

ARTISAN®
TECHNOLOGY GROUP

Your **definitive** source for quality pre-owned equipment.

Artisan Technology Group
(217) 352-9330 | sales@artisantg.com | artisantg.com

Full-service, independent repair center
with experienced engineers and technicians on staff.

We buy your excess, underutilized, and idle equipment
along with credit for buybacks and trade-ins.

Custom engineering
so your equipment works exactly as you specify.

- Critical and expedited services
- In stock / Ready-to-ship
- Leasing / Rentals / Demos
- ITAR-certified secure asset solutions

Expert team | Trust guarantee | 100% satisfaction

All trademarks, brand names, and brands appearing herein are the property of their respective owners.

Find the *Keysight / Agilent 3320B* at our website: ***Click HERE***

Errata

Title & Document Type: **3320A/B Frequency Synthesizer Operating and Service Manual**

Manual Part Number: **03320-90002**

Revision Date: **January 1971**

About this Manual

We've added this manual to the Agilent website in an effort to help you support your product. This manual provides the best information we could find. It may be incomplete or contain dated information, and the scan quality may not be ideal. If we find a better copy in the future, we will add it to the Agilent website.

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, life sciences, and chemical analysis businesses are now part of Agilent Technologies. The HP XXXX referred to in this document is now the Agilent XXXX. For example, model number HP8648A is now model number Agilent 8648A. We have made no changes to this manual copy.

Support for Your Product

Agilent no longer sells or supports this product. You will find any other available product information on the Agilent Test & Measurement website:

www.agilent.com

Search for the model number of this product, and the resulting product page will guide you to any available information. Our service centers may be able to perform calibration if no repair parts are needed, but no other support from Agilent is available.

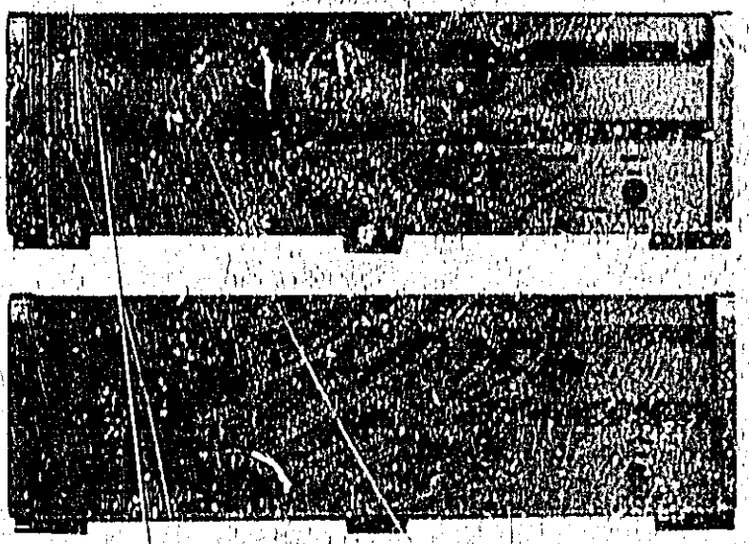
Agilent Technologies

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

OPERATING AND SERVICE MANUAL

FREQUENCY SYNTHESIZER

3320A/B



HEWLETT hp PACKARD

HP 3320A/B

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

OPERATING AND SERVICE MANUAL

MODEL 3320A/B
FREQUENCY SYNTHESIZER

Serial Numbers: 1524A00446 and greater (Model 3320A)
1532A01381 and greater (Model 3320B)

IMPORTANT NOTICE

Any changes made in instruments with serial numbers greater than those stated on this title page will be noted on a change sheet supplied with this manual. If the serial number of your instrument is lower than that stated above, the manual can contain revisions that do not apply to your instrument. Backdating information located in Section VIII adapts this manual to these instruments.

WARNING

To help minimize the possibility of electrical fire or shock hazards, do not expose this instrument to rain or excessive moisture.

Manual Part No. 03320-90002

Microfiche Part No. 03320-90052

Copyright Hewlett-Packard Company 1971
P.O. Box 301, Loveland, Colorado, 80537 U.S.A.

Printed: October 1976

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

HEWLETT PACKARD

CERTIFICATION

Hewlett-Packard Company certifies that this instrument met its publis specifications at the time of shipment from the factory. Hewlett-Pac Company further certifies that its calibration measurements are traceable to United States Natio Bureau of Standards, to the extent allowed by Bureau's calibration facility, and to the calibration facilities of o International Standards Organization members.

WARRANTY AND ASSISTANCE

This Hewlett-Packard product is warranted against defects in materials workmanship for a period of one year from the date of shipment, except in the case of certain components, if any, listed in Section I of this opera manual, the warranty shall be for the specified period. Hewlett-Packard wil its option, repair or replace products which prove to be defective during warranty period provided they are retur ed to Hewlett-Packard and proy the proper preventive mainte nance procedures as listed in this manual followed. Repairs necessitated by misuse of the product are not covered by warranty. NO OTHER WARRANTIES ARE EXPRESSED OR IMPLI INCLUDING, BUT NOT LIMITED TO THE IMPLIED WARRANTIES MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPO HEWLETT-PACKARD IS NOT LIABLE FOR CONSEQUENTIAL DAMAG

If this product is sold as part of a Hewlett-Packard integrated instrum system, the above warranty shall not be applicable, and this product shal covered only by the system warranty.

Service contracts or customer assistance agreements are available Hewlett-Packard products.

For any assistance, contact your nearest Hewlett-Packard Sales and Ser Office. Addresses are provided at the back of this manual.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

TABLE OF CONTENTS

Section		Page
I	GENERAL INFORMATION	1-1
1-1	Introduction	1-1
1-3	Specifications	1-1
1-6	Description	1-1
1-9	Options	1-3
1-12	Accessories Supplied	1-3
1-14	Accessories Available	1-3
1-16	Instrument and Manual Identification	1-3
II	INSTALLATION	2-1
2-1	Introduction	2-1
2-3	Initial Inspection	2-1
2-5	Power Requirements	2-1
2-7	Line Voltage Selection	2-1
2-9	Environmental Requirements	2-2
2-11	Preparation for Shipment	2-2
2-13	Power Cord and Receptacles	2-2
2-15	Rear Panel Connections	2-3
2-17	Remote GPIB Operation	2-3
2-19	Remote GPIB Operation	2-3
III	OPERATING INSTRUCTIONS	3-1
3-1	Introduction	3-1
3-3	Controls, Indicators and Connectors	3-1
3-5	Front Panel Operation	3-1
3-7	Amplitude	3-1
3-9	Frequency	3-1
3-11	Remote GPIB Operation	3-2
3-13	3320B Amplitude	3-2
3-15	Amplitude	3-2
3-17	Frequency	3-2
3-19	Frequency	3-2
3-21	Modulation	3-2
3-23	Delay and Recording	3-3
3-25	Remote GPIB Programming	3-3
3-27	Hardware	3-3
3-29	Data Format	3-3
3-31	Interface Messages	3-4
3-33	Reference Crystal Oven	3-4
IV	THEORY OF OPERATION	4-1
4-1	Introduction	4-1
4-3	General Description	4-1
4-5	Simplified Block Diagram	4-1
4-7	Introduction	4-2
4-9	Controller Section	4-2
4-11	Reference Section	4-2
4-13	Amplitude Section	4-2
4-15	Reference Section	4-2
4-17	Functional Block Description	4-2
4-19	Controller Section	4-2
4-41	Frequency Section	4-7
4-49	Amplitude Section	4-7
4-56	Reference Section	4-9
4-62	Unique Circuits	4-10
4-63	3320B Thimpopple Circuitry	4-10
4-70	The "N Counter"	4-11
V	MAINTENANCE	5-1
5-1	Introduction	5-1
5-3	Test Equipment	5-1
5-5	Performance Tests	5-1
5-7	Frequency Accuracy, Vernier Out	5-1
5-9	Frequency Accuracy, Vernier In	5-1
5-11	Harmonic Distortion	5-3
5-13	Spurious	5-4
5-15	SSB Phase Noise	5-4
5-17	Amplitude Accuracy, Absolute	5-5
5-19	3320A Frequency Response, 0.0 Hz to 1.3 MHz	5-6
5-20	3320B Frequency Response, 0.0 Hz to 10 Hz	5-6
5-21	3320B Frequency Response, 10 Hz to 13 MHz	5-6
5-23	3320B Attenuator Accuracy, 0 Hz	5-7
5-25	3320B Attenuator Frequency Response	5-8
5-27	Adjustment Procedures	5-11
5-29	Power Supply	5-11
5-31	Reference Oscillator	5-11
5-33	VTO Linearity	5-11
5-35	Vernier	5-11
5-37	Amplitude Reference, 3320A	5-12
5-39	Carrier Balance	5-12
5-41	Amplitude	5-12
5-43	Hump Inc., 3320B	5-13
5-45	Leveling, 3320B	5-13
5-47	Deflection Response, 3320B	5-14
5-49	General Maintenance Information	5-14
5-51	Front Panel Removal	5-14
5-53	Front Panel Disassembly	5-15
5-55	Front Panel Assembly	5-16
5-57	Attenuator Cam Setting	5-16
VI	REPLACEABLE PARTS	6-1
6-1	Introduction	6-1
6-4	Ordering Information	6-1
6-6	Non-Listed Parts	6-1

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

ntents

	Page
UIT DIAGRAMS AND DUBLESHOOTING	7-1
Introduction	7-1
Troubleshooting	7-1
Schematic Diagrams	7-1

	Page
KDATING	8-1
Introduction	8-1
Instrument Serial Number Sequence	8-1
Change 1, for Serial Numbers 1121A-00110 and Below (3320A), 1122A-00120 and Below (3320B)	8-1
Change 2, 3320B	8-2
Change 3, 3320B	8-2
Change 4, for Serial Numbers 1138A-00135 and Below (3320A), 1139A-00200 and Below (3320B)	8-2
Change 5, for Serial Numbers 1138A-00135 and Below (3320A), 1139A-00250 and Below (3320B)	8-2
Change 6, for Serial Numbers 1139A-00340 and Below (3320B)	8-2
Change 7, for Serial Numbers 1138A-00185 and Below (3320A), 1139A-00540 and Below (3320B)	8-2
Change 8, for Serial Numbers 1139A-00590 and Below (3320B)	8-2
Change 9, for Serial Numbers 1138A-00275 and Below (3320A), 1319A00690 and Below (3320B)	8-3
Change 10, for 3320B with Revision B Assembly 03320-66514	8-3
Change 11, for 3320B with Revision B Assembly 03320-66537	8-3
Change 12, for Serial Numbers 1524A00415 and Below (3320A), and 1319A01100 and Below (3320B)	8-3
Change 13, for Serial Numbers 1319A01150 and Below (3320B)	8-3
Change 14, for Serial Numbers 1524A00525 and Below	8-4
Change 15, for 3320B Serial Numbers 1532A01381 Through 1532A01460 Only	8-4

	Page
APPENDICES	
A. CODE LIST OF MANUFACTURERS	
B. SALES AND SERVICE OFFICES	

LIST OF TABLES

	Page
fications	1-1
al Information	1-2
ories Supplied	1-3
ories Available	1-3
Cables	2-3
ency Control Settings	3-1
tude and Frequency Setting Times	3-4
ssing Codes	3-4
Signal Mnemonics	3-5
Programming Codes	3-5
Programming	3-6
g Times	3-8
A/B Ranges	4-2
Signal Mnemonics	4-4
ency Setting vs. ÷N Number	4-12
Number	4-14

Table		Page
5-1.	Test Equipment Required	5-2
5-2.	3320A Frequency Response (0.01 Hz – 13 MHz)	5-6
5-3.	3320B Frequency Response (0.01 Hz – 10 Hz)	5-7
5-4.	3320B Frequency Response (10 Hz – 13 MHz)	5-7
5-5.	Output Attenuator	5-9
5-6.	3320B Frequency Response	5-9
5-7.	Readout Disks Positions	5-16
6-1.	Replaceable Parts	6-2
7-1.	Assembly Identification and Location	7-2
8-1.	Serial Number Index	8-1
8-2.	A21B Replaceable Parts	8-4
8-3.	A24B Replaceable Parts	8-5

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

LIST OF ILLUSTRATIONS

Figure		Page
2-1.	Voltage Selection	2-1
2-2.	Power Cords	2-2
2-3.	BCD Remote Connector	2-2
2-4.	HP-IB Remote Connector	2-3
2-5.	Typical HP-IB System	2-3
3-1.	Controls, Indicators, and Connectors	3-0
3-2.	BCD Input Connector	3-2
3-3.	BCD Timing Sequence	3-4
3-4.	HP-IB Input Connector	3-5
3-5.	Handshake Timing Diagram	3-7
3-6.	Option 002 Circuit Diagram	3-8
4-1.	Simplified 3320A/B Block Diagram	4-1
4-2.	Frequency Generation	4-2
4-3.	Reference Sources	4-3
4-4.	3320A Standard Controller	4-3
4-5.	3320B Standard Controller	4-3
4-6.	3320A BCD Controller	4-3
4-7.	3320B BCD Controller	4-3
4-8.	Typical HP-IB Bus System	4-4
4-9.	HP-IB Controller	4-5
4-10.	VTO and Phase Lock Loop	4-6
4-11.	Range Dividers	4-7
4-12.	3320A Amplitude Section	4-8
4-13.	3320B Amplitude Section	4-8
4-14.	Simplified Amplitude Reference	4-9
4-15.	Reference Section	4-9
4-16.	Vernier Oscillator	4-10
4-17.	AC/DC Converter in the Amplitude Section	4-11
4-18.	AC/DC Converter With Overload Circuits	4-11
4-19.	÷ N Control Logic Diagram	4-13
5-1.	Harmonic Distortion	5-3
5-2.	3320A/B Output Section	5-4
5-3.	Spurious	5-5
5-4.	Signal-to-Phase Noise	5-5
5-5.	3320B Frequency Response (10 Hz – 13 MHz)	5-7
5-6.	3320B Attenuator Accuracy	5-8
5-7.	75 Ohm to 50 Ohm Adapter	5-10
5-8.	Chassis Mounted Components	5-13
5-9.	Front Panel and Vernier Control Mechanical Parts	5-17
6-1.	External Mechanical Parts	6-33
6-2.	Internal Mechanical Parts	6-34
6-3.	Front Panel and Vernier Control Mechanical Parts	6-35
7-1.	HP-IB Troubleshooting	7-3/7-4
7-2.	Reference Frequency Troubleshooting Tree	7-5/7-6
7-3.	Frequency Generating Section Troubleshooting Tree	7-7/7-8
7-4.	Amplitude Section Troubleshooting Tree	7-9/7-10
7-5.	Controller Functional Block Diagram	7-11/7-12
7-6.	Controller Configurations	7-13/7-14
7-7.	Analog Functional Block Diagram	7-15/7-16
7-8.	Common Assemblies, Top and Bottom View	7-17/7-18
7-9.	Front Panel A13; Panel Interface A20; 3320A Standard, Options 001, 002, 006	7-19/7-20
7-10.	Front Panel A13B; Panel Interface A21; 3320B Standard, Options 001, 002, 006	7-21/7-22
7-11.	BCD Frequency Control P/O A23; 3320A Option 003, 3320B Option 004	7-23/7-24
7-12.	BCD Frequency Control P/O A23; 3320A Option 003, 3320B Option 004	7-25/7-26
7-13.	BCD Amplitude Control A24B, 3320B Option 004; Inverter A24A, 3320A Option 003	7-27
7-14.	HP-IB Input A37 and HP-IB Controller A38, 3320B Option 007	7-29/7-30
7-15	HP-IB Latches A25, 3320B Option 007	7-31/7-32
7-16.	HP-IB Frequency Control P/O A23, 3320B Option 007	7-33/7-34
7-17.	HP-IB Frequency Control P/O A23, 3320B Option 007	7-35/7-36
7-18.	HP-IB Amplitude Control A24B, 3320B Option 007	7-37/7-38
7-19.	VTO A3	7-39/7-40
7-20.	÷ N Counter A2	7-41/7-42
7-21.	Range Divider A4	7-43/7-44
7-22.	Range Divider A5, 3320A/B Standard; Range Divider A6, 3320A/B Option 006	7-45/7-46
7-23.	Mixer Preamp A10	7-47/7-48
7-24.	Power Amplifier A12A, 3320A	7-49/7-50
7-25.	Power Amplifier A14, Attenuator A15; 3320B	7-51/7-52
7-26.	Modulator A9A, 3320A	7-53/7-54
7-27.	Modulator A9B, 3320B	7-55/7-56
7-28.	Detector A12B, 3320B	7-57/7-58
7-29.	Amplitude Reference A11, 3320B	7-59/7-60
7-30.	20 MHz Reference Oscillator A8, Reference Phase Lock P/O A7	7-61/7-62
7-31.	Vernier Reference Oscillator A1, Reference Phase Lock P/O A7	7-63/7-64
7-32.	Power Supplies; A16A, A17A, 3320A; A16B, A17B, 3320B	7-65/7-66
7-33.	Wiring Diagram	7-67/7-68
8-1.	Panel Interface A21; 3320B Standard, Options 001, 002, 006 Serial No. 1319A01150 and Lower (3320B)	8-7/8-8
8-2.	BCD Amplitude Control A24B, 3320B Option 004; Inverter A24A, 3320A Option 003 Serial No. 1319A01150 and Lower (3320B)	8-9/8-10
8-3.	GP-IB Amplitude Control A24B, 3320B Option 007 Serial No. 1319A01150 and Lower (3320B)	8-11/8-12

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SECTION I
GENERAL INFORMATION

1-1. INTRODUCTION.

1-2. This section contains general information about the Model 3320A/B Frequency Synthesizer. A general description plus information on specifications, accessories, and instrument identification is given.

1-3. SPECIFICATIONS.

1-4. Table 1-1 lists the Model 3320A/B Specifications, which are the performance standards against which the instrument is tested. The general information listed in Table 1-2 is not to be considered as specifications but as typical characteristics included as additional information for the user.

1-5. Any change in the specifications due to manufacturing, design, or traceability to the U.S. National Bureau of Standards will be listed on a manual change supplement included with this manual. The manual and manual change supplement supersede all previous information concerning specifications of the 3320A/B.

1-6. DESCRIPTION.

1-7. The Hewlett-Packard Model 3320A/B Frequency Synthesizer provides accurate and stable frequencies from 0.001 Hz to 12.9999 MHz. Frequency selection is by three controls that provide three digits of resolution plus an

Table 1-1. Specifications.

Frequency accuracy
Vernier Out: ± 0.001% of setting for 6 mo, 0°C to 55°C.
Vernier In: ± 0.01% of range for 6 mo, 0°C to 55°C.

Frequency stability
Long term: ± 10 parts in 10^6 of setting per year (Vernier Out) with ambient temperature reference. Optional high stability crystal reference oven available (Option 002).

Signal to phase noise (integrated), > 40 dB in 30 kHz band, excluding ± 1 Hz, centered on carrier, 10 MHz range, Vernier Out. Improves on lower frequency ranges.

Spurious: > 60 dB down.

Harmonic distortion: with output frequencies > 0.1% of range at full output amplitude any harmonically related signal will be less than the following specified levels.
- 60 dB with output from 5 Hz to 100 kHz.
- 50 dB with output from 100 kHz to 1 MHz.
- 40 dB with output from 1 MHz to 13 MHz.

3320A AMPLITUDE SECTION

Amplitude: maximum 2 V rms ± 10% open circuit, maximum 1 V rms ± 10% into 50 Ω.

Frequency response: ± 2 dB over total range.

3320B AMPLITUDE SECTION

Amplitude accuracy (absolute): ± 0.05 dB at 10 kHz and +26.99 dBm (20°C to 30°C).

Attenuator accuracy (10 kHz reference): ± 0.02 dB/10 dB step.

Frequency response (10 kHz reference):

3320B ATTENUATOR SETTINGS (dBm)		SPECIFICATION (dB)	
Standard	Option 001	LEVELING OFF	LEVELING ON (> 10 Hz)
+26.99 to -3.00	+24.99 to -5.00	± 0.5	± 0.05
-3.01 to -23.00	-5.01 to -25.00	± 0.5	± 0.1
-23.01 to -53.00	-25.01 to -55.00	± 0.5	± 0.2
-53.01 to -69.99*	-55.01 to -69.99**	± 0.5	± 0.4

* -73.00 dBm, remote control.
** -75.00 dBm, remote control.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 1-2. General Information.

Frequency range: 0.01 Hz to 13 MHz in 7 ranges.

Frequency ranges:
10 MHz
1000 kHz
100 kHz
10 kHz
1000 Hz
100 Hz } Optional
10 Hz }

30% overrange on all ranges.

Frequency resolution:

Range	Vernier Out (local or remote)	Vernier In (local)	Vernier In (remote)
10 MHz	10 kHz	10 Hz	1 kHz
1000 kHz	1 kHz	1 Hz	100 Hz
100 kHz	100 Hz	0.1 Hz	10 Hz
10 kHz	10 Hz	0.01 Hz	1 Hz
1000 Hz	1 Hz	1 mHz	0.1 Hz
100 Hz	0.1 Hz	0.1 mHz	0.01 Hz
10 Hz	0.01 Hz	0.01 mHz	0.001 Hz

Internal frequency standard: 20 MHz ambient temperature crystal. Optional 5 MHz reference crystal oven available (Option 002).

Phase locking: the 3320A/B may be phase locked with a 200 mV to 2 V rms signal that is any subharmonic of 20 MHz from 1 MHz through 10 MHz (e.g., 1 MHz, 2 MHz, 2.5 MHz, 5 MHz, 10 MHz), BNC female connector.

Rear panel output: front or rear panel output is available. Can be easily changed by routing internal cable to front or rear female BNC connectors. No degradation of performance for rear panel output.

Auxiliary outputs

Tracking output: 20 MHz to 33 MHz offset signal. Tracks main output with 20 MHz offset. Rear panel female BNC, > 100 mV rms/50 Ω.

1 MHz reference output: sine wave, rear panel female BNC, > 220 mV rms/50 Ω (> 0 dBm/50 Ω).

Low level output: same frequency as main output but remains between 50 mV rms and 158 mV rms (into 50 Ω) depending on main output level setting. May be used as counter output if wanted. Rear panel female BNC, sine wave.

3320A AMPLITUDE SECTION

Amplitude range: 0 dBm to + 13 dBm range through 3/4 turn front panel control (not programmable).

Output impedance: 50 Ω.

3320B AMPLITUDE SECTION

Amplitude range: + 26.99 dBm (1/2 watt) to - 99.99 dBm (- 73.00 dBm under remote control) into 50 Ω. (+ 26.99 dBm = 5 V rms into 50 Ω).

Amplitude resolution: 0.01 dB.

Output impedance: 50 Ω.

GENERAL 3320A/B

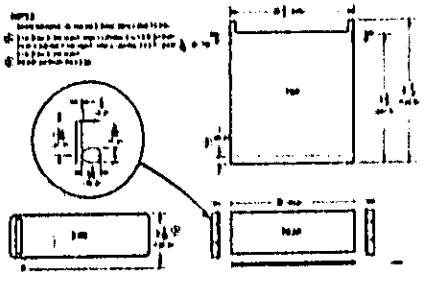
Operating temperature: 0°C to 55°C.

Storage temperature: - 40°C to + 70°C.

Power requirements: 115 V or 230 V ± 10%, 48 Hz to 63 Hz, < 110 W, (400 Hz operation on special basis).

Weight
3320A: 45 lb. (20,4 kg).
Shipping: 60 lb (26,7 kg).
3320B: 47 lb. (21,3 kg).
Shipping: 61 lb. (27.3 kg).

Outline drawing:



OPTIONS

75 Ohm Output Impedance Option 001 3320A/B

Attenuation and output referenced to 75 Ω.
Amplitude range (3320B only): + 24.99 dBm to - 69.99 dBm (- 75.00 dBm under remote control) into 75 Ω. (3320A only): - 2 dBm to + 11 dBm into 75 Ω.

Reference Crystal Oven* Option 002 3320A/B

5 MHz crystal in temperature stabilized oven.
Long term stability: ± 1 part in 10^9/day.
± 1 part in 10^7/mo.
Frequency accuracy: ± 1 part in 10^7 of setting per month.
For field installation order accessory kit HP 11237A.

Parallel BCD Remote Control* Option 003 3320A Only

Allows digital remote control of frequency only on 3320A. Digital control of output level is not available on 3320A. The most significant digit of the Vernier may be programmed thus giving four digits, plus 30% overrange, control of frequency in seven ranges (two are optional).
Control lines required: 24 plus remote line.
Logic levels: TTL, "1" state low, non-isolated.
Frequency switching and settling time: ± 0.01% range, 15 ms, ± 0.001% range, 60 ms.
For field installation order accessory kit HP 11238A.

Parallel BCD Remote Control* Option 004 3320B Only

Allows full digital remote control of frequency and amplitude. (1) Four digits of frequency, overrange, frequency range, Vernier In/Out, four digits of amplitude, and leveling loop response times are all controlled digitally. All front panel controls, except line switch, are disabled in remote.

Control lines required: 40 plus remote line.
Logic levels: TTL, "1" state low, non-isolated.
Frequency switching and settling time: ± 0.01% range, 15 ms; ± 0.001% range, 60 ms.
Amplitude switching and settling time: < 1.5 s to rated accuracy.
For field installation order accessory kit HP 11239C.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 1-2. General Information (cont'd).

HP-IB Remote Control*
Option 007 3320B Only

Allows bit-parallel word-serial digital remote control of all functions. (1) A 3320B with this option will recognize an address and then accept instructions in a serial fashion. Instructions are in a 7-bit parallel ASCII code. Due to the addressing feature, up to ten 3320B's (with this option) may be programmed from one programmer.

This option uses ten digital input lines for control of all functions except the last vernier digit and line switch. Three digital output lines are provided.

Full digital isolation is standard with this option.

Timing: max of 6 μs per word required to input program data.

Logic level requirements: (same as parallel BCD remote). Switching and settling times for frequency and amplitude are the same as with the parallel BCD remote option. For field installation, order accessory kit HP 11239C.

Logic Level Requirements for All Digital Remote Control Options.

State	Requirements
"Low" (logical "1")	0 V to 0.4 V (5 mA max.) or contact closure to ground through < 80 ohms.
"High" (logical "0")	+ 2.4 V to + 5 V or removal of contact closure to ground.

100 Hz and 10 Hz Ranges*
Option 006 3320A/B

Adds two lower frequency ranges, 100.0 Hz and 10.00 Hz, yielding greater resolution for low frequency outputs (see resolution section of specifications). These two ranges are fully programmable if digital remote options are installed.
For field installation order accessory kit HP 11240A.

*Field installable.

(1) Except last vernier digit and line switch

overrange digit, and a vernier control that provides two digits of resolution. A range control provides five ranges of 1000 Hz, 10 kHz, 100 kHz, 1000 kHz, and 10 MHz. The output frequencies are derived from a precision single frequency source by an indirect synthesis technique.

1-8. In the 3320A, the output amplitude is selected by a 0–13 dBm continuous potentiometer. Maximum output voltage is 1 V rms into 50 Ω. The 3320B has a range of +26.99 dBm to -69.99 dBm with a resolution of 0.01 dB. The output amplitude can be selected in steps of 0.01 dB, 0.1 dB, 1.0 dB, or 10 dB. Maximum output voltage of the 3320B is 5 V rms into 50 Ω.

1-9. OPTIONS.

1-10. The 3320A/B series of instruments include a total of nine options. These options are as follows:

3320A Options	3320B Options	Description
001	001	75 Ω Output Impedance
002	002	Reference Crystal Oven
003	004	Parallel BCD Remote Control
006	006	100 Hz and 10 Hz Ranges
	007	HP-IB Remote Control
908	908	Rack Mount Kit
910	910	Additional Operating and Service Manual

1-11. The 3320B Option 007, HP-IB (Hewlett-Packard Interface Bus) Remote Control utilizes a seven-line data bus, a three line transfer bus, and four additional control bus lines to manage the flow of information over the data bus and the transfer bus. Data information is transferred in an ASCII (American Standard Code for Information Interchange) code. For more information concerning this and other options, refer to Table 1-2, Section III, or your local Sales and Service Office.

1-12. ACCESSORIES SUPPLIED.

1-13. Accessories supplied with the 3320A/B are listed in Table 1-3.

Table 1-3. Accessories Supplied.

hp Model or Part No.	Qty.	Description
11239-84401	1	HP-IB Adapter (Option 007 only)
03320-84411	1	Kit: Accessory Consists of:
03320-66530	1	PC Assy: Extender
03320-62703	2	Filter Assy: Fan

1-14. ACCESSORIES AVAILABLE.

1-15. Accessories available for the 3320A/B are listed in Table 1-4.

Table 1-4. Accessories Available.

hp Model or Part No.	Description
5060-8740	Rack Mount Kit
11237A	Option 002 Kit
11238A	Option 003 Kit (A only)
11238C	Option 004 Kit (B only)
11239C	Option 007 Kit (B only)
11240A	Option 006 Kit
11048C	50 Ω Feedthrough
11094B	75 Ω Feedthrough (Opt. 001 only)

1-16. INSTRUMENT AND MANUAL IDENTIFICATION.

1-17. This manual applies to instruments with the serial number prefix shown on the title page. If changes have been made in the instrument since this manual was printed, a "Manual Changes" supplement supplied with the manual will define these changes. Be sure to record these changes in your manual. Backdating information in Section VIII adapts the manual to instruments with serial number prefixes lower than those shown on the title page. Part numbers for the manual and the microfiche copy of the manual are also shown on the title page.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SECTION II
INSTALLATION

2-1. INTRODUCTION.

2-2. This section contains information and instructions necessary for the installation and shipping of the Model 3320A/B Frequency Synthesizer. Included are initial inspection procedures, power and grounding requirements, environmental information, power cord information, interfacing and instructions for repackaging for shipment.

2-3. INITIAL INSPECTION.

2-4. This instrument was carefully inspected both mechanically and electrically before shipment. It should be free of mars or scratches and in perfect electrical order upon receipt. To confirm this, the instrument should be inspected for physical damage in transit, and the electrical performance should be tested using the procedure outlined in Paragraph 5-7. If there is damage or deficiency, see the warranty inside the front cover of this manual.

2-5. POWER REQUIREMENTS.

2-6. The 3320A/B operates from an ac power source of 48 to 66 Hz at the following voltages:

115/120 V + 5% - 10%
230/240 V + 5% - 10%

The 3320A/B is normally set for 115/120 V operation at the factory. Refer to Figure 2-1 for the procedure to change your instrument for operation on 230/240 V.

2-7. GROUNDING REQUIREMENTS.

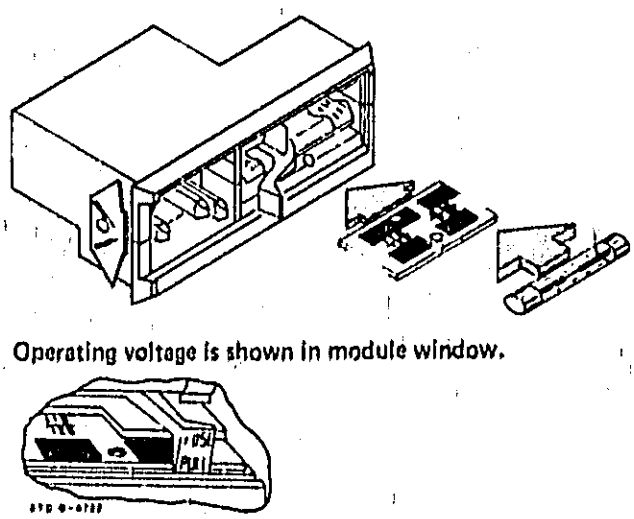
2-8. To protect operating personnel, the National Electrical Manufacturer's Association (NEMA) recommends that the instrument panel and cabinet be grounded. The Model 3320A/B is equipped with a three-conductor power cable which, when plugged into an appropriate receptacle, grounds the instrument. The offset pin on the power cable is the ground wire.

WARNING

Your instrument is equipped with a power cord which grounds it when connected to a 3 contact grounded receptacle. Do not attempt to defeat this feature.

2-9. ENVIRONMENTAL REQUIREMENTS.

2-10. The Model 3320A/B is equipped with a cooling fan mounted on the rear panel. The instrument should not be mounted in any manner which would obstruct the flow of air into the rear panel and out the perforated covers. The filters for the cooling fan can be removed and replaced or flushed with soapy water. Two extra filters are furnished as spares. The Model 3320A/B should not be operated where the ambient temperature range exceeds 0° C to 55° C (32° F to 131° F) or stored where the ambient temperature range exceeds -40° C to 70° C (-40° F to 158° F).



Operating voltage is shown in module window.

SELECTION OF OPERATING VOLTAGE

1. Open cover door and rotate fuse-pull to left.
2. Select operating voltage by orienting PC board to position desired voltage on top-left side. Select 115/120 V or 230/240 V only. Instrument will not operate with PC board positioned for 100 V or 220 V. Push board firmly into module slot.
3. Rotate fuse-pull back into normal position and re-insert fuse in holders, using caution to select correct fuse value.

   115–120 V – 1.0 Amp SB 2110-0312
   230–240 V – 0.5 Amp SB 2110-0202

Figure 2-1. Voltage Selection.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

2-11. REPACKAGING FOR SHIPMENT.

2-12. The following paragraphs contain a general guide for repackaging the instrument for shipment. Refer to Paragraph 2-13 if the original container is to be used; 2-14 if it is not. If you have any questions, contact your nearest -hp- Sales and Service Office (see Appendix B for office locations).

2-13. Place the instrument in the original container with appropriate packing material and seal well with strong tape or metal bands.

2-14. If the original container is not to be used, proceed as follows:

a. Wrap the instrument in heavy paper or plastic before placing in an inner container.

b. Place packing material around all sides of the instrument and protect the panel face with cardboard strips.

c. Place the instrument and the inner container in a heavy carton or wooden box and seal with strong tape or metal bands.

d. Mark the shipping container "DELICATE INSTRUMENT", "FRAGILE", etc.

NOTE

If the instrument is to be shipped to Hewlett-Packard for service or repair, attach a tag to the instrument identifying the owner and indicating the service or repair to be accomplished. Include the model number and full serial number of the instrument. In any correspondence, identify the instrument by model number and full serial number.

2-15. POWER CORDS AND RECEPTACLES.

2-16. Figure 2-2 illustrates the power cord configurations available for use with the 3320A/B. The -hp- part number directly below each drawing is the part number for an instrument power cord equipped with a connector of that configuration. If the appropriate power cord is not included with the instrument, notify the nearest -hp- Sales and Service Office and a replacement cord will be provided.

2-17. INTERFACING.

2-18. Remote BCD Options.

2-19. The 3320A Option 003 and the 3320B Option 004 are designed for remote programming from an external BCD source. The remote input/output connector is shown in Figure 2-3. A complete description of the input/output signals and logic levels is given in Section III.

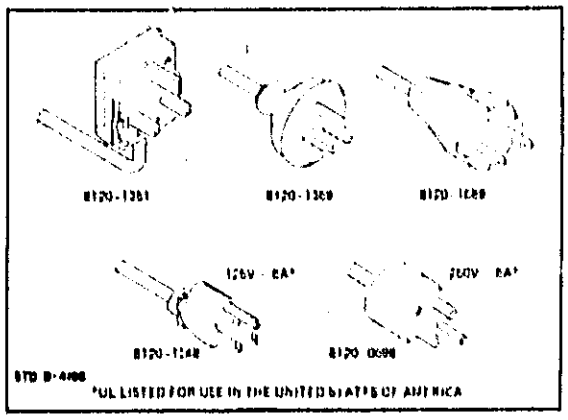


Figure 2-2. Power Cords.

2-20. An interfacing connector (-hp- Part Number 1251-3056) and two connector covers (-hp- Part Number 10513-4001) are supplied for external connections. This connector can be wired to contribute to the user's application. A field installation kit (-hp- Part Number 11238A for the 3320A, or 11238C for the 3320B) is available for converting a standard 3320A or 3320B to a BCD remote controlled option. Installation instructions are supplied with the kit.

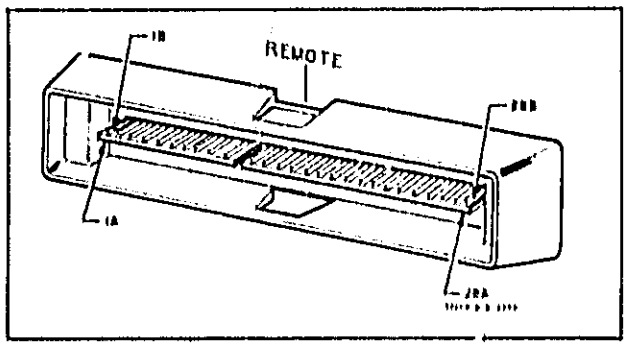


Figure 2-3. BCD Remote Connector.

2-21. Remote HP-IB Option.

2-22. The 3320B Option 007 is designed for remote programming from an external HP-IB (Hewlett-Packard Interface Bus, see Paragraph 1-11) source. The remote input/output connector is shown in Figure 2-4. A complete description of the input/output signals and logic levels required is given in Section III.

2-23. Remote programming sources for the 3320B Option 007 include the -hp- 9800 series Calculators and the -hp- 2100 series computers. The -hp- 11235A Adapter must be used to interface all HP-IB sources to the 3320B remote input.

2-24. There are three HP-IB cables available (see Table 2-1). Up to 15 instruments may be connected in parallel

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

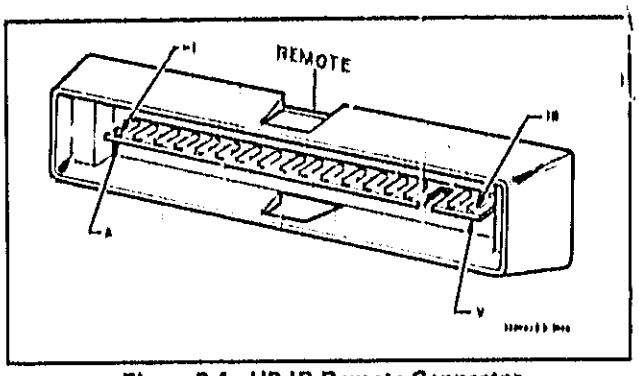


Figure 2-4. HP-IB Remote Connector.

using these cables; however, the following two restrictions must be observed.

1. When more than two instruments are connected to the bus, the cable length added for each additional instrument cannot exceed six feet per unit.

2. The total cable length to all units cannot exceed 51 feet.

The cables are listed with their respective lengths, in Table 2-1. A typical bus system is shown in Figure 2-5.

2-25. The -hp- 9800 series Calculators can be interfaced to the 3320B using the appropriate Interface Card and cables.

Table 2-1. HP-IB Cables.

Accessory Number	Length
10631A	3 ft.
10631B	6 ft.
10631C	12 ft.

2-26. The -hp- Model 2114, 2115, 2116 or 2100 computers can be interfaced using the -hp- Model 59310 Interface Kit. The 59310 kit includes an interface cable, a computer I/O card, and computer programming instructions. An -hp- 11235A Adapter must be used to interface the cable supplied with the 59310 kit to the 3320B.

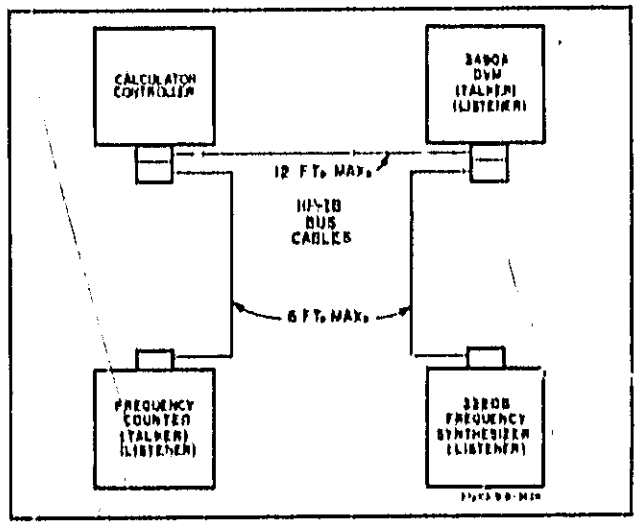
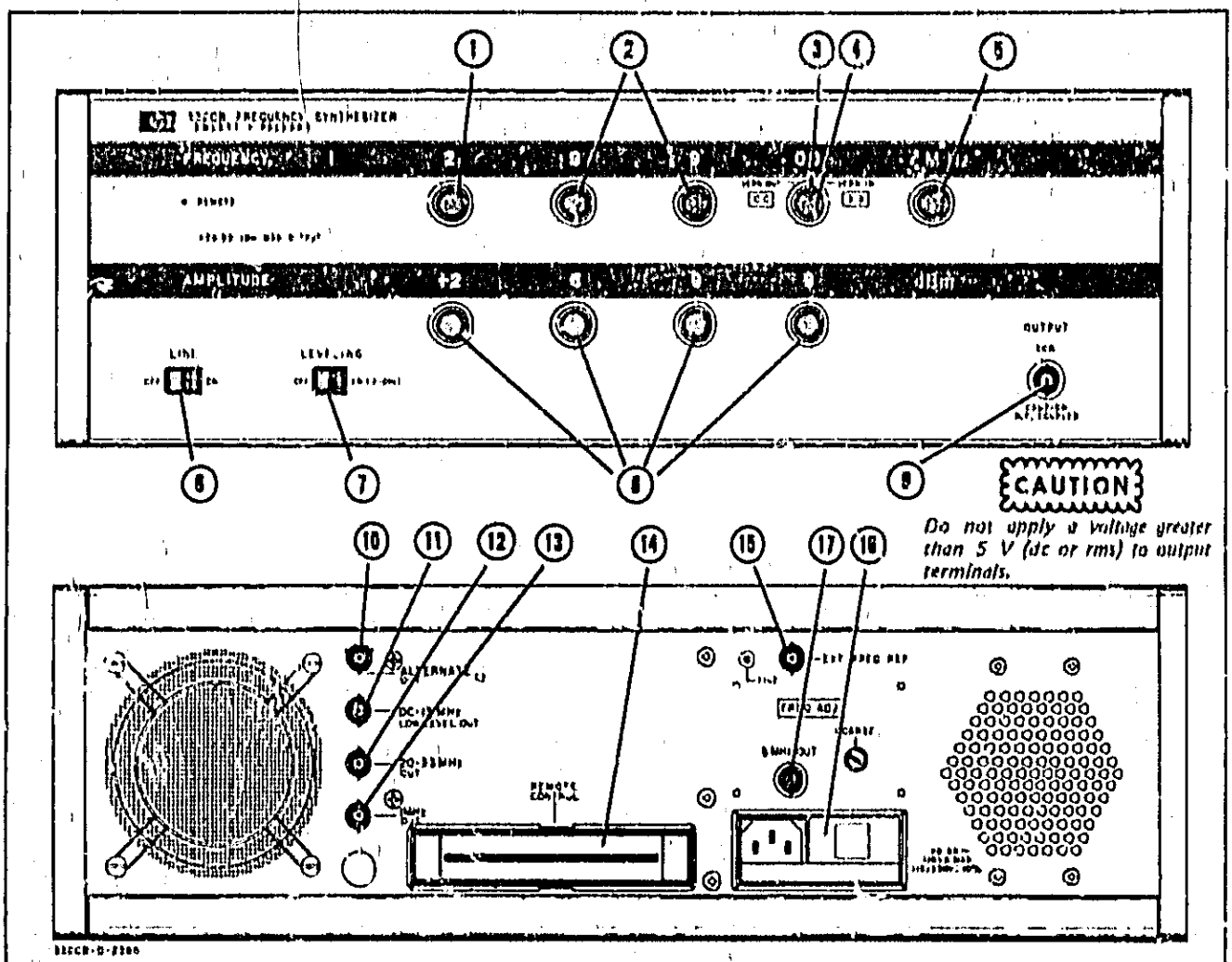


Figure 2-5. Typical HP-IB System.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

OPERATION

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



1. Frequency control for most significant digit of output frequency. Also controls overrange digit (Paragraph 3-7).
2. Frequency controls for second and third significant digit of output frequency (Paragraph 3-7).
3. Vernier: Controls two least significant digits of frequency (Paragraph 3-7).
4. VERN IN/VERN OUT: Turns vernier oscillator on or off (Paragraph 3-7).
5. RANGE: Controls range of frequency. 5 ranges in standard instrument - 1000 Hz, 10 kHz, 100 kHz, 1000 kHz, 10 MHz (Paragraph 3-7).
6. LINE: Power on/off control.
7. LEVELING: Controls the amplitude stability. Short loop for < 10 Hz, Long loop for > 10 Hz (Paragraph 3-12).
8. AMPLITUDE: Sets output amplitude from + 26.99 dBm to - 69.99 dBm (Paragraph 3-6).
9. Output jack: 3320A = 1 V rms into 50 ohms, 0-13 dB continuous adjustment. 3320B = 5 V rms into 50 ohms, + 26.99 dBm to - 69.99 dBm, 0.01 dB resolution.
10. Rear output: (Triax Connector) Same output as front panel output jack. Must move cable connector to rear jack in front jack. (See Section VIII, Manual Backdating.)
11. LOW LEVEL OUTPUT: Comes through 30 dB pad from output amplifier. Amplitude follows electronic attenuator setting (9.99 dB).
12. 20–33 MHz: Output from Mixer board. Indicates selected frequency out of Frequency Generating portion of Synthesizer (tracks front panel with 20 MHz offset).
13. 1 MHz: Divided output of Reference Oscillator out of Reference Phase Lock board.
14. Remote input connector for options 003, 004, and 007 (BCD and HP-IB) (Paragraphs 3-14, 3-17).
15. External Phase Lock: Input for Reference 5 MHz External Oven or External Phase Lock Signal.
16. Ac power input: Includes input power assembly.
17. Option 002 Reference Oscillator. 5 MHz crystal oscillator output and adjustments.

Figure 3-1. Controls, Indicators, and Connectors.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SECTION III
OPERATING INSTRUCTIONS

3-1. INTRODUCTION.

3-2. This section contains information necessary for operation of the Hp- Model 3320A/B Frequency Synthesizer. Included are descriptions and identification of front and rear panel controls, indicators and connectors, operating instructions, and remote programming information.

3-3. CONTROLS, INDICATORS and CONNECTORS.

3-4. A brief description of each control, indicator and connector is given in Figure 3-1. Controls, indicators and connectors requiring additional information are referenced to descriptive paragraphs within this section.

3-5. FRONT PANEL OPERATION.

3-6. The following paragraphs contain information for setting frequency, amplitude and leveling. Also included is information on remote programming and input/output connectors.

3-7. Frequency.

3-8. The 3320A/B provides five digits of frequency resolution plus an overrange digit. The frequency is determined by the position of the RANGE control, the two Vernier controls (VERN IN/VERN OUT and vernier frequency), and the three FREQUENCY controls. The three FREQUENCY controls set the three most significant digits and the overrange digit. The RANGE control places the decimal point. The vernier controls allow the operator to adjust two additional digits of frequency from 00 to 99. When the vernier control is in the VERN OUT position, these additional digits are always 00. Table 3-1 shows the control settings for maximum output in each of the five range positions.

Table 3-1. Frequency Control Settings.

Range	Frequency Digits (MAX)	Vernier Digits (MAX)
Hz	1299.	99
kHz	12.99	99
kHz	129.9	99
kHz	1299.	99
MHz	12.99	99

3-9. Amplitude.

3-10. The 3320A output amplitude is adjusted by a 0–13 dB potentiometer. Maximum output voltage for the 3320A is 1 V rms into 50 ohms or 2 V rms open circuit.

3-11. The 3320B output amplitude is adjusted by four front panel AMPLITUDE controls. Output levels from +26.99 dBm to -69.99 dBm with a resolution of 0.01 dB are obtainable. Each amplitude control operates independently, allowing changes of 0.01 dB, 0.1 dB, 1 dB or 10 dB in the output level. Maximum output voltage is 5 V rms into 50 ohms or 10 V rms open circuit.

3-12. Leveling.

3-13. The 3320B frequency response is determined by the position of the LEVELING control. For frequencies below 10 Hz, the LEVELING control should be in the OFF position. This prevents the thermistor in the leveling loop from responding to the instantaneous value of the output sinewave. For frequencies above 10 Hz, the thermistor will respond only to the true rms value of the output frequency, therefore, the LEVELING control should be in the ON (> 10 Hz) position.

3-14. REMOTE BCD PROGRAMMING.

3-15. The 3320A Option 003 and 3320B Option 004 can be remotely programmed with an 8-4-2-1 BCD code. All functions of the 3320A can be programmed *with the exception of amplitude, the last vernier digit, and the power switch.* All functions of the 3320B can be programmed *with the exception of the last vernier digit and the power switch.* There is no internal storage capability, therefore, the program lines must be held until the program is changed. Figure 3-2 shows the BCD input connector and the signal inputs for each pin. Paragraphs 3-16 through 3-33 explain each input/output signal. Logic levels for the BCD input/outputs are as follows:

State	Requirements
L = LOW (logical "1")	0 V to 0.4 V (5 mA max.) or contact closure to ground through <80 ohms.
H = HIGH (logical "0")	+2.4 V to +5 V or removal of contact closure to ground.

3-16. Remote Enable.

3-17. The signal input labeled REN controls the remote/local mode of operation (REN LOW = remote, REN HIGH = local). When the 3320A/B is programmed to the remote mode, the front panel controls have no effect.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

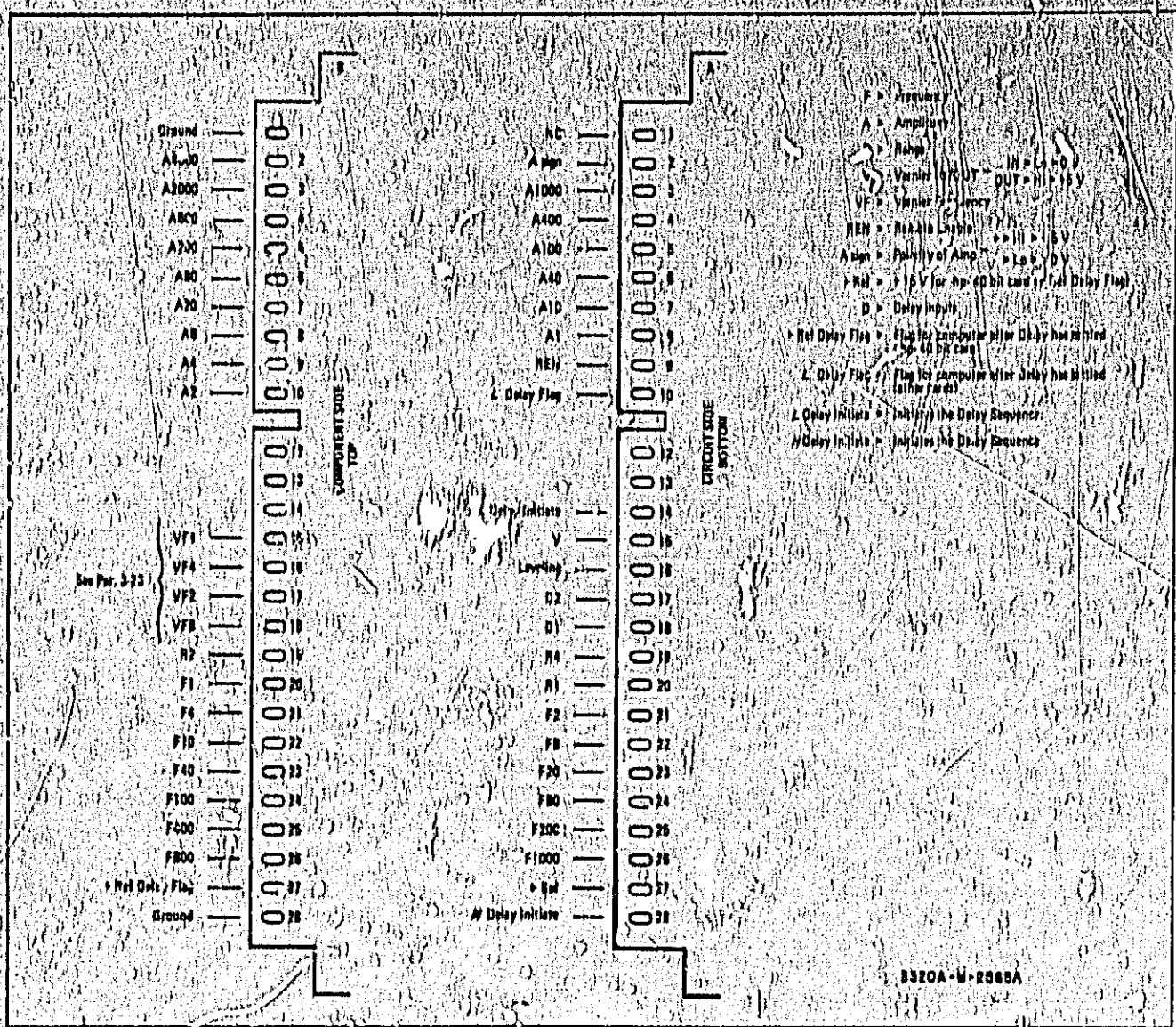


Figure 3-2. BCD Input Connector.

3-18. 3320B Amplitude.

3-19. The 16 signal inputs prefaced A control the four amplitude digits and the sign of the amplitude. The inputs representing each digit are as follows:

A1, A2, A4, A8 — least significant digit of amplitude

A10, A20, A40, A80 — second significant digit of amplitude

A100, A200, A400, A800 — third significant digit of amplitude

A1000, A2000, A4000 — most significant digit of amplitude

A sign — polarity of amplitude

Each digit is programmed by applying an 8-4-2-1 BCD code representing the digit desired. The three least significant digits can be selected from 0 to 9. The most significant digit can be selected from 0 to 7. The A sign input determines the polarity of the amplitude. For a + dBm the input level must be HIGH. For a - dBm the input level must be LOW.

CAUTION

When remote programming is used, the minimum output is -73.00 dBm (-75.00 dBm Option 001). If the 3320B is programmed for a lower level, the output voltage increases.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Example amplitude program:

desired amplitude = -34.2 dBm

LSD	2nd SD
A1 = H	A10 = L
A2 = H	A20 = L
A4 = L	A40 = H
A8 = H	A80 = H

3rd SD	MSD and Sign
A100 = H	A1000 = L
A200 = L	A2000 = H
A400 = H	A4000 = H
A800 = H	A sign = L

3-20. Frequency.

3-21. The 13 signal inputs prefaced F control the three most significant frequency digits plus the overrange digit. The inputs representing each digit are as follows:

F1, F2, FA, F8 — least significant digit of frequency

F10, F20, F40, F80 — second significant digit of frequency

F100, F200, F400, F800 — most significant digit of frequency

F1000 — overrange digit

Each digit is programmed by applying an 8-4-2-1 BCD code representing the digit desired. All frequency digits can be selected from 0 to 9. The overrange digit can be either a 0 or a 1. NOTE: *Although the maximum frequency of the 3320A/B is specified as 12.99 MHz, it is possible to program a higher frequency. However, the response is not specified and will deteriorate.*

Example frequency Program:

desired frequency = 12.34 MHz *

LSD	2nd SD	3rd MSD	Overrange
F1 = H	F10 = L	F100 = H	F1000 = L
F2 = H	F20 = L	F200 = L	
FA = L	F40 = H	F400 = H	
F8 = H	F80 = H	F800 = H	

* MHz RANGE programmed (See Paragraph 3-24).

3-22. Vernier.

3-23. The signal input prefaced V and the four signal inputs prefaced VF control the vernier in/out and the vernier frequency. Programming conditions for vernier in/out are HIGH = out and LOW = in. *Only the first vernier digit can be remotely programmed.* The least significant digit remains at zero. Programming is accomplished by applying an 8-4-2-1 BCD code representing the digit desired.

3-24. Range.

3-25. The three signal inputs prefaced R control the position of the range switch. Each position is designated by a number. There are five range positions available (seven in the 3320A/B Option 006). Programming is accomplished by applying a 4-2-1 BCD code representing the number for the range position desired. The following list identifies the range position by number and respective range:

0 = 10 Hz } Option 006
1 = 100 Hz }
2 = 1000 Hz
3 = 10 kHz
4 = 100 kHz
5 = 1000 kHz
6 = 10 MHz

3-26. Leveling.

3-27. The signal input labeled Leveling controls the leveling mode of operation (leveling HIGH = ON (> 10 Hz), leveling LOW = OFF). The programmed frequency (or group of frequencies) must be considered when selecting the leveling mode. If a frequency of 10 Hz or less is programmed, the leveling should be programmed OFF. This will eliminate any distortion of the 3320B output caused by the leveling loop (see Paragraph 3-12). If a frequency greater than 10 Hz is programmed, the leveling should be programmed ON (> 10 Hz).

3-28. Delay and Response.

3-29. The two signal inputs prefaced D and the signal input/outputs labeled Delay Flag, L Delay Initiate, H Delay Initiate, - Ref, and + Ref. Delay Flag control the delay and response time of the 3320A/B.

3-30. The delay is simply an internal clock which counts for the time interval programmed by the D1 and D2 inputs. During the count sequence, the clock outputs a flag to the

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

external controller. This flag can be monitored to determine the accuracy which the 3320A/B frequency and the 3320B amplitude has settled. Table 3-2 lists the delay codes, the clock time interval and the tolerances to which the frequency and amplitude have settled. Figure 3-3 shows the timing sequence of the delay.

3-31. The delay sequence is started by programming a Delay Initiate (data strobe). Two Delay Initiate inputs are available. If the strobe output from the external controller is HIGH true, the H Delay Initiate input must be used. If the strobe output from the controller is LOW true, the L Delay Initiate input must be used.

NOTE

The H Delay Initiate input is not TTL compatible. It may require a minimum of +4 V applied to this input to initiate the delay sequence.

3-32. There are also two delay flag (Holdoff Flag) outputs available. The L Delay Flag output is standard LOW true TTL logic. When it is necessary to have a HIGH true delay flag, the positive reference voltage, from the external controller (such as the -hp- 12556A 40 bit BCD Interface Card) can be applied to the + Ref. Input. The + Ref. Delay Flag will be held at the + Ref. potential while the delay sequence is in progress. When the delay sequence is completed, the + Ref. Delay Flag will go LOW.

3-33. When the 3320B is programmed for a low frequency (below 1000 Hz) and the leveling is ON (> 10 Hz), the output can become distorted due to the response of the 3320B amplitude section. This response can be slowed to eliminate the distortion. This is accomplished by programming a delay code of 3. With all other delay codes, the response is in the fast mode. When the 3320B is in the local mode, the response is always in the slow mode.

NOTE

When going from local to remote, the response is automatically set to the fast mode (delay code 0). Therefore, if low frequencies are programmed, the response should be set to the slow mode (delay code 3).

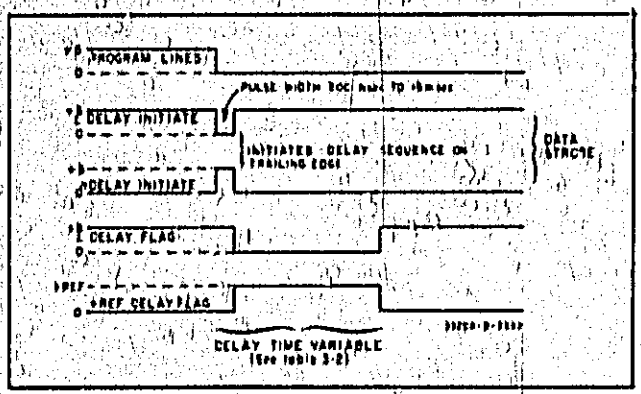


Figure 3-3. BCD Timing Sequence.

Table 3-2. Amplitude and Frequency Settling Times.

Delay Code	Time Interval	% of Range Frequency Tolerance	Amplitude Tolerance
0	15 ms	1	— —
1	60 ms	.01	— —
2	300 ms	— —	1 %
* 3	1500 ms	— —	within rated accuracy

* Response in slow mode (See Paragraph 3-33).

3-34. REMOTE HP-IB PROGRAMMING.

3-35. The HP-IB (Hewlett-Packard Interface Bus) remote control option permits the Model 3320B to operate on a single data/control bus with several other instruments. A typical HP-IB system is shown in Figure 4-8. Each bus contains eight data lines and seven control lines. The ASCII (American Standard Code for Information Interchange) code format is used to transfer data on the eight data lines.

3-36. A total of 15 instruments may be connected in parallel to the bus. Each instrument on the bus is assigned an address (or addresses) so that it can be selected individually by an external controller. This enables the external controller to determine which instruments will be communicating on the bus at any given time. An instrument will have a listen address if it can receive data, a talk address if it can transmit data, or both a listen and a talk address if it can both receive and transmit data. For example, the 3320B HP-IB option has only a listen address, which allows the controlling instrument to instruct the 3320B to receive programming information as outlined in the following paragraphs.

Table 3-3. Addressing Codes.

Address	40	20	10	4	2	1
40	1	0	0	0	0	0
41	1	0	0	0	0	1
42	1	0	0	0	1	0
43	1	0	0	0	1	1
44	1	0	0	1	0	0
45	1	0	0	1	0	1
46	1	0	0	1	1	0
47	1	0	0	1	1	1
50	1	0	1	0	0	0
51	1	0	1	0	0	1
52	1	0	1	0	1	0
53	1	0	1	0	1	1
54	1	0	1	1	0	0
55	1	0	1	1	0	1
56	1	0	1	1	1	0
57	1	0	1	1	1	1
60	1	1	0	0	0	0
61	1	1	0	0	0	1
62	1	1	0	0	1	0
63	1	1	0	0	1	1
64	1	1	0	1	0	0
65	1	1	0	1	0	1
66	1	1	0	1	1	0
67	1	1	0	1	1	1
70	1	1	1	0	0	0
71	1	1	1	0	0	1
72	1	1	1	0	1	0
73	1	1	1	0	1	1
74	1	1	1	1	0	0
75	1	1	1	1	0	1
76	1	1	1	1	1	0

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

3-37. The listen address for the 3320B is normally the ASCII character 3, octal code 063, but may be changed by means of internal jumper wires on the HP-IB Input Assembly (A37). Instructions for changing the address are given in Note 2, Figure 7-14. Table 3-3 lists the different addresses which can be assigned.

3-38. A principal advantage of the HP-IB system is that all information is routed over the same 15 lines. For this reason standard cables are used to connect each instrument to the bus. Section II lists the HP-IB cables available.

3-39. For convenience and brevity, each HP-IB signal line is identified by a mnemonic, which is an abbreviation of the signal name. Table 3-4 lists the seven control lines and eight data lines used on the HP-IB.

Table 3-4. HP-IB Signal Mnemonics.

Mnemonic	Signal Name
NDAC	Not Data Accepted
DAV	Data Valid
ATN	Attention
REN	Remote Enable
NRFD	Not Ready for Data
SRQ	Service Request
IFC	Interface Clear
DI01	Data Input/Output bits 1 through 8.
DI02	
DI03	
DI04	
DI05	
DI06	
DI07	
DI08	

3-40. An H preceding a mnemonic indicates that the signal is HIGH true, L indicates LOW is true. For example, L DAV indicates that a LOW true signal is required for a data Valid signal. All HP-IB lines are LOW true. Table 1-2 lists the signal levels required.

NOTE

In the 3320B the Data Input/Output bit 8 (DI08) and Service Request (SRQ) are not used (no connections).

3-41. All 3320B front panel functions are programmable *with the exception of the last vernier digit and the line.* Table 3-5 lists each of the functions and the octal codes, the ASCII character for each code, and the seven bit binary code for each octal code. The binary code is applied to the seven Data Input lines on the remote input/output connector. Figure 3-4 shows the remote connector pin numbers and the input/output signals for each pin.

Table 3-5. HP-IB Programming Codes.

Character	Octal	Binary	
?	077	0111111	*Address clear
A	101	1000001	Amplitude preface
C	103	1000011	Command (initiates delay)
D	104	1000100	Delay code preface
F	106	1000110	Frequency preface
K	113	1001011	Vernier "IN"
M	115	1001101	Vernier "OUT"
R	122	1010010	Range preface
V	126	1010110	**Vernier preface
+	053	0101011	Polarity of amplitude
-	055	0101101	Polarity of amplitude
0	060	0110000	Digits for address*, amplitude, frequency, vernier, etc.
1	061	0110001	
2	062	0110010	
3	063	0110011	
4	064	0110100	
5	065	0110101	
6	066	0110110	
7	067	0110111	
8	070	0111000	
9	071	0111001	
,	054	0101100	Function execute
I	111	1001001	Local enable

*Address and clear must be accompanied by an ATN.
**Least significant vernier digit cannot be programmed.

Range Codes

Character	Range	
0	10 Hz	optional (A6 assembly)
1	100 Hz	
2	1000 Hz	
3	10 kHz	
4	100 kHz	
5	1000 kHz	
6	10 MHz	

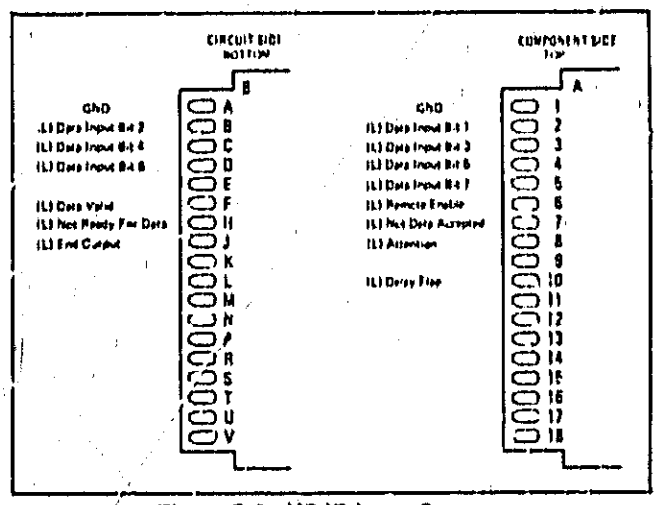


Figure 3-4. HP-IB Input Connector.

3-42. The first step in HP-IB programming is to address the 3320B. Addressing is accomplished by applying the address code to the data line, setting the ATN (Attention) LOW, and setting DAV (Data Valid) LOW. An example program is listed in Table 3-6. The 3320B does not have to be in the

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

remote mode to be addressed. Conversely, it must be addressed before it can be put into the remote mode.

NOTE

When power is initially applied the 3320B may or may not be addressed. This is why the "Address Clear" command (ASCII ?) is recommended prior to addressing any instrument(s) on the HP-IB.

3-43. To put the 3320B into the remote mode (after it has been addressed) set the REN (Remote Enable) LOW, MRE HIGH, apply the Function Execute code (ASCII comma) to the data lines, and set DAV LOW. The REN can be set LOW at any time prior to the Function Execute (ie., while addressing) but the 3320B will not go into the remote mode until the Function Execute and L DAV is applied. The Function Execute can be applied during the function programming sequence (See Notes, Table 3-6).

Table 3-6. HP-IB Programming.

Example: 5.0 kHz frequency Vernier Out, - 5.00 dBm Amplitude 60 ms delay.								
Instruction	State or Octal Code	Binary Codes						
		DI07	DI06	DI05	DI04	DI03	DI02	DI01
		100	40	20	10	4	2	1
ATN	LOW							
Clear	077*	0	1	1	1	1	1	1
Address	063	0	1	1	0	0	1	1
REN	LOW							
ATN	HIGH							
R	122	1	0	1	0	0	1	0
4	064	0	1	1	0	1	0	0
, **	054	0	1	0	1	1	0	0
F	106	1	0	0	0	1	1	0
5	065	0	1	1	0	1	0	1
0	060	0	1	1	0	0	0	0
,	054	0	1	0	1	1	0	0
m	115	1	0	0	1	1	0	1
A	101	1	0	0	0	0	0	1
-	055	0	1	0	1	1	0	1
5	065	0	1	1	0	1	0	1
0	060	0	1	1	0	0	0	0
0	060	0	1	1	0	0	0	0
.	054	0	1	0	1	1	0	0
D	104	1	0	0	0	1	0	0
1	061	0	1	1	0	0	0	1
,	054	0	1	0	1	1	0	0
C	103	1	0	0	0	0	1	1

*Each code applied to the data lines must be followed by a DAV LOW.

**Instrument goes to remote mode at this time.

3-44. When power is initially applied, the 3320B may go to the remote mode for a few seconds, then to the local mode even if REN is held LOW. It will remain in the local mode until the address and a Function Execute is programmed.

3-45. When programmed to the remote mode, the condition of the 3320B output depends on the position of a jumper wire on the A38 assembly (See Figure 7-14). If there is a jumper wire between points A and B on the A38 assembly, the 3320B will go to the conditions listed below:

FREQUENCY ..... 800 Hz
RANGE ..... 1000 Hz
AMPLITUDE ..... -69.00 dBm
VERNIER ..... OUT/0 Hz
DELAY ..... 1500 ms
LEVELING ..... ON(> 10 Hz)

If there is no jumper between points A and B on the A38 assembly, the 3320B will go to the previously remote programmed conditions when programmed to the remote mode. The 3320B leaves the factory with no jumper.

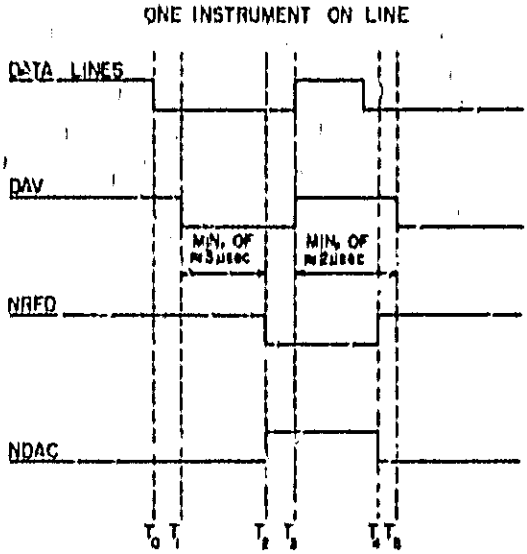
3-46. The second step in HP-IB programming is the function programming. This is accomplished by applying the ASCII code, representing the information desired, to the seven data lines and strobing the information into the 3320B. The LDAV is the strobe pulse. Each seven bit code applied to the data lines must be accompanied by an LDAV. The programming information for each 3320B function is applied in two parts, the preface command representing the function (ie., V for Vernier) and the desired digits for that function (i.e., 9 for a Vernier setting of 90). After each preface command and the digits have been strobed into the 3320B, they must be followed by a Function Execute.

3-47. If all functions have been programmed and it is desired to reprogram a specific function, it is only necessary to reprogram that function. When frequency or amplitude is programmed the instrument assumes the leading zeros. If an amplitude polarity is not programmed, the instrument assumes a + polarity.

3-48. Handshake.

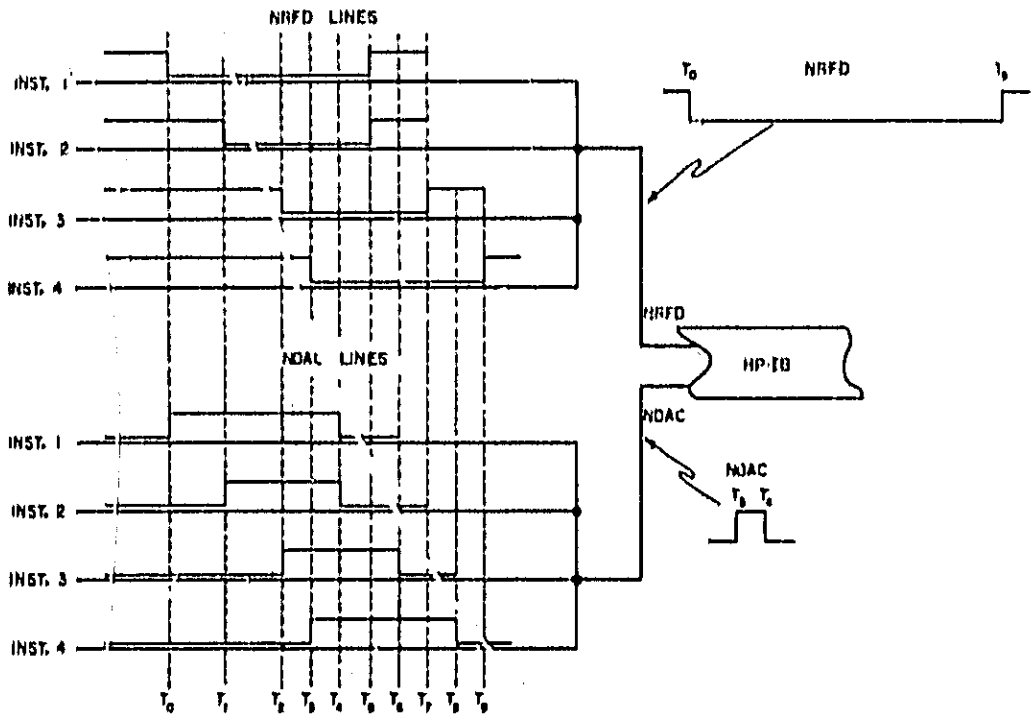
3-49. The Data Valid (DAV), Not Ready for Data (NRFD), and Not Data Accepted (NDAC) signals form a "handshake" sequence, controlling the timing for data transfer on the Data lines. When an address code or a programming instruction is applied to the seven data lines, the external controller must set the DAV LOW. This indicates to the 3320B that data is available on the data lines. If the 3320B is not processing previous data, the NRFD will be HIGH and the NDAC will be LOW. Approximately three microseconds after the DAV is set LOW by the external controller, the 3320B will set NDAC HIGH and NRFD LOW. The NDAC indicates to the controller that the 3320B has accepted the data and is processing it. The NRFD signal also indicates to the external controller that the 3320B is not ready for more data. When the 3320B has set NRFD LOW and NDAC HIGH, the external controller can remove the DAV and the data from the data lines and replace it with new data. The cycle repeats until all programming is completed. Figure 3-5 shows the timing relationship between the DAV, NRFD, and NDAC signals.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



$T_2 - T_3$ = Determined by how fast controller sets DAV HIGH.

$T_2 - T_4$ = Determined by delay if programmed.



T_0 = Fastest instrument is ready for data.

T_3 = Slowest instrument has accepted data and the data can be removed.

T_5 = Fastest instrument becomes ready for new data.

T_9 = Slowest instrument has processed data and new data can be programmed.

All lines wire or'ed means a low on line, 1 or 2 or 3 or 4 will hold output low.

Figure 3-5. Handshake Timing Diagram.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

3-50. It is not necessary for the external controller to monitor the NRFD or NDAC signals. However, if these signals are not monitored, the external controller must wait approximately three microseconds before removing the LDAV and the data from the data lines and applying new data, and approximately two microseconds before setting DAV LOW again. This ensures the 3320B has had time to accept and process the previous data.

3-51. The RFD line is also controlled by the delay programmed (See Paragraph 3-52). As soon as a Delay Initiate code (Octal code 103) is programmed, NRFD will remain LOW for the length of time programmed by the delay. If the NRFD signal is monitored, the user can be sure the 3320B amplitude and frequency has settled to the desired tolerance when NRFD goes HIGH.

3-52. Delay Flag.

3-53. The delay is generated by an internal clock which counts for the time internal programmed on the data lines. At the end of the count sequence the clock outputs a flag to the external controller (delay flag or NRFD). This flag can be monitored to determine the accuracy to which the 3320B frequency and amplitude has settled. Table 3-7 lists the delay codes, the clock time interval, and the tolerances to which the frequency and amplitude have settled. The programmed delay code must be followed by a Delay Initiate (ASCII character C). This code initiates the delay sequence. The Delay Initiate code does not have to be followed by a Function Execute code.

Example: To program a delay of 60 ms,

ASCII Programming Characters	D - delay preface 1 - delay code (60 ms) , - Function Execute C - Delay Initiate

3-54. When the 3320B is programmed for a low frequency (below 1000 Hz) and the leveling is ON (> 10 Hz), the output can become distorted due to the response time of the amplitude section. The response can be slowed to eliminate this distortion by programming a delay code of 3. With all other delay codes the response is in the fast mode.

3-55. The delay code programmed also controls the leveling mode of operation (Delay Codes 0-3, LEVELING ON (> 10 Hz), Delay Code 4-7, LEVELING OFF). The programmed frequency (or group of frequencies) must be considered when selecting the leveling mode. If a frequency of 10 Hz or less is programmed, the leveling should be programmed OFF. This will eliminate any distortion of the 3320B output caused by the leveling loop (See Paragraph 3-12). If a frequency greater than 10 Hz is programmed, the leveling should be programmed ON (> 10 Hz).

3-56. Interface Clear.

3-57. The Interface Clear (IFC) signal allows the external controller to terminate all activity on the HP-IB lines. When this line is set low by the controller, the 3320B and all other instruments paralleled to the bus lines, will set all data lines, ATN, DAV, NRFD, and NDAC HIGH.

3-58. REFERENCE CRYSTAL OVEN.

3-59. The 3320A/B Option 002 is a standard instrument with an oven controlled, 5 MHz, reference crystal oscillator. The signal from the 5 MHz oscillator is applied to the reference phase lock assembly to phase lock the 20 MHz VCXO. The result is an increase in 3320A/B output frequency accuracy and stability (See Table 1-2). An Option 002 Field Installation Kit is obtainable by ordering Accessory Kit 11237A.

3-60. For operation, connect a short jumper cable between the 5 MHz OUT and EXT FREQ REF (both on rear panel). A circuit diagram for the Option 002 is shown in Figure 3-6.

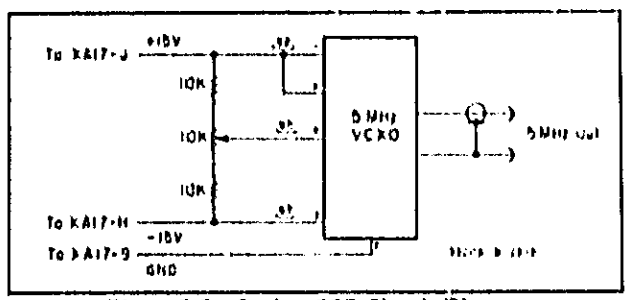


Figure 3-6. Option 002 Circuit Diagram.

Table 3-7. Settling Times.

Remote Control		3320 Operation			
Frequency of Operation	Delay Code	Leveling Mode	Settling Time	Frequency Tolerance (% of Range)	Amplitude Tolerance
≥1000 Hz	0	On	15 ms	.01	*
	1	On	60 ms	.001	*
	2	On	300 ms		1%
10 Hz ≤ f ≤ 1000 Hz	3*	On	1500 ms		**
≤10 Hz	4	Off	15 ms	.01	*
	5	Off	60 ms	.001	*
	6	Off	300 ms		1%
	7	Off	1500 ms		**

* Use delay code 3 to eliminate distortion caused by low frequency and leveling on.
** Denotes amplitude within rated accuracy.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

THEORY

Artsan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SECTION IV
THEORY OF OPERATION

4-1. INTRODUCTION.

4-2. This section contains the theory of operation for the 3320A/B. Included is a general description, a simplified block description, a functional block description, and basic circuit theory on unique circuits.

4-3. GENERAL DESCRIPTION.

4-4. The Hp- Model 3320A/B Frequency Synthesizer provides a wide range of accurate and stable frequencies with variable amplitude settings. The frequency range is from 0.001 Hz to 12.9999 MHz. Five digits of frequency resolution plus an overrange is provided in five ranges. The 3320A amplitude is variable from 0 dBm to 13 dBm into 50 ohms by a front panel potentiometer. The 3320B amplitude is variable from +26.99 dBm to -69.99 dBm into 50 ohms in steps of 0.01 dB, 0.1 dB, 1 dB or 10 dB.

4-5. Options available which increase the flexibility of the 3320A/B are as follows:

OPTION	DESCRIPTION
001	75 ohm output
002	A high stability reference oscillator. (Increases frequency stability and accuracy.)
003,004	BCD remote programming.
006	Two extra ranges (100 Hz and 10 Hz) to increase the low frequency resolution to 0.00001 Hz.
007	HP-IB remote programming.

The discussion on theory in this section will include these options where applicable.

4-6. SIMPLIFIED BLOCK DIAGRAM.

4-7. Introduction.

4-8. The 3320A/B can be divided into four basic sections: controller, frequency, amplitude, and reference (see Figure 4-1). The signal out of the 3320A/B is developed in the frequency section and applied to the amplitude section where it is translated down in frequency and the level is determined. Both frequency and amplitude are referenced to a crystal oscillator in the reference section. In the 3320B, both frequency and amplitude are controlled by BCD signals from the controller section. In the 3320A, the frequency only is controlled by BCD signals from the controller. The amplitude of the 3320A is controlled by a 0--13 dBm front panel potentiometer. The BCD signals from the controller are, in turn, controlled by front panel switch settings or HP-IB remote programming.

4-9. Controller Section.

4-10. The controller section of the 3320A/B processes information from the front panel controls or the remote inputs into BCD codes for controlling the frequency in the 3320A/B and amplitude in the 3320B. As shown in the Controller Configuration diagram (Figure 7-6), the complexity of the controller section varies with the 3320 Model and Options. Refer to Paragraph 4-19 for a detailed block discussion of each controller type.

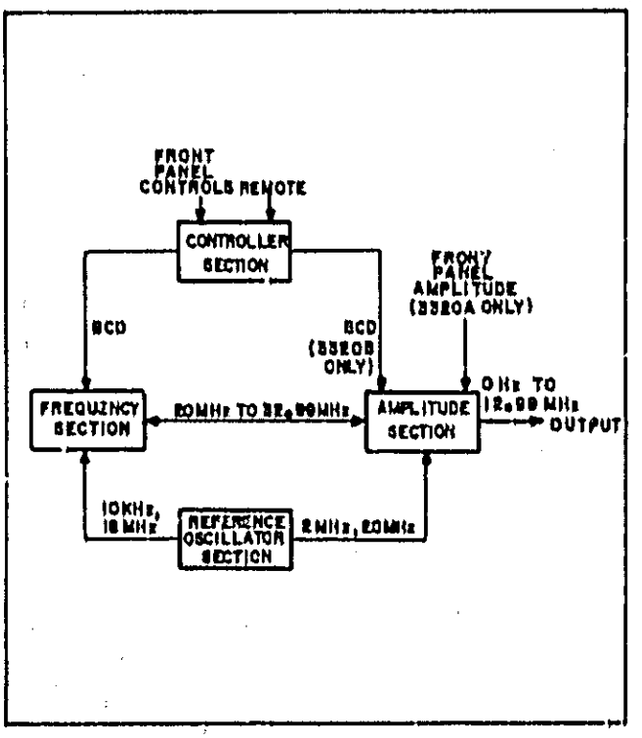


Figure 4-1. Simplified 3320A/B Block Diagram.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 4-1. 3320A/B Ranges.

Range Position	Range Dividers Used	Frequency Applied to Amplitude Section
10 MHz	0	20 MHz to 32.99 MHz
1000 kHz	1	20 MHz to 21.203 MHz
100 kHz	2	20 MHz to 20.1299 MHz
10 kHz	3	20 MHz to 20.01299 MHz
1000 Hz	4	20 MHz to 20.001299 MHz
100 Hz } Option	5	20 MHz to 20.0001299 MHz
10 Hz } 006 only	6	20 MHz to 20.00001299 MHz

4-11. Frequency Section.

4-12. The 3320A/B signal is developed in the frequency section by an indirect synthesis technique. This method uses a voltage tuned oscillator (VTO) phase-locked to a standard reference oscillator (see Figure 4-2). The VTO frequency then becomes as stable and accurate as the reference oscillator. The output of the VTO (20 MHz to 32.99 MHz) is applied to a range switch. If the range switch is in the MHz position, the VTO output is applied directly to the amplitude section. If the range switch is in any position other than the MHz position, the output of the VTO is applied to a series of range dividers. Table 4-1 lists the range positions, the number of range dividers used on each range switch position, and the output frequencies of each range divider. Each range divider uses a divide and mix technique to increase the resolution while decreasing the maximum output frequency of the 3320A/B.

4-13. Amplitude Section.

4-14. The 3320A amplitude and the three least significant digits of the 3320B amplitude are controlled by amplitude modulating a 20 MHz signal from the reference oscillator. This signal is mixed with the signal from the frequency section. The 3320B also has a 10 dB/step attenuator at the output for 90 dB of level control.

4-15. Reference Section.

4-16. There are two frequency references in the 3320A/B; the 20 MHz Reference Oscillator and the Vernier Oscillator (see Figure 4-3). When the VERN IN/OUT control is in the VERN IN position, the Vernier Oscillator is the source for the VTO and phase-lock circuitry. The 20 MHz Reference Oscillator is the source for the range dividers and the 3320A/B amplitude section. This allows the operator to adjust the last two digits of the 3320A/B output frequency by adjusting the frequency of the Vernier Oscillator. When the VERN IN/OUT control is in the VERN OUT position, the 20 MHz Reference Oscillator is the source for all 3320A/B circuits.

4-17. FUNCTIONAL BLOCK DESCRIPTION.

4-18. The functional block description is broken into four parts: frequency section, amplitude section, controller section, and reference section. For illustration assistance, refer to the Functional Block Diagrams (Figures 7-5 and 7-7), the Controller Configuration (Figure 7-6), and the schematics in Section VII.

4-19. Controller Section.

4-20. The following is a functional block description of the various controller sections used in the 3320A/B synthesizers. The controller processes information from the front panel or remote input, into a BCD format for controlling the frequency and amplitude sections as shown in Figure 4-1. The complexity of the controller section increases from front panel control only, as in the 3320A standard, to

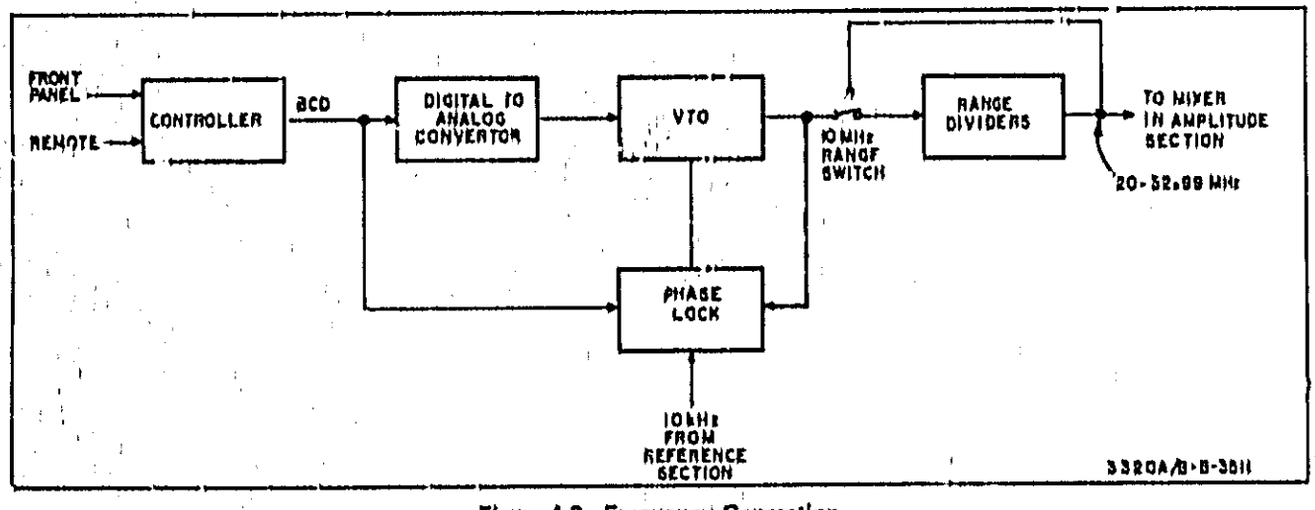


Figure 4-2. Frequency Generation.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

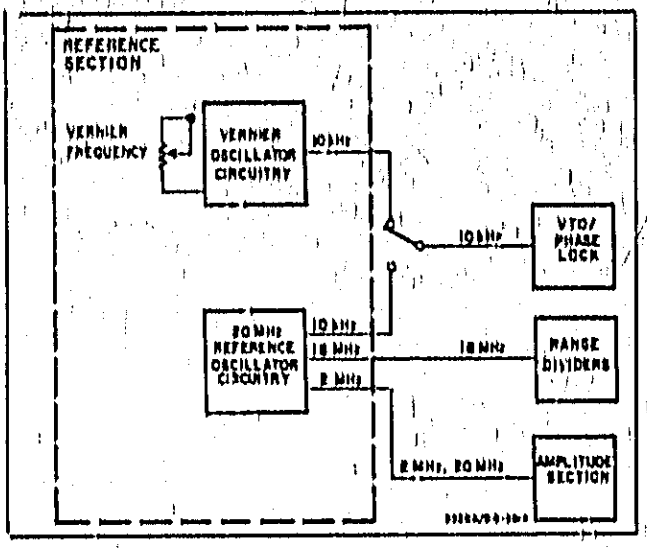


Figure 4-3. Reference Sources.

HP-IB control, as in the 3320B Option 007. The various 3320A/B controller sections are shown in the controller Configuration diagram, Figure 7-5. Each controller is discussed in the following paragraphs.

4-21. 3320A Standard Controller. The controller for the standard Model 3320A is shown in Figure 4-4. The BCD codes representing the front panel frequency, range, leveling and vernier in/out settings are converted in the A20 assembly and applied to the frequency section. The amplitude setting is controlled manually by the amplitude potentiometer on the front panel.

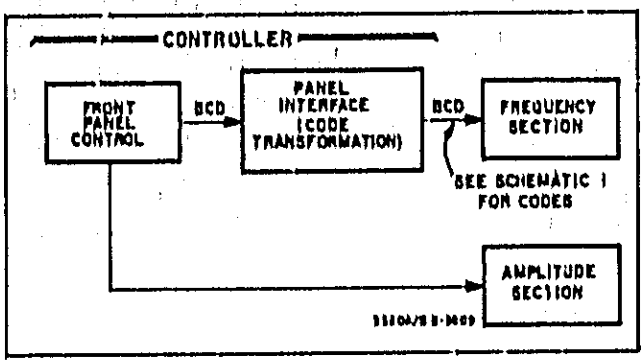


Figure 4-4. 3320A Standard Controller.

4-22. 3320B Standard Controller. The controller for the standard Model 3320B consists of the front panel and the panel interface assembly as shown in Figure 4-5. The BCD data representing the front panel frequency setting is converted in the panel interface block and applied to the frequency sections. The BCD data representing the front panel amplitude setting is added to a preset BCD number in the panel interface assembly. This addition provides the proper BCD code for controlling the amplitude section. Since the 3320B output is calibrated in dBm, the magnitude of the preset BCD number depends on the output impedance of the 3320B.

4-23. 3320A BCD Option 003. The 3220A Option 003 controller is shown in Figure 4-6. Option 003 can be controlled from the front panel or remotely with parallel BCD lines as outlined in Section III of this manual. In local control (front panel) the BCD code representing the frequency, range, and vernier in/out setting are converted in the BCD control circuits. The converted BCD code from the BCD control circuits is applied to the frequency section through the A22 Cable Board. In remote control mode the BCD information from the remote lines is converted in the BCD control circuits and applied to the frequency section. The Delay Flag shown in Figure 4-6 remains low for the amount of delay time programmed per Section III. The amplitude setting for Model 3320A Option 003 is controlled manually by the front panel potentiometer.

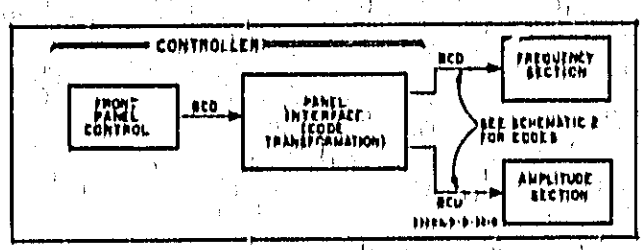


Figure 4-5. 3320B Standard Controller.

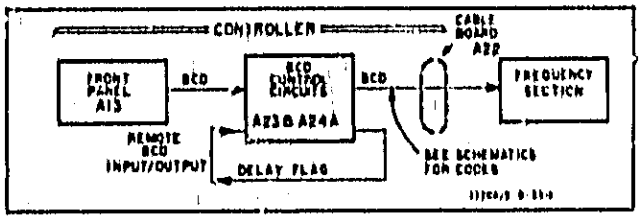


Figure 4-6. 3320A BCD Controller.

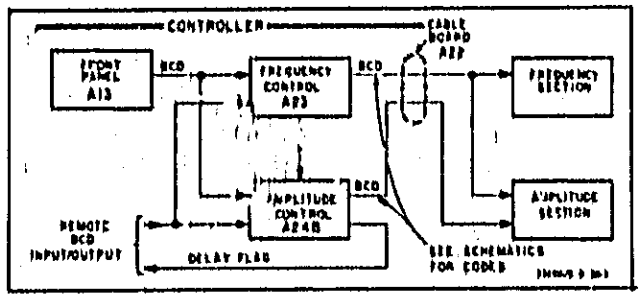


Figure 4-7. 3320B BCD Controller.

4-24. 3320B BCD Option 004. The 3320B Option 004 controller is shown in Figure 4-7. Option 004 can be controlled from the front panel or remotely with parallel BCD lines as outlined in Section III of this manual. In local control the BCD data from the front panel is processed by A23 and A24B assemblies as shown in Figure 4-7. In remote control mode the BCD data from the remote input lines is processed by A23 and A24B.

4-25. The frequency control block (A23) converts the BCD codes representing frequency, range, leveling, and vernier in/out settings into appropriate BCD codes for controlling the frequency and amplitude leveling. The BCD data representing the amplitude setting is added to a preset BCD number in the amplitude control block (A24). This

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

addition provides the proper BCD code for controlling the amplitude sections. Since the 3320B output is calibrated in dBm, the magnitude of the preset BCD number depends on the output impedance of the 3320B. The delay flag shown in Figure 4-7 remains low for the amount of delay time programmed. Although the delay flag(s) comes from the A24B assembly, the actual timing is performed by the A23 assembly as indicated by the dotted line in Figure 4-7.

