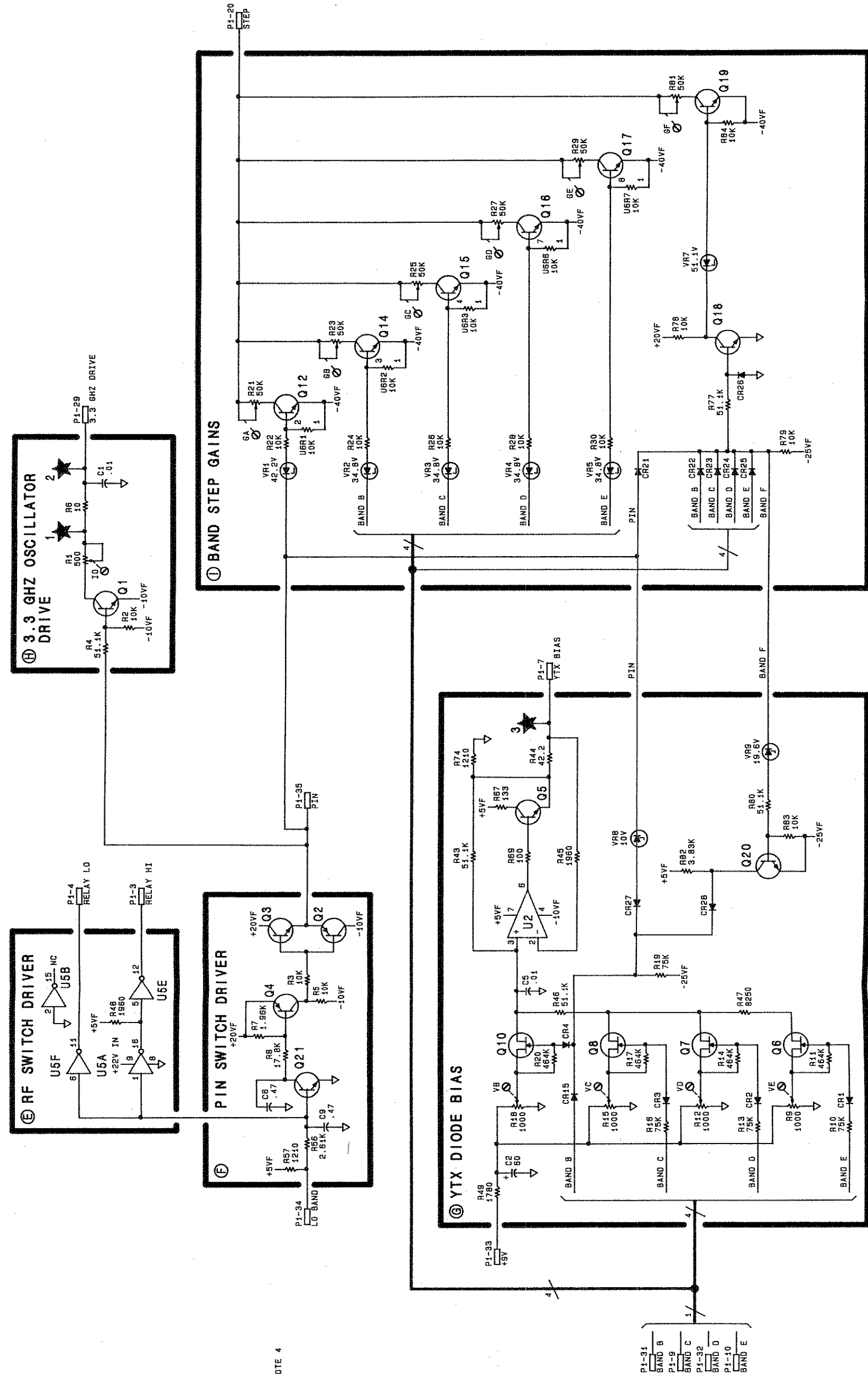
NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED FOR COMPLETE REFERENCE DESIGNATION. PREFIX ABBREVIATION WITH ASSEMBLY DESIGNATION.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IS IN OHMS (Ω), CAPACITANCE IS IN MICROFARADS (μ F), INDUCTANCE IS IN MICROHENRIES (μ H)
3. UNLESS OTHERWISE INDICATED, SIGNALS ENTER BLOCKS AND EXIT AT RIGHT SIDE OF FUNCTION BLOCKS.
4. NEGATIVE TRUE LOGIC ON OUTPUTS.
5. U6 PIN CONFIGURATION:



6. U5B IS NOT USED. PIN 2 IS CONNECTED TO GROUND. PIN 15 IS NOT CONNECTED.
7. MNEMONICS TABLE:

MNEMONIC	DESCRIPTION
HPUF	HIGH-POWER UP



A6A10

FIGURE 3. A6A10 MISCELLANEOUS BIAS/RELAY DRIVER, SCHEMATIC DIAGRAM
A6A10 11/12

A6A11 SLOPE GENERATOR, CIRCUIT DESCRIPTION

The slope generator takes a voltage which is proportional to YTX frequency and produces a current to control the slope attenuator in the A6A3 Last Converter, which corrects for conversion loss variations of the input mixer within each band. The slope generator also has circuitry which decodes bandswitch and attenuator settings, produces pulses for the sample and hold, and hysteresis circuits in the A6A12 YTX Driver, produces the YTX peaking signal for the YTX Driver, and a signal to switch in the filter capacitor on the A6A7 YTX Current Driver.

Bandswitch and Attenuator Decode (A)

U9 is a hex latch which receives six lines from the 50-wire Instrument Bus and a strobe, LCK2, which goes low when the six lines have valid RF Module information. Three of the latch outputs have attenuator setting information and go to the A6A10 Miscellaneous Bias/Relay Driver. The other three lines have bandswitch information which is decoded by U3A and U3B.

U3B decodes the low band (Band A, 0–2.5 GHz) and the external mixer band (BAND F). When pin 2 of U9 is high and pin 12 is low, the LO BAND is selected. The output of U3B is high, turning Q22 on, bringing the collector of Q22 low. This turns Q19 off, bringing the collector of Q19 (LO BAND) high. This information goes to the A6A10 Miscellaneous Bias/Relay Driver to control the RF input switch. Q20 inverts the signal and drives amplifier U4A, producing a signal which is approximately +17V when Band A is valid and approximately -8V otherwise. This signal is used throughout the A6A11 Slope Generator. When pins 2 and 12 of U9 are both high, BAND F is active. The output of U3B is low, turning Q22 off, and bringing the collector of Q22 (and BAND F line) high. At the same time, Q19 turns on, bringing the LO BAND line low.

U3A decoder is enabled when pin 2 of U9 is low. Pins 5 and 12 of U9 have coded information giving harmonic numbers as shown in Table 1.

TABLE 1. BANDSWITCH DECODING

BAND	B2 (PIN 12)	B1 (PIN 5)	N
B	0	1	1
C	1	0	2
D	1	1	3
E	0	0	4

This information is decoded by U3A and amplified by U5. The outputs of U5 are approximately +3V when a band is valid and approximately -22V otherwise. These signals are used to drive FET switches on the A6A11 Slope Generator and the A6A12 YTX Driver.

Preselector Peak (B)

A second latch, U10, receives the same six lines as U9, but receives a different strobe, LCK5. This strobe is valid when the six lines have preselector peaking information. The outputs of this latch drive six bits of a DAC which produces 0 to 10V at the output of U4B. This voltage goes to the A6A12 YTX Driver. This circuit is used to adjust the tracking of the YTX in an automatic routine.

Hysteresis, Sample-Hold Control, and Filter Capacitor (D)

U8 is a Quad D-Latch which is used to decode information relating to Hysteresis, Sample and Hold, and Filter Capacitor information. Four lines from the 50-wire Instrument Bus go to the inputs of the latch. The latch is

strobed when these lines have valid RF Module information. The instrument controller is able to connect the filter capacitor across the YTX, and control the Hysteresis and Sample and Hold circuits on the YTX Driver.

Slope Offset (C)

U7 receives the $-0.525\text{V}/\text{GHz}$ signal from the A6A12 YTX Driver, amplifies and offsets it such that a ramp centered about 6V is produced at TP8. Q11 – Q15 and associated circuitry produce the offset for each band.

Slope Breakpoint Generator (E)

The signal at TP8 has a maximum range on Band C (5.8 – 12.5 GHz, second harmonic) of approximately 0 – 12V. This signal is applied to two voltage dividers R36/R37 and R38/R39 which drive the positive inputs to U6A and U6B respectively. The voltage at the inputs to these op amps is clamped by CR5 and CR6 such that U6A sees only the first half of the full band ramp and U6B sees only the second half. In this manner, each full band is divided into two segments with one breakpoint in the center.

Upper Segment Generator (F) and Lower Segment Generator (G)

The outputs of U6 drive variable gain amplifiers as shown in Figure 1:

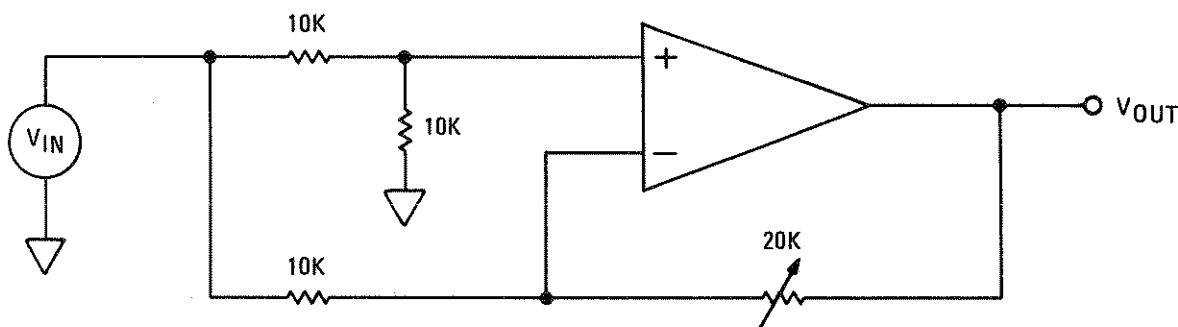


FIGURE 1. VARIABLE GAIN AMPLIFIER, SIMPLIFIED SCHEMATIC

When the 20K potentiometer is set to zero, the amplifier has a gain of $+1/2$; when set to 20K, the gain is $-1/2$; and when set to 10K, the gain is zero. FETs Q1 – Q10 switch in different 20K potentiometers for the five bands. The outputs for the two segments at U2 are summed together in U1. A waveform similar to Figure 2 is present at the output of U2B if a full band is swept (e.g. 5.8 – 12.5 GHz), and the oscilloscope horizontal input is connected to the sweep output of the analyzer. Similarly, the output of U2A will appear as shown in Figure 3.

Slope Output (H)

Both waveforms (Figures 2 and 3) are summed together at U1 to form a current source with Q16 to drive the slope attenuator in the A6A3 Last Converter. The average output current is set by slope gain adjustment R84.

The slope attenuator in the A6A3 Last Converter varies the gain of the 21.4 MHz IF with the collector current of Q16 providing gain correction that varies with frequency. Within each band, there is independent control over two halves of the band, and IF gain that increases or decreases with increasing frequency.

When Band F (external mixer) is selected, Q18 and Q21 provide additional gain to make up for the conversion loss of the external mixer.

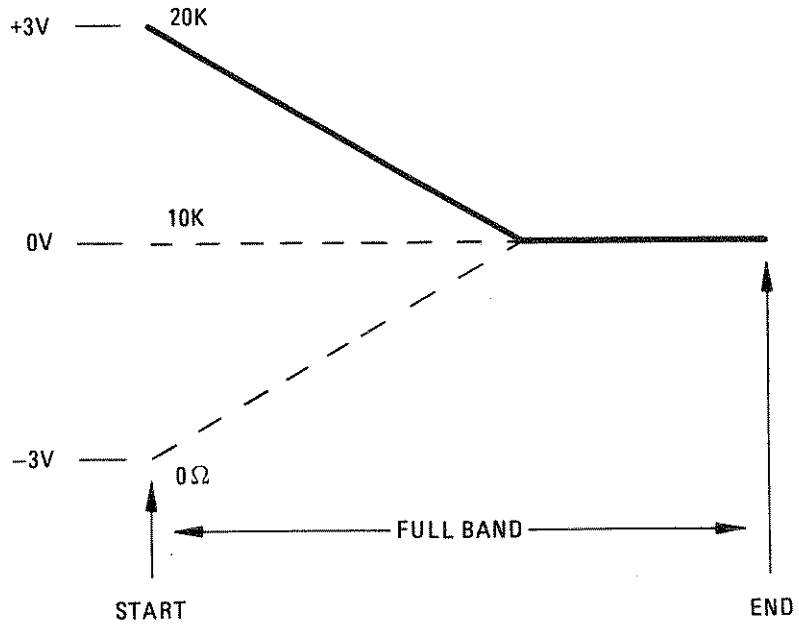


FIGURE 2. U2B OUTPUT WAVEFORM

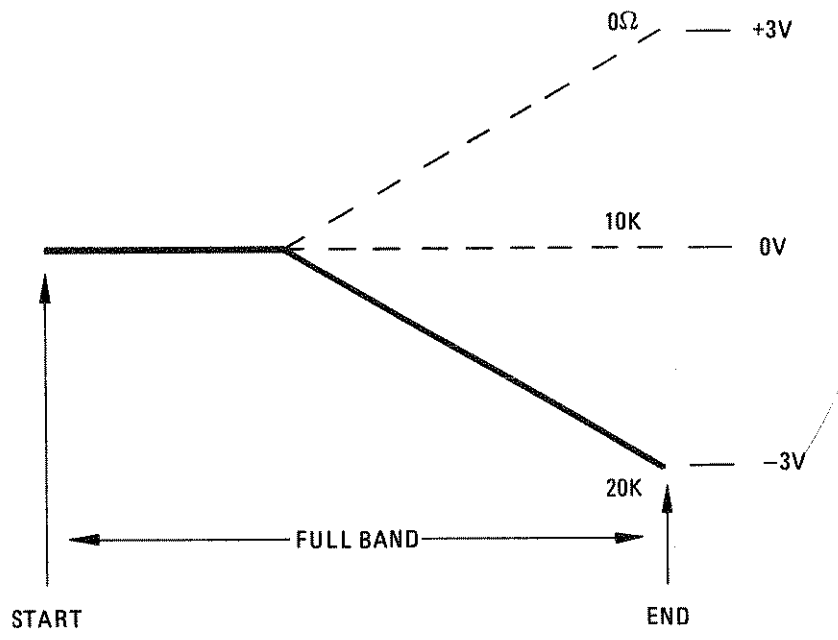


FIGURE 3. U2A OUTPUT WAVEFORM

TABLE 2. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A6A11	85660-60126	9	1	BOARD ASSEMBLY, SLOPE GENERATOR	28480	85660-60126
A6A11C1	0160-0291	3	1	CAPACITOR-FXD 1UF+-10% 35VDC TA	56289	150D185X9035A2
A6A11C2	0160-3877	5	1	CAPACITOR-FXD 108PF +-20% 200VDC CER	28480	0160-3877
A6A11C3	0180-0229	7	1	CAPACITOR-FXD 33UF+-10% 10VDC TA	56289	150D336X9010B2
A6A11C4	0180-0116	1	2	CAPACITOR-FXD 6.0UF+-10% 35VDC TA	56289	150D685X9035B2
A6A11C5	0180-1746	5	1	CAPACITOR-FXD 15UF+-10% 26VDC TA	56289	150D156X9020B2
A6A11C6	0180-0116	1		CAPACITOR-FXD 6.0UF+-10% 35VDC TA	56289	150D685X9035B2
A6A11CR1	1901-1067	4	16	DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A11CR2	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A11CR3	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A11CR4	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A11CR5	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A11CR6	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A11CR7	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A11CR8	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A11CR9	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A11CR10	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A11CR11	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A11CR12	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A11CR13	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A11CR14	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A11CR15	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A11CR16	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A11CR17	1901-0518	8	1	DIODE-SM SIG SCHOTTKY	28480	1901-0518
A6A11Q1	1855-0414	4	10	TRANSISTOR J-FET 2N4393 N-CHAN D-MODE	04713	2N4393
A6A11Q2	1855-0414	4		TRANSISTOR J-FET 2N4393 N-CHAN D-MODE	04713	2N4393
A6A11Q3	1855-0414	4		TRANSISTOR J-FET 2N4393 N-CHAN D-MODE	04713	2N4393
A6A11Q4	1855-0414	4		TRANSISTOR J-FET 2N4393 N-CHAN D-MODE	04713	2N4393
A6A11Q5	1855-0414	4		TRANSISTOR J-FET 2N4393 N-CHAN D-MODE	04713	2N4393
A6A11Q6	1855-0414	4		TRANSISTOR J-FET 2N4393 N-CHAN D-MODE	04713	2N4393
A6A11Q7	1855-0414	4		TRANSISTOR J-FET 2N4393 N-CHAN D-MODE	04713	2N4393
A6A11Q8	1855-0414	4		TRANSISTOR J-FET 2N4393 N-CHAN D-MODE	04713	2N4393
A6A11Q9	1855-0414	4		TRANSISTOR J-FET 2N4393 N-CHAN D-MODE	04713	2N4393
A6A11Q10	1855-0414	4		TRANSISTOR J-FET 2N4393 N-CHAN D-MODE	04713	2N4393
A6A11Q11	1854-0477	7	9	TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A6A11Q12	1854-0477	7		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A6A11Q13	1854-0477	7		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A6A11Q14	1854-0477	7		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A6A11Q15	1854-0477	7		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A6A11Q16	1854-0637	1	1	TRANSISTOR NPN 2N2219A SI TO-5 PD=800MW	01295	2N2219A
A6A11Q17	1853-0281	9	4	TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A6A11Q18	1853-0281	9		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A6A11Q19	1854-0477	7		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A6A11Q20	1854-0477	7		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A6A11Q21	1854-0477	7		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A6A11Q22	1854-0477	7		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A6A11Q23	1853-0281	9		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A6A11Q24	1853-0281	9		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A6A11R1	0757-0440	7	1	RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A6A11R2*	0698-3453	2	1	RESISTOR 196K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1963-F
A6A11R3	0757-0465	6	23	RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6A11R4	0698-3260	9	2	RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A6A11R5	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6A11R6	0757-0199	3	1	RESISTOR 21.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2152-F
A6A11R7	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6A11R8	0757-0290	5	2	RESISTOR 6.19K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-6191-F
A6A11R9	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6A11R10	0698-3150	6	1	RESISTOR 2.37K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2371-F
A6A11R11	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6A11R12	0757-0442	9	20	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A11R13	0757-0123	3	1	RESISTOR 34.0K 1% .125W F TC=0+-100	28480	0757-0123
A6A11R14	0698-0084	9	1	RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A6A11R15	0757-0280	3	8	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6A11R16	0757-1094	9	1	RESISTOR 1.47K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1471-F
A6A11R17	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6A11R18	0757-0414	7	4	RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A6A11R19	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A6A11R20	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A6A11R21	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6A11R22	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6A11R23	0698-3260	9		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A6A11R24				NOT ASSIGNED		
A6A11R35				NOT ASSIGNED		

*Indicates Factory Selected Value

TABLE 2. REPLACEABLE PARTS

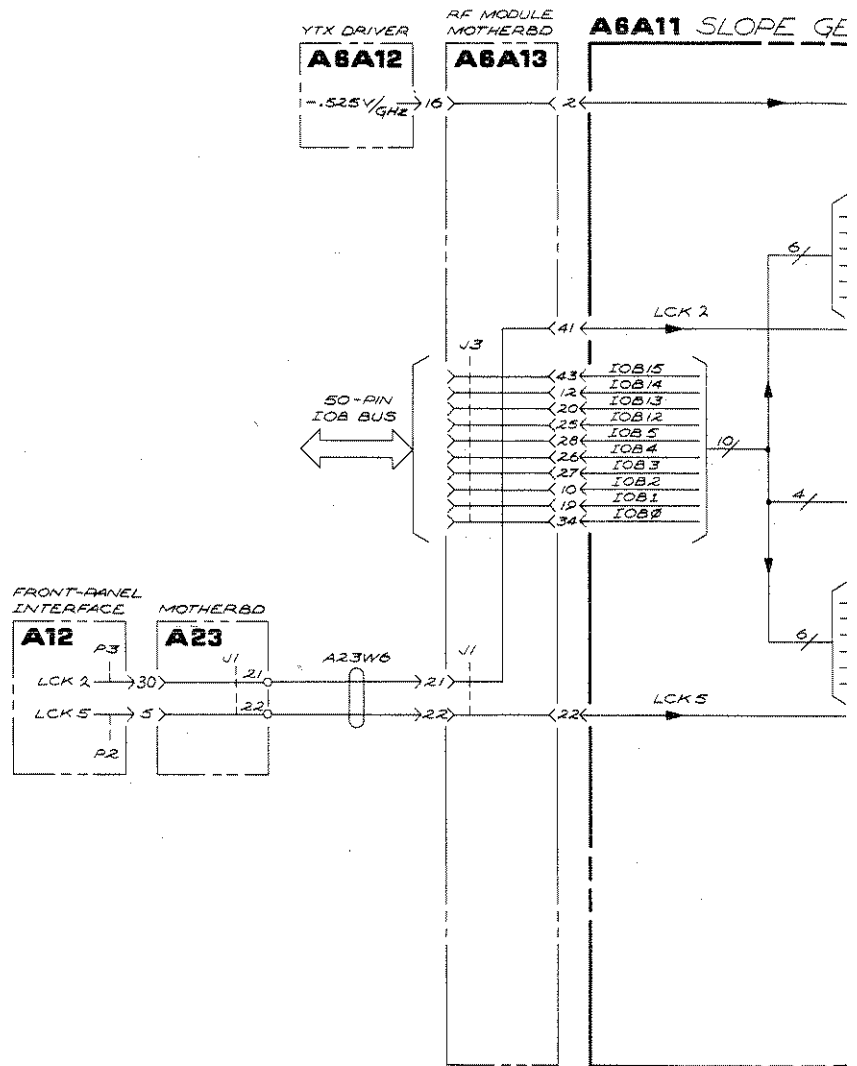
Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A6A11R36	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6A11R37	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6A11R38	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6A11R39	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6A11R40	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A11R41	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A11R42	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A11R43	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A11R44	0698-0085	8	1	RESISTOR 2.61K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2611-F
A6A11R45	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A11R46	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A11R47	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A11R48	2100-3353	8	10	RESISTOR-TRMR 20K 10% C SIDE-ADJ 1-TRN	28480	2100-3353
A6A11R49	0683-3955	8	10	RESISTOR 3.9M 5% .25W FC TC=-900/+1100	01121	CB3955
A6A11R50	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6A11R51	2100-3353	8		RESISTOR-TRMR 20K 10% C SIDE-ADJ 1-TRN	28480	2100-3353
A6A11R52	0683-3955	8		RESISTOR 3.9M 5% .25W FC TC=-900/+1100	01121	CB3955
A6A11R53	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6A11R54	2100-3353	8		RESISTOR-TRMR 20K 10% C SIDE-ADJ 1-TRN	28480	2100-3353
A6A11R55	0683-3955	8		RESISTOR 3.9M 5% .25W FC TC=-900/+1100	01121	CB3955
A6A11R56	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6A11R57	2100-3353	8		RESISTOR-TRMR 20K 10% C SIDE-ADJ 1-TRN	28480	2100-3353
A6A11R58	0683-3955	8		RESISTOR 3.9M 5% .25W FC TC=-900/+1100	01121	CB3955
A6A11R59	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6A11R60	2100-3353	8		RESISTOR-TRMR 20K 10% C SIDE-ADJ 1-TRN	28480	2100-3353
A6A11R61	0683-3955	8		RESISTOR 3.9M 5% .25W FC TC=-900/+1100	01121	CB3955
A6A11R62	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6A11R63	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A11R64	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A11R65	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A11R66	2100-3353	8		RESISTOR-TRMR 20K 10% C SIDE-ADJ 1-TRN	28480	2100-3353
A6A11R67	0683-3955	8		RESISTOR 3.9M 5% .25W FC TC=-900/+1100	01121	CB3955
A6A11R68	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6A11R69	2100-3353	8		RESISTOR-TRMR 20K 10% C SIDE-ADJ 1-TRN	28480	2100-3353
A6A11R70	0683-3955	8		RESISTOR 3.9M 5% .25W FC TC=-900/+1100	01121	CB3955
A6A11R71	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6A11R72	2100-3353	8		RESISTOR-TRMR 20K 10% C SIDE-ADJ 1-TRN	28480	2100-3353
A6A11R73	0683-3955	8		RESISTOR 3.9M 5% .25W FC TC=-900/+1100	01121	CB3955
A6A11R74	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6A11R75	2100-3353	8		RESISTOR-TRMR 20K 10% C SIDE-ADJ 1-TRN	28480	2100-3353
A6A11R76	0683-3955	8		RESISTOR 3.9M 5% .25W FC TC=-900/+1100	01121	CB3955
A6A11R77	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6A11R78	2100-3353	8		RESISTOR-TRMR 20K 10% C SIDE-ADJ 1-TRN	28480	2100-3353
A6A11R79	0683-3955	8		RESISTOR 3.9M 5% .25W FC TC=-900/+1100	01121	CB3955
A6A11R80	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6A11R81	0698-3136	8	2	RESISTOR 17.8K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1782-F
A6A11R82	0698-3136	8		RESISTOR 17.8K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1782-F
A6A11R83	0698-3157	5	1	RESISTOR 26.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2612-F
A6A11R84	2100-3273	1	1	RESISTOR-TRMR 2K 10% C SIDE-ADJ 1-TRN	28480	2100-3273
A6A11R85	0698-3156	2	2	RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A6A11R86	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6A11R87				NOT ASSIGNED		
A6A11R88	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A6A11R89	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A11R90	0757-0438	3	3	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A6A11R91	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A6A11R92	0757-0290	5		RESISTOR 6.19K 1% .125W F TC=0+-100	19781	MF4C1/8-T0-6191-F
A6A11R93	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6A11R94	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6A11R95	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6A11R96	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6A11R97	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6A11R98	0698-3157	3	4	RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A6A11R99	0698-3157	3		RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A6A11R100	0698-3157	3		RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A6A11R101	0698-3157	3		RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A6A11R102	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A11R103	0757-0463	4	1	RESISTOR 82.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8251-F
A6A11R104	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A6A11R105	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A6A11R106	0757-0200	7	1	RESISTOR 5.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5621-F
A6A11R107	0757-0346	2	4	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A6A11R108	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A6A11R109	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A6A11R110	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F

*Indicates Factory Selected Value

TABLE 2. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A6A11R11	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6A11R112				NOT ASSIGNED		
A6A11R113	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6A11R114	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A11R115	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A11R116	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A11R117	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A11R118	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A11R119	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A11R120	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A11TP1	1251-0600	0	8	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A6A11TP2	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A6A11TP3	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A6A11TP4	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A6A11TP5	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A6A11TP6	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A6A11TP7	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A6A11TP8	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A6A11U1	1826-1058	3	2	IC OP AMP GP 8-TO-?? PKG	28480	1826-1058
A6A11U2	5081-8117	3	3	SCREEN 1826-0092	28480	5081-8117
A6A11U3	1820-1281	2	1	IC DCDR TTL LS 2-TO-4-LINE DUAL 2-INP	01295	SN74LS139N
A6A11U4	5081-8117	3		SCREEN 1826-0092	28480	5081-8117
A6A11U5	1826-0161	7	1	IC OP AMP GP QUAD 14-DIP-P PKG	04713	MLM324P
A6A11U6	5081-8117	3		SCREEN 1826-0092	28480	5081-8117
A6A11U7	1826-1058	3		IC OP AMP GP 8-TO-?? PKG	28480	1826-1058
A6A11U8	1820-1195	7	1	IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS175N
A6A11U9	1820-1196	8	2	IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS174N
A6A11U10	1820-1196	8		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS174N
A6A11U11	1826-0188	8	1	IC CONV 8-B-D/A 16-DIP-C PKG	04713	MC1408L-B
A6A11VR1	1902-0625	0	1	DIODE-ZNR 1N829 6.2V 5% DO-7 PD=.25W	04713	1N829
A6A11VR2	1902-0041	4	1	DIODE-ZNR 5.11V 5% DO-35 PD=.4W	28480	1902-0041
A6A11VR3	1902-3203	6	1	DIODE-ZNR 14.7V 5% DO-35 PD=.4W	28480	1902-3203
A6A11VR4	1902-0025	4	1	DIODE-ZNR 18V 5% DO-35 PD=.4W TC=+.06%	28480	1902-0025
				MISCELLANEOUS PARTS		
	4040-0749	4	2	EXTR PC BD BRN	28480	4040-0749

*Indicates Factory Selected Value



A6A11
SLOPE GENERATOR
85660-60126

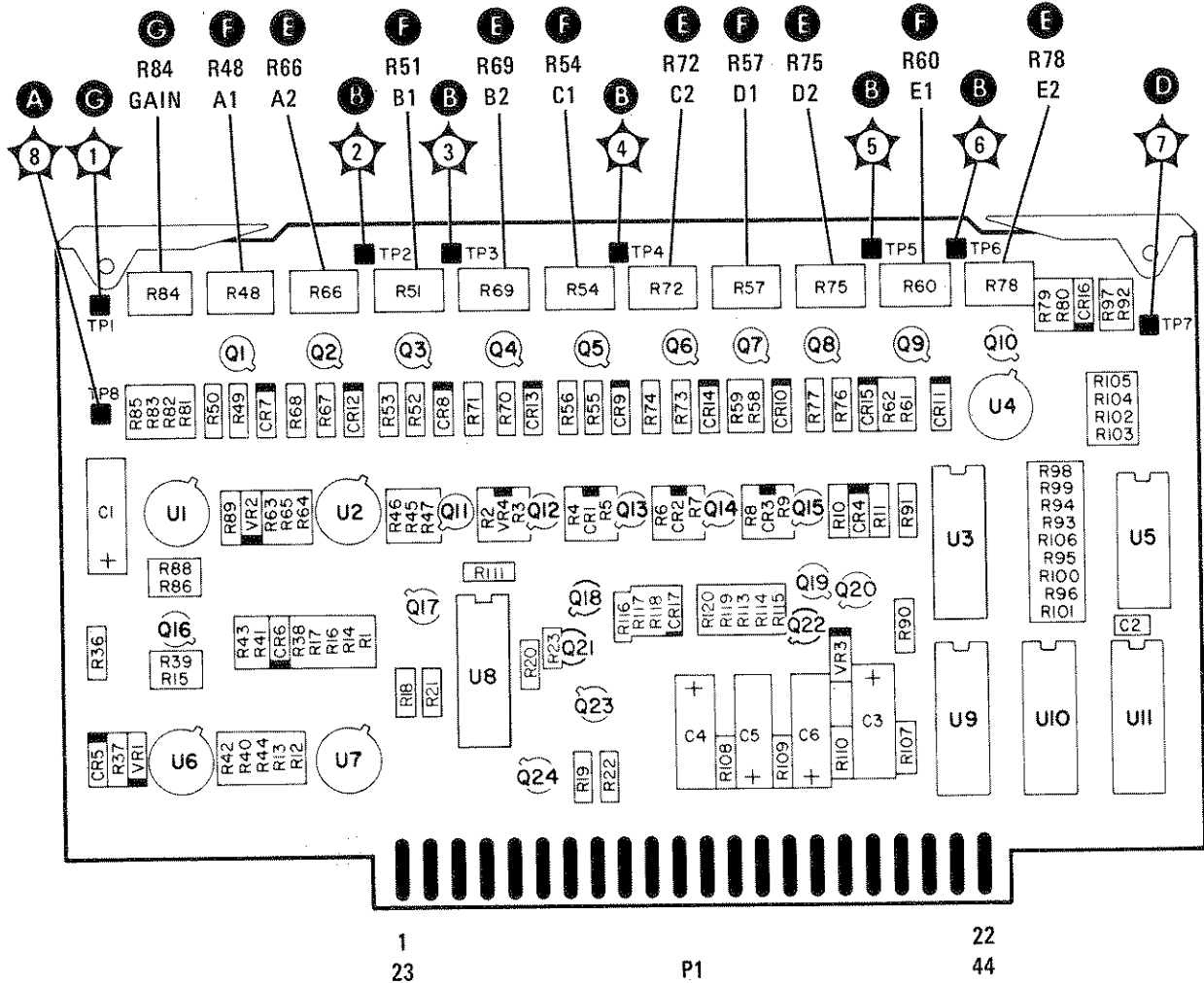
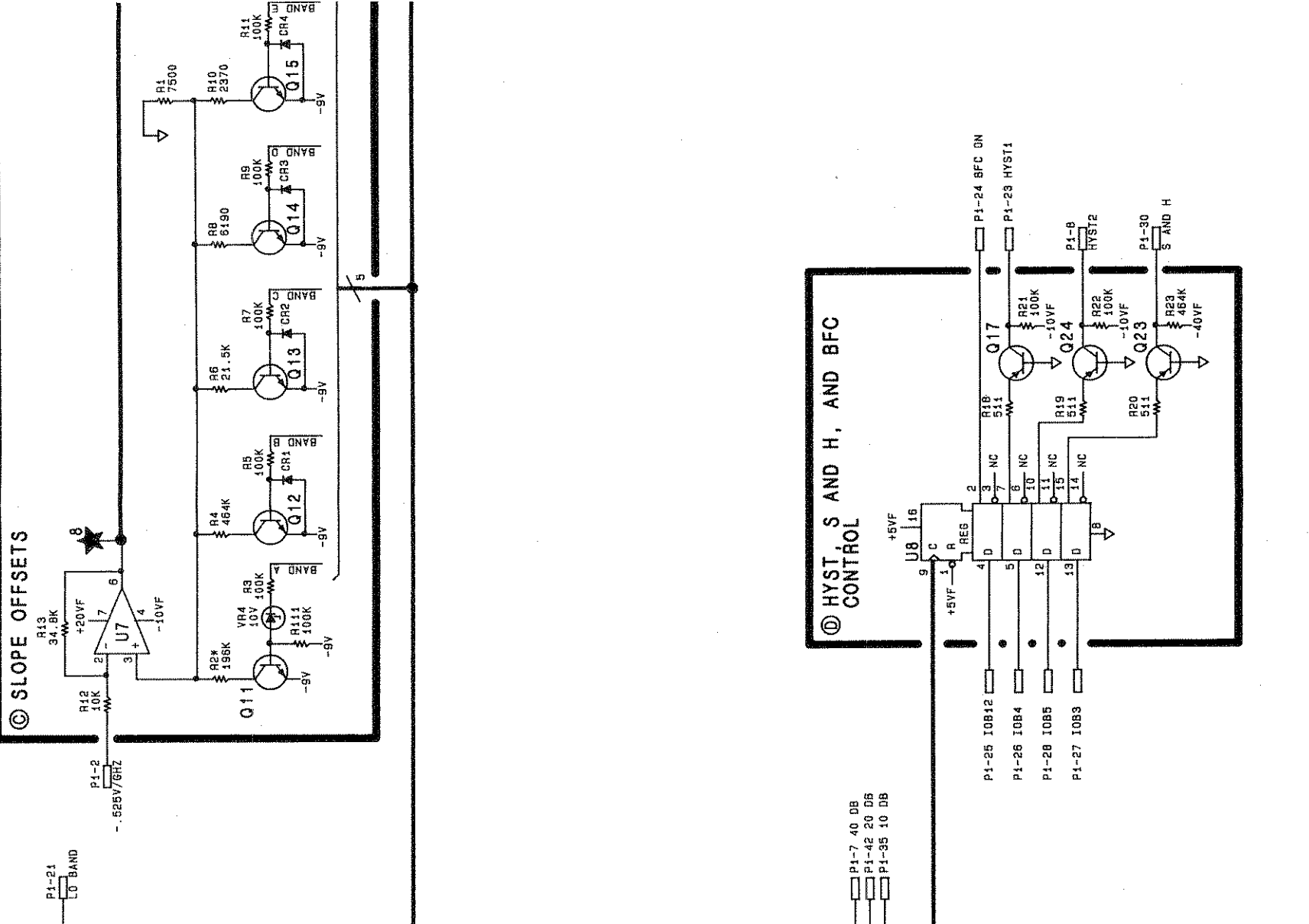
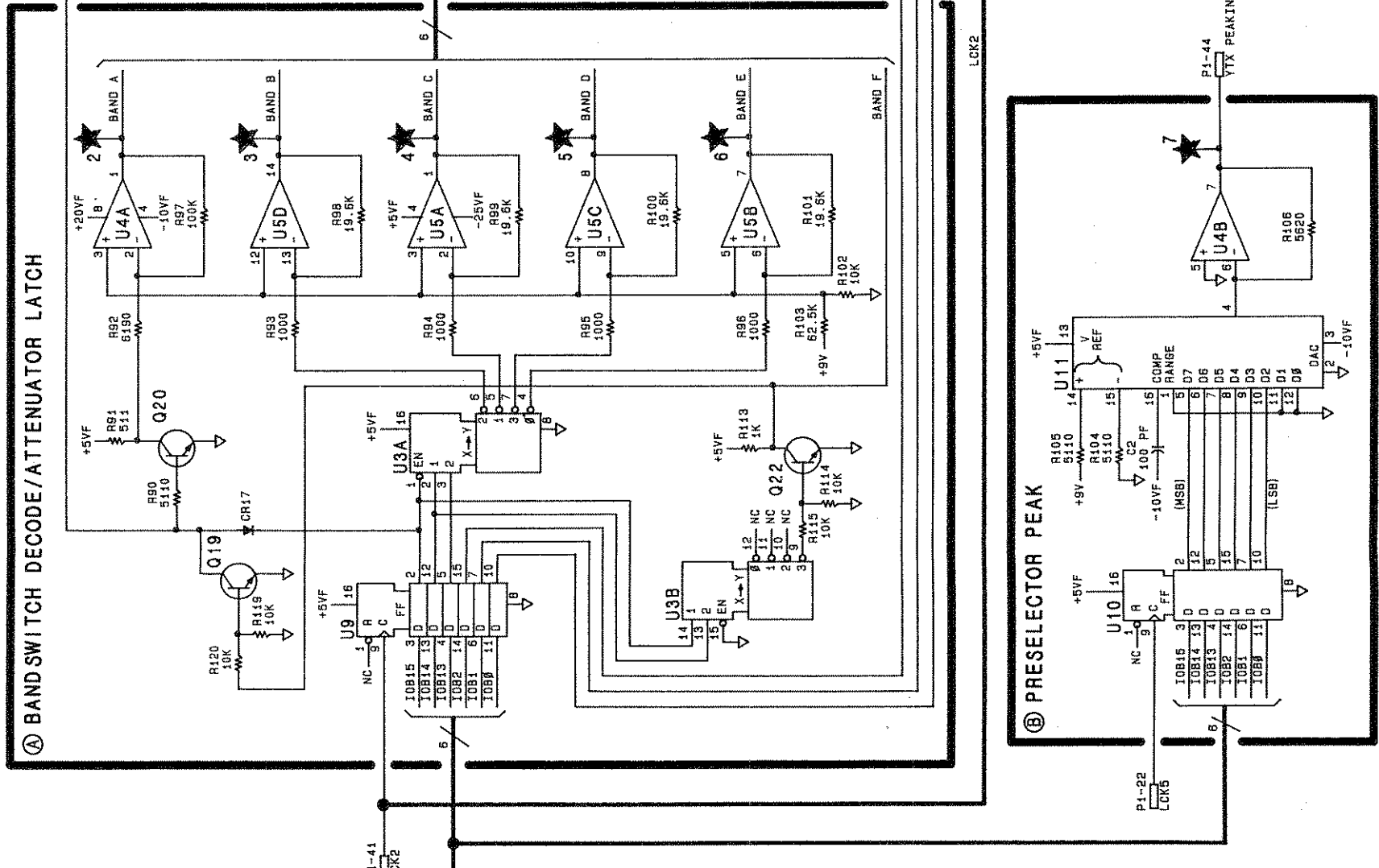


FIGURE 5. A6A11 SLOPE GENERATOR, COMPONENT LOCATIONS

6A11 SLOPE GENERATOR
5660-60126

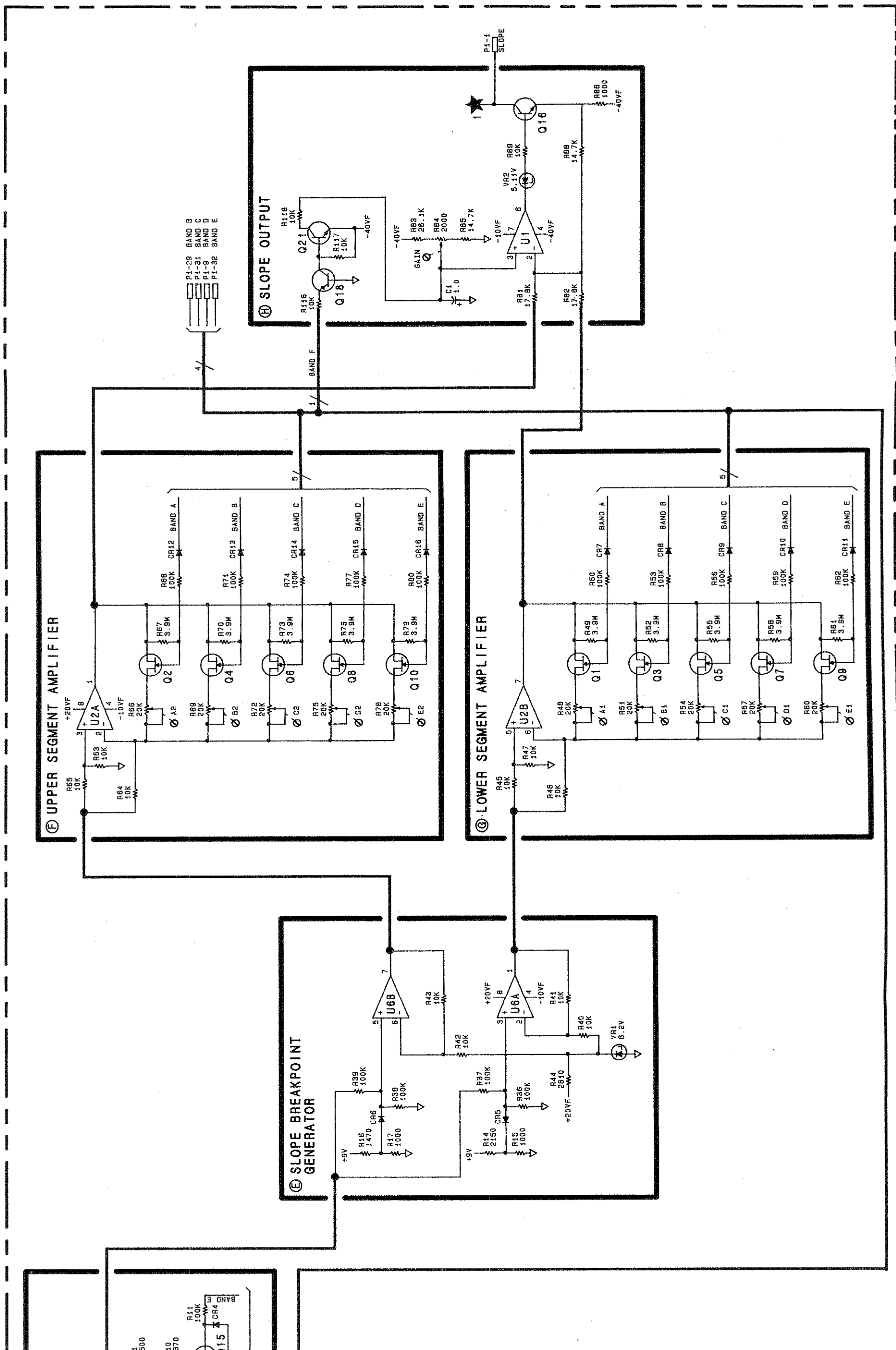
SIGNAL	TO/FROM	FUNCTION BLOCK
OPE	6A3P1-25	H
ST1	6A12P1-27	D
E25V/6HZ	6A12P1-16	C
C DN	6A7J2-11	D
B12	IOC BUS	D
B4	IOC BUS	D
B3	IOC BUS	D
B5	IOC BUS	D
DB	6A10P1-11	A
DB	6A12P1-17	A
DB	6A10P1-31	A
ST2	6A12P1-12	D
AND H	6A12P1-28	D
ND D	6A12P1-18	A
ND D	6A10P1-32	A
ND C	6A12P1-2	A
ND C	6A10P1-9	A
B2	IOC BUS	A
ND E	6A12P1-3	A
ND E	6A10P1-10	A
V	6A12P1-4	I
V	6A12P1-19	I
B14	IOC BUS	A
B9	IOC BUS	A
DB	6A10P1-13	A
0V		I
0V		I
0V		I
0V		I
.2V		I
.2V		I
B1	IOC BUS	A
K2	A12P3-30	A
B13	IOC BUS	A
DB	6A10P1-12	A
BAND	6A10P1-34	A
B15	IOC BUS	A
K5	A12P2-5	A
X PEAKING	6A12P1-20	B



NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATION PREFIX ABBREVIATION WITH ASSEMBLY DESIGNATION.
2. UNLESS OTHERWISE INDICATED, RESISTANCE IS IN OHMS (Ω), CAPACITANCE IS IN MICROFARADS (μF) AND INDUCTANCE IS IN MICROHENRIES (μH).
3. UNLESS OTHERWISE INDICATED, SYMBOLS ENTERED LEFT SIDE AND EXIT AT RIGHT SIDE OF FUNCTION BLOCKS.
4. MNEMONIC TABLE:

MNEMONIC	DESCRIPTION
BFC ON	FILTER CAPACITOR ENABLE
I09B-15	INSTRUMENT BUS DATA BITS 0 THRU 15
LCK2	LOW-CLOCK2
LCK5	LOW-CLOCK5
L1DA15	INSTRUCTION DATA AND ADDRESS BUS BIT 15



A6A11

FIGURE 6. A6A11 SLOPE GENERATOR, SCHEMATIC DIAGRAM
A6A11 11/12

A6A12 YIG-TUNED MIXER (YTX) DRIVER, CIRCUIT DESCRIPTION

The YTX Driver receives a voltage proportional to the instrument LO frequency and produces a signal to control current in the YTX coil.

