HEWLETT hp PACKARD

OPERATING AND SERVICE MANUAL

CHAPTERS B + C

8505A
NETWORK ANALYZER
500 kHz to 1.3 GHz

SERIAL NUMBERS

Chapter A of this manual applies directly to HP Model 8505A Network Analyzers with serial number prefix 1816A. Chapters B and on apply directly to instruments with serial number prefix 1628A. For instruments with serial number lower than these, refer to the Manual Changes section of each chapter.

1400 FOUNTAIN GROVE PARKWAY, SANTA ROSA, CALIFORNIA 95404 U.S.A.

MANUAL PART NO. 08505-90002

Microfiche Part No. 08505-90003

Printed: SEPTEMBER 1978

MANUAL CHANGES

MANUAL IDENTIFICATION

Model Number: 8505A
Date Printed: September 1978
Part Number: 08505-90002

This supplement contains important information for correcting manual errors and for adapting the manual to instruments containing improvements made after the printing of the manual.

To use this supplement:

Make all ERRATA corrections

Make all appropriate serial number related changes indicated in the tables below.

Serial Prefix or Number	Make Manual Changes
1628A00240 and thru 1631A prefix	1
1644A, 1653	1,2
1646A	1,3
1602A00112	4
1710A	1,2,5
1712A	1,2,5,6,7
1716A	1,2,5,6,7,8
1720A	1,2,5,6,7,8,9
1723A	1,2,5,6,7,8,9,10
1733A	1,2,5 – 11
1735A, 1739	1,2,5 – 12
1745A	1,2,5 – 13
1747A	1,2,5 – 14
1802A	1,2,5 – 15
1804A	1,2,5 – 16

Serial Prefix or Number	Make Manual Changes
1806A	1,2,5 – 17
1816A	1,2,5 – 18
1831A	1,2,5 – 19
1833A	1,2,5 – 20
1845A	1,2,5–21
► 1928A	1,2,5–22
► 1930A, 1932A	1,2,5–23

► NEW ITEM

NOTE

Manual change supplements are revised as often as necessary to keep manuals as current and accurate as possible. Hewlett-Packard recommends that you periodically request the latest edition of this supplement. Free copies are available from all HP offices. When requesting copies quote the manual identification information from your supplement, or the model number and print date from the title page of the manual.

9 OCTOBER 1979

70 Pages

HEWLETT hp PACKARD

The following Service Notes are available from your local HP Sales and Service Office.

SERVICE NOTE	SERIAL NUMBER	DESCRIPTION
8505A-1A	1716A00380 and below	*INCREASED POWER SUPPLY RELIABILITY*
8505A-2	1602A00111 thru 1610A00140	*REDUCED 50 HZ LINE RELATED VARIATIONS ON CRT TRACE*
8505A-3	1622A00185 and below	*RECOMMENDED REPLACEMENT FOR OP AMP*
8505A-4	1606A00130 and below	*IMPROVED OPERATION OF A3A11 GROUP DELAY CIRCUIT*
8505A-5	1723A00396 and below	*AIR FILTER RETAINER*
8505A-6A	All serials	*A3A11 GROUP DELAY DETECTOR TROUBLESHOOTING*
8505A-7	All serials	*A3A4 PROCESSOR INTERFACE BOARD TROUBLESHOOTING*
8505A-8	1716A00380 and below	*ELIMINATION OF MARKER GLITCHES ON CRT WHEN 8505A IS USED WITH HP8501A STORAGE NORMALIZER*
8505A-9	1710A00350 and below	*ELIMINATION OF ERRONEOUS DATA TAKING BY HP-IB AT "TURN ON"*
8505A-10A	All serials	*A3A5 PROCESSOR D/A TROUBLESHOOTING*
8505A-12	All serials	*CRT CONTROL CIRCUITS TROUBLESHOOTING*
8505A-17	All serials	*A3A17 MARKER I ASSEMBLY TROUBLESHOOTING*
8505A-18	All serials	*A3A18 MARKER II ASSEMBLY TROUBLESHOOTING*

ERRATA

All references to "Option 001" should be deleted throughout the manual and the phrase "HP-IB" substituted in their pl

Page A4-24, Paragraph A4-18:
In step a, "On A3 Signal Processor, Channel 1", change MODE switch position to PHASE.

Page B2-8, Table B2-2:
Change A1A15J1 thru J5 to HP Part Number 1250-0691.

Page B2-10, Table B2-2:
Add another entry after A1A15A1Y1 as follows:
HP Part No. 0410-0675, Crystal, Matched Set, A1A15A1Y1 9.9 MHz Crystal and A2A12Y1 100 MHz Crystal.

Page C2-4, Table C2-2:
Add Reference Designation A2A1W3S1 to the replaceable switch (3101-2025) which is part of Line Switch Cable Ass bly A2A1W3.
Change A2A1A1DS1 thru DS14 to HP Part Number 1990-0503.

Page C2-5, Table C2-2:
Change A2A1A1U2 to HP Part Number 1820-1823.
Change A2A1A1U3 to HP Part Number 1820-1823.
Change A2A1A1U5 to HP Part Number 1820-1823.

Page C2-8, Table C2-2:
Change A2A3U28 to HP Part Number 1820-1823.
Change A2A3U29 to HP Part Number 1820-1823.
Change A2A3U30 to HP Part Number 1820-1823.
Change A2A3U31 to HP Part Number 1820-1823.
Change A2A3U32 to HP Part Number 1820-1823.
Change A2A3U33 to HP Part Number 1820-1823.

Page C2-10, Table C2-2:
► Change A2A4U2 to HP Part No. 1826-0229, OP AMP LOW DRIFT TO-99.
► Change A2A4U5 to HP Part No. 1826-0229, OP AMP LOW DRIFT TO-99.
Add A2A5C35, 0160-0571, CAPACITOR-FXD 470PF +-20% 100 WVDC CER
Add A2A5C36, 0160-3879, CAPACITOR-FXD .01 UF +-20% 100 WVDC CER

Page C2-12, Table 2-2:
Change A2A5U12 to HP Part Number 1820-1823.
Change A2A5U13 to HP Part Number 1820-1823.
Change A2A5U14 to HP Part Number 1820-1823.
Change A2A5U15 to HP Part Number 1820-1823.

►Page C2-15, Table C2-2:
Change A2A7U1 to HP Part No. 1826-0229, OP AMP LOW DRIFT TO-99.
Change A2A7U2 to HP Part No. 1826-0229, OP AMP LOW DRIFT TO-99.
Change A2A7U3 to HP Part No. 1826-0229, OP AMP LOW DRIFT TO-99.
Change A2A7U11 to HP Part No. 1826-0229, OP AMP LOW DRIFT TO-99.
Change A2A7U12 to HP Part No. 1826-0229, OP AMP LOW DRIFT TO-99.

►Page C2-18, Table C2-2:
Change A2A8U17 to HP Part No. 1826-0229, OP AMP LOW DRIFT TO-99.
Change A2A8U19 to HP Part No. 1826-0229, OP AMP LOW DRIFT TO-99.

Page C2-20, Table C2-2:
Change A2A10CR4 and A2A10CR5 to HP Part Number 1901-0743, DIODE-PWR RECT IN4004 400V 1A DO-41.

Page C2-24, Table C2-2:
Add another entry after A2A12Y1 as follows:
HP Part Number 0410-0675, Crystal, Matched Set, A1A15A1Y1 9.9 MHz Crystal and A2A12Y1 100 MHz Crystal

ERRATA (Cont'd)

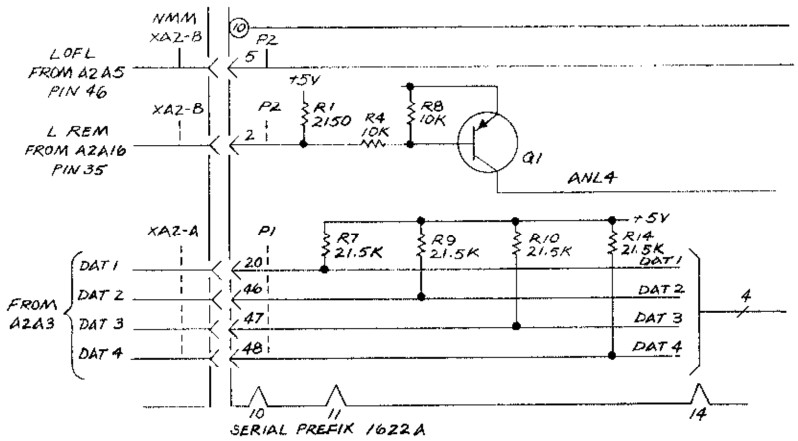
Page C2-25, Table C2-2:
Add additional entries for A2A19 as follows:
A2A19, HP Part Number 08505-60227, YIG OSCILLATOR, NEW (includes A2A11R22 and A2A11R40 Selected Value Resistors).
A2A19, HP Part Number 08505-60228, YIG OSCILLATOR, REBUILT (includes A2A11R22 and A2A11R40 Selected Value Resistors).

Page C2-27, Table C2-2:
Add A2A23, HP Part Number 5086-7005, PREAMP 0.1 - 1300 MHz.

Page C2-28, Figure C2-1:
Change Reference Designation 69 part number to 08505-00135.

►Page C3-33, Table C3-1:
In signal line "MPX H", delete entry in "LOCAL" column and add "A2A15-30" in "REMOTE" column.

Page C3-49, Figure C3-22:
Change notations on connector plugs and jacks as shown in the Partial Schematic.



P/O Figure C3-22. A2A2 Display Logic Schematic (ERRATA)

Page C3-81, Figure C3-31:
Change CR1 to CR3 and CR3 to CR1.

Page C3-81, Figure C3-32:
Change "R58" at input pin 2 of U9A to "R38."

Page C3-93, Figure C3-39:
Change R43 to R42.
Change C9 to C8.
Change R42 to R41.
Change C8 to C9.
Change R41 to R43.

Page C3-93, Figure C3-40:
Change R41 to 10K.
Change R43 to 147K.

Page C3-99, Figure C3-44:
Change "+2V SERIES REGULATORS" to "+20V SERIES REGULATOR".

ERRATA (Cont'd)

Page C3-105, Figure C3-47:
Change references to NOTE 5 on Q1, Q2 and Q3 to NOTE 3.

Page D2-4, Table D2-2:
Change A3F1 from HP Part Number 2110-0059 to HP Part Number 2110-0304, FUSE 1.5 AT 250V SLO-BLO.
Change Reference Designation "A3F2" to A3F1.
Change A3S1 to HP Part Number 3101-1235.
Change A3V1 to HP Part Number 08505-60196, CRT ASSEMBLY WITH OVERLAY TAB MOUNTS.

Page D2-5, Table D2-2:
Add HP Part Number 08505-60154 to the Overlay Kit listed in the table.
Change A3A1DS20-22, 24-26, 28 and 29 to HP Part Number 1990-0503.

Page D2-7, Table D2-2:
Change A3A3C8 to HP Part Number 0180-0116 CAPACITOR-FXD 6.8UF 35VDC.

►Page D2-14, Table D2-2:
Change A3A8VR1 to HP Part No. 1902-3082, DIODE–ZNR 4.64V 5% DO-7 PO = .2W TC = -.016%.

Page D2-30, Table D2-2:
Change A3A24CR2 to HP Part Number 1901-0743, DIODE-PWR RECT IN4004 400V 1A DO-41.

Page D2-31, Table D2-2:
Change Part Number of A3A25R1, A3A25R4, A3A25R5, and A3A25R7 to 2100-3476.
Change Part Number of A3A25R2 to 2100-3473.
Change Part Number of A3A25R3 to 2100-3475.
Change Part Number of A3A25R6 to 2100-3474.

Page D2-32, Table D2-2:
Change A3A26VR1 and A3A26VR2 to HP Part No. 2140-0015, LAMP-GLOW C2A 115/58 VDC 1.9 mA T-2-BULB (Recommended Replacement).

►Change A3A27 to HP Part No. 08505-60237. 08505-60237 is a preferred replacement for 08505-60172.

Page D2-35, Table D2-2:
Change A3A28R20 to A3A28R26, A3A28R24 to A3A28R20, and A3A28R26 toA3A28R24.
Change A3A30C1 to A3A30C2, A3A30C2 to A3A30C5, A3A30C4 to A3A30C1 and A3A30C5 to A3A30C4.

Page D2-36, Figure D2-1:
Add after Item 1 and 5 the following attaching hardware:
0570-1171, SCREW; COVER MTG; 6-32 THD; 0.460-IN LG
0510-0043, RETAINER-RING .141-DIA STL CD-PL
Change Item 16 to HP Part Number 01332-02201.
Change Item 33 to HP Part Number 1490-0968.
►Change Item 34 to HP Part No. 08505-20219, DIVIDER, FRONT FRAME, VERTICAL.
Change Item 36A to HP Part Number 5001-1043.

Page D2-37, Figure D2-1:
Add Item 111, HP Part Number 5001-0432, GUSSET-SIDE.
Change Reference Designation 101 part number to 08505-00135.

Page D3-63, Figure D3-24:
Change C8 to 6.8 UF.

ERRATA (Cont'd)

►Page D3-81, Figure D3-34:
Change the notation on VR1 to "4.64V."
Just above C8, add a notation under "−4.6V" as follows: "TYPICALLY −3.9V."

►Page D3-118, Figure D3-52B:
Change U6 to Up.

►Page D3-131/132, Figure D3-56B:
Change the resistor between C7 and Q8 on the Parts Location drawing from R24 to R26.

Page E4-4, Table E4-2:
Change A2A13U4 to HP Part Number 1820-1823.
Change A2A13U6 to HP Part Number 1820-1823.
Change A2A13U8 to HP Part Number 1820-1823.

Page E4-5, Table E4-2:
Change A2A14U6 to HP Part Number 1820-1823.
Change A2A14U10 to HP Part Number 1820-1823.
Change A2A14U14 to HP Part Number 1820-1823.
Change A2A15U14 to HP Part Number 1820-1823.

Page E4-6, Table E4-2:
Change A2A16U11 to HP Part Number 1820-1823.
Change A2A16U16 to HP Part Number 1820-1823.

Page E4-7, Table E4-2:
Change A3A19U14 to HP Part Number 1820-1823.
Change A3A19U15 to HP Part Number 1820-1823.
Change A3A20U13 to HP Part Number 1820-1823.

Page E4-8, Table E4-2:
Change A3A21U11 to HP Part Number 1820-1823.

Page F4-21/F4-22, Figure F4-15 (Option 005 Supplement):
Change A2A101L1 and A2A101L2 to 270UH.

CHANGE 1

NOTE

This change is required with divide-by-ten IC A2A5U1, Part Number 1820-1636 with "H" at the end of the Manufacturer's Part Number.

Page C2-10, Table C2-2:
Delete A2A5C3, A2A5C8, A2A5C18.

Page C2-11, Table C2-2:
Delete A2A5CR2, A2A5L2, A2A5R2, and A2A5R3.
Change A2A5R1 to HP Part Number 0698-7206, RESISTOR 56.2 OHMS 2% .05W F TC=0+−100.
Change A2A5R4 to HP Part Number 0698-7229 RESISTOR 511 OHM 2% .05W F TC=0+−100.

Page C3-70, Figure C3-27:
Change Parts Location for A2A5 in the manual for Parts Location in this change sheet.

Page C3-71, Figure C3-28:
Change A2A5U1 Circuit as shown in the partial schematic in this change sheet.

CHANGE 2

Pages C2-18, C2-19, and C2-20, Table C2-2:
Change Discriminator Board A2A9 to HP Part Number 08505-60169 and change all component parts per the A2A9 parts list contained in this change sheet.

Page C2-26, Table C2-2:
Change Transistor A2A21Q8 to HP Part Number 1854-0271, Transistor NPN.
Change Resistor A2A21R2 to HP Part Number 0698-3447, Resistor 422 OHM, 1% .125W F TC=0+−100.

CHANGE 1 (Cont'd)

A2A5

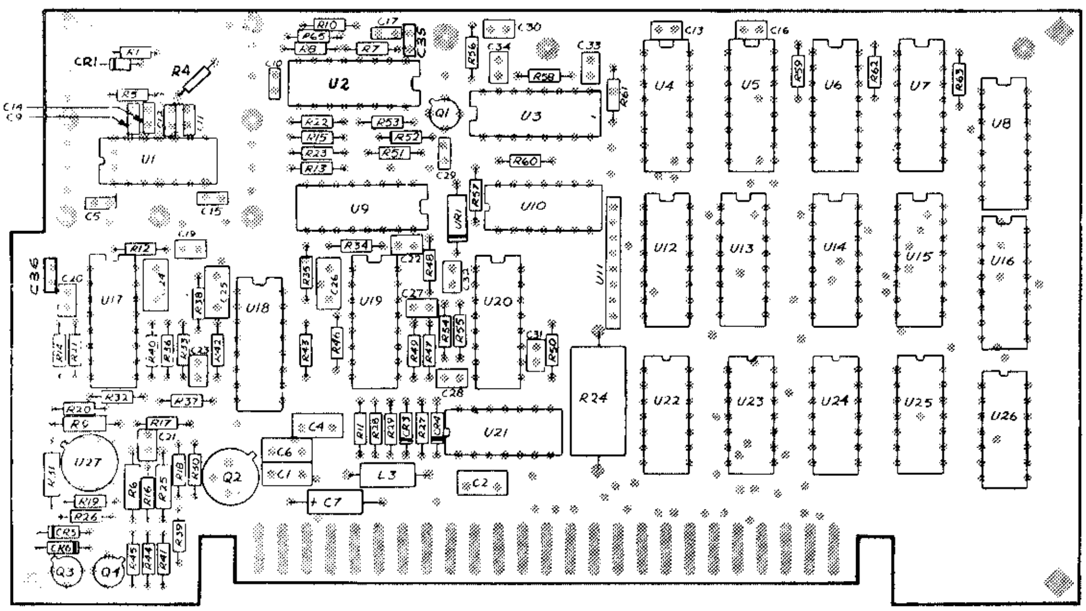
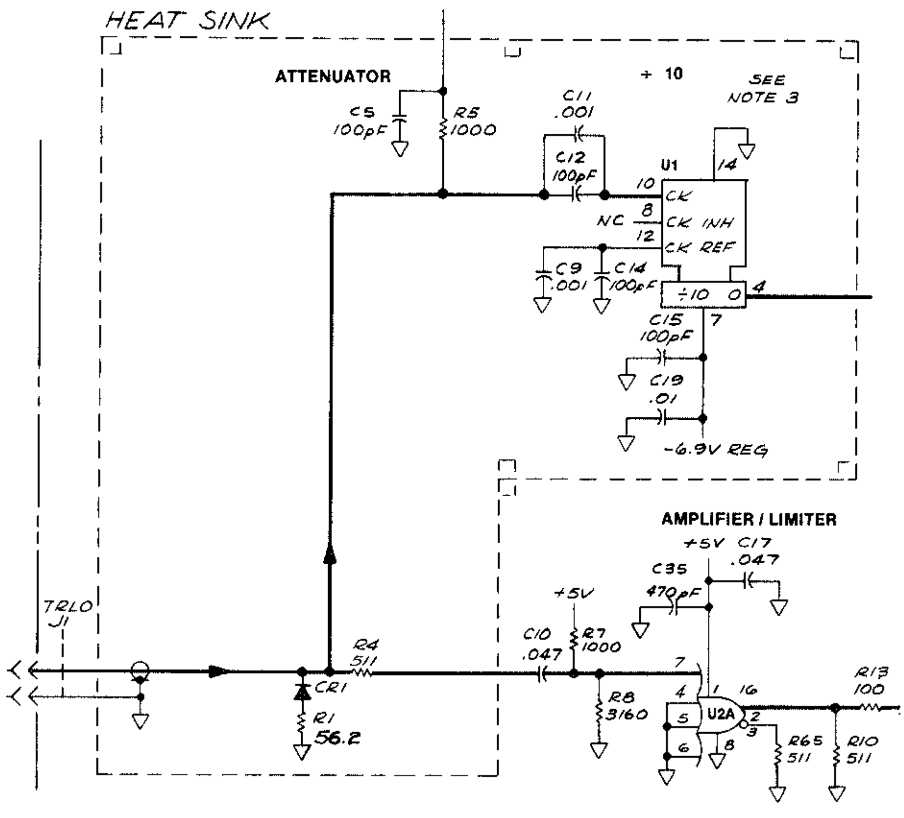


Figure C3-27. A2A5 Prescaler/Counter Parts Locations (CHANGE 1)



P/O Figure C3-28. Partial Schematic of A2A5 (CHANGE 1)

CHANGE 2 (Cont'd)

Pages C3-83 thru C3-90:
Replace pages in the manual for A2A9 Service with new pages contained in this change sheet.

Page C3-103, Figure C3-46:
Change A2A21R2 to 422 Ohms.

Page D2-6, Table D2-2:
Change A3A1S1 thru A3A1S6, A3A1S11 thru A3A1S16, and A3A1S21 thru A3A1S24 to HP Part Number 08505-40010, INCREMENT Button.
Change A3A1S9 and A3A1S19 to HP Part Number 08505-40011, MRK Button.
Change A3A1S7 and A3A1S17 to HP Part Number 08505-40012, REF Button.
Change A3A1S10, A3A1S20, and A3A1S25 to HP Part Number 08505-40013, ZRO Button.
Change A3A1S8, A3A1S18, and A3A1S26 to HP Part Number 08505-40014, CLR Button.

Page D2-36, Figure D2-1:
Delete Items 21, 22, 26, 31, and 32 in Reference Designator column and on photo.

Page F4-13, Figure F4-5:
Replace schematic of A2A9 with new one in this change sheet for Figure 3-36 (Change 2).

CHANGE 3

Page C2-7, Table C2-2:
►Delete A2A3C22 and A2A3CR12.

Page C2-8, Table C2-2:
Delete A2A3Q2 and A2A3R41.
Change A2A3Q3 to A2A3Q2, A2A3Q4 to A2A3Q3, A2A3Q5 to A2A3Q4, A2A3Q6 to A2A3Q5, A2A3Q7 to A2A3Q6, and A2A3Q8 to A2A3Q7.

Page C2-18, Table C2-2:
Delete A2A9C10.
Change A2A9C17 to HP Part Number 0180-0197, CAPACITOR-FXD 2.2UF +--10% 20 VDC TA.

Page C2-26, Table C2-2:
Change Transistors A2A21Q1 to A2A21Q6, A2A21Q2 to A2A21Q7, A2A21Q3 to A2A21Q8, A2A21Q4 to A2A21Q1, A2A21Q5 to A2A21Q2, A2A21Q6 to A2A21Q4, A2A21Q7 to A2A21Q3, and A2A21Q8 to A2A21Q5.
Change A2A21Q5 to HP Part Number 1854-0271.

Page C3-61/62, Figure C3-23:
Delete C22, CR12, Q2, and R41.
Change Q3 to Q2, Q4 to Q3, Q5 to Q4, Q6 to Q5, Q7 to Q6, and Q8 to Q7.

Page C3-61/62, Figure C3-24:
Change A2A3Q3 to Q2, Q4 to Q3, Q5 to Q4, and Q6 to Q5.

CHANGE 3 (Cont'd)

Page C3-63, Figure C3-24:
Delete C22, CR12, Q2, and R41.
Change Q7 to Q6, and Q8 to Q7.

Page C3-89, Figure C3-36:
Delete Capacitor A2A9C10.
Change Capacitor A2A9C17 to 2.2UF.

Page C3-103, Figure C3-45 and C3-46:
Change Resistor A2A21R2 to 422 Ohms.
Change Transistors Q1 to Q6, Q2 to Q7, Q3 to Q8, Q4 to Q1, Q5 to Q2, Q6 to Q4, Q7 to Q3, and Q8 to Q5.

CHANGE 4 (SERIAL NUMBER 1602A00112 ONLY)

Page C4-1, Table C4-1:
Change entry for 1602A Serial Number Prefix 1602A to: "1602A, Make Changes A, B, C,E."

Page E6-1, Table E6-1:
Add to second line entry in Table, "Serial Prefix 1602A to Make Changes A, B."
Delete Serial Prefix 1602A from fourth line entry in Table.

P/O Table C2-2. A2A9 Parts List (CHANGE 2) (1 of 4)

Reference Designator	HP Part Number	Description
A2A9	08505-60169	BOARD ASSEMBLY, DISCRIMINATOR
A2A9C1	0180-0197	CAPACITOR-FXD 2.2UF +—10% 20VDC TA
A2A9C2	0180-0197	CAPACITOR-FXD 2.2UF +—10% 20VDC TA
A2A9C3	0180-0197	CAPACITOR-FXD 2.2UF +—10% 20VDC TA
A2A9C4	0180-0116	CAPACITOR-FXD 6.8UF 35V TA
A2A9C5 thru A2A9C8		NOT ASSIGNED
A2A9C9	0160-0575	CAPACITOR-FXD .047UF +—20% 50WVDC CER
A2A9C10	0180-0116	CAPACITOR-FXD 6.8UF 35V TA
A2A9C11	0180-0116	CAPACITOR-FXD 6.8UF 35V TA
A2A9C12	0180-0116	CAPACITOR-FXD 6.8UF 35V TA
A2A9C13		NOT ASSIGNED
A2A9C14	0160-4084	CAPACITOR-FXD .1UF +—20% 50WVDC CER
A2A9C15	0180-0116	CAPACITOR-FXD 6.8UF 35V TA
A2A9C16	0160-0174	CAPACITOR-FXD .47UF +80—20% 25WVDC CER
A2A9C17	0160-0174	CAPACITOR-FXD .47UF +80—20% 25WVDC CER
A2A9C18	0160-4084	CAPACITOR-FXD .1UF +—20% 50WVDC CER
A2A9C19	0160-4084	CAPACITOR-FXD .1UF +—20% 50WVDC CER
A2A9C20	0160-0174	CAPACITOR-FXD .1UF +—20% 50WVDC CER
A2A9C21	0160-0174	CAPACITOR-FXD .1UF +—20% 50WVDC CER
A2A9C22	0160-2306	CAPACITOR-FXD 27PF +—5% 300WVDC MICA
A2A9C23	0180-0197	CAPACITOR-FXD 2.2UF +—10% 20VDC TA
A2A9C24	0160-2256	CAPACITOR-FXD 9.1PF +—.25PF 500WVDC CER
A2A9C25	0160-0168	CAPACITOR-FXD .1UF +—10% 200WVDC POLYE
A2A9C26	0160-0161	CAPACITOR-FXD .01UF +—10% 200WVDC POLYE
A2A9C27	0160-3533	CAPACITOR-FXD 470PF +—5% 100WVDC MICA
A2A9C28	0160-0945	CAPACITOR-FXD 910PF +—5% 100WVDC MICA
A2A9C29	0160-0174	CAPACITOR-FXD .1UF +—20% 50WVDC CER
A2A9C30	0160-0174	CAPACITOR-FXD .1UF +—20% 50WVDC CER
A2A9C31	0180-0116	CAPACITOR-FXD 6.8UF 35V TA
A2A9C32	0160-0174	CAPACITOR-FXD .47UF +80—20% 25WVDC CER
A2A9C33	0160-3456	CAPACITOR-FXD 1000PF +—10% 1000WVDC CER
A2A9C34	0160-0174	CAPACITOR-FXD .47UF +80—20% 25WVDC CER
A2A9C35	0160-0174	CAPACITOR-FXD .47UF +80—20% 25WVDC CER
A2A9C36	0160-0574	CAPACITOR-FXD .022UF +—20% 100WVDC CER
A2A9C37	0160-2437	CAPACITOR-FD THRU 5000PF +80—20% 200V
A2A9C38	0160-4083	CAPACITOR-FD THRU 10PF 10% 200V CERAMIC
A2A9C39	0160-0570	CAPACITOR-FXD 220PF +—20% 100WVDC CER
A2A9C40 thru A2A9C99		NOT ASSIGNED
A2A9C100	0180-0116	CAPACITOR-FXD 6.8UF 35V TA
A2A9C101	0160-0570	CAPACITOR-FXD 220PF +—20% WVDC CER
A2A9CR1	1901-0050	DIODE-SWITCHING 80V 200MA 2NS DO-7
A2A9CR2	1901-0050	DIODE-SWITCHING 80V 200MA 2NS DO-7
A2A9CR3	1901-0050	DIODE-SWITCHING 80V 200MA 2NS DO-7
A2A9CR4	1901-0050	DIODE-SWITCHING 80V 200MA 2NS DO-7
A2A9CR5	1901-0050	DIODE-SWITCHING 80V 200MA 2NS DO-7
A2A9CR6	1901-0050	DIODE-SWITCHING 80V 200MA 2NS DO-7
A2A9CR7	1901-0050	DIODE-SWITCHING 80V 200MA 2NS DO-7
A2A9CR8	1901-0539	DIODE-SCHOTTKY
A2A9DS1	1990-0404	LED-VISIBLE LUM-INT-300UCD IF=50MA-MAX
A2A9FL1	9135-0002	FILTER-LOW PASS SOLDER -TERMS
A2A9FL2	9135-0002	FILTER-LOW PASS SOLDER-TERMS
A2A9J1	08443-00041	TEST POINT CONNECTOR
A2A9J2	1250-0691	CONNECTOR-SGL CONT SKT .022-IN-BSC-SZ
A2A9L1	9100-1641	COIL-MLD 240UH 5% Q65 .155DX .375LG
A2A9L2	9100-1641	COIL-MLD 240UH 5% Q65 .155DX .375LG

P/O Table C2-2. A2A9 Parts List (CHANGE 2) (2 of 4)

Reference Designator	HP Part Number	Description
A2A9L3	9140-0114	COIL-MLD 10UH 10% Q=55 .155DX .375LG
A2A9L4	9100-2257	COIL-MLD 820NH 10% Q=32 .095DX .25LG
A2A9L5	9100-2254	COIL-MLD 390NH 10% Q=35 .095DX .25LG
A2A9L6	9100-2248	COIL-MLD 120NH 10% Q=34 .095DX .25LG
A2A9L7	9100-1641	COIL-MLD 240UH 5% Q=65 .155DX .375LG
A2A9MP1	0520-0128	SCREW-MACH 2-56 .25-IN-LG PAN-HD-POZI
A2A9MP2	0520-0169	SCREW-MACH 2-56 .625-IN-LG 82 DEG
A2A9MP3	0590-0519	THREADED INSERT-NUT 4-40 .062-LG
A2A9MP4	0610-0003	NUT-HEX-DBL-CHAM 2-56-THD .062-IN-THK
A2A9MP5	2190-0014	WASHER-LK INTL T NO.2 .089-IN-ID
A2A9MP6	2190-0123	WASHER-FL MTLC NO.1 .08-IN-ID
A2A9MP7	2190-0910	WASHER-LK NO.4 .12-IN-ID .275-IN-OD STL
A2A9MP8	2200-0101	SCREW-MACH 4-40 .188-IN-LG PAN-HD-POZI
A2A9MP9	2200-0105	SCREW-MACH 4-40 .312-IN-LG PAN-HD-POZI
A2A9MP10	2200-0168	SCREW—MACH 4-40 .438-IN-LG 82 DEG
A2A9MP11	08505-20154	KNOB-PULL
A2A9MP12	08505-00127	TOP COVER
A2A9MP13	08505-00128	COVER
A2A9MP14	08505-20196	RF SHIELD
A2A9MP15	08505-20197	BOTTOM COVER
A2A9Q1	5081-8120	TRANSISTOR NPN SI TO-18 PD=360MW
A2A9Q2	1854-0330	TRANSISTOR NPN SI
A2A9Q3	1853-0075	TRANSISTOR-DUAL PNP PD=400MW
A2A9Q4	1854-0345	TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW
A2A9Q5	1854-0345	TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW
A2A9Q6	1853-0007	TRANSISTOR PNP 2N3251 51 TO-18 PD=360MW
A2A9Q7	1853-0007	TRANSISTOR PNP 2N3251 51 TO-18 PD=360MW
A2A9Q8	1853-0007	TRANSISTOR PNP 2N3251 51 TO-18 PD=360MW
A2A9Q9	1853-0007	TRANSISTOR PNP 2N3251 51 TO-18 PD=360MW
A2A9Q10	1855-0020	TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI
A2A9Q11	1855-0020	TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI
A2A9Q12	1855-0020	TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI
A2A9Q13	1855-0020	TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI
A2A9Q14	1855-0020	TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI
A2A9Q15	1854-0404	TRANSISTOR NPN SI TO-18 PD=360MW
A2A9Q16	1854-0404	TRANSISTOR NPN SI TO-18 PD=360MW
A2A9Q17	1853-0007	TRANSISTOR PNP 2N3251 51 TO-18 PD=360MW
A2A9Q18	1853-0007	TRANSISTOR PNP 2N3251 51 TO-18 PD=360MW
A2A9Q19	1854-0404	TRANSISTOR NPN SI TO-18 PD=360MW
A2A9Q20	1854-0404	TRANSISTOR NPN SI TO-18 PD=360MW
A2A9Q22	1855-0020	TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI
A2A9R1		NOT ASSIGNED
A2A9R2	0811-3247	RESISTOR 150 1% 7.5W PW TC=0+—20
A2A9R3	0757-0465	RESISTOR 100K 1% .125W F TC=0+—100
A2A9R4	0757-0465	RESISTOR 100K 1% .125W F TC=0+—100
A2A9R5 thru A2A9R11		NOT ASSIGNED
A2A9R12	0757-0465	RESISTOR 100K 1% .125W F TC=0+—100
A2A9R13	0757-0458	RESISTOR 51.1K 1% .125W F TC=0+—100
A2A9R14	0757-0465	RESISTOR 100K 1% .125W F TC=0+—100
A2A9R15	0757-0458	RESISTOR 51.1K 1% .125W F TC=0+—100
A2A9R16	0757-0465	RESISTOR 100K 1% .125W F TC=0+—100
A2A9R17	0757-0465	RESISTOR 100K 1% .125W F TC=0+—100
A2A9R18		NOT ASSIGNED
A2A9R19	0757-0458	RESISTOR 51.1K 1% .125W F TC=0+—100
A2A9R20	0757-0458	RESISTOR 51.1K 1% .125W F TC=0+—100
A2A9R21	0698-3450	RESISTOR 42.2K 1% .125W F TC=0+—100

P/O Table C2-2. A2A9 Parts List (CHANGE 2) (3 of 4)

Reference Designator	HP Part Number	Description
A2A9R22 thru A2A9R26		NOT ASSIGNED
A2A9R27	0757-0401	RESISTOR 100% .125W F TC=0+—100
A2A9R28	0757-0416	RESISTOR 511 1% .125W F TC=0+—100
A2A9R29	0757-0416	RESISTOR 511 1% .125W F TC=0+—100
A2A9R30	0757-0465	RESISTOR 100K 1% .125W F TC=0+—100
A2A9R31	0757-0416	RESISTOR 511 1% .125W F TC=0+—100
A2A9R32	0698-3445	RESISTOR 348 1% .125W F TC=0+—100
A2A9R33	0698-3153	RESISTOR 3.83K 1% .125W F TC=0+—100
A2A9R34	0811-2813	RESISTOR 1 5% .75W PW TC=0+—50
A2A9R35	0757-0398	RESISTOR 75 1% .125W F TC=0+—100
A2A9R36	0698-3454	RESISTOR 215K 1% .125W F TC=0+—100
A2A9R37	0757-0416	RESISTOR 511 1% .125W F TC=0+—100
A2A9R38	0757-0416	RESISTOR 511 1% .125W F TC=0+—100
A2A9R39	0698-3454	RESISTOR 215K 1% .125W F TC=0+—100
A2A9R40	0698-3441	RESISTOR 215 1% .125W F TC=0+—100
A2A9R41	0757-0416	RESISTOR 511 1% .125W F TC=0+—100
A2A9R42	0757-0379	RESISTOR 12.1 1% .125W F TC=0+—100
A2A9R43	0757-0289	RESISTOR 13.3K 1% .125W F TC=0+—100
A2A9R44	0757-0465	RESISTOR 100K 1% .125W F TC=0+—100
A2A9R45	0698-3435	RESISTOR 38.3 1% .125W F TC=0+—100
A2A9R46	0757-0405	RESISTOR 162 1% .125W
A2A9R47	0698-3438	RESISTOR 147 1% .125W F TC=0+—100
A2A9R48	0757-0465	RESISTOR 100K 1% .125W F TC=0+—100
A2A9R49	0757-0280	RESISTOR 1K 1% .125W F TC=0+—100
A2A9R50	0757-0398	RESISTOR 75 1% .125W F TC=0+—100
A2A9R51	0698-8640	RESISTOR 4.734K .1% .125W F TC=0+—25
A2A9R52	0698-3454	RESISTOR 215K 1% .125W F TC=0+—100
A2A9R53	0698-3441	RESISTOR 215 1% .125W F TC=0+—100
A2A9R54	0757-0416	RESISTOR 511 1% 125W F TC=0+—100
A2A9R55	0683-5655	RESISTOR 5.6 M 5% .25W FC TC=900/+1100
A2A9R56	0698-3435	RESISTOR 38.3 1% .125W F TC=0+—100
A2A9R57	2100-3349	RESISTOR TRMR 100 10% C SIDE-ADJ 1-TURN
A2A9R58	0698-6862	RESISTOR 1.153K .25% .125W F TC=0+—50
A2A9R59	0698-6620	RESISTOR 150K .1% .125W F TC=0+—25
A2A9R60	0698-3447	RESISTOR 422 1% .125W F TC=0+—100
A2A9R61	0698-8052	RESISTOR 590 .1% .25 F TC=0+—25
A2A9R62	0698-7205	RESISTOR 51.1 1% .05W F TC=0+—100
A2A9R63	0757-0317	RESISTOR 1.33K 1% .125W F TC=0+—100
A2A9R64	0757-0278	RESISTOR 1.78K 1% .125W F TC=0+—100
A2A9R65	0757-0199	RESISTOR 21.5K 1% .125W F TC=0+—100
A2A9R66	0757-0465	RESISTOR 100K 1% .125W F TC=0+—100
A2A9R67	0757-0458	RESISTOR 51.1K 1% .125W F TC=0+—100
A2A9R68	2100-3052	RESISTOR-TRMR 50 20% C SIDE-ADJ 17-TURN
A2A9R69	0698-3442	RESISTOR 237 1% .125W F TC=0+—100
A2A9R70	0698-5552	RESISTOR 1K 1% .125W F TC=0+—100
A2A9R71	0757-0199	RESISTOR 21.5K 1% .125W F TC=0+—100
A2A9R72	0757-0458	RESISTOR 51.1K 1% .125W F TC=0+—100
A2A9R73	0757-0442	RESISTOR 10K 1% .125W F TC=0+—100
A2A9R74	0698-5552	RESISTOR 1K 1% .125W F TC=0+—25
A2A9R75	0698-3454	RESISTOR 215K 1% .125W F TC=0+—100
A2A9R76	0757-0442	RESISTOR 10K 1% .125W F TC=0+—100
A2A9R77	0698-3156	RESISTOR 14.7K 1% .125W F TC=0+—100
A2A9R78	0698-5552	RESISTOR 1K 1% .125W F TC=0+—100

P/O Table C2-2. A2A9 Parts List (CHANGE 2) (4 of 4)

Reference Designator	HP Part Number	Description
A2A9R79	0757-0199	RESISTOR 21.5K 1% .125W F TC=0+—100
A2A9R80	0698-3160	RESISTOR 31.6K 1% .125W F TC=0+—100
A2A9R81	0757-0447	RESISTOR 16.2K 1% .125W F TC=0+—100
A2A9R82	0698-0084	RESISTOR 2.15K 1% .125W F TC=0+—100
A2A9R83	0757-0443	RESISTOR 11K 1% .125W F TC=0+—100
A2A9R84	0698-3458	RESISTOR 348K 1% .125W F TC=0+—100
A2A9R85	0757-0442	RESISTOR 10K 1% .125W F TC=0+—100
A2A9R86 thru A2A9R99		NOT ASSIGNED
A2A9R100	0757-0420	RESISTOR 750 1% .125W F TC=0+—100
A2A9R101	0698-3442	RESISTOR 237 1% .125W F TC=0+—100
A2A9R102	0757-0442	RESISTOR 10K 1% .125W F TC=0+—100
A2A9R103	0698-3152	RESISTOR 3.48K 1% .125W F TC=0+—100
A2A9R104	0757-0447	RESISTOR 16.2K 1% .125W F TC=0+—100
A2A9R105	0698-3159	RESISTOR 26.1K 1% .125W F TC=0+—100
A2A9R106	0698-3158	RESISTOR 23.7K 1% .125W F TC=0+—100
A2A9R107	0757-0401	RESISTOR 100 1% .125W F TC=0+—100
A2A9TP1	1251-0600	CONTACT-CONN U/W-POST-TYPE MALE DPSLDR
A2A9U1	1826-0013	IC 741 OP AMP
A2A9U2	1820-1308	IC-DIGITAL MC10116L ECL TPL 2 LINE RCVR
A2A9U3	1826-0302	IC MC 1741SC OP AMP
►A2A9U4	1826-0249	IC AD 504J OP AMP
A2A9U5	1826-0026	IC LM 311 COMPARATOR
►A2A9U6	1820-1538	IC-DIGITAL MC14011UBCL CMOS QUAD 2 NAND
►A2A9U7	1820-1531	IC-DIGITAL MC14013BCL CMOS DUAL D-TYPE
►A2A9U8	1820-1538	IC-DIGITAL MC14011UBCL CMOS QUAD 2 NAND
A2A9VR1		NOT ASSIGNED
A2A9VR2	1902-3071	DIODE-ZNR 4.22V 2% DO-7 PD= .4W TC= .038%
►A2A9VR3	1902-0692	DIODE-ANR 6.3V 1% PD= .4W
A2A9VR4	1902-3048	DIODE-ZNR 3.48V 5% DO-7 PD=.4W TC=.058%
A2A9VR5	1902-3048	DIODE-ZNR 3.48V 5% DO-7 PD=.4W TC=.058%
A2A9VR6 thru A2A9VR99		NOT ASSIGNED
A2A9VR100	1902-0025	DIODE-ZNR 10V 5% DO-7 PD=.4W TC=+.06%

A2A9 DISCRIMINATOR (CHANGE 2)

General Description

The Discriminator is part of the Automatic Frequency Control (AFC) Loop, which also includes the Prescaler/Counter (A2A5) and FM Driver (A2A10). The RF output of the Source/Converter is first fed to the Prescaler/Counter, where its frequency is prescaled, and then applied to the input (PTLO) of the Discriminator. The Discriminator generates a current proportional to the frequency of the RF input and compares it with a current which is proportional to the Tuning Voltage (V TUN). The difference between these currents, a measure of the frequency error of the Source/Converter, is amplified and fed to the FM Driver (A2A10) as V FM. The FM Driver further amplifies this error signal to drive the FM coil of the YIG-tuned Oscillator (A2A19), thereby closing the AFC loop. This feedback reduces the drift and residual FM of the Source/Converter. The AFC loop operates only in the 13 MHz and 130 MHz ranges; in the 1300 MHz range the Discriminator output is disconnected from the FM Driver.

The Discriminator has five major parts: Frequency-to-Current Converter, Summing Amplifier, Frequency Range Logic and FET Drivers, Low-Frequency Clamp, and Search Control (See Figure C3-34E).

Frequency-to-Current Converter

The Frequency-to-Current Converter generates a current which is proportional to the frequency of the RF signal from the Source/Converter. There are four elements: Amplifier-Limiter, Delay Line Driver, Delay Line, and Current Switch.

Two differential amplifiers from an ECL line receiver (U2) make up the Amplifier-Limiter, which shapes the RF pulses (PTLO) from the Prescaler/Counter (A2A5). The first amplifier is connected as a single-input amplifier with a differential output. The second amplifier is a Schmitt trigger whose differential output is ac-coupled to the Delay Line Driver. The base bias supply of the differential amplifiers is tapped at U2 pin 11 to provide a stable reference voltage for the input (pin 4) of the first stage.

The Delay Line Driver consists of the differential pair Q4 and Q5 with positive feedback. Positive feedback causes the driver to act as the second Schmitt trigger in the input chain. The normal state of the driver is Q5 ON, Q4 OFF, with the base of Q4 biased near 0 volts ($V_{be}4$ = 0 volts). When the input to the driver causes Q4 to turn ON, the current flowing through Q5 is diverted to the Delay Line. This causes the voltage at the collector of Q5 to rise, which turns Q4 on harder. Because of this positive feedback, the state of the driver changes rapidly to Q4 ON, Q5 OFF. The exact inverse occurs when Q4 is turned OFF by the input. The output of the driver is thus a square wave of current into the Delay Line.

The Delay Line, consisting of L4-6, C21, C22, and C24, is a lumped approximation of a shorted transmission line with an 11 nsec delay. The current wave applied to the Delay Line by the Driver is converted to constant width voltage pulses. (See Figure C3-34A.) These pulses are then applied to the Current Switch.

The Current Switch, Q3A and Q3B, is a differential pair with emitter current fixed by VR3, CR7, R61, and R68. The emitter current is adjusted with R68 for a high frequency reading of 20.000 MHz ±0.2 MHz on the FREQ COUNTER readout . The normal state of the Current Switch is Q3A ON, Q3B OFF. When the voltage pulse from the Delay Line goes

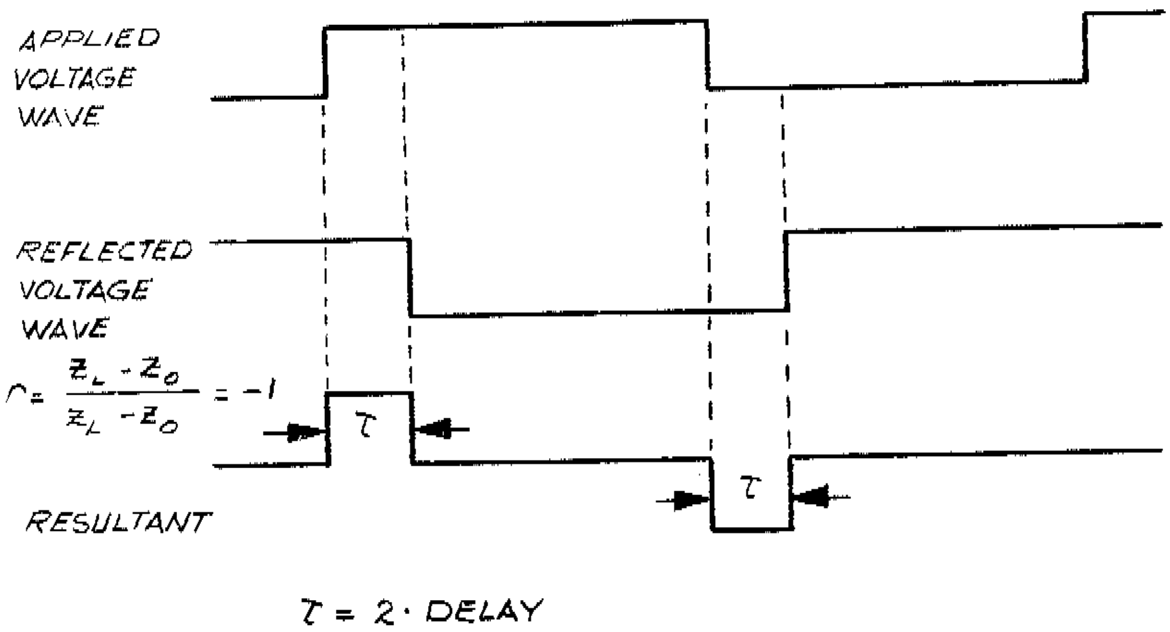


Figure C3-34A. Shorted Delay Line Principle

high, Q3A is turned OFF and Q3B is turned ON, switching the emitter current to C28, L7, and R54, the low-pass filter. The average current through the filter is proportional to the frequency of the input signal, PTLO.

Summing Amplifier

The Tuning Voltage, V TUN, is converted by R51 to a current and summed with the output of the Frequency-to-Current Converter by U4. The difference between these two currents is amplified by U4 to produce the output voltage V FM. V FM drives the FM Driver to correct any frequency errors of the YTO. Feedback capacitors C25 and C26 set the AFC loop compensation and bandwidth. The capacitors are selected by Q9, which is driven by the Frequency Range Logic. The offset voltage at U4 pin 3 is changed by FET Q10 when the frequency range of the instrument is changed; the offset is approximately +100 mV in the 13 MHz range and about +10 mV in the 130 MHz range. In the 1300 MHz (undiscriminated) range, the Frequency Range Logic turns FET Q11 on, reducing the gain of U4 to zero. R57 is used to adjust the offset for a low frequency indication of 5.000 MHz ±0.010 MHz on the FREQ COUNTER readout.*

Frequency Range Logic and FET Drivers

The Frequency Range Logic consists of CMOS NAND Gates (U6) connected as inverters driving level shifters Q6 —Q9. The level shifters turn on and off the FET's (Q10, Q11, Q12, Q13, and Q14) used as switches in the Summing Amplifier and Low-Frequency Clamp.

The Frequency Range Logic detects the frequency range of the instrument and adjusts the AFC loop compensation capacitors (C25, C26), offset voltages at U4 pin 3, and V TUN clamp voltages for proper operation of the AFC loop. The offset voltages are required because the RF input to the Discriminator, PTLO, is offset by 100 kHz from the RF output of the source. Compensation changes are needed because the source RF frequency is divided by one in the 13 MHz range and by 10 in the 130 MHz range before it reaches the Discriminator. The change in division ratio is an effective change in AFC loop gain and bandwidth which is compensated for by the change in feedback capacitance.

* See adjustment procedure, paragraph A5-21.

Low-Frequency Clamp

A Low-Frequency Clamp is used to accurately set the low frequency of the RF source and prevent the RF from going through zero frequency (where the instrument is unspecified and the Discriminator is unlocked). U3 clamps the tuning voltage, V TUN, to about −400 mV in the 13 MHz range and −40 mV in the 130 MHz range. The clamp voltage is selected by Q13, which is driven by the Frequency Range Logic. This voltage is applied to pin 3 of U3. When V TUN goes above the voltage at pin 3, the output of U3 goes low, pulling V TUN more negative. The output of U3 also drives Q15, which generates one of the blanking pulses (BP2) to the Sweep Select Board, A2A8.

When the instrument is put in the 1300 MHz range, Q7 drives FET Q14 ON, pulling U3 pin 3 up to + 1.5 volts. Since V TUN cannot go this positive, the Low-Frequency Clamp is effectively removed from the circuit in the 1300 MHz range.

Search Control

A detailed block diagram of the Search Control is shown in Figure C3-34F. This block diagram will be referred to in the following description.

The function of the Search Control is to keep the Discriminator output, V FM, in the range where the AFC loop will lock. The Search Control detects when V FM goes above or below an allowable range (about −3V to +3V). If V FM goes too positive, the positive limit detector (VR4 and Q20) sets flip-flop U7A, turning Q13 ON; this injects a search current into the summing junction which causes the output of U4 to slew in the negative direction. When V FM reaches the negative limit, the negative limit detector (VR5 and Q21) sets flip-flop U7B. Since the outputs of the two flip-flops are ANDed to drive both of their reset inputs, flip-flop U7A is reset at this point; flip-flop U7B remains set since its set input is held high by the negative limit detector. The high output of U7B turns Q19 ON, injecting a search current into the summing junction which causes V FM to slew in the positive direction. As V FM goes through +1.5V, the output of the reset comparator goes high, applying a reset pulse to flip-flop U7B and turning off the search current. With V FM at this reset voltage (+1.5V) the AFC loop will lock.

The no-lock state (either flip-flop set) turns on the no-lock indicator DS1. In the 130 MHz range, FET Q12 is driven ON in the no-lock state to increase the feedback capacitance of U4 and thus decrease the slope of V FM during the search. Capacitor C9 keeps Q12 ON for a period following the search current reset (both flip-flops reset) to allow the AFC loop to stabilize before the bandwidth is increased.

Typical search waveforms and a description of Search Control operation are presented in the Troubleshooting section which follows.

A2A9 Discriminator — Troubleshooting Information

Equipment:

Oscilloscope

Frequency-to-Current Converter

The Frequency-to-Current Converter produces a current which is proportional to the frequency of the prescaled source RF signal, PTLO, in all frequency ranges.

The operation of this portion of the Discriminator may be checked by setting the front panel controls of the Frequency Control as follows:

RANGE MHz	0.5—1300
SCAN TIME SEC	.01
MODE	LIN FULL

Connect the oscilloscope to C38 feedthrough. Set TIME/DIV to 2 msec and VOLTS/DIV to 0.2V. The voltage should look like the waveform of Figure C3-34B.

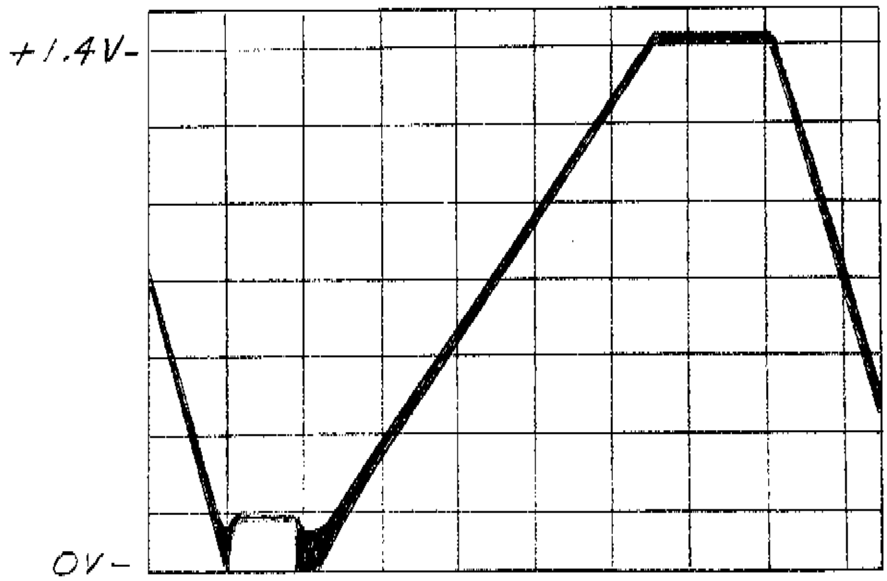


Figure C3-34B. Output of Frequency-to-Current Converter (C38 feedthrough)

The voltage at C38 is proportional to the average current output of the Current Switch and thus to the frequency of the RF input signal, PTLO, as it varies from 600 kHz to 1300.1 MHz.

If this waveform is not present, then one or more of the following components may be faulty: (1) Current Switch: Q3, (2) Delay Line Driver: Q4, Q5, or VR2, (3) Amplifier-Limiter: U2. Also, operational amplifier U4 may not be maintaining a virtual ground at U4 pin 2.

Search Control

The operation of the Search Control may be checked in the two discriminated frequency ranges as described below.

0.5 — 13 MHz Range

1. Set the front-panel controls as follows:

RANGE MHz	0.5 — 13
MODE	LIN EXP
WIDTH	CW±ΔF
SCAN TIME SEC	.01
CW FREQUENCY MHz	0
ΔF FREQUENCY MHz	0

2. Disconnect PTLO at J2.

With PTLO disconnected, frequency feedback is prevented from reaching the summing junction of the Discriminator and the AFC loop will be unable to lock. The Tuning Voltage (V TUN) should be clamped at – 400 mV by the Low-Frequency Clamp and the voltage off set at U4 pin 3 should be +100mV.

Connect the oscilloscope to pin 25 or 50. Set TIME/DIV to 0.5 msec and VOLT/DIV to 1 volt. Since there is no frequency feedback, the Discriminator output (V FM) should look like the search waveform of Figure C3-34C.

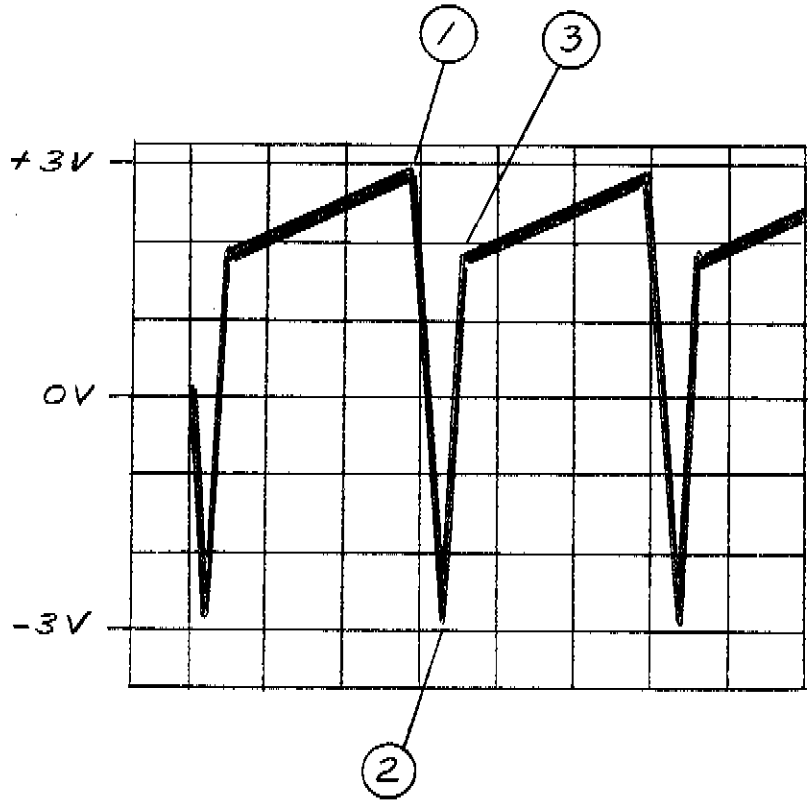


Figure C3-34C. Search Waveform, 0.5 – 13 MHz Range (Pin 25, 50)

The waveform of Figure C3-34C is generated by the Search Control as it attempts to keep V FM in the allowable range and bring it to + 1.5 volts, where the AFC loop will lock if there is frequency feedback. The numbered points of the waveform are described below:

Point 1: Positive limit detector (VR4 and Q20) turns on Q18, causing V FM to slew in the negative direction.

Point 2: Negative limit detector (VR5 and Q21) turns on Q19 (Q18 is turned off since U8A and U8B apply a reset to flip-flop U7A at this point), causing V FM to slew in the positive direction.

Point 3: Reset comparator (U5) turns off Q19 so that no search current is injected into the summing junction. The only current flowing into the summing junction is due to the clamped Tuning Voltage. V FM slews in the positive direction at the reduced slope determined by the Tuning Voltage (clamped at – 400 mV), the offset voltage at U4 pin 3 (+100 mV), and the feedback capacitance on U4 (Q12 should be on, providing maximum feedback capacitance.

0.5 — 130 MHz Range

The front panel controls should be set as for the 0.5 — 13 MHz range except that the RANGE MHz control should be set to 0.5 — 130. The RF input, PTLO, should be disconnected at J2.

With these control settings, the tuning voltage (V TUN) should be clamped at −40 mV and the offset at U4 pin 3 should be +10 mV.

Connect the oscilloscope to pin 25 or 50. Set TIME/DIV to 1 msec and VOLT/DIV to 1 volt. The absence of frequency feedback should cause the Search Control and Summing Amplifier to generate the search waveform of Figure C3-34D at the Discriminator output (pin 25, 50).

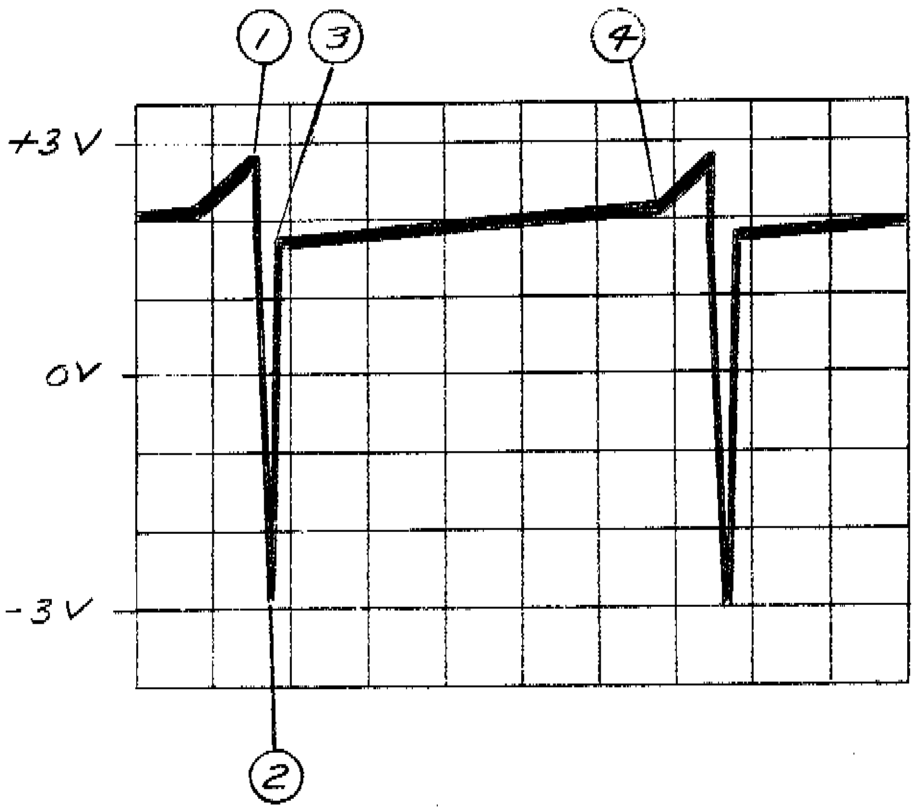


Figure C3-34D. Search Waveform, 0.5 – 130 MHz Range (Pin 25, 50)

Points 1 and 2 of the search waveform in Figure C3-34D correspond exactly to points 1 and 2 in Figure C3-34C, described above. Points 3 and 4 are described below:

Point 3: Reset comparator (U5) turns off Q19 so that no search current is injected into the summing junction. The only current flowing into the summing junction is due to the clamped Tuning Voltage. V FM slews in the positive direction with a reduced slope determined by the Tuning Voltage (clamped at −40mV), the offset voltage at U4 pin 3 (+10 mV), and the feedback capacitance on U4 (since C9 has been discharged by Q16, Q12 should be on, providing maximum capacitance.

Point 4: FETQ12 is turned off by Q9 (C9 is now charged), reducing the feedback capacitance on U4. This causes V FM to slew with an increased slope until the positive limit is reached.

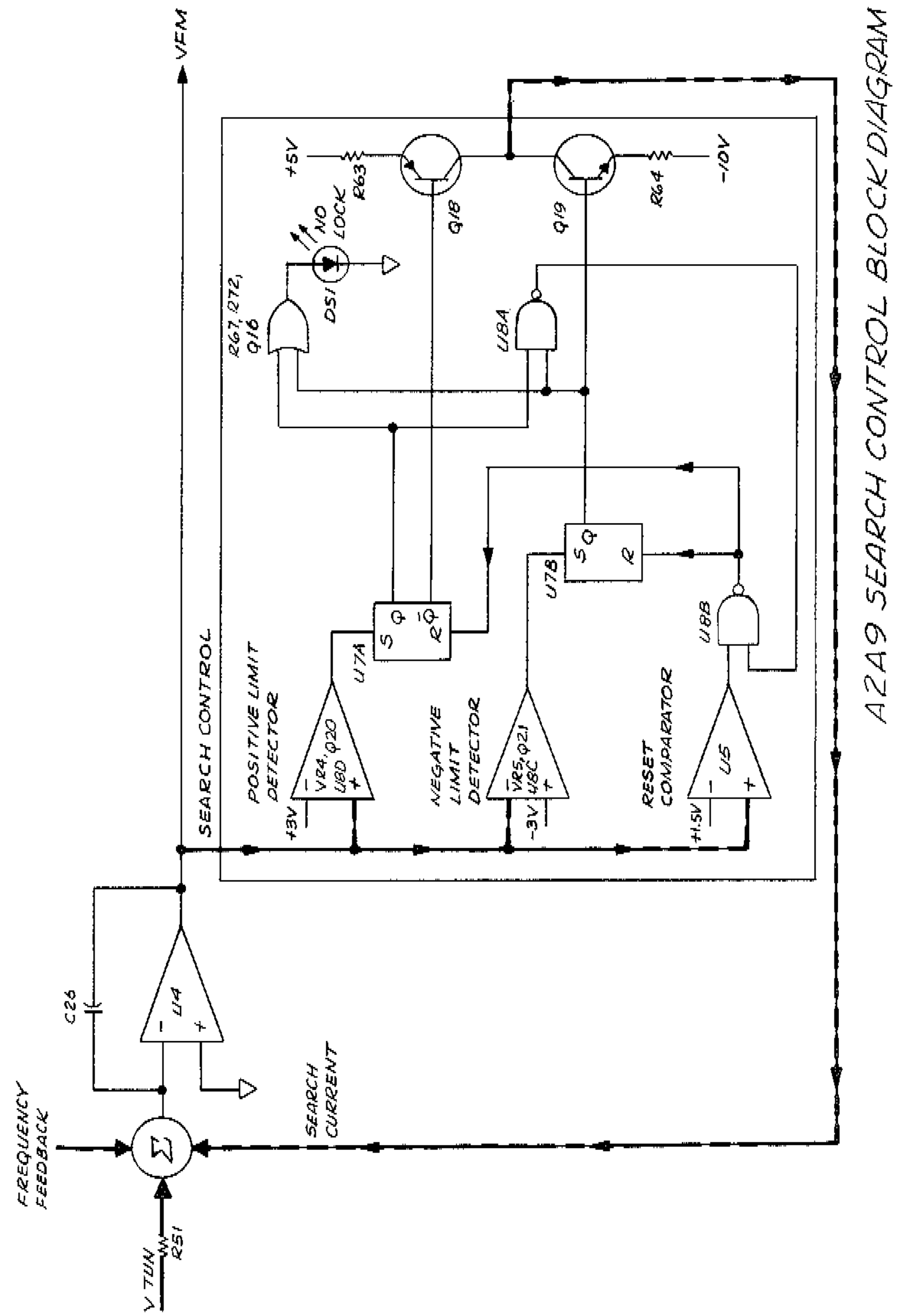
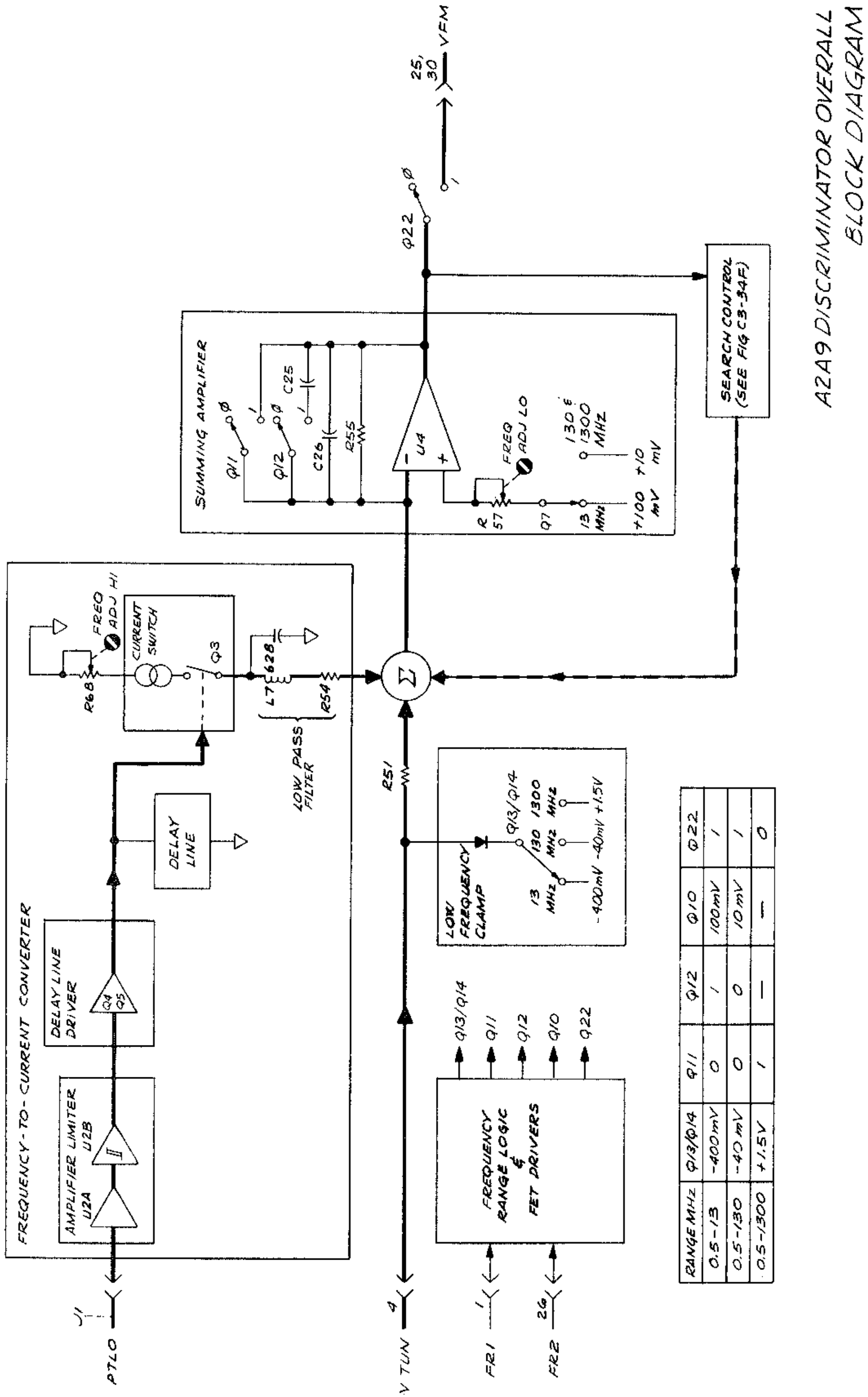


Figure C3-34E. A2A9 Discriminator, Block Diagram (Change 2)



RANGE MHz	Q13/Q14	Q11	Q12	Q10	Q22
0.5-13	-400mV	0	1	100mV	1
0.5-130	-40mV	0	0	10mV	1
0.5-1300	+1.5V	1	—	—	0

Figure C3-34F. A2A9 Discriminator Search Control Circuit, Block Diagram (Change 2)

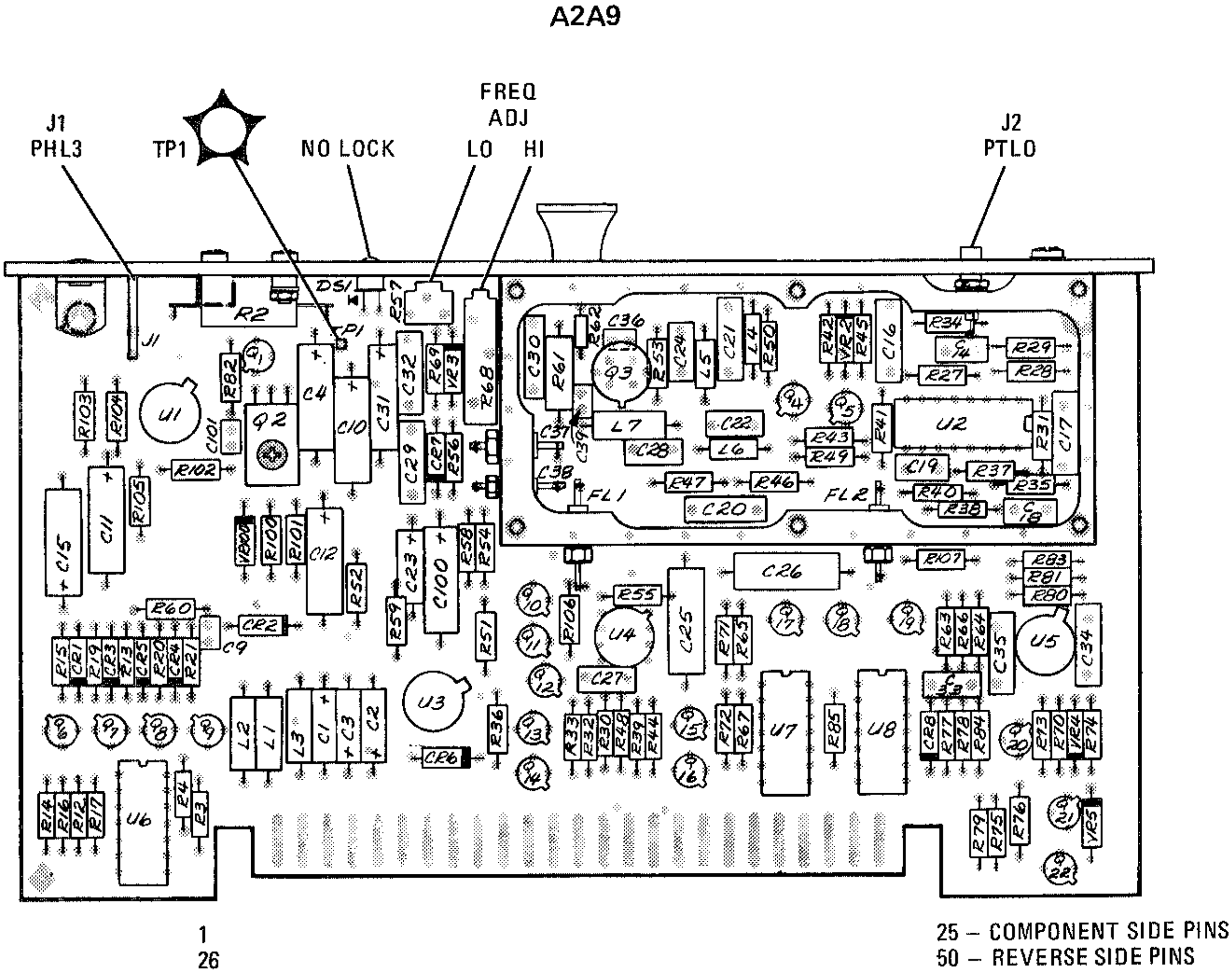
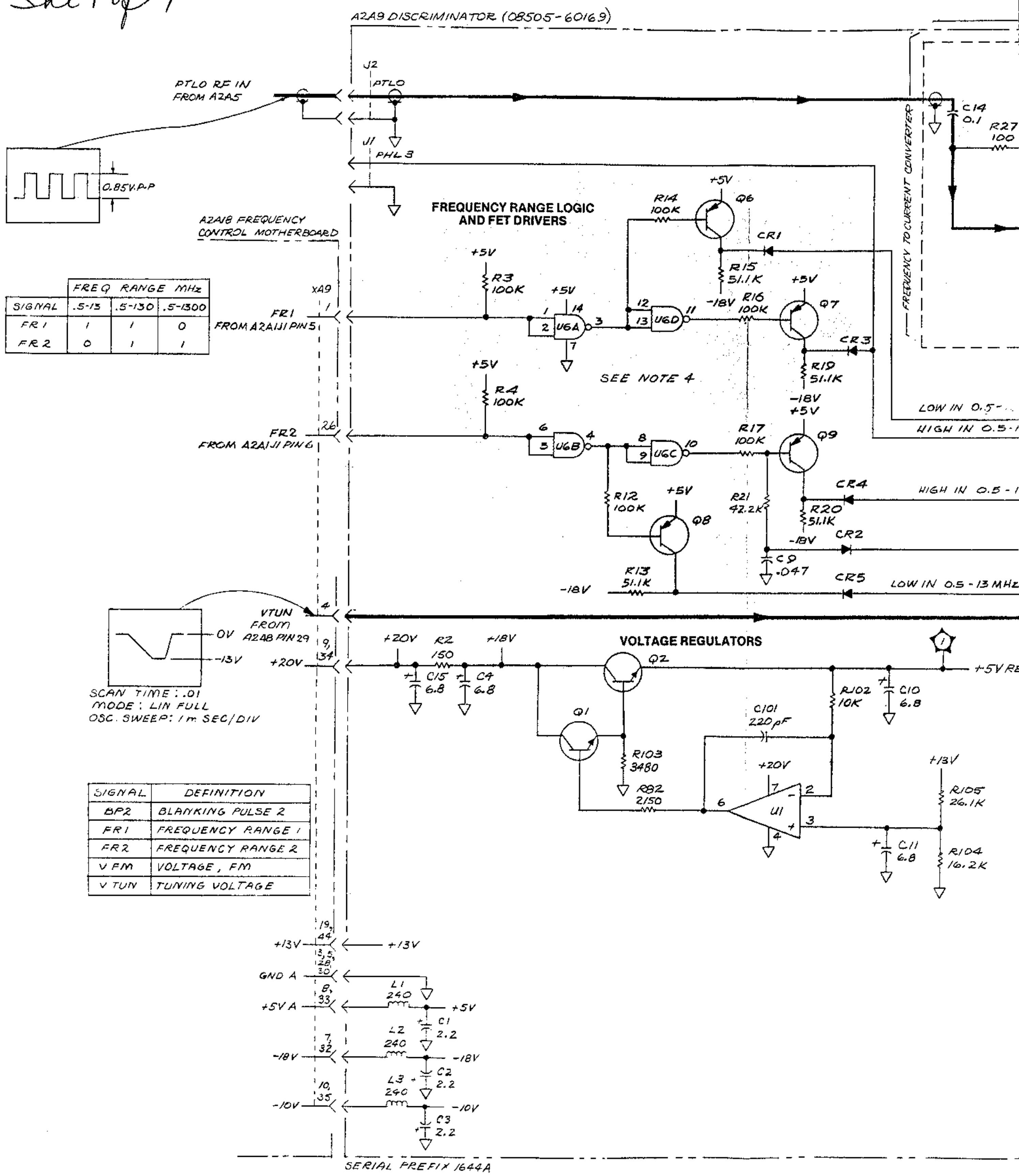


Figure C3-35. A2A9 Discriminator Parts Locations (Change 2)

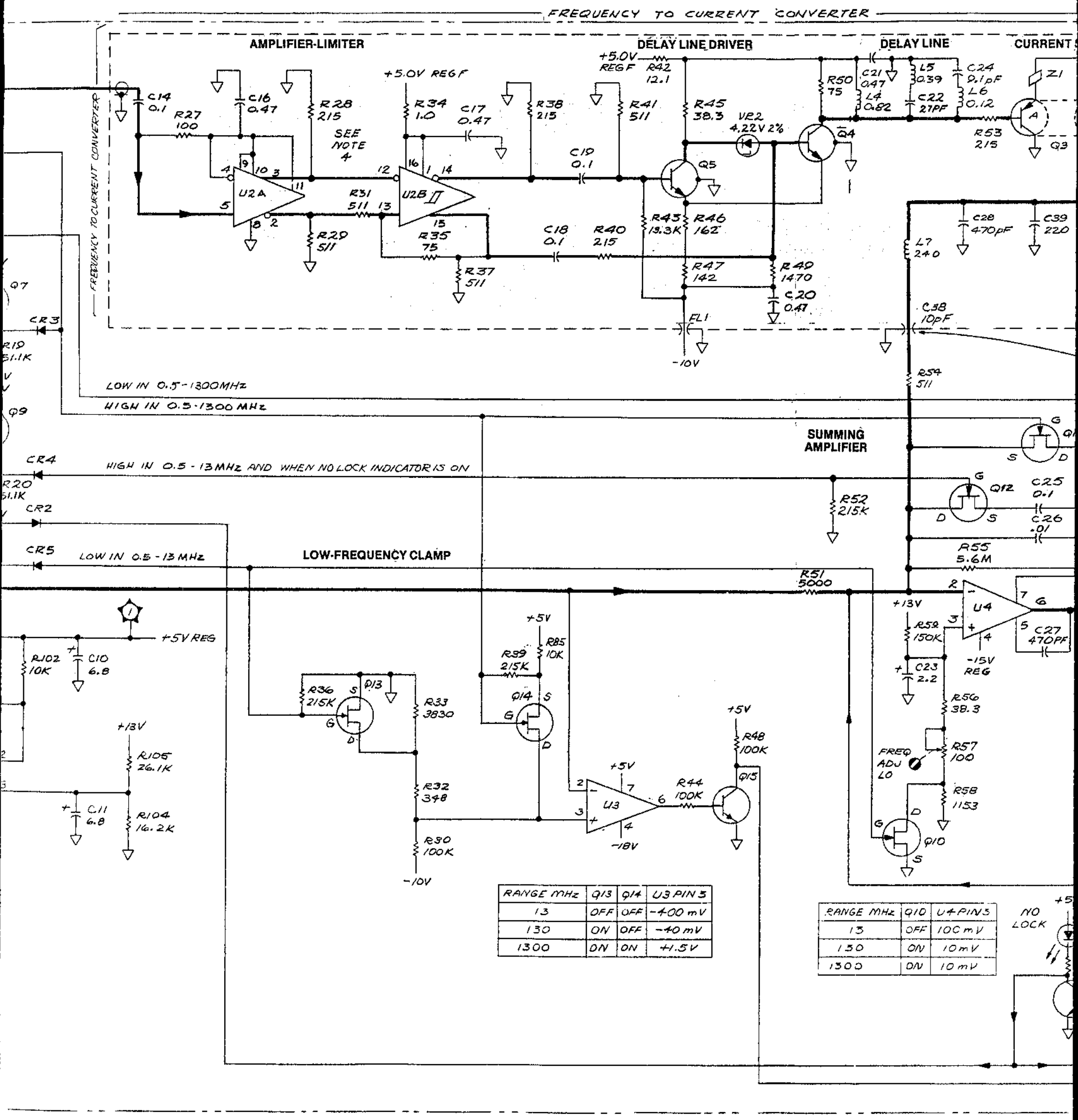
Fig. 3-36
Sht 1 of 4



	FREQ RANGE MHz		
SIGNAL	.5-13	.5-130	.5-1300
FR1	1	1	0
FR2	0	1	1

SIGNAL	DEFINITION
BP2	BLANKING PULSE 2
FR1	FREQUENCY RANGE 1
FR2	FREQUENCY RANGE 2
V FM	VOLTAGE, FM
V TUN	TUNING VOLTAGE

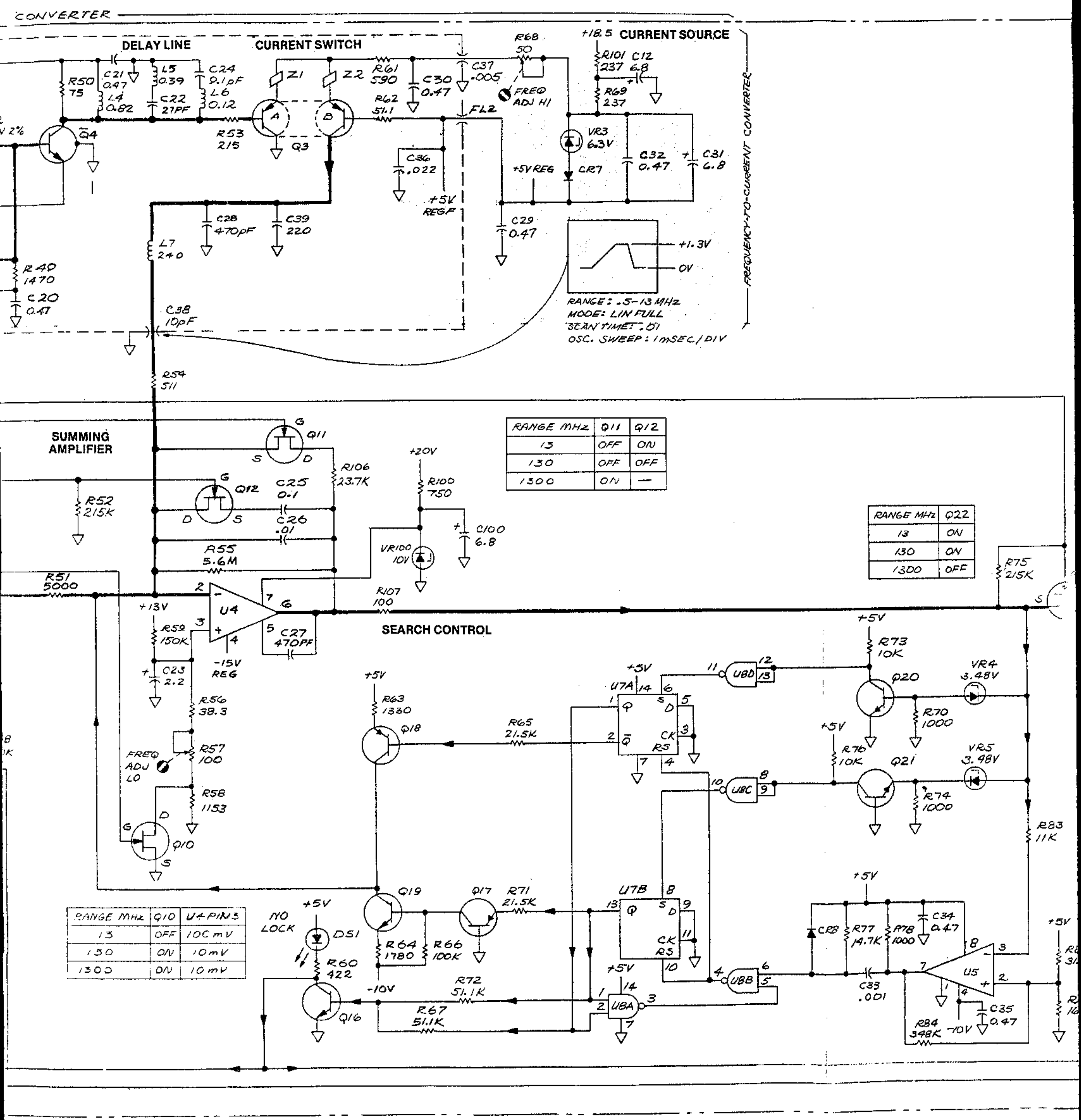
Fig. 3-36
Sht 2 of 4



RANGE MHz	Q13	Q14	U3 PIN 3
13	OFF	OFF	-400 mV
130	ON	OFF	-40 mV
1300	ON	ON	+1.5V

RANGE MHz	Q10	U4 PIN 3
13	OFF	100 mV
130	ON	10 mV
1300	ON	10 mV

Fig 3-36
Sht 3 of 4



RANGE MHz	Q11	Q12
13	OFF	ON
130	OFF	OFF
1300	ON	—

RANGE MHz	Q22
13	ON
130	ON
1300	OFF

RANGE MHz	Q10	U4 PIN 3
13	OFF	10C mV
130	ON	10 mV
1300	ON	10 mV

Fig 3-36
Sht 4 of 4

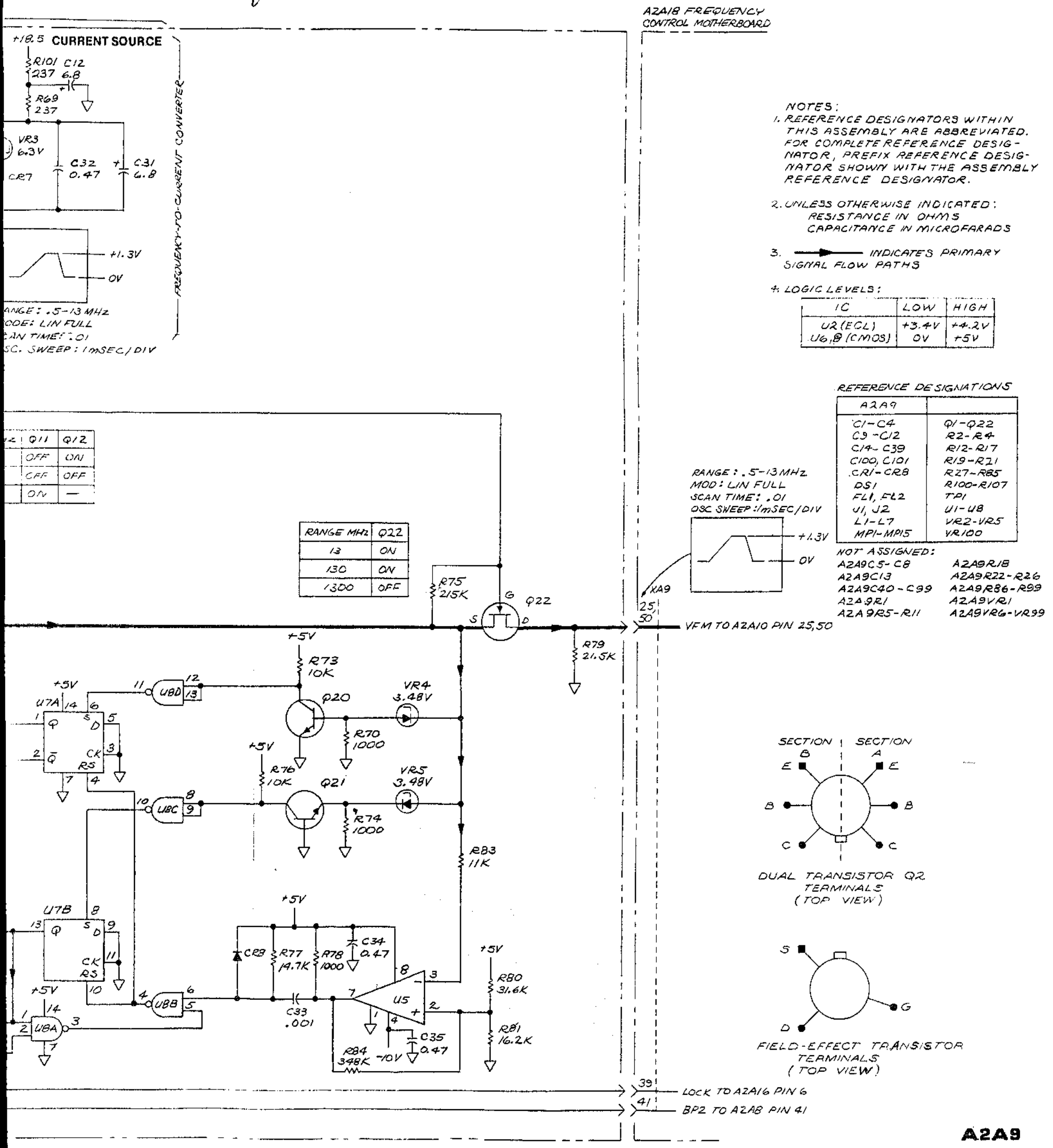


Figure 3-36. A2A9 Discriminator, Schematic (CHANGE 2)

CHANGE 5

Page B2-9, Table B2-2:
Add A1A15A1CR4, HP Part No. 1901-0033, DIODE-GEN PRP 180V 200MA DO-7

Page B2-10, Table B2-2:
Change A1A15A1U1 to HP Part No. 1820-0681, IC GATE TTL S NAND QUAD 2-INP
Change A1A15A2U1 to HP Part No. 1820-0681, IC GATE TTL S NAND QUAD 2-INP

Page B3-45, Figure B3-40:
Add CR4 to A1A15A1 as shown in parts location drawing in this change sheet.

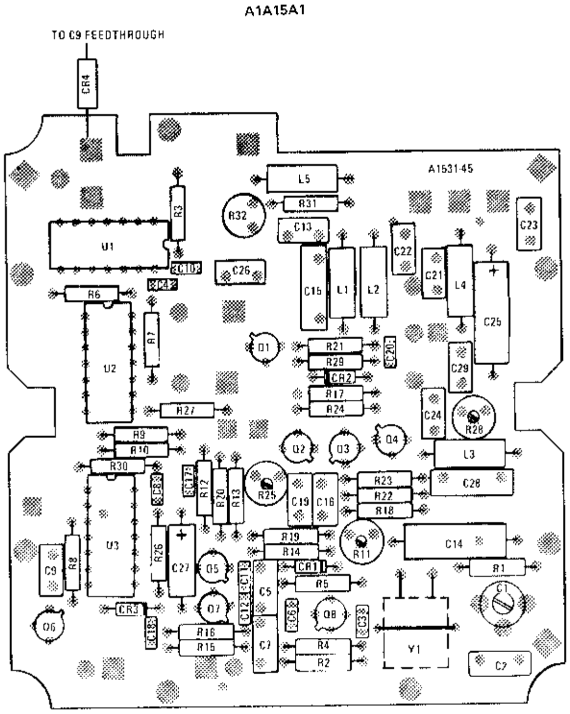
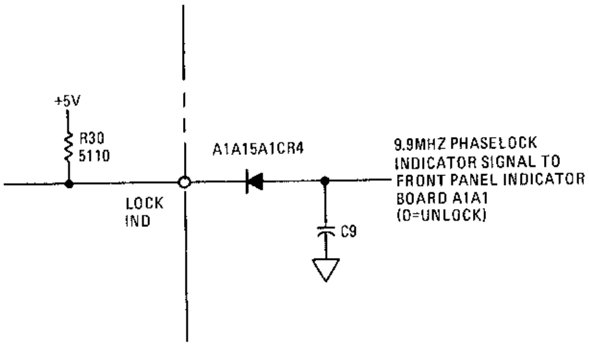


Figure B3-40. A1A15A1 9.9 MHz Phase Lock Board Assembly Parts Locations (CHANGE 5)

Page B3-45, Figure B3-41:
Add Diode A1A15A1CR4 to schematic as shown below.



CHANGE 5 (Cont'd)

Page C2-4, Table C2-2:
Delete A2W15.
Add A2W20, HP Part No. 1250-0669, BARREL MALE TO MALE.
Add A2W107, HP Part Number 08505-60193, CABLE ASSEMBLY, VTN 1, BLUE.
Add A2W108, HP Part Number 08505-60194, CABLE ASSEMBLY, VTN 2, GRAY/BLUE.

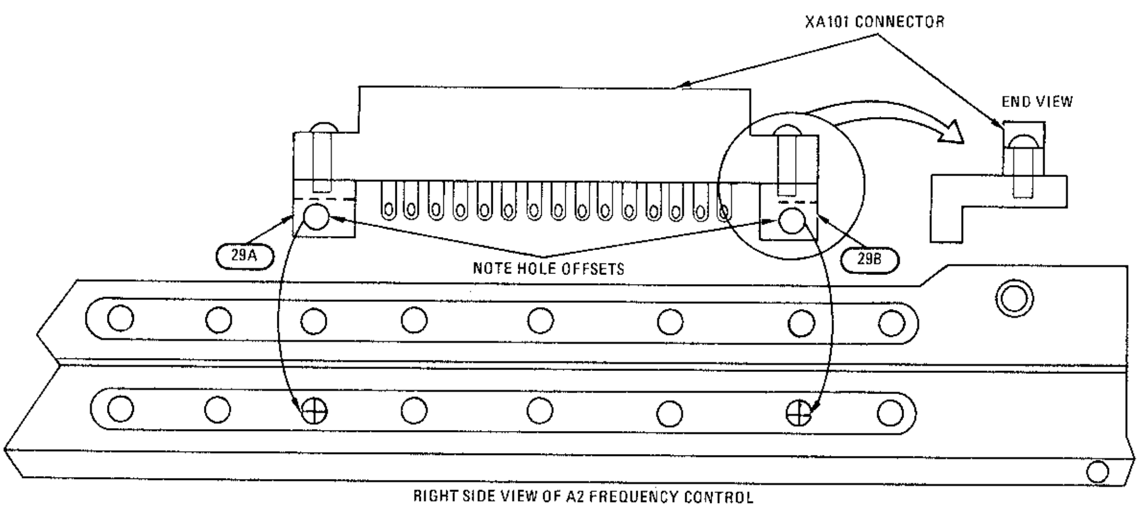
Page C2-9, Table C2-2:
Change A2A4 to HP Part Number 08505-60185 and a complete new listing of component parts for the Scaling Board in this change sheet.

Page C2-20, Table C2-2:
Change A2A10 to HP Part Number 08505-60184 and a complete new listing of component parts for the FM Driver Board in this change sheet.

Page C2-27, Table C2-2:
Add A2XA101, HP Part Number 08505-60186, Connector Assembly.

Page C2-28, Figure C2-1:
Change Item 29 to HP Part Number 08505-00126.
Add Item 29A, HP Part Number 08505-20178, Phase Lock Bracket, Right Hand.
Add Item 29B, HP Part Number 08505-20179, Phase Lock Bracket, Left Hand.
Change Item 32 to HP Part Number 08505-00130.
Change Item 36 to HP Part Number 08505-00131.
Change Item 66 to HP Part Number 08505-00129.

Page C2-30, Figure C2-1 (4 of 4):
Add drawing showing connector XA101 and mounting hardware as shown in this change sheet.



P/O Figure C2-1. A2 Frequency Control Mechanical Parts Location (4 of 4) (CHANGE 5)

P/O Table C2-2. Replaceable Parts (CHANGE 5)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
			A2A4 SCALER BOARD		
A2A4	08505-60185	1	BOARD ASSEMBLY, SCALER	28480	08505-60185
A2A4C1	0180-1746	4	CAPACITOR-FXD 15UF+-10% 20VDC TA	04200	150D156X9020B2
A2A4C2	0180-2206	1	CAPACITOR-FXD 60UF+-10% 6VDC TA	04200	150D606X9006B2
A2A4C3	0180-1746		CAPACITOR-FXD 15UF+-10% 20VDC TA	04200	150D156X9020B2
A2A4C4	0180-0116	1	CAPACITOR-FXD 6.8UF+-10% 35VDC TA	04200	150D685X9035B2
A2A4C5	0180-0197	1	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	04200	150D225X9020A2
A2A4C6	0160-2199	1	CAPACITOR-FXD 30PF +-5% 300VDC	28480	0160-2199
A2A4C7	0140-0200	1	CAPACITOR-FXD 390PF +-5% 300VDC MICA	04522	DM15F391J0300WV1CR
A2A4C8	0140-0193	1	CAPACITOR-FXD 82PF +-5% 300VDC	04522	DM15E820J0300WV1CR
A2A4C9			DELETED		
A2A4C10			DELETED		
A2A4C11	0160-0127	1	CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-0127
A2A4CR1	1901-0033	7	DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A2A4CR2	1901-0033		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A2A4CR3	1901-0033		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A2A4CR4	1901-0033		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A2A4CR5	1901-0033		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A2A4CR6	1901-0033		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A2A4CR7	1901-0539	2	DIODE-SCHOTTKY	28480	1901-0539
A2A4CR8	1901-0539		DIODE-SCHOTTKY	28480	1901-0539
A2A4CR9	1901-0033		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A2A4J1	1250-0543	2	CONNECTOR-RF SM-SNP M PC 50-OHM	05769	51-053-0000
A2A4J2	08443-00041	1	TEST POINT	28480	08443-00041
A2A4L1	9100-1623	1	COIL-MLD 27UH 5% Q=60 .155DX.375LG	02172	15-4455-2J
A2A4L2	9100-1645	3	COIL-MLD 390UH 5% Q=65 .19DX.44LG	02172	19-1331-25J
A2A4L3	9100-1645		COIL-MLD 390UH 5% Q=65 .19DX.44LG	02172	19-1331-25J
A2A4L4	9100-1645		COIL-MLD 390UH 5% Q=65 .19DX.44LG	02172	19-1331-25J
A2A4MP1	5000-9043	2	PIN:P.C. BOARD EXTRACTOR	28480	5000-9043
A2A4MP2	5040-6848	1	EXTRACTOR, BOARD, YELLOW	28480	5040-6846
A2A4MP3	08505-00131	1	COVER, SCALING BOARD	28480	08505-00131
A2A4Q1	1855-0020	3	TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A2A4Q2	1853-0050	1	TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0050
A2A4Q3	1854-0404	5	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A2A4Q4	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A2A4Q5	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A2A4Q6	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A2A4Q7	1855-0020		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A2A4Q8	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A2A4Q9	1855-0020		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A2A4R1	0757-0465	10	RESISTOR 100K 1% .125W F TC=0+-100	03292	C4-1/8-T0-1003-F
A2A4R2	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03292	C4-1/8-T0-1003-F
A2A4R3	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03292	C4-1/8-T0-1003-F
A2A4R4	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03292	C4-1/8-T0-1003-F
A2A4R5	0757-0438	7	RESISTOR 5.11K 1% .125W F TC=0+-100	03292	C4-1/8-T0-5111-F
A2A4R6	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03292	C4-1/8-T0-1003-F
A2A4R7	0757-0458	5	RESISTOR 51.1K 1% .125W F TC=0+-100	03292	C4-1/8-T0-5112-F
A2A4R8	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03292	C4-1/8-T0-1003-F
A2A4R9	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03292	C4-1/8-T0-1003-F
A2A4R10	0757-0458		RESISTOR 51.1K 1% .125W F TC=0+-100	03292	C4-1/8-T0-5112-F
A2A4R11	0757-0458		RESISTOR 51.1K 1% .125W F TC=0+-100	03292	C4-1/8-T0-5112-F
A2A4R12	0757-0458		RESISTOR 51.1K 1% .125W F TC=0+-100	03292	C4-1/8-T0-5112-F
A2A4R13	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03292	C4-1/8-T0-1003-F
A2A4R14	2100-3273	1	RESISTOR-TRMR 2K 10% C SIDE-ADJ 1-TRN	04568	72-144-0
A2A4R15	0698-3440	1	RESISTOR 196 1% .125W F TC=0+-100	03292	C4-1/8-T0-196R-F
A2A4R16	2100-3352	1	RESISTOR-TRMR 1K 10% C SIDE-ADJ 1-TRN	04568	72-143-0
A2A4R17	0683-1055	1	RESISTOR 1M 5% .25W FC TC=-800/+900	01607	CB1055
A2A4R18	0698-3162	1	RESISTOR 46.4K 1% .125W F TC=0+-100	03292	C4-1/8-T0-4642-F
A2A4R19	0698-3136	1	RESISTOR 17.8K 1% .125W F TC=0+-100	03292	C4-1/8-T0-1782-F
A2A4R20	0757-0401	1	RESISTOR 100 1% .125W F TC=0+-100	03292	C4-1/8-T0-101-F
A2A4R21	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03292	C4-1/8-T0-5111-F
A2A4R22	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03292	C4-1/8-T0-5111-F
A2A4R23	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03292	C4-1/8-T0-5111-F
A2A4R24	2100-3350	2	RESISTOR-TRMR 200 10% C SIDE-ADJ 1-TRN	04568	72-141-0
A2A4R25	2100-3350		RESISTOR-TRMR 200 10% C SIDE-ADJ 1-TRN	04568	72-141-0
A2A4R26	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03292	C4-1/8-T0-1003-F
A2A4R27	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03292	C4-1/8-T0-5111-F
A2A4R28	0698-3457	4	RESISTOR 316K 1% .125W F TC=0+-100	02995	MF4C-1
A2A4R29	0698-3457		RESISTOR 316K 1% .125W F TC=0+-100	02995	MF4C-1
A2A4R30	0757-0346	6	RESISTOR 10 1% .125W F TC=0+-100	03292	C4-1/8-T0-10R0-F

P/O Table C2-2. Replaceable Parts (CHANGE 5)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A2A4R31	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03292	C4-1/8-T0-10R0-F
A2A4R32	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03292	C4-1/8-T0-10R0-F
A2A4R33	0698-3457		RESISTOR 316K 1% .125W F TC=0+-100	02995	MF4C-1
A2A4R34	0698-3457		RESISTOR 316K 1% .125W F TC=0+-100	02995	MF4C-1
A2A4R35	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03292	C4-1/8-T0-10R0-F
A2A4R36	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03292	C4-1/8-T0-10R0-F
A2A4R37	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03292	C4-1/8-T0-10R0-F
A2A4R38	0698-3449	1	RESISTOR 28.7K 1% .125W F TC=0+-100	03292	C4-1/8-T0-2872-F
A2A4R39	0757-0458		RESISTOR 51.1K 1% .125W F TC=0+-100	03292	C4-1/8-T0-5112-F
A2A4R40	2100-3207	1	RESISTOR-TRMR 5K 10% C SIDE-ADJ 1-TRN	04568	72-145-0
A2A4R41	0698-7236	1	RESISTOR 1K 1% .05W F TC=0+-100	03292	C3-1/8-T0-1001-G
A2A4R42	0757-0199	1	RESISTOR 21.5K 1% .125W F TC=0+-100	03292	C4-1/8-T0-2152-F
A2A4R43	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03292	C4-1/8-T0-1003-F
A2A4U1	1810-0221	2	NETWORK-RES 14-PIN-DIP .1-PIN-SPCG	28480	1810-0221
A2A4U2	1826-0249	1	IC OP AMP	03285	AD504J
A2A4U3	1820-1545	10	IC DSEL/MULTIPLXR CMOS TPL	02037	MC14053BCL
A2A4U4	1820-1545		IC DSEL/MULTIPLXR CMOS TPL	02037	MC14053BCL
A2A4U5	1826-0229	2	IC OP AMP	02180	OP-05CJ
A2A4U6	1810-0221		NETWORK-RES 14-PIN-DIP .1-PIN-SPCG	28480	1810-0221
A2A4U7	1820-1536	2	IC GATE CMOS EXCL-OR QUAD 2-INP	01921	CD4030AF
A2A4U8	1820-1545		IC DSEL/MULTIPLXR CMOS TPL	02037	MC14053BCL
A2A4U9	1820-1545		IC DSEL/MULTIPLXR CMOS TPL	02037	MC14053BCL
A2A4U10	1820-1545		IC DSEL/MULTIPLXR CMOS TPL	02037	MC14053BCL
A2A4U11	1820-1545		IC DSEL/MULTIPLXR CMOS TPL	02037	MC14053BCL
A2A4U12	1820-1536		IC GATE CMOS EXCL-OR QUAD 2-INP	01921	CD4030AF
A2A4U13	1820-1534	3	IC GATE CMOS NOR QUAD 2-INP	01921	CD4001AF
A2A4U14	1820-1545		IC DSEL/MULTIPLXR CMOS TPL	02037	MC14053BCL
A2A4U15	1820-1545		IC DSEL/MULTIPLXR CMOS TPL	02037	MC14053BCL
A2A4U16	1820-1545		IC DSEL/MULTIPLXR CMOS TPL	02037	MC14053BCL
A2A4U17	1820-1545		IC DSEL/MULTIPLXR CMOS TPL	02037	MC14053BCL
A2A4U18	1820-1534		IC GATE CMOS NOR QUAD 2-INP	01921	CD4001AF
A2A4U19	1820-1540	6	IC LCH CMOS D-TYPE QUAD	01921	CD4042AF
A2A4U20	1820-1540		IC LCH CMOS D-TYPE QUAD	01921	CD4042AF
A2A4U21	1820-1540		IC LCH CMOS D-TYPE QUAD	01921	CD4042AF
A2A4U22	1820-1538	4	IC GATE CMOS NAND QUAD 2-INP	01921	CD4011AF
A2A4U23	1820-1534		IC GATE CMOS NOR QUAD 2-INP	01921	CD4001AF
A2A4U24	1820-1531	1	IC FF CMOS D-TYPE POS-EDGE-TRIG DUAL	01921	CD4013AF
A2A4U25	1820-1538		IC GATE CMOS NAND QUAD 2-INP	01921	CD4011AF
A2A4U26	1820-1538		IC GATE CMOS NAND QUAD 2-INP	01921	CD4011AF
A2A4U27	1820-1538		IC GATE CMOS NAND QUAD 2-INP	01921	CD4011AF
A2A4U28	1820-1540		IC LCH CMOS D-TYPE QUAD	01921	CD4042AF
A2A4U29	1820-1540		IC LCH CMOS D-TYPE QUAD	01921	CD4042AF
A2A4U30	1820-1540		IC LCH CMOS D-TYPE QUAD	01921	CD4042AF
			A2A10 FM DRIVER BOARD		
A2A10	08505-60184	1	BOARD ASSEMBLY, FM DRIVER	28480	08505-60184
A2A10C1	0160-2307	1	CAPACITOR-FXD 47PF +-5% 300VDC	28480	0160-2307
A2A10C2	0160-2230	3	CAPACITOR-FXD 3300PF +-5% 300VDC	28480	0160-2230
A2A10C3	0160-2230		CAPACITOR-FXD 3300PF +-5% 300VDC	28480	0160-2230
A2A10C4	0160-0945	1	CAPACITOR-FXD 910PF +-5% 100VDC MICA0+70	28480	0160-0945
A2A10C5	0160-2209	1	CAPACITOR-FXD 360PF +-5% 300VDC MICA0+70	28480	0160-2209
A2A10C6	0160-3539	1	CAPACITOR-FXD 820PF +-5% 100VDC MICA0+70	28480	0160-3539
A2A10C7	0160-2230		CAPACITOR-FXD 3300PF +-5% 300VDC	28480	0160-2230
A2A10C8	0180-2141	1	CAPACITOR-FXD 3.3UF+-10% 50VDC TA	04200	150D335X9050B2
A2A10C9	0160-0161	3	CAPACITOR-FXD .01UF +-10% 200VDC POLYE	04200	292P10392
A2A10C10	0160-3537	1	CAPACITOR-FXD 680PF +-5% 100VDC MICA0+70	28480	0160-3537
A2A10C11	0180-1746		CAPACITOR-FXD 15UF+-10% 20VDC TA	04200	150D156X9020B2
A2A10C12	0160-0161		CAPACITOR-FXD .01UF +-10% 200VDC POLYE	04200	292P10392
A2A10C13	0180-1746		CAPACITOR-FXD 15UF+-10% 20VDC TA	04200	150D156X9020B2
A2A10C14	0160-0161		CAPACITOR-FXD .01UF +-10% 200VDC POLYE	04200	292P10392
A2A10CR1	1901-0040	3	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A2A10CR2	1901-0040	2	DIODE-SWITCHING 1N4004 30V 50MA 2NS DO-35	28480	1901-0040
A2A10CR3	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A2A10CR4	1901-0743		DIODE-PWR RECT 400V 1 AMP DO-41	01698	1N4004
A2A10CR5	1901-0743		DIODE-PWR RECT 1N4004 400V 1 AMP DO-41	01698	1N4004
A2A10J1	1250-0543		CONNECTOR-RF SM-SNP M PC 50-OHM	05769	51-053-0000
A2A10L1	9100-2585	2	COIL-MLD 10MH 10% Q=40 .156DX.375LG	02172	158-103K
A2A10L2	9100-2585		COIL-MLD 10MH 10% Q=40 .156DX.375LG	02172	158-103K
A2A10MP1	5000-9043		PIN:P.C. BOARD EXTRACTOR	28480	5000-9043
A2A10MP2	5040-6843	1	EXTRACTOR, P.C. BOARD	28480	5040-6843
A2A10MP3	0340-0162	2	INSULATOR-XSTR ALUMINUM	28480	0340-0162
A2A10MP4	0340-0162		INSULATOR-XSTR ALUMINUM	28480	0340-0162
A2A10MP5	0590-0519	8	THREADED INSERT-NUT 4-40 .062-LG STL	28480	0590-0519
A2A10MP6	0590-0519		THREADED INSERT-NUT 4-40 .062-LG STL	28480	0590-0519
A2A10MP7	0590-0519		THREADED INSERT-NUT 4-40 .062-LG STL	28480	0590-0519
A2A10MP8	0590-0519		THREADED INSERT-NUT 4-40 .062-LG STL	28480	0590-0519
A2A10MP9	0590-0519		THREADED INSERT-NUT 4-40 .062-LG STL	28480	0590-0519
A2A10MP10	0590-0519		THREADED INSERT-NUT 4-40 .062-LG STL	28480	0590-0519

P/O Table C2-2. Replaceable Parts (CHANGE 5)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A2A10MP11	0590-0519		THREADED INSERT-NUT 4-40 .062-LG STL	28480	0590-0519
A2A10MP12	0590-0519		THREADED INSERT-NUT 4-40 .062-LG STL	28480	0590-0519
A2A10MP13	2200-0103	4	SCREW-MACH 4-40 .25-IN-LG PAN-HD-POZI	28480	2200-0103
A2A10MP14	2200-0103		SCREW-MACH 4-40 .25-IN-LG PAN-HD-POZI	28480	2200-0103
A2A10MP15	2200-0103		SCREW-MACH 4-40 .25-IN-LG PAN-HD-POZI	28480	2200-0103
A2A10MP16	2200-0103		SCREW-MACH 4-40 .25-IN-LG PAN-HD-POZI	28480	2200-0103
A2A10MP17	2200-0113	4	SCREW-MACH 4-40 .625-IN-LG PAN-HD-POZI	28480	2200-0113
A2A10MP18	2200-0113		SCREW-MACH 4-40 .625-IN-LG PAN-HD-POZI	28480	2200-0113
A2A10MP19	2200-0113		SCREW-MACH 4-40 .625-IN-LG PAN-HD-POZI	28480	2200-0113
A2A10MP20	2200-0113		SCREW-MACH 4-40 .625-IN-LG PAN-HD-POZI	28480	2200-0113
A2A10MP21	08505-20135	1	SHIELD	28480	08505-20135
A2A10MP22	08505-20136	1	BASE, SHIELD	28480	08505-20136
A2A10MP23	1205-0012	1	HEAT SINK TO-18-PKG	28480	1205-0012
A2A10MP24	08505-00130	1	FM DRIVER COVER	28480	08505-00130
A2A10Q1	1853-0007	1	TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	02037	2N3251
A2A10Q2	1854-0237	1	TRANSISTOR NPN SI TO-66 PD=20W FT=10MHZ	28480	1854-0237
A2A10Q3	1854-0039	1	TRANSISTOR NPN 2N3053S SI TO-39 PD=1W	02037	2N3053
A2A10Q4	1853-0052	1	TRANSISTOR PNP 2N3740 SI TO-66 PD=25W	02037	2N3740
A2A10Q5	1854-0475	1	TRANSISTOR-DUAL NPN PD=750MW	28480	1854-0475
A2A10R1	0698-3160	1	RESISTOR 31.6K 1% .125W F TC=0+-100	03292	C4-1/8-T0-3162-F
A2A10R2	0757-0442	2	RESISTOR 10K 1% .125W F TC=0+-100	03292	C4-1/8-T0-1002-F
A2A10R3	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03292	C4-1/8-T0-5111-F
A2A10R4	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03292	C4-1/8-T0-1002-F
A2A10R5	0698-3151	1	RESISTOR 2.87K 1% .125W F TC=0+-100	03292	C4-1/8-T0-2871-F
A2A10R6	0698-0084	2	RESISTOR 2.15K 1% .125W F TC=0+-100	03292	C4-1/8-T0-2151-F
A2A10R7	0757-0422	3	RESISTOR 909 1% .125W F TC=0+-100	03292	C4-1/8-T0-909R-F
A2A10R8	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03292	C4-1/8-T0-5111-F
A2A10R9	0757-0290	1	RESISTOR 6.19K 1% .125W F TC=0+-100	02995	MF4C1/8-T0-6191-F
A2A10R10	0757-0280	1	RESISTOR 1K 1% .125W F TC=0+-100	03292	C4-1/8-T0-1001-F
A2A10R11	0698-3132	1	RESISTOR 261 1% .125W F TC=0+-100	03292	C4-1/8-T0-2610-F
A2A10R12	0757-0422		RESISTOR 909 1% .125W F TC=0+-100	03292	C4-1/8-T0-909R-F
A2A10R13	0757-0422		RESISTOR 909 1% .125W F TC=0+-100	03292	C4-1/8-T0-909R-F
A2A10R14	0698-3631	1	RESISTOR 330 5% 2W MO TC=0+-200	03412	FP-42
A2A10R15	0698-3430	3	RESISTOR 21.5 1% .125W F TC=0+-100	01992	PME55-1/8-T0-21R5-F
A2A10R16	0757-1090	1	RESISTOR 261 1% .5W F TC=0+-100	02995	MF7C1/2-T0-261R-F
A2A10R17	0698-3430		RESISTOR 21.5 1% .125W F TC=0+-100	01992	PME55-1/8-T0-21R5-F
A2A10R18	0698-3430		RESISTOR 21.5 1% .125W F TC=0+-100	01992	PME55-1/8-T0-21R5-F
A2A10R19	0698-3607	1	RESISTOR 18 5% 2W MO TC=0+-200	03412	FP42-2-T00-18R0-J
A2A10R20	0757-0394	1	RESISTOR 51.1 1% .125W F TC=0+-100	03292	C4-1/8-T0-51R1-F
A2A10R21	0698-3603	1	RESISTOR 12 5% 2W MO TC=0+-200	03412	FP42-2-T00-12R0-J
A2A10R22	0698-0084		RESISTOR 2.15K 1% .125W F TC=0+-100	03292	C4-1/8-T0-2151-F
A2A10U1	1826-0229		IC OP AMP	02180	OP-05CJ

CHANGE 5 (Cont'd)

Page C3-66, Figure C3-25:
Replace Figure C3-25 with new Parts Location drawing of A2A4 in this change sheet.

Page C3-67, Figure C3-26:
Replace Figure C3-26 with new Schematic of A2A4 in this change sheet.

Page C3-91, Figure C3-37:
Replace Figure C3-37 with new Parts Location drawing of A2A10 in this change sheet.

Page C3-91, Figure C3-38:
Replace Figure C3-38 with new Schematic of A2A10 in this change sheet.

Page C3-105/106:
Add new Figures C3-48 and C3-49 in this change sheet.