4-26. 3320B HP-IB Option 007. The HP-IB (Hewlett-Packard Interface Bus) remote control option permits the Model 3320B to operate on a single data/control bus with several other instruments. A typical HP-IB system is shown in Figure 4-8. A total of 15 instruments may be connected in parallel to the bus. Each instrument on the bus is assigned an address (or addresses) so that it can be selected individually by an external controller. This enables the external controller to determine which instruments will be communicating on the bus at any given time. An instrument will have a listen address if it can receive data, a talk address if it can transmit data, or both a listen and a talk address if it can both receive and transmit data. For example, the 3320B HP-IB option has only a listen address which allows the controlling instrument to instruct the 3320B to receive programming information as outlined in Paragraph 3-34. The listen address for the 3320B is normally the ASCII character 3, octal code 063, but may be changed as outlined in Section III. The 3320B HP-IB option is directly compatible with the -hp- 9800 series calculators. The -hp- 3260A Marked Card Programmer may also be used as the remote controller.

4-27. HP-IB Connections. A principal advantage of the HP-IB system is that all information is routed over the same 15 lines. For this reason standard cables (which may be various lengths) are used to connect each instrument to the bus. The cable contains eight data lines and seven control lines. Section III of this manual describes the function of each HP-IB line. Section II lists the HP-IB cables available.

4-28. For convenience and brevity, each HP-IB signal line is identified by a mnemonic, which is an abbreviation of the signal name. Table 4-2 lists the seven control lines and eight data lines used on the HP-IB.

Table 4-2. HP-IB Signal Mnemonics.

Mnemonic	Signal Name
NDAC	Not Data Accepted
DAV	Data Valid
ATN	Attention
REN	Remote Enable
NRFD	Not Ready for Data
SRQ	Service Request
IFC	End Output
DIO1	Data Input/Output bits 1 through 8.
DIO2	
DIO3	
DIO4	
DIO5	
DIO6	
DIO7	
DIO8	

4-29. An H preceding a mnemonic indicates that the signal is HIGH true, L indicates LOW is true. For example, L DAV indicates that a LOW true signal is required for a data Valid signal. All HP-IB lines are LOW true. Table 1-2 lists the signal levels required.

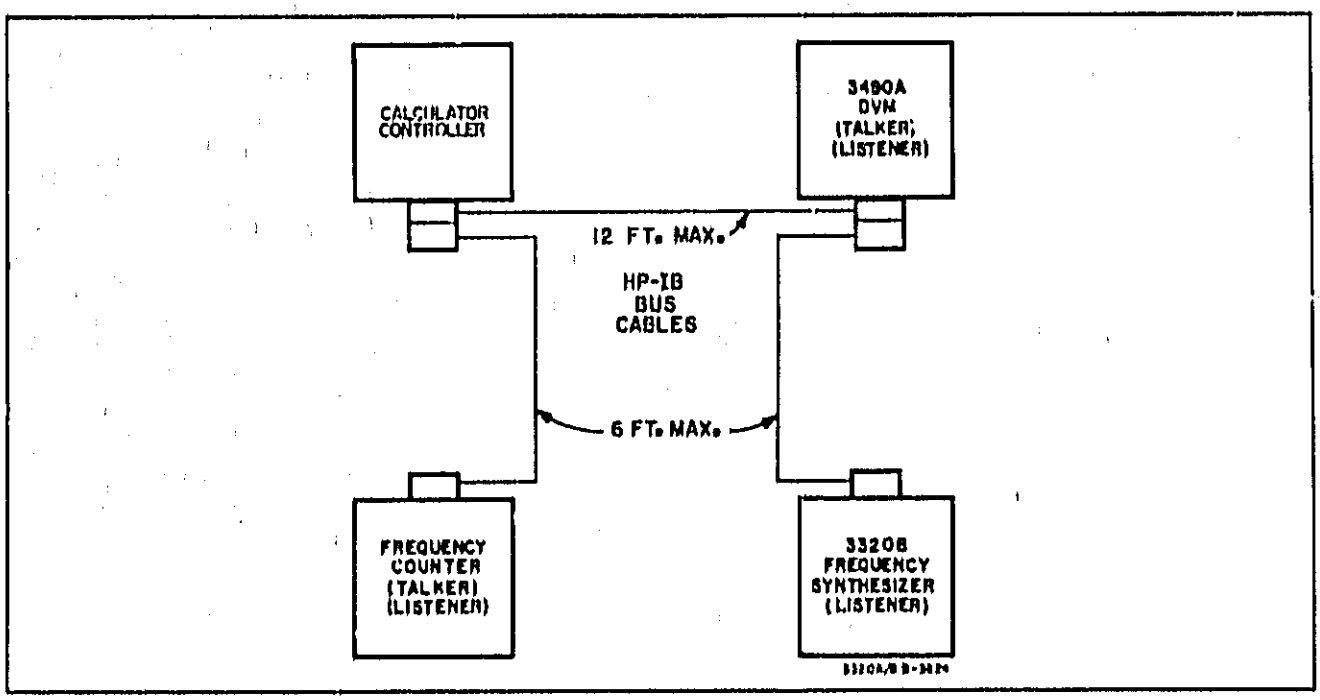


Figure 4-8. Typical HP-IB Bus System.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

NOTE

In the 3320B the Data Input/Output bit 8 (DIO8) and Service Request (SRQ) are not used (no connections).

4-30. HP-IB Basic Theory and Operation. The 3320B HP-IB circuits employ both combinational and sequential logic to convert the ASCII data input into parallel BCD data for controlling the various settings of frequency and amplitude. A block diagram of the HP-IB circuits is shown in Figure 4-9.

4-31. By means of the HP-IB control lines, each appropriate ASCII character on the data lines is accepted by the Input Circuit. As each data character is accepted, a Data Accepted Signal (H DAC) is supplied back to the remote controller to indicate that the data has been accepted. After a data character has been processed, NRFD is allowed to go HIGH, indicating to the remote controller that the 3320B is ready for new data.

4-32. To provide isolation, each ASCII character and various control data is transferred to the controller block by means of pulse transformers or photo-couplers. The controller decodes the ASCII character into a "Preface Command" or "Numerical Data". For example, if the ASCII characters A, 1, 2, 3 and 4 were accepted by the Input Circuit in sequence, the first character A would be decoded in the controller and applied to the Latches (storage registers) as an Amplitude Preface Command. The next four ASCII characters, being numerals, would be decoded as numerical data and applied to the Latches prefaced by the earlier Amplitude Preface Command.

4-33. The Latches and associated circuits function primarily as a series to parallel converter. It converts the preface commands and the serial numerical data from the controller into stored parallel BCD data.

4-34. The main function of the BCD Circuits is to process the BCD format used for controlling the frequency and amplitude sections.

4-35. The BCD data for the frequency setting is converted to 9's complement and applied directly to the frequency section of the 3320B. The 9's complement of a number is a number which, when added to the first number, equals nine. For example, the 9's complement of a BCD 2 is a BCD 7 since 2 + 7 = 9. The BCD data for the amplitude settings is added to a preset BCD number in the BCD Circuits. This BCD addition provides the proper BCD numbers for controlling the amplitude reference and 10 dB/step attenuator in the amplitude section of the 3320B. Since the 3320B output is calibrated in dBm, the magnitude of the preset BCD number depends on the output impedance of the 3320B.

4-36. In addition to processing the amplitude and frequency data, the BCD circuit also processes the remaining programmable parameters such as vernier frequency, leveling and delay. The delay flag shown in Figure 4-9 holds the HP-IB NRFD LOW for the amount of delay time programmed.

NOTE

A more detailed functional block diagram of all the assemblies (A37, A38, A25, A23 and A24B) used in the HP-IB controller is shown in Figure 7-5.

4-37. Reset Conditions. When power is first applied to the 3320B, Reset and Clear signals from the controller block reset the latches to the turn on conditions given in Section III. However, the Reset signal also clears the Remote Flip-Flop, forcing the 3320B into local (front panel) control. Local control is automatic when power is initially applied even if the REN is held LOW.

4-38. Addressing the 3320B. When the ATN is LOW, the Input Circuit waits for DAV to go LOW indicating that the data information is valid. When L DAV is received, the information on the data lines, LDIO1 through LDIO7, is compared to the 3320B address. If they match, the 3320B is addressed and the NDAC signal is allowed to go HIGH to indicate that the address has been accepted.

NOTE

When power is initially applied the 3320B may or may not be addressed. This is why the "Address Clear" command (ASCII ?) is recommended prior to addressing any instrument(s) on the HP-IB.

4-39. Remote Programming. After the 3320B has been

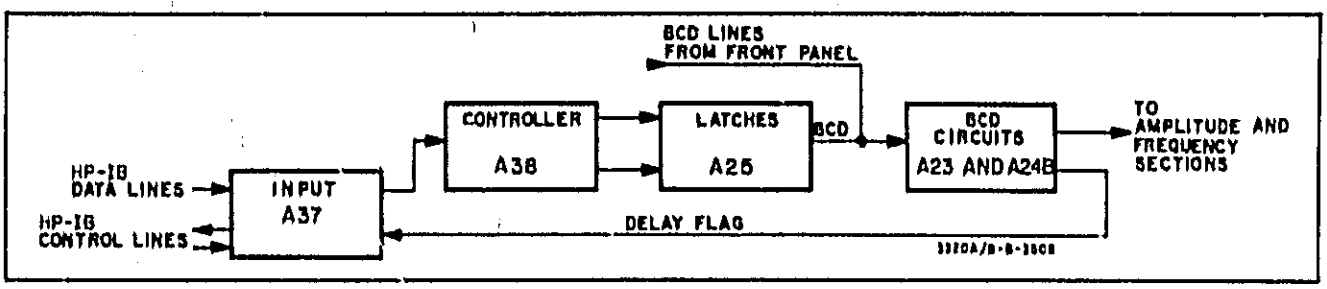


Figure 4-9. HP-IB Controller.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

addressed to listen, it may be placed into the remote control mode. Remote control is selected by REN and applying a "Function Execute" command (ASCII comma) to the data lines. The 3320B will not go into remote mode by simply holding REN LOW. The 3320B will remain in local mode until a Function Execute command (ASCII comma) is received on the data lines. This Function Execute command must follow the programming of each preface command (parameter) as discussed in Section III. The first Function Execute in a programming sequence sets the Remote Flip-Flop to the remote mode, and transfers any prefaced data to the Latches. Any following Function Execute command simply transfers the prefaced data to the Latches.

NOTE

The 3320B must be addressed before it can be placed in remote control.

4-40. Local Control. In local control, the BCD circuits process the BCD data coming from the front panel settings (switch closures to ground). The input, controller and latch circuits have no function during local control. The 3320B HP-IB option may be put into local control by one of the following methods:

1. Initially applying power.
2. By giving a "Local Enable" command (ASCII Character 1) during remote control.
3. By controlling the REN.

NOTE

Some "special" 3320B instruments have a front panel switch to control the REN and force local control. For more information, see notes on Schematic No. 6.

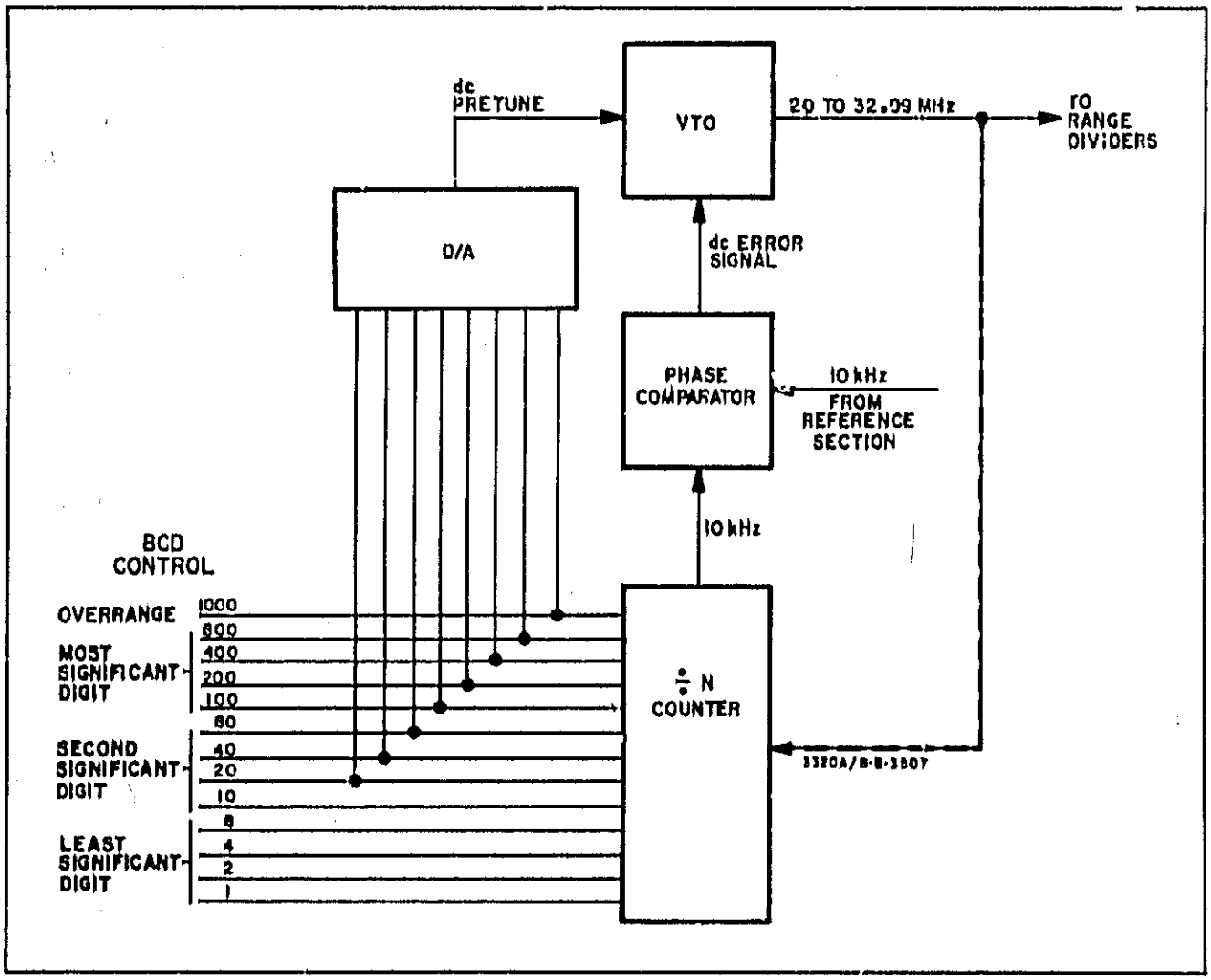


Figure 4-10. VTO and Phase Lock Loop.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

4-41. Frequency Section.

4-42. The frequency section of the 3320A/B is composed of a BCD controlled voltage tuned oscillator (VTO), phase locked to a 10 kHz reference signal, and six range dividers, including Option 006 (see Figure 4-2).

4-43. The output frequency of the frequency section is variable from 20 MHz to 32.99 MHz with the vernier in/out control in the vernier out position. With the vernier in/out control in the vernier in position, two more additional digits are variable via the vernier oscillator making the output frequency of the frequency section 20 MHz to 32.9999 MHz. In the following discussion, the frequencies given are considered to be with the vernier in/out in the vernier out position. Refer to Paragraph 4-60 for a discussion of the vernier oscillator.

4-44. **VTO, Phase-Lock Circuitry.** The BCD signal, from the controller section, for the overrange digit and the two most significant digits of 3320A/B output frequency, is applied to a D/A converter on the VTO assembly (see Figure 4-10). The D/A converter converts the BCD signal to a dc voltage which is applied to the VTO as a pretune voltage. This sets the VTO close to the desired frequency.

4-45. Precise frequency control is achieved by phase-locking the output of the VTO to a 10 kHz reference signal from the reference oscillator. This is accomplished by applying the output of the VTO to a ÷ N counter. The ÷ N number is controlled by the same BCD signal which pretuned the VTO plus the BCD signal for the remainder of the frequency digits. This signal sets the ÷ N counter in such a manner that the counter will divide the output of the VTO to 10 kHz (refer to Paragraph 4-70 for a detailed discussion on the ÷ N counter). The 10 kHz output from the ÷ N counter is applied to a phase comparator where it is compared to a 10 kHz signal from the reference oscillator. Any difference in phase between the two signals will be developed as a dc voltage. This dc voltage is applied to the VTO to correct its frequency.

4-46. **Range Dividers.** The output signal of the VTO is applied either to the amplitude section or to a series of range dividers, depending on the position of the range control. Seven ranges are available on the 3320A/B, including Option 006. Table 4-1 lists the range positions, the number of range dividers used for each position, and the output frequency of each range divider.

4-47. With the range control in the 10 MHz position, the output of the VTO (20 MHz to 32.99 MHz) is applied directly to the amplitude section. In the amplitude section, the signal is mixed with 20 MHz and the difference frequency (0 Hz to 12.99 MHz) is available at the 3320A/B output jack.

4-48. With the range switch in any position other than the MHz position, the output of the VTO is applied to one or more of the range dividers. Each divider uses a divide and mix technique to increase the resolution of the output signal by one decade while decreasing the maximum frequency by one decade (see Figure 4-11). For example, if the range control is placed in the 1000 kHz position, the VTO output (20 MHz to 32.99 MHz) is divided by 10 (2 MHz to 3.299 MHz) and mixed with 18 MHz from the reference section. The sum of these two signals (20 MHz to 21.299 MHz) is applied to the amplitude section. This signal is mixed with 20 MHz in the amplitude section, and the difference frequency (0 Hz to 1299 kHz) is available at the 3320A/B output jack.

4-49. Amplitude Section.

4-50. **3320A Amplitude.** The 3320A output signal is variable from 0 dBm to 13 dBm, into 50 ohms, by a front panel potentiometer. The potentiometer applies a dc voltage to a modulator to amplitude modulate a 20 MHz signal from the reference section (see Figure 4-12). The leveled (amplitude modulated) 20 MHz is applied to a mixer where it is mixed with the 20 MHz to 32.99 MHz from the frequency section. The difference frequency out of the mixer (0 Hz to 12.99 MHz) is amplified, filtered, and amplified again before it is applied to the 3320A output.

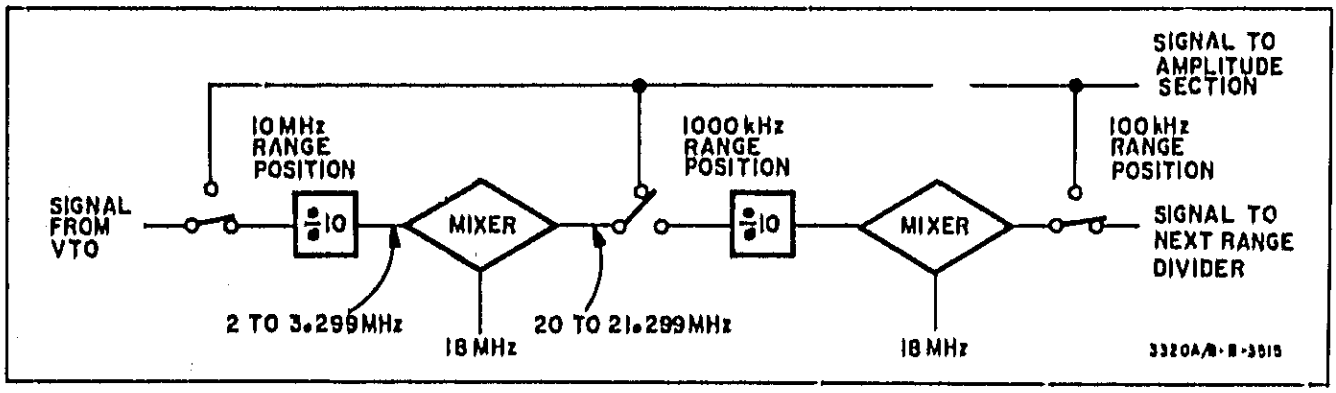


Figure 4-11. Range Dividers.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

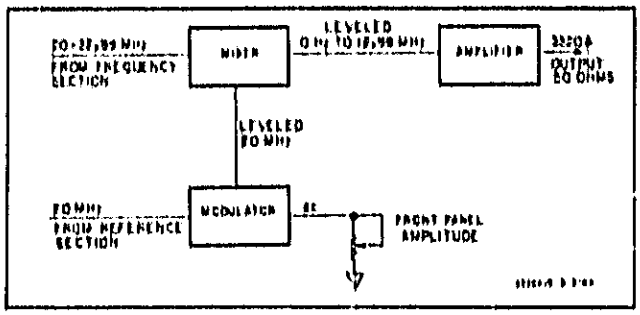


Figure 4-12. 3320A Amplitude Section.

4-51. 3320B Amplitude. The 3320B output signal is variable from +26.99 dBm to -69.99 dBm (-73.00 dBm in remote mode) into 50 ohms. The three least significant digits are controlled by amplitude modulating the 20 MHz from the reference section with a dc voltage and applying the modulated 20 MHz to the output mixer (see Figure 4-13). The most significant digit is controlled by a 10 dB/step attenuator at the 3320B output.

4-52. The dc voltage used to modulate the 20 MHz signal originates in the D/A converter assembly (A11). The D/A converter consists of a counter, clocked with a 2 MHz signal from the Reference Oscillator, and a series of FET switches controlling the charge and discharge of a capacitor (see Figure 4-14). The BCD signal from the controller section determines the length of time the counter counts. At T_0, switch A is closed allowing C_1 to charge to 10 V. Switch A is opened and switch B is closed allowing C_1 to discharge through R_1. When the counter has counted the length of time allowed by the BCD signal, switch B is opened and switch C is closed. The dc voltage remaining on C_1 is transferred to holding capacitor, C_2. From C_2, the dc level is applied to the Modulator as a pretune dc, and the Leveling assembly.

4-53. The Leveling assembly consists of a thermopile circuit and a comparator (see Figure 4-13). The signal applied to the thermopile circuit is determined by the position of the LEVELING control. When the LEVELING control is in the ON position, the 3320B output is applied to the thermopile circuit. When the LEVELING control is in the OFF position, the 20 MHz from the modulator is applied to the thermopile circuit. The thermopile circuit detects the signal and applies the dc to the comparator. This dc is compared to the dc from the D/A converter. Any difference in the two dc levels is applied to the modulator

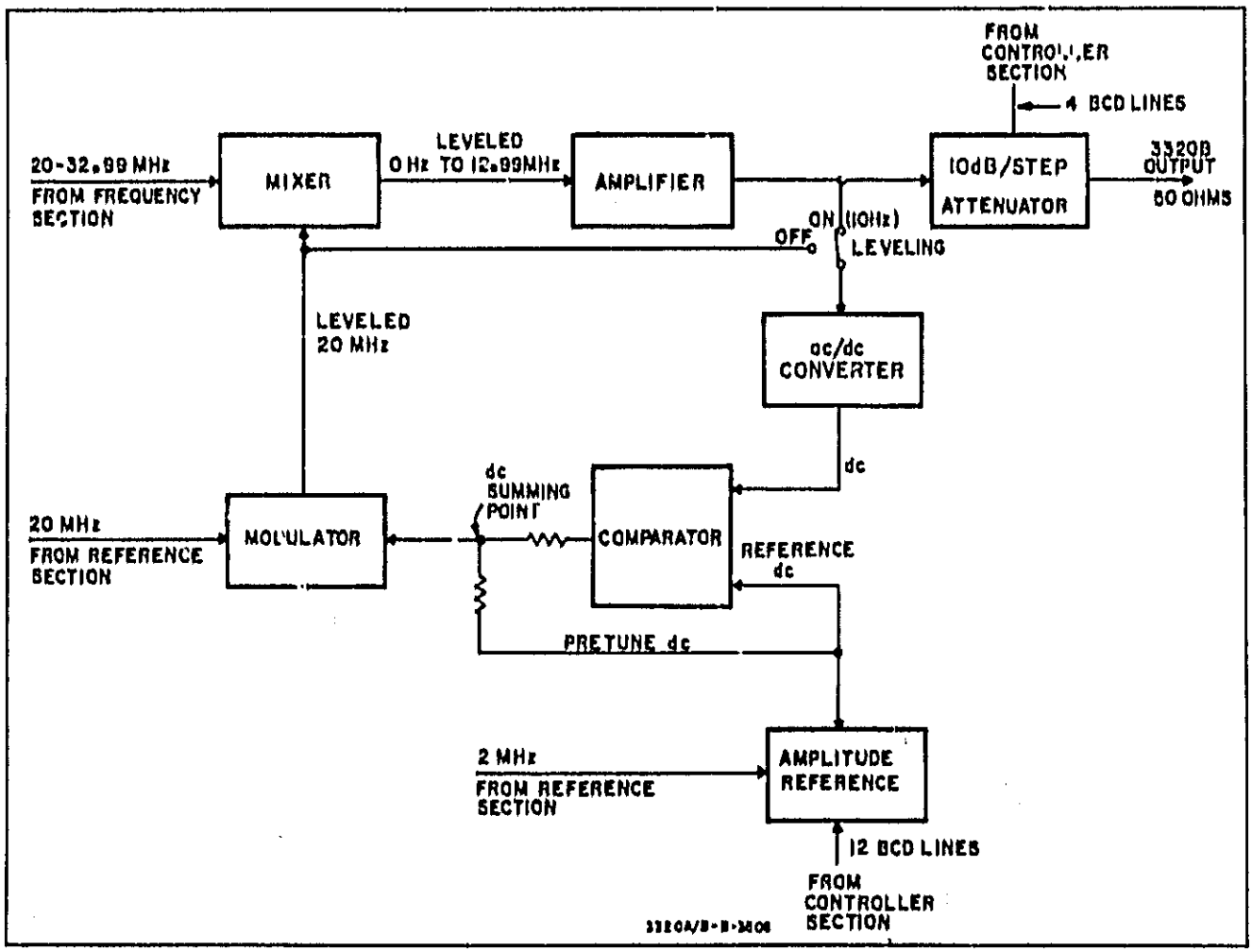


Figure 4-13. 3320B Amplitude Section.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

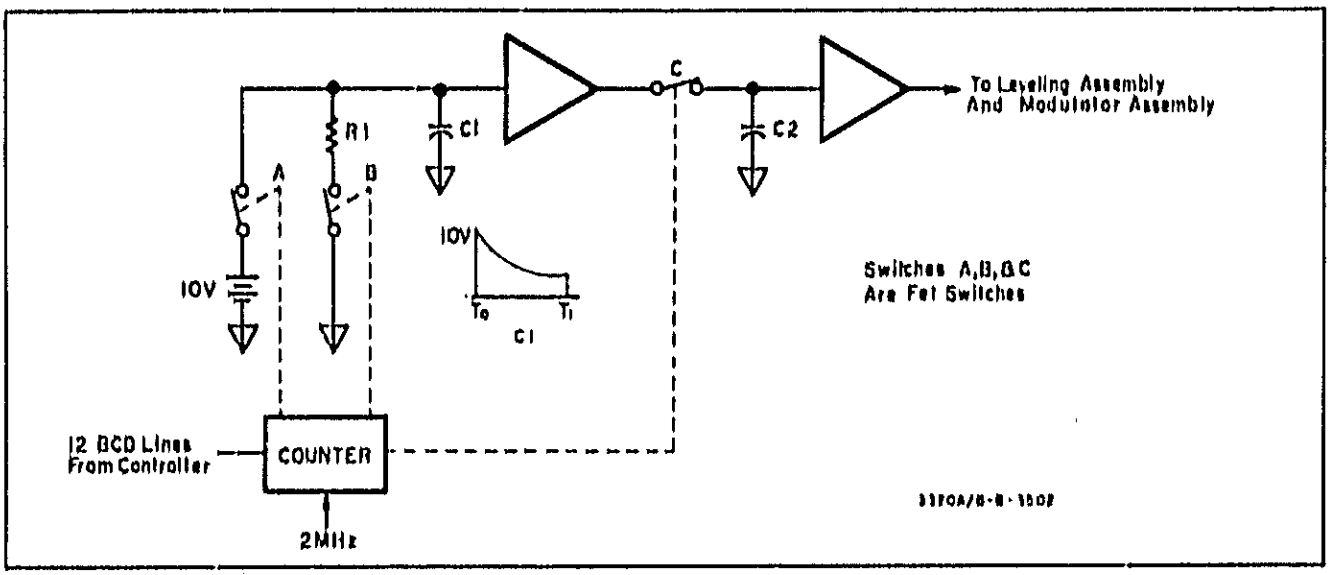


Figure 4-14. Simplified Amplitude Reference.

to correct the amplitude of the leveled 20 MHz. See Paragraph 4-63 for a detailed discussion of the thermopile circuitry.

4-54. The leveled 20 MHz is applied to a mixer where it is mixed with the 20 MHz to 32.99 MHz from the frequency section. The difference frequency out of the mixer (0 Hz to 12.99 MHz) is amplified, filtered, and amplified again before it is applied to a BCD controlled 10 dB/step attenuator assembly.

4-55. The 10 dB/step attenuator is capable of switching in up to 90 dB of attenuation in 10 dB steps. The leveled 20 MHz is capable of applying 9.99 dB of attenuation in 0.01 dB, 0.1 dB, or 1 dB steps. These two attenuators work in conjunction to cover the 3320B range of +26.99 to -69.99 dBm. At +26.99 dBm, both attenuators are applying 0 dB of attenuation. When attenuation is added, the first 9.99 dB is from the leveled 20 MHz. Then at +16.99 dBm, the 10 dB/step attenuator will supply 10 dB of attenuation and the leveled 20 MHz is back to 0 dB of attenuation. This operation continues through the attenuation range to -69.99 dBm. The switching points of the 10 dB/step attenuator below 0 dBm is -3.01 dBm, -13.01 dBm, -23.01 dBm, etc.

4-56. Reference Section.

4-57. The reference section of the 3320A/B consists of two voltage controlled crystal oscillators; a vernier oscillator, which is switched in and out with the vernier control, and a

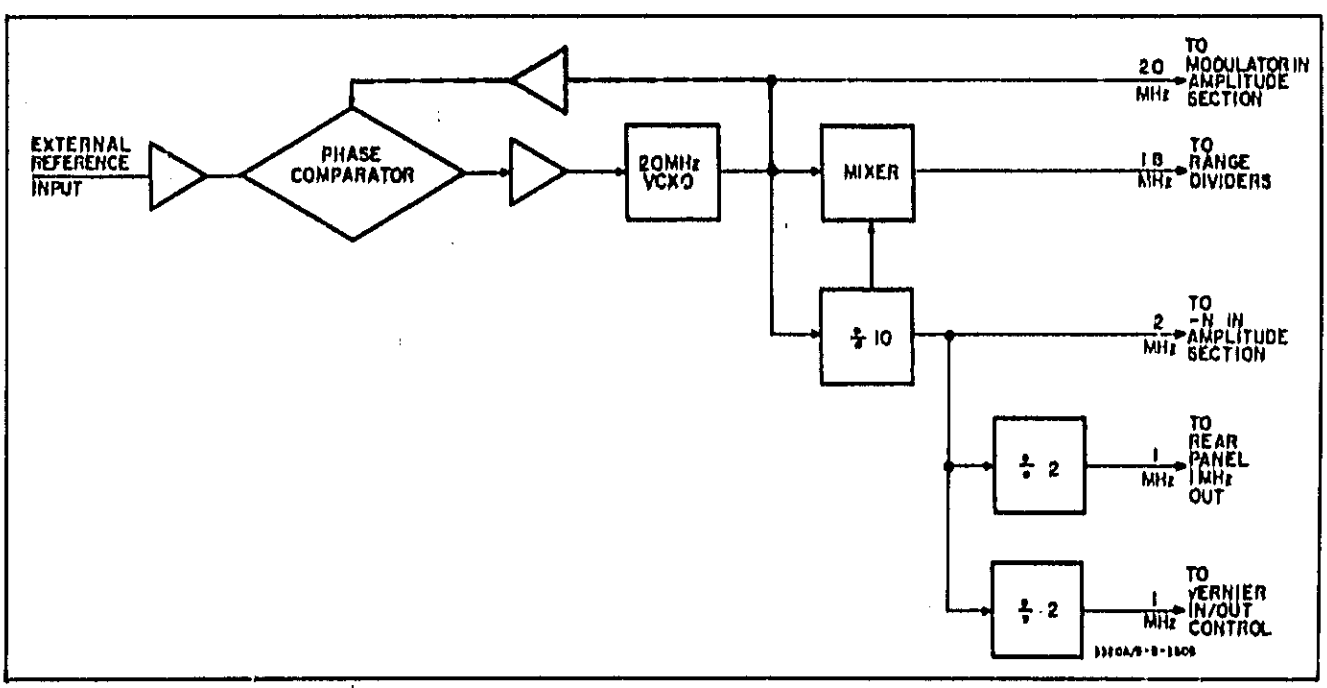


Figure 4-15. Reference Section.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

20 MHz oscillator. The vernier oscillator can be used to vary the last two digits of the 3320A/B output frequency. The 20 MHz oscillator can be phase-locked to an external reference source.

4-58. 20 MHz Reference Oscillator. There are four frequencies supplied by the 20 MHz Reference Oscillator; 20 MHz, 18 MHz, 2 MHz, and 1 MHz (see Figure 4-15). The 20 MHz signal is applied to the amplitude section level control modulator directly from the 20 MHz oscillator. The 20 MHz signal is also applied to a ÷ 10 circuit and a mixer circuit on the 20 MHz Reference Oscillator assembly. The 2 MHz signal out of the ÷ 10 is applied to the mixer and mixed with the 20 MHz signal. The difference frequency of 18 MHz is applied to the range dividers in the frequency generating section. The 2 MHz from the ÷ 10 circuit is also applied to the ÷ N Variable Modulus Counter in the amplitude section and to two ÷ 2 circuits on the 20 MHz Reference Oscillator assembly. The 1 MHz from one of the ÷ 2 circuits is applied to the rear panel 1 MHz OUT jack. The 1 MHz from the second ÷ 2 circuit is applied to the VERN IN/OUT control. With the VERN IN/OUT control in the VERN OUT position, the 1 MHz is applied to a ÷ 100 circuit on the Vernier Oscillator assembly. The 10 KHz from the ÷ 100 circuit is applied to the phase-lock loop in the frequency generating section.

4-59. A phase-lock circuit is provided for phase locking an external frequency reference to the 20 MHz oscillator. The external frequency reference, such as the 5 MHz oven stabilized reference oscillator (Option 002) is applied to a phase comparator on the Phase-Lock assembly. Here, it is compared to a portion of the 20 MHz output. Any difference in phase between the two signals will create a dc voltage which is applied to the 20 MHz oscillator to change its output frequency.

4-60. Vernier Oscillator. The Vernier Oscillator is a 10 MHz voltage controlled crystal oscillator. The output of the oscillator is applied to a ÷ 10 circuit (see Figure 4-16). The 1 MHz from the ÷ 10 circuit is applied to the VERN IN/OUT control. With the VERN IN/OUT control in the VERN IN position, the 1 MHz from the ÷ 10 circuit is applied to a ÷ 100 circuit. The 10 KHz from the ÷ 100 circuit is applied to the phase-lock loop in the frequency generating section.

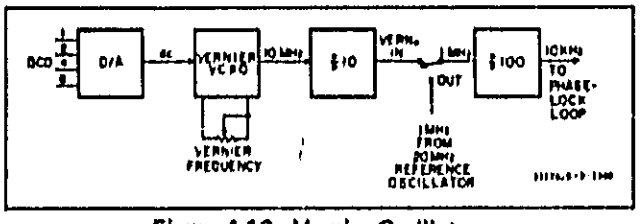


Figure 4-16. Vernier Oscillator.

4-61. The Vernier Oscillator can be tuned by either a front panel vernier control or by remote programming. The front panel control allows the 10 MHz from the oscillator to be varied which in turn varies the 10 kHz reference to the phase-lock loop in the frequency section. Varying the 10 kHz reference will vary the last two digits of the 3320A/B output frequency (Vernier digits) from 00 to 99. Remote programming allows the most significant of these two digits to be varied from 0 to 9. Remote programming can be accomplished by the BCD remote programming Option 003 for the 3320A model or by the BCD remote programming Option 004 or ASCII remote programming Option 007 in the 3320B. With all programming options, a BCD 8-4-2-1 signal is applied to a D/A converter on the Vernier Oscillator assembly. The dc voltage from the D/A is applied to the oscillator to vary its output frequency.

4-62. UNIQUE CIRCUITS.

4-63. 3320B Thermopile Circuitry.

4-64. When the 3320B LEVELING is ON (> 10 Hz), the AC/DC converter monitors the output of the power amplifier (see Figure 4-13). The converter converts this signal to a dc voltage which is compared to a dc amplitude reference. The resulting difference voltage is amplified by the comparator. The comparator output changes the level of the 20 MHz output of the Modulator. This, in turn, changes the level out of the mixer and the power amplifier. The level change out of the power amplifier is monitored by the converter and allows the converter output to approach the amplitude reference level.

4-65. When the 3320B LEVELING circuit is off, the AC/DC converter monitors the 20 MHz output of the Modulator (see Figure 4-13). The AC/DC converter converts this signal to a dc voltage which is compared to a dc amplitude reference. The resulting difference voltage is amplified by the comparator and used to adjust the 20 MHz output of the Modulator. When the LEVELING circuit is off, the Mixer and Power Amplifier are not included in the amplitude leveling loop.

4-66. AC/DC Converter. A simplified diagram of the AC/DC converter is shown in Figure 4-17. The converter utilizes a thermopile and responds to the RMS value of the input signal. The input signal drives a resistive load which is the heater element for the thermopile. The extremely flat frequency response of the thermopile allows the leveling loop to function effectively over a very broad frequency range.

4-67. An increased signal level into the converter causes point 2 to go more positive which will cause point 3 to go more positive. This increased voltage at 3 increases the voltage at 4. This causes point 4 to approach the same voltage as point 2. Since the thermopiles are matched, the RMS voltage at point 1 is very nearly equal to the dc level at point 3 (1 volt ac at point 1 yields 1 volt dc at point 3).

4-68. Protection Circuits. A simplified diagram of the AC/DC converter and the associated protection circuits are shown in Figure 4-18. The protection circuits are designed to protect the thermopile and Output Amplifier from overvoltage caused by instrument malfunction or by accidental application of voltage to the output terminals. If the

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

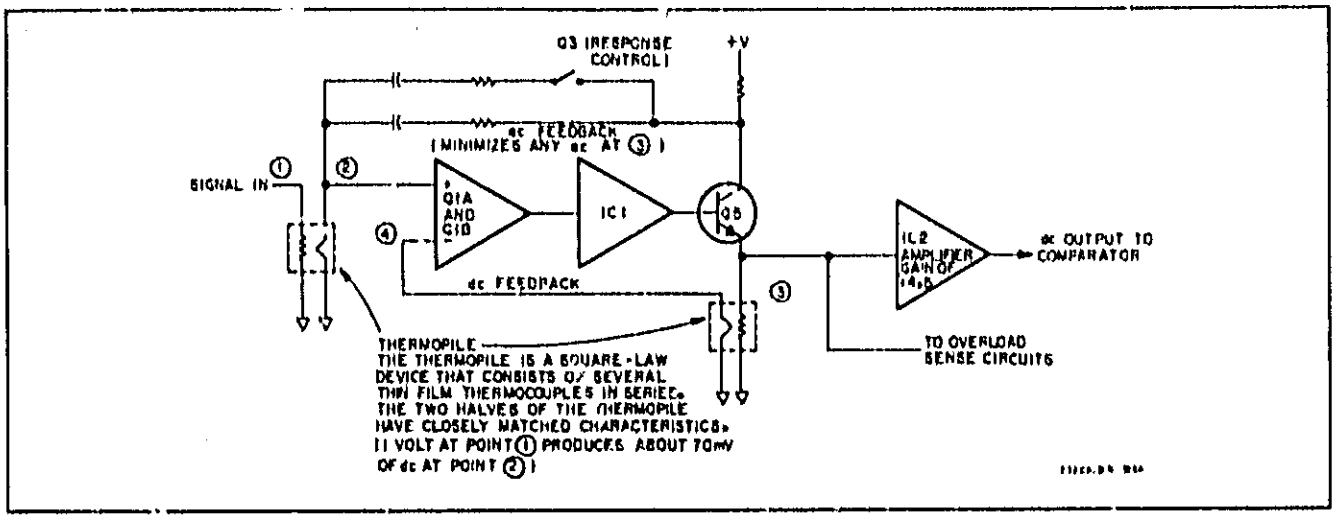


Figure 4-17. AC/DC Converter In The Amplitude Section.

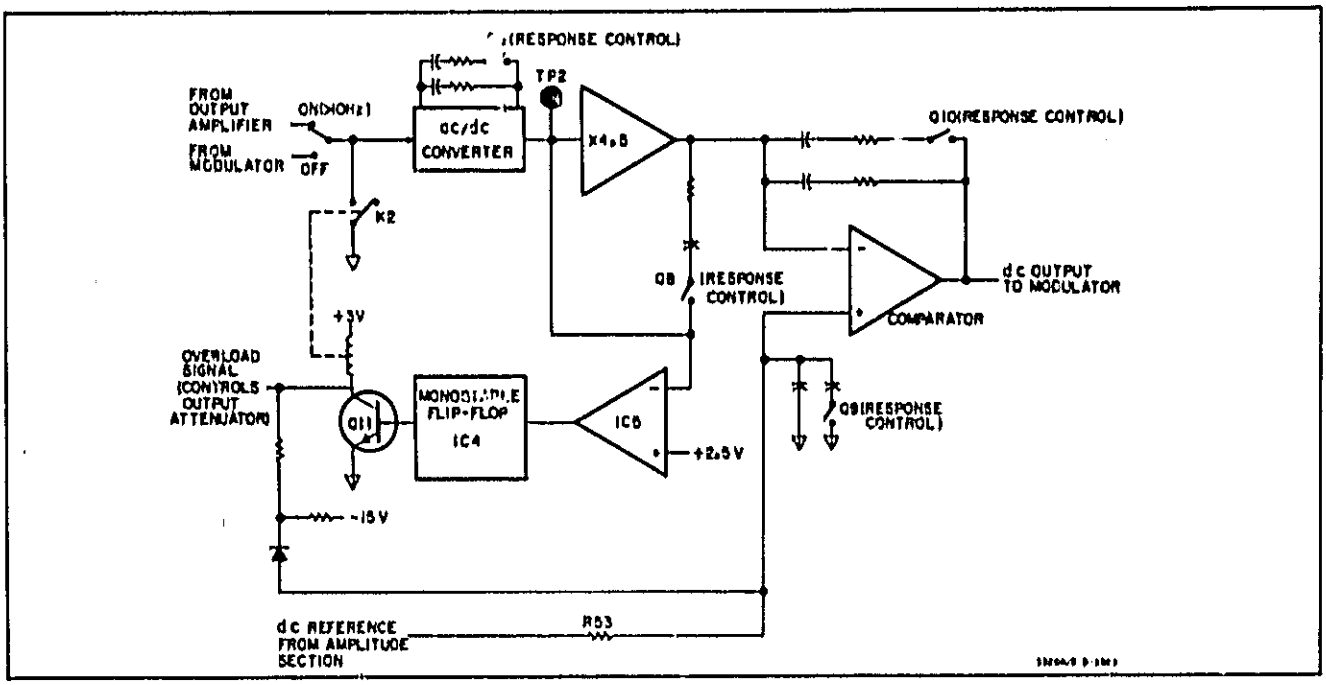


Figure 4-18. AC/DC Converter With Overload Circuits.

voltage at TP2 exceeds about +2.5 volts, IC5 sets the Monostable Flip–Flop. This causes K2 to close shorting the converter input to ground and the output attenuator to provide at least 40 dB of attenuation. While the Monostable Flip–Flop is set, the voltage at TP2 approaches 0 volts. At the end of 5 seconds, the Monostable returns to its normal state. If the overload condition still exists, the Monostable is set again. The resistor and diode between the output of Q11 and . dc reference pulls the dc reference line negative during overload. This reduces the 20 MHz signal out of the Modulator.

4-69. The response is set to SLOW for the standard 3320B. This requires the four response control switches shown in Figure 4-18 to be closed. Options 003, 004 and 007 allow the response to be remotely programmed to FAST. FAST response requires these four switches to be open.

4-70. The ÷ N Counter.

4-71. Refer to Figure 4-10 for the block diagram of the VTO Phase Lock Loop containing the ÷ N Counter. The purpose of the VTO Phase Lock Loop is to provide an output frequency to the amplitude section. The range of the output frequency from the VTO depends on the position of the vernier control switch:

Vernier	VTO Output
In	20 to 32.9999 MHz
Out	20 to 32.99 MHz

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The actual output frequency depends on the frequency setting selected.

NOTE

For the following discussion, the vernier in/out control is considered to be in the out position.

4-72. The function of the ÷ N Counter in the VTO Phase Lock Loop is to divide the output of the VTO (20 to 32.99 MHz) by some number N. The number N is determined by the BCD control lines from the controller. The output of the ÷ N Counter is compared with the 10 kHz reference signal from the frequency reference section. If the output of the ÷ N Counter is not equal to the 10 kHz reference signal, an error signal is generated to tune the VTO to the proper frequency. When the output of the ÷ N is exactly 10 kHz, the Loop is phase locked to the 10 kHz reference and the VTO will be tuned to the correct frequency. When a new frequency is selected, a different ÷ N number is set by the BCD control lines. At the same time, the D/A converter pretunes the VTO to a frequency close to the required output and then the Phase Lock Loop tunes the VTO to the required frequency. When the loop is phase locked, the output of the ÷ N counter is 10 kHz and the frequency of the VTO is given by the following formula:

VTO frequency = N x 10 kHz

Where N = ÷ N number between 2000 and 3299

Since the 3320A/B uses Range Dividers to provide additional resolution, the output of the VTO always varies between 20 MHz and 3299 MHz independent of RANGE setting. The ÷ N number varies between 2000 and 3299 at each range setting as shown in Table 4-3.

4-73. The ÷ N Counter utilizes three presettable decade counters and the control circuits shown in Figure 4-19. The presettable counters and the A Flip-Flop are set to a "preset" number by the BCD control lines. The counter starts counting the VTO cycles starting with the preset number. The ÷ N Counter counts up to a maximum number of 3999 (Sense No.). Each time the 3999 number is reached, a completed pulse is supplied to the Phase Comparator.

The basic sequence of operation for the ÷ N Counter is:

1) Load Preset Number (from BCD control lines).

2) Count VTO frequency until counter reaches 3999 (maximum count).

3) Provide output pulse to Phase Comparator.

4) Repeat cycle.

Since the maximum number that the counter can achieve is 3999, the preset number may be determined by subtracting the N number from 3999 (preset = 3999 - N), for example:

Maximum frequency (any range)
VTO = 32.99 MHz
N = 3299
Preset Number = 0700 = 3999 - 3299

Minimum frequency (0 Hz)
VTO = 20.00 MHz
N = 2000
Preset Number = 1999 = 3999 - 2000

If the VTO frequency is unknown, proceed as follows:

1. To determine the VTO frequency, add 20 MHz to the desired output frequency.

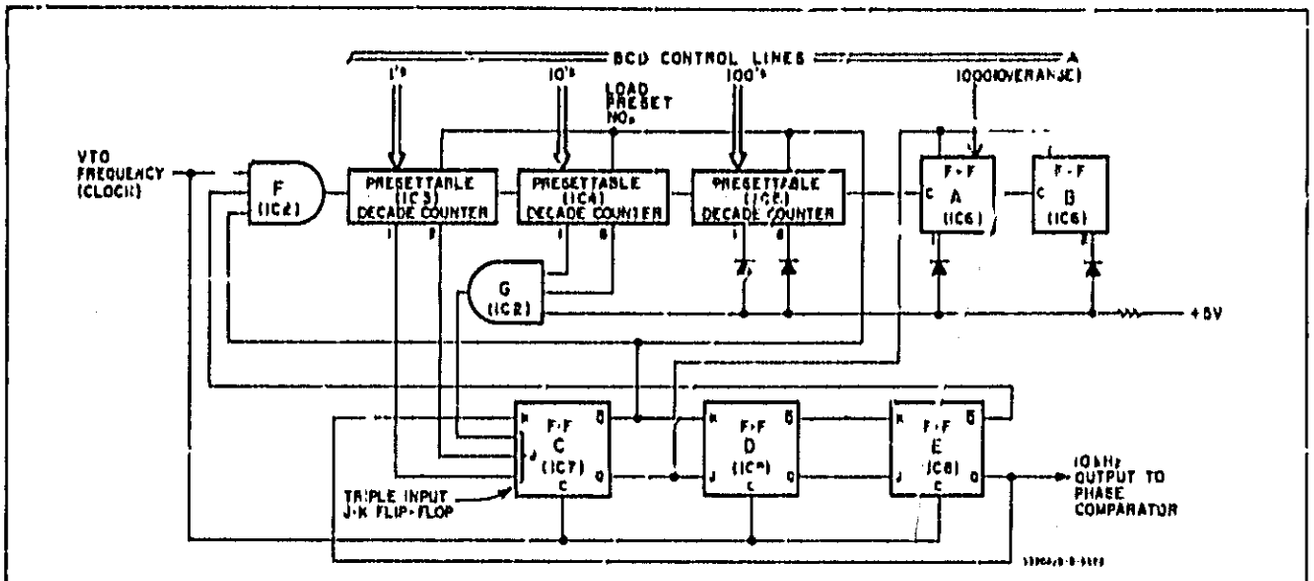
2. To determine the N number, divide the VTO frequency by 10 kHz. This number is always between 2000 and 3299.

3. To determine the preset number, subtract the N number from 3999. This number is always between 0700 and 1999.

Table 4-3. Frequency Setting vs. ÷ N Number.

FREQUENCY RANGE/SETTING					F_{VTO}	÷N
10 MHz	1000 kHz	100 kHz	10 kHz	1000 Hz	(A3TP3)	Number
0 Hz	0 Hz	0 Hz	0 Hz	0 Hz	20 MHz	2000
5 MHz	500 kHz	50 kHz	5 kHz	500 Hz	25 MHz	2500
10 MHz	1000 kHz	100 kHz	10 kHz	10000 Hz	30 MHz	3000
12.99 MHz	1299 kHz	129.9 kHz	12.99 kHz	1299 Hz	32.99 MHz	3299

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



Counting Sequence	Flip-Flops B	Flip-Flops A	Presettable Decade Counters IC5	IC4	IC3 BCD 2	IC3 BCD 1	Flip-Flops C	D	E	Gates F	G	Remarks
Preset Number	0	*	*	*	*	*	0	0	0	Enabled	Disabled	Start of Cycle
Preset + 1	†	†	†	†	†	†						
.	.	.	.	.	.	.						
.	.	.	.	.	.	.						
.	.	.	.	.	.	.						
3990	1	1	9	9	0	0					Enabled	Gate G Enabled
.	1	1	9	9	0	1						
.	1	1	9	9	1	0						
3993	1	1	9	9	1	1	0	0	0	Enabled	Enabled	
3994	0	*	*	*	*	*	1	0	0	Disabled	Disabled	Counters and F-F 1 are preset, F-F B is cleared.
3995	0	*	*	*	*	*	1	1	0			
3996	0	*	*	*	*	*	1	1	1			Output to phase comparator goes high
3997	0	*	*	*	*	*	0	1	1			
3998	0	*	*	*	*	*	0	0	1	Disabled		
3999	0	*	*	*	*	*	0	0	0	Enabled	Disabled	Output to phase comparator goes low and cycle repeats

* Set to preset number
† Preset number + 1

Figure 4-19. ÷ N Control Logic Diagram.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

An example of how the preset number is determined by the BCD control lines is shown in Table 4-4.

4-74. The table in Figure4-19 shows the counting sequence for the ÷ N Counter. When the counter reaches 3990, Gate G is enabled. At 3993, all three J inputs at Flip–Flop C are high. At 3994, Gate F is disabled but the count continues by clocking Flip–Flops C, D, and E until 3999 is reached. At 3996, the output to the phase comparator goes high and remains high until 3999 is reached.

Table 4-4. Preset Number.

Title	Overrange Digit	Most Significant Digit	2nd Most Significant Digit	3rd Most Significant Digit
Frequency Control Digits	1	2	6	5
BCD Code of Frequency Control Digits	1	0010	0110	0101
Code to ÷N Counter	1	0111*	0011*	0100*
Preset Number	0	7	3	4

*The required preset number is the 9's compliment of the corresponding Frequency Control Digits

Summation of table:
N = 3999 - 734 = 3265
VTO Frequency = 3265 x 10 kHz = 32.650000 MHz

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

MAINTENANCE

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

WARNING

These servicing instructions are for use by qualified personnel only. To avoid electrical shock, do not perform any servicing other than that contained in the operating instructions unless you are qualified to do so.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SECTION V
MAINTENANCE

5-1. INTRODUCTION.

5-2. This section contains the information necessary for maintenance of the Model 3320A/B Frequency Synthesizer. Included is a list of test equipment required, in-cabinet performance tests for standard and options, adjustment procedures for standard and options, and front panel disassembly procedures.

5-3. TEST EQUIPMENT.

5-4. The test equipment required for the maintenance of the 3320A/B is listed in Table 5-1. If the recommended model is not available, use a substitute that meets the required characteristics.

NOTE

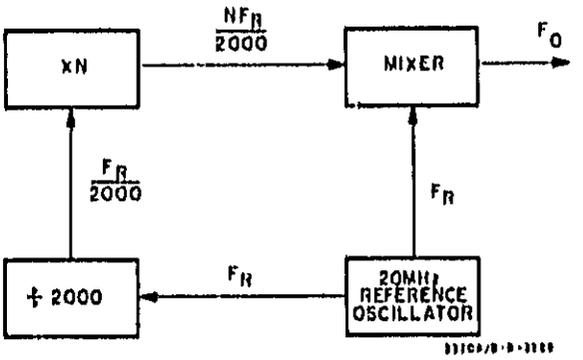
To insure proper stabilization of all circuitry, allow a 30-minute warmup period before beginning any performance tests or adjustment procedures.

5-5. PERFORMANCE TESTS.

5-6. The following performance tests compare the 3320A/B performance with the list of specifications given in Table 1-1. These tests may be used for incoming inspection, periodic maintenance, or to verify specifications after repair. A Performance Test Card is provided at the end of this section for recording the performance of the instrument during the performance tests. The card may be removed from the manual as a permanent record. If the instrument fails to meet any of its specifications, perform the adjustment procedures outlined in Paragraph 5-27. During the performance test, periodically vary the line voltage ± 10% with a power line transformer to insure proper operation at various ac line voltages. When checking the performance of Option 001, use a 75 ohm to 50 ohm adapter on the output of the 3320A/B (excluding Paragraphs 5-17 and 5-21). Refer to Figure 5-7 for part numbers and diagram of 75 ohm to 50 ohm adapter.

5-7. Frequency Accuracy, Vernier Out.

5-8. This performance test insures the 3320A/B meets the Frequency Accuracy performance specifications listed in Table 1-1 when the vernier control is in the out position. The output frequency of the 3320A/B is derived from the 20 MHz Oscillator as follows:



The XN circuitry is controlled by a phase lock loop. If either the ÷ 2 K or the XN number is incorrect, the loop will not lock. The following formula can be used to derive F_O:

$$F_O = \frac{NF_R}{2000} - F_R = F_R\frac{(N-2000)}{2000} = F_R(K)$$

If $F_O = F_R(K)$ and if the phase lock loop is locked up, any frequency error in F_O must be due to F_R (20 MHz). This performance test measures the accuracy of the 20 MHz Reference Oscillator and the output of the 3320A/B to insure phase lockup. The Frequency Accuracy specification listed in Table 1-1 with the Vernier out is ± 0.001% of setting.

a. Connect an electronic counter to the 1 MHz output jack on the 3320A/B rear panel. The counter indication should be 1.000000 MHz ± 10 Hz.

b. Connect the counter to the 3320A/B front panel OUTPUT jack.

c. Set the 3320A/B RANGE to MHz and FREQUENCY to 12.22. Set VERN IN/OUT to VERN OUT. The counter indication should be 12.220000 MHz ± 122 Hz.

d. Set the 3320A/B FREQUENCY to 1.10. The counter indication should be 1.100000 MHz ± 11 Hz.

e. Set the 3320A/B FREQUENCY to 00.01. Set the counter TIME BASE to .1 μs and FUNCTION to PERIOD AVERAGE 10 K. The counter indication should be 100.00000 μs ± 1 ns.

5-9. Frequency Accuracy, Vernier In.

5-10. The 3320A/B uses two unrelated reference oscillators to derive the output frequency when the vernier control is

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 5-1. Test Equipment Required.

Instrument Type	Required Characteristics	Recommended Model
Electronic Counter	Frequency: dc to 33 MHz Time Base: .1 μsec to 10 sec Period Average: 1 to 100 K Output: 100 kHz, 1 MHz, 10 MHz (rear panel) 10 MHz (front panel) Sensitivity: 1 mV	-hp- Model 5245L with 5261A plug-in
Wave Analyzer	Frequency: 20 Hz to 16 MHz Amplitude: 100 μV to 30 V B.W.: 10 Hz Outputs: Recorder Dynamic Range: > 70 dB	-hp- Models 3128 and 3580A
ac Voltmeter	Range: 7.000 mV ± 70 μV to 5 V ± 25 mV Frequency: 50 Hz to 100 kHz	-hp- Model 3490A
ac Voltmeter	Dynamic Range: 100 dB Freq: 5 Hz minimum	-hp- Model 403B
Oscilloscope	Dual channel (Ch. B. Trigger); Frequency: dc to 13 MHz Accuracy: ± .1% of setting	-hp- Model 180C/D (with 1801A and 1820A plug-ins.)
dc Voltmeter	Voltage Range: 100 mV to 30 V Accuracy: ± 0.05%	-hp- Model 3490A
Spectrum Analyzer	Frequency: 10 MHz to 48 MHz Response: ± 0.5 dB	-hp- Model 8553B/8552A (in 141T display)
Attenuator	Attenuation: 20 dB in 10 dB steps Accuracy: ± 0.01 dB	-hp- Model 355D with known error
Attenuator	Attenuator: 10 dB in 1 dB steps	-hp- Model 355C
Thermocouple	Input: 3 V rms Output: 7.0 mV dc Input Impedance: 50 ohms and 75 ohms	-hp- Model 11049A -hp- Model 11049-H01 (for Option 001)
Double Balanced Mixer	Frequency: 100 kHz to 13 MHz	-hp- Model 10534A
Low Pass Filter	Frequency: 150 kHz	See Figure 5-4
Low Pass Filter	Frequency: 15 kHz	See Figure 5-5
Feed thru Termination	Impedance: 50 ohms ± 0.2% 75 ohms ± 0.2%	-hp- Model 11048C -hp- Model 11094C
Resistors	10 ohm (2 each) 100 ohm (1 each) 10 kilohm (1 each)	-hp- Part No. 0757-0469 -hp- Part No. 0757-0178 -hp- Part No. 0757-0340
Capacitors	.0068 μF (1 each) 1300 pF (1 each) .012 μF (1 each) 1600 pF (1 each)	-hp- Part No. 0160-0159 -hp- Part No. 0160-2221 -hp- Part No. 0160-0301 -hp- Part No. 0160-2223
Coil	150 μh (1 each)	-hp- Part No. 9100-1639
Oscillator	Signal to Noise Ratio: > 60 dB down Spurious: > 80 dB down Frequency: 5 MHz and 1 MHz	-hp- 105A/B
Frequency Doubler	Frequency: 5 MHz Impedance: 50 ohms	-hp- Model 10515A

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

in the IN position. This performance test insures the instrument meets the Frequency Accuracy specifications listed in Table 1-1. The specification is 0.01% of range.

a. Connect an electronic counter to the 3320A/B front panel OUTPUT jack.

b. Set the 3320A/B RANGE to MHz (10 MHz Range), VERN IN/OUT to VERN IN, and FREQUENCY to 00.0150. The counter indication should be 15.000 kHz ± 1.0 kHz.

c. Set the 3320A/B FREQUENCY to 12.9999. The counter indication should be 12.9999 MHz ± 1.0 kHz.

d. Step the RANGE to each of the lower positions. The counter indication in Step c should be divided by 10 with each step.

5-11. Harmonic Distortion.

5-12. This test compares the performance of the 3320A/B to the Harmonic Distortion specifications listed in Table 1-1. The specifications are divided into three frequency ranges: - 60 dB from 5 Hz to 100 kHz, - 50 dB from 100 kHz to 1 MHz, and - 40 dB from 1 MHz to 13 MHz. This procedure uses an -hp- Model 3580A Spectrum Analyzer (range: 5 Hz to 50 kHz) to check the lower frequencies, and an -hp- Model 312B Frequency Selective Voltmeter (range: 1 kHz to 18 MHz) to check the higher frequencies. Harmonics can be checked at frequencies higher than 18 MHz if an analyzer having a higher frequency range is available (such as -hp- Model 141T/8552A/8553A Spectrum Analyzer).

3320A:

a. Connect the spectrum analyzer to the 3320A output.

b. Set the 3320A front panel controls as follows:

AMPLITUDE . . . . . Fully clockwise
VERN IN/OUT . . . . . OUT
RANGE . . . . . .Hz
FREQUENCY 100.0

c. Adjust the spectrum analyzer to compare the second, third, and fourth harmonic levels to the level of the fundamental frequency. All harmonics should be at least 60 dB below the fundamental frequency level.

d. Repeat Step c for 3320A FREQUENCY settings of 1 kHz and 10 kHz. In both cases, harmonics should be at least 60 dB down from the fundamental level.

e. Replace the spectrum analyzer with the frequency selective voltmeter and attenuators as shown in Figure 5-1.

f. Set the 3320A FREQUENCY to 100 kHz.

g. Set the 355D attenuator to 10 dB, the 355C to 3 dB, and adjust the frequency selective voltmeter for a 0 dBm meter indication.

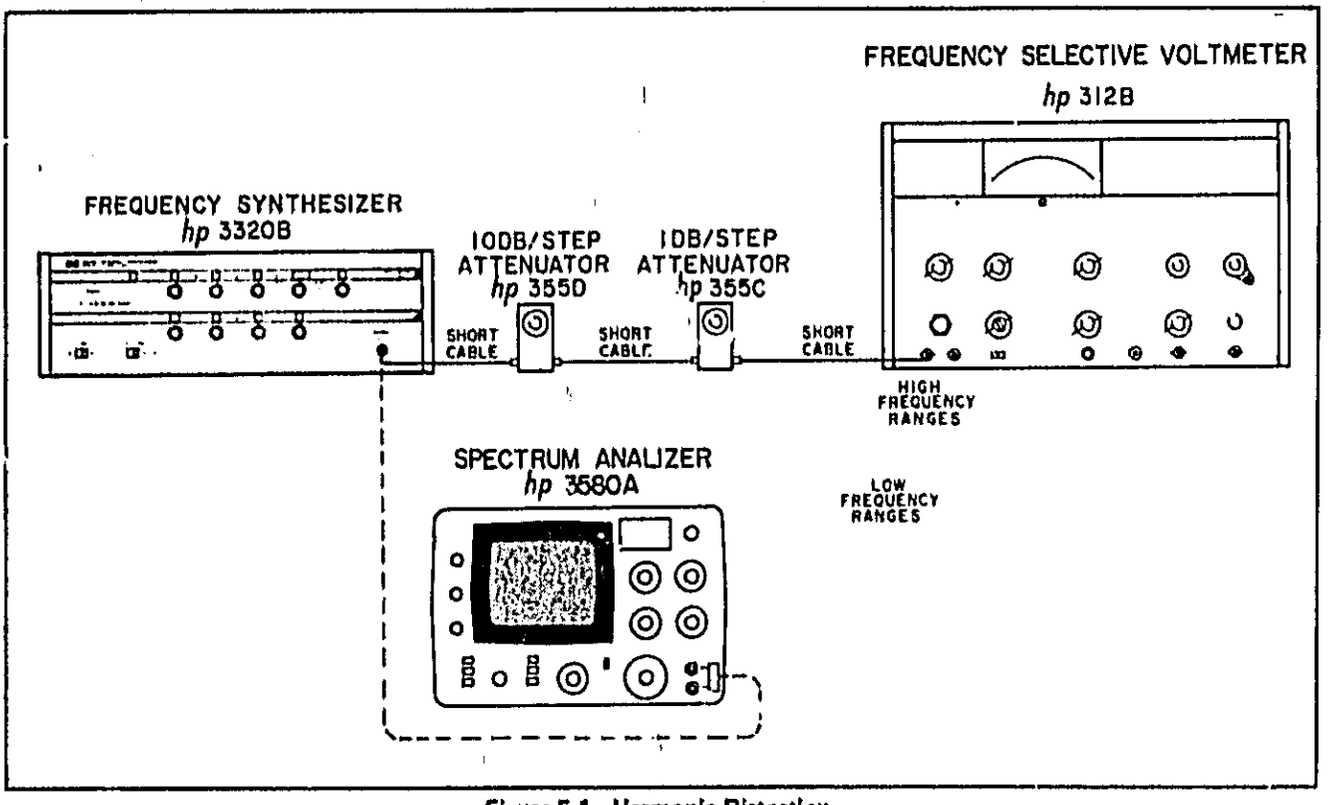


Figure 5-1. Harmonic Distortion.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

h. Tune the frequency selective voltmeter to the second, third and fourth harmonics of the 100 kHz signal. All harmonics should be at least 50 dB below the reference set in Step g.

i. Repeat Steps g and h with the 3320A FREQUENCY set to 1 MHz. All harmonics should be at least 40 dB below the reference set in Step g.

j. Repeat Steps g and h with the 3320A FREQUENCY set to 8 MHz. Note that because of the limitation of the frequency selective voltmeter, only the second harmonic can be checked. The harmonic should be at least 40 dB below the reference set in Step g.

3320B:

a. Use the same procedure as the 3320A with the following exceptions:

1. In Step b, set AMPLITUDE to + 26.99 dBm (+ 24.99 dBm, Option 001) and LEVELING to ON. (If frequencies 10 Hz or lower are checked, set LEVELING to OFF for these frequencies.)

2. In Step g, set 355D to 20 dB and 355C to 7 dB.

5-13. Spurious.

5-14. This performance test insures the 3320A/B meets the Spurious specification listed in Table 1-1. The specification is > 60 dB below the selected output. A wave analyzer is used to check random spurious and 2, 1 spurious. The 2, 1 spurious is generated by the mixing action used to develop the 3320A/B output frequency (see Figure 5-2). The 2, 1 spurious is equal to $2F_2 - F_1$. For example, if the 3320A/B is programmed for an output frequency of 8 MHz, F_1 = 28 MHz and $2F_2 - F_1$ = 40 MHz - 28 MHz = 12 MHz = 2, 1 spurious. 10 kHz and 60 Hz sidebands are checked at 10 MHz by mixing the 3320A/B output frequency to 100 kHz and 10 kHz and monitoring the sidebands with a wave analyzer.

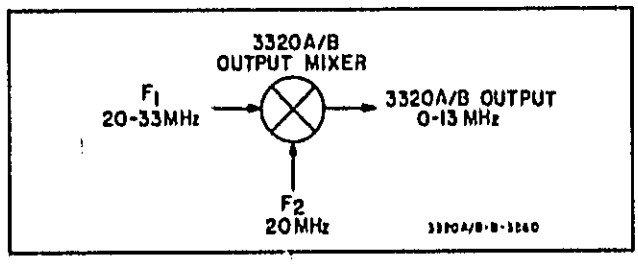


Figure 5-2. 3320A/B Output Section.

a. Connect a wave analyzer to the 3320A/B front panel OUTPUT jack. The 3580A spectrum analyzer will cover the lower frequencies of the 3320A/B. The 312B frequency selective voltmeter will cover the upper frequencies.

b. Set the 3320A/B and selective voltmeter FREQUENCY to 12.99 MHz, LEVELING ON (> 10 Hz) (3320B) and adjust the 3320A/B AMPLITUDE and the selective voltmeter for a convenient reference level on the selective voltmeter.

c Tune the selective voltmeter through the entire frequency range of the 3320A/B. The selective voltmeter indication should be > 60 dB below the reference set in Step b.

NOTE

The 2, 1 spurious for a 3320A/B output frequency of 13 MHz is 7 MHz (40 MHz - 33 MHz). In Step c above, be sure to check at 7 MHz with the selective voltmeter.

d. Connect the equipment as shown in Figure 5-3 (insure the 5 MHz oscillator is at 5,000,000.0 Hz).

CAUTION

DO NOT EXCEED THE RATED INPUT OF MIXER.

e. Set the 3320A/B RANGE to 10 MHz and FREQUENCY to 10.10. In 3320B, set LEVELING to ON (> 10 Hz).

f. Adjust the amplitude of the 3320A/B and the selective voltmeter to 0.1 V meter indication at 100 kHz.

g. Tune the selective voltmeter to 90 kHz, 80 kHz, 70 kHz, and 60 kHz. Meter indications for 10 kHz sidebands should be > 60 dB below the reference set in Step f.

h. Set the 3320A/B FREQUENCY to 10.01 and repeat Step f for 10 kHz.

i. Tune the selective voltmeter to 10.060 kHz, 10.120 kHz, 10.240 kHz, and 10.300 kHz. Meter indications for the 60 Hz sidebands should be > 60 dB below the reference set in Step f.

5-15. Signal-to-Phase Noise.

5-16. This performance test insures the 3320A/B meets the Signal-to-Phase Noise specifications listed in Table 1-1. The specification for signal-to-phase noise is > 40 dB down. This test uses a 5 MHz oscillator, with a frequency doubler, as a reference frequency. The output of the 3320A/B and the reference frequency are mixed and the difference signal is applied to a wideband ac voltmeter. When the 5 MHz oscillator is tuned slightly off frequency, the phase of the 3320A/B output signal will drift slightly. As the 3320A/B output and the reference oscillator drift through phase quadrature, the ac voltmeter will peak. This peak value is the maximum phase noise.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

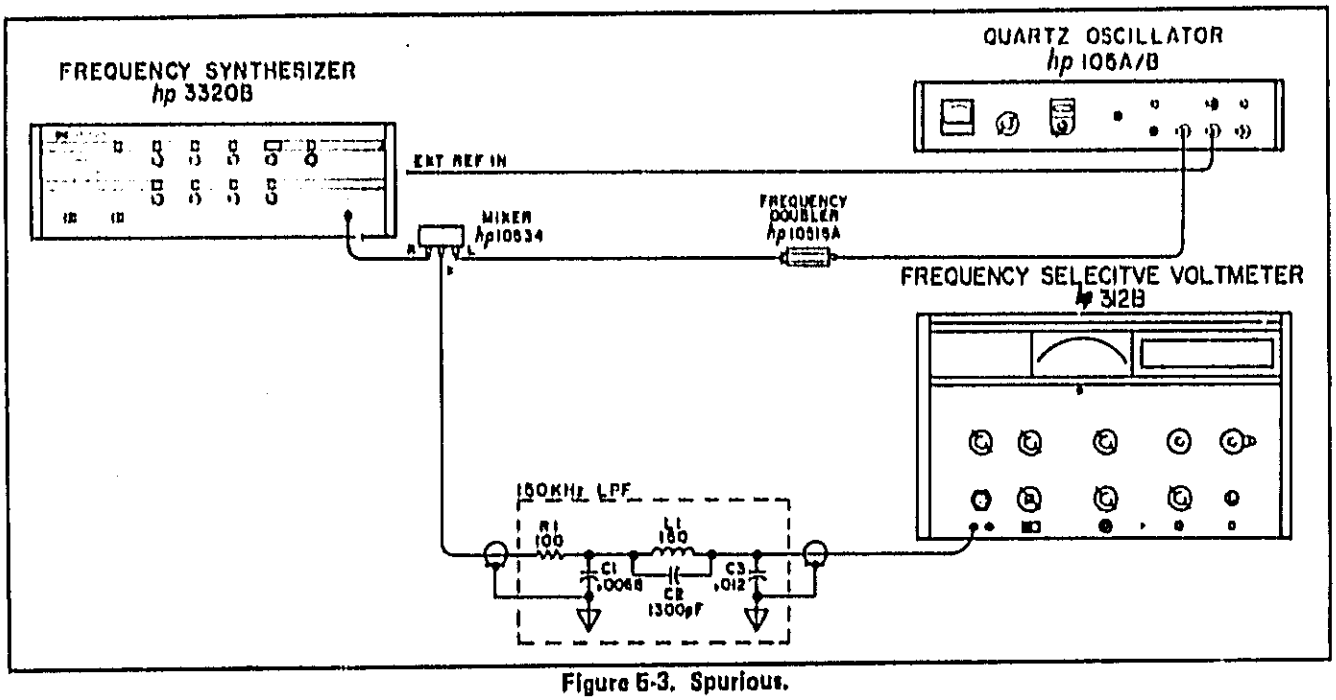


Figure 5-3. Spurious.

a. Connect the 5 MHz oscillator to a counter and adjust the frequency for 5,000,000.0 Hz.

b. Connect the equipment as shown in Figure 5-4.

CAUTION

DO NOT EXCEED THE RATED INPUT OF MIXER.

c. Set the 3320A/B RANGE to 10 MHz, FREQUENCY to 10.01, and VERN IN/VERN OUT to OUT. Adjust the 3320A/B amplitude for a convenient reference level on the ac voltmeter.

d. Set the oscilloscope DISPLAY to ALT B Trigger and adjust for a convenient display of both channels. The channel A signal will not lock.

e. Set the 3320A/B FREQUENCY to 10.00. Adjust the frequency of the 5 MHz oscillator until the channel A display on the oscilloscope is drifting *very* slowly.

f. Ground the Channel B input terminal on the oscillo-

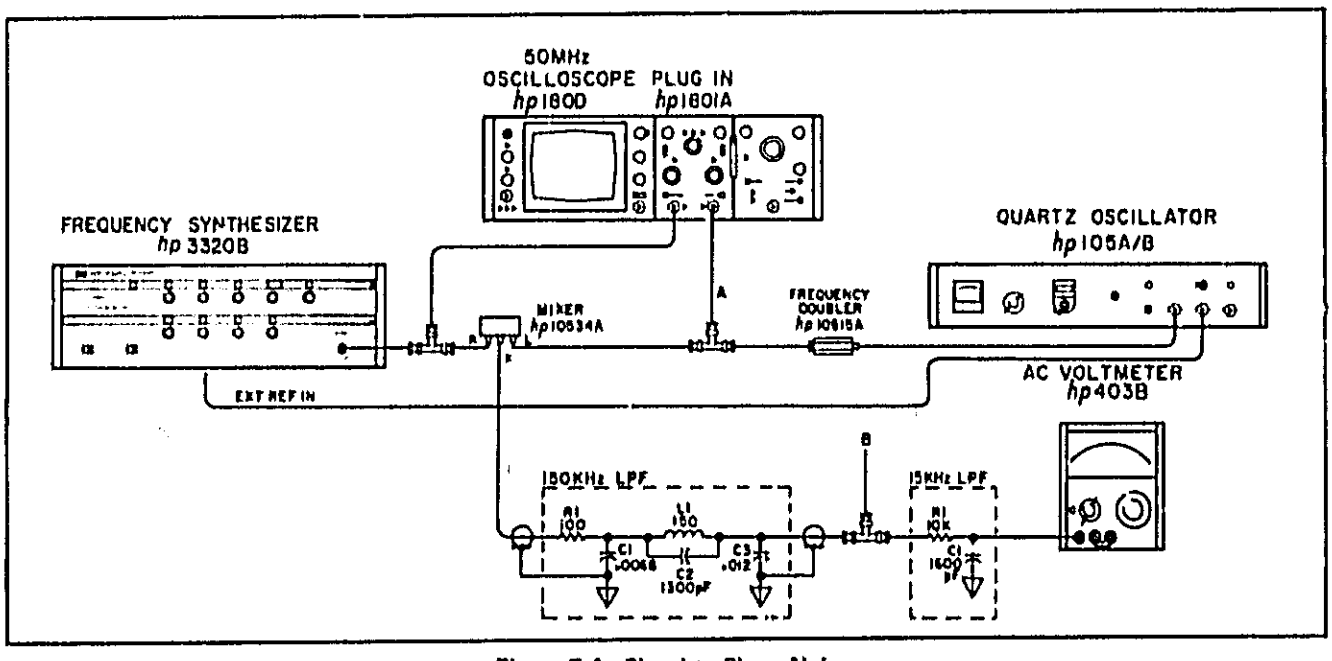


Figure 5-4. Signal-to-Phase Noise.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

scope and adjust the display for a convenient reference. Set the input terminal to dc.

g. Disconnect Channel B of the oscilloscope from point A (Figure 5-4) and connect to point B.

h. The oscilloscope display on Channel B should drift through 0 Vdc when the 3320A/B signal and the reference oscillator signal are in phase quadrature. The indication on the ac voltmeter, when the Channel B oscilloscope display is at 0 Vdc, should be >40 dB below the reference set in Step c.

5-17. Amplitude Accuracy, Absolute.

5-18. This performance test insures the 3320A/B meets the absolute amplitude accuracy specifications listed in Table 1-1. The specifications are:

3320A Standard and Option 001:
1 V rms ± 10% into 50 ohms (75 ohms, Option 001).
2 V rms ± 10% open circuit.
3320B Standard:
5.0 V rms ± 0.5% into 50 ohms.
10.0 V rms ± 0.5% open circuit.
3320B Option 001:
4.86 V rms ± 0.5% into 75 ohms
9.73 V rms ± 0.5% open circuit.

3320A:

a. Connect an ac voltmeter to the 3320A front panel OUTPUT jack through a 50 ohm load (75 ohm load, Option 001).

b. Set the AMPLITUDE full clockwise. The ac voltmeter indication should be 1 V rms ± 0.1 V rms.

c. Remove the 50 ohm load (75 ohm load, Option 001). The ac voltmeter indication should be 2 V rms ± 0.2 V rms.

3320B:

a. Set the 3320B front panel controls as follows:

AMPLITUDE (3320B Standard) ... + 26.99 dBm
(3320B, Option 001) . + 24.99 dBm
VERN IN/OUT ..... VERN OUT
RANGE ..... 10 kHz
FREQUENCY 10.00
LEVELING ..... ON (>10 Hz)

b. Connect an ac voltmeter to the 3320B front panel OUTPUT jack through a 50 ohm load (75 ohm load, Option 001). The ac voltmeter indication should be 5.000 V rms ± 0.025 V rms (4.863 V rms ± 0.024 V rms, Option 001).

c. Remove the 50 ohm load (75 ohm load, Option 001). The ac voltmeter indication should be 10.000 V rms ± 0.05 V rms (9.726 V rms ± 0.048 V rms, Option 001).

5-19. 3320A Frequency Response, 0.01 Hz - 13 MHz. 3320B Frequency Response, 0.01 Hz - 10 Hz.

5-20. This performance test insures the 3320A meets the Frequency Response specification listed in Table 1-1 over its entire frequency range. This test also insures the 3320B meets the Frequency Response specification listed in Table 1-1 from 0.01 Hz to 10 Hz. The specification for the 3320A is ± 2 dB. The specification for the 3320B is ± 0.5 dB (referenced to 10 kHz). The total frequency response specification for the 3320B covers all frequencies at all settings of the 10 dB output level attenuator. To test total frequency response of the 3320B perform this test; Frequency Response, 10 Hz - 13 MHz, Paragraph 5-21; and 3320B Output Attenuator Frequency Response, Paragraph 5-25.

3320A:

a. Connect an oscilloscope to the 3320A front panel OUTPUT jack.

b. Set the 3320A AMPLITUDE full CW, VERN IN/OUT to VERN OUT, RANGE to 10 kHz, and FREQUENCY to 10.00.

c. Ground the input terminal of the oscilloscope and adjust the vertical position control to position the sweep at center. Set the input terminal to dc and adjust the vertical gain for 8 cm display.

d. Set the oscilloscope vertical position control so the positive peaks of the display are on the center line.

e. Set the 3320A front panel controls to the positions listed in Table 5-2. The peaks on the oscilloscope display should not vary more than 1 cm positive and 0.8 cm negative.

Table 5-2. 3320A Frequency Response (0.01 Hz - 13 MHz).

RANGE	FREQUENCY	VERN IN/OUT
10 MHz	12.99	OUT
10 MHz	00.01	OUT
1000 kHz	1299.	OUT
1000 kHz	0001.	OUT
100 kHz	129.9	OUT
100 kHz	000.1	OUT
10 kHz	12.99	OUT
10 kHz	00.01	OUT
1000 Hz	1299.	OUT
1000 Hz	0001.	OUT
1000 Hz	0000.99	IN
1000 Hz	0000.50	IN
1000 Hz	0000.10	IN

3320B:

a. Connect an oscilloscope to the 3320B front panel OUTPUT jack.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

b. Set the 3320B front panel controls as follows:

AMPLITUDE (Standard) ..... + 26.99 dBm
(Option 001) .... + 24.99 dBm
VERN IN/OUT ..... VERN IN
RANGE ..... 10 kHz
FREQUENCY 10.00
LEVELING ..... OFF

c. Perform Steps c and d of the 3320A section of this performance check.

d. Set the 3320B FREQUENCY, RANGE, and Vernier to the positions listed in Table 5-3. The peaks on the oscilloscope should not vary more than ± 0.2 cm.

Table 5-3. 3320B Frequency Response (0.01 Hz - 10 Hz).

RANGE	FREQUENCY	Vernier
1000 Hz	0010	00
1000 Hz	0005	00
1000 Hz	0001	00
1000 Hz	0000	99
1000 Hz	0000	55
1000 Hz	0000	10
1000 Hz	0000	01

5-21. 3320B Frequency Response, 10 Hz - 13 MHz.

5-22. This performance test insures the 3320B meets the Frequency Response specifications listed in Table 1-1 with the 10 dB attenuator in the straight through position. The specification is ± 0.05 dB (referenced to 10 kHz).

a. Set the 3320B front panel controls as follows:

AMPLITUDE (Standard) ..... + 17.00 dBm
(Option 001) ..... + 15.00 dBm
VERN IN/OUT ..... VERN OUT
RANGE ..... 10 kHz
FREQUENCY 10.00
LEVELING ..... ON (> 10 Hz)

b. Connect the equipment as shown in Figure 5-5.

c. Increase the 3320B AMPLITUDE until the dc voltmeter reads 7.000 mV ± 10 microvolt. Do not make any further changes in amplitude during the remainder of this test.

d. Set the 3320B RANGE and FREQUENCY to the positions listed in Table 5-4. The dc voltmeter indication should not vary more than ± 70 microvolt from the indication in Step c. Record the voltage difference for each setting, noting whether the error is positive or negative with respect to the reference.

e. Because the Attenuator Accuracy and Frequency Response tests are referenced to 1 V rather than 7 mV, the voltage differences recorded in Step d must be multiplied by a factor of 71.5. These adjusted errors are used in calculating the Attenuator Frequency Response errors. This factor is determined by $\frac{1\ V}{.007\ V} \div 2 \cong 71.5$. Division by 2 is required because the thermal converter is a power (square law) device. The divide by 2 is accurate if the thermal converter is used over a very small portion of its power range. Record these adjusted error voltages (see the Performance Test Card). Be sure to record them as positive or negative with respect to the reference.

Table 5-4. 3320B Frequency Response (10 Hz - 13 MHz).

RANGE	FREQUENCY
10 MHz	12.99
10 MHz	00.01
1000 kHz	1299
1000 kHz	0001
100 kHz	129.9
100 kHz	000.1
10 kHz	12.99
10 kHz	00.01
1000 Hz	1299
1000 Hz	0010

5-23. 3320B Attenuator Accuracy, 10 kHz.

5-24. This performance test insures the 3320B meets the attenuator accuracy specification listed in Table 1-1. The specification is ± 0.02 dB/10 dB step, 10 kHz, referenced to the straight-through position of the output attenuator. This specification is accumulative as attenuation is added to

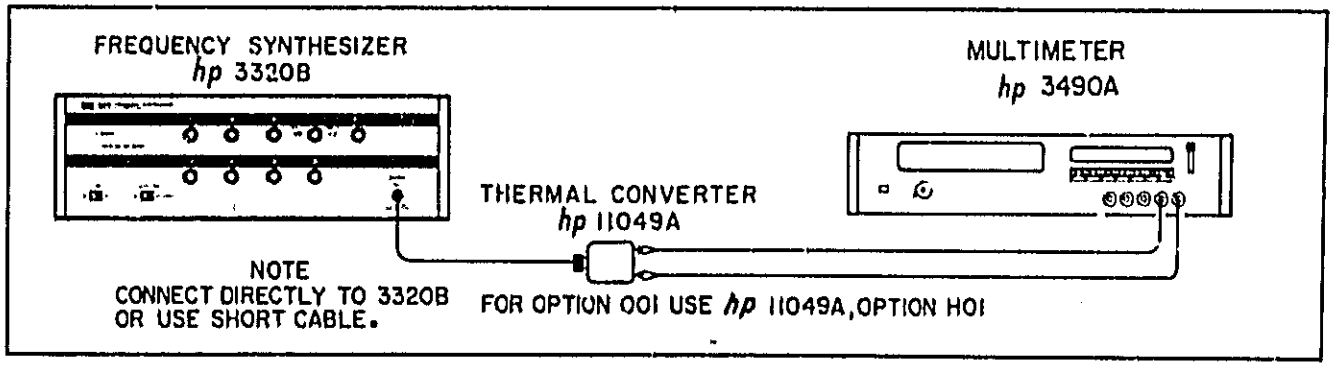


Figure 5-5. 3320B Frequency Response (10 Hz–13 MHz).

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

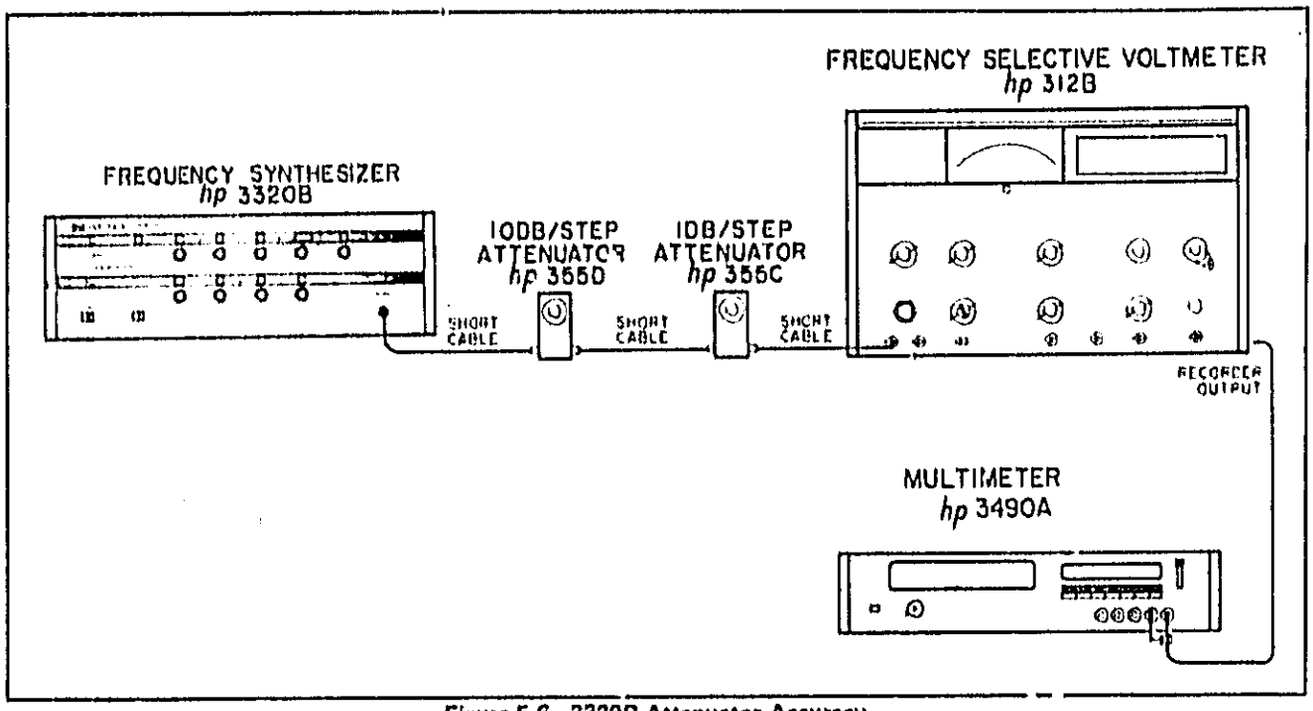


Figure 5-6. 3320B Attenuator Accuracy.

the output. The tolerance for each added step is equal to the tolerance of the previous step plus 0.02 dB. The output of the 3320B is applied to a wave analyzer through a calibrated attenuator. The wave analyzer detects the 3320B output signal and applies the detected signal to a dc voltmeter. The dc voltmeter indications are recorded for later use in determining the 3320B output attenuator frequency response.

a. Connect the equipment as shown in Figure 5-6.

NOTE

This performance test uses a 355D 10 dB attenuator with a known accuracy on the 0 dB and 10 dB settings. The error in the attenuator must be considered in determining the error of the 3320B.

b. Set the 3320B front panel controls as follows:

AMPLITUDE (Standard) ..... + 25.00 dBm
(Option 001) .... + 24.00 dBm
VERN IN/OUT ..... VERN OUT
RANGE ..... 10 kHz
FREQUENCY 10.00
LEVELING ..... ON (> 10 Hz)

c. Set the 355D to 10 dB and adjust the 355C and the wave analyzer for a 1.000 V dc indication on the dc voltmeter.

d. Set the 3320B AMPLITUDE to + 15.00 dBm (+ 14.00 dBm, Option 001). Set the 355D to 0 dB and record the difference between the dc voltmeter indication and the reference set in Step c.

e. Set the 355D to 10 dB and down range the wave analyzer 10 dB. Adjust the 355C and the wave analyzer for a 1.000 V dc indication on the dc voltmeter.

f. Set the 3320B AMPLITUDE to + 5.00 dBm (+ 4.00 dBm, Option 001) and set the 355D to 0 dB. Algebraically add and record the difference between the dc voltmeter indication and the reference set in Step e to the difference recorded in Step d.

g. Repeat Steps e and f for the remaining attenuator settings listed in Table 5-5. In Step f, algebraically add to the previously recorded difference instead of the difference recorded in Step d.

h. Specifications for each position of the output attenuator are as follows:

Attenuator (dBm)		Specification (mV)
Standard	Option 001	(accumulative)
+ 15.00	+ 14.00	± 2
+ 5.00	+ 4.00	± 4
- 5.00	- 6.00	± 6
- 15.00	- 16.00	± 8
- 25.00	- 26.00	± 10
- 35.00	- 36.00	± 12
- 45.00	- 46.00	± 14
- 55.00	- 56.00	± 16
- 65.00	- 66.00	± 18

5-25. 3320B Attenuator Frequency Response.

5-26. This test compares the performance of the 3320B to its Frequency Response specifications listed in Table 1-1 (repeated in Table 5-6) at all positions of its 10 dB/step

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 5-5. Output Attenuator.

3320B Attenuator (dBm)		355D (dB)	Wave Analyzer (dBm)
Standard	Option 001		
+ 25,00 (Ref)	+ 24,00 (Ref)	10	+ 10
+ 15,00	+ 14,00	0	Record dc Voltmeter Indication
+ 15,00 (Ref)	+ 14,00 (Ref)	10	0
+ 5,00	+ 4,00	0	Record dc Voltmeter Indication
+ 5,00 (Ref)	+ 4,00 (Ref)	10	- 10
- 5,00	- 6,00	0	Record dc Voltmeter Indication
- 5,00 (Ref)	- 6,00 (Ref)	10	- 20
- 15,00	- 16,00	0	Record dc Voltmeter Indication
- 15,00 (Ref)	- 16,00 (Ref)	10	- 30
- 25,00	- 26,00	0	Record dc Voltmeter Indication
- 25,00 (Ref)	- 26,00 (Ref)	10	- 40
- 35,00	- 36,00	0	Record dc Voltmeter Indication
- 35,00 (Ref)	- 36,00 (Ref)	10	- 50
- 45,00	- 46,00	0	Record dc Voltmeter Indication
- 45,00 (Ref)	- 46,00 (Ref)	10	- 60
- 55,00	- 56,00	0	Record dc Voltmeter Indication
- 55,00 (Ref)	- 56,00 (Ref)	10	- 70
- 65,00	- 66,00	0	Record dc Voltmeter Indication

output attenuator. All specifications are referenced to 10 kHz. The last three digits of amplitude (i.e., 6.99 digits in + 26,99 dBm) are controlled by electronic attenuation in the 3320B. Frequency response is not affected by this attenuation; therefore, this test evaluates only the most significant digit (10 dB attenuator). The attenuator frequency response is determined by measuring the attenuator accuracy at various frequencies, comparing these errors to the accuracy at 10 kHz (Paragraph 5-23), and adding the results to the 3320B frequency response with the 10 dB/step attenuator in the straight-through position (Paragraph 5-21).

a. Connect the equipment as shown in Figure 5-6.

NOTE

This performance test uses a 355D 10 dB attenuator with a known accuracy on the 0 dB and 10 dB settings. The error in the attenuator should be used in determining the error of the 3320B.

b. Set the 3320B front panel controls as follows:

AMPLITUDE (Standard) . . . . . + 25.00 dBm
(Option 001). . . . + 24.00 dBm
VERN IN/OUT. . . . . VERN OUT
RANGE. . . . . 10 MHz
FREQUENCY 12.99
LEVELING . . . . . ON (> 10 Hz)

Table 5-6. 3320B Frequency Response.