Input Differential Amplifier (A)

This input signal to the YTX Driver comes from the A19 DAC and is $-3\text{V}/\text{GHz}$. For example, as the LO sweeps from 2–6 GHz, this input signal sweeps from -6 to -18V . It is buffered by differential amplifier U1A, and appears at TP1.

Bandswitch (C)

The frequency that the YTX is tuned to must be made to follow the first, second, third, or fourth harmonic of the LO frequency, depending on the frequency band in which the instrument is operating. This is done by attenuating the buffered input signal with a voltage divider as shown in Figure 1.

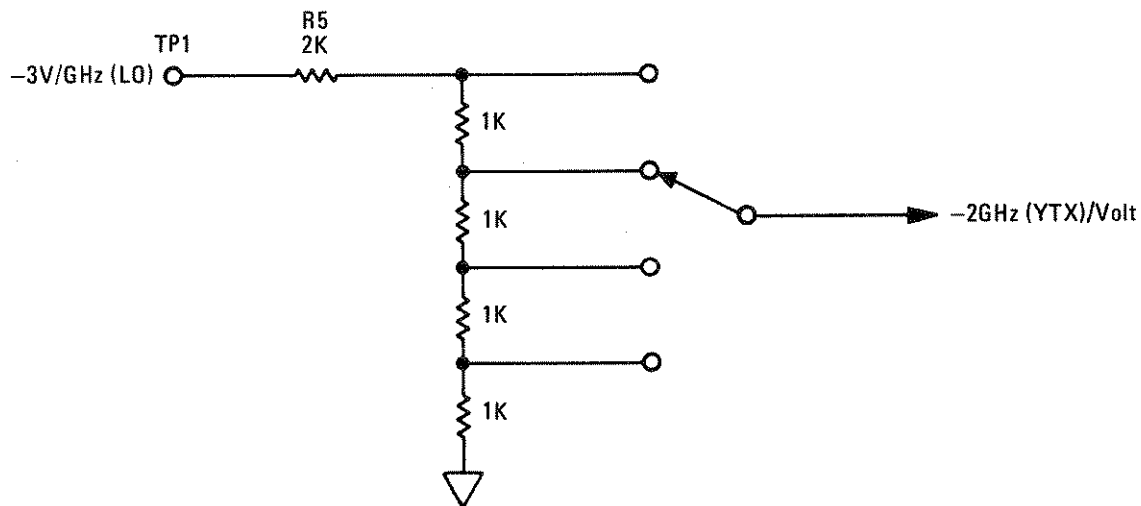


FIGURE 1. VOLTAGE DIVIDER

The position on the attenuator is determined by the harmonic number in use. The bandswitching is done with FET Q1, Q2, Q3, and Q12. The bandswitch information used to turn on the FETs comes from A6A11 Slope Generator. R6 and R11–R14 form a second voltage divider used as a gate return through R15–R18. This prevents current through bandswitch diodes and resistors (e.g. R19 and CR1) when the associated FET is switched off from affecting the bandswitch voltage divider R5 and R7–R10.

Sample and Hold (E)

The output of the bandswitch drives preamp U5. U5 and U1B together form an op amp with U5 a low-noise, low-temperature drift preamplifier. U5, U1B, and U6 are used in a sample and hold circuit as shown in Figure 2.

Q15, a JFET, is used as the switch for the sample and hold. The switch is opened (i.e., the FET is turned off) whenever a bandcrossing occurs. When a bandcrossing occurs, the input voltage at J1 changes as the LO resets its frequency to start a new band, and the YTX bandswitch changes bands. At this time, the voltage at the input of U5 varies. The sample and hold circuit is used to prevent these variations from reaching the YTX. The sample and hold switch is controlled through Q14 by a signal from the A6A11 Slope Generator. R44, R45, CR10, and CR11 keep the output of U1B from saturating when the feedback loop is opened by Q15 being off. This prevents a “glitch” at the output of U6 when the loop closes if U1B suddenly had to recover from a saturated condition.

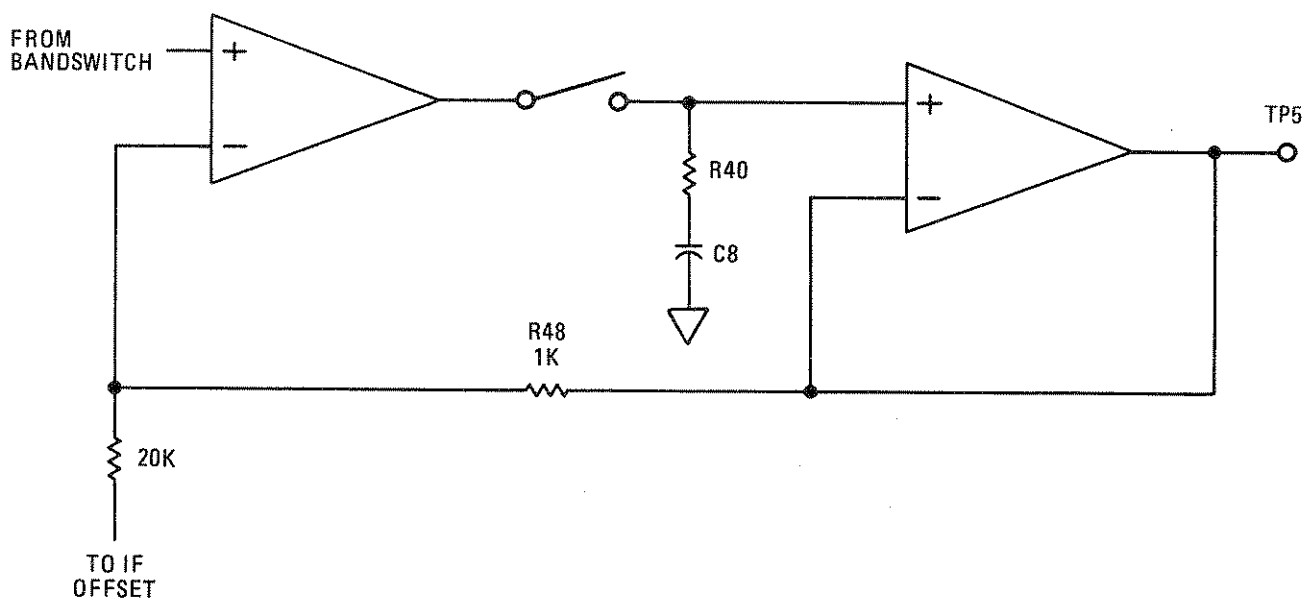


FIGURE 2. SAMPLE AND HOLD, SIMPLIFIED SCHEMATIC

IF Offsets (F)

In addition to tracking a harmonic of the LO, the YTX must be offset from this LO harmonic by the first IF (321.4 MHz). This is done by U7A and its associated components. Q7–Q10 switch in different IF offset adjustments for each band. The YTX peaking signal from A6A11 Slope Generator is also summed into U7A through R77.

Sweep + Tune (H)

Since the U5, U1B, and U6 combination have a gain of 1.05 set by R48 and R75, the voltage at TP5 has a sensitivity of $-0.525\text{V}/\text{GHz}$ (YTX). This signal goes to the A6A11 Slope Generator, to voltage divider R54 and R55, and to U8. U8 is set to give $-1\text{V}/\text{GHz}$ (YTX) at its output which goes to J2. This signal is cabled to the rear panel of the instrument to provide an analog voltage proportional to input frequency. U2A and its associated circuitry provide an offset voltage for U8 to correct for the LO offset in the 0–2.5 GHz band. R98 is adjusted for 0V at J2 with the analyzer tuned to 0 Hz.

YTX Drive Output (G)

Voltage divider R54 and R55 drive the output stage shown in Figure 3.

R_s and the output transistor are on A6A7 YTX Current Driver. The YTX has a nominal coil sensitivity of 75 MHz/mA. R63 and R66 provide the means for compensating for variations among YTXs. When the YTX center frequency is tuned to 5.8 GHz, the voltage at pin 3 of U3 is +1.52V. There is no voltage across R66 so it has no effect. R63 is adjusted for tracking at 5.8 GHz and R66 is adjusted at 2 GHz. U4A and voltage divider R68 and R69 provide the +1.52V source.

The YTX magnet exhibits hysteresis which must be corrected for. This is done by signals from the A6A11 Slope Generator which is controlled by the instrument controller. Q18 is turned on for a short period of time to correct for hysteresis in narrow spans (<1 GHz); Q18 and Q19 are both turned on for a short period of time in large spans and when making large downward steps in frequency. The length of time that the transistors are on and the length of time after they are off before the sweep starts is controlled by the instrument controller and varies with start frequency, span, previous stop frequency, etc.

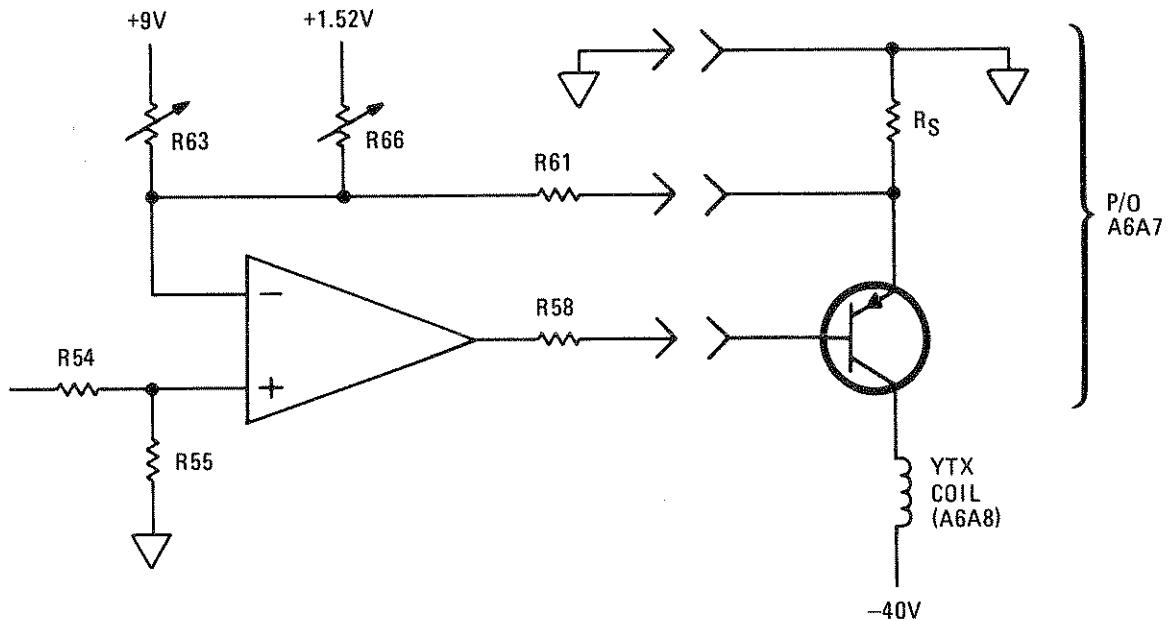


FIGURE 3. OUTPUT AMPLIFIER, SIMPLIFIED SCHEMATIC

Delay Compensation (B)

The YTX and YTO (LO) are electromagnetically tuned devices. As such, they both exhibit a delay in their response to changes in magnet current. When a change in coil current occurs, there is a delay before the corresponding change in frequency occurs. When a ramp of current is applied to a YTX or YTO magnet coil, there is a time delay between the ramp current and the corresponding frequency. Since the YTX and YTO have different magnet structures, they exhibit different amounts of delay. This causes tracking problems. These problems are compounded by harmonic mixing.

On the fourth harmonic, the YTO is sweeping 1/4 as much in frequency as the YTX. Thus the YTO exhibits its least delay with respect to the YTX. R24, R25, C1, C2, C11, and C23 are used to "speed up" the YTX to track the YTO on fourth harmonic. On lower harmonics, the YTO exhibits more delay compared to the YTX since it must now sweep further. The YTX is then delayed to match the YTO under these conditions by R26 and C3.

Since these RC combinations have long time constants, they cannot readily respond to the transients produced at band crossings and scan resets. Therefore, whenever the sample and hold circuit is holding, R24 – R26 are shorted by Q4 – Q6 respectively.

+9V and -9V Reference Supplies (D)

U2B and U7B and their associated circuitry form -9V and +9V reference supplies used in the YTX Driver, and elsewhere in the A6 RF Module.

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A6A12	65660-60013	3	1	BOARD ASSEMBLY, YIG-TUNED MIXER (YTX) DRIVER	28480	65660-60013
A6A12C1*	0180-2285	3	1	CAPACITOR-FXD .33UF+-10% 35VDC TA	56289	150D334X9035A2
A6A12C2*	0180-0218	4	1	CAPACITOR-FXD .15UF+-10% 35VDC TA	56289	150D154X9035A2
A6A12C3*	0180-0373	2	1	CAPACITOR-FXD .68UF+-10% 35VDC TA	56289	150D684X9035A2
A6A12C4	0160-0571	8	4	CAPACITOR-FXD 470PF +-20% 100VDC CER	28480	0160-0571
A6A12C5	0160-0571	8	4	CAPACITOR-FXD 470PF +-20% 100VDC CER	28480	0160-0571
A6A12C6	0180-0197	0	3	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A6A12C7	0160-3097	1	4	CAPACITOR-FXD .47UF +00-20% 50VDC CER	28480	5033E50RD474Z
A6A12C8	0160-3097	7	1	CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3097
A6A12C9	0160-3097	1	1	CAPACITOR-FXD .47UF +00-20% 50VDC CER	28480	5033E50RD474Z
A6A12C10	0180-0197	8	4	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A6A12C11*	0180-1735	2	1	CAPACITOR-FXD .22UF+-10% 35VDC TA	56289	150D224X9035A2
A6A12C12	0160-0571	8	4	CAPACITOR-FXD 470PF +-20% 100VDC CER	28480	0160-0571
A6A12C13	0160-0571	0	4	CAPACITOR-FXD 470PF +-20% 100VDC CER	28480	0160-0571
A6A12C14	0180-0197	8	4	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A6A12C15	0160-3097	1	4	CAPACITOR-FXD .47UF +00-20% 50VDC CER	28480	5033E50RD474Z
A6A12C16	0160-4084	8	1	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A6A12C17	0160-3097	1	4	CAPACITOR-FXD .47UF +00-20% 50VDC CER	28480	5033E50RD474Z
A6A12C18	0100-0229	7	2	CAPACITOR-FXD 33UF+-10% 10VDC TA	56289	150D336X9010B2
A6A12C19	0180-0116	1	2	CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A6A12C20	0180-1746	5	1	CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A6A12C21	0180-0116	1	2	CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A6A12C22	0180-0229	7	2	CAPACITOR-FXD 33UF+-10% 10VDC TA	56289	150D336X9010B2
A6A12C23*	0180-0376	5	1	CAPACITOR-FXD .47UF+-10% 35VDC TA	56289	150D474X9035A2
A6A12CR1	1901-1067	4	17	DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A12CR2	1901-1067	4	17	DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A12CR3	1901-1067	4	17	DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A12CR4	1901-1067	4	17	DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A12CR5	1901-1067	4	17	DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A12CR6	1901-1067	4	17	DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A12CR7	1901-1067	4	17	DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A12CR8	1901-1067	4	17	DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A12CR9	1901-1067	4	17	DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A12CR10	1901-1067	4	17	DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A12CR11	1901-1067	4	17	DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A12CR12	1901-1067	4	17	DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A12CR13	1901-1067	4	17	DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A12CR14	1901-1067	4	17	DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A12CR15	1901-1067	4	17	DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A12CR16	1901-1067	4	17	DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A12CR17	1901-1067	4	17	DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A12CR18	1901-1067	4	17	DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A12J1	1250-0543	8	2	CONNECTOR-RF SM-SNP M PC 50-OHM	28480	1250-0543
A6A12J2	1250-0543	8	2	CONNECTOR-RF SM-SNP M PC 50-OHM	28480	1250-0543
A6A12Q1	1855-0414	4	8	TRANSISTOR J-FET 2N4393 N-CHAN D-MODE	04713	2N4393
A6A12Q2	1855-0414	4	8	TRANSISTOR J-FET 2N4393 N-CHAN D-MODE	04713	2N4393
A6A12Q3	1855-0414	4	8	TRANSISTOR J-FET 2N4393 N-CHAN D-MODE	04713	2N4393
A6A12Q4	1855-0420	2	4	TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A6A12Q5	1855-0420	2	4	TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A6A12Q6	1855-0420	2	4	TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A6A12Q7	1855-0414	4	8	TRANSISTOR J-FET 2N4393 N-CHAN D-MODE	04713	2N4393
A6A12Q8	1855-0414	4	8	TRANSISTOR J-FET 2N4393 N-CHAN D-MODE	04713	2N4393
A6A12Q9	1855-0414	4	8	TRANSISTOR J-FET 2N4393 N-CHAN D-MODE	04713	2N4393
A6A12Q10	1855-0414	4	8	TRANSISTOR J-FET 2N4393 N-CHAN D-MODE	04713	2N4393
A6A12Q11	1853-0201	9	1	TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A6A12Q12	1855-0414	4	8	TRANSISTOR J-FET 2N4393 N-CHAN D-MODE	04713	2N4393
A6A12Q13	1854-0357	4	2	TRANSISTOR NPN 2N2432A SI TO-18 PD=300MW	01295	2N2432A
A6A12Q14	1854-0357	4	2	TRANSISTOR NPN 2N2432A SI TO-18 PD=300MW	01295	2N2432A
A6A12Q15	1855-0420	2	4	TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A6A12Q16	1854-0637	1	1	TRANSISTOR NPN 2N2217A SI TO-5 PD=600MW	01295	2N2217A
A6A12Q17	1853-0322	9	1	TRANSISTOR PNP 2N2946A SI TO-46 PD=400MW	01295	2N2946A
A6A12Q18	1854-0477	7	2	TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A6A12Q19	1854-0477	7	2	TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A6A12R1	0698-8067	4	6	RESISTOR 5K .01% .15W F TC=0+-1	28480	0698-8067
A6A12R2	0698-8067	4	6	RESISTOR 5K .01% .15W F TC=0+-1	28480	0698-8067
A6A12R3	0698-8067	4	6	RESISTOR 5K .01% .15W F TC=0+-1	28480	0698-8067
A6A12R4	0698-8067	4	6	RESISTOR 5K .01% .15W F TC=0+-1	28480	0698-8067
A6A12R5	0699-0153	5	1	RESISTOR 2K .1% .225W F TC=0+-1	28480	0699-0153
A6A12R6	0698-8067	4	6	RESISTOR 5K .01% .15W F TC=0+-1	28480	0698-8067
A6A12R7	0698-8067	4	6	RESISTOR 5K .01% .15W F TC=0+-1	28480	0698-8067
A6A12R8	0698-8067	4	6	RESISTOR 5K .01% .15W F TC=0+-1	28480	0698-8067
A6A12R9	0698-8067	4	6	RESISTOR 5K .01% .15W F TC=0+-1	28480	0698-8067
A6A12R10	0698-8067	4	6	RESISTOR 5K .01% .15W F TC=0+-1	28480	0698-8067

*Indicates Factory Selected Value

TABLE 1. REPLACEABLE PARTS

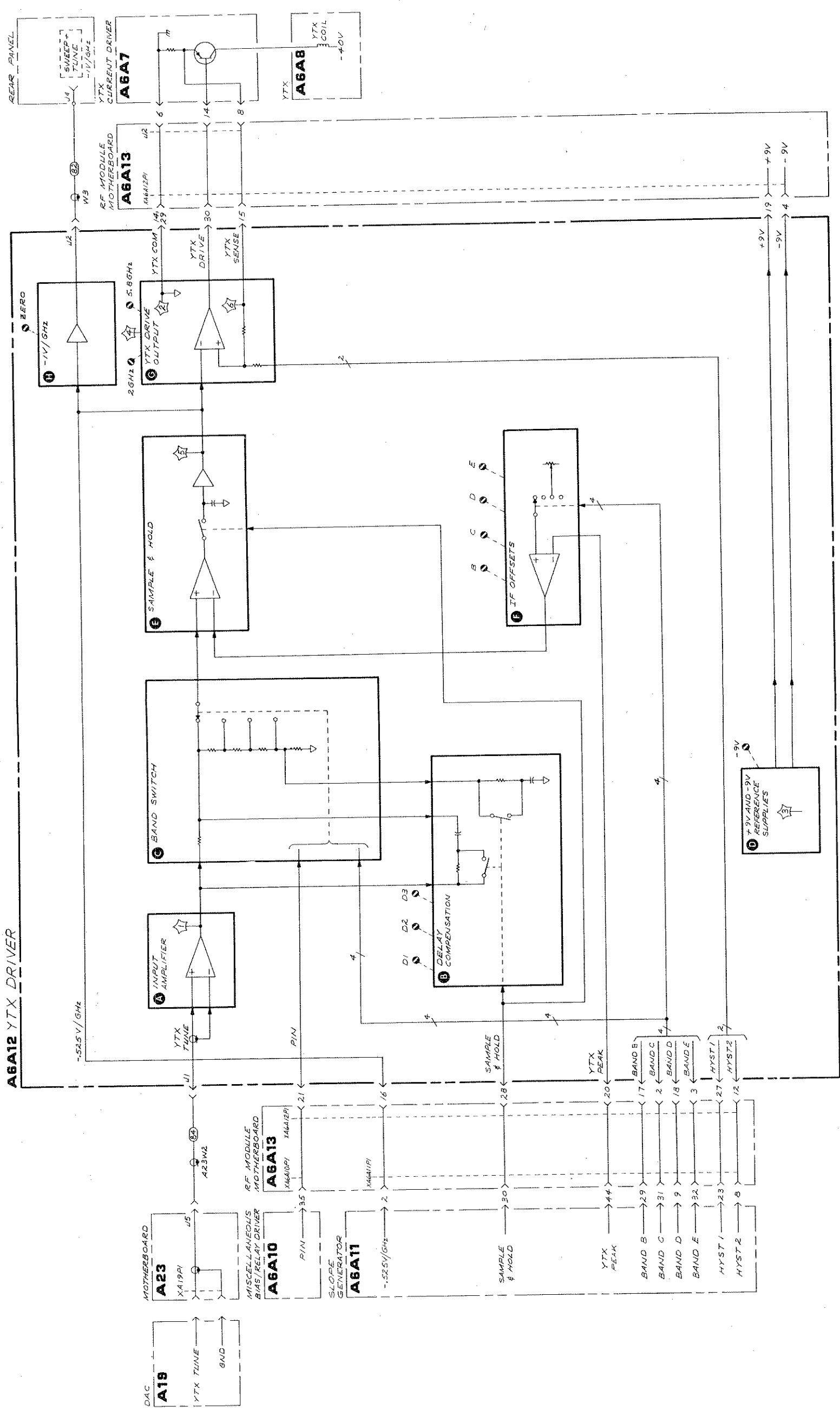
Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A6A12R11	0698-0003	8	6	RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A6A12R12	0698-0003	0		RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A6A12R13	0698-0003	8		RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A6A12R14	0698-0003	8		RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A6A12R15	0698-3453	2		RESISTOR 196K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1963-F
A6A12R16	0698-3453	2	11	RESISTOR 196K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1963-F
A6A12R17	0698-3453	2		RESISTOR 196K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1963-F
A6A12R18	0698-3453	2		RESISTOR 196K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1963-F
A6A12R19	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6A12R20	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6A12R21	0757-0280	3	12	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6A12R22	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6A12R23	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A12R24	2100-3353	8		RESISTOR-TRMR 20K 10% C SIDE-ADJ 1-TRN	20480	2100-3353
A6A12R25	2100-3353	8		RESISTOR-TRMR 20K 10% C SIDE-ADJ 1-TRN	20480	2100-3353
A6A12R26	2100-3357	2	1	RESISTOR-TRMR 500K 10% C SIDE-ADJ 1-TRN	20480	2100-3357
A6A12R27	0698-3453	2		RESISTOR 196K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1963-F
A6A12R28	0698-3453	2		RESISTOR 196K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1963-F
A6A12R29	0698-3453	2		RESISTOR 196K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1963-F
A6A12R30	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6A12R31	0757-0280	3	4	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6A12R32	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6A12R33	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A12R34	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6A12R35	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A12R36	0698-3157	3	4	RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A6A12R37	0698-3157	3		RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A6A12R38	0698-4037	0		RESISTOR 46.4 1% .125W F TC=0+-100	24546	C4-1/8-T0-46R4-F
A6A12R39	0698-4037	0		RESISTOR 46.4 1% .125W F TC=0+-100	24546	C4-1/8-T0-46R4-F
A6A12R40	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A6A12R41	0698-4037	0	6	RESISTOR 46.4 1% .125W F TC=0+-100	24546	C4-1/8-T0-46R4-F
A6A12R42	0698-4037	0		RESISTOR 46.4 1% .125W F TC=0+-100	24546	C4-1/8-T0-46R4-F
A6A12R43	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	20480	0698-8827
A6A12R44	0698-8063	8		RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A6A12R45	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A6A12R46	0757-0465	6	9	RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6A12R47	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A12R48	0698-8625	0		RESISTOR 1K .1% .1W F TC=0+-5	20480	0698-8625
A6A12R49	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A12R50	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6A12R51	0757-0280	3	3	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6A12R52	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A12R53				NOT ASSIGNED		
A6A12R54	0698-7479	0		RESISTOR 10K .1% .225W F TC=0+-1	20480	0698-7479
A6A12R55	0698-7479	0		RESISTOR 10K .1% .225W F TC=0+-1	20480	0698-7479
A6A12R56	0698-3157	3	4	RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A6A12R57	0698-3157	3		RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A6A12R58	0698-0002	7		RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-464-F
A6A12R59	0698-4037	0		RESISTOR 46.4 1% .125W F TC=0+-100	24546	C4-1/8-T0-46R4-F
A6A12R60	0698-4037	0		RESISTOR 46.4 1% .125W F TC=0+-100	24546	C4-1/8-T0-46R4-F
A6A12R61	0698-8625	0	3	RESISTOR 1K .1% .1W F TC=0+-5	20480	0698-8625
A6A12R62	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	20480	0698-8827
A6A12R63	2100-4052	6		RESISTOR-TRMR 20K 5% MF SIDE-ADJ 25-TRN	20480	2100-4052
A6A12R64	0698-7479	0		RESISTOR 10K .1% .225W F TC=0+-1	20480	0698-7479
A6A12R65	0698-8485	0		RESISTOR 6.69K .1% .1W F TC=0+4	20480	0698-8485
A6A12R66	2100-4052	6	3	RESISTOR-TRMR 20K 5% MF SIDE-ADJ 25-TRN	20480	2100-4052
A6A12R67	0698-8625	0		RESISTOR 1K .1% .1W F TC=0+-5	20480	0698-8625
A6A12R68	0698-8485	0		RESISTOR 6.69K .1% .1W F TC=0+4	20480	0698-8485
A6A12R69	0698-6407	2		RESISTOR 32.8K .1% .1W F TC=0+4	20480	0698-6407
A6A12R70	0698-3158	4		RESISTOR 23.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2372-F
A6A12R71	0757-0442	9	1	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A12R72	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A12R73	0698-3151	7		RESISTOR 2.87K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2871-F
A6A12R74	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A12R75	0698-8161	9		RESISTOR 20K 1% .1W F TC=0+-5	20480	0698-8161
A6A12R76	0757-0442	9	4	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A12R77	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6A12R78	0698-3161	9		RESISTOR 30.3K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3032-F
A6A12R79	0698-3161	9		RESISTOR 30.3K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3032-F
A6A12R80	0698-3161	9		RESISTOR 30.3K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3032-F
A6A12R81	0698-3161	9	4	RESISTOR 30.3K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3032-F
A6A12R82	2100-1661	7		RESISTOR-TRMR 20K 5% WW SIDE-ADJ 22-TRN	32977	3057P-1-203
A6A12R83	2100-1661	7		RESISTOR-TRMR 20K 5% WW SIDE-ADJ 22-TRN	32977	3057P-1-203
A6A12R84	2100-1661	7		RESISTOR-TRMR 20K 5% WW SIDE-ADJ 22-TRN	32977	3057P-1-203
A6A12R85	2100-1661	7		RESISTOR-TRMR 20K 5% WW SIDE-ADJ 22-TRN	32977	3057P-1-203

*Indicates Factory Selected Value

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A6A12R86	0698-3453	2		RESISTOR 196K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1963-F
A6A12R87	0698-3453	2		RESISTOR 196K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1963-F
A6A12R88	0698-3453	2		RESISTOR 196K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1963-F
A6A12R89	0698-3453	2		RESISTOR 196K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1963-F
A6A12R90	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6A12R91	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6A12R92	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6A12R93	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6A12R94	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6A12R95	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6A12R96	0698-3156	2	1	RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A6A12R97	0757-0444	1	1	RESISTOR 12.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1212-F
A6A12R98	2100-3390	3	1	RESISTOR-TRMR 1K 10% MF SIDE-ADJ 25-TRN	18612	1202-Y-1K
A6A12R99	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A12R100	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A12R101	0757-0450	7	1	RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A6A12R102	0757-0289	2	1	RESISTOR 13.3K 1% .125W F TC=0+-100	19761	MF4C1/8-T0-1332-F
A6A12R103	0757-0346	2	4	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-1000-F
A6A12R104	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-1000-F
A6A12R105	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-1000-F
A6A12R106	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-1000-F
A6A12R107	0757-0416	7	1	RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A6A12R108	0698-0083	8		RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A6A12R109	0698-7479	0		RESISTOR 10K .1% .125W F TC=0+-1	28480	0698-7479
A6A12R110	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A6A12R111	0757-0438	3	2	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A6A12R112	0698-8485	0		RESISTOR 6.69K 1% .1W F TC=0+4	28480	0698-8485
A6A12R113	2100-4052	6		RESISTOR-TRMR 20K 5% MF SIDE-ADJ 25-TRN	28480	2100-4052
A6A12R114	0698-8067	4		RESISTOR 5K .01% .15W F TC=0+-1	28480	0698-8067
A6A12R115	0698-8067	4		RESISTOR 5K .01% .15W F TC=0+-1	28480	0698-8067
A6A12R116	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A6A12R117	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A6A12R118	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A12TP1	1251-0600	0	6	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A6A12TP2	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A6A12TP3	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A6A12TP4	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A6A12TP5	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A6A12TP6	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A6A12U1	5081-8117	3	4	SCREEN 1826-0092	28480	5081-8117
A6A12U2	5081-8117	3		SCREEN 1826-0092	28480	5081-8117
A6A12U3	1826-0162	8	2	IC PREAMPLIFIER T0-99 PKG	27014	LM321H
A6A12U4	5081-8117	3		SCREEN 1826-0092	28480	5081-8117
A6A12U5	1826-0162	8		IC PREAMPLIFIER T0-99 PKG	27014	LM321H
A6A12U6	1826-0371	1	1	IC OP AMP LOW-BIAS-H-IMPD T0-99 PKG	27014	LF256H
A6A12U7	5081-8117	3		SCREEN 1826-0092	28480	5081-8117
A6A12U8	1826-1058	3	1	IC OP AMP GP 8-T0-99 PKG	28480	1826-1058
A6A12VR1	1902-3203	6	2	DIODE-ZNR 14.7V 5% D0-35 PD=.4W	28480	1902-3203
A6A12VR2				NOT ASSIGNED		
A6A12VR3	1902-0025	4	1	DIODE-ZNR 10V 5% D0-35 PD=.4W TC=+.06%	28480	1902-0025
A6A12VR4	1902-3203	6		DIODE-ZNR 14.7V 5% D0-35 PD=.4W	28480	1902-3203
A6A12VR5	1902-0625	8	1	DIODE-ZNR 1N829 6.2V 5% D0-7 PD=.25W	04713	1N829
				MISCELLANEOUS PARTS		
	4040-0749	4	1	EXTR PC BD BRN	28480	4040-0749
	4040-0750	7	1	EXTR PC BD RED	28480	4040-0750

*Indicates Factory Selected Value



A6A12

FIGURE 4. A6A12 YTX DRIVER, BLOCK DIAGRAM

A6A12
YTX DRIVER
85660-60013

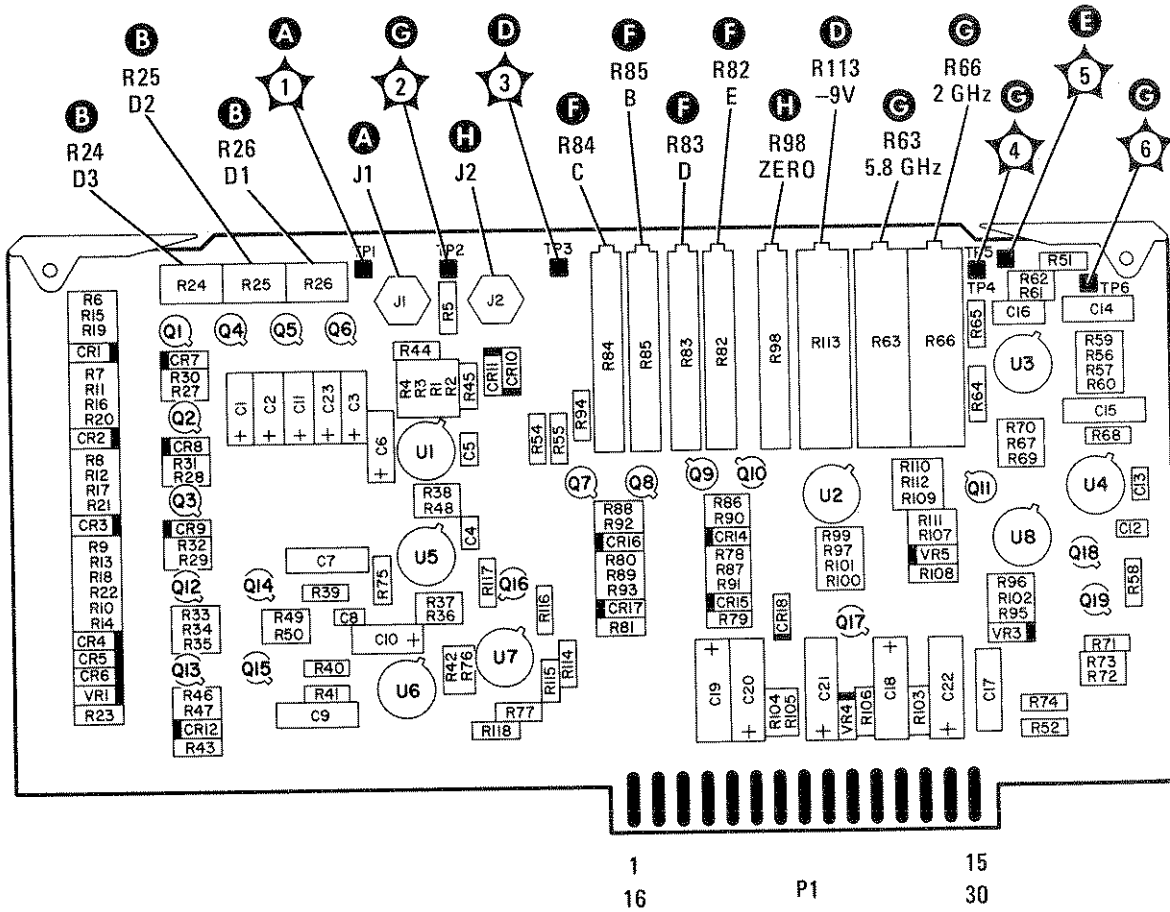
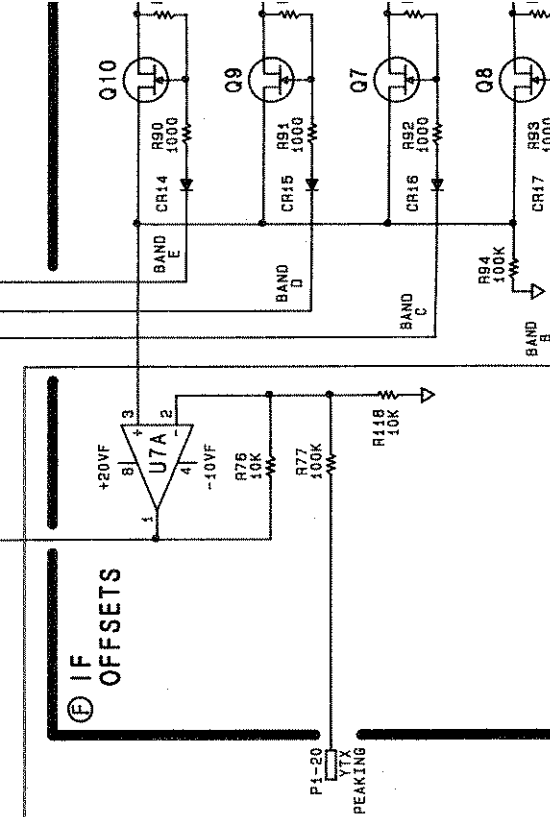
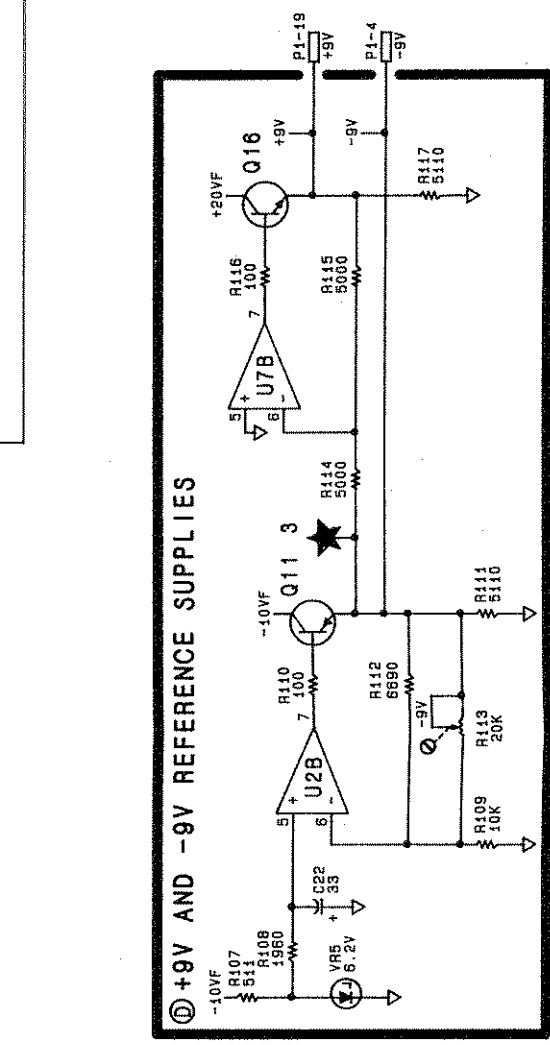
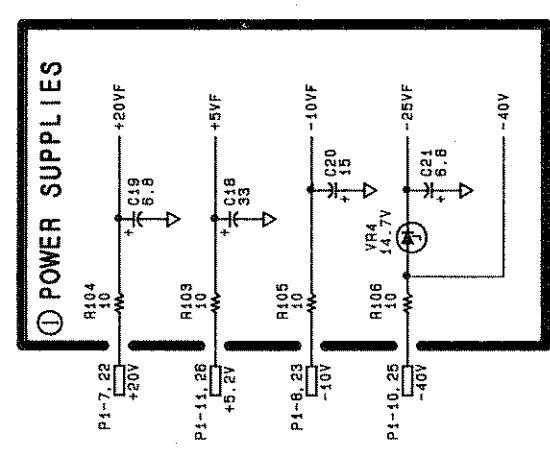
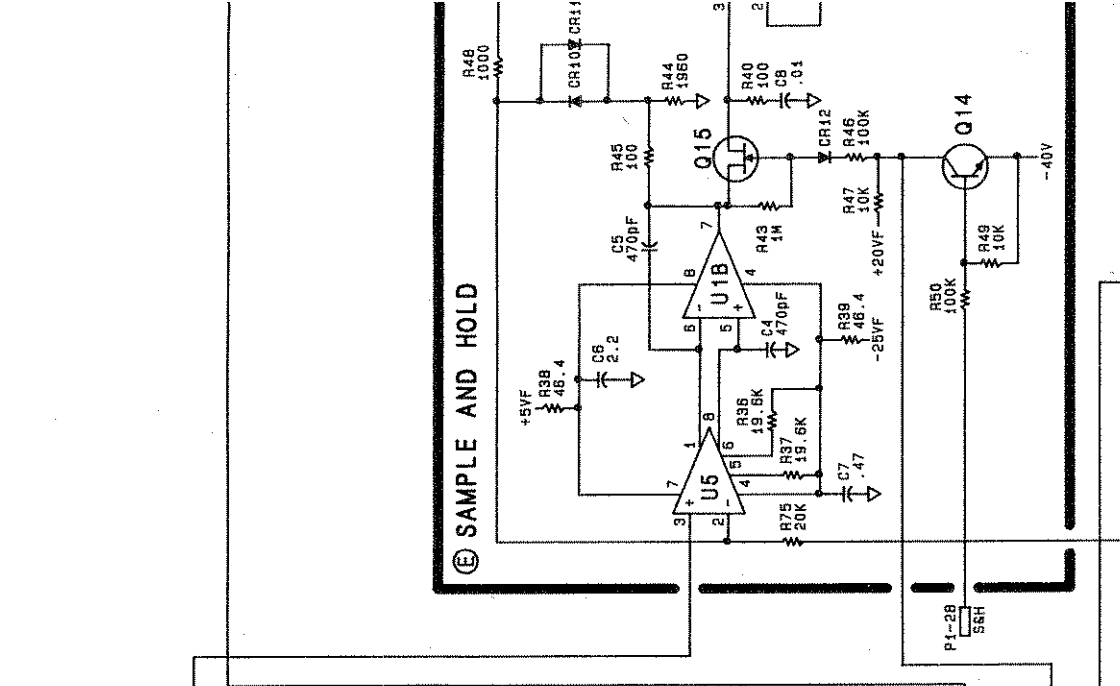
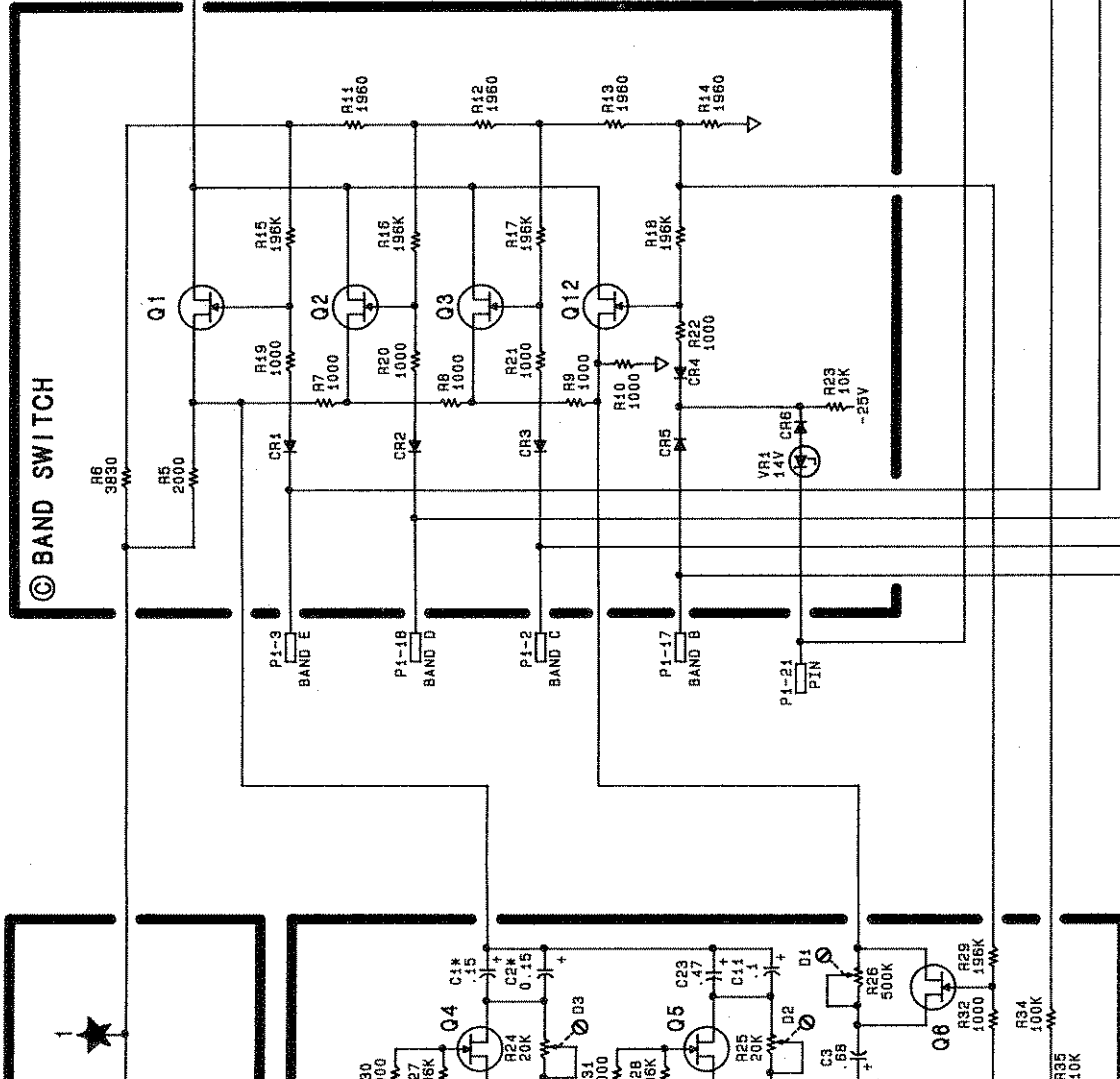
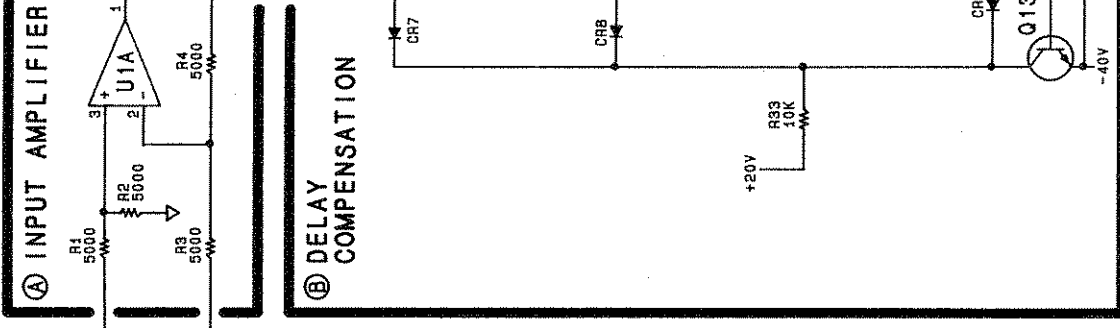