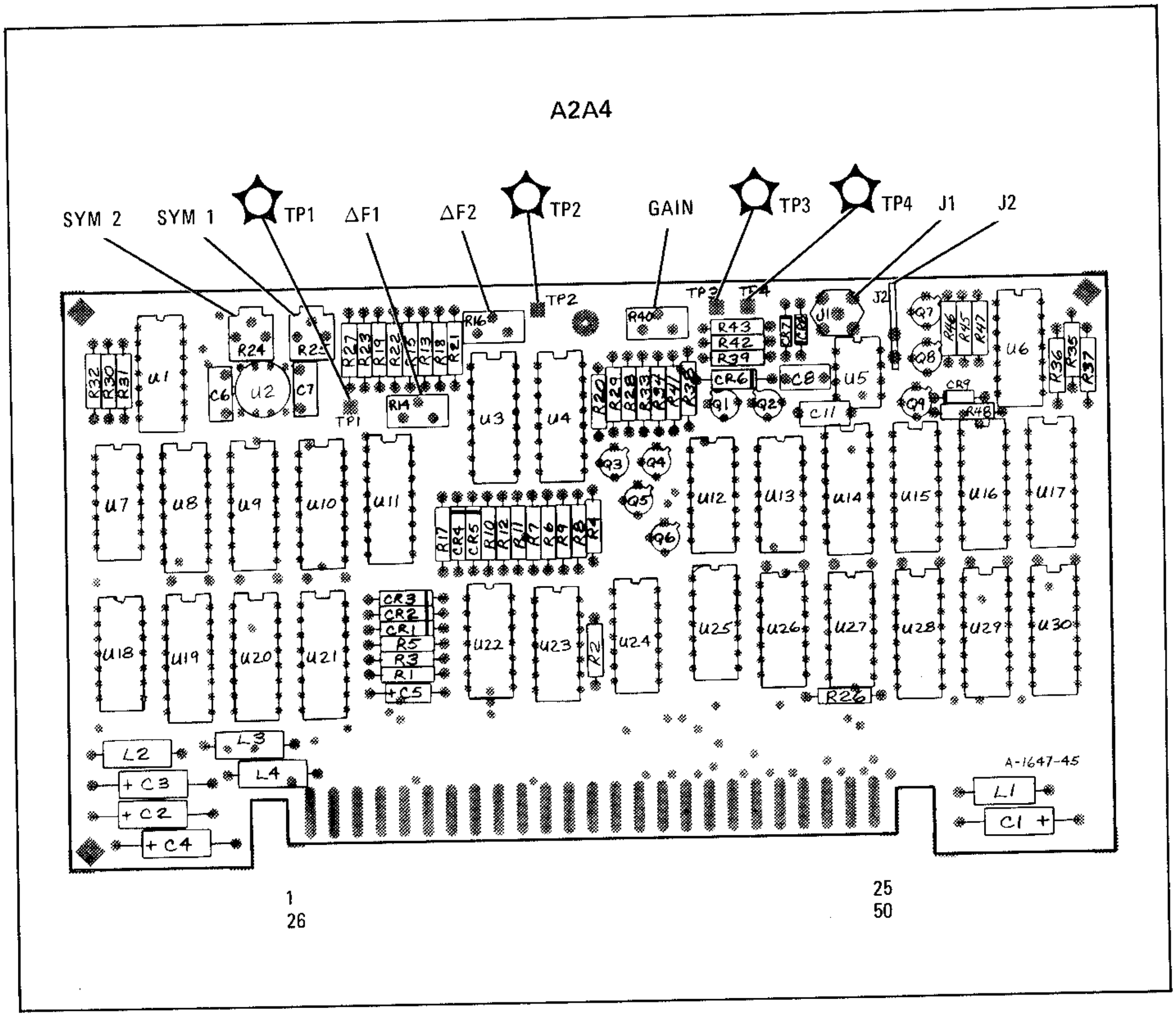


Figure C3-25. A2A4 Scaling Circuit, Parts Location (CHANGE 5)

Fig C3-26
Sht 1 of 5

SIGNAL	DEFINITION
DAT 1	DATA 1 FOR INSTRUMENT I/O
DAT 2	DATA 2 FOR INSTRUMENT I/O
DAT 3	DATA 3 FOR INSTRUMENT I/O
DAT 4	DATA 4 FOR INSTRUMENT I/O
DIG 1	DIGIT 1
DIG 2	DIGIT 2
DIG 3	DIGIT 3
DIG 4	DIGIT 4
LT EN	LATCH ENABLE
POSN1	POSITION1 (START/CW)
POSN2	POSITION 2 (STOP/ΔF)
LVDIS	VERNIER DISABLE (0=NO VERNIER)
WTH1	WIDTH 1
WTH3	WIDTH 3
VSC	SCALING VOLTAGE

WIDTH		
	WTH1	WTH3
SS1	1	0
SS2	1	0
ALT	0	0
ΔF	0	1
CW	1	1

SWITCH CONTROL					
	U3			U4B	
	A	B	C	B	C
SS1	1	1	1	1	1
SS2	1	1	1	1	1
ALT	1	1	1	1	1
ΔF	0	1	0	0	0
CW	OPEN	—	—	0	1

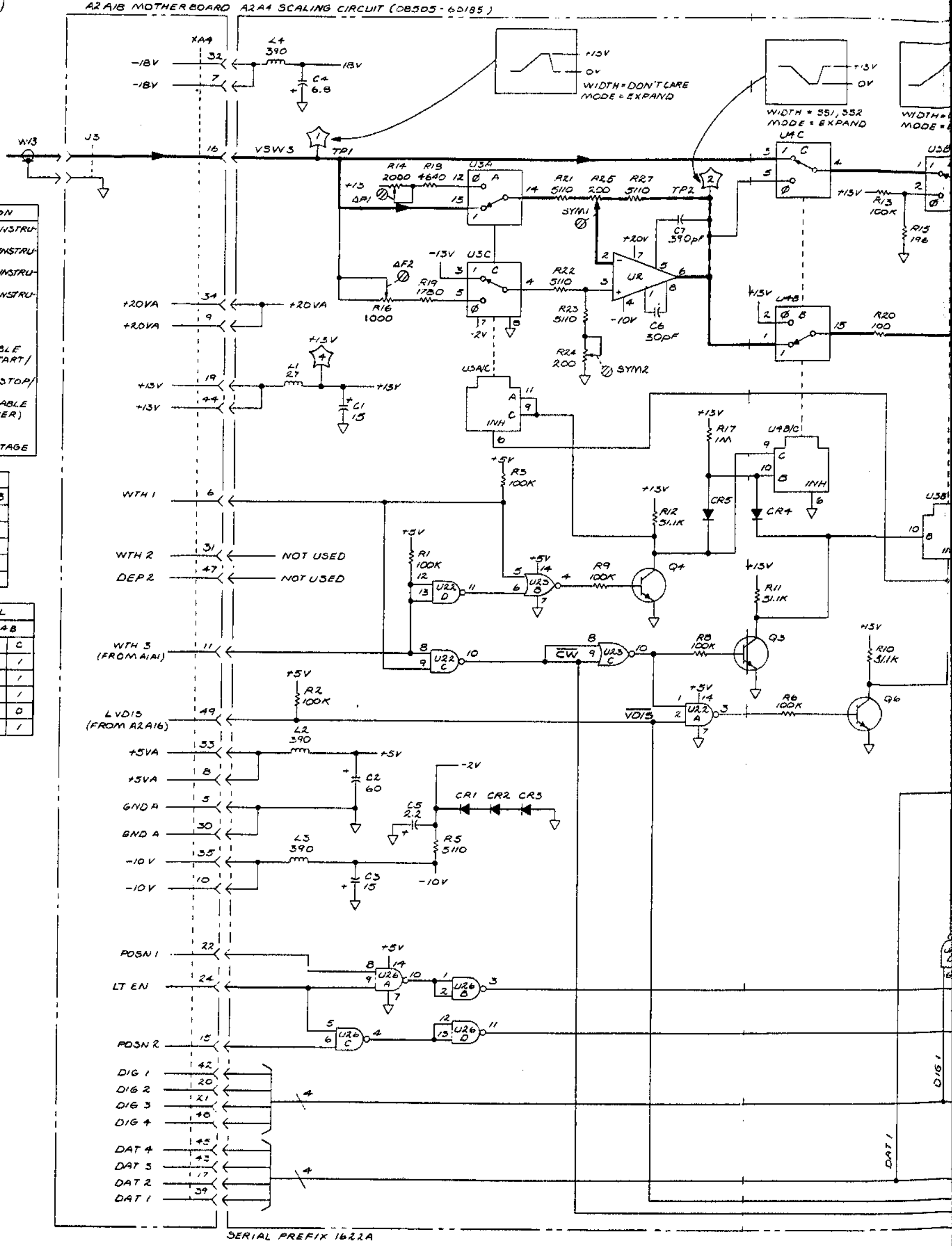


Fig. C3-26
Sht 2 of 5

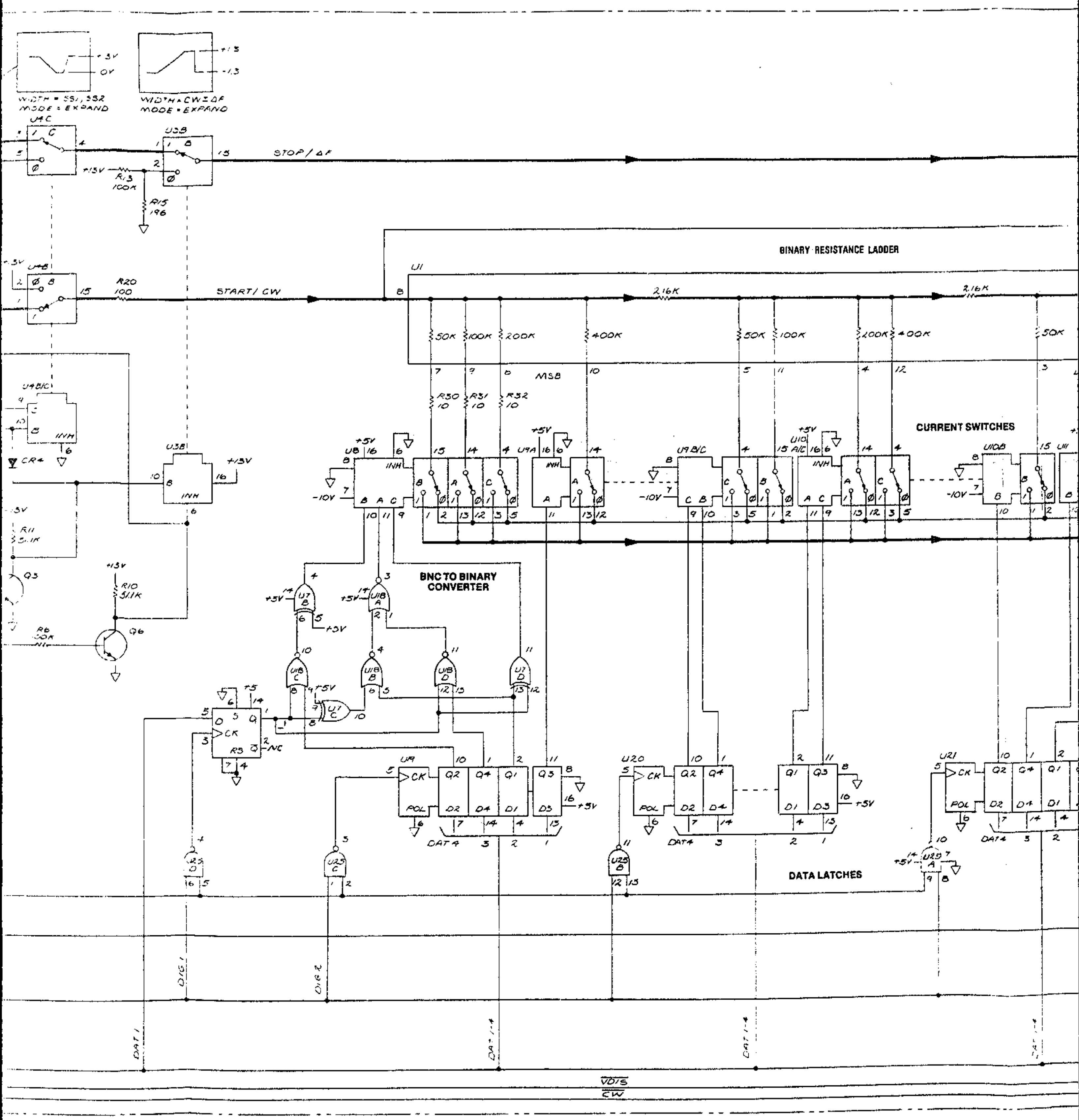


Fig. C3-26
Sht 3 of 5

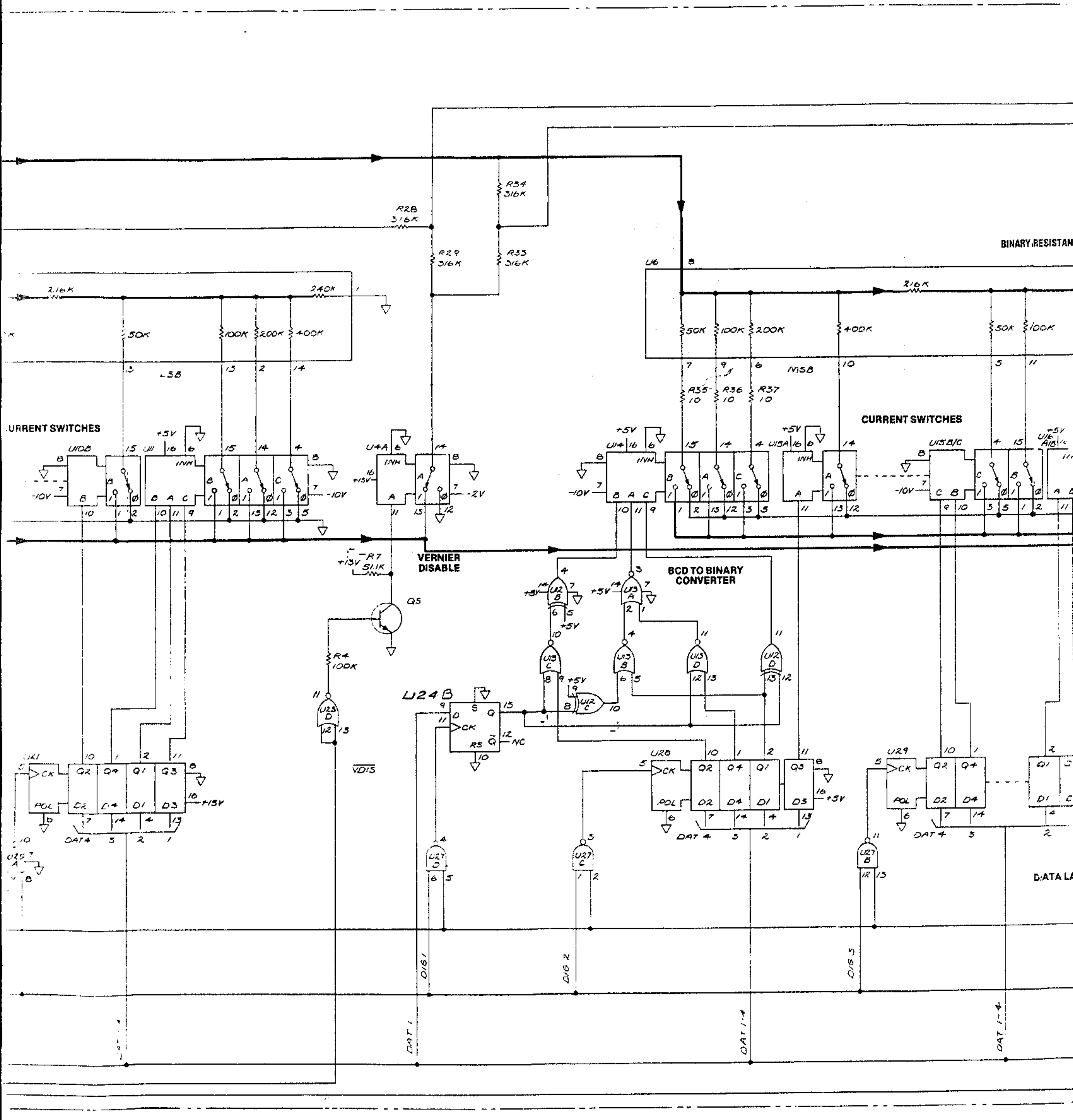


Fig C3-26
Sht 4 of 5

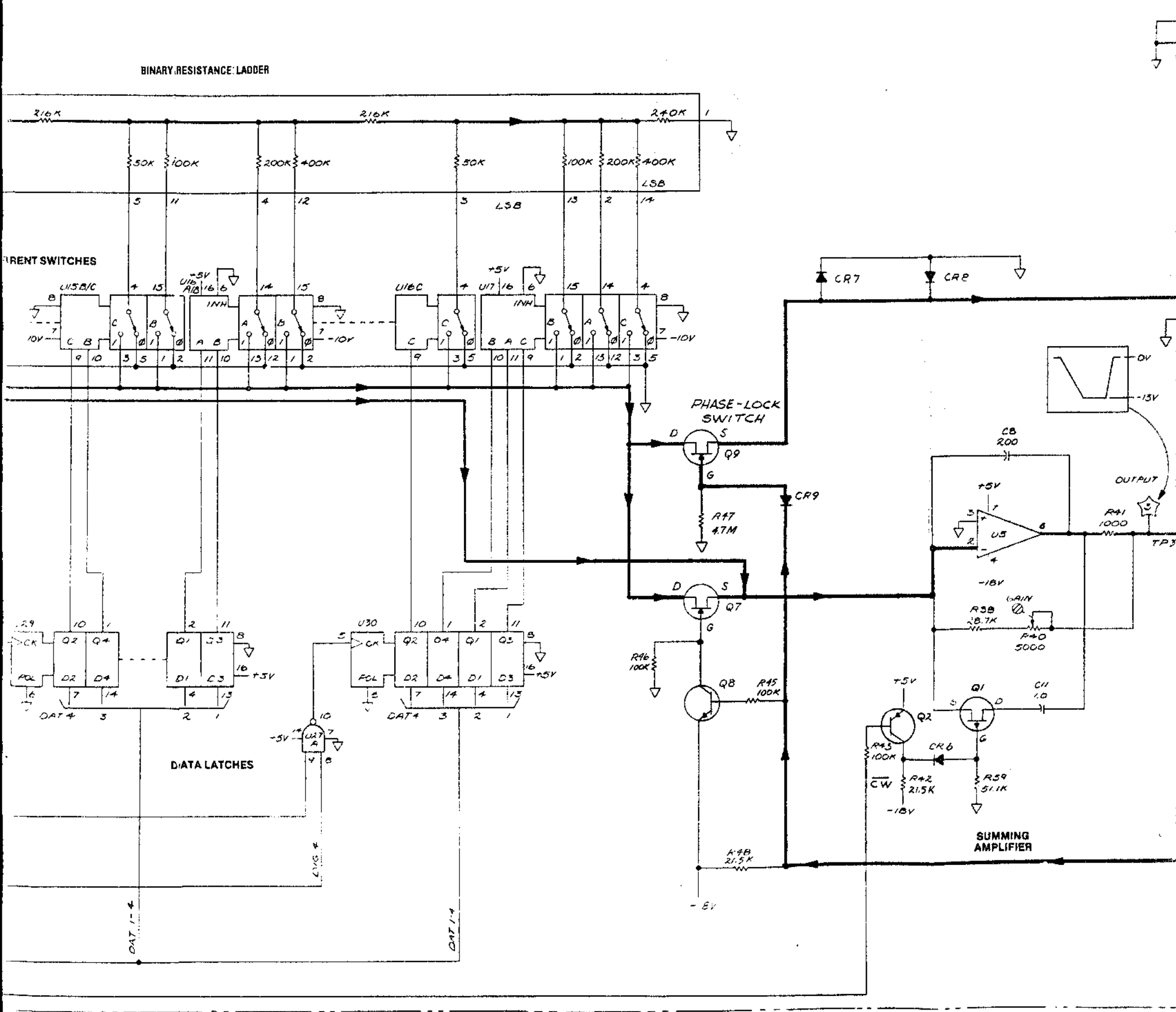
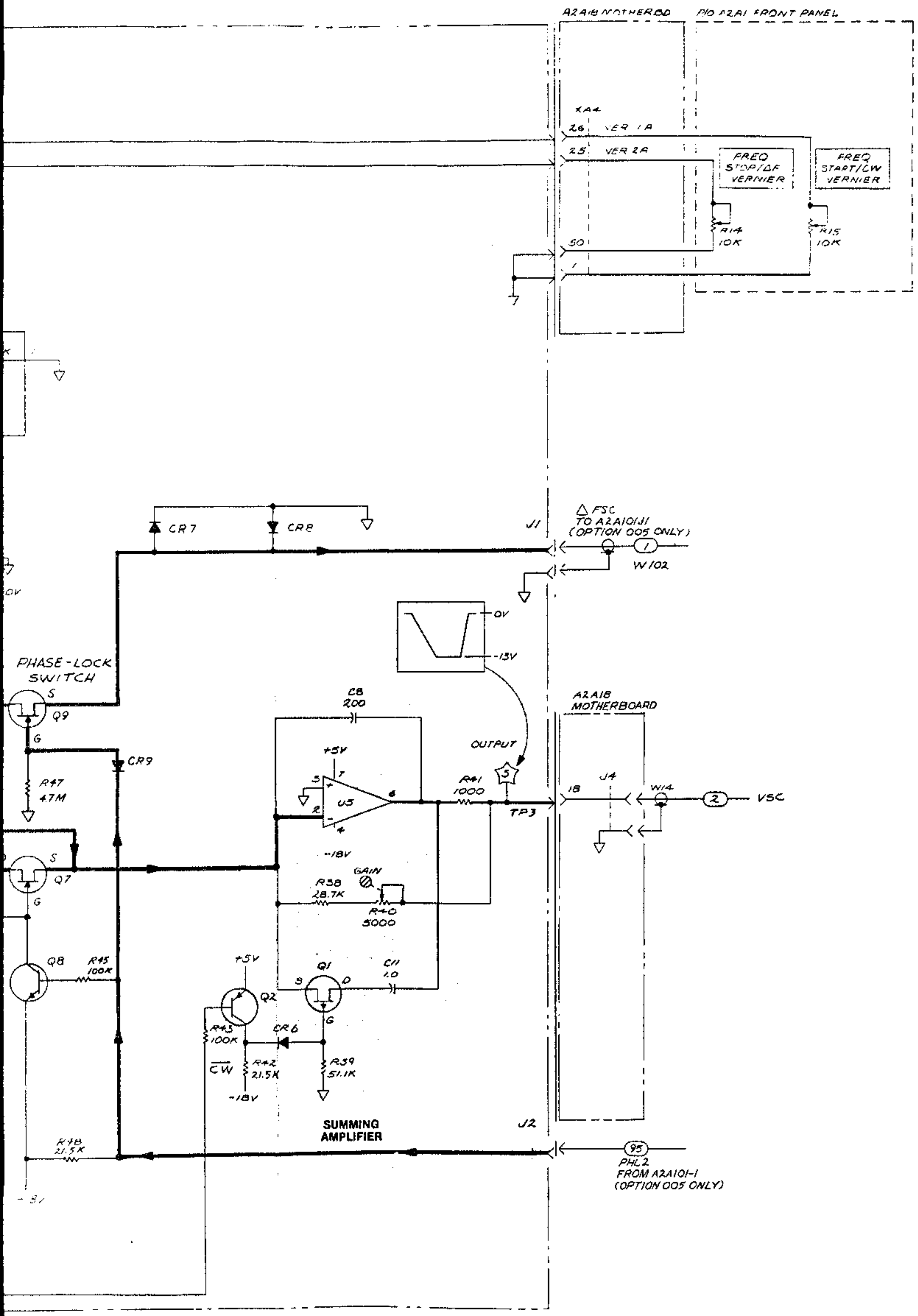


Fig. C3-26
Sht 5 of 5



NOTES

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATOR, PREFIX REFERENCE SHOWN WITH THE ASSEMBLY REFENCE DESIGNATOR.
2. UNLESS OTHERWISE INDICATED RESISTANCE IN OHMS CAPACITANCE IN MICROFARADS
3. INTERCONNECTION SYMBOL FOR (1)
4. LOGIC LEVELS ARE: LOW = 0 = < 0.8V HIGH = 1 = > 2.2V

REFERENCE DESIGNATORS

NO PREFIX	W13, W14
A2A1	R14, R15
A2A4	C1-C8, C11 CR1-CR9 L1-L4 Q1-Q9 R1-R47 U1-U30
A2A18	XA4 J3, J4

NOT ASSIGNED
A2A4C9
A2A4C10

Figure C3-26. A2A4 Scaling, Schematic (CHANGE 5)

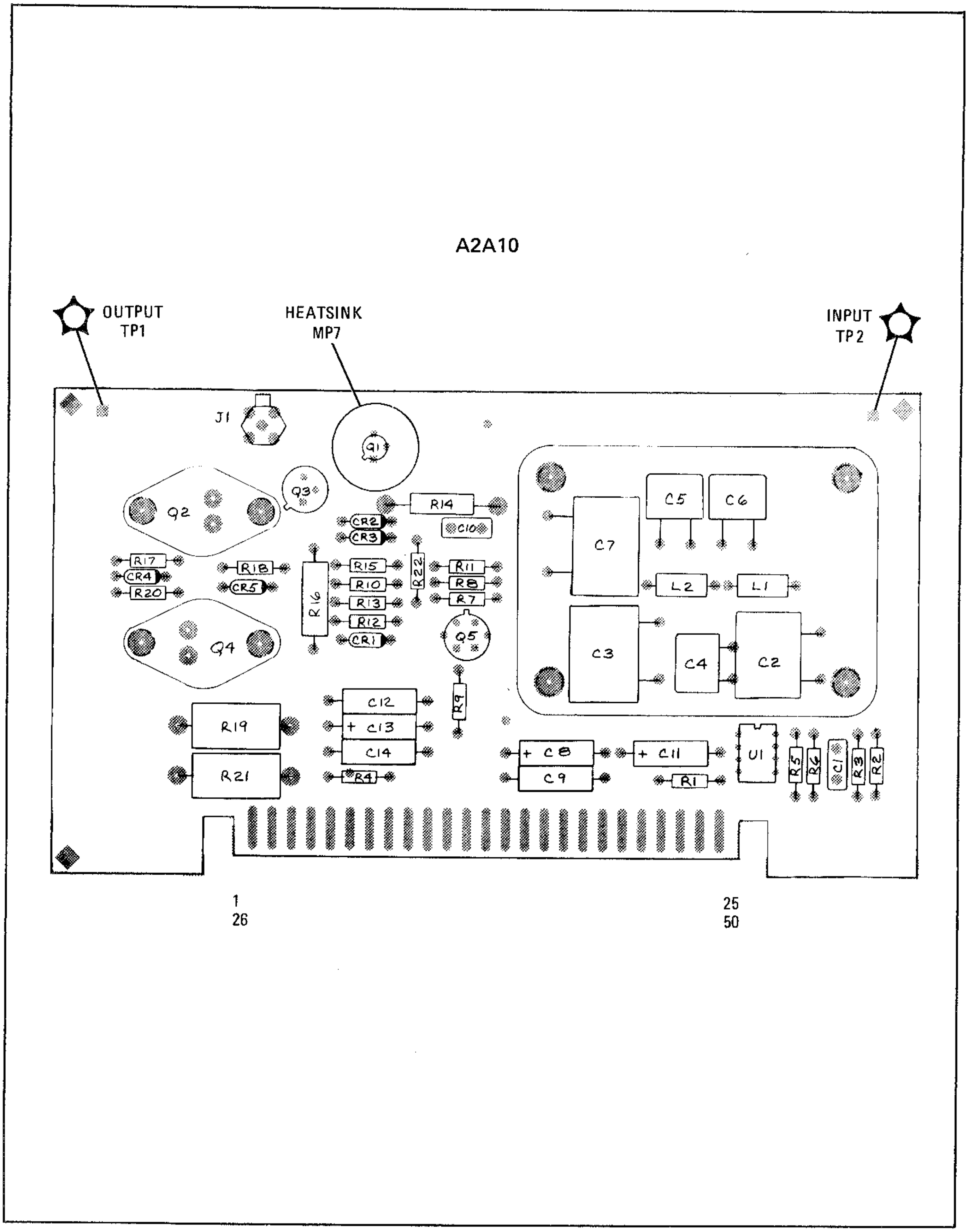


Figure C3-37. A2A10 FM Driver, Parts Location (CHANGE 5)

Fig. C3-38, Sht 1 of 4

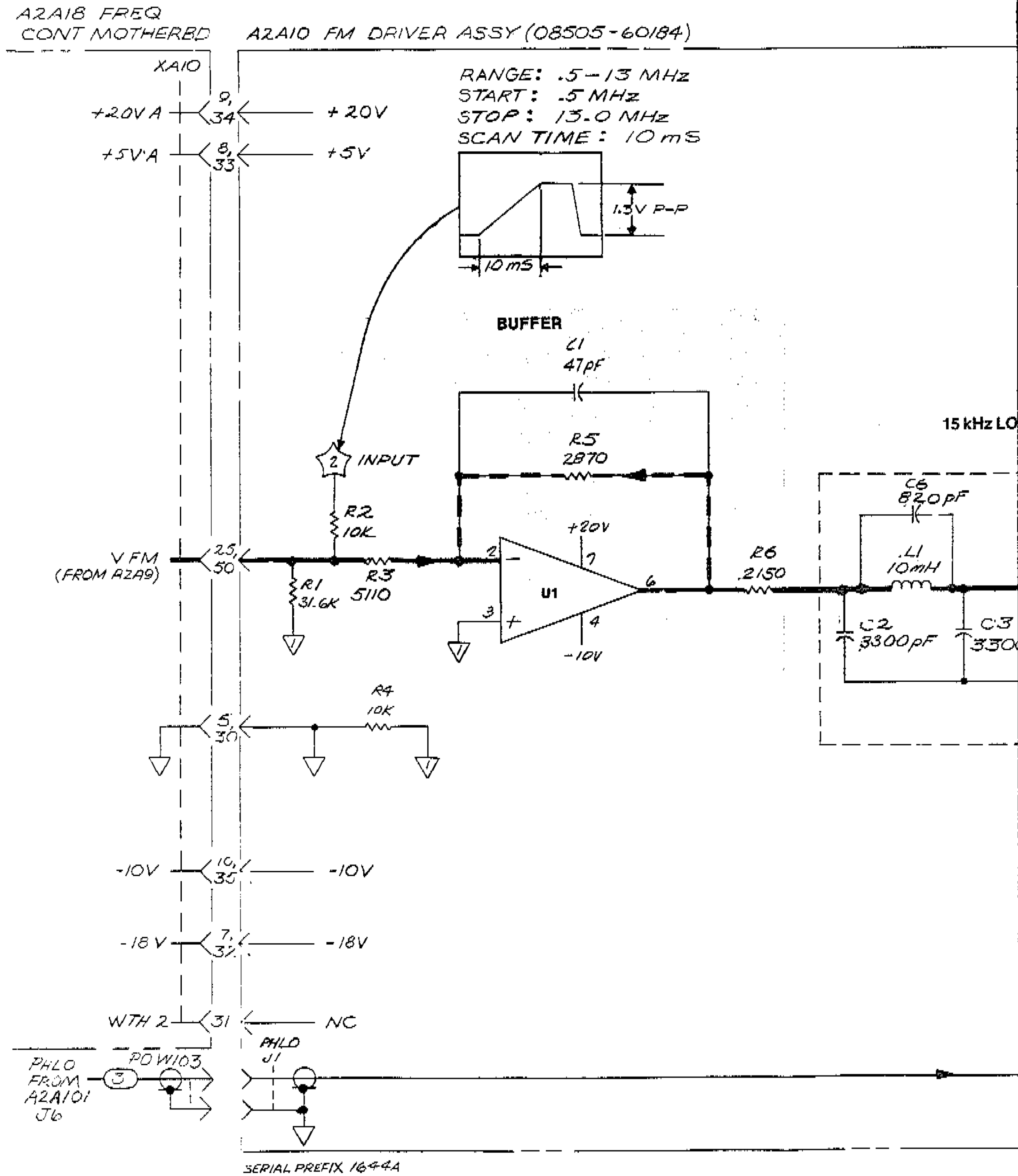


Fig C3-38
Sht 2 of 4

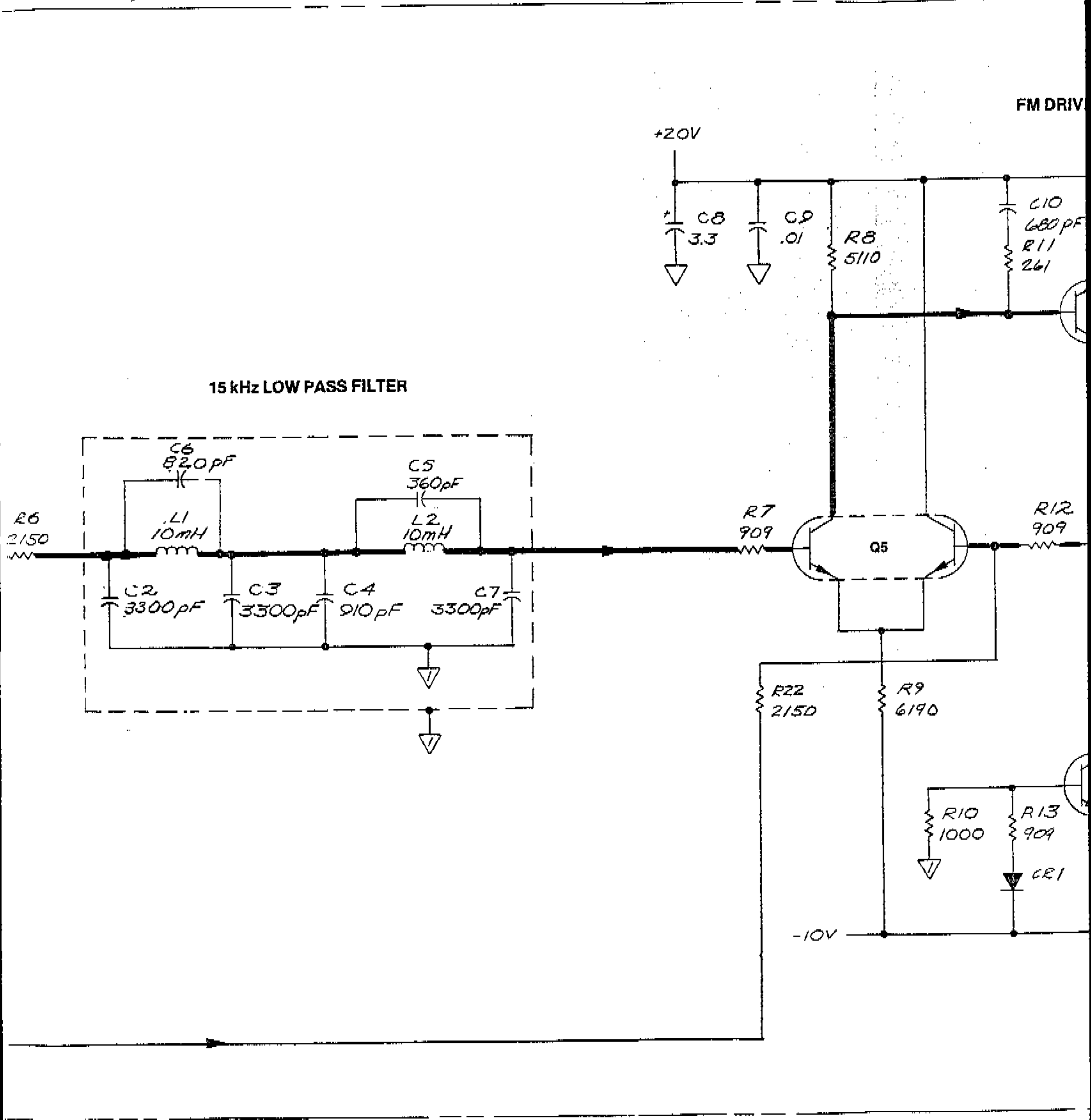


Fig C3-38
Sht 3 of 4

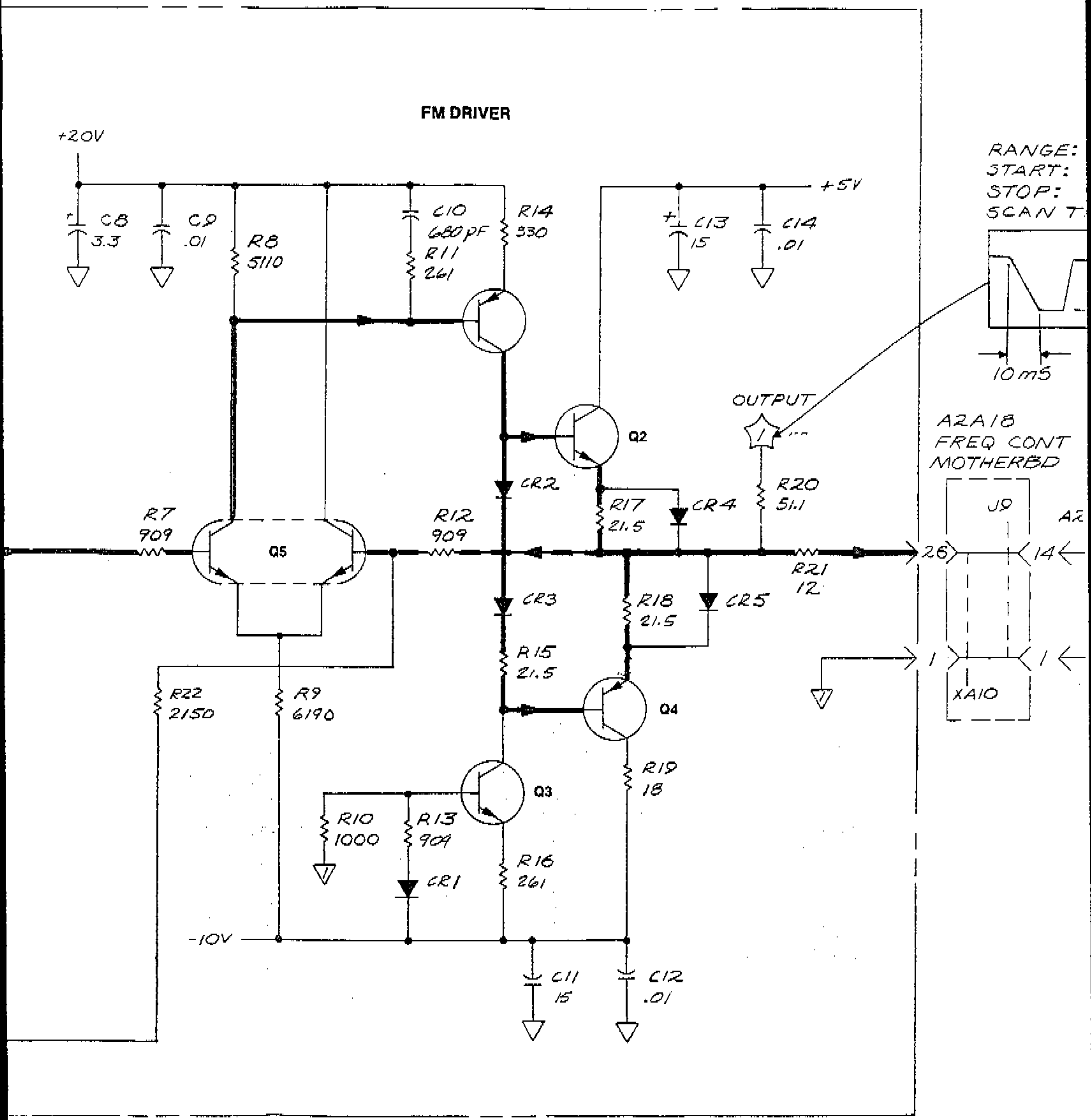
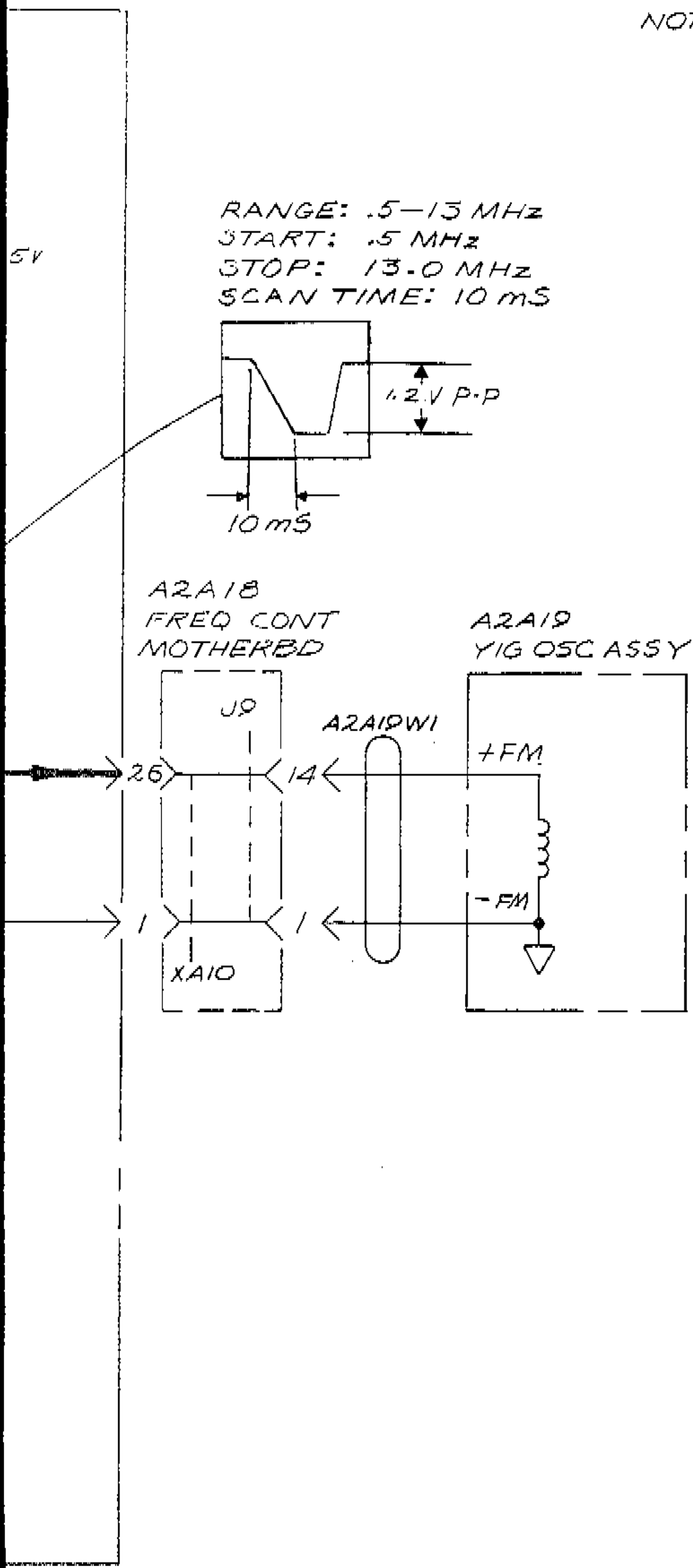


Fig. C3-38
Sht 4 of 4



NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATOR, PREFIX REFERENCE DESIGNATOR SHOWN WITH THE ASSEMBLY REFERENCE DESIGNATOR.
2. UNLESS OTHERWISE INDICATED, RESISTANCE IN OHMS CAPACITANCE IN MICROFARADS

REFERENCE DESIGNATIONS

A2A10
C1-C14
CR1-CR5
L1, L2
Q1-Q5
R1-R22
U1

3. ——► INDICATES PRIMARY SIGNAL FLOW PATH; — —◄— — INDICATES PRIMARY FEEDBACK PATH.

Figure C3-38. A2A10 FM Driver Schematic (CHANGE 5)

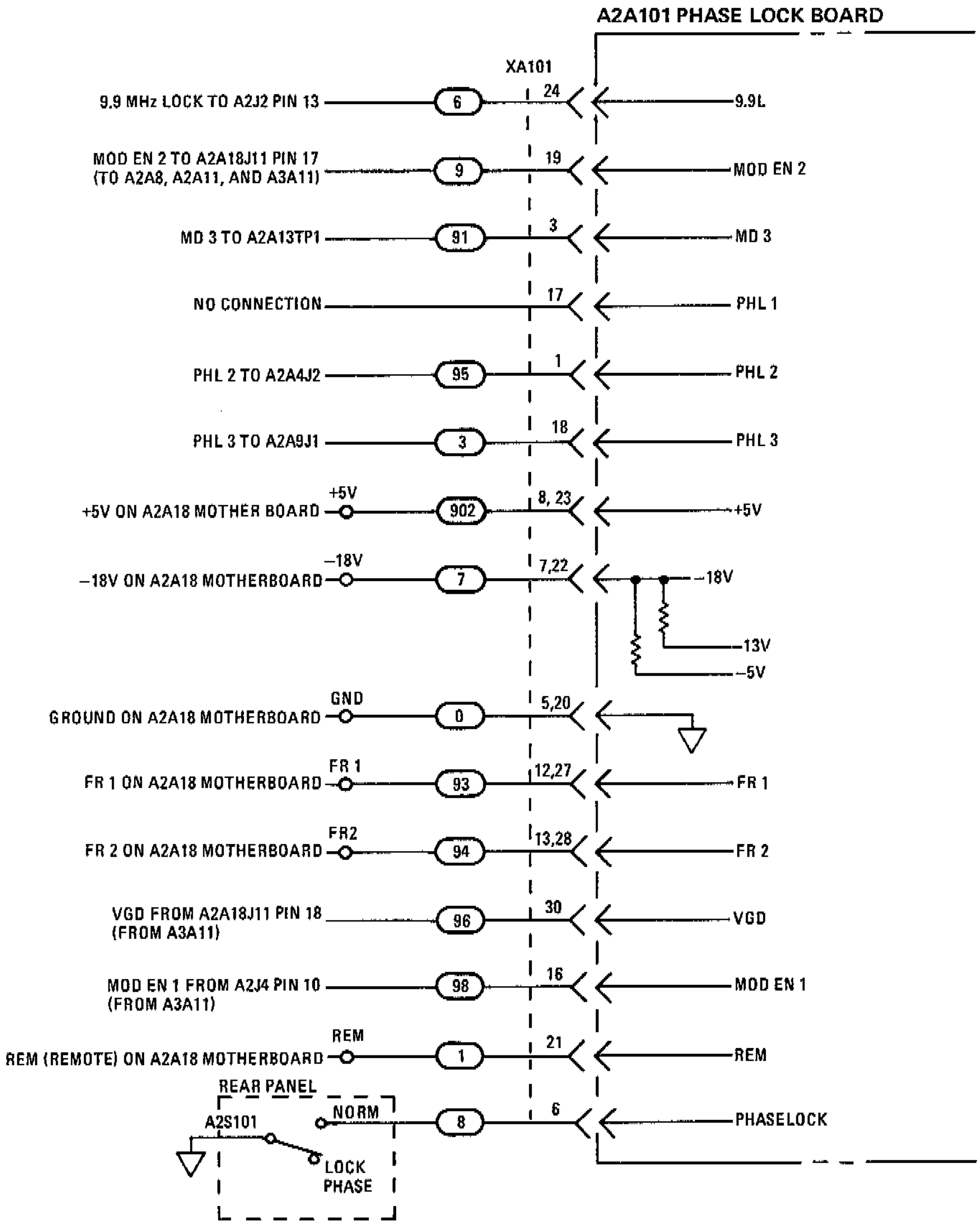


Figure C3-48. Wiring to Connector A2XA101 (CHANGE 5)

CHANGE 5 (Cont'd)

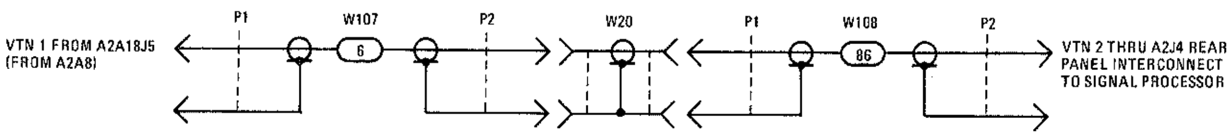


Figure C3-49. Tuning Voltage Cable Interconnect for Standard Instrument without Opt. 005 (CHANGE 5)

Page E4-4, Table E4-2:
Change A2A13 to HP Part Number 08505-60198 and a complete new listing of component parts for the Switch Register Board in this change sheet.

Page E5-5, Figure E5-1C:
Replace Figure E5-1C with new Parts Location drawing of A2A13 in this change sheet.

Page E5-5, Figure E5-2:
Replace Figure E5-2 with new schematic of A2A13 in this change sheet.

P/O Table E4-2. Replaceable Parts (CHANGE 5)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
			A2A13 SWITCH REGISTER BOARD		
A2A13	08505-60198	1	SWITCH REGISTER STORAGE ASSEMBLY	28480	08505-60198
A2A13C1	0180-0197	1	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	04200	150D225X9020A2
A2A13C2	0160-2055	5	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A2A13C3	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A2A13C4	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A2A13C5	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A2A13C6	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A2A13MP1	5000-9043	1	PIN:P.C. BOARD EXTRACTOR	28480	5000-9043
A2A13MP2	5040-6852	1	EXTRACTOR, ORANGE	28480	5040-6852
A2A13R1	0757-0416	1	RESISTOR 511 1% .125W F TC=0+-100	03292	C4-1/8-T0-511R-F
A2A13R2	0757-0199	6	RESISTOR 21.5K 1% .125W F TC=0+-100	03292	C4-1/8-T0-2152-F
A2A13R3	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03292	C4-1/8-T0-2152-F
A2A13R4	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03292	C4-1/8-T0-2152-F
A2A13R5	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03292	C4-1/8-T0-2152-F
A2A13R6	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03292	C4-1/8-T0-2152-F
A2A13R7	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03292	C4-1/8-T0-2152-F
A2A13R8	2100-3103	1	RESISTOR-TRMR 10K 10% C SIDE-ADJ 17-TRN	03744	3006P-1-103
A2A13R9	0757-0438	2	RESISTOR 5.11K 1% .125W F TC=0+-100	03292	C4-1/8-T0-5111-F
A2A13R10	2100-3054	1	RESISTOR-TRMR 50K 10% C SIDE-ADJ 17-TRN	03744	3006P-1-503
A2A13R11	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03292	C4-1/8-T0-5111-F
A2A13R12	0757-0401	1	RESISTOR 100 1% .125W F TC=0+-100	03292	C4-1/8-T0-101-F
A2A13R13	0757-0123	1	RESISTOR 34.8K 1% .125W F TC=0+-100	02273	CEA-993
A2A13R14	0757-0465	1	RESISTOR 100K 1% .125W F TC=0+-100	03292	C4-1/8-T0-1003-F
A2A13U1	1820-1216	1	IC DCDR TTL LS 3-TO-8-LINE 3-INP	01698	SN74LS138N
A2A13U2	1826-0092	1	IC OP AMP	28480	1826-0092
A2A13U3	1820-1538	1	IC GATE CMOS NAND QUAD 2-INP	01921	CD4011AF
A2A13U4	1820-1823	3	IC BFR CMOS NON-INV HEX 1-INP	03406	MM80C97N
A2A13U5	0960-0442	1		28480	0960-0442
A2A13U6	1820-1823		IC BFR CMOS NON-INV HEX 1-INP	03406	MM80C97N
A2A13U7	1820-1552	1	IC GATE CMOS NAND TPL 3-INP	01921	CD4023BF
A2A13U8	1820-1823		IC BFR CMOS NON-INV HEX 1-INP	03406	MM80C97N
A2A13U9	1820-1544	8	IC FF CMOS D-TYPE POS-EDGE-TRIG COM	01921	CD4076AF
A2A13U10	1820-1544		IC FF CMOS D-TYPE POS-EDGE-TRIG COM	01921	CD4076AF
A2A13U11	1820-1547	3	IC DSEL/MULTIPLXR CMOS	02037	MC14051BCL
A2A13U12	1820-1544		IC FF CMOS D-TYPE POS-EDGE-TRIG COM	01921	CD4076AF
A2A13U13	1820-1547		IC DSEL/MULTIPLXR CMOS	02037	MC14051BCL
A2A13U14	1820-1547		IC DSEL/MULTIPLXR CMOS	02037	MC14051BCL
A2A13U15	1820-1544		IC FF CMOS D-TYPE POS-EDGE-TRIG COM	01921	CD4076AF
A2A13U16	1820-1544		IC FF CMOS D-TYPE POS-EDGE-TRIG COM	01921	CD4076AF
A2A13U17	1820-1544		IC FF CMOS D-TYPE POS-EDGE-TRIG COM	01921	CD4076AF
A2A13U18	1820-1544		IC FF CMOS D-TYPE POS-EDGE-TRIG COM	01921	CD4076AF
A2A13U19	1810-0224	4	NETWORK-RES 8-PIN-SIP .1-PIN-SPCG	02483	750-83-R33K
A2A13U20	1810-0224		NETWORK-RES 8-PIN-SIP .1-PIN-SPCG	02483	750-83-R33K
A2A13U21	1810-0224		NETWORK-RES 8-PIN-SIP .1-PIN-SPCG	02483	750-83-R33K
A2A13U22	1810-0224		NETWORK-RES 8-PIN-SIP .1-PIN-SPCG	02483	750-83-R33K
A2A13U23	1820-1544		IC FF CMOS D-TYPE POS-EDGE-TRIG COM	01921	CD4076AF

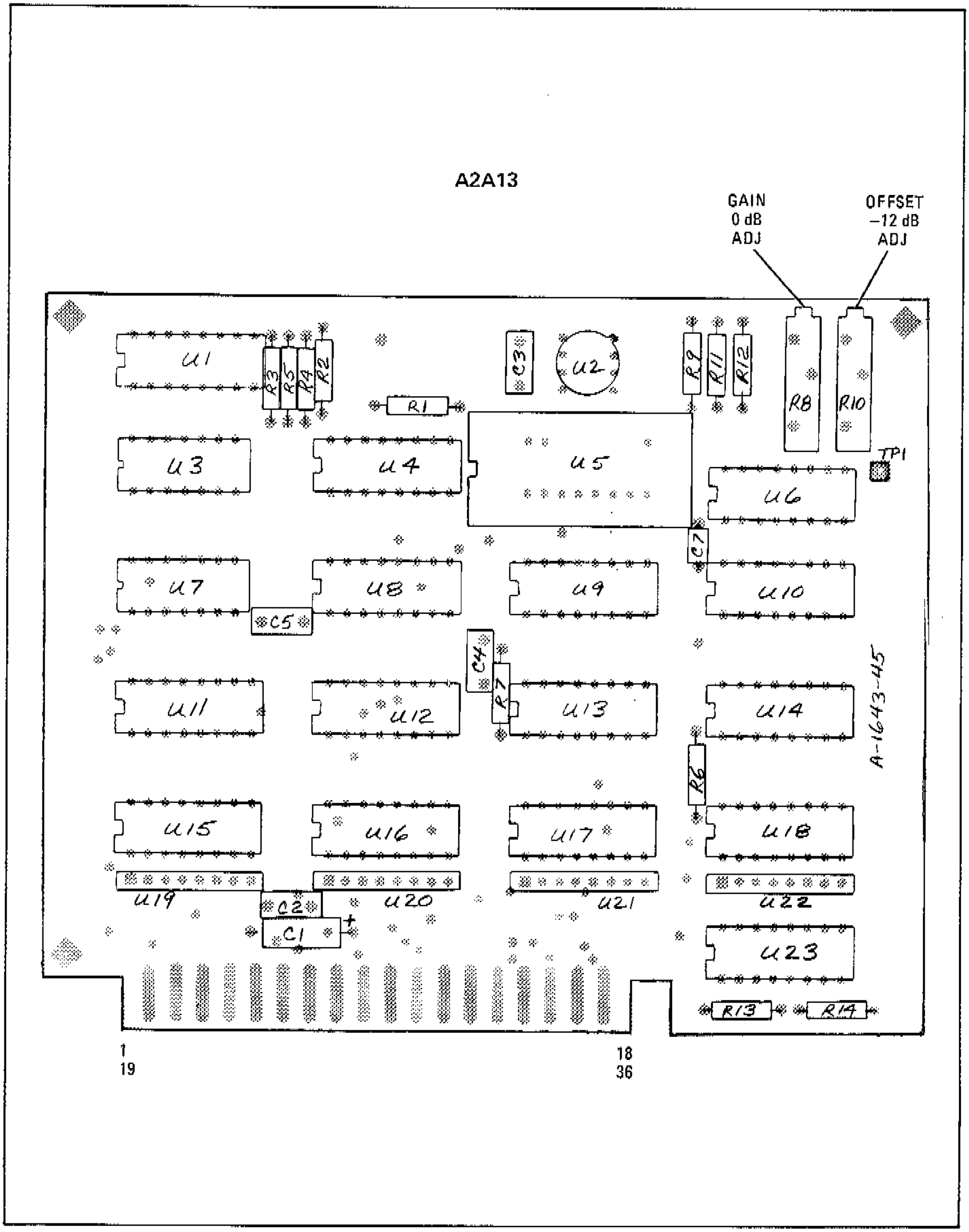
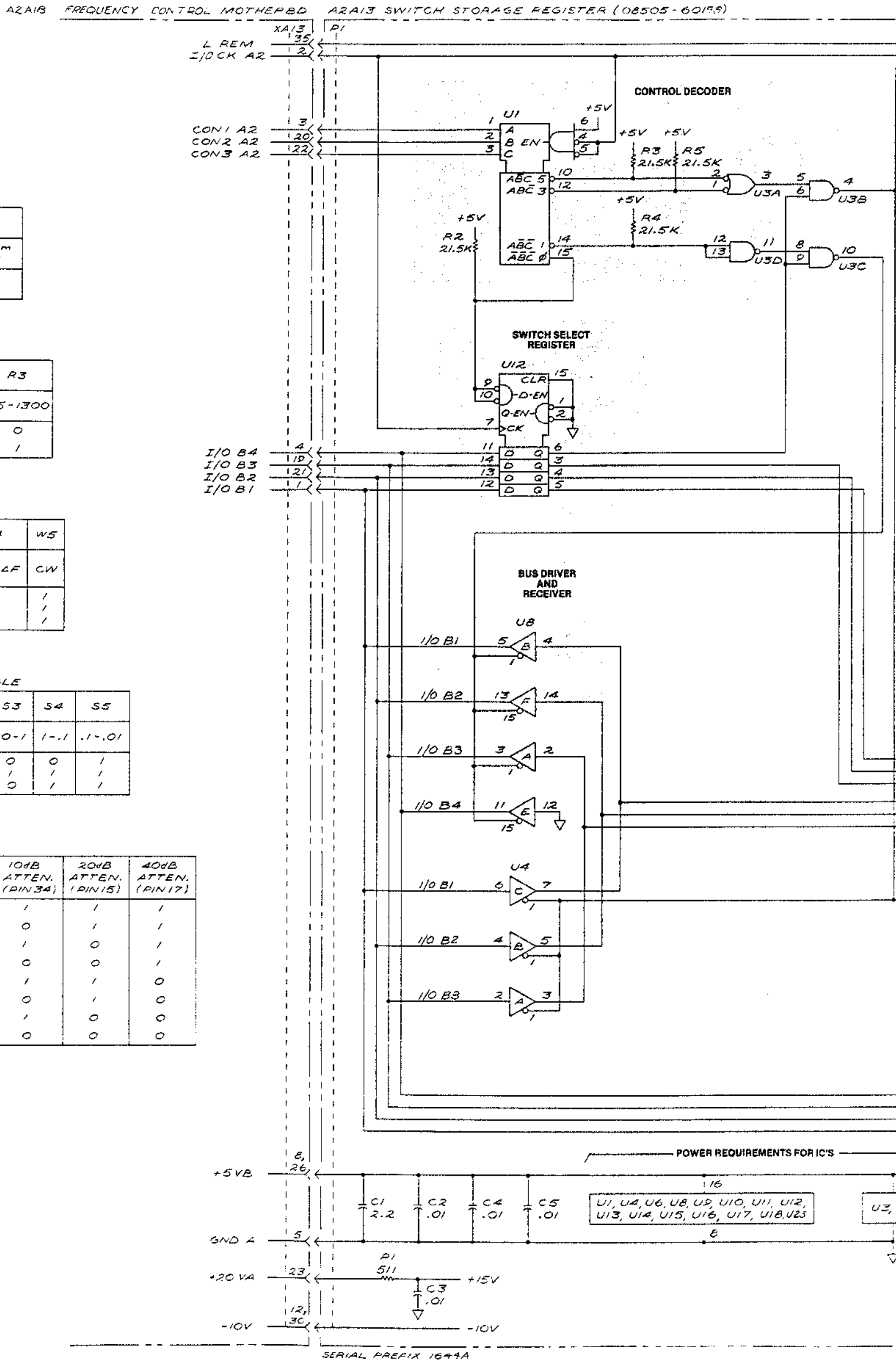


Figure E5-1C. A2A13 Frequency Control Switch Register Storage Board Parts Locations (CHANGE 5)

Fig. E5-2
Sht 1 of 4



INPUT SWITCH TRUTH TABLE

CONTROLLER CODE	I1	I2
INPUT LEVEL dBm MAX	-30dBm MAX	-10dBm MAX
IFG (IF GAIN)	0	1

RANGE SWITCH TRUTH TABLE

CONTROLLER CODE	R1	R2	R3
FREQ. RANGE MHz	.5-13	.5-130	.5-1300
FR1	1	1	0
FR2	0	1	1

WIDTH SWITCH TRUTH TABLE

CONTROLLER CODE	W1	W2	W3	W4	W5
WIDTH:	START/STOP			CW I∠F	CW
	1	2	ALT		
WTH 1	1	1	0	0	1
WTH 2	0	1	1	1	1
WTH 3	0	0	0	1	1

SCAN TIME SWITCH TRUTH TABLE

CONTROLLER CODE	S1	S2	S3	S4	S5
SCAN TIME SEC:	MANUAL	100-10	10-1	1-.1	.1-.01
SCT 1	1	1	0	0	1
SCT 2	0	1	1	1	1
SCT 3	0	0	0	1	1

OUTPUT LEVEL TRUTH TABLE

CONTROLLER CODE	FRONT PANEL OUTPUT LEVEL SWITCH	10dB ATTEN. (PIN 34)	20dB ATTEN. (PIN 15)	40dB ATTEN. (PIN 17)
08	+10	1	1	1
07	0	0	1	1
06	-10	1	0	1
05	-20	0	0	1
04	-30	1	1	0
03	-40	0	1	0
02	-50	1	0	0
01	-60	0	0	0

Fig E5-2, Sht 2 of 4

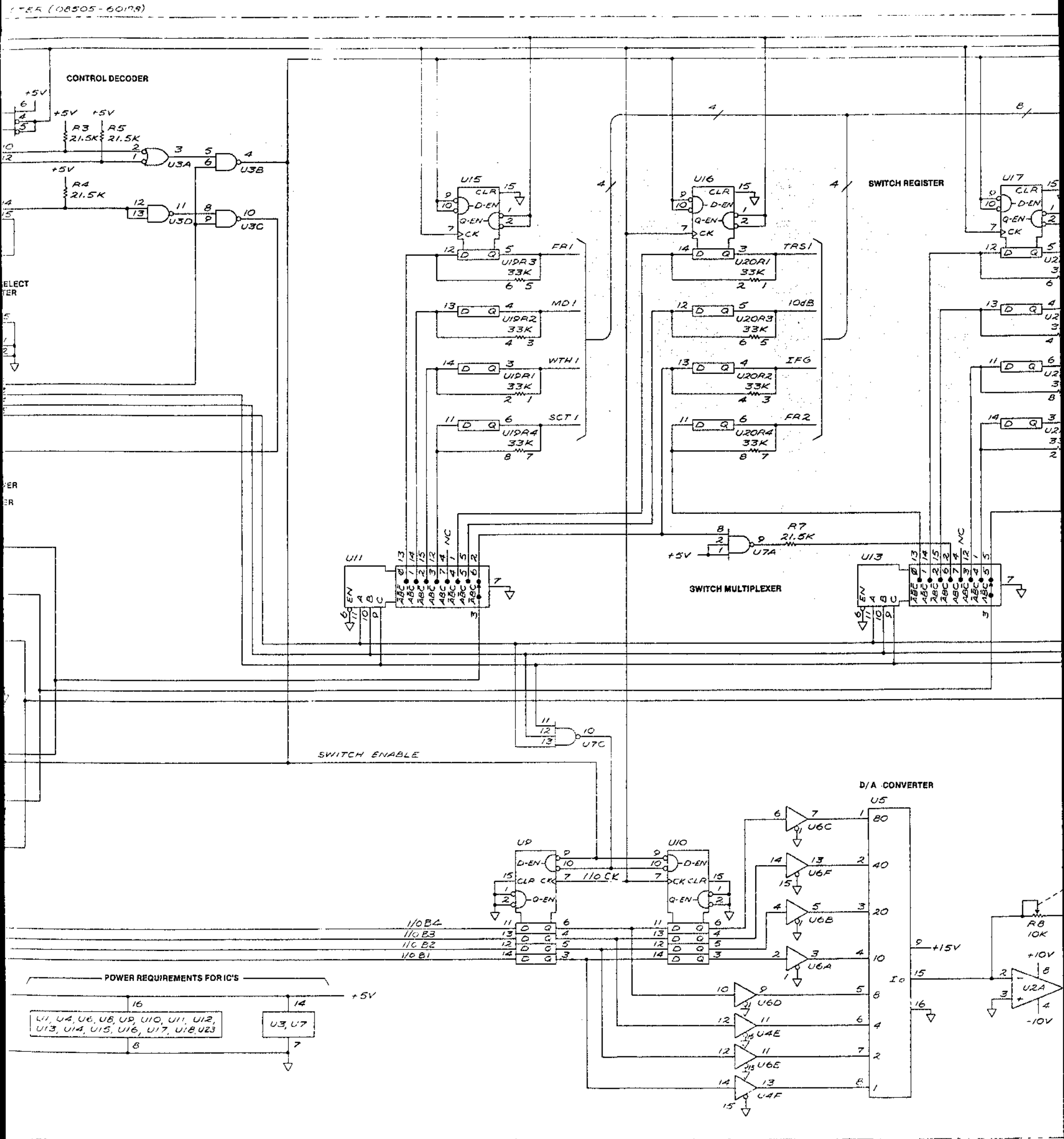


Fig. E5-2
Sht 3 of 4

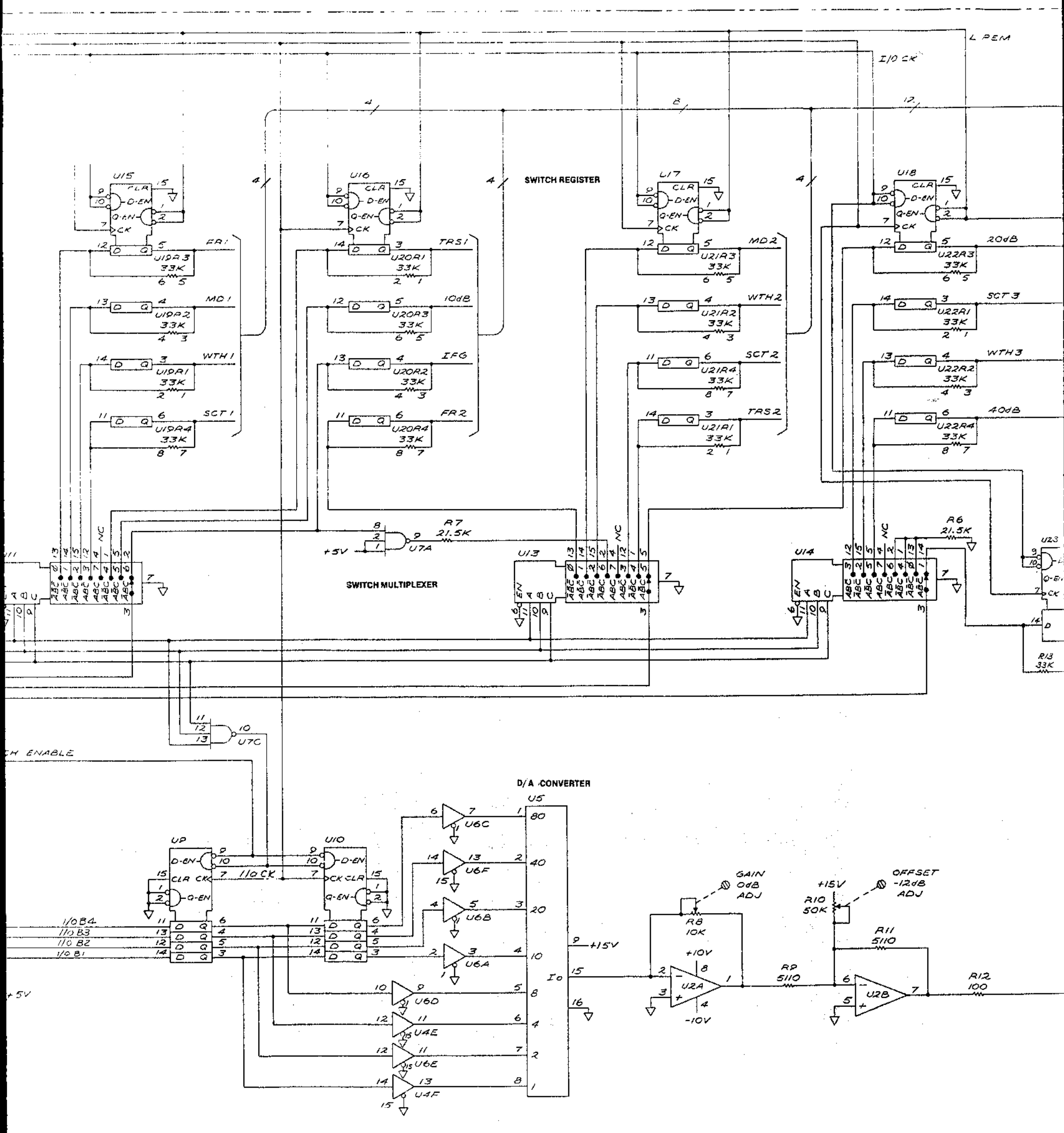
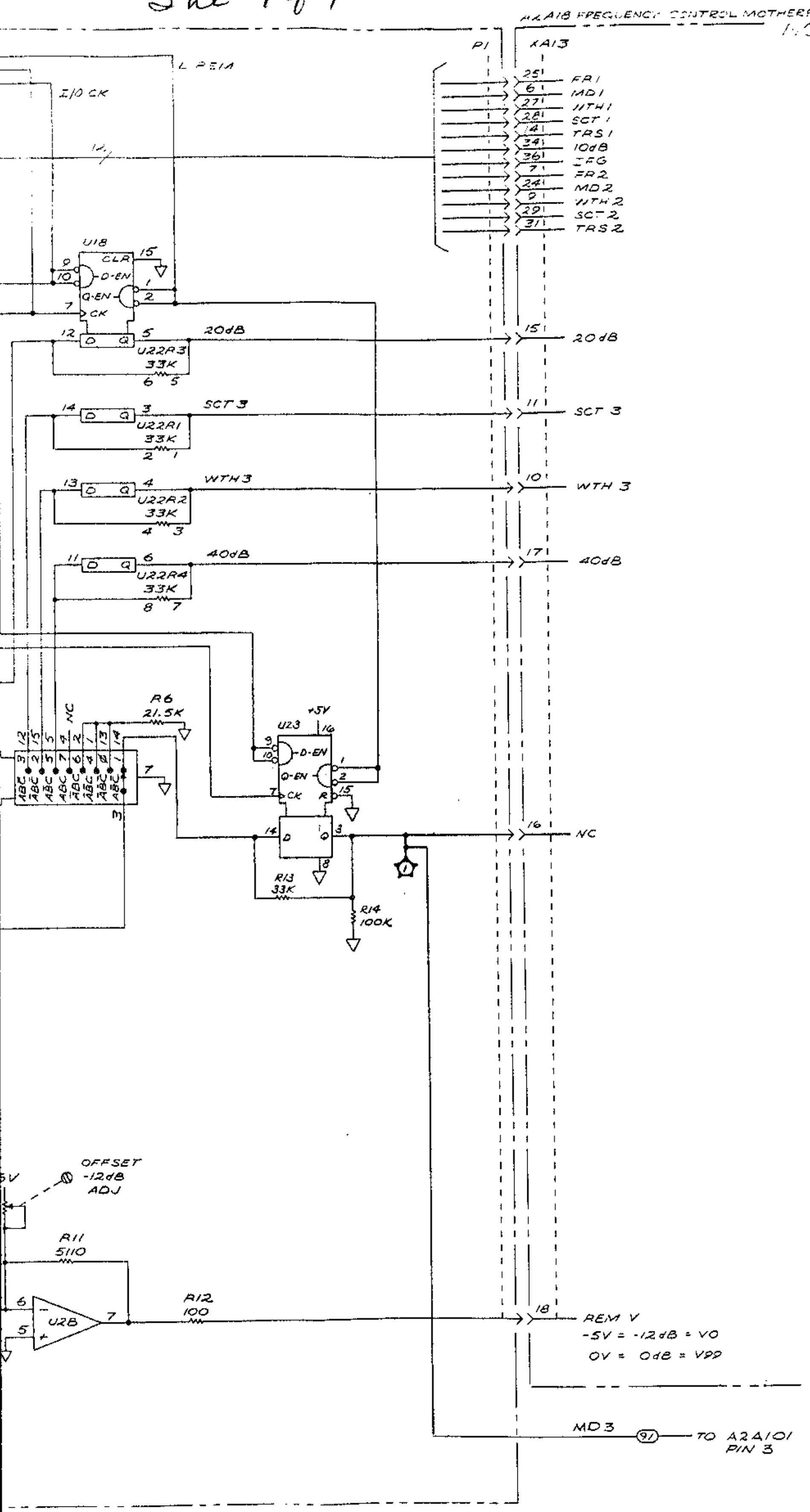


Fig E5-2
Sht 4 of 4



NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATOR, PREFIX REFERENCE DESIGNATOR SHOWN WITH THE ASSEMBLY REFERENCE DESIGNATOR.
2. UNLESS OTHERWISE INDICATED:
   RESISTANCE IN OHMS
   CAPACITANCE IN MICROFARADS
3. ABBREVIATIONS:
   CK = CLOCK
   CLR = CLEAR
   EN = ENABLE
   D-EN = DATA INPUT ENABLE
   Q-EN = Q OUTPUT ENABLE
4. LOGIC LEVELS ARE:
   0 = LOW = < 0.8V
   1 = HI = > 2.2V

   EXCEPT INPUTS OF U1 (1,2,3) WHICH ARE:
   0 = LOW = < 1.5V
   1 = HI = > 3.5V

REFERENCE DESIGNATORS

A2A13
C1-7
R1-14
U1-23

MODE SWITCH TRUTH TABLE

CONTROLLER CODE	M1	M2	M3
MODE:	LOG FULL	LIN FULL	LIN EXPAND
MD 1	1	1	0
MD 2	0	1	1

TRIGGER SWITCH TRUTH TABLE

CONTROLLER CODE	T1	T2	T3	NONE
TRIGGER	AUTO	LINE	EXT	SINGLE
TRS 1	1	1	0	0
TRS 2	0	1	1	1

A2A13

Figure E5-2. A2A13 Switch Register Storage, Schematic (CHANGE 5)

CHANGE 6

Page C2-27, Table C2-2:
Delete A2A22U1.
Add the following:
A2A24, HP Part Number 08505-60199, PLUS 5 VOLT RECTIFIER BOARD ASSEMBLY
A2A24C1, HP Part Number 0160-4300, CAPACITOR-FXD .047 UF +80 --20% 100 WVDC CER.
A2A24CR1 through A2A24CR4, HP Part Number 1901-0662, DIODE PWR RECT 100V 6A
A2A24E1 and A2A24E2, HP Part Number 2110-0269, FUSEHOLDER-CLIP TYPE 0.25 FUSE
A2A24F1, HP Part Number 2110-0036, FUSE 8A 125A FAST-BLO

Page C3-97/98, Figure C3-97/98, Figure C3-42A:
Delete A2A22U1.
Replace A2A22U1 Rectifier circuit with A2A24 +5 Volt Rectifier Board as shown in the partial schematic in this change sheet.

Page C3-99/100, Figure C3-44:
Delete A2A22U1.
Replace A2A22U1 Rectifier circuit with A2A24 +5 Volt Rectifier Board as shown in the partial schematic in this change sheet.

Page C3-105/106:
Add Figure C3-46A, A2A24 Parts Location, as shown in this change sheet.

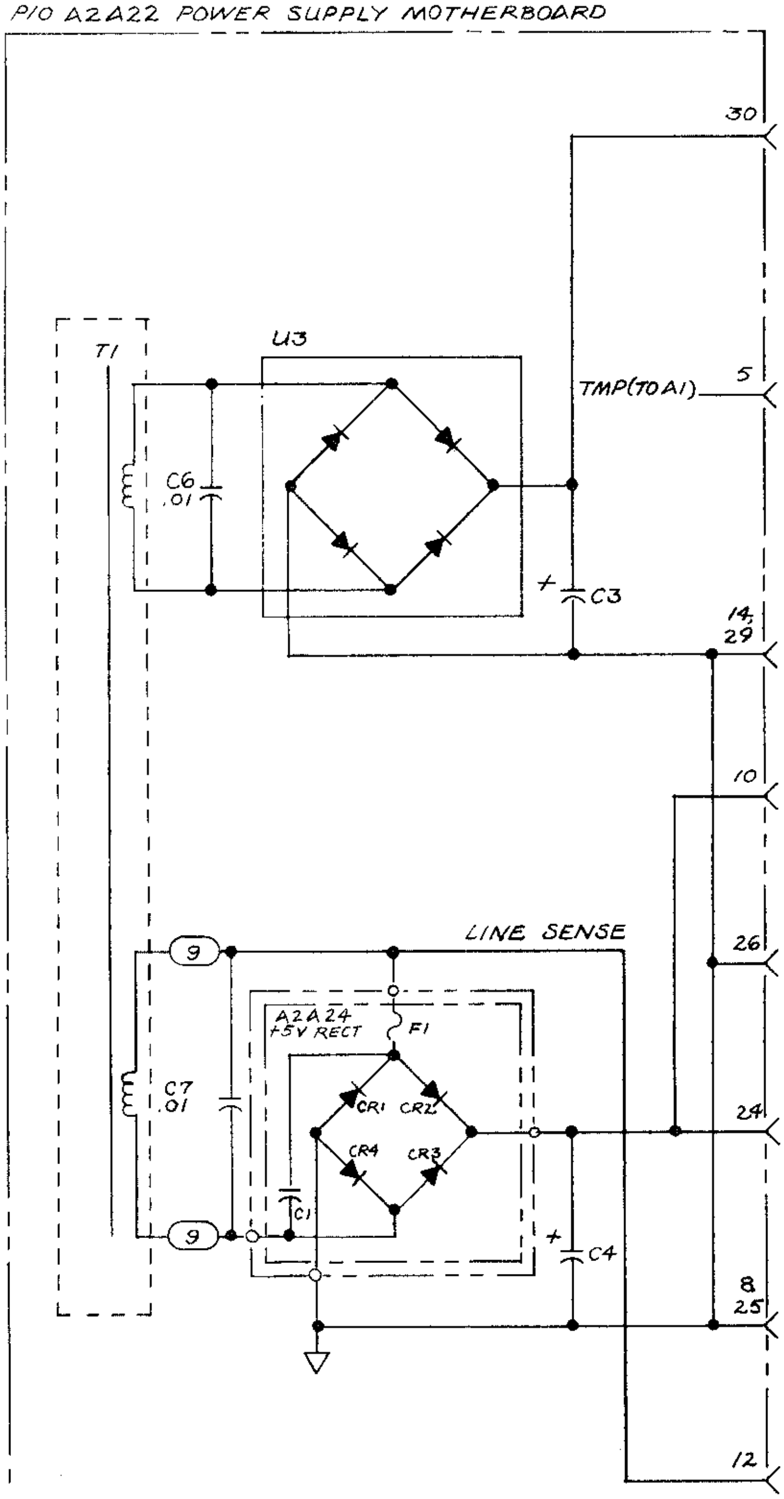
Page C3-105/106, Figure C3-47:
Delete A2A22U1.
Replace A2A22U1 Rectifier circuit with A2A24 +5 Volt Rectifier Board as shown in the partial schematic in this change sheet.

Page E4-6, Table E4-2:
Change A3A19C11 to HP Part Number 0180-0106, CAPACITOR-FXD, 60UF +–20% 6VDC TA.

Page E4-7, Table E4-2:
Change A3A19R8 to HP Part Number, 0698-3157, RESISTOR 19.6K 1% .125W F TC=0+–100.

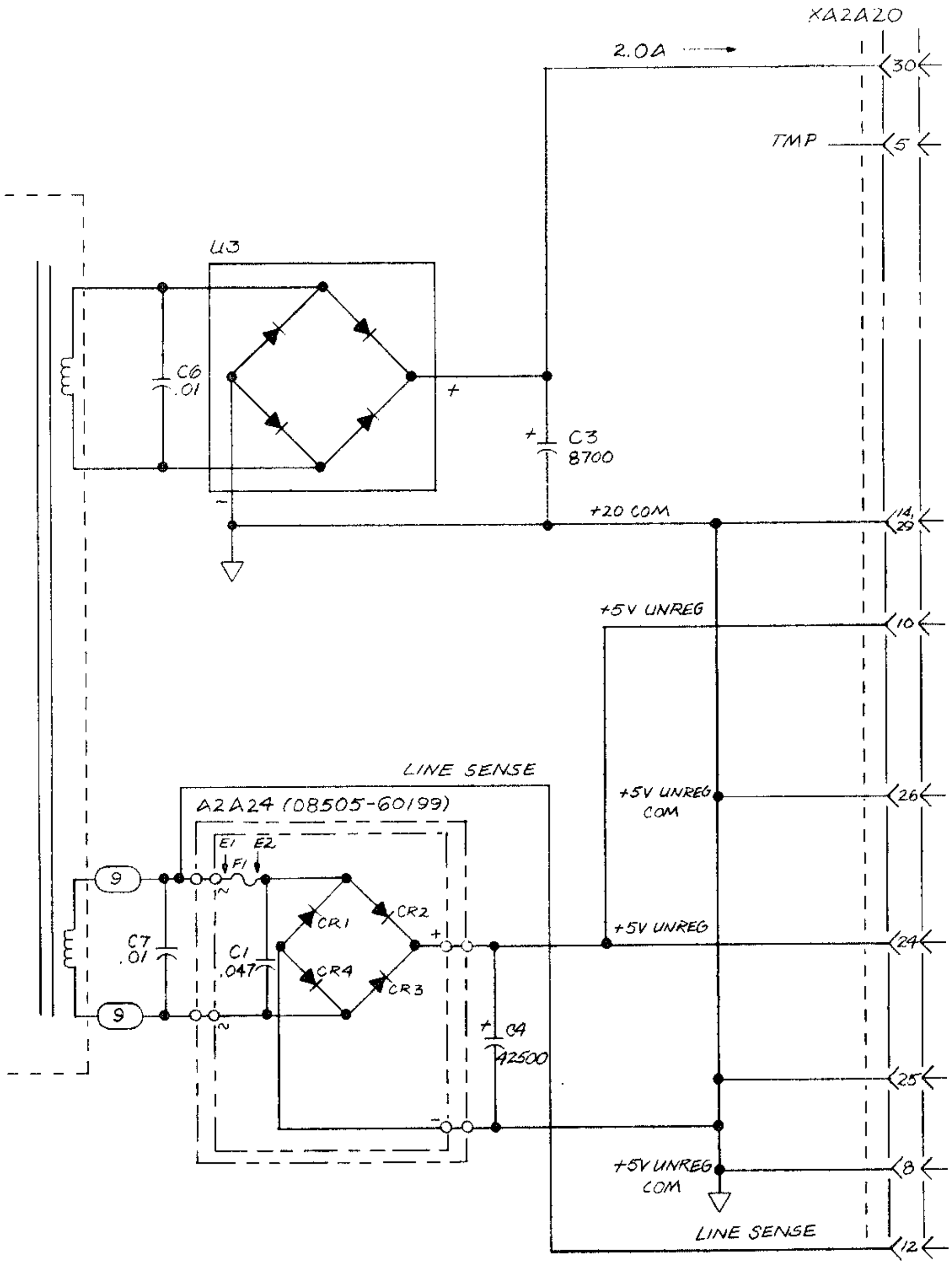
Page E5-33, Figure E5-10:
Change A3A19R8 to 19.6KΩ.
Change A3A19C11 to 60μF.

CHANGE 6 (Cont'd)



P/O Figure C3-42A. A2A20 Positive Voltage Regulator Block Diagram (CHANGE 6)

CHANGE 6 (Cont'd)



P/O Figure C3-44. A2A20 Positive Voltage Regulator, Schematic (CHANGE 6)

CHANGE 6 (Cont'd)

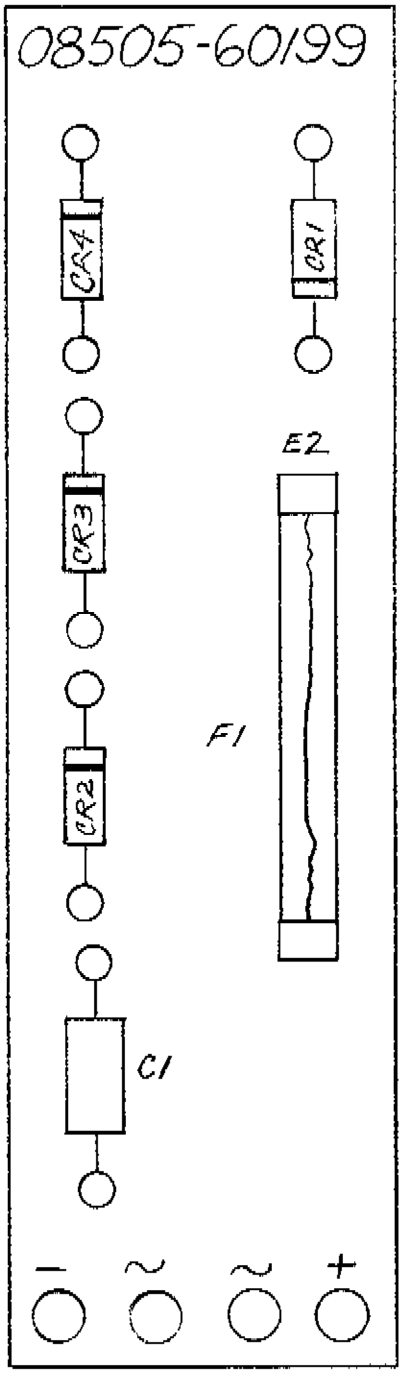
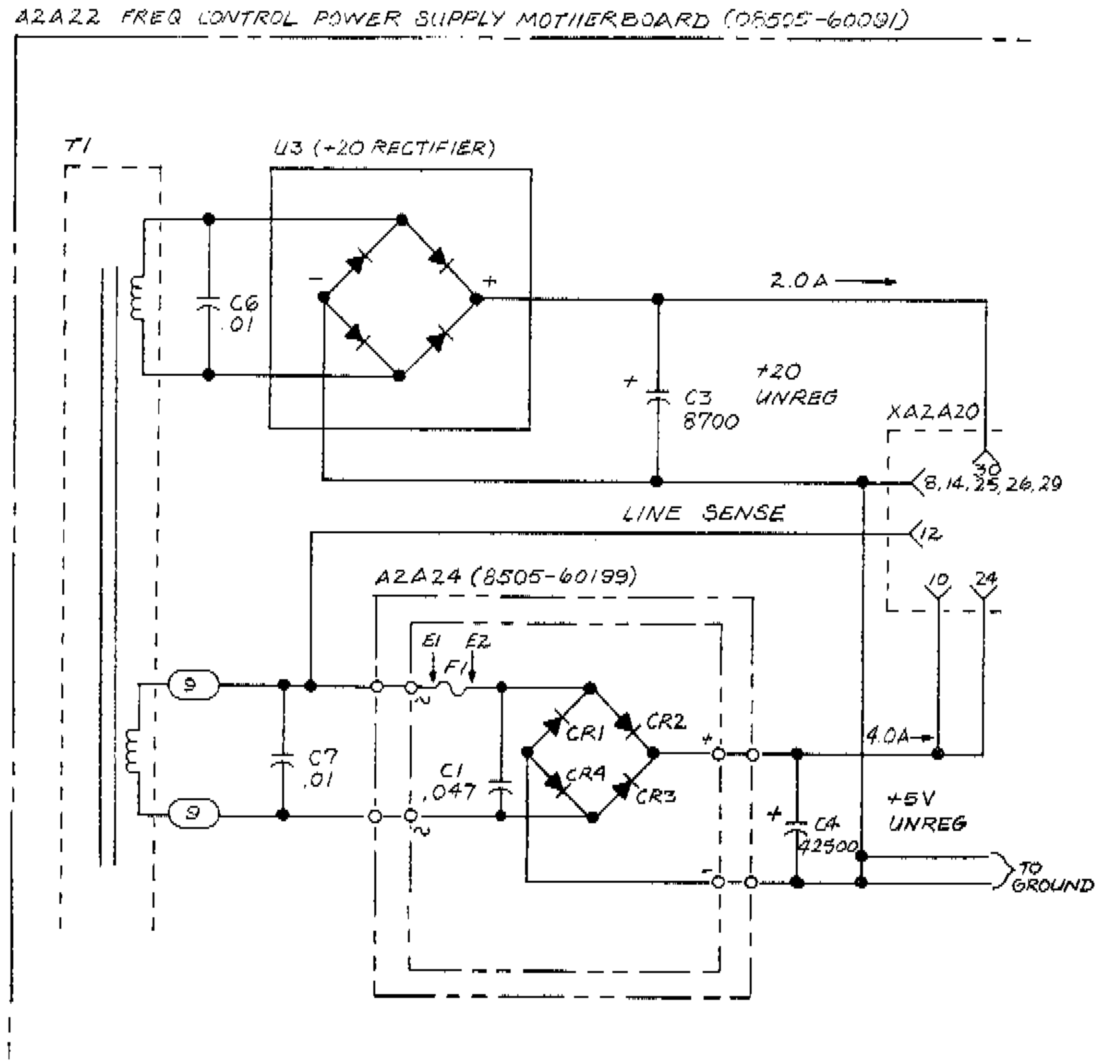


Figure C3-46A. A2A24 Plus 5 Volt Rectifier Board Parts Location (CHANGE 6)

CHANGE 6 (Cont'd)



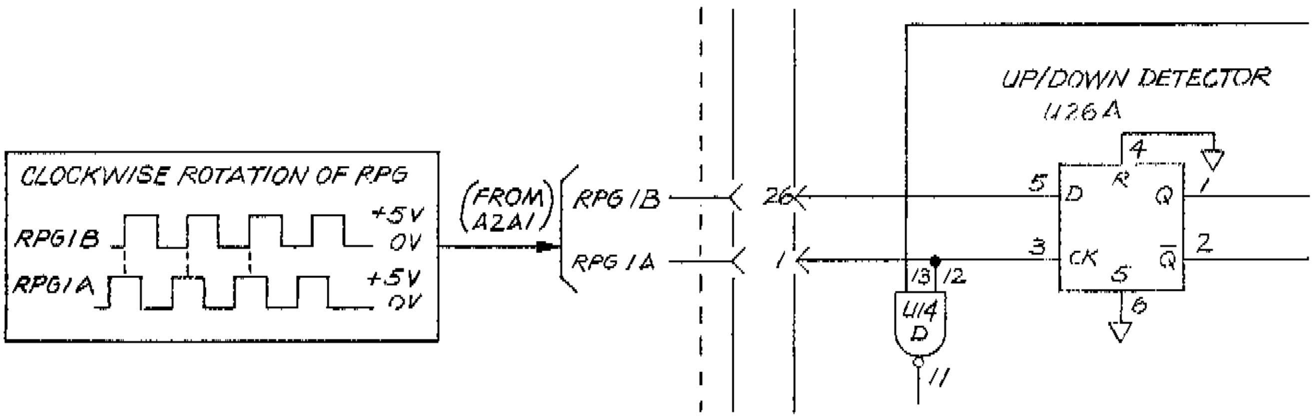
P/O Figure C3-47. A2A22 Frequency Control Power Supply, Schematic (CHANGE 6)

CHANGE 7

Page C2-5, Table C2-2:
Change A2A1A2 to HP Part Number 08505-60203 and delete all components listed for A2A1A2.
Change A2A1A3 to HP Part Number 08505-60203.

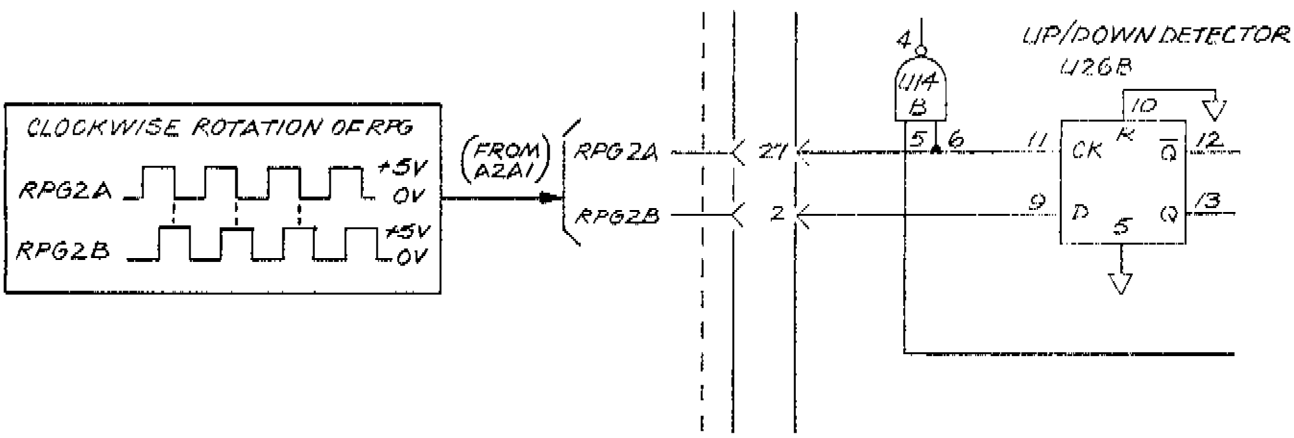
Page C3-43, Figure C3-20A:
Delete Figure C3-20A, A2A1A2/A3 Schematic.

Page C3-61, Figure C3-24:
Change A2A3U26A Circuit as shown in the partial schematic in this change sheet.



P/O Figure C3-24. Partial Schematic of A2A3 (CHANGE 7)

Change A2A3U26B Circuit as shown in the partial schematic in this change sheet.



P/O Figure C3-24. Partial Schematic of A2A3 (CHANGE 7)

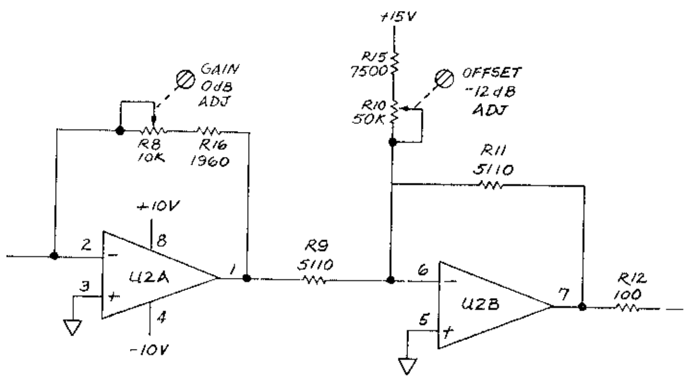
CHANGE 8

Page C2-25, Table C2-2:
Change A2A20 R2 to HP Part Number 0757-0447, RESISTOR 16.2K 1% .125W F TC=0+–100.

►Page C3-99/100:
Change Resistor A2A20R2 to 16.2K Ohm.

Page E4-4, Table E4-2:
Add A2A13R15, 0757-0440, RESISTOR 7.5K 1% .125W TC=0+–100.
Add A2A13R16, 0698-0083, RESISTOR 1.96K 1% .125W TC=0+–1.00.

Page E5-5, Figure E5-2:
Change A2A13U2 circuit as shown in the partial schematic in this change sheet.



P/O Figure E5-2. Partial Schematic of A2A13 (CHANGE 8)

CHANGE 9

Page C2-25, Table C2-2:
Change A2A20R15 to HP Part Number 0698-0082, RESISTOR 464 1% .125W F TC=0+–100

►Page C3-99/100, Figure C3-44:
Change A2A20R15 to 464 Ohms.

CHANGE 9 (Cont'd)

Page D2-5, Table D2-2:
Change A3W18 to HP Part Number 08505-60176.
Change A3W19 to HP Part Number 08505-60177.
Change A3W20 to HP Part Number 08505-60179.
Change A3W21 to HP Part Number 08505-60180.
Change A3W22 to HP Part Number 08505-60181.

Page D2-11, Table D2-2:
Add A3A7C21 and A3A7C22, HP Part Number 0160-3451, CAPACITOR-FXD .01UF +80-20% 100Vdc CER.

Page D2-12, Table D2-2:
Change A3A8 to HP Part number 08505-60205.

Page D2-14, Table D2-2:
Add A3A8R93 and A3A8R95, HP Part Number 2100-2031, RESISTOR-TRMR 50K 10% C TOP-ADJ 1 TRN.
Add A3A8R94 and A3A8R96, HP Part Number 0683-6845, RESISTOR 680K 5% .25W FC TC=-800/+900.

Page D2-30, Table D2-2:
Change A3A24 to HP Part Number 08505-60175.
Change A3A24MP1 to HP Part Number 08505-00115.

Page D2-31, Table D2-2:
Change A3A25R1, A3A25R4, A3A25R5, and A3A25R7 to HP Part Number 2100-3476.
Change A3A25R2 to HP Part Number 2100-3473.
Change A3A25R3 to HP Part Number 2100-3475.
Change A3A25R6 to HP Part Number 2100-3474.
Change A3A25S1 to HP Part number 08505-80006.
Change A3A25S2 to HP Part Number 3101-1982.

Page D2-32, Table D2-2:
Change A3A27 to HP Part Number 08505-60172.
Add A3A27E5, 0340-0614, INSULATOR-XSTR.

Page D2-34, Table D2-2:
Change A3A28 to HP Part Number 08505-60173.

Page D2-35, Table D2-2:
Change A3A29 to HP Part Number 08505-60173.
Change A3A30 to HP Part Number 08505-60174.
Add A3A30E29--A3A30E35, 1251-2039, CONNECTOR-SGL CONT SKT .041-IN-BSC-SZ.

Page D2-36, Figure D2-1:
Change 15 to HP Part Number 08505-00108.
Change 18 to HP Part Number 08505-00112.
Change 19 to HP Part Number 08505-00111.
Change 37 to HP Part Number 08505-00109.
Change 39 to HP Part Number 08505-00122.
Change 42 to HP Part Number 1220-0203.
Change 44 to HP Part Number 08505-00119.
Change 52 to HP Part Number 08505-00123.
Change 53 to HP Part Number 08505-00124.
Change 61 to HP Part Number 08505-00121.
Change 66 to HP Part Number 08505-00118.
Change 67 to HP Part Number 08505-00117.
Change 68 to HP Part Number 08505-00116.

CHANGE 9 (Cont'd)

Page D2-37, Figure D2-1:

Change 86 to HP Part Number 08505-00120.
Change 87 to HP Part Number 08505-00113.
Change 88 to HP Part Number 08505-00107.
Change 95 to HP Part Number 08505-00106.
Change 108 to HP Part Number 08505-00110.
Change 117 to HP Part Number 08505-00114.
Add the following hardware after item 117:

HP PART NUMBER	DESCRIPTION
0510-0062	RETAINER-PUSH ON RECT EXT .125-DIA STL
0520-0164	SCREW-MACH 2-56 .25-IN-LG-82 DEG
1251-2942	LOCK-SUBMIN D CONN
1400-0082	CLAMP-CABLE .125-DIA .375 WD NYL
2190-0004	WASHER-LK INTL T NO. 6 .115-IN-ID
2190-0017	WASHER-LK HLCL NO. 8 .168-IN-ID
2190-0045	WASHER-LK HLCL NO. 2 .088-IN-ID
2190-0047	WASHER LK 82 CTSK EXT T NO. 6 .142-IN-ID
2190-0067	WASHER-LK INTL T 1/4 IN .256-IN-ID
2200-0139	SCREW-MACH 4-40 .250-IN-LG PAN-HD-POZI
2360-0116	SCREW-MACH 6-32 .312-IN-LG 82 DEG
2360-0181	SCREW-MACH 6-32 .25-IN-LG 82 DEG
2360-0194	SCREW-MACH 6-32 .312-IN-LG 100 DEG
2360-0201	SCREW-MACH 6-32 .5-IN-LG PAN-HD-POZI
2360-0331	SCREW-MACH 6-32 .25-IN-LG PAN-HD-POZI
2510-0137	SCREW-MACH 8-32 2.75-IN-LG PAN-HD-POZI
2580-0003	NUT-HEX-W/LKWR 8-32-THD .125-IN THK
2950-0072	NUT-HEX-DBL-CHAM 1/4-32-THD .062-IN-THK
2950-0153	NUT-HEX-DBL-CHAM 1/4-32-THD .29-IN-THK
3030-0083	SCREW-SET 2-56 .188-IN-LG SMALL CUP-PT
3050-0001	WASHER-FL MTLC NO. 8 .172-IN-ID
3050-0010	WASHER-FL MTL NO. 6 .147-IN-ID
3050-0105	WASHER-FL MTLC NO. 4 .125-IN-ID
3050-0152	WASHER-SHLDR NM NO. 8 .172-IN-ID
3050-0226	WASHER-FL MTLC NO. 10 .203-IN-ID
7120-3812	LABEL-WARNING
7120-4192	LABEL-INFO
7120-4829	LABEL-INFO

Page D3-77, Figure D3-32:

Add C21, .01 UF, from pin 14 of U1A Signal Multiplexer to ground.
Add C22, .01 UF, from pin 14 of U11A Signal Multiplexer to ground.

Page D3-80, Figure D3-33:

Replace Figure D3-33 with new Parts Location drawing of A3A8 in this change sheet.

A3A8

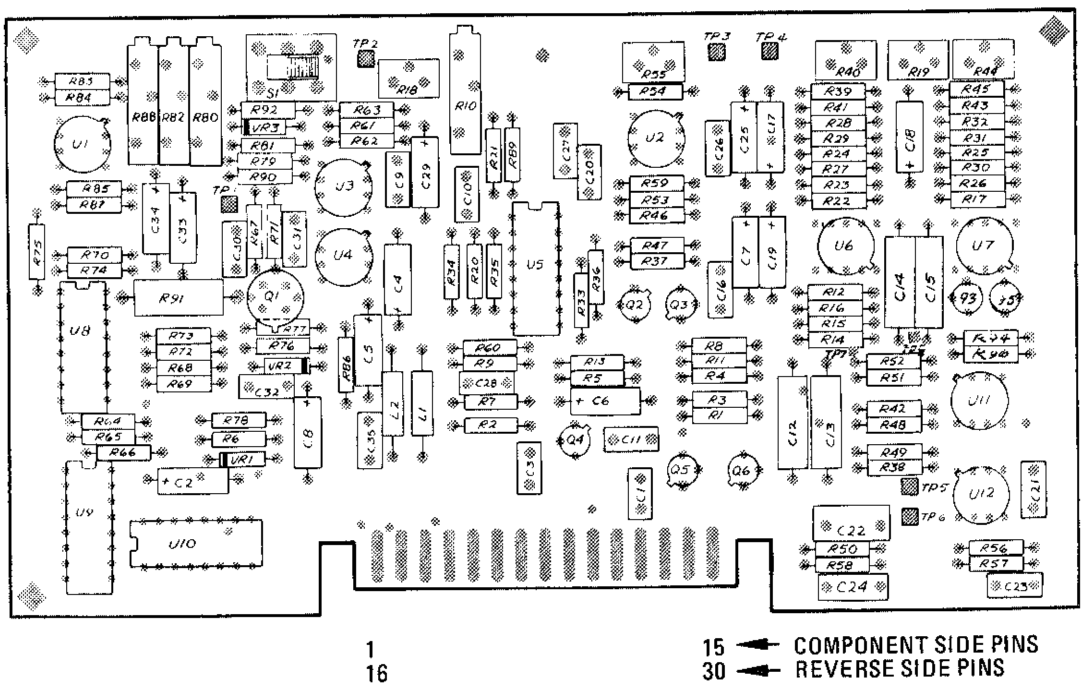


Figure D3-33. A3A8 Polar Converter Parts Locations (Change 9)

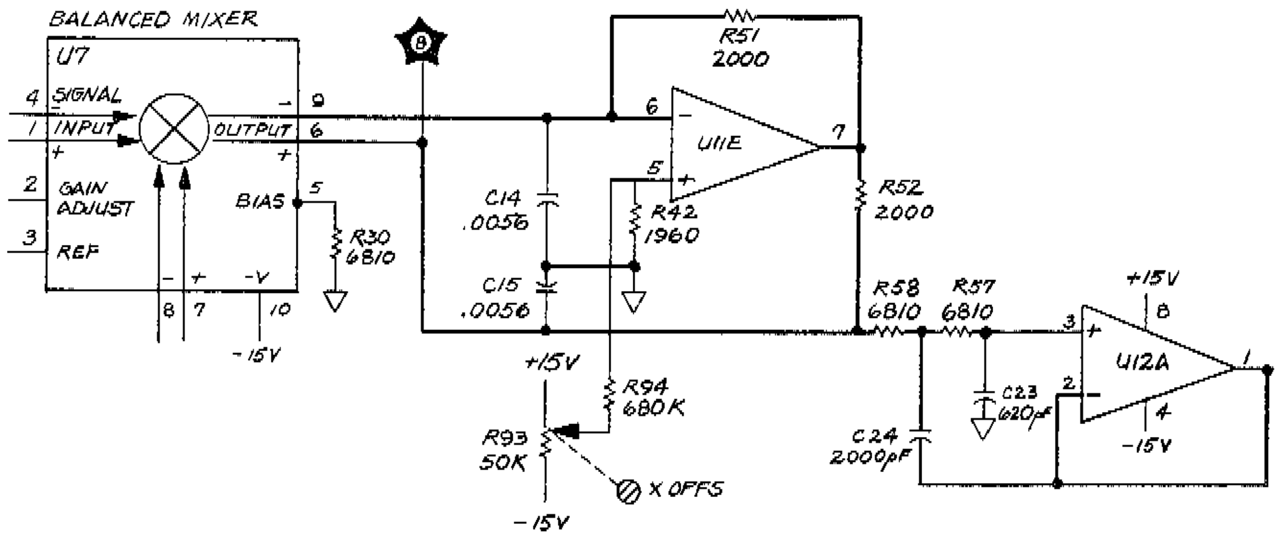
CHANGE 9 (Cont'd)

Page D3-81, Figure D3-34:

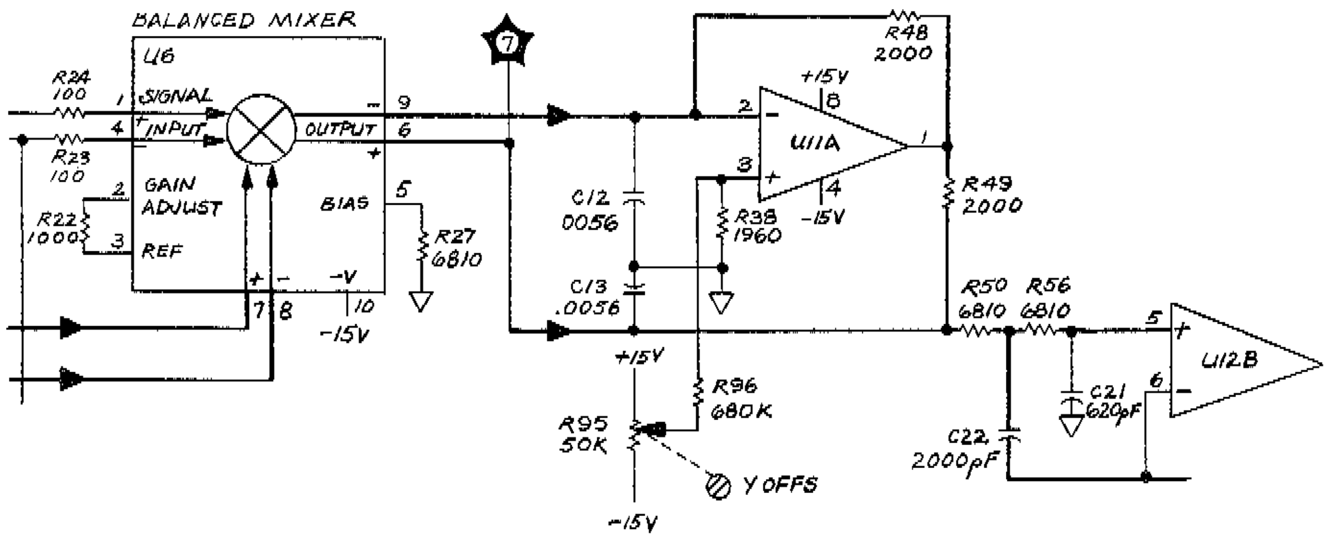
Change the circuit for U11A and U11B as shown in the partial schematic in this change sheet.

Change the HP Part Number for A3A8 at the top of schematic to 08505-60205.

X AXIS OUTPUT MIXER AND FILTER



Y AXIS OUTPUT MIXER AND FILTER



P/O Figure D3-34. Partial Schematic of A3A8 (CHANGE 9)

CHANGE 9 (Cont'd)

Page E4-7, Table E4-2:
Change "A3A20C10" to A3A20C10* HP Part Number 0160-0571, CAPACITOR-FXD 470PF (FACTORY SELECTED VALUE).
Change "A3A20R11" to A3A20R11* HP Part Number 0698-0083, RESISTOR 1.96K 1% .125W (FACTORY SELECTED VALUE).

Page E5-45, Figure E5-12:
Change "A3A20R11" to A3A20R11* 1.96K and change "A3A20C10" to A3A20C10* 470 pf.

CHANGE 10

Page D2-4, Table D2-2:
Change A3FL1 to HP Part Number 9135-0052, Filter RFI.

Page D2-36, Figure D2-1:
Change Item 36A to HP Part Number 9135-0052, Filter RFI.

Page D2-23, Table D2-2:
Change A3A13C44 and A3A13C45 to HP Part Number 0160-3459. CAPACITOR-FXD .02μF, +–10%, 250 WVDC, CER.

Page D3-99, Figure D3-44:
Change value of C44 and C45 to .02μF.

CHANGE 11

Page C2-25, Table C2-2:
Add at end of description for A2A19 the statement, "Alternate replacement for 5086-7268".
Add prior to the existing entry for A2A19, a listing for A2A19, HP Part Number 5086-7268, YIG OSCILLATOR 4.2 – 5.5 GHz.

Page D2-15, Table D2-2:
Add A3A9C32, HP Part Number 0170-0066, CAPACITOR-FXD .027UF+–10% 200VDC POLYE.

Page D2-31, Table D2-2:
Change A3A25R2 to HP Part Number 2100-3684, RESISTOR-VARIABLE CONTROL CC 50 10% LIN.

Page D3-85, Figure D3-36:
Add A3A9C32, 0.027UF Capacitor, between U5 pin 6 and ground.

Page D3-121, Figure D3-54:
Change A3A25R2 to 50 Ohm.

CHANGE 12

Page D2-14, Table D2-2:
Change A3A8R82 to HP Part Number 2100-3161, RESISTOR-TRMR 20K 10% C SIDE-ADJ 17-TURN

Page D2-19, Table D2-2:
Change A3A11R12* to HP Part Number 0757-0199, RESISTOR 21.5K 1% .125W F TC=0+–100 (*FACTORY SELECTED PART, TYPICAL VALUE GIVEN.)

Page D3-81, Figure D3-34:
Change A3A8R82 to 20K.

CHANGE 12 (Cont'd)

Page D3-91, Figure D3-40:
Change A3A11R12 to 21.5K.

CHANGE 13

Page C2-21, Table C2-2:
Add A2A11C11, HP Part Number 0160-4256, CAPACITOR-FXD .047UF 200 WVDC MICA.

Page C3-93, Figure C3-39:
Add C11 between the left end of R42 and the bottom end of R30 (but not connected to R30).

Page C3-93, Figure C3-40:
Add C11, a .047UF capacitor between pins 1 and 28 of A2A11 board.

CHANGE 14

P/O Table C2-2, A2A9 Parts List, CHANGE 2 of this Change Sheet:
Change the entry for A2A9R65 to HP Part Number 0757-0280, RESISTOR 1K 1% .125W F TC=0+–100.

Page C2-27, Table C2-2:
Change A2A22 to HP Part Number 08505-60209.
Delete A2A22C6 thru C10.
Add A2A22T1P1, HP Part Number 1251-3389, Connector-Receptacle 10 contact.
Delete A2A22U1 thru U5.
Add A2A22XA25, HP Part Number 1251-2035, CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS.
Add A2A25, HP Part Number 08505-60210, Rectifier Board Assembly.
Add Component Parts of A2A25 as follows:
A2A25C1 thru C5, HP Part Number 0170-0060, CAPACITOR-FXD .047UF 400V.
A2A25CR1 thru CR12, HP Part Number 1902-0662, DIODE-POWER RECT 100V 6A.
A2A25F1, HP Part Number 2110-0036, FUSE 8A 125V F.
A2A25J1, HP Part Number 1251-3750, CONNECTOR-POST 10 CONTACT.
A2A25U1 and U2, HP Part Number 1906-0094, DIODE-FW BRIDGE 400V 1.5A.
A2A25XF1, HP Part Number 2110-0269, FUSE HOLDER CLAMP (2 REQUIRED).

Page C2-28, Figure C2-1:
Change Reference Designator 27 Quantity to 6.

►Page C3-105/106, Figure C3-47:
Change schematic as shown in Partial Schematic contained in this change sheet.
►Add Figure C3-46A contained in this change sheet.