3320B ATTENUATOR SETTINGS (dBm)		SPECIFICATION (dB)	
Standard	Option 001	LEVELING OFF	LEVELING ON (> 10 Hz)
+ 26,99 to - 3,00	+ 24,99 to - 5,00	± 0,5	± 0,05
- 3,01 to - 23,00	- 5,01 to - 25,00	± 0,5	± 0,1
- 23,01 to - 53,00	- 25,01 to - 55,00	± 0,5	± 0,2
- 53,01 to - 69,99 *	- 55,01 to - 69,99 **	± 0,5	± 0,4

* - 73,00 dBm, remote control.
** - 75,00 dBm, remote control.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

c. Set the 355D to 10 dB and adjust the 355C and wave analyzer for a 1.000 V dc indication on the dc voltmeter.

d. Set the 3320B AMPLITUDE TO + 15.00 dBm (+ 14.00 dBm, Option 001). Set the 355D to 0 dB and record the difference between the dc voltmeter indication and the reference set in Step c. Be sure to indicate whether the error is positive or negative with respect to the reference. This records the accuracy error for the first 10 dB step of the attenuator (see Table 5-5).

e. Repeat Steps c and d for the remainder of the attenuator steps as indicated in Table 5-5. At each setting marked (Ref), adjust the 355 and wave analyzer for a dc voltmeter indication of 1.000 V.

f. Repeat Steps c, d and e for the following page and frequency settings:

RANGE	FREQUENCY
10 MHz	00.01
1000 kHz	1299
1000 kHz	0001
100 kHz	129.9
10 kHz	12.99
1000 Hz	1299

g. The attenuator frequency response is determined by using the formula A = B + C - D, where

A = The relationship of the error, measured at a specific frequency and on a certain attenuator step to the 10 kHz reference.

B = The measured error recorded in Step d.

C = The adjusted frequency response error measured at the same frequency as B on the next higher step of the attenuator. For the first step down on the attenuator (+ 15 dBm), C is the adjusted error recorded in Paragraph 5-21 at the same frequency. For each succeeding step down, the calculated error A of the previous step is used for C. This is true because the attenuator error is cumulative; that is, the error on any step includes the accumulated errors of all higher steps.

D = The error at 10 kHz measured on the same attenuator step as B.

Example:

B = + 2 mV (the recorded error at 12.99 MHz in Step d).

C = - 1 mV (the adjusted error at 12.99 MHz on the straight-through step of the attenuator, recorded in Paragraph 5-21, Step e).

D = - 1 mV (the error at 10 kHz measured on the + 15 dBm step of the attenuator, recorded in Paragraph 5-23, Step d).

A = 2 mV + (- 1 mV) - (- 1 mV) = 2 mV. This indicates that the output at 12.99 MHz is 2 mV positive with respect to the output at 10 kHz on the same attenuator step. In calculating the error on the next step down on the attenuator, C would be + 2 mV.

h. Calculate the error (A) for each step of the attenuator at each of the frequencies measured above. The frequency response tolerances, using this procedure, are as follows:

3320B Attenuator Settings (dBm)		Tolerances
Standard	Option 001	LEVELING ON (> 10 Hz)
+ 26.99 to - 3.00	+ 24.99 to - 5.00	± 6 mV
- 3.01 - 23.00	- 5.01 to - 25.00	± 12 mV
- 23.01 to - 53.00	- 25.01 to - 55.00	± 23 mV
- 53.01 - 69.99 *	- 55.01 - 69.99 **	± 45 mV

* 73.00 dBm, remote control.
** 75.00 dBm, remote control.

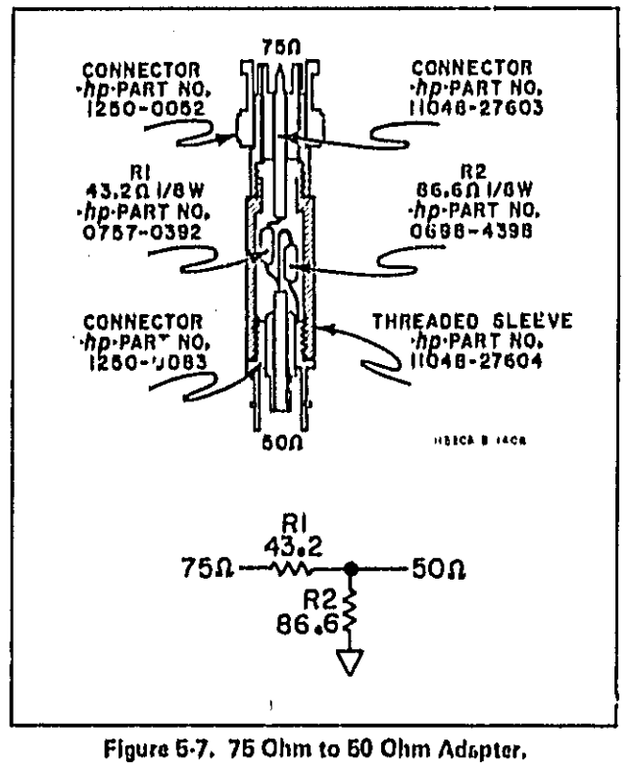


Figure 5-7. 75 Ohm to 50 Ohm Adapter.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5-27. ADJUSTMENT PROCEDURES.

5-28. The following is a complete adjustment procedure for the 3320A/B. This procedure should be conducted only if the 3320A/B has failed the performance tests. If proper performance cannot be achieved by the adjustment procedures, refer to the troubleshooting procedures, Section VII.

5-29. Power Supply.

5-30. This adjustment procedure sets the + 15 V dc supply and checks the voltages of the - 15 V dc, + 5 V dc, - 2 V dc, and ± 30 V dc supplies.

a. Connect a dc voltmeter between A17 pin L (+ 15 V dc) and A17 pin 10 (ground).

b. Adjust A17R23 (+ 15 V adjust) for 14.950 V dc to 15.050 V dc.

c. Connect the dc voltmeter to the following pins and insure each voltage is within the tolerances shown.

A17 pin 14	5.000 to 5.300
A17 pin p	5.000 to 5.300
A17 pin 7	- 1.8 to - 2.2
A17 pin 8	- 14.8 to - 15.2

d. Connect the dc voltmeter ground to A17 pin 4. Check the following voltages to insure they are within the tolerances shown.

A17 pin B	29.125 to 30.875
A17 pin C	- 28.800 to - 31.200

5-31. Reference Oscillator.

5-32. This adjustment procedure sets the 20 MHz Reference Oscillator by monitoring the 1 MHz output on the rear panel of the 3320A/B. It also sets the External Reference Phase Lock circuitry.

NOTE

If the 3320A/B being adjusted is an Option 002, steps b and c of this performance test do not need to be performed. If the 3320A/B being adjusted is not an Option 002, step a of this performance test does not need to be performed.

a. (All instruments except Option 002) Disconnect the short cable between the EXT FREQ REF and the 5 MHz OUT on the 3320A/B rear panel. Connect the electronic counter to the 5 MHz OUT and adjust the COURSE and FINE adjustments on the 3320A/B rear panel for 5,000,000 Hz. Reconnect the short cable between the EXT FREQ REF and the 5 MHz OUT. Connect the oscilloscope to A17TP1.

b. (Option 002 only) Connect the oscilloscope to A7TP1. Connect the rear panel output of the counter to the EXT FREQ REF input on the rear panel of the 3320A/B.

c. (Option 002 only) Set the counter rear panel MODE to INT STD FREQ and OUTPUT STD FREQ to 10 MHz.

d. Adjust A8C4 (20 MHz ADJUST) until the display on the oscilloscope is a sinewave > 6 V p-p.

e. Ground the oscilloscope input and adjust trace for center of display. Set oscilloscope input to dc and readjust A8C4 for 0 V dc with no sinewave on oscilloscope display.

f. Connect the counter to the 1 MHz OUT on the rear panel of the 3320A/B. Counter indication should be 1 MHz ± 1 Hz.

5-33. VTO Linearity.

5-34. This adjustment procedure sets the VTO for a linear output over the 3320A/B frequency range.

a. Connect the dc voltmeter to A3TP2. Set the 3320A/B FREQUENCY to 12.99 and adjust A3R36 (PRETUNE ADJUST) for a voltmeter indication of - 10.5 V dc ± 0.2 V dc.

b. Connect the dc voltmeter to A3TP1. Set the 3320A/B FREQUENCY from 00.99 to 12.99 in 1 MHz steps. The dc voltmeter indication should not be more negative than - 4V dc on each frequency setting.

5-35. Vernier.

5-36. This adjustment procedure sets the Vernier Oscillator for a 10 kHz swing (VTO output) on the front panel Vernier.

a. Set the 3320A/B FREQUENCY to 12.99, RANGE to 10 MHz, VERN IN/VERN OUT to VERN IN, VERNIER to 00.

b. Connect the dc voltmeter to A1TP1. Adjust A1R1 (DC REF ADJ) for a dc voltmeter indication of - 6.06 V dc ± 0.02 V dc.

c. Connect the counter to the 3320A/B rear panel L.O. OUTPUT (20-33 MHz). Set the 3320A/B FREQUENCY to 0000, adjust A1R50 for 20 MHz ± 100 Hz.

d. Connect the oscilloscope to A1TP2 through a 6.8 pF capacitor. Adjust A1C3 (10 MHz LEVEL ADJUST) for maximum signal on oscilloscope display. Display should be > 250 mV p-p.

e. Set the 3320A/B Vernier to 99. Adjust A1R34 (10 kHz ADJUST) for 20,010,000 Hz to 20,010,075 Hz indication on the counter.

f. Set the 3320A/B Vernier to 50. Adjust A1R50 (5 kHz ADJUST) for 20,004,950 Hz to 20,005,050 Hz indication on the counter.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

g. Set the 3320A/B Vernier to 00. Adjust A1C6 (0 Hz ADJUST) for 19,999,950 Hz to 20,000,000 Hz indication on the counter.

h. Repeat steps e, f, and g until all limits are met.

i. Set the 3320A/B Vernier to 99, FREQUENCY to 12.99. If necessary readjust A1R34 (10 kHz ADJUST) for 33,000,000 Hz to 33,000,100 Hz indication on the counter.

5-37. Amplitude Reference, 3320B.

5-38. This adjustment procedure sets the reference dc level from the D/A Converter.

a. Connect the dc voltmeter to A11TP1.

b. Set the 3320B AMPLITUDE to 16.99 dBm (-5.01 dBm, Option 001). Adjust A11R10 (REFERENCE ADJUST) for 10.0000 V dc ± 0.0005 V dc (9.729 V dc ± 0.005 mV dc, Option 001) indication on the dc voltmeter.

c. Set the 3320B AMPLITUDE to 17.00 dBm (-5.00 dBm, Option 001). Adjust A11R16 (DECAY ADJUST) for 3.1659 V dc ± 0.0002 V dc (3.0801 V dc ± 0.002 V dc, Option 001) indication on the dc voltmeter.

5-39. Carrier Balance.

5-40. This adjustment procedure sets the output of the Mixer for minimum carrier signal feed thru and maximum common mode rejection.

a. Set the 3320A/B FREQUENCY to 0100, RANGE to 1000 Hz, and LEVELING to OFF (3320B).

b. Connect the ac voltmeter to A10TP1. Adjust A10R37 (AC SIGNAL NULL) for a null indication on the ac voltmeter (< 100 mV ac).

c. Remove the brown cable from the Pre-Amp output on the A10 assembly. Move the green cable from the 20-30 MHz out on the A10 assembly to the Pre-Amp output jack.

d. Connect the spectrum analyzer through the 355D attenuator to the 3320A/B rear panel L.O. OUTPUT (20-33 MHz).

NOTE

Set 355D attenuator to 20 dB before connecting to 3320A/B.

e. Set the 3320A/B FREQUENCY to 12.99 and RANGE to 10 MHz.

f. Adjust A10R31 (CARRIER NULL) for minimum amplitude of the 32.99 MHz signal on the spectrum analyzer display.

g. Return the green cable to the 20-33 MHz jack on the A10 assembly. Replace the brown cable to the Pre-Amp output on the A10 assembly.

5-41. Amplitude.

5-42. This adjustment procedure sets the amplitude section of the 3320A/B for minimum temperature drift, minimum dc offset, and proper output voltage level.

3320B:

a. Set the 3320B FREQUENCY to 10.00, RANGE to 10 K, and AMPLITUDE to +17.00 dBm (+ 15.00 dBm, Optic 001). Remove the red cable from the 20 MHz input on the A12B assembly. Remove the clear cable from the 0-13 MHz input on the A12B assembly. Short A12BTP2 to ground with a jumper cable.

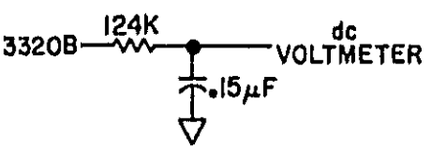
b. Using jumper cables connect a 5 ohm resistor (two 10 ohm resistors in parallel) between A12BTP1 and ground. Connect Channel A input of the oscilloscope across the 5 ohm resistor.

c. Set the oscilloscope INPUT to dc and VOLTS/DIV to .1 (.01 if 10:1 divider probe is used). Adjust oscilloscope display for a convenient reference.

d. Adjust A12BR10 (OFFSET ADJUST) until there is a noticeable (approximately 1.5 cm) dc level shift (either up or down) on the oscilloscope display then readjust A12BR10 in the opposite direction until the dc level on the oscilloscope display is on the threshold of shifting back.

e. Remove the 5 ohm resistor and all jumper cables. Replace the red cable to the 20 MHz input and the clear cable to the 0-13 MHz input on the A12B assembly.

f. Connect the dc voltmeter to the 3320B front panel output jack. It may be necessary to use a filter at the 3320B output to eliminate any ac component. The following values may be used:



g. Set the 3320B AMPLITUDE to +26.99 dBm (+24.99 dBm, Option 001).

h. Adjust A10R45 (DC OFFSET) for a 0 V dc ± 2 mV dc indication on the dc voltmeter.

i. Connect the ac voltmeter through a 50 ohm load (75

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

ohm load, Option 001) to the 3320B front panel output jack.

j. Set the 3320B FREQUENCY to 10.00, RANGE to 10 kHz, AMPLITUDE to +26.99 dBm (+24.99 dBm, Option 001), and LEVELING to ON (> 10 Hz).

k. Adjust A12BR30 (+5 V ADJ) for 5.000 V ac ± 0.001 V ac (4.8646 V ac ± 0.0012 V ac, Option 001) indication on the ac voltmeter. If A12BR30 does not have enough range, turn power OFF, remove A1BTC1 (thermocouple), rotate it 180°, replace it back on the A12B assembly, and turn power ON. Repeat adjustment of A12BR30.

l. Set the 3320B AMPLITUDE to +17.00 dBm (+15.00 dBm, Option 001) and adjust A12BR34 (1.583 V ADJ) for 1.583 V ac ± 0.001 V ac (1.540 V ac ± 0.002 V ac, Option 001) indication on the ac voltmeter.

3320A:

a. Connect the dc voltmeter to the 3320A front panel output jack. Set the 3320A AMPLITUDE Full C W.

b. Remove the brown cable from the input of the A12A assembly. Connect a jumper cable between A12A J1 and ground.

c. Adjust A12AR7 (DC OFFSET) for 0 V dc ± 2 mV dc indication on the dc voltmeter.

d. Remove the shorting cable from A12A J1 and replace the brown cable. Adjust A10R45 (DC OFFSET) for a 0 V dc ± 2 mV dc indication on the dc voltmeter.

e. Connect the ac voltmeter through a 50 ohm load (75 ohm load, Option 001) to the 3320A front panel output jack.

f. Adjust A9AR52 (AMPLITUDE ADJUST) for 1.000 V ac ± 0.1 V ac indication on the ac voltmeter.

5-43. Harmonics, 3320B.

5-44. This adjustment procedure sets the harmonic level of the 3320B output signal to a minimum.

a. Connect the spectrum analyzer through the 355D (set to 40 dB) attenuator to the 3320B front panel output jack.

b. Set the 3320B FREQUENCY to 12.99, RANGE to 10 MHz, AMPLITUDE to +26.99 dBm (+24.99 dBm, Option 001), and LEVELING to ON (> 10 Hz).

c. Adjust A14R55 (BIAS ADJUST) until the third harmonic of the 12.99 MHz signal is approximately 42 dB below the 12.99 MHz fundamental on the spectrum analyzer display.

d. Connect a dc voltmeter between A14TP1 and A14TP2. The voltage reading should be less than 1.15 V dc.

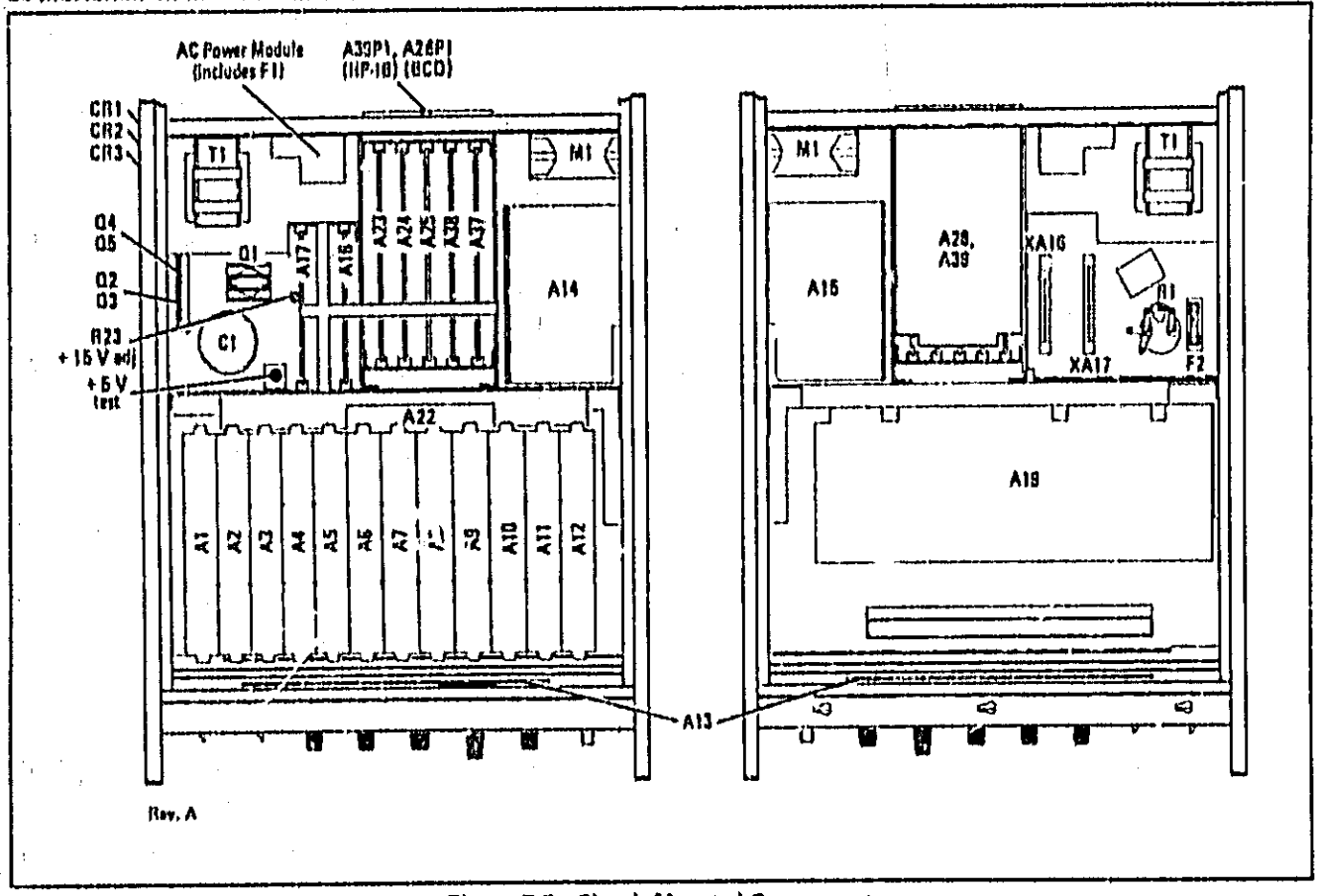


Figure 5-8. Chassis Mounted Components.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5-45. Leveling, 3320B.

5-46. This adjustment procedure sets the 3320B output signal for equal ac levels when switching from LEVELING OFF to LEVELING ON (> 10 Hz).

a. Connect the ac voltmeter to the 3320B front panel output jack.

b. Set the 3320B FREQUENCY to 10.00, RANGE to 10 kHz, AMPLITUDE to +16.99 dBm (+14.99 dBm, Option 001), and LEVELING to ON (> 10 Hz). Record the ac voltmeter indication.

c. Set the 3320B LEVELING to OFF and adjust A9BC24 (LEVELING OFF ADJUST) to the same ac voltmeter indication as recorded in step b ± 10 mV ac.

5-47. Transient Response, 3320B.

5-48. This adjustment procedure sets the 3320B Leveling loop transient response.

a. Connect the dc voltmeter to A12BTP3.

b. Set the 3320B FREQUENCY to 10.00, RANGE to 10 kHz, and AMPLITUDE to +16.99 dBm (+14.99 dBm, Option 001). Record dc voltmeter indication.

c. Set 3320B AMPLITUDE to +17.00 dBm (+15.00 dBm, Option 001). Adjust A9BR27 (PRETUNE ADJUST) for the same dc voltmeter indication as recorded in step b.

d. Adjusting A9BR27 effects the voltage indication at +16.99 dBm. Repeat steps b and c until the two indications are within ± 200 mV dc.

GENERAL MAINTENANCE INFORMATION

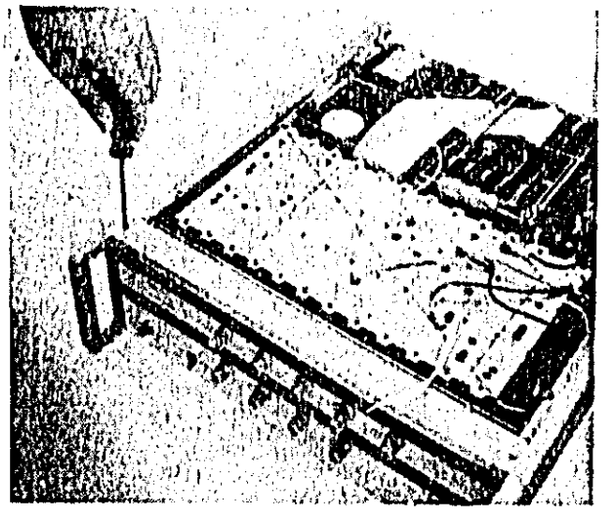
5-49. GENERAL MAINTENANCE INFORMATION.

5-50. The following paragraphs contain information on front panel removal, front panel disassembly and front panel assembly. Also included is a cam positioning information for 50 ohm and 75 ohm instruments.

5-51. Front Panel Removal.

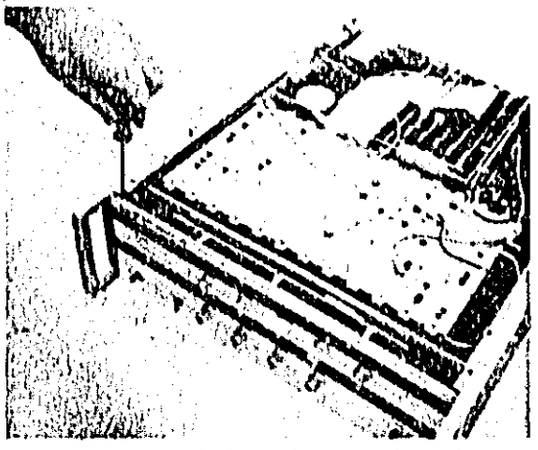
5-52. The following procedure provides information for removing the 3320A/B front panel.

Step A



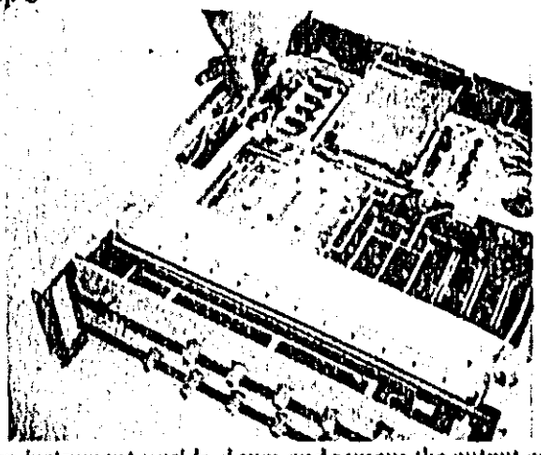
Remove top and bottom covers, MP21 and MP25.

Step B



Remove four screws holding front panel to side castings.

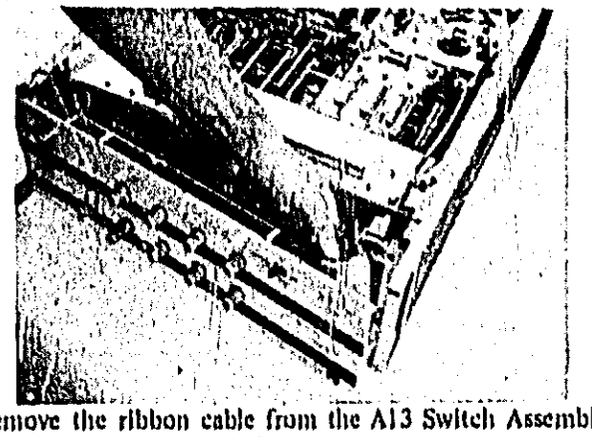
Step C



Turn instrument upside down and remove the output cable at J9.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Step D

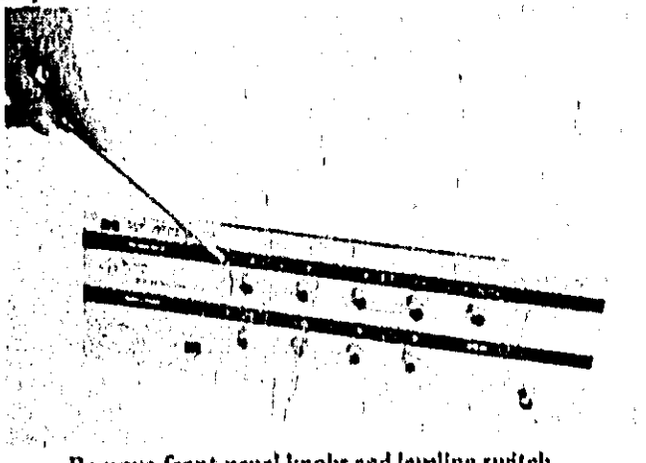


Remove the ribbon cable from the A13 Switch Assembly and remove the front panel.

5-53. Front Panel Disassembly.

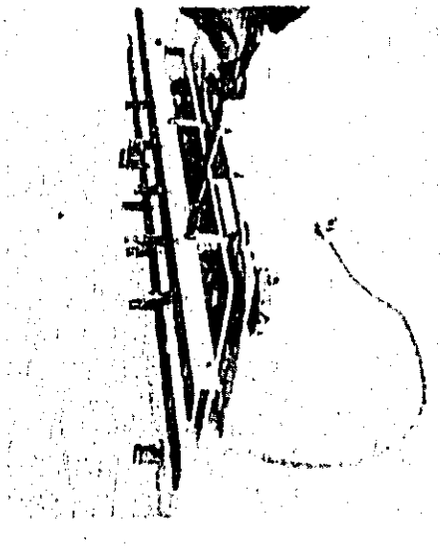
5-54. The following procedure provides information for disassembling the 3320A/B front panel. This will allow replacement of the switch wafers on the A13 Switch Assembly. On earlier 3320A/B instruments the switch wafers were not replaceable. Refer to the backdating Section VIII for serial number breakdown for the earlier instruments.

Step A



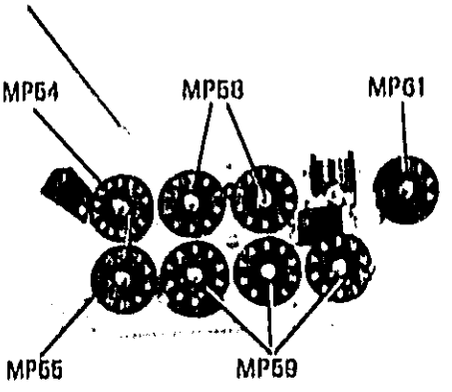
Remove front panel knobs and leveling switch.

Step B



Remove the six screws holding the front panel to the A13 Switch Assembly. Unsolder decimal indicator wires (Note wire colors and destinations).

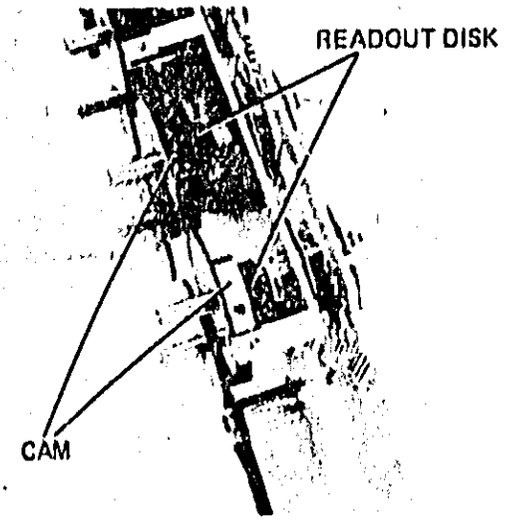
Step C



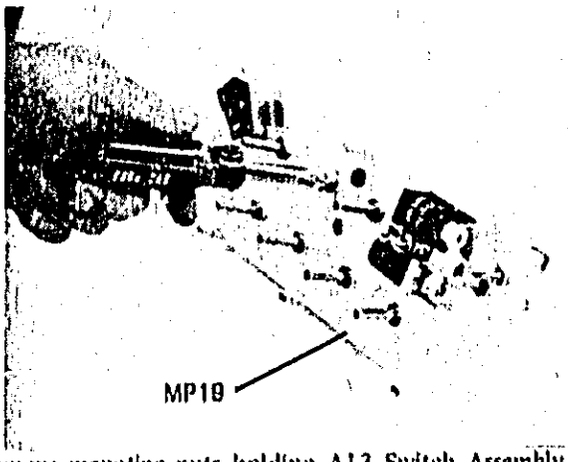
Remove Readout Disks (MP54, MP55, MP58 – 2 each, MP59 – 3 each).

NOTE

MP54, MP55, MP59 and MP61 Readout Disks have cams mounted on them. Do not loosen the Allen screws on the cams.



Step D



Remove mounting nuts holding A13 Switch Assembly to MP19.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

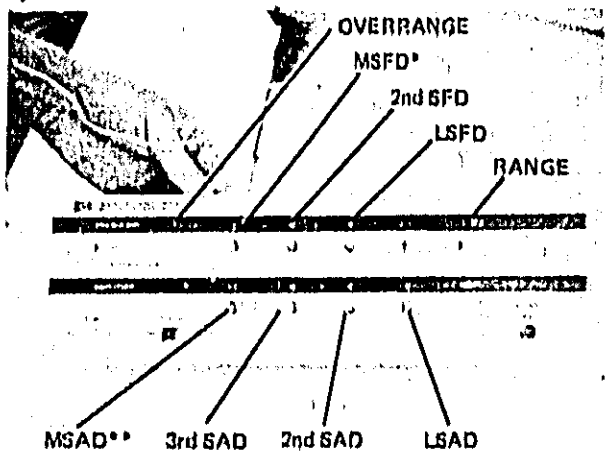
5-55. Front Panel Assembly.

5-56. The following procedure provides information for assembling the 3320A/B front panel.

Step A

Replace MP19 with locking nuts. (See Paragraph 5-54, Step D). Slide Readout Disks onto switch shafts. (Do not tighten Allen screws). Replace and fasten front panel. (See Paragraph 5-54, Step B).

Step B



* Most significant frequency digit.
** Most significant amplitude digit.

Set the frequency, Range and amplitude switches as follows:

MSFD ..... CW
2nd SFD, LSFD, 3rd SAD,
2nd SAD, LSAD ..... gap in rotor blade is up. (See Figure below).
MSAD ..... CW
Range ..... CW, then CCW one position.

Hold Readout Disks in positions listed in Table 5-7 and tighten Allen screws.

NOTE

Maintain approximately 1/16 inch clearance between Readout Disk and front panel. This will prevent scratching of Readout Disks when they are rotated.

TOP OF ASSEMBLY

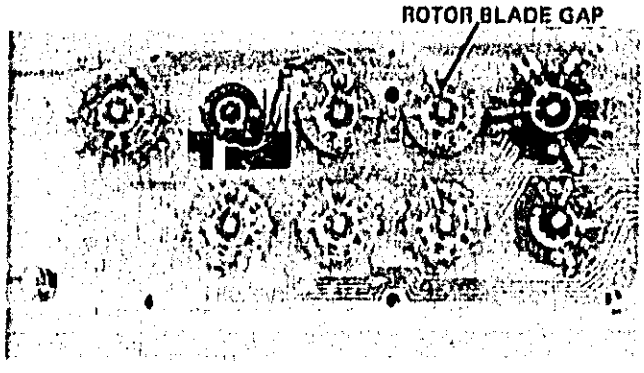


Table 5-7. Readout Disks Positions.

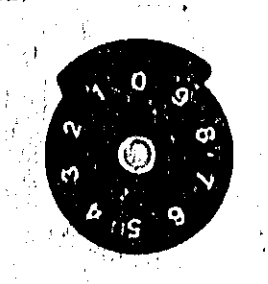
Readout Disk	Number In Front Panel Window
Overrange, MSFD *	12
2nd SFD	0
LSFD	0
Range	3rd K (next to M)
MSAD	+ 2
3rd SAD	0
2nd SAD	0
LSAD	0

* On MSFD and overrange digit, rotate the Readout Disk until the cam trips the overrange flag for a 1 in the overrange window. Continue to rotate the Readout Disk until a 2 appears in the MSFD window.

5-57. Impedance Cam Settings.

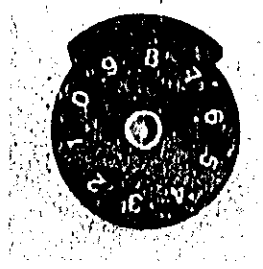
5-58. The following procedures indicate the proper positioning of the impedance cams. These cams are located on the 2nd SAD Readout Disk (See Paragraph 5-56, Step B). Proper positioning of this cam prevents the amplitude controls from being set higher than the maximum output dBm. The maximum output for the standard 3320B is + 26.99 dBm. The maximum output for the 3320B Option 001 is + 24.99 dBm.

Standard 3320B:



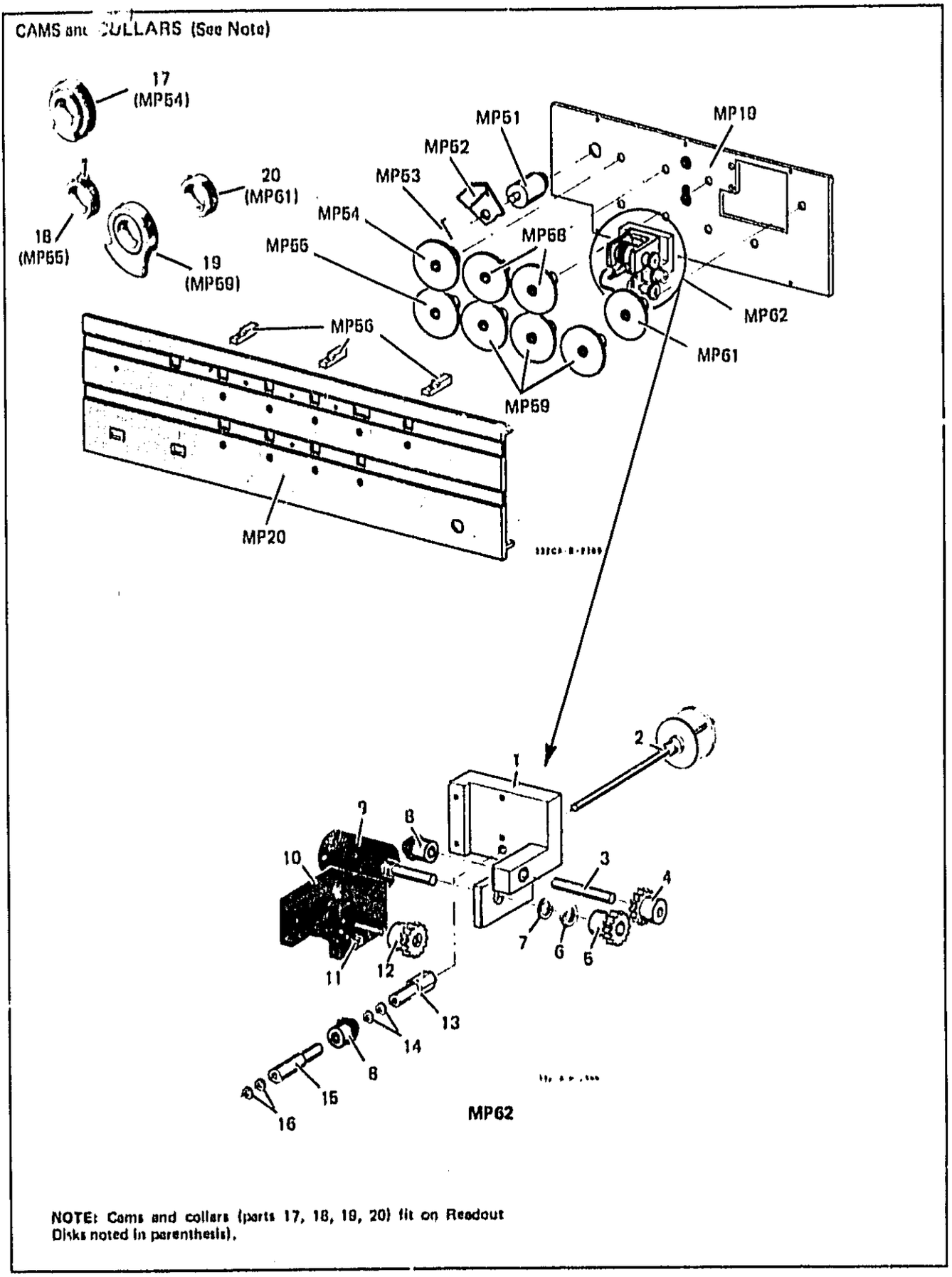
Loosen Allen screws on cam, position cam as shown above, tighten Allen screws.

3320B Option 001:



Loosen Allen screws on cam, position cam as shown above, tighten Allen screws.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



NOTE: Cams and collars (parts 17, 18, 19, 20) fit on Readout Disks noted in parenthesis).

Figure 5-9. Front Panel and Vernier Control Mechanical Parts.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5-59. Variable Capacitor Replacement.

5-60. In some cases, the mounting pins on replacement capacitors for A1C3, A1C6, A8C4, and A9C24 do not correspond exactly to the holes in the printed circuit boards. *Do not attempt to force the pins into the holes.* This will cause stress on the capacitor which may result in a capacitance change and an eventual short circuit between rotor and stator plates. Use the following procedure for replacement.

a. Remove old capacitor from printed circuit board.

b. Clean out the printed circuit board holes.

c. Using needle-nose pliers, preform the replacement capacitor leads so that they will drop easily into the printed circuit board holes. *Do not force the part into the holes*

d. Solder the capacitor leads. Use only sufficient heat to melt the solder. Excessive heat may weaken the solder joint in the capacitor and cause eventual failure.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

PERFORMANCE TEST CARD

Hewlett-Packard Model 3320A/B
Frequency Synthesizer

Test Performed By _____

Date _____

Serial No. _____

Frequency Accuracy

Vernier Out			
1 MHz	.999990 MHz	_____	1.000010 MHz
12.22 MHz	12.219878 MHz	_____	12.220122 MHz
1.10 MHz	1.099989 MHz	_____	1.100011 MHz
00.01 MHz	99.99000 µs	_____	100.00100 µs
Vernier In			
00.0150 MHz	14.000 kHz	_____	16.000 kHz
12.9999 MHz	12.9989 MHz	_____	13.0009 MHz
1000 kHz Range		_____	
100 kHz Range		_____	
10 kHz Range		_____	
1000 Hz Range		_____	

Harmonic Distortion

10 kHz		_____	> -60 dB
129.9 kHz		_____	> -60 dB
150 kHz		_____	> -60 dB
1299 kHz		_____	> -40 dB
4 MHz		_____	> -40 dB
7 MHz		_____	> -40 dB
12.99 MHz		_____	> -40 dB

Spurious		_____	> -60 dB or -110 dBm
Signal to Phase Noise		_____	> -40 dB

3320A Amplitude Accuracy

50 Ohm load	0.9 V rms	_____	1.1 V rms
Open circuit	1.8 V rms	_____	2.2 V rms

3320B Amplitude Accuracy

50 Ohm load	4.975 V rms	_____	5.025 V rms
Open circuit	9.95 V rms	_____	10.05 V rms

Frequency Response

3320A	-0.8 cm	_____	+1 cm
3320B, 0.01 Hz–10 Hz	-0.2 cm	_____	+0.2 cm
3320B, 10 Hz–13 MHz	6930 µV dc	_____	7070 µV dc

Adjusted Errors: Adjusted Errors: (Para. 5-22(e)): C in the formula A = B + C - D

12.99 MHz	.01 MHz	1299 kHz	1 kHz	129.9 kHz	.1 kHz	12.99 kHz	.01 kHz	1299 Hz	10 Hz

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Attenuator Accuracy, 3320B (Para. 5-24(d)): D in the formula A = B + C - D

+ 15.00 dBm	0.998 V dc	_____	1.002 V dc
+ 5.00 dBm	0.996 V dc	_____	1.004 V dc
- 5.00 dBm	0.994 V dc	_____	1.006 V dc
- 15.00 dBm	0.992 V dc	_____	1.008 V dc
- 25.00 dBm	0.990 V dc	_____	1.010 V dc
- 35.00 dBm	0.988 V dc	_____	1.012 V dc
- 45.00 dBm	0.986 V dc	_____	1.014 V dc
- 55.00 dBm	0.984 V dc	_____	1.016 V dc
- 65.00 dBm	0.982 V dc	_____	1.018 V dc

Attenuator Frequency Response, 3320B Record Readings (Para. 5-26(d)): B in the formula A = B + C - D

Record Readings (Step d):

	12.00 MHz	.01 MHz	1299 kHz	1 kHz	129.9 kHz	12.99 kHz	1299 Hz
+ 15							
+ 5							
- 5							
- 15							
- 25							
- 35							
- 45							
- 55							
- 65							

Calculated Error (Para. 5-26(h)): A in the formula A = B + C - D

	12.00 MHz	.01 MHz	1299 kHz	1 kHz	129.9 kHz	12.99 kHz	1299 Hz	Tolerance
+ 15								± 5 mV
+ 5								± 5 mV
- 5								± 12 mV
- 15								± 12 mV
- 25								± 23 mV
- 35								± 23 mV
- 45								± 23 mV
- 55								± 46 mV
- 65								± 46 mV

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

PARTS LIST

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SECTION VI
REPLACEABLE PARTS

6-1. INTRODUCTION.

6-2. This section contains information for ordering replacement parts. Table 6-1 lists parts in alphanumeric order of their reference designators and indicates the -hp- part number of each part, with any applicable notes, and provides the following:

a. Total quantity used in the instrument (TQ column). The total quantity of a part is given the first time the part number appears.

b. Description of the part. See list of abbreviations below.

c. Typical manufacturer of the part in a five-digit code. See Appendix A for a list of manufacturers.

d. Manufacturer's part number.

6-3. Miscellaneous parts are listed at the end of Table 6-1.

6-4. ORDERING INFORMATION.

6-5. To obtain replacement parts, address order or inquiry to your local Hewlett-Packard Field Office. See Appendix B for a list of office locations. Identify parts by their Hewlett-Packard part numbers. Rebuilt boards can be purchased at a reduced price on an exchange basis. See Page 6-31 for a list of 3320A/B rebuilt boards and their part numbers. For more information contact your local Hewlett-Packard Field Office.

6-6. NON-LISTED PARTS.

6-7. To obtain a part that is not listed, include:

a. Instrument model number.
b. Instrument serial number.
c. Description of the part.
d. Function and location of the part.

ABBREVIATIONS

Ag ..... silver	hz ..... hertz (cycle/s) per second	NPO ..... negative positive zero (zero temperature coefficient)	sl ..... slide
Al ..... aluminum	ID ..... inside diameter	ns ..... nanosecond(s) = 10^{-9} seconds	SPDT ..... single pole double throw
A ..... ampere(s)	impg ..... impregnated	nsr ..... not separately replaceable	SPST ..... single pole single throw
Au ..... gold	incd ..... incandescent	Ω ..... ohm(s)	Ta ..... tantalum
C ..... capacitor	ins ..... insulation(ed)	obd ..... order by description	TC ..... temperature coefficient
cer ..... ceramic	kΩ ..... kilohm(s) = 10^3 ohms	OD ..... outside diameter	TiO_2 ..... titanium dioxide
tcef ..... coefficient	kHz ..... kilohertz = 10^3 hertz	p ..... peak	tog ..... toggle
com ..... common	L ..... inductor	pA ..... picoampere(s)	tol ..... tolerance
comp ..... composition	lin ..... linear taper	pc ..... printed circuit	trim ..... trimmer
conn ..... connection	log ..... logarithmic taper	pF ..... picofarad(s) 10^{-12} farads	TSTR ..... transistor
dep ..... deposited	mA ..... milliampere(s) = 10^{-3} amperes	piv ..... peak inverse voltage	V ..... volt(s)
DPDT ..... double pole double throw	MHz ..... megahertz = 10^6 hertz	p/o ..... part of	vacw ..... alternating current working voltage
DPST ..... double pole single throw	MΩ ..... megohm(s) = 10^6 ohms	pos ..... position(s)	var ..... variable
elect ..... electrolytic	met flm ..... metal film	poly ..... polystyrene	vdcw ..... direct current working voltage
encap ..... encapsulated	mfr ..... manufacturer	pot ..... potentiometer	W ..... watt(s)
F ..... farad(s)	ms ..... millisecond	p-p ..... peak to peak	w/ ..... with
FET ..... field effect transistor	mtg ..... mounting	ppm ..... parts per million	ww ..... working inverse voltage
fxd ..... fixed	mV ..... millivolt(s) = 10^{-3} volts	prec ..... precision (temperature coeff'cnt, long term stability and/or tolerance)	w/o ..... without
GaAs ..... gallium arsenide	μF ..... microfarad(s)	R ..... resistor	ww ..... wirewound
GHz ..... gigahertz = 10^9 hertz	μs ..... microsecond(s)	Rh ..... rhodium	* ..... optimum value selected at factory, average value shown (part may be omitted)
gd ..... guarded	μV ..... microvolt(s) = 10^{-6} volts	rms ..... root mean square	** ..... no standard type number assigned selected or special type
Ge ..... germanium	my ..... Mylar®	rot ..... rotary	
gnd ..... ground(ed)	nA ..... nanoampere(s) = 10^{-9} amperes	Se ..... selenium	
H ..... henry(ies)	NC ..... normally closed	sect'n(s) ..... section(s)	
Hg ..... mercury	Ne ..... neon	Si ..... silicon	
	NO ..... normally open		

® Dupont de Nemours

DECIMAL MULTIPLIERS

Prefix	Symbols	Multiplier	Prefix	Symbols	Multiplier
tera	T	10^{12}	con't	c	10^{-2}
giga	G	10^9	milli	m	10^{-3}
mega	M or Meg	10^6	micro	μ	10^{-6}
kilo	K or k	10^3	nano	n	10^{-9}
hecto	h	10^2	pico	p	10^{-12}
deka	da	10	femto	f	10^{-15}
deci	d	10^{-1}	atto	a	10^{-18}

STD B-2734

DESIGNATORS

A ..... assembly	FL ..... filter	Q ..... transistor	TS ..... terminal strip
B ..... motor	HR ..... heater	QCR ..... transistor diode	U ..... microcircuit
BT ..... battery	IC ..... integrated circuit	R ..... resistor	V ..... vacuum tube, neon bulb, photocell, etc.
C ..... capacitor	J ..... jack	RT ..... thermistor	W ..... cable
CR ..... diode	K ..... relay	S ..... switch	X ..... socket
DL ..... delay line	L ..... inductor	T ..... transformer	XDS ..... lampholder
DS ..... lamp	M ..... meter	TB ..... terminal board	XF ..... fuseholder
E ..... misc electronic part	MP ..... mechanical part	TC ..... thermocouple	Y ..... crystal
F ..... fuse	P ..... plug	TP ..... test point	Z ..... network

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 6-1. Replaceable Parts.

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1	03320-66501	1	BOARD ASSY:VERNIER OSCILLATOR	28480	03320-66501
A1C1	0160-2009	8	CAPACITOR-FXD MICA 620 PF 5% 300VDCW	00853	[illegible]
A1C2	0140-0153	1	CAPACITOR-FXD MICA 82 PF 5%	28480	0140-0153
A1C3	0121-0426	2	CAPACITOR-VAR AIR 2.4-9.5 PF	74970	[illegible]
A1C4	0150-0091	120	CAPACITOR-FXD CER 0.01 UF +80-20% 100VDCW	72982	301-000011
A1C5	0150-0093		CAPACITOR-FXD CER 0.01 UF +80-20% 100VDCW	72982	301-000011
A1C6	0121-0432	2	CAPACITOR-VAR AIR 1.7-14.1 PF	74970	[illegible]
A1C7	0150-0093		CAPACITOR-FXD CER 0.01 UF +80-20% 100VDCW	72982	301-000011
A1C8	0180-1746	29	CAPACITOR-FXD ELECT 15 UF 10% 20VDCW	28480	0180-1746
A1C9	0180-1746		CAPACITOR-FXD ELECT 15 UF 10% 20VDCW	28480	0180-1746
A1C10	0180-1746		CAPACITOR-FXD ELECT 15 UF 10% 20VDCW	28480	0180-1746
† A1C11	0180-0018	1	CAPACITOR-FXD 5 UF	28480	Type GA
A1C12	0180-1746		CAPACITOR-FXD ELECT 15 UF 10% 20VDCW	28480	0180-1746
A1C13	0180-1746		CAPACITOR-FXD ELECT 15 UF 10% 20VDCW	28480	0180-1746
A1C14	0150-0093		CAPACITOR-FXD CER 0.01 UF +80-20% 100VDCW	72982	301-000011
A1C15	0180-1746		CAPACITOR-FXD ELECT 15 UF 10% 20VDCW	28480	0180-1746
A1CR1	1901-0040	57	DIODE:SILICON 30MA 30MV	07263	FD01088
A1CR2	0122-0039	4	DIODE:VOLTAGE VARIABLE CAPACITANCE	28480	0122-0039
A1CR3	1901-0040		DIODE:SILICON 30MA 30MV	07263	FD01088
A1IC1	1826-0043	27	IC:LINEAR OPERATIONAL AMPLIFIER	28480	1826-0043
A1IC2	1826-0043		IC:LINEAR OPERATIONAL AMPLIFIER	28480	1826-0043
A1IC3	1826-0043		IC:LINEAR OPERATIONAL AMPLIFIER	28480	1826-0043
A1IC4	1820-0584	24	IC:TTL QUAD 2-INPT NOR GATE	28480	[illegible]
A1IC5	1820-0751	6	IC:DIGITAL	01295	[illegible]
A1IC6	1820-0584		IC:TTL QUAD 2-INPT NOR GATE	28480	[illegible]
A1IC7	1820-0751		IC:DIGITAL	01295	[illegible]
A1IC8	1820-0751		IC:DIGITAL	01295	SN74L90N
A1IC9	1826-0043		IC:LINEAR OPERATIONAL AMPLIFIER	28480	1826-0043
A1L1	9140-0180	1	COIL/CHOKE 2.70 UH 10%	28480	9140-0180
A1L2	9100-1621	1	COIL/CHOKE 18 UH ICR	28480	9100-1621
A1L3	9140-0107	9	COIL:FXD RF 27 UH 10%	54800	1840-18
A1L5	9140-0107		COIL:FXD RF 27 UH 10%	54800	1840-18
A1L6	9140-0107		COIL:FXD RF 27 UH 10%	54800	1840-18
A1L7	9140-0107		COIL:FXD RF 27 UH 10%	54800	1840-18
A1Q1	1853-0020	10	TST:SI PNP(SELECTED FROM 2N3702)	28480	1853-0020
A1Q2	1853-0020		TST:SI PNP(SELECTED FROM 2N3702)	28480	1853-0020
A1Q3	1853-0020		TST:SI PNP(SELECTED FROM 2N3702)	28480	1853-0020
A1Q4	1853-0020		TST:SI PNP(SELECTED FROM 2N3702)	28480	1853-0020
A1Q5	1853-0020		TST:SI PNP(SELECTED FROM 2N3702)	28480	1853-0020
A1Q6	1854-0019	16	TST:SI NPN	28480	1854-0019
A1Q7	1854-0019		TST:SI NPN	28480	1854-0019
A1Q8	1854-0019		TST:SI NPN	28480	1854-0019
A1Q9	1854-0404	21	TST:SI NPN	28480	1854-0404
A1Q10	1853-0020		TST:SI PNP(SELECTED FROM 2N3702)	28480	1853-0020
A1Q11	1854-0404		TST:SI NPN	28480	1854-0404
A1R1	2100-2489	1	R:VAR FLM 5K OHM 10% LIN 1/2W	28480	2100-2489
A1R2	0698-3387	1	R:FXD MET FLM 6.49K OHM 1% 1/8W	19701	MF4C T 0
A1R3	0698-3279	16	R:FXD MET FLM 4990 OHM 1% 1/8W	28480	0698-3279
A1R4	0757-0452	1	R:FXD MET FLM 27.4K OHM 1% 1/8W	28480	0757-0452
A1R5	0757-0441	1	R:FXD MET FLM 8.25K OHM 1% 1/8W	28480	0757-0441
A1R6	0757-0289	3	R:FXD MET FLM 13.3K OHM 1% 1/8W	28480	0757-0289
A1R7	0757-0442	22	R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A1R8	0698-3279		R:FXD MET FLM 4990 OHM 1% 1/8W	28480	0698-3279
A1R9	0757-0283	10	R:FXD MET FLM 2.00K OHM 1% 1/8W	28480	0757-0283
A1R10	0698-4479	3	R:FXD FLM 14K OHM 1% 1/8W	28480	0698-4479
A1R12	0698-3259	5	R:FXD FLM 7.87K OHM 1% 1/8W	28480	0698-3259
A1R13	0698-3259		R:FXD FLM 7.87K OHM 1% 1/8W	28480	0698-3259
A1R14	0757-0283		R:FXD MET FLM 2.00K OHM 1% 1/8W	28480	0757-0283
A1R15	0698-4479		R:FXD FLM 14K OHM 1% 1/8W	28480	0698-4479
A1R16	0698-4480	2	R:FXD MET FLM 15.8K OHM 1% 1/8W	28480	0698-4480
A1R17	0698-4480		R:FXD MET FLM 15.8K OHM 1% 1/8W	28480	0698-4480
A1R18	0757-0283		R:FXD MET FLM 2.00K OHM 1% 1/8W	28480	0757-0283
A1R19	0698-4479		R:FXD FLM 14K OHM 1% 1/8W	28480	0698-4479
A1R20	0698-3160	1	R:FXD MET FLM 31.6K OHM 1% 1/8W	28480	0698-3160
A1R21	0698-3160		R:FXD MET FLM 31.6K OHM 1% 1/8W	28480	0698-3160
A1R23	0698-3558	2	R:FXD MET FLM 4.02K OHM 1% 1/8W	28480	0698-3558
A1R24	0698-4489	1	R:FXD FLM 28K OHM 1% 1/8W	28480	0698-4489
A1R25	0757-0460	2	R:FXD MET FLM 61.9K OHM 1% 1/8W	28480	0757-0460
A1R26	0757-0460		R:FXD MET FLM 61.9K OHM 1% 1/8W	28480	0757-0460
A1R27	0698-4473	3	R:FXD FLM 8.06K OHM 1% 1/8W	28480	0698-4473
A1R28	0757-0459	2	R:FXD MET FLM 56.2K OHM 1% 1/8W	28480	0757-0459
A1R29	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A1R30	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A1R32	0698-3519	1	R:FXD MET FLM 12.4K OHM 1% 1/8W	28480	0698-3519
A1R33	0698-3279		R:FXD MET FLM 4990 OHM 1% 1/8W	28480	0698-3279
A1R34	2100-3103	2	R:VAR CERMET 10K OHM 10% TYPE P 3/4W	28480	2100-3103

† See Section VIII Manual Backdating.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 6-1. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1R35	0698-3279		RESISTOR 4990 OHM 1% 1/8W	28480	0698-3279
A1R36	0698-3279		RESISTOR 4990 OHM 1% 1/8W	28480	0698-3279
A1R37	0757-0283		RESISTOR 2.00K OHM 1% 1/8W	28480	0757-0283
A1R38	0757-0401	4	RESISTOR 100 OHM 1% 1/8W	28480	0757-0401
A1R39	0757-0442		RESISTOR 10.0K OHM 1% 1/8W	28480	0757-0442
A1R40	0757-0430	2	RESISTOR 2.21K OHM 1% 1/8W	28480	0757-0430
A1R41	0757-0442		RESISTOR 10.0K OHM 1% 1/8W	28480	0757-0442
A1R42	0698-3279		RESISTOR 4990 OHM 1% 1/8W	28480	0698-3279
A1R43	0698-4486	1	RESISTOR 24.9K OHM 1% 1/8W	28480	0698-4486
A1R44	0757-0459		RESISTOR 56.2K OHM 1% 1/8W	28480	0757-0459
A1R45	0698-4473		RESISTOR 8.06K OHM 1% 1/8W	28480	0698-4473
A1R46	0757-0401		RESISTOR 100 OHM 1% 1/8W	28480	0757-0401
A1R47	0757-0401		RESISTOR 100 OHM 1% 1/8W	28480	0757-0401
A1R48	0698-3279		RESISTOR 4990 OHM 1% 1/8W	28480	0698-3279
A1R49	0757-0290	2	RESISTOR 6.19K OHM 1% 1/8W	28480	0757-0290
A1R50	2100-3103		RESISTOR CERMET 10K OHM 10% TYPE P 1/4W	28480	2100-3103
A1R51	0698-4435	2	RESISTOR 2.49K OHM 1% 1/8W	28480	0698-4435
A1R53	0757-0442		RESISTOR 10.0K OHM 1% 1/8W	28480	0757-0442
A1R54	0757-0283		RESISTOR 2.00K OHM 1% 1/8W	28480	0757-0283
A1R55	0757-0283		RESISTOR 2.00K OHM 1% 1/8W	28480	0757-0283
A1R56	0684-1051	3	RESISTOR COMP 1MEGOHM 10% 1/4W	01121	CB 1051
A1R57	0757-0280	10	RESISTOR 1K OHM 1% 1/8W	28480	0757-0280
† A1R58			UNASSIGNED		
A1R59	0684-1051		RESISTOR COMP 1MEGOHM 10% 1/4W	01121	CB 1051
A1R60	0684-3321	4	RESISTOR COMP 3300 OHM 10% 1/4W	01121	CB 3321
A1R61	0698-3279		RESISTOR 4990 OHM 1% 1/8W	28480	0698-3279
A1TP1	08443-00041	4	TEST POINT	28480	08443-00041
A1TP2	08443-00041		TEST POINT	28480	08443-00041
A1Y1	0410-0437	1	CRYSTAL:QUARTZ	28480	0410-0437
A2	03320-66502	1	BOARD ASSY:SAMPLER	28480	03320-66502
A2C1	0180-1702	1	CAPACITOR FXD ELECT 160 UF 20% 6VDCW	56289	150D187X0006B2-DYS
A2C2	0150-0093		CAPACITOR FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A2C3	0150-0093		CAPACITOR FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A2C4	0150-0093		CAPACITOR FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A2C5	0150-0093		CAPACITOR FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A2C6	0150-0093		CAPACITOR FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A2C7	0150-0093		CAPACITOR FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A2C8	0150-0093		CAPACITOR FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A2C9	0150-0093		CAPACITOR FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A2C11	0180-1746		CAPACITOR FXD ELECT 15 UF 10% 20VDCW	28480	0180-1746
A2C12	0150-0084	21	CAPACITOR FXD CER 0.1 UF +80-20% 100VDCW	56289	33C4185-CDH
A2C13	0180-0194	1	CAPACITOR FXD TA 150 UF 10% 15VDCW	56289	150D157X9015S2-DYS
A2C14	0150-0084		CAPACITOR FXD CER 0.1 UF +80-20% 100VDCW	56289	33C4185-CDH
A2C15	0150-0084		CAPACITOR FXD CER 0.1 UF +80-20% 100VDCW	56289	33C4185-CDH
A2C16	0160-0154	1	CAPACITOR FXD MY 0.015 UF 10%	56289	192P15392-P15
A2C17	0160-2229	1	CAPACITOR FXD MICA 3000 PF 5%	28480	0160-2229
A2C18	0160-2199	3	CAPACITOR FXD MICA 30 PF 5% 300VDCW	28480	0160-2199
A2C19	0160-2291	1	CAPACITOR FXD MY 0.16 UF 10% 80VDCW	56289	192P16499B-PTS
A2C21	0150-0084		CAPACITOR FXD CER 0.1 UF +80-20% 100VDCW	56289	33C4185-CDH
A2C22	0180-1746		CAPACITOR FXD ELECT 15 UF 10% 20VDCW	28480	0180-1746
A2C23	0180-1746		CAPACITOR FXD ELECT 15 UF 10% 20VDCW	28480	0180-1746
A2C24	0150-0093		CAPACITOR FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A2C25	0170-0040	1	CAPACITOR FXD MY 0.047 UF 10% 200VDCW	56289	192P47392-P15
A2C26	0150-0093		CAPACITOR FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
† A2CR1	1910-0016		DIODE:GER 60 MA 60 WIV	93332	D2361
† A2CR2	1910-0016		DIODE:GER 60 MA 60 WIV	93332	D2361
† A2CR3	1910-0016		DIODE:GER 60 MA 60 WIV	93332	D2361
† A2CR4	1910-0016		DIODE:GER 60 MA 60 WIV	93332	D2361
A2CR5	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A2CR6	1901-0050	8	DIODE:SI 200 MA AT 1V	07263	FDA 6308
A2CR7	1901-0053	3	DIODE:SILICON 30VDCW	07263	FD3444
A2CR8	1901-0050		DIODE:SI 200 MA AT 1V	07263	FDA 6308
A2CR9	1901-0053		DIODE:SILICON 30VDCW	07263	FD3444
A2CR11	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A2CR12	1901-0050		DIODE:SI 200 MA AT 1V	07263	FDA 6308
A2CR13	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A2CR14	1901-0050		DIODE:SI 200 MA AT 1V	07263	FDA 6308
A2IC1	1820-0370	1	IC:TTL QUAD 2-INPT NAND GATE	01295	SN5479
† A2IC2	1820-0388	1	IC:TTL TRIPLE 3-INPT AND GATE	01295	SN74S54
A2IC3	1820-0751		IC:DIGITAL	01295	SN74L96N
A2IC4	1820-0751		IC:DIGITAL	01295	SN74L96N
A2IC5	1820-0751		IC:DIGITAL	01295	SN74L96N
A2IC6	1820-0752	1	IC:DIGITAL TTL	01295	SN7358
A2IC7	1820-0469	1	IC:DIGITAL TTL HI-SPEED F/F	01295	SN19214
† A2IC8	1820-0885	1	IC:DIGITAL TTL DUAL J-K FF	04713	SC91590K

† See Section VIII, Manual Backdating

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 6-1. Replaceable Parts (cont'd).

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A2IC9	1826-0065	1	IC: LINEAR	07263	SL72485
A2L1	9100-1618	8	COIL:MOLDED CHOKE 5.60 UH	28480	9100-1618
† A2L2			NOT ASSIGNED		
A2L3	9100-1618		COIL:MOLDED CHOKE 5.60 UH	28480	9100-1618
A2L4	9100-1629	3	COIL/CHOKE 47.0 UH 5%	28480	9100-1629
A2L5	9140-0137	1	CHOKE/COIL FXD 1000 UH 5%	28480	9140-0137
A2Q1	1854-0010		TSTR:SI NPN	28480	1854-0010
A2Q2	1854-0354	7	TSTR:SI NPN	28480	1854-0354
A2Q7	1953-0203	27	TSTR:SI PNP	28480	1853-0203
A2Q8	1854-0404		TSTR:SI NPN	28480	1854-0404
A2Q4	1854-0354		TSTR:SI NPN	28480	1854-0354
A2Q6	1854-0404		TSTR:SI NPN	28480	1854-0404
A2R1	C683-2715	1	RESD COMP 270 OHM 5% 1/4W	01121	CB 2715
A2R2	C683-3315	7	RESD COMP 330 OHM 5% 1/4W	01121	CB 3315
A2R3	0683-5125	17	RESD COMP 5100 OHM 5% 1/4W	01121	CB 5125
A2R4	0683-5125		RESD COMP 5100 OHM 5% 1/4W	01121	CB 5125
A2R5	C683-2025	14	RESD COMP 2000 OHM 5% 1/4W	01121	CB 2025
A2R6	0683-2025		RESD COMP 2000 OHM 5% 1/4W	01121	CB 2025
A2R7	0683-2025		RESD COMP 2000 OHM 5% 1/4W	01121	CB 2025
† A2R8			NOT ASSIGNED		
† A2R9	0683-1015	16	RESD COMP 100 OHM 5% 1/4W	01121	CB 1015
A2R11	0683-1535	7	RESD COMP 15K OHM 5% 1/4W	01121	CB 1535
A2R12	0683-2025		RESD COMP 2000 OHM 5% 1/4W	01121	CB 2025
A2R13	0683-1015	4	RESD COMP 100 OHM 5% 1/4W	01121	CB 1015
A2R14	C683-2025		RESD COMP 2000 OHM 5% 1/4W	01121	CB 2025
A2R15	0698-6745	1	RESD FLM 22 OHM 5% 1/8W	28480	0698-6745
A2R16	C757-0280		RESD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A2R17	0757-0280		RESD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A2R18	C698-4123	7	RESD MET FLM 499 OHM 1% 1/8W	28480	0698-4123
A2R19	0757-0442		RESD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A2R21	C757-0442		RESD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A2R22	0757-0346	8	RESD MET FLM 10 OHM 1% 1/8W	28480	0757-0346
A2R23	C757-0346		RESD MET FLM 10 OHM 1% 1/8W	28480	0757-0346
A2R24	0757-0346		RESD MET FLM 10 OHM 1% 1/8W	28480	0757-0346
A2R25	0757-0346		RESD MET FLM 10 OHM 1% 1/8W	28480	0757-0346
A2R26	0757-0438	6	RESD MET FLM 5.11K OHM 1% 1/8W	28480	0757-0438
A2R27	C757-0442		RESD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A2R28	0698-3497	1	RESD FLM 6.04K OHM 1% 1/8W	28480	0698-3497
A2R29	0757-0442		RESD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A2R31	0757-0438		RESD MET FLM 5.11K OHM 1% 1/8W	28480	0757-0438
A2R32	0757-0438		RESD MET FLM 5.11K OHM 1% 1/8W	28480	0757-0438
A2R33	0757-0438		RESD MET FLM 5.11K OHM 1% 1/8W	28480	0757-0438
A2R34	C757-0438		RESD MET FLM 5.11K OHM 1% 1/8W	28480	0757-0438
A2R35	0757-0442		RESD MET FLM 10 K OHM 1% 1/8 W	19701	MF4C T-0
A2T1	9100-1383	1	TRANSFORMER: TOROID	28480	9100-1283
A3	03320-66503	1	BOARD ASSY: VTO	28480	03320-66503
A3C1	0180-0251	21	CAPD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A3C2	0160-0167	1	CAPD MYLAR 4700 PF 10% 200VDCW	56289	192P47292-PTS
A3C3	0140-0200	2	CAPD MICA 390 PF 5% 300VDCW	00853	RDM15F391J3S
A3C4	0160-0207	3	CAPD MYLAR 0.01UF 5% 200VDCW	28480	0160-0207
A3C5	0160-0207		CAPD MYLAR 0.01UF 5% 200VDCW	28480	0160-0207
A3C6	0170-0063	1	CAPD MY 0.020 UF 10% 400VDCW	56289	148P170A-PUN
A3C8	0180-1746		CAPD ELECT 15 UF 10% 20VDCW	28480	0180-1746
A3C9	0150-0093		CAPD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A3C10	0180-1746		CAPD ELECT 15 UF 10% 20VDCW	28480	0180-1746
A3C12	0160-2199		CAPD MICA 30 PF 5% 300VDCW	28480	0160-2199
A3C13	0160-2199		CAPD MICA 30 PF 5% 300VDCW	28480	0160-2199
A3C14	0150-0093		CAPD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A3C15	0150-0093		CAPD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A3C16	0150-0093		CAPD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A3C17	0150-0093		CAPD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A3C18	0150-0093		CAPD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A3C19	0150-0093		CAPD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A3C20	0150-0093		CAPD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A3C21	0150-0084		CAPD CER 0.1 UF +80-20% 100VDCW	56289	33C4185-CDH
A3C22	0150-0084		CAPD CER 0.1 UF +80-20% 100VDCW	56289	33C4185-CDH
A3C23	0180-0374	7	CAPD TANT. 10 UF 10% 20VDCW	56289	150D106X902082-DYS
A3C24	0180-0374		CAPD TANT. 10 UF 10% 20VDCW	56289	150D106X902082-DYS
A3C25	0150-0093		CAPD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A3C26	0160-0093		CAPD CER 0.01 UF +80-20% 100VDCW	28480	0160-0093
A3C27	0140-0149	1	CAPD MICA 470PF 5% 300VDCW	28480	0140-0149
A3CR1, 2	1901-0618	2	DIODE:HOT CARRIER	28480	1901-0618
A3CR3	0122-0059		DIODE:VOLTAGE VARIABLE CAPACITANCE	28480	0122-0059
A3CR4	0122-0059		DIODE:VOLTAGE VARIABLE CAPACITANCE	28480	0122-0059
A3IC1	1826-0043		IC:LINEAR OPERATIONAL AMPLIFIER	28480	1826-0043
A3IC2	1920-0306	1	INTEGRATED CIRCUIT	28480	1820-0306
A3IC3	1826-0043		IC:LINEAR OPERATIONAL AMPLIFIER	28480	1826-0043

† See Section VIII, Manual Backdating.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 6-1. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A3IC4	1826-0043		IC:LINEAR OPERATIONAL AMPLIFIER	28480	1826-0043
A3L1*	9140-0096	4	COIL:FXD RF 1 UH	28480	9140-0096
A3L4	9140-0179	2	COIL/CHOKE 22.0 UH 10%	28480	9140-0179
A3L5	9140-0098	2	COIL:FXD RF 2.2 UH	28480	9140-0098
A3L5	9100-1629		COIL/CHOKE 47.0 UH 5%	28480	9100-1629
A3L6	9100-1629		COIL/CHOKE 47.0 UH 5%	28480	9100-1629
A3L7	9100-1622		COIL FXD 24 UH 5%	28480	9100-1622
A3P1	1250-1314	4	CONNECTOR:RF COAX,CENTER CONTACT	98291	52-054-0000
A3Q1	1854-0404		TSTR:SI NPN	28480	1854-0404
A3Q2	1854-0404		TSTR:SI NPN	28480	1854-0404
A3Q3	1854-0404		TSTR:SI NPN	28480	1854-0404
A3Q4	1854-0404		TSTR:SI NPN	28480	1854-0404
A3Q5	1854-0404		TSTR:SI NPN	28480	1854-0404
A3Q6	1854-0404		TSTR:SI NPN	28480	1854-0404
A3Q7	1854-0404		TSTR:SI NPN	28480	1854-0404
A3Q8	1854-0404		TSTR:SI NPN	28480	1854-0404
A3Q9	1854-0404		TSTR:SI NPN	28480	1854-0404
A3Q10	1853-0010	10	TSTR:SI PNP(SELECTED FROM 2N3251)	28480	1853-0010
A3Q11	1854-0345	6	TSTR:SI NPN	80131	2N5179
A3Q12	1854-0345		TSTR:SI NPN	80131	2N5179
A3Q13	1854-0345		TSTR:SI NPN	80131	2N5179
A3Q14	1854-0404		TSTR:SI NPN	28480	1854-0404
A3Q15	1854-0404		TSTR:SI NPN	28480	1854-0404
A3Q16	1854-0404		TSTR:SI NPN	28480	1854-0404
A3Q17	1853-0010		TSTR:SI PNP(SELECTED FROM 2N3251)	28480	1853-0010
A3R1	0683-6825	11	R:FXD COMP 6800 OHM 5% 1/4W	01121	CB 6825
A3R2	0683-7535	10	R:FXD COMP 75K OHM 5% 1/4W	01121	CB 7535
A3R3	0683-5145	2	R:FXD COMP 510K OHM 5% 1/4W	01121	CB 5145
A3R4	0683-5145		R:FXD COMP 510K OHM 5% 1/4W	01121	CB 5145
A3R5	0683-6825		R:FXD COMP 6800 OHM 5% 1/4W	01121	CB 6825
A3R6	0681-7838	5	R:FXD COMP 78 K OHM 5% 1/4 W	01121	CB 7838
A3R7	0683-2045	1	R:FXD COMP 200K OHM 5% 1/4W	01121	CB 2045
A3R8	0683-3045	1	R:FXD COMP 300K OHM 5% 1/4W	01121	CB 3045
A3R9	0683-6825		R:FXD COMP 6800 OHM 5% 1/4W	01121	CB 6825
A3R10	0683-7535		R:FXD COMP 75K OHM 5% 1/4W	01121	CB 7535
A3R12	0683-1045	6	R:FXD COMP 100K OHMS 5% 1/4W	01121	CB 1045
A3R13	0683-1545	3	R:FXD COMP 150K OHM 5% 1/4W	01121	CB 1545
A3R14	0683-6825		R:FXD COMP 6800 OHM 5% 1/4W	01121	CB 6825
A3R15	0683-7535		R:FXD COMP 75K OHM 5% 1/4W	01121	CB 7535
A3R16	0757-0465	2	R:FXD MET FLM 100K OHM 1% 1/8W	28480	0757-0465
A3R17	0757-0465		R:FXD MET FLM 100K OHM 1% 1/8W	28480	0757-0465
A3R18	0683-6825		R:FXD COMP 6800 OHM 5% 1/4W	01121	CB 6825
A3R19	0683-7535		R:FXD COMP 75K OHM 5% 1/4W	01121	CB 7535
A3R20	0698-3228	4	R:FXD MET FLM 49.9K OHM 1% 1/8W	28480	0698-3228
A3R22	0698-3228		R:FXD MET FLM 49.9K OHM 1% 1/8W	28480	0698-3228
A3R23	0683-6825		R:FXD COMP 6800 OHM 5% 1/4W	01121	CB 6825
A3R24	0683-7535		R:FXD COMP 75K OHM 5% 1/4W	01121	CB 7535
A3R25	0757-0449	9	R:FXD FLM 20K OHM 1% 1/8W	28480	0757-0449
A3R26	0757-0453	2	R:FXD MET FLM 30.1K OHM 1% 1/8W	28480	0757-0453
A3R27	0683-6825		R:FXD COMP 6800 OHM 5% 1/4W	01121	CB 6825
A3R28	0683-7535		R:FXD COMP 75K OHM 5% 1/4W	01121	CB 7535
A3R29	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A3R30	0757-0446		R:FXD MET FLM 15.0K OHM 1% 1/8W	28480	0757-0446
A3R32	0683-6825		R:FXD COMP 6800 OHM 5% 1/4W	01121	CB 6825
A3R33	0683-7535		R:FXD COMP 75K OHM 5% 1/4W	01121	CB 7535
A3R34	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A3R35	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A3R36	C698-3182	1	R:FXD MET FLM 46.4K OHM1% 1/8W	19701	MF4C T-0
A3R37	0757-0445	1	R:FXD FLM 13K OHM 1% 1/8W	28480	0757-0445
A3R38	2100-2521	2	R:VAR FLM 2000 OHM 10% LIN 1/2W	28480	2100-2521
A3R39	0683-6825		R:FXD COMP 6800 OHM 5% 1/4W	01121	CB 6825
A3R40	0683-2215	1	R:FXD COMP 220 OHM 5% 1/4W	01121	CB 2215
A3R41	0683-1015		R:FXD COMP 100 OHM 5% 1/4W	01121	CB 1015
A3R42	0757-0273		R:FXD MET FLM 3.01 K OHM 1% 1/8 W	75042	CEA T-0
A3R43	0757-0283		R:FXD MET FLM 2.00K OHM 1% 1/8W	28480	0757-0283
A3R44	0683-6825		R:FXD COMP 6800 OHM 5% 1/4W	01121	CB 6825
A3R45	0757-0437	2	R:FXD MET FLM 4750 OHM 1% 1/8W	28480	0757-0437
A3R46	0757-0420	1	R:FXD MET FLM 750 OHM 1% 1/8W	28480	0757-0420
A3R47	0757-0410	1	R:FXD MET FLM 301 OHM 1% 1/8W	28480	0757-0410
A3R48	0757-1094	2	R:FXD MET FLM 1.47K OHM 1% 1/8W	28480	0757-1094
A3R49	0757-1094		R:FXD MET FLM 1.47K OHM 1% 1/8W	28480	0757-1094
A3R50	0683-5105		R:FXD COMP 5[illegible] OHM 5% 1/4W	01121	CB 5105
A3R51,R53	0757-0449		R:FXD FLM 20K OHM 1% 1/8W	28480	0757-0449
A3R54	0757-0449		R:FXD FLM 20K OHM 1% 1/8W	28480	0757-0449
A3R55	0757-0447	4	R:FXD FLM 16.2K OHM 1% 1/8W	28480	CMF-1/10-32 T-1

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 6-1. Replaceable Parts (cont d).

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A3R56	0757-0442		R FXD FLM 10K OHM 1% 1/8W	81637	CMF 1/10 3271-1
A3R57	C683-2025		RIFXD COMP 2000 OHM 5% 1/4W	01121	CB 2025
A3R58	0683-6825		RIFXD COMP 6800 OHM 5% 1/4W	01121	CB 6825
A3R59	C683-5105		RIFXD COMP 51 OHM 5% 1/4W	01121	CB 5105
A3R60	0683-3915	2	RIFXD COMP 390 OHM 5% 1/4W	01121	CB 3915
A3R62	C683-3915		RIFXD COMP 390 OHM 5% 1/4W	01121	CB 3915
A3R63	0883-3338	8	R FXD COMP 33000HM 8% 1/4W	01121	CB 3338
A3R64	0683-1025	66	RIFXD COMP 1000 OHM 5% 1/4W	01121	CB 1025
A3R65	0683-2025		RIFXD COMP 2000 OHM 5% 1/4W	01121	CB 2025
A3R66	C683-5105		RIFXD COMP 51 OHM 5% 1/4W	01121	CB 5105
A3R67	0683-3315		RIFXD COMP 330 OHM 5% 1/4W	01121	CB 3315
A3R68	0683-1625	1	RIFXD COMP 1600 OHM 5% 1/4W	01121	CB 1625
A3R69	0683-4325	4	RIFXD COMP 4300 OHM 5% 1/4W	01121	CB 4325
A3R70	0683-5105		RIFXD COMP 51 OHM 5% 1/4W	01121	CB 5105
A3R71	0683-5115	14	RIFXD COMP 510 OHM 5% 1/4W	01121	CB 5115
A3R72	0683-5115		RIFXD COMP 510 OHM 5% 1/4W	01121	CB 5115
A3R73	0683-5105		RIFXD COMP 51 OHM 5% 1/4W	01121	CB 5105
A3R74	0683-6225	1	RIFXD COMP 6200 OHM 5% 1/4W	01121	CB 6225
A3R75	0683-3025		RIFXD COMP 3000 OHM 5% 1/4W	01121	CB 3025
A3R76	0683-1025		RIFXD COMP 1000 OHM 5% 1/4W	01121	CB 1025
A3R77	0683-2425	7	RIFXD COMP 2400 OHM 5% 1/4W	01121	CB 2425
A3R78	0683-2015	8	RIFXD COMP 200 OHM 5% 1/4W	01121	CB 2015
A3R79	0757-0444		RIFXD MET FLM 12.1K OHM 1% 1/8W	28480	0757-0444
A3R80	0757-0451	1	RIFXD MET FLM 24.3K OHM 1% 1/8W	28480	0757-0451
A3R81	0698-4473		RIFXD FLM 8.06K OHM 1% 1/8W	28480	0698-4473
A3R82	0683-1025		RIFXD COMP 1000 OHM 5% 1/4W	01121	CB 1025
A3R83	0757-0449		RIFXD FLM 20K OHM 1% 1/8W	28480	0757-0449
A3R84	0757-0449		RIFXD FLM 20K OHM 1% 1/8W	28480	0757-0449
A3R85	0757-0447		R FXD FLM 16.2K OHM 1% 1/8W	28480	0757-0447
A4	03320-66604	1	BOARD ASSY: RNG DIV	28480	03320-66604
A4A1	03320-67701	1	FILTER ASSY	28480	03320-67701
A4A2	03320-62702	2	FILTER ASSY	28480	03320-62702
A4C1	0150-0050	47	CIFXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E102Z526-CDH
A4C2	0150-0093		CIFXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A4C3	0150-0050		CIFXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E102Z526-CDH
A4C4	0160-0939	2	CI FXD MICA 430 PF 5% 300 VDCW	28480	0160-0939
A4C5	0160-0938	9	CIFXD MICA 1090 PF 5%	72136	RDM15E102JJC
A4C6	0160-2035	2	CIFXD MICA 750 PF 5% 300VDCW	00853	RDM15E751J3S
A4C7	0160-0939		CI FXD MICA 430 PF 5% 300 VDCW	28480	0160-0939
A4C8	0150-0093		CIFXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A4C9	0150-0093		CIFXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A4C10	0150-0093		CIFXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A4C11	0150-0050		CIFXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E102Z526-CDH
A4C12	0150-0093		CIFXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A4C13	0150-0050		CIFXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E102Z526-CDH
A4C14	0150-0050		CIFXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E102Z526-CDH
A4C15	0150-0050		CIFXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E102Z526-CDH
A4C16	0150-0050		CIFXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E102Z526-CDH
A4C17	0150-0093		CIFXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A4C18	0150-0050		CIFXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E102Z526-CDH
A4C19	0150-0050		CIFXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E102Z526-CDH
A4C20	0150-0050		CIFXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E102Z526-CDH
A4C21	0150-0093		CIFXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A4C22	0150-0093		CIFXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A4C23	0150-0050		CIFXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E102Z526-CDH
A4C24	0150-0050		CIFXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E102Z526-CDH
A4C25	0150-0050		CIFXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E102Z526-CDH
A4C26	0150-0093		CIFXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A4C27	0150-0050		CIFXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E102Z526-CDH
A4C28	0160-2009		CIFXD MICA 820 PF 5% 300VDCW	00853	RDM15FM21J3C
A4C29	0160-0938		CIFXD MICA 1000 PF 5%	72136	RDM15E102JJC
A4C30	0160-0538		CIFXD MICA 1000 PF 5%	72136	RDM15E102JJC
A4C31	0150-0093		CIFXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A4C32	0150-0093		CIFXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A4C33	0150-0093		CIFXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A4C34	0150-0050		CIFXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E102Z526-CDH
A4C35	0150-0093		CIFXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A4C36	0150-0050		CIFXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E102Z526-CDH
A4C37	0150-0050		CIFXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E102Z526-CDH
A4C38	0150-0050		CIFXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E102Z526-CDH
A4C39	0150-0050		CIFXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E102Z526-CDH
A4C40	0150-0093		CIFXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A4C41	0150-0050		CIFXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E102Z526-CDH
A4C42	0150-0050		CIFXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E102Z526-CDH
A4C43	0150-0050		CIFXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E102Z526-CDH
A4C44	0150-0093		CIFXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 6-1. Replaceable Parts (cont'd).

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A4C45	0150-0093		C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-000011
A4C46	0150-0050		C:FXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E102Z526-CDH
A4C47	0150-0050		C:FXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E102Z52a-CDH
A4C48	0180-1746		C:FXD ELECT 15 UF 10% 20VDCW	28480	0180-1746
A4C49	0180-1746		C:FXD ELECT 15 UF 10% 20VDCW	28480	0180-1746
A4IC1	1820-0460	5	IC: DIGITAL	18324	NH280A
A4IC2	1820-0427	5	IC:LINEAR MODULE	04713	SG8232GK
A4IC3	1826-0058	8	IC:LINEAR VIDEO AMPLIFIER	18324	NE 501A
A4IC4	1826-0058		IC:LINEAR VIDEO AMPLIFIER	18324	NE 501A
A4IC5	1820-0450	4	IC:DIGITAL TTL	18324	NH290A
A4IC6	1820-0427		IC: LINEAR MODULE	04713	SG8232GK
A4IC7	1826-0058		IC:LINEAR VIDEO AMPLIFIER	18324	NE 501A
A4IC8	1826-0058		IC:LINEAR VIDEO AMPLIFIER	18324	NE 501A
A4L1	9100-3248	2	COIL:FXD 10 UH	28480	9100-3248
A4L2	9100-3248		COIL:FXD 10 UH	28480	9100-3248
A4L3	9100-3247	3	COIL:FXD 15 UH	28480	9100-3247
A4L4	9100-1618		COIL:MOLDED CHOKE 5.60 UH	28480	9100-1618
A4L5	9100-1618		COIL:MOLDED CHOKE 5.60 UH	28480	9100-1618
A4L6 THRU L11	9170-0016		FERRITE BEADS	28480	9170-0016
A4P1	1250-1314		CONNECTOR: RF COAX, CENTER CONTACT	0626	52 084 0040
A4Q1	1853-0705		TSTR: SI PNP	28480	1853-0705
A4Q2	1853-0203		TSTR:SI PNP	28480	1853-0203
A4Q3	1854-0009	6	TSTR:SI NPN	80131	2N709
A4Q4	1854-0071	18	TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A4Q5	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A4Q6	1853-0010		TSTR:SI PNP(SELECTED FROM 2N3251)	28480	1853-0010
A4Q7	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A4Q8	1853-0203		TSTR:SI PNP	28480	1853-0203
A4Q9	1853-0203		TSTR:SI PNP	28480	1853-0203
A4Q10	1854-0009		TSTR:SI NPN	80131	2N709
A4Q11	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A4Q12	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A4Q13	1853-0010		TSTR:SI PNP(SELECTED FROM 2N3251)	28480	1853-0010
A4Q14	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A4R1	0683-6215	31	RES:FXD COMP 620 OHM 5% 1/4W	01121	CB 6215
A4R2	0683-5625	10	RES:FXD COMP 5600 OHM 5% 1/4W	01121	CB 5625
A4R3	C683-5625		RES:FXD COMP 5600 OHM 5% 1/4W	01121	CB 5625
A4R4	C683-6215		RES:FXD COMP 620 OHM 5% 1/4W	01121	CB 6215
A4R5	C683-6215		RES:FXD COMP 620 OHM 5% 1/4W	01121	CB 6215
A4R6	0683-1025		RES:FXD COMP 1000 OHM 5% 1/4W	01121	CB 1025
A4R7	C683-2015		RES:FXD COMP 200 OHM 5% 1/4W	01121	CB 2015
A4R8	0683-6215		RES:FXD COMP 620 OHM 5% 1/4W	01121	CB 6215
A4R9	0683-4715		RES:FXD COMP 470 OHM 5% 1/4W	01121	CB 4715
A4R10	0683-5105		RES:FXD COMP 51 OHM 5% 1/4W	01121	CB 5105
A4R11	C683-6815	1	RES:FXD COMP 680 OHM 5% 1/4W	01121	CB 6815
A4R12	0683-7505	1	RES:FXD COMP 75 OHM 5% 1/4W	01121	CB 7505
A4R13	0683-2225	8	RES:FXD COMP 2.2K OHM 5% 1/4W	01121	CB 2225
A4R14	0683-5105		RES:FXD COMP 51 OHM 5% 1/4W	01121	CB 5105
A4R15	0683-1125	10	RES:FXD COMP 1100 OHM 5% 1/4W	01121	CB 1125
A4R16	0683-3615	1	RES:FXD COMP 360 OHM 5% 1/4W	01121	CB 3615
A4R17	C683-1025		RES:FXD COMP 1000 OHM 5% 1/4W	01121	CB 1025
A4R18	0683-1315	9	RES:FXD COMP 130 OHM 5% 1/4W	01121	CB 1315
A4R19	0683-1025		RES:FXD COMP 1000 OHM 5% 1/4W	01121	CB 1025
A4R20	0683-4715	6	RES:FXD COMP 470 OHM 5% 1/4W	01121	CB 4715
A4R21	C683-1315		RES:FXD COMP 130 OHM 5% 1/4W	01121	CB 1315
A4R23	0683-3325	13	RES:FXD COMP 3300 OHM 5% 1/4W	01121	CB 3325
A4R24	C683-3025		RES:FXD COMP 3000 OHM 5% 1/4W	01121	CB 3025
A4R25	0683-1025		RES:FXD COMP 1000 OHM 5% 1/4W	01121	CB 1025
A4R26	0683-1025		RES:FXD COMP 1000 OHM 5% 1/4W	01121	CB 1025
A4R27	0683-4735	6	RES:FXD COMP 47K OHM 5% 1/4W	01121	CB 4735
A4R28	0683-6835	4	RES:FXD COMP 68K OHM 5% 1/4W	01121	CB 6835
A4R29	0683-1125		RES:FXD COMP 1100 OHM 5% 1/4W	01121	CB 1125
A4R30	C683-6215		RES:FXD COMP 620 OHM 5% 1/4W	01121	CB 6215
A4R31	0683-1045		RES:FXD COMP 100K OHMS 5% 1/4W	01121	CB 1045
A4R32	0683-2735	9	RES:FXD COMP 27K OHM 5% 1/4W	01121	CB 2735
A4R33	0683-7525	7	RES:FXD COMP 7500 OHM 5% 1/4W	01121	CB 7525
A4R34	0683-5125		RES:FXD COMP 5100 OHM 5% 1/4W	01121	CB 5125
A4R35	0683-6215		RES:FXD COMP 620 OHM 5% 1/4W	01121	CB 6215
A4R36	0683-5625		RES:FXD COMP 5600 OHM 5% 1/4W	01121	CB 5625
A4R37	0683-5625		RES:FXD COMP 5600 OHM 5% 1/4W	01121	CB 5625
A4R38	C683-6215		RES:FXD COMP 620 OHM 5% 1/4W	01121	CB 6215
A4R39	0683-6215		RES:FXD COMP 620 OHM 5% 1/4W	01121	CB 6215
A4R40	C683-1025		RES:FXD COMP 1000 OHM 5% 1/4W	01121	CB 1025
A4R41	0683-2015		RES:FXD COMP 200 OHM 5% 1/4W	01121	CB 2015
A4R42	C683-6215		RES:FXD COMP 620 OHM 5% 1/4W	01121	CB 6215
A4R43	0683-6215		RES:FXD COMP 620 OHM 5% 1/4W	01121	CB 6215

† See Section VIII, Manual Backdating

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 6-1. Replaceable Parts (cont'd).