FIGURE 5. A6A12 YTX DRIVER, COMPONENT LOCATIONS

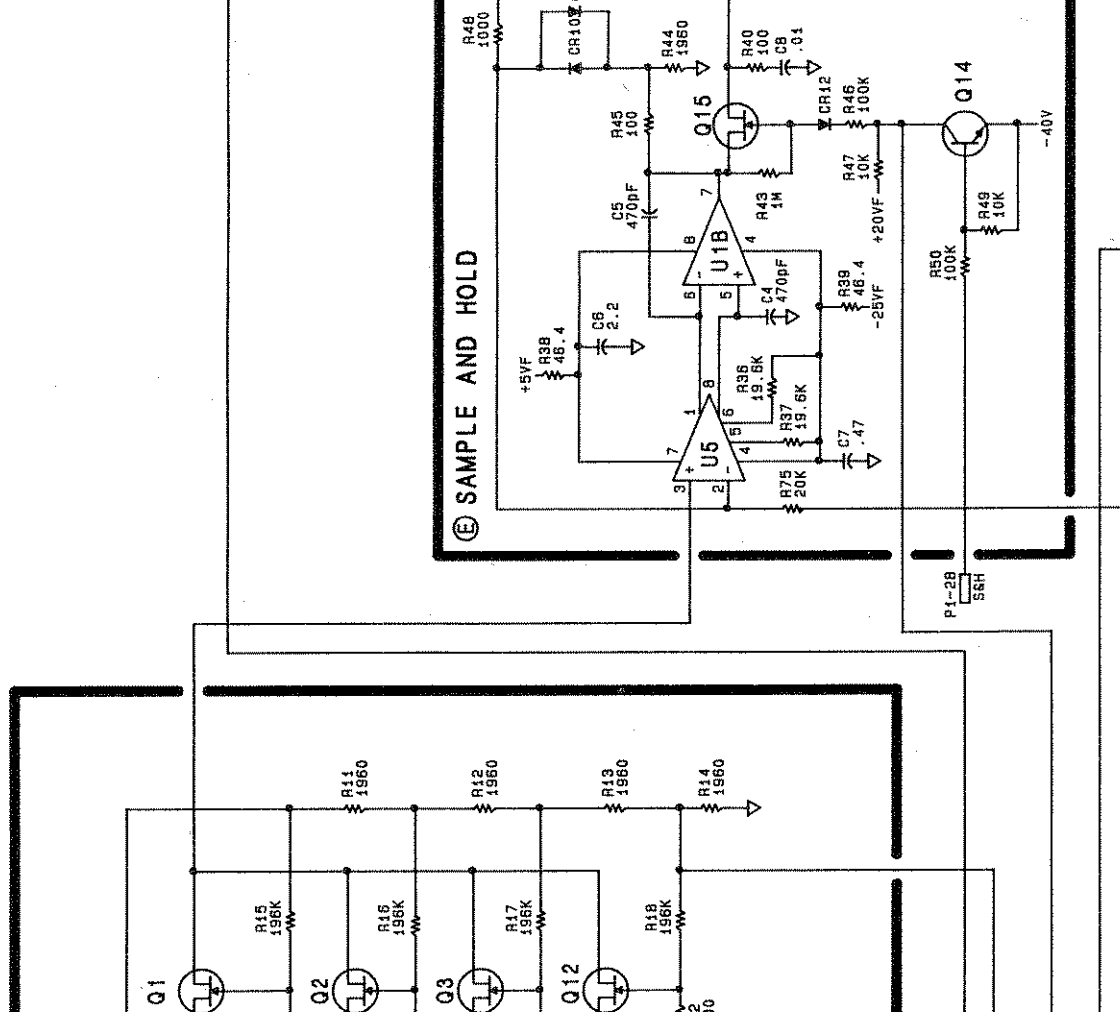
AGA12 YIG-TUNED MIXER (YTX) DRIVER

85660-60013

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	NC		
16	-.525V/RHZ	AGA11P1-2	E
2	BAND C	AGA11P1-31	C
17	BAND B	AGA11P1-29	C
3	BAND E	AGA11P1-32	C
18	BAND D	AGA11P1-9	C
4	-9V	AGA11P1-11 AGA10P1-B AGA9P1-19	D
19	+9V	AGA11P1-33 AGA10P1-33	D
5	NC		
20	YTX PEAKING	AGA11P1-44	F
6	NC		
21	PIN	AGA10P1-35	C
7	+20V		
22	+20V		
8	-10V		
23	-10V		
9	GND		H
24	GND		H
10	-40V		
11	+5.2V		
26	+5.2V		
12	HYST 2	AGA11P1-8	G
27	HYST 1	AGA11P1-23	G
13	NC		
28	58H	AGA11P1-30	E
14	YTX COM	AGA7J2-6	G
29	YTX COM	AGA10P1-22	G
15	YTX SENSE	AGA10P1-21	G
30	YTX DRIVE	AGA7J2-14	G



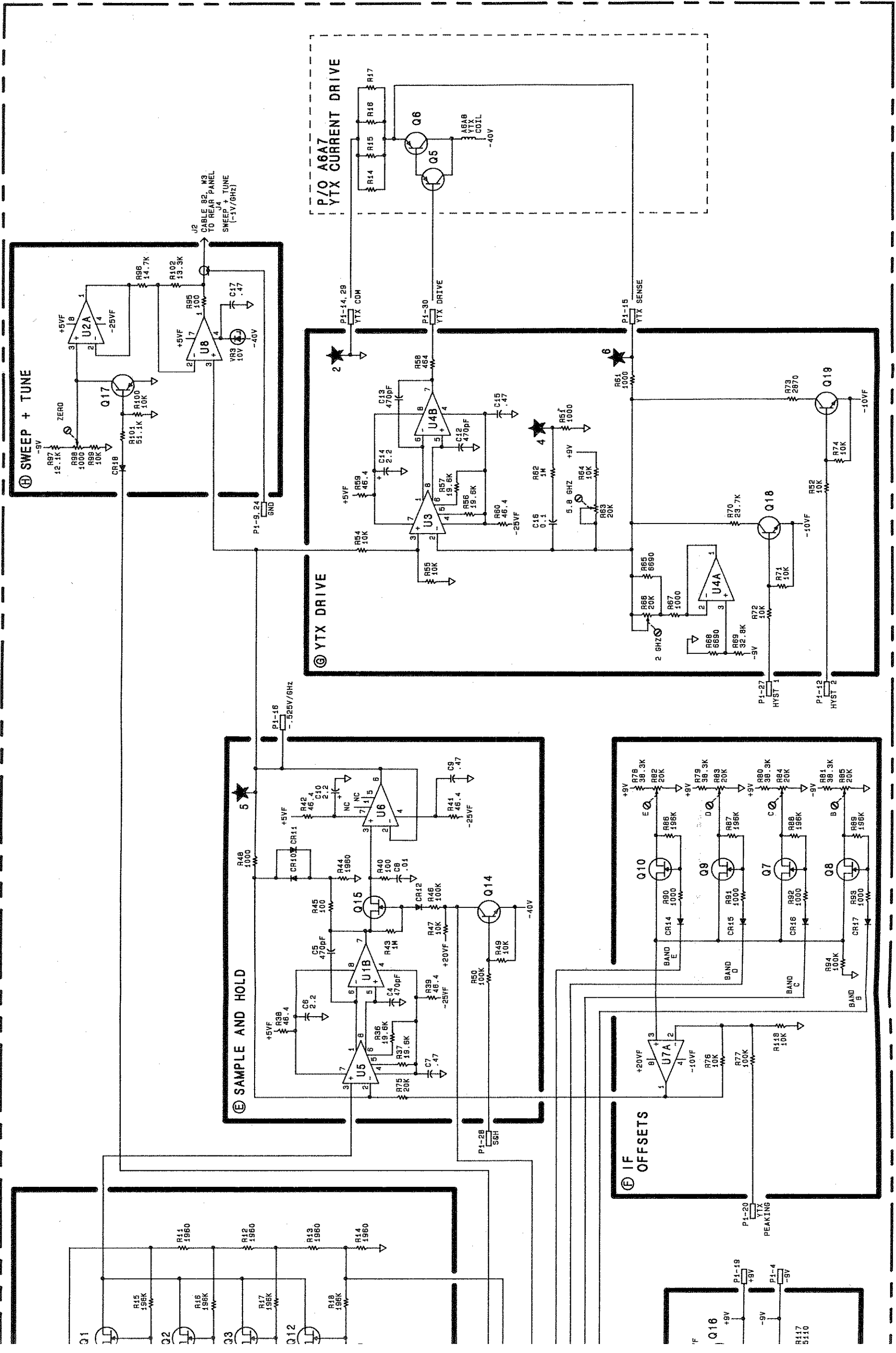
© BAND SWITCH



SERIAL PREFIX: 2410A

NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATION, PREFIX ABBREVIATION WITH ASSEMBLY DESIGNATION.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IS IN OHMS (Ω), CAPACITANCE IS IN MICROFARADS (μ F), INDUCTANCE IS IN MICROHENRIES (μ H).
3. UNLESS OTHERWISE INDICATED: SIGNALS ENTER AT LEFT SIDE AND EXIT AT RIGHT SIDE OF FUNCTION BLOCKS.



A6A12

FIGURE 6. A6A12 YTX DRIVER, SCHEMATIC DIAGRAM
A6A12 11/12

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A6A13	05660-60014	4	1	BOARD ASSEMBLY, RF MODULE MOTHERBOARD	28480	05660-60014
A6A13C1	0180-2216	6	1	CAPACITOR-FXD 350UF+75-10% 16VDC AL	56289	30D3576016DH2
A6A13C2	0180-1997	8	1	CAPACITOR-FXD 20UF+50-10% 150VDC AL	28480	9180-1997
A6A13C3	0180-2144	9	1	CAPACITOR-FXD 200UF+75-10% 25VDC AL	56289	30D2076025DH9
A6A13C4	0180-1819	3	1	CAPACITOR-FXD 100UF+75-10% 50VDC AL	56289	30D1076050DH2
A6A13C5	0160-3879	7	1	CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A13C6	0180-0229	7	1	CAPACITOR-FXD 33UF+-10% 10VDC TA	56289	150D336X9010B2
A6A13C7	0180-0141	2	1	CAPACITOR-FXD 50UF+75-10% 50VDC AL	56289	30D5066050DD2
A6A13J1	1251-5550	9	1	CONNECTOR 26-PIN M POST TYPE	28480	1251-5550
A6A13J2	1251-5144	7	1	CONNECTOR 14-PIN M POST TYPE	28480	1251-5144
A6A13J3	1251-5549	6	1	CONNECTOR 50-PIN M POST TYPE	28480	1251-5549
A6A13J4	1251-5145	8	1	CONNECTOR 12-PIN M POST TYPE	28480	1251-5145
A6A13J5	1200-0508	0	1	SOCKET-IC 14-CONT DIP-SLDR	28480	1200-0508
A6A13L1	08558-80011	6	5	FILTER COIL BLUE	28480	08558-80011
A6A13L2	08558-80011	6		FILTER COIL BLUE	28480	08558-80011
A6A13L3	08558-80011	6		FILTER COIL BLUE	28480	08558-80011
A6A13L4	08558-80011	6		FILTER COIL BLUE	28480	08558-80011
A6A13L5	9140-0144	0	1	INDUCTOR RF-CH-MLD 4.7UH 10% .105DX.26LG	28480	9140-0144
A6A13L6	08558-80011	6		FILTER COIL BLUE	28480	08558-80011
A6A13R1	0757-0401	0	1	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A6A13VR1	1902-0049	2	1	DIODE-ZNR 6.19V 5% DO-35 PD=.4W	28480	1902-0049
A6A13XA1				NOT ASSIGNED		
A6A13XA2				NOT ASSIGNED		
A6A13XA3	1251-2035	9	3	CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A6A13XA4				NOT ASSIGNED		
A6A13XA5				NOT ASSIGNED		
A6A13XA9	1251-2035	9		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A6A13XA10	1251-1365	6	2	CONNECTOR-PC EDGE 22-CONT/ROW 2-ROWS	28480	1251-1365
A6A13XA11	1251-1365	6		CONNECTOR-PC EDGE 22-CONT/ROW 2-ROWS	28480	1251-1365
A6A13XA12	1251-2035	9		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035

*Indicates Factory Selected Value

A6A13
RF MODULE MOTHERBOARD
85660-60014

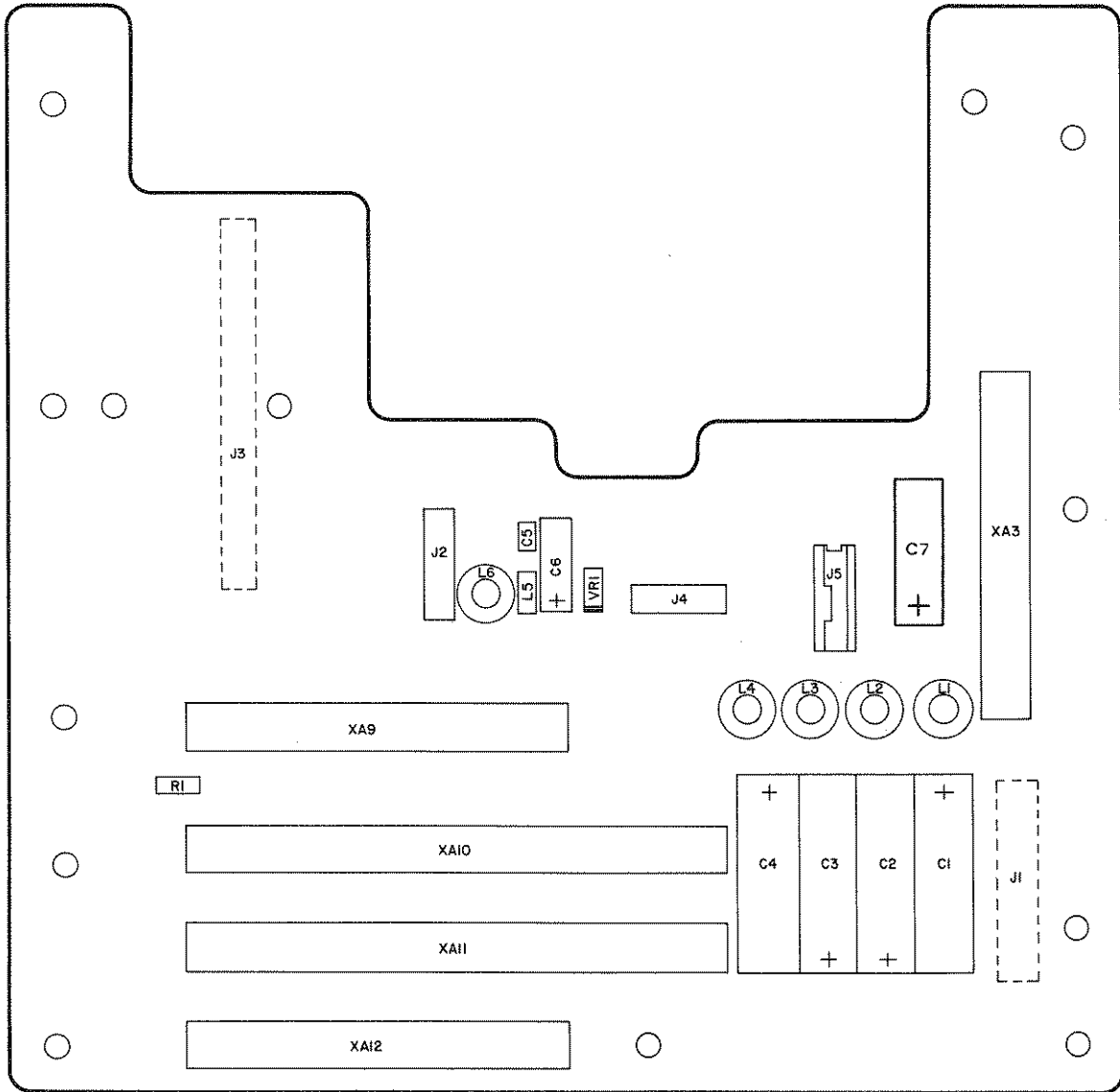
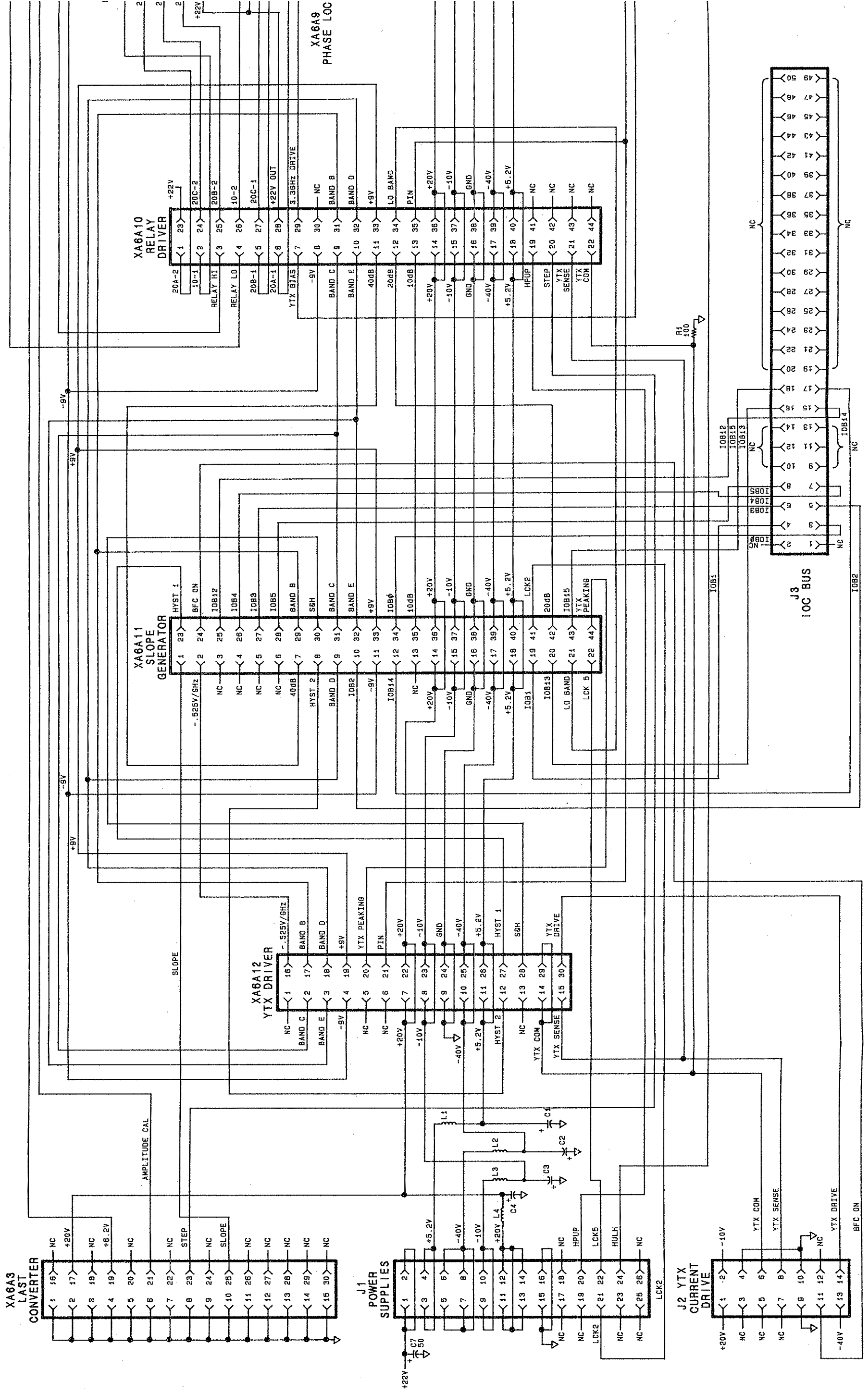


FIGURE 1. A6A13 RF MODULE MOTHERBOARD, COMPONENT LOCATIONS

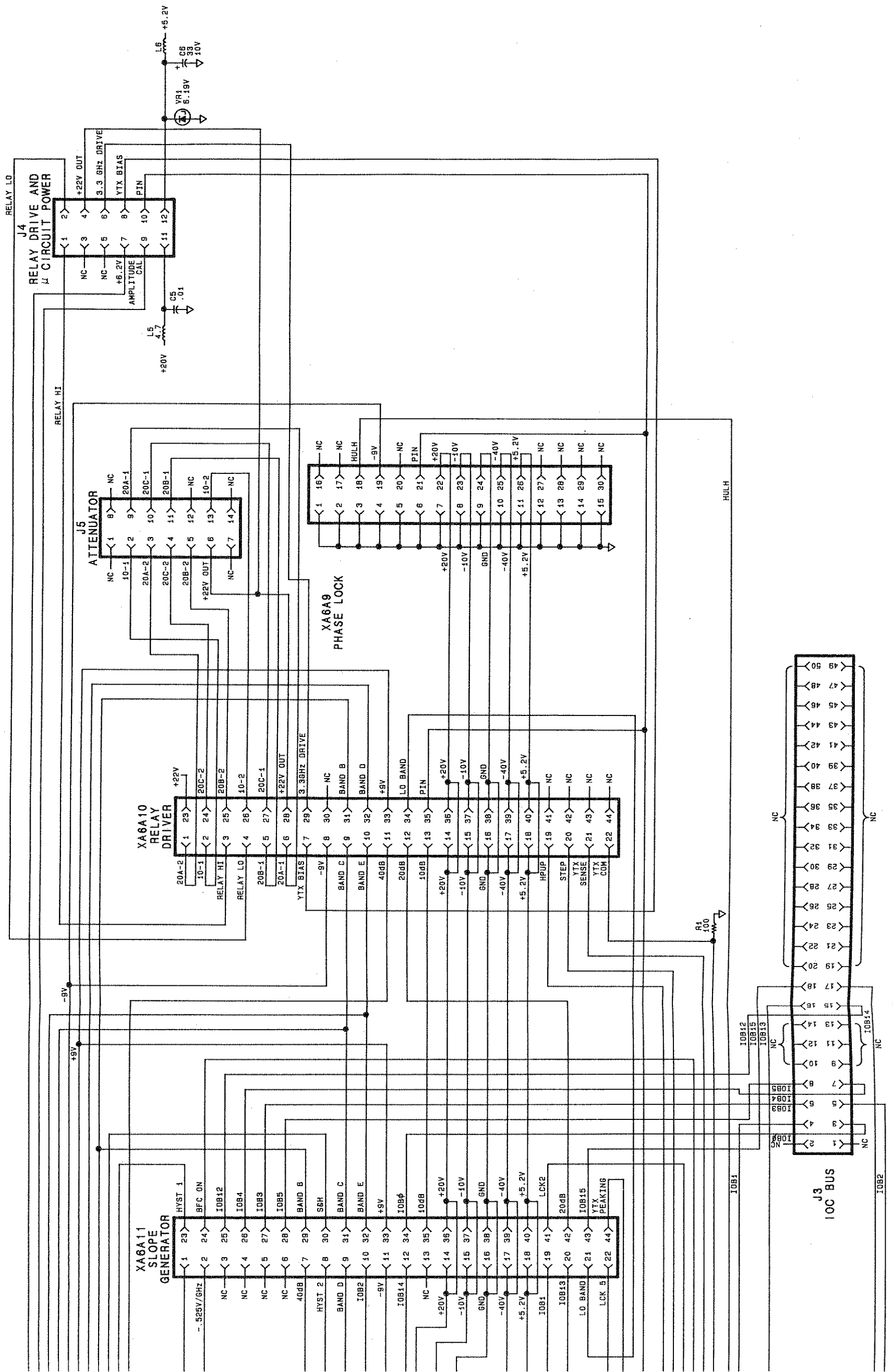
A6A13 RF MODULE MOTHERBOARD 85660-60014



SERIAL NUMBER PREFIX: 2410A

NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATOR LIST, REFER TO THE ASSEMBLY DESIGNATION WITH THIS ASSEMBLY DESIGNATION.
2. UNLESS OTHERWISE INDICATED: CAPACITANCES IN PICTOGRAMS CAPACITANCES IN MICROGRAMS. INDUCTANCE IS IN MICROHENRIES μ H.



A6A13

FIGURE 2. A6A13 RF MODULE MOTHERBOARD, INTERCONNECT DIAGRAM
A6A13 3/4

A7 M/N REFERENCE, TROUBLESHOOTING

Reference

All phase lock loops in the 8566B are referenced to the A22 10 MHz Frequency Standard. The 10 MHz Frequency Standard is used to directly phase-lock the A7A2 100 MHz VCXO only. All other phase lock loops receive their reference from either the A7A1 or A7A2 (10 and 20 MHz from the A7A1 and 100 and 400 MHz from the A7A2).

A malfunction of the 100 MHz VCXO is indicated by all phase lock error messages (PL1 UNLOCK, PL2 UNLOCK, REF UNLOCK, YTO UNLOCK, M/N UNLOCK, and HET UNLOCK) being displayed on the 8566B CRT. Table 1 lists the phase lock error messages, related reference, location for measurement, and signal level.

TABLE 1. PHASE LOCK ERROR MESSAGES

Phase Lock Error Message	Reference Frequency	Output Connector	Level (dBm)
PL1 UNLOCK	100 MHz	A7A2J3	0 dBm
PL1 UNLOCK	10 MHz	A7A1J4	0 dBm
PL2 UNLOCK	10 MHz	A7A1J5	0 dBm
YTO UNLOCK and M/N UNLOCK	400 MHz	A7A2J1*	-10 dBm
YTO UNLOCK and M/N UNLOCK	20 MHz	A7A1J3	0 dBm
HET UNLOCK	100 MHz	A7A2J4	0 dBm
All Flags	100 MHz	A7A2J2	0 dBm

*Measure output at end of A7A2W1 96 cable.



M/N Loop

The M/N Loop consists of a 355 to 395 MHz VCO, part of A7A4, and a phase detector, part of A7A3. The output of the VCO is divided by two and is used to drive the A11A5 Sampler assembly. This divided signal is disabled by means of control line LMNE during sweeps when the frequency span is greater than 5 MHz (fundamental mixing). The two divider numbers, M and N, are selected by the A15 Controller such that the Nth harmonic (same as the N divide number) of the divided VCO output changes in exactly 10 MHz increments as M is changed. For example:

If $M = 26$,
 $N = 20$,
 and VCO Frequency = 187.0 MHz,
 then M/N output frequency = $N(\text{VCO}) = 20 \times 187.0 = 3,740$ MHz.

If M is changed to 25,
 then the VCO frequency changes to 187.5 MHz,
 and the M/N output frequency changes to 3,750 MHz (20×187.5).

Result = 10 MHz change for M divider change of 1.

An incorrect M or N number, due to the main controller or a bad latch on A7A3, can be easily detected. The frequency diagnostic   gives the M and N numbers and the M/N output frequency (VCO divided by two) for the start frequency selected. A frequency counter attached to A7A4J2 indicates the actual frequency output. Table 2, M and N Numbers and Resulting Frequencies, of the RF Section Analog Troubleshooting tab, lists all possible M/N output frequencies. By locating the M/N frequency measured by the counter, the M and N numbers required to produce this frequency are obtained. The M and N numbers can then be compared to those shown in the frequency diagnostic. The latch and divider for the number in error can then be located using the troubleshooting procedure outlined for A7A3.

A7 M/N-REFERENCE REPLACEMENT

NOTE

For location of hardware and cables referred to in this procedure, see Figure 1.

Removal

1. Remove ac line cords, IF-Display Section, and RF Section top and bottom covers.
2. Remove the following cables from A7 M/N Reference:

80 (gray/black) cable (A7A1J1, STD IN) (1)
 86 (gray/blue) cable (A7A1J4, 10 MHz OUT) (2)
 9 (white) cable (A7A1J5, 10 MHz OUT) (3)
 85 (gray/green) cable (A7A2J4, 100 MHz OUT) (4)
 8 (gray) cable (A7A2J3, 100 MHz OUT) (5)
 93 (white/orange) cable (A7A4J2, M/N OUT) (6)
 6 (blue) cable (A7A1J6, 10 MHz OUT) (7)

3. Remove clear plastic shield from motherboard (Figure 1, VIEW A) by removing all nylon screws. Remove eight screws (8) from the motherboard (refer to View A). Note: Screws are marked on motherboard with the letter "B" for easy identification.

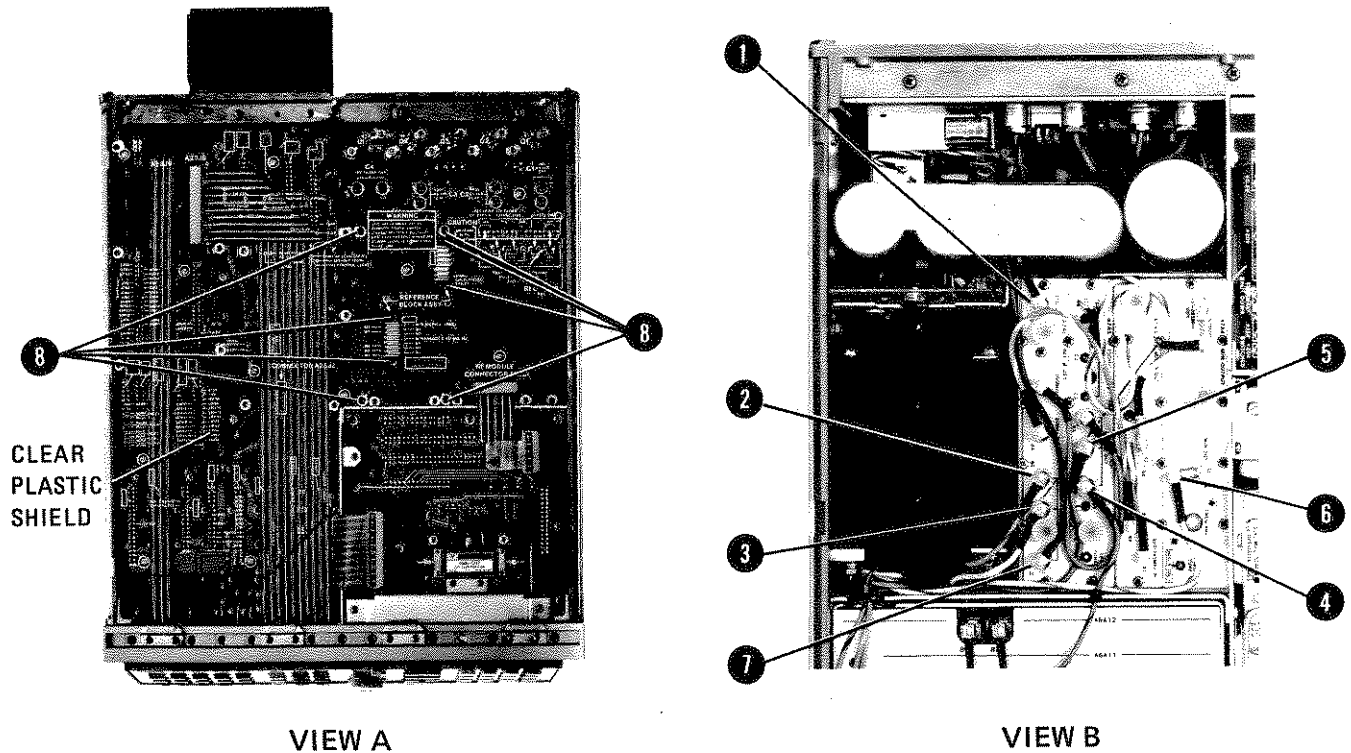


FIGURE 1. A7 M/N REFERENCE REMOVAL AND INSTALLATION

Installation

4. Position A7 section in RF Section and secure with eight screws **(8)**. Replace clear plastic shield over motherboard. Reconnect cables removed in step 2.
5. Replace RF Section top and bottom covers. Reassemble IF-Display Section to RF Section. Reconnect ac line cords.

A22 10 MHz STANDARD REPLACEMENT

NOTE

For location of hardware and cables referred to in this procedure, see Figure 2.

Removal

1. Remove ac line cords and RF Section bottom cover.
2. Remove A11 YTO Loop by removing three screws as indicated by instructions on top of YTO Loop assembly. Disconnect cable connector (2).
3. Release A22 10 MHz Standard by removing two screws (1).
4. When removing 10 MHz Standard, disconnect 87 (gray/violet) cable and 6-pin connector from behind.

Installation

5. When installing new 10 MHz Standard, check that rear studs are supported by both rear rubber mounts and reconnect 87 (gray/violet) cable and 6-pin connector (red wire to rear pin). Fasten 10 MHz Standard to RF Section with two screws (1).
6. Replace A11 YTO Loop. Replace three screws removed in step 2 and reconnect cable connector (2).
7. Replace RF Section bottom cover and reconnect ac line cords.

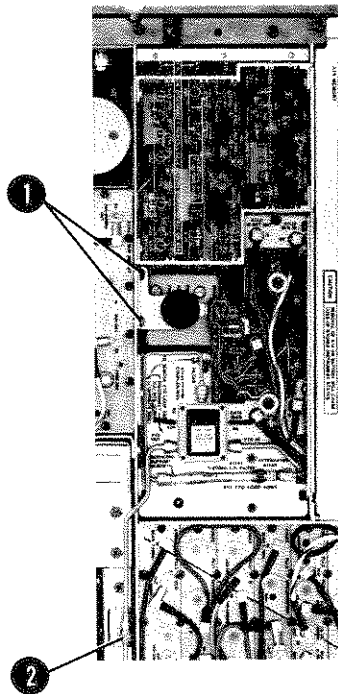


FIGURE 2. A22 10 MHz STANDARD REPLACEMENT

TABLE 2. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A7				M/N-REFERENCE		
A7A1	85660-60015	5	1	BOARD ASSEMBLY, REFERENCE PHASE DETECTOR	28480	85660-60015
A7A2	85660-60135	0	1	BOARD ASSEMBLY, 100 MHZ VCXO	28480	85660-60135
A7A3	85660-60136	1	1	BOARD ASSEMBLY, M/N PHASE DETECTOR	28480	85660-60136
A7A4	85660-60113	4	1	BOARD ASSEMBLY, M/N OUTPUT	28480	85660-60113
A7A5	85660-60020	2	1	BOARD ASSEMBLY, M/N-REFERENCE MOTHERBOARD	28480	85660-60020

*Indicates Factory Selected Value

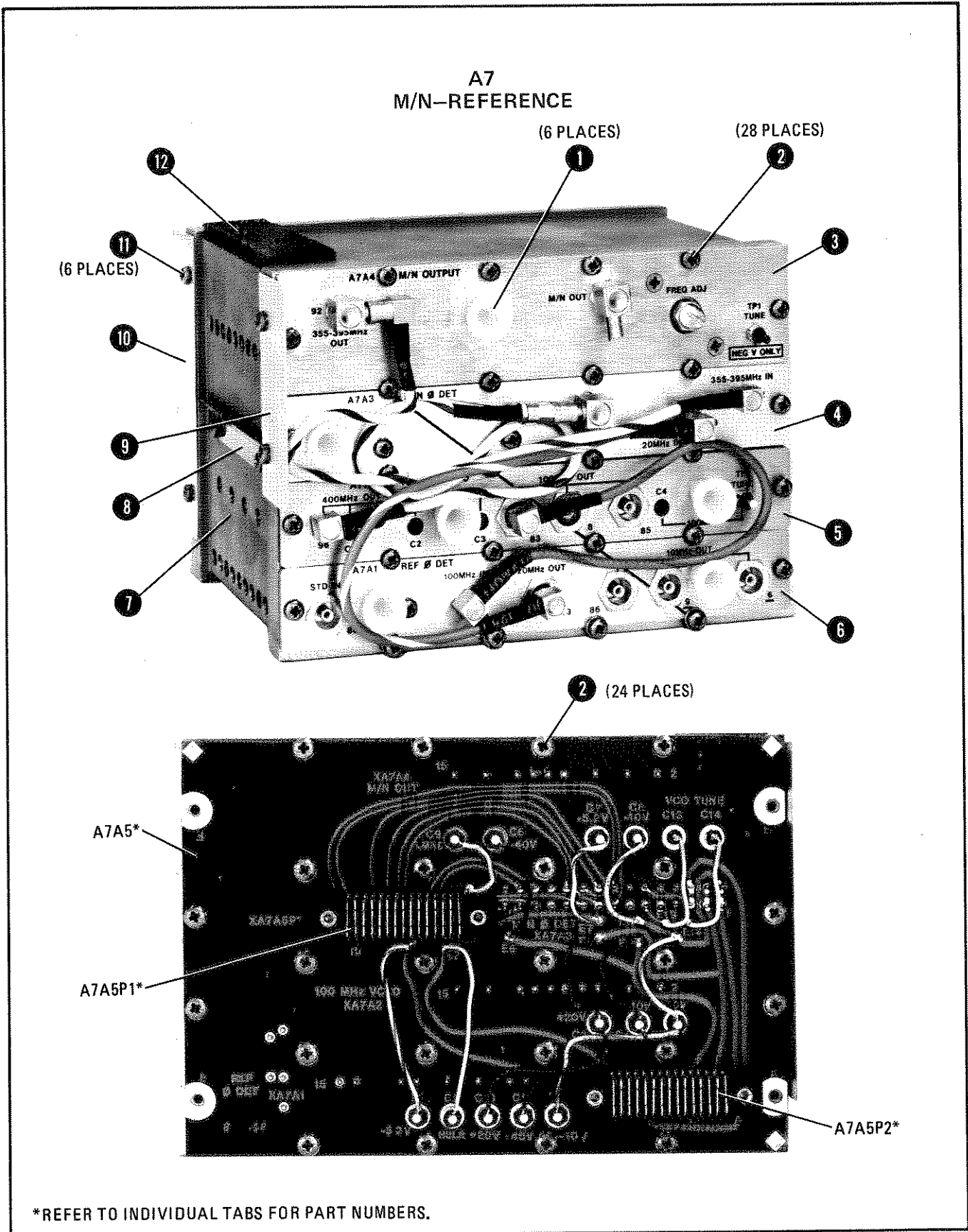
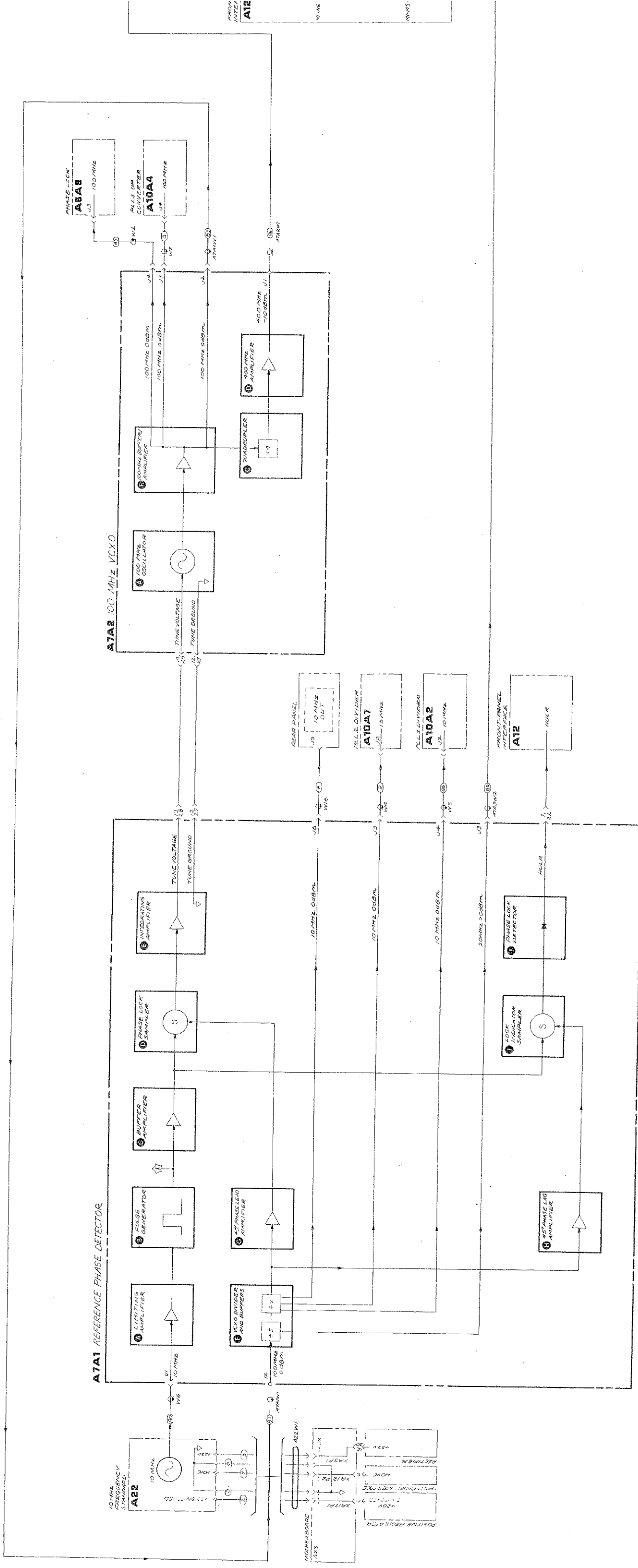
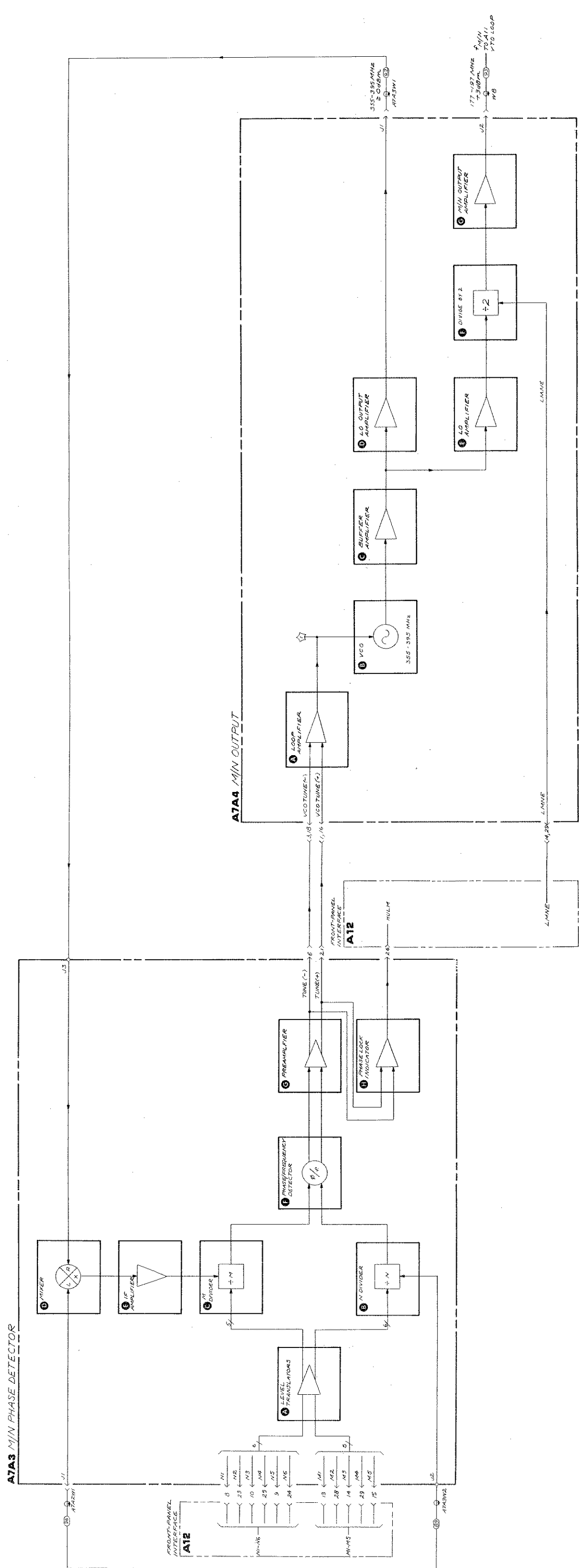


FIGURE 3. A7 M/N REFERENCE, PARTS IDENTIFICATION (1 OF 2)

Item	HP Part Number	C D	Description	Mfr. Code	Manufacturer's Part Number
1	86701-40001	9	Extractor, PC Board	28480	86701-40001
2	2200-0105	4	Screw, Mach, 4-40, .312-IN LG, PAN HD	28480	2200-0105
3	85660-20049	1	Cover, PC Board (A7A4 M/N Output)	28480	85660-20049
4	85660-20047	9	Cover, PC Board (A7A3 M/N ϕ DET)	28480	85660-20047
5	85660-20046	8	Cover, PC Board (A7A2 100 MHz VCXO)	28480	85660-20046
6	85660-20045	7	Cover, PC Board (A7A1 REF ϕ DET)	28480	85660-20045
7	5021-3208	7	Housing, M/N-Reference Block	28480	5021-3208
8	86701-00024	2	Air Scoop	28480	86701-00024
9	86701-00029	7	Air Baffle, Top	28480	86701-00029
10	86701-00030	0	Air Baffle, Bottom	28480	86701-00030
11	2200-0103	2	Screw, Mach, 4-40, .25-IN LG, PAN HD	28480	2200-0103
12	0460-0778	5	Tape, Adhesive, Foam Cushion (4-IN)	28480	0460-0778

FIGURE 3. A7 M/N REFERENCE, PARTS IDENTIFICATION (2 OF 2)





A7

FIGURE 4. A7 MIN REFERENCE BLOCK DIAGRAM

A7/A22 9/10

A7A1 REFERENCE PHASE DETECTOR, CIRCUIT DESCRIPTION

The A7A1 Reference Phase Detector contains the frequency divider, phase detector, and integrating amplifier for the 100 MHz Reference phase-lock loop. Basically, 100 MHz from the A7A2 VCXO is divided by 10 and compared to the 10 MHz frequency standard by the phase detector. The error voltage from this comparison is fed back to the VCXO to keep its frequency locked to 10 times that of the frequency standard. The bandwidth of the reference phase-lock loop is 100 Hz; the 10 MHz derived from the 100 MHz VCXO must be within 100 Hz of the 10 MHz frequency standard for the loop to lock reliably.

