

## Errata

**Title & Document Type:** 8640B Service Manual Volumes  
1 and 2

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### HP References in this Manual

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

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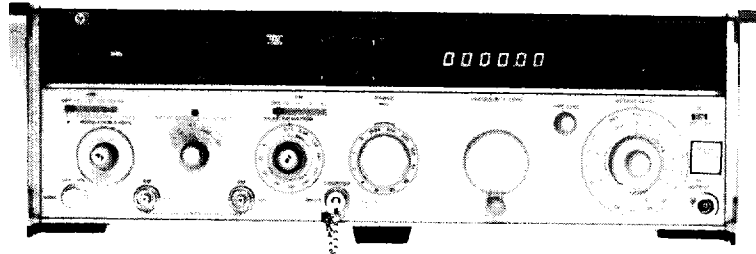
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# SERVICE MANUAL

## HP 8640B SIGNAL GENERATOR



May 1991  
08640-90215



**HEWLETT  
PACKARD**

# HP 8640B SIGNAL GENERATOR

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Replaceable Parts List

Instrument Changes

Service

- General Information
- Principles of Operation/  
Troubleshooting

HP 8640B

May 91

08640-90215

Service  
2520A/Above

**volume 1**  
SERVICE MANUAL



HEW  
PACK

# HP 8640B SIGNAL GENERATOR (Including Options 001, 002, 003 and 004) Service Manual

## SERIAL NUMBERS

This manual applies directly to instruments with serial numbers prefixed:

2520A to 2923A and all *MAJOR* changes that apply to your instrument.

*rev.01MAY91*

Information for *MAJOR* changes is also provided for instruments with serial-number prefixes not listed in the above range.

For additional important information about serial numbers, refer to "Instruments Serial Numbers" in Section 1.

Second Edition

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Service Manual HP Part 08640-90215

Other Documents Available:

Operation and Calibration Manual HP Part 08640-90208

Microfiche Operation and Service Manual HP Part 08640-90210

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## Section 6 REPLACEABLE PARTS

### 6-1. INTRODUCTION

This section contains information for ordering parts. Table 6-1 lists reference designations and abbreviations used in the parts list and throughout the manual. Table 6-2 lists exchange assemblies. Table 6-3 lists all replaceable parts in reference designator order. Table 6-4 contains the names and addresses that correspond to the manufacturer's code numbers.

### 6-2. EXCHANGE ASSEMBLIES

Table 6-1 lists assemblies within the instrument that may be replaced on an exchange basis, thus affording a considerable cost saving. The table also lists the part numbers of the exchanged assembly (with trade-in) and the part number of a new assembly. Exchange, factory-repaired and tested assemblies are only available on a trade-in basis; therefore, the defective assemblies must be turned in for credit. For this reason, assemblies required for spare parts stock must be ordered by the new assembly part number.

*Table 6-1. Part Numbers for Exchange Assemblies*

Reference Designation	Description	Part Number	
		Exchange Assy	New Assy
A1	Output Level Assy (Retrofit Kit for all options except Option 004)		08640-60496
A1	Output Level Assy (Option 004 Only)	08640-60077	08640-60062
A3	RF Oscillator Assy	08640-60098	08640-60099
A19	10 dB Output Level Assy (Option 004 Only)	08640-60078	08640-60060

### 6-3. REFERENCE DESIGNATORS AND ABBREVIATIONS

Table 6-2 lists reference designators and abbreviations used in the parts list, schematics, and throughout the manual. In some cases, two forms of the abbreviation are used, one all in capital letters, and one partial or no capitals. This occurs because the abbreviations in the parts list are always capitals. However, in the schematics and other parts of the manual, other abbreviation forms are used with both lower case and upper case letters.

### 6-4. REPLACEABLE PARTS LIST

Table 6-3 is a list of replaceable parts and is organized as follows:

- a. Electrical assemblies and their components in alphanumeric order by reference designation.
- b. Chassis-mounted parts in alphanumeric order by reference designator.
- c. Mechanical parts.



The information given for each part consists of the following:

- a. The Hewlett-Packard part number.
- b. Part number check digit (CD).
- c. The total quantity (Qty) for the entire instrument except for option assemblies.
- d. The description of the part.
- e. A typical manufacturer of the part in a five digit code.
- f. The manufacturer's number of the part.

#### NOTE

*The total quantity for each part is given only once, that is, at the first occurrence of the part number in the list. The total quantities for optional assemblies are totalled by assembly and not integrated into the standard list.*

## How To Use The Replaceable Parts List

**Parts List Organization** This parts list documents the standard HP 8640B Signal Generator and its four options. Each option is configured basically the same as the standard instrument except for the assembly or assemblies which are modified to provide the optional capability.

Assemblies which have more than one part number and part listing to accommodate different options are filed sequentially behind the Standard assembly part listing. For example, there are two A1 part listings; one for the Standard instrument and one for the Option 004, which is filed behind the standard. Instruments with options other than 004 will be configured the same as the Standard instrument and will use the Standard list for this assembly.

In cases where there are only minor differences between the Standard instrument and the instrument with an option, the option information is included in the Standard list with the description of the part or parts which are different.

**Standard HP 8640B Instruments** To find part numbers for a standard instrument, use all unmarked listings and the listings designated as "Standard (Not Option/s 00X)".

**HP 8640B Instruments With Options** To find part numbers for an instrument with one or more options, use all unmarked listings and the listing designated for your instrument option. If your instrument option is not specifically designated on either list, use the list designated "Standard (Not Option 00X)".

### 6-5. FACTORY SELECTED PARTS(\*)

Parts marked with an asterisk (\*) are factory selected parts. The value listed in the parts list is the nominal value. Refer to Sections 5 and 8 of this manual for information on determining what value to use for replacement.

### 6-6. PARTS LIST UPDATING (MANUAL UPDATES)

Production changes to the Signal Generator made after the publication date of this manual are accompanied by a change in the serial number prefix. Changes to the parts list are recorded by serial number prefix on an addition or replacement page(s). The MANUAL UPDATE can be ordered

by filling out and returning the DOCUMENTATIONS UPDATE SERVICE REQUEST reply card found in the beginning of this manual.

## 6-7. ILLUSTRATED PARTS BREAKDOWN

Illustrated Parts Breakdowns for the following assemblies are given on the alphabetic foldout pages in this manual (located after the numbered Service Sheets):

- A1 Output Level Assembly
- A3 RF Oscillator Assembly
- A9 Peak Deviation and Range Switch Assembly
- A10 Divider/Filter Assembly
- A11 Variable-Frequency Modulation Oscillator
- A19 10 dB Output Level Assembly
- A26 AM/AGC and RF Amplifier Assembly

Figure 6-1 locates the front panel mechanical parts. Figures 6-2 and 6-3 are breakdowns of the generator's cabinet parts and the parts that constitute the Type N connector, J1. These figures are located at the end of the Replaceable Parts table.

## 6-8. ORDERING INFORMATION

To order a part listed in the replaceable parts table, include the Hewlett-Packard part number (with the check digit) and the quantity required. Address the order to the nearest Hewlett-Packard office. The check digit will ensure accurate and timely processing of your order.

To order a part that is not listed in the replaceable parts table, include the instrument number, instrument serial number, description and function of the part, and quantity of parts required. Address the order to the nearest Hewlett-Packard office.

### NOTE

*Within the USA, it is better to order directly from the HP Support Materials Organization, Roseville, California. Ask your nearest HP office for information and forms for the "Direct Order Systems".*

## 6-9. RECOMMENDED SPARES LIST

Stocking spare parts for an instrument is often done to ensure quick return to service after a malfunction occurs. Hewlett-Packard has prepared a "Recommended Spares" list for this instrument. The contents of the list are based on failure reports and repair data. Quantities given are for one year of parts support. A complimentary copy of the "Recommended Spares" list may be requested from your nearest Hewlett-Packard office.

When stocking parts to support more than one Signal Generator or to support a variety of Hewlett-Packard instruments, it may be more economical to work from one consolidated list rather than simply adding together stocking quantities from the individual instrument lists. Hewlett-Packard will prepare consolidated "Recommended Spares" lists for any number or combination of instruments. Contact your nearest Hewlett-Packard office for details.

A "Spare Parts Kit" is also available. The kit consists of selected replaceable assemblies and components to provide parts support for the instrument for one year.

Table 6-1. Reference Designations

REFERENCE DESIGNATIONS			
A ..... assembly	E ..... miscellaneous	P ..... electrical connector	U ..... integrated circuit;
AT ..... attenuator; isolator;	electrical part	(movable portion);	microcircuit
termination	F ..... fuse	plug	V ..... electron tube
B ..... fan; motor	FL ..... filter	Q ..... transistor; SCR;	VR ..... voltage regulator;
BT ..... battery	H ..... hardware	triode thyristor; FET	breakdown diode
C ..... capacitor	HY ..... circulator	R ..... resistor	W ..... cable; transmission
CP ..... coupler	J ..... electrical connector	RT ..... thermistor	path; wire
CR ..... diode; diode	(stationary portion);	S ..... switch	X ..... socket
thyristor; varactor	jack	T ..... transformer	Y ..... crystal unit (piezo-
DC ..... directional coupler	K ..... relay	TB ..... terminal board	electric or quartz)
DL ..... delay line	L ..... coil; inductor	TC ..... thermocouple	Z ..... tuned cavity; tuned
DS ..... annunciator;	M ..... meter	TP ..... test point	circuit
signaling device	MP ..... miscellaneous		
(audible or visual);	mechanical part		
lamp; LED			

Table 6-2. Abbreviations (1 of 2)

ABBREVIATIONS			
A ..... ampere	COEF ..... coefficient	EDP ..... electronic data	INT ..... internal
ac ..... alternating current	COM ..... common	processing	kg ..... kilogram
ACCESS ..... accessory	COMP ..... composition	ELECT ..... electrolytic	kHz ..... kilohertz
ADJ ..... adjustment	COMPL ..... complete	ENCAP ..... encapsulated	k ..... kilohm
A/D ..... analog-to-digital	CONN ..... connector	EXT ..... external	kV ..... kilovolt
AF ..... audio frequency	CP ..... cadmium plate	F ..... farad	lb ..... pound
AFC ..... automatic	CRT ..... cathode-ray tube	FET ..... field-effect transistor	LC ..... inductance-
frequency control	CTL ..... complementary	F/F ..... flip-flop	capacitance
AGC ..... automatic gain	transistor logic	FH ..... flat head	LED ..... light-emitting diode
control	CW ..... continuous wave	FIL H ..... fillister head	LF ..... low frequency
AL ..... aluminum	clockwise	FM ..... frequency modulation	LG ..... long
ALC ..... automatic level	cm ..... centimeter	FP ..... front panel	LH ..... left hand
control	D/A ..... digital-to-analog	FREQ ..... frequency	LIM ..... limit
AM ..... amplitude modulation	dB ..... decibel	FXD ..... fixed	LIN ..... linear taper (used
AMPL ..... amplifier	dBm ..... decibel referred	g ..... gram	in parts list)
APC ..... automatic phase	to 1 mW	GE ..... germanium	LK WASH ..... lock washer
control	dc ..... direct current	GHz ..... gigahertz	LO ..... low; local oscillator
ASSY ..... assembly	deg ..... degree (temperature	GL ..... glass	LOG ..... logarithmic taper
AUX ..... auxiliary	interval or difference)	GRD ..... ground(ed)	(used in parts list)
avg ..... average	...° ..... degree (plane	H ..... henry	log ..... logarithm(ic)
AWG ..... American wire	angle)	h ..... hour	LPF ..... low pass filter
gauge	°C ..... degree Celsius	HET ..... heterodyne	LV ..... low voltage
BAL ..... balance	(centigrade)	HEX ..... hexagonal	m ..... meter (distance)
BCD ..... binary coded	°F ..... degree Fahrenheit	HD ..... head	mA ..... milliampere
decimal	°K ..... degree Kelvin	HDW ..... hardware	MAX ..... maximum
BD ..... board	DEPC ..... deposited carbon	HF ..... high frequency	M ..... megohm
BECU ..... beryllium copper	DET ..... detector	HG ..... mercury	MEG ..... meg (10 <sup>6</sup> ) (used
BFO ..... beat frequency	diam ..... diameter	HI ..... high	in parts list)
oscillator	DIA ..... diameter (used in	HP ..... Hewlett-Packard	MET FLM ..... metal film
BH ..... binder head	parts list)	HPF ..... high pass filter	MET OX ..... metallic oxide
BKDN ..... breakdown	DIFF AMPL ..... differential	HR ..... hour (used in	MF ..... medium frequency;
BP ..... bandpass	amplifier	parts list)	microfarad (used in
BPF ..... bandpass filter	div ..... division	HV ..... high voltage	parts list)
BRS ..... brass	DPDT ..... double-pole,	Hz ..... Hertz	MFR ..... manufacturer
BWO ..... backwave-wave	double-throw	ID ..... integrated circuit	mg ..... milligram
oscillator	DR ..... drive	IC ..... inside diameter	MHz ..... megahertz
CAL ..... calibrate	DSB ..... double sideband	ID ..... intermediate	mH ..... millihenry
ccw ..... counter-clockwise	DTL ..... diode transistor	IF ..... frequency	mho ..... mho
CER ..... ceramic	logic	IMPG ..... impregnated	min ..... minute (time)
CHAN ..... channel	DVM ..... digital voltmeter	in ..... incandescent	...° ..... minute (plane angle)
cm ..... centimeter	ECL ..... emitter coupled	INCL ..... include(s)	MINAT ..... miniature
CMO ..... cabinet mount only	logic	INP ..... input	mm ..... millimeter
COAX ..... coaxial	EMF ..... electromotive force	INS ..... insulation	

**NOTE**

All abbreviations in the parts list will be in upper-case.

Table 6-2. Abbreviations (2 of 2)

MOD ..... modulator	OD ..... outside diameter	PWV ..... peak working voltage	TD ..... time delay
MOM ..... momentary	OH ..... oval head	RC ..... resistance-capacitance	TERM ..... terminal
MOS ..... metal-oxide semiconductor	OP AMPL ..... operational amplifier	RECT ..... rectifier	TFT ..... thin-film transistor
ms ..... millisecond	OPT ..... option	REF ..... reference	TGL ..... toggle
MTG ..... mounting	OSC ..... oscillator	REG ..... regulated	THD ..... thread
MTR ..... meter (indicating device)	OX ..... oxide	REPL ..... replaceable	THRU ..... through
mV ..... millivolt	oz ..... ounce	RF ..... radio frequency	TI ..... titanium
mVac ..... millivolt, ac	Ω ..... ohm	RFI ..... radio frequency interference	TOL ..... tolerance
mVdc ..... millivolt, dc	P ..... peak (used in parts list)	RH ..... round head; right hand	TRIM ..... trimmer
mVpk ..... millivolt, peak	PAM ..... pulse-amplitude modulation	RLC ..... resistance-inductance-capacitance	TSTR ..... transistor
mVp-p ..... millivolt, peak-to-peak	PC ..... printed circuit	RMO ..... rack mount only	TTL ..... transistor-transistor logic
mVrms ..... millivolt, rms	PCM ..... pulse-code modulation; pulse-count modulation	rms ..... root-mean-square	TV ..... television
mW ..... milliwatt	PDM ..... pulse-duration modulation	RND ..... round	TVI ..... television interference
MUX ..... multiplex	pF ..... picofarad	ROM ..... read-only memory	TWT ..... traveling wave tube
MY ..... mylar	PH BRZ ..... phosphor bronze	R&P ..... rack and panel	U ..... micro (10 <sup>-6</sup> ) (used in parts list)
μA ..... microampere	PHL ..... Phillips	RWV ..... reverse working voltage	UF ..... microfarad (used in parts list)
μF ..... microfarad	PIN ..... positive-intrinsic-negative	S ..... scattering parameter	UHF ..... ultrahigh frequency
μH ..... microhenry	PIV ..... peak inverse voltage	s ..... second (time)	UNDEF ..... undefined
μmho ..... micromho	pk ..... peak	"....." ..... second (plane angle)	UNREG ..... unregulated
μs ..... microsecond	PL ..... phase lock	S-B ..... slow-blow (fuse) (used in parts list)	V ..... volt
μV ..... microvolt	PLO ..... phase lock oscillator	SCR ..... silicon controlled rectifier; screw	VA ..... voltampere
μVac ..... microvolt, ac	PM ..... phase modulation	SE ..... selenium	Vac ..... volts, ac
μVdc ..... microvolt, dc	PNP ..... positive-negative-positive	SECT ..... sections	VAR ..... variable
μVpk ..... microvolt, peak	P/O ..... part of	SEMICON ..... semiconductor	VCO ..... voltage-controlled oscillator
μVp-p ..... microvolt, peak-to-peak	POLY ..... polystyrene	SHF ..... superhigh frequency	Vdc ..... volts, dc
μVrms ..... microvolt, rms	PORC ..... porcelain	SI ..... silicon	VDCW ..... volts, dc, working (used in parts list)
μW ..... microwatt	POS ..... positive; position(s) (used in parts list)	SIL ..... silver	V(F) ..... volts, filtered
nA ..... nanoampere	POSN ..... position	SL ..... slide	VFO ..... variable-frequency oscillator
NC ..... no connection	POT ..... potentiometer	SNR ..... signal-to-noise ratio	VHF ..... very-high frequency
N/C ..... normally closed	p-p ..... peak-to-peak	SPDT ..... single-pole, double-throw	Vpk ..... volts, peak
NE ..... neon	PP ..... peak-to-peak (used in parts list)	SPG ..... spring	Vp-p ..... volts, peak-to-peak
NEG ..... negative	PPM ..... pulse-position modulation	SR ..... split ring	Vrms ..... volts, rms
nF ..... nanofarad	PREAMPL ..... preamplifier	SPST ..... single-pole, single-throw	VSWR ..... voltage standing wave ratio
NI PL ..... nickel plate	PRF ..... pulse-repetition frequency	SS ..... Service Sheet	VTO ..... voltage-tune oscillator
N/O ..... normally open	PRR ..... pulse repetition rate	SSB ..... single sideband	VTVM ..... vacuum-tube voltmeter
NOM ..... nominal	ps ..... picosecond	SST ..... stainless steel	V(X) ..... volts, switched
NORM ..... normal	PT ..... point	STL ..... steel	W ..... watt
NPN ..... negative-positive-negative	PTM ..... pulse-time modulation	SQ ..... square	W/ ..... with
NPO ..... negative-positive zero (zero temperature coefficient)	PWM ..... pulse-width modulation	SWR ..... standing-wave ratio	WIV ..... working inverse voltage
NRFR ..... not recommended for field replacement		SYNC ..... synchronize	WW ..... wirewound
NSR ..... not separately replaceable		T ..... timed (slow-blow fuse)	W/O ..... without
ns ..... nanosecond		TA ..... tantalum	YIG ..... yttrium-iron-garnet
nW ..... nanowatt		TC ..... temperature compensating	Z <sub>0</sub> ..... characteristic impedance
OBD ..... order by description			

**NOTE**

All abbreviations in the parts list will be in upper-case.

**MULTIPLIERS**

Abbreviation	Prefix	Multiple
T	tera	10 <sup>12</sup>
G	giga	10 <sup>9</sup>
M	mega	10 <sup>6</sup>
k	kilo	10 <sup>3</sup>
da	deka	10
d	deci	10 <sup>-1</sup>
c	centi	10 <sup>-2</sup>
m	milli	10 <sup>-3</sup>
μ	micro	10 <sup>-6</sup>
n	nano	10 <sup>-9</sup>
p	pico	10 <sup>-12</sup>
f	femto	10 <sup>-15</sup>
a	atto	10 <sup>-18</sup>

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A1 STANDARD AND ALL OPTIONS EXCEPT OPTION.004</b>						
A1	08640-50496	0	1	08640-60496 (DOES NOT INCLUDE A1MP9 AND A1MP15)		
A1MP1	08640-00112	1	1	SUPPORT, VARIABLE RESISTOR	28480	08640-00112
A1MP2	0380-0660	4	1	SPACER-RND 1.25-IN-LG .128-IN-ID	00000	ORDER BY DESCRIPTION
A1MP3	3130-0038	4	1	COUPLER-SWITCH "U" SHAPED; .0450 +-.0005	28480	3130-0038
A1MP4	0510-0005	8	2	RETAINER-RING BSC EXT .25-IN-DIA STL	28480	0510-0005
A1MP5	3050-0103	4	4	WASHER-FL MTLCL NO. 12 .25-IN-ID	28480	3050-0103
A1MP6	1460-0019	8	4	SPRING-CPRSN .384-IN-OD .375-IN-OA-LG	28480	1460-0019
A1MP7	08640-20249	7	3	SWITCH, ROTOR 3-C	28480	08640-20249
A1MP8	08640-00111	0	1	SUPPORT, BOARD	28480	08640-00111
A1MP9	08640-20266	8	1	SUPPORT, ATTENUATOR	28480	08640-20266
A1MP10	08640-80015	1	1	SHAFT-INNER .125-IN-DIA,9.38-IN-LG, SS	28480	08640-80015
A1MP11	2190-0016	3	3	WASHER-LK INTL T 3/8 IN .377-IN-ID	28480	2190-0016
A1MP12	2950-0001	8	1	NUT-HEX-DBL-CHAM 3/8-32-THD .094-IN-THK	00000	ORDER BY DESCRIPTION
A1MP13	2200-0127	0	2	SCREW-MACH 4-40 1.75-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
A1MP14	0550-0053	0	1	SCREW-MACH 5-40 .75-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
A1MP15	2200-0109	8	1	SCREW-MACH 4-40 .438-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
A1MP16	2190-0108	4	4	WASHER-LK HLCL NO. 4 .115-IN-ID	28480	2190-0108
A1MP17	2190-0020	9	1	WASHER-LK HLCL NO. 5 .128-IN-ID	28480	2190-0020
A1MP18	08641-00004	1	1	COVER, ATTENUATOR	28480	08641-00004
A1R1	2100-3855	5	1	RESISTOR-VAR CONTROL CP 1K 10% LIN	28480	2100-3855
<b>A1A1</b>						
A1A1	08640-60303	8	1	RF VERNIER ASSEMBLY (INCLUDES A1A1R1-A1A1TP2)	28480	08640-60303
A1A1	08640-60500	7	1	RF VERNIER ASSY RETROFIT KIT (INCLUDES A1MP1-A1MP8, A1MP10-A1MP14, A1MP16-A1MP18 AND A1R1)	28480	08640-60500
A1A1R1	0757-0401	0	8	RESISTOR 100 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-101-F
A1A1R2	0698-7794	2	1	RESISTOR 10K .25% .125W F TC = 0 + -100	19701	MF4C1/8-T0-1002-C
A1A1R3	0698-3449	6	1	RESISTOR 28.7K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-2872-F
A1A1R4	0757-0280	3	15	RESISTOR 1K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1001-F
A1A1TP1	1251-0600	0	17	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A1A1TP2	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
<b>A1A2</b>						
A1A2	08640-60327	6	1	OUTPUT ATTENUATOR ASSEMBLY NOT SEPARATELY REPLACEABLE, ORDER A1	28480	08640-60327

† Refer to Section 7 for update information.

\* Factory Selected Component (Refer to Section 5).

Δ Errata part change.

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A1</b>						
<b>OPTION 004 ONLY</b>						
A1	08640-60062	6	1	OUTPUT LEVEL ASSY, 1DB (DOES NOT INCLUDE A1MP9 AND A1MP15)	28480	08640-60062
A1MP1	0380-0020	0	3	SPACER-RND .25-IN-LG .128-IN-ID	00000	ORDER BY DESCRIPTION
A1MP2	0380-0023	3	1	SPACER-RND .5-IN-LG .128-IN-ID .19-IN-OD	28480	0380-0023
A1MP3	0380-0029	9	1	SPACER-RND 1-IN-LG .128-IN-ID .19-IN-OD	28480	0380-0029
A1MP4	2200-0781	2	1	SCREW-MACH 4-40 2.75-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
A1MP5	3130-0038	4	1	COUPLER-SWITCH "U" SHAPED; .0450 +- .0005	28480	3130-0038
A1MP6	08640-00068	6	1	PLATE, POT MOUNTING	28480	08640-00068
A1MP7	08640-20235	1	1	PLATE, 1DB ATTENUATOR MOUNTING	28480	08640-20235
A1MP8	08640-20236	2	1	SHAFT, VERNIER	28480	08640-20236
A1MP9	2190-0003	8	2	WASHER-LK HLCL NO. 4 .115-IN-ID	28480	2190-0003
A1MP10	2190-0016	3	1	WASHER-LK INTL T 3/8 IN .377-IN-ID	28480	2190-0016
A1MP11	2360-0120	1	2	SCREW-MACH 6-32 .438-IN-LG 82 DEG	00000	ORDER BY DESCRIPTION
A1MP12	2950-0001	8	1	NUT-HEX-DBL-CHAM 3/8-32-THD .094-IN-THK	00000	ORDER BY DESCRIPTION
A1P1	1251-0198	1	1	CONNECTOR-PC EDGE 6-CONT/ROW 2-ROWS	28480	1251-0198
A1R1	2100-0638	6	1	RESISTOR-VAR CONTROL C 250 20% LIN	32997	3852A-222-251A
A1R2	0698-4197	3	1	RESISTOR 1.081K .25% .125W F TC = 0 + -100	03888	PME55-1/8-T0-1081R-C
A1R3	0698-0096	3	1	RESISTOR 968 1% .125W F TC = 0 + -100	03888	PME55-1/8-T0-9680-F
A1R4	0698-3495	2	1	RESISTOR 866 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-866R-F
A1R5	0698-4462	5	1	RESISTOR 768 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-768R-F
A1R6	0757-0419	0	1	RESISTOR 681 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-681R-F
A1R7	0698-3162	0	1	RESISTOR 46.4K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-4642-F
A1R8	0757-0418	9	2	RESISTOR 619 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-619R-F
A1R9	0698-7676	9	1	RESISTOR 546 1% .125W F TC = 0 + -100	19701	MF4C1/8-T0-546R-F
A1R10	0698-3178	8	1	RESISTOR 487 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-487R-F
A1R11	0757-0414	5	1	RESISTOR 432 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-432R-F
A1R12	0698-3446	3	1	RESISTOR 383 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-383R-F
A1R13	0698-3445	2	1	RESISTOR 348 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-348R-F
A1R14	0698-4449	8	1	RESISTOR 309 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-309R-F
A1R15	0698-6250	3	1	RESISTOR 2.5K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-2501-F
A1S1A	3130-0487	7	1	SECTION-SWITCH SWITCH-RTRY; 1 SEC NS	28480	3130-0487
A1S1B	3130-0486	6	1	SECTION-SWITCH SWITCH-RTRY; 1 SEC NS	28480	3130-0486
A1S1C	3130-0485	5	1	SECTION-SWITCH SWITCH-RTRY; 1 SEC NS	28480	3130-0485
<b>A1A1</b>						
A1A1	08640-60063	7	1	ATTENUATOR ASSY (DOES NOT INCLUDE INCLUDE A1MP1-A1S1C)	28480	08640-60063
A1A1J1				NOT SEPARATELY REPLACEABLE, P/O A1A1		
A1A1J2				NOT SEPARATELY REPLACEABLE, P/O A1A1		

† Refer to Section 7 for update information.

\* Factory Selected Component (Refer to Section 5)

Δ Errata part change.

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A2</b>						
A2	08640-60304	9	1	METER SWITCH AND DRIVE ASSEMBLY (EXCEPT OPTION 004) (INCLUDES BUTTONS MP40, 41, AND 42)	28480	08640-60304
A2	08640-60312	9		METER SWITCH AND DRIVE ASSEMBLY (OPTION 004 ONLY) (INCLUDES BUTTONS MP40, 41, AND 42)	28480	08640-60312
A2C1	0180-0197	8	15	CAPACITOR-FXD 2.2UF + -10% 20VDC TA	56289	150D225X9020A2
A2C2	0180-0197	8		CAPACITOR-FXD 2.2UF + -10% 20VDC TA	56289	150D225X9020A2
A2C3	0160-0128	3	1	CAPACITOR-FXD 2.2UF + -20% 50VDC CER	28480	0160-0128
A2C4	0160-3879	7	27	CAPACITOR-FXD .01UF + -20% 100VDC CER	28480	0160-3879
A2C5	0160-2199	2	2	CAPACITOR-FXD 30PF + -5% 300VDC MICA	28480	0160-2199
A2C6	0160-3879	7		CAPACITOR-FXD .01UF + -20% 100VDC CER	28480	0160-3879
A2C7	0180-2206	4	2	CAPACITOR-FXD 60UF + -10% 6VDC TA	56289	150D606X9006B2
A2C8	0180-0116	1	5	CAPACITOR-FXD 6.8UF + -10% 35VDC TA	56289	150D685X9035B2
A2C9	0160-3879	7		CAPACITOR-FXD .01UF + -20% 100VDC CER	28480	0160-3879
A2C10	0160-2306	2		CAPACITOR-FXD 160PF + -5% VDC MICA	28480	0160-2306
A2CR1	1901-0040	1	4	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A2MP1	4040-0749	4	1	EXTR-PC BD BRN POLYC .062-BD-THKNS	28480	4040-0749
	1480-1116	8	5	PIN-GRV .062-IN-DIA .25-IN-LG STL	28480	1480-0073
A2Q1	1854-0071	7	21	TRANSISTOR NPN SI PD = 300MW FT = 200MHZ	28480	1854-0071
A2Q2	1854-0071	7		TRANSISTOR NPN SI PD = 300MW FT = 200MHZ	28480	1854-0071
A2Q3	1854-0071	7		TRANSISTOR NPN SI PD = 300MW FT = 200MHZ	28480	1854-0071
A2Q4	1854-0071	7		TRANSISTOR NPN SI PD = 300MW FT = 200MHZ	28480	1854-0071
A2Q5	1853-0020	4	11	TRANSISTOR PNP SI PD = 300MW FT = 150MHZ	28480	1853-0020
A2R1	0757-0420	3	2	RESISTOR 750 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-751-F
A2R2	0757-0346	2	16	RESISTOR 10 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-10R0-F
A2R3	0757-0421	4	1	RESISTOR 825 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-825R-F
A2R4	0757-0419	0	1	RESISTOR 681 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-681R-F
A2R5	0698-7095	6	1	RESISTOR 11K .25% .125W F TC = 0 + -50 (EXCEPT OPTION 004)	28480	0698-7095
A2R5				NOT ASSIGNED (OPTION 004 ONLY)		
A2R6	0698-3160	8	2	RESISTOR 31.6K 1% .125W F TC = 0 + -100 (EXCEPT OPTION 004)	24546	C4-1/8-T0-3162-F
A2R6	0698-3260	9		RESISTOR 464K 1% .125W F TC = 0 + -100 (OPTION 004 ONLY)	24546	C4-1/8-T0-4643-F
A2R7	0698-3160	8		RESISTOR 31.6K 1% .125W F TC = 0 + -100 (EXCEPT OPTION 004)	24546	C4-1/8-T0-3162-F
A2R7	0698-3260	9		RESISTOR 464K 1% .125W F TC = 0 + -100 (OPTION 004 ONLY)	24546	C4-1/8-T0-4643-F
A2R8	0757-0466	7	1	RESISTOR 110K 1% .125W F TC = 0 + -100 (EXCEPT OPTION 004)	24546	C4-1/8-T0-1103-F
A2R8				NOT ASSIGNED (OPTION 004 ONLY)		
A2R9	0757-0442	9	15	RESISTOR 10K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1002-F
A2R10	0698-3450	9	4	RESISTOR 42.2K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-4222-F
A2R11	0698-3440	7	3	RESISTOR 196 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-196R-F
A2R12	0757-0280	3		RESISTOR 1K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1001-F
A2R13	0683-1065	7	1	RESISTOR 10M 5% .25W CC TC = -900/ + 1100	01121	CB1065
A2R14	2100-3353	8	1	RESISTOR-TRMR 20K 10% C SIDE-ADJ 1-TRN	28480	2100-3353
A2R15	2100-3207	1	1	RESISTOR-TRMR 5K 10% C SIDE-ADJ 1-TRN	28480	2100-3207
A2R16	0698-3156	2	4	RESISTOR 14.7K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1472-F
A2R17	0757-0280	3		RESISTOR 1K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1001-F

†Refer to Section 7 for update information.

\*Factory Selected Component (Refer to Section 5).

Δ Errata part change.

*Table 6-3. Replaceable Parts*

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
A2R18	0683-4755	8	1	RESISTOR 4.7M 5% .25W FC TC = -900/+1100	01121	CB4755
A2R19	0698-3156	2		RESISTOR 14.7K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1472-F
A2R20	0757-0440	7	4	RESISTOR 7.5K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-7501-F
A2R21	0698-3260	9	3	RESISTOR 464K 1% .125W F TC = 0 + -100	28480	0698-3260
A2R22	0683-1055	5	1	RESISTOR 1M 5% .25W FC TC = -800/+900	01121	CB1055
A2R23	0757-0280	3		RESISTOR 1K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1001-F
A2R24	0757-0280	3		RESISTOR 1K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1001-F
A2R25	0757-0200	7	3	RESISTOR 5.62K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-5621-F
A2R26	0698-3156	2		RESISTOR 14.7K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1472-F
A2R27	0757-0422	5	5	RESISTOR 909 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-909R-F
A2R28	2100-3350	5	1	RESISTOR-TRMR 200 10% C SIDE-ADJ 1-TRN	28480	2100-3350
A2R29	0757-0346	2		RESISTOR 10 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-10R0-F
A2R30	0757-0346	2		RESISTOR 10 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-10R0-F
A2S1	3101-1728	0	1	SWITCH-PB 3-STATION 10MM C-C SPACING	28480	3101-1728
A2TP1	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A2TP2	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A2TP3	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A2TP4	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A2U1	1820-1227	8	1	IC OP AMP GP 8-DIP-C PKG	03406	LM30AJ
A2U2	1826-1292	7	1	IC COMPARATOR PRCN 8-DIP-P PKG	03406	LM311N
A2VR1	1902-0025	4	2	DIODE-ZNR 10V 5% DO-35 PD = .4W TC = +.06%	28480	1902-0025
A2VR2	1902-0025	4		DIODE-ZNR 10V 5% DO-35 PD = .4W TC = +.06%	28480	1902-0025

† Refer to Section 7 for update information.

\* Factory Selected Component (Refer to Section 5).

Δ Errata part change.



Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A3</b>						
A3	08640-60099	9	1	RF OSCILLATOR ASSEMBLY (SEE SERVICE SHEET B)	28480	08640-60099
A3	08640-60098	8		RESTORED 08640-60099 OR 60100, REQUIRES EXCHANGE.	28480	08640-60098
A3MP1	0510-0052	5	2	RETAINER-RING GRPR EXT .125-IN-DIA STL	28480	0510-0052
A3MP2	0510-0055	8	2	RETAINER-RING BSC EXT .438-IN-DIA STL	28480	0510-0055
A3MP3 <sup>Δ</sup>	1430-0771	6	1	GEAR-COMB SPUR 48-DP 14.5-DEG-PA DLRN	11781	N48-12-80
A3MP4	1430-0759	0	3	GEAR-SPUR 48-T 48-DP 14.5-DEG-PA DLRN	28480	1430-0759
A3MP5 <sup>Δ</sup>	8160-0230	6	1	RFI GASKET NI-ALY .63-IN-WD .005-IN-THK	09227	48-90093
A3MP6	08640-20106	5	2	BUSHING, POT	28480	08640-20106
A3MP7 <sup>Δ</sup>	8160-0233	9	1	RFI PLUG BE-CU AU-PL .173-IN-OD	09227	32-90141
A3MP8	08640-20106	5		BUSHING, POT	28480	08640-20106
A3MP9 <sup>Δ</sup>	08640-20267	9	1	CAP, TRANSISTOR	28480	08640-20267
A3MP10	08640-60206	0	1	OSCILLATOR, LINE TUNE ASSEMBLY	28480	08640-60206
A3MP11	2200-0151	0	2	SCREW-MACH 4-40 .75-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
A3MP12	2190-0108	4		WASHER-LK HLCL NO. 4 .115-IN-ID	28480	2190-0108 <sup>†</sup>
A3MP13 <sup>Δ</sup>				NOT ASSIGNED		
A3MP14	0510-0055	8		RETAINER-RING BSC EXT .438-IN-DIA STL	28480	0510-0055
A3MP15	3030-0007	5	4	SCREW-SET 4-40 .125-IN-LG SMALL CUP-PT	00000	ORDER BY DESCRIPTION
A3MP16	1430-0759	0		GEAR-SPUR 48-T 48-DP 14.5-DEG-PA DLRN	28480	1430-0759
A3MP17 <sup>Δ</sup>	3030-0007	5	2	SCREW-SET 4-40 .125-IN-LG SMALL CUP-PT	00000	ORDER BY DESCRIPTION
A3MP18	2190-0016	3		WASHER-LK INTL T 3/8 IN .377-IN-ID	28480	2190-0016
A3MP19 <sup>Δ</sup>	3030-0007	5		SCREW-SET 4-40 .125-IN-LG SMALL CUP-PT	00000	ORDER BY DESCRIPTION
A3MP20	2190-0016	3		WASHER-LK INTL T 3/8 IN .377-IN-ID	28480	2190-0016
A3MP21	3030-0007	5		SCREW-SET 4-40 .125-IN-LG SMALL CUP-PT	00000	ORDER BY DESCRIPTION
A3MP22	2510-0135	7	1	SCREW-MACH 8-32 2.25-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
A3MP23	3050-0001	1	1	WASHER-FL MTLC NO. 8 .172-IN-ID	28480	3050-0001
A3MP24	2190-0017	4	1	WASHER-LK HLCL NO. 8 .168-IN-ID	28480	2190-0017
A3MP25	08640-40092	0	1	SHAFT, MOD. FINE TUNE	28480	08640-40092
A3MP26	0510-0015	0	3	RETAINER-RING E-R EXT .125-IN-DIA STL	28480	0510-0015
A3Q1	1GS1-4214	2	1	TRANSISTOR	28480	1GS1-4214
A3R1	2100-3856	6	1	RESISTOR-VAR CONTROL C 10K 10% LIN	28480	2100-3856
A3R2	2100-0541	0	1	RESISTOR-VAR PREC WWV 1-TRN 1K 3% NOTE: WHEN REPLACING A3R1, R2, ALSO REPLACE BUSHING A3MP6 OR MP8.	28480	2100-0541

† Refer to Section 7 for update information.

\* Factory Selected Component (Refer to Section 5)

Δ Errata part change.

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A3A1</b>						
A3A1				FILTER/BUFFER AMPLIFIER ASSY (NOT RECOMMENDED FOR FIELD REPAIR)		
A3A1FL1	0160-0204	6	10	FILTER-LOW PASS STUD-TERMS	00779	859554-5
A3A1FL2	0160-0204	6		FILTER-LOW PASS STUD-TERMS	00779	859554-5
A3A1FL3				NOT SEPARATELY REPLACEABLE		
A3A1FL4				NOT SEPARATELY REPLACEABLE		
A3A1FL5	0160-0204	6		FILTER-LOW PASS STUD-TERMS	00779	859554-5
A3A1FL6	0160-0204	6		FILTER-LOW PASS STUD-TERMS	00779	859554-5
A3A1J1	1250-0830	6	2	CONNECTOR-RF SMC M SGL-HOLE-FR 50-OHM	28480	1250-0830
A3A1J2	1250-0830	6		CONNECTOR-RF SMC M SGL-HOLE-FR 50-OHM	28480	1250-0830
A3A1MP1	08640-00011	9	2	COVER, BUFFER BOARD	28480	08640-00011
A3A1MP2	2200-0105	4	4	SCREW-MACH 4-40 .312-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
A3A1MP3	3050-0105	6	3	WASHER-FL MTLCL NO. 4 .125-IN-ID	28480	3050-0105
A3A1MP4	8160-0229	3	2	RFI GASKET NI-ALY 2.08-IN-WD .005-IN-THK	28480	8160-0229
A3A1MP5	08640-00011	9		COVER, BUFFER BOARD	28480	08640-00011
A3A1MP6	8160-0229	3		RFI GASKET NI-ALY 2.08-IN-WD .005-IN-THK	28480	8160-0229
A3A1MP7	2200-0105	4		SCREW-MACH 4-40 .312-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
A3A1MP8	3050-0105	6		WASHER-FL MTLCL NO. 4 .125-IN-ID	28480	3050-0105
A3A1MP9	2740-0001	3	2	NUT-HEX-DBL-CHAM 10-32-THD .109-IN-THK	00000	ORDER BY DESCRIPTION
A3A1MP10	2190-0011	8	2	WASHER-LK INTL T NO. 10 .195-IN-ID	28480	2190-0011
A3A1MP11	2740-0001	3		NUT-HEX-DBL-CHAM 10-32-THD .109-IN-THK	00000	ORDER BY DESCRIPTION
A3A1MP12	2190-0011	8		WASHER-LK INTL T NO. 10 .195-IN-ID	28480	2190-0011
A3A1MP13	2200-0121	4	2	SCREW-MACH 4-40 1.125-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
A3A1MP14 <sup>Δ</sup>	2190-0108	4		WASHER-LK HLCL NO. 4 .115-IN-ID	28480	2190-0108
A3A1MP15 <sup>Δ</sup>	2190-0108	4		WASHER-LK HLCL NO. 4 .115-IN-ID	28480	2190-0108
A3A1MP16	2200-0143	0	1	SCREW-MACH 4-40 .375-IN-LG PAN-HD-POZI	28480	2200-0143
A3A1MP17 <sup>Δ</sup>	0403-0729	6		BUMPER FOOT-ADH MTG	04726	SJ-5017

**A3A1A1**

A3A1A1  
VARACTOR HEAD FILTER ASSEMBLY  
NOT RECOMMENDED FOR FIELD REPAIR

<sup>†</sup>Refer to Section 7 for update information.

\*Factory Selected Component (Refer to Section 5).

<sup>Δ</sup> Errata part change.

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A3A1A2</b>						
A3A1A2	08640-60024	0	1	RF DIVIDER/FILTER BUFFER AMPLIFIER ASSY	28480	08640-60024
A3A1A2C1	0160-3456	6	41	CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A3A1A2C2	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A3A1A2C3	0160-3878	6	7	CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A3A1A2C4	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A3A1A2C5	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A3A1A2C6	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A3A1A2C7	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A3A1A2C8	0160-3873	1	1	CAPACITOR-FXD 4.7PF +-5PF 200VDC CER	28480	0160-3873
A3A1A2C9	0160-3878	4	3	CAPACITOR-FXD 47PF +-20% 200VDC CER	28480	0160-3878
A3A1A2L1	9140-0142	8	4	INDUCTOR RF-CH-MLD 2.2UH 10% .105DX.26LG	28480	9140-0142
A3A1A2L2	9140-0142	8		INDUCTOR RF-CH-MLD 2.2UH 10% .105DX.26LG	28480	9140-0142
A3A1A2MP1 <sup>Δ</sup>				NOT ASSIGNED		
A3A1A2MP2	1200-0173	5		INSULATOR-XSTR DAP-GL	28480	1200-0173
A3A1A2Q1	1854-0247	9	4	TRANSISTOR NPN SI TO-39 PD = 1W FT = 800MHZ	28480	1854-0247
A3A1A2Q2	1854-0247	9		TRANSISTOR NPN SI TO-39 PD = 1W FT = 800MHZ	28480	1854-0247
A3A1A2R1	0757-0422	5		RESISTOR 909 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-909R-F
A3A1A2R2	0698-7212	9	2	RESISTOR 100 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-100R-F
A3A1A2R3	0699-1902	4		RESISTOR 10 1% .05W TF TC = 0 + -100	28480	0699-1902
A3A1A2R4	0698-3445	2	4	RESISTOR 348 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-348R-F
A3A1A2R5	0698-7214	1	2	RESISTOR 121 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-121R-F
A3A1A2R6	0699-1971	7		RESISTOR 316 1% .05W TF TC = 0 + -100	28480	0699-1971
A3A1A2R7	0757-0422	5		RESISTOR 909 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-909R-F
A3A1A2R8	0698-7193	5	2	RESISTOR 16.2 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-16R2-F
A3A1A2R9	0698-3445	2		RESISTOR 348 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-348R-F
<i>2520A TO 2546A</i>						
A3A1A2R10	0698-7214	1		RESISTOR 121 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-121R-F
<i>2708A AND ABOVE</i>						
A3A1A2R10				NOT ASSIGNED		
A3A1A2T1	08640-00007	3	2	LOOP BUFFER INPUT	28480	08640-00007

<sup>†</sup>Refer to Section 7 for update information.

<sup>\*</sup>Factory Selected Component (Refer to Section 5).

<sup>Δ</sup> Errata part change.

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A3A1A3</b>						
A3A1A3	08640-60037	5	1	COUNTER/BUFFER AMPLIFIER ASSEMBLY	28480	08640-60037
A3A1A3C1	0160-3456	6		CAPACITOR-FXD 1000PF + -10% 1KVDC CER	28480	0160-3456
A3A1A3C2	0160-3456	6		CAPACITOR-FXD 1000PF + -10% 1KVDC CER	28480	0160-3456
A3A1A3C3	0160-3878	6		CAPACITOR-FXD 1000PF + -20% 100VDC CER	28480	0160-3878
A3A1A3C4	0160-3456	6		CAPACITOR-FXD 1000PF + -10% 1KVDC CER	28480	0160-3456
A3A1A3C5	0160-3456	6		CAPACITOR-FXD 1000PF + -10% 1KVDC CER	28480	0160-3456
A3A1A3C6	0160-3878	6		CAPACITOR-FXD 1000PF + -20% 100VDC CER	28480	0160-3878
A3A1A3C7	0160-3456	6		CAPACITOR-FXD 1000PF + -10% 1KVDC CER	28480	0160-3456
A3A1A3L1	9140-0142	8		INDUCTOR RF-CH-MLD 2.2UH 10% .105DX.26LG	28480	9140-0142
A3A1A3L2	9140-0142	8		INDUCTOR RF-CH-MLD 2.2UH 10% .105DX.26LG	28480	9140-0142
A3A1A3MP1	1200-0173	5		INSULATOR-XSTR DAP-GL	28480	1200-0173
A3A1A3Q1	1854-0247	9		TRANSISTOR NPN SI TO-39 PD = 1W FT = 800MHZ	28480	1854-0247
A3A1A3Q2	1854-0247	9		TRANSISTOR NPN SI TO-39 PD = 1W FT = 800MHZ	28480	1854-0247
A3A1A3R1	0757-0422	5		RESISTOR 909 1% .125W F TC = 0 + -100	24546	C4-1/8-TO-909R-F
A3A1A3R2	0698-7212	9		RESISTOR 100 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-100R-F
A3A1A3R3	0699-1902	4		RESISTOR 10 1% .05W TF TC = 0 + -100	28480	0699-1902
A3A1A3R4	0698-3445	2		RESISTOR 348 1% .125W F TC = 0 + -100	24546	C4-1/8-TO-348R-F
A3A1A3R5	0698-7216	3	1	RESISTOR 147 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-147R-F
A3A1A3R6	0699-1971	7		RESISTOR 316 1% .05W TF TC = 0 + -100	28480	0699-1971
A3A1A3R7	0757-0422	5		RESISTOR 909 1% .125W F TC = 0 + -100	24546	C4-1/8-TO-909R-F
A3A1A3R8	0698-7193	5		RESISTOR 16.2 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-16R2-F
A3A1A3R9	0698-3445	2		RESISTOR 348 1% .125W F TC = 0 + -100	24546	C4-1/8-TO-348R-F
A3A1A3R10	0698-7196	8	2	RESISTOR 21.5 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-21R5-F
A3A1A3R11	0698-7196	8		RESISTOR 21.5 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-21R5-F
A3A1A3R12	0698-7205	0	2	RESISTOR 51.1 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-51R1-F
A3A1A3T1	08640-00007	3		LOOP BUFFER INPUT	28480	08640-00007

**A3A2**

A3A2 VARACTOR HEAD ASSEMBLY  
NOT RECOMMENDED FOR FIELD REPAIR

**A3A3**

A3A3 OSCILLATOR LOOP ASSEMBLY  
NOT RECOMMENDED FOR FIELD REPAIR

†Refer to Section 7 for update information.

\*Factory Selected Component (Refer to Section 5)

Δ Errata part change.

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A3A4</b>						
A3A4	08640-60196	7	1	CONNECTOR BOARD ASSEMBLY	28480	08640-60196
A3A4C1				NOT ASSIGNED		
A3A4C2				NOT ASSIGNED		
A3A4C3	0180-0116	1		CAPACITOR-FXD 6.8UF + -10% 35VDC TA	56289	150D685X9035B2
A3A4C4	0180-0116	1		CAPACITOR-FXD 6.8UF + -10% 35VDC TA	56289	150D685X9035B2
A3A4L1	9100-1664	7	2	INDUCTOR RF-CH-MLD 3MH 5% .23DX.57LG	28480	9100-1664
A3A4L2	9100-1664	7		INDUCTOR RF-CH-MLD 3MH 5% .23DX.57LG A3A4MP1-5 NOT INCLUDED WITH 08640-60196	28480	9100-1664
A3A4MP1	08640-00036	8	1	SUPPORT, P.C. BOARD	28480	08640-00036
A3A4MP2	2200-0141	8	1	SCREW-MACH 4-40 .312-IN-LG PAN-HD-POZI	28480	2200-0141
A3A4MP3	3050-0105	6		WASHER-FL MTLN NO. 4 .125-IN-ID	28480	3050-0105
A3A4MP4 <sup>Δ</sup>	2190-0108	4	1	WASHER-LK HLCL NO.4 .115-IN-ID	28480	2190-0108
A3A4MP5	2260-0009	3	2	NUT-HEX-W/LKWR 4-40-THD .094-IN-THK	00000	ORDER BY DESCRIPTION
A3A4R1	2100-3054	6	1	RESISTOR-TRMR 50K 10% C SIDE-ADJ 17-TRN	02111	43P503
A3A4R2	2100-3109	2	3	RESISTOR-TRMR 2K 10% C SIDE-ADJ 17-TRN	02111	43P202
A3A4R3	2100-3123	0	1	RESISTOR-TRMR 500 10% C SIDE-ADJ 17-TRN	02111	43P501
A3A4R4	2100-3154	7	2	RESISTOR-TRMR 1K 10% C SIDE-ADJ 17-TRN	02111	43P102
A3A4R5				NOT ASSIGNED		
A3A4R6				NOT ASSIGNED		
A3A4R7	0698-3439	4	1	RESISTOR 178 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-178R-F
A3A4R8	0757-0416	7	10	RESISTOR 511 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-511R-F
A3A4R9	0757-0416	7		RESISTOR 511 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-511R-F
A3A4R10 <sup>Δ</sup>	0757-0417	8		RESISTOR 562 1% .125W F TC = 0 + -100	02995	SFR25H
A3A4TP1	1251-0600	0		CONNECTOR = SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A3A4TP2	1251-0600	0		CONNECTOR = SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600

<sup>†</sup> Refer to Section 7 for update information.

<sup>\*</sup> Factory Selected Component (Refer to Section 5).

<sup>Δ</sup> Errata part change.

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A4</b>				<b>NOT ASSIGNED</b>		
<b>A5</b>						
A5	08640-60029	5	1	FM AMPLIFIER ASSEMBLY	28480	08640-60029
A5C1	0160-2228	8	2	CAPACITOR-FXD 2700PF + -5% 300VDC MICA	28480	0160-2228
A5C2	0160-2228	8		CAPACITOR-FXD 2700PF + -5% 300VDC MICA	28480	0160-2228
A5C3	0180-0116	1		CAPACITOR-FXD 6.8UF + -10% 35VDC TA	56289	150D685X9035B2
A5C4	0180-1715	8	3	CAPACITOR-FXD 150UF + -10% 6VDC TA	56289	150D157X9006R2
A5C5	0180-0269	5	1	CAPACITOR-FXD 1UF + 50-10% 150VDC AL	56289	30D105G150BA2
A5C6	0180-0197	8		CAPACITOR-FXD 2.2UF + -10% 20VDC TA	56289	150D225X9020A2
<i>3025A and below</i>						
A5C7	0180-0116	1		CAPACITOR-FXD 6.8UF + -10% 35VDC TA	56289	150D685X9035B2
<i>3050A and above</i>						
A5C7				NOT ASSIGNED		
A5C8	0180-2211	1	1	CAPACITOR-FXD 5UF + 50-10% 150VDC AL	56289	30D505F150CC2
A5C9	0160-0939	4	3	CAPACITOR-FXD 430PF + -5% 300VDC MICA	28480	0160-0939
A5C10	0180-2617	1	1	CAPACITOR-FXD 6.8UF + -10% 35VDC TA	25088	D6R8GS1B35K
A5CR1				NOT ASSIGNED		
A5CR2				NOT ASSIGNED		
A5CR3				NOT ASSIGNED		
A5CR4				NOT ASSIGNED		
A5CR5	1901-0025	2	24	DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A5CR6	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A5CR7	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A5CR8	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A5CR9	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A5CR10	1901-1098	1		DIODE-SWITCHING 1N4150 50V 200MA 4NS	9N171	1N4150
A5CR11	1901-1098	1		DIODE-SWITCHING 1N4150 50V 200MA 4NS	9N171	1N4150
A5CR12	1901-1098	1		DIODE-SWITCHING 1N4150 50V 200MA 4NS	9N171	1N4150
A5CR13	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A5K1	0490-1078	3	1	RELAY-REED 1A 500MA 200VDC 5VDC-COIL	28480	0490-1078
A5MP1	4040-0750	7	1	EXTR-PC BD RED POLYC .062-BD-THKNS	28480	4040-0750
	1480-1116	8		PIN-GRV .062-IN-DIA .25-IN-LG STL	28480	1480-0073
A5MP2	4040-0756	3	1	EXTR-PC BD WHT POLYC .062-BD-THKNS	28480	4040-0756
	1480-1116	8		PIN-GRV .062-IN-DIA .25-IN-LG STL	28480	1480-0073
A5MP3 <sup>Δ</sup>	0400-0018	0	1	GROMMET, CHANNEL NCH .056-IN-GRV-WD	00000	OBD
	0470-0722	0		ADHESIVE TESCON ZIPBOND/PACER M-50	02640	ZIPBOND
A5Q1 <sup>Δ</sup>	1854-0830	6	2	TRANSISTOR-DUAL NPN PD = 500MW	28480	1854-0830
A5Q2 <sup>Δ</sup>	1854-0830	6		TRANSISTOR-DUAL NPN PD = 500MW	28480	1854-0830
A5Q3	1854-0404	0	4	TRANSISTOR NPN SI TO-18 PD = 360MW	28480	1854-0404
A5Q4	1854-0404	0		TRANSISTOR NPN SI TO-18 PD = 360MW	28480	1854-0404
A5Q5 <sup>Δ</sup>	5081-2046	5	4	TRANSISTOR PNP SI TO-39 PD = 1W FT = 100MHZ	28480	1853-0038
	1205-0011	0	3	HEAT SINK TO-5/TO-39-CS	28480	1205-0011
	1200-0173	5	10	INSULATOR-XSTR DAP-GL	28480	1200-0173
A5Q6 <sup>Δ</sup>	5081-2046	5		TRANSISTOR PNP SI TO-39 PD = 1W FT = 100MHZ	28480	1853-0038
	1205-0011	0		HEAT SINK TO-5/TO-39-CS	28480	1205-0011
	1200-0173	5		INSULATOR-XSTR DAP-GL	28480	1200-0173
A5Q7 <sup>Δ</sup>	5081-2046	5		TRANSISTOR PNP SI TO-39 PD = 1W FT = 100MHZ	28480	1853-0038
	1200-0173	5		INSULATOR-XSTR DAP-GL	28480	1200-0173

<sup>†</sup>Refer to Section 7 for update information.

<sup>\*</sup>Factory Selected Component (Refer to Section 5).

<sup>Δ</sup> Errata part change.

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
A5Q8	1854-0039	7	1	TRANSISTOR NPN 2N3053S SI TO-39 PD = 1W	3L585	2N3053S
	1205-0011	0		HEAT SINK TO-5/TO-39-CS	28480	1205-0011
A5Q9 <sup>Δ</sup>	1854-1255	1	2	TRANSISTOR NPN SI TO-39 PD = 1W FT = 50MHZ	02037	MM3007
A5Q10 <sup>Δ</sup>	1854-0237	7	2	TRANSISTOR NPN SI TO-68 PD = 20W FT = 10MHZ	28480	1854-0237
	0510-0002	5	2	THREADED INSERT-NUT 6-32 .062-IN-LG STL	28480	0510-0002
	1205-0085	8	2	HEAT SINK TO-68-CS	28480	1205-0085
	2360-0119	8	2	SCREW-MACH 6-32 .438-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
	2420-0003	7	2	NUT-HEX-DBL-CHAM 6-32-THD .094-IN-THK	28480	2420-0003
	2190-0918	4	2	WASHER-LK HLCL NO. 6 .141-IN-ID	03118	2190-0918
	2190-0007	2	2	WASHER-LK INTL T NO. 6 .141-IN-ID	28480	2190-0007
A5Q11	1853-0012	4	1	TRANSISTOR PNP 2N2904A SI TO-39 PD = 600MW	01295	2N2904A
A5Q12	1854-0237	7		TRANSISTOR NPN SI TO-68 PD = 20W FT = 10MHZ	28480	1854-0237
	0510-0002	5		THREADED INSERT-NUT 6-32 .062-IN-LG STL	28480	0510-0002
	1205-0085	8		HEAT SINK TO-68-CS	28480	1205-0085
	2360-0119	8		SCREW-MACH 6-32 .438-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
	2420-0003	7		NUT-HEX-DBL-CHAM 6-32-THD .094-IN-THK	28480	2420-0003
	2190-0918	4		WASHER-LK HLCL NO. 6 .141-IN-ID	03118	2190-0918
	2190-0007	2		WASHER-LK INTL T NO. 6 .141-IN-ID	28480	2190-0007
A5R1	0698-3162	0	3	RESISTOR 46.4K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-4642-F
A5R2	0757-0180	2	3	RESISTOR 31.6 1% .125W F TC = 0 + -100	28480	0757-0180
A5R3	0757-0403	2	2	RESISTOR 121 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-121R-F
A5R4	0757-0290	5	4	RESISTOR 6.19K 1% .125W F TC = 0 + -100	19701	MF4C1/8-T0-6191-F
A5R5	0757-0317	7	3	RESISTOR 1.33K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1331-F
A5R6	0698-3132	4	4	RESISTOR 261 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-2610-F
A5R7	0699-1043	4		RESISTOR FIXED 3.3K 5% 2W F TC = 0 + -100	28480	0699-1043
A5R8	2100-3164	9	1	RESISTOR-TRMR 10 20% C SIDE-ADJ 17-TRN	02111	43P100
A5R9	0698-0085	0	4	RESISTOR 2.61K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-2611-F
A5R10	0757-0317	7		RESISTOR 1.33K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1331-F
A5R11	0698-3132	4		RESISTOR 261 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-2610-F
A5R12	0757-0290	5		RESISTOR 6.19K 1% .125W F TC = 0 + -100	19701	MF4C1/8-T0-6191-F
A5R13	0757-0180	2		RESISTOR 31.6 1% .125W F TC = 0 + -100	28480	0757-0180
A5R14	0757-0403	2		RESISTOR 121 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-121R-F
A5R15	0698-3162	0		RESISTOR 46.4K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-4642-F
A5R16	0757-0401	0		RESISTOR 100 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-101-F
A5R17	0698-3446	3	1	RESISTOR 383 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-383R-F
A5R18	0698-3132	4		RESISTOR 261 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-2610-F
A5R19	0757-0401	0		RESISTOR 100 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-101-F
A5R20	0757-0346	2		RESISTOR 10 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-10R0-F
A5R21				NOT ASSIGNED		
A5R22	0698-3430	5	1	RESISTOR 21.5 1% .125W F TC = 0 + -100	03888	PME55-1/8-T0-21R5-F
A5R23	2100-3154	7		RESISTOR-TRMR 1K 10% C SIDE-ADJ 17-TRN	02111	43P102
A5R24	0757-0280	3		RESISTOR 1K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1001-F
A5R25	0757-0280	3		RESISTOR 1K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1001-F
A5R26	0757-0346	2		RESISTOR 10 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-10R0-F
A5R27	0757-0441	8	3	RESISTOR 8.25K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-8251-F
A5R28	0757-0440	7		RESISTOR 7.5K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-7501-F
A5R29	0698-3158	4	1	RESISTOR 23.7K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-2372-F
A5R30	0757-0443	0	2	RESISTOR 11K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1102-F

†Refer to Section 7 for update information.

\*Factory Selected Component (Refer to Section 5).

Δ Errata part change

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
A5R31	0757-0442	9		RESISTOR 10K 1% .125W F TC = 0 + -100	24548	C4-1/8-T0-1002-F
A5R32	0757-0438	3	13	RESISTOR 5.11K 1% .125W F TC = 0 + -100	24548	C4-1/8-T0-5111-F
A5R33	0698-0085	0		RESISTOR 2.61K 1% .125W F TC = 0 + -100	24548	C4-1/8-T0-2611-F
A5R34	0698-0085	0		RESISTOR 2.61K 1% .125W F TC = 0 + -100	24548	C4-1/8-T0-2611-F
A5R35	0757-0399	5	4	RESISTOR 82.5 1% .125W F TC = 0 + -100	24548	C4-1/8-T0-82R5-F
A5R36	0757-0399	5		RESISTOR 82.5 1% .125W F TC = 0 + -100	24548	C4-1/8-T0-82R5-F
A5R37	0698-3391	7	1	RESISTOR 21.5 1% .5W F TC = 0 + -100	28480	0698-3391
A5R38	0757-0198	2	1	RESISTOR 100 1% .5W F TC = 0 + -100	28480	0757-0198
A5R39	0698-5839	2	2	RESISTOR 9.1 5% .25W FC TC = -400/+500	01121	CB91G5
A5R40	0698-5839	2		RESISTOR 9.1 5% .25W FC TC = -400/+500	01121	CB91G5
A5R41	0698-3260	9		RESISTOR 464K 1% .125W F TC = 0 + -100	28480	0698-3260
A5R42*	0698-3157	3	2	RESISTOR 19.6K 1% .125W F TC = 0 + -100	24548	C4-1/8-T0-1962-F
A5TP1	1251-0600	0		CONNECTOR = SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A5TP2	1251-0600	0		CONNECTOR = SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A5TP3	1251-0600	0		CONNECTOR = SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A5TP4	1251-0600	0		CONNECTOR = SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A5TP5	1251-0600	0		CONNECTOR = SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A5TP6	1251-0600	0		CONNECTOR = SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A5U1	1820-0158	0	1	IC OP AMP GP TO-99 PKG	27014	LM302H

†Refer to Section 7 for update information.

\*Factory Selected Component (Refer to Section 5).

Δ Errata part change.



Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A6</b>						
A6	08640-60328	7	1	ANNUNCIATOR ASSY (INCLUDES MP31)	28480	08640-60328
A6DS1	2140-0427	5	6	LAMP-INCAND 5VDC 60MA T-1-BULB	28480	2140-0427
A6DS2	2140-0427	5		LAMP-INCAND 5VDC 60MA T-1-BULB	28480	2140-0427
A6DS3	2140-0427	5		LAMP-INCAND 5VDC 60MA T-1-BULB	28480	2140-0427
A6DS4	2140-0427	5		LAMP-INCAND 5VDC 60MA T-1-BULB	28480	2140-0427
A6DS5	2140-0427	5		LAMP-INCAND 5VDC 60MA T-1-BULB	28480	2140-0427
A6DS6	2140-0427	5		LAMP-INCAND 5VDC 60MA T-1-BULB	28480	2140-0427
A6R1	0757-0346	2		RESISTOR 10 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-10R0-F
MP31 <sup>Δ</sup>	08640-40016	8	1	METER CLAMP	28480	08640-40016
	2190-0108	4	2	WASHER-LK HLCL NO.4 .115-IN-ID	28480	2190-0108
	2190-0756	8	2	WASHER-FL MTLC NO.5 .13-IN-ID .25-IN-OD	28480	2190-0756
	2200-0139	4	2	SCREW-MACH 4-40 .25-IN-LG PAN-HD-POZI	28480	2200-0139
	3050-0080	6	2	WASHER-FL NM NO.5 .13-IN-ID .25-IN-OD	28480	3050-0080

†Refer to Section 7 for update information.

\*Factory Selected Component (Refer to Section 5).

Δ Errata part change.

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A7</b>						
A7	08640-80309	4	1	FM SHAPING ASSEMBLY	28480	08640-80309
A7C1	0180-1735	2	3	CAPACITOR-FXD .22UF + -10% 35VDC TA	56289	150D224X9035A2
A7C2	0180-1735	2		CAPACITOR-FXD .22UF + -10% 35VDC TA	56289	150D224X9035A2
A7C3	0180-0373	2	1	CAPACITOR-FXD .68UF + -10% 35VDC TA	56289	150D684X9035A2
A7C4	0180-2141	8	1	CAPACITOR-FXD 3.3UF + -10% 50VDC TA	56289	150D335X9050B2
A7C5	0180-0141	2	2	CAPACITOR-FXD 50UF + 75-10% 50VDC AL	56289	30D506G050DD2
A7C6	0180-1715	8		CAPACITOR-FXD 150UF + -10% 6VDC TA	56289	150D157X9006R2
A7C7	0160-2453	1	1	CAPACITOR-FXD .22UF + -10% 80VDC POLYE	28480	0160-2453
A7C8	0180-1846	6	1	CAPACITOR-FXD 2.2UF + -10% 35VDC TA	56289	150D225X9035B2
A7C9	0160-2204	0	4	CAPACITOR-FXD 100PF + -5% 300VDC MICA	28480	0160-2204
A7C10	0180-0141	2		CAPACITOR-FXD 50UF + 75-10% 50VDC AL	56289	30D506G050DD2
A7C11	0180-1715	8		CAPACITOR-FXD 150UF + -10% 6VDC TA	56289	150D157X9006R2
A7C12	0160-2204	0		CAPACITOR-FXD 100PF + -5% 300VDC MICA	28480	0160-2204
A7C13	0180-2206	4		CAPACITOR-FXD 60UF + -10% 6VDC TA	56289	150D606X9006B2
A7C14	0180-0229	7		CAPACITOR-FXD 33UF + -10% 10VDC TA	56289	150D336X9010B2
A7C15	0160-3876	4		CAPACITOR-FXD 47PF + -20% 200VDC CER	28480	0160-3876
A7C16	0180-2618	2		CAPACITOR-FXD 33UF + -10% 10VDC TA	25088	D33GS1B10K
A7C17	0180-2618	2		CAPACITOR-FXD 33UF + -10% 10VDC TA	25088	D33GS1B10K
A7C18	0160-3451	1	1	CAPACITOR-FXD .01UF + 80-20% 100VDC CER	28480	0160-3451
A7CR1	1901-0033	2	20	DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A7CR2	1901-0033	2		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A7CR3	1901-0033	2		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A7CR4	1901-0033	2		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A7CR5	1901-0033	2		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A7CR6	1901-0033	2		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A7CR7	1901-0033	2		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A7CR8	1901-0033	2		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A7CR9	1901-0033	2		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A7CR10	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A7CR11	1901-0033	2		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A7CR12	1901-0033	2		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A7CR13	1901-0033	2		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A7CR14	1901-0033	2		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A7CR15	1901-0033	2		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A7CR16	1901-0033	2		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A7CR17	1901-0033	2		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A7CR18	1901-0033	2		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A7CR19	1901-0033	2		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A7CR20	1901-0033	2		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A7CR21	1901-0033	2		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A7K1	0490-1080	7	1	RELAY-REED 1C 250MA 150VAC 5VDC-COIL 3VA	28480	0490-1080
A7L1	9140-0129	1	1	INDUCTOR RF-CH-MLD 220UH 5% .166DX.385LG	28480	9140-0129
A7MP1	4040-0751	8	1	EXTR-PC BD ORN POLYC .062-BD-THKNS	28480	4040-0751
	1480-1116	8		PIN-GRV .062-IN-DIA .25-IN-LG STL	28480	1480-0073
A7MP2	4040-0748	3	1	EXTR-PC BD BLK POLYC .062-BD-THKNS	28480	4040-0748
	1480-1116	8		PIN-GRV .062-IN-DIA .25-IN-LG STL	28480	1480-0073
A7Q1	1854-0071	7		TRANSISTOR NPN SI PD = 300MW FT = 200MHZ	28480	1854-0071
A7Q2 <sup>Δ</sup>	1854-0071	7		TRANSISTOR NPN SI PD = 300MW FT = 200MHZ	28480	1854-0071
A7Q3	1854-0071	7		TRANSISTOR NPN SI PD = 300MW FT = 200MHZ	28480	1854-0071
A7Q4	1853-0020	4		TRANSISTOR PNP SI PD = 300MW FT = 150MHZ	28480	1853-0020
A7Q5	1854-0071	7		TRANSISTOR NPN SI PD = 300MW FT = 200MHZ	28480	1854-0071
A7Q6 <sup>Δ</sup>	5081-2046	5		TRANSISTOR PNP SI TO-39 PD = 1W FT = 100MHZ	28480	1853-0038
A7Q7	1853-0020	4		TRANSISTOR PNP SI PD = 300MW FT = 150MHZ	28480	1853-0020
A7Q8	1853-0020	4		TRANSISTOR PNP SI PD = 300MW FT = 150MHZ	28480	1853-0020

{Refer to Section 7 for update information

\*Factory Selected Component (Refer to Section 5)

Δ Errata part change.

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
A7R1	0698-3162	0		RESISTOR 46.4K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-4642-F
A7R2	0698-3450	9		RESISTOR 42.2K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-4222-F
A7R3	0698-3153	9	1	RESISTOR 3.83K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-3831-F
A7R4	0757-0199	3	1	RESISTOR 21.5K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-2152-F
A7R5	0757-0440	7		RESISTOR 7.5K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-7501-F
A7R6	0698-3243	8	2	RESISTOR 178K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1783-F
A7R7	0698-3454	3	1	RESISTOR 215K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-2153-F
A7R8	0757-0289	2	1	RESISTOR 13.3K 1% .125W F TC = 0 + -100	19701	MF4C1/8-T0-1332-F
A7R9	0698-3161	9	1	RESISTOR 38.3K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-3832-F
A7R10	0698-3154	0	2	RESISTOR 4.22K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-4221-F
A7R11	0757-0288	1	1	RESISTOR 9.09K 1% .125W F TC = 0 + -100	19701	MF4C1/8-T0-9091-F
A7R12	2100-3109	2		RESISTOR-TRMR 2K 10% C SIDE-ADJ 17-TRN	02111	43P202
A7R13	0698-3155	1	5	RESISTOR 4.64K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-4641-F
A7R14	0698-3260	9		RESISTOR 464K 1% .125W F TC = 0 + -100	28480	0698-3260
A7R15	0757-0458	7	1	RESISTOR 51.1K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-5112-F
A7R16	0757-0443	0		RESISTOR 11K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1102-F
A7R17	0698-3155	1		RESISTOR 4.64K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-4641-F
A7R18	0757-0123	3	1	RESISTOR 34.8K 1% .125W F TC = 0 + -100	28480	0757-0123
A7R19	2100-3103	6	1	RESISTOR-TRMR 10K 10% C SIDE-ADJ 17-TRN	02111	43P103
A7R20	0698-3152	8	1	RESISTOR 3.48K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-3481-F
A7R21	0698-3437	2	1	RESISTOR 133 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-133R-F
A7R22	0757-0417	8	1	RESISTOR 562 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-562R-F
A7R23	0698-0083	8	6	RESISTOR 1.96K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1961-F
A7R24	0757-0279	0	2	RESISTOR 3.16K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-3161-F
A7R25	0698-3154	0		RESISTOR 4.22K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-4221-F
A7R26	0757-0438	3		RESISTOR 5.11K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-5111-F
A7R27	0757-0290	5		RESISTOR 6.19K 1% .125W F TC = 0 + -100	19701	MF4C1/8-T0-6191-F
A7R28	0757-0439	4	4	RESISTOR 6.81K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-6811-F
A7R29	0757-0401	0		RESISTOR 100 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-101-F
A7R30	0698-4037	0	7	RESISTOR 46.4 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-46R4-F
A7R31	0698-4037	0		RESISTOR 46.4 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-46R4-F
A7R32	0698-4037	0		RESISTOR 46.4 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-46R4-F
A7R33	0698-4037	0		RESISTOR 46.4 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-46R4-F
A7R34	0698-4037	0		RESISTOR 46.4 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-46R4-F
A7R35	0698-4037	0		RESISTOR 46.4 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-46R4-F
A7R36	0698-4037	0		RESISTOR 46.4 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-46R4-F
A7R37	0757-0180	2		RESISTOR 31.6 1% .125W F TC = 0 + -100	28480	0757-0180
A7R38	0757-0401	0		RESISTOR 100 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-101-F
A7R39	0757-0280	3		RESISTOR 1K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1001-F
A7R40	0757-0438	3		RESISTOR 5.11K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-5111-F
A7R41	2100-3056	8		RESISTOR-TRMR 5K 10% C SIDE-ADJ 17-TRN	02111	43P502
A7R42	0757-0441	8		RESISTOR 8.25K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-8251-F
A7R43	0698-3155	1		RESISTOR 4.64K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-4641-F
A7R44	0757-0433	8	1	RESISTOR 3.32K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-3321-F
A7R45	0698-3156	2		RESISTOR 14.7K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1472-F
A7R46	0757-0441	8		RESISTOR 8.25K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-8251-F
A7R47	0757-0440	7		RESISTOR 7.5K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-7501-F
A7R48	0757-0439	4		RESISTOR 6.81K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-6811-F
A7R49	0757-0290	5		RESISTOR 6.19K 1% .125W F TC = 0 + -100	19701	MF4C1/8-T0-6191-F
A7R50	0757-0200	7		RESISTOR 5.62K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-5621-F

† Refer to Section 7 for update information.

\* Factory Selected Component (Refer to Section 5).

Δ Errata part change.

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
A7R51	0757-0438	3		RESISTOR 5.11K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-5111-F
A7R52	0698-3155	1		RESISTOR 4.84K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-4641-F
A7R53	0757-0200	7		RESISTOR 5.62K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-5621-F
A7R54	0757-0439	4		RESISTOR 6.81K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-6811-F
A7R55	0757-0401	0		RESISTOR 100 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-101-F
A7R56	0698-3432	7	1	RESISTOR 26.1 1% .125W F TC = 0 + -100	03888	PME55-1/8-T0-26R1-F
A7R57	0757-0402	1	1	RESISTOR 110 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-111-F
A7R58	0757-0401	0		RESISTOR 100 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-101-F
A7R59	0757-0400	9	3	RESISTOR 90.9 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-90R9-F
A7R60	0757-0399	5		RESISTOR 82.5 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-82R5-F
A7R61	0757-0398	4	2	RESISTOR 75 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-75R0-F
A7R62	0757-0387	3	1	RESISTOR 68.1 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-68R1-F
A7R63	0757-0276	7	1	RESISTOR 61.9 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-6192-F
A7R64	0757-0395	1	1	RESISTOR 56.2 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-56R2-F
A7R65	0757-0394	0	23	RESISTOR 51.1 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-51R1-F
A7R66	0757-0401	0		RESISTOR 100 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-101-F
A7R67-69				NOT ASSIGNED		
A7R70	0698-3150	6	2	RESISTOR 2.37K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-2371-F
A7R71	0757-0424	7	1	RESISTOR 1.1K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1101-F
A7R72	0698-3450	9		RESISTOR 42.2K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-4222-F
A7R73	0698-3450	9		RESISTOR 42.2K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-4222-F
A7R74	0698-3150	6		RESISTOR 2.37K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-2371-F
A7R75	0757-0420	3		RESISTOR 750 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-751-F
A7R76	0757-0441	8		RESISTOR 8.25K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-8251-F
A7R77	0757-0438	3		RESISTOR 5.11K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-5111-F
A7R78	0757-0346	2		RESISTOR 10 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-10R0-F
A7R79	0757-0416	7		RESISTOR 511 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-511R-F
A7TP1	1251-0600	0		CONNECTOR = SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A7TP2	1251-0600	0		CONNECTOR = SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A7TP3	1251-0600	0		CONNECTOR = SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A7TP4	1251-0600	0		CONNECTOR = SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A7TP5	0360-0124	3		CONNECTOR-SGL CONT PIN .04-IN-BSC-SZ RND	28480	0360-0124
A7U1	1826-0013	8	1	IC OP AMP LOW-NOISE TO-99 PKG	06665	SSS741CJ
A7U2	1820-0125	1	1	IC COMPARATOR GP DUAL TO-100 PKG	07263	711HC
A7U3	1820-0175	1	1	IC INV TTL HEX 1-INP	01295	SN7405N
A7VR1	1902-0049	2	1	DIODE-ZNR 6.19V 5% DO-35 PD = .4W	28480	1902-0049
A7VR2	1902-3182	0	2	DIODE-ZNR 12.1V 5% DO-35 PD = .4W	28480	1902-3182

†Refer to Section 7 for update information.

\*Factory Selected Component (Refer to Section 5).

Δ Errata part change.

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A8</b>						
A8	08640-60381	2	2	COUNTERLOCK ASSEMBLY(INCLUDES MP25) (SEE SERVICE SHEET C)	28480	08640-60381
A8C1	0160-2049	1	3	CAPACITOR-FDTHRU 5000PF +80 -20% 500V	33095	54-743-009-X5V0-502Z
A8C2	0160-2049	1		CAPACITOR-FDTHRU 5000PF +80 -20% 500V	33095	54-743-009-X5V0-502Z
A8C3	0160-2357	4	4	CAPACITOR-FDTHRU 1000PF +80 -20% 500V	28480	0160-2357
A8C4	0160-2049	1		CAPACITOR-FDTHRU 5000PF +80 -20% 500V	33095	54-743-009-X5V0-502Z
A8C5	0160-3219	9		CAPACITOR-FDTHRU 100PF 20% 500V CER	28480	0160-3219
A8C6	0160-3219	9		CAPACITOR-FDTHRU 100PF 20% 500V CER	28480	0160-3219
A8C7	0160-2357	4		CAPACITOR-FDTHRU 1000PF +80 -20% 500V	28480	0160-2357
A8FL1	0160-0204	6		FILTER-LOW PASS STUD-TERMS	00779	859554-5
A8FL2	0160-0204	6		FILTER-LOW PASS STUD-TERMS	00779	859554-5
A8FL3	0160-0204	6		FILTER-LOW PASS STUD-TERMS	00779	859554-5
A8L1	9100-2232	7	4	INDUCTOR RF-CH-MLD 560NH 10%	28480	9100-2232
A8L2	9100-2232	7		INDUCTOR RF-CH-MLD 560NH 10%	28480	9100-2232
A8L3	9100-2232	7		INDUCTOR RF-CH-MLD 560NH 10%	28480	9100-2232
A8L4	9100-2232	7		INDUCTOR RF-CH-MLD 560NH 10%	28480	9100-2232
A8L5	9100-2232	7	2	INDUCTOR RF-CH-MLD 560NH 10%	28480	9100-2232
A8MP1				NOT ASSIGNED		
A8MP2				NOT ASSIGNED		
A8MP3				NOT ASSIGNED		
A8MP4	8160-0219	1	1	RFI GASKET NI-ALY 1.06-IN-WD 2.64-IN-LG	28480	8160-0219
A8MP5	8160-0220	4	1	RFI STRIP NI-ALY 2.48-IN-WD 4.215-IN-LG	28480	8160-0220
A8MP6	08640-00162	1	1	SHIELD, LED	28480	08640-00162
A8MP7	08640-00009	5	1	COVER, COUNTER FILTER	28480	08640-00009
A8MP8	08640-00051	7	1	FRAME C, SHIELD, LARGE	28480	08640-00051
A8MP9	08640-00052	8	1	FRAME C, SHIELD, SMALL	28480	08640-00052
A8MP10	08640-00167	6	1	COUNTER COVER, INPUT	28480	08640-00167
A8MP11				NOT ASSIGNED		
A8MP12				NOT ASSIGNED		
A8MP13	08640-20089	3	1	SUPPORT, P.C. BOARD, COUNTER	28480	08640-20089
A8MP14	08640-20092	8	1	SHIELD, BUTTON	28480	08640-20092
A8MP15	08640-20202	2	1	TOP COVER, COUNTER	28480	08640-20202
A8MP16	08640-20397	6	1	BOTTOM COVER, COUNTER	28480	08640-20397
A8MP17	08640-40003	3	1	PIPE, LIGHT -	28480	08640-40003
A8MP18				NOT ASSIGNED		
A8MP19	5040-0391	3	1	PUSHBUTTON, X10	28480	5040-0391
A8MP20	5040-0392	4	1	BUTTON, X100	28480	5040-0392
A8MP21	5040-0393	5	1	BUTTON, ON	28480	5040-0393
A8MP22	5040-6945	5	1	BUTTON, + 1/2 DIGIT	28480	5040-6945
A8MP23	5040-6947	7	1	BUTTON, EXT	28480	5040-6947
A8MP24	5040-6946	6	1	BUTTON, INT/EXT	28480	5040-6946
A8MP25	08640-00100	7	1	INSULATOR, RF SCALER	28480	08640-00100
A8MP26	2200-0147	4	2	SCREW-MACH 4-40 .5-IN-LG PAN-HD-POZI	28480	2200-0147
A8MP27	2200-0107	6	2	SCREW-MACH 4-40 .375-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
A8MP28				NOT ASSIGNED		
A8MP29				NOT ASSIGNED		

† Refer to Section 7 for update information.

\* Factory Selected Component (Refer to Section 5).

Δ Errata part change.

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
A8MP30	2200-0115	6	2	SCREW-MACH 4-40 .75-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
A8MP31	2200-0140	7	4	SCREW-MACH 4-40 .25-IN-LG 100 DEG	28480	2200-0140
A8MP32	08640-00102	9	1	INSULATOR, COUNTER, TIME BASE	28480	08640-00102
A8MP33	2200-0105	4		SCREW-MACH 4-40 .312-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
A8MP34				NOT ASSIGNED		
A8MP35				NOT ASSIGNED		
A8MP36 <sup>Δ</sup>				NOT ASSIGNED		
A8MP37	2200-0103	2	2	SCREW-MACH 4-40 .25-IN-LG PAN-HD-POZI	28480	2200-0103
A8MP38				NOT ASSIGNED		
A8MP39				NOT ASSIGNED		
A8MP40	2200-0504	7	1	SCREW-MACH 4-40 1.062-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
A8MP41				NOT ASSIGNED		
A8MP42				NOT ASSIGNED		
A8MP43	2190-0124	4	3	WASHER-LK INTL T NO. 10 .195-IN-ID	28480	2190-0124
A8MP44	2190-0108	4	8	WASHER-LK HLCL NO. 4 .115-IN-ID	28480	2190-0108
A8MP45	2950-0078	9	3	NUT-HEX-DBL-CHAM 10-32-THD .067-IN-THK	28480	2950-0078
A8MP46				NOT ASSIGNED		
A8MP47				NOT ASSIGNED		
A8MP48	8160-0239	5		RFI RING MNL .63-IN-OD .12-IN-ID	28480	8160-0239
A8MP49				NOT ASSIGNED		
A8MP50 <sup>Δ</sup>	3050-0300	3		WASHER-FL NM NO.4 .125-IN-ID .25-IN-OD	04234	BNW-4-092
A8MP51	08640-00163	2		PAD, SPACER	28480	08640-00163
A8MP52				NOT ASSIGNED		
A8MP53				NOT ASSIGNED		
A8MP54	08640-00164	3		INSULATOR, RISER	28480	08640-00164
A8MP55 <sup>Δ</sup>	2200-0105	4	1	SCREW-MACH 4-40 .312-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION

†Refer to Section 7 for update information.

\*Factory Selected Component (Refer to Section 5).

Δ Errata part change.

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A8A1 08640-60372 – SERIAL PREFIX 1609A AND BELOW</b>						
A8A1	08640-60510	1	1	RF SCALER KIT	28480	08640-60510
<b>A8A1 08640-60372 – SERIAL PREFIX 2520A TO 2849A</b>						
A8A1	08640-60372	1	1	RF SCALER ASSEMBLY	28480	08640-60372
A8A1C1	0160-4350	1		CAPACITOR-FXD 68PF + -5% 200VDC CER0 + -30	28480	0160-4350
A8A1C2	0160-4040	6		CAPACITOR-FXD 1000PF + -5% 100VDC CER	28480	0160-4040
A8A1C3	0160-3879	7	15	CAPACITOR-FXD .01UF + -20% 100VDC CER	28480	0160-3879
A8A1C4				NOT ASSIGNED		
A8A1C5	0160-4040	6		CAPACITOR-FXD 1000PF + -5% 100VDC CER	28480	0160-4040
A8A1C6	0160-3879	7		CAPACITOR-FXD .01UF + -20% 100VDC CER	28480	0160-3879
A8A1C7	0160-3879	7		CAPACITOR-FXD .01UF + -20% 100VDC CER	28480	0160-3879
A8A1C8	0160-3879	7		CAPACITOR-FXD .01UF + -20% 100VDC CER	28480	0160-3879
A8A1C9	0180-2619	3	1	CAPACITOR-FXD 22UF + -10% 15VDC TA	25088	D22GS1B15K
A8A1C10	0160-4492	2	1	CAPACITOR-FXD 18PF + -5% 200VDC CER 0 + -30	28480	0160-4492
A8A1C11	0160-4040	6		CAPACITOR-FXD 1000PF + -5% 100VDC CER	28480	0160-4040
A8A1C12	0160-0576	5	2	CAPACITOR-FXD .1UF + -20% 50VDC CER	28480	0160-0576
A8A1C13	0160-3879	7		CAPACITOR-FXD .01UF + -20% 100VDC CER	28480	0160-3879
A8A1C14	0160-0573	2	1	CAPACITOR-FXD 4700PF + -20% 100VDC CER	28480	0160-0573
A8A1C15*	0160-0690	4	1	CAPACITOR-FXD 1PF + -.5PF 100VDC CER	28480	0160-0690
A8A1C16*	0160-4040	6	5	CAPACITOR-FXD 1000PF + -5% 100VDC CER	28480	0160-4040
A8A1C17	0160-0699	3	1	CAPACITOR-FXD 1PF + .1PF 100VDC CER	51642	100-100-NP0-109B
A8A1CR1	1901-1098	1		DIODE-SWITCHING 1N4150 50V 200MA 4NS	9N171	1N4150
A8A1CR2	1901-1098	1		DIODE-SWITCHING 1N4150 50V 200MA 4NS	9N171	1N4150
A8A1CR3	1901-1098	1		DIODE-SWITCHING 1N4150 50V 200MA 4NS	9N171	1N4150
A8A1J1	1250-1220	0	2	CONNECTOR-RF SMC M PC 50-OHM	28480	1250-1220
A8A1J2	1250-1220	0		CONNECTOR-RF SMC M PC 50-OHM	28480	1250-1220
A8A1K1	0490-1158	0	1	RELAY 2C 5VDC-COIL 1A 28VDC	28480	0490-1158
	3050-0737	0	1	WASHER-FL NM 1/4 IN .254-IN-ID .4-IN-OD	28480	3050-0737
A8A1L1	9100-3922	4	4	INDUCTOR-FIXED 120-1300 HZ	28480	9100-3922
A8A1L2	9100-3922	4		INDUCTOR-FIXED 120-1300 HZ	28480	9100-3922
A8A1Q1	1853-0430	0	1	TRANSISTOR PNP 2N4959 SI TO-72 PD = 200MW	04713	2N4959
A8A1Q2	1854-0944	3	1	TRANSISTOR NPN SI PD = 600MW FT = 5GHZ	28480	1854-0944
A8A1Q3	1854-0477	7	2	TRANSISTOR NPN 2N2222A SI TO-18 PD = 500MW	04713	2N2222A
A8A1R1	0698-7231	2	1	RESISTOR 619 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-619R-F
A8A1R2	0698-7221	0	3	RESISTOR 237 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-237R-F
A8A1R3*	0698-7233	4	1	RESISTOR 750 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-750R-F
A8A1R4	08640-80039	7	2	RESISTOR 19.6 1% .05W F TC = 0 + -100	28480	08640-80039
A8A1R5	08640-80039	7		RESISTOR 19.6 1% .05W F TC = 0 + -100	28480	08640-80039
A8A1R6	0698-7235	6	1	RESISTOR 909 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-909R-F
A8A1R7	2100-2061	3	1	RESISTOR-TRMR 200 10% C TOP-ADJ 1-TRN	73138	82PR200
A8A1R8	0698-7221	0		RESISTOR 237 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-237R-F

†Refer to Section 7 for update information.

\*Factory Selected Component (Refer to Section 5)

Δ Errata part change

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A8A1 08640-60372 – SERIAL PREFIX 2520A TO 2849A</b>						
A8A1R9	0698-7200	5	1	RESISTOR 31.6 1% .05W F TC = 0 + -100	24548	C3-1/8-TO-31R6-F
A8A1R10	0698-7209	4	1	RESISTOR 75 1% .05W F TC = 0 + -100	24548	C3-1/8-TO-75R0-F
A8A1R11	0698-7236	7	28	RESISTOR 1K 1% .05W F TC = 0 + -100	24548	C3-1/8-TO-1001-F
A8A1R12	0698-7244	7	1	RESISTOR 2.15K 1% .05W F TC = 0 + -100	24548	C3-1/8-TO-2151-F
A8A1R13	0698-7229	8	10	RESISTOR 511 1% .05W F TC = 0 + -100	24548	C3-1/8-TO-511R-F
A8A1R14	0698-7240	3	10	RESISTOR 1.47K 1% .05W F TC = 0 + -100	24548	C3-1/8-TO-1471-F
A8A1R15	0698-7240	3		RESISTOR 1.47K 1% .05W F TC = 0 + -100	24548	C3-1/8-TO-1471-F
A8A1R16	0698-7240	3		RESISTOR 1.47K 1% .05W F TC = 0 + -100	24548	C3-1/8-TO-1471-F
A8A1R17	0698-7240	3		RESISTOR 1.47K 1% .05W F TC = 0 + -100	24548	C3-1/8-TO-1471-F
A8A1R18	0698-7240	3		RESISTOR 1.47K 1% .05W F TC = 0 + -100	24548	C3-1/8-TO-1471-F
A8A1R19	0698-7240	3		RESISTOR 1.47K 1% .05W F TC = 0 + -100	24548	C3-1/8-TO-1471-F
A8A1R20	0698-7240	3		RESISTOR 1.47K 1% .05W F TC = 0 + -100	24548	C3-1/8-TO-1471-F
A8A1R21	0698-7240	3		RESISTOR 1.47K 1% .05W F TC = 0 + -100	24548	C3-1/8-TO-1471-F
A8A1R22	0698-7240	3		RESISTOR 1.47K 1% .05W F TC = 0 + -100	24548	C3-1/8-TO-1471-F
A8A1R23	0698-7229	8		RESISTOR 511 1% .05W F TC = 0 + -100	24548	C3-1/8-TO-511R-F
A8A1R24	0698-7284	5	4	RESISTOR 100K 1% .05W F TC = 0 + -100	24548	C3-1/8-TO-1003-F
A8A1R25	0698-7241	4	1	RESISTOR 1.62K 1% .05W F TC = 0 + -100	24548	C3-1/8-TO-1621-F
A8A1R26	0698-7240	3		RESISTOR 1.47K 1% .05W F TC = 0 + -100	24548	C3-1/8-TO-1471-F
A8A1R27	0698-7205	0	1	RESISTOR 51.1 1% .05W F TC = 0 + -100	24548	C3-1/8-TO-511R-F
A8A1U1	1820-0817	8	5	IC FF ECL D-M/S DUAL	04713	MC10131P
A8A1U2	1820-2935	5	1	IC PRESCR ECL	28480	1820-2935
A8A1U3	1820-0802	1	4	IC GATE ECL NOR QUAD 2-INP	04713	MC10102P
A8A1U4	1820-0817	8		IC FF ECL D-M/S DUAL	04713	MC10131P

†Refer to Section 7 for update information.

\*Factory Selected Component (Refer to Section 5).

Δ Errata part change



Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A8A1 08640-60472 – SERIAL PREFIX 2910A AND ABOVE</b>						
A8A1	08640-60472	2	1	RF SCALER ASSEMBLY	28480	08640-60472
A8A1C1	0160-5955	4		CAPACITOR-FXD 68PF + -5% 50VDC CER 0 + -30	12473	RALEIGH
A8A1C2	0160-4040	6		CAPACITOR-FXD 1000PF + -5% 100VDC CER	28480	0160-4040
A8A1C3	0160-6120	7		CAPACITOR-FXD .01UF + -5% 50VDC CER	12473	RALEIGH
A8A1C4				NOT ASSIGNED		
A8A1C5	0160-6216	2		CAPACITOR-FXD 1000PF + -5% 50VDC CER	12473	RALEIGH
A8A1C6	0160-3879	7		CAPACITOR-FXD .01UF + -20% 100VDC CER	28480	0160-3879
A8A1C7	0160-3879	7		CAPACITOR-FXD .01UF + -20% 100VDC CER	28480	0160-3879
A8A1C8	0160-3879	7		CAPACITOR-FXD .01UF + -20% 100VDC CER	28480	0160-3879
A8A1C9	0180-2619	3	1	CAPACITOR-FXD 22UF + -10% 15VDC TA	25088	D22GS1B15K
A8A1C10	0160-4492	2	1	CAPACITOR-FXD 18PF + -5% 200VDC CER 0 + -30	28480	0160-4492
A8A1C11	0160-4040	6		CAPACITOR-FXD 1000PF + -5% 100VDC CER	28480	0160-4040
A8A1C12	0160-0576	5	2	CAPACITOR-FXD .1UF + -20% 50VDC CER	28480	0160-0576
A8A1C13	0160-3879	7		CAPACITOR-FXD .01UF + -20% 100VDC CER	28480	0160-3879
A8A1C14	0160-0573	2	1	CAPACITOR-FXD 4700PF + -20% 100VDC CER	28480	0160-0573
A8A1C15*	0160-0690	4	1	CAPACITOR-FXD 1PF + -.5PF 100VDC CER	28480	0160-0690
A8A1C16*	0160-4040	6	5	CAPACITOR-FXD 1000PF + -5% 100VDC CER	28480	0160-4040
A8A1C17	0160-0699	3	1	CAPACITOR-FXD 1PF + -.1PF 100VDC CER	51642	100-100-NP0-109B
A8A1CR1	1901-1098	1		DIODE-SWITCHING 1N4150 50V 200MA 4NS	9N171	1N4150
A8A1CR2	1901-1098	1		DIODE-SWITCHING 1N4150 50V 200MA 4NS	9N171	1N4150
A8A1CR3	1901-1098	1		DIODE-SWITCHING 1N4150 50V 200MA 4NS	9N171	1N4150
A8A1J1	1250-1220	0	2	CONNECTOR-RF SMC M PC 50-OHM	28480	1250-1220
A8A1J2	1250-1220	0		CONNECTOR-RF SMC M PC 50-OHM	28480	1250-1220
A8A1K1	0490-1158	0	1	RELAY 2C 5VDC-COIL 1A 28VDC	28480	0490-1158
	3050-0737	0	1	WASHER-FL NM 1/4 IN .254-IN-ID .4-IN-OD	28480	3050-0737
A8A1L1	9100-3922	4	4	INDUCTOR-FIXED 120-1300 HZ	28480	9100-3922
A8A1L2	9100-3922	4		INDUCTOR-FIXED 120-1300 HZ	28480	9100-3922
A8A1MP1	3050-0737	0		WASHER-FL NM 1/4 IN .254-IN-ID .4-IN-OD	28480	3050-0737
A8A1Q1	1853-0430	0	1	TRANSISTOR PNP 2N4959 SI TO-72 PD = 200MW	04713	2N4959
A8A1Q2	1854-0944	3	1	TRANSISTOR NPN SI PD = 600MW FT = 5GHZ	28480	1854-0944
A8A1Q3	1854-0477	7	2	TRANSISTOR NPN 2N2222A SI TO-18 PD = 500MW	04713	2N2222A
A8A1R1	0698-7231	2	1	RESISTOR 619 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-619R-F
A8A1R2	0699-1423	4		RESISTOR 215 + -1% .125W TKF TC = 0 + -100	02995	9C12063AFKR
A8A1R3	0698-1437	0		RESISTOR 825 - -1% .125W TKF TC = 0 + -100	02995	9C12063AFKR
A8A1R4	0699-1356	2		RESISTOR 31.6 + -1% .125W TKF TC = 0 + -100	02995	9C12063AFKR
A8A1R5	0699-1356	2		RESISTOR 31.6 + -1% .125W TKF TC = 0 + -100	02995	9C12063AFKR
A8A1R6	0698-7235	6	1	RESISTOR 909 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-909R-F
A8A1R7	2100-2061	3	1	RESISTOR-TRMR 200 10% C TOP-ADJ 1-TRN	73138	82PR200
A8A1R8	0698-7221	0		RESISTOR 237 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-237R-F
A8A1R9	0698-7200	5	1	RESISTOR 31.6 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-31R6-F
A8A1R10	0698-7209	4	1	RESISTOR 75 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-75R0-F

† Refer to Section 7 for update information.

\* Factory Selected Component (Refer to Section 5).

Δ Errata part change.

*Table 6-3. Replaceable Parts*

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A8A1 08640-60472 – SERIAL PREFIX 2910A AND ABOVE</b>						
A8A1R11	0698-7236	7	28	RESISTOR 1K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-1001-F
A8A1R12	0698-7244	7	1	RESISTOR 2.15K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-2151-F
A8A1R13	0698-7229	8	10	RESISTOR 511 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-511R-F
A8A1R14	0698-7240	3	10	RESISTOR 1.47K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-1471-F
A8A1R15	0698-7240	3		RESISTOR 1.47K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-1471-F
A8A1R16	0698-7240	3		RESISTOR 1.47K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-1471-F
A8A1R17	0698-7240	3		RESISTOR 1.47K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-1471-F
A8A1R18	0698-7240	3		RESISTOR 1.47K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-1471-F
A8A1R19	0698-7240	3		RESISTOR 1.47K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-1471-F
A8A1R20	0698-7240	3		RESISTOR 1.47K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-1471-F
A8A1R21	0698-7240	3		RESISTOR 1.47K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-1471-F
A8A1R22	0698-7240	3		RESISTOR 1.47K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-1471-F
A8A1R23	0698-7229	8		RESISTOR 511 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-511R-F
A8A1R24	0698-7284	5	4	RESISTOR 100K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-1003-F
A8A1R25	0698-7241	4	1	RESISTOR 1.62K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-1621-F
A8A1R26	0698-7240	3		RESISTOR 1.47K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-1471-F
A8A1R27	0698-7205	0	1	RESISTOR 51.1 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-51R1-F
A8A1R28	0699-1503	1		RESISTOR-ZERO OHMS SMD ZERO OHM JUMPER	02995	9C1206
A8A1U1	1820-0817	8	5	IC FF ECL D-M/S DUAL	04713	MC10131P
A8A1U2 <sup>Δ</sup>	08640-80024	2	1	IC PRESCR ECL SELECT	28480	08640-80024
A8A1U3	1820-0802	1	4	IC GATE ECL NOR QUAD 2-INP	04713	MC10102P
A8A1U4	1820-0817	8		IC FF ECL D-M/S DUAL	04713	MC10131P

<sup>1</sup> Refer to Section 7 for update information.

<sup>\*</sup> Factory Selected Component (Refer to Section 5).

<sup>Δ</sup> Errata part change.

*Table 6-3. Replaceable Parts*

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A8A2</b>						
<i>2249A AND BELOW A8A2</i>	08640-60382	3	1	COUNTER LOCK/DISPLAY RETROFIT KIT	28480	08640-60382
<i>2250A AND ABOVE A8A2</i>	08640-60380	1	1	COUNTER LOCK/DISPLAY ASSEMBLY	28480	08640-60380
A8A2MP1	3050-0156	7		WASHER-FL MTLN NO. 12 .25-IN-ID	28480	3050-0156
A8A2	08640-60382	3	1	COUNTER LOCK/DISPLAY RETROFIT KIT	28480	08640-60382

† Refer to Section 7 for update information.

\* Factory Selected Component (Refer to Section 5)

Δ Errata part change.

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A8A2A1</b>						
<i>2249A AND BELOW</i>						
A8A2	08640-60382	3	1	COUNTER LOCK/DISPLAY RETROFIT KIT	28480	08640-60382
<i>2250A AND ABOVE</i>						
A8A2A1	08640-60377	3	1	P/O A8A2, COUNTER LOCK ASSEMBLY INCLUDES BUTTONS A8MP19, A8MP20, A8MP21, A8MP50, A8MP51	28480	08640-60377
A8A2A1C1	0160-4822	2	3	CAPACITOR-FXD 1000PF + -5% 100VDC CER	28480	0160-4822
A8A2A1C2	0160-3094	8	3	CAPACITOR-FXD .1UF + -10% 100VDC CER	28480	0160-3094
A8A2A1C3	0160-3094	8		CAPACITOR-FXD .1UF + -10% 100VDC CER	28480	0160-3094
A8A2A1C4 <sup>Δ</sup>	0180-2944	7	1	CAPACITOR-FXD 15UF + -10% 20VDC TA	04200	150D156X9020B2
A8A2A1C5	0180-1735	2	1	CAPACITOR-FXD .22UF + -10% 35VDC TA	56289	150D224X9035A2
A8A2A1C6	0180-0197	8	6	CAPACITOR-FXD 2.2UF + -10% 20VDC TA	56289	150D225X9020A2
A8A2A1C7	0160-4822	2		CAPACITOR-FXD 1000PF + -5% 100VDC CER	28480	0160-4822
A8A2A1C8-C14				NOT ASSIGNED		
A8A2A1C15	0160-3879	7		CAPACITOR-FXD .01UF + -20% 100VDC CER	28480	0160-3879
A8A2A1C16	0160-3879	7		CAPACITOR-FXD .01UF + -20% 100VDC CER	28480	0160-3879
A8A2A1C17	0160-0174	9	1	CAPACITOR-FXD .47UF + -80-20% 25VDC CER	28480	0160-0174
A8A2A1C18	0160-3094	8		CAPACITOR-FXD .1UF + -10% 100VDC CER	28480	0160-3094
A8A2A1C19	0160-4805	1	2	CAPACITOR-FXD 47PF + -5% 100VDC CER 0 + -30	28480	0160-4805
A8A2A1C20	0180-0291	3	1	CAPACITOR-FXD 1UF + -10% 35VDC TA	56289	150D105X9035A2
A8A2A1C21	0180-0197	8		CAPACITOR-FXD 2.2UF + -10% 20VDC TA	56289	150D225X9020A2
A8A2A1C22	0160-3879	7		CAPACITOR-FXD .01UF + -20% 100VDC CER	28480	0160-3879
A8A2A1C23	0180-0197	8		CAPACITOR-FXD 2.2UF + -10% 20VDC TA	56289	150D225X9020A2
A8A2A1C24	0160-4832	4	3	CAPACITOR-FXD .01UF + -10% 100VDC CER	28480	0160-4832
A8A2A1C25	0160-4832	4		CAPACITOR-FXD .01UF + -10% 100VDC CER	28480	0160-4832
A8A2A1C26	0160-4832	4		CAPACITOR-FXD .01UF + -10% 100VDC CER	28480	0160-4832
A8A2A1C27	0160-4805	1		CAPACITOR-FXD 47PF + -5% 100VDC CER 0 + -30	28480	0160-4805
A8A2A1C28-C30				NOT ASSIGNED		
A8A2A1C31	0160-4822	2		CAPACITOR-FXD 1000PF + -5% 100VDC CER	28480	0160-4822
A8A2A1C32				NOT ASSIGNED		
A8A2A1C33	0160-3877	5	1	CAPACITOR-FXD 100PF + -20% 200VDC CER	28480	0160-3877
A8A2A1C34	0160-3874	2	6	CAPACITOR-FXD 10PF + -.5PF 200VDC CER	28480	0160-3874
A8A2A1C35	0160-3874	2		CAPACITOR-FXD 10PF + -.5PF 200VDC CER	28480	0160-3874
A8A2A1C36	0160-3874	2		CAPACITOR-FXD 10PF + -.5PF 200VDC CER	28480	0160-3874
A8A2A1C37	0160-3874	2		CAPACITOR-FXD 10PF + -.5PF 200VDC CER	28480	0160-3874
A8A2A1C38	0180-2661	5	1	CAPACITOR-FXD 1UF + -10% 50VDC TA	25088	D1R0GS1A50K
A8A2A1C39	0160-3874	2		CAPACITOR-FXD 10PF + -.5PF 200VDC CER	28480	0160-3874
A8A2A1C40	0180-0491	5	1	CAPACITOR-FXD 10UF + -20% 25VDC TA	28480	0180-0491
A8A2A1C41	0180-2815	1	1	CAPACITOR-FXD 100UF + -20% 10VDC TA	28480	0180-2815
A8A2A1CR1	1901-0040	1	3	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A8A2A1CR2	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A8A2A1CR3				NOT ASSIGNED		
A8A2A1CR4	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A8A2A1MP1	08640-40040	8	1	INSULATOR, SWITCH	28480	08640-40040
A8A2A1Q1	1854-0071	7	10	TRANSISTOR NPN SI PD = 300MW FT = 200MHZ	28480	1854-0071
A8A2A1Q2	1853-0020	4	7	TRANSISTOR PNP SI PD = 300MW FT = 150MHZ	28480	1853-0020
A8A2A1Q3	1853-0020	4		TRANSISTOR PNP SI PD = 300MW FT = 150MHZ	28480	1853-0020
A8A2A1Q4	1854-0071	7		TRANSISTOR NPN SI PD = 300MW FT = 200MHZ	28480	1854-0071
A8A2A1Q5				NOT ASSIGNED		

<sup>Δ</sup> Refer to Section 7 for update information.

\* Factory Selected Component (Refer to Section 5).

<sup>Δ</sup> Errata part change.

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
A8A2A1Q6	1855-0271	1	1	TRANSISTOR J-FET N-CHAN D-MODE SI	28480	1855-0271
A8A2A1Q7	1853-0020	4		TRANSISTOR PNP SI PD = 300MW FT = 150MHZ	28480	1853-0020
A8A2A1Q8	1854-0071	7		TRANSISTOR NPN SI PD = 300MW FT = 200MHZ	28480	1854-0071
A8A2A1Q9	1854-0071	7		TRANSISTOR NPN SI PD = 300MW FT = 200MHZ	28480	1854-0071
A8A2A1Q10	1854-0071	7		TRANSISTOR NPN SI PD = 300MW FT = 200MHZ	28480	1854-0071
A8A2A1Q11	1854-0071	7		TRANSISTOR NPN SI PD = 300MW FT = 200MHZ	28480	1854-0071
A8A2A1Q12	1854-0071	7		TRANSISTOR NPN SI PD = 300MW FT = 200MHZ	28480	1854-0071
A8A2A1Q13				NOT ASSIGNED		
A8A2A1Q14				NOT ASSIGNED		
A8A2A1Q15	1854-0071	7		TRANSISTOR NPN SI PD = 300MW FT = 200MHZ	28480	1854-0071
A8A2A1Q16	1853-0020	4		TRANSISTOR PNP SI PD = 300MW FT = 150MHZ	28480	1853-0020
A8A2A1Q17	1853-0020	4		TRANSISTOR PNP SI PD = 300MW FT = 150MHZ	28480	1853-0020
A8A2A1Q18	1853-0020	4		TRANSISTOR PNP SI PD = 300MW FT = 150MHZ	28480	1853-0020
A8A2A1R1	0698-7219	6	3	RESISTOR 198 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-198R-F
A8A2A1R2	0698-7236	7		RESISTOR 1K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-1001-F
A8A2A1R3	0698-7253	8	4	RESISTOR 5.11K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-5111-F
A8A2A1R4	0698-7253	8		RESISTOR 5.11K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-5111-F
A8A2A1R5	0698-7239	0	2	RESISTOR 1.33K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-1331-F
A8A2A1R6	0698-7239	0		RESISTOR 1.33K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-1331-F
A8A2A1R7	0698-7246	9	2	RESISTOR 2.61K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-2611-F
A8A2A1R8	0698-7246	9		RESISTOR 2.61K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-2611-F
A8A2A1R9	0698-7277	6	6	RESISTOR 51.1K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-5112-F
A8A2A1R10	0698-7277	6		RESISTOR 51.1K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-5112-F
A8A2A1R11	0683-8245	9	2	RESISTOR 820K 5% .25W FC TC = -800/+900	01121	CB8245
A8A2A1R12	0683-8245	9		RESISTOR 820K 5% .25W FC TC = -800/+900	01121	CB8245
A8A2A1R13	0698-7267	4	2	RESISTOR 19.6K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-1962-F
A8A2A1R14	0698-7272	1	1	RESISTOR 31.6K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-3162-F
A8A2A1R15	0698-7277	6		RESISTOR 51.1K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-5112-F
A8A2A1R16	0698-7267	4		RESISTOR 19.6K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-1962-F
A8A2A1R17	0698-7277	6		RESISTOR 51.1K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-5112-F
A8A2A1R18	0698-7284	5		RESISTOR 100K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-1003-F
A8A2A1R19	0698-7270	9	1	RESISTOR 26.1K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-2612-F
A8A2A1R20	0698-7288	9	1	RESISTOR 147K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-1473-F
A8A2A1R21	0698-7253	8		RESISTOR 5.11K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-5111-F
A8A2A1R22	0698-7253	8		RESISTOR 5.11K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-5111-F
A8A2A1R23	0698-7277	6		RESISTOR 51.1K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-5112-F
A8A2A1R24	0698-7260	7	17	RESISTOR 10K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-1002-F
A8A2A1R25	0698-7284	5		RESISTOR 100K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-1003-F
A8A2A1R26	0698-3453	2	2	RESISTOR 196K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1963-F
A8A2A1R27	0698-7260	7		RESISTOR 10K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-1002-F
A8A2A1R28	0698-7258	3	2	RESISTOR 8.25K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-8251-F
A8A2A1R29	0698-7256	1	1	RESISTOR 6.81K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-6811-F
A8A2A1R30	0698-7258	3		RESISTOR 8.25K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-8251-F
A8A2A1R31	0698-7260	7		RESISTOR 10K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-1002-F
A8A2A1R32	0698-7260	7		RESISTOR 10K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-1002-F
A8A2A1R33	0698-7264	1	2	RESISTOR 14.7K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-1472-F
A8A2A1R34	0698-7243	6	2	RESISTOR 1.96K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-1961-F
A8A2A1R35	0698-7229	8		RESISTOR 511 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-511R-F

† Refer to Section 7 for update information.

\* Factory Selected Component (Refer to Section 5)

Δ Errata part change

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
A8A2A1R36	0698-7260		7	RESISTOR 10K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-1002-F
A8A2A1R37	0698-7229		8	RESISTOR 511 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-511R-F
A8A2A1R38 <sup>Δ</sup>	0698-7218		5	RESISTOR 178 1% .05W F TC = 0 + -100	02995	5063J
A8A2A1R39-R50				NOT ASSIGNED		
A8A2A1R51	0698-7248		1	RESISTOR 3.16K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-3161-F
A8A2A1R52	0698-7248		1	RESISTOR 3.16K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-3161-F
A8A2A1R53	0698-7229		8	RESISTOR 511 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-511R-F
A8A2A1R54	0698-7229		8	RESISTOR 511 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-511R-F
A8A2A1R55	0698-7236		7	RESISTOR 1K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-1001-F
A8A2A1R56				NOT ASSIGNED		
A8A2A1R57	0698-7219		6	RESISTOR 196 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-196R-F
A8A2A1R58	2100-2497		9	RESISTOR-TRMR 2K 10% C TOP-ADJ 1-TRN	73138	82PR2K
A8A2A1R59	0698-7281		2	RESISTOR 75K 2% .05W F TC = 0 + -100	24546	C3-1/8-T0-7502-G
A8A2A1R60				NOT ASSIGNED		
A8A2A1R61				NOT ASSIGNED		
A8A2A1R62	0698-0082		7	RESISTOR 464 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-4640-F
A8A2A1R63				NOT ASSIGNED		
A8A2A1R64	0698-7260		7	RESISTOR 10K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-1002-F
A8A2A1R65				NOT ASSIGNED		
A8A2A1R66	0698-7260		7	RESISTOR 10K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-1002-F
A8A2A1R67	0698-7260		7	RESISTOR 10K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-1002-F
A8A2A1R68	0698-7260		7	RESISTOR 10K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-1002-F
A8A2A1R69	0698-7264		1	RESISTOR 14.7K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-1472-F
A8A2A1R70	0698-7260		7	RESISTOR 10K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-1002-F
A8A2A1R71	0698-7188		8	RESISTOR 10 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-10R-F
A8A2A1R72	0698-7236		7	RESISTOR 1K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-1001-F
A8A2A1R73	0698-7249		2	RESISTOR 3.48K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-3481-F
A8A2A1R74	0698-7257		2	RESISTOR 7.5K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-7501-F
A8A2A1R75	0698-7243		6	RESISTOR 1.96K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-1961-F
A8A2A1R76	0698-7260		7	RESISTOR 10K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-1002-F
A8A2A1R77	0698-7260		7	RESISTOR 10K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-1002-F
A8A2A1R78	0698-7236		7	RESISTOR 1K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-1001-F
A8A2A1R79	0698-7260		7	RESISTOR 10K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-1002-F
A8A2A1R80	0698-7260		7	RESISTOR 10K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-1002-F
A8A2A1R81	0698-7269		6	RESISTOR 23.7K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-2372-F
A8A2A1R82	0698-3453		2	RESISTOR 196K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1963-F
A8A2A1R83	0698-7236		7	RESISTOR 1K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-1001-F
A8A2A1R84	0698-7188		8	RESISTOR 10 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-10R-F
A8A2A1R85	0698-7236		7	RESISTOR 1K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-1001-F
A8A2A1R86	1810-0330		9	NETWORK-RES 16-DIP470.0 OHM X 8	01121	316B471
A8A2A1R87	1810-0330		9	NETWORK-RES 16-DIP470.0 OHM X 8	01121	316B471
A8A2A1R88	1810-0330		9	NETWORK-RES 16-DIP470.0 OHM X 8	01121	316B471
A8A2A1R89	1810-0330		9	NETWORK-RES 16-DIP470.0 OHM X 8	01121	316B471
A8A2A1R90	1810-0330		9	NETWORK-RES 16-DIP470.0 OHM X 8	01121	316B471
A8A2A1R91	1810-0330		9	NETWORK-RES 16-DIP470.0 OHM X 8	01121	316B471
A8A2A1R92	0698-7260		7	RESISTOR 10K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-1002-F
A8A2A1R93	0698-7188		8	RESISTOR 10 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-10R-F
A8A2A1R94	0698-7236		7	RESISTOR 1K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-1001-F
A8A2A1R95	0698-7260		7	RESISTOR 10K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-1002-F

† Refer to Section 7 for update information.

\* Factory Selected Component (Refer to Section 5)

Δ Errata part change

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
A8A2A1R98	0698-7236	7		RESISTOR 1K 1% .05W F TC = 0+ -100	24546	C3-1/8-T0-1001-F
A8A2A1R97	0698-7236	7		RESISTOR 1K 1% .05W F TC = 0+ -100	24546	C3-1/8-T0-1001-F
A8A2A1S1	3101-1729	1	1	SWITCH-PB 3-STATION 15MM C-C SPACING	28480	3101-1729
A8A2A1TP1	1251-0600	0	11	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ NOT ASSIGNED	28480	1251-0600
A8A2A1TP2						
A8A2A1TP3	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A8A2A1TP4	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A8A2A1TP5				NOT ASSIGNED		
A8A2A1TP6	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A8A2A1U1	1820-0077	2	1	IC FF TTL D-TYPE POS-EDGE-TRIG CLEAR	01295	SN7474N
A8A2A1U2	1820-1197	9	4	IC GATE TTL LS NAND QUAD 2-INP	01295	SN74LS00N
A8A2A1U3	1820-1197	9		IC GATE TTL LS NAND QUAD 2-INP	01295	SN74LS00N
A8A2A1U4	1820-1199	1	1	IC INV TTL LS HEX 1-INP	01295	SN74LS04N
A8A2A1U5	1820-1112	8	2	IC FF TTL LS D-TYPE POS-EDGE-TRIG	01295	SN74LS74AN
A8A2A1U6	1820-1322	2	2	IC GATE TTL S NOR QUAD 2-INP	01295	SN74S02N
A8A2A1U7	1820-1688	3	6	IC DCDR TTL LS BCD-TO-7-SEG	01295	SN74LS247N
A8A2A1U8	1820-1688	3		IC DCDR TTL LS BCD-TO-7-SEG	01295	SN74LS247N
A8A2A1U9	1820-1688	3		IC DCDR TTL LS BCD-TO-7-SEG	01295	SN74LS247N
A8A2A1U10	1820-1688	3		IC DCDR TTL LS BCD-TO-7-SEG	01295	SN74LS247N
A8A2A1U11	1820-1688	3		IC DCDR TTL LS BCD-TO-7-SEG	01295	SN74LS247N
A8A2A1U12	1820-1688	3		IC DCDR TTL LS BCD-TO-7-SEG	01295	SN74LS247N
A8A2A1U13	1820-1201	6	3	IC GATE TTL LS AND QUAD 2-INP	01295	SN74LS08N
A8A2A1U14	1820-0208	1	1	IC FF TTL J-K DUAL	18324	N8826N
A8A2A1U15	1820-1197	9		IC GATE TTL LS NAND QUAD 2-INP	01295	SN74LS00N
A8A2A1U16	1820-1197	9		IC GATE TTL LS NAND QUAD 2-INP	01295	SN74LS00N
A8A2A1U17	1820-1201	6		IC GATE TTL LS AND QUAD 2-INP	01295	SN74LS08N
A8A2A1U18	1820-1201	6		IC GATE TTL LS AND QUAD 2-INP	01295	SN74LS08N
A8A2A1U19 <sup>Δ</sup>	1820-3598	8	7	IC CNTR TTL LS DECD UP/DOWN SYNCHRO	01698	SN74LS192N
A8A2A1U20	1820-1277	6		IC CNTR TTL LS DECD UP/DOWN SYNCHRO	01295	SN74LS192N
A8A2A1U21	1820-1277	6		IC CNTR TTL LS DECD UP/DOWN SYNCHRO	01295	SN74LS192N
A8A2A1U22	1820-1277	6		IC CNTR TTL LS DECD UP/DOWN SYNCHRO	01295	SN74LS192N
A8A2A1U23	1820-1277	6		IC CNTR TTL LS DECD UP/DOWN SYNCHRO	01295	SN74LS192N
A8A2A1U24	1820-1277	6		IC CNTR TTL LS DECD UP/DOWN SYNCHRO	01295	SN74LS192N
A8A2A1U25	1820-1322	2		IC GATE TTL S NOR QUAD 2-INP	01295	SN74S02N
A8A2A1U26	1820-1112	8		IC FF TTL LS D-TYPE POS-EDGE-TRIG	01295	SN74LS74AN
A8A2A1U27	1820-1449	4	1	IC GATE TTL S OR QUAD 2-INP	01295	SN74S32N
A8A2A1U28	1820-1277	6		IC CNTR TTL LS DECD UP/DOWN SYNCHRO	01295	SN74LS192N
A8A2A1U29 <sup>Δ</sup>	5180-1817	6	1	IC OP AMP LOW-BIAS-H-IMP DUAL 8-DIP-C	28480	1826-0785
A8A2A1U30	1820-2102	8	3	IC LCH TTL LS D-TYPE OCTL	01295	SN74LS373N
A8A2A1U31	1820-2102	8		IC LCH TTL LS D-TYPE OCTL	01295	SN74LS373N
A8A2A1U32	1820-2102	8		IC LCH TTL LS D-TYPE OCTL	01295	SN74LS373N
A8A2A1U33	1820-1423	4	3	IC MV TTL LS MONOSTBL RETRIG DUAL	01295	SN74LS123N
A8A2A1U34	1820-1423	4		IC MV TTL LS MONOSTBL RETRIG DUAL	01295	SN74LS123N
A8A2A1U35	1820-1423	4		IC MV TTL LS MONOSTBL RETRIG DUAL	01295	SN74LS123N
A8A2A1VR1	1902-3070	5	1	DIODE-ZNR 4.22V 5% DO-35 PD = .4W	28480	1902-3070
A8A2A1VR2	1902-3182	0	1	DIODE-ZNR 12.1V 5% DO-35 PD = .4W	28480	1902-3182
A8A2A1VR3	1902-0943	5	3	DIODE-ZNR 2.4V 5% DO-35 PD = .4W TC = -.037%	28480	1902-0943

† Refer to Section 7 for update information

\* Factory Selected Component (Refer to Section 5)

Δ Errata part change

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A8A2A2</b>						
<i>2249A AND BELOW</i>						
A8A2A2	08640-60382	3		COUNTER LOCK/DISPLAY RETROFIT KIT	28480	08640-60382
<i>2250A AND ABOVE</i>						
A8A2A2	08640-60378	7		COUNTER DISPLAY ASSEMBLY (INCLUDES A8MP48, MP73, A8MP51)	28480	08640-60378
A8A2A2DS1-DS7 <sup>Δ</sup>	1990-0531	2		DISPLAY-NUM-SEG 1-CHAR .3-H	01542	5082-7610
A8A2A2DS8	1990-0784	7	1	LED-LIGHT BAR MODULE LUM-INT = 5.4MCD	28480	HLMP-2755
A8A2A2DS9	2140-0356	9	1	LAMP-INCAND 7683 5VDC 60MA T-1-BULB	1F556	7683
A8A2A2E1	1251-8195	4	1	CONN PST 27M	28480	1251-8195
A8A2A2E2	1251-4243	5	1	CONNECTOR 25-PIN M POST TYPE	28480	1251-4243
A8A2A2J1	1200-0508	0	7	SOCKET-IC 14-CONT DIP-SLDR	28480	1200-0508
A8A2A2J2	1200-0508	0		SOCKET-IC 14-CONT DIP-SLDR	28480	1200-0508
A8A2A2J3	1200-0508	0		SOCKET-IC 14-CONT DIP-SLDR	28480	1200-0508
A8A2A2J4	1200-0508	0		SOCKET-IC 14-CONT DIP-SLDR	28480	1200-0508
A8A2A2J5	1200-0508	0		SOCKET-IC 14-CONT DIP-SLDR	28480	1200-0508
A8A2A2J6	1200-0508	0		SOCKET-IC 14-CONT DIP-SLDR	28480	1200-0508
A8A2A2J7	1200-0508	0		SOCKET-IC 14-CONT DIP-SLDR	28480	1200-0508
A8A2A2MP1	3050-0737	0		WASHER-FL NM 1/4 IN .254-IN-ID .4-IN-OD	28480	3050-0737
A8A2A2MP2	3050-0156	7		WASHER-FL MTLN NO. 12 .25-IN-ID	28480	3050-0156
A8A2A2Q1	1853-0020	4		TRANSISTOR PNP SI PD = 300MW FT = 150MHZ	28480	1853-0020
A8A2A2Q2	1854-0071	7		TRANSISTOR NPN SI PD = 300MW FT = 200MHZ	28480	1854-0071
A8A2A2R1	2100-3592	7	1	RESISTOR-VAR W/SW 5K 20% LIN SPST-NO	28480	2100-3592
A8A2A2R2	2100-3216	2	1	RESISTOR-TRMR 10K 10% C TOP-ADJ 4-TRN	32997	3339H-1-103
A8A2A2R3	0698-7277	6		RESISTOR 51.1K 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-5112-F
A8A2A2R4	0698-7224	3	1	RESISTOR 316 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-316R-F
A8A2A2R5	0698-7276	5	1	RESISTOR 46.4K 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-4642-F
A8A2A2R6	0698-7217	4	4	RESISTOR 162 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-162R-F
A8A2A2R7	0698-7217	4		RESISTOR 162 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-162R-F
A8A2A2R8	0698-7217	4		RESISTOR 162 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-162R-F
A8A2A2R9	0698-7217	4		RESISTOR 162 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-162R-F
A8A2A2R10	0698-7228	7	5	RESISTOR 464 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-464R-F
A8A2A2R11	0698-7228	7		RESISTOR 464 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-464R-F
A8A2A2R12	0698-7228	7		RESISTOR 464 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-464R-F
A8A2A2R13	0698-7228	7		RESISTOR 464 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-464R-F
A8A2A2R14	0698-7228	7		RESISTOR 464 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-464R-F
A8A2A2MP3 <sup>Δ</sup>	3050-0105	6	2	WASHER-FL MTLN NO.4 .125-IN-ID	04821	3050-0105
A8A2A2MP4 <sup>Δ</sup>	3030-0051	9	2	SCREW-SKT HD CAP 8-32 1-IN-LG SST-300	04418	3030-0051

†Refer to Section 7 for update information.

\*Factory Selected Component (Refer to Section 5)

Δ Errata part change.



Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A8A3</b>						
<i>1609A AND BELOW</i>						
A8A3	08640-60026	2	1	TIME BASE ASSEMBLY	28480	08640-60026
<i>1617A AND ABOVE</i>						
A8A3	08640-60330	1	1	TIME BASE ASSEMBLY (INCLUDES A8MP22, A8MP23, A8MP24)	28480	08640-60330
A8A3C1	0160-3879	7		CAPACITOR-FXD .01UF + -20% 100VDC CER	28480	0160-3879
A8A3C2	0160-3879	7		CAPACITOR-FXD .01UF + -20% 100VDC CER	28480	0160-3879
A8A3C3	0160-3879	7		CAPACITOR-FXD .01UF + -20% 100VDC CER	28480	0160-3879
A8A3C4	0160-3879	7		CAPACITOR-FXD .01UF + -20% 100VDC CER	28480	0160-3879
A8A3C5	0160-3879	7		CAPACITOR-FXD .01UF + -20% 100VDC CER	28480	0160-3879
A8A3C6	0160-4084	8		CAPACITOR-FXD .1UF + -20% 50VDC CER	28480	0160-4084
A8A3C7	0160-0575	4	2	CAPACITOR-FXD .047UF + -20% 50VDC CER	28480	0160-0575
A8A3C8	0160-0575	4		CAPACITOR-FXD .047UF + -20% 50VDC CER	28480	0160-0575
A8A3C9	0160-3879	7		CAPACITOR-FXD .01UF + -20% 100VDC CER	28480	0160-3879
A8A3C10	0160-3879	7		CAPACITOR-FXD .01UF + -20% 100VDC CER	28480	0160-3879
A8A3C11	0180-0197	8		CAPACITOR-FXD 2.2UF + -10% 20VDC TA	56289	150D225X9020A2
A8A3C12	0180-0197	8		CAPACITOR-FXD 2.2UF + -10% 20VDC TA	56289	150D225X9020A2
A8A3C13	0160-3879	7		CAPACITOR-FXD .01UF + -20% 100VDC CER	28480	0160-3879
A8A3C14	0160-3879	7		CAPACITOR-FXD .01UF + -20% 100VDC CER	28480	0160-3879
A8A3C15	0180-0197	8		CAPACITOR-FXD 2.2UF + -10% 20VDC TA	56289	150D225X9020A2
A8A3C16	0160-3879	7		CAPACITOR-FXD .01UF + -20% 100VDC CER	28480	0160-3879
A8A3C17	0160-3879	7		CAPACITOR-FXD .01UF + -20% 100VDC CER	28480	0160-3879
A8A3C18	0160-3879	7		CAPACITOR-FXD .01UF + -20% 100VDC CER	28480	0160-3879
A8A3C19	0160-3879	7		CAPACITOR-FXD .01UF + -20% 100VDC CER	28480	0160-3879
A8A3C20	0160-2206	2	4	CAPACITOR-FXD 160PF + -5% 300VDC MICA	28480	0160-2206
A8A3C21	0160-2206	2		CAPACITOR-FXD 160PF + -5% 300VDC MICA	28480	0160-2206
A8A3C22	0160-3454	4	1	CAPACITOR-FXD 220PF + -10% 1KVDC CER	28480	0160-3454
A8A3C23	0160-3455	5		CAPACITOR-FXD 470PF + -10% 1KVDC CER	28480	0160-3455
A8A3C24	0160-3879	7		CAPACITOR-FXD .01UF + -20% 100VDC CER	28480	0160-3879
A8A3C25	0160-3879	7		CAPACITOR-FXD .01UF + -20% 100VDC CER	28480	0160-3879
A8A3C26	0180-2618	2		CAPACITOR-FXD 33UF + -10% 10 VDC TA	25088	D33GS1B10K
A8A3C27	0160-3876	4		CAPACITOR-FXD 47PF + -20% 200VDC CER	28480	0160-3876
A8A3C28	0160-4084	8		CAPACITOR-FXD .1UF + -20% 50VDC CER	28480	0160-4084
A8A3C29	0160-4084	8		CAPACITOR-FXD .1UF + -20% 50VDC CER	28480	0160-4084
A8A3CR1	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A8A3CR2	1901-0518	8	1	DIODE-SM SIG SCHOTTKY	28480	1901-0518
A8A3J1	1250-1383	6	1	CONNECTOR-RF SM-SNP M SGL-HOLE-RR 50-OHM	28480	1250-1383
A8A3L1	9140-0137	1	10	INDUCTOR RF-CH-MLD 1MH 5% .2DX.45LG Q= 60	28480	9140-0137
A8A3L2	9140-0137	1		INDUCTOR RF-CH-MLD 1MH 5% .2DX.45LG Q= 60	28480	9140-0137
A8A3L3	9140-0137	1		INDUCTOR RF-CH-MLD 1MH 5% .2DX.45LG Q= 60	28480	9140-0137
A8A3L4	9140-0137	1		INDUCTOR RF-CH-MLD 1MH 5% .2DX.45LG Q= 60	28480	9140-0137
A8A3L5	9140-0137	1		INDUCTOR RF-CH-MLD 1MH 5% .2DX.45LG Q= 60	28480	9140-0137
A8A3L6	08640-80001	5	7	FILTER, TOROID	28480	08640-80001
A8A3L7	08640-80001	5		FILTER, TOROID	28480	08640-80001
A8A3L8	9140-0137	1		INDUCTOR RF-CH-MLD 1MH 5% .2DX.45LG Q= 60	28480	9140-0137
A8A3L9	9140-0137	1		INDUCTOR RF-CH-MLD 1MH 5% .2DX.45LG Q= 60	28480	9140-0137
A8A3L10	9140-0137	1		INDUCTOR RF-CH-MLD 1MH 5% .2DX.45LG Q= 60	28480	9140-0137
A8A3L11	9140-0137	1		INDUCTOR RF-CH-MLD 1MH 5% .2DX.45LG Q= 60	28480	9140-0137
A8A3L12	9140-0137	1		INDUCTOR RF-CH-MLD 1MH 5% .2DX.45LG Q= 60	28480	9140-0137
A8A3L13	08640-80001	5		FILTER, TOROID	28480	08640-80001

† Refer to Section 7 for update information.

\* Factory Selected Component (Refer to Section 5).

Δ Errata part change.

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
A8A3MP1	08640-20211	3	1	GUIDE, CONNECTOR COUNTER	28480	08640-20211
A8A3MP2	08640-40040	8		INSULATOR, SWITCH	28480	08640-40040
A8A3Q1	1854-0019	3	2	TRANSISTOR NPN SI TO-18 PD = 360MW	28480	1854-0019
A8A3Q2	1854-0019	3		TRANSISTOR NPN SI TO-18 PD = 360MW	28480	1854-0019
A8A3Q3	1854-0071	7		TRANSISTOR NPN SI PD = 300MW FT = 200MHZ	28480	1854-0071
A8A3R1	0757-0442	9		RESISTOR 10K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1002-F
A8A3R2	0757-0421	4	2	RESISTOR 825 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1211-F
A8A3R3	0698-3153	9		RESISTOR 3.83K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-3831-F
A8A3R4	1810-0208	8	1	NETWORK-RES 8-SIP10.0K OHM X 7	01121	208A103
A8A3R5-R10				NOT ASSIGNED		
A8A3R11	0757-0442	9		RESISTOR 10K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1002-F
A8A3R12	0757-0442	9		RESISTOR 10K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1002-F
A8A3R13	0698-3151	7	1	RESISTOR 2.87K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-2871-F
A8A3R14	0757-0416	7		RESISTOR 511 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-511R-F
A8A3R15	0757-0442	9		RESISTOR 10K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1002-F
A8A3R16	0757-0416	7		RESISTOR 511 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-511R-F
A8A3R17	0757-0442	9		RESISTOR 10K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1002-F
A8A3R18	0757-0442	9		RESISTOR 10K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1002-F
A8A3R19	0757-1094	9		RESISTOR 1.47K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1471-F
A8A3R20	0698-0083	8		RESISTOR 1.96K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1961-F
A8A3R21	0698-0083	8		RESISTOR 1.96K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1961-F
A8A3R22	0757-0317	7		RESISTOR 1.33K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1331-F
A8A3R23	0698-3157	3		RESISTOR 19.6K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1962-F
A8A3R24	0698-3444	1		RESISTOR 316 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-316R-F
A8A3R25	0698-3444	1		RESISTOR 316 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-316R-F
A8A3R26	0698-7275	4	1	RESISTOR 42.2K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-4222-F
A8A3R27	0698-7215	2		RESISTOR 133 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-133R-F
A8A3R28	0698-7210	7	1	RESISTOR 82.5 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-82R5-F
A8A3R29	0698-7224	3		RESISTOR 316 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-316R-F
A8A3R30	0698-7277	6		RESISTOR 51.1K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-5111-F
A8A3R31	0698-7243	6		RESISTOR 1.96K 1% .05W F TC = + -100	24546	C3-1/8-T0-1961
A8A3S1A	3101-2079	6	1	SWITCH-PB 3-STATION 15MM C-C SPACING	28480	3101-2079
A8A3S1B				PART OF A8A3S1A		
A8A3S1C				PART OF A8A3S1A		
A8A3TP1	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A8A3U1	1820-1442	7	5	IC CNTR TTL LS DECD ASYNCHRO	01295	SN74LS290N
A8A3U2	1820-1112	8		IC FF TTL LS D-TYPE POS-EDGE-TRIG	01295	SN74LS74AN
A8A3U3	1820-1421	2	1	IC SHF-RGTR TTL LS R-S SERIAL-IN PRL-OUT	01295	SN74LS96N
A8A3U4	1820-1442	7		IC CNTR TTL LS DECD ASYNCHRO	01295	SN74LS290N
A8A3U5	1820-1208	3		IC GATE TTL LS OR QUAD 2-INP	01295	SN74LS32N
A8A3U6	1820-1197	9		IC GATE TTL LS NAND QUAD 2-INP	01295	SN74LS00N
A8A3U7	1820-1197	9		IC GATE TTL LS NAND QUAD 2-INP	01295	SN74LS00N
A8A3U8	1820-1431	4	3	IC CNTR TTL LS DECD SYNCHRO	01295	SN74LS162AN
A8A3U9	1820-1442	7		IC CNTR TTL LS DECD ASYNCHRO	01295	SN74LS290N
A8A3U10	1820-1431	4		IC CNTR TTL LS DECD SYNCHRO	01295	SN74LS162AN

†Refer to Section 7 for update information

\*Factory Selected Component (Refer to Section 5)

Δ Errata part change.