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A4R44	0683-5105		RESISTOR COMP 51 OHM 5% 1/4W	01121	CB 5105
A4R45	0683-9115	3	RESISTOR COMP 910 OHM 5% 1/4W	01121	CB 9115
A4R46	0683-1115	3	RESISTOR COMP 110 OHM 5% 1/4W	01121	CB 1115
A4R48	0683-5105		RESISTOR COMP 51 OHM 5% 1/4W	01121	CB 5105
A4R47	0683-4325		RESISTOR COMP 4300 OHM 5% 1/4W	01121	CB 4325
A4R49	0683-1125		RESISTOR COMP 1100 OHM 5% 1/4W	01121	CB 1125
A4R50	0683-7515	4	RESISTOR COMP 750 OHM 5% 1/4W	01121	CB 7515
A4R51	0683-1025		RESISTOR COMP 1000 OHM 5% 1/4W	01121	CB 1025
A4R52	0683-1315		RESISTOR COMP 130 OHM 5% 1/4W	01121	CB 1315
A4R53	0683-2425		RESISTOR COMP 2400 OHM 5% 1/4W	01121	CB 2425
A4R54	0683-8215	5	RESISTOR COMP 820 OHM 5% 1/4W	01121	CB 8215
A4R55	0683-1315		RESISTOR COMP 130 OHM 5% 1/4W	01121	CB 1315
A4R57	0683-3325		RESISTOR COMP 3300 OHM 5% 1/4W	01121	CB 3325
A4R58	0683-3025		RESISTOR COMP 3000 OHM 5% 1/4W	01121	CB 3025
A4R59	0683-1025		RESISTOR COMP 1000 OHM 5% 1/4W	01121	CB 1025
A4R60	0683-1025		RESISTOR COMP 1000 OHM 5% 1/4W	01121	CB 1025
A4R61	0683-4735		RESISTOR COMP 47K OHM 5% 1/4W	01121	CB 4735
A4R62	0683-6835		RESISTOR COMP 68K OHM 5% 1/4W	01121	CB 6835
A4R63	0683-1125		RESISTOR COMP 1100 OHM 5% 1/4W	01121	CB 1125
A4R64	0683-8215		RESISTOR COMP 820 OHM 5% 1/4W	01121	CB 8215
A4R65	0683-1045		RESISTOR COMP 100K OHMS 5% 1/4W	01121	CB 1045
A4R66	0683-2735		RESISTOR COMP 27K OHM 5% 1/4W	01121	CB 2735
A4R67	0683-7525		RESISTOR COMP 7500 OHM 5% 1/4W	01121	CB 7525
A4R68	0683-5125		RESISTOR COMP 5100 OHM 5% 1/4W	01121	CB 5125
A5	03320-66505	1	BOARD ASSY: RNG DIV	28480	03320-66505
A5A1,A2	03320-62702		FILTER ASSY	28480	03320-62702
A5C1	0150-0050		CAPACITOR-FXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E1022526-CDH
A5C2	0150-0093		CAPACITOR-FXD CER 0.01 UF +80-20% 100VDCW	72982	801-KB00011
A5C3	0150-0050		CAPACITOR-FXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E1022526-CDH
A5C4			NOT ASSIGNED		
A5C5	0160-0538		CAPACITOR-FXD MICA 1000 PF 5%	72136	RDM15E102J3C
A5C6	0160-2009		CAPACITOR-FXD MICA 820 PF 5% 300VDCW	00853	RDM15FN821J3C
A5C7	0160-0538		CAPACITOR-FXD MICA 1000 PF 5%	72136	RDM15E102J3C
A5C8	0150-0050		CAPACITOR-FXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E1022526-CDH
A5C9	0150-0093		CAPACITOR-FXD CER 0.01 UF +80-20% 100VDCW	72982	801-KB00011
A5C10	0150-0093		CAPACITOR-FXD CER 0.01 UF +80-20% 100VDCW	72982	801-KB00011
A5C11	0150-0050		CAPACITOR-FXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E1022526-CDH
A5C12	0150-0093		CAPACITOR-FXD CER 0.01 UF +80-20% 100VDCW	72982	801-KB00011
A5C13	0150-0050		CAPACITOR-FXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E1022526-CDH
A5C14	0150-0050		CAPACITOR-FXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E1022526-CDH
A5C15	0150-0050		CAPACITOR-FXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E1022526-CDH
A5C16	0150-0093		CAPACITOR-FXD CER 0.01 UF +80-20% 100VDCW	72982	801-KB00011
A5C17	0150-0050		CAPACITOR-FXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E1022526-CDH
A5C18	0150-0050		CAPACITOR-FXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E1022526-CDH
A5C19	0150-0093		CAPACITOR-FXD CER 0.01 UF +80-20% 100VDCW	72982	801-KB00011
A5C20	0150-0050		CAPACITOR-FXD CER 1000 PF +80-20% 1000 VDCW	56289	C067B102E1022526 CDH
A5C21	0150-0093		CAPACITOR-FXD CER 0.01 UF +80-20% 100 VDCW	72982	801-KB00011
A5C22	0150-0050		CAPACITOR-FXD CER 1000 PF +80-20% 1000 VDCW	56289	C067B102E1022526 CDH
A5C23	0150-0050		CAPACITOR-FXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E1022526-CDH
A5C24	0150-0050		CAPACITOR-FXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E1022526-CDH
A5C25	0150-0093		CAPACITOR-FXD CER 0.01 UF +80-20% 100VDCW	72982	801-KB00011
A5C26	0140-0050		CAPACITOR-FXD CER 1000 PF +80-20% 1000 VDCW	56289	C067B102E1022526 CDH
A5C27	0160-2008		CAPACITOR-FXD MICA 820 PF 5% 300 VDCW	00853	RDM15F821J3C
A5C28	0160-0538		CAPACITOR-FXD MICA 1000 PF 5%	72136	RDM15E102J3C
A5C29	0160-0938		CAPACITOR-FXD MICA 1000 PF 5%	72136	RDM15E102J3C
A5C30	0150-0093		CAPACITOR-FXD CER 0.01 UF +80-20% 100VDCW	72982	801-KB00011
A5C31	0150-0050		CAPACITOR-FXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E1022526-CDH
A5C32	0150-0093		CAPACITOR-FXD CER 0.01 UF +80-20% 100VDCW	72982	801-KB00011
A5C33	0150-0093		CAPACITOR-FXD CER 0.01 UF +80-20% 100VDCW	72982	801-KB00011
A5C34	0150-0050		CAPACITOR-FXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E1022526-CDH
A5C35	0150-0093		CAPACITOR-FXD CER 0.01 UF +80-20% 100VDCW	72982	801-KB00011
A5C36	0150-0050		CAPACITOR-FXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E1022526-CDH
A5C37	0150-0050		CAPACITOR-FXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E1022526-CDH
A5C38	0150-0050		CAPACITOR-FXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E1022526-CDH
A5C39	0160-0093		CAPACITOR-FXD CER 0.01 UF +80-20% 100 VDCW	72982	801-KB00011
A5C40	0150-0050		CAPACITOR-FXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E1022526-CDH
A5C41	0150-0050		CAPACITOR-FXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E1022526-CDH
A5C42	0150-0093		CAPACITOR-FXD CER 0.01 UF +80-20% 100VDCW	72982	801-KB00011
A5C43	0150-0050		CAPACITOR-FXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E1022526-CDH
A5C44	0150-0093		CAPACITOR-FXD CER 0.01 UF +80-20% 100VDCW	72982	801-KB00011
A5C45	0150-0050		CAPACITOR-FXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E1022526-CDH
A5C46	0150-0050		CAPACITOR-FXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E1022526-CDH
A5C47	0180-1746		CAPACITOR-FXD ELECT 15 UF 10% 20 VDCW	28480	0180-1746
A5C48	0180-1746		CAPACITOR-FXD ELECT 15 UF 10% 20 VDCW	28480	0180-1746
A5IC1	1820-0482		IC: DIGITAL TTL	18324	NE280A
A5IC2	1820-0477		IC: LINEAR MODULE	04713	SG3523R
A5IC3	1826-0068		IC: LINEAR VIDEO AMPLIFIER	18324	NE 501A

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 6-1. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A5IC4	1826-0058		IC:LINEAR VIDEO AMPLIFIER	18324	NE 501A
A5IC5	1820-0450		IC:DIGITAL TTL	18324	N8229CA
A5IC6	1826-0427		IC:LINEAR MODULE	04713	SC82320K
A5IC7	1826-0058		IC:LINEAR VIDEO AMPLIFIER	18324	NE 501A
A5IC8	1826-0058		IC:LINEAR VIDEO AMPLIFIER	18324	NE 501A
A5L1	9100-3247		COIL:FXD 15 UH	28480	9100-3247
A5L2	9100-3247		COIL:FXD 15 UH	28480	9100-3247
A5L3	9100-1618		COIL:MOLDED CHOKE 5.60 UH	28480	9100-1618
A5L4	9100-1618		COIL:MOLDED CHOKE 5.60 UH	28480	9100-1618
A5L5 THRU L11	9170-0016	7	BEAD:MAGNETIC SHIELDING	02114	56 590 65/3B
A5P1	1200-1214		CONNECTOR:RF COAX,CENTER CONTACT	98291	82 064 6000
A5Q1	1853-0203		TSTR:SI PNP	28480	1853-0203
A5Q2	1853-0203		TSTR:SI PNP	28480	1853-0203
A5Q3	1854-0039		TSTR:SI NPN	80131	2N709
A5Q4	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A5Q5	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A5Q6	1853-0010		TSTR:SI PNP(SELECTED FROM 2N3251)	28480	1853-0010
A5Q7	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A5Q8	1853-0203		TSTR:SI PNP	28480	1853-0203
A5Q9	1853-0203		TSTR:SI PNP	28480	1853-0203
A5Q10	1854-0039		TSTR:SI NPN	80131	2N709
A5Q11	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A5Q12	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A5Q13	1853-0010		TSTR:SI PNP(SELECTED FROM 2N3251)	28480	1853-0010
A5Q14	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A5R1	0683-6215		RESD COMP 620 OHM 5% 1/4W	01121	CB 6215
A5R2	0683-5625		RESD COMP 5600 OHM 5% 1/4W	01121	CB 5625
A5R3	0683-5625		RESD COMP 5600 OHM 5% 1/4W	01121	CB 5625
A5R4	0683-6215		RESD COMP 620 OHM 5% 1/4W	01121	CB 6215
A5R5	0683-6215		RESD COMP 620 OHM 5% 1/4W	01121	CB 6215
A5R6	C683-1025		RESD COMP 1000 OHM 5% 1/4W	01121	CB 1025
A5R7	0683-2015		RESD COMP 200 OHM 5% 1/4W	01121	CB 2015
A5R8	0683-6215		RESD COMP 620 OHM 5% 1/4W	01121	CB 6215
A5R9	0683-6215		RESD COMP 620 OHM 5% 1/4W	01121	CB 6215
A5R10	0683-5105		RESD COMP 51 OHM 5% 1/4W	01121	CB 5105
A5R11	0683-9115		RESD COMP 910 OHM 5% 1/4W	01121	CB 9115
A5R12	0683-1115		RESD COMP 110 OHM 5% 1/4W	01121	CB 1115
A5R13	0683-4325		RESD COMP 4300 OHM 5% 1/4W	01121	CB 4325
A5R14	0683-5105		RESD COMP 51 OHM 5% 1/4W	01121	CB 5105
A5R15	0683-1125		RESD COMP 1100 OHM 5% 1/4W	01121	CB 1125
A5R16	0683-7515		RESD COMP 750 OHM 5% 1/4W	01121	CB 7515
A5R17	0683-1025		RESD COMP 1000 OHM 5% 1/4W	01121	CB 1025
A5R18	0683-1315		RESD COMP 130 OHM 5% 1/4W	01121	CB 1315
A5R19	0683-2425		RESD COMP 2400 OHM 5% 1/4W	01121	CB 2425
A5R20	0683-8215		RESD COMP 820 OHM 5% 1/4W	01121	CB 8215
A5R21	0683-1315		RESD COMP 130 OHM 5% 1/4W	01121	CB 1315
A5R23	C683-3325		RESD COMP 3300 OHM 5% 1/4W	01121	CB 3325
A5R24	0683-1025		RESD COMP 1000 OHM 5% 1/4W	01121	CB 1025
A5R25	0683-1025		RESD COMP 1000 OHM 5% 1/4W	01121	CB 1025
A5R26	C683-1025		RESD COMP 1000 OHM 5% 1/4W	01121	CB 1025
A5R27	C683-4735		RESD COMP 47K OHM 5% 1/4W	01121	CB 4735
A5R28	0683-6835		RESD COMP 68K OHM 5% 1/4W	01121	CB 6835
A5R29	0683-1125		RESD COMP 1100 OHM 5% 1/4W	01121	CB 1125
A5R30	0683-6215		RESD COMP 620 OHM 5% 1/4W	01121	CB 6215
A5R31	0683-1045		RESD COMP 100K OHMS 5% 1/4W	01121	CB 1045
A5R32	0683-2735		RESD COMP 27K OHM 5% 1/4W	01121	CB 2735
A5R33	0683-7525		RESD COMP 7500 OHM 5% 1/4W	01121	CB 7525
A5R34	0683-5125		RESD COMP 5100 OHM 5% 1/4W	01121	CB 5125
A5R35	C683-6215		RESD COMP 620 OHM 5% 1/4W	01121	CB 6215
A5R36	0683-5625		RESD COMP 5600 OHM 5% 1/4W	01121	CB 5625
A5R37	C683-5625		RESD COMP 5600 OHM 5% 1/4W	01121	CB 5625
A5R38	0683-6215		RESD COMP 620 OHM 5% 1/4W	01121	CB 6215
A5R39	0683-6215		RESD COMP 620 OHM 5% 1/4W	01121	CB 6215
A5R40	C683-1025		RESD COMP 1000 OHM 5% 1/4W	01121	CB 1025
A5R41	0683-2015		RESD COMP 200 OHM 5% 1/4W	01121	CB 2015
A5R42	0683-6215		RESD COMP 620 OHM 5% 1/4W	01121	CB 6215
A5R43	0683-6215		RESD COMP 620 OHM 5% 1/4W	01121	CB 6215
A5R44	C683-5105		RESD COMP 51 OHM 5% 1/4W	01121	CB 5105
A5R45	0683-9115		RESD COMP 910 OHM 5% 1/4W	01121	CB 9115
A5R46	0683-1115		RESD COMP 110 OHM 5% 1/4W	01121	CB 1115
A5R47	0683-4325		RESD COMP 4300 OHM 5% 1/4W	01121	CB 4325
A5R48	C683-5105		RESD COMP 51 OHM 5% 1/4W	01121	CB 5105
A5R49	0683-1125		RESD COMP 1100 OHM 5% 1/4W	01121	CB 1125
A5R50	C683-7515		RESD COMP 750 OHM 5% 1/4W	01121	CB 7515

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 6-1. Replaceable Parts (cont'd).

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A5R51	0683-1025		R:FXD COMP 1000 OHM 5% 1/4W	01121	CB 1025
A5R52	0683-1315		R:FXD COMP 130 OHM 5% 1/4W	01121	CB 1315
A5R53	0683-2425		R:FXD COMP 2400 OHM 5% 1/4W	01121	CB 2425
A5R54	0683-8215		R:FXD COMP 820 OHM 5% 1/4W	01121	CB 8215
A5R55	0683-1315		R:FXD COMP 130 OHM 5% 1/4W	01121	CB 1315
A5R57	0683-3325		R:FXD COMP 3300 OHM 5% 1/4W	01121	CB 3325
A5R58	0683-3025		R:FXD COMP 3000 OHM 5% 1/4W	01121	CB 3025
A5R59	0683-1025		R:FXD COMP 1000 OHM 5% 1/4W	01121	CB 1025
A5R60	0683-1025		R:FXD COMP 1000 OHM 5% 1/4W	01121	CB 1025
A5R61	0683-4735		R:FXD COMP 47K OHM 5% 1/4W	01121	CB 4735
A5R62	0683-6835		R:FXD COMP 68K OHM 5% 1/4W	01121	CB 6835
A5R63	0683-1125		R:FXD COMP 1100 OHM 5% 1/4W	01121	CB 1125
A5R64	0683-6215		R:FXD COMP 620 OHM 5% 1/4W	01121	CB 6215
A5R65	0683-1045		R:FXD COMP 100K OHMS 5% 1/4W	01121	CB 1045
A5R66	0683-2735		R:FXD COMP 27K OHM 5% 1/4W	01121	CB 2735
A5R67	0683-7525		R:FXD COMP 7500 OHM 5% 1/4W	01121	CB 7525
A5R68	0683-5125		R:FXD COMP 5100 OHM 5% 1/4W	01121	CB 5125
A6 (OPTION 008)	03320-66606		IDENTICAL TO A6. REFER TO A6 PARTS LIST	28480	03320-66606
A7	03320-66607		PC ASSEMBLY: PHASE LOCK	28480	03320-66607
A7C1	0180-1748	4	C:FXD 15 UF 10% 20 VDCW	56289	150D156X9020B2 OYS
A7C2	0140-0180	1	C:FXD MICA 39 PF 5%	72136	DM15E390J3C
A7C3	0160-0783	1	C:FXD MICA 5 PF 10%	72136	DM15C050D5S
A7C4, C5	0160-0083	8	C:FXD .01 UF +80%-20% 100 VDCW	81458	TA abd
A7C6	0140-0200		C:FXD 390 PF 5%	03863	RDM15F391J3S
A7C7, C8	0160-0083		C:FXD .01 UF +80%-20% 100 VDCW	81458	TA abd
A7C9	0160-0206	1	C:FXD MICA 10 PF 5%	72136	RDM15C100J5S
A7C11, C12	0160-0083		C:FXD .01 UF +80%-20% 100 VDCW	81458	TA abd
A7C14, C15	0160-0083		C:FXD .01 UF +80%-20% 100 VDCW	81458	TA abd
A7C16	0180-0291	1	C:FXD 1 UF 10% 35 VDCW	56289	150D105X9035A2 OYS
A7C17	0140-0100		C:FXD 39 PF 5%	72136	RDM15E390J3C
A7C20, C21	0180-1746		C:FXD 15 UF 10% 20 VDCW	56289	150D156X9020B2 OYS
A7C22	0160-0083		C:FXD .01 UF +80%-20% 100 VDCW	81458	TA abd
A7C23	0170-0066	1	C:FXD MYLAR 10% .027 UF 200 VDCW	56289	192P27392 P15
A7C24	0180-0155	1	C:FXD .0033 UF 200 VDCW	56289	6C13C CM1 abd
A7C25, C26	0160-2271	2	C:FXD MICA 1300 PF 5%	72136	RDM19F132J3C
A7C27	0180-1746		C:FXD 15 UF 10% 20 VDCW	56289	150D156X9020B2 OYS
A7CR1 THRU CR6	1901-0040	6	DIODE:SI 50 MA 2 PF 2 NS 30 V	07263	FDG1CB
A7IC1	1820-0923	1	IC, QUAD 2 INPUT NOR GATE	04713	SL3677PX
A7IC2, IC3	1826-0043	2	IC:LINEAR OP. AMP	27040	SL12286
A7IC4	1820-1674	1	IC:DUAL DIGITAL	01295	SN74LS73N
A7L1	9100-3314	1	COIL, MOLDED	28480	9100-3314
A7L2 THRU L4	9140-0178	4	COIL, MOLDED CHOKE	28480	9140-0178
A7L6	9100-3316	1	COIL, MOLDED	28480	9100-3316
A7L7	9140-0178		COIL, MOLDED CHOKE	28480	9140-0178
A7L8	9100-3313	1	COIL, MOLDED	28480	9100-3313
A7J1, J2	1250-1186	2	CONNECTOR: R.F.	98291	67-053-0000
A7Q1	1853-0203	1	TSTR:SI PNP	04713	566651
A7Q2	1854-0008	1	TSTR	04713	SS7376A
A7Q3	1854-0018	1	TSTR:SI NPN	04713	S 6616
A7Q4 THRU Q6	1854-0071	3	TSTR:SI NPN	01295	SKA1124
A7R1	0683-1525	1	R:FXD COMP 1500 Ω 5% 1/4 W	01121	CB1525
A7R2	0683-1025	6	R:FXD COMP 10000 5% 1/4 W	01121	CB1025
A7R3	0683-1315	1	R:FXD COMP 130 Ω 5% 1/4 W	01121	CB1315
A7R4	0683-4315	1	R:FXD COMP 430 Ω 5% 1/4 W	01121	CB4315
A7R5, R6	0683-2015	2	R:FXD COMP 200 Ω 5% 1/4 W	01121	CB2015
A7R7	0683-5115	1	R:FXD COMP 510 OHMS 5% 1/4 W	01121	CB5115
A7R8, R9	0683-1615	2	R:FXD COMP 160 OHM 5% 1/4 W	01121	CB1615
A7R10, R13	0683-2725	2	R:FXD COMP 2700 OHM 5% 1/4 W	01121	CB2725
A7R14, R15	0683-1235	2	R:FXD COMP 12 K OHM 5% 1/4 W	01121	CB1235
A7R16	0683-2035	4	R:FXD COMP 2000 OHM 5% 1/4 W	01121	CB2035
A7R17	0683-6125	3	R:FXD COMP 6100 OHM 5% 1/4 W	01121	CB6125
A7R20	0683-1035	2	R:FXD COMP 10 K OHM 5% 1/4 W	01121	CB1035
A7R21	0683-1025		R:FXD COMP 1000 OHM 5% 1/4 W	01121	CB1025
A7R22	0683-1805	1	R:FXD COMP 18 OHM 5% 1/4 W	01121	CB1805
A7R23	0683-1045	1	R:FXD COMP 100 K OHM 5% 1/4 W	01121	CB1045
A7R24	0683-6125		R:FXD COMP 6100 OHM 5% 1/4 W	01121	CB6125
A7R25	0683-2035	1	R:FXD COMP 20 K OHM 5% 1/4 W	01121	CB2035
A7R26	0683-1625	1	R:FXD COMP 1600 OHM 5% 1/4 W	01121	CB1625
A7R27	0683-2025		R:FXD COMP 2000 OHM 5% 1/4 W	01121	CB2025
A7R28	0683-8115	1	R:FXD COMP 810 OHM 5% 1/4 W	01121	CB8115
A7R29	0683-3605	1	R:FXD COMP 36 OHM 5% 1/4 W	01121	CB3605
A7R30	0683-2025		R:FXD COMP 2000 OHM 5% 1/4 W	01121	CB2025
A7R31	0683-1025		R:FXD COMP 1000 OHM 5% 1/4 W	01121	CB1025
A7R32	0683-3325	1	R:FXD COMP 3300 OHM 5% 1/4 W	01121	CB3325
A7R33	0683-2705	1	R:FXD COMP 2.7 OHM 5% 1/4 W	01121	CB2705

† See Section VIII, Manual Backdating

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 6-1. Replaceable Parts (cont'd).

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A7 R34	0683-1026		R:FXD COMP 1000 OHM 5% 1/4 W	01121	CB1025
A7 R35,R36	0683-1056	2	R:FXD COMP 1 MEGOHM 5% 1/4 W	01121	CB1055
A7 R37	0683-4325	1	R:FXD COMP 4300 OHM 5% 1/4 W	01121	CB4325
A7 R38	0683-2725	1	R:FXD COMP 2700 OHM 5% 1/4 W	01121	CB2725
A7 R39	0683-6125		R:FXD COMP 6100 OHM 5% 1/4 W	01121	CB6125
A7 R40	0683-1035		R:FXD COMP 10 K OHM 5% 1/4 W	01121	CB1035
A7 R41	0683-1025		R:FXD COMP 1000 OHM 5% 1/4 W	01121	CB1025
A7 R42	0683-3025		R:FXD COMP 3000 OHM 5% 1/4 W	01121	CB3025
A7 R43	0683-3005	1	R:FXD COMP 30 OHM 5% 1/4 W	01121	CB3005
A7 T1	9100-1387	2	TRANSFORMER:TOROID	28480	9100-1387
A7 T2	"	1	TRANSFORMER:TOROID	28480	9100-1351
A7 T3			TRANSFORMER:TOROID	28480	9100-1387
A8		1	BOARD ASSY:REFERENCE OSCILLATOR	28480	03320-66508
A8C1		7	C:FXD CER 2000 PF 20% 500VDCW	72982	801-000-Y5S-202M
A8C2			C:FXD ELECT 15 UF 10% 20VDCW	28480	0180-1746
A8C3		1	C:FXD MICA 30PF 5% 300VDCW	14655	RDM15E300J3S
A8C4	0121-0[illegible]		C:VAR AIR 2.4-24.5 PF	74970	189-509-105
A8C5	0160-2324	1	C:FXD MICA 18 PF 5% 100VDCW	00853	RDM15C180J3S
A8C6	0150-0093		C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A8C7	0160-2205	1	C:FXD MICA 91 PF 5%	72136	RDM19F910J3C
A8C8	0150-0093		C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A8C9	0150-0093		C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A8C10	0150-0093		C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A8C11	0160-2209		C:FXD MICA 820 PF 5% 300VDCW	00853	RDM19F821J3C
A8C12	0140-0179	2	C:FXD MICA 1000 PF 2%	28480	0140-0179
A8C13	0140-0179		C:FXD MICA 1000 PF 2%	28480	0140-0179
A8C14	0150-0093		C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A8C15	0150-0093		C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A8C16	0150-0093		C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A8C17	0150-0093		C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A8C18*	0140-0210	1	C:FXD MICA 270 PF 1% 300VDCW	72136	DM18F271J0300WV1CR
A8C19	0160-0122		C:FXD CER 2000 PF 20% 500VDCW	72982	801-000-Y5S-202M
A8C20	0160-0093		C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A8C21	0160-0093		C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A8C22,23	0160-0122		C:FXD CER 2000 PF 20% 500VDCW	72982	801-000-Y5S-202M
A8C24*	0140-0210		C:FXD MICA 270 PF 1% 300VDCW	72136	DM18F271J0300WV1CR
A8C25,26	0160-0093		C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A8C27*	0140-0210		C:FXD MICA 270 PF 1% 300VDCW	72136	DM18F271J0300WV1CR
A8C28	0150-0122		C:FXD CER 2000 PF 20% 500VDCW	72982	801-000-Y5S-202M
A8C29	0150-0122		C:FXD CER 2000 PF 20% 500VDCW	72982	801-000-Y5S-202M
A8C30	0150-0122		C:FXD CER 2000 PF 20% 500VDCW	72982	801-000-Y5S-202M
A8C31	0140-0210	1	C:FXD MICA 270 PF 5%	28480	0140-0210
A8C32	0160-2225	1	C:FXD MICA 2000 PF 5% 300VDCW	72136	RDM19F202J3C
A8C33	0150-0093		C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A8C34	0150-0093		C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A8C35	0150-0093		C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A8C36	0150-0093		C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A8C37	0150-0093		C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A8C38	0150-0093		C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A8C39	0150-0093		C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A8C40	0150-0093		C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
† A8C41			UNASSIGNED		
† A8C42			UNASSIGNED		
† A8C43			UNASSIGNED		
† A8C44			UNASSIGNED		
† A8C45			UNASSIGNED		
† A8C46			UNASSIGNED		
A8C47	0180-1746		C:FXD ELECT 15 UF 10% 20VDCW	28480	0180-1746
A8C48	0180-1746		C:FXD ELECT 15 UF 10% 20VDCW	28480	0180-1746
A8C49	0150-0093		C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A8C50	0180-1746		C:FXD ELECT 15 UF 10% 20VDCW	28480	0180-1746
A8CR1	0122-0058		DIODE:VOLTAGE VARIABLE CAPACITANCE	28480	0122-0058
A8F1	2110-0077		FUSE 1/8A 3AG	28480	2110-0077
A8U1	1820-0450		IC:DIGITAL TTL	18324	N8290A
A8U2	1820-0427		IC:LINEAR MODULE	04713	SG8373BK
† A8P1			UNASSIGNED		
A8L1	9140-0179		COIL/CHOKE 22.0 UH 10%	28480	9140-0179

† See Section VIII, Manual Backdating.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 6-1. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A6L2	9100-1620	3	COIL MOLDED CHOKE 160 UH 10%	28480	9100-1620
A6L3	9100-3361	4	COIL RF [illegible] UH 5%	28480	9100-3361
A6L4	9100-3361		COIL RF [illegible] UH 5%	28480	9100-3361
A6L5	9100-3361		COIL RF [illegible] UH 5%	28480	9100-3361
A6L6	9100-3361		COIL: RF 0.30 UH 5%	28480	9100-3361
† A6L7			UNASSIGNED		
A6L8	9140-0107		COIL:FXD RF 27 UH 10%	99800	1840-38
A6L9	9140-0107		COIL:FXD RF 27 UH 10%	99800	1840-38
A6L10	9140-0107		COIL:FXD RF 27 UH 10%	99800	1840-38
A6L11	9100-1618		COIL:MOLDED CHOKE 5.60 UH	28480	9100-1618
A6Q1	1854-0019		TSTR:SI NPN	28480	1854-0019
A6Q2	1854-0019		TSTR:SI NPN	28480	1854-0019
A6Q3	1853-0203		TSTR:SI PNP	28480	1853-0203
A6Q4	1853-0203		TSTR:SI PNP	28480	1853-0203
A6Q5	1854-0009		TSTR:SI NPN	80131	2N709
A6Q6	1854-0009		TSTR:SI NPN	80131	2N709
A6Q7	1854-0019		TSTR:SI NPN	28480	1854-0019
A6Q8	1854-0019		TSTR:SI NPN	28480	1854-0019
A6Q9	1853-0203		TSTR:SI PNP	28480	1853-0203
A6Q10	1853-0203		TSTR:SI PNP	28480	1853-0203
A6Q11	1853-0203		TSTR:SI PNP	28480	1853-0203
A6Q12	1853-0203		TSTR:SI PNP	28480	1853-0203
† A6Q13			UNASSIGNED		
† A6Q14			UNASSIGNED		
A6R1	0683-5125		RESISTOR 5100 OHM 5% 1/4W	01121	CB 5125
A6R2	0757-0442		RESISTOR:FXD MET FLM 100 K OHM 1% 1/8 W	28480	0757-0442
A6R3	0757-0463		RESISTOR:FXD MET FLM 30.1 K OHM 1% 1/8 W	28480	0757-0463
A6R4	0698-3459	2	RESISTOR:FXD FLM 40.2K OHM 1% 1/8W	28480	0698-3459
A6R5	0683-4715		RESISTOR:FXD COMP 470 OHM 5% 1/4W	01121	CB 4715
A6R6	0683-1535		RESISTOR:FXD COMP 15K OHM 5% 1/4W	01121	CB 1535
A6R7	0683-3035	2	RESISTOR:FXD COMP 30K OHM 5% 1/4W	01121	CB 3035
A6R8	0683-3035		RESISTOR:FXD COMP 30K OHM 5% 1/4W	01121	CB 3035
A6R9	0683-4715		RESISTOR:FXD COMP 470 OHM 5% 1/4W	01121	CB 4715
A6R10	0683-1025		RESISTOR:FXD COMP 1000 OHM 5% 1/4W	01121	CB 1025
A6R11	0683-2025		RESISTOR:FXD COMP 2000 OHM 5% 1/4W	01121	CB 2025
A6R12	0683-1025		RESISTOR:FXD COMP 1000 OHM 5% 1/4W	01121	CB 1025
A6R13	0683-5625		RESISTOR:FXD COMP 5600 OHM 5% 1/4W	01121	CB 5625
A6R14	0683-5625		RESISTOR:FXD COMP 5600 OHM 5% 1/4W	01121	CB 5625
A6R15	0683-6215		RESISTOR:FXD COMP 620 OHM 5% 1/4W	01121	CB 6215
A6R16	0683-6215		RESISTOR:FXD COMP 620 OHM 5% 1/4W	01121	CB 6215
A6R17	0683-1025		RESISTOR:FXD COMP 1000 OHM 5% 1/4W	01121	CB 1025
A6R18	0683-2015		RESISTOR:FXD COMP 200 OHM 5% 1/4W	01121	CB 2015
A6R19	0683-3315		RESISTOR:FXD COMP 330 OHM 5% 1/4W	01121	CB 3315
A6R20	0683-1035	5	RESISTOR:FXD COMP 10K OHM 5% 1/4W	01121	CB 1035
A6R21	0683-2025		RESISTOR:FXD COMP 2000 OHM 5% 1/4W	01121	CB 2025
A6R22	0683-6215		RESISTOR:FXD COMP 620 OHM 5% 1/4W	01121	CB 6215
A6R23	0683-6215		RESISTOR:FXD COMP 620 OHM 5% 1/4W	01121	CB 6215
A6R24	0683-1015		RESISTOR:FXD COMP 100 OHM 5% 1/4W	01121	CB 1015
A6R25	0683-9125	1	RESISTOR:FXD COMP 9100 OHM 5% 1/4W	01121	CB 9125
A6R26	0683-3025		RESISTOR:FXD COMP 3000 OHM 5% 1/4W	01121	CB 3025
A6R27	0683-3025		RESISTOR:FXD COMP 3000 OHM 5% 1/4W	01121	CB 3025
A6R28	0683-5105		RESISTOR:FXD COMP 51 OHM 5% 1/4W	01121	CB 5105
A6R29	0683-5105		RESISTOR:FXD COMP 51 OHM 5% 1/4W	01121	CB 5105
A6R30	0683-1315		RESISTOR:FXD COMP 130 OHM 5% 1/4W	01121	CB 1315
A6R31	0683-7525		RESISTOR:FXD COMP 7500 OHM 5% 1/4W	01121	CB 7525
A6R32	0683-3315		RESISTOR:FXD COMP 330 OHM 5% 1/4W	01121	CB 3315
A6R33	0683-3315		RESISTOR:FXD COMP 330 OHM 5% 1/4W	01121	CB 3315
A6R34	0683-4705	8	RESISTOR:FXD COMP 47 OHM 5% 1/4W	01121	CB 4705
A6R35	0683-4705		RESISTOR:FXD COMP 47 OHM 5% 1/4W	01121	CB 4705
A6R36	0683-3315		RESISTOR:FXD COMP 330 OHM 5% 1/4W	01121	CB 3315
A6R37	0683-2225		RESISTOR:FXD COMP 2.2K OHM 5% 1/4W	01121	CB 2225
A6R38	0683-1015		RESISTOR:FXD COMP 100 OHM 5% 1/4W	01121	CB 1015
A6R39	0683-2225		RESISTOR:FXD COMP 2.2K OHM 5% 1/4W	01121	CB 2225
A6R40	0683-4705		RESISTOR:FXD COMP 47 OHM 5% 1/4W	01121	CB 4705
A6R41	0683-1035		RESISTOR:FXD COMP 10K OHM 5% 1/4W	01121	CB 1035
A6R42	0683-1035		RESISTOR:FXD COMP 10K OHM 5% 1/4W	01121	CB 1035
A6R43	0683-3315		RESISTOR:FXD COMP 330 OHM 5% 1/4W	01121	CB 3315
A6R44	0683-1025		RESISTOR:FXD COMP 1000 OHM 5% 1/4W	01121	CB 1025
A6R45	0683-6215		RESISTOR:FXD COMP 620 OHM 5% 1/4W	01121	CB 6215
A6R46	0683-4705		RESISTOR:FXD COMP 47 OHM 5% 1/4W	01121	CB 4705
A6R47	0683-4715		RESISTOR:FXD COMP 470 OHM 5% 1/4W	01121	CB 4715
A6R48	0683-5125		RESISTOR:FXD COMP 5100 OHM 5% 1/4W	01121	CB 5125
A6R49	0683-5125		RESISTOR:FXD COMP 5100 OHM 5% 1/4W	01121	CB 5125
A6R50	0683-4705		RESISTOR:FXD COMP 47 OHM 5% 1/4W	01121	CB 4705
A6R51	0683-5125		RESISTOR:FXD COMP 5100 OHM 5% 1/4W	01121	CB 5125

† See Section VIII, Manual Backdating.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 6-1. Replaceable Parts(Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A8R52	0683-2015		R:FXD COMP 200 OHM 5% 1/4W	01121	CB 2015
A8R53	0683-1025		R:FXD COMP 1000 OHM 5% 1/4W	01121	CB 1025
A8R54	0683-6215		R:FXD COMP 620 OHM 5% 1/4W	01121	CB 6215
A8R55	0683-4705		R:FXD COMP 47 OHM 5% 1/4W	01121	CB 4705
A8R56	0683-4715		R:FXD COMP 470 OHM 5% 1/4W	01121	CB 4715
A8R57	0683-5125		R:FXD COMP 5100 OHM 5% 1/4W	01121	CB 5125
A8R58	0683-5125		R:FXD COMP 5100 OHM 5% 1/4W	01121	CB 5125
A8R59	0683-4705		R:FXD COMP 47 OHM 5% 1/4W	01121	CB 4705
A8R60	0683-5125		R:FXD COMP 5100 OHM 5% 1/4W	01121	CB 5125
A8R61	0683-2015		R:FXD COMP 200 OHM 5% 1/4W	01121	CB 2015
†A8R62-66			UNASSIGNED		
†A8R67-R71			UNASSIGNED		
†A8T1			UNASSIGNED		
A8Y1	0410-0438	1	CRYSTAL:QUARTZ	28480	0410-0438
A8A13320A ONLY)	03320-66633	1	PC ASSY: MODULATOR A8A IS IDENTICAL TO A8B WITH THE FOLLOWING EXCEPTIONS:	28480	03320-66633
A8C1-12			NOT ASSIGNED		
A8C16	0160-2201		C:FXD 51 PF +-5% 300WVDC MICA	28480	0160-2201
A8C24			NOT ASSIGNED		
A8C26	0140-0190		C:FXD 39PF +-5% 300WVDC MICA	72136	DM15E390J0300WV1CR
A8C32			NOT ASSIGNED		
A8C35	0180-1746		C:FXD ELECT 15UF 10% 20VDCW	56289	150D156X9010B2-DYS
A8CR1, 2			NOT ASSIGNED		
A8IC1 THRU A8IC5			NOT ASSIGNED		
A8J1 THRU A8J5			NOT ASSIGNED		
A8R1 THRU A8R28			NOT ASSIGNED		
A8R43	0698-3627		R:FXD FLM 806 OHM 1% 1/8W	14674	CAT-0 ab4
A8R44	0683-3316		R:FXD COMP 330 OHM 5% 1/4 W	01121	CB3315
A8R45	0698-4448		R:FXD FLM 284 OHM 1% 1/8W	14674	CAT-0 ab4
A8R47			NOT ASSIGNED		
A8R51	0698-3510		R:FXD FLM 453 OHM 1% 1/8W	72136	MFACT-0 ab4
A8R52	2100-2489		R:VAR COMP 5K OHM 10% 1/2W	28480	2100-2489
A8B (33308 ONLY)	03320-66508	1	PC ASSY: MODULATOR	28480	03320-66508
A8C1	0180-0374		C:FXD TANT. 10 UF 10% 20 VDCW	56289	150D106X9010B2-DYS
A8C2	0180-1735	4	C:FXD ELECT 0.22 UF 10% 35 VDCW	28480	0180-1735
A8C3	0180-1735		C:FXD ELECT 0.22 UF 10% 35 VDCW	28480	0180-1735
A8C4	0180-0374		C:FXD TANT. 10 UF 10% 20 VDCW	56289	150D106X9020B2-DYS
A8C5	0180-0373	1	C:FXD ELECT 0.68 UF 10% 35 VDCW	56289	150D684X9035A2-DYS
A8C6	0180-1743	3	C:FXD ELECT 0.1 UF 10% 35 VDCW	56289	150D104X9035A2-DYS
A8C7	0180-0184	2	C:FXD MICA MY 0.0022 UF 10% 250 VDCW	56289	192P22292-PTS
A8C8	0180-0184		C:FXD MICA MY 0.0022 UF 10% 200 VDCW	56289	192P22292-PTS
A8C9	0180-1743		C:FXD ELECT 0.1 UF 10% 35 VDCW	56289	150D104X9035A2-DYS
A8C10	0163-0158	1	C:FXD MY 0.0056 UF 10% 200 VDCW	56289	192P60292-PTS
A8C11	0180-1743		C:FXD ELECT 0.1 UF 10% 35 VDCW	56289	150D104X9035A2-DYS
A8C13	0160-0083		C:FXD CER 0.01 UF +80-20% 100 VDCW	72982	801-KB00011
A8C14	0160-0083		C:FXD CER 0.01 UF +80-20% 100 VDCW	72982	801-KB00011
A8C15	0160-0083		C:FXD CER 0.01 UF +80-20% 100 VDCW	72982	801-KB00011
A8C16*	0140-0191	1	C:FXD MICA 68 PF 5%	72136	DM15E680J0300WV1CR
A8C17	0160-0083		C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-KB00011
A8C18	0140-0191	1	C:FXD MICA 68 PF 5% 300 VDCW	18701	RDM15E680J 300 V
A8C19	0160-0083		C:FXD CER 0.01 UF +80-20% 100 VDCW	72982	801-KB00011
A8C20	0160-0083		C:FXD CER 0.01 UF +80-20% 100 VDCW	72982	801-KB00011
A8C21	0180-1746		C:FXD ELECT 15 UF 10% 20 VDCW	28480	0180-1746
A8C22	0160-0083		C:FXD CER 0.01 UF +80-20% 100 VDCW	72982	801-KB00011
A8C23	0160-0083		C:FXD CER 0.01 UF +80-20% 100 VDCW	72982	801-KB00011
A8C24	0121-0432		C:VAR AIR 1.7-14.1 PF	74970	189-806-105
A8C26	0160-0158		C:FXD MICA 390 PF 5% 300 VDCW	00853	RDM15F391J3S
A8C28	0160-2150	1	C:FXD MICA 33 PF 5%	28480	0160-2150
A8C27	0180-3378	2	C:FXD MICA 27 PF 5%	72136	RDM15E270J5S
A8C28	0160-2202	2	C:FXD MICA 75 PF 5%	28480	0160-2202
A8C29	0160-0156	1	C:FXD MICA 24 PF 5% 300 VDCW	04062	RDM15C240J3S
A8C30	0160-2202		C:FXD MICA 75 PF 5%	28480	0160-2202
A8C31	0160-0378		C:FXD MICA 27 PF 5%	72136	RDM15E270J5S
A8C32	0180-1746		C:FXD ELECT 15 UF 10% 20 VDCW	28480	0180-1746
A8C33	0180-1746		C:FXD ELECT 15 UF 10% 20 VDCW	28480	0180-1746
A8C34, A8C36	0160-0083		C:FXD CER 0.01 UF +80-20% 100 VDCW	72982	801-KB00011
A8CR1	1901-0040		DIODE:SIL CON 30 MA 30 WV	07263	FDG1088
A8CR2	1901-0040		DIODE:SILICON 30 MA 30 WV	07263	FDG1088
A8IC1	1826-0043		IC:LINEAR OPERATIONAL AMPLIFIER	28480	1826-0043
A8IC2	1826-0043		IC:LINEAR OPERATIONAL AMPLIFIER	28480	1826-0043
A8IC3	1826-0043		IC:LINEAR OPERATIONAL AMPLIFIER	28480	1826-0043
A8IC4	1826-0043		IC:LINEAR OPERATIONAL AMPLIFIER	28480	1826-0043
A8IC5	1826-0043		IC:LINEAR OPERATIONAL AMPLIFIER	28480	1826-0043
A8IC6	1821-0001	1	TRANSISTOR ARRAY:SI NPN	02735	CA3046
A8J1	1250-1185	5	CONNECTOR:RF SUB-MINIATURE SERIES	86928	52-063-0000

† See Section VIII, Manual Backdating.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 6-1. Replaceable Parts (cont'd).

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A9L1	9140-0086		COIL:FXD RF 1 UH	28480	9140-0086
A9L2	9140-0086		COIL:FXD RF 1 UH	28480	9140-0086
A9L3	9140-0107		COIL:FXD RF 27 UH 10%	99800	1640-38
A9L4	9140-0086		COIL:FXD RF 1 UH	28480	9140-0086
A9L5	9140-0111		COIL:FXD RF 3.3 UH	28480	9140-0111
A9L6	9140-0112	2	COIL:FXD RF 4.7 UH	28480	9140-0112
A9L7	9140-0111	2	COIL:FXD RF 3.3 UH	28480	9140-0111
A9L8	9140-0107		COIL:FXD RF 27 UH 10%	99800	1640-38
A9Q1	1854-0071		TSTR:SI NPN (SELECTED FROM 2N3704)	28480	1854-0071
A9Q2	1853-0020		TSTR:SI PNP (SELECTED FROM 2N3702)	28480	1853-0020
A9Q3	1854-0071		TSTR:SI NPN (Selected from 2N3704)	28480	1854-0071
A9Q4	1855-0041	4	TSTR:SI FET	80131	2N5246
A9Q5	1855-0041		TSTR:SI FET	80131	2N5246
A9Q6	1853-0008	2	TSTR:SI PNP	80131	2N4250
A9Q7	1854-0018		TSTR:SI NPN	28480	1854-0018
A9Q8	1854-0018		TSTR:SI NPN	28480	1854-0018
A9Q9	1854-0018		TSTR:SI NPN	28480	1854-0018
A9Q10	1853-0008		TSTR:SI PNP	80131	2N4250
A9R1	0698-3619	5	R:FXD FLM 7.32 K OHM 1% 1/8 W	28480	0698-3619
A9R2	0698-3618		R:FXD FLM 7.32 K OHM 1% 1/8 W	28480	0698-3618
A9R3	0757-0463	2	R:FXD MET FLM 82.5 K OHM 1% 1/8 W	28480	0757-0463
A9R4	0757-0280		R:FXD MET FLM 1 K OHM 1% 1/8 W	28480	0757-0280
A9R5	0757-0444		R:FXD MET FLM 12.1 K OHM 1% 1/8 W	28480	0757-0444
A9R6	0698-4307	4	R:FXD FLM 14.3 K OHM 1% 1/8 W	28480	0698-4307
A9R7	0698-4462	2	R:FXD FLM 17.8 K OHM 1% 1/8 W	28480	0698-4462
A9R8	0698-3268		R:FXD FLM 7.87 K OHM 1% 1/8 W	28480	0698-3268
A9R9, A9R10	0283-2738		R:FXD COMP 27 K OHM 5% 1/4 W	01121	CB2735
A9R11	0683-4765		R:FXD COMP 4.7 MEGOHM 5% 1/4 W	01121	CB4765
A9R12, A9R13	0683-2735		R:FXD COMP 27 K OHM 5% 1/4 W	01121	CB2735
A9R14	0683-4765		R:FXD COMP 4.7 MEGOHM 5% 1/4 W	01121	CB4765
A9R15	0683-2735		R:FXD COMP 27 K OHM 5% 1/4 W	01121	CB2735
A9R16, A9R17	0698-3618		R:FXD FLM 7.32 K OHM 1% 1/8 W	28480	0698-3618
A9R18	0757-0463		R:FXD MET FLM 82.5 K OHM 1% 1/8 W	28480	0757-0463
A9R19	0757-0280		R:FXD MET FLM 1 K OHM 1% 1/8 W	28480	0757-0280
A9R20	0757-0444		R:FXD MET FLM 12.1 K OHM 1% 1/8 W	28480	0757-0444
A9R21	0698-4307		R:FXD FLM 14.3 K OHM 1% 1/8 W	28480	0698-4307
A9R22	0698-4462		R:FXD FLM 17.8 K OHM 1% 1/8 W	28480	0698-4462
A9R23	0698-3268		R:FXD FLM 7.87 K OHM 1% 1/8 W	28480	0698-3268
A9R24	0683-4725	2	R:FXD COMP 4700 OHM 5% 1/4 W	01121	CB4725
A9R25	0698-3483	1	R:FXD FLM 4.12 K OHM 1% 1/8 W	28480	0698-3483
A9R26	0757-0349	1	R:FXD MET FLM 22.6 K OHM 1% 1/8 W	28480	0757-0349
A9R27	2100-3821		R:VAR FLM 2500 OHM 10% LIN 1/2 W	28480	2100-3821
A9R28	0757-0273	3	R:FXD MET FLM 2.01 K OHM 1% 1/8 W	28480	0757-0273
A9R29	0698-4123		R:FXD MET FLM 499 OHM 1% 1/8 W	28480	0698-4123
A9R30	0698-4123		R:FXD MET FLM 499 OHM 1% 1/8 W	28480	0698-4123
A9R31	0698-4123		R:FXD MET FLM 499 OHM 1% 1/8 W	28480	0698-4123
A9R32	0757-0438		R:FXD MET FLM 6.11 K OHM 1% 1/8 W	28480	0757-0438
A9R33	0698-4478	1	R:FXD FLM 18.2 K OHM 1% 1/8 W	28480	0698-4478
A9R34	0698-4415	1	R:FXD FLM 196 OHM 1% 1/8 W	28480	0698-4415
A9R35	0757-0280		R:FXD MET FLM 1 K OHM 1% 1/8 W	28480	0757-0280
A9R36	0757-0200	1	R:FXD MET FLM 5.62 K OHM 1% 1/8 W	28480	0757-0200
A9R37	0757-0281	3	R:FXD MET FLM 2.74 K OHM 1% 1/8 W	28480	0757-0281
A9R38	0683-4705		R:FXD COMP 47 OHM 5% 1/4 W	01121	CB4705
A9R39	0757-0280		R:FXD MET FLM 1 K OHM 1% 1/8 W	28480	0757-0280
A9R40	0683-4705		R:FXD COMP 47 OHM 5% 1/4 W	01121	CB4705
A9R41	0757-0397	1	R:FXD MET FLM 68.1 OHM 1% 1/8 W	28480	0757-0397
A9R42	0757-0426	2	R:FXD FLM 1.3 K OHM 1% 1/8 W	28480	0757-0426
A9R43	0757-0346		R:FXD MET FLM 10 OHM 1% 1/8 W	28480	0757-0346
A9R44	0757-0415	1	R:FXD MET FLM 475 OHM 1% 1/8 W	28480	0757-0415
A9R45	0757-0384	3	R:FXD FLM 20 OHM 1% 1/8 W	28480	0757-0384
A9R46	0757-0398	2	R:FXD MET FLM 75 OHM 1% 1/8 W	28480	0757-0398
A9R47	0757-0277	13	R:FXD MET FLM 49.9 OHM 1% 1/8 W	28480	0757-0277
A9R48					
A10	03320-66510	1	BOARD ASSY:AMP	28480	03320-66510
A10C1	0160-2200	1	C:FXD MICA 43 PF 5%	72136	RDM15E430J5C
A10C2	0140-0202	1	C:FXD MICA 15 PF 5% 300VDCW	28480	0140-0202
A10C3	0140-0146	1	C:FXD MICA 82 PF 5% 300VDCW	14655	RDM15E820J5S
A10C4	0150-0093		C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A10C5	0150-0093		C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A10C6	0150-0093		C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A10C7	0150-0093		C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A10C8	0150-0093		C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A10C10	0150-0093		C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A10C11	0150-0093		C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A10C12	0150-0093		C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A10C14	0150-0093		C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A10C15	0150-0093		C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A10C16	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A10C17	0180-0197	5	C:FXD ELECT 2.2 UF 10% 20VDCW	56289	150D225X9020A2-DYS

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 6-1. Replaceable Parts (cont'd).

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A10C18	0150-0093		C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A10C20	0160-0157	3	C:FXD MY 0.0047 UF 10% 200VDCW	56289	192P47292-PTS
A10C21	0150-0093		C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A10C22	0150-0093		C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A10C23	0180-0197		C:FXD ELCT 2.2 UF 10% 20VDCW	56289	150D225X9020A2-DYS
A10C24	0150-0042	1	C:FXD TI 4.7 PF 5% 500VDCW	78488	TYPE GA
A10C25	0160-0488	1	C:FXD CER 10 PF 2% 500VDCW	71471	CM-1
A10C26	0160-3306	1	C:FXD MICA 25+/-0.5 PF 100VDCW	00853	RDM15C250D1C
A10C27	0160-0206	1	C:FXD MICA 10 PF 5%	28480	0160-0206
A10C28	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A10C30	0160-2009		C:FXD MICA 820 PF 5% 300VDCW	00853	RDM19F821 J3C
A10C31	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A10C32	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A10C33	0140-0176	3	C:FXD MICA 100 PF 2%	28480	0140-0176
A10C34	0160-0157		C:FXD MY 0.0047 UF 10% 200VDCW	56289	192P47292-PTS
A10C35	0140-0198	1	C:FXD MICA 200 PF 5%	72136	RDM19F201J3C
A10C36	0140-0174	1	C:FXD CER 0.47 UF +80-20% 25VDCW	56289	5C11875-CML
A10C38	0150-0084		C:FXD CER 0.1 UF +80-20% 100VDCW	56289	33C4185-CDH
A10C39	0150-0084		C:FXD CER 0.1 UF +80-20% 100VDCW	56289	33C4185-CDH
A10C40	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A10C41	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A10C42	0180-1746		C:FXD ELCT 15 UF 10% 20VDCW	28480	0180-1746
A10C43	0180-0197		C:FXD ELECT 2.2 UF 10% 20VDCW	56289	150D225X9020A2-DYS
A10C44	0180-1746		C:FXD ELECT 15 UF 10% 20VDCW	28480	0180-1746
A10C45	0180-0197		C:FXD ELECT 2.2 UF 10% 20VDCW	56289	150D225X9020A2-DYS
A10CR1	1901-0044	9	DIODE:SILICON 20MA/1V	28480	1901-0044
A10CR2	1901-0044		DIODE:SILICON 20MA/1V	28480	1901-0044
A10CR3	1901-0044		DIODE:SILICON 20MA/1V	28480	1901-0044
A10IC1	1858-0015	1	IC:HEX LIMITER	28480	1858-0015
A10IC2	1826-0062	1	IC:HEX MIXER	28480	1826-0062
A10IC3	1826-0043		IC:LINEAR OPERATIONAL AMPLIFIER	28480	1826-0043
A10IC4	1826-0043		IC:LINEAR OPERATIONAL AMPLIFIER	28480	1826-0043
A10IC5	1826-0043		IC:LINEAR OPERATIONAL AMPLIFIER	28480	1826-0043
A10J1	1250-1195		CONNECTOR:RF SUB-MINIATURE SERIES	98291	52-053-0000
A10J2	1250-1195		CONNECTOR:RF SUB-MINIATURE SERIES	98291	52-053-0000
A10L1	9140-0106	2	COIL:FXD 0.47 UH	28480	9140-0106
A10L2	9140-0098		COIL:FXD RF 2.2 UH	28480	9140-0098
A10L3	9140-0106		COIL:FXD 0.47 UH	28480	9140-0106
A10L4	9140-0114	6	COIL:FXD RF 10 UH	28480	9140-0114
A10L5	9100-1620		COIL:MOLDED CHOKE 15.0 UH 10%	28480	9100-1620
A10L6	9100-3316	1	COIL:FXD 5.6 UH	28480	9100-3316
A10L7	9100-3311	1	COIL:FXD 8.0 UH	28480	9100-3311
A10L8	9140-0114		COIL:FXD RF 10 UH	28480	9140-0114
A10L9	9140-0114		COIL:FXD RF 10 UH	28480	9140-0114
A10L10	9140-0114		COIL:FXD RF 10 UH	28480	9140-0114
A10L11	9100-1620		COIL:MOLDED CHOKE 15.0 UH 10%	28480	9100-1620
A10P1	1250-1314		CONNECTOR:RF COAX,CENTER CONTACT	98291	52-054-0000
A10Q1	1854-0019		TSTR:SI NPN	28480	1854-0019
A10Q2	1854-0019		TSTR:SI NPN	28480	1854-0019
A10Q3	1854-0404		TSTR:SI NPN	28480	1854-0404
A10Q4	1854-0457	1	TSTR:SI NPN	28480	1854-0457
A10Q6	1853-0036		TSTR:SI PNP	28480	1853-0036
A10Q7	1854-0215		TSTR:SI NPN	28480	1854-0215
A10Q8	1854-0215		TSTR:SI NPN	28480	1854-0215
A10Q9	1853-0036		TSTR:SI PNP	28480	1853-0036
A10R1	0698-3279		R:FXD MET FLM 4990 OHM 1% 1/8W	28480	0698-3279
A10R2	0757-0407	1	R:FXD MET FLM 200 OHM 1% 1/8W	28480	0757-0407
A10R3	0698-3498	1	R:FXD MET FLM 8.66K OHM 1% 1/8W	28480	0698-3498
A10R4	0757-0398		R:FXD MET FLM 75 OHM 1% 1/8W	28480	0757-0398
A10R5	0757-0388	1	R:FXD FLM 30.1 OHM 1% 1/8W	28480	0757-0388
A10R6	0698-3434	1	R:FXD MET FLM 34.8 OHM 1% 1/8W	28480	0698-3434
A10R7	0698-4420	1	R:FXD FLM 226 OHM 1% 1/8W	28480	0698-4420
A10R8	0698-4406	1	R:FXD FLM 115 OHM 1% 1/8W	28480	0698-4406
A10R9	0698-4433	1	R:FXD FLM 2260 OHM 1% 1/8W	28480	0698-4433
A10R10	0698-4445	1	R:FXD FLM 5.76K OHM 1% 1/8W	28480	0698-4445
A10R11	0698-3512	1	R:FXD FLM 1160 OHM 1% 1/8W	28480	0698-3512
A10R12	0698-4452	4	R:FXD FLM 374 OHM 1% 1/8W	28480	0698-4452
A10R13	0698-4123		R:FXD MET FLM 499 OHM 1% 1/8W	28480	0698-4123
A10R14	0698-4452		R:FXD FLM 374 OHM 1% 1/8W	28480	0698-4452
A10R16	0757-0277		R:FXD MET FLM 49.9 OHM 1% 1/8W	28480	0757-0277
A10R17	0757-0277		R:FXD MET FLM 49.9 OHM 1% 1/8W	28480	0757-0277
A10R18	0757-0434	1	R:FXD MET FLM 3.65K OHM 1% 1/8W	28480	0757-0434
A10R19	0698-3484	1	R:FXD FLM 6650 OHM 1% 1/8W	28480	0698-3484
A10R20	0698-4474	3	R:FXD FLM 8450 OHM 1% 1/8W	28480	0698-4474
A10R21	0757-0289		R:FXD MET FLM 13.3K OHM 1% 1/8W	28480	0757-0289
A10R22	0698-4435		R:FXD FLM 2.49K OHM 1% 1/8W	28480	0698-4435
A10R23	0757-0427	2	R:FXD MET FLM 1.5K OHM 1% 1/8W	28480	0757-0427

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 6-1. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A10R24	0757-0408	1	RESISTOR:FXD MET FLM 243 OHM 1% 1/8W	28480	0757-0408
A10R25	0757-0405	2	RESISTOR:FXD FLM 162 OHM 1% 1/8W	19701	MF4C T-0
A10R26	0757-0405		RESISTOR:FXD FLM 162 OHM 1% 1/8W	19701	MF4C T-0
A10R27	0757-0289		RESISTOR:FXD MET FLM 13.3K OHM 1% 1/8W	28480	0757-0289
A10R28	0757-0281		RESISTOR:FXD MET FLM 2.74K OHM 1% 1/8W	28480	0757-0281
A10R29	0757-0281		RESISTOR:FXD MET FLM 2.74K OHM 1% 1/8W	28480	0757-0281
A10R30	0757-0317	1	RESISTOR:FXD MET FLM 1.33K OHM 1% 1/8W	28480	0757-0317
A10R31	2100-3574	1	RESISTOR:VAR CERMET 500 OHM 10% LIN 1/2W	28480	2100-3574
A10R32	0698-4426	2	RESISTOR:FXD FLM 1580 OHM 1% 1/8W	28480	0698-4426
A10R34	0757-0291	8	RESISTOR:FXD FLM 24.9 OHM 1% 1/8W	28480	0757-0291
A10R35	1810-0078	1	RESISTIVE NETWORK	28480	1810-0078
A10R36	0757-0449		RESISTOR:FXD FLM 20K OHM 1% 1/8W	28480	0757-0449
A10R37	2100-3154	2	RESISTOR:VAR 1K OHM 10% LIN	28480	2100-3154
A10R38	0757-0449		RESISTOR:FXD FLM 20K OHM 1% 1/8W	28480	0757-0449
A10R39	0757-0291		RESISTOR:FXD FLM 24.9 OHM 1% 1/8W	28480	0757-0291
A10R40	0757-0438		RESISTOR:FXD MET FLM 5.11K OHM 1% 1/8W	28480	0757-0438
A10R41	0757-0442		RESISTOR:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A10R42	0698-3279		RESISTOR:FXD MET FLM 4990 OHM 1% 1/8W	28480	0698-3279
A10R44	C684-3911	4	RESISTOR:FXD COMP 390 OHM 10% 1/4W	01121	CB 3911
A10R45	2100-3054	2	RESISTOR:VAR CERMET 50K OHM 10% 3/4W	28480	2100-3054
A10R46	C698-4211	1	RESISTOR:FXD FLM 158K OHM 1% 1/8W	28480	0698-4211
A10R47	0698-4508	1	RESISTOR:FXD FLM 78.7K OHM 1% 1/8W	28480	0698-4508
A10R48	C757-0278	1	RESISTOR:FXD MET FLM 1.78K OHM 1% 1/8W	28480	0757-0278
A10R49	0698-3268	1	RESISTOR:FXD FLM 11.5K OHM 1% 1/8W	28480	0698-3268
A10R50	0698-4457	1	RESISTOR:FXD FLM 576 OHM 1% 1/8W	28480	0698-4457
A10R51	0757-0277		RESISTOR:FXD MET FLM 49.9 OHM 1% 1/8W	28480	0757-0277
A10R52	0757-0438		RESISTOR:FXD MET FLM 5.11K OHM 1% 1/8W	28480	0757-0438
A10R53	0757-0277		RESISTOR:FXD MET FLM 49.9 OHM 1% 1/8W	28480	0757-0277
A10R54	C757-0280		RESISTOR:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A10R55	0698-3151	3	RESISTOR:FXD MET FLM 2.87K OHM 1% 1/8W	28480	0698-3151
A10R56	C698-4369	1	RESISTOR:FXD FLM 23.2 OHM 1% 1/8W	28480	0698-4369
A10R57	0698-3151		RESISTOR:FXD MET FLM 2.87K OHM 1% 1/8W	28480	0698-3151
A10R59	0757-0414	2	RESISTOR:FXD FLM 432 OHM 1% 1/8W	28480	0757-0414
A10R60	0757-0438		RESISTOR:FXD MET FLM 5.11K OHM 1% 1/8W	28480	0757-0438
A10R61	C698-3558		RESISTOR:FXD MET FLM 4.02K OHM 1% 1/8W	28480	0698-3558
A10R62	0757-0442		RESISTOR:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A10R63	0757-0442		RESISTOR:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A10R64	C684-5641	1	RESISTOR:FXD COMP 560K OHM 10% 1/4W	01121	CB 5641
A10R65	C757-0437		RESISTOR:FXD MET FLM 4750 OHM 1% 1/8W	28480	0757-0437
A10R66	0757-0277		RESISTOR:FXD MET FLM 49.9 OHM 1% 1/8W	28480	0757-0277
A10R67	C684-5611		RESISTOR:FXD COMP 560 OHM 10% 1/4W	01121	CB 5611
A10R68	0757-0277		RESISTOR:FXD MET FLM 49.9 OHM 1% 1/8W	28480	0757-0277
A10R69	0757-0277		RESISTOR:FXD MET FLM 49.9 OHM 1% 1/8W	28480	0757-0277
A10R70	C698-4123		RESISTOR:FXD MET FLM 499 OHM 1% 1/8W	28480	0698-4123
A10R72	C698-3262	3	RESISTOR:FXD MET FLM 40.2 OHM 1% 1/8W	28480	0698-3262
A10R73	0698-3262		RESISTOR:FXD MET FLM 40.2 OHM 1% 1/8W	28480	0698-3262
A10R74	0698-4123		RESISTOR:FXD MET FLM 499 OHM 1% 1/8W	28480	0698-4123
A10R75	0757-0277		RESISTOR:FXD MET FLM 499 OHM 1% 1/8W	28480	0757-0277
A10R76*	0757-0407		RESISTOR:FXD MET FLM 200 OHM 1% 1/8W	24546	CA-1/8-T0-2[illegible]-F
A10T1	9100-1362		TRANSFORMER:TOROID	28480	9100-1362
A10T2	9100-1361	1	TRANSFORMER:TOROID	28480	9100-1361
A11	03320-66811	1	BOARD ASSY:D/A CONVERTER	28480	03320-66811
A11(Option 001)	03320-66840	1	BOARD ASSY:D/A CONVERTER	28480	03320-66840
A11C1	0160-0157		CAPACITOR:FXD MY 0.0047 UF 10% 200VDCW	56289	192P47292-PTS
A11C2	0160-0287		CAPACITOR:FXD MYLAR 0.01 UF 5% 200 VDCW	28480	0160-0287
A11C3	0160-0496	1	CAPACITOR:FXD MICA 22000 PF 1% 100VDCW	00853	RDM30F223FIC
A11C4	C150-0084		CAPACITOR:FXD CER 0.1 UF +80-20% 100VDCW	56289	33C4185-CDH
A11C5	0170-0055	1	CAPACITOR:FXD MY 0.1UF 20% 200VDCW	56289	192P1C402
A11C6	C180-1746		CAPACITOR:FXD ELECT 15 UF 10% 20VDCW	28480	0180-1746
A11C8	0180-1746		CAPACITOR:FXD ELECT 15 UF 10% 20VDCW	28480	0180-1746
A11C9	0150-0093		CAPACITOR:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A11C10	0150-0093		CAPACITOR:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A11C11	C180-1746		CAPACITOR:FXD ELECT 15 UF 10% 20VDCW	28480	0180-1746
A11C12	0150-0093		CAPACITOR:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A11CR1	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A11CR2	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A11CR3	1902-0048	1	DIODE:BREAKDOWN 6.81V 5%	04713	SZ10939-134
A11CR4	1902-0692	1	DIODE:TC REFERENCE 6.3V 1%	28480	1902-0692
A11CR5	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A11IC1	1820-0583	17	IC:TTL QUAD 2-INPT NAND GATE	28480	1820-0583
A11IC2	1820-0703	3	IC:DIGITAL TTL DECADE COUNTER	28480	1820-0703
A11IC3	1820-0703		IC:DIGITAL TTL DECADE COUNTER	28480	1820-0703
A11IC4	1820-0703		IC:DIGITAL TTL DECADE COUNTER	28480	1820-0703
A11IC5	1820-0595	7	IC:TTL DUAL J-K MASTER SLAVE F/F	28480	1820-0595
A11IC6	1820-0207	4	IC:TTL MONOSTABLE MULTIVIBRATOR	28480	1820-0207
A11IC7	1820-0207		IC:TTL MONOSTABLE MULTIVIBRATOR	28480	1820-0207
A11IC8	1826-0043		IC:LINEAR OPERATIONAL AMPLIFIER	28480	1826-0043

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 6-1. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A11IC9	1826-0043		IC:LINEAR OPERATIONAL AMPLIFIER	28480	1826-0043
A11IC10	1826-0043		IC:LINEAR OPERATIONAL AMPLIFIER	28480	1826-0043
A11L1, L2	9140-0137	2	COIL:FXD RF 1000 UH 5%	28480	9140-0137
A11L3	9100-1618		COIL:MOLDED CHOKE 5.60 UH	28480	9100-1618
A11Q1	1853-0020		TSTR:SI PNP(SELECTED FROM 2N3702)	28480	1853-0020
A11Q2	1854-0351	5	TSTR:SI NPN	04713	2N3904
A11Q3	1855-0386	3	TSTR:FET N-CHANNEL	80131	2N4392
A11Q4	1854-0404		TSTR:SI NPN	28480	1854-0404
A11Q5	1853-0010		TSTR:SI PNP(SELECTED FROM 2N3251)	28480	1853-0010
A11Q6	1853-0020		TSTR:SI PNP(SELECTED FROM 2N3702)	28480	1853-0020
A11Q7	1854-0351		TSTR:SI NPN	04713	2N3904
A11Q8	1855-0386		TSTR:FET N-CHANNEL	80131	2N4392
A11Q9	1853-0020		TSTR:SI PNP(SELECTED FROM 2N3702)	28480	1853-0020
A11Q10	1854-0351		TSTR:SI NPN	04713	2N3904
A11Q11	1855-0386		TSTR:FET N-CHANNEL	80131	2N4392
A11R1	0757-0449		RES:FXD FLM 20K OHM 1% 1/8W	28480	0757-0449
A11R2	0757-0449		RES:FXD FLM 20K OHM 1% 1/8W	28480	0757-0449
A11R3	0683-4725		RES:FXD COMP 4700 OHM 5% 1/4W	01121	CB 4725
A11R4	0683-1525	51	RES:FXD COMP 1500 OHM 5% 1/4W	01121	CB 1525
A11R5	0683-2225		RES:FXD COMP 2.2K OHM 5% 1/4W	01121	CB 2225
A11R6	0683-1035		RES:FXD COMP 10K OHM 5% 1/4W	01121	CB 1035
A11R8	0757-0274	1	RES:FXD MET FLM 1.21K OHM 1% 1/8W	28480	0757-0274
A11R9	0698-8026	1	RES:FXD FLM 1.81K OHM 0.5% 1/8W	28480	0698-8026
A11R10 (Option 001)	0698-3207	1	RES:FXD MET FLM 1.74K OHM 1% 1/8 W	28480	0698-3207
A11R11	2100-3085	1	RES:VAR CERMET 200 OHM 10% TYPE P 3/4W	28480	2100-3085
A11R12	0698-8670	1	RES:FXD MET FLM 1K OHM 0.5% 1/8W	28480	0698-8670
A11R13	0683-3335	1	RES:FXD COMP 33 K OHM 5% 1/4W	01121	CB 3335
A11R14	0683-1025		RES:FXD COMP 1000 OHM 5% 1/4W	01121	CB 1025
A11R15	0698-8027	1	RES:FXD FLM 19.3K OHM 0.5% 1/8W	28480	0698-8027
A11R16	2100-3154		RES:VAR 1K OHM 10% LIN	28480	2100-3154
A11R17	0683-2225		RES:FXD COMP 2.2K OHM 5% 1/4W	01121	CB 2225
A11R18	0698-4484	2	RES:FXD FLM 19.1K OHM 1% 1/8W	28480	0698-4484
A11R19	0683-2225		RES:FXD COMP 2.2K OHM 5% 1/4W	01121	CB 2225
A11R20	0683-1035		RES:FXD COMP 10K OHM 5% 1/4W	01121	CB 1035
A11R21	0683-2225		RES:FXD COMP 2.2K OHM 5% 1/4W	01121	CB 2225
A11R22	0698-4484		RES:FXD FLM 19.1K OHM 1% 1/8W	28480	0698-4484
A11R24	0683-2225		RES:FXD COMP 2.2K OHM 5% 1/4W	01121	CB 2225
A11R25	0683-1525		RES:FXD COMP 1500 OHM 5% 1/4W	01121	CB 1525
A11R26	0683-5635	1	RES:FXD COMP 56K OHMS 5% 1/4W	01121	CB 5635
A11R27	0683-1025		RES:FXD COMP 1000 OHM 5% 1/4W	01121	CB 1025
A11R28	0683-1025		RES:FXD COMP 1000 OHM 5% 1/4W	01121	CB 1025
A11R29	0683-2235	1	RES:FXD COMP 22K OHM 5% 1/4W	01121	CB 2235
A11R30	0698-3228		RES:FXD MET FLM 49.9K OHM 1% 1/8W	28480	0698-3228
A11R31	0698-4459	1	RES:FXD FLM 634 OHM 1% 1/8W	28480	0698-4459
A12A (3320A ONLY)	03320-66618	1	AMPLIFIER ASSY	28480	03320-66618
A12 C1	0160-2198	4	CAP:FXD MICA 20 PF 5%	72136	RDM15C200J3C
A12 C2	0140-0176		CAP:FXD MICA 100 PF 2%	28480	0140-0176
A12 C3	0160-3691	1	CAP:FXD MICA 75 PF 1% 100VDCW	72136	RDM15E750F1S
A12 C4	0140-0218	2	CAP:FXD MICA 160 PF 2%	28480	0140-0218
A12 C5	0160-0205	2	CAP:FXD MICA 10 PF 5%	28480	0160-0205
A12 C6	0140-0228	2	CAP:FXD MICA 360 PF 1% 300VDCW	28480	0140-0228
A12 C7	0140-0226	2	CAP:FXD MICA 320 PF 1%	28480	0140-0226
A12 C8	0160-2198		CAP:FXD MICA 20 PF 5%	72136	RDM15C200J3C
A12 C9	0140-0220	2	CAP:FXD MICA 200 PF 1% 300VDCW	28480	0140-0220
A12 C10	0160-2009		CAP:FXD MICA 820 PF 5% 300VDCW	00853	RDM19F821J1C
A12 C12	0150-0093		CAP:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K80C011
A12 C13	0150-0084		CAP:FXD CER 0.1 UF +80-20% 100VDCW	56289	3IC4185-C0H
A12 C15	0150-0093		CAP:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K80C011
A12 C16	0150-0093		CAP:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K80C011
A12 C17	0180-2288	2	CAP:FXD ELECT 600 UF +75-10% 15VDCW	56289	39D607G015EE4
A12 C18	0150-0084		CAP:FXD CER 0.1 UF +80-20% 100VDCW	56289	3IC4185-C0H
A12 C19	0150-0084		CAP:FXD CER 0.1 UF +80-20% 100VDCW	56289	3IC4185-C0H
A12 C20	0150-0093		CAP:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K80C011
A12 C22	0150-0093		CAP:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K80C011
A12 C23	0180-2288		CAP:FXD ELECT 600 UF +75-10% 15VDCW	56289	39D607G015EE4
A12 C24	0160-0121	2	CAP:FXD CER 0.1 UF +80-20% 50 VDCW	56289	5C5081 CMI
A12 C25	0160-0121		CAP:FXD CER 0.1 UF +80-20% 50 VDCW	56289	5C5081 CMI
A12 C26	0180-1746		CAP:FXD ELECT 15 UF 10% 20VDCW	56289	0180-1746
A12 CR1	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A12 CR2	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A12 CR3	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A12 CR4	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A12 CR5	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A12 CR6	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 6-1. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A12 CR7	1901-0050		DIODE:SI 200 MA AT 1V	07263	FDA 6308
A12 CR8	1902-0554	2	DIODE BREAKDOWN:10V 1W	28480	1902-0554
A12 CR9	1901-0050		DIODE:SI 200 MA AT 1V	07263	FDA 6308
A12 CR10	1902-0554		DIODE BREAKDOWN:10V 1W	28480	1902-0554
A12 F1	2110-0027	1	FUSE:0.125A 250V	75915	312.125
A12 J1	1251-2969	6	CONNECTOR:PHONO, SINGLE JACK	27264	15-24-0501
A12 J2	1251-2969		CONNECTOR:PHONO, SINGLE JACK	27264	15-24-0501
A12 J3	1251-2969		CONNECTOR:PHONO, SINGLE JACK	27264	15-24-0501
A12 L1	9100-3319	2	COIL:FXD 0.74 UH	28480	9100-3319
A12 L2	9100-3318	4	COIL:FXD 0.58 UH	28480	9100-3318
A12 L3	9100-3318		COIL:FXD 0.58 UH	28480	9100-3318
A12 L4	9170-0016		BEAD:MAGNETIC SHIELDING	02114	56-590-65/3B
A12 L5	9170-0016		BEAD:MAGNETIC SHIELDING	02114	56-590-65/3B
A12 L6	9170-0016		BEAD:MAGNETIC SHIELDING	02114	56-590-65/3B
A12 L7	9170-0016		BEAD:MAGNETIC SHIELDING	02114	56-590-65/3B
A12 L11,L8	9140-0180		COIL:FXD RF 2.7 UH 10%	89536	1537-32
A12 Q1	1854-0345		TSTR:SI NPN	80131	2N5179
A12 Q2	1854-0345		TSTR:SI NPN	80131	2N5179
A12 Q3	1853-0203		TSTR:SI PNP	28480	1853-0203
A12 Q4	1854-0019		TSTR:SI NPN	28480	1854-0019
A12 Q5	1854-0053	1	TSTR:SI NPN	80131	2N2218
A12 Q6	1854-0345		TSTR:SI NPN	80131	2N5179
A12 Q7	1853-0203		TSTR:SI PNP	28480	1853-0203
A12 Q8	1853-0012	2	TSTR:SI PNP	80131	2N2904A
A12 R1	0757-0378	1	R:FXD MET FLM 11.0 OHM 1% 1/8W	28480	0757-0378
A12 R2	0698-4354	1	R:FXD FLM 11.8 OHM 1% 1/8W	28480	0698-4354
A12 R3	0698-3441	1	R:FXD MET FLM 215 OHM 1% 1/8W	28480	0698-3441
A12 R4	0757-0395	1	R:FXD MET FLM 56.2 OHM 1% 1/8W	28480	0757-0395
A12 R5	0698-4449	2	R:FXD MET FLM 309 OHM 1% 1/8W	91637	CMF-1/10 32 T-1 obd
A12 R6	0698-4388		R:FXD FLM 46.3 OHM 1% 1/8W	91637	CMF-1/10 32 T-1 obd
A12 R7	2100-2683	1	R:VAR CERMET 10 OHM 2% LIN 1/2 W	28480	2100-2683
A12 R8	0698-4388		R:FXD FLM 46.3 OHM 1% 1/8 W	91637	CMF-1/10 32 T-1
A12 R10	0684-4701		R:FXD COMP 47 OHM 10% 1/4W	01121	CB4701
A12 R11	0757-0338	2	R:FXD MET FLM 1.00K OHM 1% 1/4W	28480	0757-0338
A12 R12	C698-4195	1	R:FXD MET FLM 1.02K OHM 1% 1/8W	28480	0698-4195
A12 R13	0684 8201	4	R:FXD COMP 82 OHM 10% 1/4W	01121	CB8201
A12 R14	0698-0082	1	R:FXD MET FLM 464 OHM 1% 1/8W	28480	0698-0082
A12 R15	0684-4701		R:FXD COMP 47 OHM 10% 1/4W	01121	CB 4701
A12 R16	0698-4452		R:FXD FLM 374 OHM 1% 1/8W	28480	0698-4152
A12 R17	C757-0284	3	R:FXD MET FLM 150 OHM 1% 1/8W	28480	0757-0284
A12 R18	0757-0388	3	R:FXD FLM 33.2 OHM 1% 1/8W	19701	MF4C T 0
A12 R19	C757-0346		R:FXD MET FLM 10 OHM 1% 1/8W	28480	0757-0346
A12 R20	0757-0346		R:FXD MET FLM 10 OHM 1% 1/8W	28480	0757-0346
A12 R21	0757-0388		R:FXD FLM 33.2 OHM 1% 1/8W	19701	MF4C T 0
A12 R22	C698-4447	1	R:FXD MET FLM 280 OHM 1% 1/8W	28480	0698-4447
A12 R23	0757-0284		R:FXD MET FLM 150 OHM 1% 1/8W	28480	0757-0284
A12 R24	C698-4452		R:FXD FLM 374 OHM 1% 1/8W	28480	0698-4452
A12 R25	0684-4701		R:FXD COMP 47 OHM 10% 1/4W	01121	CB 4701
A12 R26	C698-4449	1	R:FXD FLM 309 OHM 1% 1/8W	28480	0698-4449
A12 R27	C698-3259		R:FXD FLM 7.87K OHM 1% 1/8W	28480	0698-3259
A12 R28	0698-4471	2	R:FXD FLM 7.15K OHM 1% 1/8W	28480	0698-4471
A12 R29	0684-4701		R:FXD COMP 47 OHM 10% 1/4W	01121	CB 4701
A12 R30	C698-4465	1	R:FXD FLM 931 OHM 1% 1/8W	28480	0698-4465
A12 R31	C684-4721	3	R:FXD COMP 4700 OHM 10% 1/4W	01121	CB 4721
A12 R32	0684-4721		R:FXD COMP 4700 OHM 10% 1/4W	01121	CB 4721
A12 R33 OPTION 001	0757-0710		R:FXD FLM 73.2 OHM 1% 1/4W	01295	MC60 T-1
A12 R33 (Std)	0757-0393		R:FXD FLM 47.5 OHM 1% 1/8W	24546	C4-1/8-T0-47R5-F
A12 R34	0698-4428		R:FXD FLM 1.69 KOHM 1% 1/8W	91637	CMF-1/10-32 T-1 obd
A12 R35, R36	0684-4701		R:FXD COMP 47 OHM 10% 1/4W	01121	CB4701
A12 R37, R38	0684-10011		R:FXD COMP 10 OHM 10% 1/4 W	01121	CB1001
A12R39*	0757-0460		R:FXD FLM 150K 1% 1/8W	24546	C4-1/8-T0-1503-F
A12 U (33206 ONLY)	03320-66512	1	BOARD ASSY:DETECTOR	28480	03320 66512
A12 A1	03320-66701	1	TRANSISTOR ASSY	28480	03320 66701
A12 C1	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	1500105X9035A2-DYS
A12 C2	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	1500105X9035A2-DYS
A12 C3	0160-0182	1	C:FXD MICA 47PF 5% 300VDCW	14655	RDM15E470J3S
A12 C4	0160-0298	1	C:FXD MY 0.0015 UF 10% 200VDCW	56289	192P15292-PTS
A12 C5	0180-3183	1	C:FXD MY 0.47 UF 20% 50VDCW	84411	HEM 101
A12 C6	0170-0079	1	C:FXD MY 0.047UF 20% 50VDCW	84411	STYLE 3 TYPE 601PE
A12 C7	0160-0161	5	C:FXD MY 0.01 UF 10% 200VDCW	56289	192P10392-PTS
A12 C8	0160-0161		C:FXD MY 0.01 UF 10% 200VDCW	56289	192P10392-PTS
A12 C9	0160-0161		C:FXD MY 0.01 UF 10% 200VDCW	56289	192P10392-PTS
A12 C10	0180-0374		C:FXD TANT, 10 UF 10% 20VDCW	56289	1500106X9020B2-DYS
A12 C11	0180-3877		C:FXD MYLAR .022 UF 10% 100 VDCW	56289	225P2733WB1-PWM
A12 C12	0180-3877		C:FXD MYLAR .022 UF 10% 100 VDCW	56289	225P2733WB1-PWM
A12 C13	0160-0161		C:FXD MY 0.01 UF 10% 200VDCW	56289	192P10392-PTS
A12 C14	0160-2611	2	C:FXD MY 1 UF 10% 50VDCW	84411	HEM 101
A12 C15	0160-0161		C:FXD MY 0.01 UF 10% 200VDCW	56289	192P10392-PTS

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 6-1 Replaceable Parts. (cont'd).

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A12 C16	0140-2611		C:F/M MY 1 UF 10% 50VDCW	84411	NEW 101
A12 C17	0180-0197		C:FXD ELECT 2.7 UF 10% 20VDCW	56289	150D225X9020A2-DYS
A12 C18	0180-0060	1	C:FXD AL ELECT 200 UF +75-10% 3VDCW	56289	30D207G003CC2-DSM
A12C19*	0160-7322		C:FXD MICA 18 PF 5% 100VDCW	00853	RDM15C180J15
A12CR1, CR2	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A12 CR3	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A12 CR4	1902-0049	3	DIODE:BREAKDOWN 6.19V 5%	04713	SZ10939-122
A12 CR5	1901-0053		DIODE:SILICON 30VDCW	07263	FD3144
A12 CR6	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A12 CR7	1902-0049		DIODE:BREAKDOWN 6.19V 5%	04713	SZ10939-122
A12 CR8	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A12 CR9	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A12 CR10	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A12 IC1	1826-0043		IC:LINEAR OPERATIONAL AMPLIFIER	28480	1826-0043
A12 IC2	1826-0043		IC:LINEAR OPERATIONAL AMPLIFIER	28480	1826-0043
A12 IC3	1826-0043		IC:LINEAR OPERATIONAL AMPLIFIER	28480	1826-0043
A12 IC4	1820-0207		IC:TTL MONOSTABLE MULTIVIBRATOR	28480	1820-0207
A12 IC5	1826-0043		IC:LINEAR OPERATIONAL AMPLIFIER	28480	1826-0043
A12 J1, J2	1251-3888	2	CONNECTOR:PHONO	27264	16-24 0101
A12 K1	0490-0863	6	RELAY:MULTI-REED	28480	0490-0863
A12 K2	0490-1016	1	RELAY:REED COIL 10 VA 250 V	16636	R27317
A12 Q1	1854-0404		TSTR:SI NPN	28480	1854-0404
A12 Q2	1853-0012		TSTR:SI PNP	80131	2N2904A
A12 Q3	1855-0368	4	TSTR:FET SI NPN N-CHANNEL	28480	1855-0368
A12 Q5	1854-0210	4	TSTR:SI NPN	80131	2N2222
A12 Q6	1854-0210		TSTR:SI NPN	80131	2N2222
A12 Q7	1854-0404		TSTR:SI NPN	28480	1854-0404
A12 Q8	1855-0368		TSTR:FET SI NPN N-CHANNEL	28480	1855-0368
A12 Q9	1855-0368		TSTR:FET SI NPN N-CHANNEL	28480	1855-0368
A12 Q10	1855-0368		TSTR:FET SI NPN N-CHANNEL	28480	1855-0368
A12 Q11	1854-0210		TSTR:SI NPN	80131	2N2222
A12 Q12	1854-0210		TSTR:SI NPN	80131	2N2222
A12 R1	0684-4721		R:FXD COMP 4700 OHM 10% 1/4W	01121	CB 4721
A12 R2	0684-2231	2	R:FXD COMP 22K OHM 10% 1/4W	01121	CB 2231
A12 R3	0684-2231		R:FXD COMP 22K OHM 10% 1/4W	01121	CB 2231
A12 R4	0684-4731	4	R:FXD COMP 47K OHM 10% 1/4W	01121	CB 4731
A12 R5	0684-4751	4	R:FXD COMP 4.7 MEGOHM 10% 1/4W	01121	CB 4751
A12 R6	0684-2261		R:FXD COMP 2.2 MEGOHM 10% 1/4W	01121	CB 2261
A12 R7	0698-4499	1	R:FXD FLM 54.9K OHM 1% 1/8W	28480	0698-4499
A12 R8	0698-8004	2	R:FXD FLM 200K OHM 0.1% 1/8W	28480	0698-8004
A12 R10	2100-3056	2	R:VAR CERMET 5K OHM 10% TYPE P 3/4W	28480	2100-3056
A12 R12	0698-8004		R:FXD FLM 200K OHM 0.1% 1/8W	28480	0698-8004
A12 R13	0757-0472	2	R:FXD MET FLM 200K OHM 1% 1/8W	28480	0757-0472
A12 R14	0757-0472		R:FXD MET FLM 200K OHM 1% 1/8W	28480	0757-0472
A12 R15	0684-4731		R:FXD COMP 47K OHM 10% 1/4W	01121	CB 4731
A12 R17	0698-4530	1	R:FXD FLM 232K OHM 1% 1/8W	28480	0698-4530
A12 R18	0757-0446		R:FXD MET FLM 15.0K OHM 1% 1/8W	28480	0757-0446
A12 R19	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A12 R20	0698-4462	1	R:FXD FLM 768 OHM 1% 1/8W	28480	0698-4462
A12 R21	0757-0728	1	R:FXD MET FLM 619 OHM 1% 1/4W	28480	0757-0728
A12 R22	0757-0423	3	R:FXD MET FLM 1.62K OHM 1% 1/8W	28480	0757-0423
A12 R23	0757-0427		R:FXD MET FLM 1.5K OHM 1% 1/8W	28480	0757-0427
A12 R24	0684-3331	1	R:FXD COMP 33K OHM 10% 1/4W	01121	CB 3331
A12 R25	0698-8005	1	R:FXD FLM 75 OHM .001% 1/8W	28480	0698-8005
A12 R27	0698-3238		R:FXD MET FLM 49.8 K OHM 1% 1/8W	19701	MFDC T-0 ab-1
A12 R28	0757-0270	3	R:FXD MET FLM 249K OHM 1% 1/8W	28480	0757-0270
A12 R29	0698-8007	1	R:FXD FLM 7.054K OHM .001% 1/8W	28480	0698-8007
A12 R30	2100-3122	1	R:VAR CERMET 100 OHM 10% 3/4W	28480	2100-3122
A12 R31	0698-8006	1	R:FXD FLM 1.772K OHM .001% 1/8W	28480	0698-8006
A12 R32	0698-3262		R:FXD MET FLM 40.2 OHM 1% 1/8W	28480	0698-3262
A12 R33	0698-3582	1	R:FXD MET FLM 41.2K OHM 1% 1/8W	28480	0698-3582
A12 R34	2100-3054		R:VAR CERMET 50K OHM 10% 3/4W	28480	2100-3054
A12 R35	0684-1221	1	R:FXD COMP 1.2K 10% 1/4W	01121	CB 1221
A12 R36	0684-1061		R:FXD COMP 10 MEGOHM 10% 1/4W	01121	CB 1061
A12 R37	0684-4751		R:FXD COMP 4.7 MEGOHM 10% 1/4W	01121	CB 4751
A12 R38	0684-4751		R:FXD COMP 4.7 MEGOHM 10% 1/4W	01121	CB 4751
A12 R39	0684-1021	2	R:FXD COMP 1000 OHM 10% 1/4W	01121	CB 1021
A12 R40	0698-3228		R:FXD MET FLM 49.9K OHM 1% 1/8W	28480	0698-3228
A12 R41	0698-3499		R:FXD FLM 40.2K OHM 1% 1/8W	28480	0698-3499
A12 R42	0684-4751		R:FXD COMP 4.7 MEGOHM 10% 1/4W	01121	CB 4751
A12 R43	0684-6811	1	R:FXD COMP 680 OHM 10% 1/4W	01121	CB 6811
A12 R44	0684-3311	1	R:FXD COMP 330 OHM 10% 1/4W	01121	CB 3311
A12 R45	0684-3321		R:FXD COMP 3300 OHM 10% 1/4W	01121	CB 3321
A12 R46	0684-4731		R:FXD COMP 47K OHM 10% 1/4W	01121	CB 4731
A12 R47	0684-1021		R:FXD COMP 1000 OHM 10% 1/4W	01121	CB 1021
A12 R48	0698-3160		R:FXD MET FLM 31.6 K OHM 1% 1/8 W	28480	0698-3160
A12 R49	0698-3228		R:FXD MET FLM 6.49 K OHM 1% 1/8 W	28480	0698-3228
A12 R50	0684-6821	1	R:FXD MET COMP 6.8 K OHM 10% 1/4 W	01121	CB6821

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 6-1. Replaceable Parts(Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A12R81	0884-4731		R: FXD COMP 47 K OHM 10% 1/4 W	01121	CB4731
A12R82	0884-1061		R: FXD COMP 1 MEGOHM 10% 1/4 W	01121	CB1061
A12R83	0757-0270		R: FXD MET FLM 348K OHM 1% 1/8 W	28480	0757-0270
A12R84	0884-1001	2	R: FXD COMP 10 OHM 10% 1/4 W	01121	CB1001
A12R85	0884-1001		R: FXD COMP 10 OHM 10% 1/4 W	01121	CB1001
A12TC1	0863-0017		THERMOCOUPLE	28480	0863-0017
A13A (3320A ONLY)	03320-61902	1	PC ASSY: SWITCH	28480	
A13R1	0698-4416		R: FXD FLM 169 OHM 1% 1/8 W	91637	CMF 1/10 32 T-1 obd
	3130-0471		MSFD: WAFER	28480	3130-0471
	3130-0473		MSFD: DETENT	28480	3130-0473
	3130-0472		2ND SFD: WAFER	28480	3130-0472
	3130-0477		2ND SFD: DETENT	28480	3130-0477
	3130-0472		LSFD: WAFER	28480	3130-0472
	3130-0477		LSFD: DETENT	28480	3130-0477
	3130-0474		RANGE: TOP WAFER	28480	3130-0474
	3130-0475		RANGE: BOTTOM WAFER	28480	3130-0475
	3130-0478		RANGE: DETENT	28480	3130-0478
A13B (3320B ONLY)	03320-61901	1	PC ASSY: SWITCH	28480	03320-61901
A13R1	0698-4416		R: FXD FLM 169 OHM 1% 1/8 W	91637	CMF 1/10 32 T-1 obd
	3130-0471		MSFD: WAFER	28480	3130-0471
	3130-0473		MSFD: DETENT	28480	3130-0473
	3130-0472		2ND SFD: WAFER	28480	3130-0472
	3130-0477		2ND SFD: DETENT	28480	3130-0477
	3130-0472		LSFD: WAFER	28480	3130-0472
	3130-0477		LSFD: DETENT	28480	3130-0477
	3130-0478		MSAD: WAFER	28480	3130-0478
	3130-0479		MSAD: DETENT	28480	3130-0479
	3120-0472		3RD SAD: WAFER	28480	3130-0472
	3130-0477		3RD SAD: DETENT	28480	3130-0477
	3130-0472		2ND SAD: WAFER	28480	3130-0472
	3130-0477		2ND SAD: DETENT	28480	3130-0477
	3130-0472		LSAD: WAFER	28480	3130-0472
	3130-0477		LSAD: DETENT	28480	3130-0477
	3130-0474		RANGE: TOP WAFER	28480	3130-0474
	3130-0475		RANGE: BOTTOM WAFER	28480	3130-0475
	3130-0478		RANGE: DETENT	28480	3130-0478
A14 (3320B ONLY)	03320-66614	1	BOARD ASSY: POWER AMPLIFIER	28480	03320-66614
A14C1	0160-2198		C:FXD MICA 20 PF 5%	72136	RDM15C200J3C
A14C2	0160-0336	1	C:FXD MICA 100 PF 1%	28480	0160-0336
A14C3	0160-3520	1	C:FXD MICA 75 PF 1% 100VDCM	72136	RDM19E750F1C
A14C4	0160-0218		C:FXD MICA 160 PF 2%	28480	0160-0218
A14C5	0160-0205		C:FXD MICA 10 PF 5%	28480	0160-0205
A14C6	0160-0228		C:FXD MICA 240 PF 1% 300VDCM	28480	0160-0228
A14C7	0160-0226		C:FXD MICA 320 PF 1%	28480	0160-0226
A14C8	0160-2198		C:FXD MICA 20 PF 5%	72136	RDM15C200J3C
A14C9	0160-0220		C:FXD MICA 200 PF 1% 300VDCM	28480	0160-0220
A14C10	0160-0176		C:FXD MICA 100 PF 2%	28480	0160-0176

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 6-1. Replaceable Parts(Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A14C11	0160-2228	1	C:FXD MICA 2700 PF 5%	28480	0160-2228
A14C12	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	1500105X9035A2-DY5
A14C13	0150-0093		C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-M800011
A14C14	0180-1846	2	C:FXD ELECT 2.2 UF 10% 35VDCW	56289	1500225X9035B2-DY5
A14C15	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	1500105X9035A2-DY5
A14C16	0150-0084		C:FXD CER 0.1 UF +80-20% 100VDCW	56289	33C4185-CDH
† A14C17			NOT ASSIGNED		
A14C18	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	1500105X9035A2-DY5
A14C19	0150-0018		C:FXD TI DIOX 2.2 PF 10% 500VDCW	28480	TYPE GA
A14C20	0150-0084		C:FXD CER 0.1 UF +80-20% 100VDCW	56289	33C4185-CDH
A14C21	0180-0116	2	C:FXD ELECT 6.8 UF 10% 35VDCW	56289	150D685X9035B2-DY5
A14C22	0150-0084		C:FXD CER 0.1 UF +80-20% 100VDCW	56289	33C4185-CDH
A14C23	0160-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	1500105X9035A2-DY5
A14C24	0180-0376	3	C:FXD ELECT 0.47 UF 10% 35VDCW	56289	1500474X9035A2-DY5
A14C25	0180-0376		C:FXD ELECT 0.47 UF 10% 35VDCW	56289	1500474X9035A2-DY5
A14C26	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	1500105X9035A2-DY5
A14C27	0150-0084		C:FXD CER 0.1 UF +80-20% 100VDCW	56289	33C4185-CDH
† A14C28			NOT ASSIGNED		
A14C29	0180-1846		C:FXD ELECT 2.2 UF 10% 35VDCW	56289	1500225X9035B2-DY5
A14C30	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	1500105X9035A2-DY5
A14C32	0150-0022		C:FXD TI DIOX 3.3 PF 10% 500VDCW	28480	TYPE GA
A14C33	0150-0084		C:FXD CER 0.1 UF +80-20% 100VDCW	56289	33C4185-CDH
A14C34	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	1500105X9035A2-DY5
A14C35	0150-0084		C:FXD CER 0.1 UF +80-20% 100VDCW	56289	33C4185-CDH
A14C36	0180-0116		C:FXD ELECT 6.8 UF 10% 35VDCW	56289	150D685X9035B2-DY5
A14C37	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	1500105X9035A2-DY5
A14C38	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	1500105X9035A2-DY5
A14C39	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	1500105X9035A2-DY5
A14C40	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	1500105X9035A2-DY5
A14C41	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	1500105X9035A2-DY5
A14C42	0150-0093		C:FXD .01 UF +80-20% 100VDCW	28480	0150-0093
A14CR1	1902-3205	3	DIODE BREAKDOWN:15.0V 5%	28480	1902-3205
A14CR2	1902-3205		DIODE BREAKDOWN:15.0V 5%	28480	1902-3205
A14CR3	1902-0556	2	DIODE:BREAKDOWN 20.0V 5% 1W	28480	1902-0556
A14CR4	1901-0044		DIODE:SILICON 20MA/1V	28480	1901-0044
A14CR5	1901-0044		DIODE:SILICON 20MA/1V	28480	1901-0044
A14CR6	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A14CR7	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A14CR8	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A14CR9	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A14CR10	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A14CR11	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A14CR12	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A14CR14	1901-0044		DIODE:SILICON 20MA/1V	28480	1901-0044
A14CR15	1901-0044		DIODE:SILICON 20MA/1V	28480	1901-0044
A14CR16	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A14CR17	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A14CR18	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A14CR19	1901-0050		DIODE:SI 200 MA AT 1V	07263	FDA 6108
A14CR20	1902-0202	2	DIODE BREAKDOWN:15.0V 5% 1W	28480	1902-0202
A14CR22	1901-0050		DIODE:SI 200 MA AT 1V	07263	FDA 6108
A14CR23	1902-0202		DIODE BREAKDOWN:15.0V 5% 1W	28480	1902-0202
A14CR24	1902-0556		DIODE:BREAKDOWN 20.0V 5% 1W	28480	1902-0556
A14CR25	1901-0044		DIODE:SILICON 20MA/1V	28480	1901-0044
A14CR26	1901-0044		DIODE:SILICON 20MA/1V	28480	1901-0044
A14IC1	1826-0043	1	IC:OPERATIONAL AMPLIFIER	28480	1826-0043

† See Section VIII, Manual Backdating

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 6-1. Replaceable Parts (cont'd).