Limiting Amplifier (A)

U1 amplifies and limits the amplitude of the 10 MHz from the frequency standard. U1A and U1B form a limiting differential pair, while the emitter follower U1 provides a low impedance output.

Pulse Generator (B)

U2D is biased with feedback resistor R10 to further limit the 10 MHz to a well-shaped square wave and set the proper logic levels for digital buffer U2C. U2A and U2B generate narrow pulses, the width being the gate delay of U2A plus the delay from R11 and C5. When the output of U2C goes low, the output of U2B goes high after one gate delay (of U2B). After a delay due to R11, C5 and U2A gate delay, the output of U2A goes high which causes U2B output to return low again, thus generating a narrow pulse.

Phase Lock Sampler (D)

The phase lock sampler performs the function of phase detector. The 10 MHz pulses from the buffer amplifier are applied to the primary of T1 which causes CR3 and CR4 to turn on for the duration of the pulses. This samples the divided by 10 VCXO frequency and stores this voltage on C26. When the loop is locked, the feedback due to the complete phase-lock loop forces this voltage to be nearly zero. When the loop is unlocked, this voltage may be zero or varying, depending on the reason for unlock.

Integrating Amplifier (E)

Q4 is a differential input pair which together with Q5 and Q6 forms a high gain amplifier. Feedback is added with C32 and R49 to make an integrating amplifier. C32 provides ac feedback only, so for the amplifier to remain linear, dc feedback is accomplished by virtue of the entire phase-lock loop.

VCXO Divider and Buffers (F)

100 MHz from the A7A2 VCXO is applied to the counter U3 which divides by 5, then by 2. Its outputs are 10 MHz and 20 MHz which are buffered by U4 to be used as reference frequencies by other assemblies in the instrument. The other 10 MHz output is used to drive the Phase Lock Sampler (D) and Lock Indicator Sampler (I).

45° Phase Lead and Buffer Amplifier (G) and 45° Phase Lag and Buffer Amplifier (H)

The 45° phase shift buffers are used to provide two 10 MHz signals which are 90° apart in phase, the purpose of which is explained in Lock Indicator Sampler description. 45° phase shift in (G) is accomplished with C35 and R53, while in (H) it is done by R59 and C38.

Lock Indicator Sampler (I)

The lock indicator sampler functions the same as the phase lock sampler (D). The only difference is that the 10 MHz is 90° shifted in phase. This causes the output of the lock indicator sampler to be a maximum negative voltage when the loop is locked, since in this state the output of the phase-lock sampler is 0V.

Phase Lock Detector (J)

The output of the lock indicator sampler is compared to $-0.5V$ by U5. When the output voltage becomes closer to 0 than to $-0.5V$, U5 switches its output to TTL high to indicate to the A15 Processor that the loop is unlocked.

A7A1 REFERENCE PHASE DETECTOR, TROUBLESHOOTING

The A7A1 Reference Phase Detector compares the output of the 10 MHz Frequency Standard to the output of the A7A2 100 MHz VCXO and provides the tuning drive voltage for the VCXO. A phase lock detector in A7A1 indicates to the main processor (A15) the state of the Reference Phase Lock Loop.

Samplers (D), (I)

The Phase Lock and Lock Indicator Samplers are identical. The diodes are biased to approximately the same level in each. The dc bias on the diodes is as shown in Table 1.

TABLE 1. SAMPLER DIODE BIAS VOLTAGE LEVELS

Diode	dc Bias
CR3 Anode	+1.87
CR4 Cathode	-1.92
CR5 Cathode	-1.92
CR6 Anode	+1.82

The Phase Lock Sampler output (junction of R32 and R34) is 0V when locked or with no 10 MHz reference, and approximately +0.1V with no 100 MHz input. The Lock Indicator output (junction of R25 and R23) is -1.5V when locked, 0V with no 10 MHz reference, and approximately +0.2V with no 100 MHz input.

45° Phase Lead Amplifier (G) and 45° Phase Lag Amplifier (H)

The Phase Amplifiers shift the 100 MHz VCXO signal, which has been divided by 10 by U3, +45° and -45° respectively. Figure 1 is typical of the waveforms at the collectors of Q1 and Q2. The dc voltages for Q1 and Q2 are as shown in Table 2.

Oscilloscope Settings:
 Vertical: 0.05V/Div AC
 Horizontal: 0.05uSec/Div
 Probe: 10:1

Analyzer Settings:
 INSTR PRESET

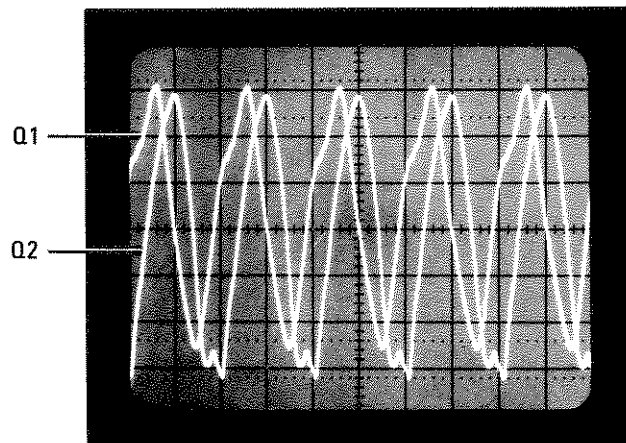


FIGURE 1. OUTPUTS OF 45° PHASE AMPLIFIERS

TABLE 2. PHASE AMPLIFIER VOLTAGE LEVELS

	Voltage Levels	
	Q1	Q2
Emitter	-8.0	-8.0
Base	-7.4	-7.4
Collector	-3.6	-3.6

Limiting Amplifier (A)

The Limiting Amplifier shapes and amplifies the 10 MHz reference from the Frequency Standard (A22). Typical voltage levels for U1 are shown in Table 3.

TABLE 3. LIMITING AMPLIFIER VOLTAGE LEVELS

U1 Pin No.	dc Voltage Level
1	+5.0
2	0
3	+0.5
4	0
5	+2.3
6	+2.3
7	+1.6
8	+5.0

Pulse Generator (B)

Typical input/output waveforms for the Pulse Generator are shown in Figures 2 and 3.

Oscilloscope Settings:
 Vertical: 0.1V/Div
 Horizontal: 0.2usec/Div
 X10 Magnifier
 Probes: 10:1
 Channel A: U2B Pin 5
 Channel B: U2A Pin 2

Analyzer Settings:
 INSTR PRESET

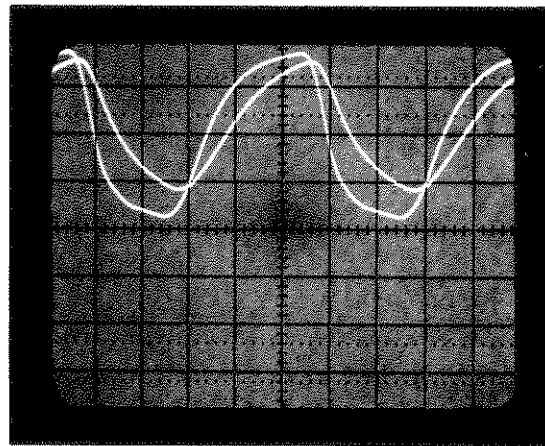


FIGURE 2. PULSE GENERATOR INPUT WAVEFORMS

Oscilloscope Settings:

Vertical: 0.1V/Div
 Horizontal: 0.05usec/Div
 Probe: 10:1
 Channel A: U2B Pin 4(TP1)

Analyzer Settings:

INSTR PRESET

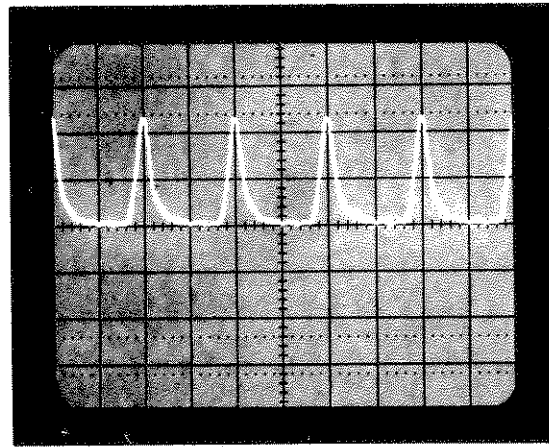


FIGURE 3. PULSE GENERATOR OUTPUT PULSES

Buffer Amplifier (C)

Typical voltage levels for the Buffer Amplifier are shown in Table 4.

TABLE 4. BUFFER AMPLIFIER VOLTAGE LEVELS

	Voltage Levels	
	Q2	Q7
Emitter	-4.6	-4.6
Base	-4.5	-4.5
Collector	-0.3	-9.4

Integrating Amplifier (E)

Typical voltage levels for the Integrating Amplifier are shown in Table 5.

Integrating Amplifier tune voltage output (junction of R75 and R51):

- 8.6V (locked)
- 23.6V (unlocked with no 10 MHz)
- 1.4V (unlocked with no 100 MHz)

NOTE

The tune voltage can be measured at A7A2TP1. However, the voltage levels will be slightly lower.

TABLE 5. INTEGRATING AMPLIFIER VOLTAGE LEVELS

Transistor	dc Voltage Levels
Q4A Pin 1 Pin 2 Pin 3	+0.9 +9.8 0.0 (locked) 0.0 (no 10 MHz) +0.1 (no 100 MHz)
Q4B Pin 4 Pin 5 Pin 6	+0.9 +9.8 0.0
Q5 Emitter Base Collector	+10.3 +9.8 Gnd
Q6 Emitter Base Collector	+10.3 +9.8 -2.2

Phase Lock Detector (J)

The output of the Lock Indicator Sampler is compared to a reference of $-0.4V$ by comparator U5. The output of U5 is high for any unlocked condition. VR1 limits the output voltage (HULR) to approximately 4.64V.

This can be checked by disconnecting the 10 MHz input at A7A1J1 (gray/white cable) and measuring the output of U5. With the loop unlocked (10 MHz removed), this output should be approximately 4.64V.

TABLE 6. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A7A1	85660-60015	5	1	BOARD ASSEMBLY, REFERENCE PHASE DETECTOR	28480	85660-60015
A7A1C1	0180-0197	8	5	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A7A1C2	0180-0197	8		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A7A1C3	0180-1746	5	4	CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A7A1C4	0160-3879	7	6	CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A7A1C5	0140-0198	7	1	CAPACITOR-FXD 39PF +-5% 300VDC MICA	72136	DM15E820J0300WV1CR
A7A1C6	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A7A1C7	0160-2055	9	24	CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-2055
A7A1C8	0180-3073	5	1	CAPACITOR-FXD 2.2UF+-20% 30VDC TA	28480	0180-3073
A7A1C9	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A7A1C10	0160-2055	9		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-2055
A7A1C11	0180-0197	8		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A7A1C12	0160-2199	2	1	CAPACITOR-FXD 30PF +-5% 300VDC MICA	28480	0160-2199
A7A1C13	0180-0197	8		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A7A1C14	0160-2204	0	3	CAPACITOR-FXD 100PF +-5% 300VDC MICA	28480	0160-2204
A7A1C15	0180-0197	8		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A7A1C16	0160-2055	9		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-2055
A7A1C17	0160-2055	9		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-2055
A7A1C18	0160-2055	9		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-2055
A7A1C19	0160-2055	9		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-2055
A7A1C20	0160-2055	9		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-2055
A7A1C21	0160-2055	9		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-2055
A7A1C22	0160-2055	9		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-2055
A7A1C23	0180-0553	0	2	CAPACITOR-FXD 22UF+-20% 25VDC TA	28480	0180-0553
A7A1C24	0160-2055	9		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-2055
A7A1C25	0160-2055	9		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-2055
A7A1C26	0160-2204	0		CAPACITOR-FXD 100PF +-5% 300VDC MICA	28480	0160-2204
A7A1C27	0140-0193	0	4	CAPACITOR-FXD 82PF +-5% 300VDC MICA	72136	DM15E820J0300WV1CR
A7A1C28	0180-0553	0		CAPACITOR-FXD 22UF+-20% 25VDC TA	28480	0180-0553
A7A1C29	0160-2055	9		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-2055
A7A1C30	0140-0193	0		CAPACITOR-FXD 82PF +-5% 300VDC MICA	72136	DM15E820J0300WV1CR
A7A1C31	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A7A1C32	0170-0066	9	1	CAPACITOR-FXD .027UF +-10% 200VDC POLYE	28480	0170-0066
A7A1C33	0160-2055	9		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-2055
A7A1C34	0160-2055	9		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-2055
A7A1C35	0140-0193	0		CAPACITOR-FXD 82PF +-5% 300VDC MICA	72136	DM15E820J0300WV1CR
A7A1C36	0160-2055	9		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-2055
A7A1C37	0160-2055	9		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-2055
A7A1C38	0140-0193	0		CAPACITOR-FXD 82PF +-5% 300VDC MICA	72136	DM15E820J0300WV1CR
A7A1C39	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A7A1C40	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A7A1C41	0160-2055	9		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-2055
A7A1C42	0160-2055	9		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-2055
A7A1C43	0160-2204	2	1	CAPACITOR-FXD 100PF +-5% 300VDC MICA	28480	0160-2204
A7A1C44	0160-2055	9		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-2055
A7A1C45	0160-2055	9		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-2055
A7A1C46	0140-3210	2	3	CAPACITOR-FXD 270PF +-5% 300VDC MICA	72136	DM15F271J0300WV1CR
A7A1C47	0160-2055	9		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-2055
A7A1C48	0140-0210	2		CAPACITOR-FXD 270PF +-5% 300VDC MICA	72136	DM15F271J0300WV1CR
A7A1C49	0160-2201	7	1	CAPACITOR-FXD 51PF +-5% 300VDC MICA	28480	0160-2201
A7A1C50	0160-2055	9		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-2055
A7A1C51	0140-3210	2		CAPACITOR-FXD 270PF +-5% 300VDC MICA	72136	DM15F271J0300WV1CR
A7A1C52	0160-2055	9		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-2055
A7A1C53	0160-2055	9		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-2055
A7A1C54	0180-0183	2	1	CAPACITOR-FXD 10UF+-10% 50VDC AL	56289	30D106G050C82
A7A1C55	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A7A1C56	0180-3229	7	1	CAPACITOR-FXD 33UF+-10% 10VDC TA	56289	150D336X9010B2
A7A1C57	0160-2204	0		CAPACITOR-FXD 100PF +-5% 300VDC MICA	28480	0160-2204
A7A1C58	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A7A1C59	0160-3878	6	2	CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A7A1C60	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A7A1C61	0160-3454	4	1	CAPACITOR-FXD 220PF +-10% 1KVDC CER	28480	0160-3454
A7A1C62	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A7A1CR1	1901-0518	8	6	DIODE-SM SIG SCHOTTKY	28480	1901-0518
A7A1CR2	1901-0518	8		DIODE-SM SIG SCHOTTKY	28480	1901-0518
A7A1CR3	1901-0518	8		DIODE-SM SIG SCHOTTKY	28480	1901-0518
A7A1CR4	1901-0518	8		DIODE-SM SIG SCHOTTKY	28480	1901-0518
A7A1CR5	1901-0518	8		DIODE-SM SIG SCHOTTKY	28480	1901-0518
A7A1CR6	1901-0518	8		DIODE-SM SIG SCHOTTKY	28480	1901-0518
A7A1J1	1250-0544	9	5	CONNECTOR-RF SM-SNP M SGL-HOLE-FR 50-OHM	28480	1250-0544
A7A1J2				P/O A7A1W1		
A7A1J3	1250-0544	9		CONNECTOR-RF SM-SNP M SGL-HOLE-FR 50-OHM	28480	1250-0544
A7A1J4	1250-0544	9		CONNECTOR-RF SM-SNP M SGL-HOLE-FR 50-OHM	28480	1250-0544
A7A1J5	1250-0544	9		CONNECTOR-RF SM-SNP M SGL-HOLE-FR 50-OHM	28480	1250-0544

*Indicates Factory Selected Value

TABLE 6. REPLACEABLE PARTS

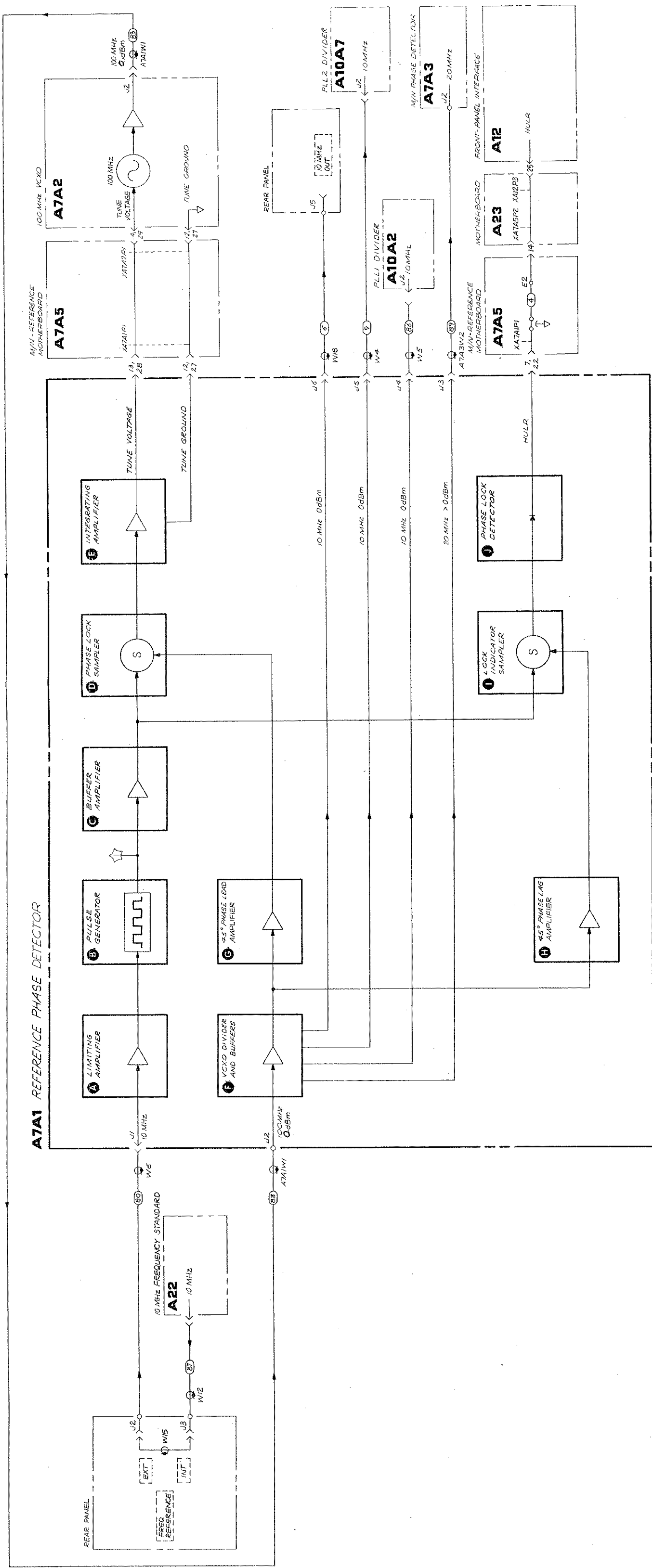
Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A7A1J6	1250-0544	9		CONNECTOR-RF SM-SNP M SGL-HOLE-FR 50-OHM	20480	1250-0544
A7A1L1	9140-0230	3	2	INDUCTOR RF-CH-MLD 820H 5% .166DX,395LG	20480	9140-0230
A7A1L2	9140-0230	3		INDUCTOR RF-CH-MLD 820H 5% .166DX,395LG	20480	9140-0230
A7A1L3	9140-0143	9	2	INDUCTOR RF-CH-MLD 3.30H 10% .105DX,26LG	20480	9140-0143
A7A1L4	9140-0143	9		INDUCTOR RF-CH-MLD 3.30H 10% .105DX,26LG	20480	9140-0143
A7A1L5	9100-2261	2	1	INDUCTOR RF-CH-MLD 2.70H 10% .105DX,26LG	20480	9100-2261
A7A1L6	9140-0114	4	1	INDUCTOR RF-CH-MLD 100H 10% .166DX,395LG	20480	9140-0114
A7A1L7	9100-2255	4	4	INDUCTOR RF-CH-MLD 470NH 10% .105DX,26LG	20480	9100-2255
A7A1L8	9100-0368	6	1	INDUCTOR RF-CH-MLD 330NH 10% .105DX,26LG	20480	9100-0368
A7A1L9	9100-2257	6	3	INDUCTOR RF-CH-MLD 820NH 10% .105DX,26LG	20480	9100-2257
A7A1L10	9100-2255	4		INDUCTOR RF-CH-MLD 470NH 10% .105DX,26LG	20480	9100-2255
A7A1L11	9100-2257	6	1	INDUCTOR RF-CH-MLD 820NH 10% .105DX,26LG	20480	9100-2257
A7A1L12	9100-2255	4		INDUCTOR RF-CH-MLD 470NH 10% .105DX,26LG	20480	9100-2255
A7A1L13	9100-2257	6	4	INDUCTOR RF-CH-MLD 820NH 10% .105DX,26LG	20480	9100-2257
A7A1L14	9100-2255	4		INDUCTOR RF-CH-MLD 470NH 10% .105DX,26LG	20480	9100-2255
A7A1L15	9100-2256	5	1	INDUCTOR RF-CH-MLD 560NH 10% .105DX,26LG	20480	9100-2256
A7A1L16	9100-2891	4	1	INDUCTOR RF-CH-MLD 50NH 10% .105DX,26LG	20480	9100-2891
A7A1Q1	1854-0019	3	3	TRANSISTOR NPN SI TO-18 PD=360MW	20480	1854-0019
A7A1Q2	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	20480	1854-0019
A7A1Q3	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	20480	1854-0019
A7A1Q4	1855-0049	1	1	TRANSISTOR-JFET DUAL N-CHAN D-MODE SI	20480	1855-0049
A7A1Q5	1853-0451	5	2	TRANSISTOR PNP 2N3799 SI TO-18 PD=360MW	01295	2N3799
A7A1Q6	1853-0451	5		TRANSISTOR PNP 2N3799 SI TO-18 PD=360MW	01295	2N3799
A7A1Q7	1853-0034	0	1	TRANSISTOR PNP SI TO-18 PD=360MW	20480	1853-0034
A7A1R1	0757-0399	5	2	RESISTOR 82.5 1% .125W F TC=0+-100	24546	C4-1/8-T0-82R5-F
A7A1R2	0757-0417	0	1	RESISTOR 562 1% .125W F TC=0+-100	24546	C4-1/8-T0-562R-F
A7A1R3	0757-0416	7	4	RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A7A1R4	0757-0401	0	3	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A7A1R5	0698-3156	2	1	RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A7A1R6	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A7A1R7	0757-0420	3	1	RESISTOR 750 1% .125W F TC=0+-100	24546	C4-1/8-T0-751-F
A7A1R8	0757-0438	3	1	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A7A1R9	0757-0399	5		RESISTOR 82.5 1% .125W F TC=0+-100	24546	C4-1/8-T0-82R5-F
A7A1R10	0698-7222	1	1	RESISTOR 261 1% .05W F TC=0+-100	24546	C3-1/8-T0-261R-F
A7A1R11	0698-7219	6	1	RESISTOR 196 1% .05W F TC=0+-100	24546	C3-1/8-T0-196R-F
A7A1R12	0757-0442	9	5	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-10K2-F
A7A1R13	0698-3453	2	3	RESISTOR 196K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1963-F
A7A1R14	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-10K2-F
A7A1R15	0698-3453	2		RESISTOR 196K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1963-F
A7A1R16	0757-0441	0	2	RESISTOR 8.25K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8251-F
A7A1R17	0698-3438	3	2	RESISTOR 147 1% .125W F TC=0+-100	24546	C4-1/8-T0-147R-F
A7A1R18	0757-0346	2	6	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A7A1R19	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A7A1R20	0757-0441	0	8	RESISTOR 8.25K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8251-F
A7A1R21	0698-3438	3		RESISTOR 147 1% .125W F TC=0+-100	24546	C4-1/8-T0-147R-F
A7A1R22	0698-3136	0	1	RESISTOR 17.8K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1782-F
A7A1R23	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A7A1R24	0698-3154	0	5	RESISTOR 4.22K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4221-F
A7A1R25	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A7A1R26	0757-0280	3	5	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A7A1R27	0698-3154	0		RESISTOR 4.22K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4221-F
A7A1R28	0698-3450	9	1	RESISTOR 42.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4222-F
A7A1R29	0698-3449	6	1	RESISTOR 20.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2072-F
A7A1R30	0757-0444	1	2	RESISTOR 12.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1212-F
A7A1R31	0698-3154	0		RESISTOR 4.22K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4221-F
A7A1R32	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A7A1R33	0698-3154	0		RESISTOR 4.22K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4221-F
A7A1R34	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A7A1R35	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A7A1R36	0757-0444	1		RESISTOR 12.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1212-F
A7A1R37	0757-0200	7	1	RESISTOR 5.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5621-F
A7A1R38	0757-0421	4	2	RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
A7A1R39	0757-0440	7	1	RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A7A1R40	0757-0394	0	2	RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A7A1R41	0698-3446	3	2	RESISTOR 383 1% .125W F TC=0+-100	24546	C4-1/8-T0-383R-F
A7A1R42	0698-0085	0	3	RESISTOR 2.61K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2611-F
A7A1R43	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-10K2-F
A7A1R44	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-10K2-F
A7A1R45	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A7A1R46	0698-3154	0		RESISTOR 4.22K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4221-F
A7A1R47	0698-3453	2		RESISTOR 196K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1963-F
A7A1R48	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-10K2-F
A7A1R49	0698-7285	6	1	RESISTOR 119K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1103-F
A7A1R50	0698-3157	3	2	RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F

*Indicates Factory Selected Value

TABLE 6. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A7A1R51	0698-3157	3		RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A7A1R52	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A7A1R53	0698-3440	7	2	RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8-T0-196R-F
A7A1R54	0698-7234	5	1	RESISTOR 825 1% .05W F TC=0+-100	24546	C3-1/8-T0-825R-F
A7A1R55	0698-7257	2	1	RESISTOR 7.5K 1% .05W F TC=0+-100	24546	C3-1/8-T0-7501-F
A7A1R56	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A7A1R57	0698-3446	3		RESISTOR 383 1% .125W F TC=0+-100	24546	C4-1/8-T0-383R-F
A7A1R58	0698-7246	9	1	RESISTOR 196 1% .05W F TC=0+-100	24546	C3-1/8-T0-2611-F
A7A1R59	0698-3440	7		RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8-T0-196R-F
A7A1R61	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A7A1R62	0757-0278	9	1	RESISTOR 1.78K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1781-F
A7A1R63	0698-0085	0		RESISTOR 2.61K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2611-F
A7A1R64	0698-3132	4	2	RESISTOR 2.61K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2611-F
A7A1R65	0698-0085	0		RESISTOR 2.61K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2611-F
A7A1R66	0757-0421	4		RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
A7A1R67	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A7A1R68	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A7A1R69	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A7A1R70	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A7A1R71	0757-0274	5	1	RESISTOR 1.21K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1211-F
A7A1R72	0698-3132	4		RESISTOR 261 1% .125W F TC=0+-100	24546	C4-1/8-T0-261R-F
A7A1R73	0757-0317	7	1	RESISTOR 1.33K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1331-F
A7A1R74	0757-0289	2	1	RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A7A1R75	0698-7236	7	1	RESISTOR 1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1001-F
A7A1T1	08552-6044	1	2	TRANSF RF 5 PIN	28480	08552-6044
A7A1T2	08552-6044	1		TRANSF RF 5 PIN	28480	08552-6044
A7A1TP1	1251-0600	0	1	CONNECTOR-SGL CONT PIN 1.14 MM-BSC-SZ SQ	28480	1251-0600
A7A1U1	1858-0032	8	1	TRANSISTOR ARRAY 14-PIN PLSTC DIP	3L585	CA3146E
A7A1U2	1820-0328	6	1	IC GATE TTL NOR QUAD 2-INP	01295	SN7402N
A7A1U3	1820-1303	5	1	IC CNTR ECL BCD POS-EDGE-TRIG	04713	MC10130L
A7A1U4	1820-0002	1	1	IC GATE ECL NOR QUAD 2-INP	04713	MC10102P
A7A1U5	1820-0223	0	1	IC OP AMP GP TD-99 PKG	3L585	CA301AT
A7A1U6	1820-0429	8	1	IC V RCLTR TO-3P	18324	LM309H
A7A1VR1	1902-3082	9	1	DIODE-ZNR 4.64V 5% DO-35 PD=.4W	28480	1902-3082
A7A1VR2	1902-3256	9	1	DIODE-ZNR 23.7V 5% DO-35 PD=.4W	28480	1902-3256
A7A1W1	85660-60084	8	1	CDL AY GRA/OR	28480	85660-60084
MISCELLANEOUS PARTS						
	2190-0124	4	1	WASHER-LK INTL T NO. 10 .195-IN-ID	28480	2190-0124
	2200-0101	0	2	SCREW-MACH 4-40 .188-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
	2200-0103	2	1	SCREW-MACH 4-40 .25-IN-LG PAN-HD-POZI	28480	2200-0103
	2950-0078	9	1	NUT-HEX-DBL-CHAM 10-32-THD .067-IN-THK	28480	2950-0078
	85660-20045	7	1	CVR PC REF PHDET	28480	85660-20045
	86701-40001	9	2	EXTRACTOR PC	28480	86701-40001

*Indicates Factory Selected Value



A7A1

FIGURE 4. A7A1 REFERENCE PHASE DETECTOR, BLOCK DIAGRAM

A7A1 REFERENCE PHASE DETECTOR 85660-60015

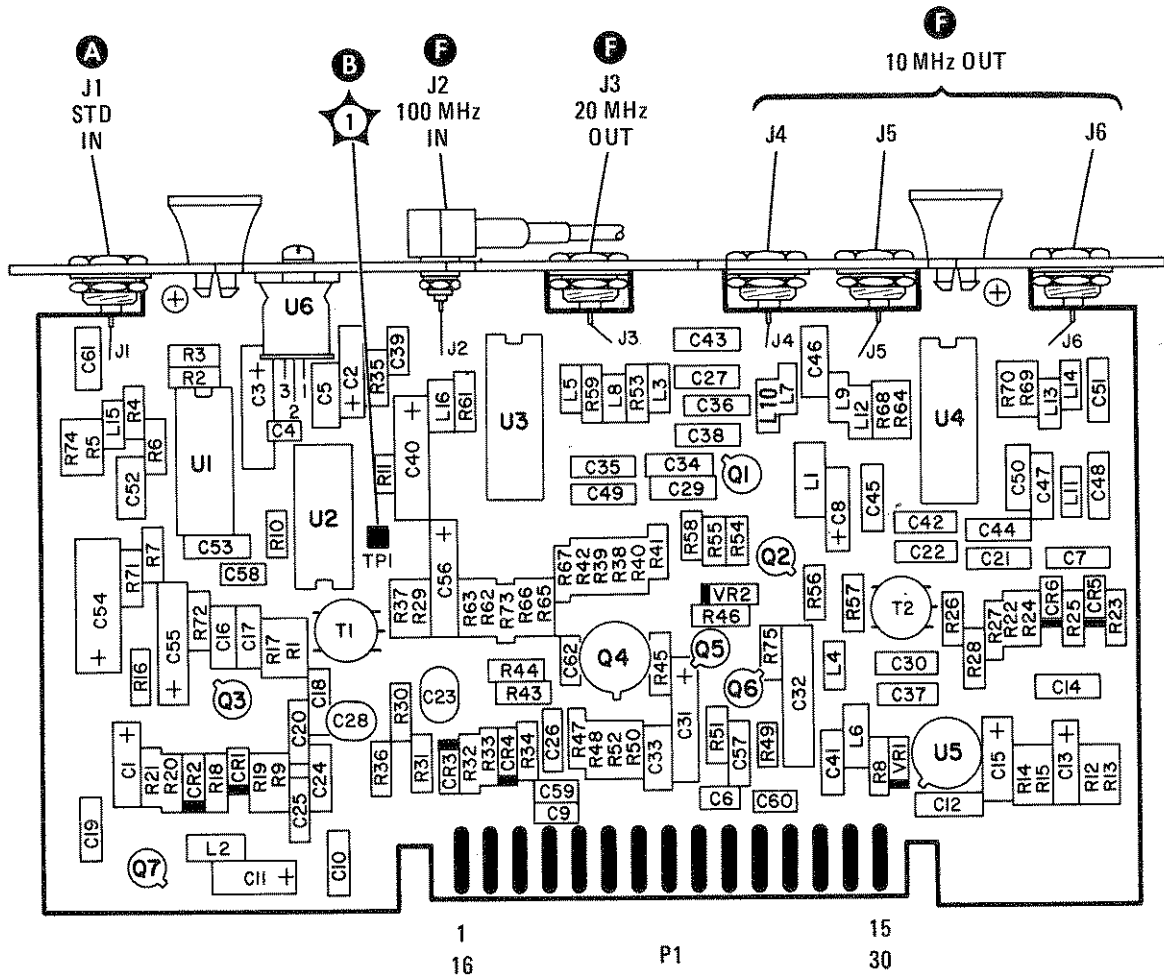
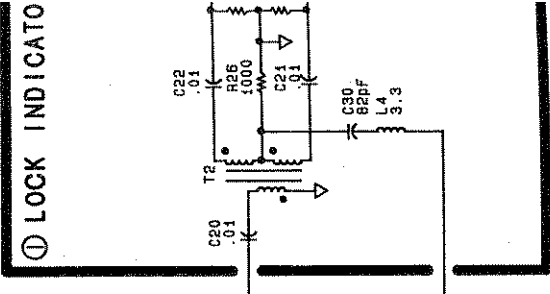
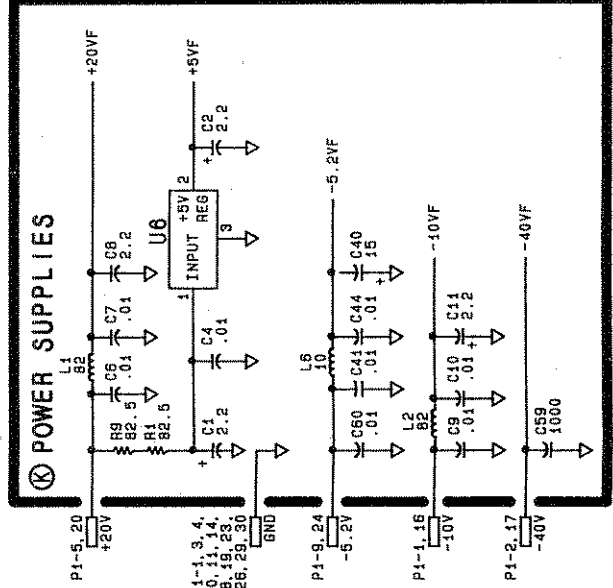
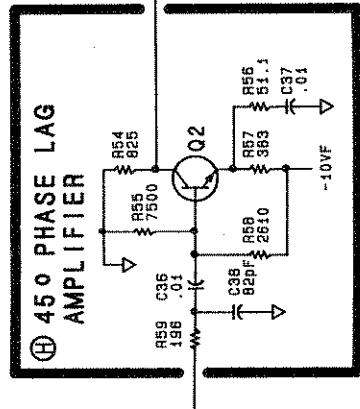
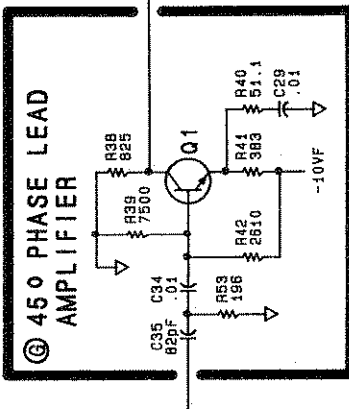
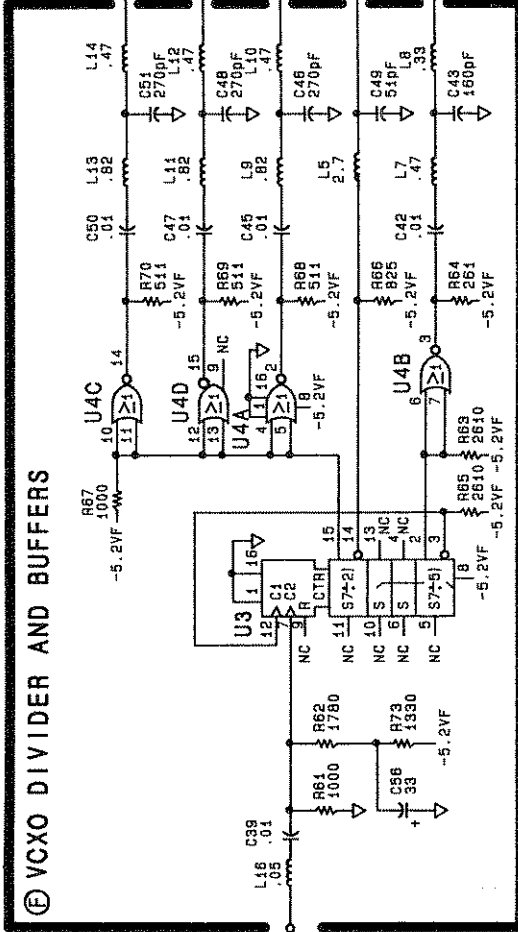
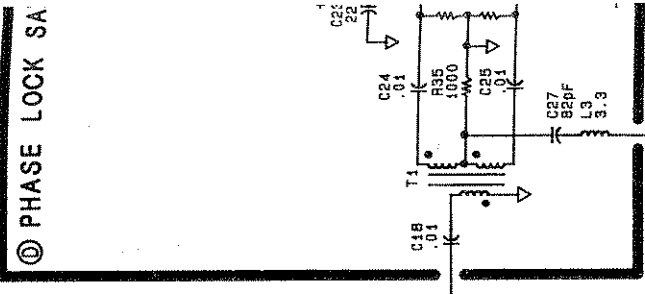
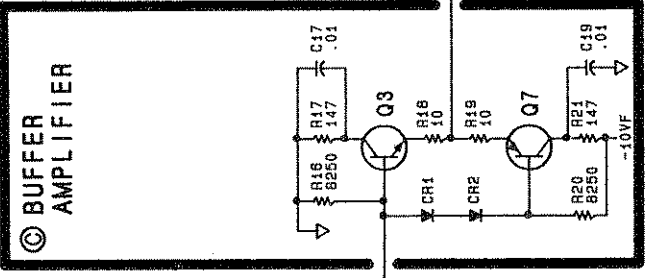
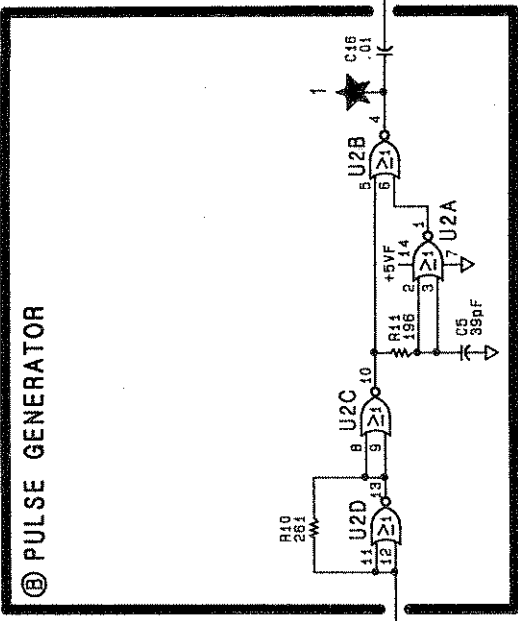
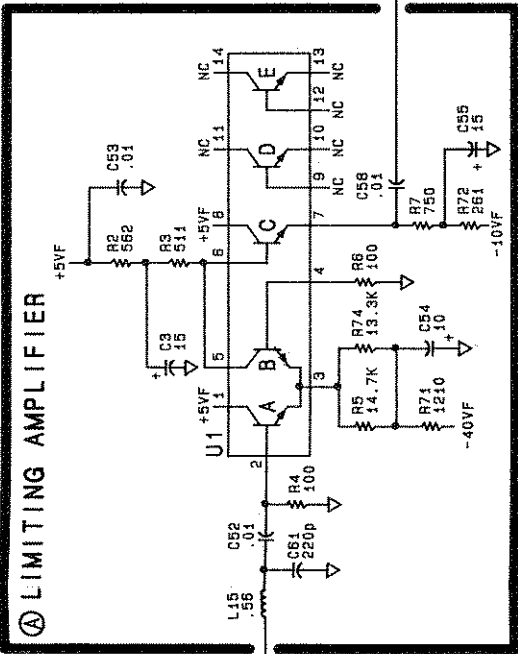


FIGURE 5. A7A1 REFERENCE PHASE DETECTOR, COMPONENT LOCATIONS

**A7A1 REFERENCE PHASE
DETECTOR 85660-60015**

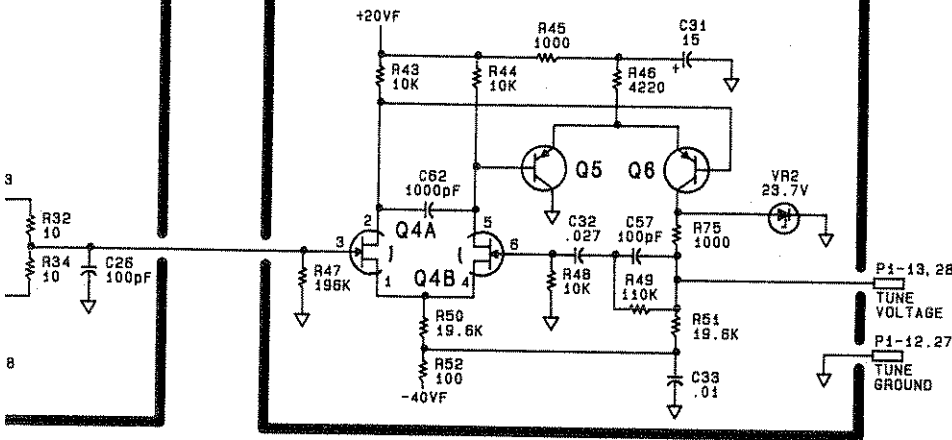
PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	-10V		K
16	-10V		K
2	-40V		K
3	GND		K
18	GND		K
4	GND		K
19	GND		K
5	+20V		K
20	+20V		K
6	N.C.		
21	N.C.		
7	HULR	A12P3-25	J
22	HULR	A12P3-25	J
8	GND		K
23	GND		K
9	-5.2V		K
24	-5.2V		K
10	GND		K
25	GND		K
11	GND		K
26	GND		K
12	TUNE	A7A2	E
27	GROUND	P1-12, 27	E
13	TUNE	A7A2	E
28	VOLTAGE	P1-14, 29	E
14	GND		K
29	GND		K
15	GND		K
30	GND		K



SERIAL PREFIX: 2410A

RESECTION

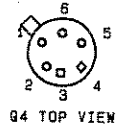
ⓔ INTEGRATING AMPLIFIER



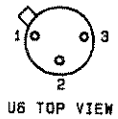
NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATION, PREFIX ABBREVIATION WITH ASSEMBLY DESIGNATION.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IS IN OHMS (Ω) CAPACITANCE IS IN MICROFARADS (μF) INDUCTANCE IS IN MICROHENRIES (μH)
3. UNLESS OTHERWISE INDICATED: SIGNALS ENTER AT LEFT SIDE AND EXIT AT RIGHT SIDE OF FUNCTION BLOCKS.