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
A8A3U11	1820-1201	6		IC GATE TTL LS AND QUAD 2-INP	01295	SN74LS08N
A8A3U12	1820-1053	6	1	IC SCHMITT-TRIG TTL INV HEX	01295	SN7414N
A8A3U13	1820-1431	4		IC CNTR TTL LS DECD SYNCHRO	01295	SN74LS162AN
A8A3U14	1820-1442	7		IC CNTR TTL LS DECD ASYNCHRO	01295	SN74LS290N
A8A3U15	1820-1442	7		IC CNTR TTL LS DECD ASYNCHRO	01295	SN74LS290N
A8A3VR1	1902-3203	6	1	DIODE-ZNR 14.7V 5% DO-35 PD = .4W	28480	1902-3203
A8A3XA8A4	1251-2035	9		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A8A3Y1	1813-0006	2	1	IC OSC HYBRID 1-INP	28480	1813-0006

**A8A4**

A8A4	08640-60028	4	1	COUNTER RISER BOARD ASSEMBLY	28480	08640-60028
A8A4XA8A2A	1251-2035	9	1	CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035

ⓘ Refer to Section 7 for update information.

\* Factory Selected Component (Refer to Section 5)

Δ Errata part change.

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A9</b>						
<i>1609A AND BELOW</i> A9	08640-60492	6	1	PEAK DEVIATION & RANGE SWITCH ASSEMBLY (SEE SERVICE SHEET D) (INCLUDES A9MP29, A9MP4, A9MP5)	28480	08640-60492
<i>1617A AND ABOVE</i> A9	08640-60325	4	1	PEAK DEVIATION & RANGE SWITCH ASSEMBLY (SEE SERVICE SHEET D) (DOES NOT INCLUDE A9MP29, A9MP4, A9MP5)	28480	08640-60325
A9MP1	0380-0013	1	1	SPACER-RND 1-IN-LG .18-IN-ID .25-IN-OD	00000	ORDER BY DESCRIPTION
A9MP2	2190-0368	8	5	WASHER-LK MTLCL NO.5 .13-IN-ID	28480	2190-0368
A9MP3	0510-0005	8	3	RETAINER-RING BSC EXT .25-IN-DIA STL	28480	0510-0005
A9MP4 <sup>Δ</sup>	3030-0196	3	2	SCREW-SET 4-40 .25-IN-LG FLAT-PT ALY STL	00000	ORDER BY DESCRIPTION
A9MP5	3030-0022	4	2	SCREW-SET 6-32 .125-IN-LG SMALL CUP-PT	00000	ORDER BY DESCRIPTION
A9MP6	0510-0015	0		RETAINER-RING E-R EXT .125-IN-DIA STL	28480	0510-0015
A9MP7	0510-0052	5		RETAINER-RING GRPR EXT .125-IN-DIA STL	28480	0510-0052
A9MP8	3030-0007	5		SCREW-SET 4-40 .125-IN-LG SMALL CUP-PT	00000	ORDER BY DESCRIPTION
A9MP9	1430-0759	0		GEAR-SPUR 48-T 48-DP 14.5-DEG-PA DLRN	28480	1430-0759
A9MP10	1430-0772	7	2	GEAR-BEV 18T 48-DP 20.0-DEG-PA DLRN	28480	1430-0772
A9MP11	1430-0772	7		GEAR-BEV 18T 48-DP 20.0-DEG-PA DLRN	28480	1430-0772
A9MP12	1430-0773	8	1	GEAR-COMB SPUR 48-T 48-DP 14.5-DEG-PA	28480	1430-0773
A9MP13	1430-0774	9	1	GEAR-COMB SPUR DLRN	28480	1430-0774
A9MP14	1460-0019	8		SPRING-CPRSN .384-IN-OD .375-IN-OA-LG	28480	1460-0019
A9MP15	1460-0019	8		SPRING-CPRSN .384-IN-OD .375-IN-OA-LG	28480	1460-0019
A9MP16	1460-0019	8		SPRING-CPRSN .384-IN-OD .375-IN-OA-LG	28480	1460-0019
A9MP17	0380-0005	1	1	SPACER-RND .312-IN-LG .18-IN-ID	28480	0380-0005
A9MP18	3050-0103	4		WASHER-FL MTLCL NO. 12 .25-IN-ID	28480	3050-0103
A9MP19	3050-0103	4		WASHER-FL MTLCL NO. 12 .25-IN-ID	28480	3050-0103
A9MP20	3050-0103	4		WASHER-FL MTLCL NO. 12 .25-IN-ID	28480	3050-0103
A9MP21	3130-0503	8	1	SHAFT & INDEX ASSEMBLY- 11 POS; 30-DEG.	28480	3130-0503
A9MP22	3130-0504	9	1	SHAFT & INDEX ASSEMBLY 1.031 STRUT CTR	28480	3130-0504
A9MP23	08640-00091	5	1	MOUNTING PLATE, DETENTS	28480	08640-00091
A9MP24	08640-00092	6	1	MOUNTING PLATE, GEARS(INCLUDES A9MP43, A9MP44)	28480	08640-00092
A9MP25	08640-00093	7	1	MOUNTING PLATE, POT	28480	08640-00093
A9MP26	08640-00169	8	1	BOARD, SUPPORT	28480	08640-00098
A9MP27	08640-20241	9	2	BUSHING, PLASTIC	28480	08640-20241
A9MP28	08640-20242	0	1	SHAFT, FM GAIN SWITCH	28480	08640-20242
A9MP29	08640-20248	6	1	SWITCH, ROTOR 4-CONTACT(P/O A9A2S1) (DOES NOT INCLUDE A9MP46)	28480	08640-20248
A9MP30	08640-20249	7		SWITCH, ROTOR 3-CONTACT(P/O A9A2S2) (DOES NOT INCLUDE A9MP46)	28480	08640-20249
A9MP31	08640-20250	0	1	SWITCH, ROTOR 2-CONTACT(P/O A9A2S1) (DOES NOT INCLUDE A9MP46)	28480	08640-20250
A9MP32	2360-0220	2	1	SCREW-MACH 6-32 2.25-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
A9MP33	2360-0133	6	2	SCREW-MACH 6-32 1.25-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
A9MP34	2260-0009	3	4	NUT-HEX-W/LKWR 4-40-THD .094-IN-THK	00000	ORDER BY DESCRIPTION
A9MP35				NOT ASSIGNED		
A9MP36	2360-0135	8	1	SCREW-MACH 6-32 1.5-IN-LG PAN-HD-POZI	28480	2360-0135
A9MP37	2200-0107	6	4	SCREW-MACH 4-40 .375-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
A9MP38	0380-0010	8	2	SPACER-RND .625-IN-LG .18-IN-ID	28480	0380-0010
A9MP39 <sup>Δ</sup>	2190-0918	4	3	WASHER-LK HLCL NO. 6 .141-IN-ID	03118	2190-0918
A9MP40	2950-0006	3		NUT-HEX-DBL-CHAM 1/4-32-THD .094-IN-THK	00000	ORDER BY DESCRIPTION

†Refer to Section 7 for update information.

\*Factory Selected Component (Refer to Section 5).

Δ Errata part change.

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A9</b>						
A9MP41	2190-0027	6		WASHER-LK INTL T 1/4 IN .256-IN-ID	28480	2190-0027
A9MP42	3050-0016	8	1	WASHER-FL MTLCL NO. 6 .147-IN-ID	28480	3050-0016
A9MP43	08640-20355	6	2	GEAR-SPUR-28-T; 48-DP;14.5 DEG-PA	28480	08640-20355
A9MP44	08640-20355	6		GEAR-SPUR-28-T; 48-DP;14.5 DEG-PA	28480	08640-20355
A9MP45	2360-0219	7	1	SCREW-MACH 6-32 1.75-IN-LG 100 DEG	00000	ORDER BY DESCRIPTION
A9R1	2100-3435	7	1	RESISTOR-VAR CONTROL C 2.5K 10% LIN	28480	2100-3435
<b>(RETROFIT ONLY)</b>						
A9MP45	08640-60486	8		ADAPTOR BOARD	28480	08640-60486
A9MP46	08654-20090	2	6	LEVELER PADS	28480	08654-20090
A9MP47	2360-0133	6		SCREW-MACH 6-32 1.25-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
A9MP48	3050-0016	8	1	WASHER-FL MTLCL NO. 6 .147-IN-ID	28480	3050-0016
A9MP49	2190-0918	4		WASHER-LK HLCL NO. 6 .141-IN-ID	03118	2190-0918
<b>A9A1</b>						
A9A1	08640-60307	2	1	PEAK DEVIATION BAND SWITCH BD. ASSEMBLY (DOES NOT INCLUDE ROTORS A9A1MP31 AND A9A1MP30, P/O S1 AND S2)	28480	08640-60307
A9A1R1	0698-8299	4	1	RESISTOR 4.259K .25% .125W F TC = 0 + -25	19701	MF4C1/8-T9-4259R-C
A9A1R2	0698-8298	3	1	RESISTOR 1.071K .25% .125W F TC = 0 + -25	19701	MF4C1/8-T9-1071R-C
A9A1R3	0698-8297	2	1	RESISTOR 1.284K .25% .125W F TC = 0 + -25	19701	MF4C1/8-T9-1284R-C
A9A1R4	0757-0398	4		RESISTOR 75 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-75R0-F
A9A1R5	0698-8296	1	1	RESISTOR 1.493K .25% .125W F TC = 0 + -25	19701	MF4C1/8-T9-1493R-C
A9A1R6	0757-0399	5		RESISTOR 82.5 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-82R5-F
A9A1R7	0698-8295	0	1	RESISTOR 1.556K .25% .125W F TC = 0 + -25	19701	MF4C1/8-T9-1556R-C
A9A1R8	0757-0400	9		RESISTOR 90.9 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-90R9-F
A9A1R9	0757-0400	9		RESISTOR 90.9 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-90R9-F
A9A1S1				NSR,INCL. P.C. TRACES & ROTOR A9MP31.		
A9A1S2				NSR,INCL. P.C. TRACES & ROTOR A9MP30.		
<b>2520A TO 2743A</b>						
A9A1W1	8120-2247	5	1	CABLE ASSY 26AWG 16-CNDCT	28480	8120-2247
<b>2828A AND ABOVE</b>						
A9A1W1	8120-5188	9		FLAT RIBBON ASSY 26-AWG 16-COND CONF-D	28480	8120-5188

† Refer to Section 7 for update information.

\* Factory Selected Component (Refer to Section 5).

Δ Errata part change.

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A9A2</b>						
A9A2	08640-60308	3	1	FM GAIN SWITCH BOARD ASSEMBLY (DOES NOT INCLUDE ROTOR A9MP29, P/O S1)	28480	08640-60308
A9A2C1	0140-0191	8	5	CAPACITOR-FXD 56PF + -5% 300VDC MICA	72136	DM15E560J0300WV1CR
A9A2C2	0140-0191	8		CAPACITOR-FXD 56PF + -5% 300VDC MICA	72136	DM15E560J0300WV1CR
A9A2C3	0140-0191	8		CAPACITOR-FXD 56PF + -5% 300VDC MICA	72136	DM15E560J0300WV1CR
A9A2C4	0140-0191	8		CAPACITOR-FXD 56PF + -5% 300VDC MICA	72136	DM15E560J0300WV1CR
A9A2C5	0140-0191	8		CAPACITOR-FXD 56PF + -5% 300VDC MICA	72136	DM15E560J0300WV1CR
A9A2C6*	0160-2204	0		CAPACITOR-FXD 100PF + -5% 300VDC MICA	28480	0160-2204
A9A2C7*	0160-2218	6	1	CAPACITOR-FXD 1000PF + -5% 300VDC MICA	28480	0160-2218
A9A2C8*	0160-2226	6	1	CAPACITOR-FXD 2200PF + -5% 300VDC MICA	28480	0160-2226
A9A2C9				NOT ASSIGNED		
A9A2R1	0757-0280	3		RESISTOR 1K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1001-F
A9A2R2	0757-0278	9	1	RESISTOR 1.78K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1781-F
A9A2R3	0757-0274	5		RESISTOR 1.21K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1211-F
A9A2R4	0757-0416	7		RESISTOR 511 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-511R-F
A9A2R5	0698-0082	7	1	RESISTOR 464 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-4640-F
A9A2R6	0757-0280	3		RESISTOR 1K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1001-F
A9A2R7	0698-7799	7	1	RESISTOR 2K .25% .125W F TC = 0 + -100	19701	MF4C1/8-T0-2001-C
A9A2R8	0698-5669	6	6	RESISTOR 1.5K .25% .125W F TC = 0 + -25	28480	0698-5669
A9A2R9	0698-8212	1	1	RESISTOR 6K .25% .125W F TC = 0 + -25	19701	MF4C1/4-T9-6001-C
A9A2R10	0698-5669	6		RESISTOR 1.5K .25% .125W F TC = 0 + -25	28480	0698-5669
A9A2R11	0698-8213	2	4	RESISTOR 3K .25% .125W F TC = 0 + -25	19701	MF4C1/4-T9-3001-C
A9A2R12	0698-5669	6		RESISTOR 1.5K .25% .125W F TC = 0 + -25	28480	0698-5669
A9A2R13	0698-8213	2		RESISTOR 3K .25% .125W F TC = 0 + -25	19701	MF4C1/4-T9-3001-C
A9A2R14	0757-0280	3		RESISTOR 1K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1001-F
A9A2R15	0698-5669	6		RESISTOR 1.5K .25% .125W F TC = 0 + -25	28480	0698-5669
A9A2R16	0698-8213	2		RESISTOR 3K .25% .125W F TC = 0 + -25	19701	MF4C1/4-T9-3001-C
A9A2R17	0698-5669	6		RESISTOR 1.5K .25% .125W F TC = 0 + -25	28480	0698-5669
A9A2R18	0698-8213	2		RESISTOR 3K .25% .125W F TC = 0 + -25	19701	MF4C1/4-T9-3001-C
A9A2R19	0698-5669	6		RESISTOR 1.5K .25% .125W F TC = 0 + -25	28480	0698-5669
A9A2R20	0757-0447	4	1	RESISTOR 18.2K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1622-F
A9A2S1				NSR,INCLUDES P.C. TRACES & ROTOR A9MP29.		
<i>2620A TO 2743A</i>						
A9A2W1	8120-2246	4	1	CABLE ASSY 26AWG 16-CNDCT	28480	8120-2246
<i>2828A AND ABOVE</i>						
A9A2W1	8120-2247	5	1	CABLE ASSY 26AWG 16-CNDCT	28480	8120-2247

† Refer to Section 7 for update information.

\* Factory Selected Component (Refer to Section 5).

Δ Errata part change.

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A10</b>						
A10	08640-80105	8	1	DIVIDER/FILTER ASSEMBLY (SEE SERVICE SHEET E) (DOES NOT INCLUDE SHAFT COUPLER MP28)	28480	08640-80105
A10MP1	0403-0158	3	1	GUIDE-PC BD YEL POLYC .062-BD-THKNS 1-LG	28480	0403-0158
A10MP2	0403-0157	4	1	GUIDE-PC BD GRN POLYC .062-BD-THKNS 1-LG	28480	0403-0157
A10MP3	0403-0158	5	1	GUIDE-PC BD BLU POLYC .062-BD-THKNS 1-LG	28480	0403-0158
A10MP4	8160-0448	8	1	RFI ROUND STRIP 0.062 +/-0.008 IN OD	28480	8160-0448
A10MP5	08640-00047	1	1	SHIELD, SPRING #1	28480	08640-00047
A10MP6	08640-00048	2	1	SHIELD-SPRING #2	28480	08640-00048
A10MP7	08640-00049	3	1	SHIELD, SPRING #2	28480	08640-00049
A10MP8	08640-00050	6	1	SHIELD, SPRING #4	28480	08640-00050
A10MP9	08640-20268	0	1	CAST, TOP COVER, D/F	28480	08640-20268
A10MP10	08640-20269	1	1	CAST, CENTER, D/F	28480	08640-20269
A10MP11 <sup>Δ</sup>	2190-0108	4	1	WASHER-LK HLCL NO. 4 .115-IN-HD	28480	2190-0108
A10MP12	2200-0101	0	1	SCREW-MACH 4-40 .188-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
A10MP13	2200-0121	4		SCREW-MACH 4-40 1.125-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
A10MP14 <sup>Δ</sup>	2200-0145	2		SCREW-MACH 4-40 .438-IN-LG	28480	2200-0145
A10MP15	2200-0127	0		SCREW-MACH 4-40 1.75-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
A10MP16	2190-0124	4		WASHER-LK INTL T NO. 10 .195-IN-HD	28480	2190-0124
A10MP17	2950-0078	9		NUT-HEX-DBL-CHAM 10-32-THD .067-IN-THK NOT ASSIGNED	28480	2950-0078
A10MP18 <sup>Δ</sup>						
A10MP19	0361-1071	3	1	RIVET-BLIND DOME-HD .125DIA	11815	AAP-4-3
A10MP20 <sup>Δ</sup>	2200-0103	2	1	SCREW-MACH 4-40 .25-IN-LG PAN-HD-POZI	28480	2200-0103
A10MP21 <sup>Δ</sup>	2200-0105	4	1	SCREW-MACH 4-40 .312-IN-LG PAN-HD-POZI	28480	2200-0105

<sup>†</sup>Refer to Section 7 for update information.

\*Factory Selected Component (Refer to Section 5).

<sup>Δ</sup> Errata part change

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A10A1</b>						
A10A1	08640-60204	8	1	RF FILTER ASSEMBLY	28480	08640-60204
A10A1C1	0160-2055	9		CAPACITOR-FXD .01UF + 80-20% 100VDC CER	28480	0160-2055
A10A1C2	0160-2055	9		CAPACITOR-FXD .01UF + 80-20% 100VDC CER	28480	0160-2055
A10A1C3	0160-2055	9		CAPACITOR-FXD .01UF + 80-20% 100VDC CER	28480	0160-2055
A10A1C4	0160-2055	9		CAPACITOR-FXD .01UF + 80-20% 100VDC CER	28480	0160-2055
A10A1C5	0160-2055	9		CAPACITOR-FXD .01UF + 80-20% 100VDC CER	28480	0160-2055
A10A1C6	0160-2055	9		CAPACITOR-FXD .01UF + 80-20% 100VDC CER	28480	0160-2055
A10A1C7	0160-2055	9		CAPACITOR-FXD .01UF + 80-20% 100VDC CER	28480	0160-2055
A10A1C8	0160-2055	9		CAPACITOR-FXD .01UF + 80-20% 100VDC CER	28480	0160-2055
A10A1C9 <sup>Δ</sup>	0160-2530	5	2	CAPACITOR-FXD 180PF +2% 300VDC MICA	02367	CD15FD181G03
A10A1C10	0160-2535	0	2	CAPACITOR-FXD 320PF + -1% 300VDC MICA	28480	0160-2535
A10A1C11	0160-2535	0		CAPACITOR-FXD 320PF + -1% 300VDC MICA	28480	0160-2535
A10A1C12	0160-2328	9	3	CAPACITOR-FXD 200PF + -1% 300VDC MICA	28480	0160-2328
A10A1C13	0160-0183	0	2	CAPACITOR-FXD 130PF + -5% 300VDC MICA	28480	0160-0183
A10A1C14	0160-2328	9		CAPACITOR-FXD 200PF + -1% 300VDC MICA	28480	0160-2328
A10A1C15	0160-2328	9		CAPACITOR-FXD 200PF + -1% 300VDC MICA	28480	0160-2328
A10A1C16	0160-0183	0		CAPACITOR-FXD 130PF + -5% 300VDC MICA	28480	0160-0183
A10A1C17	0160-4456	8	2	CAPACITOR-FXD 750PF + -1% 300VDC MICA	28480	0160-4456
A10A1C18	0160-6183	2	1	CAPACITOR-FXD 3200PF + -1% 100VDC MICA	28480	0160-6183
A10A1C19	0160-2587	2	1	CAPACITOR-FXD 4000PF + -1% 100VDC MICA	28480	0160-2587
A10A1C20	0160-4217	9	1	CAPACITOR-FXD 3900PF + -1% 500VDC MICA	28480	0160-4217
A10A1C21	0160-2276	6	1	CAPACITOR-FXD 2780PF + -2% 300VDC MICA	28480	0160-2276
A10A1C22	0160-6186	5	1	CAPACITOR-FXD 3000PF + -1% 100VDC MICA	28480	0160-6186
A10A1C23	0160-2585	0	2	CAPACITOR-FXD 2000PF + -1% 100VDC MICA	28480	0160-2585
A10A1C24	0160-2537	2	3	CAPACITOR-FXD 360PF + -1% 300VDC MICA	28480	0160-2537
A10A1C25	0160-0341	2	2	CAPACITOR-FXD 640PF + -1% 300VDC MICA	28480	0160-0341
A10A1C26	0160-0341	2		CAPACITOR-FXD 640PF + -1% 300VDC MICA	28480	0160-0341
A10A1C27	0140-0200	0	1	CAPACITOR-FXD 390PF + -5% 300VDC MICA	72136	DM15F391J0300WV1CR
A10A1C28	0140-0199	6	2	CAPACITOR-FXD 240PF + -5% 300VDC MICA	72136	DM15F241J0300WV1CR
A10A1C29	0160-0939	4		CAPACITOR-FXD 430PF + -5% 300VDC MICA	28480	0160-0939
A10A1C30	0160-0939	4		CAPACITOR-FXD 430PF + -5% 300VDC MICA	28480	0160-0939
A10A1C31	0140-0199	6		CAPACITOR-FXD 240PF + -5% 300VDC MICA	72136	DM15F241J0300WV1CR
A10A1C32	0160-2537	2		CAPACITOR-FXD 360PF + -1% 300VDC MICA	28480	0160-2537
A10A1C33 <sup>Δ</sup>	0160-3092	6	1	CAPACITOR-FXD 1600PF + -1% 100VDC MICA	02367	CD19FD162F03
A10A1C34	0160-2585	0		CAPACITOR-FXD 2000PF + -1% 100VDC MICA	28480	0160-2585
A10A1C35	0160-6184	3	1	CAPACITOR-FXD 1916PF + -1% 100VDC MICA	28480	0160-6184
A10A1C36	0160-3939	0	1	CAPACITOR-FXD 1400PF + -1% 100VDC MICA	28480	0160-3939
A10A1C37	0160-3938	9	1	CAPACITOR-FXD 1470PF + -1% 100VDC MICA	28480	0160-3938
A10A1C38	0160-6185	4	2	CAPACITOR-FXD 1000PF + -1% 500VDC MICA	28480	0160-6185
A10A1C39	0160-0335	4	2	CAPACITOR-FXD 91PF + -1% 300VDC MICA 0 + 70	28480	0160-0335
A10A1C40	0160-2206	2		CAPACITOR-FXD 160PF + -5% 300VDC MICA	28480	0160-2206
A10A1C41	0160-2206	2		CAPACITOR-FXD 160PF + -5% 300VDC MICA	28480	0160-2206
A10A1C42	0160-2204	0		CAPACITOR-FXD 100PF + -5% 300VDC MICA	28480	0160-2204
A10A1C43	0160-3083	5		CAPACITOR-FXD 62PF + -1% 500VDC MICA	28480	0160-3083
A10A1C44	0160-6188	7	2	CAPACITOR-FXD 110PF + -1% 300VDC MICA	28480	0160-6188
A10A1C45	0160-6188	7		CAPACITOR-FXD 110PF + -1% 300VDC MICA	28480	0160-6188

†Refer to Section 7 for update information.

\*Factory Selected Component (Refer to Section 5).

Δ Errata part change.



Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
A10A1C46	0160-3083	5		CAPACITOR-FXD 62PF +-1% 500VDC MICA	28480	0160-3083
A10A1C47	0140-0219	1		CAPACITOR-FXD 180PF +-2% 300VDC MICA	72136	DM15F181G0300WV1CR
A10A1C48	0160-3395	2	1	CAPACITOR-FXD 800PF +-1% 300VDC MICA	28480	0160-3395
A10A1C49	0160-6185	4		CAPACITOR-FXD 1000PF +-1% 500VDC MICA	28480	0160-6185
A10A1C50	0160-3935	6	1	CAPACITOR-FXD 958PF +-1% 100VDC MICA	28480	0160-3935
A10A1C51	0160-3936	7	1	CAPACITOR-FXD 700PF +-1% 100VDC MICA	28480	0160-3936
A10A1C52	0160-4456	8		CAPACITOR-FXD 750PF +-1% 300VDC MICA	28480	0160-4456
A10A1C53	0140-0234	0	2	CAPACITOR-FXD 500PF +-1% 300VDC MICA	72136	DM15F501F0300WV1C
A10A1C54 <sup>Δ</sup>	0160-0182	9	1	CAPACITOR-FXD 47PF +-5% 300VDC MICA	02367	CD15ED470J03
A10A1C55	0140-0215	7	2	CAPACITOR-FXD 80PF +-2% 300VDC MICA	71236	DM15E800G0300WV1CR
A10A1C56	0140-0215	7		CAPACITOR-FXD 80PF +-2% 300VDC MICA	71236	DM15E800G0300WV1CR
A10A1C57 <sup>Δ</sup>	0160-4457	9	3	CAPACITOR-FXD 51PF +-5% 300VDC MICA	02367	CD15ED510J03
A10A1C58 <sup>Δ</sup>	0160-2306	3	1	CAPACITOR-FXD 27PF +-5% 300VDC MICA	02367	RDM15E270J3C
<i>3006A AND BELOW</i>						
A10A1C59	0160-2201	7		CAPACITOR-FXD 51PF +-5% 300VDC MICA	28480	0160-2201
A10A1C60	0160-2201	7		CAPACITOR-FXD 51PF +-5% 300VDC MICA	28480	0160-2201
<i>3006A AND ABOVE</i>						
A10A1C59	0160-2307	4		CAPACITOR-FXD 47PF +-5% 300VDC MICA	02367	CD15ED470J03
A10A1C60	0160-2307	4		CAPACITOR-FXD 47PF +-5% 300VDC MICA	02367	CD15ED470J03
A10A1C61 <sup>Δ</sup>	0160-2199	2		CAPACITOR-FXD 30PF +-5% 300VDC MICA	02367	CD15E0300J03
A10A1C62	0160-0335	4		CAPACITOR-FXD 91PF +-1% 300VDC MICA 0 + 70	28480	0160-0335
A10A1C63 <sup>Δ</sup>	0160-2537	2	1	CAPACITOR-FXD 360PF +-1% 300VDC MICA	02367	CD15FD361F03
A10A1C64	0140-0234	0		CAPACITOR-FXD 500PF +-1% 300VDC MICA	72136	DM15F501F0300WV1C
A10A1C65	0160-2542	9	1	CAPACITOR-FXD 480PF +-1% 300VDC MICA	28480	0160-2542
A10A1C66	0160-3934	5	1	CAPACITOR-FXD 350PF +-1% 100VDC MICA	28480	0160-3934
A10A1C67	0160-2537	2		CAPACITOR-FXD 360PF +-1% 300VDC MICA	28480	0160-2537
A10A1C68	0160-3046	0	1	CAPACITOR-FXD 250PF +-1% 100VDC MICA	28480	0160-3046
A10A1C69	0160-2265	3	1	CAPACITOR-FXD 22PF +-5% 500VDC CER 0 + -30	28480	0160-2265
A10A1C70	0140-0190	7	2	CAPACITOR-FXD 39PF +-5% 300VDC MICA	72136	DM15E390J0300WV1CR
A10A1C71	0140-0190	7		CAPACITOR-FXD 39PF +-5% 300VDC MICA	72136	DM15E390J0300WV1CR
A10A1C72	0160-2266	4	3	CAPACITOR-FXD 24PF +-5% 500VDC CER 0 + -30	28480	0160-2266
A10A1C73	0160-2260	8	1	CAPACITOR-FXD 13PF +-5% 500VDC CER 0 + -30	28480	0160-2260
A10A1C74	0160-2266	4		CAPACITOR-FXD 24PF +-5% 500VDC CER 0 + -30	28480	0160-2266
A10A1C75	0160-2266	4		CAPACITOR-FXD 24PF +-5% 500VDC CER 0 + -30	28480	0160-2266
A10A1C76	0160-2262	0	1	CAPACITOR-FXD 16PF +-5% 500VDC CER 0 + -30	28480	0160-2262
A10A1C77	0160-2257	3	2	CAPACITOR-FXD 10PF +-5% 500VDC CER 0 + -60	28480	0160-2257
<i>3006A AND BELOW</i>						
A10A1C78	0160-2263	1	2	CAPACITOR-FXD 18PF +-5% 500VDC CER 0 + -30	28480	0160-2263
A10A1C79	0160-2263	1		CAPACITOR-FXD 18PF +-5% 500VDC CER 0 + -30	28480	0160-2263
<i>3006A AND ABOVE</i>						
A10A1C78	0160-2262	0	2	CAPACITOR-FXD 16PF +-5% 500VDC CER 0 + -30	09538	301-000-C060-160J
A10A1C79	0160-2262	0		CAPACITOR-FXD 16PF +-5% 500VDC CER 0 + -30	09538	301-000-C060-160J
A10A1C80	0160-2257	3		CAPACITOR-FXD 10PF +-5% 500VDC CER 0 + -60	28480	0160-2257
A10A1C81	0121-0060	0	2	CAPACITOR-V TRMR-CER 2-8PF 350V PC-MTG	52763	304322 2/8PF NPO
A10A1C82	0121-0061	1	2	CAPACITOR-V TRMR-CER 5.5-18PF 350V	52763	304322 5.5/18PF NPO
A10A1C83	0121-0061	1		CAPACITOR-V TRMR-CER 5.5-18PF 350V	52763	304322 5.5/18PF NPO
A10A1C84	0121-0060	0		CAPACITOR-V TRMR-CER 2-8PF 350V PC-MTG	52763	304322 2/8PF NPO
A10A1C85	0160-0174	9		CAPACITOR-FXD .47UF + 80-20% 25VDC CER	28480	0160-0174
A10A1C86	0180-0197	8		CAPACITOR-FXD 2.2UF +-10% 20VDC TA	56289	150D225X9020A2
A10A1C87	0160-0174	9		CAPACITOR-FXD .47UF + 80-20% 25VDC CER	28480	0160-0174
A10A1C88	0180-0197	8		CAPACITOR-FXD 2.2UF +-10% 20VDC TA	56289	150D225X9020A2
A10A1C89	0160-0174	9		CAPACITOR-FXD .47UF + 80-20% 25VDC CER	28480	0160-0174
A10A1C90	0180-0197	8		CAPACITOR-FXD 2.2UF +-10% 20VDC TA	56289	150D225X9020A2
A10A1C91	0160-2055	9		CAPACITOR-FXD .01UF + 80-20% 100VDC CER	28480	0160-2055
A10A1FL1	0160-0204	6		FILTER-LOW PASS STUD-TERMS	00779	859554-5
A10A1FL2	0160-0204	6		FILTER-LOW PASS STUD-TERMS	00779	859554-5
A10A1FL3	0160-0204	6		FILTER-LOW PASS STUD-TERMS	00779	859554-5

† Refer to Section 7 for update information.

\* Factory Selected Component (Refer to Section 5).

Δ Errata part change.

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
A10A1J1	1250-1220	0		CONNECTOR-RF SMC M PC 50-OHM	28480	1250-1220
A10A1J2	1250-1220	0		CONNECTOR-RF SMC M PC 50-OHM	28480	1250-1220
A10A1J3	1250-1220	0		CONNECTOR-RF SMC M PC 50-OHM	28480	1250-1220
A10A1J4	1250-1220	0		CONNECTOR-RF SMC M PC 50-OHM	28480	1250-1220
A10A1K1	0490-1073	8		RELAY-REED 1A 250MA 120VAC 4.5VDC-COIL	28480	0490-1073
A10A1K2	0490-1073	8		RELAY-REED 1A 250MA 120VAC 4.5VDC-COIL	28480	0490-1073
A10A1K3	0490-1073	8		RELAY-REED 1A 250MA 120VAC 4.5VDC-COIL	28480	0490-1073
A10A1K4	0490-1073	8		RELAY-REED 1A 250MA 120VAC 4.5VDC-COIL	28480	0490-1073
A10A1L1	9100-3375	1	2	INDUCTOR RF-CH-MLD 462NH 5% .2DX.385LG	28480	9100-3375
A10A1L2	9100-3365	9	2	INDUCTOR RF-CH-MLD 500NH 5% .2DX.385LG	28480	9100-3365
A10A1L3	9100-3375	1		INDUCTOR RF-CH-MLD 462NH 5% .2DX.385LG	28480	9100-3375
A10A1L4	9100-3361	5	2	INDUCTOR RF-CH-MLD 300NH 5% .2DX.385LG	28480	9100-3361
A10A1L5	9100-3362	6	1	INDUCTOR RF-CH-MLD 323NH 5% .2DX.385LG	28480	9100-3362
A10A1L6	9100-3361	5		INDUCTOR RF-CH-MLD 300NH 5% .2DX.385LG	28480	9100-3361
A10A1L7	9100-3364	8	1	INDUCTOR RF-CH-MLD 8UH 5% .2DX.385LG	28480	9100-3364
A10A1L8	9100-3374	0	2	INDUCTOR RF-CH-MLD 4UH 5% .2DX.385LG	28480	9100-3374
A10A1L9	9100-3363	7	1	INDUCTOR RF-CH-MLD 4.74UH 5% .2DX.385LG	28480	9100-3363
A10A1L10	9100-3369	3	2	INDUCTOR RF-CH-MLD 924NH 5% .2DX.385LG	28480	9100-3369
A10A1L11	9100-3370	6	3	INDUCTOR RF-CH-MLD 1UH 5% .2DX.385LG	28480	9100-3370
A10A1L12	9100-3369	3		INDUCTOR RF-CH-MLD 924NH 5% .2DX.385LG	28480	9100-3369
A10A1L13	9100-3368	2	2	INDUCTOR RF-CH-MLD 600NH 5% .2DX.385LG	28480	9100-3368
A10A1L14	9100-3367	1	1	INDUCTOR RF-CH-MLD 646NH 5% .2DX.385LG	28480	9100-3367
A10A1L15	9100-3368	2		INDUCTOR RF-CH-MLD 600NH 5% .2DX.385LG	28480	9100-3368
A10A1L16	9100-3374	0		INDUCTOR RF-CH-MLD 4UH 5% .2DX.385LG	28480	9100-3374
A10A1L17	9100-3372	8	2	INDUCTOR RF-CH-MLD 2UH 5% .2DX.385LG	28480	9100-3372
A10A1L18	9100-3373	9	1	INDUCTOR RF-CH-MLD 2.37UH 5% .2DX.385LG	28480	9100-3373
A10A1L19	9100-3359	1	2	INDUCTOR RF-CH-MLD 231NH 5% .2DX.385LG	28480	9100-3359
A10A1L20	9100-3360	4	1	INDUCTOR RF-CH-MLD 250NH 5% .2DX.385LG	28480	9100-3360
A10A1L21	9100-3359	1		INDUCTOR RF-CH-MLD 231NH 5% .2DX.385LG	28480	9100-3359
A10A1L22	9100-3357	9	2	INDUCTOR RF-CH-MLD 150NH 5% .2DX.385LG	28480	9100-3357
A10A1L23	9100-3358	0	1	INDUCTOR RF-CH-MLD 162NH 5% .2DX.385LG	28480	9100-3358
A10A1L24	9100-3357	9		INDUCTOR RF-CH-MLD 150NH 5% .2DX.385LG	28480	9100-3357
A10A1L25	9100-3372	8		INDUCTOR RF-CH-MLD 2UH 5% .2DX.385LG	28480	9100-3372
A10A1L26	9100-3370	6		INDUCTOR RF-CH-MLD 1UH 5% .2DX.385LG	28480	9100-3370
A10A1L27	9100-3371	7	1	INDUCTOR RF-CH-MLD 1.18UH 5% .2DX.385LG	28480	9100-3371
A10A1L28	9100-3355	7	2	INDUCTOR RF-CH-MLD 115NH 5% .2DX.385LG	28480	9100-3355
A10A1L29	9100-3356	8	1	INDUCTOR RF-CH-MLD 125NH 5% .2DX.385LG	28480	9100-3356
A10A1L30	9100-3355	7		INDUCTOR RF-CH-MLD 115NH 5% .2DX.385LG	28480	9100-3355
A10A1L31	9100-3513	9	3	COIL-VAR 75UH .285DX.4-IN-LG NOM	28480	9100-3513
A10A1L32	9100-3513	9		COIL-VAR 75UH .285DX.4-IN-LG NOM	28480	9100-3513
A10A1L33	9100-3513	9		COIL-VAR 75UH .285DX.4-IN-LG NOM	28480	9100-3513
A10A1L34	9100-3370	6		INDUCTOR RF-CH-MLD 1UH 5% .2DX.385LG	28480	9100-3370
A10A1L35	9100-3365	9		INDUCTOR RF-CH-MLD 500NH 5% .2DX.385LG	28480	9100-3365
A10A1L36	9100-3366	0	1	INDUCTOR RF-CH-MLD 592NH 5% .2DX.385LG	28480	9100-3366
A10A1L37	9100-3512	8	3	COIL-VAR 50UH .285DX.4-IN-LG NOM	28480	9100-3512
A10A1L38	9100-3512	8		COIL-VAR 50UH .285DX.4-IN-LG NOM	28480	9100-3512
A10A1L39	9100-3512	8		COIL-VAR 50UH .285DX.4-IN-LG NOM	28480	9100-3512
A10A1L40	9100-3514	0	6	COIL-VAR 30UH .285DX.4-IN-LG NOM	28480	9100-3514

[Refer to Section 7 for update information.]

\* Factory Selected Component (Refer to Section 5).

△ Errata part change.

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
A10A1L41	9100-3514	0		COIL-VAR 30UH .285DX.4-IN-LG NOM	28480	9100-3514
A10A1L42	9100-3514	0		COIL-VAR 30UH .285DX.4-IN-LG NOM	28480	9100-3514
A10A1L43	9100-3514	0		COIL-VAR 30UH .285DX.4-IN-LG NOM	28480	9100-3514
A10A1L44	9100-3514	0		COIL-VAR 30UH .285DX.4-IN-LG NOM	28480	9100-3514
A10A1L45	9100-3514	0		COIL-VAR 30UH .285DX.4-IN-LG NOM	28480	9100-3514
A10A1L46				PART OF ETCHED CIRCUIT BOARD		
A10A1L47				PART OF ETCHED CIRCUIT BOARD		
A10A1L48				PART OF ETCHED CIRCUIT BOARD		
A10A1L49	9140-0144	0	2	INDUCTOR RF-CH-MLD 4.7UH 10% .105DX.26LG	28480	9140-0144
A10A1L50	9140-0144	0		INDUCTOR RF-CH-MLD 4.7UH 10% .105DX.26LG	28480	9140-0144
A10A1L51	9100-4078	2		INDUCTOR 650H 54%	28480	9100-4078
A10A1L52	9100-4078	2		INDUCTOR 650H 54%	28480	9100-4078
A10A1L53	9100-4078	2		INDUCTOR 650H 54%	28480	9100-4078
A10A1L54	9100-4078	2		INDUCTOR 650H 54%	28480	9100-4078
A10A1MP1	1480-0352	4	1	PIN-STR .055-IN-DIA .75-IN-LG SST	28480	1480-0352
A10A1MP2	00355-20034	4	1	ROLLER, DETENT	28480	00335-20034
A10A1MP3	08640-00029	9	1	SPRING, DETENT	28480	08640-00029
A10A1MP4	08640-20082	6	1	SHAFT, CAM	28480	08640-20082
A10A1MP5	08640-20083	7	1	SHAFT, CAM FOLL	28480	08640-20083
A10A1MP6	08640-20274	8	1	DIVIDER/FILTER COVER (BOTTOM)	28480	08640-20274
A10A1MP7	08640-20214	6	1	BUSHING, CAM HOUSING	28480	08640-20214
A10A1MP8	08640-20283	9	1	COVER, CAM, ALC	28480	08640-20283
A10A1MP9	08640-40004	4	1	FOLLOWER, CAM	28480	08640-40004
A10A1MP10	08640-20394	3	1	CLAMP, SLIDER	28480	08640-20394
A10A1MP11	2200-0105	4		SCREW-MACH 4-40 .312-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
A10A1MP12	08640-20133	8	1	SUPPORT, CLAMP	28480	08640-20133
A10A1MP13	3030-0007	5		SCREW-SET 4-40 .125-IN-LG SMALL CUP-PT	00000	ORDER BY DESCRIPTION
A10A1MP14	2200-0145	2	1	SCREW-MACH 4-40 .438-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
A10A1MP15 <sup>Δ</sup>	0510-0015	0	1	RETAINER-RING E-R EXT .125-IN-DIA STL	05732	1000-12-ST-ZD
A10A1MP16	0510-0015	0		RETAINER-RING E-R EXT .125-IN-DIA STL	28480	0510-0015
A10A1MP17 <sup>Δ</sup>				NOT ASSIGNED		
A10A1R1	0757-0346	2		RESISTOR 10 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-10R0-F
A10A1R2	0757-0346	2		RESISTOR 10 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-10R0-F
A10A1R3	0757-0346	2		RESISTOR 10 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-10R0-F
A10A1R4	0757-0346	2		RESISTOR 10 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-10R0-F
A10A1R5	0757-0346	2		RESISTOR 10 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-10R0-F
A10A1R6	0757-0346	2		RESISTOR 10 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-10R0-F
A10A1R7	0757-0346	2		RESISTOR 10 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-10R0-F
A10A1R8	0757-0346	2		RESISTOR 10 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-10R0-F
A10A1R9	0757-0346	2		RESISTOR 10 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-10R0-F
A10A1S1	08640-60106	9	6	SWITCH, SLIDE D/F	28480	08640-60106
	08640-80013	9	6	CONTACT-SWITCH 0.002-IN	28480	08640-80013
A10A1S2	08640-60106	9		SWITCH, SLIDE D/F	28480	08640-60106
	08640-80013	9		CONTACT-SWITCH 0.002-IN	28480	08640-80013
A10A1S3	08640-60106	9		SWITCH, SLIDE D/F	28480	08640-60106
	08640-80013	9		CONTACT-SWITCH 0.002-IN	28480	08640-80013
A10A1S4	08640-60106	9		SWITCH, SLIDE D/F	28480	08640-60106
	08640-80013	9		CONTACT-SWITCH 0.002-IN	28480	08640-80013
A10A1S5	08640-60106	9		SWITCH, SLIDE D/F	28480	08640-60106
	08640-80013	9		CONTACT-SWITCH 0.002-IN	28480	08640-80013
A10A1S6	08640-60106	9		SWITCH, SLIDE D/F	28480	08640-60106
	08640-80013	9		CONTACT-SWITCH 0.002-IN	28480	08640-80013
A10A1W1	8120-1830	0	1	CABLE ASSY-COAX 50-OHM 2.586-IN-LG	28480	8120-1830
A10A1W2	8120-1832	2	1	CABLE ASSY-COAX 50-OHM .95-IN-LG	28480	8120-1832
A10A1W3	8120-1831	1	1	CABLE ASSY-COAX 50-OHM 1.29-IN-LG	28480	8120-1831
A10A1XA10A3A <sup>Δ</sup>	1251-2035	9		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	03394	220-624-03
A10A1XA10A3B	1251-2026	8	3	CONNECTOR-PC EDGE 18-CONT/ROW 2-ROWS	28480	1251-2026

<sup>†</sup> Refer to Section 7 for update information.

\* Factory Selected Component (Refer to Section 5)

<sup>Δ</sup> Errata part change.

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A10A2</b>						
2520A TO 2828A A10A2	08640-60383	4	1	RF DIVIDER ASSEMBLY	28480	08640-60383
2835A AND ABOVE A10A2	08640-60483	5	1	RF DIVIDER ASSEMBLY	28480	08640-60483
A10A2C1	0180-0374	3	2	CAPACITOR-FXD 10UF + -10% 20VDC TA	56289	150D106X9020B2
A10A2C2	0180-0374	3		CAPACITOR-FXD 10UF + -10% 20VDC TA	56289	150D106X9020B2
2520A TO 2828A A10A2C3	0160-3456	6	16	CAPACITOR-FXD 1000PF + -10% 1KVDC CER	28480	0160-3456
A10A2C4	0160-3456	6		CAPACITOR-FXD 1000PF + -10% 1KVDC CER	28480	0160-3456
2835A AND ABOVE A10A2C3	0160-5099	7	1	CAPACITOR-FXD 3300PF + -5% 100VDC CER	16299	CAC05COG33IJ100A
A10A2C4	0160-5099	7	1	CAPACITOR-FXD 3300PF + -5% 100VDC CER	16299	CAC05COG33IJ100A
A10A2C5				NOT ASSIGNED		
A10A2C6	0160-0576	5		CAPACITOR-FXD .1UF + -20% 50VDC CER	28480	0160-0576
2520A TO 2828A A10A2C7	0180-1743	2	7	CAPACITOR-FXD .1UF + -10% 35VDC TA	56289	150D104X9035A2
2835A AND ABOVE A10A2C7	0160-4835	7	1	CAPACITOR-FXD .1UF + -10% 50VDC CER	28480	0160-4835
A10A2C8				NOT ASSIGNED		
A10A2C9 <sup>Δ</sup>	0160-4574	1		CAP-FXD 1000pF + -10% 100V CER X7R	02010	SA101C102KAAH
A10A2C10 <sup>Δ</sup>	0160-4574	1		CAP-FXD 1000pF + -10% 100V CER X7R	02010	SA101C102KAAH
A10A2C11	0160-3878	6	3	CAPACITOR-FXD 1000PF + -20% 100VDC CER	28480	0160-3878
A10A2C12	0160-3879	7		CAPACITOR-FXD .01UF + -20% 100VDC CER	28480	0160-3879
A10A2C13	0160-3878	6		CAPACITOR-FXD 1000PF + -20% 100VDC CER	28480	0160-3878
A10A2C14 <sup>Δ</sup>	0160-4574	1		CAP-FXD 1000pF + -10% 100V CER X7R	02010	SA101C102KAAH
A10A2C15	0160-3878	6		CAPACITOR-FXD 1000PF + -20% 100VDC CER	28480	0160-3878
A10A2C16	0160-3879	7		CAPACITOR-FXD .01UF + -20% 100VDC CER	28480	0160-3879
A10A2C17	0160-3879	7		CAPACITOR-FXD .01UF + -20% 100VDC CER	28480	0160-3879
A10A2C18	0160-4387	4	1	CAPACITOR-FXD 47PF + -5% 200VDC CER 0 + -30	28480	0160-4387
A10A2C19	0160-4832	4	24	CAP-FXD 0.01uF + -10% 100V CER X7R	02010	SA101C103KAAH
A10A2C20				NOT ASSIGNED		
A10A2C21	0160-3879	7		CAPACITOR-FXD .01UF + -20% 100VDC CER	28480	0160-3879
A10A2C22	0160-3879	7		CAPACITOR-FXD .01UF + -20% 100VDC CER	28480	0160-3879
A10A2C23 <sup>Δ</sup>	0160-4574	1		CAP-FXD 1000pF + -10% 100V CER X7R	02010	SA101C102KAAH
A10A2C24 <sup>Δ</sup>	0160-4574	1		CAP-FXD 1000pF + -10% 100V CER X7R	02010	SA101C102KAAH
A10A2C25 <sup>Δ</sup>	0160-4574	1		CAP-FXD 1000pF + -10% 100V CER X7R	02010	SA101C102KAAH
A10A2C26	0160-4832	4	24	CAP-FXD 0.01uF + -10% 100V CER X7R	02010	SA101C103KAAH
A10A2C27 <sup>Δ</sup>	0160-4574	1		CAP-FXD 1000pF + -10% 100V CER X7R	02010	SA101C102KAAH

† Refer to Section 7 for update information.

\* Factory Selected Component (Refer to Section 5).

Δ Errata part change.

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
A10A2C28 <sup>Δ</sup>	0160-4574	1		CAP-FXD 1000pF +-10% 100V CER X7R	02010	SA101C102KAAH
A10A2C29 <sup>Δ</sup>	0160-4574	1		CAP-FXD 1000pF +-10% 100V CER X7R	02010	SA101C102KAAH
A10A2C30	0160-4832	4	24	CAP-FXD 0.01uF +-10% 100V CER X7R	02010	SA101C103KAAH
A10A2C31	0180-0197	8		CAPACITOR-FXD 2.2UF +-10% 20VDC TA	56289	150D225X9020A2
A10A2C32 <sup>Δ</sup>	0160-4832	4	24	CAP-FXD 0.01uF +-10% 100V CER X7R	02010	SA101C103KAAH
A10A2C33 <sup>Δ</sup>	0160-4832	4	24	CAP-FXD 0.01uF +-10% 100V CER X7R	02010	SA101C103KAAH
A10A2C34 <sup>Δ</sup>	0160-4832	4	24	CAP-FXD 0.01uF +-10% 100V CER X7R	02010	SA101C103KAAH
A10A2C35 <sup>Δ</sup>	0160-4832	4	24	CAP-FXD 0.01uF +-10% 100V CER X7R	02010	SA101C103KAAH
A10A2C36 <sup>Δ</sup>	0160-4574	1		CAP-FXD 1000pF +-10% 100V CER X7R	02010	SA101C102KAAH
A10A2C37 <sup>Δ</sup>	0160-4832	4	24	CAP-FXD 0.01uF +-10% 100V CER X7R	02010	SA101C103KAAH
A10A2C38 <sup>Δ</sup>	0160-4832	4	24	CAP-FXD 0.01uF +-10% 100V CER X7R	02010	SA101C103KAAH
A10A2C39 <sup>Δ</sup>	0160-4574	1		CAP-FXD 1000pF +-10% 100V CER X7R	02010	SA101C102KAAH
A10A2C40 <sup>Δ</sup>	0160-4832	4	24	CAP-FXD 0.01uF +-10% 100V CER X7R	02010	SA101C103KAAH
<i>2520A TO 2828A</i>						
A10A2C41	0180-1743	2		CAPACITOR-FXD .1UF +-10% 35VDC TA	56289	150D104X9035A2
<i>2835A AND ABOVE</i>						
A10A2C41	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A10A2C42 <sup>Δ</sup>	0160-4832	4	24	CAP-FXD 0.01uF +-10% 100V CER X7R	02010	SA101C103KAAH
A10A2C43 <sup>Δ</sup>	0160-4832	4	24	CAP-FXD 0.01uF +-10% 100V CER X7R	02010	SA101C103KAAH
A10A2C44 <sup>Δ</sup>	0160-4832	4	24	CAP-FXD 0.01uF +-10% 100V CER X7R	02010	SA101C103KAAH
<i>2520A TO 2828A</i>						
A10A2C45	0180-1743	2		CAPACITOR-FXD .1UF +-10% 35VDC TA	56289	150D104X9035A2
A10A2C46	0180-1743	2		CAPACITOR-FXD .1UF +-10% 35VDC TA	56289	150D104X9035A2
<i>2835A AND ABOVE</i>						
A10A2C45	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A10A2C46	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A10A2C47 <sup>Δ</sup>	0160-4832	4	24	CAP-FXD 0.01uF +-10% 100V CER X7R	02010	SA101C103KAAH
A10A2C48 <sup>Δ</sup>	0160-4574	1		CAP-FXD 1000pF +-10% 100V CER X7R	02010	SA101C102KAAH
A10A2C49 <sup>Δ</sup>	0160-4574	1		CAP-FXD 1000pF +-10% 100V CER X7R	02010	SA101C102KAAH
<i>2520A TO 2828A</i>						
A10A2C50	0180-1743	2		CAPACITOR-FXD .1UF +-10% 35VDC TA	56289	150D104X9035A2
A10A2C51	0180-1743	2		CAPACITOR-FXD .1UF +-10% 35VDC TA	56289	150D104X9035A2
A10A2C52	0180-1743	2		CAPACITOR-FXD .1UF +-10% 35VDC TA	56289	150D104X9035A2
<i>2835A AND ABOVE</i>						
A10A2C50	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A10A2C51	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A10A2C52	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A10A2C53 <sup>Δ</sup>	0160-4832	4	24	CAP-FXD 0.01uF +-10% 100V CER X7R	02010	SA101C103KAAH
A10A2C54 <sup>Δ</sup>	0160-4832	4	24	CAP-FXD 0.01uF +-10% 100V CER X7R	02010	SA101C103KAAH
A10A2C55 <sup>Δ</sup>	0160-4832	4	24	CAP-FXD 0.01uF +-10% 100V CER X7R	02010	SA101C103KAAH
A10A2C56 <sup>Δ</sup>	0160-4832	4	24	CAP-FXD 0.01uF +-10% 100V CER X7R	02010	SA101C103KAAH
A10A2C57 <sup>Δ</sup>	0160-4574	1		CAP-FXD 1000pF +-10% 100V CER X7R	02010	SA101C102KAAH

<sup>Δ</sup>Refer to Section 7 for update information.

<sup>\*</sup>Factory Selected Component (Refer to Section 5).

<sup>Δ</sup> Errata part change

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
A10A2C58 <sup>Δ</sup>	0160-4832	4	24	CAP-FXD 0.01uF +-10% 100V CER X7R	02010	SA101C103KAAH
A10A2C59	0180-0100	3	2	CAPACITOR-FXD 4.7UF +-10% 35VDC TA	56289	150D475X9035B2
A10A2C60	0180-0197	8		CAPACITOR-FXD 2.2UF +-10% 20VDC TA	56289	150D225X9020A2
A10A2C61 <sup>Δ</sup>	0160-4832	4	24	CAP-FXD 0.01uF +-10% 100V CER X7R	02010	SA101C103KAAH
A10A2C62	0180-0100	3		CAPACITOR-FXD 4.7UF +-10% 35VDC TA	56289	150D475X9035B2
A10A2C63	0180-0197	8		CAPACITOR-FXD 2.2UF +-10% 20VDC TA	56289	150D225X9020A2
A10A2C64	0140-0149	6	2	CAPACITOR-FXD 470PF +-5% 300VDC MICA	72136	DM15F471J0300WV1CR
A10A2C65	0140-0149	6		CAPACITOR-FXD 470PF +-5% 300VDC MICA	72136	DM15F471J0300WV1CR
A10A2C66				NOT ASSIGNED		
A10A2C67				NOT ASSIGNED		
A10A2C68				NOT ASSIGNED		
A10A2C69	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A10A2C70	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A10A2C71				NOT ASSIGNED		
A10A2C72				NOT ASSIGNED		
A10A2C73				NOT ASSIGNED		
A10A2C74	0160-3874	2		CAPACITOR-FXD 10PF +-5PF 200VDC CER	28480	0160-3874
A10A2C75	0160-3875	3	2	CAPACITOR-FXD 22PF +-5% 200VDC CER 0+-30	28480	0160-3875
A10A2CR1	1901-0025	2	18	DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR2	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR3	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR4	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR5	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR6	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR7	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR8	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR9	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR10	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR11	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR12	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR13	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR14	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR15	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR16	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR17	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR18	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
2520A TO 2828A						
A10A2CR19-20				NOT ASSIGNED		
2835A AND ABOVE						
A10A2CR19	1901-1098	1		DIODE-SWITCHING 1N4150 50V 200MA 4NS	9N171	1N4150
A10A2CR20	1901-1098	1		DIODE-SWITCHING 1N4150 50V 200MA 4NS	9N171	1N4150
J1 <sup>Δ</sup>	8159-0005	0	2	RESISTOR-ZERO OHMS 22 AWG	28480	8159-0005
J2 <sup>Δ</sup>	8159-0005	0		RESISTOR-ZERO OHMS 22 AWG	28480	8159-0005

{Refer to Section 7 for update information

\*Factory Selected Component (Refer to Section 5)

Δ Errata part change.

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
A10A2L1	9100-1620	5	4	INDUCTOR RF-CH-MLD 15UH 10% .166DX.385LG	28480	9100-1620
<i>2520A TO 2828A</i>						
A10A2L2	9140-0098	1	2	INDUCTOR RF-CH-MLD 1UH 10% .166DX.385LG	28480	9140-0098
A10A2L3	9140-0098	1		INDUCTOR RF-CH-MLD 1UH 10% .166DX.385LG	28480	9140-0098
<i>2835A AND ABOVE</i>						
A10A2L2	9100-2486	4		INDUCTOR RF-CH-MLD 330NH 5% .166DX.385LG	28480	9100-2486
A10A2L3	9100-2486	4		INDUCTOR RF-CH-MLD 330NH 5% .166DX.385LG	28480	9100-2486
A10A2L4	9100-1612	5	1	INDUCTOR RF-CH-MLD 330NH 20%	28480	9100-1612
A10A2L5				NOT ASSIGNED		
<i>2520A TO 2828A</i>						
A10A2L6	9140-0094	9	1	INDUCTOR RF-CH-MLD 680NH 10%	28480	9140-0094
<i>2835A AND ABOVE</i>						
A10A2L6	9100-2486	4		INDUCTOR RF-CH-MLD 330NH 5% .166DX.385LG	28480	9100-2486
A10A2L7	9100-1615	8	1	INDUCTOR RF-CH-MLD 1.2UH 10%	28480	9100-1615
A10A2L8	9140-0098	3	1	INDUCTOR RF-CH-MLD 2.2UH 10%	28480	9140-0098
A10A2L9	9140-0114	4	1	INDUCTOR RF-CH-MLD 10UH 10% .166DX.385LG	28480	9140-0114
A10A2L10	9100-1620	5		INDUCTOR RF-CH-MLD 15UH 10% .166DX.385LG	28480	9100-1620
A10A2L11	9100-1620	5		INDUCTOR RF-CH-MLD 15UH 10% .166DX.385LG	28480	9100-1620
A10A2L12	9100-1620	5		INDUCTOR RF-CH-MLD 15UH 10% .166DX.385LG	28480	9100-1620
A10A2L13	9100-1628	3	1	INDUCTOR RF-CH-MLD 43UH 5% .166DX385LG	28480	9100-1628
A10A2L14				NOT ASSIGNED		
A10A2L15	9100-3922	4		INDUCTOR-FIXED 120-1300 HZ	28480	9100-3922
<i>2520A TO 2828A</i>						
A10A2L16	9100-3922	4		INDUCTOR-FIXED 120-1300 HZ	28480	9100-3922
<i>2835A AND ABOVE</i>						
A10A2L16				NOT ASSIGNED		
A10A2Q1	1854-0071	7		TRANSISTOR NPN SI PD = 300MW FT = 200MHZ	28480	1854-0071
A10A2Q2	1854-0477	7		TRANSISTOR NPN 2N2222A SI TO-18 PD = 500MW	04713	2N2222A
<i>2520A TO 2828A</i>						
A10A2Q3	1854-0632	6	1	TRANSISTOR NPN SI PD = 180MW FT = 4GHZ	25403	BFR-91
<i>2835A AND ABOVE</i>						
A10A2Q3				NOT ASSIGNED		
A10A2Q4				NOT ASSIGNED		
A10A2Q5				NOT ASSIGNED		
A10A2Q6	1853-0326	3	2	TRANSISTOR PNP SI PD = 1W FT = 50MHZ	04713	MPS-U51
A10A2Q7	1853-0326	3		TRANSISTOR PNP SI PD = 1W FT = 50MHZ	04713	MPS-U51
<i>2520A TO 2828A</i>						
A10A2Q8-Q11				NOT ASSIGNED		
<i>2835A AND ABOVE</i>						
A10A2Q8	1853-0459	3		TRANSISTOR PNP SI PD = 625MW FT = 200MHZ	28480	1853-0459
A10A2Q9	1854-0810	2		TRANSISTOR NPN SI PD = 625MW FT = 200MHZ	28480	1854-0810
A10A2Q10	1854-0810	2		TRANSISTOR NPN SI PD = 625MW FT = 200MHZ	28480	1854-0810
A10A2Q11	1853-0459	3		TRANSISTOR PNP SI PD = 625MW FT = 200MHZ	28480	1843-0459
A10A2R1	0757-1000	7	1	RESISTOR 51.1 1% .5W F TC = 0 + -100	28480	0757-1000
A10A2R2	0698-7284	5		RESISTOR 100K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-1003-F
A10A2R3	0698-7229	8		RESISTOR 511 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-511R-F
A10A2R4	0698-7236	7		RESISTOR 1K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-1001-F
A10A2R5	0698-7236	7		RESISTOR 1K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-1001-F

[Refer to Section 7 for update information.]

\*Factory Selected Component (Refer to Section 5)

Δ Errata part change

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
A10A2R6	0698-7236	7		RESISTOR 1K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-1001-F
A10A2R7	0757-0346	2	9	RESISTOR 10 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-10R0-F
A10A2R8-R10				NOT ASSIGNED		
A10A2R11	0757-0394	0	17	RESISTOR 51.1 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-51R1-F
A10A2R12				NOT ASSIGNED		
A10A2R13	0698-7210	7	4	RESISTOR 82.5 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-82R5-F
A10A2R14	0757-0346	2		RESISTOR 10 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-10R0-F
2520A TO 2828A A10A2R15	0698-7229	8		RESISTOR 511 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-511R-F
2835A AND ABOVE A10A2R15				NOT ASSIGNED		
A10A2R16	0757-0346	2		RESISTOR 10 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-10R0-F
A10A2R17	0757-0438	3	7	RESISTOR 5.11K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-5111-F
A10A2R18	0698-7219	6		RESISTOR 196 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-196R-F
A10A2R19	0757-0394	0		RESISTOR 51.1 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-51R1-F
A10A2R20	0699-1968	2		RESISTOR 68.1 1% .05W F TC = + -100	28480	0699-1968
A10A2R21	0698-7236	7		RESISTOR 1K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-1001-F
A10A2R22	0698-7223	2	3	RESISTOR 287 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-287R-F
2520A TO 2828A A10A2R23*	0698-7212	9	6	RESISTOR 100 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-100R-F
2835A AND ABOVE A10A2R23	0698-7213	0		RESISTOR 110 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-110R-F
A10A2R24	0757-0346	2		RESISTOR 10 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-10R0-F
A10A2R25	0757-0438	3		RESISTOR 5.11K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-5111-F
A10A2R26	0698-7229	8		RESISTOR 511 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-511R-F
A10A2R27	0757-0394	0		RESISTOR 51.1 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-51R1-F
A10A2R28	0698-7188	8		RESISTOR 10 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-10R-F
A10A2R29	0698-7229	8		RESISTOR 511 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-511R-F
A10A2R30	0757-0394	0		RESISTOR 51.1 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-51R1-F
A10A2R31	0757-0394	0		RESISTOR 51.1 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-51R1-F
A10A2R32	0757-0394	0		RESISTOR 51.1 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-51R1-F
A10A2R33	0757-0346	2		RESISTOR 10 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-10R0-F
A10A2R34	0757-0438	3		RESISTOR 5.11K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-5111-F
A10A2R35	0757-0346	2		RESISTOR 10 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-10R0-F
A10A2R36	0757-0394	0		RESISTOR 51.1 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-51R1-F
A10A2R37	0757-0438	3		RESISTOR 5.11K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-5111-F
A10A2R38	0698-7227	6	4	RESISTOR 422 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-422R-F
A10A2R39	0698-7190	2	2	RESISTOR 12.1 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-12R1-F
A10A2R40	0698-7227	6		RESISTOR 422 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-422R-F
A10A2R41	0757-0394	0		RESISTOR 51.1 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-51R1-F
A10A2R42	0757-0394	0		RESISTOR 51.1 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-51R1-F
A10A2R43	0757-0394	0		RESISTOR 51.1 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-51R1-F
A10A2R44	0757-0394	0		RESISTOR 51.1 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-51R1-F
A10A2R45	0757-0346	2		RESISTOR 10 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-10R0-F
A10A2R46	0757-0438	3		RESISTOR 5.11K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-5111-F
A10A2R47	0757-0346	2		RESISTOR 10 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-10R0-F
A10A2R48	0757-0438	3		RESISTOR 5.11K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-5111-F

† Refer to Section 7 for update information.

\* Factory Selected Component (Refer to Section 5).

Δ Errata part change.



Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
A10A2R49	0698-7227	6		RESISTOR 422 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-422R-F
A10A2R50	0698-7190	2		RESISTOR 12.1 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-12R1-F
A10A2R51	0757-0394	0		RESISTOR 51.1 1% .125W F TC = 0 + -100	24546	C4-1/8-TO-51R1-F
A10A2R52	0698-7227	6		RESISTOR 422 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-422R-F
A10A2R53	0757-0394	0		RESISTOR 51.1 1% .125W F TC = 0 + -100	24546	C4-1/8-TO-51R1-F
A10A2R54	0757-0394	0		RESISTOR 51.1 1% .125W F TC = 0 + -100	24546	C4-1/8-TO-51R1-F
A10A2R55	0757-0394	0		RESISTOR 51.1 1% .125W F TC = 0 + -100	24546	C4-1/8-TO-51R1-F
A10A2R56	0757-0442	9	11	RESISTOR 10K 1% .125W F TC = 0 + -100	24546	C4-1/8-TO-1002-F
A10A2R57	0757-0346	2		RESISTOR 10 1% .125W F TC = 0 + -100	24546	C4-1/8-TO-10R0-F
A10A2R58	0757-0394	0		RESISTOR 51.1 1% .125W F TC = 0 + -100	24546	C4-1/8-TO-51R1-F
A10A2R59	0757-0442	9		RESISTOR 10K 1% .125W F TC = 0 + -100	24546	C4-1/8-TO-1002-F
A10A2R60	0698-0085	0	1	RESISTOR 2.61K 1% .125W F TC = 0 + -100	24546	C4-1/8-TO-2611-F
A10A2R61	0757-1094	9	1	RESISTOR 1.47K 1% .125W F TC = 0 + -100	24546	C4-1/8-TO-1471-F
A10A2R62	0757-0438	3		RESISTOR 5.11K 1% .125W F TC = 0 + -100	24546	C4-1/8-TO-5111-F
A10A2R63	0698-3440	7	1	RESISTOR 196 1% .125W F TC = 0 + -100	24546	C4-1/8-TO-196R-F
A10A2R64	0757-0394	0		RESISTOR 51.1 1% .125W F TC = 0 + -100	24546	C4-1/8-TO-51R1-F
A10A2R65	0698-3243	8	1	RESISTOR 178K 1% .125W F TC = 0 + -100	24546	C4-1/8-TO-1783-F
A10A2R66	0698-3444	1	1	RESISTOR 316 1% .125W F TC = 0 + -100	24546	C4-1/8-TO-316R-F
A10A2R67	0757-0280	3	6	RESISTOR 1K 1% .125W F TC = 0 + -100	24546	C4-1/8-TO-1001-F
A10A2R68	0757-0442	9		RESISTOR 10K 1% .125W F TC = 0 + -100	24546	C4-1/8-TO-1002-F
<i>2520A ONLY</i>						
A10A2R69	0698-3447	4	5	RESISTOR 422 1% .125W F TC = 0 + -100	24546	C4-1/8-TO/422R-F
A10A2R70	0757-0379	1	1	RESISTOR 12.1 1% .125W F TC = 0 + -100	19701	MF4C1/8-TO-12R1-F
<i>2532A AND ABOVE</i>						
A10A2R69	0698-3439	8	2	RESISTOR 178 1% .125W F TC = 0 + -100	24546	0698-3439
A10A2R70	0757-0180	2	1	RESISTOR 31.6 1% .125W F TC = 0 + -100	28480	0757-0180
A10A2R71	0757-0280	3		RESISTOR 1K 1% .125W F TC = 0 + -100	24546	C4-1/8-TO-1001-F
<i>2520A ONLY</i>						
A10A2R72	0698-3447	4		RESISTOR 422 1% .125W F TC = 0 + -100	24546	C4-1/8-TO/422R-F
<i>2532A AND ABOVE</i>						
A10A2R72	0698-3439	8	2	RESISTOR 178 1% .125W F TC = 0 + -100	24546	0698-3439
<i>2520A TO 2828A</i>						
A10A2R73*	0698-7209	4	1	RESISTOR 75 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-75R0-F
<i>2835A AND ABOVE</i>						
A10A2R73	0698-7207	2	1	RESISTOR 61.9 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-61R9-F
A10A2R74	0698-7210	7		RESISTOR 82.5 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-82R5-F

† Refer to Section 7 for update information.

\* Factory Selected Component (Refer to Section 5)

Δ Errata part change.

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<i>2520A TO 2828A</i>						
A10A2R75*	0698-7212	9		RESISTOR 100 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-100R-F
<i>2835A AND ABOVE</i>						
A10A2R75	0698-7213	0		RESISTOR 110 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-110R-F
A10A2R76	0698-7210	7		RESISTOR 82.5 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-82R5-F
<i>2520A TO 2828A</i>						
A10A2R77	0698-7223	2		RESISTOR 287 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-287R-F
<i>2835A AND ABOVE</i>				NOT ASSIGNED		
A10A2R78	0698-7215	2		RESISTOR 133 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-133R-F
A10A2R79	0698-7236	7		RESISTOR 1K 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-1001-F
A10A2R80				NOT ASSIGNED		
A10A2R81	0698-7215	2		RESISTOR 133 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-133R-F
A10A2R82	0698-7210	7		RESISTOR 82.5 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-82R5-F
A10A2R83	0698-7236	7		RESISTOR 1K 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-1001-F
A10A2R84	0698-7236	7		RESISTOR 1K 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-1001-F
A10A2R85	0698-7236	7		RESISTOR 1K 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-1001-F
A10A2R86	0698-7236	7		RESISTOR 1K 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-1001-F
A10A2R87	0698-7236	7		RESISTOR 1K 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-1001-F
A10A2R88	0698-7236	7		RESISTOR 1K 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-1001-F
A10A2R89	0698-7236	7		RESISTOR 1K 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-1001-F
A10A2R90-R95				NOT ASSIGNED		
A10A2R96	0698-7236	7		RESISTOR 1K 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-1001-F
A10A2R97	0698-7223	2		RESISTOR 287 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-287R-F
A10A2R98	0698-7215	2		RESISTOR 133 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-133R-F
A10A2R99	0698-7236	7		RESISTOR 1K 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-1001-F
A10A2R100	0698-7236	7		RESISTOR 1K 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-1001-F
A10A2R101	0698-7215	2		RESISTOR 133 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-133R-F
A10A2R102	0757-0280	3		RESISTOR 1K 1% .125W F TC = 0 + -100	24546	C4-1/8-TO-1001-F
A10A2R103	0698-7236	7		RESISTOR 1K 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-1001-F
A10A2R104	0698-7236	7		RESISTOR 1K 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-1001-F
A10A2R105	0698-7236	7		RESISTOR 1K 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-1001-F
<i>2520A TO 2828A</i>						
A10A2R106-R112				NOT ASSIGNED		
<i>2835A AND ABOVE</i>						
A10A2R106	0698-3446	3		RESISTOR 383 1% .125W F TC = 0 + -100	24546	C4-1/8-TO-383R-F
A10A2R107	0757-0419	0		RESISTOR 681 1% .125W F TC = 0 + -100	24546	C4-1/8-TO-681R-F
A10A2R108	0757-0419	0		RESISTOR 681 1% .125W F TC = 0 + -100	24546	C4-1/8-TO-681R-F
A10A2R109	0698-3446	3		RESISTOR 383 1% .125W F TC = 0 + -100	24546	C4-1/8-TO-383R-F
A10A2R110	0698-7190	2		RESISTOR 12.1 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-12R1-F
A10A2R111	0698-7236	7		RESISTOR 1K 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-1001-F
A10A2R112	0698-7236	7		RESISTOR 1K 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-1001-F

†Refer to Section 7 for update information

\*Factory Selected Component (Refer to Section 5).

Δ Errata part change

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
A10A2T1	08640-60355	0	3	TRANSFMR-RF BLU	28480	08640-60355
A10A2T2	08640-60355	0		TRANSFMR-RF BLU	28480	08640-60355
A10A2T3	08640-60355	0		TRANSFMR-RF BLU	28480	08640-60355
A10A2T4	08640-80002	8	1	XFMR RF 12 TURN	28480	08640-80002
A10A2TP1	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A10A2TP2	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A10A2TP3	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A10A2TP4	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A10A2U1	1826-0303	9	1	IC OP AMP GP 8-DIP-P PKG	3L585	CA741G
A10A2U2	1820-0817	8		IC FF ECL D-M/S DUAL	04713	MC10131P
A10A2U3	1820-0817	8		IC FF ECL D-M/S DUAL	04713	MC10131P
A10A2U4	1820-0535	7	1	IC DRVR TTL AND DUAL 2-INP	01295	SN75451BP
A10A2U5	1820-0802	1		IC GATE ECL NOR QUAD 2-INP	04713	MC10102P
A10A2U6	1820-0802	1		IC GATE ECL NOR QUAD 2-INP	04713	MC10102P
A10A2U7	1820-3435	2	1	IC GATE ECL/10K OR-NOR DUAL 4-INP	28480	1820-3435
A10A2U8	1820-0790	6	1	IC GATE ECL OR-NOR DUAL 4-INP	04713	MC1660L
A10A2U9	1820-0803	2	3	IC GATE ECL OR-NOR TPL	04713	MC10105P
A10A2U10	1820-0803	2		IC GATE ECL OR-NOR TPL	04713	MC10105P
A10A2U11	1820-3485	2	2	IC 12090 1 FF-D	28480	1820-3485
A10A2U12	1820-3485	2		IC 12090 1 FF-D	28480	1820-3485
A10A2U13	1820-0803	2		IC GATE ECL OR-NOR TPL	04713	MC10105P
A10A2U14	1820-1225	4	1	IC FF ECL D-M/S DUAL	04713	MC10231P
A10A2U15	1820-0817	8		IC FF ECL D-M/S DUAL	04713	MC10131P
A10A2U16	1820-0802	1		IC GATE ECL NOR QUAD 2-INP	04713	MC10102P
<i>2620A TO 2828A</i>						
<i>A10A2U17</i>				NOT ASSIGNED		
<i>2836A AND ABOVE</i>						
<i>A10A2U17</i>	1813-0212	2		IC WIDEBAND AMPL TO-39 PKG	04713	MWA120
A10A2VR1	1902-0943	5		DIODE-ZNR 2.4V 5% DO-35 PD = .4W TC = -.037%	28480	1902-0943
A10A2W1	08640-20384	1	1	COAX CABLE ASSY	28480	08640-20384
A10A2W2	08640-20385	2	1	COAX CABLE ASSY	28480	08640-20385
A10A2W3	08640-20386	3	1	COAX CABLE ASSY	28480	08640-20386
A10A2W4	08640-20387	4	1	COAX CABLE ASSY	28480	08640-20387
A10A2W5	08640-20388	5	1	COAX CABLE ASSY	28480	08640-20388
A10A2W6	08640-20389	6	1	COAX CABLE ASSY	28480	08640-20389
A10A2W7	08640-20390	9	1	COAX CABLE ASSY	28480	08640-20390
A10A2W8				WIRE JUMPER		
A10A2W9				WIRE JUMPER		

† Refer to Section 7 for update information.

\* Factory Selected Component (Refer to Section 5)

Δ Errata part change

*Table 6-3. Replaceable Parts*

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A10A3</b>						
A10A3	08640-60022	8	2	RISER ASSEMBLY	28480	08640-60022
A10A3XA10A2A	1251-2035	9		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A10A3XA10A2B	1251-2025	8		CONNECTOR-PC EDGE 18-CONT/ROW 2-ROWS	28480	1251-2025

†Refer to Section 7 for update information.

\*Factory Selected Component (Refer to Section 5).

Δ Errata part change.

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A11 STANDARD AND ALL OPTIONS EXCEPT OPTION 001</b>						
A11	08640-60020	6	1	FIXED AUDIO OSCILLATOR ASSEMBLY	28480	08640-60020
A11C1	0160-3548	7	1	CAPACITOR-FXD .01UF + -1% 100VDC MICA	28480	0160-3548
A11C2	0160-0336	5	1	CAPACITOR-FXD 100PF + -1% 300VDC MICA	28480	0160-0336
A11C3	0180-0094	4	2	CAPACITOR-FXD 100UF + 75-10% 25VDC AL	56289	30D107G025DD2
A11C4	0180-0094	4	2	CAPACITOR-FXD 100UF + 75-10% 25VDC AL	56289	30D107G025DD2
A11C5	0180-2206	4	1	CAPACITOR-FXD 60UF + -10% 6VDC TA	56289	150D806X9006B2
A11C6	0180-1746	5	2	CAPACITOR-FXD 15UF + -10% 20VDC TA	56289	150D156X9020B2
A11C7	0180-1746	5	2	CAPACITOR-FXD 15UF + -10% 20VDC TA	56289	150D156X9020B2
A11CR1	1901-0040	1	3	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A11CR2	1901-0040	1	3	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A11CR3	1901-0040	1	3	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A11MP1	4040-0749	4	1	EXTR-PC BD BRN POLYC .062-BD-THKNS	28480	4040-0749
	1480-1116	8	1	PIN-GRV .062-IN-DIA .25-IN-LG STL	28480	1480-0073
A11Q1	1854-0003	5	4	TRANSISTOR NPN SI TO-39 PD = 800MW	28480	1854-0003
	1200-0173	5	4	INSULATOR-XSTR DAP-GL	28480	1200-0173
A11Q2	1854-0003	5	4	TRANSISTOR NPN SI TO-39 PD = 800MW	28480	1854-0003
	1200-0173	5	4	INSULATOR-XSTR DAP-GL	28480	1200-0173
A11Q3 <sup>Δ</sup>	1854-0717	8	2	TRANSISTOR NPN SI PD = 550MW FT = 200MHZ	28480	1854-0717
A11Q4	1854-0003	5	4	TRANSISTOR NPN SI TO-39 PD = 800MW	28480	1854-0003
	1200-0173	5	4	INSULATOR-XSTR DAP-GL	28480	1200-0173
A11Q5	1854-0003	5	4	TRANSISTOR NPN SI TO-39 PD = 800MW	28480	1854-0003
	1200-0173	5	4	INSULATOR-XSTR DAP-GL	28480	1200-0173
A11Q6 <sup>Δ</sup>	1854-0717	8	2	TRANSISTOR NPN SI PD = 550MW FT = 200MHZ	28480	1854-0717
A11R1				NOT ASSIGNED		
A11R2	0757-0346	2	1	RESISTOR 10 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-10R0-F
A11R3	0757-0438	3	4	RESISTOR 5.11K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-5111-F
A11R4	0698-3457	6	1	RESISTOR 316K 1% .125W F TC = 0 + -100	28480	0698-3457
A11R5	0698-0085	0	2	RESISTOR 2.61K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-2611-F
A11R6	2100-1758	3	1	RESISTOR-TRMR 1K 5% WW SIDE-ADJ 1-TRN	28480	2100-1758
A11R7	0698-3151	7	1	RESISTOR 2.87K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-2871-F
A11R8	0757-0280	3	2	RESISTOR 1K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1001-F
A11R9	0698-3453	2	1	RESISTOR 196K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1963-F
A11R10	0757-0280	3	2	RESISTOR 1K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1001-F
A11R11	0757-0438	3	4	RESISTOR 5.11K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-5111-F
A11R12	0757-0438	3	4	RESISTOR 5.11K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-5111-F
A11R13	0757-0438	3	4	RESISTOR 5.11K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-5111-F
A11R14	0698-0085	0	2	RESISTOR 2.61K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-2611-F
A11R15	0757-0401	0	4	RESISTOR 100 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-101-F
A11R16	0757-0401	0	4	RESISTOR 100 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-101-F
A11R17	0757-0401	0	4	RESISTOR 100 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-101-F
A11R18	0757-0401	0	4	RESISTOR 100 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-101-F
A11R19	0698-0024	7	4	RESISTOR 2.61K 1% .5W F TC = 0 + -100	28480	0698-0024
A11R20	0698-0024	7	4	RESISTOR 2.61K 1% .5W F TC = 0 + -100	28480	0698-0024
A11R21	0698-0024	7	4	RESISTOR 2.61K 1% .5W F TC = 0 + -100	28480	0698-0024

{Refer to Section 7 for update information.

\*Factory Selected Component {Refer to Section 5}

Δ Errata part change.

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A11 STANDARD AND ALL OPTIONS EXCEPT OPTION 001</b>						
A11R22	0698-0024	7		RESISTOR 2.61K 1% .5W F TC = 0 + -100	28480	0698-0024
A11R23	0757-1100	8	2	RESISTOR 600 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-601-F
A11R24	0757-1100	8		RESISTOR 600 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-601-F
A11R25	0757-0442	9	2	RESISTOR 10K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1002-F
A11R26	0757-0442	9		RESISTOR 10K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1002-F
A11TP1	1251-0600	0		CONNECTOR = SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A11TP2	1251-0600	0		CONNECTOR = SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A11TP3	1251-0600	0		CONNECTOR = SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A11TP4	1251-0600	0		CONNECTOR = SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A11TP5	1251-0600	0		CONNECTOR = SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A11TP6	1251-0600	0		CONNECTOR = SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A11U1 <sup>Δ</sup>	1820-0271	8	1	IC OP AMP GP 8-DIP-P PKG	03406	LM741CN
A11VR1	1902-0049	2	2	DIODE-ZNR 6.19V 5% DO-35 PD = .4W	28480	1902-0049
A11VR2	1902-0049	2		DIODE-ZNR 6.19V 5% DO-35 PD = .4W STANDARD & ALL OPTIONS EXCEPT 001	28480	1902-0049

<sup>†</sup>Refer to Section 7 for update information.

<sup>\*</sup>Factory Selected Component (Refer to Section 5).

<sup>Δ</sup> Errata part change.

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A11A1 STANDARD AND ALL OPTIONS EXCEPT OPTION 001</b>						
A11A1	08640-60118	1	1	FREQUENCY SELECT SWITCH ASSEMBLY	28480	08640-60118
A11A1MP1	08640-20218	0	1	HOUSING, GEAR SPROCKET, AUDIO	28480	08640-20218
A11A1R1	0698-8272	3	2	RESISTOR 157K 1% .125W F TC = 0 + -100	19701	MF4C1/8-T0-1573-F
A11A1R2	0757-0479	2	2	RESISTOR 392K 1% .125W F TC = 0 + -100	19701	MF4C1/8-T0-3923-F
A11A1R3	0698-8272	3		RESISTOR 157K 1% .125W F TC = 0 + -100	19701	MF4C1/8-T0-1573-F
A11A1R4	0757-0479	2		RESISTOR 392K 1% .125W F TC = 0 + -100	19701	MF4C1/8-T0-3923-F
A11A1S1	3100-3091	2	1	SWITCH-ROTARY 0.812 STRUT CTR SPCG; 2	28480	3100-3091
A11A1MP2	2190-0016	3	1	WASHER-LK INTL T 3/8 IN .377-IN-ID	04805	1920-02
A11A1MP3	2190-0108	4	2	WASHER-LK HLCL NO.4 .115-IN-ID	28480	2190-0108
A11A1MP4	2200-0141	8	2	SCREW-MACH 4-40 .312-IN-LG PAN-HD-POZI	01125	4322
A11A1MP5	2950-0043	8	1	NUT-HEX-DBL-CHAM 3/8-32-THD .094-IN-THK	04605	28200-10-101

† Refer to Section 7 for update information

\* Factory Selected Component (Refer to Section 5)

Δ Errata part change

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A11</b>				<b>OPTION 001 ONLY</b>		
A11	08640-60019	3	1	VARIABLE AUDIO OSCILLATOR ASSEMBLY SEE SERVICE SHEET E DOES NOT INCLUDE MP91-MP93	28480	08640-60019
A11C1	0121-0477	3	1	CAPACITOR-V AIR DIEI 10.3-365.7PF 350V INCLUDES C2 AND C3 PART OF A11C1	80486	2112 MODIFIED
A11C2				PART OF A11C1		
A11C3				PART OF A11C1		
A11C4	0160-2257	3	1	CAPACITOR-FXD 10PF + -5% 500VDC CER 0 + -60	28480	0160-2257
A11C5	0160-2261	9	2	CAPACITOR-FXD 15PF + -5% 500VDC CER 0 + -30	28480	0160-2261
A11C6	0140-0213	5	2	CAPACITOR-FXD 2000PF + -1% 300VDC MICA	72138	DM19F202F0300WV1CR
A11C7	0140-0213	5		CAPACITOR-FXD 2000PF + -1% 300VDC MICA	72138	DM19F202F0300WV1CR
A11C8	0160-2055	9	1	CAPACITOR-FXD .01UF + 80-20% 100VDC CER	28480	0160-2055
A11C9	0121-0036	0	1	CAPACITOR-V TRMR-CER 5.5-18PF 350V	52763	304324 5.5/18PF NPO
A11C10	0180-0374	3	1	CAPACITOR-FXD 10UF + -10% 20VDC TA	56289	150D106X9020B2
A11C11	0160-2204	0	1	CAPACITOR-FXD 100PF + -5% 300VDC MICA	28480	0160-2204
A11C12	0160-2199	2	2	CAPACITOR-FXD 30PF + -5% 300VDC MICA	28480	0160-2199
A11C13	0180-0116	1	4	CAPACITOR-FXD 6.8UF + -10% 35VDC TA	56289	150D685X9035B2
A11C14	0180-0116	1		CAPACITOR-FXD 6.8UF + -10% 35VDC TA	56289	150D685X9035B2
A11C15	0180-1714	7	2	CAPACITOR-FXD 330UF + -10% 6VDC TA	56289	150D337X9006S2
A11C16	0180-1714	7		CAPACITOR-FXD 330UF + -10% 6VDC TA	56289	150D337X9006S2
A11C17	0180-0116	1		CAPACITOR-FXD 6.8UF + -10% 35VDC TA	56289	150D685X9035B2
A11C18	0180-0116	1		CAPACITOR-FXD 6.8UF + -10% 35VDC TA	56289	150D685X9035B2
A11C19	0180-0228	6	1	CAPACITOR-FXD 22UF + -10% 15VDC TA	56289	150D226X9015B2
A11C20	0160-2261	9		CAPACITOR-FXD 15PF + -5% 500VDC CER 0 + -30	28480	0160-2261
A11C21	0160-2236	8	1	CAPACITOR-FXD 1PF + -.25PF 500VDC CER	28480	0160-2236
A11C22	0180-2214	4		CAPACITOR-FXD 90UF + 75 -10% 16VDC AL	56289	30D906G016CC22
A11C23	0180-2214	4		CAPACITOR-FXD 90UF + 75 -10% 16VDC AL	56289	30D906G016CC22
A11C24	0160-2199	2		CAPACITOR-FXD 30PF + -5% 300VDC MICA	28480	0160-2199
A11CR1	1901-0040	1	10	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A11CR2	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A11CR3	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A11CR4	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A11CR5	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A11CR6	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A11CR7	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A11CR8	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A11CR9	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A11CR10	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A11MP1	0340-0037	5	2	TERMINAL-STUD DBL-TUR PRESS-MTG	28480	0340-0037
	0340-0039	7	2	TERMINAL BUSHING - TEFLON: MOUNTS IN	28480	0340-0039
A11MP2	0340-0037	5		TERMINAL-STUD DBL-TUR PRESS-MTG	28480	0340-0037
	0340-0039	7		TERMINAL BUSHING - TEFLON: MOUNTS IN	28480	0340-0039
A11MP3	1430-0764	7	1	GEAR-SPUR 36T 48 DP 14.5-DEG-PA-DLRN	28480	1430-0764
A11MP4	08640-00006	2	1	COVER, AUDIO OSCILLATOR	28480	08640-00006

† Refer to Section 7 for update information.

\* Factory Selected Component (Refer to Section 5).

Δ Errata part change.



Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A11</b>						
<b>OPTION 001 ONLY</b>						
A11MP5	08640-20090	6	1	SUPPORT, COVER, AUDIO OSCILLATOR	28480	08640-20090
A11MP6	08640-00008	4	1	COVER, BACK AUDIO OSCILLATOR	28480	08640-00008
A11MP7	08640-20062	2	1	SPACER, BUSHING	28480	08640-20062
A11MP8	2200-0103	2	1	SCREW-MACH 4-40 .25-IN-LG PAN-HD-POZI	28480	2200-0103
A11MP9	2360-0199	4		SCREW-MACH 6-32 .375-IN-LG RD-HD-SLT	00000	ORDER BY DESCRIPTION
A11MP10	2190-0004	9	1	WASHER-LK INTL T NO. 4 .115-IN-ID	28480	2190-0004
A11MP11	2260-0009	3	1	NUT-HEX-W/LKWR 4-40-THD .094-IN-THK	00000	ORDER BY DESCRIPTION
A11MP12	0403-0026	6	1	PLUG-HOLE BDR-HD FOR .187-D-HOLE NYL	02768	207-120241-03-0101
A11MP13	4040-0749	4	1	EXTR-PC BD BRN POLYC .062-BD-THKNS	28480	4040-0749
	1480-1116	8		PIN-GRV .062-IN-DIA .25-IN-LG STL	28480	1480-0073
A11MP14	2950-0043	8	1	NUT-HEX-DBL-CHAM 3/8-32-THD .094-IN-THK	00000	ORDER BY DESCRIPTION
A11MP15	2190-0016	3	1	WASHER-LK INTL T 3/8 IN .377-IN-ID	28480	2190-0016
A11MP16 <sup>Δ</sup>	3050-0029	3	1	WASHER-FL MTLK 3/8 IN .378-IN-ID	28480	3050-0029
A11MP17	08640-00087	9	1	INSULATOR, VAR. AUDIO OSCILLATOR	28480	08640-00087
A11MP18	3050-0032	8	1	WASHER-FL MTLK NO. 8 .189-IN-ID	28480	3050-0032
A11MP19	2190-0368	8	1	WASHER-FL MTLK NO. 5 .13-IN-ID	28480	2190-0368
A11Q1	1853-0007	7	1	TRANSISTOR PNP 2N3251 SI TO-18 PD = 360MW	04713	2N3251
A11Q2 <sup>Δ</sup>	1854-0071	7	3	TRANSISTOR NPN SI PD = 300MW FT = 200MHZ	28480	1854-0071
A11Q3	1853-0276	2	2	TRANSISTOR PNP SI TO-52 PD = 360MW	04713	MM3906
A11Q4	1854-0351	6	2	TRANSISTOR NPN SI TO-18 PD = 360MW	28480	1854-0351
A11Q5	1854-0003	5	2	TRANSISTOR NPN SI TO-39 PD = 800MW	28480	1854-0003
A11Q6 <sup>Δ</sup>	1854-0003	5		TRANSISTOR NPN SI TO-39 PD = 800MW	28480	1854-0003
A11Q7	1854-0351	6		TRANSISTOR NPN SI TO-18 PD = 360MW	28480	1854-0351
A11Q8	1853-0276	2		TRANSISTOR PNP SI TO-52 PD = 360MW	04713	MM3906
A11Q9	1854-0071	7		TRANSISTOR NPN SI PD = 300MW FT = 200MHZ	28480	1854-0071
A11Q10	1853-0020	4	1	TRANSISTOR PNP SI PD = 300MW FT = 150MHZ	28480	1853-0020
A11Q11	1855-0062	8	1	TRANSISTOR J-FET N-CHAN D-MODE SI	28480	1855-0062
A11Q12	1854-0071	7		TRANSISTOR NPN SI PD = 300MW FT = 200MHZ	28480	1854-0071

<sup>†</sup>Refer to Section 7 for update information.

<sup>\*</sup>Factory Selected Component (Refer to Section 5)

<sup>Δ</sup> Errata part change.

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A11</b>						
<b>OPTION 001 ONLY</b>						
<i>2520A TO 2717A</i>						
A11R1	0699-2039	0	2	RESISTOR 21.5M 1% .6W F TC = 0 + -100	28480	0699-2039
<i>2730A AND ABOVE</i>						
A11R1	0699-0075	0	2	RESISTOR 21.5M 1% .125W F TC = 0 + -150	28480	0699-0075
A11R2	0698-3453	2	2	RESISTOR 196K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1963-F
A11R3	0698-4508	0	1	RESISTOR 78.7K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-7872-F
<i>2520A TO 2717A</i>						
A11R4	0699-2039	0		RESISTOR 21.5M 1% .6W F TC = 0 + -100	28480	0699-2039
<i>2730A AND ABOVE</i>						
A11R4	0699-0075	0	2	RESISTOR 21.5M 1% .125W F TC = 0 + -150	28480	0699-0075
A11R5	0698-3451	0	1	RESISTOR 133K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1333-F
A11R6	0757-0472	5	1	RESISTOR 200K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-2003-F
A11R7	0757-0401	0	8	RESISTOR 100 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-101-F
A11R8	0757-0401	0		RESISTOR 100 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-101-F
A11R9	0757-0441	8	1	RESISTOR 8.25K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-8251-F
A11R10	0757-0447	4	1	RESISTOR 16.2K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1622-F
A11R11	0757-0199	3	5	RESISTOR 21.5K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-2152-F
A11R12	0757-0442	9	6	RESISTOR 10K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1002-F
A11R13	0757-0279	0	2	RESISTOR 3.16K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-3161-F
A11R14	0757-0199	3		RESISTOR 21.5K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-2152-F
A11R15	0698-0082	7	2	RESISTOR 464 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-4640-F
A11R16	0757-0200	7	2	RESISTOR 5.62K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-5621-F
A11R17	0757-0442	9		RESISTOR 10K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1002-F
A11R18	0757-0401	0		RESISTOR 100 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-101-F
A11R19	0757-0395	1	5	RESISTOR 56.2 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-56R2-F
A11R20	0757-0401	0		RESISTOR 100 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-101-F
A11R21	0757-0395	1		RESISTOR 56.2 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-56R2-F
A11R22	0757-0395	1		RESISTOR 56.2 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-56R2-F
A11R23	0757-0346	2	4	RESISTOR 10 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-10R0-F
A11R24	0757-0346	2		RESISTOR 10 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-10R0-F
A11R25	0757-0442	9		RESISTOR 10K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1002-F
A11R26	0698-3156	2	2	RESISTOR 14.7K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1472-F
A11R27	0757-0280	3	2	RESISTOR 1K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1001-F
A11R28	2100-2574	3	1	RESISTOR-TRMR 500 10% C SIDE-ADJ 1-TRN	30983	ET50X501
A11R29				NOT ASSIGNED		
A11R30	0757-0346	2		RESISTOR 10 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-10R0-F
A11R31	0757-0346	2		RESISTOR 10 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-10R0-F
A11R32	0757-0280	3		RESISTOR 1K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1001-F
A11R33	0698-3453	2		RESISTOR 196K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1963-F
<i>2520A TO 2708A</i>						
A11R34	0698-3152	8	1	RESISTOR 3.48K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-3481-F
<i>2714A AND ABOVE</i>						
A11R34	0698-3476	9	1	RESISTOR 6K 1% .125W F TC = 0 + -100	03888	PME55-1/8-T0-6001-F
A11R35	2100-2521	0	2	RESISTOR-TRMR 2K 10% C SIDE-ADJ 1-TRN	30983	ET50X202
A11R36	0757-0290	5	1	RESISTOR 6.19K 1% .125W F TC = 0 + -100	19701	MF4C1/8-T0-6191-F
A11R37	0757-0279	0		RESISTOR 3.16K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-3161-F
A11R38	0757-0199	3		RESISTOR 21.5K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-2152-F
A11R39	0698-3150	6	1	RESISTOR 2.37K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-2371-F
A11R40	2100-2521	0		RESISTOR-TRMR 2K 10% C SIDE-ADJ 1-TRN	30983	ET50X202
A11R41	0698-0082	7		OPTION 001 ONLY RESISTOR 464 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-4640-F
A11R42	0757-0200	7		RESISTOR 5.62K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-5621-F
A11R43	0757-0401	0		RESISTOR 100 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-101-F
A11R44	0757-0401	0		RESISTOR 100 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-101-F
A11R45	0757-0442	9		RESISTOR 10K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1002-F
A11R46	0757-0401	0		RESISTOR 100 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-101-F

† Refer to Section 7 for update information.

\* Factory Selected Component (Refer to Section 5).

Δ Errata part change

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A11</b>						
<b>OPTION 001 ONLY</b>						
A11R47	0757-0401	0		RESISTOR 100 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-101-F
A11R48	0698-3156	2		RESISTOR 14.7K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1472-F
A11R49	0698-0024	7	2	RESISTOR 2.61K 1% .5W F TC = 0 + -100	28480	0698-0024
A11R50	0698-0024	7		RESISTOR 2.61K 1% .5W F TC = 0 + -100	28480	0698-0024
A11R51	0757-0395	1		RESISTOR 56.2 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-56R2-F
A11R52	0757-0395	1		RESISTOR 56.2 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-56R2-F
A11R53	0757-1100	8	2	RESISTOR 600 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-601-F
A11R54	0757-1100	8		RESISTOR 600 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-601-F
A11R55	0757-0442	9		RESISTOR 10K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1002-F
A11R56	0757-0442	9		RESISTOR 10K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1002-F
A11RT1	5080-1718	4	1	THERMISTOR	28480	5080-1718
A11TP1	1251-0600	0		CONNECTOR = SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A11TP2	1251-0600	0		CONNECTOR = SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A11TP3	1251-0600	0		CONNECTOR = SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A11TP4	1251-0600	0		CONNECTOR = SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A11TP5	1251-0600	0		CONNECTOR = SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A11TP6	1251-0600	0		CONNECTOR = SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A11VR1	1902-3059	0	2	DIODE-ZNR 3.83V 5% DO-35 PD = .4W	28480	1902-3059
A11VR2	1902-3059	0		DIODE-ZNR 3.83V 5% DO-35 PD = .4W	28480	1902-3059
				OPTION 001 ONLY		

[Refer to Section 7 for update information.

\*Factory Selected Component (Refer to Section 5).

Δ Errata part change.

*Table 6-3. Replaceable Parts*

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A11A1</b>						
<b>OPTION 001 ONLY</b>						
A11A1	08640-60185	4	1	FREQUENCY SELECT SWITCH ASSEMBLY (INCLUDES A11MP14 THRU MP16) (DOES NOT INCLUDE A11A1MP1 THRU MP6)	28480	08640-60185
A11A1MP1	08640-20218	0	1	HOUSING, GEAR SPROCKET, AUDIO	28480	08640-20218
A11A1MP2	08640-20205	5	1	GEAR SPUR	28480	08640-20205
A11A1MP3	1430-0763	6	1	GEAR-SPUR 36T 48DP 14.5-DEG-PA NYL	28480	1430-0763
A11A1MP5	3030-0007	5	1	SCREW-SET 4-40 .125-IN-LG SMALL CUP-PT	00000	ORDER BY DESCRIPTION
A11A1MP6	3030-0007	5	1	SCREW-SET 4-40 .125-IN-LG SMALL CUP-PT	00000	ORDER BY DESCRIPTION
A11A1R1	0698-4471	6	2	RESISTOR 7.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7151-F
A11A1R2	0757-0199	3		RESISTOR 21.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2152-F
A11A1R3	0698-3454	3	2	RESISTOR 215K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2153-F
A11A1R4	0698-5903	1	2	RESISTOR 2.4M 1% .5W F TC=0+-100	28480	0698-5903
A11A1R5	0698-4471	6		RESISTOR 7.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7151-F
A11A1R6	0757-0199	3		RESISTOR 21.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2152-F
A11A1R7	0698-3454	3		RESISTOR 215K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2153-F
A11A1R8	0698-5903	1		RESISTOR 2.4M 1% .5W F TC=0+-100	28480	0698-5903
A11A1S1	3100-3081	0	1	SWITCH-ROTARY 0.812 STRUT CTR SPCG; 7	28480	3100-3081

† Refer to Section 7 for update information.

\* Factory Selected Component (Refer to Section 5)

Δ Errata part change.

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A12</b>						
A12	08640-60375	4	1	RECTIFIER ASSY	28480	08640-60375
A12C1	0160-5755	2	5	CAPACITOR-FXD .1UF + -10% 100VDC CER	28480	0160-5755
A12C2	0160-5755	2	5	CAPACITOR-FXD .1UF + -10% 100VDC CER	28480	0160-5755
A12C3	0160-5755	2	5	CAPACITOR-FXD .1UF + -10% 100VDC CER	28480	0160-5755
A12C4	0160-5755	2	5	CAPACITOR-FXD .1UF + -10% 100VDC CER	28480	0160-5755
A12C5	0160-5755	2	5	CAPACITOR-FXD .1UF + -10% 100VDC CER	28480	0160-5755
A12CR1	1901-0693	0	16	DIODE-PWR RECT 100V 1A 200NS DO-41	04713	1N4934
A12CR2	1901-0693	0		DIODE-PWR RECT 100V 1A 200NS DO-41	04713	1N4934
A12CR3	1901-0693	0		DIODE-PWR RECT 100V 1A 200NS DO-41	04713	1N4934
A12CR4	1901-0693	0		DIODE-PWR RECT 100V 1A 200NS DO-41	04713	1N4934
A12CR5	1901-0693	0		DIODE-PWR RECT 100V 1A 200NS DO-41	04713	1N4934
A12CR6	1901-0693	0		DIODE-PWR RECT 100V 1A 200NS DO-41	04713	1N4934
A12CR7	1901-0693	0		DIODE-PWR RECT 100V 1A 200NS DO-41	04713	1N4934
A12CR8	1901-0693	0		DIODE-PWR RECT 100V 1A 200NS DO-41	04713	1N4934
A12CR9	1901-0693	0		DIODE-PWR RECT 100V 1A 200NS DO-41	04713	1N4934
A12CR10	1901-0693	0		DIODE-PWR RECT 100V 1A 200NS DO-41	04713	1N4934
A12CR11	1901-0693	0		DIODE-PWR RECT 100V 1A 200NS DO-41	04713	1N4934
A12CR12	1901-0693	0		DIODE-PWR RECT 100V 1A 200NS DO-41	04713	1N4934
A12CR13	1901-0693	0		DIODE-PWR RECT 100V 1A 200NS DO-41	04713	1N4934
A12CR14	1901-0693	0		DIODE-PWR RECT 100V 1A 200NS DO-41	04713	1N4934
A12CR15	1901-0693	0		DIODE-PWR RECT 100V 1A 200NS DO-41	04713	1N4934
A12CR16	1901-0693	0		DIODE-PWR RECT 100V 1A 200NS DO-41	04713	1N4934
A12CR17	1901-0662	3	4	DIODE-PWR RECT 100V 6A	04713	MR751
A12CR18	1901-0662	3		DIODE-PWR RECT 100V 6A	04713	MR751
A12CR19	1901-0662	3		DIODE-PWR RECT 100V 6A	04713	MR751
A12CR20	1901-0662	3		DIODE-PWR RECT 100V 6A	04713	MR751
A12R1	0757-0199	3	1	RESISTOR 21.5K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-2152-F
A12R2	0757-0442	9		RESISTOR 10K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1002-F
A12R3	0757-0442	9		RESISTOR 10K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1002-F
A12R4	0757-0442	9		RESISTOR 10K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1002-F
A12R5	0757-0442	9		RESISTOR 10K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1002-F

† Refer to Section 7 for update information.

\* Factory Selected Component (Refer to Section 5)

Δ Errata part change

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A13</b>						
<i>1609A AND BELOW</i>						
A13	08640-60002	4	1	MODULATION/METERING MOTHER BD. ASSEMBLY (EXCEPT OPTION 004)	28480	08640-60002
A13	08640-60057	9	1	MODULATION/METERING MOTHERBOARD ASSEMBLY (OPTION 004 ONLY)	28480	08640-60057
<i>1617A AND ABOVE</i>						
A13	08640-60300	5	1	MODULATION/METERING MOTHER BD. ASSEMBLY (EXCEPT OPTION 004)	28480	08640-60300
A13	08640-60313	0	1	MODULATION/METERING MOTHERBOARD ASSEMBLY (OPTION 004 ONLY)	28480	08640-60313
A13C1	0180-2208	6	5	CAPACITOR-FXD 220UF + -10% 10VDC TA	56289	150D227X9010S2
A13C2	0180-2208	6		CAPACITOR-FXD 220UF + -10% 10VDC TA	56289	150D227X9010S2
A13C3	0180-2208	6		CAPACITOR-FXD 220UF + -10% 10VDC TA	56289	150D227X9010S2
A13C4	0180-2208	6		CAPACITOR-FXD 220UF + -10% 10VDC TA	56289	150D227X9010S2
A13J1	1250-0257	1	3	CONNECTOR-RF SMB M PC 50-OHM	28480	1250-0257
A13J2				NOT ASSIGNED		
A13J3	1250-0257	1		CONNECTOR-RF SMB M PC 50-OHM	28480	1250-0257
A13J4	1250-0257	1		CONNECTOR-RF SMB M PC 50-OHM	28480	1250-0257
A13J5				NOT ASSIGNED		
A13J6	1200-0507	9	2	SOCKET-IC 16-CONT DIP-SLDR	28480	1200-0507
A13J7	1200-0507	9		SOCKET-IC 16-CONT DIP-SLDR	28480	1200-0507
A13MP1	0403-0026	6		PLUG-HOLE BDR-HD FOR .187-D-HOLE NYL	02768	207-120241-03-0101
A13MP2 <sup>Δ</sup>				NOT ASSIGNED (EXCEPT OPTION 004)		
A13MP2	08640-80040	2		LABEL, INFO (OPTION 004 ONLY)	28480	08640-80040
A13MP3	08640-20211	3	1	GUIDE, CONNECTOR COUNT	28480	08640-20211
A13MP4				NOT ASSIGNED		
A13MP5	0361-0028	8	1	RIVET-SEMITUB OVH .089 DIA .312 LG	00000	ORDER BY DESCRIPTION
A13MP6	1251-0600	0	4	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A13R1	0757-0004	9	1	RESISTOR 860 1% .5W F TC = 0 + -100 (EXCEPT OPTION 004)	28480	0757-0004
A13R1 <sup>Δ</sup>				NOT ASSIGNED (OPTION 004 ONLY)		
A13R2	0757-0442	9		RESISTOR 10K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1002-F
A13R3	2100-2497	9	1	RESISTOR-TRMR 2K 10% C TOP-ADJ 1-TRN	73138	82PR2K
A13R4	0757-0460	1	2	RESISTOR 61.9K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-6192-F
A13R5	0757-0460	1		RESISTOR 61.9K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-6192-F
A13R6	0698-4014	3	1	RESISTOR 787 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-787R-F
A13R7	0757-0442	9		RESISTOR 10K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1002-F
A13S1	08640-60152	5	1	SWITCH, SLIDE P.C. 4R (FM)	28480	08640-60152
	5020-3440	7	2	SPRING:DETENT	28480	5020-3440
	08640-40063	5	2	GUIDE, SLIDE SWITCH	28480	08640-40063
A13S2	08640-60153	6	1	SWITCH, SLIDE P.C. 3R (AM)	28480	08640-60153
	5020-3440	7		SPRING:DETENT	28480	5020-3440
	08640-40063	5		GUIDE, SLIDE SWITCH	28480	08640-40063
A13XA2	1251-2571	8	7	CONNECTOR-PC EDGE 15-CONT/ROW 1-ROW	28480	1251-2571
A13XA5	1251-2571	8		CONNECTOR-PC EDGE 15-CONT/ROW 1-ROW	28480	1251-2571
A13XA7	1251-2571	8		CONNECTOR-PC EDGE 15-CONT/ROW 1-ROW	28480	1251-2571
A13XA11	1251-2571	8		CONNECTOR-PC EDGE 15-CONT/ROW 1-ROW	28480	1251-2571
A13XA15	1251-2035	9	1	CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A13XA3A4	1251-0472	4	1	CONNECTOR-PC EDGE 6-CONT/ROW 2-ROWS	28480	1251-0472
A13XA8 <sup>Δ</sup>				NOT ASSIGNED		
A13XA8A3 <sup>Δ</sup>				NOT ASSIGNED		

† Refer to Section 7 for update information

\* Factory Selected Component (Refer to Section 5)

Δ Errata part change.

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A14</b>						
A14	0960-0443	1	1	LINE MODULE WITH FILTER, BLACK	28480	0960-0443
A14C6	0160-4065	5	1	CAPACITOR .1UF	28480	0160-4065
<i>2835A AND BELOW A14MP1</i>	08640-00026	8	1	LABEL, INFO, LINE VOLTAGE	28480	08640-00026
	0960-0736	2		LINE MODULE SELECTION CARD	28480	0960-0736
<i>2849A AND ABOVE A14MP1<sup>Δ</sup></i>				NOT ASSIGNED		
	0960-0736	2		LINE MODULE SELECTION CARD	28480	0960-0736
<b>A15</b>						
A15	08640-60018	2	1	RISER ASSEMBLY	28480	08640-60018
A15MP1	0403-0153	0	1	GUIDE-PC BD BRN POLYC .062-BD-THKNS 1-LG	28480	0403-0153
A15MP2	0403-0154	1	1	GUIDE-PC BD RED POLYC .062-BD-THKNS 1-LG	28480	0403-0154
A15MP3	0403-0155	2	1	GUIDE-PC BD ORN POLYC .062-BD-THKNS 1-LG	28480	0403-0155
A15XA17	1251-3308	1	1	CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-3308
<b>A16</b>						
<b>NOT ASSIGNED</b>						
<b>A17</b>						
A17	08640-60001	3	1	POWER SUPPLY MOTHER BOARD ASSEMBLY (DOES NOT INCLUDE A17C1, A17R1, A17MP1, A17U1)	28480	08640-60001
A17C1	0150-0121	5		CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0160-0121
A17R1	0698-3444	1		RESISTOR 316 1% .125W F TC --+ -100	24546	C4-1/8-TO-316R-F
A17MP1	1251-2361	4	1	CONTACT-CONN UW-POST-TYPE MALE DPSLDR OPTION 003 ONLY	28480	1251-2361
A17U1	1826-0631	6		IC V REGLTR-ADJ-POS 1.2/33V TO-3 PKG	28480	1826-0631
A17XA12	1251-2034	8	3	CONNECTOR-PC EDGE 10-CONT/ROW 2-ROWS	28480	1251-2034
A17XA18	1251-2571	8		CONNECTOR-PC EDGE 15-CONT/ROW 1-ROW	28480	1251-2571
A17XA20	1251-2571	8		CONNECTOR-PC EDGE 15-CONT/ROW 1-ROW	28480	1251-2571
A17XA22	1251-2571	8		CONNECTOR-PC EDGE 15-CONT/ROW 1-ROW	28480	1251-2571
A17XA24	1251-2034	8		CONNECTOR-PC EDGE 10-CONT/ROW 2-ROWS	28480	1251-2034
A17XA26	1251-2034	8		CONNECTOR-PC EDGE 10-CONT/ROW 2-ROWS	28480	1251-2034

† Refer to Section 7 for update information.

\* Factory Selected Component (Refer to Section 5).

Δ Errata part change

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A14</b>						
A14	0960-0443	1	1	LINE MODULE WITH FILTER, BLACK	28480	0960-0443
A14C6	0160-4065	5	1	CAPACITOR .1UF	28480	0160-4065
<i>2836A AND BELOW</i>						
A14MP1	08640-00026	6	1	LABEL, INFO, LINE VOLTAGE	28480	08640-00026
	0960-0736	2		LINE MODULE SELECTION CARD	28480	0960-0736
<i>2849A AND ABOVE</i>						
A14MP1 <sup>Δ</sup>	0960-0736	2		NOT ASSIGNED LINE MODULE SELECTION CARD	28480	0960-0736
<b>A15</b>						
A15	08640-60018	2	1	RISER ASSEMBLY	28480	08640-60018
A15MP1	0403-0153	0	1	GUIDE-PC BD BRN POLYC .062-BD-THKNS 1-LG	28480	0403-0153
A15MP2	0403-0154	1	1	GUIDE-PC BD RED POLYC .062-BD-THKNS 1-LG	28480	0403-0154
A15MP3	0403-0155	2	1	GUIDE-PC BD ORN POLYC .062-BD-THKNS 1-LG	28480	0403-0155
A15XA17	1251-3308	1	1	CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-3308
<b>A16</b>						
NOT ASSIGNED						
<b>A17</b>						
A17	08640-60001	3	1	POWER SUPPLY MOTHER BOARD ASSEMBLY (DOES NOT INCLUDE A17C1, A17R1, A17MP1, A17U1)	28480	08640-60001
A17C1	0150-0121	5		CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0160-0121
A17R1	0698-3444	1		RESISTOR 316 1% .125W F TC ± ± -100	24546	C4-1/8-TO-316R-F
A17MP1	1251-2361	4	1	CONTACT-CONN U/W-POST-TYPE MALE DPSLDR OPTION 003 ONLY	28480	1251-2361
A17U1	1826-0631	6		IC V REGLTR-ADJ-POS 1.2/33V TO-3 PKG	28480	1826-0631
A17XA12	1251-2034	8	3	CONNECTOR-PC EDGE 10-CONT/ROW 2-ROWS	28480	1251-2034
A17XA18	1251-2571	8		CONNECTOR-PC EDGE 15-CONT/ROW 1-ROW	28480	1251-2571
A17XA20	1251-2571	8		CONNECTOR-PC EDGE 15-CONT/ROW 1-ROW	28480	1251-2571
A17XA22	1251-2571	8		CONNECTOR-PC EDGE 15-CONT/ROW 1-ROW	28480	1251-2571
A17XA24	1251-2034	8		CONNECTOR-PC EDGE 10-CONT/ROW 2-ROWS	28480	1251-2034
A17XA26	1251-2034	8		CONNECTOR-PC EDGE 10-CONT/ROW 2-ROWS	28480	1251-2034

†Refer to Section 7 for update information.

\*Factory Selected Component (Refer to Section 5).

Δ Errata part change



Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A18</b>						
A18	08640-60392	5		-5.2V SUPPLY AND FAN DRIVER ASSEMBLY	28480	08640-60392
A18C1	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A18C2	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A18C3	0180-1974	1	2	CAPACITOR-FXD 10UF +-10% 35VDC TA	56289	150D106X9035R2
A18C4	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A18C5	0180-1974	1	2	CAPACITOR-FXD 10UF +-10% 35VDC TA	56289	150D106X9035R2
A18CR1	1901-0028	5	1	DIODE-PWR RECT 400V 750MA D0-29	28480	1901-0028
A18DS1	1990-0326	3		LED-LAMP LUM-INT = 300UCD IF = 50MA-MAX	28480	5082-4444
A18F1	2110-0425	0	1	FUSE 2A 125V .25X.27	28480	2110-0425
	1251-2313	6		CONNECTOR-SGL CONT SKT .04-IN-BSC-SZ RND	28480	1251-2313
A18MP1 <sup>Δ</sup>	1480-0116	8		PIN-GRV .062-IN-DIA .25-IN-LG STL	28480	1480-0116
	4040-0752	9		EXTR-PC BD YEL POLYC .062-BD-THKNS	28480	4040-0752
A18P1	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A18P2	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A18Q1 <sup>Δ</sup>	1854-0814	6	1	TRANSISTOR NPN SI TO-66 PD = 75W FT = 3MHZ	28480	1854-0814
	2200-0107	6	2	SCREW-MACH 4-40 .375-IN-LG PAN-HD-POZI	28480	2200-0107
	3050-0105	6	2	WASHER-FL MTLN NO. 4 .125-IN-ID	28480	3050-0105
	2260-0001	5	2	NUT-HEX-DBL-CHAM 4-40-THD .094-IN-THK	28480	2260-0001
	2190-0918	4	2	WASHER-LK HLCL NO.6 .141-IN-ID	03118	2190-0918
A18Q2	1854-0637	1	1	TRANSISTOR NPN 2N2219A SI TO-5 PD = 800MW	01295	2N2219A
<i>2520A TO 2910A</i>						
A18Q3	1884-0244	9	1	THYRISTOR-SCR VRRM = 400	3L585	S2600D
	0699-0992	0	1	RESISTOR 227.2 .1% .125W F TC = 0 + -25	28480	0699-0992
<i>2923A AND ABOVE</i>						
A18Q3	1884-0345	1	1	THYRISTOR-SCR VRRM = 400	3L585	S2600D
	0699-0992	0	1	RESISTOR 227.2 .1% .125W F TC = 0 + -25	28480	0699-0992
A18R1	2100-3095	5	1	RESISTOR-TRMR 200 10% C SIDE-ADJ 17-TRN	02111	43P201
A18R2	0757-0422	5	1	RESISTOR 909 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-909R-F
A18R3	0757-0276	7	3	RESISTOR 61.9 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-6192-F
A18R4	0757-0401	0	2	RESISTOR 100 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-101-F
A18R5	0757-0401	0		RESISTOR 100 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-101-F
<i>2520A TO 2910A</i>						
A18R6	0698-3447	4		RESISTOR 422 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-422R-F
<i>2923A AND ABOVE</i>						
A18R6	0757-0316	6		RESISTOR 42.2 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-42R2-F
A18R7	0757-0276	7		RESISTOR 61.9 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-6192-F
A18R8	0757-0276	7		RESISTOR 61.9 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-6192-F
A18R9	0811-2844	5	1	RESISTOR 2.5 5% 10W PW TC = 0 + -50	28480	0811-2844
A18TP1 <sup>Δ</sup>	1251-0600	0	1	CONNECTOR-SGL CONT PIN 1.14-MM-13 SC-SZ SQ	28480	1251-0600
A18TP2 <sup>Δ</sup>	1251-0600	0	1	CONNECTOR-SGL CONT PIN 1.14-MM-13 SC-SZ SQ	28480	1251-0600
A18TP3 <sup>Δ</sup>	1251-0600	0	1	CONNECTOR-SGL CONT PIN 1.14-MM-13 SC-SZ SQ	28480	1251-0600
A18TP4 <sup>Δ</sup>	1251-0600	0	1	CONNECTOR-SGL CONT PIN 1.14-MM-13 SC-SZ SQ	28480	1251-0600
A18VR1	1902-0960	6	1	DIODE-ZNR 12V 5% DO-35 PD = .4W TC = + .077%	28480	1902-0960
A18VR2	1902-0953	7	1	DIODE-ZNR 6.2V 5% DO-35 PD = .4W TC = + .053%	28480	1902-0953
A18VR3	1902-0943	5		DIODE-ZNR 2.4V 5% DO-35 PD = .4W TC = -.037%	28480	1902-0943

†Refer to Section 7 for update information.

\*Factory Selected Component (Refer to Section 5).

Δ Errata part change.

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A19 NOT ASSIGNED (EXCEPT OPTION 004)</b>						
<b>A19 OPTION 004 ONLY</b>						
A19	08640-60060	4	1	OUTPUT LEVEL ASSY, 10 DB (DOES NOT INCLUDE A19MP4) SEE SERVICE SHEET A	28480	08640-60060
A19MP1	0380-0020	0		SPACER-RND .25-IN-LG .128-IN-ID	00000	ORDER BY DESCRIPTION
A19MP2	0380-0072	2	2	SPACER-RND .188-IN-LG .128-IN-ID	28480	0380-0072
A19MP3	0550-0053	0	2	SCREW-MACH 5-40 .75-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
A19MP4	1500-0382	4	1	COUPLER-FLEX 2.45-LG ACTL	28480	1500-0382
A19MP5	2190-0020	9	1	WASHER-LK HLCL NO. 5 .128-IN-ID	28480	2190-0020
A19MP6	2360-0119	8	2	SCREW-MACH 6-32 .438-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
A19MP7	3050-0080	6	2	WASHER-FL NM NO. 5 .13-IN-ID .25-IN-OD	28480	3050-0080
A19MP8 <sup>Δ</sup>	2190-0918	4	2	WASHER-LK HLCL NO. 6 .141-IN-ID	03118	2190-0918
A19MP9	3050-0023	7	2	WASHER-FL NM NO. 6 .144-IN-ID .25-IN-OD	28480	3050-0023
A19S1A	3130-0445	7	1	SECTION-SWITCH SW-SECT,1SECT,1.562 MTG	28480	3130-0445
A19S1B	3130-0446	8	1	SECTION-SWITCH SW-SECT,1SECT,1.562 MTG	28480	3130-0446
<b>A19A1 OPTION 004 ONLY</b>						
A19A1	08640-60061	5	1	ATTENUATOR ASSY	28480	08640-60061
A19A1C1				NOT SEPARATELY REPLACEABLE, P/O A19A1		
A19A1J1				NOT SEPARATELY REPLACEABLE, P/O A19A1		
A19A1J2				NOT SEPARATELY REPLACEABLE, P/O A19A1		
<b>A19A2 OPTION 004 ONLY</b>						
A19A2	08640-60054	6	1	BOARD ASSY, RF VERNIER	28480	08640-60054
A19A2R1	0757-0420	3	1	RESISTOR 750 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-751-F
A19A2R2	0757-0279	0	2	RESISTOR 3.16K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-3161-F
A19A2R3	0698-3150	6	1	RESISTOR 2.37K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-2371-F
A19A2R4	0757-0442	9		RESISTOR 10K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1002-F
A19A2R5	0698-3449	6	1	RESISTOR 28.7K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-2872-F
A19A2R6	0757-0280	3		RESISTOR 1K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1001-F
A19A2R7 <sup>Δ</sup>				NOT ASSIGNED		
A19A2R8 <sup>Δ</sup>				NOT ASSIGNED		
A19A2R9	0698-3447	4		RESISTOR 422 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-422R-F
A19A2TP1	0360-1514	7		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A19A2TP2	0360-1514	7		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514

†Refer to Section 7 for update information.

\*Factory Selected Component (Refer to Section 5).

Δ Errata part change.

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A20</b>						
A20	08640-60005	7	1	REGULATOR ASSEMBLY, +5.2V P +44.6V	28480	08640-60005
A20C1	0160-0153	4	1	CAPACITOR-FXD 1000PF + -10% 200VDC POLYE	28480	0160-0153
A20C2	0180-0229	7		CAPACITOR-FXD 33UF + -10% 10VDC TA	56289	150D336X9010B2
A20C3	0180-0234	4	1	CAPACITOR-FXD 33UF + -20% 75VDC TA	06001	69F286G7
A20C4	0180-0228	6	1	CAPACITOR-FXD 22UF + -10% 15VDC TA	56289	150D226X9015B2
A20C5	0160-0300	3	1	CAPACITOR-FXD 2700PF + -10% 200VDC POLYE	28480	0160-0300
A20C6	0180-2208	6		CAPACITOR-FXD 220UF + -10% 10VDC TA	56289	150D227X9010S2
A20C7	0180-0229	7		CAPACITOR-FXD 33UF + -10% 10VDC TA	56289	150D336X9010B2
A20C8	0160-3094	8	1	CAPACITOR-FXD .1UF + -10% 100VDC CER	28480	0160-3094
A20CR1	1901-0028	5		DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
A20CR2	1901-1098	1		DIODE-SWITCHING 1N4150 50V 200MA 4NS	9N171	1N4150
A20CR3	1901-0028	5		DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
A20CR4	1901-1098	1		DIODE-SWITCHING 1N4150 50V 200MA 4NS	9N171	1N4150
A20CR5	1901-1098	1		DIODE-SWITCHING 1N4150 50V 200MA 4NS	9N171	1N4150
A20DS1	1990-0326	3		LED-LAMP LUM-INT = 300UCD IF = 50MA-MAX	28480	5082-4444
A20DS2	1990-0326	3		LED-LAMP LUM-INT = 300UCD IF = 50MA-MAX	28480	5082-4444
A20F1	2110-0332	8	1	FUSE 3A 125V .25X.27	28480	2110-0332
A20F2	2110-0047	2	1	FUSE 1A 125V .25X.27	71400	GMW-1
A20MP1	4040-0748	3	1	EXTR-PC BD BLK POLYC .062-BD-THKNS	28480	4040-0748
	1480-1116	8		PIN-GRV .062-IN-DIA .25-IN-LG STL	28480	1480-0073
A20MP2	4040-0753	0	1	EXTR-PC BD GRN POLYC .062-BD-THKNS	28480	4040-0753
	1480-1116	8		PIN-GRV .062-IN-DIA .25-IN-LG STL	28480	1480-0073
A20MP3	0340-0669	5		INSULATOR MYLAR	28480	0340-0669
<i>2520A TO 2910A</i>						
A20Q1	1884-0224	9		THYRISTOR-SCR VRRM = 400	3L585	S2600D
	1205-0095	0		HEAT SINK SGL TO-5/TO-39-CS	30161	3225B
<i>2923A AND ABOVE</i>						
A20Q1	1884-0345	1		THYRISTOR-SCR VRRM = 400	3L585	S2600D
	1205-0095	0		HEAT SINK SGL TO-5/TO-39-CS	30161	3225B
A20Q2	1854-0232	2		TRANSISTOR NPN SI TO-39 PD = 1W FT = 15MHZ	28480	1854-0232
A20Q3 <sup>Δ</sup>	1854-1255	1	1	TRANSISTOR NPN SI TO-39 PD = 1W FT = 50MHZ	02037	MM3007
A20Q4	1853-0224	0	1	TRANSISTOR PNP SI TO-39 PD = 1W FT = 15MHZ	3L585	2N5415
A20Q5	1853-0020	4		TRANSISTOR PNP SI PD = 300MW FT = 150MHZ	28480	1853-0020
A20Q6	1854-0023	9	1	TRANSISTOR NPN SI TO-18 PD = 360MW	28480	1854-0023

<sup>†</sup> Refer to Section 7 for update information.

<sup>\*</sup> Factory Selected Component (Refer to Section 5).

<sup>Δ</sup> Errata part change.

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<i>2820A TO 2910A</i>						
A20Q7	1884-0224	5		THYRISTOR-SCR VRRM = 400	3L585	S2600D
	1205-0095	0		HEAT SINK SGL TO-5/TO-39-CS	30161	3225B
<i>2923A AND ABOVE</i>						
A20Q7	1884-0345	1		THYRISTOR-SCR VRRM = 400	3L585	S2600D
	1205-0095	0		HEAT SINK SGL TO-5/TO-39-CS	30161	3225B
A20R1	0698-3160	8	1	RESISTOR 31.6K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-3162-F
A20R2	0698-3438	3		RESISTOR 147 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-147R-F
A20R3	0757-0462	3	1	RESISTOR 75K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-7502-F
A20R4	0698-0083	8	1	RESISTOR 1.96K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1961-F
A20R5	0698-3407	6	1	RESISTOR 1.96K 1% .5W F TC = 0 + -100	28480	0698-3407
A20R6	0698-3155	1	1	RESISTOR 4.64K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-4641-F
A20R7	0698-3449	6	1	RESISTOR 28.7K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-2872-F
A20R8	2100-3154	7	1	RESISTOR-TRMR 1K 10% C SIDE-ADJ 17-TRN	02111	43P102
A20R9	0757-0438	3	1	RESISTOR 5.11K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-5111-F
A20R10	0811-2813	8		RESISTOR 1 5% .75W PW TC = 0 + -50	91637	RS1/2-T2-1R0-J
A20R11	0757-0819	4	1	RESISTOR 909 1% .5W F TC = 0 + -100	28480	0757-0819
A20R12	0757-0397	3		RESISTOR 28.7K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-2872-F
A20R13	0698-3447	4		RESISTOR 422 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-422R-F
A20R14	0811-1668	7	3	RESISTOR 1 5% 2W PW TC = 0 + -800	75042	BWH2-1R0-J
A20R15	0757-0420	3		RESISTOR 750 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-751-F
A20R16	2100-3123	0		RESISTOR-TRMR 500 10% C SIDE-ADJ 17-TRN	02111	43P501
A20R17	0698-3150	6	1	RESISTOR 68.1 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-68R1-F
A20R19	0698-3440	7		RESISTOR 196 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-196R-F
A20R20	0757-0420	3		RESISTOR 750 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-751-F
A20R21	0811-2813	8		RESISTOR 1 5% .75W PW TC = 0 + -50	91637	RS1/2-T2-1R0-J
A20R22	0757-0276	7		RESISTOR 61.9 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-6192-F
A20R23	0757-0397	3		RESISTOR 68.1 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-68R1-F
<i>2820A TO 2910A</i>						
A20R24	0698-3447	4		RESISTOR 422 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-422R-F
<i>2923A AND ABOVE</i>						
A20R24	0757-0394	0		RESISTOR 51.1 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-51R1-F
A20R25	0811-1668	7		RESISTOR 1 5% 2W PW TC = 0 + -800	75042	BWH2-1R0-J
A20R26	0811-1668	7		RESISTOR 1 5% 2W PW TC = 0 + -800	75042	BWH2-1R0-J
A20R27	0698-7246	9		RESISTOR 2.61K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-2611-F
A20TP1	1251-0600	0		CONNECTOR = SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A20TP2	1251-0600	0		CONNECTOR = SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A20TP3	1251-0600	0		CONNECTOR = SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A20TP4	1251-0600	0		CONNECTOR = SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A20TP5	1251-0600	0		CONNECTOR = SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A20TP6	1251-0600	0		CONNECTOR = SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A20TP7	1251-0600	0		CONNECTOR = SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A20TP8	1251-0600	0		CONNECTOR = SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A20TP9	1251-0600	0		CONNECTOR = SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A20TP10	1251-0600	0		CONNECTOR = SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A20U1	1826-0177	5		IC 723 V RGLTR TO-100	15818	723BE
A20U2	1826-0177	5		IC 723 V RGLTR TO-100	15818	723BE

† Refer to Section 7 for update information.

\* Factory Selected Component (Refer to Section 5).

Δ Errata part change.

*Table 6-3. Replaceable Parts*

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
A20VR1	1902-0025	4	1	DIODE-ZNR 10V 5% DO-35 PD = .4W TC = +.06%	28480	1902-0025
A20VR2	1902-3234	3	1	DIODE-ZNR 19.6V 5% DO-35 PD = .4W	28480	1902-3234
A20VR3	1902-0244	9	1	DIODE-ZNR 30V 5% PD = 1W IR = 5UA	28480	1902-0244
A20VR4	1902-3345	7	1	DIODE-ZNR 51.1V 5% DO-35 PD = .4W	28480	1902-3345
A20VR5	1902-3005	6		DIODE-ZNR 2.43V 5% DO-7 PD = .4W TC = -.076%	28480	1902-3005
A20VR6	1902-0049	2		DIODE-ZNR 6.19V 5% DO-35 PD = .4W	28480	1902-0049
A20XF1A	1251-2313	6		CONNECTOR-SGL CONT SKT .04-IN-BSC-SZ RND	28480	1251-2313
A20XF1B	1251-2313	6		CONNECTOR-SGL CONT SKT .04-IN-BSC-SZ RND	28480	1251-2313
A20XF2A	1251-2313	6		CONNECTOR-SGL CONT SKT .04-IN-BSC-SZ RND	28480	1251-2313
A20XF2B	1251-2313	6		CONNECTOR-SGL CONT SKT .04-IN-BSC-SZ RND	28480	1251-2313

† Refer to Section 7 for update information.

\* Factory Selected Component (Refer to Section 5)

Δ Errata part change.

*Table 6-3. Replaceable Parts*

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A21 NOT ASSIGNED (EXCEPT OPTION 003)</b>						
<b>A21 OPTION 003 ONLY</b>						
A21	08640-60176	3	1	REVERSE POWER ASSEMBLY	28480	08640-60176
A21	08640-60220	8	1	REVERSE POWER ASSEMBLY (with OPTION 004)	28480	08640-60220
A21FL1	9135-0002	8	2	FILTER-LOW PASS SOLDER-TERMS	33095	51-744-018
<i>2520A TO 2632A A21FL2 2540A AND ABOVE A21FL2</i>	9135-0002	8		FILTER-LOW PASS SOLDER-TERMS	33095	51-744-018
	3030-0021	3	1	NOT ASSIGNED SCREW-SET 8-32 .125-IN-LG FLAT-PT ALY	00000	ORDER BY DESCRIPTION
A21J1	1250-0829	3	2	CONNECTOR-RF SMC M SGL-HOLE-FR 50-OHM	28480	1250-0829
A21J2	1250-0829	3		CONNECTOR-RF SMC M SGL-HOLE-FR 50-OHM	28480	1250-0829
A21L1	1460-1395	5	2	WIREFORM BE CU TND	28480	1460-1395
A21L2	1460-1395	5		WIREFORM BE CU TND	28480	1460-1395
A21MP1	08640-20191	8	1	HOUSING, REVERSE POWER ASSEMBLY	28480	08640-20191
	08640-00164	3		INSULATOR, RISER	28480	08640-00164
A21MP2	2200-0103	2	1	SCREW-MACH 4-40 .25-IN-LG PAN-HD-POZI	28480	2200-0103

†Refer to Section 7 for update information.

\*Factory Selected Component (Refer to Section 5).

Δ Errata part change.