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A14J1	1251-287		CONNECTOR: PHONO, SINGLE JACK	27264	16-24-0801
A14J3	1251-2969		CONNECTOR: PHONO, SINGLE JACK	27264	16-24-0801
A14J4	1251-2969		CONNECTOR: PHONO, SINGLE JACK	27264	16-24-0801
A14L1	9100-3319		COIL:FXD 0.74 UH	28480	9100-3319
A14L2	9100-3318		COIL:FXD 0.56 UH	28480	9100-3318
A14L3	9100-3318		COIL:FXD 0.56 UH	28480	9100-3318
A14L4	9100-1619	1	COIL:MOLDED CHOKE 6.8 UH 10%	28480	9100-1619
A14L5-8	9170-0694		BEAD,MAGNETIC SHIELDING	28480	9170-0694
A14J2	1250-1196		CONNECTOR RF SUB-MINIATURE SERIES	98291	62-063-0000
†A14Q1	1853-0036		TSTR: SI PNP	04713	SPS-3612
†A14Q2	1853-0036		TSTR: SI PNP	04713	SPS-3612
A14Q3	1853-0010		TSTR SI PNP (SELECTED FROM 2N3261)	28480	1853-0010
A14Q4	1853-0312	2	TSTR SI PNP	04713	2N6160
A14Q5	1854-0631	2	TSTR SI NPN	28480	1854-0631
A14Q6	1854-0404		TSTR SI NPN	28480	1854-0404
A14Q7	1854-0039	4	TSTR SI NPN	80131	2N3053
A14Q8	1854-0308	1	TSTR SI NPN	80131	2N3663
†A14Q9	1854-0215	2	TSTR SI NPN	04713	SPS 3611
A14Q10	1854-0404		TSTR SI NPN	28480	1854-0404
A14Q11	1854-0631		TSTR SI NPN	28480	1854-0631
A14Q12	1853 0312		TSTR SI NPN	04713	2N6160
A14Q13	1853-0313	1	TSTR SI PNP	04713	MM 4010
A14Q14	1853-0010		TSTR SI PNP (SELECTED FROM 2N3261)	28480	1853-0010
A14Q15	1853-0061	2	TSTR SI PNP	80131	2N4037
†A14Q16	1854-0215		TSTR SI NPN	04713	SPS 3611
A14R1	0757-0277		R:FXD MET FLM 499 OHM 1% 1/8W	28480	0757-0277
A14R2	0757-0442		R:FXD MET FLM 100 K OHM 1% 1/8W	28480	0757-0442
A14R3	0757-0442		R:FXD MET FLM 100K OHM 1% 1/8W	28480	0757-0442
A14R4	0757-0270		R:FXD MET FLM 249K OHM 1% 1/8W	28480	0757-0270
A14R5	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A14R6	0684-1521	2	R:FXD COMP 680OHM 5% 1/4W	01121	CB6805
A14R8	0757-0442		R:FXD FLM 10K OHM 1% 1/8W	24546	C4-1/8-T0-1002-F
A14R9	0757-0283	1	R:FXD FLM 2K OHM 1% 1/8W	24546	C4-1/8-T0-2001-F
A14R10	0683-0685	4	R:FXD COMP 6.8 OHM 5% 1/4W	01121	CB6805
A14R11	0683-0685		R:FXD COMP 6.8 OHM 5% 1/4W	01121	CB6805
A14R12			NOT ASSIGNED		
A14R13	0757-0394	1	R:FXD MET FLM 51.1 OHM 1% 1/8W	28480	0757-0394
A14R14	0757-0283		R:FXD MET FLM 2.00K OHM 1% 1/8W	28480	0757-0283
A14R15	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A14R16	0757-0384		R:FXD FLM 20 OHM 1% 1/8W	28480	0757-0384
A14R17	0757-0291		R:FXD FLM 24.9 OHM 1% 1/8W	28480	0757-0291
A14R18	0757-0747	2	R:FXD FLM 5110 OHM 1% 1/4W	28480	0757-0747
A14R19	0757-0428		R:FXD MET FLM 1.62K OHM 1% 1/8W	28480	0757-0428
A14R20	0698-0058	1	R:FXD MET FLM 402K OHM 1.0% 1/2W	81637	CMF-1/4-T1-4021-F
A14R21	0757-0277		R:FXD MET FLM 499 OHM 1% 1/8W	28480	0757-0277
† A14R22	0757-0277		R:FXD FLM 499 OHM 1% 1/8W	28480	0757-0277
A14R23	0698-4474		R:FXD FLM 8450 OHM 1% 1/8W	28480	0698-4474
A14R24	0698-3535	2	R:FXD MET FLM 1650 OHM 1.0% 1/2W	28480	0698-3535
A14R25	0687-1001	2	R:FXD COMP 10 OHM 10% 1/2W	01121	EB 1001
A14R26	0698-7985	2	R:FXD FLM 2 OHM 5% 1/4W	28480	0698-7985
A14R27	0698-0001	2	R:FXD COMP 4.7 OHM 5% 1/2W	01121	EB 4705
A14R28	0698-0001		R:FXD COMP 4.7 OHM 5% 1/2W	01121	EB 4705
A14R29	0684-3321		R:FXD COMP 3300 OHM 10% 1/4W	01121	CB 3321
A14R30	0757-0338		R:FXD MET FLM 3.00K OHM 1% 1/4W	28480	0757-0338
A14R31	0698-0068		R:FXD MET FLM 402K OHM 1% 1/8W	81637	CMF-1/4-T1-4021-F
A14R32,33	0698-7990	4	R:FXD MET FLM 200 OHM 01% 1/2W	28480	0698-7990
A14R34	0698-7990		R:FXD MET FLM 200 OHM .01% 1/2W	28480	0698-7990
A14R35	0698-7990		R:FXD MET FLM 200 OHM .01% 1/2W	28480	0698-7990
A14R36	0698-8008	1	R:FXD FLM 357 OHM	28480	0698-8008
A14R37	0698-4426		R:FXD FLM 1580 OHM 1% 1/8W	28480	0698-4426
A14R38	0698-8009	1	R:FXD FLM 95 OHM	28480	0698-8009
A14R39	0757-0394		R:FXD MET FLM 51.1 OHM 1% 1/8W	28480	0757-0394
A14R40	0684-3321		R:FXD COMP 3300 OHM 10% 1/4W	01121	CB 3321
A14R41	0757-0283		R:FXD MET FLM 2.00K OHM 1% 1/8W	28480	0757-0283
A14R42	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A14R43	0757-0394		R:FXD MET FLM 51.1 OHM 1% 1/8W	28480	0757-0394
A14R44	0683-0685		R:FXD COMP 6.8 OHM 5% 1/4W	01121	CB6805
A14R45	0683-0685		R:FXD COMP 6.8 OHM 5% 1/4W	01121	CB6805
A14R46	0757-0384		R:FXD FLM 20 OHM 1% 1/8W	28480	0757-0384
A14R47	0757-0291		R:FXD FLM 24.9 OHM 1% 1/8W	28480	0757-0291
A14R48	0757-0747		R:FXD FLM 5110 OHM 1% 1/4W	28480	0757-0747
A14R49	0757-0283		R:FXD MET FLM 2.00K OHM 1% 1/8W	28480	0757-0283
A14R50	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A14R51	0683-0275		R:FXD COMP 2.7 OHM 5% 1/4W	01121	CB27G5
A14R52	0757-0428		R:FXD MET FLM 1.62K OHM 1% 1/8W	28480	0757-0428
A14R53	0757-0277		R:FXD MET FLM 499 OHM 1% 1/8W	28480	0757-0277
A14R54	0683-0275		R:FXD COMP 2.7 OHM 5% 1/4W	01121	CB27G5
A14R55	2100-1984	1	R:VAR FLM 100 OHM 10% LIN 1/2W	28480	2100-1984
† A14R56	0757-0277		R:FXD FLM 499 OHM 1% 1/8W	28480	0757-0277
A14R57	0757-0277		R:FXD MET FLM 499 OHM 1% 1/8W	28480	0757-0277
A14R58	0698-7985		R:FXD FLM 2 OHM 5% 1/4W	28480	0698-7985
A14R59	0698-3535		R:FXD MET FLM 1650 OHM 1.0% 1/2W	28480	0698-3535
A14R60	0698-4474		R:FXD FLM 8450 OHM 1% 1/8W	28480	0698-4474

† See Section VIII, Manual Backdating

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 6-1. Replaceable Parts (cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A14R61	0687-1001		R:FXD COMP 1K OHM 10% 1/2W	01121	EB 1001
A14R62	0698-7820	2	R:FXD FLM 3.01 OHM 1% 1/4W	28480	0698-7820
A14R63	0698-7820		R:FXD FLM 3.01 OHM 1% 1/4W	28480	0698-7820
A14R64	0757-0414		R:FXD FLM 432 OHM 1% 1/8W	28480	0757-0414
A14R65	0698-8070	1	R:FXD FLM 1.3 OHM 5% 1/4 W	28480	0698-8070
A18 (33203B ONLY)	03320-66518	1	BOARD ASSY:ATTENUATOR	28480	03320-66518
A18 (Opt 001)	03320-66558	1	BOARD ASSY:ATTENUATOR	28480	03320-66558
A18C1	0160-0378	7	C:FXD ELECT 33 UF 10% 10VDCW	28480	0160-0378
A18C2-C8	0160-0093		C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-000011
A18C9	0160-3672		C:FXD MICA 1 UF 5%	72136	DDM15E102J3C
A18CR1	1901-0040		DIODE:SIL;CON 30MA 30WV	07263	FDG1088
A18CR2	1901-0040		DIODE:SIL;CON 30MA 30WV	07263	FDG1088
A18CR3	1901-0040		DIODE:SIL;CON 30MA 30WV	07263	FDG1088
A18CR4	1901-0040		DIODE:SIL;CON 30MA 30WV	07263	FDG1088
A18IC1	1820-0586	7	IC:DIGITAL TTL HEX CONVERTER	28480	1820-0586
A18IC2	1820-0256	1	IC:DTL QUAD 2-INPUT POWER GATE	04713	MC846P
A18J1	1250-1195		CONNECTOR:RF SUB-MINIATURE SERIES	98291	SP-053-0000
A18J2	1250 1339		CONNECTOR:RF SUB MINIATURE SERIES	98291	SP-051-0000
A18K1, K2	0490-0963		RELAY:MULTI-REED	28480	0490-0963
A18K3	0490-0963		RELAY:MULTI-REED	28480	0490-0963
A18K4	0490-0963		RELAY:MULTI-REED	28480	0490-0963
A18K5	0490-0963		RELAY:MULTI-REED	28480	0490-0963
A18Q1	1854-0354		TSTR:SI NPN	28480	1854-0354
A18Q2	1854-0354		TSTR:SI NPN	28480	1854-0354
A18Q3	1854-0354		TSTR:SI NPN	28480	1854-0354
A18Q4	1854-0354		TSTR:SI NPN	28480	1854-0354
A18R1	0684-3911		R:FXD COMP 390 OHM 10% 1/4W	01121	CB 3911
A18R2	0684-3911		R:FXD COMP 390 OHM 10% 1/4W	01121	CB 3911
A18R3	0684-3911		R:FXD COMP 390 OHM 10% 1/4W	01121	CB 3911
A18R4	0684-1811	1	R:FXD COMP 180 OHM 10% 1/4W	01121	CB 1811
A18R5	0698-7984	8	R:FXD FLM 61.1 OHM .01% 1/2W	28480	0698-7984
A18R6	0698-8387	4	R:FXD PREC FLM 247.5 OHM .1% 1/4W	19701	MF62C114-T2-247R5-B
A18R7	0698-7084		R:FXD FLM 61.1 OHM .01% 1/2W	28480	0698-7084
A18R8	0698-8390	3	R:FXD FLM 90.25 OHM 0.1% 1/4W	28480	0698-8390
A18R9	0698-7982	1	R:FXD FLM 71.15 OHM 0.1% 1/4W	28480	0698-7982
A18R10	0698-8390		R:FXD FLM 90.25 OHM 0.1% 1/4W	28480	0698-8390
A18R12	0698-7984		R:FXD FLM 61.1 OHM .01% 1/2W	28480	0698-7984
A18R13	0698-8387		R:FXD PREC FLM 247.5 OHM .1% 1/4W	19701	MF62C114-T2-247R5-B
A18R14	0698-7984		R:FXD FLM 61.1 OHM .01% 1/2W	28480	0698-7984
A18R15	0698-7984		R:FXD FLM 61.1 OHM .01% 1/2W	28480	0698-7984
A18R16	0698-8387		R:FXD PREC FLM 247.5 OHM .1% 1/4W	19701	MF62C114-T2-247R5-B
A18R17, R18	0698-7984		R:FXD FLM 61.1 OHM .01% 1/2W	28480	0698-7984
A18R19	0698-8387		R:FXD PREC FLM 247.5 OHM .1% 1/4W	19701	MF62C114-T2-247R5-B
A18R20	0698-7984		R:FXD FLM 61.1 OHM .01% 1/2 W	28480	0698-7984
A18R21(OPTION 001)	0698-8011	1	R:FXD FLM 35 OHM 0.1% 1/4 W	28480	0698-8011
A18A (33203A ONLY)	03320-66534		PC ASSY:FILTER	28480	03320-66534
A18C1	0180-2385		C:FXD ELECT 3000 UF -10+75% 40 VDCW	56289	39D302
A18C2	0180-2385		C:FXD ELECT 3000 UF -10+75% 40 VDCW	56289	39D302
A18R1	0687-1231		R:FXD COMP 12 K OHM 10% 1/2 W	01121	EB1231
A18R2	0687-1231		R:FXD COMP 12 K OHM 10% 1/2 W	01121	EB1231
A18 (33203 ONLY)	03320-66516	1	BOARD ASSY:FILTER	28480	03320-66516
A18C1	0180-2395	2	C:FXD AL ELECT 3000 UF +75-10% 40VDCW	56289	39D302
A18C2	0180-2395		C:FXD AL ELECT 3000 UF +75-10% 40VDCW	56289	39D302
A18C3	0180-2396	2	C:FXD AL ELECT 1000 UF +75-10% 75VDCW	56289	39D108G075JP4
A18C4	0180-2396		C:FXD AL ELECT 1000 UF +75-10% 75VDCW	56289	39D108G075JP4
A18R1	0687-1231	2	R:FXD COMP 12K OHM 10% 1/2W	01121	EB 1231
A18R2	0687-1231		R:FXD COMP 12K OHM 10% 1/2W	01121	EB 1231
A18R3	0687-2231	2	R:FXD COMP 22K OHM 10% 1/2W	01121	EB 2231
A18R4	0687-2231		R:FXD COMP 22K OHM 10% 1/2W	01121	EB 2231
A17A (33220A ONLY)	03320-66535	1	PC ASSY:POWER SUPPLY A17A IS IDENTICAL TO A17B WITH THE FOLLOWING EXCEPTIONS:	28480	03320-66535
A17C4			NOT ASSIGNED		
A17C9-C13			NOT ASSIGNED		
A17CR4, 5			NOT ASSIGNED		
A17CR13-16			NOT ASSIGNED		
A17IC3			NOT ASSIGNED		
A17Q2			NOT ASSIGNED		
A17Q7-13			NOT ASSIGNED		
A17R15-17			NOT ASSIGNED		
A17R33, 34	0696-6678		R:FXD FLM 13K OHM 0.5% 03888	FME55	
A17R36-50			NOT ASSIGNED		
A17B (33208 ONLY)	03320-66661	1	BOARD ASSY POWER SUPPLY	28480	03320-66661
A17C1	0150-0299	1	C:FXD MY 1800 PF 10% 200VDCW	56289	192P18292-PT5
A17C2	0180 0374		C:FXD TANT. 10 UF 10% 200VDCW	56289	150D106X9020B2-DYS
A17C3	0180-0374	1	C:FXD ELECT 4.7 UF 20% 10VDCW	56289	150D475X0010A2-DYS
A17C4	0180-0374		C:FXD TANT. 10 UF 10% 20VDCW	56289	150D106X9020B2-DYS
A17C5	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A17C6	0180-0229		C:FXD ELECT 33 UF 10% 10VDCW	28480	0180-0229
A17C7, 8	0180-1974	2	C:FXD TA 10 UF 10% 35VDCW	56289	150D106X9035B2-EYS
A17C9	0180-0031	2	C:FXD ELECT 10 UF +50-10% 100VDCW	56289	300106F100DC2-DSM
A17C10	0160-2204	2	C:FXD MICA 100PF 5%	72136	RDM15F101J3C

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 6-1 Replaceable Parts (cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A17C17	0140-0204		CAPACITOR-FIXED MICA 100PF 5%	72136	DM15F101J03
A17C18	0180-0091		CAPACITOR-FIXED ELECT 10 UF +50-10% 100VDCW	56289	150D106X9100C2-DS
A17CR1	1901-0040		DIODE-SILICON 30MA 30WV	07263	FD6030A
A17CR2	1902-3104	1	DIODE-BREAKDOWN 5.62V 5%	04713	SZG439-110
A17CR3	1884-0068	1	TRANSISTOR	28480	1884-0068
A17CR4	1901-0040		DIODE-SILICON 30MA 30WV	07263	FD6030A
A17CR5	1901-0040		DIODE-SILICON 30MA 30WV	07263	FD6030A
A17CR6	1902-0049		DIODE-BREAKDOWN 6.19V 5%	04713	SZG439-127
A17CR7	1901-0040		DIODE-SILICON 30MA 30WV	07263	FD6030A
A17CR8	1901-0040		DIODE-SILICON 30MA 30WV	07263	FD6030A
A17CR9	1902-0686	1	DIODE BREAKDOWN 6.2V 5%	04713	SZG439
A17CR10	1902-1205		DIODE BREAKDOWN 15.0V 5%	28480	1902-1205
A17CR12	1901-0040		DIODE-SILICON 30MA 30WV	07263	FD6030A
A17CR13	1901-0040	1	DIODE SI 30MA 30 WV	28480	1901-0040
A17CR14	1901-0627	2	DIODE CURRENT REGULATOR	28480	1901-0627
A17CR15	1902-3114	1	DIODE BREAKDOWN 6.19V 2%	28480	1902-3114
A17CR16	1901-0627		DIODE CURRENT REGULATOR	28480	1901-0627
A17CR17,18	1901-0040		DIODE SI 30MA 30 WV	28480	1901-0040
A17IC1	1826-0043		IC LINEAR OPERATIONAL AMPLIFIER	28480	1826-0043
A17IC2	1826-0043		IC LINEAR OPERATIONAL AMPLIFIER	28480	1826-0043
A17IC3	1826-0043		IC LINEAR OPERATIONAL AMPLIFIER	28480	1826-0043
A17IC4	1826-0043		IC LINEAR OPERATIONAL AMPLIFIER	28480	1826-0043
A17IC5	1826-0043		IC LINEAR OPERATIONAL AMPLIFIER	28480	1826-0043
A17Q1	1854-0039		TSTR SI NPN	80131	2N3053
A17Q2	1854-0039		TSTR SI NPN	80131	2N3053
A17Q3	1854-0039		TSTR SI NPN	80131	2N3053
A17Q4	1854-0071	1	TSTR SI NPN	28480	1854-0071
A17Q5	1853-0061		TSTR SI PNP	80131	2N4037
A17Q6	1853-0066	1	TSTR SI PNP	28480	1853-0066
A17Q7	1854-0408	7	TSTR SI NPN	28480	1854-0408
A17Q8	1854-0071		TSTR SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A17Q9	1854-0408		TSTR SI NPN	28480	1854-0408
A17Q10	1853-0238	3	TSTR SI PNP	28480	1853-0238
A17Q11	1853-0010		TSTR SI PNP(SELECTED FROM 2N3251)	28480	1853-0010
A17Q12	1853-0238		TSTR SI PNP	28480	1853-0238
A17Q13	1853-0238		TSTR SI PNP	28480	1853-0238
A17R1	0684-1821	2	RESD COMP 1800 OHM 10% 1/4W	01121	CB 1821
A17R2	0698-3279		RESD MET FLM 4990 OHM 1% 1/8W	28480	0698-3279
A17R3	0757-0429	3	RESD MET FLM 1.82K OHM 1% 1/8W	28480	0757-0429
A17R4	0698-3279		RESD MET FLM 4990 OHM 1% 1/8W	28480	0698-3279
A17R5	0698-3279		RESD MET FLM 4990 OHM 1% 1/8W	28480	0698-3279
A17R6	0684-1041	1	RESD COMP 100K OHM 10% 1/4W	01121	CB 1041
A17R7	0757-0284		RESD MET FLM 150 OHM 1% 1/8W	28480	0757-0284
A17R8	0811-1700	2	RESD WW 0.10 OHM 10% 2W	28480	0811-1700
A17R9	0811-1700		RESD WW 0.10 OHM 10% 2W	28480	0811-1700
A17R10	0757-0401		RESD MET FLM 100 OHM 1% 1/8W	28480	0757-0401
A17R12	0757-0429		RESD MET FLM 1.82K OHM 1% 1/8W	28480	0757-0429
A17R13	0698-3154	1	RESD MET FLM 4.22K OHM 1% 1/8W	19701	MFF1216
A17R14	0757-0430		RESD MET FLM 2.21K OHM 1% 1/8W	28480	0757-0430
A17R15	0757-0429		RESD MET FLM 1.82K OHM 1% 1/8W	28480	0757-0429
A17R16	0684-1821		RESD COMP 1800 OHM 10% 1/4W	01121	CB 1821
A17R17	0683-0275	3	RESD COMP 2.7 OHM 5% 1/4W	01121	CB 2705
A17R18	0811-3320	2	RESD WW 2.7 OHM 5% 1W	07088	KM-300
A17R19	0698-4433	2	RESD FLM 2260 OHM 1% 1/8W	16299	C4-1/8-T0-2261-F
A17R20	0698-3369		RESD FLM 127K OHM 1% 1/8W	16299	C4-1/8-T0-1272-F
A17R21	0757-0273		RESD MET FLM 3.01K OHM 1% 1/8W	28480	0757-0273
A17R22	0698-4477	1	RESD MET FLM 10.5K OHM 1% 1/8W	28480	0698-4477
A17R23	2100-2633	1	RESVAR CERMET 1K OHM 10% LIN 1/2W	28480	2100-2633
A17R24	0698-4471		RESD FLM 7.15K OHM 1% 1/8W	28480	0698-4471
A17R25	0698-3279		RESD MET FLM 4990 OHM 1% 1/8W	28480	0698-3279
A17R26	0698-3279		RESD MET FLM 4990 OHM 1% 1/8W	28480	0698-3279
A17R27	0757-0426		RESD FLM 1.5K OHM 1% 1/8W	28480	0757-0426
A17R28	0811-3320		RESD WW 2.7 OHM 5% 1W	07088	KM-300
A17R29	0698-4433		RESD FLM 2260 OHM 1% 1/8W	16299	C4-1/8-T0-2261-F
A17R30	0698-3369		RESD FLM 2260 OHM 1% 1/8W	16299	C4-1/8-T0-1272-F
A17R32	0757-0273		RESD MET FLM 3.01K OHM 1% 1/8W	28480	0757-0273
A17R33	0698-6678	4	RESD MET FLM 15K OHM 0.5% 1/8W	28480	0698-6678
A17R34	0698-6678		RESD MET FLM 15K OHM 0.5% 1/8W	28480	0698-6678
A17R35	0683-7525		RESD COMP 7500 OHM 5% 1/4W	01121	CB 7525
A17R36	0757-0281	1	RESD FLM 2740 OHM	24546	C4-1/8-T0-2741-F
A17R39	0683-0335	2	RESD COMP 3.3 OHM 5% 1/4W	01121	CB 0335
A17R40	0683-0275		RESD COMP 2.7 OHM 5% 1/4W	01121	CB 2705
A17R42	0698-4157	1	RESD FLM 10K OHM 0.1% 1/8W	28480	0698-4157
A17R43*	0698-4437		RESD FLM 2.04K OHM 1% 1/8W	16299	C4-1/8-T0-2041-F
A17R44	0698-4641	1	RESD FLM 3240 OHM 1% 1/4W	28480	0698-4641
A17R45	0757-0446		RESD MET FLM 15.0K OHM 1% 1/8W	28480	0757-0446
A17R46	0683-7525		RESD COMP 7500 OHM 5% 1/4W	01121	CB 7525
A17R47	0698-6678		RESD MET FLM 15K OHM 0.5% 1/8W	28480	0698-6678
A17R48	0698-6678		RESD MET FLM 15K OHM 0.5% 1/8W	28480	0698-6678

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 6-1. Replaceable Parts (cont'd).

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A17R49	0683-0275		RESD COMP 2.7 OHM 5% 1/4W	01121	CB 2705
A17R50	0683-0335		RESD COMP 3.3 OHM 5% 1/4W	01121	CB 3305
A17TP1	08443-00041		TEST POINT	28480	08443-00041
A17TP2	08443-00041		TEST POINT	28480	08443-00041
A18			NOT ASSIGNED		
A19	03320-66619	1	BOARD ASSY:MOTHER	28480	03320-66619
A19XA1	1251-2038	8	CONN:PC 30(2X15) CONTACTS	76530	AB-7140
A19XA2	1251-2038		CONN:PC 30(2X15) CONTACTS	76530	AB-7140
A19XA3	1251-2038		CONN:PC 30(2X15) CONTACTS	28520	LB-7140
A19XA4	1251-1633	4	CONN:PC(1 x 16)16 CONTACT	71785	252-15-90-310
A19XA5	1251-1633		CONNECTOR:PC(1 x 16)16 CONTACT	71785	252-15-90-310
A19XA6, A8	1251-1633		CONNECTOR:PC(1 x 16)16 CONTACT	71785	252-15-90-310
A19XA9	1251-2038		CONN:PC 30(2 x 15) CONTACTS	28520	LB-7140
A19XA10	1251-1633		CONNECTOR:PC(1 x 16)16 CONTACT	71785	252-15-90-310
A19XA11	1251-2035		CONN:PC 30(2X15) CONTACTS	76530	AB-7140
A19XA12	1251-1633		CONNECTOR:PC(1 X 16)16 CONTACT	71785	252-15-90-310
A19XA20 (STD 3320A ONLY)	1251-1365		CONNECTOR:PC(2X22) CONTACTS	71785	252-22-90-300
A19XA21 (STD 3320B ONLY)	1251-1365	6	CONN:PC 44(2X22) CONTACTS	71785	252-22-90-300
A19XA22 (3320A/B OPT. 003 THRU 007)	1251-1365		CONN:PC 44(2X22) CONTACTS		
A20 (STD 3320A ONLY)	03320-66620	1	BOARD ASSY:INTERFACE A	28480	03320-66620
A20IC1	1820-0586		IC:DIGITAL TTL HEX CONVERTER	28480	1820-0586
A20IC2	1820-0598	3	IC:DIGITAL TTL QUAD 2-INPT EXCL OR GATE	28480	1820-0598
A20IC3	1820-0587	3	IC:TTL TRIPLE 3-INPT NAND GATE	28480	1820-0587
A20IC4	1820-0586		IC:DIGITAL TTL HEX CONVERTER	28480	1820-0586
A20IC5	1820-0777	8	IC:DIGITAL	01295	SN74LS38
A20A1	1810-0041	14	R:NETWORK,8 RES, 2.7K OHM 5%	28480	1810-0041
A20A2	1810-0041		R:NETWORK,8 RES, 2.7K OHM 5%	28480	1810-0041
A20R3	0683-2725	4	R:RESD COMP 2700 OHM 5% 1/4W	01121	CB 2725
A20R4	0683-2725		R:RESD COMP 2700 OHM 5% 1/4W	01121	CB 2725
A21(STD 3320B)	03320-66660	1	BOARD ASSY:INTERFACE B	28480	03320-66660
A21C1	0140-0190	1	C:FXD MICA 56 PF 5%	28480	0140-0190
A21C2-C4	0160-0093	3	C:FXD CER 01 UF +80-20% 10 VDCW	28480	0160-0093
A21IC1-3	1820-0586		IC:DIGITAL TTL HEX CONVERTER	28480	1820-0586
A21IC4-7	1818-2192		IC, MOS ROM	28480	1818-2192
A21IC8	1820-0598		IC:DIGITAL TTL QUAD 2-INPT	28480	1820-0598
A21IC9	1820-0584		IC:TTL QUAT 2-INPT NOR GATE	28480	1820-0584
A21IC12	1820-0587		IC:TTL TRIPLE 3-INPT NAND GATE	28480	1820-0587
A21IC13, 14	1820-0586		IC:DIGITAL TTL HEX CONVERTER	28480	1820-0586
A21IC15	1820-0777		IC:DIGITAL	01295	SN74LS38N
A21R1-R4	1810-0041		R:NETWORK,8RES, 2.7K OHM 5%	28480	1810-0041
A21R5, 6	0683-2026		R:FXD COMP 2000 OHM	01121	CB2025
A21R16	0683-2725		R:FXD COMP 2700 OHM 5% 1/4W	01121	CB2725
A21R17	0683-6825		R:FXD COMP 6800 OHM 5% 1/4W	01121	CB6825
A21R18, R19	0683-2725		R:FXD COMP 2700 OHM 5% 1/4W	01121	CB2725
A21R20	0683-1535		R:FXD COMP 15K OHM 5% 1/4W	01121	CB1535
A22 (OPT. 003, 004, 007)	03320-66622		BOARD ASSY: CABLE	28480	03320-66622
A22IC1	1820-0777		IC: DIGITAL	01295	SN74LS38N
A23 (OPT. 003, 004, 007)	03320-66623		BOARD ASSY:FREQUENCY	28480	03320-66623
A23C1	0160-0938		C:FXD MICA 1000 PF 5%	72136	RDM15E102J1C
A23C2	0180-0210	1	C:FXD ELECT 3.3 UF 20% 15VDCW	56289	150D335X0015A2-DYS
A23C3	0180-0195	1	C:FXD ELECT 0.33 UF 20% 35VDCW	56289	150D334X0035A2-DYS
A23C4	0150-0093		C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-Z5U0011
A23IC1	1820-0590	17	IC:DIGITAL TTL DUAL 2-WIDE, INPT AND/OR	28480	1820-0590

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 6-1. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A23IC2	1820-0590		IC:DIGITAL TTL DUAL 2-WIDE,INPT AND/OR	28480	1820-0590
A23IC3	1820-0590		IC:DIGITAL TTL DUAL 2-WIDE,INPT AND/OR	28480	1820-0590
A23IC4	1820-0590		IC:DIGITAL TTL DUAL 2-WIDE,INPT AND/OR	28480	1820-0590
A23IC5	1820-0590		IC:DIGITAL TTL DUAL 2-WIDE,INPT AND/OR	28480	1820-0590
A23IC6	1820-0590		IC:DIGITAL TTL DUAL 2-WIDE,INPT AND/OR	28480	1820-0590
A23IC7	1820-0590		IC:DIGITAL TTL DUAL 2-WIDE,INPT AND/OR	28480	1820-0590
A23IC8	1820-0590		IC:DIGITAL TTL DUAL 2-WIDE,INPT AND/OR	28480	1820-0590
A23IC9	1820-0590		IC:DIGITAL TTL DUAL 2-WIDE,INPT AND/OR	28480	1820-0590
A23IC10	1820-0586		IC:DIGITAL TTL HEX CONVERTER	28480	1820-0586
A23IC11	1820-0598		IC:DIGITAL TTL QUAD 2-INPT EXCL OR GATE	28480	1820-0598
A23IC12	1820-0584		IC:TTL QUAD 2-INPT NOR GATE	28480	1820-0584
A23IC13	1820-0584		IC:TTL QUAD 2-INPT NOR GATE	28480	1820-0584
A23IC14	1820-1490	2	IC:DIGITAL TTL DECADE COUNTER	01295	SN74L590N
A23IC15	1820-1490		IC:DIGITAL TTL DECADE COUNTER	01295	SN74L590N
A23IC16	1820-0683		IC:TTL QUAD 2-INPT NAND GATE	28480	1820-0683
A23IC17	1820-0584		IC:TTL QUAD 2-INPT NOR GATE	28480	1820-0584
A23IC18	1820-0207		IC:TTL MONOSTABLE MULTIVIBRATOR	28480	1820-0207
A23IC19	1820-0587		IC:TTL TRIPLE 3-INPT NAND GATE	28480	1820-0587
A23IC20	1820-0683		IC:TTL QUAD 2-INPT NAND GATE	28480	1820-0683
A23IC21	1820-1674		IC:TTL DUAL J-K MASTER SLAVE F/F	01295	SN74L673N
A23Q1	1854-0071		TST:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A23R1	1810-0041		NETWORK,RES 2.7K OHM 5%	28480	1810-0041
A23R2	1810-0041		NETWORK,RES 2.7K OHM 5%	28480	1810-0041
A23R3,R4	0683-2725		RES:FXD COMP 2700 OHM 5% 1/4 W	01121	CB2725
A23R5	0683-3925	44	RES:FXD COMP 3900 OHM 5% 1/4W	01121	CB 3925
A23R6	2100-1056		RES:VAR CERMET 5K OHM LOG TYPE P 3/4W	28480	2100-1056
A23R7	0683-1235	1	RES:FXD COMP 12K OHM 5% 1/4W	01121	CB 1235
A23R8	0683-1025		RES:FXD COMP 1000 OHM 5% 1/4W	01121	CB 1025
A23R9	0683-5125		RES:FXD COMP 5100 OHM 5% 1/4W	01121	CB 5125
A23R10	0683-1825	1	RES:FXD COMP 1800 OHM 5% 1/4W	01121	CB 1825
A23R11	0683-2025		RES:FXD COMP 2000 OHM 5% 1/4W	01121	CB 2025
A24 (3320A OPT. 003 ONLY)	03320-66636		PC ASSY: INVERTER	28480	03320-66636
A24IC1	1820-0471		IC:TTL HEX INVERTER	01295	SN7404N
A24R1	0683-6115		RES:FXD COMP 610 OHM 5% 1/4 W	01121	CB6115
A24R2	0683-6115		RES:FXD COMP 610 OHM 5% 1/4 W	01121	CB6115
A24R3	0683-1815		RES:FXD COMP 180 OHM 5% 1/4 W	01121	CB1815
A24R4	0683-1635		RES:FXD COMP 16 K OHM 5% 1/4 W	01121	CB1635
A24B (3320B OPT 004, 007 ONLY)	03320-66660	1	BOARD ASSY:AMPLITUDE CONTROL	28480	03320-66660
A24C1, C3	0160-0093		C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-Z5U0011
A24C4	0140-0190	1	C:FXD MICA 39 PF 5%	28480	0140-0190
A24IC1-IC8	1820-0590		IC:DIGITAL TTL DUAL 2-WIDE,INPT AND/OR	28480	1820-0590
A24IC9-IC12	1818-2192		IC:MOS ROM	28480	1818-2192
A24IC14	1820-0684		IC:TTL QUAD 2-INPUT NOR GATE	28480	1820-0684
A24IC16	1820-0471	1	IC:TTL HEX INVERTER	28480	1820-0471
A24R1, R2	1810-0041		R:NETWORK,RES 2.7K OHM 5%	28480	1810-0041
A24R3, R4	0683-2025		R:FXD COMP 2000 OHM 5% 1/4W	01121	CB2025
A24R5	0683-1535		R:FXD COMP 15K OHM 5% 1/4W	01121	CB1535
A24R6, R7	0683-6115		R:FXD COMP 610 OHM 5% 1/4W	01121	CB6115
A24R8	0683-1815		R:FXD COMP 180 OHM 5% 1/4W	01121	CB1815
A24R9	0683-2725		R:FXD COMP 2700 OHM 5% 1/4W	01121	CB2725
A24R10	0683-6825		R:FXD COMP 6800 OHM 5% 1/4W	01121	CB6825
A24R11	0683-1535		R:FXD COMP 15K OHM 5% 1/4W	01121	CB1535
A25 (3320B OPT. 007 ONLY)	03320-66525	1	PC ASSY:LATCH	28480	03320-66525
A25C1	0140-0232	1	C:FXD MICA 460 PF 1% 300VDCW	28480	0140-0232

1 See Section VIII, Manual Backdating.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 6-1. Replaceable Parts(Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A25C2	0140-0199	1	C:FXD MICA 240 PF 5%	28480	0140-0199
A25C3	0160-0163	1	C:FXD MICA 620PF 5%	28480	0160-0163
A25IC1	1820-0584		IC:TTL QUAD 2-INPT NOR GATE	28480	1820-0584
A25IC2	1820-0584		IC:TTL QUAD 2-INPT NOR GATE	28480	1820-0584
A25IC5	1820-1674		IC:TTL DUAL J-K MASTER SLAVE F/F	28480	1820-1674
A25IC4	1820-1674		IC:TTL DUAL J-K MASTER SLAVE F/F	28480	1820-1674
A25IC5	1820-1674		IC:TTL DUAL J-K MASTER SLAVE F/F	28480	1820-1674
A25IC6	1820-0563		IC:TTL QUAD 2-INPT NAND GATE	28480	1820-0583
A25IC7	1820-0584		IC:TTL QUAD NOR GATE	28480	1820-0584
A25IC8,C9	1820-0497	4	IC:DIGITAL 4-BIT RIGHT/LEFT	01295	SN14995
A25IC10	1820-0497		IC:DIGITAL 4-BIT RIGHT/LEFT	01295	SN14995
A25IC11	1820-0497		IC:DIGITAL 4-BIT RIGHT/LEFT	01295	SN14995
A25IC12	1820-1674		IC:TTL DUAL J-K MASTER SLAVE F/F	28480	1820-1674
A25IC13	1820-0583		IC:TTL QUAD 2-INPT NAND GATE	28480	1820-0583
A25IC14	1820-0583		IC:TTL QUAD 2-INPT NAND GATE	28480	1820-0583
A25IC15	1820-0583		IC:TTL QUAD 2-INPT NAND GATE	28480	1820-0583
A25IC17	1820-0584		IC:TTL QUAD 2-INPT NOR GATE	28480	1820-0584
A25IC18	1820-0456	10	IC:DIGITAL TTL 4-BIT DATA SELECTOR	01295	SN14246
A25IC19	1820-0456		IC:DIGITAL TTL 4-BIT DATA SELECTOR	01295	SN14246
A25IC20	1820-0456		IC:DIGITAL TTL 4-BIT DATA SELECTOR	01295	SN14246
A25IC21	1820-0456		IC:DIGITAL TTL 4-BIT DATA SELECTOR	01295	SN14246
A25IC22	1820-0456		IC:DIGITAL TTL 4-BIT DATA SELECTOR	01295	SN14246
A25IC23	1820-0456		IC:DIGITAL TTL 4-BIT DATA SELECTOR	01295	SN14246
A25IC25	1820-0456		IC:DIGITAL TTL 4-BIT DATA SELECTOR	01295	SN14246
A25IC26	1820-0456		IC:DIGITAL TTL 4-BIT DATA SELECTOR	01295	SN14246
A25IC27	1820-0456		IC:DIGITAL TTL 4-BIT DATA SELECTOR	01295	SN14246
A25IC28	1820-0456		IC:DIGITAL TTL 4-BIT DATA SELECTOR	01295	SN14246
A25R1	0683-1025		R:FXD COMP 1000 OHM 5% 1/4W	01121	CB 1025
A25R2	0683-1025		R:FXD COMP 1000 OHM 5% 1/4W	01121	CB 1025
A25R3	0683-1025		R:FXD COMP 1000 OHM 5% 1/4W	01121	CB 1025
A26 (OPT. 003, 004 ONLY)	08320-66528	1	BOARD ASSY:P.M LGC	28480	08320-66528
A26Q1	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A26R1	0683-1525		R:FXD COMP 1500 OHM 5% 1/4W	01121	CB 1525
A26R2	0683-1525		R:FXD COMP 1500 OHM 5% 1/4W	01121	CB 1525
A26R3	0683-3925		R:FXD COMP 3900 OHM 5% 1/4 W	01121	CB3925
A26R4	0683-3925		R:FXD COMP 3900 OHM 5% 1/4 W	01121	CB3925
A26R5	0683-1525		R:FXD COMP 1500 OHM 5% 1/4 W	01121	CB1525
A26R6	0683-1525		R:FXD COMP 1500 OHM 5% 1/4 W	01121	CB1525
A26R7	0683-3925		R:FXD COMP 3900 OHM 5% 1/4 W	01121	CB3925
A26R8	0683-3925		R:FXD COMP 3900 OHM 5% 1/4 W	01121	CB3925
A26R9	0683-1525		R:FXD COMP 1500 OHM 5% 1/4 W	01121	CB1525
A26R10	0683-1525		R:FXD COMP 1500 OHM 5% 1/4 W	01121	CB1525
A26R11	0683-3925		R:FXD COMP 3900 OHM 5% 1/4 W	01121	CB3925
A26R12	0683-3925		R:FXD COMP 3900 OHM 5% 1/4 W	01121	CB3925
A26R13	0683-1525		R:FXD COMP 1500 OHM 5% 1/4 W	01121	CB1525
A26R14	0683-1525		R:FXD COMP 1500 OHM 5% 1/4 W	01121	CB1525
A26R15	0683-3925		R:FXD COMP 3900 OHM 5% 1/4 W	01121	CB3925
A26R16	0683-3925		R:FXD COMP 3900 OHM 5% 1/4 W	01121	CB3925
A26R17	0683-1525		R:FXD COMP 1500 OHM 5% 1/4 W	01121	CB1525
A26R18	0683-1525		R:FXD COMP 1500 OHM 5% 1/4 W	01121	CB1525
A26R19	0683-3925		R:FXD COMP 3900 OHM 5% 1/4 W	01121	CB3925
A26R20	0683-3925		R:FXD COMP 3900 OHM 5% 1/4 W	01121	CB3925
A26R21	0683-1525		R:FXD COMP 1500 OHM 5% 1/4 W	01121	CB1525
A26R22	0683-1525		R:FXD COMP 1500 OHM 5% 1/4 W	01121	CB1525
A26R23	0683-3925		R:FXD COMP 3900 OHM 5% 1/4 W	01121	CB3925
A26R24	0683-3925		R:FXD COMP 3900 OHM 5% 1/4 W	01121	CB3925
A26R27	0683-1525		R:FXD COMP 1500 OHM 5% 1/4 W	01121	CB1525
A26R28	0683-1525		R:FXD COMP 1500 OHM 5% 1/4 W	01121	CB1525
A26R29	0683-3925		R:FXD COMP 3900 OHM 5% 1/4 W	01121	CB3925
A26R30	0683-3925		R:FXD COMP 3900 OHM 5% 1/4 W	01121	CB3925
A26R31	0683-1525		R:FXD COMP 1500 OHM 5% 1/4 W	01121	CB1525
A26R32	0683-1525		R:FXD COMP 1500 OHM 5% 1/4 W	01121	CB1525
A26R33	0683-3925		R:FXD COMP 3900 OHM 5% 1/4 W	01121	CB3925
A26R34	0683-3925		R:FXD COMP 3900 OHM 5% 1/4 W	01121	CB3925
A26R35	0683-1525		R:FXD COMP 1500 OHM 5% 1/4 W	01121	CB1525
A26R36	0683-3925		R:FXD COMP 3900 OHM 5% 1/4 W	01121	CB3925
A26R37	0683-1525		R:FXD COMP 1500 OHM 5% 1/4 W	01121	CB1525
A26R38	0683-1525		R:FXD COMP 1500 OHM 5% 1/4 W	01121	CB1525
A26R39	0683-3925		R:FXD COMP 3900 OHM 5% 1/4 W	01121	CB3925
A26R40	0683-3925		R:FXD COMP 3900 OHM 5% 1/4 W	01121	CB3925
A26R41	0683-1525		R:FXD COMP 1500 OHM 5% 1/4 W	01121	CB1525
A26R42	0683-1525		R:FXD COMP 1500 OHM 5% 1/4 W	01121	CB1525
A26R43	0683-3925		R:FXD COMP 3900 OHM 5% 1/4 W	01121	CB3925
A26R44	0683-3925		R:FXD COMP 3900 OHM 5% 1/4 W	01121	CB3925
A26R45	0683-1525		R:FXD COMP 1500 OHM 5% 1/4 W	01121	CB1525
A26R46	0683-1525		R:FXD COMP 1500 OHM 5% 1/4 W	01121	CB1525
A26R47	0683-3925		R:FXD COMP 3900 OHM 5% 1/4 W	01121	CB3925
A26R48	0683-3925		R:FXD COMP 3900 OHM 5% 1/4 W	01121	CB3925
A26R49	0683-1525		R:FXD COMP 1500 OHM 5% 1/4 W	01121	CB1525

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 6-1. Replaceable Parts(Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A28R59	0683-1825		R: FXD COMP 1800 OHM 5% 1/4 W	01121	CB1825
A28R61	0683-3925		R: FXD COMP 3900 OHM 5% 1/4 W	01121	CB3925
A28R62	0683-3925		R: FXD COMP 3900 OHM 5% 1/4 W	01121	CB3925
A28R63	0683-1825		R: FXD COMP 1800 OHM 5% 1/4 W	01121	CB1825
A28R64	0683-1825		R: FXD COMP 1800 OHM 5% 1/4 W	01121	CB1825
A28R65	0683-3925		R: FXD COMP 3900 OHM 5% 1/4 W	01121	CB3925
A28R66	0683-3925		R: FXD COMP 3900 OHM 5% 1/4 W	01121	CB3925
A28R67	0683-1825		R: FXD COMP 1800 OHM 5% 1/4 W	01121	CB1825
A28R68	0683-1825		R: FXD COMP 1800 OHM 5% 1/4 W	01121	CB1825
A28R69	0683-1825		R: FXD COMP 1800 OHM 5% 1/4 W	01121	CB1825
A28R70	0683-1825		R: FXD COMP 1800 OHM 5% 1/4 W	01121	CB1825
A28R71	0683-1825		R: FXD COMP 1800 OHM 5% 1/4 W	01121	CB1825
A28R72	0683-3925		R: FXD COMP 3900 OHM 5% 1/4 W	01121	CB3925
A28R73	0683-3925		R: FXD COMP 3900 OHM 5% 1/4 W	01121	CB3925
A28R74	0683-1825		R: FXD COMP 1800 OHM 5% 1/4 W	01121	CB1825
A28R75	0683-3925		R: FXD COMP 3900 OHM 5% 1/4 W	01121	CB3925
A28R76	0683-1825		R: FXD COMP 1800 OHM 5% 1/4 W	01121	CB1825
A28R77	0683-3925		R: FXD COMP 3900 OHM 5% 1/4 W	01121	CB3925
A28R78	0683-1825		R: FXD COMP 1800 OHM 5% 1/4 W	01121	CB1825
A28R79	0683-3925		R: FXD COMP 3900 OHM 5% 1/4 W	01121	CB3925
A28R80	0683-3925		R: FXD COMP 3900 OHM 5% 1/4 W	01121	CB3925
A28A81	0683-1325		R: FXD COMP 1300 OHM 5% 1/4 W	01121	CB1325
A28R82	0683-1825		R: FXD COMP 1800 OHM 5% 1/4 W	01121	CB1825
A28R83	0683-3925		R: FXD COMP 3900 OHM 5% 1/4 W	01121	CB3925
A28R84	0683-1825		R: FXD COMP 1800 OHM 5% 1/4 W	01121	CB1825
A28R85	0683-3925		R: FXD COMP 3900 OHM 5% 1/4 W	01121	CB3925
A28R86	0683-1825		R: FXD COMP 1800 OHM 5% 1/4 W	01121	CB1825
A28R87	0683-3925		R: FXD COMP 3900 OHM 5% 1/4 W	01121	CB3925
A28R88	0683-1825		R: FXD COMP 1800 OHM 5% 1/4 W	01121	CB1825
A28R89	0683-3925		R: FXD COMP 3900 OHM 5% 1/4 W	01121	CB3925
A28R91	0683-7515		R: FXD COMP 750 OHM 5% 1/4 W	01121	CB7515
A28XA83	1251-1385		CONN: PC 44 (2X22) CONTACTS	71785	252-22-30-380
A28XA84	1251-1385		CONN: PC 44 (2X22) CONTACTS	71785	252-22-30-380
A27 (33209 OPT. 007 ONLY)	03320-66937		HP-IB INPUT	28480	03320-66937
A27C1	0160-0810		C: FXD MICA 100 pF 2% 300 VDCW	72136	DBD
A27C2	0160-0383		C: FXD MICA 620 pF 5% 300 VDCW	72136	DBD
A27C3	0160-0838		C: FXD MICA 1000 pF 5% 300 VDCW	72136	DBD
A27C4	0160-0838		C: FXD MICA 1000 pF 5% 300 VDCW	72136	DBD
A27C5	0140-0188		C: FXD MICA 200 pF 5%	72176	DBD
A27C6	0180-2164		C: FXD AL ELECT 200 UF -10% +75% 10 VDCW	56289	30D207G010DF2-DSM
A27C7	0180-0104		C: FXD AL ELECT 200 UF -10% +75% 10 VDCW	56289	30D207G010DF2-DSM
A27C8	0160-0612		C: FXD CER 0.01 UF 20% 1000 VDCW	56289	C023A102Z103M838-CDR
A27C9	0160-0363		C:FXD MICA 620 PF	72136	DBD
A27CR1, CR2	1910-0016		DIODE: GE 100 MA	14433	G716
A27CR3	1910-0016		DIODE: GE 100 MA	14433	G716
A27CR4	1910-0016		DIODE: GE 100 MA	14433	G716
A27CR5	1910-0016		DIODE: GE 100 MA	14433	G716
A27CR6	1910-0016		DIODE: GE 100 MA	14433	G716
A27CR7	1910-0016		DIODE: GE 100 MA	14433	G716
A27CR8	1910-0016		DIODE: GE 100 MA	14433	G716
A27CR9	1901-0158		DIODE: SI .75 A 200 V	04713	SR 1358-3
A27CR10	1901-0158		DIODE: SI .75 A 200 V	04713	SR 1358-3
A27CR11	1901-0158		DIODE: SI .75 A 200 V	04713	SR 1358-3
A27CR12	1901-0158		DIODE: SI .75 A 200 V	04713	SR 1358-3
A27IC1	1820-0883		INTEGRATED CIRCUIT: DIGITAL QUAD 2-INPUT GATE	12040	SD12885
A27IC2	1820-0883		INTEGRATED CIRCUIT: DIGITAL QUAD 2-INPUT GATE	12040	SD12885
A27IC3	1820-0888		INTEGRATED CIRCUIT: DIGITAL DUAL 4-INPUT GATE	12040	SD12881
A27IC4	1820-0888		INTEGRATED CIRCUIT: DIGITAL DUAL 4-INPUT GATE	12040	SD12881
A27IC5	1820-0884		INTEGRATED CIRCUIT: DIGITAL QUAD 2-INPUT NOR GATE	12040	DM74L62N
A27IC6	1820-0874		INTEGRATED CIRCUIT: DIGITAL QUAD 2-INPUT NOR GATE	12040	DM74L62N

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE! | www.artisantg.com

Table 6-1. Replaceable Parts(Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A37IC7	1820-0584		INTEGRATED CIRCUIT: DIGITAL QUAD 2-INPUT NOR GATE	12040	DM74L02N
A37IC8	1820-0583		INTEGRATED CIRCUIT: DIGITAL QUAD 2-INPUT NAND GATE	12040	SN74L00N
A37IC9	1820-0585		INTEGRATED CIRCUIT: DIGITAL HEX INVERTER	12040	DM74L04N
A37IC10	1990-0313		PHOTO ISOLATOR	01295	OBD
A37IC11	1990-0312		PHOTO ISOLATOR	01295	OBC
A37Q1	1854-0264		TSTR: SI NPN	04713	SS3077
A37Q2	1854-0264		TSTR: SI NPN	04713	SS3077
A37Q3	1494-0003		TSTR: SI NPN 2N708	04713	SS3706
A37Q4	1853-0205		TSTR: SI PNP	04713	SS5651
A37Q5	1854-0264		TSTR: SI NPN	04713	SS2077
A37R1	1810-0035		N: NETWORK FLM	91637	OBD
A37R2	0683-5115		R: FXD COMP 510 OHM 5% 1/4 W	01121	CB 5115
A37R3	0683-5115		R: FXD COMP 510 OHM 5% 1/4 W	01121	CB 5115
A37R4	0683-5115		R: FXD COMP 510 OHM 5% 1/4 W	01121	CB 5115
A37R5	0683-5115		R: FXD COMP 510 OHM 5% 1/4 W	01121	CB 5115
A37R6	0683-5115		R: FXD COMP 510 OHM 5% 1/4 W	01121	CB 5115
A37R7	0683-5115		R: FXD COMP 510 OHM 5% 1/4 W	01121	CB 5115
A37R8	0683-5115		R: FXD COMP 510 OHM 5% 1/4 W	01121	CB 5115
A37R9	0683-3035		R: FXD COMP 3 K OHM 5% 1/4 W	01121	CB 3035
A37R10	0683-6225		R: FXD COMP 6200 OHM 5% 1/4 W	01121	CB 6225
A37R11			NOT ASSIGNED		
A37R12	0683-3035		R: FXD COMP 3 K OHM 5% 1/4 W	01121	CB 3035
A37R13	0683-6235		R: FXD COMP 62000 OHM 5% 1/4 W	01121	CB 6235
A37R14	0683-5115		R: FXD COMP 510 OHM 5% 1/4 W	01121	CB 5115
A37R15	0683-6215		R: FXD COMP 620 OHM 5% 1/4 W	01121	CB 6215
A37R16	0683-1035		R: FXD COMP 1 K OHM 5% 1/4 W	01121	CB 1035
A37R17	0683-6215		R: FXD COMP 620 OHM 5% 1/4 W	01121	CB 6215
A37R18	0683-5115		R: FXD COMP 510 OHM 5% 1/4 W	01121	CB 5115
A37R19	0683-1335		R: FXD COMP 1300 OHM 5% 1/4 W	01121	CB 1335
A37R20	0683-1335		R: FXD COMP 1300 OHM 5% 1/4 W	01121	CB 1335
A37R21	0683-1035		R: FXD COMP 1 K OHM 5% 1/4 W	01121	CB 1035
A37R22	0683-1635		R: FXD COMP 16 K OHM 5% 1/4 W	01121	CB 1635
A37R23			NOT ASSIGNED		
A37R24	0683-1035		R: FXD COMP 1 K OHM 5% 1/4 W	01121	CB 1035
A37R25	0683-1635		R: FXD COMP 16 K 5% 1/4 W	01121	CB 1635
A37R26	0683-3615		R: FXD COMP 360 OHM 5% 1/4 W	01121	CB 3615
A37R27	0683-1035		R: FXD COMP 1 K OHM 5% 1/4 W	01121	CB 1035
A37R28	0683-1035		R: FXD COMP 10 K OHM 5% 1/4 W	01121	CB 1035
A37R29	0683-1035		R: FXD COMP 1 K OHM 5% 1/4 W	01121	CB 1035
A37R30	0683-1635		R: FXD COMP 16 K 5% 1/4 W	01121	CB 1635
A37R31	0683-3035		R: FXD COMP 3 K OHM 5% 1/4 W	01121	CB 3035
A37R32	0683-6235		R: FXD COMP 62000 OHM 5% 1/4 W	01121	CB 6235
A37R33	0683-3615		R: FXD COMP 360 OHM 5% 1/4 W	01121	CB 3615
A37R34	0683-1035		R: FXD COMP 10 K OHM 5% 1/4 W	01121	CB 1035
A37R35	0683-1035		R: FXD COMP 1 K OHM 5% 1/4 W	01121	CB 1035
A37R36	0683-3005		R: FXD COMP 30 OHM 5% 1/4 W	01121	CB 3005
A37R37	0683-3925		R:FXD COMP 3900 OHM 5% 1/4W	01121	CB3925
A37T1	9100-1238		XFMR: PULSE	80009	2WEMA
A37T2	9100-1238		XFMR: PULSE	80009	2WEMA
A37T3	9100-1238		XFMR: PULSE	80009	2WEMA
A37T4	9100-1238		XFMR: PULSE	80009	2WEMA
A37T5	9100-1238		XFMR: PULSE	80009	2WEMA
A37T6	9100-1238		XFMR: PULSE	80009	2WEMA
A37T7	9100-1238		XFMR: PULSE	80009	2WEMA
A37T8	9100-1238		XFMR: PULSE	80009	2WEMA
A38 (33206 OPT. 007 ONLY)	03320-66538		GPIB CONTROL	28480	03320-66538
A38C1	0160-0838		C: FXD MICA 1000 pF 5% 300 VDCW	72136	OBD
A38C2	0160-0281		C: FXD TA 1 UF 10% 35 VDCW	56289	150D105X9035A2-DYS
A38C3	0160-0836		C: FXD MICA 1000 pF 5% 300 VDCW	72136	OBD
A38C4	0160-2207		C: FXD MICA 300 pF 5% 300 VDCW	72136	OBD
A38C5	0160-1746		C: FXD TA 15 UF 10% 20 VDCW	56289	150D156X9020B2-DYS
A38C6	0160-2207		C: FXD MICA 300 pF 5% 300 VDCW	72136	OBD
A38CR1	1910-0016		DIODE: GE 100 MA	14433	G718
A38CR2	1910-0016		DIODE: GE 100 MA	14433	G718
A38IC1	1820-0584		INTEGRATED CIRCUIT: DIGITAL QUAD 2-INPUT NOR GATE	12040	DM74L02N
A38IC2	1820-0584		INTEGRATED CIRCUIT: DIGITAL QUAD 2-INPUT NOR GATE	12040	DM74L02N
A38IC3	1820-0584		INTEGRATED CIRCUIT: DIGITAL QUAD 2-INPUT NOR GATE	12040	DM74L02N
A38IC4	1820-0584		INTEGRATED CIRCUIT: DIGITAL QUAD 2-INPUT NOR GATE	12040	DM74L02N
A38IC5			NOT ASSIGNED		
A38IC6	1820-0584		INTEGRATED CIRCUIT: DIGITAL QUAD 2-INPUT NOR GATE	12040	DM74L02N
A38IC7	1820-0584		INTEGRATED CIRCUIT: DIGITAL QUAD 2-INPUT NOR GATE	12040	DM74L02N
A38IC8	1820-0584		INTEGRATED CIRCUIT: DIGITAL QUAD 2-INPUT NOR GATE	12040	DM74L02N

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 6-1. Replaceable Parts(Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A38IC9	1820-0883		INTEGRATED CIRCUIT: DIGITAL QUAD 2-INPUT NAND GATE	12040	SD12966
A38IC10	1820-1674		INTEGRATED CIRCUIT: DIGITAL DUAL FLIP FLOP	01295	SN74L373N
A38IC11	1820-0804		INTEGRATED CIRCUIT: DIGITAL QUAD 2-INPUT NOR GATE	12040	DM74L02N
A38IC12	1820-0777		INTEGRATED CIRCUIT: DIGITAL	01295	SN72818
A38IC13	1820-0777		INTEGRATED CIRCUIT: DIGITAL	01295	SN72818
A38IC14	1820-0777		INTEGRATED CIRCUIT: DIGITAL	01295	SN72818
A38IC15	1820-0888		INTEGRATED CIRCUIT: DIGITAL HEX INVERTER	12040	DM74L04N
A38IC16	1820-0804		INTEGRATED CIRCUIT: DIGITAL QUAD 2-INPUT NOR GATE	12040	DM74L02N
A38IC17	1820-0888		INTEGRATED CIRCUIT: DIGITAL HEX INVERTER	12040	DM74L04N
A38Q1	1853-0086		TSTR: SI PNP	04713	SPS3397
A38R1	0683-8115		R: FXD COMP 810 OHM 5% 1/4 W	01121	CB 8115
A38R2	0683-6215		R: FXD COMP 620 OHM 5% 1/4 W	01121	CB 6215
A38R3	0683-1035		R: FXD COMP 1 K OHM 5% 1/4 W	01121	CB 1035
A38R4	0683-2035		R: FXD COMP 20 K 5% 1/4 W	01121	CB 2035
A38R5	0683-1035		R: FXD COMP 1 K OHM 5% 1/4 W	01121	CB 1035
A38R6	0683-8115		R: FXD COMP 810 OHM 5% 1/4 W	01121	CB 8115
A38R7	0683-6215		R: FXD COMP 620 OHM 5% 1/4 W	01121	CB 6215
A38R8	0683-1035		R: FXD COMP 1 K OHM 5% 1/4 W	01121	CB 1035
A38R9	0683-1035		R: FXD COMP 1 K OHM 5% 1/4 W	01121	CB 1035
A38R10	0683-1035		R: FXD COMP 1 K OHM 5% 1/4 W	01121	CB 1035
A39 (33208 OPT. 007 ONLY)	03320-66639	1	PC ASSY: MOTHER	28480	03320-66639
A39XA23	1251-1365		CONN: PC 44 (2X22) CONTACTS	71785	252 22 30 300
A39XA24	1251-1365		CONN: PC 44 (2X22) CONTACTS	71785	252 22 30 300
A39XA25	1251-2035		CONN: PC 30 (2X15) CONTACTS	76530	66 7160
A39XA37	1251-2035		CONN: PC 30 (2X15) CONTACTS	76530	66 7160
A39XA38	1251-2035		CONN: PC 30 (2X15) CONTACTS	76530	66 7160
			CHASSIS MOUNTED COMPONENTS		
C1	0180-2287	1	C: FXD 18000 UF	56289	36D183G025BB2B
CR1, CR2	1901-0626	2	ASSY: DIODE BRIDGE SI 100 PIV 6A	28480	1901-0626
CR3*	1901-0626		ASSY: DIODE BRIDGE SI 100 PIV 6A	28480	1901-0626
F1 (110 V ac)	2110-0312	1	FUSE: 1A 250 V SLO BLO	71400	MDL-1
F1 (230 V ac)	2110-0202	1	FUSE: 0.50A 250 V SLO BLO	75915	313.500S
F2	2110-0066	1	FUSE: 4A 250 V NORMAL BLO	71400	MTH-4
J1 THRU J5	1250-1194		CONNECTOR: RF (SUBMIN)	28480	1250-1194
J6	1250-0262		CONNECTOR: RF	24931	28JS108-1
J7 (3320A ONLY)	1250-0102		CONNECTOR: RF	28480	1250-0102
J8	1250-0262		CONNECTOR: RF	24931	28JS108-1
J9	1250-1194		CONNECTOR: RF (SUBMIN)	28480	1250-1194
J10 (33208 ONLY)	1250-0102		CONNECTOR: RF	28480	1250-0102
J11	1250-1193		P/O 03320-61618 CABLE ASSY	28480	1250-1193
J12, J13	1250-0262				
J14			REM: I/O, 1A28, OPT. 003, 004) (A39, OPT. 007)	24931	28JS108-1
J15	1250-0118		CONNECTOR: RF	00000	31-2221-1022
LED1 THRU LED4	03320-66101		DECIMAL INDICATOR ASSEMBLY	28480	03320-66101
B1	3160-0246	1	FAN: TUB AXIAL	28876	MMS2107-F1
Q1	1854-0063	1	TSTR: SI NPN 2N3055	28480	1854-0063
Q2	1854-0072	2	TSTR: SI NPN 2N3054	02735	2N3054
Q3	1853-0052	2	TSTR: SI PNP 2N3740	04713	2N3740
Q4*	1854-0072		TSTR: SI NPN 2N3054	02735	2N3054
Q5*	1853-0052		TSTR: SI PNP 2N3740	04713	2N3740
R1	0684-4711		R: FXD COMP 470 OHM 10% 1/4 W	01121	CB4711
R2	2100-2317	1	R: VAR WW LIN 10 K OHM 5% 3 W	02111	534-9543
R3	2100-2167	1	R: VAR 25 K OHM (3320A ONLY)		
S1	3101-0896	1	SWITCH: TOGGLE (POWER)	28480	3101-0896
S2	3100-2726	1	SWITCH: ROTARY (VERNIER)	28480	3100-2726
S3*	3101-1178	1	SWITCH: TOGGLE (LEVELING)	28480	3101-1178
T1	9100-3234	1	TRANSFORMER: POWER	28480	9100-3234
			CABLE ASSEMBLIES		
W1	03320-61601	1	FLAT CABLE ASSEMBLY (3320A/B STD AND OPTIONS 001, 002, 004)	28480	03320-61601
W2	03320-61602	1	FLAT CABLE ASSEMBLY (3320A/B OPTIONS 003 THRU 007 ONLY)	28480	03320-61602
	03320-61603	1	CABLE ASSEMBLY A (BROWN)	28480	03320-61603
	03320-61604	1	CABLE ASSEMBLY B (RED)	28480	03320-61604
	03320-61605	1	CABLE ASSEMBLY C (A12 TO A14 B MODEL ONLY)	28480	03320-61605
W3	8120-1538		CABLE POWER	28480	8120-1538
	03320-61606	1	CABLE ASSEMBLY D (4 COND. TO POWER SWITCH)	28480	03320-61606
	03320-61607	1	CABLE ASSEMBLY E (TO FRONT PANEL OUTPUT)	28480	03320-61607
	03320-61608	1	CABLE ASSEMBLY F (ORANGE)	28480	03320-61608
	03320-61610	1	CABLE ASSEMBLY H (GREEN)	28480	03320-61610
	03320-61611	1	CABLE ASSEMBLY I (BLUE)	28480	03320-61611
	03320-61612	1	CABLE ASSEMBLY J (VIOLET)	28480	03320-61612
	03320-61613	1	CABLE ASSEMBLY K (WHITE)	28480	03320-61613
(*) INDICATES PART ON B MODEL ONLY.	03320-61614	1	CABLE ASSEMBLY L (FROM A15)	28480	03320-61614
	03320-61618	1	CABLE ASSEMBLY (ALTERNATE OUTPUT)	28480	03320-61618

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 6-1. Replaceable Parts(Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
	5060-8740		RACK MOUNT KIT	28480	5060-8740
	5040-6832	1	COVER: MAIN POWER SWITCH	28480	5040-6832
	10513-4001	1	COVER: 18 PIN CONNECTOR (OPTION 003)	28480	10513-4001
	05216-4008	1	GUARD SOCKET (REMOTE CONTROL)	28480	05216-4008
	5040-1448	1	HINGE	28480	5040-1448
	1400-0008	1	HOLDER: FUSE (F2)	28480	1400-0008
	0960-0443	1	MODULE: POWER LINE	28480	0960-0443
	05216-4007	1	HOUSING: CONNECTOR (REMOTE CONTROL)	28480	05216-4007
	5040-0707	2	INSULATOR: CONNECTOR (FOR J6)	28480	5040-0707
	03320-84411	1	KIT: ACCESSORY-INCLUDES THE FOLLOWING		
	03320-66530	1	PC EXTENDER	28480	03320-66530
	03320-62703	1	FILTER ASSY	28480	03320-62703
	Option 002 only				
	03320-81601	1	BRKT ASSY: TERM CONSISTS OF:	hp	
	03320-01709	1	BRKT: TERM	hp	
	0757-0442	2	R: FXD FLM 10K OHM 1% 1/8W	19701	MFF1216 Option 4 and Type W
	2100-2488	1	R: VAR COMP 10K OHM 20% 1/2 W	01121	
	0960-0154	1	CRYSTAL: OVEN OSCILLATOR	28480	
	10503-6001	1	CABLE: EXTERNAL PULSE	hp	
	1251-3066		66 PIN CONNECTOR (OPT. 003, 004)	05574	3VH28/1JN5
			MECHANICAL PARTS (REFER TO FIGURES 6-1 THRU 6-3)		
MP1	5060-8606	1	COVER: TOP	28480	5060-8606
MP2	03320-00202 (3320A)	1	PANEL: REAR	28480	03320-00202
	03320-00201 (3320B)	1	PANEL: REAR	28480	03320-00201
MP3	03320-04118	1	COVER: OVEN	28480	03320-04118
MP4	3160-0240	1	GRILLE: FAN	28480	3160-0240
MP5	3160-0222	1	FILTER: FAN	28480	3160-0222
MP6	3160-0228	1	SCREEN: FILTER	28480	3160-0228
MP7	5000-8637	1	COVER: REAR (RIGHT SIDE)	28480	5000-8637
MP8	5060-8737	2	RETAINER: HANDLE	28480	5060-8737
MP9	5060-0222	2	ASSY: HANDLE	28480	5060-0222
MP10	5000-8626	2	COVER: FRONT SIDE	28480	5000-8626
MP11	5000-0051	2	PLATE: FLUTED	28480	5000-0051
MP12	1490-0030	1	STAND: TILT	28480	1490-0030
MP13	5060-0767	5	ASSY: FOOT	28480	5060-0767
MP14	03320-24901	2	FRAME: SIDE	28480	03320-24901
MP16	03320-01214	2	BAR: FRONT PANEL MOUNTING	28480	03320-01214
MP17	03320-24706	2	SPACER: ROD	28480	03320-24706
MP18	5060-8613	1	COVER: BOTTOM	28480	5060-8613
MP19	03320-04301	1	PLATE: SWITCH	28480	03320-04301
MP20			MP20, Front Panel Assembly Includes A13 Switch Assembly:		
	03320-60201	1	PANEL: FRONT 3320A	28480	03320-60201
	03320-60204	1	PANEL: FRONT 3320A (OPTION 001)	28480	03320-60204
	03320-60200	1	PANEL: FRONT 3320B*	28480	03320-60200
	03320-60203	1	PANEL: FRONT 3320B (OPTION 001)*	28480	03320-60203
MP21	5020-8806	1	TRIM: BOTTOM	28480	5020-8806
MP22	0370-2257	8	KNOB: RND	28480	0370-2257
MP23	0370-1092	1	KNOB: 1/2 RND (VERNIER)	28480	0370-1092
MP24	0370-2188	1	KNOB: CONCENTRIC (VERNIER IN/OUT)	28480	0370-2188
MP25	5020-8805	1	TRIM: TOP	28480	5020-8805
MP26	0370-1099	1	KNOB: POINTER (A ONLY)	28480	0370-1099
MP27	5000-8631	1	COVER: REAR (LEFT SIDE)	28480	5000-8631
MP28	03320-01206	1	BRACKET: RECTIFIER	28480	03320-01206
† MP29	03320-61206	1	BRACKET: POWER SUPPLY	28480	03320-61206
MP30	03320-01208	1	STRAP: RETAINER	28480	03320-01208
† MP31	03320-68636	1	REAR DECK ASSEMBLY INCLUDES:	28480	03320-68636
	03320-60112	1	DECK: POWER SUPPLY	28480	03320-60112
	03320-61204	1	BRACKET: RIGHT	28480	03320-61204
	03320-61210	1	BRACKET: CONTROL FRONT	28480	03320-61210
	03320-61211	1	BRACKET: CONTROL REAR	28480	03320-61211
MP32	03320-00104	1	DECK: AMP AND ATTEN	28480	03320-00104
MP33	03320-60101	1	ASSY: GUSSET	28480	03320-60101
MP34	03320-00101	1	DECK: CARD REST	28480	03320-00101
MP35	03320-00601	1	SHIELD	28480	03320-00601
MP36	03320-26501	11	EXTRU: CARD REST (A1 THRU A11)	28480	03320-26501
MP37	03320-61201 (3320A)	1	ASSY: TSTR BRACKET	28480	03320-61201
	03320-61202 (3320B)	1	ASSY: TSTR BRACKET	28480	03320-61202
MP38	03320-04101	1	COVER: CARD REST (A1)	28480	03320-04101
MP39	03320-04102	1	COVER: CARD REST (A2)	28480	03320-04102
MP40	03320-04103	1	COVER: CARD REST (A3)	28480	03320-04103
MP41	03320-04104	1	COVER: CARD REST (A4)	28480	03320-04104
MP42	03320-04105	1	COVER: CARD REST (A5)	28480	03320-04105
MP43	03320-04106	1	COVER: CARD REST (A6)	28480	03320-04106
MP44	03320-04107	1	COVER: CARD REST (A7)	28480	03320-04107
MP45	03320-04108	1	COVER: CARD REST (A8)	28480	03320-04108
MP46	03320-04109	1	COVER: CARD REST (A9)	28480	03320-04109
MP47	03320-04110	1	COVER: CARD REST (A10)	28480	03320-04110
MP48	03320-04111 (3320B)	1	COVER: CARD REST (A11)	28480	03320-04111
MP45	03320-04119 (3320A)	1	COVER: CARD REST (A11)	28480	03320-04119
MP50	03320-42301	1	EXTRU: CARD REST (A12)	28480	03320-42301
MP51	03320-24705	1	SUPPORT: FLAG	28480	03320-24706
MP52	5040-6882	1	ASSY: FLAG	28480	5040-6882

† See Section VIII, Manual Backdating.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

MECHANICAL PARTS (cont'd.

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
MP53	03370-79101	1	SPRING	28480	03370-79101
MP54	6040-6885	1	DISK: READOUT	28480	6040-6885
MP55	6040-6886	1	DISK: READOUT*	28480	6040-6886
MP56	03370-24704	6	SPACER	28480	03370-24704
MP57			NOT ASSIGNED		
MP58	6040-6884	2	DISK: READOUT	28480	6040-6884
MP59, MP60	6040-6887	3	DISK: READOUT*	28480	6040-6887
MP61	6040-6883	1	DISK: READOUT	28480	6040-6883
MP62	03370-61401	1	ASSY: VERNIER DRIVE (SEE FIGURE 6-3)	28480	03370-61401
MP63	03370-21701	1	BRACKET: SWITCH	28480	03370-21701
1	03370-23601	1	SUPPORT: GEAR	28480	03370-23601
2	3100-2776	1	SWITCH: ROTARY	28480	3100-2776
3	03370-23707	1	SHAFT: DRIVE GEAR	28480	03370-23707
4	1430-0737	1	GEAR: DRIVE	28480	1430-0737
5	6060-5991	1	GEAR: POT	28480	6060-5991
6	2950-0001	1	NUT: HEX 3/8-32	28480	2950-0001
7	2190-0016	1	WASHER: LOCK INT.	28480	2190-0016
8	03370-22401	2	GEAR: BEVEL	28480	03370-22401
9	2100-2217	1	R: VAR WW LIN 10 K OHM 6% 3 W	28480	2100-2217
10	1140-0063	1	COUNTER	28480	1140-0063
11	1630-1638	1	POINTER	28480	1630-1638
12	1430-0741	1	GEAR: CENTER SPUR	28480	1430-0741
13	03370-24706	1	SPACER: GEAR	28480	03370-24706
14	2190-0378	2	WASHER: S.S.	28480	2190-0378
15	03370-23701	1	SHAFT: BEVEL GEAR	28480	03370-23701
16	2190-0679	2	WASHER: NYLON	28480	2190-0679
17	6040-6878	1	CAM	28480	6040-6878
18	03370-26702	1	COLLAR	28480	03370-26702
19	6040-6946	1	CAM	28480	6040-6946
20	03370-26701	1	COLLAR	28480	03370-26701
	0340-0140	4	INSULATOR:TSTR	28480	0340-0140
	0340-0782	1	INSULATOR:TSTR	28480	0340-0782

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

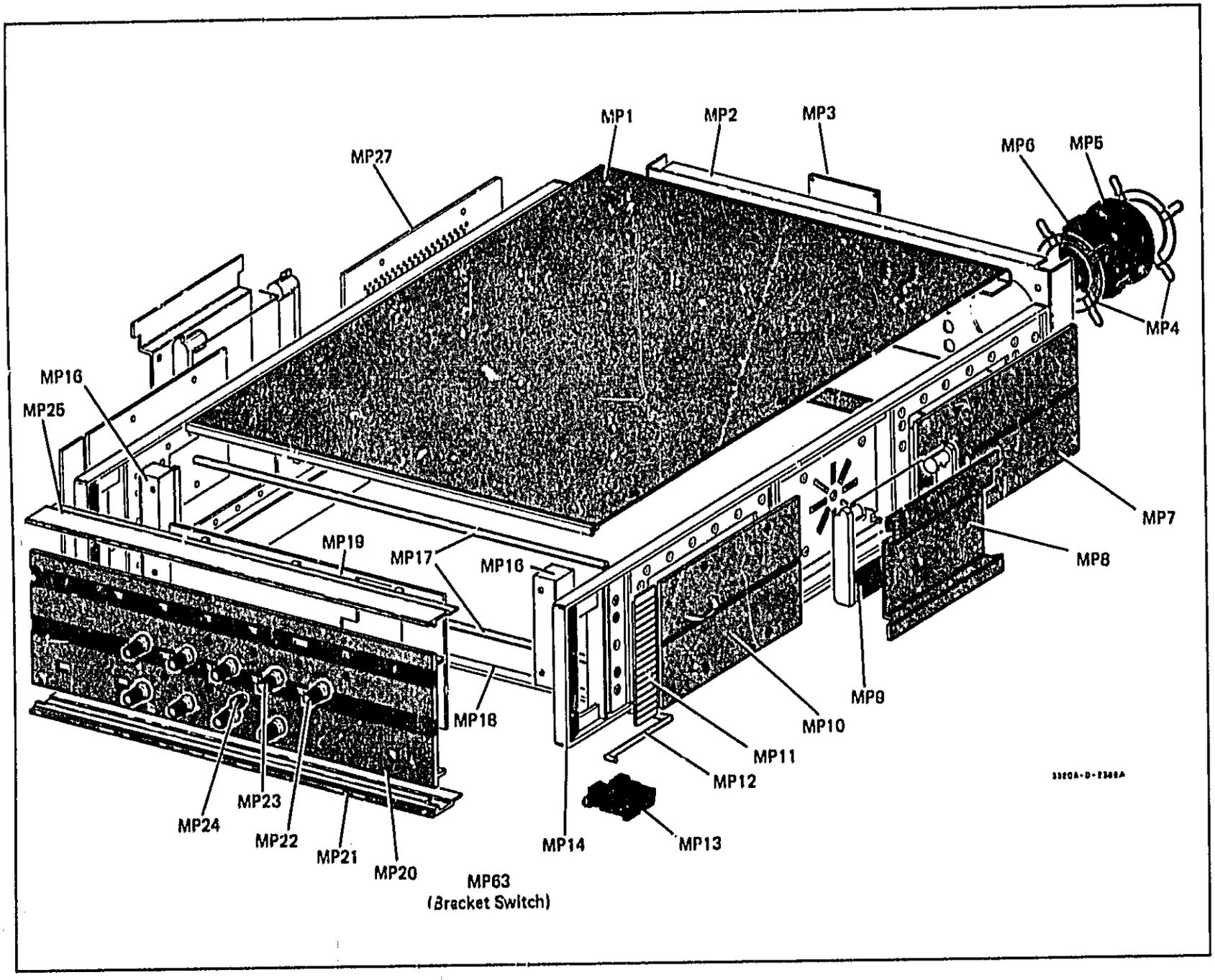


Figure 6-1. External Mechanical Parts.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

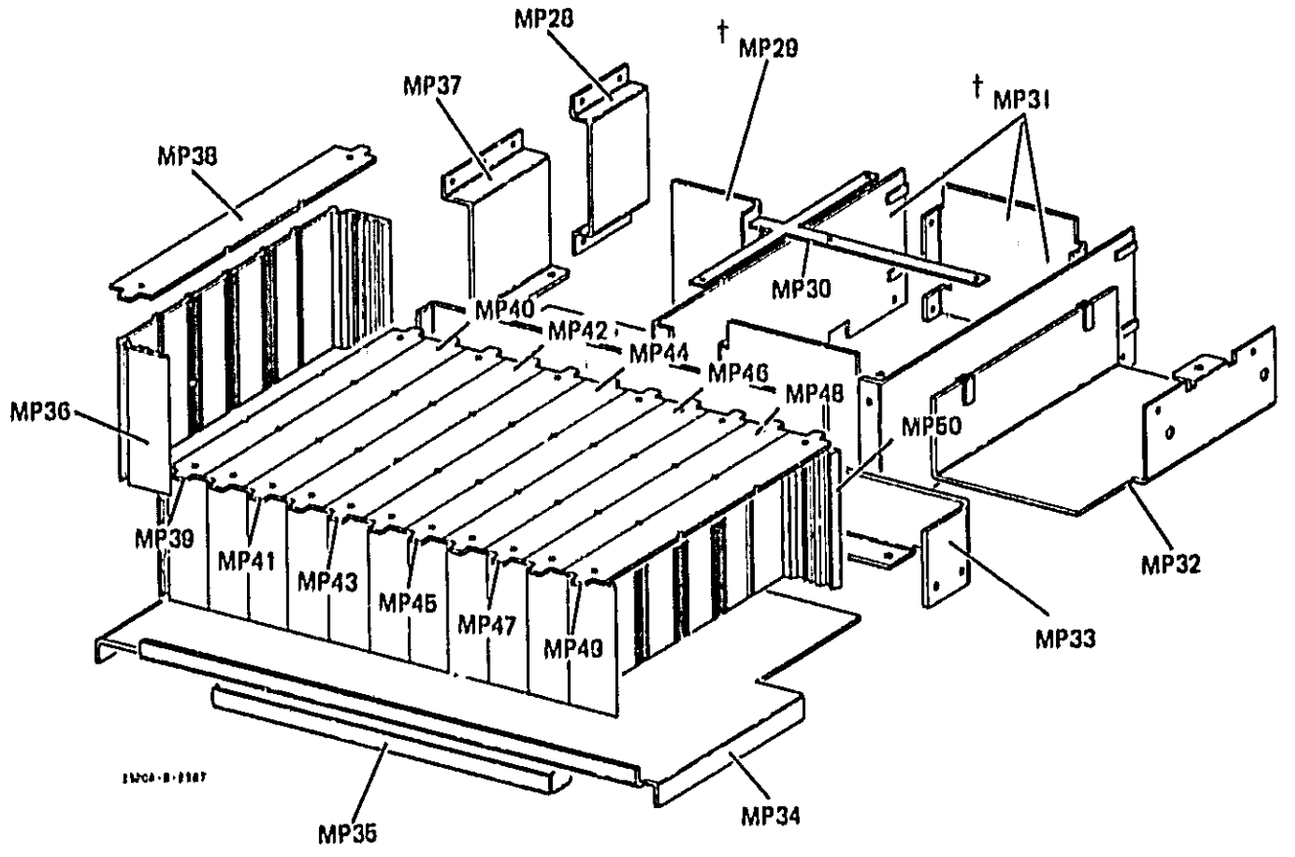
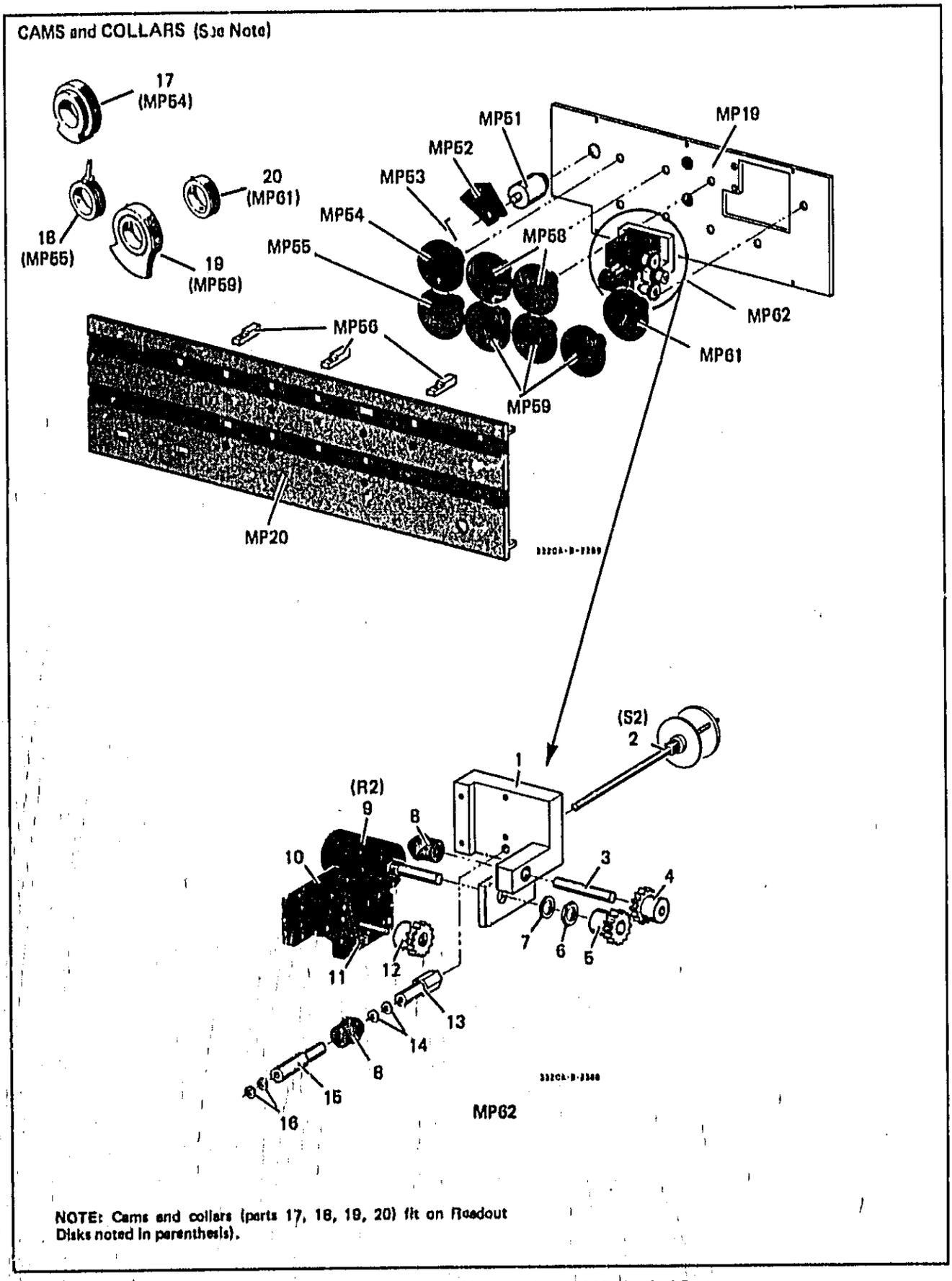


Figure 6-2. Internal Mechanical Parts.

† See Appendix C, Manual Backdating.

Rev. A - For Instrument Serial Numbers: 3320A - 1121A - 00111 and above.
3320B - 1122A - 00121 and above.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



NOTE: Cams and collars (parts 17, 18, 19, 20) fit on Readout Disks noted in parenthesis).

Figure 6-3. Front Panel and Vernier Control Mechanical Parts.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

CODE LIST OF MANUFACTURERS

The following code numbers are from the Federal Supply Code for Manufacturers Cataloging Handbooks H4-1 (Name to Code) and H4-2 (Code to Name) and their latest supplements. The date of revision and the date of the supplements used appear at the bottom of each page. Alphabetical codes have been arbitrarily assigned to suppliers not appearing in the H4 Handbooks.