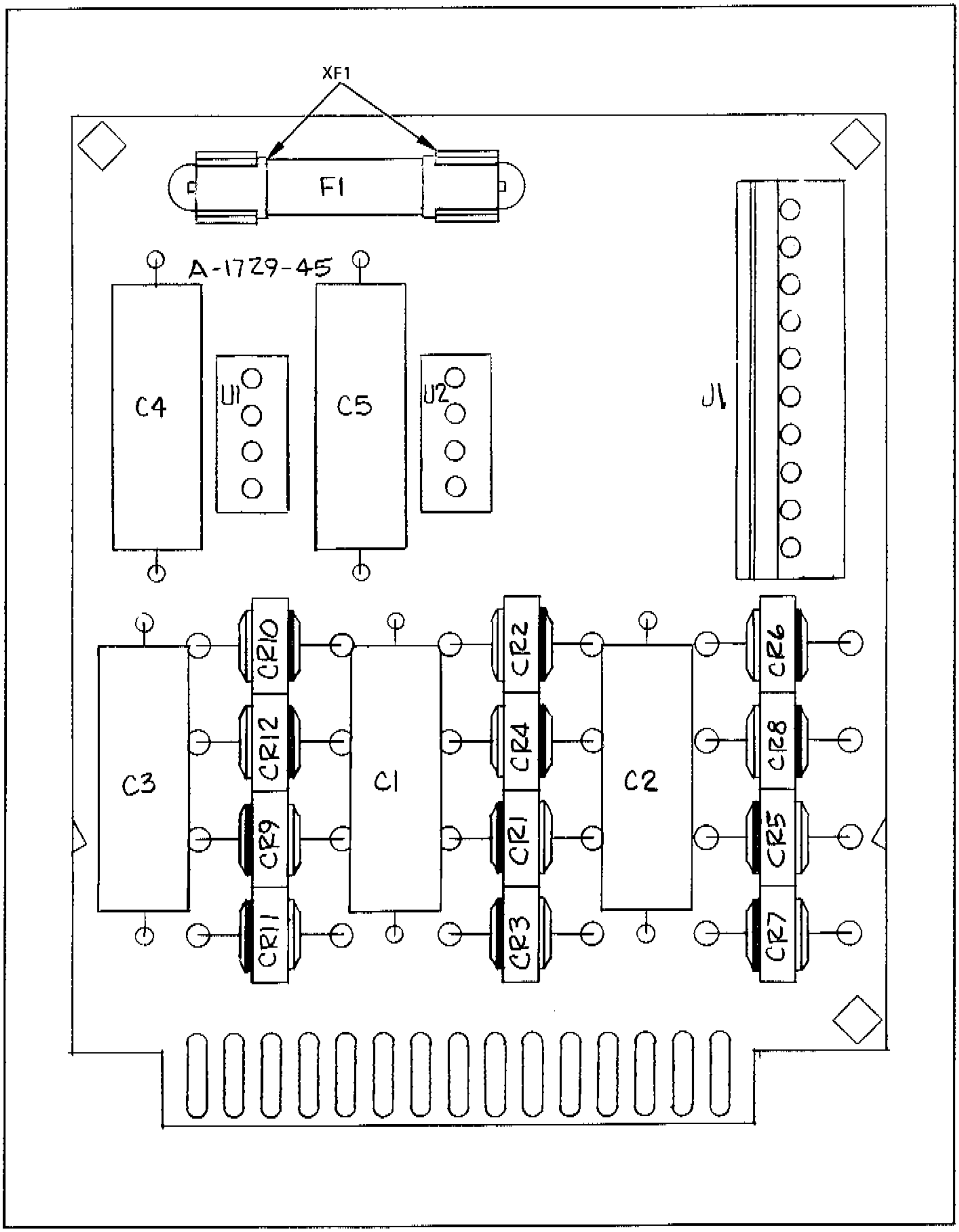
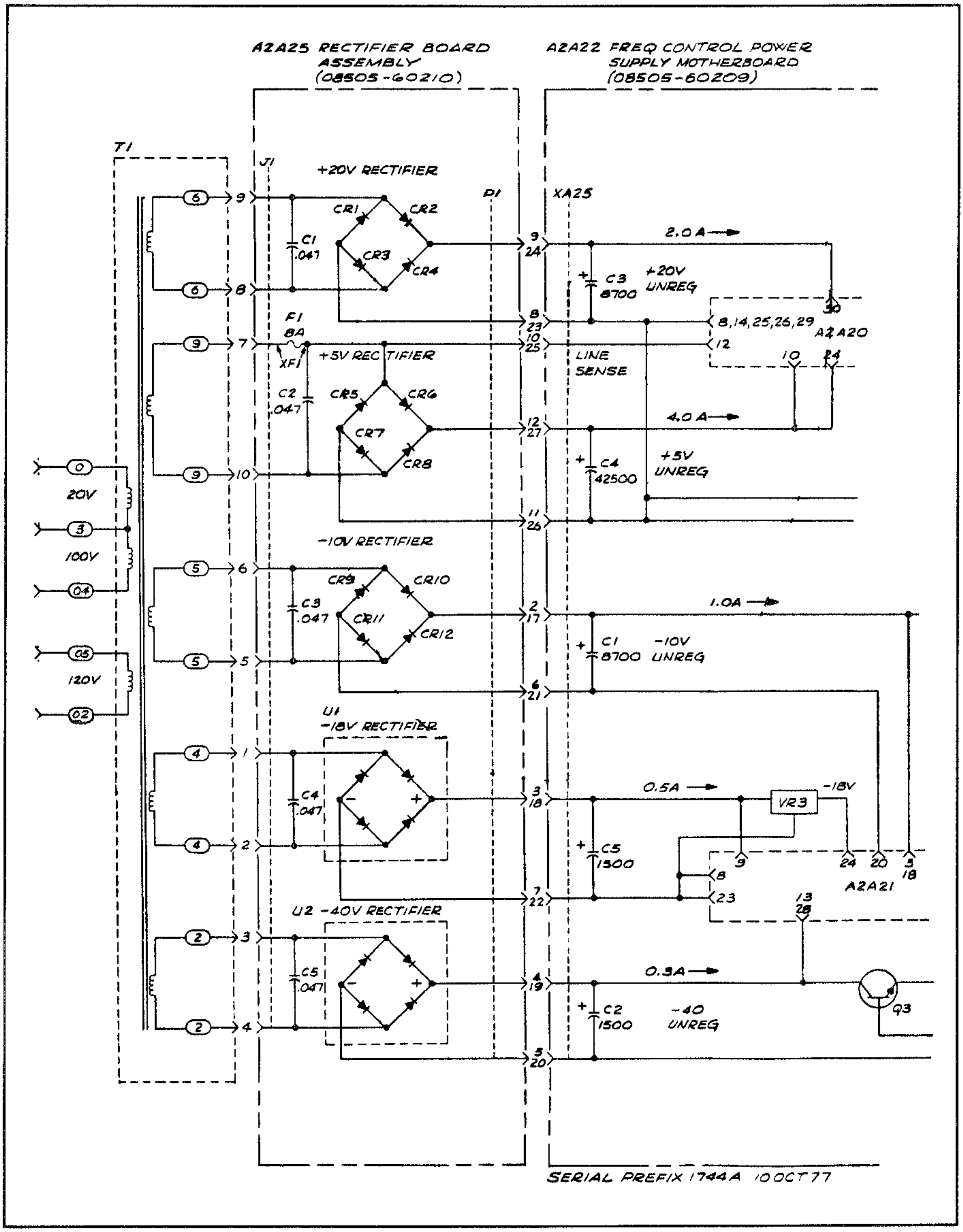


Figure C3-46A. A2A25 Rectifier Board Assembly, Parts Location (CHANGE 14)



P/O Figure C3-47. A2A22 Frequency Control Power Supply, Schematic (CHANGE 14)

CHANGE 15

Page D2-29, Table D2-2:
Change A3A18C1 to HP Part Number 0140-0198, CAPACITOR-FXD 200pF +-5% 300 WVDC MICA.
Change A3A18C2 to HP Part Number 0160-2203, CAPACITOR-FXD 91pF +-5% 300 WVDC MICA.

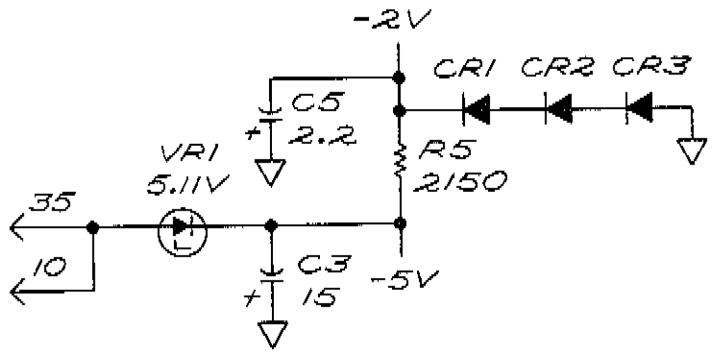
Page D3-115/116, Figure D3-52:
Change A3A18C1 to 200pF.
Change A3A18C2 to 91pF.

CHANGE 16

In this Change Sheet, Table C2-2, CHANGE 5:
Change the Parts List in Change 5 of this change sheet as follows:
Delete A2A4L3.
Add A2A4MP4 through MP13, HP Part Number 1200-0507, IC SOCKET 16 CONTACT.
Change A2A4R5 to HP PART NUMBER 0698-0084, RESISTOR 2.15K 1% .125W F TC=0+–100.
Add A2A4VR1, HP PART NUMBER 1902-0041, DIODE-ZNR 5.11V 5% DO-7 PD= .4W TC=–.009%.

In this Change Sheet, Figure C3-25, CHANGE 5:
Change L3 to VR1.

In this Change Sheet, Figure C3-26, CHANGE 5:
Delete L3 and add VR1 in its place, change the value of R5, and change –10V to –5V as shown in the partial schematic below.



Change the "–10V" notation to "–5V" on U2, U8 through U11, and U14 through U17.

Page C2-23, Table C2-2:
Change A2A11VR1 to HP Part Number 1902-1336.

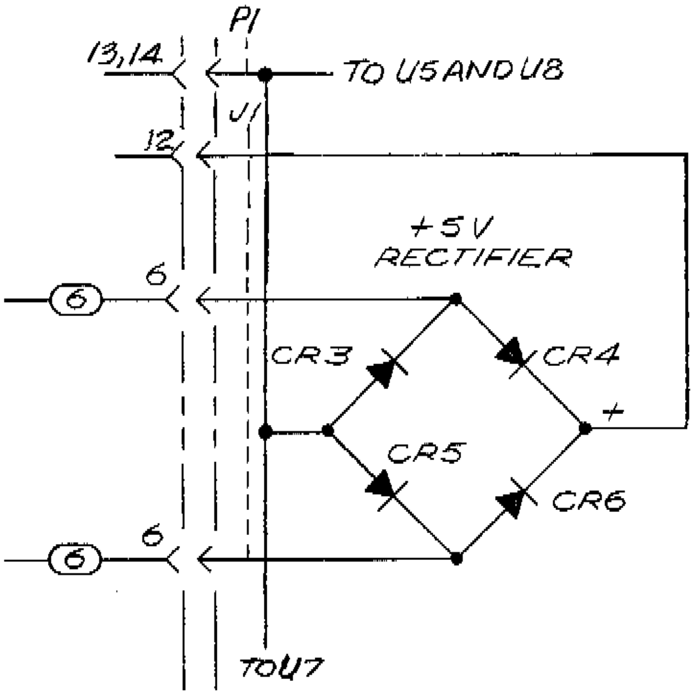
Page D2-30, Table D2-2:
Add A3A24CR3 through CR6, HP Part Number 1901-0662, DIODE PWR RECT 100V 6A.

Page D2-31, Table D2-2:
Change A3A24U5 through U8 to HP Part Number 1906-0094, DIODE-MULT FULL WAVE BRIDGE 400V 1.5A.
Delete A3A24U9.

►CHANGE 16 (Cont'd)

Page D3-118, Figure D3-52B:
Replace Figure D3-52B with new Parts Location Drawing of A3A24 in this change sheet.

►Page D3-119/120, Figure D3-53:
Delete A3A24U6 and add in its place A3A24CR3 through CR6 as shown in the partial schematic below:



A3A24

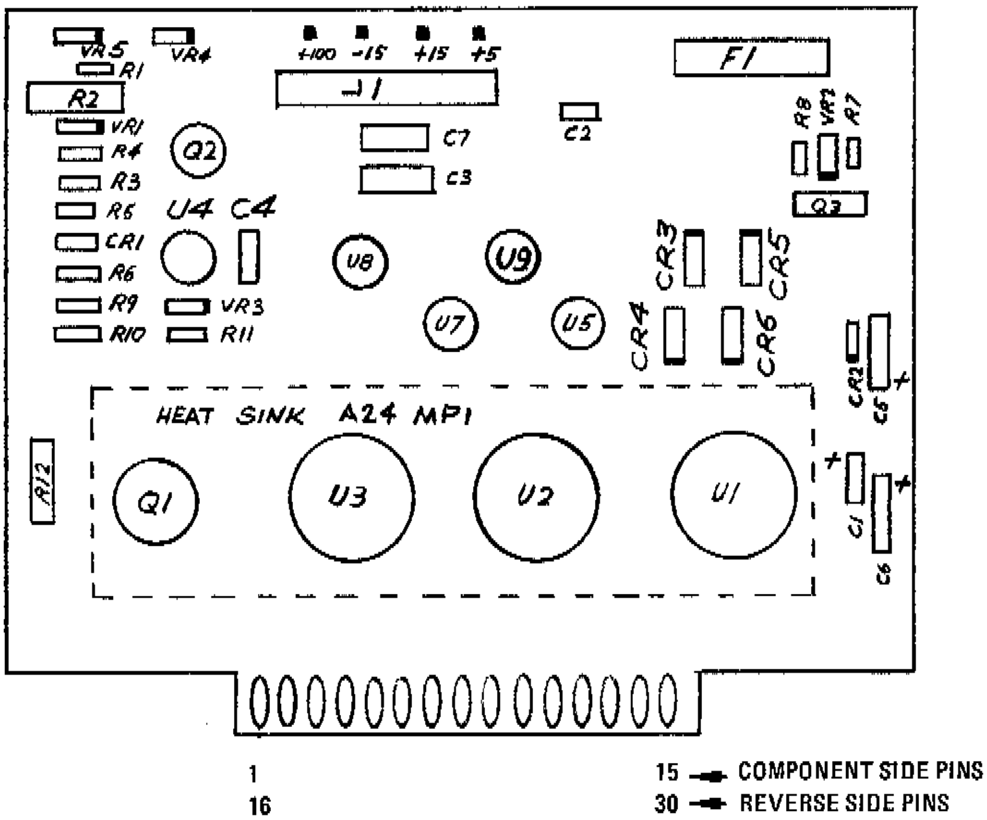


 Figure D3-52B. A3A24 Voltage Regulator Board Parts Locations (Change 16)

CHANGE 17

Page C2-4, Table C2-2:
Change A2A1A1DS1 through DS14 to MFR PART NUMBER 1990-0503.

Page D2-25, Table D2-2:
Change A3A13R83 to HP Part Number 0757-0442, RESISTOR 10K 1% .125W F TC=0+–100.
Change A3A13R91 to HP Part Number 2100-3154, RESISTOR-TRMR 1K 10% C SIDE-ADJ 17-TURN.

Page D2-28, Table D2-2:
Delete A3A17C19.

Page D2-29, Table D2-2:
Change A3A17U5 to HP Part Number 1826-0371, IC OP AMP TO-99.

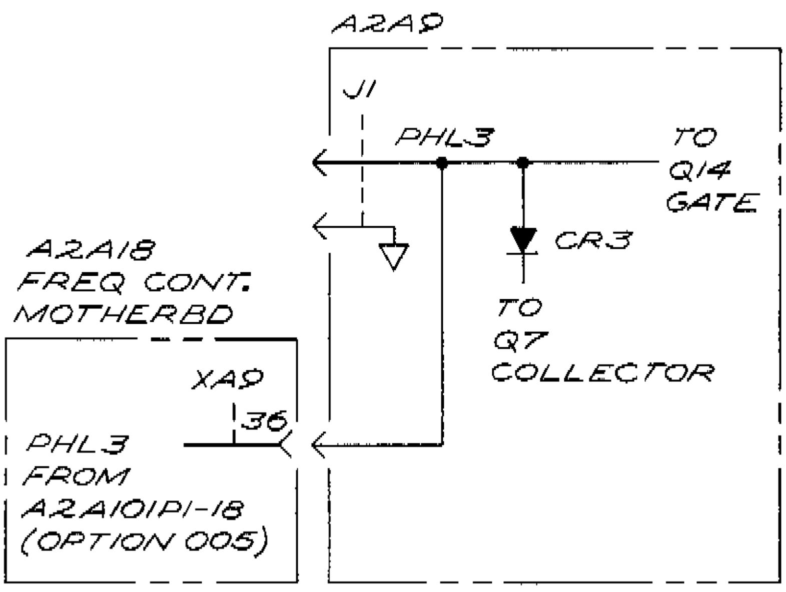
Page D2-36, Figure D2-1:
Change Reference Designator 66 to HP Part Number 08505-00136.

Page D2-37, Figure D2-1:
Change Reference Designator 95 to HP Part Number 08505-00137.
Change Machine Screw, HP Part Number 2510-0137, to 2510-0136.

Page D3-99, Figure D3-44:
Change R83 to 10K.
Change R91 to 1000.

In this Change Sheet, Table C2-2, A2A9 Part List, CHANGE 2:
Change A2A9 to HP Part Number 08505-60211.

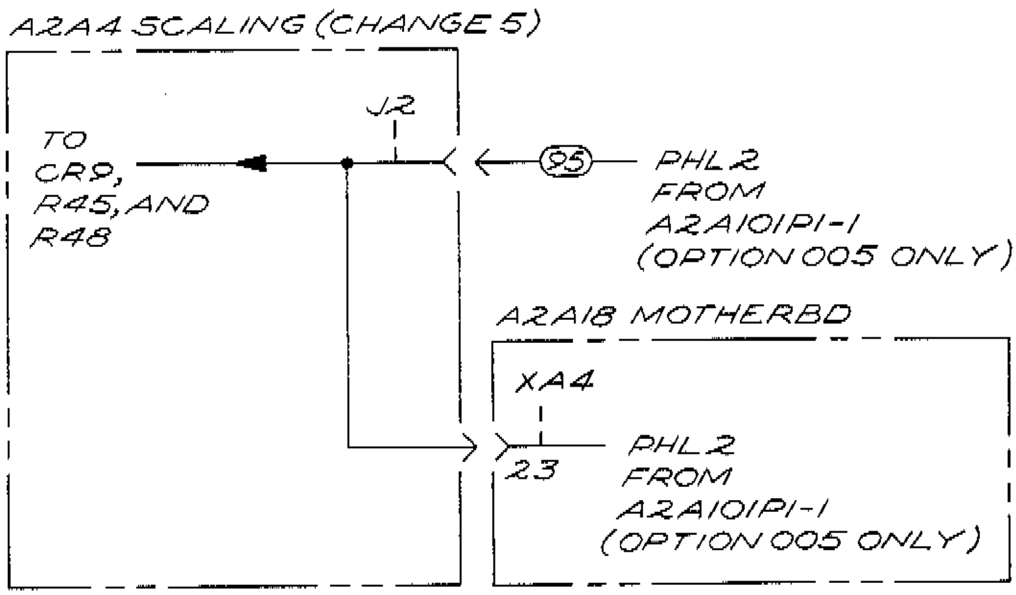
In this Change Sheet Figure C3-36, A2A9 Discriminator Schematic CHANGE 2; and Figure F4-5, in Option 005 Supplement:
Change Part Number of A2A9 in upper left hand corner to 08505-60211.
►Change the phase lock circuit for Option 005 as shown in the partial schematic following:



CHANGE 17 (Cont'd)

In this Change Sheet, Table C2-2 CHANGE 5:
Change A2A4 to Part Number 08505-60212.

In this Change Sheet, Figure C3-26, A2A4 Scaling Schematic, CHANGE 5:
Change the phase lock circuit for Option 005 as shown in the partial schematic following:



CHANGE 18

Page C2-4, Table C2-2:
Change A2W107 to HP Part Number 08505-60217.
Change A2W108 to HP Part Number 08505-60218.
Change A2W8 to HP Part Number 08505-60219.
Change A2W9 to HP Part Number 08505-60220.
Change A2W10 to HP Part Number 08505-60221.
Change A2W16 to HP Part Number 08505-60216.

Page C2-5, Table C2-2:
Change A2A1A1U2, A2A1A1U3, and A2A1A1U5 to HP Part Number 1820-1823.

Page C2-7, Table C2-2:
Delete A2A3C22.

Page C2-8, Table C2-2:
Change A2A3U28, A2A3U29, and A2A3U30 to HP Part Number 1820-1823.

CHANGE 18 (Cont'd)

Page C2-9, Table C2-2:
Change A2A3U31, A2A3U32, and A2A3U33 to HP Part Number 1820-1823.

Page C2-12, Table C2-2:
Change A2A5U12 thru A2A5U15 to HP Part Number 1820-1823.

Page C2-24, Table C2-2:
Change A2A18 to HP Part Number 08505-60214.

Page C2-28, Figure C2-1:
Change Item 29 to HP Part Number 08505-00141.
Delete Items 29A and 29B.
Change Item 30 to HP Part Number 08505-20216.
Change Item 33 to HP Part Number 08505-20217.

Page C3-63, Figure C3-24:
Delete A2A3C22.

Page D2-11, Table D2-2:
Change A3A7C21 and A3A7C22 to HP Part Number 0160-2055.

Page E4-4, Table E4-2:
Change A2A13U4, A2A13U6, and A2A13U8 to HP Part Number 1820-1823.

Page E4-5, Table E4-2:
Change A2A14U6, A2A14U10, A2A14U14, and A2A15U14 to HP Part Number 1820-1823.

Page E4-6, Table E4-2:
Change A2A16C3 to HP Part Number 0180-0116, CAPACITOR-FXD 6.8 UF +−10% 35VDC TA.
Change A2A16U11 and A2A16U16 to HP Part Number 1820-1823.

Page E4-7, Table E4-2:
Change A3A19U14, A3A19U15, and A3A20U13 to HP Part Number 1820-1823.

Page E4-8, Table E4-2:
Change A3A21U11 and A3A21U17 to HP Part Number 1820-1823.

Page E5-29, Figure E5-8:
Change A2A16C3 to 6.8 UF.

CHANGE 19

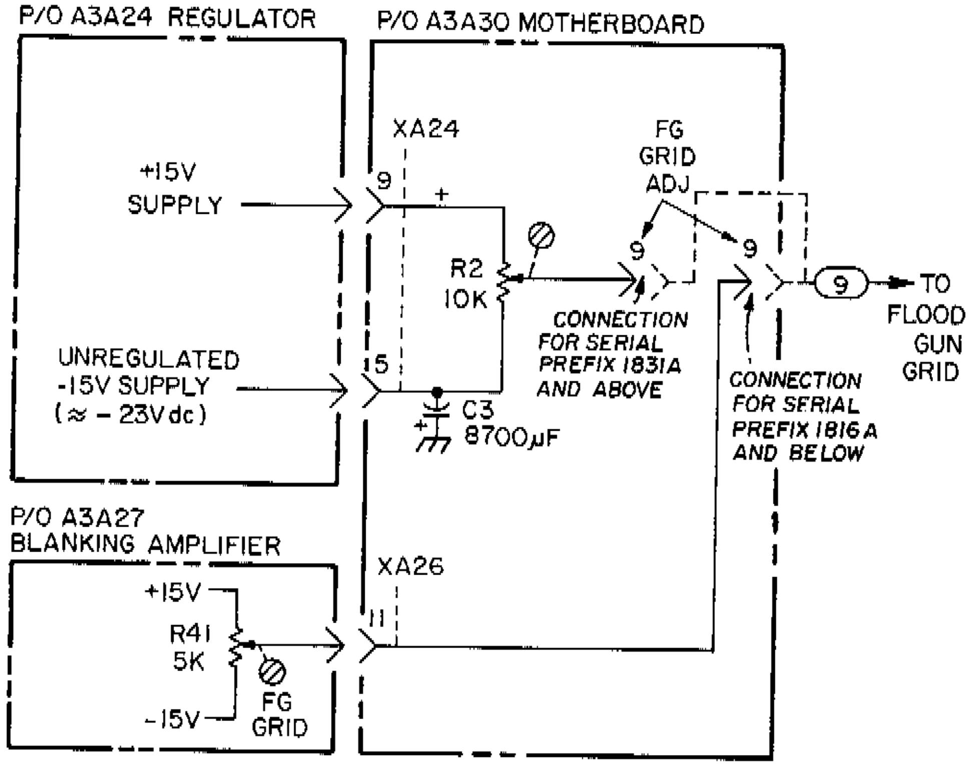
Page A5-67, Paragraph A5-36:
Add the following Flood Gun adjustment:
Flood Gun
ac-1. Set front-panel SCALE control fully clockwise to turn on flood gun. For instruments with serial prefix 1831A and above, adjust FG GRID ADJ control A3A30R2 on the bottom center of Display Motherboard A3A30 for the most uniform illumination on the screen. For instruments with serial prefix 1816A and below, adjust "FG GRID" control A3A27R41 for the most uniform illumination on the screen.
ac-2. If illumination is too bright, increase resistance of A3A30R1 (½ watt resistor). If illumination is too dark, decrease value of A3A30R1. Do not make any smaller value than 6.8 ohms ½ watt or damage to filament may occur.

CHANGE 19 (Cont'd)

Page D2-4, Table D2-2:
Change A3V1 to HP Part Number 08505-60232, CRT ASSEMBLY WITH OVERLAY TAB MOUNTS.

Page D2-35, Table D2-2:
Change A3A30 to HP Part Number 08505-60230.

Page D3-127, Figure D3-56:
Add Partial Schematic of flood gun grid circuit shown in this change sheet.



P/O Figure D3-56. A3A27 Blanking Amplifier, Schematic (CHANGE 19)

In Chapters A and E, delete all references to "Option 001" and substitute "HP-IB" as appropriate. Option 001 HP-IB is now a standard part of the 8505A and is included with all instruments starting at Prefix 1831A.

CHANGE 20

Page C2-5A, Table C2-2:
Change A2A1A2 to HP Part Number 5060-9444.
Change A2A1A3 to HP Part Number 5060-9444.

NOTE

Part Number 5060-9444 is the recommended replacement for A2A1A2 and A2A1A3 in all instruments.

CHANGE 21

Page A1-0, Figure A1-1:
Change part number under Interconnect Cable to 08505-60231.

Page A1-4, Paragraph A1-41:
Change the part number of "Interconnect Cable" to 08505-60231.

Page B2-13, Figure B2-1:
Change item 14 to HP Part Number 08505-00139.
Change item 33 to HP Part Number 08505-00140.

CHANGE 21 (Cont'd)

Page D2-31, Table D2-2:
Add A3A25R10 through A3A25R14, HP Part Number 0757-0280, RESISTOR 1K 1% .125W TC=0+-100.
Change the HP Part Number of A3A26 to 08505-60215.

Page D2-32, Table D2-2:
Add A3A26MP8, HP Part Number 85662-20042, GUIDE-HIGH VOLTAGE BD.
Change A3A26R13 to HP Part Number 0698-8992, RESISTOR 8M 2% 1W C TC=0+-250.
Change A3A26R14 to HP Part Number 2100-3626.
Change A3A26R15 to HP Part Number 0698-8993, RESISTOR 14M 2% 1W C TC=0+-250.
Change A3A26VR1 and A3A26VR2 to HP Part Number 2140-0015, LAMP-GLOW C2A 115/58 VDC 1.9 mA BULB (Recommended Replacement).

Page D2-36, Figure D2-1:
Change item 52 to HP Part Number 08505-00144, COVER-HIGH VOLTAGE.
Change item 67 to HP Part Number 08505-00138.

Page D2-37, Figure D2-1:
Change item 88 to HP Part Number 08505-00145.

► Page D3-121, Figure D3-54:
Add A3A25R10, 1K RESISTOR, in the "3" line between W22 and the wiper of R1.
Add A3A25R11, 1K RESISTOR, in the "5" line between W22 and the wiper of R4.
Add A3A25R12, 1K RESISTOR, in the "9" line between W22 and the wiper of R5.
Add A3A25R13, 1K RESISTOR, in the "1" line between W22 and the wiper of R7.
Add A3A25R14, 1K RESISTOR, in the "7" line between W22 and the wiper of R8.

Page D3-123, Figure D3-55:
Change the Part Number of A3A26 at top of schematic to 08505-60215.
Change the value of VR1 and VR2 to 115V.
Change the value of R13 to 8M.
Change the value of R15 to 14M.

Page E4-8, Table E4-2:
Change A3A21C7 to HP Part Number 0180-0116, CAPACITOR-FXD 6.8UF +-10% 35VDC TA.

Page E5-49, Figure E5-14:
Change A3A21C7 (located in parallel with R2 in POWER-ON RESET circuit) to 6.8UF.

►CHANGE 22

Page C2-9, Table C2-2:
Change A2A4R16 to HP Part No. 2100-3273, RESISTOR-TRMR 2K 10% C Side-Adj 1-Trn, Mfr Part No. 3386-Y46-202.
Change A2A4R24 to HP Part No. 2100-3351, RESISTOR-TRMR 500 10% C Side-Adj 1-Trn, Mfr Part No. 3386-Y46-501.

Page C2-26, Table C2-2:
Change A2A21 to HP Part No. 08505-60235, Mfr Part No. 08505-60235.
Change A2A21Q3 to HP Part No. 1884-0261, THYRISTOR-SCR TO-220AB Mfr Code 01698, Mfr Part No. S2060A.
Change A2A21Q7 to HP Part No. 1854-0271, TRANSISTOR NPN SI TO-39 PD = 1W FT 150MHZ, Mfr Code 02037, Mfr Part No. SS92.

Page C3-67, Figure C3-26:
Change the value of R16 to 2000 ohms.
Change the value of R24 to 500 ohms.

Page C3-103/104, Figure C3-46:
Change A2A21 to HP Part No. 08505-60235.

Page D2-9, Table D2-2:
Change A3A5R42 to HP Part No. 0698-3444, RESISTOR 316 10% .125W, Mfr Part No. C4-1/8-TO-316R-F.
Change A3A5R45 to HP Part No. 2100-3351, RESISTOR-TRMR 500 10% C Side-Adj 1-Trn, Mfr Part No. 3386-Y46-501.

Page D2-31, Table D2-2:
Delete A3A25R10 thru A3A25R14.

Page D2-35, Table D2-2:
Change A3A30 to HP Part No. 08505-60236.
Add A3A30R2 thru A3A30R6, HP Part No. 0757-0280, RESISTOR, 1K 1% .125W TC = 0+-100.

Page D3-71, Figure D3-28:
Change the value of R42 to 316 ohms.
Change the value of R45 to 500 ohms.

Page D3-121, Figure D3-54:
Change the position of the 1K RESISTORS A3A25R10 thru A3A25R14 to the A3A30 Mother Board. Change the reference designators as follows:

Old Reference Designator	New Reference Designator	Move From A3A25	To New Location on A3A30
A3A25R10	A3A30R2	In "3" line from wiper of R1	In line to pin J1FP-7
A3A25R11	A3A30R3	In "5" line from wiper of R4	In line to pin J1FP-8
A3A25R12	A3A30R4	In "9" line from wiper of R5	In line to pin J1FP-5
A3A25R13	A3A30R5	In "1" line from wiper of R7	In line to pin J1FP-6
A3A25R14	A3A30R6	In "7" line from wiper of R8	In line to pin J1FP-4

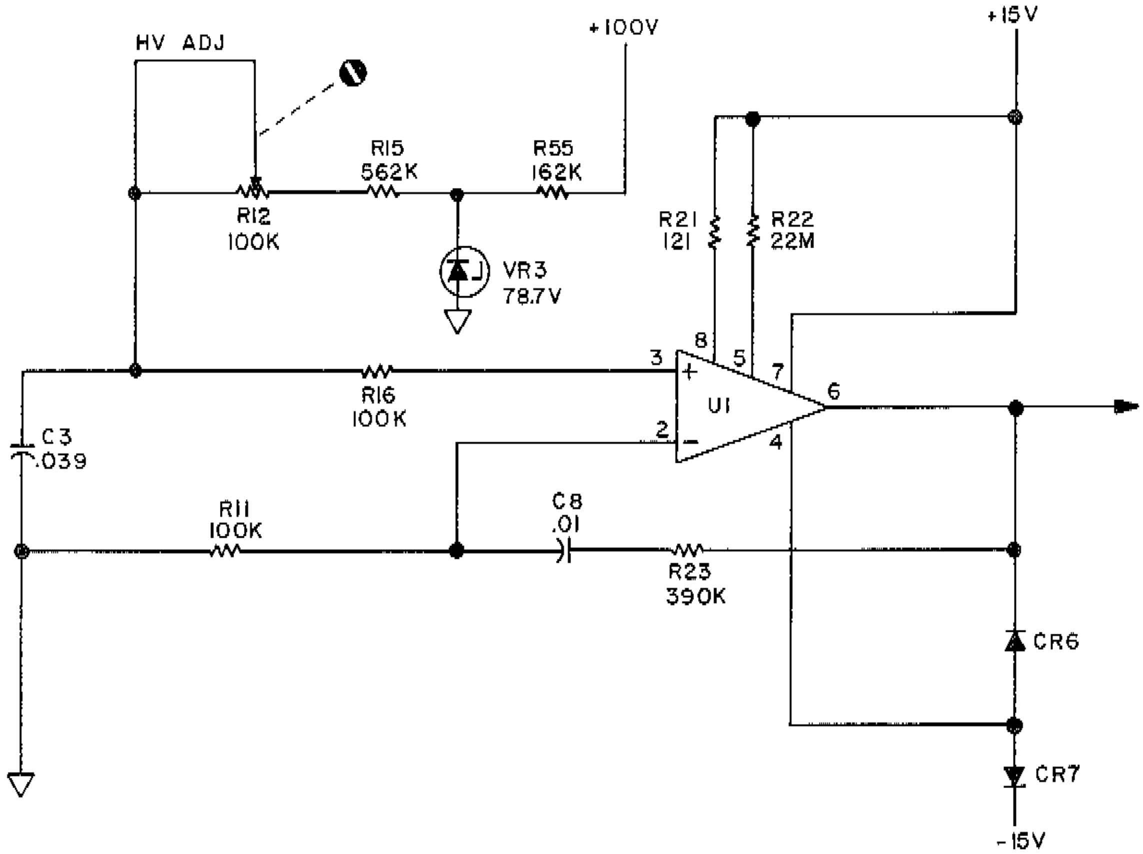
►CHANGE 23

Page D2-32, Table D2-2:
Change A3A27 to HP Part No. 08505-60237.
Change A3A27R12 to HP Part No. 2100-2655, RESISTOR-TRMR, 100K 10% TOP-ADJ, 1-TRN.
Change A3A27R15 to HP Part No. 0698-8824, RESISTOR, 562K 1% .125W F TC = 0+-100.
Add A3A27R55, HP Part No. 0757-0470, RESISTOR, 162K 1% .125W F TC = 0+-100.
Add A3A27VR3, HP Part No. 1902-3400, DIODE-ZNR 78.7V 2% DO-7 PD = .4W TC = +.08%.

Page D3-127, Figure D3-55B:
Replace Figure D3-55B with Figure D3-55B (Change 23) of this Manual Change.

Page D3-127, Figure D3-56:
Change FEEDBACK AMPLIFIER, A3A27 Circuit as shown in the partial schematic following:

FEEDBACK AMPLIFIER



A3A27

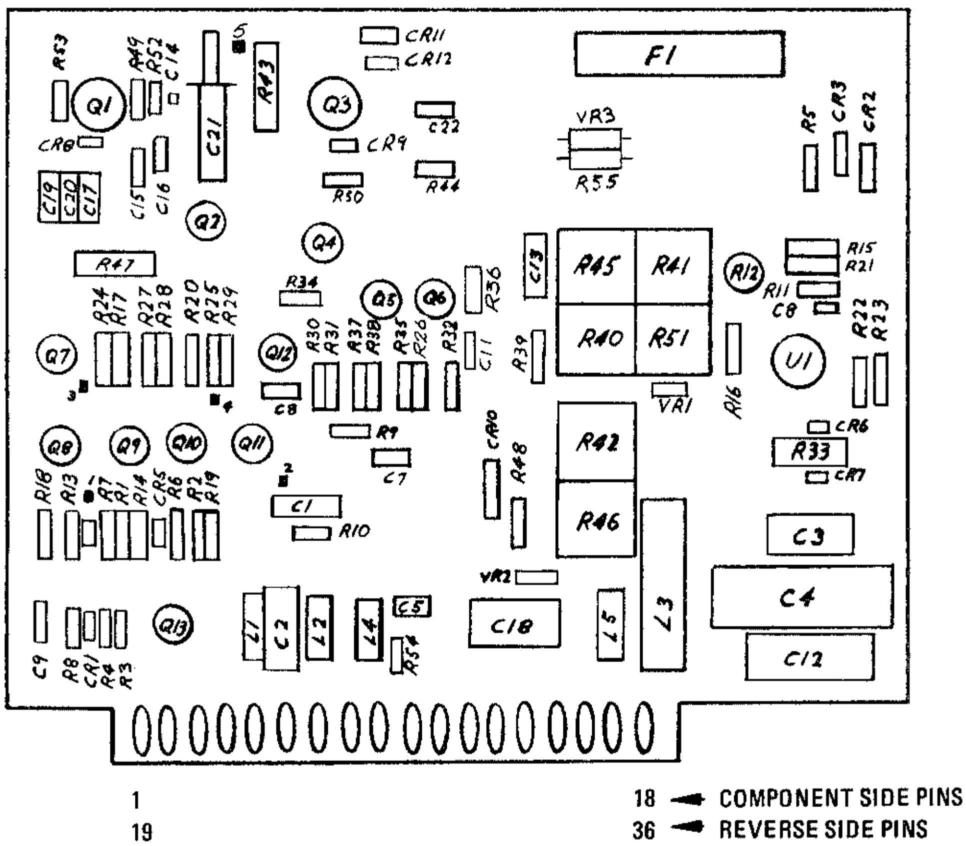


Figure D3-55B. A3A27 Blanking Amplifier Parts Locations (CHANGE 23)

CONTENTS

CHAPTER A
MODEL 8505A NETWORK ANALYZER

CONTENTS (Cont'd)

CHAPTER B
RF SOURCE/CONVERTER

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ILLUSTRATIONS

CHAPTER A
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ILLUSTRATIONS (Cont'd)

ILLUSTRATIONS (Cont'd)

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RF SOURCE/CONVERTER

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CHAPTER C
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ILLUSTRATIONS (Cont'd)

CHAPTER D
SIGNAL PROCESSOR

ILLUSTRATIONS (Cont'd)

CHANGE A

TABLES

CHAPTER A
MODEL 8505A NETWORK ANALYZER

CHAPTER B
RF SOURCE/CONVERTER

CHAPTER C
FREQUENCY CONTROL

CHAPTER D
SIGNAL PROCESSOR

CHAPTER B
RF SOURCE/CONVERTER

B-1. INTRODUCTION

B-2. This chapter of the manual contains the information you will need to service the RF Source/Converter Assembly. The chapter is divided into four sections: Section I contains general information about the Source/Converter Assembly; Section II contains a list of the assembly's replacable parts; Section III provides troubleshooting information, the assembly schematic diagrams, and parts location illustrations; and Section IV contains changes you must make to this chapter to adapt (backdate) it to instruments having serial number prefixes below those indicated on the manual's title page.

SECTION I
GENERAL INFORMATION

B1-1. DESCRIPTION

B1-2. RF Source/Converter Assembly A1 (Part No. 08505-60050) provides the 8505A Network Analyzer with a built-in source of leveled RF energy over the frequency range of 500 kHz to 1300 MHz. The source portion of the Source/Converter is, in effect, a wide-band sweep oscillator which is used to supply signals to the device under test (DUT). The converter portion accepts up to three RF inputs and regardless of their frequencies, converts them into 100 kHz IF signals which are fed to the 8505A's Signal Processor Assembly.

B1-3. The RF Source/Converter is a modular assembly which plugs into the bottom chassis unit of the 8505A, alongside the Frequency Control Assembly. It is accessible when the top and bottom covers are removed from the chassis for repairs.

CHAPTER B
RF SOURCE/CONVERTER

SECTION II
REPLACEABLE PARTS FOR A1 ASSEMBLY

B2-1. INTRODUCTION

B2-2. This section contains information for ordering parts for the RF Source/Converter Assembly. Table B2-1 is a list of abbreviations used in the parts list and throughout the manual. Table B2-2 lists all the replaceable parts in the Source/Converter Assembly in reference designator order. Table B2-3 lists the manufacturers codes used in the Replaceable Parts List and the names of the corresponding manufacturers. Miscellaneous mechanical parts are identified in Figure B2-1.

B2-3. PARTS LIST ARRANGEMENT

B2-4. In Table B2-2, the Replaceable Parts List, electrical assemblies and their components are listed in alpha-numerical order by reference designator. Chassis-mounted parts are listed first followed by sub-assemblies A1A1 through A1A15A6 and their components.

B2-5. ORDERING INFORMATION

B2-6. To order a part listed in Table B2-2, address the order to the nearest Hewlett-Packard office, stating the Hewlett-Packard part number and quantity required.

B2-7. To order a part that is not listed in the Replaceable Parts List, include the instrument serial number, the description and funcction of the part, and the number of parts required.

Table B2-1. Reference Designations and Abbreviations (1 of 2)

REFERENCE DESIGNATIONS

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

ABBREVIATIONS

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

NOTE

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

Table B2-1. Reference Designations and Abbreviations (2 of 2)

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

NOTE

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

MULTIPLIERS

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

Table B2-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1J1	1250-0914	4	CONNECTOR-RF APC-N FEM UNMTD	90949	131-150
	1250-0915	4	CONTACT, RF CONNECTOR, FEMALE CENTER	71785	131-149
	5040-0306	4	INSULATOR	28480	5040-0306
	08505-20072	4	BODY, CONNECTOR	28480	08505-20072
	08555-20093	4	CONTACT, JACK	28480	08555-20093
	08761-2027	4	INSULATOR	28480	08761-2027
A1J2	1250-0914		CONNECTOR-RF APC-N FEM UNMTD	90949	131-150
	1250-0915		CONTACT, RF CONNECTOR, FEMALE CENTER	71785	131-149
	5040-0306		INSULATOR	28480	5040-0306
	08505-20072		BODY, CONNECTOR	28480	08505-20072
	08555-20093		CONTACT, JACK	28480	08555-20093
	08761-2027		INSULATOR	28480	08761-2027
A1J3	1250-0914		CONNECTOR-RF APC-N FEM UNMTD	90949	131-150
	1250-0915		CONTACT, RF CONNECTOR, FEMALE CENTER	71785	131-149
	5040-0306		INSULATOR	28480	5040-0306
	08505-20072		BODY, CONNECTOR	28480	08505-20072
	08555-20093		CONTACT, JACK	28480	08555-20093
	08761-2027		INSULATOR	28480	08761-2027
A1J4	1250-0914		CONNECTOR-RF APC-N FEM UNMTD	90949	131-150
	1250-0915		CONTACT, RF CONNECTOR, FEMALE CENTER	71785	131-149
	5040-0306		INSULATOR	28480	5040-0306
	08505-20072		BODY, CONNECTOR	28480	08505-20072
	08555-20093		CONTACT, JACK	28480	08555-20093
	08761-2027		INSULATOR	28480	08761-2027
A1J5	5060-0467	2	CONNECTOR, MALE PROBE	28480	5060-0467
A1J6	5060-0467		CONNECTOR, MALE PROBE	28480	5060-0467
A1R1	2100-2728	1	RESISTOR-VAR CONTROL C 1K 20% LIN (OUTPUT VERNIER)	28480	2100-2728
A1S1	3100-3339	1	SWITCH, ROTARY (OUTPUT)	28480	3100-3339
A1W1	08505-60081	1	R100 KHZ IF OUTPUT, GRAY/BROWN	28480	08505-60081
A1W1P1	1250-0872	7	CONNECTOR-RF SMB FEM UNMTD	24931	32P101-1
A1W1P2	1251-0179	5	INSERT-SUBMIN D CONN	71785	DM-53740-5001
A1W10	08505-20073	1	CABLE "B" INPUT TO MIXER	28480	08505-20073
A1W11	08505-20074	1	CABLE "A" INPUT TO MIXER	28480	08505-20074
A1W12	08505-20075	1	CABLE "R" INPUT TO MIXER	28480	08505-20075
A1W13	08505-20076	1	CABLE, ATTEN. OUT TO RF OUTPUT	28480	08505-20076
A1W14	08505-20077	1	CABLE, RF AMP/DET TO CONN. INPUT	28480	08505-20077
A1W15	08505-20078	1	CABLE, LO AMP/DET TO CONV. INPUT	28480	08505-20078
A1W16	08505-20079	2	CABLE C-BAND TO RF AMP/DET MIXER	28480	08505-20079
A1W17	08505-20079		CABLE C-BAND TO RF AMP/DET MIXER	28480	08505-20079
A1W18	08505-20081	1	CABLE, YIG TO SPLITTER/AMPL	28480	08505-20081
A1W19	08505-20082	2	CABLE, C-BAND OUT TO MIXER INPUT	28480	08505-20082
A1W2	08505-60082	1	A TO 100KHZ IF OUTPUT, GREY/RED	28480	08505-60082
A1W2P1	1250-0872		CONNECTOR-RF SMB FEM UNMTD	24931	32P101-1
A1W2P2	1251-0179		INSERT-SUBMIN D CONN	71785	DM-53740-5001
A1W20	08505-20082		CABLE, C-BAND OUT TO MIXER INPUT	28480	08505-20082
A1W21	8120-0620	2	CABLE, INDICATOR BD. TO MOTHER BD.	28480	8120-0620
A1W22	8120-0620		CABLE, MOTHER BD. TO INDICATOR BD.	28480	8120-0620
A1W23	08505-60070	1	CABLE ASSEMBLY, ATTENUATOR 1	28480	08505-60070
A1W23P1	1251-3820	1	CONNECTOR	28480	1251-3820
A1W3	08505-60083	1	B-100 KHZ IF OUTPUT, GREY/ORANGE	28480	08505-60083
A1W3P1	1250-0872		CONNECTOR-RF SMB FEM UNMTD	24931	32P101-1
A1W3P2	1251-0179		INSERT-SUBMIN D CONN	71785	DM-53740-5001
A1W4	08505-60084	1	COUPLED LO OUTPUT, GREY/BLUE	28480	08505-60084
A1W4P1	1250-0888	1	CONNECTOR-RF SMC FEM UNMTD	98291	50-028-0139
	1250-1167	1	CONNECTOR-RF SMC FEM UNMTD	98291	9436-99
	1250-1174	1	COVER:RF CONNECTOR	98291	5561-27
	1250-1175	1	SLEEVE:RF CONNECTOR	98291	6100-42
A1W4P2	1251-0179		INSERT-SUBMIN D CONN	71785	DM-53740-5001
A1W5	08505-60085	1	100 MHZ TO FIXED OSCILLATOR, VIOLET	28480	08505-60085
A1W5P1	1250-0872		CONNECTOR-RF SMB FEM UNMTD	24931	32P101-1
A1W5P2	1251-0179		INSERT-SUBMIN D CONN	71785	DM-53740-5001
A1W6	08505-60086	1	10 MHZ TO FIXED OSCILLATOR, BLUE	28480	08505-60086
A1W6P1	1250-0872		CONNECTOR-RF SMB FEM UNMTD	24931	32P101-1
A1W6P2	1251-0179		INSERT-SUBMIN D CONN	71785	DM-53740-5001
A1W7	08505-60087	1	100 MHZ OSC/OSC, GREY	28480	08505-60087
A1W7P1	1250-0872		CONNECTOR-RF SMB FEM UNMTD	24931	32P101-1
A1W7P2	1250-0872		CONNECTOR-RF SMB FEM UNMTD	24931	32P101-1

Table B2-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1W8	08505-60089	1	4.210 GHZ OSC/OUTPUT, YELLOW	28480	08505-60089
A1W8P1	1250-0654	4	CONNECTOR-RF SMA	28480	1250-0654
A1W8P2	1250-0654		CONNECTOR-RF SMA	28480	1250-0654
A1W9	08505-60090	1	4.20996 GHZ OSC OUTPUT, BLACK	28480	08505-60090
A1W9P1	1250-0654		CONNECTOR-RF SMA	28480	1250-0654
A1W9P2	1250-0654		CONNECTOR-RF SMA	28480	1250-0654
A1A1	08505-60068		BOARD ASSEMBLY, INDICATOR	28480	08505-60068
A1A1C1	0180-0374	1	CAPACITOR-FXD: 10UF +-10% 20VDC TA-SOLID	56289	150D106X902082
A1A1C2	0180-0374	2	CAPACITOR-FXD: 10UF +-10% 20VDC TA-SOLID	56289	150D106X902082
A1A1C3	0160-2055		CAPACITOR-FXD .01UF +80% -20% 100WVDC	28480	0160-2055
A1A1C4	0160-2055		CAPACITOR-FXD .01UF +80% -20% 100WVDC	28480	0160-2055
A1A1C5	0160-2055		CAPACITOR-FXD .01UF +80% -20% 100WVDC	28480	0160-2055
A1A1CR1	1901-0081	12	DIODE-SWITCHING 50V 75NA 10NS	28480	1901-0081
A1A1CR2	1901-0081		DIODE-SWITCHING 50V 75NA 10NS	28480	1901-0081
A1A1CR3	1901-0081		DIODE-SWITCHING 50V 75NA 10NS	28480	1901-0081
A1A1CR4	1901-0081		DIODE-SWITCHING 50V 75NA 10NS	28480	1901-0081
A1A1DS1	1990-0325	4	LED-VISIBLE	28480	1990-0325
A1A1DS2	1990-0325		LED-VISIBLE	28480	1990-0325
A1A1DS3	1990-0325		LED-VISIBLE	28480	1990-0325
A1A1DS4	1990-0325		LED-VISIBLE	28480	1990-0325
A1A1DS5	1990-0485	3	LED-VISIBLE	28480	1990-0485
A1A1DS6	1990-0485		LED-VISIBLE	28480	1990-0485
A1A1DS7	1990-0485		LED-VISIBLE	28480	1990-0485
A1A1DS8	1990-0486	6	LED-VISIBLE	28480	1990-0486
A1A1DS9	1990-0486		LED-VISIBLE	28480	1990-0486
A1A1DS10	1990-0486		LED-VISIBLE	28480	1990-0486
A1A1DS11	1990-0486		LED-VISIBLE	28480	1990-0486
A1A1DS12	1990-0486		LED-VISIBLE	28480	1990-0486
A1A1DS13	1990-0486		LED-VISIBLE	28480	1990-0486
A1A1J1			PART OF A1A1 BOARD, NOT REPLACEABLE		
A1A1MP1	08505-60152	3	DIFFUSER ASSEMBLY, SINGLE	28480	08505-60152
A1A1MP2	08505-60152		DIFFUSER ASSEMBLY, SINGLE	28480	08505-60152
A1A1MP3	08505-60152		DIFFUSER ASSEMBLY, SINGLE	28480	08505-60152
A1A1MP4	08505-60153	1	DIFFUSER ASSEMBLY, TRIPLE	28480	08505-60153
A1A1MP5	08505-20085	1	GUIDE, SLIDE ASSEMBLY, A	28480	08505-20085
A1A1MP6	08505-20086	1	GUIDE, SLIDE ASSEMBLY, B	28480	08505-20086
A1A1Q1	1854-0404	22	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A1A1Q2	1853-0007	4	TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A1A1R1	0698-3447	1	RESISTOR 422 1% .125W F TC=0+-100	16299	C4-1/8-T0-422R-F
A1A1R2	0698-3440	11	RESISTOR 196 1% .125W F TC=0+-100	16299	C4-1/8-T0-196R-F
A1A1R3	0698-3440		RESISTOR 196 1% .125W F TC=0+-100	16299	C4-1/8-T0-196R-F
A1A1R4	0698-3440		RESISTOR 196 1% .125W F TC=0+-100	16299	C4-1/8-T0-196R-F
A1A1R5	0698-3440		RESISTOR 196 1% .125W F TC=0+-100	16299	C4-1/8-T0-196R-F
A1A1R6	0698-3154	6	RESISTOR 4.22K 1% .125W F TC=0+-100	16299	C4-1/8-T0-4221-F
A1A1R7	0698-3154		RESISTOR 4.22K 1% .125W F TC=0+-100	16299	C4-1/8-T0-4221-F
A1A1R8	0698-3440		RESISTOR 196 1% .125W F TC=0+-100	16299	C4-1/8-T0-196R-F
A1A1R9	0698-0083	7	RESISTOR 1.96K 1% .125W F TC=0+-100	16299	C4-1/8-T0-1961-F
A1A1R13	0698-3154		RESISTOR 4.22K 1% .125W F TC=0+-100	16299	C4-1/8-T0-4221-F
A1A1R14	0698-3154		RESISTOR 4.22K 1% .125W F TC=0+-100	16299	C4-1/8-T0-4221-F
A1A1R15	0698-3154		RESISTOR 4.22K 1% .125W F TC=0+-100	16299	C4-1/8-T0-4221-F
A1A1R16	0698-3454	5	RESISTOR 215K 1% .125W F TC=0+-100	16299	C4-1/8-T0-2153-F
A1A1R17	0757-0199	5	RESISTOR 21.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2152-F
A1A1R18	0757-0280	32	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A1A1R19	0698-3440		RESISTOR 196 1% .125W F TC=0+-100	16299	C4-1/8-T0-196R-F
A1A1R20	0698-3440		RESISTOR 196 1% .125W F TC=0+-100	16299	C4-1/8-T0-196R-F
A1A1R21	0698-3440		RESISTOR 196 1% .125W F TC=0+-100	16299	C4-1/8-T0-196R-F
A1A1R22	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A1A1R23	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A1A1R24	0698-3157	7	RESISTOR 19.6K 1% .125W F TC=0+-100	16299	C4-1/8-T0-1962-F
A1A1R25	0698-3154		RESISTOR 4.22K 1% .125W F TC=0+-100	16299	C4-1/8-T0-4221-F
A1A1R26	0698-3440		RESISTOR 196 1% .125W F TC=0+-100	16299	C4-1/8-T0-196R-F
A1A1R27	0698-3440		RESISTOR 196 1% .125W F TC=0+-100	16299	C4-1/8-T0-196R-F
A1A1R28	0698-3440		RESISTOR 196 1% .125W F TC=0+-100	16299	C4-1/8-T0-196R-F
A1A1R29	0698-3157		RESISTOR 19.6K 1% .125W F TC=0+-100	16299	C4-1/8-T0-1962-F
A1A1R30	0757-0458	3	RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A1A1R31	0698-3454		RESISTOR 215K 1% .125W F TC=0+-100	16299	C4-1/8-T0-2153-F

Table B2-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1A1S1	08505-20144	1	SLIDE SWITCH ASSEMBLY	28480	08505-20144
A1A1U1	1826-0133	1	IC LM339N COMPTR	27014	LM339N
A1A1U2	1820-0174	1	IC:TTL HEX INVERTER	01295	SN7404N
A1A1U3	1820-0577	1	IC SN74 16 N INV	01295	SN7416N
A1A2	08505-60151	1	PROC ATTENUATOR, 70 DB	28480	08505-60151
A1A3	08505-60067	1	BOARD ASSEMBLY, ALC	28480	08505-60067
A1A3C1	0180-0116	21	CAPACITOR-FXD; 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A1A3C2	0180-0116		CAPACITOR-FXD; 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A1A3C3	0180-0116		CAPACITOR-FXD; 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A1A3C4	0180-0116		CAPACITOR-FXD; 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A1A3C5	0180-0116		CAPACITOR-FXD; 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A1A3C6	0180-0141	1	CAPACITOR-FXD; 50UF+75-10% 50VDC AL	56289	30D506G050DD2
A1A3C7	0160-2229	1	CAPACITOR-FXD 3000PF +-5% 300WVDC MICA	28480	0160-2229
A1A3C8	0160-0162	1	CAPACITOR-FXD .022UF +-10% 200WVDC POLYE	56289	292P22392
A1A3CR1	1901-0081		DIODE-SWITCHING 50V 75NA 10NS	28480	1901-0081
A1A3CR2	1901-0081		DIODE-SWITCHING 50V 75NA 10NS	28480	1901-0081
A1A3CR3	1901-0081		DIODE-SWITCHING 50V 75NA 10NS	28480	1901-0081
A1A3CR4	1901-0081		DIODE-SWITCHING 50V 75NA 10NS	28480	1901-0081
A1A3CR5	1901-0081		DIODE-SWITCHING 50V 75NA 10NS	28480	1901-0081
A1A3CR6	1901-0081		DIODE-SWITCHING 50V 75NA 10NS	28480	1901-0081
A1A3CR7	1901-0039	6	DIODE-SWITCHING 50V 300NA 8NS	28480	1901-0039
A1A3CR8	1901-0039		DIODE-SWITCHING 50V 300NA 8NS	28480	1901-0039
A1A3CR9	1901-0039		DIODE-SWITCHING 50V 300NA 8NS	28480	1901-0039
A1A3CR10	1901-0039		DIODE-SWITCHING 50V 300NA 8NS	28480	1901-0039
A1A3CR11	1901-0039		DIODE-SWITCHING 50V 300NA 8NS	28480	1901-0039
A1A3CR12	1901-0039		DIODE-SWITCHING 50V 300NA 8NS	28480	1901-0039
A1A3CR13	1901-0081		DIODE-SWITCHING 50V 75NA 10NS	28480	1901-0081
A1A3CR14	1901-0081		DIODE-SWITCHING 50V 75NA 10NS	28480	1901-0081
A1A3L1	9140-0137	9	COIL-FXD MOLDED RF CHOKE 1MH 5%	24226	19/104
A1A3L2	9140-0137		COIL-FXD MOLDED RF CHOKE 1MH 5%	24226	19/104
A1A3L3	9140-0137		COIL-FXD MOLDED RF CHOKE 1MH 5%	24226	19/104
A1A3MP1	5040-6852	1	BOARD EXTRACTOR, ORANGE	28480	5040-6852
A1A3MP2	5000-9043	4	PIN:P.C. BOARD EXTRACTOR	28480	5000-9043
A1A3Q1	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A1A3Q2	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A1A3R1	0698-3136	1	RESISTOR 14.7K 1% .125W F TC=0+-100	16299	C4-1/8-TO-1472-F
A1A3R2	0757-0442	12	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1002-F
A1A3R3	0698-3157		RESISTOR 19.6K 1% .125W F TC=0+-100	16299	C4-1/8-TO-1962-F
A1A3R4	0698-3157		RESISTOR 19.6K 1% .125W F TC=0+-100	16299	C4-1/8-TO-1962-F
A1A3R5	0698-3157		RESISTOR 19.6K 1% .125W F TC=0+-100	16299	C4-1/8-TO-1962-F
A1A3R6	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1002-F
A1A3R7	2100-2522	2	RESISTOR-TRMR 10K 10% C SIDE-ADJ 1-TURN	30983	ET50X103
A1A3R8	0698-3157		RESISTOR 19.6K 1% .125W F TC=0+-100	16299	C4-1/8-TO-1962-F
A1A3R9	0698-0083		RESISTOR 1.96K 1% .125W F TC=0+-100	16299	C4-1/8-TO-1961-F
A1A3R10	0698-3162	2	RESISTOR 46.4K 1% .125W F TC=0+-100	16299	C4-1/8-TO-4642-F
A1A3R11	0698-3159	1	RESISTOR 26.1K 1% .125W F TC=0+-100	16299	C4-1/8-TO-2612-F
A1A3R12	0757-0460		RESISTOR 61.9K 1% .125W F TC=0+-100	16299	C4-1/8-TO-6192-F
A1A3R13	0698-3423		RESISTOR 46.4K 1% .125W F TC=0+-100	16299	C4-1/8-TO-4642-F
A1A3R14	0757-0467		RESISTOR 121K 1% .125W F TC=0+-100	16299	C4-1/8-TO-1213-F
A1A3R15	2100-2522		RESISTOR-TRMR 10K 10% C SIDE-ADJ 1-TURN 1-TURN	30983	ET50X103
A1A3R16	0698-3159		RESISTOR 26.1K 1% .125W F TC=0+-100	16299	C4-1/8-TO-2612-F
A1A3R17	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1001-F
A1A3R18	0698-3454		RESISTOR 215K 1% .125W F TC=0+-100	16299	C4-1/8-TO-2153-F
A1A3R19	0698-3155	2	RESISTOR 4.64K 1% .125W F TC=0+-100	16299	C4-1/8-TO-4641-F
A1A3R20	0698-3454		RESISTOR 215K 1% .125W F TC=0+-100	16299	C4-1/8-TO-2153-F
A1A3R21	0698-3155		RESISTOR 4.64K 1% .125W F TC=0+-100	16299	C4-1/8-TO-4641-F
A1A3R22	0757-0458		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-TO-5112-F
A1A3R23	0757-0416	3	RESISTOR 511 1% .125W F TC=+-100	24546	C4-1/8-TO-5114-F
A1A3R24	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1002-F
A1A3R25	0757-0458		RESISTOR 51.1K 1% .125W F TC=0+-100	14546	C4-1/8-TO-5112-F
A1A3R26	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1002-F
A1A3R27	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1002-F
A1A3U1	1820-0535	3	IC SN75 451BP DRIVER	01295	SN75451BP
A1A3U2	1820-0535		IC SN75 451BP DRIVER	01295	SN75451BP
A1A3U3	1820-0535		IC SN75 451BP DRIVER	01295	SN75451BP
A1A3U4	1820-1542	1	IC CD4049AY BUFFER	02735	CD4049AY
A1A3U5	1820-1545	1	IC CD4053AY MUXR	02735	CD4053AY
A1A3U6	1826-0261	2	IC AMPL	28480	1826-0261
A1A3U7	1826-0261		IC AMPL	28480	1826-0261
A1A3VR1	1902-0041	1	DIODE-ZNR 5.11V 5% DO-7PD=.4W TC=.009%	04713	SZ 10939-98
A1A3VR2	1902-3149	1	DIODE-ZNR 9.09V 5% DO-7PD=.4W TC=+.05%	04713	SZ 10939-170
A1A3VR3	1902-0041	1	DIODE-ZNR 5.11 5% DO-7PD=.4W TC=+-.009%	04713	SZ 10939-98

Table B2-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1A4	08505-60065	3	BOARD ASSEMBLY, 100 KHZ AMPLIFIER	28480	08505-60065
A1A4C1	0180-0197	17	CAPACITOR-FXD;2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A1A4C2	0160-0127	54	CAPACITOR-FXD 1.0UF	28480	0160-0127
A1A4C3	0180-0197		CAPACITOR-FXD; 2.2UF+-10% 35VDC TA	56289	
A1A4C4	0180-0197		CAPACITOR-FXD;2.2UF+-10%35VDC TA	56289	
A1A4C5	0160-2265	8	CAPACITOR-FXD 22PF+-5% 500WVDC CER	28480	0160-2265
A1A4C6	0160-4084		CAPACITOR-FXD;0.1UF+-10% 20VDC TA	56289	150D225X9020A2
A1A4C7	0160-0297		CAPACITOR-FXD .0012+-5% 100WVDC MICA	28480	0160-0945
A1A4C8	0121-0105		CAPACITOR-9-35+-5%100WVDC MICA	28480	0160-0945
A1A4C9	0160-0300	3	CAPACITOR-FXD .0027+-5%300WVDC MICA	28480	0160-2208
A1A4C10*	0140-0191	3	CAPACITOR-FXD 56PF +-5% 300WVDC MICA *FACTORY SELECTED PART	72136	DM15E560J0300WV1CP
A1A4C11	0160-0297		CAPACITOR-FXD; 0.1UF+-10% 20VDC TA	56289	150D225X9020A2
A1A4C12	0180-0197		CAPACITOR-FXD; 2.2UF +-10%20VDC TA	56289	150D225X9020A2
A1A4C13	0160-2265		CAPACITOR-FXD 22PF +-5% 500WVDC CER	28480	0160-2265
A1A4C14	0180-0197		CAPACITOR-FXD; 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A1A4C15	0160-0127		CAPACITOR-FXD; 1.0UF+-20% 25WVDCCER	28480	0160-0127
A1A4C16	0160-4084		CAPACITOR-FXD 7.1UF+-20% 50WVDC CER	28480	0160-4084
A1A4C17	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A1A4C18	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A1A4C19	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A1A4CR1	1901-0040	3	DIODE-SWITCHING 30V 50NA 2NS DO-35	28480	1901-0040
A1A4CR2	1901-0518	6	DIODE-SCHOTTKY	28480	1901-0518
A1A4CR3	1901-0518		DIODE-SCHOTTKY	28480	1901-0518
A1A4L1	9140-0137		COIL-FXD MOLDED RF CHOKE 1MH 5%	24226	19/104
A1A4L2	9140-0137		COIL-FXD MOLDED RF CHOKE 1MH 5%	24226	19/104
A1A4L3	9100-2572	6	COIL-FXD MOLDED RF CHOKE 820UH 10%	24226	16/823
A1A4L4	9100-2572		COIL-FXD MOLDED RF CHOKE 820UH 10%	24226	16/823
A1A4MP1	5040-6848	3	BOARD EXTRACTOR, YELLOW	28480	5040-6848
A1A4MP2	5000-9043		PIN:P.C. BOARD EXTRACTOR	28480	5000-9043
A1A4Q1	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A1A4Q2	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A1A4Q3	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A1A4Q4	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A1A4Q5	1853-0271	3	TRANSISTOR PNP 2N4403 SI TO-92 PD=310MW	04713	2N4403
A1A4R1	0757-0440	5	RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A1A4R2	0698-0032	6	RESISTOR 464 1% .125W F TC=0+-100	16299	C4-1/8-T0-4640-F
A1A4R3	0698-0034	9	RESISTOR 2.15K 1% .125W F TC=0+-100	16299	C4-1/8-T0-2151-F
A1A4R4	0698-0083		RESISTOR 1.96K 1% .125W F TC=0+-100	16299	C4-1/8-T0-1961-F
A1A4R5	2100-1775	3	RESISTOR-TRMR 5K 5% WW TOP-ADJ 1-TURN	08027	CT-100-4
A1A4R6	0757-0420	3	RESISTOR 750 1% .125W F TC=0+-100	24546	C4-1/8-T0-751-F
A1A4R7	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A1A4R8	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A1A4R9	0698-0085	3	RESISTOR 2.61K 1% .125W F TC=0+-100	16299	C4-1/8-T0-2611-F
A1A4R10	0757-0317	3	RESISTOR 1.33K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1331-F
A1A4R11	0698-0082		RESISTOR 464 1% .125W F TC=0+-100	16299	C4-1/8-T0-4640-F
A1A4R12	0757-0278	3	RESISTOR 1.78K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1781-F
A1A4R13	0698-4037	3	RESISTOR 46.4 1% .125W F TC=0+-100	16299	C4-1/8-T0-46R4-F
A1A4R14	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A1A4R15	0698-0034		RESISTOR 2.15K 1% .125W F TC=0+-100	16299	C4-1/8-T0-2151-F
A1A4R16	0698-0084		RESISTOR 2.15K 1% .125W F TC=0+-100	16299	C4-1/8-T0-2151-F
A1A4R17	0757-0200	3	RESISTOR 5.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5621-F
A1A4R18	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A1A4R19	0698-0083		RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A1A4R20	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A1A4R21	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A1A5	08505-60065		SAME AS A1A4, USE PREFIX A1A5		
A1A6	08505-60065		SAME AS A1A4, USE PREFIX A1A6		
A1A7	5086-7141	1	AMPL-DETECTOR LO.	28480	5086-7141
A1A8	5086-7142	1	DOWN CONVERTER	28480	5086-7142
A1A9	5086-7236	2	MIXER ASSEMBLY, C-BAND	28480	5086-7236
A1A10	5086-7140	1	SPLITTER/AMP	28480	5086-7140
A1A11	5086-7236		MIXER ASSEMBLY, C-BAND	28480	5086-7236
A1A12	5086-7139	1	AMPL DETECTOR RF	28480	5086-7139
A1A13	08505-60069	1	BOARD ASSEMBLY, CONNECTOR	28480	08505-60069
A1A13J1	1251-3421	2	CONNECTOR 24-PIN M O SERIES	28480	1251-3421
A1A13J2	1251-3421		CONNECTOR 24-PIN M O SERIES	28480	1251-3421
A1A13J3	1251-4008	1	CONNECTOR 8-PIN M POST TYPE	28480	1251-4008

Table B2-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1A13MP1	0380-0334	4	STANDOFF-RVT-ON .375LG 4-40THD .250D BRS	28480	0380-0334
A1A13MP2	0380-0334		STANDOFF-RVT-ON .375LG 4-40THD .250D BRS	28480	0380-0334
A1A13MP3	0380-0334		STANDOFF-RVT-ON .375LG 4-40THD .250D BRS	28480	0380-0334
A1A13MP4	0380-0334		STANDOFF-RVT-ON .375LG 4-40THD .250D BRS	28480	0380-0334
A1A13RT1	0837-0007	1	THERMISTOR NEG TC 10K DISC	83186	4102
A1A14	08505-60066	1	BOARD ASSEMBLY, MOTHER	28480	08505-60066
A1A14C1	0180-0116		CAPACITOR-FXD; 6.8UF+-10% 35VDC TA	56289	150D685X903582
A1A14C2	0180-0116		CAPACITOR-FXD; 6.8UF+-10% 35VDC TA	56289	150D685X903582
A1A14C3	0180-0116		CAPACITOR-FXD; 6.8UF+-10% 35VDC TA	56289	150D685X903582
A1A14C4	0180-0116		CAPACITOR-FXD; 6.8UF+-10% 35VDC TA	56289	150D685X903582
A1A14C5	0180-0116		CAPACITOR-FXD; 6.8UF+-10% 35VDC TA	56289	150D685X903582
A1A14C6	0180-0116		CAPACITOR-FXD; 6.8UF+-10% 35VDC TA	56289	150D685X903582
A1A14C7	0180-0116		CAPACITOR-FXD; 6.8UF+-10% 35VDC TA	56289	150D685X903582
A1A14C8	0180-0116		CAPACITOR-FXD; 6.8UF+-10% 35VDC TA	56289	150D685X903582
A1A14C9	0180-0116		CAPACITOR-FXD; 6.8UF+-10% 35VDC TA	56289	150D685X903582
A1A14C10	0180-0116		CAPACITOR-FXD; 6.8UF+-10% 35VDC TA	56289	150D685X903582
A1A14J1			PART OF MOTHER BOARD, NOT REPLACEABLE		
A1A14J2	1200-0508	2	SOCKET-IC 14-CONT DIP-SLDR-TERMS	06776	ICN-143-S3W
A1A14J3	1200-0508		SOCKET-IC 14-CONT DIP-SLDR-TERMS	06776	ICN-143-S3W
A1A14J4	1250-1255	3	CONNECTOR-RF SMB M PC	98291	51-051-0000
A1A14J5	1250-1255		CONNECTOR-RF SMB M PC	98291	51-051-0000
A1A14J6	1250-1255		CONNECTOR-RF SMB M PC	98291	51-051-0000
A1A14L1	9100-1630	8	COIL-FXD MOLDED RF CHOKE 51UH 5%	28480	9100-1630
A1A14L2	9100-1630		COIL-FXD MOLDED RF CHOKE 51UH 5%	28480	9100-1630
A1A14L3	9140-0210		COIL-FXD MOLDED RF CHOKE 100UH 5%	24226	15/103
A1A14L4	9140-0210		COIL-FXD MOLDED RF CHOKE 100UH 5%	24226	15/103
A1A14L5	9140-0210		COIL-FXD MOLDED RF CHOKE 100UH 5%	24226	15/103
A1A14L6	9140-0210		COIL-FXD MOLDED RF CHOKE 100UH 5%	24226	15/103
A1A14L7	9140-0210		COIL-FXD MOLDED RF CHOKE 100UH 5%	24226	15/103
A1A14L8	9140-0210		COIL-FXD MOLDED RF CHOKE 100UH 5%	24226	15/103
A1A14R1	0698-3398	2	RESISTOR 46.4 1% .5W F TC=0+-100	GM005	CEC, T-0
A1A14R2	0757-0799	2	RESISTOR 121 1% .5W F TC=0+-100	19701	MF7C-1/2-T0-121R-F
A1A14R3	0757-0799		RESISTOR 121 1% .5W F TC=0+-100	19701	MF7C-1/2-T0-121R-F
A1A14R4	0698-3398		RESISTOR 46.4 1% .5W F TC=0+-100	GM005	CEC, T-0
A1A14XA3	1251-2035	2	CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	71785	252-15-30-300
A1A14XA4	1251-0472	3	CONNECTOR-PC EDGE 6-CONT/ROW 2-ROWS	71785	252-06-30-300
A1A14XA5	1251-0472		CONNECTOR-PC EDGE 6-CONT/ROW 2-ROWS	71785	252-06-30-300
A1A14XA6	1251-0472		CONNECTOR-PC EDGE 6-CONT/ROW 2-ROWS	71785	252-06-30-300
A1A14XA13	1251-2035		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	71785	252-15-30-300
A1A15	08505-60080	1	OSCILLATOR ASSEMBLY, FIXED	28480	08505-60080
A1A15C1	0160-4082	21	CAPACITOR-FXD 1000PF +-20% 200WVDC CER	28480	0160-4082
A1A15C2	0160-4082		CAPACITOR-FXD 1000PF +-20% 200WVDC CER	28480	0160-4082
A1A15C3	0160-4082		CAPACITOR-FXD 1000PF +-20% 200WVDC CER	28480	0160-4082
A1A15C4	0160-4082		CAPACITOR-FXD 1000PF +-20% 200WVDC CER	28480	0160-4082
A1A15C5	0160-4082		CAPACITOR-FXD 1000PF +-20% 200WVDC CER	28480	0160-4082
A1A15C6	0160-4082		CAPACITOR-FXD 1000PF +-20% 200WVDC CER	28480	0160-4082
A1A15C7	0160-4082		CAPACITOR-FXD 1000PF +-20% 200WVDC CER	28480	0160-4082
A1A15C8	0160-4082		CAPACITOR-FXD 1000PF +-20% 200WVDC CER	28480	0160-4082
A1A15C9	0160-4082		CAPACITOR-FXD 1000PF +-20% 200WVDC CER	28480	0160-4082
A1A15C10	0160-4082		CAPACITOR-FXD 1000PF +-20% 200WVDC CER	28480	0160-4082
A1A15C11	0160-4082		CAPACITOR-FXD 1000PF +-20% 200WVDC CER	28480	0160-4082
A1A15C12	0160-4082		CAPACITOR-FXD 1000PF +-20% 200WVDC CER	28480	0160-4082
A1A15C13	0160-4082		CAPACITOR-FXD 1000PF +-20% 200WVDC CER	28480	0160-4082
A1A15C14	0160-4083	4	CAPACITOR-FXD 10PF +-10% 200WVDC CER	28480	0160-4083
A1A15C15	0160-4082		CAPACITOR-FXD 1000PF +-20% 200WVDC CER	28480	0160-4082
A1A15C16	0160-4083		CAPACITOR-FXD 10PF +-10% 200WVDC CER	28480	0160-4083
A1A15C17	0160-4082		CAPACITOR-FXD 1000PF +-20% 200WVDC CER	28480	0160-4082
A1A15C18	0160-4082		CAPACITOR-FXD 1000PF +-20% 200WVDC CER	28480	0160-4082
A1A15C19	0160-4082		CAPACITOR-FXD 1000PF +-20% 200WVDC CER	28480	0160-4082
A1A15C20	0160-4082		CAPACITOR-FXD 1000PF +-20% 200WVDC CER	28480	0160-4082
A1A15C21	0160-4082		CAPACITOR-FXD 1000PF +-20% 200WVDC CER	28480	0160-4082
A1A15C22	0160-4083		CAPACITOR-FXD 10PF +-10% 200WVDC CER	28480	0160-4083
A1A15C23	0160-4082		CAPACITOR-FXD 1000PF +-20% 200WVDC CER	28480	0160-4082
A1A15C24	0160-4083		CAPACITOR-FXD 10PF +-10% 200WVDC CER	28480	0160-4083
A1A15C25	0160-4082		CAPACITOR-FXD 1000PF +-20% 200WVDC CER	28480	0160-4082
A1A15E1	9170-0016	2	CORE-SHIELDING BEAD	02114	56-590-65A1/3B
A1A15E2	9170-0016		CORE-SHIELDING BEAD	02114	56-590-65A1/3B
A1A15J1	1250-0901	5	CONNECTOR-RF SMB M SGL HOLE FR	2K497	700166
A1A15J2	1250-0901		CONNECTOR-RF SMB M SGL HOLE FR	2K497	700166
A1A15J3	1250-0901		CONNECTOR-RF SMB M SGL HOLE FR	2K497	700166
A1A15J4	1250-0901		CONNECTOR-RF SMB M SGL HOLE FR	2K497	700166
A1A15J5	1250-0901		CONNECTOR-RF SMB M SGL HOLE FR	2K497	700166

Table B2-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1A15W1	08505-60073	1	HARNESS ASSEMBLY, BACK	28480	08505-60073
	1251-4003	1	CONNECTOR, SINGLE RUN	28480	1251-4003
	1251-3653	7	CONNECTOR CRIMP	00779	85969-6
	1400-0249	3	CABLE STRAP	06383	PLT1M-M-8
A1A15A1	08505-60063	1	BOARD ASSEMBLY, 9.9 MHZ OSC	28480	08505-60063
A1A15A1C1	0121-0445	3	CAPACITOR-V TRMR-CER 4.5/20PF 160V	00865	7S-TRIKO-16 4.5-20 PF, N750
A1A15A1C2	0160-2262	1	CAPACITOR-FXD 16PF +-5% 500WVDC CER	28480	0160-2262
A1A15A1C3	0160-3879	25	CAPACITOR-FXD .01UF +-20% 100WVDC CER	28480	0160-3879
A1A15A1C4	0160-3879		CAPACITOR-FXD .01UF +-20% 100WVDC CER	28480	0160-3879
A1A15A1C5	0160-2205	1	CAPACITOR-FXD 120PF +-5% 300WVDC MICA	28480	0160-2205
A1A15A1C6	0160-3879		CAPACITOR-FXD .01UF +-20% 100WVDC CER	28480	0160-3879
A1A15A1C7	0140-0199	1	CAPACITOR-FXD 240PF +-5% 300WVDC MICA	72136	DM15F241J0300WV1CR
A1A15A1C8	0160-3879		CAPACITOR-FXD .01UF +-20% 100WVDC CER	28480	0160-3879
A1A15A1C9	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A1A15A1C10	0160-3879		CAPACITOR-FXD .01UF +-20% 100WVDC CER	28480	0160-3879
A1A15A1C11	0160-3879		CAPACITOR-FXD .01UF +-20% 100WVDC CER	28480	0160-3879
A1A15A1C12	0160-3879		CAPACITOR-FXD .01UF +-20% 100WVDC CER	28480	0160-3879
A1A15A1C13	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A1A15A1C14	0160-0161	2	CAPACITOR-FXD .01UF +-10% 200WVDC POLYE	56289	292P10392
A1A15A1C15	0160-0127	6	CAPACITOR-FXD 1UF +-20% 25WVDC CER	28480	0160-0127
A1A15A1C16	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A1A15A1C17	0160-3879		CAPACITOR-FXD .01UF +-20% 100WVDC CER	28480	0160-3879
A1A15A1C18	0160-3879		CAPACITOR-FXD .01UF +-20% 100WVDC CER	28480	0160-3879
A1A15A1C19	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A1A15A1C20	0160-3878	16	CAPACITOR-FXD 1000PF +-20% 100WVDC CER	28480	0160-3878
A1A15A1C21	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A1A15A1C22	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A1A15A1C23	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A1A15A1C24	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A1A15A1C25	0180-0229	2	CAPACITOR-FXD; 33UF+-10% 10VDC TA-SOLID	56289	150D336X9010B2
A1A15A1C26	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A1A15A1C27	0180-0197		CAPACITOR-FXD; 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A1A15A1C28	0160-0127		CAPACITOR-FXD 1UF +-20% 25WVDC CER	28480	0160-0127
A1A15A1C29	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A1A15A1CR1	1901-0050	5	DIODE-SWITCHING 80V 200NA 2NS DO-7	28480	1901-0050
A1A15A1CR2	1901-0050		DIODE-SWITCHING 80V 200NA 2NS DO-7	28480	1901-0050
A1A15A1CR3	1901-0050		DIODE-SWITCHING 80V 200NA 2NS DO-7	28480	1901-0050
A1A15A1L1	9100-1641	12	COIL-FXD MOLDED RF CHOKE 240UH 5%	24226	15/243
A1A15A1L2	9140-0144	2	COIL-FXD MOLDED RF CHOKE 4.7UH 10%	24226	10/471
A1A15A1L3	9100-1641		COIL-FXD MOLDED RF CHOKE 240UH 5%	24226	15/243
A1A15A1L4	9140-0096	2	COIL-FXD MOLDED RF CHOKE 1UH 10%	24226	15/101
A1A15A1L5	9100-1641		COIL-FXD MOLDED RF CHOKE 240UH 5%	24226	15/243
A1A15A1Q1	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A1A15A1Q2	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A1A15A1Q3	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A1A15A1Q4	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A1A15A1Q5	1854-0019	4	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A1A15A1Q6	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A1A15A1Q7	1854-0019		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A1A15A1Q8	1855-0230	1	TRANSISTOR, MOSFET DUAL GATE	28480	1855-0230
A1A15A1R1	0757-0465	1	RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A1A15A1R2	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A1A15A1R3	0757-0428	5	RESISTOR 1.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1621-F
A1A15A1R4	0757-0279	3	RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A1A15A1R5	0698-3439	1	RESISTOR 178 1% .125W F TC=0+-100	16299	C4-1/8-T0-178R-F
A1A15A1R6	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A1A15A1R7	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A1A15A1R8	0757-0290	8	RESISTOR 6.19K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-6191-F
A1A15A1R9	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2152-F
A1A15A1R10	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2152-F
A1A15A1R11	2100-2216	2	RESISTOR-TRMR 5K 10% C TOP-ADJ 1-TURN	30983	ET50W502
A1A15A1R12	0757-0419	1	RESISTOR 681 1% .125W F TC=0+-100	24546	C4-1/8-T0-681R-F
A1A15A1R13	0757-0123	2	RESISTOR 34.8K 1% .125W F TC=0+-100	24546	C5-1/4-T0-3482-F
A1A15A1R14	0757-0289	2	RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A1A15A1R15	0757-0123		RESISTOR 34.8K 1% .125W F TC=0+-100	24546	C5-1/4-T0-3482-F
A1A15A1R16	0757-0289		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A1A15A1R17	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A1A15A1R18	0757-0440		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A1A15A1R19	0757-0401	1	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A1A15A1R20	0698-3442	3	RESISTOR 237 1% .125W F TC=0+-100	16299	C4-1/8-T0-237R-F
A1A15A1R21	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A1A15A1R22	0698-3151	2	RESISTOR 2.87K 1% .125W F TC=0+-100	16299	C4-1/8-T0-2871-F
A1A15A1R23	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A1A15A1R24	0757-0441	4	RESISTOR 8.25K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8251-F
A1A15A1R25	2100-1986	2	RESISTOR-TRMR 1K 10% C TOP-ADJ 1-TURN	30983	ET50W102

Table B2-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1A15A1R26	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A1A15A1R27	0757-0441		RESISTOR 8.25K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8251-F
A1A15A1R28	2100-2061	3	RESISTOR-TRMR 200 10% C TOP-ADJ 1-TURN	30983	ET50W201
A1A15A1R29	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A1A15A1R30	0757-0438	2	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A1A15A1R31	0757-0428		RESISTOR 1.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1621-F
A1A15A1R32	2100-2061		RESISTOR-TRMR 200 10% C TOP-ADJ 1-TURN	30983	ET50W201
A1A15A1U1	1820-0370	2	IC:TTL QUAD 2-INPT NAND GATE	01295	SN74H00N
A1A15A1U2	1820-0693	2	IC SN74S 74 N FLIP-FLOP	01295	SN74S74N
A1A15A1U3	1820-0282	2	IC SN74 86 N GATE	01295	SN7486N
A1A15A1Y1	0410-0593	1	CRYSTAL, QUARTZ 9.9 MHZ	28480	0410-0593
A1A15A2	08505-60064	1	BOARD ASSEMBLY, 10 MHZ PHASE LOCK	28480	08505-60064
A1A15A2C1	0160-3879		CAPACITOR-FXD .01UF +-20% 100WVDC CER	28480	0160-3879
A1A15A2C2	0160-3879		CAPACITOR-FXD .01UF +-20% 100WVDC CER	28480	0160-3879
A1A15A2C3	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A1A15A2C4	0160-3879		CAPACITOR-FXD .01UF +-20% 100WVDC CER	28480	0160-3879
A1A15A2C5	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A1A15A2C6	0160-0161		CAPACITOR-FXD .01UF +-10% 200WVDC POLYE	56289	292P10392
A1A15A2C7	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A1A15A2C8	0160-0127		CAPACITOR-FXD 1UF +-20% 25WVDC CER	28480	0160-0127
A1A15A2C9	0160-3879		CAPACITOR-FXD .01UF +-20% 100WVDC CER	28480	0160-3879
A1A15A2C10	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A1A15A2C11	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A1A15A2C12	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A1A15A2C13	0180-0229		CAPACITOR-FXD; 33UF+-10% 10VDC TA-SOLID	56289	150D336X901082
A1A15A2C14	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A1A15A2C15	0160-0127		CAPACITOR-FXD 1UF +-20% 25WVDC CER	28480	0160-0127
A1A15A2C16	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A1A15A2C17	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A1A15A2C18	0160-3878		CAPACITOR-FXD 1000PF +-20% 100WVDC CER	28480	0160-3878
A1A15A2C19	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A1A15A2C20	0180-0197		CAPACITOR-FXD; 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A1A15A2CR1	1901-0050		DIODE-SWITCHING 80V 200NA 2NS DO-7	28480	1901-0050
A1A15A2CR2	1901-0050		DIODE-SWITCHING 80V 200NA 2NS DO-7	28480	1901-0050
A1A15A2L1	9100-1641		COIL-FXD MOLDED RF CHOKE 240UH 5%	24226	15/243
A1A15A2L2	9100-1641		COIL-FXD MOLDED RF CHOKE 240UH 5%	24226	15/243
A1A15A2L3	9140-0096		COIL-FXD MOLDED RF CHOKE 1UH 10%	24226	15/101
A1A15A2L4	9100-1641		COIL-FXD MOLDED RF CHOKE 240UH 5%	24226	15/243
A1A15A2L5	9140-0144		COIL-FXD MOLDED RF CHOKE 4.7UH 10%	24226	10/471
A1A15A2Q1	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A1A15A2Q2	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A1A15A2Q3	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A1A15A2Q4	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A1A15A2Q5	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A1A15A2R1	0757-0428		RESISTOR 1.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1621-F
A1A15A2R2	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A1A15A2R3	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A1A15A2R4	0757-0290		RESISTOR 6.19K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-6191-F
A1A15A2R5	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2152-F
A1A15A2R6	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2152-F
A1A15A2R7	2100-2216		RESISTOR-TRMR 5K 10% C TOP-ADJ 1-TURN	30983	ET50W502
A1A15A2R8	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A1A15A2R9	0698-3151		RESISTOR 2.87K 1% .125W F TC=0+-100	16299	C4-1/8-T0-2871-F
A1A15A2R10	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A1A15A2R11	0757-0440		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A1A15A2R12	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A1A15A2R13	2100-2061		RESISTOR-TRMR 200 10% C TOP-ADJ 1-TURN	30983	ET50W201
A1A15A2R14	0757-0441		RESISTOR 8.25K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8251-F
A1A15A2R15	2100-1986		RESISTOR-TRMR 1K 10% C TOP-ADJ 1-TURN	30983	ET50W102
A1A15A2R16	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A1A15A2R17	0757-0441		RESISTOR 8.25K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8251-F
A1A15A2R18	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A1A15A2R19	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A1A15A2U1	1820-0370		IC:TTL QUAD 2-INPT NAND GATE	01295	SN74H00N
A1A15A2U2	1820-0693		IC SN74S 74 N FLIP-FLOP	01295	SN74S74N
A1A15A2U3	1820-0282		IC SN74 86 N GATE	01295	SN7486N
A1A15A3	08505-60061	2	BOARD ASSEMBLY, SAMPLER/DRIVER	28480	08505-60061
A1A15A3C1	0160-2265		CAPACITOR-FXD 22PF +-5% 500WVDC CER	28480	0160-2265
A1A15A3C2	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A1A15A3C3	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A1A15A3C4	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A1A15A3C5	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084

Table B2-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1A15A3C6	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A1A15A3C7	0160-0127		CAPACITOR-FXD 1UF +-20% 25WVDC CER	28480	0160-0127
A1A15A3C8	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A1A15A3C9	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A1A15A3C10	0160-3878		CAPACITOR-FXD 1000PF +-20% 100WVDC CER	28480	0160-3878
A1A15A3C11	0160-3878		CAPACITOR-FXD 1000PF +-20% 100WVDC CER	28480	0160-3878
A1A15A3C12	0160-3879		CAPACITOR-FXD .01UF +-20% 100WVDC CER	28480	0160-3879
A1A15A3C13	0160-2261	4	CAPACITOR-FXD 15PF +-5% 500WVDC CER	28480	0160-2261
A1A15A3C14	0160-3878		CAPACITOR-FXD 1000PF +-20% 100WVDC CER	28480	0160-3878
A1A15A3C15	0160-2261		CAPACITOR-FXD 15PF +-5% 500WVDC CER	28480	0160-2261
A1A15A3C16	0160-3878		CAPACITOR-FXD 1000PF +-20% 100WVDC CER	28480	0160-3878
A1A15A3C17	0160-3879		CAPACITOR-FXD .01UF +-20% 100WVDC CER	28480	0160-3879
A1A15A3C18	0121-0445		CAPACITOR-V TRMR-CER 4.5/20PF 160V	0086S	7S-TRIKO-16 4.5-20 PF, N750
A1A15A3C19	0160-3878		CAPACITOR-FXD 1000PF +-20% 100WVDC CER	28480	0160-3878
A1A15A3C20	0160-3879		CAPACITOR-FXD .01UF +-20% 100WVDC CER	28480	0160-3879
A1A15A3C21	0160-3879		CAPACITOR-FXD .01UF +-20% 100WVDC CER	28480	0160-3879
A1A15A3C22	0160-2207	4	CAPACITOR-FXD 300PF +-5% 300WVDC MICA	28480	0160-2207
A1A15A3C23	0160-2207		CAPACITOR-FXD 300PF +-5% 300WVDC MICA	28480	0160-2207
A1A15A3C24	0121-0046	2	CAPACITOR-V TRMR-CER 9/35PF 200V PC-MTG	0086S	304322 9/35PF N650
A1A15A3C25	0160-3878		CAPACITOR-FXD 1000PF +-20% 100WVDC CER	28480	0160-3878
A1A15A3C26	0160-2150	2	CAPACITOR-FXD 33PF +-5% 300WVDC MICA	28480	0160-2150
A1A15A3C27	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A1A15A3C28	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A1A15A3C29	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A1A15A3C30	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A1A15A3C31	0160-3878		CAPACITOR-FXD 1000PF +-20% 100WVDC CER	28480	0160-3878
A1A15A3C32	0160-2200	2	CAPACITOR-FXD 43PF +-5% 300WVDC MICA	28480	0160-2200
A1A15A3C33	0160-3879		CAPACITOR-FXD .01UF +-20% 100WVDC CER	28480	0160-3879
A1A15A3C34	0160-3879		CAPACITOR-FXD .01UF +-20% 100WVDC CER	28480	0160-3879
A1A15A3E1	9170-0029	2	CORE-SHIELDING BEAD	02114	56-590-65A2/4A
A1A15A3L1	9100-1621	2	COIL-FXD MOLDED RF CHOKE 18UH 10%	24226	15/182
A1A15A3L2	9100-2249	2	COIL-FXD MOLDED RF CHOKE .15UH 10%	24226	10/150
A1A15A3L3	9100-1641		COIL-FXD MOLDED RF CHOKE 240UH 5%	24226	15/243
A1A15A3L4	9140-0238	2	COIL-FXD MOLDED RF CHOKE 82UH 5%	24226	15/822
A1A15A3L5	9100-1641		COIL-FXD MOLDED RF CHOKE 240UH 5%	24226	15/243
A1A15A3L6	9100-1641		COIL-FXD MOLDED RF CHOKE 240UH 5%	24226	15/243
A1A15A3L7	9100-1619	2	COIL-FXD MOLDED RF CHOKE 6.8UH 10%	24226	15/681
A1A15A3L8	9140-0158	4	COIL-FXD MOLDED RF CHOKE 1UH 10%	24226	10/101
A1A15A3L9	9100-0368	2	COIL-FXD MOLDED RF CHOKE .33UH 10%	24226	10/330
A1A15A3L10	9100-2891	4	COIL-FXD MOLDED RF CHOKE .05UH 10%	28480	9100-2891
A1A15A3L11	9100-2256	2	COIL-FXD MOLDED RF CHOKE .56UH 10%	24226	10/560
A1A15A3L12	9100-2251	2	COIL-FXD MOLDED RF CHOKE .22UH 10%	24226	10/220
A1A15A3L13	9140-0158		COIL-FXD MOLDED RF CHOKE 1UH 10%	24226	10/101
A1A15A3L14	9100-2891		COIL-FXD MOLDED RF CHOKE .05UH 10%	28480	9100-2891
A1A15A3Q1	1854-0247	4	TRANSISTOR NPN SI TO-39 PD=1W FT=800MHZ	28480	1854-0247
	0340-0453	4	INSULATOR-XSTR TO-5 .21-ID .038-THK	13103	7717-94-N
A1A15A3Q2	1853-0034	2	TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0034
A1A15A3Q3	1855-0081	2	TRANSISTOR J-FET 2N5245 N-CHAN D-MODE SI	01295	2N5245
A1A15A3Q4	1854-0247		TRANSISTOR NPN SI TO-39 PD=1W FT=800MHZ	28480	1854-0247
	0340-0453		INSULATOR-XSTR TO-5 .21-ID .038-THK	13103	7717-94-N
A1A15A3Q5	1854-0345	2	TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A1A15A3Q6	1854-0019		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A1A15A3R1	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A1A15A3R2	0698-3445	2	RESISTOR 348 1% .125W F TC=0+-100	16299	C4-1/8-T0-348R-F
A1A15A3R3	0698-3443	2	RESISTOR 287 1% .125W F TC=0+-100	16299	C4-1/8-T0-287R-F
A1A15A3R4	0698-0083		RESISTOR 1.96K 1% .125W F TC=0+-100	16299	C4-1/8-T0-1961-F
A1A15A3R5	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A1A15A3R6	0757-0274	2	RESISTOR 1.21K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1213-F
A1A15A3R7	0757-0290		RESISTOR 6.19K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-6191-F
A1A15A3R8	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A1A15A3R9	0698-3150	2	RESISTOR 2.37K 1% .125W F TC=0+-100	16299	C4-1/8-T0-2371-F
A1A15A3R10	0698-3132	2	RESISTOR 261 1% .125W F TC=0+-100	16299	C4-1/8-T0-2610-F
A1A15A3R11	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A1A15A3R12	0757-0424	2	RESISTOR 1.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1101-F
A1A15A3R13	0757-0418	2	RESISTOR 619 1% .125W F TC=0+-100	24546	C4-1/8-T0-619R-F
A1A15A3R14	0698-3442		RESISTOR 237 1% .125W F TC=0+-100	16299	C4-1/8-T0-237R-F
A1A15A3R15	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A1A15A3R16	0757-0290		RESISTOR 6.19K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-6191-F
A1A15A3R17	0757-0290		RESISTOR 6.19K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-6191-F
A1A15A3R18	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A1A15A3R19	0757-0428		RESISTOR 1.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1621-F
A1A15A3RT1	0839-0011	2	THERMISTOR NEG TC 100 OHM DISC	83186	21E23

Table B2-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1A15A3J1	1820-0474	2	IC CA3012 AMPL	02735	CA3012
A1A15A3U2	1820-0306	2	IC CA3028A AMPL	02735	CA3028A
A1A15A4			SAME AS A1A15A3, USE PREFIX A1A15A4		
A1A15A5	5086-7143	2	OSCILLATOR SAMPLER	28480	5086-7143
A1A15A6	5086-7143		OSCILLATOR SAMPLER	28480	5086-7143

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
			A1 MISCELLANEOUS MECHANICAL PARTS LIST		
1	08505-20070	1	WINDOW, FRONT PANEL	28480	08505-20070
2	5040-6937	2	WINDOW CLIP	28480	5040-6937
3	08505-00025	1	FRONT PANEL	28480	08505-00025
4	2190-0016	4	WASHER-LK INTL T NO.-3/8 .377-IN-ID	78189	1920-02
5	2950-0043	4	NUT-HEX-DBL-CHAM 3/8-32-THD .094-THK	73743	2X 28200
6	3050-0383	4	WASHER-FL MTLC NO.-5/8 .688-IN-ID	28480	3050-0383
7	2190-0120	4	WASHER-LK INTL T NO.-5/8 .64-IN-ID	78189	1928-02
8	2950-0079	4	NUT-HEX-DBL-CHAM 5/8-24-THD .125-THK	76854	169997-002
9	0370-1099	2	KNOB-BASE-PTR .5 IN JGK SGI-DECAL	28480	0370-1099
10	0360-0355	1	TERMINAL-LUG-SLDR 5 SCR .136/.063 ID	79963	541
11	2200-0103	37	SCREW-MACH 4-40 .25-IN-LG PAN-HD-POZI	28480	2200-0103
12	08505-00023	1	COVER, TOP OSC. HOUSING	28480	08505-00023
13	08505-00021	1	COVER, IF AMP	28480	08505-00021
14	08505-00011	1	PANEL, SUB, FRONT	28480	08505-00011
15	2360-0113	14	SCREW-MACH 6-32 .25-IN-LG PAN-HD-POZI	28480	2360-0113
16	2200-0129	2	SCREW-MACH 4-40 2-IN-LG PAN-HD-POZI	28480	2200-0129
17	0520-0173	30	SCREW-MACH 2-56 .188-IN-LG PAN-HD-POZI	28480	0520-0173
18	08505-20159	3	AMP SHIELD	28480	08505-20159
19	08505-00018	1	BRACKET, ATTENUATOR	28480	08505-00018
20	08505-00026	1	COVER, BOTTOM, OSC. HOUSING, 4.209 GHZ	28480	08505-00026
21	08505-00064	1	HEAT SINK, SPLTR	28480	08505-00064
22	08505-00063	2	HEAT SINK, AMPL.	28480	08505-00063
23	08505-00065	1	HEAT SINK, DOWN CONVERTER	28480	08505-00065
24	08505-00017	1	FIXED OSC. SUPPORT	28480	08505-00017
25	08505-20071	2	HOUSING, OSCILLATOR	28480	08505-20071
26	08505-00024	1	COVER, BOTTOM, OSC. HOUSING, 4.21 GHZ	28480	08505-00024
27	2200-0112	4	SCREW-MACH 4-40 .5-IN-LG 82 DEG	28480	2200-0112
28	2200-0113	20	SCREW-MACH 4-40 .625-IN-LG PAN-HD-POZI	28480	2200-0113
29	2200-0111	4	SCREW-MACH 4-40 .5-IN-LG PAN-HD-POZI	28480	2200-0111
30	2200-0109	8	SCREW-MACH 4-40 .438-IN-LG PAN-HD-POZI	28480	2200-0109
31	08505-00015	1	DECK, CHASSIS	28480	08505-00015
32	08505-20114	3	ISOLATOR	28480	08505-20114
33	08505-00012	1	BRACKET, FRONT SUPPORT	28480	08505-00012
34	2360-0192	16	SCREW-MACH 6-32 .25-IN-LG 100 DEG	28480	2360-0192
35	08505-00016	1	PANEL, REAR	28480	08505-00016
36	7122-0097	1	SERIAL NUMBER NAMEPLATE (NOT SHOWN)	28480	7122-0097
37	2200-0165	8	SCREW-MACH 4-40 .25-IN-LG 82 DEG	28480	2200-0165
38	08505-00014	1	GUSSET, RIGHT SIDE	28480	08505-00014
39	08505-00013	1	GUSSET, LEFT SIDE	28480	08505-00013

Figure B2-1. A1 Source/Converter Mechanical Parts Location

Fig. B2-1(a)
Sht 1 of 3

A1 FRONT VIEW

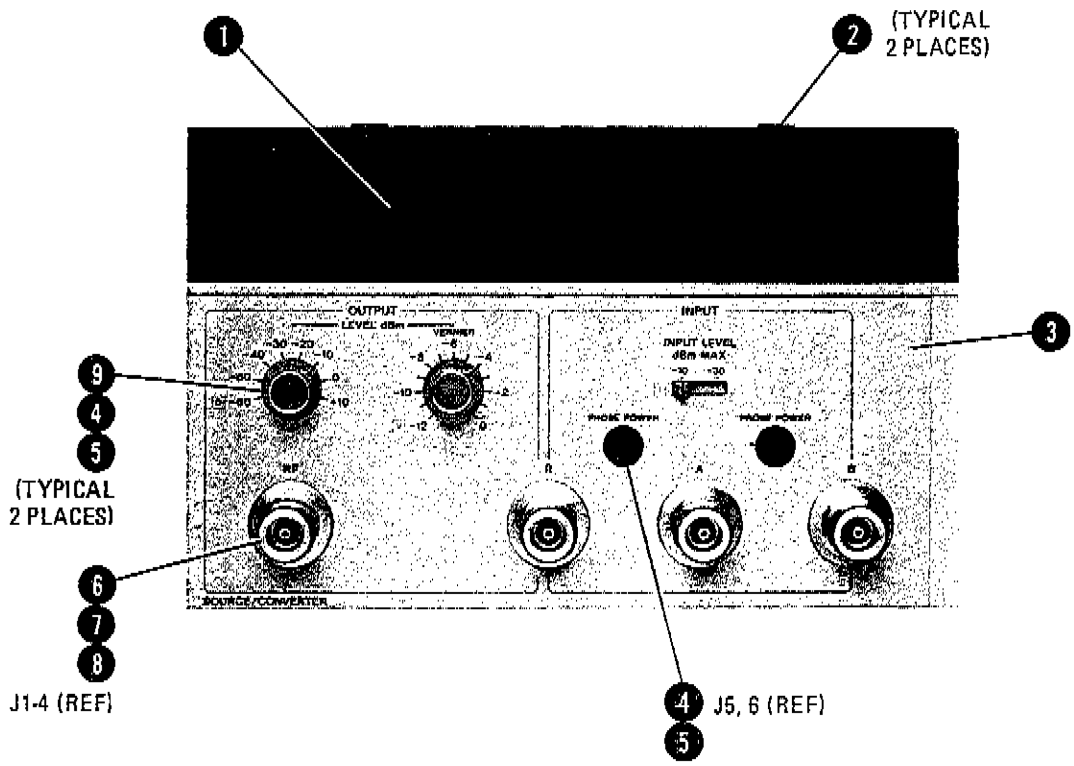


Fig. B2-1(a)
Sht 2 of 3

A1 TOP VIEW

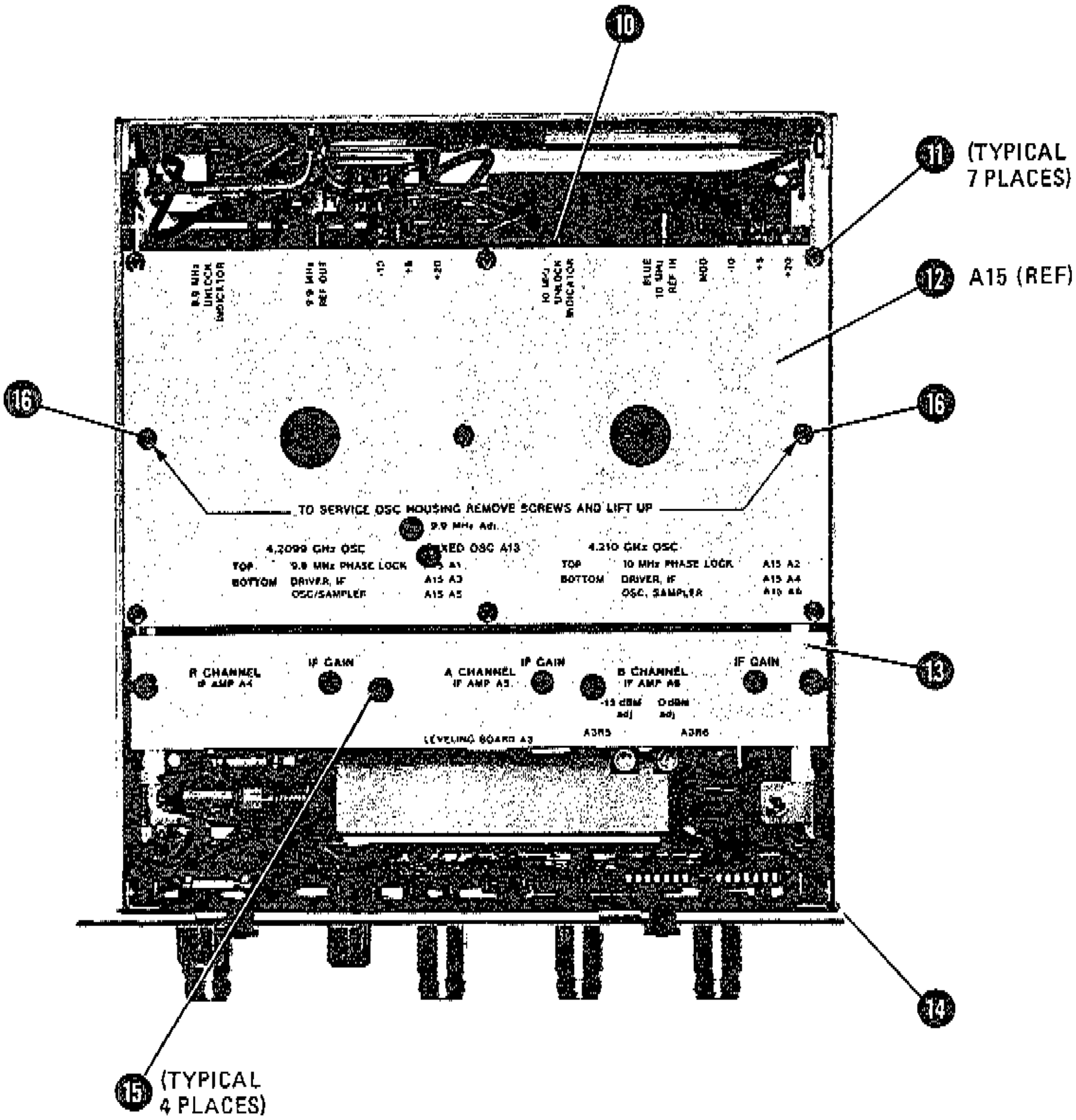


Fig. B2-1(a)
Sht 3 of 3

A1 TOP VIEW WITH COVERS REMOVED

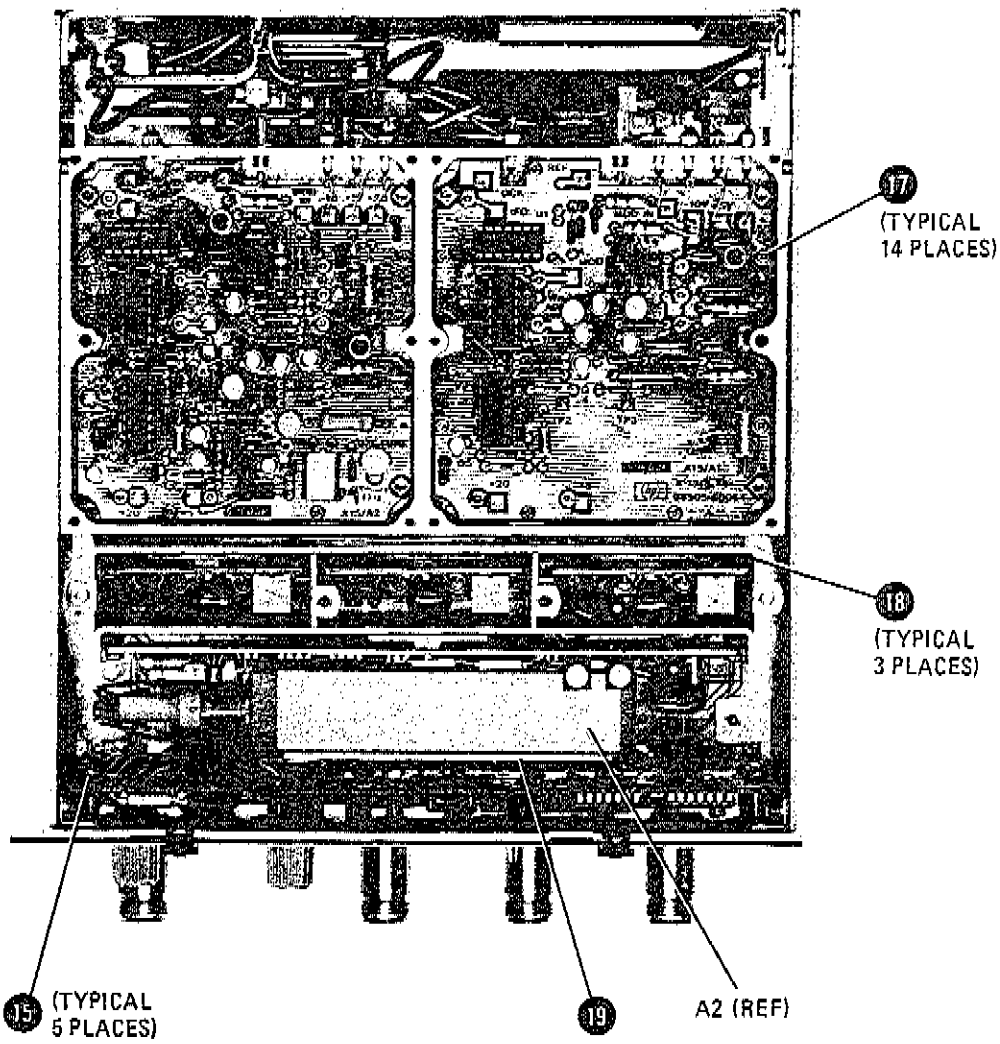


Figure B2-1. A1 Source/Converter Mechanical Parts Location (2 of 4)

Fig. B2-1(b)
Sht 1 of 4

A1 TOP VIEW WITH A1A15 FOLDED OUT

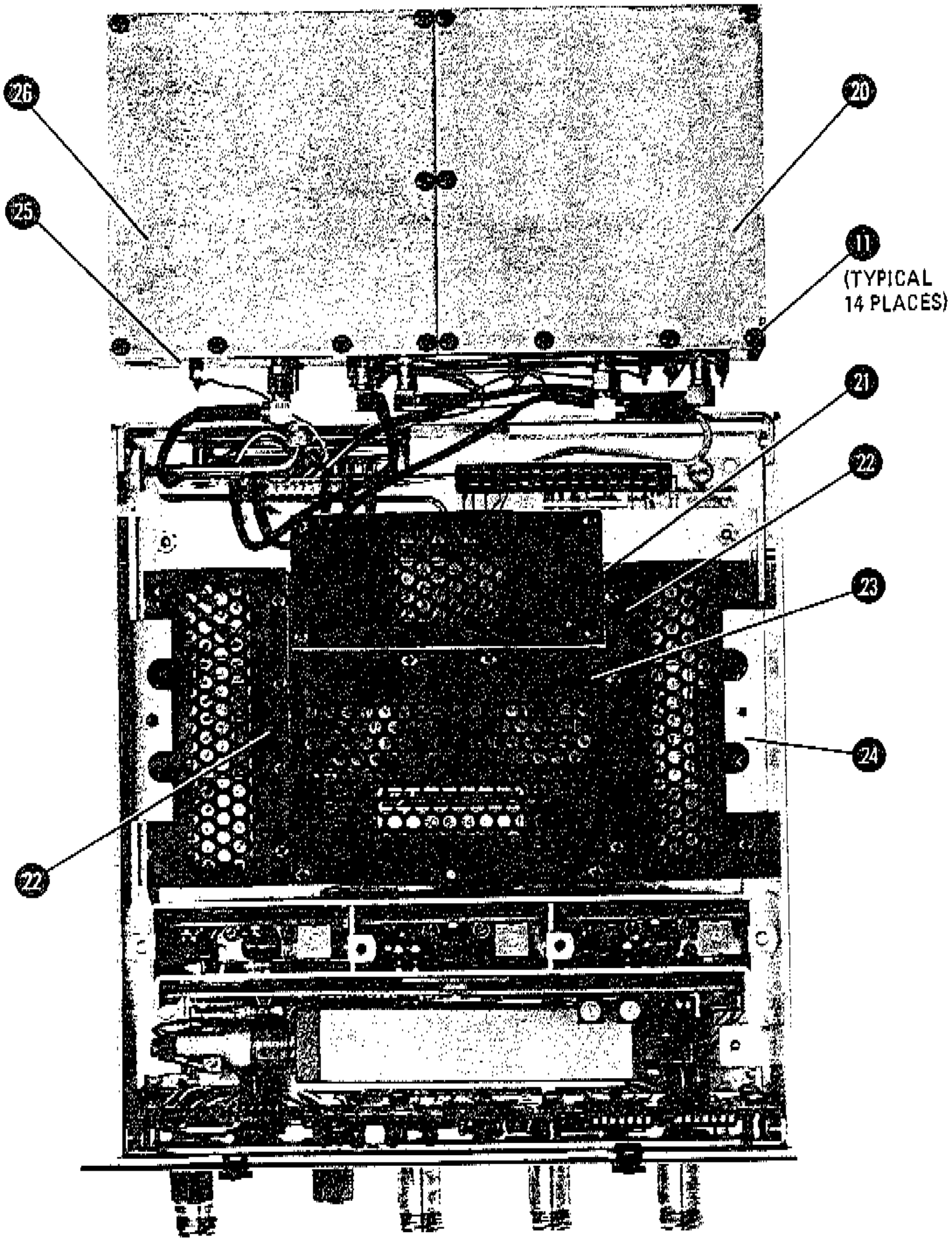


Fig. B2-1(b)
Sht 2 of 4

A1 TOP VIEW WITH A1A15
FOLDED OUT AND COVERS REMOVED

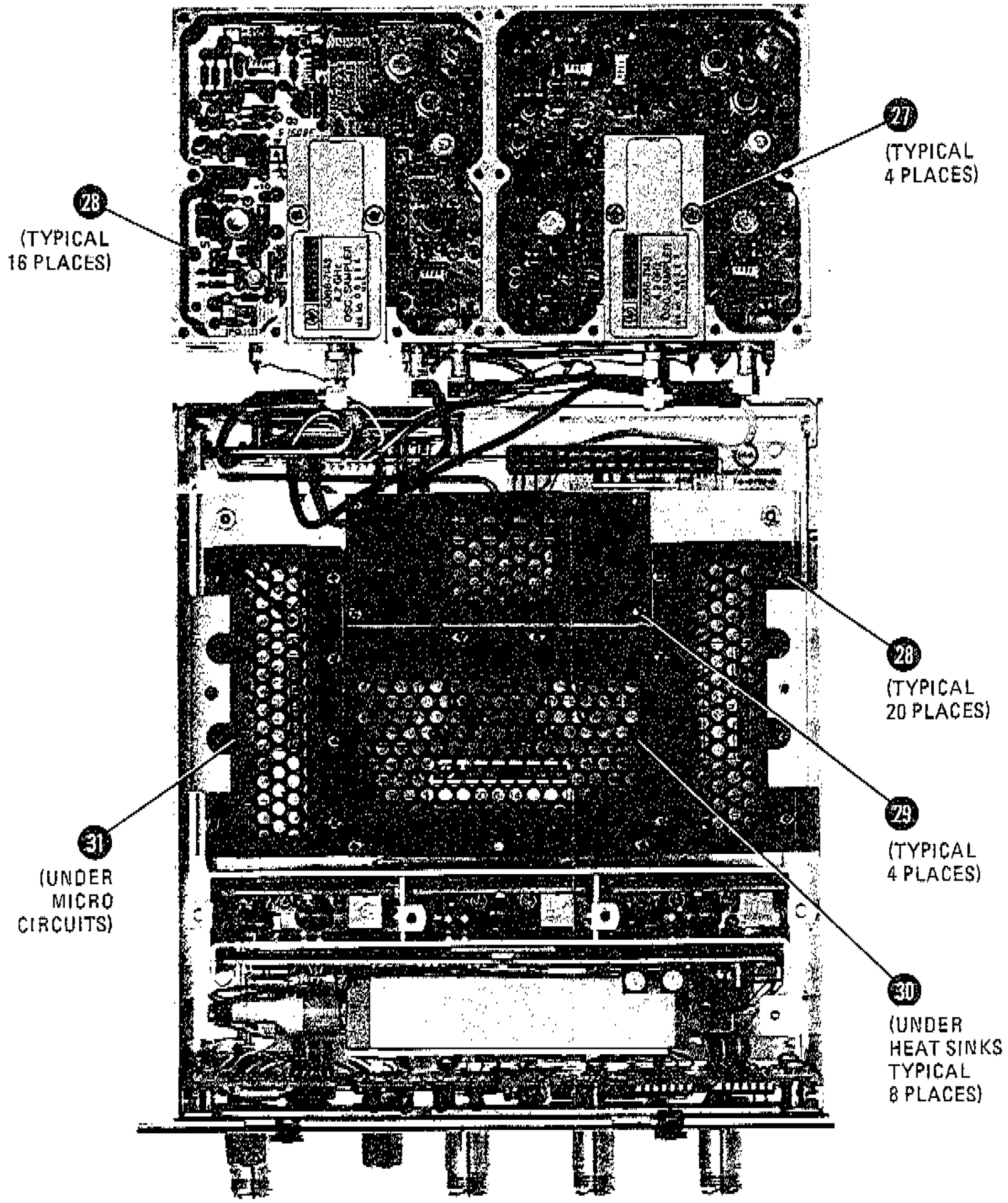


Fig. B2-1(b)
Sht 3 of 4

A1 BOTTOM VIEW

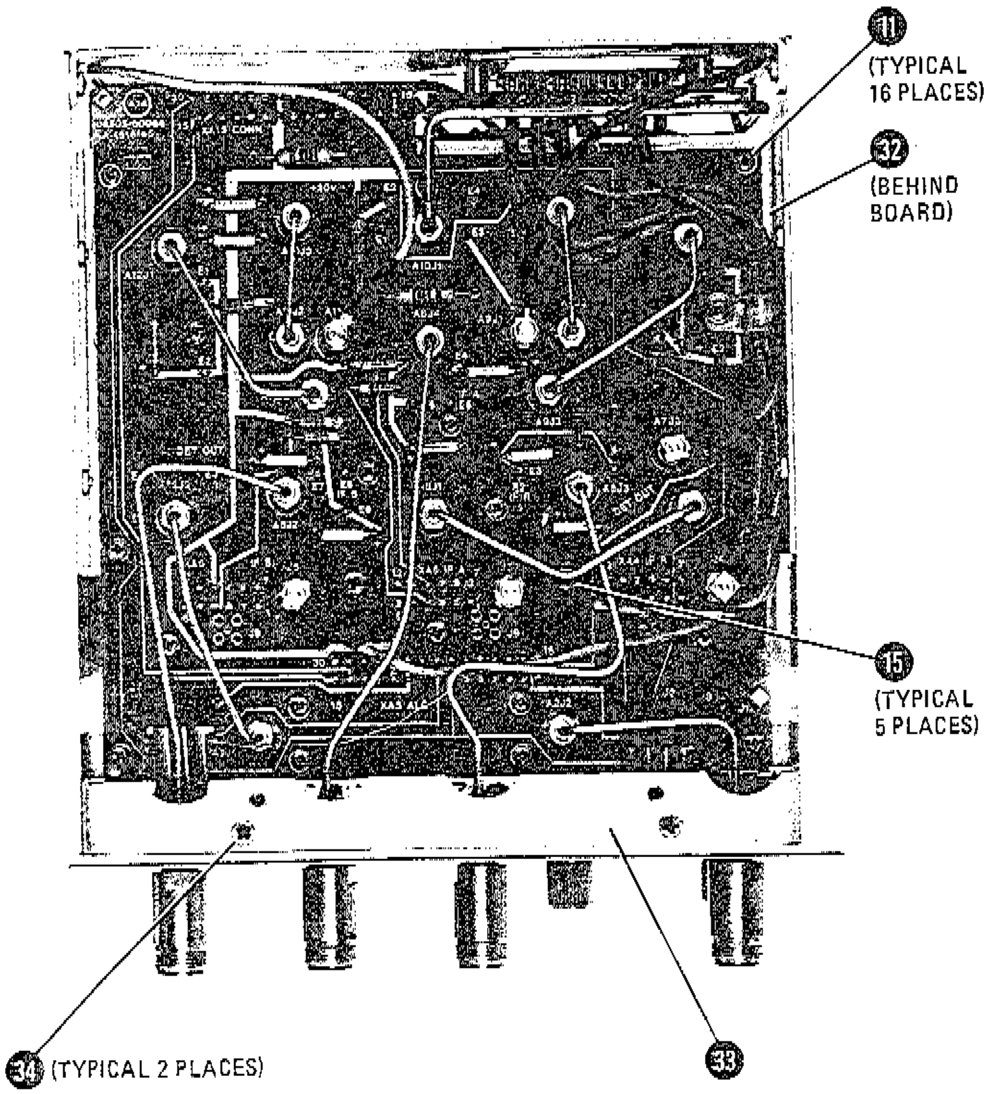
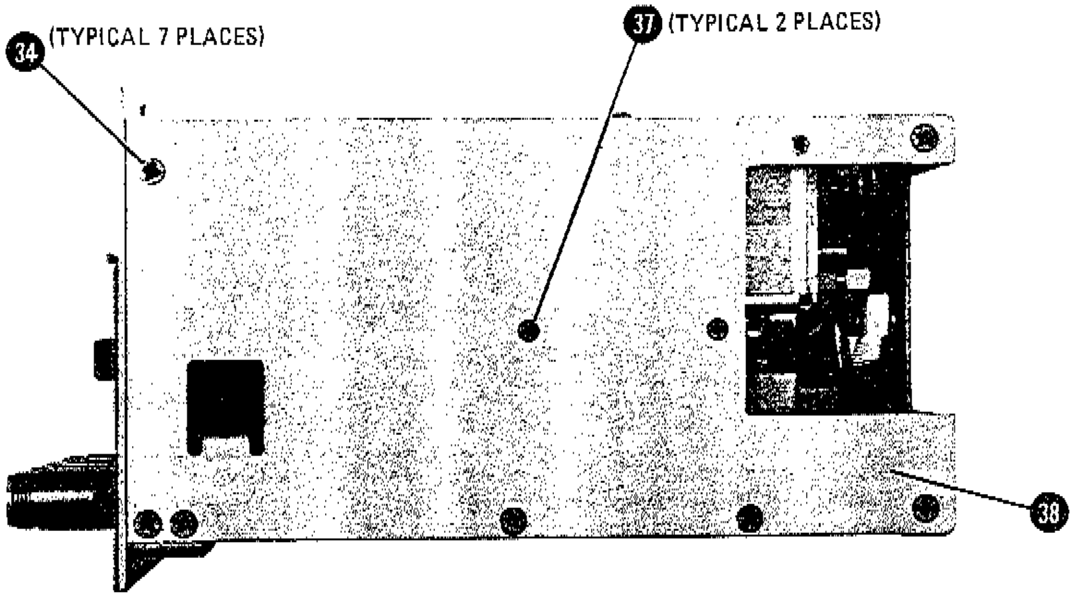


Fig B2-1(b)
Sht 4 of 4

A1 RIGHT SIDE



A1 LEFT SIDE

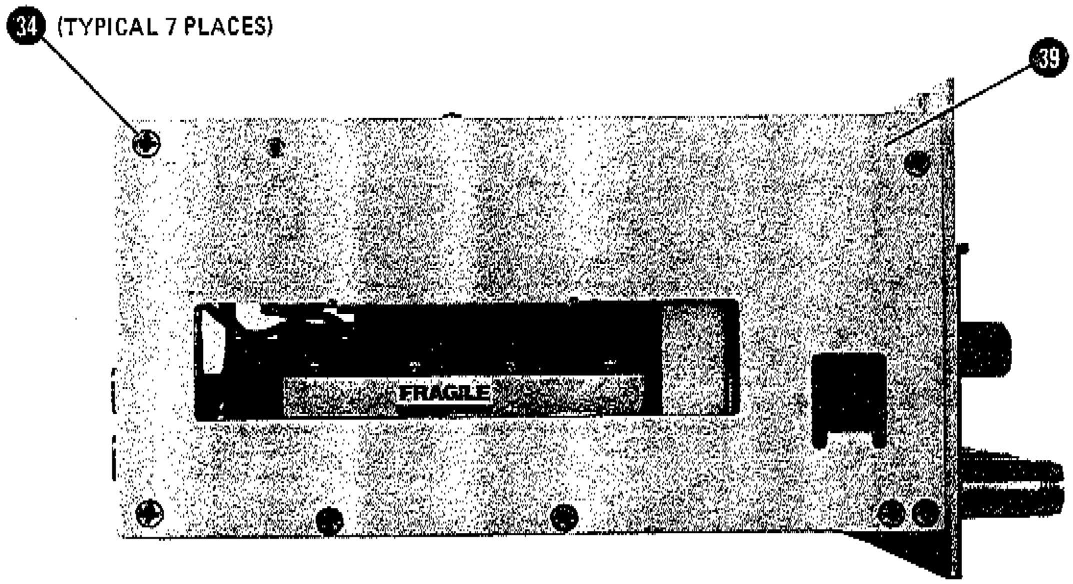


Figure B2-1. A1 Source/Converter Mechanical Parts Location (3 of 4)

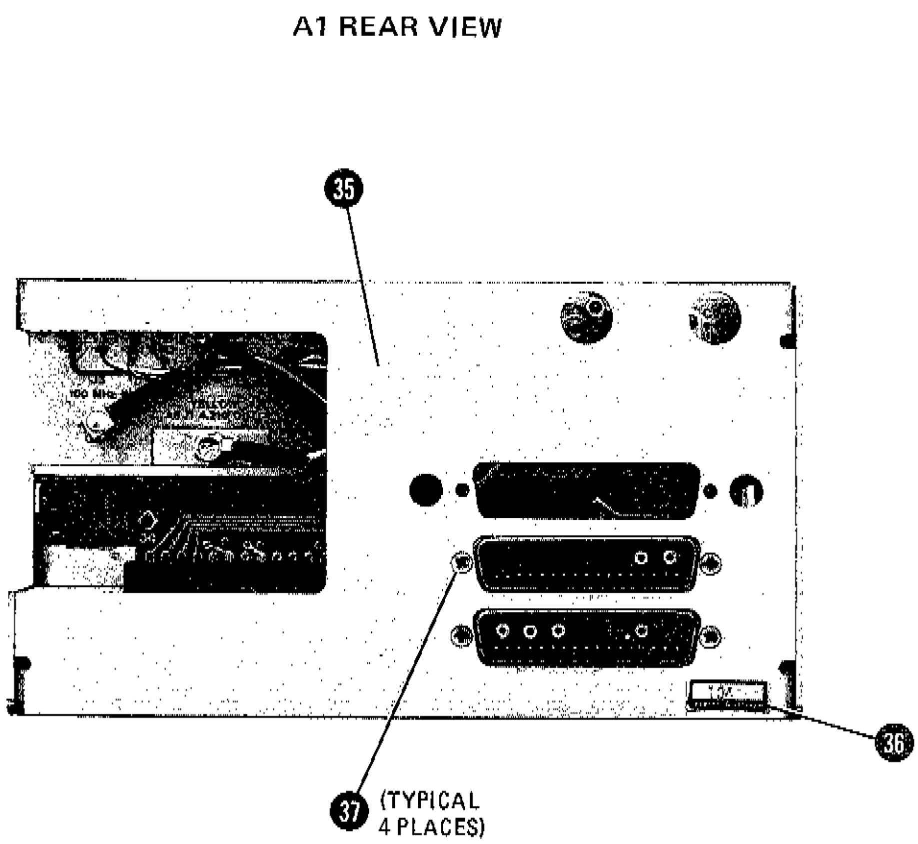


Figure B2-1. A1 Source/Converter Mechanical Parts Location (4 of 4)

Table B2-3. Code List of Manufacturers

MFR NO.	MANUFACTURER NAME	ADDRESS	ZIP CODE
GB027	NEOHM	ENGLAND	
GM005	DEUTSCHE VITROHM GMBH & CO	GERMANY	
00779	AMP INC	HARRISBURG PA	17105
00865	STETTNER-TRUSH INC	CAZENOVIA NY	13035
01121	ALLEN BRADLEY CO	MILWAUKEE WI	53212
01295	TEXAS INSTR INC SEMICOND CMPNT DIV	DALLAS TX	75231
02114	FERROXCUBE CORP	SAUGERTIES NY	12477
02735	RCA CORP SOLID STATE DIV	SOMMERVILLE NJ	08876
04713	MOTOROLA SEMICONDUCTOR PRODUCTS	PHOENIX AZ	85008
06383	PANDUIT CORP	TINLEY PARK IL	60477
06776	ROBINSON NUGENT INC	NEW ALBANY IN	47150
13103	THERMALLOY CO	DALLAS TX	75247
16299	CORNING GL WK ELEC CMPNT DIV	RALEIGH NC	27604
19701	MEPCO/ELECTRA CORP	MINERAL WELLS TX	76067
2K497	CABLEWAVE SYSTEMS INC	NORTH HAVEN CT	06473
24226	GOWANDA ELECTRONICS CORP	GOWANDA NY	14070
24546	CORNING GLASS WORKS (BRADFORD)	BRADFORD PA	16701
24931	SPECIALTY CONNECTOR CO INC	INDIANAPOLIS IN	46227
27014	NATIONAL SEMICONDUCTOR CORP	SANTA CLARA CA	95051
28480	HEWLETT-PACKARD CO CORPORATE HQ	PALO ALTO CA	94304
30983	MEPCO/ELECTRA CORP	SAN DIEGO CA	92121
56289	SPRAGUE ELECTRIC CO	NORTH ADAMS MA	01247
71785	TRW ELEK COMPONENTS CINCH DIV	ELK GROVE VILLAGE IL	60007
72136	ELECTRO MOTIVE MFG CO INC	WILLIMANTIC CT	06226
73743	FISCHER SPECIAL MFG CO	CINCINNATI OH	45206
76854	OAK IND INC SW DIV	CRYSTAL LAKE IL	60014
78189	ILLINOIS TOOL WORKS INC SHAKEPROOF	ELGIN IL	60126
79963	ZIERICK MFG CO	MT KISCO NY	10549
83186	VICTORY ENGINEERING CORP	SPRINGFIELD NJ	07081
90949	AMPHENOL SALES DIV OF BUNKER-RAMO	HAZELWOOD MO	63042
98291	SEALECTRO CORP	MAMARONECK NY	10544

CHAPTER B
RF/SOURCE CONVERTER

SECTION III
SERVICE

B3-1. INTRODUCTION

B3-2. This section contains information for troubleshooting and repairing the RF Source/Converter Assembly. The first part of this section is a general, overall theory of operation at the Source/Converter block diagram level. Troubleshooting of the RF Source/Converter down to a subassembly or group of subassemblies is presented next. This includes test setups, an indicator diagnostic table, and troubleshooting procedures.