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A21A1</b>						
<b>OPTION 003 ONLY</b>						
A21A1	08640-60049	9	1	POWER DETECTOR BOARD ASSEMBLY	28480	08640-60049
<i>2520A TO 2714A</i>						
A21A1C1	0160-5765	4	3	CAPACITOR-FXD .1UF 100VDC CER	28480	0160-5765
A21A1C2	0160-5765	4	3	CAPACITOR-FXD .1UF 100VDC CER	28480	0160-5765
<i>2717A AND ABOVE</i>						
A21A1C1	0160-6222	0		CAPACITOR-FXD .1UF +-10% 50VDC CER	06352	C3225X7R1H104K
A21A1C2	0160-6222	0		CAPACITOR-FXD .1UF +-10% 50VDC CER	06352	C3225X7R1H104K
A21A1C3	0160-3879	7	2	CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A21A1C4	0180-0197	8	1	CAPACITOR-FXD 2.2UF +-10% 20VDC TA	56289	150D225X9020A2
A21A1C5	0160-3877	5	1	CAPACITOR-FXD 100PF +-20% 200VDC CER	28480	0160-3877
<i>2520A TO 2714A</i>						
A21A1C6	0160-5765	4	3	CAPACITOR-FXD .1UF 100VDC CER	28480	0160-5765
<i>2717A AND ABOVE</i>						
A21A1C6	0160-6222	0		CAPACITOR-FXD .1UF +-10% 50VDC CER	06352	C3225X7R1H104K
A21A1C7	0160-3875	3	1	CAPACITOR-FXD 22PF +-5% 200VDC CER 0+ -30	28480	0160-3875
A21A1C8	0160-3873	1	1	CAPACITOR-FXD 4.7PF +- .5PF 200VDC CER	28480	0160-3873
A21A1C9	0121-0448	8	1	CAPACITOR-V TRMR-CER 2.5-5PF 63V PC-MTG	28480	0121-0448
A21A1C10	0160-0699	3	1	CAPACITOR-FXD 1PF +- .1PF 100VDC CER	51642	100-100-NP0-109B
A21A1C11	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A21A1CR1	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS D0-35	28480	1901-0050
A21A1CR2	1901-0518	8	2	DIODE-SM SIG SCHOTTKY	28480	1901-0518
A21A1CR3	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS D-35	28480	1901-0050
A21A1CR4	1901-0518	8		DIODE-SM SIG SCHOTTKY	28480	1901-0518
A21A1K1	0490-1073	8	1	RELAY-REED 1A 250MA 120VAC 4.5VDC-COIL	28480	0490-1073
A21A1L1				NOT ASSIGNED		
A21A1L2				NOT ASSIGNED		
A21A1L3	9100-2249	6		INDUCTOR RF-CH-MLD 150NH 10% .105DX.26LG	28480	9100-2249
A21A1MP1	0363-0105	6	2	CONTACT-FINGER .15-WD .062-FREE-HGT	28480	0363-0105
A21A1MP2	0363-0105	6		CONTACT-FINGER .15-WD .062-FREE-HGT	28480	0363-0105
A21A1Q1	1854-0210	6	3	TRANSISTOR NPN 2N2222 SI TO-18 PD = 500MW	04713	2N2222
A21A1Q2	1854-0210	6		TRANSISTOR NPN 2N2222 SI TO-18 PD = 500MW	04713	2N2222
<i>2520A TO 2532A</i>						
A21A1Q3	1854-0210	6		TRANSISTOR NPN 2N2222 SI TO-18 PD = 500MW	04713	2N2222
<i>2540A AND ABOVE</i>						
A21A1Q3				NOT ASSIGNED		

† Refer to Section 7 for update information.

\* Factory Selected Component (Refer to Section 5).

Δ Errata part change.

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
A21A1R1	0698-7241	4	1	RESISTOR 1.62K 1% .05W F TC = 0+ -100	24548	C3-1/8-TO-1621-F
A21A1R2	2100-1988	9	1	RESISTOR-TRMR 1K 10% C TOP-ADJ 1-TRN	73138	82PR1K
A21A1R3	0683-1055	5	1	RESISTOR 1M 5% .25W FC TC = -800/+900	01121	CB1055
A21A1R4	0698-7277	6		RESISTOR 51.1K 1% .05W F TC = 0+ -100	24548	C3-1/8-TO-5112-F
A21A1R5	0698-7212	9	1	RESISTOR 100 1% .05W F TC = 0+ -100	24548	C3-1/8-TO-100R-F
A21A1R6				NOT ASSIGNED		
A21A1R7	0698-7277	6		RESISTOR 51.1K 1% .05W F TC = 0+ -100	24548	C3-1/8-TO-5112-F
A21A1R8	0698-7238	7	1	RESISTOR 1K 1% .05W F TC = 0+ -100	24548	C3-1/8-TO-1001-F
A21A1R9	0698-7229	8		RESISTOR 511 1% .05W F TC = 0+ -100	24548	C3-1/8-TO-511R-F
<i>2520A TO 2532A</i>						
A21A1R10	0698-7229	8		RESISTOR 511 1% .05W F TC = 0+ -100	24548	C3-1/8-TO-511R-F
A21A1R11	0757-0348	2	1	RESISTOR 10 1% .125W F TC = 0+ -100	24548	C4-1/8-TO-10R0-F
<i>2640A AND ABOVE</i>						
A21A1R10				NOT ASSIGNED		
A21A1R11				NOT ASSIGNED		
A21A1U1	1826-0028	3	1	IC COMPARATOR PRCN TO-99 PKG	01295	LM311L
A21A1VR1	1902-0554	4	2	DIODE-ZNR 10V 5% PD = 1W IR = 10UA	28480	1902-0554
A21A1VR2	1902-0244	9	1	DIODE-ZNR 30V 5% PD = 1W IR = 5UA	28480	1902-0244
A21A1VR3	1902-0554	4		DIODE-ZNR 10V 5% PD = 1W IR = 10UA	28480	1902-0554

†Refer to Section 7 for update information

\*Factory Selected Component (Refer to Section 5)

Δ Errata part change



Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A22</b>						
A22	08640-60177	4	1	REGULATOR ASSEMBLY, +20V & -20V	28480	08640-60177
A22C1	0180-0229	7	2	CAPACITOR-FXD 33UF + -10% 10VDC TA	56289	150D336X9010B2
A22C2	0160-3534	1	2	CAPACITOR-FXD 510PF + -5% 100VDC MICA	28480	0160-3534
A22C3	0160-0158	9	2	CAPACITOR-FXD 5600PF + -10% 200VDC POLYE	28480	0160-0158
A22C4	0180-0058	0	2	CAPACITOR-FXD 50UF + 75-10% 25VDC AL	56289	30D506G025CC2
A22C5	0180-0229	7		CAPACITOR-FXD 33UF + -10% 10VDC TA	56289	150D336X9010B2
A22C6	0160-3534	1		CAPACITOR-FXD 510PF + -5% 100VDC MICA	28480	0160-3534
A22C7	0160-0158	9		CAPACITOR-FXD 5600PF + -10% 200VDC POLYE	28480	0160-0158
A22C8	0180-0058	0		CAPACITOR-FXD 50UF + 75-10% 25VDC AL	56289	30D506G025CC2
A22CR1	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A22CR2	1901-0028	5		DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
A22CR3	1901-1098	1		DIODE-SWITCHING 1N4150 50V 200MA 4NS	9N171	1N4150
A22CR4	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A22CR5	1901-1098	1		DIODE-SWITCHING 1N4150 50V 200MA 4NS	9N171	1N4150
A22CR6	1901-0028	5		DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
A22DS1	1990-0326	3	2	LED-LAMP LUM-INT = 300UCD IF = 50MA-MAX	28480	5082-4444
A22DS2	1990-0326	3		LED-LAMP LUM-INT = 300UCD IF = 50MA-MAX	28480	5082-4444
A22F1	2110-0424	9	2	FUSE .75A 125V .25X.27	28480	2110-0424
A22F2	2110-0424	9		FUSE .75A 125V .25X.27	28480	2110-0424
A22MP1	4040-0748	3	1	EXTR-PC BD BLK POLYC .062-BD-THKNS	28480	4040-0748
	1480-1116	8		PIN-GRV .062-IN-DIA .25-IN-LG STL	28480	1480-0073
A22MP2	4040-0754	1	1	EXTR-PC BD BLU POLYC .062-BD-THKNS	28480	4040-0754
	1480-1116	8		PIN-GRV .062-IN-DIA .25-IN-LG STL	28480	1480-0073
<i>2520A TO 2910A</i>						
A22Q1	1884-0244	9		THYRISTOR-SCR VRRM = 400	3L585	52600D
	1205-0095	0		HEAT SINK SGL TO-5/TO-39-CS	30161	3225B
<i>2923A AND ABOVE</i>						
A22Q1	1884-0345	1		THYRISTOR-SCR VRRM = 400	3L585	52600D
	1205-0095	0		HEAT SINK SGL TO-5/TO-39-CS	30161	3225B
A22Q2	1854-0232	2	2	TRANSISTOR NPN SI TO-39 PD = 1W FT = 15MHZ	28480	1854-0232
A22Q3	1854-0232	2		TRANSISTOR NPN SI TO-39 PD = 1W FT = 15MHZ	28480	1854-0232
<i>2520A TO 2910A</i>						
A22Q4	1884-0244	9		THYRISTOR-SCR VRRM = 400	3L585	52600D
	1205-0095	0		HEAT SINK SGL TO-5/TO-39-CS	30161	3225B
<i>2923A AND ABOVE</i>						
A22Q4	1884-0345	1		THYRISTOR-SCR VRRM = 400	3L585	52600D
	1205-0095	0		HEAT SINK SGL TO-5/TO-39-CS	30161	3225B

†Refer to Section 7 for update information.

\*Factory Selected Component (Refer to Section 5).

Δ Errata part change.

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
A22R1	0698-0085	0	2	RESISTOR 2.61K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2611-F
A22R2	0757-0280	3	2	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A22R3	0698-3154	0	2	RESISTOR 4.22K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4221-F
A22R4	0757-0401	0	2	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A22R5	0698-0084	9	2	RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A22R6	0757-0438	3	2	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A22R7	2100-3123	0	2	RESISTOR-TRMR 500 10% C SIDE-ADJ 17-TRN	02111	43P501
A22R8	0683-0275	9	2	RESISTOR 2.7 5% .25W FC TC=-400/+500	01121	CB27G5
A22R9	0698-3132	4	2	RESISTOR 261 1% .125W F TC=0+-100	24546	C4-1/8-T0-2610-F
A22R10	0757-0397	3	2	RESISTOR 68.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-68R1-F
<i>2520A TO 2910A</i>						
A22R11	0698-3447	4	2	RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
<i>2923A AND ABOVE</i>						
A22R11	0698-3440	7		RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8-T0-196R-F
A22R12	0811-1668	9	2	RESISTOR 1.5 5% 2W PW TC=0+-400	75042	BWH2-1R5-J
A22R13	0757-0278	9	2	RESISTOR 1.78K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1781-F
A22R14	0698-0085	0		RESISTOR 2.61K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2611-F
A22R15	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A22R16	0698-3154	0		RESISTOR 4.22K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4221-F
A22R17	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A22R18	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A22R19	2100-3123	0		RESISTOR-TRMR 500 10% C SIDE-ADJ 17-TRN	02111	43P501
A22R20	0698-0084	9		RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A22R21	0683-0275	9		RESISTOR 2.7 5% .25W FC TC=-400/+500	01121	CB27G5
A22R22	0698-3132	4		RESISTOR 261 1% .125W F TC=0+-100	24546	C4-1/8-T0-2610-F
A22R23	0757-0397	3		RESISTOR 68.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-68R1-F
<i>2520A TO 2910A</i>						
A22R24	0698-3447	4		RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
<i>2923A AND ABOVE</i>						
A22R24	0698-3440	7		RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8-T0-196R-F
A22R25	0811-1668	9		RESISTOR 1.5 5% 2W PW TC=0+-400	75042	BWH2-1R5-J
A22R26	0698-7260	7	2	RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-F
A22R27	0698-7260	7		RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-F
A22R28	0757-0278	9		RESISTOR 1.78K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1781-F
A22TP1	1251-0600	0		CONNECTOR=SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A22TP2	1251-0600	0		CONNECTOR=SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A22TP3	1251-0600	0		CONNECTOR=SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A22TP4	1251-0600	0		CONNECTOR=SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A22TP5	1251-0600	0		CONNECTOR=SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A22TP6	1251-0600	0		CONNECTOR=SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A22TP7	1251-0600	0		CONNECTOR=SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A22TP8	1251-0600	0		CONNECTOR=SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A22TP9	1251-0600	0		CONNECTOR=SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A22TP10	1251-0600	0		CONNECTOR=SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600

† Refer to Section 7 for update information.

\* Factory Selected Component (Refer to Section 5).

Δ Errata part change.

*Table 6-3. Replaceable Parts*

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
A22U1	1826-0177	5	2	IC 723 V RGLTR TO-100	15818	723BE
A22U2	1826-0177	5		IC 723 V RGLTR TO-100	15818	723BE
A22VR1	1902-0202	9	2	DIODE-ZNR 15V 5% PD = 1W IR = 5UA	28480	1902-0202
A22VR2	1902-3256	9	2	DIODE-ZNR 23.7V 5% DO-35 PD = .4W	28480	1902-3256
A22VR3	1902-0761	5	2	DIODE-ZNR 1N821 6.2V 5% DO-7 PD = .4W	04713	1N821
A22VR4	1902-0202	9		DIODE-ZNR 15V 5% PD = 1W IR = 5UA	28480	1902-0202
A22VR5	1902-3256	9		DIODE-ZNR 23.7V 5% DO-35 PD = .4W	28480	1902-3256
A22VR6	1902-0761	5		DIODE-ZNR 1N821 6.2V 5% DO-7 PD = .4W	04713	1N821
A22XF1A	1251-2313	6	4	CONNECTOR-SGL CONT SKT .04-IN-BSC-SZ RND	28480	1251-2313
A22XF1B	1251-2313	6		CONNECTOR-SGL CONT SKT .04-IN-BSC-SZ RND	28480	1251-2313
A22XF2A	1251-2313	6		CONNECTOR-SGL CONT SKT .04-IN-BSC-SZ RND	28480	1251-2313
A22XF2B	1251-2313	6		CONNECTOR-SGL CONT SKT .04-IN-BSC-SZ RND	28480	1251-2313

†Refer to Section 7 for update information.

\*Factory Selected Component (Refer to Section 5)

Δ Errata part change

*Table 6-3. Replaceable Parts*

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A23</b>						
<b>NOT ASSIGNED</b>						
<b>A24</b>						
A24	08640-60007	9	1	SERIES REGULATOR SOCKET ASSEMBLY	28480	08640-60007
A24MP1	0403-0152	9	1	GUIDE-PC BD BLK POLYC .062-BD-THKNS 1-LG	28480	0403-0152
A24MP2	0361-0009	5	1	RIVET-SEMITUB OVH .123 DIA .188LG	00000	ORDER BY DESCRIPTION
A24XQ1	1200-0041	6	4	SOCKET-XSTR 2-CONT TO-3 SLDR-EYE	28480	1200-0041
A24XQ2	1200-0041	6		SOCKET-XSTR 2-CONT TO-3 SLDR-EYE	28480	1200-0041
A24XQ3	1200-0041	6		SOCKET-XSTR 2-CONT TO-3 SLDR-EYE	28480	1200-0041
A24XQ4	1200-0041	6		SOCKET-XSTR 2-CONT TO-3 SLDR-EYE	28480	1200-0041
<b>A25</b>						
<b>NOT ASSIGNED</b>						

†Refer to Section 7 for update information.

\*Factory Selected Component (Refer to Section 5).

Δ Errata part change

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A26</b>		<b>STANDARD</b>				
<b>(OPTION 002, 004 SEE RESPECTIVE LISTING)</b>						
A26	08640-60318	5	1	AM CASTING ASSEMBLY (SEE SERVICE SHEET F) (EXCEPT OPTION 002, 004)	28480	08640-60318
A26C1	0160-2049	1	10	CAPACITOR-FDTHRU 5000PF +80 -20% 500V	33095	54-743-009-X5V0-502Z
A26C2	0160-2049	1		CAPACITOR-FDTHRU 5000PF +80 -20% 500V	33095	54-743-009-X5V0-502Z
A26C3	0160-3219	9	5	CAPACITOR-FDTHRU 100PF 20% 500V CER	28480	0160-3219
A26C4	0160-3219	9		CAPACITOR-FDTHRU 100PF 20% 500V CER	28480	0160-3219
A26C5	0160-2049	1		CAPACITOR-FDTHRU 5000PF +80 -20% 500V	33095	54-743-009-X5V0-502Z
A26C6	0160-2049	1		CAPACITOR-FDTHRU 5000PF +80 -20% 500V	33095	54-743-009-X5V0-502Z
A26C7	0160-2049	1		CAPACITOR-FDTHRU 5000PF +80 -20% 500V	33095	54-743-009-X5V0-502Z
A26C8	0160-2049	1		CAPACITOR-FDTHRU 5000PF +80 -20% 500V	33095	54-743-009-X5V0-502Z
A26C9	0160-2049	1		CAPACITOR-FDTHRU 5000PF +80 -20% 500V	33095	54-743-009-X5V0-502Z
A26C10	0160-2049	1		CAPACITOR-FDTHRU 5000PF +80 -20% 500V	33095	54-743-009-X5V0-502Z
A26C11				NOT ASSIGNED		
A26C12				NOT ASSIGNED		
A26C13	0160-3961	8	1	CAPACITOR-FDTHRU 56PF 20% 500V CER	28480	0160-3961
A26C14	0160-3219	9		CAPACITOR-FDTHRU 100PF 20% 500V CER	28480	0160-3219
A26C15	0160-2049	1		CAPACITOR-FDTHRU 5000PF +80 -20% 500V	33095	54-743-009-X5V0-502Z
A26C16	0160-2049	1		CAPACITOR-FDTHRU 5000PF +80 -20% 500V	33095	54-743-009-X5V0-502Z
A26C17	0160-3219	9		CAPACITOR-FDTHRU 100PF 20% 500V CER	28480	0160-3219
A26C18	0160-3219	9		CAPACITOR-FDTHRU 100PF 20% 500V CER	28480	0160-3219
A26J1	1250-0829	3	1	CONNECTOR-RF SMC M SGL-HOLE-FR 50-OHM	28480	1250-0829
A26J2				NOT SEPARATELY REPLACEABLE, P/O A26W4		
A26L1	9100-1620	5	8	INDUCTOR RF-CH-MLD 15UH 10% .166DX.385LG	28480	9100-1620
A26L2	9100-1621	6	1	INDUCTOR RF-CH-MLD 18UH 10% .166DX.385LG	28480	9100-1621
A26L3	9100-1620	5		INDUCTOR RF-CH-MLD 15UH 10% .166DX.385LG	28480	9100-1620
A26L4	9100-1620	5		INDUCTOR RF-CH-MLD 15UH 10% .166DX.385LG	28480	9100-1620
A26L5	9100-1620	5		INDUCTOR RF-CH-MLD 15UH 10% .166DX.385LG	28480	9100-1620
A26L6				NOT ASSIGNED		
A26L7	9140-0178	0	1	INDUCTOR RF-CH-MLD 12UH 10% .166DX.385LG	28480	9140-0178
A26L8	9100-1620	5		INDUCTOR RF-CH-MLD 15UH 10% .166DX.385LG	28480	9100-1620
A26L9	9140-0098	3	1	INDUCTOR RF-CH-MLD 2.2UH 10%	28480	9140-0098
A26MP1	8160-0218	0	1	RFI GASKET NI-ALY .782-IN-WD 4.728-IN-LG	28480	8160-0218
A26MP2	8160-0222	6	1	RFI GASKET NI-ALY 2.027-IN-WD	28480	8160-0222
A26MP3	8160-0223	7	1	RFI GASKET NI-ALY 1-IN-WD 2.196-IN-LG	28480	8160-0223
A26MP4	8160-0224	8	1	RFI GASKET NI-ALY 4.264-IN-WD	28480	8160-0224
A26MP5	08640-00012	0	1	COVER, ACCESS		
A26MP6	08640-00018	6	1	COVER, FILTER MODULE	28480	08640-00018
A26MP7				NOT ASSIGNED		
A26MP8	08640-20263	5	1	CASTING, MODULE	28480	08640-20263
A26MP9	08640-20264	6	1	COVER, BOTTOM MODULE	28480	08640-20264
A26MP10	08640-00013	1	1	COVER, AMPLIFIER FILTER	28480	08640-00013
A26MP11	0403-0153	0	1	GUIDE-PC BD BRN POLYC .062-BD-THKNS 1-LG	28480	0403-0153
A26MP12	0403-0156	3	1	GUIDE-PC BD YEL POLYC .062-BD-THKNS 1-LG	28480	0403-0156
A26MP13	0403-0157	4	1	GUIDE-PC BD GRN POLYC .062-BD-THKNS 1-LG	28480	0403-0157
A26MP14				NOT ASSIGNED		
A26MP15	1250-1423	5	1	CAP-COAX TO FIT F-BNC NON-SHTG 2.5-CH	28480	1250-1423

†Refer to Section 7 for update information

\*Factory Selected Component (Refer to Section 5)

Δ Errata part change.

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A26 STANDARD</b>						
<b>(OPTION 002, 004 SEE RESPECTIVE LISTING)</b>						
A26MP16	2200-0107	8	7	SCREW-MACH 4-40 .375-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
A26MP17	2950-0035	8	1	NUT-HEX-DBL-CHAM 15/32-32-THD	00000	ORDER BY DESCRIPTION
A26MP18	2190-0068	5	1	WASHER-LK INTL T 1/2 IN .505-IN-ID	28480	2190-0068
A26MP19	2200-0107	6		SCREW-MACH 4-40 .375-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
A26MP20	1251-3231	9	2	CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-3231
A26MP21	2200-0107	6		SCREW-MACH 4-40 .375-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
A26MP22	1251-1886	6	3	CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-1886
A26MP23	1251-2571	8		CONNECTOR-PC EDGE 15 CONT/ROW 1 ROW	28480	1251-2571
A26MP24	2200-0107	6		SCREW-MACH 4-40 .375-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
A26MP25	0520-0173	2	1	SCREW-MACH 2-56 .188-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
A26MP26	0403-0158	5		GUIDE-PC BOARD BLUE POLYC .062-BD-THKNS	28480	0403-0158
A26MP27	2360-0203	1	2	SCREW-MACH 6-32 .625-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
A26MP28	2190-0018	5	2	WASHER-LK HLCL NO. 6 .141-IN-ID	28480	2190-0018
A26MP29	3050-0066	8	2	WASHER-FL MTLC NO. 6 .147-IN-ID	28480	3050-0066
A26MP30	2360-0203	1		SCREW-MACH 6-32 .625-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
A26MP31	2190-0018	5		WASHER-LK HLCL NO. 6 .141-IN-ID	28480	2190-0018
A26MP32	3050-0066	8		WASHER-FL MTLC NO. 6 .147-IN-ID	28480	3050-0066
A26MP33	08640-00002	4	1	HEAT SINK, MICROCIRCUITS	28480	08640-0002
A26MP34	2200-0105	4	3	SCREW-MACH 4-40 .312-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
A26MP35	2950-0078	9	4	NUT-HEX-DBL-CHAM 10-32-THD .067-IN-THK	28480	2950-0078
A26MP36	2190-0124	4	4	WASHER-LK INTL T NO. 10 .195-IN-ID	28480	2190-0124
A26MP37	2950-0078	9		NUT-HEX-DBL-CHAM 10-32-THD .067-IN-THK	28480	2950-0078
A26MP38	2190-0124	4		WASHER-LK INTL T NO. 10 .195-IN-ID	28480	2190-0124
A26MP39	2950-0078	9		NUT-HEX-DBL-CHAM 10-32-THD .067-IN-THK	28480	2950-0078
A26MP40	2190-0124	4		WASHER-LK INTL T NO. 10 .195-IN-ID	28480	2190-0124
A26MP41	2950-0078	9		NUT-HEX-DBL-CHAM 10-32-THD .067-IN-THK	28480	2950-0078
A26MP42	2190-0124	4		WASHER-LK INTL T NO. 10 .195-IN-ID	28480	2190-0124
A26MP43	2200-0105	4		SCREW-MACH 4-40 .312-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
A26MP44	2200-0107	6		SCREW-MACH 4-40 .375-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
A26MP45	2200-0107	6		SCREW-MACH 4-40 .375-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
A26MP46	2200-0107	6		SCREW-MACH 4-40 .375-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
A26MP47	2190-0034	5	1	WASHER-LK HLCL NO. 10 .194-IN-ID	28480	2190-0034
A26MP48	2200-0105	4		SCREW-MACH 4-40 .312-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
A26MP49 <sup>Δ</sup>	3030-0238	4	1	SCREW-SET 12-28 .25-IN-LG SMAL CUP-PT	28480	3030-0238
A26MP50 <sup>Δ</sup>	3030-0238	4	1	SCREW-SET 12-28 .25-IN-LG SMAL CUP-PT	28480	3030-0238
A26U1	08640-67022	8	1	OUTPUT AMPLIFIER	28480	08640-67022
A26U2	08640-67023	3	1	MODULATOR PREAMPLIFIER	28480	08640-67023
A26W1	8120-1889	9	1	CABLE ASSY-COAX 2.6-IN-LG (INCLUDED WITH A26A1)	28480	8120-1889
A26W2	8120-1887	7	1	CABLE ASSY-COAX 50-OHM 3.4-IN-LG (INCLUDED WITH A26A1)	28480	8120-1887
A26W3	8120-1905	0	1	CABLE ASSY-COAX 3.1-IN-LG	28480	8120-1905
A26W4	8120-1892	4	1	CABLE ASSY-COAX 3.5-IN-LG	28480	8120-1892

<sup>1</sup>Refer to Section 7 for update information.

<sup>\*</sup>Factory Selected Component (Refer to Section 5)

<sup>Δ</sup> Errata part change.

*Table 6-3. Replaceable Parts*

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A26</b>				<b>OPTION 002 ONLY</b>		
				***** NOTE ***** REFER TO STANDARD PARTS LIST FOR ALL COMPONENTS EXCEPT THE FOLLOWING. *****		
A26	08640-60316	3	1	AM/AGC & RF AMPLIFIER ASSEMBLY (SEE SERVICE SHEET F)	28480	08640-60316
<i>2620A TO 2714A</i>						
<i>A26U1</i>	08640-67007	3	1	OUTPUT AMPLIFIER	28480	08640-67007
<i>2717A AND ABOVE</i>						
<i>A26U1</i>	08640-67022	2	1	OUTPUT AMPLIFIER 550MHZ	28480	08640-67022
A26C11 <sup>Δ</sup>	0160-2049	1	1	CAP-NOM:5000pF TOL: + 80% -20% WVDC:500V	03746	54-743-009
A26C12 <sup>Δ</sup>	0160-2049	1	1	CAP-NOM:5000pF TOL: + 80% -20% WVDC:500V	03746	54-743-009
A26L6 <sup>Δ</sup>	9100-1620	5	1	INDUCTOR RF-CH-MLD 15uH + -10%	05826	1537-40

<sup>†</sup>Refer to Section 7 for update information.

<sup>\*</sup>Factory Selected Component (Refer to Section 5)

<sup>Δ</sup> Errata part change.

*Table 6-3. Replaceable Parts*

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A26</b>						
<b>OPTION 004 ONLY</b>						
***** NOTE *****						
REFER TO STANDARD PARTS LIST FOR ALL COMPONENTS EXCEPT THE FOLLOWING.						
*****						
A26	08640-60314	1	1	AM CASTING ASSEMBLY	28480	08640-60314
A26MP7	08640-20262	4	1	COVER, TOP MODULE	28480	08640-60262
A26MP14 A26MP49 <sup>Δ</sup>	2200-0107	6	39	SCREW MACH 4-40 .275-IN-LG PAN-HD-POZI NOT ASSIGNED	00000	ORDER BY DESCRIPTION
A26U1	08640-67026	6	1	OUTPUT AMPLIFIER	28480	08640-67026
A26C17 <sup>Δ</sup>	0160-2152	7	1	CAP-FXD 10pF + -20% 500V CER S2L	09538	2499-043S2LO
A26C18 <sup>Δ</sup>	0160-2152	7	1	CAP-FXD 10pF + -20% 500V CER S2L	09538	2499-043S2LO
A26R1 <sup>Δ</sup>	0757-0159	57	1	RESISTR 1K + -1% .5W TF TC = 0 + -100	02273	CEC-993

<sup>1</sup>Refer to Section 7 for update information

<sup>\*</sup>Factory Selected Component (Refer to Section 5)

<sup>Δ</sup> Errata part change



Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A26A1 STANDARD</b>						
<b>(OPTION 002, 004 SEE RESPECTIVE LISTING)</b>						
A26A1	08640-60043	3	1	POWER AMPLIFIER & AGC DETECTOR ASSEMBLY (EXCEPT OPTION 002, 004)	28480	08640-60043
A26A1C1	0160-3094	8	5	CAPACITOR-FXD .1UF +-10% 100VDC CER	28480	0160-3094
A26A1C2	0160-3094	8		CAPACITOR-FXD .1UF +-10% 100VDC CER	28480	0160-3094
A26A1C3	0160-3094	8		CAPACITOR-FXD .1UF +-10% 100VDC CER	28480	0160-3094
A26A1C4	0160-2026	4	1	CAPACITOR-FXD 380PF +-5% 500VDC MICA	28480	0160-2026
A26A1C5	0160-2383	6	1	CAPACITOR-FXD 100PF +-1% 500VDC MICA	28480	0160-2383
A26A1C6	0180-0197	8	2	CAPACITOR-FXD 2.2UF +-10% 20VDC TA	56289	150D225X9020A2
A26A1CR1	1901-0040	1	13	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A26A1CR2	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A26A1CR3 <sup>Δ</sup>	1901-0040	1	9	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A26A1CR4	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A26A1CR5	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A26A1CR6	1901-0539	3	3	DIODE-SM SIG SCHOTTKY	28480	1901-0539
A26A1L1	9100-1620	5		INDUCTOR RF-CH-MLD 15UH 10% .166DX.385LG	28480	9100-1620
A26A1L2	9140-0180	4	1	INDUCTOR RF-CH-MLD 2.7UH 10%	28480	9140-0180
A26A1Q1	1853-0007	7	4	TRANSISTOR PNP 2N3251 SI TO-18 PD = 360MW	04713	2N3251
A26A1Q2	1855-0049	1	1	TRANSISTOR-JFET DUAL N-CHAN D-MODE SI	28480	1855-0049
A26A1Q3	1855-0020	8	1	TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A26A1Q4	1853-0007	7		TRANSISTOR PNP 2N3251 SI TO-18 PD = 360MW	04713	2N3251
A26A1Q5 <sup>Δ</sup>	1854-0717	8	8	TRANSISTOR NPN SI PD = 550MW FT = 200MHZ	28480	1854-0717
A26A1Q6 <sup>Δ</sup>	1854-0717	8		TRANSISTOR NPN SI PD = 550MW FT = 200MHZ	28480	1854-0717
A26A1Q7 <sup>Δ</sup>	1854-0717	8		TRANSISTOR NPN SI PD = 550MW FT = 200MHZ	28480	1854-0717
A26A1Q8 <sup>Δ</sup>	1854-0717	8		TRANSISTOR NPN SI PD = 550MW FT = 200MHZ	28480	1854-0717
A26A1Q9 <sup>Δ</sup>	1854-0717	8		TRANSISTOR NPN SI PD = 550MW FT = 200MHZ	28480	1854-0717
A26A1R1	0698-3447	4	2	RESISTOR 422 1% .125W F TC = 0+ -100	24546	C4-1/8-T0-422R-F
A26A1R2	0698-3446	3	1	RESISTOR 383 1% .125W F TC = 0+ -100	24546	C4-1/8-T0-383R-F
A26A1R3	0757-0420	3	2	RESISTOR 750 1% .125W F TC = 0+ -100	24546	C4-1/8-T0-751-F
A26A1R4	0757-0317	7	2	RESISTOR 1.33K 1% .125W F TC = 0+ -100	24546	C4-1/8-T0-1331-F
A26A1R5	0757-0420	3		RESISTOR 750 1% .125W F TC = 0+ -100	24546	C4-1/8-T0-751-F
A26A1R6	0757-0280	3	4	RESISTOR 1K 1% .125W F TC = 0+ -100	24546	C4-1/8-T0-1001-F
A26A1R7	0757-0441	8	2	RESISTOR 8.25K 1% .125W F TC = 0+ -100	24546	C4-1/8-T0-8251-F
A26A1R8	0698-3443	0	1	RESISTOR 287 1% .125W F TC = 0+ -100	24546	C4-1/8-T0-287R-F
A26A1R9	0757-0199	3	2	RESISTOR 21.5K 1% .125W F TC = 0+ -100	24546	C4-1/8-T0-2152-F
A26A1R10	0757-0199	3		RESISTOR 21.5K 1% .125W F TC = 0+ -100	24546	C4-1/8-T0-2152-F
A26A1R11	0757-0458	7	3	RESISTOR 51.1K 1% .125W F TC = 0+ -100	24546	C4-1/8-T0-5112-F
A26A1R12	0683-3355	2	1	RESISTOR 3.3M 5% .25W FC TC = -900/+ 1100	01121	CB3355
A26A1R13	0698-3450	9	3	RESISTOR 42.2K 1% .125W F TC = 0+ -100	24546	C4-1/8-T0-4222-F
A26A1R14	0698-3450	9		RESISTOR 42.2K 1% .125W F TC = 0+ -100	24546	C4-1/8-T0-4222-F
A26A1R15	0683-1055	5	4	RESISTOR 1M 5% .25W FC TC = -800/+ 900	01121	CB1055
A26A1R16	0698-3438	3	1	RESISTOR 147 1% .125W F TC = 0+ -100	24546	C4-1/8-T0-147R-F
A26A1R17	0698-3132	4	3	RESISTOR 261 1% .125W F TC = 0+ -100	24546	C4-1/8-T0-2610-F
A26A1R18	0757-0438	3	13	RESISTOR 5.11K 1% .125W F TC = 0+ -100	24546	C4-1/8-T0-5111-F
A26A1R19	2100-2061	3	1	RESISTOR-TRMR 200 10% C TOP-ADJ 1-TRN	73138	82PR200
A26A1R20	0757-0442	9	15	RESISTOR 10K 1% .125W F TC = 0+ -100	24546	C4-1/8-T0-1002-F

<sup>1</sup>Refer to Section 7 for update information.

\*Factory Selected Component (Refer to Section 5)

<sup>Δ</sup> Errata part change.

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A26A1</b>						
<b>STANDARD</b>						
(OPTION 002, 004 SEE RESPECTIVE LISTING)						
A26A1R21	0698-7233	4	1	RESISTOR 750 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-750R-F
A26A1R22	0698-7272	1	1	RESISTOR 31.6K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-3162-F
A26A1R23	0683-1055	5		RESISTOR 1M 5% .25W FC TC = -300/+900	01121	CB1055
A26A1TP1	0340-0044	4		TERMINAL-STUD DBL-TUR PRESS-MTG	28480	0340-0044
A26A1TP2	1251-0600	0		CONNECTOR = SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A26A1VR1	1902-0184	6	2	DIODE-ZNR 16.2V 5% DO-35 PD = .4W	28480	1902-0184
A26A1VR2	1902-0956	0	1	DIODE-ZNR 8.2V 5% DO-35 PD = .4W TC = + .065%	28480	1902-0956
A26A1XA26U1A	1251-2613	9	10	CONNECTOR-SGL CONT SKT .033-IN-BSC-SZ	28480	1251-2613
A26A1XA26U1B	1251-2613	9		CONNECTOR-SGL CONT SKT .033-IN-BSC-SZ	28480	1251-2613
A26A1XA26U1C	1251-2613	9		CONNECTOR-SGL CONT SKT .033-IN-BSC-SZ	28480	1251-2613
A26A1XA26U1D	1251-2613	9		CONNECTOR-SGL CONT SKT .033-IN-BSC-SZ	28480	1251-2613
A26A1XA26U1E	1251-2613	9		CONNECTOR-SGL CONT SKT .033-IN-BSC-SZ	28480	1251-2613

†Refer to Section 7 for update information

\*Factory Selected Component (Refer to Section 5).

Δ Errata part change.

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A26A1</b>						
<b>OPTION 002 ONLY</b>						
A26A1	08640-80048	8	1	OUTPUT AMPLIFIER, DOUBLER & AGC DETECTOR	28480	08640-60048
A26A1C1	0160-3094	8	3	CAPACITOR-FXD .1UF +-10% 100VDC CER	28480	0160-3094
A26A1C2	0160-3094	8		CAPACITOR-FXD .1UF +-10% 100VDC CER	28480	0160-3094
A26A1C3	0160-3094	8		CAPACITOR-FXD .1UF +-10% 100VDC CER	28480	0160-3094
A26A1C4	0160-3879	7	2	CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A26A1C5	0160-3877	5	1	CAPACITOR-FXD 100PF +-20% 200VDC CER	28480	0160-3877
A26A1C6	0160-3878	6	8	CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A26A1C7	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A26A1C8	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A26A1C9	0121-0448	8	1	CAPACITOR-V TRMR-CER 2.5-5PF 63V PC-MTG	28480	0121-0448
A26A1C10	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A26A1C11	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A26A1C12	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A26A1C13	0160-3878	4	2	CAPACITOR-FXD 47PF +-20% 200VDC CER	28480	0160-3878
A26A1C14	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A26A1C15	0160-2026	4	1	CAPACITOR-FXD 360PF +-5% 300VDC MICA	28480	0160-2026
A26A1C16	0160-2383	6	1	CAPACITOR-FXD 100PF +-1% 500VDC MICA	28480	0160-2383
A26A1C17	0180-0197	8	2	CAPACITOR-FXD 2.2UF +-10% 20VDC TA	56289	150D225X9020A2
A26A1C18	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A26A1C19	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A26A1C20	0160-3878	4		CAPACITOR-FXD 47PF +-20% 200VDC CER	28480	0160-3878
A26A1C21	0160-4399	8	1	CAPACITOR-FXD .66PF +-33PF 50VDC CER	28480	0160-4399
A26A1CR1	1908-0098	9	1	DIODE-MATCHED IV	28480	1906-0098
A26A1CR2				NOT SEPARATELY REPLACEABLE, P/O A26A1CR1		
A26A1CR3				NOT SEPARATELY REPLACEABLE, P/O A26A1CR1		
A26A1CR4				NOT SEPARATELY REPLACEABLE, P/O A26A1CR1		
A26A1CR5	1901-0535	9	3	DIODE-SM SIG SCHOTTKY	28480	1901-0535
A26A1CR6 <sup>Δ</sup>	1901-1098	1	1	1N4150 50V 200MA 4NS	28480	1901-1098
A26A1CR7	1901-0040	1	11	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A26A1CR8	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A26A1CR9	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A26A1CR10	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A26A1CR11	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A26A1CR12	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A26A1J1	1250-1425	7	1	CONNECTOR-RF SMC M SGL-HOLE-RR 50-OHM	28480	1250-1425
A26A1K1	0490-0565	1	2	RELAY 2C 12VDC-COIL	28480	0490-0565
A26A1K2*	0490-0565	1		RELAY 2C 12VDC-COIL	28480	0490-0565
A26A1L1	9100-1620	5	1	INDUCTOR RF-CH-MLD 15UH 10% .166DX.385LG	28480	9100-1620
A26A1L2	9100-2247	4	3	INDUCTOR RF-CH-MLD 100NH 10% .105DX.26LG	28480	9100-2247
A26A1L3	9100-2247	4		INDUCTOR RF-CH-MLD 100NH 10% .105DX.26LG	28480	9100-2247
A26A1L4				NOT ASSIGNED		
A26A1L5				PART OF ETCHED CIRCUIT BOARD		

Refer to Section 7 for update information.

\*Factory Selected Component (Refer to Section 5)

Δ Errata part change.

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A26A1</b>						
<b>OPTION 002 ONLY</b>						
A26A1L8	9100-2247	4		INDUCTOR RF-CH-MLD 100NH 10% .105DX.26LG	28480	9100-2247
A26A1L7	9140-0180	4	1	INDUCTOR RF-CH-MLD 2.7UH 10%	28480	9140-0180
A26A1MP1	08640-20164	5	1	COVER, FILTER/AMPLIFIER(OPT. 002 ONLY)	28480	08640-20164
A26A1MP2	2200-0103	2	1	SCREW-MACH 4-40 .25-IN-LG PAN-HD-POZI	28480	2200-0103
A26A1Q1	1GS1-4213	1	2	TRANSISTOR PACKAGE,HP-12	28480	1GS1-4213
A26A1Q2	1GS1-4213	1		TRANSISTOR PACKAGE,HP-12	28480	1GS1-4213
A26A1Q3	1853-0020	4	2	TRANSISTOR PNP SI PD = 300MW FT = 150MHZ	28480	1853-0020
A26A1Q4	1853-0020	4		TRANSISTOR PNP SI PD = 300MW FT = 150MHZ	28480	1853-0020
A26A1Q5 <sup>Δ</sup>	1854-0717	8	8	TRANSISTOR NPN SI PD = 550MW FT = 200MHZ	28480	1854-0717
A26A1Q6 <sup>Δ</sup>	1854-0717	8		TRANSISTOR NPN SI PD = 550MW FT = 200MHZ	28480	1854-0717
A26A1Q7 <sup>Δ</sup>	1854-0717	8		TRANSISTOR NPN SI PD = 550MW FT = 200MHZ	28480	1854-0717
A26A1Q8 <sup>Δ</sup>	1854-0717	8		TRANSISTOR NPN SI PD = 550MW FT = 200MHZ	28480	1854-0717
A26A1Q9	1853-0007	7	4	TRANSISTOR PNP 2N3251 SI TO-18 PD = 360MW	04713	2N3251
A26A1Q10	1855-0020	8	1	TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI (OPTION 002 ONLY)	28480	1855-0020
A26A1Q11 <sup>Δ</sup>	1854-0717	8		TRANSISTOR NPN SI PD = 550MW FT = 200MHZ	28480	1854-0717
A26A1Q12	1855-0049	1	1	TRANSISTOR JFET DUAL N-CHAN D-MODE SI	28480	1855-0049
A26A1Q13	1853-0007	7		TRANSISTOR PNP 2N3251 SI TO-18 PD = 360MW	04713	2N3251
A26A1R1	0698-7253	8	2	RESISTOR 5.11K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-5111-F
A26A1R2*	0698-7264	1	1	RESISTOR 14.7K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-1472-F
A26A1R3	0698-7195	7	1	RESISTOR 19.6 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-19R6-F
A26A1R4	0699-1966	0	1	RESISTOR 26.1 1% .05W F TC = + -100	28480	0699-1966
A26A1R5	0757-1002	9	1	RESISTOR 61.9 1% .5W F TC = 0 + -100	28480	0757-1002
A26A1R6	0698-7236	7	4	RESISTOR 1K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-1001-F
A26A1R7	0698-7236	7		RESISTOR 1K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-1001-F
A26A1R8	0757-0403	2	2	RESISTOR 121 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-121R-F
A26A1R9	0699-1969	3	1	RESISTOR 90.9 1% .05W F TC = 0 + -100	28480	0699-1969
A26A1R10	0699-2072	1	1	RESISTOR 34.8 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-34R8-F
A26A1R11	0698-7236	7		RESISTOR 1K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-1001-F
A26A1R12	0683-1055	5	4	RESISTOR 1M 5% .25W FC TC = -800/+ 900	01121	CB1055
A26A1R13	0698-7272	1	1	RESISTOR 31.6K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-3162-F
A26A1R14	0698-3446	3	1	RESISTOR 383 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-383R-F
A26A1R15	0698-3447	4	1	RESISTOR 422 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-422R-F
A26A1R16	0698-7233	4	3	RESISTOR 750 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-750R-F
A26A1R17	0698-7233	4		RESISTOR 750 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-750R-F
A26A1R18	0757-0317	7	2	RESISTOR 1.33K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1331-F
A26A1R19	0698-7233	4		RESISTOR 750 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-750R-F
A26A1R20	0698-7223	2	1	RESISTOR 287 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-287R-F
A26A1R21	0698-7268	5	2	RESISTOR 21.5K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-2152-F
A26A1R22	0698-7258	3	1	RESISTOR 8.25K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-8251-F
A26A1R23	0698-7268	5		RESISTOR 21.5K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-2152-F
A26A1R24	0698-7236	7		RESISTOR 1K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-1001-F
A26A1R25	0698-7277	6	1	RESISTOR 51.1K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-5112-F
A26A1R26	0683-3355	2	1	RESISTOR 3.3M 5% .25W FC TC = -900/+ 1100	01121	CB3355
A26A1R27	0698-7275	4	2	RESISTOR 42.2K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-4222-F
A26A1R28	0698-7275	4		RESISTOR 42.2K 1% .05W F TC = 0 + -100	24546	C3-1/8-T0-4222-F

† Refer to Section 7 for update information.

\* Factory Selected Component (Refer to Section 5).

Δ Errata part change.

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A26A1</b>		<b>OPTION 002 ONLY</b>				
A26A1R29	0683-1055	5		RESISTOR 1M 5% .25W FC TC = -800/+900	01121	CB1055
A26A1R30	0698-7253	8		RESISTOR 5.11K 1% .05W F TC = 0+ -100	24548	C3-1/8-T0-5111-F
A26A1R31	0698-7218	3	1	RESISTOR 147 1% .05W F TC = 0+ -100	24548	C3-1/8-T0-147R-F
A26A1R32	0698-7222	1	1	RESISTOR 261 1% .05W F TC = 0+ -100	24548	C3-1/8-T0-261R-F
A26A1R33	0698-7260	7	1	RESISTOR 10K 1% .05W F TC = 0+ -100	24548	C3-1/8-T0-1002-F
A26A1R34	2100-2061	3	1	RESISTOR-TRMR 200 10% C TOP-ADJ 1-TRN	73138	82PR200
A26A1R35	0757-0403	2		RESISTOR 121 1% .125W F TC = 0+ -100	24548	C4-1/8-T0-121R-F
A26A1T1	08640-80004	8	1	BALUN ASSEMBLY	28480	08640-80004
	1251-2194	1	1	CONNECTOR-SGL CONT SKT .021-IN-BSC-SZ	28480	1251-2194
A26A1TP1	1251-0600	0	1	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A26A1TP2	0340-0044	4	1	TERMINAL-STUD DBL-TUR PRESS-MTG	28480	0340-0044
A26A1VR1	1902-0184	6	2	DIODE-ZNR 16.2V 5% DO-35 PD = .4W	28480	1902-0184
A26A1VR2	1902-0956	0	1	DIODE-ZNR 8.2V 5% DO-35 PD = .4W TC = +.065%	28480	1902-0956
A26A1W1	8120-1971	0	1	CABLE ASSY-COAX 1.3-IN-LG	28480	8120-1971
A26A1W2	8120-1887	7	1	CABLE ASSY-COAX 50-OHM 3.4-IN-LG	28480	8120-1887
A26A1XA26U1A	1251-2613	9	5	CONNECTOR-SGL CONT SKT .033-IN-BSC-SZ	28480	1251-2613
A26A1XA26U1B	1251-2613	9		CONNECTOR-SGL CONT SKT .033-IN-BSC-SZ	28480	1251-2613
A26A1XA26U1C	1251-2613	9		CONNECTOR-SGL CONT SKT .033-IN-BSC-SZ	28480	1251-2613
A26A1XA26U1D	1251-2613	9		CONNECTOR-SGL CONT SKT .033-IN-BSC-SZ	28480	1251-2613
A26A1XA26U1E	1251-2613	9		CONNECTOR-SGL CONT SKT .033-IN-BSC-SZ	28480	1251-2613

† Refer to Section 7 for update information.

\* Factory Selected Component (Refer to Section 5).

Δ Errata part change.

*Table 6-3. Replaceable Parts*

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A26A1</b>				<b>OPTION 004 ONLY</b>		
				***** NOTE ***** REFER TO STANDARD PARTS LIST FOR ALL COMPONENTS EXCEPT THE FOLLOWING. *****		
A26A1	08640-60074	0		POWER AMPLIFIER & AGC DETECTOR ASSEMBLY	28480	08640-60074
A26A1C4 <sup>Δ</sup>	0140-0198	5		CAPACITOR-FXD 220 PF +-5% 300VDC MICA	02367	CD15FD201J03
A26A1R22				NOT ASSIGNED		

<sup>†</sup>Refer to Section 7 for update information.

\*Factory Selected Component (Refer to Section 5)

<sup>Δ</sup> Errata part change.

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A26A2</b>						
A26A2	08640-60014	8	1	AM OFFSET & PULSE SWITCHING ASSEMBLY	28480	08640-60014
A26A2C1	0180-0291	3	9	CAPACITOR-FXD 1UF +-10% 35VDC TA	56289	150D105X9035A2
A26A2C2	0180-0291	3		CAPACITOR-FXD 1UF +-10% 35VDC TA	56289	150D105X9035A2
A26A2C3	0180-0291	3		CAPACITOR-FXD 1UF +-10% 35VDC TA	56289	150D105X9035A2
A26A2C4	0180-0291	3		CAPACITOR-FXD 1UF +-10% 35VDC TA	56289	150D105X9035A2
A26A2C5	0160-3458	8	2	CAPACITOR-FXD 5000PF +-10% 250VDC CER	28480	0160-3458
A26A2C6	0160-0161	4	2	CAPACITOR-FXD .01UF +-10% 200VDC POLYE	28480	0160-0161
A26A2C7	0160-3458	8		CAPACITOR-FXD 5000PF +-10% 250VDC CER	28480	0160-3458
A26A2C8	0180-1743	2	1	CAPACITOR-FXD .1UF +-10% 35VDC TA	56289	150D104X9035A2
A26A2C9				NOT ASSIGNED		
A26A2C10	0180-0100	3	1	CAPACITOR-FXD 4.7UF +-10% 35VDC TA	56289	150D475X9035B2
A26A2C11	0180-0116	1	1	CAPACITOR-FXD 6.8UF +-10% 35VDC TA	56289	150D685X9035B2
A26A2C12	0180-0291	3		CAPACITOR-FXD 1UF +-10% 35VDC TA	56289	150D105X9035A2
A26A2CR1	1901-0022	9		DIODE-STABISTOR 10V 250MA	28480	1901-0022
A26A2CR2	1901-0022	9		DIODE-STABISTOR 10V 250MA	28480	1901-0022
A26A2CR3	1901-0022	9		DIODE-STABISTOR 10V 250MA	28480	1901-0022
A26A2CR4	1901-0022	9		DIODE-STABISTOR 10V 250MA	28480	1901-0022
A26A2CR5				NOT ASSIGNED		
A26A2CR6				NOT ASSIGNED		
A26A2CR7	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A26A2CR8				NOT ASSIGNED		
A26A2CR9	1901-0539	3		DIODE-SM SIG SCHOTTKY	28480	1901-0539
A26A2CR10	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A26A2CR11	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A26A2CR12	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A26A2CR13	1901-0539	3		DIODE-SM SIG SCHOTTKY	28480	1901-0539
A26A2CR14	1910-0022	8	4	DIODE-GE 5V 60MA 3.5NS DO-7	28480	1910-0022
A26A2CR15	1910-0022	8		DIODE-GE 5V 60MA 3.5NS DO-7	28480	1910-0022
A26A2CR16	1910-0022	8		DIODE-GE 5V 60MA 3.5NS DO-7	28480	1910-0022
A26A2CR17	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A26A2CR18	1910-0022	8		DIODE-GE 5V 60MA 3.5NS DO-7	28480	1910-0022
A26A2L1	9100-1641	0	4	INDUCTOR RF-CH-MLD 240UH 5% .166DX.385LG	28480	9100-1641
A26A2L2	9100-1641	0		INDUCTOR RF-CH-MLD 240UH 5% .166DX.385LG	28480	9100-1641
A26A2L3	9100-1620	5		INDUCTOR RF-CH-MLD 15UH 10% .166DX.385LG	28480	9100-1620
A26A2MP1	4040-0749	4	2	EXTR-PC BD BRN POLYC .062-BD-THKNS	28480	4040-0749
	1480-1116	8		PIN-GRV .062-IN-DIA .25-IN-LG STL	28480	1480-0073
A26A2MP2	4040-0752	9	1	EXTR-PC BD YEL POLYC .062-BD-THKNS	28480	4040-0752
	1480-1116	8		PIN-GRV .062-IN-DIA .25-IN-LG STL	28480	1480-0073
A26A2Q1	1854-0830	6	3	TRANSISTOR-DUAL NPN PD = 500MW	27014	LM394
A26A2Q2	1854-0404	0	4	TRANSISTOR NPN SI TO-18 PD = 360MW	28480	1854-0404
A26A2Q3	1853-0034	0	6	TRANSISTOR PNP SI TO-18 PD = 360MW	28480	1853-0034
A26A2Q4	1853-0034	0		TRANSISTOR PNP SI TO-18 PD = 360MW	28480	1853-0034
A26A2Q5	1854-0404	0		TRANSISTOR NPN SI TO-18 PD = 360MW	28480	1854-0404
A26A2Q6	1854-0404	0		TRANSISTOR NPN SI TO-18 PD = 360MW	28480	1854-0404
A26A2Q7	1854-0404	0		TRANSISTOR NPN SI TO-18 PD = 360MW	28480	1854-0404
A26A2Q8	1853-0034	0		TRANSISTOR PNP SI TO-18 PD = 360MW	28480	1853-0034
A26A2Q9	1853-0034	0		TRANSISTOR PNP SI TO-18 PD = 360MW	28480	1853-0034

†Refer to Section 7 for update information.

\*Factory Selected Component (Refer to Section 5).

Δ Errata part change.

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
A26A2R1	0757-0465	8	4	RESISTOR 100K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1003-F
A26A2R2	0757-0440	7	5	RESISTOR 7.5K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-7501-F
A26A2R3	0757-0442	9		RESISTOR 10K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1002-F
A26A2R4	0757-0442	9		RESISTOR 10K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1002-F
A26A2R5	0698-3155	1	1	RESISTOR 4.64K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-4641-F
A26A2R6	0757-0442	9		RESISTOR 10K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1002-F
A26A2R7	0757-0440	7		RESISTOR 7.5K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-7501-F
A26A2R8	0757-0422	5	1	RESISTOR 909 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-909R-F
A26A2R9	0757-0421	4	3	RESISTOR 825 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-825R-F
A26A2R10	0757-0439	4	1	RESISTOR 6.81K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-6811-F
A26A2R11	0757-0442	9		RESISTOR 10K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1002-F
A26A2R12	0757-0442	9		RESISTOR 10K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1002-F
A26A2R13	0757-0401	0	3	RESISTOR 100 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-101-F
A26A2R14	0757-0421	4		RESISTOR 825 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-825R-F
A26A2R15	0757-0438	3		RESISTOR 5.11K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-5111-F
A26A2R16	0757-0280	3		RESISTOR 1K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1001-F
A26A2R17	0698-3440	7	1	RESISTOR 196 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-196R-F
A26A2R18	0757-0438	3		RESISTOR 5.11K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-5111-F
A26A2R19	2100-2574	3	1	RESISTOR-TRMR 500 10% C SIDE-ADJ 1-TRN	30983	ET50X501
A26A2R20	0698-3157	3	2	RESISTOR 19.6K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1962-F
A26A2R21	0757-0416	7	3	RESISTOR 511 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-511R-F
A26A2R22	0757-0394	0	2	RESISTOR 51.1 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-51R1-F
A26A2R23	0698-3162	0	3	RESISTOR 46.4K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-4642-F
A26A2R24	0757-0438	3		RESISTOR 5.11K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-5111-F
A26A2R25	0698-3162	0		RESISTOR 46.4K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-4642-F
A26A2R26	0757-0438	3		RESISTOR 5.11K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-5111-F
A26A2R27	0698-0085	0	1	RESISTOR 2.61K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-2611-F
A26A2R28	0698-3162	0		RESISTOR 46.4K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-4642-F
A26A2R29	0698-3150	6	2	RESISTOR 2.37K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-2371-F
A26A2R30	0757-0438	3		RESISTOR 5.11K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-5111-F
A26A2R31	0698-3154	0	3	RESISTOR 4.22K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-4221-F
A26A2R32	0757-0438	3		RESISTOR 5.11K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-5111-F
A26A2R33	0698-3450	9		RESISTOR 42.2K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-4222-F
A26A2R34	0757-0289	2	2	RESISTOR 13.3K 1% .125W F TC = 0 + -100	19701	MF4C1/8-T0-1332-F
A26A2R35	0698-3447	4		RESISTOR 422 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-422R-F
A26A2R36	0698-0083	8	5	RESISTOR 1.96K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1961-F
A26A2R37	0757-0442	9		RESISTOR 10K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1002-F
A26A2R38	0757-0438	3		RESISTOR 5.11K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-5111-F
A26A2R39	0698-0083	8		RESISTOR 1.96K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1961-F
A26A2R40	0698-3157	3		RESISTOR 19.6K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1962-F
A26A2TP1	1251-0600	0		CONNECTOR = SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A26A2TP2	1251-0600	0		CONNECTOR = SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A26A2TP3	1251-0600	0		CONNECTOR = SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A26A2TP4	1251-0600	0		CONNECTOR = SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A26A2TP5	1251-0600	0		CONNECTOR = SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A26A2TP6	1251-0600	0		CONNECTOR = SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A26A2TP7	1251-0600	0		CONNECTOR = SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A26A2TP8	1251-0600	0		CONNECTOR = SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A26A2U1	1826-0114	0	1	IC COMPARATOR GP TO-99 PKG	07263	710HM
A26A2U2	1820-0054	5	1	IC GATE TTL NAND QUAD 2-INP	01295	SN7400N
A26A2U3	1820-0579	9	1	IC MV TTL MONSTBL RETRIG DUAL	01295	SN74123N
A26A2VR1	1902-3139	7	1	DIODE-ZNR 8.25V 5% DO-35 PD = .4W	28480	1902-3139

† Refer to Section 7 for update information

\* Factory Selected Component (Refer to Section 5)

Δ Errata part change



Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A26A3</b>						
A26A3 <sup>Δ</sup>	08640-80387	8		MODULATOR ASSEMBLY RETROFIT KIT (INCLUDES A26A3T1 AND A26A3T2)	28480	08640-80387
A26A3	08640-60018	0	1	MODULATOR ASSEMBLY (DOES NOT INCLUDE A26A3T1 AND A26A3T2)	28480	08640-60018
A26A3C1	0160-3094	8		CAPACITOR-FXD .1UF + -10% 100VDC CER	28480	0160-3094
A26A3C2	0160-3094	8		CAPACITOR-FXD .1UF + -10% 100VDC CER	28480	0160-3094
A26A3C3*	0150-0048	5	4	CAPACITOR-FXD .22PF + -5% 500VDC TI DIOX	28480	0150-0048
A26A3C4*	0150-0048	5		CAPACITOR-FXD .22PF + -5% 500VDC TI DIOX	28480	0150-0048
A26A3C5*	0150-0048	5		CAPACITOR-FXD .22PF + -5% 500VDC TI DIOX	28480	0150-0048
A26A3C6*	0150-0048	5		CAPACITOR-FXD .22PF + -5% 500VDC TI DIOX	28480	0150-0048
A26A3CR1	5010-1201	8	1	MATCHED DIODE SET (INCLUDES A26A3CR2 THRU CR8, NSR) NOT SEPARATELY REPLACEABLE, P/O A26A3CR1	28480	08640-60163
A26A3CR2				NOT SEPARATELY REPLACEABLE, P/O A26A3CR1		
A26A3CR3				NOT SEPARATELY REPLACEABLE, P/O A26A3CR1		
A26A3CR4				NOT SEPARATELY REPLACEABLE, P/O A26A3CR1		
A26A3CR5				NOT SEPARATELY REPLACEABLE, P/O A26A3CR1		
A26A3CR6				NOT SEPARATELY REPLACEABLE, P/O A26A3CR1		
A26A3CR7				NOT SEPARATELY REPLACEABLE, P/O A26A3CR1		
A26A3CR8				NOT SEPARATELY REPLACEABLE, P/O A26A3CR1		
A26A3J1	1250-1425	7	1	CONNECTOR-RF SMC M SGL-HOLE-RR 50-OHM	28480	1250-1425
A26A3J2	1251-2194	1	1	CONNECTOR-SGL CONT SKT .021-IN-BSC-SZ	28480	1251-2194
A26A3L1	9100-1620	5		INDUCTOR RF-CH-MLD 15UH 10% .166DX.385LG	28480	9100-1620
A26A3L2	9140-0112	2	1	INDUCTOR RF-CH-MLD 4.7UH 10%	28480	9140-0112
MP1	1251-2229	3	1	CONNECTOR-SGL CONT SKT .033-IN-BSC-SZ	28480	1251-2229
A26A3R1	0698-7221	0	1	RESISTOR 237 1% .05W F TC = 0 + -100	24546	C3-1/8-TO-237R-F
A26A3R2	0698-3132	4		RESISTOR 261 1% .125W F TC = 0 + -100	24546	C4-1/8-TO-2610-F
A26A3R3	0698-3132	4		RESISTOR 261 1% .125W F TC = 0 + -100	24546	C4-1/8-TO-2610-F
A26A3R4	0757-0416	7		RESISTOR 511 1% .125W F TC = 0 + -100	24546	C4-1/8-TO-511R-F
A26A3R5	0757-0416	7		RESISTOR 511 1% .125W F TC = 0 + -100	24546	C4-1/8-TO-511R-F
<i>2520A TO 2540A</i>						
A26A3T1	08640-80003	7	2	BALUN ASSEMBLY	28480	08640-80003
A26A3T2	08640-80003	7		BALUN ASSEMBLY	28480	08640-80003
<i>2546A AND ABOVE</i>						
A26A3T1	08640-80019	5	2	BALUN ASSEMBLY	28480	08640-80019
A26A3T2	08640-80019	5		BALUN ASSEMBLY	28480	08640-80019
A26A3XA26U1A	1251-2613	9		CONNECTOR-SGL CONT SKT .033-IN-BSC-SZ	28480	1251-2613
A26A3XA26U1B	1251-2613	9		CONNECTOR-SGL CONT SKT .033-IN-BSC-SZ	28480	1251-2613
A26A3XA26U1C	1251-2613	9		CONNECTOR-SGL CONT SKT .033-IN-BSC-SZ	28480	1251-2613
A26A3XA26U1D	1251-2613	9		CONNECTOR-SGL CONT SKT .033-IN-BSC-SZ	28480	1251-2613
A26A3XA26U1E	1251-2613	9		CONNECTOR-SGL CONT SKT .033-IN-BSC-SZ	28480	1251-2613

†Refer to Section 7 for update information.

\*Factory Selected Component (Refer to Section 5)

Δ Errata part change.

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A26A4 STANDARD</b>						
<b>(OPTION 002, 004 SEE RESPECTIVE LISTING)</b>						
A26A4	08640-60351	6	1	AGC AMPLIFIER ASSEMBLY (EXCEPT OPTION 002)	28480	08640-60351
A26A4C1	0180-0291	3		CAPACITOR-FXD 1UF + -10% 35VDC TA	56289	150D105X9035A2
A26A4C2	0180-0291	3		CAPACITOR-FXD 1UF + -10% 35VDC TA	56289	150D105X9035A2
A26A4C3	0180-0291	3		CAPACITOR-FXD 1UF + -10% 35VDC TA	56289	150D105X9035A2
A26A4C4	0160-2307	4	2	CAPACITOR-FXD 47PF + -5% 300VDC MICA	28480	0160-2307
A26A4C5	0160-2307	4		CAPACITOR-FXD 47PF + -5% 300VDC MICA	28480	0160-2307
A26A4C6	0160-3458	8	1	CAPACITOR-FXD 5000PF + -10% 250VDC CER	28480	0160-3458
A26A4C7	0180-0291	3		CAPACITOR-FXD 1UF + -10% 35VDC TA	56289	150D105X9035A2
A26A4C8	0180-0197	8		CAPACITOR-FXD 2.2UF + -10% 20VDC TA	56289	150D225X9020A2
A26A4C9	0160-0161	4		CAPACITOR-FXD .01UF + -10% 200VDC POLYE	28480	0160-0161
A26A4C10	0160-0194	3	1	CAPACITOR-FXD .015UF + -10% 200VDC POLYE	28480	0160-0194
A26A4C11	0160-0158	9	1	CAPACITOR-FXD .0056UF + -10% 200VDC POLYE	28480	0160-0158
A26A4C12	0140-0191	8	1	CAPACITOR-FXD 56PF + -5% 300VDC MICA	72136	DM15E560J0300WV1CR
A26A4C13	0180-2206	4	1	CAPACITOR-FXD 60UF + -10% 6VDC TA	56289	150D606X9006B2
A26A4C14	0160-0576	5	1	CAPACITOR-FXD .1UF + -20% 50VDC CER	28480	0160-0576
A26A4C15	0160-0297	7	1	CAPACITOR-FXD 1200PF + -10% 200VDC POLYE	28480	0160-0297
A26A4C16	0160-3534	1	1	CAPACITOR-FXD 510PF + -5% 100VDC MICA	28480	0160-3534
A26A4C17	0160-3459	9	1	CAPACITOR-FXD .02UF + -20% 100VDC CER	28480	0160-3459
A26A4C18				NOT ASSIGNED		
A26A4C19	0180-2619	3	2	CAPACITOR-FXD 22UF + -10% 15VDC TA	25088	D22GS1B15K
A26A4C20	0180-2619	3		CAPACITOR-FXD 22UF + -10% 15VDC TA	25088	D22GS1B15K
A26A4CR1	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A26A4CR2	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A26A4CR3				NOT ASSIGNED		
A26A4CR4				NOT ASSIGNED		
A26A4CR5 <sup>Δ</sup>	1901-0040	1		DIODE-BM LD QUAD RINGS	02788	MA-4E402L
A26A4CR6 <sup>Δ</sup>	1901-0040	1		DIODE-BM LD QUAD RINGS	02788	MA-4E402L
A26A4CR7	1901-0518	8	5	DIODE-SM SIG SCHOTTKY	28480	1901-0518
A26A4CR8	1901-0518	8		DIODE-SM SIG SCHOTTKY	28480	1901-0518
A26A4CR9	1901-0518	8		DIODE-SM SIG SCHOTTKY	28480	1901-0518
A26A4CR10 <sup>Δ</sup>	1901-0040	1		DIODE-BM LD QUAD RINGS	02788	MA-4E402L
A26A4CR11	1901-0040	1		DIODE-BM LD QUAD RINGS	02788	MA-4E402L
A26A4CR12 <sup>Δ</sup>	1901-0040	1		DIODE-BM LD QUAD RINGS	02788	MA-4E402L
A26A4CR13	1901-0518	8		DIODE-SM SIG SCHOTTKY	28480	1901-0518
A26A4CR14	1901-0518	8		DIODE-SM SIG SCHOTTKY	28480	1901-0518
A26A4CR15				NOT ASSIGNED		
A26A4CR16	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A26A4E1	9170-0847	3		CORE-SHIELDING BEAD	02114	56-590-65/38 PARLENE
A26A4L1	9100-1641	0		INDUCTOR RF-CH-MLD 240UH 5% .166DX.385LG	28480	9100-1641
A26A4L2	9100-1641	0		INDUCTOR RF-CH-MLD 240UH 5% .166DX.385LG	28480	9100-1641
A26A4MP1 <sup>Δ</sup>	4040-0749	4		EXTR-PC BD BRN POLYC .062-BD-THKNS	28480	4040-0749
	1480-0116	8		PIN-GRV .062-IN-DIA .25-IN-LG STL	04622	G24-062X250-17
A26A4MP2 <sup>Δ</sup>	4040-0753	0	1	EXTR-PC BD GRN POLYC .062-BD-THKNS	28480	4040-0753
	1480-0116	8		PIN-GRV .062-IN-DIA .25-IN-LG STL	04622	G24-062X250-17

<sup>†</sup>Refer to Section 7 for update information.

\*Factory Selected Component (Refer to Section 5)

<sup>Δ</sup> Errata part change.

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A26A4 STANDARD</b>						
<b>(OPTION 002, 004 SEE RESPECTIVE LISTING)</b>						
A26A4Q1	1854-0221		9	TRANSISTOR-DUAL NPN PD = 750MW	28480	1854-0221
A26A4Q2 <sup>Δ</sup>	1854-0717		8	TRANSISTOR NPN SI PD = 550MW FT = 200MHZ	28480	1854-0717
A26A4Q3	1853-0007		7	TRANSISTOR PNP 2N3251 SI TO-18 PD = 360MW	04713	2N3251
A26A4Q4	1854-0221		9	TRANSISTOR-DUAL NPN PD = 750MW	28480	1854-0221
A26A4Q5	1853-0034		0	TRANSISTOR PNP SI TO-18 PD = 360MW	28480	1853-0034
A26A4Q6 <sup>Δ</sup>	1854-0717		8	TRANSISTOR NPN SI PD = 550MW FT = 200MHZ	28480	1854-0717
A26A4Q7	1853-0034		0	TRANSISTOR PNP SI TO-18 PD = 360MW	28480	1853-0034
A26A4Q8				NOT ASSIGNED		
A26A4Q9 <sup>Δ</sup>	1854-0717		8	TRANSISTOR NPN SI PD = 550MW FT = 200MHZ	28480	1854-0717
A26A4Q10	1853-0007		7	TRANSISTOR PNP 2N3251 SI TO-18 PD = 360MW	04713	2N3251
A26A4R1	2100-2489		9	1 RESISTOR-TRMR 5K 10% C SIDE-ADJ 1-TRN	30983	ET50X502
A26A4R2				NOT ASSIGNED		
A26A4R3	0757-0401		0	RESISTOR 100 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-101-F
A26A4R4	0757-0440		7	RESISTOR 7.5K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-7501-F
A26A4R5				NOT ASSIGNED		
				STANDARD		
				OPT 002, 004, SEE RESPECTIVE LISTING		
A26A4R6	0757-0440		7	RESISTOR 7.5K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-7501-F
A26A4R7	0698-3154		0	RESISTOR 4.22K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-4221-F
A26A4R8	0757-0440		7	RESISTOR 7.5K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-7501-F
A26A4R9	0757-0465		6	RESISTOR 100K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1003-F
A26A4R10	0757-0442		9	RESISTOR 10K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1002-F
A26A4R11	0757-0442		9	RESISTOR 10K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1002-F
A26A4R12	2100-2514		1	1 RESISTOR-TRMR 20K 10% C SIDE-ADJ 1-TRN	30983	ET50W203
A26A4R13	0698-3156		2	2 RESISTOR 14.7K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1472-F
A26A4R14	0757-0442		9	RESISTOR 10K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1002-F
A26A4R15	0698-3156		2	RESISTOR 14.7K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1472-F
A26A4R16	0757-0438		3	RESISTOR 5.11K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-5111-F
A26A4R17	0698-3453		2	1 RESISTOR 196K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1963-F
A26A4R18	0698-3153		9	2 RESISTOR 3.83K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-3831-F
A26A4R19	0757-0464		5	2 RESISTOR 90.9K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-9092-F
A26A4R20	0757-0438		3	RESISTOR 5.11K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-5111-F
A26A4R21	0757-0438		3	RESISTOR 5.11K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-5111-F
A26A4R22	0757-0278		9	2 RESISTOR 1.78K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1781-F
A26A4R23	0757-0290		5	1 RESISTOR 6.19K 1% .125W F TC = 0 + -100	19701	MF4C1/8-T0-6191-F
A26A4R24	0698-0083		8	RESISTOR 1.96K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1961-F
A26A4R25	0757-0458		7	RESISTOR 51.1K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-5112-F
A26A4R26	0757-0438		3	RESISTOR 5.11K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-5111-F
A26A4R27	0757-0458		7	RESISTOR 51.1K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-5112-F
A26A4R28				NOT ASSIGNED		
A26A4R29	0757-0442		9	RESISTOR 10K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1002-F
A26A4R30	0757-0441		8	RESISTOR 8.25K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-8251-F
A26A4R31	0757-0317		7	RESISTOR 1.33K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1331-F
A26A4R32	0757-0442		9	RESISTOR 10K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1002-F
A26A4R33	0757-0438		3	RESISTOR 5.11K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-5111-F
A26A4R34	0683-1055		5	RESISTOR 1M 5% .25W FC TC = -800/+900	01121	CB1055
A26A4R35	0683-1055		5	RESISTOR 1M 5% .25W FC TC = -800/+900	01121	CB1055
A26A4R36	0698-0083		8	RESISTOR 1.96K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1961-F
A26A4R37	0757-0394		0	RESISTOR 51.1 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-51R1-F
A26A4R38	0698-3153		9	RESISTOR 3.83K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-3831-F
A26A4R39	0757-0280		3	RESISTOR 1K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1001-F

† Refer to Section 7 for update information

\* Factory Selected Component (Refer to Section 5).

Δ Errata part change.

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A26A4 STANDARD</b>						
<b>(OPTION 002, 004 SEE RESPECTIVE LISTING)</b>						
A26A4R40	0698-3437	2	1	RESISTOR 133 1% .125W F TC = 0 + -100	24548	C4-1/8-T0-133R-F
A26A4R41	0757-0485	6		RESISTOR 100K 1% .125W F TC = 0 + -100	24548	C4-1/8-T0-1003-F
A26A4R42	0757-0485	6		RESISTOR 100K 1% .125W F TC = 0 + -100	24548	C4-1/8-T0-1003-F
A26A4R43	0698-0083	8		RESISTOR 1.96K 1% .125W F TC = 0 + -100	24548	C4-1/8-T0-1961-F
A26A4R44	0757-0421	4		RESISTOR 825 1% .125W F TC = 0 + -100	24548	C4-1/8-T0-825R-F
A26A4R45	0757-0442	9		RESISTOR 10K 1% .125W F TC = 0 + -100	24548	C4-1/8-T0-1002-F
A26A4R46	0698-3154	0		RESISTOR 4.22K 1% .125W F TC = 0 + -100	24548	C4-1/8-T0-4221-F
A26A4R47	0757-0401	0		RESISTOR 100 1% .125W F TC = 0 + -100	24548	C4-1/8-T0-101-F
A26A4R48	0757-0289	2		RESISTOR 13.3K 1% .125W F TC = 0 + -100	19701	MF4C1/8-T0-1332-F
A26A4R49	0698-3150	6		RESISTOR 2.37K 1% .125W F TC = 0 + -100	24548	C4-1/8-T0-2371-F
A26A4R50	0698-3451	0	1	RESISTOR 133K 1% .125W F TC = 0 + -100	24548	C4-1/8-T0-1333-F
A26A4R51				NOT ASSIGNED		
A26A4R52	0757-0280	3		RESISTOR 1K 1% .125W F TC = 0 + -100	24548	C4-1/8-T0-1001-F
A26A4R53	0757-0278	9		RESISTOR 1.78K 1% .125W F TC = 0 + -100	24548	C4-1/8-T0-1781-F
A26A4R54				NOT ASSIGNED		
A26A4R55				NOT ASSIGNED		
A26A4R56	0757-0442	9		RESISTOR 10K 1% .125W F TC = 0 + -100	24548	C4-1/8-T0-1002-F
A26A4R57				NOT ASSIGNED		
A26A4R58	0757-0465	6		RESISTOR 100K 1% .125W F TC = 0 + -100	24548	C4-1/8-T0-1003-F
A26A4R59	0757-0442	9		RESISTOR 10K 1% .125W F TC = 0 + -100	24548	C4-1/8-T0-1002-F
A26A4S1	3101-0860	9	1	SWITCH-SL DPDT MINTR .5A 125VAC/DC PC	28480	3101-0860
A26A4TP1	1251-0600	0	8	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A26A4TP2	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A26A4TP3	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A26A4TP4	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A26A4TP5	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A26A4TP6	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A26A4TP7	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A26A4TP8	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A26A4U1 <sup>Δ</sup>	5180-1817	6	1	IC OP AMP LOW-BIAS-H-IMP DUAL 8-DIP-C	28480	1826-0785
A26A4U2	1828-0065	0	1	IC COMPARTOR PRCN 8-DIP-C PKG	03406	LM39AJL
A26A4U3	1820-0328	6	1	IC GATE TTL NOR QUAD 2-INP	01295	SN7402N
A26A4U4	1820-0471	0	1	IC INV TTL HEX 1-INP	01295	SN7406N
A26A4VR1	1902-0025	4	1	DIODE-ZNR 10V 5% DO-35 PD = .4W TC = +.06%	28480	1902-0025
A26A4VR2	1902-0184	6		DIODE-ZNR 16.2V 5% DO-35 PD = .4W	28480	1902-0184

<sup>†</sup>Refer to Section 7 for update information.

<sup>\*</sup>Factory Selected Component (Refer to Section 5).

<sup>Δ</sup> Errata part change

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A26A4</b>						
<b>OPTION 002 ONLY</b>						
A26A4	08640-60350	5	1	AGC AMPLIFIER BOARD ASSEMBLY	28480	08640-60350
A26A4C1	0180-0291	3	4	CAPACITOR-FXD 1UF +-10% 35VDC TA	56289	150D105X9035A2
A26A4C2	0180-0291	3		CAPACITOR-FXD 1UF +-10% 35VDC TA	56289	150D105X9035A2
A26A4C3	0180-0291	3		CAPACITOR-FXD 1UF +-10% 35VDC TA	56289	150D105X9035A2
A26A4C4	0160-2307	4	2	CAPACITOR-FXD 47PF +-5% 300VDC MICA	28480	0160-2307
A26A4C5	0160-2307	4		CAPACITOR-FXD 47PF +-5% 300VDC MICA	28480	0160-2307
A26A4C8	0160-3458	8	1	CAPACITOR-FXD 5000PF +-10% 250VDC CER	28480	0160-3458
A26A4C7	0180-0291	3		CAPACITOR-FXD 1UF +-10% 35VDC TA	56289	150D105X9035A2
A26A4C8	0180-0187	8		CAPACITOR-FXD 2.2UF +-10% 20VDC TA	56289	150D225X9020A2
A26A4C9	0160-0161	4	1	CAPACITOR-FXD .01UF +-10% 200VDC POLYE	28480	0160-0161
A26A4C10*	0160-0184	3	1	CAPACITOR-FXD .015UF +-10% 200VDC POLYE	28480	0160-0184
A26A4C11*	0160-0158	9	1	CAPACITOR-FXD 5600PF +-10% 200VDC POLYE	28480	0160-0158
A26A4C12	0140-0191	8	1	CAPACITOR-FXD 56PF +-5% 300VDC MICA	72136	DM15E560J0300WV1CR
A26A4C13	0180-2206	4	1	CAPACITOR-FXD 60UF +-10% 6VDC TA	56289	150D606X9006B2
A26A4C14	0160-0576	5	1	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A26A4C15	0160-0297	7	1	CAPACITOR-FXD 1200PF +-10% 200VDC POLYE	28480	0160-0297
A26A4C16	0160-3534	1	1	CAPACITOR-FXD 510PF +-5% 100VDC MICA	28480	0160-3534
A26A4C17	0160-3459	9	1	CAPACITOR-FXD .02UF +-20% 100VDC CER	28480	0160-3459
A26A4C18	0180-2619	3	3	CAPACITOR-FXD 22UF +-10% 15VDC TA	25088	D22GS1B15K
A26A4C19	0180-2619	3		CAPACITOR-FXD 22UF +-10% 15VDC TA	25088	D22GS1B15K
A26A4C20	0180-2619	3		CAPACITOR-FXD 22UF +-10% 15VDC TA	25088	D22GS1B15K
A26A4CR1	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A26A4CR2	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A26A4CR3	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A26A4CR4	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A26A4CR5 <sup>Δ</sup>	1901-0040	1	4	DIODE-BM LD QUAD RINGS	02788	MA-4E402L
A26A4CR6 <sup>Δ</sup>	1901-0040	1		DIODE-BM LD QUAD RINGS	02788	MA-4E402L
A26A4CR7	1901-0518	8	5	DIODE-SM SIG SCHOTTKY	28480	1901-0518
A26A4CR8	1901-0518	8		DIODE-SM SIG SCHOTTKY	28480	1901-0518
A26A4CR9	1901-0518	8		DIODE-SM SIG SCHOTTKY	28480	1901-0518
A26A4CR10 <sup>Δ</sup>	1901-0040	1		DIODE-BM LD QUAD RINGS	02788	MA-4E402L
A26A4CR11	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A26A4CR12 <sup>Δ</sup>	1901-0040	1		DIODE-BM LD QUAD RINGS	02788	MA-4E402L
A26A4CR13	1901-0518	8		DIODE-SM SIG SCHOTTKY	28480	1901-0518
A26A4CR14	1901-0518	8		DIODE-SM SIG SCHOTTKY	28480	1901-0518
A26A4CR15	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A26A4CR16	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A26A4E1	9170-0847	3		CORE-SHIELDING BEAD	02114	56-590-65/38 PARLENE
A26A4K1	0490-1080	7	1	RELAY-REED 1C 250MA 150VAC 5VDC-COIL 3VA	28480	0490-1080
A26A4L1	9100-1641	0	2	INDUCTOR RF-CH-MLD 240UH 5% .166DX.385LG	28480	9100-1641
A26A4L2	9100-1641	0		INDUCTOR RF-CH-MLD 240UH 5% .166DX.385LG	28480	9100-1641

{Refer to Section 7 for update information.

\*Factory Selected Component {Refer to Section 5}.

Δ Errata part change.

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A26A4</b>						
<b>OPTION 002 ONLY</b>						
A26A4MP1 <sup>△</sup>	4040-0753	0	1	EXTR-PC BD GRN POLYC .062-BD-THKNS	28480	4040-0753
	1480-0116	8	2	PIN-GRV .062-IN-DIA .25-IN-LG STL	04622	G24-062X250-17
A26A4MP2 <sup>△</sup>	4040-0749	4	1	EXTR-PC BD BRN POLYC .062-BD-THKNS	28480	4040-0749
	1480-0116	8		EXTR-PC BD BRN POLYC .062-BD-THKNS	28480	G24-062X250-17
A26A4Q1	1854-0221	9	2	TRANSISTOR-DUAL NPN PD = 750MW	28480	1854-0221
A26A4Q2 <sup>△</sup>	1854-0717	8		TRANSISTOR NPN SI PD = 550MW FT = 200MHZ	28480	1854-0717
A26A4Q3	1853-0007	7		TRANSISTOR PNP 2N3251 SI TO-18 PD = 360MW	04713	2N3251
A26A4Q4	1854-0221	9		TRANSISTOR-DUAL NPN PD = 750MW	28480	1854-0221
A26A4Q5	1853-0034	0	2	TRANSISTOR PNP SI TO-18 PD = 360MW	28480	1853-0034
A26A4Q6 <sup>△</sup>	1854-0717	8		TRANSISTOR NPN SI PD = 550MW FT = 200MHZ	28480	1854-0717
A26A4Q7	1853-0034	0		TRANSISTOR PNP SI TO-18 PD = 360MW	28480	1853-0034
A26A4Q8				NOT ASSIGNED		
A26A4Q9 <sup>△</sup>	1854-0717	8		TRANSISTOR NPN SI PD = 550MW FT = 200MHZ	28480	1854-0717
A26A4Q10	1853-0007	7		TRANSISTOR PNP 2N3251 SI TO-18 PD = 360MW	04713	2N3251
A26A4R1	2100-2489	9	1	RESISTOR-TRMR 5K 10% C SIDE-ADJ 1-TRN	30983	ET50X502
A26A4R2	2100-2522	1	1	RESISTOR-TRMR 10K 10% C SIDE-ADJ 1-TRN	30983	ET50X103
A26A4R3	0757-0401	0	2	RESISTOR 100 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-101-F
A26A4R4	0757-0440	7	4	RESISTOR 7.5K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-7501-F
A26A4R5	0757-0274	5	1	RESISTOR 1.21K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1211-F
A26A4R6	0757-0440	7		RESISTOR 7.5K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-7501-F
A26A4R7	0698-3154	0	3	RESISTOR 4.22K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-4221-F
A26A4R8	0757-0440	7		RESISTOR 7.5K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-7501-F
A26A4R9	0757-0465	6	4	RESISTOR 100K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1003-F
A26A4R10	0757-0442	9	8	RESISTOR 10K 1% .125W F TC = 0 + -100 (OPTION 002 ONLY)	24546	C4-1/8-T0-1002-F
A26A4R11	0757-0442	9		RESISTOR 10K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1002-F
A26A4R12	2100-2514	1	1	RESISTOR-TRMR 20K 10% C SIDE-ADJ 1-TRN	30983	ET50W203
A26A4R13	0698-3156	2	2	RESISTOR 14.7K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1472-F
A26A4R14	0757-0442	9		RESISTOR 10K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1002-F
A26A4R15	0698-3156	2		RESISTOR 14.7K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1472-F
A26A4R16	0757-0438	3	5	RESISTOR 5.11K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-5111-F
A26A4R17	0698-3453	2	1	RESISTOR 196K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1963-F
A26A4R18	0698-3153	9	2	RESISTOR 3.83K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-3831-F
A26A4R19	0757-0464	5	1	RESISTOR 90.9K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-9092-F
A26A4R20	0757-0438	3		RESISTOR 5.11K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-5111-F
A26A4R21	0757-0438	3		RESISTOR 5.11K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-5111-F
A26A4R22	0757-0278	9	2	RESISTOR 1.78K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1781-F
A26A4R23	0757-0290	5	1	RESISTOR 6.19K 1% .125W F TC = 0 + -100	19701	MF4C1/8-T0-6191-F
A26A4R24	0698-0083	8	3	RESISTOR 1.96K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1961-F
A26A4R25	0757-0458	7	2	RESISTOR 51.1K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-5112-F
A26A4R26	0757-0438	3		RESISTOR 5.11K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-5111-F
A26A4R27	0757-0458	7		RESISTOR 51.1K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-5112-F
A26A4R28	0698-3154	0		RESISTOR 4.22K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-4221-F
A26A4R29	0757-0442	9		RESISTOR 10K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1002-F
A26A4R30	0757-0441	8	1	RESISTOR 8.25K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-8251-F
A26A4R31	0757-0317	7		RESISTOR 1.33K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1331-F
A26A4R32	0757-0442	9		RESISTOR 10K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1002-F
A26A4R33	0757-0438	3		RESISTOR 5.11K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-5111-F
A26A4R34	0683-1055	5		RESISTOR 1M 5% .25W FC TC = -800/+900	01121	CB1055
A26A4R35	0683-1055	5		RESISTOR 1M 5% .25W FC TC = -800/+900	01121	CB1055
A26A4R36	0698-0083	8		RESISTOR 1.96K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1961-F
A26A4R37	0757-0394	0	1	RESISTOR 51.1 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-51R1-F

† Refer to Section 7 for update information.

\* Factory Selected Component (Refer to Section 5).

△ Errata part change

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A26A4</b>				<b>OPTION 002 ONLY</b>		
A26A4R38	0698-3153	9		RESISTOR 3.83K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-3831-F
A26A4R39	0757-0280	3	3	RESISTOR 1K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1001-F
A26A4R40	0698-3437	2	1	RESISTOR 133 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-133R-F
A26A4R41	0757-0465	6		RESISTOR 100K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1003-F
A26A4R42	0757-0465	6		RESISTOR 100K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1003-F
A26A4R43	0698-0083	8		RESISTOR 1.96K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1961-F
A26A4R44	0757-0421	4		RESISTOR 825 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-825R-F
A26A4R45	0757-0442	9		RESISTOR 10K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1002-F
A26A4R46	0698-3154	0		RESISTOR 4.22K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-4221-F
A26A4R47	0757-0401	0		RESISTOR 100 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-101-F
A26A4R48	0757-0289	2	1	RESISTOR 13.3K 1% .125W F TC = 0 + -100	19701	MF4C1/8-T0-1332-F
A26A4R49	0698-3150	6	1	RESISTOR 2.37K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-2371-F
A26A4R50	0698-3451	0	1	RESISTOR 133K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1333-F
A26A4R51				NOT ASSIGNED		
A26A4R52	0757-0280	3		RESISTOR 1K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1001-F
A26A4R53	0757-0278	9		RESISTOR 1.78K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1781-F
A26A4R54	2100-2517	4	1	RESISTOR-TRMR 50K 10% C SIDE-ADJ 1-TRN	30983	ET50X503
A26A4R55	0698-3260	9	1	RESISTOR 464K 1% .125W F TC = 0 + -100	28480	0698-3260
A26A4R56	0757-0442	9		RESISTOR 10K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1002-F
A26A4R57	0757-0280	3		RESISTOR 1K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1001-F
A26A4R58	0757-0465	6		RESISTOR 100K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1003-F
A26A4R59	0757-0442	9		RESISTOR 10K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1002-F
A26A4S1	3101-0860	9	1	SWITCH-SL DPDT MINTR .5A 125VAC/DC PC	28480	3101-0860
A26A4TP1	1251-0600	0		CONNECTOR = SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A26A4TP2	1251-0600	0		CONNECTOR = SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A26A4TP3	1251-0600	0		CONNECTOR = SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A26A4TP4	1251-0600	0		CONNECTOR = SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A26A4TP5	1251-0600	0		CONNECTOR = SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A26A4TP6	1251-0600	0		CONNECTOR = SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A26A4TP7	1251-0600	0		CONNECTOR = SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A26A4TP8	1251-0600	0		CONNECTOR = SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A26A4TP9	1251-0600	0		CONNECTOR = SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A26A4U1 <sup>Δ</sup>	5180-1817	6	1	IC OP AMP LOW-BIAS-H-IMPDP DUAL 8-DIP-C	28480	1826-0785
A26A4U2	1826-0065	0	1	IC COMPARATOR PRCN 8-DIP-P PKG S	0545 U	PC311C
A26A4U3	1826-0328	8		IC OP AMP GP DUAL 8-DIP-C PKG	07933	RV4558DE
A26A4U4	1820-0471	0		IC INV TTL HEX 1 INP	01295	SM7406N
A26A4VR1	1902-0025	4	1	DIODE-ZNR 10V 5% DO-35 PD = .4W TC = + .06%	28480	1902-0025
A26A4VR2	1902-0184	6		DIODE-ZNR 16.2V 5% DO-35 PD = .4W	28480	1902-0184

<sup>†</sup> Refer to Section 7 for update information.

<sup>\*</sup> Factory Selected Component (Refer to Section 5).

<sup>Δ</sup> Errata part change.

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A26A4</b>						
<b>OPTION 004 ONLY</b>						
***** NOTE ***** REFER TO STANDARD PARTS LIST FOR ALL COMPONENTS EXCEPT THE FOLLOWING. *****						
A26A4	08640-60352		7	AGC AMPLIFIER ASSEMBLY	28480	08640-60352
A26A4C4 <sup>Δ</sup>	0160-2055		9	CAP-FXD 0.01uF +80% -20% 100V CER Y5V	09538	805-504Y5V103Z
A26A4C9	0160-0157		8	CAPACITOR-FXD 4700 PF +-10% 200VDC POLYC	28480	0160-0157
A26A4C14	0160-2055		9	CAPACITOR-FXD .01UF +-80% -20% 100 VDC CER	28480	0160-2055
A26A4C18	0160-0157		8	CAPACITOR-FXD 4700PF +-10% 200VDC POLYC	28480	0160-0157
A26A4C21	0180-2619		1	CAPACITOR-FXD 22UF +-10% 15 VDC TA	25088	D22GS1B15K
A26A4C22	0140-0193		0	CAPACITOR-FXD 82PF +-5% 300VDC MICA	28480	0140-0193
A26A4C23	0160-3875		3	CAPACITOR-FXD 22PF +-5% 200VDC CER 0+-30	28480	0160-3875
A26A4R4	0757-0290		5	RESISTOR 6.19K 1% .125W F TC=0+-100	24546	C4-1/8-TO-6191-F
A26A4R7	0757-0424		7	RESISTOR 1.1K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1101-F
A26A4R9 <sup>Δ</sup>	0757-0460		1	RESISTOR 61.9K+-1% .125W TF=0+-100	02995	SFR25H
A26A4R31	0698-3447		4	RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-TO-422R-F
A26A4R32	0757-0279		0	RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-TO-3161-F
A26A4R40 <sup>Δ</sup>	0757-0346		2	RESISTOR 10+-1% .125W TF TC=0+-100	05524	CMF-55-1,T-1
A26A4R55	0757-0280		3	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1001-F
A26A4R57	0757-0424		7	RESISTOR 1.1K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1101-F
A26A4R59	0757-0442		9	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1002-F
A26A4R60	0757-0442		9	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1002-F

<sup>Δ</sup>Refer to Section 7 for update information

\*Factory Selected Component (Refer to Section 5)

<sup>Δ</sup> Errata part change



Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A26A5</b>						
A26A5	08640-60302	7	1	RISER ASSEMBLY (DOES NOT INCLUDE W20)	28480	08640-60302
A26A5	08640-60319	6	1	RISER ASSEMBLY (INCLUDES W20) (EXCEPT OPTION 004)	28480	08640-60319
	0362-0265	7	1	W20 WIRE CRIMPS - A1	28480	0362-0265
	0362-0227	1	1	W20 WIRE CRIMPS - A13	28480	0362-0227
A26A5	08640-60315	2	1	RISER ASSEMBLY (INCLUDES W20) (OPTION 004 ONLY)	28480	08640-60315
	0362-0265	7	1	W20 WIRE CRIMPS - A1	28480	0362-0265
	0362-0227	1	1	W20 WIRE CRIMPS - A13	28480	0362-0227
A26A5XA26A6	1251-3231	9		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-3231

**A26A6 STANDARD & ALL OPTIONS EXCEPT OPTION 004**

A26A6	08640-60011	5	1	AM MOTHER BOARD ASSEMBLY	28480	08640-60011
A26A6XA26A2	1251-1886	6		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-1886
A26A6XA26A4	1251-1886	6		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-1886

**A26A6 OPTION 004 ONLY**

\*\*\*\*\* NOTE \*\*\*\*\*  
 REFER TO STANDARD PARTS LIST FOR ALL  
 COMPONENTS EXCEPT THE FOLLOWING.  
 \*\*\*\*\*

A26A6	08640-60067	1		AM MOTHER BOARD ASSEMBLY	28480	08640-60067
A26A6XA26A2 <sup>Δ</sup>	1251-1886	6		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	12355	SCM15D/7-4HP
A26A6XA26A4 <sup>Δ</sup>	1251-1886	6		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	12355	SCM15D/7-4HP
A26A6XA26A8	1251-2571	8		CONNECTOR-PC EDGE 15-CONT/ROW 1-ROW	28480	1251-2571

**A26A7 NOT ASSIGNED**

<sup>†</sup>Refer to Section 7 for update information.

\*Factory Selected Component (Refer to Section 5).

<sup>Δ</sup> Errata part change.

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>A26A8 NOT ASSIGNED (EXCEPT OPTION 004)</b>						
<b>A26A8 OPTION 004 ONLY</b>						
A26A8	08640-60069	3	1	DEMODULATOR AMPLIFIER BOARD ASSEMBLY	28480	08640-60069
A26A8C1	0180-0116	1	3	CAPACITOR-FXD 6.8UF + .10% 35VDC TA	56289	150D685X9035B2
A26A8C2	0160-2055	9		CAPACITOR-FXD .01UF + 80-20% 100VDC CER	28480	0160-2055
A26A8C3	0180-0116	1		CAPACITOR-FXD 6.8UF + .10% 35VDC TA	56289	150D685X9035B2
A26A8C4	0160-2055	9		CAPACITOR-FXD .01UF + 80-20% 100VDC CER	28480	0160-2055
A26A8C5	0180-0116	1		CAPACITOR-FXD 6.8UF + .10% 35VDC TA	56289	150D685X9035B2
A26A8C6	0160-2055	9		CAPACITOR-FXD .01UF + 80-20% 100VDC CER	28480	0160-2055
A26A8MP1	4040-0749	4	1	EXTR-PC BD BRN POLYC .062-BD-THKNS	28480	4040-0749
A26A8MP2	4040-0754	1	1	EXTR-PC BD BLU POLYC .062-BD-THKNS	28480	4040-0754
A26A8R1	0698-3334	8	2	RESISTOR 178 1% .5W F TC = 0 + -100	28480	0698-3334
A26A8R2	0698-3334	8		RESISTOR 178 1% .5W F TC = 0 + -100	28480	0698-3334
A26A8R3	2100-3154	7	1	RESISTOR-TRMR 1K 10% C SIDE-ADJ 17-TRN	02111	43P102
A26A8R4	0757-0442	9		RESISTOR 10K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1002-F
A26A8R5	0757-0280	3		RESISTOR 1K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-1001-F
A26A8R6	2100-3103	6	2	RESISTOR-TRMR 10K 10% C SIDE-ADJ 17-TRN	02111	43P103
A26A8R7 <sup>Δ</sup>	0757-0418	9	1	RESISTOR 619 + -1% .125W TF TC = 0 + -100	02995	SFR25H
A26A8R8	2100-3103	6		RESISTOR-TRMR 10K 10% C SIDE-ADJ 17-TRN	02111	43P103
A26A8R9	0698-3450	9	1	RESISTOR 42.2K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-4222-F
A26A8R10	2100-3109	2	1	RESISTOR-TRMR 2K 10% C SIDE-ADJ 17-TRN	02111	43P202
A26A8R11	0757-0441	8	1	RESISTOR 8.25K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-8251-F
A26A8R12	0757-0462	3	2	RESISTOR 75K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-7502-F
A26A8R13 <sup>Δ</sup>	0757-0440	7		RESISTOR 7.5K + -1% .125W TF TC = 0 + -100	02995	SFR25H
A26A8R14	0757-0462	3		RESISTOR 75K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-7502-F
A26A8R15	2100-3054	6	1	RESISTOR-TRMR 50K 10% C SIDE-ADJ 17-TRN	02111	43P503
A26A8S1	3101-0973	5	1	SWITCH-SL DPDT MINTR .5A 125VAC/DC PC	28480	3101-0973
A26A8TP1 <sup>Δ</sup>	1251-0600	0		CONNECTOR-SGL CONN PIN 1.14 MM-BSC-SZ SP	03418	16-06-0034
A26A8TP2 <sup>Δ</sup>	1251-0600	0		CONNECTOR-SGL CONN PIN 1.14 MM-BSC-SZ SP	03418	16-06-0034
A26A8TP3 <sup>Δ</sup>	1251-0600	0		CONNECTOR-SGL CONN PIN 1.14 MM-BSC-SZ SP	03418	16-06-0034
A26A8U1	1820-0158	0	1	IC OP AMP GP TO-99 PKG	27014	LM302H
A26A8U2	1826-0081	0	1	IC OP AMP WB TO-99 PKG	27014	LM318H
A26A8VR1	1902-0202	9	2	DIODE-ZNR 15V 5% PD = 1W IR = 5UA	28480	1902-0202
A26A8VR2	1902-0202	9		DIODE-ZNR 15V 5% PD = 1W IR = 5UA	28480	1902-0202

<sup>†</sup>Refer to Section 7 for update information.

<sup>\*</sup>Factory Selected Component (Refer to Section 5).

<sup>Δ</sup> Errata part change.

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>MISCELLANEOUS PARTS</b>						
2939A AND BELOW B1	3160-0453	0		FAN-TBAX 23-CFM 12VDC .25KV-DIEL	28480	3100-0453
2939A AND ABOVE B1	3160-0497	2		FAN-TBAX 23-CFM 12VDC	11039	612
C1	0180-2530	7	2	CAPACITOR-FXD 3900UF +75-10% 50VDC AL	28480	0180-2530
C2	0180-2530	7		CAPACITOR-FXD 3900UF +75-10% 50VDC AL	28480	0180-2530
C3	0180-2334	9	1	CAPACITOR-FXD 3900UF +75-10% 75VDC AL	56289	36D392F075BB2B
C4	0180-2277	9	2	CAPACITOR-FXD 8200UF +75-10% 25VDC AL	28480	0180-2277
C5	0180-2277	9		CAPACITOR-FXD 8200UF +75-10% 25VDC AL	28480	0180-2277
C6	0160-4065	9	1	CAPACITOR-FXD .022UF +-.20% 250VAC(RMS)	C0633	PME 271 M 522
DS1	2140-0244	4	1	LAMP-GLOW A1H 135/105VDC 1.2MA T-2-BULB	00471	A1H
F1	2110-0002	9	1	FUSE 2A 250V NTD 1.25X.25 UL (FOR 100/120V OPERATION)	75915	312002
F1	2110-0094	9	1	FUSE 1.25A 250V NTD 1.25X.25 UL IEC (FOR 220/240V OPERATION)	28480	2110-0094
FL1	0955-0052	7	1	FILTER, LOW PASS, 1120 MHZ (OPTION 002 ONLY)	11880	TLP-1120-5XX1
J1	5061-4826	1	1	CONNECTOR ASSEMBLY, OUTPUT(SEE FIG.6-3)	28480	5061-4826
J2				NOT SEPARATELY REPLACEABLE, PART OF W4		
J3				NOT SEPARATELY REPLACEABLE, PART OF W12		
J4				NOT ASSIGNED		
J5				NOT SEPARATELY REPLACEABLE, PART OF W14		
J6				NOT SEPARATELY REPLACEABLE, PART OF W15		
J7				NOT SEPARATELY REPLACEABLE, P/O W17 (OPTION 004 ONLY)		
M1	1120-0539	7	1	METER	28480	1120-0539
	0360-0053	7	2	TERMINAL-SLDR LUG LK-MTG FOR-#10-SCR	28480	0360-0053
MP1 <sup>Δ</sup>				NOT ASSIGNED		
MP2	0370-3037	4	1	KNOB, FREQUENCY RANGE (EXCEPT OPT. 002)	28480	0370-3037
MP2	0370-3038	5	1	KNOB, FREQUENCY RANGE (OPT. 002 ONLY)	28480	0370-3038
MP3	0370-2378	4	1	KNOB, FM VERNIER	28480	0370-2378
MP4	0370-2379	5	1	KNOB, AM VERNIER	28480	0370-2379
MP5	0370-3035	2	1	KNOB, PEAK DEVIATION	28480	0370-3035
MP6	0370-2381	9	1	KNOB,AUD OUT 3V(OPT. 001 ONLY)	28480	0370-2381
MP7	0370-2382	0	1	KNOB, AUD FXD FREQ.(EXCEPT OPT. 001)	28480	0370-2382
MP8	0370-2623	2	1	KNOB, FINE TUNE	28480	0370-2623
MP9	0370-2387	5	1	KNOB, AUD OUT 1V(EXCEPT OPT. 001)	28480	0370-2387
MP10	0370-2445	6	1	KNOB, RND OUTPUT LEVEL VERNIER (EXCEPT OPTION 004)	28480	0370-2445
MP10	0370-0623	8		KNOB, RND OUTPUT LEVEL VERNIER (OPTION 004 ONLY)	28480	0370-0623
MP11	0370-2446	7	1	KNOB-CONC 1/2 JGK .125-IN-ID MOD. FREQ. VERNIER (OPT. 001 ONLY)	28480	0370-2446
MP12	0403-0026	6	2	PLUG-HOLE BDR-HD FOR .187-D-HOLE NYL	02768	207-120241-03-0101
MP13 <sup>Δ</sup>	0590-1251	6	1	NUT-SPCLY 15/32-32-THD .1-IN-THK .562-WD (FRONT PANEL CONNECTORS)	28480	0590-1251

† Refer to Section 7 for update information.

\* Factory Selected Component (Refer to Section 5).

Δ Errata part change.

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>MISCELLANEOUS PARTS</b>						
MP14				NOT ASSIGNED		
MP15				NOT ASSIGNED		
MP16	4040-0976	9	1	CLAMP:CAP	00000	OBD
MP17	3150-0203	7	1	FILTER-AIR AL-MESH 3.6-WD 6-LG	28480	3150-0203
MP18	5001-0135	1	1	WRENCH:COMB	28480	5001-0135
MP19	5060-0109	3	1	CONNECTOR:15 CONTACTS	28480	5060-0109
MP20	08640-00107	4	1	PANEL, FRONT (EXCEPT OPTION 004)	28480	08640-00107
MP20	08640-00066	4		PANEL, FRONT (OPTION 004 ONLY)	28480	08640-00066
MP21	08640-00021	1	1	SHIELD, FM AMPLIFIER	28480	08640-00021
MP22	2510-0136	8	1	SCREW-MACH 8-32 2.5-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
MP23	08640-00022	2	1	SUPPORT, P.C. BOARD	28480	08640-00022
MP24	08640-00030	2	1	SUPPORT, MODULATOR	28480	08640-00030
MP25 <sup>Δ</sup>	08640-00087	9	1	INSULATOR	28480	08640-00087
MP26 <sup>Δ</sup>				NOT ASSIGNED		
MP27	08640-20078	0	1	EXTRUSION, TOP	28480	08640-20078
MP28				NOT ASSIGNED		
MP29	1500-0589	3	1	COUPLER-FLEX .68-LG NYL/BRN (FILTER CAM)	99934	T-301-34N
MP30	08640-20204	4	1	CASTING, FRONT (EXCEPT OPTION 004)	28480	08640-20204
MP30	08640-20231	7		CASTING, FRONT (OPTION 004 ONLY)	28480	08640-20231
MP31	08640-40016	8	1	CLAMP, METER	28480	08640-40016
MP32	0370-2916	6	1	KNOB/DIAL ASSEMBLY, OUTPUT LEVEL (EXCEPT OPTION 004)	28480	0370-2916
MP33	08640-40046	4	1	LENS, DIFFUSING	28480	08640-40046
MP34	0370-1092	7	1	KNOB BASE 1/2 JGK .25-IN-HD	28480	0370-1092
	4213-0004	1		MOLD CPD PLOYC	28480	4213-0004
MP35	08640-20312	5	1	WINDOW, FRONT	28480	08640-20312
MP36	08640-20296	4	1	DIAL/GEAR ASSEMBLY (OPT. 001 ONLY) (MOD. FREQ. VERNIER SKIRT)	28480	08640-20296
MP37	08640-40055	5	1	TUNE KNOB AND SKIRT	28480	08640-40055
MP38	3101-0559	3	1	CAP-PUSHBUTTON TRL WHT; BLK.ZIZ-ZAG	28480	3101-0559
MP39				NOT ASSIGNED		
MP40 <sup>Δ</sup>				NOT ASSIGNED		
MP41 <sup>Δ</sup>				NOT ASSIGNED		
MP42 <sup>Δ</sup>				NOT ASSIGNED		
MP43	3030-0007	5	25	SCREW-SET 4-40 .125-IN-LG SMALL CUP-PT (FRONT PANEL KNOBS)	00000	ORDER BY DESCRIPTION
MP44	0624-0267	5	8	SCREW-TPG 6-20 .625-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
MP45	0626-0002	0	2	SCREW-TPG 6-20 .5-IN-LG PAN-HD-SLT	00000	ORDER BY DESCRIPTION
MP46	1200-0043	8	5	INSULATOR-XSTR ALUMINUM	28480	1200-0043
MP47	3160-0217	4	1	FAN BLADE 3-OD .079-ID	28480	3160-0217
MP48	5040-0170	6	2	GUIDE:PLUG-IN PC BOARD	28480	5040-0170
MP49	3030-0007	5		SCREW-SET 4-40 .125-IN-LG SMALL CUP-PT	00000	ORDER BY DESCRIPTION
MP50	5040-0447	0	2	FOOT:REAR(LONG)	28480	5040-0447
MP51				NOT ASSIGNED		
MP52	08620-20016	2	1	HEAT SINK, TRANSISTOR	28480	08620-20016
MP53	08640-00014	2	1	DECK, TRANSFORMER	28480	08640-00014
MP54	08640-00015	3	1	DECK, MAIN	28480	08640-00015
MP55				NOT ASSIGNED		
MP56				NOT ASSIGNED		
MP57	0403-0026	6		PLUG-HOLE BDR-HD FOR .187-D-HOLE NYL	02768	207-120241-03-0101
MP58	8160-0276	0	1	RFI RING MNL .75-IN-OD .235-IN-ID	28480	8160-0276

†Refer to Section 7 for update information.

\*Factory Selected Component (Refer to Section 5).

Δ Errata part change.

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>MISCELLANEOUS PARTS</b>						
MP59	8160-0239	5	1	RFI RING MNL .63-IN-OD .12-IN-ID	28480	8160-0239
MP60	3050-0227	3		WASHER-FL MTLG NO.8 .149-IN-ID	28480	3050-0227
	0510-0052	5		RETAINER RING GRPR EXT .125-IN-DIA STL	28480	0510-0052
MP61	08640-40052	2	1	SWITCH, LEVER SLIDE	28480	08640-40052
MP62	08640-20057	5	1	INSULATOR, TRANSISTOR SCREW	28480	08640-20057
MP63	08640-00077	9		KNOB ASSEMBLY 1 DB ATTENUATOR (OPTION 004 ONLY)	28480	08640-00077
MP64	08640-00078	8		KNOB ASSEMBLY 10 DB ATTENUATOR (OPTION 004 ONLY)	28480	08640-00078
MP65	5020-0343	3		KNOB SHAFT 1-7/8-IN-LG (OPTION 004 ONLY)	28480	5020-0343
MP66	1410-0758	7		BUSHING-PNL .235-ID .5-LG 3/8-32-THD BRS (OPTION 004 ONLY)	28480	1410-0758
MP67	1400-0558	4	1	CLIP-CMPNT .5-DIA 1-WD PVC (OPTION 002 ONLY)	28480	1400-0558
MP68				NOT ASSIGNED		
MP69				NOT ASSIGNED		
MP70	08640-00074	4	1	FOAM STRIP, BOTTOM COVER	28480	08640-00074
MP71	7120-4244	5		LABEL-INFORMATION .57-IN-WD 3.33-IN-LG (OPTION 004 ONLY)	28480	7120-4244
MP72	7120-4294	5	1	LABEL, WARNING (EXCEPT OPTION 004)	28480	7120-4294
MP73	08640-40067	9	1	KNOB, TIME BASE VERNIER	28480	08640-40067
MP74	3030-0007	5		SCREW-SET 4-40 .125-IN-LG SMALL CUP-PT (FINE TUNE COLLAR)	00000	ORDER BY DESCRIPTION
MP75				NOT ASSIGNED		
MP76	8160-0245	3	1	RFI GASKET NI-ALY 1.56-IN-WD 3.97-IN-LG (OPTION 003 ONLY)	28480	8160-0245
MP77	7120-4657	4	1	LABEL, INFO(REV.POWER)(OPT. 003 ONLY)	28480	7120-4657
MP78	1400-0510	8	5	CLAMP-CABLE .15-DIA .62-WD NYL (OPTION 003 ONLY)	28480	1400-0510
MP79	2200-0103	2	6	SCREW-MACH 4-40 .25-IN-LG PAN-HD-POZI (FOR CAM COVER, EXCEPT OPTION 003)	28480	2200-0103
MP79	2200-0171	4	6	SCREW-MACH 4-40 .75-IN-LG 82 DEG (FOR CAM COVER, OPTION 003 ONLY)	00000	ORDER BY DESCRIPTION
MP80				NOT ASSIGNED		
MP81	08640-00037	9	2	INSULATOR, BOTTOM COVER	28480	08640-00037
MP82				NOT ASSIGNED		
2520A TO 2730A						
MP83	3030-0343	2	1	SCREW-SET 1/4-28 .25-IN-LG HALF DOG-PT	00000	ORDER BY DESCRIPTION
2743A AND ABOVE						
MP83	2940-0275	7	1	SCREW-MACH 1/16-27 .25-IN-LG (AM CASTING, BOTTOM COVER PLUG)	28480	2940-0275
MP84	08640-40068	0	1	TRANSFORMER COVER, PROTECTIVE	28480	08640-40068
MP85	0380-0004	0	2	SPACER-RND .188-IN-LG .18-IN-ID (FOR TRANSFORMER COVER)	00000	ORDER BY DESCRIPTION

† Refer to Section 7 for update information.

\* Factory Selected Component (Refer to Section 5).

Δ Errata part change.

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>MISCELLANEOUS PARTS</b>						
MP86	2510-0194	8	1	SCREW-MACH 8-32 .625-IN-LG PAN-HD-POZI	28480	2510-0194
	3050-0001	1	1	WASHER-FL MTLC NO. 8 .172-IN-ID	28480	3050-0001
	2190-0108	4		WASHER-LK HLCL NO. 4 .115-IN-ID (FOR TRANSFORMER COVER)	28480	2190-0108
MP87	1250-1471	3	1	CAP-COAX TO FIT F-BNC NON-SHTG 2.5-CH	28480	1250-1471
MP88	1400-0510	8		CLAMP-CABLE .15-DIA .62-WD NYL (USED ON PULSE CABLE)	28480	1400-0510
MP89	08640-00109	6	1	FOAM STRIP, TOP COVER (EXCEPT OPTION 004)	28480	08640-00109
MP90				NOT ASSIGNED		
MP91	2200-0143	0	1	SCREW-MACH 4-40 .375-IN-LG PAN-HD-POZI (OPTION 001 ONLY)	28480	2200-0143
MP92	2190-0108	4		WASHER-LK HLCL NO. 4 .115-IN-ID (OPTION 001 ONLY)	28480	2190-0108
MP93	3050-0105	6	1	WASHER-FL MTLC NO. 4 .125-IN-ID (OPTION 001 ONLY)	28480	3050-0105
MP94	08640-20285	1	1	SCREEN, RFI	28480	08640-20285
MP95	0510-0005	8		RETAINER-RING BSC EXT .25-IN-DIA STL	28480	0510-0005
MP96	3050-0103	4	1	WASHER-FL MTLC NO.12 .25-IN-ID	28480	3050-010
MP97	8160-0276	0	1	RFI RING MNL 1-IN-OD .235-IN-ID (EXCEPT OPTION 004)	28480	8160-0276
MP98 <sup>Δ</sup>				NOT ASSIGNED		
MP99	2420-0001	5	1	NUT-HEX-W/LKWVR 6-32-THD .109-IN-THK (EXCEPT OPTION 004)	00000	ORDER BY DESCRIPTION
MP100	08640-40054	4	1	METER, BEZEL (EXCEPT OPTION 004) (INCLUDES MP33)	28480	08640-40054
MP101	08640-00138	1	1	RETAINER (FOR RECTIFIER BOARD)	28480	08640-00138
MP102				NOT ASSIGNED		
MP103	08640-20241	9		BUSHING-PLÁSTIC	28480	08640-20241
MP104	08640-20402	4		HEAT SINK	28480	08640-20402
MP105	08640-40093	1		FAN MOUNTING GASKET	28480	08640-40093
MP106	3050-0001	1		WASHER-FL MTLC NO. 8 .172-IN-ID	28480	3050-0001
Q1	1854-0063	7	4	TRANSISTOR NPN 2N3055 SI TO-3 PD = 115W	3L585	2N3055
Q2	1854-0063	7		TRANSISTOR NPN 2N3055 SI TO-3 PD = 115W	3L585	2N3055
Q3	1854-0250	4	1	TRANSISTOR NPN SI TO-3 PD = 115W	28480	1854-0250
Q4	1854-0063	7		TRANSISTOR NPN 2N3055 SI TO-3 PD = 115W	3L585	2N3055
R1	2100-3325	4	1	RESISTOR-VAR DUAL 20K-10%-CC 2K-10%-CC PART OF R1	28480	2100-3325
R2						
R3	0698-3162	0	1	RESISTOR 46.4K 1% .125W F TC = 0 + -100	24546	C4-1/8-T0-4642-F
S1	3101-1395	7	1	SWITCH-PB DPDT-DB ALTNG 10.5A 250VAC	28480	3101-1395
	8160-0058	6	1	RFI BRAID CABLE (LINE)	28480	8160-0058
S2	3101-1903	3	1	SWITCH-SL DPDT MINTR .5A 125VAC/DC (RF ON/OFF)	28480	3101-1903
S3	3101-0163	5	1	SWITCH-TGL SUBMIN SPDT 5A 115VAC (TIME BASE)	28480	3101-0163
T1	9100-4024	9	1	TRANSFORMER, POWER	28480	9100-4024
U1	1826-0631	6		IC-350K MIPAREG	28480	1826-0631

old 9541 Insul. Cover Plastic 0340-1119

† Refer to Section 7 for update information.

\* Factory Selected Component (Refer to Section 5)

Δ Errata part change.

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
<b>MISCELLANEOUS PARTS</b>						
W1	8120-1378	1	1	CABLE ASSY 18AWG 3-CNDCT JGK-JKT	28480	8120-1378
W2	8120-1886	6	1	CABLE ASSY-COAX 6.3-IN-LG (RF OSC. TO COUNTER - EXCEPT OPT 004)	28480	8120-1886
W2	8120-0660	2		CABLE ASSY-COAX (9.579) (RF OSC. TO COUNTER - OPTION 004 ONLY)	28480	8120-0660
W3	8120-1890	2	1	CABLE ASSY-COAX 5.253-IN-LG (OSCILLATOR TO DIVIDER)	28480	8120-1890
W4 W5	08640-60180	9	1	CABLE ASSEMBLY,(FM INPUT/OUTPUT) NOT ASSIGNED	28480	08640-60180
W6	8120-1881	1	1	CABLE ASSY-COAX 2.7-IN-LG (MOD. TO FILTER)	28480	8120-1881
W7	08640-20363	6	1	CABLE ASSEMBLY-COAX 8.8-IN-LG (DIVIDER TO MODULATOR)	28480	08640-20363
W8	8120-0580	5	1	CABLE ASSY-COAX 4.2-IN-LG (FILTER OUTPUT)	28480	8120-0580
W9 W10	8120-0581	6	1	NOT ASSIGNED CABLE ASSY-COAX (EXCEPT OPTIONS 002, 004)	28480	8120-0581
W10	8120-0661	3		CABLE ASSY-COAX (5.409) (OPTION 004 ONLY)	28480	8120-0661
W11	8120-1885	5	1	CABLE ASSY-COAX 2.4-IN-LG (EXCEPT OPTIONS 003, 004)	28480	8120-1885
W11	08640-20246	4		CABLE ASSEMBLY, OUTPUT (OPTION 004 WITH OPTION 003 ONLY)	28480	08640-20246
W11	8120-0663	5		CABLE ASSEMBLY, OUTPUT (OPTION 004 WITHOUT OPTION 003 ONLY)	28480	8120-0663
W11	08640-20245	3	1	CABLE ASSEMBLY,(OUTPUT, OPT. 003 ONLY)	28480	08640-20245
W12	08640-60128	5	1	CABLE ASSEMBLY,(AM INPUT/OUTPUT)	28480	08640-60128
W13	08640-60192	3	1	CABLE ASSEMBLY, (PULSE MODULATOR)	28480	08640-60192
W14	8120-1891	3	1	CABLE ASSY-COAX 12.1-IN-LG (COUNTER INPUT EXCEPT OPTION 004)	28480	8120-1891
W14	8120-0659	9		CABLE ASSY-COAX (COUNTER INPUT) (OPTION 004 ONLY)	28480	8120-0659
W15	08640-60124	1	1	CABLE ASSEMBLY, (EXT. TIME BASE)	28480	08640-60124
W16	8120-1593	2	1	CABLE-SHLD 22AWG 5-CNDCT JGK-JKT	28480	8120-1593
W17	08640-60188	7		CABLE ASSY-COAX (DEMODO OUTPUT) (OPTION 004 ONLY)	28480	8120-0662
W18	8120-0662	4		CABLE ASSY-COAX (RF - A28 TO A1) (OPTION 004 ONLY)	28480	8120-0662
W19	08640-20247	7		CABLE ASSEMBLY, ATTENUATOR (OPTION 003 WITH OPTION 004)	28480	08640-20267
W19	08640-20244	2	1	CABLE ASSEMBLY, ATTENUATOR (OPTION 003 WITHOUT OPTION 004)	28480	08640-20244
W20				NOT SEPARATELY REPLACEABLE P/O A26A5		

† Refer to Section 7 for update information

\* Factory Selected Component (Refer to Section 5)

Δ Errata part change

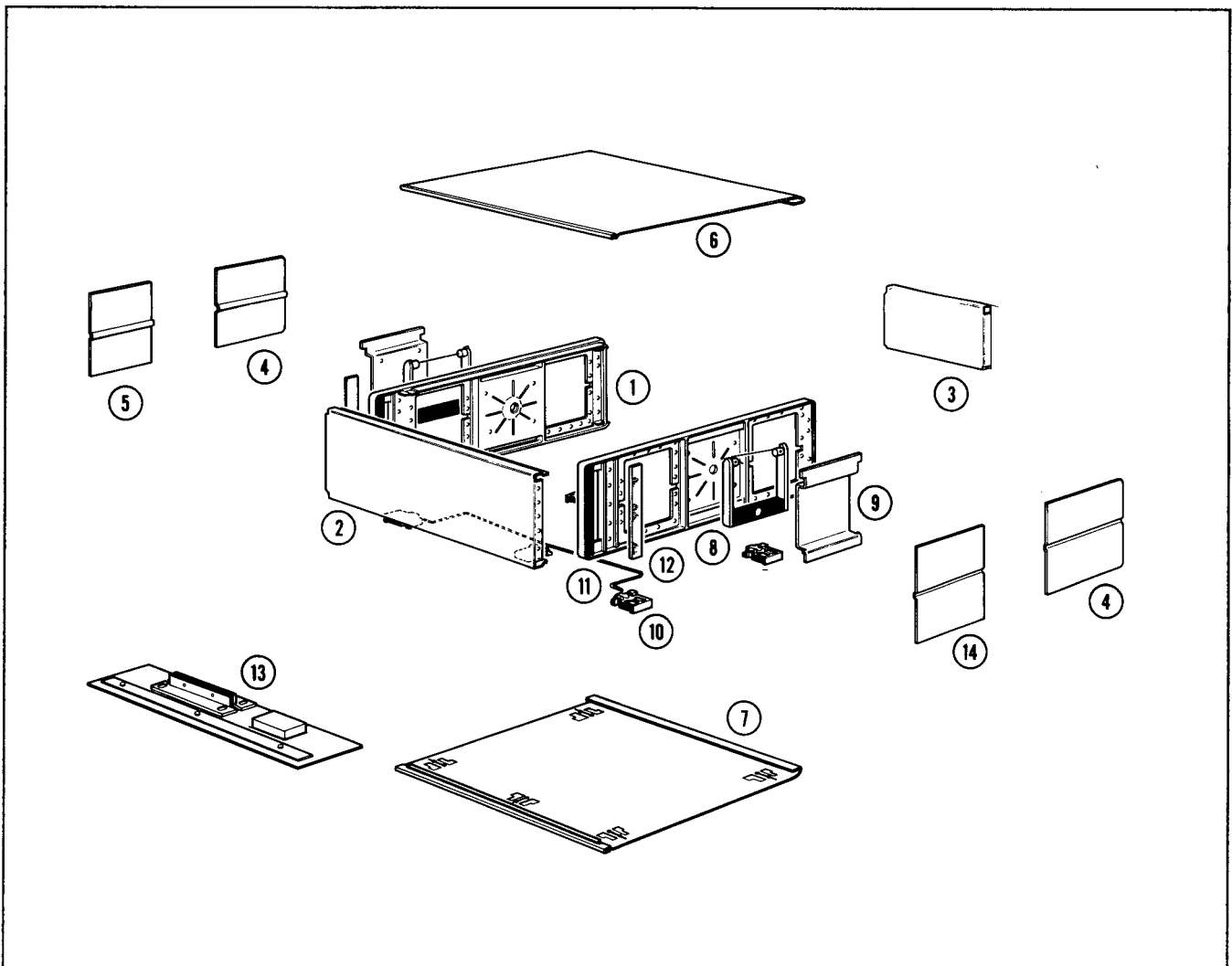
Table 6-4. Code List of Manufacturers

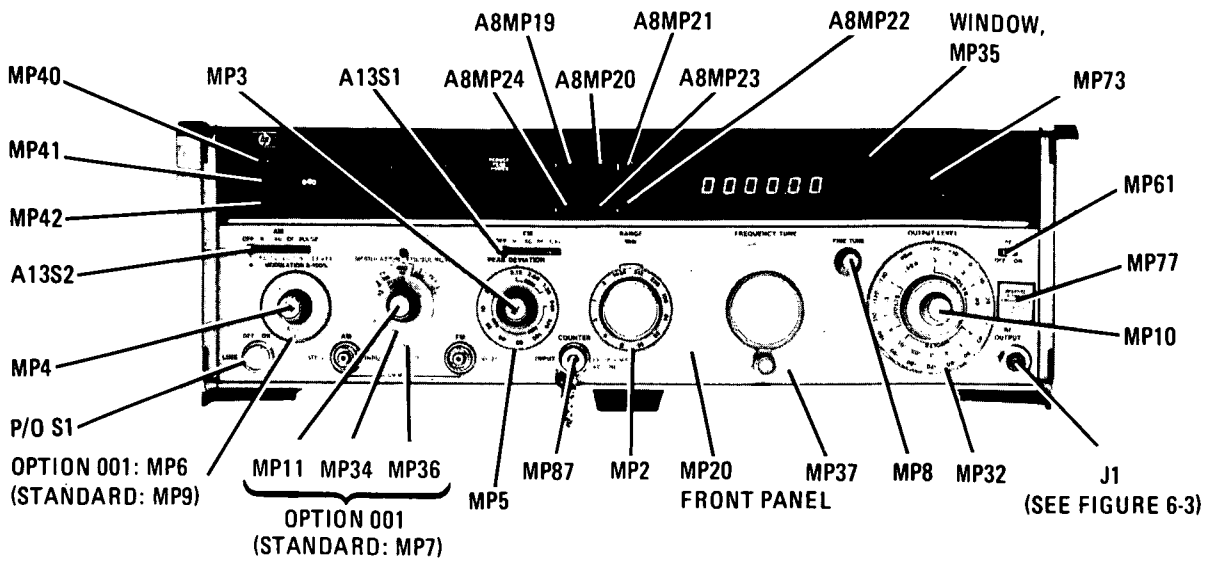
Mfr. Code	Manufacturer Name	Address	Zip Code
C0633	RIFA	BROMMA SE	
00000	ANY SATISFACTORY SUPPLIER		
00115	ACE GLASS INC	VINELAND NJ	08360
00471	DOW-KEY CO INC	BROOMFIELD WY	80020
00779	AMP INC	HARRISBURG PA	17105
01121	ALLEN-BRADLEY CO	MILWAUKEE WI	53204
01295	TEXAS INSTR INC SEMICOND CMPNT DIV	DALLAS TX	75222
02111	SPECTROL ELECTRONICS CORP	CITY OF IND CA	91745
02768	ILLINOIS TOOL WORKS INC FASTEX DIV	DES PLAINES IL	60016
03888	K D I PYROFILM CORP	WHIPPANY NJ	07981
04713	MOTOROLA SEMICONDUCTOR PRODUCTS	PHOENIX AZ	85008
06001	MEPCO ELECTRA CORP	COLUMBIA SC	29063
06665	PRECISION MONOLITHICS INC	SANTA CLARA CA	95050
07263	FAIRCHILD SEMICONDUCTOR DIV	MOUNTAIN VIEW CA	94042
07322	MINNESOTA RUBBER CO	MINNEAPOLIS MN	55416
1F556	PRECISION LAMP INC	COTATI CA	94040
16299	CORNING GLASS WKS COMPONENT DIV	RALEIGH NC	27604
11815	CHERRY RIVET DIV TOWNSEND CO	SANTA ANA CA	92707
11880	MARSTAN ELEK DIV OF BALCO ELEK CORP	ORANGE NJ	07050
15818	TELEDYNE SEMICONDUCTOR	MOUNTAIN VIEW CA	94043
18324	SIGNETICS CORP	SUNNYVALE CA	94086
19701	MEPCO/ELECTRA CORP	MINERAL WELLS TX	76067
24546	CORNING GLASS WORKS (BRADFORD)	BRADFORD PA	16701
25088	SIEMENS CORP	ISELIN NJ	08830
25403	N.V. PHILIPS-ELCOMA DEPARTMENT	EINDHOVEN HL	02876
27014	NATIONAL SEMICONDUCTOR CORP	SANTA CLARA CA	95051
28292	REDINGTON COUNTERS, INC	WINDSOR CT	06095
28480	HEWLETT-PACKARD CO CORPORATE HQ	PALO ALTO CA	94304
3L585	RCA CORP SOLID STATE DIV	SOMERVILLE NJ	
30161	AAVID ENGINEERING INC	LACONIA NH	03246
30983	MEPCO/ELECTRA CORP	SAN DIEGO CA	92121
32997	BOURNS INC TRIMPOT PROD DIV	RIVERSIDE CA	92507
33095	SPECTRUM CONTROL INC	FAIRVIEW PA	16415
51633	FLUOROCARBON CO THE	SUNNYVALE CA	94088
51642	CENTRE ENGINEERING INC	STATE COLLEGE PA	16801
52763	STETTNER ELECTRONICS INC	CHATTANOOGA TN	13035
56289	SPRAGUE ELECTRIC CO	NORTH ADAMS MA	01247
71400	BUSSMAN MFG DIV OF MCGRAW-EDISON CO	ST LOUIS MO	63107
72136	ELECTRO MOTIVE CORP	FLORENCE SC	06226
73138	BECKMAN INSTRUMENTS INC HELIPOT DIV	FULLERTON CA	92634
75042	TRW INC PHILADELPHIA DIV	PHILADELPHIA PA	19108
75915	LITTELFUSE INC	DES PLAINES IL	60016
76680	FEDERAL-MOGUL CORP RBR & PLSTC GP	REDWOOD CITY CA	94062
80486	OREN ELLOITT PRODUCT INC	DEFIANCE OH	43512
9D949	AMPHENOL SALES DIV OF BUNKER-RAMO	BROADVIEW IL	60153
91637	DALE ELECTRONICS INC	COLUMBUS NE	68601
99934	RENBRANDT INC	BOSTON MA	02118



Table 6-3. Replaceable Parts

Item Number	HP Part Number	C	D	Qty.	Description	Mfr. Code	Mfr. Part Number
1	08640-20075	7	2	2	FRAME ASSEMBLY, 5 X 16	28480	08640-20075
	0510-0075	2	8	8	NUT-SHMET-U 6-32-THD .5-WD STL	00000	ORDER BY DESCRIPTION
2	08640-20204	4	3	3	FRONT CASTING, 5H FM	28480	08640-20204
3	08640-00026	6	1	1	PANEL, REAR	28480	08640-00026
4	5000-8705	5	2	2	SIDE COVER, REAR	28480	5000-8705
5	5000-8707	7	2	2	SIDE COVER, FRONT	28480	5000-8707
6	08640-60488	0	1	1	COVER, TOP ASSY	28480	08640-60488
7	08640-60489	1	1	1	COVER, BOTTOM ASSY	28480	08640-60489
8	5060-0222	1	2	2	HANDLE ASSEMBLY, 5H SIDE	28480	5060-0222
9	5060-8737	9	2	2	HANDLE RETAINER	28480	5060-8737
10	5060-0767	9	5	5	FOOT ASSEMBLY: FM	28480	5060-0767
11	1490-0030	6	1	1	TILT STAND	28480	1490-0030
12	5000-0051	8	2	2	TRIM STRIP	28480	5000-0051
13	5060-8740	4	1	1	RACK MOUNT KIT	28480	5060-8740
14	5000-8711	3	1	1	SIDE COVER, FRONT PERFORATED	28480	5000-8711

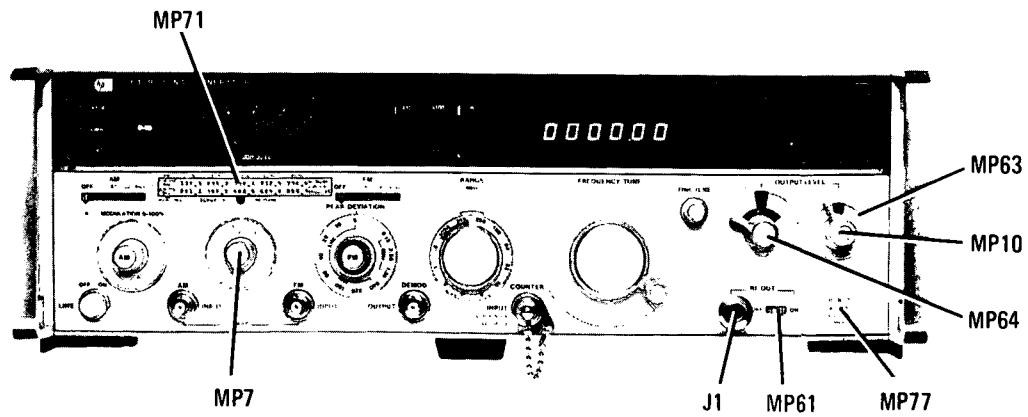




Standard

**NOTE**

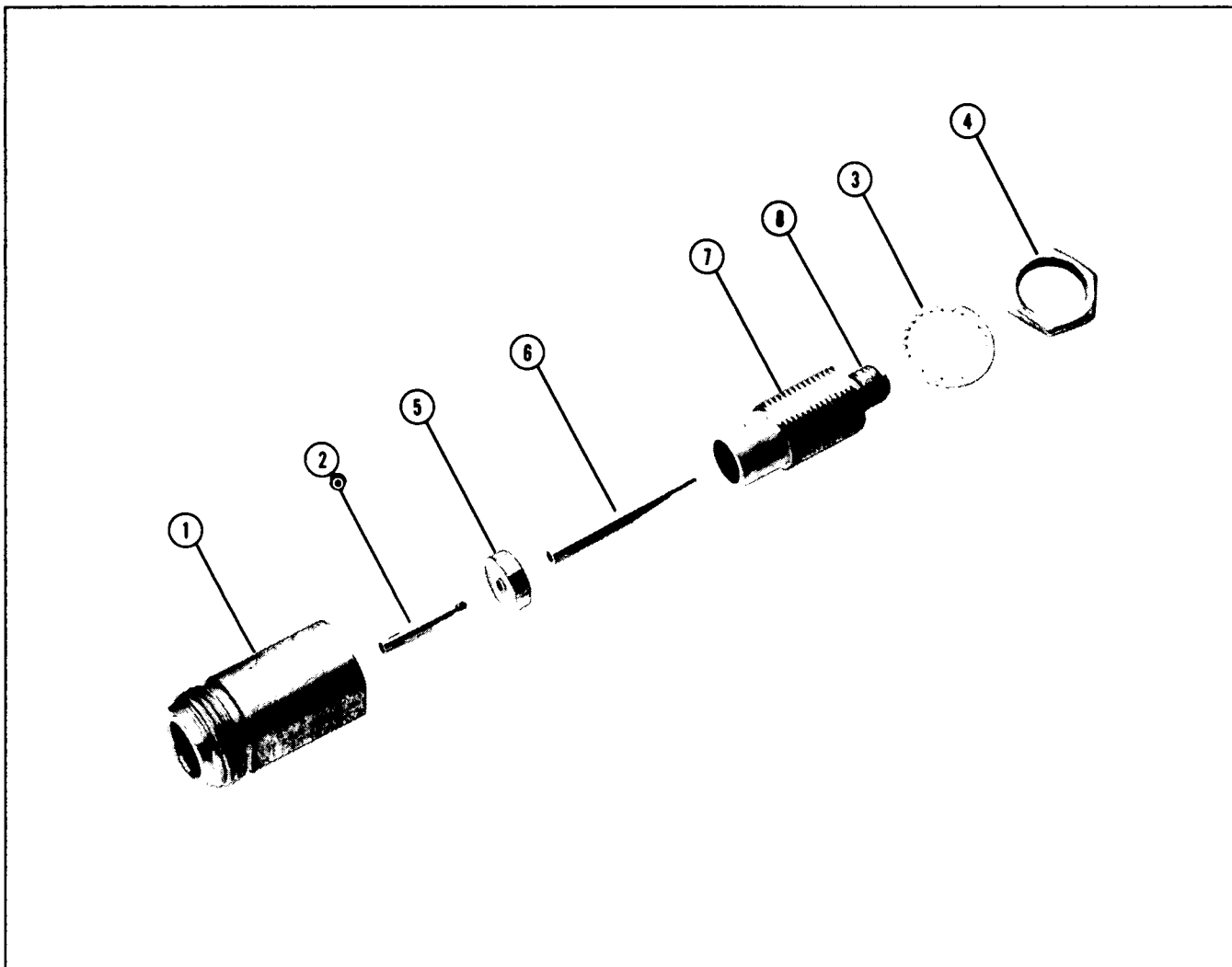
See Standard Instrument Front Panel photo for parts which are common to both Standard and Option 004 Instruments. The parts that are unique to Option 004 Instrument are shown below.