4. Q4 PIN CONFIGURATION:



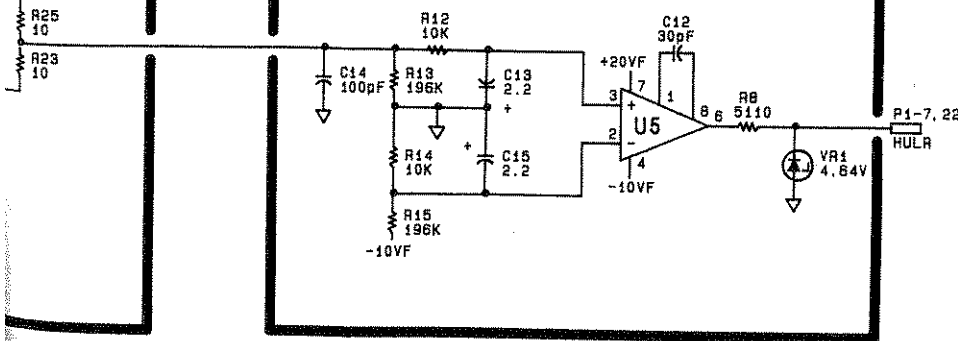
5. U6 PIN CONFIGURATION:



6. MNEMONICS TABLE:

MNEMONIC	DESCRIPTION
HULR	HIGH-REFERENCE UNLOCKED

ⓓ PHASE LOCK DETECTOR



A7A1

FIGURE 6. A7A1 REFERENCE PHASE DETECTOR, SCHEMATIC DIAGRAM

A7A2 100 MHz VOLTAGE-CONTROLLED CRYSTAL OSCILLATOR (VCXO), CIRCUIT DESCRIPTION

A7A2 consists of a 100 MHz voltage-controlled crystal oscillator, buffer amplifiers, and a frequency quadrupler. In conjunction with A7A1 Reference Phase Detector, it forms the reference phase-lock loop. Outputs of 100 MHz and 400 MHz are used as frequency references by other assemblies in the instrument.

100 MHz Oscillator (A)

Q5 functions as a common-base amplifier with feedback to form an oscillator. The feedback includes the 100 MHz crystal Y1 and varactor CR1 which are the principal frequency-determining components. CR1 is tuned by the output of A7A1 and can vary the frequency by approximately ± 1 kHz. The amplitude of the oscillations is limited by CR3 and CR4. TP1 is accessible from the top cover; the voltage should be near -8 V dc for proper operation. The voltage is adjusted by tuning the oscillator with C4.

100 MHz Buffer Amplifier (B)

Q6, Q7, Q8, Q9, and Q11 form a series of 100 MHz amplifiers. They buffer the 100 MHz outputs from each other as well as from the oscillator.

Quadrupler (C)

100 MHz from Q7 in (B) is applied to T3. The secondary of T3 is connected to Q3 and Q4 to form a full-wave rectifier. Positive half cycles of 100 MHz to T3 turn on Q3 while negative half cycles turn on Q4. The collectors are connected together to sum the currents and produce even harmonics of 100 MHz. The output is tuned to 400 MHz by C3 and L10 to select 400 MHz.

400 MHz Amplifier (D)

Q1 and Q2 are two common-emitter tuned amplifier stages which amplify 400 MHz and filter undesired harmonics of 100 MHz. R67, R68, and R69 form a pad which is selected to give -9 dBm ± 2 dB output at 400 MHz.

A7A2 100 MHz VCXO, TROUBLESHOOTING

The 100 MHz VCXO supplies all of the fixed reference frequencies for the 8566B. Separate 100 MHz outputs are routed to the A6A9, A10A4, and A7A1 assemblies. A 400 MHz signal is applied to the A7A3 assembly. The A7A1 assembly divides the 100 MHz input to provide 10 MHz and 20 MHz references.

100 MHz Oscillator (A)

The tune voltage at A7A2TP1 is nominally -8V . If an unlocked condition exists, this voltage is either -23V or -1.3V . If the level is -23V , check the 10 MHz reference to A7A1. If the level is -1.3V , check the outputs of the 100 MHz Buffer/Amplifier.

Typical voltage levels for the oscillator transistor Q5 are:

Emitter	-12.8V
Base	-11.9V
Collector	0.0V

100 MHz Buffer/Amplifier (B)

All 100 MHz output levels should be approximately 0 dBm. Typical voltage levels for each transistor are as shown in Table 1.

TABLE 1. 100 MHz BUFFER/AMPLIFIER VOLTAGE LEVELS

	Q6	Q7	Q11	Q8	Q9
Emitter	3.8	3.8	3.8	4.3	5.0
Base	4.5	4.5	4.5	5.0	5.5
Collector	9.2	9.1	9.3	10.0	11.0

Quadrupler (C) and 400 MHz Amplifier (D)

Typical voltage levels for the Quadrupler and 400 MHz Amplifier are as shown in Table 2.

The 400 MHz Amplifier output at A7A2J1 (white/blue cable) is approximately -10 dBm .

TABLE 2. QUADRUPLER AND 400 MHz AMPLIFIER VOLTAGE LEVELS

	Q3	Q4	Q1	Q2
Emitter	-4.6	-5.1	-6.6	-6.6
Base	-5.9	-5.9	-5.9	-5.9
Collector	0.0	0.0	0.0	0.0

TABLE 3. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A7A2	85660-60135	0	1	BOARD ASSEMBLY, 100MHZ VOLTAGE-CONTROL-LED CRYSTAL OSCILLATOR (VCXD)	28480	85660-60135
A7A2C1	0121-0495	5	3	CAPACITOR-V TRMR-AIR 1.9-15.7PF 175V	74970	187-0309-125
A7A2C2	0121-0495	5		CAPACITOR-V TRMR-AIR 1.9-15.7PF 175V	74970	187-0309-125
A7A2C3	0121-0495	5		CAPACITOR-V TRMR-AIR 1.9-15.7PF 175V	74970	187-0309-125
A7A2C4	0121-0493	3	1	CAPACITOR-V TRMR-AIR 1.7-11PF 175V	74970	187-0306-125
A7A2C5	0160-0049	9	1	CAPACITOR-FXD 20UF+75-10% 50VDC AL	56289	3002060050CC2
A7A2C6	0160-3456	6	5	CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A7A2C7	0160-3454	4	19	CAPACITOR-FXD 220PF +-10% 1KVDC CER	28480	0160-3454
A7A2C8*	0160-2251	7	1	CAPACITOR-FXD 5.6PF +- .25PF 500VDC CER	28480	0160-2251
A7A2C9	0160-4084	8	1	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A7A2C10	0140-0191	8	1	CAPACITOR-FXD 56PF +-5% 300VDC MICA	72136	DM15E560J0300WV1CR
A7A2C11	0160-2204	0	1	CAPACITOR-FXD 100PF +-5% 300VDC MICA	28480	0160-2204
A7A2C12	0160-3454	4		CAPACITOR-FXD 220PF +-10% 1KVDC CER	28480	0160-3454
A7A2C13	0160-3454	4		CAPACITOR-FXD 220PF +-10% 1KVDC CER	28480	0160-3454
A7A2C14	0160-3454	4		CAPACITOR-FXD 220PF +-10% 1KVDC CER	28480	0160-3454
A7A2C15	0160-2261	9	8	CAPACITOR-FXD 15PF +-5% 500VDC CER 0+-30	28480	0160-2261
A7A2C16	0160-2261	9		CAPACITOR-FXD 15PF +-5% 500VDC CER 0+-30	28480	0160-2261
A7A2C17	0160-3454	4		CAPACITOR-FXD 220PF +-10% 1KVDC CER	28480	0160-3454
A7A2C18	0160-3454	4		CAPACITOR-FXD 220PF +-10% 1KVDC CER	28480	0160-3454
A7A2C19	0160-2261	9		CAPACITOR-FXD 15PF +-5% 500VDC CER 0+-30	28480	0160-2261
A7A2C20	0160-2261	9		CAPACITOR-FXD 15PF +-5% 500VDC CER 0+-30	28480	0160-2261
A7A2C21	0160-3454	4		CAPACITOR-FXD 220PF +-10% 1KVDC CER	28480	0160-3454
A7A2C22	0160-3454	4		CAPACITOR-FXD 220PF +-10% 1KVDC CER	28480	0160-3454
A7A2C23	0160-3454	4		CAPACITOR-FXD 220PF +-10% 1KVDC CER	28480	0160-3454
A7A2C24	0160-3454	4		CAPACITOR-FXD 220PF +-10% 1KVDC CER	28480	0160-3454
A7A2C25	0160-3454	4		CAPACITOR-FXD 220PF +-10% 1KVDC CER	28480	0160-3454
A7A2C26	0160-2261	9		CAPACITOR-FXD 15PF +-5% 500VDC CER 0+-30	28480	0160-2261
A7A2C27	0160-2261	9		CAPACITOR-FXD 15PF +-5% 500VDC CER 0+-30	28480	0160-2261
A7A2C28	0160-3872	0	2	CAPACITOR-FXD 2.2PF +- .25PF 200VDC CER	28480	0160-3872
A7A2C29	0160-3872	0		CAPACITOR-FXD 2.2PF +- .25PF 200VDC CER	28480	0160-3872
A7A2C30	0160-3454	4		CAPACITOR-FXD 220PF +-10% 1KVDC CER	28480	0160-3454
A7A2C31	0160-3454	4		CAPACITOR-FXD 220PF +-10% 1KVDC CER	28480	0160-3454
A7A2C32	0160-2261	9		CAPACITOR-FXD 15PF +-5% 500VDC CER 0+-30	28480	0160-2261
A7A2C33	0160-2261	9		CAPACITOR-FXD 15PF +-5% 500VDC CER 0+-30	28480	0160-2261
A7A2C34	0160-3454	4		CAPACITOR-FXD 220PF +-10% 1KVDC CER	28480	0160-3454
A7A2C35	0160-3454	4		CAPACITOR-FXD 220PF +-10% 1KVDC CER	28480	0160-3454
A7A2C36	0160-3878	6	5	CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A7A2C37	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A7A2C38	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A7A2C39	0160-3454	4		CAPACITOR-FXD 220PF +-10% 1KVDC CER	28480	0160-3454
A7A2C40	0160-2238	0	1	CAPACITOR-FXD 1.5PF +- .25PF 500VDC CER	28480	0160-2238
A7A2C41				NOT ASSIGNED		
A7A2C42	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A7A2C43	0160-0116	1	2	CAPACITOR-FXD 6.0UF+-10% 35VDC TA	56289	150D605X9635B2
A7A2C44	0160-2253	9	1	CAPACITOR-FXD 6.0PF +- .25PF 500VDC CER	28480	0160-2253
A7A2C45				NOT ASSIGNED		
A7A2C46	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A7A2C47	0160-3454	4		CAPACITOR-FXD 220PF +-10% 1KVDC CER	28480	0160-3454
A7A2C48	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A7A2C49	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A7A2C50	0180-0116	1		CAPACITOR-FXD 6.0UF+-10% 35VDC TA	56289	150D605X9635B2
A7A2C51	0160-4279	7	1	CAPACITOR-FXD 2200PF +-20% 250VDC CER	56289	C067F251F222MS2-CDH
A7A2C52	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A7A2C53	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A7A2C54	0160-3454	4		CAPACITOR-FXD 220PF +-10% 1KVDC CER	28480	0160-3454
A7A2C55	0160-3454	4		CAPACITOR-FXD 220PF +-10% 1KVDC CER	28480	0160-3454
A7A2C56	0160-2437	1	1	CAPACITOR-FDTHRU 5000PF +80 -20% 200V	28480	0160-2437
A7A2CR1	0122-0245	5	1	DIODE-VVC 1N5139 6.0PF 10%	01281	1N5139
A7A2CR2				NOT ASSIGNED		
A7A2CR3	1901-0539	3	2	DIODE-SM SIG SCHOTTKY	28480	1901-0539
A7A2CR4	1901-0539	3		DIODE-SM SIG SCHOTTKY	28480	1901-0539
A7A2E1	9170-0029	3	1	CURE-SHIELDING BEAD	28480	9170-0029
A7A2J1				P/O A7A2W1		
A7A2J2	1250-0544	9	3	CONNECTOR-RF SM-SNP M SGL-HOLE-FR 50-OHM	28480	1250-0544
A7A2J3	1250-0544	9		CONNECTOR-RF SM-SNP M SGL-HOLE-FR 50-OHM	28480	1250-0544
A7A2J4	1250-0544	9		CONNECTOR-RF SM-SNP M SGL-HOLE-FR 50-OHM	28480	1250-0544
A7A2L1				NOT ASSIGNED		
A7A2L2	9100-2250	9	1	INDUCTOR RF-CH-MLD 180NH 10% .185DX.26LG	28480	9100-2250
A7A2L3	9140-0158	6	3	INDUCTOR RF-CH-MLD 1UH 10% .185DX.26LG	28480	9140-0158
A7A2L4*	9100-0368	0	1	INDUCTOR RF-CH-MLD 330NH 10% .185DX.26LG	28480	9100-0368
A7A2L5	9100-2538	6	1	INDUCTOR RF-CH-MLD 1UH 10% .161DX.365LG	28480	9100-2538

*Indicates Factory Selected Value

TABLE 3. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A7A2L6	9100-2251	0	4	INDUCTOR RF-CH-MLD 220NH 10% .105DX .26LG	28480	9100-2251
A7A2L7	9100-2251	0		INDUCTOR RF-CH-MLD 220NH 10% .105DX .26LG	28480	9100-2251
A7A2L8	9100-2251	0		INDUCTOR RF-CH-MLD 220NH 10% .105DX .26LG	28480	9100-2251
A7A2L9	9100-2251	0		INDUCTOR RF-CH-MLD 220NH 10% .105DX .26LG	28480	9100-2251
A7A2L10- A7A2L13				NOT ASSIGNED		
A7A2L14	9100-2247	4	2	INDUCTOR RF-CH-MLD 100NH 10% .105DX .26LG	28480	9100-2247
A7A2L15	9100-2248	5		INDUCTOR RF-CH-MLD 120NH 10% .105DX .26LG	28480	9100-2248
A7A2L16	9140-0158	6		INDUCTOR RF-CH-MLD 1UH 10% .105DX .26LG	28480	9140-0158
A7A2L17	9140-0158	6		INDUCTOR RF-CH-MLD 1UH 10% .105DX .26LG	28480	9140-0158
A7A2L18	9140-0144	0	2	INDUCTOR RF-CH-MLD 4.7UH 10% .105DX .26LG	28480	9140-0144
A7A2L19	9140-0144	0		INDUCTOR RF-CH-MLD 4.7UH 10% .105DX .26LG	28480	9140-0144
A7A2Q1	1854-0345	0	9	TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A7A2Q2	1854-0345	0		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A7A2Q3	1854-0345	0		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A7A2Q4	1854-0345	0		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A7A2Q5	1854-0247	9	1	TRANSISTOR NPN SI TO-39 PD=1W FT=800MHZ	28480	1854-0247
A7A2Q6	1854-0345	0		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A7A2Q7	1854-0345	0		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A7A2Q8	1854-0345	0		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A7A2Q9	1854-0345	0		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A7A2Q10	1854-0464	0	1	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0464
A7A2Q11	1854-0345	0		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A7A2R1	0757-0279	0	3	RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A7A2R2	0757-0419	0	1	RESISTOR 681 1% .125W F TC=0+-100	24546	C4-1/8-T0-681R-F
A7A2R3	0698-3446	7	1	RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8-T0-196R-F
A7A2R4	0757-0422	5	6	RESISTOR 909 1% .125W F TC=0+-100	24546	C4-1/8-T0-909R-F
A7A2R5	0698-3155	1	2	RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A7A2R6	0698-7224	3	1	RESISTOR 316 1% .05W F TC=0+-100	24546	C3-1/8-T0-316R-F
A7A2R7	0757-0346	2	2	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A7A2R8	0757-0422	5	1	RESISTOR 909 1% .125W F TC=0+-100	24546	C4-1/8-T0-909R-F
A7A2R9	0757-0442	9	1	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A7A2R10	0757-0401	0	7	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A7A2R11	0757-0394	0	5	RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A7A2R12	0757-0416	7	6	RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A7A2R13	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A7A2R14	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A7A2R15	0757-0422	5		RESISTOR 909 1% .125W F TC=0+-100	24546	C4-1/8-T0-909R-F
A7A2R16	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A7A2R17	0698-3150	6	0	RESISTOR 2.37K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2371-F
A7A2R18	0698-3150	6	6	RESISTOR 2.37K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2371-F
A7A2R19	0698-7198	0	2	RESISTOR 26.1 1% .05W F TC=0+-100	24546	C3-1/8-T0-26R1-F
A7A2R20	0698-3443	0	5	RESISTOR 287 1% .125W F TC=0+-100	24546	C4-1/8-T0-287R-F
A7A2R21	0698-3429	2	3	RESISTOR 19.6 1% .125W F TC=0+-100	03888	PME55-1/8-T0-19R6-F
A7A2R22	0698-3443	0		RESISTOR 287 1% .125W F TC=0+-100	24546	C4-1/8-T0-287R-F
A7A2R23	0698-3150	6		RESISTOR 2.37K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2371-F
A7A2R24	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A7A2R25	0698-3150	6		RESISTOR 2.37K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2371-F
A7A2R26	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A7A2R27	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A7A2R28	0757-0422	5		RESISTOR 909 1% .125W F TC=0+-100	24546	C4-1/8-T0-909R-F
A7A2R29	0698-7198	0		RESISTOR 26.1 1% .05W F TC=0+-100	24546	C3-1/8-T0-26R1-F
A7A2R30	0698-3443	0		RESISTOR 287 1% .125W F TC=0+-100	24546	C4-1/8-T0-287R-F
A7A2R31	0698-3429	2		RESISTOR 19.6 1% .125W F TC=0+-100	03888	PME55-1/8-T0-19R6-F
A7A2R32	0698-3443	0		RESISTOR 287 1% .125W F TC=0+-100	24546	C4-1/8-T0-287R-F
A7A2R33	0698-3443	0		RESISTOR 287 1% .125W F TC=0+-100	24546	C4-1/8-T0-287R-F
A7A2R34	0698-3429	2		RESISTOR 19.6 1% .125W F TC=0+-100	03888	PME55-1/8-T0-19R6-F
A7A2R35	0698-7223	2	1	RESISTOR 287 1% .05W F TC=0+-100	24546	C3-1/8-T0-287R-F
A7A2R36	0698-3150	6		RESISTOR 2.37K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2371-F
A7A2R37	0757-0422	5		RESISTOR 909 1% .125W F TC=0+-100	24546	C4-1/8-T0-909R-F
A7A2R38	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A7A2R39	0698-3150	6		RESISTOR 2.37K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2371-F
A7A2R40	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A7A2R41	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A7A2R42	0698-0084	9	3	RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A7A2R43	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A7A2R44	0698-0084	9		RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A7A2R45	0698-0084	9		RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A7A2R46	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A7A2R47	0757-0439	4	2	RESISTOR 6.81K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6811-F
A7A2R48	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A7A2R49	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A7A2R50	0757-0439	4		RESISTOR 6.81K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6811-F

*Indicates Factory Selected Value

TABLE 3. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A7A2R31	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A7A2R32	0757-0280	3	2	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A7A2R33	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A7A2R54	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A7A2R55	0757-0422	5		RESISTOR 999 1% .125W F TC=0+-100	24546	C4-1/8-T0-999R-F
A7A2R56	0698-3150	6		RESISTOR 2.37K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2371-F
A7A2R57	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A7A2R58	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A7A2R59	0698-3150	6		RESISTOR 2.37K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2371-F
A7A2R60	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A7A2R61	0757-0397	3	1	RESISTOR 68.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-68R1-F
A7A2R62	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A7A2R63*				NOT ASSIGNED		
A7A2R66	0698-3437	2	2	RESISTOR 133 1% .125W F TC=0+-100	24546	C4-1/8-T0-133R-F
A7A2R67*				RESISTOR 133 1% .125W F TC=0+-100	24546	C4-1/8-T0-133R-F
A7A2R68*	0698-4037	0	1	RESISTOR 46.4 1% .125W F TC=0+-100	24546	C4-1/8-T0-46R4-F
A7A2R69*	0698-3437	2		RESISTOR 133 1% .125W F TC=0+-100	24546	C4-1/8-T0-133R-F
A7A2T1	08553-6012	5	3	TRNSFRMR RF BLUE	28480	08553-6012
A7A2T2	08553-6012	5		TRNSFRMR RF BLUE	28480	08553-6012
A7A2T3	08553-6012	5		TRNSFRMR RF BLUE	28480	08553-6012
A7A2TP1				NOT ASSIGNED		
A7A2TP2	1251-0600	0	3	CONNECTOR-SGL CDNT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A7A2TP3	1251-0600	0		CONNECTOR-SGL CDNT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A7A2TP4	1251-0600	0		CONNECTOR-SGL CDNT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A7A2W1	85660-60082	6	1	CBL AY WHT/BLU	28480	85660-60082
A7A2Y1	0418-1086	5	1	CRYSTAL-QUARTZ 100.00 MHZ HC-35/U-GLDR	28480	0418-1086
				MISCELLANEOUS PARTS		
	85660-20046	8	1	COVER V	28480	85660-20046
	86701-40001	9	2	EXTRACTOR PC	28480	86701-40001

*Indicates Factory Selected Value

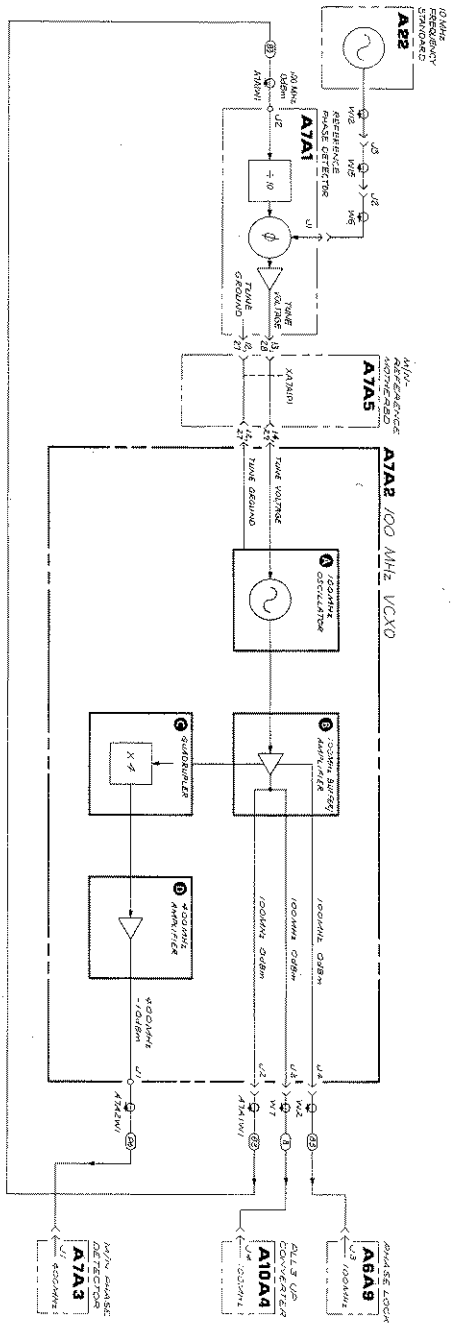


FIGURE 1 A7A2 100 MHz VCXO BLOCK DIAGRAM
A7A2 718

A7A2

A7A2
100 MHz VCXO
85660-60135

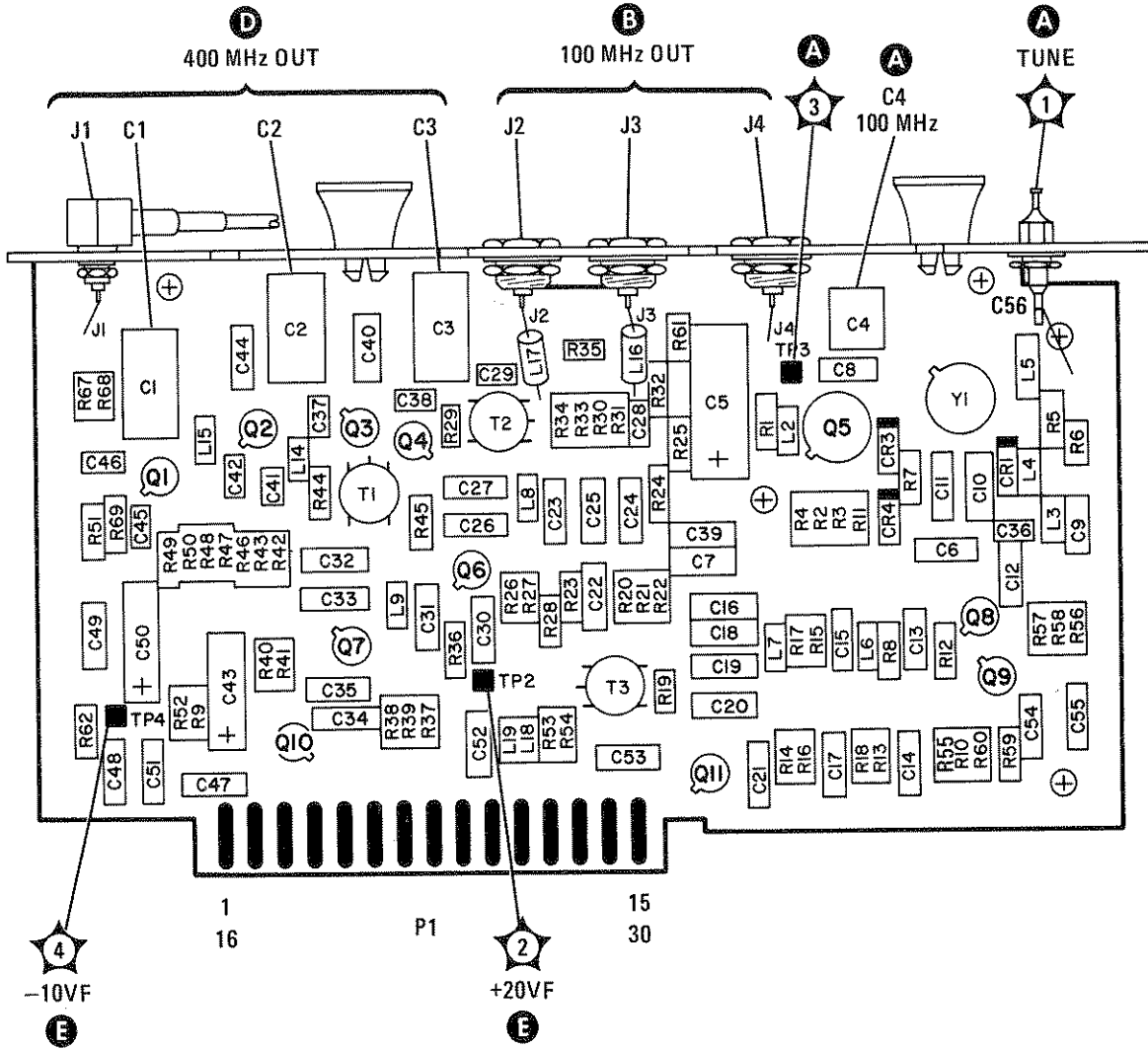
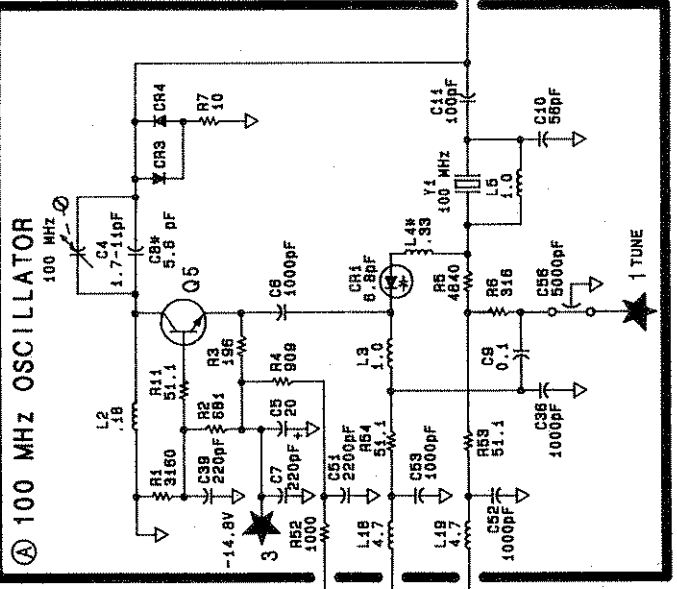


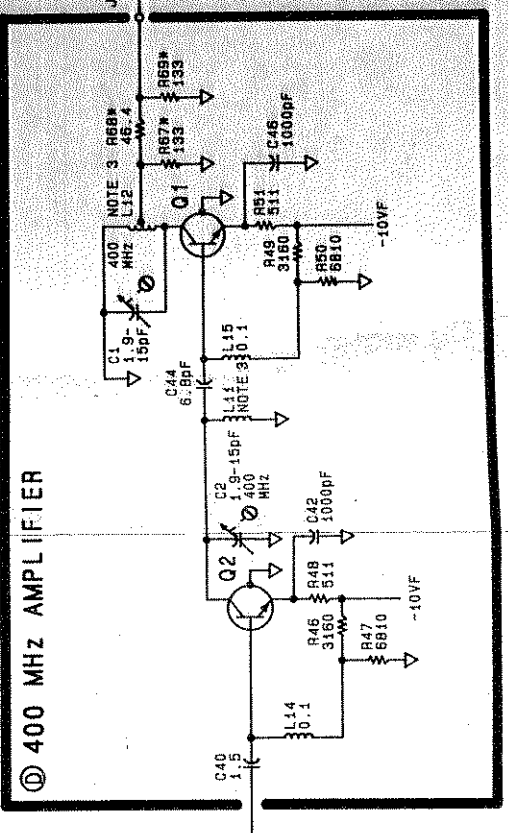
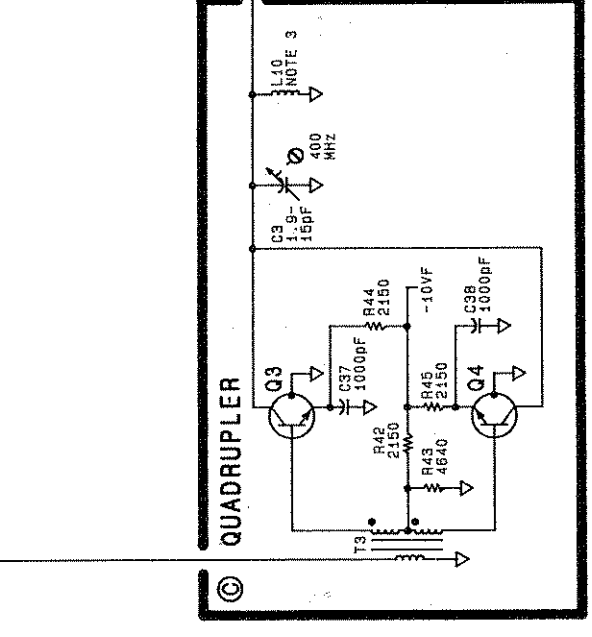
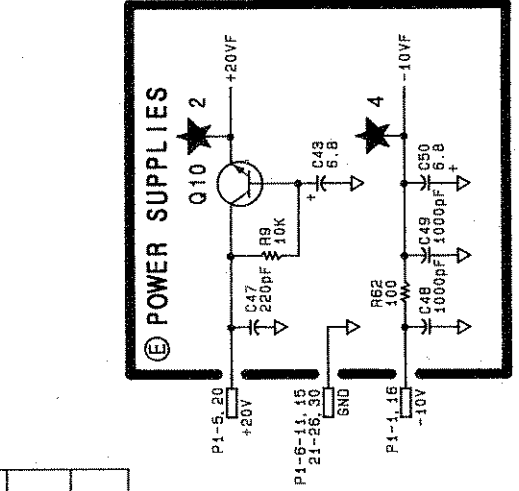
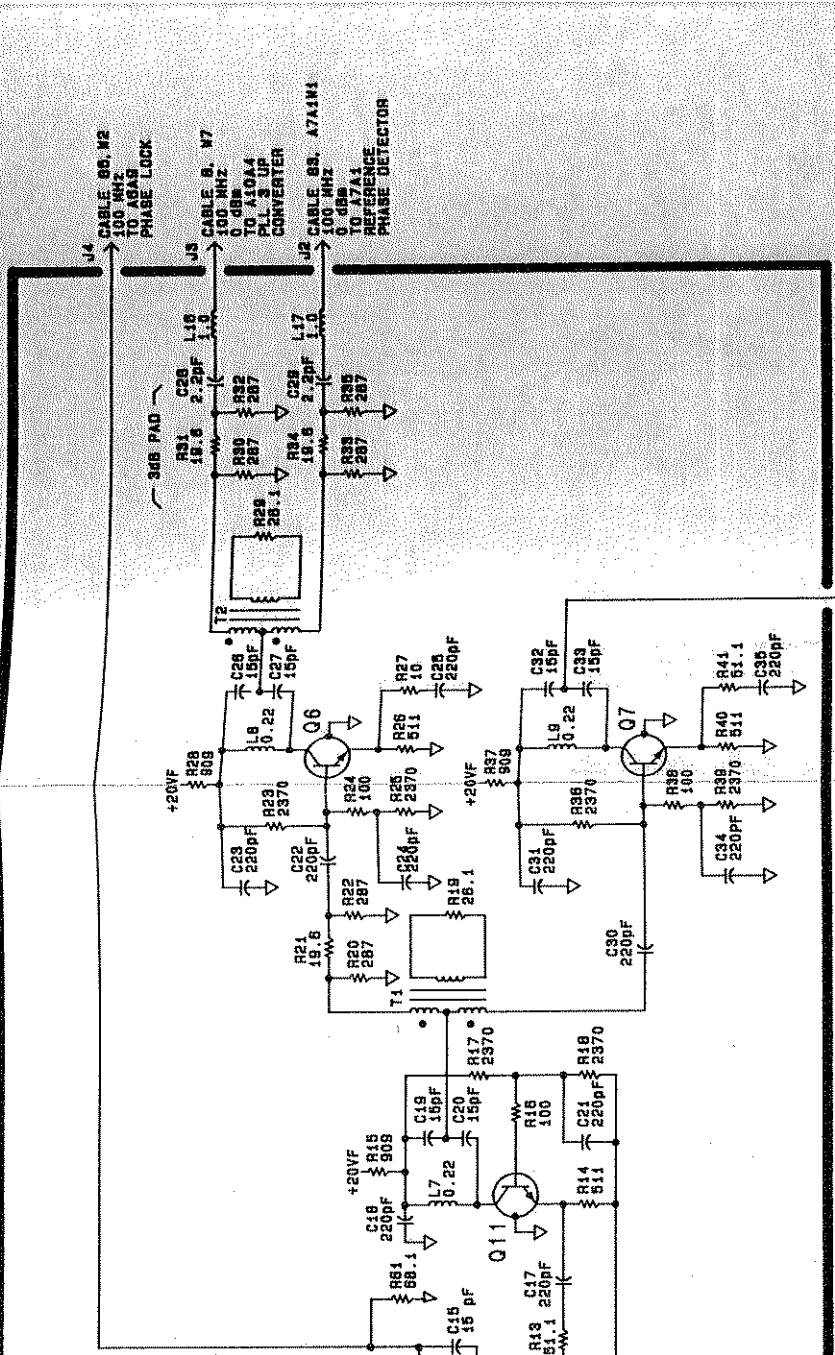
FIGURE 2. A7A2 100 MHz VCXO, COMPONENT LOCATIONS

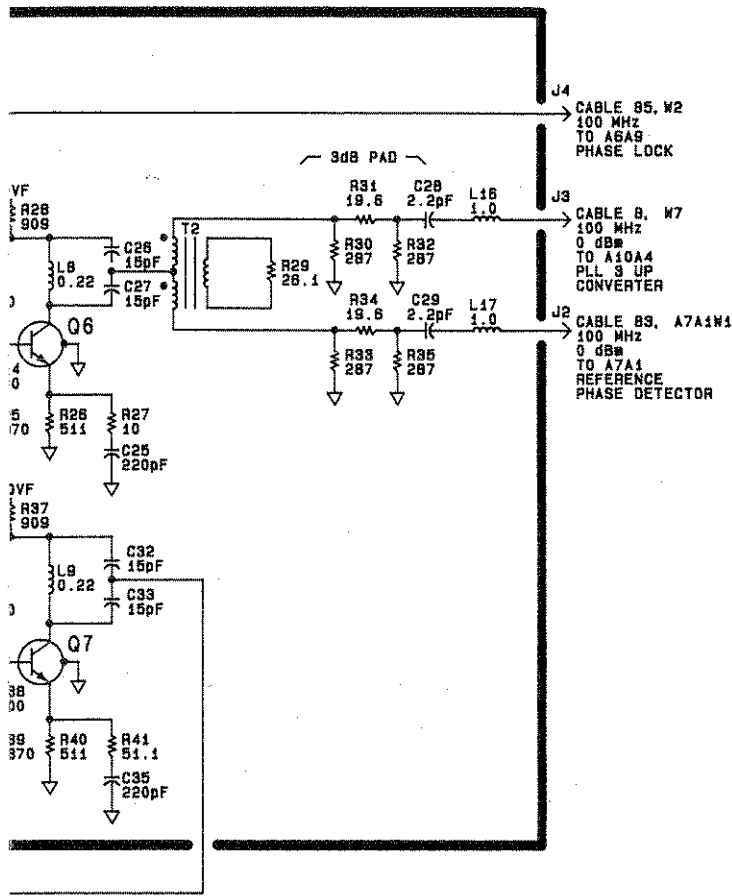
P1

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	-10V		E
16	-10V		E
2	NC		
17	NC		
3	-40V		A
18	-40V		A
4	NC		
19	NC		
5	+20V		E
20	+20V		E
6	GND		E
21	GND		E
7	GND		E
22	GND		E
8	GND		E
23	GND		E
9	GND		E
24	GND		E
10	GND		E
25	GND		E
11	GND		E
26	GND		E
12	TUNE	A7A1	A
13	GROUND	P1-12, 27	A
27	GROUND		
14	NC		
28	NC		
15	TUNE	A7A1	A
29	VOLTAGE	P1-13, 28	A
30	VOLTAGE		
15	GND		E
30	GND		E

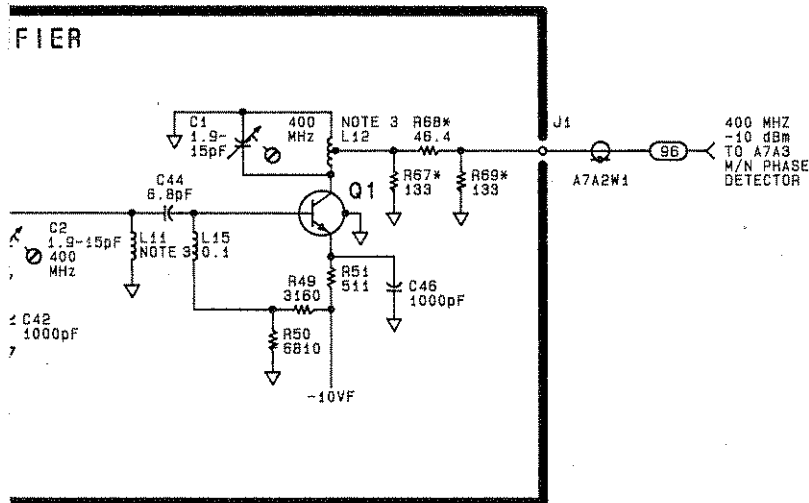


100 MHz BUFFER/AMPLIFIER





1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATION, PREFIX ABBREVIATION WITH ASSEMBLY DESIGNATION.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IS IN OHMS (Ω) CAPACITANCE IS IN MICROFARADS (μF) INDUCTANCE IS IN MICROHENRIES (μH)
3. L10, L11, AND, L12 ARE PART OF PRINTED CIRCUIT BOARD
4. ASTERISK (*) INDICATES FACTORY SELECTED COMPONENT. TYPICAL VALUE IS SHOWN.
5. UNLESS OTHERWISE INDICATED: SIGNALS ENTER AT LEFT SIDE AND EXIT AT RIGHT SIDE OF FUNCTION BLOCKS.



A7A2

FIGURE 3. A7A2 100 MHz VCXO, SCHEMATIC DIAGRAM

A7A2 11/12

A7A3 M/N PHASE DETECTOR, CIRCUIT DESCRIPTION

The M/N phase detector has two programmable frequency dividers: an M divider and an N divider. M and N are integer numbers which give the ratio of divider input frequency to divider output frequency (i.e. the divide number). The input to the N divider is 20 MHz; the M divider input is the difference frequency between the M/N VCO (355 – 395 MHz) and 400 MHz. The two divider outputs are compared in a phase/frequency detector. The detector output is amplified and applied to A7A4 M/N Output where it is used to tune the M/N VCO.

In general, the M/N output frequency (from A7A4) is $(200 - 10 M/N)$ MHz. The M/N VCO frequency is twice the M/N output frequency. The spectrum analyzer frequency diagnostics (displayed by SHIFT R) show the M number, N number, and M/N frequency. The fifth line of diagnostics contains three integers; the second integer is the M number, and the third integer is the N number. The next (sixth) diagnostic line gives the M/N output frequency in MHz (177.5 MHz to 197.5 MHz).

TTL→ECL Level Translators (A)

The numbers to program the frequency dividers come from A12 Front-Panel Interface in binary at TTL levels. U3, U13, and U17 shift these to ECL levels which are approximately $-0.9V$ logic high and $-1.7V$ logic low. N1 and M1 designate the least significant bits.

N Divider (B) and M Divider (C)

The M and N dividers are virtually identical. Basically, the four most significant bits of N (three bits for M), N3, N4, N5, N6 load a counter U6. It counts down to two and is reloaded on the next clock pulse. The 2 least significant bits, N1 and N2, control pulse swallowing logic which causes the counter to count down to 1 instead of 2 before reloading. The logic determines the proper number of extra pulses to be swallowed to effect the proper divide number.

For troubleshooting, it is expedient to set the M and N numbers equal in a 1 MHz span using the frequency diagnostics explained above. Waveforms at corresponding points in the two dividers can then be compared to pinpoint the problem.

MIXER (D)

Q3 is an amplifier which drives the LO port of the mixer U24. It supplies about $+5$ dBm over the 355 to 395 MHz range. The output of the mixer is the difference between 400 MHz and the M/N VCO frequency which gives an IF frequency between 5 and 45 MHz. The IF level is about -17 dBm.

IF AMPLIFIER (E)

The 60 MHz low-pass filter rejects unwanted mixing products from the mixer. Q4 and U18B amplify and limit the IF signal and give it the proper levels to run the following ECL circuitry.

Phase/Frequency Detector (F)

The outputs of M and N dividers are compared in U1. When they are in phase, the outputs of U1 are narrow, coincident pulses. For unlock conditions, the output pulses are of varying widths.

Preamplifier (G)

Q1 and Q2 are a low-noise differential pair preamplifier. Their outputs are combined in the integrating amplifier of A7A4.

Phase Lock Indicator (H)

U2A and U2B are voltage comparators which compare each tune line to the average plus a small offset provided by R29. If the loop unlocks, one of the preamplifier outputs is higher than the comparison voltage, and the phase lock indicator goes high, indicating the unlock condition.