B3-3. The final part of this section is made up of service sheets, each covering a particular subassembly of the RF Source/Converter. Contained in each service sheet is the information needed to troubleshoot within the subassembly it covers, down to a failed component. This information includes, but is not limited to, the subassembly schematic, block diagram, theory of operation, component location diagram, and interface information. An index to the schematic diagrams is provided in Table B3-1.

Table B3-1. RF Source/Converter Schematics Index

Reference Designator	Assembly Name	Figure Number
A1A1	Front Panel Board Assembly	B3-18
A1A2	Programmable Attenuator	B3-22
A1A3	Automatic Level Control and Attenuator Driver	
A1A4	100 kHz IF Amplifier	B3-25
A1A5	100 kHz IF Amplifier	
A1A6	100 kHz IF Amplifier	
A1A7	Local Oscillator Amplifier/Detector	B3-26
A1A8	Down Converter	
A1A9	C-Band Mixer	
A1A10	Splitter/Amplifier	
A1A11	C-Band Mixer	
A1A12	RF Amplifier/Detector	
A1A13	Connector Board	B3-29
A1A14	Motherboard	B3-31
A1A15	Fixed Oscillators Assembly	B3-34
A1A15A1	9.9 MHz Phase Lock Board	B3-41
A1A15A2	10 MHz Phase Lock Board	B3-48
A1A15A3	Driver IF Board	B3-54
A1A15A4	Driver IF Board	
A1A15A5	4.2100 GHz Oscillator/Sampler	
A1A15A6	4.2099 GHz Oscillator/Sampler	

B3-4. RF SOURCE/CONVERTER THEORY OF OPERATION

B3-5. GENERAL DESCRIPTION

B3-6. RF Source/Converter Assembly A1 is the RF section of the 8505A Network Analyzer. Its source circuits provide RF energy over the frequency range of 0.5 to 1300 MHz, which is used to excite the device or devices under test. Its frequency converter circuits take the RF, fed back from each device under test, and convert it to 100 kHz IF signals regardless of the source RF output frequency. The IF signals are then processed in the Signal Processor Assembly (A3) for viewing on the Signal Processor display CRT.

B3-7. Source Function

B3-8. The source part of the RF Source/Converter Assembly is a swept signal generator operating from 0.5 to 1300 MHz. The source RF output level is continosly variable from − 72 dBm to + 10 dBm with a 70 dB programmable attenuator and associated vernier, both controlled from the RF Source/Converter front panel.

B3-9. In addition to supplying an RF output to the device under test, the source furnishes local osillator (LO) drive to the three mixers in the RF Source/Converter's down converter assembly and to Frequency Control Assembly A2. This LO drive tracks 100 kHz above the 0.5 to 1300 MHz RF output.

B3-10. Converter Function

B3-11. The converter portion of the RF Source/Converter has three separate but identical channels: R, A, and B, each of which will convert an RF input originating in the source circuitry to a 100 kHz IF. In each channel the IF is produced by mixing the RF input with the LO drive. The IF, containing all the characteristics of the RF input, is fed out of the RF Source/Converter through the Frequency Control Assembly and the Frequency Control/Signal Processor interconnect cable to the Signal Processor detectors.

B3-12. FUNCTIONAL DESCRIPTION

B3-13. As shown in the simplified block diagram, Figure B3-1, the RF Source/Converter consists of a 0.5 to 1300 MHz RF signal generator (the source) with output level controls, and a three-channel receiver (the converter) which accepts and converts the signals that are fed to the 8505A's Signal Processor Assembly. In the detailed RF Source/Converter block diagram, Figure B3-7, the source circuits are on the left, extending to the RF OUT receptacle. The converter circuits extend to the right from the R, A, and B channel input receptacles.

B3-14. RF Output Generation

B3-15. The RF source is generated by mixing the signal from a 4.2105-to-5.51090 GHz variable-frequency YIG-tuned oscillator (YTO) with 4.2100 GHz from a fixed-frequency oscillator. This mixing function is shown in Figure B3-2. The desired output frequency is the difference between the output frequencies of the two oscillators. The fixed-frequency oscillator is located in the RF Source/Converter. The YIG-tuned oscillator, however, is in Frequency Control Assembly A2, and its output frequency (swept or CW) is selected with controls on assembly A2's front panel.

B3-16. The mixer output, purposely at a low level to restrict spurious signals, is amplified to raise it to the required + 10 dBm output level. Output level variations are detected and fed back to an automatic level control (ALC) circuit. The ALC in turn, drives a modulator which modulates the output of the 4.2100 GHz in direct opposition to the output variations to provide a leveled RF output. A front-panel VERNIER control, associated with the automatic level control circuit, provides 12 dBm of output level adjustment. An additional 70 dB of output level adjustment, from − 60 dBm to + 10 dBm, is provided in 10 dB steps by a programmable attenuator controlled from the RF Source/Converter's front panel.

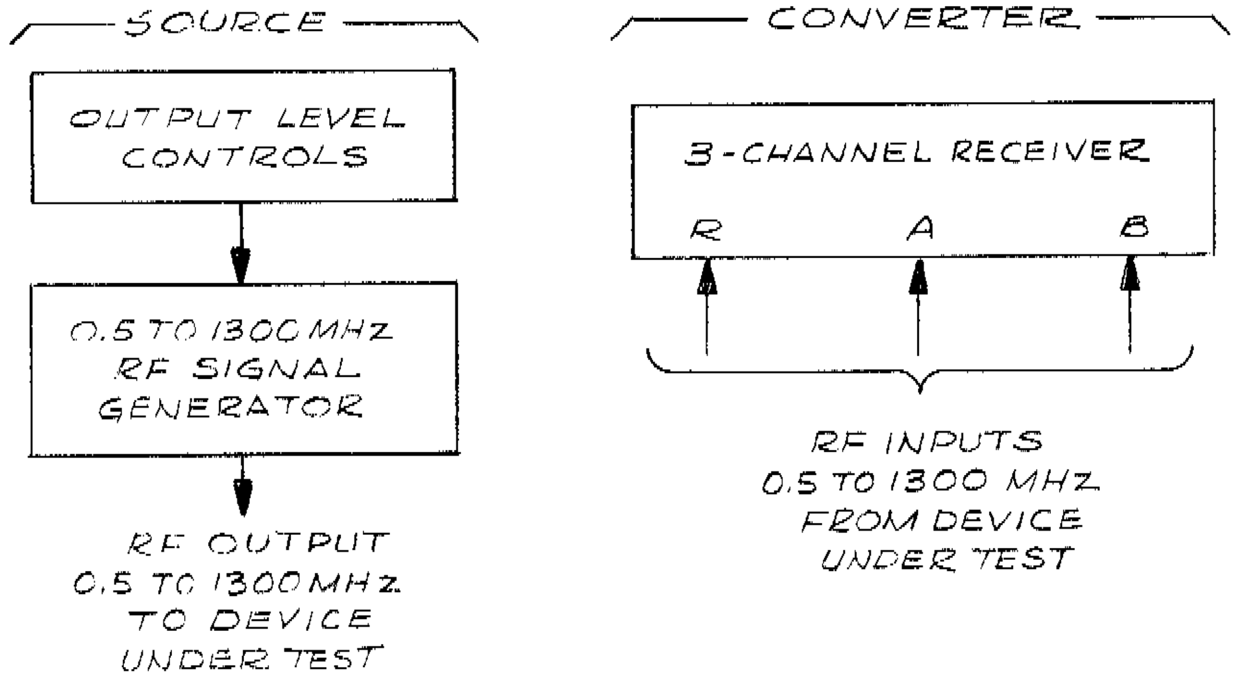


Figure B3-1. RF Source/Converter Simplified Block Diagram

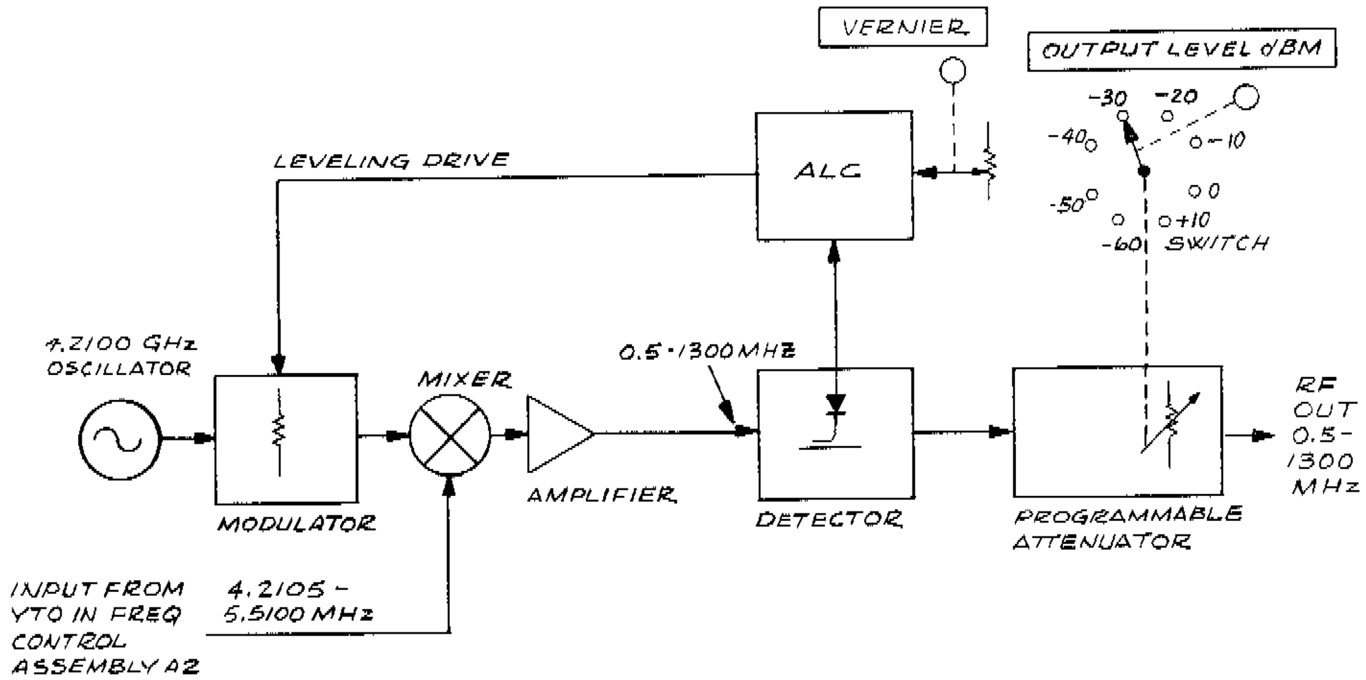


Figure B3-2. RF Output Generator Block Diagram

B3-17. Input Converter

B3-18. The three signal paths of the input converter are shown in Figure B3-3. Each path includes an input amplifier, a mixer (both part of Down Converter Assembly A8), and a 100 kHz IF Amplifier. All three signal paths are electrically identical and they each develop a 100 kHz IF output (for use in the Signal Processor Assembly's detectors) from their RF signal inputs. The IF signal is produced in each channel by mixing the RF input with an LO (local oscillator) signal that tracks 100 kHz above the RF output from the source. This LO signal is also produced in the source part of the RF Source/Converter.

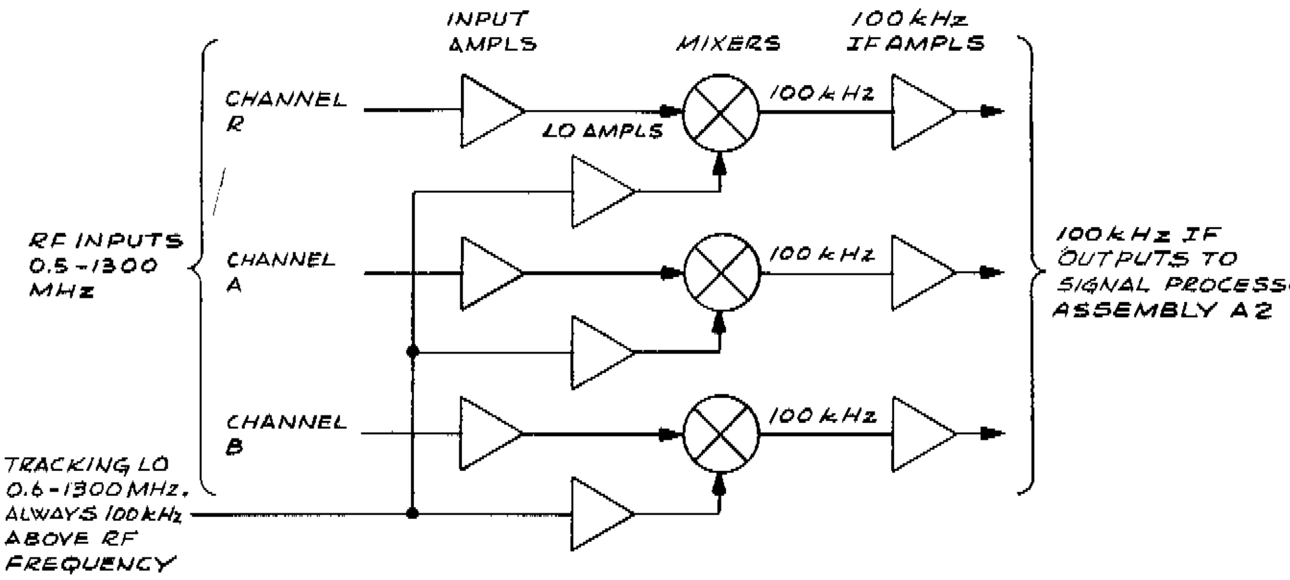


Figure B3-3. Input Converter Simplified Block Diagram

B3-19. LO Signal Generation

B3-20. The LO signal that tracks 100 kHz above the source RF output is generated in basically the same way as the RF (see Figure B3-4). The 4.2105-to-5.5100 GHz variable frequency from the same YIG-tuned oscillator used to develop the RF output is mixed with a 4.2099 GHz signal from a fixed-frequency oscillator. This produces a difference frequency of 0.6 MHz to 1300.1 MHz, which is amplified and used as the LO. When the LO frequency is compared with the RF frequency of 0.5 MHz to 1300 MHz, it can be seen that from the low end of the YIG-tuned oscillator output to the high end, the LO is exactly 100 kHz higher than the RF output. Thus, when the LO signal and the RF signal are mixed in the converter, a 100 kHz IF is produced.

B3-21. A portion of the LO signal (coupled LO) is cabled out of the RF Source/Converter Assembly and into the Frequency Control Assembly where it is used in the frequency counter and frequency control loop.

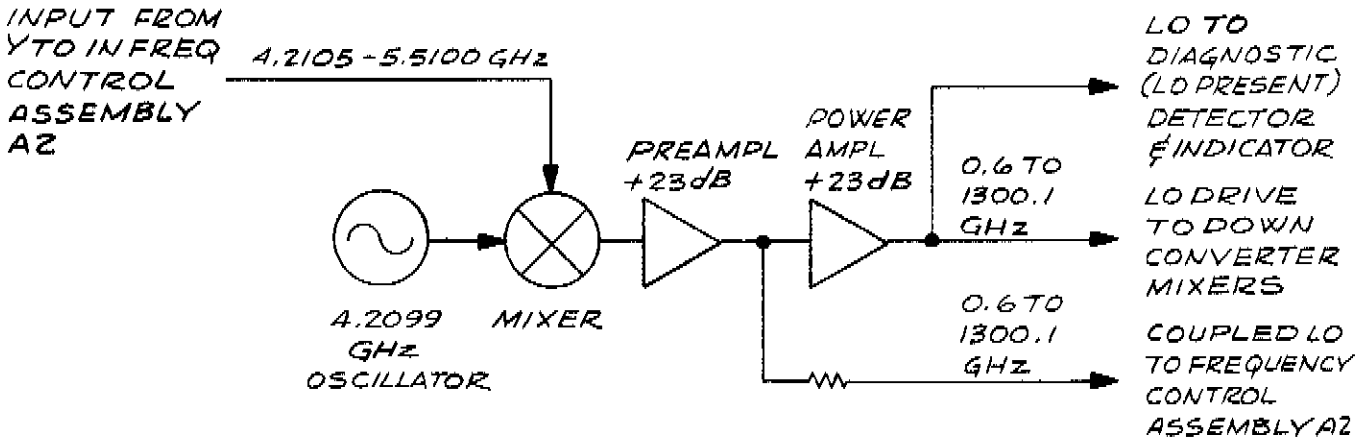


Figure B3-4. LO Generator Block Diagram

B3-22. RF Path and LO Path Isolation

B3-23. Since the same YIG-tuned oscillator (YTO) provides the variable-frequency drive for both the RF output and the LO drive to the converter's mixers, the RF and LO paths must be isolated to maintain clean RF and IF outputs. This is achieved by buffers in the splitter/amplifier (microcircuit subassembly A10) where the YTO input is divided (see Figure B3-5).

B3-24. Phase-Locked Fixed Oscillators

B3-25. The two fixed oscillators that produce the drives to the RF and LO developing mixers are locked to their respective output frequencies to make sure the IF frequency stays fixed at 100 kHz. This locking is accomplished in both oscillators with a phase-lock loop. A simplified block diagram of the two loops is shown in Figure B3-5.

B3-26. In the loop used in the RF output producing path, a 100 MHz signal from the Frequency Control Assembly reference oscillator is applied to a sampler along with 4.2100 GHz from a 4.2100 GHz voltage-tuned oscillator (VTO). Stripped to its bare essentials, the loop comprises the sampler, a phase detector, and the 4.2100 GHz VTO. The VTO is forced to run at 4.2100 GHz, 10 MHz above the 42nd harmonic of the 100 MHz sampler drive, by a 10 MHz reference input (also from Frequency Control Assembly A2) to the phase detector. The 4.2100 GHz output is fed to a mixer (A11) which develops the 0.5 to 1300 MHz RF output.

B3-27. The loop in the LO producing path operates in exactly the same manner as the loop in the RF path. The reference frequency, however, is 9.9 MHz; therefore, the VTO output is 4.2099 GHz (9.9 MHz above the 42nd harmonic of the 100 MHz sampler drive). The 4.2099 GHz is fed to a mixer (A9) which develops the 0.6 to 1300.1 MHz drive to the three mixers in the Down Converter (A8).

B3-28. Diagnostic Indicators

B3-29. Light-emitting diodes (LED's) on the RF Source/Converter front panel board indicate the status of various operating functions. Used properly, these indicators can quickly lead you to the general area of a malfunction.

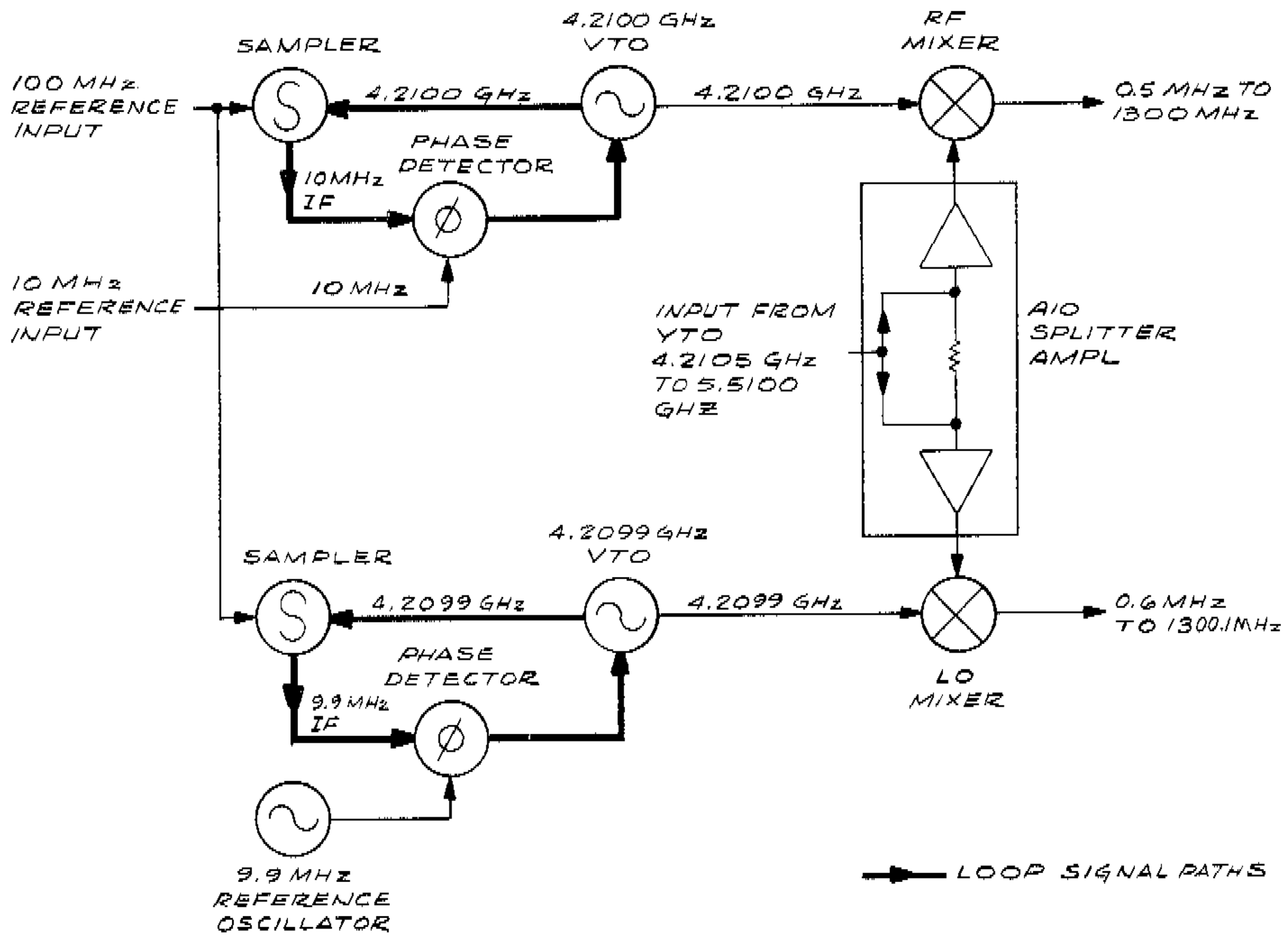


Figure B3-5. RF and LO Fixed Oscillators Phase-Locked Loops

B3-30. RF failures are indicated by four red LED's, each of which lights to indicate a particular kind of failure. RF failure indicators are provided for:

1. 10 MHz phase lock failure, which can result in drift of the RF output frequency.

2. 9.9 MHz phase lock failure, which can result in frequency drift of the LO drive to the converter IF mixers, thereby causing the 100 kHz IF output to drift off frequency.

3. LO drive shutdown, which will disable the 100 kHz output IF.

4. RF output failure, meaning there is no RF applied to the device under test.

B3-31. Status of the power inputs to the RF Source/Converter is indicated by three green LED's, each normally lighted to confirm the presence of a particular one of the three input supply voltages: +20, +5, and −10. All power applied to the RF Source/Converter is developed in the positive and negative voltage regulators in the Frequency Control Assembly.

B3-32. An input exceeding the maximum permissible input level (–30 dBm or –10 dBm), as established with the INPUT LEVEL dBm MAX switch, will light a red LED associated with the affected channel (R, A, or B). Simultaneously, the overload condition will light a three-LED overload indicator associated with all three input channels.

B3-33. Functional Groups Interface

B3-34. The relationships between the functional groups described in the preceding paragraphs are shown in the Functional Block Diagram, Figure B3-6.

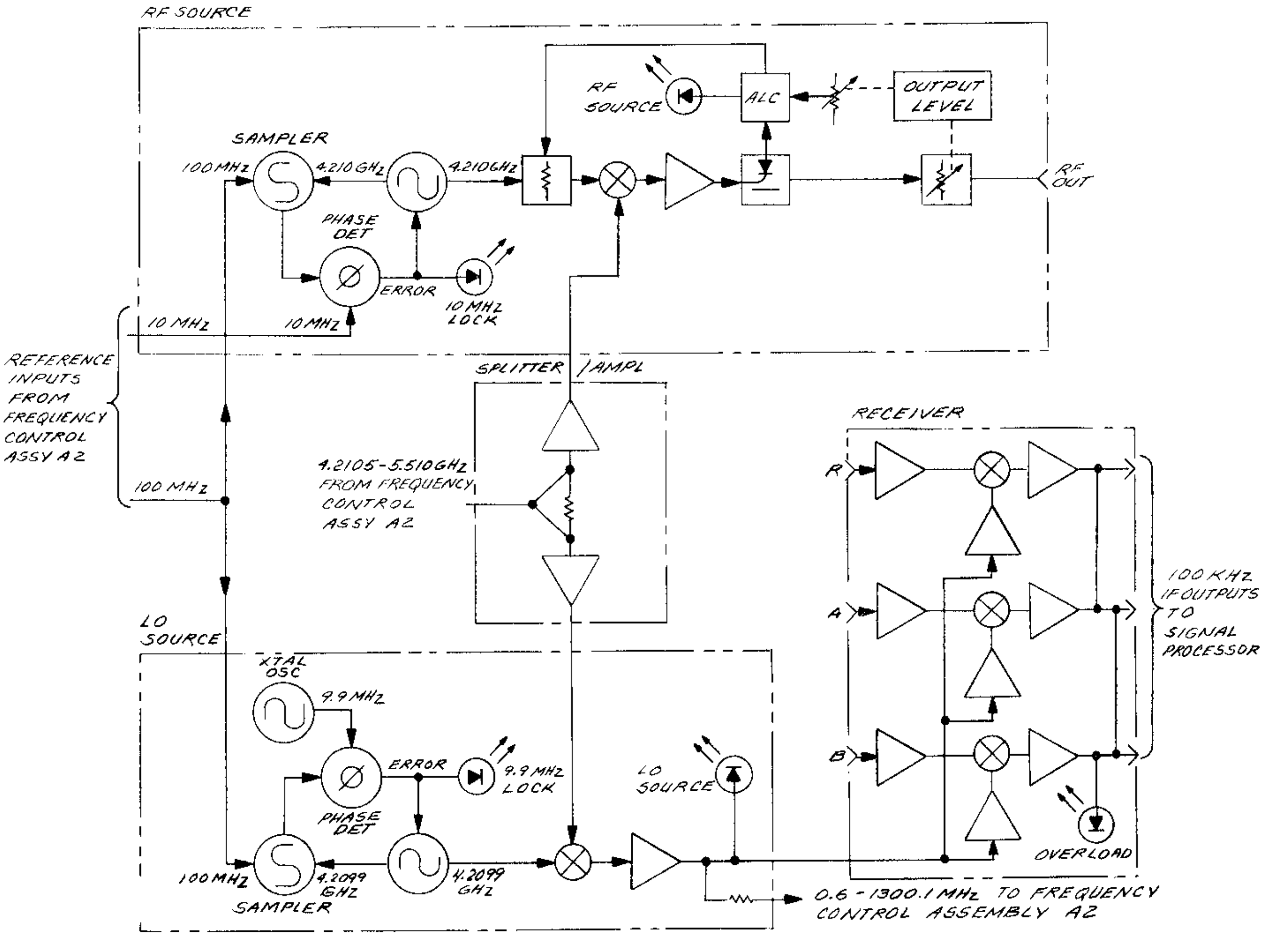


Figure B3-6. RF Source/Converter Functional Block Diagram

Model 8505A

Fig B3-7
Sht 1 of 5

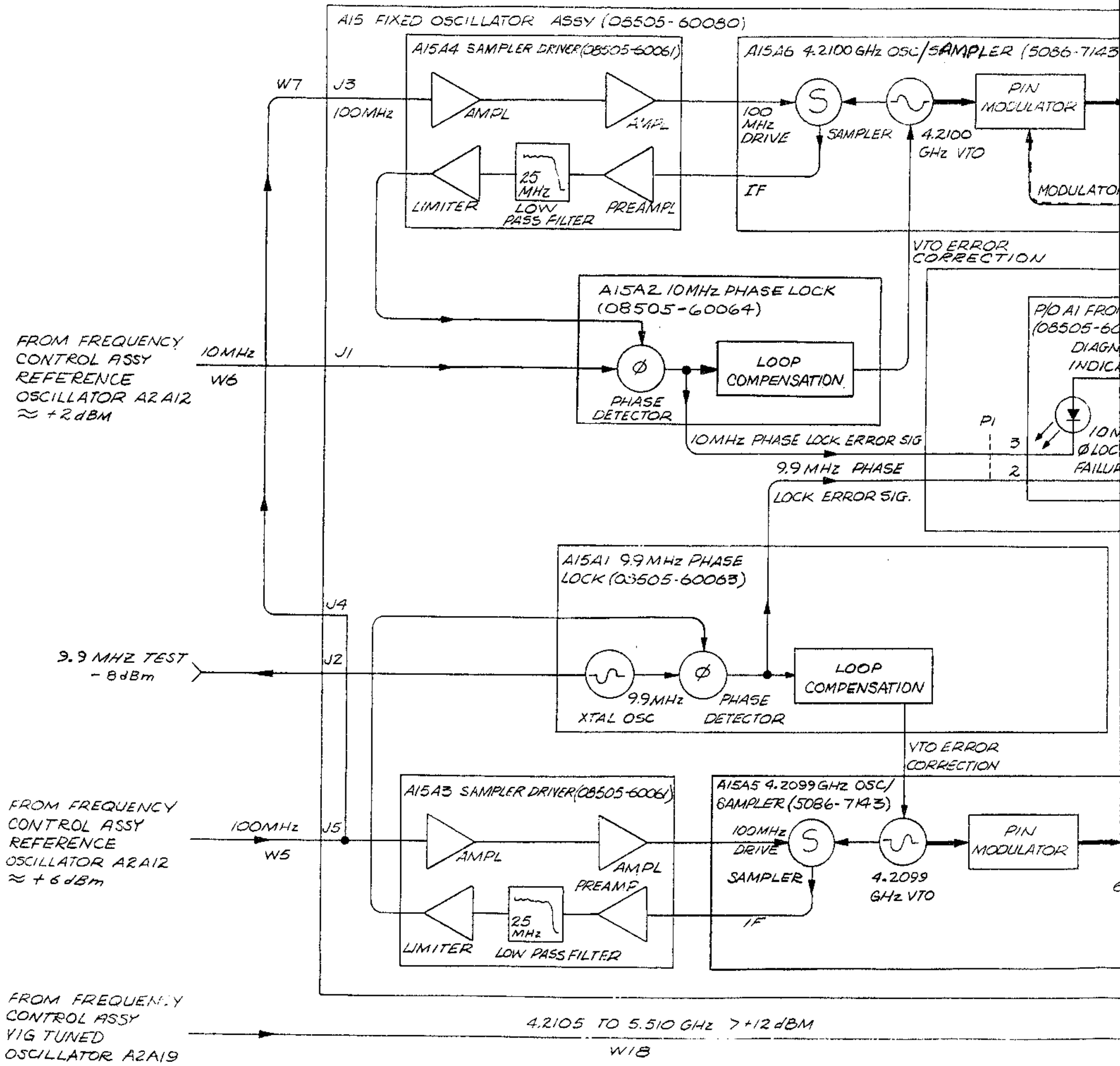


Fig. B3-7
Sht 2 of 5

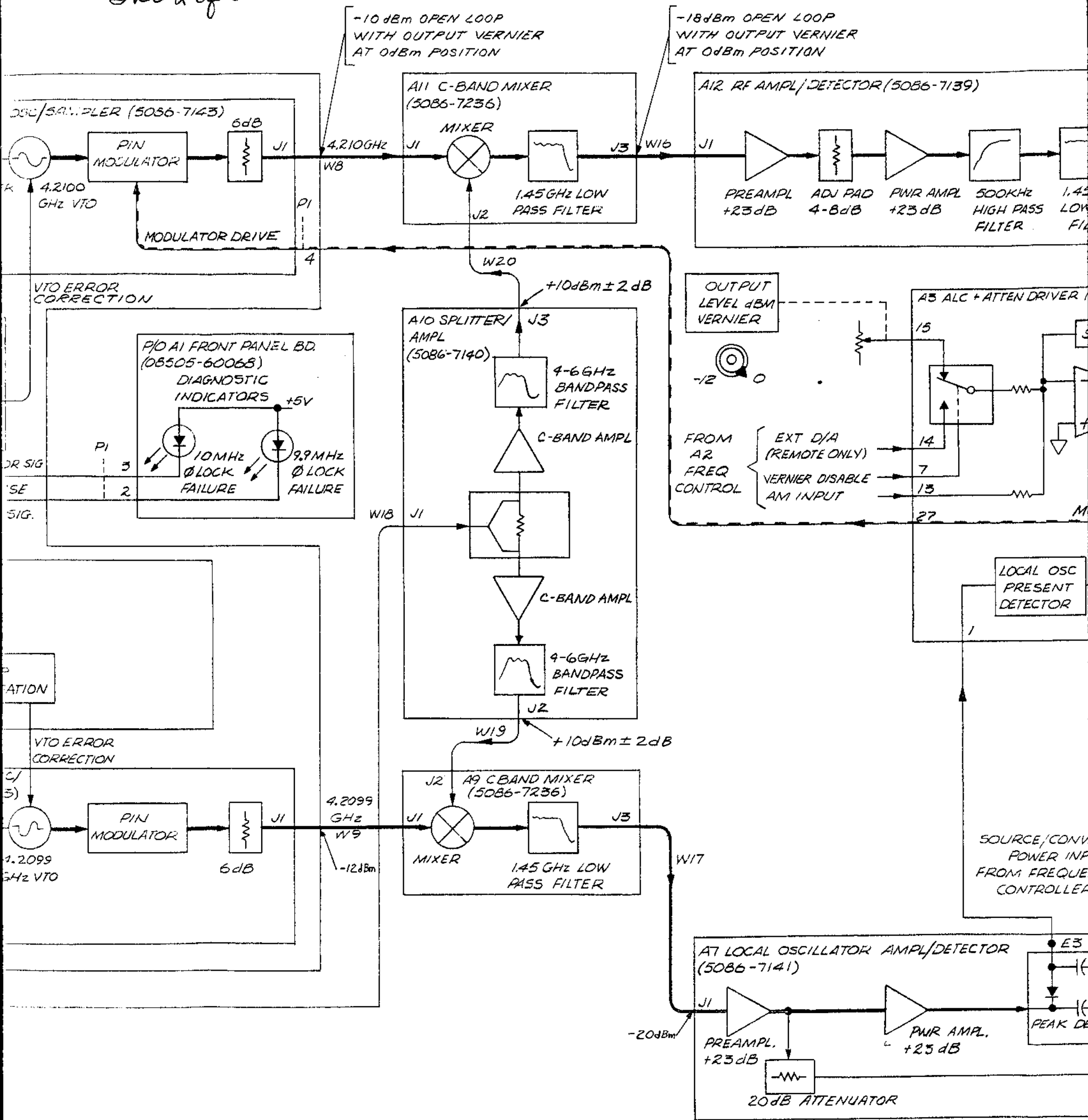


Fig B3-7
Sht 3 of 5

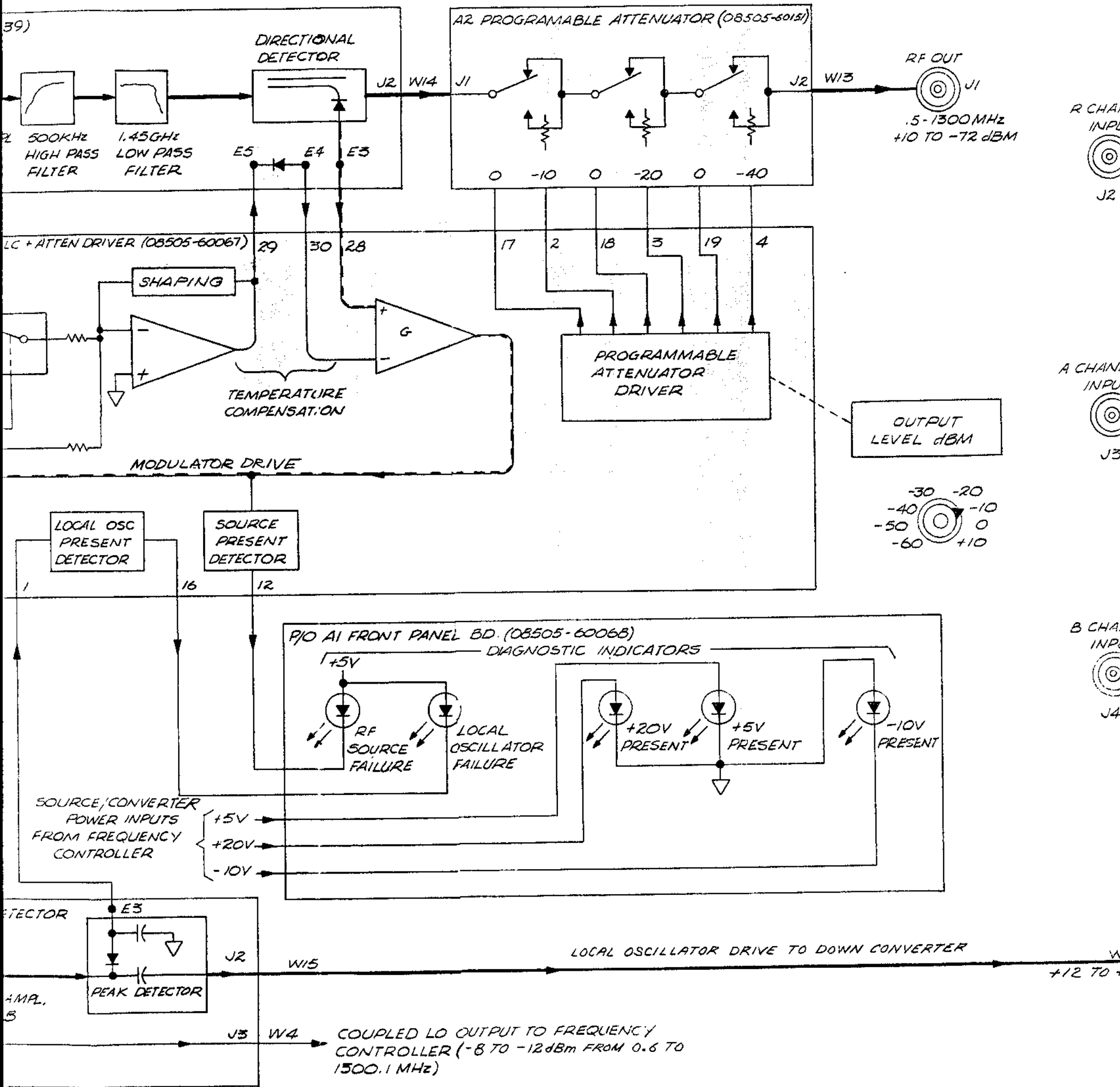


Fig. B3-7
Sht 4 of 5

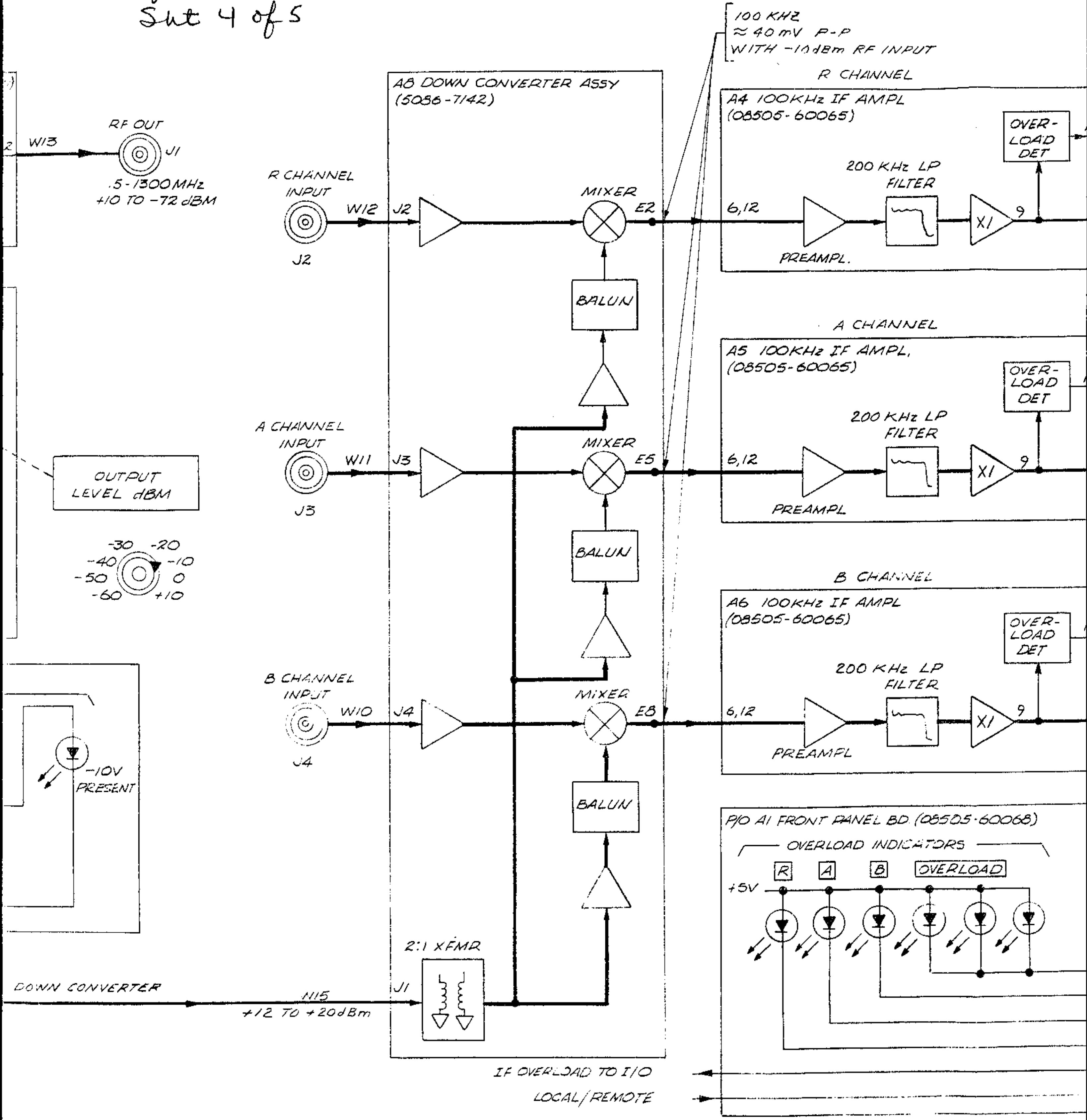
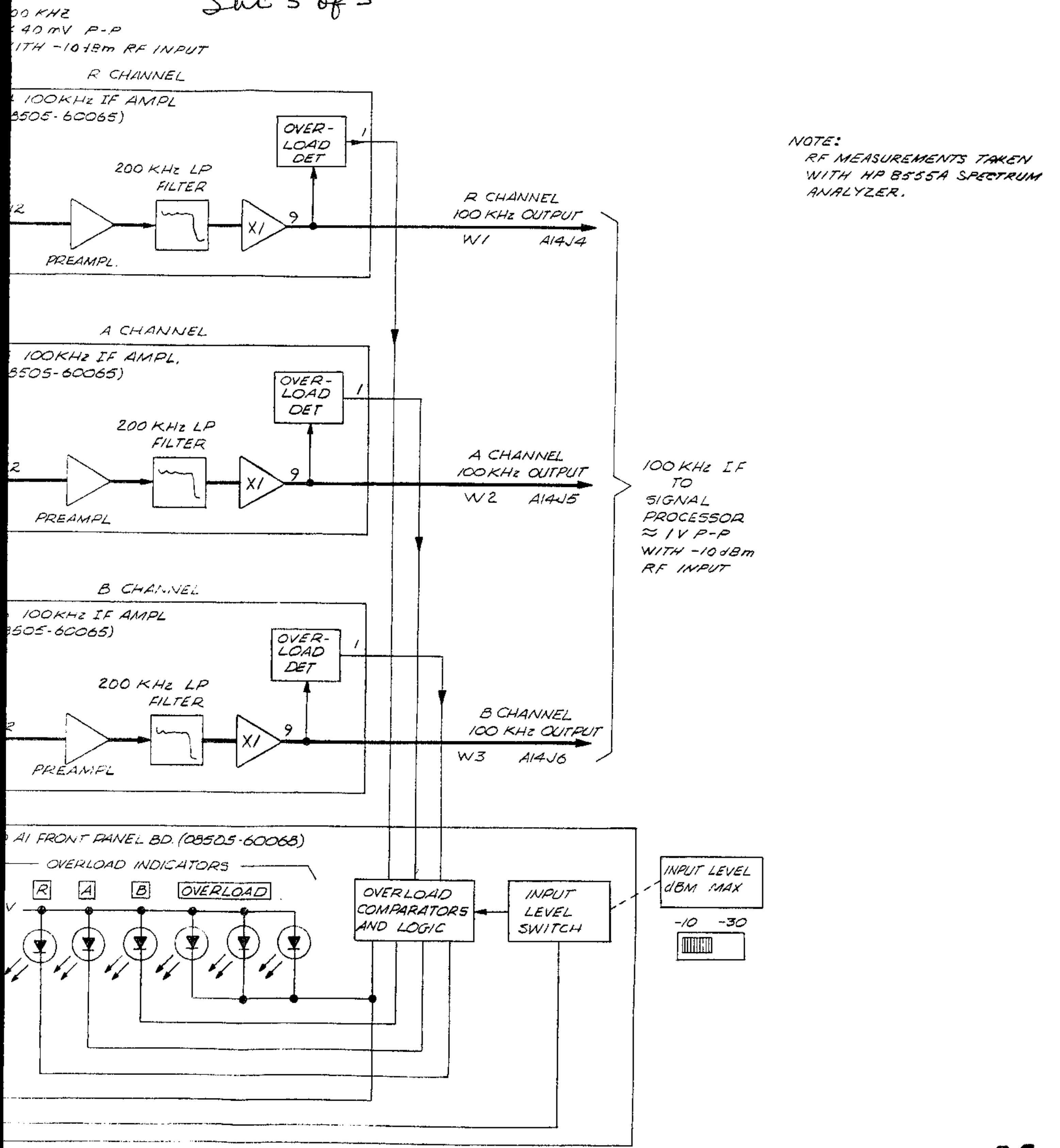


Fig B3-7
Sht 5 of 5



A1

Figure B3-7. RF Source/Converter Detailed Block Diagram

B3-35. RF Source/Converter Troubleshooting Procedure

DESCRIPTION:

The purpose of this troubleshooting procedure is to isolate a problem in the RF Source/Converter to one of the following circuits: 1) RF Source, 2) LO Source, 3) Receiver. Diagnostic indicators and IF Channel Overload tests give a quick check of the basic operation of the RF Source/Converter. Checks are then made which check specific characteristics to verify detailed operation of the RF Source/Converter. When a problem occurs, the trouble area is identified and the correct troubleshooting procedure is indicated.

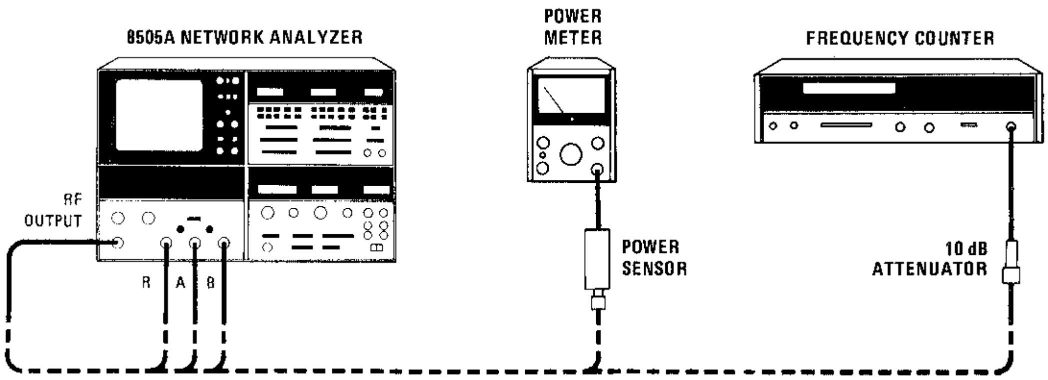


Figure B3-8. RF Source/Converter Troubleshooting Test Setup

EQUIPMENT:

Network Analyzer	HP 8505A
Frequency Counter	HP 5340A
Power Meter	HP 435A
Power Sensor	HP 8482A
10 dB Attenuator	HP 8491A

CRITICAL 8505A SWITCH SETTINGS:

OUTPUT LEVEL switch	−10 dBm
OUTPUT LEVEL vernier	0 dBm
MAXIMUM INPUT	−10 dBm
FREQ RANGE	.5 — 1300 MHz
WIDTH	CW
MODE	LIN EXPAND
SWEEP TIME SEC	.1 — .01
TRIGGER	AUTO

PROCEDURE:

NOTE

When a problem is known to occur at a specific frequency, tune the 8505A to that CW frequency while troubleshooting.

a. Set 8505A LINE switch to ON and set critical switch settings as designated for Figure B3-8.

Diagnostic Indicator Check

b. Check the four red LED diagnostic indicators which are visible through the RF Source/Converter front panel window. These indicators monitor whether RF Source or LO Source power is present and if RF Source and LO Source fixed oscillators are phaselocked. If any of the diagnostic indicators are lit, refer to Table B3-2 for further troubleshooting.

NOTE

Connector reference designators and outlines of microcircuits are labeled on RF Source/Converter Motherboard A1A14.

IF Channel Overload Check

NOTE

The Overload check ensures that the RF Source/Converter IF signal outputs are approximately the correct amplitude and frequency. This test is not intented to be a complete check of the RF Source/Converter.

c. Connect the front panel RF OUT signal through an RF cable to the R Channel input connector. Adjust OUTPUT LEVEL switch (−60 to +10 dBm) and OUTPUT LEVEL CONTROL (−12 to 0 dBm) to the minimum power level which gives an OVERLOAD indication. The OUTPUT LEVEL controls should indicate a power output of −9 dBm ±2 dB. Repeat overload check for A and B channels.

1. If the OVERLOAD indication occurs at the proper level for R, A, and B channels, proceed to step d.

2. If the OVERLOAD indication does not occur at the proper output level for only one or two of the channels, the trouble is in Down Converter A8 or the respective channel IF Amplifier (A4, A5 or A6). Exchange IF Amplifier from bad channel with IF Amplifier from channel that has correct OVERLOAD indication and perform Overload check again. If the incorrect overload indication changes channels with the IF Amplifier, the trouble is in the IF Amplifier. If the incorrect overload indication remains in the same channel, the trouble is in Down Converter A8 or cable connections. Return IF Amplifiers to their original positions.

3. If the OVERLOAD Indication does not occur at the proper OUTPUT LEVEL for all three channels (R, A, and B) the trouble is in either the RF Source or LO Source. Set OUTPUT LEVEL switch to −10 dBm and OUTPUT LEVEL vernier to 0 dBm. Connect power meter to J1 RF OUTPUT and ensure power out is −10 dBm ±2 dBm. If the correct RF OUT power is indicated, refer to Figure B3-15 for troubleshooting the RF Source. If RF OUT power is out of tolerance, refer to Figure B3-12 for troubleshooting the RF Source.

Table B3-2. RF Source/Converter Diagnostic Indicator Reference Table (1 of 2)

Diagnostic Indicators				
9.9 MHz Lock	**L.O.**	**10 MHz Lock**	**Source**	**Probable Trouble Area**
OFF	OFF	OFF	ON	No RF output from A1A12. Refer to Figure B3-12 to troubleshoot RF Source assemblies A1A10, A1A11, A1A12 and A1A15.
OFF	OFF	ON	OFF	RF Source Fixed Oscillator not properly phaselocked. Refer to Figure B3-12 to check 10 MHz input to A1A15J1 and the 4.210 GHz Fixed Oscillator (P/O A1A15).
OFF	OFF	ON	ON	No output from RF Source Fixed Oscillator. Refer to Figure B3-12 to check operation of A1A15A2, A1A15A4 and A1A15A6.
OFF	ON	OFF	OFF	No RF output from A1A7. Refer to Figure B3-15 to troubleshoot LO Source assemblies A1A7, A1A9, A1A10 and A1A15.
OFF	ON	OFF	ON	No RF Source output from A1A12 and no LO Source output from A1A7. Check 4.2105-5.510 GHz YIG-tuned Oscillator input to J1 of A1A10.
OFF	ON	ON	OFF	Multiple problems. No LO Source output from A1A7 and RF Source Fixed Oscillator not properly phaselocked. Refer to Figure B3-15 to troubleshoot LO Source and Figure B3-12 to troubleshoot RF Source Fixed Oscillator.
OFF	ON	ON	ON	Multiple problems. No LO Source output from A1A7. No RF Source output from A1A12. RF Source Fixed Oscillator not properly phaselocked. Check 4.2105-5.510 GHz YIG-tuned Oscillator input to A1A10. Check 10 MHz input to A1A15J1. Refer to Figure B3-12 to troubleshoot RF Source and refer to Figure B3-15 to troubleshoot LO Source.
ON	OFF	OFF	OFF	LO Source Fixed Oscillator not properly phaselocked. Refer to Figure B3-15 to check operation of 4.2099 GHz LO Source Fixed Oscillator in A1A15.
ON	OFF	OFF	ON	Multiple problems. LO Source Fixed Oscillator not properly phaselocked. No RF Source output from A1A12. Refer to Figure B3-12 to troubleshoot RF Source and refer to Figure B3-15 to check operation of 4.2099 GHz LO Source Fixed Oscillator in A1A15.
ON	OFF	ON	OFF	RF Source Fixed Oscillator and LO Source Fixed Oscillator not properly phaselocked. Check 100 MHz input to A1A15J5.
ON	OFF	ON	ON	Multiple problems. RF Source Fixed Oscillator and LO Source Fixed Oscillator not properly phaselocked. No RF Source output from A1A12. Check 100 MHz input to A1A15J5. Refer to Figure B3-12 to troubleshoot RF Source.

Table B3-2. RF Source/Converter Diagnostic Indicator Reference Table (2 of 2)

Diagnostic Indicators				
9.9 MHz Lock	**L.O.**	**10 MHz Lock**	**Source**	**Probable Trouble Area**
ON	ON	OFF	OFF	No output from LO Source Fixed Oscillator. Refer to Figure B3-15 to check operation of A1A15A1, A1A15A3 and A1A15A5.
ON	ON	OFF	ON	Multiple problems. No RF Source output from A1A12 and No LO Source output from A1A7. LO Fixed Oscillator not properly phaselocked. Check 4.2105-5.510 GHz YIG-tuned Oscillator input to A1A10. Refer to Figure B3-15 to check operation of 4.2099 GHz Fixed Oscillator in A1A15.
ON	ON	ON	OFF	Multiple problems. RF Source and LO source Fixed Oscillators not properly phaselocked. No LO Source output from A1A7. Check 100 MHz input to A1A15J5. Refer to Figure B3-15 to troubleshoot LO Source.
ON	ON	ON	ON	Trouble is probably external to RF Source/Converter. Ensure power supply indicators behind RF Source/Converter front panel are lit. If they are not, check power supplies in Frequency Control Assembly A2. Check 100 MHz input to A1A15J5. Check 4.2105-5.510 GHz YIG-tuned Oscillator input to A1A10J1.

RF OUT Accuracy and Leveling

d. Set OUTPUT LEVEL switch to − 10 dBm and OUTPUT LEVEL vernier to 0 dBm. Connect power meter to J1 RF OUT connector. Power out indication should be − 10 dBm ± 2 dB. If power out indication is incorrect, refer to Figure B3-12 for troubleshooting the RF Source.

e. Slowly adjust OUTPUT LEVEL vernier counterclockwise to − 12 dBm. RF OUT power should indicate − 22 dBm ± 3 dBm. If power out indication is incorrect, refer to Figure B3-12 to troubleshoot the OUTPUT LEVEL vernier circuit in the RF Source.

f. Set OUTPUT LEVEL vernier to 0 dBm and slowly adjust CW frequency from 0.5 to 1300 MHz. The difference between maximum and minimum power levels should be less than 1 dB. If the power variation is greater than 1 dB, set the CW frequency for the minimum power output and perform troubleshooting procedure in Figure B3-12.

Receiver Frequency Response

EQUIPMENT:

Network Analyzer . . . . HP 8505A
Power Splitter . . . . HP 11850A

g. Set 8505A controls as follows:

OUTPUT LEVEL . . . . − 10 dBm
RANGE. . . . . .5 — 1300 MHz
MODE. . . . . LIN FULL
SWEEP TIME SEC . . . . .1 — .01
TRIGGER . . . . AUTO
MODE . . . . MAG
SCALE/DIV . . . . .5 dB

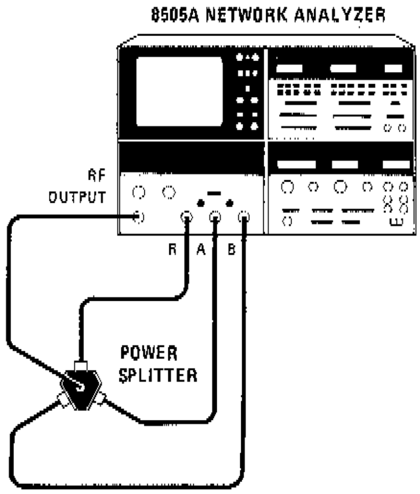


Figure B3-9. Receiver Frequency Response Troubleshooting Test Setup

h. Connect RF OUT through the three way power splitter R, A and B channel inputs. (See Figure B3-9.) Center the CRT display for each channel input and check the maximum peak-to-peak power variation on the display as shown in Table B3-3.

Table B3-3. Receiver Frequency Response and Tracking Characteristics

Input	Maximum Variation	Probable Trouble Area
R A	1.7 dB 1.7 dB	If one or two channels fail, exchange IF Amplifier (A4, A5, or A6) with an amplifier from a known good channel. If the trouble changes with the IF Amplifier, the trouble is in the amplifier; otherwise the problem is in Down Converter A8. Return IF Amplifiers to their original positions.
B	1.7 dB	If all the channels fail, the trouble is in the LO Source. Set SCAN TIME SEC switch to MANUAL and perform tests in Figure B3-15. Ensure power requirements are met while manually sweeping over the full frequency range.
A/R B/R	0.5 dB 0.5 dB	If leveling is out of specification for both ratio displays, Channel R is probably not tracking properly. If leveling is out of specification for only one ratio display, the respective A or B channel is probably not tracking properly. Exchange IF amplifier (A4, A5 or A6) from suspected channel with the IF Amplifier from the A or B channel that is properly operational. If the tracking problem changes to a different ratio display, the trouble is in the suspected IF Amplifier. If the same ratio display has the tracking problem, the trouble is in Down Converter Assembly A8. Return IF Amplifiers to their original positions.

B3-36. RF Source Troubleshooting Procedure

DESCRIPTION

The RF Source troubleshooting block diagram and troubleshooting procedures diagram are used together to isolate a problem to the assembly level. Critical test points in the troubleshooting block diagram are designated with a letter which corresponds with the same test point on the troubleshooting procedures diagram. If a signal at a particular test point is known to be incorrect, the troubleshooting procedures may be started at that point.

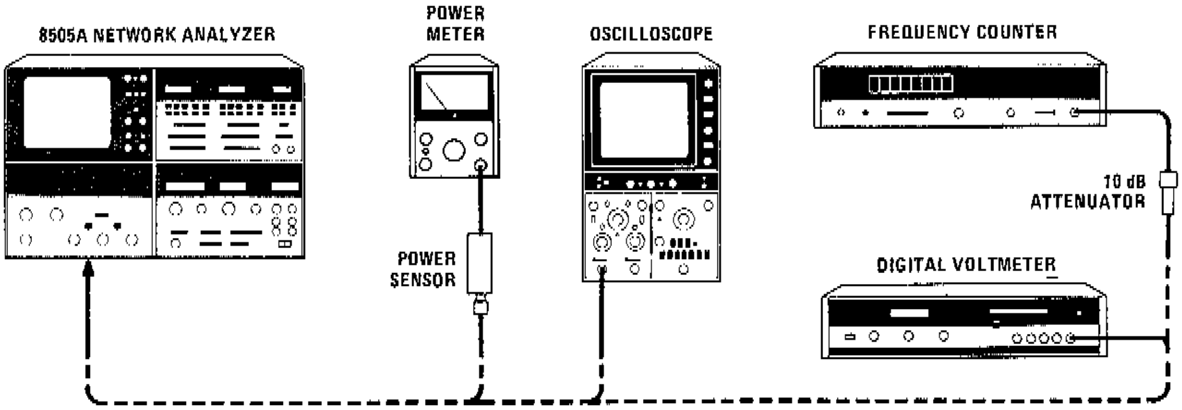


Figure B3-10. RF Source Troubleshooting Test Setup

EQUIPMENT:

Network Analyzer	HP 8505A
Oscilloscope	HP 182C/1801A/1820A
Frequency Counter	HP 5340A
Digital Voltmeter	HP 3480D
Power Meter	HP 435A
Power Sensor	HP 8482A
10 dB Attenuator	HP 8491A

CRITICAL 8505A SWITCH SETTINGS:

OUTPUT LEVEL dBm	– 10 dBm
OUTPUT LEVEL dBm VERNIER	0 dBm
INPUT LEVEL dBm MAX	– 10 dBm
FREQ RANGE	.5 — 1300 MHz
WIDTH	CW
MODE	LIN EXPAND
SWEEP TIME SEC	.1 — .01
TRIGGER	AUTO

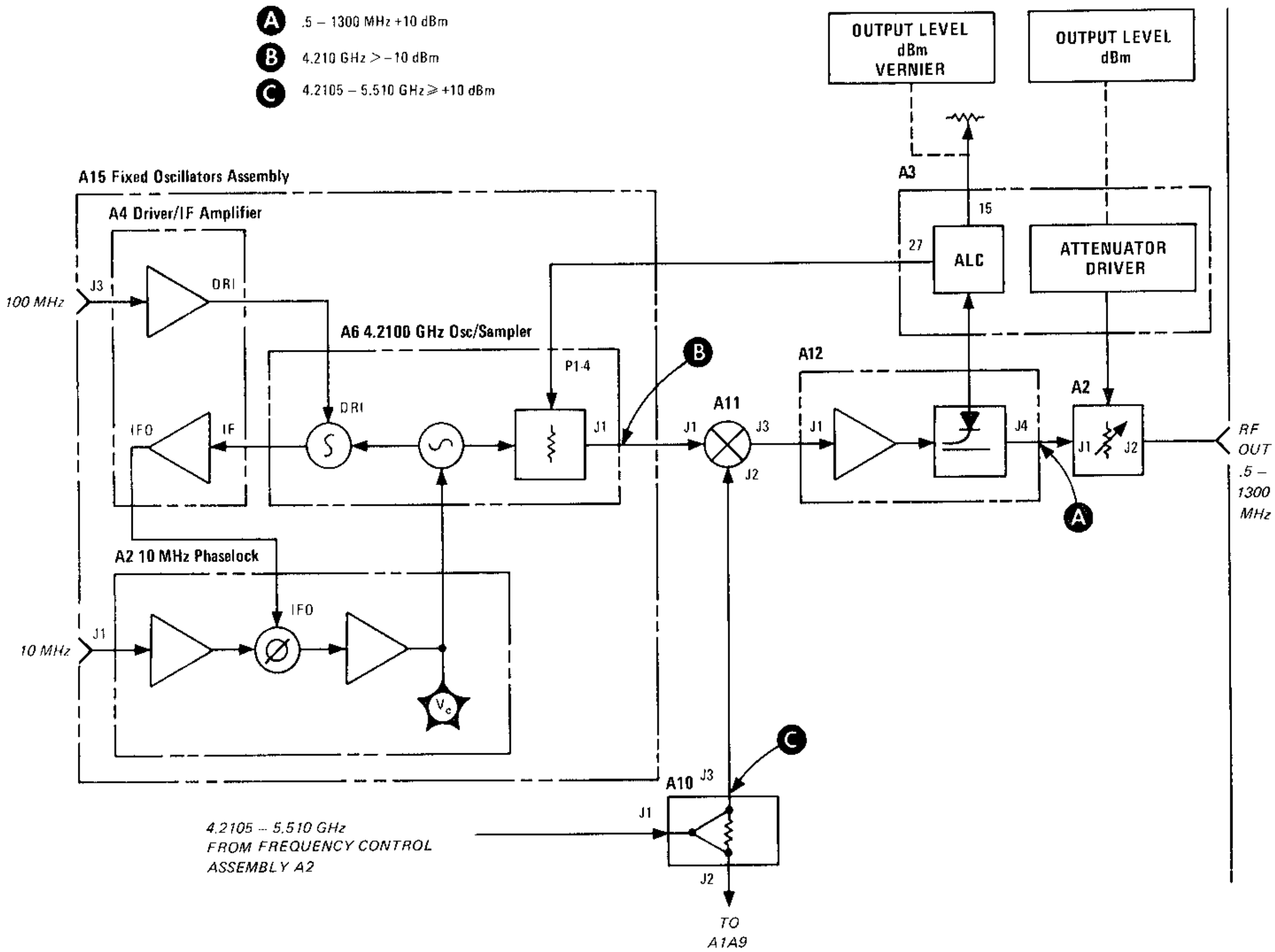


Figure B3-11. RF Source Troubleshooting Block Diagram

Fig. B3-12
Sht 1 of 3

Connect equipment as shown in Figure B3-10

Ensure RF Source and 10 MHz LOCK diagnostic indicators are not lit.

NO → If RF Source diagnostic indicator is lit, start troubleshooting here. NO →

YES

A

Test Point A1A12J2
Frequency . . . . .5 – 1300 MHz
Power Out . . . . +10 dBm

NO →

B

Test Point A1A15A6J1
Frequency . . . . 4.210 GHz
Power Out . . . . > –10 dBm

NO →

YES

Test Point A1A11J3
Frequency . . . . .5 – 1300 MHz
Power Out . . . . –30 dBm

NO →

YES

Trouble is in A1A12 RF Ampl/Detector

YES

Test Point . . . . J1 RF OUT
Frequency . . . . .5 – 1300 MHz
Power Out . . . . –10 dBm

NO →

OUTPUT LEVEL dBm	ATTENUATOR DRIVER OUTPUTS					
	A3-2	A3-3	A3-4	A3-17	A3-18	A3-19
+10	+20V	+20V	+20V	0V	0V	0V
0	0V	+20V	+20V	+20V	0V	0V
–10	+20V	0V	+20V	0V	+20V	0V
–20	0V	0V	+20V	+20V	+20V	0V
–30	+20V	+20V	0V	0V	0V	+20V
–40	0V	+20V	0V	+20V	0V	+20V
–50	+20V	0V	0V	0V	+20V	+20V
–60	0V	0V	0V	+20V	+20V	+20V

NO → Troub uator

YES

Refer to Figure B3-15 for troubleshooting the LO Source.

YES

Trouble is in A1A2 Programmable Attenuator

Fig B3-12
Sht 2 of 3

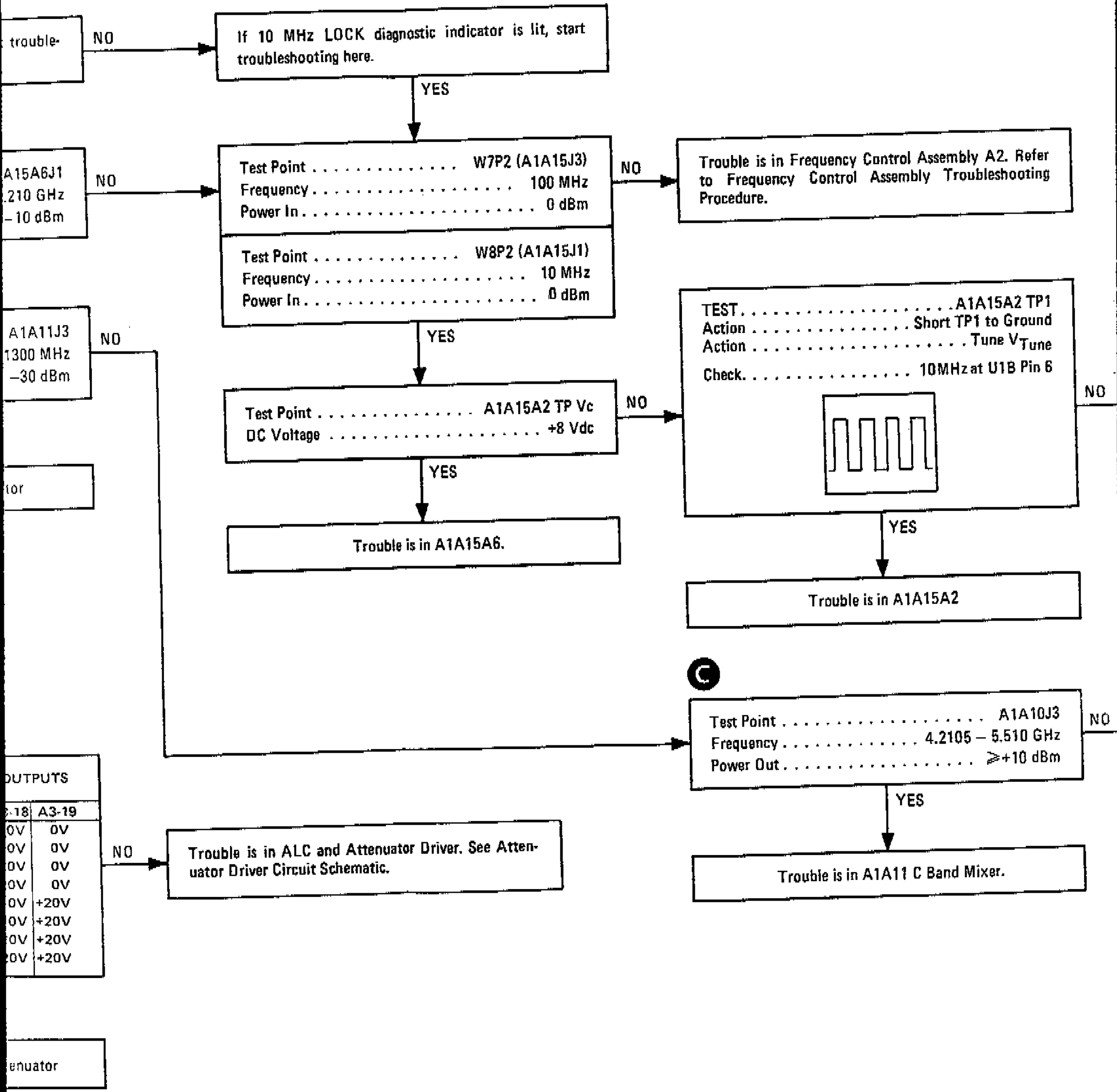


Fig B3-12
Sht 3
of 3

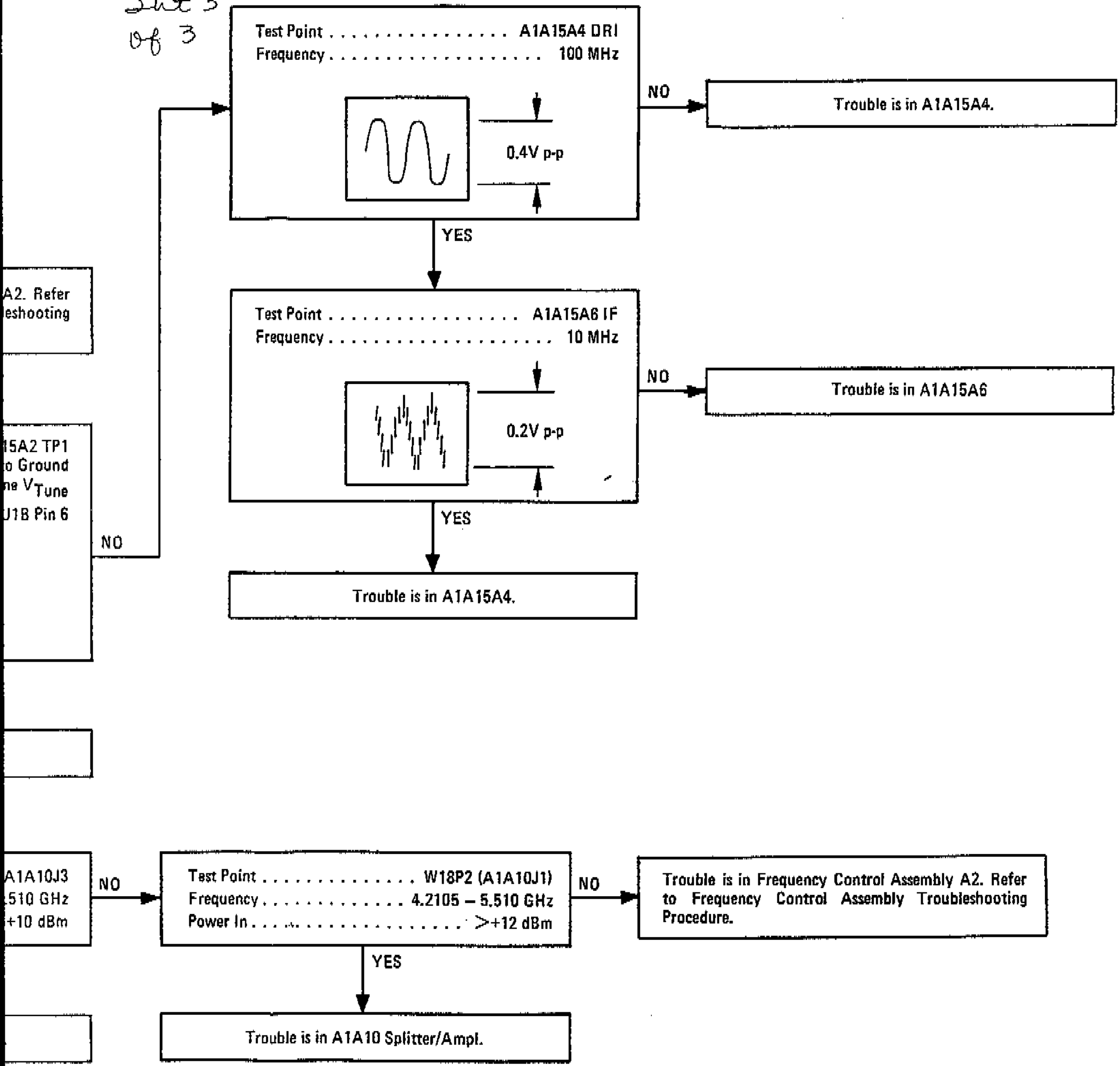


Figure B3-12. RF Source Troubleshooting Procedure

B3-37. LO Source and Receiver Troubleshooting Procedure

DESCRIPTION

The LO Source/Receiver troubleshooting block diagram and troubleshooting procedures diagram are used together to isolate a problem to the assembly level. Critical test points in the troubleshooting block diagram are designated with a letter which corresponds with the same test point on the troubleshooting procedures diagram. If a signal at a particular test point is known to be incorrect, the troubleshooting procedures may be started at that point.

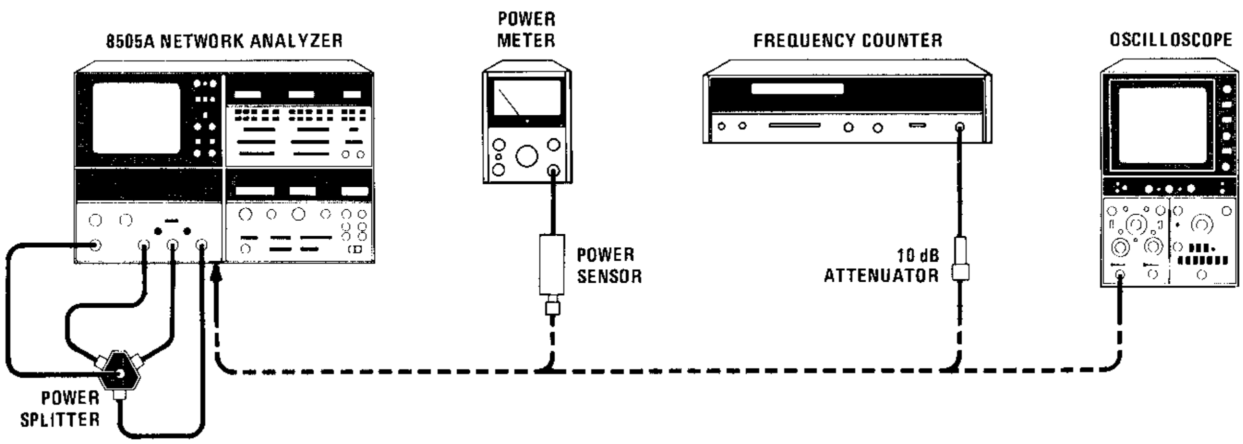


Figure B3-13. LO Source and Receiver Troubleshooting Test Setup

EQUIPMENT:

Network Analyzer	HP 8505A
Oscilloscope	HP 182C/1801A/1820A
Frequency Counter	HP 5340A
Power Meter	HP 435A
Power Sensor	HP 8482A
Power Splitter	HP 11850A
10 dB Attenuator	HP 8491A

CRITICAL 8505A SWITCH SETTINGS:

OUTPUT LEVEL dBm	0 dBm
OUTPUT LEVEL dBm VERNIER	0 dBm
INPUT LEVEL dBm MAX	– 10 dBm
FREQ RANGE	.5 — 1300 MHz
WIDTH	CW
MODE	LIN EXPAND
SWEEP TIME SEC	.1 – .01
TRIGGER	AUTO

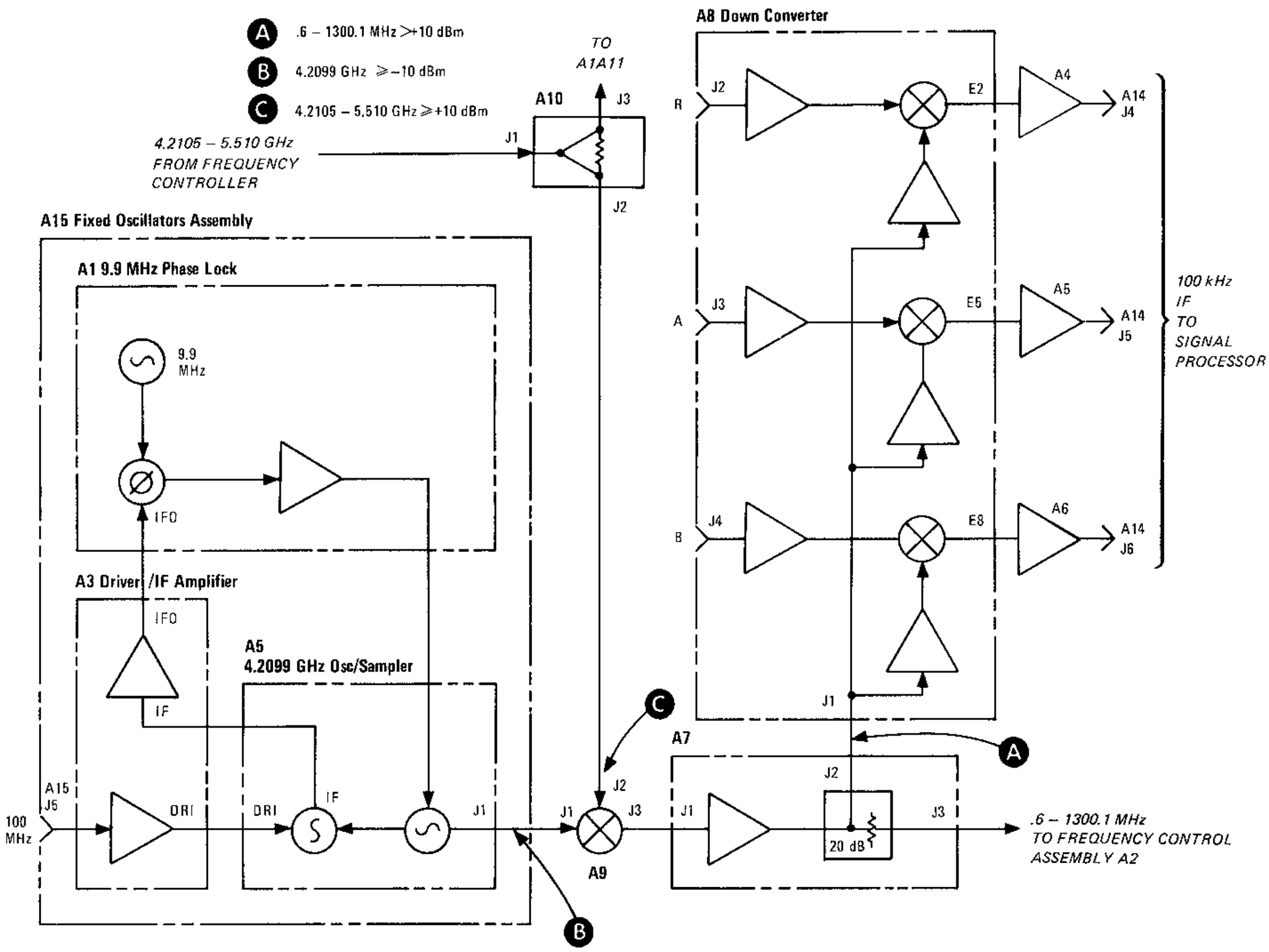


Figure B3-14. LO Source and Receiver Troubleshooting Block Diagram

Fig. B3-15
Sht 1 of 4

Connect equipment as shown in Figure B3-13.

Ensure LO SOURCE and 9.9 MHz LOCK diagnostic indicators are not lit.

NO

If LO Source diagnostic indicator is lit, start trouble-shooting here.

NO

YES

YES

A

Test Point A1A7J2
Frequency . . . . .6 – 1300.1 MHz
Power Out . . . . +10 dBm

NO

B

Test Point A1A15A5J1
Frequency . . . . 4.2099 GHz
Power Out . . . . $\geq$ –10 dBm

NO

YES

YES

Test Point A1A9J3
Frequency . . . . .6 – 1300.1 MHz
Power Out . . . . –30 dBm

NO

C

Test Point . . .
Frequency . . .
Power Out . . .

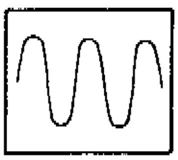
YES

Trouble is in A1A7 Local Oscillator/Ampl Detector.

Troul

Test Point . . . . A1A14J4 (CHAN R)
A1A14J5 (CHAN A)
A1A14J6 (CHAN B)

Frequency . . . . 100 KHz



1V p-p

NO

Is 100 kHz IF Output correct for one or more channels?

NO

Troubl

YES

YES

Exchange IF Amplifier from bad channel with IF Amplifier from channel that has correct 100 kHz IF Output. Is 100 kHz IF problem in same channel?

NO

Trouble is in

Troubleshooting complete. A1 Source/Converter is operating normally.

YES

On A1A14 Motherboard check continuity of 100 kHz IF trace. Is trace continuity unbroken?

NO

Trouble is ope
board.

YES

Trouble is in A1A8 Downconverter.

Fig. B3-15
Sht 2 of 4

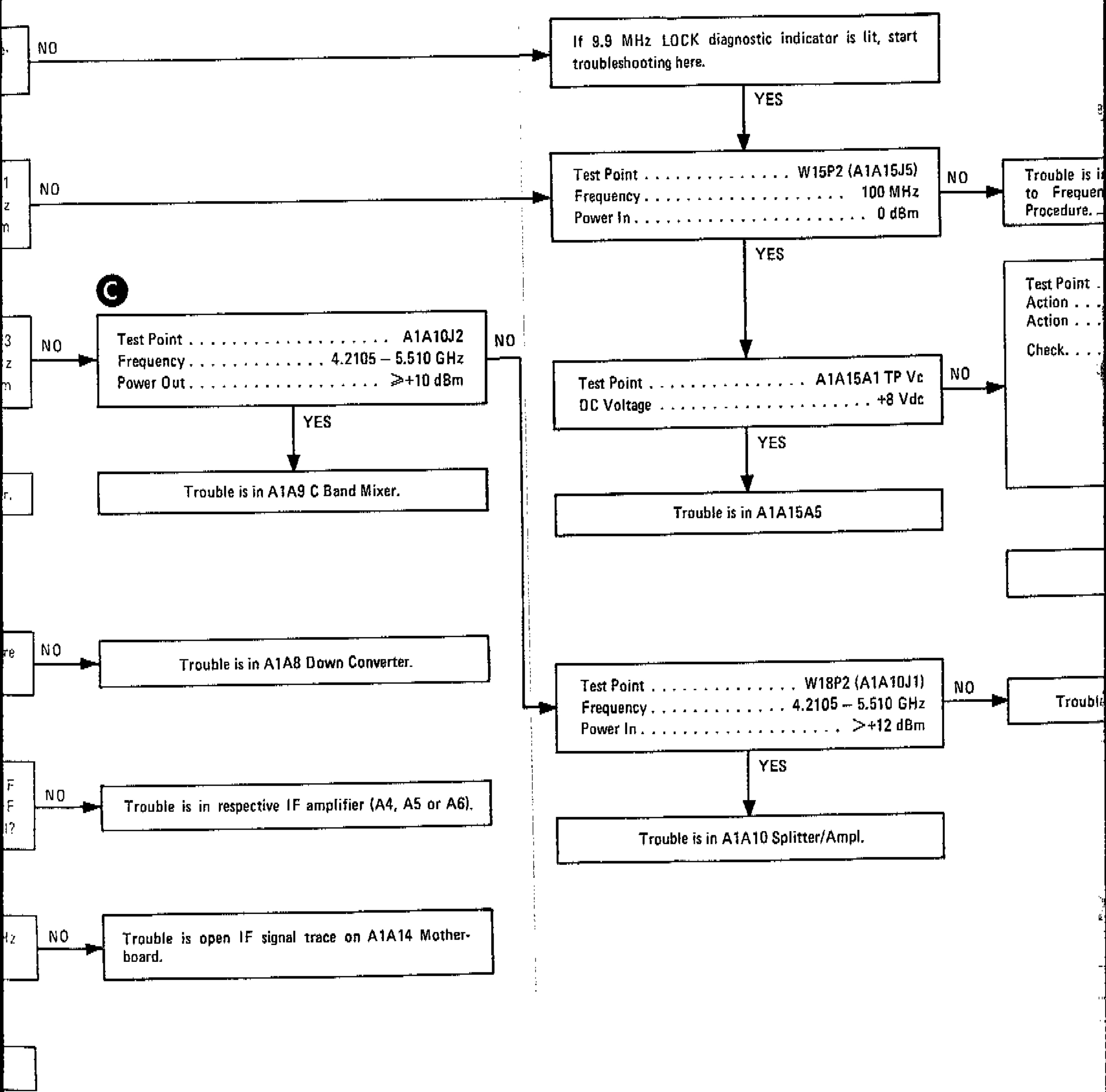


Fig B3-15
Sht 3 of 4

K diagnostic indicator is lit, start
re.

YES

. . . . W15P2 (A1A15J5)
. . . . 100 MHz
. . . . 0 dBm

NO

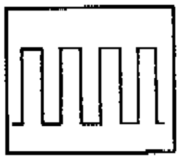
Trouble is in Frequency Control Assembly A2. Refer to Frequency Control Assembly Troubleshooting Procedure.

YES

. . . . A1A15A1 TP Vc
. . . . +8 Vdc

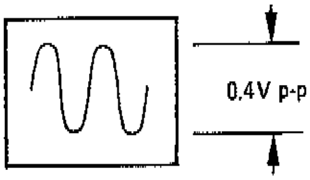
NO

Test Point A1A15A1TP1
Action . . . . Short TP1 to Ground
Action . . . . Tune V_{Tune}
Check. . . . . 9.9 MHz at A1A15A1U1 Pin 6



NO

Test Point A1A15A3
Frequency 100



YES

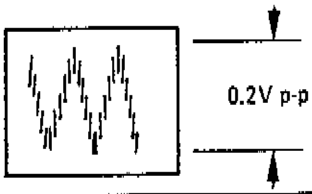
uble is in A1A15A5

YES

Trouble is in A1A15A1.

YES

Test Point A1A15A
Frequency 9.9



. . . . W18P2 (A1A10J1)
. . . . 4.2105 – 5.510 GHz
. . . . >+12 dBm

NO

Trouble is in Frequency Control Assembly A2.

YES

YES

s in A1A10 Splitter/Ampl.

Trouble is in A1A15A3.

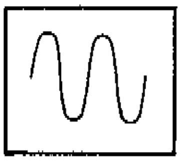
Fig B3-15
Sht 4 of 4

mbly A2. Refer
Troubleshooting

A1A15A1TP1
TP1 to Ground
. Tune V_{Tune}
A15A1U1 Pin 6

NO →

Test Point . . . . A1A15A3 DRI
Frequency . . . . 100 MHz

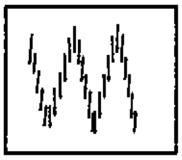


0.4V p-p

NO → Trouble is in A1A15A3.

YES ↓

Test Point . . . . A1A15A5 IF
Frequency . . . . 9.9 MHz



0.2V p-p

NO → Trouble is in A1A15A5.

YES ↓

Trouble is in A1A15A3.

sembly A2.

Figure B3-15. LO Source Troubleshooting Procedure

Table B3-4. RF Source/Converter Coax Cables (1 of 2)

Reference Designation	HP Part No.	Description	Mnemonic	Remarks
W1	08505-60081	GRAY/BROWN COAX: IF OUTPUT R A1A14J4 to A1A13J1-A1	IF PORT R	
W2	08505-60082	GRAY/RED COAX; IF OUTPUT A A1A14J5 to A1A13J1-A2	IF PORT A	
W3	08505-60083	GRAY/ORANGE COAX; IF OUTPUT B A1A14J6 to A1A13J1-A3	IF PORT B	
W4	08505-60084	GRAY/BLUE COAX; COUPLED LO OUTPUT. A1A7J3 to A1A13J1-A6		
W5	08505-60085	GRAY COAX; 100 MHz IN A1A15J4 to A1A15J3	100 MHz	
W6	08505-60086	BLUE COAX; 10 MHz IN A1A13J2 to A1A15J1	10 MHz	
W7	08505-60087	VIOLET COAX; 100 MHz IN A1A13J2 to A1A15J5	100 MHz	
W8	08505-60089	YELLOW COAX; 4.210 GHz OSC. OUT A1A6J1 to A1A11J1	4.210 OUT	
W9	08505-60090	BLACK COAX; 4.2099 GHz OSC. OUT A1A5J1 to A1A9J1	4.2099 OUT	
W10	08505-20073	CABLE ASSY, SEMI-RIGID COAX; B INPUT TO DWN CNVTR (A1A8J2)	INPUT B	
W11	08505-20074	CABLE ASSY, SEMI-RIGID COAX; A INPUT TO DWN CNVTR (A1A8J4)	INPUT A	
W12	08505-20075	CABLE ASSY, SEMI-RIGID COAX; R INPUT TO DWN CNVTR (A1A8J3)	INPUT R	
W13	08505-20076	CABLE ASSY, SEMI-RIGID COAX; ATTEN OUT (A1A2J2) TO RF OUTPUT	OUTPUT RF	
W14	08505-20077	CABLE ASSY, SEMI-RIGID COAX; RF AMPL to ATTEN INPUT A1A12J2 to A1A2J1		
W15	08505-20078	CABLE ASSY, SEMI-RIGID COAX; LO AMPL to DWN CNVTR A1A7J2 to A1A8J1		

Table B3-4. RF Source/Converter Coax Cables (2 of 2)

Reference Designation	HP Part No.	Description	Mnemonic	Remarks
W16	08505-20079	CABLE ASSY, SEMI-RIGID COAX; C-BAND MXR to RF AMPL. A1A11J3 to A1A12J1		
W17	08505-20079	CABLE ASSY, SEMI-RIGID COAX; C-BAND MXR to LO AMPL. A1A9J3 to A1A7J1		
W18	08505-20081	CABLE ASSY, SEMI-RIGID COAX; C-BAND YIG INPUT. A2J1 to A1A10J1		
W19	08505-20082	CABLE ASSY, SEMI-RIGID COAX; SPLITTER to MIXER. A1A10J2 to A1A9J2		
W20	08505-20082	CABLE ASSY, SEMI-RIGID COAX; SPLITTER to MIXER. A1A10J3 to A1A11J2		
W21	8120-0620	CABLE ASSY, RIBBON; INTER-CONNECT from MOTHERBOARD to FRONT PANEL INDICATOR BOARD. A1A14J2 to A1A1J1		
W22	8120-0620	CABLE ASSY, RIBBON; INTER-CONNECT from MOTHERBOARD to FRONT PANEL INDICATOR BOARD. A1A14J3 to A1A1J2		
W23	08505-60070	CABLE ASSY; ATTEN A1A14J1 to ATTEN		

A1A1 FRONT PANEL BOARD ASSEMBLY

General

The Front Panel Board Assembly is the interface between the RF Source/Converter's front panel controls, the LED diagnostic indicators, and the rest of the RF Source/Converter Assembly. Signals between the Front Panel Board and other assemblies in the RF Source/Converter are carried by two 16-wire flexible cables, which connect between the Front Panel Board and the RF Source/Converter Motherboard (A1A14). DC levels to and from the front-panel OUTPUT LEVEL dBm controls are carried by seven wires which connect to standoffs on the Front Panel Board. An additional six wires, also connected to standoffs on the Front Panel Board, supply +15 volts and −12.6 volts dc power to PROBE POWER connectors J5 and J6 on the front panel.

Output Level Control

The RF output level is adjusted with two front-panel OUTPUT LEVEL dBm controls. One is an eight-position rotary switch with settings from −60 dBm to +10 dBm in 10 dB increments. The second is a VERNIER potentiometer, which operates in conjunction with the switch and provides a continuously variable 12 dB of range for each of the switch positions. The VERNIER potentiometer connects between −10 volts and ground. Its wiper voltage is fed out of the Front Panel Board to the ALC and Attenuator Driver Board (A1A3) where it establishes the level of the RF modulator drive. With the VERNIER wiper at ground potential (full clockwise), no attenuation at all is imposed on the RF output by the modulation drive. The RF output level, therefore, is the maximum available, consistent with the setting of the OUTPUT LEVEL dBm switch. With the VERNIER wiper at −10 volts (full counterclockwise), the RF output is attenuated 12 dB by the modulator drive applied to the PIN modulator in 4.2 GHz Oscillator/Sampler A1A15A6. Thus, the RF output is 12 dB down from the output level selected with the OUTPUT LEVEL dBm switch.

Local / Remote

The Local/Remote input to the Front Panel Board feeds through an inverter, U3A, to the common side of the three-pole, eight-position OUTPUT LEVEL dBm switch. For local operation, the input to U3A is low, causing the switch common to be held at zero volts. A particular setting of the switch selects a particular combination of this low level to be fed out the 10, 20, and 40 dB control lines to the ALC and Attenuator Driver Board, A1A3.

During remote operation, the input to inverter U3A is low, causing the switch common to be held at approximately +5 volts. This back-biases control-line switching diodes CR1, CR2, and CR3 which effectively disconnects the control line outputs from the switch. For remote operation, therefore, the OUTPUT LEVEL dBm switch is ineffective.

Overload Indicators and Drivers

The overload indicators and drivers are controlled by the overload signal inputs from the R, A, and B 100 kHz IF Amplifier Board Assemblies, A1A4, A1A5, and A1A6, and by the setting, −30 or −10, of the INPUT LEVEL dBm MAX switch.

With the INPUT LEVEL dBm MAX switch set to −30, the IF gain (IFG) control line is set to the same value as the switch common line (low for local operation). When it is set to −10, the switch opens the IFG line. Transistor Q1 is then driven to saturation by the positive voltage applied to its base through resistors R30 and R31. As Q1's collector goes less positive (to approximately +0.2 volt), Q2 is driven to saturation and its collector rises to approximately +20 volts. This sets the voltage at the junction of R17 and R18 and the reference (−) inputs to the comparators (U1A, U1B, and U1C) to +1.0 volt.

The other (+) input to each comparator is the overload detector output from one of the three 100 kHz IF Amplifier Assemblies. Normally this input is near zero volts. If, however, the overload detector input rises above the 1.0 volt reference, the associated comparator's output will go high and the two outputs of the inverter buffers (U2 or U3) driven by the comparator will go low. As a result, current drawn from the +5 volts supply through the R, A, or B LED and the three OVERLOAD LED's will cause the LED's to light. Simultaneously, the IF overload indicator line to the HP-IB Buffer Board Assembly (A2A16) in Frequency Control Assembly A2 will be driven low.

When the INPUT LEVEL dBm MAX switch is set to −30, Q1's base is pulled low through CR4 and the switch common line (assuming local operation). This holds Q1 off. Q1's high collector voltage, in turn, cuts off Q2. Under these conditions, the voltage at the junction of R17 and R18 is approximately +0.1 volt. This voltage is now the reference applied to the negative (−) inputs of the comparators. If the overload detector input to a comparator rises above the +0.1 volt reference as a result of an input greater than −30 dBm to a 100 kHz IF Amplifier Assembly (A1A4, A1A5, or A1A6), the comparator output will switch from low to high and cause an overload indication.

During remote operation, the INPUT LEVEL dBm MAX switch is disabled and the overload reference level applied to the comparators is established by the level imposed on the IF gain (IFG) control line by the Switch Register Storage Board, A2A13, in Frequency Control Assembly A2.

Diagnostic Indicators

In addition to the red OVERLOAD indicating LED's, the Front Panel Board Assembly contains three greeen supply-voltage-present LED indicators and four red LED's that indicate failures in the signal generating circuitry.

The three supply-voltage-present LED's monitor the +20 volts, +5 volts, and −10 volts dc power inputs to the RF Source/Converter Assembly. These LED's, connected in series between their respective supply voltages and ground, remain lighted as long as the voltages they monitor are present.

The four red LED signal generating status indicators monitor the lock condition of the RF output phase lock loop (10 MHz phase lock), the lock condition of the LO phase lock loop (9.9 MHz phase lock), the RF output (source), and the LO drive to the Down Converter Assembly (A1A8).

Each LED is connected between +5 volts and an input line which connects to a monitoring circuit on another board assembly in the RF Source/Converter. When the function being monitored is normal, the input line is high and little or no current is drawn through the LED. Therefore, the LED remains off. If, however, the function being monitored fails, the input line level drops to zero, current is drawn through the LED, and the LED lights.