Option 004

Table 6-3. Replaceable Parts

Item Number	HP Part Number	C	D	Qty.	Description	Mfr. Code	Mfr. Part Number
1	1250-0914	7	1	1	CONNECTOR-RF APC-N FEM UNMTD 50-OHM	28480	1250-0914
2	1250-0915	8	1	1	CONTACT, RF CONNECTOR, FEMALE CENTER	28480	1250-0915
3	2190-0104	0	1	1	WASHER-LK INTL T 7/16 IN .439-IN-ID	28480	2190-0104
4	2950-0132	6	1	1	NUT-HEX-DBL-CHAM 7/16-20-THD .094-IN-THK	00000	ORDER BY DESCRIPTION
5	5040-0306	0	1	1	INSULATOR	28480	5040-0306
6	08555-20293	7	2	2	CENTER CONDUCTOR	28480	08555-20293
7	08555-20294	8	1	1	BODY, BULKHEAD	28480	08555-20294
8	08671-2027	5	4	4	INSULATOR	28480	08671-2027



## **Section 7 INSTRUMENT CHANGES**

### **7-1. INTRODUCTION**

This section contains any instrument modification recommendations and procedures that could improve the performance and reliability of your instrument. Refer to "Instruments Covered By This Manual" paragraph 1-4 in Section 1 of the Operation and Calibration Manual for important information about serial number coverage.

### **7-2. INSTRUMENT MODIFICATION RECOMMENDATIONS AND PROCEDURES**

This paragraph includes descriptions of changes to the Instrument stating the reasons why a part is added, deleted, or recommended as a replacement. The instrument modification recommendations and procedures are listed in order by serial number.

## Section 8 SERVICE

### 8-1. INTRODUCTION

This section contains the information required to troubleshoot and repair the HP 8640B Signal Generator and is divided into four major subsections: General Information, Principles of Operation/Troubleshooting, Service Sheets and Assembly/Disassembly Instructions.

#### General Information

This section provides general information about troubleshooting and repair of the whole instrument: Equipment required, common safety procedures etc.

#### Principles of Operation/Troubleshooting

This section is divided into information referring to each foldout contained in the "Service Sheet" subsection. Principles of operation and then the troubleshooting instructions appear for each Block Diagram. Then the principles of operation and troubleshooting instructions for the schematic on each Service Sheet appear.

#### Service Sheets

**Organization.** This subsection is made up of foldouts containing Block Diagrams and Service Sheets. Block Diagram 1 is an simplified block diagram that shows overall standard instrument operation in a simplified format.

The Block Diagrams 2-4 provide an assembly-by-assembly description of instrument operation. They are keyed to the schematics on the Service Sheets that follow them.

The Service Sheets provide a stage-by-stage description of the circuits on the schematics. The stages are keyed to the descriptions by the stage names that appear on the schematic.

Service Sheets also contain component locators for all the printed circuit boards involved in the circuit operation, a simplified block diagram showing the circuits relationship to the appropriate Service Sheets.

**Numbering.** All Block Diagrams and Service Sheets which are numbered alpha-numerically (e.g. BD 3A, BD 3B and BD 3C) indicate that there are significantly different drawings for the options that may be included in your instrument. Be sure you are using the right drawing.

### 8-2. SAFETY CONSIDERATIONS

#### Before Applying Power

Verify that the instrument is set to match the available line voltage and that the correct fuse is installed (refer to paragraph 2-3). An uninterrupted safety earth ground must be provided from the main power source to the instrument input wiring terminals, power cord, or supplied power cord set.

## Warnings and Cautions

Pay attention to WARNINGS and CAUTIONS. They must be followed for your protection and to avoid damage to the equipment.

### WARNING

*Maintenance described herein is performed with power supplied to the instrument and with the protective covers removed. Such maintenance should be performed only by service-trained personnel who are aware of the hazards involved (for example, fire and electrical shock). Where maintenance can be performed without power supplied, the power should be removed.*

*Any interruption of the protective (grounding) conductor (inside or outside the instrument) or disconnection of the protective earth terminal will create a potential shock hazard that could result in personal injury. Grounding one conductor of a two conductor outlet is not sufficient. Whenever it is likely that the protection has been impaired, the instrument must be made inoperative (i.e., secured against unintended operation).*

*If this instrument is to be energized via an autotransformer, make sure that the autotransformer's common terminal is connected to the earth terminal of the power source.*

*Capacitors inside the instrument can still be charged even if the instrument is disconnected from its source of supply.*

*Make sure that only 250 volt fuses with the required rated current and of the specified type (normal blow, time delay, etc.) are used for replacement. Do not use repaired fuses or short-circuited fuseholders. To do so could create a shock or fire hazard.*

### CAUTION

*Do not disconnect or remove any boards in the Signal Generator unless the instrument is unplugged. Some boards contain devices which can be damaged if the board is removed when the power is on. Use conductive foam when removing MOS devices from sockets. Use care when unplugging ICs from high-grip sockets.*

## 8-3. RECOMMENDED TEST EQUIPMENT AND ACCESSORIES

Test equipment and test accessories required to maintain the Signal Generator are listed in the table of Recommended Test Equipment in Section I of the Operation/Calibration manual. Equipment other than that listed may be used if it meets the listed critical specifications.

## 8-4. SERVICE TOOLS, AIDS AND INFORMATION

### Service Tools

There are unique tools available that will make servicing of this instrument easier. Some service aids are provided in the instrument.

**Pozidriv Screwdrivers.** Many screws in the Signal Generator appear to be Phillips type, but are not. To avoid damage to the screw slots, Pozidriv screwdrivers should be used. HP 8710-0899 is the No. 1 Pozidriv. HP 8710-0900 is the No. 2 Pozidriv.

**Tuning Tools.** For adjustments requiring non-metallic tuning tools, use the HP 8710-0033 blade tuning tool or the HP 8710-1010 (JFD Model No. 5284) hex tuning tool. For other adjustments an ordinary small screwdriver or suitable tool is sufficient. No matter which tool is used, never force any adjustment control. This is especially critical when adjusting variable inductors or capacitors.

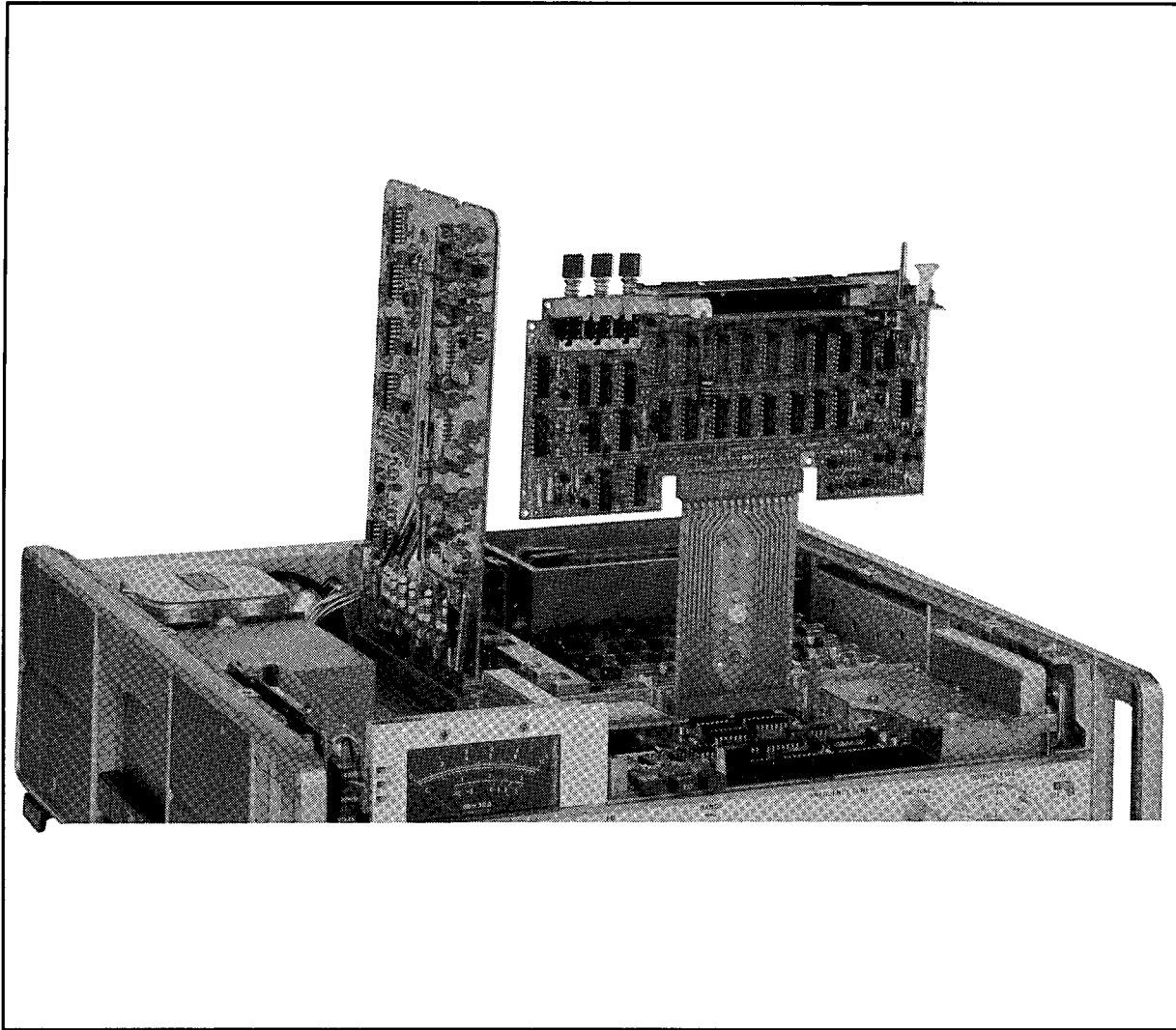
**Service Kit.** The following parts can be ordered for use in a service kit for the generator. (Before ordering, check to ensure that they are not on hand; most of them are common to service kits for other Hewlett-Packard instruments.)

- 1 SMC Adapter.....HP 1250-0827
- 2 Test Cables SMC to BNC.....HP 11592-60001
- 1 Extender Board 30 pins.....HP 08640-60036
- 1 Extender Board-20 pins.....HP 5060-0256
- 1 Extender Board-12 pins.....HP 5060-0257
- 2 Bumpers (for Board).....HP 0403-0115

**Hardware Kit.** The HP 08640-60095 Hardware Kit contains miscellaneous mechanical spare parts for the generator-such things as nuts, bolts, screws and washers.

**Wrench** A wrench is supplied with the generator. One end fits  $7/32''$  connectors while the other end fits  $1/4''$  connectors. Both of these SMC RF connector sizes are used in the generator. (See Service Sheet H for location.)

**Extender Board** An extender board (HP 08640-60036) is available that can be used to extend all circuit boards (except the A10A2 RF Divider Assembly and the A12 Rectifier Assembly) that are not accessible by removing a casting cover. The RF Divider Assembly is self-extending. To use this capability, just remove the riser board and insert the RF Divider Assembly into the riser's slot. Figure 8A-1 shows the extender board in use and the RF Divider Assembly extended.



*Figure 8A-1. Signal Generator with Circuit Boards on Extenders*

## Part and Cable Locations

The locations of some chassis-mounted parts and the major assemblies are shown on the last two foldouts in this manual. In addition, illustrated parts breakdowns located in Section 6 and the Service Sheets in *Assembly/Disassembly Instructions* facilitate identification of mechanical parts.

The locations of individual components mounted on printed circuit boards or other assemblies are shown adjacent to the schematic diagram on the back of the preceding Service Sheet. For specific component descriptions and ordering information, refer to Table 6-3, Replaceable Parts, in Section 6. Illustrated parts breakdowns of chassis and frame parts are shown in Figures 6-1 through 6-3.

Mechanical parts have reference designations that begin with the letters MP. Some mechanical parts, such as screws, are listed in the replaceable parts list below the part to which they fasten. To find the part number and description of mechanical part, find the part in one of the figures in Section 6 or Section 8. The part in the figure is labeled with its reference designator. Look up that reference designator in the table of Replaceable Parts. If the part is a fastener, such as a screw, nut, or washer and does not have an assigned reference designator, look to the figure for the part to which it fastens. Then, look up the fastened part in the parts list. Just below the fastened part, you will see the part numbers and descriptions of the desired fastener.



## Test Point and Adjustment Locations

Most test points and adjustments are indicated on individual circuit board assemblies. Test points and adjustments can also be found on the component locator diagram adjacent to the assembly's schematic diagram.

## Other Service Documents

Service Notes, Manual Changes supplements, and other service literature are available through Hewlett-Packard. For further information, contact your nearest Hewlett-Packard office.

## 8-5. TROUBLESHOOTING

### Types of Instrument Failures

Instrument problems usually fall into three general categories: operator errors, instrument out of specification, and catastrophic failures. The troubleshooting strategy is different for each category. For more information refer to the table of Specifications in Section I and the detailed operating instructions found in Section III.

**Operator Error.** Apparent failures sometimes result from operator errors. These may take one of several forms. The operator may allow external influences which affect instrument operation. At times he may attempt to operate the instrument in an "out of specification" mode. Under certain circumstances the Signal Generator allows for out of specification operation. Under other conditions it does not.

#### NOTE

*Without Option 003 installed, the HP 8640B has NO reverse power protection.*

**Instrument Out of Specification.** If it is suspected that the instrument's operating parameters are out of tolerance, the Post-Repair Performance Tests table in Section 4 tells which test may be performed to verify proper operation. This table may also be used to determine which assembly requires adjusting and on what service sheet the adjustable components are located. The Post-Repair Adjustments table in Section V tells which adjustments are related and may also require adjustment. After adjustments are complete, perform the performance test(s) in Section IV. If the performance is still out of tolerance, refer to troubleshooting information. Although the problem may be solved very quickly by going to the service sheet where the adjustment is located, it is good practice to begin with the overall troubleshooting information found on Service Sheet BD1.

**Catastrophic Failure.** When a catastrophic failure occurs, begin troubleshooting on Service Sheet BD1.

### Strategy

Troubleshooting for the Signal Generator is organized into three levels. The overall troubleshooting level is where problems are isolated to the power supply or one of the functional sections (BD1A & 1B). The functional section level of troubleshooting isolates the malfunction to the circuit level (BD2-4). At the circuit level, the problem is isolated to a stage within the circuits shown on the schematic (SS1-21). It is expected that further troubleshooting, to the component level, depends on the skill and experience of the troubleshooter.

## 8-6. REPAIR

### Assembly/Disassembly Instructions

For the most part, disassembling the Signal Generator is quite straightforward. Most of the procedures simply indicate the size, number, type, and general location of the mounting hardware. When it is necessary the procedures are more detailed. Refer to Service Sheets A through G which are behind the *Assembly/Disassembly Instructions* tab.

### Factory-Selected Components (\*)

Some component values are selected at the time of final checkout at the factory (see Table 5-1 in the Operation/Calibration manual). These values are selected to provide optimum compatibility with associated components. These components are identified on individual schematics and the parts list by an asterisk (\*).

### Static Sensitive Devices

This information is provided to familiarize users of Hewlett-Packard instruments with special handling precautions for static sensitive devices. These precautions should be observed when servicing printed circuit boards or components that are static sensitive.

All schematics with circuit assemblies containing static sensitive components are designated with the international awareness symbol. This symbol indicates that special precautions apply when servicing these circuits. Following the precautions described in the following paragraphs could prevent damage to the circuit and its components.



*Figure 8A-2. Static Devices Symbol*

**Definition of a Static Sensitive Device.** Static Sensitive Devices are electronic components that are susceptible to damage or complete destruction in the presence of a static discharge. While all electronic components are static sensitive to some degree, the possibility of damage due to electro-static discharge (ESD) becomes greater as the insulating materials in the components become thinner and as component densities increase. Depending on the magnitude of the charge, device substrates can be punctured or destroyed by contact or mere proximity of a static charge.

Static charges accumulate harmlessly in a person's body, therefore the charges can be passed on in numerous ways such as simple contact with the device, during separation of materials, or during normal motions of persons with static sensitive devices. In many cases, destructive static discharges (<4000 V) cannot be seen or felt. The results of this damage can cause degradation of device performance, early failure, or complete destruction of the device.

**Static Sensitive Device Classes.** The following is a classification of the ESD sensitivity of components used in most Hewlett-Packard instruments:

CLASS I devices have a sensitivity range from 0 to 1000 volts. Devices in this range include microwave diodes (especially Schottky), BIFET and precision OP AMP ( $I_{os} < 50$  nA,  $V_{os} < 1$  mV), unprotected

MOS (especially VLSI), MOS capacitors, advanced Schottky logic, junction FETs and low current SCRs (<.15A), microwave and VHF transistors and ICs, precision IC voltage regulators and resistors, low power resistors (<.05W), VLSICs with dual-level metalization, and Surface Acoustic Wave (SAW) devices.

CLASS II devices have a sensitivity range from 1000 to 4000 volts. Devices in this range include MOS ICs with internal protection (CMOS, NMOS, PMOS) and LSI ICs, Schottky rectifier diodes, linear ICs (bipolar), precision resistor networks, high speed bipolar logic (ECL, LS-TTL, S-TTL), varactor diodes, monolithic ceramic capacitors, RF Mixers and other RF devices utilizing diodes.

CLASS III devices have a sensitivity range from 4000 to 15000 volts. Devices in this range include small signal diodes, and transistors, low-speed bipolar logic (TTL, DTL), quartz and piezoelectric crystals, and thin and thick film resistors (<1/8 W, >500k  $\Omega$ ).

#### **Static Sensitive Device Handling Precautions.**

1. Those persons servicing the instrument should use metal or conductive plastic wriststraps with a 1 M $\Omega$  series resistor connected to ground.
2. Packages should not be removed from their conductive or antistatic carriers until required and should only be removed by an operator that is grounded through a 1 M $\Omega$  series resistor. Devices that are removed should be placed in a conductive tray.
3. Metal parts of fixtures, tools, soldering irons, and table tops should be grounded to a common point.
4. Handling equipment, trays, table tops, and transport carts should be electrically conductive.
5. The circuit board should have a conductive strip placed on the board edge-connectors to short all the connections together.

#### **Etched Circuits (Printed Circuit Boards)**

The etched circuit boards in the Signal Generator have plated-through holes which make a solderable path through to both sides of the insulating material. Soldering can be done from either side of the board with equally good results. When soldering to any circuit board, keep in mind the following recommendations:

1. Avoid unnecessary component substitution. Substitution can result in damage to the circuit board and/or adjacent components.
2. Do not use a high power soldering iron on etched circuit boards. Excessive heat may lift a conductor or damage the board.
3. Use a suction device or wooden toothpick to remove solder from component mounting holes. **DO NOT USE A SHARP METAL OBJECT SUCH AS AN AWL OR TWIST DRILL FOR THIS PURPOSE. SHARP OBJECTS MAY DAMAGE THE PLATED-THROUGH CONDUCTOR.** Refer to Table 8A-21 for information on available tools for working on etched circuit boards.

Table 8A-1. Etched Circuits Soldering Equipment

Item	Use	Specification	Item Recommended	HP Part No.
<b>Soldering Tool</b>	Soldering, Heat Staking	Wattage: 35W Tip Temp.: 390-440°C (735-825°F)	Ungar No. 135 Ungar Division Eldon Ind. Corp. Compton, CA 90220	8690-0167
<b>Soldering Tip</b>	Soldering, Unsoldering Heat Staking	Shape: Chisel* Shape; Cupped	Unger PL113* HP 5020-8160 or Modified Unger PL111 (see Figure 8-5)	8690-0007 5020-8160
<b>De-Soldering Aid</b>	To remove molten solder from connection	Suction Device	Soldapullit by edsyn Co., Van Nuys, CA 91406	8690-0060
<b>Solder</b>	Component replacement: Circuit Board repair wiring	Rosin (flux) core, high tin content (63/37 tin/ lead), 18 gauge (SWG) 0.048 in. diameter preferred.		8090-0607
*For working on circuit boards; for general purpose work, use No. 555 Handle (8690-0261) and No. 4037 Heating Unit 47 <sup>1</sup> / <sub>2</sub> - 56 <sup>1</sup> / <sub>2</sub> W (HP 8690-0006); tip temperature of 850-900°F, and Ungar No. PL113 1/8" chisel tip.				

## MOS and CMOS Integrated Circuit Replacement

MOS and CMOS integrated circuits are used in this instrument. They are prone to damage from both static and transients and must be handled carefully. Refer to paragraph 8-10 Special Handling Considerations for Static Sensitive Devices for further information. When working on the Signal Generator, keep in mind the following recommendations to avoid damaging these sensitive components.

1. Do not remove any board unless the Signal Generator has been unplugged.
2. When removing a socketed MOS and CMOS device from an assembly, be careful not to damage it. Avoid removing devices from these sockets with pullers. Instead, use a small screwdriver to pry the device up from one end, slowly pulling it up one pair of pins at a time.
3. Once a MOS or CMOS device has been removed from an assembly, immediately stick it into a pad of conductive foam or other suitable holding medium.
4. When replacing a MOS or CMOS device, ground the foam on which it resides to the instrument before removing it. If a device requires soldering, make sure that the assembly is lying on a sheet of conductive foam, and that the foam and soldering iron tip are grounded to the assembly. Apply as little heat as possible.
5. Before turning the instrument off, remove any large ac sources which may be driving MOS switches.

## 8-7. SCHEMATIC SYMBOLOGY AND OPERATING PRINCIPLES

### Schematic Diagram Notes

Table 8A-2, at the end of this section, summarizes the symbology used in presenting the devices found in the Signal Generator.

### Basic Logic Symbology

The logic symbols used in this manual are based on the Institute of Electrical and Electronic Engineers (IEEE) IEEE-STD 91-1984, "Graphic Symbols for Logic Functions". A summary of this symbology is provided to aid in interpreting these symbols. This publication may be purchased from:

Institute of Electrical & Electronic Engineers Inc.  
345 East 47th Street  
New York, NY 10017

**Gates and Qualifiers.** This section includes a brief description of the basic symbols used on the service sheets (see Figure 8A-3), a summary of indicator symbols (see Figure 8A-4), dependency notation (see Figure 8A-5), control blocks (see Figure 8A-6), and a summary of symbology for some of the more complex devices.

Qualifiers are that portion of a device symbol that denotes the logic function. For example, "&" denotes the AND function. See Figure 8A-3 for a summary of the basic logic symbols and their qualifiers.

**Indicator Symbols.** Indicator symbols identify the active state of a device's input or output, as shown in Figure 8A-4.

**Dependency Notation.** Dependency Notation simplifies symbols for complex integrated circuit elements by defining the interdependencies of inputs or outputs without actually showing all the elements and interconnections involved (see Figure 8A-5). The dependent input or output is controlled by a similarly numbered dependency input labeled C, G, V, EN, X or M as explained in Table 8A-3.

**Common Control Block.** The Control block is used in conjunction with an array of related symbols in order to group common logic lines. A quad D-type Flip-Flop with reset can be redrawn as shown in Figure 8A-6. Note that individual Flip-Flop symbols can be used when flip-flops are functionally scattered around the schematic (i.e. not used as a quad unit).

**Complex Device Symbology.** Figures 8A-7 through 8A-10 show how the basic symbols can be combined to illustrate behavior of fairly complex devices. Two symbols may share a common boundary parallel or perpendicular to the direction of the signal flow. There is generally no logic connection across a horizontal line, but there is always an implied logic connection across a vertical line. Notable exceptions to this rule are the horizontal lines beneath control blocks and between sections of shift registers and counters (dividers).

**Shift Register.** The control block shown in Figure 8A-7 is used to show common inputs to a Bidirectional Shift Register. Input "a" has two functions common to one pin. When input "a" is high, parallel-loading of the D-type flip-flops (1,3D) is enabled after high-to-low transition of the clock input (C3). During parallel-loading, entry of serial data is inhibited. When input "a" is low, one input to the top D-type flip-flop (2,3D) is enabled to shift data "m" units after high-to-low transition of the clock input (C3). Input "b" is active during the high-to-low transition of the clock input. Input "b" loads

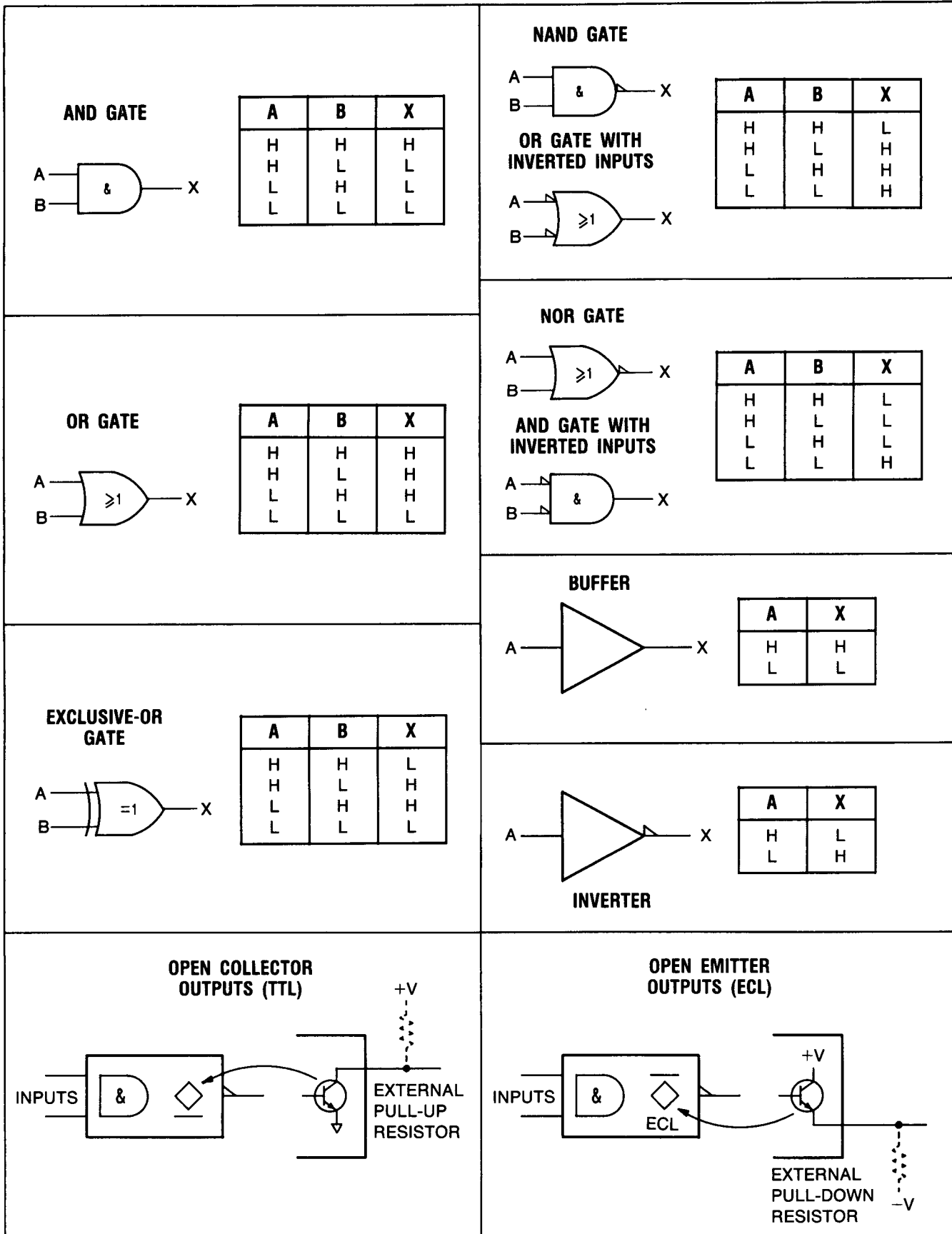


Figure 8A-3. Basic Logic Symbols and Qualifiers

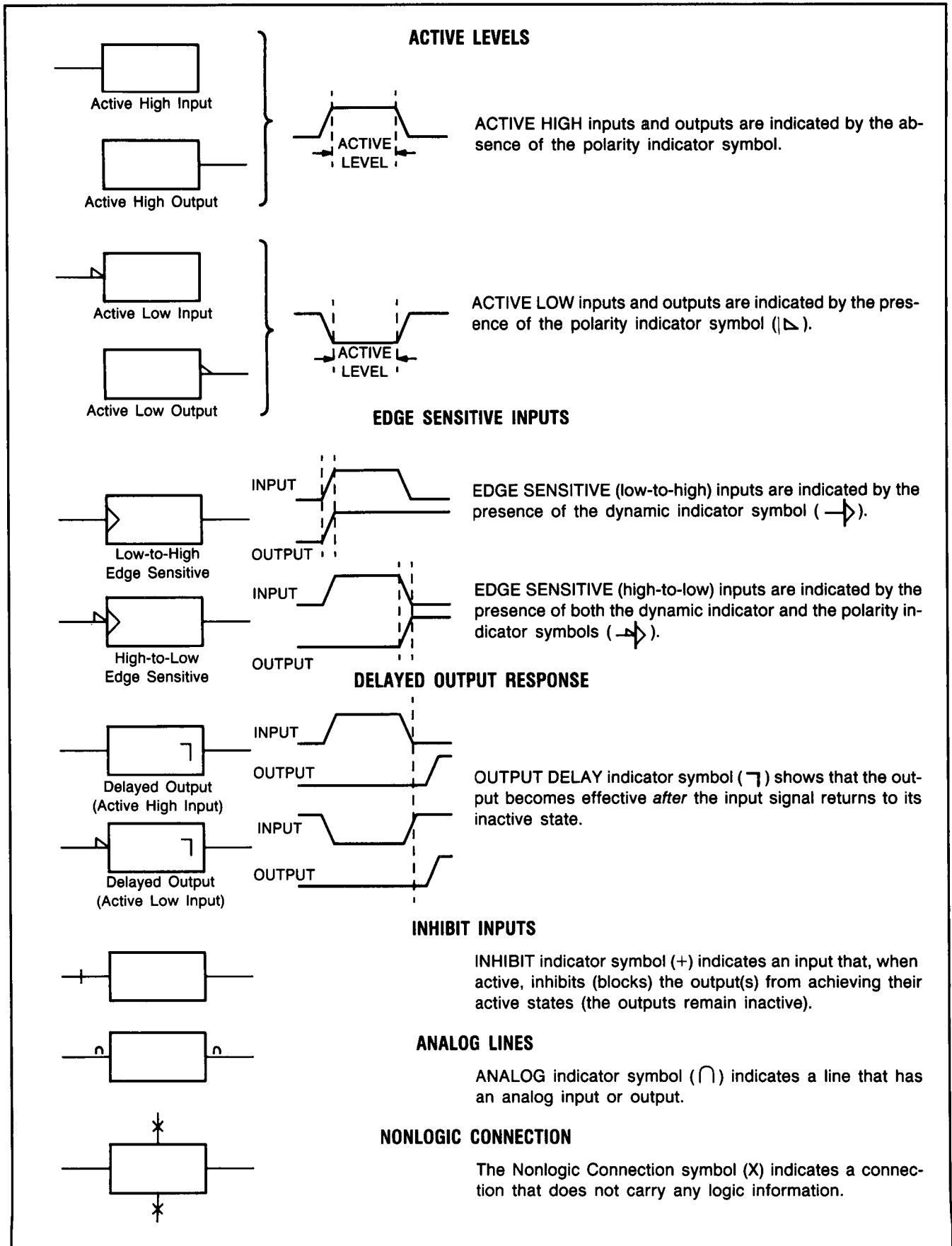
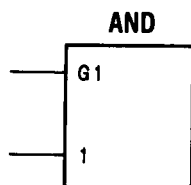
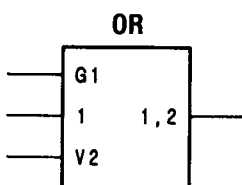


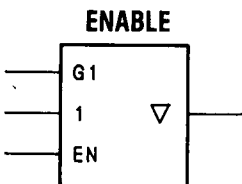
Figure 8A-4. Indicator Symbols



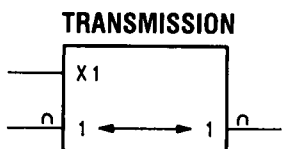
The input that controls or gates other inputs is labeled with a C or a G, followed by an identifying number. The controlled or gated input or output is labeled with the same number. In this example, 1 is controlled by G1.



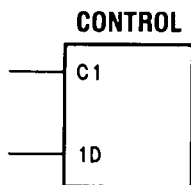
When a V input is active, the output will be in its active state. With the V input inactive, the device functions as if the V input doesn't exist.



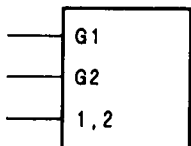
When the EN input is active, the output is enabled to function normally. When the EN input is inactive, the three-state output ( ▽ ), in this case, becomes a high impedance, effectively removing that device from the circuit.



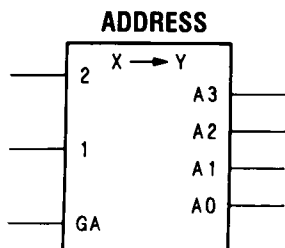
When the X1 input is active, the associated input-output pair are bi-directionally connected together. When X1 is inactive, the connection is broken.



When the controlled or gated input or output already has a functional label (D is used here), that label will be prefixed by the identifying number.



If the input or output is affected by more than one gate or control input, then the identifying numbers of each gate or control input will appear separated by commas.



When GA is active, the active address line (0 through 3) is the decoded value of the 1 and 2 binary inputs. When the controlled address lines have a functional value, that value will be prefixed by the identifying letter.

Figure 8A-5. Dependency Notation



all four flip-flops (1,3D) in parallel, and the top flip-flop input (2,BD) in serial. Notice that “ $\rightarrow m$ ” means shift contents to the right or down by “m” units. Note: if  $m=1$  “m” may be omitted. Input “c”, active-low, enables normal logic levels of the “4” outputs to drive loads or bus lines. The “4” outputs are disabled by a high logic level at input “c”. The “4” outputs then present a high impedance state represented by the three-state symbol “ $\nabla$ ”. Input “d”, active-low, is a common reset.

**Up/Down Counter.** The control block shown in Figure 8A-8 is used to show common inputs to a Presettable Decade Up/Down Counter. Input “a”, active-low, outputs each flip-flop on a low-to-high level transition of the clock. Input “b” has two functions common to one pin. When input “b” is high, the direction of count is down. When input “b” is low, the direction of count is up. Input “c” has two functions common to one pin. Input “c” is an edge-triggered control input for the count up/down output “e” and a control input for the ripple clock output “f”. Input “d”, active-low, enables the four data inputs (5D) to accept a count up/down number in BCD.

**Quad D-Type Latch.** The control block shown in Figure 8A-9 is used to illustrate a Quad D-type Latch. It has a common active-low reset (R), and a common edge-triggered control input (C1). There is only one dependency relationship; the controlling input is numbered and the controlled functions have the control dependency notation (1D) next to them.

**Analog Switch.** The analog switch is a bidirectional device, as indicated by the double-ended arrow (see Figure 8A-10). The X1 input is the gate. X1 indicates that the input and output (both labeled “1”) are dependent on this input.

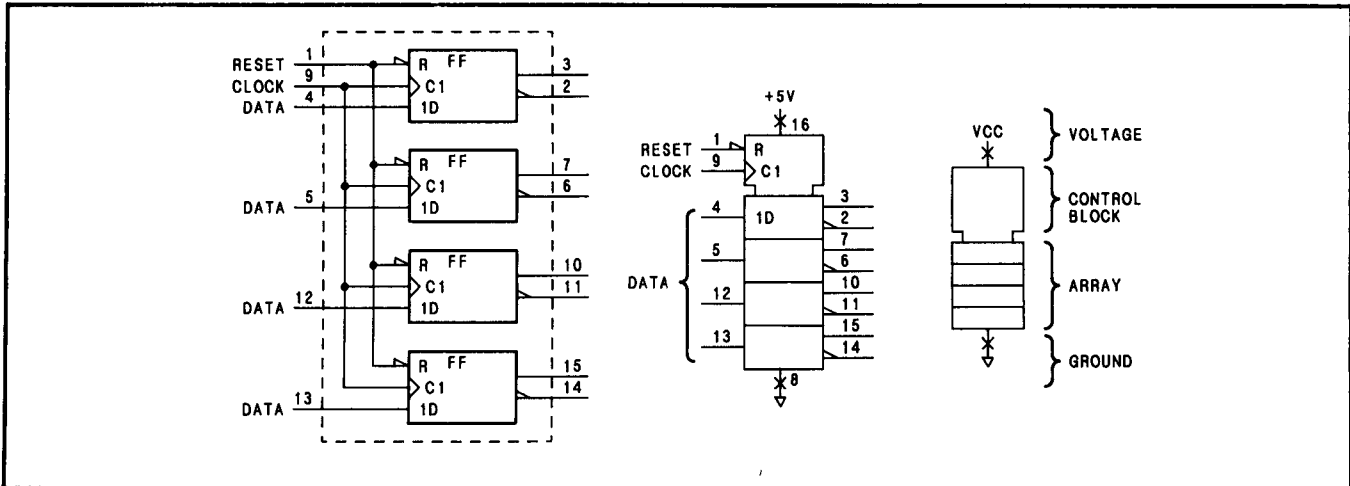


Figure 8A-6. Common Control Block

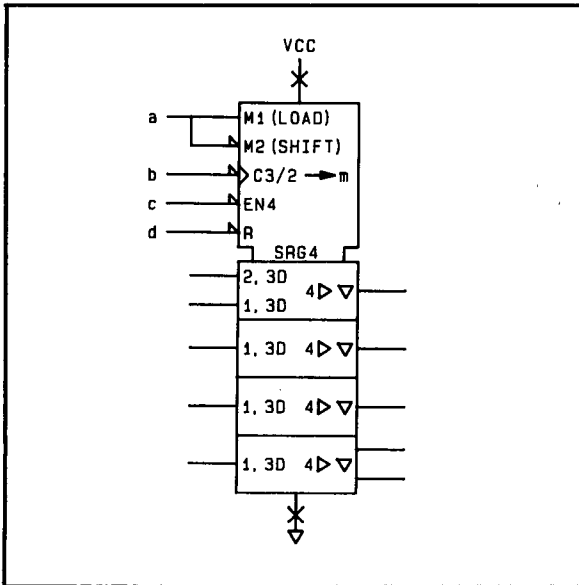


Figure 8A-7. Shift Register

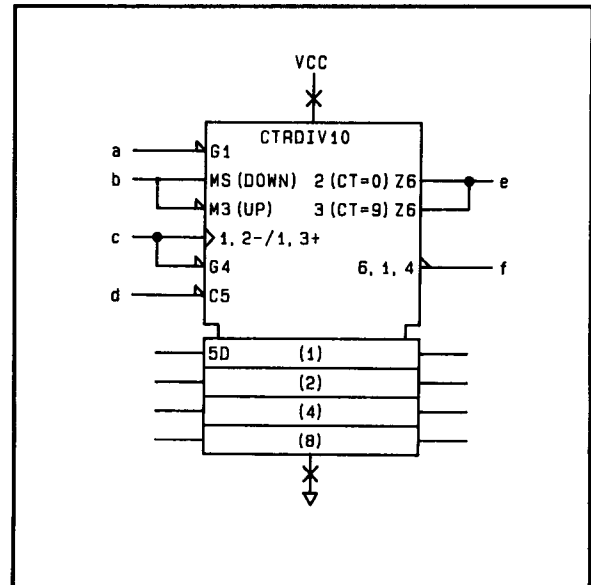


Figure 8A-8. Up/Down Counter

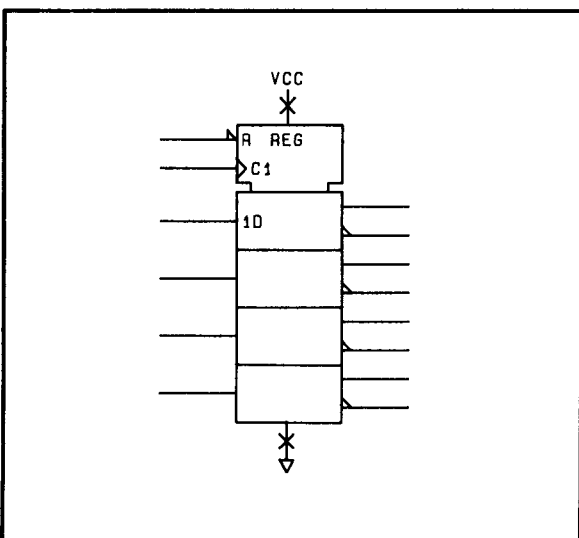


Figure 8A-9. Quad D-Type Latch

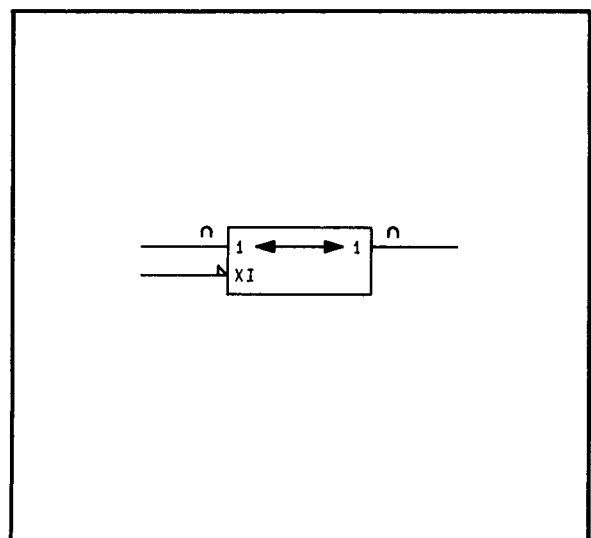


Figure 8A-10. Analog Switch

## Linear Device Operating Principles

**Operational Amplifiers.** The source of gain in an operation amplifier can be characterized as an ideal differential voltage amplifier having low output impedance, high input impedance, and very high differential gain. The output of an operational amplifier is proportional to the difference in the voltages applied to the two input terminals. In use, the amplifier output drives the input voltage difference close to zero through a feedback path.

When troubleshooting an operational amplifier circuit, measure the voltages at the two inputs; the difference between these voltages should be less than 10 mV. (Note: This troubleshooting procedure will not work for operational amplifiers which are configured as comparators.) A difference voltage much greater than 10 mV indicates trouble in the amplifier or its external circuitry. Usually, this difference is several volts and one of the inputs is very close to one of the supply voltages (e.g., +15V or -15V).

Next, check the amplifier's output voltage. It will probably also be close to one of the supply voltages (e.g., ground, +15V or -15V). Check to see that the output conforms to the inputs. For example, if the inverting input is more positive than the non-inverting input, the output should be negative; if the non-inverting input is more positive than the inverting input, the output should be positive. If the output conforms to the inputs, check the amplifier's external circuitry. If the amplifier's output does not conform to its inputs, it is probably defective.

Figures 8A-11, 8A-12, and 8A-13 show typical operational amplifier configurations. Figure 8A-11 shows a non-inverting buffer amplifier with a gain of 1. Figure 8A-12 is a non-inverting amplifier with a gain determined by R1 and R2. Figure 8A-13 is an inverting amplifier with gain determined by R1 and R2.

**Comparators.** Comparators are used as level sense amplifiers, switch drivers, pulse height discriminators, and voltage comparators. A voltage reference is connected to one of the amplifier's inputs as shown in Figures 8A-14 and 8A-15. When the other input signal voltage crosses the reference, the output is switched to the opposite polarity; the output remains at this polarity until the input signal re-crosses the reference.

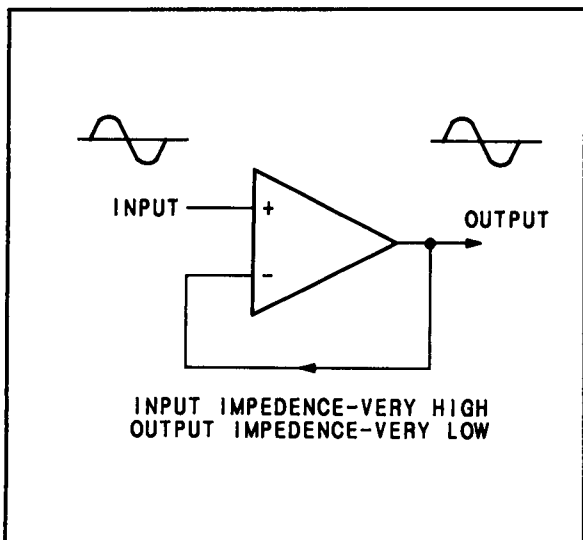


Figure 8A-11. Non-Inverting Amplifier (Gain=1)

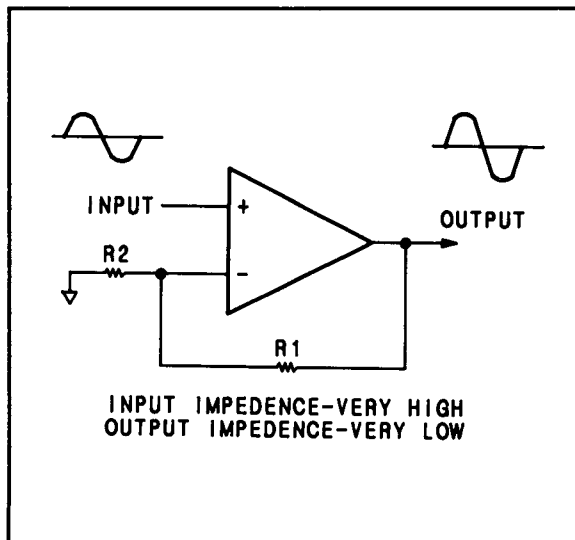


Figure 8A-12. Non-Inverting Amplifier (Gain=1+R1/R2)

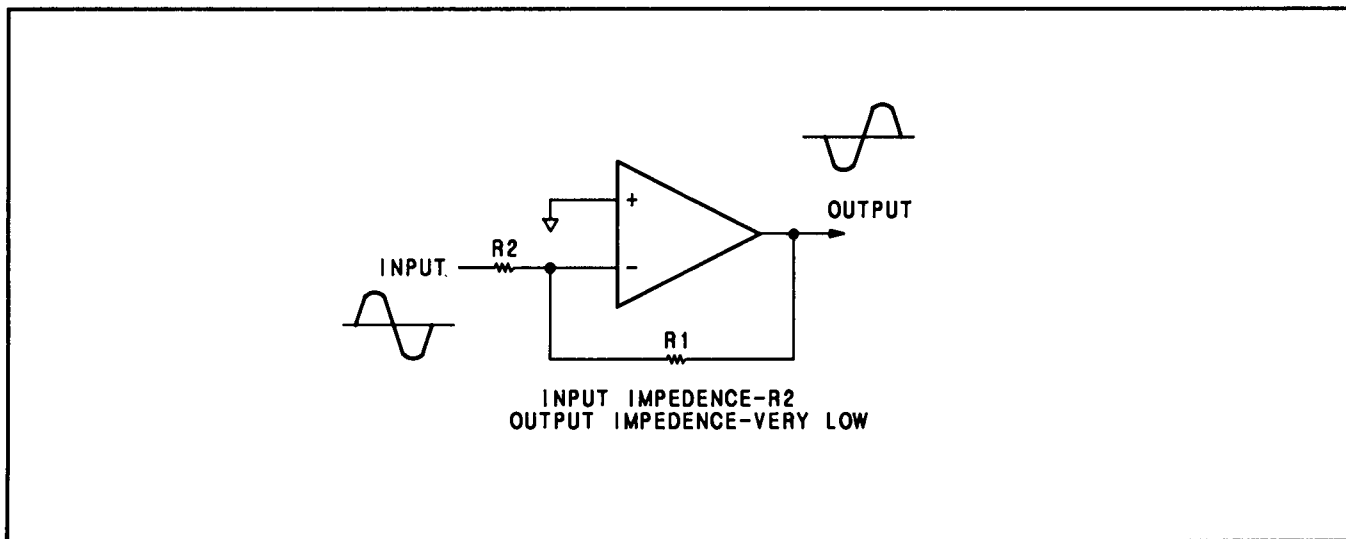


Figure 8A-13. Inverting Amplifier (Gain= -R1/R2)

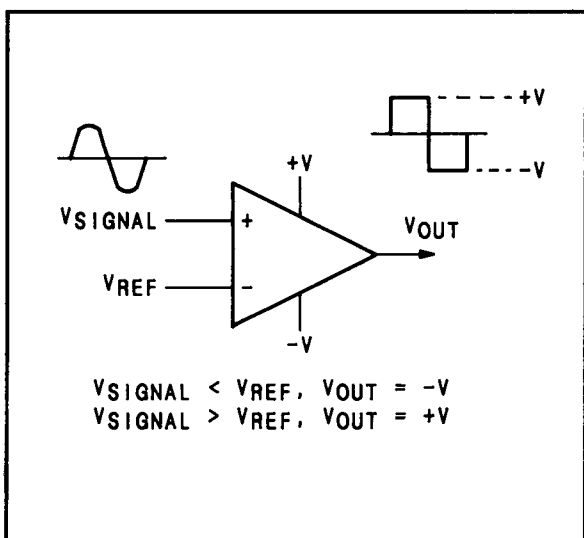


Figure 8A-14. Non-Inverting Comparator

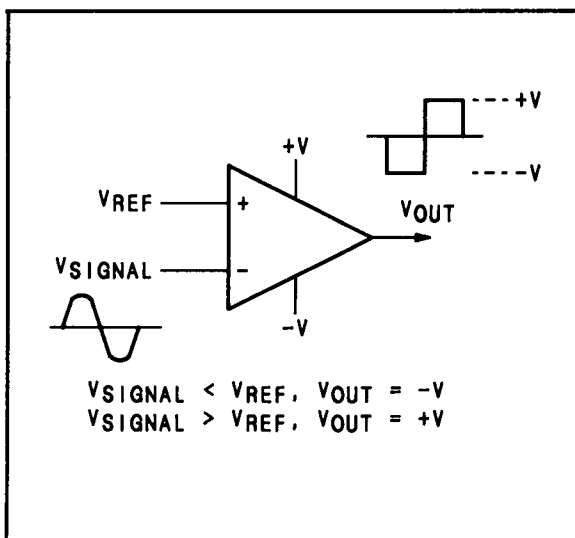
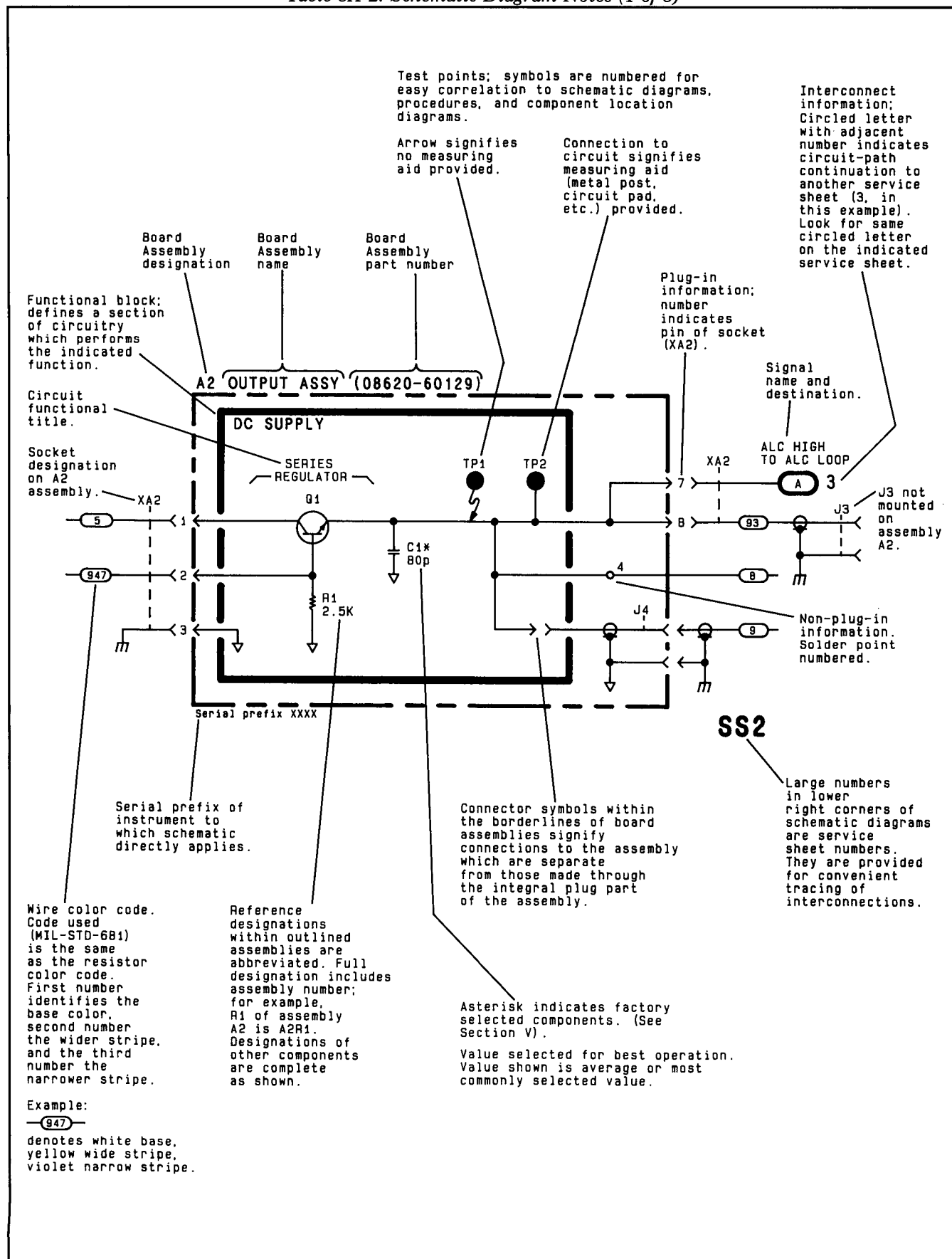


Figure 8A-15. Inverting Comparator

Table 8A-2. Schematic Diagram Notes (1 of 8)



Test points; symbols are numbered for easy correlation to schematic diagrams, procedures, and component location diagrams.

Arrow signifies no measuring aid provided.

Connection to circuit signifies measuring aid (metal post, circuit pad, etc.) provided.

Interconnect information: Circled letter with adjacent number indicates circuit-path continuation to another service sheet (3, in this example). Look for same circled letter on the indicated service sheet.

Board Assembly designation  
Board Assembly name  
Board Assembly part number

Functional block; defines a section of circuitry which performs the indicated function.

Circuit functional title.

Socket designation on A2 assembly.

Plug-in information; number indicates pin of socket (XA2).

Signal name and destination.

J3 not mounted on assembly A2.

Non-plug-in information. Solder point numbered.

Serial prefix XXXX

Serial prefix of instrument to which schematic directly applies.

Connector symbols within the borderlines of board assemblies signify connections to the assembly which are separate from those made through the integral plug part of the assembly.

SS2

Large numbers in lower right corners of schematic diagrams are service sheet numbers. They are provided for convenient tracing of interconnections.

Wire color code. Code used (MIL-STD-681) is the same as the resistor color code. First number identifies the base color, second number the wider stripe, and the third number the narrower stripe.

Reference designations within outlined assemblies are abbreviated. Full designation includes assembly number; for example, R1 of assembly A2 is A2R1. Designations of other components are complete as shown.

Asterisk indicates factory selected components. (See Section V).

Value selected for best operation. Value shown is average or most commonly selected value.

Example:  
947 denotes white base, yellow wide stripe, violet narrow stripe.

Table 8A-2. Schematic Diagram Notes (2 of 8)

Values for all components are marked in units of farads, henries, and ohms unless otherwise specified.





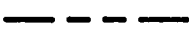
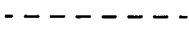












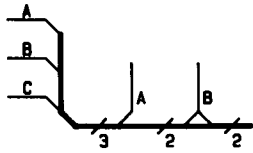
*	Asterisk denotes a factory-selected value. Value shown is typical. See Section V.
	Tool-aided adjustment.
	Manual control.
	Encloses front-panel designation.
	Encloses rear-panel designation
	Circuit assembly borderline.
	Other assembly borderline.
	Heavy line with arrows indicates path and direction of main signal.
	Heavy dashed line with arrows indicates path and direction of main feedback.
	Indicates stripline (i.e., RF transmission line above ground).
	Wiper moves toward cw with clockwise rotation of control (as viewed from shaft or knob).
	Numbered Test Point measurement aid provided.
	Encloses wire or cable color code. Code used is the same as the resistor color code. First number identifies the base color, second number identifies the wider stripe, and the third number identifies the narrower stripe, e.g.,  denotes white base, yellow wide stripe, violet narrow stripe.
	A direct conducting connection to earth, or a conducting connection to a structure that has a similar function (e.g., the frame of an air, sea, or land vehicle).
	A conducting connection to a chassis or frame.
	Common connections. All like-designation points are connected.
	Letter = off-page connection. Number = Service Sheet number for off-page connection. In the example, signal flow is continued on Service Sheet 12, at the point marked
	Number (only) = on-page connection.

Table 8A-2. Schematic Diagram Notes (3 of 8)



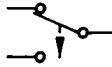
Indicates multiple paths represented by only one line. Letters or names identify individual paths. Numbers indicate number of paths represented by the line.



Coaxial or shielded cable.



Ferrite bead. (Increases the self-inductance of the conductor passing through the bead.)



Relay. Contact moves in direction of arrow when energized.



Indicates a pushbutton switch with a momentary (ON) position.



Feedthrough capacitor. (Acts as a feedthrough terminal when mounted on a chassis or a frame.)



Indicates a PIN diode.



Indicates a current regulation diode.



Indicates a voltage regulation diode.



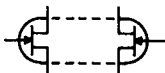
Indicates a capacitive (varactor) diode.



Indicates a Schottky (hot-carrier) diode.



Light-emitting diode.

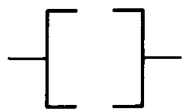


Multiple transistors in a single package—physical location of the pins is shown in package outline on schematic.

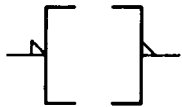


Identification of logic families as shown (in this case, ECL).

Table 8A-2. Schematic Diagram Notes (4 of 8)

**DIGITAL SYMBOLOGY REFERENCE INFORMATION****Input and Output Indicators**

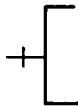
Implied Indicator—Absence of polarity indicator (see below) implies that the active state is a relative high voltage level. Absence of negation indicator (see below) implies that the active state is a relative high voltage level at the input or output.



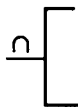
Polarity Indicator—The active state is a relatively low voltage level.



Dynamic Indicator—The active state is a transition from a relative low to a relative high voltage level.



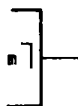
Inhibit Input—Input that, when active, inhibits (blocks) the active state outputs of a digital device.



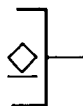
Analog Input—Input that is a continuous signal function (e.g., a sine wave).



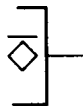
Polarity Indicator used with Inhibit Indicator—Indicates that the relatively low level signal inhibits (blocks) the active state outputs of a digital device.



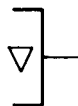
Output Delay—Binary output changes state only after the referenced input (m) returns to its inactive state (m should be replaced by appropriate dependency or function symbols).



Open Collector Output.



Open Emitter Output.



Three-state Output—Indicates outputs can have a high impedance (disconnect) state in addition to the normal binary logic states.



Table 8A-2. Schematic Diagram Notes (5 of 8)

**DIGITAL SYMBOLOGY REFERENCE INFORMATION**

**Combinational Logic Symbols and Functions**



$\Sigma$	Summing Junction—Outputs added together at a common point.
&	AND—All inputs must be active for the output to be active.
$\geq 1$	OR—One or more inputs being active will cause the output to be active.
$\geq m$	Logic Threshold—m or more inputs being active will cause the output to be active (replace m with a number).
=1	EXCLUSIVE OR—Output will be active when one (and only one) input is active.
=m	m and only m—Output will be active when m (and only m) inputs are active (replace m with a number).
=	Logic Identity—Output will be active only when all or none of the inputs are active (i.e., when all inputs are identical, output will be active).
	Amplifier—The output will be active only when the input is active (can be used with polarity or logic indicator at input or output to signify inversion).
X/Y	Signal Level Converter—Input level(s) are different than output level(s).
	Bilateral Switch—Binary controlled switch which acts as an on/off switch to analog or binary signals flowing in both directions. Dependency notation should be used to indicate affecting/affected inputs and outputs. Note: amplifier symbol (with dependency notation) should be read to indicate unilateral switching.
X→Y	Coder—Input code (X) is converted to output code (Y) per weighted values or a table.
(Functional Labels)	The following labels are to be used as necessary to ensure rapid identification of device function.
MUX	Multiplexer—The output is dependent only on the selected input.
DEMUX	Demultiplexer—Only the selected output is a function of the input.
CPU	Central Processing Unit

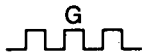
Table 8A-2. Schematic Diagram Notes (6 of 8)

## DIGITAL SYMBOLOGY REFERENCE INFORMATION

## Sequential Logic Functions



Monostable—Single shot multivibrator. Output becomes active when the input becomes active. Output remains active (even if the input becomes inactive) for a period of time that is characteristic of the device and/or circuit.



Oscillator—The output is a uniform repetitive signal which alternates between the high and low state values. If an input is shown, then the output will be active if an only if the input is in the active state.

FF

Flip-Flop—Binary element with two stable states, set and reset. When the flip-flop is set, its outputs will be in their active states. When the flip-flop is reset, its outputs will be in their inactive states.

T

Toggle Input—When active, causes the flip-flop to change states.

S

Set Input—When active, causes the flip-flop to set.

R

Reset Input—When active, causes the flip-flop to reset.

J

J Input—Analogous to set input.

K

K Input—Analogous to reset input.

D

Data Input—Always enabled by another input (generally a C input—see Dependency Notation). When the D input is dependency-enabled, a high level at D will set the flip-flop; a low level will reset the flip-flop. Note: strictly speaking, D inputs have no active or inactive states—they are just enabled or disabled.

+m

Count-Up Input—When active, increments the contents (count) of a counter by "m" counts (m is replaced with a number).

-m

Count-Down Input—When active, decrements the contents (count) of a counter by "m" counts (m is replaced with a number).

→m

Shift Right (Down) Input—When active, causes the contents of a shift register to shift to the right or down "m" places (m is replaced with a number).

←m

Shift Left (Up) Input—When active, causes the contents of a shift register to shift to the left or up "m" places (m is replaced with a number).

## NOTE

*For the four functions shown above, if m is one, it is omitted.*

(Functional Labels)

The following functional labels are to be used as necessary in symbol build-ups to ensure rapid identification of device function.

mCNTR

Counter—Array of flip-flops connected to form a counter with modules m (m is replaced with a number that indicates the number of states: 5 CNTR, 10 CNTR, etc.).

Table 8A-2. Schematic Diagram Notes (7 of 8)

**DIGITAL SYMBOLOGY REFERENCE INFORMATION****Sequential Logic Functions (Cont'd)**

REG	Register—Array of unconnected flip-flops that form a simple register or latch.
SREG	Shift Register—Array of flip-flops that form a register with internal connections that permit shifting the contents from flip-flop to flip-flop.
ROM	Read Only Memory—Addressable memory with read-out capability only.
RAM	Random Access Memory—Addressable memory with read-in and read-out capability.

**Dependency Notation**

Cm	Control Dependency—Binary affecting input used where more than a simple AND relationship exists between the C input and the affected inputs and outputs (used only with D-type flip-flops).
Gm	Gate (AND) Dependency—Binary affecting input with an AND relationship to those inputs or outputs labeled with the same identifier. The m is replaced with a number or letter (the identifier).
Vm	OR Dependency—Binary affecting input with an OR relationship to those inputs or outputs labeled with the same identifier. The m is replaced with a number or the letter (the identifier).
mAm	Address Dependency—Binary affecting inputs of affected outputs. The m prefix is replaced with a number that differentiates between several address inputs, indicates dependency, or indicates demultiplexing of address inputs and outputs. The m suffix indicates the number of cells that can be addressed.
ENm	Enable Dependency—Binary affecting input which, when active enables all outputs. When inactive open-collector and open-emitter outputs are off, and three-state outputs are at an external high impedance state.  When the enable input affects only certain inputs and outputs, they will be numbered to indicate the logic connection.
Xm	Transmission Dependency—Binary affecting input which bidirectionally connects dependent inputs and outputs.
Mm	Mode Dependency—Binary affecting input used to indicate that the effects of particular inputs and outputs of an element depend on the mode in which the element is operating. The m is replaced with a number or letter (the identifier).
Zm	Interconnection Dependency—Indicates the existence of internal logic connections between inputs, outputs, internal inputs, and/or internal outputs. The m is replaced with a number (the identifier).
,	Comma—AND Function.
/	Slant—OR Function.

**NOTE**

*The identifier (m) is omitted if it is one—that is, when there is only one dependency relationship of that kind in a particular device. When this is done, the dependency indicator itself (G, C, EN, or V) is used to prefix or suffix the affected (dependent) input or output.*

*Table 8A-2. Schematic Diagram Notes (8 of 8)***DIGITAL SYMBOLOGY REFERENCE INFORMATION****Miscellaneous**

Schmitt Trigger—Input characterized by hysteresis; one threshold for positive going signals and a second threshold for negative going signals.

Active

Active State—A binary physical or logical state that corresponds to the true state of an input, an output, or a function. The opposite of the inactive state.

# BLOCK DIAGRAM 1

## DESCRIPTION

- Overall Block Diagrams

## PRINCIPLES OF OPERATION

### General

The Standard (no Options) Hewlett-Packard Model 8640B Signal Generator is a mechanically-tuned, solid-state RF source producing signals from 0.5 to 512 MHz. The RF oscillator produces a basic frequency range of 256 to 512 MHz. Nine lower ranges (0.5 to 256 MHz) are obtained by dividing down this range, and one higher range (512 to 1024 MHz, Option 002) is obtained by frequency doubling. The leveled output may be continuously varied over an 18 dB range or attenuated in 10 dB steps from +19 to -145 dBm (+13 to -145 dBm in the 512 to 1024 range). Calibrated AM and FM (either internal or external) and external pulse modulation are provided. The RF output frequency is read on an internal counter which may also be used to count external signals up to 550 MHz or to synchronize the generator to a stable reference oscillator.

Refer to the Overall Block Diagram, BD 1 (1 of 2) throughout the following discussion.

### FM Circuits and RF Oscillator

The RF source is a 256 to 512 MHz cavity-tuned oscillator that is mechanically tuned by the FREQUENCY TUNE and FINE TUNE controls. The oscillator can also be electrically tuned over a smaller range by the FM circuits and the counter/lock circuits. The FM circuits amplify and shape the modulation input to provide linear, calibrated frequency modulation. The phase lock circuits tune the oscillator to phase lock it to a reference. FM inputs can be either external (ac or dc coupled), internal from the modulation oscillator, or an accurate 1 Vdc useful for FM calibration.

### AM/AGC Circuit and Output Amplifier

The RF oscillator drives the RF dividers (a chain of binary dividers) which yield the RF for the lower nine frequency ranges. The RF filters remove the harmonics from the RF signal.

The AM/AGC circuits form a feedback system to control the amplitude of the output and to provide AM or pulse modulation. The detector senses the level of the RF signal from the RF output amplifier. A summing amplifier compares the detector output against an input reference and drives the modulator. The modulator acts as a current-controlled attenuator to control the RF level.

The reference to the summing amplifier consists of the level reference, which comes from the output level vernier, and the modulation signal, if present. The modulation signal can be either external (ac or dc coupled) or internal (from the modulation oscillator). In the pulse modulation mode, external modulation pulses switch the modulator off and on. Amplitude leveling is maintained in this mode by storing the detector output between pulses.

**Standard.** The 10 dB RF step attenuator further controls the output level. The meter circuits monitor either the detector output (and hence the output level), the positive peak of the AM modulating signal (calibrated to give signal (calibrated to give peak deviation).

**Option 002, Internal Doubler.** If the 512-1024 MHz range is selected, a frequency doubler circuit is switched in at the output of the output amplifier. The doubler is a full-wave rectifier followed by a high frequency amplifier. On this range a separate detector is used.

**Option 003, Reverse Power Protection.** Reverse power protection consists of a power level sensor, limiter, and RF relay which opens the RF path to the output connector when excessive RF power is sensed.

**Option 004, Avionics.** In the Avionics Option, the detector output is also supplied to a buffer (demodulation) amplifier. A switch on the buffer amplifier selects ac only (0-5 Vrms) or ac plus dc (0-1 Vrms) at DEMOD OUTPUT.

The 10 dB and 1 dB RF step attenuators further control the output level. The meter circuits monitor either the detector output (and hence the output level), the positive peak of the AM modulating signal (calibrated to give % AM), or the positive peak of the FM modulating signal (calibrated to give peak deviation).

### Counter/Lock Circuits

In the internal count mode, the counter always counts the 256-512 MHz signal from the RF oscillator. The time base period is adjusted to give the correct frequency reading for the different frequency ranges. In the external count modes, external input signals are counted directly. In the phase lock mode, the counter compares the count of the RF signal against the count just before acquisition of phase lock and adjusts the frequency of the RF oscillator to make the counts coincide. The counter time base reference may be either the internal or an external 5 MHz (or 1 MHz for instruments with a modified time base see Service Sheet 15).

## TROUBLESHOOTING

Use the Overall Block Diagram (2 of 2) to isolate the trouble to a specific section of the instrument. Then turn to the troubleshooting block diagram that covers that section of the instrument and use the information on the diagram to isolate the trouble to the defective assembly. Next, turn to the Service Sheet that covers that assembly and isolate the trouble to the defective component or replace the assembly.

For example, suppose you have a Standard instrument and the AM functions are out of specification. The Overall Block Diagram (2 of 2) is keyed to the troubleshooting block diagrams that follow; in this case, Block Diagram 3A. Block Diagram 3A gives a list of generator control settings (the list is located in the box on the right-hand side of the sheet) and the voltages and waveforms that should be found at the test points and along the signal paths.

To check a voltage at a test point, change the control settings as specified in the box associated with that test point, check the voltage, then reset the controls to the settings specified in the box on the right-hand side.

### NOTE

*The last two foldouts in this manual have top and bottom internal views of the instrument that show the locations of the test points, assemblies, and cables (all RF cables are accessible from the bottom of the instrument).*

The blocks on Block Diagram 3A are keyed, by the numbers located in their lower right-hand corners, to the Service Sheets that have the circuit schematics. In our example, suppose the signals to the A26A3 Assembly are correct and the signals from A26A3 are incorrect. Turn to Service Sheet 8A, 8B or 8C (depending on whether you have a Standard, Option 002 or 004 instrument), isolate the trouble to a component or replace A26A3.

### NOTE

*After repairs are complete, see Tables 4-1 and 5-2 for appropriate Post-repair Performance Tests and Adjustments.*

### WARNING

*The opening of covers or removal of parts, except those to which access can be gained by hand, is likely to expose live parts, and also accessible terminals may be live. Any adjustment, maintenance, and repair of the opened instrument under voltage should be avoided as much as possible and, if inevitable, should be carried out only by a skilled person who is aware of the hazard involved.*

*Capacitors inside the instrument may still be charged even if the instrument has been disconnected from its source of supply. Make sure that only fuses with the required rated current and of the specified type (normal blow, time delay, etc.) are used for replacement. The use of repaired fuses and the short-circuiting of fuse-holders must be avoided.*

*Whenever it is likely that the protection has been impaired, the instrument must be made inoperative and be secured against any unintended operation.*

## BLOCK DIAGRAM 2

### DESCRIPTION

- FM Circuits and RF Oscillator

### PRINCIPLES OF OPERATION

#### RF Oscillator

The full frequency range of the RF Oscillator is 230 to 550 MHz (nominally 256-512 MHz). The oscillator uses a single high-frequency transistor in a foreshortened cavity. Frequency is controlled by varying the capacitive loading of the cavity. The oscillator drives two output amplifiers. The Frequency Counter Buffer Amplifier drives the frequency counter; the Divider/Filter Buffer Amplifier drives the dividers which drive the amplitude modulating and leveling circuits. The oscillator's cavity has two varactor diodes that allow the capacitive loading to be varied by voltages (at the anode and cathode) to provide FM and phase lock.

#### FM Circuits

The RF oscillator's varactor cathode is driven by the FM Amplifier which provides accurate amplification or attenuation of the modulation signal and shapes the signal to compensate for the non-linear characteristics of the varactor diodes. Separate shaping circuits are used for positive and negative voltage excursions. The PEAK DEVIATION switch, which controls basic FM amplifier gain, is mechanically linked to the RANGE switch since, for a given amount of peak deviation, the percent deviation (i.e., the amount of deviation relative to the carrier frequency) changes as the frequency range is changed. Also, as the frequency is tuned, the FM deviation changes. An FM Gain Compensation circuit with a potentiometer, which is geared to the FREQUENCY TUNE control, adjusts for the change in FM sensitivity with tuning.

Inputs to the FM circuits are routed through the FM switch. In the CAL position, an accurate 1 Vdc is applied to the FM input. External inputs are applied in AC and DC, and an internal modulation signal in INT. The PEAK DEVIATION vernier adjusts the input level into a unity gain Buffer Amplifier. In addition to driving the FM amplifier, the Buffer Amplifier drives the Over-Deviation Detector and the Meter Attenuator. In the event that the input signal exceeds  $\pm 1.1V$ , the Over-Deviation Detector turns on the REDUCE FM VERNIER lamp. The Meter Attenuator scales the input signal to the meter circuits in such a way that a 1 Vpk input corresponds to the deviation selected when read on the meter.

#### Modulation Oscillator (Standard and Option 001)

Internal AM and FM is provided by the Modulation Oscillator. The oscillator drives either the AM modulation circuits and AM OUTPUT jack or the FM modulation circuits and FM OUTPUT jack or all four. The oscillator is enabled whenever either the AM or FM switch is in INT.

The standard modulation oscillator has two fixed frequencies 400 Hz and 1 kHz. The oscillator supplied with Option 001 has, in addition, five variable frequency ranges covering from 20 Hz to 600 kHz.

#### Power Supplies and Fan

The instrument has five regulated supply voltages, +44.6V, +20V, -20V, +5.2V, -5.2V. All supplies are protected against overloading, over voltage, and reverse voltage. An LED annunciator on each supply indicates proper operation when on.



## TROUBLESHOOTING

It is assumed that a problem has been isolated to the FM circuits and RF oscillator as a result of using the overall block diagram. Troubleshoot by using the test equipment and procedures specified below.

### Test Equipment

Digital Voltmeter .....HP 3455A  
Oscilloscope .....HP 1740A

### Initial Test Conditions

Top and bottom covers removed (refer to General Removal Procedures).

### Procedure

Set the generator's controls as listed in the box at the right-hand side of the diagram. To check a voltage at a test point, change the control settings as specified in the box associated with that test point, check the voltage, then reset the controls to the settings specified in the box at the right-hand side. The blocks are keyed (to the Service Sheets that have the circuit schematics) by the numbers located in their lower right-hand corners.

#### NOTE

1. *The last two foldouts in this manual have top and bottom internal views of the instrument that show the locations of the test points, assemblies, and cables (all RF cables are accessible from the bottom of the instrument).*
2. *After repairs are complete, see Tables 4-1 and 5-2 for appropriate Post-repair Performance Tests and Adjustments.*

## BLOCK DIAGRAM 3A

### DESCRIPTION

- AM/AGC Circuits and Output Amplifier (Standard)

### PRINCIPLES OF OPERATION

#### Divider/Filters

Except for the 256-512 MHz and 512-1024 MHz frequency ranges, the RF signal from the Divider/Filter Buffer Amplifier (Service Sheet 2) is routed through a series of binary frequency dividers (i.e.,  $\div 2$ ) by slide switches on the filter section of the A10 Divider/Filter Assembly. The RF signal is divided to the selected range. This is also illustrated in the simplified logic diagram, Figure 8B-2 (refer to SS6).

The divided signal passes through the Modulator Preamplifier, the Modulator, and then to the RF Filters. The filters remove unwanted harmonics from the signal (which is approximately a square wave after being divided). The upper frequency ranges have two filters per range one for the lower half (Low Band Filters) and one for the upper half (High Band Filters) of the range. This is necessary to effectively remove the second harmonic on the lower half of the range. The midpoint of the range is sensed by a Schmitt Trigger which compares a reference voltage to a voltage proportional to the frequency tuning. On the four lowest frequency ranges, the RF signal has little second harmonic content because of good waveform symmetry; therefore, each range has only one filter.

#### AM/AGC Circuits

The output of the RF Filters is amplified by the Output Amplifier located in the AM/AGC Assembly.

The amplified output is peak-detected and buffered by the Detector Buffer Amplifier. The detected voltage, which is negative, is summed (in the Summing Amplifier) with a positive AGC reference voltage from the OUTPUT LEVEL vernier. The AGC reference may also have the amplitude modulation voltage superimposed on it. The sum of the detector and reference voltages is amplified by the Summing and Modulator Driver Amplifiers. The Modulator Driver Amplifier supplies control current to the Modulator which adjusts the RF output level.

In the pulse modulation mode, the Modulator Driver Amplifier is switched on and off by input pulses from the Schmitt Trigger. To maintain a constant detector voltage into the summing amplifier, the detected output voltage is sampled during the RF-on period and then stored in the Sample-And-Hold section of the Detector Buffer Amplifier when the RF is off. The Pulse Overload Detector senses any large errors in the leveling circuit which may occur when the OUTPUT LEVEL vernier is reduced. In case of large errors, the hold function is defeated until equilibrium occurs.

The Rate Detector senses pulses of low repetition rate and turns off the meter circuit when the rate is so low that the meter is no longer accurate.

The Modulation Overload Detector senses when the AGC reference, the AM signal, or a combination of the two is beyond the Modulator's capability to deliver power. The REDUCE PEAK POWER lamp is then turned on. The Meter Amplifier produces an output voltage proportional to the detected output voltage (and hence the output level) to drive the meter circuits. The AGC reference voltage originates in the AM Offset Amplifier where it is summed with any AM input signal. The voltage out of the amplifier then passes through the OUTPUT LEVEL vernier to the modulation Summing Amplifier. The Modulator can be disabled (i.e., maximum modulator attenuation) by the RF ON/OFF switch.

#### Meter Circuits

The meter can be set to measure either percent AM, peak frequency deviation (FM), or output level. In measuring AM and FM, the modulation signal is peak-detected by the Positive Peak Detector and amplified. For output level, the output of the Meter Amplifier, which is proportional to the detector output, is amplified by the Meter Drive Amplifier.

## TROUBLESHOOTING

It is assumed that a problem has been isolated to the AM/AGC circuits and output amplifier as a result of using the overall block diagram. Troubleshoot by using the test equipment and procedures specified below.

### Test Equipment

Digital Voltmeter .....	HP 3455A
Oscilloscope .....	HP 1740A
Power Meter and Sensor .....	HP 435A/8482A, Opt.030
Frequency Counter .....	HP 5328A, Opt. 031

### Initial Test Conditions

Top and bottom covers removed (refer to *Assembly/Disassembly Instructions, Service Sheet G*).

### Procedure

Set the generator's controls as specified in the box at the right-hand side of the diagram. To check a voltage at a test point, change the control setting as specified in the box associated with that test point, check the voltage, then reset the controls to the settings specified in the box at the right-hand side.

The blocks are keyed, by the numbers located in their lower right-hand corners, to the Service Sheets that have the circuit schematics.

#### NOTE

1. *The last two foldouts in this manual have top and bottom internal views of the instrument that show the locations of the test points, assemblies, and cables (all RF cables are accessible from the bottom of the instrument).*
2. *After repairs are complete, see Tables 4-1 and 5-2 for appropriate Post-repair Performance Tests and Adjustments.*

## BLOCK DIAGRAM 3B

### Description

- **Internal Doubler and Reverse Power (Options 002 and 003)**

### PRINCIPLES OF OPERATION

#### Internal Doubler Circuits (Option 002)

On the 0.5 to 512 MHz ranges, the RF signal from the Output Amplifier is fed un-doubled to the output jack. On the 512-1024 MHz range, a frequency doubler and Doubler Amplifier are inserted into the RF path. The RF doubler is a passive full-wave rectifier. If the input signal is sinusoidal and the rectifier is well balanced, the output from the doubler will contain even harmonics of the input signal (the second harmonic being the strongest). This doubled signal is amplified by the Doubler Amplifier. The 1120 MHz Low-Pass Filter filters out the high frequency harmonics of the doubled signal which are not otherwise effectively attenuated by the Step Attenuator. A Doubler Detector is switched in at the output of the Doubler Amplifier to include it in the AGC loop.

#### Reverse Power Protection Circuit (Option 003)

If high level reverse power is applied into the RF OUTPUT jack, this level is sensed by a Comparator which drives an RF relay and opens the RF path. The Limiter protects the generator's output circuits during the time that elapses while the relay is de-energizing. The relay contacts are open when the generator is off.

## TROUBLESHOOTING

It is assumed that a problem has been isolated to the AM/AGC circuits and output amplifier as a result of using the overall block diagram. Troubleshoot by using the test equipment and procedures specified below.

### Test Equipment

Digital Voltmeter .....	HP 3455A
Oscilloscope .....	HP 1740A
Power Meter and Sensor .....	HP 435A/8482A
Frequency Counter .....	HP 5328A, Opt. 031

### Initial Test Conditions

Top and bottom covers removed (refer to General Removal Procedures).

### Procedure

Set the generator's controls as specified in the box at the right-hand side of the diagram. To check a voltage at a test point, change the control setting as specified in the box associated with that test point, check the voltage, then reset the controls to the settings specified in the box at the right-hand side.

The blocks are keyed, by the numbers located in their lower right-hand corners, to the Service Sheets that have the circuit schematics.

#### NOTE

- 1. The last two foldouts in this manual have top and bottom internal views of the instrument that show the locations of the test points, assemblies, and cables (all RF cables are accessible from the bottom of the instrument).*
- 2. After repairs are complete, see Tables 4-1 and 5-2 for appropriate Post-repair tests and adjustments.*

## BLOCK DIAGRAM 3C

### DESCRIPTION

- AM/AGC Circuits and Output Amplifier (Option 004)

### PRINCIPLES OF OPERATION

#### Divider/Filters

Except for the 256-512 MHz (and the doubler) ranges, the RF signal from the Divider/Filter Buffer Amplifier (Block Diagram 2) is routed through a series of binary frequency dividers (i.e.,  $\div 2$ ) by slide switches on the filter section of the A10 Divider/Filter Assembly. The RF signal is divided to the selected range. This is also illustrated in the simplified logic diagram, Figure 8B-2 (refer to SS 6).

The divided signal passes through the Modulator Preamplifier, the Modulator, and then to the RF Filters. The filters remove unwanted harmonics from the signal (which is approximately a square wave after being divided). The upper frequency ranges have two filters per range one for the lower half (Low Band Filters) and one for the upper half (High Band Filters) of the range. This is necessary to effectively remove the second harmonic on the lower half of the range. The midpoint of the range is sensed by a Schmitt Trigger which compares a reference voltage to a voltage proportional to the frequency tuning. On the four lowest frequency ranges, the RF signal has little second harmonic content because of good waveform symmetry; therefore, each range has only one filter.

#### AM/AGC Circuits

The output of the RF Filters is amplified by the Output Amplifier located in the AM/AGC Assembly.

The amplified output is peak-detected and buffered by the Detector Buffer Amplifier. The detected voltage which is negative is buffered and amplified by the Demodulation Amplifier which drives DEMOD OUTPUT. The detected voltage is also summed (in the Summing Amplifier) with a positive AGC reference voltage from the OUTPUT LEVEL vernier. The AGC reference may also have the amplitude modulation voltage superimposed on it. The sum of the detector and reference voltages is amplified by the Summing and Modulator Driver Amplifiers. The Modulator Driver Amplifier supplies control current to the Modulator which adjusts the RF output level.

In the pulse modulation mode, the Modulator Driver Amplifier is switched on and off by input pulses from the Schmitt Trigger. To maintain a constant detector voltage into the summing amplifier, the detected output voltage is sampled during the RF-on period and then stored in the Sample-And-Hold section of the Detector Buffer Amplifier when the RF is off. The Pulse Overload Detector senses any large errors in the leveling circuit which may occur when the OUTPUT LEVEL vernier is reduced. In case of large errors, the hold function is defeated until equilibrium occurs.

The Rate Detector senses pulses of low repetition rate and turns off the meter circuit when the rate is so low that the meter is no longer accurate.

The Modulation Overload Detector senses when the AGC reference, the AM signal, or a combination of the two is beyond the Modulator's capability to deliver power. The REDUCE PEAK POWER lamp is then turned on. The Meter Amplifier produces an output voltage proportional to the detected output voltage (and hence the output level) to drive the meter circuits. The AGC reference voltage originates in the AM Offset Amplifier where it is summed with any AM input signal. The voltage out of the amplifier then passes through the OUTPUT LEVEL vernier to the modulation Summing Amplifier. The Modulator can be disabled (i.e., maximum modulator attenuation) by the RF ON/OFF switch.

## Demodulation Amplifier

The Demodulation Amplifier provides a front panel output proportional to the AM depth. This is accomplished by amplification of the detector output. the amplifier's output may be selected as ac only (5 Vrms equals 100% AM) or both ac and dc (1 Vrms equals 100%AM). The amplifier has very low phase shift and its output is calibrated only when the OUTPUT LEVEL Vernier is in the CAL position.

## Meter Circuits

The meter can be set to measure either percent AM, peak frequency deviation (FM), or output level. In measuring AM and FM, the modulation signal is peak-detected by the Positive Peak Detector and amplified. For output level, the output of the Meter Amplifier, which is proportional to the detector output, is amplified by the Meter Drive Amplifier.

## TROUBLESHOOTING

It is assumed that a problem has been isolated to the AM/AGC circuits and output amplifier as a result of using the overall block diagram. Troubleshoot by using the test equipment and procedures specified below.

### Test Equipment

Digital Voltmeter .....	HP 3455A
Oscilloscope .....	HP 1740A
Power Meter and Sensor .....	HP 435A/8482A, Opt.030
Frequency Counter .....	HP 5328A, Opt. 031

### Initial Test Conditions

Top and bottom covers removed (refer to *Assembly/Disassembly Instructions, Service Sheet G*).

### Procedure

Set the generator's controls as specified in the box at the right-hand side of the diagram. To check a voltage at a test point, change the control setting as specified in the box associated with that test point, check the voltage, then reset the controls to the settings specified in the box at the right-hand side.

The blocks are keyed, by the numbers located in their lower right-hand corners, to the Service Sheets that have the circuit schematics.

#### NOTE

1. *The last two foldouts in this manual have top and bottom internal views of the instrument that show the locations of the test points, assemblies, and cables (all RF cables are accessible from the bottom of the instrument).*
2. *After repairs are complete, see Tables 4-1 and 5-2 for appropriate Post-repair Performance Tests and Adjustments.*



## BLOCK DIAGRAM 4

### DESCRIPTION

- Counter/Lock Circuits

### PRINCIPLES OF OPERATION

#### Counter Time Base

The time base serves two functions: (1) in the unlocked mode, it gates the counter and determines the count period; (2) in the phase lock mode, it is the reference with which the divided-down RF signal is compared in the phase detector.

The time base is derived from either the internal 5 MHz Reference Oscillator or an external reference. The internal reference is also available at the rear panel TIME BASE jack. The 5 MHz reference signal is then divided by 5. The time base may be modified to bring the 1 MHz signal in or out of the TIME BASE jack (see Service Sheet 15).

The 1 MHz signal is then divided by N1 and N2. The  $N1 \times N2$  combination programs the gate period of the counter. This period compensates for the frequency division of the RF oscillator output by the RF dividers (see Block Diagram 3A) since the counter input is from the RF oscillator itself (and not the divided-down output signal). Next, the Expand Decoder divides the time base signal by 1 (normally) or 10 (in EXPAND X10) or 100 (in EXPAND X100). The final divider (Lock Decoder) is either a  $\div 100$  (locked) or  $\div 101$  (unlocked). When unlocked, the time base is high for 100 counts of the input and low for one count. This one count gives adequate time for the counter to transfer its count to the Display and to reset to zero between count cycles. When locked the  $\div 100$  makes the time base period equal to the period of the high time when counter was unlocked (i.e., the one-count low period is eliminated). The Decimal Point Decoder positions the decimal properly in the Display for the selected count and expand modes.

#### RF Scaler

The RF Scaler is the counter front end. It conditions the RF input signal to be compatible with the Up/Down Counter. The RF signal comes from either the RF Oscillator or front panel COUNTER INPUT as selected by the COUNTER MODE source switch. The Amplifier/Trigger shapes the RF signal waveform for use by subsequent logic circuits.

With either INT or EXT 10-550 MHz COUNTER MODE selected, the RF signal is divided by 64 ( $\div 32$  followed by  $\div 2$ ). For EXT 0-10 MHz COUNTER MODE, the  $\div 64$  is bypassed. The signal frequency that is fed into the Up/Down Counter is always less than 10 MHz.

If the  $+1/2$  DIGIT switch is depressed, the  $\div 64$  circuit is modified slightly. Once during each count-down cycle, one RF pulse from the  $\div 32$  is not allowed to toggle the divide by two. This "pulse swallowing" causes the signal frequency to seem lower than the original frequency. The Pulse Swallowing Circuit operates with the Up/Down Counter in the phase lock mode to raise the generator's output exactly  $1/2$  the least significant digit displayed prior to  $+1/2$  DIGIT selection.

#### Up/Down Counter and Display - Unlocked Mode

In the unlocked mode the Up/Down counter is configured as a six-decade up-counter. The counter operation is controlled by the time base. When the time base is high, the counter counts the input signal, incrementing one count for each input pulse. When the time base goes low, the count input is inhibited, the counter outputs are transferred to the Storage Buffers, and the latest count appears on the Display. The Storage Buffers are then latched (i.e., they are no longer influenced by the counter outputs), and the counters are cleared to zero. When the time base returns to a high, the counter counts the input pulses beginning at zero, and the count cycle repeats.

If the counter exceeds 999999, a carry (CRY) pulse is generated. The Overflow Detector then turns on the OVERFLOW annunciator to warn that a significant digit is not shown on the Display.

## Up/Down Counter and Phase Lock Circuits - Phase Lock Mode

In the phase lock mode, the Up/Down Counter is configured as a six-decade down counter. The counter is free running and is not controlled by the time base. When the LOCK switch is first depressed, the counter continues to count up until the present count cycle is terminated. The count is then stored in the Storage Buffers for the Display and for the down-counter as Countdown Preset. The counter enters the phase lock mode and counts down beginning at the Countdown Preset Frequency. The counter counts to zero, the underflows (i.e., count is 999999) and a Counter Load pulse is generated. The counter is again preset to the same number and the cycle is repeated.

The time of occurrence of the underflow (the Counter Load pulse) is compared with the termination of the time base cycle in the null phase detector. The phase detector produces a voltage proportional to the phase (or time difference) between the two signals. The detector voltage, after low-pass filtering and conditioning, drives the varactor anode of the RF Oscillator (see Block Diagram 2). This voltage tunes the oscillator to synchronize the counter load pulses with the time base.

The phase lock circuits form a variation of an M/N phase lock loop. The time base reference (5 MHz) divided by M is compared in the Null Phase Detector to the RF Oscillator frequency divided by N. In operation, this is  $5 \text{ MHz} \div 65 \div N1 \div N2 \div 100$  and the RF Oscillator frequency is  $\div 64 \div$  Countdown Preset.

### NOTE

*Countdown Preset is the complete number shown in Display (without decimal point). The down counter produces one Counter Load pulse each time it counts to zero from the preset number.*

If the two frequencies differ, the RF oscillator is tuned to synchronize the signals. M is a fixed number and N is self-programmed since it is determined by the count just prior to entering phase lock.

If the phase detector voltage exceeds preset limits, an error condition occurs, and the counter reverts to the count-up mode. The error also switches on a 2 Hz Flash Oscillator causing the Display to blink (an indication that phase lock has been broken).

When  $+1/2$  DIGIT is depressed, operation is the same as normal phase lock except for the use of the Pulse Swallowing Circuit in the RF Scaler. The Pulse Swallowing Circuit blocks one pulse to the final  $\div 2$  stage every count-down cycle. During normal phase lock, the least significant digit in the Display is the ones digit in the counter after RF scaling. Now suppose that one pulse is blocked from the down counter each count cycle. The count-to-zero time would take one count longer. The Phase Lock Circuits would sense this condition as a one-count error and tune the signal frequency higher by one count. In actual operation, however, the "pulse swallowing" occurs before the final  $\div 2$  stage in the RF Scaler. Therefore the final count takes only  $1/2$  count longer. The Phase Lock Circuits sense a  $1/2$ -count error and drive the signal frequency higher by  $1/2$  count. A new least significant digit (5) is shown on the Display to indicate the increase of  $1/2$  count.

### NOTE

*The additional digit 5 is not part of the Countdown Preset frequency.*

## TROUBLESHOOTING

### Description

A fault in the counter can usually be isolated to the functional level by following the steps in the troubleshooting table. The steps are simple and make maximum use of front panel controls and display indications for diagnosis. The steps of the table should be followed in order. When the first abnormality is observed, turn to the service sheet indicated and begin troubleshooting by following the corresponding table for that service sheet. After a repair has been completed, return to this table and check the counter again by following the steps below to the conclusion.

### Procedure

1. Remove the instrument top cover (refer to General Removal Procedures) for top and bottom cover removal.

2. Set controls as follows:

COUNTER MODE:

EXPAND .....	Off
LOCK .....	Off
Source .....	INT
+ <sup>1</sup> / <sub>2</sub> DIGIT .....	Off
TIME BASE VERN .....	CAL
Meter Function .....	LEVEL
AM .....	OFF
FM .....	OFF
RANGE .....	0.5-1 MHz
FREQUENCY TUNE .....	Fully ccw
OUTPUT LEVEL Switch .....	0 dBm
OUTPUT LEVEL Vernier .....	Fully cw
RF ON/OFF .....	ON
LINE .....	ON
TIME BASE (rear panel) .....	INT

3. Follow the steps in the troubleshooting table below in sequence.

Table 8B-1. Counter/Lock Circuits Troubleshooting (1 of 3)

Step	Instruction	Normal Indication	If Indication Abnormal
1	Set LINE to ON.	Five power supply LED indicators on.	See Service Sheets 18 & 19: Check regulator circuits.
		Panel meter shows RF power at $\approx +3$ dBm.	See Block Diagrams 2 & 3. Check RF circuits beginning with AUX RF OUT.
		Display not blinking.	(1) See Service Sheet 17: Lock Switching, then Error Detector, then Phase Detector Circuits. (2) See Service Sheet 16: Flash Oscillator.
		Least significant digit (LSD) blank.	See Service Sheet 16: $+1/2$ Digit.
		All digits lighted except LSD.	If all digits are blank, (1) See Service Sheet 15: Time Base. (2) See Service Sheet 16: Flash Oscillator. If one or more digits are blank, (1) See Service Sheet 15: Time Base. (2) See Service Sheet 16: Counter-Count Up Mode.
2	Set controls as follows and note decimal point position.		See Service Sheet 15: Decimal Point Decoder.
	<b>FREQUENCY RANGE (MHz)</b>	<b>COUNTER MODE</b>	<b>Display</b>
		<b>Source &amp; Range</b> <b>EXPAND</b>	
	0.5-1 1-16 16-128 128-1024	INT                      Off	X X
	0.5-1 1-16 16-128 128-1024	INT                      X10	X X
	0.5-1 1-16 16-128 128-1024	INT                      X100	X X X X X X (NOTE: No decimal point displayed) X X X X X X X X X X X X X X X X X X
	—	EXT 10-550 MHz              Off X10 X100	X X X X X X X X X X X X X X X X X X
—	EXT 0-10 MHz                Off X10 X100	X X X X X X X X X X X X X X X X X X	
3	Release EXPAND X100. Set counter range to 10-550 MHz. Switch LINE between OFF and ON at least 5 times with 5 seconds between switchings.	Display blank in OFF. Display 0000.00 in ON after a short wait.	If display other than 0000.00 and remains the same for each ON, see Service Sheet 16: Counter-Count Up Mode.  If display other than 0000.00 (or one or more digits blank) and changes for each ON, see Service Sheet Time Base.
4	Set LINE to ON. Connect TIME BASE output (rear panel) to COUNTER INPUT.	Display reads 0005.00 (0001.00 if instrument has modified time base).	If display is 0000.00, (1) See Service Sheet 14: Input Circuits, then Dividers. (2) See Service Sheet 16: Shaping, then Counter-Count Up Mode.  <i>(continued)</i>

Table 8B-1. Counter/Lock Circuits Troubleshooting (2 of 3)

Step	Instructions	Normal Indication	If Indication Abnormal																								
4 (cont)			If display constant (except 0000.00) but incorrect, (1) See Service Sheet 15: Time Base. (2) See Service Sheet 16: Counter — Count Up Mode.																								
5	Depress EXPAND X10.	Display reads 005.000 (or 01.0000 if instrument has modified time base).	See Service Sheet 15: Time Base.																								
6	Release EXPAND X10. Depress EXPAND X100.	Display reads 0.50000 (or 01.0000 if instrument has modified time base).	See Service Sheet 15: Time Base.																								
7	Release EXPAND X100. Set counter range to 0–10 MHz.	Display reads 05.0000 (or 01.0000 if instrument has modified time base).	See Service Sheet 14: Input Circuits then Dividers.																								
8	Depress LOCK.	Display reads 05.0000 (or 01.0000 if instrument has modified time base), for longer than 10 seconds without blinking.	(1) See Service Sheet 17: Lock Switching then Phase Detector Circuits. (2) See Service Sheet 16: Counter — Count Down Mode. (3) See Service Sheet 15: Time Base.																								
9	Release LOCK. Set counter source to INT. Adjust FREQUENCY TUNE for a display of approximately 0.5000 MHz. Switch RANGE as shown and note display.	<table border="1"> <thead> <tr> <th>RANGE (MHz)</th> <th>Displayed Frequency (MHz)</th> </tr> </thead> <tbody> <tr><td>0.5–1</td><td>0.500</td></tr> <tr><td>1–2</td><td>1.00</td></tr> <tr><td>2–4</td><td>2.00</td></tr> <tr><td>4–8</td><td>4.00</td></tr> <tr><td>8–16</td><td>8.00</td></tr> <tr><td>16–32</td><td>16.0</td></tr> <tr><td>32–64</td><td>32.0</td></tr> <tr><td>64–128</td><td>64.0</td></tr> <tr><td>128–256</td><td>128</td></tr> <tr><td>256–512</td><td>256</td></tr> <tr><td>512–1024</td><td>512</td></tr> </tbody> </table>	RANGE (MHz)	Displayed Frequency (MHz)	0.5–1	0.500	1–2	1.00	2–4	2.00	4–8	4.00	8–16	8.00	16–32	16.0	32–64	32.0	64–128	64.0	128–256	128	256–512	256	512–1024	512	See Service Sheet 15: Time Base.
RANGE (MHz)	Displayed Frequency (MHz)																										
0.5–1	0.500																										
1–2	1.00																										
2–4	2.00																										
4–8	4.00																										
8–16	8.00																										
16–32	16.0																										
32–64	32.0																										
64–128	64.0																										
128–256	128																										
256–512	256																										
512–1024	512																										
10	Set counter source to EXT. Set counter range to 10–550 MHz. Connect RF OUTPUT to COUNTER INPUT. Switch RANGE as follows and note display. (Tune FREQUENCY TUNE cw to obtain the first reading.) Set counter range to 0–10 MHz for RANGE settings of 8–16 MHz and below.	<table border="1"> <thead> <tr> <th>RANGE (MHz)</th> <th>Displayed Frequency (MHz)</th> </tr> </thead> <tbody> <tr><td>512–1024</td><td>256 (512 for Option 002)</td></tr> <tr><td>256–512</td><td>256</td></tr> <tr><td>128–256</td><td>128</td></tr> <tr><td>64–128</td><td>64.0</td></tr> <tr><td>32–64</td><td>32.0</td></tr> <tr><td>16–32</td><td>16.0</td></tr> <tr><td>8–16</td><td>8.0</td></tr> <tr><td>4–8</td><td>4.0</td></tr> <tr><td>2–4</td><td>2.0</td></tr> <tr><td>1–2</td><td>1.0</td></tr> <tr><td>0.5–1</td><td>0.50</td></tr> </tbody> </table>	RANGE (MHz)	Displayed Frequency (MHz)	512–1024	256 (512 for Option 002)	256–512	256	128–256	128	64–128	64.0	32–64	32.0	16–32	16.0	8–16	8.0	4–8	4.0	2–4	2.0	1–2	1.0	0.5–1	0.50	(1) See Service Sheet D: Check Coupler (MP29) between A9 and A10. (2) See Service Sheet 7: Check switching of RF Dividers.
RANGE (MHz)	Displayed Frequency (MHz)																										
512–1024	256 (512 for Option 002)																										
256–512	256																										
128–256	128																										
64–128	64.0																										
32–64	32.0																										
16–32	16.0																										
8–16	8.0																										
4–8	4.0																										
2–4	2.0																										
1–2	1.0																										
0.5–1	0.50																										

Table 8B-1. Counter/Lock Circuits Troubleshooting (3 of 3)

Step	Instructions	Normal Indication	If Indication Abnormal
11	With frequency at approximately 0.5 MHz, set counter source to INT. Depress EXPAND X100.	OVERFLOW lamp on.	See Service Sheet 16: Overflow Detector.
12	Release EXPAND X100. Depress LOCK.	Displayed count is steady and not blinking.	See Service Sheet 3: Check Phase Lock Loop Filter. Check RF Oscillator's stability and ability to FM.
13	Tune FREQUENCY TUNE one turn cw.	Display blinks at 2 Hz rate.	See Service Sheet 17: Error Detector then Lock Switching.
14	Release, then depress LOCK. Tune FREQUENCY TUNE one turn ccw.	Display blinks at a 2 Hz rate.	See Service Sheet 17: Error Detector.
15	Release, then depress LOCK. Tune FINE TUNE one quarter turn cw, then one half turn ccw.	No change in display. No blinking of display.	See Service Sheet 17: Phase Detector and Error Detector.
16	Release LOCK. Set frequency to approximately 0.500 MHz. Tune TIME BASE VERN over its full range.	Least significant digit displayed should vary approximately by 5 (i.e., 50 Hz) over vernier range.	See Service Sheet 15: Time Base.
		UNCAL lamp on.	See Service Sheet 16: Time Base Vernier.
17	Set TIME BASE VERN to CAL. Depress LOCK. Depress +½ DIGIT.	A new least significant "5" digit lights .	See Service Sheet 16: +½ Digit.
		Display does not blink.	See Service Sheet 14: Pulse Swallowing Circuit.
18	Miscellaneous problems: Counter frequency slightly in error.	TIME BASE output (rear panel) 5 MHz (or 1 MHz if instrument has modified time base).	<b>Perform paragraph 5-27, Internal Reference Frequency Adjustment.</b>
	Excessive residual FM only when locked.	Residual FM same as when unlocked.	See Service Sheet 17: Phase Detector Circuits.
	Count when locked disagrees significantly with that measured on external counter.	Both read the same (allowing for time base error and ±1 count of external counter).	See Service Sheet 16: Counter—Count Down Mode.
	Count when locked does not shift up the indicated ½ digit as measured on an external counter when +½ DIGIT is depressed.	Both read the same (allowing for time base error and ±1 count of external counter).	See Service Sheet 14: Pulse Swallowing Circuits.
	Fails input sensitivity test.	Counts properly for levels down -7 dBm.	See Service Sheet 14: Input Circuits.

# SERVICE SHEET 1

## DESCRIPTION

- RF Oscillator

## PRINCIPLES OF OPERATION

### General

The A3 RF Oscillator Assembly contains the main RF Oscillator, a varactor assembly, and two buffer amplifiers. The output of the RF oscillator is applied to the RF OUTPUT jack through the A10 Divider/Filter Assembly, the A26 AM/AGC and RF Amplifier Assembly, and the A1 Output Attenuator (see block diagrams for schematic locations).

### RF Oscillator

The 230 to 550 MHz RF Oscillator is a single transistor, cavity-tuned oscillator. Integral with the oscillator assembly is a Varactor Head Assembly which provides electrical tuning for FM and phase lock. The Varactor Head Filter Assembly prevents RF from leaking back into the FM and phase lock circuits. The high-frequency transistor is in a common-base configuration. The emitter and collector loops couple into the cavity and to each other to provide the positive feedback necessary for oscillation.

The cavity is a foreshortened type which is essentially a length of coaxial transmission line with a short at one end and a capacitive load at the other. The shorted transmission line is less than wavelength long at the frequency of oscillation and its impedance is inductive. The cavity resonates at the frequency at which the inductive reactance of the transmission line equals to capacitive reactance of the load capacitor. The resonant frequency is varied by changing the length of the cavity (a secondary effect) and by changing the load capacitance. The cavity is mechanically fine tuned by rotating a small vane in the cavity. Signal is coupled out of the cavity into two buffer amplifiers by loops which protrude into the cavity.

### Buffer Amplifiers (A3A1A2, and A3A1A3)

Operation of the Divider/Filter Buffer Amplifier and the Counter Buffer Amplifier is essentially the same. The Divider/Filter Buffer Amplifier drives the RF Dividers. The Counter Buffer Amplifier drives the counter input. The main function of these amplifiers, however, is to isolate the RF Oscillator from external circuits.

Transistors Q1 and Q2 are two common-emitter amplifier stages. The base of Q1 is dc grounded through the coupling loop T1. Emitter current is established by resistors R3 and R4; capacitor C2 ac bypasses the emitter. The gain of Q1 is set by R1, R2, R3, and R6 (also C8, Divider/Filter Buffer Amplifier only). The collector of Q1 is ac coupled to the base of Q2 by capacitor C4. The base of Q2 is grounded through R6. Emitter current is established by resistors R8 and R9; capacitor C5 ac bypasses the emitter. The gain of A2 is set by R7, R10 and R8. The output of the amplifier is ac coupled through capacitor C7 and C9.

### NOTE

*In the Counter Buffer Amplifier only, resistors R10, R11, and R12 form a 10 dB pad at the output. This pad is present but not connected in this configuration of the Signal Generator.*

The amplifier board is secured through slotted holes by two screws. By loosening the screws and sliding the board, the amount of coupling loop protruding into the cavity can be altered and the amplifier output level varied.

## TROUBLESHOOTING

### General

The oscillator transistor, buffer amplifiers, and external circuits of the A3 RF Oscillator Assembly may be repaired to the component level. However, if a problem has been isolated to components in the RF Oscillator cavity, the oscillator assembly should be returned to Hewlett-Packard for repair. Do not attempt to disassemble it because proper reassembly depends upon specialized skills and procedures.

### Buffer Amplifiers

Refer to *Assembly/Disassembly Instructions, Service Sheet B* for access to the buffer amplifier assemblies. Check dc bias voltages to reveal a faulty component. See Section 5 for adjustment.

### RF ON/OFF Switch Modification

The RF ON/OFF switch function may be wired one of two ways:

1. It may be wired to switch off only the Modulator leaving the RF Oscillator on and warmed up, the Auxiliary RF Output on, and the counter and phase lock operating. In this case, however, the RF is not truly off but is reduced by an amount equal to the pulse on/off ratio (at least 40 dB down and dependent on OUTPUT LEVEL vernier setting). The switch is wired to this configuration at the factory.
2. It may be wired to switch off both the RF Oscillator and Modulator leaving the RF output completely off but requiring a stabilization period after turn on.

Either configuration can be easily altered to the other as follows:

- a. Remove bottom cover (See Service Sheet 18).
- b. Remove two nuts that secure A3A4 Connector Board Assembly, and remove board. The board is located directly behind the Divider/Filter cam housing.
- c. To modify the circuitry to leave the RF Oscillator On at all times, add jumper wire if it is missing between the two holes labeled "RF OSC ON/OFF INHIBIT" as shown on the A3A4 Component Locator (SS 1). The jumper wire comes pre-installed from the factory, but may be removed.
- d. To modify the circuitry so the RF Oscillator is switched Off, remove the existing jumper wire.
- e. Reinstall board and bottom cover.
- f. Check RF ON/OFF operation by observing counter or Auxiliary RF Output signal.



## SERVICE SHEET 2

### DESCRIPTION

- FM Amplifier

### PRINCIPLES OF OPERATION

#### General

The A5 FM Amplifier Assembly, in conjunction with the A9 Peak Deviation and Range Switch and the A7 Shaping Assembly, conditions the modulation signal to drive the varactor diodes which frequency modulate the RF oscillator. Modulation signals may be dc or ac coupled.

#### Input and Buffer Circuits (A5)

The FM modulating signal is applied to the PEAK DEVIATION vernier. Buffer Amplifier U1 is internally connected as a voltage follower. The output of U1 drives the Meter Attenuator (Service Sheet 4), the Over-Deviation Detector (Service Sheet 4), and the FM Gain Compensation circuit through relay K1. When the FM switch is OFF, or if the PEAK DEVIATION switch is set to an unallowable position, the relay is de-energized and the signal path to the FM and meter circuits is opened. FM gain compensation potentiometer A3R2 is geared to the FREQUENCY TUNE control and adjusts the gain of the circuit. FM sensitivity is higher for higher RF oscillator frequencies and the FM Gain Compensation circuit reduces the modulation circuit drive at high frequencies. The gain compensation adjustment potentiometers (A3A4R2, R3, and R4) set the FM sensitivity at the frequency mid-point and extremes. The output of the FM Gain Compensation circuit drives the FM Amplifier input.

#### Amplifier (A5)

The FM Amplifier is a non-linear, feedback amplifier which drives the varactor diodes in the RF Oscillator. The amplifier and shaping circuits compensate for the non-linear tuning sensitivity of the varactor diodes in the RF Oscillator. The positive shaping network is in the feedback path and for large positive voltage excursions it increases the feedback attenuation and hence increases the amplifier gain. The negative shaping network is in the output path, and for large negative voltage excursions, the output attenuation is increased and the overall amplifier gain decreases.

Transistors Q1 through Q4 form a two-stage differential input amplifier. The dual transistors Q1 and Q2 are connected in a Darlington configuration to provide matched, high impedance inputs. Amplifier offset adjustment, R8 adjusts the dc offset. The gain of the first stage is approximately one-half the ratio  $R4/R3$ ; gain for the second stage is approximately one-half the ratio  $R5/R6$ .

Transistors Q5 through Q8 form an intermediate driver stage. The voltage gain of the stage is approximately twice the ratio of the impedance across R27 to that of R17.

The shaping circuits require more gain for large positive voltage excursions. For low positive voltages, the resistor network R29 to R34 is in parallel with R27. As the voltage increases, diodes CR10, 11, and 12 respectively switch off and increase the impedance across R27 and thereby increase the amplifier's gain.

Transistors Q9 through Q12 form the amplifier output stage. Transistors Q9 and Q10 are in a Darlington configuration and supply current to the load during positive excursions. Transistors Q11 and Q12 are in an inverted Darlington configuration and sink load current during negative excursions.

## Amplifier Configurations

The FM Amplifier is switched by the A9 Peak Deviation and Range Switch into three different configurations depending on the gain needed. For gains less than 0 dB, the amplifier is in a unity gain configuration followed by the positive shaping network (Service Sheet 3) which has little effect, an attenuator which determines the overall gain, and the negative shaping network (Service Sheet 3) which has only a small effect. The effect of the shaping networks is small because voltage swings are small and the tuning characteristic of the varactor diodes is fairly linear over the narrow range of operation. For 0 dB gain, the amplifier is in a unity gain configuration, the positive shaping network and attenuator have no effect, and the negative shaping network has a small effect. For gains greater than 0 dB, the attenuator is in the feedback path and the gain is inversely proportional to the feedback attenuation.

## Attenuator (A9)

Before entering the feedback path, the FM Amplifier output passes through an attenuator formed by resistors R1 through R5 which reduces the open-loop gain of the amplifier when only small closed loop gain is needed. The gain control attenuator used in the feedback or output of the amplifier is formed by resistors R8 through R13 and R15 through R19.

## TROUBLESHOOTING

It is assumed that a problem has been isolated to the FM amplifier circuits as a result of using the troubleshooting block diagrams. Troubleshoot by using the test equipment listed below, performing the initial test conditions and control settings, and following the procedures outlined in the table.

### Test Equipment

Digital Voltmeter ..... HP 3455A  
 Oscilloscope ..... HP 1740A

### NOTE

*Use a 10Ω resistor, in series with the DVM probe tip, to reduce spurious oscillations in the amplifier circuitry while making dc measurements.*

### Initial Test Conditions

Bottom cover removed (refer to *Assembly/Disassembly Instructions, General Removal Procedures*  
 Extend A5 FM Amplifier Assembly on extender board. Remove A7 FM Shaping Assembly from chassis.

### Initial Control Setting

MODULATION FREQUENCY ..... 400 Hz  
 FM ..... INT  
 PEAK DEVIATION ..... 5 kHz  
 PEAK DEVIATION Vernier ..... Fully cw  
 RANGE ..... 0.5-1 MHz  
 FREQUENCY TUNE ..... Centered  
 (Four turns from stop)  
 RF ON/OFF ..... ON

*Table 8B-2. FM Amplifier Troubleshooting*

Component or Circuit	Test Conditions and Control Settings	Normal Indication	If Indication is Abnormal
Buffer Amplifier (A5)	Initial conditions and settings. Adjust PEAK DEVIATION vernier for 2 Vpp at TP5 (BUFFER IN).	2 Vpp at TP6 (BUFFER OUT)	Check U1 and associated circuitry
FM Amplifier (A5)	Initial conditions and settings. Adjust PEAK DEVIATION vernier for 2 Vpp at TP5 (BUFFER IN).	Peak-to-peak voltages at TP3 (INPUT) and TP4 (INPUT) are the same.	Set FM to OFF and use DVM to check dc voltages shown on schematic.
	Switch RANGE through all ranges and check gain from A5TP3 to A9A2TP1.	Gain in accordance with FM system gain table on schematic.	Check switching of A9.

## SERVICE SHEET 3

### DESCRIPTION

- FM Shaping Circuits and Phase Lock Loop Filter

### PRINCIPLES OF OPERATION

#### General

The FM shaping networks, in conjunction with the FM amplifier and the peak deviation attenuator (Block Diagram 2), condition the modulation signal to drive the RF Oscillator's varactor diodes which electrically tune the oscillator. The tuning sensitivity of the oscillator with respect to the modulation input decreases as the tuning voltage becomes more positive. The shaping networks compensate for this non-linear tuning characteristic. In addition, the varactor diodes can be tuned by the phase lock circuits to synchronize the RF Oscillator with an accurate and stable reference oscillator.

#### FM Enable (A7)

The varactor diode cathodes are switched by FM Enable reed relay K1 either to R39 when the FM is disabled or to the amplifier output when the FM is enabled. The relay is energized only when the FM switch is not OFF and when the PEAK DEVIATION and RANGE switches are set to an allowable combination. The maximum peak FM deviation possible is 1low end of a range (e.g., 2.56 MHz deviation on the 256-512 MHz range). The PEAK DEVIATION and RANGE switches, however, can be set to combinations that exceed this deviation (e.g., 2.56 MHz deviation on the 2-4 MHz range). For such unallowable combinations, the FM amplifier is disabled (by A5K1 on Block Diagram 2), the varactor diode cathodes are grounded (by A7K1), the meter input is opened (by A5K1), and the REDUCE PEAK DEVIATION annunciator lamp A6DS2 is turned on (see Block Diagram 4). The interaction of the PEAK DEVIATION switch and the RANGE switch is accomplished by differential gearing between the two switches.

#### Positive and Negative Shaping (A7)

The Positive Shaping network presents an increasingly lower impedance to the input as the input voltage increases. Resistors R11, R12, and R13 set the base voltage of transistor Q5, and Q5 sets the voltage supply to the resistor-diode ladder. Transistor Q6 supplies most of the current. Capacitor C5 keeps the base of Q5 at an ac ground potential. Diode CR9 protects Q6 in the event of a shorted +20V supply. The base-emitter junction of Q5 temperature-compensates the diodes of the ladder near it.

Transistor Q7 sets the voltage at the other end of the resistor-diode ladder at one diode junction drop below ground; it also temperature-compensates the diodes of the ladder near it. Transistor Q8 is a current sink. Capacitor C6 frequency-stabilizes Q7 and Q8. The diode cathodes in the ladder between Q7 and Q5 are at increasingly higher potentials. As the voltage at the input to the ladder increases, the diodes turn on consecutively and the impedance at the input lowers. The Negative Shaping network is analogous to the Positive Shaping network except the polarity of all voltages is reversed, the diodes are reversed, all transistors are complemented, and the shaping characteristic is modified.

#### Phase Lock Loop Filter (A7)

The Phase Lock Loop Filter is a 17 Hz active elliptic-function low-pass filter which filters the phase detector error voltage and drives the varactor diode anodes (on Service Sheet 1). The phase lock input may vary from +5 to +15V; the voltage at the varactor anodes varies from -13.6 to -16V with a quiescent value adjusted by R19.

## TROUBLESHOOTING

It is assumed that a problem has been isolated to the FM shaping circuits or to the phase lock loop filter as a result of using the troubleshooting block diagrams. Troubleshoot by using the test equipment listed below, performing the initial test conditions and control settings, and following the procedures outlined in the table.

### Test Equipment

Digital Voltmeter ..... HP 3455A

### Initial Test Conditions

Bottom cover removed (refer to *Assembly/Disassembly Instructions, Service Sheet G*). Extend A7 FM Shaping Assembly on extender board.

### Initial Control Settings

COUNTER MODE LOCK ..... OFF

### Positive and Negative Shaping

A trouble in one of the shaping circuits will usually cause FM sensitivity, distortion, and meter accuracy to be out of specification and will also prevent FM linearity from being correctly adjusted. The quickest way to troubleshoot the shaping circuits is to use the ohms function of the DVM to check the components.

### Phase Lock Loop Filter

A trouble in the loop filter will either prevent the generator from becoming phase-locked or prevent frequency modulation at low modulation rates. Trouble might also cause an increase in SSB noise or residual FM while phase-locked. A low voltage at A7TP2 (Varactor Anode) may indicate a faulty Phase Lock Loop Filter or Varactor Assembly (shown on Block Diagram 1).

*Table 8B-3. FM Shaping Circuits and Phase Lock Loop Filter Troubleshooting*

Component or Circuit	Test Conditions and Control Settings	Normal Indication	If Indication is Abnormal
POSITIVE and NEGATIVE SHAPING (A7)	Remove A7 Assembly from chassis. Check component resistances with DVM.	Components check good	Replace faulty component
PHASE LOCK LOOP FILTER (A7)	Initial conditions and settings. Check voltages shown on schematic.	Voltages check good	Check counter phase lock circuits and U1.
	Remove A7 Assembly from chassis. Check component resistances with DVM.	Components check good	Replace faulty component

## SERVICE SHEET 4

### DESCRIPTION

- **Over-Deviation Detector and Meter Control Circuits**

### PRINCIPLES OF OPERATION

#### Over-Deviation Detector (A7)

If the FM input signal is too large for the FM circuits to operate properly, the Over-Deviation Detector lights the REDUCE FM VERNIER annunciator lamp A6DS1. Integrated circuit U2 is a dual comparator amplifier with wired-OR outputs. Pin 7 of U2B is at 1.1 Vdc; pin 4 of U2A is at -1.1 Vdc; these two voltages are the high and low reference voltages. Pins 6 and 3 of U2 are the common inputs. If the input, which comes from the FM buffer amplifier, is not between +1.1 and -1.1V, the outputs go high (1V). Integrated circuit U3 is a hex inverter with open collector outputs. U3A inverts the comparator output. When U3A goes low, capacitor C13 is discharged; when U3A goes high again, C13 slowly charges through R76. This effectively increases the duration of the comparator output when overloading occurs only for short periods. U3B inverts the output of U3A and drives four parallel inverters U3C to U3F. When the outputs of the four parallel inverters are low, the display lamp turns on, which occurs whenever the input to U3B is low.

#### Peak Deviation Switch (A9)

The Meter Attenuator scales the FM input signal to give the correct reading on the meter. The Scale/Annunciator Lamp Control section of the switch lights the proper scale annunciator lamp (on A6) for a given peak deviation range when the meter mode selected is FM.

### TROUBLESHOOTING

It is assumed that a problem has been isolated to the over-deviation detector, meter attenuator, or scale/annunciator lamp control circuits as a result of using the troubleshooting block diagrams.



#### Test Equipment

Digital Voltmeter.....	HP 3455A
Oscilloscope.....	HP 1740A

#### Initial Test Conditions

Bottom cover removed (refer to *Assembly/Disassembly Instructions, General Removal Procedures*).  
Extend A7 FM Shaping Assembly on extender Board. Connect AM OUTPUT to FM OUTPUT.

#### Initial Control Settings

AM.....	INT
AUDIO OUTPUT LEVEL.....	cw
MODULATION.....	ccw
MODULATION FREQUENCY.....	400 Hz (Fixed)
FM.....	AC
PEAK DEVIATION.....	5 kHz
PEAK DEVIATION Vernier.....	ccw
RANGE.....	0.5-1 MHz



Table 8B-4. Over-Deviation and Meter Control Circuits Troubleshooting

Component or Circuit	Test Conditions and Control Settings	Normal Indication	If Indication is Abnormal
OVER-DEVIATION DETECTOR (A7)	Initial conditions and settings. Adjust PEAK DEVIATION vernier for 1.8 Vpp at U2 pins 3 and 6.	REDUCE FM VERNIER lamp unlit and 1. pins 6, 8, 10, 12 high 2. U3B pin 4 low 3. U3A pin 2 high 4. TP4 (FM OVERLOAD) low	Replace faulty component
	Adjust PEAK DEVIATION vernier for 2.4 Vpp at U2 pins 3 and 6	REDUCE FM VERNIER lamp lit and 1. pins 6, 8, 10, 12 low 2. U3B pin 4 high 3. U3A pin 2 low 4. TP4 (FM OVERLOAD) $\approx$ 2 Vpp	Replace faulty component
SCALE/ANNUNCIATOR LAMP CONTROL (A9)	Initial conditions and settings. Set Meter Function to FM and set PEAK DEVIATION as follows: 5 kHz 10 kHz 20 kHz 40 kHz 80 kHz 160 kHz 320 kHz 640 kHz 1.28 MHz 2.56 MHz 5.12 MHz	SCALE lamps light as follows:  5 10 3 5 10 3 3 10 3 3 5	Check scale lamps (A6) and switches (A9)



## SERVICE SHEET 5A

### Description

- Fixed-Frequency Modulation Oscillator (Standard)

### PRINCIPLES OF OPERATION

#### General

This Service Sheet documents instruments with the fixed-frequency modulation oscillator (standard). When either the AM or FM modulation select switch is set to INT, the Modulation Oscillator is enabled. The oscillator feeds a 1000 or 400 Hz signal (selected by the MODULATION FREQUENCY switch) into the AM or FM modulator circuits and to the AM or FM front panel OUTPUT jacks.

#### Modulation Oscillator (A11)

Amplifier U1 is the gain block. A frequency-selective bridged-tee network forms a negative feedback path for U1. (This network is a notch filter with zero phase shift at the minimum of the notch.) The frequency of oscillation is determined by the network: C1, C2, and either A11A1R1 and R2 or R3 and R4. The positive-feedback path is a voltage divider in which the amount of feedback is determined by the output of a peak detector. (The amount of feedback automatically adjusts to maintain oscillation at a constant amplitude.) The voltage divider consists of A11R4, R3, CR1, and CR2. Diodes CR1 and CR2 are in ac parallel and dc series. The ac resistance is determined by the dc voltage across capacitor C5. At the peak of each output cycle VR2 and CR3 conduct and replenish the charge lost from C5. The ac voltage at the output of U1 is about 14.4 Vpp ( $\approx 5.1$  Vrms).

#### Buffer Amplifiers (A11)

Resistors R5, R6, and R7 lower the oscillator output voltage to 2.3 Vrms at TP5. Resistors R13 and R14 lower the voltage to about 0.84 Vrms at TP3 and TP4. Transistor Q5 drives the FM PEAK DEVIATION vernier potentiometer; Q4 drives the AM MODULATION potentiometer; Q1 drives the AM OUTPUT jack; and Q2 drives the FM OUTPUT jack. Signal levels at the two jacks are approximately 1 Vrms into 600 $\Omega$ .

**TROUBLESHOOTING**

It is assumed that a problem has been isolated to the fixed-frequency modulation oscillator as a result of using the troubleshooting block diagrams. Troubleshoot by using the test equipment listed below, performing the initial test conditions and control settings, and following the procedures outlined in the table.

**Test Equipment**

Digital Voltmeter ..... HP 3455A  
 Oscilloscope ..... HP 1740A

**Initial Test Conditions**

Top and bottom covers removed (refer to *Assembly/Disassembly Instructions, Service Sheet G*). Extend A11 Fixed-Frequency Modulation Oscillator Assembly on extender board (refer to *Service Sheet E* for removal procedure).

**Initial Control Settings**

AM ..... INT  
 AUDIO OUTPUT LEVEL ..... cw  
 MODULATION FREQUENCY ..... 400 Hz

**Fine Frequency Adjustment**

The oscillator's frequency can be lowered slightly by twisting the orange (3), yellow (4), and green (5) wires together. The wires connect MODULATION FREQUENCY switch A11A1S1 to the A11 circuit board.

*Table 8B-5. Fixed-Frequency Modulation Oscillator Troubleshooting*

Component or Circuit	Test Conditions and Control Settings	Normal Indication	If Indication is Abnormal
MODULATION OSCILLATOR ASSY (A11)	Initial conditions and settings. Then set MODULATION FREQUENCY to 1000 Hz.	Peak-to-peak voltages are as shown on schematic	Check appropriate circuit and replace faulty component
	Set AM to OFF. Use DVM to check dc voltages.	DC voltages check good	Replace faulty component

## SERVICE SHEET 5B

### DESCRIPTION

- Variable-Frequency Modulation Oscillator (Option 001)

### PRINCIPLES OF OPERATION

#### General

This Service Sheet documents instruments with the variable frequency modulation oscillator (Option 001). When either the AM or FM modulation select switch is set to INT, the Modulation Oscillator is enabled. The oscillator feeds a signal with a frequency selected by the MODULATION FREQUENCY switch into the AM or FM modulator circuits and to the AM or FM front panel OUTPUT jacks.

#### Modulation Oscillator (A11)

The Modulation Oscillator is a Wein-bridge type oscillator. Transistors Q7 to Q12 form a differential amplifier. The gate of FET Q11 is a high impedance non-inverting input of the amplifier. Transistor Q12 is an emitter-follower buffer amplifier. Trimmer capacitor C9 compensates for the high-frequency phase shift of the amplifier. Transistors Q9 and Q10 provide voltage gain and drive the complementary symmetry output transistors Q7 and Q8. The inverting input to the amplifier is the emitter of Q9. Diodes CR2 to CR4 bias and thermally compensate the amplifier. Resistor R26 provides negative dc feedback.

A frequency-selective Wein ladder forms a positive feedback path. This network is a band-pass filter with zero phase shift at the maximum of the pass band. The frequency of oscillation is determined by the resistors and capacitors of the ladder. In the FIXED FREQ range, C6 and C7 are the ladder capacitors and either R2 and R6, or R3 and R5 in parallel with R6 are the resistors. In the variable frequency ranges, C1A and C1B are the variable ladder capacitors and R1 and R4 (each in parallel with one or none of the resistors on the A11A1 Frequency Select Switch) are the resistors. Capacitors C2, C3, C4, and C5 set the frequency end points and maximize flatness for a given frequency range.

The negative feedback path is a voltage divider in which the amount of feedback is determined by the output signal level. The amount of feedback adjusts to maintain oscillation at a constant amplitude. The voltage divider consists of R28 and RT1, a thermistor assembly. Diodes VR1, VR2, CR5, and CR6 add a small amount of odd-harmonic distortion to stabilize the amplitude characteristic of the oscillator.

#### Buffer Amplifiers (A11)

Transistors Q1 to Q4 form the AM/FM Output Buffer Amplifier which is similar in operation to the oscillator output amplifier. Gain of the amplifier is adjusted by R40. The outputs drive the external AM or FM jacks. Resistors R34, R35, and R36 attenuate the oscillator output to a level of 0.84 Vrms. Transistor Q5 drives the FM PEAK DEVIATION potentiometer (Block Diagram 2), and Q6 drives the AM MODULATION potentiometer (Service Sheet 6).

## TROUBLESHOOTING

It is assumed that a problem has been isolated to the variable-frequency modulation oscillator as a result of using the troubleshooting block diagrams. Troubleshoot by using the test equipment listed below, performing the initial test conditions and control settings, and following the procedures outlined in the table.

### Test Equipment

Digital Voltmeter ..... HP 3455A  
 Oscilloscope ..... HP 1740A

### Initial Test Conditions

Top and bottom covers removed (refer to *Assembly/Disassembly Instructions, Service Sheet G*). Extend A11 Variable-Frequency Modulation Oscillator Assembly on extender board (refer to *Service Sheet E* for removal procedure).

### Initial Control Settings

AM ..... INT  
 AUDIO OUTPUT LEVEL ..... cw  
 MODULATION FREQUENCY ..... 400 Hz (Fixed)

### Amplitude Stability and Distortion

The signal level of the oscillator is set by adjusting R28 for best compromise between harmonic distortion and amplitude stability (squegging at turn-on or range change).

*Table 8B-6. Variable-Frequency Modulation Oscillator Troubleshooting*

Component or Circuit	Test Conditions and Control Settings	Normal Indication	If Indication is Abnormal
MODULATION OSCILLATOR ASSY (A11)	Initial conditions and settings. Then set MODULATION FREQUENCY to 1000 Hz (fixed) and to each of the variable ranges (X1, X10, etc.). Vary the vernier on each range.	Peak-to-peak voltages are as shown on schematic.	Check appropriate circuit and replace faulty component.
	Set AM to OFF.	DC voltages are as shown on schematic.	Replace faulty component.

## SERVICE SHEET 6

### DESCRIPTION

- RF Filters

### PRINCIPLES OF OPERATION

#### Divider/Filter Assembly (A10), General

The A10 Divider/Filter Assembly frequency-divides and filters the signal from the RF oscillator. The divider network (see Figure 8B-2) consists of a chain of nine binary dividers ( $\div 2$ ). The output is taken either from the RF oscillator buffer or from an OR gate at the output of one of the dividers, depending on the frequency range selected; all other divider output gates are disabled and also the divider immediately following the output divider. The signal from the output gates is transformer coupled out to a power amplifier which drives the modulator. The modulator controls the signal level and adds AM.

The output from the dividers is approximately a square wave. The low-pass filters remove the signal's harmonics. On the four lowest frequency ranges, the square wave output is quite symmetrical (i.e., second harmonics are well suppressed). In the lower portion of these ranges, the filters suppress only the third harmonic and higher.

On higher frequency ranges the divider output is more asymmetrical and more second harmonic is present. Each of these ranges has two filters. In the lower portion of these ranges, the first filter's stop-band frequency is made low enough to suppress the second harmonic. In the higher portion of the range, a filter with a higher stop-band frequency is switched in to suppress the second harmonic. The high-band filter is switched in at approximately the geometric mean of the frequency extremes of the range. A Schmitt Trigger senses a dc voltage,  $V_T$ , which is proportional to the frequency, and relays switch the filters at the geometric mean. On the four lowest ranges, the low-band filter for the 16-32 MHz range is also switched in series with the range filters to improve the rejection of high-order harmonics. All range switching is done by cam-operated slide switches on the filter board (A10A1). The filters drive the output amplifier which drives the RF output and AGC circuits. The filters are inside the AGC feedback loop.

#### RF Filters (A10A1)

The A10A1 RF Filter Assembly contains sixteen RF low-pass filters and six slide switches that are controlled by the RANGE switch. The filters for the four lowest ranges (0.5 to 8 MHz) are sharp-cutoff, elliptic-function filters. The remaining filters are Chebyshev filters. In the six highest ranges, relays K1 and K3 switch in the low-band filters when the frequency is below the geometric mean frequency of the range and relays K2 and K4 switch in the high-band filters when above the geometric mean. The slide switches route the RF signal to the proper filters, activate the frequency dividers, and route the RF signal to and from dividers. Each slider has three detented positions. Mechanical action of the RANGE switch is shown in Figure 8B-1.

### TROUBLESHOOTING

It is assumed that a problem has been isolated to the RF Filter circuits as a result of using the troubleshooting block diagrams. The quickest way to isolate a Divider/Filter problem is to step through the ranges, tuning to both high and low band frequencies, while monitoring the output level meter. Start by performing the initial test conditions and control settings, and following the procedure outlined in the tables.

#### Test Equipment

Digital Voltmeter ..... HP 3455A

#### Initial Test Conditions

Top cover removed (refer to *Assembly/Disassembly Instructions, Service Sheet G*). A10 Divider/Filter Assembly casting cover removed, A10A2 RF Divider Assembly removed and extended for service with access to A10A1 RF Filter Assembly (refer to *Service Sheet E*).