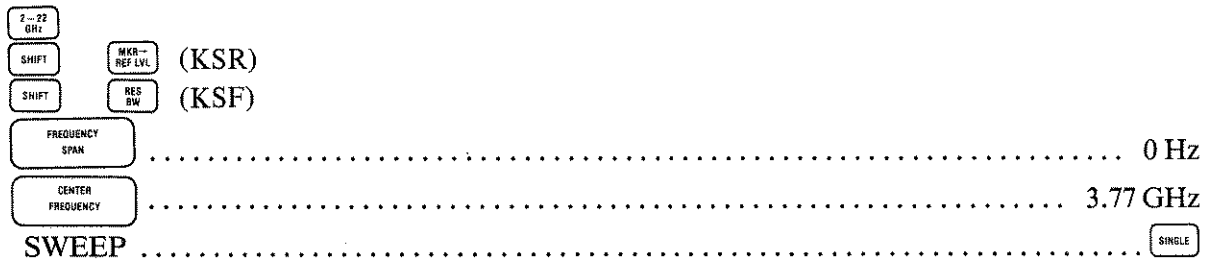
A7A3 M/N PHASE DETECTOR, TROUBLESHOOTING

The A7A3 M/N Phase Detector mixes the A7A4 M/N VCO output (355 to 395 MHz) with 400 MHz from the A7A2 100 MHz VCXO. The product of this mixing and the 20 MHz reference from the A7A1 are then divided by the M and N dividers respectively, and their resultant outputs are compared by a phase/frequency detector. The phase error is used to tune the A7A4 VCO.

The two dividers (M and N) are identical in operation and their waveforms can be compared for troubleshooting purposes. The M and N numbers can be set to the same value and various test points within each divider compared to reveal a malfunction, providing one of the dividers is known to be operating properly.

M Divider (C) and N Divider (B)

To display the M and N divide numbers on the 8566B CRT, key in the following settings:



The third line of the diagnostic (KSR) should read as follows:

1 20 20

The second and third numbers are the M and N divide numbers respectively. The waveform at test points 3 and 7, 5 and 6, and 1 and 2 should be as shown in Figures 1, 2, and 3 respectively. The Center Frequencies for Figures 1a, 1b, 1c, and 1d are 3.77 GHz, 3.96 GHz, 4.15 GHz, and 4.34 GHz respectively. The M and N numbers are 20, 21, 22, and 23 respectively.

Oscilloscope control settings for Figures 1 through 3 are:

Vertical: 0.1 V/Div
 Horizontal: 0.2 μ sec/Div
 Probe: 10:1

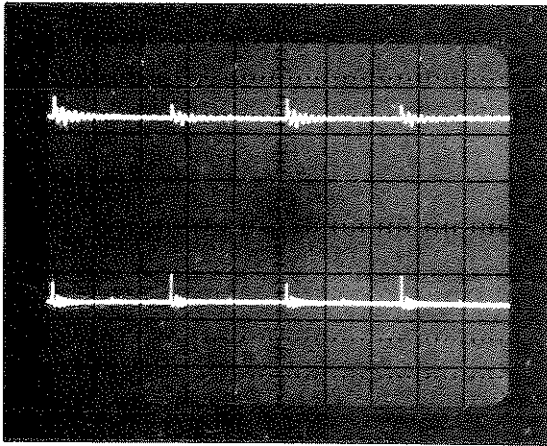
NOTE

**All waveform voltage levels are emitter coupled logic (ECL) levels:
 - 0.9V = high, - 1.7V = low.**

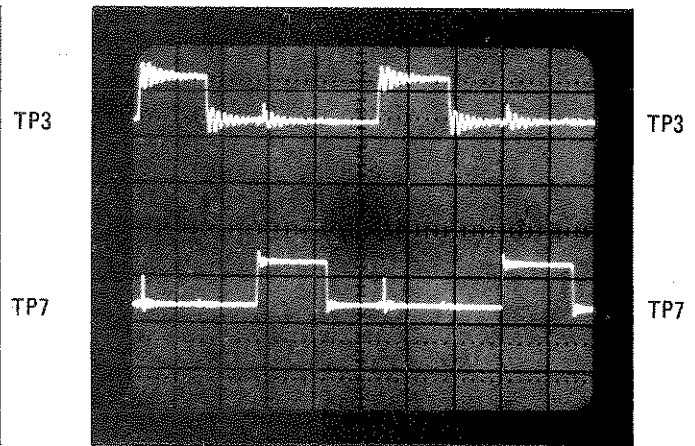
Mixer (D) and IF Amplifier (E)

The Mixer inputs are 400 MHz from A7A2 100 MHz VCXO and 355 to 395 MHz from A7A4 M/N Output. When the M and N numbers are the same, the M/N output frequency is 380 MHz.

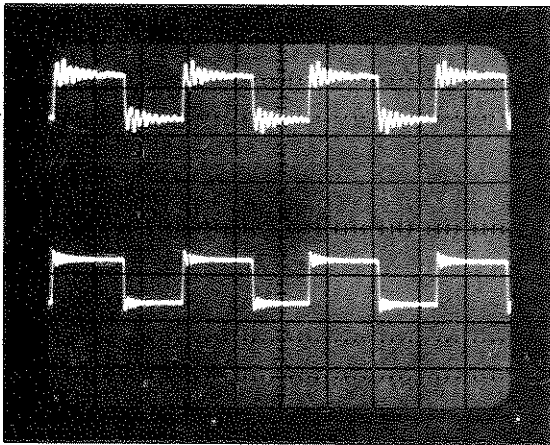
LEVELS = ECL LOW = -1.7V



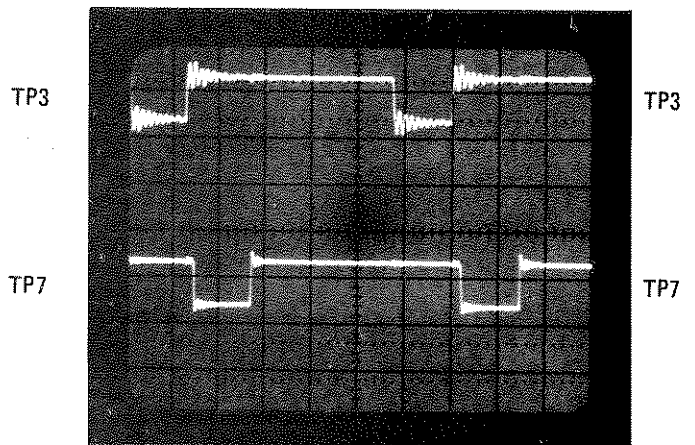
a. M or N Numbers 8, 12, 16, 20, 24, 28, or 32

DUTY CYCLE $< 1/3$ 

b. M or N Numbers 9, 13, 17, 21, 25, or 29

DUTY CYCLE $\approx 1/2$ 

c. M or N Numbers 10, 14, 18, 22, 26, or 30

DUTY CYCLE $> 2/3$ 

d. M or N Numbers 11, 15, 19, 23, 27, or 31

FIGURE 1. M AND N DIVIDER WAVEFORMS FOR TEST POINTS 3 AND 7

DUTY CYCLE $\approx 1/2$

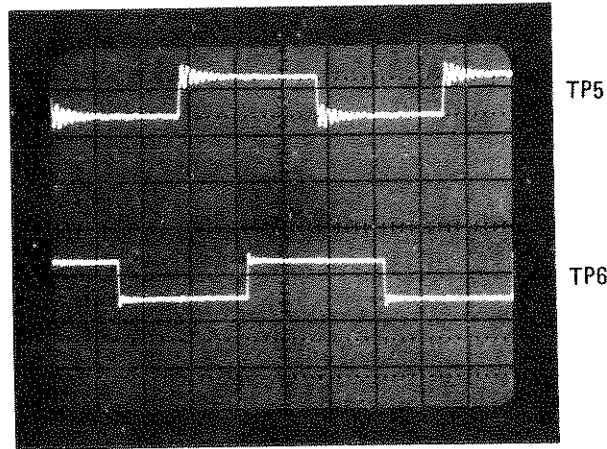


FIGURE 2. M AND N DIVIDER WAVEFORMS FOR TEST POINTS 5 AND 6

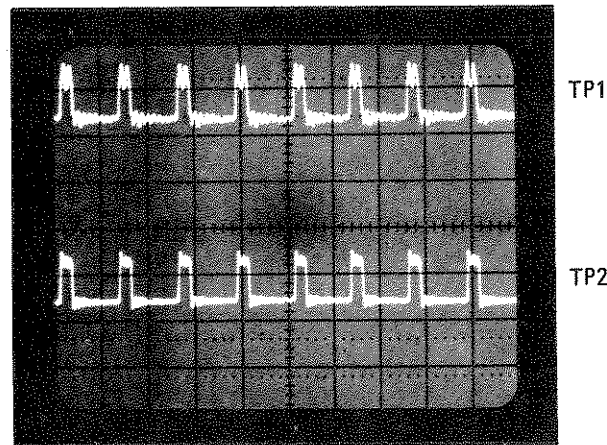


FIGURE 3. M AND N DIVIDER WAVEFORMS FOR TEST POINTS 1 AND 2

The output of the IF Amplifier at U18 Pin 3 is at ECL logic levels: $-0.9V = \text{high}$, $-1.7V = \text{low}$. Typical voltage levels for Q3 and Q4 are shown in Table 1.

TABLE 1. IF AMPLIFIER VOLTAGE LEVELS

	Voltage Levels	
	Q3	Q4
Emitter	-5.6	-7.4
Base	-4.8	-6.6
Collector	0	-1.9

Phase Frequency Detector (F) and Preamplicifier (G)

The Phase/Frequency Detector outputs pulses whose width is proportional to the phase difference of the two input signals. These pulses are filtered by the combination of R24/C5 and R25/C6. The Preamplicifier amplifies these pulses which are representative of the phase difference of the two input signals. Typical voltage levels for the Preamplicifier are shown in Table 2.

TABLE 2. TYPICAL PREAMPLIFIER VOLTAGE LEVELS

	Voltage Levels			
	Phase Locked	No Input At		
		J1	J2	J3
Q1				
Emitter	-1.0	-1.0	-1.0	-1.0
Base	-1.7	-0.8	-1.7	-0.8
Collector	-4.8	-7.9	-1.8	-7.9
Q2				
Emitter	-1.0	-1.0	-1.0	-1.0
Base	-1.7	-1.7	-0.8	-1.7
Collector	-4.8	-1.8	-7.9	-1.8

Phase Lock Indicator (H)

The outputs of the Preamplicifier are compared to a reference voltage of $-4V$ by U2A and U2B. The output (HULM) is high (active state) when the loop is unlocked.

This can be checked by disconnecting the 400 MHz input at A7A3J1 (white/blue cable) and measuring the output of U2 (P1-26). With the loop unlocked (400 MHz removed), this voltage should be approximately 4.64V.

TABLE 3. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A7A3	65660-60136	1	1	BOARD ASSEMBLY, M/N PHASE DETECTOR	28480	65660-60136
A7A3C1	0160-4299	7	4	CAPACITOR-FXD 2200PF +-20% 250VDC CER	56289	C067F251F222MS22-CDH
A7A3C2	0160-0574	3	6	CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	3160-3574
A7A3C3	0160-4299	7	3	CAPACITOR-FXD 2200PF +-20% 250VDC CER	56289	C067F251F222MS22-CDH
A7A3C4	0180-0100	3	1	CAPACITOR-FXD 4.7UF+-10% 35VDC TA	56289	150D475X9035B2
A7A3C5	0160-0572	1	2	CAPACITOR-FXD 2200PF +-20% 100VDC CER	28480	0160-0572
A7A3C6	0160-0572	1	1	CAPACITOR-FXD 2200PF +-20% 100VDC CER	28480	0160-0572
A7A3C7	0160-3876	4	2	CAPACITOR-FXD 47PF +-20% 200VDC CER	28480	0160-3876
A7A3C8	0160-3877	5	1	CAPACITOR-FXD 100PF +-20% 200VDC CER	28480	0160-3877
A7A3C9	0160-3876	4	1	CAPACITOR-FXD 47PF +-20% 200VDC CER	28480	0160-3876
A7A3C10	0160-0574	3	3	CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A7A3C11	0160-3873	1	1	CAPACITOR-FXD 4.7PF +-5PF 200VDC CER	28480	0160-3873
A7A3C12	0160-0574	3	3	CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A7A3C13	0160-3878	6	3	CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A7A3C14	0160-0574	3	3	CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A7A3C15	0160-3878	6	3	CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A7A3C16	0160-3878	6	1	CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A7A3C17	0180-0197	8	1	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A7A3C18	0160-4299	7	3	CAPACITOR-FXD 2200PF +-20% 250VDC CER	56289	C067F251F222MS22-CDH
A7A3C19	0180-0291	3	1	CAPACITOR-FXD 1UF+-10% 35VDC TA	56289	150D105X9035A2
A7A3C20	0160-0574	3	3	CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A7A3C21	0160-4299	7	3	CAPACITOR-FXD 2200PF +-20% 250VDC CER	56289	C067F251F222MS22-CDH
A7A3C22	0160-0574	3	3	CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A7A3J1	1250-0690	6	1	CONNECTOR-RF SMB M SGL-HOLE-FR 50-OHM	28480	1250-0690
A7A3L1	9100-1641	0	2	INDUCTOR RF-CH-MLD 240UH 5% .166DX.385LG	28480	9100-1641
A7A3L2	9100-2259	0	1	INDUCTOR RF-CH-MLD 1.5UH 10% .105DX.26LG	28480	9100-2259
A7A3L3	9100-1641	0	1	INDUCTOR RF-CH-MLD 240UH 5% .166DX.385LG	28480	9100-1641
A7A3L4	9100-2891	4	2	INDUCTOR RF-CH-MLD 50NH 10% .105DX.26LG	28480	9100-2891
A7A3L5	9100-2891	4	1	INDUCTOR RF-CH-MLD 50NH 10% .105DX.26LG	28480	9100-2891
A7A3L6	9100-2248	5	3	INDUCTOR RF-CH-MLD 120NH 10% .105DX.26LG	28480	9100-2248
A7A3L7	9100-2248	5	1	INDUCTOR RF-CH-MLD 120NH 10% .105DX.26LG	28480	9100-2248
A7A3L8	9100-2248	5	1	INDUCTOR RF-CH-MLD 120NH 10% .105DX.26LG	28480	9100-2248
A7A3Q1	1853-0451	5	2	TRANSISTOR PNP 2N3779 SI TO-18 PD=360MW	01295	2N3779
A7A3Q2	1853-0451	5	1	TRANSISTOR PNP 2N3779 SI TO-18 PD=360MW	01295	2N3779
A7A3Q3	1854-0345	8	2	TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A7A3Q4	1854-0345	8	1	TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A7A3R1	0698-3154	0	3	RESISTOR 4.22K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4221-F
A7A3R2	0698-3154	0	0	RESISTOR 4.22K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4221-F
A7A3R3	0698-3154	0	0	RESISTOR 4.22K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4221-F
A7A3R4	0698-3154	0	0	RESISTOR 4.22K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4221-F
A7A3R5	0698-7267	4	1	RESISTOR 19.6K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1962-F
A7A3R6	0757-0461	0	1	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A7A3R7	0698-0803	0	2	RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A7A3R8	0698-7192	4	2	RESISTOR 14.7 1% .05W F TC=0+-100	24546	C3-1/8-T0-14R7-F
A7A3R9	0757-0280	3	2	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A7A3R10	0757-0280	3	3	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A7A3R11	0698-3154	0	1	RESISTOR 4.22K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4221-F
A7A3R12	0698-7212	9	1	RESISTOR 100 1% .05W F TC=0+-100	24546	C3-1/8-T0-100R-F
A7A3R13	0698-3157	3	2	RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A7A3R14	0757-0416	7	4	RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A7A3R15	0757-0416	7	7	RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A7A3R16	0698-7240	1	3	RESISTOR 3.16K 1% .05W F TC=0+-100	24546	C3-1/8-T0-3161-F
A7A3R17	0698-7248	1	1	RESISTOR 3.16K 1% .05W F TC=0+-100	24546	C3-1/8-T0-3161-F
A7A3R18	0698-7223	2	1	RESISTOR 207 1% .05W F TC=0+-100	24546	C3-1/8-T0-207R-F
A7A3R19	0698-7256	1	1	RESISTOR 6.81K 1% .05W F TC=0+-100	24546	C3-1/8-T0-6811-F
A7A3R20	0698-7248	1	1	RESISTOR 3.16K 1% .05W F TC=0+-100	24546	C3-1/8-T0-3161-F
A7A3R21	0698-7220	9	2	RESISTOR 215 1% .05W F TC=0+-100	24546	C3-1/8-T0-215R-F
A7A3R22	0698-7220	9	1	RESISTOR 215 1% .05W F TC=0+-100	24546	C3-1/8-T0-215R-F
A7A3R23	0698-7192	4	1	RESISTOR 14.7 1% .05W F TC=0+-100	24546	C3-1/8-T0-14R7-F
A7A3R24	0757-0416	7	1	RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A7A3R25	0757-0416	7	1	RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A7A3R26	0757-0441	8	2	RESISTOR 8.25K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8251-F
A7A3R27	0757-0441	8	1	RESISTOR 8.25K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8251-F
A7A3R28	0698-3157	3	3	RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A7A3R29	0698-3162	0	1	RESISTOR 46.4K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4642-F
A7A3R30	0698-0883	8	1	RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A7A3TP1	1251-0600	0	7	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A7A3TP2	1251-0600	0	0	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A7A3TP3	1251-0600	0	0	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A7A3TP4	1251-0600	0	0	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A7A3TP5	1251-0600	0	0	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600

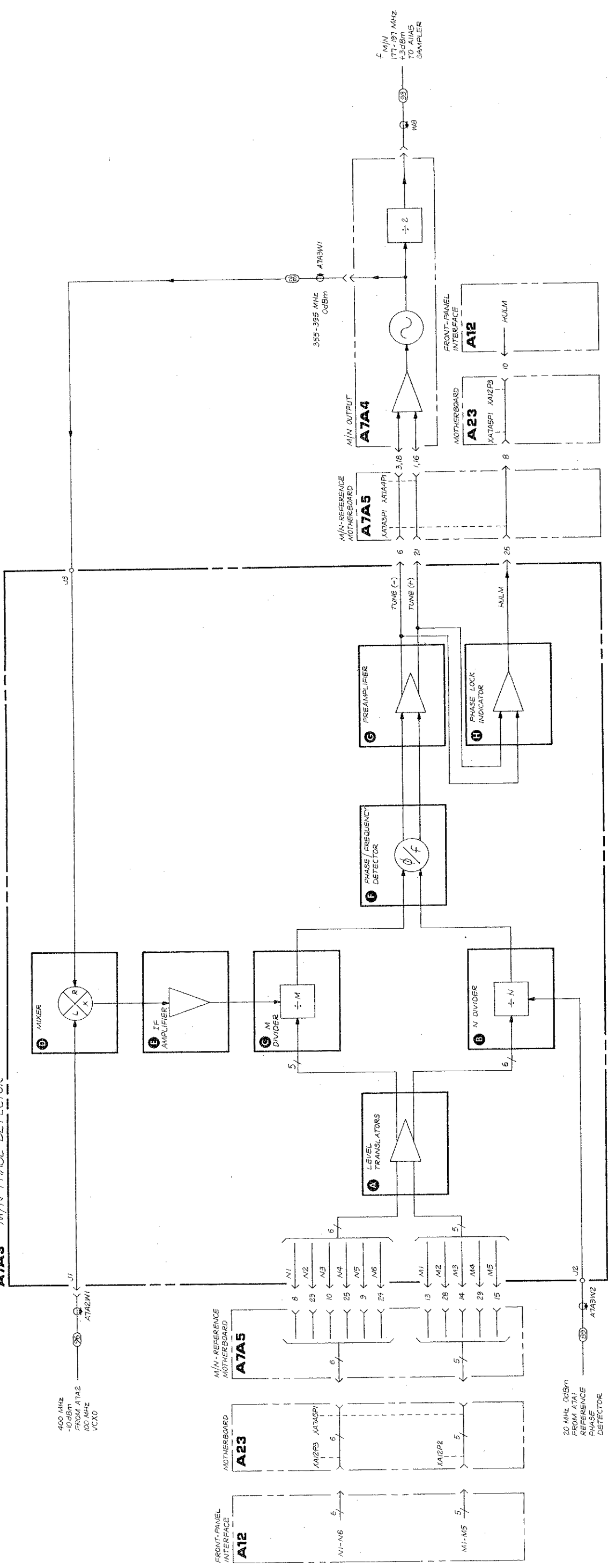
*Indicates Factory Selected Value

TABLE 3. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A7A3TP6	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A7A3TP7	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A7A3U1	1820-1344	8	1	IC PL LOOP 14-DIP-C PKG	04713	MC12049L
A7A3U2	5081-8117	3	1	SCREEN 1826-0092	28480	5081-8117
A7A3U3	1810-0251	3	3	NETWORK-RES 10-SIP MULTI-VALUE	28480	1810-0251
A7A3U4	1820-1225	4	2	IC FF ECL D-M/S DUAL	04713	MC10231P
A7A3U5	1810-0204	6	6	NETWORK-RES 8-SIP1.0K OHM X 7	01121	208A102
A7A3U6	1820-0821	4	2	IC CNTR ECL BIN UP/DOWN SYNCHRO	04713	MC10136L
A7A3U7	1820-0802	1	4	IC GATE ECL NOR QUAD 2-INP	04713	MC10102P
A7A3U8	1810-0204	6	6	NETWORK-RES 8-SIP1.0K OHM X 7	01121	208A102
A7A3U9	1820-0806	5	2	IC GATE ECL OR-NOR DUAL 4-5-INP	04713	MC10109P
A7A3U10	1820-0820	3	2	IC FF ECL J-BAR K-BAR COM CLOCK DUAL	04713	MC10135L
A7A3U11	1810-0204	6	6	NETWORK-RES 8-SIP1.0K OHM X 7	01121	208A102
A7A3U12	1820-0802	1	1	IC GATE ECL NOR QUAD 2-INP	04713	MC10102P
A7A3U13	1810-0251	3	3	NETWORK-RES 10-SIP MULTI-VALUE	28480	1810-0251
A7A3U14	1820-1225	4	4	IC FF ECL D-M/S DUAL	04713	MC10231P
A7A3U15	1810-0204	6	6	NETWORK-RES 8-SIP1.0K OHM X 7	01121	208A102
A7A3U16	1820-0821	4	4	IC CNTR ECL BIN UP/DOWN SYNCHRO	04713	MC10136L
A7A3U17	1810-0251	3	3	NETWORK-RES 10-SIP MULTI-VALUE	28480	1810-0251
A7A3U18	1820-0802	1	1	IC GATE ECL NOR QUAD 2-INP	04713	MC10102P
A7A3U19	1810-0204	6	6	NETWORK-RES 8-SIP1.0K OHM X 7	01121	208A102
A7A3U20	1820-0806	5	5	IC GATE ECL OR-NOR DUAL 4-5-INP	04713	MC10109P
A7A3U21	1820-0820	3	3	IC FF ECL J-BAR K-BAR COM CLOCK DUAL	04713	MC10135L
A7A3U22	1810-0204	6	6	NETWORK-RES 8-SIP1.0K OHM X 7	01121	208A102
A7A3U23	1820-0802	1	1	IC GATE ECL NOR QUAD 2-INP	04713	MC10102P
A7A3U24	0955-0063	0	1	MIXER-DOUBLE BALANCE PWR INP=200MW; PK	28480	0955-0063
A7A3VR1	1902-3082	9	1	DIODE-ZNR 4.64V SZ DO-35 PD=.4W	28480	1902-3082
A7A3W1	85660-60083	7	1	CEL AY WHT/RED	28480	85660-60083
A7A3W2	85660-60085	9	1	CEL AY GRA/WHT	28480	85660-60085
MISCELLANEOUS PARTS						
	2190-0890	1	10	WASHER-LK HLCL NO. 2 .088-IN-ID	28480	2190-0890
	2200-0101	0	2	SCREW-MACH 4-40 .188-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
	2200-0103	2	2	SCREW-MACH 4-40 .25-IN-LG PAN-HD-POZI	28480	2200-0103
	2950-0078	9	3	NUT-HEX-DBL-CHAM 10-32-THD .067-IN-THK	28480	2950-0078
	85660-20047	9	1	COVER PC M/N DET	28480	85660-20047
	86701-40001	9	1	EXTRACTOR PC	28480	86701-40001
	1285-0285	0	5	HEAT SINK SGL DIP	28480	1285-0285
	2190-0014	1	3	WASHER-LK INTL T NO. 2 .089-IN-ID	28480	2190-0014
	2190-0124	4	5	WASHER-LK INTL T NO. 10 .195-IN-ID	28480	2190-0124
	2190-0124	4	4	WASHER-LK INTL T NO. 10 .195-IN-ID	28480	2190-0124

*Indicates Factory Selected Value

A7A3 M/N PHASE DETECTOR



A7A3

FIGURE 4. A7A3 M/N PHASE DETECTOR, BLOCK DIAGRAM

A7A3
M/N PHASE DETECTOR
85660-60136

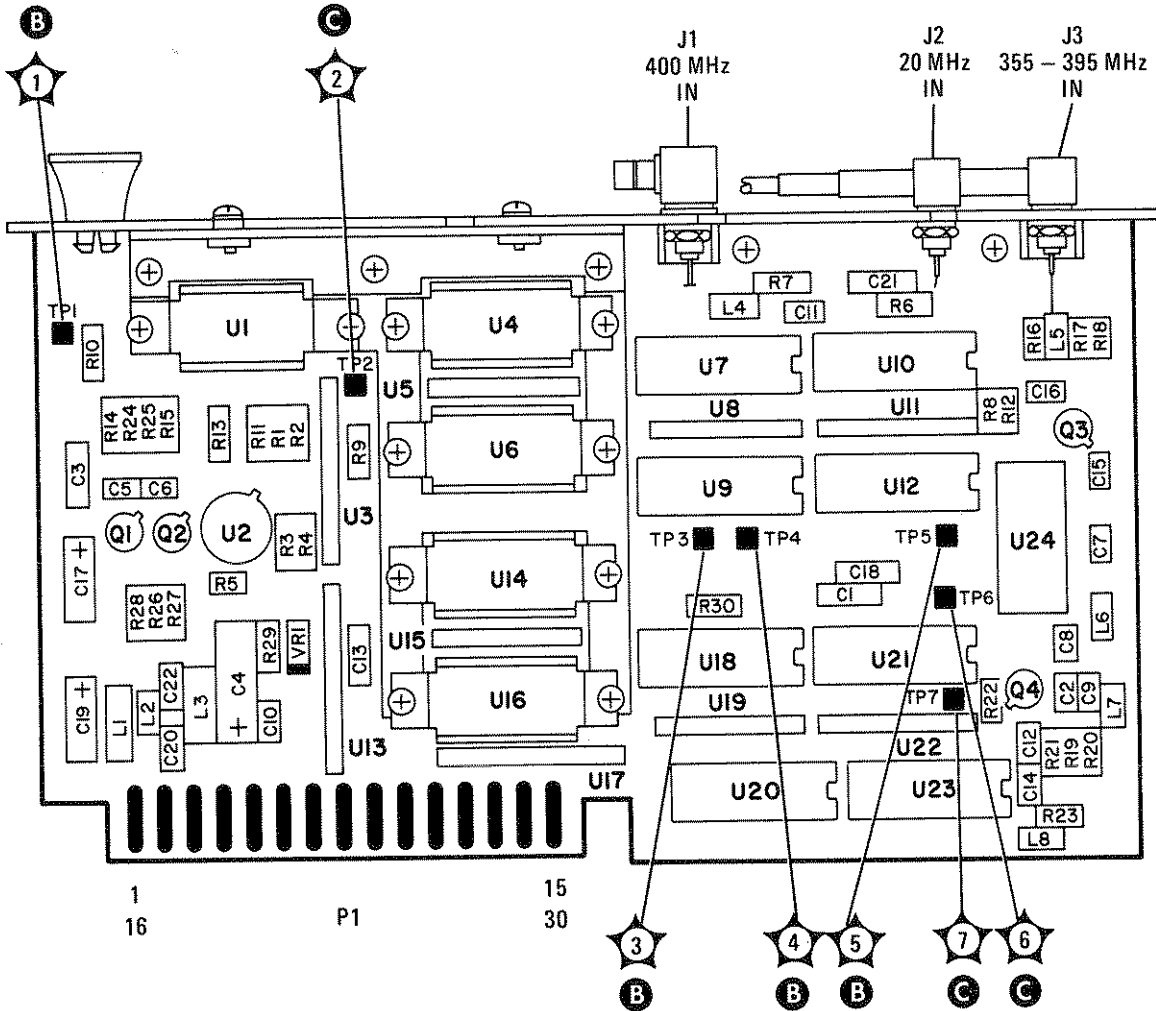
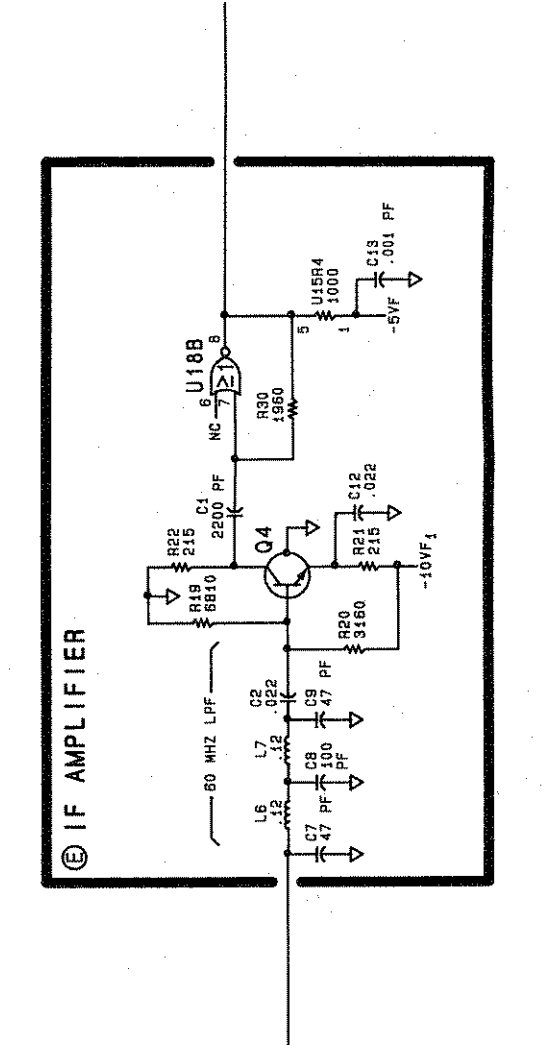
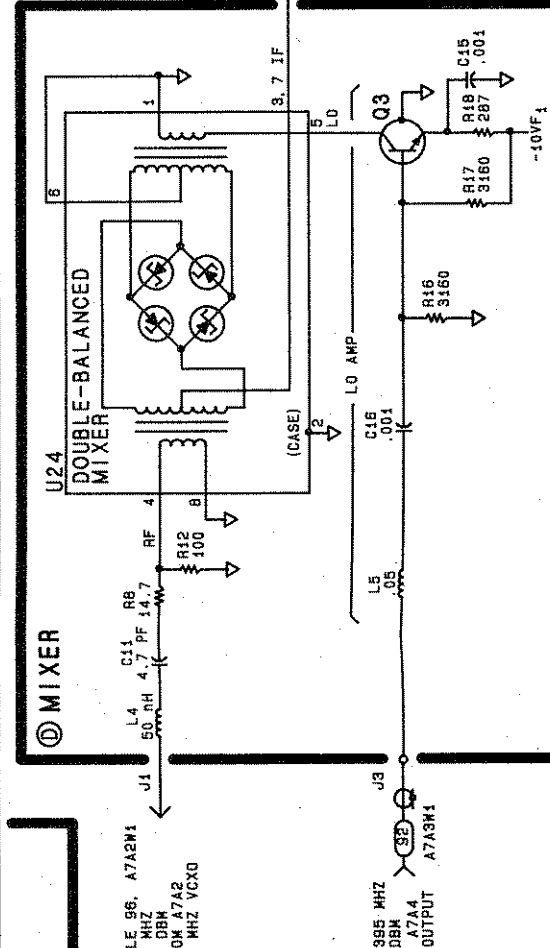
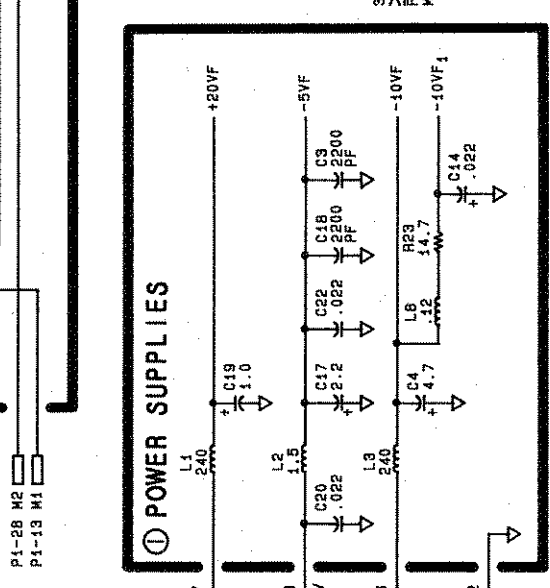
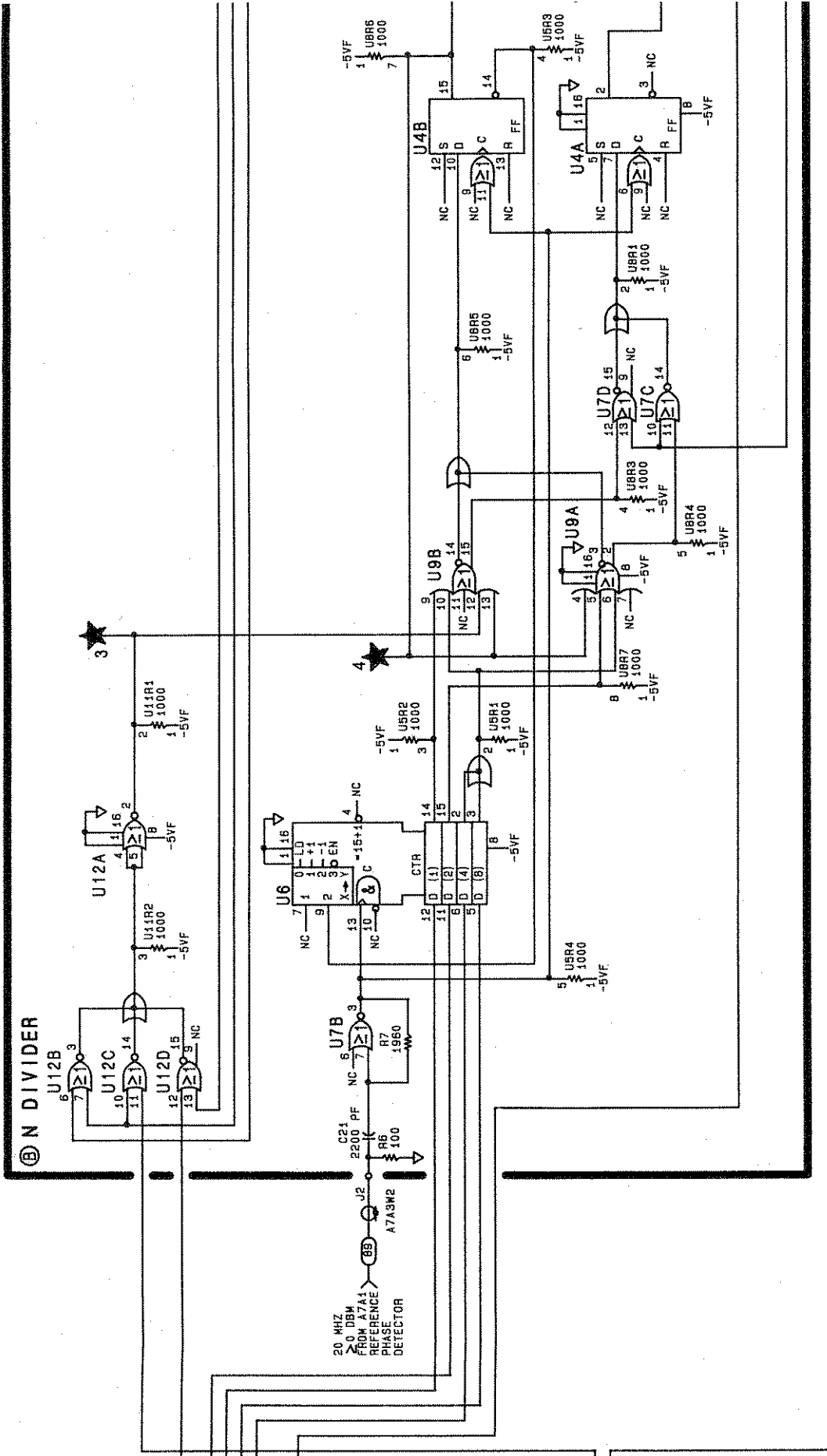
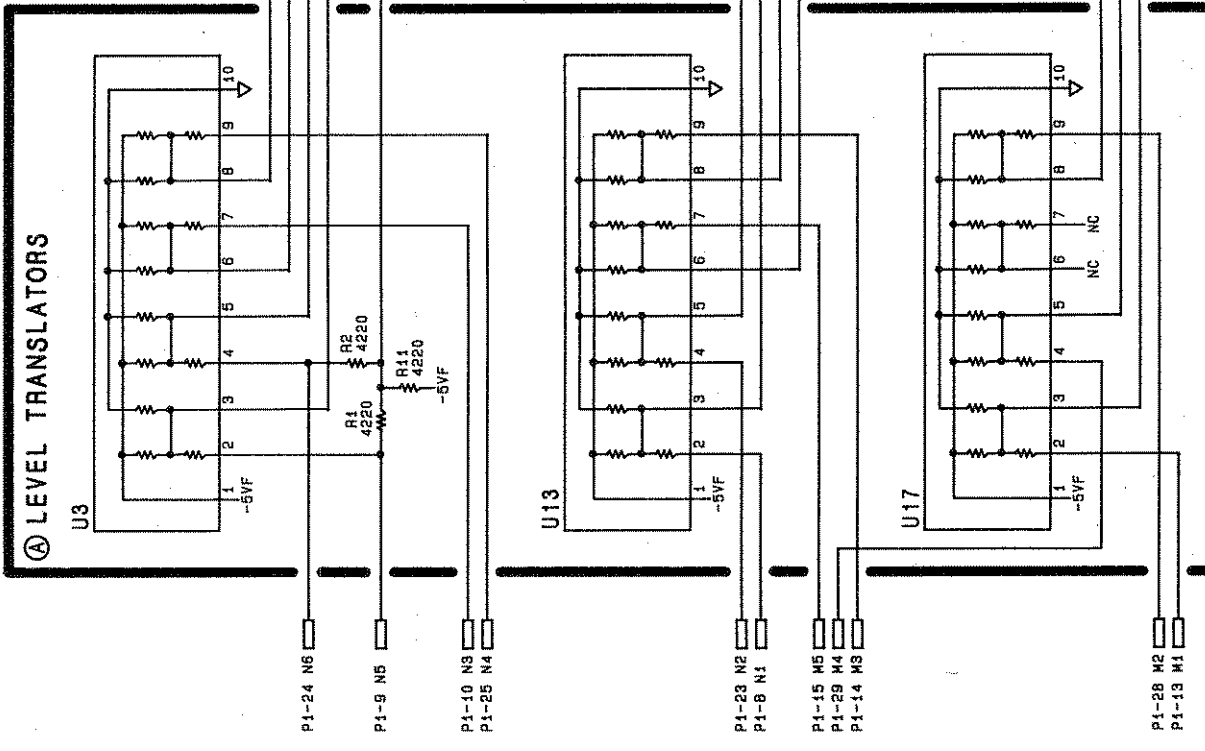


FIGURE 5. A7A3 M/N PHASE DETECTOR, COMPONENT LOCATIONS

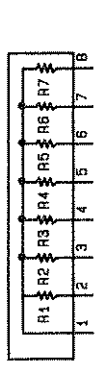
A7A3 M/N PHASE DETECTOR
85660-60136

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	-10V		
16	-10V		
2	+20V		
17	+20V		
3	-5.2V		
18	-6.2V		
4	GND		
19	GND		
5	GND		
20	GND		
6	VCO TUNE (-)	A7A4P1-3	G
21	VCO TUNE (+)	A7A4P1-1	G
7	GND		
22	GND		
8	N1	A12P3-4	A
23	N2	A12P3-19	A
9	N5	A12P3-2	A
24	N6	A12P3-17	A
10	N3	A12P3-3	A
25	N4	A12P3-18	A
11	NC		
26	HULLM	A12P3-10	H
12	NC		
27	NC		
13	M1	A12P2-14	A
28	M2	A12P2-32	A
14	M3	A12P2-13	A
29	M4	A12P2-31	A
15	M5	A12P2-12	A
30	NC		



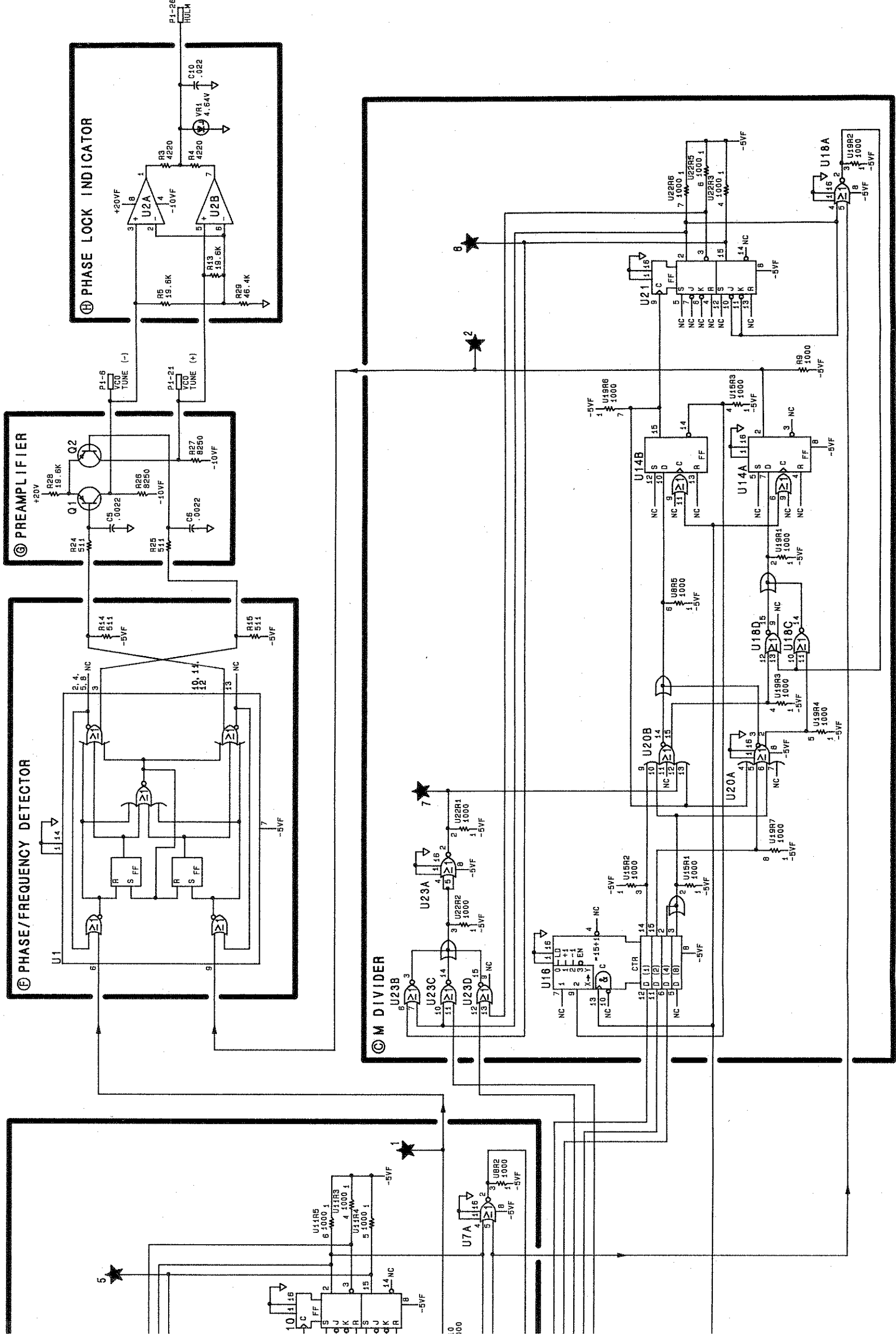
NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATION, PREFIX, ABBREVIATION WITH ASSEMBLY DESIGNATION.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IS IN OHMS (Ω) CAPACITANCE IS IN MICROFARADS (μF) INDUCTANCE IS IN MICRORHENS (μH)
3. PIN CONFIGURATION FOR U5, U8, U11, U15, U19, U22:



4. UNLESS OTHERWISE INDICATED: SIGNALS ENTER AT LEFT SIDE AND EXIT AT RIGHT SIDE OF FUNCTION BLOCKS.
5. MNEMONIC TABLE:

MNEMONIC	DESCRIPTION
HULM	HIGH-M/N UNLOCKED



A7A3

FIGURE 6. A7A3 MIN PHASE DETECTOR, SCHEMATIC DIAGRAM
A7A3 13/14

A7A4 M/N OUTPUT, CIRCUIT DESCRIPTION

A7A4 amplifies the output of the A7A4A1 M/N VCO in two different paths. One path is amplification and buffering to drive the mixer in the M/N phase-lock loop. The other path drives a divide by two which, after further amplification, goes to the A11A5 Sampler.

The integrating loop amplifier which generates the tuning voltage for the M/N VCO is also included on A7A4.