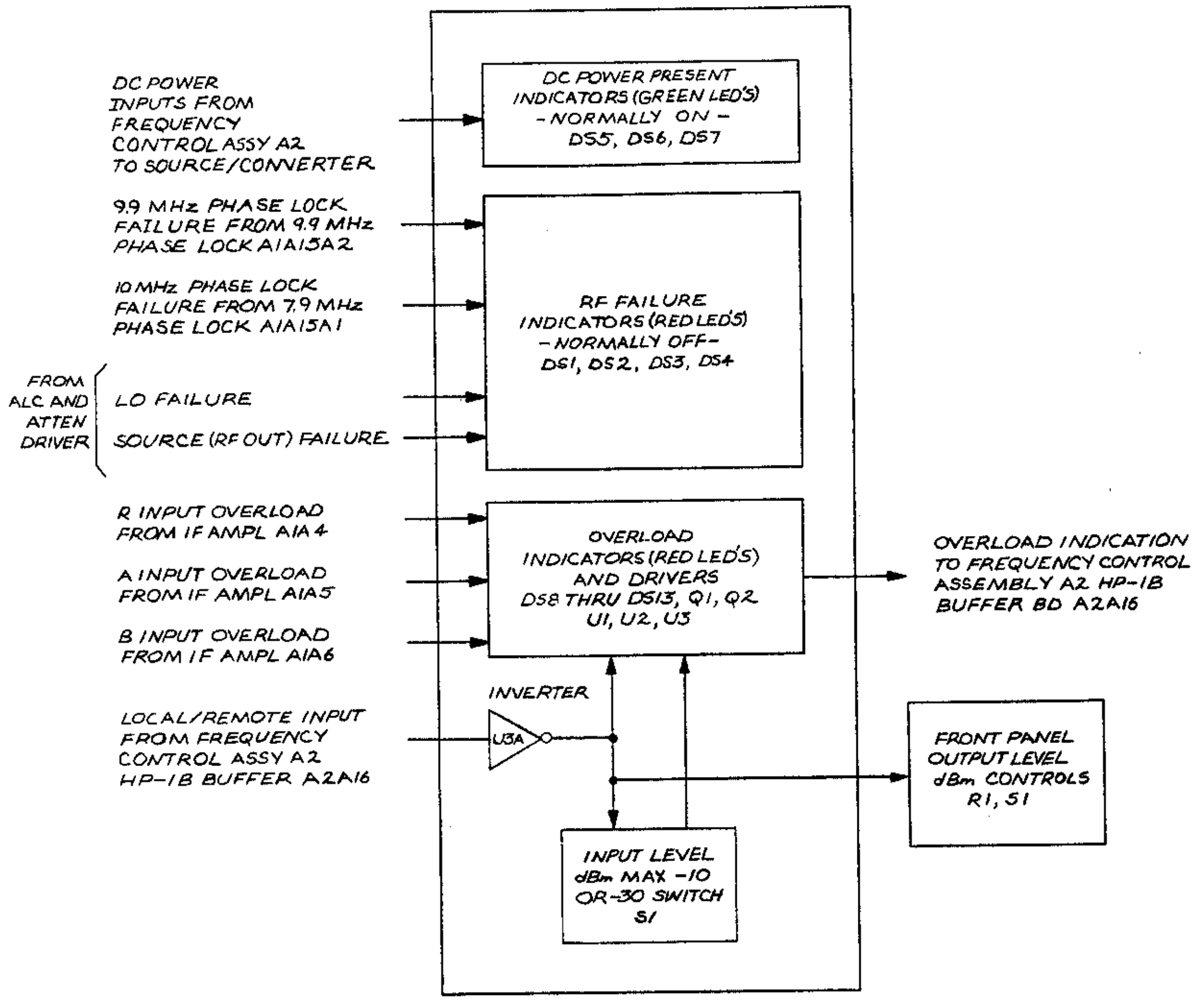


Figure B3-16. A1A1 Front Panel Board Block Diagram

A1A1

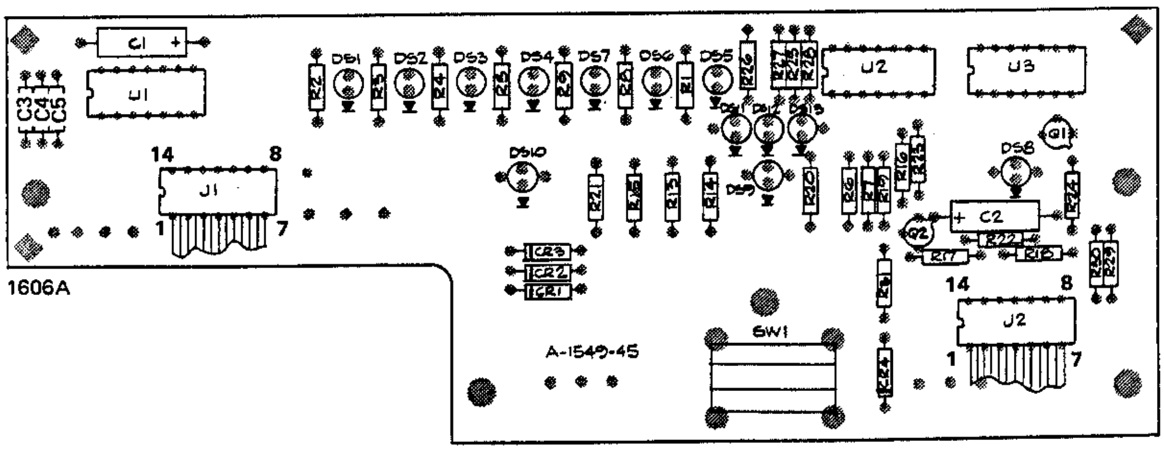


Figure B3-17. A1A1 Front Panel Board Parts Locations

Fig B3-18, Sht 1 of 3

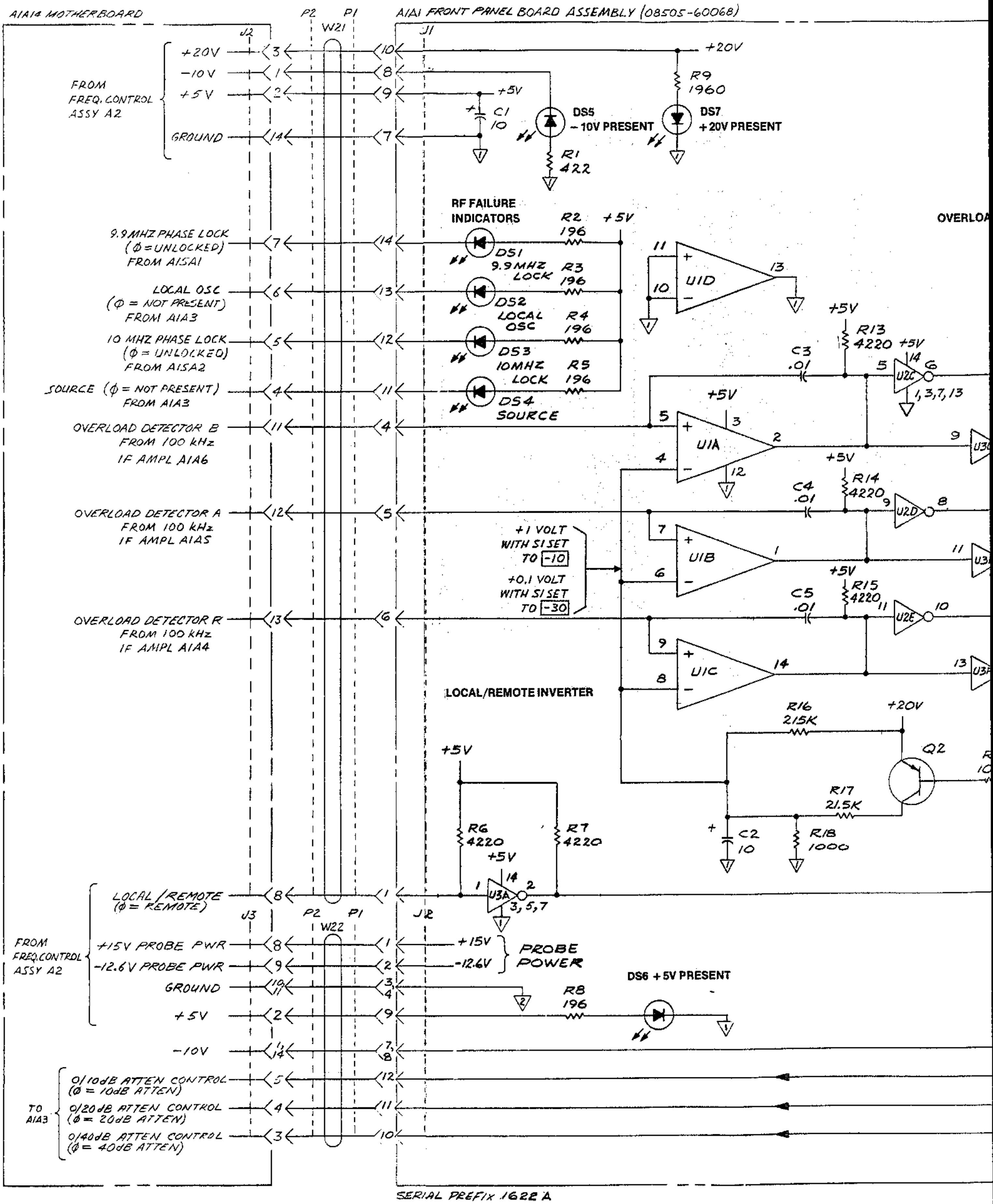


Fig. B3-18, Sht 2 of 3

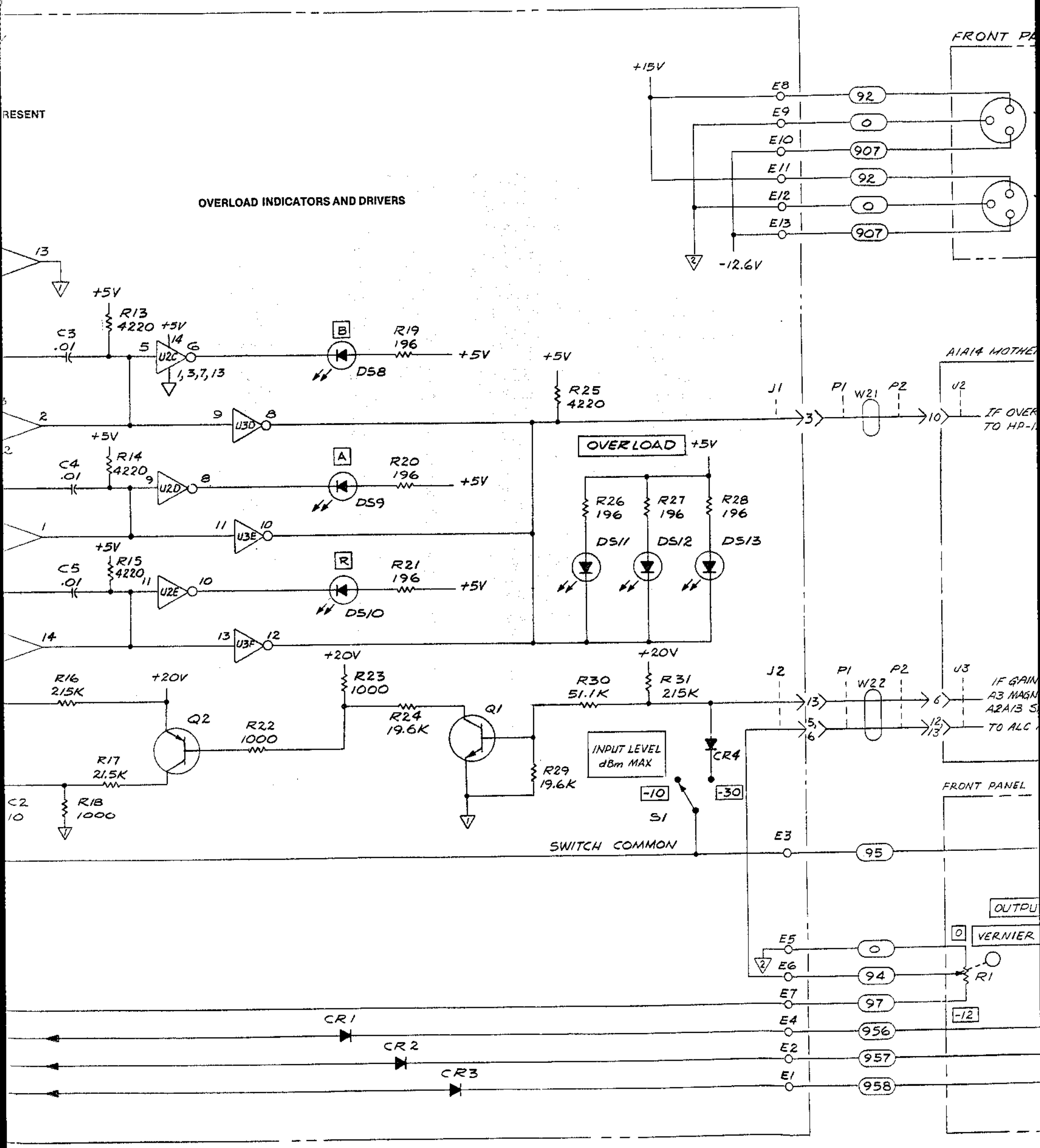
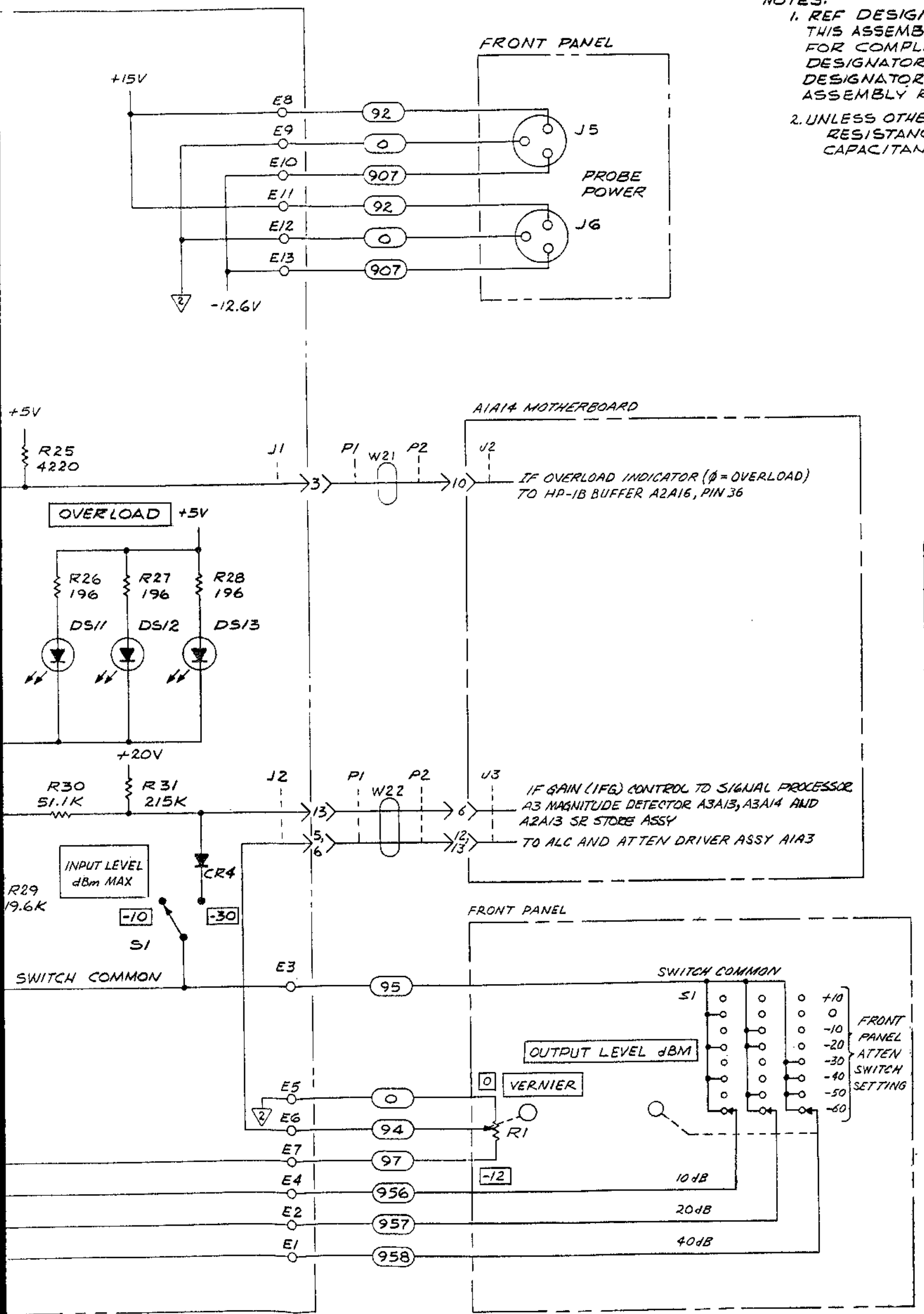


Fig B3-18, Sht 3 of 3

NOTES:
1. REF DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATOR, PREFIX REFERENCE DESIGNATOR SHOWN WITH THE ASSEMBLY REFERENCE DESIGNATOR.
2. UNLESS OTHERWISE INDICATED, RESISTANCE IN OHMS CAPACITANCE IN MICROFARADS



REFERENCE DESIGNATORS

A1A1
C1 - 5
CR1 - 4
DS1 - 13
J1 - 2
Q1 - 2
R1-9, R13-31
U1 - 3

OUTPUT SW	E4	E2	E1
+10	0	0	0
0	1	0	0
-10	0	1	0
-20	1	1	0
-30	0	0	1
-40	1	0	1
-50	0	1	1
-60	1	1	1

A1A1

Figure B3-18. A1A1 Front Panel Assembly, Schematic

A1A2 PROGRAMMABLE ATTENUATOR ASSEMBLY

The Programmable Attenuator Assembly contains three attenuator pads and three solenoid switch sections. The pads, 10, 20, and 40 dB respectively, are arranged in series and are switched into or out of the RF signal path by control inputs to the solenoids from ALC and Attenuator Driver Board A1A3. By switching various combinations of the pads into the RF path, 0 to 70 dB of attenuation can be obtained in 10-dB steps.

The solenoid switch section for each attenuator consists of two coils and two switches. Energizing one of the coils switches the associated attenuator into the RF path; energizing the other coil switches the RF to a "thru" path around the attenuator. Each coil in a two-coil solenoid and switch section has a separate input control line, and the levels on the lines to the two coils are always in opposition. If one line goes from high to low, the other goes from low to high.

A control line is active when it is low, pulling current from the +20 volts supply through the coil. Switching an attenuator into or out of the RF line is accomplished in approximately 20 milli-seconds. When the switching is completed, a mechanical linkage opens the line to the "on" coil to prevent it from drawing any more current, and simultaneously closes the line to the "off" coil. The attenuator switches, however, remain as set by the latest control inputs.

A1A3 AUTOMATIC LEVEL CONTROL AND ATTENUATOR DRIVER BOARD ASSEMBLY

General

The automatic level control (ALC) and the attenuator driver perform two completely separate functions. The attenuator driver circuitry, responding to three inputs from the OUTPUT LEVEL dBm switch on the RF Source/Converter front panel, provides two control outputs to each of the three switching solenoids in Programmable Attenuator A1A2.

The automatic level control circuitry has three functions. First, it uses the input from the OUTPUT LEVEL dBm VERNIER control or Switch Register Storage Board A2A13 (remote opertion only) to establish an output level zero to 12 dB lower than the level set with the OUTPUT LEVEL dBm switch. Second, it utilizes feedback from the RF output to maintain the RF at a constant power level. And third, it monitors the Source RF output and the LO output and if either fails, it sends a "source not present" or "LO not present" signal to the appropriate failure indicator (LED) driver on Front Panel Board Assembly A1A1.

Attenuator Drivers

There are three identical attenuator driver circuits on the A1A3 board, one for each of the attenuator sections in the Programmable Attenuator. The following description applies to the 10 dB attenuator driver.

The input to the driver circuit depends on the setting of the OUTPUT LEVEL dBm switch. As shown on the Attenuator Drive Inputs Truth Table on the schematic diagram, Figure B3-22, the input to the 10 dBm driver is high (1) when the switch is set to +10, −10, −30, or −50 and the input is low (0) when the switch is set to 0, −20, −40, or −60. If you look at the switch connections on the Front Panel Board Schematic, Figure B3-18, you will notice that the high inputs are actually open circuits, while the low inputs are the switch common (low for local operation). On the A1A3 board, the open circuits are translated to high inputs by a resistor (R3, for example) which pulls the input line up to +5 volts.

Assuming the OUTPUT LEVEL dBm switch is set to +10, the open circuit on A1A3's pin 20 (0/10 dB input) causes pin 3 of inverter U4A to be pulled high by pull-up resistor R3's connection to +5 volts. This applies a low level to pin 2 of two-input AND gate U1B and the input of inverter U4F. Since the other input, pin 1, of AND gate U1B is held high through its connection to the +5 volts supply, U1B's output will be set low. This sets the 0/10 dB drive line input to the Programmable Attenuator at zero which provides a return for the +20 volts through the solenoid to switch in the "thru" section. A2S1A opens at the completion of this switching to open the current path on the 0/10 dB drive line. Simultaneously, A2S1B closes so it is ready to switch in the "10 dB Pad" when the 10 dB drive line goes low.

At the same time, the high output from inverter U4F sets pin 6 of AND gate U1A high. Since the other input to U1A is held high by its connection to +5 volts, the gate output goes high. This sets the 10 dB attenuation drive line high.

When the OUTPUT LEVEL dBm switch is reset to a position that sets the input at pin 20 of the A1A3 board low, the levels on the 0/10 dB drive (pin 17) and 10 dB attenuation drive (pin 2) reverse, activating the 10 dB coil and attenuator switch and de-activating the "thru" coil and switch. In effect, the AND gates that drive the control lines open their respective lines when their outputs are high, and provide a current path through the solenoid coils when their outputs are low.

The diodes connected between the control lines and ground and between the control lines and the +20 volts supply protect the AND gates from any high-voltage spikes which may occur as the coils are activated and deactivated.

Automatic Level Control

The automatic level control (ALC) circuitry on the A1A3 board is part of a feedback loop which includes RF Amplifier/Detector Assembly A1A2 and 4.2 GHz Oscillator/Sampler A1A15A6. A block diagram of this loop is shown in Figure B3-19. A sample of the RF output in the form of a dc level taken from the detector in A1A2 is compared to a reference dc on the ALC board. The difference between the dc representing the RF output and the dc reference is amplified and used to modulate (regulate) the output from the 4.210 GHz fixed oscillator. Because the 4.210 GHz is used to develop the RF output, the RF output level is subsequently affected.

The modulator drive power is set with the OUTPUT LEVEL dBm VERNIER control during local operation of the 8505A, and by a control input (REM V) from Switch Register Storage Board A2A13 during remote operation. Selection of either the vernier or remotely established level control input is selected by the input mode switch, U5. This switch will select the vernier unless a low vernier disable input to its A, B, and C control terminals causes it to switch to the remote level control. Trim potentiometer R7 in the vernier input line is set to limit the maximum attenuation available with VERNIER control to −12 dB.

The mode switch output is fed to a shaping circuit composed of operational amplifier U7 and a feedback network which includes resistors R10 through R12 and breakdown diodes VR2 and VR3. Also summed into the input to the shaping circuit is an AM input which can, if desired, be connected through a connector on the Frequency Control Assembly rear panel.

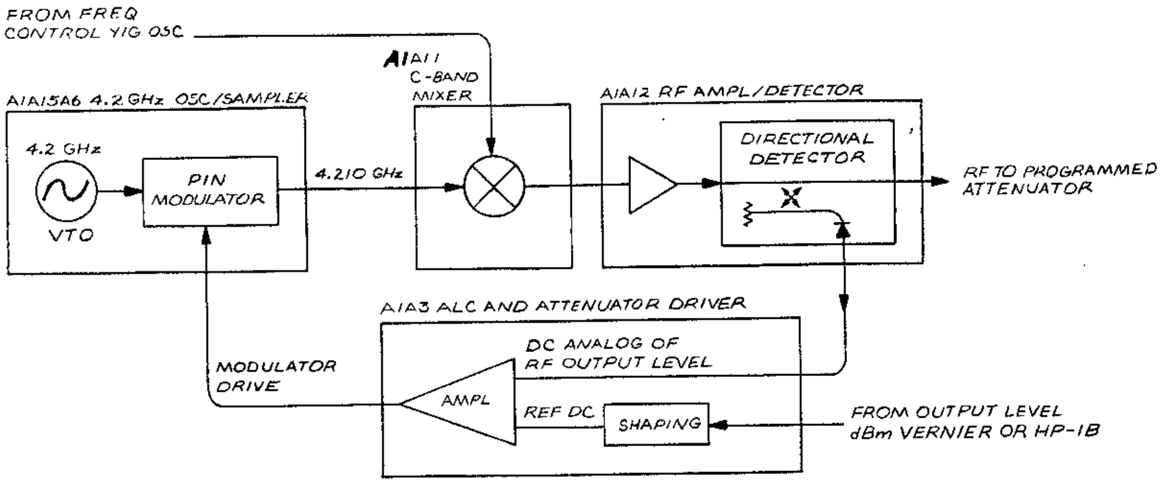


Figure B3-19. ALC Loop Block Diagram

The summed inputs and the feedback are applied to the inverting input of U7. The output of U7 is the product of its input current and the effective resistance in its feedback path. The vernier adjustment range is zero to −10 volts. As the input level approaches −10 volts, the output of U7 tends to go more positive. When the output reaches +5.11 volts, VR3 breaks down, adding R12 into the feedback path and reducing the amplifier gain. At +9.09 volts out of U7, VR2 breaks down, adding R11 in parallel with R12 to further reduce the amplifier gain. The result of these gain reductions is a non-linear output from U7 developed from a linear input.

The purpose of this shaping is to make U7's output which is used as a reference, track the detected RF from RF Amplifier/Detector Assembly A1A12, which feeds into the ALC board at pin 28. This tracking must occur in such a way that the RF power output in dB is linear with respect to the vernier (or remote) input level.

The output of U7 is applied through voltage divider R13 and R17, and out pin 29 to a temperature compensating diode mounted on RF Amplifier/Detector A1A12. Trim potentiometer R15 at U7's output is used to adjust the "no attenuation" level of the vernier to 0 dBm.

A small bias current is added through R18 to the temperature compensating diode on A1A12 to match it to the detector diode inside A1A12 which samples the RF output. This current generates the vernier reference voltage which is coupled to the inverting input of U6 through pin 30 of the ALC board and resistor R19.

The detector output from Amplifier/Detector A1A12 feeds into the ALC board through pin 28 and is coupled to the non-inverting input (pin 3) of reference amplifier U6. Resistor R20 connected between the detected RF input and +20 volts is used to develop a small bias current in the detector portion of Amplifier/Detector A1A12.

Integrated circuit U6 is an operational amplifier with a high dc gain. At the higher frequencies, feedback through capacitor C7 reduces the gain to maintain the stability of the overall leveling loop. The output of U6 is fed off the ALC board through pin 27 and the motherboard wiring to 4.2 GHz Oscillator/Amplifier A1A15A6. At A1A15A6, this signal (modulator drive) controls the level of the 4.210 GHz output from A1A15A6, and thereby affects the level of the RF output.

Failure Indicator Drivers

Transistors Q1 and Q2 are drivers for the RF (source) present and LO present LED indicators on Front Panel Board Assembly A1A1. If there is no RF present at the output of RF Amplifier/Detector Assembly A1A12, the dc voltage from the detector, applied to U6 pin 3, rises above the reference input to U6 pin 2. This occurs because, with no RF, the modulator drive will increase abnormally as it tries to force more RF out.

The resulting positive voltage at the base of Q2 drives Q2 toward saturation and pulls the RF source failure line low. This low input to the Front Panel Board then lights the RF source failure LED.

Transistor Q1, the LO failure indicator driver, is normally held at cutoff by the detected output from Local Oscillator Amplifier/Detector Assembly A1A7. With the LO present, this output is greater than 1 volt negative. If, however, the LO fails, the detected LO output will go positive to approximately 0 volts. Resistor R25 will then pull the base of Q1 toward +0.6 volts and Q1 will turn on. With Q1 on, the LO failure line will go low and turn on the LO failure LED indicator on the Front Panel Board.

Fig. B3-20
Sht 1 of 3

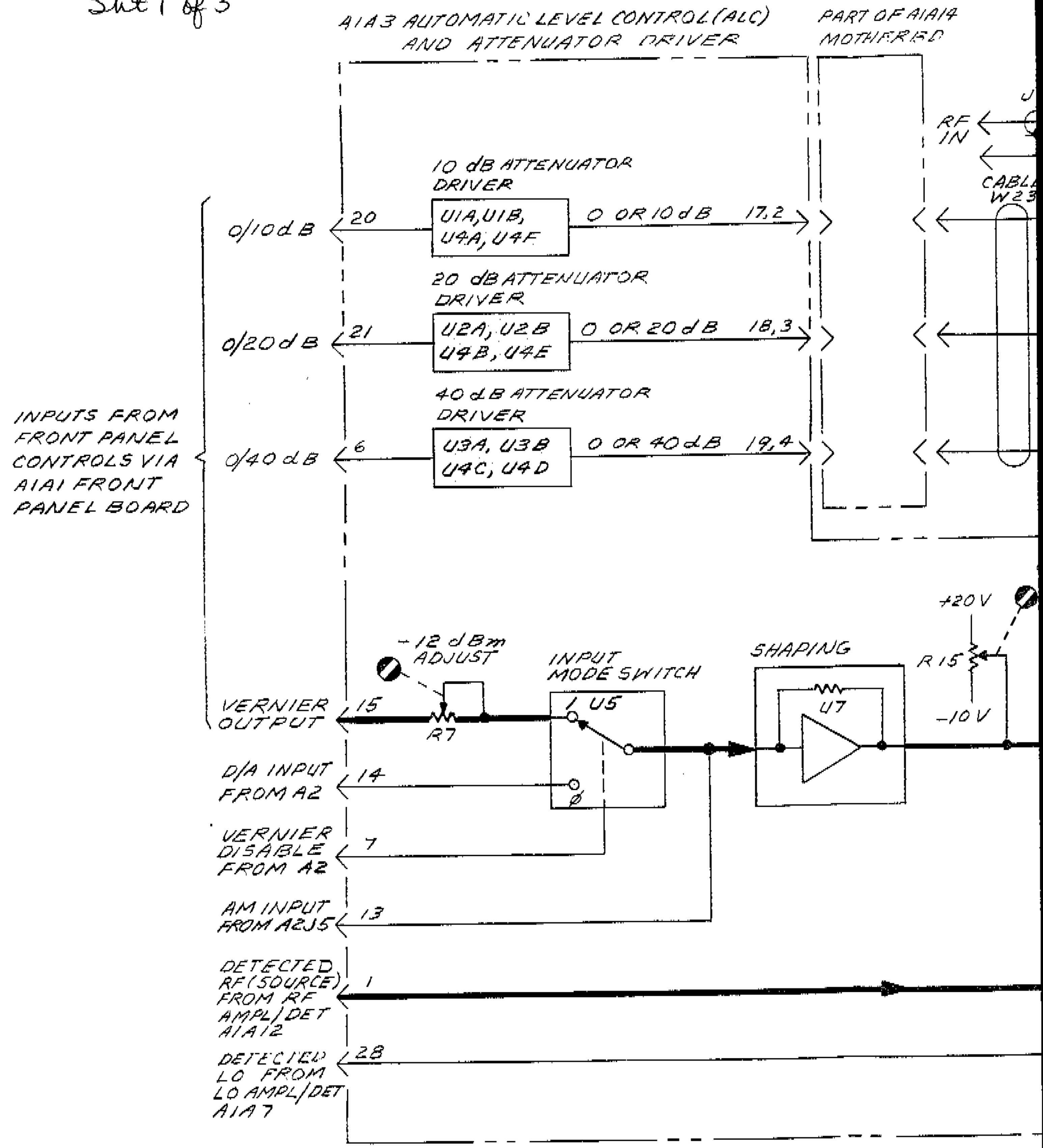
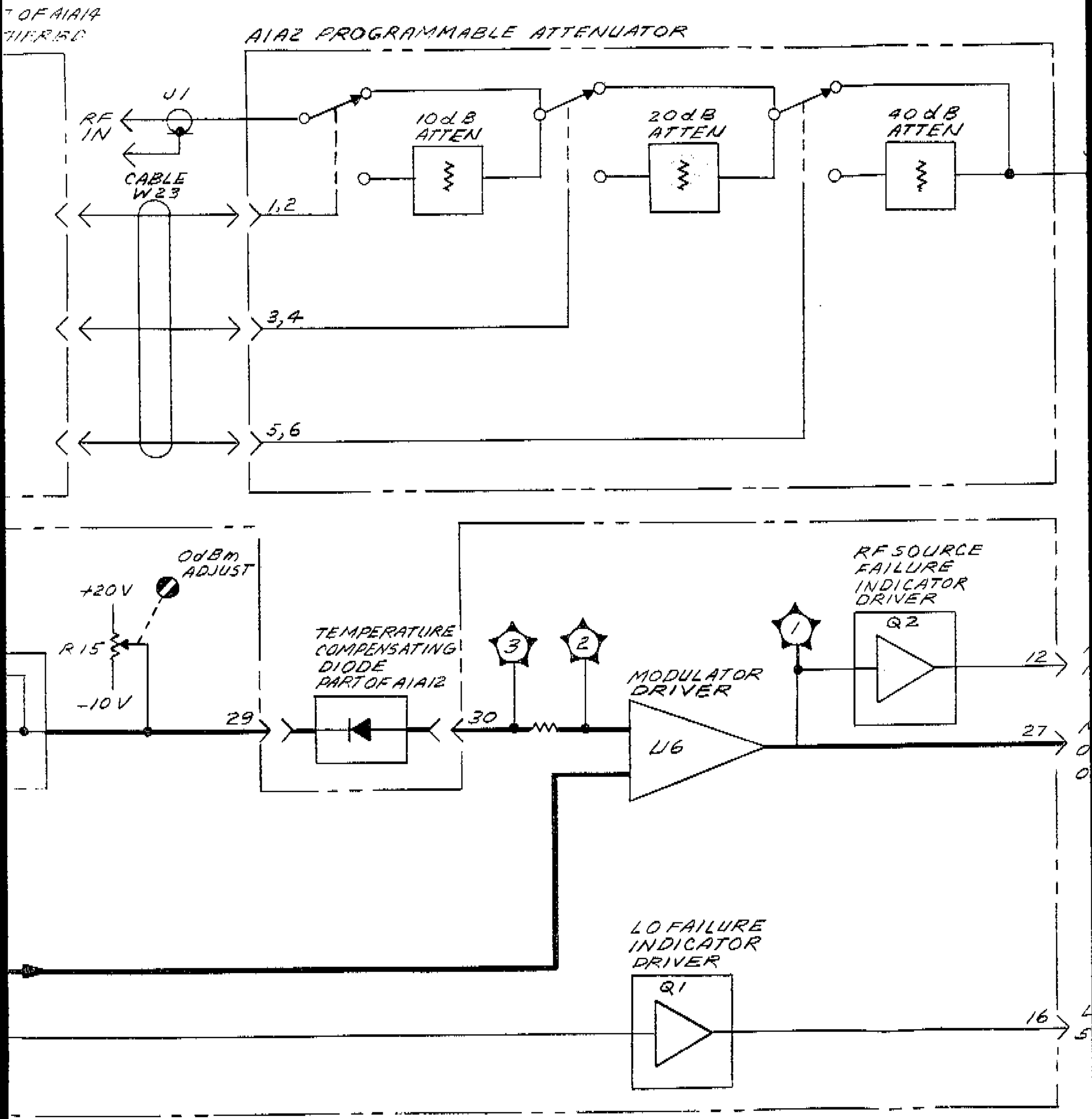
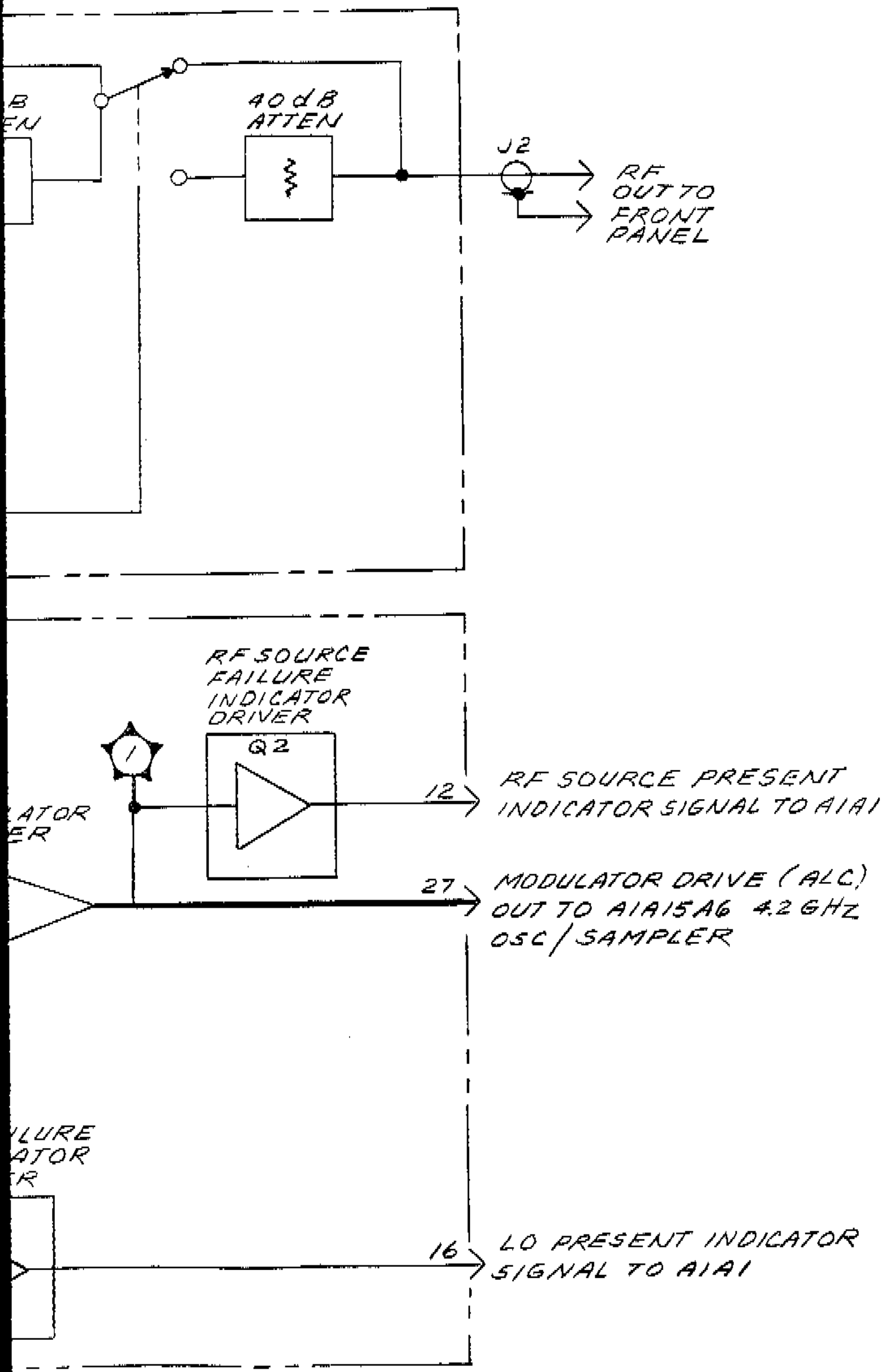


Fig. B3-20
Sht 2 of 3



Figu

Fig. B3-20
Sht 3 of 3



A1A2/A1A3

Figure B3-20. A1A2 Programmable Attenuator and A1A3 ALC Block Diagram

A1A3

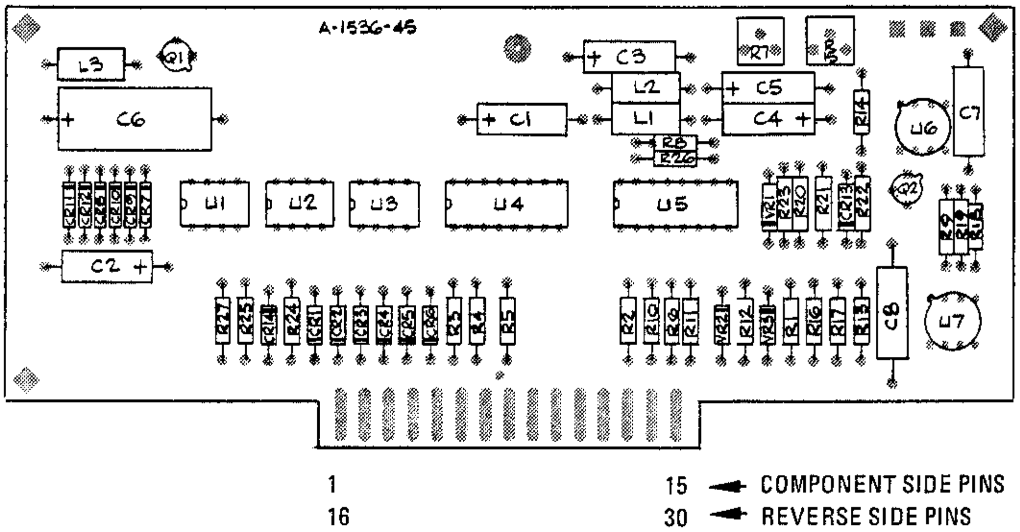


Figure B3-21. A1A3 Automatic Level Control (ALC) Assembly Parts Locations

Fig B3-22
Sht 1 of 4

ATTENUATOR DRIVE INPUTS
TRUTH TABLE

OUTPUT LEVEL dBm SWITCH POSITION	INPUT STATUS		
	0/10 dB PIN 20	0/20 dB PIN 21	0/40 dB PIN 6
+10	1	1	1
0	0	1	1
-10	1	0	1
-20	0	0	1
-30	1	1	0
-40	0	1	0
-50	1	0	0
-60	0	0	0

1 = ATTENUATOR SECTION INACTIVE
0 = ATTENUATOR SECTION ACTIVE

DC LEVELS *

TEST POINT	VERNIER POSITION		
	0	-6	-12
U7-6	+37mV	+8.6V	+13.2V
1	-1.3V	-1.82V	-2.6V
2	+85mV	+25mV	+350mV
3	+83mV	+256mV	+348mV
PIN 29	-185mV	-14.7mV	+81mV
PIN 15	0V	-5V	-10V

* MEASURED AT 1300 MHZ

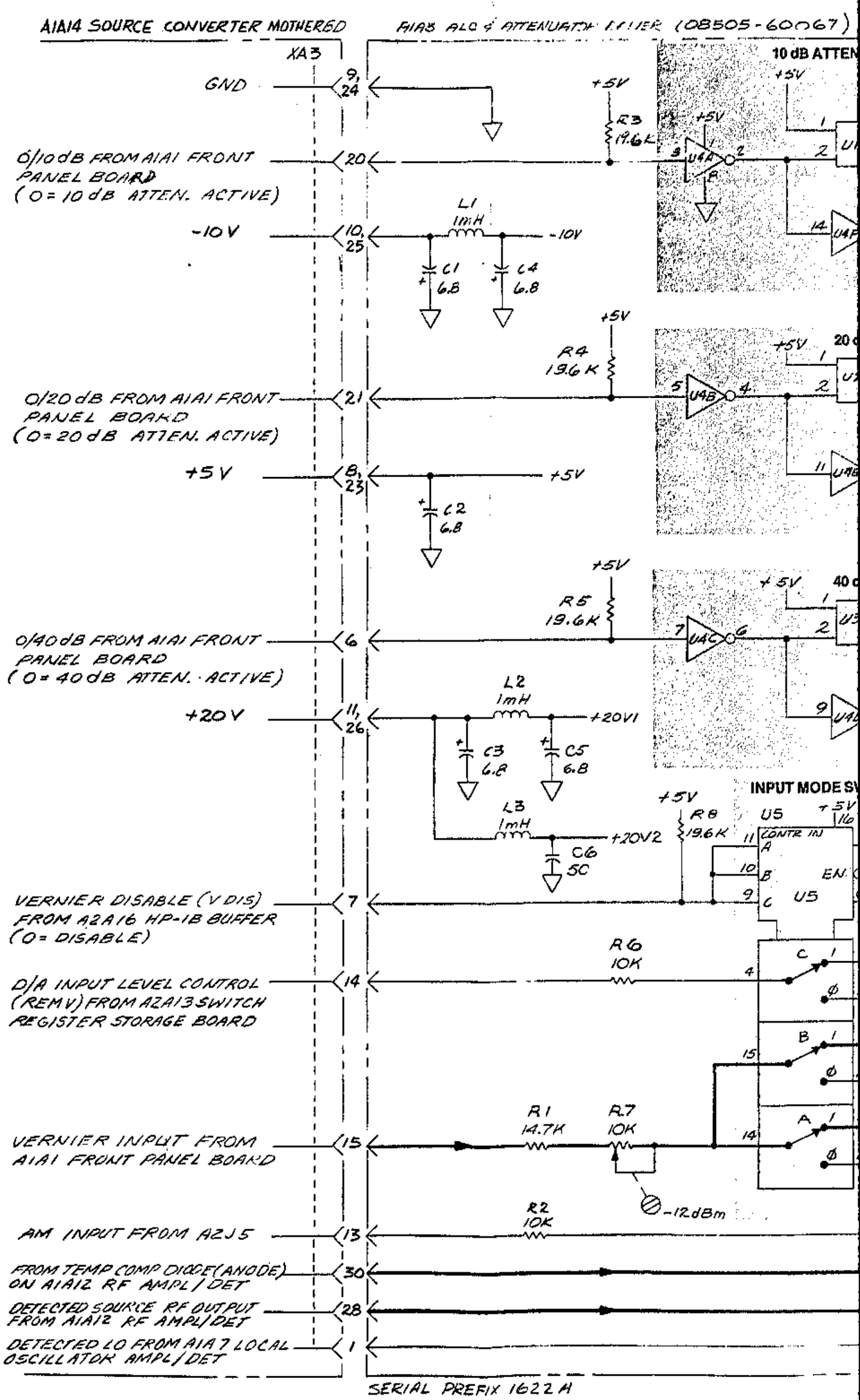


Fig. B3-22
Sht 2 of 4

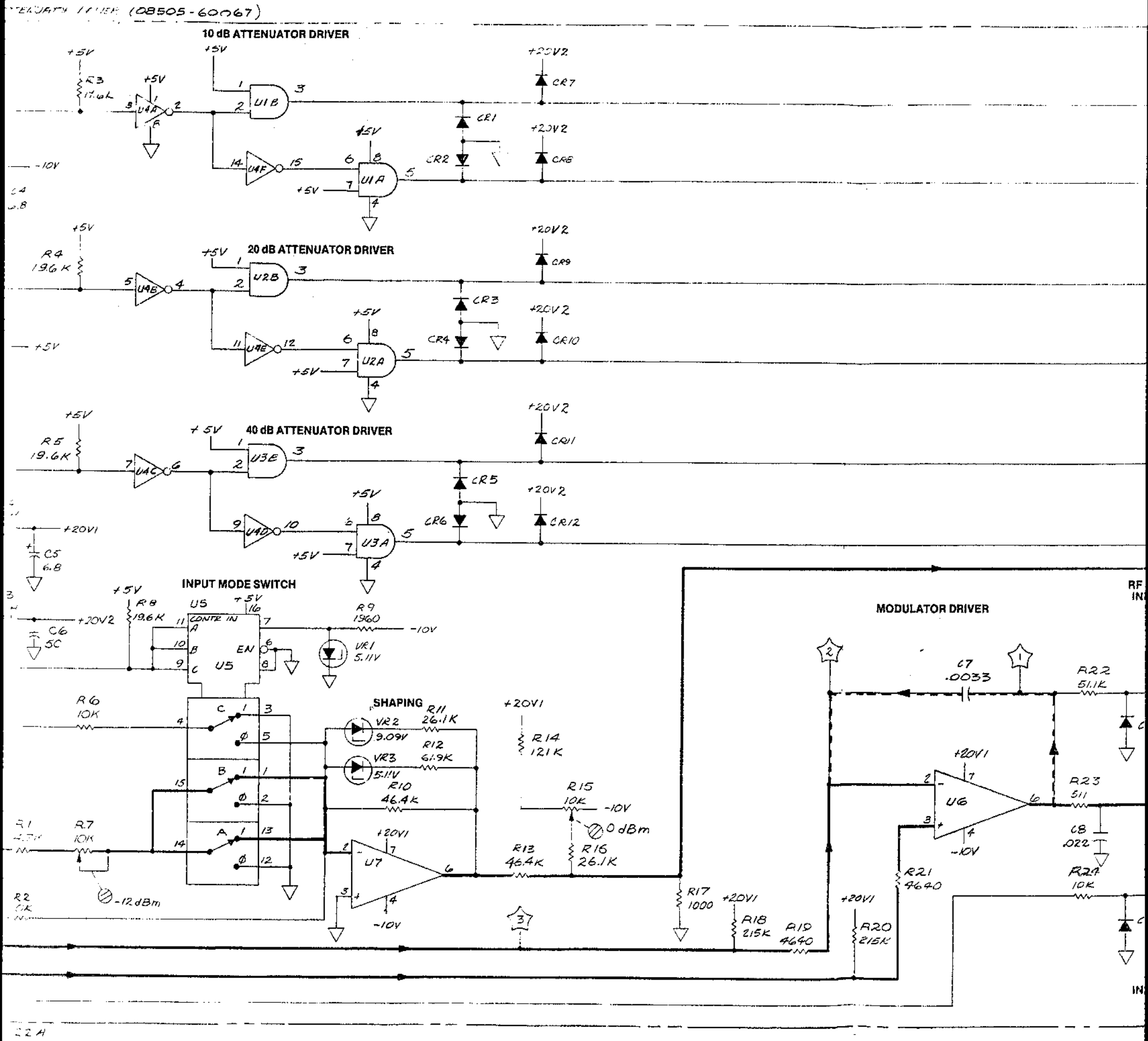
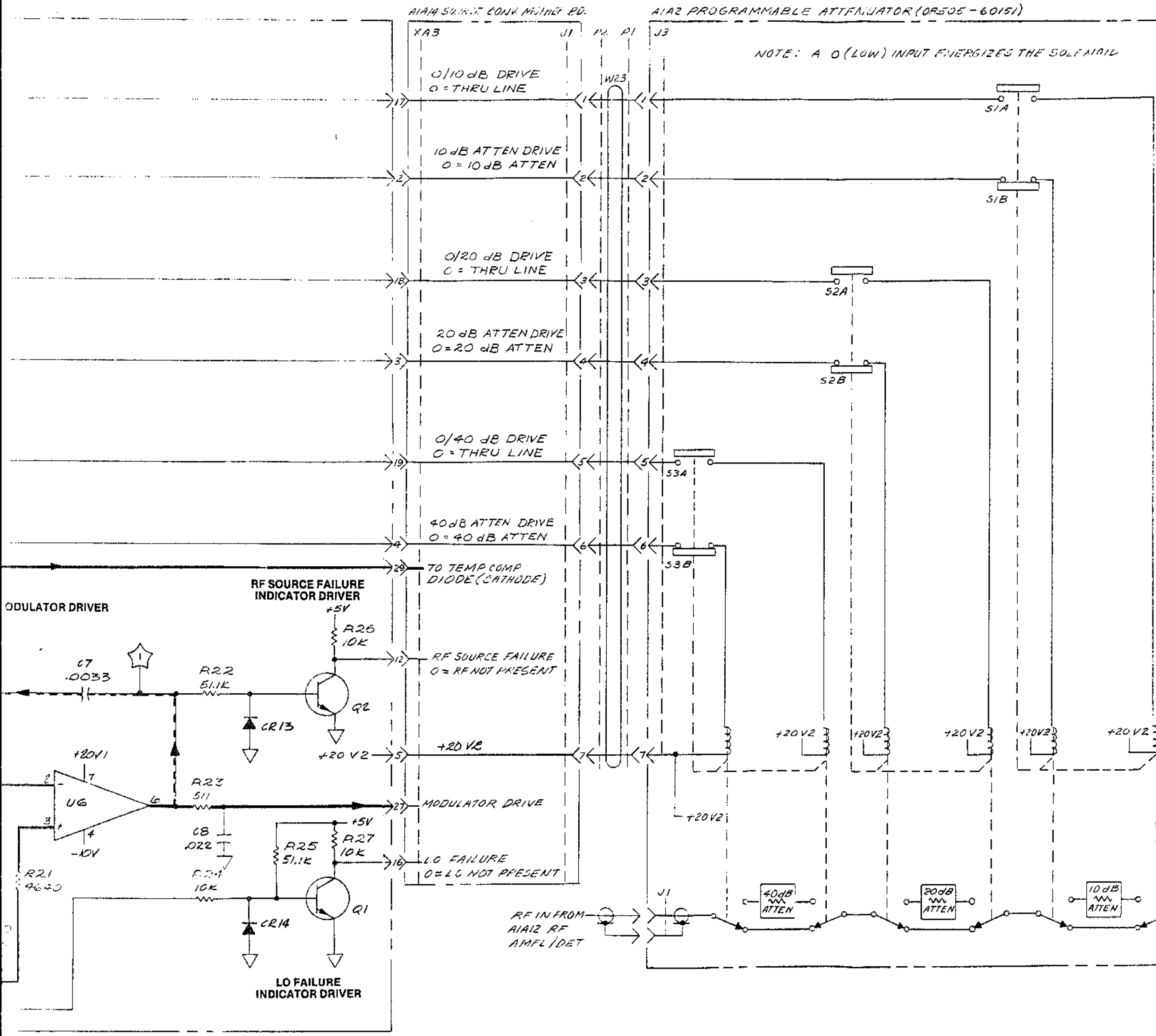
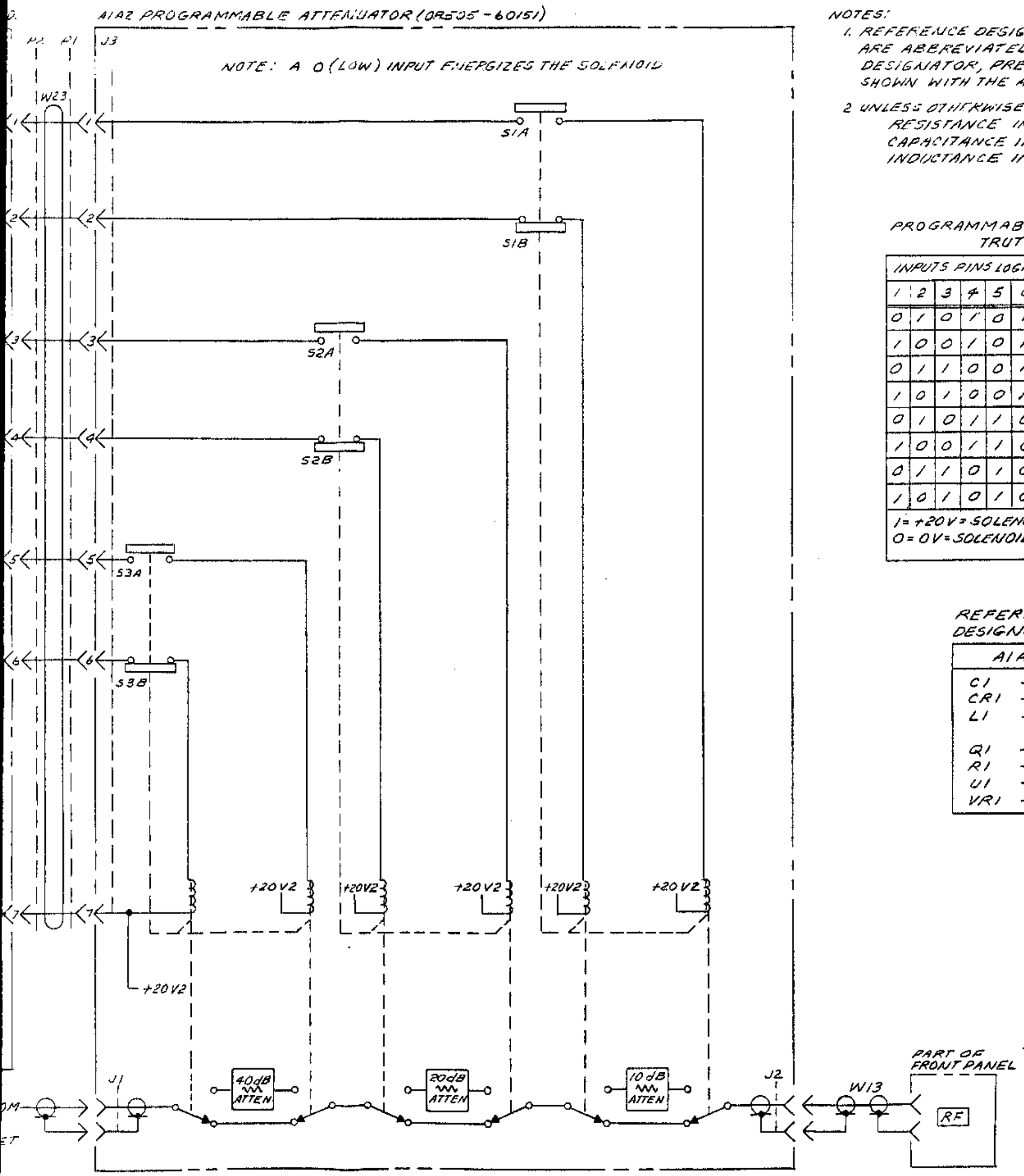


Fig. B3-22
Sht 3 of 4



Figure

Fig. B3-22
Sht 4 of 4



NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATOR, PREFIX REFERENCE DESIGNATOR SHOWN WITH THE ASSEMBLY REFERENCE DESIGNATOR
2. UNLESS OTHERWISE INDICATED –
   RESISTANCE IN OHMS
   CAPACITANCE IN MICRO FARADS
   INDUCTANCE IN MICROHENRIES

PROGRAMMABLE ATTENUATOR TRUTH TABLE

INPUTS PINS LOGIC						TOTAL ATTENUATION
1	2	3	4	5	6	
0	1	0	1	0	1	0 dB
1	0	0	1	0	1	10 dB
0	1	1	0	0	1	20 dB
1	0	1	0	0	1	30 dB
0	1	0	1	1	0	40 dB
1	0	0	1	1	0	50 dB
0	1	1	0	1	0	60 dB
1	0	1	0	1	0	70 dB

1 = +20 V = SOLENOID DE-ENERGIZED
0 = 0 V = SOLENOID ENERGIZED

REFERENCE DESIGNATORS

A1A3
C1 – C8
CR1 – CR14
L1 – L3
Q1 – Q2
R1 – R27
U1 – U7
VR1 – VR4

A1A2/A1A3

Figure B3-22. A1A2 Programmable Attenuator and A1A3 ALC and Attenuator Driver, Schematic

A1A4, A1A5, A1A6 IF AMPLIFIER

IF Amplifier Board Assemblies A1A4, A1A5, and A1A6 are identical. They amplify and filter the three outputs of the Down-Converter Assembly (A1A8). The 100 kHz output from each IF Amplifier is detected in the Signal Processor Assembly A3. Each IF Amplifier consists of a Preamplifier with magnitude adjustment, a 200 kHz Low Pass Filter, an Output Buffer with phase adjustment, and an Overload Detector (see Figure B3-15A).

A dc level proportional to the 100 kHz output is fed out of each IF Amplifier to an associated overload detector and indicator circuit on the Source/Converter's Front Panel Board Assembly A1A1.

Preamplifier

Low-noise transistor Q5, connected in a common-base configuration, provides a low input impedance to the mixer drive current applied to the IF Amplifier input. Q5's collector current drives common-emitter stage Q4, and Q4's collector current is fed back to the amplifier input. Instantaneous voltages at the collector of Q4 are the product of the input current and the resistance in the preamplifier's feedback path. Variable resistor R6 in the feedback path will vary the amplifier gain approximately 1.6 dB. This adjustment is used to compensate for Mixer/IF Amplifier gain variations. R6 is adjusted for 1.0 volt peak-to-peak 100 kHz IF output at test point B with a −10 dBm input into the associated Mixer.

200 kHz Low Pass Filter

Capacitors C7, C9, and C11, and inductors L3 and L4 form a 200 kHz low pass filter between source impedance resistor R8 and load impedance resistor R9. The purpose of this LPF is to attenuate any RF and local oscillator drive feeding into the IF Amplifier from the Down Converter mixers. (During operation at lower frequencies, signals at 500 and 600 kHz could be present at the amplifier input.) If they were not blocked by the filter, higher frequency signals feeding through to Signal Processor Assembly A3 could cause detection problems.

Output Buffer

The 100 kHz IF signal is buffered by feedback amplifier Q1 and Q2. Transistor Q2 is connected in a common base configuration and Q1 is connected as a common emitter. Collector current from Q1 is fed back to Q2 through a network comprising R11, R10, C8, C10, and C12.

The gain of the buffer amplifier stage is equal to the product of the input current and the overall impedance in the feedback path at 100 kHz. In this stage, the feedback is a complex impedance. Phase shift through the buffer amplifier, determined by the values of C8, C10, and R10, is used to control the total phase shift in the mixer/amplifier chain. Capacitor C10 is factory selected to make the phase shift identical in all three IF Amplifiers. (The primary purpose of C10 is to compensate for phase shift differences in the 200 kHz low pass filters.) Variable capacitor C8 in the feedback path permits an adjustment of approximately 2.0 degrees of phase shift. It is used during adjustment procedures as a final vernier adjustment to match the phase shifts of the three IF Amplifiers after they are installed in a particular Source/Converter Assembly.

The buffer amplifier output, taken from the collector of Q1, is a low impedance drive which is fed to the Magnitude Detectors in the Signal Processor Assembly. This output is coupled through a 46.4 ohm resistor (R16) to set the output impedance at approximately 50 ohms. Another output, taken from the collector of Q1 through 1000 ohm resistor R17, provides a high-impedance auxiliary output for applications requiring minimum current drive.

Overload Detector

The 100 kHz signal that appears at the collector of Q1 also appears across resistor R15. The current through R15 drives the emitter of transistor Q3, connected in a common base configuration. This causes Q3 to dump its collector current into the rectifier circuit formed by diodes CR2 and CR3. The positive dc developed in CR2 establishes a voltage across resistor R21 that is proportional to the initial drive current (the 100 kHz output). This voltage is fed to an overload detector and indicator circuit on the Front Panel Board Assembly (A1A1).

An overload, indicated by the lighting of an OVERLOAD light-emitting diode on the Front Panel Board Assembly, occurs if the signal level input to the associated RF connector (R, A, or B) on the Source/Converter front panel is higher than the level (−10 dBm or −30 dBm) set with the front-panel INPUT LEVEL dBm MAX switch. If the input signal is too great, distortion may occur in the input mixer or in the Signal Processor's Magnitude Detectors.

The overload signal output level at which an overload indication is triggered on the Front Panel Board Assembly depends on the setting of the front-panel INPUT LEVEL dBm MAX switch. With the switch set to −30, the trigger threshold is met when the overload signal rises to +0.1 volt. When the switch is set to −10, the overload indication is triggered when the overload signal reaches +1.0 volt.

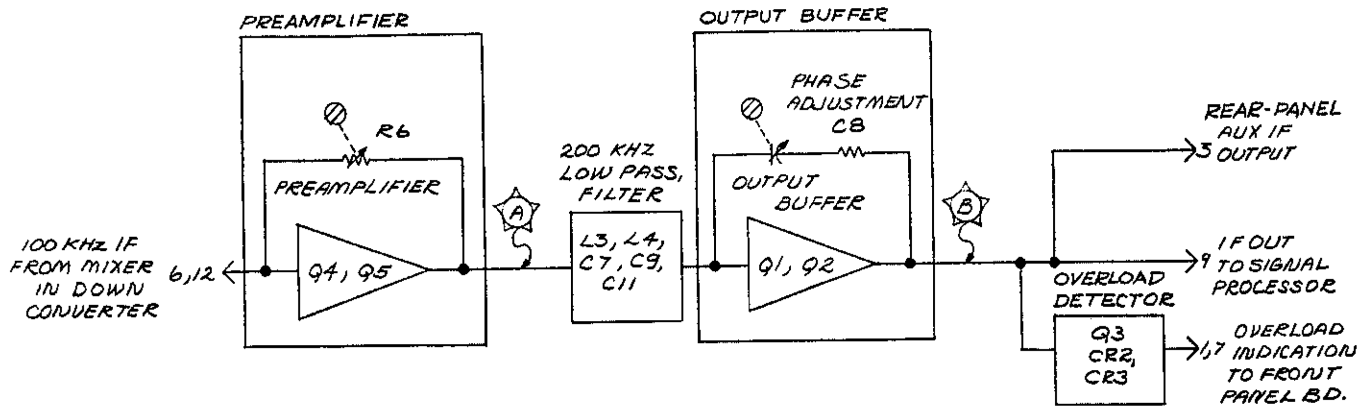


Figure B3-23. A1A4, A1A5, and A1A6 100 kHz IF Amplifier Block Diagram

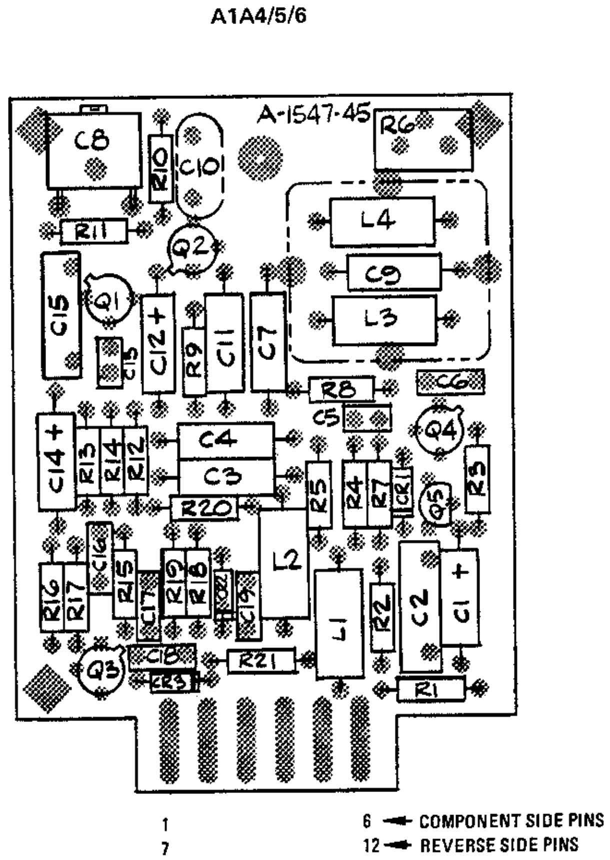
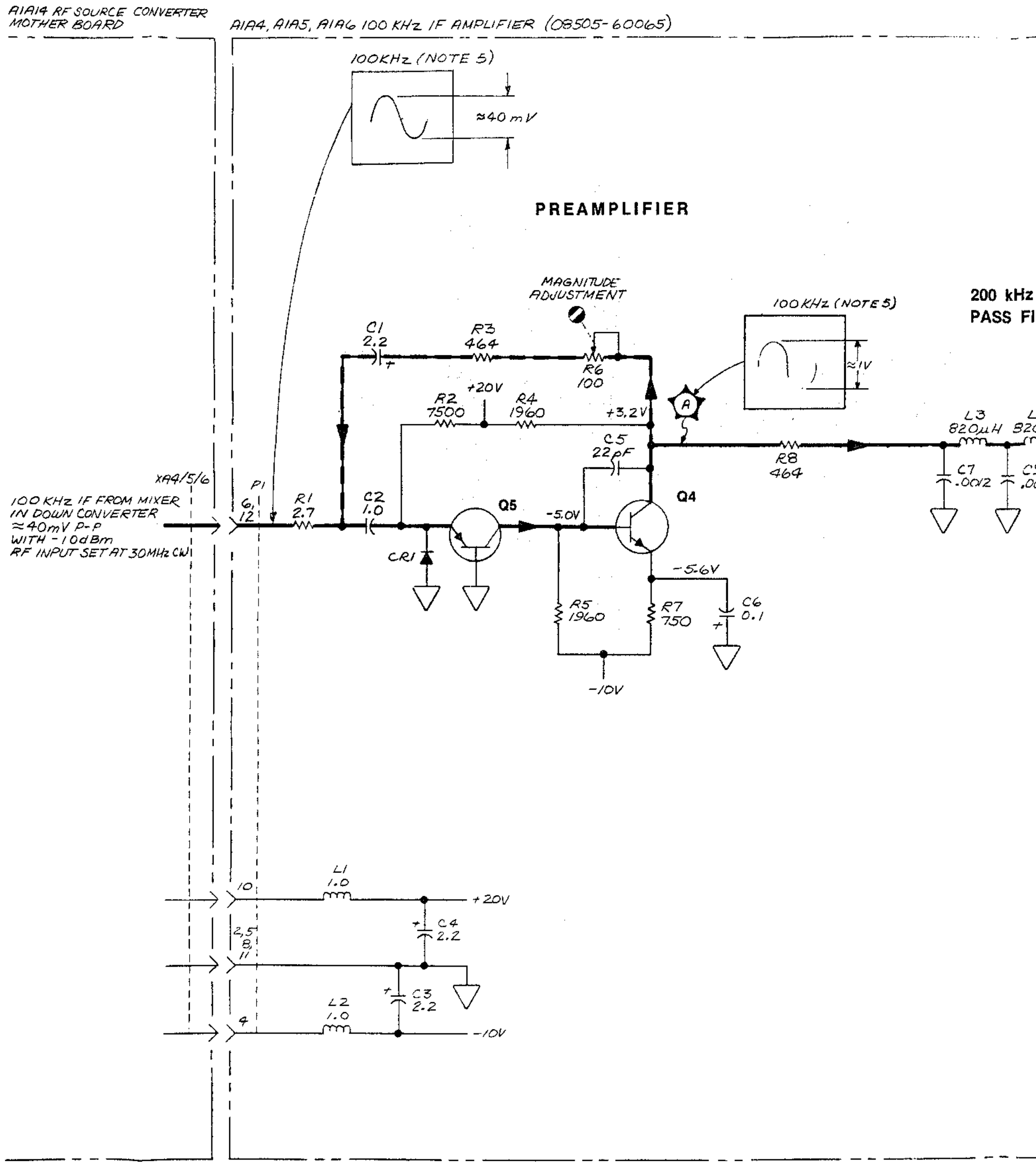


Figure B3-24. A1A4, A1A5, and A1A6 100 kHz IF Amplifier Parts Locations

Fig. B3-25
Sht 1 of 3



SERIAL PREFIX 1622A

Fig. B3-25
Sht 2 of 3

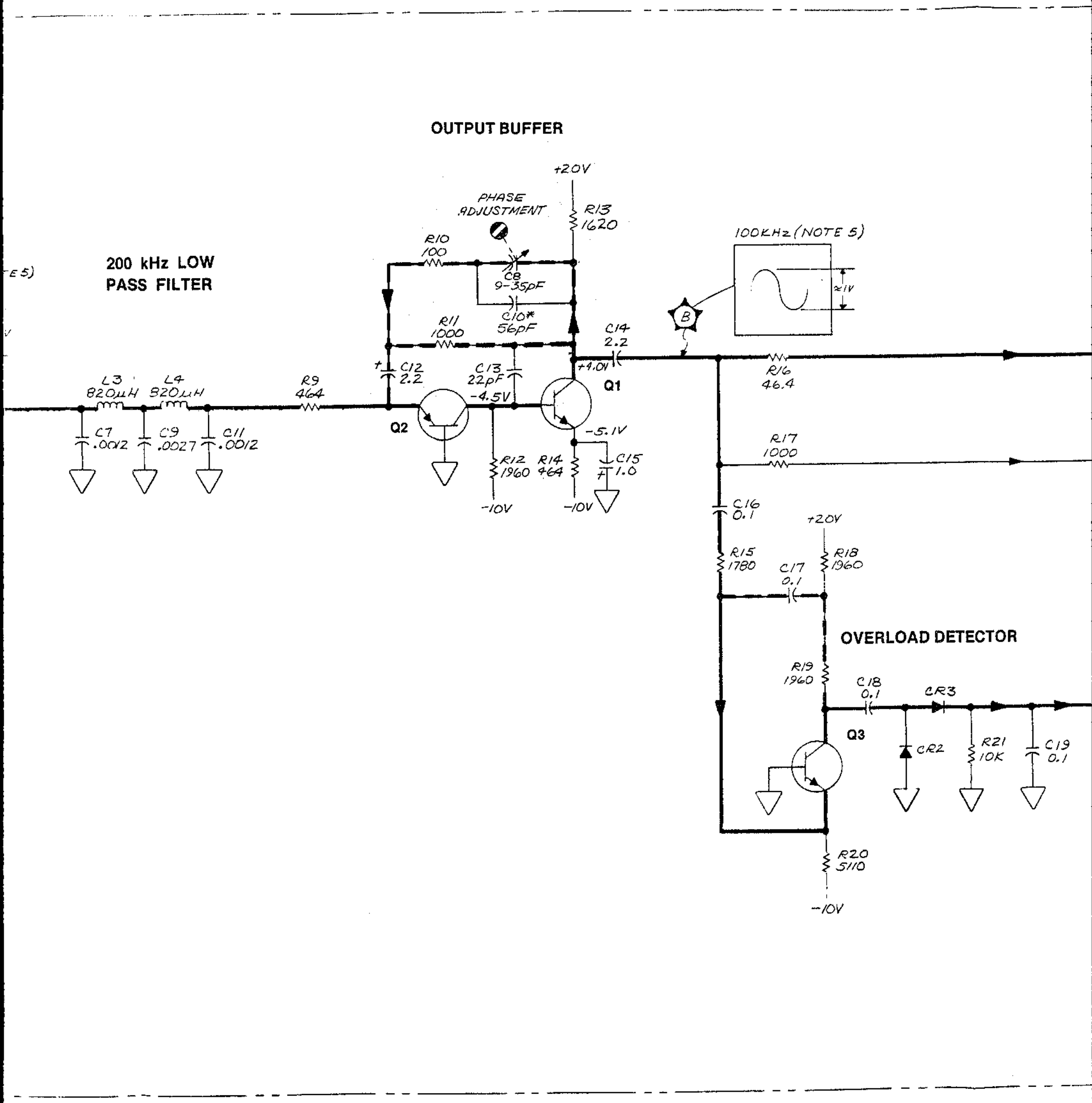
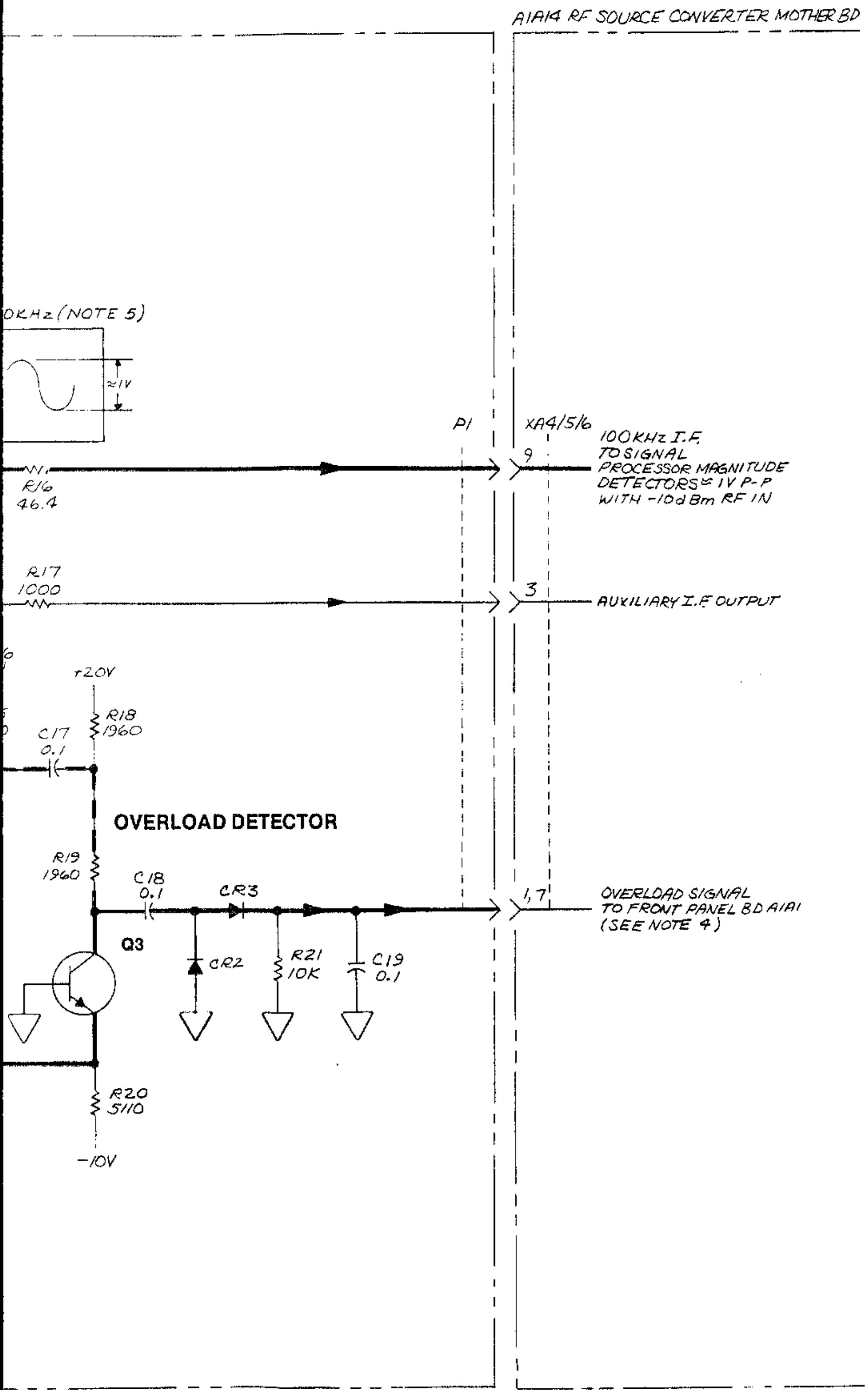


Fig B3-25
Sht 3 of 3



NOTES

1. UNLESS OTHERWISE INDICATED, RESISTANCE IN OHMS CAPACITANCE IN MICROFARADS
2. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATOR, PREFIX REFERENCE DESIGNATOR SHOWN WITH THE ASSEMBLY REFERENCE DESIGNATOR.
3. * FACTORY-SELECTED COMPONENT
4. NORMAL INPUT LEVEL IS EQUAL TO OR LESS THAN LEVEL SELECTED WITH $\boxed{\text{INPUT LEVEL dBm MAX}}$ SWITCH. OVERLOAD IS ANY INPUT LEVEL GREATER THAN LEVEL SELECTED WITH $\boxed{\text{INPUT LEVEL dBm MAX}}$ SWITCH.
5. WAVEFORMS TAKEN WITH -10dBm RF INPUT TO APPROPRIATE CHANNEL AT 30 MHz CW.

REFERENCE DESIGNATIONS

A1A4/5/6
C1-19
CR1-3
L1-4
P1
Q1-5
R1-21

INPUT LEVEL dBm MAX SWITCH POSITION	OVERLOAD TRIGGER LEVEL
-10	≥1.0VDC
-30	≥0.1VDC

A1A4/5/6

Figure B3-25. A1A4, A1A5, and A1A6 100 kHz IF Amplifier, Schematic

A1A7 THROUGH A1A12 MICROCIRCUIT ASSEMBLIES FUNCTIONAL DESCRIPTION

NOTE

Microcircuit subassemblies used in the RF Source/Converter Assembly are not field-repairable. If one of them fails, a new one must be ordered from the factory through the nearest HP office.

Introduction

Microcircuit subassemblies A1A7 through A1A12 are mounted under Fixed Oscillators Assembly A1A15 on top of the RF Source/ConverterMotherboard Assembly, A1A14. The microcircuit RF connectors protrude through the motherboard, and are accessible, along with their interconnecting cables, from the underside of the RF Source/Converter Assembly when the bottom cover is removed. Pins on the microcircuit are used for operating power, dc bias, and low-frequency signal connections. These pins insert into sockets in the motherboard etched wiring. RF connector and pin reference designators, cable interconnections, and microcircuit positions are printed in white on the bottom of the motherboard.

Block diagrams of the individual microcircuits, and their relation to each other are shown in Figure B3-26.

A1A7 LOCAL OSCILLATOR AMPLIFIER/DETECTOR

The Local Oscillator (LO) Amplifier/Detector amplifies the IF output of C-Band Mixer Assembly A1A9 to a level that enables the IF to drive all three mixers in Down Converter Assembly A1A8 simultaneously. This amplification is accomplished by two thin-film amplifiers biased by +20 volts applied to pins E1 and E2 of the assembly. The overall gain between input J1 and output J2 is approximately 45 dB. With the operating levels used, the output amplifier is operating at saturation, producing a high harmonic content at output connector J2.

Some of the 0.6 — 1300.1 MHz signal, taken from between the two amplifiers, is coupled out through a resistor and connector J3. This signal is sent to Frequency Control Assembly A2 for use in its counter and discriminator functions. A diode peak detector supplies an output through pin E3 that is used in the diagnostic system to indicate the LO output is present. At 100 Mhz and +15 dBm output, the detector voltage is at least 1 volt negative. To maintain a low noise level in the Down Converter, the low-frequency power out is reduced several dB. At 500 kHz, the output power should be greater than +10 dBm, and increase as you increase the output frequency.

A1A8 DOWN CONVERTER ASSEMBLY

The Down Converter Assembly is the front end receiver of the 8505A. It contains three separate mixers, one for each RF input, R, A, and B. All three mixers, driven by the same LO input, convert the RF at their inputs to 100 kHz outputs.

The 0.6 to 1300.1 MHz LO drive, tracking 100 kHz above the 0.5 to 1300 MHz inputs to the R, A, and B input connectors, is applied to connector J1. It is then changed from an equivalent 50-ohm drive to a 12.5-ohm drive to match it to the input impedance of the three paralleled mixers

The three mixers are identical. In each one, common base transistor amplifiers buffer the RF and LO inputs. Both inputs are fed to a two-diode balanced mixer, which develops the 100 kHz IF signal. Each mixer receives bias inputs of +20 volts and −10 volts applied to pins which extend through sockets in the RF Source/Converter Motherboard (A1A14). A third pin on each mixer feeds the mixer's 100 kHz IF output through the motherboard etched wiring to one of the three 100 kHz IF Amplifier Assemblies (A1A4, A1A5, and A1A6).

Troubleshooting Hints

1. Prevent dc transients from getting on the IF output pins. Transients can damage the mixing diodes.

2. Probe on the dc pins and not on the motherboard sockets the pins extend through. The problem may be that the pin and socket are not making contact, in which case a dc voltage present on the socket would not be applied to the pin on the Down Converter.

3. The R, A, and B inputs to the Down Converter are ac coupled. The LO input is shunted to ground by the input transformer.

4. Use the OVERLOAD indicating LED's on Front Panel Board A1A1 to check basic front end performance.

5. If the problem involves an IF output, exchange IF Amplifier Boards to make sure the problem is not in the IF Amplifier before assuming the Down Converter is defective.

A1A9 AND A1A11 C-BAND MIXERS

Microcircuits A1A9 and A1A11 are identical high-frequency, Quad-diode, balanced mixers. In each of them, the four diodes receive their LO switching drive at input port J2. The small signal input to port J1 is from the 4.2099 GHz or 4.2100 GHz phase-locked oscillator in Fixed Oscillators Assembly A1A15. The mixer output is the difference between the frequency of the signal at J1 and the frequency of the signal at J2. This difference frequency is filtered by a five-pole, thin-film, low-pass filter. This attenuates all undesirable harmonics and spurious products that come out of the mixer at a frequency higher than the 1300 MHz high-end operating range of the 8505A. The ratio of the signal input at J1 to the signal output at J3 is approximately 8 dB.

Troubleshooting Hints

1. If one of the two C-Band Mixer microcircuits appears faulty, but you are not sure that it actually is, substitute the other C-Band Mixer for the suspect one to confirm or disprove your suspicions.

2. When probing the inputs, avoid getting large dc transients on the input pins. Large transients can damage the four mixing diodes.

A1A10 SPLITTER/AMPLIFIER

Splitter/Amplifier Assembly A1A10 divides the variable-frequency input from Frequency Control Assembly A2's YIG oscillator into two equal signals. These two signals then provide the LO drive for C-Band Mixers A1A9 and A1A11. An amplifier in each output signal path boosts the LO power and helps isolate the two C-Band Mixers from each other and from the YIG oscilator input.

The YIG oscillator signal is applied to the Splitter/Amplifier at connector J1 and is split by a thin-film, hybrid power splitter. Each output of the splitter is then amplified. Bias inputs to the two high-frequency amplifiers are applied to the assembly at pins E1, E2, E3, and E4, which insert into sockets in the motherboard. External bias resistors, mounted on the motherboard, prevent excessive power consumption by the Splitter/Amplifier's internal components.

Preceding each of the two outputs from the Splitter/Amplifier is a 4—6 GHz bandpass filter. This filter attenuates any spurious mixing products reflected back from the C-Band Mixer.

The overall gain of the assembly from input to output over the YIG oscillator frequency range varies from approximately −2 to −5 dB.

Troubleshooting Hints

1. When checking a bias voltage, probe the bias pin instead of the socket in the motherboard. The problem might be that the pin and the socket are not making contact.

2. DO NOT short the dc bias pins to ground. A short to ground on these pins can damage the assembly's internal circuits.

3. If there is an apparent problem in one output path of the assembly, use the output of the opposite path (by switching cable connections) to confirm operation of the other assemblies affected by the apparently faulty output.

4. Output connectors J2 and J3 are internally grounded by the output bandpass filters. Check for continuiy between the connectors and ground to verify that they are actually connected to the internal circuitry.

A1A12 RF AMPLIFIER/DETECTOR

The signal out of the C-Band Mixer is too small for many measurement applications and must be amplified before it is fed to the 8505A's RF output connector. RF Amplifier/Detector A1A12 amplifies the IF output of C-Band Mixer A1A11, filters it, and detects the output power. The input signal at connector J1 is amplified, attenuated, and then amplified again to enhance the signal-to-noise ratio and reduce distortion at high output levels.

Two pins, E1 and E2, which plug into sockets in the motherboard, provide +20 volts operating power to the assembly's two amplifiers. At the output of the second (power) amplifier, a 500 kHz high-pass filter filters out 100 kHz noise. A 1.45 GHz low-pass filter removes unwanted RF source harmonics and high-frequency mixing spurs above 1300 MHz.

A diode detector just preceding the assembly RF output provides a dc voltage output proportional to the RF output power. The detector operates with 100 microamperes of bias current feeding into pin E3. With the front-panel VERNIER control set to 0, the voltage at E3 should be +85 mV. With the VERNIER set to −12, the voltage at E3 should be +350 mV.

Troubleshooting Hints

1. When you are probing the dc pins, DO NOT short them to ground or to other supply voltages. A short on one of these pins can damage the assembly's internal circuits.

2. Probe on the pins and not on the motherboard sockets. The problem may be a poor contact between a pin and its socket.

3. Pins E3, E4, and E5 connect to hot-carrier diodes with low breakdown voltages. These diodes are easily destroyed with measuring devices (ohmmeters, etc.) having high output voltages.

4. If you have a problem with the temperature compensating diode, connecting a jumper between E4 and E5 will allow the rest of the system to function normally.

B3-35/36a

Fig B3-26
Sht 1 of 2

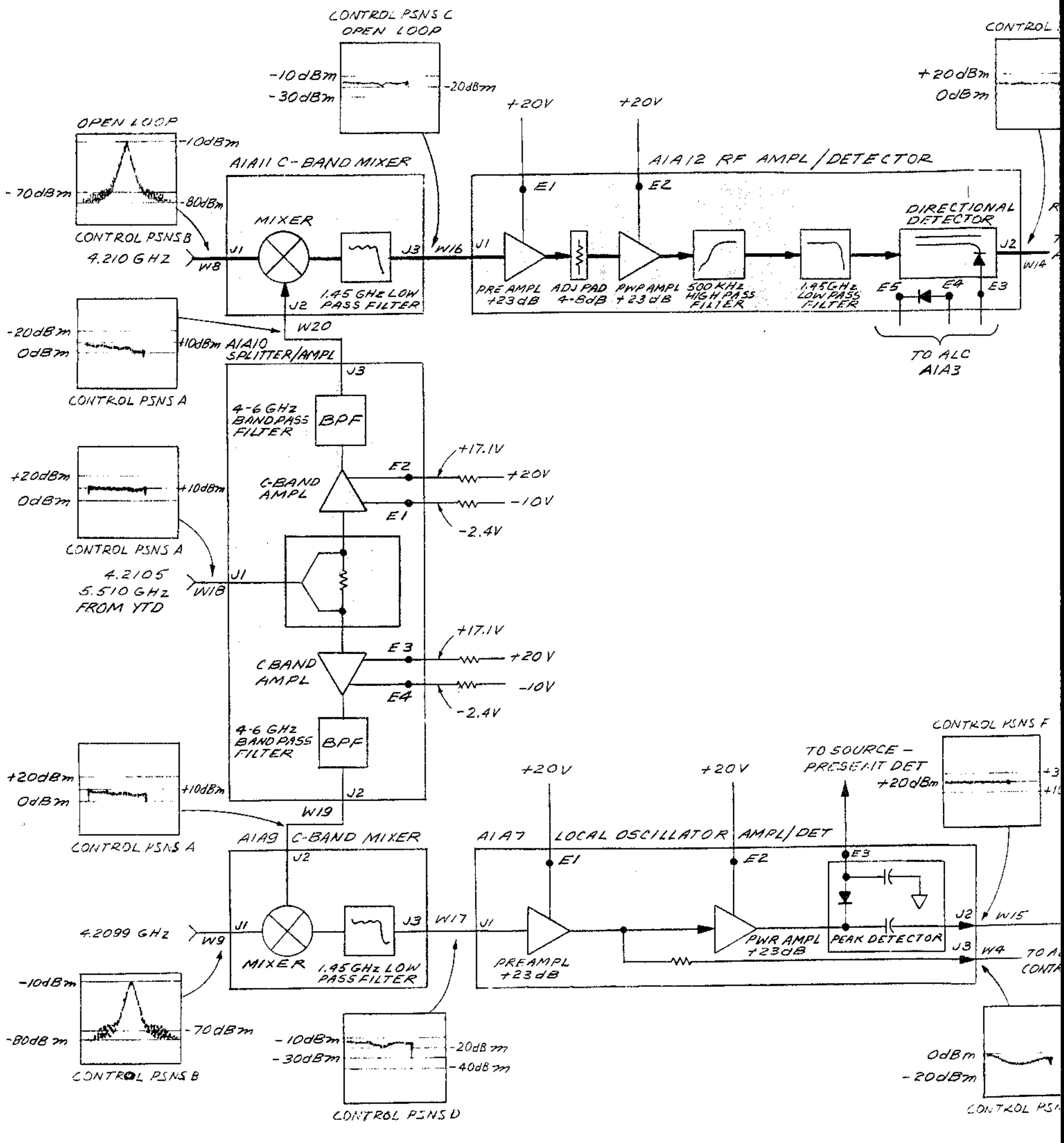
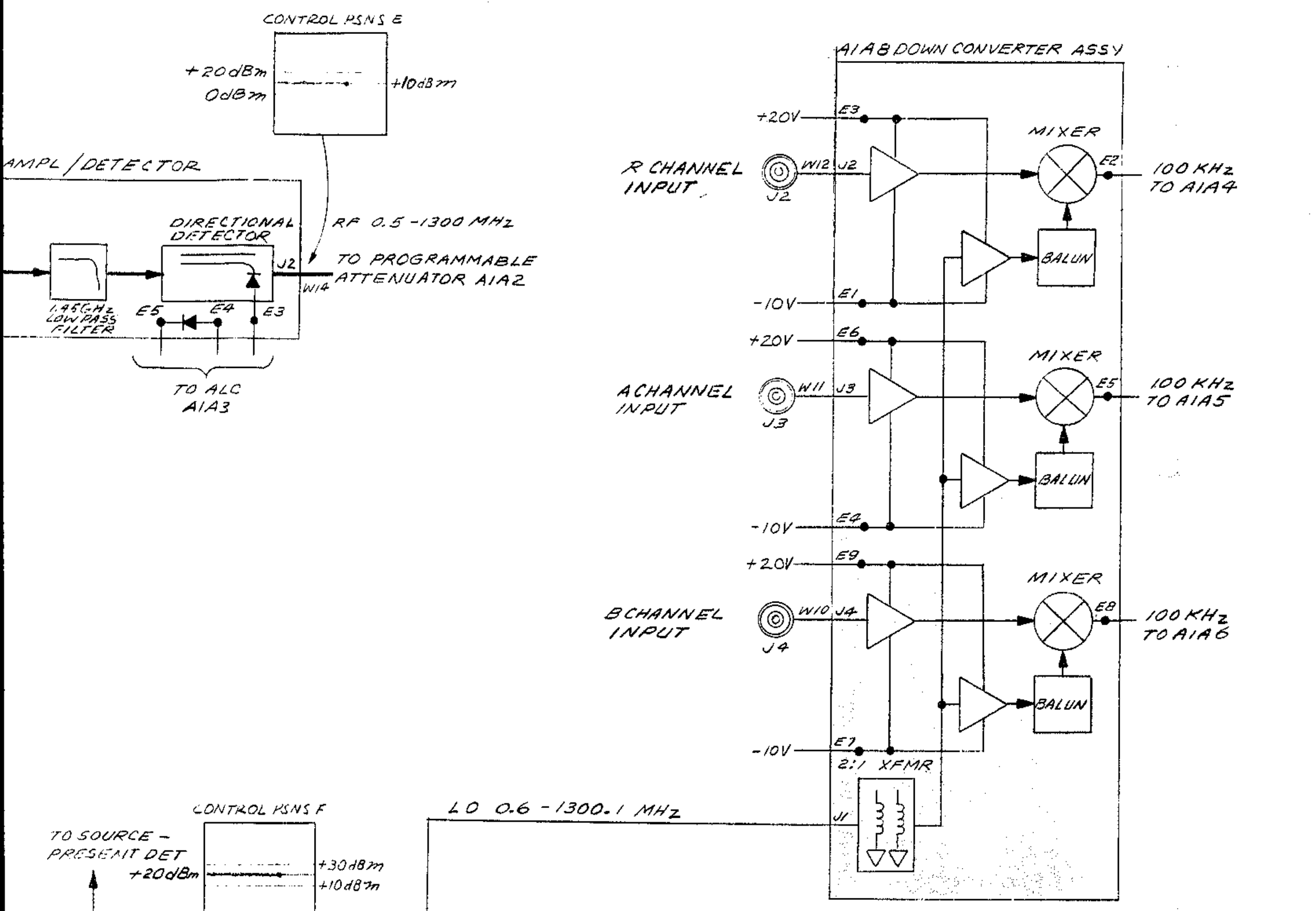
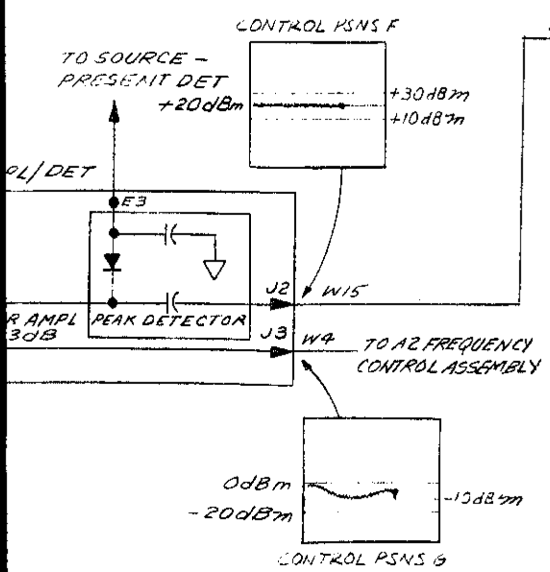


Fig B3-26
Sht 2 of 2





SPECTRUM ANALYZER* CONTROL POSITIONS

CONTROL	CONTROL POSITIONS A	B	C	D	E	F	G
BAND	N+1	N+1	N-1	N-1	N-1	N-1	N-1
FREQ	5.1 GHz	4.2 GHz	1 GHz	1 GHz	1 GHz	1 GHz	1 GHz
BANDWIDTH	300 kHz	300 Hz	300 kHz	300 kHz	300 kHz	300 kHz	300 kHz
SCAN WIDTH	200 MHz	2 kHz	200 MHz	200 MHz	200 MHz	200 MHz	200 MHz
SCAN TIME	10 mS	200 mS	10 mS	10 mS	10 mS	10 mS	10 mS
LOG REF LEVEL	+50 dBm 10 dB LOG	-10 dBm 10 dB LOG	+20 dBm 10 dB LOG	+10 dBm 10 dB LOG	+50 dBm 10 dB LOG	+60 dBm 10 dB LOG	+40 dBm 10 dB LOG

* SIGNALS OBSERVED ON HP 8555A

Figure B3-26. Microcircuits A1A7 through A1A12 Block Diagrams and Interconnections

A1A13 CONNECTOR BOARD

Connector Board A1A13 functions as a wiring harness interconnecting Frequency Control Assembly A2 with RF Source/Converter Motherboard A1A14, Fixed Oscillator Assembly A1A15, and LO Amplifier Detector Assembly A1A7. Negative temperature coefficient thermistor RT1 on the Connector Board controls a high-temperature shutdown circuit on the Positive Voltage Regulator Board (A2A20) in Frequency Conrol Assembly A2. If the RF Source/Converter gets hot enough to decrease the resistance of RT1 to between 450 and 400 ohms, the temperature shutdown circuit disables the +20 volt and +15 volt regulated outputs of the Positive Voltage Regulator, and the −10 volt and −40 volt outputs of the Negative Voltage Regulator. This, in turn, effectively disables the RF Source/Converter, which gets its operating power from the Frequency Control Assembly.

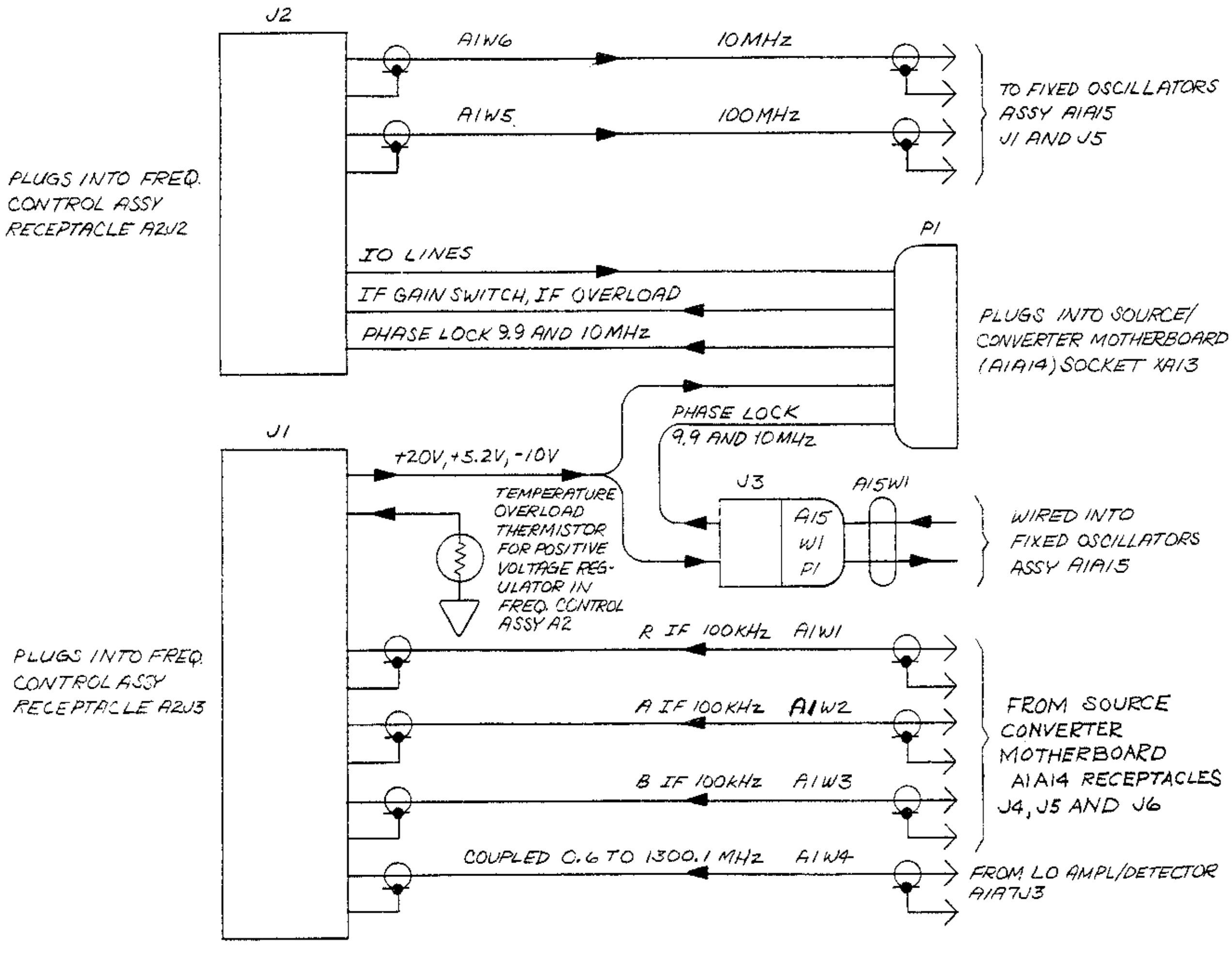


Figure B3-27. A1A13 Connector Board Simplified Wiring Diagram

A1A13

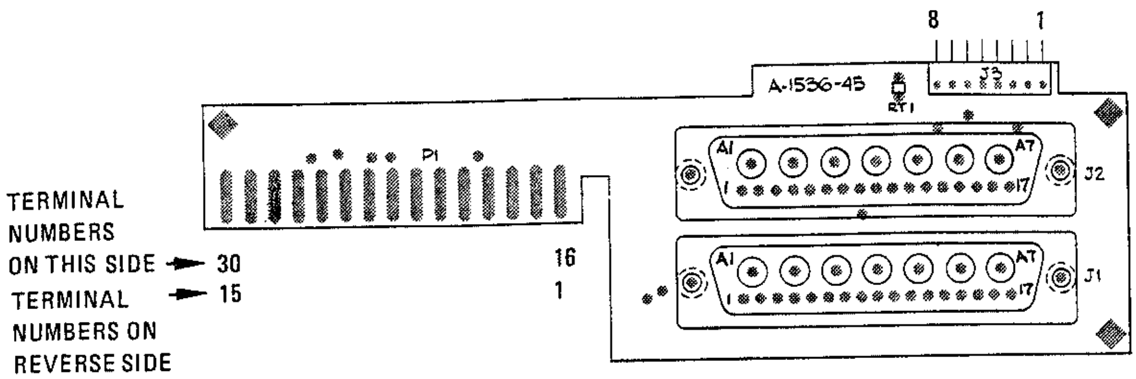
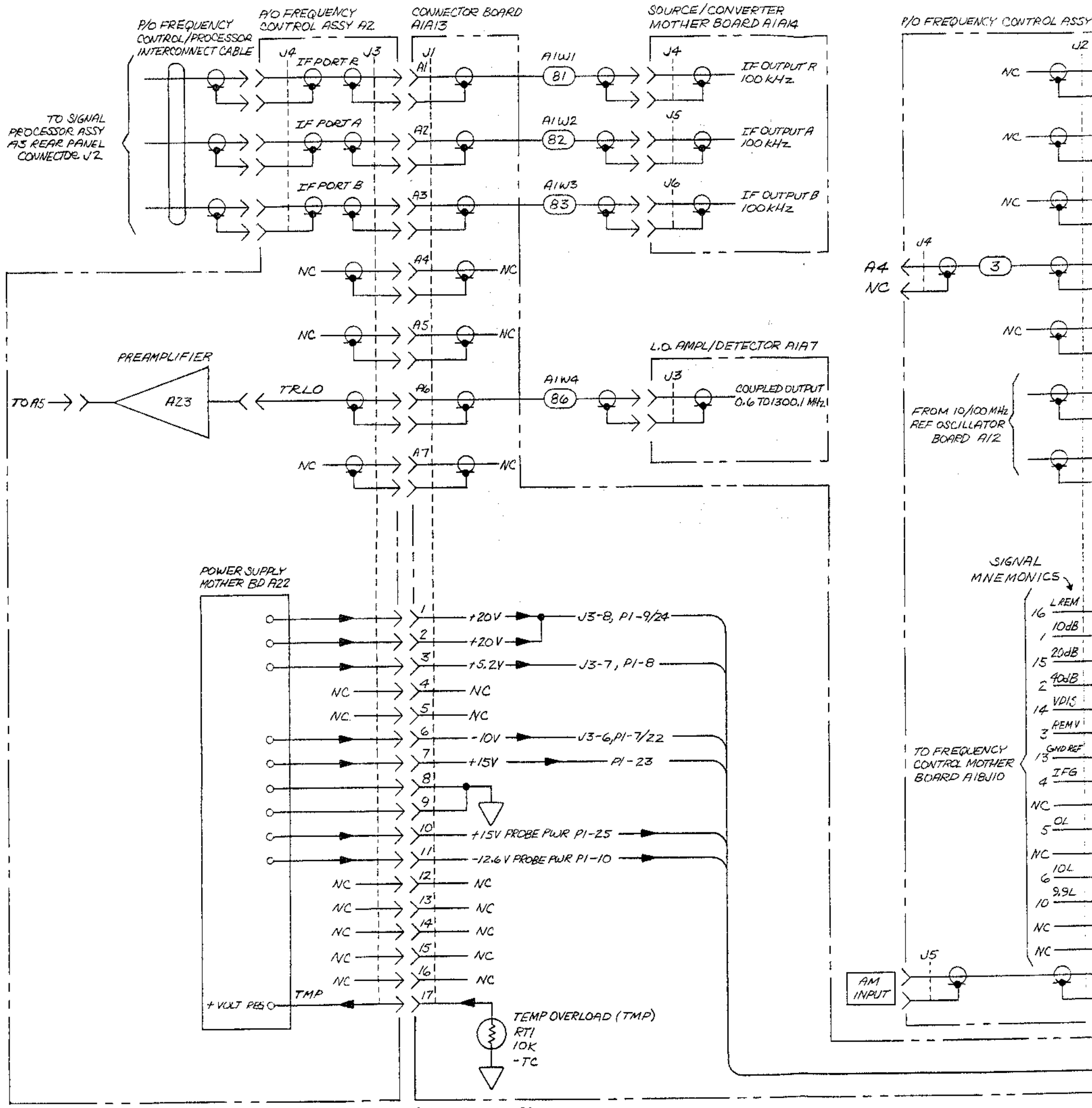


Figure B3-28. A1A13 Connector Board Parts Locations

TABLE OF LOGIC LEVELS AND CONDITIONS

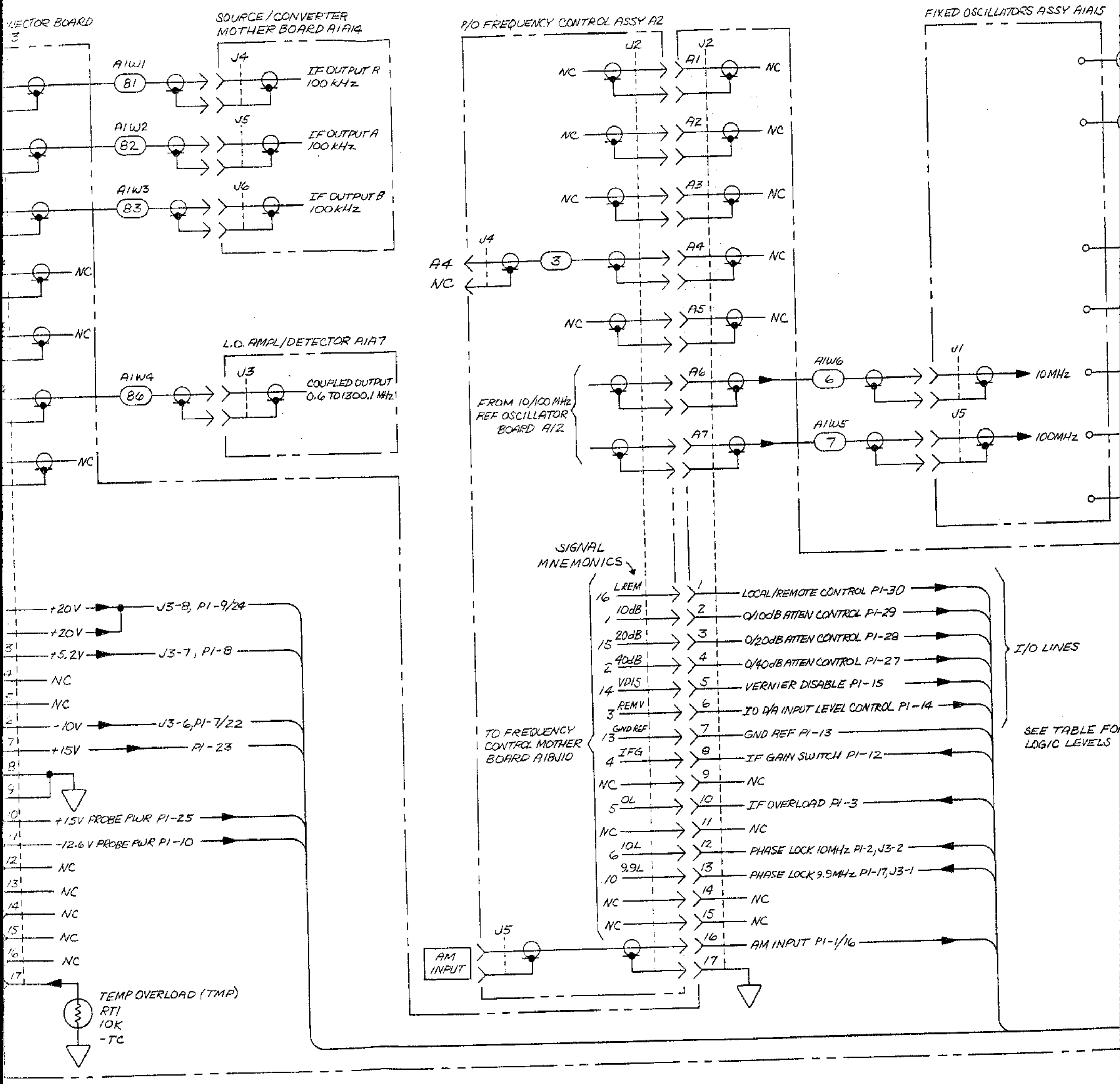
LINE AND LEVEL >+3.6V = 1 <+0.8V = Ø		CONDITION
LOCAL/REMOTE	1	LOCAL
	Ø	REMOTE
0/10dB ATTENUATION	1	0dB ATTENUATION
	Ø	10dB ATTENUATION
0/20dB ATTENUATION	1	0dB ATTENUATION
	Ø	20dB ATTENUATION
0/40dB ATTENUATION	1	0dB ATTENUATION
	Ø	40dB ATTENUATION
VERNIER DISABLE	1	VERNIER ENABLED
	Ø	VERNIER DISABLED
I.F. GAIN SWITCH	1	-10dBm INPUT
	Ø	-30dBm INPUT
I.F. OVERLOAD	1	NO OVERLOAD
	Ø	OVERLOAD PRESENT
PHASE LOCK 10 MHz	1	10 MHz LOCKED
	Ø	10 MHz UNLOCKED
PHASE LOCK 9.9 MHz	1	9.9 MHz LOCKED
	Ø	9.9 MHz UNLOCKED

Fig 8-3-29
Sht 1 of 3



SERIAL PREFIX 1622A

Fig B3-29
Sht 2 of 3



SERIAL PREFIX 1622A

Fig B3-29
SUT 3083

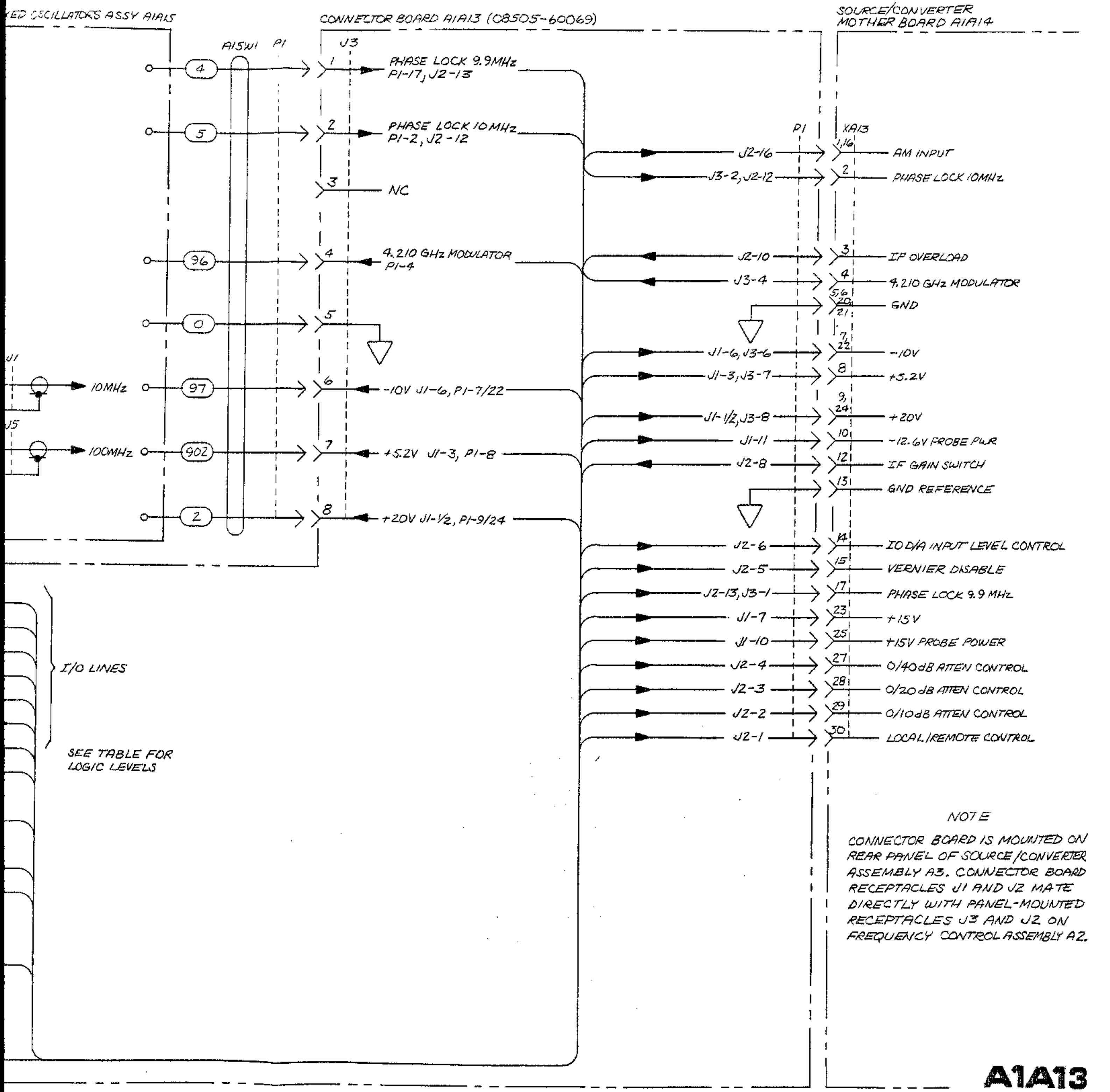


Figure B3-29. A1A13 Connector Board Wiring Diagram

A1A14 RF SOURCE/CONVERTER MOTHERBOARD

The RF Source/Converter Motherboard provides the interconnect wiring between the RF Source / Converter's plug-in boards and microcircuits. Reference designators of all connectors, whether they are actually on the motherboard or merely extend through it from a microcircuit assembly, are printed on the bottom of the motherboard where they can be easily seen when the bottom cover of the chassis is removed. Cable runs between microcircuit assemblies are also printed (broken lines) on the bottom of the motherboard. To determine the electrical relationships of connections printed on the motherboard, but not shown on the Motherboard Assembly Wiring Diagram, Figure B3-31, see the RF Source/Converter Block Diagram, Figure B3-7.

CAUTION

Shorting a microcircuit pin to ground will almost always destroy the microcircuit. Therefore, you must be extremely careful when you are probing on a microcircuit pin that you do not short it.

"X" reference designators indicate sockets for the plug-in printed circuit board assemblies. The alpha-numerical designation following the "X" is the reference designator of the board that plugs into that particular socket. The socket pin numbers printed on the motherboard correspond with the pin numbers on the plug-in board. "E" reference designators indicate sockets for the pins on microcircuit assemblies.

NOTE

When you are verifying a dc power input to a microcircuit, place the probe on the microcircuit pin rather than on the socket it plugs into. If the contact between the pin and the socket is loose, the required voltage may be present at the socket but not at the pin.