#### Initial Control Settings

COUNTER MODE:

EXPAND ..... Off

LOCK ..... Off

Source ..... INT

Meter Function ..... LEVEL

AM ..... OFF

FM ..... OFF

RANGE ..... 256-512 MHz

FREQUENCY TUNE ..... 550 MHz

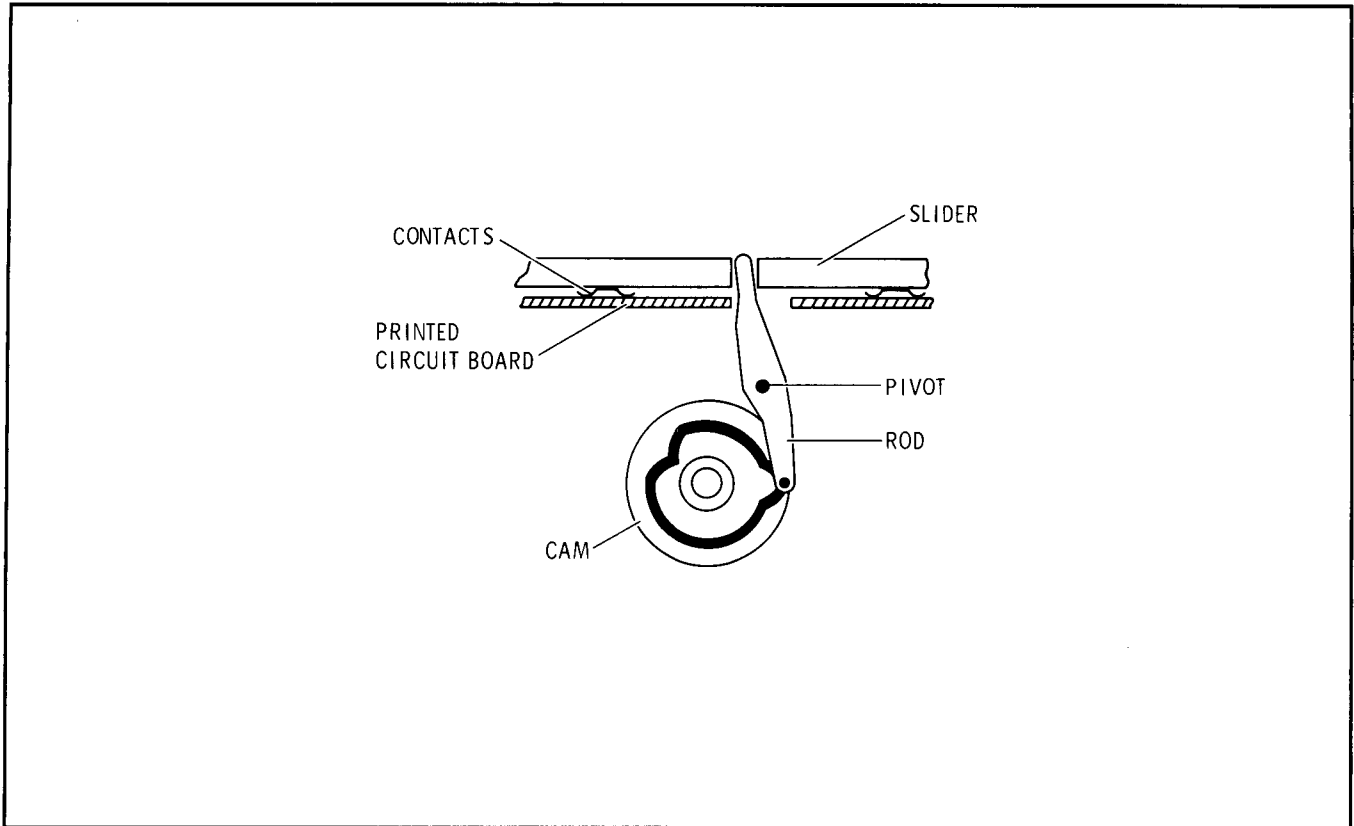
OUTPUT LEVEL ..... -10 dBm

RF ON/OFF ..... ON

The dividers and the Schmitt Trigger circuits are shown and discussed on Service Sheet 3 (the relays driven by the Schmitt Trigger circuits are shown on this service sheet).

*Table 8B-8. RF Filters Troubleshooting*

<b>Component or Circuit</b>	<b>Test Conditions and Control Settings</b>	<b>Normal Indication</b>	<b>If Indication is Abnormal</b>
HIGH/LOW BAND RELAYS (A10A1)	Initial conditions and settings	DC continuity across contacts of K2 and K4	Check K2, K4, and associated circuitry
	Set FREQUENCY TUNE to 256 MHz	DC continuity across contacts of K1 and K3	Check K1, K3 and associated circuitry.
RF FILTERS (A10A1)	Initial conditions and settings then set RANGE to each position and tune FREQUENCY TUNE full cw and full ccw.	-20 dBm on panel meter	Check appropriate switch contacts and appropriate high and low band filters.



*Figure 8B-1. Action of Range Switch*



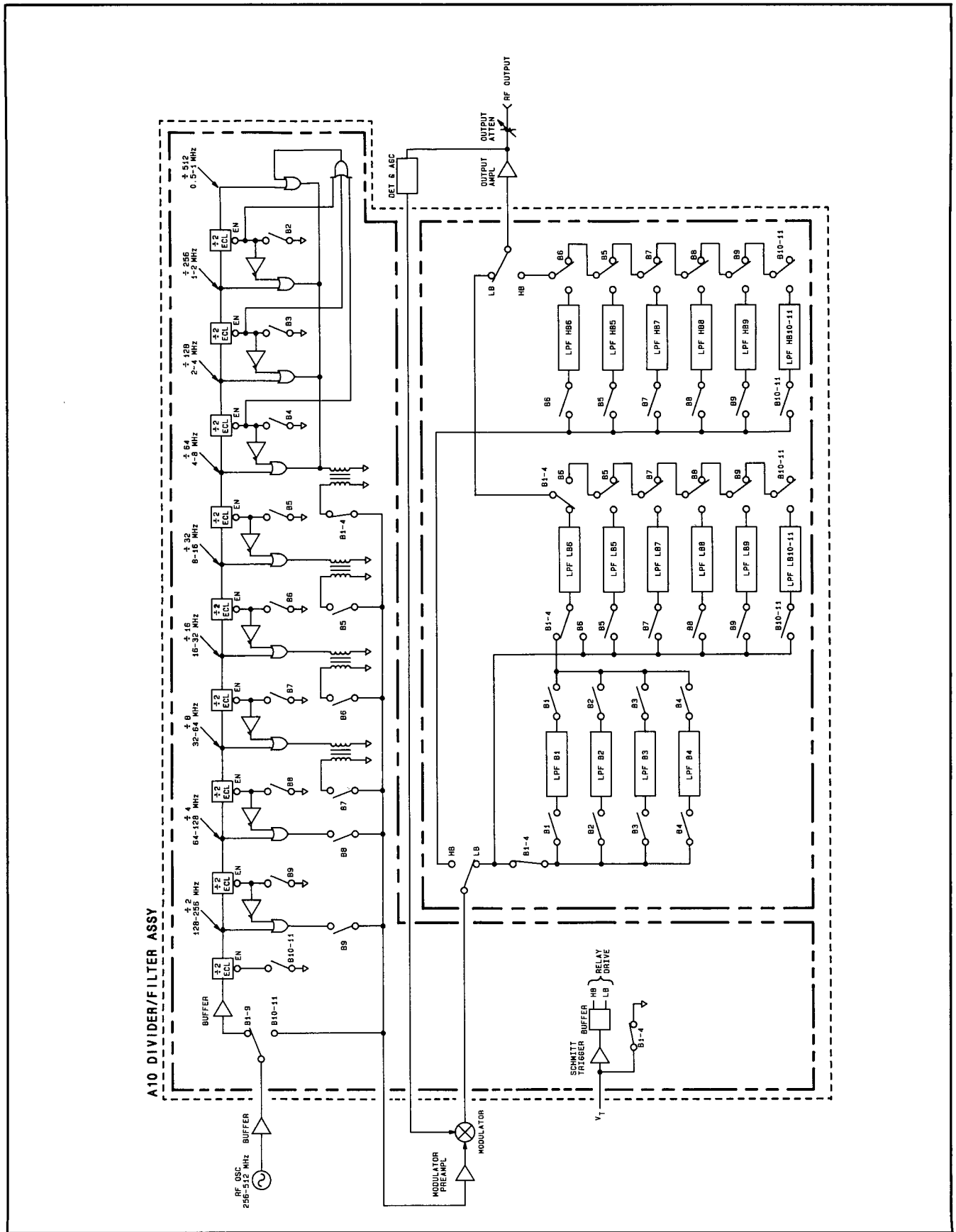


Figure 8B-2. Divider/Filter Assembly Simplified Logic Diagram

## SERVICE SHEET 7

### DESCRIPTION

- RF Dividers

### PRINCIPLES OF OPERATION

#### RF Dividers (A10A2)

The A10A2 RF Divider Assembly frequency-divides the 256 to 512 MHz signal from the RF oscillator to obtain the lower output ranges. Overall operation of the A10 Divider/Filter Assembly is described on Service Sheet 6. Refer also to Figure 8B-2 (SS 6) for a simplified logic diagram of the RF Dividers and Filters. On the two highest frequency ranges (256-512 MHz and 512-1024 MHz), the dividers are bypassed. On all other ranges, the signal from the oscillator is amplified and buffered by transistor Q3 and input to the divider chain, which begins with U11. All dividers are ECL and all are D flip-flops wired to divide-by-two (Q output tied to D input).

The output for the selected frequency range is obtained by (1) enabling all needed dividers, (2) disabling the next divider, (3) enabling the output of the last-used divider, and (4) disabling the outputs of all previous dividers. Disabling all subsequent dividers eliminates sub-harmonics. Disabling the outputs of all previous dividers minimizes harmonics. Consider, for example, the selection of the 32-64 MHz frequency range (band 7).

- (1) Dividers U11, U12, and U14 must be enabled. The RANGE switch places an ECL high (short to ground) on line B7 and ECL lows on lines B9, B8, and B6 through B1. (The lows result from opens on the RANGE switch and pull-down resistors, such as R89, on the lines.) Since lines B9 through B1 are not all low, the combination of gates U13A, U13B, and U13C cause the output of U13A to be low. This enables U11 (pin 9 is low). The low on line B9 is buffered by the OR output of U7B which enables U12. The low on line B8 is buffered by the OR output of U8B, which enables U14.
- (2) Divider U15A must be disabled. The high on line B7 sets U15A, which inhibits the divide-by-two function. Since U15A is disabled, no signal is present at U15B and subsequent dividers though they are all enabled.
- (3) The output path of U14 must be enabled. U9C couples the output of U14 through T1 and on to the RF output (via the B7 OUT line). The high on line B7 is inverted by U9B, which enables U9C to pass the divided RF signal from U14.
- (4) The outputs of U11 and U12 must be disabled. Since line B7 only is high, U7A is disabled by the high at the NOR output of U7B, and U8A is disabled by the high at the NOR output of U8B.

Note that dividers U11 and U12 (via U7B and U8B) drive their respective output lines (B9 OUT and B8 OUT) directly. Dividers U14, U15A, and U15B drive complementary OR gates which are transformer-coupled to the output lines via pi-network attenuators. This push-pull arrangement helps preserve waveform symmetry for best even-harmonic balance. The attenuators prevent excessive signal level from being applied to A26U2 (Service Sheet 8A, B, or C). The last four dividers share a common transformer T4 and attenuator, and they couple to the transformer via OR gate pairs driven in complement.

VR1, Q6, Q7, and associated components form two -2.0 Vdc voltage regulators. The purpose of the supplies is to provide the ECL devices with the proper dc load current. (A 50 ohm load to -2 Vdc provides the proper load termination.)

### Schmitt Trigger (A10A2)

Amplifier U1 is a Schmitt Trigger which senses when the voltage  $V_T$  (proportional to the RF oscillator frequency) reaches the value corresponding to the geometric mean of the frequency band. The reference voltage is determined by resistors R60 and R61; R65 adds a small amount of hysteresis. Transistor Q1 complements the amplifier output. Inverter U4A activates the low-band relays A10A1K1 and K3 (Service Sheet 6); and U4B activates the high-band relays A10A1K2 and K4 (Service Sheet 6). The inverters are driven in complement except that capacitors C62 and C63 hold both inverters on simultaneously for a few milliseconds during a transition to provide a make-before-break action.

### TROUBLESHOOTING

It is assumed that a problem has been isolated to the RF Filter circuits as a result of using the troubleshooting block diagrams. The quickest way to isolate a divider/filter problem is to step through the ranges, tuning to both high and low band frequencies, while monitoring the output level meter. Start by performing the initial test conditions and control settings, and following the procedure outlined in the tables.

#### Test Equipment

Digital Voltmeter ..... HP 3455A

#### NOTE

*If problems occur only on the lower ranges, an oscilloscope can be used to locate the defective RF circuit. On the higher ranges, either a high frequency oscilloscope, a sampling oscilloscope, or a spectrum analyzer (with a 511 ohm resistor in series with the input) can be used.*

#### Initial Test Conditions

Top cover removed (refer to *Assembly/Disassembly Instructions, Service Sheet G*) and A10 Divider/Filter Assembly casting cover removed (refer to *Service Sheet E*).

#### Initial Control Settings

COUNTER MODE:

EXPAND ..... Off

LOCK ..... Off

Source ..... INT

Meter Function ..... LEVEL

AM ..... OFF

FM ..... OFF

RANGE ..... 256-512 MHz

FREQUENCY TUNE ..... 550 MHz

OUTPUT LEVEL ..... -10dBm

RF ON/OFF ..... ON

The filters, slide-switches, and the relays driven by the Schmitt Trigger circuits are shown and discussed on Service Sheet 6.

**NOTE**

*Check that the control inputs to the RF gates are correct before suspecting the gates themselves.*

*Table 8B-9. RF Dividers, Possible Troubles*

Symptom	Probable Cause
No output at one range only.	Defective output circuit for one of the dividers, a filter, or a slide switch.
No output on one range and all ranges below that range.	Defective divider or 16-32 MHz low band filter or 0.5 to 8 MHz divider output transformer.
Low power at highest end of ranges (8 to 1024 MHz) only.	Defective geometric mean switching (high band filters not being switched in).
Overly high harmonics at lowest end of range (8 to 1024 MHz) only.	Defective geometric mean switching (low band filters not being switched in).
Intermittent power.	Poor contact on slide switch.
Changing range does not change output frequency even though the counter may indicate a change.	Loose coupler between RANGE switch and Divider/Filter switch assembly.

*Table 8B-10. RF Divider Troubleshooting*

Component or Circuit	Test Conditions and Control Settings	Normal Indication	If Indication is Abnormal
SCHMITT TRIGGER (A10A2)	Initial conditions and settings	$\approx 10V$ at TP1 ( $V_T$ )	Check slide-switches (Service Sheet 10) and $V_T$ pot (Service Sheet 5).
		$\approx -3V$ at TP2 (ST OUT)	Check U1 and associated circuitry.
		$\approx 0V$ at TP3	Check U4 and associated circuitry.
		$\approx +5V$ at TP4	Check U4, Q1 and associated circuitry.
	Set FREQUENCY TUNE to 230 MHz.	$\approx 0V$ at TP1 ( $V_T$ )	Check $V_T$ pot (Service Sheet 5).
		$\approx +5V$ at TP3	Check U4 and associated circuitry.
RF DIVIDERS (A10A2)	Initial conditions and settings then set RANGE to each position.	$-10$ dBm on panel meter.	Check appropriate divider and associated circuitry. Check that following divider is off.

## SERVICE SHEET 8A

### DESCRIPTION

- AGC Amplifier and Amplitude Modulator (Standard)

### PRINCIPLES OF OPERATION

#### General

This Service Sheet documents instruments without Option 002 or Option 004.

The A26A3 Modulator Assembly contains a current-controlled attenuator which varies the RF output level. The A26A4 AGC Amplifier controls the drive to the modulator. Attenuation is determined by the OUTPUT LEVEL vernier and by the AM input signal when the AM switch is on or by the pulse input signals when AM is set to PULSE.

#### Modulator (A26A3)

The RF signal from the binary dividers is amplified by Modulator Preamplifier A26U2. The amplifier is a sealed microcircuit. The amplifier drives the AUX RF OUTPUT jack through resistor R1 and drives the modulator diodes. Diodes CR1 through CR8 form a balanced resistive network in which the resistance is controlled by the current biasing them. Capacitors C3 through C6 improve the modulator balance at high frequencies. The control current comes from the AGC output amplifier through choke L2 and then splits between R4, CR1 to CR4, and R3 or R5, CR5 to CR8, and R2. The RF signal is coupled into the modulator through T1 and out through T2. The modulator output drives the RF filters (Service Sheet 6).

#### AGC Amplifier (A26A4)

The AGC Amplifier sums the negative detector output from the A26A1 Detector Buffer Amplifier (Service Sheet 9A) with the positive AGC reference voltage from the OUTPUT LEVEL vernier A1R1 (Service Sheet 12A). The input to the vernier is a  $2 V_{dc}$  reference voltage upon which may be superimposed a preamplified AM signal ( $\pm 2 V_{pk}$  for 100% AM). When AM is set to PULSE, the amplifier's output (and therefore, the modulator) is switched on and off by the input pulses.

#### Summing Amplifier (A26A4)

Transistors Q1, Q2, and Q3 form a Summing Amplifier. The output of Q3 is the amplified sum of the detector and reference currents and represents the output level error. Resistor R1 is adjusted to give the correct RF output voltage corresponding to the AGC reference. Switch S1 allows the AGC circuits to be tested in an open-loop condition.

#### Modulator Driver Amplifier (A26A4)

Transistors Q4, Q5, and Q6 form the Modulator Driver Amplifier. R32 and C9 frequency-compensate the AGC system. Capacitor C10 is switched in parallel with C9 in the 0.5-1 and 1-2 MHz ranges (called LO BAND 1) to give added compensation. The LO BAND 1 line is grounded in LO BAND 1 ranges and causes inverter U3B to go high and inverter U4F (an open collector output gate) to go low which switches in C10. In a similar manner capacitor C11 is switched in parallel with C9 in the 2-4 and 4-8 MHz ranges (called LO BAND 2). Transistor Q5 is a current source. Transistor Q6 is a constant current sink. The difference between the collector currents of Q5 and Q6 is the modulator drive current.

In the pulse modulation mode of operation, Q5 is switched on and off at the pulse repetition rate by transistor switch Q7 which is driven by the pulse Schmitt Trigger output of A26A2 (Service Sheet 9A). When Q7 is on, Q5 and the modulator are off (i.e., when either the MOD PULSE line is low or

when the RF OFF line is low). Hot carrier diodes CR13 and CR14 prevent saturation of Q7 and Q6 for rapid switching. Capacitor C15 is switched in across the modulator drive line by gates U3C and U4E to lower the rise and fall time of the modulator in LO BAND 1 ranges to reduce RF ringing in the filters following the modulator. Similarly, capacitor C16 is switched in for LO BAND 2 ranges. Transistor Q10 prevents the RF signal from coming on too fast and too hard when the RF ON/OFF switch is turned on.

### **Pulse Overload Detector (A26A4)**

In the pulse modulation mode, the peak detector in A26U1 (Service Sheet 9A) samples the RF output only when an input pulse is present; when no pulse is present, the detector output is stored on a capacitor. If the OUTPUT LEVEL vernier is reduced while in the pulse mode, the error voltage of the summing amplifier becomes very large and the modulator is turned off. The detector storage capacitor then discharges only during each pulse-on period until the error is zero. At low repetition rates and short on-periods, the capacitor discharge time is very long. To correct for this, Pulse Overload Detector U1B senses the condition of large error (i.e., when the collector voltage of Q3 exceeds  $+0.4 V_{dc}$ ) and switches a discharge resistor on to bring the system to a near zero error condition.

### **Meter Amplifier (A26A4)**

Amplifier U1A is an inverting amplifier with a gain of about  $-1.3$  (adjusted by R12) which scales the detector output voltage to drive the metering circuits. Capacitor C8 filters any superimposed modulation signal on the detector output.

### **Modulator Overload Detector (A26A4)**

If the OUTPUT LEVEL vernier setting or input modulation signal requires the output to exceed its maximum capability, Modulator Overload Detector U2 senses the condition and lights the REDUCE PEAK POWER annunciator A26A6DS3 (Service Sheet 8A or 8B). The reference voltage is set by resistors R29, R30, and R31. When the output from the OUTPUT LEVEL vernier exceeds the reference, the output of U2 goes high and turns on Q9 and the annunciator. Since the overload condition may be of short duration, capacitor C13 holds the output of U2 high to keep the annunciator lighted for a longer period.

## TROUBLESHOOTING

It is assumed that a problem has been isolated to the AGC amplifier or the modulator as a result of using the troubleshooting block diagrams. Troubleshoot by using the test equipment listed below, performing the initial test conditions and control settings, and following the procedures outlined in the table.

### Test Equipment

Digital Voltmeter .....	HP 3455A
Oscilloscope .....	HP 1740A

### Initial Test Conditions

To test A26A4 AGC Amplifier Assembly, remove top cover (refer to *Assembly/Disassembly Instructions, Service Sheet G*) and remove A26A4 and extend for service (refer to *Service Sheet F*).

To test A26A3 Modulator Assembly and A26U2 Modulator Preamplifier, remove bottom cover and remove A26 casting bottom cover.

### Initial Control Settings

COUNTER MODE:	
EXPAND .....	Off
LOCK .....	Off
Source .....	INT
Meter Function .....	LEVEL
AM .....	INT
MODULATION .....	100%
MODULATION FREQUENCY .....	1 kHz
FM .....	OFF
RANGE .....	8-16 MHz
FREQUENCY TUNE .....	7.20 MHz
OUTPUT LEVEL Switch .....	+10 dBm
OUTPUT LEVEL Vernier .....	Fully cw
RF ON/OFF .....	ON



Table 8B-11. AGC Amplifiers and Amplitude Modulator, Standard; Troubleshooting

Component or Circuit	Test Conditions and Control Settings	Normal Indication	If Indication is Abnormal
SUMMING AMPLIFIER (A26A4)	Initial conditions and settings. Set AGC switch, S1, to AGC off position.	≈ 800 mV sine wave (1 kHz) at TP6 (CQ1).	Check Q1, Q2, Q3 and associated circuitry.
MODULATOR DRIVER AMPLIFIER (A26A4)	Initial conditions and settings. Set AGC switch, S1, to AGC off position.	≈ 2 V <sub>p-p</sub> sine wave (1 kHz) at TP7 (DRVR). ≈ 8 V <sub>p-p</sub> sine wave (1 kHz) at TP8 (MOD).	Check Q4 and associated circuitry. Check Q5, Q6, Q7 and associated circuitry.
	Set RANGE to 4–8 MHz (LO BAND 2).	≈ 7.2 V <sub>p-p</sub> sine wave (1 kHz) at TP8 (MOD).	Check U3A, U3D, U4B, U4D and associated circuitry.
	Set RANGE to 1–2 MHz (LO BAND 1).	≈ 6 V <sub>p-p</sub> sine wave (1 kHz) at TP8 (MOD).	Check U3B, U3C, U4E, U4F and associated circuitry.
MODULATOR PREAMPLIFIER (A26U2)	Initial conditions and settings (AGC switch, A26A4S1, set to AGC on position).	> -5 dBm (>125 mV <sub>rms</sub> into 50Ω) at AUX RF OUTPUT jack on rear panel.	Check A26U2 and associated circuitry.
METER AMPLIFIER (A26A4)	Initial conditions and settings.	Panel meter indicates +10 dBm (707 mV).	Check U1A and associated circuitry.
MODULATION OVERLOAD DETECTOR (A26A4)	Initial conditions and settings.	REDUCE PEAK POWER annunciator unlighted.	Check U2, Q9 and associated circuitry.
	Set OUTPUT LEVEL switch one step cw.	REDUCE PEAK POWER annunciator lighted.  <b>NOTE</b> <i>Annunciator should be off at +19 dBm RF output and on at +20 dBm output.</i>	
PULSE OVERLOAD DETECTOR (A26A4)	Initial conditions and settings except set AM to OFF.  <div style="border: 1px dashed black; padding: 5px; display: inline-block;"><b>CAUTION</b></div> <i>Check that the OUTPUT LEVEL switch is set one step ccw from full cw.</i>	≈ +9V at TP3 (OVLD).	Check U1B and associated circuitry.
	Short TP5 (GND) to TP4 (VERN).	≈ 0V <sub>dc</sub> at TP3 (OVLD).	

## SERVICE SHEET 8B

### DESCRIPTION

- AGC Amplifier and Amplitude Modulator (Option 002)

### PRINCIPLES OF OPERATION

#### General

This Service Sheet documents instruments with the internal doubler (Option 002). The A26A3 Modulator Assembly contains a current-controlled attenuator which varies the RF output level. The A26A4 AGC Amplifier controls the drive to the modulator. Attenuation is determined by the OUTPUT LEVEL vernier and by the AM input signal when the AM switch is on or by the pulse input signals when AM is set to PULSE.

#### Modulator (A26A3)

The RF signal from the binary dividers is amplified by Modulator Preamplifier A26U2. The amplifier is a sealed microcircuit. The amplifier drives the AUX RF OUTPUT jack through resistor R1 and drives the modulator diodes. Diodes CR1 through CR8 form a balanced resistive network in which the resistance is controlled by the current biasing them. Capacitors C3 through C6 improve the modulator balance at high frequencies. The control current comes from the AGC output amplifier through choke L2 and then splits between R4, CR1 to CR4, and R3 or R5, CR5 to CR8, and R2. The RF signal is coupled into the modulator through T1 and out through T2. The modulator output drives the RF filters (Service Sheet 6).

#### AGC Amplifier (A26A4)

The AGC Amplifier sums the negative detector output from the A26A1 Detector Buffer Amplifier (Service Sheet 9B) with the positive AGC reference voltage from the OUTPUT LEVEL vernier A1R1 (Service Sheet 12A or 12B). The input to the vernier is a  $2 V_{dc}$  reference voltage upon which may be superimposed an AM input signal ( $\pm 2 V_{pk}$  for 100% AM). When AM is set to PULSE, the amplifier's output (and therefore, the modulator) is switched on and off by the input pulses.

#### Summing Amplifier (A26A4)

Transistors Q1, Q2, and Q3 form a Summing Amplifier. The output of Q3 is the amplified sum of the detector and reference currents and represents the output level error. Resistor R1 is adjusted to give the correct RF output voltage corresponding to the AGC reference. When the 512-1024 MHz RANGE (Option 002) is selected, relay K1 switches summing resistors R2 and R5 into the summing line to adjust for the doubler amplitude characteristic. Pot R54 adjusts offset of the doubler detector to match the offset of the microcircuit detector used on the lower ranges (Service Sheet 9B). Switch S1 allows the AGC circuits to be tested in an open-loop condition.

#### Modulator Driver Amplifier (A26A4)

Transistors Q4, Q5, and Q6 form the Modulator Driver Amplifier. R32 and C9 frequency-compensate the AGC system. Capacitor C10 is switched in parallel with C9 in the 0.5-1 and 1-2 MHz ranges (called LO BAND 1) to give added compensation. The LO BAND 1 line is grounded in LO BAND 1 ranges and causes inverter U3B to go high and inverter U4F (an open collector output gate) to go low which switches in C10. In a similar manner capacitor C11 is switched in parallel with C9 in the 2-4 and 4-8 MHz ranges (called LO BAND 2). Transistor Q5 is a current source. Transistor Q6 is a constant current sink. The difference between the collector currents of Q5 and Q6 is the modulator drive current.

In the pulse modulation mode of operation, Q5 is switched on and off at the pulse repetition rate by transistor switch Q7 which is driven by the pulse Schmitt Trigger output of A26A2 (Service Sheet 9A). When Q7 is on, Q5 and the modulator are off (i.e., when either the MOD PULSE line is low or when the RF OFF line is low). Hot carrier diodes CR13 and CR14 prevent saturation of Q7 and Q6 for rapid switching. Capacitor C15 is switched in across the modulator drive line by gates U3C and U4E to lower the rise and fall time of the modulator in LO BAND 1 ranges to reduce RF ringing in the filters following the modulator. Similarly, capacitor C16 is switched in for LO BAND 2 ranges. Transistor Q10 prevents the RF signal from coming on too fast and too hard when the RF ON/OFF switch is turned on.

### **Pulse Overload Detector (A26A4)**

In the pulse modulation mode, the peak detector in A26U1 (Service Sheet 9B) samples the RF output only when an input pulse is present; when no pulse is present, the detector output is stored on a capacitor. If the OUTPUT LEVEL vernier is reduced while in the pulse mode, the error voltage of the summing amplifier becomes very large and the modulator is turned off. The detector storage capacitor then discharges only during each pulse-on period until the error is zero. At low repetition rates and short on-periods, the capacitor discharge time is very long. To correct for this, Pulse Overload Detector U1B senses the condition of large error (i.e., when the collector voltage of Q3 exceeds  $+0.4 V_{dc}$ ) and switches a discharge resistor on to bring the system to a near zero error condition.

### **Meter Amplifier (A26A4)**

Amplifier U1A is an inverting amplifier with a gain of about  $-1.3$  (adjusted by R12) which scales the detector output voltage to drive the metering circuits. Capacitor C8 filters any superimposed modulation signal on the detector output.

### **Modulator Overload Detector (A26A4)**

If the OUTPUT LEVEL vernier setting or input modulation signal requires the output to exceed its maximum capability, Modulator Overload Detector U2 senses the condition and lights the REDUCE PEAK POWER annunciator A6DS3 (Service Sheet 12A or 12B). The reference voltage is set by resistors R29, R30, and R31 and in addition by R28 when the 512-1024 MHz RANGE is selected. When the output from the OUTPUT LEVEL vernier exceeds the reference, the output of U2 goes high and turns on Q9 and the annunciator. Since the overload condition may be of short duration, capacitor C13 holds the output of U2 high to keep the annunciator lighted for a longer period.

## TROUBLESHOOTING

It is assumed that a problem has been isolated to the AGC amplifier or the modulator as a result of using the troubleshooting block diagrams. Troubleshoot by using the test equipment listed below, performing the initial test conditions and control settings, and following the procedures outlined in the table.

### Test Equipment

Digital Voltmeter .....	HP 3455A
Oscilloscope .....	HP 1740A

### Initial Test Conditions

To test A26A4 AGC Amplifier Assembly, remove top cover (refer to *Assembly/Disassembly Instructions, Service Sheet G*) and remove A26A4 and extend for service (refer to *Service Sheet F*).

To test A26A3 Modulator Assembly and A26U2 Modulator Preamplifier, remove bottom cover and remove A26 casting bottom cover.

### Initial Control Settings

COUNTER MODE:	
EXPAND .....	Off
LOCK .....	Off
Source .....	INT
Meter Function .....	LEVEL
AM .....	INT
MODULATION .....	100%
MODULATION FREQUENCY .....	1 kHz
FM .....	OFF
RANGE .....	8-16 MHz
FREQUENCY TUNE .....	7.20 MHz
OUTPUT LEVEL Switch .....	+10 dBm
OUTPUT LEVEL Vernier .....	Fully cw
RF ON/OFF .....	ON

Table 8B-12. AGC Amplifiers and Amplitude Modulator, Option 002; Troubleshooting

Component or Circuit	Test Conditions and Control Settings	Normal Indication	If Indication is Abnormal
SUMMING AMPLIFIER (A26A4)	Initial conditions and settings. Set AGC switch, S1, to AGC off position.	$\approx 800 \text{ mV}_{\text{p-p}}$ sine wave (1 kHz) at TP6 (CQ1).	Check Q1, Q2, Q3 and associated circuitry.
MODULATOR DRIVER AMPLIFIER (A26A4)	Initial conditions and settings. Set AGC switch, S1, to AGC off position.	$\approx 2 \text{ V}_{\text{p-p}}$ sine wave (1 kHz) at TP7 (DRVR). $\approx 8 \text{ V}_{\text{p-p}}$ sine wave (1 kHz) at TP8 (MOD).	Check Q4 and associated circuitry. Check Q5, Q6, Q7 and associated circuitry.
	Set RANGE to 4–8 MHz (LO BAND 2).	$\approx 7.2 \text{ V}_{\text{p-p}}$ sine wave (1 kHz) at TP8 (MOD).	Check U3A, U3D, U4B, U4D and associated circuitry.
	Set RANGE to 1–2 MHz (LO BAND 1).	$\approx 6 \text{ V}_{\text{p-p}}$ sine wave (1 kHz) at TP8 (MOD).	Check U3B, U3C, U4E, U4F and associated circuitry.
MODULATOR PREAMPLIFIER (A26U2)	Initial conditions and settings (AGC switch, A26A4S1, set to AGC on position).	$> -5 \text{ dBm}$ ( $> 125 \text{ mV}_{\text{rms}}$ into $50\Omega$ ) at AUX RF OUTPUT jack on rear panel.	Check A26U2 and associated circuitry.
METER AMPLIFIER (A26A4)	Initial conditions and settings.	Panel meter indicates $+10 \text{ dBm}$ (707 mV).	Check U1A and associated circuitry.
MODULATION OVERLOAD DETECTOR (A26A4)	Initial conditions and settings.	REDUCE PEAK POWER annunciator unlighted.	Check U2, Q8, Q9 and associated circuitry.
	Set OUTPUT LEVEL switch one step cw.	REDUCE PEAK POWER annunciator lighted.  <b>NOTE</b> <i>Annunciator should be off at +19 dBm RF output and on at +20 dBm output.</i>	
PULSE OVERLOAD DETECTOR (A26A4)	Initial conditions and settings except set AM to OFF.  <div style="border: 1px dashed black; padding: 2px; display: inline-block; text-align: center;">CAUTION</div>  <i>Check that the OUTPUT LEVEL switch is set one step ccw from full cw.</i>	$\approx +9\text{V}$ at TP3 (OVLN).	Check U1B and associated circuitry.
	Short TP5 (GND) to TP4 (VERN).	$\approx 0 \text{ V}_{\text{dc}}$ at TP3 (OVLN).	

## SERVICE SHEET 8C

### DESCRIPTION

- AGC Amplifier and Amplitude Modulator (Option 004)

### PRINCIPLES OF OPERATION

#### General

The A26A3 Modulator Assembly contains a current controlled attenuator which varies the RF output level. The A26A4 AGC Amplifier controls the drive to the modulator. Attenuation is determined by the OUTPUT LEVEL vernier and by the AM input signal when the AM switch is on, or by the pulse input signal when AM is set to PULSE.

#### Modulator (A26A3)

The RF signal from the binary dividers is amplified by Modulator Preamplifier A26U2. The amplifier is a sealed microcircuit. The amplifier drives the AUX RF OUTPUT jack through resistor R1 and also drives the modulator diodes. Diodes CR1 through CR8 form a balanced resistive network in which the resistance is controlled by the current biasing them. Capacitors C3 through C6 improve the modulator balance at high frequencies. The control current comes from the AGC output amplifier through choke L2 and then splits between R4, CR1 to CR4, and R3, or R5, CR5 to CR8, and R2. The RF signal is coupled into the modulator through T1 and out through T2. The modulator output drives the RF filters (Service Sheet 6).

#### AGC Amplifier (A26A4)

The AGC Amplifier sums the negative detector output from the A26A1 Detector Buffer Amplifier (Service Sheet 9A) with the positive AGC reference voltage from the OUTPUT LEVEL vernier A1R1 (Service Sheet 12B). The input to the vernier is a 2 Vdc signal ( $\pm 2$  Vpk for 100% AM). When AM is set to PULSE, the amplifier's output (and therefore, the modulator) is switched on and off by the input pulses.

#### Summing Amplifier (A26A4)

Transistors Q1, Q2, and Q3 form a Summing Amplifier. The output of Q3 is the amplified sum of the detector and reference currents and represents the output level error. Resistor R1 is adjusted to give the correct RF output voltage corresponding to the AGC reference. Switch S1 allows the AGC circuits to be tested in an open-loop condition.

#### Modulator Driver Amplifier (A26A4)

Transistors Q4, Q5, and Q6 form the high-gain Modulator Driver Amplifier. R56, R57, R32, C18, and C9 frequency-compensate the AGC system. Capacitor C10 is switched in parallel with C9 in the 0.5-1 and 1-2 MHz ranges (called LO BAND 1) to give added compensation. The LO BAND 1 line is grounded in LO BAND 1 ranges and causes inverter U3B to go high and inverter U4F (an open collector output gate) to go low which switches in C10. In a similar manner capacitor C11 is switched in parallel with C9 in the 2-4 and 4-8 MHz ranges (called LO BAND 2). In a similar manner resistor R55 is switched in parallel with C18 and R57 to attenuate the signal in the pulse modulation mode of operation. Transistor Q5 is a current source. Transistor Q6 is a constant current sink. The difference between the collector currents of Q5 and Q6 is the modulator drive current.

In the pulse modulation mode of operation, Q5 is switched on and off at the pulse repetition rate by transistor switch Q7 which is driven by the pulse Schmitt Trigger output of A26A2 (Service Sheet 9A). When A7 is on, Q5 and the modulator are off (i.e., when either the MOD PULSE line is low or

when the RF OFF line is low). Hot carrier diodes CR13 and CR14 prevent saturation of Q7 and Q6 for rapid switching. Capacitor C15 is switched in across the modulator drive line by gates U3C and U4E to lower the rise and fall time of the modulator in LO BAND 1 ranges to reduce RF ringing in the filters following the modulator. Similarly, capacitor C16 is switched in for LO BAND 2 ranges.

### **Pulse Overload Detector (A26A4)**

In the pulse modulation mode, the peak detector in A26U1 (Service Sheet 9A) samples the RF output only when an input pulse is present; when no pulse is present, the detector output is stored on a capacitor. If the OUTPUT LEVEL vernier is reduced while in the pulse mode, the error voltage of the summing amplifier becomes very large and the modulator is turned off. The detector storage capacitor then discharges only during each pulse on period until the error is zero. At low repetition rates and short on-periods, the capacitor discharge time is very long. To correct for this, Pulse Overload Detector U1B senses the condition of large error (i.e., when the collector voltage of Q3 exceeds +0.4 Vdc) and switches a discharge resistor on to bring the system to a near zero error condition.

### **Meter Amplifier**

Amplifier U1A is an inverting amplifier with a gain of about (adjusted by R12) which scales the detector output voltage to drive the metering circuits. Capacitor C8 filters any superimposed modulation signal on the detector output.

### **Modulator Overload Detector**

If the OUTPUT LEVEL vernier setting or input modulation signal requires the output to exceed its maximum capability, Modulator Overload Detector U2 senses the condition and lights the REDUCE PEAK POWER annunciator A6DS3 (Service Sheet 12B). The reference voltage is set by resistors R29, R30, and R31. When the output from the OUTPUT LEVEL vernier exceeds the reference, the output of U2 goes high and turns on Q9 and the annunciator. Since the overload condition may be of short duration, capacitor C13 holds the output of U2 high to keep the annunciator lighted for a longer period.

## TROUBLESHOOTING

It is assumed that a problem has been isolated to the AGC amplifier or the modulator as a result of using the troubleshooting block diagrams. Troubleshoot by using the test equipment listed below, performing the initial test conditions and control settings, and following the procedures outlined in the table.

### Test Equipment

Digital Voltmeter .....	HP 3490A
Oscilloscope .....	HP 180C/1801A/1820C

### Initial Test Conditions

To test A26A4 AGC Amplifier Assembly, remove top cover (refer to *Assembly/Disassembly Instructions, Service Sheet G*), remove A26 AM/AGC and RF Amplifier Assembly casting top cover, and remove A26A4 and extend for service (refer to *Service Sheet F*).

To test A26A3 Modulator Assembly and A26U2 Modulator Preamplifier, remove bottom cover and remove A26 casting bottom cover.

### Initial Control Settings

COUNTER MODE:	
EXPAND .....	Off
LOCK .....	Off
Source .....	INT
Meter Function .....	LEVEL
AM .....	INT
MODULATION .....	100%
MODULATION FREQUENCY .....	1 kHz
FM .....	OFF
RANGE .....	8-16 MHz
FREQUENCY TUNE .....	7.20 MHz
OUTPUT LEVEL Switches .....	10 dBm (+10, 0)
OUTPUT LEVEL Vernier .....	CAL
RF ON/OFF .....	ON



Table 8B-13. AGC Amplifier and Amplitude Modulator Troubleshooting (Option 004)

Component or Circuit	Test Conditions and Control Settings	Normal Indication	If Indication is Abnormal
SUMMING AMPLIFIER (A26A4)	Initial conditions and settings. Set AGC switch, S1, to AGC off position.	$\approx 1.2 V_{pp}$ sine wave (1 kHz) at TP6 (CQ3)	Check Q1, Q2, Q3 and associated circuitry
MODULATOR DRIVER AMPLIFIER (A26A4)	Initial conditions and settings. Set AGC switch, S1, to AGC off position.	$\approx 4.8 V_{pp}$ modified square wave (1 kHz) at TP7 (DRVR) $\approx 16 V_{pp}$ modified square wave (1 kHz) at TP8 (MOD)	Check Q4, U4A, U4C, and associated circuitry Check Q5, Q6, Q7 and associated circuitry
	Set RANGE to 4-8 MHz (LO BAND 2)	$\approx 16 V_{pp}$ modified square wave (1 kHz) at TP8 (MOD)	Check U3A, U3D, U4B, U4D, and associated circuitry
	Set RANGE to 1-2 MHz (LO BAND 1)	$\approx 16 V_{pp}$ modified square wave (1 kHz) at TP8 (MOD)	Check U3B, U3C, U4E, U4F and associated circuitry
MODULATOR PREAMPLIFIER (A26U2)	Initial conditions and settings (AGC switch, A26A4S1, set to AGC on position)	$> -5$ dBm ( $>125$ mVrms into $50\Omega$ ) at AUX RF OUTPUT jack on rear panel	Check A26U2 and associated circuitry
METER AMPLIFIER (A26A4)	Initial conditions and settings	Panel meter indicates +10 dBm (707 mV)	Check U1A and associated circuitry
MODULATION OVERLOAD DETECTOR (A26A4)	Initial conditions and settings except set OUTPUT LEVEL switches to +16 dBm	REDUCE PEAK POWER annunciator unlighted	Check U2, Q9 and associated circuitry
	Set MODULATION fully cw	REDUCE PEAK POWER annunciator lighted	
PULSE OVERLOAD DETECTOR (A26A4)	Initial conditions and settings except set AM to OFF  <div style="border: 1px dashed black; padding: 5px; text-align: center;"><b>CAUTION</b></div> <i>Check that the OUTPUT LEVEL 10 dB switch is set one step cw from full cw.</i>	$\approx +9V$ at TP3 (OVLD)	Check U1B and associated circuitry
	Short TP5 (GND) to TP4 (VERN)	$\approx 0$ Vdc at TP3 (OVLD)	

## SERVICE SHEET 9A

### DESCRIPTION

- RF Amplifier, Pulse Switching, and Step Attenuators (Standard)

### PRINCIPLES OF OPERATION

#### General

This Service Sheet documents instruments without the internal doubler (Option 002). The RF signal from the RF Filters is amplified by RF Output Amplifier A26U1. The amplifier, a sealed microcircuit, drives the Output Attenuator. The step attenuator consists of resistive attenuator sections which are switched in and out by cam driven microswitches. The attenuator steps are 10 dB.

#### AGC Detector (A26U1)

The AGC detector CR1 detects the negative peaks of the RF signal from the Output Amplifier. The detector output is summed with the positive AGC reference voltage in the Summing Amplifier (Service Sheet 8A). Detector diode CR1 conducts whenever the RF amplifier output is one diode junction voltage drop below the voltage across C3. The capacitor is then negatively charged until the amplifier voltage rises, at which time CR1 shuts off. C3 then slowly discharges through resistors A26A1R22 and R23 until another negative peak recharges it.

#### AM Bandwidth Control (A26A1)

In the 2-4 and 4-8 MHz (or LO BAND 2) frequency ranges, capacitor C5 is switched in parallel with A26U1C3 by Q7. Transistor Q7 is a switch which operates in the inverted mode (i.e., the emitter functions as a collector and the collector as an emitter). The added capacitance of C5 reduces the amount of capacitor discharge between RF voltage peaks on the lower frequency ranges, but limits the AM bandwidth. Capacitor C4 is also switched in for 0.5-1 and 1-2 MHz (or LO BAND 1) ranges by Q6.

In the pulse modulation mode Q5, Q8, and Q9 are switched on. This switches out C4 and C5 and switches C6 in. Switching of Q5-Q9 is multiplexed onto one line by transistors A26A2Q8 and Q9. A26A2Q8 is a switchable current source. In LOW BAND 2 it generates just enough current to turn on the collector-base junction of Q7. In LOW BAND 1 the current increases enough to turn on both Q6 and Q7 (because the voltage drop across R4 is enough to turn on zener diode VR2). When the PULSE CODE line is low, A26A2Q9 is on which turns on Q5, Q8 and Q9 through zener diode VR1.

#### Sample and Hold (A26A1)

The Schmitt Trigger (A26A2) and Q4 bias FET Q3 (normally biased on) off between pulses, which prevents C6 from discharging. (If C6 were to discharge between pulse bursts, the Modulator would be driven to maximum output when the next pulse arrived.)

#### Schmitt Trigger (A26A2)

The Schmitt Trigger formed by U1 and U2A converts the pulse input voltage into TTL pulses. When the PULSE CODE line is low, the Schmitt Trigger output is enabled at U2C. Resistors R20 and R21 set the trigger reference at about  $0.5 V_{dc}$ . When the input to U1 is above the reference, the output of U2A is low. When the input goes below the reference, the output of U2A goes high (+5V). Resistor R23 adds a small amount of hysteresis to the reference voltage.

In the pulse modulation mode, NAND gate U2C inverts the trigger output and switches transistors A26A1Q4 and Q3 on when the input pulse is high, or off when the input pulse is low. Thus the charge on capacitor A26A1C6 is stored between pulses. Similarly, NAND gate U2D inverts the trigger output and switches the Modulator Driver Amplifier A26A4 (Service Sheet 8A).

### Detector Buffer Amplifier (A26A1)

Transistor Q1 and FET Q2 form a high impedance, unity gain buffer amplifier. Diode CR6 and resistor R19 add a dc offset which compensates for the junction voltage drop of the detector diode to maintain constant LEVEL vernier is varied.

### Rate Detector (A26A2)

Flip-flops U3A and U3B form a rate detector to turn off the RF level drive to the meter circuits whenever the pulse repetition rate falls below 20 Hz. Below 20 Hz rates, the output leveling system cannot accurately control the output amplitude. The flip-flops are arranged as retriggerable monostable (one-shot) multivibrators with timing elements R25 and C10, and R28 and C11. A low-going output from U2A triggers U3A and the Q output of U3A goes low for 50 ms. If the repetition rate of the incoming pulses is higher than 20 Hz, U3A retriggers and the Q output remains low. In the absence of pulses from the Q output of U3A, the Q output of U3B is low, transistor Q7 is off, and the meter operates normally. For pulse repetition rates less than 20 Hz, U3B is periodically triggered by the Q output of U3A. The Q output of U3B goes high for 100 ms (or longer if U3B is retriggered by U3A) and turns on Q7 which disables the meter drive amplifier output, and the meter reads zero. Thus the meter is turned off for low rate pulses. When not in the pulse modulation mode, the output of inverter U2B is low; the output of U2C is high and A26A1Q4 and Q3 are held on; the output of U2D is high and the modulator is held in its normal on mode; and Q7 is held off.

## TROUBLESHOOTING

It is assumed that a problem has been isolated to the power amplifier and AGC detector or to the AM offset and pulse switching circuits as a result of using the troubleshooting block diagrams. Troubleshoot by using the test equipment listed below, performing the initial test conditions and control settings, and following the procedures outlined in the table.

### Test Equipment

Digital Voltmeter .....	HP 3455A
Oscilloscope .....	HP 1740A
Pulse Generator .....	HP 8011A
Power Meter .....	HP 435A Power
Sensor .....	HP 8482A

### Initial Test Conditions

To test A26A2 AM Offset and Pulse Switching Assembly, remove top cover (refer to *Assembly/Disassembly Instructions, Service Sheet G*) and remove A26A2 and extend for service (refer to *Service Sheet F*).

To test A26U1 Output Amplifier and A26A1 AGC Detector Assembly, remove bottom cover and remove A26 casting bottom cover.

Connect the pulse generator to AM INPUT. Set the pulse generator for a repetition rate of 20 Hz, a pulse width of 25 ms, and an amplitude of 1V.

### Initial Control Settings

COUNTER MODE:	
EXPAND .....	Off
LOCK .....	Off
Source .....	INT
Meter Function .....	LEVEL
AM .....	OFF
MODULATION .....	Fully cw
MODULATION FREQUENCY .....	1 kHz
FM .....	OFF
RANGE .....	8-16 MHz
FREQUENCY TUNE .....	7.20 MHz
OUTPUT LEVEL .....	+19 dBm
RF ON/OFF .....	ON

**NOTE**

*If pulse burst amplitude is too high for low-duty cycle pulses, check A26A1Q3, Q2, C6, and interconnecting lines for dc current leakage.*

*Table 8B-14. RF Amplifier, Pulse Switching and Step Attenuator (Standard) Troubleshooting*

Component or Circuit	Test Conditions and Control Settings	Normal Indication	If Indication is Abnormal
OUTPUT AMPLIFIER (A26U1)	Initial conditions and settings (+19 dBm output). Connect power meter and sensor to RF OUTPUT.	+19 dBm at RF OUTPUT.	Check A26U1 and associated circuitry.
	Set AGC switch (A26A4S1) to AGC off. Adjust OUTPUT LEVEL vernier for +13 dBm at RF OUTPUT.	$\approx -2 V_{dc}$ at TP2 (A26A1Q2-G1).	
DETECTOR BUFFER AMPLIFIER (A26A1)	As above.	$\approx -3 V_{dc}$ at TP1 (DET).	Check Q1, Q2, and associated circuitry.
SCHMITT TRIGGER (A26A2)	Initial conditions and settings except set AM to PULSE (AGC switch, A26A4S1, set to AGC on position).	$\approx 5V$ pulse at TP6 (MOD PUL) and $\approx 4V$ pulse at TP5 (DET PUL).	Check A26A2U1, U2, and associated circuitry.
RATE DETECTOR (A26A2)	Initial conditions and settings except set AM to PULSE.	Panel meter reads normal (+19 dBm).	Check A26A2U3, Q7, and associated circuitry.
	Set pulse generator pulse repetition rate to 15 Hz.	Panel meter reads approximately zero.	
BW CONTROL (A26A2)	Initial conditions and settings.	$< +1V$ at TP8 (BW).	Check A26A2Q8, Q9, and associated circuitry.
	Set RANGE to 4-8 MHz.	$\approx +5V$ at TP8 (BW).	
	Set RANGE to 1-2 MHz.	$\approx +12V$ at TP8 (BW).	
	Set AM to PULSE.	$\approx +19V$ at TP8 (BW).	
BW CONTROL (A26A1)	Initial conditions and settings except set AM to INT.	Same signal level on both sides of C4 and C5.	—————
	Set RANGE to 4-8 MHz.	Signal level differs from C5 (i.e., no signal at Q7-e).	Check C5, Q7, Q9 and associated circuitry.
	Set RANGE to 1-2 MHz.	Signal level differs across C4 (i.e., no signal at Q6-e).	Check C4, Q6, Q8, VR2 and associated circuitry.
	Set AM to PULSE.	Signal level differs across C6 (i.e., no signal at Q5-e).	Check Q5-9, VR1, and associated circuitry.

## SERVICE SHEET 9B

### DESCRIPTION

- Output Amplifier, Doubler, and AGC Detector (Option 002)

### PRINCIPLES OF OPERATION

#### General

This Service Sheet documents instruments with the internal doubler (Option 002). The RF Signal from the RF Filters is amplified by Output Amplifier A26U1. The amplifier is a sealed microcircuit; it drives either the Output Attenuator via A26A1W1 and FL1, or the doubler circuits when the generator RANGE switch is set to 512-1024 MHz. FL1 prevents harmonics above 1120 MHz, which would not otherwise be effectively attenuated, from reaching the Output Attenuator. The step attenuator consists of resistive attenuator sections which are switched in and out by cam driven microswitches. The attenuator steps are 10 dB.

#### Passive Doubler (A26A1)

When the generator RANGE switch is set to 512-1024 MHz, relays K1 and K2 are energized. K1A switches the RF signal from the Output Amplifier to the doubler circuits. T1 matches the unbalanced signal path from the Output Amplifier to the balanced input of the bridge rectifier. Diodes CR1 to CR4 form the full wave rectifier which doubles the frequency of the input signal.

#### Doubler Amplifier (A26A1)

Transistors Q1 and Q2 amplify the RF signal approximately 10 dB (to restore signal amplitude lost in the Passive Doubler). Q3 provides active current bias to Q1. When the collector voltage of Q1 varies it is sensed at the emitter of Q3, causing the current through Q3 to vary. This changes the base current through Q1 to return Q1 to its original conducting state. Q4 controls the bias of Q2 in the same manner. Capacitor C9 functions with inductor L5 to adjust the flatness of the amplifier over the doubler frequency range. K2 switches the output of the doubler amplifier to the Output Attenuator. Diode CR5, capacitors C13, C20, and C21, and resistor R9 function as the AGC negative peak detector for the doubler range.

#### AGC Detector (A26A1)

In all ranges except 512-1024 MHz, the AGC detector A26U1CR1 detects the negative peaks of the RF signal from the Output Amplifier. The detector output is summed with the positive AGC reference voltage in the Summing Amplifier (Service Sheet 8B). Detector diode A26U1CR1 conducts whenever the RF amplifier output is one diode junction voltage drop below the voltage across A26U1C3. The capacitor is then negatively charged until the amplifier voltage rises, at which time A26U1CR1 shuts off. A26U1C3 then slowly discharges through resistors R12 and R13 until another negative peak recharges it. In the 512-1024 MHz range, K1B switches out A26U1CR1 and switches CR5 in. CR5, C13, C20, and C21 then function as the AGC detector in the same manner as described above.

### **Bandwidth Control (A26A1)**

In the 2-4 and 4-8 MHz (or LO BAND 2) frequency ranges, capacitor C16 is switched in parallel with A26U1C3 by Q8. Transistor Q8 is a switch which operates in the inverted mode (i.e., the emitter functions as a collector and the collector as an emitter). The added capacitance of C16 reduces the amount of capacitor discharge between RF voltage peaks on the lower frequency ranges but limits the AM bandwidth. Capacitor C15 is also switched in for the 0.5-1 and 1-2 MHz (or LO BAND 1) ranges by Q6.

In the pulse modulation mode Q5, Q7, and Q11 are switched on. This switches out C15 and C16 and switches C17 in. Switching of Q5-Q8 and Q11 is multiplexed onto one line by the BW control circuit (A26A2). BW Control is a switchable current source (see Service Sheet 9A for details). In LOW BAND 2 it generates just enough current to turn on the collector-base junction of Q8. In LOW BAND 1 the current increases enough to turn on both Q6 and Q8 (because the voltage drop across R18 is enough to turn on zener diode VR2). When the PULSE CODE line is low, the BW Control turns on Q5, Q7 and Q11.

### **Sample and Hold (A26A1)**

The Schmitt Trigger (A26A2) and Q9 bias FET Q10 (normally biased on) off between pulses, which prevents C17 from discharging. (If C17 were to discharge between pulse bursts, the Modulator would be driven to maximum output when the next pulse arrived.)

When the PULSE CODE line is low, the Schmitt Trigger is enabled (see Service Sheet 8A for details). The Schmitt Trigger converts the pulse input voltage to TTL pulses. In the pulse modulation mode the Schmitt Trigger switches transistors Q9 and Q10 on when the input pulse is high, or off when the input pulse is low. Thus the charge on capacitor C17 is stored between pulses.

### **Detector Buffer Amplifier (A26A1)**

Transistor Q13 and FET Q12 form a high impedance, unity gain buffer amplifier. Diode CR12 and resistor R34 add a dc offset which compensates for the function voltage drop of the detector diode to maintain constant when OUTPUT LEVEL vernier is varied.

## TROUBLESHOOTING

It is assumed that a problem has been isolated to the output amplifier, doubler, and AGC detector circuits as a result of using the troubleshooting block diagrams. Troubleshoot by using the test equipment listed below, performing the initial test conditions and control settings, and following the procedures outlined in the table.

### Test Equipment

Digital Voltmeter .....	HP 3455A
Oscilloscope .....	HP 1740A
Pulse Generator .....	HP 8011A
Power Meter .....	HP 435A
Power Sensor .....	HP 8482A
Spectrum Analyzer .....	HP 8554B/8553B/141T

### Initial Test Conditions

To test A26U1 Output Amplifier and A26A1 AGC Detector Assembly, remove bottom cover (refer to *Assembly/Disassembly Instructions, Service Sheet G*) and remove A26 casting bottom cover (refer to *Service Sheet F*).

Connect the pulse generator to AM INPUT. Set the pulse generator for a repetition rate of 20 Hz, a pulse width of 25 ms, and an amplitude of 1V.

Spectrum analyzer waveforms shown in the table are typical for frequencies (F) within the doubler range. (F is shown at 800 MHz). Level F should be as displayed,  $\pm 3$  dB. Level 1/2F should be >20 dB below F. Set spectrum analyzer frequency span per division (scan width) to 200 MHz, 10 dB per division with a 0 dBm reference level.

### NOTE

*When taking readings within the doubler amplifier use a cable assembly, blocking capacitor, voltage divider, and ground clip (such as those suggested in Table 1-3 and shown in Figure 8B-3). This will produce a measureable signal without loading the circuit excessively.*

### Initial Control Settings

COUNTER MODE:	
EXPAND .....	Off
LOCK .....	Off
Source .....	INT
Meter Function .....	LEVEL
AM .....	OFF
MODULATION .....	Fully cw
MODULATION FREQUENCY .....	1 kHz
FM .....	OFF
RANGE .....	8-16 MHz
FREQUENCY TUNE .....	7.20 MHz
OUTPUT LEVEL .....	+13 dBm
RF ON/OFF .....	ON

### NOTE

*If pulse burst amplitude is too high for low-duty cycle pulses, check A26A1Q12, Q10, C17, and interconnecting lines for dc current leakage.*



Table 8B-15. AGC Detector and Pulse Switching (Option 002) Troubleshooting

Component or Circuit	Test Conditions and Control Settings	Normal Indication	If Indication is Abnormal
OUTPUT AMPLIFIER (A26U1)	Initial conditions and settings (+13 dBm output). Connect power meter and sensor to RF OUTPUT. Set AGC switch (A26A4S1) to AGC off. Adjust OUTPUT LEVEL vernier for +10 dBm at RF OUTPUT.	+13 dBm at RF OUTPUT $\approx -3 V_{dc}$ at TP2 (A26A1Q12-G1)	Check A26U1, A26A1Q10 and associated circuitry
DETECTOR BUFFER AMPLIFIER (A26A1)	As above	$\approx -3 V_{dc}$ at TP1 (DET)	Check Q12, Q13 and associated circuitry
BW CONTROL (A26A1)	Initial conditions and settings except set AM to INT	Same signal level on both sides of C15 and C16	_____
	Set RANGE to 4-8 MHz	Signal level differs across C16 (i.e., no signal at Q8-e)	Check C16, Q7, Q8 and associated circuitry
	Set RANGE to 1-2 MHz	Signal level differs across C15 (i.e., no signal at Q6-e)	Check C15, Q5, Q6, VR2 and associated circuitry
	Set AM to PULSE	Signal level differs across C17 (i.e., no signal at Q11-e)	Check Q5-8, Q11, VR1, and associated circuitry

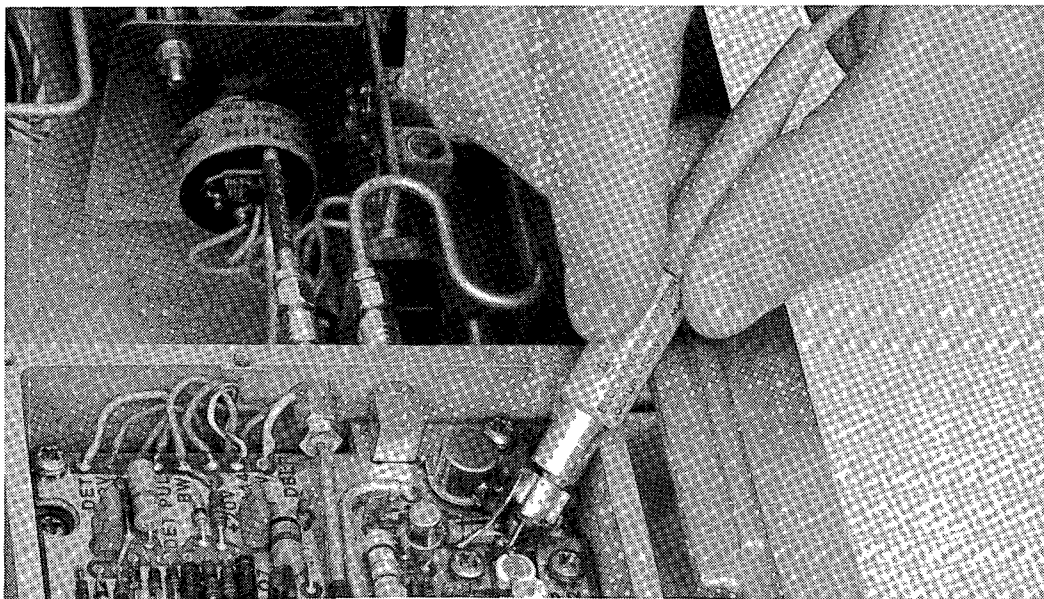
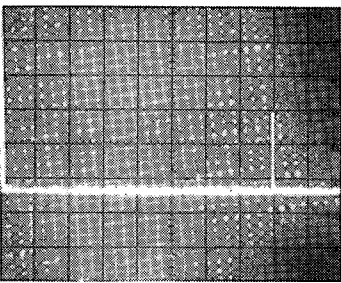
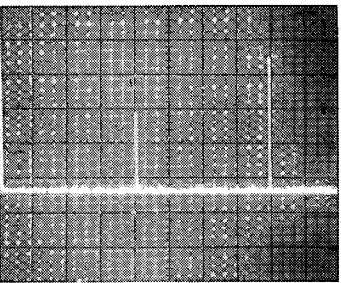
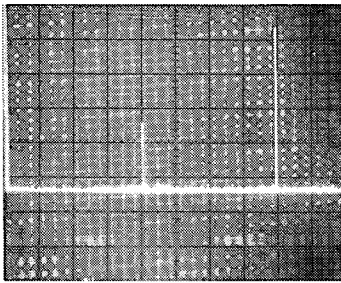


Figure 8B-3. Troubleshooting Probe for use within Doubler Amplifier (Option 002)

Table 8B-16. Doubler Amplifier (Option 002) Troubleshooting

Component or Circuit	Test Conditions and Control Settings	Normal Indication	If Indication is Abnormal
DOUBLER AMPLIFIER (A26A1)	Initial conditions and settings except set RANGE to 512-1024 MHz, FREQUENCY TUNE to 800 MHz, and OUTPUT LEVEL to -7 dBm. Test probe at Q1-b.		Check passive doubler Q1, and associated circuitry
	Same as above except test probe at Q1-c.		Check Q1 and associated circuitry
	Same as above except test probe at Q2-c.		Check Q2 and associated circuitry

## SERVICE SHEET 9C

### DESCRIPTION

- Reverse Power Protection (Option 003)

### PRINCIPLES OF OPERATION

#### General

This Service Sheet documents instruments with reverse power protection (Option 003). The Reverse Power Protection circuit opens a relay contact in the RF signal path if excessive power is applied to the output jack A21J2 to prevent damage to the generator's output circuits. During the time required to open the relay ( $\approx 50\mu\text{s}$ ), the Limiter maintains a safe signal level at the output circuits of the generator. (With LINE switch set to OFF, the relay contacts are open.)

#### Detector (A21A1)

The Detector is a peak-to-peak detector which senses the RF level. The signal is first reduced by a capacitive voltage divider to protect the detector against large RF levels. It is formed by C10 and the parallel capacitances of C8, CR4, and CR2 with VR2. During negative excursions of the RF signal, current flows through CR4 and charges C10 to approximately  $V_{pk}/8$ . During positive excursions, the stored charge adds to the signal passed by C10 and passes through detector diode CR2. The detected output is stored in the parasitic capacitance of VR2. VR2 also protects the comparator by limiting the maximum signal applied to the comparator.

#### Level Sensor and Relay Driver (A21A1)

Normally, the RF output signal passes through relay K1 to the output jack A21J2. K1 is held closed by the action of the Detector, Level Sensor, and Relay Driver. Resistors R1 and R2 set a reference level at the non-inverting input of comparator U1. This reference level is more positive than the normal Detector voltage, so the comparator output is pulled high through resistor R7 (U1 is an open-collector output device requiring an external pull-up resistor). The high level on the base of transistor Q1 biases Q1 and Q2 on, thus energizing relay K1 (closed).

An increased signal level at A21J2 will cause an increased Detector output level. If the level from the Detector exceeds the reference level, the comparator output will switch low. (Resistor R4 provides hysteresis to the comparator input to prevent oscillations and ensure positive switching.) A low level on the base of Q1 will bias Q1 and Q2 off. Relay K1 will de-energize (open) when the collector current of Q2 stops flowing. Collector voltage of Q2 will approach source potential to drive transistor Q3 into conduction and supply approximately +4V at 50 mA to FL2. When the relay opens, capacitor C11 provides a discharge path for the current induced in the relay coil.

When reverse power is removed, the Detector voltage drops below the reference level. The comparator output starts rising toward its high state to close the relay. Capacitor C4 slows the rate of change to decrease relay contact chatter if the reverse power signal is pulsed.

#### Limiter (A21A1)

The limiter clips any RF voltage imposed on it (from any direction) at approximately 21.2V peak-to-peak as described below.

Assume a reverse power signal entering from RF Output. During the first incoming RF cycle, CR3 clips off any negative signal voltage lower than one diode junction drop. During the following half cycle, capacitors C2 and C6 store a charge that positively offsets the cathode of CR3. This has the effect of re-referencing the subsequent RF signal at CR3 so that its peak negative voltage occurs just

one diode junction drop below ground. For example, a  $5V_{p-p}$  signal at J2 has excursions of  $\pm 2.5 V_p$ . The re-referenced signal at CR3 will have a positive excursion of  $+4.4V$  and a negative excursion of  $-0.6V$ . During the second RF cycle, the anode of CR1 acquires a similar but negative offset. A re-referenced  $5V_{p-p}$  signal at CR1 will have a positive excursion of  $+0.6V$  and a negative excursion of  $-4.4V$ . Once these offsets are established, the sum of the re-referenced in-phase RF signals across VR1 and VR3 is a dc voltage equal to the peak-to-peak RF voltage minus the two diode junction drops of CR1 and CR3. For the  $5V_{p-p}$  signal, this voltage from CR1 anode to CR3 cathode, would be approximately  $+3.8 V_{dc}$ , insufficient to cause the zeners to conduct. When this dc voltage exceeds the sum of the breakdown voltages of VR1 and VR2, the limiter symmetrically clips the RF waveform. This occurs at RF inputs greater than  $21.2 V_{p-p}$ . Note that the limiter acts on RF from either direction, the generator or reverse power.

Capacitors C8, C9, and C10, inductors L1 and L2, and the parasitic capacitances of CR1 and CR3 form a low-pass filter to maintain level flatness of the output signal over the range of the generator. Capacitors C3, C5, and C7, and resistors R5, R8, and R9 prevent RF from entering the Relay Driver.

- **Reverse Power Protection (Option 003)**

## TROUBLESHOOTING

Troubleshoot the A21 assembly by using the test equipment and following the procedure listed below.

### Test Equipment

Digital Voltmeter .....	HP 3455A
Oscilloscope .....	HP 1740A
Test Oscillator .....	HP 3320B
50-Ohm Load .....	HP 11593A

### Limiter

1. With **LINE** set to **OFF**, connect test oscillator output to **RF IN (FROM ATTEN)**, A21J1, through a coaxial tee. Connect other port of the tee to an oscilloscope.
2. Set test oscillator to 600 kHz with amplitude turned down. Set oscilloscope to display a 600 kHz signal with 10V per vertical division.
3. Increase test oscillator output level until clipping of the signal appears on oscilloscope. Amplitude of the clipped waveform should be 19 to 23  $V_{p-p}$ .

### Detector

1. With **LINE** set to **OFF**, disconnect output cable W11 and connect 50 ohm load to **RF OUT (TO FRONT PANEL)**, A21J2.
2. Orient the Reverse Power Protection Assembly so that comparator A21U1 is accessible.
3. Set **OUTPUT LEVEL** to +19 dBm (not on 512-1024 MHz range, Option 002/003) and **LINE** to **ON**.
4. Observe dc voltage at pin 3 of A21U1 while adjusting **OUTPUT LEVEL** over full vernier ranges. The voltage should vary from approximately 50 to 250  $mV_{dc}$ .

### Level Sensor, Relay Driver, and Indicator Driver

1. Short pin 2 of comparator A21U1 to ground. The Level Sensor, Relay Driver, and Indicator Driver circuits should switch to "relay-open" conditions (see appropriate dc voltages on schematic).

## SERVICE SHEET 10

### DESCRIPTION

- AM Preamplifiers

### Principles of Operation

#### AM Offset (A26A2)

The AM Offset Amplifier establishes the AGC reference for the output leveling system and superimposes the AM modulation signal on this reference. The modulation signal is coupled into the amplifier through slide switch A13S2C and MODULATION potentiometer R2. The amplifier input stage is the differential transistor pair Q1A and Q1B. Transistor Q2 is a constant current source for the emitters of Q1. Transistors Q3 and Q4 form a second differential amplifier stage. Transistor Q5 is a common emitter output stage. Resistors R16, R19, and R8 form a resistive feedback divider. The ac voltage gain ( $\approx +2$ ) is adjusted by R19. Transistor Q6 is a constant source. The collector current of Q6 causes a 2V drop across R16 which offsets the amplifier output by  $+2 V_{dc}$  and establishes the AGC reference. Capacitors C5, C6, and C7 frequency compensate the amplifier. The amplifier output drives OUTPUT LEVEL vernier A1R1 (Service Sheet 16A).

### Troubleshooting

It is assumed that a problem has been isolated to the AM preamplifier as a result of using the troubleshooting block diagrams. Troubleshoot by using the test equipment listed below, performing the initial test conditions and control settings, and following the procedures outlined in the table.

#### Test Equipment

Digital Voltmeter ..... HP 3455A  
 Oscilloscope ..... HP 1740A

#### Initial Test Conditions

Top cover removed (refer to *Assembly/Disassembly Instructions, Service Sheet G*), and A26A2 AM Offset and Pulse Switching Assembly extended for service (refer to *Service Sheet F*).

#### Initial Control Settings

Meter Function ..... AM  
 AM ..... INT  
 MODULATION ..... 100%  
 MODULATION FREQUENCY ..... 1 kHz

*Table 8B-17. AM Preamplifier Troubleshooting*

Component or Circuit	Test Conditions and Control Settings	Normal Indication	If Indication is Abnormal
AM PREAMPLIFIER (A26A2)	Initial conditions and settings	$\approx 2 V_{p-p}$ at TP1 (AM IN)	Check input switching
		$\approx 4 V_{p-p}$ and $+2 V_{dc}$ at TP3 (AM OUT)	Check Q1-Q6 and associated circuitry

## SERVICE SHEET 11A

### DESCRIPTION

- AM Interconnections and RF On/Off Switch

### PRINCIPLES OF OPERATION

#### RF On/Off Switch

The RF ON/OFF switch S2 may be wired to turn both RF Oscillator and Modulator off, or to turn only the Modulator off. The RF ON/OFF function may easily be changed to either configuration by following the instructions on Service Sheet 1.

### TROUBLESHOOTING

Troubleshoot by checking switches and connectors for proper contact.



## SERVICE SHEET 11B

### DESCRIPTION

- AM Interconnections and RF On/Off Switch (Option 004)

### PRINCIPLES OF OPERATION

#### RF On/Off Switch

The RF On/Off switch S2 may be wired to turn both RF Oscillator and Modulator off. The RF On/Off function may easily be changed to either configuration by following the instructions on Service Sheet 1.

#### Demodulation Amplifier (A26A8)

Buffer Amplifier U1 is internally connected as a voltage follower. The output of U1 drives the Scaling Amplifier U2, which is connected in an inverting configuration. With S1 in the AC position R8 and R9 form the feedback path and set the gain of the amplifier (such that 100% AM produces 5Vrms at DEMOD OUTPUT). R15 provides adjustment to set the dc level at the output of U2.

#### NOTE

*If the -20V supply is replaced or repaired, perform the Preliminary AM Adjustments (paragraph 5-30), AM Accuracy Adjustment (paragraph 5-31, and Demodulated Output Accuracy performance test (paragraph 4-22).*

## TROUBLESHOOTING

It is assumed that a problem has been isolated to the Demodulation Amplifier as a result of using the troubleshooting block diagrams. Troubleshoot by using the test equipment listed below, performing the initial test conditions and control settings, and following the procedures outlined in the table.

### Test Equipment

Oscilloscope .....HP180C/1801A/1820C

### Initial Test Conditions

To test A26A8 Demodulation Amplifier Assembly, remove top cover (refer to *General Removal Procedures*), remove A26 AM/AGC and RF Amplifier Assembly casting top cover, and remove A26A8 and extend for service (refer to *A26, Removal and Disassembly Procedure*).

### Initial Control Settings

COUNTER MODE:  
 EXPAND ..... Off  
 LOCK ..... Off  
 Source ..... INT  
 Meter Function ..... AM  
 AM ..... INT  
 Modulation ..... 50%  
 Modulation Frequency ..... 1kHz  
 FM ..... Off  
 Range ..... 64-128 MHz  
 Frequency Tune ..... 110 MHz  
 Output Level Switches ..... +dBm (+10,0)  
 RF On/Off ..... On

*Table 8B-18. Demodulation Amplifier Troubleshooting*

Component or Circuit	Test Conditions and Control Settings	Normal Indication	If Indication is Abnormal
BUFFER AMPLIFIER (A26A8)	Initial conditions and settings	$\approx -1.4V_{dc}$ with $\approx 1.5V_{p-p}$ at TP1	Check A26A8U1 and associated circuitry
SCALING AMPLIFIER (A26A8)	Initial conditions and settings. Set AC/DC switch (A1) to DC position.	$\approx 1.4 V_{p-p}$ at TP3	Check A26A8U2 and associated circuitry
	Set AC/DC switch (S1) to AC position	$\approx 0 V_{dc}$ with $\approx 7.0 V_{p-p}$ at TP3	Check A26A8U2 and associated circuitry

## SERVICE SHEET 12A

### DESCRIPTION

- RF Vernier (Standard)

### Principles of Operation

#### Vernier Attenuator (A1)

OUTPUT LEVEL vernier R1 attenuates the AGC reference voltage and the superimposed AM modulation signal and drives the AGC Amplifier. Resistor A1A1R1 limits the low resistance end of the potentiometer. Resistor A1A1R2 is switched into the AGC amplifier input line by S1A in all but the highest OUTPUT LEVEL range. With R2 switched out, the AGC reference is effectively increased by 10 dB (a factor of 3.16) and the RF output is increased by 10 dB.

#### Meter Attenuator and Odd Range Code (A1A1)

The output of Meter Amplifier A26A4U1A (Service Sheet 8A or 8B) is the RF LEVEL meter voltage. Resistor A1A1R3 attenuates the amplifier output by 1/3.5 in the highest or 16th OUTPUT LEVEL range. Resistor A1A1R4 attenuates the output by 1/1.1 on the other ranges. Switching is done on S1B. Switch S1C gives a closure to ground on all odd numbered ranges for use by the lamp logic circuits on A2 (Service Sheet 13).

### Troubleshooting

Troubleshoot by checking switches, connector, and resistors for proper contact and resistance.

## SERVICE SHEET 12B

### DESCRIPTION

- RF Vernier (Option 004)

### Principles of Operation

#### Vernier Attenuator (A1 and A19A2)

OUTPUT LEVEL Vernier A1R1 attenuates the AGC reference voltage and the superimposed AM modulation signal and drives the AGC Amplifier. The potentiometer has a detent for the CAL position where the wiper is fully clockwise. Resistor A19A2R1 limits the low resistance end of the potentiometer. Resistor A19A2R4 is switched into the AGC amplifier input line by S1BF in all but the highest OUTPUT LEVEL range. On the highest OUTPUT LEVEL range, A19A2R3 is switched in place of R4, and the AGC reference is increased by 6 dB (a factor of 2), and the RF OUTPUT is increased by 6 dB.

#### Meter, Attenuator and Odd Range Code (A1, A19A2)

The output of Meter Amplifier A26A4U1A (Service Sheet 8C) is the RF LEVEL meter voltage. Resistor A19A2R5 attenuates the amplifier output by 1/3.5 in the highest or 16 dBm OUTPUT LEVEL range. Resistor A19A2R6 attenuates the output by 1/1.1 on all lower ranges. This switching is done on S1AF. Switch S1BR gives a closure to ground on all odd numbered ranges for use by the lamp logic circuits on A2 (Service Sheet 13). Switch A1S1 provides additional 1 dB steps for attenuating the RF LEVEL meter voltage.

#### OUTPUT LEVEL Vernier Modification

OUTPUT LEVEL Vernier, A1R1, is normally wired to provide additional attenuation (0-2 dB) to the AGC reference voltage and the superimposed AM modulation signal. The potentiometer has a CAL detent where the wiper is fully clockwise and the potentiometer is effectively removed from the circuit. However, for some applications it may be desirable to disable the vernier function so that the OUTPUT LEVEL will always be calibrated.

To modify the OUTPUT LEVEL Vernier function, proceed as follows:

1. Remove the bottom cover (refer to *Assembly/Disassembly Instructions, Service Sheet G*).
2. Locate variable resistor A1R1.
3. Unsolder and remove wire 90 (white-black) from the center terminal of R1.
4. Connect and solder wire 90 to wire 4 (yellow) on the top terminal of R1.
5. Reinstall bottom cover.
6. CHECK OUTPUT LEVEL Vernier operation by observing OUTPUT LEVEL which should remain constant as the vernier knob is adjusted.

### Troubleshooting

Troubleshoot by checking switches, connectors, and resistors for proper contact and resistance.

## SERVICE SHEET 13

### DESCRIPTION

- Meter Switch and Drive

### Principles of Operation

#### General

Front panel meter M1 indicates one of three quantities selected by meter function switch A2S1. For each function, the metering circuitry performs the following:

1. AM percent modulation (X10%): The ac component of the modulation signal from MODULATION potentiometer R2 is peak detected and amplified. Logic circuitry selects the 0-10 meter scale lamp.
2. FM peak deviation (kHz or MHz): The ac component of the modulation signal from the Meter Attenuator section of the PEAK DEVIATION switch is peak detected and amplified. The scale lamp is selected by the PEAK DEVIATION switch.
3. RF output level (VOLTS or dBm): A positive dc voltage proportional to the detected AGC voltage of the A26A4 AGC Amplifier Assembly is amplified. The scale lamp is selected by the OUTPUT LEVEL switch and logic circuitry.

The meter has three linear scales (0-5, 0-10, and 0-3 or actually 0-3.16) with three lamps to indicate the appropriate scale. The lamps are located on the A6 Annunciator Assembly. The meter also has a log scale calibrated in dBm  $50\Omega$  for use in the LEVEL meter mode.

#### Positive Peak Detector (A2)

The Positive Peak Detector samples the ac peak of the incoming signal and stores the voltage on capacitor C7. The AM or FM input signals are ac coupled into the detector by capacitor C3 and resistor R9. Resistor R7 provides input bias current for U2 and presents a constant load impedance to the inputs.

U2 is a voltage comparator. When the input voltage at pin 3 exceeds the voltage at pin 2, the output rapidly switches low pulling on Q5. Q5 quickly charges C7 and brings the voltage at pin 2 up to that of pin 3. This condition is maintained until the voltage at pin 3 drops, at which time the output switches high and turns Q5 off. With Q5 off, C7 essentially holds at the value of the peak of the input signal. R10 and R22 slowly discharge C7 when the input signal is lowered or removed. R11 adds a small amount of gain to the detector.

#### Meter Drive Amplifier (A2)

Meter Drive Amplifier U1 converts the input voltage into a current which deflects the meter movement. U1 with Q4 are wired as a voltage follower, i.e., the voltage at the emitter of Q4 equals the input of U1. The voltage developed across R27 and R28 generates a current which becomes the emitter current of Q4 (very little current is required by the inverting input of U1). The collector current of Q4, which is nearly equal to the emitter current, drives the meter. The meter sensitivity is adjusted by R28. CR1 protects Q4. A13R6 limits the maximum current that M1 can draw to prevent damage to the meter.

### Lamp Drive Logic (A2)

Transistors Q1, Q2, and Q3 control the scale lamps (except for FM). When AM is selected, Q1 and Q2 are switched off by switch S1C. With Q1 off, Q3 switches on and lights A6DS6 (0-10 lamp). When FM is selected, the emitters of Q2 and Q3 are held open by S1B and have no control over the lighting of the scale lamps. In this case the lamps are controlled by the PEAK DEVIATION switch (Service Sheet 4). When LEVEL is selected, the 0-10 and 0-3 scale lamps are controlled by the ODD RANGE CODE line through S1C. The odd ranges correspond to OUTPUT LEVEL ranges of  $1V \times 10^{-n}$  (e.g., 3V, .3V, .03V, etc.). For odd ranges, the ODD RANGE CODE line is low and the 0-10 lamp lights as for AM. For even ranges, the line is high (open) and Q1 and Q2 are switched on by R20. Q3 is switched off and Q2 turns on A6DS5 (0-3 lamp).

### Troubleshooting

It is assumed that a problem has been isolated to the meter circuits as a result of using the troubleshooting block diagrams. Troubleshoot by using the test equipment listed below, performing the initial test conditions and control settings, and following the procedures outlined in the table.

#### Test Equipment

Digital Voltmeter ..... HP 3455A  
 Oscilloscope ..... HP 1740A

#### Initial Test Conditions

Top cover, trim strip, and front panel window removed (refer to *Assembly/Disassembly Instructions, Service Sheet G*). Use extender board to extend Meter Switch and Drive assembly (set instrument LINE power switch to OFF while removing or inserting circuit boards).

#### Initial Control Settings

Meter Function ..... AM  
 AM ..... INT  
 MODULATION FREQUENCY ..... 1 kHz  
 FM ..... INT  
 PEAK DEVIATION ..... 5 kHz  
 OUTPUT LEVEL Switches ..... 0 dBm  
 (2 steps ccw from full cw)  
 RF ON/OFF ..... ON

Table 8B-19. Meter Circuits Troubleshooting

Component or Circuit	Test Conditions and Control Settings	Normal Indication	If Indication is Abnormal
POSITIVE PEAK DETECTOR (A2U2)	Initial conditions and settings. Adjust MODULATION for a 2 V <sub>p-p</sub> (1 V <sub>pk</sub> ) signal at TP2 (AC IN)	1 V <sub>dc</sub> at TP3 (DC OUT)	Check U2, Q5, C7, and associated circuitry
METER DRIVE AMPL (A2U1)	Initial conditions and settings. Adjust MODULATION for 1 V <sub>dc</sub> at TP3 (DC OUT)	1 V <sub>dc</sub> at TP4 ≈ 9 V <sub>dc</sub> at Q4-c.	Check U1, Q4, and associated circuitry. Check Q4, M1, and associated circuitry.
SCALE Annunciator	Initial conditions and settings except set Meter Function to FM	0-5 SCALE Annunciator lit.	Check DS4
	Set PEAK DEVIATION to 10 kHz	0-10 SCALE Annunciator lit.	Check DS6
	0-3 SCALE Annunciator lit.	Set PEAK DEVIATION to 20 kHz	Check DS5

## SERVICE SHEET 14

### DESCRIPTION

- Counter RF Scaler

### Principles of Operation

#### General

The A8A1 RF Scaler Assembly selects the RF input to the counter, conditions the signal waveform, prescales (divides) the signal, and when in LOCK + $\frac{1}{2}$ DIGIT mode, performs pulse swallowing. The circuit is the high frequency portion of the counter.

#### Input Circuits (A8A1)

When the Counter Mode Source is set to INT, the I/E line is at  $-5v$ , and relay K1 will be in its normally closed position. This provides an RF path for the internal RF signal to the Limiter stage Q1. Trimmer resistor R7 adjusts the limiting threshold of Q1. When the COUNTER MODE is set to EXT, the I/E line is at  $+5v$  which then energizes relay K1 and amplifier stage Q2. The external signal, amplified 15 dB, is connected to the Limiter by relay K1B. External signals less than 10 MHz are directed through R1 and C9 to pin 4 of NOR gate U3A.

#### RF Dividers (A8A1)

U2 is configured to divide the main signal from the Limiter stage by 8 while U1A, U1B, and U4A are configured to divide the signal by 2. If INT or EXT 10-550 MHz COUNTER MODES have been selected, the 0-10 IN line will be low (ECL). This disables U3A and enables U1A, U1B, and U4A to successively divide the signal from Q1 by 64. The signal then leaves the RF Scaler Assembly at 4-8 OUT via U3D.

When the COUNTER MODE source is set to EXT 0-10 MHz, the 0-10 IN line is high (ECL) which disables U1A, U1B, and U4A, and enables U3A. U3A, biased into its active region by R11, is a 12 dB amplifier. The external 0-10 MHz signal is amplified by U3A and directed to 4-8 OUT via U3D.

#### Pulse Swallowing Circuit (A8A1)

When LOCK and + $\frac{1}{2}$ DIGIT are depressed, the Pulse Swallowing Circuits are enabled each time the PULSE SWALLOW line (CL) goes low. The PULSE SWALLOW signal is generated by the COUNTER LOAD signal at OR gate A8A3U5D when the + $\frac{1}{2}$ DIGIT button is depressed (see Service Sheet 19). This circuit blocks one pulse to the final  $\div 2$  (U4A) of the RF scaler during each cycle of the down-counter. Thus, after the final  $\div 2$ , the signal entering the down counter takes one-half count longer to reach zero.

In LOCK + $\frac{1}{2}$ DIGIT mode, the PULSE SWALLOW signal controls the operation of the Pulse Swallowing Circuit. Initially, the input to NOR gate U3C pin 10 is held high (ground through R25) and the output is low. Pulses entering pin 9 of U4B clock the low D input to the Q output which enables U4A (its usual mode of operation). Also, the low at Q of U4B cuts off Q3, putting a low at pin 11 of U3C.

When the PULSE SWALLOW signal goes low, the output of U3C goes high (both inputs are now low) which puts a high at the D input of U4B. This causes the next clock pulse into U4B to clock its Q output to a high, disabling the input to U4A. The high from U4B also puts a high (through Q3) on pin 11 of U3C causing its output and the D input of U4B to return low (see note). The next clock pulse does not clock U4A since it is disabled. However, it does clock the low at D of U4B into its Q output and thus enables U4A again.



**NOTE**

*The high input at pin 11 of U3C is stretched by C14 to hold the output low until PULSE SWALLOW returns high. This ensures that one and only one pulse is blocked (swallowed) during the PULSE SWALLOW low.*

In summary, when the PULSE SWALLOW line goes low, the next clock pulse disables U4A. The following clock pulse is blocked by U4A but re-enables it. U4A then resumes normal operation.

### TROUBLESHOOTING

The counter input circuits consist of the counter front end, RF scaler dividers, and pulse swallowing circuit. Circuit troubleshooting is done by tracing the signal from input to output. The pulse swallowing circuit is checked by forcing it to continuously swallowing pulses.

#### Test Equipment

Oscilloscope .....	HP 1740A
Frequency Counter .....	HP 5328A, Opt. 030

#### Initial Test Conditions

Remove instrument top cover, top trim strip, and front window. Remove counter top cover and extend Counter/Lock Board Assembly. Remove RF scaler cover. Refer to *Assembly/Disassembly Instructions, Service Sheet C*.

#### Initial Control Settings

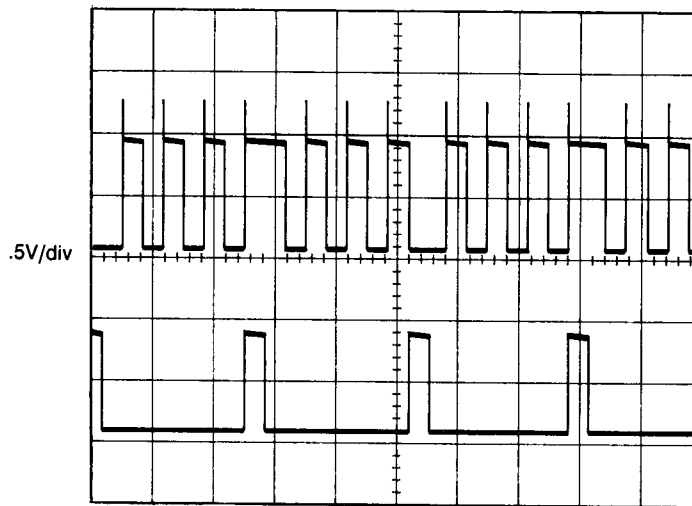
COUNTER MODE:	
LOCK .....	Off
Source .....	EXT
Range .....	10-550 MHz
Meter Function .....	LEVEL
AM .....	OFF
FM .....	OFF
RANGE .....	8-16 MHz
FREQUENCY TUNE .....	10 MHz
OUTPUT LEVEL Switch .....	0 dBm
OUTPUT LEVEL Vernier .....	0 dBm
RF ON/OFF .....	ON
LINE .....	ON
TIME BASE (rear panel) .....	INT

Table 8B-20. Counter RF Scaler Troubleshooting (1 of 2)

Step	Instructions	Normal Indication	If Indication Abnormal
<b>Input Circuits (A8A1)</b>			
1	Connect the RF OUTPUT to the COUNTER INPUT. Measure J2.	Sine wave 800 mV to 1.2 V <sub>pp</sub> , 10 MHz.	Check cabling to COUNTER INPUT (W14).
2	Measure Q2-c.	Pulses 5 to 7 V <sub>pp</sub> , 10 MHz.	Check K1, Q2, and associated components. Check voltage at the emitters of Q2 (+0.13 V to +0.17 V). Voltage measurement is only valid when no signal input to the scalar board is present. Any signal greater than -40 dBm will affect Q2 emitter voltage measurements.
3	Measure Q1-c.	Pulses, 2 to 4 V <sub>pp</sub> , 10 MHz.	Check Q1 and associated components. Check voltage at the emitter of Q1 (-0.17 V to -0.19 V). Voltage measurement is only valid when no signal input to the scalar board is present. Any signal greater than -40 dBm will affect Q2 emitter voltage measurements.
4	NOTE: For a check of internal input and high frequency performance input of ICs, perform the steps under Dividers, in the following table.		
<b>Dividers (A8A1)</b>			
1	Connect the RF OUTPUT to the COUNTER INPUT. Set the counter range to 10-550 MHz. Measure U2-2.	Square wave, 800 mV to 1.2 V <sub>pp</sub> , 1.25 MHz.	Check U2.
2	Measure U1A-2.	Square wave, 800 mV to 1.2 V <sub>pp</sub> , 625 kHz.	Check U1A.
3	Measure U1B-15.	Square wave, 800 mV to 1.2 V <sub>pp</sub> , 312.5 kHz.	Check U1B.
4	Set the counter range to 0-10 MHz. Measure U3A-2.	Pulses, 800 mV to 1.2 V <sub>pp</sub> , 10 MHz.	Check U3A.
5	U4A-2. Set the counter range to 10-550 MHz.	Square wave, 800 mV to 1.2 V <sub>pp</sub> , 156.25 kHz.	Check U4A-2, should be ECL low.
6	Measure U3D-15.	Square wave, 800 mV to 1.2 V <sub>pp</sub> , 156.25 kHz.	Check U3D. U3D-13 should be ECL low.
7	Set counter range 0-10 MHz. Measure signal at A8C5 (connected to U3D-15 via A8L5, see Service Sheet C).	Waveform 600 mV to 1 V <sub>pp</sub> , 10 MHz.	Check U3, A8C6, C5, and L5. U3D-12 and U3B-3 should be ECL low.
8	Measure A8A3Q2-c.	TTL compatible waveform, 10 MHz.	Check A8A3Q2 and associated components.

Table 8B-20. Counter RF Scaler Troubleshooting (2 of 2)

9	Set counter source to INT. Measure signal at A8C5.	Waveform 600 mV to 1 V <sub>pp</sub> , approximately 5 MHz.	Check A3 RF Oscillator, W2, RF Relay K1, and A8A1Q1, U1, U2, U3 and U4. To verify the presence of the high frequency signals use an RF spectrum analyzer with a 500 ohm resistor in series with the input cable to probe the circuits.
10	Tune FREQUENCY TUNE fully cw.	Waveform 800 mV to 1 V <sub>pp</sub> , approximately 8.6 MHz.	
11	Set FREQUENCY RANGE to 256-512 MHz. Set OUTPUT LEVEL to -7 dBm. Connect RF OUTPUT to COUNTER INPUT. Set counter source to EXT. Set counter range to 10-550 MHz. Tune frequency across range.	Counter display indicates frequency.	Check Q1, Q2 and K1.
<b>Pulse Swallowing Circuit (A8A1)</b>			
1	Dividers must be working to perform this test. Set FREQUENCY RANGE to 8-16 MHz. Set counter range to 10-550 MHz. Connect RF OUTPUT (9.5 to 10.5 MHz) to COUNTER INPUT. Measure signal at A8C5.	Counter display indicates 148.44 to 164.06 kHz.	Check U3C, U4, Q3, and associated components. 148.44 to 164.06 kHz waveform should appear at U4B-10, U4B-15, U3C-14, and Q3-e.
2	Short leads of A8A3R26 (see Service Sheet 15). Measure signal at A8C5.	Counter display indicates 129.88 to 143.55 kHz.	
3	Display Pulse Swallowing waveform on oscilloscope. Connect A INPUT to A8C5. Connect B INPUT to A8A1CR3. Set channel A and B to .05 VOLTS/DIV and 10 μs/DIV using x10 probe.	Pulse swallowing waveforms should appear as follows.	



Pulse Swallowing

## SERVICE SHEET 15

### DESCRIPTION

- Counter Time Base Assembly (A8A3)

### Principles of Operation

#### General

The A8A3 Time Base Assembly contains the internal counter time base reference and circuits that frequency-divide the time base reference down to the period required to gate the counter for a particular selection of frequency range and counter mode. Additional circuits adjust the duty cycle of the time base for phase lock and non-phase lock modes and decode the decimal point to the counter display. All counter assembly inputs are heavily filtered to prevent RF leakage.

#### Time Base Reference Crystal Oscillator (A8A3)

The internal Time Base Reference Crystal Oscillator Y1 is a 5 MHz crystal oscillator which can be voltage tuned over a  $\pm 100$  Hz range. The tuning voltage comes from the TIME BASE VERN potentiometer A8A2A2R1 (Service Sheet 20). The oscillator output is NANDed with the INT/EXT time base switch S3. The output of the NAND gate U6A follows the oscillator frequency when S3 is high (INT), or is high when S3 is ground (EXT). An external time base reference (if present) is ac coupled into the output of U6A. Transistor Q1 is a buffer amplifier and drives the  $\div 5$  counter U9A.

The time base input and output can be modified for 1 MHz operation by rearrangement of the jumpers at points A to F. In this case the  $\div 5$  U9A is wired ahead of U6A.

#### Time Base Reference Decoder (A8A3)

The Preset Decoder decodes the settings of the RANGE and COUNTER MODE switches and appropriately programs (presets) time base reference dividers U10, U13, and U8. U10 and U13 form a programmable, synchronously loading,  $\div 25$ ,  $\div 32$ , or  $\div 40$  counter. U8 is a programmable  $\div 1$ ,  $\div 2$ ,  $\div 4$ ,  $\div 5$ , or  $\div 8$  counter. The total division ratios of the three dividers for various settings of the switches are given in Table 8B-21.

Counters U10 and U13 work as follows: At the last count of a 99-count sequence, the load inputs (pin 9) are enabled (with a low). The next count input presets the counters to the BDC count at the data inputs (pins 3-6). Counter U10 then counts the clock input (pin 2) pulses beginning at the preset count. When the count reaches nine, U10 generates a high carry output pulse (pin 15). The carry pulse (pin 10) enables counter U13 for one clock period which increments the count of U13 by one. Counter U10 then counts from zero to nine and generates another carry pulse. Counter U13 then increments by one more count. This process continues until both counters reach a count of nine. Counter U13 then generates a high carry which enables the load inputs of U10 and U13 (via inverter U12D). The next clock pulse presets the counter. The count sequence is then repeated. The total count equals  $(9 \text{ minus the preset count of U13}) \times 10 + (10 \text{ minus the preset count of U10})$ .

The preset count for U10 and U13 is determined by the range section of the switch A9S2 and the COUNTER MODE switches. When COUNTER MODE source is set to INT, the COMMON switch line is low, gates U6C and U11A and transistor Q3 decode the band code lines (CODE B and CODE C) and preset the data inputs of U10 and U13. When the source is set to EXT, the COMMON line is high and CODE B and CODE C are high. The data inputs of U10 and U13 for different count conditions are given in Table 8B-22. Note that band CODE A is defined as high on both CODE B and CODE C.

Table 8B-21. Total Count of Time Base Reference Counters U10, U13, and U8

COUNTER Mode	RANGE (MHz)	BAND Code	Total Count (Division)
INT	0.5-1	A5	$25 \times 5 = 125$
	1-2	A1	$25 \times 1 = 25$
	2-4	A2	$25 \times 2 = 50$
	4-8	A4	$25 \times 4 = 100$
	8-16	A8	$25 \times 8 = 200$
	16-32	C1	$40 \times 1 = 40$
	32-64	C2	$40 \times 2 = 80$
	64-128	C4	$40 \times 4 = 160$
	128-256	B1	$32 \times 1 = 32$
	256-512	B2	$32 \times 2 = 64$
512-1024	B4	$32 \times 4 = 128$	
EXT 10-550 MHz	—	—	$32 \times 2 = 64$
EXT 0-10 MHz	—	—	$25 \times 4 = 100$

Table 8B-22. Count Modes of Counters U10 and U13

Counter Mode Source	Count Condition	U10 and U13 Data Input Pins										Total Count* (Division)
		U10					U13					
		3	4	5	6	Preset Count	3	4	5	6	Preset Count	
INT	Band Code $\begin{cases} A \\ B \\ C \end{cases}$	H	L	H	L	5	H	H	H	L	7	25
		L	L	L	H	8	L	H	H	L	6	32
		L	L	L	L	0	L	H	H	L	6	40
EXT (MHz)	10-550	L	L	L	H	8	L	H	H	L	6	32
	0-10	H	L	H	L	5	H	H	H	L	7	25

\*Total Count = (9 - Preset Count of U13) × 10 + (10 - Preset Count of U10)

The output of U13 (pin 11) drives counter U8 and OR gate U5A. Operation of counter U8 is similar to that of U10 and U13. When U8 reaches a count of 9, the load input (pin 9) is enabled. The next count input presets the counter to the binary count at the data inputs (pins 3-6). The counter then counts the clock input pulses (pin 2) beginning at the preset count. When the count reaches nine, the counter generates a high carry (pin 15). The carry pulse enables the load input (via inverter 12A) and on the next clock pulse presets the counter. The count sequence is then repeated. The total count equals 10 minus the preset count.

The preset count for U8 is also determined by the RANGE switch and COUNTER MODE switches. The band code lines CODE 1, CODE 2, CODE 5, and CODE 8 and the COUNTER MODE functions are decoded by gates U5C, U6B, U7, and U11B, which drive the data inputs of U8. The data inputs of U8 for different count conditions are given in Table 8B-23. Note that band CODE 4 is defined as all highs on CODE 1, CODE 2, CODE 5, and CODE 8. When counter U8 is preset for ÷1, the carry output remains high and the output of U12A remains low. OR gate U5A now reproduces the output of counter U13 directly.

Table 8B-23. Count Modes of Counter U8

Counter Mode Source	Count Condition	U8 Data Input Pins					Preset Count	Total Count* (Division)
		3	4	5	6			
INT	Band Code	1	H	L	L	H	9	1
		2	L	L	L	H	8	2
		4	L	H	H	L	6	4
		5	H	L	H	L	5	5
		8	L	H	L	L	2	8
EXT (MHz)	10-550	L	L	L	H	8	2	
	0-10	L	H	H	L	6	4	

\*Total Count = 10 - Preset Count of U8.

### Expand Decoder (A8A3)

The Expand Decoder counters, U14 and U15, are programmed to divide the Time Base Reference Decoder output by one (normally), by ten (in EXPAND X10), or by 100 (in EXPAND X100). The counters are configured as  $\div 10$  counters with output (pin 9) connected to input (pin 11). When the reset-to-nine input (pin 3) is low, the counter operates as a  $\div 10$  counter. When pin 3 is high, the counter, initially at a count of nine, overflows to zero when input (pin 10) goes low. The other reset-to-nine inputs (pin 1) are normally low, being held low by the resistors (R20 and R21) on their inputs. When input (pin 10) goes high, capacitors C20 and C21 ac-couple the high into the reset-to-nine inputs which resets the counters to nine. A short time later pin 1 returns low. When input (pin 10) again goes low, the counter again overflows to zero and the sequence repeats. The pin 8 output then follows the pin 10 input in frequency.

In the unexpanded mode, EXP 10 and EXP 100 are both high, the output of AND gate U11D is high. Both reset-to-nine inputs are high and counters U14 and U15 function as  $\div 1$  counters.

In EXPAND X10, EXP 10 is low, AND gate U11 is low, and counter U14 functions as a  $\div 10$  counter. In EXPAND X100, EXP 100 is low, and gate U11D is again low, and this time both counters U14 and U15 functions as  $\div 10$  counters. The two counters in series divide the output of U5A by 100.

### Lock Decoder (A8A3)

U1, U4, and U9B function as a  $\div 101$  (unlocked mode) or a  $\div 100$  (lock mode). In the  $\div 101$  mode, TP1 is low for the first 100 counts into pin 10 of U1 and high for the 101st count into pin 10 of U1. In the  $\div 100$  mode, TP1 is low except for 0.5  $\mu$ s every 100th count.

**$\div 101$  (Unlocked Mode).** In  $\div 101$  mode, the LOCK line is low and the reset-to-zero gates (pins 12 and 13) of U1 and U4 are disabled. The reset-to-nine gates (pins 1 and 3) are held low at pin 3 by R22 through AND gate U11C. Assume initially that pin 9 of U9B is low. U1 and U4 count up normally until the count of 99. On the 100th count (into pin 10 of U1), U1 and U4 clock to the next count (zero). This causes pin 8 of U4 to go low which clocks pin 9 of U9B to a high. This high is coupled across C22 and momentarily raises U11C to a high which resets U1 and U4 to 99. The next count clocks U1 and U4 again to zero and pin 9 of U9B returns low. Thus pin 9 of U9B is low for 100 counts and high for one count.

**$\div 100$  (Lock Mode).** In  $\div 100$  mode, the LOCK line is high putting a high on pin 12 (the  $R_0$  gates) of U1 and U4. Assume initially that pin 9 of U9B is low. This holds pin 13 of U1 and U4 (the  $R_0$  gates) low, thus disabling them. The  $R_9$  gates of U1 and U4 are held low at pin 3 by R22 through AND gate U11C. U1 and U4 count up normally until the count of 99. On the 100th count (into pin 10 of U1), U1 and U4 clock to the next count (zero). This causes pin 8 of U4 to go low and clocks pin 9 of U9B to a high. This causes pin 13 of U1 and U4 to be high. The high is also coupled across C22 and momentarily raises U11C to a high. Thus U1 and U4 have a simultaneous reset-to-zero and reset-to-nine. However, the reset-to-nine predominates and U1 and U4 reset to 99. Approximately 0.5

$\mu$ s later the high across R22 returns low, and the reset-to-nine is released. Since a reset-to-zero is still present, U1 and U4 reset to zero. This clocks U9B back to a low. Thus pin 9 of U9B is low for almost 100 counts and high for 0.5  $\mu$ s.

After being inverted by U12C, the pin 9 output of U9B becomes the time base.

### Decimal Point Decode (A8A3)

The decimal point decoder decodes the band code and COUNTER MODE inputs and drives the decimal point lines to the display. In the EXPAND X10 mode the decimal point is shifted to the left one place; in the EXPAND X100 mode it is shifted two places. Gates U6C, U6D, and U11A and transistor Q3 decode the decimal point location from the band code and COUNTER MODE inputs and drive the data inputs (pins 2,3,4 and 6) of the decimal point shift register U3. The data inputs for the different counter modes are shown in Table 8B-24. Note that only one data input is low for each case.

Table 8B-24. Data Inputs of Decimal Point Shift Register U3

Counter Mode	Range (MHz)	Band Code	Data Inputs					Decimal Point Position
			A	B	C	D	E	
INT	0.5-1	A5	H	H	H	L	H	6
	1-2	A1	H	H	L	H	H	5
	2-4	A2	H	H	L	H	H	5
	4-8	A4	H	H	L	H	H	5
	8-16	A8	H	H	L	H	H	5
	16-32	C1	H	L	H	H	H	4
	32-64	C2	H	L	H	H	H	4
	64-128	C4	H	L	H	H	H	4
	128-256	B1	L	H	H	H	H	3
	256-512	B2	L	H	H	H	H	3
512-1024	B4	L	H	H	H	H	3	
EXT 10-550 MHz	—	—	L	H	H	H	H	3
EXT 0-10 MHz	—	—	H	H	L	H	H	5

**Unexpanded Mode.** In the unexpanded counter mode, both EXP 10 and EXP 100 are high, the output of AND gate U11D is high, the output of inverter U12E is low, and the clear input (pin 13) of D flip-flop U2B is low. Flip-flop U2B clears and holds the output high which holds one input of OR gate U5B high. The output of OR gate U5B remains high regardless of the state of the other input which is the clock output from U5A. The pin 1 input of shift register U3 is held high. At the termination of a time base period, the output of U11C goes momentarily high. This output is inverted by U12F and drives the clear input (pin 16) of U3. The output of U11C is also delayed by resistor-capacitor network R24 and C23 and drives the load input (pin 8) of U3. At the termination of each time base period, the shift register outputs (pins 10,11,13,14,15) are first cleared (i.e., all go low) and then loaded with the data inputs. The outputs drive the decimal point inputs of the LED display.

**EXPAND X10 Mode.** In the EXPAND X10 mode, EXP 10 is low; the output of U11D is low and the output of U12E is high; the set input (pin 4) of flip-flop U2A is low and sets the output (i.e., pin 6 is low). The pin 12 input of U2B is low. Except at the termination of the time base period, the clear input (pin 1) of U2A and the set input of U2B (pin 10) are high. The output of U2B is high and holds the output of OR gate U5B high. At the termination of a time base period, the set input of U2B goes momentarily low; the output goes low until the clock pulse returns it to a high. The output of OR gate U5B is low for one low clock period, then it goes high. The pin 1 input of U3 then receives one trigger pulse for each time base period in EXPAND X10. At the termination of a time base period the shift register is cleared, the input data is transferred to the output and then shifted up one bit. A



high appears in the output (pin 15) of U3 when shifting because the serial input (pin 9) is a high (i.e., open).

**EXPAND X100 Mode.** In the EXPAND X100 mode, EXP 100 is low; the output of U11D is low, and the output of U12E is high. Except at the termination of a time base period, the clear and set inputs of U2A and U2B are high. The output of U2A is low, and the output of U2B is high, therefore the output of OR gate U5B is high. At the termination of a time base period, the set input of U2B goes momentarily low as does the clear input of U2A which causes the output of U2A to go high and the output of U2B to go low. When the clock is low, the output of OR gate U5B is low. When the clock goes high, the output of U2A goes low, the output of U2B remains low, and the output of OR gate U5B goes high. When the clock goes low, the output of OR gate U5A again goes low. When the clock goes high, the output of U2B goes high as does the output of OR gate U5B and remains high until the next time base termination. The input of U3 (pin 1) received two pulses, which shifted the output register up twice after being cleared and loaded with the preset inputs.

Table 8B-25. Truth Table for Preset Decoders

Counter MODE	Range (MHz)	XA8A3-5 U6B-4 U7D-12 U7B-4 U6D-13 U3-6	XA8A3-13 U6B-5 U7A-1	XA8A3-6 U7B-5 U7C-9	XA8A3-12 U11B-4	XA8A3-10 U6C-9	XA8A3-8 U11A-2 U3-3	U11B-5 U6C-10	U6B-6 U5C-9	U11B-6 U7C-10
INT	0.5-1	L	H	H	H	H	H	H	H	H
	1-2	H	H	L	H	H	H	H	L	H
	2-4	H	H	H	L	H	H	H	L	L
	4-8	H	H	H	H	H	H	H	L	H
	8-16	H	L	H	H	H	H	H	H	H
	16-32	H	H	L	H	H	L	H	L	H
	32-64	H	H	H	L	H	L	H	L	L
	64-128	H	H	H	H	H	L	H	L	H
	128-256	H	H	L	H	L	H	H	L	H
	256-512	H	H	H	L	L	H	H	L	L
512-1024	H	H	H	H	L	H	H	H	L	H
EXT 10-550 MHz	—	H	H	H	H	H	H	L	L	L
EXT 0-10 MHz	—	H	H	H	H	H	H	H	L	H

COUNTER MODE	RANGE (MHz)	U5C-8 U7A-2 U7D-13	U7D-11 U8-5	U7A-3 U8-4	U7B-6 U8-3	U7C-8 U8-6 U5C-10	U6C-8 U10-6	Q3-C U11A-1 U3-2	U11A-3 U10-3 U10-5 U13-3 6D-12	U6D-11 U3-4
INT	0.5-1	H	H	L	H	L	L	H	H	H
	1-2	H	L	L	H	H	L	H	H	L
	2-4	H	L	L	L	H	L	H	H	L
	4-8	L	H	H	L	L	L	H	H	L
	8-16	H	L	H	L	L	L	H	H	L
	16-32	H	L	L	H	H	L	H	L	H
	32-64	H	L	L	L	H	L	H	L	H
	64-128	L	H	H	L	L	L	H	L	H
	128-256	H	L	L	H	H	H	L	L	H
	256-512	H	L	L	L	H	H	L	L	H
512-1024	L	H	H	L	L	H	L	L	H	
EXT 10-550 MHz	—	H	L	L	L	H	H	L	L	H
EXT 0-10 MHz	—	L	H	H	L	L	L	H	H	L

### TROUBLESHOOTING

The Time Base signal is generated by dividing down a reference signal. The circuits are troubleshot by first checking the reference and then the outputs from the various stages of the divider chain. A low capacitance probe should be used with both the oscilloscope and high impedance counter to make the measurements. This will minimize the effects of capacitive loading on the logic outputs which can cause multiple triggering of the counter. For frequencies below 1 kHz, a period measurement is easier than measuring frequency.

Go to the section in the table below which diagnoses the area where the fault is suspected. Start at the beginning of the section and follow it in sequence. Reset controls before going on to another section.

#### Test Equipment

Oscilloscope .....	HP 1740A
Frequency Counter .....	HP 5328A, Opt. 030
Voltage Divider Probe (2 preferred) .....	HP 10004D

#### Initial Test Conditions

Remove instrument top cover, top trim strip, and front window. Remove counter top cover and extend Counter/Lock Board Assembly. Refer to *A8, Removal and Disassembly Procedure*.

#### Initial Control Settings

COUNTER MODE:	
EXPAND .....	Off
LOCK .....	Off
Source .....	INT
+1/2 DIGIT .....	Off
TIME BASE VERN .....	CAL
RANGE .....	0.5-1 MHz
LINE .....	ON
TIME BASE (rear panel) .....	INT

Table 8B-26. Counter Timebase Troubleshooting (1 of 3)

Step	Instructions	Normal Indication	If Indication Abnormal
<b>Time Base (A8A3)</b>		<b>NOTE</b> <i>For instruments with modified time base perform steps 1' to 6' in place of 1 to 6.</i>	
1	Measure U6A-1	Square wave 4 to 6 Vpp, 5 000 000 $\pm$ 10 Hz.	Check Y1 and supply and tune lines. If frequency only slightly off, perform Internal Reference Frequency Adjustment.
1'	Measure U9A-11.	Square wave 4 to 6 Vpp, 5 000 000 $\pm$ 10 Hz.	Check Y1 and supply and tune lines. If frequency only slightly off, perform Internal Reference Frequency Adjustment.
2	Tune TIME BASE VERN over its full range. Measure U6A-1.	Frequency varies at least $\pm$ 100 Hz about 5 MHz. UNCAL lamp on.	Check VR1, Y1, and associated components. See Service Sheet 16: Check A8A2A2Q1, DS1, and associated components.
2'	Tune TIME BASE VERN over its full range. Measure U9A-11.	Frequency varies at least $\pm$ 100 Hz about 5 MHz. UNCAL lamp on.	Check VR1, Y1, and associated components. See Service Sheet 16: Check A8A2A2Q1, DS1, and associated components.
3	Set TIME BASE VERN to CAL. Measure U6A-3.	TTL square wave, 5 MHz.	Check U6A. U6A-2 should be high.
3'	Set TIME BASE VERN to CAL. Measure U9A-8.	TTL pulses, 1 MHz.	Check U9A.
4	Measure TIME BASE output (rear panel). NOTE: Use voltage divider probe.	Triangular waveform, 2 to 3 Vpp, 5 MHz.	Check output line and associated components.
4'	Measure U6A-3.	TTL pulses, 1 MHz.	Check U6A. U6A-2 should be high.
5	Measure U12B-4.	TTL waveform, 5 MHz.	Check Q1, U12B, and associated components.
5'	Measure TIME BASE output (rear panel). NOTE: Use voltage divider probe.	Waveform 3 to 4 Vpp, 1 MHz.	Check output line and associated components.
6	Measure U10-2.	TTL pulses, 1 MHz.	Check U9A.
6'	Check U12B-4.	TTL pulses, 1 MHz.	Check Q1, U12B, and associated components.

Table 8B-26. Counter Timebase Troubleshooting (2 of 3)

Step	Instructions	Normal Indication	If Indication Abnormal			
7	Set RANGE and COUNTER MODE source and range as follows. Measure U13-11.	TTL pulses. (NOTE: Pulses also present at U12D-8.)	Check Preset Decoder ICs, U12D, U10, U13, A9S2, and associated lines. Logic states for the Preset Decoders are given in Table 8B-5. Check preset inputs to U10 and U13 first.			
				<b>COUNTER MODE</b>	<b>RANGE (MHz)</b>	<b>Frequency (kHz)</b>
				INT	0.5-16 16-128 128-1024	40 25 31.25
				EXT 10-550 MHz EXT 0-10 MHz	- -	31.25 40
8	Set RANGE and COUNTER MODE source and range as follows. Measure U5A-3.	TTL pulses.	Check Preset Decoder ICs, U8, U12A, U5A, A9S2 and associated lines. Logic states for the Preset Decoders are given in Table 8B-5. Check preset inputs of U8 first. NOTE: When U8 is set up to ÷1, U5A-1 should be a constant low.			
				<b>COUNTER MODE</b>	<b>RANGE (MHz)</b>	<b>Frequency (kHz)</b>
				INT	0.5-1 1-2 2-4 4-8 8-16	8 40 20 10 5
				EXT 10-550 MHz EXT 0-10 MHz	- -	15.625 10
9	Set COUNTER source to EXT. Set COUNTER range to 0-10 MHz. Measure U14-8 and U15-8.	TTL pulses, 10 kHz.	Check U14, U15, and associated components. U14-3 and U15-3 should be high.			
10	Depress EXPAND X10. Measure U14-8.	TTL pulses, 1 kHz.	Check U14 and associated components. U14-3 should be low. U15-3 should be high.			
11	Release EXPAND X10. Depress EXPAND X100. Measure U15-8.	TTL pulses, 100 Hz.	Check U15 and associated components. U14-3 and U15-3 should be low.			
12	Release EXPAND X100. Measure TP1.	TTL pulses, ≈99.01 Hz or 10.1 ms. If correct, go to step 19.	Continue on with steps 13 to 18.			

Table 8B-26. Counter Timebase Troubleshooting (3 of 3)

Step	Instructions	Normal Indication	If Indication Abnormal							
13	Short R22. Measure U1-8.	TTL pulses, 1 kHz or 1 ms.	Check U1. U1-12 and U1-3 should be low.							
14	Measure U4-8.	TTL pulses, 100 Hz or 10 ms.	Check U4.							
15	Measure U9B-9 and U12C-6.	TTL square wave, 50 Hz or 20 ms.	Check U9B and U12C.							
16	Remove short from R22. Short U11C-9 to U11C-10. Measure U1 and U4 Q outputs.	Binary nines: i.e., QA pin 9 and QD pin 8 TTL high, QB pin 5 and QC pin 4, TTL low.	Check U1 and U4.							
17	Remove short on U11C-9 and U11C-10. Short together U4-12, U4-13, U4-14. Measure U1 and U4 Q outputs.	Pins 8 and 9 TTL low.	Check U1 and U4.							
18	Remove shorts from U4. Check U11C and associated components.									
19	Ground A8A2A1TP4 (see Service Sheet 17). Depress LOCK. Measure TP1.	TTL pulses, 100 Hz or 10 ms. NOTE: Pulses will be very faint, $\approx 0.5 \mu s$ wide.	Check U1-12 for high. If low see Service Sheet 17: Lock Switching. If high, release LOCK and continue on with steps 13 to 18.							
<b>Decimal Point Decoder (A8A3)</b>										
1	Set RANGE as follows. Note decimal point and if incorrect measure U3D inputs and Q outputs.		If D inputs incorrect, check Preset Decoder ICs, U6D, and associated lines. Logic states for Preset Decoders and U6D are given in Table 8B-5. If Q outputs incorrect (with correct D inputs), check U3 and associated components. High going TTL pulses, $\approx 600$ ns wide, should appear at U3-16 and low going TTL pulses, $\approx 100$ ns wide, at U3-8; these will be very faint and at a rate of 50 to 400 Hz. If Q outputs correct, check A8U3 to U7 (see Service Sheet 16).							
				<b>RANGE (MHz)</b>	<b>Display</b>	<b>U3 Pins</b>				
						<b>7,10</b>	<b>6,11</b>	<b>4,13</b>	<b>3,14</b>	<b>2,15</b>
				0.5-1	X.X X X X X	H	L	H	H	H
				1-16	X X.X X X X	H	H	L	H	H
16-128	X X X.X X X	H	H	H	L	H				
128-1024	X X X X.X X	H	H	H	H	L				
2	Set RANGE to 0.5-1 MHz. Set TIME BASE (rear panel) to EXT (with no external source connected). Firmly but momentarily ground U5B-6 four times and note decimal point. (This clocks U3.)	At the release of each grounding decimal point shifts one position to the left until it shifts off the display. NOTE: Because of contact bounce several tries may be required to get a proper sequence. To restart the sequence, set TIME BASE to INT then EXT.	Check U2 and U5B. If the leftmost decimal fails to light, check A8U7; if it still fails to light, check U3.							

## SERVICE SHEET 16

### DESCRIPTION

- Up/Down Counter and Display (A8A2A1, A8A2A2)

### PRINCIPLES OF OPERATION

#### General

The counter has two modes of operation: the count-up mode and the count-down mode. In the count-up mode, the counter counts the frequency of the signal from the RF scaler. In the count-down mode, the counter is configured as a self-programmed, frequency divider imbedded in a phase lock loop. As in the count-up mode, the input to the counter is the RF scaler. The count-down mode is initiated when the LOCK button is depressed, at which time the counter completes its last count-up cycle, stores the count, and loads the count back into the counter. The counter counts down to zero, reloads the stored count, and repeats.

The frequency is normally displayed on a six-digit LED numeric display. A seventh, least-significant digit (a "5") is lighted only when the LOCK and  $+1/2$  DIGIT buttons are depressed.

#### Counter Operation: Count-Up Mode (A8A2A1)

The counter operates as a count-up counter when the phase lock mode is not selected. In the count-up mode, the LOCK line is high, which enables AND gate U17D. When the TIME BASE is high, U17D enables U2D to route the signal from the RF scaler into decade counters U19 through U24, which count the input pulses. When TIME BASE goes low, U17D causes U2D to inhibit the signal into the counter. The outputs of the counter are then transferred to the Storage Buffers (U30, U31, and U32), which drive the seven-segment, numeric displays (A8DS2 through A8DS7) through Seven-Segment Decoders U7 through U12. The Storage Buffer outputs are then latched, and the counters are cleared. When the TIME BASE line goes high, the count begins again.

The sequence for latching the Storage Buffers and clearing the Counters is as follows: The pin 5 output of one-shot U33B is normally low, and the pin 4 output of one-shot U33A is normally high. When the TIME BASE line goes low, the pin 13 output of U33A goes high for 250 ns (pin 4 goes low for 250 ns). While the pin 13 output of U33A is high, the enable inputs (pin 11) of Storage Buffers U30, U31, and U32 allow the data inputs to transfer to the outputs. When the pin 4 output of U33A returns high, it triggers U33B, making the output of U33B go high for 150 ns. This clears counters U19 through U24. When the TIME BASE line goes high, the outputs of U33A and U33B remain unchanged.

**Shaping and Input Gating (A8A2A1)** Gates U15A, U2B, U2C, U14D, and U13A shape the waveform into pulses of about 30 ns duration. The circuit uses gate delays and positive feedback to shape the pulses. NAND gate U2D blocks the input to the counter when the TIME BASE is low. D flip-flop U1A and gates U14B and U15B also shape the input pulses and assure that should the TIME BASE line go low midway through an input pulse, the output of U15B is either of full duration or is absent. (This function is of particular importance during the transition from the count-up mode to the count-down mode.)

**Overflow Detector (A8A2A1)** The Overflow Detector lights the OVERFLOW annunciator whenever a carry is generated by counter U19 to indicate that the count has exceeded the number of digits in the display. The output of one-shot U34B is normally high. When U19 reaches the count of nine, it generates a low at the carry input (pin 10). The low, however, does not affect U34B (the output remains high). When counter U19 reaches the count of ten, the carry output of U19 returns high and triggers U34B. The output of U34B goes low for 65 ns and clears D flip-flop U5A.

When the TIME BASE line goes low, it triggers one-shot U33A. The pin 4 output of U33A goes low for 250 ns and then returns high, toggling D flip-flop U5B. If a low is present at the pin 12 input of U5B, the output goes low, turns on transistor Q18, and lights the OVERFLOW annunciator A8A2A2DS8. When the TIME BASE line goes high, the output of U5A goes (or remains) high, and remains high until U19 generates another carry. Therefore, the counter must generate an overflow each time base period to keep the OVERFLOW annunciator lighted.

### Counter Operation: Phase Lock, Count-Down Mode (A8A2A1)

When the LOCK button is depressed, the count just prior to acquisition of phase lock is transferred to Storage Buffers U30, U31, and U32, then the buffers are latched to store the count. Next, decade counters U19 through U24 are cleared and then loaded (preset) with the count stored in the Storage Buffers. The counters then count the signal from the RF scaler beginning at the loaded count and counting down towards zero.

When the count reaches zero, the next input pulse generates an underflow count (999 999). The input signal is diverted from the main counter to the Stall Counter (U28). The main counter is reloaded with the count stored in the Storage Buffers and remains at that count for four more input pulses (as counted by the Stall Counter). On the fourth count, a pulse is fed into the second counter (U23) which (in effect) subtracts ten from the present count. Finally, when a total of nine input pulses have occurred, the input signal is routed back into the main counter, which starts counting down towards zero. The stall of nine counts gives the main counters adequate time to preset. The nine-count delay plus the count to one below zero (that is, to 999 999) is compensated by subtracting ten from the main counter.

The circuit details of the count-down mode are as follows: When the count reaches 099 999, the borrow output (pin 13) of U19 goes low. The count proceeds to 000 000 then (on the next pulse) to 999 999. On count 999 999, the borrow output of U19 returns high and triggers one-shot U34A which outputs a 40 ns pulse. This pulse clears U28 and U1B. Clearing U1B forces its output high which triggers one-shot U35A. The output of U35A drives the COUNTER LOAD line. The output of U35A goes low for 220 ns which loads (presets) the count stored in U30, U31, and U32 into counters U19 through U24. The low on the output of U1B also inhibits the input to the main counter via OR gate U14C and enables the Stall Counter via AND gate 17B.

The Stall Counter now does the counting. When Stall Counter U28 reaches a count of four, its pin 6 output goes high and NAND gate U2A goes low. During the stall count, the borrow output (pin 13) of counter U24 is high because its count-down input (pin 4) is held high by U14C. The low from U2A causes a low at the outputs of U13C and U13D. Since U14C is high, the output of NOR gate U25A is low. The low from U13D generates a high at the output of NOR gate U25B which clocks the count-down input of U23 (pin 4) once. If U23 is at a zero count, its borrow output clocks counter U22. If U22 is at zero, it clocks counter U21, etc.

When Stall Counter U28 reaches the count of eight, pin 7 output goes high and generates a high at the pin 12 input of flip-flop U1B. The next input pulse causes the output of U1B to go low, which enables the input to the main counter via U14C and disables the Stall Counter via U17B. The main counter now does the counting.

Except during the stall count, decade counters U19 to U24 form a synchronous counter. The outputs of OR gates U27A to U27C and AND gate U13C are high unless all previous counters are at the zero count. When any of the OR gates (or AND gate U13C) are low, the output of the following NOR gate (U6A to U6D or U25B) goes high on the next input pulse. Thus each counter changes count only at the occurrence of an input pulse and only if all previous counters are zero (their borrows having rippled through to enable it).



**Counter Operation: Transition from Unlocked Mode to Phase Lock Mode (A8A2A1)**

During the count-up mode, the DELAYED LOCK(H) line is low. This low is applied to the load input (pin 11) of Stall Counter U28 and presets U28 to the count of eight. When the LOCK button is depressed, counters U19 through U24 continue counting up until the TIME BASE(H) line goes low. It is at this time that the count-down mode is initiated. First, Storage Buffers U30, U31, and U32 are loaded with the outputs of the counters and latched; then the counters are cleared. The input to the main counter is inhibited, while the input to the Stall Counter is enabled. The DELAYED LOCK(H) line now goes high and gates the high at the pin 7 output of Stall Counter U28 onto the pin 12 input of U1B via U17A. The next input pulse sends the main counter to 999 999 since it was previously cleared to zero. The counter now operates in the normal count-down mode.

**Power-Up Led Test (A8A2A10)** All segments of the front-panel numeric LED displays are lighted during instrument power-up, facilitating a visual check of their operation. On instrument power-up, the input of U35B makes a transition from low to high, causing the output of U35B to go low for approximately one second. This low enables the Lamp Test inputs of A8DS1 through A8DS7, lighting all segments during the one second pulse.

## TROUBLESHOOTING

### General

Troubleshooting information for the entire Up/Down Counter and Display is presented on this page and is keyed to the detailed schematic. However, the circuit operation is described on the preceding supplemental Service Sheet and is keyed to simplified circuit diagrams.

The counter functions as a six-decade up counter when unlocked or a presettable down counter when locked. The counter is troubleshot separately for the two modes. In the count-up mode, the count, clear, and output transfer actions are checked. In the count-down mode, the count down, preset and stall count actions are checked. A low capacitance probe should be used with both the oscilloscope and high impedance counter to make the measurements. This will minimize the effects of capacitive loading on the logic outputs which can cause multiple triggering of the counter. Both period and frequency measurements will be made.

Go to the section in the table below which diagnoses the area where the fault is suspected. Start at the beginning of the section and follow it in sequence. Reset controls before going on to another section.

### Test Equipment

Oscilloscope .....	HP 1740A
Frequency Counter .....	HP 5328A, Opt. 030
Test Oscillator .....	HP 3320B
Voltage Divider Probe (2 preferred) .....	HP 10004D

### Initial Test Condition

Remove instrument top cover, top trim strip, and front window. Remove counter top cover and extend Counter/Lock Board Assembly. Refer to A8, Removal and Disassembly Procedure.

### Initial Control Settings

COUNTER MODE:	
EXPAND .....	Off
LOCK .....	Off
Source .....	EXT
Range .....	0-10 MHz
+ DIGIT .....	Off
TIME BASE VERN .....	CAL
LINE .....	ON
TIME BASE (rear panel) .....	INT

Table 8B-27. Up/Down Counter And Display Troubleshooting (1 of 3)

Step	Instructions	Normal Indication	If Indication Abnormal										
<b>Shaping (A8A2A1)</b>													
1	Connect 10 MHz, 1 Vrms signal to COUNTER INPUT. Measure U13A-3.	TTL pulses, 10 MHz, 30 ns wide.	Check U2B, U2C, U13A, U14D, U15A and associated components. 10 MHz square wave should appear at U15A-3, U2B-6, U2C-8, and U14D-11. Propagation delay through U2C, U14D, R57 and C19 determines pulse width.										
<b>Counter — Count-Up (Unlocked) Mode (A8A2A1)</b>													
1	Connect 10 MHz, 1 Vrms signal to COUNTER INPUT. Measure U15B-6.	TTL pulses (low going), 10 MHz, 70 ns wide.	Check U1A, U2D, U13A, U14B, U15B and U17D. 10 MHz pulses should appear at U2D-11, U1A-6, U14B-6 and U15B-6. U2D-13, U17D-12 and U17D-13 should be high.										
2	Measure U33A-4.	TTL pulses (low going), $\approx 99$ Hz or 10.1 ms, 250 ns wide. NOTE: Oscilloscope trace will be very faint.	Check U33A and associated components.										
3	Measure U33B-5.	TTL pulses, $\approx 99$ Hz or 10.1 ms, 150 ns wide. NOTE: Oscilloscope trace will be very faint.	Check U33B and associated components.										
4	Short U33B-5 (clear counters) to +5.2V for one second or less.	Display reads 00.0000.	Check counter (U19 to U24), storage buffer (U30 to U32), BCD to 7-segment decoder (U7 to U12) and display (DS2 to DS7) associated with the incorrect digit.										
5	Connect external signal to input of an external counter as well as COUNTER INPUT. Set external counter gate time to 10 ms. Set oscillator frequency for displays shown below and note external counter reading.	Display and counter frequencies agree within $\pm 2$ counts.	If abnormal indication is restricted to one digit only, check storage buffer, (U30 to U32), BCD to 7-segment decoder (U7 to U12), display (DS2 to DS7) and counter (U19 to U24) associated with that digit. If abnormal indication not restricted to one digit, check counter associated with the first digit from the right which is in error. (Example: Display reads 04.4444. Counter reads 00.7444. Check U21.) NOTE: Pin 4 of U19 to U24 should be high (CD input).										
	<table border="1"> <tr> <td>Display</td> </tr> <tr> <td>09.9999</td> </tr> <tr> <td>08.8888</td> </tr> <tr> <td>07.7777</td> </tr> <tr> <td>06.6666</td> </tr> <tr> <td>05.5555</td> </tr> <tr> <td>04.4444</td> </tr> <tr> <td>03.3333</td> </tr> <tr> <td>02.2222</td> </tr> <tr> <td>01.1111</td> </tr> </table>	Display	09.9999	08.8888	07.7777	06.6666	05.5555	04.4444	03.3333	02.2222	01.1111		
Display													
09.9999													
08.8888													
07.7777													
06.6666													
05.5555													
04.4444													
03.3333													
02.2222													
01.1111													

Table 8B-27. Up/Down Counter And Display Troubleshooting (2 of 3)

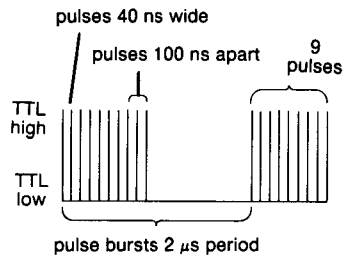
Step	Instructions	Normal Indication	If Indication Abnormal																				
6	Depress EXPAND X10. Repeat step 5 for the following displays. NOTE: X indicates DON'T CARE. <table border="1" data-bbox="442 342 596 667" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Display</th> </tr> </thead> <tbody> <tr><td>9.XXXX</td></tr> <tr><td>8.XXXX</td></tr> <tr><td>7.XXXX</td></tr> <tr><td>6.XXXX</td></tr> <tr><td>5.XXXX</td></tr> <tr><td>4.XXXX</td></tr> <tr><td>3.XXXX</td></tr> <tr><td>2.XXXX</td></tr> <tr><td>1.XXXX</td></tr> </tbody> </table>	Display	9.XXXX	8.XXXX	7.XXXX	6.XXXX	5.XXXX	4.XXXX	3.XXXX	2.XXXX	1.XXXX	Most significant digit of display and counter agree.	Check U32, U19 and DS7.										
Display																							
9.XXXX																							
8.XXXX																							
7.XXXX																							
6.XXXX																							
5.XXXX																							
4.XXXX																							
3.XXXX																							
2.XXXX																							
1.XXXX																							
<b>Counter — Count-Down (Locked) Mode (A8A2A1)</b>																							
1	Connect 10 MHz, 1 Vrms signal to COUNTER INPUT. In addition connect this signal to an external counter's external time base oscillator input. Set external counter's time base to external. Ground TP4 (see Service Sheet 17). Ground TP1. Ground U35A-3. Depress LOCK. Measure the frequency at U19-13. If incorrect, also measure pin 4 of U24 to U19.	TTL pulses with exact frequencies. <table border="0" data-bbox="612 814 968 1314" style="margin-left: auto; margin-right: auto;"> <tr> <td style="padding-right: 20px;">U19-13</td> <td>10 Hz</td> </tr> <tr> <td>U24-4</td> <td>10 MHz</td> </tr> <tr> <td>U23-4</td> <td>1 MHz</td> </tr> <tr> <td> </td> <td> </td> </tr> <tr> <td>U22-4</td> <td>100 kHz</td> </tr> <tr> <td>U21-4</td> <td>10 kHz</td> </tr> <tr> <td>U20-4</td> <td>1 kHz</td> </tr> <tr> <td>U19-4</td> <td>100 Hz</td> </tr> <tr> <td> </td> <td> </td> </tr> <tr> <td>U19-13</td> <td>10 Hz</td> </tr> </table>	U19-13	10 Hz	U24-4	10 MHz	U23-4	1 MHz			U22-4	100 kHz	U21-4	10 kHz	U20-4	1 kHz	U19-4	100 Hz			U19-13	10 Hz	Proceed with remaining measurements. Check U14C. U14C-9 should be low. Check U2A, U13C, U13D, U24, U25A and U25B. U13C-10 and U24-5 should be high. Check U6B, U18B, U23 and U27A. U23-5 should be high. Check U6A, U18A, U22 and U27D. U22-5 should be high. Check U6D, U18C, U21 and U27B. U21-5 should be high. Check U6C U18D, U20 and U27C. U20-5 should be high. Check U19. U19-5 should be high.
U19-13	10 Hz																						
U24-4	10 MHz																						
U23-4	1 MHz																						
U22-4	100 kHz																						
U21-4	10 kHz																						
U20-4	1 kHz																						
U19-4	100 Hz																						
U19-13	10 Hz																						
2	Remove grounds at TP1 and U35A-3. Release LOCK. Set oscillator to approximately 2 kHz; fine tune for display of 00.0020 and depress LOCK. Increase frequency to 10 MHz. Measure U17B-6.		Measure U17A-2; if not high, see Service Sheet 17: Lock Switching. If pulse burst period incorrect, continue on with steps 3 to 5. Otherwise, check U1B, U14C, U17A, U17B and U28. TTL pulses, 100 ns period should appear at U17B-4. TTL square wave, 2 μs period should appear at U17A-1, U17A-3 and U17B-5.																				
3	Measure U35A-4.	TTL pulses (low going), 2 μs period.	Check U35A and associated components.																				
4	Release LOCK. Remove signal from COUNTER INPUT. Ground U24-11.	Display reads 00.0000.	Check counter (U19 to U24), storage buffer (U30 to U32), BCD to 7-segment decoder (U7 to U12) and display (DS2 to DS7) associated with incorrect digit.																				