LO Output Amplifier (D)

Q5 is a common-emitter amplifier followed by a resistive pad to increase reverse isolation. Q2 is a common-base amplifier which is broadly tuned by L2, L10, and associated capacitances. Q1 is another common-emitter amplifier which is followed by a 400 MHz low-pass filter.

Divide By 2 (F)

U2 is an EECL (HP ECL) divide by 2. This generates the M/N output frequency which is one-half that of the M/N VCO. For frequency spans of greater than 5 MHz, the M/N control line goes TTL high during the sweep which turns U2 off. At the end of the sweep, U2 is turned back on and the M/N VCO is phase-locked to give the correct start frequency. During multi-band sweeps, U2 will be turned on at the beginning of each band, but will be turned off during the actual sweep.

Loop Amplifier (A)

U1 is connected as an integrating amplifier and generates $-5V$ to $-35V$ for tuning the M/N VCO. C13 is the integrating capacitor; C12 and C15 are for compensation of U1 to guarantee stability, and R34, C14, and R15 compensate the entire phase-lock loop. The 200 kHz low-pass filter rejects the sampling frequency (20 MHz divided by N) and its harmonics which are generated in the phase detector.

Voltage-Controlled Oscillator (B)

The M/N voltage-controlled oscillator (VCO) consists of a resonator A7A4A1A1 and Q2 with its associated circuitry. The oscillation frequency is determined by the bias on the varactors CR1 and CR2 which tunes the cavity resonator. Coarse tuning is provided by C1, while C5 is used to vary the output coupling to the cavity thereby varying the output power. The impedance looking into the emitter of Q2 has a negative real part which provides the conditions necessary for oscillation to occur.

Buffer Amplifier (C)

Q1 is a common-emitter buffer amplifier which provides at least 0 dBm output over the 355 to 395 MHz range of the VCO.

LO Amplifier (E)

Q6 and Q7 form a buffer amplifier to assure that there is roughly 0 dBm to drive the divide-by-2 (U2 in block (F)). R24 and R25 set the proper dc level to drive U2.

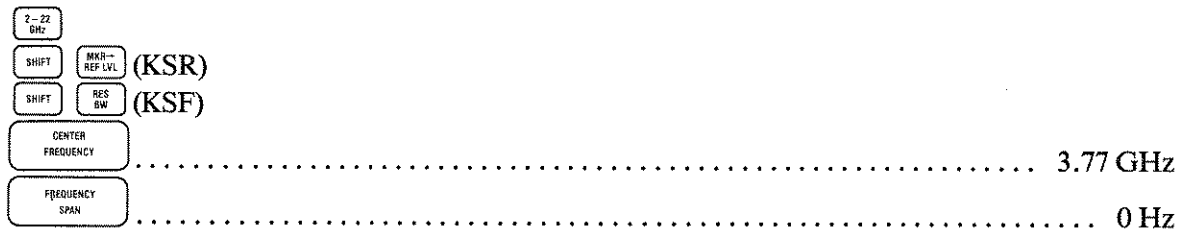
M/N Output Amplifier (G)

Q3 and Q4 provide buffering between the divider U2 and the output.

A7A4 M/N OUTPUT, TROUBLESHOOTING

The VCO tune voltage from the A7A3 M/N Phase Detector is amplified and applied to the Voltage-Controlled Oscillator (VCO) by the loop amplifier. The VCO output is amplified, divided by two, and applied to the A11A5 Sampler for phase locking the A11A3 YIG-Tuned Oscillator (YTO) in 10 MHz increments. A portion of the VCO output provides feedback to the A7A3 Phase Detector for phase locking of the M/N Loop.

Spectrum analyzer control settings for A7A4 troubleshooting:



Loop Amplifier (A)

The tune voltage from the Loop Amplifier can be measured at TP1, located on the cover of the A7A4. The dc voltage at TP1, with the front panel settings indicated above, should be -13.5V . If an unlocked condition exists, the voltage is approximately -0.5V or -37.5V . If the level is -0.5V , the probable cause is no VCO output to the A7A3 Phase Detector. A level of -37.5V indicates that the 20 MHz reference to the A7A3 Phase Detector is not present.

Voltage-Controlled Oscillator (VCO) (B) and Buffer Amplifier (C)

The VCO output frequency with the tuning voltage set to -13.5V should be 380 MHz. Typical voltage levels for the VCO are as shown in Table 1.

TABLE 1. TYPICAL VCO VOLTAGE LEVELS

A7A4A1A2 Voltage Levels		
	Q2	Q1
Emitter	-10.8	-8.3
Base	-10.2	-7.6
Collector	0	0

LO Output Amplifier (D)

TABLE 2. TYPICAL LO OUTPUT AMPLIFIER VOLTAGE LEVELS

A7A4A2 Voltage Levels			
	Q5	Q2	Q1
Emitter	-6.7	-6.7	-6.7
Base	-6.2	-6.2	-6.2
Collector	-0.5	0	0

LO Amplifier (E) and M/N Output Amplifier (G)

TABLE 3. TYPICAL LO AND M/N OUTPUT AMPLIFIER VOLTAGE LEVELS

A7A4A2 Voltage Levels				
	Q6	Q7	Q3	Q4
Emitter	-6.7	-3.1	-4.5	-5.2
Base	-6.2	-2.4	-3.8	-4.5
Collector	-2.4	0	0	0

TABLE 4. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A7A4	85660-60113	4	1	BOARD ASSEMBLY, M/N OUTPUT (INCLUDES A7A4A1 M/N VCO ASSY AND A7A4A2 M/N VCO BOARD ASSY)	28480	85660-60113
A7A4J1 A7A4J2 A7A4J3				SEE A7A4A2J1 SEE A7A4A2J2 SEE A7A4A2J3		
A7A4TP1				SEE A7A4A2C23		
A7A4A1	85660-60076	2	1	M/N VCO ASSEMBLY, (INCLUDES A7A4A1A1 OSCILLATOR ASSEMBLY AND A7A4A1A2 BOARD ASSEMBLY)	28480	85660-60076
A7A4A1A1				OSCILLATOR ASSEMBLY, M/N VCO (P/D A7A4A1-NOT SEPARATELY REPLACEABLE)		
A7A4A1A1C1	86701-20049	3	1	SCREW TUNING FREQUENCY ADJ.	28480	86701-20049
A7A4A1A1C2	0160-4301	2	2	CAPACITOR-FXD 3.9PF +- .1PF 500VDC PORC	29798	ATC100-B-3R9-B-C-500
A7A4A1A1C3	0160-4301	2	2	CAPACITOR-FXD 3.9PF +- .1PF 500VDC PORC	29798	ATC100-B-3R9-B-C-500
A7A4A1A1C4				CAPACITANCE FORMED BY RESONATOR		
A7A4A1A1C5	06701-20046	0	1	POWER PROBE	28480	86701-20046
A7A4A1A1CR1	0122-0084	0	2	DIODE-VVC 5.25PF 5% C4/C45-MIN=2.4	28480	0122-0084
A7A4A1A1CR2	0122-0084	0	2	DIODE-VVC 5.25PF 5% C4/C45-MIN=2.4	28480	0122-0084
A7A4A1A1L1	9140-0158	6	3	INDUCTOR RF-CH-MLD 1UH 10% .105DX.26LG	28480	9140-0158
A7A4A1A1L2	9140-0158	6	3	INDUCTOR RF-CH-MLD 1UH 10% .105DX.26LG	28480	9140-0158
A7A4A1A2				BOARD ASSEMBLY, M/N VCO (P/D A7A4A1-NOT SEPARATELY REPLACEABLE)		
A7A4A1A2C1	0160-3878	6	20	CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A7A4A1A2C2	0160-3878	6	20	CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A7A4A1A2C3	0160-3879	7	2	CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A7A4A1A2C4	0160-3878	6	7	CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A7A4A1A2C5	0180-1731	0	1	CAPACITOR-FXD 4.7UF+-10% 50VDC TA	56289	150D475X9850B2
A7A4A1A2C6	0160-3878	6	6	CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A7A4A1A2C7	0160-3878	6	6	CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A7A4A1A2C8	0160-3873	1	3	CAPACITOR-FXD 4.7PF +- .5PF 200VDC CER	28480	0160-3873
A7A4A1A2C9	0160-3878	6	6	CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A7A4A1A2C10	0160-3879	7	7	CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A7A4A1A2C11	0180-2161	0	1	CAPACITOR-FXD .75UF+-10% 50VDC TA	56289	150D754X9050A2
A7A4A1A2J1				P/D A7A4A1A2W1		
A7A4A1A2J2	1251-0600	0	3	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A7A4A1A2J3	1251-0600	0	3	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A7A4A1A2J4	1251-0600	0	3	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A7A4A1A2L1	9135-0073	3	1	INDUCTOR RF-CH-MLD 51NH 6% .102DX.26LG	28480	9135-0073
A7A4A1A2L2	9180-0346	0	1	INDUCTOR RF-CH-MLD 50NH 20% .105DX.26LG	28480	9180-0346
A7A4A1A2L3	86701-20051	7	1	INDUCTOR	28480	86701-20051
A7A4A1A2L4	9140-0158	6	6	INDUCTOR RF-CH-MLD 1UH 10% .105DX.26LG	28480	9140-0158
A7A4A1A2Q1	1854-0686	0	2	TRANSISTOR NPN SI TO-72 PD=200MW FT=4CHZ	28480	1854-0686
A7A4A1A2Q2	1854-0610	0	1	TRANSISTOR NPN SI TO-46 FT=800MHZ	28480	1854-0610
A7A4A1A2R1	0757-0317	7	1	RESISTOR 1.33K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1331-F
A7A4A1A2R2	0698-7219	6	2	RESISTOR 196 1% .05W F TC=0+-100	24546	C3-1/8-T0-196R-F
A7A4A1A2R3	0698-7193	5	1	RESISTOR 16.2 1% .05W F TC=0+-100	24546	C3-1/8-T0-16R2-F
A7A4A1A2R4	0698-3154	0	1	RESISTOR 4.22K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4221-F
A7A4A1A2R5	0757-0428	1	2	RESISTOR 1.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1621-F
A7A4A1A2R6	0698-7262	9	1	RESISTOR 12.1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1212-F
A7A4A1A2R7	0757-0420	1	1	RESISTOR 1.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1621-F
A7A4A1A2R8	0698-7248	0	5	RESISTOR 3.16K 1% .05W F TC=0+-100	24546	C3-1/8-T0-3161-F
A7A4A1A2R9	0698-7205	1	2	RESISTOR 51.1 1% .05W F TC=0+-100	24546	C3-1/8-T0-51R1-F
A7A4A1A2R10	0698-7265	2	1	RESISTOR 16.2K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1622-F
A7A4A1A2R11	0698-7250	5	1	RESISTOR 3.03K 1% .05W F TC=0+-100	24546	C3-1/8-T0-3031-F
A7A4A1A2R12	0757-0401	0	1	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A7A4A1A2R13	0757-0400	9	1	RESISTOR 99.9 1% .125W F TC=0+-100	24546	C4-1/8-T0-99R9-F
A7A4A1A2W1	85660-60118	9	1	CBL AY WHT	28480	85660-60118
A7A4A1A2W2	86701-20050	6	1	CABLE JUMPER	28480	86701-20050
A7A4A2				BOARD ASSEMBLY, M/N OUTPUT (PART OF A7A4-NOT SEPARATELY REPLACEABLE)		
A7A4A2C1	0160-3878	6	6	CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A7A4A2C2	0160-3878	6	6	CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A7A4A2C3	0160-3874	2	4	CAPACITOR-FXD 10PF +- .5PF 200VDC CER	28480	0160-3874
A7A4A2C4	0160-3878	6	6	CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A7A4A2C5	0160-3878	6	6	CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878

*Indicates Factory Selected Value

TABLE 4. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A7A4A2C6	0160-3873	1	1	CAPACITOR-FXD 4.7PF +-5PF 200VDC CER	28480	0160-3873
A7A4A2C7	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A7A4A2C8	0160-3873	1		CAPACITOR-FXD 4.7PF +-5PF 200VDC CER	28480	0160-3873
A7A4A2C9	0160-3874	2		CAPACITOR-FXD 10PF +-5PF 200VDC CER	28480	0160-3874
A7A4A2C10	0160-3872	0		CAPACITOR-FXD 2.2PF +-25PF 200VDC CER	28480	0160-3872
A7A4A2C11	0160-3874	2	1	CAPACITOR-FXD 10PF +-5PF 200VDC CER	28480	0160-3874
A7A4A2C12	0160-2261	9		CAPACITOR-FXD 15PF +-5% 500VDC CER 0+-30	28480	0160-2261
A7A4A2C13	0160-2290	4		CAPACITOR-FXD .15UF +-10% 80VDC POLYE	28480	0160-2290
A7A4A2C14	0160-2290	4		CAPACITOR-FXD .15UF +-10% 80VDC POLYE	28480	0160-2290
A7A4A2C15	0140-0196	3		CAPACITOR-FXD 150PF +-5% 300VDC MICA	72136	DM15F151J0300WV1CR
A7A4A2C16	0160-3878	6	1	CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A7A4A2C17	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A7A4A2C18	0160-3874	2		CAPACITOR-FXD 10PF +-5PF 200VDC CER	28480	0160-3874
A7A4A2C19	0160-3876	4		CAPACITOR-FXD 47PF +-20% 200VDC CER	28480	0160-3876
A7A4A2C20	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A7A4A2C21	0160-3878	6	1	CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A7A4A2C22	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A7A4A2C23	0160-4351	2		CAPACITOR-FDTHRU 1000PF 20% 200V CER	28480	0160-4351
A7A4A2C24	0160-0161	4		CAPACITOR-FXD .01UF +-10% 200VDC POLYE	28480	0160-0161
A7A4A2C25	0160-0153	4		CAPACITOR-FXD 1000PF +-10% 200VDC POLYE	28480	0160-0153
A7A4A2C26	0160-0161	4	1	CAPACITOR-FXD .01UF +-10% 200VDC POLYE	28480	0160-0161
A7A4A2C27	0160-3534	1		CAPACITOR-FXD 510PF +-5% 100VDC MICA	28480	0160-3534
A7A4A2C28	0160-0298	8		CAPACITOR-FXD 1500PF +-10% 200VDC POLYE	28480	0160-0298
A7A4A2C29	0100-0197	8		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56209	150D225X9020A2
A7A4A2C30	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A7A4A2C31	0100-0197	8	1	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56209	150D225X9020A2
A7A4A2C32		6		NOT ASSIGNED		
A7A4A2C33	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A7A4A2C34	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A7A4A2C35	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A7A4A2CR1			2	NOT ASSIGNED		
A7A4A2CR2				NOT ASSIGNED		
A7A4A2CR3	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A7A4A2CR4	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A7A4A2J1	1250-0657	5		CONNECTOR-RF SMB M SCL-HOLE-FR 50-OHM	28480	1250-0657
A7A4A2J2	1250-0657	5	CONNECTOR-RF SMB M SCL-HOLE-FR 50-OHM	28480	1250-0657	
A7A4A2J3	1250-0257	1	CONNECTOR-RF SMB M PC 50-OHM	28480	1250-0257	
A7A4A2L1	9100-2891	4	9	INDUCTOR RF-CH-MLD 50NH 10% .105DX.26LG	28480	9100-2891
A7A4A2L2	9100-2891	4		INDUCTOR RF-CH-MLD 50NH 10% .105DX.26LG	28480	9100-2891
A7A4A2L3	9100-2891	4		INDUCTOR RF-CH-MLD 50NH 10% .105DX.26LG	28480	9100-2891
A7A4A2L4	9100-2891	4		INDUCTOR RF-CH-MLD 50NH 10% .105DX.26LG	28480	9100-2891
A7A4A2L5	9100-2891	4		INDUCTOR RF-CH-MLD 50NH 10% .105DX.26LG	28480	9100-2891
A7A4A2L6	9100-1634	1	1	INDUCTOR RF-CH-MLD 75UH 5% .166DX.385LG	28480	9100-1634
A7A4A2L7	9100-1635	2		INDUCTOR RF-CH-MLD 91UH 5% .166DX.385LG	28480	9100-1635
A7A4A2L8	9100-1620	5		INDUCTOR RF-CH-MLD 15UH 10% .166DX.385LG	28480	9100-1620
A7A4A2L9	9140-0210	1		INDUCTOR RF-CH-MLD 100UH 5% .166DX.385LG	28480	9140-0210
A7A4A2L10	9100-2891	4		INDUCTOR RF-CH-MLD 50NH 10% .105DX.26LG	28480	9100-2891
A7A4A2L11	9100-2891	4	1	INDUCTOR RF-CH-MLD 50NH 10% .105DX.26LG	28480	9100-2891
A7A4A2L12	9100-2891	4		INDUCTOR RF-CH-MLD 50NH 10% .105DX.26LG	28480	9100-2891
A7A4A2L13	9100-2891	4		INDUCTOR RF-CH-MLD 50NH 10% .105DX.26LG	28480	9100-2891
A7A4A2L14	9140-0144	0		INDUCTOR RF-CH-MLD 4.7UH 10% .105DX.26LG	28480	9140-0144
A7A4A2Q1	1854-0546	1		2	TRANSISTOR NPN SI TO-72 PD=200MW	28480
A7A4A2Q2	1854-0345	8	TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW		04713	2N5179
A7A4A2Q3	1854-0345	8	TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW		04713	2N5179
A7A4A2Q4	1854-0345	8	TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW		04713	2N5179
A7A4A2Q5	1854-0546	1	TRANSISTOR NPN SI TO-72 PD=200MW		28480	1854-0546
A7A4A2Q6	1854-0686	0	8	TRANSISTOR NPN SI TO-72 PD=200MW FT=4GHZ	28480	1854-0686
A7A4A2Q7	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A7A4A2R1	0698-7212	9	3	RESISTOR 100 1% .05W F TC=0+-100	24546	C3-1/8-T0-100R-F
A7A4A2R2	0698-7248	1		RESISTOR 3.16K 1% .05W F TC=0+-100	24546	C3-1/8-T0-3161-F
A7A4A2R3	0698-7243	6		RESISTOR 1.96K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1961-F
A7A4A2R4	0698-7285	8		RESISTOR 51.1 1% .05W F TC=0+-100	24546	C3-1/8-T0-51R1-F
A7A4A2R5	0698-7223	2		RESISTOR 207 1% .05W F TC=0+-100	24546	C3-1/8-T0-207R-F
A7A4A2R6	0698-7248	1	1	RESISTOR 3.16K 1% .05W F TC=0+-100	24546	C3-1/8-T0-3161-F
A7A4A2R7	0698-7243	6		RESISTOR 1.96K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1961-F
A7A4A2R8	0757-0316	6		RESISTOR 42.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-42R2-F
A7A4A2R9	0698-7218	5		RESISTOR 178 1% .05W F TC=0+-100	24546	C3-1/8-T0-178R-F
A7A4A2R10	0698-7188	8		RESISTOR 10 1% .05W F TC=0+-100	24546	C3-1/8-T0-10R-F
A7A4A2R11	0698-7212	9	1	RESISTOR 100 1% .05W F TC=0+-100	24546	C3-1/8-T0-100R-F
A7A4A2R12	0757-0394	8		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A7A4A2R13	0698-7212	9		RESISTOR 100 1% .05W F TC=0+-100	24546	C3-1/8-T0-100R-F
A7A4A2R14	0757-1094	9		RESISTOR 1.47K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1471-F
A7A4A2R15	0757-1094	9		RESISTOR 1.47K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1471-F

*Indicates Factory Selected Value

TABLE 4. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A7A4A2R16	0757-1094	7		RESISTOR 1.47K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1471-F
A7A4A2R17	0757-1094	9		RESISTOR 1.47K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1471-F
A7A4A2R18	0698-7260	7	2	RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-F
A7A4A2R19	0698-7248	1		RESISTOR 3.16K 1% .05W F TC=0+-100	24546	C3-1/8-T0-3161-F
A7A4A2R20	0698-7222	1	1	RESISTOR 261 1% .05W F TC=0+-100	24546	C3-1/8-T0-261R-F
A7A4A2R21	0698-7223	2		RESISTOR 287 1% .05W F TC=0+-100	24546	C3-1/8-T0-287R-F
A7A4A2R22	0698-7188	8		RESISTOR 10 1% .05W F TC=0+-100	24546	C3-1/8-T0-10R-F
A7A4A2R23	0698-7229	8	3	RESISTOR 511 1% .05W F TC=0+-100	24546	C3-1/8-T0-511R-F
A7A4A2R24	0698-7219	6		RESISTOR 176 1% .05W F TC=0+-100	24546	C3-1/8-T0-196R-F
A7A4A2R25	0698-7239	0	1	RESISTOR 1.33K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1331-F
A7A4A2R26	0698-7243	6		RESISTOR 1.96K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1961-F
A7A4A2R27	0698-7248	1		RESISTOR 3.16K 1% .05W F TC=0+-100	24546	C3-1/8-T0-3161-F
A7A4A2R28	0698-7229	8		RESISTOR 511 1% .05W F TC=0+-100	24546	C3-1/8-T0-511R-F
A7A4A2R29	0698-7243	6		RESISTOR 1.96K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1961-F
A7A4A2R30	0698-7200	5	1	RESISTOR 31.6 1% .05W F TC=0+-100	24546	C3-1/8-T0-3161-F
A7A4A2R31	0698-7224	3	1	RESISTOR 316 1% .05W F TC=0+-100	24546	C3-1/8-T0-316R-F
A7A4A2R32	0698-7188	8		RESISTOR 10 1% .05W F TC=0+-100	24546	C3-1/8-T0-10R-F
A7A4A2R33	0757-0280	3	1	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A7A4A2R34	0757-0279	0	1	RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A7A4A2R35	0698-7223	2		RESISTOR 287 1% .05W F TC=0+-100	24546	C3-1/8-T0-287R-F
A7A4A2R36	0698-7210	7	1	RESISTOR 02.5 1% .05W F TC=0+-100	24546	C3-1/8-T0-02R5-F
A7A4A2R37	0698-7257	2	1	RESISTOR 7.5K 1% .05W F TC=0+-100	24546	C3-1/8-T0-7501-F
A7A4A2R38	0698-7260	7		RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-F
A7A4A2R39	0698-7229	8		RESISTOR 511 1% .05W F TC=0+-100	24546	C3-1/8-T0-511R-F
A7A4A2U1	1826-0059	2	1	IC OP AMP GP T0-99 PKC	01295	LM201AL
A7A4A2U2	1820-2106	2	1	IC FF ECL D-M/S POS-EDGE-TRIG	07263	F1106DC
A7A4A2VR1	1902-3070	5	2	DIODE-ZNR 4.22V 5% D0-35 PD=.4W	28480	1902-3070
A7A4A2VR2	1902-3070	5		DIODE-ZNR 4.22V 5% D0-35 PD=.4W	28480	1902-3070
A7A4A2W1	85660-60103	2	1	JUMPER WIRE AY	28480	85660-60103
MISCELLANEOUS PARTS						
	1205-0285	0	1	HEAT SINK SCL DIP	28480	1205-0285
	2190-0009	4	1	WASHER-LK INTL T NO. 8 .168-IN-ID	28480	2190-0009
	2190-0124	4	4	WASHER-LK INTL T NO. 10 .195-IN-ID	28480	2190-0124
	86701-40001	9	1	EXTRACTOR PC	28480	86701-40001
	2190-0890	1	2	WASHER-LK HLCL NO. 2 .088-IN-ID	28480	2190-0890
	2200-0101	0	2	SCREW-MACH 4-40 .188-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
	2200-0103	2	2	SCREW-MACH 4-40 .25-IN-LG PAN-HD-POZI	28480	2200-0103
	2580-0002	4	1	NUT-HEX-DBL-CHAM 8-32-THD .085-IN-THK	28480	2580-0002
	2950-0078	9	2	NUT-HEX-DBL-CHAM 10-32-THD .067-IN-THK	28480	2950-0078
	3050-0082	8	1	WASHER-FL NM NO. 4 .116-IN-ID .180-IN-OD	28480	3050-0082
	85660-00065	9	1	HEAT SINK I.C.	28480	85660-00065
	85660-20049	1	1	COVER PC M/N OUT	28480	85660-20049

*Indicates Factory Selected Value

A7A4 M/N OUTPUT ASSEMBLY

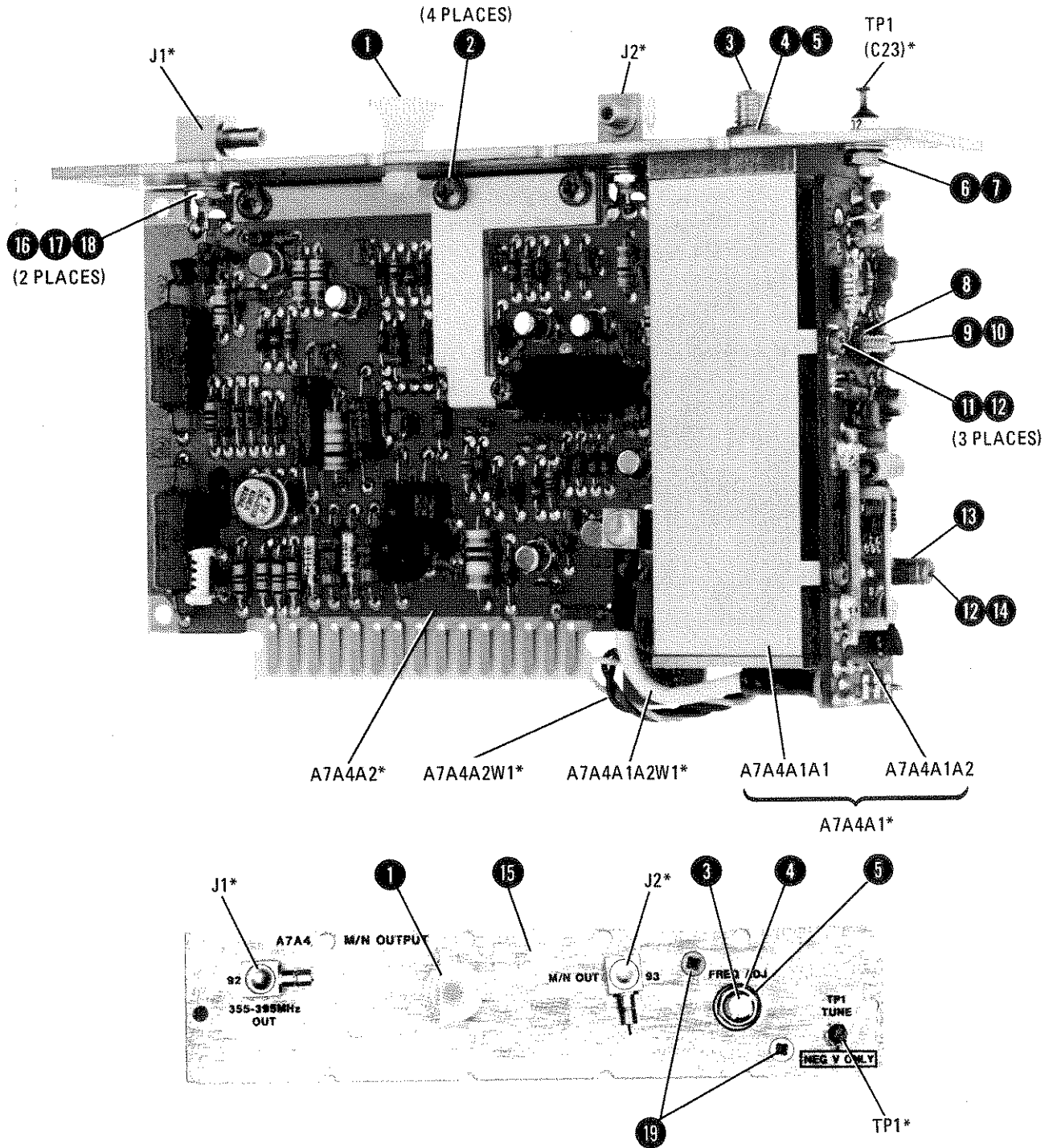
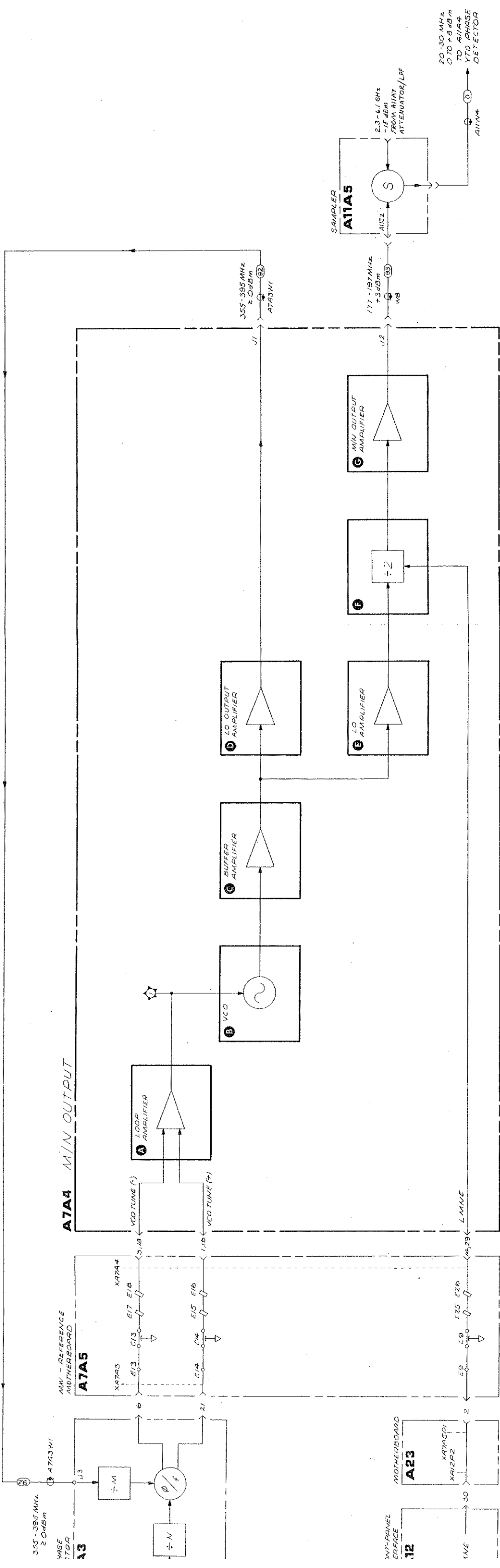


FIGURE 1. A7A4 M/N OUTPUT ASSEMBLY, PARTS IDENTIFICATION (1 OF 2)

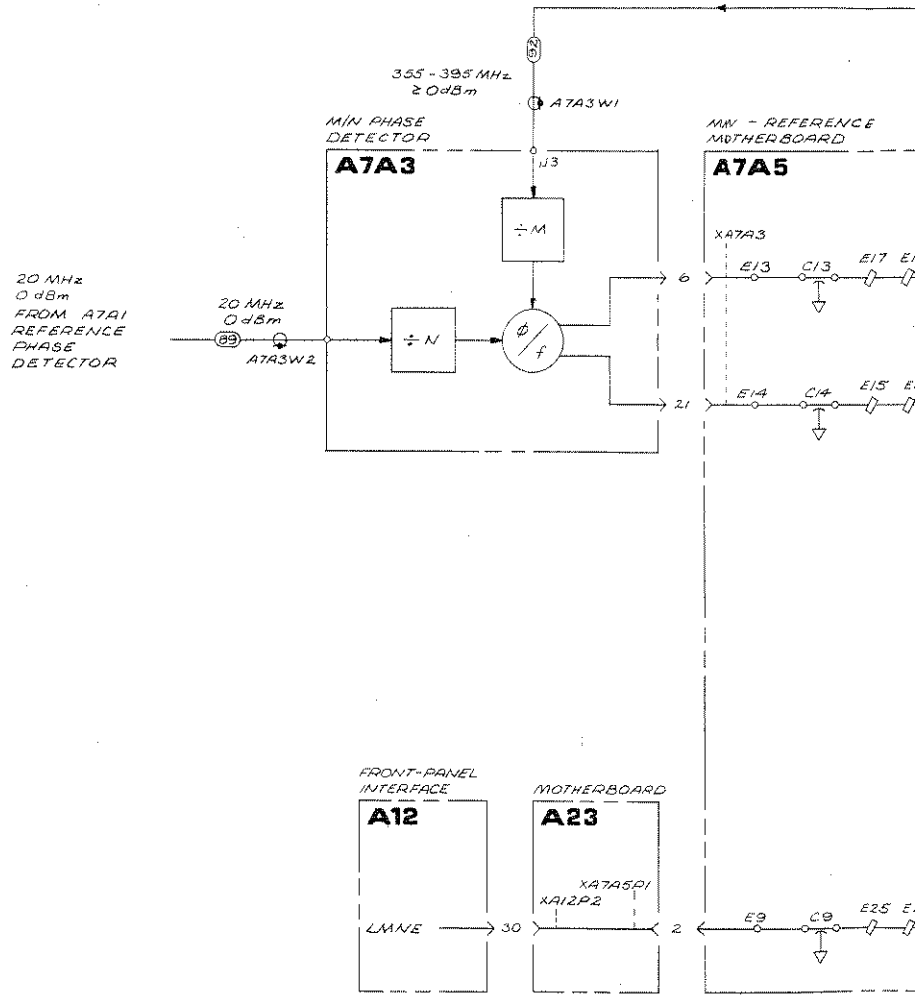
Item	HP Part Number	C D	Description	Mfr. Code	Manufacturer's Part Number
1	86701-40001	9	Extractor, PC Board	28480	86701-40001
2	2200-0101	0	Screw, Mach, 4-40, .188-IN LG, PAN HD	28480	2200-0101
3	86701-20049	3	Screw, Tuning, Freq Adjust	28480	86701-20049
4	2950-0078	9	Nut, Hex, 10-32 (For Freq Adjust (3))	28480	2950-0078
5	3050-0082	8	Washer, FL NM, .116-IN ID (For (3))	28480	3050-0082
6	2580-0002	4	Nut, Hex, 8-32 (For C23)	28480	2580-0002
7	2190-0009	4	Washer, Lock, .168-IN ID (For C23)	28480	2190-0009
8	2260-0002	6	Nut, Hex, 4-40 (For Pwr Adjust)	28480	2260-0002
9	86701-20046	0	Probe, 4-40 Thread (Pwr Adjust)	28480	86701-20046
10	86701-20047	1	Support-Resonator (For Probe (9))	28480	86701-20047
11	0520-0128	7	Screw, Mach, 2-56, .250-IN LG, PAN HD	28480	0520-0128
12	2190-0045	8	Washer, Lock, .088-IN ID (For screw (11))	28480	2190-0045
13	0380-0020	0	Spacer, .250-IN LG, .128-IN ID (For (14))	28480	0380-0020
14	0520-0133	4	Screw, Mach, 2-56, .500-IN LG, PAN HD	28480	0520-0133
15	85660-20049	1	Cover, PC Board, (A7A4 M/N Output)	28480	85660-20049
16	2950-0078	9	Nut, Hex, 10-32 (For J1 and J2)	28480	2950-0078
17	2190-0124	4	Washer, Lock, .195-IN ID (For J1 and J2)	28480	2190-0124
18	85660-20068	4	Ground Lug (For J1 and J2)	28480	85660-20068
19	2200-0167	8	Screw, Mach, 4-40, .375-IN LG, FLAT HD	28480	2200-0167

FIGURE 1. A7A4 M/N OUTPUT ASSEMBLY, PARTS IDENTIFICATION (2 OF 2)



A7A4

FIGURE 2. A7A4 MIN OUTPUT, BLOCK DIAGRAM



A7A4A1A2
M/N VCO
85660-60096

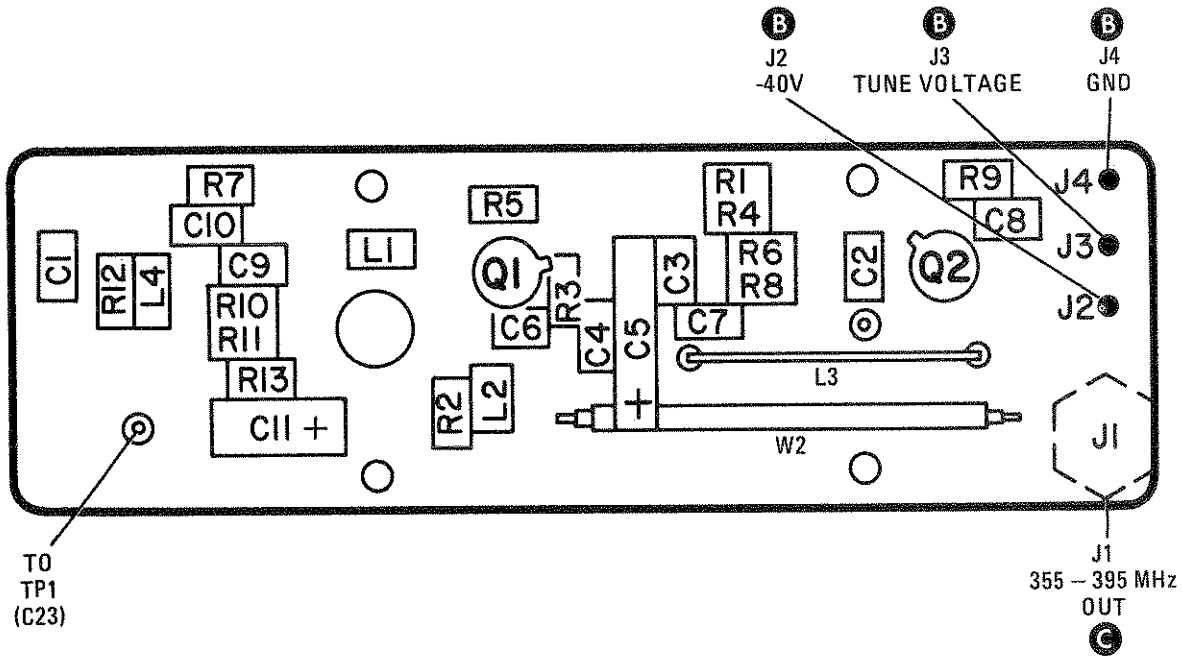


FIGURE 3. A7A4A1A2 M/N VCO BOARD, COMPONENT LOCATIONS

A7A4A2
M/N OUTPUT BOARD
85660-60113

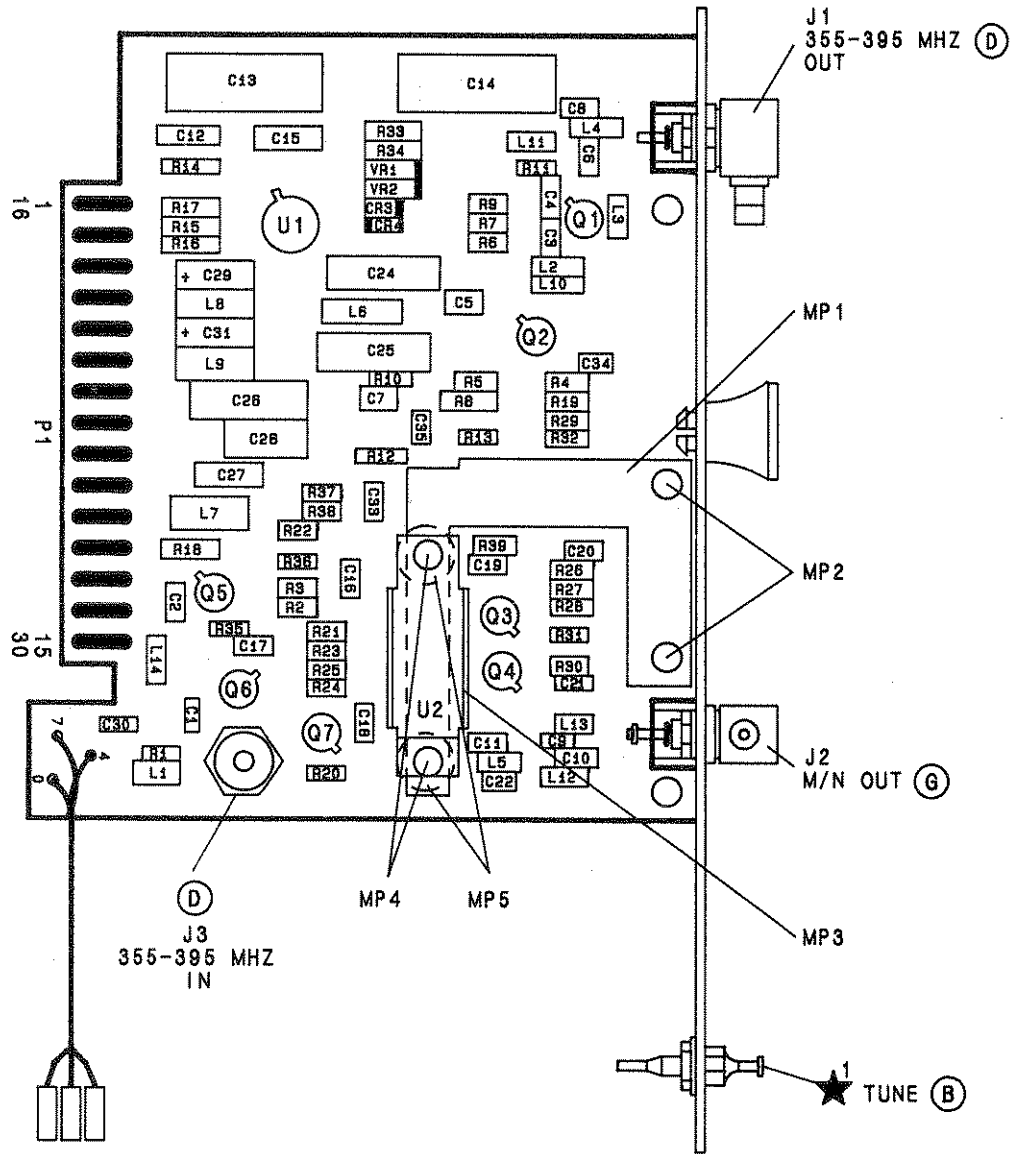
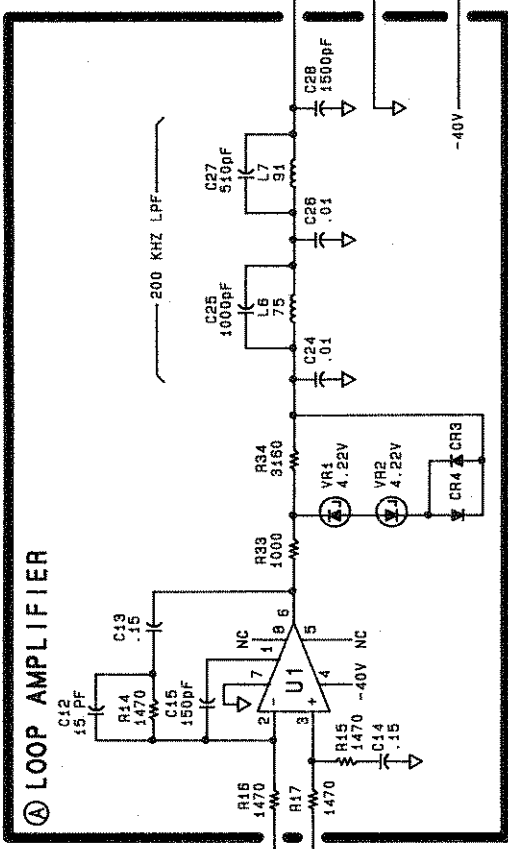