Code No.	Manufacturer	Address
00000	U.S.A Common	Any supplier of U.S.
00136	McCoy Electronics	Mount Holly Springs, Pa.
00213	Sage Electronics Corp.	Rochester, N.Y.
00287	Cemco, Inc.	Danielson, Conn.
00334	Humidial	Colton, Calif.
00346	Mictron, Co., Inc.	Valley Stream, N.Y.
00372	Garlock Inc.	Cherry Hill, N.J.
00656	Aerovox Corp.	New Bedford, Mass.
00779	Amp, Inc.	Harrisburg, Pa.
00781	Aircraft Radio Corp.	Boonton, N.J.
00809	Crowen, Ltd.	Whitby, Ontario, Canada
00815	Northern Engineering Laboratories, Inc.	Burlington, Wis.
00853	Sangamo Electric Co., Pickens Div.	Pickens, S.C.
00866	Gae Engineering Co.	City of Industry, Cal.
00891	Carl E. Holmes Corp.	Los Angeles, Cal.
00928	Microlab Inc.	Livingston, N.J.
01002	General Electric Co., Capacitor Dept.	Hudson Falls, N.Y.
01009	Alden Products Co.	Brockton, Mass.
01121	Allen Bradley Co.	Milwaukee, Wis.
01255	Litton Industries, Inc.	Beverly Hills, Cal.
01281	TRW Semiconductors, Inc.	Lawndale, Cal.
01295	Texas Instruments, Inc., Transistor Products Div.	Dallas, Texas
01349	The Alliance Mfg. Co	Alliance, Ohio
01538	Small Parts Inc.	Los Angeles, Cal.
01569	Pacific Relays, Inc.	Van Nuys, Cal.
01670	Gudebrod Bros. Silk Co.	New York, N.Y.
01930	Amerock Corp.	Rockford, Ill.
01960	Pulse Engineering Co	Santa Clara, Cal.
02114	Ferroxcube Corp. of America	Saugerties, N.Y.
02116	Wheelock Signals, Inc.	Long Branch, N.J.
02286	Cole Rubber and Plastics Inc.	Sunnyvale, Cal.
02660	Amphenol-Borg Electronics Corp.	Broadview, Ill.
01735	Radio Corp. of America, Semiconductor and Materials Division	Somerville, N.J.
02771	Vocaline Co. of America, Inc.	Old Saybrook, Conn.
02777	Hopkins Engineering Co.	San Fernando, Cal.
02875	Hudson Tool & Die	Newark, N.J.
03296	Nylon Molding Corp.	Springfield, N.J.
03508	G.E. Semiconductor Prod. Dept.	Syracuse, N.Y.
03705	Apex Machine & Tool Co.	Dayton, Ohio
03797	Eldema Corp.	Compton, Calif.
03818	Parker Seal Co.	Los Angeles, Cal.
03877	Transitron Electric Corp.	Wakefield, Mass.
03888	Pyrofilm Resistor Co., Inc.	Cedar Knolls, N.J.
03954	Singer Co., Diehl Div., Finderne Plant	Somerville, N.J.
04009	Arrow, Hart and Hegeman Elect. Co.	Hartford, Conn.
04013	Taruwa Corp.	Lambertville, N.J.
04062	Arco Electronic Inc.	Great Neck, N.Y.
04217	Essex Wire	Los Angeles, Cal.
04222	ITI-Q Division of Aerovox	Myrtle Beach, S.C.
04264	Precision Paper Tube Co.	Wheeling, Ill.
04404	Palo Alto Division of Hewlett-Packard Co.	Palo Alto, Cal.
04681	Sylvania Electric Products, Microwave Device Div.	Mountain View, Cal.
04673	Dakota Engr. Inc.	Culver City, Cal.
04713	Motorola Inc. Semiconductor Prod. Div.	Phoenix, Arizona
04732	Filtron Co., Inc. Western Div.	Culver City, Cal.
04773	Automatic Electric Co.	Northlake, Ill.
04796	Sequoia Wire Co.	Redwood City, Cal.
04811	Precision Coil Spring Co.	El Monte, Cal.
04870	P.M. Motor Company	Westchester, Ill.
04918	Component Mfg. Service Co.	W. Bridgewater, Mass.
05006	Twentieth Century Plastics, Inc.	Los Angeles, Cal.
05277	Westinghouse Electric Corp. Semiconductor Dept.	Youngwood, Pa.
05347	Ultronix, Inc.	San Mateo, Cal.
05397	Union Carbine Corp., Elect. Div.	New York, N.Y.
05574	Viking Ind Inc.	Canoga Park, Cal.
05693	Icore Electro-Plastics Inc.	Sunnyvale, Cal.
05816	Cosmo Plastic (c/o Electrical Spec Co.)	Cleveland, Ohio
05624	Barber Colman Co.	Rockford, Ill.
05728	Tiffen Optical Co.	Roslyn Heights, Long Island, N.Y.
05729	Metro-Tel Corp.	Westbury, N.Y.
05763	Stewart Engineering Co.	Santa Cruz, Cal.
05870	Wakefield Engineering Inc.	Wakefield, Mass.
05964	Barsick Co., Div. of Stewart Warner Corp.	Bridgeport, Conn.
06090	Raychem Corp.	Redwood City, Cal.
06175	Bausch and Lomb Optical Co.	Rochester, N.Y.
06402	E.T.A. Products Co. of America	Chicago, Ill.
06540	Amatom Electronic Hardware Co., Inc.	New Rochelle, N.Y.
06666	Beede Electrical Instrument Co., Inc.	Penacook, N.H.
06666	General Devices Co., Inc.	Indianapolis, Ind.
06751	Components Inc., Ariz. Div.	Phoenix, Arizona
06812	Torrington Mfg. Co., West Div.	Van Nuys, Cal.
06980	Varian Assoc. Eimac Div.	San Carlos, Cal.
07088	Kelvin Electric Co.	Van Nuys, Cal.
07126	Digitran Co.	Pasadena, Cal.
07137	Transistor Electronics Corp.	Minneapolis, Minn.
07138	Westinghouse Electric Corp., Electronic Tube Div.	Elmira, N.Y.
07149	Filmohm Corp.	New York, N.Y.
07233	Cinch-Graphik Co.	City of Industry, Cal.
07256	Silicon Transistor Corp.	Carle Place, N.Y.
07261	Avnet Corp.	Culver City, Cal.
07263	Fairchild Camera & Inst. Corp., Semiconductor Div.	Mountain View, Cal.
07322	Minnesota Rubber Co.	Minneapolis, Minn.
07367	Birtcher Corp, The	Monterey Park, Cal.
07397	Sylvania Elect. Prod. Inc., Mt. View Operations	Mountain View Cal.
07700	Technical Wire Products Inc.	Cranford, N.J.
07829	Bodine Elect. Co.	Chicago, Ill.
07910	Continental Device Corp.	Hawthorne, Cal.
07933	Raytheon Mfg. Co., Semiconductor Div.	Mountain View, Cal.
07960	Hewlett-Packard Co., New Jersey Division	Rockaway, N.J.
08145	U.S. Engineering Co.	Los Angeles, Cal.
08288	Bilan, Delbert Co.	Pomona, Cal.
08358	Burgess Battery Co.	Niagara Falls, Ontario, Canada
08524	Deutsch Fastener Corp.	Los Angeles, Cal.
08664	Bristol Co., The	Waterbury, Conn
08717	Sloan Company	Sun Valley, Cal.
08718	ITT Cannon Electric Inc., Phoenix Div.	Phoenix, Arizona
08727	National Radio Lab. Inc.	Paramus, N.J.
08792	CBS Electronics Semiconductor Operations, Div. of CBS Inc	Lowell, Mass.
08806	General Electric Co., Miniature Lamp Dept.	Cleveland, Ohio
08984	Mel-Rain	Indianapolis, Ind.
09026	Babcock Relays Div.	Costa Mesa, Cal.
09097	Electronic Enclosures Inc.	Los Angeles, Calif.
09134	Texas Capacitor Co.	Houston, Texas
09145	Tech. Ind. Inc, Atohm Elect.	Burbank, Cal.
09250	Electro Assemblies, Inc.	Chicago, Ill.
09353	C & K Components Inc.	Newton, Mass.
09569	Mallory Battery Co. of Canada, Ltd.	Toronto, Ontario, Canada
09795	Pennsylvania Florocarbon Clifton Heights, Penn.	
09935	Burndy Corp	Norwalk, Conn.
10214	General Transistor Western Corp.	Los Angeles, Cal.
10411	Ti-Tal, Inc.	Berkeley, Cal.
10616	Carborundum Co.	Niagara Falls, N.Y.
11236	CTS of Berne, Inc.	Berne, Ind.
11237	Chicago Telephone of California, Inc.	So. Pasadena, Cal.
11262	Bay State Electronics Corp.	Waltham, Mass
11312	Teledyne Inc. Microwave Div.	Palo Alto, Cal.
11314	National Seal	Downey, Cal.
11453	Precision Connector Corp.	Jamaica, N.Y.
11534	Duncan Electronics Inc.	Costa Mesa, Cal.
11711	General Instrument Corp., Semiconductor Division Products Group	Newark, N.J.
11717	Imperial Electronic, Inc.	Buena Park, Cal.
11870	Melabs, Inc.	Palo Alto, Cal.
12136	Philadelphia Handle Co	Camden, N.J.
12361	Grove Mfg. Co., Inc.	Shady Grove, Pa.
12674	Gulton Ind. Inc., Data System Div.	Albuquerque, N.M.
12697	Clarostat Mfg. Co.	Dover, N.H.
12726	Elmar Filter Corp	W. Haven, Conn.
12859	Nippon Electric Co., Ltd.	Tokyo, Japan
12881	Metex Electronics Corp.	Clark, N.J.
12930	Delta Semiconductor Inc.	Newport Beach, Cal.
12954	Dickson Electronics Corp.	Scottsdale, Arizona
13019	Airco Supply Co., Inc.	Wichita, Kansas
13061	Wilco Products	Detroit, Mich.
13103	Thermalloy	Dallas, Texas
13327	Solitron Devices Inc.	Tappan, N.Y.
13396	Telefunken (Gmbh)	Hanover, Germany
13835	Midland-Wright Div. of Pacific Industries, Inc.	Kansas City, Kansas
14099	Sem-Tech	Newbury Park, Cal.
14183	Calif. Resistor Corp	Santa Monica, Cal.
14298	American Components, Inc.	Conshohocken, Pa.
14433	ITT Semiconductor, a Div. of Int. Telephone and Telegraph Corporation	West Palm Beach, Fla.
14493	Hewlett-Packard Company	Loveland, Colo.
14655	Cornell Dubilier Electric Corp	Newark, N.J.
14674	Corning Glass Works	Corning, N.Y.
14752	Electro Cube Inc.	San Gabriel, Cal.
14960	Williams Mfg. Co.	San Jose, Cal.
15106	The Sphere Co., Inc.	Little Falls, N.J.
15203	Webster Electronics Co.	New York, N.Y.
15287	Scionics Corp.	Northridge, Cal.
15291	Adjustable Bushing Co.	N. Hollywood, Cal.
15558	Micron Electronics, Garden City, Long Island, N.Y.	
15666	Amprobe Inst. Corp.	Lynbrook, N.Y.
15681	Cableitronics	Costa Mesa, Cal.
15772	Twentieth Century Coil Spring Co.	Santa Clara, Cal.
15801	Fenwal Elect. Inc.	Framingham, Mass.
15818	Amelco Inc.	Mountain View, Cal.
16037	Spruce Pine Mica Co	Spruce Pine, N.C.
16179	Omni-Spectra Inc.	Detroit, Ill.
16352	Computer Diode Corp.	Lodi, N.J.
16854	Electroid Co.	Union, N.J.
16885	Boots Aircraft Nut Corp.	Pasadena, Cal.
16888	Ideal Prec. Meter Co., Inc., De Jur Meter Div.	Brooklyn, N.Y.
16758	Delco Radio Div. of G.M. Corp.	Kokomo, Ind.
17109	Thermonetics Inc.	Canoga Park, Cal.
17474	Transex Company	Mountain View, Cal.
17675	Hamlin Metal Products Corp.	Akron, Ohio
17745	Angstrohm Prec. Inc.	No. Hollywood, Cal.
17856	Siliconix Inc.	Sunnyvale, Cal.
17870	McGraw-Edison Co.	Manchester, N.H.
18042	Power Design Pacific Inc.	Palo Alto, Cal.
18083	Clevite Corp. Semiconductor Div.	Palo Alto, Cal.
18324	Signetics Corp.	Sunnyvale, Cal.
18476	Ty-Car Mfg. Co., Inc.	Holliston, Mass.
18486	TRW Elect. Comp. Div.	Des Plaines, Ill.
18565	Chomerics	Plainville, Mass.
18583	Curtis Instrument, Inc.	Mt. Kisco, N.Y.
18612	Vishay Instruments Inc.	Malvern, Pa.
18873	E.I. DuPont and Co., Inc.	Wilmington, Del.
18911	Durant Mfg. Co.	Milwaukee, Wis.
19315	The Bendix Corp., Navigation & Control Div.	Teterboro, N.J.
19500	Thomas A. Edison Industries, Div. of McGraw-Edison	West Orange, N.J.
19589	Concoa	Baldwin Park, Cal.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

CODE LIST OF MANUFACTURERS (Continued)

Code No.	Manufacturer	Address
14444	LMC Electronics	Bornesheads, N.Y.
19701	Electra Mfg. Co.	Independence, Kansas
20183	General Atronics Corp.	Philadelphia, Pa.
21226	Executone, Inc.	Long Island City, N.Y.
21355	Fafnir Bearing Co., The	New Britian, Conn.
21520	Fansteel Metallurgical Corp.	N. Chicago, Ill.
23020	General Reed Co.	Malden, N.J.
23042	Texscan Corp.	Indianapolis, Ind.
23783	British Radio Electronics Ltd.	Washington, D.C.
24455	G.E. Lamp Division, Nela Park,	Cleveland, Ohio
24655	General Radio Co.	West Concord, Mass.
24681	Memcor Inc., Comp. Div.	Huntington, Ind.
26365	Grien Reproducer Corp.	New Rochelle, N.Y.
26462	Grobert File Co. of America, Inc.	Carlstadt, N.J.
26851	Compar, Hollister Co.	Hollister, Cal.
26992	Hamilton Watch Co.	Lancaster, Pa.
28480	Hewlett-Packard Co.	Palo Alto, Cal.
28520	Heyman Mfg. Co.	Kenilworth, N.J.
30817	Instrument Specialties Co., Inc.	Little Falls, N.J.
33173	G.E. Receiving Tube Dept.	Owensboro, Ky.
33434	Lectrohm Inc.	Chicago, Ill.
36186	Stanwyck Coil Products, Ltd.	Hawkesbury, Ontario, Canada
36267	Cunningham, W.H. & Hill, Ltd.	Toronto, Ontario, Canada
37942	P.R. Mallory & Co., Inc.	Indianapolis, Ind.
38443	Mechanical Industries Prod. Co.	Akron, Ohio
40020	Miniature Precision Bearings, Inc.	Keene, N.H.
40871	Honeywell Inc.	Minneapolis, Minn.
42190	Muter Co.	Chicago, Ill.
43990	C.A. Norgren Co.	Englewood, Colo.
44655	Ohmite Mfg. Co.	Skokie, Ill.
46384	Penn Eng. & Mfg. Corp.	Doylestown, Pa.
47904	Polaroid Corp.	Cambridge, Mass.
48620	Precision Thermometer & Inst. Co.	Southampton, Pa.
49956	Microwave & Power Tube Div.	Waltham, Mass.
52090	Rowan Controller Co.	Westminster, Md.
52983	HP Co., Med. Elec. Div.	Waltham, Mass.
54294	Shallcross Mfg. Co.	Selma, N.C.
55026	Simpson Electric Co.	Chicago, Ill.
55933	Sonotone Corp.	Elmsford, N.Y.
55938	Raytheon Co, Commercial Apparatus & System Div.	So. Norwalk, Conn.
56137	Spaulding Fibre Co., Inc.	Tonawanda, N.Y.
56289	Sprague Electric Co.	North Adams, Mass.
58474	Superior Elect. Co.	Bristol, Conn.
58446	Telex Corp.	Tulsa, Okla.
59730	Thomas & Betts Co.	Elizabeth, N.J.
60741	Triplett Electrical Inst. Co.	Bluffton, Ohio
61775	Union Switch and Signal Div. of Westinghouse Air Brake Co.	Pittsburgh, Pa.
62119	Universal Electric Co.	Owosso, Mich.
63743	Ward-Leonard Electric Co.	Mt. Vernon, N.Y.
64959	Western Electric Co., Inc.	New York, N.Y.
65092	Weston Inst. Inc. Weston-Newark	Newark, N.J.
66295	Willek Mfg. Co.	Chicago, Ill.
66346	Minnesota Mining & Mfg. Co. Revere Mincom Div.	St. Paul, Minn.
70276	Allen Mfg. Co.	Hartford, Conn.
70309	Allied Control	New York, N.Y.
70318	Allmetal Screw Product Co., Inc.	Garden City, N.Y.
70417	Amplex, Div. of Chrysler Corp.	Detroit, Mich.
70485	Atlantic India Rubber Works, Inc.	Chicago, Ill.
70563	Amperite Co., Inc.	Union City, N.J.
70674	ADC Products Inc.	Minneapolis, Minn.
70903	Belden Mfg. Co.	Chicago, Ill.
70998	Bird Electric Corp.	Cleveland, Ohio
71002	Birnbach Radio Co.	New York, N.Y.
71034	Billey Electric Co., Inc.	Erie, Pa.
71041	Boston Gear Works Div. of Murray Co. of Texas	Quincey, Mass.
71218	Bud Radio, Inc.	Willoughby, Ohio
71279	Cambridge Thermionics Corp.	Cambridge, Mass.
71286	Camloc Fastener Corp.	Paramus, N.J.
71313	Cardwell Condenser Corp.	Lindenhurst, L.I., N.Y.
71400	Bussmann Mfg. Div. of McGraw-Edison Co.	St. Louis, Mo.
71436	Chicago Condenser Corp.	Chicago, Ill.
71447	Calif. Spring Co., Inc.	Pico-Rivera, Cal.
71450	CTS Corp.	Elkhart, Ind.
71468	ITT Cannon Electric Inc.	Los Angeles, Cal.
71471	Cinema, Div. Aerovox Corp.	Burbank, Cal.
71482	C.P. Clare & Co.	Chicago, Ill.
71590	Centralab Div. of Globe Union Inc.	Milwaukee, Wis.
71616	Commercial Plastics Co.	Chicago, Ill
71700	Cornish Wire Co., The	New York, N.Y.
71707	Coto Coil Co., Inc.	Providence, R.I.
71744	Chicago Miniature Lamp Works	Chicago, Ill
71785	Cinch Mfg. Co., Howard B. Jones Div.	Chicago, Ill
71814	Dow Corning Corp.	Midland, Mich
72136	Electro Motive Mfg. Co., Inc.	Willimantic, Conn.
72619	Dialight Corp.	Brooklyn, N.Y.
72656	Indiana General Corp., Electronics Div.	Keasby, N.J.
72699	General Instrument Corp., Cap Division	Newark, N.J.
72765	Drake Mfg. Co.	Harwood Heights, Ill.
72825	Hugh H. Eby Inc.	Philadelphia, Pa.
72928	Gudeman Co.	Chicago, Ill.
72962	Elastic Stop Nut Corp.	Union, N.J.
72964	Robert M. Hadley Co.	Los Angeles, Cal.
72982	Erie Technological Products, Inc.	Erie, Pa.
73061	Hansen Mfg. Co., Inc.	Princeton, Ind.
73076	H.M. Harper Co.	Chicago, Ill.
73138	Helipot Div. of Beckman Inst., Inc.	Fullerton, Cal.
793	Hughes Products Division of Hughes Aircraft Co.	Newport Beach, Cal.
73445	Amperex Elect. Co.	Hicksville, L.I., N.Y.
73506	Bradley Semiconductor Corp.	New Haven, Conn.
73559	Carling Electric, Inc.	Hartford, Conn.
73586	Circle F Mfg. Co.	Trenton, N.J.
73682	George K. Garrett Co., Div. Mfg. Industries, Inc.	Philadelphia, Pa
73734	Federal Screw Products, Inc.	Chicago, Ill.
73743	Fischer Special Mfg. Co.	Cincinnati, Ohio
73793	General Industries Co., The	Elyria, Ohio
73846	Goshen Stamping & Tool Co.	Goshen, Ind.
73899	JFD Electronics Corp.	Brooklyn, N.Y.
73905	Jennings Radio Mfg. Corp.	San Jose, Cal.
73957	Groove-Pin Corp.	Ridgefield, N.J.
74276	Signalite Inc.	Neptune, N.J.
74455	J.H. Winns, and Sons	Winchester, Mass.
74861	Industrial Condenser Corp.	Chicago, Ill.
74868	H.F. Products Division of Amphenol-Borg Electronic Corp.	Danbury, Conn.
74970	E.F. Johnson Co.	Waseca, Minn.
75042	International Resistance Co.	Philadelphia, Pa.
75263	Keystone Carbon Co., Inc.	St. Marys, Pa.
75378	CTS Knights, Inc.	Sandwich, Ill.
75382	Kulka Electric Corp.	Mt. Vernon, N.Y.
75818	Lenz Electric Mfg. Co.	Chicago, Ill.
75915	Littlefuse, Inc.	Des Plaines, Ill.
76005	Lord Mfg. Co.	Erie, Pa.
76210	C.W. Marwedel	San Francisco, Cal.
76433	General Instrument Corp., Micamold Division	Newark, N.J.
76487	James Millen Mfg. Co., Inc.	Malden, Mass.
76493	J.W. Miller Co.	Los Angeles, Cal.
76530	Cinch-Monadnock, Div. of United Carr Fastener Corp.	San Leandro, Cal.
76545	Mueller Electric Co.	Cleveland, Ohio
76703	National Union	Newark, N.J.
76854	Oak Manufacturing Co.	Crystal Lake, Ill.
77068	The Bendix Corp., Electrodynamics Div.	N. Hollywood, Cal.
77075	Pacific Metals Co.	San Francisco, Cal.
77221	Phaostron Instrument and Electronic Co.	So. Pasadena, Cal.
77252	Philadelphia Steel and Wire Corp.	Philadelphia, Pa.
77342	American Machine & Foundry Co. Potter & Brumfield Div.	Princeton, Ind.
77630	TRW Electronic Components Div.	Camden, N.J.
77638	General Instrument Corp., Rectifier Division	Brooklyn, N.Y.
77764	Resistance Products Co.	Harrisburg, Pa.
77969	Rubbercraft Corp. of Calif.	Torrance, Cal.
78189	Shakeproof Division of Illinois Tool Works	Elgin, Ill.
78277	Sigma	So. Braintree, Mass.
78283	Signal Indicator Corp.	New York, N.Y.
78290	Struthers-Dunn Inc.	Pitman, N.J.
78452	Thompson-Bremer & Co	Chicago, Ill
78471	Tilley Mfg. Co	San Francisco, Cal
78488	Stackpole Carbon Co	St. Marys, Pa
78493	Standard Thomson Corp	Waltham, Mass
78553	Tinnerman Products, Inc	Cleveland, Ohio
78590	Transformer Engineers	San Gabriel, Cal
78947	Uclitic Co.	Newtonville, Mass
79136	Walden Robinson Inc	Long Island City, N.Y.
79142	Veeder Root, Inc.	Hartford, Conn.
79261	Wenco Mfg. Co	Chicago, Ill
79727	Continental-Wirt Electronics Corp.	Philadelphia, Pa.
79963	Zierick Mfg. Corp	New Rochelle, N.Y.
80031	Mepco Division of Sessions Clock Co.	Morristown, N.J.
80033	Prentole Corp	Toledo, Ohio
80120	Semitrex Alloy Products Co	Elizabeth, N.J
80131	Electronic Industries Association, Standard tube or semiconductor device, any manufacturer.	
80207	Unitrap Switch, Div. Mason Electronics Corp.	Wallingford, Conn.
80223	United Transformer Corp.	New York, N.Y.
80248	Oxford Electric Corp.	Chicago, Ill.
80294	Bourns Inc.	Riverside, Cal.
80411	Arco Div. of Robertshaw Controls Co.	Columbus, Ohio
80486	All Star Products Inc.	Defiance, Ohio
80509	Avery Label Co.	Monrovia, Cal
80583	Hammarlund Co., Inc.	Mars Hill, N.C.
80640	Stevens, Arnold, Co., Inc.	Boston, Mass.
80813	Dimco Gray Co.	Dayton, Ohio
81030	International Inst. Inc.	Orange, Conn
81073	Grayhill Co.	LaGrange, Ill.
81095	Triad Transformer Corp.	Venice, Cal.
81312	Winchester Elec Div. Litton Ind., Inc.	Oakville, Conn.
81349	Military Specification	
81483	International Rectifier Corp.	El Segundo, Cal.
81541	Airpax Electronics Inc.	Cambridge, Maryland
81860	Barry Controls, Div. Barry Wright Corp.	Watertown, Mass.
82042	Carter Precision Electric Co.	Skokie, Ill.
82047	Sperti Faraday Inc., Copper Hewitt Electric Div.	Hoboken, N.J.
82116	Electric Regulator Corp.	Norwalk, Conn
82142	Jeffers Electronics Division of Speer Carbon Co.	Du Bois, Pa.
82170	Fairchild Camera & Inst. Corp., Space & Defense Systems Div.	Paramus, N.J.
82209	Maguire Industries, Inc.	Greenwich, Conn.
82219	Sylvania Electric Prod., Inc. Electronic Tube Division	Emporium, Pa.
82376	Astron Corp.	East Newark, Harrison, N.J.
82389	Switchcraft, Inc.	Chicago, Ill.
82647	Metals & Controls Inc., Spencer Products	Attleboro, Mass.
82768	Phillips-Advance Control Co.	Joliet, Ill.
82866	Research Products Corp.	Madison, Wis.
82877	Rotron Mfg. Co., Inc.	Woodstock, N.Y.
82893	Vector Electronic Co.	Glendale, Cal.
83058	Carr Fastener Co.	Cambridge, Mass.
83086	New Hampshire Ball Bearing, Inc.	Peterborough, N.H.
83125	General Instrument Corp., Capacitor Div.	Darlington, S.C.
83148	ITT Wire and Cable Div.	Los Angeles, Cal.
83186	Victory Eng. Corp.	Springfield, N.J.
83298	Bendix Corp., Red Bank Div.	Red Bank, N.J.
83315	Bubbell Corp.	Mundelein, Ill.
83324	Rosan Inc.	Newport Beach, Cal.
83330	Smith, Herman H., Inc.	Brooklyn, N.Y.
83332	Tech Labs	Palisades Park, N.J.
83385	Central Screw Co.	Chicago, Ill.
83501	Gavitt Wire and Cable Co., Div. of Amerace Corp.	Brookfield, Mass.
83594	Burroughs Corp., Electronic Tube Div.	Plainfield, N.J.
83740	Union Carbide Corp., Consumer Prod. Div.	New York, N.Y.
83777	Model Eng. and Mfg., Inc.	Huntington, Ind.
83821	Loyd Scruggs Co.	Festus, Mo.
83942	Aeronautical Inst. & Radio Co.	Lodi, N.J.
84171	Arco Electronics Inc.	Great Neck, N.Y.
84396	A.J. Glessner Co., Inc.	San Francisco, Cal
84411	TRW Capacitor Div.	Ogallala, Neb.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

CODE LIST OF MANUFACTURERS (Continued)

Code No.	Manufacturer	Address
04870	Barber Turnian, Inc.	Bloomington, Ind.
05454	Boonton Molding Company	Boonton, N.J.
05571	A.H. Boyd Co.	San Francisco, Cal.
05574	R.M. Bracamonte & Co.	San Francisco, Cal.
05660	Rolled Korda, Inc.	Hamden, Conn.
05953	Seamless Rubber Co.	Chicago, Ill.
06174	Fafnir Bearing Co.	Los Angeles, Calif.
06197	Clifton Precision Products Co., Inc.	Clifton Heights, Pa.
06579	Precision Rubber Products Corp.	Dayton, Ohio
06664	Radio Corp. of America, Electronic Comp. & Devices Division	Harrison, N.J.
06915	Sealtron Mfg. Co.	Glendale, Cal.
07034	Marco Industries	Anaheim, Cal.
07138	Philco Corporation (Lansdale Division)	Lansdale, Pa.
07473	Western Fibrous Glass Products Co.	San Francisco, Cal.
07664	Van Waters & Rogers Inc.	San Francisco, Cal.
07910	Tower Mfg. Corp.	Providence, R.I.
08140	Cutler-Hammer, Inc.	Lincoln, Ill.
08310	Gould-National Batteries, Inc.	St. Paul, Minn.
08478	General Mills, Inc.	Buffalo, N.Y.
08921	Gonyber Electric Co.	Oakland, Cal.
09473	G.E. Distributing Corp.	Schenectady, N.Y.
09479	Security Co.	Detroit, Mich.
09685	United Transformer Co.	Chicago, Ill.
09010	United Shoe Machinery Corp	Beverly, Mass.
09179	U.S. Rubber Co., Consumer [illegible] & Plastics Prod. Div.	Passaic, N.J.
09318	Belleville Specialty Tool Mfg., Inc.	Belleville, Ill.
09761	United Carr Fastener Corp.	Chicago, Ill.
09870	Bearing Engineering Co.	San Francisco, Cal.
11148	ITT Cannon Elect. Inc., Salem Div.	Salem, Mass.
11360	Connor Spring Mfg. Co.	San Francisco, Cal.
11365	Miller Dial & Nameplate Co.	El Monte, Cal.
11478	Radio Materials Co.	Chicago, Ill.
11506	Angst Inc.	Attleboro, Mass.
11637	Dale Electronics, Inc.	Columbus, Nebr.
11642	Elco Corp.	Willow Grove, Pa.
11673	Epiphone Inc.	New York, N.Y.
11717	Gramar Mfg. Co., Inc.	Wakefield, Mass.
11737	K F Development Co.	Redwood City, Cal.
11886	Malco Mfg., Inc.	Chicago, Ill.
11938	Honeywell Inc., Micro Switch Division	Freeport, Ill.
11961	Nahm-Bros. Spring Co.	Oakland, Cal.
12180	Tru-Connector Corp.	Peabody, Mass.
12367	Elgeet Optical Co., Inc.	Rochester, N.Y.
12607	Tensolite Insulated Wire Co., Inc.	Tarrytown, N.Y.
12702	IMC Magnetics Corp.	Westbury, L.I., N.Y.
12706	Hudson Lamp Co	Kearney, N.J.
12725	Sylvania Electric Prod. Inc., Semiconductor Div.	Woburn, Mass.
12969	Bulbins & Myers Inc.	Phillipsburg Park, N.J.
13410	Hamer Controls, Div. of Essex Wire Corp.	Mansfield, Ohio
13612	Waters Mfg. Co.	Culver City, Cal.
13920	G.V. Controls	Livingston, N.J.
14137	General Cable Corp.	Bayonne, N.J.
14144	Raytheon Co., Comp. Div., Ind. Comp. Operations	Quincy, Mass.
14148	Scientific Electronics Products, Inc.	Loveland, Colo.
14154	Wagner Elect. Corp., Tung-Sol Div.	Newark, N.J.
14197	Curtiss-Wright Corp., Electronics Div.	East Patterson, N.J.
14233	South Chester Corp.	Chester, Pa.
14310	Wire Cloth Products, Inc.	Bellwood, Ill.
14376	Automatic Metal Products Co.	Brooklyn, N.Y.
14482	Worcester Pressed Aluminum Corp.	Worcester, Mass.
14656	Magnecraft Electric Co.	Chicago, Ill.
15023	George A. Philbrick Researchers, Inc.	Boston, Mass.
15148	Alco Elect. Mfg. Co.	Lawrence, Mass.
15236	Allen Products Corp.	Diania, Fla.
15238	Continental Connector Corp.	Woodside, N.Y.
15263	Leecraft Mfg. Co., Inc.	Long Island, N.Y.
15765	National Co. Co.	Sheridan, Wyo.
15275	Vitramon, Inc.	Bridgeport, Conn.
15348	Gordos Corp.	Bloomfield, N.J.
15354	Methode Mfg. Co.	Rolling Meadows, Ill.
15566	Arnold Engineering Co.	Marengo, Ill.
15712	Dage Electric Co., Inc.	Franklin, Ind.
15884	Siemon Mfg. Co.	Wayne, Ill.
15967	Weckesser Co.	Chicago, Ill.
16067	Microwave Assoc., West, Inc.	Sunnyvale, Cal.
16096	Hi-Q Div. of Aerovox Corp.	Olean, N.Y.
16256	Thordarson-Meissner Inc.	Mt. Carmel, Ill.
16296	Solar Mfg. Co.	Los Angeles, Cal.
16366	Microswitch, Div. of Minn.-Honeywell	Freeport, Ill.
16530	Carlton Screw Co.	Chicago, Ill.
16741	Microwave Associates, Inc.	Burlington, Mass.
16801	Excel Transformer Co.	Oakland, Cal.
16808	Xcelite, Inc.	Orchard Park, N.Y.
16733	San Fernando Elec. Mfg. Co.	San Fernando, Cal.
16881	Thomson Ind. Inc.	Long Island, N.Y.
17474	Industrial Retaining Ring Co.	Irvington, N.J.
17539	Automatic & Precision Mfg.	Englewood, N.J.
17819	Bron Resistor Corp.	Yonkers, N.Y.
17963	Litton System Inc., Adler-Westrex Commun. Div.	New Rochelle, N.Y.
18141	R-Tronics, Inc.	Jamaica, N.Y.
18189	Rubber Tech, Inc	Gardena, Cal.
18220	Hewlett-Packard Co., Medical Elec. Div.	Pasadena, Cal.
18378	Microdot, Inc.	So. Pasadena, Cal.
18391	Sealectro Corp.	Mamaroneck, N.Y.
18736	Zero Mfg. Co.	Burbank, Cal.
18810	Elc Inc.	Cleveland, Ohio
18731	General Mills Inc., Electronics Div.	Minneapolis, Minn.
18724	Pasco Division of Hewlett-Packard Co.	Palo Alto, Cal.
18821	North Hills Electronics, Inc.	Glen Cove, N.Y.
18978	International Electronic Research Corp.	Burbank, Cal.
19109	Columbia Technical Corp.	New York, N.Y.
19313	Varian Associates	Palo Alto, Cal.
19378	Alice Corp.	Winchester, Mass.
19515	Marshall Ind., Capacitor Div	Monrovia, Cal.
19707	Control Switch Division, Controls Co. of America	El Segundo, Cal.
19800	Dejean Electronics Corp.	East Aurora, N.Y.
19848	Wilco Corporation	Indianapolis, Ind.
19928	Branson Corp.	Whippany, N.J.
19934	Rembrandt, Inc.	Canton, Mass.
19942	Hoffman Electronics Corp., Semiconductor Division	El Monte, Cal.
19957	Technology Instrument Corp. of California	Newbury Park, Cal.

The following HP Vendors have no number assigned in the latest supplement to the Federal Supply Code for Manufacturers Handbook.

0000F	Malco Tool and Die	Los Angeles, Calif.	000C8	Hewlett-Packard Co., Colorado Springs Div.	Colorado Springs, Colorado
0000Z	Willow Leather Products Corp.	Newark, N.J.	000MM	Rubber Eng. & Development	Hayward, Cal.
G00AE	BTA	England	000NN	A "N" D Mfg. Co.	San Jose, Cal.
000BB	Precision Instrument Comp. Co.	San Fuys, Cal.	000QQ	Coultron	Oakland, Cal.
			000WW	California Eastern Lab	Burlington, Cal.
			000YY	S.K. Smith Co.	Los Angeles, Cal.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SCHEMATIC DIAGRAMS

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SECTION VII
CIRCUIT DIAGRAMS

7-1. INTRODUCTION.

7-2. This section of the manual contains troubleshooting information and ciruit diagrams for the 3320A/B Automatic Synthesizer. Included are troubleshooting trees, functional block diagrams, schematic diagrams and component location diagrams.

7-3. TROUBLESHOOTING.

7-4. The following troubleshooting information is designed to eliminate needless unrelated checks in locating instrument malfunctions. It should first be determined that a malfunction does exist and that it does not exist external to the 3320A/B. Before troubleshooting the 3320A/B, become familiar with the principles of operation (Section III) and the functional composition (Section IV) of the instrument.

7-5. To isolate the malfunction to an assembly, use the Block Diagrams (Figures 7-5, 7-6, 7-7) and/or the troubleshooting trees (Figures 7-1 through 7-4). To further isolate the malfunction to a component, use the schematic diagrams (Figures 7-9 through 7-32).

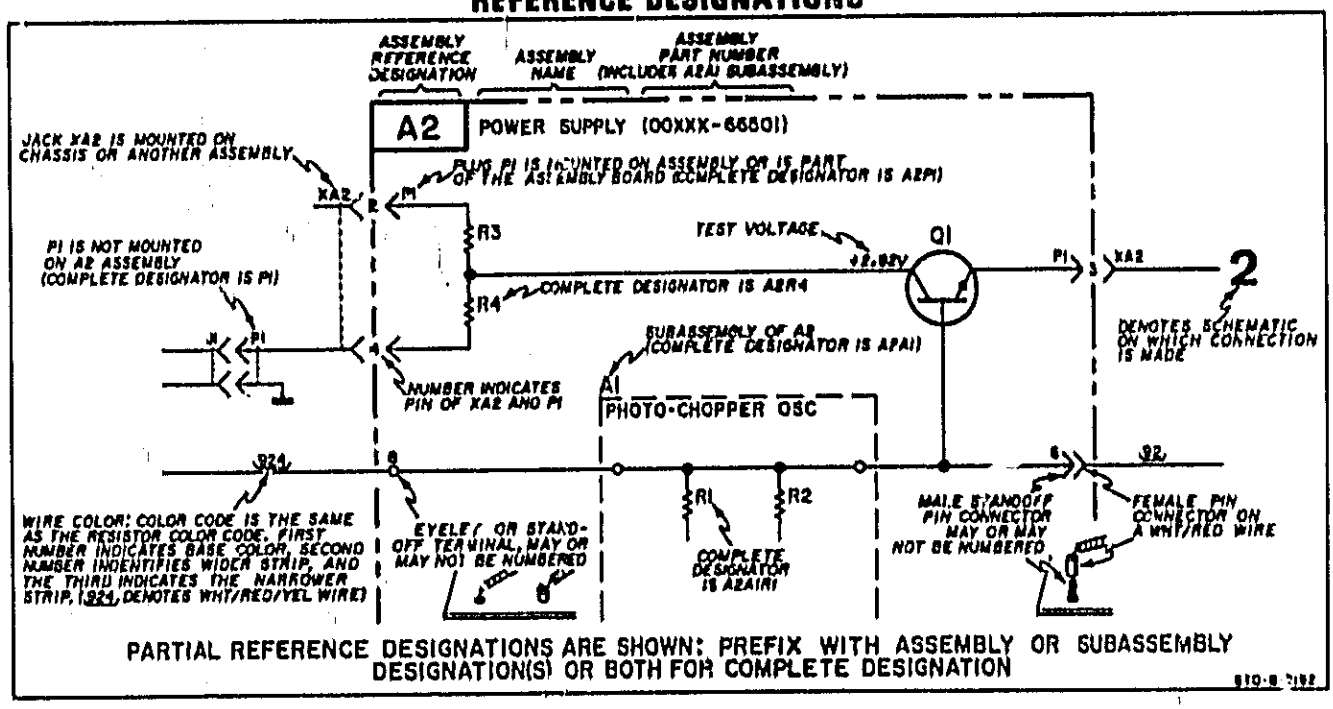
NOTE

Use the troubleshooting trees in the sequence in which they appear in the manual with one exception. The first troubleshooting tree, (Figure 7-1, System Component Isolation and GPIB Troubleshooting Tree) should be used for Option 007 (GPIB) 3320B instruments only. For standard instruments start the troubleshooting with Figure 7-2, Reference Frequency Troubleshooting Tree.

7-6. SCHEMATIC DIAGRAMS.

7-7. The schematic diagrams (Figure 7-9 through Figure 7-32) contained in this section show the detailed circuits of the 3320A/B. Components marked with an asterisk are those that are critical in value. The value of these components may vary from one instrument to another. The optimum value is selected at the factory. All options available with the 3320A/B are shown.

REFERENCE DESIGNATIONS



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 7-1. Assembly Identification and Location.

Assembly No.	Part Number	Name	Instrument	Replaces Part Number	Schematic No.
A1	03320-66501	Vernier Ref Oscillator	3320A/B		23
A2	03320-66502	÷N Counter	3320A/B		12
A3	03320-66503	VTO	3320A/B		11
A4	03320-66504	Range Divider	3320A/B		13
A5	03320-66505	Range Divider	3320A/B		14
A6	03320-66506	Range Divider	3320A/B Option 006		14
A7	03320-66507	Reference Phase Lock	3320A/B		22, 23
A8	03320-66508	20 MHz Reference Oscillator	3320A/B		22
A9A	03320-66533	Modulator	3320A		18
A9B	03320-66509	Modulator	3320B		19
A10	03320-66510	Mixer Preamp	3320A/B		15
A11	03320-66511	Amplitude Reference	3320A/B Standard		21
A11	03320-66540	Amplitude Reference	3320A/B Option 001		21
A12A	03320-66518	Power Amplifier	3320A		16
A12B	03320-66512	Detector	3320B		20
A13A	03320-61001	Front Panel	3320A		1,3,4
A13B	03320-61001	Front Panel	3320B		2,3,4,5,8,9,10
A14	03320-66514	Power Amplifier	3320B		17
A15	03320-66515	Attenuator	3320B Standard		17
A15	03320-66550	Attenuator	3320B Option 001		17
A16A	03320-66534	Power Supply	3320A		24
A16B	03320-66516	Power Supply	3320B		24
A17A	03320-66535	Power Supply	3320A		24
A17B	03320-66551	Power Supply	3320B	03320-66517	24
A18	03320-66518	Mother Board	3320A/B		
A20	03320-66520	Panel Interface	3320A		1
A21	03320-66559	Panel Interface	3320B	03320-66521	2
A22	03320-66522	Cable Board	3320A Option 003 3320B Options 004, 007		3,4,5,7,8,9,10
A23	03320-66523	BCD Frequency Control	3320A Option 003 3320B Options 004, 007		3,4,8,9
A24A	03320-66536	Inverter	3320A Option 003		6
A24B	03320-66560	BCD Amplitude Control	3320B Options 004, 007	03320-66524	6,10
A25	03320-66525	HP-IB Latches	3320B Option 007		7
A26	03320-66526	BCD Mother Board	3320A Option 003 3320B Option 004		3,4,5
A37	03320-66537	HP-IB Input	3320B Option 007		6
A38	03320-66538	HP-IB Controller	3320B Option 007		6
A39	03320-66539	HP-IB Mother Board	3320B Option 007		6,7,8,9,10

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SCHEMATIC NOTES

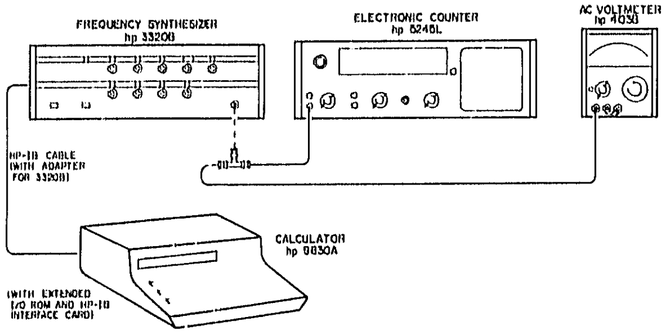
1. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. PREFIX WITH ASSEMBLY OR SUBASSEMBLY DESIGNATION(S) OR BOTH FOR COMPLETE DESIGNATION.
2. COMPONENT VALUES ARE SHOWN AS FOLLOWS UNLESS OTHERWISE NOTED.

   RESISTANCE IN OHMS
   CAPACITANCE IN MICROFARADS
   INDUCTANCE IN MICROHENRYS

3. DENOTES FLOATABLE CIRCUIT GROUND.
4. DENOTES ASSEMBLY CIRCUIT GROUND.
5. DENOTES CHASSIS CIRCUIT GROUND.
6. DENOTES POWER LINE GROUND.
7. DENOTES SCREWDRIVER GROUND.
8. DENOTES ASSEMBLY.
9. 2 DENOTES SIGNAL DESTINATION.
10. DENOTES FRONT PANEL MARKING.
11. DENOTES SIDE AND REAR PANEL MARKING.
12. DENOTES SCREWDRIVER ADJUST.
13. BRN/RED/YEL DENOTES WIRE COLOR; COLOR CODE SAME AS RESISTOR COLOR CODE. FIRST NUMBER IDENTIFIES BASE COLOR, SECOND NUMBER IDENTIFIES WIDER STRIP, THIRD NUMBER IDENTIFIES NARROWER STRIP.

    (e.g. BRN/RED/YEL = WHITE, RED, YELLOW.)

14. * AVERAGE VALUE SHOWN, OPTIMUM VALUE SELECTED AT FACTORY.
15. SCHEMATIC DIAGRAMS INCLUDE ALL OPTIONS.



1. Connect equipment as shown in Figure 7-1.
2. To determine if the 3320B operates correctly in local mode, set Frequency to 0.00 kHz, Vernier Out, Amplitude to + 10.00. Electronic counter should indicate 0.000 kHz. AC voltmeter reading will not be + 10.00 dBm unless the ac voltmeter is calibrated to 50 ohm impedance. Note voltmeter reading.
3. If the correct indications are obtained in Step 2, proceed with the following steps; if not, go to the troubleshooting on the following pages.
4. Run Program A. This program is written for the hp-9830A Calculator. If a different calculator model is used, it will be necessary to adapt the program.

Program A

```
10 FORMAT B
20 OUTPUT 713;10* 638
30 CMD "@U3";"A1,2,09,R3,F1099,V0,D,E"
40 END
```

5. If the 3320B responds correctly to the program, the Remote indicator will light, the electronic counter will indicate 10.999 kHz, and the ac voltmeter indication will increase approximately 10 dB from the reading in Step 2.
6. If the results in Step 5 are correct, check the other instruments used in the HP-IB system where the problem was observed, or check the software used.
7. If the results in Step 5 are not correct, did the 3320B respond correctly to part of the program or to none of the program?

   Part: Go to Step 8.
   None: Go to Step 15.

8. Using a logic probe (-hp- Model 10525T), check the levels of the A25 outputs. It may be necessary to check only the function that did not program correctly. (Refer to Schematic Diagram No. 7.) Correct levels are as follows:

Function	Connector	Pin No.	Level
		1	0
		2	0
		3	1
		4	0
	XA25A	5	0
		A	1
		B	1
Amplitude		C	0
		D	1
		E	1
		13	1
		14	0
	XA25B	15	1
		R	1
		S	0
Ampl. Sign	XA25B	P	1
		10	1
		11	0
		12	1
		13	1
		14	1
Frequency	XA25A	15	0
		K	0
		L	1
		M	0
		N	1
		P	0
		R	1
		S	1
		8	1
Range	XA25A	9	0
		J	0
Vernier In	XA25A	G	0
		11	1
Vernier Frequency	XA25B	12	1
		M	1
		N	0
		7	0
Delay	XA25A	F	1
		H	0

1 = Probe light ON
0 = Probe light OFF

9. If all A25 output levels are correct, the trouble may be on one of the following assemblies:

Function	Assembly	Schematic No.
Amplitude	A24	10
Frequency	A23	8
Range	A23	8
Vernier Frequency	A1	23
Delay	A23	9

10. If not all A25 outputs are correct, check the following A38 outputs with the logic probe before, during, and after running Program A. In all cases the light should blink (b) when the program is run. (Refer to Schematic No. 6.)

Signal	XA38 Pin No.	Level Before	Level During	Level After
H No. Strobe	2	0	b	0
L Frequency	3	1	b	1
L Delay	5	1	b	1
H Function Execute	6	0	b	0
L Vernier Digit	B	1	b	1
L Amplitude	C	1	b	1
H Vernier In	D	0	b	0
L Range	E	1	b	1
H Strobe	F	0	b	0
L Data Bit 1	J	0	b	0
L Data Bit 2	K	0	b	0
L Data Bit 3	L	0	b	0
L Data Bit 4	M	0	b	0
L Delay Initiate	S	1	b	1

1 = Light ON
0 = Light OFF
b = Light blinks

11. If all A38 outputs are correct, the trouble is probably on A25.
12. If not all A38 outputs are correct, check the following ouputs on A37 with the logic probe while running Program B. In all cases, the light should blink three or four times while the program is running. (Refer to Schematic No. 6.)

Program B

```
10 CMD "@U3"
20 WAIT 500
30 FORMAT B
40 OUTPUT 713;30*1*7
50 WAIT 500
60 OUTPUT 713;30*0
70 WAIT 500
80 OUTPUT 713;30*1*7
90 END
```

Signal	XA37 Pin No.	Level Before	Level During	Level After
Data Bit 1	C	0	b(3)	0
Data Bit 2	D	0	b(4)	0
Data Bit 3	E	0	b(4)	0
Data Bit 4	F	0	b(4)	0
Data Bit 5	H	0	b(3)	0
Data Bit 6	J	0	b(4)	0
Data Bit 7	K	0	b(4)	0
H Strobe	L	0	b(3)	0
HRFD	12	1	b(4)	1
HDAC	13	0	b(4)	0

1 = Light ON
0 = Light OFF
b = Light blinks (number of times)

13. If all A37 outputs are correct, troubleshoot or replace A38.
14. If not all A37 outputs are correct, troubleshoot or replace A37.
15. If the 3320B will not accept Program A (see Step 4), the problem may be in the handshake, Remote enable, strobe, or delay flag circuits. Most of these circuits are on A37 (see Schematic No. 6). First, turn the 3320B OFF, then ON, to make sure it is in the local mode. Check the Remote enable signal at XA38 pin R with a logic probe (-hp- Model 10525T) before and after running Program A. The probe light should be ON before the program is run and should be OFF following the program.
16. If the Remote enable signal is not correct in Step 15, check XA37 pin M. This point should be high (probe light ON). If this is not correct, troubleshoot the Remote enable circuits.
17. If the Remote enable signal is correct at XA37 pin M, check A37TP4. This point should be low (probe light OFF). Also check the following points with the logic probe while running Program B (found in Step 12). In each case, the probe light should blink at least once while the program is running.

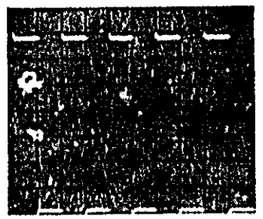
Test Point	Level Before	Level During	Level After
A37TP2	0	b(4)	0
A37TP3	1	b(1)	1
A37TP5	1	b(4)	1
A37TP6	0	b(4)	0
A37TP7	1	b(4)	1
XA37 Pin L	0	b(3)	0
A38TP1	0	b(3)	0

1 = Light ON
0 = Light OFF
b = Light blinks (no. of times)

18. Troubleshoot the circuits indicated by an incorrect signal level.

Figure 7-1. HP-IB Troubleshooting.

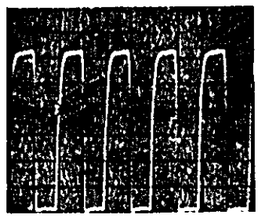
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



@ A7 PIN M (10kHz)

0 VOLTS

1** 10 kHz SIGNAL
SCOPE SETTINGS
TIME/DIV = 50 μs/CM
VOLTS/DIV = 0.05 VOLTS/DIV
VERT INPUT DC COUPLED
SLOPE +
ACF
INTERNAL TRIGGER



@ A7 PIN 18 (1 MHz)

0 VOLTS

2** 1 MHz SIGNAL
TIME/DIVISION = 0.5 μs/DIV
VOLTS/DIVISION = 0.05 VOLTS/DIV
VERT INPUT DC COUPLED
MODE - AUTO
SLOPE +
ACF
INTERNAL TRIGGER



@ A7 PIN 10 (2 MHz)

0 VOLTS

3** 2 MHz SIGNAL
SCOPE SETTINGS
TIME/DIVISION = 0.2 μs/DIV
VOLTS/DIVISION = 0.05 VOLTS/DIV
VERT INPUT DC COUPLED
MODE - AUTO
SLOPE +
ACF
INTERNAL TRIGGER

*IF THERE IS AN ASTERISK BY A PIN NUMBER, THE MEASUREMENT IS TO BE MADE ON THE MOTHER BOARD (A1B).

**All mode with ÷ 10 probe.

5320A-0-2544

ENTER HERE

CONNECT SCOPE TO A7 PIN M*, SET VERN IN/VERN OUT TO VERN OUT

AT A7 PIN M* (10kHz) DOES COUNTER READ 10 μs ± 1 ns, AMPLITUDE 2 V (FIGURE 1)?

No

SET VERN IN/VERN OUT TO VERN IN TURN VERNIER THROUGH FULL RANGE WHILE MONITORING FREQUENCY AT PIN M. DOES FREQUENCY VARY FROM 10.0003 MHz TO AT LEAST 10.0031 MHz?

No

REMOVE A7 FROM 5320A/5320B

REPLACE A7 WITH NEW BOARD

Yes

AT A7 PIN M* (10kHz) DOES F VARY FROM 10.0003 MHz TO AT LEAST 10.0031 MHz? b IS SIGNAL AS IN FIGURE 1?

No

REPLACE A7 WITH NEW BOARD

Yes

CONNECT SCOPE TO A7 PIN 10* (2 MHz)

AT A7 PIN 10*, IS a SIGNAL AS IN FIGURE 3? b FREQUENCY = 2 MHz ± 20 Hz?

No

REMOVE A7 FROM 5320A/5320B

REPLACE A7 WITH NEW BOARD

Yes

AT A7 PIN 10* (2 MHz), IS SIGNAL a 2 MHz ± 20 Hz? b AS IN FIGURE 3, BUT 4.2 Vpp?

No

REMOVE A11 FROM 5320B

REPLACE A11 WITH NEW BOARD

Yes

AT A7 PIN 10* (2 MHz), IS a FREQUENCY = 2 MHz ± 20 Hz? b AS IN FIGURE 3, BUT 4.2 Vpp?

No

REPLACE A7 WITH NEW BOARD.

Yes

AT A7 PIN 18* (1 MHz) IS SIGNAL a 1 MHz ± 10 Hz? b AS IN FIGURE 2 ONLY 3.8 VOLTS p-p?

No

REPLACE A7 WITH NEW BOARD.

Yes

AT A7 PIN 18* (1 MHz), IS SIGNAL a 1 MHz ± 10 Hz? b AS IN FIGURE 2?

No

REMOVE A7 FROM UNIT

REPLACE A7 WITH NEW BOARD

Yes

AT A7 PIN 3* (10 kHz) IS FREQUENCY = 10 kHz ± 500 Hz, AMPLITUDE = 1 V p-p, DC OFFSET = 0 VOLTS?

No

REPLACE A9 WITH NEW BOARD

Yes

AT A9 PIN 3* (20 MHz) IS FREQUENCY = 20 MHz ± 200 kHz, AMPLITUDE = 800 mV p-p, DC OFFSET = -2.6 VOLTS?

No

REMOVE A9 BOARD FROM UNIT

GO TO FREQUENCY OPERATING SECTION TROUBLESHOOTING

Yes

AT A5 PIN 14* (5 MHz) IS FREQUENCY = 10 MHz ± 100 Hz, AMPLITUDE = 400 mV p-p, DC OFFSET = 0 VOLTS?

No

REMOVE A5 AND A6 FROM 5320A/5320B

DETERMINE FAULTY BOARD AND REPLACE A5 OR A6

Yes

AT A5 PIN 14* (5 MHz) IS FREQUENCY = 10 MHz ± 100 Hz, AMPLITUDE = 750 mV p-p, DC OFFSET = 0 VOLTS?

No

REPLACE A5 WITH NEW BOARD

Figure 7-2. Reference Frequency Troubleshooting Tree.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

TABLE 1: RANGE SWITCH LOGIC.
(AVAILABLE ON MOTHER BOARD)

FREQUENCY SETTING	A2	A3	A4	A5	A6
1222 Hz on 1000 Hz Range	0 0V	1 36V	1 36V	1 36V	1 36V
9.36 kHz on 10 kHz Range	1	0	1	1	1
93.8 kHz to 122.2 kHz on 100 kHz Range	1	1	0	1	1
911.00 kHz on 1000 kHz Range	1	1	1	0	1

TABLE 2 PRETUNE D/A AND COUNTER INPUTS.
(AVAILABLE ON MOTHER BOARD)

Front Panel Frequency Setting	USED ON A2 AND A3									USED ONLY ON A2			
	1000	800	400	200	100	80	40	20	10	8	4	2	1
0111 Any Range	1 36V	1 36V	0 0V	0 0V	0	1	0	0	0	1	0	0	0
1222 Any Range	0	0	1	1	1	0	1	1	1	0	1	1	1

TABLE 3: FREQUENCY SWITCH LOGIC.
(ALL PIN NUMBERS ARE LOCATED ON W7)

FREQUENCY SETTING	PINS ON W7																
	12	14	16	18	20	3	5	7	9	11	13	15	17	21	19	23
222 kHz	open	gnd	open	gnd	gnd	open	gnd	gnd	gnd	gnd	gnd	gnd	open	open	open	gnd
9.36 kHz	open	open	gnd	open	open	gnd	open	open	open	open	open	open	gnd	gnd	gnd	open
12.00 MHz	gnd															

TABLE 4

INSTRUCTIONS

A. If you are Troubleshooting the 3320B Option 001, you do not have A23 in the unit.

B. If you arrived at this point via path ① , replace A23 with a new board.

C. If you arrived at this point via path ① , check the pin numbers in Table after setting the appropriate frequencies.

Frequency	Pins on W23A		
	1	3	5
10.00 kHz	1	1	0
100.00 kHz	0	0	1

If the unit passes these tests, replace A22.

If the unit fails these tests, replace A23.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

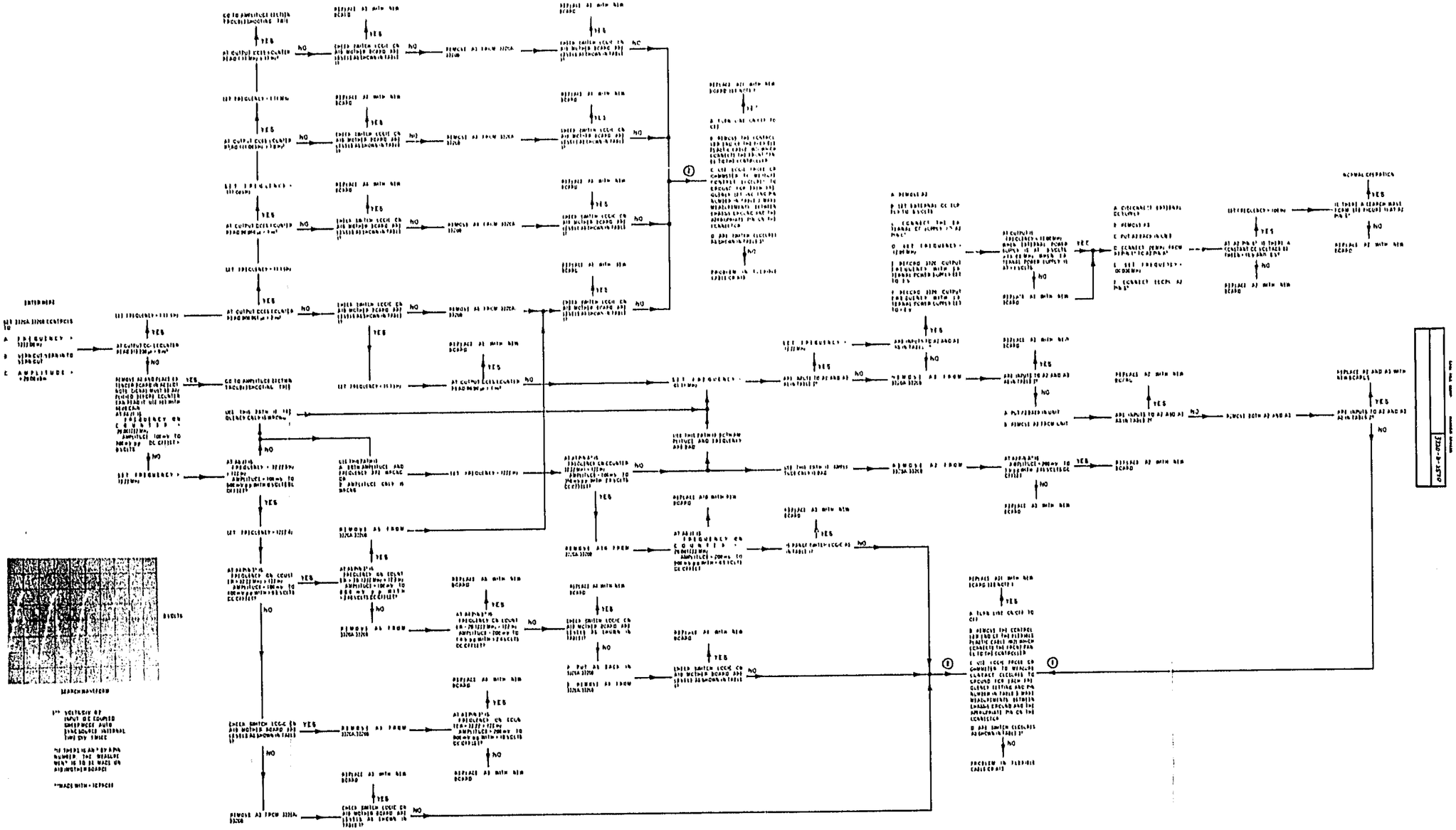


Figure 7-3 Frequency Generating Section Troubleshooting Tree.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

TABLE 1. LOGIC WEIGHTS FOR ATTENUATOR MOTHER BOARD.

AMPLITUDE SETTING	LOGIC WEIGHTS											
	800	400	200	100	80	40	20	10	8	4	2	1
+25.00 dBm	5 V 1	5 V 0	5 V 0	5 V 0	5 V C	5 V 0	5 V 0	5 V 0	5 V 0	5 V 0	5 V 0	5 V 0
+24.99 dBm	1	0	0	1	1	0	0	1	1	0	0	1
+23.68 dBm	0	1	1	0	0	1	1	1	0	1	1	0

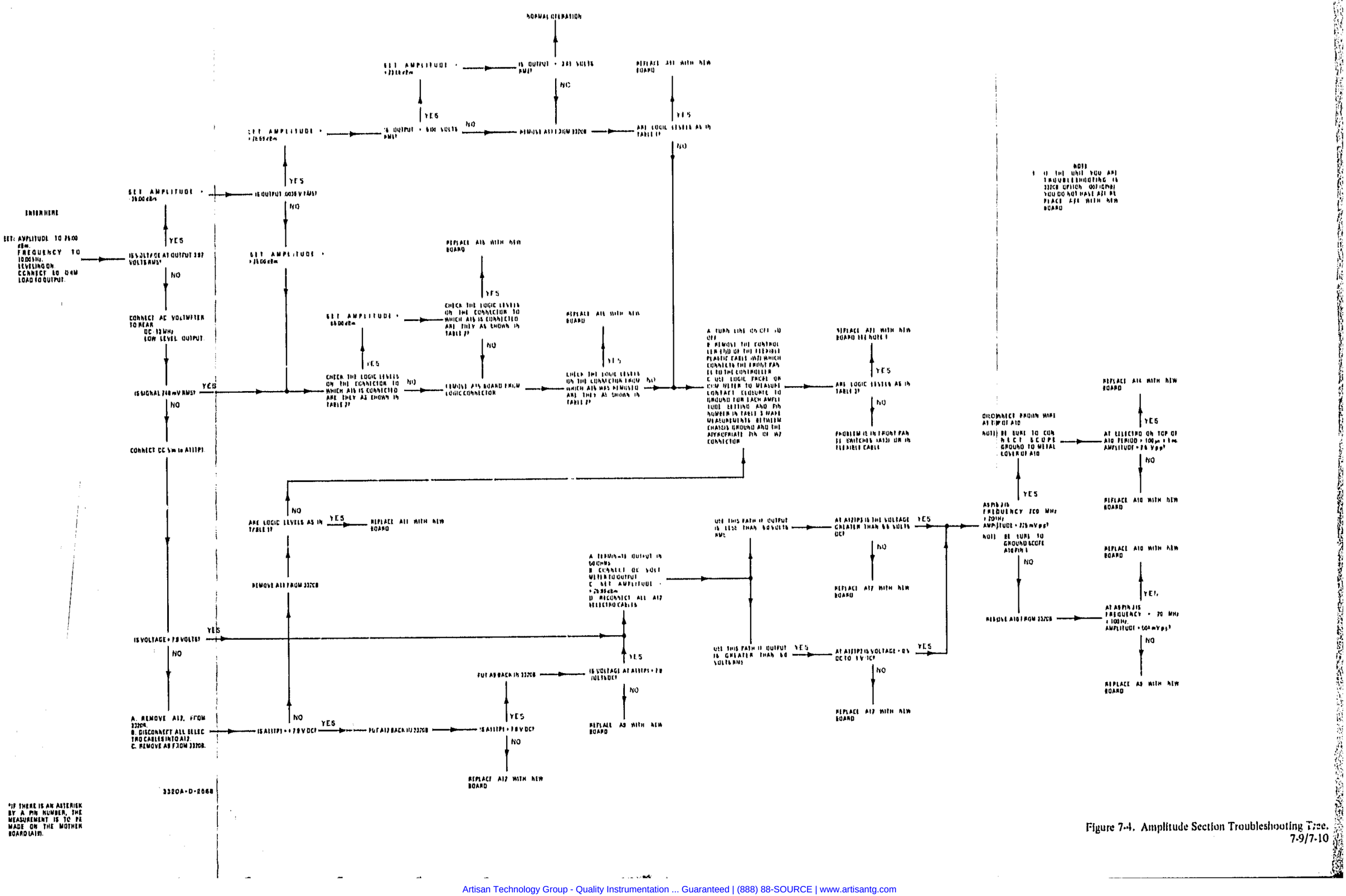
TABLE 2. LOGIC FOR A1 LOGIC CONNECTOR.

AMPLITUDE SETTING	LOGIC WEIGHTS			
	4	2	1	
+25.00 dBm	+3 V to +5 V 1	+3 V to +5 V 1	+3 V to +5 V 1	+3 V to +5 V 1
23.00 dBm	0 V to +5 V 0	0 V to +5 V 0	0 V to +5 V 0	0 V to +15 V C

TABLE 3. AMPLITUDE SWITCH LOGIC.
(ALL PIN NUMBERS ARE LOCATED ON W2)

AMPLITUDE SETTING	PINS ON W2															
	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42
+12.27 dBm	open	open	gnd	open	gnd	gnd	open	gnd	gnd	gnd	open	gnd	gnd	gnd	open	gnd
-84.88	gnd	gnd	open	gnd	open	open	gnd	open	open	open	gnd	open	open	open	gnd	open

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



*IF THERE IS AN ASTERISK BY A PIN NUMBER, THE MEASUREMENT IS TO BE MADE ON THE MOTHER BOARD (A19).

Figure 7-4. Amplitude Section Troubleshooting Tree.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

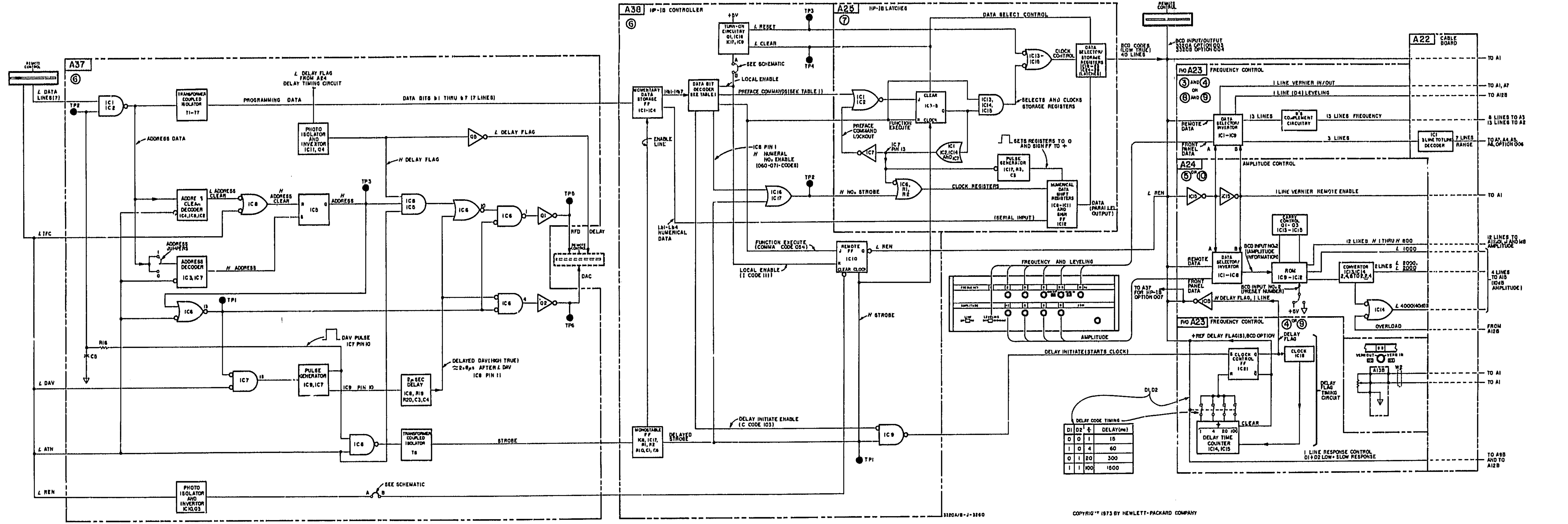
Table 1. Data Bit Decoder.

ASCII Character	INPUT* b7	b6	b5	b4	b3	b2	b1	OUTPUT or Preface Commands
0	0	1	1	X**	X	X	X	H Numerical No. Enable (IC8 pin 1)
1	0	1	1	–	–	–	–	
2	0	1	1	–	–	–	–	
3	0	1	1	–	–	–	–	
4	0	1	1	–	–	–	–	
5	0	1	1	–	–	–	–	
6	0	1	1	–	–	–	–	
7	0	1	1	–	–	–	–	
8	0	1	1	–	–	–	–	
9	0	1	1	–	–	–	–	
,	0	1	0	1	1	0	0	H Function Execute (XA 38 pin 6)
.	0	1	0	1	1	0	1	H -dBm (XA38 pin 7)
A	1	0	0	0	0	0	1	L Amplitude (XA38 pin C)
C	1	0	0	0	0	1	1	L Delay Initiate (XA38 pin 5)
D	1	0	0	0	1	0	0	L Delay (XA38 pin 5)
F	1	0	0	0	1	1	0	L Frequency (XA38 pin 3)
I	1	0	0	1	0	0	1	H Local Enable (IC11 pin 10)
K	1	0	0	0	0	1	1	H Vernier In (XA38 pin D)
M	1	0	0	1	1	0	1	H Vernier Out (XA38 pin 4)
R	1	0	1	0	0	1	0	L RANGE (XA38 pin E)
V	1	0	1	0	1	1	0	L Vernier Digit (XA38 pin B)

* Positive True.
** X = Don't Care.

NOTE

This is a Functional Block Diagram of the HP-IB and BCD Controller. The logic symbology shown is functional and may not agree with the conventional Logic shown on schematics. Two or more Logic gates may be combined into one gate on this diagram. The circle(s) on the inputs of the IC's indicates the logic level required not necessarily inversion. The circle "O" indicates a low logic level (0 V) required to perform the gate function.



COPYRIGHT 1973 BY HEWLETT-PACKARD COMPANY

Figure 7-5. Controller Functional Block Diagram.

Artisan Technology Group | Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

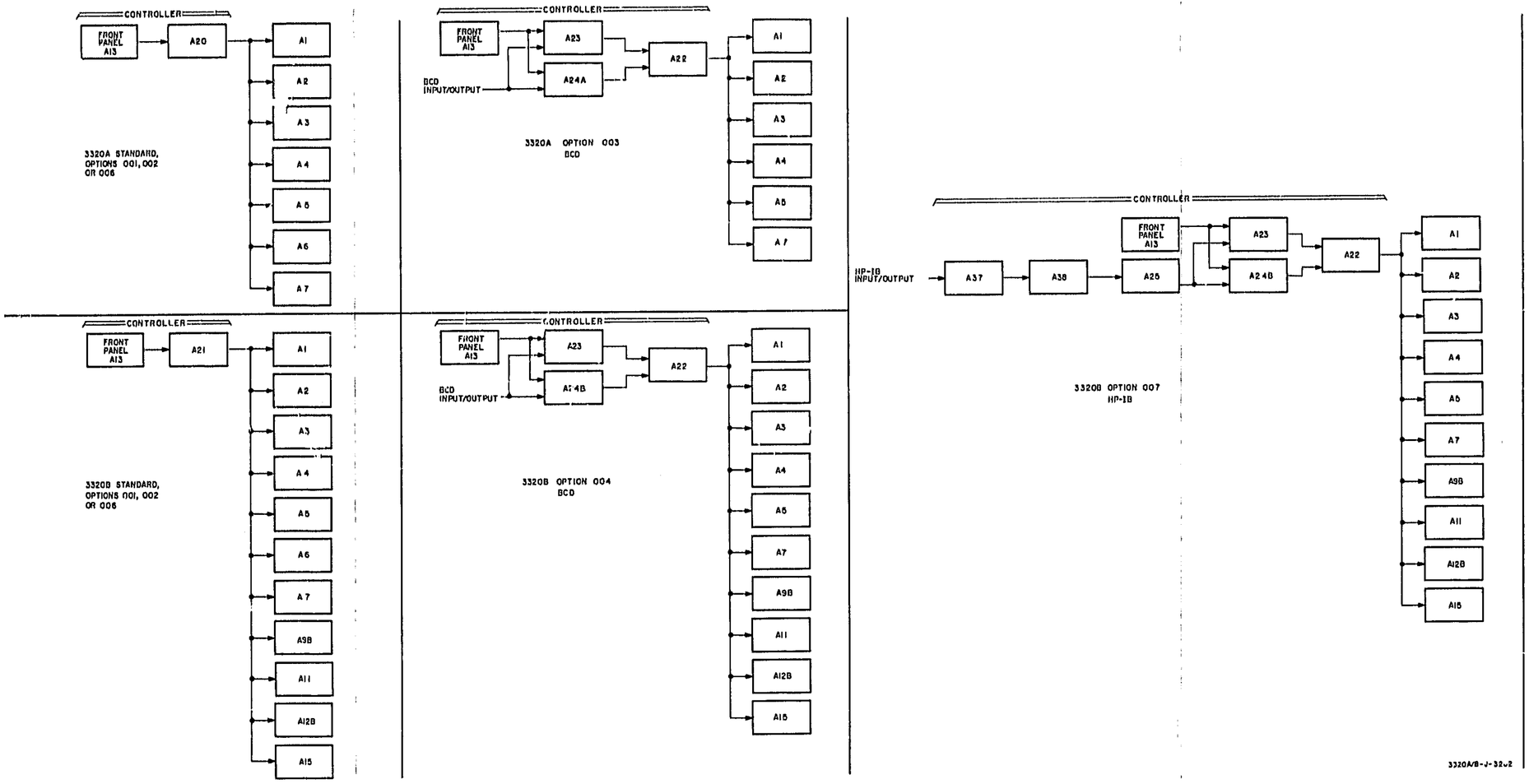


Figure 7-6. Controller Configurations.
7-13/7-14

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

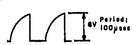
NOTE 1: Circled number indicates schematic number for circuit shown.

NOTE 2: RESPONSE CONTROL: In local mode of operation, response is always in "slow" mode (switches closed). In remote mode response is in "fast" mode (switches open) unless programmed for "slow" mode. See Section III.

1 Troubleshooting Points For Functional Block Diagram

A1TP2 10 to 10.004 MHz; VERN at "00" (full ccw) ≈9999.0 MHz; VERN at "99" ≈ 10003.0 MHz.

A2TP1 10 kHz; see waveform:



A3TP3 The VTO frequency varies between 20 MHz and 32.99 MHz depending on frequency setting.

FREQUENCY RANGE/SETTING					A3TP3
10 MHz	1000 kHz	100 kHz	10 kHz	1000 Hz	
0 Hz	0 Hz	0 Hz	0 Hz	0 Hz	20 MHz
6 MHz	500 kHz	60 kHz	5 kHz	600 Hz	25 MHz
10 MHz	1000 kHz	100 kHz	10 kHz	1000 Hz	30 MHz

NOTE

Use a 10:1 probe and a counter with high sensitivity (Hp- 5246L with 5201A) when measuring frequency at A3TP3.

A7J1 > 0 V p-p when unlocked, see Reference Oscillator Adjustment procedure, Section V.

A8TP1 20 MHz, 1.7 V p-p.

A8TP5 18 MHz, 2 V p-p.

A11TP1 + 10.000 V dc at +16.99 dBm setting. +3.1660 V dc at +17.00 dBm setting. For 3220Ω with 50 Ω output only.

A12TP3 On properly adjusted unit, typically + 2 V dc but must remain within ± .2 V with any amplitude change with LEVELING ON.

20-33 MHz Out (Rear Panel) Tracks output frequency, 20 MHz plus front panel frequency setting. > 100 mV rms into 50 Ω.

Low Level Out (Rear Panel) Same frequency as main output, between 50 mV and 158 mV rms into 50 Ω depending on amplitude level setting.

1 MHz Out (Rear Panel) > 220 mV rms into 50 Ω.

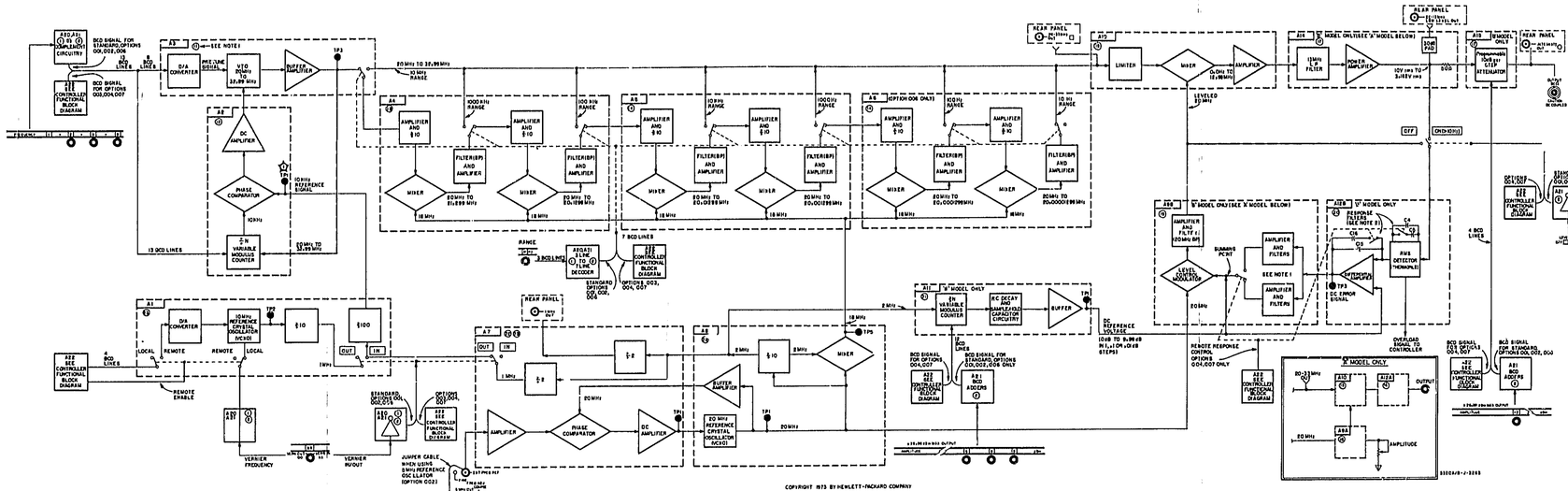
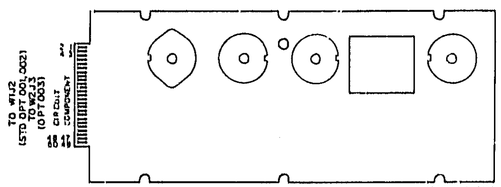


Figure 7-7. Analog Functional Block Diagram.
7-15/7-16

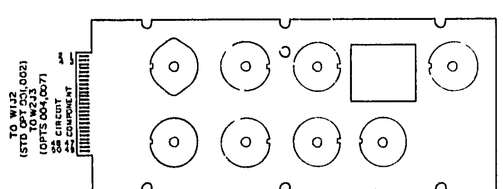
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



A13A

hp Part No. 03320-61002

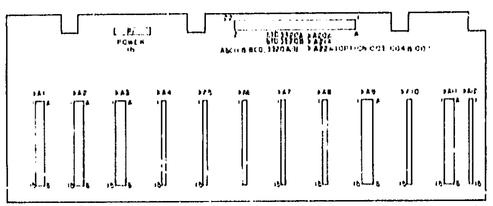
FRONT PANEL SWITCH ASSEMBLY



A13B

hp Part No. 03320-61901

FRONT PANEL SWITCH ASSEMBLY

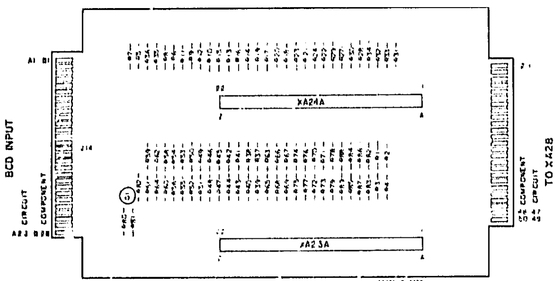


A19

hp Part No. 03320-66519

Rev B

MOTHER BOARD

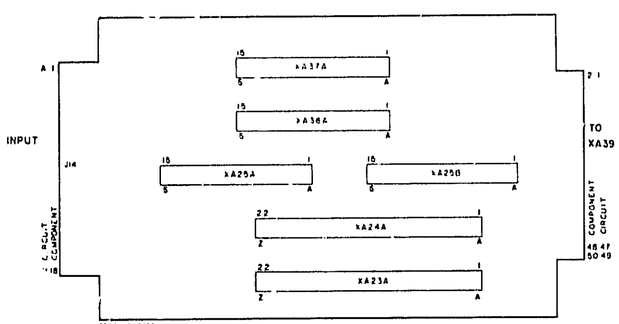


A28

hp Part No. 03320-66528

Rev A

BCD MOTHER BOARD, OPTION 003 or 004

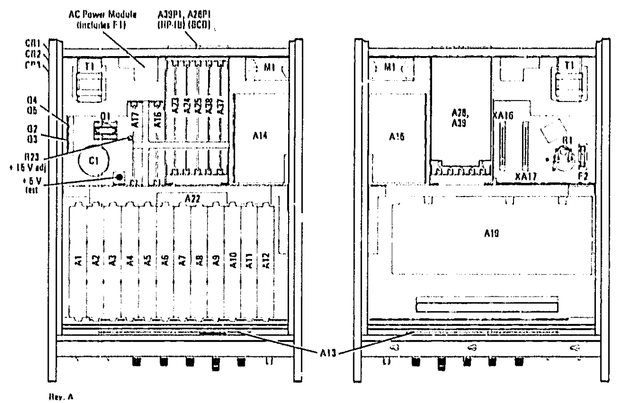


A39

hp Part No. 03320-66539

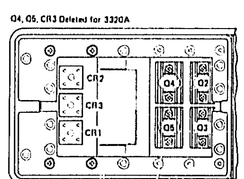
RevA

MOTHER BOARD, OPTION 007



TOP VIEW

BOTTOM VIEW



RIGHT SIDE VIEW

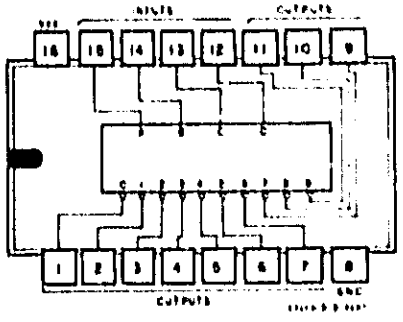
Figure 7-8. Common Assemblies, Top and Bottom View.
7-17/7-18

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

NOTE 1: 9's Complement Circuitry:

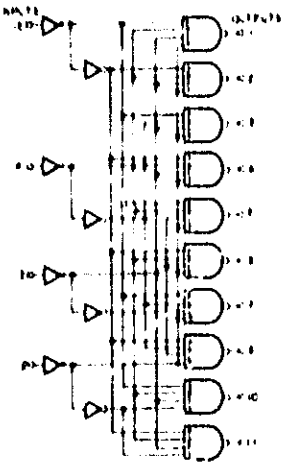
Digit	INPUT 1	2	4	8	9's COMPLEMENT 1	2	4	8
0	H	H	H	H	H	L	L	H
1	L	H	H	H	L	L	L	H
2	H	L	H	H	H	H	H	L
3	L	L	H	H	L	H	H	L
4	H	H	L	H	H	L	H	L
5	L	H	L	H	L	L	H	L
6	H	L	L	H	H	H	L	L
7	L	L	L	H	L	H	L	L
8	H	H	H	L	H	L	L	L
9	L	H	H	L	L	L	L	L

NOTE 2: On A20IC5, input at pin 12 is hard wired low, and output pins 9, 10, and 11 are not used (N/C).



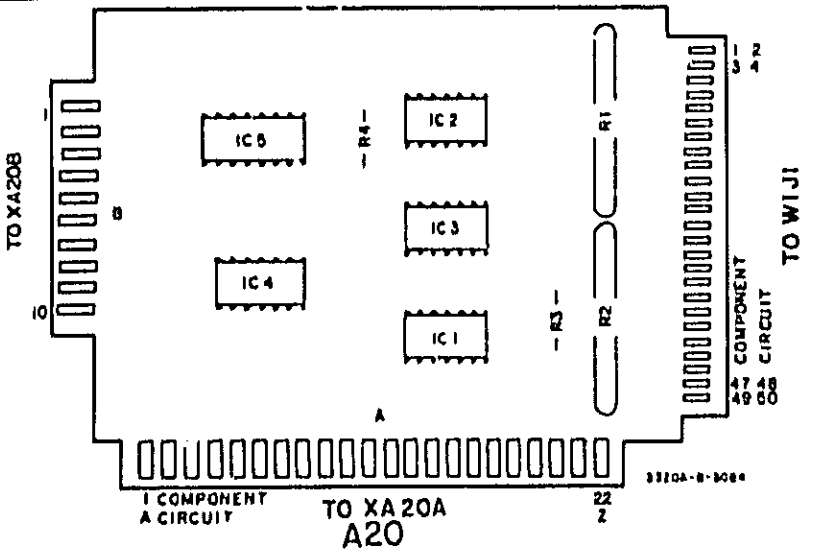
INPUT 12	13	14	15	DECIMAL OUTPUT 1	2	3	4	5	6	7	8	10	11
L	L	L	L	L	H	H	H	H	H	H	H	H	H
L	L	L	H	H	L	H	H	H	H	H	H	H	H
L	L	H	L	H	H	L	H	H	H	H	H	H	H
L	L	H	H	H	H	H	L	H	H	H	H	H	H
L	H	L	L	H	H	H	H	L	H	H	H	H	H
L	H	L	H	H	H	H	H	H	L	H	H	H	H
L	H	H	L	H	H	H	H	H	H	L	H	H	H
L	H	H	H	H	H	H	H	H	H	H	L	H	H
H	L	L	L	H	H	H	H	H	H	H	H	L	H
H	L	L	H	H	H	H	H	H	H	H	H	H	L
H	L	H	L	H	H	H	H	H	H	H	H	H	H
H	L	H	H	H	H	H	H	H	H	H	H	H	H
H	H	L	L	H	H	H	H	H	H	H	H	H	H
H	H	L	H	H	H	H	H	H	H	H	H	H	H
H	H	H	L	H	H	H	H	H	H	H	H	H	H
H	H	H	H	H	H	H	H	H	H	H	H	H	H

NOTE 2: (Cont'd)



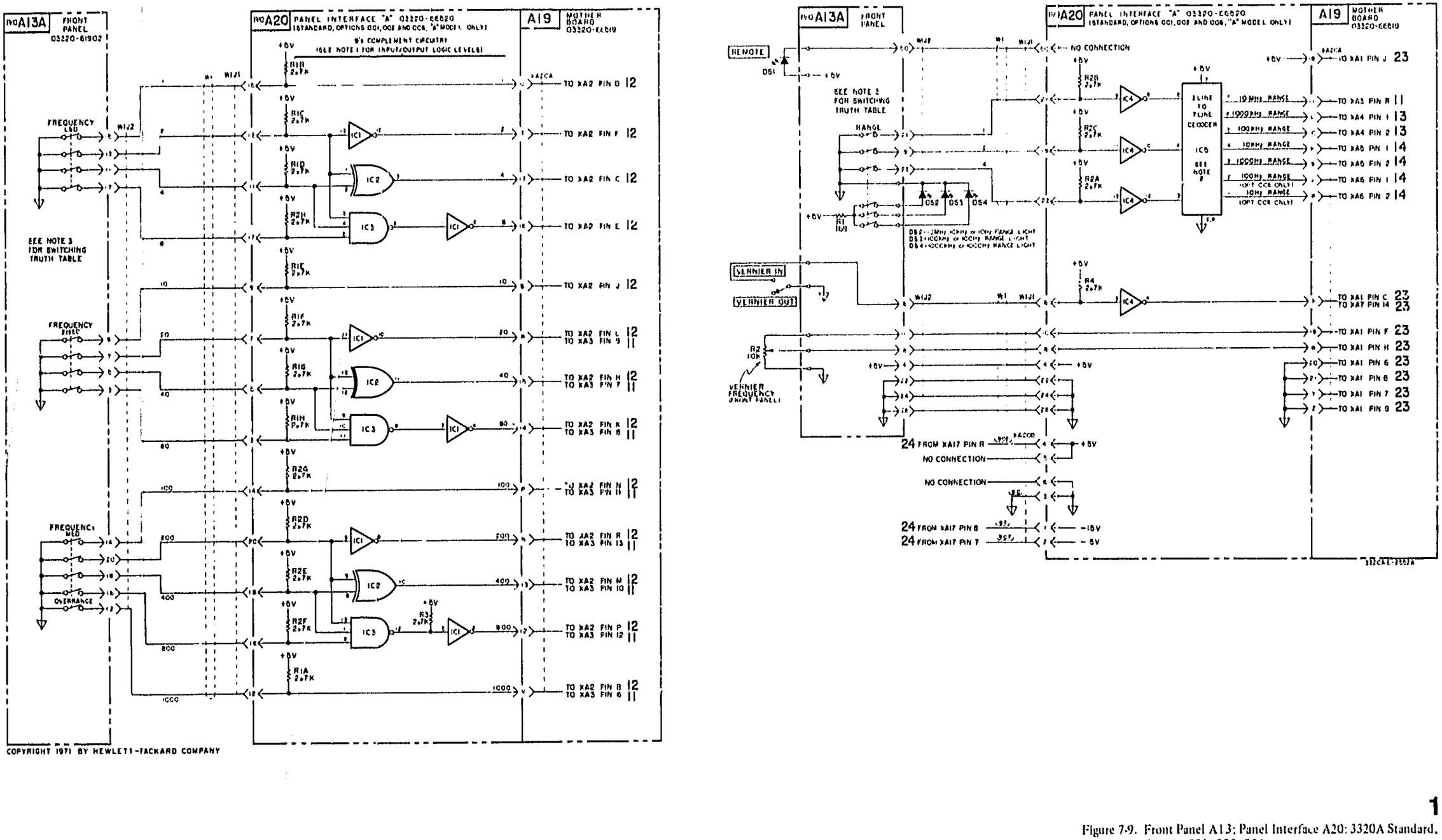
NOTE 3: BCD Low true logic, switch contact(s) to Ground is true state.

Digit	CODE 1	2	4	8
0	0	0	0	0
1	1	0	0	0
2	0	1	0	0
3	1	1	0	0
4	0	0	1	0
5	1	0	1	0
6	0	1	1	0
7	1	1	1	0
8	0	0	0	1
9	1	0	0	1



hp Part No. 03320-66520 Rev A

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



1

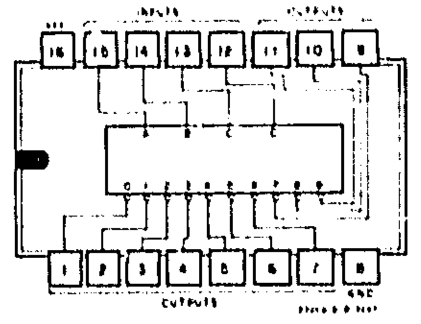
Figure 7-9. Front Panel A13; Panel Interface A20: 3320A Standard, Options 001, 002, 006.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

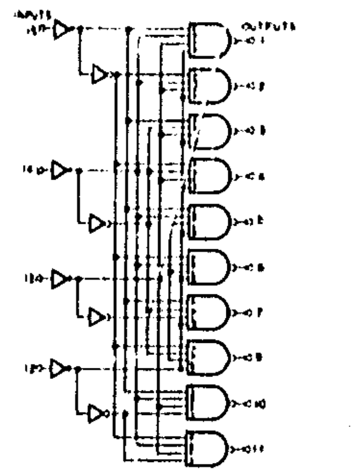
NOTE 1: 9's Complement Circuitry:

Digit	INPUT 1	2	4	8	9's COMPLEMENT 1	2	4	8
0	H	H	H	H	H	L	L	H
1	L	H	H	H	L	L	L	H
2	H	L	H	H	H	H	H	L
3	L	L	H	H	L	H	H	L
4	H	H	L	H	H	L	H	L
5	L	H	L	H	L	L	H	L
6	H	L	L	H	H	H	L	L
7	L	L	L	H	L	H	L	L
8	H	H	H	L	H	L	L	L
9	L	H	H	L	L	L	L	L

NOTE 2: On A21IC16, input at pin 12 is hard wired low, and output pins 9, 10, and 11 are not used (N/C).



INPUT 12	13	14	15	DECIMAL OUTPUT 1	2	3	4	5	6	7	9	10	11
L	L	L	L	L	H	H	H	H	H	H	H	H	H
L	L	L	H	H	L	H	H	H	H	H	H	H	H
L	L	H	L	H	H	L	H	H	H	H	[illegible]	H	H
L	L	H	H	H	H	H	L	H	H	H	H	H	H
L	H	L	L	H	H	H	H	L	H	H	H	H	H
L	H	L	H	H	H	H	H	H	L	H	H	H	H
L	H	H	L	H	H	H	H	H	H	L	H	H	H
L	H	H	H	H	H	H	H	H	H	H	L	H	H
H	L	L	L	H	H	H	H	H	H	H	H	L	H
H	L	L	H	H	H	H	H	H	H	H	H	H	L
H	L	H	L	H	H	H	H	H	H	H	H	H	H
H	L	H	H	H	H	H	H	H	H	H	H	H	H
H	H	L	L	H	H	H	H	H	H	H	H	H	H
H	H	L	H	H	H	H	H	H	H	H	H	H	H
H	H	H	L	H	H	H	H	H	H	H	H	H	H
H	H	H	H	H	H	H	H	H	H	H	H	H	H



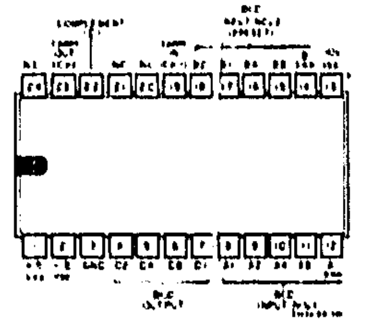
NOTE 3: BCD Low true logic, switch contact(s) to Ground is true state.

Digit	CODE 1 2 4 8
0	0 0 0 0
1	1 0 0 0
2	0 1 0 0
3	1 1 0 0
4	0 0 1 0
5	1 0 1 0
6	0 1 1 0
7	1 1 1 0
8	0 0 0 1
9	1 0 0 1

NOTE 4: IC4, 5, 6, or 7 operate as a BCD Adder. The two BCD Inputs (#1 and #2) are summed together and applied to the BCD Output. The BCD Inputs and output lines are high true logic. A true signal on the A Sign input indicates a negative amplitude number (i.e., -10.00 dBm). The BCD Input #2 is a "hard wired" input, preset by means of jumper wires on the pc assembly. See Note 5.

The Complement /D/ input controls the BCD output (D1, D2, D4, D8). With the Complement /D/ input high (≈ +5 V) the direct BCD sum of inputs #1 and #2 are applied to the BCD Output. With the Complement /D/ input low (≈ -5 V) the 9's complement of the two inputs is applied to the BCD Output. The BCD Output lines have internal pull-up resistors.

Transistor Q1 inhibits a Carry-In signal to IC4 when the Amplitude Sign is positive. Transistors Q2, Q3 and IC8 control the level of the Complement /D/ input.