Table 8B-27. Up/Down Counter And Display Troubleshooting (3 of 3)

Step	Instructions	Normal Indication	If Indication Abnormal		
5	Remove ground from U24-11. Reconnect signal to COUNTER INPUT. Set frequency for display shown below. For each frequency, release and depress LOCK. Measure period at U13C-10. NOTE: X indicates DON'T CARE.	NOTE: External counter still uses external oscillator as external time base.	Check counter (U19 to U24), storage buffer (U30 to U32), BCD to 7-segment decoder (U7 to U12), and display (DS2 to DS7) associated with incorrect digit. If no signal is present or second digit from right (DS3) is incorrect also, check U2A, U13C and U28.		
				Display	Measured Period ( $\mu$ s)
				08.8888 or 08.8889	08.8888 or 08.8889
				Depress EXPAND X10	07.7777 7.XXXXX 8.XXXXX
<b>Overflow Detector (A8A2A1)</b>					
1	Connect 10.1 MHz, 1 Vrms signal to COUNTER INPUT. Depress EXPAND X10. Measure U5B-9.	TTL low.	Check U34B, U5 and associated components.		
		OVERFLOW light on.	Check Q18, DS8 and associated components.		
2	Set oscillator to 9.9 MHz.	OVERFLOW light goes off.	Check U34B, U5 and associated components.		
<b>Time Base Vernier (A8A2A2)</b>					
1	Switch TIME BASE VERN out of CAL.	UNCAL lamp on.	Check S1 and DS9.		
2	Tune TIME BASE VERN over its range (except not into detent). Measure wiper of R1.	Varies 0 to $\approx$ 5 Vdc.	Check Q2, S1, R1, R2 and DS9.		
<b>+1/2 Digit (A8A2A2)</b>					
1	Set counter source to INT. Depress LOCK. Depress +1/2 DIGIT.	New least significant digit, "5" appears.	Check DS1, Q1 and associated components. LSD line should be low.		

## SERVICE SHEET 17

### DESCRIPTION

- Counter Phase Lock Circuits

### PRINCIPLES OF OPERATION

#### Initiation of Phase Lock (A8A2A1)

The lock mode is entered as follows: Cross-coupled NAND gates U3A and U3B form an RS flip-flop. The output of U3A is low in the count-up mode and goes high after the LOCK button is depressed and TIME BASE goes low. U3A remains high until LOCK is released. Transistor Q1 and diodes CR1 and CR2 form an OR gate, with TIME BASE and LOCK switch as inputs.

When the phase lock error exceeds a predetermined limit, an error condition exists. A low appears at the input to NAND gate U16A and at the input to NAND gate U3D of the cross-coupled pair formed by U3C and U3D (RS flip-flop). The output of U3D goes high and turns on the Flash Oscillator (Service Sheet 20). The output of U3C is normally high, but goes low when an error exists (if U3A is high). The output of NAND gate U16C is low when phase lock exists. This is true when the output of U3A is high (i.e., the LOCK button has been depressed and after TIME BASE has gone low) and the output of U3C is high (i.e., in addition no error exists). The output of U16C is delayed by the resistor-capacitor network of R38 and C7 and inverted by U4D which enables the Stall Counter and the main counter. When excessive error occurs, the output of U16C goes high and the counter breaks phase lock (reverts to count mode). Phase lock is re-established when the LOCK button is released and depressed again. As an aid to troubleshooting, TP4 can be grounded to prevent the error condition from reaching U3D.

#### Phase Detector Circuit (A8A2A1)

A phase error is sensed in the Null Phase Detector by detecting the difference in time of occurrence of COUNTER LOAD (the 999 999 count of the counter; see Service Sheet 20) and the TIME BASE signal. D flip-flops U26A and U26B and NAND gate U16B form the phase detector. When phase locked, both set (S) inputs are high. Between the low occurrences of COUNTER LOAD and TIME BASE, the outputs (pins 5 and 9) of both U26A and U26B are low. If COUNTER LOAD goes high first, the pin 9 of U26B goes high first. When TIME BASE goes high, pin 5 of U26A goes high. Both inputs of NAND gate U16B are now high so the output goes low, and after a slight delay through resistor-capacitor network R1 and C1 and OR gate U14A both flip-flops are cleared. Since U26B was triggered first, its pin 8 output remained low longer than the pin 6 output of U26A. If a high on TIME BASE had occurred first, the opposite would have been true. If both occur simultaneously, both outputs remain high for an equation duration.

The pins 6 and 8 output pulses of U26A and U26B are increased in duration by a Pulse Width Stretcher and then drive Current Sources which charge and discharge storage capacitors C4 and C32. When the pin 8 output of U26B goes low it turns on current source Q8. Capacitor C2 is at 10V when Q8 is off because the non-inverting input of amplifier U29A is at 10V; the output of U29A is also at 10V since with Q8 off no current flows through R7 and R11. When Q8 goes on, it begins discharging through C2. The output of U29A goes high to about 20V and remains at that voltage until Q8 switches off and C2 charges slowly to about 10V. The charging and discharging of C2 has the effect of lengthening the time that the output of U29A is at 20V. Current source Q7 is on when the output of U29A goes high. In a similar manner, amplifier U29B goes high and turns on current source Q12 when the pin 6 output of U26A goes low. Current source Q7 charges capacitors C4 and C32 and Q12 discharges them. Any phase difference from the phase detector results in a net charge or discharge (i.e., an increase or decrease in voltage) of C4 and C32. FET Q6 is a high impedance buffer amplifier which drives buffer Q11. Q11 drives the Phase Lock Loop Filter (Service Sheet 7) which drives the varactor anode. In the unlocked mode U26A and U26B are both set and cleared, i.e., pins 5, 6, 8 and 9 are simultaneously high, the current sources Q13 and Q14 are switched on to bias C4 and C32 at a nominal mid-range voltage.

### **Error Detector (A8A2A1)**

If the phase lock tune voltage from Q11 is too high or too low, the limit of the lock range is exceeded. The excessive error is sensed by transistors Q2 and Q15. The emitter of Q2 is held at a positive dc reference by VR1 and R33 to bias Q2 on. If the base of Q15 is too low, Q15 turns off; its collector goes high and turns off Q2. If the base of Q15 is high, Q15 saturates. At this point, an increase in base voltage will force an increase in collector voltage (collector tracks base) and ultimately turn Q2 off. When Q2 turns off, a low exists at pin 2 of U16A. This low represents an excessive error causing the Flash Oscillator to trigger and the counter to break phase lock (revert to count-up mode).

### **Flash Oscillator (A8A2A1)**

When a phase lock error is detected, a Flash Oscillator is enabled to blink the display at a 3 Hz rate. When no error exists, the output of U3D is low which prevents the astable multivibrator (U15C, U4E, and associated components) from oscillating. When a phase lock error is detected U3D goes high. U15C now functions as an inverter. R96 and R97 bias U15C and U4E into the active region. U15C and U4E generate a 360 degree phase shift, which is coupled back to the input of U15C through C41—creating the conditions necessary for oscillation.

U17C buffers the oscillator output. When U17C is high, Storage Buffers U30, U31, and U32 (see Service Sheet 16) are disabled and their outputs go to a high impedance state which causes the Seven Segment Decoders to decode a blank for the displays.

## TROUBLESHOOTING

The phase detector circuits are troubleshot by observing the tune line from the detector as the two inputs are separately triggered (to simulate a phase error increase and decrease). The tune line is also observed for excessive ripple.

Go to the section in the table below which diagnoses the area where the fault is suspected. Start at the beginning of the section and follow it in sequence. Reset controls before going on to another section.

### Test Equipment

Oscilloscope .....	HP 1740A
Multimeter .....	HP 3355A
Voltage Divider Probe .....	HP 10004D

### Initial Test Equipment

Remove instrument top cover, trim strip and front window. Remove counter top cover and extend Counter/Lock Board Assembly. Refer to *Assembly/Disassembly Instructions, Service Sheet C*.

### Initial Control Settings

COUNTER MODE:	
EXPAND .....	Off
LOCK .....	Off
Source .....	EXT
Range .....	0-10 MHz
+1/2 DIGIT .....	Off
LINE .....	ON
TIME BASE (rear panel) .....	EXT

### Phase Locking Verification Test

A simple test of the locking range of the phase lock system should be made after completing any repair of the Counter or before beginning troubleshooting of a phase lock problem. Proceed as follows:

1. Set the COUNTER MODE to INT with no expand or lock. Set FM to OFF.
2. Press LOCK. The instrument should acquire and hold lock indefinitely.
3. After locking, rotate the FINE TUNE knob 1/4 turn cw. The instrument should remain locked.
4. Rotate the FINE TUNE knob an additional 1/2 turn cw. The instrument should break lock as indicated by a blinking display.
5. Release, then depress LOCK again. The instrument should again acquire lock.
6. Rotate the FINE TUNE knob 1/4 turn ccw. The instrument should remain locked.
7. Rotate the FINE TUNE knob an additional 1/2 turn ccw. The instrument should break lock.

Failure of the instrument to break lock with 3/4 of a turn in either direction often indicates a misadjustment of A8A2A1R58. See Phase Lock Error Voltage Adjustment Section 5.



Table 8B-28. Counter Phase Lock Circuits Troubleshooting (1 of 2)

Step	Instructions	Normal Indication	If Indication Abnormal
<b>Lock Switching (A8A2A1)</b>			
1	Set TIME BASE (rear panel) to INT. Measure U16C-8.	TTL high.	Check U3A, U3B, and U16C. U3A-3 should be low.
2	Measure U3D-11.	TTL low.	Check U3C and U3D. U3D-13 should be high.
3	Ground TP4. Depress LOCK. Measure Q1-e.	Low going pulses, $\approx 2$ Vpp, 100 Hz, 0.5 to 1.5 $\mu$ s wide. NOTE: Oscilloscope trace will be very faint.	Check Q1, CR1, CR2, and associated components. The anode of CR2 should be $\approx 0.2$ Vdc.
4	Measure U16C-8.	TTL low.	Check U3 and U16C.
5	Measure U4D-8 and U4F-12.	TTL high.	Check U4D, U4F, R38, and C7.
<b>Phase Detector Circuits (A8A2A1)</b>			
1	Measure TP6.	10 to 12 Vdc. If correct go to step 7.	Continue on with steps 2 to 6.
2	Measure U26A-5, U26A-6, U26B-8, and U26B-9.	TTL high. NOTE: A simultaneous set and clear gives Q and $\bar{Q}$ high.	Check U14A, U16B, U15D, U26, and associated components. U15D-12 should be high. U15D-11, U14A-3, and U16B-6 should be low.
3	Measure Q8-c and Q9-c.	9.7 to 10.3 Vdc.	Check Q8, Q9, U29, and associated components. U29A-1 should be 9.7 to 10.3 Vdc.
4	Measure U29A-1 and U29B-7.	9.7 to 10.3 Vdc.	Check U29 and associated components.
5	Measure Q6-g.	9.7 to 10.3 Vdc.	Check Q6, Q7, Q10, Q12, Q13, Q14 and associated components. Q13 and Q14 should be saturated (i.e., $V_{CE} \approx 0.2$ Vdc).
6	Measure Q11-b.	0.5 to 2V greater than Q6-g.	Check Q6. Otherwise check Q11.
7	Ground TP4. Depress LOCK. Set TIME BASE (rear panel) to INT then back to EXT (sets U16C-8 to low). Momentarily ground U14A-1 (clears U26). Measure TP6. NOTE: In performing the following steps, transients may cause lock to break. If so, repeat this step.	4 to 17 Vdc and stable.	Check U26, U29, Q8, Q9, and associated components. U15D-11 should be high. U26A-5 and U26B-9 should be low.
8	Momentarily ground U26B-11 (clocks U26B). Measure TP6.	Voltage rises to 15 to 18 Vdc.	Check U26B, U29A, Q7, Q8, and associated components. Q8-c should be 4.5 Vdc. U29A-1 should be 20 Vdc. Q13-c and Q14-c should be same voltage as Q6-g.
9	Momentarily ground U14A-1 (clears U26). Measure TP6.	4 to 17 Vdc and stable.	Check U26B, Q14, and associated components. U26B-9 should be low.
10	Momentarily ground U26A-3 (clocks U26A). Measure TP6.	Voltage drops to 4 to 7 Vdc.	Check U26A, U29B, Q4, Q12, and associated components. Q9-c should be 4.5 Vdc. U29B-7 should be 20 Vdc.
11	Momentarily ground U14A-1 (clears U26). Measure TP6.	4 to 17 Vdc and stable.	Check U26A, Q13, and associated components. U26A-5 should be low.

Table 8B-28. Counter Phase Lock Circuits Troubleshooting (2 of 2)

Step	Instructions	Normal Indication	If Indication Abnormal
12	Depress EXPAND X10. Repeat steps 8 to 11.	Same as steps 8 to 11.	Check Q16, Q17, and associated components.
13	Remove ground from TP4. Set TIME BASE (rear panel) to INT. Release EXPAND X10. Release then depress LOCK. Measure TP6 (ac couple oscilloscope).	Low frequency ripple (50 to 400 Hz) less than 200 mVpp.	There likely is a leakage path (either to ground or to +20V) at the gate of Q6. Check Q6 first, then check Q7, Q12, Q13, Q14, C4, C17, and C18. NOTE: Other forms of residual FM can be caused by microphonics, noise (ripple or popcorn type) on power supply lines to RF Oscillator, noisy Phase Lock Loop Filter (see Service Sheet 3), or noisy RF Oscillator.
14	Release LOCK. Depress EXPAND X10. Depress LOCK. Measure TP6.	Low frequency ripple (5 to 40 Hz) less than 200 mVpp.	
<b>Error Detector (A8A2A1)</b>			
1	Ground TP4. Depress LOCK. Momentarily ground U26A-3. Measure U16A-3.	TTL high.	Check Q2, Q15, U16A, and associated components. U16A-2 should be low. TP6 should be 4 to 7 Vdc.
2	Momentarily ground U14A-1 then momentarily ground U26B-11. Measure U16A-3.	TTL high. <b>NOTE:</b> A wait of a few seconds may be necessary.	Check Q2, Q15, U16A, and associated components. U16A-2 should be low. TP6 should be 15 to 18 Vdc.
<b>Flash Oscillator (A8A2A1)</b>			
1	Remove signal from COUNTER INPUT. Depress LOCK.	Display blinks at a 3 Hz rate.	Check U3D-11 for TTL high. (See Service Sheet 17.) If high, check U15C, U4C, U17D, and associated components. If low see Lock Switching.
2	Release LOCK.	Blinking ceases.	See Lock Switching.

## SERVICE SHEET 18

### DESCRIPTION

- Power Supply Circuits

### Principles of Operation

#### General

The power supply assemblies provide five regulated dc supply voltages. The characteristics and locations of each regulator are as follows:

Table 8B-29.

Supply Voltage	Voltage Regulation	Limiting Current	Assembly Number	SS No.
+44.6V	± 10 mV	1A	A20	22
+20V	± 10 mV	0.7A	A22	22
+5.2V	± 10 mV	2.25A	A20	22
-5.2V	± 10 mV *	1.75A	A18	23
-20V	± 10 mV	0.7A	A22	22

\*With a temperature coefficient of  $-4.2 \text{ mV}/^\circ \text{C}$ .

#### Input Voltage

Main ac power enters the A14 Line Power Assembly, which contains the primary line fuse, an RFI filter, and a printed circuit card switch which matches the transformer primary windings to the appropriate line voltage. Power transformer T1 has a separate secondary winding for each regulator. The A12 Rectifier Assembly contains five full-wave rectifiers.

#### +5.2V Regulator (A20)

The +5.2V Regulator is a linear series type with current foldback for over-current protection and a crowbar for over-voltage protection. The Voltage Regulator amplifier U1 compares the output voltage with the (internal) divided-down reference voltage and drives transistor Q2 which in turn drives the Series Regulator Transistor Q1 (chassis mounted) to regulate the current through it.

Current foldback is activated when the voltage drop across (and hence the current through) R25 and R26 exceeds the voltage drop across R19. The base-to-emitter junction between pins 1 and 10 of U1 (see note on schematic) is then forward biased which reduces the drive to the Series Regulator transistor. As shown in Figure 8B-4, short-circuit current is quite low.

The output crowbar consisting of Q1, VR6, R23, and R24 protects against over-voltage outputs (due for example to a shorted series pass transistor). An output voltage greater than about 6.2V triggers Q1 which conducts and causes current foldback or blows F1. Light-emitting diode DS2 is on only if the output voltage is high enough to allow VR5 to conduct but not high enough to activate the crowbar. Diode CR3 protects the regulator against reverse polarity load voltages. Diode CR4 protects Q1 against reverse bias.

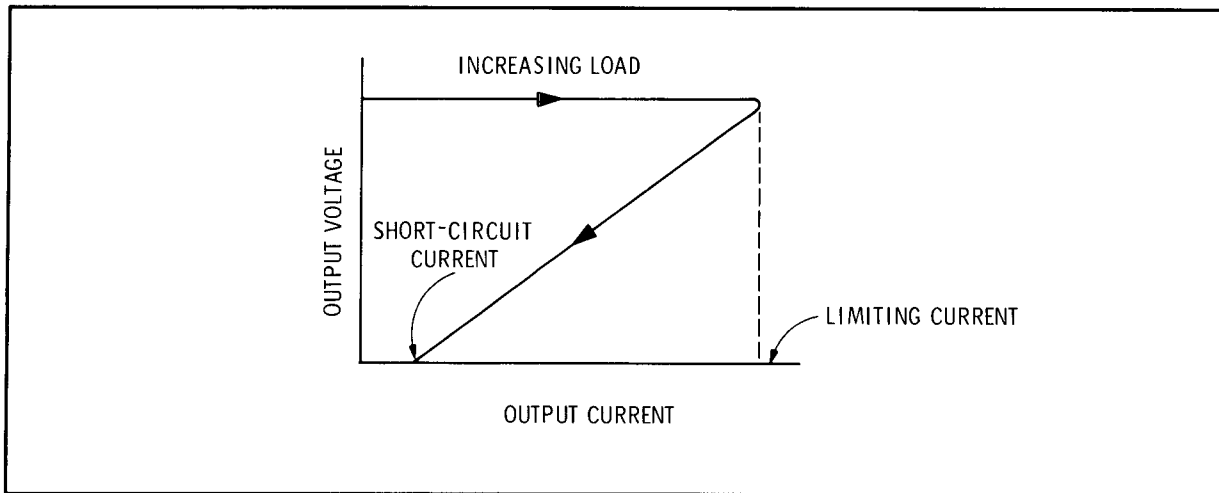


Figure 8B-4. Current Foldback

### +20V Regulator (A22)

The +20V Regulator functions similarly to the +5.2V Regulator, except that the output voltage is reduced by the voltage divider formed by R5, R6, and R7 and is referenced to the voltage across VR6. Also, the series pass transistor base-emitter junction is not in the current foldback circuit, resulting in a larger short-circuit output current.

### -20V Regulator (A22)

The -20V Regulator functions identically to the +20V Regulator, except that the -20V output is taken from the point corresponding to the ground point on the +20V regulator, and the -20V ground return is connected to a point that corresponds to the +20V output.

### +44.6V Regulator (A20)

The +44.6V Regulator functions similarly to the +5.2V Regulator, except that the output voltage is reduced by the voltage divider formed by R7, R8, and R9 and is applied to the non-inverting input of the comparison amplifier of U2 (pin 3). The reference voltage (from pin 4) is applied to the inverting input (pin 2). The Series Regulator transistor Q3 (chassis mounted) is in the regulator return line and is driven by Q4. The two transistors are in an inverted-Darlington configuration (which is common emitter instead of emitter follower as in the +5.2V Regulator). Components of Q3, Q6, R1, and R2 form a constant current source which sinks the current from pin 6 of U2 and the base of Q4. Q5 provides foldback current limiting.

## TROUBLESHOOTING

It is assumed that one of the light-emitting diodes is not lit or that ripple, noise, or voltage from one of the power supplies is suspect. Troubleshoot by using the test equipment listed below, performing the initial test conditions, and following the procedures outlined in the text and the table.

### Test Equipment

Digital Voltmeter ..... HP 3455A  
 Oscilloscope ..... HP 1740A

### Initial Test Conditions

Top cover removed (Refer to General Removal Procedures). Use extender board to extend desired assembly (set instrument LINE power switch to OFF while removing or inserting circuit boards).

### Initial Control Settings

LINE ..... ON

### Rectifiers (A12)

If one or two rectifier diodes in one of the bridge rectifiers are defective, ripple and noise could increase without affecting the supply's average voltage or output current. Use the oscilloscope to measure ripple and noise; connect the probe from the test points given below to chassis ground.

Table 8B-30.

Supply	Test Point	Typical Ripple and Noise
+44.6V	A20TP1	<0.7 Vpp
+20V	A22TP1	<0.5 Vpp
+5.2V	A20TP6	<1 Vpp
-20V	A22TP6	<0.3 Vpp
-5.2V	A18TP1	<0.8 Vpp

If one of the supplies is out of specification, check the rectifier diodes, filter capacitors, and associated components. Also check the Series Regulator transistor.

If noise on a supply appears to be excessive, check the reference (either internal or external) and its associated filter capacitor and the regulator amplifier. Noise may either be of the broadband type (i.e., white noise) or it may consist of random jumps in level on the order of 1 mV (i.e., popcorn noise).

### Regulator Circuits (A20 and A22)

The first step in solving a power supply problem is to ensure that the problem is caused by the power supply. Minimum load resistances are given in the table for each supply. However, depending upon the ohmmeter and resistance range used, measured resistance can vary from a few ohms to several kilo ohms. So unless the load is actually shorted to ground, measuring load resistance doesn't always isolate the problem.

Another way to isolate a power supply problem is to disconnect the supply from the load and check the supply voltage. The quickest way to do this is to unsolder and lift pins on the extender board. However, under some failure conditions, the regulator integrated circuit can regulate correctly with the load removed from the power supply and yet cannot regulate correctly when the supply has its current load.

To isolate a power supply problem to a specific circuit, use the data given in the table.

## Regulator Circuits (A20 and A22)

The first step in solving a power supply problem is to ensure that the problem is caused by the power supply. Minimum load resistances are given in the table for each supply. However, depending upon the ohmmeter and resistance range used, measured resistance can vary from a few ohms to several kilo ohms. So unless the load is actually shorted to ground, measuring load resistance doesn't always isolate the problem.

Another way to isolate a power supply problem is to disconnect the supply from the load and check the supply voltage. The quickest way to do this is to unsolder and lift pins on the extender board. However, under some failure conditions, the regulator integrated circuit can regulate correctly with the load removed from the power supply and yet cannot regulate correctly when the supply has its current load.

To isolate a power supply problem to a specific circuit, use the data given in the table.

### NOTE

*The voltmeter input must float (i.e., both connections must be ungrounded) when checking voltages with extender board pins open.*

### WARNING

*Any adjustment, maintenance, and repair of the opened instrument under voltage should be avoided as much as possible and, if inevitable, should be carried out only by a skilled person who is aware of the hazard involved.*

*Capacitors inside the instrument may still be charged even if the instrument has been disconnected from its source of supply.*

*Make sure that only fuses with the required rated current and of the specified type (normal blow, time delay, etc.) are used for replacement. The use of repaired fuses and the short-circuiting of fuseholders must be avoided.*

*Any interruptions of the protective (grounding) conductor inside or outside the instrument or disconnection of the protective earth terminal is likely to make the instrument dangerous. Intentional interruption is prohibited.*

*Whenever it is likely that the protection has been impaired, the instrument must be made inoperative and be secured against any unintended operation.*

Table 8B-31. Power Supply Troubleshooting

Component or Circuit	Test Conditions and Control Settings	Normal Indication	If Indication is Abnormal
-20V Regulator	<p>Remove A22 assembly. Measure resistance from A17XA22-1 to chassis ground.</p> <p>Open pins 5 and 26 on extender board. Extend A22 assembly and check voltage from A22 board pin 5 to A20TP9.</p> <p>Check diodes and transistors for correct operation with voltage applied. Check components for correct resistance.</p>	<p><math>&gt;30 \Omega</math></p> <p><math>-20 \pm 0.1V</math></p> <p>Correct operation and resistance.</p>	<p>Check supply load circuits for short.</p> <p>Check A 22U1 and supply load circuits.</p> <p>Replace faulty component.</p>
+20V Regulator	<p>Remove A22 assembly. Measure resistance from A17XA22-7 to chassis ground.</p> <p>Open pins 7 and 24 on extender board. Extend A22 assembly and check voltage from A22TP5 to TP4.</p> <p>Check diodes and transistors for correct operation with voltage applied. Check components for correct resistance.</p>	<p><math>&gt;26 \Omega</math></p> <p><math>+20 \pm 0.1V</math></p> <p>Correct operation and resistance.</p>	<p>Check supply load circuits for short.</p> <p>Check A22U2 and supply load circuits.</p> <p>Replace faulty component.</p>
+5.2V Regulator	<p>Remove A20 assembly. Measure resistance from A17XA20-4, 7 to chassis ground.</p> <p>Open pins 4, 27, 7, and 24 on extender board. Extend A20 assembly and check voltage from A20 board pin 1 to A20TP10.</p> <p>Check diodes and transistors for correct operation with voltage applied. Check components for correct resistance.</p>	<p><math>&gt;3 \Omega</math></p> <p><math>+5.2 \pm 0.15V</math></p> <p>Correct operation and resistance.</p>	<p>Check supply load circuits for short.</p> <p>Check A20U1 and supply load circuits.</p> <p>Replace faulty component.</p>
+44.6V Regulator	<p>Remove A20 assembly. Measure resistance from A17XA20-15 to chassis ground.</p> <p>Open pins 13 and 18 on extender board. Extend A20 assembly and check voltage from A20 board pin 13 to A20TP4.</p> <p>Check diodes and transistors for correct operation with voltage applied. Check components for correct resistance.</p>	<p><math>&gt;45 \Omega</math></p> <p><math>+44.6 \pm 0.1V</math></p> <p>Correct operation and resistance.</p>	<p>Check supply load circuits for short.</p> <p>Check A20U2 and supply load circuits.</p> <p>Replace faulty component.</p>

## SERVICE SHEET 19

### DESCRIPTION

- **-5.2V Supply and Fan Driver**

### PRINCIPLES OF OPERATION

#### **-5.2V Supply**

The -5.2V Supply consists of a linear series-type regulator and a crowbar for over-voltage protection. The voltage regulator, A17U1 provides current limiting to approximately 3 amps maximum and is fused at 2 amps.

The output crowbar consisting of Q3, VR2, R6 and R7 protects against over-voltage outputs. An output voltage greater than about -6.2V triggers Q3 which conducts and causes current foldback or blows F1. Light-emitting diode DS1 is ON only if the output voltage is high enough to allow VR3 to conduct but not high enough to activate the crowbar.

#### **Fan Motor (B1) and Fan Driver (A18)**

Fan Motor A16B1 is a brushless, DC motor. 12.2 Vdc is supplied to the fan motor. The 12.2 Vdc is derived from supplying +7 Vdc to one side of the motor and -5.2 Vdc to the other. The +7 Vdc is coarsely regulated and non-adjustable.

The +7 Vdc is based on the voltage level at TP1. Any voltage at TP1 above 10 Vdc will be regulated to +7 Vdc at TP4. Any voltage below +7 Vdc at TP1 will cause a corresponding drop from +7 Vdc at TP4.



### TROUBLESHOOTING

It is assumed that the light-emitting diode is unlit or that ripple, noise, or voltage from the -5.2V power supply is suspect, or that the fan is operating erratically or not at all. Troubleshoot by using the test equipment listed below, performing the initial test conditions, and following the procedures outlined in the text and the table.

#### Test Equipment

Digital Voltmeter .....	HP 3455A
Oscilloscope .....	HP 1740A

#### Initial Test Conditions

Top cover removed (refer to *Assembly/Disassembly Instructions, Service Sheet G*. Use extender board to extend desired assembly (set instrument LINE power switch to OFF while removing or inserting circuit boards).

#### Initial Control Settings

LINE .....	ON
------------	----

#### -5.2V Supply Circuits (A18)

The first step in solving a power supply problem is to ensure that the problem is caused by the power supply. Minimum load resistances are given below for the supply. However, depending upon the ohmmeter and resistance range used, measured resistance can vary from a few ohms to several kilohms. So unless the load is actually shorted to ground, measuring load resistance doesn't isolate the problem.

Another way to isolate a power supply problem is to disconnect the supply from the load and check the supply voltage. The quickest way to do this is to unsolder and lift pins on the extender board. However under some failure conditions, the regulator integrated circuit can regulate correctly with the load removed from the power supply and yet cannot regulate correctly when the supply has its correct load.

To isolate a power supply problem to a specific circuit, use the data given in the table.

startnote The voltmeter input must float(i.e., both connectors must be ungrounded) when checking voltages with extender board pins open. finishnote

#### Fan Driver

If the fan is not being supplied with the correct voltage, it may not operate. Check A18TP4 for +7 Vdc and A18TP3 for -5.2 Vdc. If the supply voltages are incorrect, use the table to isolate the problem to a specific circuit.

If these voltages are correct, the fan is probably defective and should be replaced. Check that the fan blades are not obstructed.

Table 8B-32. -5.2V Supply and Fan Driver Troubleshooting

Component or Circuit	Test Conditions and Control Settings	Normal Indication	If Indication is Abnormal
-5.2V Supply	<p>Remove A18 assembly. Measure resistance from A17XA18-6, 14 to chassis ground.</p> <p>Open pins 15 and 16 on extender board. Extend A18 assembly and check voltage from A18 board pin 15 to A18TP3.</p> <p>Check diodes and transistors for correct operation with voltage applied. Check components for correct resistance.</p>	<p><math>&gt; 3\Omega</math></p> <p><math>-5.2\pm 0.1V</math></p> <p>Correct operation and resistance.</p>	<p>Check supply load circuits for short.</p> <p>Check A17U1 and supply load circuits.</p> <p>Replace faulty component.</p>
Fan Driver	Measure voltages applied to motor at A18TP3 and A18TP4	<p>TP3 <math>-5.2Vdc\pm 0.1V</math></p> <p>TP4 <math>+7Vdc\pm 0.5V</math></p>	Check appropriate components. Check A18TP1 for +10Vdc (approximately).

# HP 8640B SIGNAL GENERATOR

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**volume 2**  
SERVICE MANUAL



HEWLETT  
PACKARD

*Service Information Index*

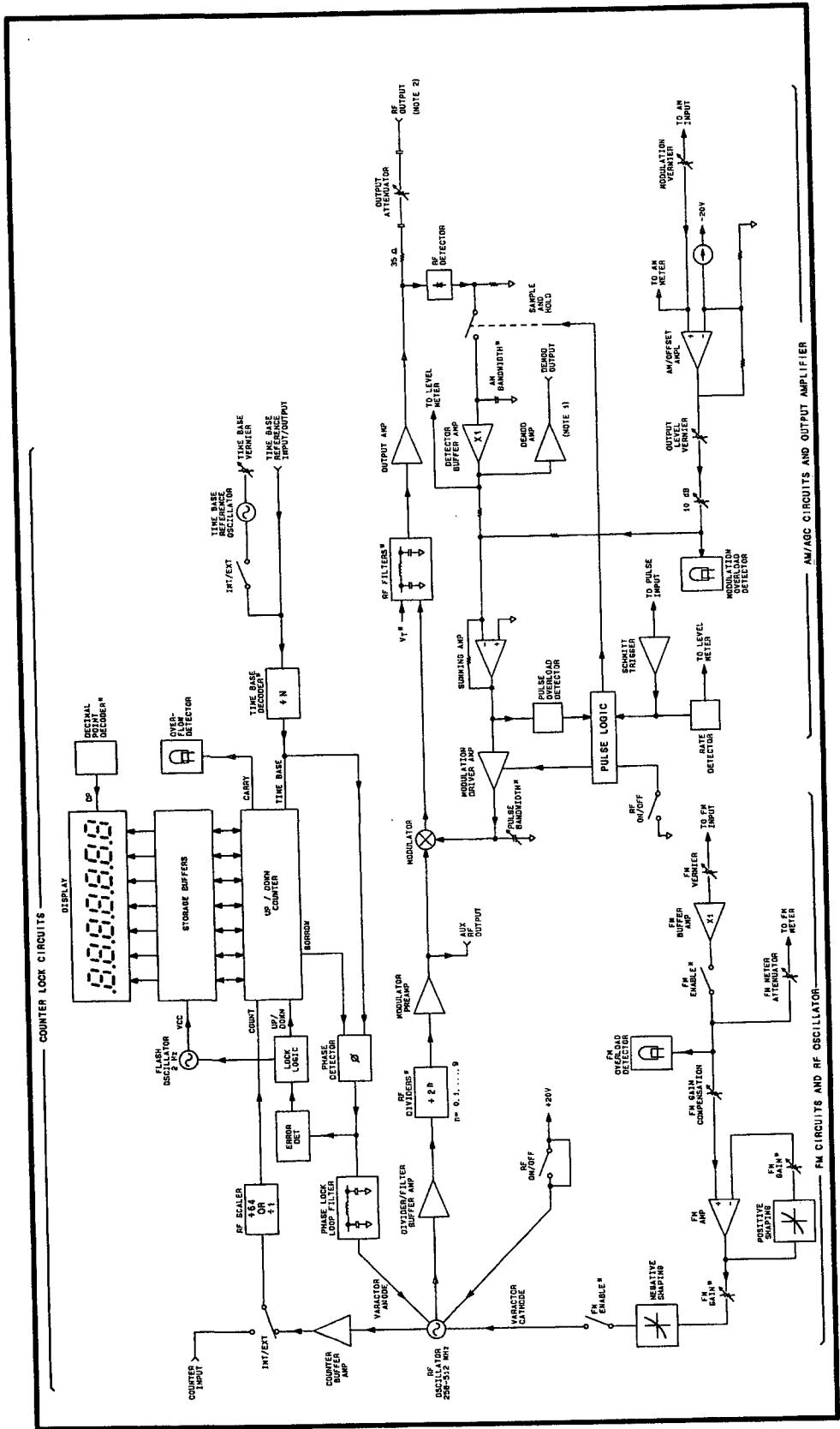
Assembly <sup>1</sup>		Service Sheet Number		
		Block Diagram	Schematic <sup>2</sup>	Illustrated Parts Breakdown <sup>3</sup>
A1	Output Level Assembly (Standard)	3A	9A, 9B, 9C, 12A	A
A1	Output Level 1 dB Assembly (Option 004)	3C	9A, 9C, 12B	A
A2	Meter Switch and Drive Assembly	3	13	
A3	RF Oscillator Assembly	2	1, 2	B
A5	FM Amplifier Assembly	2	2	
A6	Annunciator Assembly	3	4,13	
A7	FM Shaping Assembly	2	3, 4	
A8	Counter/Lock Assembly	4	14, 15, 16, 17	C
A9	Peak Deviation and Range Switch Assembly	2	2, 3, 4, 11, 15	D
A10	Divider/Filter Assembly	3	6,7	B
A11	Fixed-Frequency Modulation Oscillator Assembly (Standard)	2	5A	
A11	Variable-Frequency Modulation Oscillator Assembly (Option 001)		5B	E
A12	Rectifier Assembly		18	
A13	Modulation/Metering Motherboard Assembly	2, 3	2, 5A, 5B, 10, 21	
A14	Line Power Assembly		18	B
A15	Riser Assembly		10, 11,12	
A17	Power Supply Motherboard		20	B
A18	-5.2V Supply and Fan Driver Assembly	2	19	
A19	Output Level 10 dB Assembly (Option 004)	3C	9A, 9C, 12B	A
A20	+5.2V and +44.6V Regulator Assembly	2	18	
A21	Reverse Power Protection Assembly (Option 003)	3B	9C	
A22	+20V and -20V Regulator Assembly	2	18	
A24	Series Regulator Assembly		18	
A26	AM/AGC and RF Amplifier Assembly (Standard)	3A	8A, 9A, 10, 11A, 12A	F
A26	AM/AGC and RF Amplifier Assembly (Option 002)	3B	8B, 9B, 10,11A	F
A26	AM/AGC and RF Amplifier Assembly (Option 004)	3C	8C, 9A, 10, 11B, 12B	F

<sup>1</sup> Odd numbered assemblies and their sub-assemblies are accessible from the bottom of the instrument. Even numbered assemblies and their sub-assemblies are accessible from the top of the instrument. See Service Sheets G and H.

<sup>2</sup> Assembly Principles of Operation, Troubleshooting, and Component Locators have the same Service Sheet number.

<sup>3</sup> Assembly/Disassembly Instructions have the same Service Sheet character as the Illustrated Parts Breakdown.

NOTES:  
 1. For option 004 only.  
 2. Refer to BD1 of 2) to see the RF output circuitry for Options 002 and 003.  
 \* Controlled by Ramp Switch.



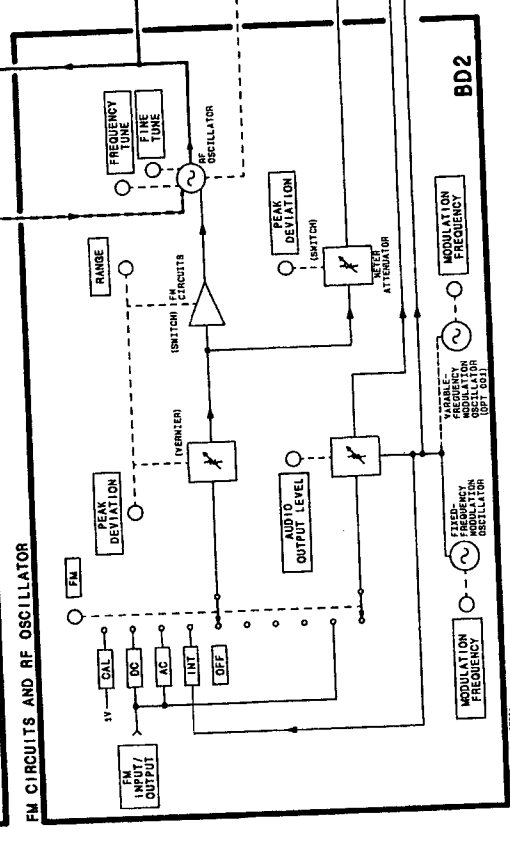
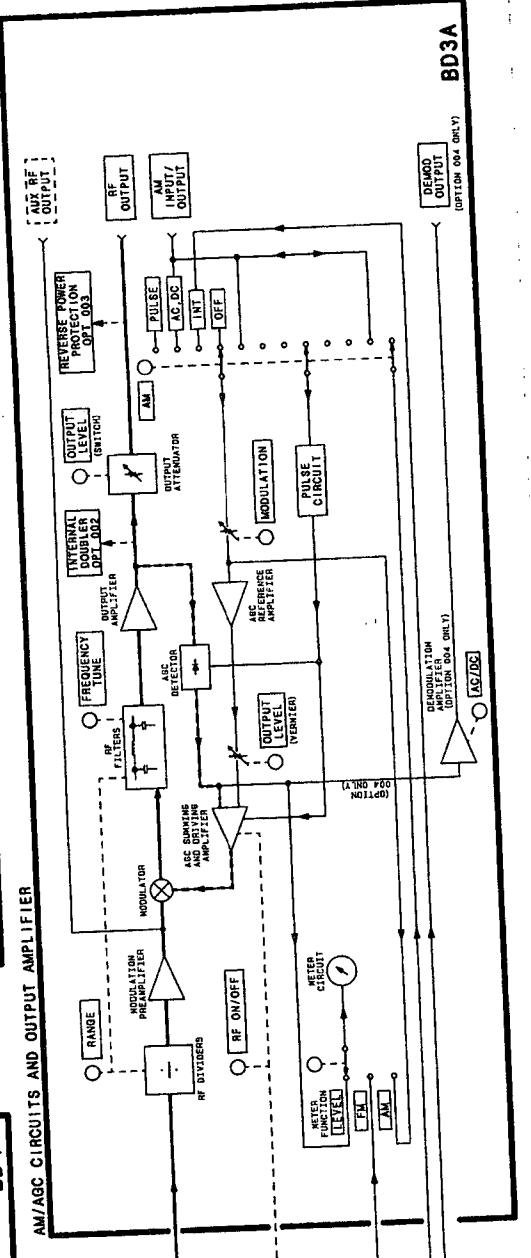
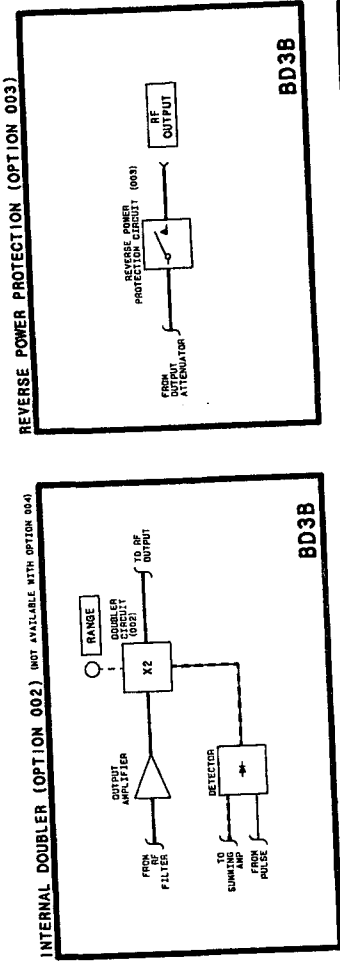
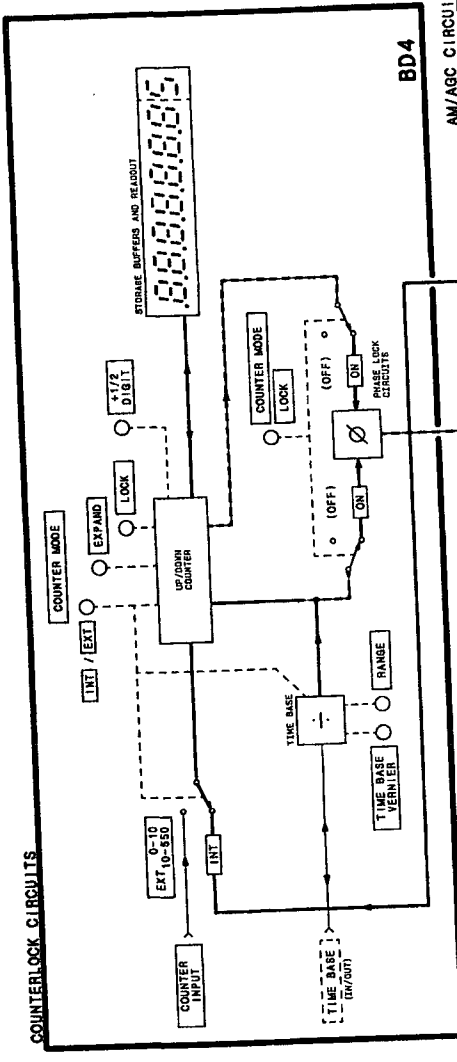
OVERALL BLOCK DIAGRAMS

SEE REVERSE SIDE

(STANDARD)

**BD 1**

(1 OF 2)

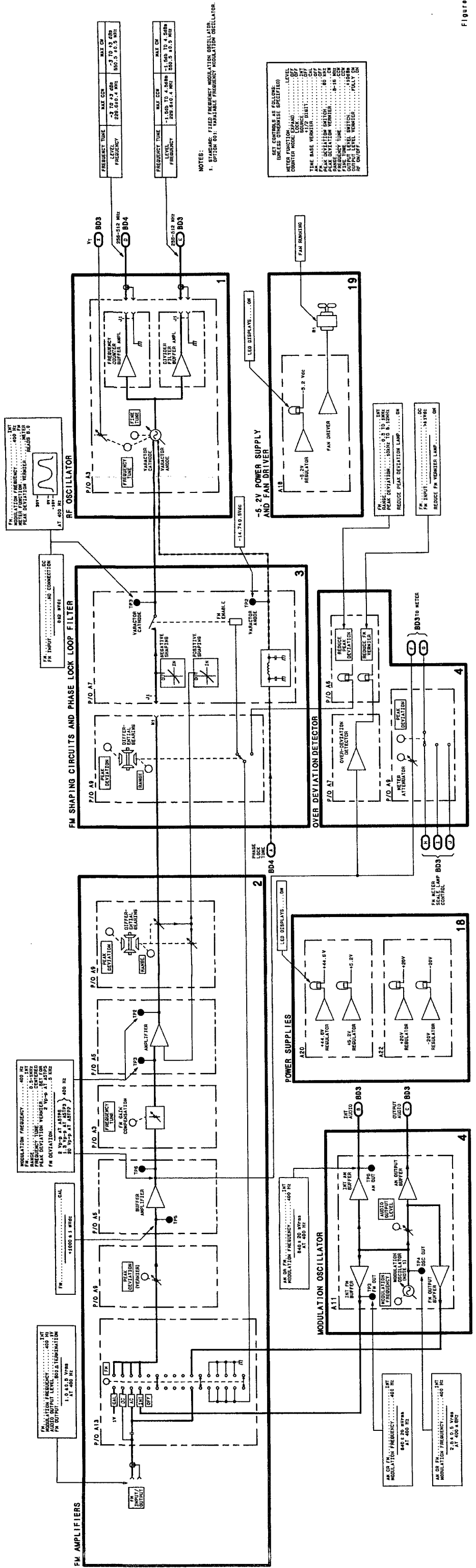


OVERALL BLOCK DIAGRAMS

**BD 1**

SEE REVERSE SIDE (STANDARD AND OPTIONS) (2 OF 2)





NOTES:  
 1. STANDARD: FIRED FREQUENCY MODULATION OSCILLATOR.  
 2. OPTION 00-1: VARIABLE FREQUENCY MODULATION OSCILLATOR.

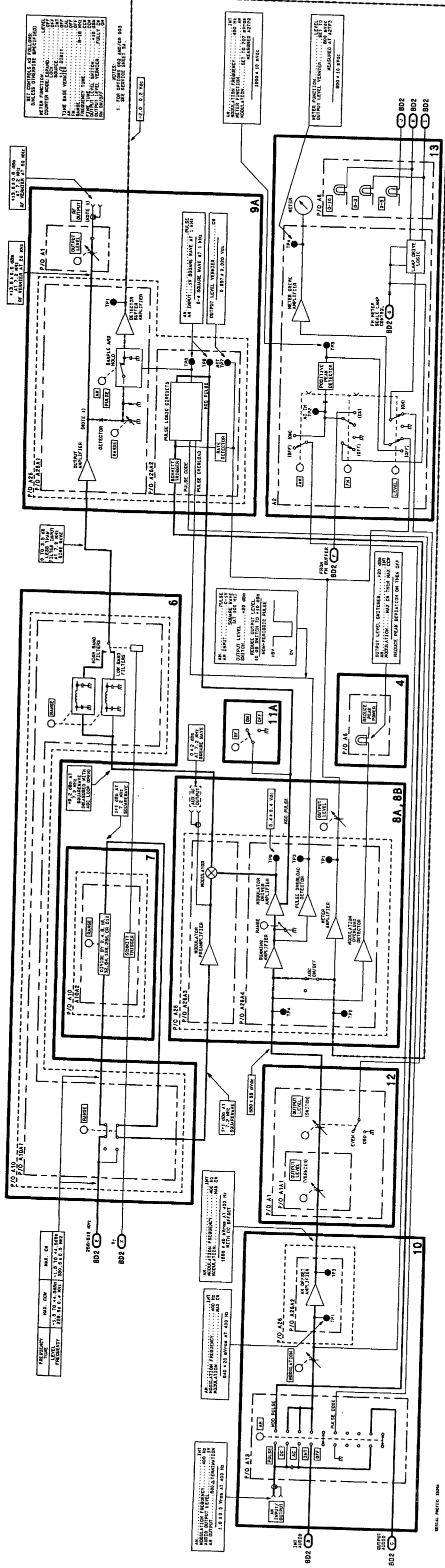
BD2  
 BD3  
 Figure 8C-3  
 8C-5

FM CIRCUITS AND RF OSCILLATOR

**BD2**

SEE REVERSE SIDE

(STANDARD AND OPTION 001)



1. FOR OPERATOR AND/OR 003  
SEE SERVICE SHEET 3A

13.9 TO 13.95 MHz  
RF VENTILATOR AT 13.95 MHz

13.9 TO 13.95 MHz  
RF VENTILATOR AT 13.95 MHz

0 TO 3.3 GHz  
13.9 TO 13.95 MHz  
RF VENTILATOR AT 13.95 MHz

0 TO 3.3 GHz  
13.9 TO 13.95 MHz  
RF VENTILATOR AT 13.95 MHz

0 TO 3.3 GHz  
13.9 TO 13.95 MHz  
RF VENTILATOR AT 13.95 MHz

0 TO 3.3 GHz  
13.9 TO 13.95 MHz  
RF VENTILATOR AT 13.95 MHz

0 TO 3.3 GHz  
13.9 TO 13.95 MHz  
RF VENTILATOR AT 13.95 MHz

0 TO 3.3 GHz  
13.9 TO 13.95 MHz  
RF VENTILATOR AT 13.95 MHz

0 TO 3.3 GHz  
13.9 TO 13.95 MHz  
RF VENTILATOR AT 13.95 MHz

0 TO 3.3 GHz  
13.9 TO 13.95 MHz  
RF VENTILATOR AT 13.95 MHz

0 TO 3.3 GHz  
13.9 TO 13.95 MHz  
RF VENTILATOR AT 13.95 MHz

0 TO 3.3 GHz  
13.9 TO 13.95 MHz  
RF VENTILATOR AT 13.95 MHz

0 TO 3.3 GHz  
13.9 TO 13.95 MHz  
RF VENTILATOR AT 13.95 MHz

0 TO 3.3 GHz  
13.9 TO 13.95 MHz  
RF VENTILATOR AT 13.95 MHz

0 TO 3.3 GHz  
13.9 TO 13.95 MHz  
RF VENTILATOR AT 13.95 MHz

0 TO 3.3 GHz  
13.9 TO 13.95 MHz  
RF VENTILATOR AT 13.95 MHz

BD9A  
Figure 8C-4

RETAIL PRICE \$250

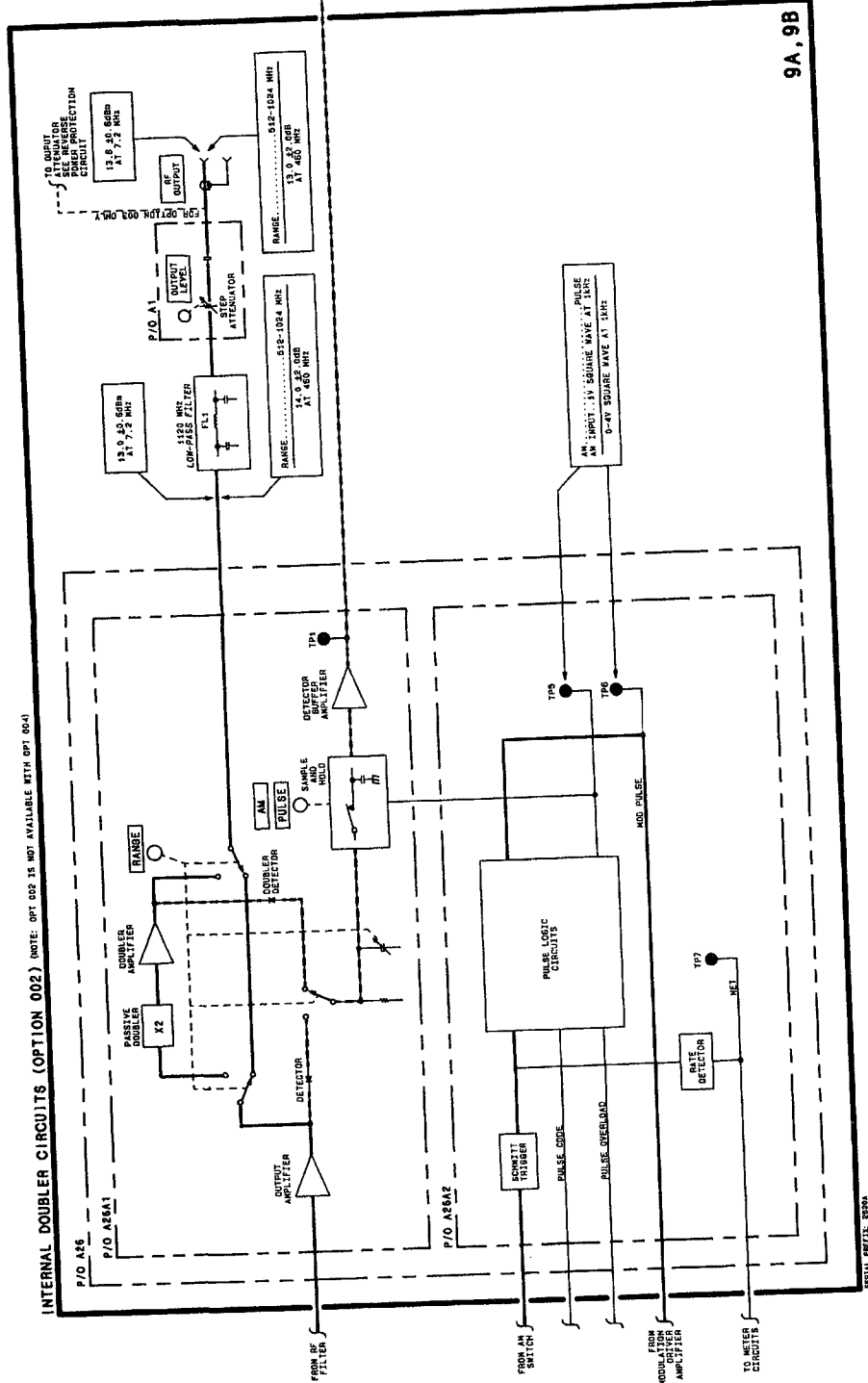
AM/AGC CIRCUITS AND  
OUTPUT AMPLIFIER

**BD3A**  
(STANDARD)

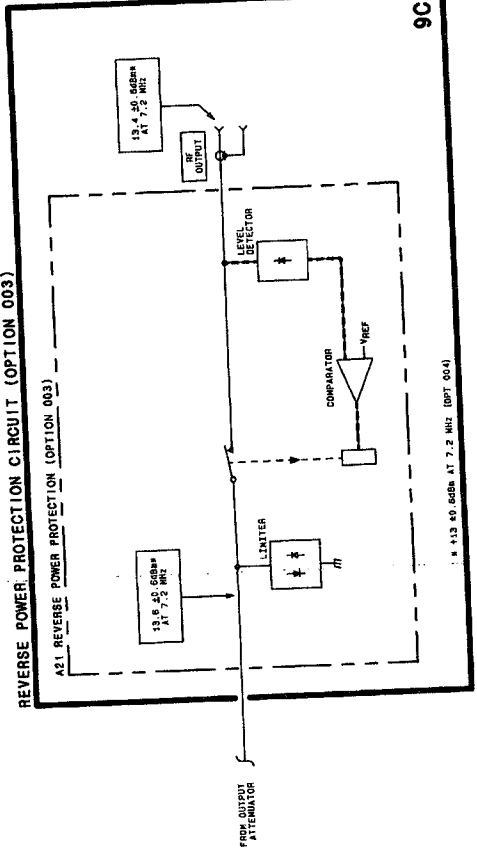
SEE REVERSE SIDE

SET CONTROLS AS FOLLOWS  
(UNLESS OTHERWISE SPECIFIED)

METER FUNCTION: EXPAND.....LEVEL  
 COUNTER MODE: INT.....OFF  
 SOURCE: 112 DIGIT.....CAL  
 TIME BASE: VERN.....OFF  
 RANGE: 10.....OFF  
 RANGE: TIME.....8-18MHz  
 OUTPUT LEVEL SWITCH: FULLY ON  
 RT: ON/OFF.....FULLY ON



9A.9B



9C

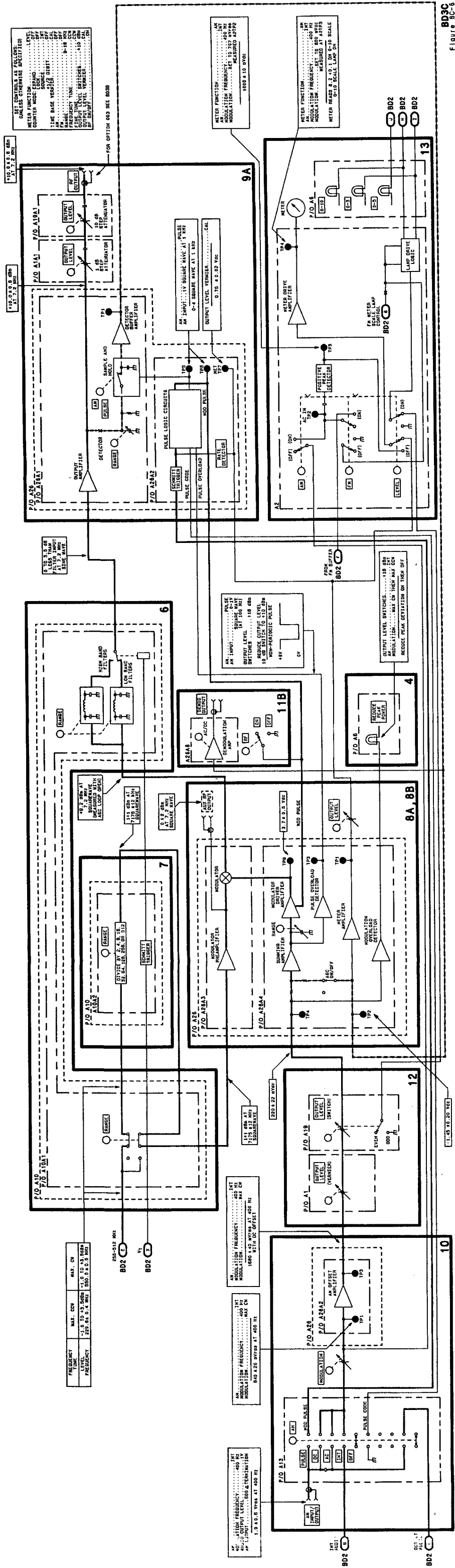
RD3B  
 Figure 8C-5  
 8C-9

INTERNAL DOUBLER AND  
REVERSE POWER PROTECTION

**BD3B**

(OPTIONS 002 AND 003)

SEE REVERSE SIDE



BD3C  
Figure 8C-6  
BD-11

SCHEMATIC DATA

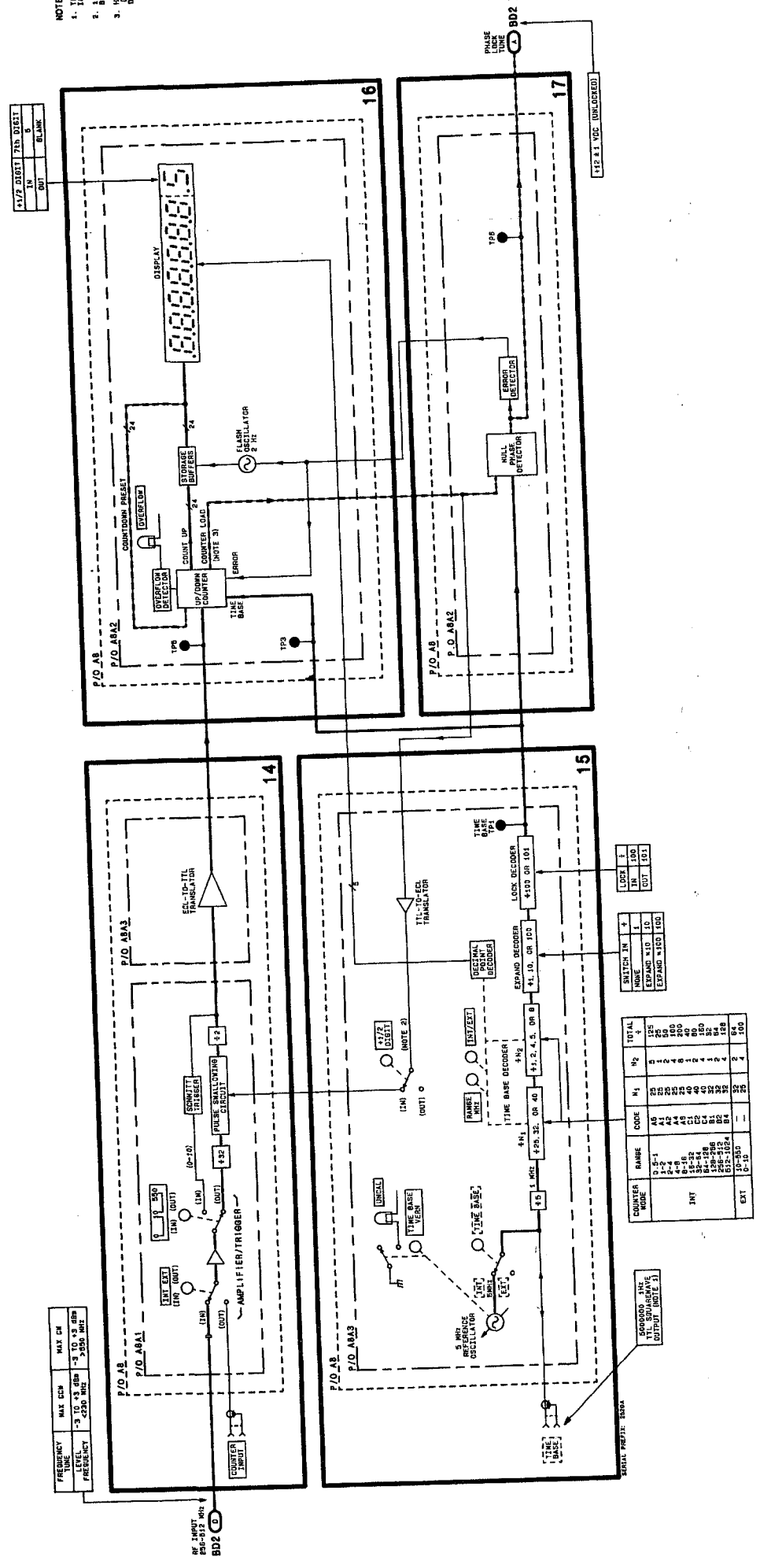
AM/AGC CIRCUITS AND  
OUTPUT AMPLIFIER

**BD3C**  
(OPTION 004)

SEE REVERSE SIDE



- NOTES:
1. THE TIME BASE AND REGULATION ARE 1.4 Mhz.
  2. INPUTS 11 IS PROGRESSIVE MEGA LOCK.
  3. HEAVY DASHED LINE WITH ARROWS INDICATES DOWN/PHASE LOCK SIGNAL FLOW.



FREQUENCY	MAX CH	MAX CW
-3 TO 13 MHz	-3 TO 12 MHz	1.4 MHz
< 250 MHz	< 250 MHz	> 250 MHz

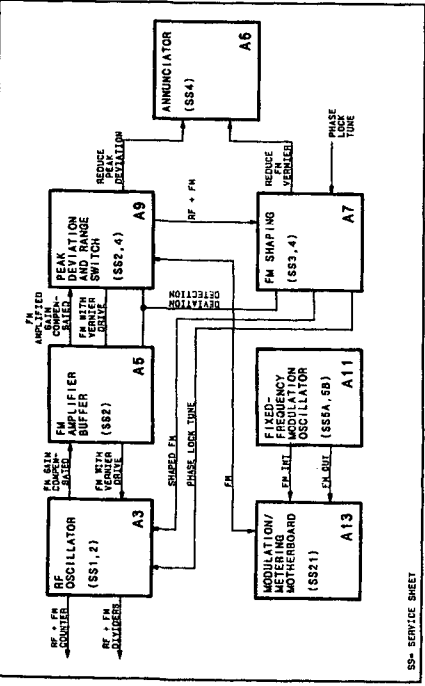
11.2.1.1 VCC (UNLOCKED)	IN	OUT

SWITCH IN	1	2	3	4
LOCK	100	100	100	100
EXT	100	100	100	100

COUNTER MODE	RANGE	CODE	N1	N2	TOTAL
INT	3-5-1	43	23	4	23
	2-4	43	23	4	100
	4-16	43	23	8	200
	32-64	43	23	16	400
EXT	10-20	43	23	4	84
	20-40	43	23	8	168
	40-80	43	23	16	336
	80-160	43	23	32	672

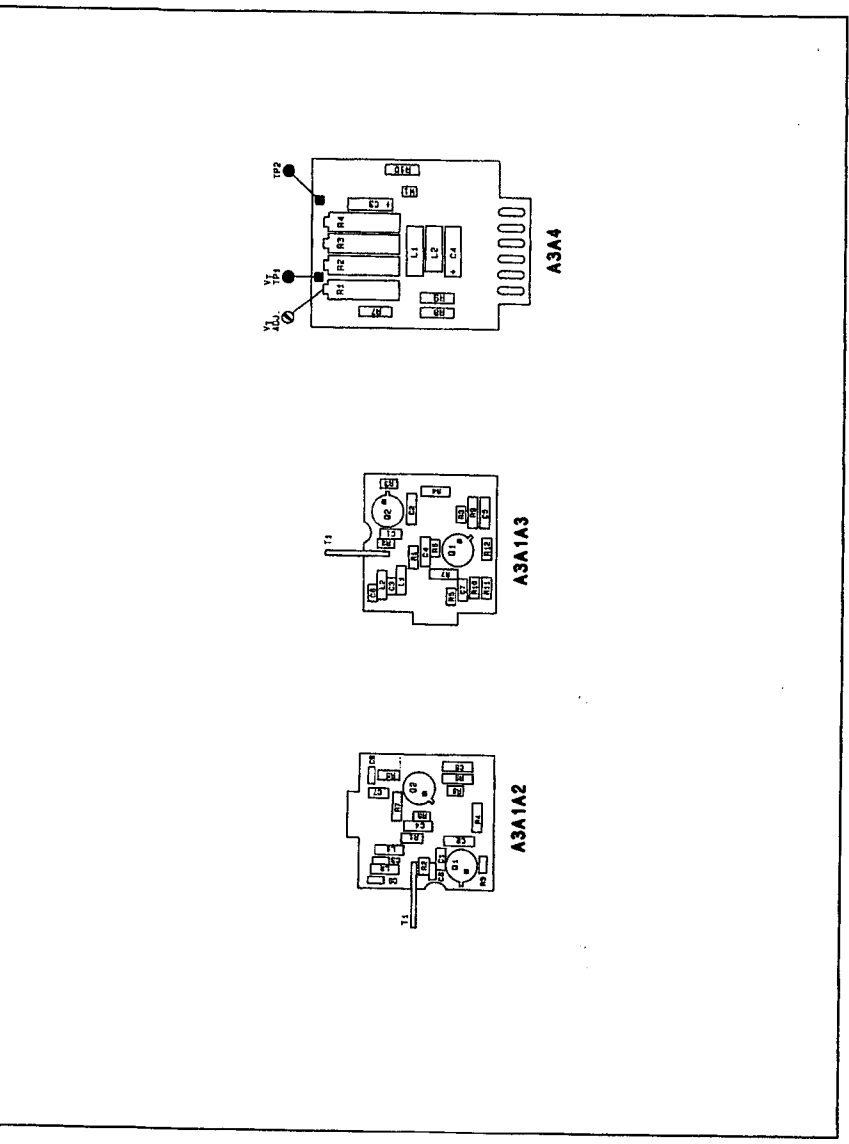
SWITCH IN	1	2	3	4
LOCK	100	100	100	100
EXT	100	100	100	100

BD4  
Figure 8C-7  
8C-13



Reference Block Diagram

SS- SERVICE SHEET

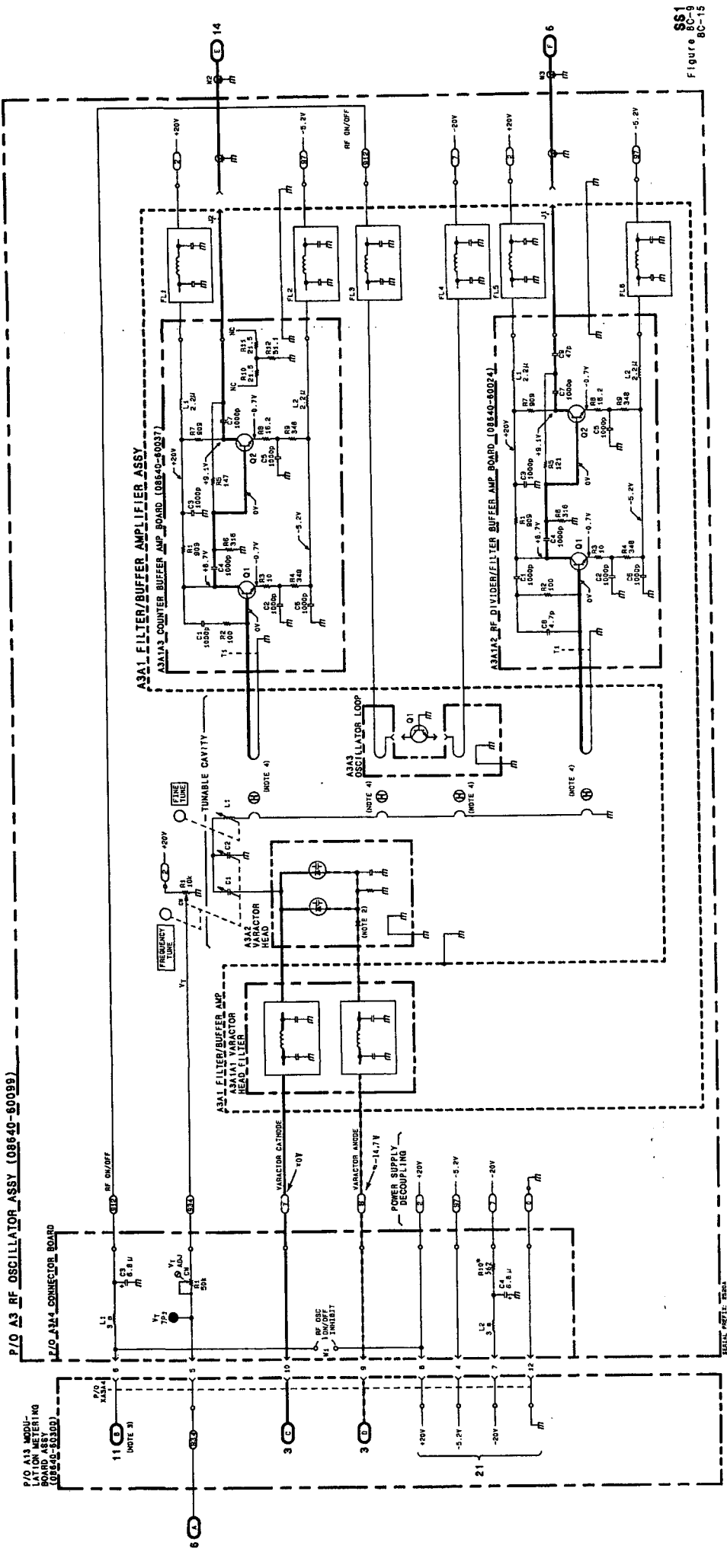


Component Locators

Figure 80-8 Service Sheet 1 Information.

- NOTES
1. For an explanation of schematic symbols, see "Schematic Diagram Notes" in Section 8.
  2. For troubleshooting, measured resistance of resistor ends to is approximately 61.0M ohms.
  3. For Standard/DT 802/DT 803 see SS11A. For DT 804 see SS11B.
  4. RF coupling by magnetic (M) field.

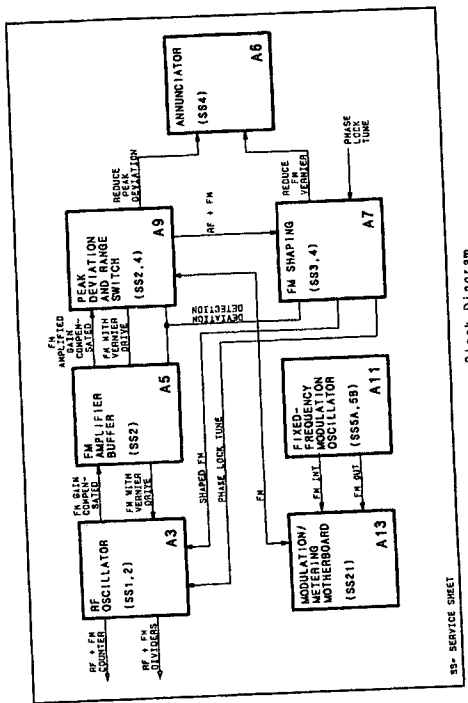
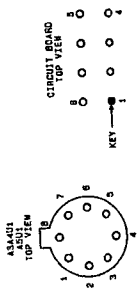
COUNTER/LOCK CIRCUITS  
BLOCK DIAGRAM  
BD4



881  
FIGURE 8C-15

Service

- NOTES:
1. For an explanation of schematic symbols, see "Schematic Diagrams" in section 6.
  2. All voltage are with FM switch set to OFF. Tolerance is 5%.  
3. Interconnecting cable points to print wiring pin positions on A8 and A13 are identical.
  4. For staggered/offset 002/001 003/004 see SSA. For 001 002 see SSB.



SP- SERVICE SHEET

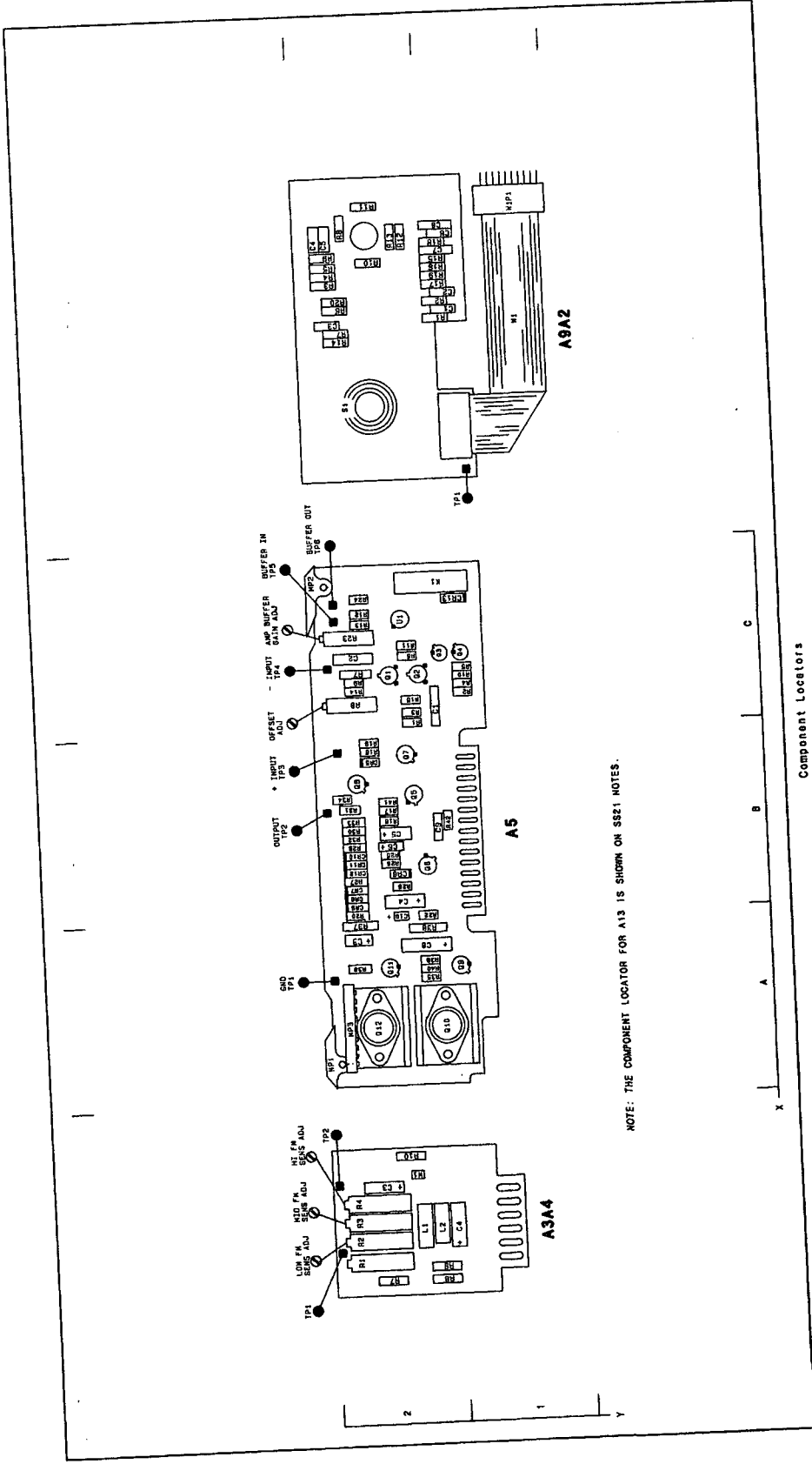
Reference Block Diagram

Component Coordinates		COMP X,Y		COMP X,Y		COMP X,Y		COMP X,Y		COMP X,Y	
A3	SS1,2	11	11	11	11	11	11	11	11	11	11
A5	SS2	12	12	12	12	12	12	12	12	12	12
A9	SS2,4	13	13	13	13	13	13	13	13	13	13
A11	SS5A,5B	14	14	14	14	14	14	14	14	14	14
A13	SS21	15	15	15	15	15	15	15	15	15	15
A7	SS3,4	16	16	16	16	16	16	16	16	16	16
A8	SS4	17	17	17	17	17	17	17	17	17	17

SS1 RF OSCILLATOR (SIMPLIFIED DIAGRAM)

Schematic General Information

8C-16



NOTE: THE COMPONENT LOCATOR FOR A13 IS SHOWN ON SS21 NOTES.

Component Locators

Figure 8C-10 Service Sheet 2 Information.

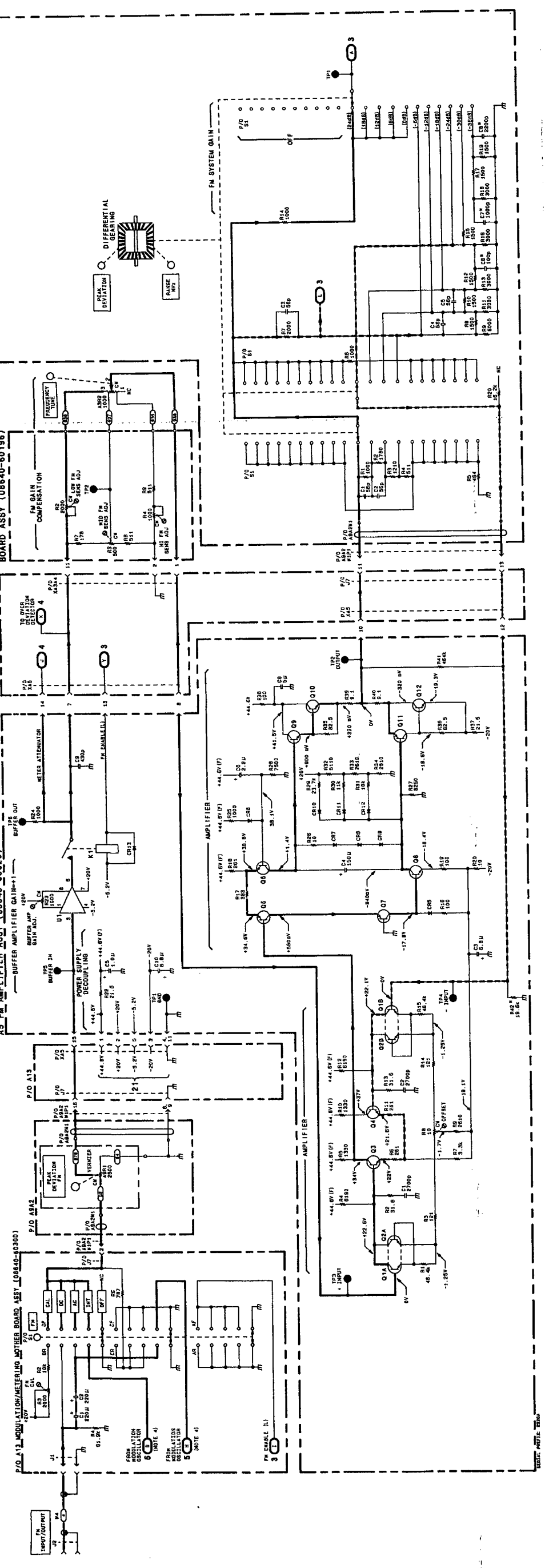
P/O A13 MODULATION/METERING MOTHER BOARD ASSY (08640-60300)

P/O A3A4 CONNECTOR BOARD ASSY (08640-60186)

A5 FM AMPLIFIER ASSY (08640-60029)

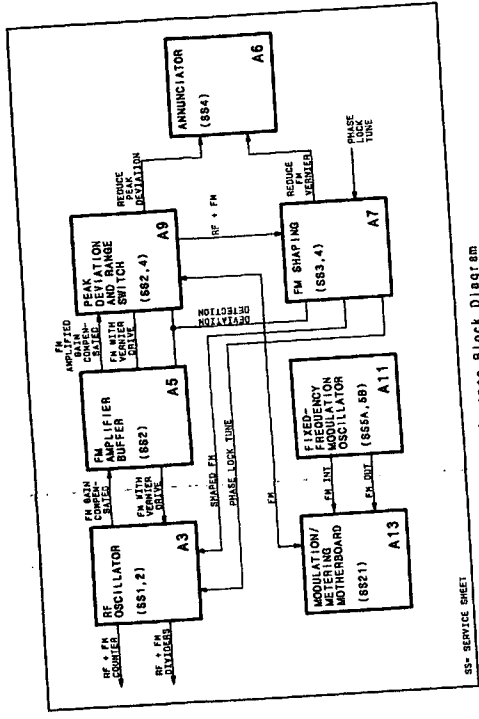
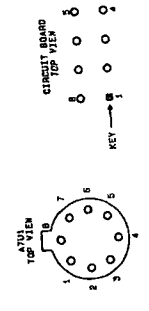
P/O A1J

P/O A8A2 FM GAIN SWITCH BOARD ASSY (08640-60308)



SERVICE

- NOTES:
1. For an explanation of schematic symbols, see "Schematic Diagram Notes" in Section 8.
  2. DC voltages are with counter mode lock switch set OFF; tolerance is ±10%.
  3. Interconnecting cable paint-to-paint wiring pin positions on A8 and A13 are identical.



COMP	X, Y	COMP	X, Y	COMP	X, Y	COMP	X, Y	COMP	X, Y	COMP	X, Y	COMP	X, Y
U1	A.1	U2	A.2	U3	A.2	U4	A.2	U5	A.2	U6	A.2	U7	A.2
U8	A.2	U9	A.2	U10	A.2	U11	A.2	U12	A.2	U13	A.2	U14	A.2
U15	A.2	U16	A.2	U17	A.2	U18	A.2	U19	A.2	U20	A.2	U21	A.2
U22	A.2	U23	A.2	U24	A.2	U25	A.2	U26	A.2	U27	A.2	U28	A.2
U29	A.2	U30	A.2	U31	A.2	U32	A.2	U33	A.2	U34	A.2	U35	A.2
U36	A.2	U37	A.2	U38	A.2	U39	A.2	U40	A.2	U41	A.2	U42	A.2
U43	A.2	U44	A.2	U45	A.2	U46	A.2	U47	A.2	U48	A.2	U49	A.2
U50	A.2	U51	A.2	U52	A.2	U53	A.2	U54	A.2	U55	A.2	U56	A.2
U57	A.2	U58	A.2	U59	A.2	U60	A.2	U61	A.2	U62	A.2	U63	A.2
U64	A.2	U65	A.2	U66	A.2	U67	A.2	U68	A.2	U69	A.2	U70	A.2
U71	A.2	U72	A.2	U73	A.2	U74	A.2	U75	A.2	U76	A.2	U77	A.2
U78	A.2	U79	A.2	U80	A.2	U81	A.2	U82	A.2	U83	A.2	U84	A.2
U85	A.2	U86	A.2	U87	A.2	U88	A.2	U89	A.2	U90	A.2	U91	A.2
U92	A.2	U93	A.2	U94	A.2	U95	A.2	U96	A.2	U97	A.2	U98	A.2
U99	A.2	U100	A.2	U101	A.2	U102	A.2	U103	A.2	U104	A.2	U105	A.2

Schematic General Information

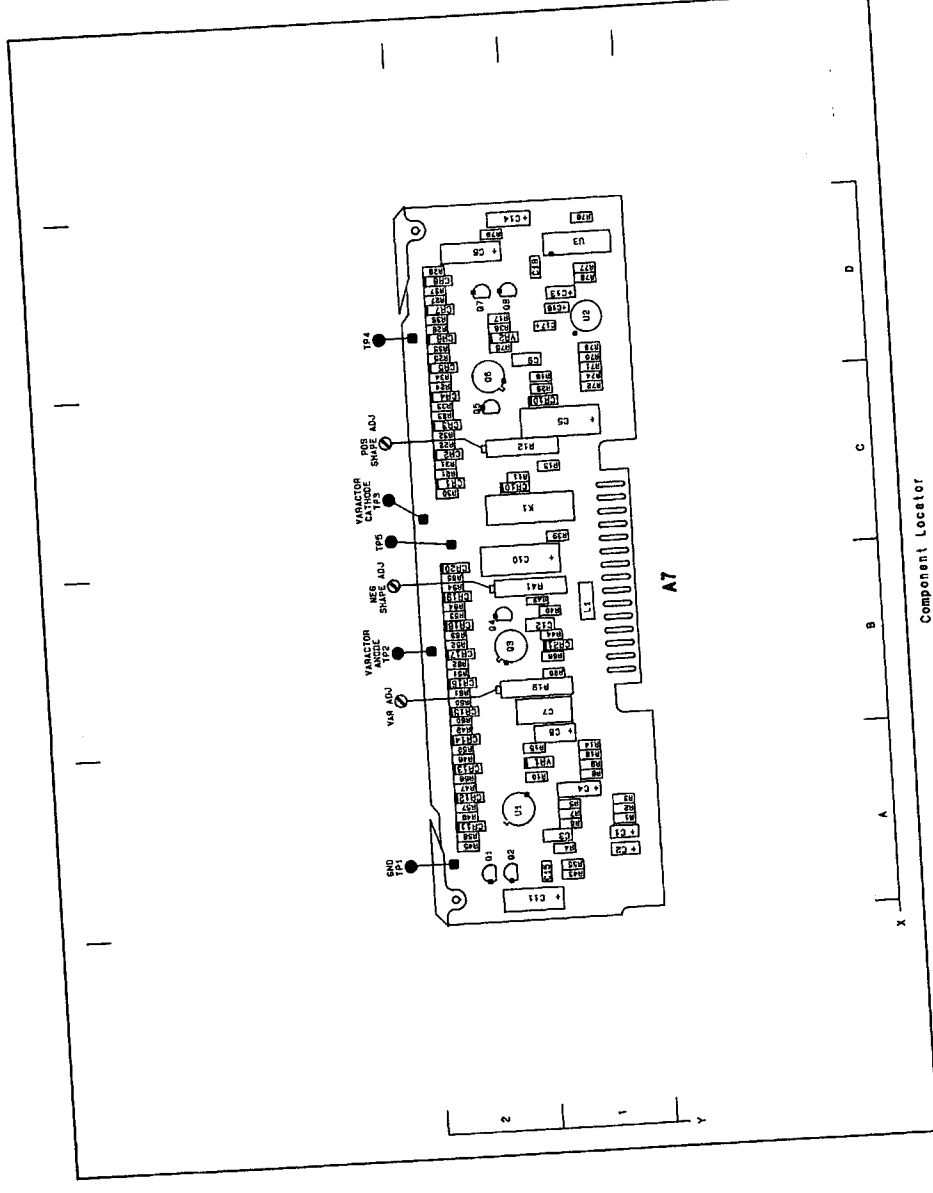
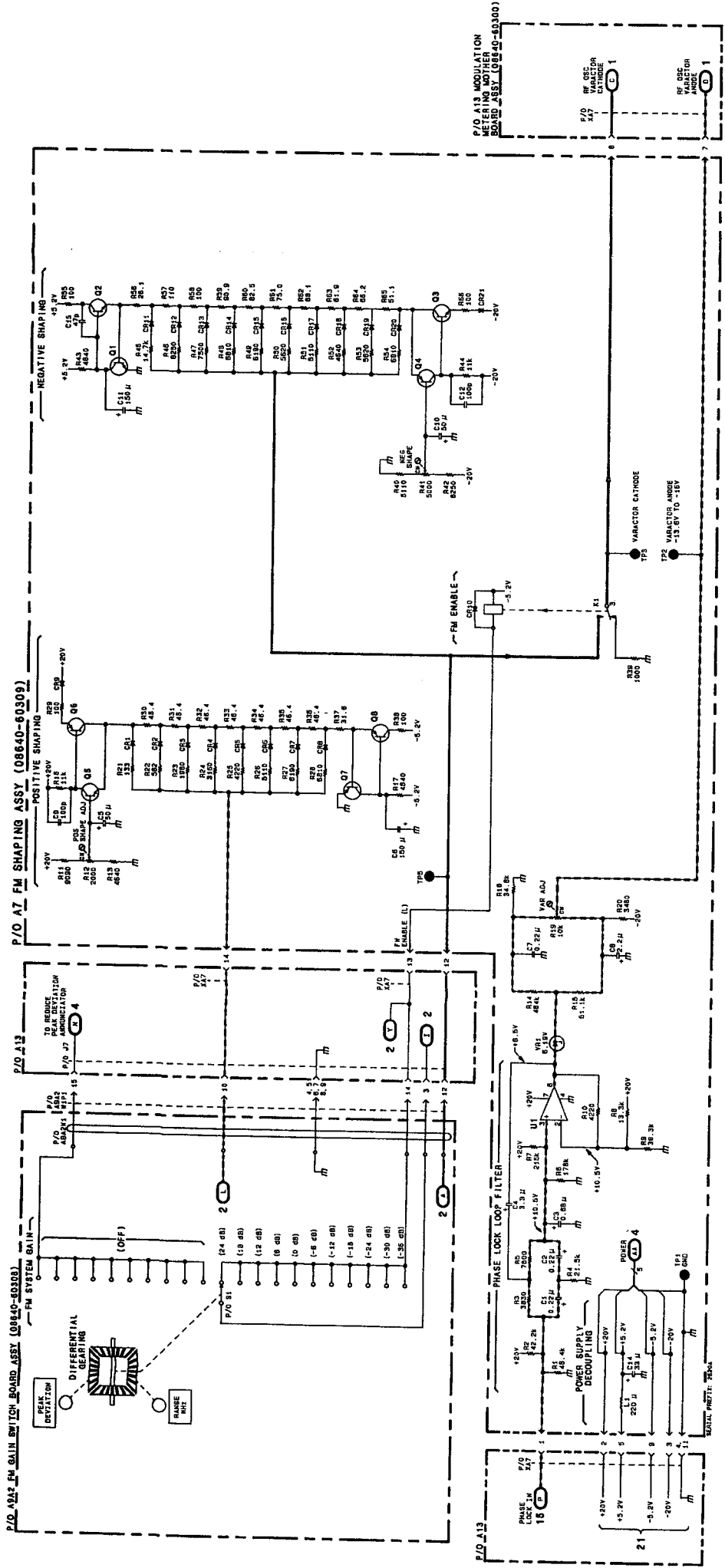


Figure 8C-12 Service Sheet 3 Information.

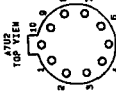
P/O A3A4, A5 FM AMPLIFIER



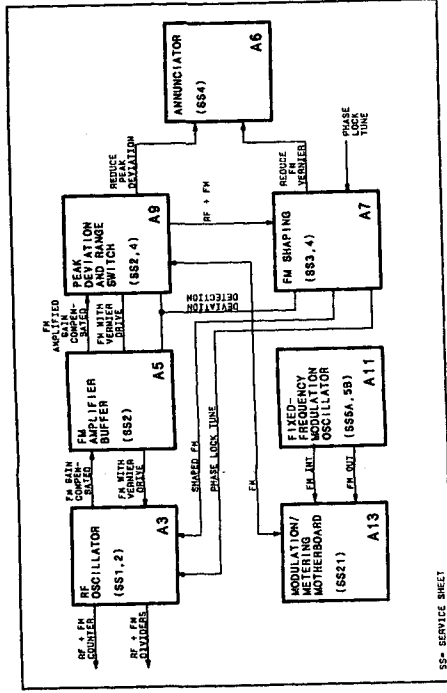
883  
Figure 8C-13

Service

- NOTES:
1. For an explanation of schematic symbols, see "Schematic Diagram Notes" in Section 5.
  2. ABA1 is grounded by contact to ABA2 through the rivets. In addition both assemblies are grounded to the chassis.
  3. For Resistor/DPT 002/DPT 003 use SS114. For DPT 004 use SS118.



Schematic General Information



SS- SERVICE SHEET

Reference Block Diagram

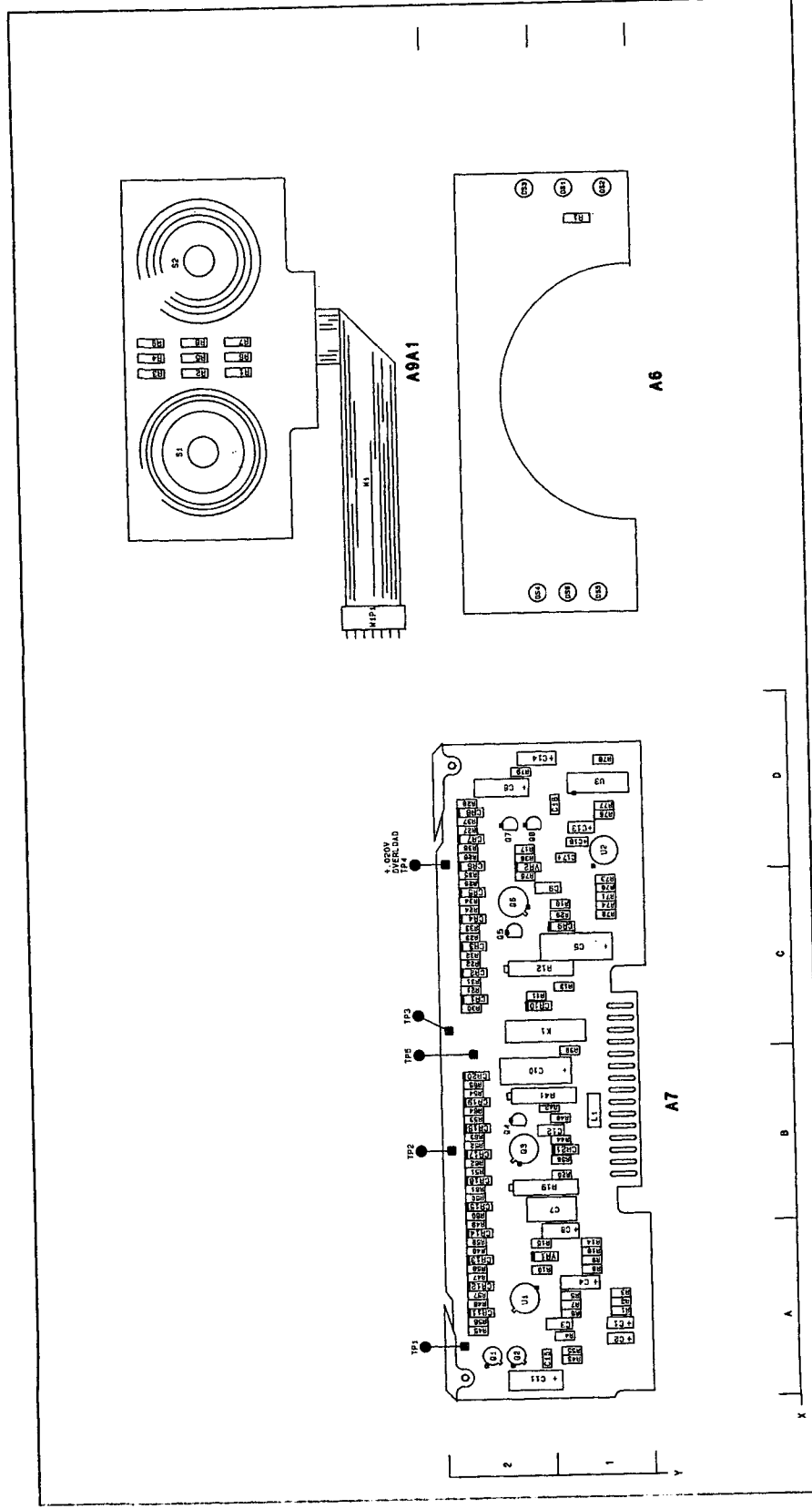
Component Coordinates

COMP	X,Y	COMP	X,Y	COMP	X,Y	COMP	X,Y	COMP	X,Y	COMP	X,Y
A7											
C13	D.1										
R70	D.1										
R71	D.1										
R72	D.1										
R73	D.1										
R74	D.1										
R75	D.1										
R76	D.1										
R77	D.1										
R78	D.1										
R79	D.2										
R80	D.2										
TP4	D.2										
U2	D.1										
U3	D.1										
VR2	D.2										

P/O A7

SS3

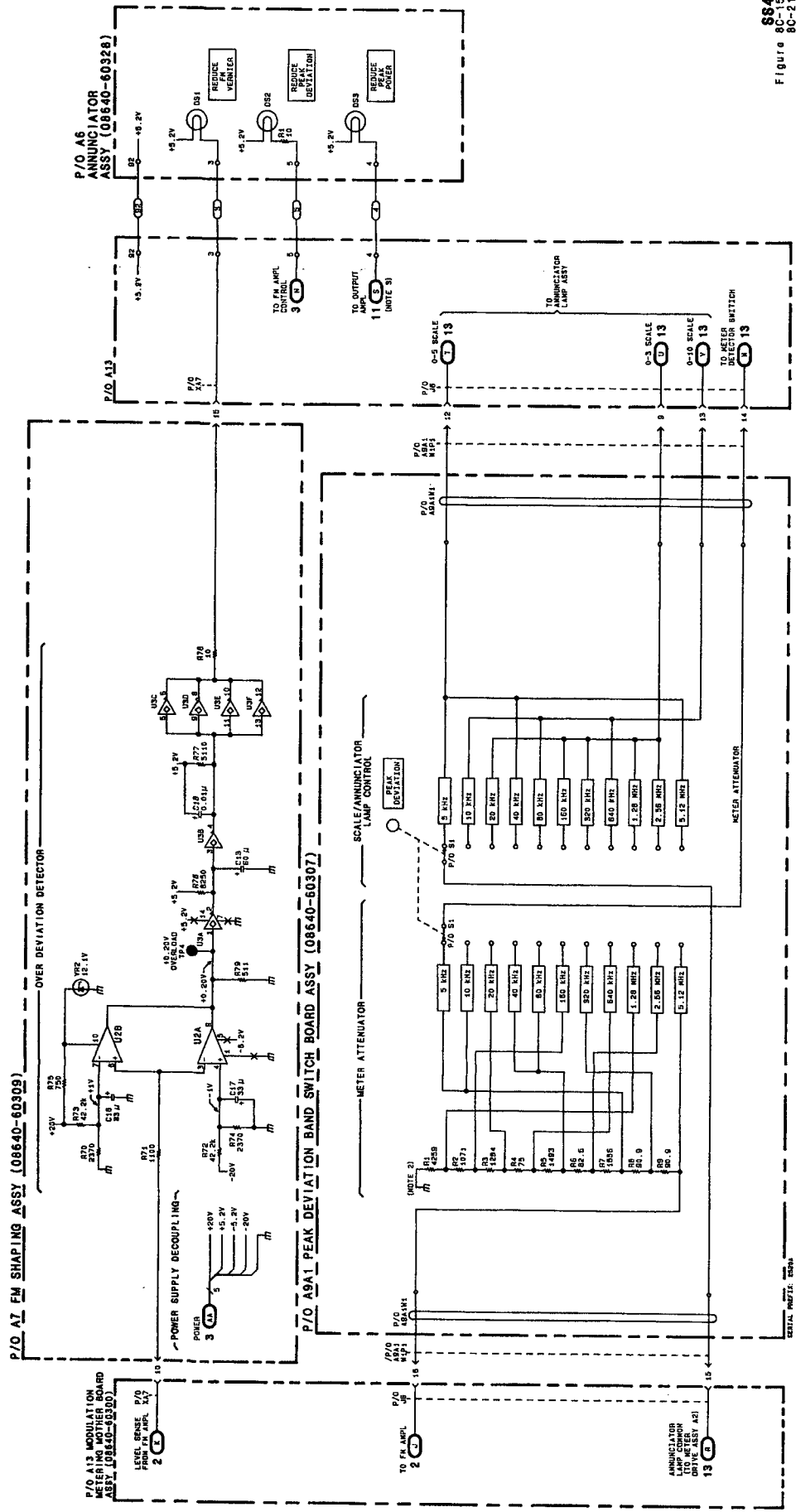
FM SHAPING PHASE LOCK LOOP FILTER



Component Locators

Figure 8C-14 Service Sheet 4 Information.





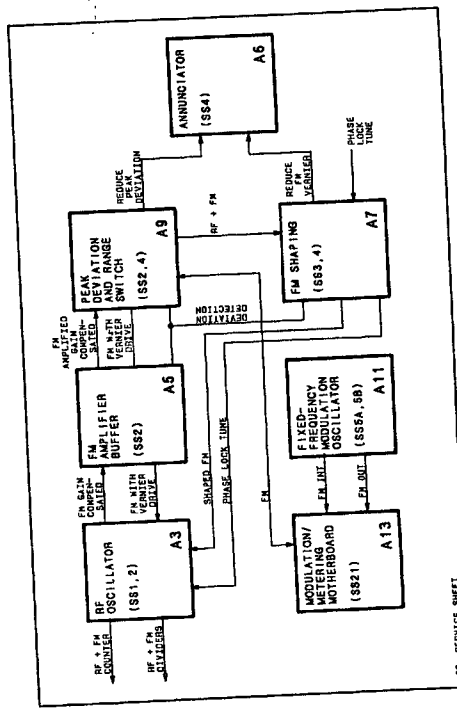
884  
Figure 8C-15  
8C-21

Service

NOTES:  
1. For an explanation of schematic symbols, see "Schematic Symbols" in Section 8.

Schematic General Information

8C-22



Reference Block Diagram Component Coordinates

COMP	X, Y	COMP	X, Y	COMP	X, Y	COMP	X, Y	COMP	X, Y	COMP	X, Y
C1	10	R18	C, 2								
C2	10	R19	A, 1								
C3	10	R20	A, 1								
C4	10	R21	A, 1								
C5	10	R22	A, 1								
C6	10	R23	A, 1								
C7	10	R24	A, 1								
C8	10	R25	A, 1								
C9	10	R26	A, 1								
C10	10	R27	A, 1								
C11	10	R28	A, 1								
C12	10	R29	A, 1								
C13	10	R30	A, 1								
C14	10	R31	A, 1								
C15	10	R32	A, 1								
C16	10	R33	A, 1								
C17	10	R34	A, 1								
C18	10	R35	A, 1								
C19	10	R36	A, 1								
C20	10	R37	A, 1								
C21	10	R38	A, 1								
C22	10	R39	A, 1								
C23	10	R40	A, 1								
C24	10	R41	A, 1								
C25	10	R42	A, 1								
C26	10	R43	A, 1								
C27	10	R44	A, 1								
C28	10	R45	A, 1								
C29	10	R46	A, 1								
C30	10	R47	A, 1								
C31	10	R48	A, 1								
C32	10	R49	A, 1								
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C41	10	R58	A, 1								
C42	10	R59	A, 1								
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C45	10	R62	A, 1								
C46	10	R63	A, 1								
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C49	10	R66	A, 1								
C50	10	R67	A, 1								
C51	10	R68	A, 1								
C52	10	R69	A, 1								
C53	10	R70	A, 1								
C54	10	R71	A, 1								
C55	10	R72	A, 1								
C56	10	R73	A, 1								
C57	10	R74	A, 1								
C58	10	R75	A, 1								
C59	10	R76	A, 1								
C60	10	R77	A, 1								
C61	10	R78	A, 1								
C62	10	R79	A, 1								
C63	10	R80	A, 1								
C64	10	R81	A, 1								
C65	10	R82	A, 1								
C66	10	R83	A, 1								
C67	10	R84	A, 1								
C68	10	R85	A, 1								
C69	10	R86	A, 1								
C70	10	R87	A, 1								
C71	10	R88	A, 1								
C72	10	R89	A, 1								
C73	10	R90	A, 1								
C74	10	R91	A, 1								
C75	10	R92	A, 1								
C76	10	R93	A, 1								
C77	10	R94	A, 1								
C78	10	R95	A, 1								
C79	10	R96	A, 1								
C80	10	R97	A, 1								
C81	10	R98	A, 1								
C82	10	R99	A, 1								
C83	10	R100	A, 1								
C84	10	R101	A, 1								
C85	10	R102	A, 1								
C86	10	R103	A, 1								
C87	10	R104	A, 1								
C88	10	R105	A, 1								
C89	10	R106	A, 1								
C90	10	R107	A, 1								
C91	10	R108	A, 1								
C92	10	R109	A, 1								
C93	10	R110	A, 1								
C94	10	R111	A, 1								
C95	10	R112	A, 1								
C96	10	R113	A, 1								
C97	10	R114	A, 1								
C98	10	R115	A, 1								
C99	10	R116	A, 1								
C100	10	R117	A, 1								

P/O A6, A9A1  
OVER-DEVIATION  
DETECTOR  
METER CONTROL  
SS4

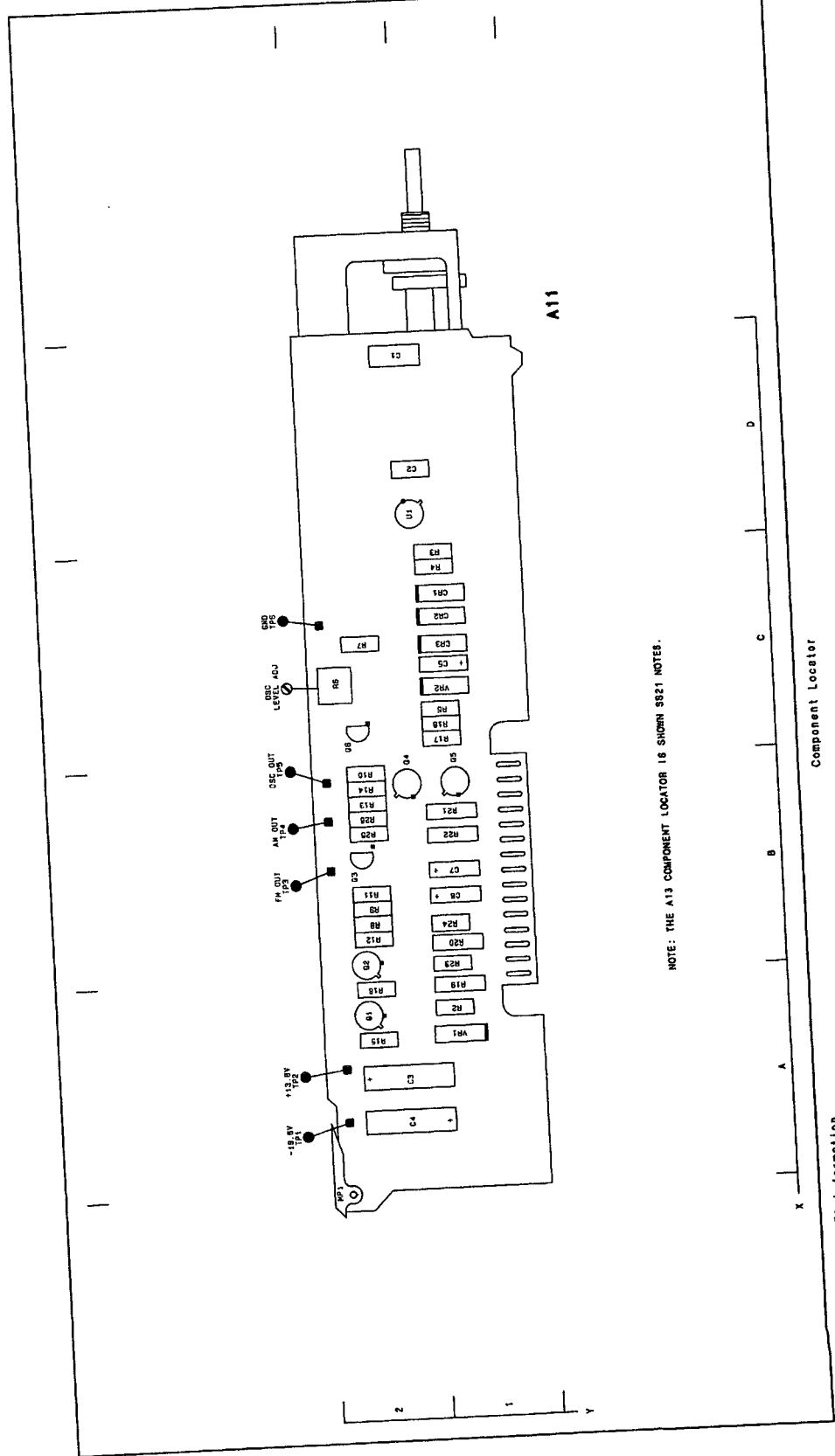
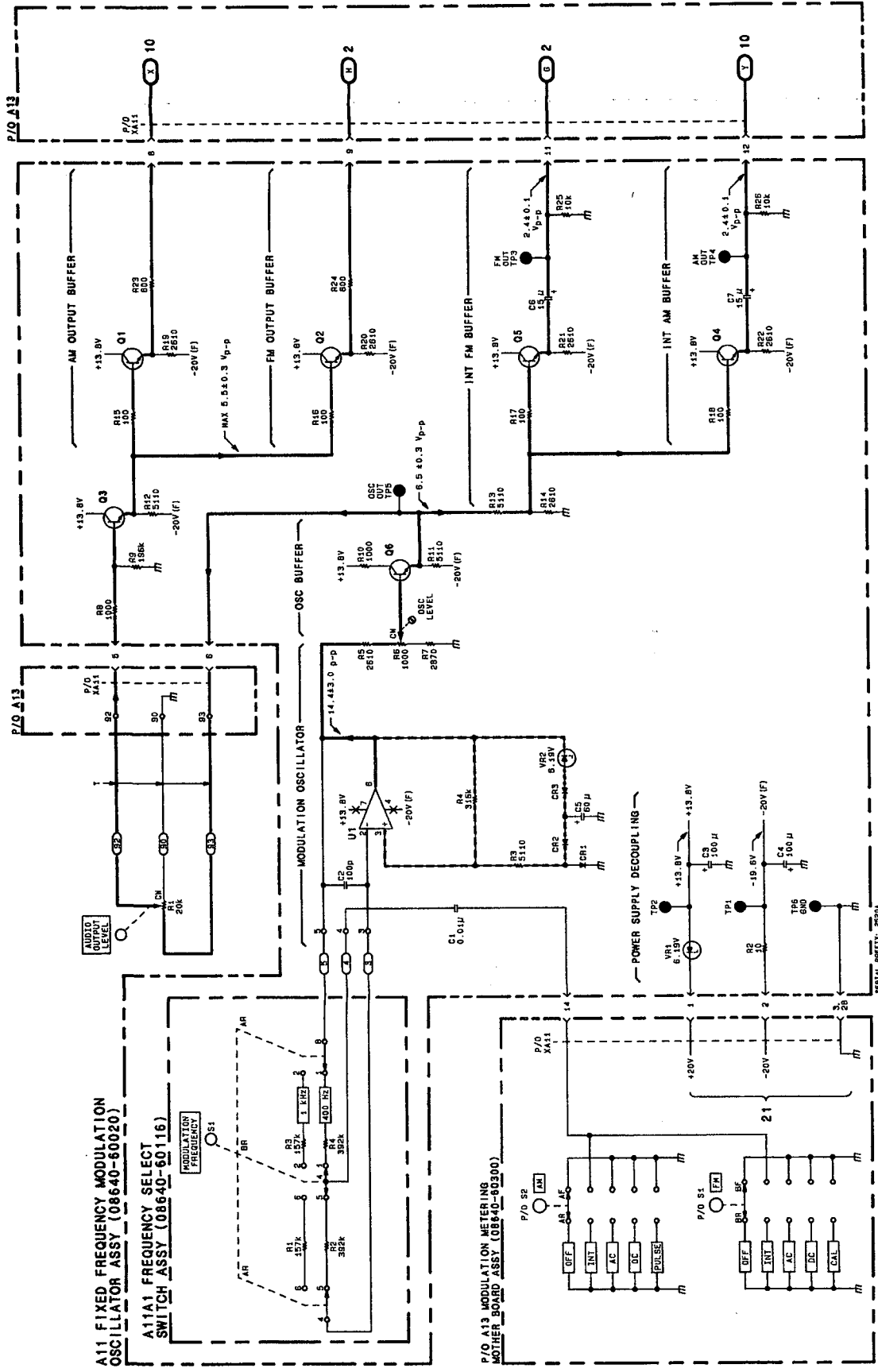
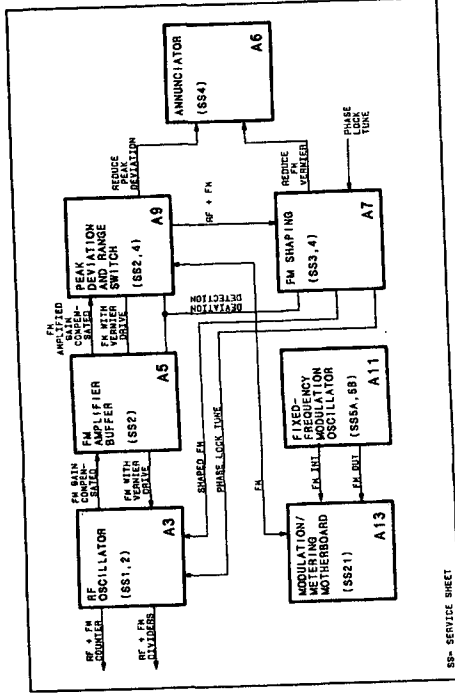


Figure 8C-16 Service Sheet 5A Information.



SS5A  
8C-17  
Figure 8C-23

- NOTES:
1. For an explanation of schematic symbols, see "Schematic Diagram Notes" in Section 8.
  2. The capacitance of A13C1 and A13C2 is approximately 10-20PF.



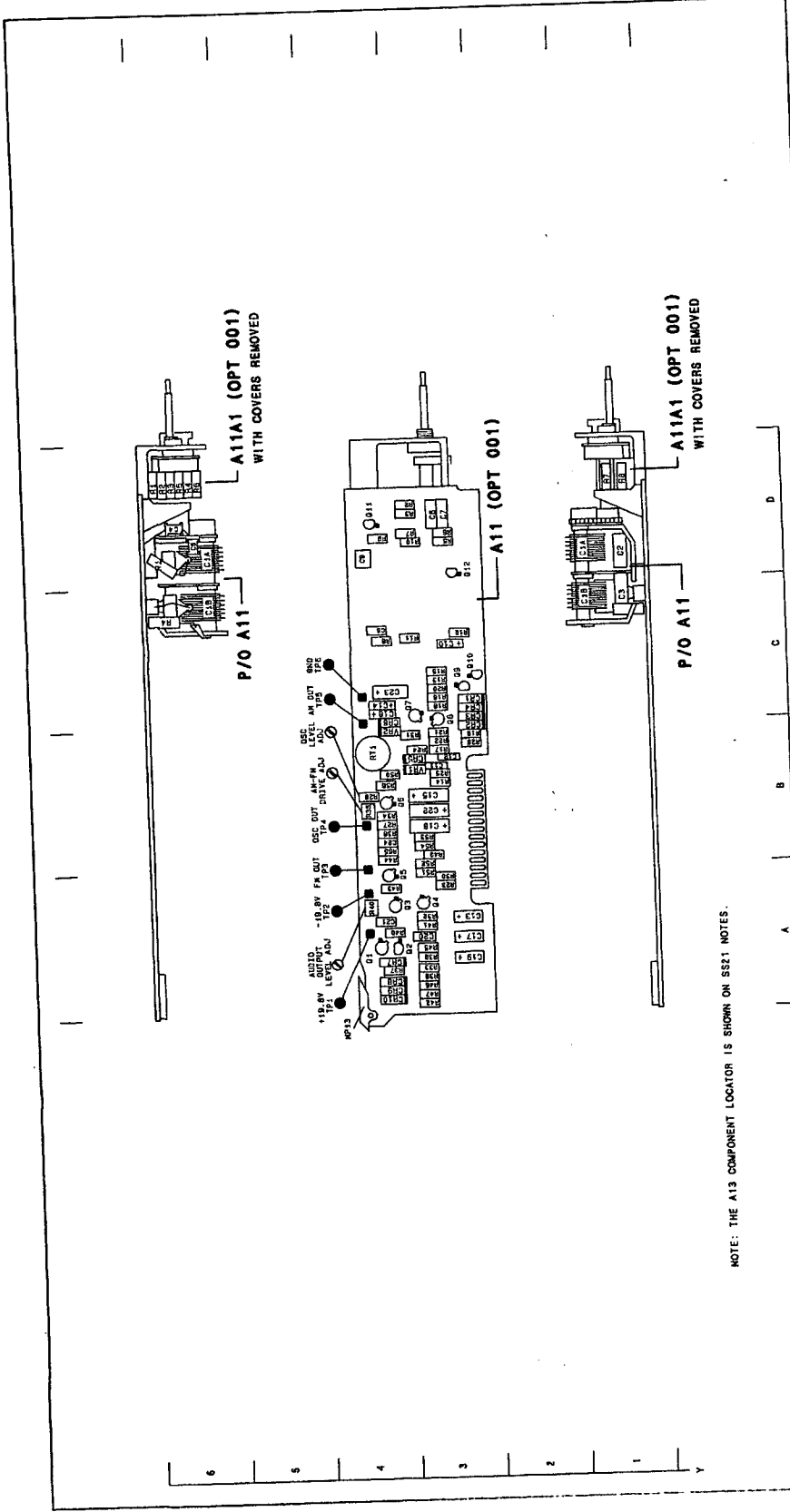
58- SERVICE SHEET

Reference Block Diagram

COMPONENT COORDINATES		COMPONENT COORDINATES		COMPONENT COORDINATES		COMPONENT COORDINATES		COMPONENT COORDINATES	
COMP	X, Y	COMP	X, Y	COMP	X, Y	COMP	X, Y	COMP	X, Y
A11	0-10	A11A1	0-10	A11A1	0-10	A11A1	0-10	A11A1	0-10
C1A	0-10	C1A	0-10	C1A	0-10	C1A	0-10	C1A	0-10
C1B	0-10	C1B	0-10	C1B	0-10	C1B	0-10	C1B	0-10
C2	0-10	C2	0-10	C2	0-10	C2	0-10	C2	0-10
C3	0-10	C3	0-10	C3	0-10	C3	0-10	C3	0-10
C4	0-10	C4	0-10	C4	0-10	C4	0-10	C4	0-10
C5	0-10	C5	0-10	C5	0-10	C5	0-10	C5	0-10
C6	0-10	C6	0-10	C6	0-10	C6	0-10	C6	0-10
C7	0-10	C7	0-10	C7	0-10	C7	0-10	C7	0-10
C8	0-10	C8	0-10	C8	0-10	C8	0-10	C8	0-10
C9	0-10	C9	0-10	C9	0-10	C9	0-10	C9	0-10
C10	0-10	C10	0-10	C10	0-10	C10	0-10	C10	0-10
C11	0-10	C11	0-10	C11	0-10	C11	0-10	C11	0-10
C12	0-10	C12	0-10	C12	0-10	C12	0-10	C12	0-10
C13	0-10	C13	0-10	C13	0-10	C13	0-10	C13	0-10
C14	0-10	C14	0-10	C14	0-10	C14	0-10	C14	0-10
C15	0-10	C15	0-10	C15	0-10	C15	0-10	C15	0-10
C16	0-10	C16	0-10	C16	0-10	C16	0-10	C16	0-10
C17	0-10	C17	0-10	C17	0-10	C17	0-10	C17	0-10
C18	0-10	C18	0-10	C18	0-10	C18	0-10	C18	0-10
C19	0-10	C19	0-10	C19	0-10	C19	0-10	C19	0-10
C20	0-10	C20	0-10	C20	0-10	C20	0-10	C20	0-10
C21	0-10	C21	0-10	C21	0-10	C21	0-10	C21	0-10
C22	0-10	C22	0-10	C22	0-10	C22	0-10	C22	0-10
C23	0-10	C23	0-10	C23	0-10	C23	0-10	C23	0-10
C24	0-10	C24	0-10	C24	0-10	C24	0-10	C24	0-10
C25	0-10	C25	0-10	C25	0-10	C25	0-10	C25	0-10
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C27	0-10	C27	0-10	C27	0-10	C27	0-10	C27	0-10
C28	0-10	C28	0-10	C28	0-10	C28	0-10	C28	0-10
C29	0-10	C29	0-10	C29	0-10	C29	0-10	C29	0-10
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C62	0-10	C62	0-10	C62	0-10	C62	0-10	C62	0-10
C63	0-10	C63	0-10	C63	0-10	C63	0-10	C63	0-10
C64	0-10	C64	0-10	C64	0-10	C64	0-10	C64	0-10
C65	0-10	C65	0-10	C65	0-10	C65	0-10	C65	0-10
C66	0-10	C66	0-10	C66	0-10	C66	0-10	C66	0-10
C67	0-10	C67	0-10	C67	0-10	C67	0-10	C67	0-10
C68	0-10	C68	0-10	C68	0-10	C68	0-10	C68	0-10
C69	0-10	C69	0-10	C69	0-10	C69	0-10	C69	0-10
C70	0-10	C70	0-10	C70	0-10	C70	0-10	C70	0-10
C71	0-10	C71	0-10	C71	0-10	C71	0-10	C71	0-10
C72	0-10	C72	0-10	C72	0-10	C72	0-10	C72	0-10
C73	0-10	C73	0-10	C73	0-10	C73	0-10	C73	0-10
C74	0-10	C74	0-10	C74	0-10	C74	0-10	C74	0-10
C75	0-10	C75	0-10	C75	0-10	C75	0-10	C75	0-10
C76	0-10	C76	0-10	C76	0-10	C76	0-10	C76	0-10
C77	0-10	C77	0-10	C77	0-10	C77	0-10	C77	0-10
C78	0-10	C78	0-10	C78	0-10	C78	0-10	C78	0-10
C79	0-10	C79	0-10	C79	0-10	C79	0-10	C79	0-10
C80	0-10	C80	0-10	C80	0-10	C80	0-10	C80	0-10
C81	0-10	C81	0-10	C81	0-10	C81	0-10	C81	0-10
C82	0-10	C82	0-10	C82	0-10	C82	0-10	C82	0-10
C83	0-10	C83	0-10	C83	0-10	C83	0-10	C83	0-10
C84	0-10	C84	0-10	C84	0-10	C84	0-10	C84	0-10
C85	0-10	C85	0-10	C85	0-10	C85	0-10	C85	0-10
C86	0-10	C86	0-10	C86	0-10	C86	0-10	C86	0-10
C87	0-10	C87	0-10	C87	0-10	C87	0-10	C87	0-10
C88	0-10	C88	0-10	C88	0-10	C88	0-10	C88	0-10
C89	0-10	C89	0-10	C89	0-10	C89	0-10	C89	0-10
C90	0-10	C90	0-10	C90	0-10	C90	0-10	C90	0-10
C91	0-10	C91	0-10	C91	0-10	C91	0-10	C91	0-10
C92	0-10	C92	0-10	C92	0-10	C92	0-10	C92	0-10
C93	0-10	C93	0-10	C93	0-10	C93	0-10	C93	0-10
C94	0-10	C94	0-10	C94	0-10	C94	0-10	C94	0-10
C95	0-10	C95	0-10	C95	0-10	C95	0-10	C95	0-10
C96	0-10	C96	0-10	C96	0-10	C96	0-10	C96	0-10
C97	0-10	C97	0-10	C97	0-10	C97	0-10	C97	0-10
C98	0-10	C98	0-10	C98	0-10	C98	0-10	C98	0-10
C99	0-10	C99	0-10	C99	0-10	C99	0-10	C99	0-10
C100	0-10	C100	0-10	C100	0-10	C100	0-10	C100	0-10

A11 FIXED-FREQUENCY MODULATION OSCILLATOR (STANDARD/004)

Schematic General Information



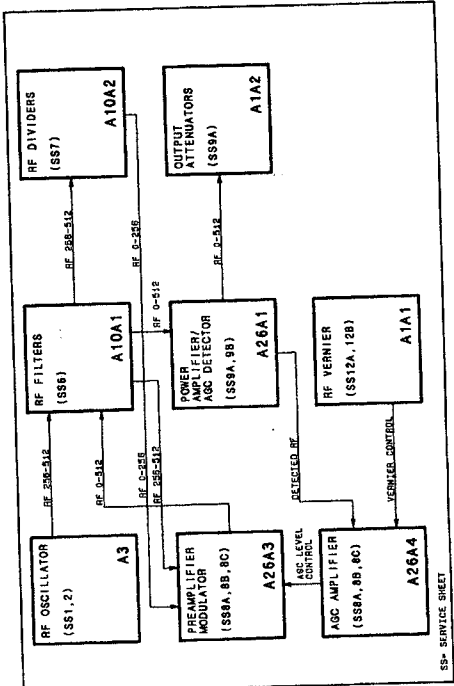
Component Locator

Figure 8C-18 Service Sheet 5B Information.



Service

NOTES:  
 1. For an explanation of schematic symbols, see "Schematic Diagram Notes" in Section B.  
 2. All switches shown set for 0.5-1 Mcz range.  
 3. All switches on this schematic belong to ECL and ECH, facilities. Ground is high and open (negative) to 250 V. All switches are "normally closed" at 100V, 0, and 50-100 V. All switches are "normally open" at 100V, 0, and 50-100 V.  
 4. Connectors J100A, J100B, J100C, J100D, J100E, J100F, J100G, J100H, J100I, J100J, J100K, J100L, J100M, J100N, J100O, J100P, J100Q, J100R, J100S, J100T, J100U, J100V, J100W, J100X, J100Y, J100Z are connected to ground. Connector J100A pin 3-5, 7-11, 14-16, 19-21, 24-26, 29-31, 34-36, 39-41, 44-46, 49-51, 54-56, 59-61, 64-66, 69-71, 74-76, 79-81, 84-86, 89-91, 94-96, 99-101 are connected to ground. Connector J100A pins 1, 2, 11, 12 are connected to -B 2V(F). Connector J100B pins 8, 7, 12, 13 are connected to -5.2V(F).  
 5. For Standard/DPT 003 see SSB. For DPT 007 see SSB. For DPT 004 see SSB.  
 6. For Standard/DPT 003 see SSB. For DPT 007 see SSB. For DPT 004 see SSB.  
 7. For Standard/DPT 004 see SSB. For DPT 007 see SSB. For DPT 004 see SSB.