FIGURE 4. A7A4A2 M/N OUTPUT BOARD, COMPONENT LOCATIONS

A7A4 M/N OUTPUT ASSEMBLY
85660-60192

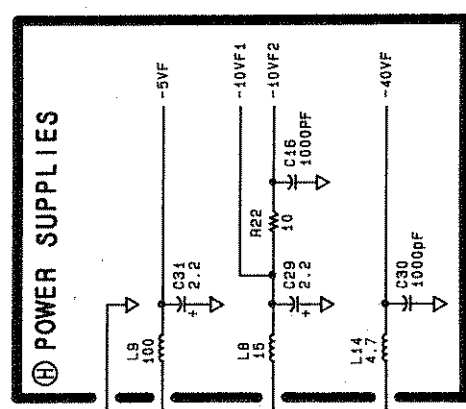
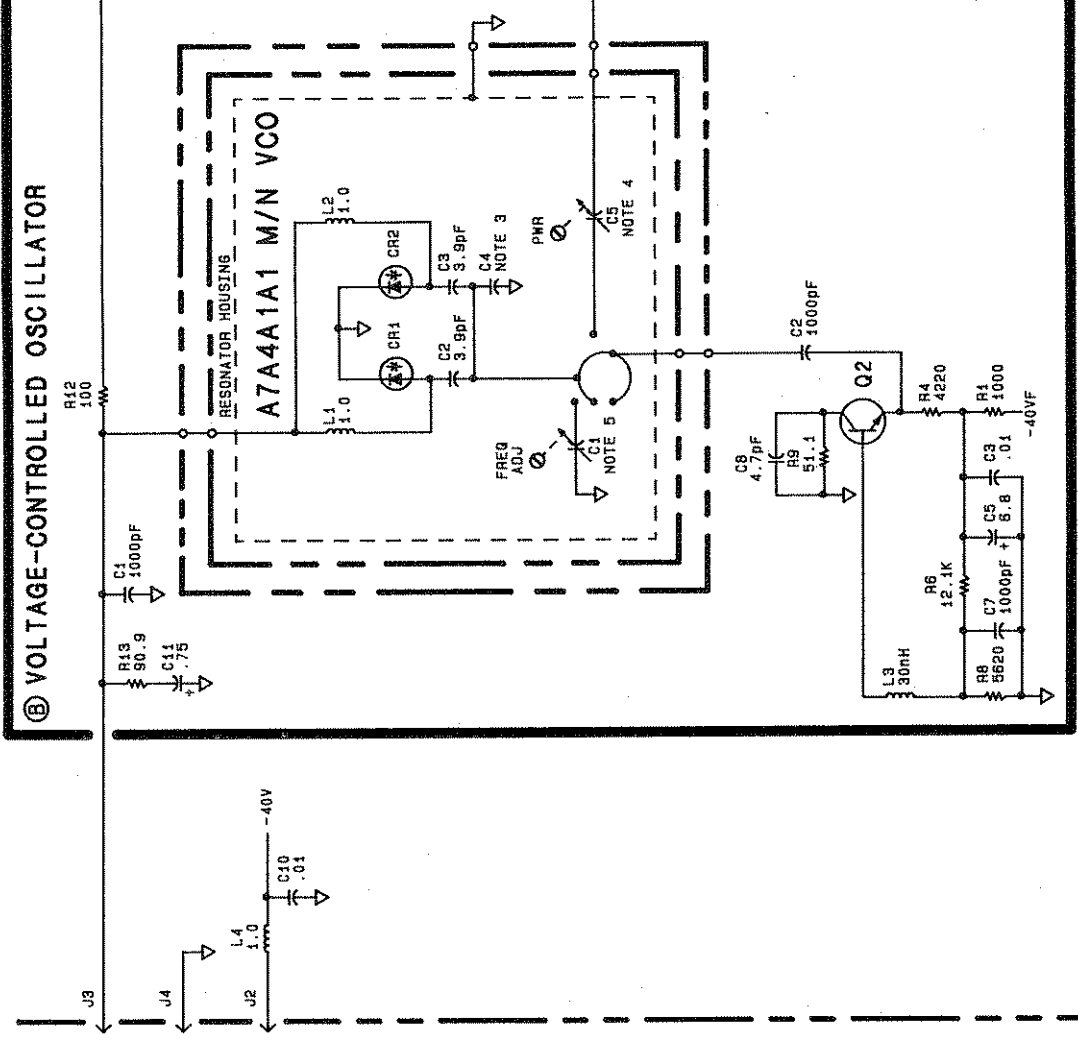
A7A4A2 M/N OUTPUT BOARD



PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	VCO TUNE (+)	A7A3P1-21	A
16	VCO TUNE (+)	A7A3P1-21	A
2	GND		H
17	GND		H
3	VCO TUNE (-)	A7A3P1-6	A
18	VCO TUNE (-)	A7A3P1-6	A
4	GND		H
19	GND		H
5	-10V		
20	-10V		
6	GND		
21	GND		
7	-5.2V		
22	-5.2V		
8	GND		
23	GND		
9	GND		
24	GND		
10	GND		
25	GND		
11	GND		
26	GND		
12	-40V		
27	-40V		
13	GND		
28	GND		
14	LMNE	A12P2-30	F
29	LMNE	A12P2-30	F
15	GND		H
30	GND		H

A7A4A1 M/N VOLTAGE CONTROLLED OSCILLATOR (VCO) ASSEMBLY
85660-60096

A7A4A1A2 M/N VCO BOARD

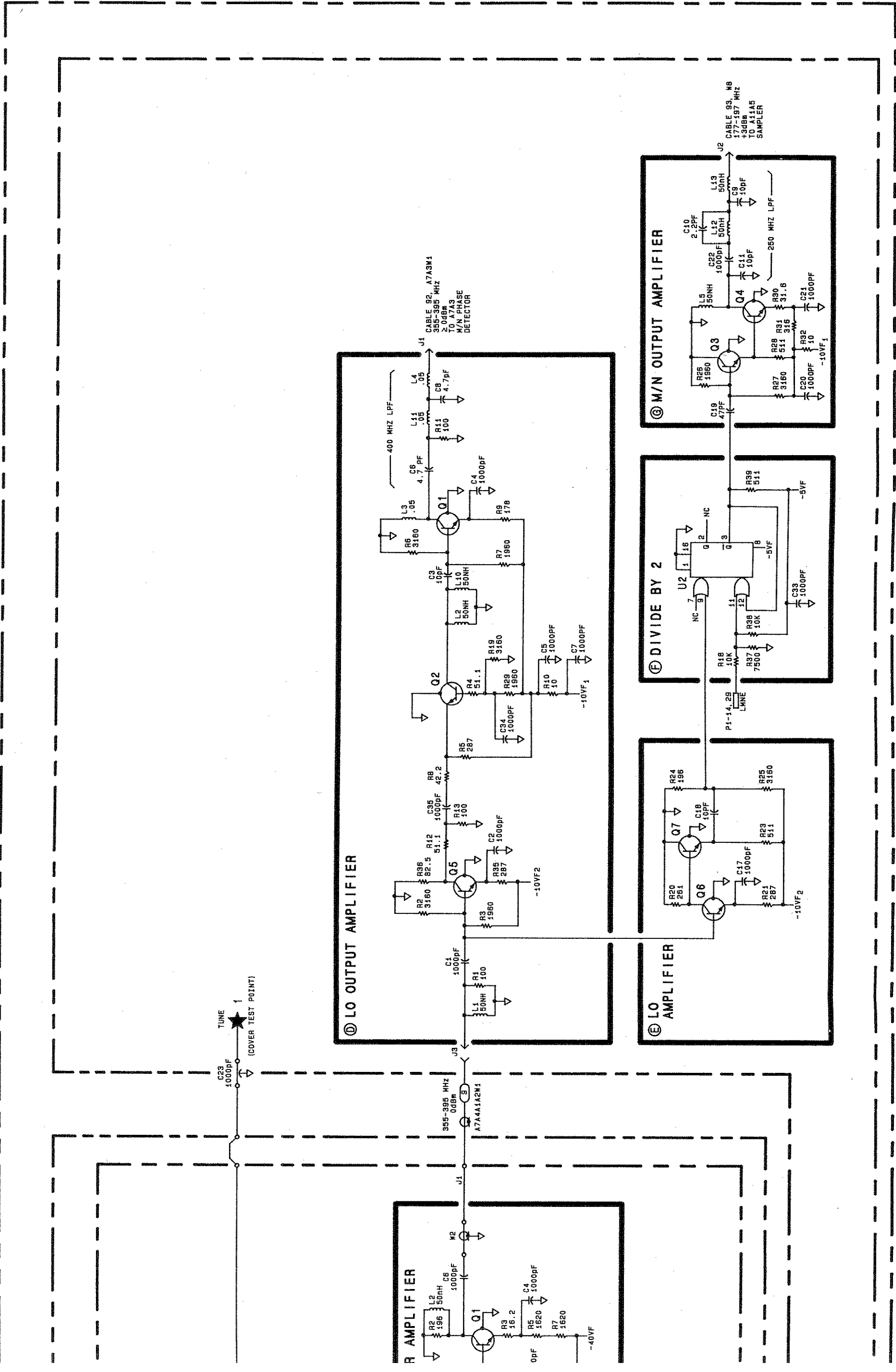


P1-2, 4, 6, 8-11, 13, 15, 17, 19, 21, 23-26, 28, 30
P1-7, 22
P1-5, 20
P1-12, 27

NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATION, PREFIX ABBREVIATION WITH ASSEMBLY DESIGNATION.
2. UNLESS OTHERWISE INDICATED, RESISTANCE IS IN OHMS (Ω), CAPACITANCE IS IN MICROFARADS (μF) AND INDUCTANCE IS IN MICROHENRIES (μH).
3. A7A4A1A4 IS AN AIR DIELECTRIC CAPACITOR FORMED BY RESONATOR CONSTRUCTION AND RESONATOR CENTER CONDUCTOR.
4. PHR ADJUSTMENT THIS IS AN ADJUSTABLE PHR WHICH IS ON A7A4 VCO PC BOARD AND EXTENDING INTO RESONATOR HOUSING.
5. ADJUSTMENT SCREW LOCATED ON COVER OF A7A4 M/N OUTPUT.
6. UNLESS OTHERWISE INDICATED, SIGNALS ENTER AT LEFT SIDE AND EXIT AT RIGHT SIDE OF FUNCTION BLOCKS.
7. MNEMONIC TABLE

MNEMONIC	DESCRIPTION
LMNE	LOW-M/N OUTPUT ENABLE



A7A4

FIGURE 5. A7A4 MIN OUTPUT, SCHEMATIC DIAGRAM
A7A4 13/14

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A7A5	85660-60020	2	1	BOARD ASSEMBLY, M/N REFERENCE MOTHERBOARD	28480	85660-60020
A7ASC1	0160-2437	1	12	CAPACITOR-FDTHRU 5000PF +80 -20% 200V	28480	0160-2437
A7ASC2	0160-2437	1		CAPACITOR-FDTHRU 5000PF +80 -20% 200V	28480	0160-2437
A7ASC3	0160-2437	1		CAPACITOR-FDTHRU 5000PF +80 -20% 200V	28480	0160-2437
A7ASC4	0160-2437	1		CAPACITOR-FDTHRU 5000PF +80 -20% 200V	28480	0160-2437
A7ASC5	0160-2437	1		CAPACITOR-FDTHRU 5000PF +80 -20% 200V	28480	0160-2437
A7ASC6	0160-2437	1		CAPACITOR-FDTHRU 5000PF +80 -20% 200V	28480	0160-2437
A7ASC7	0160-2437	1		CAPACITOR-FDTHRU 5000PF +80 -20% 200V	28480	0160-2437
A7ASC8	0160-2437	1		CAPACITOR-FDTHRU 5000PF +80 -20% 200V	28480	0160-2437
A7ASC9	0160-2437	1		CAPACITOR-FDTHRU 5000PF +80 -20% 200V	28480	0160-2437
A7ASC10	0160-2437	1		CAPACITOR-FDTHRU 5000PF +80 -20% 200V	28480	0160-2437
A7ASC11	0160-2437	1		CAPACITOR-FDTHRU 5000PF +80 -20% 200V	28480	0160-2437
A7ASC12	0160-2437	1		CAPACITOR-FDTHRU 5000PF +80 -20% 200V	28480	0160-2437
A7ASC13	0160-4083	7	2	CAPACITOR-FDTHRU 10PF 16% 200V CER	28480	0160-4083
A7ASC14	0160-4083	7		CAPACITOR-FDTHRU 10PF 16% 200V CER	28480	0160-4083
A7ASE1				PART OF PC BOARD		
A7ASE2				PART OF PC BOARD		
A7ASE3				PART OF PC BOARD		
A7ASE4				PART OF PC BOARD		
A7ASE5				PART OF PC BOARD		
A7ASE6				PART OF PC BOARD		
A7ASE7				PART OF PC BOARD		
A7ASE8				PART OF PC BOARD		
A7ASE9				PART OF PC BOARD		
A7ASE10-						
A7ASE12				NOT ASSIGNED		
A7ASE13				PART OF PC BOARD		
A7ASE14				PART OF PC BOARD		
A7ASE15	9170-0029	3	12	CORE-SHIELDING BEAD	28480	9170-0029
A7ASE16	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A7ASE17	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A7ASE18	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A7ASE19	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A7ASE20	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A7ASE21	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A7ASE22	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A7ASE23	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A7ASE24	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A7ASE25	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A7ASE26	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A7ASXA7A1	1251-4423	3	1	CONNECTOR-PC EDGE 15-CONT/ROW 1-ROW	28480	1251-4423
A7ASXA7A2	1251-4174	1	1	CONNECTOR-PC EDGE 15-CONT/ROW 1-ROW	28480	1251-4174
A7ASXA7A3	1251-2035	9	1	CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A7ASXA7A4	1251-5020	8	1	CONNECTOR-PC EDGE 15-CONT/ROW 1-ROW	28480	1251-5020
A7ASXA7A5P1	5660-0112	8	2	CONNECTOR:15 CONTACTS	28480	5660-0112
A7ASXA7A5P2	5660-0112	8		CONNECTOR:15 CONTACTS	28480	5660-0112
				MISCELLANEOUS PARTS		
	2190-0007	2	2	WASHER-LK INTL T NO. 6 .141-IN-ID	28480	2190-0007
	2190-0043	4	12	WASHER-LK INTL T NO. 8 .165-IN-ID	28480	2190-0043
	2420-0003	7	2	NUT-HEX-DBL-CHAM 6-32-THD .094-IN-THK	28480	2420-0003
	2580-0002	4	12	NUT-HEX-DBL-CHAM 8-32-THD .085-IN-THK	28480	2580-0002

*Indicates Factory Selected Value

A7A5
M/N – REFERENCE MOTHERBOARD
(Top View)
85660-60020

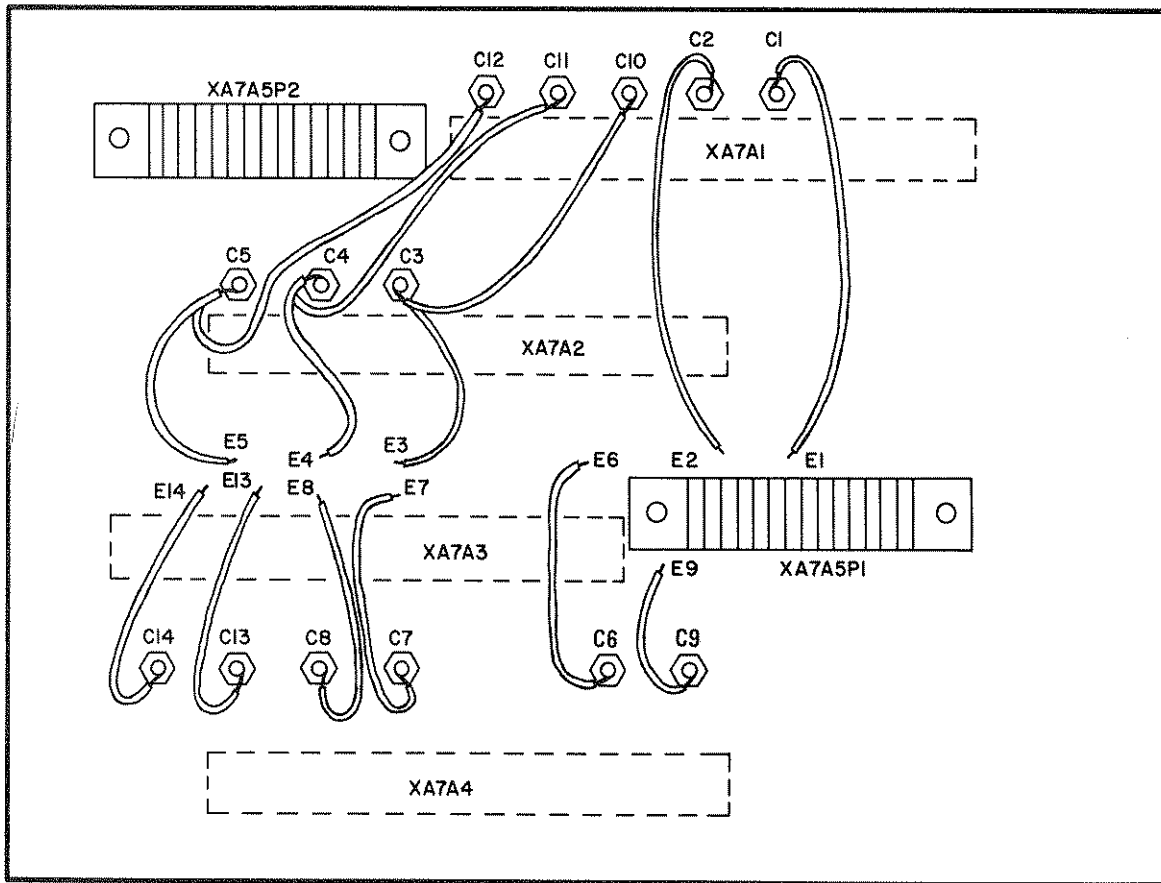


FIGURE 1. A7A5 M/N-REFERENCE MOTHERBOARD, COMPONENT LOCATIONS (TOP VIEW)

A7A5
M/N – REFERENCE MOTHERBOARD
(Bottom View)
85660-60020

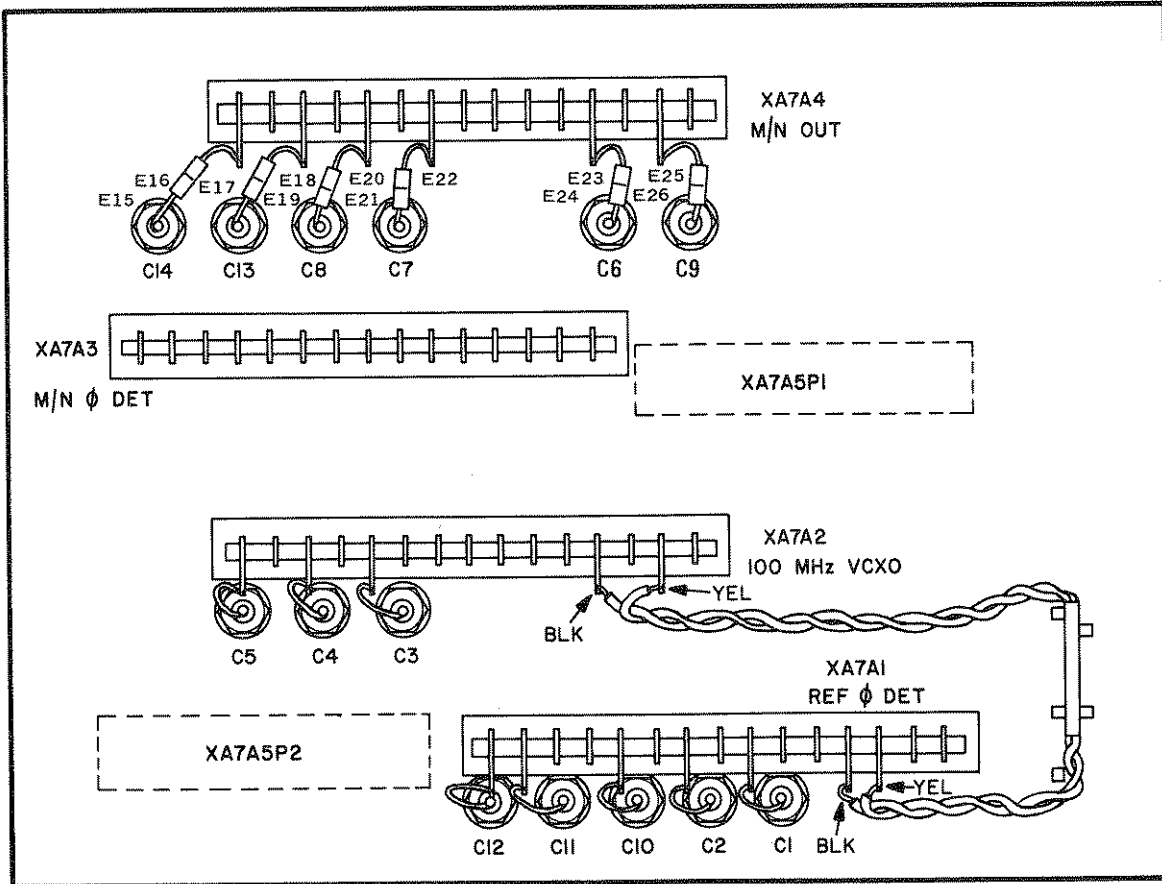


FIGURE 2. A7A5 M/N-REFERENCE MOTHERBOARD, COMPONENT LOCATIONS (BOTTOM VIEW)



A8 RECTIFIER, CIRCUIT DESCRIPTION

Power is supplied to the instrument through the A9 Power Line Module, which contains the line voltage selector, to the primary of transformer T1. Three bridge rectifiers and one center-tapped secondary provide the rectified outputs.

Diodes CR1 through CR4 form a bridge rectifier that provides approximately 55V for the -40V supply, part of the A18 Negative Regulator. CR5 through CR8 form a bridge rectifier that provides about 20V for the -10V supply and the -5.2V supply, also part of the A18 Negative Regulator.

Diodes CR9 through CR12 form a bridge rectifier that provides approximately 30V for the $+22\text{V}$ supply, part of the A8 Rectifier, and also the $+20\text{V}$ and $+12\text{V}$ supplies, part of the A17 Positive Regulator. Diodes CR13 and CR14 form a full-wave rectifier that provides about 12V for the $+5.2\text{V}$ supply, part of the A17 Positive Regulator.

The $+22\text{V}$ supply is an 18V three-terminal regulator U1 which has its common terminal biased at $+4\text{V}$ by R1, DS1, and R2. DS1 is a LED indicator that indicates the presence of $+22\text{V}$. VR1 and CR16 form a crowbar circuit for overvoltage protection. Fuse F1 provides overcurrent protection. The regulator U1 is also internally protected against short circuits on its output. The $+22\text{V}$ supply is always on as long as the instrument is connected to an ac line outlet.

The instrument is also protected against line overvoltages by an input crowbar circuit consisting of VR2 and CR18. This crowbar causes the line fuse to blow if an overvoltage condition occurs on the line.

All power supply filter capacitors and bleeder resistors are located on the A23 Motherboard. The location of fuses in the RF Section is shown in Figure 1.

RF SECTION INTERNAL FUSE REPLACEMENT

NOTE

For location of hardware and cables referred to in this procedure, see Figure 1.

WARNING

Remove ac line cord from both instruments before proceeding with this procedure.

1. Position instrument upside-down as shown in View A.
2. Remove feet (1) from rear of RF Section by removing screws (2) shown in View A.
3. Remove bottom cover by loosening screw (3) and pulling cover toward rear of instrument.
4. Location of fuses is shown in View B.

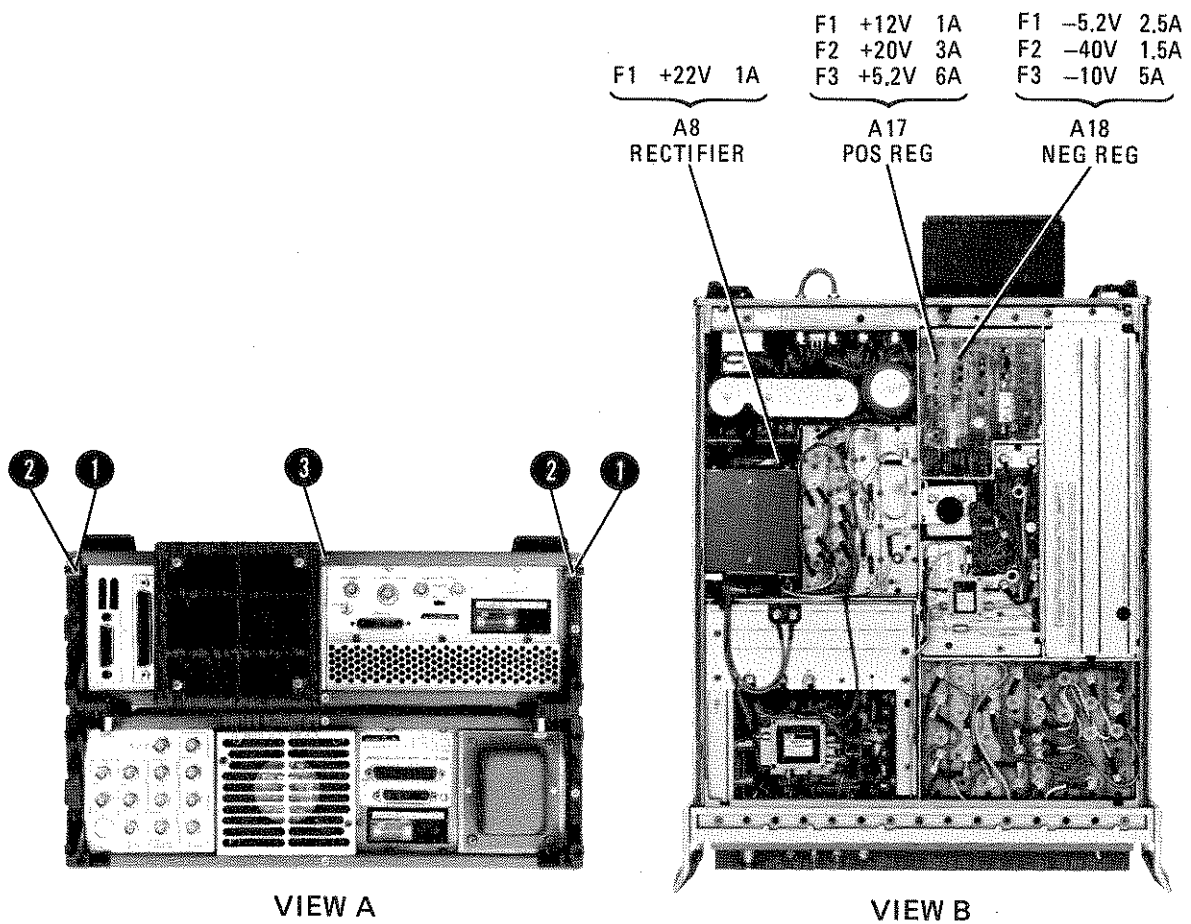


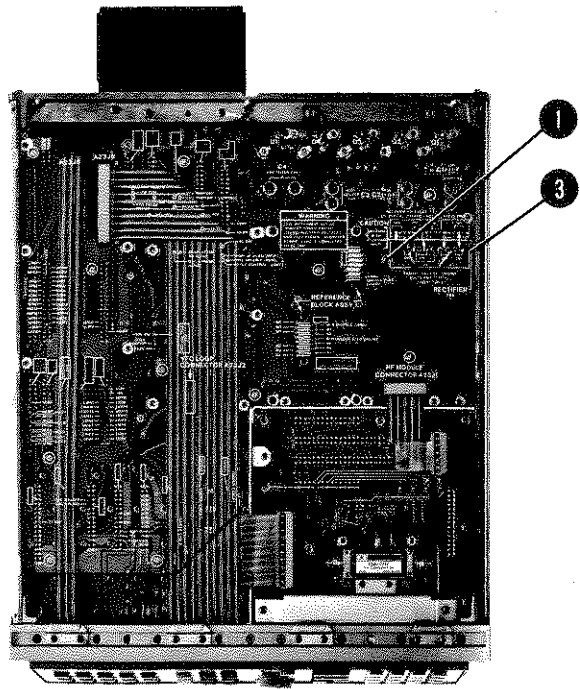
FIGURE 1. INTERNAL FUSE REPLACEMENT

TRANSFORMER REPLACEMENT

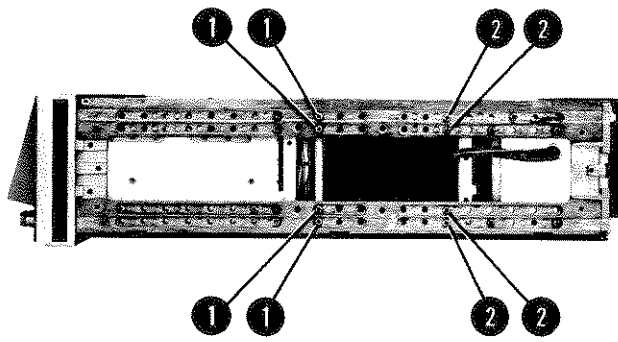
NOTE

For location of hardware and cables referred to in this procedure, see Figure 2.

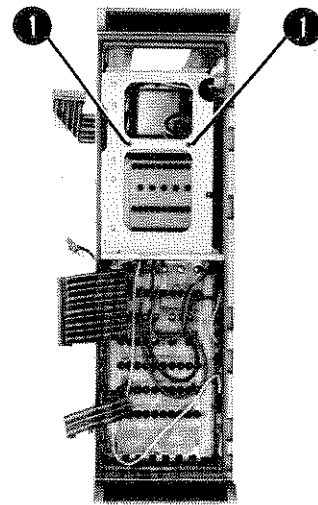
1. Remove ac line cords, IF-Display Section, and RF Section bottom cover, top cover, and right side cover.
2. Remove front panel. (See A5 Front Panel section for A5 Front Panel Removal procedure.)
3. Remove A6 RF Module. (See A6 section for A6 RF Module removal procedure.)
4. Remove seven screws **(1)**.
5. To avoid losing washers and nuts from screws **(2)** (View B) into the interior of the RF Section, it is recommended to do the following:
 - a. Set RF Section on right side with transformer on bottom.
 - b. Set the RF Section partially off the table so that a screwdriver can reach the remaining four mounting screws.
 - c. For each screw **(2)**, hold nut with needlenose pliers while removing screw. Note: Mounting screws on motherboard side can be accessed through small opening **(3)** (View A) on motherboard.
 - d. When installing new transformer, set RF Section on side as described in steps 5a and 5b. For each mounting screw, align nut and washers with hole, and while holding nut with needlenose pliers, tighten screw.
 - e. Tighten remaining seven screws **(1)** to secure Transformer to RF Section.
6. Replace RF Module.
7. Replace front panel.
8. Replace covers, attach IF-Display section to RF Section, and replace ac line cords.



VIEW A



VIEW B



VIEW C

FIGURE 2. TRANSFORMER REPLACEMENT

POWER TRANSISTOR REPLACEMENT (REAR RF COVER REMOVAL)

NOTE

For location of hardware and cables referred to in this procedure, see Figure 3.

With ac line cords and RF Section bottom cover removed, proceed as follows:

1. Loosen rear cover by removing five screws (1) shown in Views A and B.
2. Power Transistors can now be easily replaced.

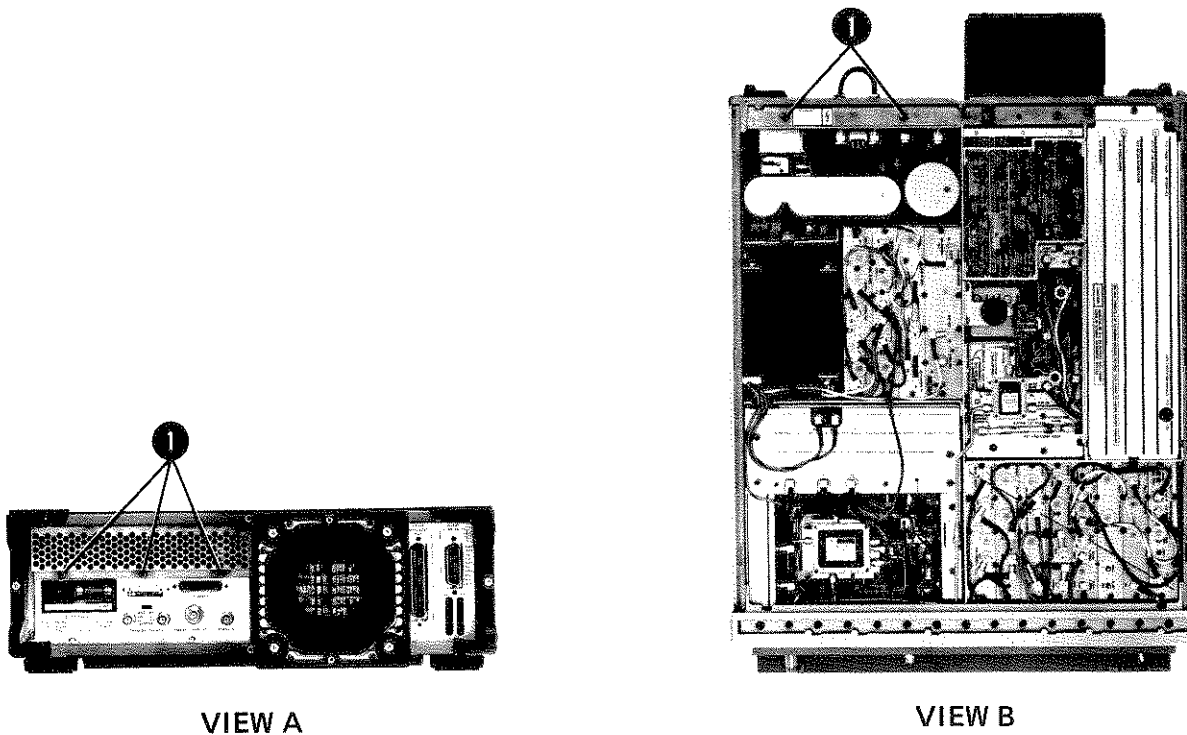


FIGURE 3. POWER TRANSISTOR REPLACEMENT

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
AB	85660-60196	3	1	BOARD ASSEMBLY, RECTIFIER	28480	85660-60196
ABC1	0160-2055	9	3	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
ABC2	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
ABC3	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
ABC4	0160-4084	8	1	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
ABC5	0100-0230	0	2	CAPACITOR-FXD 1UF+-20% 50VDC TA	56289	150D105X0050A2
ABC6	0100-0230	0		CAPACITOR-FXD 1UF+-20% 50VDC TA	56289	150D105X0050A2
ABC7	0100-0197	8	1	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X7020A2
ABC8	0160-4005	3	4	CAPACITOR-FXD 1UF +-20% 100VDC CER	28480	0160-4005
ABC9	0160-4005	3		CAPACITOR-FXD 1UF +-20% 100VDC CER	28480	0160-4005
ABC10	0160-4005	3		CAPACITOR-FXD 1UF +-20% 100VDC CER	28480	0160-4005
ABC11	0160-4005	3		CAPACITOR-FXD 1UF +-20% 100VDC CER	28480	0160-4005
ABC12	0160-3638	6	1	CAPACITOR-FXD .22UF +80-20% 200VDC CER	28480	0160-3638
ABC13	0100-1731	8	1	CAPACITOR-FXD 4.7UF+-10% 50VDC TA	56289	150D475X9050B2
ABCR1	1901-0662	3	13	DIODE-PWR RECT 100V 6A	04713	MR751
ABCR2	1901-0662	3		DIODE-PWR RECT 100V 6A	04713	MR751
ABCR3	1901-0662	3		DIODE-PWR RECT 100V 6A	04713	MR751
ABCR4	1901-0662	3		DIODE-PWR RECT 100V 6A	04713	MR751
ABCR5	1901-0662	3		DIODE-PWR RECT 100V 6A	04713	MR751
ABCR6	1901-0662	3		DIODE-PWR RECT 100V 6A	04713	MR751
ABCR7	1901-0662	3		DIODE-PWR RECT 100V 6A	04713	MR751
ABCR8	1901-0662	3		DIODE-PWR RECT 100V 6A	04713	MR751
ABCR9	1901-0662	3		DIODE-PWR RECT 100V 6A	04713	MR751
ABCR10	1901-0662	3		DIODE-PWR RECT 100V 6A	04713	MR751
ABCR11	1901-0662	3		DIODE-PWR RECT 100V 6A	04713	MR751
ABCR12	1901-0662	3		DIODE-PWR RECT 100V 6A	04713	MR751
ABCR13	1901-0765	7	2	DIODE-PWR RECT 1N5812 50V 20A 35NS DO-4	12969	1N5812
ABCR14	1901-0765	7		DIODE-PWR RECT 1N5812 50V 20A 35NS DO-4	12969	1N5812
ABCR16	1084-0010	5	2	THYRISTOR-SCR 2N4106 VRRM=200	04713	2N4106
ABCR17	1901-0662	3		DIODE-PWR RECT 100V 6A	04713	MR751
ABCR18	1084-0010	5		THYRISTOR-SCR 2N4106 VRRM=200	04713	2N4106
ABCR19	1901-0743	1	2	DIODE-PWR RECT 1N4004 400V 1A DO-41	01295	1N4004
ABCR20	1901-0743	1		DIODE-PWR RECT 1N4004 400V 1A DO-41	01295	1N4004
ABDS1	1990-0487	7	1	LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5002-4584
ABF1	2110-0001	8	1	FUSE 1A 250V NTD 1.25X.25 UL	75915	312001
ABR1	0698-0083	8	1	RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
ABR2	2100-3052	4	1	RESISTOR-TRMR 50 10% C SIDE-ADJ 17-TRN	02111	43P500
ABR3	0757-0346	2	1	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
ABR4	0698-3444	1	1	RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-T0-316R-F
ABR5	0698-3444	4	1	RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
ABR6*	0698-3442	9	1	RESISTOR 237 1% .125W F TC=0+-100	24546	C4-1/8-T0-237R-F
ABR7	0698-3550	8	1	RESISTOR 4.02K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4021-F
ABU1	1026-0423	4	1	IC V RGLTR T0-3	27014	LM317K
ABVR1	1902-3263	8	1	DIODE-ZNR 24.9V 2% D0-35 PD=.4W	28480	1902-3263
ABVR2	1902-0197	1	1	DIODE-ZNR 82.5V 5% D0-7 PD=.1W TC=+.082%	28480	1902-0197
				MISCELLANEOUS PARTS		
	0340-1077	5	1	INSULATOR FPPR	28480	0340-1077
	1200-0001	4	2	INSULATOR-FLG-BGHC NYLON	28480	1200-0001
	2110-0269	8	2	FUSEHOLDER-CLIP TYPE.25D-FUSE	28480	2110-0269
	2190-0124	4	2	WASHER-LK INTL T NO. 10 .195-IN-ID	28480	2190-0124
	2200-0107	6	2	SCREW-MACH 4-40 .375-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
	2740-0001	3	2	NUT-HEX-DBL-CHAM 10-32-TRD .109-IN-THK	00000	ORDER BY DESCRIPTION
	3050-0876	8	2	WASHER-FL MM NO. 10 .194-IN-ID	28480	3050-0876
	5040-6843	2	1	EXTRACTOR	28480	5040-6843
	86701-00010	4	1	HEATSINK RECT	28480	86701-00010
A9	0960-0443	1	1	LINE MODULE-FILTERED	28480	0960-0443
A9C1	0160-4065	5	1	CAPACITOR-FXD .1UF +-20% 250VAC(RMS)	28480	0160-4065

*Indicates Factory Selected Value

A8 RECTIFIER 85660-60196

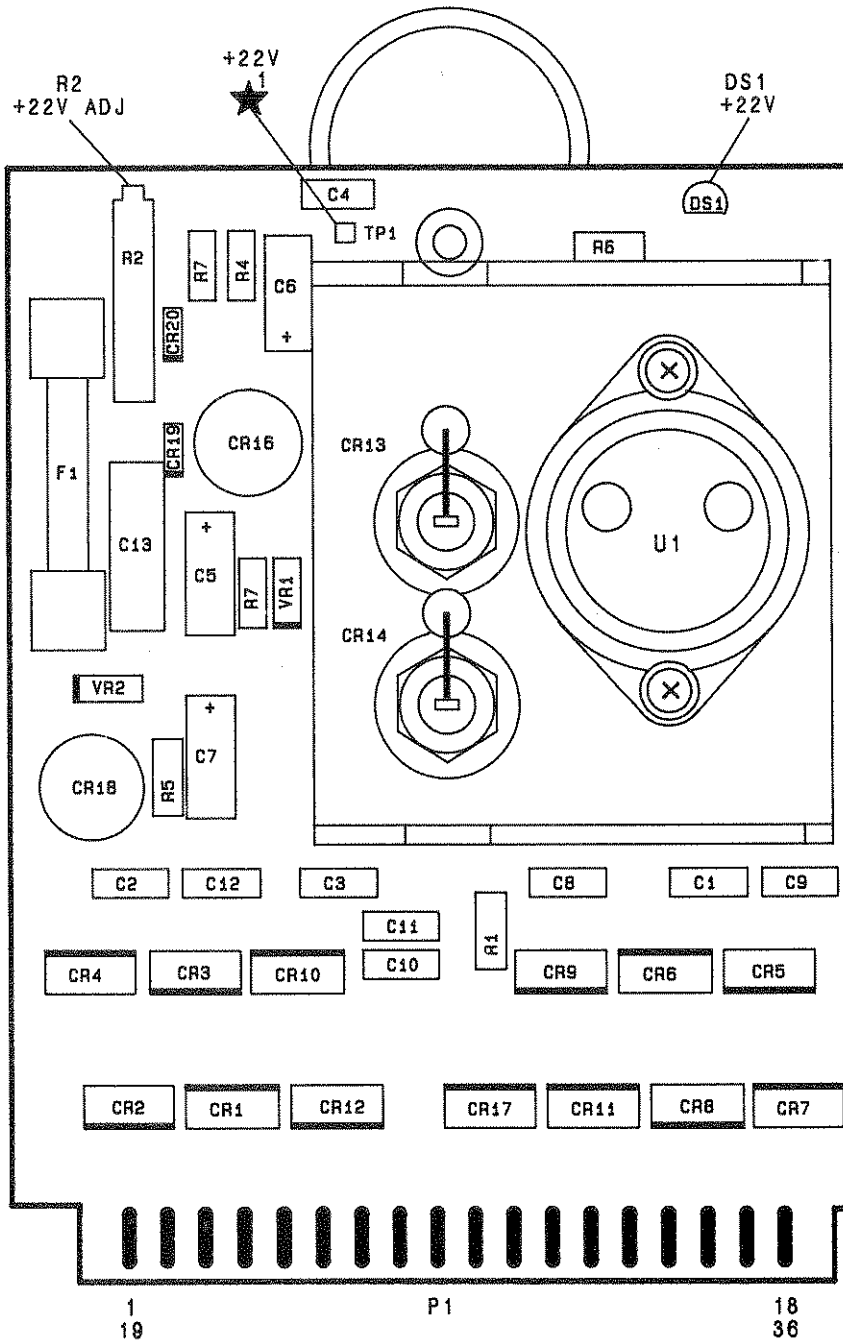
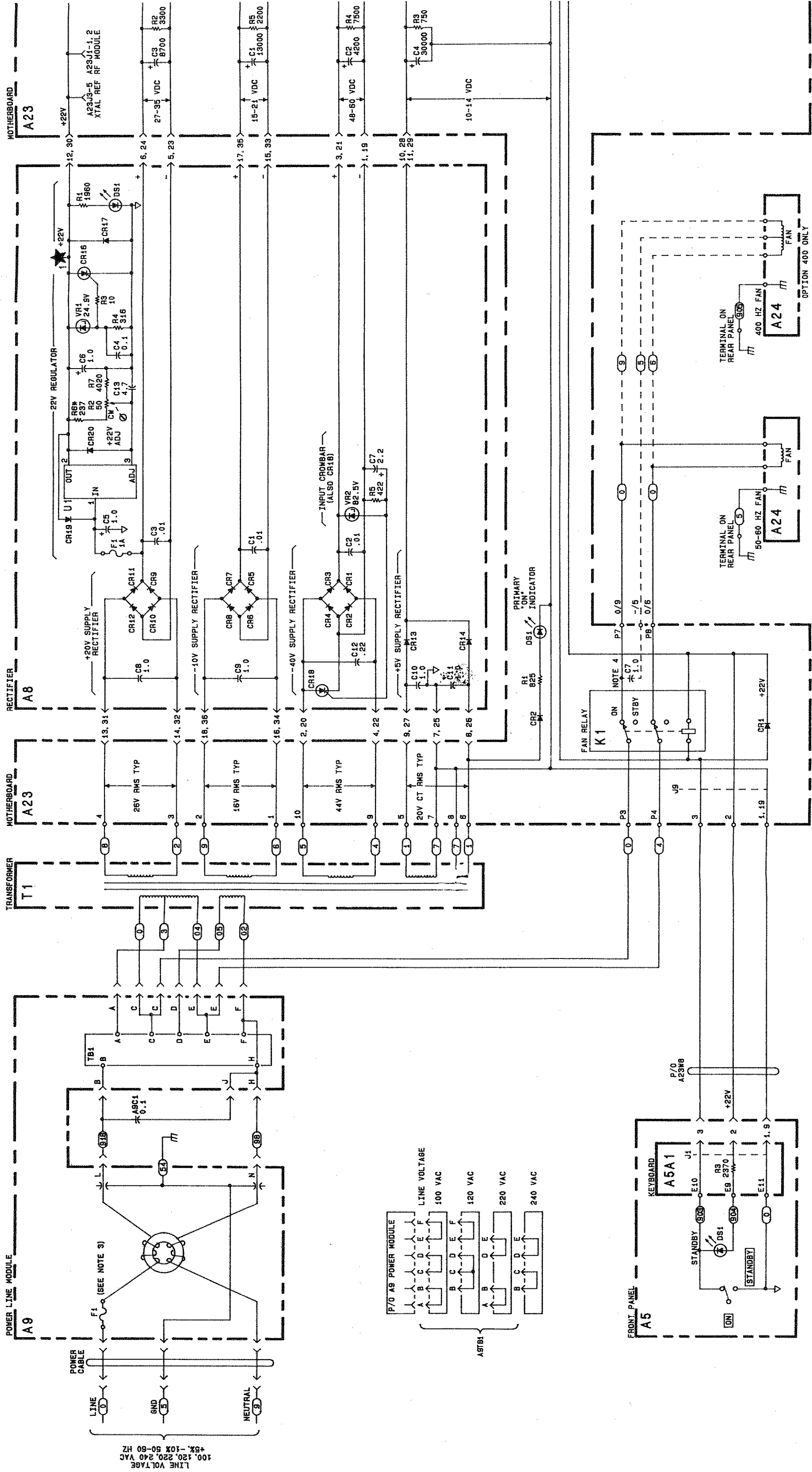


FIGURE 4. A8 RECTIFIER, COMPONENT LOCATIONS



SERIAL NUMBER PREFIX: 2410A