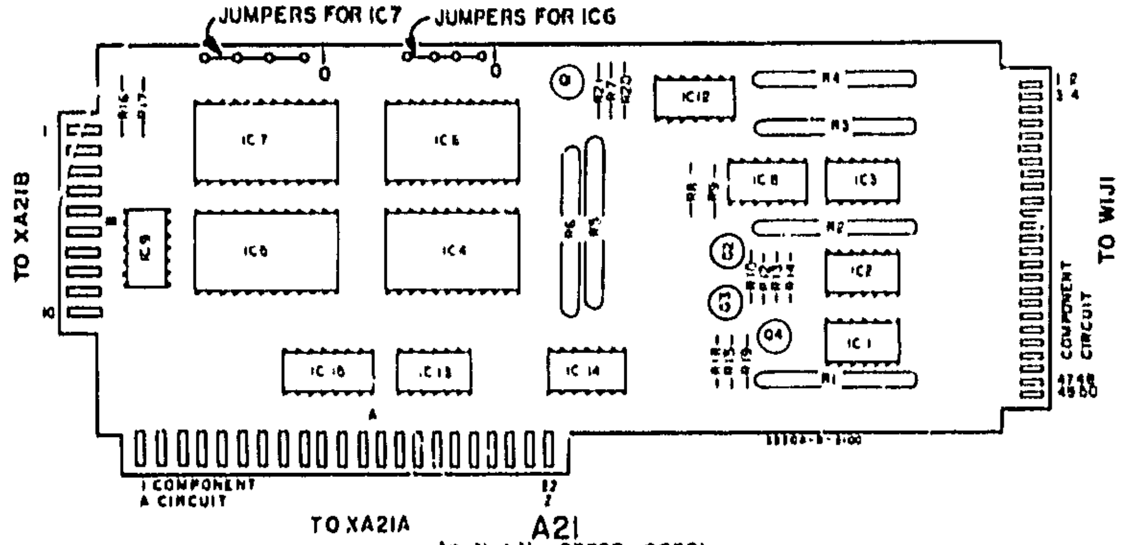
NOTE 5: Jumpers on the A21 Assembly for IC6 and IC7 are preset at the factory:

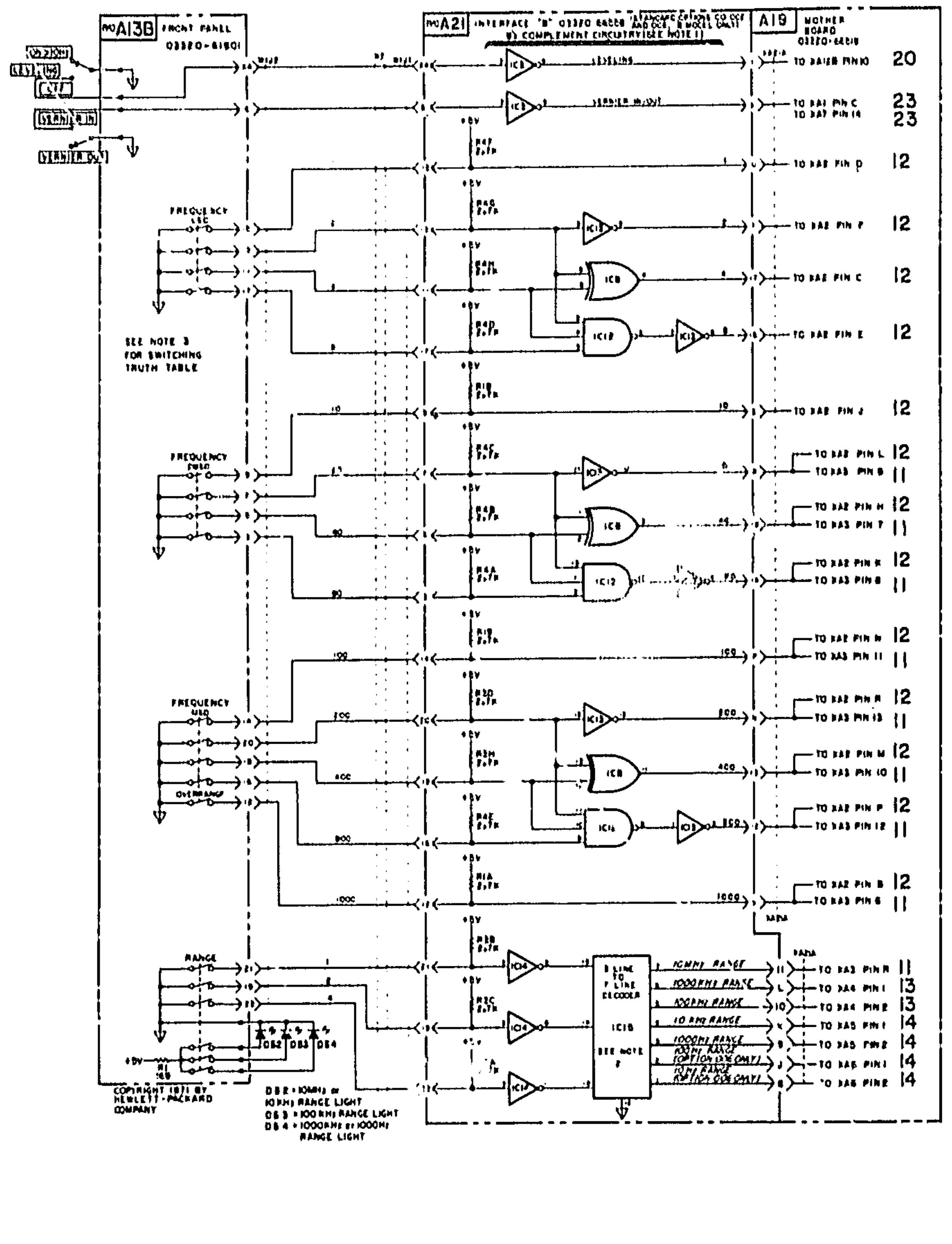
3320B STANDARD, 50Ω Impedance

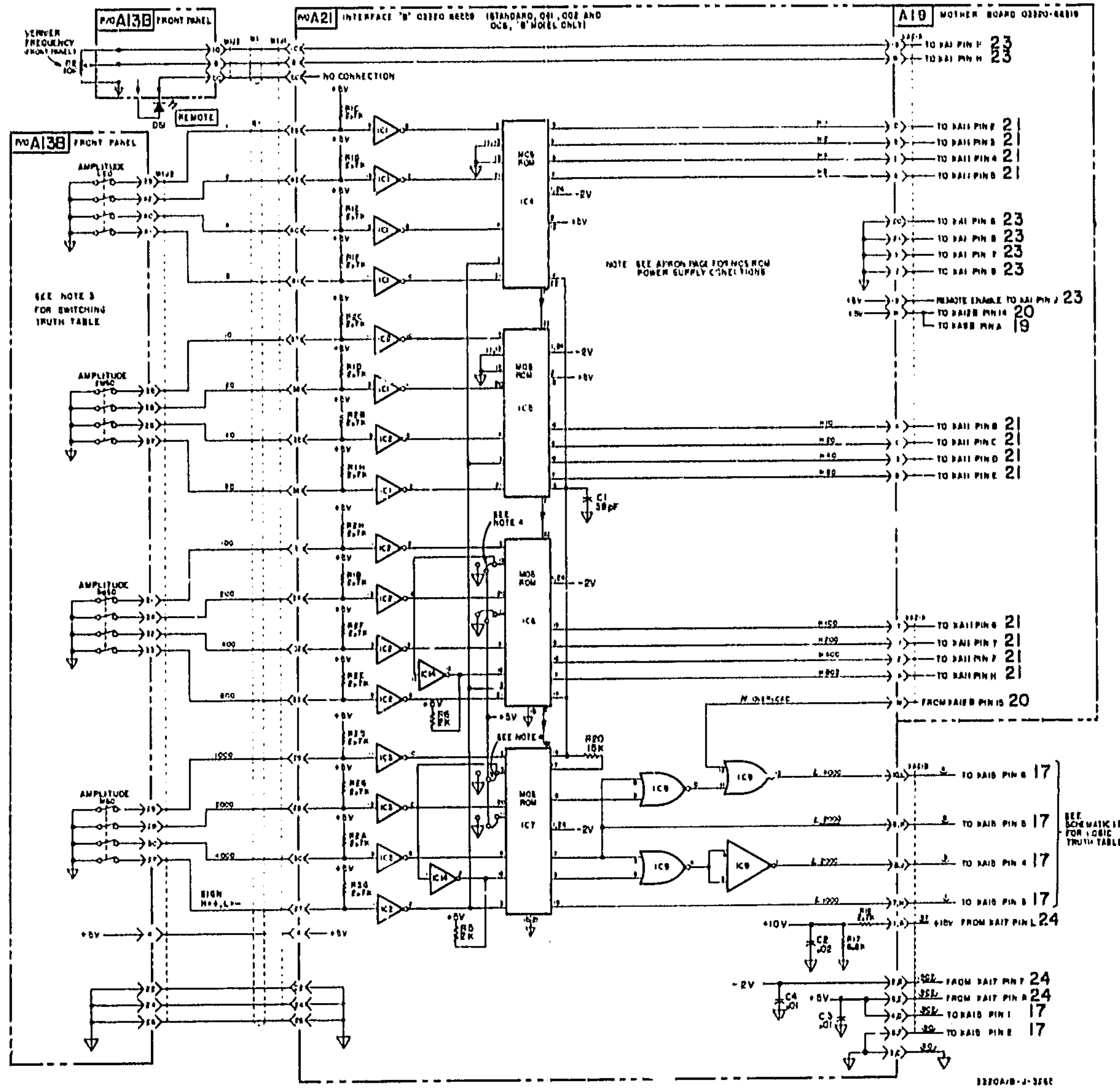
IC7 Jumpered for BCD 7
IC6 Jumpered for BCD 3

3320B OPTION 001, 75Ω Impedance

IC7 Jumpered for BCD 7
IC6 Jumpered for BCD 6







2

Figure 7-10. Front Panel A13B; Panel Interface A21; 3320B Standard, Options 001, 002, 006.

NOTE 1: Logic signal levels are shown by the letters H or L preceding the name of the line. The H and L indicates the true state (signal present). Voltage levels for the H and L are:

H = +5 V
L = 0 V

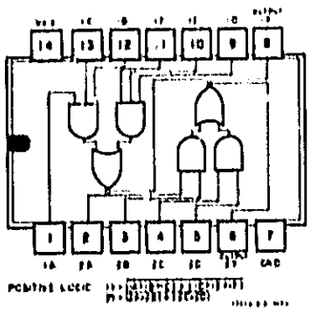
Example:

H Delay Flag – Indicates the delay flag line should be +5 V when a delay flag signal is present.

L Data Valid – Indicates the data valid line should be 0 V when a data valid signal is present.

NOTE 2: In Remote Mode (A High, B Low) the input on pins 12 and 13 is inverted and applied to pin 8. The input on pin 3 is inverted and applied to pin 6.

In Local Mode (A Low, B High) the input on pins 9 and 10 is inverted and applied to pin 8. The input on pin 5 is inverted and applied to pin 6.



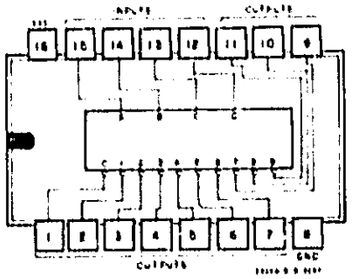
NOTE 3: BCD Low true logic, switch contact(s) to ground is true state.

Digit	CODE 1	2	4	8
0	0	0	0	0
1	1	0	0	0
2	0	1	0	0
3	1	1	0	0
4	0	0	1	0
5	1	0	1	0
6	0	1	1	0
7	1	1	1	0
8	0	0	0	1
9	1	0	0	1

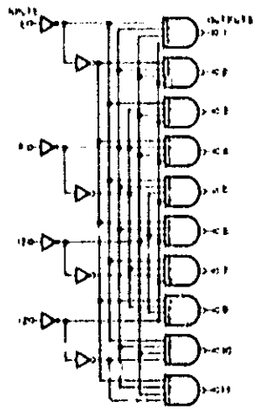
NOTE 4: 9's Complement Circuitry:

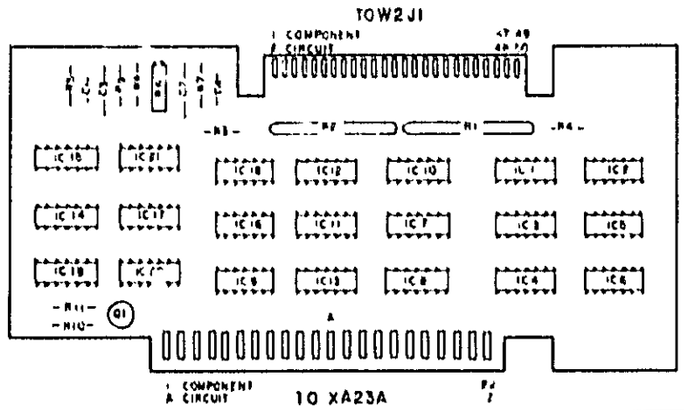
Digit	INPUT 1	2	4	8	9's COMPLEMENT 1	2	4	8
0	L	L	L	L	H	L	L	H
1	H	L	L	L	L	L	L	H
2	L	H	L	L	H	H	H	L
3	H	H	L	L	L	H	H	L
4	L	L	H	L	H	L	H	L
5	H	L	H	L	L	L	H	L
6	L	H	H	L	H	H	L	L
7	H	H	H	L	L	H	L	L
8	L	L	L	H	H	L	L	L
9	H	L	L	H	L	L	L	L

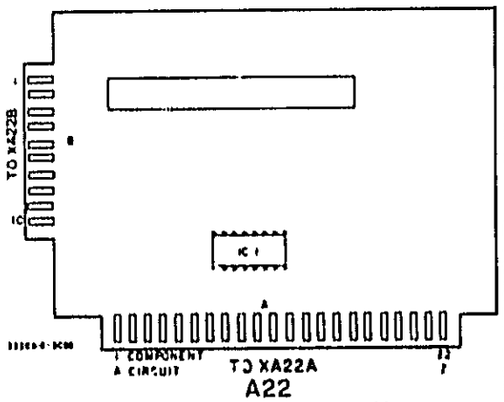
NOTE 5: On A22IC1, input at pin 12 is hard wired low, and output pins 9, 10, and 11 are not used (N/C).

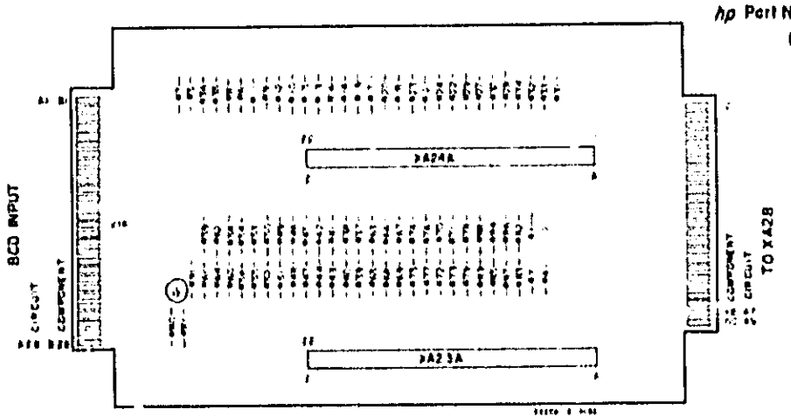


INPUT 12	13	14	15	DECIMAL OUTPUT 1	2	3	4	5	6	7	8	9	10	11
L	L	L	L	L	H	H	H	H	H	H	H	H	H	H
L	L	L	H	H	L	H	H	H	H	H	H	H	H	H
L	L	H	L	H	H	L	H	H	H	H	H	H	H	H
L	L	H	H	H	H	H	L	H	H	H	H	H	H	H
L	H	L	L	H	H	H	H	L	H	H	H	H	H	H
L	H	L	H	H	H	H	H	H	L	H	H	H	H	H
L	H	H	L	H	H	H	H	H	H	L	H	H	H	H
L	H	H	H	H	H	H	H	H	H	H	L	H	H	H
H	L	L	L	H	H	H	H	H	H	H	H	L	H	H
H	L	L	H	H	H	H	H	H	H	H	H	H	L	H
H	L	H	L	H	H	H	H	H	H	H	H	H	H	L
H	L	H	H	H	H	H	H	H	H	H	H	H	H	H
H	H	L	L	H	H	H	H	H	H	H	H	H	H	H
H	H	L	H	H	H	H	H	H	H	H	H	H	H	H
H	H	H	L	H	H	H	H	H	H	H	H	H	H	H
H	H	H	H	H	H	H	H	H	H	H	H	H	H	H

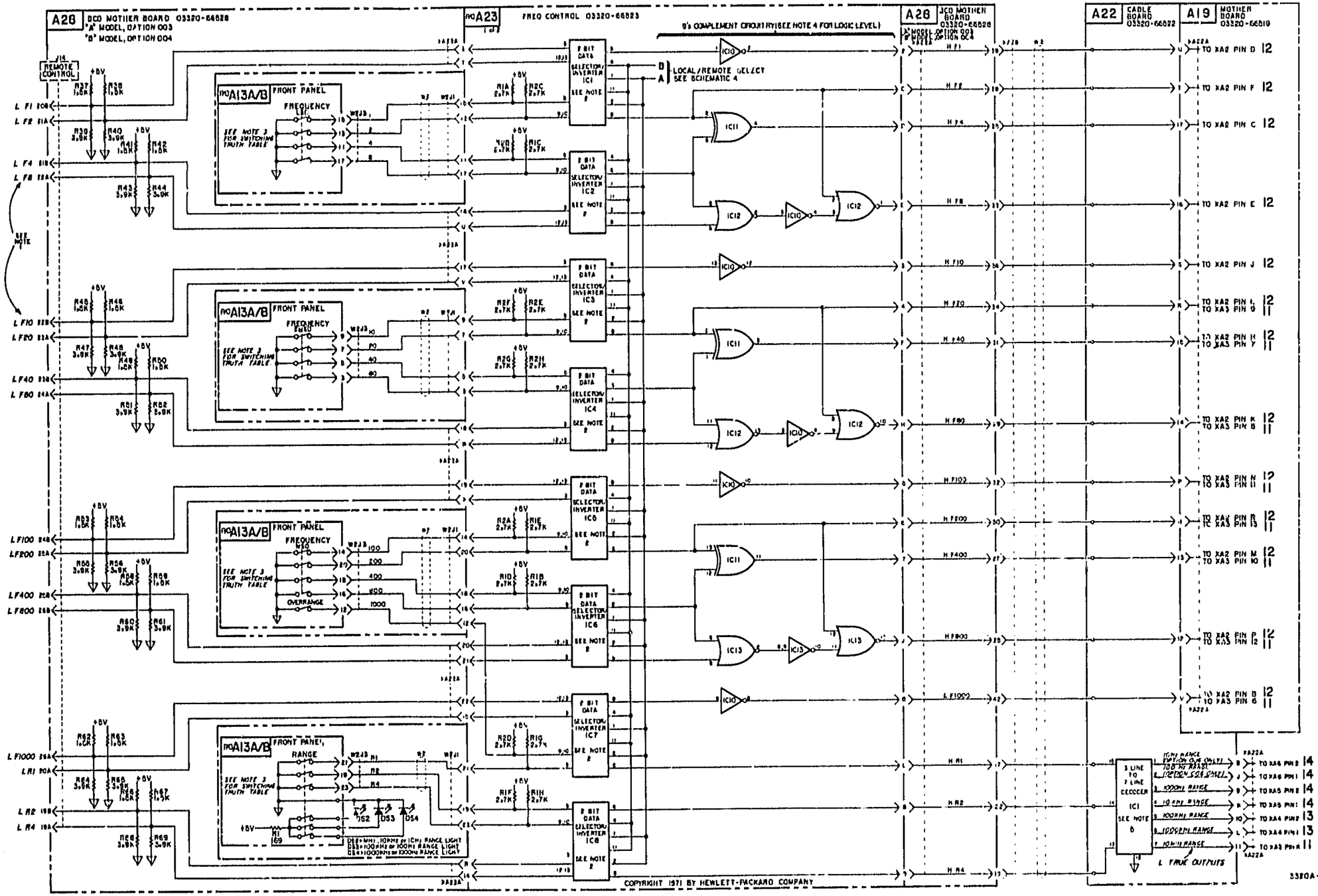








Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

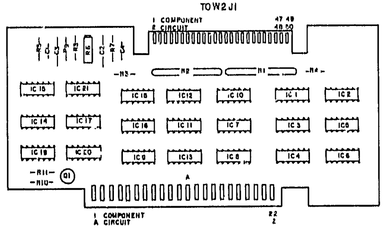


3

Figure 7-11. BCD Frequency Control P/O A23; 3320A Option 003, 3320B Option 004.

7-23/7-24

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



TO XA23A

A23

hp Part No. 03320-66523

Rev B

NOTE 1: Logic signal levels are shown by the letters H or L preceding the name of the line. The H and L indicates the true state (signal present). Voltage levels for the H and L are:

H = +5 V
L = 0 V

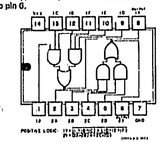
Example:

H Delay Flag – Indicates the delay flag line should be +5 V when a delay flag signal is present.

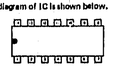
L Data Valid – Indicates the data valid line should be 0 V when a data valid signal is present.

NOTE 2: In Remote Mode (A High, B Low) the input on pins 12 and 13 is inverted and applied to pin B. The input on pin 9 is inverted and applied to pin G.

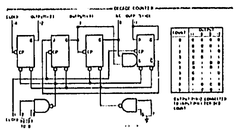
In Local Mode (A Low, B High) the input on pins 9 and 10 is inverted and applied to pin B. The input on pin 6 is inverted and applied to pin G.



NOTE 3: Logic diagram of IC is shown below.



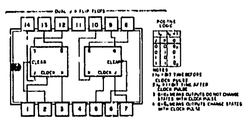
NOTE 3: (CONT'D)



NOTE 4: Local/Remote select lines from A24 Assembly:

Local mode A Low, B High
Remote mode A High, B Low

NOTE 5: Logic Diagram of IC is shown below.



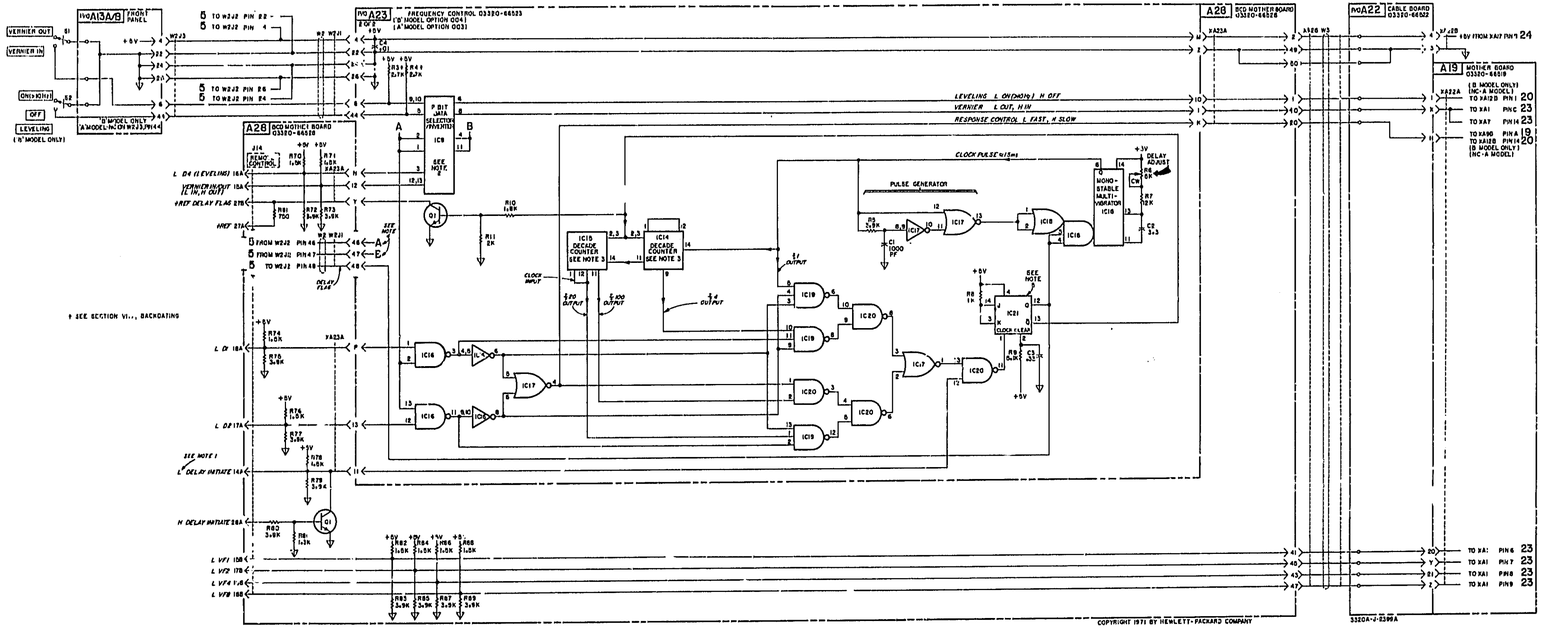


Figure 7-12. BCD Frequency Control P/O A23; 3320A Option 003, 3320B Option 004.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

NOTE 1: Logic signal levels are shown by the letters H or L preceding the name of the line. The H and L indicates the true state (signal present). Voltage levels for the H and L are:

H = +5 V
L = 0 V

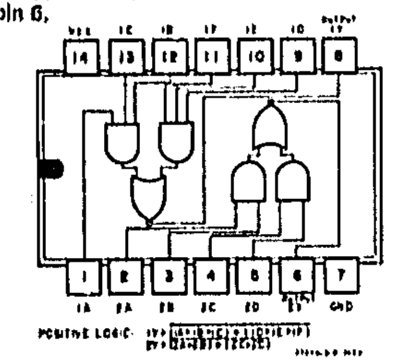
Example:

H Delay Flag — Indicates the delay flag line should be +5 V when a delay flag signal is present.

L Data Valid — Indicates the data valid line should be 0 V when a data valid signal is present.

NOTE 2: In Remote Mode (A High, B Low) the input on pins 12 and 13 is inverted and applied to pin 8. The input on pin 1 is inverted and applied to pin 6.

In Local Mode (A Low, B High) the input on pins 9 and 10 is inverted and applied to pin 8. The input on pin 5 is inverted and applied to pin 6.



NOTE 3: BCD Low true logic, switch contact(s) to ground i- true state.

Digit	CODE 1	2	4	8
0	0	0	0	0
1	1	0	0	0
2	0	1	0	0
3	1	1	0	0
4	0	0	1	0
5	1	0	1	0
6	0	1	1	0
7	1	1	1	0
8	0	0	0	1
9	1	0	0	1

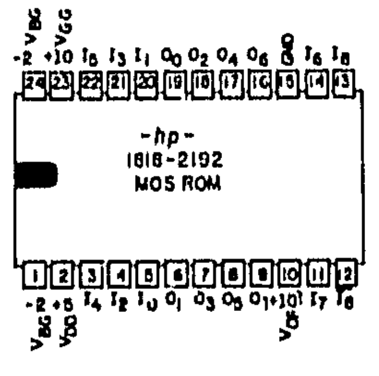
NOTE 4: Jumpers on the A24B Assembly for IC11 and IC12 are preset at the factory:

3320B STANDARD, 50 Ω Impedance
(Preset No. 73)

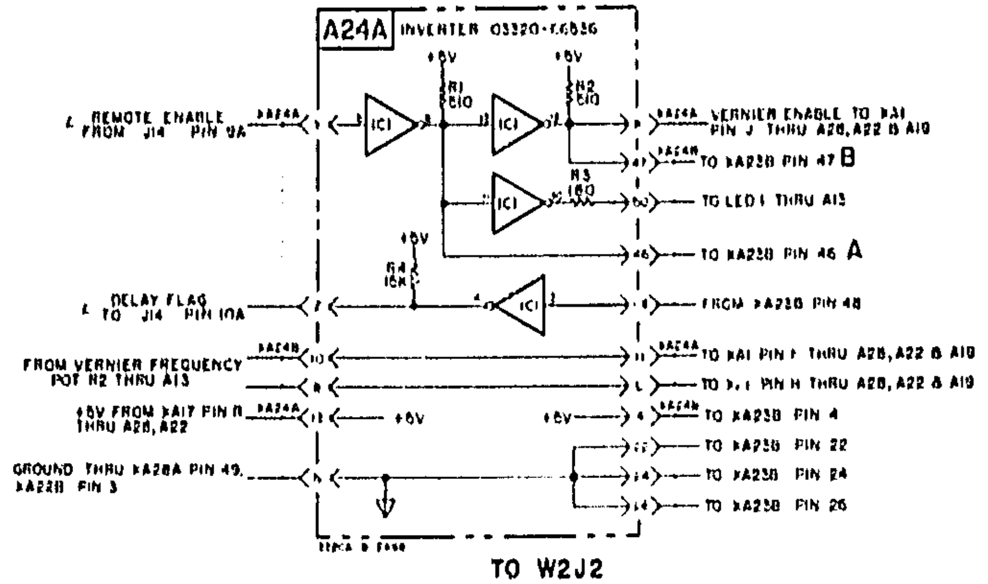
"W" Connected to "1"
"X" Connected to "0"
"Y" Connected to "1"
"Z" Connected to "1"

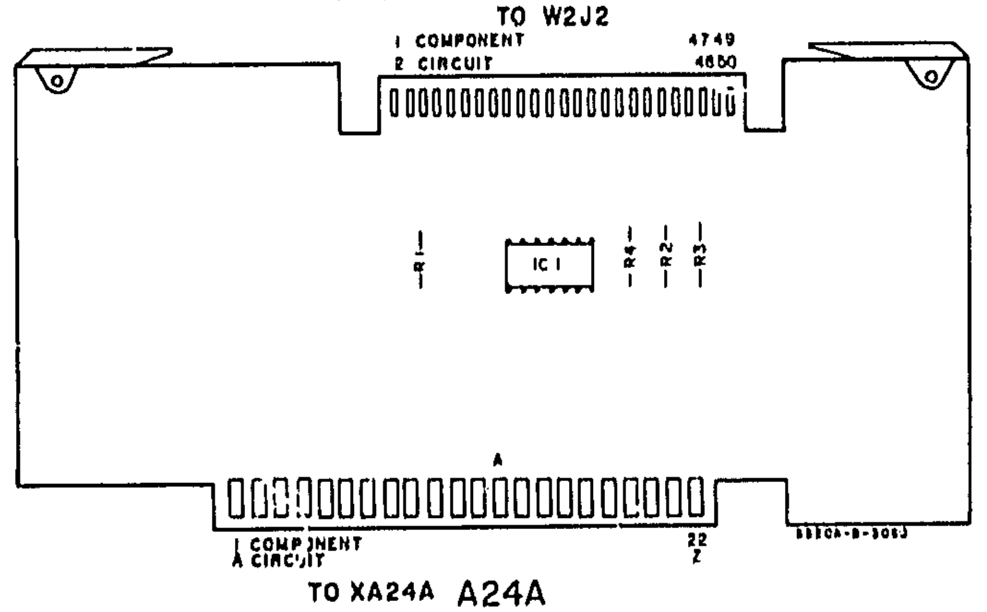
3320B OPTION 001, 75 Ω Impedance
(Preset No. 76)

"W" Connected to "0"
"X" Connected to "1"
"Y" Connected to "1"
"Z" Connected to "1"

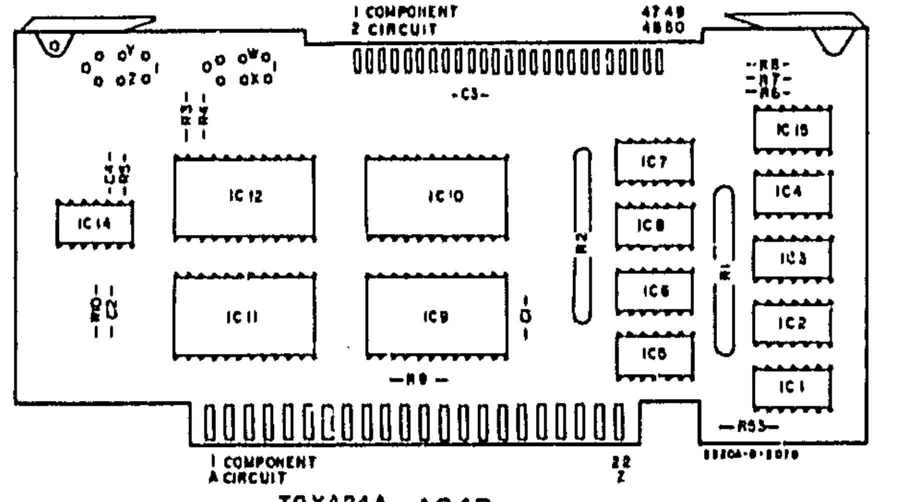


Pin configuration for A24IC9—IC12.

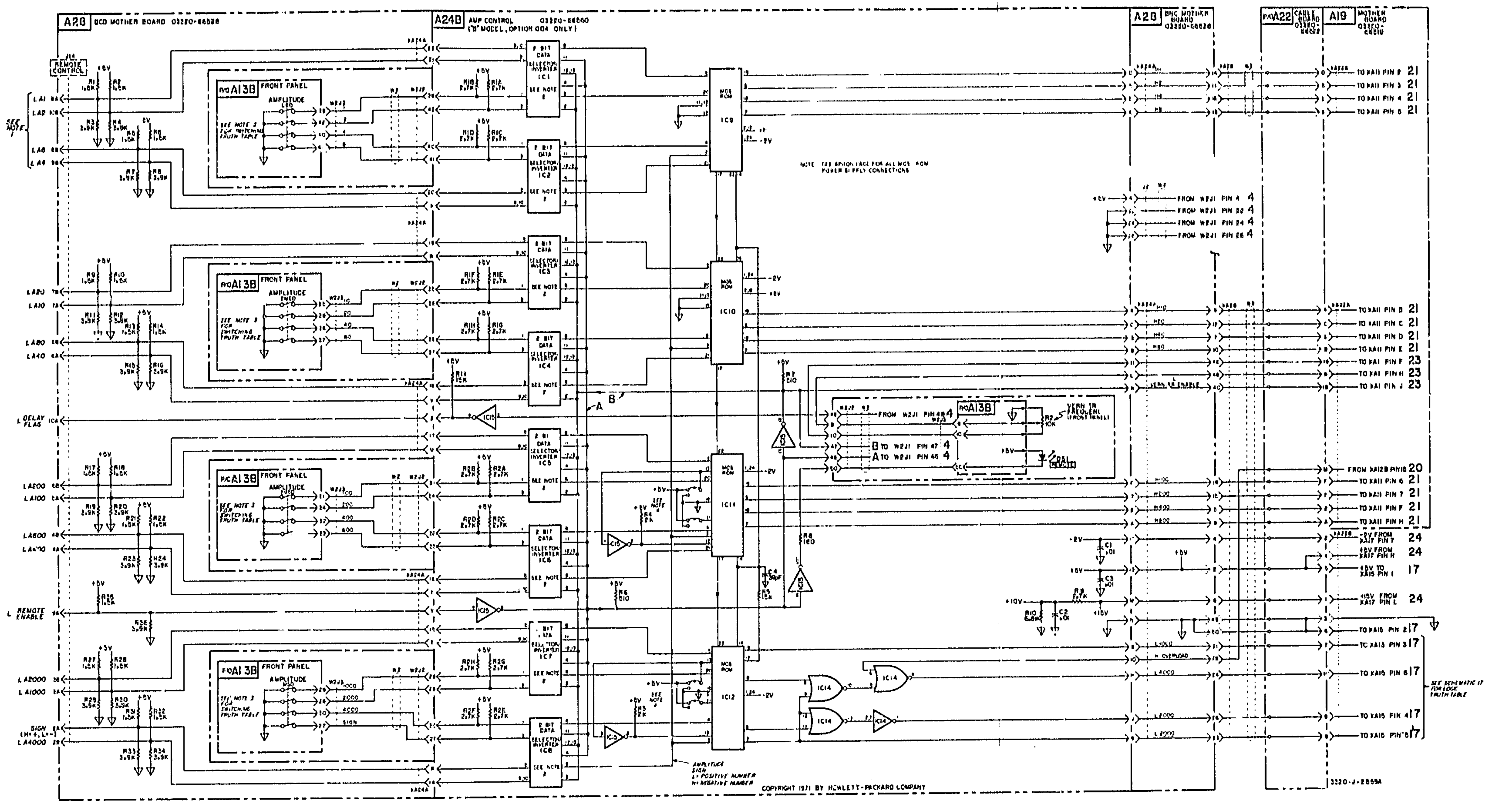




TO XA24A A24A
hp Part No. 03320-66536



TO XA24A A24B
hp Part No. 03320-66560
Rev A



5

Figure 7-13. BCD Amplitude Control A24B, 3320B Option 004; Inverter A24A, 3320A Option 003.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

NOTE 1: Logic signal levels are shown by the letters H or L preceding the name of the line. The H and L indicates the true state (signal present). Voltage levels for the H and L are:

H = +5 V
L = 0 V

Example:

H Delay Flag – Indicates the delay flag line should be +5 V when a delay flag signal is present.

L Data Valid – Indicates the data valid line should be 0 V when a data valid signal is present.

NOTE 2: Location of jumpers on A37 Assembly indicates HP-IB Address of instrument. Instruments are shipped from factory with Address 03, jumpered in as shown on schematic. To change Address, move jumpers to desired number according to the following table:

BIT	WEIGHT
b1	1
b2	2
b3	4
b4	10
b5	20

Note: b6 (40 weight) is "hard-wired".
b7 (100 weight) is "hard wired".

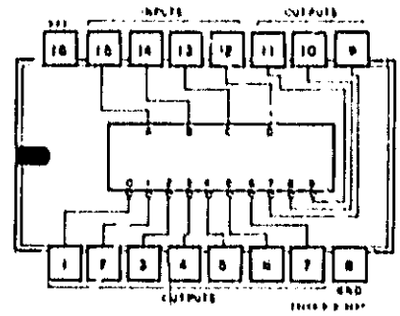
NOTE 3: Instruments are shipped from factory with jumper A-B on A37 Assembly connected. The jumper wire can be removed and a ground connected to B to inhibit remote enable.

If it is desired to control local or remote mode of the instrument with a switch, connect the switch to the S.W. REMOTE ENABLE point on the A39 Assembly. Grounding the S.W. REMOTE ENABLE point forces local mode. No connection (switch open) to the S.W. REMOTE ENABLE point will allow the instrument to be remotely programmed, as outlined in Section III, if jumper A-B is connected.

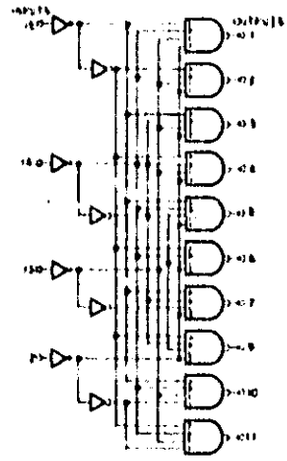
NOTE 4: Instruments are shipped from factory with jumper A-B on A38 Assembly removed (disconnected). With the jumper disconnected, the last remote program for amplitude, frequency, etc., is retained when changing from remote to local and then back to remote. If it is not desired to retain the last remote program, connect a jumper between points A and B. This will enable the Data Selector/Storage Registers on the A26 Assembly to be reset by the Local Enable Command to the initial remote turn-on condition listed below.

Frequency	800 Hz
Range	1000 Hz
Amplitude	-69.00 dBm
Vernier	out/0 Hz
Delay	1500 ms
Leveling	ON (>10 Hz)

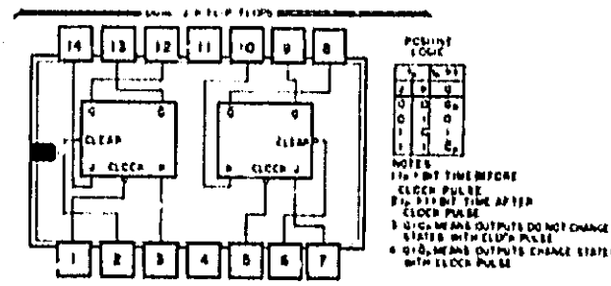
NOTE 5: The Logic diagram for a 4 Line to 10 Line Decoder is shown below. IC12, 13, 14 along with NOR gates IC6, 7, 11 and Inverter IC15 constitute a "data bit decoder". See Figure 7-5 for truth table.



INPUT				DECIMAL OUTPUT									
12	13	14	15	1	2	3	4	5	6	7	8	10	11
L	L	L	L	L	H	H	H	H	H	H	H	H	H
L	L	L	H	H	L	H	H	H	H	H	H	4	H
L	L	H	L	H	H	L	H	H	H	H	H	H	H
L	L	H	H	H	H	H	L	H	H	H	H	H	H
L	H	L	L	H	H	H	H	L	H	H	H	H	H
L	H	L	H	H	H	H	H	H	L	H	H	H	H
L	H	H	L	H	H	H	H	H	H	L	H	H	H
L	H	H	H	H	H	H	H	H	H	H	L	H	H
H	L	L	L	H	H	H	H	H	H	H	H	L	H
H	L	L	H	H	H	H	H	H	H	H	H	H	L
H	L	H	L	H	H	H	H	H	H	H	H	H	H
H	L	H	H	H	H	H	H	H	H	H	H	H	H
H	H	L	L	H	H	H	H	H	H	H	H	H	H
H	H	L	H	H	H	H	H	H	H	H	H	H	H
H	H	H	L	H	H	H	H	H	H	H	H	H	H
H	H	H	H	H	H	H	H	H	H	H	H	H	H

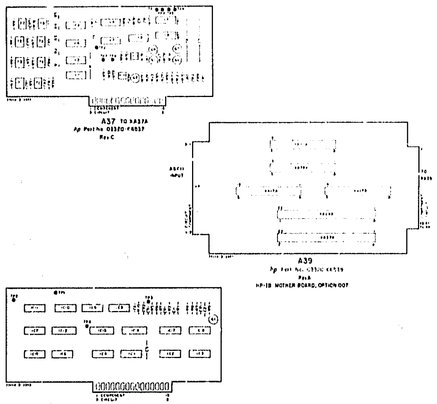


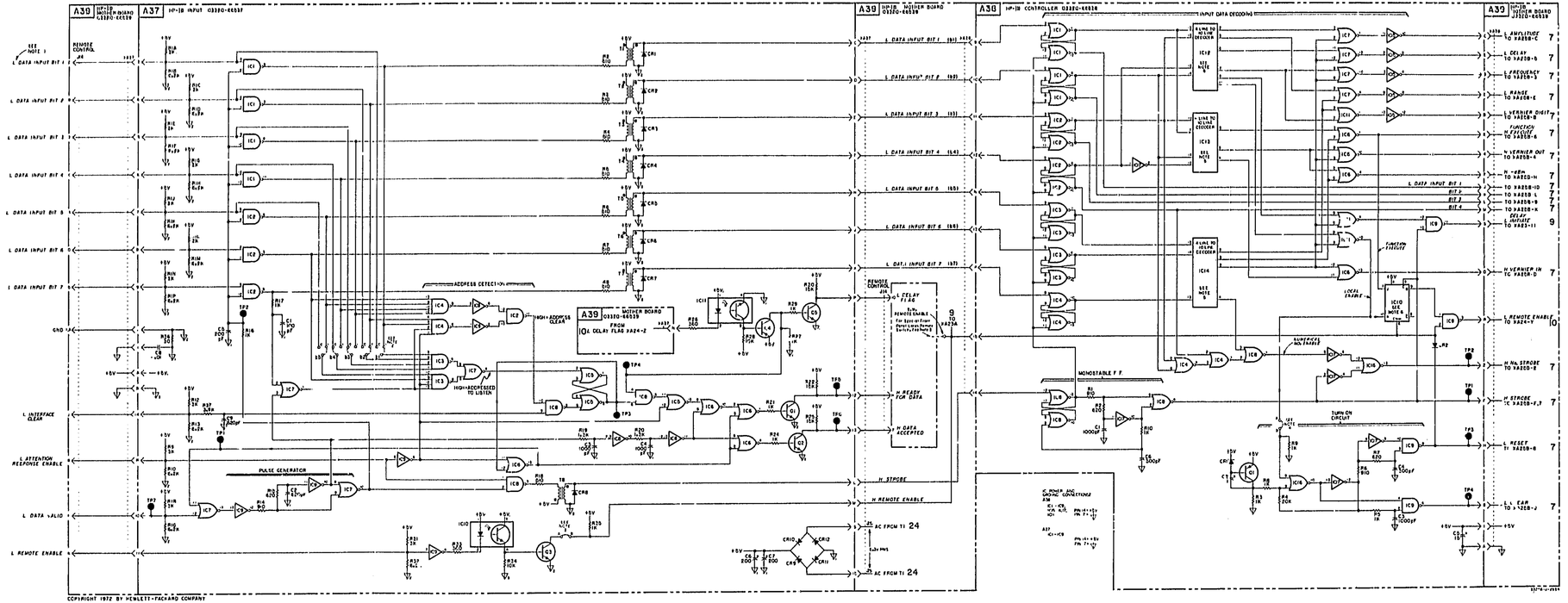
NOTE 6: Logic diagram of IC is shown below.



Low input to clear sets Q to logical 0.
Clear is independent of Clock.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com





6

Figure 7-14. HP-IB Input A37 and HP-IB Controller A38, 3320B Option 007. 7-20/7-30

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SCHEMATIC DIAGRAMS

CON'T

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

NOTE 1: Logic signal levels are shown by the letters H or L preceding the name of the line. The H and L indicates the true state (signal present). Voltage levels for the H and L are:

H = +5 V
L = 0 V

Example:

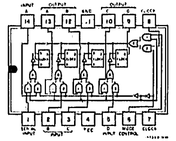
H Delay Flag — Indicates the delay flag line should be +5 V when a delay flag signal is present.

L Data Valid — Indicates the data valid line should be 0 V when a data valid signal is present.

NOTE 2: IC8–IC11 are 4-bit Shift Registers. The mode of operation is controlled by the voltage level on mode control line, pin 6. When the mode control line is high (≥ +5 V), the registers are reset by parallel loading of inputs A, B, C and D. Inputs A, B, C and D are hard-wired to +5 V. When the mode control line is low (≤ 0 V) the Serial Input, pin 1, is enabled. These IC's are connected for serial-to-parallel conversion of the numerical data bits, b_1–b_4.

The "A" output of each IC represents the least significant digit. The "D" output of each IC represents the most significant digit.

All inputs and outputs are low true.



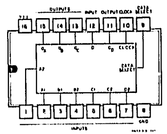
NOTE 3: IC18–IC23, and IC25–IC28 are 4-bit Data Selectors/Storage Registers (latches). All inputs and outputs are BCD, low true. When L Clear (Data Select) input is low (≤ 0 V), input data A1, B1, C1, and D1 is applied to the respective outputs Q_A, Q_B, Q_C, and Q_D. When Data Select input is high, input data A2, B2, C2 and D2 is applied to the respective outputs. The selected input data is shifted to the output terminals on the negative-going edge of clock pulse.

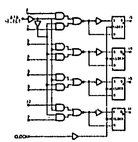
Input data A1, B1, C1, and D1 is hardwired, as listed below, for the "initial turn on conditions" listed in Section III.

IC	PINS	WIRED	BCD OUTPUT
IC18	5, 12 2, 3	+5 V	3
IC19	2, 5, 12 3	+5 V	2
IC20–IC22 IC23	2, 3, 5, 12 2, 3, 5 12	+5 V +5 V	0 8
IC25–IC26 IC27	2, 3, 5, 12 3, 5 2, 12	+5 V +5 V	0 9

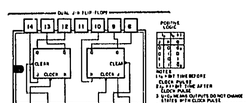
IC	PINS	WIRED	BCD OUTPUT
IC26	2 3, 5, 12	+5 V	6
IC4	Clear		VERN OUT

Input Data A2, B2, C2, and D2 is numerical data from shift registers IC8–IC11.

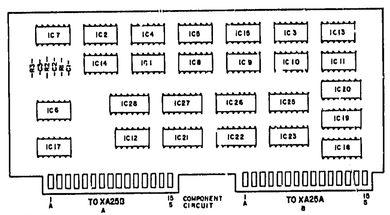




NOTE 4: Logic diagram of IC is shown below.



Low input to Clear sets Q to logical 0.
Clear is independent of Clock



A25
hp Part No. 03320-66525
Rev A

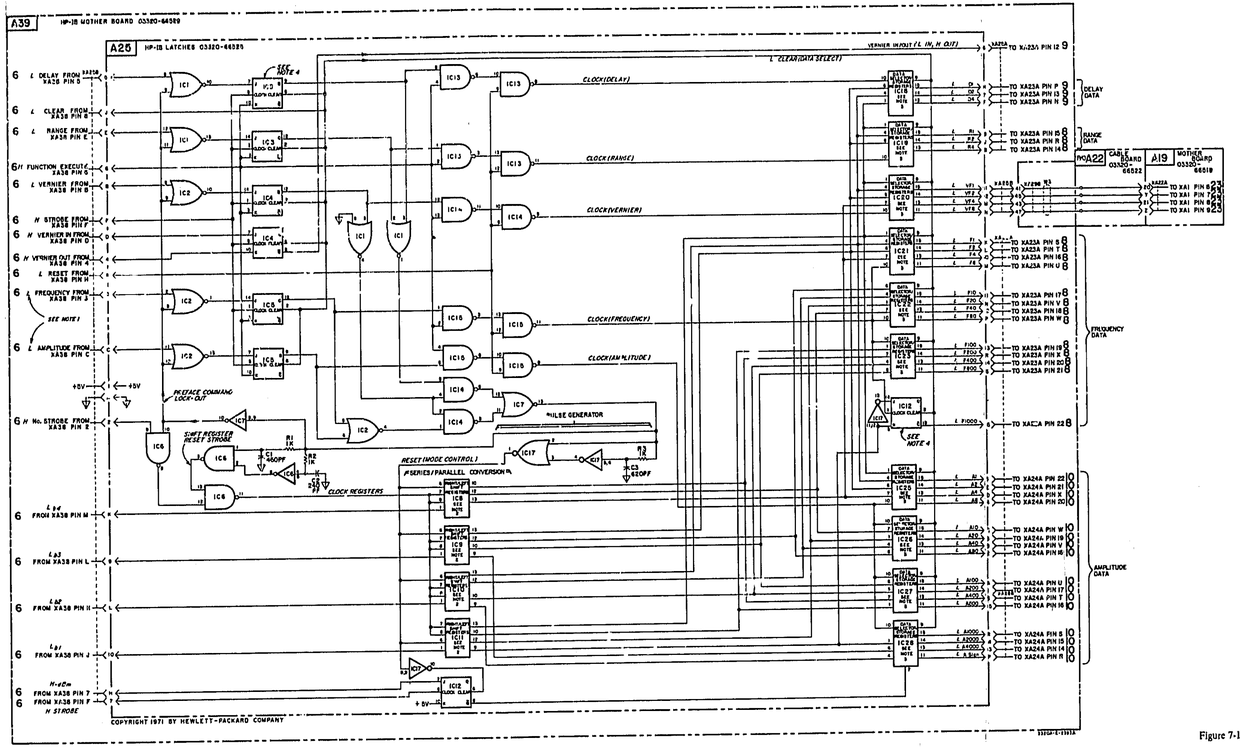


Figure 7-15. HP-IB Latches A25, 3320B Option 007.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

NOTE 1: Logic signal levels are shown by the letters H or L preceding the name of the line. The H and L indicates the true state (signal present). Voltage levels for the H and L are:

H = +5 V
L = 0 V

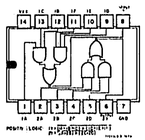
Example:

H Delay Flag — Indicates the delay flag line should be +5 V when a delay flag signal is present.

L Data Valid — Indicates the data valid line should be 0 V when a data valid signal is present.

NOTE 2: In Remote Mode (A High, B Low) the input on pins 12 and 13 is inverted and applied to pin 8. The input on pin 3 is inverted and applied to pin 6.

In Local Mode (A Low, B High) the input on pins 9 and 10 is inverted and applied to pin 8. The input on pin 5 is inverted and applied to pin 6.



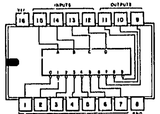
NOTE 3: BCD Low true logic, switch contact(s) to ground is true state.

Digit	CODE 1	2	4	8
0	0	0	0	0
1	1	0	0	0
2	0	1	0	0
3	1	1	0	0
4	0	0	1	0
5	1	0	1	0
6	0	1	1	0
7	1	1	1	0
8	0	0	0	1
9	1	0	0	1

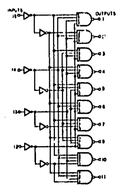
NOTE 4: 9's Complement Circuitry:

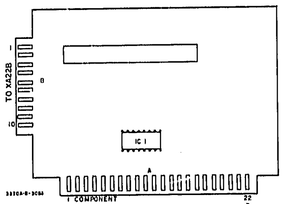
Digit	INPUT 1	2	4	8	9's COMPLEMENT 1	2	4	8
0	L	L	L	L	H	L	L	H
1	H	L	L	L	L	H	H	L
2	L	H	L	L	H	L	H	L
3	H	H	L	L	L	H	H	L
4	L	L	H	L	H	L	L	H
5	H	L	H	L	L	H	L	H
6	L	H	H	L	H	H	L	L
7	H	H	H	L	L	L	L	L
8	L	L	L	H	H	L	L	L
9	H	L	L	H	L	H	L	L

NOTE 5: On A22IC1, input at pin 12 is hard wired low, and output pins 9, 10, and 11 are not used (N/C).

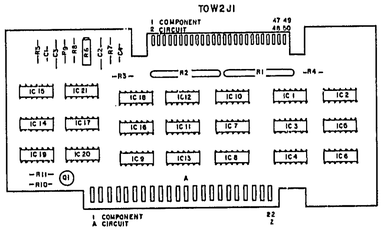


INPUT 12	13	14	15	DECIMAL OUTPUT 1	2	3	4	5	6	7	8	10	13
L	L	L	L	L	H	H	H	H	H	H	H	H	H
H	L	L	L	H	L	H	H	H	H	H	H	H	H
L	H	L	L	H	H	L	H	H	H	H	H	H	H
H	H	L	L	H	H	H	L	H	H	H	H	H	H
L	L	H	L	H	H	H	H	L	H	H	H	H	H
H	L	H	L	H	H	H	H	H	L	H	H	H	H
L	H	H	L	H	H	H	H	H	H	L	H	H	H
H	H	H	L	H	H	H	H	H	H	H	L	H	H
L	L	L	H	H	H	H	H	H	H	H	H	L	H
H	L	L	H	H	H	H	H	H	H	H	H	H	L





TO XA22A
A22
hp Part No. 03320-66522
Rev A



TO XA23A
A23
hp Part No. 03320-66523
Rev B

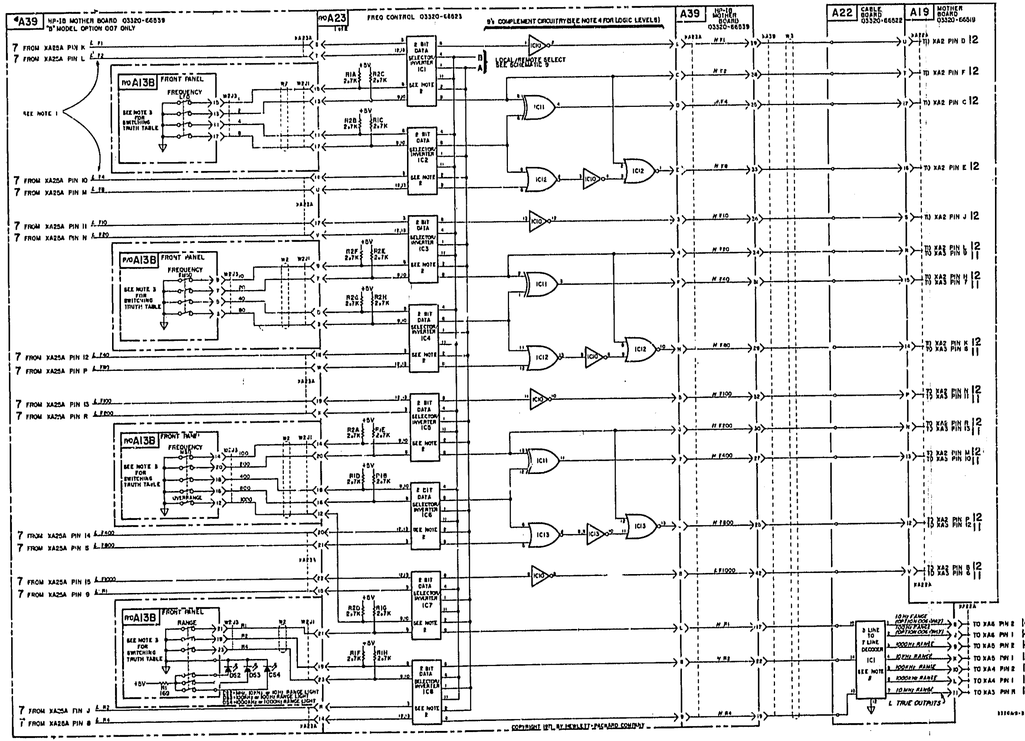
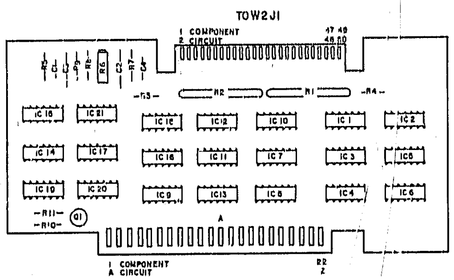


Figure 7-16. HP-IB Frequency Control P/O A23, 3320B Option 007.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



TO XA23A

A23

hp Part No. 03320-66523

Rev B

NOTE 1: Logic signal levels are shown by the letters H or L preceding the name of the line. The H and L indicates the true state (signal present). Voltage levels for the H and L are:

H = +5 V
L = 0 V

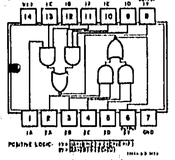
Example:

H Delay Flag — Indicates the delay flag line should be +5 V when a delay flag signal is present.

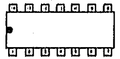
L Data Valid — Indicates the data valid line should be 0 V when a data valid signal is present.

NOTE 2: In Remote Mode (A High, B Low) the input on pins 12 and 13 is inverted and applied to pin 8. The input on pin 3 is inverted and applied to pin 6.

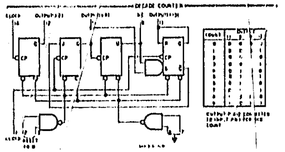
In Local Mode (A Low, B High) the input on pins 9 and 10 is inverted and applied to pin 8. The input on pin 5 is inverted and applied to pin 6.



NOTE 3: Logic diagram of IC is shown below.



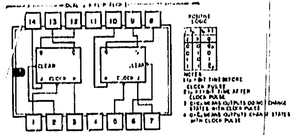
NOTE 3: (CONT'D.)



NOTE 4: Local/Remote select lines from A24 Assembly:

Local mode A Low, B High
Remote mode A High, B Low

NOTE 5: Logic Diagram of IC is shown below.



Low input to Clear sets Q to logical 0. Clear is independent of Clock

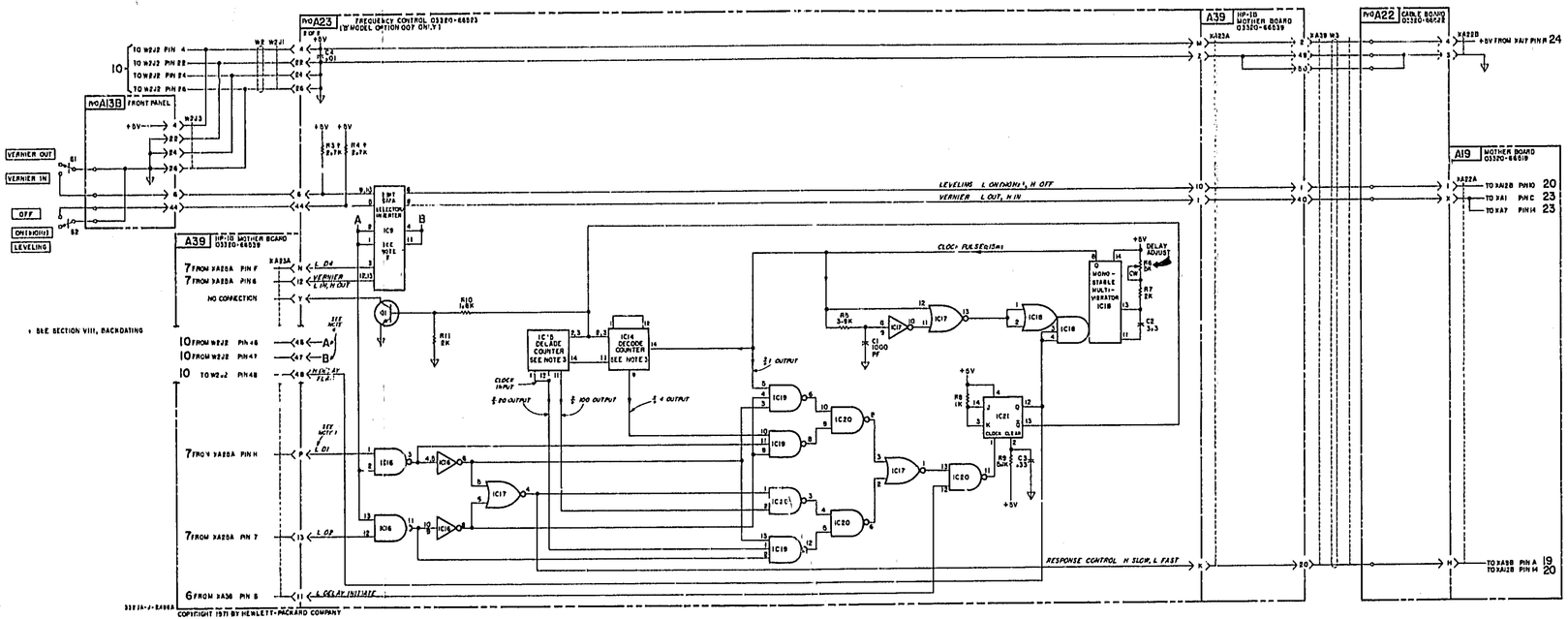


Figure 7-17. HP-IB Frequency Control P/O A23, 3320B Option 007.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

NOTE 1: Logic signal levels are shown by the letters H or L preceding the name of the line. The H and L indicates the true state (signal present). Voltage levels for the H and L are:

H = +5 V
L = 0 V

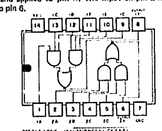
Example:

H Delay Flag – Indicates the delay flag line should be +5 V when a delay flag signal is present.

L Data Valid – Indicates the data valid line should be 0 V when a data valid signal is present.

NOTE 2: In Remote Mode (A High, B Low) the input on pins 12 and 13 is inverted and applied to pin B. The input on pin 3 is inverted and applied to pin G.

In Local Mode (A Low, B High) the input on pins 9 and 10 is inverted and applied to pin A. The input on pin 5 is inverted and applied to pin G.



NOTE 3: BCD Low true logic, switch contact(s) to ground is true state.

Digit	CODE 1	2	4	8
0	0	0	0	0
1	1	0	0	0
2	0	1	0	0
3	1	1	0	0
4	0	0	1	0
5	1	0	1	0
6	0	1	1	0
7	1	1	1	0
8	0	0	0	1
9	1	0	0	1

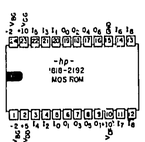
NOTE 4: Jumpers on the A24B assembly for IC11 and IC12 are preset at the factory:

3320B STANDARD, 50 Ω Impedance
(Preset No. 73)

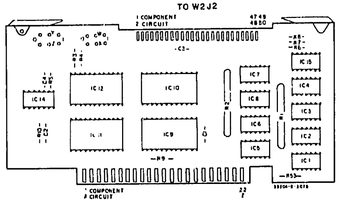
"W" Connected to "1"
"X" Connected to "0"
"Y" Connected to "1"
"Z" Connected to "1"

3320B OPTION 001, 75 Ω Impedance
(Preset No. 75)

"W" Connected to "0"
"X" Connected to "1"
"Y" Connected to "1"
"Z" Connected to "1"



Pin configuration for A24IC9–IC12.



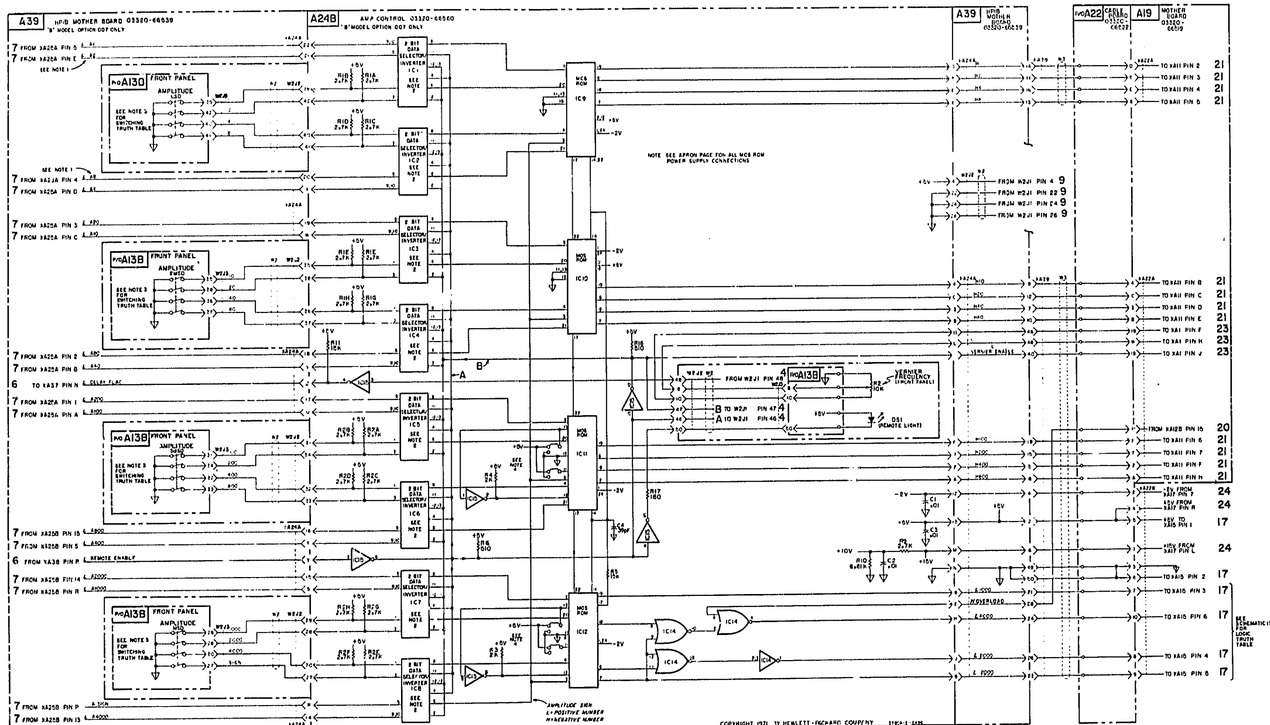
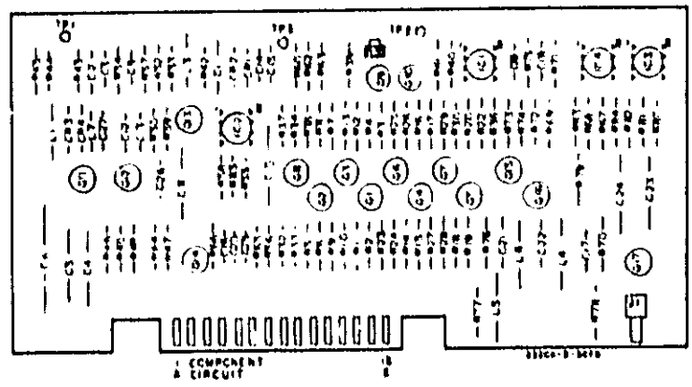


Figure 7-18. HP-IB Amplitude Control A24B, 3320B Option 00



TO XA3 A3

hp Part No. 03320-66503

Rev D

NOTE 1: The following table lists the schematic number and connector number versus instrument type for controller board interfacing:

SCHEMATIC NUMBER	CONNECTOR NUMBER	INSTRUMENT TYPE
1	XA20A	"A" Model – Standard, Options 001, 002, 006
2	XA21A	"B" Model – Standard, Options 001, 002, 006
3	XA22A	"A" Model – Option 003 "B" Model – Option 004
8	XA22A	"B" Model – Option 007

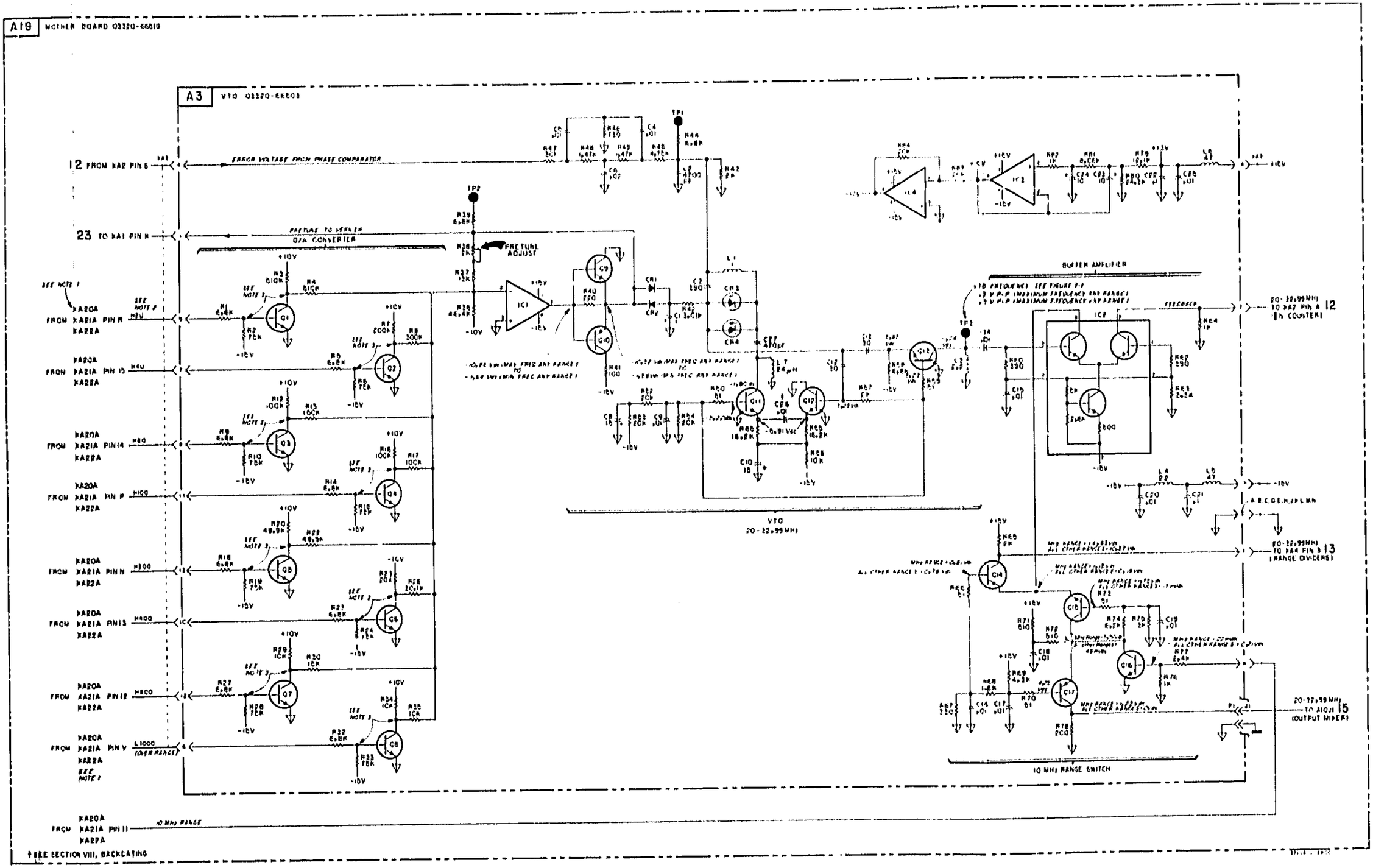
NOTE 2: Logic levels are high true (+ 5 V)
(0's complement of front panel settings)

NOTE 3: DC voltage levels on the base and collector of transistors Q1 thru Q8 depend on logic level of base signal. Voltage levels versus logic levels are as follows:

Logic level high (true) ..... Base = 0.64 Vdc
Collector = 2.64 Vdc

Logic level low (false) ..... Base = -1.19 Vdc
Collector = -5.93 Vdc

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

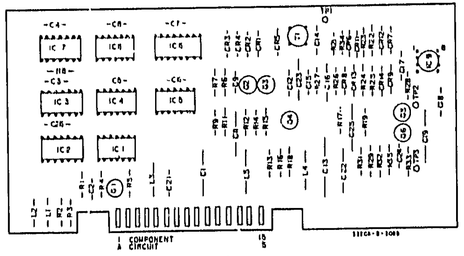


11

Figure 7-19. VTO A3.

7-39/7-40

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



TO XA2 A2

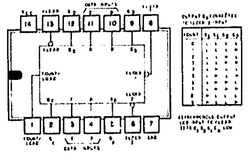
hp Part No. 03320-66502

Rev C

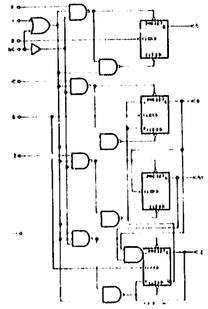
NOTE 1: The following table lists the schematic number and connector number versus instrument type for controller board interfacing:

SCHEMATIC NUMBER	CONNECTOR NUMBER	INSTRUMENT TYPE
1	XA20A	"A" Model – Standard, Options 001, 002, 006
2	XA21A	"B" Model – Standard, Options 001, 002, 006
3	XA22A	"A" Model – Option 003 "B" Model – Option 004
8	XA22A	"B" Model – Option 007

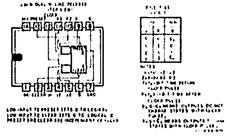
NOTE 2: IC3, IC4 and IC5 are programmable decade counters. The outputs are preset to any state (number) by placing a low on the Count/Load input and parallel loading the desired data (number) on the Data Inputs. The outputs will change to agree with the Data Inputs independently of the state of the clocks.

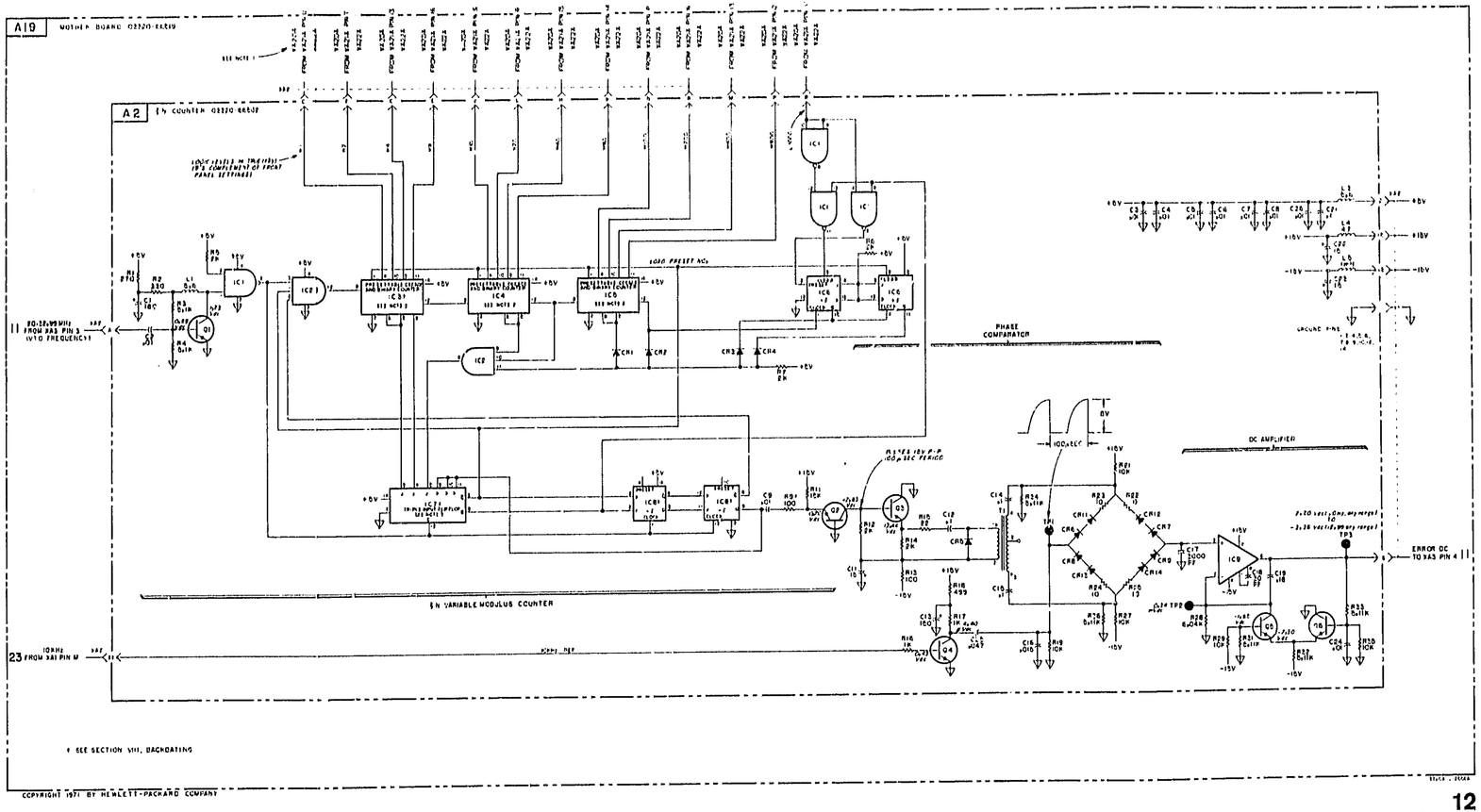


NOTE 2: (CONT'D.)



NOTE 3: Logic diagram of IC is shown below.

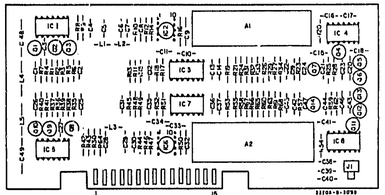




12

Figure 7-20. ÷N Counter A2.
7-41/7-42

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



NOTE 1: The following table lists the schematic number and connector number versus instrument type for controller board interfacing:

SCHEMATIC NUMBER	CONNECTOR NUMBER	INSTRUMENT TYPE
1	XA20A	"A" Model — Standard, Options 001, 002, 003
2	XA21A	"B" Model — Standard, Options 001, 002, 003
3	XA22A	"A" Model — Option 003 "B" Model — Option 004
8	XA22A	"B" Model — Option 007

1. DC voltages on Q1, Q2, Q3 measured with 3320A/B in 1000 kHz range position using high input resistance, low capacitance voltmeter (hp-412A).
2. Top voltage measured with 3320A/B in 1000 kHz range position.
   Bottom voltage measured with 3320A/B in any other range position.
3. DC voltages on Q8, Q9, Q10 measured with 332L A/B in 100 kHz range position using high input resistance, low capacitance voltmeter (hp-412A).
4. Top voltage measured with 3320A/B in 100 kHz range position.
   Bottom voltage measured with 3320A/B in any other range position.
5. .7 to .9 V p-p on 1000 kHz or 100 kHz range position.

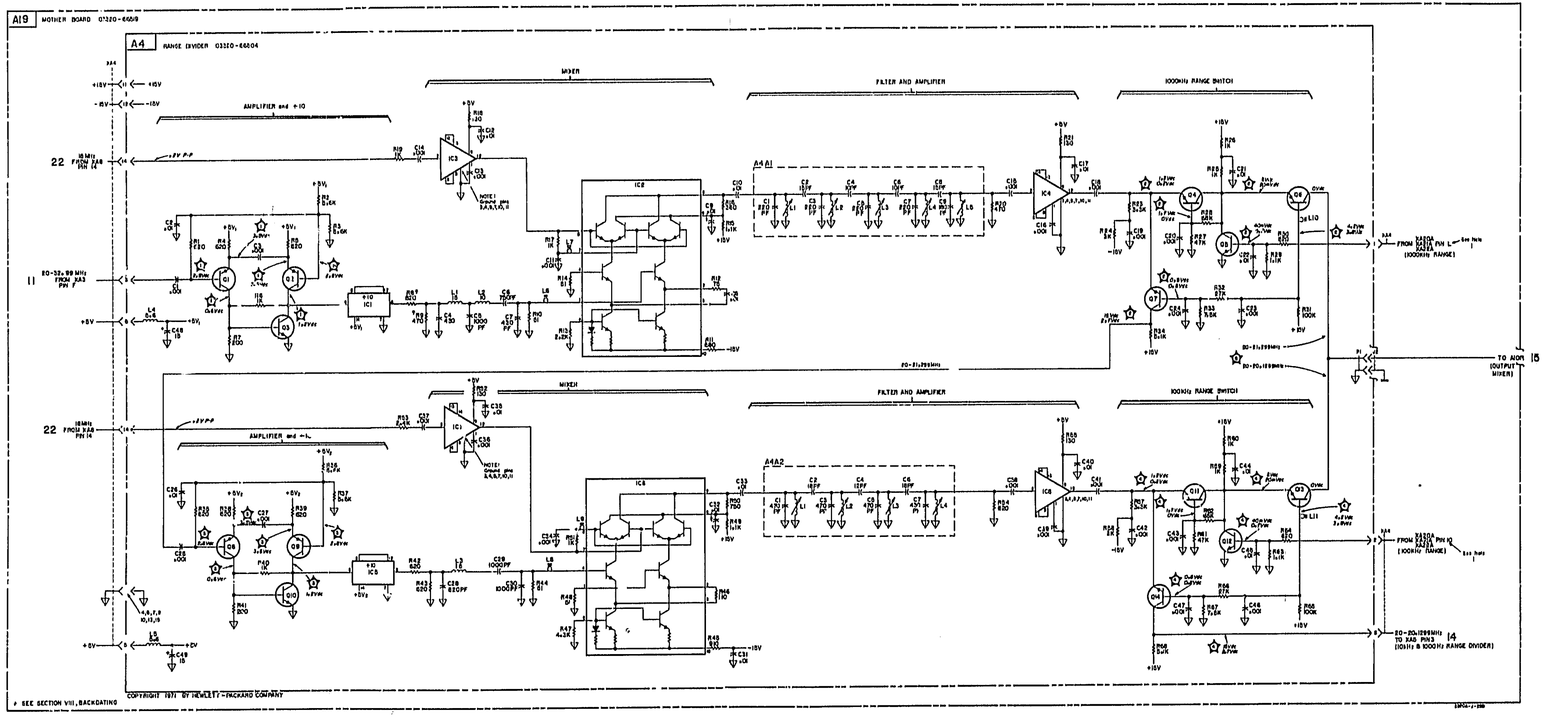
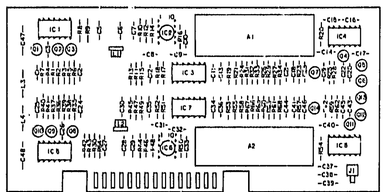


Figure 7-21. Range Divider A4.
7-43/7-44

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



NOTE 1: The following table lists the schematic number and connector number versus instrument type for controller board interfacing:

SCHEMATIC NUMBER	CONNECTOR NUMBER	INSTRUMENT TYPE
1	XA20A	"A" Model — Standard, Options 001, 002, 006
2	XA21A	"B" Model — Standard, Options 001, 002, 006
3	XA22A	"A" Model — Option 003 "B" Model — Option 004
3	XA22A	"B" Model — Option 007

1. DC voltages on Q1, Q2, Q3 measured with 3320A/B in 10 kHz (100 Hz for A6, Option 006) range position using high input resistance, low capacitance voltmeter (hp-412A).
2. Top voltage measured with 3320A/B in 10 kHz range (100 Hz range for A6, Option 006) position. Bottom voltage measured with 3320A/B in any other range.
3. DC voltages on Q8, Q9, Q10 measured with 3320A/B in 1000 Hz (10 Hz for A6, Option 006) range position using high input resistance, low capacitance voltmeter (hp-412A).
4. Top voltage measured with 3320A/B in 1000 Hz range (10 Hz range for A6, Option 006) position. Bottom voltage measured with 3320A/B in any other range position.
5. .7 to .9 V p-p on 10 kHz and 1000 Hz ranges (100 Hz and 10 Hz ranges for A6, Option 006).

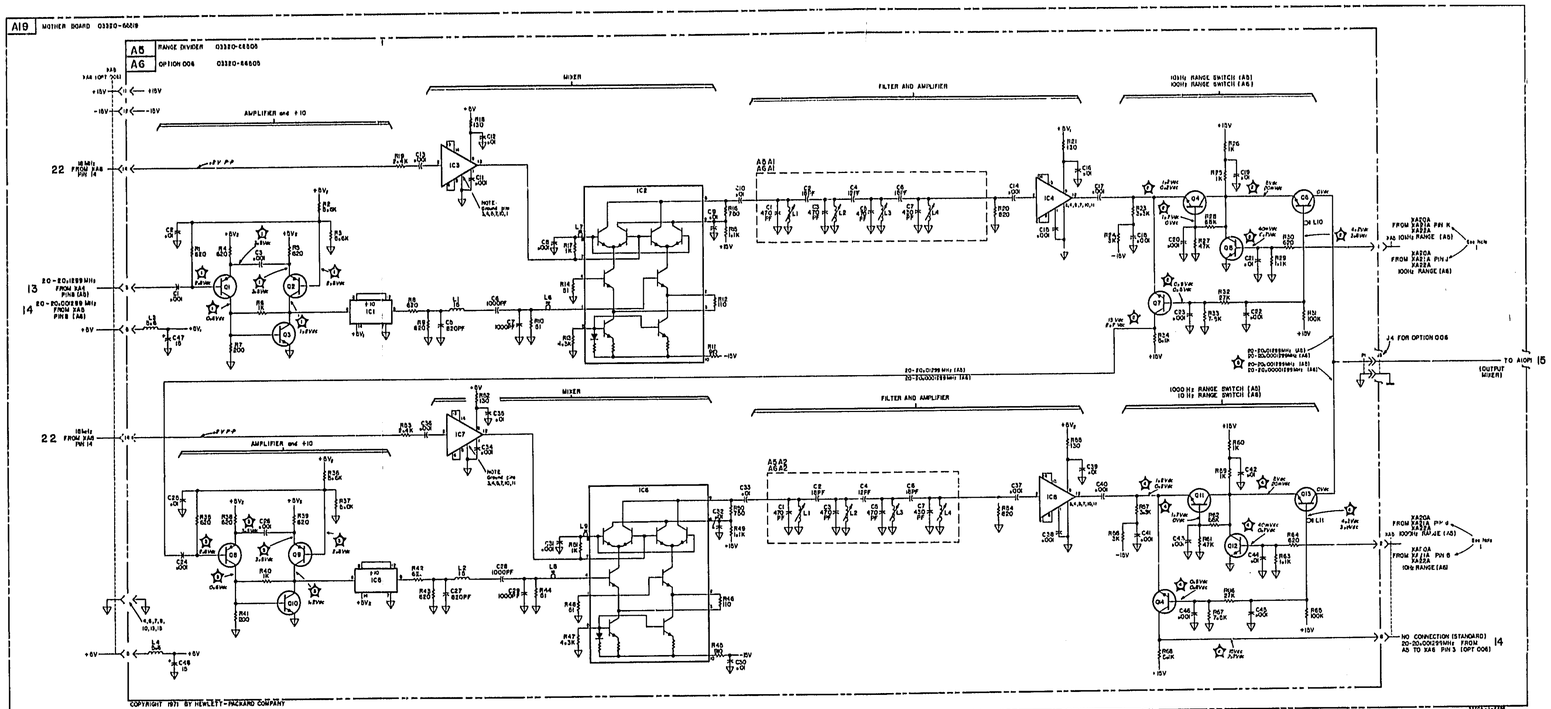
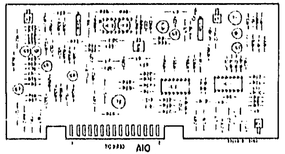
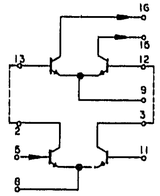


Figure 7-22. Range Divider A5, 3320A/B Standard; Range Divider A6, 3320A/B Option 006.

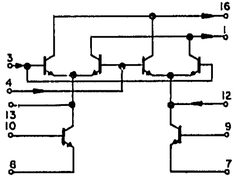
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



NOTE 1: IC1 is a high frequency transistor array consisting of 4 transistors for use as a limiter. Circuit diagram is shown below.



NOTE 2: IC2 is a high frequency transistor array consisting of 6 transistors for use as a mixer. Circuit diagram is shown below.



1. .3 to .9 V p-p varies with range setting.
2. For 3320B with 50 Ω output voltage varies from ≈ .1 V p-p at +17.00 dBm to ≈ .3 V p-p at +16.99 dBm. NOTE: to prevent oscillations, make measure on bottom side of mother board with A10 in place.
3. 0 Hz to 12.99 MHz. For 3320B with 50 Ω output, 3 V p-p at +17.00 dBm, 6 V p-p at +16.99 dBm. NOTE: with BRN (PRE AMP OUT) cable disconnected.

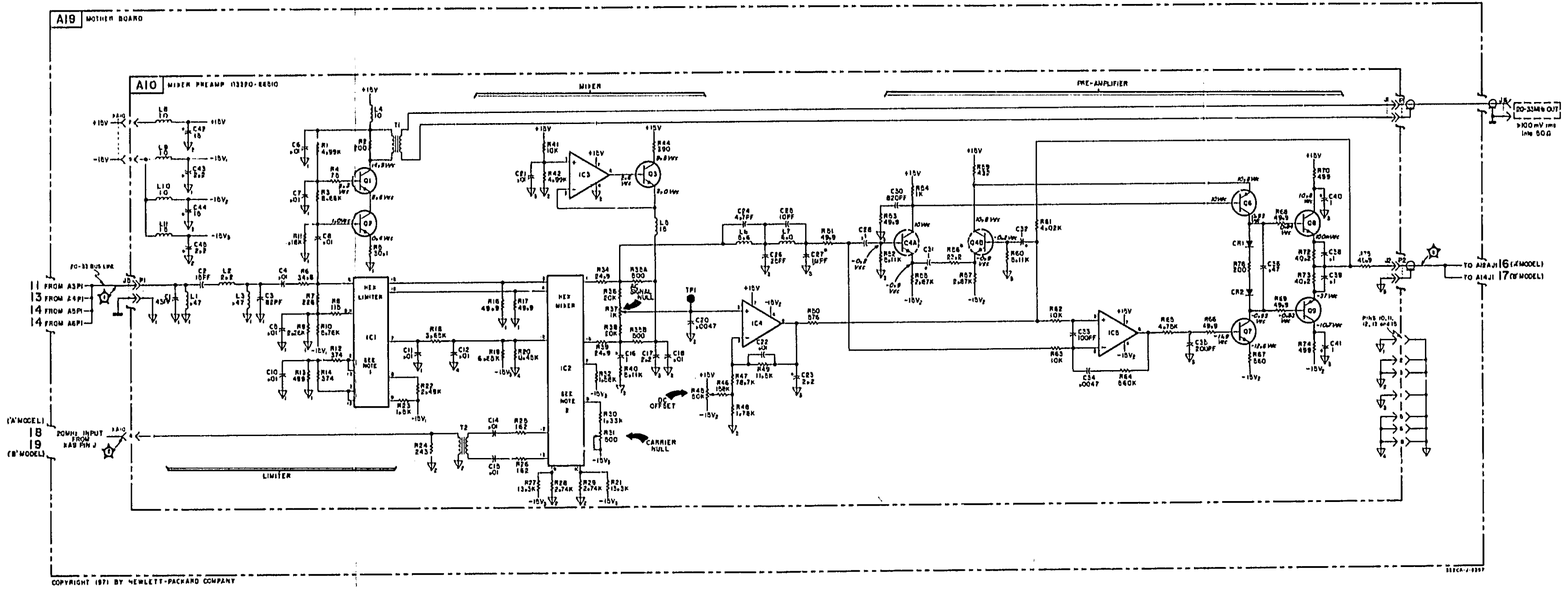
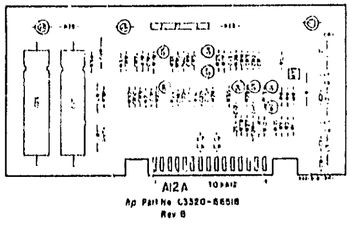


Figure 7-23. Mixer Preamp A10.
7-47/7-48

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



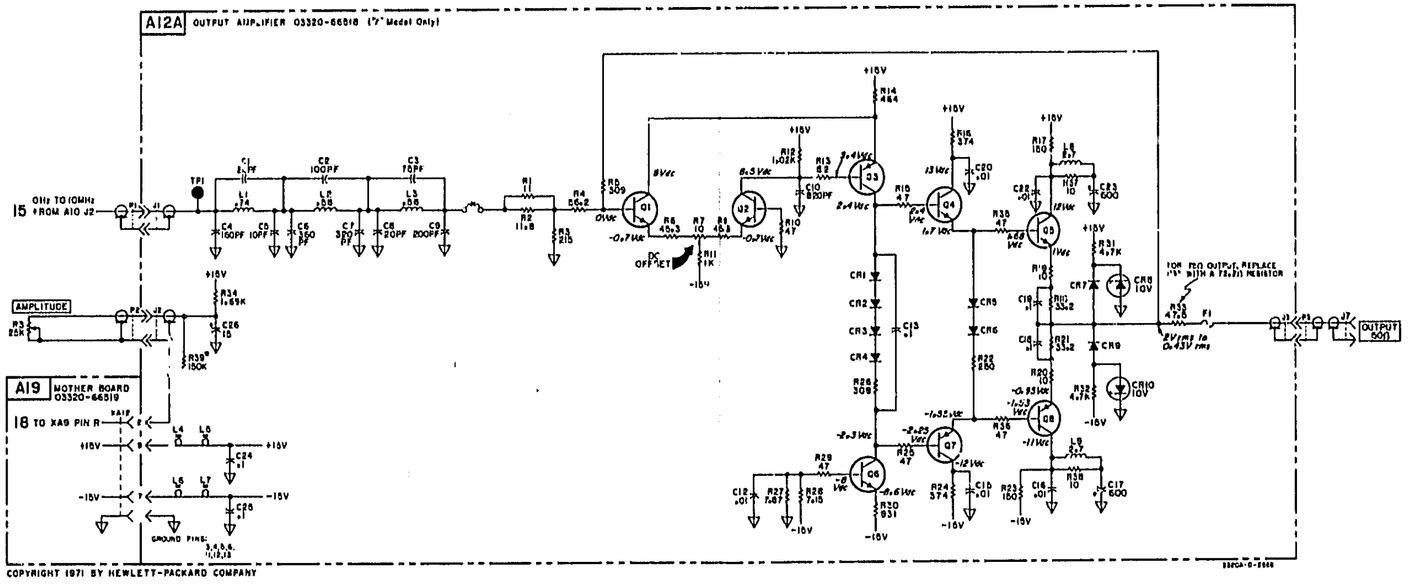
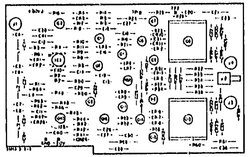
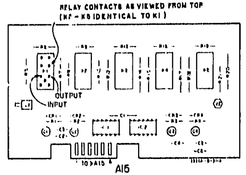


Figure 7-24. Power Amplifier A12A, 3320A.
7-49/7-50

Analog Technology Group - Quality Instrumentation - Test and Measurement Equipment (800) 403-0801 / www.atginet.com



A14
hp Part No. 03320-66014
Rev. C



A15
hp Part No. 03320-66018 (STANDARD)
03320-66556 (OPTION 001)
Rev. D

NOTE 1: The following table lists the schematic number and connector number versus instrument type for controller board interfacing:

SCHEMATIC NUMBER	CONNECTOR NUMBER	INSTRUMENT TYPE
2	XA21A	"B" Model – Standard, Options 001, 002, 000
5	XA22B	"B" Model – Option 004
10	XA22B	"B" Model – Option 007

NOTE 2: The Low Level Out varies with settings of amplitude controls. At maximum output (+ 26.99 dBm for 50 Ω, + 24.99 dBm for 75 Ω), the output is 158 mV. At all levels in 10 dB steps down from maximum output, the Low Level Out is 158 mV. See output level for standard (50 Ω) unit listed below.