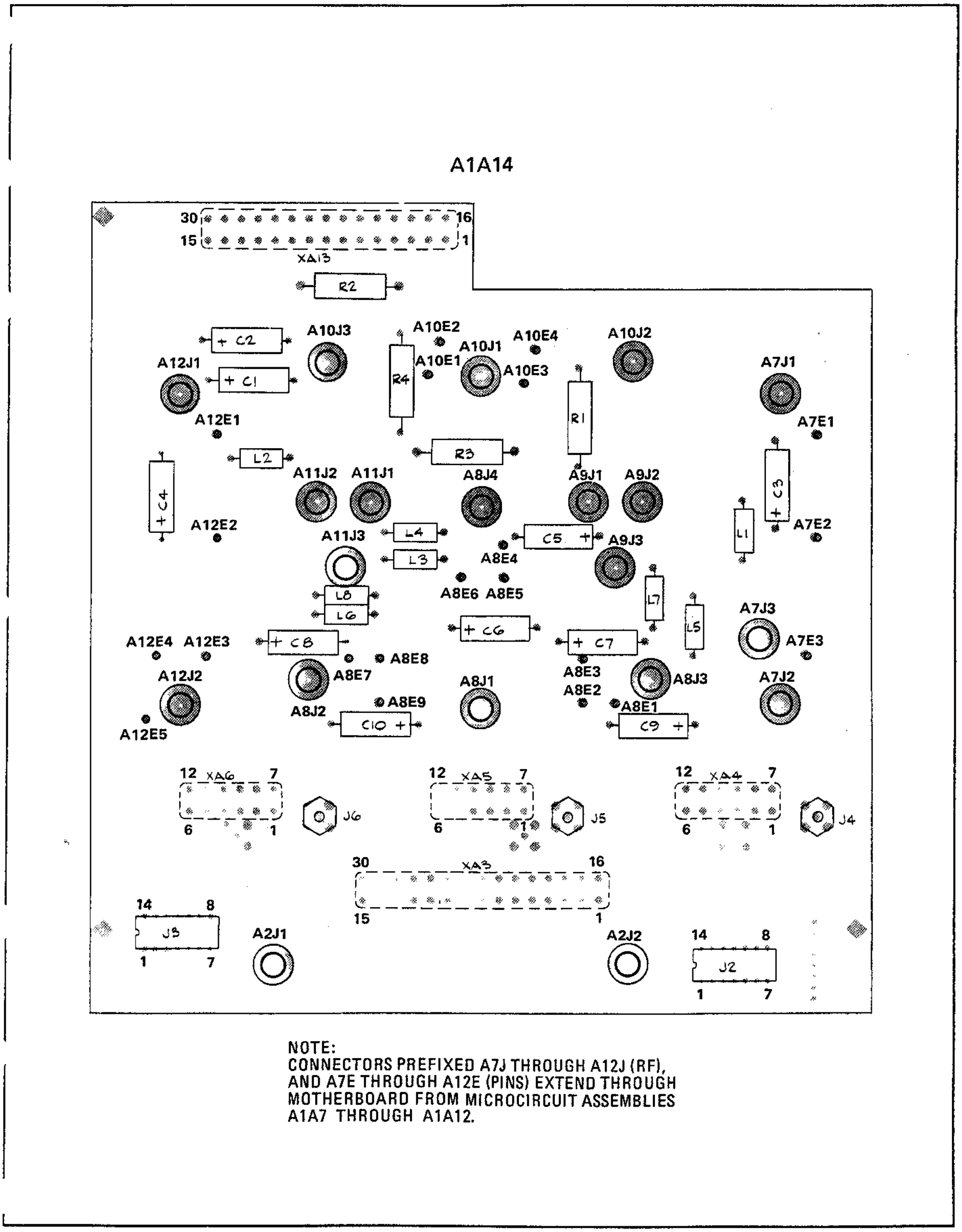


Figure B3-30. A1A14 Source/Converter Motherboard Parts Locations

Fig B3-31
Sht 1 of 4

A1A14 MOTHERBOARD WIRING DIAGRAM (08505-60066)

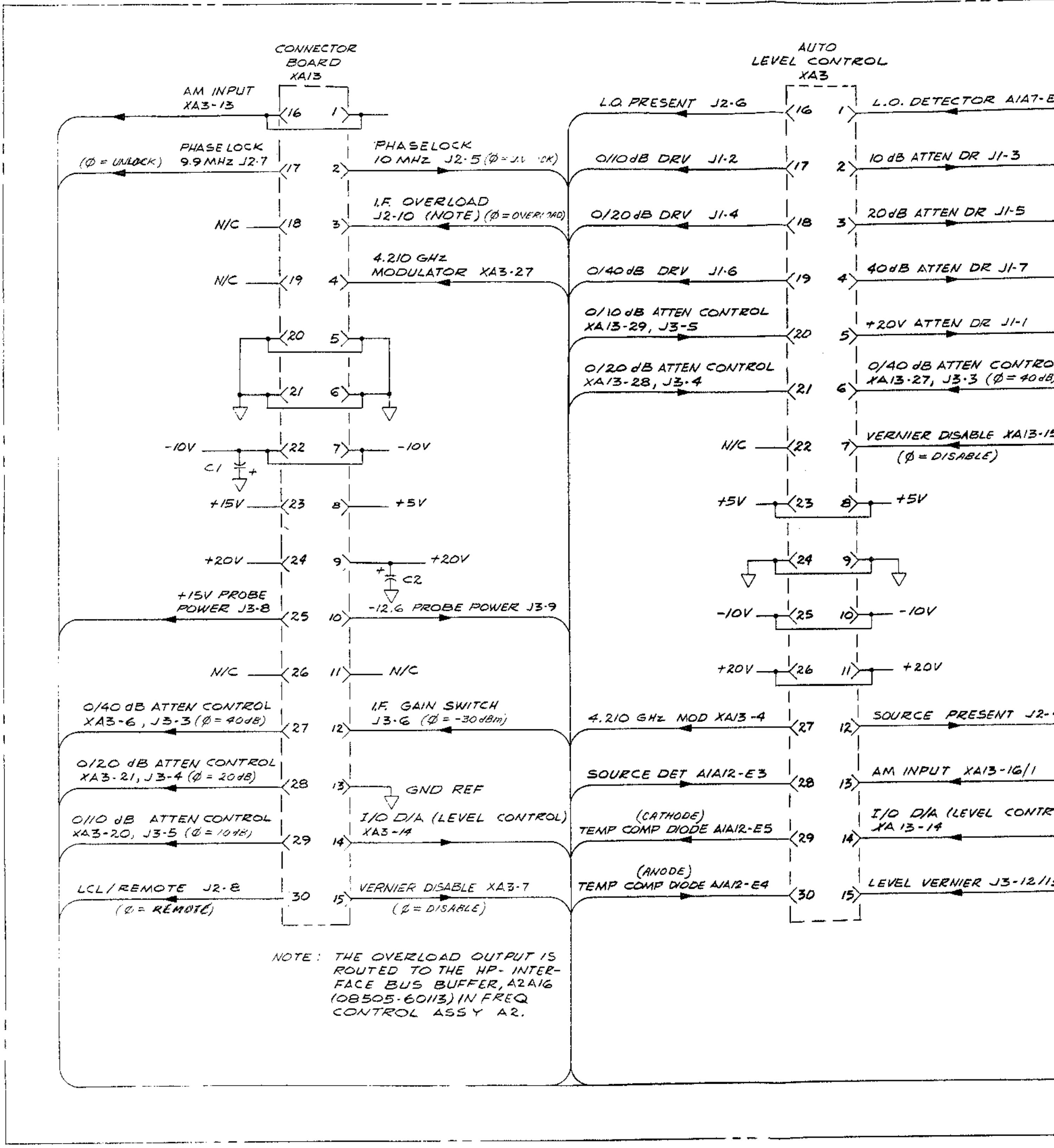


Fig. B3-31
Sht 2 of 4

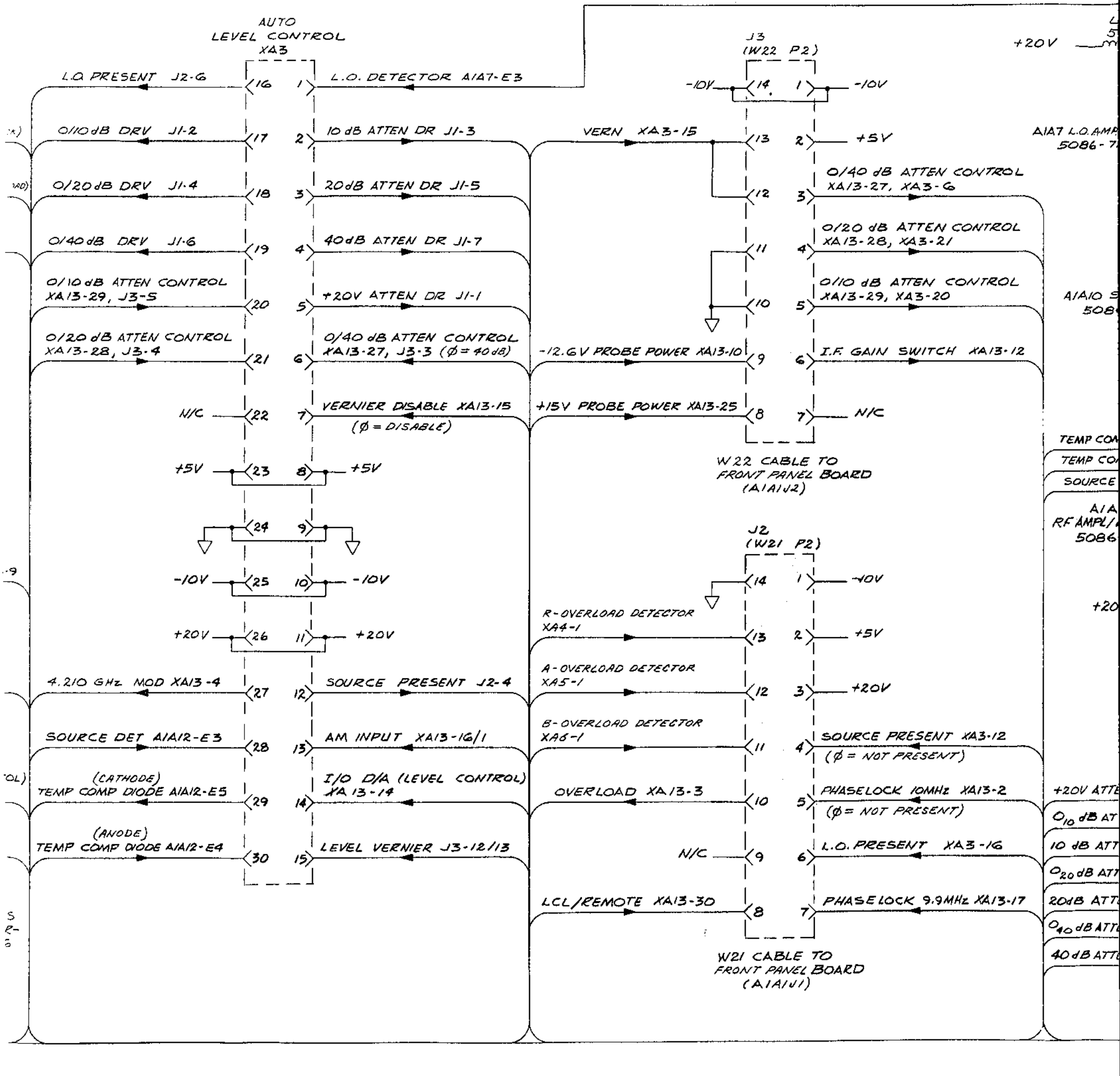


Fig B3-31
Sht 3 of 4

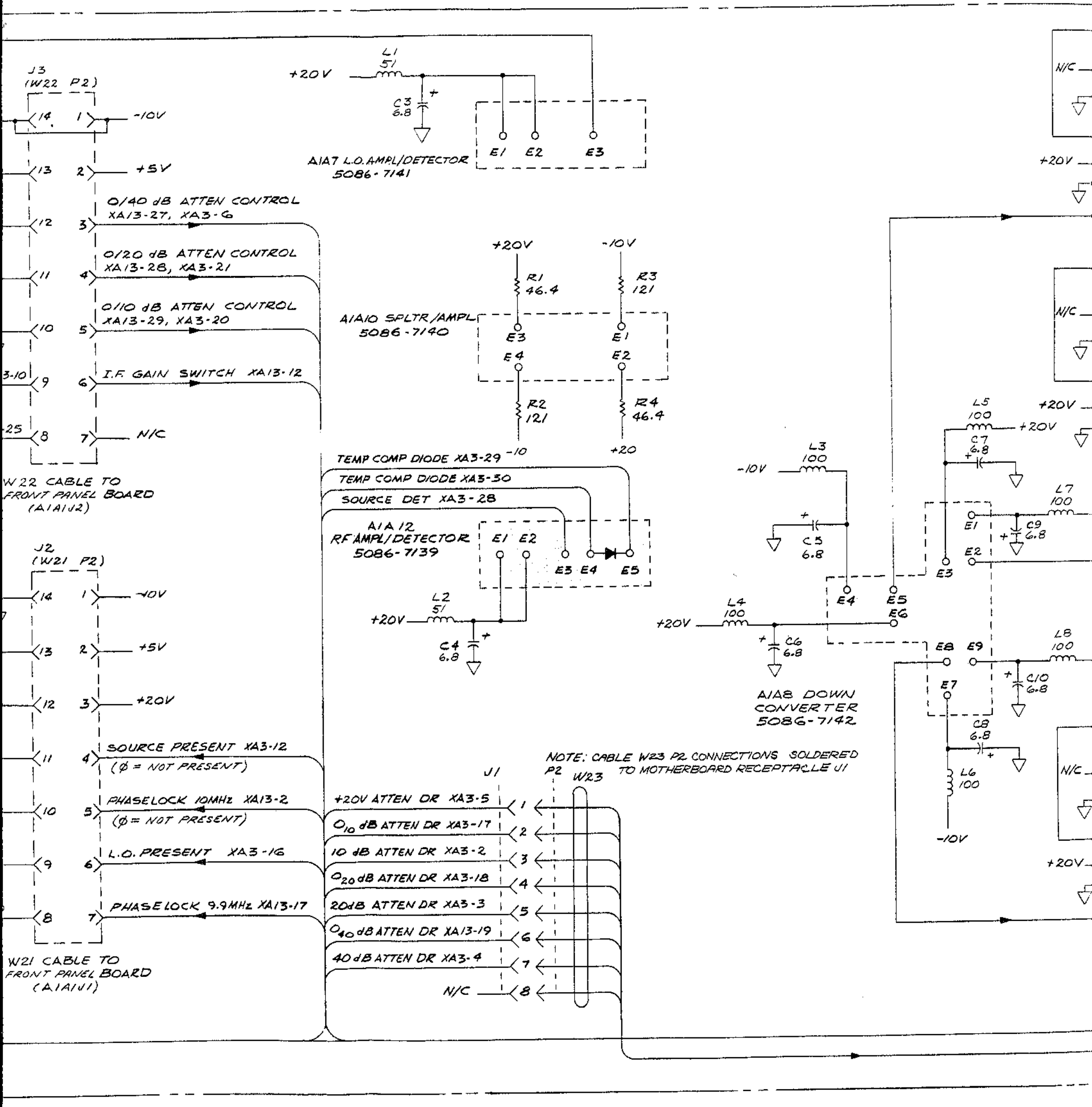
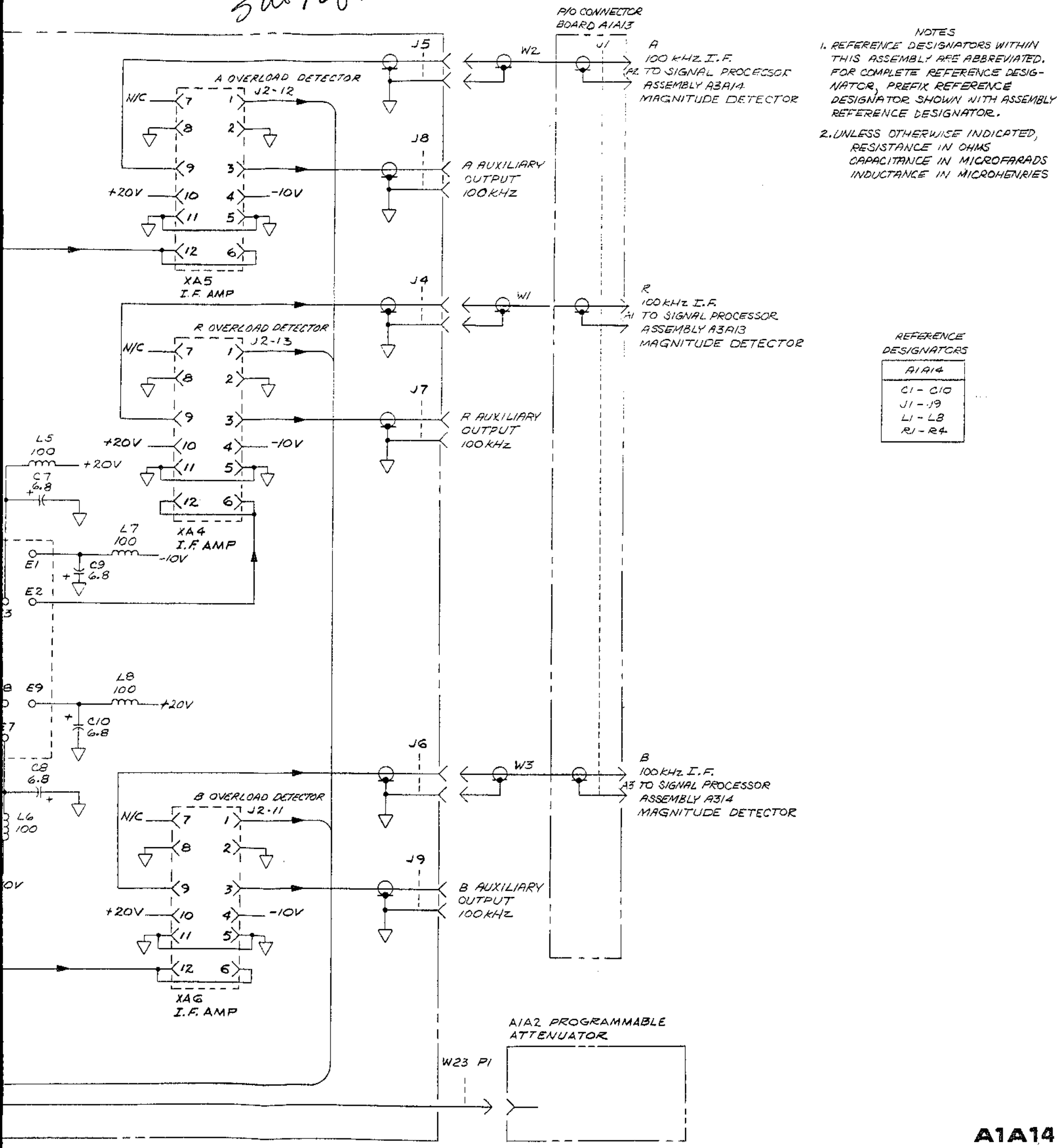


Fig B3-31
Sht 4 of 4



A1A14

Figure B3-31. A1A14 RF Source/Converter Motherboard Wiring Diagram

A1A15 FIXED OSCILLATORS ASSEMBLY

The subassemblies in the Fixed Oscillators Assembly make up two fixed-frequency oscillators. These two oscillators develop the 4.2100 GHz and 4.2099 Ghz signals that are used to generate the 0.5 to 1300 MHz RF source and the 0.6 to 1300.1 MHz tracking LO. Each of them is stabilized by a phase lock loop arrangement which includes three subassemblies. The first subassembly is a microcircuit which contains a voltage-tuned oscillator (VTO), a sampler (harmonic mixer), and a PIN modulator. The second is a board assembly containing a sampler driver and a sampler output buffer amplifier. The third, also a board assembly, contains phase locking circuits.

All the subassemblies that make up the A1A15 Fixed Oscillators Assembly are enclosed in a cast aluminum housing. Dc power inputs and non-RF signals connect through the housing on feedthrough capacitors. A wiring harness (A1A15W1) connects the external terminals of the feedthrough capacitors to Connector Board Assembly A1A13. All RF signals connect into and out of the Fixed Oscillators Assembly on coaxial connectors. Two reference inputs, 10 MHz and 100 MHz, feed into the assembly from Frequency Control Assembly A2. Two RF signals are supplied by the fixed oscillators to assemblies in the RF and LO signal paths. One is 4.2100 GHz, which is fed through cable A1W8 to C-Band Mixer A1A11 in the RF output path; the other is the 4.2099 GHz signal fed through cable A1W9 to C-Band Mixer A1A9 in the LO path.

4.2099 GHz Signal Development

The 4.2099 GHz signal used to produce the LO is developed by Driver/IF Board A1A15A3, 4.2099 GHz Oscillator/Sampler Assembly (microcircuit) A1A15A5, and 9.9 MHz Phase Lock Board A1A15A1. The sampler in the Oscillator/Sampler Assembly receives two signal inputs: a 100 MHz reference input applied to the sampler through drivers on the Driver/IF Board, and a 4.2099 GHz signal from the Oscillator/Sampler's voltage-tuned oscillator (VTO). The sampler output is an IF signal having a frequency that is the difference between the VTO output and the 42nd harmonic of the 100 MHz input. With the oscillator phase-locked, this IF output is 9.9 MHz (4209.9 MHz − 4200.0 MHz = 9.9 MHz).

The 9.9 MHz IF is fed through buffer amplifiers on the Driver/IF Board to a phase detector on the 9.9 MHz Phase Lock Board. In the phase detector, the 9.9 MHz IF is compared with a 9.9 MHz reference generated by a crystal-controlled oscillator. If the IF and reference frequencies are not identical, the phase detector supplies a dc error-correction signal, proportional to the amount of the frequency difference, to the VTO. This signal then tunes the VTO in whatever direction is required to set the VTO output exactly 9.9 MHz above the 42nd harmonic of the 100 MHz reference. In this way, the VTO, which is designed to operate at 4.2 GHz, is forced to oscillate at 4.2099 GHz.

The 4.2099 GHz output of the VTO is fed through a PIN modulator (for level setting) and out of the Fixed Oscillators Assembly on coaxial cable A1W9 to C-Band Mixer Assembly (microcircuit) A1A9.

4.2100 GHz Signal Development

The 4.210 GHz phase-locked signal is developed in a phase locking loop in much the same way the 4.2099 GHz signal is developed. The loop, in this case, includes Driver/IF Board A1A15A4, 4.2100 GHz Oscillator/Sampler Assembly (microcircuit) A1A15A6, and 10 MHz Phase Lock Board A1A15A2.

The sampler in the Oscillator/Sampler Assembly receives a 100 MHz reference input, which is applied to it through the Driver/IF Board, and a 4.2100 GHz signal from the Oscillator/Sampler's VTO. The sampler output IF signal frequency is the difference between the VTO output and the 42nd harmonic of the 100 MHz input. With the oscillator phase-locked, this IF output is 10 MHz (4210.0 MHz − 4200.0 MHz = 10 MHz).

The 10 MHz IF is fed through buffer amplifiers on the Driver/IF Board to a phase detector on the 10 MHz Phase Lock Board. In the phase detector, the 10 MHz IF is compared with a 10 MHz reference generated in Frequency Control Assembly A2. If the IF and reference frequencies are not identical, the phase detector supplies a dc error-correction signal, proportional to the frequency difference, to the VTO. This signal then tunes the VTO in whatever direction is required to set the VTO output exactly 10 MHz above the 42nd harmonic of the 100 MHz reference. The VTO, which is identical with the one used to generate the 4.2099 GHz signal, is thus forced to oscillate at 4.2100 GHz.

The 4.2100 GHz output of the VTO is fed through a PIN modulator, where it is leveled by a modulator drive input from Automatic Level Control (ALC) and Attenuator Driver A1A3. From the PIN modulator, the leveled 4.2100 GHz signal is fed out of the Fixed Oscillators Assembly on coaxial cable A1W8 to C-Band Mixer Assembly (microcircuit) A1A11.

Fig B3-32
Sht 1 of 3

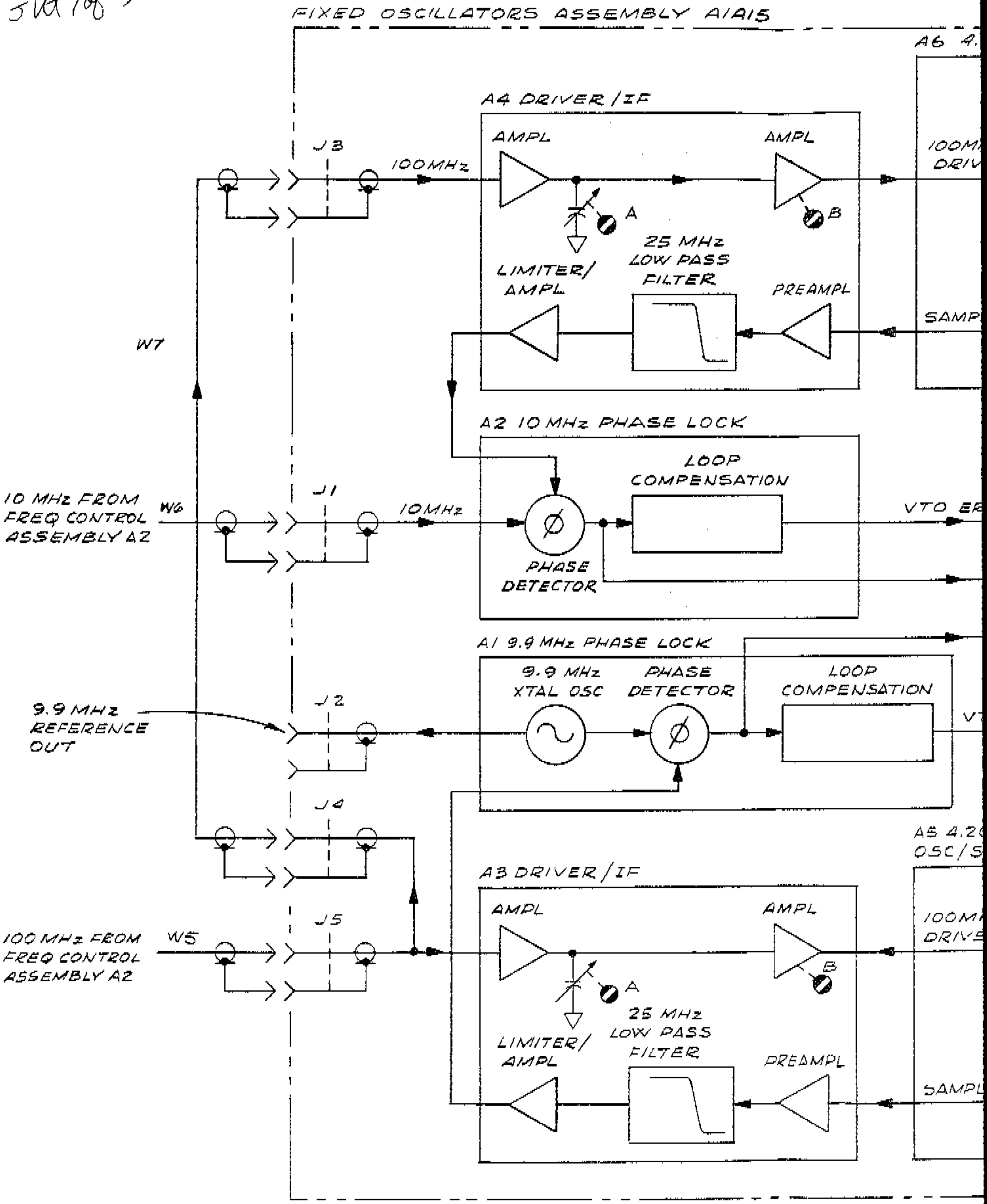


Fig B3-32
SW-2083

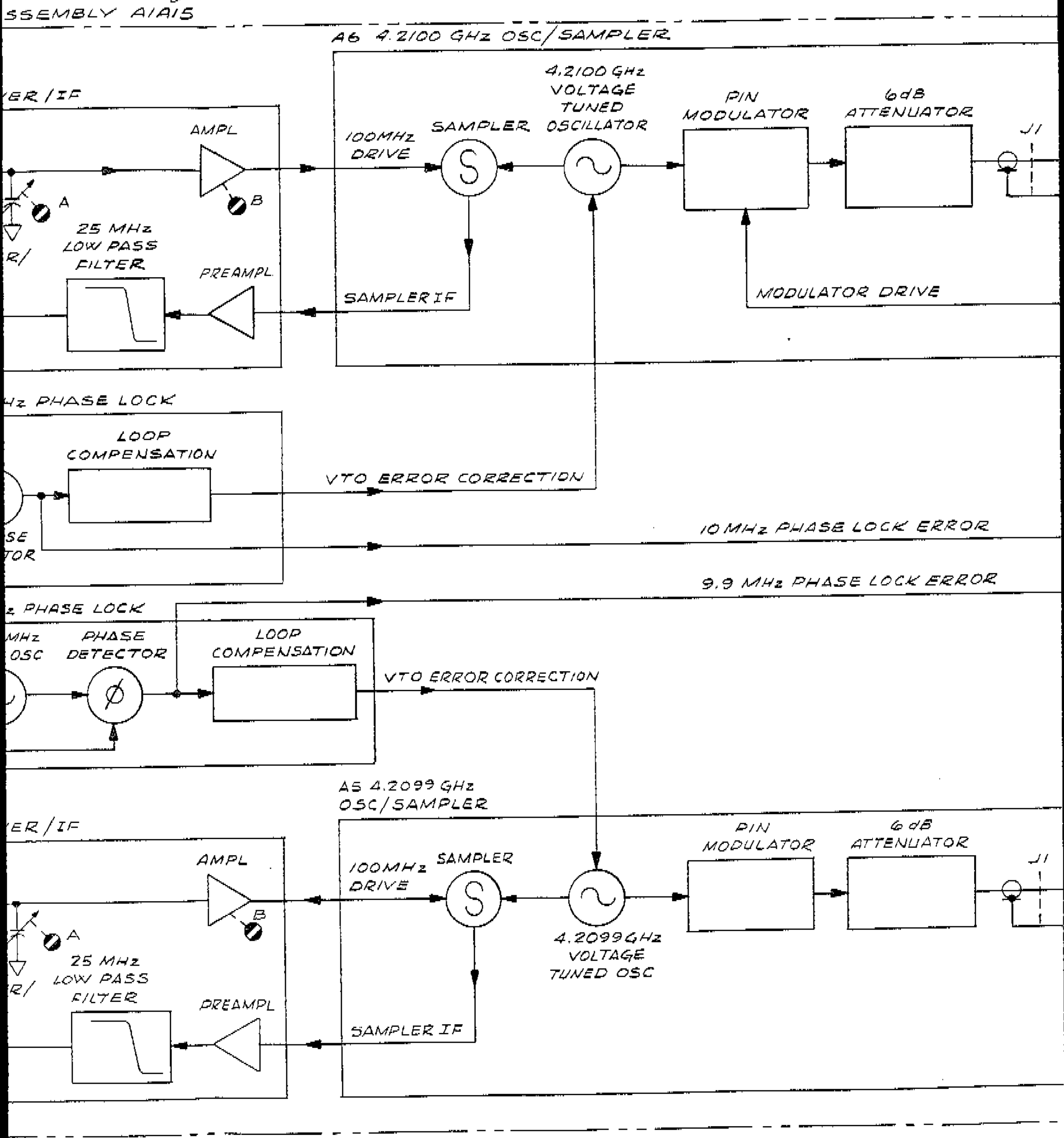


Fig B3-32 Sht 3 of 3

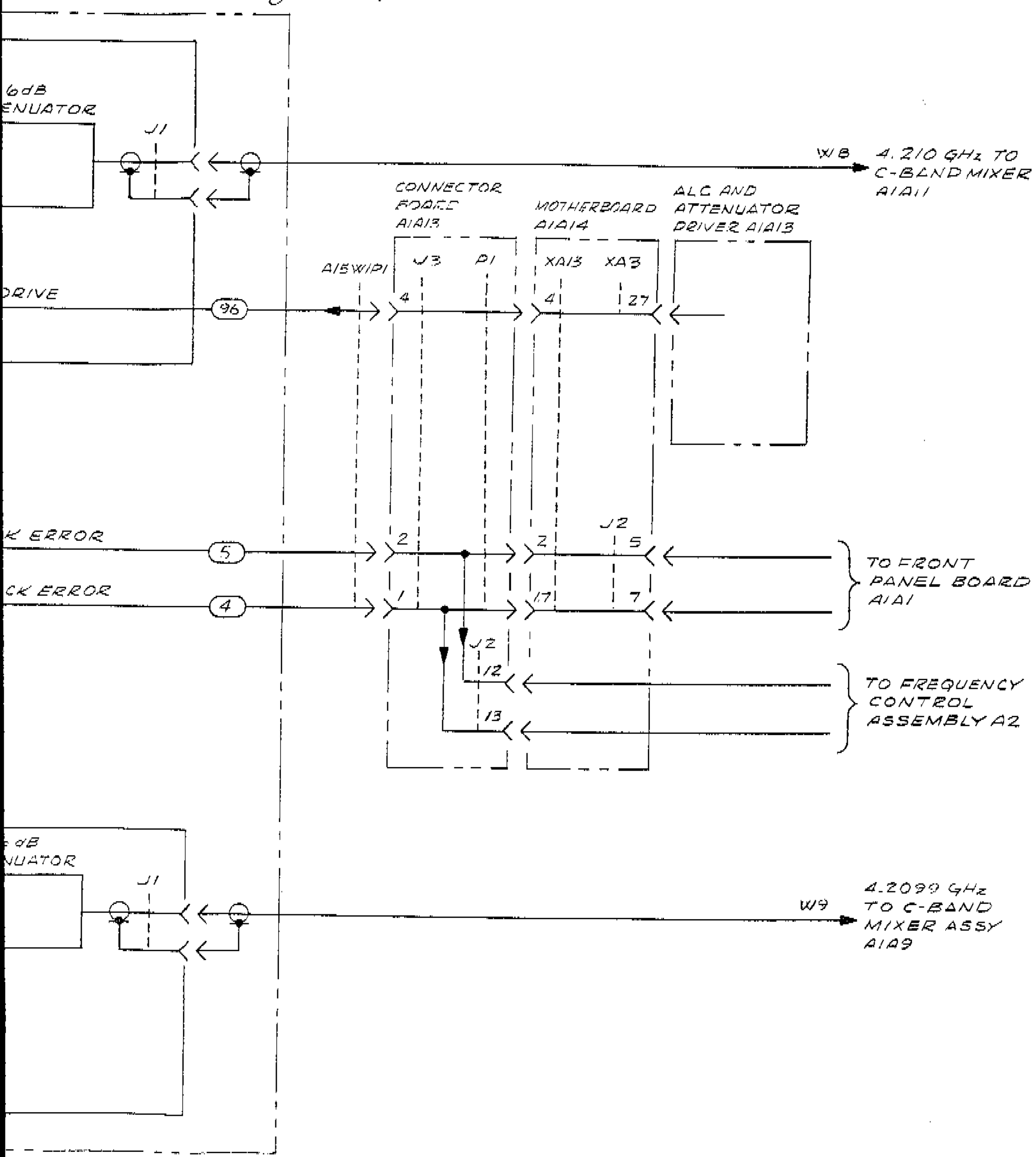
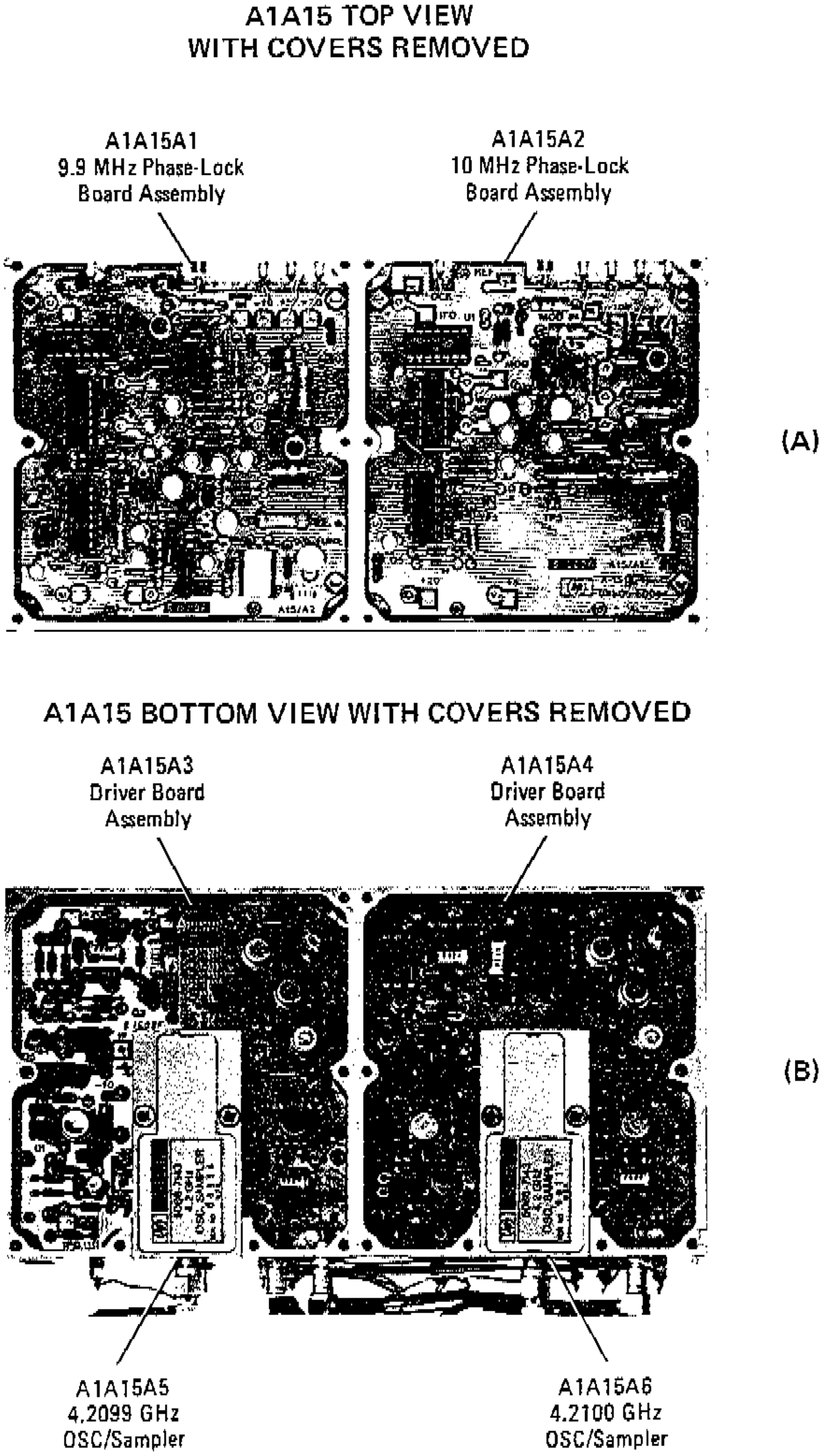


Figure B3-32. A1A15 Fixed Oscillators Assembly Block Diagram



B3-33. A1A15 Fixed Oscillators Assembly Subassemblies Locations

Fig B3-34
Sht 1 of 2

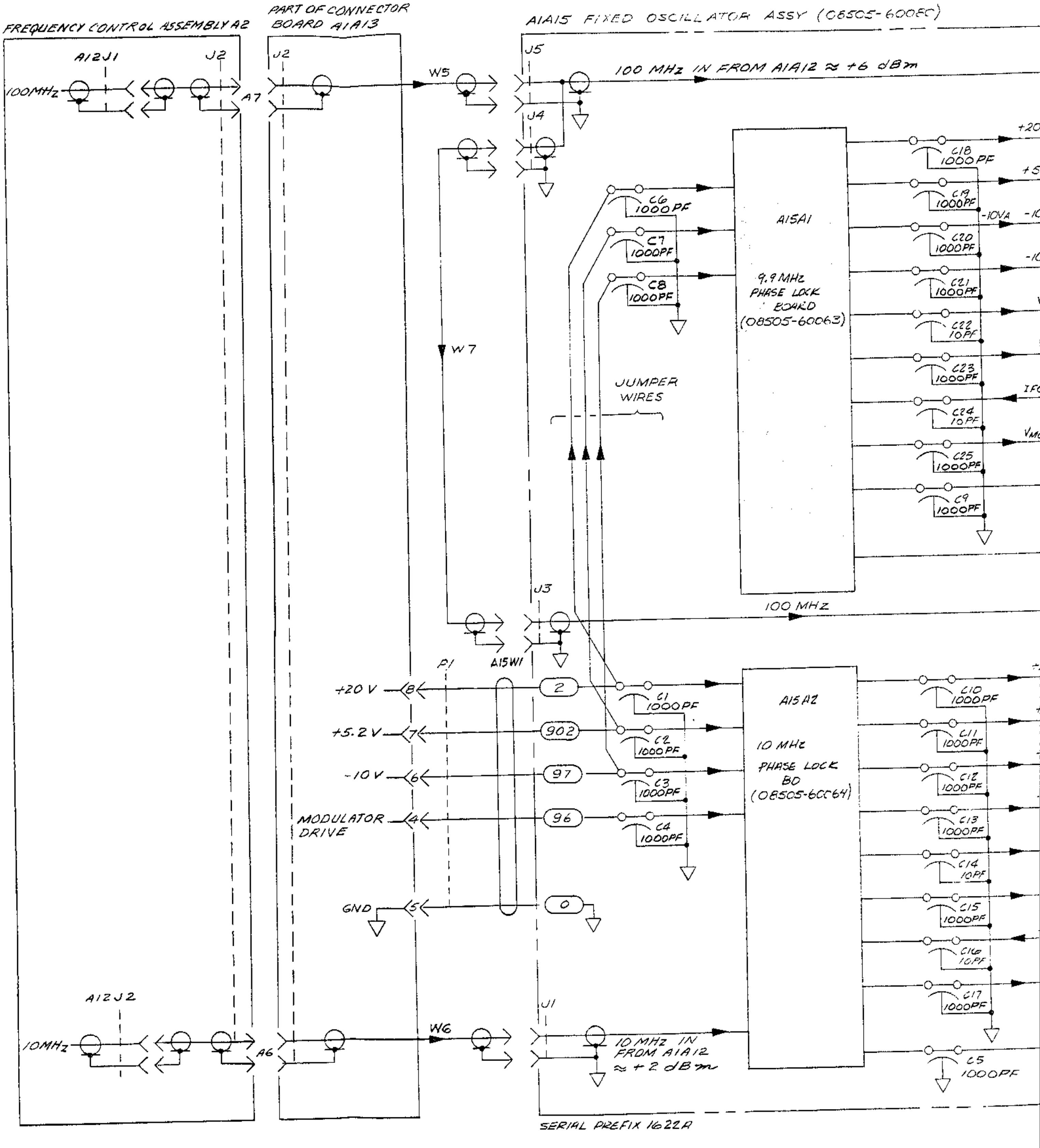


Fig B3-34
Sht 2 of 2

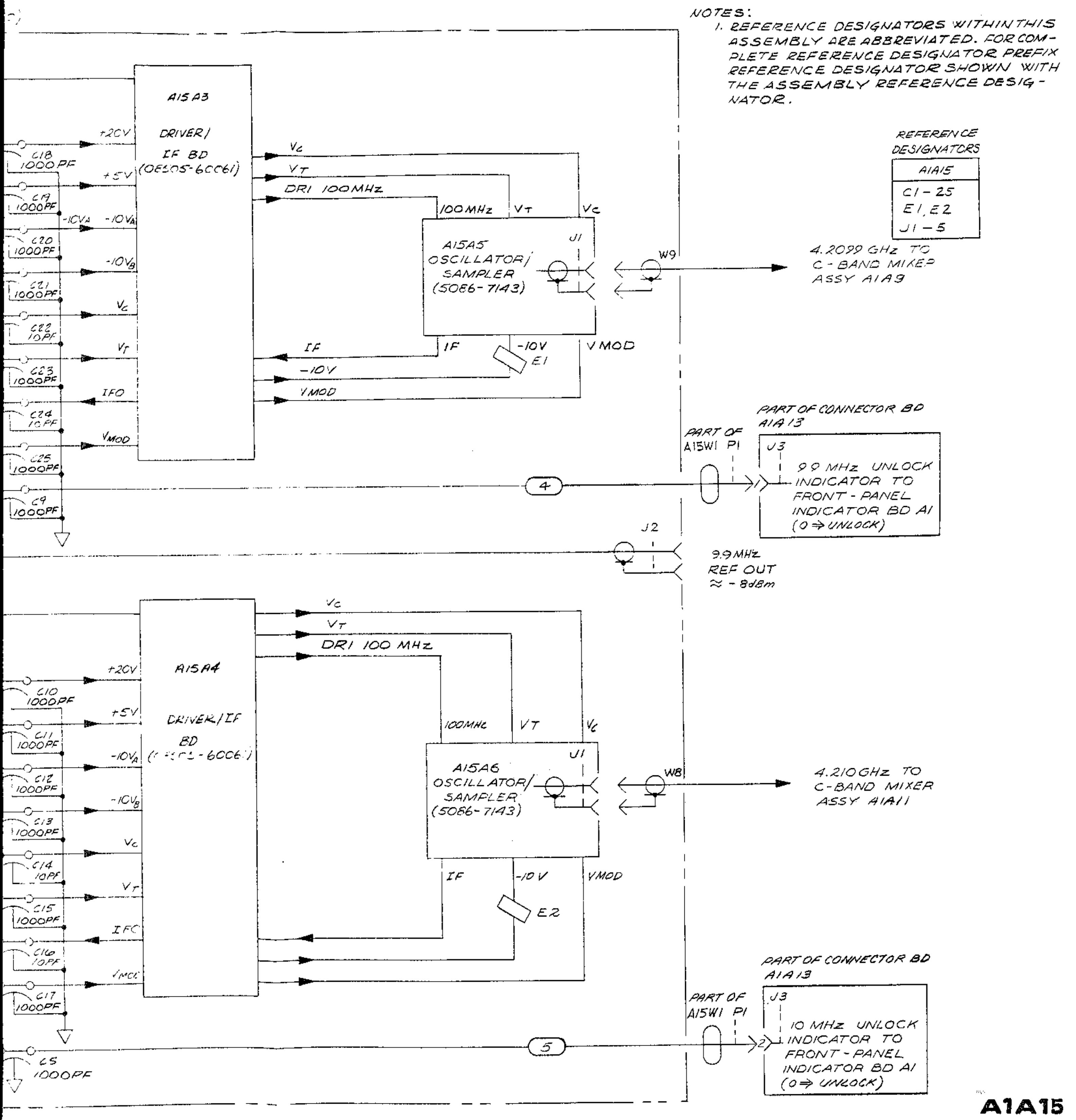


Figure B3-34. A1A15 Fixed Oscillator Assembly, Schematic

A1A15A1 9.9 MHz PHASE LOCK BOARD ASSEMBLY

The 9.9 MHz Phase Lock Board contains a 9.9 MHz crystal oscillator, a phase detector circuit, a dc loop compensation circuit (for the phase lock loop), an unlock indicator driver, and a search oscillator.

9.9 MHz Crystal Oscillator

The 9.9 MHz oscillator consists primarily of dual-gate field effect transistor (FET) Q8 and crystal Y1. The crystal provides feedback from the FET's drain to its gate at the crystal's 9.9 MHz resonant frequency. Parallel capacitors C1 (variable) and C2 provide a small loading reactance to establish the oscillator frequency range. Capacitor C1 also enables precise tuning of the oscillator frequency. The total tuning range is approximately 300 Hz.

Feedback from the drain of Q8 applied through C5 and CR1 functions as a gain control to maintain a constant oscillator output level. The remaining oscillator components (resistors R1, R2, R4, and R5, and capacitors C3, C6, and C7) provide dc bias and 9.9 MHz bypassing.

The oscillator output is capacitive coupled through capacitors C11 and C12 to buffer amplifiers Q5 and Q7. Emitter follower Q7 feeds its 9.9 MHz output to the Fixed Oscillator Assembly's 9.9 MHz reference output connector, A1A15J2. Buffer amplifier Q5's output, taken from its collector, has an amplitude of approximately 3 volts peak-to-peak. This signal, inverted in NAND gate U1D (used here only as an inverter-buffer), is applied to the clock input of flip-flop U2B, the reference side of the phase detector circuit.

Phase Detector Circuit

The phase detector circuit supplies a dc output that is proportional to the phase difference between the frequencies of two input signals. It consists of two D-type, positive edge-triggered flip-flops and a two-input NAND gate. The basic circuit is shown in Figure B3-35.

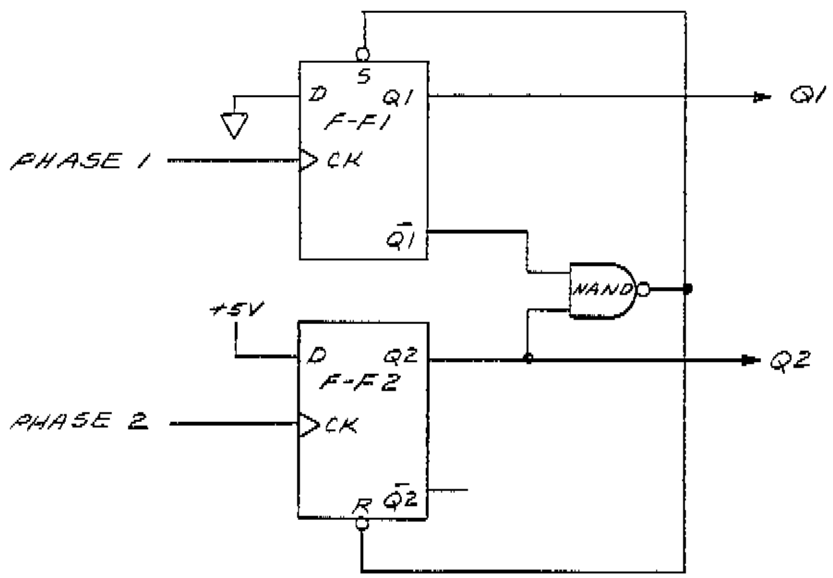


Figure B3-35. Phase Detector Stage Simplified Block Diagram

Phase 1 represents the IF input from the sampler, and phase 2 the reference input from the oscillator. To start, assume the NAND gate output has just gone low, placing F-F 1 in its "set" state and F-F 2 in its "reset" state. As a result Q1 has gone high and $\overline{Q1}$ and Q2 have both gone low. Now, the NAND gate with two low inputs applied to it, changes its output from low to high (one low input would do the same thing).

At this point, the first positive-going signal edge to appear at a clock input will change the state of the flip-flop receiving it. In Figure B3-36, the phase 1 input is shown leading the phase 2 input. On the positive-going edge of phase 1, F-F 1 will change state, causing Q1 to go low and $\overline{Q1}$ to go high. Shortly afterwards, a positive-going phase 2 signal clocks F-F 2 into the opposite (set) state causing Q2 to go high. Now, both inputs to the NAND gate are high, setting the NAND gate output low. The low NAND output immediately restores the two flip-flops to their former state (F-F1 set, and F-F 2 reset). Q1 again goes high and Q2 low. Thus, during one cycle of the two phase inputs, Q1 supplies a negative-going pulse which starts on the positive-going edge of phase 1 and ends on the negative-going edge of Q2. The Q2 output in this case is a narrow positive-going pulse which starts on the positive-going edge of phase 2 and lasts only for the very short reaction time of the gate and two flip-flops. If the phase 2 input had been leading phase 1, Q2 would have been the relatively wide pulse and Q1 the narrow pulse.

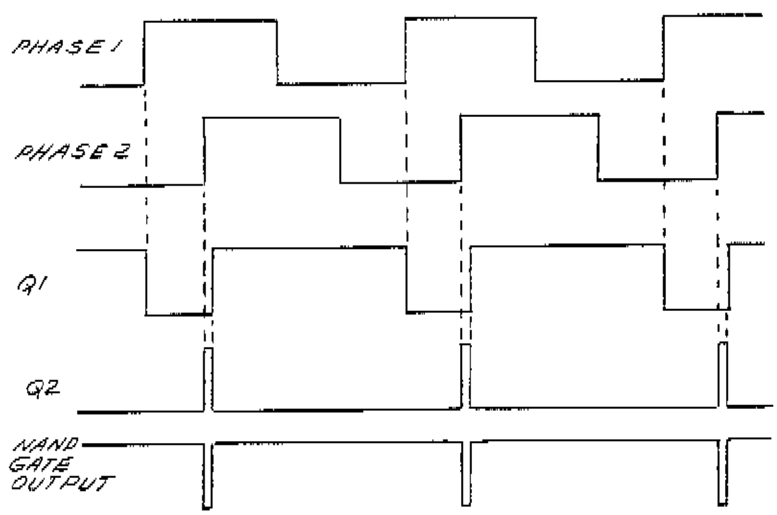


Figure B3-36. Phase Detector Timing Diagram

The phase detector outputs are the dc averages of the Q1 and Q2 outputs. They are summed into a dc amplifier as shown in Figure B3-37. The amplifier input is biased halfway between the swing of Q1 and the swing of Q2. If Q1 is high and Q2 is low, the total current summed into the amplifier is zero. If, as shown in the timing diagram, Figure B3-36, phase 1 is leading phase 2, during a portion of the cycle the detector will draw current out of the amplifier causing the amplifier output voltage to go positive. Conversely, if phase 2 leads phase 1, the current flow will be into the amplifier and the output voltage will go negative. Because the amplifier has a very large dc gain, a small phase offset will produce a relatively large error correction output voltage.

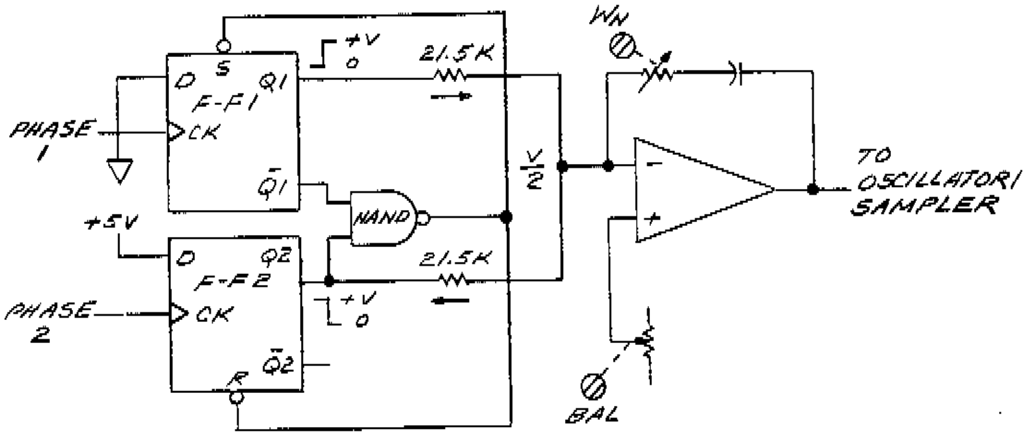


Figure B3-37. Phase Detector Output Summing Simplified Schematic

Loop Compensation

The amplifier driven by the phase detector consists of transistors Q2 and Q4 connected as a differential pair with Q3 as a constant-current source. The amplifier output is taken from the collector of Q4. Potentiometer R11 and capacitor C14 form a feedback element which helps establish the high-frequency gain of the loop, (also dependent on resistors R9 and R10). R11 adjusts the overall loop bandwidth of the phaselock loop. Potentiometer R25 sets the base voltage of Q2, the amplifier's non-inverting input, and thus establishes the voltage reference for the summing juction. R25 is adjusted to set the phase offset out of the phase detector to minimum (this enhances the overall loop operation). Capacitor C20 and inductor L2 at the amplifier output filter out the 9.9 MHz pulses to prevent them from frequency-modulating the VTO.

Phase Unlock Indicator

The active components of the phase unlock indicator circuit are a two-input EXCLUSIVE OR gate, U3A, and transistor Q6. One input to U3A is taken from the $\overline{Q}$ output ($\overline{Q1}$) of flip-flop U2A; the other is from the Q output (Q2) of flip-flop U2B. When the IF and reference inputs to the phase detector flip-flops are in phase, outputs $\overline{Q1}$ and Q2 track each other; therefore, the output from U3A is low. And with a low input to its base, NPN transistor Q6 is off and its collector voltage is pulled toward +5 volts through pull-up resistor R30.

When the IF and reference inputs to the two flip-flops are out of phase, the two inputs ($\overline{Q1}$ and Q2) to gate U3A continually change their relationship, causing the output of U3A to alternate between high and low. This tends to bias Q6 on through resistor R8. As a result, the collector of Q6 goes low, turning on the search oscillator (U3C and U3D) and lighting the 9.9 MHz unlock indicator LED on the RF Source/Converter Front Panel Board Assembly (A1A1).

B3-44c

Search Oscillator Circuit

The search oscillator circuit consists of EXCLUSIVE OR gates U3C and U3D, capacitor C27, and resistor R26. These four components make up a free-running multivibrator, which oscillates at approximately 50 Hz when turned on by a low output from EXCLUSIVE OR gate U3B.

Normally, one input (pin 4) to EXCLUSIVE OR gate U3B is held high by the collector of Q6 while the other input (pin 5) is always low. Thus, the output of U3B is high. This high output, applied through forward-biased diode CR3, disables the search oscillator. If, however, the phase loop becomes unlocked, the collector of Q6 goes low, causing the output of U3B to go low and back-bias diode CR3. With the disabling input removed, the multivibrator will start to oscillate.

The oscillator output will cause transistor Q1 to turn on and off at the oscillation rate. During the period Q1 is on, diode CR2 is forward biased, pulling the base of amplifier transistor Q4 close to ground and shutting it off. With Q4 off, the amplifier output is taken from a voltage divider formed by resistors R21 and R29. This reduces the output level by one half, which centers the VTO drive and gives the VTO a chance to reacquire the phase lock frequency. When Q1 is shut off by the search oscillator, Q4 returns to its original state and the loop tries to re-lock. The search cycle continues until the phase lock loop actually re-locks. When the phase lock is restored, the search oscillator is again disabled by a high input from U3B and the unlock indicator on the Front Panel Board Assembly is turned off.

Miscellaneous Circuitry

The 9.9 MHz Phase Lock Board Assembly buses power supply inputs to Driver/IF Board Assembly A1A15A3. It also contains two potentiometers which set voltage levels applied to Oscillator/Sampler Assembly A1A15A5. Potentiometer R28, in series with the +20 volts supply, adjusts the collector supply voltage of the fixed oscillator in the Oscillator/Sampler assembly. It is used as an oscillator pre-tune adjustment. Potentiometer R32, connected between −10 volts and ground, adjusts the bias on the PIN modulator in the Oscillator/Sampler Assembly to set the 4.2099 GHz output level.

Troubleshooting Hints

1. Before doing anything else, make sure the reference frequency is present.

2. If the loop will not lock, disable the search oscillator by grounding test point TP1. Then tune potentiometer R28 (TUNE) while checking at the IF input to U1B (pins 4 and 5) to see if the IF is present. If there is no IF input, the problem is in Oscillator/Sampler Assembly (microcircuit) A1A15A5 or in Driver/IF Board Assembly A1A15A3.

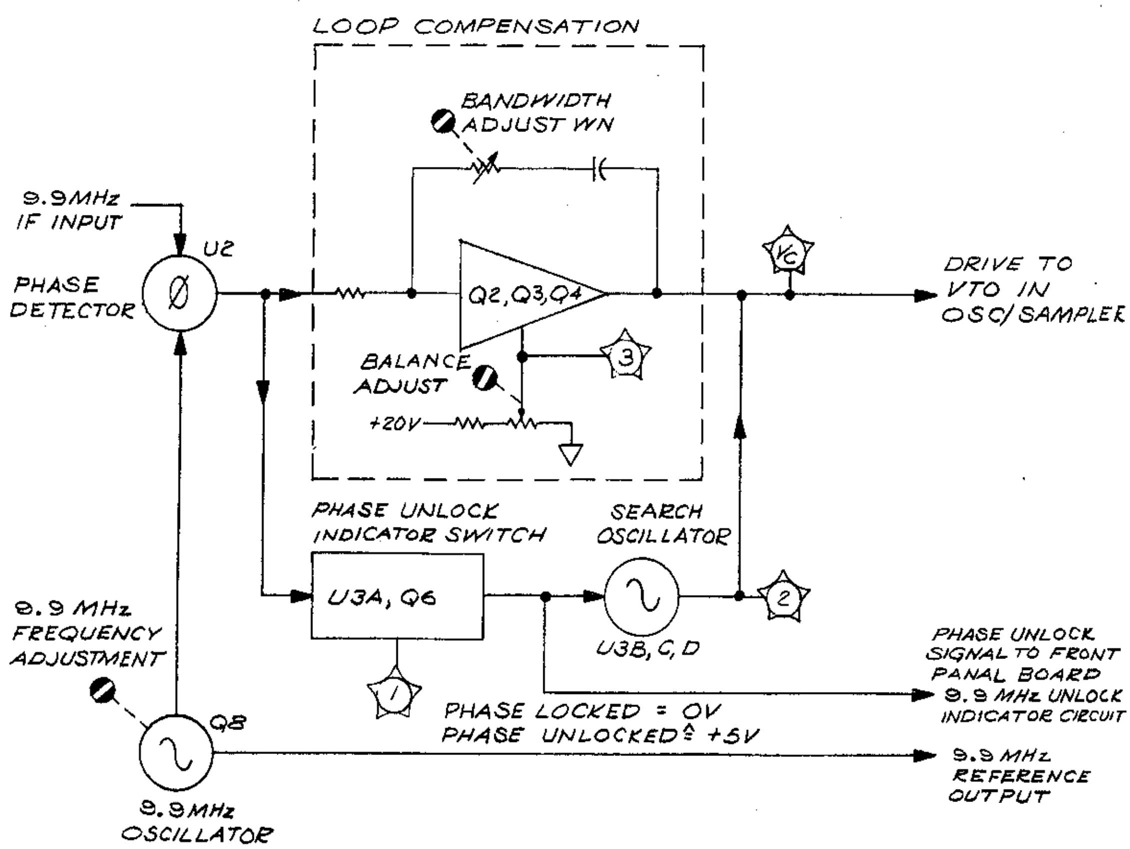


Figure B3-38. A1A15A1 9.9 MHz Phase Lock Board Assembly Block Diagram

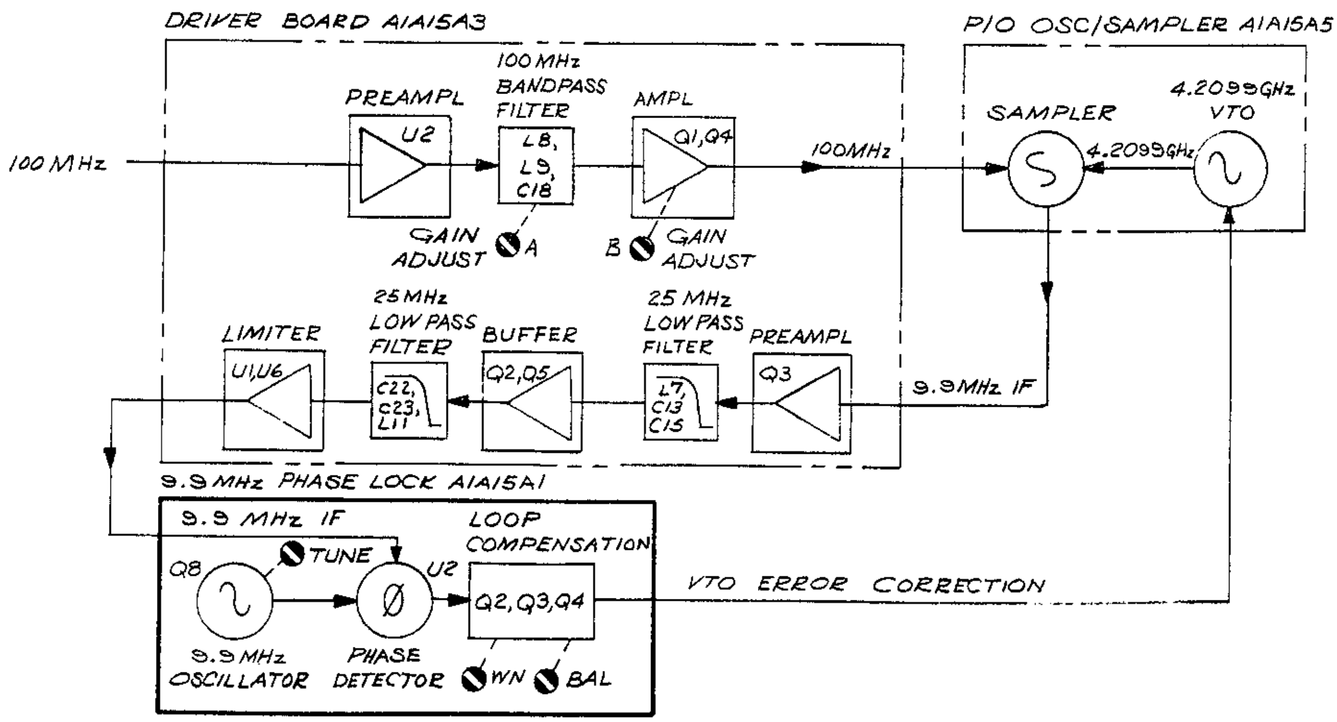
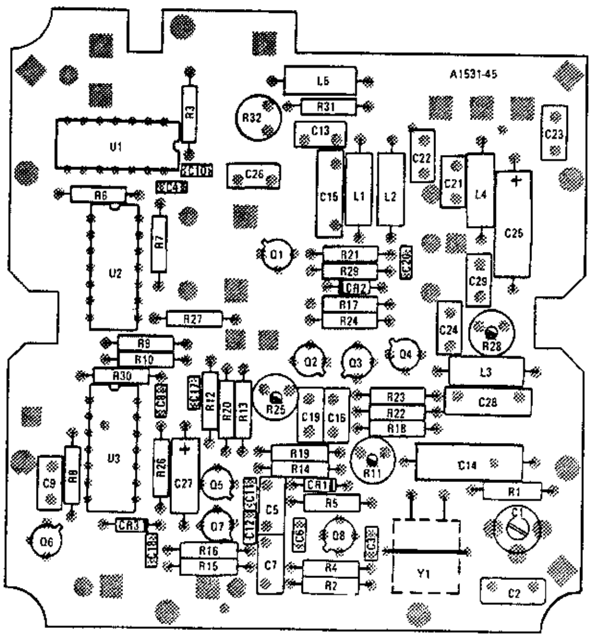


Figure B3-39. A1A15A1 9.9 MHz Phase-Locked Loop Block Diagram

A1A15A1



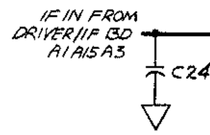
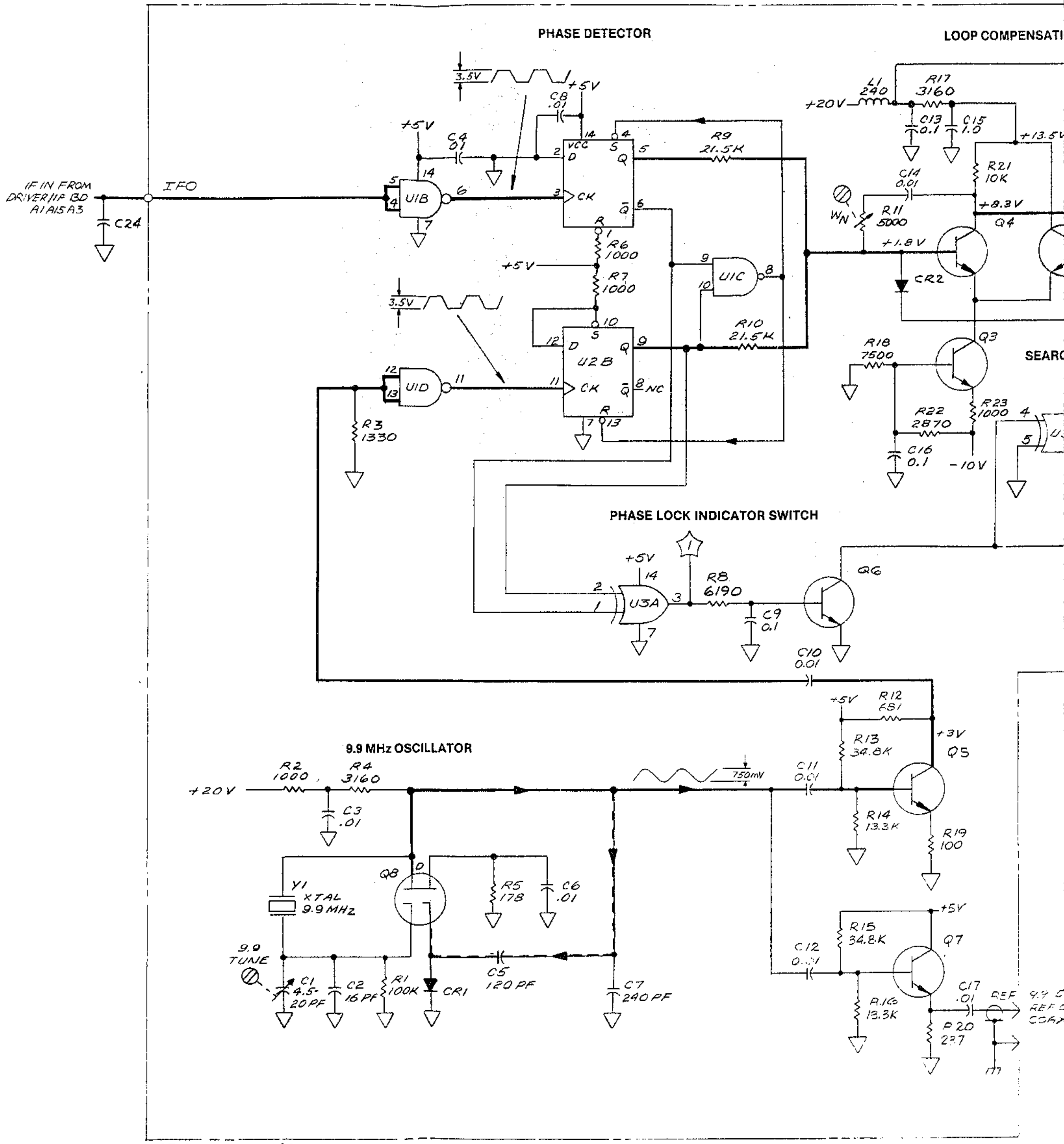


Figure B3-40. A1A15A1 9.9 MHz Phase Lock Board Assembly Parts Locations

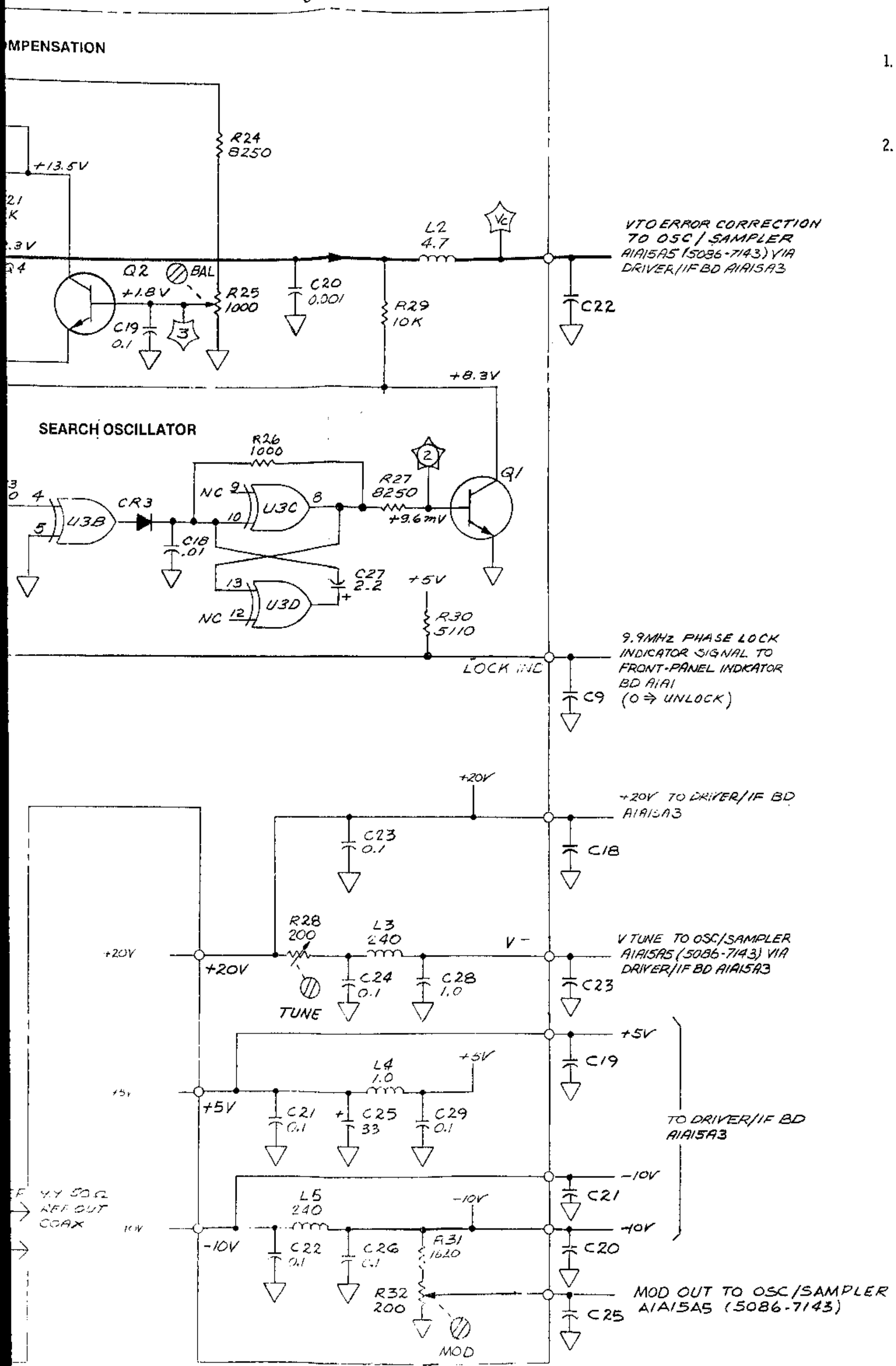
Fig B3-41
Sht 1 of 2

A1A15A1 9.9 MHz PHASE LOCK BOARD (08505-60063)



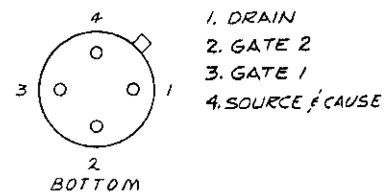
SERIAL PREFIX 1622A

Fig. B3-41
Sht 2 of 2



NOTES

1. REFERENCE DESIGNATIONS WITHIN THIS ASSEMBLY ARE ABBREVIATED. ADD ASSEMBLY NUMBER TO ABBREVIATION FOR COMPLETE DESCRIPTION.
2. UNLESS OTHERWISE INDICATED:
   RESISTANCE IN OHMS;
   CAPACITANCE IN MICROFARADS;
   INDUCTANCE IN MICROHENRIES.



REFERENCE DESIGNATORS

A1A15A1
C1 - 29
CR1 - 3
L1 - 5
Q1 - 8
R1 - 32
U1 - 3
Y1

A1A15A1

Figure B3-41. A1A15A1 9.9 MHz Phase Lock Board, Schematic

A1A15A2 10 MHz PHASE LOCK BOARD ASSEMBLY

The 10 MHz Phase Lock Board contains a phase detector circuit, a dc loop compensation circuit (for the phase lock loop), and unlock indicator driver, and a search oscillator.

Phase Detector Circuit

The phase detector circuit supplies a dc output that is proportional to the phase difference between the frequencies of two input signals. It consists of two D-type, positive edge-triggered flip-flops and a two-input NAND gate. The basic circuit is shown in Figure B3-42.

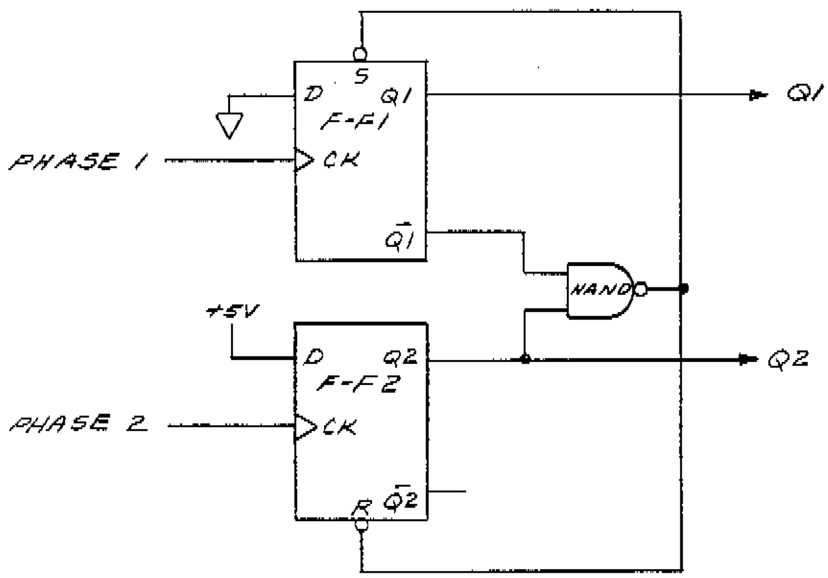


Figure B3-42. Phase Detector Stage Simplified Schematic

Phase 1 represents the IF input from the sampler, and phase 2 the 10 MHz reference input from Frequency Control Assembly A2. To start, assume the NAND gate output has just gone low, placing F-F 1 in its "set" state and F-F 2 in its "reset" state. As a result Q1 has gone high and $\overline{Q1}$ and Q2 have both gone low. Now, the NAND gate with two low inputs applied to it changes its output from low to high (one low input would do the same thing).

B3-46a

At this point, the first positive-going signal edge to appear at a clock input will change the state of the flip-flop receiving it. In Figure B3-43, the phase 1 input is shown leading the phase 2 input. On the positive-going edge of phase 1, F-F 1 will change state, causing Q1 to go low and $\overline{Q1}$ to go high. Shortly afterwards, a positive-going phase 2 signal clocks F-F 2 into the opposite (set) state causing Q2 to go high. Now, both inputs to the NAND gate are high, setting the NAND gate output low. The low NAND output immediately restores the two flip-flops to their former state (F-F 1 set, and F-F 2 reset). Q1 again goes high and Q2 low. Thus, during one cycle of the two phase inputs, Q1 supplies a negative-going pulse which starts on the positive-going edge of phase 1 and ends on the negative-going edge of phase 2. The Q2 output in this case is a narrow positive-going pulse which starts on the positive-going edge of phase 2 and lasts only for the very short reaction time of the gate and two flip-flops. If the phase 2 input had been leading phase 1, Q2 would have been the relatively wide pulse and Q1 the narrow pulse.

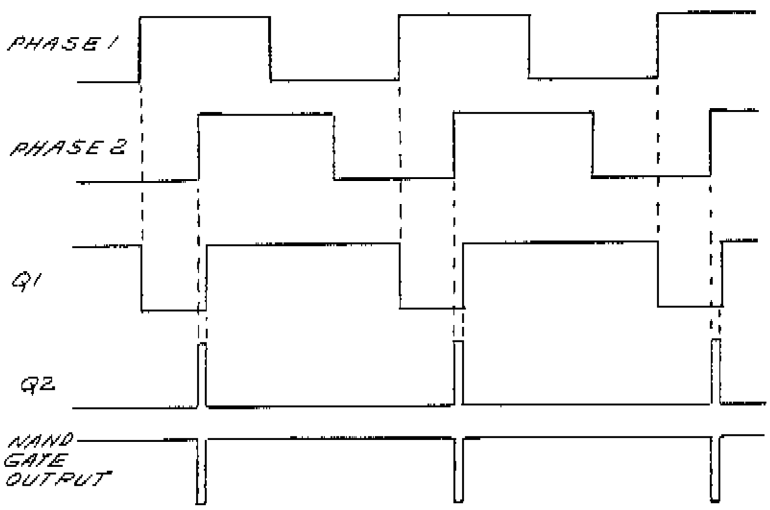


Figure B3-43. Phase Detector Timing Diagram

The phase detector outputs are the dc averages of the Q1 and Q2 outputs. They are summed into a dc amplifier as shown in Figure B3-44. The amplifier input is biased halfway between the swing of Q1 and the swing of Q2. If Q1 is high and Q2 is low, the total current summed into the amplifier is zero. If, as shown in the timing diagram, Figure B3-43, phase 1 is leading phase 2, during a portion of the cycle the detector will draw current out of the amplifier causing the amplifier output voltage to go positive. Conversely, if phase 2 leads phase 1, the current flow will be into the amplifier and the output voltage will go negative. Because the amplifier has a very large dc gain, a small phase offset will produce a relatively large error correction output voltage.

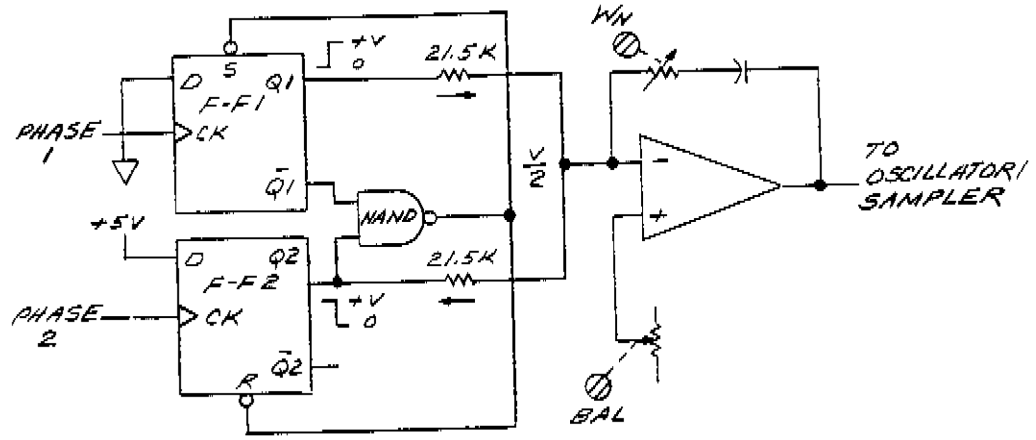


Figure B3-44. Phase Detector Output Summing Simplified Schematic

Loop Compensation

The amplifier driven by the phase detector consists of transistors Q2 and Q5 connected as a differential pair with Q1 as a constant-current source. The amplifier output is taken from the collector of Q2. Potentiometer R7 and capacitor C6 form a feedback element which helps establish the high-frequency gain of the loop (also dependent on resistors R5 and R6). R7 adjusts the overall loop bandwidth of the phaselock loop. Potentiometer R15 sets the base voltage of Q3, the amplifier's non-inverting input, and thus establishes the voltage reference for the summing junction. R15 is adjusted to set the phase offset out of the phase detector to minimum (this enhances the overall loop operation). Capacitor C18 and inductor L5 at the amplifier output filter out the 10 MHz pulses to prevent them from frequency-modulating the VTO.

Phase Unlock Indicator Circuit

The active components of the phase unlock indicator circuit are a two-input EXCLUSIVE OR gate, U3A, and transistor Q5. One input to U3A is taken from the $\overline{Q}$ output ($\overline{Q1}$) of flip-flop U2A; the other is from the Q output (Q2) of flip-flop U2B. When the IF and reference inputs to the phase detector flip-flops are in phase, outputs $\overline{Q1}$ and Q2 track each other; therefore, the output from U3A is low. And with a low input to its base, NPN transistor Q5 is off and its collector voltage is pulled toward +5 volts through pull-up resistor R18.

When the IF and reference inputs to the two flip-flops are out of phase, the two inputs ($\overline{Q1}$ and Q2) to gate U3A continually change their relationships, causing the output of U3A to alternate between high and low. This tends to bias Q5 on through resistor R4. As a result, the collector of Q5 goes low, turning on the search oscillator (U3C and U3D) and lighting the 10 MHz unlock indicator LED on the RF Source/Converter Front Panel Board Assembly (A1A1).

Search Oscillator Circuit

The search oscillator circuit consists of EXCLUSIVE OR gates U3C and U3D, capacitor C20, and resistor R16. These four components make up a free-running multivibrator, which oscillates at approximately 50 Hz when turned on by a low output from EXCLUSIVE OR gate U3B.

Normally, one input (pin 4) to EXCLUSIVE OR gate U3B is held high by the collector of Q5 while the other input (pin 5) is always low. Thus, the output of U3B is high. This high output, applied through forward-biased diode CR2, disables the search oscillator. If, however, the phase loop becomes unlocked, the collector of Q5 goes low, causing the output of U3B to go low and back-bias diode CR2. With the disabling input removed, the multivibrator will start to oscillate.

The oscillator output will cause transistor Q4 to turn on and off at the oscillation rate. During the period Q4 is on, diode CR1 is forward biased, pulling the base of amplifier transistor Q4 close to ground and shutting it off. With Q2 off, the amplifier output is taken from a voltage divider formed by resistors R10 and R19. This reduces the output level by one half, which centers the VTO drive and gives the VTO a chance to reacquire the phase lock frequency. When Q4 is shut off by the search oscillator, Q2 returns to its original state and the loop tries to re-lock. The search cycle continues until the phase lock loop actually re-locks. When the phase lock is restored, the search oscillator is again disabled by a high input from U3B and the unlock indicator on the Front Panel Board Assembly is turned off.

Miscellaneous Circuitry

The 10 MHz Phase Lock Board Assembly buses power supply inputs to Driver/IF Board Assembly A1A15A4. Potentiometer R13, in series with the +20 volts supply, adjusts the collector supply voltage of the fixed oscillator in Oscillator/Sampler Assembly A1A15A6. It is used as an oscillator pre-tune adjustment.

Troubleshooting Hints

1. Before doing anything else, make sure the reference frequency is present.

2. If the loop will not lock, disable the search oscillator by grounding test point TP1. Then tune potentiometer R13 (TUNE) while checking at the IF input to U1B (pins 4 and 5) to see if the IF is present. If there is no IF input, the problem is in Oscillator/Sampler Assembly (microcircuit) A1A15A6 or in Driver/IF Board Assembly A1A15A4.

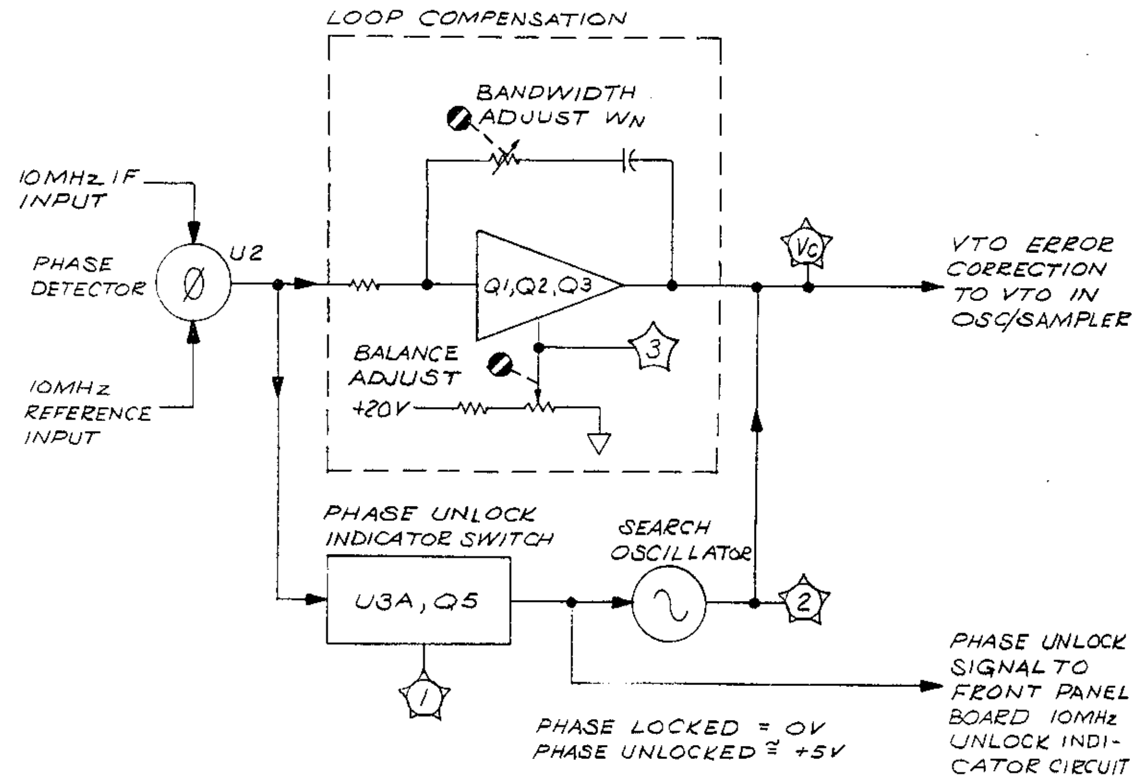


Figure B3-45. A1A15A2 10 MHz Phase Lock Board Assembly Block Diagram

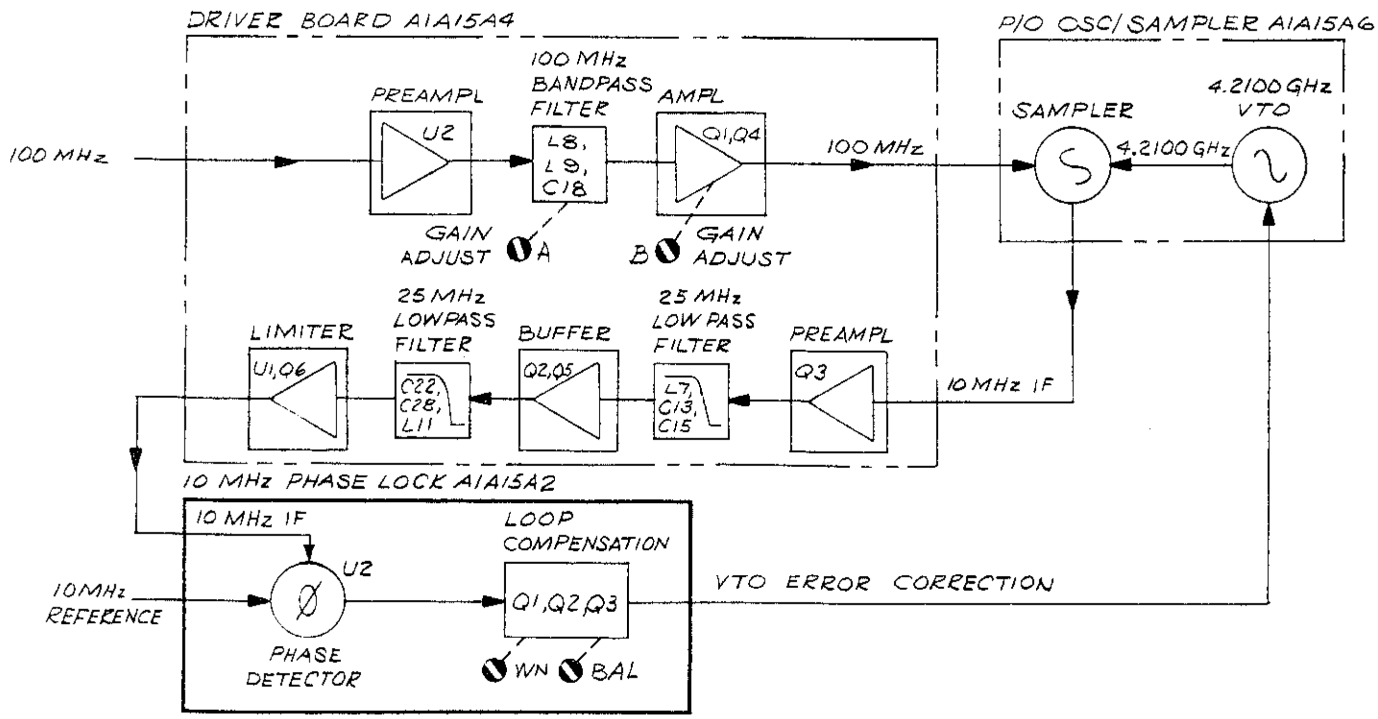


Figure B3-46. A1A15A2 10 MHz Phase Locked Loop Block Diagram

A1A15A2

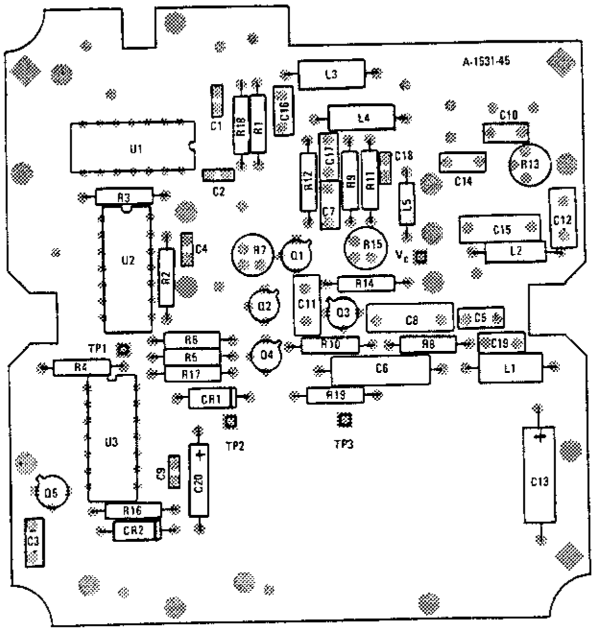
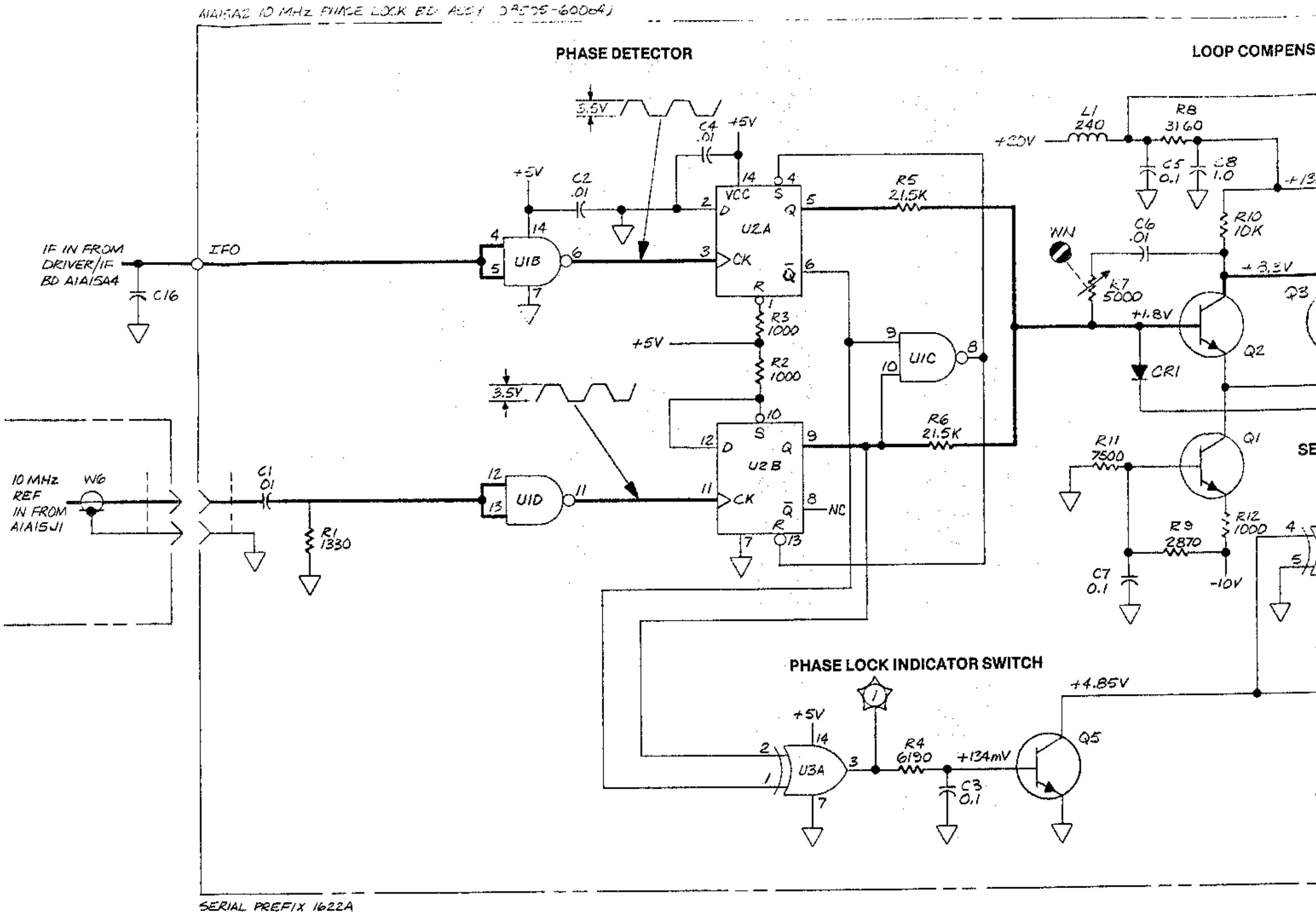
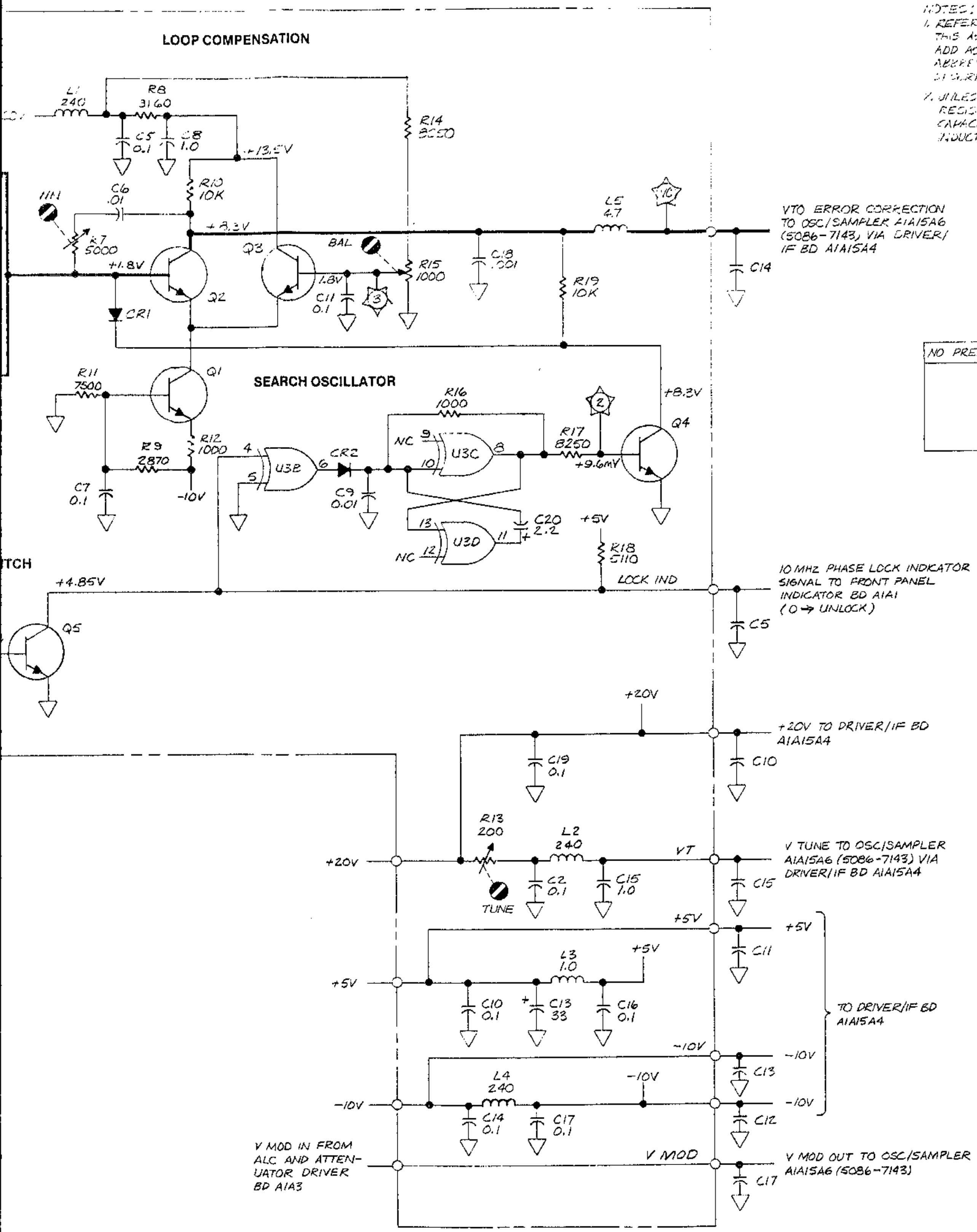


Figure B3-47. A1A15A2 10 MHz Phase Lock Board Parts Location

B3-48
5 ut 1 of 2



B3-48
Sht 2 of 2



NOTES:
1. REFERENCE DESIGNATIONS WITHIN THIS ASSEMBLY ARE ABBREVIATED. ADD ASSEMBLY NUMBER TO ABBREVIATION FOR COMPLETE DESCRIPTION.
2. UNLESS OTHERWISE NOTED: RESISTANCE IN OHMS; CAPACITANCE IN MICROFARADS; INDUCTANCE IN MICROHENRIES.

NO PREFIX	A1A15A2
	C1-C20
	CR1,2
	L1-5
	Q1-5
	R1-19
	U1-3

A1A15A2

Figure B3-48. A1A15A2 10 MHz Phase Lock Board, Schematic

A1A15A3 AND A1A15A4 DRIVER BOARD ASSEMBLIES

General Description

Driver Board Assemblies A1A15A3 and A1A15A4 are identical. One is used in each phase lock loop to supply an amplified 100 MHz reference to the loop's sampler, and to amplify and buffer the sampler's IF output to the loop's Phase Lock Board Assembly. The two driver signal paths (100 Mhz and IF) contained on each Driver Board Assembly are completely independent of one another; only the supply voltage inputs to the board are common to both of them.

100 MHz Driver

The 100 MHz reference signal, cabled into the RF Source/Converter from Frequency Control Assembly A2, is split at the input to Fixed Oscillators Assembly A1A15 and fed to both Driver Board Assemblies. The 100 MHz input to each board is coupled through capacitors C1 and C10 to integrated circuit preamplifier U2. Inductor L2 and capacitor C1 set the input impedance of the 100 MHz input to approximately 100 ohms. However, because there are two 100 MHz drivers receiving the same 100 MHz input in parallel, the actual input impedance to the Fixed Oscillators Assembly is 50 ohms.

Preamplifier U2 provides approximately 10 dB of gain to the input signal, which is then fed to a parallel-tuned 100 Mhz bandpass filter, L8 and C18. Variable capacitor C18 is adjusted to peak the signal at 100 Mhz. (Note that C18 is an especially sensitive adjustment.)

Inductor L9 matches the bandpass filter output to the input of common-emitter amplifier Q4. Inductor L10 is the collector load for Q4.

The output of Q4 is matched to the input of common-emitter amplifier Q1 with capacitors C24 and C26. C24 is variable and is adjusted for maximum output drive to the Oscillator/Sampler Assembly. C32 and L14 match the output impedance of Q1 to the Oscillator/Sampler input impedance.

IF Amplifier

The IF input from the Oscillator/Sampler Assembly is fed to preamplifier (FET) Q3. Inductor L1 at the preamplifier input and stray capacitance at the sampler output form a parallel resonant circuit which peaks the IF input near 10 MHz. The FET amplifier provides a high input impedance and isolates the input from the following circuits.

From the preamplifier, the signal is passed through a 25 MHz low-pass filter to a buffer amplifier. The filter, made up of inductor L7 and capacitors C13 and C15, passes the signals below 25 MHz which are present when the loop is unlocked and trying to relock, but it attenuates the always-present 100 MHz feedthrough from the sampler drive.

Buffer amplifier Q2—Q5 provides approximately 10 dB of gain. Q2 is connected in a common-emitter configuration with R8 providing an emitter feedback path. This arrangement gives the amplifier a relatively high input impedance. The other half of the amplifier, Q5, is connected as an emitter-follower to transform the high input impedance into output impedance of approximately 50 ohms. The output from the buffer amplifier feeds through another 25 MHz low-pass filter consisting of C22, C23, and L11. This filter serves the same purpose as the one preceding the buffer.

B3-484

From the second low-pass filter, the signal is fed to a two-stage limiter comprising integrated circuit U1 and transistor Q6. U1 is a limiting amplifier which provides the final gain for the signal before it is passed to the Phase Lock Board Assembly. Inductor L12, across the two inputs to U1, provides a dc input bias for U1. It also causes the amplifier to react to its input in such a way that the IF signal path peaks near 30 MHz and rolls off sharply before 100 MHz.

Transistor Q6 is connected as an emitter-follower to buffer the limiter output, and provide a low impedance drive to the input TTL device on Phase Lock Board Assembly. Resistor R198 draws enough current to bias the TTL input at about 1 volt (the midpoint between high and low).

The Driver Board Assembly also serves as a straight-through interconnection between its associated Phase Lock Board and Oscillator/Sampler Assemblies. The V_C line is the control voltage for the varactor oscillator (VTO). V_T is the VTO collector supply, used for pretuning the oscillator when setting up the phase lock loop. Parallel resistances, thermister RT1 and resistor R3, are in series with the V_T line to provide frequency-change temperature compensation for the VTO. The line labeled V_{MOD} is the modulator drive originating in ALC and Attenuator Driver Assembly A1A3. V_{MOD} is applied only to Oscillator/Sampler Assembly A1A15A6.

A1A15A5 4.2099 GHz OSCILLATOR/SAMPLER ASSEMBLY

The 4.2099 GHz Oscillator/Sampler Assembly (microcircuit) provides the high frequency signal used to generate the LO, and is a means of stabilizing the LO to lower frequency references.

The oscillator consists of two transistors, cross-coupled to each other by a tank circuit on a thin-film substrate. The −10 volts supply, input at pin E2, is the emitter bias for the two transistors. The V_C input on pin E4 is the collector supply for the oscillator. Changing the V_C voltage level slightly tunes the center frequency of the oscillator. Another input, V_{TUNE}, applied to pin E3, drives a varactor which is loosely coupled to the oscillator circuit. To the oscillator, this resembles a diode input that is reverse biased at positive V_{TUNE} voltages.

Between the oscillator and the RF output at J1 is a two-diode PIN modulator. Drawing current out of pin E1 causes diodes in the RF path to be shunted to ground, which attenuates the RF output.

The sampler takes the 100 MHz input signal and performs a harmonic mixing action that causes the 42nd harmonic of 100 Mhz to be mixed with the output of the 4.2 GHz VTO. The resulting IF at E5 is the difference frequency of the two components. In this loop, the difference frequency (IF) is forced to be 9.9 MHz by the rest of the loop circuitry. This 9.9 MHz IF is applied to the phase detector circuit where it is compared with a 9.9 MHz reference. The resulting output from the oscillator is 4.2099 GHz.

A1A15A6 4.210 GHz OSCILLATOR/SAMPLER ASSEMBLY

The 4.210 GHz Oscillator/Sampler Assembly (microcircuit) provides the high frequency signal used to generate the RF, and is a means of stabilizing the RF to lower frequency references.

The oscillator consists of two transistors, cross-coupled to each other by a tank circuit on a thin-film substrate. The −10 volts supply, input at pin E2, is the emitter bias for the two transistors. The V_C input at pin E4 is the collector supply for the oscillator. Changing the V_C voltage level slightly tunes the center frequency of the oscillator. Another input, V_{TUNE}, applied to pin E3, drives a varactor which is loosely coupled to the oscillator circuit. To the oscillator, this resembles a diode input that is reverse biased at positive V_{TUNE} voltages.

Between the oscillator and the RF output at J1 is a two-diode PIN modulator. Drawing current out of pin E1 causes diodes in the RF path to be shunted to ground, which attenuates the RF output.

The sampler takes the 100 MHz input signal and performs a harmonic mixing action that causes the 42nd harmonic of 100 Mhz to be mixed with the output of the 4.2 GHz VTO. The resulting IF at E5 is the difference frequency of the two components. In this loop, the difference frequency (IF) is forced to be 10 MHz by the rest of the loop circuitry. This 10 MHz IF is applied to the phase detector circuit where it is compared with a 10 MHz reference. The resulting output from the oscillator is 4.210 GHz.

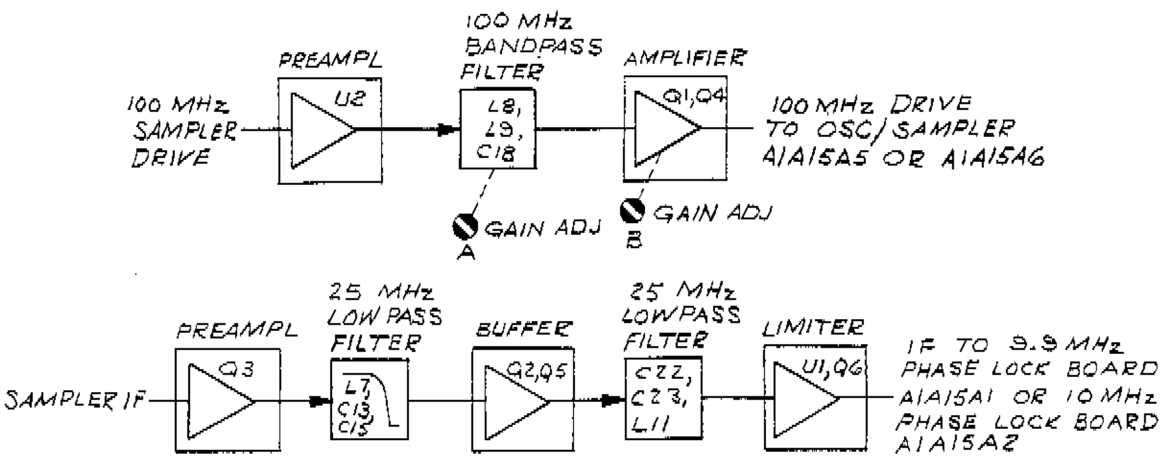


Figure B3-49. A1A15A3/4 Driver Board Assembly Block Diagram

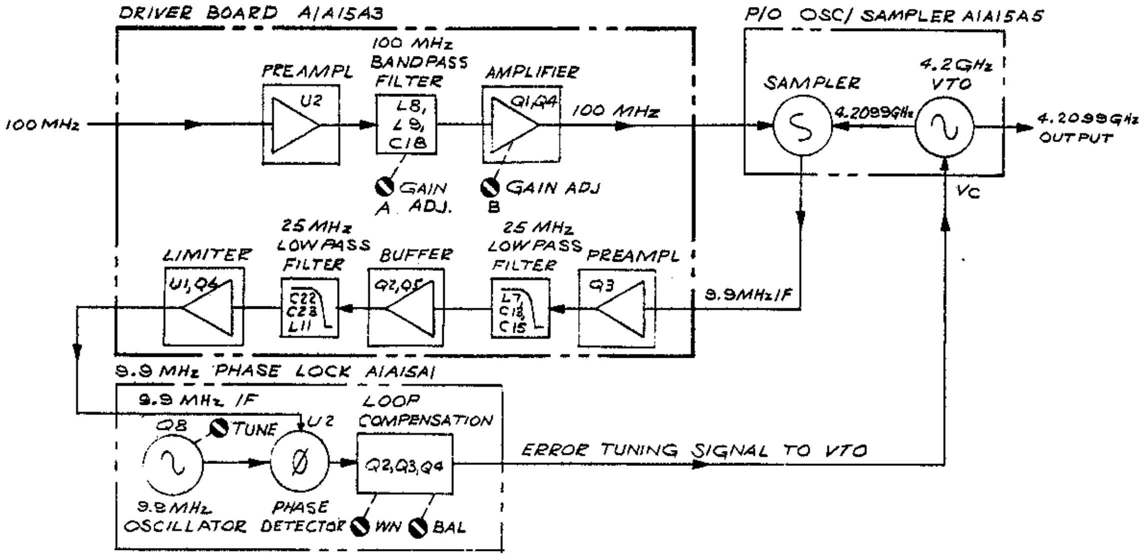


Figure B3-50. 9.9 MHz Phase Lock Loop Block Diagram

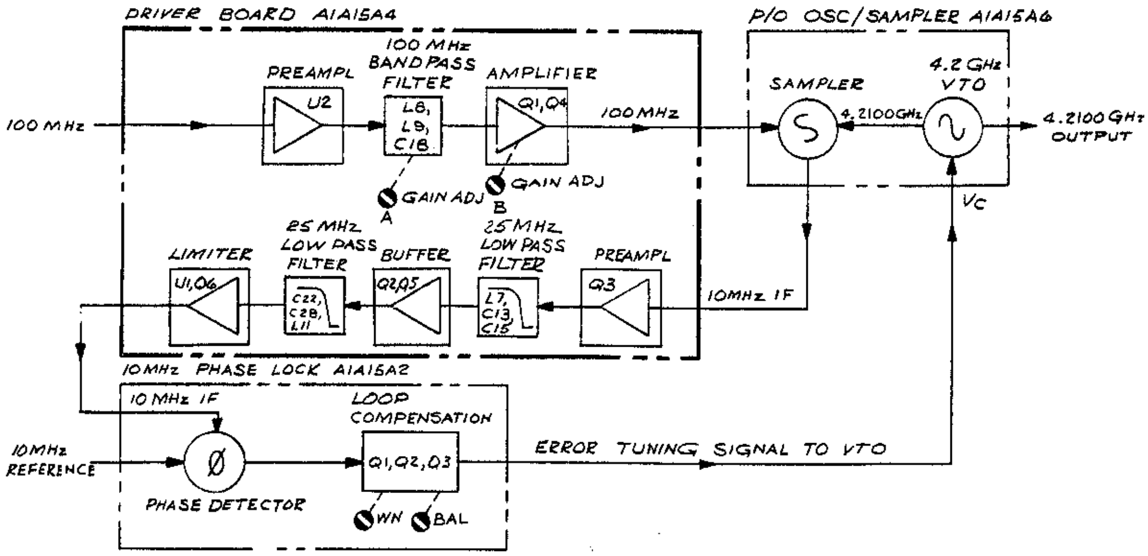


Figure B3-51. 10 MHz Phase Lock Loop Block Diagram

A1A15A3/4

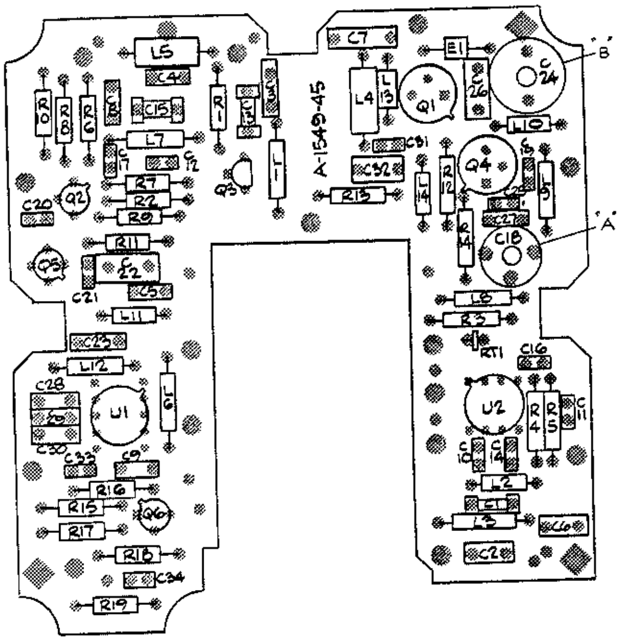


Figure B3-52. A1A15A3/4 Driver Board Assembly Parts Locations

A1A15A5/6

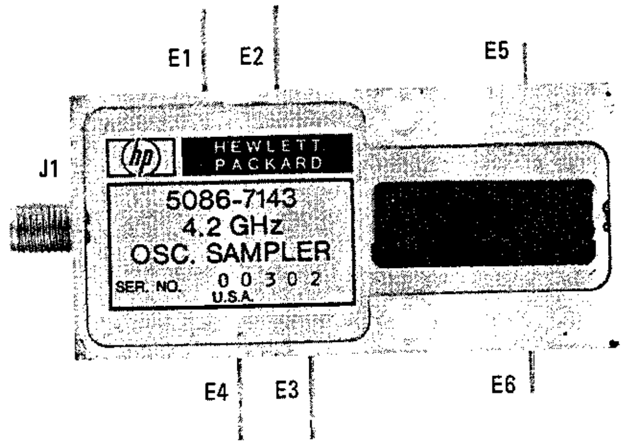


Figure B3-53. A1A15A5/6 4.2 GHz Oscillator/Sampler Assembly Terminal Locations

Fig B3-54
Sht 1 of 3

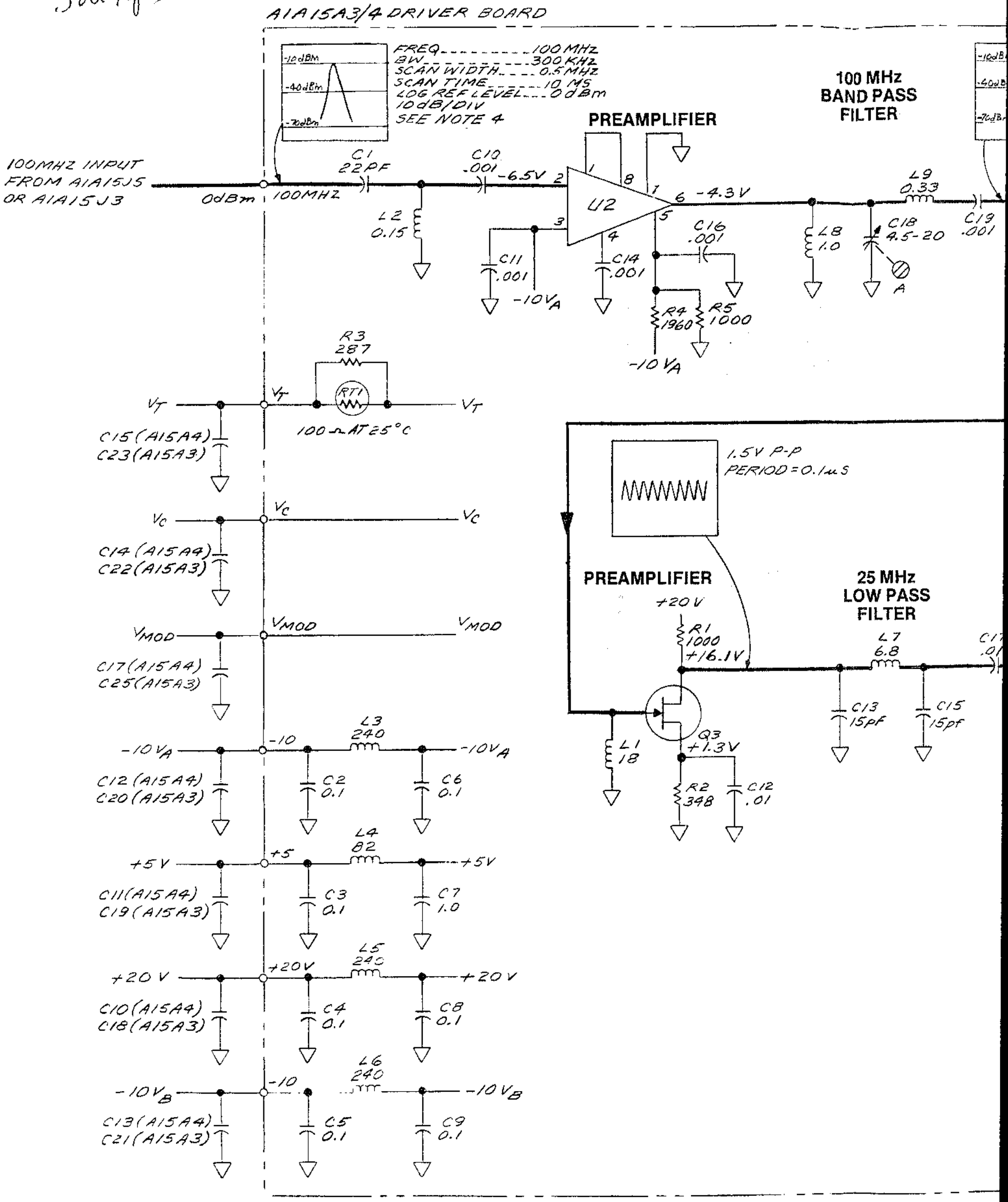


Fig B3-54
Sht 2 of 3

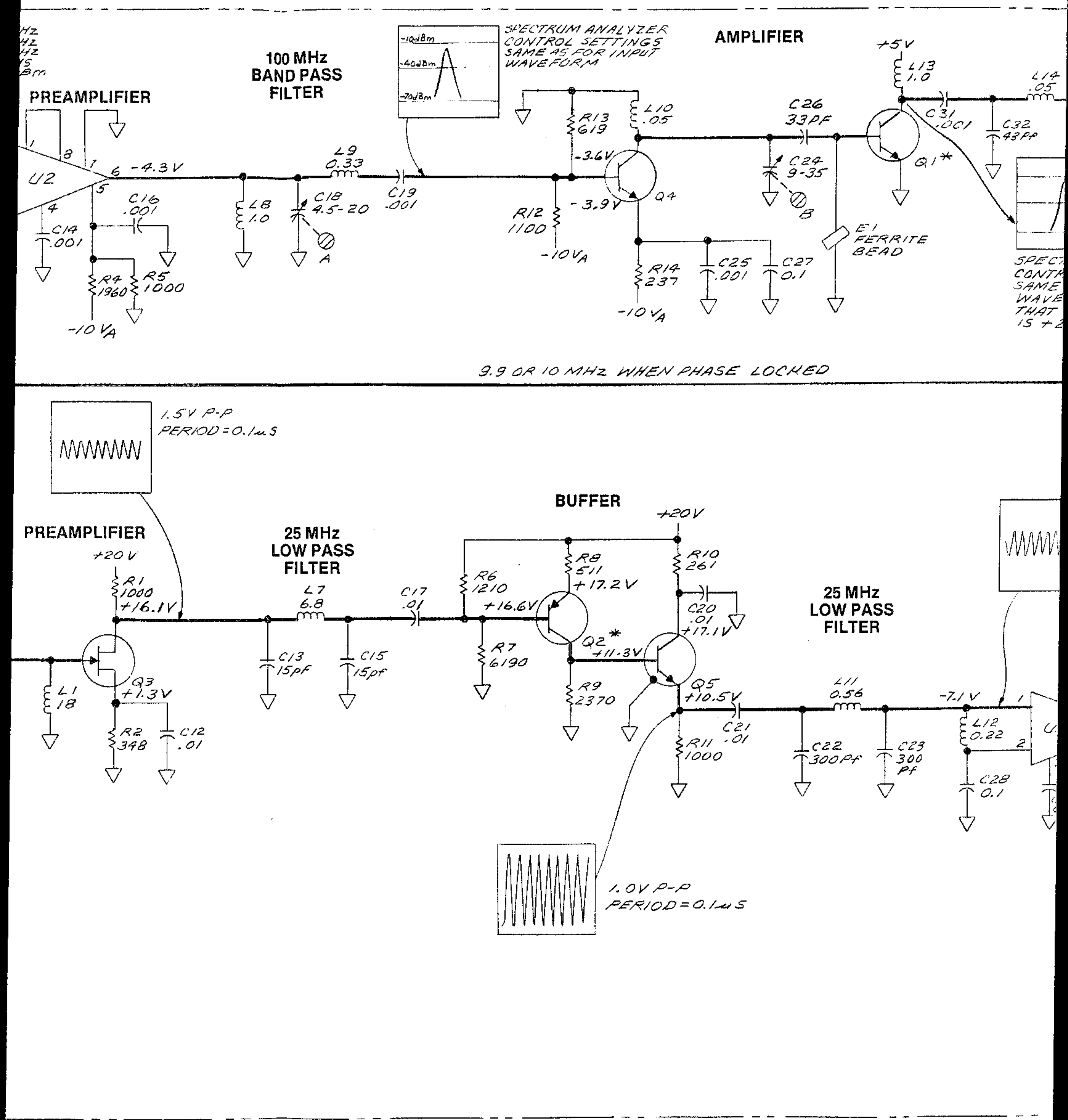
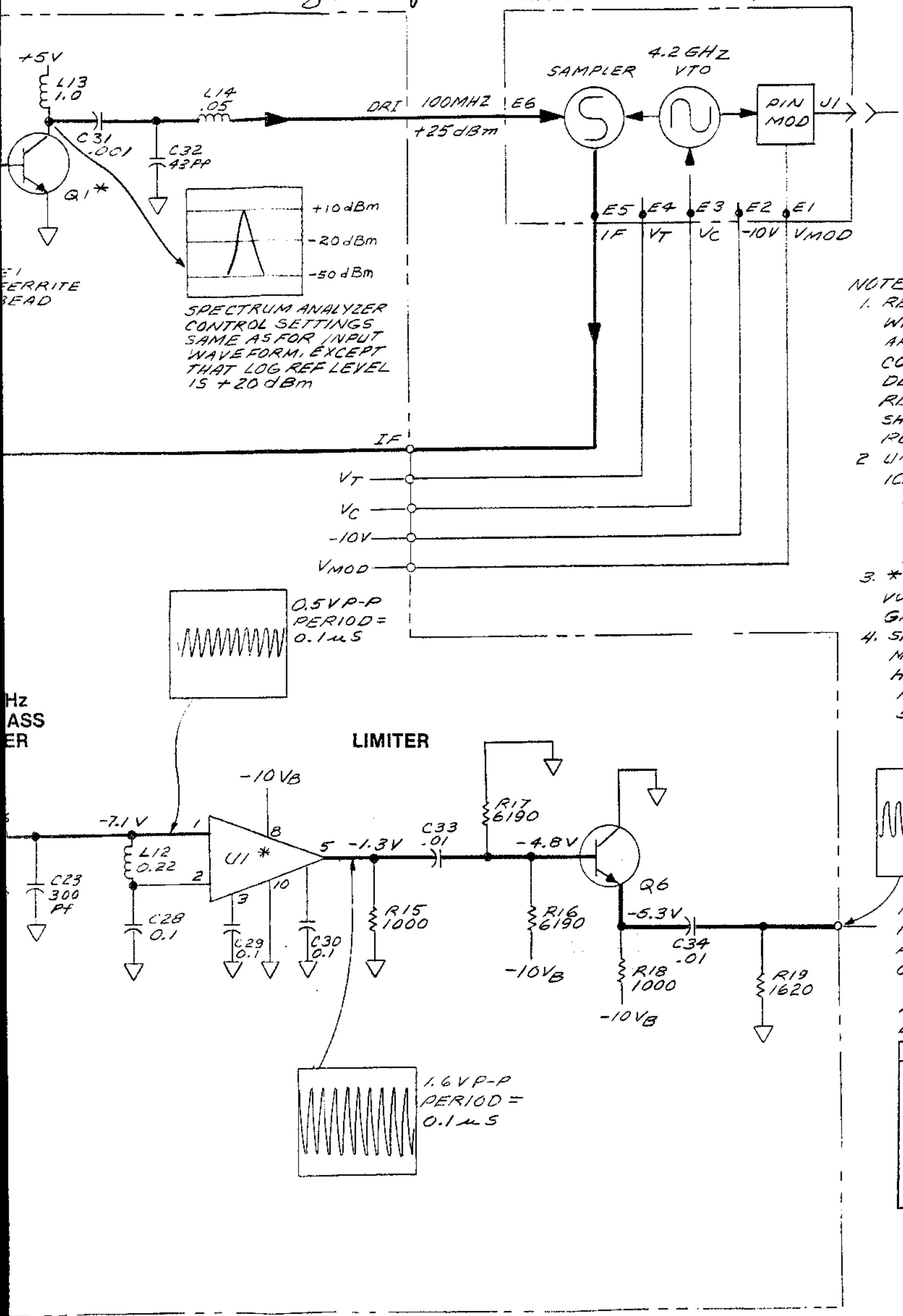


Fig B3-54
Sht 3 of 3



NOTES:
1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATOR, PREFIX REFERENCE DESIGNATOR SHOWN WITH THE ASSEMBLY REFERENCE DESIGNATOR
2. UNLESS OTHERWISE INDICATED,
   RESISTANCE IN OHMS
   CAPACITANCE IN MICROFARADS
   INDUCTANCE IN MICROHENRIES
3. * DEVICE CASE IS AT SOME VOLTAGE OTHER THAN GROUND
4. SPECTRUM ANALYZER MEASUREMENTS MADE WITH HP 8555A, AND 10020A RESISTIVE PROBE WITH 5:1 DIVIDER.