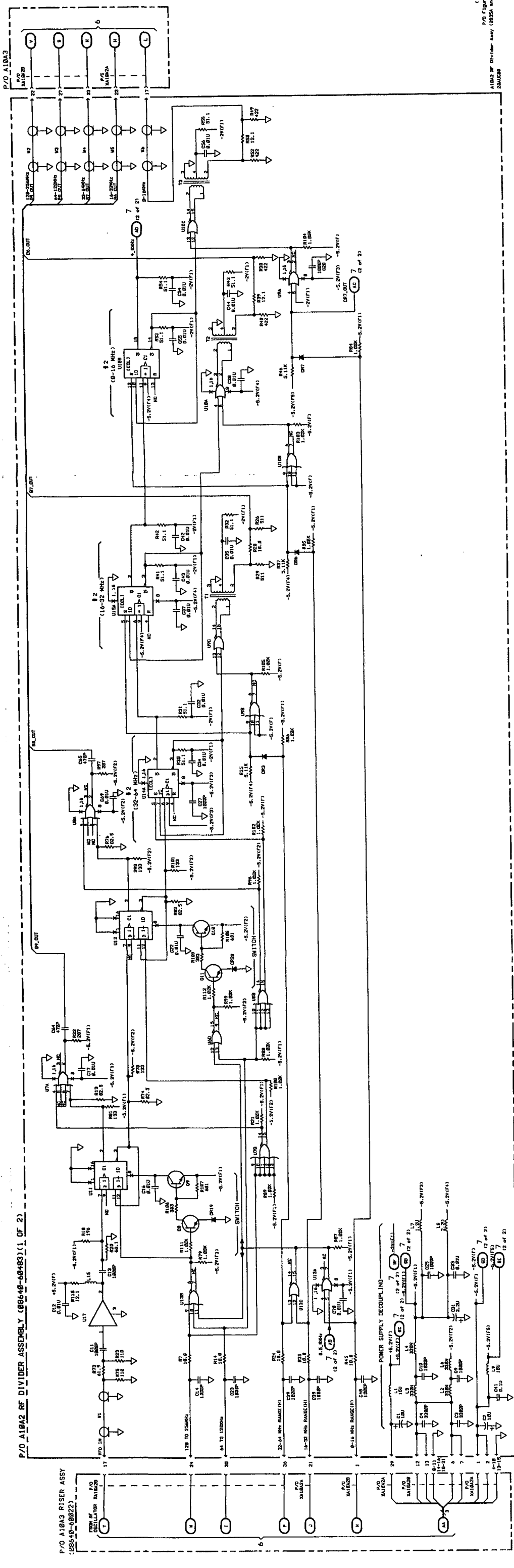
Reference Block Diagram  
 Component Coordinates

COMP	X, Y	COMP	X, Y	COMP	X, Y	COMP	X, Y	COMP	X, Y	COMP	X, Y	COMP	X, Y		
C10	1, 1	C11	1, 1	C12	1, 1	C13	1, 1	C14	1, 1	C15	1, 1	C16	1, 1		
C17	1, 1	C18	1, 1	C19	1, 1	C20	1, 1	C21	1, 1	C22	1, 1	C23	1, 1	C24	1, 1
C25	1, 1	C26	1, 1	C27	1, 1	C28	1, 1	C29	1, 1	C30	1, 1	C31	1, 1	C32	1, 1
C33	1, 1	C34	1, 1	C35	1, 1	C36	1, 1	C37	1, 1	C38	1, 1	C39	1, 1	C40	1, 1
C41	1, 1	C42	1, 1	C43	1, 1	C44	1, 1	C45	1, 1	C46	1, 1	C47	1, 1	C48	1, 1
C49	1, 1	C50	1, 1	C51	1, 1	C52	1, 1	C53	1, 1	C54	1, 1	C55	1, 1	C56	1, 1
C57	1, 1	C58	1, 1	C59	1, 1	C60	1, 1	C61	1, 1	C62	1, 1	C63	1, 1	C64	1, 1
C65	1, 1	C66	1, 1	C67	1, 1	C68	1, 1	C69	1, 1	C70	1, 1	C71	1, 1	C72	1, 1
C73	1, 1	C74	1, 1	C75	1, 1	C76	1, 1	C77	1, 1	C78	1, 1	C79	1, 1	C80	1, 1
C81	1, 1	C82	1, 1	C83	1, 1	C84	1, 1	C85	1, 1	C86	1, 1	C87	1, 1	C88	1, 1
C89	1, 1	C90	1, 1	C91	1, 1	C92	1, 1	C93	1, 1	C94	1, 1	C95	1, 1	C96	1, 1
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C529	1, 1	C530	1, 1	C531	1, 1	C532	1, 1	C533	1, 1	C534	1, 1	C535	1, 1	C536	1, 1
C537	1, 1	C538	1, 1	C539	1, 1	C540	1, 1	C541	1, 1	C542	1, 1	C543	1, 1	C544	1, 1
C545	1, 1	C546	1, 1	C547	1, 1	C548	1, 1	C549	1, 1	C550	1, 1	C551	1, 1	C552	1, 1
C553	1, 1	C554	1, 1	C555	1, 1	C556	1, 1	C557	1, 1	C558	1, 1	C559	1, 1	C560	1, 1
C561	1, 1	C562	1, 1	C563	1, 1	C564	1, 1	C565	1, 1	C566	1, 1	C567	1, 1	C568	1, 1
C569	1, 1	C570	1, 1	C571	1, 1	C572	1, 1	C573	1, 1	C574	1, 1	C575	1, 1	C576	1, 1
C577	1, 1	C578	1, 1	C579	1, 1	C580	1, 1	C581	1, 1	C582	1, 1	C583	1, 1	C584	1, 1
C585	1, 1	C586	1, 1	C587	1, 1	C588	1, 1	C589	1, 1	C590	1, 1	C591	1, 1	C592	1, 1
C593	1, 1	C594	1, 1	C595	1, 1	C596	1, 1	C597	1, 1	C598	1, 1	C599	1, 1	C600	1, 1
C601	1, 1	C602	1, 1	C603	1, 1	C604	1, 1	C605	1, 1	C606	1, 1	C607	1, 1	C608	1, 1
C609	1, 1	C610	1, 1	C611	1, 1	C612	1, 1	C613	1, 1	C614	1, 1	C615	1, 1	C616	1, 1
C617	1, 1	C618	1, 1	C619	1, 1	C620	1, 1	C621	1, 1	C622	1, 1	C623	1, 1	C624	1, 1
C625	1, 1	C626	1, 1	C627	1, 1	C628	1, 1	C629	1, 1	C630	1, 1	C631	1, 1	C632	1, 1
C633	1, 1	C634	1, 1	C635	1, 1	C636	1, 1	C637	1, 1	C638	1, 1	C639	1, 1	C640	1, 1
C641	1, 1	C642	1, 1	C643	1, 1	C644	1, 1	C645	1, 1	C646	1, 1	C647	1, 1	C648	1, 1
C649	1, 1	C650	1, 1	C651	1, 1										









P/O A10A2 RF DIVIDER ASSEMBLY (88648-60483) (1 OF 2)

P/O A10A3 RISER ASSY (88649-60822)

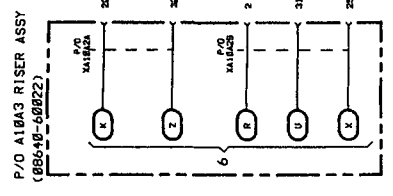
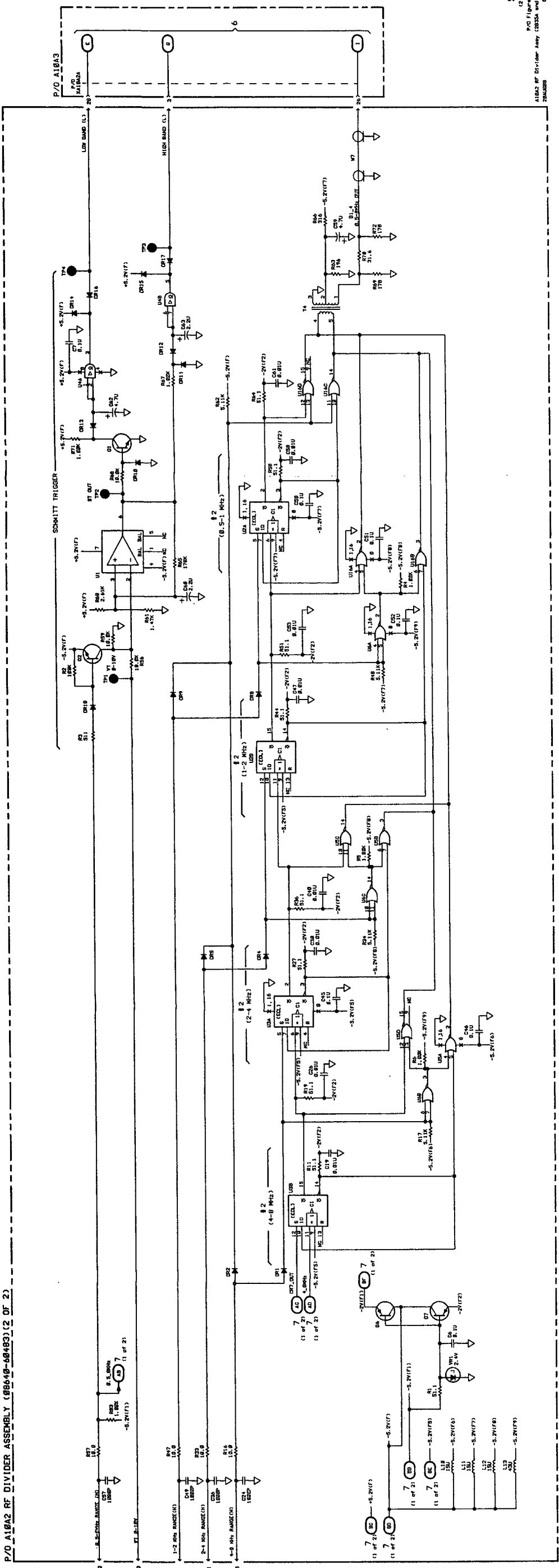
P/O A10A2

SEE REVERSE SIDE

RF  
DIVIDERS

SS7  
(1 OF 2)

P/O A10A2 RF DIVIDER ASSEMBLY (88649-66493) (2 OF 2)



SS7  
P/O Figure 8C-23  
A10A2 RF Divider Assy (88649-66493)  
28AUG68

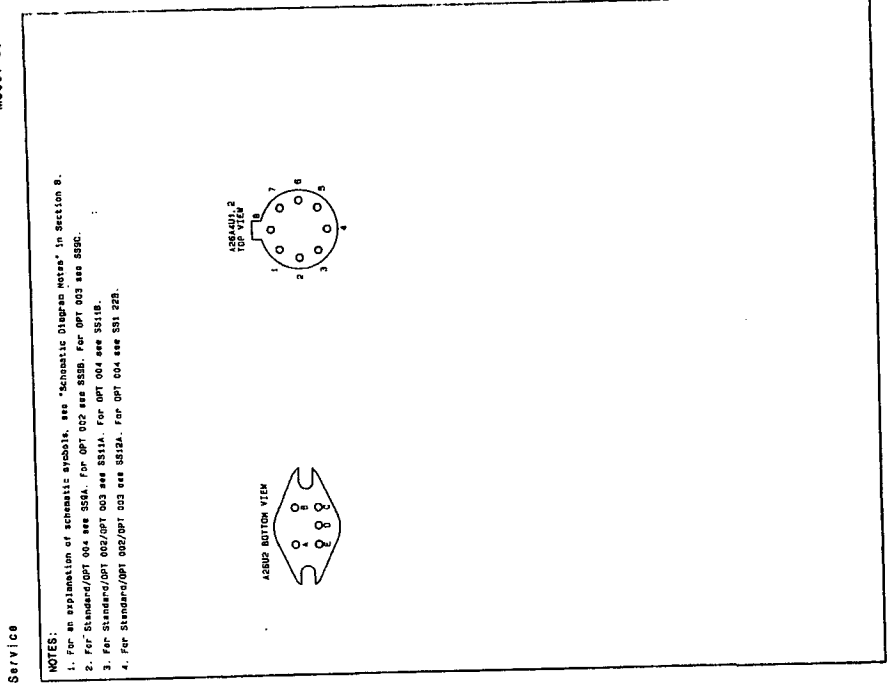
P/O A10A2

SEE REVERSE SIDE

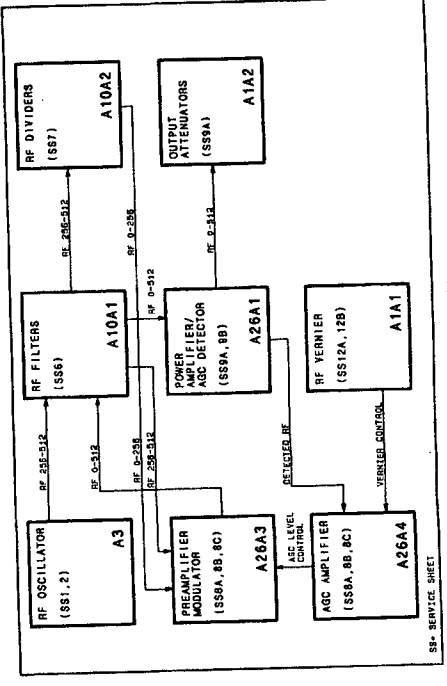
RF  
DIVIDERS

SS7  
(2 OF 2)





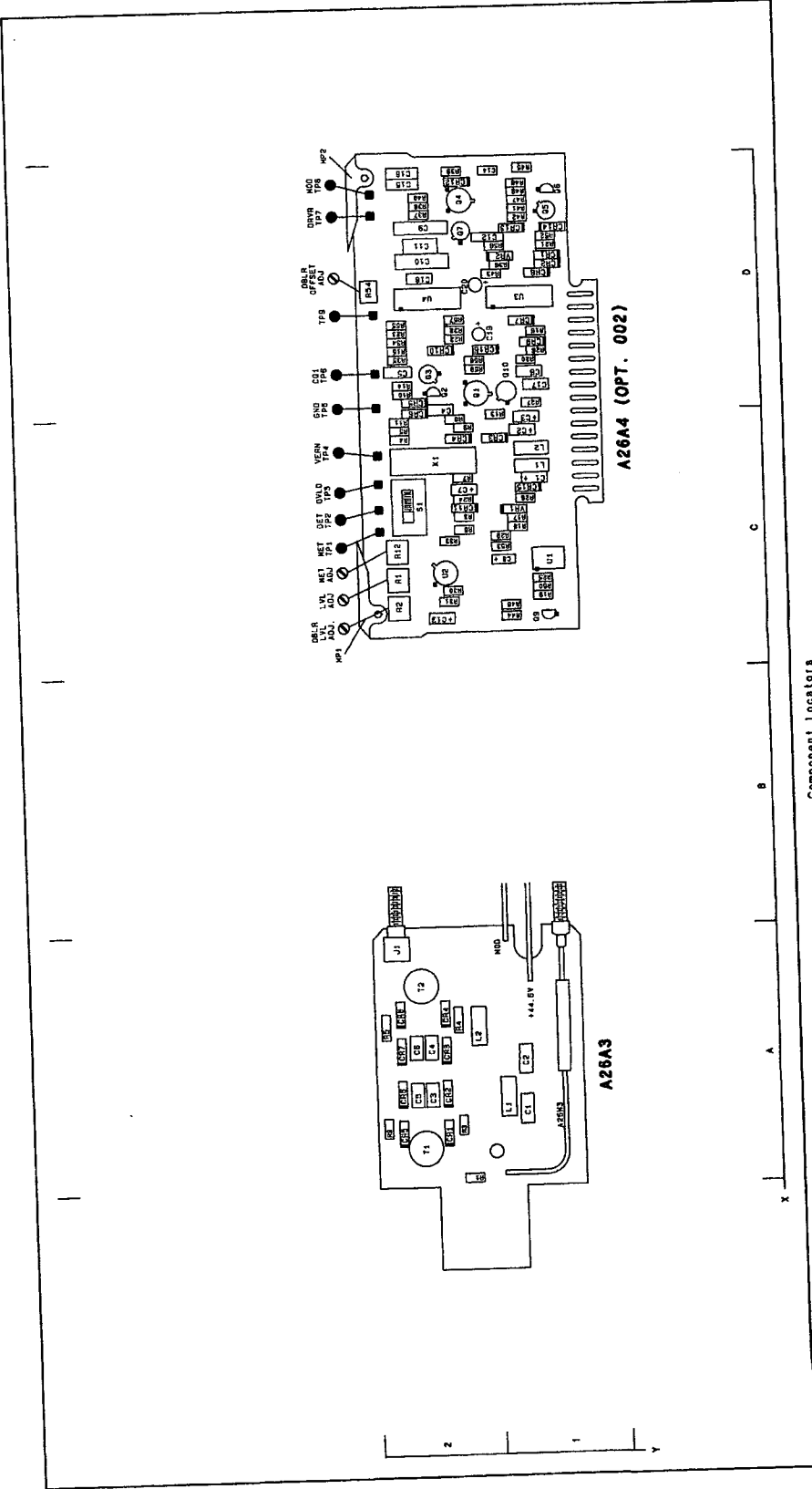
Schematic General Information



Reference Block Diagram Component Coordinates

COMP	X, Y	COMP	X, Y	COMP	X, Y	COMP	X, Y	COMP	X, Y
A26	A 1	A26A3	C 1	A26A4	C 1	A10A1	C 1	A10A2	C 1
A3	A 1	A10A1	C 1	A26A1	C 1	A1A2	C 1		
A26	A 2	A10A1	C 2	A26A1	C 2	A1A2	C 2		
A3	A 2	A10A1	C 2	A26A1	C 2	A1A2	C 2		
A26	A 3	A10A1	C 3	A26A1	C 3	A1A2	C 3		
A3	A 3	A10A1	C 3	A26A1	C 3	A1A2	C 3		
A26	A 4	A10A1	C 4	A26A1	C 4	A1A2	C 4		
A3	A 4	A10A1	C 4	A26A1	C 4	A1A2	C 4		
A26	A 5	A10A1	C 5	A26A1	C 5	A1A2	C 5		
A3	A 5	A10A1	C 5	A26A1	C 5	A1A2	C 5		

SS8A AGC AMPLIFIERS, AMPLITUDE MODULATORS (STANDARD)



Component Locators

Figure 8C-26 Service Sheet 8B Information.



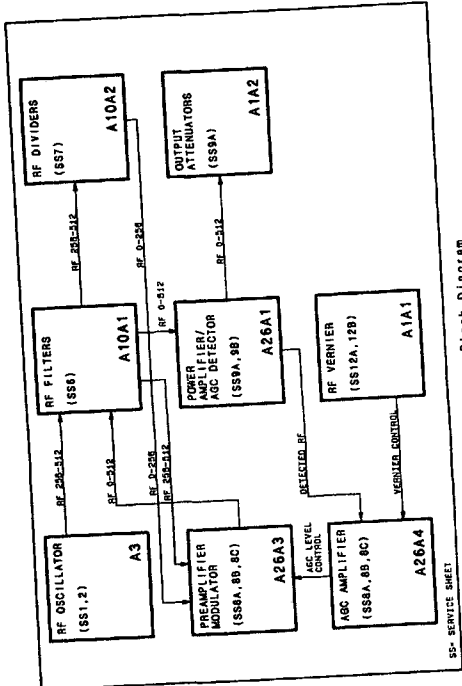
Service

- NOTES:
1. For an explanation of schematic symbols, see "Schematic Diagram Notes" in Section 6.
  2. For Standard/OPT 004 see SS8A. For OPT 002 see SS8B. For OPT 003 see SS8C.
  3. For Standard/OPT 002/OPT 003 see SS11A. For OPT 004 see SS11B.
  4. For Standard/OPT 002/OPT 003 see SS12A. For OPT 004 see SS12B.



Schematic General Information

8C-34



Reference Block Coordinates

COMP X, Y	COMP X, Y	COMP X, Y	COMP X, Y	COMP X, Y	COMP X, Y
A3	A10A1	A10A2	A26A3	A26A4	A26A1
A1A1	A1A2				

A26A3 AGC AMPLIFIERS  
A26A4 AMPLITUDE MODULATORS  
(STAND W/ OPT 002)

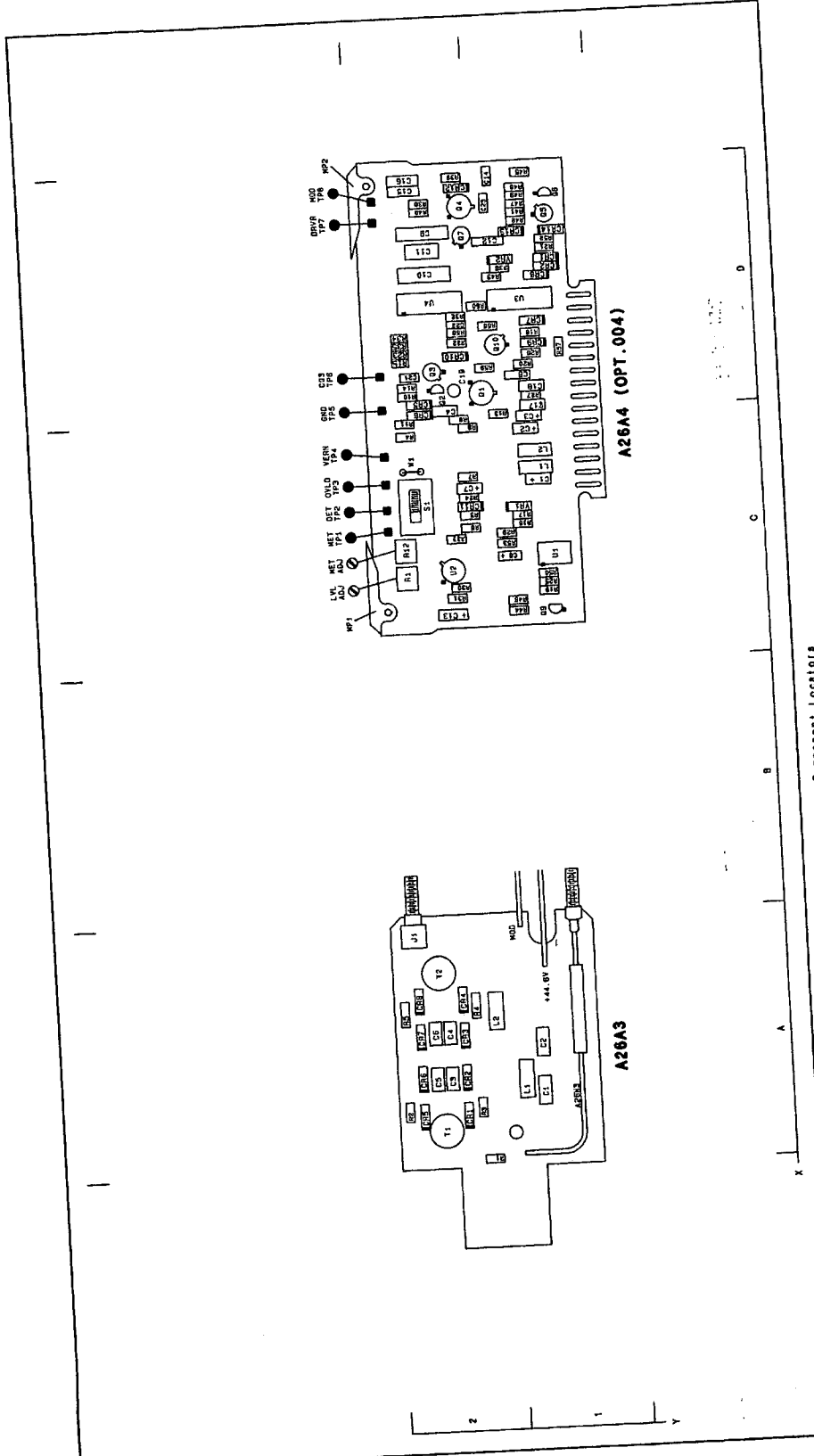
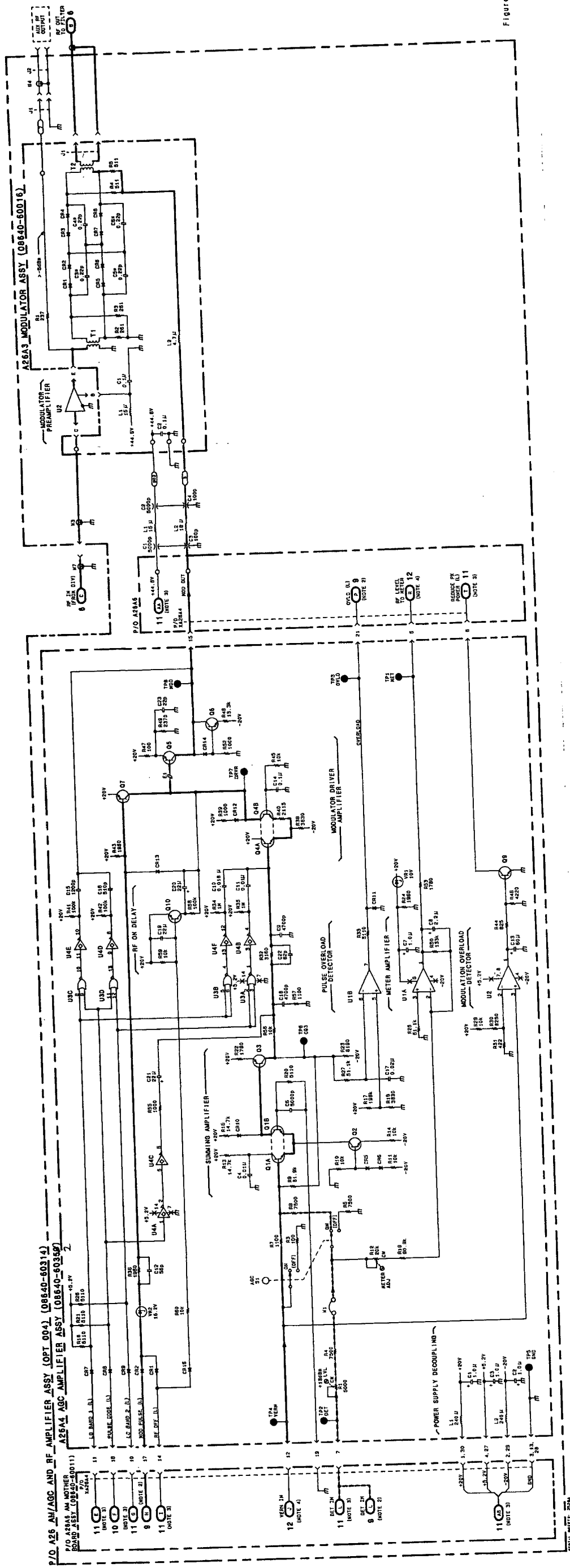


Figure 8C-28 Service Sheet 8C Information.



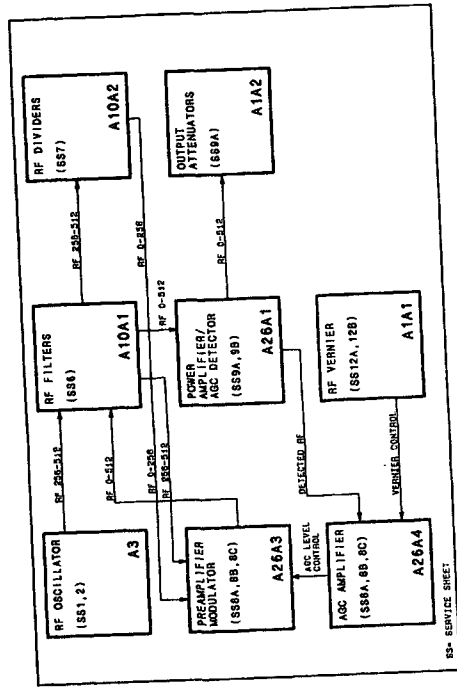


SS8C  
Figuro 8C-29  
8C-35

TOTAL PAGE: 2/14

Service

- NOTES:
1. For an explanation of schematic symbols, see "Electronic Diagrams Manual" in Section 6.
  2. For Standard/Optional 003 see 858A. For DPT 002 see 858B. For DPT 004 see 858C.
  3. For Standard/Optional 002/Optional 003 see 851A. For DPT 004 see 851B.
  4. For Standard/Optional 002/Optional 003 see 851A. For DPT 004 see 851B.
  5. Max of +10 dB for A1A2, max of +18 dB for A1A1.



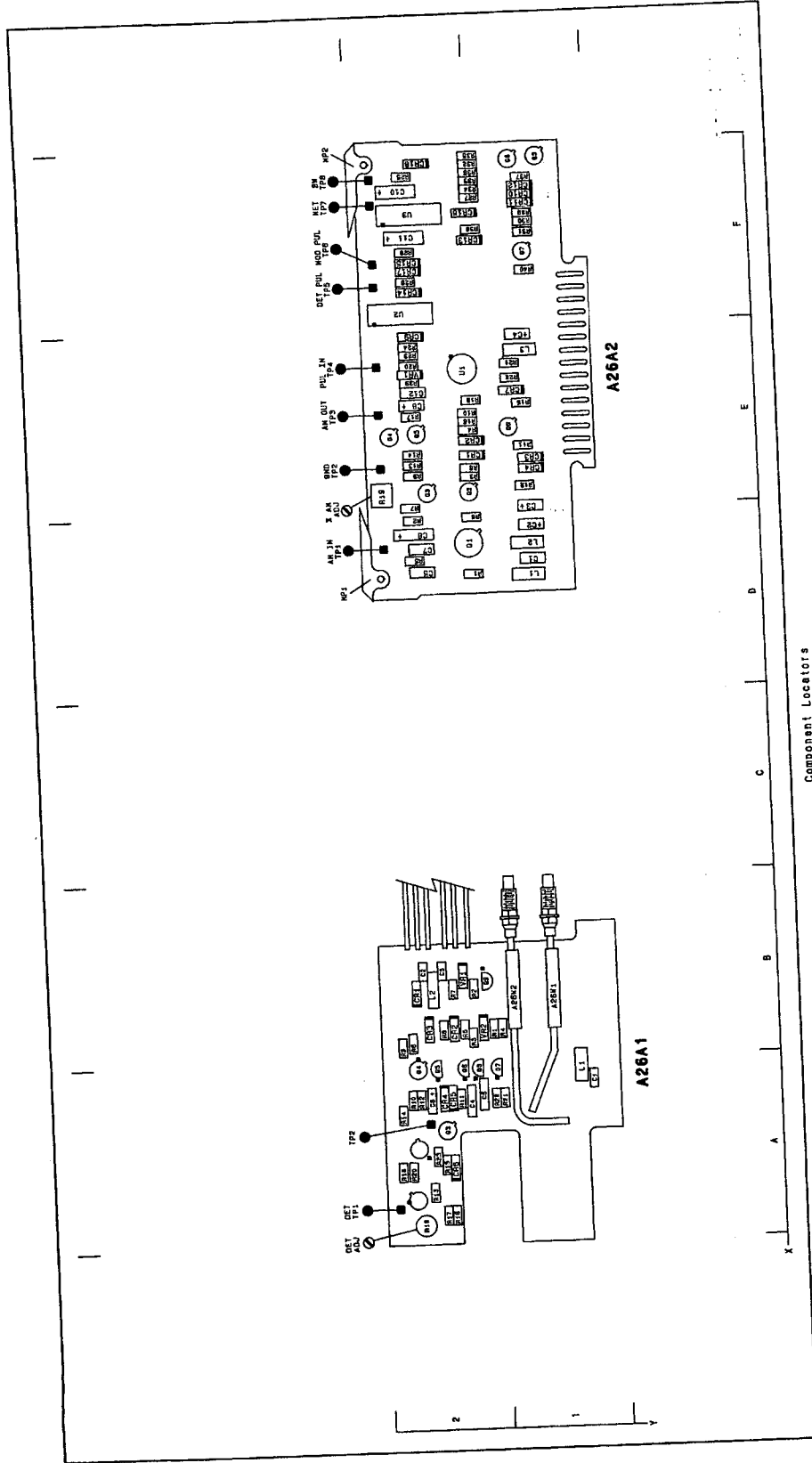
Reference Block Diagram

Component Coordinates

COMP	X	Y	COMP	X	Y	COMP	X	Y	COMP	X	Y	COMP	X	Y	
A3	B.2	1.1	A26A2	C.1	1.1	COMP	X.Y	COMP	X.Y	COMP	X.Y	COMP	X.Y	COMP	X.Y
A10A1	B.2	1.2	A26A2	C.1	1.2	COMP	X.Y	COMP	X.Y	COMP	X.Y	COMP	X.Y	COMP	X.Y
A10A2	B.2	1.3	A26A2	C.1	1.3	COMP	X.Y	COMP	X.Y	COMP	X.Y	COMP	X.Y	COMP	X.Y
A26A3	B.2	1.4	A26A2	C.1	1.4	COMP	X.Y	COMP	X.Y	COMP	X.Y	COMP	X.Y	COMP	X.Y
A26A4	B.2	1.5	A26A2	C.1	1.5	COMP	X.Y	COMP	X.Y	COMP	X.Y	COMP	X.Y	COMP	X.Y
A26A1	B.2	1.6	A26A2	C.1	1.6	COMP	X.Y	COMP	X.Y	COMP	X.Y	COMP	X.Y	COMP	X.Y
A1A1	B.2	1.7	A26A2	C.1	1.7	COMP	X.Y	COMP	X.Y	COMP	X.Y	COMP	X.Y	COMP	X.Y
A1A2	B.2	1.8	A26A2	C.1	1.8	COMP	X.Y	COMP	X.Y	COMP	X.Y	COMP	X.Y	COMP	X.Y

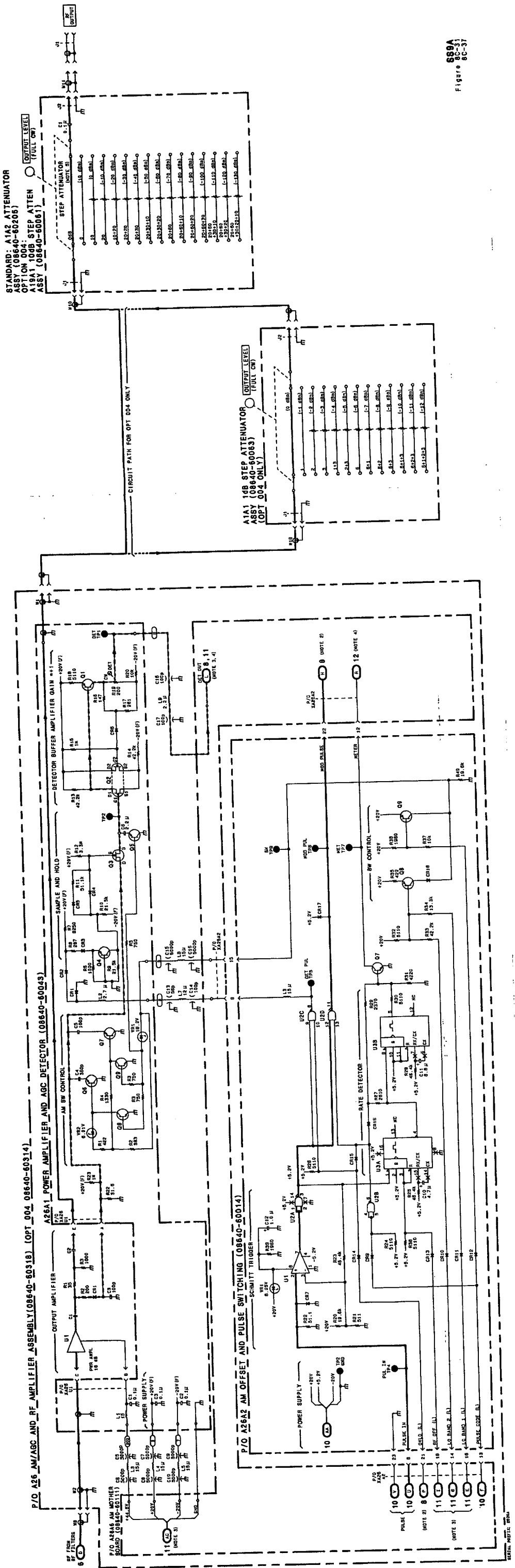
A26A3, AGC AMPLIFIER  
A26A4, AMPLITUDE MODULATORS (OPT. 004)

Schematic General Information

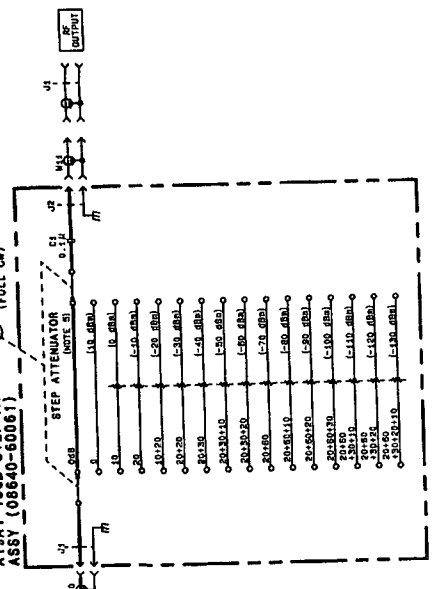


Component Locators

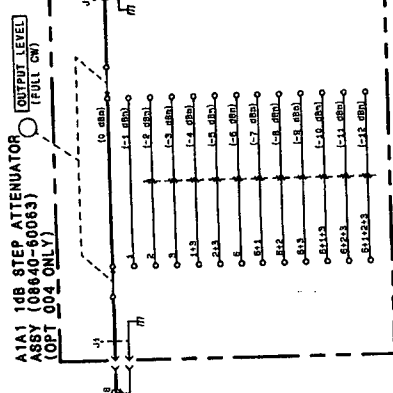
Figure 8C-30 Service Sheet 9A Information.



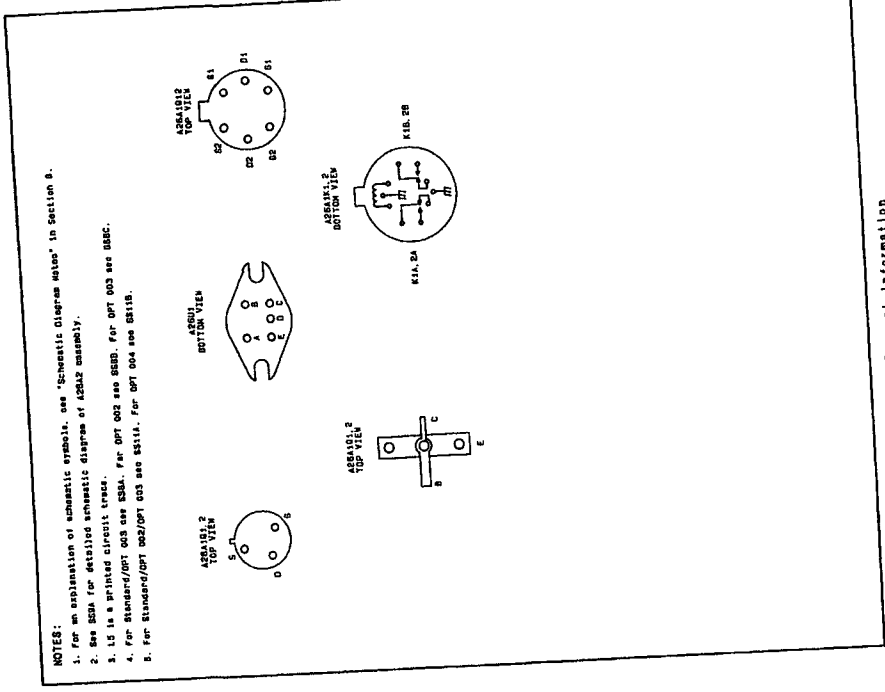
STANDARD: A1A2 ATTENUATOR  
 ASSY (08640-60206)  
 OPTION 004:  
 A19A1 10dB STEP ATTEN  
 ASSY (08640-60061)



CIRCUIT PATH FOR OPT 004 ONLY

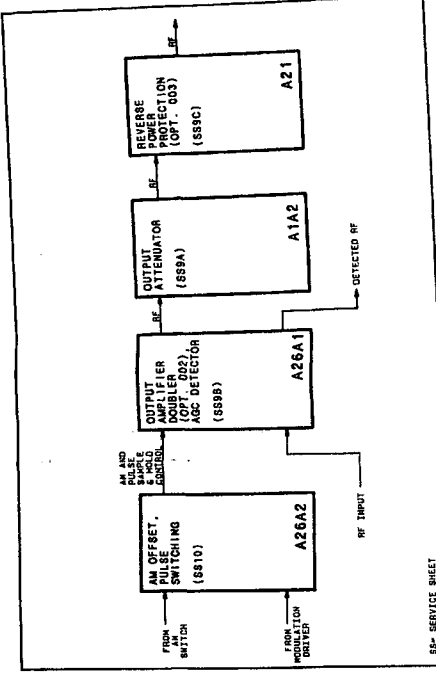


889A  
 Figure 8C-31



Schematic General Information

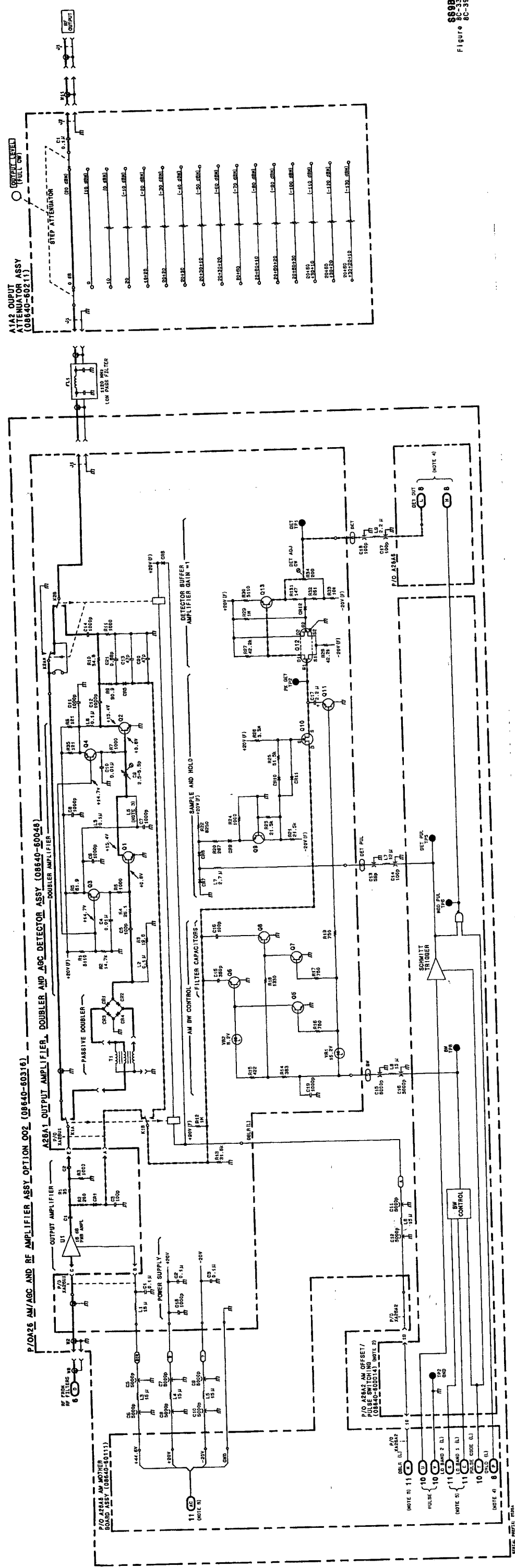
9C-38



Reference Block Diagram

Component Coordinates

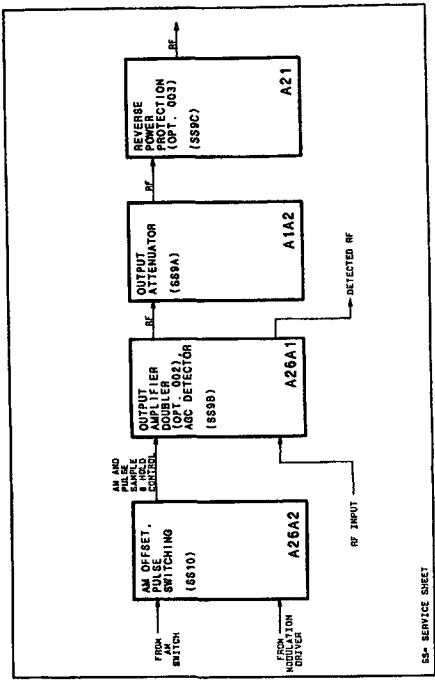
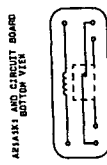
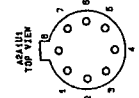
COMP	X,Y	COMP	X,Y	COMP	X,Y	COMP	X,Y	COMP	X,Y	COMP	X,Y	COMP	X,Y
A1	A.1	A2	A.2	A3	A.3	A4	A.4	A5	A.5	A6	A.6	A7	A.7
A8	A.8	A9	A.9	A10	A.10	A11	A.11	A12	A.12	A13	A.13	A14	A.14
A15	A.15	A16	A.16	A17	A.17	A18	A.18	A19	A.19	A20	A.20	A21	A.21
A22	A.22	A23	A.23	A24	A.24	A25	A.25	A26	A.26	A27	A.27	A28	A.28
A29	A.29	A30	A.30	A31	A.31	A32	A.32	A33	A.33	A34	A.34	A35	A.35
A36	A.36	A37	A.37	A38	A.38	A39	A.39	A40	A.40	A41	A.41	A42	A.42
A43	A.43	A44	A.44	A45	A.45	A46	A.46	A47	A.47	A48	A.48	A49	A.49
A50	A.50	A51	A.51	A52	A.52	A53	A.53	A54	A.54	A55	A.55	A56	A.56
A57	A.57	A58	A.58	A59	A.59	A60	A.60	A61	A.61	A62	A.62	A63	A.63
A64	A.64	A65	A.65	A66	A.66	A67	A.67	A68	A.68	A69	A.69	A70	A.70
A71	A.71	A72	A.72	A73	A.73	A74	A.74	A75	A.75	A76	A.76	A77	A.77
A78	A.78	A79	A.79	A80	A.80	A81	A.81	A82	A.82	A83	A.83	A84	A.84
A85	A.85	A86	A.86	A87	A.87	A88	A.88	A89	A.89	A90	A.90	A91	A.91
A92	A.92	A93	A.93	A94	A.94	A95	A.95	A96	A.96	A97	A.97	A98	A.98
A99	A.99	A100	A.100	A101	A.101	A102	A.102	A103	A.103	A104	A.104	A105	A.105
A106	A.106	A107	A.107	A108	A.108	A109	A.109	A110	A.110	A111	A.111	A112	A.112
A113	A.113	A114	A.114	A115	A.115	A116	A.116	A117	A.117	A118	A.118	A119	A.119
A120	A.120	A121	A.121	A122	A.122	A123	A.123	A124	A.124	A125	A.125	A126	A.126
A127	A.127	A128	A.128	A129	A.129	A130	A.130	A131	A.131	A132	A.132	A133	A.133
A134	A.134	A135	A.135	A136	A.136	A137	A.137	A138	A.138	A139	A.139	A140	A.140
A141	A.141	A142	A.142	A143	A.143	A144	A.144	A145	A.145	A146	A.146	A147	A.147
A148	A.148	A149	A.149	A150	A.150	A151	A.151	A152	A.152	A153	A.153	A154	A.154
A155	A.155	A156	A.156	A157	A.157	A158	A.158	A159	A.159	A160	A.160	A161	A.161
A162	A.162	A163	A.163	A164	A.164	A165	A.165	A166	A.166	A167	A.167	A168	A.168
A169	A.169	A170	A.170	A171	A.171	A172	A.172	A173	A.173	A174	A.174	A175	A.175
A176	A.176	A177	A.177	A178	A.178	A179	A.179	A180	A.180	A181	A.181	A182	A.182
A183	A.183	A184	A.184	A185	A.185	A186	A.186	A187	A.187	A188	A.188	A189	A.189
A190	A.190	A191	A.191	A192	A.192	A193	A.193	A194	A.194	A195	A.195	A196	A.196
A197	A.197	A198	A.198	A199	A.199	A200	A.200	A201	A.201	A202	A.202	A203	A.203
A204	A.204	A205	A.205	A206	A.206	A207	A.207	A208	A.208	A209	A.209	A210	A.210
A211	A.211	A212	A.212	A213	A.213	A214	A.214	A215	A.215	A216	A.216	A217	A.217
A218	A.218	A219	A.219	A220	A.220	A221	A.221	A222	A.222	A223	A.223	A224	A.224
A225	A.225	A226	A.226	A227	A.227	A228	A.228	A229	A.229	A230	A.230	A231	A.231
A232	A.232	A233	A.233	A234	A.234	A235	A.235	A236	A.236	A237	A.237	A238	A.238
A239	A.239	A240	A.240	A241	A.241	A242	A.242	A243	A.243	A244	A.244	A245	A.245
A246	A.246	A247	A.247	A248	A.248	A249	A.249	A250	A.250	A251	A.251	A252	A.252
A253	A.253	A254	A.254	A255	A.255	A256	A.256	A257	A.257	A258	A.258	A259	A.259
A260	A.260	A261	A.261	A262	A.262	A263	A.263	A264	A.264	A265	A.265	A266	A.266
A267	A.267	A268	A.268	A269	A.269	A270	A.270	A271	A.271	A272	A.272	A273	A.273
A274	A.274	A275	A.275	A276	A.276	A277	A.277	A278	A.278	A279	A.279	A280	A.280
A281	A.281	A282	A.282	A283	A.283	A284	A.284	A285	A.285	A286	A.286	A287	A.287
A288	A.288	A289	A.289	A290	A.290	A291	A.291	A292	A.292	A293	A.293	A294	A.294
A295	A.295	A296	A.296	A297	A.297	A298	A.298	A299	A.299	A300	A.300	A301	A.301
A302	A.302	A303	A.303	A304	A.304	A305	A.305	A306	A.306	A307	A.307	A308	A.308
A309	A.309	A310	A.310	A311	A.311	A312	A.312	A313	A.313	A314	A.314	A315	A.315
A316	A.316	A317	A.317	A318	A.318	A319	A.319	A320	A.320	A321	A.321	A322	A.322
A323	A.323	A324	A.324	A325	A.325	A326	A.326	A327	A.327	A328	A.328	A329	A.329
A330	A.330	A331	A.331	A332	A.332	A333	A.333	A334	A.334	A335	A.335	A336	A.336
A337	A.337	A338	A.338	A339	A.339	A340	A.340	A341	A.341	A342	A.342	A343	A.343
A344	A.344	A345	A.345	A346	A.346	A347	A.347	A348	A.348	A349	A.349	A350	A.350
A351	A.351	A352	A.352	A353	A.353	A354	A.354	A355	A.355	A356	A.356	A357	A.357
A358	A.358	A359	A.359	A360	A.360	A361	A.361	A362	A.362	A363	A.363	A364	A.364
A365	A.365	A366	A.366	A367	A.367	A368	A.368	A369	A.369	A370	A.370	A371	A.371
A372	A.372	A373	A.373	A374	A.374	A375	A.375	A376	A.376	A377	A.377	A378	A.378
A379	A.379	A380	A.380	A381	A.381	A382	A.382	A383	A.383	A384	A.384	A385	A.385
A386	A.386	A387	A.387	A388	A.388	A389	A.389	A390	A.390	A391	A.391	A392	A.392
A393	A.393	A394	A.394	A395	A.395	A396	A.396	A397	A.397	A398	A.398	A399	A.399
A400	A.400	A401	A.401	A402	A.402	A403	A.403	A404	A.404	A405	A.405	A406	A.406
A407	A.407	A408	A.408	A409	A.409	A410	A.410	A411	A.411	A412	A.412	A413	A.413
A414	A.414	A415	A.415	A416	A.416	A417	A.417	A418	A.418	A419	A.419	A420	A.420
A421	A.421	A422	A.422	A423	A.423	A424	A.424	A425	A.425	A426	A.426	A427	A.427
A428	A.428	A429	A.429	A430	A.430	A431	A.431	A432	A.432	A433	A.433	A434	A.434
A435	A.435	A436	A.436	A437	A.437	A438	A.438	A439	A.439	A440	A.440	A441	A.441
A442	A.442	A443	A.443	A444	A.444	A445	A.445	A446	A.446	A447	A.447	A448	A.448
A449	A.449	A450	A.450	A451	A.451	A452	A.452	A453	A.453	A454	A.454	A455	A.455
A456	A.456	A457	A.457	A458	A.458	A459	A.459	A460	A.460	A461	A.461	A462	A.462
A463	A.463	A464	A.464	A465	A.465	A466	A.466	A467	A.467	A468	A.468	A469	A.469
A470	A.470	A471	A.471	A472	A.472	A473	A.473	A474	A.474	A475	A.475	A476	A.476
A477	A.477	A478	A.478	A479	A.479	A480	A.480	A481	A.481	A482	A.482	A483	A.483
A484	A.484	A485	A.485	A486	A.486	A487	A.487	A488	A.488	A489	A.489	A490	A.490
A491	A.491	A492	A.492	A493	A.493	A494	A.494	A495	A.495	A496	A.496	A497	A.497
A498	A.498	A499	A.499	A500	A.500	A501	A.501	A502	A.502	A503	A.503	A504	A.504
A505	A.505	A506	A.506	A507	A.507	A508	A.508	A509	A.509	A510	A.510	A511	A.511
A512	A.512	A513	A.513	A514	A.514	A515	A.515	A516	A.516	A517	A.517	A518	A.518
A519	A.519	A520	A.520	A521	A.521	A522	A.522	A523	A.523	A524	A.524	A525	A.525
A526	A.526	A527	A.527	A528	A.528	A529	A.529	A530	A.530	A531	A.531	A532	A.532
A533	A.533	A534	A.534	A535	A.535	A536	A.536	A537	A.537	A538	A.538	A539	A.539
A540	A.540	A541	A.541	A542	A.542	A543	A.543	A544	A.544	A545	A.545	A546	A.546
A547	A.547	A548	A.548	A549	A.549	A550	A.550	A551	A.551	A552	A.552	A553	A.553
A554	A.554	A555	A.555	A556	A.556	A557	A.557	A558	A.558	A559	A.559	A560	A.560
A561	A.561	A562	A.562	A563	A.563	A564	A.564	A565	A.565	A566	A.566	A567	A.567
A568	A.568	A569	A.569	A570	A.570	A571	A.571	A572	A.572	A573	A.573	A574	A.574
A575	A.575	A576	A.576	A577	A.577	A578	A.578	A579	A.579	A580	A.580	A581	A.581
A582	A.582	A583	A.583	A584	A.584	A585	A.585	A586	A.586	A587	A.587	A588	A.588
A589	A.589	A590	A.590	A591	A.591	A592	A.592	A593	A.593	A594	A.594	A595	A.595
A596	A.596	A597	A.597	A598	A.598	A599	A.599	A600	A.600	A601	A.601	A602	A.602
A603	A.603	A604	A.604	A605	A.605	A606	A.606	A607	A.607	A608	A.608	A609	A.609
A610	A.610	A611	A.611	A612	A.612	A613	A.613	A614	A.614	A615	A.615	A616	A.616
A617	A.617	A618	A.618	A619	A.619	A620	A.620	A621	A.621	A622	A.622	A623	A.623
A624	A.624	A625	A.625	A626	A.626	A627	A.627	A628	A.628	A629	A.629	A630	A.630
A631	A.631	A632	A.632	A633	A.633	A634	A.634	A635	A.635	A636	A.636	A637	A.637
A638	A.638	A639	A.639	A640	A.640	A641	A.641	A642	A.642	A643	A.643	A644	A.644
A645	A.645	A646	A.646	A647	A.647	A648	A.648	A649	A.649	A650	A.650	A651	A.651
A652	A.652	A653	A.653	A654	A.654	A655	A.655	A656	A.656	A657	A.657	A658	A.658
A659	A.659	A660	A.660	A661	A.661	A662	A.662	A663	A.663	A664	A.664	A665	A.665
A666	A.666	A667	A.667	A668	A.668	A669	A.669	A670	A.670	A671	A.671		



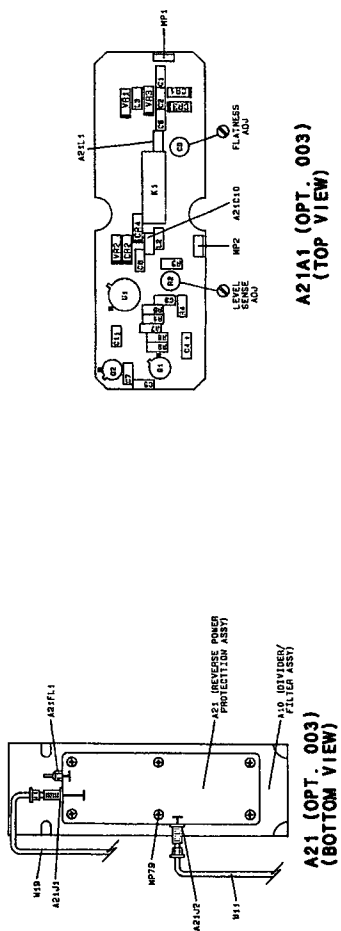
889B  
Figure 8C-33

Service

- NOTES:
1. For an explanation of schematic symbols, see "Schematic Diagram Notes" in Section 8.
  2. DC voltages are shown first for relayed circuit. Voltages for relay case are shown in parentheses.
  3. See 858B for detailed schematic diagrams of these assemblies.
  4. Refer to output impedance adjustment (OPT 003).



Reference Block Diagram



Component Locators

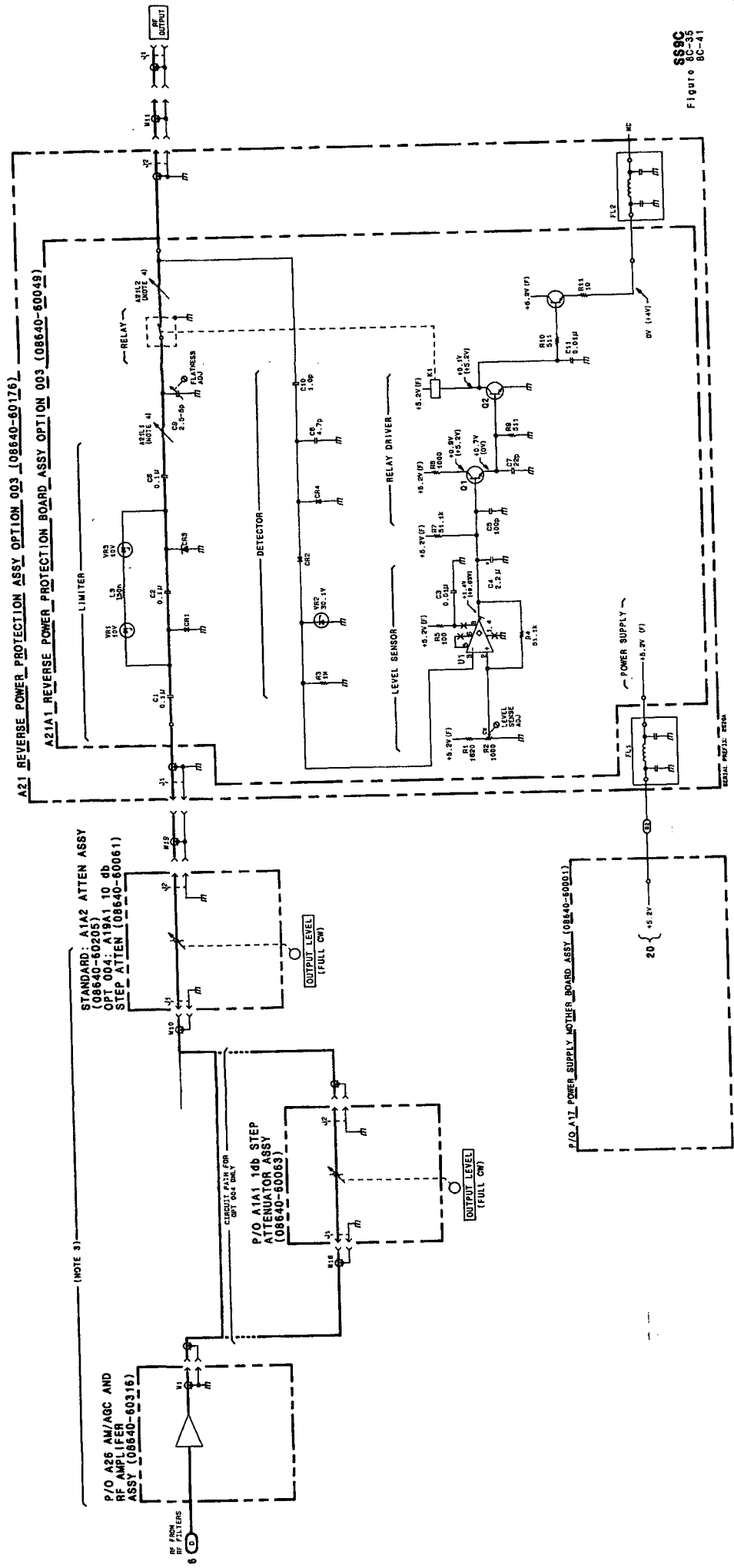
Figure 8C-34 Service Sheet 9C Information.

A26A1 OUTPUT AMPLIFIER, DOUBLER, (STAND W/ OPT 002)

SS9B

OUTPUT AMPLIFIER, DOUBLER, (STAND W/ OPT 002)

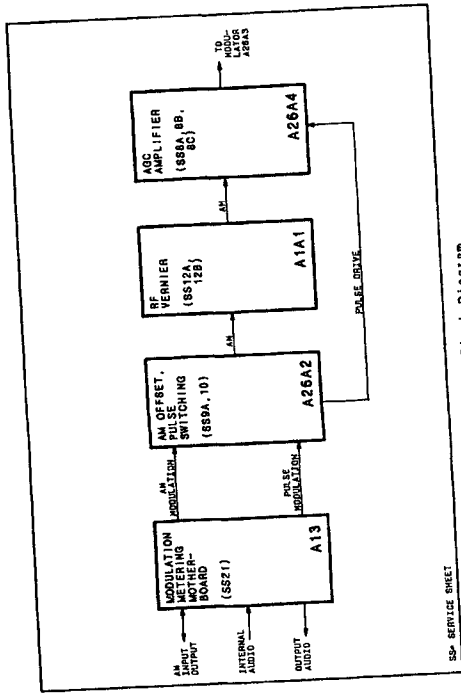
Schematic General Information



SS9C  
Figure 8C-41

Service

- NOTES:
1. For an explanation of schematic symbols, see "Schematic Diagram Notes" in Section 8.
  2. For Standards see SS2A. For OPT 001 see SS59.
  3. For Standards/OPT 002 see SS2A. For OPT 003 see SS2B. For OPT 004 see SS2C.
  4. For Standards/OPT 004 see SS2A. For OPT 005 see SS2B. For OPT 006 see SS2C.
  5. For Standards/OPT 002/OPT 003 see SS11A. For OPT 004 see SS11B.
  6. For Standards/OPT 002/OPT 003 see SS12A. For OPT 004 see SS12B.



SP- SERVICE SHEET

Reference Block Diagram

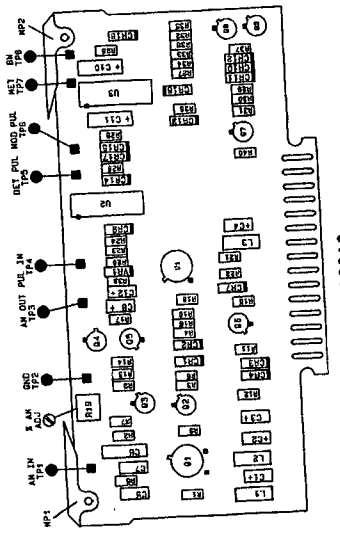
Component Coordinates

COMP	X,Y	COMP	X,Y	COMP	X,Y	COMP	X,Y	COMP	X,Y	COMP	X,Y	COMP	X,Y
1	101	2	101	3	101	4	101	5	101	6	101	7	101
8	101	9	101	10	101	11	101	12	101	13	101	14	101
15	101	16	101	17	101	18	101	19	101	20	101	21	101
22	101	23	101	24	101	25	101	26	101	27	101	28	101
29	101	30	101	31	101	32	101	33	101	34	101	35	101
36	101	37	101	38	101	39	101	40	101	41	101	42	101
43	101	44	101	45	101	46	101	47	101	48	101	49	101
50	101	51	101	52	101	53	101	54	101	55	101	56	101
57	101	58	101	59	101	60	101	61	101	62	101	63	101
64	101	65	101	66	101	67	101	68	101	69	101	70	101
71	101	72	101	73	101	74	101	75	101	76	101	77	101
78	101	79	101	80	101	81	101	82	101	83	101	84	101
85	101	86	101	87	101	88	101	89	101	90	101	91	101
92	101	93	101	94	101	95	101	96	101	97	101	98	101
99	101	100	101	101	101	102	101	103	101	104	101	105	101

A21A1 REVERSE POWER (OPT. 003)

Schematic General Information

8C-42

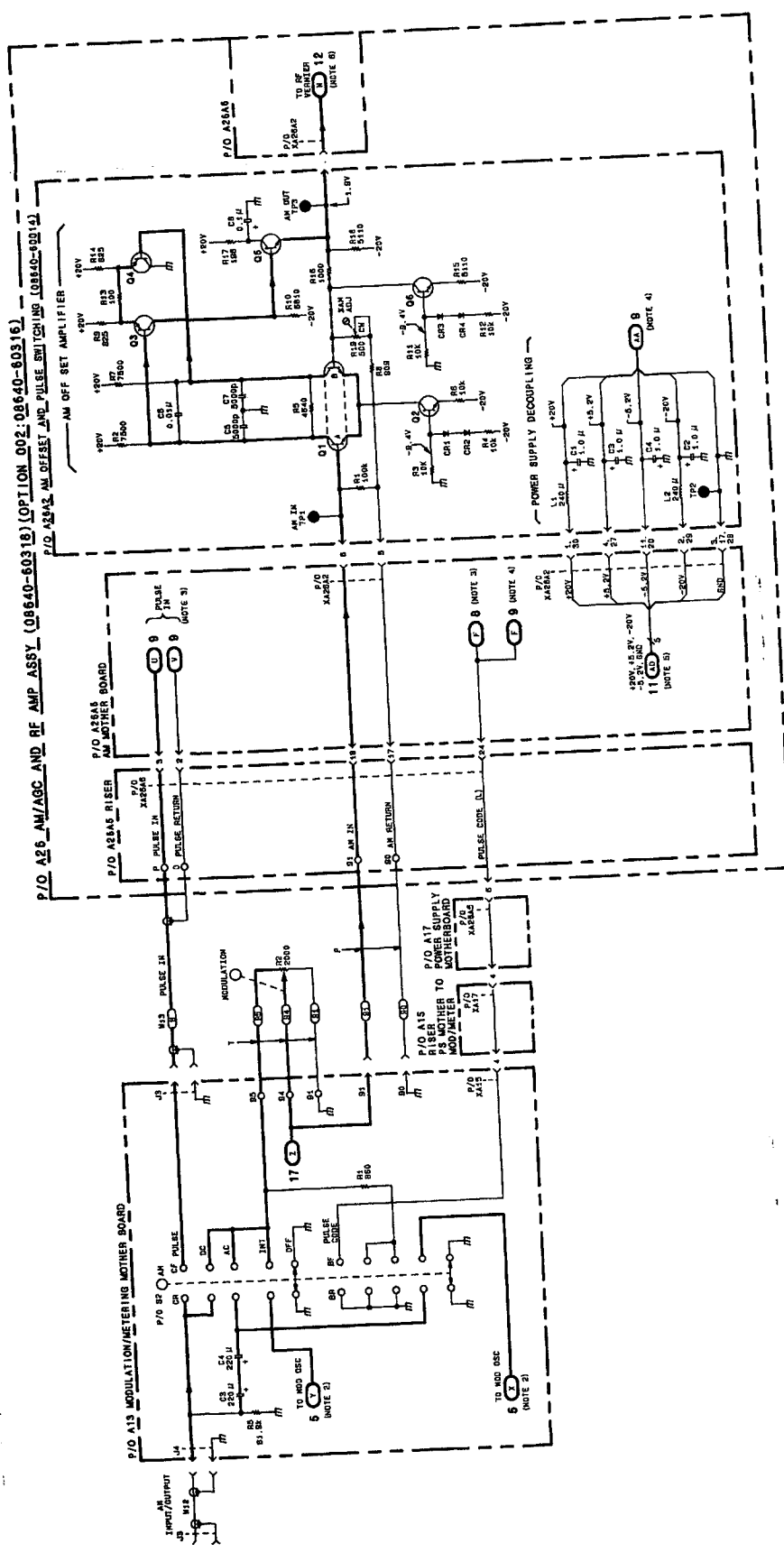


NOTE: THE COMPONENT LOCATOR FOR A13 IS SHOWN ON SS21 INFORMATION

Component Locator

Figure 8C-36 Service Sheet 10 Information.





8810  
Figure 8C-3

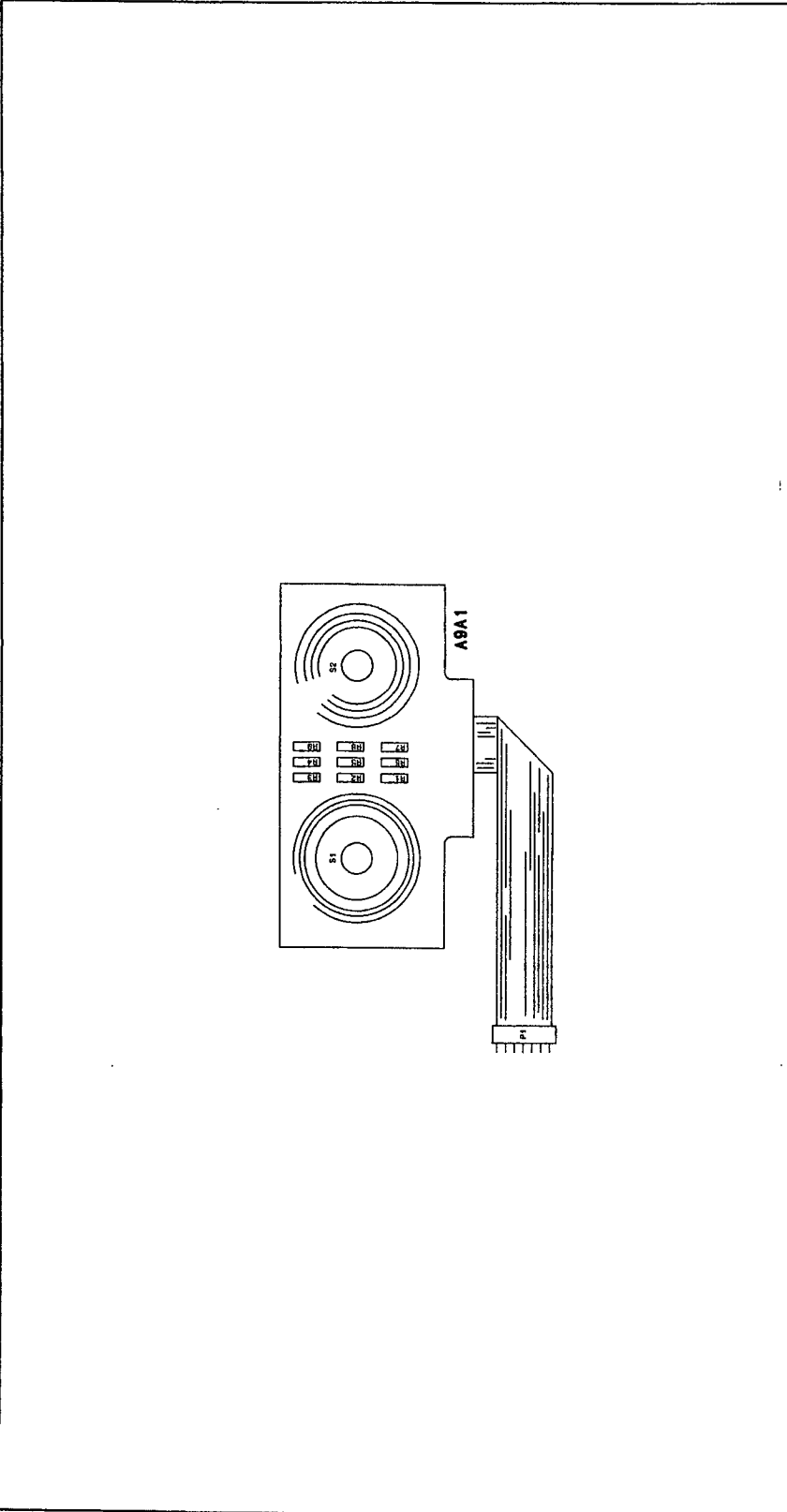
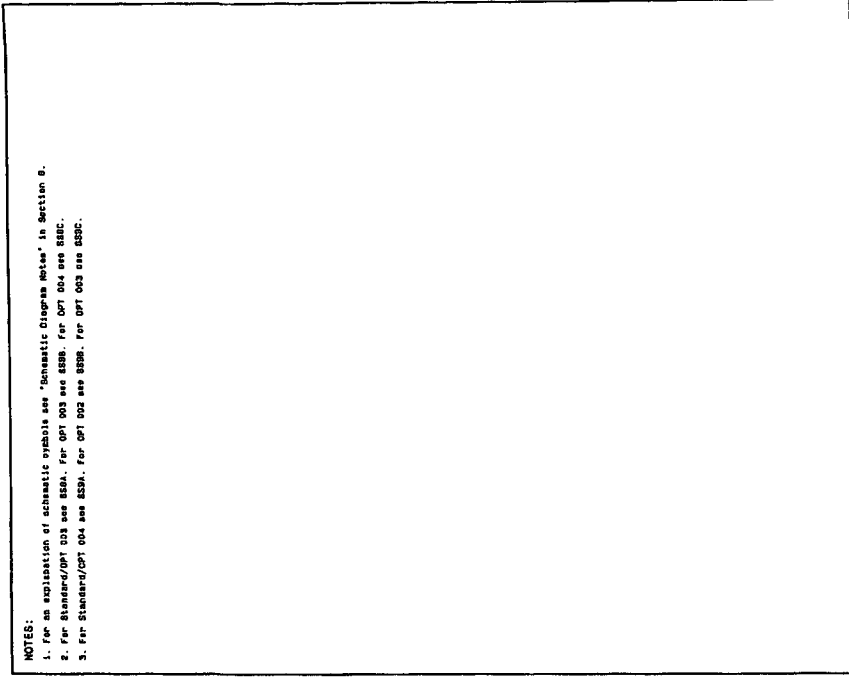


Figure 8C-38 Service Sheet 11A Information.

Component Locator

NOTES:

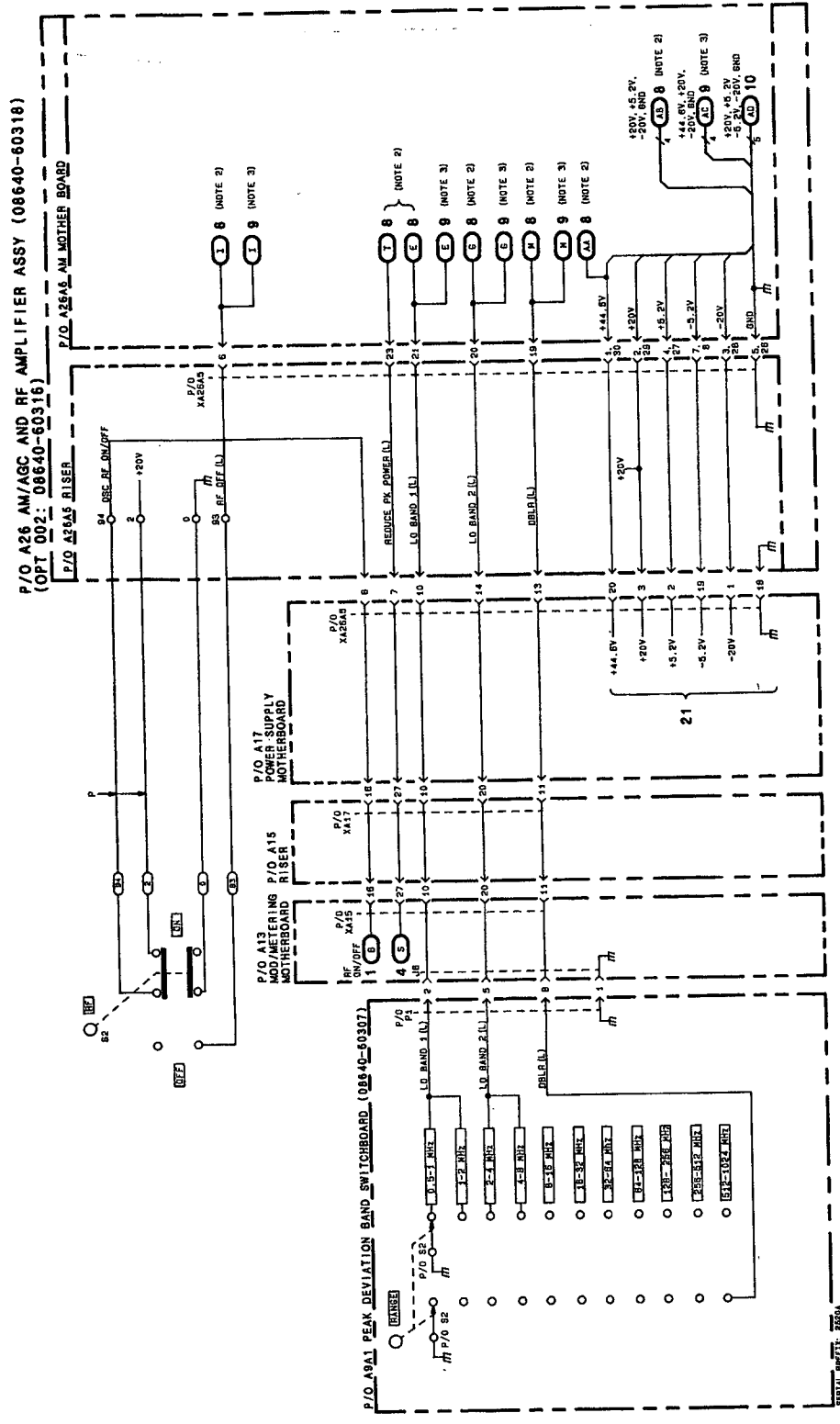
1. For an explanation of schematic symbols see "Schematic Diagram Notes" in Section 8.
2. For Standard/PT 033 see 832A. For DPT 003 see 832B. For DPT 004 see 832C.
3. For Standard/PT 004 see 833A. For DPT 002 see 833B. For DPT 003 see 833C.



Schematic General Information

**A26A2 AM PREAMPLIFIERS SS10**  
RELEASED 1952

8C-44



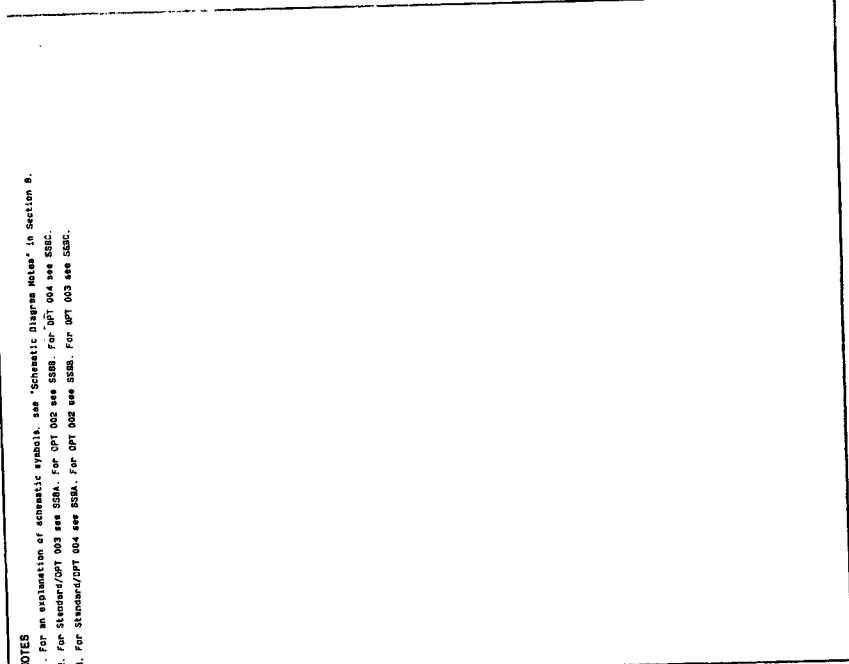
SS11A  
Figure 8C-39  
8C-45

Service

Model 86413

**NOTES**

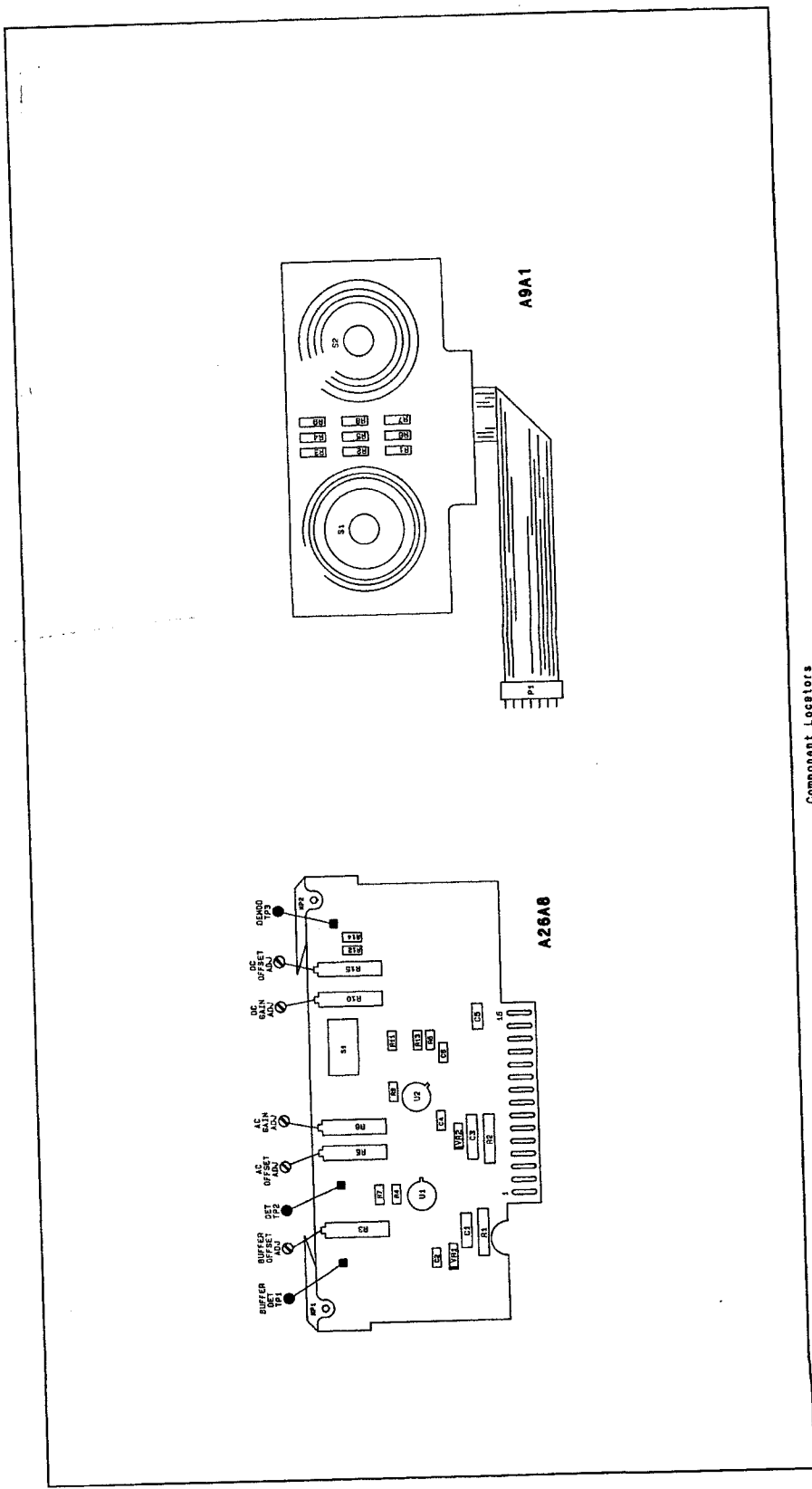
1. For an explanation of schematic symbols, see "Schematic Diagrams Manual" in Section 6.
2. For Standard/OPT 003 see SSB. For OPT 002 see SSB. For OPT 004 see SSB.
3. For Standard/OPT 004 see SSB. For OPT 002 see SSB. For OPT 003 see SSB.



Schematic General Information

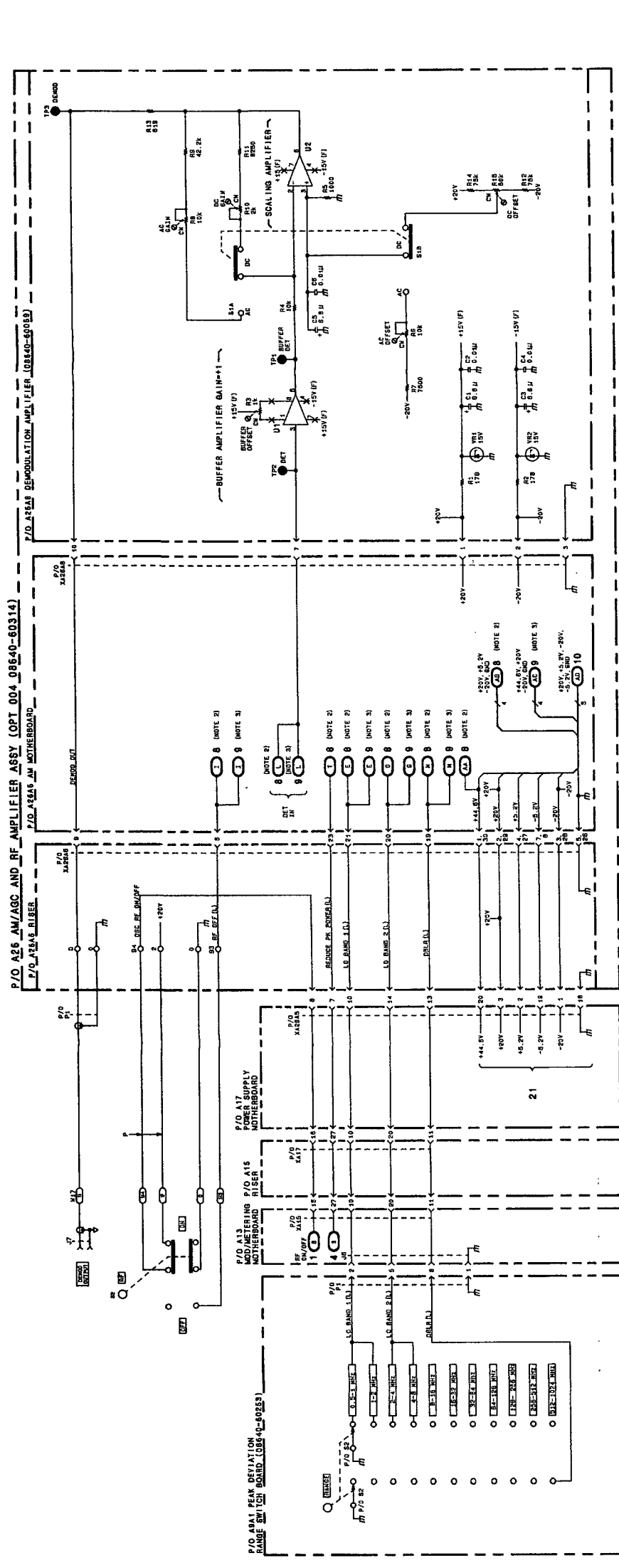
8C-46

AM INTERCONNECTIONS, **SS11A**  
RF ON/OFF SWITCH  
[STANDARD]  
SEE EXTERNAL LITE



Component Locators

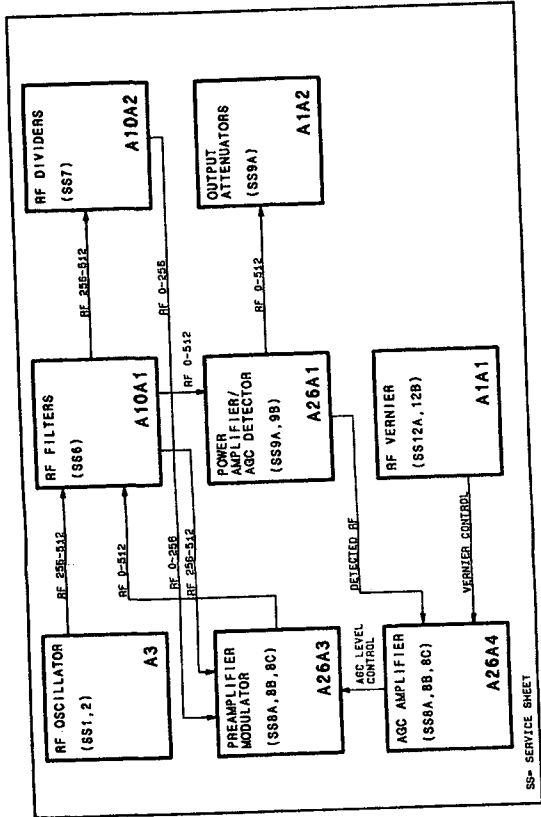
Figure 8C-40 Service Sheet 11B Information.



66118  
Figure 80-47

Service

- NOTES:
1. For an explanation of schematic symbols, see "Schematic Diagram Notes" in Section 6.
  2. For Standard/OPT 003 see SSA. For OPT 002 see SSB. For OPT 004 see SSC.
  3. For Standard/OPT 004 see SSA. For OPT 002 see SSB. For OPT 003 see SSC.



Reference Block Diagram

SS- SERVICE SHEET

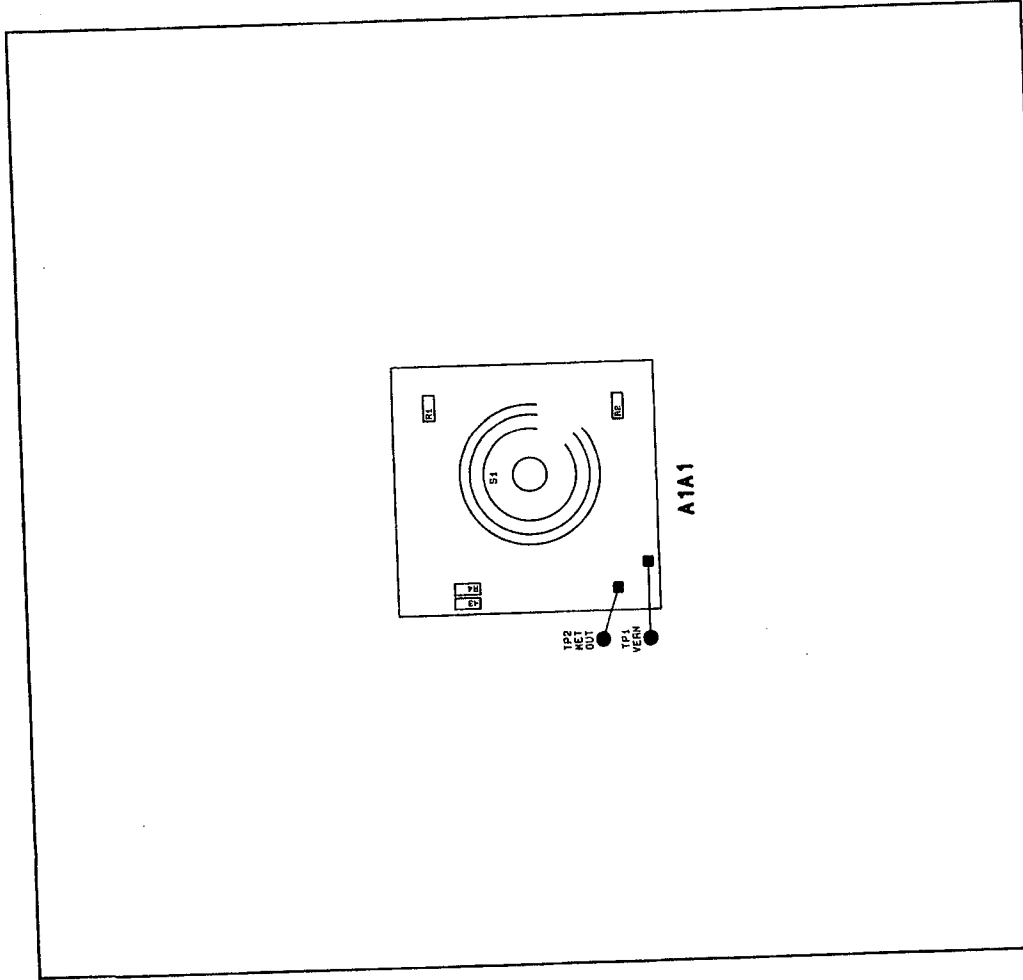
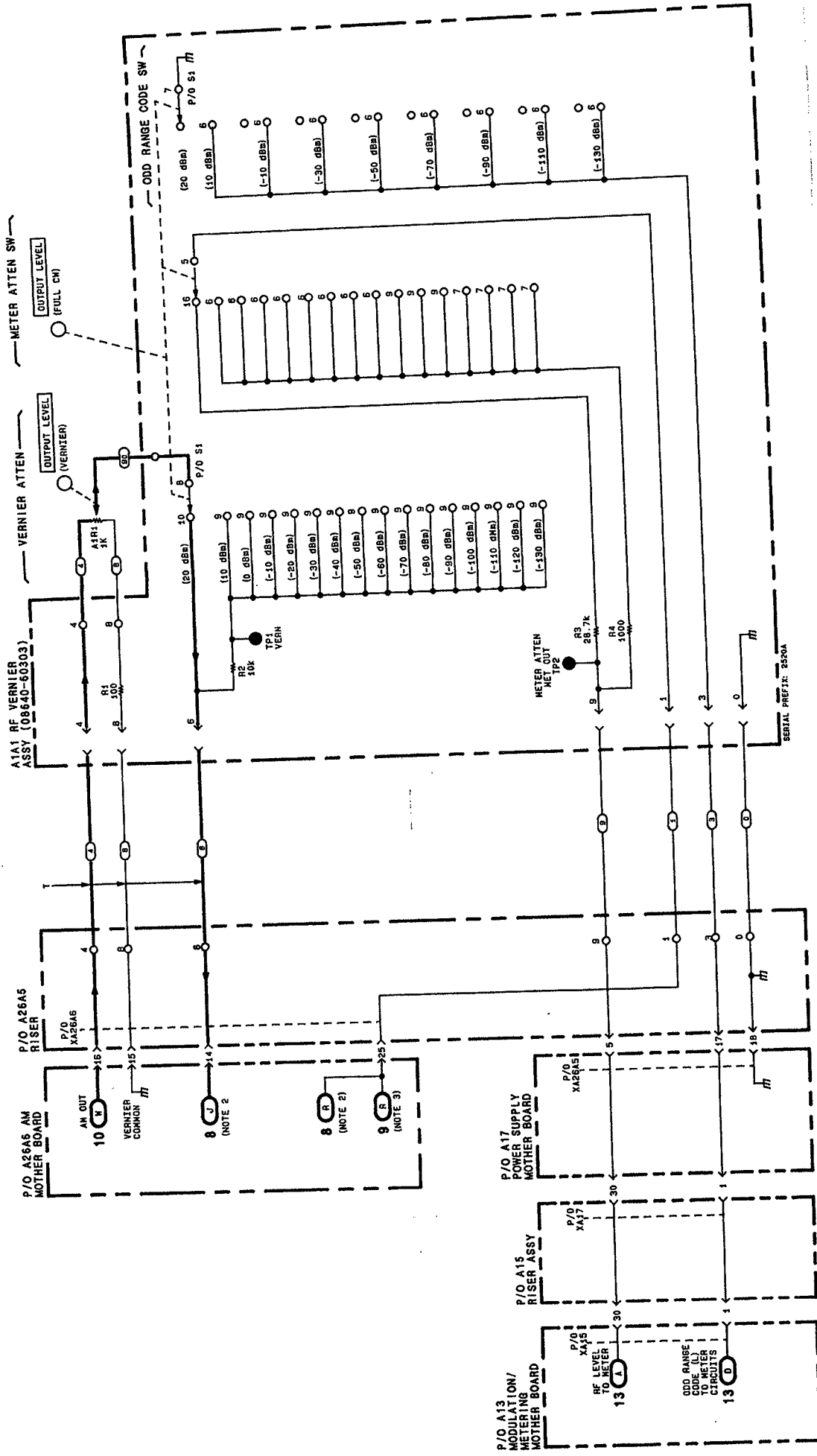


Figure 8C-42 Service Sheet 12A Information. Component Locator

AM INTERCONNECTIONS, **SS11B**  
RF ON/OFF SWITCH (OPT 004)  
SEE REVERSE SIDE

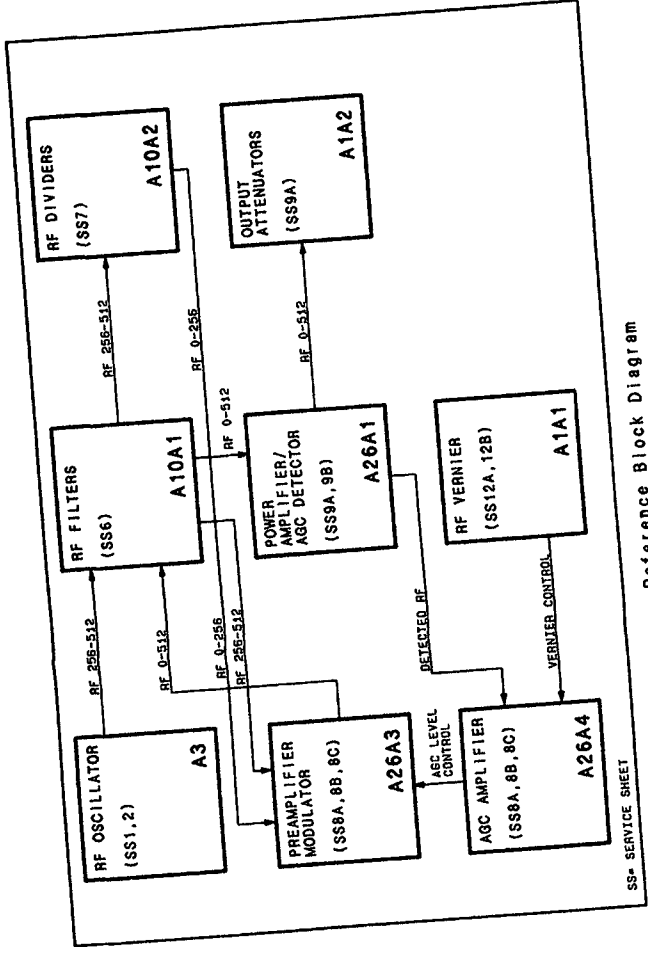


SS12A  
Figure 8C-43

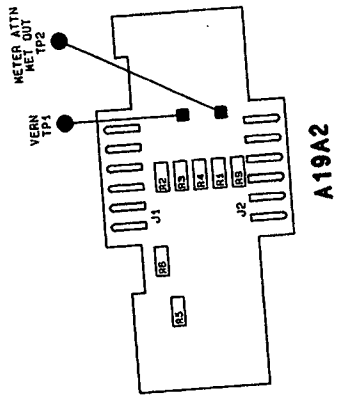
Service

NOTES: For an explanation of schematic symbols, see "Schematic Diagram Notes" in Section 6.

1. For an explanation of schematic symbols, see "Schematic Diagram Notes" in Section 6.
2. For Standard/OPT 003 see SS8A. For OPT 002 see SS8B. For OPT 004 see SS8C.
3. For Standard/OPT 003 see SS9A. For OPT 002 see SS9B. For OPT 004 see SS9C.



Reference Block Diagram

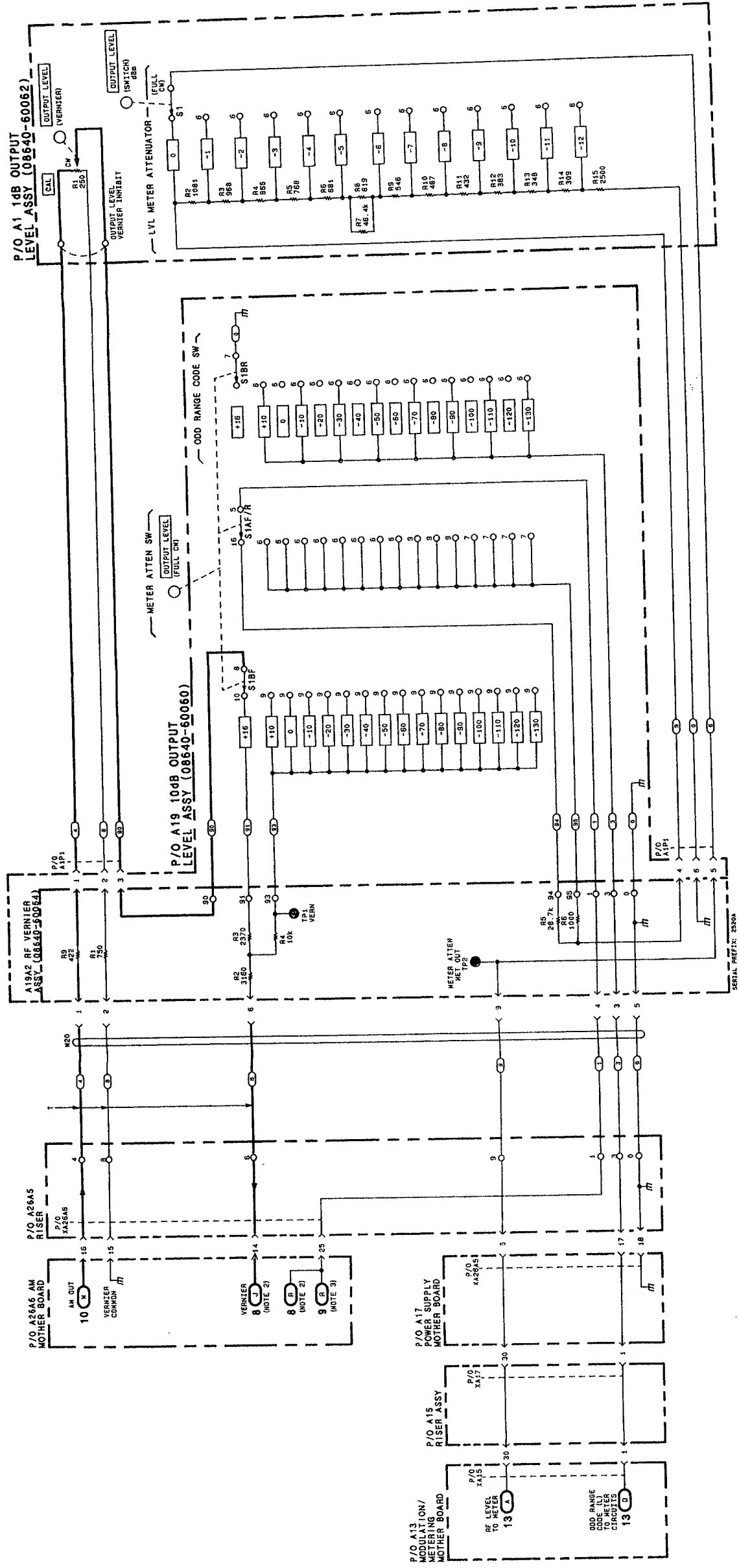


Component Locator

Figure 8C-44Service Sheet 12B Information.

**A1A1 RF VERNIER (STANDARD)**  
 SS12A  
 (SEE REVERSE SIDE)

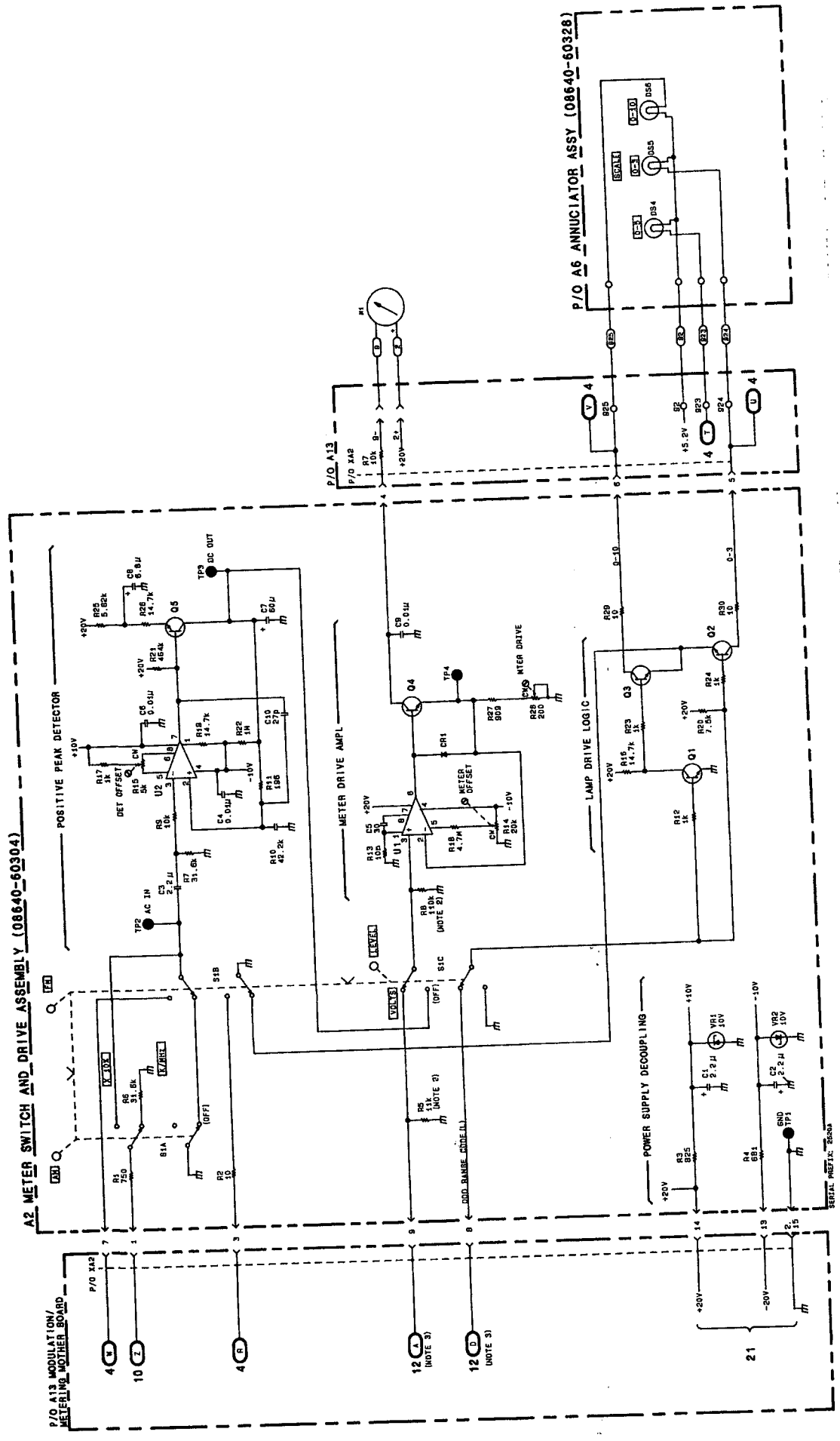




SS128  
Figure 8C-45

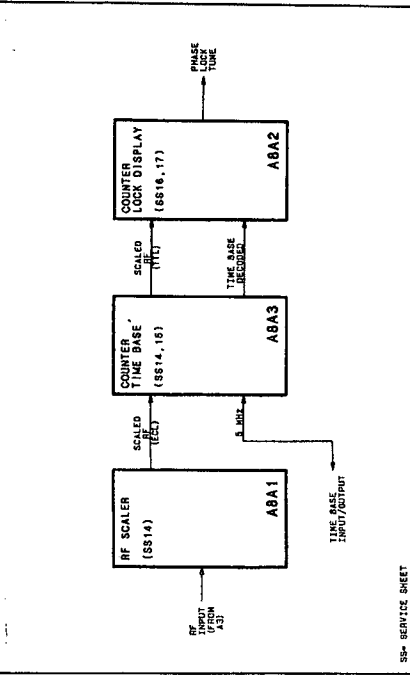
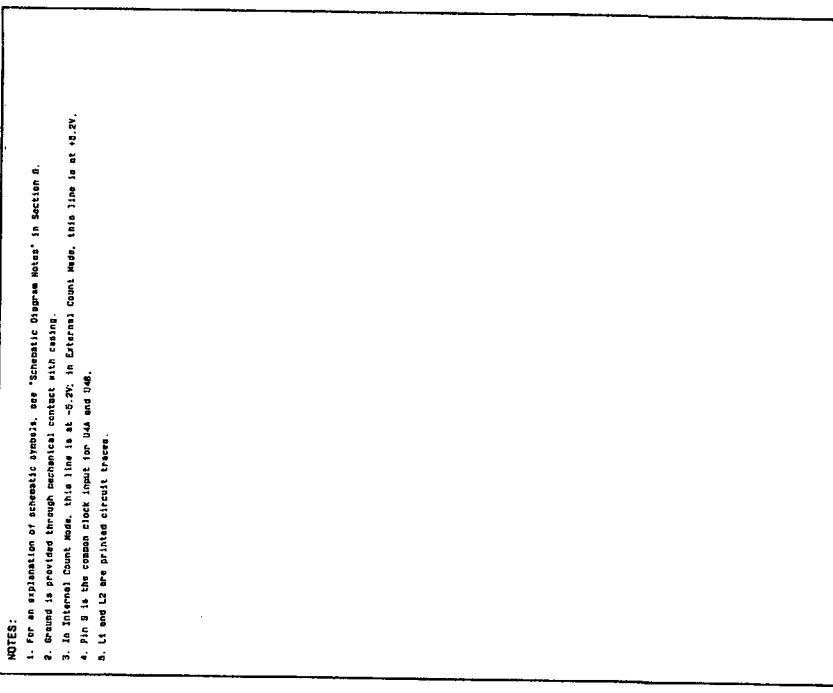


**A2 METER SWITCH AND DRIVE ASSEMBLY (08640-60304)**



Service

Model 830B



Reference Block Diagram  
Component Coordinates

COMP X, Y	COMP X, Y	COMP X, Y	COMP X, Y	COMP X, Y	COMP X, Y	COMP X, Y	COMP X, Y	COMP X, Y	COMP X, Y
ABA1	ABA2	ABA3	ABA4	ABA5	ABA6	ABA7	ABA8	ABA9	ABA10
C1	C2	C3	C4	C5	C6	C7	C8	C9	C10
C11	C12	C13	C14	C15	C16	C17	C18	C19	C20
C21	C22	C23	C24	C25	C26	C27	C28	C29	C30
C31	C32	C33	C34	C35	C36	C37	C38	C39	C40
C41	C42	C43	C44	C45	C46	C47	C48	C49	C50
C51	C52	C53	C54	C55	C56	C57	C58	C59	C60
C61	C62	C63	C64	C65	C66	C67	C68	C69	C70
C71	C72	C73	C74	C75	C76	C77	C78	C79	C80
C81	C82	C83	C84	C85	C86	C87	C88	C89	C90
C91	C92	C93	C94	C95	C96	C97	C98	C99	C100

SS13  
METER SWITCH AND DRIVE  
SEE INSTRUCTIONS

8C-54

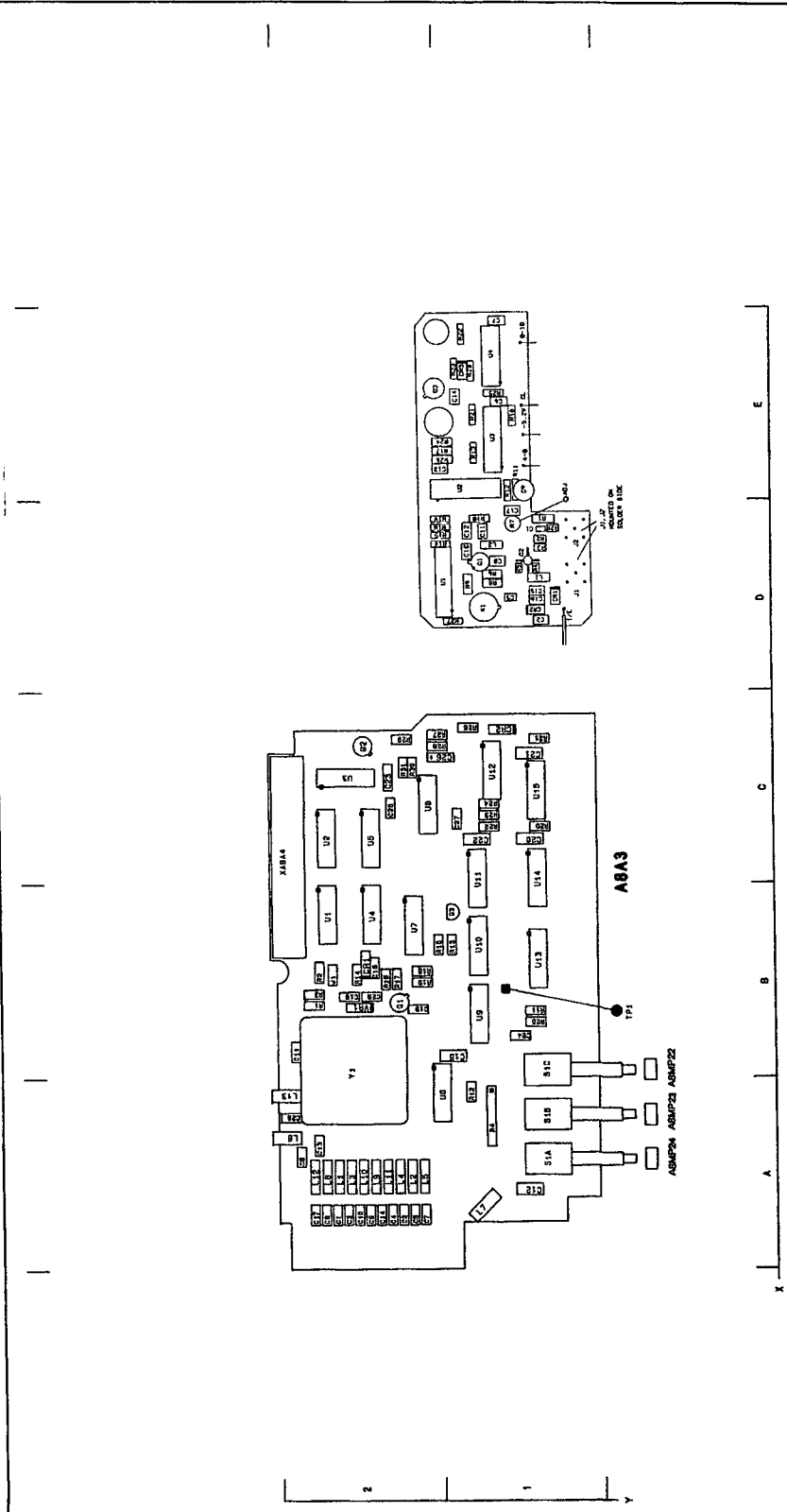
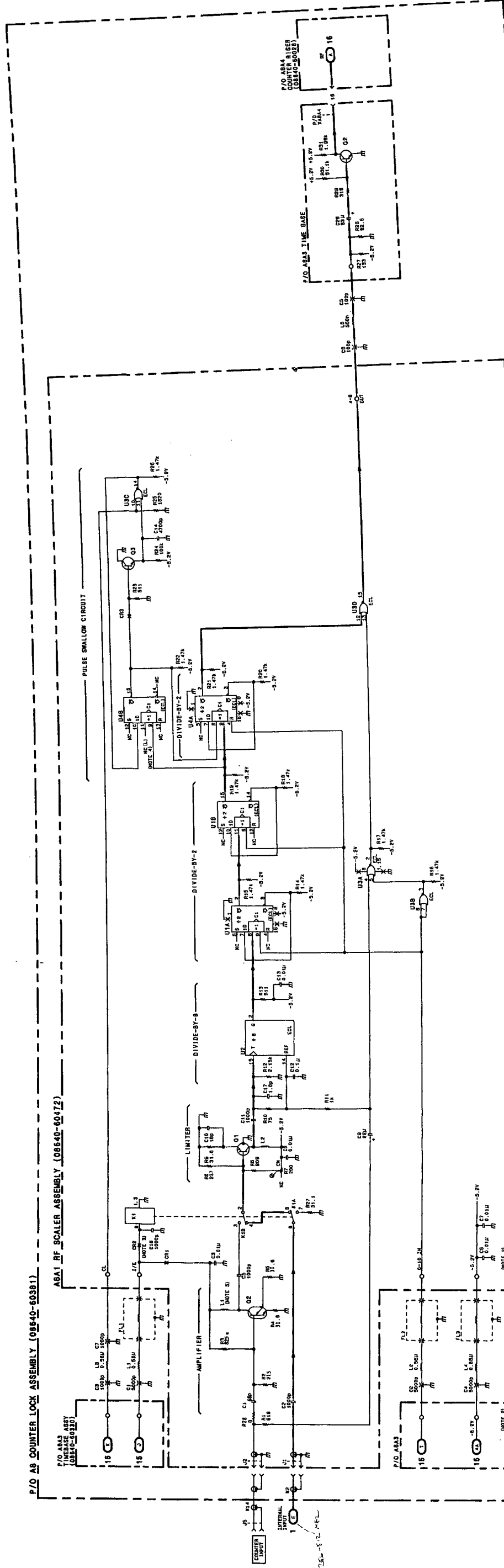


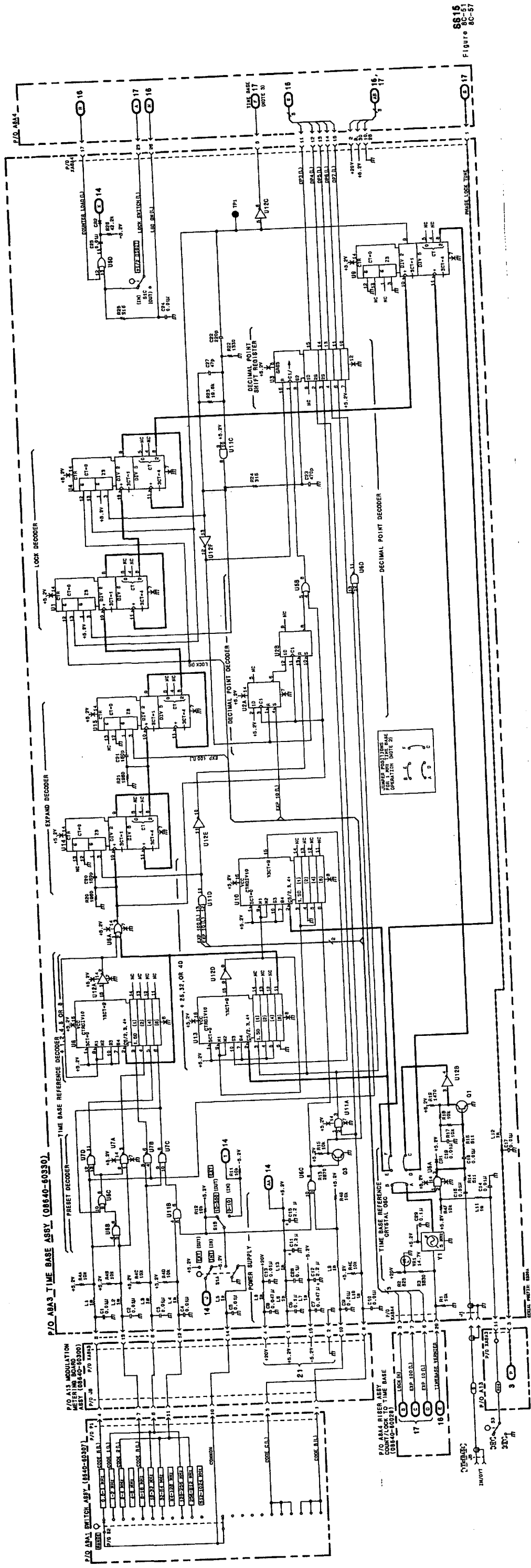
Figure 8C-48 Service Sheet 14 Information.

P/O AB COUNTER LOCK ASSEMBLY (08840-60381)

ABA1 RF SCALER ASSEMBLY (08840-60472)







- NOTES:
1. For an explanation of schematic symbols, see "Schematic Display Notes" in Section 6.
  2. ABA21 is only replaceable as ABA2 (85408-0000) which includes the ABA22 Counter Display Assy.
  3. Heavy dashed line with arrow (--->) indicates Custom/Phase Lock Signal Flow.

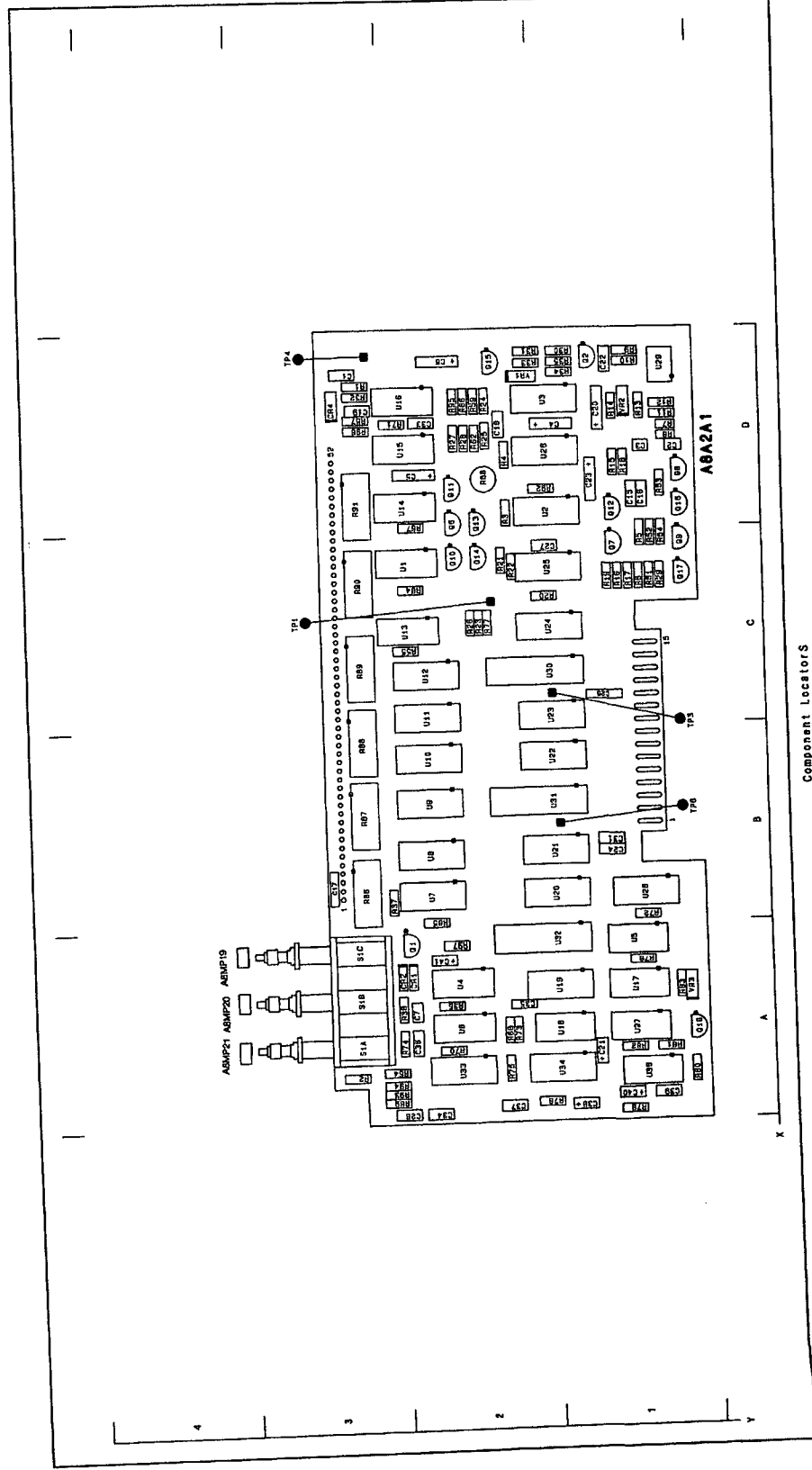
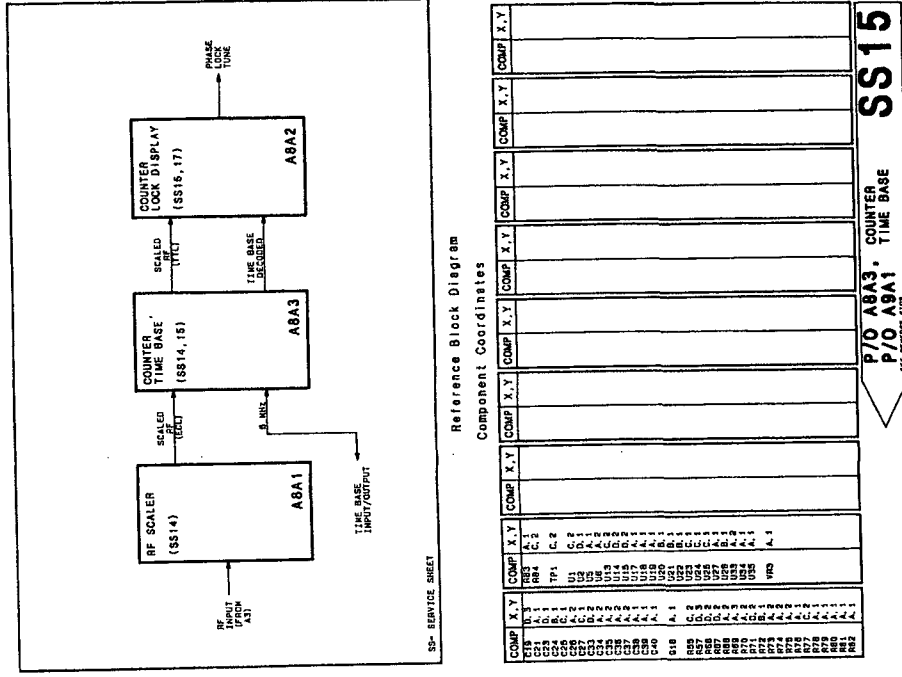
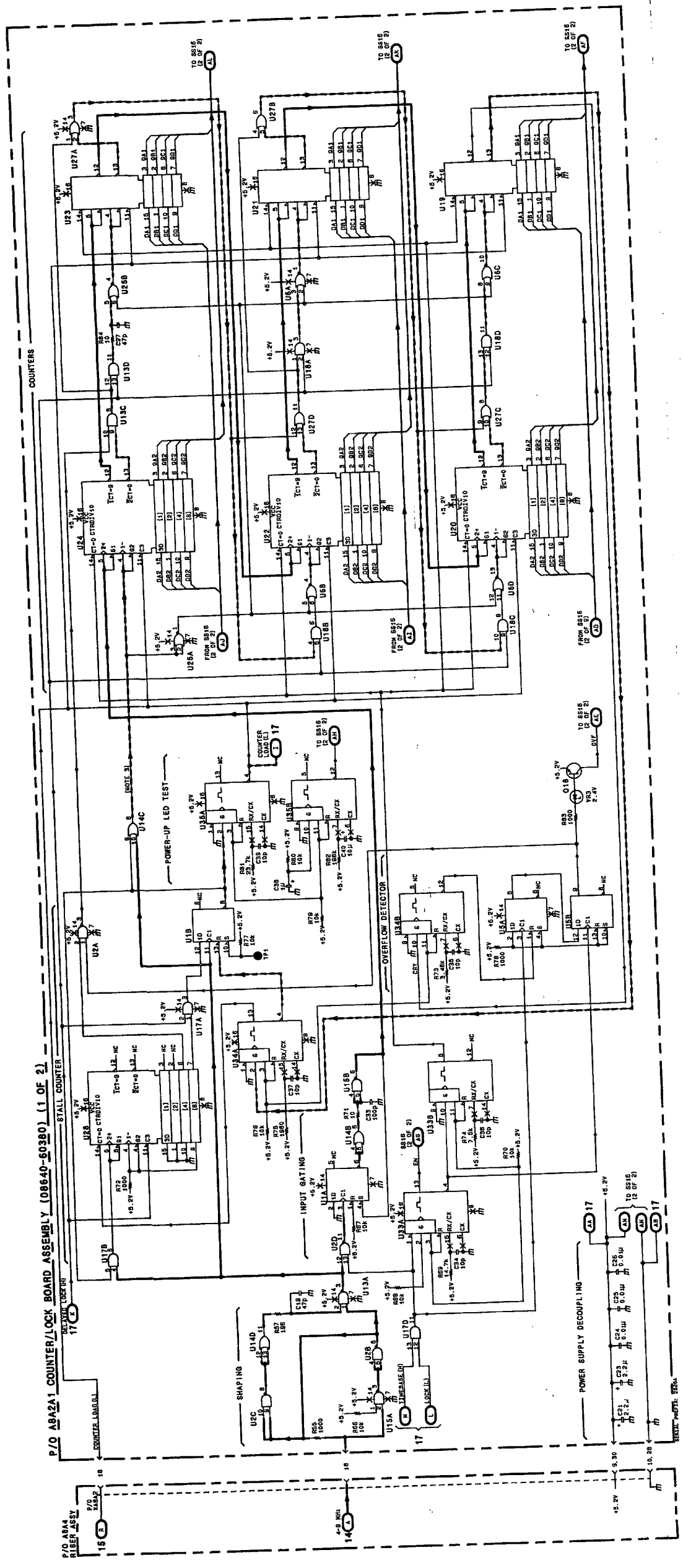


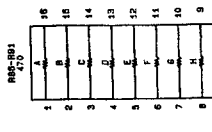
Figure 8C-52 Service Sheet 18 (1 OF 2) Information.



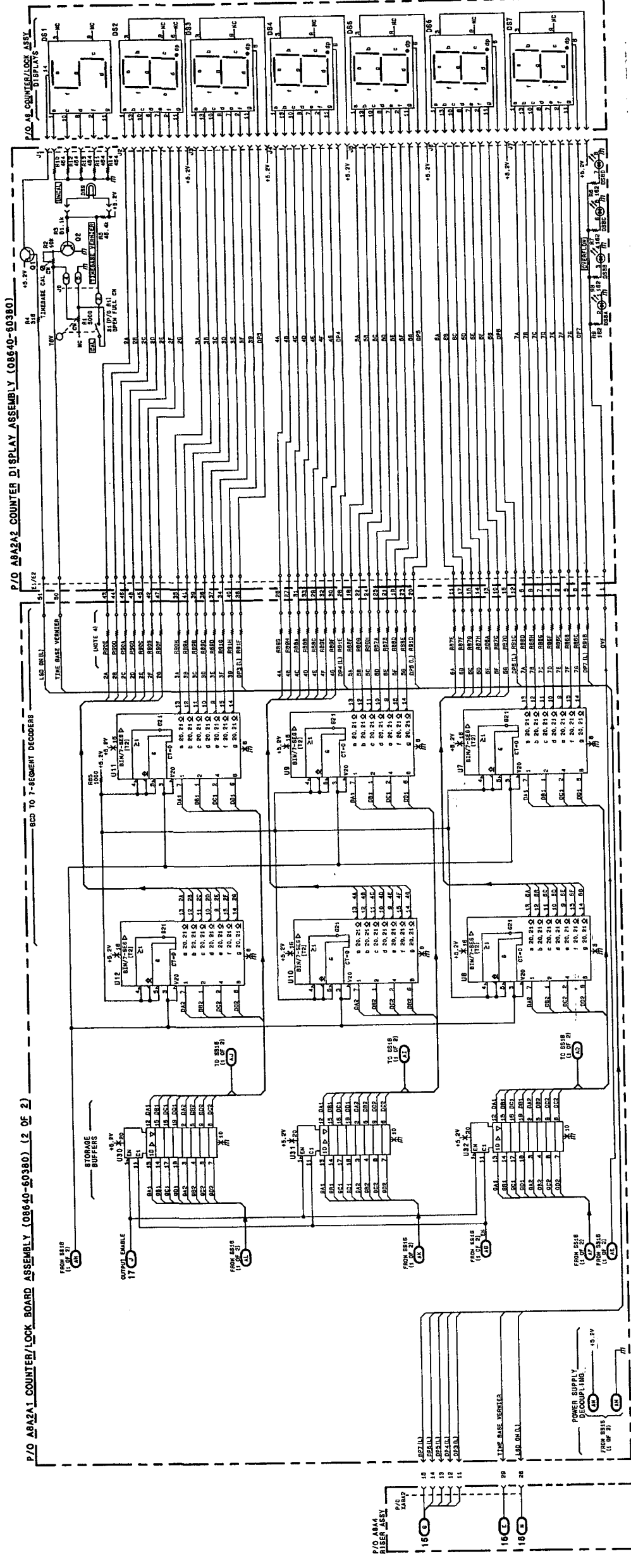


SS16  
 (1 OF 2)  
 Figure 8C-53

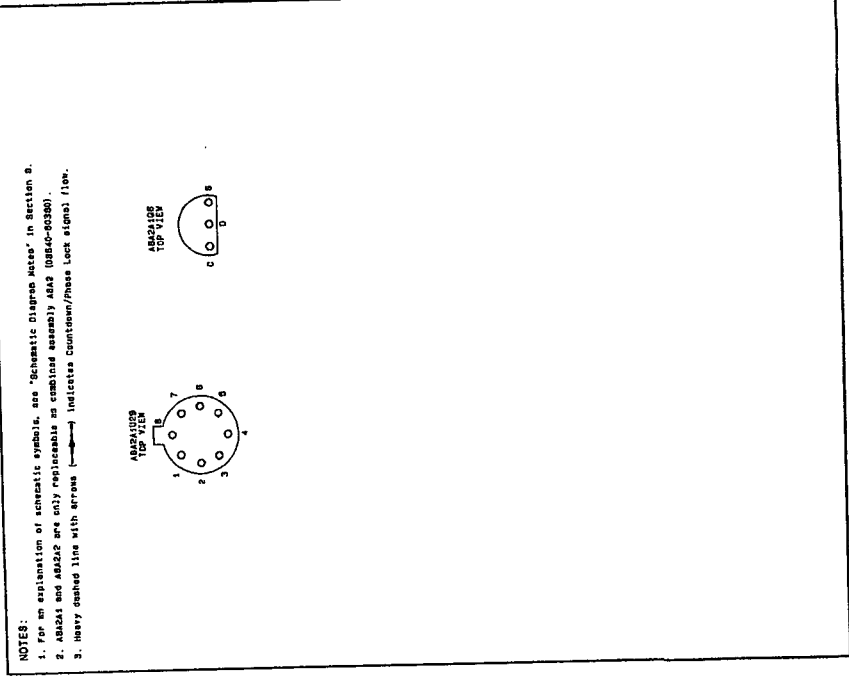
- NOTES:
- For an explanation of schematic symbols, see "Schematic Display Notes" in Section 8.
  - ABA21 is only replaceable as ABA2 (8640-020) which includes the ABA2 Counter Display Assy.
  - Both pin 9 and 14 are common mode connections for the individual 7 segment cathode connections.
  - See diagram for resistor information.