NOTE 2: (CONT'D.)

AMPLITUDE	LOW LEVEL OUT
+ 26.99	158 mV
+ 17.00	50 mV
+ 16.99	158 mV
+ 7.00	50 mV
+ 6.99	158 mV
- 3.00	50 mV
- 3.01	158 mV
- 13.00	50 mV
- 13.01	158 mV
.	.
.	.
.	.

NOTE 3: To prevent oscillations on A14 Assembly, measure dc voltage levels with high input resistance, low capacitance voltmeter (hp-412A).

Table 1. Output Attenuator.

LOW signals (0 V) at inputs (pins 3, 4, 5, and 6) puts in attenuation by de-energizing respective reed relay(s). This attenuator provides 0 dB of attenuation when amplitude is set for maximum output (+ 26.99 for 50 Ω, + 24.99 for 75 Ω). Switching occurs in 10 dB steps down from maximum output. A truth table for various amplitude settings is listed below:

AMPLITUDE* SETTING	INPUT LINES (LOW true)				ATTENUATION (thru A15)	TRANSISTORS			
	4000	2000	2000	1000		Q1	Q2	Q3	Q4
+ 26.99	H	H	H	H	0 dB	–	–	–	–
+ 16.99	H	H	H	L	10 dB	–	X	–	–
+ 6.99	H	L	H	H	20 dB	X	–	–	–
- 3.01	H	L	H	L	30 dB	X	X	–	–
- 13.01	H	L	L	H	40 dB	X	–	X	–
- 23.01	H	L	L	L	50 dB	X	X	X	–
- 33.01	L	L	H	H	60 dB	X	–	–	X
- 43.01	L	L	H	L	70 dB	X	X	–	X
- 53.01	L	L	L	H	80 dB	X	–	X	X
- 63.01	L	L	L	L	90 dB	X	X	X	X

*For Standard 3320B (50 Ω output)
H = +5 V, L = 0 V, – = transistor(s) ON, X = transistor(s) OFF

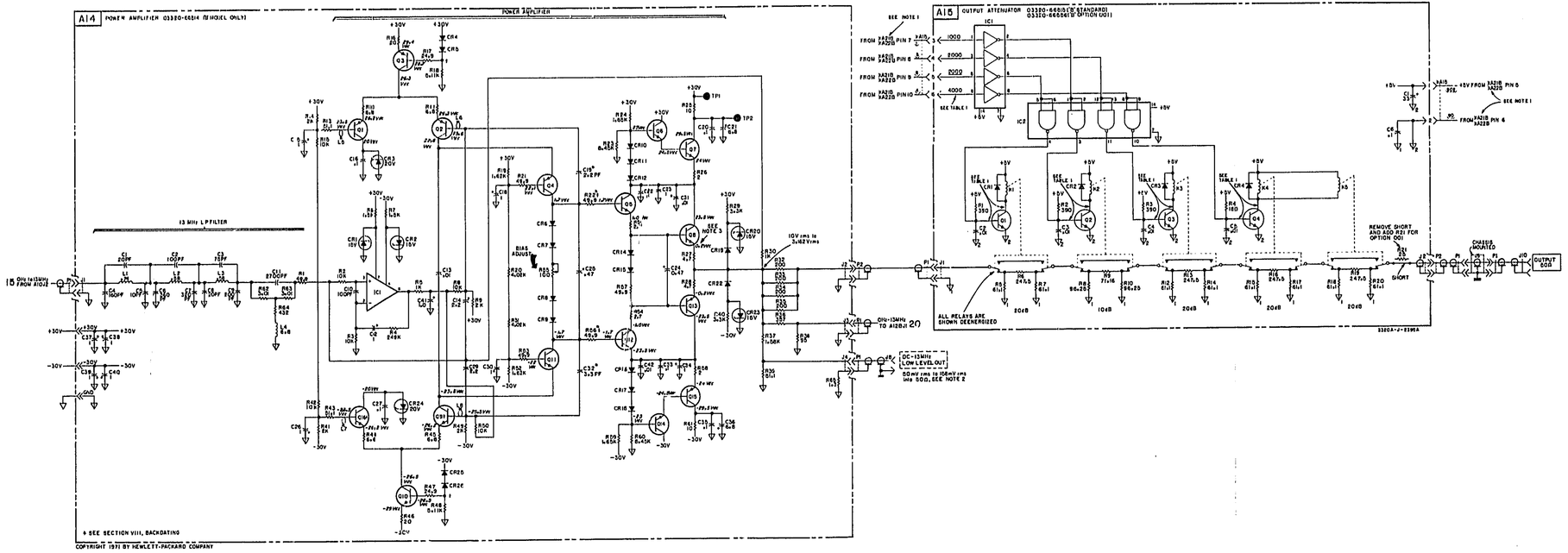
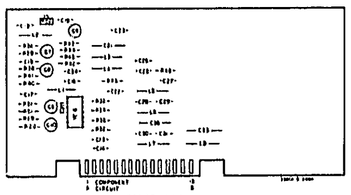


Figure 7-25. Power Amplifier A14, Attenuator A15; 3320B.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



TO XA9 A9A
Ap Part No. 03320-66533
Rev A

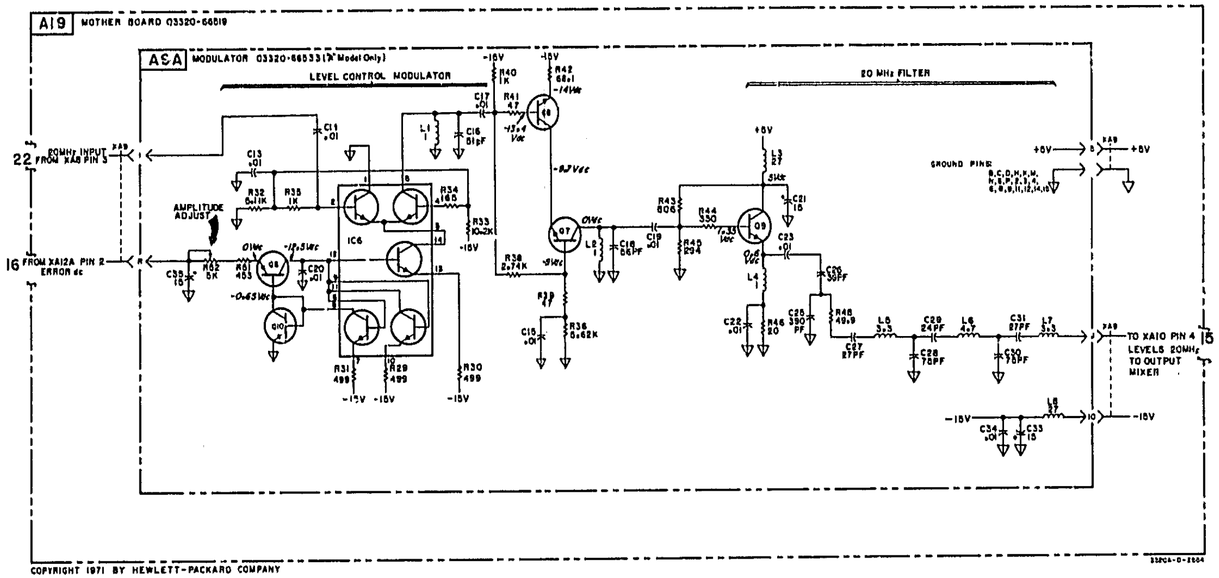
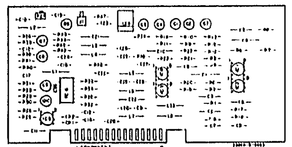


Figure 7-26. Modulator A9A, 3320A.
7-53/7-54

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



TO A9B
Hp Part No. 03320-66509
Rev A

NOTE 1: Logic signal levels are shown by the letters H or L preceding the name of the line. The H and L indicates the true state (signal present). Voltage levels for the H and L are:

H = +5 V
L = 0 V

Example:

H Delay Flag — Indicates the delay flag line should be +5 V when a delay flag signal is present.

L Data Valid — Indicates the data valid line should be 0 V when a data valid signal is present.

NOTE 2: The following table lists the schematic number and connector number versus instrument type for controller board interfacing:

SCHEMATIC NUMBER	CONNECTOR NUMBER	INSTRUMENT TYPE
2	XA21A	"B" Model — Standard, Options 001, 002, 006
4	XA22A	"B" Model — Option 004
8	XA22A	"B" Model — Option 007

NOTE 3: Refer to Paragraph 5-59 before replacing A9C24.

(1) Top voltage for Response Slow.
Bottom voltage for Response Fast.
NOTE: In local mode response is always slow.

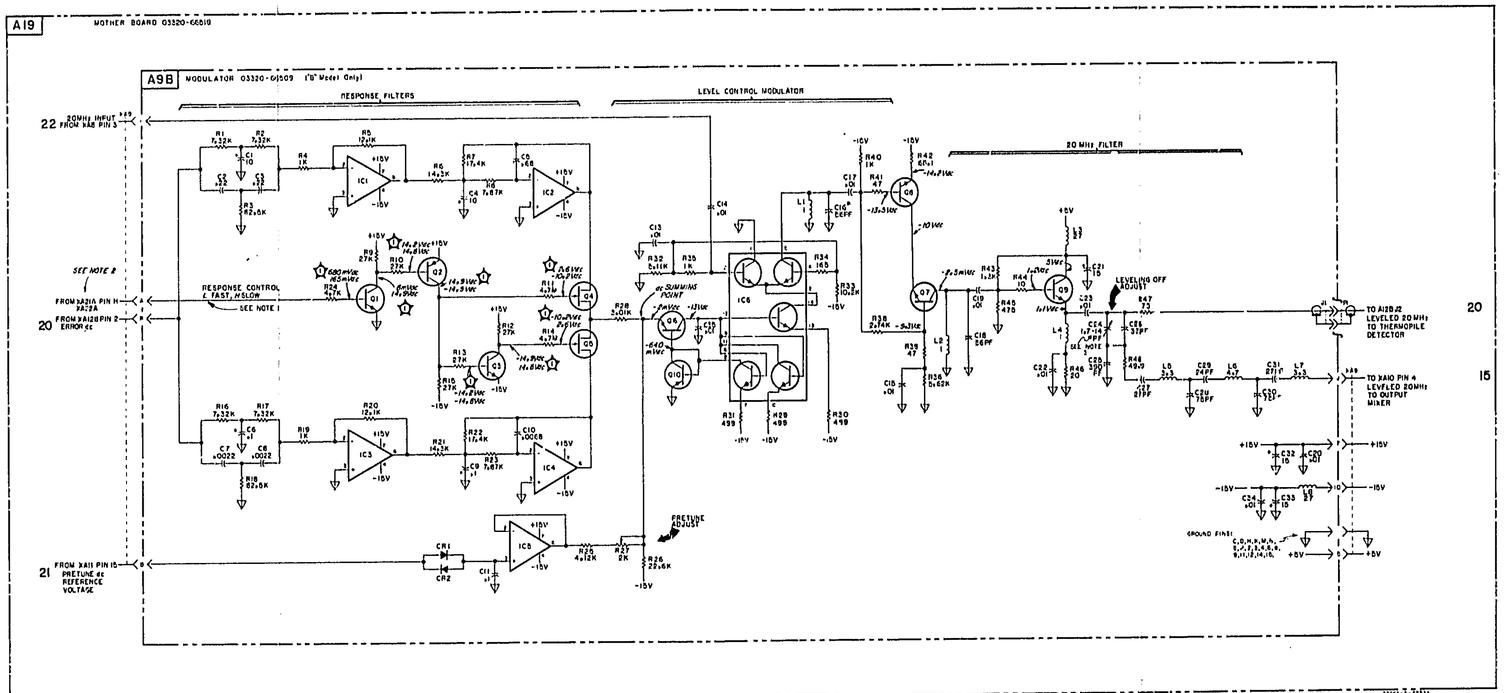
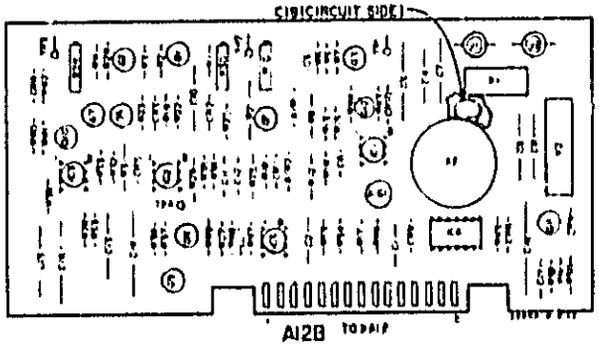


Figure 7-27. Modulator A9B, 3320B.
7-55/7-56

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



hp Part No. 03320-66052
Rev A

NOTE 1: The following table lists the schematic number and connector number versus instrument type for controller board interfacing:

SCHEMATIC NUMBER	CONNECTOR NUMBER	INSTRUMENT TYPE
2	XA21A	"B" Model – Standard, Options 001, 002, 006
4,5	XA22A	"B" Model – Option 004
9,10	XA22A	"B" Model – Option 007

NOTE 2: Logic signal levels are shown by the letters H or L preceding the name of the line. The H and L indicate the true state (signal present). Voltage levels for the H and L are.

H = +5V
L = 0 V

Example:

H Delay Flag – Indicates the delay flag line should be +5V when a delay flag signal is present.

L Data Valid – Indicates the data valid line should be 0 V when a data valid signal is present.

NOTE 3: IC4 is connected to function as a Monostable Flip-flop with negative edge triggering. The Q output will remain high for approximately 5 seconds. This IC is identical to Fairchild 9601.

(1) Top voltage for Response Slow.
Bottom voltage for Response Fast
Note: In local mode response is always slow

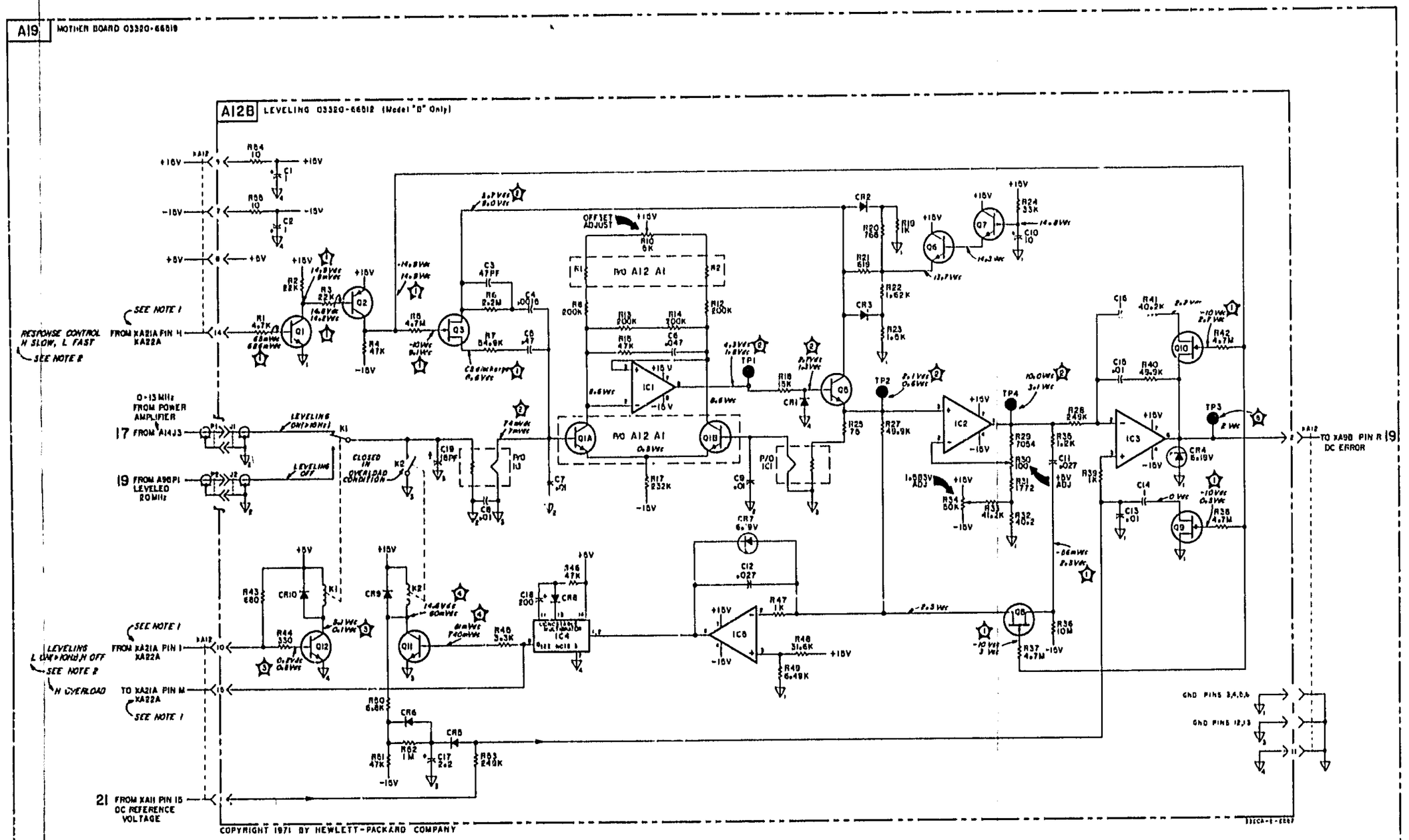
(2) Top voltage measured with BCD Inputs on A11 Assembly (Schematic 21) at 999%
Bottom voltage measured with BCD Inputs on A11 Assembly at 000.
See Schematic 21, Note 2.

(3) Top voltage, Leveling ON.
Bottom voltage, Leveling OFF.

(4) Top voltage, normal operation.
Bottom voltage, overload condition.

(5) Typically +2 V dc but must remain within ± .2 V dc with any change in amplitude setting with Leveling ON.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

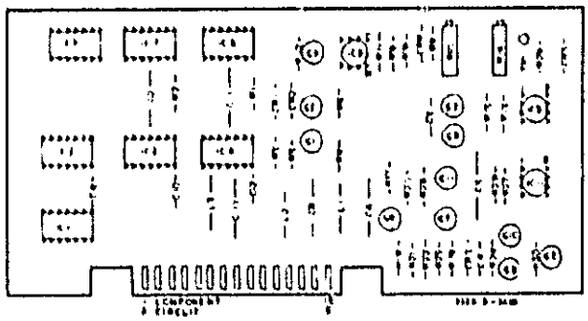


20

Figure 7-28. Detector A12B, 3320B.

7-57/7-58

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



TO XA11 A11

HP Part No 03320-66511

Rev A

NOTE 1: The following table lists the schematic number and connector number versus instrument type for controller board interfacing:

SCHEMATIC NUMBER	CONNECTOR NUMBER	INSTRUMENT TYPE
2	XA21A	"B" Model – Standard, Options 001, 002, 006
5	XA22A	"B" Model – Option 004
10	XA22A	"B" Model – Option 007

NOTE 2: Logic Signal levels for BCD INPUTS are indicated by the H preceding the BCD weighting. The H indicates the true state (signal present).

Voltage levels are:
H = +5 V
L = 0 V

The BCD INPUTS to the A11 Assembly varies with amplitude setting. The BCD INPUTS may be determined by subtracting the maximum amplitude setting (+26.99 for 50 Ω output) from the amplitude setting and then taking the 9's complement of the last three digits.

Example with + dBm setting:

max. amplitude	+26.99
subtract amplitude setting	-(+16.99)
	1000
9's complement of last 3 digits.	999

999 = BCD inputs to A11

The first digit (1 in these examples) controls the 10 dB step attenuator on the A16 assembly (Schematic 17).

Example with - dBm setting:

max. amplitude	+26.99
subtract amplitude setting	-(- 12.00)
	3899
9's complement	200

200 = BCD inputs to A11

NOTE 3: IC2, IC3 and IC4 are programmable decade counters. The outputs are preset to any state (number) by placing a low on the Count/Load input and parallel loading the desired data (BCD INPUT number) on the Data inputs. The outputs will change to agree with the Data inputs independently of the state of the clocks.

NOTE 4: IC6 and IC7 are connected to function as Monostable Flip-Flops with positive edge triggering. The Q output on IC6 will remain high for approximately 25 μsec. The Q output on IC7 will remain high for approximately 50 μsec. Identical to Fairchild Retriggerable Monostable Multivibrator 9601.

(1) Top voltage with BCD INPUTS = 999, amplitude setting of + 16.99 dBm for 3320B with 50 Ω output.

Bottom voltage with BCD INPUTS = 000 amplitude setting of + 17.00 dBm for 3320B with 50 Ω output.

(2) Amount of capacitor, C3, discharge (Delay) varies with amplitude setting and may be observed with an oscilloscope:

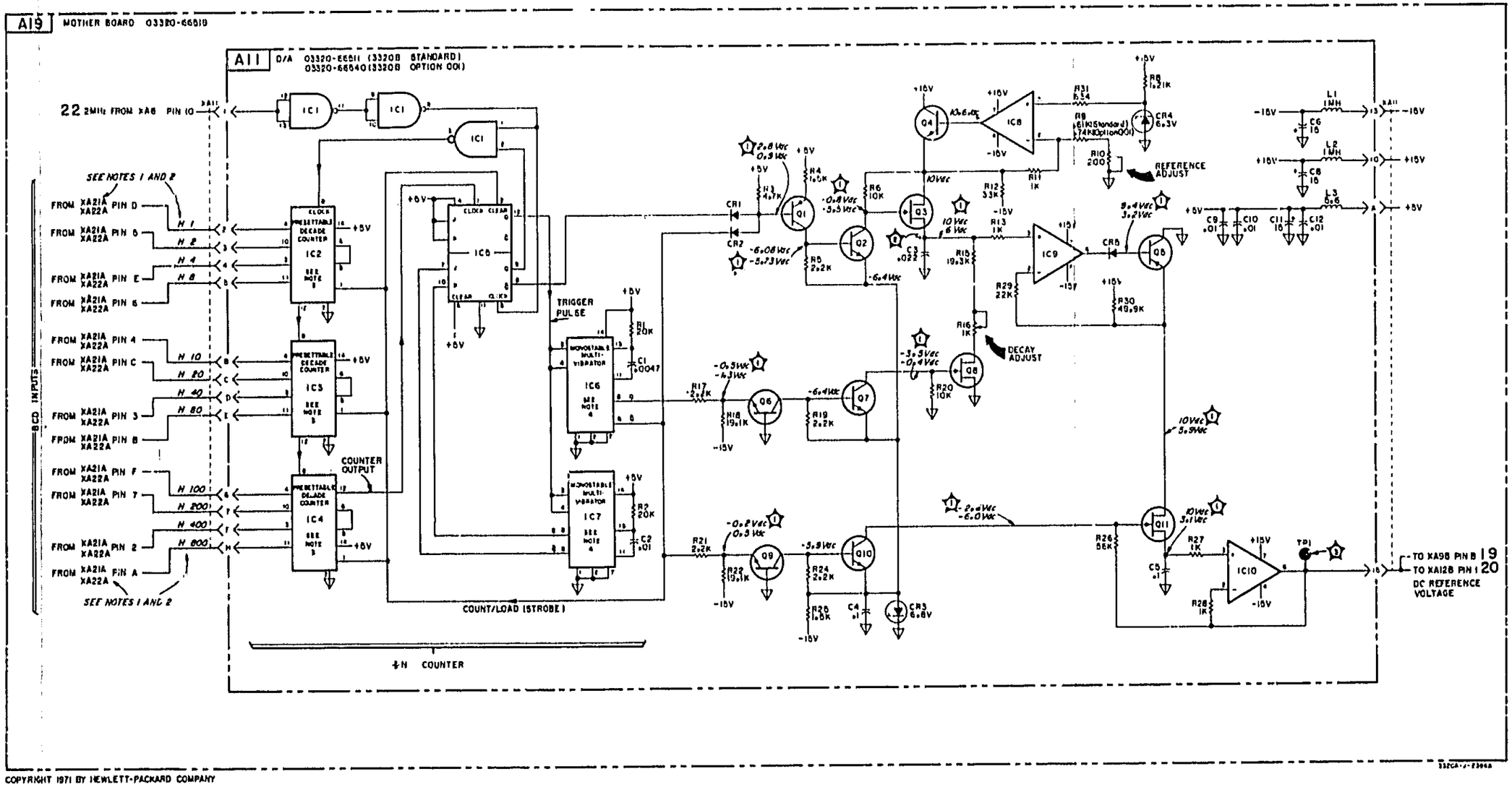
1. At maximum amplitude setting and at all levels 10 dB down from maximum amplitude, there is no discharge and the capacitor remains at + 10 V. Examples for 3320B with 50 Ω output:

Amplitude Setting	BCD INPUTS	Capacitor Discharge
+ 26.99	999	+ 10 V
+ 16.99	999	+ 10 V
+ 6.99	999	+ 10 V
- 3.01	999	+ 10 V
- 13.01	.	.
.	.	.
.	.	.
.	.	.

2. Capacitor, C3, discharges from + 10 V to + 3.165 V at 9.99 dB down from maximum output. Or, any time the BCD INPUTS to A11 = 000.

(3) For 3320B with 50 Ω output:
+ 10.000 V dc ± .002 V at + 16.99 dBm
+ 3.1659 V dc ± .0006 V at + 17.00 dBm

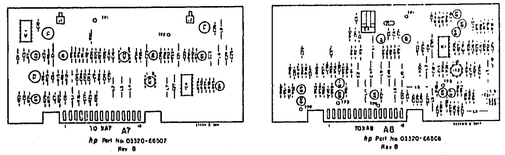
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



COPYRIGHT 1971 BY HEWLETT-PACKARD COMPANY

Figure 7-29. Amplitude Reference A11, 3320B.
7-59/7-60

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



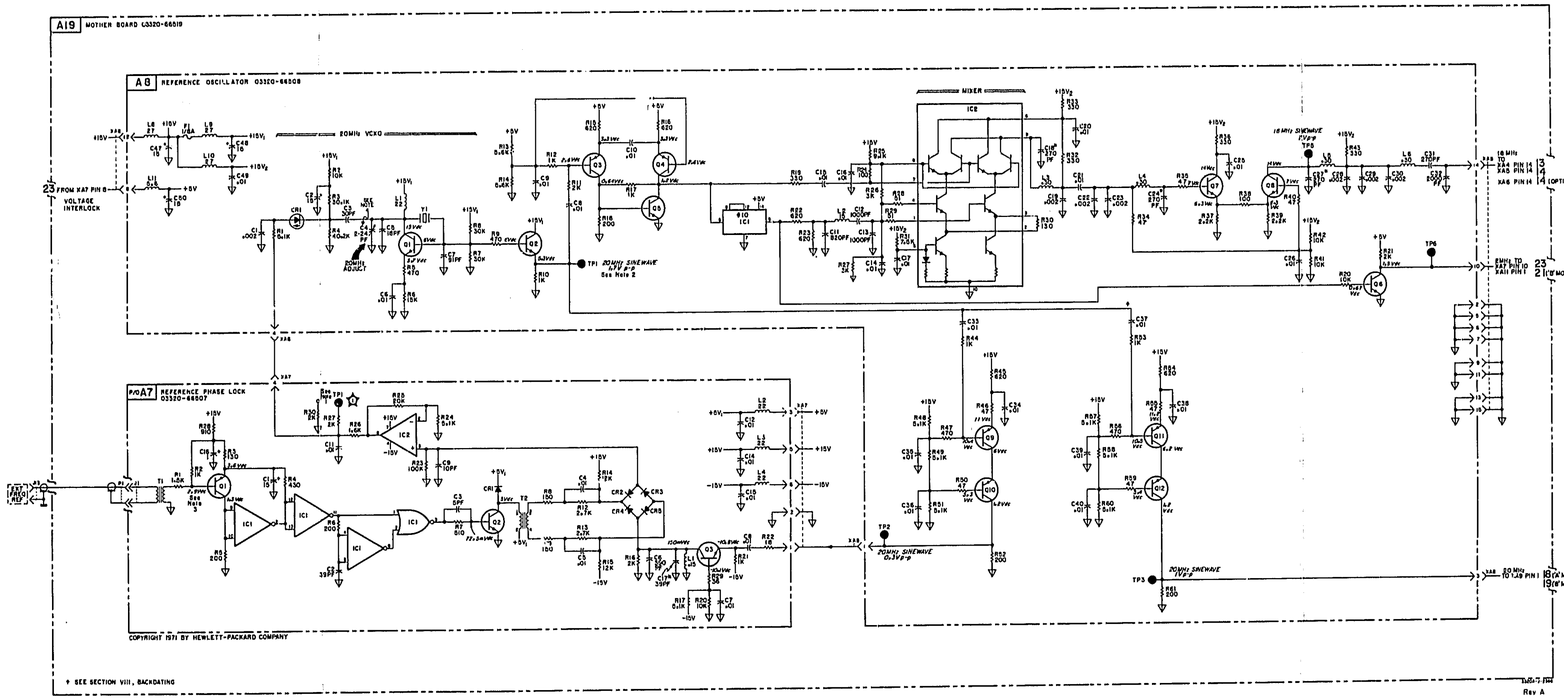
NOTE 1: TP may be removed and a jack (-hp- Part No. 1250-1105) mounted in its place. A cable can be routed from this jack to the 3320A/B rear panel. This will provide an input to the vernier for a dc voltage to control the frequency of the 20 MHz reference oscillator.

NOTE 2: Test point voltages measured with -hp- 180A Oscilloscope using 10:1 probe.
DC voltages measured with high input resistance, low capacitance voltmeter (-hp- 412A).

NOTE 3: DC voltages measured with no EXT. FREQ REF applied.

NOTE 4: Refer to Paragraph 5-59 before replacing A8C4.

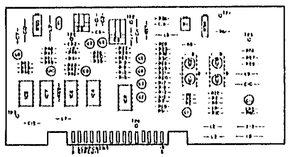
(1) A7TP1, > 6 V p-p when unlocked, see Reference Oscillator Adjustment procedure, Section V.



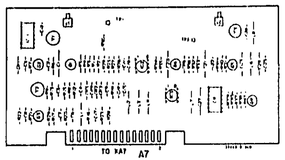
22

Figure 7-30. 20 MHz Reference Oscillator A8, Reference Phase Lock P/O A7.
7-61/7-62

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

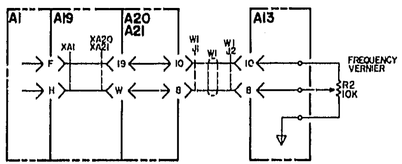


TO XA1 A1
Ap Part No. 03320-66601
Rev C

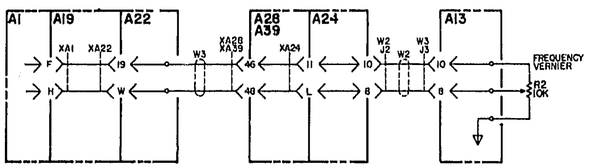


TO XA7 A7
Ap Part No 03320-66507
Rev B

NOTE 1: XA1 pins F and H connect to the Frequency Vernier control as follows.



Standard and Options 001, 002, 006
A Model, Schem. 1
B Model, Schem. 2



A Model Option 003, B Model Option 004, Schematic 6

B Model Option 007, Schematic 10

NOTE 2: Logic signal levels are shown by the letters H or L preceding the name of the line. The H and L indicate the true state (signal present). Voltage levels for the H and L are:

H = +5 V
L = 0 V

Example:

H Delay Flag — Indicates the delay flag line should be +5 V when a delay flag signal is present.

L Data Valid — Indicates the data valid line should be 0 V when a data valid signal is present.

NOTE 3: Refer to Paragraph 6-59 before replacing A1C3 or A1C6.

1. Top voltage measured with 3320A/B in remote mode. Bottom voltage measured in local mode.
2. Top voltage measured with frequency controls set to 0000. Bottom voltage measured with frequency controls set to 1299.
3. Top voltage measured with respective VF input H. Bottom voltage measured with respective VF input L.
4. Top voltage measured with VERN IN (front panel) Bottom voltage measured with VERN OUT.

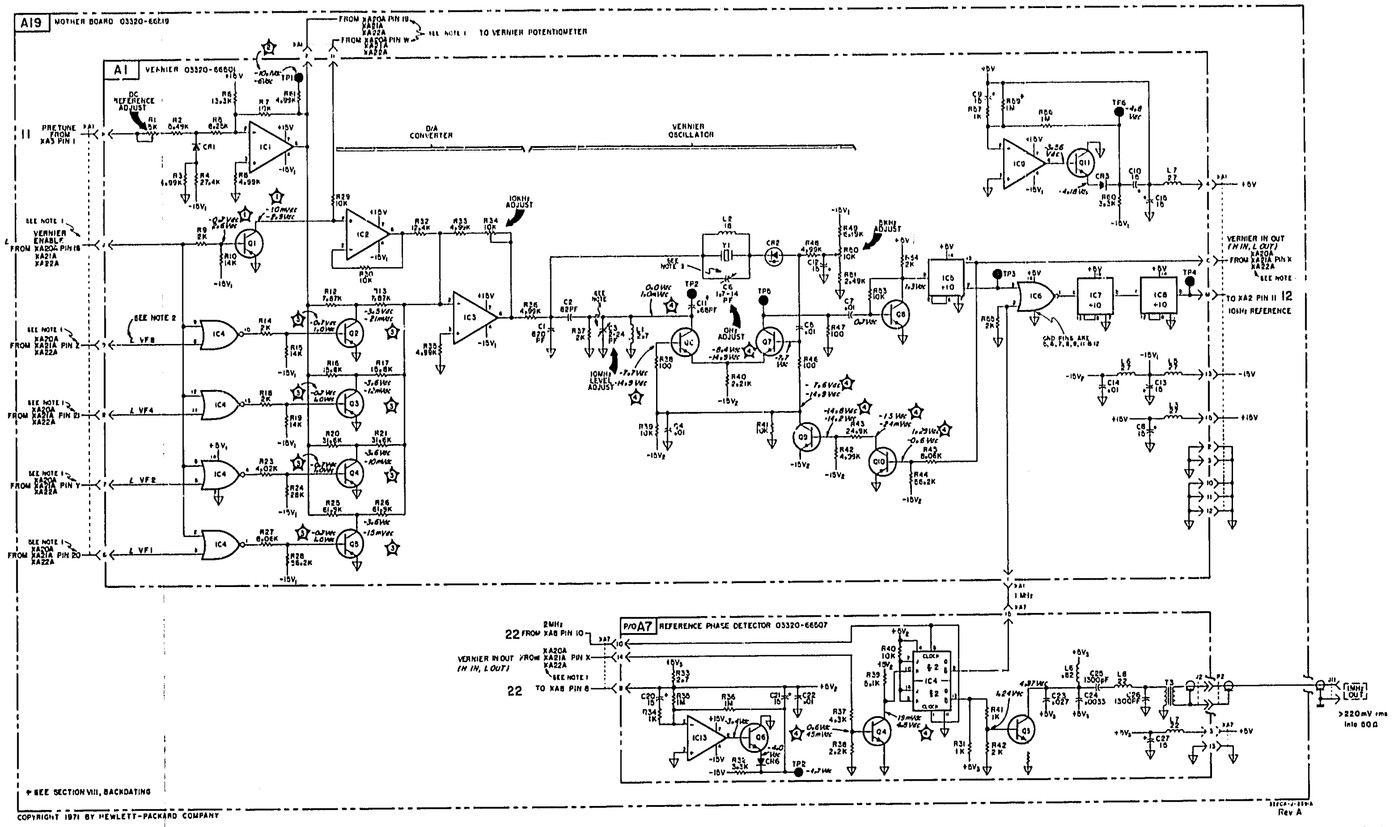
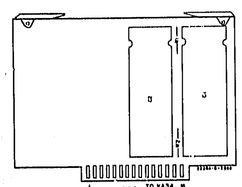
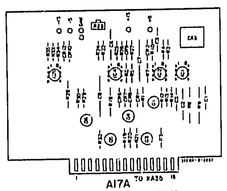
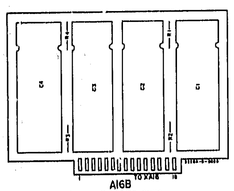


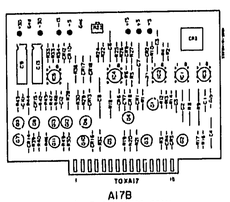
Figure 7-31. Vernier Reference Oscillator A1, Reference Phase Lock P/O A7.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



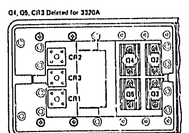


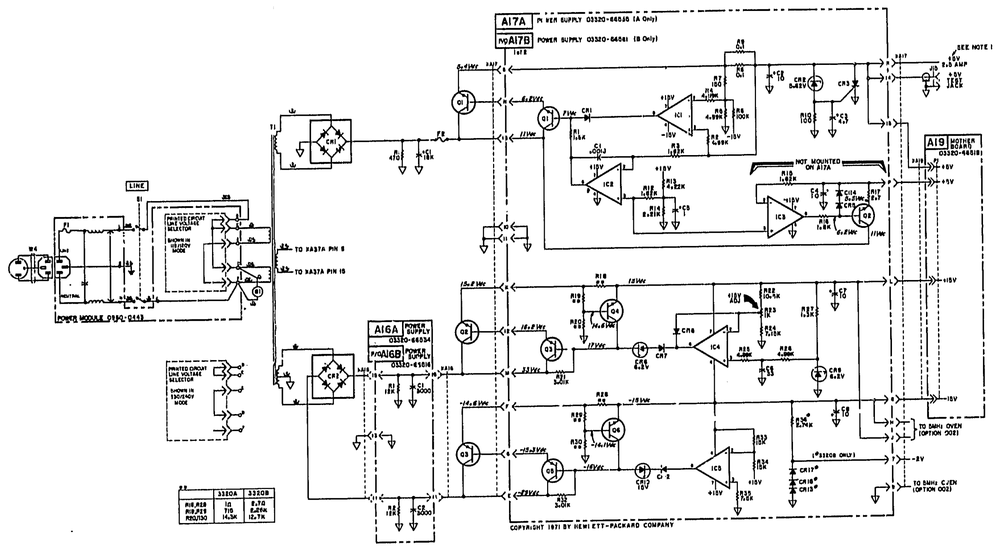




NOTE 1: Tolerances for power supply output voltages are as follows:

A17A/B pin 14 .....5.000 V dc to 5.300 V dc
A17A/B pin p .....5.000 V dc to 5.300 V dc
A17A/B pin L .....14.200 V dc to 15.050 V dc
A17A/B pin B .....-14.8 V dc to -15.2 V dc
A17A/B pin 7 .....-1.9 V dc to 2.1 V dc
A17B pin U .....29.126 V dc to 30.875 V dc
A17B pin C .....-28.803 V dc to -31.200 V dc





	3320A	3320B
R18 R28 R38 R50/130	1Ω 7/8 14.3K	8.7Ω 5.62K 12.7K

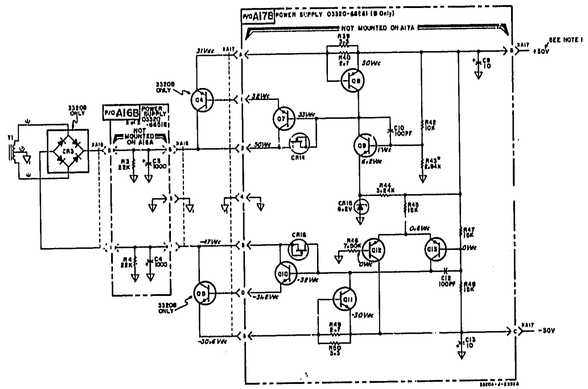
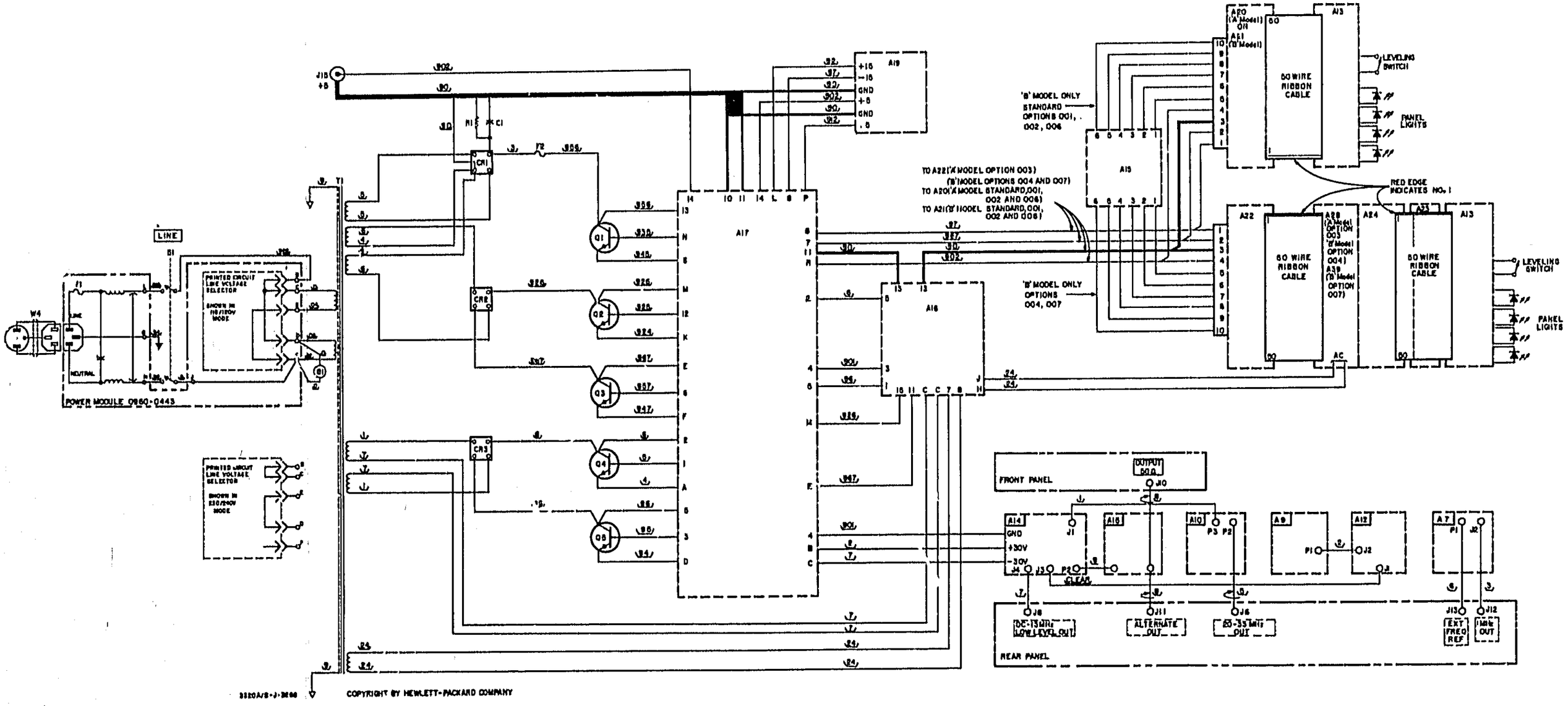


Figure 7-32. Power Supplies: A16A, A17A, 3320A; A16B, A17B, 3320B.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



COPYRIGHT BY HEWLETT-PACKARD COMPANY

Figure 7-33. Wiring Diagram. 7-67/7-68

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

BACK DATING MANUAL CHANGES

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SECTION VIII
BACKDATING

8-1. INTRODUCTION.

8-2. This section contains backdating material which makes this manual applicable to instruments with serial numbers lower than the serial number listed on the title page. Each change has been keyed in the text or illustration with a dagger (†). This alerts the user to a change which may apply to his instrument. If this manual is to be used with an earlier instrument only, the changes which apply to that instrument may be entered into the text where applicable. Where component values in an instrument differ from the Replaceable Parts List, yet are not listed in the backdating section, the components should be replaced using the part number in this manual.

8-3. INSTRUMENT SERIAL NUMBER SEQUENCE.

8-4. Changes are listed in instrument serial number order (lower serial numbers first). However, when referring to the changes for a particular instrument, begin with the latest change and progress to the earliest change that applies to the serial number in question. Table 8-1 lists the serial numbers versus the changes.

8-5. CHANGE 1, FOR SERIAL NUMBERS 1121A-00110 AND BELOW (3320A), 1122A-00120 AND BELOW (3320B).

8-6. Make the following changes:

a. In table 6-1 and Figures 7-12 and 7-17 delete A23R3 and A23R4.

b. In Table 6-1 add the following components to the A8 assembly:

Designator	Description	Part Number
A8C41, C42, C43, C44	C: 0.01 µF 100 V	0160-0093
A8C45	C: 230 pF 500 V	0160-2005
A8C46	C: 680 pF 300 V	0140-0208
A8R62	R: fxd 1000 Ω 5%	0683-1025
A8R63	R: fxd 620 Ω 5%	0683-6215
A8R64, R68	R: fxd 47 Ω 5%	0683-4705
A8R65	R: fxd 470 Ω 5%	0683-4715
A8R66, R67, R69	R: fxd 5100 Ω 5%	0683-5125
A8R70	R: fxd 560 Ω 5%	0683-5615
A8R71	R: fxd 51 Ω 5%	0683-5105
A8Q13, Q14	TSTR: Si PNP	1853-0203
A8L7	Coil: RF	9140-0088
A8P1	Conn: RF	1250-1105
A8T1	TFMR: Toroid	9100-1362

c. In Table 6-1 make the following component changes:

Delete: A1C11, MP29
Add: A1R58. R: fxd 10 kΩ 1% 1/8 W 0757-0442
Change: A1R59 to R: fxd 10 kΩ 1% 1/8 W 0757-0442
MP31 to 03320-60102 1 each Assy: rear deck

d. In Figure 7-30 add the following circuitry to the A8 assembly:

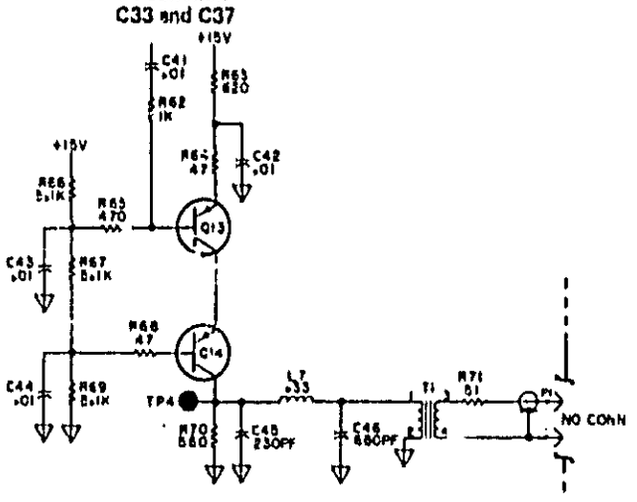


Table 8-1. Serial Number Index.

3320A		3320B	
Instrument Serial Number	Changes	Instrument Serial Number	Changes
1121A-00110 and below	1	1122A-00120 and below	1
1138A-00135 and below	4, 5	See Paragraph 8-7	2
1138A-00185 and below	7	See Paragraph 8-9	3
1138A-00275 and below	9	1139A-00200 and below	4
		1139A-00250 and below	5
		1139A-00340 and below	6
		1139A-00540 and below	7
		1139A-00590 and below	8
		1319A-00690 and below	9

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

c. In Figure 7-31 make the following circuit changes on the A1 assembly:

Delete: A1C11, A1R59
Add: A1R58 and A1R59, 10 kΩ, from pin 2 and pin 3 respectively of IC9 to ground

8-7. CHANGE 2, 3320B.

8-8. Prior to the 15 line GPIB, Option 007, the 3320B contained a 10 line GPIB, Option 005. This manual includes information for the Option 007. For information concerning the Option 005, order the Manual Insert Sheet 3320B-1118 or contact your local Sales and Service Office.

8-9. CHANGE 3, 3320B.

8-10. Change 3 is designed to improve the 3320B harmonic distortion and should be incorporated in all 3320B's.

a. In Table 6-1 the following component changes have been made:

Delete: A14C17, A14C28, C: fxd cer 0.1 μF, 0150-0084

b. In Figure 7-25 the following circuitry changes have been made:

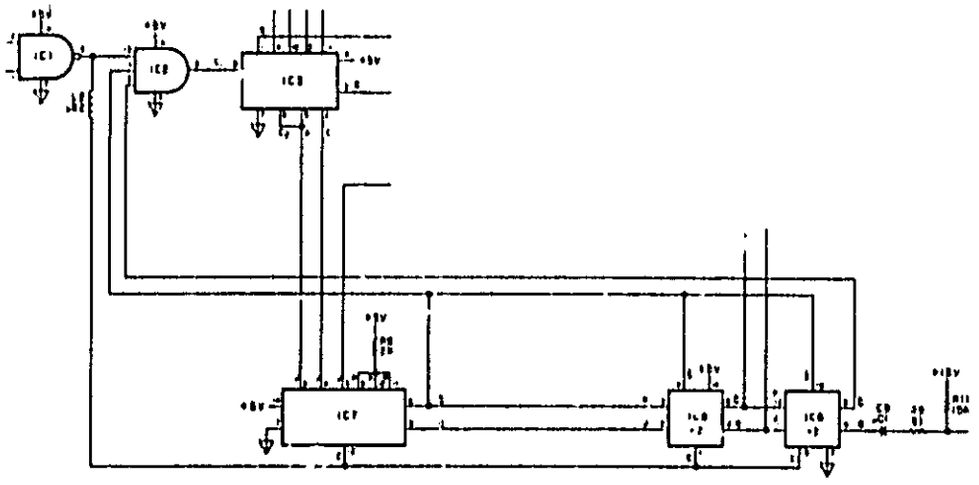
Delete: A14C17, A14C28
Change: A15Q9A and A14Q9B to A14Q16 and A14Q9 respectfully.
A14R22 to 49.9 Ω
A14R56 to 49.9 Ω

8-11. CHANGE 4, FOR SERIAL NUMBERS 1138A-00135 AND BELOW (3320A), 1139A-00200 AND BELOW (3320B).

8-12. Make the following changes:

a. In Table 6-1 make the following component changes:
Add: A2L2, coil/choke: 0.82 μH, 9100-1614
A2R8, R: fxd comp 2000 ohm, 0683-2025
Change: A2CR1, A2CR2, A2CR3, A2CR4 to Diode: Si 50 mA 30 wv, 1901-0040.
A2IC2 to IC: TTL Triple 3-Input AND Gate, 1820-0372.
A2IC8 to IC: Digital TTL Dual J-K FF, 1820-0451
A2R9 to P: fxd comp, 51 Ω, 0683-5105

b. In Figure 7-20 make the following circuitry changes:



8-13. CHANGE 5, FOR SERIAL NUMBERS 1138A-00135 AND BELOW (3320A), 1139A-00250 AND BELOW (3320B).

8-14. In Table 6-1 and Figure 7-21 make the following component changes:

Change:
A4R8 to 820 Ω, 0683-8215
A4R9 to 470 Ω, 0683-4715
A7IC1 to 1820-0923

8-15. CHANGE 6, FOR SERIAL NUMBERS 1139A-00340 AND BELOW (3320B).

8-16. In Table 6-1 and Figure 7-28 A12BC19 C: fxd 18 pF 100 V 0160-2322 has been added. This increases the output amplitude accuracy and stabilization. See Figure 7-28 for location.

8-17. CHANGE 7, FOR SERIAL NUMBERS 1138A-00185 AND BELOW (3320A), 1139A-00540 AND BELOW (3320B).

8-18. The A13A/B Switch Assembly in these instruments are not designed for the replacement of individual switch wafers and detents. If the A13A/B assembly fails in these instruments it is necessary to replace the front panel assembly with the new front panel assembly (MP20) listed in Table 6-1. The front panel assembly listed in Table 6-1 contains the latest A13A/B Switch Assembly. This assembly is designed for replacement of individual switch components. A disassembly/assembly procedure for the front panel assembly is outlined in Section V, Paragraph 5-49.

8-19. CHANGE 8, FOR SERIAL NUMBERS 1139A-00590 AND BELOW (3320B).

8-20. In Table 6-1 delete Cable Assembly 03320-61618.

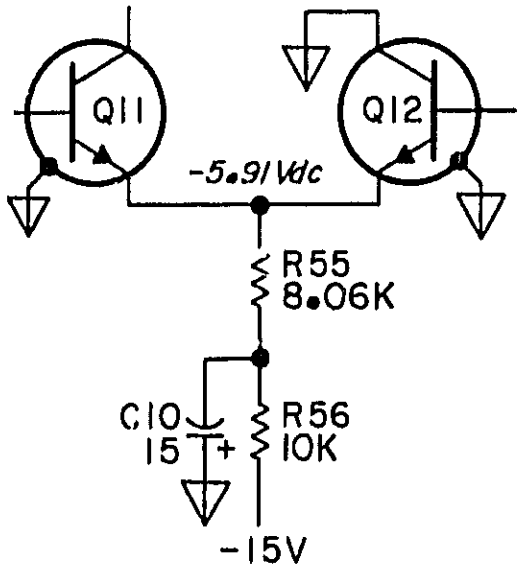
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

8-21. CHANGE 9, FOR SERIAL NUMBERS 1138A-00276 AND BELOW (3320A), 1319A-00690 AND BELOW (3320B).

8-22. Make the following changes:

a. In Table 6-1 delete A3C26 and A3R85. Change A3R55 to R: fxd 8060 Ω 1% 0698-4473.

b. In Figure 7-19 Change A3Q11 and A3Q12 circuitry as follows:



8-23. CHANGE 10, FOR 3320B WITH REVISION B ASSEMBLY 03320-66514.

8-24. In Table 6-1, Replaceable Parts, change:

A14C41 to 0180-0376 C:fxd 0.47 microfarad
A14C42 to 0160-3077 C:fxd .027 microfarad
A14IC1 to 1820-0203
A14R8 to 0698-3518 R:fxd 7.32 kilohm
A14R9 to 0698-4427 R:fxd 1.65 kilohm
A14R20 to 0698-4135 R:fxd 8.87 kilohm

Delete.
A14C31, A14R31, A14R51, A14R54

Make the above value changes and deletions on the A14 schematic diagram on Page 7-51/7-52, Figure 7-25.

8-25. CHANGE 11 FOR 3320B WITH REVISION B ASSEMBLY 03320-66537.

8-26. In Table 6-1, Replaceable Parts, and Page 7-29/7-30, Figure 7-14, delete A37C9 and A37R37.

8-27. CHANGE 12 FOR SERIAL NUMBERS 1624A00416 AND BELOW (3320A); AND 1319A01100 AND BELOW (3320B).

8-28. In Table 6-1, Replaceable Parts, and Page 7-39/7-40, Figure 7-19, delete A3C27 and A3L7.

8-29. CHANGE 13 FOR SERIAL NUMBERS 1319A01150 AND BELOW (3320B).

8-30. In Table 6-1, Replaceable Parts, make the following changes for Power Supply Assembly A17B only, Part No. 03320-66517. If the entire assembly must be replaced, use Part No. 03320-66561.

Change:
A17BCR13 to 1902-0579 Diode:bkdn 5.11 volts
A17BR18 and R28 to 0811-3050 R:fxd 0.75 ohm
A17BR19 and R29 to 0698-3700 R:fxd 715 ohms
A17BR2C and R30 to 0698-4307 R:fxd 14.3 kilohms
A17BR36 to 0687-3301 R:fxd 33 ohms

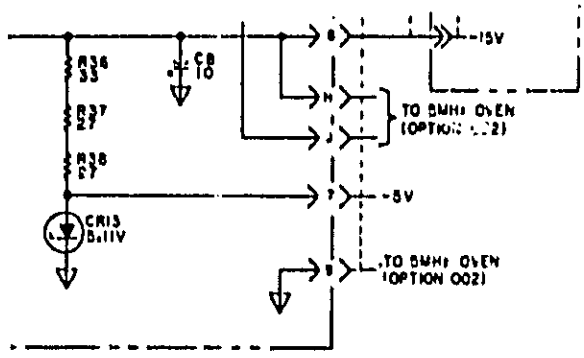
Add:
A17BR37 and R38, 0687-2701 R:fxd 27 ohms

Delete:
A17BCR17 and CR18

On Page 7-65/7-66, Figure 7-32, change the following values for A17B only.

Change:
A17BR18 and R28 to 0.75 ohm
A17BR19 and R29 to 2.26 kilohms
A17BR20 and R30 to 14.3 kilohms
A17BR36 to 33 ohms

Change the -15 V supply for A17B only as follows:



Replace the A21B parts list in Table 6-1 with Table 8-2; and use Figure 8-1 instead of Figure 7-10.

Replace the A24B parts list in Table 6-1 with Table 8-3, and use Figures 8-2 and 8-3 instead of Figures 7-13 and 7-18.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 8-2. A21B Replaceable Parts.

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A21 (STD 3320B ONLY)	03320-66521	1	BOARD ASSY-INTERFACE B	28480	03320-66521
A21IC1	1820-0586		IC:DIGITAL TTL HEX CONVERTER	28480	1820-0586
A21IC2	1820-0586		IC:DIGITAL TTL HEX CONVERTER	28480	1820-0586
A21IC3	1820-0586		IC:DIGITAL TTL HEX CONV. RTER	28480	1820-0586
A21IC4	1820-0766	8	IC: MOS	28480	1820-0766
A21IC5	1820-0766		IC: MOS	28480	1820-0766
A21IC6	1820-0766		IC: MOS	28480	1820-0766
A21IC7	1820-0766		IC: MOS	28480	1820-0766
A21IC8	1820-0598		IC:DIGITAL TTL QUAD 2-INPT EXCL OR GATE	28480	1820-0598
A21IC9	1820-0584		IC:TTL QUAD 2-INPT NOR GATE	28480	1820-0584
A21IC12	1820-0587		IC:TTL TRIPLE 3-INPT NAND GATE	28480	1820-0587
A21IC13	1820-0586		IC:DIGITAL TTL HEX CONVERTER	28480	1820-0586
A21IC14	1820-0581		IC:TTL QUAD 2-INPT NAND GATE	28480	1820-0581
A21IC15	1820 0777		IC DIGITAL	01295	SN74S18
A21Q1	1853-0203		TSTR:SI PNP	28480	1853-0203
A21Q2	8355-0081		TSTR:SI FET	80131	2N5245
A21Q3	1853-0203		TSTR:SI PNP	28480	1853-0203
A21Q4	1854-0071		TSTR:SI NPN:SELECTED FROM 2N3704)	28480	1854-0071
A21R1	1810-0041		R:NETWORK,8 RES, 2.7K OHM 5%	28480	1810-0041
A21R2	1810-0041		R:NETWORK,8 RES, 2.7K OHM 5%	28480	1810-0041
A21R3	1810-0041		R:NETWORK,8 RES, 2.7K OHM 5%	28480	1810-0041
A21R4	1810-0041		R:NETWORK,8 RES, 2.7K OHM 5%	28480	1810-0041
A21R5	1810-0041		R:NETWORK,8 RES, 2.7K OHM 5%	28480	1810-0041
A21R6	1810-0041		R:NETWORK,8 RES, 2.7K OHM 5%	28480	1810-0041
A21R7	0683-1535		R:FXD COMP 15K OHM 5% 1/4W	01121	CB 1535
A21R8	0683-7535		R:FXD COMP 75K OHM 5% 1/4W	01121	CB 7535
A21R9	0683-1125		R:FXD COMP 1100 OHM 5% 1/4W	01121	CB 1125
A21R10	0683-2035	3	R:FXD COMP 20K OHM 5% 1/4W	01121	CB 2035
A21R12	0683-8215		R:FXD COMP 82C OHM 5% 1/4W	01121	CB 8215
A21R13	0683-2425		R:FXD COMP 2400 OHM 5% 1/4W	01121	CB 2425
A21R14	0683-1325	2	R:FXD COMP 1300 OHM 5% 1/4W	01121	CB 1325
A21R15	0683-1815	3	R:FXD COMP 180 OHM 5% 1/4W	01121	CB 1815
A21R16	0683-1025		R:FXD COMP 1000 OHM 5% 1/4W	01121	CB 1025
A21R17	0683-2025		R:FXD COMP 2000 OHM 5% 1/4W	01121	CB 2025
A21R18	0683-2725		R:FXD COMP 2700 OHM 5% 1/4W	01121	CB 2725
A21R19	0683-2725		R:FXD COMP 2700 OHM 5% 1/4W	01121	CB 2725
A21R20	0683-1545		R:FXD COMP 150K OHM 5% 1/4W	01121	CB 1545
A21R21	0683-5125		R:FXD COMP 5100 OHM 5% 1/4W	01121	CB 5125

8-31. CHANGE 14 FOR SERIAL NUMBERS 1E24A00626 AND BELOW (3320A); AND 1532A01400 AND BELOW (3320B).

8-32. The use of Power Input Module, Part No. 5060-1188 has been discontinued, and this part has been replaced in the 3320A/B by Part No. 0960-0443. The principal difference is the method of selecting operating voltages. If it is necessary to replace this module in an older instrument, the following list shows the wire connections to the new module. See Figure 2-1 for voltage selection.

Wire Connections

Wire Color	Old Module 5060-1188	New Module 0960-0443
GRN/YEL	1	G (solder lug)
WHT/BRN/GRA		L
WHT/GRA		N
WHT/RED/GRA	2	B
BLK	3	C
BLK/GRN	4	D
BLK (To Blower)	4	
BLK/YEL	7	E
BLK/RED	6	F
BLK (To Blower	6	F
GRA	5	J

8-33. CHANGE 15 FOR 3320B SERIAL NUMBERS 1532A01381 THROUGH 1532A01460 ONLY.

8-34. Page 6-24, Table 6-1. Change A17BR13 to 0698-4477 R:fxd 10.5 kilohms.

8-35. Page 7-65/7-66, Figure 7-32. For A17B, change value of R13 to 10.5 K and connect upper end of R13 to + 30 V.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 8-3. A24B Replaceable Parts.

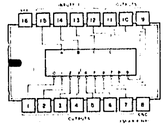
Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A24B 03320					
OPT 004 007 ONLY)	03320-66624	1	BOARD ASSY AMPLITUDE CONTROL	28480	03320-[illegible]
A24C1	0150-0093		CAPACITOR-FXD CER 0.01 UF +80-20% 100VDCW	72982	801-000011
A24C2	0150-0093		CAPACITOR-FXD CER 0.01 UF +80-20% 100VDCW	72982	801-000011
A24C3	0150-0093		CAPACITOR-FXD CER 0.01 UF +80-20% 100VDCW	72982	801-000011
A24IC1	1820-0590		IC I DIGITAL TTL DUAL 2-WIDE,INPT AND/OR	28480	1820-0590
A24IC2	1820-0590		IC I DIGITAL TTL DUAL 2-WIDE,INPT AND/OR	28480	1820-0590
A24IC3	1820-0590		IC I DIGITAL TTL DUAL 2-WIDE,INPT AND/OR	28480	1820-0590
A24IC4	1820-0590		IC I DIGITAL TTL DUAL 2-WIDE,INPT AND/OR	28480	1820-0590
A24IC5	1820-0590		IC I DIGITAL TTL DUAL 2-WIDE,INPT AND/OR	28480	1820-0590
A24IC6	1820-0590		IC I DIGITAL TTL DUAL 2-WIDE,INPT AND/OR	28480	1820-0590
A24IC7	1820-0590		IC I DIGITAL TTL DUAL 2-WIDE,INPT AND/OR	28480	1820-0590
A24IC8	1820-0590		IC I DIGITAL TTL DUAL 2-WIDE,INPT AND/OR	28480	1820-0590
A24IC9	1820-0766		IC I MOS	28480	1820-0766
A24IC10	1820-0766		IC I MOS	28480	1820-0766
A24IC11	1820-0766		IC I MOS	28480	1820-0766
A24IC12	1820-0766		IC I MOS	28480	1820-0766
A24IC13	1820-0583		IC I TTL QUAD 2-INPT NAND GATE	28480	1820-0583
A24IC14	1820-0584		IC I TTL QUAD 2-INPT NOR GATE	28480	1820-0584
A24IC15	1820-0471	1	IC I TTL HEX INVERTER	28480	1820-0471
A24Q1	1853-0203		TSTR:SI PNP	28480	1853-0203
A24Q2	1855-0081		TSTR:SI FET	80131	2N5243
A24Q3	1853-0203		TSTR:SI PNP	28480	1853-0203
A24R1	1810-0041		R NETWORK,8 RES, 2.7K OHM 5%	28480	1810-0041
A24R2	1810-0041		R NETWORK,8 RES, 2.7K OHM 5%	28480	1810-0041
A24R3	1810-0041		R NETWORK,8 RES, 2.7K OHM 5%	28480	1810-0041
A24R4	1810-0041		R NETWORK,8 RES, 2.7K OHM 5%	28480	1810-0041
A24R5	0683-1535		R:FXD COMP 15K OHM 5% 1/4W	01121	CB 1535
A24R6	0683-5125		R:FXD COMP 5100 OHM 5% 1/4W	01121	CB 5125
A24R7	0683-1545		R:FXD COMP 150K OHM 5% 1/4W	01121	CB 1545
A24R8	0683-7535		R:FXD COMP 75K OHM 5% 1/4W	01121	CB 7535
A24R9	0683-1125		R:FXD COMP 1100 OHM 5% 1/4W	01121	CB 1125
A24R10	0683-1815		R:FXD COMP 180 OHM 5% 1/4W	01121	CB 1815
A24R12	0683-2425		R:FXD COMP 2400 OHM 5% 1/4W	01121	CB 2425
A24R13	0683-8215		R:FXD COMP 820 OHM 5% 1/4W	01121	CB 8215
A24R14	0683-2035		R:FXD COMP 20K OHM 5% 1/4W	01121	CB 2035
A24R15	0683-5115		R:FXD COMP 510 OHM 5% 1/4W	01121	CB 5115
A24R16	0683-5115		R:FXD COMP 510 OHM 5% 1/4W	01121	CB 5115
A24R17	0683-1815		R:FXD COMP 180 OHM 5% 1/4W	01121	CB 1815
A24R18	0683-1025		R:FXD COMP 1000 OHM 5% 1/4W	01121	CB 1025
A24R19	0683-2025		R:FXD COMP 2000 OHM 5% 1/4W	01121	CB 2025
A24R53	0683-1535		R:FXD COMP 15K OHM 5% 1/4W	01121	CB 1535

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

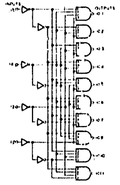
NOTE 1: 9's Complement Circuitry:

Digit	INPUT 1	2	4	8	9's COMPLEMENT 1	2	4	8
0	H	H	H	H	L	L	L	H
1	L	H	H	H	H	H	H	L
2	H	L	H	H	H	H	L	H
3	L	L	H	H	L	L	H	L
4	H	H	L	H	H	H	L	H
5	L	H	L	H	L	L	H	L
6	H	L	L	H	H	L	L	L
7	L	L	L	H	L	H	L	L
8	H	H	H	L	H	L	L	L
9	L	H	H	L	L	L	L	H

NOTE 2: On A21IC15, input at pin 12 is hard wired low, and output pins 9, 10, and 11 are not used (N/C).



INPUT 12	13	14	15	DECIMAL OUTPUT 1	2	3	4	5	6	7	9	10	11
L	L	L	L	L	H	H	H	H	H	H	H	H	H
L	L	L	H	H	L	H	H	H	H	H	H	H	H
L	L	H	L	H	H	L	H	H	H	H	H	H	H
L	L	H	H	H	H	H	L	H	H	H	H	H	H
L	H	L	L	H	H	H	H	L	H	H	H	H	H
L	H	L	H	H	H	H	H	H	L	H	H	H	H
L	H	H	L	H	H	H	H	H	H	L	H	H	H
L	H	H	H	H	H	H	H	H	H	H	L	H	H
H	L	L	L	H	H	H	H	H	H	H	H	L	H
H	L	L	H	H	H	H	H	H	H	H	H	H	L



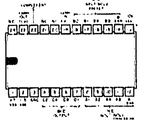
NOTE 3: BCD Low true logic, switch contact(s) to Ground is true state.

Digit	CODE 1	2	4	8
0	0	0	0	0
1	1	0	0	0
2	0	1	0	0
3	1	1	0	0
4	0	0	1	0
5	1	0	1	0
6	0	1	1	0
7	1	1	1	0
8	0	0	0	1
9	1	0	0	1

NOTE 4: IC4, 5, 6, or 7 operate as a BCD Adder. The two BCD inputs (#1 and #2) are summed together and applied to the BCD Output. The BCD Inputs and output lines are high true logic. A true signal on the A Sign Input indicates a negative amplitude number (i.e., -10.00 dBm). The BCD Input #2 is a "hard wired" input, preset by means of jumper wires on the pc assembly. See Note 5.

The Complement /D/ input controls the BCD output (D1, D2, D4, D8) With the Complement /D/ input high (≈ +5 V) the direct BCD sum of inputs #1 and #2 are applied to the BCD Output. With the Complement /D/ input low (≈ -5 V) the 9's complement of the two inputs is applied to the BCD Output. The BCD Output lines have internal pull-up resistors.

Transistor Q1 inhibits a Carry-In signal to IC4 when the Amplitude Sign is positive. Transistors Q2, Q3 and IC8 control the level of the Complement /D/ input.



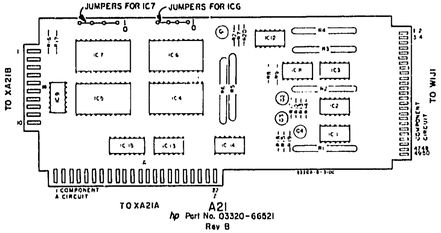
NOTE 5: Jumpers on the A21 Assembly for IC6 and IC7 are preset at the factory:

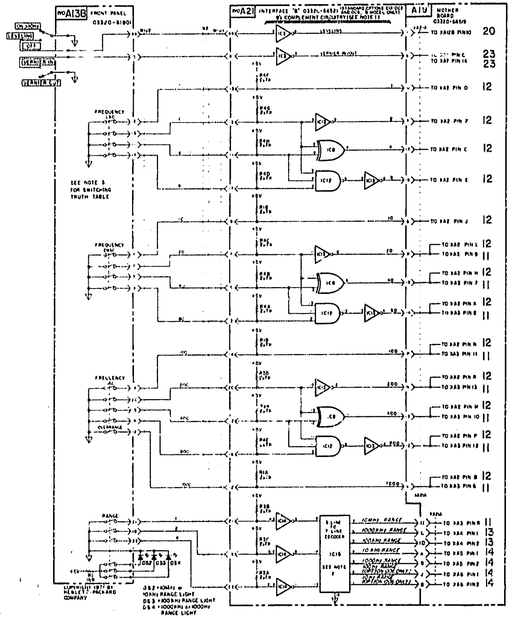
3320B STANDARD, 50Ω Impedance

IC7 Jumpered for BCD 7
IC6 Jumpered for BCD 3

3320B OPTION 001, 75Ω Impedance

IC7 Jumpered for BCD 7
IC6 Jumpered for BCD 5





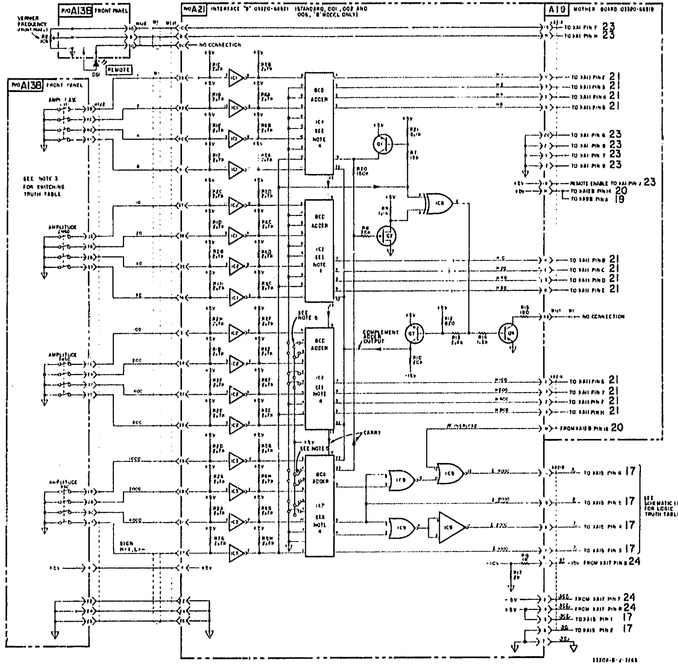


Figure 8-1. Panel Interface A21; 3320B Standard, Options 001, 002, 006 Serial No. 1319A01150 and Lower (3320B).

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

NOTE 1: Logic signal levels are shown by the letters H or L preceding the name of the line. The H and L indicate the true state (signal present). Voltage levels for the H and L are:

H = +5 V
L = 0 V

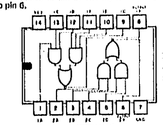
Example:

H Delay Flag – Indicates the delay flag line should be +5 V when a delay flag signal is present.

L Data Valid – Indicates the data valid line should be 0 V when a data valid signal is present.

NOTE 2: In Remote Mode (A Low, B High) the input on pins 12 and 13 is inverted and applied to pin 8. The input on pin 3 is inverted and applied to pin 6.

In Local Mode (A Low, B High) the input on pins 9 and 10 is inverted and applied to pin 8. The input on pin 5 is inverted and applied to pin 6.



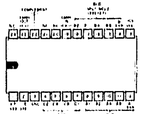
NOTE 3: BCD Low true logic, switch contact(s) to ground is true state.

Digit	CODE 1	2	4	8
0	0	0	0	0
1	1	0	0	0
2	0	1	0	0
3	1	1	0	0
4	0	0	1	0
5	1	0	1	0
6	0	1	1	0
7	1	1	1	0
8	0	0	0	1
9	1	0	0	1

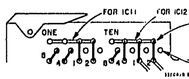
NOTE 4: IC9, 10, 11 or 12 operate as a BCD Adder. The two BCD inputs (/I1 and /I2) are summed together and applied to the BCD Output. The BCD inputs and output lines are high true logic. A true signal on the A Sign Input indicates a negative amplitude number (i.e., -10.00 dBm). The BCD Input /I2 is a "hard wired" input, preset by means of jumper wires on the pc assembly. See Note 5.

The Complement /D/ input controls the BCD output (D1, D2, D4, D8). With the Complement /D/ input high (= +5 V), the direct BCD sum of inputs /I1 and /I2 are applied to the BCD Output. With the Complement /D/ input low (= -5 V), the D's complement of the two inputs is applied to the BCD Output. The BCD Output lines have internal pull-up resistors.

Transistor Q1 inhibits a Carry-In signal to IC9 when the Amplitude Sign is positive. Transistors Q2, Q3 and associated circuits (IC13, 14 and 15) control the level of the Complement /D/ Input.



NOTE 5: Jumpers on the A24B Assembly for IC11 and IC12 are preset at the factory:

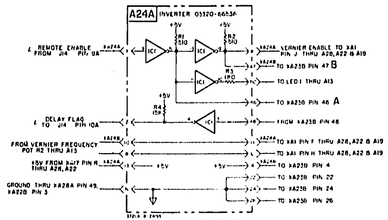


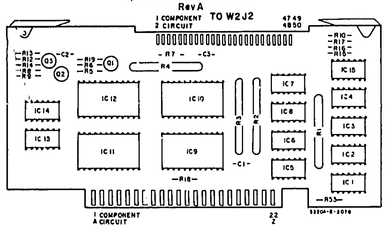
3320B STANDARD, 50 Ω Impedance
(Preset No. 73)

IC12 Jumpered for BCD 7
IC11 Jumpered for BCD 3

3320B OPTION 001, 75 Ω Impedance
(Preset No. 75)

IC12 Jumpered for BCD 7
IC11 Jumpered for BCD 6





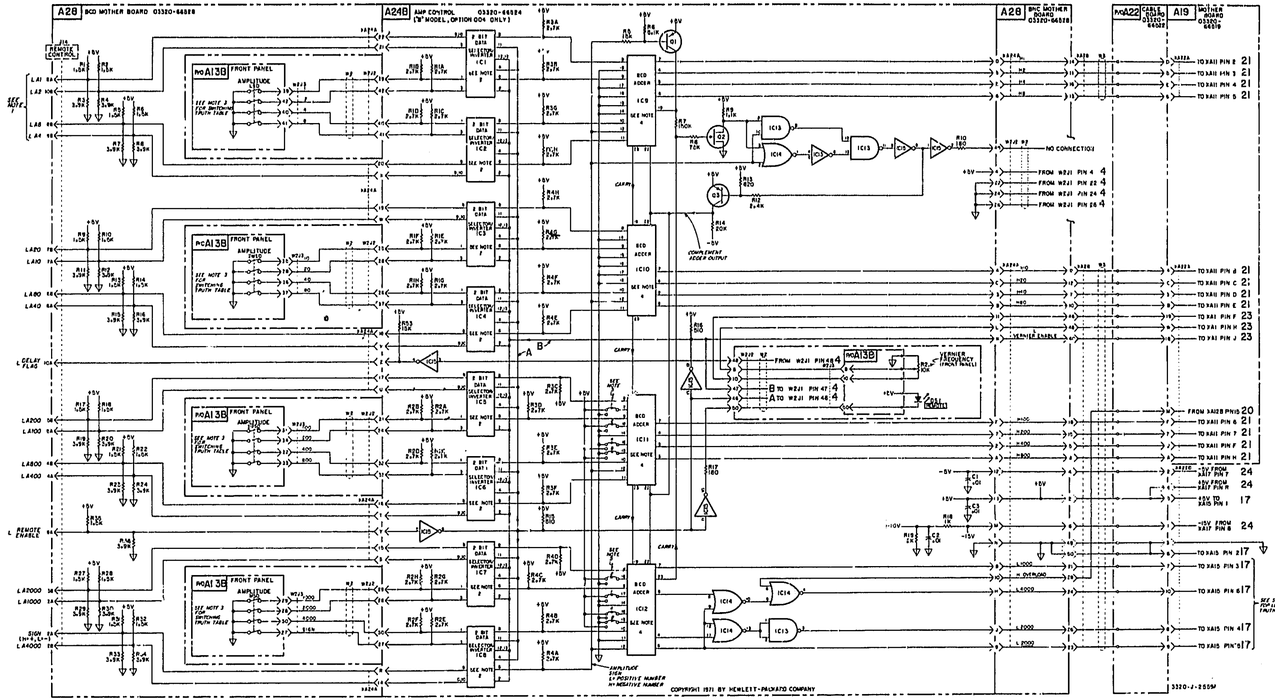


Figure 8-2. BCD Amplitude Control A24B, 3320B Option 004; Inverter A24A, 3320A Option 003 Serial No. 1319A01150 and Lower (3320B).

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

NOTE 1: Logic signal levels are shown by the letters H or L preceding the name of the line. The H and L indicates the true state (signal present). Voltage levels for the H and L are:

H = +5V
L = 0V

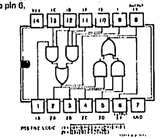
Example:

H Delay Flag – Indicates the delay flag line should be +5 V when a delay flag signal is present.

L Data Valid – Indicates the data valid line should be 0 V when a data valid signal is present.

NOTE 2: In Remote Mode (A High, B Low) the input on pins 12 and 13 is inverted and applied to pin 8. The input on pin 3 is inverted and applied to pin 6.

In Local Mode (A Low, B High) the input on pins 9 and 10 is inverted and applied to pin 8. The input on pin 5 is inverted and applied to pin 6.



NOTE 3: BCD Low true logic, switch contact(s) to ground is true (L...).

Digit	CODE 1	2	4	8
0	0	0	0	0
1	1	0	0	0
2	0	1	0	0
3	1	1	0	0
4	0	0	1	0
5	1	0	1	0
6	0	1	1	0
7	1	1	1	0
8	0	0	0	1
9	1	0	0	1

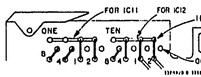
NOTE 4: IC9, 10, 11 or 12 operate as a BCD Adder. The two BCD inputs (#1 and #2) are summed together and applied to the BCD Output. The BCD inputs and output lines are high true logic. A true signal on the A Sign Input indicates a negative amplitude number (i.e., -10.00 dBm). The BCD Input #2 is a "hard wired" input, preset by means of jumper wires on the pc assembly. See Note 5.

The Complement /D/ input controls the BCD output (D1, D2, D4, D8). With the Complement /D/ input high (= +5 V), the direct BCD sum of Inputs #1 and #2 are applied to the BCD Output. With the Complement /D/ input low (=-5 V), the 9's complement of the two inputs is applied to the BCD Output. The BCD Output lines have internal pull-up resistors.

Transistor Q1 inhibits a Carry-In signal to IC9 when the Amplitude Sign is positive. Transistors Q2, Q3 and associated circuits (IC13, 14 and 15) control the level of the Complement /D/ input.



NOTE 5: Jumpers on the A24B Assembly for IC11 and IC12 are preset at the factory

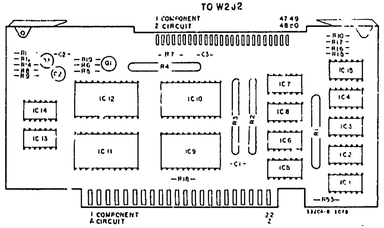


3320B STANDARD, 50 Ω Impedance
(Preset No. 73)

IC12 Jumpered for BCD 7
IC11 Jumpered for BCD 3

3320B OPTION 001, 75 Ω Impedance
(Preset No. 76)

IC12 Jumpered for BCD 7
IC11 Jumpered for BCD 6



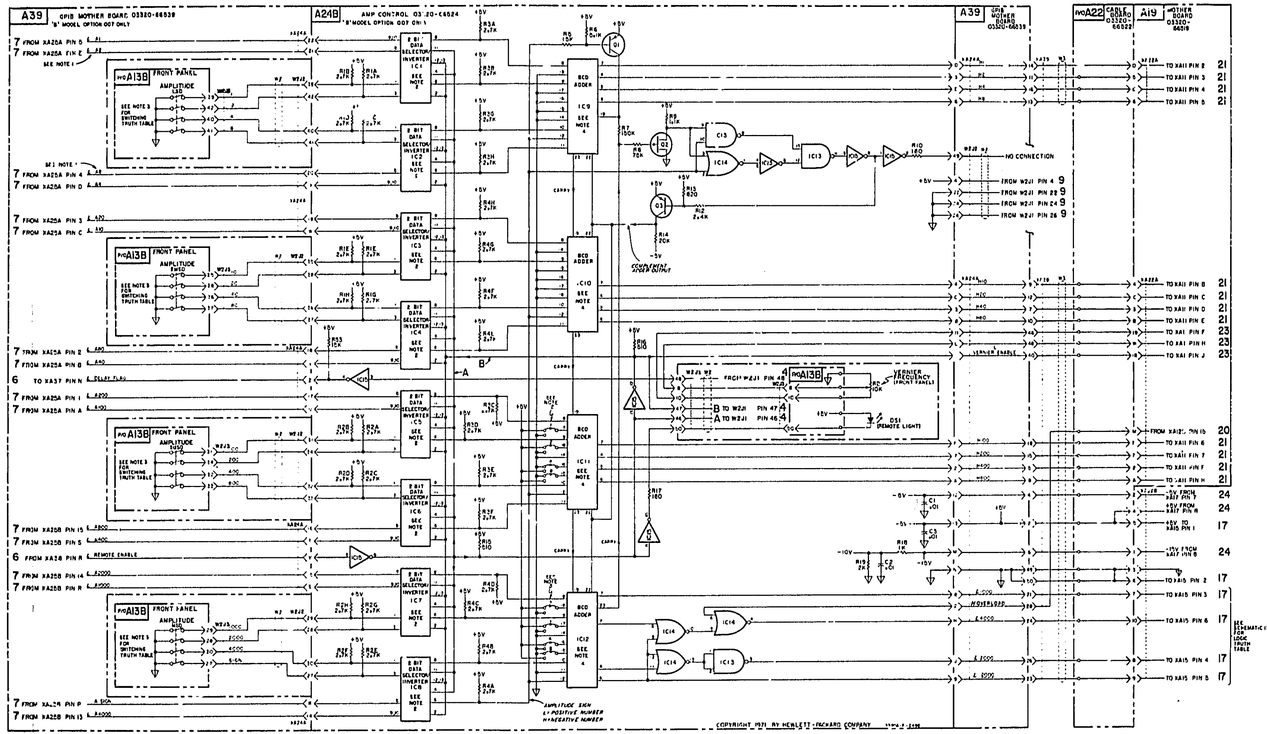


Figure 8-3. GPIB Amplitude Control A24B, 3320B Option 007 Serial No. 1319A01150 and Lower (3320B).

8-11/8-12

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

MANUAL CHANGES

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

MANUAL CHANGES

MODEL 3320A/B

FREQUENCY SYNTHESIZER

Manual Part Number 03320-90002

▌ New or Revised Item

ERRATA

▌**Page 6 6.** Delete connection between quartz Oscillator and 3320B Ext Ref Input in Figure 6-4.

Page 6 11, Paragraph 6-32a. Change the entry (All instruments except Option 002) to (Instruments with Option 002 only).

Paragraph 6 32b. Change the entry (Option 002 only) to (Except Option 002).

Paragraph 6-32c. Change the entry (Option 002 only) to (Except Option 002).

Page 6 23. Change the entry "A17B (3320B ONLY)" to "A17B (3320B ONLY*) Add at the bottom of this page "*See Note #1, Page 6-32"

Page 6 25. Change the entry "A21 (STD3320B) to "A21 (STD3320B*). Add at the bottom of this page "*See Note #1, Page 6-32".

Page 6 32. Add:

NOTE 1 THE FOLLOWING BOARD ASSEMBLIES ARE NOW OBSOLETE FOR THE 3320B ONLY

1. 03320-66517 Power Supply
2. 03320-66521 Interface B
3. 03320-66524 Amplitude Control

Replacements for these boards are as follows.

1 03320-66517 Order 03320-84412
for 3320B Options 004,007
Order 03320-84413
for 3320B all other options
2. 03320-66521 Order 03320-84413
3. 03320-66524 Order 03320-84412

Change the part numbers and descriptions (if necessary) of the following Reference Designators in Table 6-1 Replaceable Parts. This table starts on Page 6-2.

Reference Designator	hp Part Number	Description
A1C4	0160-2030	
A1C5	0160-2030	
A1C7	0160-2030	
A1C14	0160-2030	
A1IC4	1820-1144	
A1IC6	1820-1144	
A1R60	0684-3325	R:Fxd Comp 3300 Ohm, 5%,1/4w
A2C2 C9	0160-2030	
A2C24	0160-2030	
A2C26	0160-2030	
A3C8	0160-2030	
A3C16	0160-2030	
A3C20	0160-2030	
A3C26	0160-2030	
A4C2	0160-2030	
A4C8 C10	0160-2030	
A4C12	0160-2030	
A4C17	0160-2030	
A4C21 C22	0160-2030	
A4C26	0160-2030	
A4C31 C33	0160-2030	
A4C40	0160-2030	
A4C44 C45	0160-2030	
A4C1	1820-1166	
A5C2	0160-2030	
A5C8 C10	0160-2030	
A5C16	0160-2030	
A5C19	0160-2030	
A5C21	0160-2030	
A5C25	0160-2030	
A5C32 C33	0160-2030	
A5C35	0160-2030	
A5C39	0160-2030	
A5C42	0160-2030	
A5C44	0160-2030	
A7C4 C6	0160-2030	
A7C7 C8	0160-2030	
A7C11 C15	0160 2030	
A7C22	0160-2030	
A8C6	0160-2030	
A8C9 C10	0160-2030	
A8C14 C17	0160 2030	
A8C20 C21	0160-2030	
A8C34 C36	0160-2030	
A8C40	0160-2300	
A8C48	0160 2030	
A8C13 C15	0160 2030	
A8C17	0160-2030	
A8C19	0160-2030	
A8C22	0160-2030	
A8C34	0160-2030	C:Fxd 0.01UF
A10C5	0160-2030	
A10C8	0160-2030	
A10C10	0160-2030	
A10C21	0160-2030	
A10C22	0160 2030	
A11C8 C10	0160-2030	
A11C12	0160-2030	
A11IC1	1820-1197	
A11R3	0757-0416	R:Fxd 511 Ohm 1%
A11R19	0757-0433	R:Fxd 3320 Ohm 1%
A11R21	0698-4442	R:Fxd 4420 Ohm 1%
A11R22	0757-0465	R:Fxd Flm 36.5k 1%
A11R24	0698-4442	R:Fxd 4420 Ohm 1%

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Reference Designator	hp Part Number	Description
A12C12	0160-2030	
A12C13	0160-3622	
A12C15-C18	0160-2030	
A12C19-C19	0160-3622	
A12C20-C22	0160-2030	
A14C13	0160-2030	
A14R39	0684-3325	R:Fxd 3300 Ohm 5%
A14C40	0684-3325	R:Fxd 3300 Ohm 5%
A15C2-C3	0160-2030	C:Fxd 0.01UF
A15IC1	1820-1199	
A17CR2	1902-0049	Diode,Breakdown 6.1"V 5%
A17R1	0684-1825	R:Fxd 1800 Ohm 5%
A17R16	0684-1825	R:Fxd 1800 Ohm 5%
A20IC1	1820-1199	
A20IC3	1820-1202	
A10IC4	1820-1199	
A20IC5	1820-1418	
A21IC1-IC3	1820-1199	
A21IC9	1820-1144	
A21IC12	1820-1202	
A21IC12-IC14	1820-1199	
A21IC15	1820 1418	
A22IC1	1820-1418	
A23IC1-IC9	1820-1210	
A23IC12-IC13	1820-1144	
A23IC16	1820-1197	
A23IC19	1820-1202	
A24IC1-IC8	1820-1210	
A24IC14	1820-1144	
A25C1	0160-2220	
A25C2	0160-0362	C:Fxd Mica 510pF
A25C3	0160-2223	C:Fxd Mica 1600pF
A25IC1-IC2	1820-1144	
A25IC6	1820-1197	
A25IC7	1820-1144	
A25IC13-IC15	1820-1197	
A25IC17	1820-1144	
A25R1	0683-3915	R:Fxd 390 Ohm 5%
A25R2	0683-4715	
A25R3	0683-3915	R:Fxd 390 Ohm 5%
A37C1	0140-0198	C:Fxd Mica 200pF 2%
A37C2-C4	0160-0228	C:Fxd Mica 2700pF 5%
A37C5	0160 0930	C:Fxd Mica 430pF 5%
A37C8	0160-0127	C:Fxd Cer 1UF 20% 1000 Vdcw
A37C10	0160-0012	C:Fxd .01UF
A37IC2-IC2	1820-1197	
A37IC3 IC4	1820-1204	
A37IC5 IC7	1820-1144	
A37IC8	1820 1197	
A37IC9	1820-1199	
A37R14	0683-3915	R:Fxd 390 Ohm 5%
A37R15	0683 2715	R:Fxd 270 Ohm 5%
A37R16 R17	0683 4715	R:Fxd 470 Ohm 5%
A37R19 R20	0683 4715	R:Fxd 470 Ohm 5%
A37R21	0683-5115	R:Fxd 510 Ohm 5%
A37R24	0683-5115	R:Fxd 510 Ohm 5%
A37R28	0698 4123	R:Fxd 499 Ohm 1%
A37R34	0698-4123	R:Fxd 499 Ohm 1%
A37R36	0683 1005	R:Fxd 10 Ohm 5%

Reference Designator	hp Part Number	Description
A38C1	0160-2226	C:Fxd MICA 2200pF 5%
A38C3	0160 2228	C:Fxd MICA 2700pF 5%
A38C4	0140-0208	C:Fxd MICA 680pF 5%
A38C8	0160-0945	
A38IC1-IC4	1820-1144	
A38IC6-IC8	1820 1144	
A38IC9	1820-1197	
A38IC11	1820-1144	
A38IC12-IC14	1820-1418	
A38AC15	1820-1199	
A38IC16	1820-1144	
A38IC17	1820-1199	
A38R1	0683-3915	R:Fxd 390 Ohm 5%
A38R2	0698-4447	R:Fxd 280 Ohm 5%
A38R3	0683-3615	R:Fxd 360 Ohm 5%
A38R5	0683-3915	R:Fxd 390 Ohm 5%
A38R6	0683-2715	R:Fxd 270 Ohm 5%
A38R7	0683-4715	R:Fxd 470 Ohm 5%
A38R9	0683-3315	R:Fxd 330 Ohm 5%
A38R10		

Page 7-2. Delete, under "Replaces Part Number", Part Numbers 03320-66517, 03320-66521, and 03320-66524

Add under Table 7-1, the note.

NOTE

For replacement of Part Numbers 03320-66517, 03320-66521, and 03320-66524, refer to Note 1 on Page 6-37

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group is an independent supplier of quality pre-owned equipment

Gold-standard solutions

Extend the life of your critical industrial, commercial, and military systems with our superior service and support.

We buy equipment

Planning to upgrade your current equipment? Have surplus equipment taking up shelf space? We'll give it a new home.

Learn more!

Visit us at **artisantg.com** for more info on price quotes, drivers, technical specifications, manuals, and documentation.

Artisan Scientific Corporation dba Artisan Technology Group is not an affiliate, representative, or authorized distributor for any manufacturer listed herein.

We're here to make your life easier. How can we help you today?

(217) 352-9330 | sales@artisantg.com | artisantg.com

ARTISAN® TECHNOLOGY GROUP