REFERENCE DESIGNATORS

A1A15A3/4		
C1	-	34
E1	-	
L1	-	14
Q1	-	6
R1	-	19
RT1		
U1	-	2

A1A15A/3/4

A1A15A/5/6

Figure B3-54. A1A15A3/4 Driver Board and A1A15A5/6 Oscillator/Sampler Assembly Schematic

CHAPTER B
RF SOURCE/CONVERTER

SECTION IV
MANUAL CHANGES

B4-1. INTRODUCTION

B4-2. This section contains instructions for adapting this chapter of the manual to 8505A Network Analyzers having serial numbers lower than those listed on the title page. To adapt this chapter to your 8505A, refer to Table B4-1 and make all the changes listed opposite the serial number or serial number prefix indicated on the serial number plates on the top and bottom units of your 8505A.

Table B4-1. Chapter B Changes by 8505A Serial Number

Serial Number Prefix	Make Changes
1625A,1622A,1618A,1614A,1610A,1606A	No Change
1602A	A

B4-3. CHAPTER B CHANGE INSTRUCTIONS

CHANGE A

Page B2-5, Table B2-2:
Delete A1A1C3, A1A1C4, and A1A1C5.
Add A1A1R10, A1A1R11, and A1A1R12, HP Part No. 0683-1065, RESISTOR 10M 5% .25W FC TC=900/+1100, Mfr Code 01121, Mfr Part No. CB1065

Page B2-8, Table B2-2:
Change A1A14L1 and A1A14L2 to HP Part No. 9140-0210, COIL-FXD MOLDED RF CHOKE 100UH 5%, Mfr Code 24226, Mfr Part No. 15/103.

Page B3-27, Figure B3-17:
Change C3, C4, and C5 to R10, R11, and R12 respectively.

Page B3-27, Figure B3-18:
Change SERIAL PREFIX to 1602A.
Change C3, C4, and C5 to 10M resistors, R10, R11, and R12 respectively.
Change listing of capacitors and resistors in REFERENCE DESIGNATORS block to read "C1 5" and "R1 31."

CHAPTER C
FREQUENCY CONTROL

C-1. INTRODUCTION

C-2. This chapter of the manual contains the information you will need to service the Frequency Control Assembly. The chapter is divided into three sections: Section I contains general information about the Frequency Control Assembly; Section II contains a list of the assembly's replaceable parts; Section III provides troubleshooting information, the assembly schematic diagrams, and parts location illustrations; and Section IV contains changes you must make to the chapter to adapt (backdate) it to instruments having serial number prefixes below those indicated on the manual's title page.

SECTION I
GENERAL INFORMATION

CHAPTER C
FREQUENCY CONTROL

SECTION II
FREQUENCY CONTROL ASSEMBLY A2 REPLACEABLE PARTS

C2-1. INTRODUCTION

C2-2. This section contains information for ordering parts for the Frequency Control Assembly. Table C2-1 is a list of abbreviations used in the parts list and throughout the manual. Table C2-2 lists all the replaceable parts in the Frequency Control Assembly in reference designator order. Table C2-3 lists the manufacturers codes used in the Replaceable Parts List and the names of the corresponding manufacturers. Miscellaneous mechanical parts are identified in Figure C2-1.

C2-3. PARTS LIST ARRANGEMENT

C2-4. In Table C2-2, the Replaceable Parts List, electrical assemblies and their components are listed in alpha-numerical order by reference designator. Chassis-mounted parts are listed first followed by sub-assemblies A2A1 through A2A12 and A2A18 through A2A23 and their components. (Reference designators A2A13 through A2A17 are reserved for Option 001, HP Interface Bus, subassemblies.)

C2-5. ORDERING INFORMATION

C2-6. To order a part listed in Table C2-2, address the order to the nearest Hewlett-Packard office, stating the Hewlett-Packard part number and quantity required.

C2-7. To order a part that is not listed in the Replaceable Parts List, include the instrument serial number, the description and function of the part, and the number of parts required.

Table C2-1. Reference Designations and Abbreviations (1 of 2)

REFERENCE DESIGNATIONS

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

ABBREVIATIONS

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

NOTE

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

Table C2-1. Reference Designations and Abbreviations (2 of 2)

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

NOTE

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

MULTIPLIERS

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

Table C2-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A2B1	3160-0273	1	FAN-TBAX 34-CFM 115V 50/60-HZ 1.496-THK	28480	3160-0273
A2F1	2110-0006	1	FUSE 2AT 125V SLO-BLO	28480	2110-0006
A2F1	2110-0312		FUSE 1AT 250V SLO-BLO	28480	2110-0312
A2FL1	0960-0443	1	LINE MODULE, FILTERED	28480	0960-0443
A2J1	1250-1251	1	ADAPTER-COAX F-SMA F-SMA	2K497	705628-001
A2J2	1251-3419	2	CONNECTOR 24-PIN F D SERIES	71785	DDMF-24W7S
A2J3	1251-3419		CONNECTOR 24-PIN F D SERIES	71785	DDMF-24W7S
A2J4	1251-2499	1	CONNECTOR 14-PIN M RECTANGULAR	76381	3406-0000
A2J5	1250-0870	1	CONNECTOR-RF BNC FEM SGL HOLE RR	24931	28JS 112-1
A2J6	1250-0083	1	CONNECTOR-RF BNC FEM SGL HOLE FR	24931	28JR-130-1
A2W1	08505-60121	1	CABLE ASSEMBLY,BLACK;FREQ.CAL	28480	08505-60121
A2W2	08505-60123	1	CABLE ASSEMBLY,BLACK;10 MHZ OUT(A2A12J3)	28480	08505-60123
A2W3	08505-60124	1	CABLE ASSEMBLY,BLUE;10 MHZ OUT(A2A12J2)	28480	08505-60124
A2W4	08505-60126	1	CABLE ASSEMBLY,GRAY/BLUE;PREAMPL IN	28480	08505-60126
A2W5	08505-60127	1	CABLE ASSEMBLY,VIOLET;100 MHZ OUT	28480	08505-60127
A2W6	08505-60128	1	CABLE ASSEMBLY,GRAY;AM INPUT	28480	08505-60128
A2W7	08505-60132	1	CABLE ASSEMBLY,GRAY/GREEN;REAR PANEL	28480	08505-60132
		1	(P/O A2W16)		
A2W8	08505-60133	1	CABLE ASSEMBLY,GRAY/BROWN;IF R	28480	08505-60133
A2W9	08505-60134	1	CABLE ASSEMBLY,GRAY/RED;IF A	28480	08505-60134
A2W10	08505-60135		CABLE ASSEMBLY,GRAY/ORANGE IF B	28480	08505-60135
A2W11	08505-60136	1	CABLE ASSEMBLY,RED;PTLO	28480	08505-60136
A2W12	08505-60137	1	CABLE ASSEMBLY,GRAY/BLUE;TRLO	28480	08505-60137
A2W13	08505-60138	1	CABLE ASSEMBLY,BROWN;V SW 3	28480	08505-60138
A2W14	08505-60139	1	CABLE ASSEMBLY,RED	28480	08505-60139
A2W15	08505-60140	1	CABLE ASSEMBLY,GRAY/BLUE;VSC	28480	08505-60140
A2W16	08505-60142	1	CABLE ASSEMBLY,REAR PANEL;INCLUDES A2W7,	28480	08505-60142
		1	A2J4,A2W16P1(MATES WITH A2A18J11),AND CABLE STRAP		
A2W17	08505-60146	1	CABLE ASSEMBLY,RIBBON;A2J2 TO A2A18J10	28480	08505-60146
A2W18	08505-60147		CABLE ASSEMBLY,RIBBON;YIG SUPPLY	28480	08505-60147
A2W19	08505-20140	1	CABLE,COAX;SEMI-RIGID;YIG OSC OUT(A2A19)	28480	08505-21040
	8120-2231	1	BOARD ASSEMBLY, EXTENDER 50-PIN	28480	8120-2231
	08505-60108	1	BOARD ASSEMBLY,EXTENDER 50-PIN	28480	08505-60108
	6960-0002	3	PLUG-HOLE FL-HD .5-DIA STL	57771	D-2733-LCS
	08505-60109	1	BOARD ASSEMBLY,EXTENDER 12-PIN	28480	08505-60109
A2A1	08505-60120	1	PANEL ASSEMBLY, FRONT	28480	08505-60120
A2A1W1	08505-60141	2	CABLE ASSEMBLY,RIBBON;FRONT PANEL	28480	08505-60141
A2A1W2	08505-60141		CABLE ASSEMBLY,RIBBON;FRONT PANEL	28480	08505-60141
A2A1W3	08505-60149	1	CABLE ASSEMBLY, LINE SWITCH(INCL. SWITCH	28480	08505-60149
	3101-2025	1	SWITCH-RKR SUBMIN DPDT NS 2A 250VAC	28480	3101-2025
		1	(INCLUDES HARDWARE)		
A2A1A1	08505-60093	1	BOARD ASSEMBLY, PANEL FRONT	28480	08505-60093
			NOTE:		
			DS1-14, R13 NOT SUPPLIED W/A2A1A1 BOARD		
A2A1A1C1	0180-0197	17	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A2A1A1C2	0160-4084	36	CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A2A1A1C3	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A2A1A1C4	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A2A1A1C5	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A2A1A1C6	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A2A1A1C7	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A2A1A1DS1	1990-0503	14	DISPLAY NUM DOT MAT 1 CHAR .29 IN HIGH	28480	1990-0330
A2A1A1DS2	1990-0503		DISPLAY NUM DOT MAT 1 CHAR .29 IN HIGH	28480	1990-0330
A2A1A1DS3	1990-0503		DISPLAY NUM DOT MAT 1 CHAR .29 IN HIGH	28480	1990-0330
A2A1A1DS4	1990-0503		DISPLAY NUM DOT MAT 1 CHAR .29 IN HIGH	28480	1990-0330
A2A1A1DS5	1990-0503		DISPLAY NUM DOT MAT 1 CHAR .29 IN HIGH	28480	1990-0330
A2A1A1DS6	1990-0503		DISPLAY NUM DOT MAT 1 CHAR .29 IN HIGH	28480	1990-0330
A2A1A1DS7	1990-0503		DISPLAY NUM DOT MAT 1 CHAR .29 IN HIGH	28480	1990-0330
A2A1A1DS8	1990-0503		DISPLAY NUM DOT MAT 1 CHAR .29 IN HIGH	28480	1990-0330
A2A1A1DS9	1990-0503		DISPLAY NUM DOT MAT 1 CHAR .29 IN HIGH	28480	1990-0330
A2A1A1DS10	1990-0503		DISPLAY NUM DOT MAT 1 CHAR .29 IN HIGH	28480	1990-0330
A2A1A1DS11	1990-0503		DISPLAY NUM DOT MAT 1 CHAR .29 IN HIGH	28480	1990-0330
A2A1A1DS12	1990-0503		DISPLAY NUM DOT MAT 1 CHAR .29 IN HIGH	28480	1990-0330
A2A1A1DS13	1990-0503		DISPLAY NUM DOT MAT 1 CHAR .29 IN HIGH	28480	1990-0330
A2A1A1DS14	1990-0503		DISPLAY NUM DOT MAT 1 CHAR .29 IN HIGH	28480	1990-0330
A2A1A1DS15	1990-0487	9	LED-VISIBLE	28480	1990-0487
A2A1A1DS16	1990-0487		LED-VISIBLE	28480	1990-0487
A2A1A1DS17	1990-0487		LED-VISIBLE	28480	1990-0487
A2A1A1DS18	1990-0487		LED-VISIBLE	28480	1990-0487
A2A1A1DS19	1990-0487		LED-VISIBLE	28480	1990-0487
A2A1A1DS20	1990-0487		LED-VISIBLE	28480	1990-0487

Table C2-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A2A1A1DS21	1990-0487		LED-VISIBLE	28480	1990-0487
A2A1A1DS22	1990-0487		LED-VISIBLE	28480	1990-0487
A2A1A1DS23	1990-0487		LED-VISIBLE	28480	1990-0487
A2A1A1DS24	1990-0486	3	LED-VISIBLE	28480	1990-0486
A2A1A1DS25	1990-0486		LED-VISIBLE	28480	1990-0486
A2A1A1DS26	1990-0486		LED-VISIBLE	28480	1990-0486
A2A1A1R1	0698-3440	14	RESISTOR 196 1% .125W F TC=0+-100	16299	C4-1/8-T0-196R-F
A2A1A1R2	0698-3440		RESISTOR 196 1% .125W F TC=0+-100	16299	C4-1/8-T0-196R-F
A2A1A1R3	0698-3440		RESISTOR 196 1% .125W F TC=0+-100	16299	C4-1/8-T0-196R-F
A2A1A1R4	0698-3440		RESISTOR 196 1% .125W F TC=0+-100	16299	C4-1/8-T0-196R-F
A2A1A1R5	0698-3440		RESISTOR 196 1% .125W F TC=0+-100	16299	C4-1/8-T0-196R-F
A2A1A1R6	0698-3440		RESISTOR 196 1% .125W F TC=0+-100	16299	C4-1/8-T0-196R-F
A2A1A1R7	0698-3440		RESISTOR 196 1% .125W F TC=0+-100	16299	C4-1/8-T0-196R-F
A2A1A1R8	0698-3440		RESISTOR 196 1% .125W F TC=0+-100	16299	C4-1/8-T0-196R-F
A2A1A1R9	0698-3440		RESISTOR 196 1% .125W F TC=0+-100	16299	C4-1/8-T0-196R-F
A2A1A1R10	0698-3440		RESISTOR 196 1% .125W F TC=0+-100	16299	C4-1/8-T0-196R-F
A2A1A1R11	0698-3440		RESISTOR 196 1% .125W F TC=0+-100	16299	C4-1/8-T0-196R-F
A2A1A1R12	0698-3440		RESISTOR 196 1% .125W F TC=0+-100	16299	C4-1/8-T0-196R-F
A2A1A1R13	2100-3277	1	RESISTOR-VAR PREC WW 5-TRN 5K 20%	28480	2100-3277
A2A1A1R14	2100-2274	6	RESISTOR-VAR CONTROL CC 10K 10% LIN	12697	382
A2A1A1R15	2100-3532	2	RESISTOR	28480	2100-3532
A2A1A1R16	2100-2274		RESISTOR-VAR CONTROL CC 10K 10% LIN	12697	382
A2A1A1R17	2100-3532		RESISTOR	28480	2100-3532
A2A1A1R18	2100-2274		RESISTOR-VAR CONTROL CC 10K 10% LIN	12697	382
A2A1A1R19	2100-2274		RESISTOR-VAR CONTROL CC 10K 10% LIN	12697	382
A2A1A1R20	2100-2274		RESISTOR-VAR CONTROL CC 10K 10% LIN	12697	382
A2A1A1R21	2100-2274		RESISTOR-VAR CONTROL CC 10K 10% LIN	12697	382
A2A1A1R22	0757-0461	16	RESISTOR 68.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6812-F
A2A1A1R23	0757-0461		RESISTOR 68.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6812-F
A2A1A1R24	0757-0461		RESISTOR 68.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6812-F
A2A1A1S1	08505-20131	5	SWITCH ASSEMBLY, SLIDE	28480	08505-20131
A2A1A1S2	08505-20131		SWITCH ASSEMBLY, SLIDE	28480	08505-20131
A2A1A1S3	08505-20131		SWITCH ASSEMBLY, SLIDE	28480	08505-20131
A2A1A1S4	08505-20131		SWITCH ASSEMBLY, SLIDE	28480	08505-20131
A2A1A1S5	08505-20131		SWITCH ASSEMBLY, SLIDE	28480	08505-20131
A2A1A1S6	3100-3360	1	SWITCH, ROTARY	28480	3100-3360
A2A1A1U1	1810-0208	2	NETWORK-RES 8-PIN-SIP .1-PIN-SPCG	11236	750-81-R68K
A2A1A1U2	1820-1266	13	IC MM80C 97N BUFFER	27014	MM80C97N
A2A1A1U3	1820-1266		IC MM80C 97N BUFFER	27014	MM80C97N
A2A1A1U4	1810-0208		NETWORK-RES 8-PIN-SIP .1-PIN-SPCG	11236	750-81-R68K
A2A1A1U5	1820-1266		IC MM80C 97N BUFFER	27014	MM80C97N
A2A1A1VR1	1902-0041	7	DIODE-ZNR 5.11V 5% DO-7 PD=.4W TC=-.009%	04713	SZ 10939-98
A2A1A1VR2	1902-0041		DIODE-ZNR 5.11V 5% DO-7 PD=.4W TC=-.009%	04713	SZ 10939-98
A2A1A1VR3	1902-0041		DIODE-ZNR 5.11V 5% DO-7 PD=.4W TC=-.009%	04713	SZ 10939-98
A2A1A1VR4	1902-0041		DIODE-ZNR 5.11V 5% DO-7 PD=.4W TC=-.009%	04713	SZ 10939-98
A2A1A1XDS1	1200-0565	6	SOCKET-IC 24-CONT DIP-SLDR-TERMS	28480	1200-0565
A2A1A1XDS2	1200-0565		SOCKET-IC 24-CONT DIP-SLDR-TERMS	28480	1200-0565
A2A1A1XDS3	1200-0565		SOCKET-IC 24-CONT DIP-SLDR-TERMS	28480	1200-0565
A2A1A1XDS4	1200-0565		SOCKET-IC 24-CONT DIP-SLDR-TERMS	28480	1200-0565
A2A1A1XDS5	1200-0565		SOCKET-IC 24-CONT DIP-SLDR-TERMS	28480	1200-0565
A2A1A1XDS6	1200-0565		SOCKET-IC 24-CONT DIP-SLDR-TERMS	28480	1200-0565
A2A1A1XDS7	1200-0576	8	SOCKET-IC 24-CONT DIP-SLDR	28480	1200-0576
A2A1A1XDS8	1200-0576		SOCKET-IC	28480	1200-0576
A2A1A1XDS9	1200-0576		SOCKET-IC	28480	1200-0576
A2A1A1XDS10	1200-0576		SOCKET-IC	28480	1200-0576
A2A1A1XDS11	1200-0576		SOCKET-IC	28480	1200-0576
A2A1A1XDS12	1200-0576		SOCKET-IC	28480	1200-0576
A2A1A1XDS13	1200-0576		SOCKET-IC	28480	1200-0576
A2A1A1XDS14	1200-0576		SOCKET-IC	28480	1200-0576
A2A1A1XU2	1200-0507	4	SOCKET-IC 16-CONT DIP-SLDR-TERMS	06776	ICN-163-S3W
A2A1A1XU3	1200-0507		SOCKET-IC 16-CONT DIP-SLDR-TERMS	06776	ICN-163-S3W
A2A1A1XU5	1200-0507		SOCKET-IC 16-CONT DIP-SLDR-TERMS	06776	ICN-163-S3W

Table C2-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr. Code	Mfr. Part Number
A2A1A2	08505-60143	2	GENERATOR, ROTARY PULSE	28480	08505-60143
A2A1A2C1	0160-2055		CAPACITOR-FXD .01UF +80–20% 100WVDC CER	28480	0160-2055
A2A1A2DS1	2140-0016		LAMP, INCAND T-1 BULB 5V	00501	11-AS25
A2A1A2L1	9140-0144		COIL 4.7UH	28480	9140-0144
A2A1A2Q1	1853-0020		TRANSISTOR PNP SI PD=300MW	28480	1853-0020
A2A1A2Q2	1854-0071		TRANSISTOR NPN SI PD=300MW	28480	1854-0071
A2A1A2Q3	1853-0020		TRANSISTOR PNP SI PD=300MW	28480	1853-0020
A2A1A2Q4	1854-0071		TRANSISTOR NPN SI PD=300MW	28480	1854-0071
A2A1A2Q5	1990-0401		PHOTOTRANSISTOR	28480	1990-0401
A2A1A2Q6	1990-0401		PHOTOTRANSISTOR	28480	1990-0401
A2A1A2R1	0698-7276		RESISTOR-FXD 46.4K 2% .05W F TC=0+–100	24546	C3-1/8-TO-4642-G
A2A1A2R2	0698-7250		RESISTOR-FXD 3.83K 2% .05W F TC=0+–100	24546	C3-1/8-TO-3831-G
A2A1A2R3	0698-7237		RESISTOR-FXD 1.1K 2% .05W F TC=0+–100	24546	C3-1/8-TO-1101-G
A2A1A2R4	0698-7250		RESISTOR-FXD 3.83K 2% .05W F TC=0+–100	24546	C3-1/8-TO-3831-G
A2A1A2R5	2100-1984		RESISTOR-VAR 100 20%	28480	2100-1984
A2A1A2R6	0698-7276		RESISTOR-FXD 46.4K 2% .05W F TC=0+–100	24546	C3-1/8-TO-4642-G
A2A1A2R7	0698-7250		RESISTOR-FXD 3.83K 2% .05W F TC=0+–100	24546	C3-1/8-TO-3831-G
A2A1A2R8	0698-7237		RESISTOR-FXD 1.1K 2% .05W F TC=0+–100	24546	C3-1/8-TO-1101-G
A2A1A2R9	0698-7250		RESISTOR-FXD 3.83K 2% .05W F TC=0+–100	24546	C3-1/8-TO-3831-G
A2A1A2RT1	0837-0076		THERMISTER DISC 6K TC=4.4%/C-DEG	28480	0837-0076
A2A1A2RT2	0837-0076		THERMISTER DISC 6K TC=4.4%/C-DEG	28480	0837-0076
A2A1A2U1	1820-0537		IC DUAL 4-INPUT NAND SCHMITT TRIGGER	01295	SN7413
A2A1A3	08505-60143		GENERATOR, ROTARY PULSE SAME AS A2A1A2. USE PREFIX A2A1A3.	28480	08505-60143
A2A2	08505-60094	1	BOARD ASSEMBLY, DISPLAY LOGIC	28480	08505-60094
A2A2C1	0180-0197		CAPACITOR-FXD 2.2UF+–10% 20VDC TA	56289	150D225X9020A2
A2A2C2	0160-3878	27	CAPACITOR-FXD 1000PF +–20% 100WVDC CER	28480	0160-3878
A2A2C3	0160-4084		CAPACITOR-FXD .1UF+–20% 50WVDC CER	28480	0160-4084
A2A2C4	0160-4084		CAPACITOR-FXD .1UF+–20% 50WVDC CER	28480	0160-4084
A2A2C5	0160-4084		CAPACITOR-FXD .1UF+–20% 50WVDC CER	28480	0160-4084

Table C2-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A2A2C6	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A2A2C7	0160-3878		CAPACITOR-FXD 1000PF +-20% 100WVDC CER	28480	0160-3878
A2A2C8	0160-3878		CAPACITOR-FXD 1000PF +-20% 100WVDC CER	28480	0160-3878
A2A2C9	0160-0571	15	CAPACITOR-FXD 470PF +-20% 100WVDC CER	28480	0160-0571
A2A2C10	0160-0571		CAPACITOR-FXD 470PF +-20% 100WVDC CER	28480	0160-0571
A2A2C11	0160-3878		CAPACITOR-FXD 1000PF +-20% 100WVDC CER	28480	0160-3878
A2A2C12	0180-0100	2	CAPACITOR-FXD 4.7UF+-10% 35VDC TA	56289	150D475X9035B2
A2A2C13	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A2A2C14	0160-0570	5	CAPACITOR-FXD 220PF +-20% 100WVDC CER	28480	0160-0570
A2A2C15	0160-0570		CAPACITOR-FXD 220PF +-20% 100WVDC CER	28480	0160-0570
A2A2C16	0180-1745	1	CAPACITOR-FXD 1.5UF+-10% 20VDC TA	56289	150D155X9020A2
A2A2C17	0160-3538	1	CAPACITOR-FXD 750PF +-5% 100WVDC MICA	28480	0160-3538
A2A2C18	0160-0571		CAPACITOR-FXD 470PF +-20% 100WVDC CER	28480	0160-0571
A2A2C19	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A2A2C20	0160-3877	9	CAPACITOR-FXD 100PF +-20% 200WVDC CER	28480	0160-3877
A2A2C21	0160-3876	5	CAPACITOR-FXD 47PF +-20% 200WVDC CER	28480	0160-3876
A2A2C22	0160-3876		CAPACITOR-FXD 47PF +-20% 200WVDC CER	28480	0160-3876
A2A2C23	0180-2141	2	CAPACITOR-FXD 3.3UF+-10% 50VDC TA	56289	150D335X9050B2
A2A2C24	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A2A2CR1	1901-0040	11	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A2A2CR2	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A2A2CR3	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A2A2CR4	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A2A2MP1	4040-0750	2	EXTRACTOR-PC BD RED POLYC .062-BD-THKNS	28480	4040-0750
	1480-0073	4	PIN:DRIVE 0.250" LG	00000	OBD
A2A2MP2	4040-0750		EXTRACTOR-PC BD RED POLYC .062-BD-THKNS	28480	4040-0750
	1480-0073		PIN:DRIVE 0.250" LG	00000	OBD
A2A2Q1	1853-0007	26	TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A2A2R1	0698-7244	1	RESISTOR 2.15K 2% .05W F TC=0+-100	24546	C3-1/8-T0-2151-G
A2A2R2	0698-7284	14	RESISTOR 100K 2% .05W F TC=0+-100	24546	C3-1/8-T0-1003-G
A2A2R3	0698-7260	26	RESISTOR 10K 2% .05W F TC=0+-100	24546	C3-1/8-T0-1002-G
A2A2R4	0698-7260		RESISTOR 10K 2% .05W F TC=0+-100	24546	C3-1/8-T0-1002-G
A2A2R5	0698-7260		RESISTOR 10K 2% .05W F TC=0+-100	24546	C3-1/8-T0-1002-G
A2A2R6	0698-7277	17	RESISTOR 51.1K 2% .05W F TC=0+-100	24546	C3-1/8-T0-5112-G
A2A2R7	0698-7268	17	RESISTOR 21.5K 2% .05W F TC=0+-100	24546	C3-1/8-T0-2152-G
A2A2R8	0698-7260		RESISTOR 10K 2% .05W F TC=0+-100	24546	C3-1/8-T0-1002-G
A2A2R9	0698-7268		RESISTOR 21.5K 2% .05W F TC=0+-100	24546	C3-1/8-T0-2152-G
A2A2R10	0698-7268		RESISTOR 21.5K 2% .05W F TC=0+-100	24546	C3-1/8-T0-2152-G
A2A2R11	0698-7260		RESISTOR 10K 2% .05W F TC=0+-100	24546	C3-1/8-T0-1002-G
A2A2R12	0698-7260		RESISTOR 10K 2% .05W F TC=0+-100	24546	C3-1/8-T0-1002-G
A2A2R13	0698-7260		RESISTOR 10K 2% .05W F TC=0+-100	24546	C3-1/8-T0-1002-G
A2A2R14	0698-7268		RESISTOR 21.5K 2% .05W F TC=0+-100	24546	C3-1/8-T0-2152-G
A2A2R15	0698-7261	2	RESISTOR 11K 2% .05W F TC=0+-100	24546	C3-1/8-T0-1102-G
A2A2R16	0698-7286	2	RESISTOR 121K 2% .05W F TC=0+-100	24546	C3-1/8-T0-1213-G
A2A2R17	0698-7260		RESISTOR 10K 2% .05W F TC=0+-100	24546	C3-1/8-T0-1002-G
A2A2R18	0698-7261		RESISTOR 11K 2% .05W F TC=0+-100	24546	C3-1/8-T0-1102-G
A2A2R19	0698-7260		RESISTOR 10K 2% .05W F TC=0+-100	24546	C3-1/8-T0-1002-G
A2A2R20	0698-7286		RESISTOR 121K 2% .05W F TC=0+-100	24546	C3-1/8-T0-1213-G
A2A2R21	0698-7260		RESISTOR 10K 2% .05W F TC=0+-100	24546	C3-1/8-T0-1002-G
A2A2R22	0698-7260		RESISTOR 10K 2% .05W F TC=0+-100	24546	C3-1/8-T0-1002-G
A2A2R23	0698-7260		RESISTOR 10K 2% .05W F TC=0+-100	24546	C3-1/8-T0-1002-G
A2A2R24	0698-7260		RESISTOR 10K 2% .05W F TC=0+-100	24546	C3-1/8-T0-1002-G
A2A2R25	0698-7268		RESISTOR 21.5K 2% .05W F TC=0+-100	24546	C3-1/8-T0-2152-G
A2A2R26	0698-7284		RESISTOR 100K 2% .05W F TC=0+-100	24546	C3-1/8-T0-1003-G
A2A2R27	0698-7236	18	RESISTOR 1K 2% .05W F TC=0+-100	24546	C3-1/8-T0-1001-G
A2A2R28	0698-7236		RESISTOR 1K 2% .05W F TC=0+-100	24546	C3-1/8-T0-1001-G
A2A2R29	0698-7277		RESISTOR 51.1K 2% .05W F TC=0+-100	24546	C3-1/8-T0-5112-G
A2A2R30	0698-7268		RESISTOR 21.5K 2% .05W F TC=0+-100	24546	C3-1/8-T0-2152-G
A2A2R31	0698-7255	1	RESISTOR 6.19K 2% .05W F TC=0+-100	24546	C3-1/8-T0-6191-G
A2A2R32	0698-7236		RESISTOR 1K 2% .05W F TC=0+-100	24546	C3-1/8-T0-1001-G
A2A2R33	0698-7268		RESISTOR 21.5K 2% .05W F TC=0+-100	24546	C3-1/8-T0-2152-G
A2A2R34	0698-7284		RESISTOR 100K 2% .05W F TC=0+-100	24546	C3-1/8-T0-1003-G
A2A2R35	0698-7268		RESISTOR 21.5K 2% .05W F TC=0+-100	24546	C3-1/8-T0-2152-G
A2A2R36	0698-7264	1	RESISTOR 14.7K 2% .05W F TC=0+-100	24546	C3-1/8-T0-1472-G
A2A2R37	0698-7260		RESISTOR 10K 2% .05W F TC=0+-100	24546	C3-1/8-T0-1002-G
A2A2R38	0698-7260		RESISTOR 10K 2% .05W F TC=0+-100	24546	C3-1/8-T0-1002-G
A2A2R39	0698-7236		RESISTOR 1K 2% .05W F TC=0+-100	24546	C3-1/8-T0-1001-G
A2A2R40	0698-7236		RESISTOR 1K 2% .05W F TC=0+-100	24546	C3-1/8-T0-1001-G
A2A2R41	0698-7260		RESISTOR 10K 2% .05W F TC=0+-100	24546	C3-1/8-T0-1002-G
A2A2R42	0698-7284		RESISTOR 100K 2% .05W F TC=0+-100	24546	C3-1/8-T0-1003-G
A2A2R43	0698-7280	2	RESISTOR 68.1K 2% .05W F TC=0+-100	24546	C3-1/8-T0-6812-G
A2A2R44	0698-7280		RESISTOR 68.1K 2% .05W F TC=0+-100	24546	C3-1/8-T0-6812-G
A2A2R45	0698-7284		RESISTOR 100K 2% .05W F TC=0+-100	24546	C3-1/8-T0-1003-G

Table C2-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr. Code	Mfr. Part Number
A2A2R46	0698-7283		RESISTOR 100K 2% .05W F TC=0+−100	24546	C3-1/8-TO-1003-G
A2A2R47	0698-7268		RESISTOR 21.5K 2% .05W F TC=0+−100	24546	53-1/8-TO-2152-G
A2A2R48	0698-7268		RESISTOR 21.5K 2% .05W F TC=0+−100	24546	C3-1/8-TO-2152-G
A2A2R49	0698-7268		RESISTOR 21.5K 2% .05W F TC=0+−100	24546	C3-1/8-TO-2152-G
A2A2R50	0698-7268		RESISTOR 21.5K 2% .05W F TC=0+−100	24546	C3-1/8-TO-2152-G
A2A2R51	0698-7268		RESISTOR 21.5K 2% .05W F TC=0+−100	24546	C3-1/8-TO-2152-G
A2A2R52	0698-7268		RESISTOR 21.5K 2% .05W F TC=0+−100	24546	C3-1/8-TO-2152-G
A2A2R53	0698-7268		RESISTOR 21.5K 2% .05W F TC=0+−100	24546	C3-1/8-TO-2152-G
A2A2R54	0698-7273		RESISTOR 34.8K 1% .125W F TC=0+−100	16299	C4-1/8-TO-3482-F
A2A2U1	1820-1532	1	IC CD4044AY LATCH	02735	CD4044AY
A2A2U2	1820-1531	8	IC CD4013AY FLIP-FLOP	02735	CD4023AY
A2A2U3	1820-1552	3	IC CD 4023AY GATE	02735	CD4023AY
A2A2U4	1820-1534	13	IC CD4001AY GATE	02735	CD4001AY
A2A2U5	1820-1551	6	IC CD4081BY GATE	02735	CD4081BY
A2A2U6	1820-1592	5	IC CD4069BY INV	02735	CD4069BY
A2A2U7	1826-0138	2	IC LM 339 COMPARATOR	27014	LM339N
A2A2U8	1820-1592		IC CD4069BY INV	02735	CD4069BY
A2A2U9	1820-1551		IC CD4081BY GATE	02735	CD4081BY
A2A2U10	1820-1538	19	IC CD4011AY GATE	02735	CD4011AY
A2A2U11	1820-1534		IC CD4001AY GATE	02735	CD4001AY
A2A2U12	1820-1525	1	IC MC14008CL ADDER	04713	MC14008CL
A2A2U13	1820-1534		IC CD4001AY GATE	02735	CD4001AY
A2A2U14	1820-1531		IC CD4013AY FLIP-FLOP	02735	CD4013AY
A2A2U15	1820-1612	1	IC MM74C221J MV	27014	MM74C221J
A2A2U16	1820-1538		IC CD4011AY GATE	02735	CD4011AY
A2A2U17	1820-1545	14	IC CD4053AY MUXR	02735	CD4053AY
A2A2U18	1820-1550	7	IC CD4071BY GATE	02735	CD4071BY
A2A2U19	1820-1549	1	IC MC14539CL DATA SEL	04713	MC14539CL
A2A2U20	1820-1530	1	IC CD4027AY FLIP-FLOP	02735	CD4027AY
A2A2U21	1820-1543	1	IC CD4050AY BUFFER	02735	CD4050AY
A2A2U22	1820-1287	2	IC SN74LS 37 N BUFFER	01295	SN74LS37N
A2A2U23	1820-1287		IC SN74LS 37 N BUFFER	01295	SN74LS37N
A2A2U24	1820-1592		IC CD4069BY INV	02735	CD4069BY
A2A2U25	1820-1538		IC CD4011AY GATE	02735	CD4011AY
A2A2U26	1820-1547	2	IC CD4051AY MUXR	02735	CD4051AY
A2A2U27	1820-1556	3	IC CD4555BY DECODER	02735	CD4555BY
A2A2U28	1820-1550		IC CD4071BY GATE	02735	CD4071BY
A2A2U29	1820-0535	1	IC SN75 451BP DRIVER	01295	SN75451 BP
A2A2U30	1820-1484	3	IC BUFFER	07263	340098PC
A2A2U31	1820-1484		IC BUFFER	07263	340098PC
A2A2U32	1820-1484		IC BUFFER	07263	340098PC
A2A2U33	1820-1556		IC CD4555BY DECODER	02735	CD4555BY
A2A2U34	1820-1591	1	IC CD4518BY COUNTER	02735	CD4518BY
A2A2U35	1810-0206	1	NETWORK-RES 8-PIN-SIP .1-PIN-SPCG	11236	750-81-R10K
A2A2U36	1810-0207		NETWORK-RES 8-PIN-SIP .1-PIN-SPCG	11236	750-81-422K
A2A3	08505-60095	1	BOARD ASSEMBLY, MEMORY	28480	08505-60095
A2A3C1	0180-2206	2	CAPACITOR-FXD 60UF+−10% 6VDC TA	56289	150D606X9006B2
A2A3C2	0180-0197		CAPACITOR-FXD 2.2UF+−10% 20VDC TA	56289	150D225X9020A2
A2A3C3	0160-0573	2	CAPACITOR-FXD 4700PF +−20% 100WVDC CER	28480	0160-0573
A2A3C4	0160-0573		CAPACITOR-FXD 4700PF +−20% 100WVDC CER	28480	0160-0573
A2A3C5	0180-0197		CAPACITOR-FXD 2.2UF+−10% 20VDC TA	56289	150D225X9020A2
A2A3C6	0180-0197		CAPACITOR-FXD 2.2UF+−10% 20VDC TA	56289	150D225X9020A2
A2A3C7	0160-4084		CAPACITOR-FXD .1UF +−20% 50WVDC CER	28480	0160-4084
A2A3C8	0160-4084		CAPACITOR-FXD .1UF +−20% 50WVDC CER	28480	0160-4084
A2A3C9	0160-0570		CAPACITOR-FXD 220PF +−20% 100WVDC CER	28480	0160-0570
A2A3C10	0160-0570		CAPACITOR-FXD 220PF +−20% 100WVDC CER	28480	0160-0570
A2A3C11	0160-3878		CAPACITOR-FXD 1000PF +−20% 100WVDC CER	28480	0160-3878
A2A3C12	0160-3878		CAPACITOR-FXD 1000PF +−20% 100WVDC CER	28480	0160-3878
A2A3C13	0160-0575	14	CAPACITOR-FXD .047UF +−20% 50WVDC CER	28480	0160-0575
A2A3C14	0160-3879	17	CAPACITOR-FXD .01UF +−20% 100WVDC CER	28480	0160-3879
A2A3C15	0160-3877		CAPACITOR-FXD 100PF +−20% 200WVDC CER	28480	0160-3877
A2A3C16	0160-3878		CAPACITOR-FXD 1000PF +−20% 100WVDC CER	28480	0160-3878
A2A3C17	0160-0570		CAPACITOR-FXD 220PF +−20% 100WVDC CER	28480	0160-0570
A2A3C18	0160-3878		CAPACITOR-FXD 1000PF +−20% 100WVDC CER	28480	0160-3878
A2A3C19	0160-3876		CAPACITOR-FXD 47PF +−20% 200WVDC CER	28480	0160-3876
A2A3C20	0160-3877		CAPACITOR-FXD 100PF +−20% 200WVDC CER	28480	0160-3877
A2A3C21	0180-0374	1	CAPACITOR-FXD 10UF + −10% 20VDC TA	56289	150D106X9020B2
A2A3C22	0160-0575		CAPACITOR-FXD .047UF + −20% 50WVDC CER	28480	0160-0575
A2A3CR1	1901-0050	56	DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A2A3CR2	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A2A3CR3	1901-0376	4	DIODE-GEN PRP 35V 50MA DO-7	28480	1901-0376
A2A3CR4	1901-0376		DIODE-GEN PRP 35V 50MA DO-7	28480	1901-0376
A2A3CR5	1901-0376		DIODE-GEN PRP 35V 50MA DO-7	28480	1901-0376
A2A3CR6	1901-0376		DIODE-GEN PRP 35V 50MA DO-7	28480	1901-0376
A2A3CR7	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A2A3CR8	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A2A3CR9	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A2A3CR10	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A2A3CR11	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A2A3CR12	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A2A3L1	9100-1645	7	COIL-FXD MOLDED RF CHOKE 390UH 5%	24226	19/393
A2A3MP1	4040-0751	2	EXTRACTOR-PC BD ORN POLYC .062-BD-THKNS	28480	4040-0751
A2A3MP2	4040-0751		EXTRACTOR-PC BD ORN POLYC .062-BD-THKNS	28480	4040-0751
A2A3MP3	1480-0073		PIN:DRIVE 0.250" LG	00000	OBD
A2A3MP4	1480-0073		PIN:DRIVE 0.250" LG	00000	OBD

Table C2-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A2A3Q1	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW		
A2A3Q2	1854-0005		TRANSISTOR NPN 2N708 SI TO-18 PD=360MW	04713	2N3251
A2A3Q3	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	28480	1854-0005
A2A3Q4	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A2A3Q5	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A2A3Q6	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A2A3Q7	1854-0005	2	TRANSISTOR NPN 2N708 SI TO-18 PD=360MW	28480	1854-0005
A2A3Q8	1854-0005		TRANSISTOR NPN 2N708 SI TO-18 PD=360MW	28480	1854-0005
A2A3R1	0698-7260		RESISTOR 10K 2% .05W F TC=0+-100	24546	C3-1/8-TO-1002-G
A2A3R2	0698-7260		RESISTOR 10K 2% .05W F TC=0+-100	24546	C3-1/8-TO-1002-G
A2A3R3	0698-7260		RESISTOR 10K 2% .05W F TC=0+-100	24546	C3-1/8-TO-1002-G
A2A3R4	0698-7284		RESISTOR 100K 2% .05W F TC=0+-100	24546	C3-1/8-TO-1003-G
A2A3R5	0698-7277		RESISTOR 51.1K 2% .05W F TC=0+-100	24546	C3-1/8-TO-5112-G
A2A3R6	0698-7277		RESISTOR 51.1K 2% .05W F TC=0+-100	24546	C3-1/8-TO-5112-G
A2A3R7	0698-7284		RESISTOR 100K 2% .05W F TC=0+-100	24546	C3-1/8-TO-1003-G
A2A3R8	0698-7260		RESISTOR 10K 2% .05W F TC=0+-100	24546	C3-1/8-TO-1002-G
A2A3R9	0698-7229	5	RESISTOR 511 2% .05W F TC=0+-100	24546	C3-1/8-TO-511R-G
A2A3R10	0698-7229		RESISTOR 511 2% .05W F TC=0+-100	24546	C3-1/8-TO-511R-G
A2A3R11	0698-7268		RESISTOR 21.5K 2% .05W F TC=0+-100	24546	C3-1/8-TO-2152-G
A2A3R12	0698-7268		RESISTOR 21.5K 2% .05W F TC=0+-100	24546	C3-1/8-TO-2152-G
A2A3R13	0698-7243	3	RESISTOR 1.96K 2% .05W F TC=0+-100	24546	C3-1/8-TO-1961-G
A2A3R14	0698-7243		RESISTOR 1.96K 2% .05W F TC=0+-100	24546	C3-1/8-TO-1961-G
A2A3R15	0698-7260		RESISTOR 10K 2% .05W F TC=0+-100	24546	C3-1/8-TO-1002-G
A2A3R16	0698-7260		RESISTOR 10K 2% .05W F TC=0+-100	24546	C3-1/8-TO-1002-G
A2A3R17	0698-7260		RESISTOR 10K 2% .05W F TC=0+-100	24546	C3-1/8-TO-1002-G
A2A3R18	0698-7260		RESISTOR 10K 2% .05W F TC=0+-100	24546	C3-1/8-TO-1002-G
A2A3R19	0698-7277		RESISTOR 51.1K 2% .05W F TC=0+-100	24546	C3-1/8-TO-5112-G
A2A3R20	0698-7277		RESISTOR 51.1K 2% .05W F TC=0+-100	24546	C3-1/8-TO-5112-G
A2A3R21	0698-7277		RESISTOR 51.1K 2% .05W F TC=0+-100	24546	C3-1/8-TO-5112-G
A2A3R22	0698-7277		RESISTOR 51.1K 2% .05W F TC=0+-100	24546	C3-1/8-TO-5112-G
A2A3R23	0698-7277		RESISTOR 51.1K 2% .05W F TC=0+-100	24546	C3-1/8-TO-5112-G
A2A3R24	0698-7277		RESISTOR 51.1K 2% .05W F TC=0+-100	24546	C3-1/8-TO-5112-G
A2A3R25	0698-7284		RESISTOR 100K 2% .05W F TC=0+-100	24546	C3-1/8-TO-1003-G
A2A3R26	0698-7284		RESISTOR 100K 2% .05W F TC=0+-100	24546	C3-1/8-TO-1003-G
A2A3R27	0698-7253	1	RESISTOR 5.11K 2% .05W F TC=0+-100	24546	C3-1/8-TO-5111-G
A2A3R28	0698-7284		RESISTOR 100K 2% .05W F TC=0+-100	24546	C3-1/8-TO-1003-G
A2A3R29	0698-7277		RESISTOR 51.1K 2% .05W F TC=0+-100	24546	C3-1/8-TO-5112-G
A2A3R30	0698-7284		RESISTOR 100K 2% .05W F TC=0+-100	24546	C3-1/8-TO-1003-G
A2A3R31	0698-7277		RESISTOR 51.1K 2% .05W F TC=0+-100	24546	C3-1/8-TO-5112-G
A2A3R32	0698-7277		RESISTOR 51.1K 2% .05W F TC=0+-100	24546	C3-1/8-TO-5112-G
A2A3R33	0698-7277		RESISTOR 51.1K 2% .05W F TC=0+-100	24546	C3-1/8-TO-5112-G
A2A3R34	0698-7268		RESISTOR 21.5K 2% .05W F TC=0+-100	24546	C3-1/8-TO-2152-G
A2A3R35	0698-7268		RESISTOR 21.5K 2% .05W F TC=0 +-100	24546	C3-1/8-TO-2152-G
A2A3R36	0698-7284		RESISTOR 100K 2% .05W F TC=0 +-100	24546	C3-1/8-TO-1003-G
A2A3R37	0698-7268		RESISTOR 21.5K 2% .05W F TC=0 +-100	24546	C3-1/8-TO-2152-G
A2A3R38	0698-7284		RESISTOR 100K 2% .05W F TC=0 +-100	24546	C3-1/8-TO-1003-G
A2A3R39	0698-7260		RESISTOR 10K 2% .05W F TC=0 +- 100	24546	C3-1/8-TO-1002-G
A2A3R40	0698-7277		RESISTOR 51.1K 2% .125W F TC=0 +-100	24546	C-1/8-TO-5112-G
A2A3R41	0698-7284		RESISTOR 100K 2% .125W F TC=0 +-100	24546	C3-1/8-TO-1003-G
A2A3U1	1820-1534		IC CD4001AY GATE	02735	CD4001AY
A2A3U2	1820-1551		IC CD4081BY GATE	02735	CD4081BY
A2A3U3	1820-1551		IC CD4081BY GATE	02735	CD4081BY
A2A3U4	1820-1537	3	IC CD4002AY GATE	02735	CD4002AY
A2A3U5	1820-1538		IC CD4011AY GATE	02735	CD4011AY
A2A3U6	1820-1555	1	IC CD4556BY DECODER	02735	CD4556BY
A2A3U7	1820-1556		IC CD4555BY DECODER	02735	CD4555BY
A2A3U8	1820-1537		IC CD4002AY GATE	02735	CD4002AY
A2A3U9	1820-1542	7	IC CD4049AY BUFFER	02735	CD4049AY
A2A3U10	1820-1551		IC CD4081BY GATE	02735	CD4081BY
A2A3U11	1820-1538		IC CD4011AY GATE	02735	CD4011AY
A2A3U12	1820-1550		IC CD4071BY GATE	02735	CD4071BY
A2A3U13	1820-1552		IC CD4023AY GATE	02735	CD4023AY
A2A3U14	1820-1538		IC CD4011AY GATE	02735	CD4011AY
A2A3U15	1820-1531		IC CD4013AY FLIP-FLOP	02735	CD4013AY
A2A3U16	1820-1542		IC CD4049AY BUFFER	02735	CD4049AY
A2A3U17	1820-1528	10	IC CD4029AY COUNTER	02735	CD4029AY
A2A3U18	1820-1528		IC CD4029AY COUNTER	02735	CD4029AY
A2A3U19	1820-1528		IC CD4029AY COUNTER	02735	CD4029AY
A2A3U20	1820-1528		IC CD4029AY COUNTER	02735	CD4029AY
A2A3U21	1820-1528		IC CD4029AY COUNTER	02735	CD4029AY
A2A3U22	1820-1528		IC CD4029AY COUNTER	02735	CD4029AY
A2A3U23	1820-1534		IC CD4001AY GATE	02735	CD4001AY
A2A3U24	1820-1536	3	IC CD4030AY GATE	02735	CD4030AY
A2A3U25	1820-1540	7	IC CD4042AY LATCH	02735	CD4042AY
A2A3U26	1820-1531		IC CD4013AY FLIP-FLOP	02735	CD4013AY
A2A3U27	1820-1531		IC CD4013AY FLIP-FLOP	02735	CD4013AY
A2A3U28	1820-1266		IC MM80C 97N BUFFER	27014	MM80C97N
A2A3U29	1820-1266		IC MM80C 97N BUFFER	27014	MM80C97N
A2A3U30	1820-1266		IC MM80C 97N BUFFER	27014	MM80C97N

Table C2-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A2A3U31	1820-1266		IC MM80C 97N BUFFER	27014	MM80C97N
A2A3U32	1820-1266		IC MM80C 97N BUFFER	27014	MM80C97N
A2A3U33	1820-1266		IC MM80C 97N BUFFER	27014	MM80C97N
A2A3U34	1820-1392	2	IC MM74C 89N 64-BIT RAM CMOS	27014	MM74C89N
A2A3U35	1820-1392		IC MM74C 89N 64-BIT RAM CMOS	27014	MM74C89N
A2A3U36	1820-1538		IC CD4011AY GATE	02735	CD4011AY
A2A3U37	1820-1529	1	IC CD4018AY COUNTER	02735	CD4018AY
A2A4	08505-60096	1	BOARD ASSEMBLY, SCALER	28480	08505-60096
A2A4C1	0180-1746	8	CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A2A4C2	0180-2206		CAPACITOR-FXD 60UF+-10% 6VDC TA	56289	150D606X9006B2
A2A4C3	0180-1746		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A2A4C4	0180-0116	25	CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A2A4C5	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A2A4C6	0160-2199	2	CAPACITOR-FXD 30PF +-5% 300WVDC MICA	28480	0160-2199
A2A4C7	0140-0200	2	CAPACITOR-FXD 390PF +-5% 300WVDC MICA	72136	DM15F391J0300WV1CR
A2A4C8	0140-0198	1	CAPACITOR-FXD 200PF +-5% 300WVDC MICA	72136	DM15F201J0300WV1CR
A2A4C9	0160-2199		CAPACITOR-FXD 30PF +-5% 300WVDC MICA	28480	0160-2199
A2A4C10	0140-0200		CAPACITOR-FXD 390PF +-5% 300WVDC MICA	72136	DM15F391J0300WV1CR
A2A4C11	0160-0127	1	CAPACITOR-FXD 1UF +-20% 25WVDC CER	28480	0160-0127
A2A4CR1	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A2A4CR2	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A2A4CR3	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A2A4CR4	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A2A4CR5	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A2A4CR6	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A2A4L1	9100-1623	1	COIL-FXD MOLDED RF CHOKE 27UH 5%	24226	15/272
A2A4L2	9100-1645		COIL-FXD MOLDED RF CHOKE 390UH 5%	24226	19/393
A2A4L3	9100-1645		COIL-FXD MOLDED RF CHOKE 390UH 5%	24226	19/393
A2A4L4	9100-1645		COIL-FXD MOLDED RF CHOKE 390UH 5%	24226	19/393
A2A4MP1	5040-6848	1	EXTRACTOR, BOARD, YELLOW	28480	5040-6848
A2A4MP2	5000-9043	7	PIN:P.C. BOARD EXTRACTOR	28480	5000-9043
A2A4Q1	1853-0050	4	TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0050
A2A4Q2	1854-0404	19	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A2A4Q3	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A2A4Q4	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A2A4Q5	1855-0020	9	TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A2A4Q6	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A2A4R1	0757-0465	71	RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A2A4R2	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A2A4R3	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A2A4R4	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A2A4R5	0757-0438	13	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A2A4R6	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A2A4R7	0757-0458	19	RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A2A4R8	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A2A4R9	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A2A4R10	0757-0458		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A2A4R11	0757-0458		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A2A4R12	0757-0458		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A2A4R13	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A2A4R14	2100-3273	1	RESISTOR-TRMR 2K 10% C SIDE-ADJ 1-TRN	32997	3386X-Y46-202
A2A4R15	0698-3440		RESISTOR 196 1% .125W F TC=0+-100	16299	C4-1/8-T0-196R-F
A2A4R16	2100-3352	1	RESISTOR-TRMR 1K 10% C SIDE-ADJ 1-TRN	32997	3386X-Y46-102
A2A4R17	0683-1055	3	RESISTOR 1M 5% .25W FC TC=-800/+900	01121	CB1055
A2A4R18	0698-3162	1	RESISTOR 46.4K 1% .125W F TC=0+-100	16299	C4-1/8-T0-4642-F
A2A4R19	0698-3136	1	RESISTOR 17.8K 1% .125W F TC=0+-100	16299	C4-1/8-T0-1782-F
A2A4R20	0757-0401	15	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A2A4R21	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A2A4R22	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A2A4R23	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A2A4R24	2100-3350	3	RESISTOR-TRMR 200 10% C SIDE-ADJ 1-TRN	32997	3386X-Y46-201
A2A4R25	2100-3350		RESISTOR-TRMR 200 10% C SIDE-ADJ 1-TRN	32997	3386X-Y46-201
A2A4R26			NOT ASSIGNED		
A2A4R27	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A2A4R28	0698-3457	4	RESISTOR 316K 1% .125W F TC=0+-100	03888	PME55S
A2A4R29	0698-3457		RESISTOR 316K 1% .125W F TC=0+-100	03888	PME55S
A2A4R30	0757-0346	17	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A2A4R31	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A2A4R32	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A2A4R33	0698-3457		RESISTOR 316K 1% .125W F TC=0+-100	03888	PME55S
A2A4R34	0698-3457		RESISTOR 316K 1% .125W F TC=0+-100	03888	PME55S
A2A4R35	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F

Table C2-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A2A4R36	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A2A4R37	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A2A4R38	0698-3449	2	RESISTOR 28.7K 1% .125W F TC=0+-100	16299	C4-1/8-T0-2872-F
A2A4R39	0757-0459		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A2A4R40	2100-3207	1	RESISTOR-TRMR 5K 10% C SIDE-ADJ 1-TRN	73138	72-145-0
A2A4R41	0698-7236		RESISTOR 1K 1% .125W F TC=0+-100	24546	C3-1/8-T0-1001-G
A2A4R42	0757-0458		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A2A4R43	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A2A4R44	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A2A4U1	1810-0221	2	NETWORK-RES 14-PIN-DIP .1-PIN-SPCG	28480	1810-0221
A2A4U2	1826-0249	10	IC AD 504J OP AMP	24355	AD504J
A2A4U3	1820-1545		IC CD4053AY MUXR	02735	CD4053AY
A2A4U4	1820-1545		IC CD4053AY MUXR	02735	CD4053AY
A2A4U5	1826-0249		IC AD 504J OP AMP	24355	AD504J
A2A4U6	1810-0221		NETWORK-RES 14-PIN-DIP .1-PIN-SPCG	28480	1810-0221
A2A4U7	1820-1536		IC CD4030AY GATE	02735	CD4030AY
A2A4U8	1820-1545		IC CD4053AY MUXR	02735	CD4053AY
A2A4U9	1820-1545		IC CD4053AY MUXR	02735	CD4053AY
A2A4U10	1820-1545		IC CD4053AY MUXR	02735	CD4053AY
A2A4U11	1820-1545		IC CD4053AY MUXR	02735	CD4053AY
A2A4U12	1820-1536		IC CD4030AY GATE	02735	CD4030AY
A2A4U13	1820-1534		IC CD4001AY GATE	02735	CD4001AY
A2A4U14	1820-1545		IC CD4053AY MUXR	02735	CD4053AY
A2A4U15	1820-1545		IC CD4053AY MUXR	02735	CD4053AY
A2A4U16	1820-1545		IC CD4053AY MUXR	02735	CD4053AY
A2A4U17	1820-1545		IC CD4053AY MUXR	02735	CD4053AY
A2A4U18	1820-1534		IC CD4001AY GATE	02735	CD4001AY
A2A4U19	1820-1540		IC CD4042AY LATCH	02735	CD4042AY
A2A4U20	1820-1540		IC CD4042AY LATCH	02735	CD4042AY
A2A4U21	1820-1540		IC CD4042AY LATCH	02735	CD4042AY
A2A4U22	1820-1538		IC CD4011AY GATE	02735	CD4011AY
A2A4U23	1820-1534		IC CD4001AY GATE	02735	CD4001AY
A2A4U24	1820-1531		IC CD4013AY FLIP-FLOP	02735	CD4013AY
A2A4U25	1820-1538		IC CD4011AY GATE	02735	CD4011AY
A2A4U26	1820-1538		IC CD4011AY GATE	02735	CD4011AY
A2A4U27	1820-1538		IC CD4011AY GATE	02735	CD4011AY
A2A4U28	1820-1540		IC CD4042AY LATCH	02735	CD4042AY
A2A4U29	1820-1540		IC CD4042AY LATCH	02735	CD4042AY
A2A4U30	1820-1540		IC CD4042AY LATCH	02735	CD4042AY
A2A5	08505-60097	1	BOARD ASSEMBLY, PRESCALER COUNTER	28480	08505-60097
A2A5C1	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A2A5C2	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A2A5C3	0160-3878		CAPACITOR-FXD 1000PF +-20% 100WVDC CER	28480	0160-3878
A2A5C4	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A2A5C5	0160-3877		CAPACITOR-FXD 100PF +-20% 200WVDC CER	28480	0160-3877
A2A5C6	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A2A5C7	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A2A5C8	0160-3874	2	CAPACITOR-FXD 10PF +-.5PF 200WVDC CER	28480	0160-3874
A2A5C9	0160-3878		CAPACITOR-FXD 1000PF +-20% 100WVDC CER	28480	0160-3878
A2A5C10	0160-0575		CAPACITOR-FXD .047UF +-20% 50WVDC CER	28480	0160-0575
A2A5C11	0160-3878		CAPACITOR-FXD 1000PF +-20% 100WVDC CER	28480	0160-3878
A2A5C12	0160-3877		CAPACITOR-FXD 100PF +-20% 200WVDC CER	28480	0160-3877
A2A5C13	0160-0575		CAPACITOR-FXD .047UF +-20% 50WVDC CER	28480	0160-0575
A2A5C14	0160-3877		CAPACITOR-FXD 100PF +-20% 200WVDC CER	28480	0160-3877
A2A5C15	0160-3877		CAPACITOR-FXD 100PF +-20% 200WVDC CER	28480	0160-3877
A2A5C16	0160-0575		CAPACITOR-FXD .047UF +-20% 50WVDC CER	28480	0160-0575
A2A5C17	0160-0575		CAPACITOR-FXD .047UF +-20% 50WVDC CER	28480	0160-0575
A2A5C18	0160-3874		CAPACITOR-FXD 10PF +-.5PF 200WVDC CER	28480	0160-3874
A2A5C19	0160-3879		CAPACITOR-FXD .01UF +-20% 100WVDC CER	28480	0160-3879
A2A5C20	0160-3879		CAPACITOR-FXD .01UF +-20% 100WVDC CER	28480	0160-3879
A2A5C21	0160-3878		CAPACITOR-FXD 1000PF +-20% 100WVDC CER	28480	0160-3878
A2A5C22	0160-0575		CAPACITOR-FXD .047UF +-20% 50WVDC CER	28480	0160-0575
A2A5C23	0160-3877		CAPACITOR-FXD 100PF +-20% 200WVDC CER	28480	0160-3877
A2A5C24	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A2A5C25	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A2A5C26	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A2A5C27	0160-3876		CAPACITOR-FXD 47PF +-20% 200WVDC CER	28480	0160-3876
A2A5C28	0160-3876		CAPACITOR-FXD 47PF +-20% 200WVDC CER	28480	0160-3876
A2A5C29	0160-3875	1	CAPACITOR-FXD 22PF +-5% 200WVDC CER	28480	0160-3875
A2A5C30	0160-3879		CAPACITOR-FXD .01UF +-20% 100WVDC CER	28480	0160-3879
A2A5C31	0160-0575		CAPACITOR-FXD .047UF +-20% 50WVDC CER	28480	0160-0575
A2A5C32	0160-0575		CAPACITOR-FXD .047UF +-20% 50WVDC CER	28480	0160-0575
A2A5C33	0160-3877		CAPACITOR-FXD 100PF + 20% 200WVDC CER	28480	0160-3877
A2A5C34	0160-3878		CAPACITOR-FXD 1000PF +-20% 100WVDC CER	28480	0160-3878

Table C2-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A2A5CR1	1901-0639	2	DIODE-PIN 110V	28480	1901-0639
A2A5CR2	1901-0639		DIODE-PIN 110V	28480	1901-0639
A2A5CR3	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A2A5CR4	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A2A5CR5	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A2A5CR6	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A2A5L1	9140-0114	1	COIL-FXD MOLDED RF CHOKE 10UH 10%	24226	15/102
A2A5L2	9100-2248	2	COIL-FXD MOLDED RF CHOKE .12UH 10%	24226	10/120
A2A5MP1	08505-00048	1	COVER, RF	28480	08505-00048
A2A5MP2	08505-00094	2	COVER	28480	08505-00094
A2A5MP3	08505-00095	1	SPACER	28480	08505-00095
A2A5MP4	08505-20147	1	HEAT SINK	28480	08505-20147
A2A5MP5	0520-0163	7	SCREW-MACH 2-56 .188-IN-LG 82 DEG	28480	0520-0163
A2A5MP6	0520-0165	7	SCREW-MACH 2-56 .312-IN-LG 82 DEG	28480	0520-0165
A2A5MP7	0610-0001	6	NUT-HEX-DBL-CHAM 2-56-THD .062-THK	28480	0610-0001
A2A5MP8	2190-0014	4	WASHER-LK INTL T NO.-2 .089-IN-ID	78189	1902-00
A2A5MP9	2200-0103	7	SCREW-MACH 4-40 .25-IN-LG PAN-HD-POZI	28480	2200-0103
A2A5MP10	2200-0169	1	SCREW-MACH 4-40 .5-IN-LG 82 DEG	28480	2200-0169
A2A5MP11	2260-0009	1	NUT-HEX-W/LKWR 4-40-THD .094-THK .25-A/F	28480	2260-0009
A2A5MP12	08505-00104	2	HEAT SINK (BASE)	28480	08505-00104
A2A5MP13	08505-20153	2	HEAT SINK (TOP)	28480	08505-20153
A2A5MP14	08505-20154	1	KNOB, PULL	28480	08505-20154
A2A5MP15	1250-0657	1	CONNECTOR-RF SMB M SGL HOLE FR	28480	1250-0657
A2A5MP16	1250-0691	1	CONNECTOR-RF SMB M SGL-HOLE-FR 50-OHM	28480	1250-0691
A2A5MP17	2190-0124	1	WASHER-LK INTL T NO.-10 .195-IN-ID	24931	LW101-30
A2A5MP18	2200-0101	5	SCREW-MACH 4-40 .188-IN-LG PAN-HD-POZI	28480	2200-0101
A2A5Q1	1854-0345	7	TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A2A5Q2	1853-0012	5	TRANSISTOR PNP 2N2904A SI TO-5 PD=600MW	01295	2N2904A
A2A5Q3	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A2A5Q4	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A2A5R1	0698-7206	4	RESISTOR 56.2 2% .05W F TC=0+-100	24546	C3-1/8-T0-56R2-G
A2A5R2	0698-7209	1	RESISTOR 75 2% .05W F TC=0+-100	24546	C3-1/8-T00-75R0-G
A2A5R3	0698-7210	1	RESISTOR 82.5 2% .05W F TC=0+-100	24546	C3-1/8-T00-82R5-G
A2A5R4	0698-7205	3	RESISTOR 51.1 2% .05W F TC=0+-100	24546	C3-1/8-T00-51R1-G
A2A5R5	0698-7236		RESISTOR 1K 2% .05W F TC=0+-100	24546	C3-1/8-T0-1001-G
A2A5R6	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A2A5R7	0698-7236		RESISTOR 1K 2% .05W F TC=0+-100	24546	C3-1/8-T0-1001-G
A2A5R8	0698-7248	3	RESISTOR 3.16K 2% .05W F TC=0+-100	24546	C3-1/8-T0-3161-G
A2A5R9	0698-7269	21	RESISTOR 23.7K .125W F TC=0+-100	24546	C3-1/8-TO-2372-G
A2A5R10	0698-7229		RESISTOR 511 2% .05W F TC=0+-100	24546	C3-1/8-T0-511R-G
A2A5R11	0698-7277		RESISTOR 51.1K 2% .05W F TC=0+-100	24546	C3-1/8-T0-5112-G
A2A5R12	0698-7246	1	RESISTOR 2.61K 2% .05W F TC=0+-100	24546	C3-1/8-T0-2611-G
A2A5R13	0698-7212		RESISTOR 100 2% .05W F TC=0+-100	24546	C3-1/8-T0-100R-G
A2A5R14	0698-7236		RESISTOR 1K 2% .05W F TC=0+-100	24546	C3-1/8-T0-1001-G
A2A5R15	0698-7220	1	RESISTOR 215 2% .05W F TC=0+-100	24546	C3-1/8-T0-215R-G
A2A5R16	0698-7238	1	RESISTOR 1.21K 2% .05W F TC=0+-100	24546	C3-1/8-T0-1211-G
A2A5R17	0698-7256	1	RESISTOR 6.81K 2% .05W F TC=0+-100	24546	C3-1/8-T0-6811-G
A2A5R18	0698-7268		RESISTOR 21.5K 2% .05W F TC=0+-100	24546	C3-1/8-T0-2152-G
A2A5R19	0698-7269	1	RESISTOR 23.7K 2% .05W F TC=0+-100	24546	C3-1/8-T0-2372-G
A2A5R20	0698-7236		RESISTOR 1K 2% .05W F TC=0+-100	24546	C3-1/8-T0-1001-G
A2A5R21	0698-7248		RESISTOR 3.16K 2% .05W F TC=0+-100	24546	C3-1/8-T0-3161-G
A2A5R22	0698-7229		RESISTOR 511 2% .05W F TC=0+-100	24546	C3-1/8-T0-511R-G
A2A5R23	0698-7229		RESISTOR 511 2% .05W F TC=0+-100	24546	C3-1/8-T0-511R-G
A2A5R24	0757-0986	1	RESISTOR 12.1 1% .5W F TC=0+-100	19701	MF7C1/2-T0-12R1-F
A2A5R25	0698-3459	1	RESISTOR 383K 1% .125W F TC=0+-100	03888	PME55S
A2A5R26	0698-7260		RESISTOR 10K 2% .05W F TC=0+-100	24546	C3-1/8-T0-1002-G
A2A5R27	0698-7242	4	RESISTOR 1.78K 2% .05W F TC=0+-100	24546	C3-1/8-T0-1781-G
A2A5R28	0698-7242		RESISTOR 1.78K 2% .05W F TC=0+-100	24546	C3-1/8-T0-1781-G
A2A5R29	0698-7242		RESISTOR 1.78K 2% .05W F TC=0+-100	24546	C3-1/8-T0-1781-G
A2A5R30	0698-7277		RESISTOR 51.1K 2% .05W F TC=0+-100	24546	C3-1/8-T0-5112-G
A2A5R31	0698-3456	1	RESISTOR 287K 1% .125W F TC=0+-100	16299	C4-1/8-T0-2873-F
A2A5R32	0698-7267	1	RESISTOR 19.6K 2% .05W F TC=0+-100	24546	C3-1/8-T0-1962-G
A2A5R33	0698-7248		RESISTOR 3.16K 2% .05W F TC=0+-100	24546	C3-1/8-T0-3161-G
A2A5R34	0698-7236		RESISTOR 1K 2% .05W F TC=0+-100	24546	C3-1/8-T0-1001-G
A2A5R35	0698-7222	1	RESISTOR 261 2% .05W F TC=0+-100	24546	C3-1/8-T0-261R-G
A2A5R36	0698-7236		RESISTOR 1K 2% .05W F TC=0+-100	24546	C3-1/8-T0-1001-G
A2A5R37	0698-7236		RESISTOR 1K 2% .05W F TC=0+-100	24546	C3-1/8-T0-1001-G
A2A5R38	0698-7236		RESISTOR 1K 2% .05W F TC=0+-100	24546	C3-1/8-T0-1001-G
A2A5R39	0698-7277		RESISTOR 51.1K 2% .05W F TC=0+-100	24546	C3-1/8-T0-5112-G
A2A5R40	0698-7232	5	RESISTOR 681 2% .05W F TC=0+-100	24546	C3-1/8-T0-681R-G
A2A5R41	0698-7283	1	RESISTOR 90.9K 2% .05W F TC=0+-100	24546	C3-1/8-T0-9092-G
A2A5R42	0698-7236		RESISTOR 1K 2% .05W F TC=0+-100	24546	C3-1/9-T0-1001-G
A2A5R44	0698-7274	1	RESISTOR 38.3K 2% .05W F TC=0+-100	24546	C3-1/8-T0-3832-G
A2A5R45	0698-7236		RESISTOR 1K 2% .05W F TC=0+-100	24546	C3-1/8-T0-1001-G
A2A5R46	0698-7232		RESISTOR 681 2% .05W F TC=0+-100	24546	C3-1/8-T0-681R-G

Table C2-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A2A5R47	0698-7245	3	RESISTOR 2.37K 2% .05W F TC=0+-100	24546	C3-1/8-T0-2371-G
A2A5R48	0698-7236		RESISTOR 1K 2% .05W F TC=0+-100	24546	C3-1/8-T0-1001-G
A2A5R49	0698-7236		RESISTOR 1K 2% .05W F TC=0+-100	24546	C3-1/8-T0-1001-G
A2A5R50	0698-7245		RESISTOR 2.37K 2% .05W F TC=0+-100	24546	C3-1/8-T0-2371-G
A2A5R51	0698-7245		RESISTOR 2.37K 2% .05W F TC=0+-100	24546	C3-1/8-T0-2371-G
A2A5R52	0698-7242		RESISTOR 1.78K 2% .05W F TC=0+-100	24546	C3-1/8-T0-1781-G
A2A5R53	0698-7232		RESISTOR 681 2% .05W F TC=0+-100	24546	C3-1/8-T0-681R-G
A2A5R54	0698-7223	2	RESISTOR 287 2% .05W F TC=0+-100	24546	C3-1/8-T0-287R-G
A2A5R55	0698-7223		RESISTOR 287 2% .05W F TC=0+-100	24546	C3-1/8-T0-287R-G
A2A5R56	0698-7212		RESISTOR 100 2% .05W F TC=0+-100	24546	C3-1/8-T0-100P-G
A2A5R57	0698-7232		RESISTOR 681 2% .05W F TC=0+-100	24546	C3-1/8-T0-681R-G
A2A5R58	0698-7236		RESISTOR 1K 2% .05W F TC=0+-100	24546	C3-1/8-T0-1001-G
A2A5R59	0696-7268		RESISTOR 21.5K 2% .05W F TC=0+-100	24546	C3-1/8-T0-2152-G
A2A5R60	0698-7243		RESISTOR 1.96K 2% .05W F TC=0+-100	24546	C3-1/8-T0-1961-G
A2A5R61	0698-7232		RESISTOR 681 2% .05W F TC=0+-100	24546	C3-1/8-T0-681R-G
A2A5R62	0698-7268		RESISTOR 21.5K 2% .05W F TC=0+-100	24546	C3-1/8-T0-2152-G
A2A5R63	0698-7268		RESISTOR 21.5K 2% .05W F TC=0+-100	24546	C3-1/8-T0-2152-G
A2A5U1	1820-1636	1		28480	1820-1636
A2A5U2	1820-0790	1	IC MC 1661 GATE	04713	MC1661L
A2A5U3	1820-1212	2	IC SN74LS112 N FLIP-FLOP	01295	SN74LS112N
A2A5U4	1820-1279	2	IC SN74LS190 N COUNTER	01295	SN74LS190N
A2A5U5	1820-1279		IC SN74LS190 N COUNTER	01295	SN74LS190N
A2A5U6	1820-1528		IC CD4029AY COUNTER	02735	CD4029AY
A2A5U7	1820-1528		IC CD4029AY COUNTER	02735	CD4029AY
A2A5U8	1820-1528		IC CD4029AY COUNTER	02735	CD4029AY
A2A5U9	1820-1631	2		28480	1820-1631
A2A5U10	1820-1199	1	IC SN74LS 04 N INV	01295	SN74LS04N
A2A5U11	1810-0207	1	NETWORK-RES 8-PIN-SIP .1-PIN-SPCG	11236	750-81-R22K
A2A5U12	1820-1266		IC MM80C 97N BUFFER	27014	MM80C97N
A2A5U13	1820-1266		IC MM80C 97N BUFFER	27014	MM80C97N
A2A5U14	1820-1266		IC MM80C 97N BUFFER	27014	MM80C97N
A2A5U15	1820-1266		IC MM80C 97N BUFFER	27014	MM80C97N
A2A5U16	1820-1528		IC CD4029AY COUNTER	02735	CD4029AY
A2A5U17	1820-0802	2	IC MC10102P GATE	04713	MC10102P
A2A5U18	1820-1631			28480	1820-1631
A2A5U19	1820-0802		IC MC10102P GATE	04713	MC10102P
A2A5U20	1820-1308	2	IC MC10116L RCVR	04713	MC10116L
A2A5U21	1820-1592		IC CD4069BY INV	02735	CD4069BY
A2A5U22	1820-1550		IC CD4071BY GATE	02735	CD4071BY
A2A5U23	1820-1592		IC CD4069BY INV	02735	CD4069BY
A2A5U24	1820-1538		IC CD4011AY GATE	02735	CD4011AY
A2A5U25	1820-1537		IC CD4002AY GATE	02735	CD4002AY
A2A5U26	1820-1538		IC CD4011AY GATE	02735	CD4011AY
A2A5U27	1826-0092	3	IC MC 1458 OP AMP	28480	1826-0092
A2A5VR1	1902-0064	1	DIODE-ZNR 7.5V 5% DO-7 PD=.4W TC=+.05%	04713	SZ 10939-146
A2A6	08505-60098	1	BOARD ASSEMBLY, MARKER	28480	08505-60098
A2A6C1	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A2A6C2	0160-0571		CAPACITOR-FXD 470 PF +-20% 100WVDC CER	28480	0160-0571
A2A6C3	0160-3878		CAPACITOR-FXD 1000PF +-20% 100WVDC CER	28480	0160-3878
A2A6C4	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A2A6C5	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A2A6C6	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A2A6C7	0160-0571		CAPACITOR-FXD 470 PF +-20% 100WVDC CER	28480	0160-0571
A2A6C8	0160-3878		CAPACITOR-FXD 1000PF +-20% 100WVDC CER	28480	0160-3873
A2A6C9	0160-0571		CAPACITOR-FXD 470 PF +-20% 100WVDC CER	28480	0160-0571
A2A6C10	0160-3878		CAPACITOR-FXD 1000PF +-20% 100WVDC CER	28480	0160-3878
A2A6C11	0160-0571		CAPACITOR-FXD 470 PF +-20% 100WVDC CER	28480	0160-0571
A2A6C12	0160-3878		CAPACITOR-FXD 1000PF +-20% 100WVDC CER	28480	0160-3878
A2A6C13	0160-0571		CAPACITOR-FXD 470 PF +-20% 100WVDC CER	28480	0160-0571
A2A6C14	0160-3878		CAPACITOR-FXD 1000PF +-20% 100WVDC CER	28480	0160-3878
A2A6C15	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A2A6C16	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A2A6C17	0160-0571		CAPACITOR-FXD 470 PF +-20% 100WVDC CER	28480	0160-0571
A2A6C18	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A2A6C19	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A2A6C20	0160-3878		CAPACITOR-FXD 1000PF +-20% 100WVDC CER	28480	0160-3878
A2A6C21	0160-3878		CAPACITOR-FXD 1000PF +-20% 100WVDC CER	28480	0160-3878
A2A6C22	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A2A6C23	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A2A6C24	0160-3879		CAPACITOR-FXD .01UF +-20% 100WVDC CER	28480	0160-3879
A2A6C25	0160-3879		CAPACITOR-FXD .01UF +-20% 100WVDC CER	28480	0160-3879
A2A6J1	1250-0543	12	CONNECTOR-RF SM SNP M PC	98291	51-053-0000

Table C2-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A2A6L1	9100-1618	1	COIL-FXD MOLDED RF CHOKE 5.6UH 10%	24226	15/561
A2A6MP1	5040-6849	1	EXTRACTOR, P.C. BOARD	28480	5040-6849
A2A6MP2	5000-9043		PIN:P.C. BOARD EXTRACTOR	28480	5000-9043
A2A6R1	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2152-F
A2A6R2	0757-0461		RESISTOR 68.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6812-F
A2A6R3	0757-0416	12	RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A2A6R4	0757-0443	14	RESISTOR 11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1102-F
A2A6R5	0757-0461		RESISTOR 68.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6812-F
A2A6R6	0698-3156	8	RESISTOR 14.7K 1% .125W F TC=0+-100	16299	C4-1/8-T0-1472-F
A2A6R7	0757-0461		RESISTOR 68.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6812-F
A2A6R8	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2152-F
A2A6R9	0698-3260	9	RESISTOR 464K 1% .125W F TC=0+-100	03888	PME55S
A2A6R10	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A2A6R11	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2152-F
A2A6R12	0698-3156		RESISTOR 14.7K 1% .125W F TC=0+-100	16299	C4-1/8-T0-1472-F
A2A6R13	0757-0443		RESISTOR 11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1102-F
A2A6R14	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2152-F
A2A6R15	0698-3260		RESISTOR 464K 1% .125W F TC=0+-100	03888	PME55S
A2A6R16	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2152-F
A2A6R17	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A2A6R18	0698-3156		RESISTOR 14.7K 1% .125W F TC=0+-100	16299	C4-1/8-T0-1472-F
A2A6R19	0757-0443		RESISTOR 11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1102-F
A2A6R20	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2152-F
A2A6R21	0698-3260		RESISTOR 464K 1% .125W F TC=0+-100	03888	PME55S
A2A6R22	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2152-F
A2A6R23	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A2A6R24	0698-3156		RESISTOR 14.7K 1% .125W F TC=0+-100	16299	C4-1/8-T0-1472-F
A2A6R25	0757-0443		RESISTOR 11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1102-F
A2A6R26	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2152-F
A2A6R27	0698-3260		RESISTOR 464K 1% .125W F TC=0+-100	03888	PME55S
A2A6R28	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2152-F
A2A6R29	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A2A6R30	0698-3156		RESISTOR 14.7K 1% .125W F TC=0+-100	16299	C4-1/8-T0-1472-F
A2A6R31	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2152-F
A2A6R32	0757-0443		RESISTOR 11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1102-F
A2A6R33	0698-3260		RESISTOR 464K 1% .125W F TC=0+-100	03888	PME55S
A2A6R34	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A2A6R35	0698-3156		RESISTOR 14.7K 1% .125W F TC=0+-100	16299	C4-1/8-T0-1472-F
A2A6R36	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A2A6R37	0757-0461		RESISTOR 68.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6812-F
A2A6R38	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A2A6R39	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A2A6R40	0698-3156		RESISTOR 14.7K 1% .125W F TC=0+-100	16299	C4-1/8-T0-1472-F
A2A6R41	0757-0447	2	RESISTOR 16.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1622-F
A2A6R42	0757-0280	14	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A2A6R43	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A2A6R44	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A2A6R45	0698-3156		RESISTOR 14.7K 1% .125W F TC=0+-100	16299	C4-1/8-T0-1472-F
A2A6R46	0698-7247	1	RESISTOR 2.87K 2% .05W F TC=0+-100	24546	C3-1/8-T0-2871-G
A2A6R47	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A2A6R48	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A2A6R49	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A2A6R50	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A2A6R51	0698-7224	2	RESISTOR 316 2% .05W F TC=0+-100	24546	C3-1/8-T0-316R-G
A2A6R52	0698-7224		RESISTOR 316 2% .05W F TC=0+-100	24546	C3-1/8-T0-316R-G
A2A6R53	0698-7284		RESISTOR 100K 1% .125W TC=0±100	28480	0698-7284
A2A6U1	1820-1251	5	IC SN74LS196 N COUNTER	01295	SN74LS196N
A2A6U2	1820-1251		IC SN74LS196 N COUNTER	01295	SN74LS196N
A2A6U3	1820-1251		IC SN74LS196 N COUNTER	01295	SN74LS196N
A2A6U4	1820-1251		IC SN74LS196 N COUNTER	01295	SN74LS196N
A2A6U5	1820-1251		IC SN74LS196 N COUNTER	01295	SN74LS196N
A2A6U6	1820-1538		IC CD4011AY GATE	02735	CD4011AY
A2A6U7	1820-1550		IC CD4071BY GATE	02735	CD4071BY
A2A6U8	1820-1552		IC CD4023AY GATE	02735	CD4023AY
A2A6U9	1820-1197	2	IC SN74LS 00 N GATE	01295	SN74LS00N
A2A6U10	1820-1216	1	IC SN74LS138 N DECODER	01295	SN74LS138N
A2A6U11	1820-1144	1	IC SN74LS 02 N GATE	01295	SN74LS02N
A2A6U12	1820-1542		IC CD4049AY BUFFER	02735	CD4049AY
A2A6U13	1820-1542		IC CD4049AY BUFFER	02735	CD4049AY
A2A6U14	1820-1547		IC CD4051AY MUXR	02735	CD4051AY
A2A6U15	1820-1551		IC CD4081BY GATE	02735	CD4081BY
A2A6U16	1820-1550		IC CD4071BY GATE	02735	CD4071BY
A2A6U17	1820-1212		IC SN74LS112 N FLIP-FLOP	01295	SN74LS112N
A2A6U18	1820-1193	1	IC SN74LS197 N COUNTER	01295	SN74LS197N
A2A6U19	1820-1206	1	IC SN74LS 27 N GATE	01295	SN74LS27N
A2A6U20	1820-1112	1	IC SN74LS 74 N FLIP-FLOP	01295	SN74LS74N

Table C2-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A2A6U21	1820-1534		IC CD4001AY GATE	02735	CD4001AY
A2A6U22	1820-1534		IC CD4001AY GATE	02735	CD4001AY
A2A6U23	1820-1538		IC CD4011AY GATE	02735	CD4011AY
A2A6U24	1820-1550		IC CD4071BY GATE	02735	CD4071BY
A2A6U25	1826-0138		IC LM 339 COMPARATOR	27014	LM339N
A2A6U26	1826-0026	3	IC LM 311 COMPARATOR	27014	LM311H
A2A6U27	1826-0092		IC MC 1458 OP AMP	28480	1826-0092
A2A6U28	1820-1197		IC SN74LS 00 N GATE	01295	SN74LS00N
A2A6VR1	1902-0041		DIODE-ZNR 5.11V 5% DO-7 PD=.4W TC=-.009%	04713	SZ 10939-98
A2A7	08505-60099	1	BOARD ASSEMBLY, SWEEP GENERATOR	28480	08505-60099
A2A7C1	0180-0116		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A2A7C2	0180-0116		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A2A7C3	0180-0116		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A2A7C4	0180-0376	2	CAPACITOR-FXD .47UF+-10% 35VDC TA	56289	150D474X9035A2
A2A7C5	0180-0116		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A2A7C6	0160-0571		CAPACITOR-FXD 470PF +-20% 100WVDC CER	28480	0160-0571
A2A7C7	0170-0040	1	CAPACITOR-FXD .047UF +-10% 200WVDC POLYE	56289	292P47392
A2A7C8	0180-2139	1	CAPACITOR-FXD; 10UF+-20% 60VDC TA-WET	56289	109D106X0060C2
A2A7C9	0180-0234	1	CAPACITOR-FXD; 33UF+-20% 75VDC TA WET	56289	109D336X0075F2
A2A7C10	0180-0100		CAPACITOR-FXD 4.7UF+-10% 35VDC TA	56289	150D475X9035B2
A2A7C11	0180-0376		CAPACITOR-FXD .47UF+-10% 35VDC TA	56289	150D474X9035A2
A2A7C12	0160-0571		CAPACITOR-FXD 470PF +-20% 100WVDC CER	28480	0160-0571
A2A7C13	0160-0574	12	CAPACITOR-FXD .022UF +-20% 100WVDC CER	28480	0160-0574
A2A7C14	0160-0571		CAPACITOR-FXD 470PF +-20% 100WVDC CER	28480	0160-0571
A2A7C15	0160-3879		CAPACITOR-FXD .01UF +-20% 100WVDC CER	28480	0160-3879
A2A7C16	0180-0116		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A2A7C17	0180-0116		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A2A7C18	0160-0571		CAPACITOR-FXD 470PF +-20% 100WVDC CER	28480	0160-0571
A2A7C19	0160-3879		CAPACITOR-FXD .01UF +-20% 100WVDC CER	28480	0160-3879
A2A7C20	0160-0571		CAPACITOR-FXD 470PF +-20% 100WVDC CER	28480	0160-0571
A2A7C21	0160-0571		CAPACITOR-FXD 470PF +-20% 100WVDC CER	28480	0160-0571
A2A7C22	0160-0571		CAPACITOR-FXD 470PF +-20% 100WVDC CER	28480	0160-0571
A2A7C23	0180-0116		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A2A7C24	0160-3878		CAPACITOR-FXD 1000PF +-20% 100WVDC CER	28480	0160-3878
A2A7CR1	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A2A7CR2	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A2A7CR3	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A2A7CR4	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A2A7CR5	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A2A7CR6	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A2A7CR7	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A2A7CR8	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A2A7CR9	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A2A7CR10	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A2A7CR11	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A2A7CR12	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A2A7CR13	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A2A7CR14	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A2A7CR15	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A2A7CR16	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A2A7CR17-CR22	1901-0539		DIODE-SCHOTTKY	28480	1901-0539
A2A7L1	9100-1647	5	COIL-FXD MOLDED RF CHOKE 470UH 5%	24226	19/473
A2A7L2	9100-1647		COIL-FXD MOLDED RF CHOKE 470UH 5%	24226	19/473
A2A7L3	9100-1647		COIL-FXD MOLDED RF CHOKE 470UH 5%	24226	19/473
A2A7MP1	5040-6850	1	P.C.BOARD EXTRACTOR, CLEAR	28480	5040-6850
A2A7MP2	5000-9043		PIN: P.C. BOARD EXTRACTOR	28480	5000-9043
A2A7Q1	1853-0012		TRANSISTOR PNP 2N2904A SI TO-5 PD=600MW	01295	2N2904A
A2A7Q2	1853-0012		TRANSISTOR PNP 2N2904A SI TO-5 PD=600MW	01295	2N2904A
A2A7Q3	1853-0012		TRANSISTOR PNP 2N2904A SI TO-5 PD=600MW	01295	2N2904A
A2A7Q4	1855-0368	3	TRANSISTOR J-FET N-CHAN D-MODE TO-72 SI	28480	1855-0368
A2A7Q5	1855-0368		TRANSISTOR J-FET N-CHAN D-MODE TO-72 SI	28480	1855-0368
A2A7Q6	1855-0368		TRANSISTOR J-FET N-CHAN D-MODE TO-72 SI	28480	1855-0368
A2A7Q7	1854-0039	4	TRANSISTOR NPN 2N3053 SI TO-5 PD=1W	04713	2N3053
A2A7Q8	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A2A7Q9	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A2A7Q10	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A2A7Q11	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A2A7R1	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A2A7R2	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A2A7R3	0698-3454	26	RESISTOR 215K 1% .125W F TC=0+-100	16299	C4-1/8-T0-2153-F
A2A7R4	0698-0083	3	RESISTOR 1.96K 1% .125W F TC=0+-100	16299	C4-1/8-T0-1961-F
A2A7R5	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F

Table C2-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A2A7R6	0698-3454		RESISTOR 215K 1% .125W F TC=0+-100	16299	C4-1/8-T0-2153-F
A2A7R7	0698-3454		RESISTOR 215K 1% .125W F TC=0+-100	16299	C4-1/8-T0-2153-F
A2A7R8	0698-3455	2	RESISTOR 261K 1% .125W F TC=0+-100	16299	C4-1/8-T0-2613-F
A2A7R9	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A2A7R10	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A2A7R11	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2152-F
A2A7R12	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2152-F
A2A7R13	0698-3455		RESISTOR 261K 1% .125W F TC=0+-100	16299	C4-1/8-T0-2613-F
A2A7R14	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A2A7R15	0698-3243	1	RESISTOR 178K 1% .125W F TC=0+-100	16299	C4-1/8-T0-1783-F
A2A7R16	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2152-F
A2A7R17	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2152-F
A2A7R18	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A2A7R19	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A2A7R20	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A2A7R21	0698-3260		RESISTOR 464K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4643-F
A2A7R22	0698-3450	7	RESISTOR 42.2K 1% .125W F TC=0+-100	16299	C4-1/8-T0-4222-F
A2A7R23	0757-0317	4	RESISTOR 1.33K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1331-F
A2A7R24	0698-3450		RESISTOR 42.2K 1% .125W F TC=0+-100	16299	C4-1/8-T0-4222-F
A2A7R25	0698-3450		RESISTOR 42.2K 1% .125W F TC=0+-100	16299	C4-1/8-T0-4222-F
A2A7R26	0698-3260		RESISTOR 464K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4643-F
A2A7R27	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A2A7R28	0698-3450		RESISTOR 42.2K 1% .125W F TC=0+-100	16299	C4-1/8-T0-4222-F
A2A7R29	0698-3260		RESISTOR 464K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4643-F
A2A7R30	0698-3454		RESISTOR 215K 1% .125W F TC=0+-100	16299	C4-1/8-T0-2153-F
A2A7R31	0698-3450		RESISTOR 42.2K 1% .125W F TC=0+-100	16299	C4-1/8-T0-4222-F
A2A7R32	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A2A7R33	0698-3454		RESISTOR 215K 1% .125W F TC=0+-100	16299	C4-1/8-T0-2153-F
A2A7R34	0698-3454		RESISTOR 215K 1% .125W F TC=0+-100	16299	C4-1/8-T0-2153-F
A2A7R35	0698-3454		RESISTOR 215K 1% .125W F TC=0+-100	16299	C4-1/8-T0-2153-F
A2A7R36	0698-3454		RESISTOR 215K 1% .125W F TC=0+-100	16299	C4-1/8-T0-2153-F
A2A7R37	0698-3454		RESISTOR 215K 1% .125W F TC=0+-100	16299	C4-1/8-T0-2153-F
A2A7R38	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A2A7R39	0698-3450		RESISTOR 42.2K 1% .125W F TC=0+-100	16299	C4-1/8-T0-4222-F
A2A7R40	0698-3450		RESISTOR 42.2K 1% .125W F TC=0+-100	16299	C4-1/8-T0-4222-F
A2A7R41	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A2A7R42	0757-0820	2	RESISTOR 1.1K 1% .5W F TC=0+-100	19701	MF7C1/2-T0-1101-F
A2A7R43	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A2A7R44	0698-0083		RESISTOR 1.96K 1% .125W F TC=0+-100	16299	C4-1/8-T0-1961-F
A2A7R45	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A2A7R46	0698-3445	9	RESISTOR 348 1% .125W F TC=0+-100	16299	C4-1/8-T0-348R-F
A2A7R47	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A2A7R48	0698-0083		RESISTOR 1.96K 1% .125W F TC=0+-100	16299	C4-1/8-T0-1961-F
A2A7R49	2100-3095	2	RESISTOR-TRMR 200 10% C SIDE-ADJ 17-TURN	32997	3006P-1-201
A2A7R50	0698-3445		RESISTOR 348 1% .125W F TC=0+-100	16299	C4-1/8-T0-348R-F
A2A7R51	0698-3445		RESISTOR 348 1% .125W F TC=0+-100	16299	C4-1/8-T0-348R-F
A2A7R52	0698-3445		RESISTOR 348 1% .125W F TC=0+-100	16299	C4-1/8-T0-348R-F
A2A7R53	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A2A7R54	0698-3454		RESISTOR 215K 1% .125W F TC=0+-100	16299	C4-1/8-T0-2153-F
A2A7R55	0757-0820		RESISTOR 1.1K 1% .5W F TC=0+-100	19701	MF7C1/2-T0-1101-F
A2A7R56	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A2A7R57	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A2A7R58	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A2A7R59	0811-1196	2	RESISTOR 5K .1% .062W PWW TC=0+-10	20940	114-1/16-5001-B
A2A7R60	0811-1196		RESISTOR 5K .1% .062W PWW TC=0+-10	20940	114-1/16-5001-B
A2A7R61	2100-3274	1	RESISTOR-TRMR 10K 10% C SIDE-ADJ	32997	3386X-Y46-103
A2A7R62	0698-3454		RESISTOR 215K 1% .125W F TC=0+-100	16299	C4-1/8-T0-2153-F
A2A7R63	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A2A7R64	0698-3454		RESISTOR 215K 1% .125W F TC=0+-100	16299	C4-1/8-T0-2153-F
A2A7R65	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A2A7R66	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A2A7R67	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100		C4-1/8-T0-101-F
A2A7R68	0698-7260		RESISTOR-FXD 10K 2% .125W TC=0+-100	28480	0698-7260
A2A7U1	1826-0249		IC AD 504J OP AMP	24355	AD504J
A2A7U2	1826-0249		IC AD 504J OP AMP	24355	AD504J
A2A7U3	1826-0249		IC AD 504J OP AMP	24355	AD504J
A2A7U4	1826-0261	4	IC OP AMP	28480	1826-0261
A2A7U5	1820-1535	1	IC CD4025AY GATE	02735	CD4025AY
A2A7U6	1820-1539	1	IC CD4012AY GATE	02735	CD4012AY
A2A7U7	1820-1577	2	IC CD4093BY SCHMITT	02735	CD4093BY
A2A7U8	1820-1531		IC CD4013AY FLIP-FLOP	02735	CD4013AY
A2A7U9	1826-0161	2	IC LM 324 OP AMP	27014	LM324N
A2A7U10	1820-1548	4	IC CD4066AY SWITCH	02735	CD4066AY
A2A7U11	1826-0249		IC AD 504J OP AMP	24355	AD504J
A2A7U12	1826-0249		IC AD 504J OP AMP	24355	AD504J
A2A7U13	1820-1548		IC CD4066AY SWITCH	02735	CD4066AY
A2A7U14	1820-1534		IC CD4001AY GATE	02735	CD4001AY
A2A7U15	1820-1542		IC CD4049AY BUFFER	02735	CD4049AY

Table C2-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A2A7U16	1810-0215	2	NETWORK-RES 8-PIN-SIP .1-PIN-SPCG	11236	750-81-R75K
A2A7U17	1820-1545		IC CD4053AY MUXR	02735	CD4053AY
A2A7U18	1820-1577		IC CD4093BY SCHMITT	02735	CD4093BY
A2A7VR1	1902-0041		DIODE-ZNR 5.11V 5% DO-7 PD=.4W TC=-.009%	04713	SZ 10939-98
A2A7VR2	1902-0680	8	DIODE-ZNR 1N827 6.2V 5% DO-7 PD=.25W	03877	1N827
A2A7VR3	1902-0680		DIODE-ZNR 1N827 6.2V 5% DO-7 PD=.25W	03877	1N827
A2A7VR4	1902-0680		DIODE-ZNR 1N827 6.2V 5% DO-7 PD=.25W	03877	1N827
A2A7VR5	1902-3224	2	DIODE-ZNR 17.8V 5% DO-7 PD=.4W TC=+.067%	04713	SZ 10939-254
A2A7VR6	1902-3182	1	DIODE-ZNR 12.1V 5% DO-7 PD=.4W TC=+.064%	04713	SZ 10939-206
A2A7VR7	1902-0025	1	DIODE-ZNR 10V 5% DO-7 PD=.4W TC=+.06%	04713	SZ 10939-182
A2A8	08505-60100	1	BOARD ASSEMBLY, SWEEP SELECTOR	28480	08505-60100
A2A8C1	0180-0116		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A2A8C2	0180-0116		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A2A8C3	0180-0116		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A2A8C4	0180-1706	1	CAPACITOR-FXD; 100UF+-20% 25VDC TA-WET	56289	109D107X0025F2
A2A8C5	0180-0116		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A2A8C6	0180-0116		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A2A8C7	0160-3879		CAPACITOR-FXD .01UF +-20% 100WVDC CER	28480	0160-3879
A2A8C8	0160-3879		CAPACITOR-FXD .01UF +-20% 100WVDC CER	28480	0160-3879
A2A8C9	0160-0572	2	CAPACITOR-FXD 2200PF +-20% 100WVDC CER	28480	0160-0572
A2A8C10	0160-0572		CAPACITOR-FXD 2200PF +-20% 100WVDC CER	28480	0160-0572
A2A8C11	0160-0571		CAPACITOR-FXD 470PF +-20% 100WVDC CER	28480	0160-0571
A2A8C12	0160-0698	2	CAPACITOR-FXD .033UF +-10% 100WVDC MET	84411	X601PE33391W2
A2A8C13	0160-0698		CAPACITOR-FXD .033UF +-10% 100WVDC MET	84411	X601PE33391W2
A2A8C14	0160-0571		CAPACITOR-FXD 470PF +-20% 100WVDC CER	28480	0160-0571
A2A8C15	0160-0571		CAPACITOR-FXD 470PF +-20% 100WVDC CER	28480	0160-0571
A2A8C16	0160-0571		CAPACITOR-FXD 470PF +-20% 100WVDC CER	28480	0160-0571
A2A8C17	0160-0571	2	CAPACITOR-FXD 470PF +-20% 100WVDC CER	28480	0160-0571
A2A8C18	0160-0156	1	CAPACITOR-FXD 3900 PF +-10% 200WVDC POLYE	56289	292P39292
A2A8C19	0160-3878		CAPACITOR-FXD 1000PF +-10% 200WVDC MET	28480	0160-3878
A2A8C20	0160-0154	1	CAPACITOR-FXD 2200PF +-10% 200WVDC POLYE	56289	292P22292
A2A8C21	0180-0094		CAPACITOR-FXD 100 UF +75-10% 25VDC AL	56289	30D107G025DD2
A2A8C22	0180-0229		CAPACITOR-FXD 33UF +-10% 10VDC TA	56289	150D336X901082
A2A8C23	0180-0229		CAPACITOR-FXD 33UF +-10% 10VDC TA	56289	150D336X901082
A2A8C24	0180-0116		CAPACITOR-FXD 6.8UF +-10% 35VDC TA	56289	150D685X903582
A2A8CR1	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A2A8CR2	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A2A8CR3	1901-0050	4	DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A2A8CR4	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A2A8CR5	1901-0539	4	DIODE-SCHOTTKY	28480	1901-0539
A2A8CR6	1901-0539		DIODE-SCHOTTKY	28480	1901-0539
A2A8CR7	1901-0539		DIODE-SCHOTTKY	28480	1901-0539
A2A8CR8	1901-0539		DIODE-SCHOTTKY	28480	1901-0539
A2A8CR9	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A2A8L1	9100-1624	2	COIL-FXD MOLDED RF CHOKE 30UH 5%	24226	15/302
A2A8L2	9100-1624		COIL-FXD MOLDED RF CHOKE 30UH 5%	24226	15/302
A2A8L3	9100-1624		COIL-FXD MOLDED RF CHOKE 30UH 5%	24226	15/302
A2A8L4	9100-1624		COIL-FXD MOLDED RF CHOKE 30UH 5%	24226	15/302
A2A8MP1	5040-6846	1	P.C. BOARD EXTRACTOR	28480	5040-6846
A2A8MP2	5000-9043		PIN:P.C. BOARD EXTRACTOR	28480	5000-9043
A2A8Q1	1853-0316	1	TRANSISTOR-DUAL PNPPD=500MW	28480	1853-0316
A2A8Q2	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A2A8Q3	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A2A8Q4	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A2A8Q5	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A2A8Q6	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A2A8Q7	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A2A8Q8	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A2A8Q9	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A2A8Q10	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A2A8Q11	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A2A8Q12	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A2A8Q13	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A2A8Q14	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A2A8R1	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-TO-10R0-F
A2A8R2	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-TO-10R0-F
A2A8R3	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1003-F
A2A8R4	0698-3260		RESISTOR 464K 1% .125W F TC=0+-100	03888	PME55S
A2A8R5	0698-3260		RESISTOR 464K 1% .125W F TC=0+-100	03888	PME55S
A2A8R6	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1003-F
A2A8R7	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1003-F
A2A8R8	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1003-F
A2A8R9	0698-3260		RESISTOR 464K 1% .125W F TC=0+-100	03888	PME55S
A2A8R10	0757-0458		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-TO-5112-F
A2A8R11	0757-0458		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-TO-5112-F
A2A8R12	0698-7284		RESISTOR 100K 1% .125W F TC=0+-100	24546	C3-1/8-TO-1003-G
A2A8R13	0698-7229		RESISTOR 511 1% .125W F TC=0+-100	24546	C3-1/8-TO-511R-G
A2A8R14	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1001-F
A2A8R15	0757-0443		RESISTOR 11K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1102-F

Table C2-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A2A8R16	0698-7261		RESISTOR 11K 2% .125W F TC=0+-100	24546	C3-1/8-TO-1102-G
A2A8R17	0698-3162		RESISTOR 46.4K 1% .125W F TC=0+-100	24546	C4-1/8-TO-4642-F
A2A8R18	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1003-F
A2A8R19	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1003-F
A2A8R20	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1003-F
A2A8R21	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1003-F
A2A8R22	0757-0461		RESISTOR 46.4K 1% .125W F TC=0+-100	24546	C4-1/8-TO-4642-F
A2A8R23	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1003F
A2A8R24	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1003F
A2A8R25	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	24546	C3-1/8-TO-511R-G
A2A8R26	0698-3454		RESISTOR 215K 1% .125W F TC=0+-100	16299	C4-1/8-TO-2153-F
A2A8R27	0757-0461		RESISTOR 68.1K 1% .125W F TC=0+-100	24546	C4-1/8-TO-6812-F
A2A8R28	0698-7229		RESISTOR 511 2% .125W F TC=0+-100	24546	C3-1/8-TO-511R-G
A2A8R29	0698-7229		RESISTOR 511 2% .125W F TC=0+-100	24546	C3-1/8-TO-511R-G
A2A8R30	0757-0461		RESISTOR 68.1K 1% .125W F TC=0+-100	24546	C4-1/8-TO-6812-F
A2A8R31	0757-0461		RESISTOR 68.1K 1% .125W F TC=0+-100	24546	C4-1/8-TO-6812-F
A2A8R32	0698-7288		RESISTOR 147K 1% .125W F TC=0+-100	16299	C3-1/8-TO-1473G
A2A8R33	0698-7288		RESISTOR 147K 1% .125W F TC=0+-100	16299	C3-1/8-TO-1473G
A2A8R34	0757-0462		RESISTOR 75K 1% .125W F TC=0+-100	24546	C4-1/8-TO-7502-F
A2A8R35	0698-3454		RESISTOR 215K 1% .125W F TC=0+-100	16299	C4-1/8-TO-2153-F
A2A8R36	0698-3454		RESISTOR 215K 1% .125W F TC=0+-100	16299	C4-1/8-TO-2153-F
A2A8R37	0698-7229		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-TO-511R-F
A2A8R38	0698-7261		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1102-G
A2A8R39	0698-3454		RESISTOR 215K 1% .125W F TC=0+-100	16299	C4-1/8-TO-2153-F
A2A8R40	0757-0462		RESISTOR 75K 1% .125W F TC=0+-100	24546	C4-1/8-TO-7502-F
A2A8R41	0757-0443		RESISTOR 11K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1102-F
A2A8R42	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1003-F
A2A8R43	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1003-F
A2A8R44	0757-0462		RESISTOR 75K 1% .125W F TC=0+-100	24546	C4-1/8-TO-7502-F
A2A8R45	0757-0443		RESISTOR 11K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1102-F
A2A8R46	0757-0443		RESISTOR 11K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1102-F
A2A8R47	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	24546	C4-1/8-TO-2152-F
A2A8R48	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1003-F
A2A8R49	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1003-F
A2A8R50	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1003-F
A2A8R51	0757-0458		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-TO-5112-F
A2A8R52	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1003-F
A2A8R53	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1003-F
A2A8R54	0698-7277		RESISTOR 51.1K 2% .125W F TC=0+-100	24546	C3-1/8-TO-5112-G
A2A8R55	0757-0443		RESISTOR 11K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1102-F
A2A8R56	0698-7284		RESISTOR 100K 2% .125W F TC=0+-100	24546	C3-1/8-TO-1003-G
A2A8R57	0757-0443		RESISTOR 11K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1102-F
A2A8R58	2100-2633	1	RESISTOR-TRMR 1K 10% C SIDE-ADJ 1 TURN	30983	ET50X102
A2A8R59	0698-5466	1	RESISTOR 5.7K 1% .125W F TC=0+-100	24546	C4-1/8-TO-5701-F
A2A8R60	0757-0482	2	RESISTOR 511K 1% .125W F TC=0+-100	24546	NA4
A2A8R61	0811-3324	2	RESISTOR 308 .1% .062W PWW TC=0+-10	14140	1274
A2A8R62	0757-0458		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-TO-5112-F
A2A8R63	0811-2132	1	RESISTOR 200 2% .25W PWW TC=+4900+-400	54294	PC312-1/4-201-G
A2A8R64	0811-3324		RESISTOR 308 .1% .062W PWW TC=0+-10	14140	1274
A2A8R65	0757-0482		RESISTOR 511K 1% .125W F TC=0+-100	24546	NA4
A2A8R66	0757-0458		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-TO-5112-F
A2A8R67	0811-3326	1	RESISTOR 317 .1% .062W PWW TC=0+-10	14140	1274
A2A8R68	0757-0461		RESISTOR 68.1K 1% .125W F TC=0+-100	24546	C4-1/8-TO-6812-F
A2A8R69	0698-3454		RESISTOR 215K 1% .125W F TC=0+-100	16299	C4-1/8-TO-2153-F
A2A8R70	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-TO-1080-F
A2A8R71	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-TO-1080-F
A2A8R72	0757-0461		RESISTOR 68.1K 1% .125W F TC=0+-100	24546	C4-1/8-TO-6812-F
A2A8R73	0698-3454		RESISTOR 215K 1% .125W F TC=0+-100	16299	C4-1/8-TO-2153-F
A2A8R74	0757-0440	3	RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-TO-7501-F
A2A8R75	2100-3199	1	RESISTOR-TRMR 20 20% C SIDE-ADJ 1 TURN	30983	ET50X200
A2A8R76	0757-0440		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-TO-7501-F
A2A8R77	0757-0461		RESISTOR 68.1K 1% .125W F TC=0+-100	24546	C4-1/8-TO-6812-F
A2A8R78	0698-3454		RESISTOR 215K 1% .125W F TC=0+-100	16299	C4-1/8-TO-2153-F
A2A8R79	2100-2516	1	RESISTOR-TRMR 100K 10% C SIDE ADJ 1 TURN	30983	ET50X104
A2A8R80	0698-3153	5	RESISTOR 3.83K 1% .125W F TC=0+-100	16299	C4-1/8-TO-3831-F
A2A8R81	0698-7212		RESISTOR 100 2% .125W F TC=0+-100	24546	C3-1/8-TO-1000-G
A2A8R82	0698-7212		RESISTOR 100 2% .125W F TC=0+-100	24546	C3-1/8-TO-1000-G
A2A8U1	1826-0350	2	IC OP AMP	28480	1826-0350
A2A8U2	1826-0350		IC OP AMP	28480	1826-0350
A2A8U3	1826-0261		IC OP AMP	28480	1826-0261
A2A8U4	1826-0102	2	IC LM 312 OP AMP	27014	LM312H
A2A8U5	1826-0102		IC LM 312 OP AMP	27014	LM312H
A2A8U6	1820-1548		IC CD4066AY SWITCH	02735	CD4066AY
A2A8U7	1820-1534		IC CD4001AY GATE	02735	CD4001AY
A2A8U8	1820-1538		IC CD4011AY GATE	02735	CD4011AY
A2A8U9	1826-0092		IC OP AMP	28480	1826-0092
A2A8U10	1826-0092		IC OP AMP	28480	1826-0092
A2A8U11	1820-1675	1	IC QUAD BILATERAL SWITCH	02735	CD4016A

Table C2-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A2A8U12	1820-1590	1	IC MM74C 14J SCHMITT	27014	MM74C14J
A2A8U13	1820-1548		IC CD4066AY SWITCH	02735	CD4066AY
A2A8U14	1810-0215		NETWORK-RES 8-PIN-SIP .1-PIN SPCG	11236	750-81-R75K
A2A8U15	1820-1542		IC CD4049AY BUFFER	02735	CD4049AY
A2A8U16	1820-1545		IC CD4053AY MUXR	02735	CD4053AY
A2A8U17	1826-0249		IC AD 504J OP AMP	24355	AD504J
A2A8U18	1820-1545		IC CD4053AY MUXR	02735	CD4053AY
A2A8U19	1826-0249		IC AD 504J OP AMP	24355	AD504J
A2A8VR1	1902-3224		DIODE-ZNR 17.8V 5% DO 7 PD=.4W TC=+.067%	04713	SZ 10939-254
A2A9	08505-60101	1	BOARD ASSEMBLY, DISCRIMINATOR	28480	08505-60101
A2A9C1	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A2A9C2	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A2A9C3	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A2A9C4	0160-0574		CAPACITOR-FXD .022UF +-20% 100WVDC CER	28480	0160-0574
A2A9C5	0160-0574		CAPACITOR-FXD .022UF +-20% 100WVDC CER	28480	0160-0574
A2A9C6	0160-0574		CAPACITOR-FXD .022UF +-20% 100WVDC CER	28480	0160-0574
A2A9C7	0160-0574		CAPACITOR-FXD .022UF +-20% 100WVDC CER	28480	0160-0574
A2A9C8	0180-0116		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A2A9C9	0160-0574		CAPACITOR-FXD .022UF +-20% 100WVDC CER	28480	0160-0574
A2A9C10	0180-0116		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A2A9C11	0180-0116		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A2A9C12	0180-0116		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A2A9C13	0180-0116		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A2A9C14	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A2A9C15	0180-0116		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A2A9C16	0160-0174	9	CAPACITOR-FXD .47UF +80-20% 25WVDC CER	28480	0160-0174
A2A9C17	0160-0174		CAPACITOR-FXD .47UF +80-20% 25WVDC CER	28480	0160-0174
A2A9C18	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A2A9C19	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A2A9C20	0160-0174		CAPACITOR-FXD .47UF +80-20% 25WVDC CER	28480	0160-0174
A2A9C21	0160-0174		CAPACITOR-FXD .47UF +80-20% 25WVDC CER	28480	0160-0174
A2A9C22	0160-2306	1	CAPACITOR-FXD 27PF +-5% 300WVDC MICA	28480	0160-2306
A2A9C23	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A2A9C24	0160-2256	1	CAPACITOR-FXD 9.1PF +-.25PF 500WVDC CER	28480	0160-2256
A2A9C25	0170-0084	1	CAPACITOR-FXD .068UF +-20% 50WVDC POLYE	84411	601PE683OR5W3
A2A9C26	0160-0159	1	CAPACITOR-FXD 6800PF +-10% 200WVDC POLYE	56289	292P68292
A2A9C27	0160-3533	3	CAPACITOR-FXD 470PF +-5% 100WVDC MICA	28480	0160-3533
A2A9C28	0160-3533		CAPACITOR-FXD 470PF +-5% 100WVDC MICA	28480	0160-3533
A2A9C29	0160-0174		CAPACITOR-FXD .47UF +80-20% 25WVDC CER	28480	0160-0174
A2A9C30	0160-0174		CAPACITOR-FXD .47UF +80-20% 25WVDC CER	28480	0160-0174
A2A9C31	0180-0116		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A2A9C32	0160-0174		CAPACITOR-FXD .47UF +80-20% 25WVDC CER	28480	0160-0174
A2A9C33	0160-2204	4	CAPACITOR-FXD 100PF +-5% 300WVDC MICA	93790	RDM15F101J3C
A2A9C34	0160-0174		CAPACITOR-FXD .47UF +80-20% 25WVDC CER	28480	0160-0174
A2A9C35	0160-0174		CAPACITOR-FXD .47UF +80-20% 25WVDC CER	28480	0160-0174
A2A9CR1	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A2A9CR2	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A2A9CR3	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A2A9CR4	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A2A9CR5	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A2A9CR6	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A2A9CR7	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A2A9CR8	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A2A9CR9	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A2A9CR10	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A2A9DS1	1990-0404		LED-VISIBLE	28480	1990-0404
A2A9J1	1250-0543		CONNECTOR-RF SM SNP M PC	98291	51-053-0000
A2A9L1	9100-1641	6	COIL-FXD MOLDED RF CHOKE 240UH 5%	24226	15/243
A2A9L2	9100-1641		COIL-FXD MOLDED RF CHOKE 240UH 5%	24226	15/243
A2A9L3	9100-1641		COIL-FXD MOLDED RF CHOKE 240UH 5%	24226	15/243
A2A9L4	9100-2257	2	COIL-FXD MOLDED RF CHOKE .82UH 10%	24226	10/820
A2A9L5	9100-2254	1	COIL-FXD MOLDED RF CHOKE .39UH 10%	24226	10/390
A2A9L6	9100-2248		COIL-FXD MOLDED RF CHOKE .12UH 10%	24226	10/120
A2A9L7	9100-1641		COIL-FXD MOLDED RF CHOKE 240UH 5%	24226	15/243
A2A9MP1	0590-0519	14	PRESS-IN NUT 4-40 .062 LG	28480	0590-0519
A2A9MP2	2190-0910	1	WASHER-LOCK NO. 4 .12 IN ID .275 IN OD	04713	04A52200F01
A2A9MP3	2200-0103		SCREW-MACH 4-40 .25-IN-LG PAN-HD-POZI	28480	2200-0103
A2A9MP4	2200-0101		SCREW-MACH 4-40 .188-IN-LG PAN-HD-POZI	28480	2200-0101
A2A9MP5	2200-0101		SCREW-MACH 4-40 .188-IN-LG PAN-HD-POZI	28480	2200-0101
A2A9MP6	2200-0101		SCREW-MACH 4-40 .188-IN-LG PAN-HD-POZI	28480	2200-0101
A2A9MP7	08505-00050	1	COVER, RF	28480	08505-00050
A2A9MP8	0520-0128	2	SCREW-MACH 2-56 .25-IN-LG PAN-HD-POZI	28480	0520-0128
A2A9MP9	0520-0128		SCREW-MACH 2-56 .25-IN-LG PAN-HD-POZI	28480	0520-0128
A2A9MP10	0610-0001		NUT-HEX-DBL-CHAM 2-56-THD .062-THK	28480	0610-0001