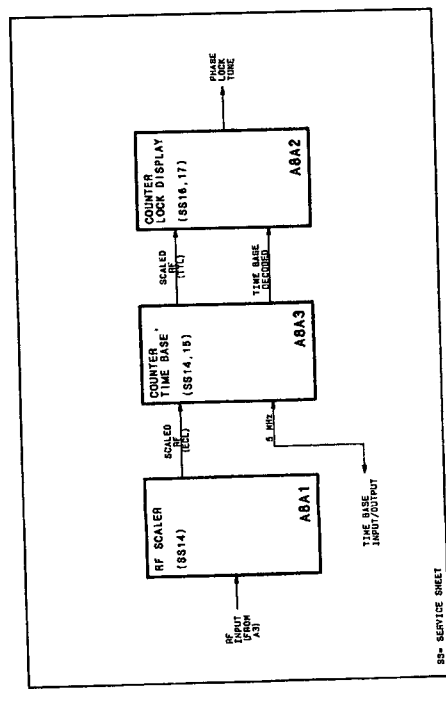
P/O ABA2A1 COUNTER BOARD ASSEMBLY (08640-60380) (2 OF 2) BCD TO 7-SEGMENT DECODERS



SS16  
(2 OF 2)  
Figure 8C-55  
8C-61



Schematic General Information



Reference Block Diagram Component Coordinates

COMP	X	Y	COMP	X	Y	COMP	X	Y	COMP	X	Y	COMP	X	Y
ABA21	1	1	ABA22	1	1	ABA23	1	1	ABA24	1	1	ABA25	1	1
ABA26	1	1	ABA27	1	1	ABA28	1	1	ABA29	1	1	ABA30	1	1
ABA31	1	1	ABA32	1	1	ABA33	1	1	ABA34	1	1	ABA35	1	1
ABA36	1	1	ABA37	1	1	ABA38	1	1	ABA39	1	1	ABA40	1	1
ABA41	1	1	ABA42	1	1	ABA43	1	1	ABA44	1	1	ABA45	1	1
ABA46	1	1	ABA47	1	1	ABA48	1	1	ABA49	1	1	ABA50	1	1
ABA51	1	1	ABA52	1	1	ABA53	1	1	ABA54	1	1	ABA55	1	1
ABA56	1	1	ABA57	1	1	ABA58	1	1	ABA59	1	1	ABA60	1	1
ABA61	1	1	ABA62	1	1	ABA63	1	1	ABA64	1	1	ABA65	1	1
ABA66	1	1	ABA67	1	1	ABA68	1	1	ABA69	1	1	ABA70	1	1
ABA71	1	1	ABA72	1	1	ABA73	1	1	ABA74	1	1	ABA75	1	1
ABA76	1	1	ABA77	1	1	ABA78	1	1	ABA79	1	1	ABA80	1	1
ABA81	1	1	ABA82	1	1	ABA83	1	1	ABA84	1	1	ABA85	1	1
ABA86	1	1	ABA87	1	1	ABA88	1	1	ABA89	1	1	ABA90	1	1
ABA91	1	1	ABA92	1	1	ABA93	1	1	ABA94	1	1	ABA95	1	1
ABA96	1	1	ABA97	1	1	ABA98	1	1	ABA99	1	1	ABA100	1	1

P/O ABA21 UP/DOWN COUNTER SS16  
P/O ABA22 AND DISPLAY SS16

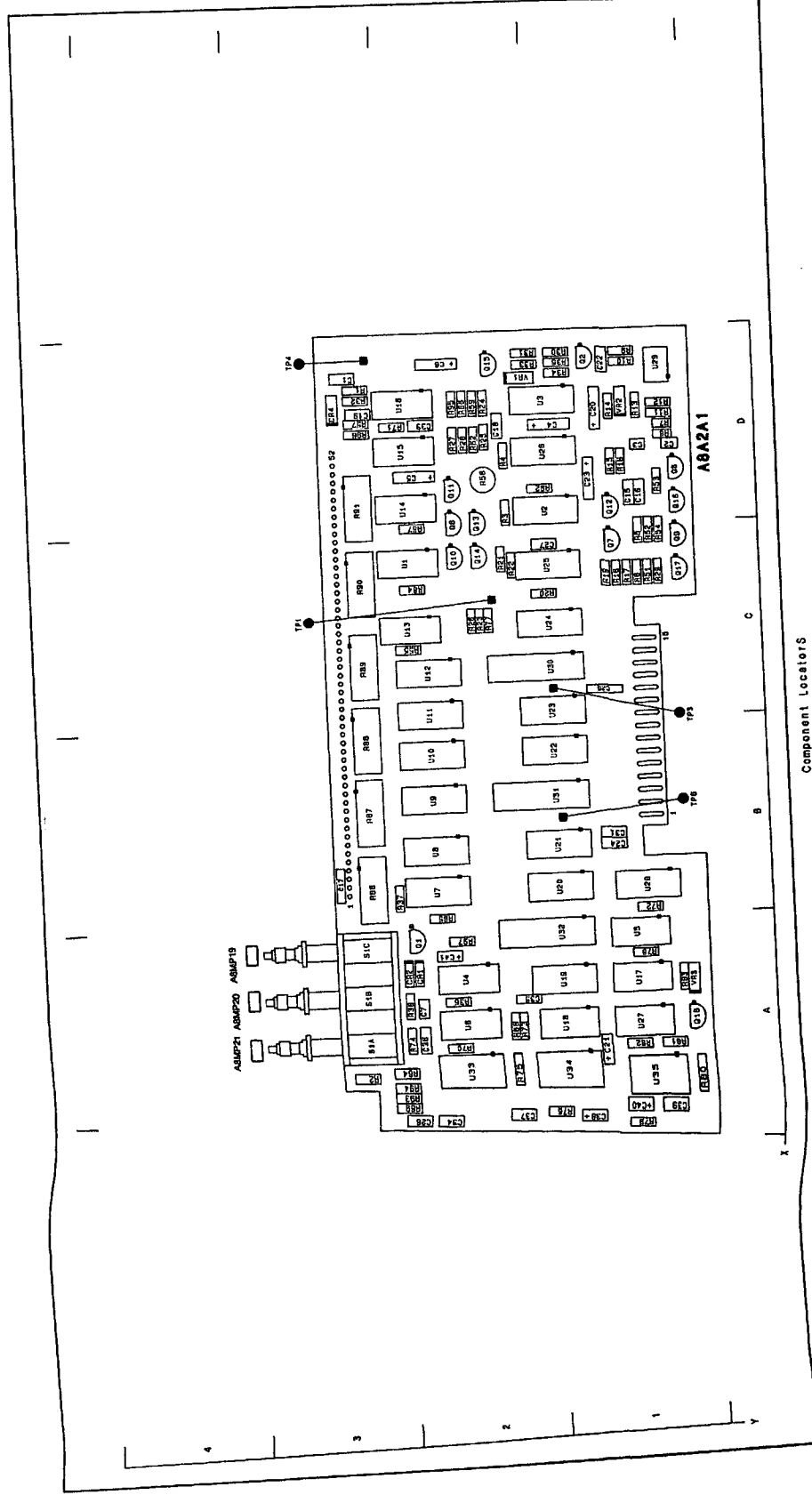
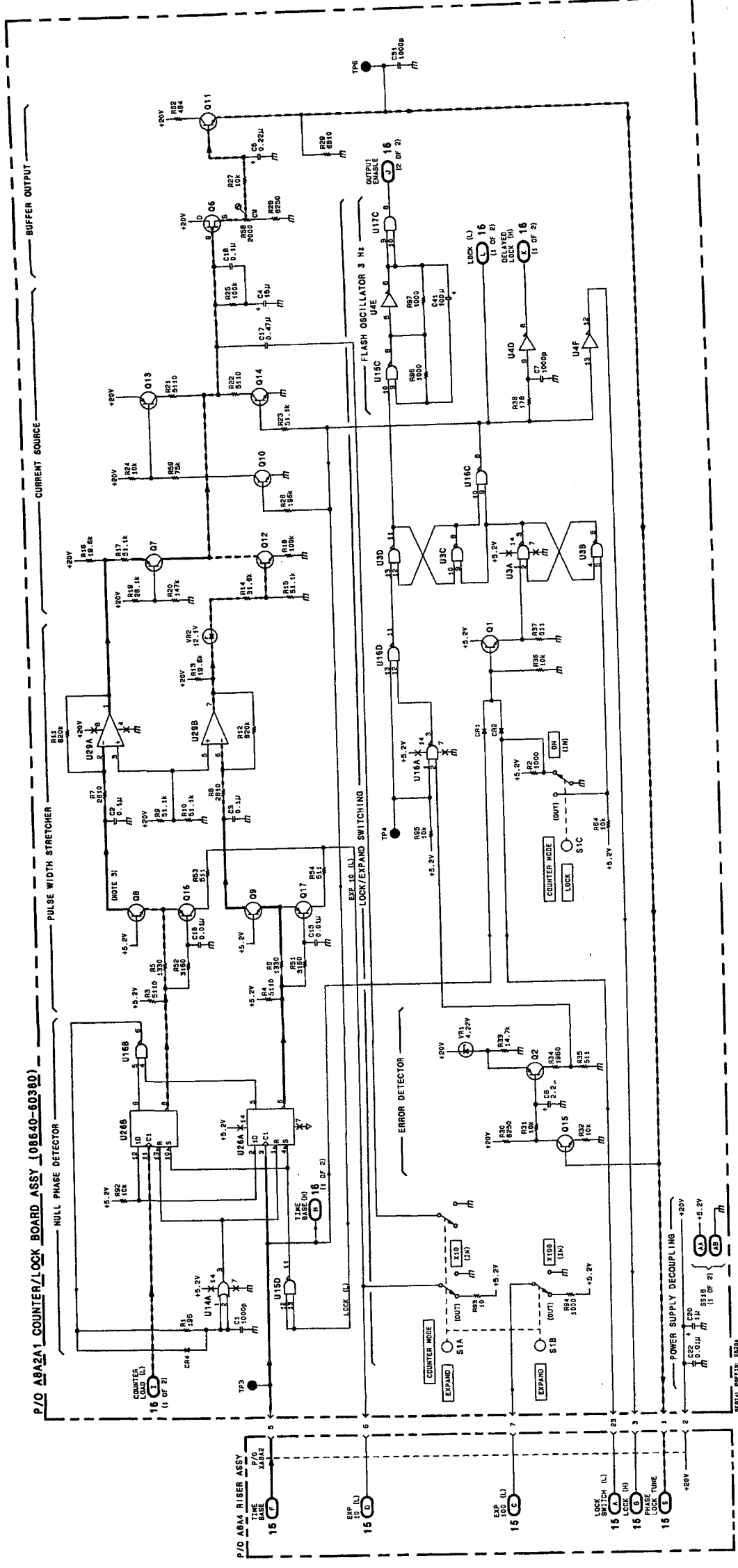
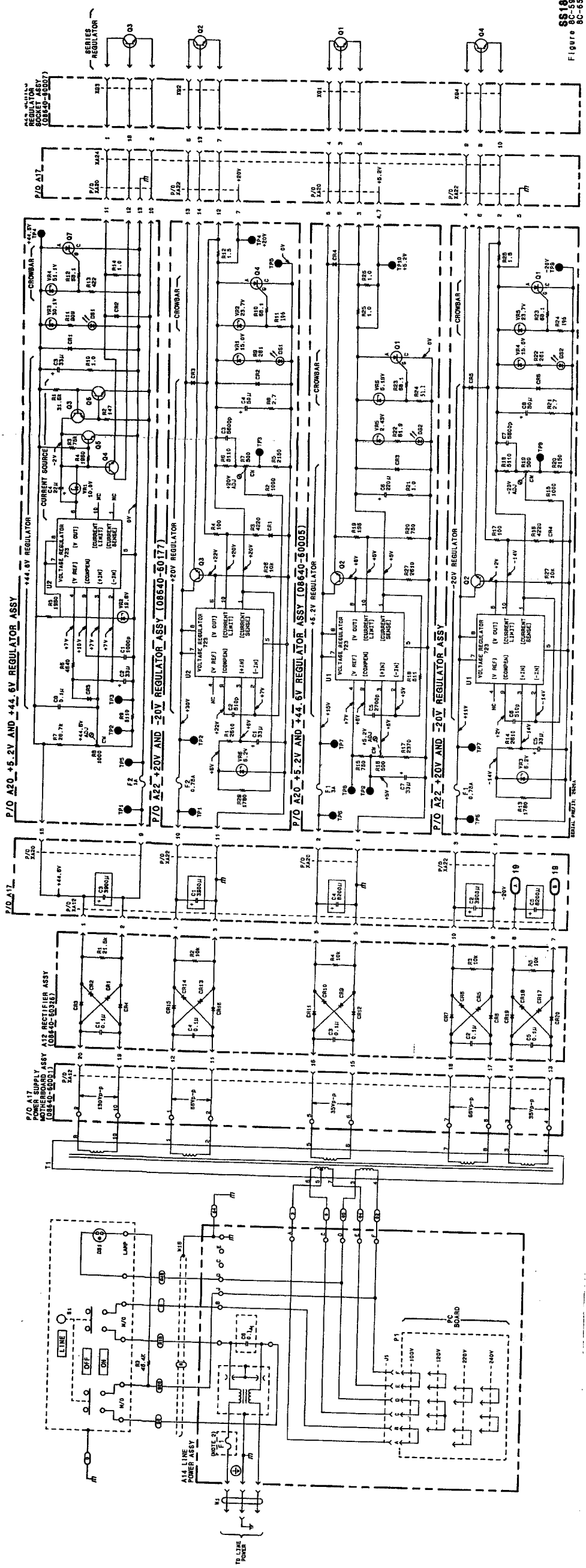


Figure 8C-55 Service Sheet 17 Information.



8617  
Figure 8C-57  
8C-63

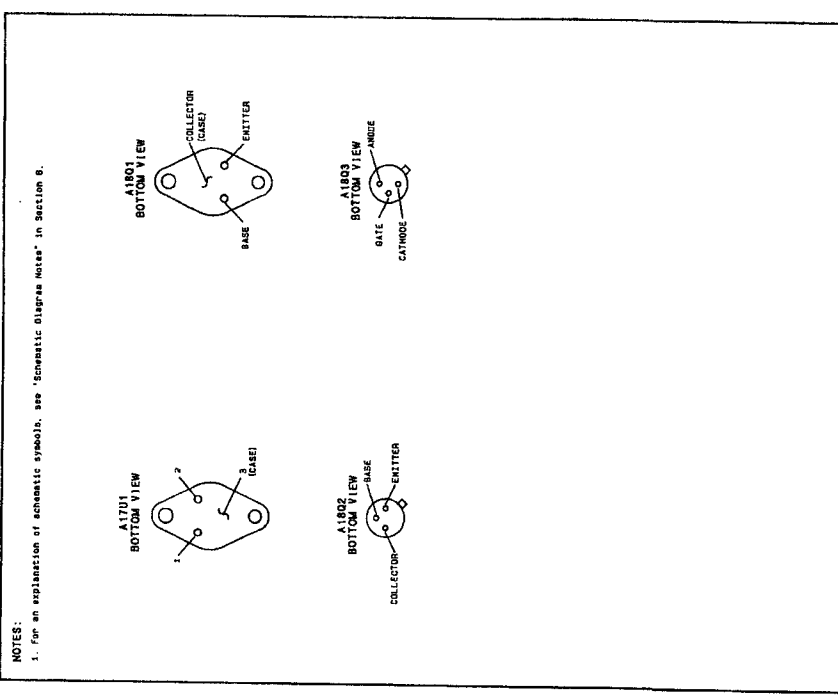




8518  
Figure 8C-59

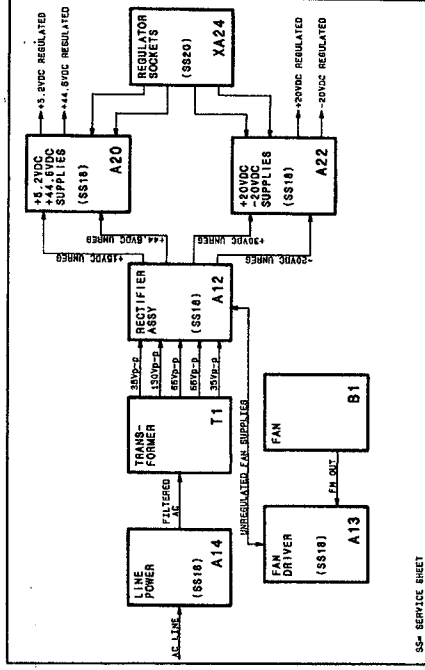
Service

Model 89-00B



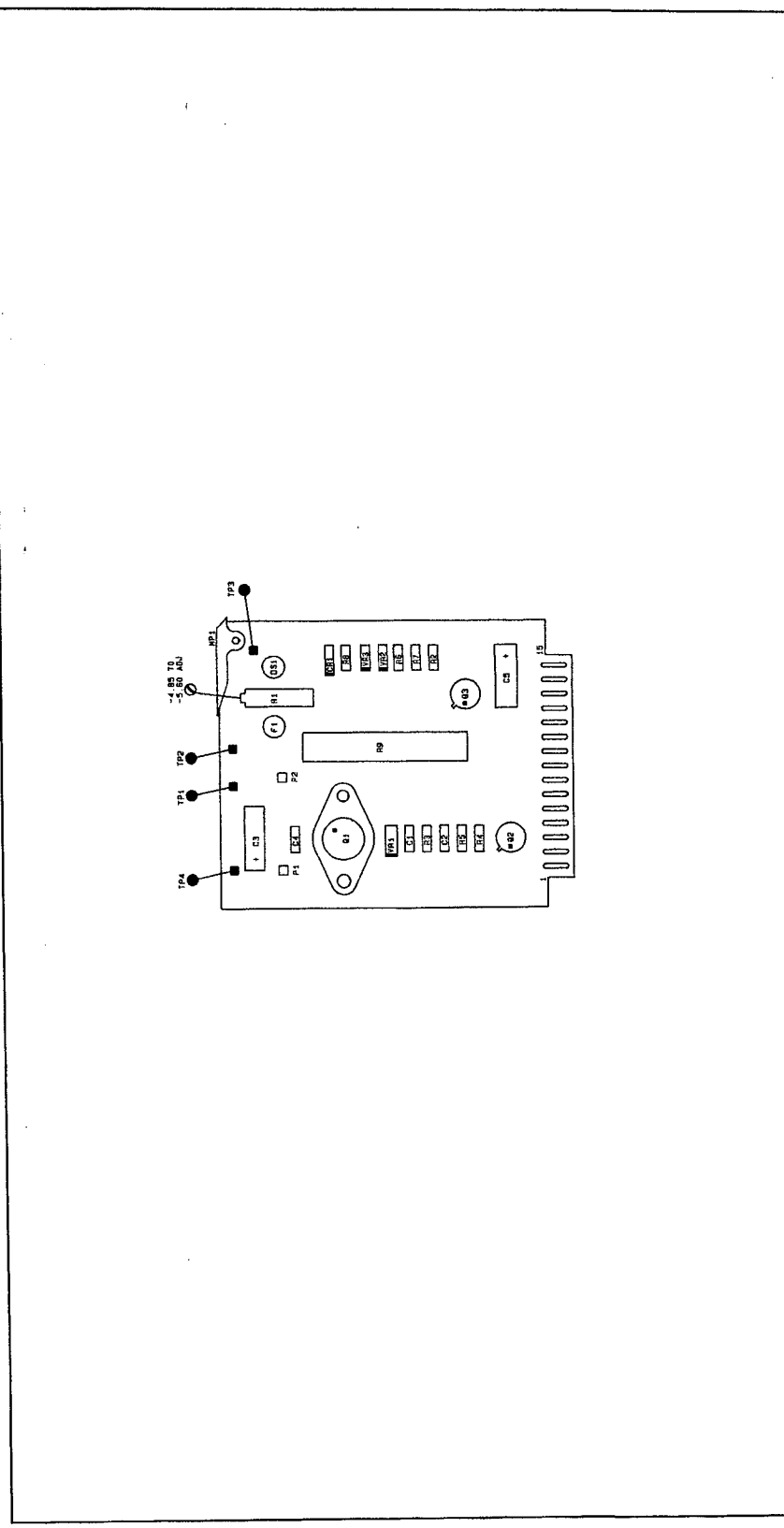
Schematic General Information

8C-66



Reference Block Diagram

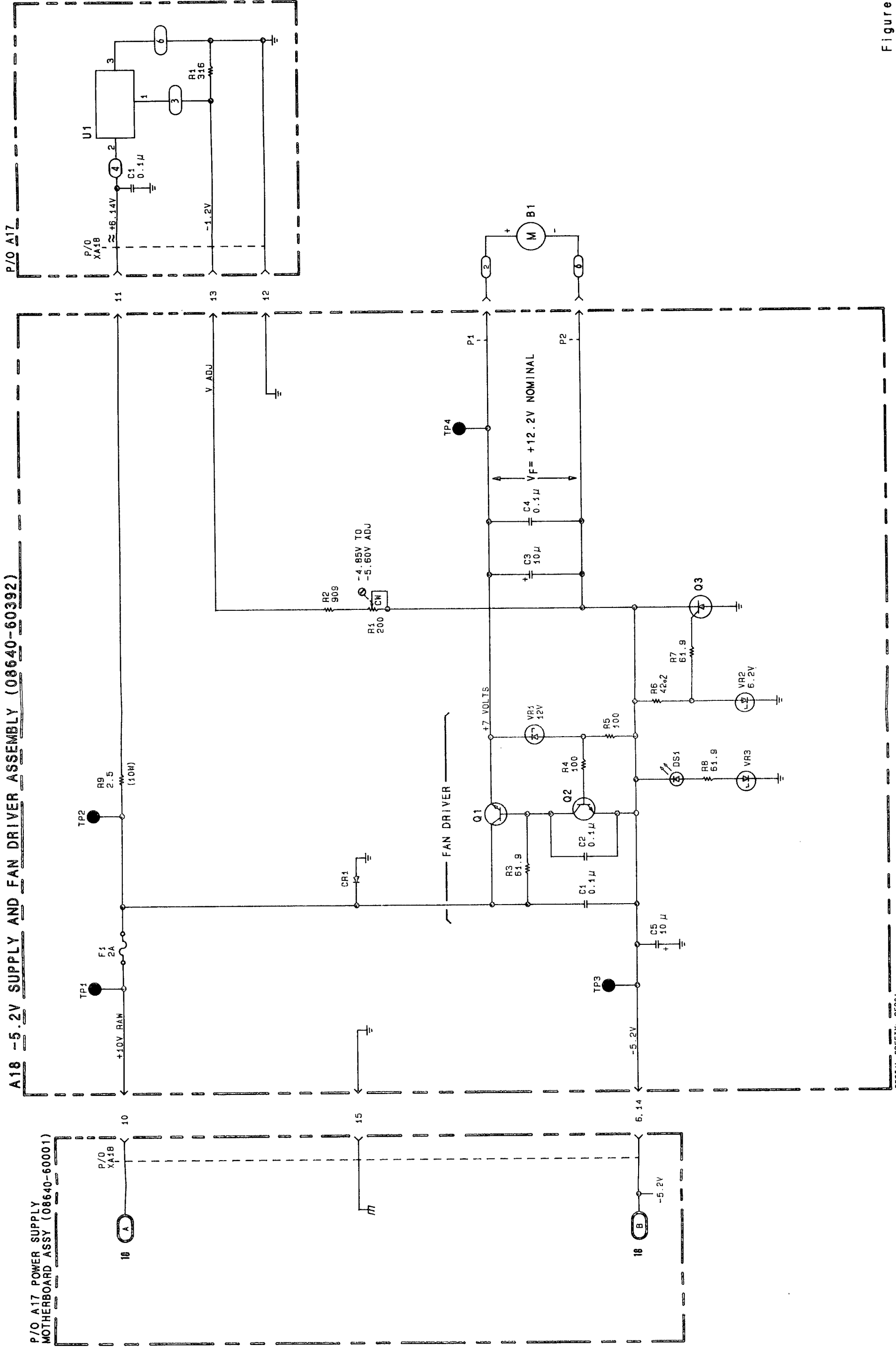
A12, A20, A22 POWER SUPPLY SS18



Component Locators

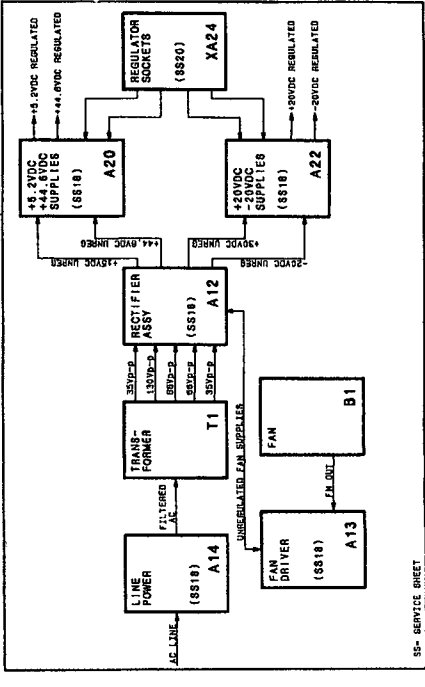
Figure 8C-60 Service Sheet 19 information.





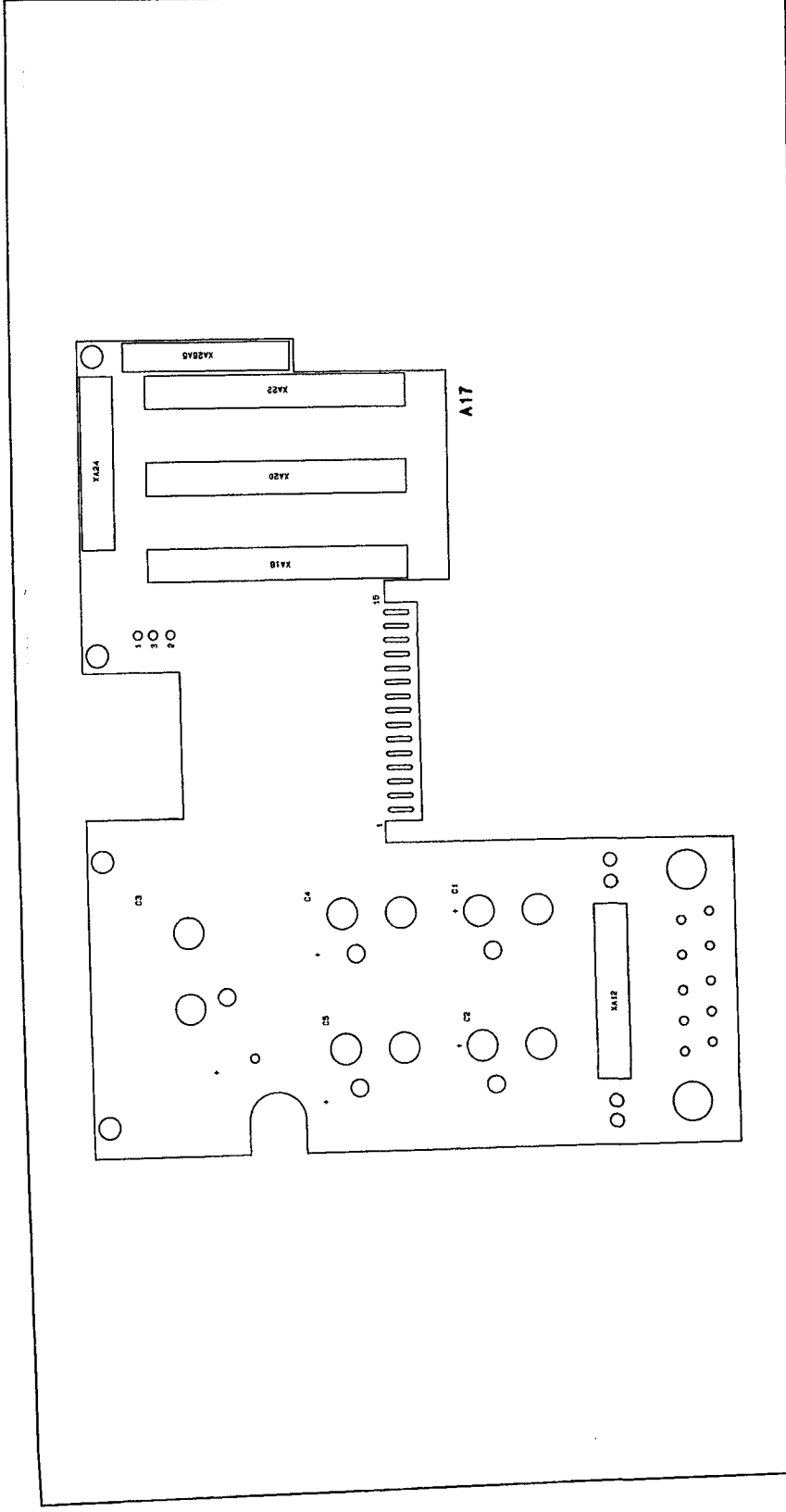
**SS19**  
 Figure 8C-61  
 8C-67

NOTES:  
 1. For an explanation of schematic symbols, see "Schematic Diagram Notes" in Section 6.



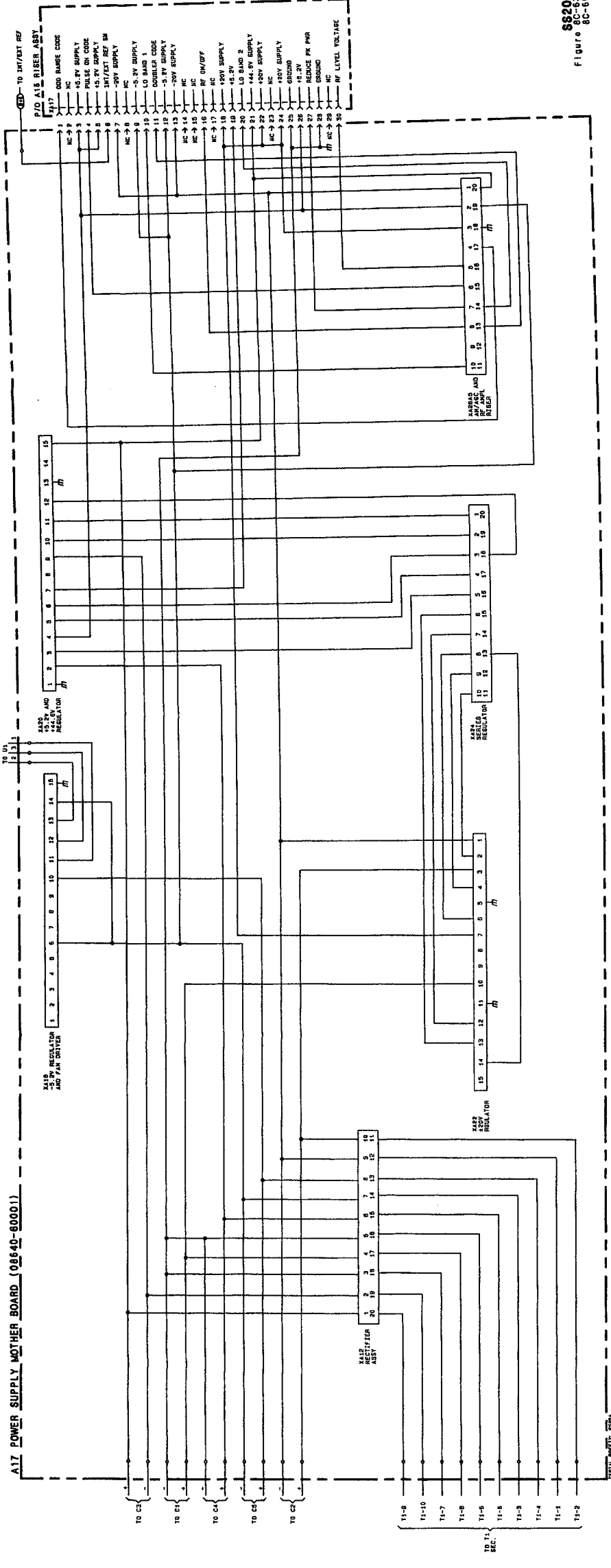
A18 -5.2V SUPPLY AND FAN DRIVER ASSY  
 SEE RESPECTIVE SHEETS

SS19



Component Locator

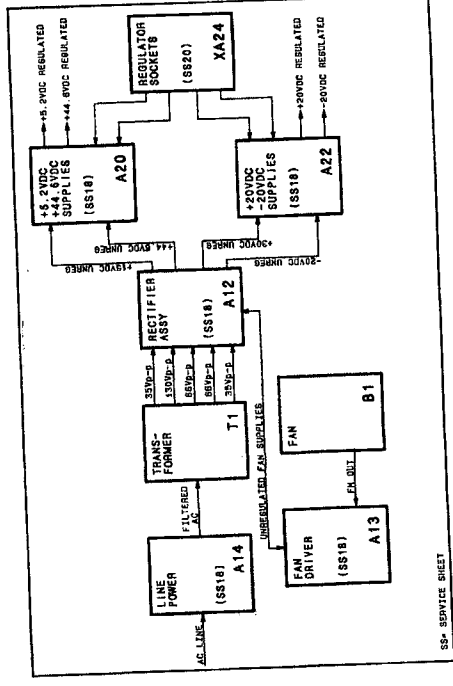
Figure 8C-62 Service Sheet 20 Information.



SS20  
Figure 8C-83

Service

- NOTES:
1. For an explanation of schematic symbols, see "Schematic Diagram Notes" in Section 9.
  2. See Service Sheet 2, 3a, 3b, 10 and 13 for component values.



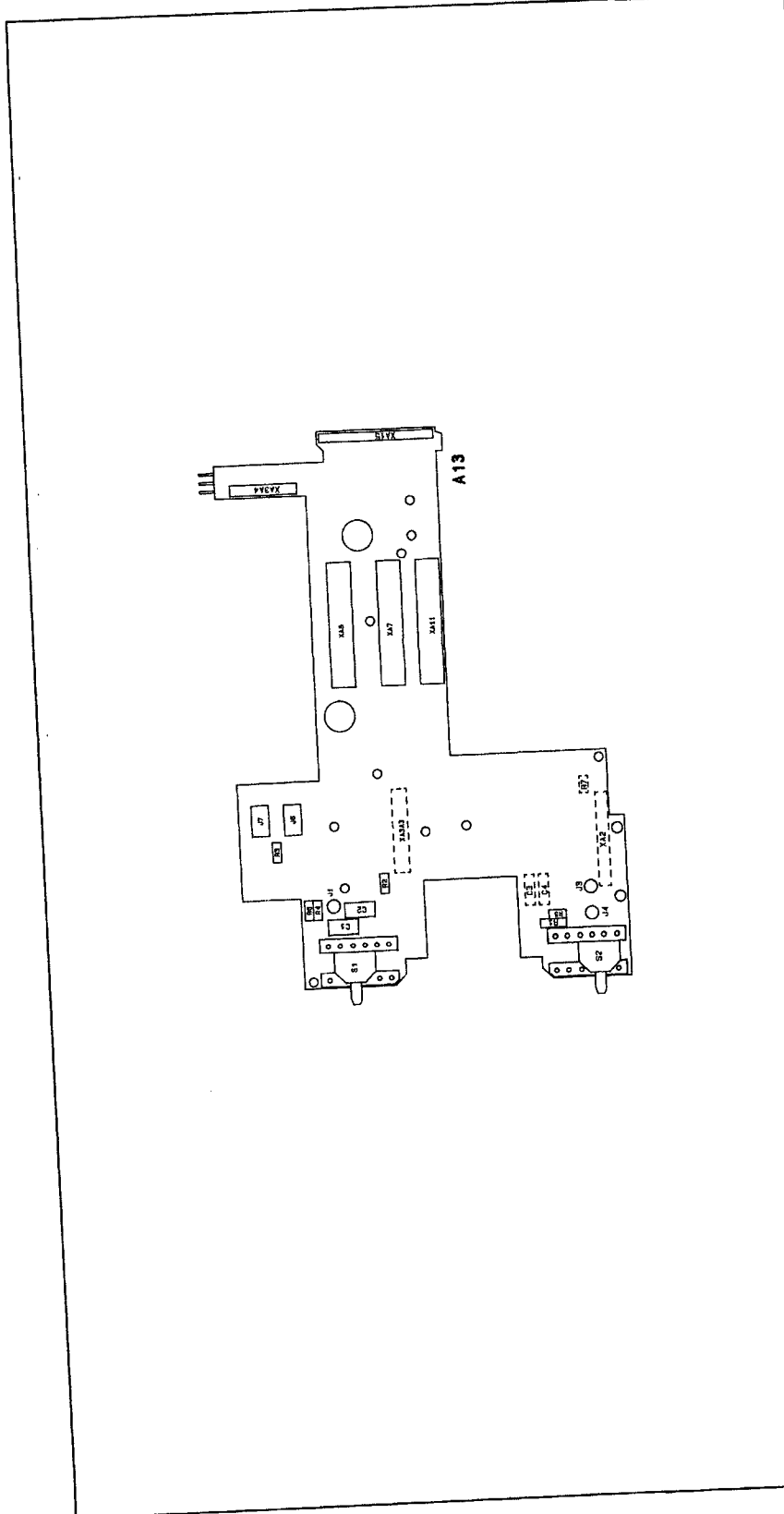
Reference Block Diagram

SS= SERVICE SHEET

A17 POWER SUPPLY MOTHER BOARD ASSY  
SS20  
RELEASE LINE

Schematic General Information

8C-70



Component Locator

Figure 8C-64 Service Sheet 21 Information.



**A13**

**MODULATION/METERING  
MOTHER BOARD ASSY**

**SS21**

SEE REVERSE SIDE

## SERVICE SHEET A

### DESCRIPTION

- A1, Output Level Assembly

### A1 REMOVAL PROCEDURE

1. Place instrument upside down and remove bottom cover (*Service Sheet G*).

**CAUTION**

*While working with and around the semi-rigid coaxial cables in the generator, do NOT bend the cables more than necessary. Do NOT torque the RF connectors to more than 0.5 Nm (inch-pounds).*

2. Remove A19 output level 10 dB assembly from the instrument. (Option 004 only).
3. Remove two OUTPUT LEVEL knobs (Option 004: 1 dB and vernier knobs) from front panel. The knobs are secured to concentric shafts with allen screws in the knobs.
4. Disconnect two semi-rigid coaxial cables from bottom of the A1A2 Output Attenuator Assembly (cable W10 at A1A2J1 and cable W11 at A1A2J2).
5. Disconnect 7 push-on wire connections from A1A1 RF Vernier Assembly (located at rear of A1 Output Level Assembly).
6. Disconnect two semi-rigid coaxial cables from bottom of A8 Counter/Lock Assembly (cable W2 at A8A1J1 and cable W14 at A8A1J2).
7. Remove front side plate cover (item 14 in Figure 6-1, Cabinet Parts) from right hand side frame by removing two flat-head screws.
8. Remove four pan-head screws (with lock-washers) that secure Attenuator to mounting plate (it is not necessary to remove the mounting plate). Remove assembly by sliding it to the rear and up.
9. Reinstall assembly by reversing the procedure in steps one through eight.

### A1 Disassembly

When disassembling the A1 assembly use the Service Sheet listed for your instrument:

1. Standard instruments, refer to Service Sheet A (1 of 2).
2. Option 004 instruments, refer to Service Sheet A (2 of 2).

## SERVICE SHEET B

### DESCRIPTION

- A3, RF Oscillator Assembly

### A3 REMOVAL PROCEDURE

1. Place instrument upside down and remove bottom cover (See *Service Sheet G*).

**CAUTION**

*While working with and around the semi-rigid coaxial cables in the generator, do not bend the cables more than necessary. Do not torque the RF connectors to more than 0.5Nm (5 inch-pounds).*

2. Set Frequency to 230 MHz.
3. Remove front panel FREQUENCY TUNE and FINE TUNE control knobs.

**NOTE**

*Numbers in parentheses refer to items in the accompanying illustrated parts breakdown.*

4. On the rear of oscillator assembly, disconnect coaxial connectors W2 at A3A1J2 (27), and W3 at A3A1J1 (32).
  - a. Option 003: Remove both cables from the oscillator.
  - b. Option 004: Remove the attenuator cables also.
5. Remove two 8-32 nuts (35) that secure connector board assembly A3A4 to chassis. Lift out connector board assembly from mating connector.
6. Remove four 8-32 screws (49) securing oscillator to center plate of chassis.

**CAUTION**

*Do not twist oscillator assembly while removing or inserting in chassis. Doing so may loosen the front section of the oscillator causing excessive RF leakage and poor frequency calibration.*

7. Exert firm pressure on assembly toward the front panel to compress the RFI gaskets and raise assembly about 1/4 inch to clear mounting studs. Ease the assembly back and upwards to clear the tuning shafts. This completes removal.

### A3A1A2 Removal Procedure

1. Remove eight 4-40 screws (16) securing cover plate to buffer housing.
2. Unsolder three leads connecting buffer board and two feed-through filters (25 and 26) and RF connector (27).
3. Remove two 6-32 screws (46) securing the buffer board to the housing.
4. Lift out buffer board, ensuring that attached probe does not bind in cavity opening.

**NOTE**

*The buffer board has two adjustment slots for attaching to the housing. Refer to the adjustment procedure in Section V, paragraph 5-20, when reinstalling the buffer board.*



**A3A1A3 Removal Procedure**

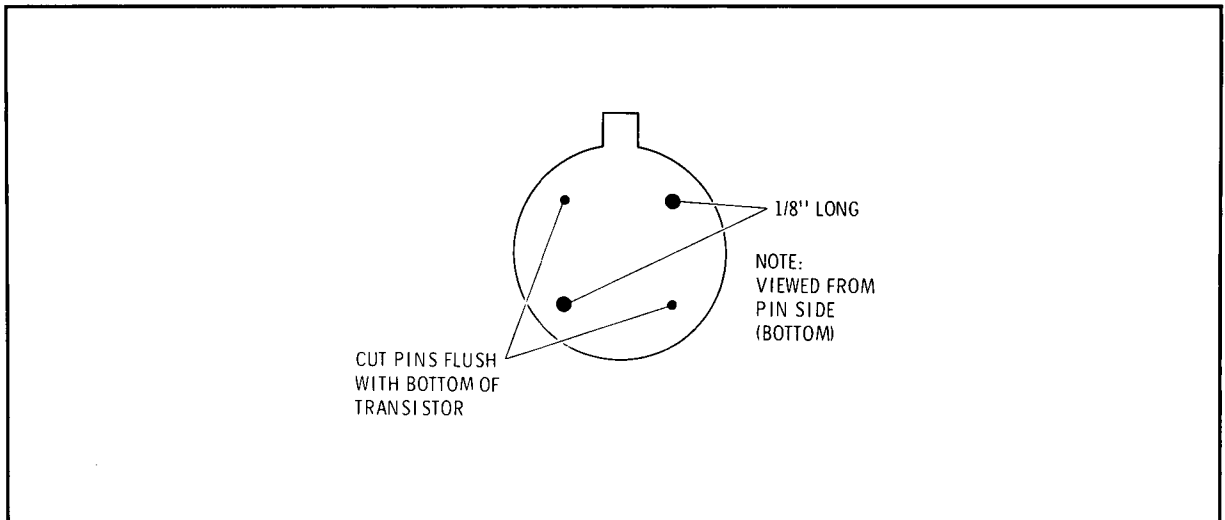
1. Remove eight 4-40 screws (16) securing cover plate to buffer housing.
2. Unsolder three leads connecting buffer board and two feed-through filters (25 and 26) and RF connector (27).
3. Remove two 6-32 (46) screws securing the buffer board to housing.
4. Lift out buffer board, ensuring that attached probe does not bind in cavity opening.

**NOTE**

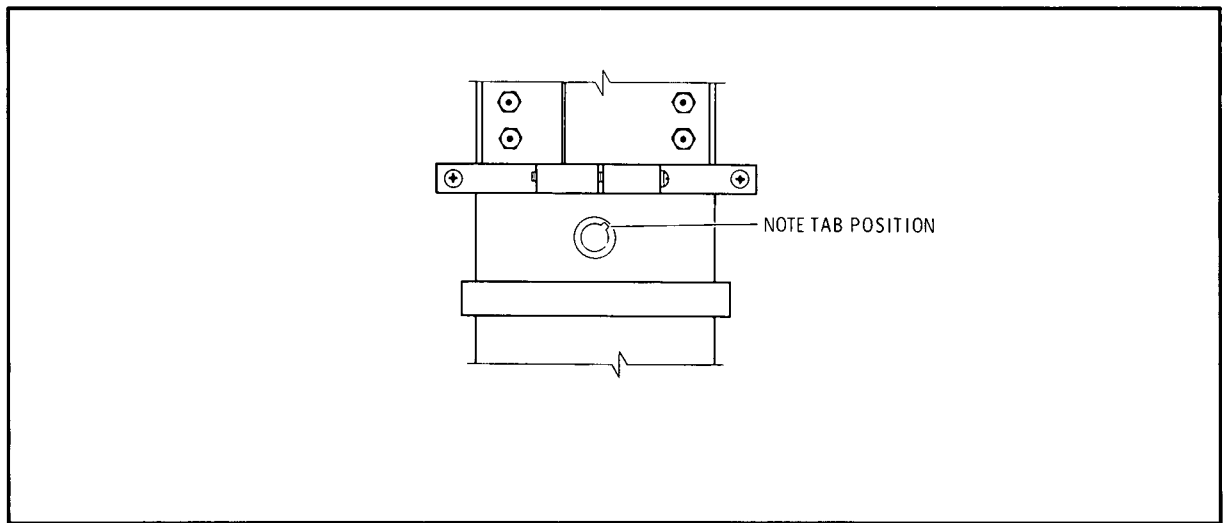
*The buffer board has two adjustment slots for attaching to the housing. Refer to the adjustment procedure in Section V, paragraph 5-20, when reinstalling the buffer board.*

**A3Q1 Replacement Procedure**

1. Unscrew transistor cap (22).
2. Remove transistor (21).
3. Clip new transistor leads as shown in Figure 8C-1, RF Oscillator Transistor Preparation.
4. Re-insert transistor as shown in Figure 8C-1, RF Oscillator Transistor Orientation. Replace transistor cap (22) including the two RFI plugs (23 and 24).
5. Connect power meter and sensor (HP 435A/8482A) to the Divider/Filter Buffer Amplifier output, A3A1J1 (32). Measure output power while tuning oscillator across band. It should always be within +0.5 to +4.5 (-1.0 to +3.5 dBm, option 004) If not, perform adjustment in paragraph 5-20.
6. Connect power meter sensor to the Counter Buffer Amplifier output, A3A1J2 (27). Measure output power while tuning oscillator across band it should always be within -3 to +3dBm. If not, perform adjustment in paragraph 5-20.



*Figure 8D-1. RF Oscillator Transistor Preparation*



*Figure 8D-2. RF Oscillator Transistor Orientation*

## SERVICE SHEET C

### DESCRIPTION

- A8, Counter/Lock Assembly

### A8 REMOVAL AND DISASSEMBLY PROCEDURE

#### A8 Casting Cover Removal

1. Place instrument right side up and remove top cover (see *Service Sheet G*).
2. Remove trim strip (extrusion) that overlaps front of A8 Assembly casting by removing two flat-head screws and the Time Base vernier knob. Remove plastic front panel window by lifting it up and out.
3. Remove three pan-head screws on front of casting and remove the button shield. Remove eight pan-head screws (with lockwashers) that secure casting cover to casting (screws marked with asterisk (\*) on casting cover).
4. Lift cover from two "honey comb" RF shields and casting.

#### A8A2A1 and A8A2A2 Removal

5. Remove two pan-head screws that secure the A8A2 Assembly. Remove A8A2A1 Counter/Lock Board Assembly and A8A4 Riser Assembly by lifting at the riser; the A8A2A2 Counter Display Assembly is attached to the A8A2A1 Assembly. Do not damage the brass LED/button shield while removing the assemblies.

#### NOTE

*The A8A2A1 and A8A2A2 Assemblies can be extended for service by removing the A8A4 Riser Assembly from A8A2A1 and installing A8A2A1 on the extender board in the riser socket (A8A3XA8A4). This also gives access to the A8A3 Time Base Assembly.*

#### A8A1 Access

#### WARNING

*The edges of the RFI gasket may be sharp and may cause personal injury if not handled with care.*

6. To gain access to the A8A1 RF Scaler Assembly, remove six pan-head screws (with lockwashers) that secure the cover shield. Remove the cover shield and gasket.

## A8 Removal

### NOTE

*The entire A8 Assembly must be removed from the chassis to remove the A8A1 and A8A3 Assemblies.*

*Do not attempt to replace components on the A8A1 and A8A3 Assemblies without removing the boards.*

7. Turn instrument upside down and remove bottom cover (see *Service Sheet G*).

### CAUTION

*While working with and around the semi-rigid coaxial cables in the generator, do NOT bend the cables more than necessary. Do NOT torque the RF connectors to more than 5 inch-pounds.*

8. Disconnect two semi-rigid coaxial cables from bottom of A8 Assembly (cable W2 at A8A1J1 and cable W14 at A8A1J1). Disconnect green flexible coaxial cable from bottom of A8 Assembly (cable W15 at A8A3J1).
9. Turn instrument right side up. Remove A8 Assembly by removing four pan-head screws (with lockwashers) that secure the A8 Assembly to the chassis.

## A8A1 Removal

10. Remove two nylon screws that secure A8U8. Remove A8U8 and two mica washers.
11. On bottom of A8 Assembly casting, under A8A1 Assembly, remove two hex nuts and lockwashers that secure coaxial connects A8A1J1 and J2.
12. Unsolder five wires from feedthroughs to left of A8A1 Assembly. Remove A8A1.

## A8A3 Removal

13. On bottom of A8 Assembly casting, under A8A3 Assembly, remove hex nut and lockwasher that secure A8A3J1.
14. Unsolder five wires from feedthroughs to right of A8A3 Assembly.
15. Remove two board supports and pan-head screw. Remove A8A3.

## Reassembly

16. Reassemble and reinstall A8 Assembly by reversing the procedures in steps 1 through 15.

### NOTE

*When replacing the casting top cover be sure that the prongs on the brass RFI shield are behind the casting wall.*

*The button shield must be carefully aligned to be sure that the buttons do not catch on the edges of the holes. Check the action of all COUNTER MODE buttons when the window is replaced.*

## SERVICE SHEET D

### DESCRIPTION

- A9, Peak Deviation and Range Switch Assembly

### A9 REMOVAL AND DISASSEMBLY PROCEDURE

1. Set PEAK DEVIATION and RANGE switches fully ccw.
2. Remove PEAK DEVIATION and RANGE switch knobs. The knobs are secure with allen screws in the knobs.
3. Place instrument upside down and remove bottom cover (see *Service Sheet G*).
4. Remove two nuts that secure A9 Assembly to front panel (located at switch bushings).
5. Remove connectors A9A1P1 and A9A2P1 from jacks on A13 Assembly. Lift rear of A9 Assembly until coupler slides apart. Gently slide the assembly back and up to remove. Re-install assembly by setting both switch shafts fully ccw and reversing the procedures in steps one through six. If Option 003 is installed, remove both cables from the Reverse Power Assembly.

#### NOTE

*The detents of both A9 Assembly and A10 Assembly switches must align and correspond to the same positions. Check that the actual RF output frequency agrees with the counter indication on all ranges. (Refer to paragraph 5-29.)*

### A9A1 and A9A2 Removal

#### NOTE

*For the following steps, orient the switch assembly with A9A1W1 and A9A2W1 up.*

*Numbers in parentheses refer to items in the accompanying illustrated parts breakdown.*

6. Set both shafts fully ccw, and desolder the three wires attached to the potentiometer terminals.
7. Remove retainer ring (49) at front of potentiometer shaft, and slide potentiometer and its mounting plate out to the rear of the switch.
8. Remove retainer ring (1), washer (25), spring (24), and 4-contact rotor (23) at rear of switch.
9. Remove two machine screws with lock and flat washers (31, 34, and 35) at right rear of switch. Remove two machine screws (2 and 8) and accompanying spacers (18) located at front left of switch.
10. Slide A9A2 Assembly (36) and gear mounting plate (37) off of detent shafts.
11. Slide T-shaft (17) with its accompanying combination gear (19) and planet gears (15 and 42) off of solid shaft (part of 50).
12. Loosen setscrews and remove combination gear (13) from solid shaft.
13. Loosen setscrews and remove spur gear (40) from hollow shaft (part of 47).
14. Remove two machine screws (46) at front right of detent mounting plate (4), and remove P.C. board support (41).
15. Slide A9A1 Assembly (11) off of detent shafts.

**A9 Reassembly**

16. Reassemble A9 Assembly by reversing steps 6 through 15 above, while observing the following points:
  - a. If the shaft index assemblies (47 and 50) were removed, mount them with the index tab pointing to the top of the switch. Mount the hollow shaft on the right side. When assembly is complete, check to be sure the shafts do not bind against the P.C. boards. If the shafts bind, loosen mounting screws (48) to adjust.
  - b. Set detent shafts fully ccw.
  - c. Install both the 3-contact rotor (9) and the 2-contact rotor (43) with contacts aligned vertically and toward the bottom of the switch.
  - d. Set the rear, 4-contact rotor with contacts aligned vertically and pointing toward the top of the switch. This adjustment is made by loosening the set screws on the combination gear (13) to reset the rotor position.
  - e. FM Deviation and Counter lights must be vertical after A9 is reassembled.

# SERVICE SHEET E

## DESCRIPTION

- A10, Divider/Filter Assembly
- A11, Variable Frequency Modulation Oscillator

## A10 REMOVAL PROCEDURE

### A10 Casting Cover Removal

1. Place instrument right side up and remove top cover (see *Service Sheet G*).
2. Remove fourteen pan-head screws (with lockwashers) that secure casting cover to casting (screws marked with asterisk (\*) on cover).

#### NOTE

*Note the location of the screws. The long screws vary in length.*

3. Lift cover from casting.

### A10A2 Removal

4. Remove twelve pan-head screws (with lockwashers) that secure A10A2 Assembly to casting. Remove A10A2 RF Divider Assembly and A10A3 Riser Assembly by lifting at the riser.

#### NOTE

*The A10A2 Assembly can be extended for service by removing the A10A3 Riser Assembly from A10A2 and installing A10A2 in the riser socket (A10A1XA10A3A and B). Remove riser evenly to avoid cracking the connector.*

*When replacing transistors on A10A2, assure that the cans will not contact the casting top cover.*

### A10A1 Access

5. Remove four pan-head screws (with lockwashers) that secure casting center section to casting.
6. Remove three power supply circuit boards (A18, A20, and A22) that are between A10 Assembly and rear panel.
7. Remove casting center section.

#### NOTE

*The A10A1 Assembly can be checked and adjusted by installing the A10A2 Assembly in the riser socket (A10A1XA10A3A and B) and reinstalling the power supply circuit boards (A18, A20 and A22).*

### A10A1 Removal

8. Turn instrument upside down and remove bottom cover (see *Service Sheet G*).

**CAUTION**

*While working with and around the semi-rigid coaxial cables in the generator, do NOT bend the cables more than necessary. Do NOT torque the RF connectors to more than 0.5Nm (5 inch-pounds.)*

9. Remove FM circuit boards (A5 and A7) and the A3A4 Connector Board Assembly (see Service Sheet F).
10. Disconnect four semi-rigid coaxial cables from bottom of A10 Assembly (cable W3 at A10A1J3, cable W7 at A10A1J2, cable W6 at A10A1J1, and cable W8 at A10A1J4). A10A1J2 and J3 are located in area occupied by FM circuit boards. A10A1J1 and J4 are located in front of A26 Assembly.
11. Remove four hex nuts and lockwashers that secure coaxial connectors A10A1J1 through J4.
12. Turn instrument right side up. Unsolder three feedthroughs at rear center of A10A1 Assembly (located to right of two toroid inductors and to left of relay).

**CAUTION**

*Be sure the terminals have been completely desoldered.*

13. Remove the ten pan-head screws (with lockwashers) that secure A10A1 Assembly to casting. Remove A10A1.

**NOTE**

*If necessary, the bottom casting cover can be removed by removing four pan-head screws (with lockwashers), and unsoldering three wires from the feedthroughs on under side of instrument.*

**Reassembly**

14. Reassemble A10 Assembly by reversing the procedures in steps 1 through 13.



## A11 Assembly Removal Procedure

### A11 Removal (Standard)

1. Remove bottom cover from instrument (see *Service Sheet G*).
2. Set MODULATION FREQUENCY to 400 Hz. Remove MODULATION FREQUENCY knob. The knob is secured to the shaft with allen screws.
3. Remove A11 Assembly by gently lifting the board extractor at rear of board and sliding assembly to the rear and out of chassis.
4. To connect A11 Assembly for service, place assembly on extender board and install in chassis. Reinstall MODULATION FREQUENCY knob with 400 Hz position toward top of instrument.

### A11 Removal (Option 001)

1. Remove top and bottom covers from instrument (see *Service Sheet G*).
2. Set MODULATION FREQUENCY knob to 400 Hz (fixed). Remove MODULATION FREQUENCY knob, vernier knob, cursor disc and gear. The knobs are secured to the shafts with allen screws in the knobs.

**CAUTION**

*When removing cursor disc and gear, gently slide it off the shaft to avoid damage to the disc.*

3. Remove pan-head screw (with washer and lockwasher) that secures A11 Assembly to A13 Mother Board Assembly. The screw is accessible from top of instrument.
4. Remove A11 Assembly by gently lifting the board extractor at rear of board and sliding assembly to rear and out of chassis.
5. To connect A11 Assembly for service, place assembly on extender board and install in chassis. Reinstall cursor disc and gear, MODULATION FREQUENCY knob and vernier knob. 400 Hz position should be toward top of instrument.

### A11 Reinstallation

6. Reinstall A11 Assembly by reversing the removal procedures.

**NOTE**

*Check variable frequency accuracy to assure that the vernier disc is in the proper position.*

*Insure Front Casting engages two pins on the meter bezel.*

# SERVICE SHEET F

## DESCRIPTION

- A26, Output Level Assembly

## A26 REMOVAL AND DISASSEMBLY PROCEDURE

### A26A2 and A26A4 Access

1. Place instrument right side up and remove top cover (see *Service Sheet G*).  
Option 004: Remove four pan-head screws that secure the casting top cover to the casting.
2. Remove four pan-head screws that secure casting top cover to casting.
3. To service either A26A2 or A26A4, gently lift board's extractors and reinstall it on extender board.
4. Reassemble by reversing procedures in steps 2 and 3.

### A26A1 and A26A3 Access

1. Place instrument upside down and remove bottom cover (see *Service Sheet G*.)

**CAUTION**

*While working with and around the semi-rigid coaxial cables in the generator, do NOT bend the cables more than necessary. Do NOT torque the RF connectors to more than 0.5 Nm (inch-pounds).*

2. Remove ten pan-head screws (with lockwashers) that secure casting bottom cover to the casting.

**WARNING**

*The RFI gasket on casting cover may have sharp edges and may cause personal injury if not handled with care.*

3. Lift cover from casting, noting the orientation of the RFI gasket under the cover.

**NOTE**

*Do not attempt to replace components on the A26A1 and A26A3 assemblies without removing them.*

### A26A1 and A26A3 Removal

4. Remove two pan-head screws (with washers) that secure microcircuit amplifier A26U1 or U2 to casting.
5. Remove A26U1 or U2.
6. Remove four pan-head screws (with lockwashers) that secure heat sink to the casting.
7. Remove pan-head screws (with lockwashers) that secure the circuit board to the casting.  
Option 002: Remove 4 pan-head screws that secure the circuit board to A26A1MP1.
8. Disconnect two coaxial cables from casting connectors and remove nuts and washers that secure cable connectors to casting.
9. To replace components mounted on the circuit board, tilt the board up while sliding it to the rear.
10. To replace or remove the circuit board, label the wires soldered to the board before unsoldering them.
11. Reassemble by reversing procedures in steps 1 through 10.

## A26 Assembly Removal

1. Place instrument upside down and remove bottom cover (see *Service Sheet G*).

**CAUTION**

*While working with and around the semi-rigid coaxial cables in the generator, do not bend the cables more than necessary. Do NOT torque the RF connectors to more than 5 inch-pounds.*

2. Disconnect 4 semi-rigid coaxial cables (W6, W7, W8, and W10) from the front of the A26 Assembly.
3. Place instrument right side up and remove A26A2 and A26A4 assemblies by gently lifting their P.C. board extractors.
4. Remove six allen-head screws (with lockwashers) from the inside of the A26 casting.
5. Disconnect A15P1, and remove A18, A20, and A22 Regulator Assemblies by gently lifting their board extractors.
6. Slide A26 casting toward top of instrument until A26A5 Riser Assembly no longer mates with its connector (A17XA26A5).
7. Remove the two pan-head screws holding the A26A5 Riser Assembly to the A26 casting module. Disconnect Riser by pulling it gently away from the casting.
8. Slide the A26 Assembly toward the top of the instrument until it is removed.
9. Reinstall the A26 Assembly by reversing the procedures in steps 1 through 8.

## SERVICE SHEET G

### DESCRIPTION

- General Removal Procedures

### REMOVAL PROCEDURE

1. Standard instruments, refer to Service Sheet G (1 of 2).
2. Option 004 instruments, refer to Service Sheet G (2 of 2).

#### Top and Bottom Cover Removal

**CAUTION**

*Before attempting to disassemble or remove any part of the generator, remove line power from the instrument by disconnecting the instrument's line power cable from the line power outlet.*

3. Remove top cover by removing four screws. Slide cover to the rear approximately two inches to disengage it from flanges at the instrument's front and rear. Lift it off.
4. Remove bottom cover by removing four screws. Slide cover to the rear approximately two inches to disengage it from flanges at the instrument's front and rear. Lift it off.

#### Circuit Board Removal

5. Remove any plug-in circuit board by gently lifting the board's extractors (the extractors are color-keyed to the guides at the board's edges).

#### Front Window and RFI Screen Removal

1. Remove top cover.
2. Remove Time Base vernier knob.
3. Remove two flat-head screws that secure the ends of the trim strip.
4. Tilt window and trim strip forward and remove strip.
5. Lift window up and out to free tabs on bottom edge and remove window and RFI screen.

#### M1 Removal

1. Remove top cover.
2. Remove trip strip (extrusion) that overlaps panel meter by removing two flat-head screws. Remove plastic front panel window by lifting it up and out.
3. Remove A8 Counter/Lock Assembly (see Service Sheet C, steps 7 through 9).
4. Remove A6 Annunciator Assembly by removing two flat-head screws on front face of meter bezel and moving A6 Assembly to the rear.
5. To remove meter, disconnect two wires at rear of meter (white wire from negative post, red wire from positive post).
6. Push top edge of meter to the rear and lift meter from chassis.

#### NOTE

*Option 001: If necessary, loosen A11 Modulation Oscillator to provide clearance for meter (see Service Sheet E).*

7. To install meter, reverse procedure given in steps 1 through 6. To install Annunciator Assembly, reverse procedure given in steps 1 through 4.

**NOTE**

*Check that the insulator between the right-hand annunciators and the counter is properly in place to prevent shorting of the lamps.*

**INSTALLATION PROCEDURES****Front Window and RFI Screen Installation**

1. Place RFI screen onto the face of the A8 Counter/Lock Assembly.
2. Place front window over the counter mode switch buttons and insert tabs on bottom of window into front subpanel.
3. Tilt the window and RFI screen forward and seat the front groove of the trim strip over the top edge of the window and RFI screen.
4. Check that the RFI screen is flush against the front window and in the trip strip groove. Tilt the window, screen, and trip strip back and catch the locking edge of the trim strip in the slots in the meter mount and side rails.
5. Replace two flat-head screws at the ends of the trip strip and reinstall top cover.

ITEM NUMBER	REFERENCE DESIGNATOR	DESCRIPTION
1	A:IMP13	Machine Screw
2	A:IMP16	Lock Washer
3	A:IMP1	Potentiometer Support
4	A:IMP2	Spacer Post
5	A:IMP5	Flat Washer
6	A:IMP7	Switch Rotor
7	A:IA1	RF Vernier Assembly
8	A:IMP8	P.C. Board Support
9	A:IA2	Output Attenuator Assembly
10	A:IMP18	Attenuator Cover
11	A:IMP15	Machine Screw
12	MP97	RFI Gasket
13	MP95	Retainer Ring
14	A:IMP15	Machine Screw
15	A:IMP9	Attenuator Support
16	A:IMP17	Lockwasher
17	A:IMP14	Machine Screw
18	A:IMP6	Compression Spring
19	A:IMP4	Retainer Ring
20	A:IMP10	Inner Shaft
21	A:IMP3	Coupler
22	A:IMP12	Hex Nut
23	A:IMP11	Lockwasher
24	A:IMP11	Lockwasher
25	A:IR1	Potentiometer
26	MP96	Flat Washer

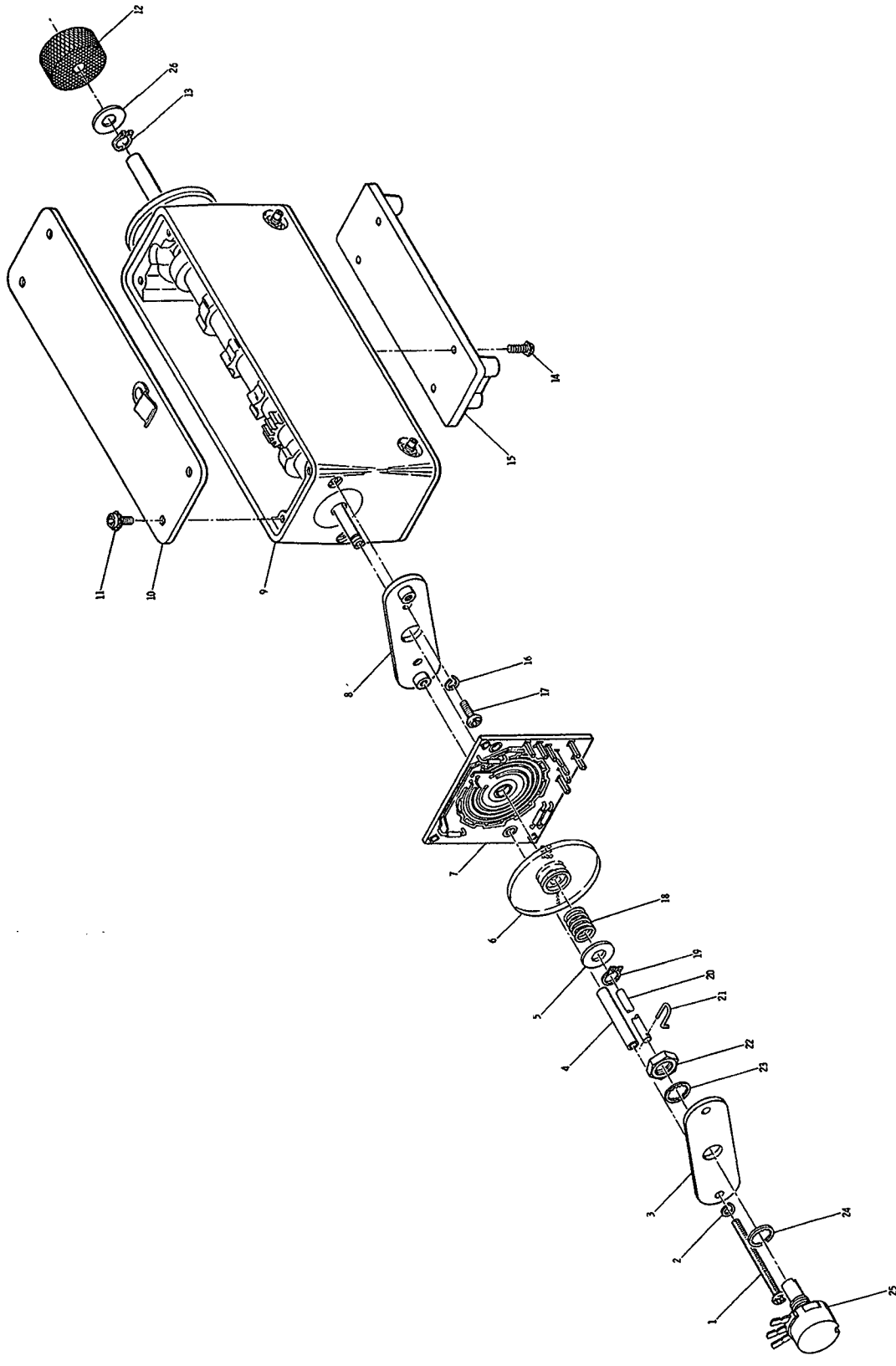


Figure 8D-3. A1 Output Level Assembly Illustrated Parts Breakdown  
SSA  
(1 of 2)  
8D-19

A1 ASSEMBLY REMOVAL  
AND DISASSEMBLY  
(1 OF 2)

SEE REVERSE SIDE

**SSA**  
(STANDARD)

Item Number	Reference Designator	Description
1	A1R1	Potentiometer, Output Level Vernier
2	A1MP6	Potentiometer Mounting Plate
3	A1MP10	Lockwasher
4	A1MP12	Hexnut
5	A1MP5	Shaft Coupler
6	A1MP8	Vernier Shaft
7	A1MP11	Machine Screw (2)
8	A1MP7	Attenuator Mounting Plate
9	A1A1J2	RF Connector
10	A1A1	1 dB Step Attenuator
11	A1A1J1	RF Connector
12	A1MP1	Spacer (2)
13	A1S1A	Switch Wafer
14	A1MP2	Spacer (4)
15	A1S1B	Switch Wafer
16	A1MP2	Spacer
17	A1S1C	Switch Wafer
18	A1MP3	Spacer (2)
19	A1MP9	Lockwasher (2)
20	A1MP4	Machine Screw (2)
21	A19MP3	Lockwasher
22	A19MP5	Machine Screw (2)
23	A19MP7	Fiber Washer
24	A19S1B	Switch Wafer
25	A19MP2	Spacer (2)
26	A19MP6	Machine Screw
27	A19MP8	Lock Washer
28	A19MP9	Fiber Washer
29	A19A2	RF Vernier Assembly
30	A19A1	10 dB Step Attenuator
31	A19MP4	Flexible Coupler
32	MP65	Shaft
33	A19A1J2	RF Connector
34	A19A1J1	RF Connector
35	A19MP1	Spacer (2)
36	A19S1A	Switch Wafer

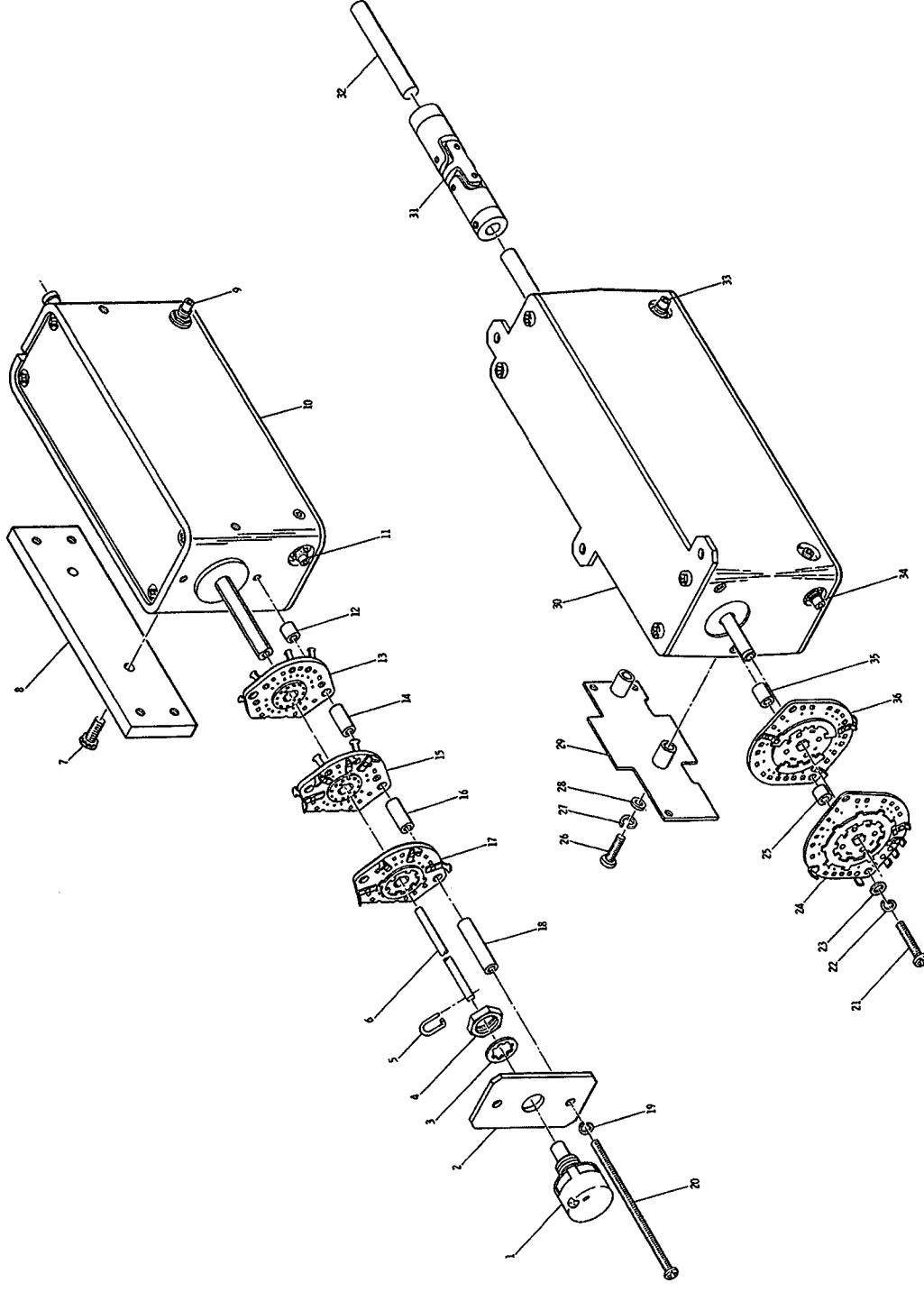


Figure 8D-4. A1 and A19 Output Level Assemblies Illustrated Parts Breakdown  
SSA  
(2 of 2)  
8D-21



A1 AND A19 ASSEMBLY  
REMOVAL AND DISASSEMBLY  
(2 OF 2)

SEE REVERSE SIDE

**SSA**  
(OPTION 004)

ITEM NUMBER	REFERENCE DESIGNATOR	DESCRIPTION
1	A3MP26	Retainer Ring
2	A3MP3	RFI Gasket
3	MP59	Set Screw
4	A3MP17	Spur Gear
5	MP106	Flat Washer
6	MP60	Retainer Ring
7	A3MP19	Seize Cap
8	A3MP16	Set Screw
9	A3MP19	Set Screw
10	A3MP19	Set Screw
11	A3MP19	Set Screw
12	A3MP19	Set Screw
13	A3MP19	Set Screw
14	A3MP19	Set Screw
15	A3R1	Potentiometer Bushing
16	A3R2	Potentiometer, FM Gain Compensation
17	A3A1MP13	Potentiometer, Buffer Gain Compensation
18	A3A1MP14	Potentiometer, Buffer Gain Compensation
19	A3A1MP4	Machine Screw
20	A3A1A3	Lockwasher
21	A3Q1	Buffer Board Cover
22	A3MP9	Counter Buffer Amplifier Assembly
23	A3MP7	Transistor Cap
24	A3MP7	RFI Plug
25	A3M1FL2	Not Assigned
26	A3M1FL1	Filter Capacitor
27	A3A1J2	RF Connector
28	A3A1MP10	Hex Nut
29	A3A1MP9	Hex Nut
30	A3A1EL6	Filter Capacitor
31	A3A1J1	Filter Capacitor
32	A3A1MP12	RF Connector
33	A3A1MP11	Lockwasher
34	MP89	Hex Nut
35	A3A4MP5	Hex Nut
36	A3A4MP1	P.C. Board Support
37	A3A4MP1	Connector Board Assembly
38	A3A4MP3	Flatwasher
39	A3A4MP4	Lockwasher
40	A3A4MP4	Machine Screw
41	A3A4MP2	Lockwasher
42	A3A1MP15	Machine Screw
43	A3A1MP15	Machine Screw
44	A3A1MP5	RFI Gasket
45	A3A1MP6	Machine Screw
46	A3A1MP7	RF Divider/Filter Buffer Amplifier Assembly
47	A3A1MP8	Machine Screw
48	A3A1A2	Lockwasher
49	A3MP22	Flatwasher
50	A3MP23	RFI Gasket
51	A3MP5	Flatwasher
52	A3MP10	RFI Gasket
53	A3MP12	Lockwasher
54	A3MP11	Machine Screw
55	A3MP11	Machine Screw
56	A3MP26	Fine Tune Shaft
57	MP59	Retainer Ring
58	A3A1MP17	RFI Gasket
59	MP59	Bumper Foot
60	MP106	Flat Washer

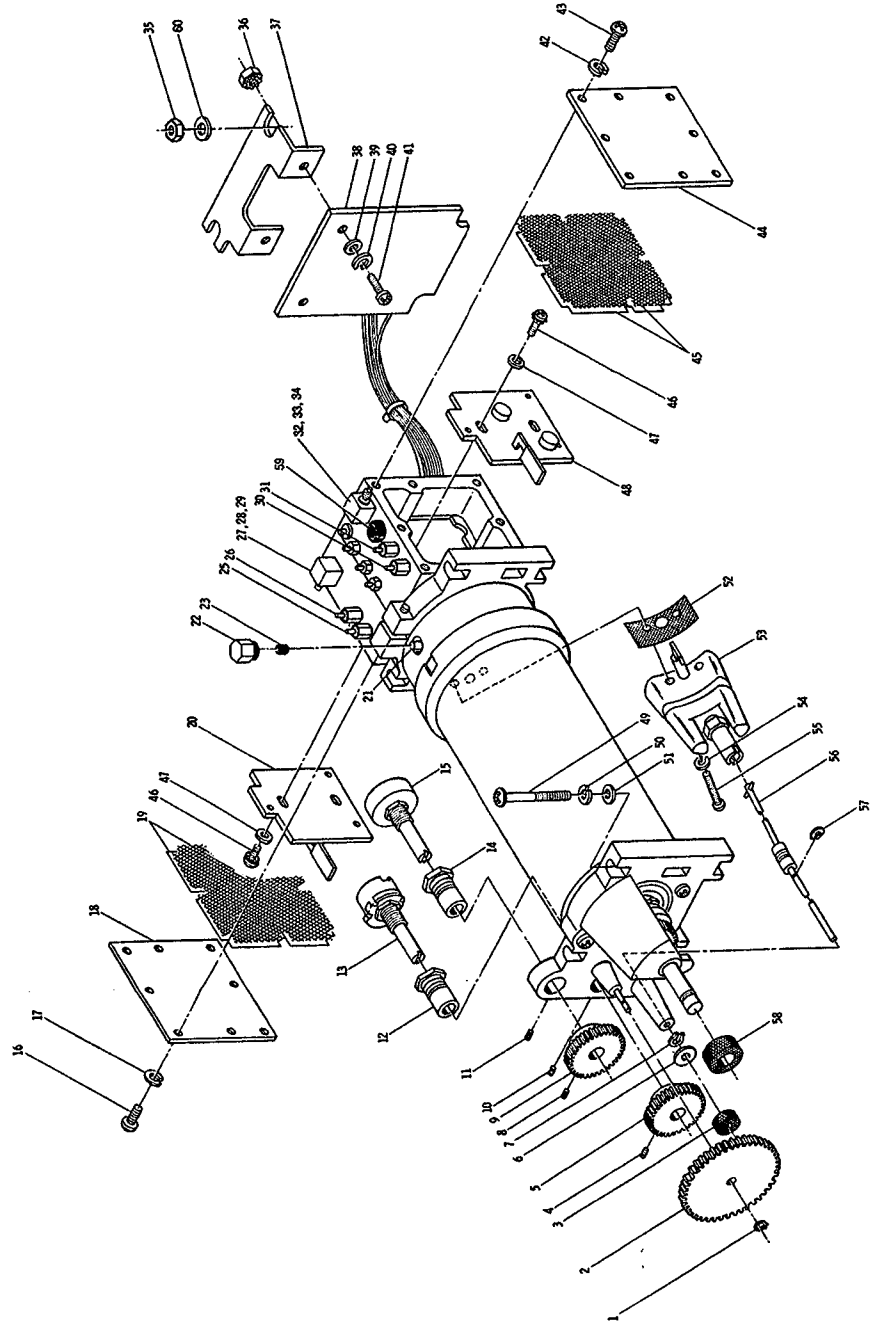


Figure 8D-5. A3 RF Oscillator Illustrated Parts Breakdown

**A3 ASSEMBLY REMOVAL  
AND DISASSEMBLY**

**SEE REVERSE SIDE**

**SSB**

Item Number	Reference Designator	Description
1	ABMP27	Machine Screw
2	ABMP14	Button Shield
3		Not Assigned
4	ABMP6	LED Shield
5		Not Assigned
6		Not Assigned
7		Not Assigned
8		Not Assigned
9		Not Assigned
10	ABMP8	Small Frame Shield
11	ABMP13	PC Board Support
12	ABMP21	ON Button
13	ABMP20	x100 Button
14	ABMP19	x10 Button
15	MP25	RF Scaler Insulator
16	ABMP15	counter Top Cover
17	ABMP44	Lock Washer
18	ABMP26	Machine Screw
19	ABMP40	Lock Washer
20	ABMP42	Machine Screw
21	ABMP17	Lighting Screw
22	ABMP33	Machine Screw
23	ABMP3	Counter Riser Assembly
24	ABMP33	Counter Lock/Display Assembly
25	ABMP3	Machine Screw
26	ABMP10	Counter Input Cover Shield
27	ABMP5	RFI Gasket
28		Not Assigned
29		Not Assigned
30		Not Assigned
31	ABMP8	RF Scaler Assembly
32	ABMP6	Large Frame Shield
33	ABMP3	Machine Screw
34	ABMP25	RF Scaler Insulator
35		Not Assigned
36		Not Assigned
37		Not Assigned
38		Not Assigned
39	ABMP7	Counter Filter Cover
40	ABMP30	Not Assigned
41	ABMP30	Machine Screw
42		Machine Screw

Item Number	Reference Designator	Description
43	ABMP4	RFI Gasket
44	ABMP32	Counter Timebase Insulator
45	ABMP37	Machine Screw
46	ABMP31	Machine Screw
47	ABMP22	1/2" Digit Button
48	ABMP23	1/2" Digit Button
49	ABMP23	1/2" Digit Button
50	ABMP23	1/2" Digit Button
51	ABMP23	1/2" Digit Button
52	ABMP23	1/2" Digit Button
53	MP73	Numerical Display
54	ABMP43	Timebase Vernier Knob
55	ABMP45	Not Assigned
56	ABL5	Lock Washer
57	ABC5	Hex Nut
58	ABC4	Inductor
59	ABC3	Feedthrough Capacitor
60	ABC1	Feedthrough Capacitor
61	ABC2	Feedthrough Capacitor
62	ABL2	Inductor
63	ABL1	Feedthrough Filter
64	ABL1	Inductor
65	ABL3	Feedthrough Filter
66	ABL3	Inductor
67	ABL3	Feedthrough Filter
68	ABL4	Inductor
69	ABMP16	Feedthrough Capacitor
70	ABMP50	Counter Bottom Cover
71	ABMP50	Spacer Washer
72	ABMP48	RFI Gasket
73	ABMP48	Spacer Pad
74	ABMP51	Machine Screw
75	ABMP55	Machine Screw
76	ABMP54	Inductor Riser
77	ABA3	Timebase Assembly

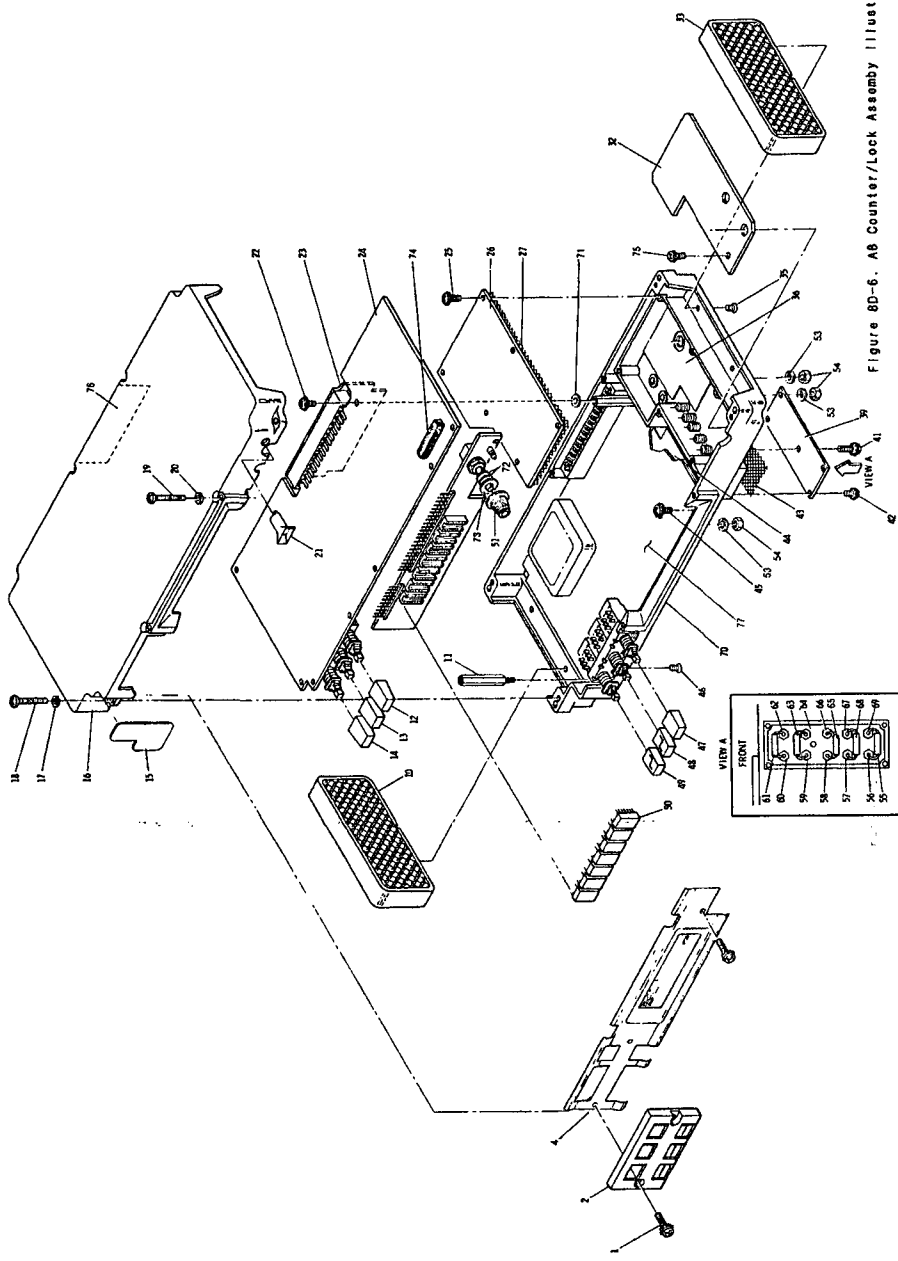


Figure 8D-6. AB Counter/Lock Assembly Illustrated Parts Breakdown

**A8 ASSEMBLY REMOVAL  
AND DISASSEMBLY**

SEE REVERSE SIDE

**SSC**

Item Number	Reference Designator	Description
1	AGMP3	Retainer Ring
2	AGMP32	Lock Washer
3	AGMP39	Detent Mounting Plate
4	AGMP23	Flat Nut
5	AGMP34	Flat Washer
6	AGMP16	Compression Spring
7	AGMP26	Machine Screw
8	AGMP30	Switch Rotor
9	AGMP28	Lock Washer
10	AGMP33	Peak Deviation Band Switch Board
11	AGMP31	Cable Assembly
12	ASA1W1	Combination Gear
13	AGMP12	Planet Gear
14	AGMP8	Retainer Ring
15	AGMP11	Spacer
16	AGMP7	Switch Shaft
17	AGMP28	Spacer
18	AGMP1	Combination Gear
19	AGMP13	Spur Gear
20	AGMP14	Spur Gear
21	AGMP43	Spur Gear
22	AGL2W1	Cable Assembly
23	AGMP29	Switch Rotor
24	AGMP15	Compression Spring
25	AGMP19	Flat Washer
26	AGMP4	Set Screw
27	MP 29	Shaft Coupler
28	AGMP5	Set Screw
29	AGR1	Potentiometer
30	AGMP25	Potentiometer Mounting Plate
31	AGMP33	Machine Screw
32	AGMP41	Lock Washer
33	AGMP10	Hex Nut
34	AGMP38	Lock Washer
35	AGMP42	Lock Washer
36	AGB2	FM Gain Switch Assembly
37	AGMP24	Gear Mounting Plate
38	AGMP44	Spur Gear
39	AGMP27	Plastic Bushing
40	AGMP9	Spur Gear
41	AGMP25	PC Board Support
42	AGMP10	Planet Gear
43	AGMP31	Switch Rotor
44	AGMP16	Compression Spring

Item Number	Reference Designator	Description
45	AGMP20	Flat Washer
46	AGMP38	Spacer
47	AGMP22	Shaft Index Assembly
48	AGMP37	Machine Screw
49	AGMP6	Retainer Ring
50	AGMP21	Shaft Index Assembly
51	AGMP46	Lock Washer
52	AGMP45	Flat Washer
53	AGMP47	Lock Washer
54	AGMP47	Machine Screw
55	AGMP45	Machine Screw
56	AGMP2	Flat Washer

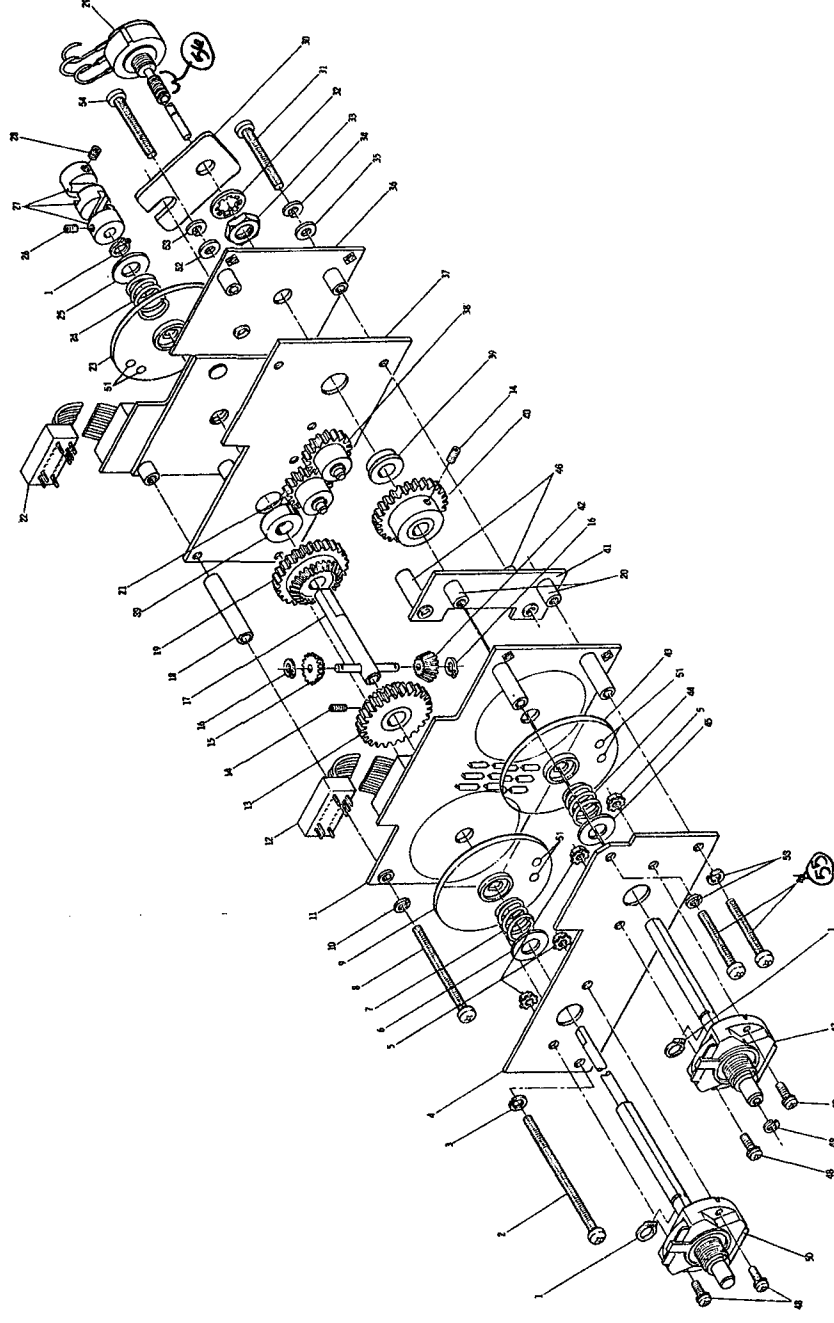


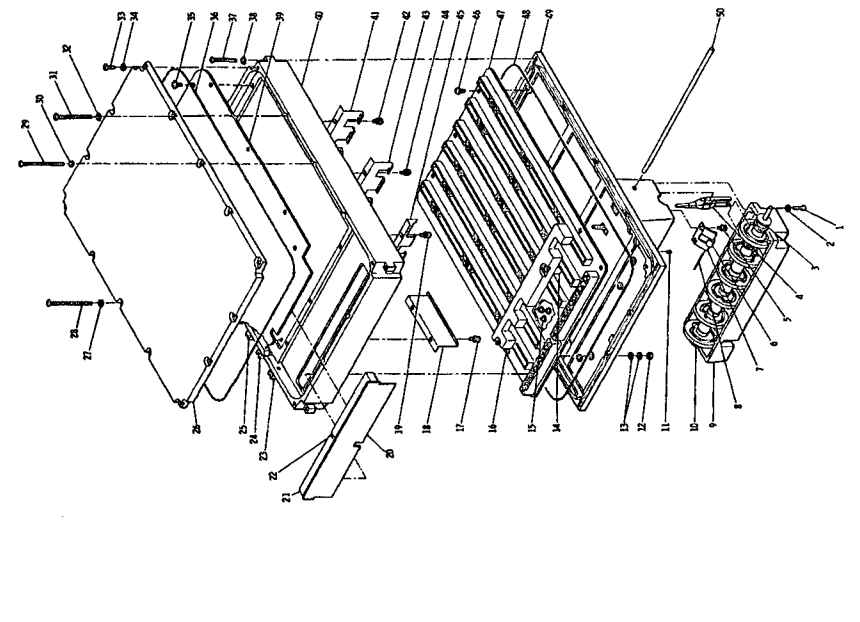
Figure 8D-7. AG Peak Deviation and Range Switch Assembly Illustrated Parts Breakdown  
86D  
8D-27

**A9 ASSEMBLY REMOVAL  
AND DISASSEMBLY**

**SEE REVERSE SIDE**

**SSD**

ITEM NUMBER	REFERENCE DESIGNATOR	DESCRIPTION
1	A10MP14	Machine Screw
2	A10MP11	Lock Washer
3	A10MP7	Cam Housing
4	A10MP20	Cam Housing
5	A10MP2	Detent Roller
6	A10MP1	Detent Spring
7	A10MP6	Cam Cover
8	A10MP13	Set Screw
9	A10MP7	Hex Nut
10	A10MP17	Clamp Support
11	A10MP12	Send Tone Filter
12	A10MP13	Machine Screw
13	A10MP10	Spring Shield No. 4
14	A10MP9	P.C. Edge Connector
15	A10MP12	Yellow P.C. Board Guide
16	A10MP10	Green P.C. Board Guide
17	A10MP12	Yellow P.C. Board Guide
18	A10MP10	Green P.C. Board Guide
19	A10MP12	Yellow P.C. Board Guide
20	A10MP10	Green P.C. Board Guide
21	A10MP12	Yellow P.C. Board Guide
22	A10MP10	Green P.C. Board Guide
23	A10MP12	Yellow P.C. Board Guide
24	A10MP10	Green P.C. Board Guide
25	A10MP12	Yellow P.C. Board Guide
26	A10MP10	Green P.C. Board Guide
27	A10MP12	Yellow P.C. Board Guide
28	A10MP10	Green P.C. Board Guide
29	A10MP12	Yellow P.C. Board Guide
30	A10MP10	Green P.C. Board Guide
31	A10MP12	Yellow P.C. Board Guide
32	A10MP10	Green P.C. Board Guide
33	A10MP12	Yellow P.C. Board Guide
34	A10MP10	Green P.C. Board Guide
35	A10MP12	Yellow P.C. Board Guide
36	A10MP10	Green P.C. Board Guide
37	A10MP12	Yellow P.C. Board Guide
38	A10MP10	Green P.C. Board Guide
39	A10MP12	Yellow P.C. Board Guide
40	A10MP10	Green P.C. Board Guide
41	A10MP12	Yellow P.C. Board Guide
42	A10MP10	Green P.C. Board Guide
43	A10MP12	Yellow P.C. Board Guide
44	A10MP10	Green P.C. Board Guide
45	A10MP12	Yellow P.C. Board Guide
46	A10MP10	Green P.C. Board Guide
47	A10MP12	Yellow P.C. Board Guide
48	A10MP10	Green P.C. Board Guide
49	A10MP12	Yellow P.C. Board Guide
50	A10MP10	Green P.C. Board Guide



ITEM NUMBER	REFERENCE DESIGNATOR	DESCRIPTION
1	A11MP18	Flat Washer
2	A11MP16	Set Screw
3	A11MP16	Flat Washer
4	A11MP16	Set Screw
5	A11MP16	Flat Washer
6	A11MP16	Set Screw
7	A11MP16	Flat Washer
8	A11MP16	Set Screw
9	A11MP16	Flat Washer
10	A11MP16	Set Screw
11	A11MP16	Flat Washer
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30	A11MP16	Set Screw
31	A11MP16	Flat Washer
32	A11MP16	Set Screw
33	A11MP16	Flat Washer
34	A11MP16	Set Screw
35	A11MP16	Flat Washer
36	A11MP16	Set Screw
37	A11MP16	Flat Washer

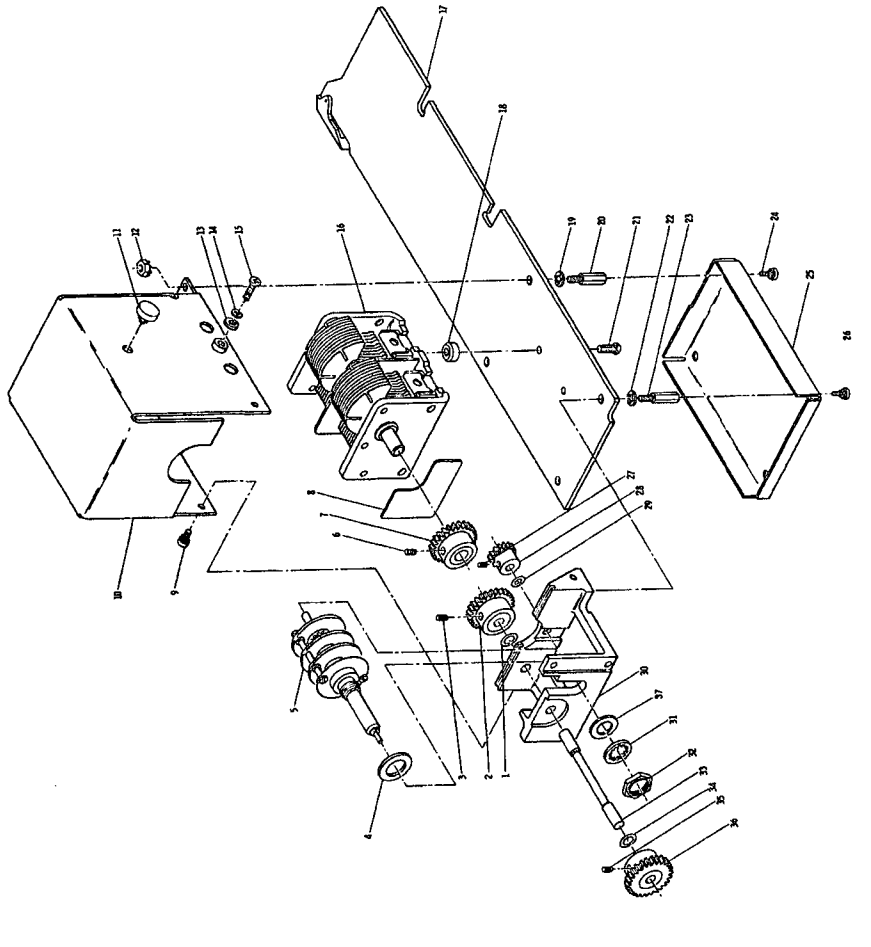


Figure 8D-8. A11 Variable-Frequency Modulation Oscillator (Option 001) Illustrated Parts Breakdown



**A10 AND A11 ASSEMBLIES  
REMOVAL AND DISASSEMBLY**

**SSE**

SEE REVERSE SIDE

Item Number	Reference Designator	Description
76	A26L2	Inductor
77	A26L1	Inductor
78	A26L9	Inductor
(78)	A26R1	Resistor (Opt. 004)
79	A26C4	Feedthrough Capacitor
80	A26C2	Feedthrough Capacitor
81	A26L5	Inductor
82	A26C18	Feedthrough Capacitor
(82)	A26C18	Feedthrough Capacitor (Opt. 004)
83	A26C9	Feedthrough Capacitor
84	A26C13	Feedthrough Capacitor
85	A26C15	Feedthrough Capacitor
86	A26C7	Feedthrough Capacitor
87	A26C5	Feedthrough Capacitor
88	A26MP50	Setscrew
(88)	A26C11	Feedthrough Capacitor (Option 002)

Item Number	Reference Designator	Description
1	A26MP34	Machine Screw
2	A26MP48	Machine Screw
3	A26MP25	Machine Screw
4	A26MP27	Machine Screw
5	A26MP28	Lock Washer
6	A26MP29	RF Gasket
7	A26LJ2	RF Gasket
8	A26MP34	Machine Screw
9	A26MP33	Machine Screw
10	A26MP43	Machine Screw
11	A26L3	Coaxial Cable
12	A26MP3	Modulator Assembly
13	A26MP25	Machine Screw
14	A26MP45	Machine Screw
15	A26MP6	Modulator Filter Cover
16	A26MP3	Machine Screw
17	A26MP24	RF Gasket
18	A26MP9	Machine Screw
19	A26MP4	Bottom Module Cover
20	A26MP16	RF Gasket
21	A26MP15	Machine Screw
22	A26MP17	Coaxial Cap
23	A26MP18	Hex Nut
24	A26MP18	Lock Washer
25	A26MP19	Casting
26	A26A5	Machine Screw
27	A26MP20	Riser Assembly
28	A26MP11	PC Edge Connector
29	A26MP47	Brown PC Board Guide
30	A26L1	Lock Washer
31	A26W4	RF Connector
32	A26A4	Coaxial Cable
33	A26A4	AGC Amplifier Assembly (Opt. 004)
34	A26A4	Machine Screw (Opt. 004)
35	A26MP14	Machine Screw (Opt. 004)
36	A26MP22	Cover Top Module (Opt. 004)
37	A26A2	PC Edge Connector
38	A26MP21	AM Offset and Pulse Switching Assembly
39	A26A6	Machine Screw
40A	A26MP12	AM Mother Board Assembly
40B	A26MP13	Yellow PC Board Guide
41	A26MP41	Green PC Board Guide
42	A26MP42	Hex Nut
43	A26MP38	Hex Nut

Item Number	Reference Designator	Description
44	A26MP40	Lock Washer
45	A26MP46	Machine Screw
46	A26MP5	Access Cover
47	A26MP1	RF Gasket
48	A26MP37	Hex Nut
49	A26MP38	Lock Washer
50	A26MP35	Lock Washer
51	A26MP39	Lock Washer
52	A26MP10	RF Gasket
53	A26A1MP1	Amplifier Filter Cover (Opt. 002)
54	A26MP44	Machine Screw
55	A26W1	Coaxial Cable
56	A26A1J1	Machine Screw
57	A26A1W2	Coaxial Cable (Opt. 002)
58	A26A1	Coaxial Cable (Opt. 002)
59	A26A1	Power Amplifier and AGC Detector Assembly
60	A26A1	Output Amplifier Doubler and AGC Detector Assembly (Opt. 002)
61	A26U1	Heat Sink
62	A26U1	Amplifier (Opt. 002)
63	A26U1	RF Gasket
64	A26MP31	Machine Screw
65	A26MP30	Lock Washer
66	A26L3	Machine Screw
67	A26L6	Inductor (Opt. 002) (Opt. 004)
68	A26MP49	Inductor
69	A26C12	Feedthrough Capacitor (Opt. 002)
70	A26L4	Inductor
71	A26C6	Feedthrough Capacitor
72	A26C8	Inductor
73	A26L8	Inductor
74	A26C16	Feedthrough Capacitor
75	A26C17	Feedthrough Capacitor
76	A26C10	Feedthrough Capacitor
77	A26C17	Feedthrough Capacitor
78	A26C17	Feedthrough Capacitor (Opt. 004)
79	A26C1	Feedthrough Capacitor
80	A26C3	Feedthrough Capacitor

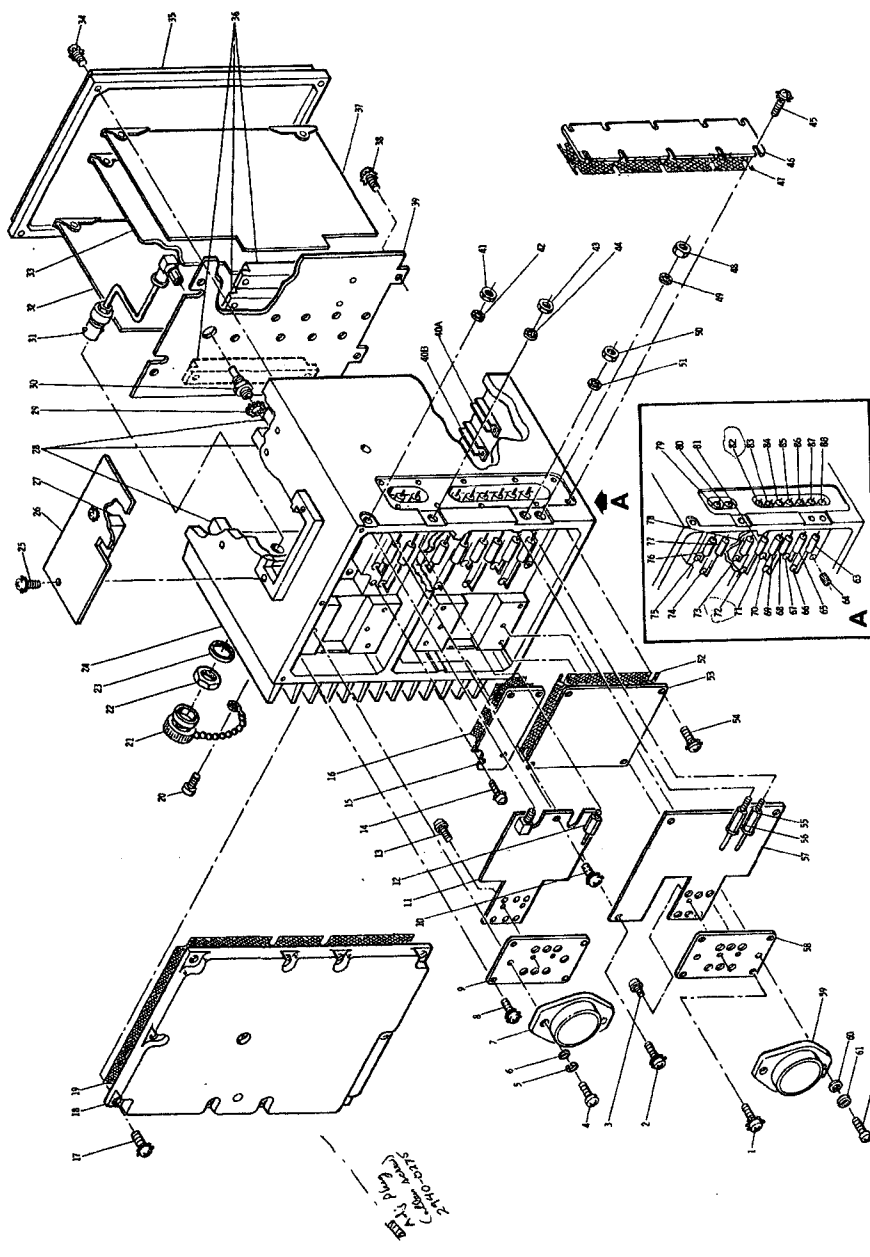


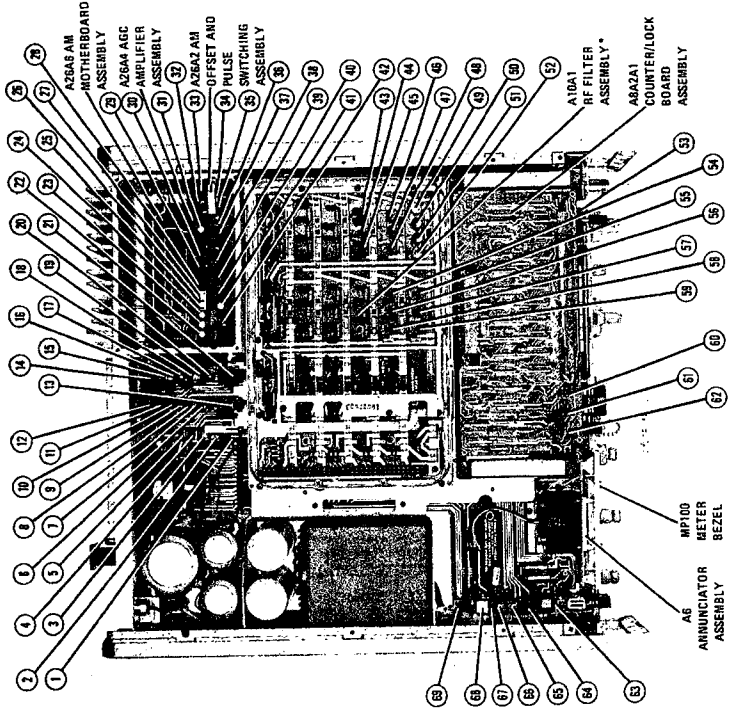
Figure 8D-9. A26 AM/AGC and RF Amplifier Assembly Illustrated Parts Breakdown

**A26 ASSEMBLY REMOVAL  
AND DISASSEMBLY**

SEE REVERSE SIDE

**SSF**

A2R14 A2R15 A2R28 A2TP1 A2TP2 A2TP3 A2TP4	METER OFFSET DET OFFSET METER DRIVE GND AC IN DC OUT	A10A1L44 A10A1L45 A18R2 A18TP1 A18TP2 A18TP5 A18TP6	-5.2V F1 TH1 -5.2V F1	A26A2TP3 A26A2TP4 A26A2TP5 A26A2TP6 A26A2TP7 A26A2TP8	AM OUT PUL IN DET PUL MOD PUL MET SW	38 38 37 38 39 39
ABAZA2R2 ABAZA1S1A ABAZA1S1B ABAZA1S1C	TIME BASE CAL EXP X10 EXP X100 LOCK	A20R8 A20R16 A20TP1 A20TP4 A20TP5	+44.8V ADJ +5.2V ADJ F2 +44.8V F2	A26A4R1 A26A4R2 A26A4R12 A26A4R54 A26A4TP1	LVL DBLR LVL MET DBLR OFFSET MET	23 22 24 31 25
A10A1C81 A10A1C82 A10A1C83 A10A1C84 A10A1L31		A20TP6 A20TP7 A20TP10 A22R7 A22R19 A22TP1 A22TP2 A22TP4	F1 F1 +5.2V +20V ADJ -20V ADJ F2 F2 +20V	A26A4TP2 A26A4TP3 A26A4TP4 A26A4TP5 A26A4TP6 A26A4TP7 A26A4TP8	DET OVL D VERN GND CO1 DRYR MOD	26 27 28 29 30 32 33
A10A1L40 A10A1L41 A10A1L42 A10A1L43		A22TP6 A22TP7 A22TP8 A26A2R19 A26A2TP1 A26A2TP2	F1 F1 -20V X AM AM IN GND			41 42 43 44



\*A10A2 RF Divider Assy Removed To Show A10A1

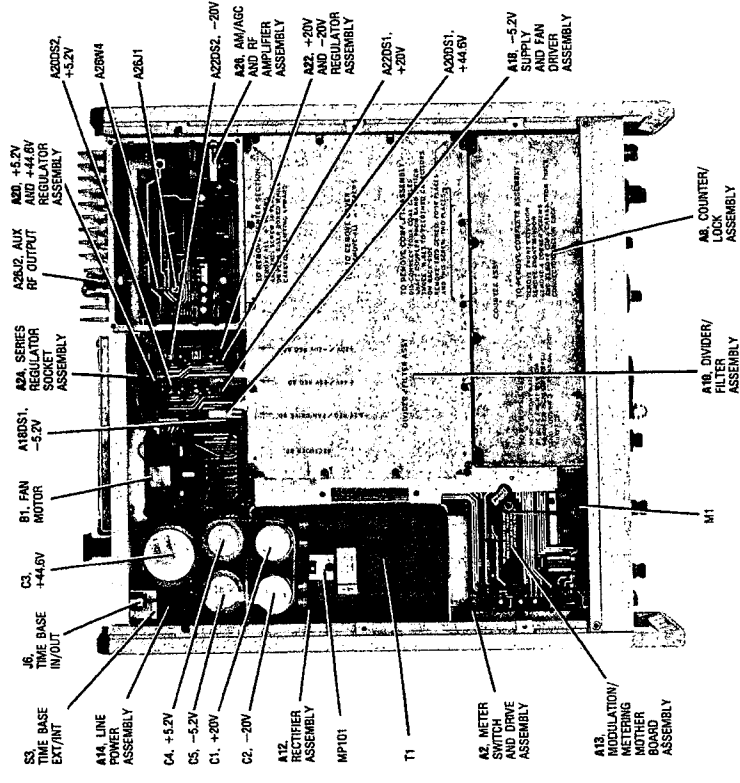


Figure 8D-10. Top Internal Views (Options 001, 002 and 003 Shown).  
888  
(1 OF 2)  
8D-33

**GENERAL REMOVAL PROCEDURES  
AND TOP INTERNAL VIEWS  
(1 OF 2)**

SEE REVERSE SIDE

**SSG**  
(STANDARD)

A2R14	METER OFFSET	A10A1L44	A26A2TP3	AM OUT
A2R15	DET OFFSET	A10A1L45	A26A2TP4	PUL IN
A2R28	METER DRIVE	A18R2	A26A2TP6	DET PUL
A2TP1	GND	A18TP1	A26A2TP7	MOD PUL
A2TP2	AC IN	A18TP2	A26A2TP8	MET
		A18TP5	A26A4R1	BW
		A18TP6		LVL
A2TP3	DC OUT		A26A4R12	METER ADJ
A2TP4	TIME BASE CAL		A26A4TP1	MET
ABA2A2R2			A26A4TP2	DET
ABA2A1S1A			A26A4TP3	OVL0
ABA2A1S1B			A26A4TP4	VERN
ABA2A1S1C			A26A4TP5	GND
A10A1CB1			A26A4TP6	CO3
A10A1CB2			A26A4TP7	DRVR
A10A1CB3			A26A4TP8	MOD
A10A1CB4			A26A8R3	GAIN
A10A1L31				
A10A1L32			A26A8R6	AC OFFSET
A10A1L33			A26A8R8	AC GAIN
A10A1L37			A26A8R10	DC GAIN
A10A1L38			A26A8R15	DC OFFSET
A10A1L39			A26A8S1	AC/DC
A10A1L40			A26A8TF1	BUFFER DET
A10A1L41			A26A8TF2	DET
A10A1L42			A26A8TF3	DEMOD
A10A1L43				

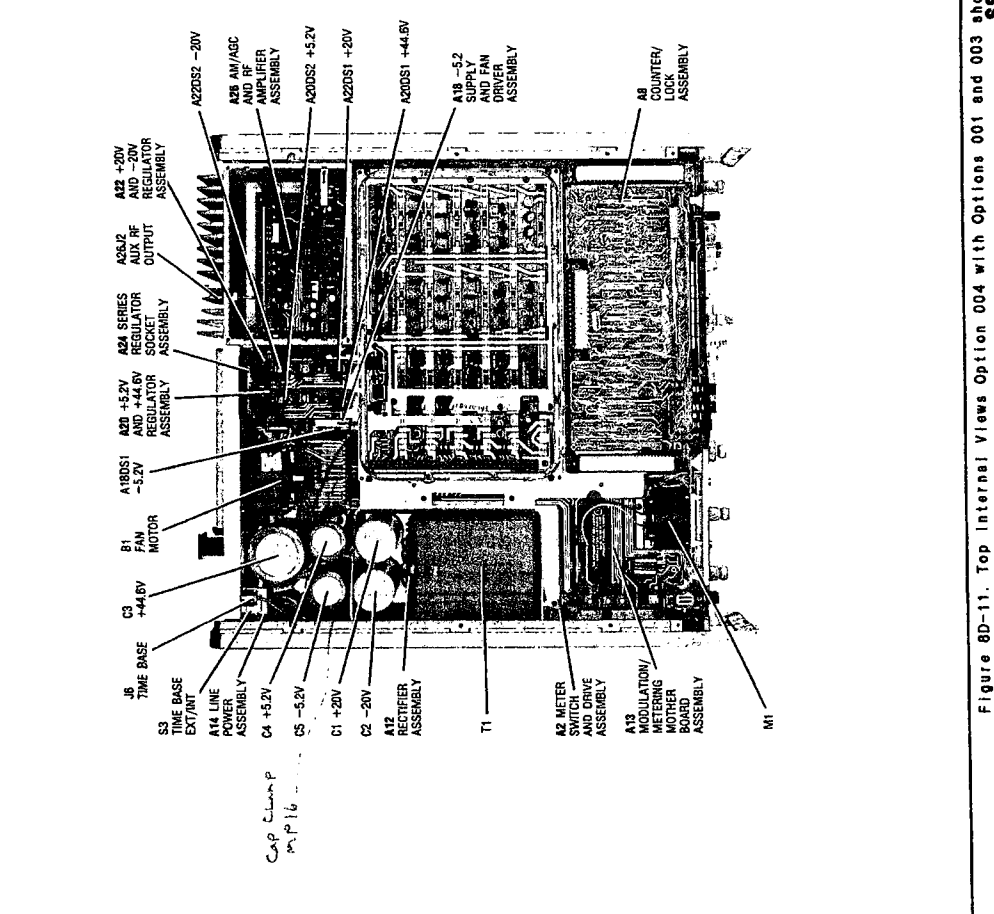
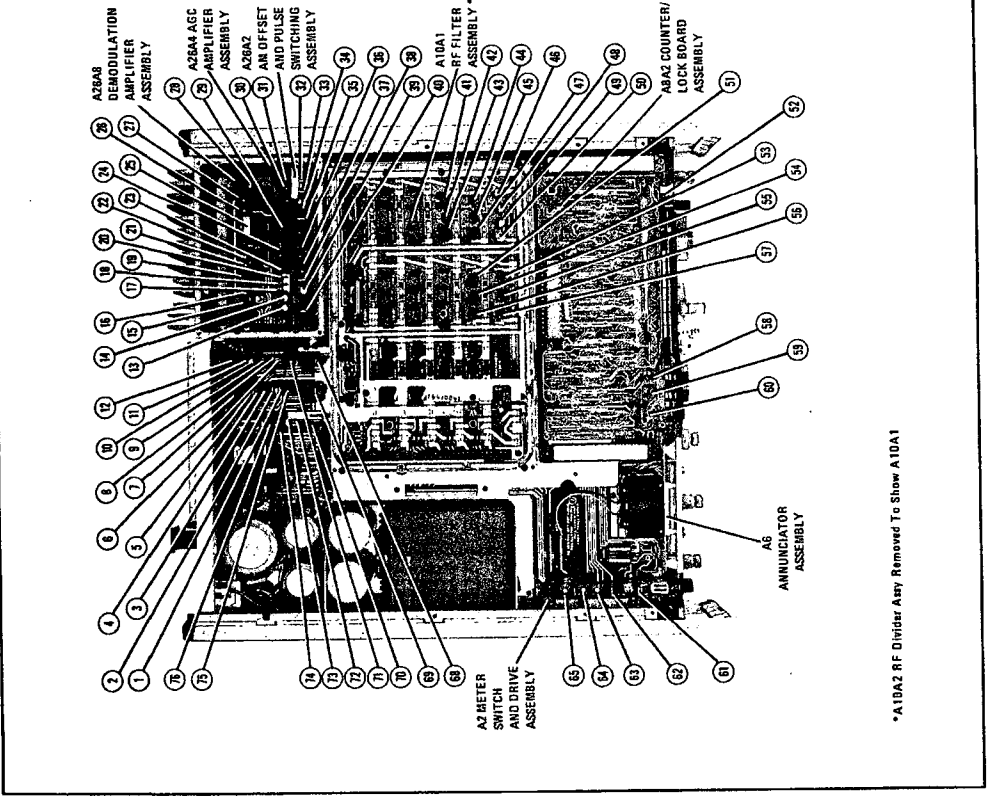


Figure 8D-11. Top Internal Views Option 004 with Options 001 and 003 shown  
 (2 of 2)  
 8D-55

**GENERAL REMOVAL PROCEDURES  
AND TOP INTERNAL VIEWS  
(2 OF 2)**

SEE REVERSE SIDE

**SSG**  
(OPTION 004)



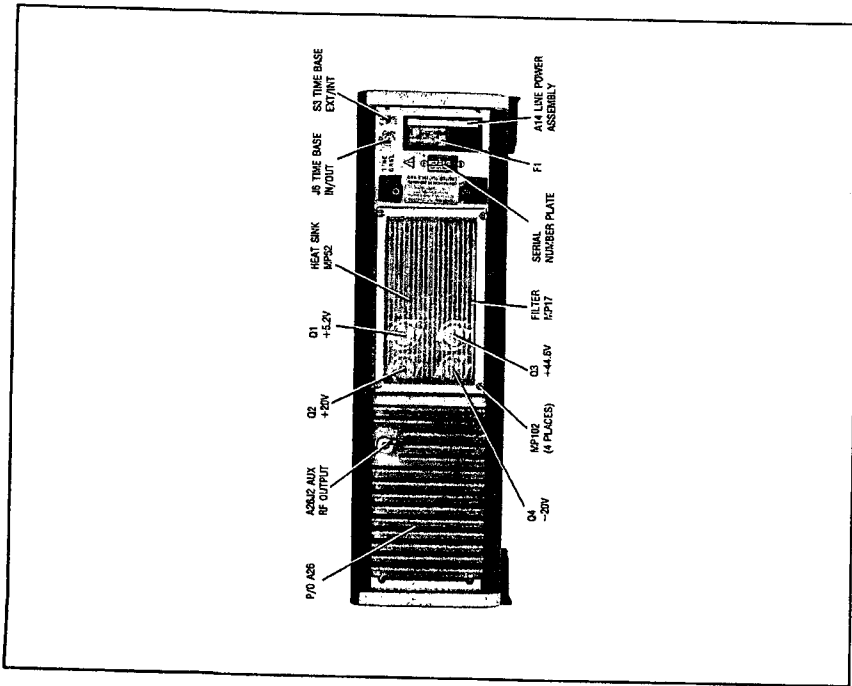


Figure 8D-12. Rear Panel View

A1R1	VERM	A1102	TRIMMER ADJ
A1A1TP1	MET OUT	A1103	TRIMMER ADJ
A1A1TP2		A1109	OCCILLATOR LEVEL
A3R1	FREQUENCY TUNE	A11R20	AM-FM DRIVE ADJ
A3A2	FREQUENCY TUNE	A11R36	AUDIO OUTPUT LEVEL
A3A4R1	F <sub>T</sub> ADJ	A11R40	FM OUT
A3A4R2	LOW FM SENS	A11TP1	OSC OUT
A3A4R3	M/D FM SENS	A11TP2	AM OUT
A3A4R4	H1 FM SENS	A11TP3	GND
A3A4TP1	F <sub>T</sub>	A11TP4	FM CAL
A3A4TP2		A11TP5	
A5R8	AMPLIFIER OFFSET	A11TP6	
A5R23	BUFFER ADJ	A13R3	
A5TP1	GND	A2E11	
A5TP2	OUTPUT	A2E12	
A5TP3	+INPUT	A2EWS	
A5TP4	-INPUT	A2EAL1G3	
A5TP5	FM BUFFER IN	A2EAL1J1	
A5TP6	BUFFER OUT	A2EAL1R18	DET ADJ (except Opt. 002)
A7R12	POSITIVE SHAPING	A2EAL1R34	DET ADJ (Opt. 002 or 1)
A7R19	VARIABLE BIAS	A2EAL1TP1	DET
A7R41	NEGATIVE SHAPING	A2EAL1TP2	PK DET
A7TP1	GND	A2EAL1W1	
A7TP2	VARIABLE ANODE	A2EAL1W2	
A7TP3	VARIABLE CATHODE	A2EAL1J1	
A7TP4	+0.20 OVERLOAD		
A7TP5			
A8R1	PEAK DEVIATION VERMIER		
A8ACTP1			

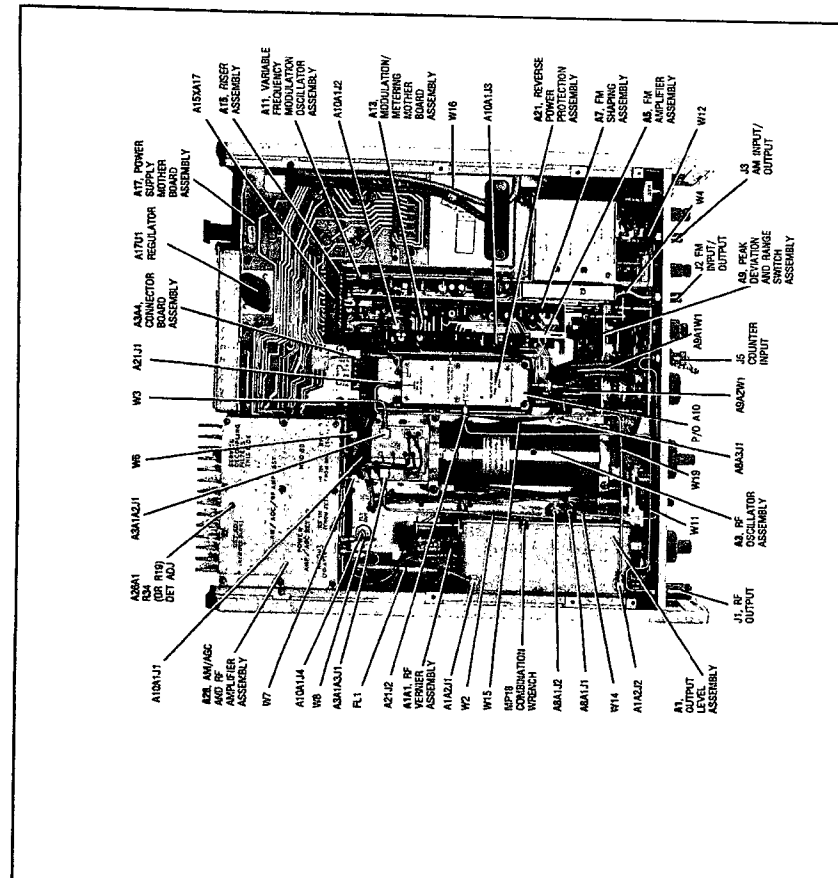
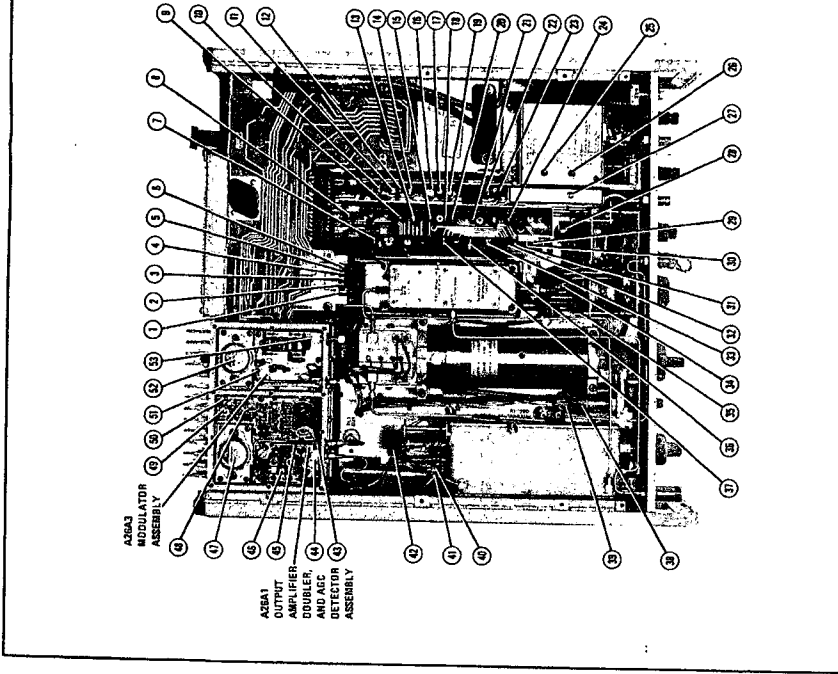


Figure 8D-13. Bottom Internal Views (Options 001, 002 and 003)

REAR PANEL AND  
BOTTOM INTERNAL VIEWS  
(1 OF 2)

SEE REVERSE SIDE

**SSH**  
(STANDARD)

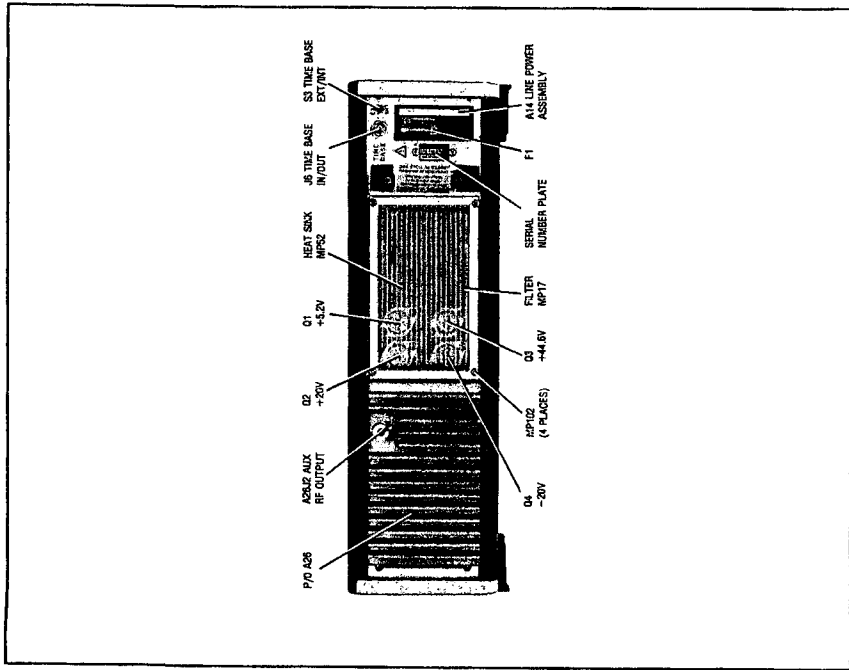


Figure 8D-14. Rear Panel View

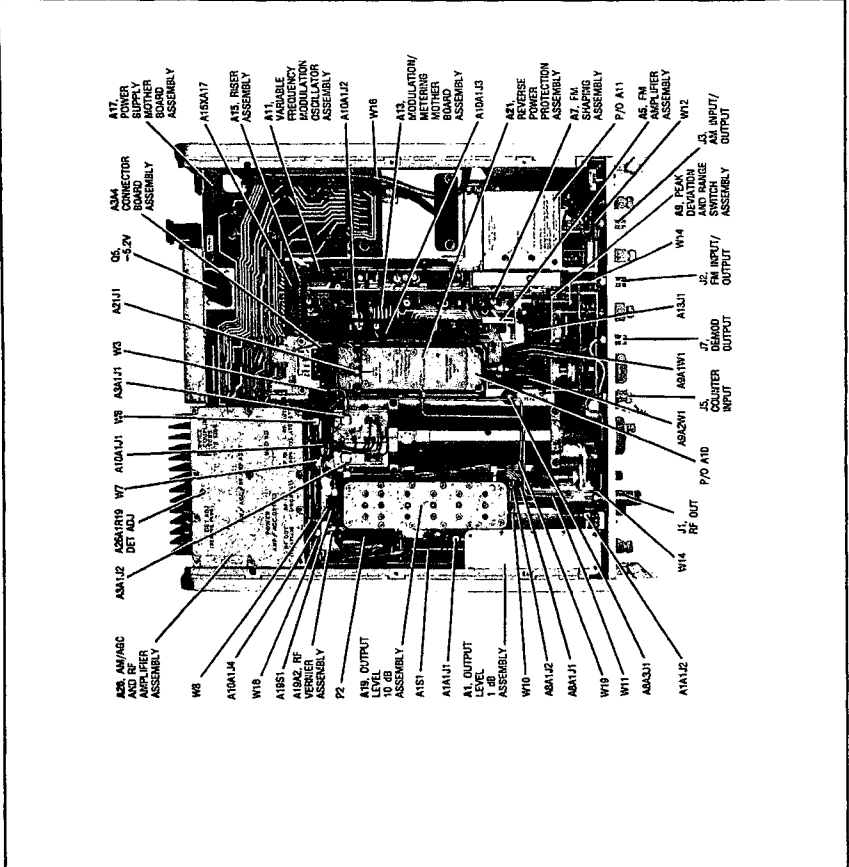
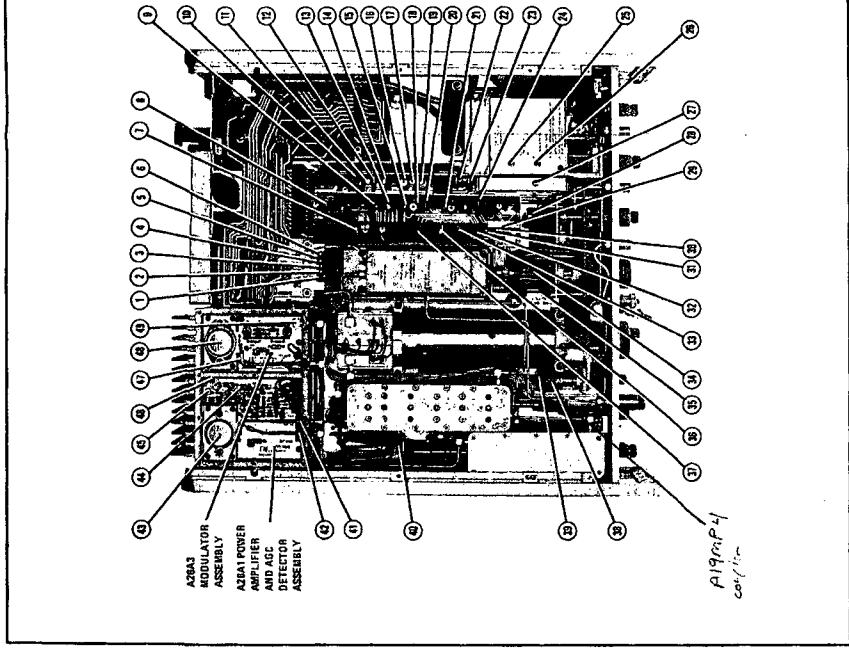
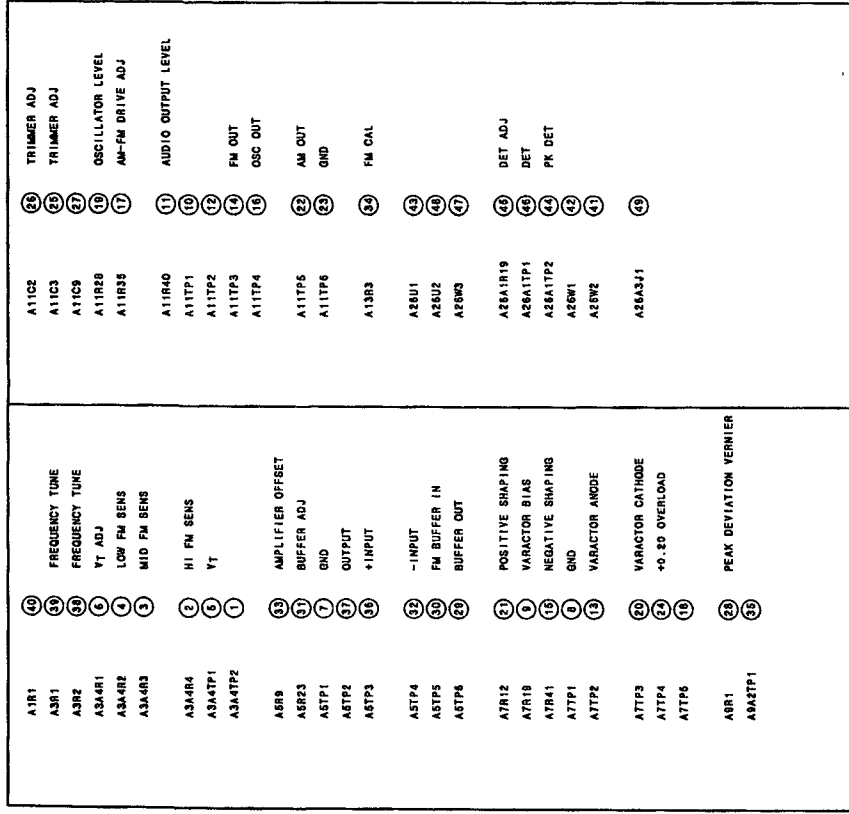


Figure 8D-15. Bottom Internal Views Option 004 with Options 001 and 003 shown  
 56H  
 (2 of 2)  
 8D-39

REAR PANEL AND  
BOTTOM INTERNAL VIEWS  
(2 OF 2)

**SSH**  
(OPTION 004)

SEE REVERSE SIDE