Table C2-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A2A9MP11	0610-0001		NUT-HEX DBL CHAM 2-56 THD .062-THK	28480	0610-0001
A2A9MP12	01801-01206	3	BRACKET	28480	01801-01206
A2A9MP13	01801-01206		BRACKET	28480	01801-01206
A2A9MP14	01801-01206		BRACKET	28480	01801-01206
A2A9Q1	1854-0039		TRANSISTOR NPN 2N3053 SI TO-5 PD=1W	04713	2N3053
A2A9Q2	1853-0075	1	TRANSISTOR-DUAL PNP PD=400MW	28480	1853-0075
A2A9Q3	1854-0330	1	TRANSISTOR NPN SI PD=21W FT=10MHZ	28480	1854-0330
A2A9Q4	1854-0345		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A2A9Q5	1854-0345		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A2A9Q6	1853-0001	1	TRANSISTOR PNP SI TO-39 PD=600MW	28480	1853-0001
A2A9Q7	1855-0020		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A2A9Q8	1855-0020		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A2A9Q9	1855-0020		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A2A9Q10	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A2A9Q11	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A2A9Q12	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A2A9Q13	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A2A9Q14	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A2A9Q15	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A2A9Q16	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A2A9Q17	1855-0020		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A2A9Q18	1855-0020		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A2A9Q19	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A2A9Q20	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A2A9Q21	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A2A9Q22	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A2A9Q23	1855-0020		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A2A9R1	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A2A9R2	0811-3246	2	RESISTOR 110 1% 7.5W PW TC=0+-20	15915	TM5-7-1/2-111-F
A2A9R3	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A2A9R4	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A2A9R5	0698-3447	4	RESISTOR 422 1% .125W F TC=0+-100	16299	C4-1/8-T0-422R-F
A2A9R6	0757-0394	10	RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A2A9R7	0757-0394		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A2A9R8	0757-0394		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A2A9R8	0811-3246		RESISTOR 110 1% 7.5W PW TC=0+-20	15915	TM5-7-1/2-111-F
A2A9R9	0698-0084	3	RESISTOR 2.15K 1% .125W F TC=0+-100	16299	C4-1/8-T0-2151-F
A2A9R10	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A2A9R10	0757-0394		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A2A9R11	0757-0278	5	RESISTOR 1.78K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1781-F
A2A9R12	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A2A9R13	0757-0458		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A2A9R14	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A2A9R15	0757-0458		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A2A9R16	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A2A9R17	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A2A9R18	0698-3236	1	RESISTOR 15K .25% .125W F TC=0+-50	24546	NC55
A2A9R19	0757-0458		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A2A9R20	0757-0458		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A2A9R21	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A2A9R22	0698-3274	1	RESISTOR 10K 1% .125W F TC=0+-25	24546	NE55
A2A9R23	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A2A9R24	0698-7395	1	RESISTOR 3.8K .1% .125W F TC=0+-50	19701	MF4C1/8-T2-3801-B
A2A9R25	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A2A9R26	0757-0278		RESISTOR 1.78K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1781-F
A2A9R27	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A2A9R28	0698-3441	10	RESISTOR 215 1% .125W F TC=0+-100	16299	C4-1/8-T0-215R-F
A2A9R29	0698-3441		RESISTOR 215 1% .125W F TC=0+-100	16299	C4-1/8-T0-215R-F
A2A9R30	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A2A9R31	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A2A9R32	0698-3445		RESISTOR 348 1% .125W F TC=0+-100	16299	C4-1/8-T0-348R-F
A2A9R33	0698-3153		RESISTOR 3.83K 1% .125W F TC=0+-100	16299	C4-1/8-T0-3831-F
A2A9R34	0811-2813	1	RESISTOR 1 5% .75W PW TC=0+-50	91637	FS1/2-T2-1R0-J
A2A9R35	0757-0398	3	RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A2A9R36	0698-3454		RESISTOR 215K 1% .125W F TC=0+-100	16299	C4-1/8-T0-2153-F
A2A9R37	0698-3441		RESISTOR 215 1% .125W F TC=0+-100	16299	C4-1/8-T0-2153-F
A2A9R38	0698-3441		RESISTOR 215 1% .125W F TC=0+-100	16299	C4-1/8-T0-215R-F
A2A9R39	0698-3454		RESISTOR 215K 1% .125W F TC=0+-100	16299	C4-1/8-T0-2153-F
A2A9R40	0698-3441		RESISTOR 215 1% .125W F TC=0+-100	16299	C4-1/8-T0-215R-F
A2A9R41	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A2A9R42	0757-0379	1	RESISTOR 12.1 1% .125W F TC=0+-100	19701	MF4C1/8-T0-12R1-F
A2A9R43	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2152-F
A2A9R44	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A2A9R44	0698-3441		RESISTOR 215 1% .125W F TC=0+-100	16299	C4-1/8-T0-215R-F
A2A9R45	0698-3435	5	RESISTOR 38.3 1% .125W F TC=0+-100	16299	C4-1/8-T0-38R3-F
A2A9R46	0698-3102	2	RESISTOR 237 1% .5W F TC=0+-100	24546	NA6
A2A9R47	0698-3102		RESISTOR 237 1% .5W F TC=0+-100	24546	NA6

Table C2-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A2A9R48	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A2A9R49	0757-1094	2	RESISTOR 1.47K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1471-F
A2A9R50	0757-0398		RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A2A9R51	0698-3237	1	RESISTOR 5K .25% .125W F TC=0+-50	24546	NC55
A2A9R52	0698-3454		RESISTOR 215K 1% .125W F TC=0+-100	16299	C4-1/8-T0-2153-F
A2A9R53	0698-3441		RESISTOR 215 1% .125W F TC=0+-100	16299	C4-1/8-T0-215R-F
A2A9R54	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A2A9R55	0683-5655	1	RESISTOR 5.6M 5% .25W FC TC=-900/+1100	01121	CB5655
A2A9R56	0698-3435		RESISTOR 38.3 1% .125W F TC=0+-100	16299	C4-1/8-T0-38R3-F
A2A9R57	2100-3349	1	RESISTOR-TRMR 100 10% C SIDE-ADJ 1-TRN	32997	3386X-Y46-101
A2A9R58	0698-6862	1	RESISTOR 1.153K .25% .125W F TC=0+-50	24546	NC55
A2A9R59	0698-6620	1	RESISTOR 150K .1% .125W F TC=0+-25	03888	PME55S
A2A9R60	0698-3447		RESISTOR 422 1% .125W F TC=0+-100	16299	C4-1/8-T0-422R-F
A2A9R61	0698-8052	1	RESISTOR 590 .1% .25W F TC=0+-25	19701	MF52C1/4-T9-590R-B
A2A9R62	0698-7205		RESISTOR 51.1 2% .05W F TC=0+-100	24546	C3-1/8-T00-51R1-G
A2A9R63	0757-0421	6	RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
A2A9R64	0757-0278		RESISTOR 1.78K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1781-F
A2A9R65	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2152-F
A2A9R66	0683-1055		RESISTOR 1M 5% .25W FC TC=-800/+900	01121	CB1055
A2A9R67	0757-0458		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A2A9R68	2100-3052	1	RESISTOR-TRMR 50 20% C SIDE-ADJ 17-TURN	32997	3006P-1-500
A2A9R69	0698-3445		RESISTOR 348 1% .125W F TC=0+-100	16299	C4-1/8-T0-348R-F
A2A9R70	0698-5552	3	RESISTOR 1K 1% .125W F TC=0+-25	24546	NE55
A2A9R71	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2152-F
A2A9R72	0757-0458		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A2A9R73	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A2A9R74	0698-5552		RESISTOR 1K 1% .125W F TC=0+-25	24546	NE55
A2A9R75	0698-3454		RESISTOR 215K 1% .125W F TC=0+-100	16299	C4-1/8-T0-2153-F
A2A9R76	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A2A9R77	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A2A9R78	0698-5552		RESISTOR 1K 1% .125W F TC=0+-25	24546	NE55
A2A9R79	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2152-F
A2A9R80	0698-3153		RESISTOR 3.83K 1% .125W F TC=0+-100	16299	C4-1/8-T0-3831-F
A2A9R81	0698-0084		RESISTOR 2.15K 1% .125W F TC=0+-100	16299	C4-1/8-T0-2151-F
A2A9U1	1826-0092		IC MC 1458 OP AMP	28480	1826-0092
A2A9U2	1820-1308		IC MC10116L RCVR	04713	MC10116L
A2A9U3	1826-0261		IC OP AMP	28480	1826-0261
A2A9U4	1826-0249		IC AD 504J OP AMP	24355	AD504J
A2A9U5	1826-0026		IC LM 311 COMPARATOR	27014	LM311H
A2A9U6	1820-1538		IC CD4011AY GATE	02735	CD4011AY
A2A9U7	1826-0302	1	IC MC 1741SC OP AMP	04713	MC1741SCG
A2A9U8	1820-1531		IC CD4013AY FLIP-FLOP	02735	CD4013AY
A2A9U9	1820-1538		IC CD4011AY GATE	02735	CD4011AY
A2A9VR1	1902-3094	1	DIODE-ZNR 5.11V 2% DO-7 PD=.4W TC=-.009%	04713	SZ 10939-99
A2A9VR2	1902-3071	1	DIODE-ZNR 4.22V 2% DO-7 PD=.4W TC=-.038%	04713	SZ 10939-75
A2A9VR3	1902-0680		DIODE-ZNR 1N827 6.2V 5% DO-7 PD=.25W	03877	1N827
A2A9VR4	1902-3048	2	DIODE-ZNR 3.48V 5% DO-7 PD=.4W TC=-.058%	04713	SZ 10939-50
A2A9VR5	1902-3048		DIODE-ZNR 3.48V 5% DO-7 PD=.4W TC=-.058%	04713	SZ 10939-50
A2A9Z1	9170-0029	2	CORE-SHIELDING BEAD	02114	56-590-65A2/4A
A2A9Z2	9170-0029		CORE-SHIELDING BEAD	02114	56-590-65A2/4A
A2A10	08505-60102	1	BOARD ASSEMBLY, FM DRIVER	28480	08505-60102
A2A10C1	0160-2307	1	CAPACITOR-FXD 47PF +-5% 300WVDC MICA	28480	0160-2307
A2A10C2	0160-2227	1	CAPACITOR-FXD 2400PF +-5% 300WVDC MICA	28480	0160-2227
A2A10C3	0160-2230	2	CAPACITOR-FXD 3300PF +-5% 300WVDC MICA	28480	0160-2230
A2A10C4	0160-0945	1	CAPACITOR-FXD 910PF +-5% 100WVDC MICA	28480	0160-0945
A2A10C5			NOT ASSIGNED		
A2A10C6	0160-0945		CAPACITOR-FXD 910PF +-5% 100WVDC MICA	28480	0160-0945
A2A10C7	0160-2230		CAPACITOR-FXD 3300PF +-5% 300WVDC MICA	28480	0160-2230
A2A10C8	0180-2141		CAPACITOR-FXD 3.3UF+-10% 50VDC TA	56289	150D335X9050B2
A2A10C9	0160-0161	3	CAPACITOR-FXD .01UF +-10% 200WVDC POLYE	56289	292P10392
A2A10C10	0160-3537	1	CAPACITOR-FXD 680PF +-5% 100WVDC MICA	28480	0160-3537
A2A10C11	0180-1746		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A2A10C12	0160-0161		CAPACITOR-FXD .01UF +-10% 200WVDC POLYE	56289	292P10392
A2A10C13	0180-1746		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A2A10C14	0160-0161		CAPACITOR-FXD .01UF +-10% 200WVDC POLYE	56289	292P10392
A2A10CR1	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A2A10CR2	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A2A10CR3	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A2A10CR4	1901-0159	2	DIODE-PWR RECT 400V 750MA DO-41	04713	SR1358-4
A2A10CR5	1901-0159		DIODE-PWR RECT 400V 750MA DO-41	04713	SR1358-4
A2A10E1	0340-0162	4	INSULATOR-XSTR TO-66 .02-THK	28480	0340-0162
A2A10E2	0340-0162		INSULATOR-XSTR TO-66 .02-THK	28480	0340-0162

Table C2-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A2A10L1	9100-2583	2	COIL-FXD MOLDED RF CHOKE 6.8MH 10%	06560	15S-682K
A2A10L2	9100-2583		COIL-FXD MOLDED RF CHOKE 6.8MH 10%	06560	15S-682K
A2A10MP1	5040-6843	1	EXTRACTOR, P.C. BOARD	28480	5040-6843
A2A10MP2	5000-9043		PIN:P.C. BOARD EXTRACTOR	28480	5000-9043
A2A10MP3	0590-0519		PRESS-IN NUT 4-40 .062-LG	28480	0590-0519
A2A10MP4	0590-0519		PRESS-IN NUT 4-40 .062-LG	28480	0590-0519
A2A10MP5	0590-0519		PRESS-IN NUT 4-40 .062-LG	28480	0590-0519
A2A10MP6	0590-0519		PRESS-IN NUT 4-40 .062-LG	28480	0590-0519
A2A10MP7	0590-0519		PRESS-IN NUT 4-40 .062-LG	28480	0590-0519
A2A10MP8	0590-0519		PRESS-IN NUT 4-40 .062-LG	28480	0590-0519
A2A10MP9	0590-0519		PRESS-IN NUT 4-40 .062-LG	28480	0590-0519
A2A10MP10	0590-0519		PRESS-IN NUT 4-40 .062-LG	28480	0590-0519
A2A10MP11	2200-0103		SCREW-MACH 4-40 .25-IN-LG PAN-HD-POZI	28480	2200-0103
A2A10MP12	2200-0103		SCREW-MACH 4-40 .25-IN-LG PAN-HD-POZI	28480	2200-0103
A2A10MP13	2200-0103		SCREW-MACH 4-40 .25-IN-LG PAN-HD-POZI	28480	2200-0103
A2A10MP14	2200-0103		SCREW-MACH 4-40 .25-IN-LG PAN-HD-POZI	28480	2200-0103
A2A10MP15	2200-0113	4	SCREW-MACH 4-40 .625-IN-LG PAN-HD-POZI	28480	2200-0113
A2A10MP16	2200-0113		SCREW-MACH 4-40 .625-IN-LG PAN-HD-POZI	28480	2200-0113
A2A10MP17	2200-0113		SCREW-MACH 4-40 .625-IN-LG PAN-HD-POZI	28480	2200-0113
A2A10MP18	2200-0113		SCREW-MACH 4-40 .625-IN-LG PAN-HD-POZI	28480	2200-0113
A2A10MP19	08505-20135	1	SHIELD	28480	08505-20135
A2A10MP20	08505-20136	1	BASE, SHIELD	28480	08505-20136
A2A10Q1	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A2A10Q2	1854-0237	1	TRANSISTOR NPN SI TO-66 PD=20W FT=10MHZ	04713	2N3738
A2A10Q3	1854-0039		TRANSISTOR NPN 2N3053 SI TO-5 PD=1W	04713	2N3053
A2A10Q4	1853-0052	3	TRANSISTOR PNP 2N3740 SI TO-66 PD=25W	04713	2N3740
A2A10Q5	1854-0475	1	TRANSISTOR-DUAL NPN PD=750MW	28480	1854-0475
A2A10R1	0698-3160	2	RESISTOR 31.6K 1% .125W F TC=0+-100	16299	C4-1/8-T0-3162-F
A2A10R2	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A2A10R3	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A2A10R4	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A2A10R5	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A2A10R6	0757-1094		RESISTOR 1.47K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1471-F
A2A10R7	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A2A10R8	0698-3452	1	RESISTOR 147K 1% .125W F TC=0+-100	16299	C4-1/8-T0-1473-F
A2A10R9	0698-3160		RESISTOR 31.6K 1% .125W F TC=0+-100	16299	C4-1/8-T0-3162-F
A2A10R10	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A2A10R11	0698-3132	1	RESISTOR 261 1% .125W F TC=0+-100	16299	C4-1/8-T0-2610-F
A2A10R12	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A2A10R13	0757-0422	1	RESISTOR 909 1% .125W F TC=0+-100	24546	C4-1/8-T0-909R-F
A2A10R14	0698-3631	1	RESISTOR 330 5% 2W MO TC=0+-200	24546	FP42-2-T00-330R-J
A2A10R15	0698-3430	4	RESISTOR 21.5 1% .125W F TC=0+-100	03888	PME55-1/8-T0-21R5-F
A2A10R16	0757-1090	1	RESISTOR 261 1% .5W F TC=0+-100	19701	MF7C1/2-T0-261R-F
A2A10R17	0698-3430		RESISTOR 21.5 1% .125W F TC=0+-100	03888	PME55-1/8-T0-21R5-F
A2A10R18	0698-3430		RESISTOR 21.5 1% .125W F TC=0+-100	03888	PME55-1/8-T0-21R5-F
A2A10R19	0698-3607	1	RESISTOR 18 5% 2W MO TC=0+-200	16299	FP42-2-T00-18R0-J
A2A10R20	0757-0394		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A2A10R21	0698-3609	1	RESISTOR 22 5% 2W MO TC=0+-200	16299	FP42-2-T00-22R0-J
A2A10U1	1826-0261		IC OP AMP	28480	1826-0261
A2A11	08505-60103	1	BOARD ASSEMBLY, MAIN DRIVER	28480	08505-60103
A2A11C1	0180-0116		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A2A11C2	0180-1997	1	CAPACITOR-FXD 20UF+50-10% 150VDC AL	28480	0180-1997
A2A11C3	0180-0228	2	CAPACITOR-FXD 22UF+-10% 15VDC TA	56289	150D226X9015B2
A2A11C4	0180-2474	2	CAPACITOR-FXD 15UF +-10% 20VDC TA WET	28480	0180-2474
A2A11C5	0180-2474		CAPACITOR-FXD 15UF +-10% 20VDC TA WET	28480	0180-2474
A2A11C6	0180-2144	1	CAPACITOR-FXD 200UF+75-10% 25VDC AL	56289	30D207G025DH9
A2A11C7	0160-3533	1	CAPACITOR-FXD 470PF +-5% 100WVDC MICA	28480	0160-3533
A2A11C8	0160-0970	1	CAPACITOR-FXD .47UF +-10% 80WVDC POLYF	28480	0160-0970
A2A11C9	0160-2222		CAPACITOR-FXD .0015UF +-5% 300WVDC MICA	29480	0160-2222
A2A11C10	0160-0575		CAPACITOR-FXD .047UF +-20% 50WVDC CER	28480	0160-0575
A2A11CR1	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A2A11CR2	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A2A11CR3	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A2A11CR4	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A2A11L1	9100-1645		COIL-FXD MOLDED RF CHOKE 390UH 5%	24226	19/393
A2A11L2	9100-1645		COIL-FXD MOLDED RF CHOKE 390UH 5%	24226	19/393
A2A11L3	9100-1645		COIL-FXD MOLDED RF CHOKE 390UH 5%	24226	19/393
A2A11MP1	5040-6853	1	EXTRACTOR, BROWN	28480	5040-6853
A2A11MP2	5000-9043		PIN:P.C. BOARD EXTRACTOR	28480	5000-9043
A2A11MP3	08505-00040	1	HEAT SINK	28480	08505-00040
A2A11MP4	0590-0519		PRESS-IN NUT 4-40 .062-LG	28480	0590-0519
A2A11MP5	0590-0519		PRESS-IN NUT 4-40 .062-LG	28480	0590-0519
A2A11MP6	0590-0519		PRESS-IN NUT 4-40 .062-LG	28480	0590-0519
A2A11MP7	0590-0519		PRESS-IN NUT 4-40 .062-LG	28480	0590-0519
A2A11MP8	0590-0533	6	PRESS-IN NUT 2-56 .06-LG .06-HGT-FMS	28480	0590-0533
A2A11MP9	0590-0533		PRESS-IN NUT 2-56 .06-LG .06-HGT-FMS	28480	0590-0533
A2A11MP10	0590-0533		PRESS-IN NUT 2-56 .06-LG .06-HGT-FMS	28480	0590-0533

Table C2-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A2A11MP11	0590-0533		PRESS-IN NUT 2-56 .06-LG .06-HGT-FMS	28480	0590-0533
A2A11MP12	2200-0105	4	SCREW-MACH 4-40 .312-IN-LG PAN-HD-POZI	28480	2200-0105
A2A11MP13	2200-0105		SCREW-MACH 4-40 .312-IN-LG PAN-HD-POZI	28480	2200-0105
A2A11MP14	2200-0105		SCREW-MACH 4-40 .312-IN-LG PAN-HD-POZI	28480	2200-0105
A2A11MP15	2200-0105		SCREW-MACH 4-40 .312-IN-LG PAN-HD-POZI	28480	2200-0105
A2A11MP16	0520-0174	4	SCREW-MACH 2-56 .25-IN-LG PAN-HD-POZI	28480	0520-0174
A2A11MP17	0520-0174		SCREW-MACH 2-56 .25-IN-LG PAN-HD-POZI	28480	0520-0174
A2A11MP18	0520-0174		SCREW-MACH 2-56 .25-IN-LG PAN-HD-POZI	28480	0520-0174
A2A11MP19	0520-0174		SCREW-MACH 2-56 .25-IN-LG PAN-HD-POZI	28480	0520-0174
A2A11MP20	3050-0105	4	WASHER-FL MTLC NO.-4 .125-IN-ID	28480	3050-0105
A2A11MP21	3050-0105		WASHER-FL MTLC NO.-4 .125-IN-ID	28480	3050-0105
A2A11MP22	3050-0105		WASHER-FL MTLC NO.-4 .125-IN-ID	28480	3050-0105
A2A11MP23	3050-0105		WASHER-FL MTLC NO.-4 .125-IN-ID	28480	3050-0105
A2A11MP24	0340-0162		INSULATOR-XSTR TO-66 .02-THK	28480	0340-0162
A2A11MP25	0340-0162		INSULATOR-XSTR TO-66 .02-THK	28480	0340-0162
A2A11Q1	1853-0052		TRANSISTOR PNP 2N3740 SI TO-66 PD=25W	04713	2N3740
A2A11Q2	1853-0052		TRANSISTOR PNP 2N3740 SI TO-66 PD=25W	04713	2N3740
A2A11Q3	1853-0050		TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0050
A2A11Q4	1853-0050		TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0050
A2A11Q5	1855-0020		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A2A11Q6	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A2A11Q7	1855-0020		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A2A11Q8	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A2A11Q9	1854-0022	2	TRANSISTOR NPN SI TO-39 PD=700MW	07263	S17843
A2A11Q10	1853-0050		TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0050
A2A11R1	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A2A11R2	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A2A11R3	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A2A11R4	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A2A11R5	0698-7332		RESISTOR 1M 5% .25W FC TC=-800/+900	28480	0698-7332
A2A11R6	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A2A11R7	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A2A11R8	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2152-F
A2A11R9	0698-0085	1	RESISTOR 2.61K 1% .125W F TC=0+-100	16299	C4-1/8-T0-2611-F
A2A11R10	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A2A11R11	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A2A11R12	0683-3955	2	RESISTOR 3.9M 5% .25W FC TC=-900/+1100	01121	CB3955
A2A11R13	0683-3955		RESISTOR 3.9M 5% .25W FC TC=-900/+1100	01121	CB3955
A2A11R14	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A2A11R15	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A2A11R16	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A2A11R17	2100-3095		RESISTOR-TRMR 200 10% C SIDE-ADJ 17 TURN	32997	3006P-1-201
A2A11R18	0757-0447		RESISTOR 16.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1622-F
A2A11R19	0698-3159	1	RESISTOR 26.1K 1% .125W F TC=0+-100	16299	C4-1/8-T0-2612-F
A2A11R20	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A2A11R21	0757-0461		RESISTOR 68.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6812-F
A2A11R22*	0698-3157	1	RESISTOR 19.6K 1% .125W F TC=0+-100 *FACTORY SELECTED PART	16299	C4-1/8-T0-1962-F
A2A11R23	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A2A11R24	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A2A11R25	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A2A11R26	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A2A11R27	0698-3260		RESISTOR 464K 1% .125W F TC=0+-100	03888	PME55S
A2A11R28	0811-3354	1	RESISTOR 420 1% 7.5W PW TC=0+-20	12463	HT-5
A2A11R29	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A2A11R30	0811-3469	1	RESISTOR 120 1% 10W PW TC=0+-10	28480	0811-3469
A2A11R31	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A2A11R32	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A2A11R33	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A2A11R34	0757-0421		RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
A2A11R35	0698-5989		RESISTOR 2.2M 1% .500 F TC=0+-100	24546	C4-1/8-T0-5112-F
A2A11R36	0811-3157	1	RESISTOR 1K 1% .125W PWW TC=0+-10	14140	1274-1/8 1001-F
A2A11R37	0698-3454		RESISTOR 215K 1% .125W F TC=0+-100	16299	C4-1/8-T0-2153-F
A2A11R38	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A2A11R39	0811-2098	1	RESISTOR 2.75K 1% .25W PWW TC=0+-10	20940	143-1/4-F-2751-F
A2A11R40*	0757-0442	25	RESISTOR 10K 1% .125W F TC=0+-100 *FACTORY SELECTED PART	24546	C4-1/8-T0-1002-F
A2A11R41	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A2A11R42	0757-0382	1	RESISTOR 16.2 1% .125W F TC=0+-100	19701	MF4C1/8 T0 1692-F
A2A11R43	0698-3452		RESISTOR 147K 1% .125W F TC=0+-100	16299	C4-1/8-TO-1473-F
A2A11U1	1826-0229	2	IC OP-05C OP AMP	06665	OP-05CJ
A2A11U2	1826-0229		IC OP-05C OP AMP	06665	OP-05CJ
A2A11U3	1820-1538		IC CD4011AY GATE	02735	CD4011AY
A2A11U4	1820-1542		IC CD4049AY BUFFER	02735	CD4049AY
A2A11U5	1820-1534		IC CD4001AY GATE	02735	CD4001AY

Table C2-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A2A11VR1	1902-3171	3	DIODE-ZNR 11V 5% DO-7 PD=.4W TC=+.062%	04713	SZ 10939-194
A2A11VR2	1902-0680		DIODE-ZNR 1N827 6.2V 5% DO-7 PD=.25W	03877	1N827
A2A11VR3	1902-0680		DIODE-ZNR 1N827 6.2V 5% DO-7 PD=.25W	03877	1N827
A2A11VR4	1902-0680		DIODE-ZNR 1N827 6.2V 5% DO-7 PD=.25W	03877	1N827
A2A12	08505-60104	1	BOARD ASSEMBLY, 10 MHZ, REF	28480	08505-60104
A2A12C1	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A2A12C2	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A2A12C3	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A2A12C4	0160-0574		CAPACITOR-FXD .022UF +-20% 100WVDC CER	28480	0160-0574
A2A12C5	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A2A12C6	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A2A12C7	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A2A12C8	0160-2252	1	CAPACITOR-FXD 6.2PF +-.25PF 500WVDC CER	28480	0160-2252
A2A12C9	0160-0574		CAPACITOR-FXD .022UF +-20% 100WVDC CER	28480	0160-0574
A2A12C10	0121-0493	1	CAPACITOR-V AIR DIEL 1.7/11PF 250V	74970	187-0306-105
A2A12C11	0160-2238	1	CAPACITOR-FXD 1.5PF +-.25PF 500WVDC CER	28480	0160-2238
A2A12C12	0160-0574		CAPACITOR-FXD .022UF +-20% 100WVDC CER	28480	0160-0574
A2A12C13	0160-0574		CAPACITOR-FXD .022UF +-20% 100WVDC CER	28480	0160-0574
A2A12C14	0160-0574		CAPACITOR-FXD .022UF +-20% 100WVDC CER	28480	0160-0574
A2A12C15	0160-3879		CAPACITOR-FXD .01UF +-20% 100WVDC CER	28480	0160-3879
A2A12C16	0160-3879		CAPACITOR-FXD .01UF +-20% 100WVDC CER	28480	0160-3879
A2A12C17	0160-3879		CAPACITOR-FXD .01UF +-20% 100WVDC CER	28480	0160-3879
A2A12C18	0160-0575		CAPACITOR-FXD .047UF +-20% 50WVDC CER	28480	0160-0575
A2A12C19	0160-0574		CAPACITOR-FXD .022UF +-20% 100WVDC CER	28480	0160-0574
A2A12C20	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A2A12C21	0160-2261	2	CAPACITOR-FXD 15PF +-5% 500WVDC CER	28480	0160-2261
A2A12C22	0160-2261		CAPACITOR-FXD 15PF +-5% 500WVDC CER	28480	0160-2261
A2A12C23	0160-3879		CAPACITOR-FXD .01UF +-20% 100WVDC CER	28480	0160-3879
A2A12C24	0160-0575		CAPACITOR-FXD .047UF +-20% 50WVDC CER	28480	0160-0575
A2A12C25	0160-0575		CAPACITOR-FXD .047UF +-20% 50WVDC CER	28480	0160-0575
A2A12C26	0160-2202	3	CAPACITOR-FXD 75PF +-5% 300WVDC MICA	28480	0160-2202
A2A12C27	0160-0575		CAPACITOR-FXD .047UF +-20% 50WVDC CER	28480	0160-0575
A2A12C28	0160-2202		CAPACITOR-FXD 75PF +-5% 300WVDC MICA	28480	0160-2202
A2A12C29	0160-0575		CAPACITOR-FXD .047UF +-20% 50WVDC CER	28480	0160-0575
A2A12C30	0160-2202		CAPACITOR-FXD 75PF +-5% 300WVDC MICA	28480	0160-2202
A2A12C31	0160-3879		CAPACITOR-FXD .01UF +-20% 100WVDC CER	28480	0160-3879
A2A12C32	0160-3879		CAPACITOR-FXD .01UF +-20% 100WVDC CER	28480	0160-3879
A2A12C33	0160-3879		CAPACITOR-FXD .01UF +-20% 100WVDC CER	28480	0160-3879
A2A12C34	0160-2055	3	CAPACITOR-FXD .01UF +80-20% 100WVDC CER	28480	0160-2055
A2A12C35	0160-2055		CAPACITOR-FXD .01UF +80-20% 100WVDC CER	28480	0160-2055
A2A12C36	0160-2055		CAPACITOR-FXD .01UF +80-20% 100WVDC CER	28480	0160-2055
A2A12CR1	1901-0179	1	DIODE-SWITCHING 15V 50MA 750PS DO-7	28480	1901-0179
A2A12J1	1250-0543		CONNECTOR-RF SM SNP M PC	98291	51-053-0000
A2A12J2	1250-0543		CONNECTOR-RF SM SNP M PC	98291	51-053-0000
A2A12J3	1250-0543		CONNECTOR-RF SM SNP M PC	98291	51-053-0000
A2A12J4	1250-0543		CONNECTOR-RF SM SNP M PC	98291	51-053-0000
A2A12L1	9100-2251	2	COIL-FXD MOLDED RF CHOKE .22UH 10%	24226	10/220
A2A12L2	9100-1641		COIL-FXD MOLDED RF CHOKE 240UH 5%	24226	15/243
A2A12L3	9100-2260	1	COIL-FXD MOLDED RF CHOKE 1.8UH 10%	76493	9230-26
A2A12L4	9100-1641		COIL-FXD MOLDED RF CHOKE 240UH 5%	24226	15/243
A2A12L5	9100-2257		COIL-FXD MOLDED RF CHOKE .82UH 10%	24226	10/820
A2A12L6	9100-0368	1	COIL-FXD MOLDED RF CHOKE .33UH 10%	24226	10/330
A2A12L7	9100-2251		COIL-FXD MOLDED RF CHOKE .22UH 10%	24226	10/220
A2A12L8	9140-0144	3	COIL-FXD MOLDED RF CHOKE 4.7UH 10%	24226	10/471
A2A12L9	9140-0144		COIL-FXD MOLDED RF CHOKE 4.7UH 10%	24226	10/471
A2A12L10	9140-0144		COIL-FXD MOLDED RF CHOKE 4.7UH 10%	24226	10/471
A2A12MP1	5040-6847	1	EXTRACTOR, RED	28480	5040-6847
A2A12MP2	5000-9043		PIN:P.C. BOARD EXTRACTOR	28480	5000-9043
A2A12MP3	0520-0127	2	SCREW-MACH 2-56 .188-IN-LG PAN-HD-POZI	28480	0520-0127
A2A12MP4	0520-0127		SCREW-MACH 2-56 .188-IN-LG PAN-HD-POZI	28480	0520-0127
A2A12MP5	0590-0533		PRESS-IN NUT 2-56 .06-LG .06-HGT-FMS	28480	0590-0533
A2A12MP6	0590-0533		PRESS-IN NUT 2-56 .06-LG .06-HGT-FMS	28480	0590-0533
A2A12MP7	1205-0243	1	HEAT-DISSIPATOR SGL DIP PKG	98978	LIC214A1WCB
A2A12MP8	1205-0244	1	RETAINER	28480	1205-0244
A2A12MP9	2190-0045	2	WASHER-LK HLCL NO.-2 .088-IN-ID	76854	1501-009
A2A12MP10	2190-0045		WASHER-LK HLCL NO.-2 .088-IN-ID	76854	1501-009
A2A12Q1	1854-0345		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A2A12Q2	1854-0345		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A2A12Q3	1854-0345		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A2A12Q4	1854-0345		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A2A12Q5	1854-0019	3	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A2A12Q6	1854-0019		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A2A12Q7	1854-0019		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019

Table C2-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A2A12R1	0698-3445		RESISTOR 348 1% .125W F TC=0+-100	16299	C4-1/8-T0-348R-F
A2A12R2	0757-0817	1	RESISTOR 750 1% .5W F TC=0+-100	19701	MF7C1/2-T0-751-F
A2A12R3	0757-0394		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A2A12R4	0757-0278		RESISTOR 1.78K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1781-F
A2A12R5	0757-0398		RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A2A12R6	0757-0394		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A2A12R7	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A2A12R8	0757-0394		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A2A12R9	0698-3447		RESISTOR 422 1% .125W F TC=0+-100	16299	C4-1/8-T0-422R-F
A2A12R10	0757-0394		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A2A12R11	0698-7205		RESISTOR 51.1 2% .05W F TC=0+-100	24546	C3-1/8-T00-51R1-G
A2A12R12	0698-4037	1	RESISTOR 46.4 1% .125W F TC=0+-100	16299	C4-1/8-T0-46R4-F
A2A12R13	0757-0421		RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
A2A12R14	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A2A12R15	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A2A12R16	0757-0424	1	RESISTOR 1.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1101-F
A2A12R17	0698-7212		RESISTOR 100 2% .05W F TC=0+-100	24546	C3-1/8-T0-100R-G
A2A12R18	0757-0403	1	RESISTOR 121 1% .125W F TC=0+-100	24546	C4-1/8-T0-121R-F
A2A12R19	0698-3447		RESISTOR 422 1% .125W F TC=0+-100	16299	C4-1/8-T0-422R-F
A2A12R20	0698-0084		RESISTOR 2.15K 1% .125W F TC=0+-100	16299	C4-1/8-T0-2151-F
A2A12R21	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A2A12R22	0698-3152	1	RESISTOR 3.48K 1% .125W F TC=0+-100	16299	C4-1/8-T0-3481-F
A2A12R23	0757-0419	3	RESISTOR 681 1% .125W F TC=0+-100	24546	C4-1/8-T0-681R-F
A2A12R24	0698-3430		RESISTOR 21.5 1% .125W F TC=0+-100	03888	PME55-1/8-T0-21R5-F
A2A12R25	0698-3445		RESISTOR 348 1% .125W F TC=0+-100	16299	C4-1/8-T0-348R-F
A2A12R26	0698-3445		RESISTOR 348 1% .125W F TC=0+-100	16299	C4-1/8-T0-348R-F
A2A12R27	0698-3443	2	RESISTOR 287 1% .125W F TC=0+-100	16299	C4-1/8-T0-287R-F
A2A12R28	0757-0419		RESISTOR 681 1% .125W F TC=0+-100	24546	C4-1/8-T0-681R-F
A2A12R29	0698-3429	1	RESISTOR 19.6 1% .125W F TC=0+-100	03888	PME55-1/8-T0-19R6-F
A2A12R30	0698-3443		RESISTOR 287 1% .125W F TC=0+-100	16299	C4-1/8-T0-287R-F
A2A12R31	0757-0419		RESISTOR 681 1% .125W F TC=0+-100	24546	C4-1/8-T0-681R-F
A2A12R32	0698-3150	5	RESISTOR 2.37K 1% .125W F TC=0+-100	16299	C4-1/8-T0-2371-F
A2A12R33	0757-0418	3	RESISTOR 619 1% .125W F TC=0+-100	24546	C4-1/8-T0-619R-F
A2A12R34	0698-3150		RESISTOR 2.37K 1% .125W F TC=0+-100	16299	C4-1/8-T0-2371-F
A2A12R35	0757-0418		RESISTOR 619 1% .125W F TC=0+-100	24546	C4-1/8-T0-619R-F
A2A12R36	0698-3150		RESISTOR 2.37K 1% .125W F TC=0+-100	16299	C4-1/8-T0-2371-F
A2A12R37	0757-0418		RESISTOR 619 1% .125W F TC=0+-100	24546	C4-1/8-T0-619R-F
A2A12R38	0698-3441		RESISTOR 215 1% .125W F TC=0+-100	16299	C4-1/8-T0-215R-F
A2A12R39	0698-3435		RESISTOR 38.3 1% .125W F TC=0+-100	16299	C4-1/8-T0-38R3-F
A2A12R40	0698-3441		RESISTOR 215 1% .125W F TC=0+-100	16299	C4-1/8-T0-215R-F
A2A12R41	0698-3435		RESISTOR 38.3 1% .125W F TC=0+-100	16299	C4-1/8-T0-38R3-F
A2A12R42	0698-3441		RESISTOR 215 1% .125W F TC=0+-100	16299	C4-1/8-T0-215R-F
A2A12R43	0698-3435		RESISTOR 38.3 1% .125W F TC=0+-100	16299	C4-1/8-T0-38R3-F
A2A12T1	08553-6012	1	TRANSFORMER, RF, BLUE	28480	08553-6012
A2A12U1	1820-1383	1	IC MC10138L	04713	MC10138L
A2A12Y1	0410-0672	1	100 MHZ CRYSTAL	28480	0410-0672
A2A13			NOT ASSIGNED		
A2A14			NOT ASSIGNED		
A2A15			NOT ASSIGNED		
A2A16			NOT ASSIGNED		
A2A17			NOT ASSIGNED		
A2A18	08505-60092	1	BOARD ASSEMBLY, MASTER MOTHER	28480	08505-60092
A2A18J1	1251-3025	2	CONNECTOR 34-PIN M RECTANGULAR	76381	3431-2002
A2A18J2	1251-3025		CONNECTOR 34-PIN M RECTANGULAR	76381	3431-2002
A2A18J3	1250-0543		CONNECTOR-RF SM SNP M PC	98291	51-053-0000
A2A18J4	1250-0543		CONNECTOR-RF SM SNP M PC	98291	51-053-0000
A2A18J5	1250-0543		CONNECTOR-RF SM SNP M PC	98291	51-053-0000
A2A18J6	1250-0543		CONNECTOR-RF SM SNP M PC	98291	51-053-0000
A2A18J7	1250-0543		CONNECTOR-RF SM SNP M PC	98291	51-053-0000
A2A18J8	1250-0543		CONNECTOR-RF SM SNP M PC	98291	51-053-0000
A2A18J9	1200-0508	1	SOCKET-IC 14-CONT DIP-SLDR-TERMS	06776	ICN-143-S3W
A2A18J10	1200-0507		SOCKET-IC 16-CONT DIP-SLDR-TERMS	06776	ICN-163-S3W
A2A18XA2A	1251-2915	11	CONNECTOR-PC EDGE 25-CONT/ROW 2-ROWS	71785	252-25-30-300
A2A18XA2B	1251-0472	1	CONNECTOR-PC EDGE 6-CONT/ROW 2-ROWS	71785	252-06-30-300
A2A18XA3	1251-2915		CONNECTOR-PC EDGE 25-CONT/ROW 2-ROWS	71785	252-25-30-300
A2A18XA4	1251-2915		CONNECTOR-PC EDGE 25-CONT/ROW 2-ROWS	71785	252-25-30-300
A2A18XA5	1251-2915		CONNECTOR-PC EDGE 25-CONT/ROW 2-ROWS	71785	252-25-30-300
A2A18XA6	1251-2915		CONNECTOR-PC EDGE 25-CONT/ROW 2-ROWS	71785	252-25-30-300
A2A18XA7	1251-2915		CONNECTOR-PC EDGE 25-CONT/ROW 2-ROWS	71785	252-25-30-300
A2A18XA8	1251-2915		CONNECTOR-PC EDGE 25-CONT/ROW 2-ROWS	71785	252-25-30-300
A2A18XA9	1251-2915		CONNECTOR-PC EDGE 25-CONT/ROW 2-ROWS	71785	252-25-30-300
A2A18XA10	1251-2915		CONNECTOR-PC EDGE 25-CONT/ROW 2-ROWS	71785	252-25-30-300

Table C2-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A2A18XA11	1251-2915		CONNECTOR-PC EDGE 25-CONT/ROW 2-ROWS	71785	252-25-30-300
A2A18XA12	1251-2915		CONNECTOR-PC EDGE 25-CONT/ROW 2-ROWS	71785	252-25-30-300
A2A18XA13	1251-2026	5	CONNECTOR-PC EDGE 18-CONT/ROW 2-ROWS	71785	252-18-30-300
A2A18XA14	1251-2026		CONNECTOR-PC EDGE 18-CONT/ROW 2-ROWS	71785	252-18-30-300
A2A18XA15	1251-2026		CONNECTOR-PC EDGE 18-CONT/ROW 2-ROWS	71785	252-18-30-300
A2A18XA16	1251-2026		CONNECTOR-PC EDGE 18-CONT/ROW 2-ROWS	71785	252-18-30-300
A2A18XA17	1251-2026		CONNECTOR-PC EDGE 18-CONT/ROW 2-ROWS	71785	252-18-30-300
A2A19	5086-7224	1	YIG OSCILLATOR 4.2-5.5 GHZ	28480	5086-7224
	7100-0618	1	CAN, RECTANGULAR	28480	7100-0618
A2A20	08505-60106	1	BOARD ASSEMBLY, + VOLTAGE REGULATOR	28480	08505-60106
A2A20C1	0180-0291	8	CAPACITOR-FXD 1UF+-10% 35VDC TA	56289	150D105X9035A2
A2A20C2	0180-0291		CAPACITOR-FXD 1UF+-10% 35VDC TA	56289	150D105X9035A2
A2A20C3	0180-0291		CAPACITOR-FXD 1UF+-10% 35VDC TA	56289	150D105X9035A2
A2A20C4	0180-0116		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A2A20C5	0180-0116		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A2A20C6	0180-2205	1	CAPACITOR-FXD .33UF+-10% 35VDC TA	56289	150D334X9035A2
A2A20C7	0180-0116		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A2A20C8	0160-2204		CAPACITOR-FXD 100PF + 5% 300WVDC MICA	93790	RDM15F101J3C
A2A20C9	0180-0291		CAPACITOR-FXD 1UF+-10% 35VDC TA	56289	150D105X9035A2
A2A20C10	0180-1746		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A2A20C11	0180-0228		CAPACITOR-FXD 22UF+-10% 15VDC TA	56289	150D226X9015B2
A2A20C12	0180-0291		CAPACITOR-FXD 1UF+-10% 35VDC TA	56289	150D105X9035A2
A2A20C13	0180-0116		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A2A20CR1	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A2A20CR2	1901-0662	5	DIODE-PWR RECT 100V 6A	28480	1901-0662
A2A20CR3	1901-0662		DIODE-PWR RECT 100V 6A	28480	1901-0662
A2A20CR4	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A2A20CR5	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A2A20CR6	1901-0662		DIODE-PWR RECT 100V 6A	28480	1901-0662
A2A20DS1	1990-0404		LED-VISIBLE	28480	1990-0404
A2A20DS2	1990-0485	8	LED-VISIBLE	28480	1990-0485
A2A20DS3	1990-0485		LED-VISIBLE	28480	1990-0485
A2A20DS4	1990-0485		LED-VISIBLE	28480	1990-0485
A2A20DS5	1990-0485		LED-VISIBLE	28480	1990-0485
A2A20F1	2110-0332	1	FUSE 3A 125V .25X.27	71400	GMW 3
A2A20F2	2110-0333	3	FUSE 1.5A 125V .25X.27	71400	GMW 1-1/2
A2A20F3	2110-0476	2	FUSE 4A 125V .25X.27	71400	GMW-4
A2A20F4	2110-0476		FUSE 4A 125V .25X.27	71400	GMW-4
A2A20MP1	0380-0885	1	STANDOFF-RVT-ON .156LG 4-40THD .250D BRS	28480	0380-0885
A2A20MP2	0590-0970	1	PRESS-IN NUT 6-32 .062-LG	28480	0590-0970
A2A20Q1	1884-0068	6	THYRISTOR-SCR	28480	1884-0068
A2A20Q2	1884-0068		THYRISTOR-SCR	28480	1884-0068
A2A20Q3	1884-0068		THYRISTOR-SCR	28480	1884-0068
A2A20Q4					
A2A20Q4	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A2A20Q5	1853-0020	1	TRANSISTOR PNP SI PD=300MW FT=150MHZ	28480	1853-0020
A2A20Q6	1853-0012		TRANSISTOR PNP 2N2904A SI TO-5 PD=600MW	01295	2N2904A
A2A20R1	0698-3444	12	RESISTOR 316 1% .125W F TC=0+-100	16299	C4-1/8-T0-316R-F
A2A20R2	0698-3154	1	RESISTOR 4.22K 1% .125W F TC=0+-100	16299	C4-1/8-T0-4221-F
A2A20R3	0683-1055		RESISTOR 1M 5% .25W FC TC=-800/+900	01121	CB1055
A2A20R4	0757-0440		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A2A20R5	0698-6835	7	RESISTOR 3.16K .5% .125W F TC=0+-50	24546	NC4-1/8-T2-3161-D
A2A20R6	0757-0443		RESISTOR 11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1102-F
A2A20R7	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A2A20R8	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A2A20R9	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A2A20R10	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A2A20R11	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A2A20R12	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	16299	C4-1/8-T0-316R-F
A2A20R13	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	16299	C4-1/8-T0-316R-F
A2A20R14	0811-1659	1	RESISTOR .27 5% 2W PW TC=0+-800	75042	BWH2-27/100-J
A2A20R15	0757-0421		RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
A2A20R16	0757-0443		RESISTOR 11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1102-F
A2A20R17	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A2A20R18	0757-0394		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A2A20R19	0698-3150		RESISTOR 2.37K 1% .125W F TC=0+-100	16299	C4-1/8-T0-2371-F
A2A20R20	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	16299	C4-1/8-T0-316R-F
A2A20R21	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	16299	C4-1/8-T0-316R-F
A2A20R22	0698-8465	1	RESISTOR 7.15K .5% .125W F TC=0+-50	24546	NC55
A2A20R23	2100-3350		RESISTOR-TRMR 200 10% C SIDE-ADJ 1-TRN	32997	3386X-Y46-201
A2A20R24	0698-6835		RESISTOR 3.16K .5% .125W F TC=0+-50	24546	NC4-1/8-T2-3161-D
A2A20R25	0698-3622	1	RESISTOR 120 5% 2W MO TC=0+-200	24546	FP42-2-T00-120R-J

Table C2-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A2A20R26	0757-0317		RESISTOR 1.33K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1331-F
A2A20R27	0698-3150		RESISTOR 2.37K 1% .125W F TC=0+-100	16299	C4-1/8-T0-2371-F
A2A20R28	0757-0278		RESISTOR 1.78K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1781-F
A2A20R29	0811-2817	3	RESISTOR 2.7 5% .75W PW TC=0+-50	07088	KM-050
A2A20R30	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A2A20R31	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	16299	C4-1/8-T0-316R-F
A2A20R32	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	16299	C4-1/8-T0-316R-F
A2A20U1	1826-0026		IC LM 311 COMPARATOR	27014	LM311H
A2A20U2	1820-0223	3	IC LM 301A OP AMP	27014	LM301AH
A2A20U3	1826-0106	1	IC V RGLTR	07263	7815UC
A2A20VR1	1902-0041		DIODE-ZNR 5.11V 5% DO-7 PD=.4W TC=-.009%	04713	SZ 10939-98
A2A20VR2	1902-0049	3	DIODE-ZNR 6.19V 5% DO-7 PD=.4W TC=+.022%	04713	SZ 10939-122
A2A20VR3	1902-0049		DIODE-ZNR 6.19V 5% DO-7 PD=.4W TC=+.022%	04713	SZ 10939-122
A2A20VR4	1902-0680		DIODE-ZNR 1N827 6.2V 5% DO-7 PD=.25W	03877	1N827
A2A20VR5	1902-3256	1	DIODE-ZNR 23.7V 5% DO-7 PD=.4W TC=+.076%	04713	SZ 10939-290
A2A20VR6	1902-3203	2	DIODE-ZNR 14.7V 5% DO-7 PD=.4W TC=+.057%	04713	SZ 10939-230
A2A21	08505-60107	1	BOARD ASSEMBLY, VOLTAGE REGULATOR	28480	08505-60107
A2A21C1	0180-0291		CAPACITOR-FXD 1UF+-10% 35VDC TA	56289	150D105X9035A2
A2A21C2	0180-0291		CAPACITOR-FXD 1UF+-10% 35VDC TA	56289	150D105X9035A2
A2A21C3	0160-3879		CAPACITOR-FXD .01UF +-20% 100WVDC CER	28480	0160-3879
A2A21C4	0180-1731	2	CAPACITOR-FXD 4.7UF+-10% 50VDC TA	56289	150D475X905082
A2A21C5	0160-2204		CAPACITOR-FXD 100PF +-5% 300WVDC MICA	93790	RDM15F101J3C
A2A21C6	0160-2204		CAPACITOR-FXD 100PF +-5% 300WVDC MICA	93790	RDM15F101J3C
A2A21C7	0180-1746		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X902082
A2A21C8	0180-1746		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X902082
A2A21C9	0180-1746		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X902082
A2A21C10	0180-1731		CAPACITOR-FXD 4.7UF+-10% 50VDC TA	56289	150D475X905082
A2A21C11	0180-0291		CAPACITOR-FXD 1UF+-10% 35VDC TA	56289	150D105X9035A2
A2A21CR1	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A2A21CR2	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A2A21CR3	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A2A21CR4	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A2A21CR5	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A2A21CR6	1901-0662		DIODE-PWR RECT 100V 6A	28480	1901-0662
A2A21CR7	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A2A21CR8	1901-0662		DIODE-PWR RECT 100V 6A	28480	1901-0662
A2A21DS1	1990-0485		LED-VISIBLE	28480	1990-0485
A2A21DS2	1990-0485		LED-VISIBLE	28480	1990-0485
A2A21DS3	1990-0485		LED-VISIBLE	28480	1990-0485
A2A21DS4	1990-0485		LED-VISIBLE	28480	1990-0485
A2A21F1	2110-0333		FUSE 1.5A 125V .25X.27	71400	GMW 1-1/2
A2A21F2	2110-0333		FUSE 1.5A 125V .25X.27	71400	GMW 1-1/2
A2A21F3	2110-0046	1	FUSE .5A 125V .25X.27	71400	TYPE GMW-1/2
A2A21F4	2110-0047	1	FUSE 1A 125V .25X.27	71400	GMW-1
A2A21MP1	1205-0011	1	HEAT-DISSIPATOR SGL TO-5/TO-39 PKG	28480	1205-0011
A2A21MP2	0590-0519		PRESS-IN NUT 4-40 .062-LG	28480	0590-0519
A2A21Q1	1884-0068	1	THYRISTOR-SCR	28480	1884-0068
A2A21Q2	1884-0068		THYRISTOR-SCR	28480	1884-0068
A2A21Q3	1884-0090		THYRISTOR-SCR	28480	1884-0090
A2A21Q4	1853-0038		TRANSISTOR PNP SI TO-39 PD=1W FT=100MHZ	28480	1853-0038
A2A21Q5	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A2A21Q6	1854-0039		TRANSISTOR NPN 2N3053 SI TO-5 PD=1W	04713	2N3053
A2A21Q7	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A2A21Q8	1854-0022		TRANSISTOR NPN SI TO-39 PD=700MW	07263	S17843
A2A21R1	0811-1665	2	RESISTOR .82 5% 2W PW TC=0+-800	75042	BWH2-82/100-J
A2A21R2	0757-0317		RESISTOR 1.33K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1331-F
A2A21R3	0698-3153		RESISTOR 3.83K 1% .125W F TC=0+-100	16299	C4-1/8-T0-3831-F
A2A21R4	0811-1665		RESISTOR .82 5% 2W PW TC=0+-800	75042	BWH2-82/100-J
A2A21R5	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	16299	C4-1/8-T0-316R-F
A2A21R6	0698-3449		RESISTOR 28.7K 1% .125W F TC=0+-100	16299	C4-1/8-T0-2872-F
A2A21R7	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A2A21R8	0757-0421		RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
A2A21R9	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A2A21R10	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A2A21R11	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	16299	C4-1/8-T0-316R-F
A2A21R12	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A2A21R13	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A2A21R14	0698-6835		RESISTOR 3.16K .5% .125W F TC=0+-50	24546	NC4-1/8-T2-3161-D
A2A21R15	0698-6835		RESISTOR 3.16K .5% .125W F TC=0+-50	24546	NC4-1/8-T2-3161-D
A2A21R16	0698-6835		RESISTOR 3.16K .5% .125W F TC=0+-50	24546	NC4-1/8-T2-3161-D
A2A21R17	0698-3440		RESISTOR 196 1% .125W F TC=0+-100	16299	C4-1/8-T0-196R-F
A2A21R18	0698-6835		RESISTOR 3.16K .5% .125W F TC=0+-50	24546	NC4-1/8-T2-3161-D
A2A21R19	0698-6835		RESISTOR 3.16K .5% .125W F TC=0+-50	24546	NC4-1/8-T2-3161-D
A2A21R20	0698-8464	1	RESISTOR 12.6K .5% .125W F TC=0+-50	24546	NC55

Table C2-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A2A21R21	0811-2817		RESISTOR 2.7 5% .75W PW TC=0+-50	07088	KM-050
A2A21R22	0811-2817		RESISTOR 2.7 5% .75W PW TC=0+ 50	07088	KM-050
A2A21R23	0811-2816	1	RESISTOR 1.8 5% .75W PW TC=0+-50	07088	KM-050
A2A21R24	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A2A21R25	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	16299	C4-1/8-T0-316R-F
A2A21R26	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	16299	C4-1/8-T0-316R-F
A2A21R27	0757-0317		RESISTOR 1.33K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1331-F
A2A21R28	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A2A21R29	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	16299	C4-1/8-T0-316R-F
A2A21R30	0757-0421		RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
A2A21U1	1820-0223		IC LM 301A OP AMP	27014	LM301AH
A2A21U2	1820-0223		IC LM 301A CP AMP	27014	LM301AH
A2A21VR1	1902-3171		DIODE-ZNR 11V 5% DO-7 PD=.4W TC=+.057%	04713	SZ 10939-194
A2A21VR2	1902-3234	1	DIODE-ZNR 19.6V 5% DO-7 PD=.4W TC=+.073%	04713	SZ 10939-266
A2A21VR3	1902-3171		DIODE-ZNR 11V 5% DO-7 PD=.4W TC=+.062%	04713	SZ 10939-194
A2A21VR4	1902-3197	1	DIODE-ZNR 13.7V 2% DO-7 PD=.4W TC=+.057%	04713	SZ 10939-222
A2A21VR5	1902-3330	1	DIODE-ZNR 44.2V 2% DO-7 PD=.4W TC=+.081%	04713	SZ 10939-369
A2A21VR6	1902-0049		DIODE-ZNR 6.19V 5% DO-7 PD=.4W TC=+.022%	04713	SZ 10939-122
A2A21VR7	1902-3171		DIODE-ZNR 11V 5% DO-7 PD=.4W TC=+.062%	04713	SZ 10939-194
A2A21VR8	1902-0244	1	DIODE-ZNR 30.1V 5% DO-15 PD=1W TC=+.075%	28480	1902-0244
A2A22	08505-60091	1	BOARD ASSEMBLY, MOTHER, POWER SUPPLY	28480	08505-60091
			NOTE PARTS WITH *** ARE NOT SUPPLIED WITH MOTHERBOARD.		
A2A22C1***	0180-2495		CAPACITOR-FXD 8700UF+75-10% 40VDC AL	56289	36D872G040AC2A
A2A22C2***	0180-2325		CAPACITOR-FXD 1500UF+75-10% 75VDC AL	90201	CGS152U075B03L
A2A22C3***	0180-2495	2	CAPACITOR-FXD 8700UF+75-10% 40VDC AL	56289	36D872G040AC2A
A2A22C4***	0180-0455	1	CAPACITOR-FXD .0425F+100-10% 15VDC AL	28480	0180-0455
A2A22C5***	0180-2325	2	CAPACITOR-FXD 1500UF+75-10% 75VDC AL	90201	CGS152U075B03L
A2A22C6	0160-3541	5	CAPACITOR-FXD .01UF +-5% 100WVDC POLYC	28480	0160-3541
A2A22C7	0160-3541		CAPACITOR-FXD .01UF +-5% 100WVDC POLYC	28480	0160-3541
A2A22C8	0160-3541		CAPACITOR-FXD .01UF +-5% 100WVDC POLYC	28480	0160-3541
A2A22C9	0160-3541		CAPACITOR-FXD .01UF +-5% 100WVDC POLYC	28480	0160-3541
A2A22C10	0160-3541		CAPACITOR-FXD .01UF +-5% 100WVDC POLYC	28480	0160-3541
A2A22MP1***	1200-0043		INSULATOR-XSTR TO-3 .02-THK	76530	322047
A2A22MP2***	1200-0043		INSULATOR-XSTR TO-3 .02-THK	76530	322047
A2A22MP3***	1200-0043		INSULATOR-XSTR TO-3 .02-THK	76530	322047
A2A22MP4***	1200-0043		INSULATOR-XSTR TO-3 .02-THK	76530	322047
A2A22MP5***	1200-0043		INSULATOR-XSTR TO-3 .02-THK	76530	322047
A2A22MP6***	1200-0043	6	INSULATOR-XSTR TO-3 .02-THK	76530	322047
A2A22Q1***	1854-0618	1	TRANSISTOR NPN SI DARL TO-3 PD=150W	04713	MJ3000
A2A22Q2***	1854-0063	1	TRANSISTOR NPN 2N3055 SI TO-3 PD=115W	28480	1854-0063
A2A22Q3***	1854-0294	1	TRANSISTOR NPN SI TO-3 PD=115W FT=500KHZ	28480	1854-0294
A2A22T1***	9100-3849	1	TRANSFORMER, POWER	28480	9100-3849
A2A22U1	1901-0638	3	DIODE-MULT FULL WAVE BRIDGE RECTIFIER	28480	1901-0638
A2A22U2	1906-0021	2	DIODE-MULT FULL WAVE BRIDGE RECTIFIER	28480	1906-0021
A2A22U3	1901-0638		DIODE-MULT FULL WAVE BRIDGE RECTIFIER	28480	1901-0638
A2A22U4	1901-0638		DIODE-MULT FULL WAVE BRIDGE RECTIFIER	28480	1901-0638
A2A22U5	1906-0021		DIODE-MULT FULL WAVE BRIDGE RECTIFIER	28480	1906-0021
A2A22VR1***	1826-0181		IC LM 323 V RGLTR	27014	LM323K
A2A22VR2***	1826-0181	2	IC LM 323 V RGLTR	27014	LM323K
A2A22VR3***	1826-0126	1	IC V RGLTR	07263	7818KC
A2A22XA20	1251-2035	2	CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	71785	252-15-30-300
A2A22XA21	1251-2035		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	71785	252-15-30-300

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
			A2 MISCELLANEOUS MECHANICAL PARTS LIST		
1	5060-9835	1	COVER, TOP	28480	5060-9835
	0570-1171		SCREW COVER MTG; 6-32 THD; 0.460 IN LG	28480	0570-1171
	0510-0043		RETAINER-RING .141-DIA STL CD-PL	28480	0510-0043
2	5060-9899	2	HANDLE ASSY, FRONT	28480	5060-9899
3	5020-8896	2	TRIM, FRONT HANDLE	28480	5020-8896
4	5060-9847	1	COVER, BOTTOM	28480	5060-9847
	0570-1171		SCREW COVER MTG; 6-32 THD; 0.460-IN LG	28480	0570-1171
	0510-0043		RETAINER-RING .141-DIA STL CD-PL	28480	0510-0043
5	5040-7201	4	FOOT (STANDARD)	28480	5040-7201
6	5061-1909	2	SIDE COVER	28480	5061-1909
7	5040-7221	2	FOOT, REAR	28480	5040-7221
8	08505-20156	1	FOOT ATTACHES A2 TO A3 (LOWER LEFT)	28480	08505-20156
8A	08505-20158	1	FOOT ATTACHES A2 TO A3 ((LOWER RIGHT)	28480	08505 20158
9	0520-0127	4	SCREW-MACH 2-56 .188-IN-LG PAN-HD-POZI	28480	0520-0127
10	2200-0165	1	SCREW-MACH 4-40 .25-IN-LG 82 DEG	28480	2200-0165
11	86701-20001	1	DIVIDER, FRONT FRAME	28480	86701-20001
12	5040-6937	2	CLIP, WINDOW	28480	5040-6937
13	08505-20130	1	WINDOW	28480	08505 20130
14	2200-0164	2	SCREW-MACH 4-40 .188-IN-LG 82 DEG	28480	2200-0164
15	08505-20038	4	PIN, SLIDE	28480	08505-20038
16	3050-0692	4	WASHER-FL MTLC NO.-10 .202-IN-ID	28480	3050-0692
17	3050-0253	4	WASHER-SPR CRVD NO.-10 .195-IN-ID	78189	3502-10-25-0541
18	0510-0045	4	RETAINER-RING .188-DIA CD PL STL	0018A	1500 18-CD
19	2510-0192	40	SCREW-MACH 8-32 100 DEG FL HD POZI REC	04866	YELLOW PATCH
20	0520-0166	4	SCREW-MACH 2-56 .375-IN-LG 82 DEG	28480	0520 0166
21	0590-0106	4	NUT-HEX-PLSTCLKG 2-56-THD .141-THK	72962	22NM-26
22	86701-20003	2	GUIDE PIN	28480	86701-20003
23	2360-0115	28	SCREW-MACH 6-32 .312-IN-LG PAN-HD-POZI	28480	2360-0115
24	5020-8804	1	FRAME, REAR	28480	5020-8804
25	1400-0774	1	CLAMP-CA .75-IN-WD PVC	06915	KKU-6
26	08505-00061	1	SUPPORT, CAPACITOR	28480	08505-00061
27	5040-0170	4	GUIDE:PLUG-IN PC BOARD	28480	5040-0170
28	0626-0002	8	SCREW-TPG 6-20 .5-IN-LG PAN-HD SLT-REC	28480	0626-0002
29	08505-00056	1	BRACKET, P.C. BOARD	28480	08505-00056
30	08505-20137	1	END PLATE	28480	08505 20137
31	08505-00053	1	COVER, RF 10+100 MHZ REF	28480	08505-00053
32	08505-00058	1	COVER, RF, FM DRIVER	28480	08505-00058
33	08505-20133	9	CIRCUIT ENCLOSURE	28480	08505-20133
34	08505-00055	1	COVER, RF SWEEP SELECT	28480	08505-00055
35	08505-00049	1	COVER, RF MARKER	28480	08505-00049
36	08505-00044	1	COVER, RF SCALING	28480	08505-00044
37	08505-00036	1	DIVIDER, CENTER	28480	08505-00036
38	5020-8803	1	FRAME, FRONT	28480	5020-8803
39	1251-0218	2	LOCK-SUBMIN D CONN	71785	D-53018
40	1600-0367	4		28480	1600 0367
41	2360-0113	20	SCREW MACH 6-32 .25-IN-LG PAN-HD-POZI	28480	2360-0113
42	08505-00037	1	DIVIDER, PLUG-IN	28480	08505-00037
43	08505-00042	1	OSCILLATOR MOUNTING	28480	08505-00042
44	08505-60109	1	BOARD ASSEMBLY, EXTENDER, 12-PIN	28480	08505-60109
44	08505-60108	1	BOARD ASSEMBLY, EXTENDER, 50-PIN	28480	08505 60108
44	08505-20143	2	OSCILLATOR MOUNTING	28480	08505-20143
45	08505-00045	1	OSC. MOUNTING BRACKET	28480	08505-00045
46	0180-0079	1	CAPACITOR-FXD 10UF+20-15% 60VDC TA	10411	MTA 10-60
47	2200-0111	4	SCREW-MACH 4-40 .5-IN-LG PAN-HD-POZI	28480	2200-0111
48	2200-0103	22	SCREW-MACH 4-40 .25-IN-LG PAN-HD-POZI	28480	2200-0103
49	0360-0676	11	JUMPER-BARR BLK BRASS; HOT TIN FINISH	28480	0360-0676
50	2200-0107	4	SCREW-MACH 4-40 .375-IN-LG PAN-HD-POZI	28480	2200-0107
51	2680-0129	10	SCREW-MACH 10-32 .312-IN-LG PAN-HD-POZI	28480	2680-0129
52	2190-0011	10	WASHER-LK INTL T NO.-10 .195-IN-ID	78189	1910-00
53	2360-0119	9	SCREW-MACH 6-32 .438-IN-LG PAN-HD-POZI	28480	2360-0119
55	2360-0117	1	SCREW-MACH 6-32 .375-IN-LG PAN-HD-POZI	28480	2360-0117
56	0360-0353	15	TERMINAL-LUG-SLDP 6 SCR .144/.144 ID	79963	176
57	2200-0105	2	SCREW-MACH 4-40 .312-IN-LG PAN-HD-POZI	28480	2200-0105
58	2190-0105	10	WASHER-LK HLCL NO.-6 .141-IN-ID	28480	2190 0105
59	2260-0001	10	NUT-HEX-DBL-CHAM 4-40-THD .094-THK	28480	2260-0001
60	0624-0349	38	SCREW-TPG 4-20 .375-IN-LG HEX WSHR-HD	93907	224-07850-012
61	3050-0023	38	WASHER-FL NM NO.-6 .144-IN-ID .25-IN-OD	28480	3050-0023
62	3050-0105	2	WASHER-FL MTLC NO.-4 .125-IN-ID	28480	3050-0105
63	08505-00041	2	CLIP	28480	08505-00041
64	2200-0101	2	SCREW-MACH 4-40 .188-IN-LG PAN-HD-POZI	28480	2200-0101
65	08505-00039	1	COVER, PLATE	28480	08505-00039
66	08505-00129	1	PANEL, REAR	28480	08505-00129
67	2950-0001	1	NUT-HEX-DBL-CHAM 3/8-32-THD .094-THK	12697	20/4-13
68	2190-0016	1	WASHER-LK INTL T NO.-3/8 .377-IN ID	78189	1920-02
69	08505-00043	1	FILTER, HOUSING	28480	08505-00043
70	7122-0097	1	SER PLT "SERIAL NO; HEWLETT PACKARD	28480	7122 0097

Figure C2-1. A2 Frequency Control Mechanical Parts Location (1 of 4)

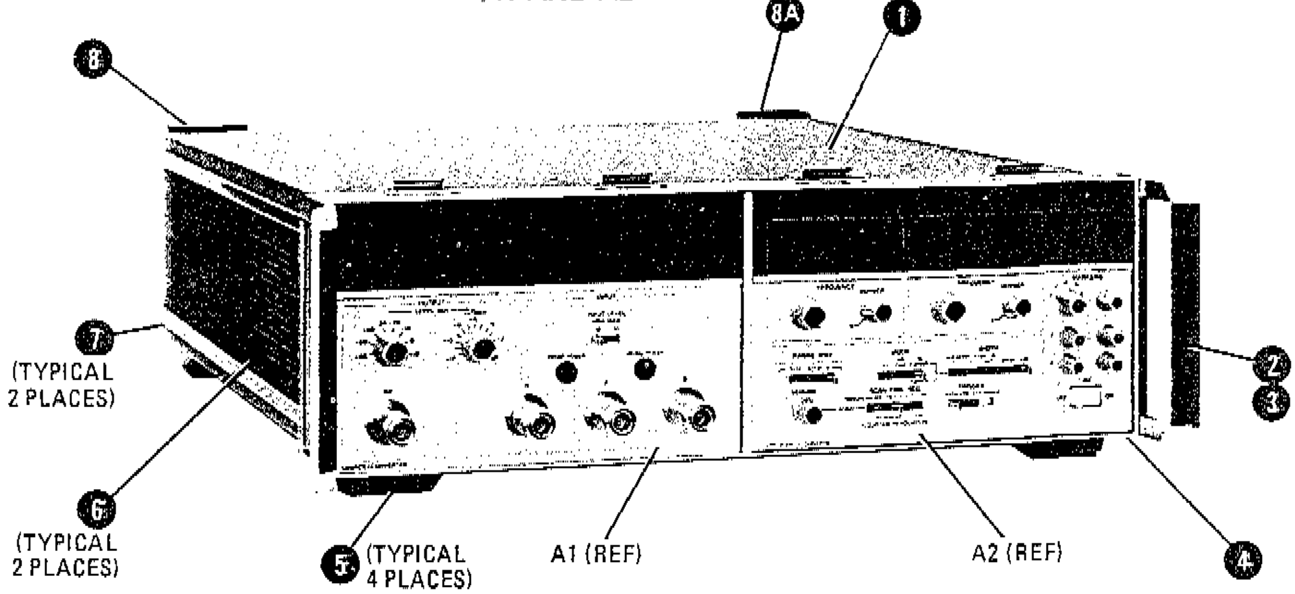
Fig. C2-1 a

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
71	08505-20121	1	HEAT SINK, POWER SUPPLY	28480	08505-20121
72	2950-0035	4	NUT-HEX-DBL-CHAM 15/32-32-THD .078-THK	28480	2950-0035
73	2190-0068	4	WASHER-LK INTL T NO.-1/2 .505-IN-ID	78189	1924-02
74	2510-0192		SCREW-MACH 8-32 100 DEG FL HD POZI REC	04866	YELLOW PATCH
75	08505-00057	1	BRACKET, P.C. BOARD	28480	08505-00057
76	1400-0116	2	STRAP-CABLE	31827	3-4-1
77	5020-8837	4	STRUT, CORNER	28480	5020-8837
78	08505-00038	1	SIDE GUSSET	28480	08505-00038
79	08505-00052	2	SLIDE, PANEL	28480	08505-00052
80	1400-0024		CABLE CLAMP, 1/4"		
81	2420-0001	2	NUT-HEX-W/LKWR 6-32-THD .109-THK	28480	2420-0001
82	2360-0123	1	SCREW-MACH 6-32 .625-IN-LG PAN-HD-POZI	28480	2360-0123
83	0520-0155		SCREW, FLAT HD 2/56 X 1/8"		
84	08505-40006	12	REFLECTOR, SINGLE	28480	08505-40006
85	4040-1001	12	DIFFUSER	28480	4040-1001
86	5040-8806	5	KNOB, MARKER 5/16"	28480	5040-8806
87	0350-1012	5		28480	0350-1012
88	0370-1005	3	KNOB, BASE AND POINTER	28480	0370-1005
89	0370-1001	1	KNOB, SCAN VERNIER	28480	0370-1001
90	08505-00031	1	PANEL, FRONT	28480	08505-00031
91	08505-00032	1	PANEL, SUB	28480	08505-00032
92	0370-1091	2	KNOB, FREQUENCY	28480	0370-1091
93	0610-0001	2	NUT-HEX-DBL-CHAM 2-56-THD .062-THK	28480	0610-0001
94	2190-0045	2	WASHER-LK HLCL NO.-2 .088-IN-ID	76854	1501-009
95	1202-0302	1	HEAT SINK	28480	1202-0302
96	08505-00074	1	BRACKET, UPPER PANEL	28480	08505-00074
97	08505-00075	1	BRACKET, LOWER PANEL	28480	08505-00075

Figure C2-1. A2 Frequency Control Mechanical Parts Location (2 of 4)

Fig e-21b
Sht 1 of 3

A1 AND A2 FRONT VIEW



A2 FRONT VIEW WITH A1 REMOVED

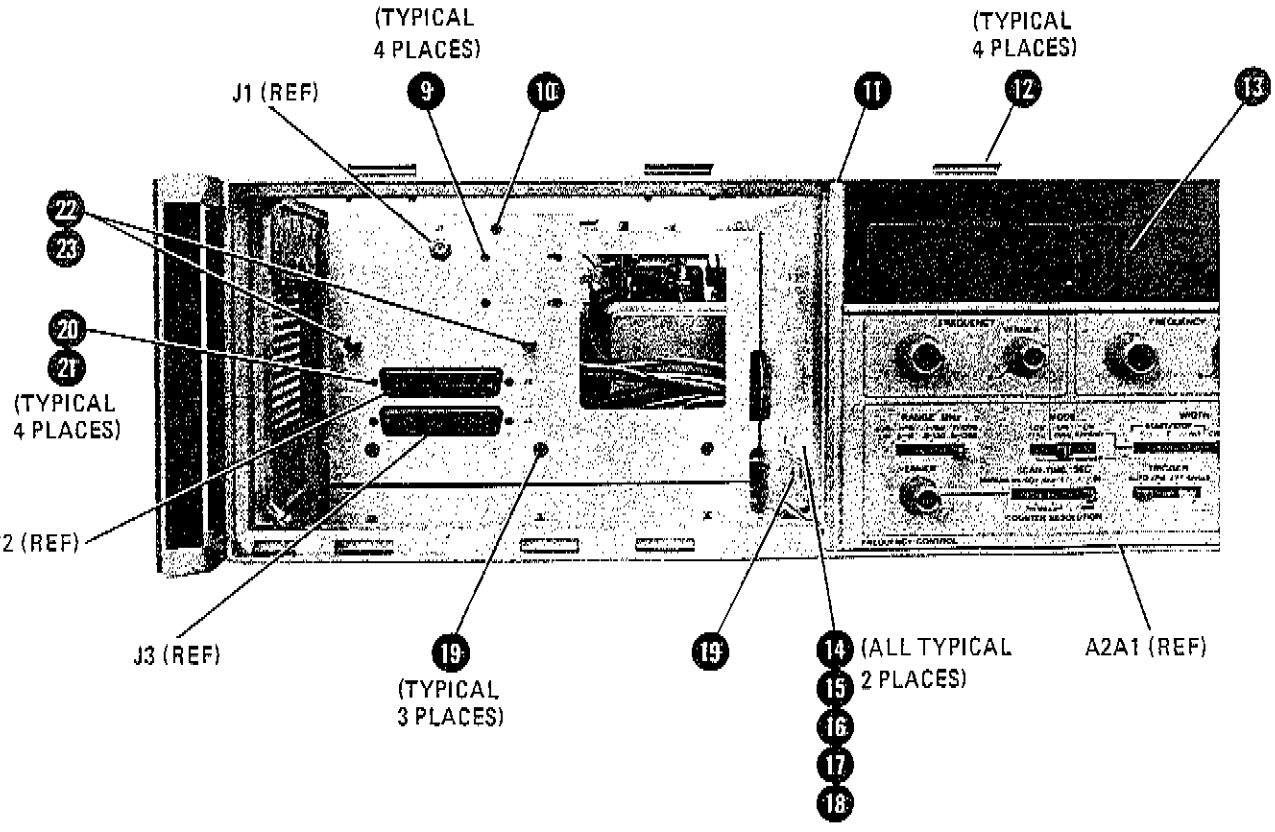


Fig 2-16
Sht 2 of 3

A1 AND A2 TOP VIEW WITH TOP COVER REMOVED

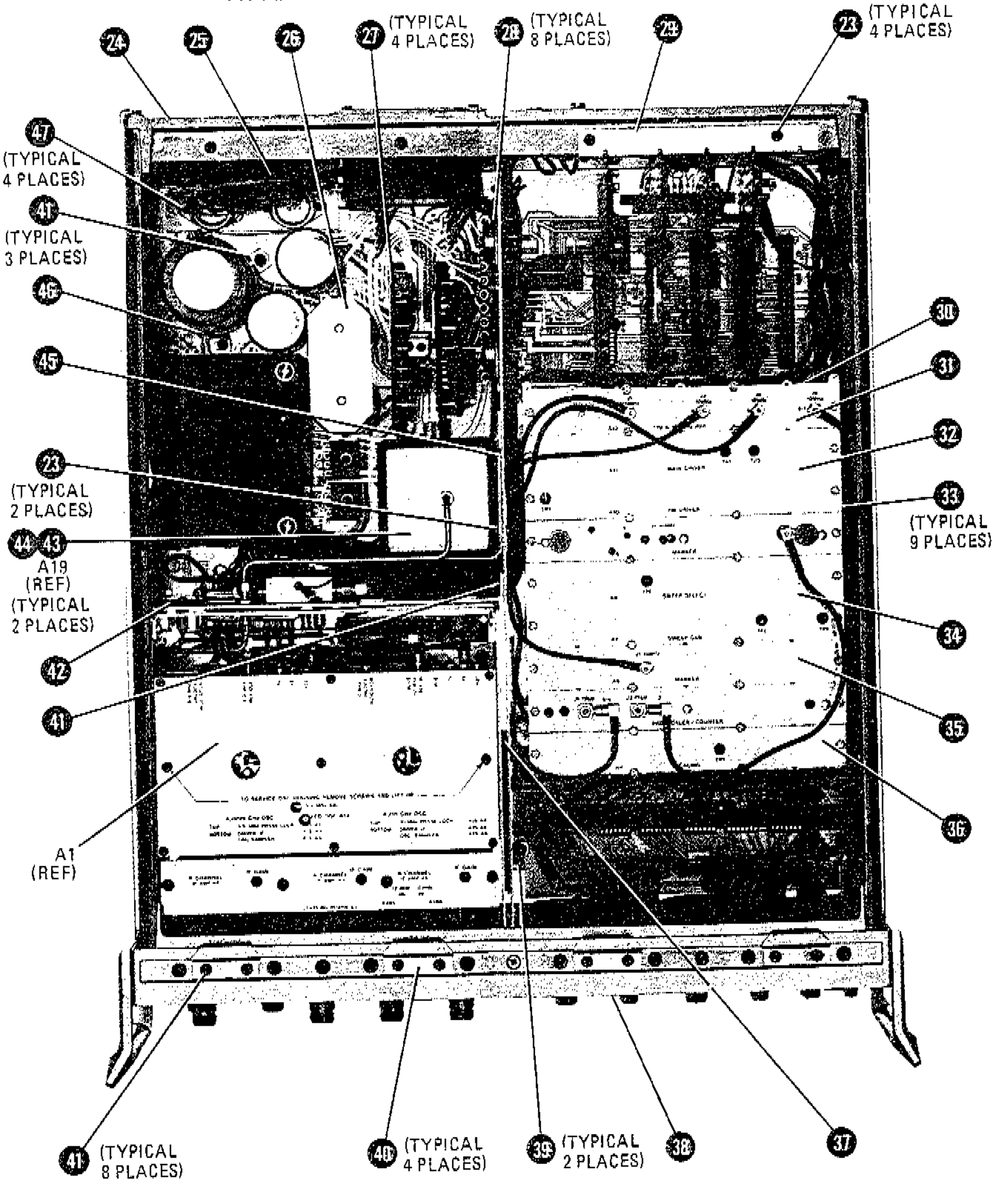


Fig C2-1b
Sht 3 of 3

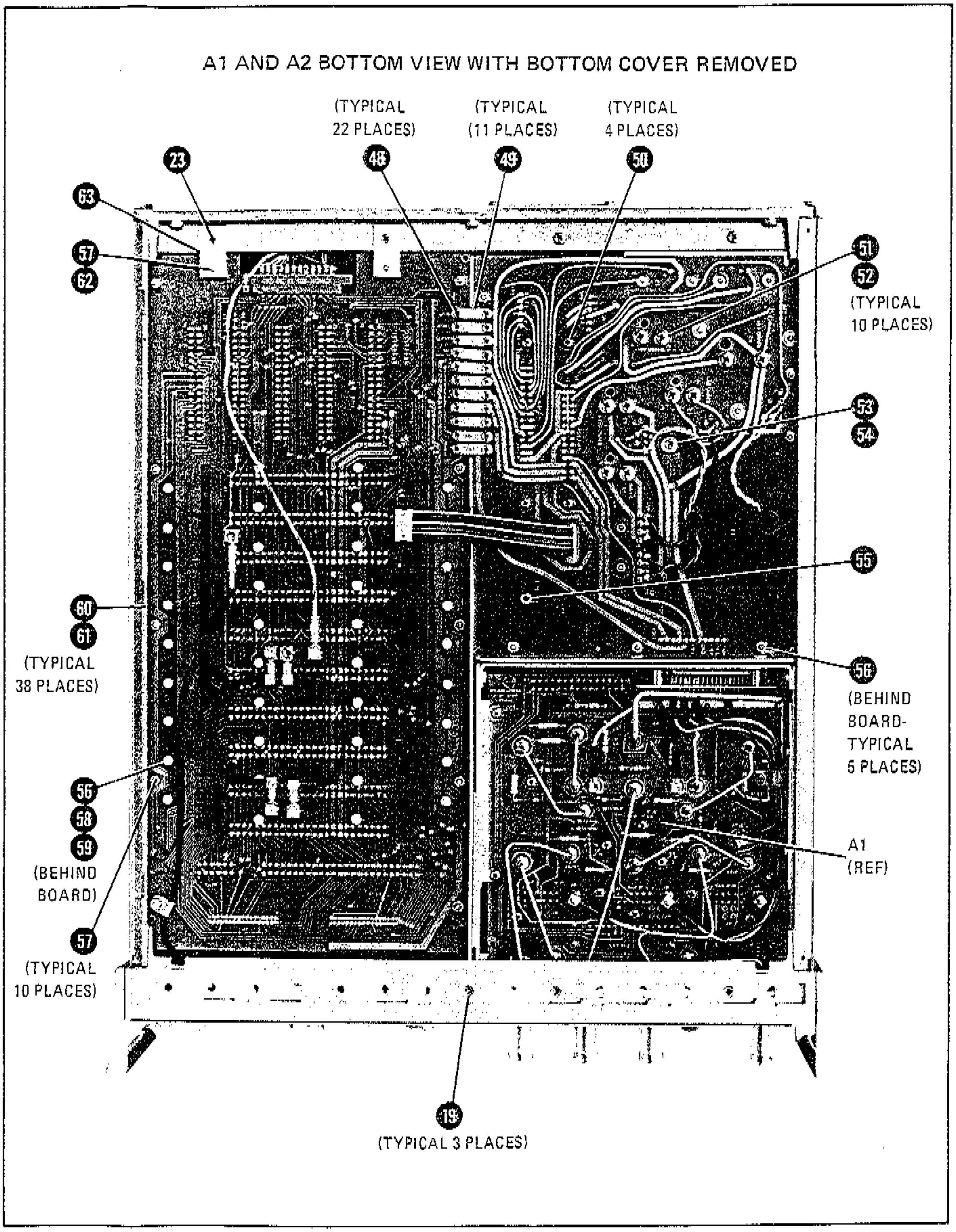


Figure C2-1. A2 Frequency Control Mechanical Parts Location (3 of 4)

Fig C2-1c
Sht 1 of 3

A2 REAR VIEW

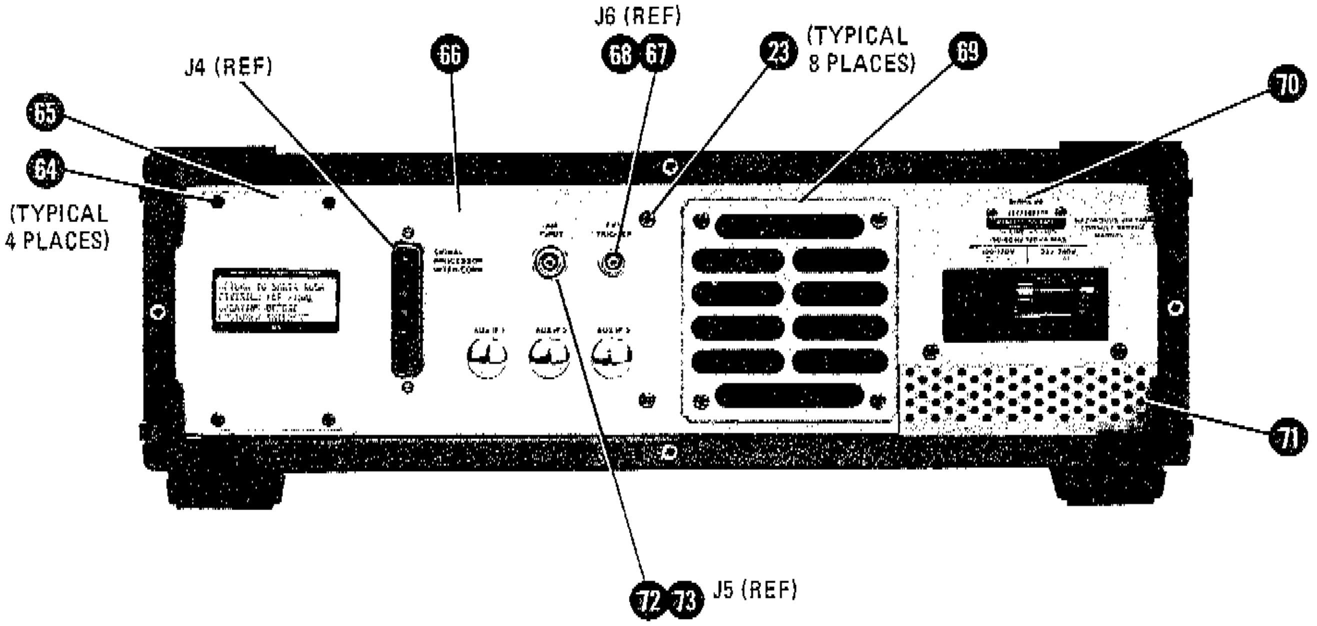
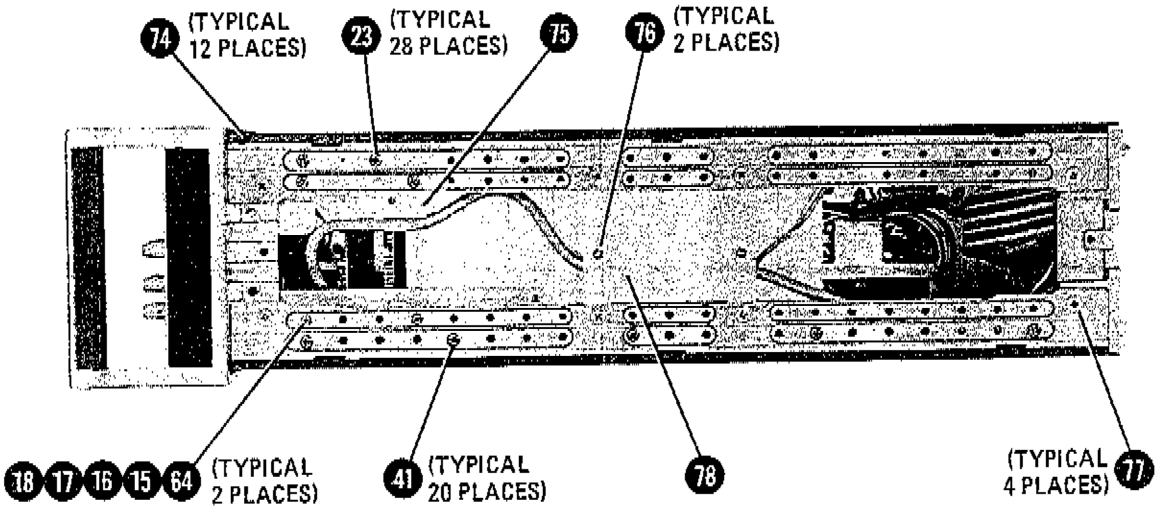


Fig C2-1c
Sht 2 of 3

A2 RIGHT SIDE WITH SIDE COVER REMOVED



A2 LEFT SIDE WITH SIDE COVER REMOVED

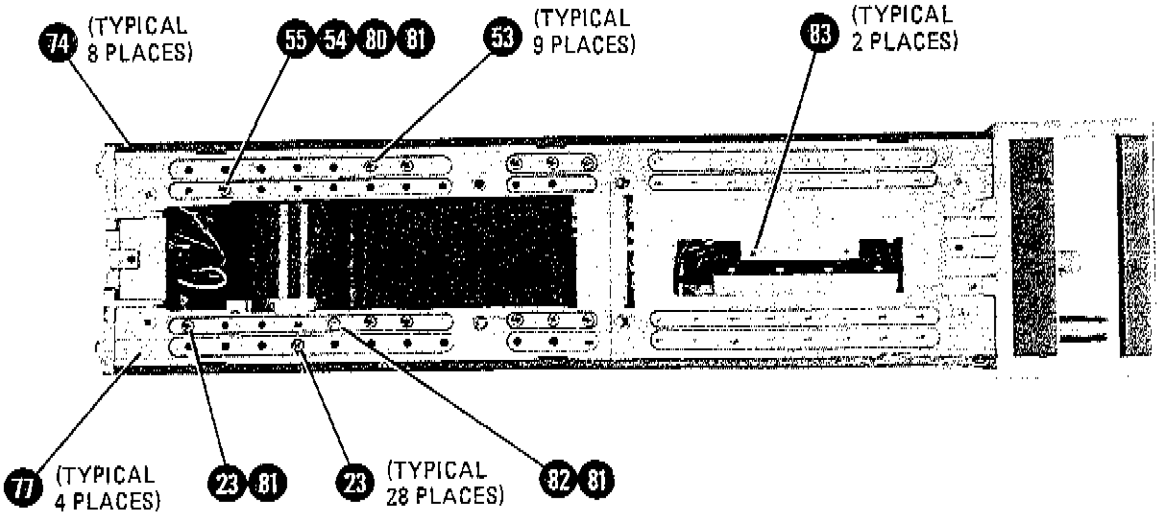
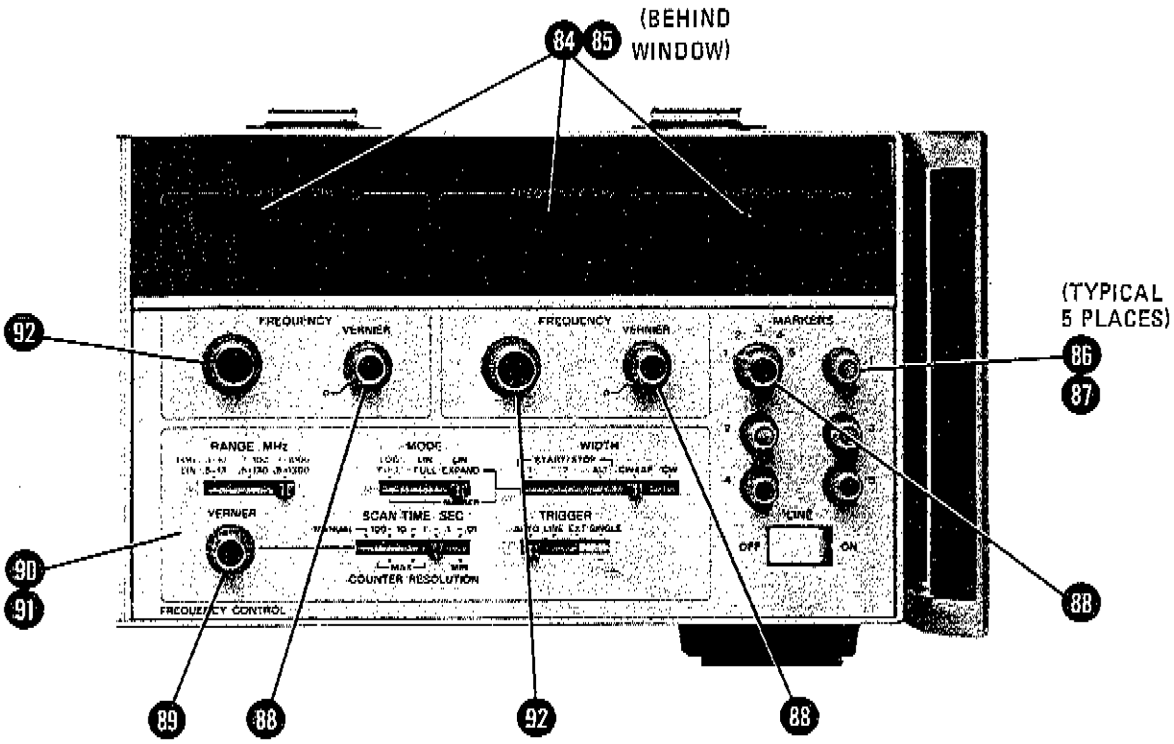


Fig C2-1c
Sht 3 of 3

A2 FRONT PANEL



A1/A2 TOP VIEW WITH A2 FRONT PANEL FOLDED OUT

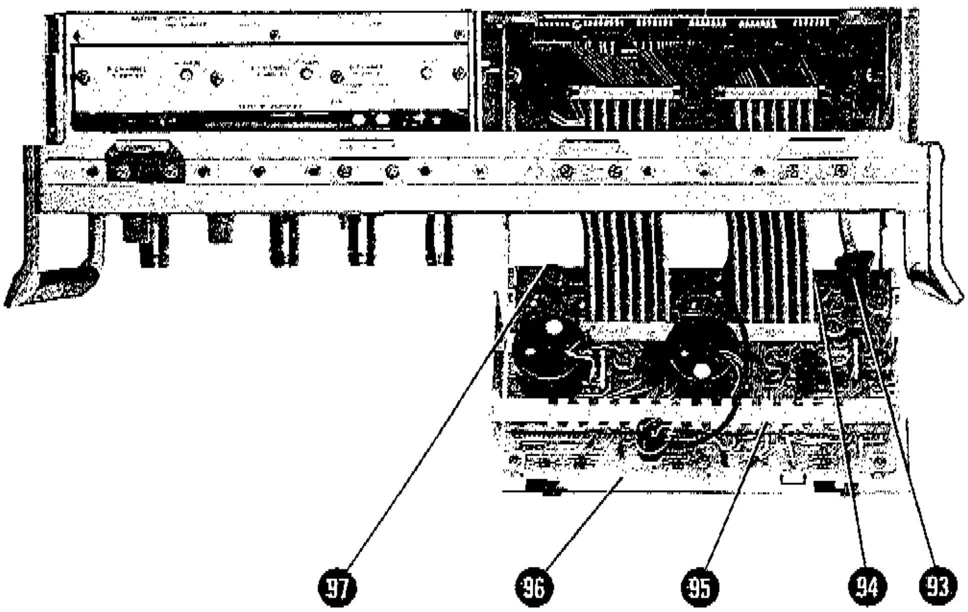


Figure C2-1. A2 Frequency Control Mechanical Parts Location (4 of 4)

Table C2-3. Code List of Manufacturers

MFR NO.	MANUFACTURER NAME	ADDRESS	ZIP CODE
00000	NO M/F DESCRIPTION FOR THIS MFG NUMBER		
0018A	AR TECH PACKAGING CORP	LOWELL MA	01854
01121	ALLEN-BRADLEY CO	MILWAUKEE WI	53212
01295	TEXAS INSTR INC SEMICOND CMPNT DIV	DALLAS TX	75231
02114	FERROXCUBE CORP	SAUGERTIES NY	12477
02735	RCA CORP SOLID STATE DIV	SOMMERVILLE NJ	08876
03877	TRANSITRON ELECTRONIC CORP	WAKEFIELD MA	01880
03888	KDI PYROFILM CORP	WHIPPANY NJ	07981
04713	MOTOROLA SEMICONDUCTOR PRODUCTS	PHOENIX AZ	85008
04866	NYLOK-DETROIT CORP	TROY MI	48084
06560	AIRCO SPEER ELEK DIV AIR RDCN CO	NOGALES AZ	85621
06665	PRECISION MONOLITHICS INC	SANTA CLARA CA	95050
06776	ROBINSON NUGENT INC	NEW ALBANY IN	47150
06915	RICHCO PLASTIC CO	CHICAGO IL	60646
07088	KELVIN ELECTRIC CO	VAN NUYS CA	91401
07263	FAIRCHILD SEMICONDUCTOR DIV	MOUNTAIN VIEW CA	94040
10411	TI-TAL INC	SANTA MONICA CA	90405
11236	CTS OF BERNE INC	BERNE IN	46711
12463	OMTRONICS MFG INC	OMAHA NE	68105
12697	CLAROSTAT MFG CO INC	DOVER NH	03820
14140	EDISON ELEK DIV MCGRAW-EDISON	MANCHESTER NH	03130
15915	TEPRO OF FLORIDA INC	DUNEDIN FL	33528
16299	CORNING GL WK ELEC CMPNT DIV	RALEIGH NC	27604
19701	MEPCO/ELECTRA CORP	MINERAL WELLS TX	76067
2K497	CABLEWAVE SYSTEMS INC	NORTH HAVEN CT	06473
20940	MICRO-OHM CORP	EL MONTE CA	91731
24226	GOWANDA ELECTRONICS CORP	GOWANDA NY	14070
24355	ANALOG DEVICES INC	NORWOOD MA	02062
24546	CORNING GLASS WORKS (BRADFORD)	BRADFORD PA	16701
24931	SPECIALTY CONNECTOR CO INC	INDIANAPOLIS IN	46227
27014	NATIONAL SEMICONDUCTOR CORP	SANTA CLARA CA	95051
28480	HEWLETT-PACKARD CO CORPORATE HQ	PALO ALTO CA	94304
30983	MEPCO/ELECTRA CORP	SAN DIEGO CA	92121
31827	BUDWIG MFG CO	RAMONA CA	92065
32997	BOURNS INC TRIMPOT PROD DIV	RIVERSIDE CA	92507
54294	CUTLER-HAMMER-INC SHALLCROSS MFG CO	SELMA NC	27576
56289	SPRAGUE ELECTRIC CO	NORTH ADAMS MA	01247
57771	STIMPSON EDWIN B CO INC	BROOKLYN NY	11205
71400	BUSSMAN MFG DIV OF MCGRAW-EDISON CO	ST LOUIS MO	63017
71785	TRW ELEK COMPONENTS CINCH DIV	ELK GROVE VILLAGE IL	60007
72136	ELECTRO MOTIVE MFG CO INC	WILLIMANTIC CT	06226
72962	ELASTIC STOP NUT DIV OF AMERACE	UNION NJ	07083
73138	BECKMAN INSTRUMENTS INC HELIPOT DIV	FULLERTON CA	92634
73743	FISCHER SPECIAL MFG CO	CINCINNATI OH	45206
74970	JOHNSON E F CO	WASECA MN	56093
75042	TRW INC PHILADELPHIA DIV	PHILADELPHIA PA	19108
75915	LITTELFUSE INC	DES PLAINES IL	60016
76381	3M COMPANY	ST PAUL MN	55101
76493	BELL INDUSTRIES INC MILLER JW DIV	COMPTON CA	90224
76530	TRW ELEK CMPNT CINCH-MONADNOCK DIV	CITY OF INDUSTRY CA	91747
76854	OAK IND INC SW DIV	CRYSTAL LAKE IL	60014
78189	ILLINOIS TOOL WORKS INC SHAKEPROOF	ELGIN IL	60126
79963	ZIERICK MFG CO	MT KISCO NY	10549
84411	TRW CAPACITOR DIV	OGALLALA NE	69153
90201	MALLORY CAPACITOR CO	INDIANAPOLIS IN	46206
91637	DALE ELECTRONICS INC	COLUMBUS NE	68601
93790	NO M/F DESCRIPTION FOR THIS MFG NUMBER		
93907	CAMCAR SCREW & MFG CO	ROCKFORD IL	61101
98291	SEALECTRO CORP	MAMARONECK NY	10544
98978	INTERNATIONAL ELEK RESEARCH CORP	BURBANK CA	91502

CHAPTER C
FREQUENCY CONTROL

SECTION III
SERVICE

DESCRIPTION:

This troubleshooting procedure identifies problems that affect operation of the A2 Frequency Controller. Tests are made in each frequency range and sweep mode and when a problem is found, a troubleshooting procedure is designated which isolates the trouble to the assembly level. Figure C3-1 shows basic operation that gives major signal flow of the A2 Frequency Controller.

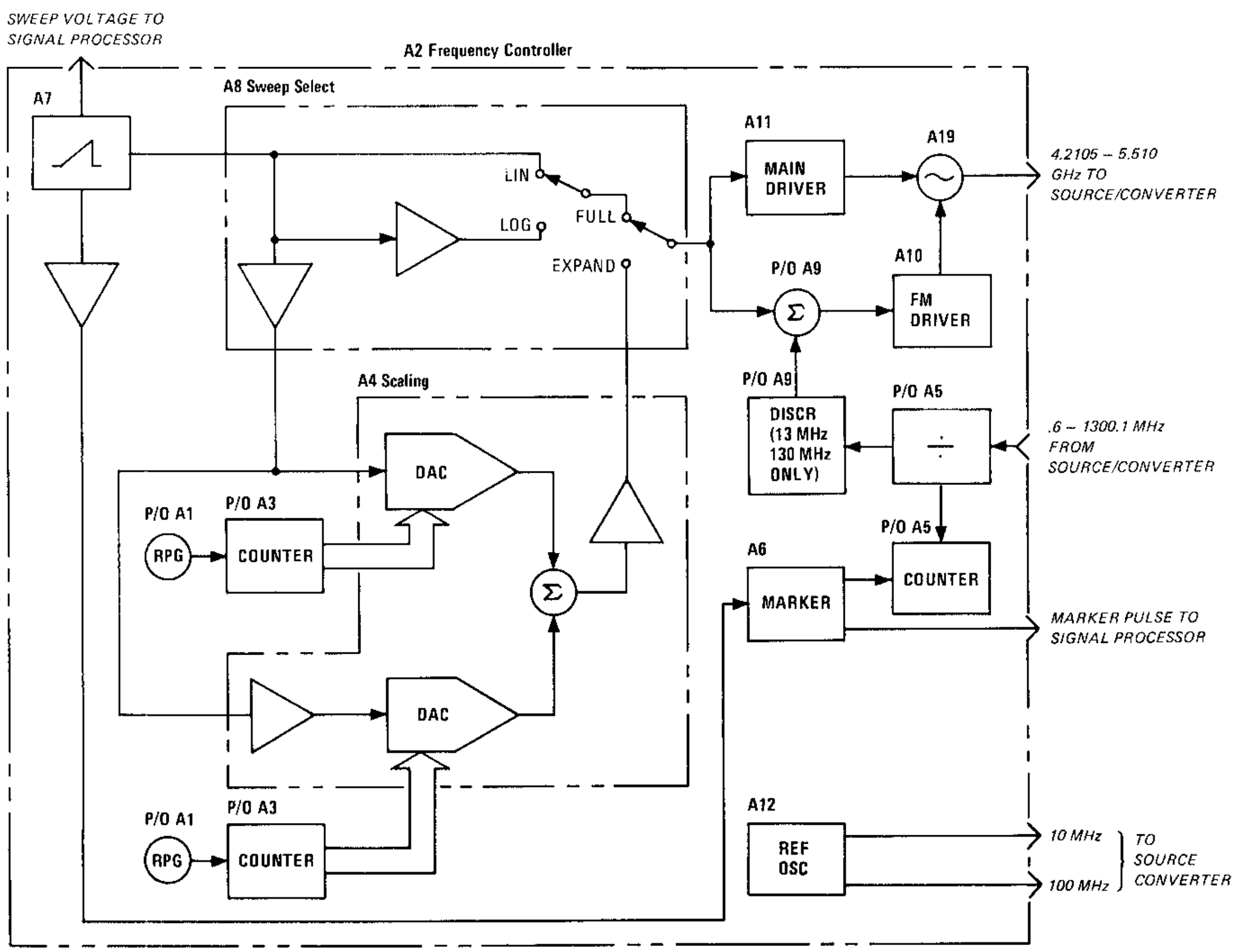


Figure C3-1. A2 Frequency Control Functional Block Diagram

C3-1. A2 FREQUENCY CONTROL TROUBLESHOOTING PROCEDURE

Test Setup

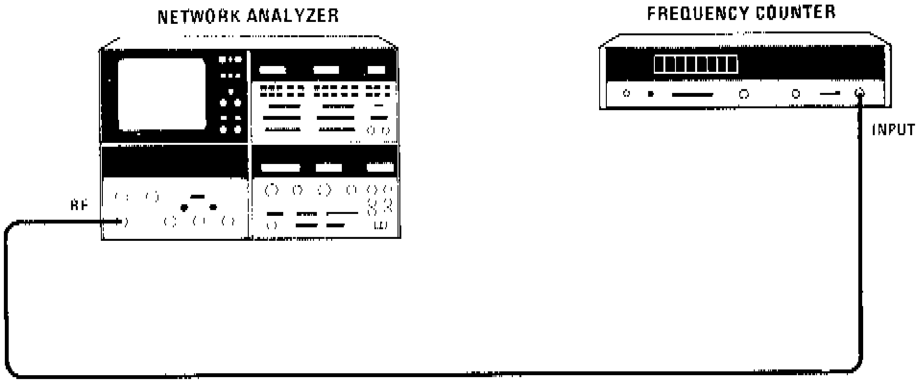


Figure C3-2. A2 Frequency Control Troubleshooting Test Setup

EQUIPMENT:

Network Analyzer . . . . HP 8505A
Frequency Counter . . . . HP 5340A

CRITICAL 8505A SWITCH SETTINGS:

OUTPUT LEVEL . . . . −10 dBm
RANGE. . . . . .5 – 1300 MHz
MODE. . . . . LIN FULL
SCAN TIME SEC Switch. . . . . .1 – .01
SCAN TIME SEC Vernier . . . . Fully Clockwise
TRIGGER. . . . . AUTO

PROCEDURE:

a. Connect equipment as shown in Figure C3-2 and set LINE switch to ON.

Basic Sweep Generation

NOTE

CRT display is not blanked when A3 Signal Processor REF LINE POSN pushbutton is depressed.

b. CRT trace should sweep twelve divisions and be blanked on retrace. If it does not, trouble is in A2A1, A2A7, A2A8, Frequency Control/Signal Processor Interconnect Cable, or A3 Signal Processor. Refer to Paragraph C3-2 for further troubleshooting.

c. Check that a counterclockwise rotation of SCAN TIME SEC vernier results in a slower scan time. If not, trouble is in A2A1 or A2A7 assemblies. Refer to Paragraph C3-2 for further troubleshooting.

d. Step SCAN TIME SEC switch through each sweep range and check that the scan time increases as slower scan times are selected. If it does not, trouble is in A2A1 or A2A7 assemblies. Refer to Paragraph C3-2 for further troubleshooting.

C3-1. A2 FREQUENCY CONTROL TROUBLESHOOTING PROCEDURE (Cont'd)

e. Set SCAN TIME SEC switch to MANUAL and SCAN TIME SEC vernier fully counterclockwise. Slowly adjust SCAN TIME SEC vernier clockwise and check the following.

   1. CRT trace should move from left to right and cover full graticule display (12 divisions). If it does not, trouble is in A2A1 or A2A7 assemblies. Refer to Paragraph C3-2 for further troubleshooting.

   2. Frequency at A1J1 RF OUT covers at least the .5 to 1300 MHz frequency range. If not, trouble is in A2A8, A2A11, A2A19 or A1 Source/Converter. Refer to Paragraph C3-2 for further troubleshooting.

f. Reset SCAN TIME SEC switch to .1 — .01 position and check CRT trace for each TRIGGER switch position as shown below. If correct results are not obtained, trouble is in A2A1 or A2A7 assemblies. Refer to Paragraph C3-2 for further troubleshooting.

   1. AUTO — Sweep triggers repeatedly.

   2. LINE — Sweep triggers repeatedly.

   3. EXT — Sweep triggers repeatedly only when external trigger is applied to rear panel EXT TRIGGER connector (Use MAIN GATE OUTPUT from rear panel of 180 series oscilloscope).

   4. SINGLE – Sweep triggers once when switch set to SINGLE. Switch returns to EXT position when released. If switch is set to SINGLE while sweep is in progress, sweep is reset.

Frequency Range and Sweep Mode Check

g. Perform frequency checks for A2 Frequency Control switch positions given in table below. These checks verify the endpoint frequencies for each sweep MODE, RANGE and WIDTH. The RF OUT frequency is clamped at its start or stop frequency by grounding A2A7TP3 or A2A7TP2 respectively. (See Figure C3-32.) This enables verification of the RF OUT frequency in respect to the FREQUENCY setting for each swept mode of operation. When checking CW operation, the RF OUT frequency may be measured directly and neither test point should be grounded.

NOTE

Meeting requirements listed in table below may required adjustment of FREQ CAL Potentiometer (located behind A2 Frequency Controller front panel window). If this adjustment is required, set 8505A controls as follows:

RANGE . . . . .5 – 1300 MHz
MODE . . . . LIN EXPAND
WIDTH . . . . CW ± ΔF
SCAN TIME SEC . . . . .1 – .1
CW Frequency . . . . 10 MHz
Δ F Frequency . . . . 0 MHz
CW Vernier . . . . Fully Counterclockwise
ΔF Vernier . . . . Fully Counterclockwise
MARKER 1 . . . . Centered on CRT Display

Adjust FREQ CAL for a FREQ COUNTER indication of 10 MHz ±0.5 MHz.

C3-1. A2 FREQUENCY CONTROL TROUBLESHOOTING PROCEDURE (Cont'd)

Mode	Range	Width	Frequency Settings		A1J1 RF Out When Grounding	
			Start/CW	Stop/±ΔF	A2A7TP3	A2A7TP2
LIN FULL	.5 – 1300 MHz				≤ 2.5 MHz	1300 MHz ±30 MHz
LIN FULL	.5 – 130 MHz				500 kHz ±200 kHz	130 MHz ±3 MHz
LIN FULL	.5 – 13 MHz				500 kHz ±20 kHz	13 MHz ±300 kHz
LOG FULL	1 – 1000 MHz				≤5 MHz	1000 MHz ±40 MHz
LIN EXPAND	.5 – 1300 MHz	START/STOP 1	0963 MHz	1248 MHz	963 MHz ±11 MHz	1248 MHz ±13.5 MHz
LIN EXPAND	.5 – 1300 MHz	START/STOP 2	1248 MHz	1295 MHz	1248 MHz ±13.5 MHz	1295 MHz ±14 MHz
LIN EXPAND	.5 – 1300 MHz	CW ±ΔF	0963 MHz	124.8 MHz	838.2 MHz ±9.5 MHz	1087.8 MHz ±12 MHz
LIN EXPAND	.5 – 1300 MHz	CW	0963 MHz			

Probable Trouble Area Corresponding to Switch Positions:

Mode	Range	Trouble Area
LIN FULL LOG FULL	.5 – 1300 MHz 1 – 1000 MHz	Trouble in basic sweep operation. Refer to Paragraph C3-2 for further troubleshooting.
LIN FULL LIN FULL	.5 – 130 MHz .5 – 13 MHz	Trouble occurs when YTO is in closed loop operation. Refer to Paragraph C3-3 for further troubleshooting.
LIN EXPAND	.5 – 1300 MHz	Trouble occurs when operating in LIN EXPAND mode. Refer to Paragraph C3-4 for further troubleshooting.

Marker Operation

h. Set 8505A controls as follows:

RANGE .... .5 — 1300 MHz
MODE .... LIN EXPAND
WIDTH .... CW±ΔF
CW FREQUENCY .... 800 MHz
ΔF FREQUENCY .... 130 MHz
MARKERS Switch 1

i. Check Marker operation as shown below. If correct results are not obtained, refer to Paragraph C3-5 for further troubleshooting.

1. Step MARKERS switch from 1 to 5 and check that number of markers displayed corresponds to MARKERS switch position.

2. Set MARKERS switch to 5 and adjust MARKERS position controls to display markers 1 thru 5 on the CRT respectively from left to right. FREQ COUNTER frequency should decrease as MARKERS switch is stepped from 5 to 1.

3. Set ΔF FREQUENCY to 0 MHz. Compare FREQ COUNTER and CW FREQUENCY displays and check that the displays correspond within 5 MHz.

j. Set Marker frequency to 800 MHz and check FREQ COUNTER resolution for switch positions shown below. If resolution is incorrect, trouble is in A2A1, A2A2 or A2A5. Refer to Paragraph C3-5 for further troubleshooting.

C3-1. A2 FREQUENCY CONTROL TROUBLESHOOTING PROCEDURE (Cont'd)

Range	Scan Time Sec	Freq. Counter	Overflow
.5 – 1300 MHz	.1 – .01	0800 MHz	OFF
.5 – 1300 MHz	1 – .1	800.0 MHz	OFF
.5 – 1300 MHz	10 – 1	00.00 MHz	ON
.5 – 130 MHz	10 – 1	0.000 MHz	ON
.5 – 13 MHz	10 – 1	.0000 MHz	ON

Memory Operation

k. Set FREQUENCY controls for each WIDTH switch position as shown below; then repeat each WIDTH switch position and check that same frequencies are displayed. If an incorrect indication occurs, the trouble is in the A2A3 Memory Assembly or its control inputs. Refer to Figure C3-24 for further troubleshooting.

NOTE

When the WIDTH switch is in ALT position and Signal Processor Channel 1 is turned on, the FREQUENCY MHz displays should indicate the same as in START/STOP 1 position.

WIDTH	FREQUENCY	
	START/CW	STOP/±ΔF
START/STOP 1	200 MHz	1000 MHz
START/STOP 2	600 MHz	800 MHz
CW ±ΔF	700 MHz	100 MHz
CW	700 MHz	

C3-2. BASIC SWEEP OPERATION TROUBLESHOOTING PROCEDURE

DESCRIPTION:

This troubleshooting procedure locates problems that affect the LOG FULL or LIN FULL sweep modes in the .5 — 1300 MHz frequency RANGE. The basic sweep generation, YIG tuning and CRT display blanking are the primary functions involved. Critical test points in the troubleshooting block diagram are designated with a letter which corresponds with the same test point on the troubleshoooting tree. If a signal at a particular test point is known to be incorrect, the troubleshooting tree procedure may be started at that point.

C3-2. BASIC-SWEEP OPERATION TROUBLESHOOTING PROCEDURE (Cont'd)

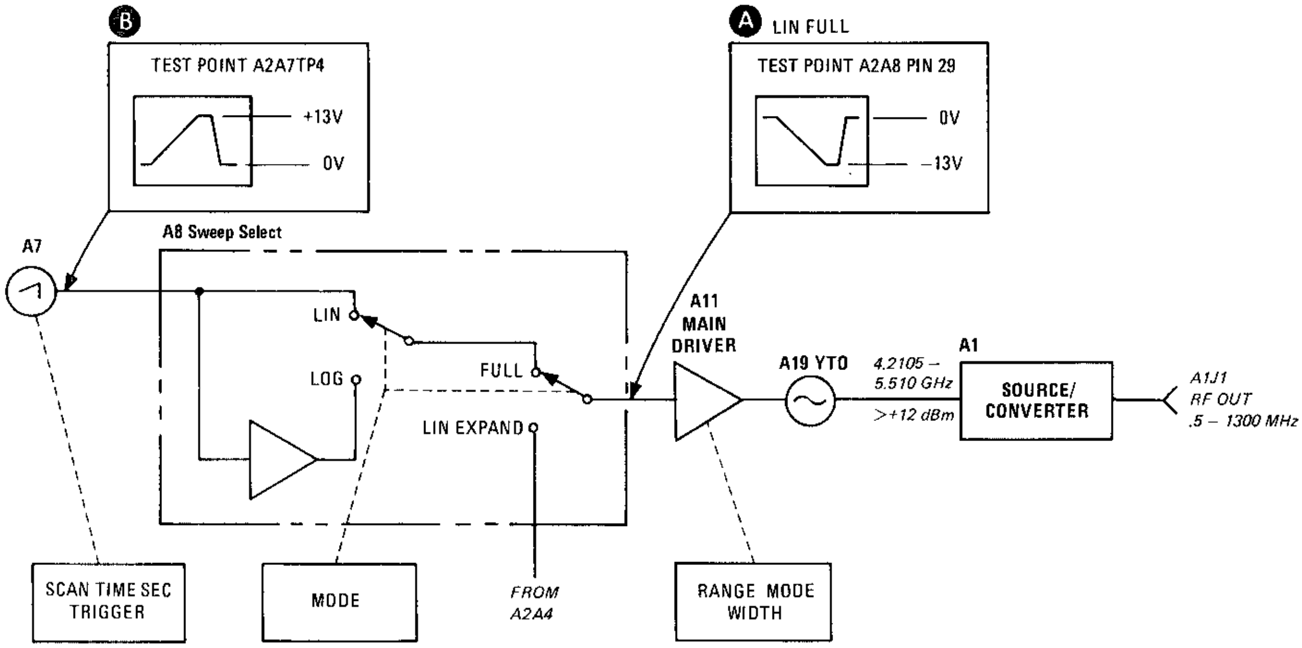


Figure C3-3. Basic Sweep Troubleshooting Block Diagram

Test Setup

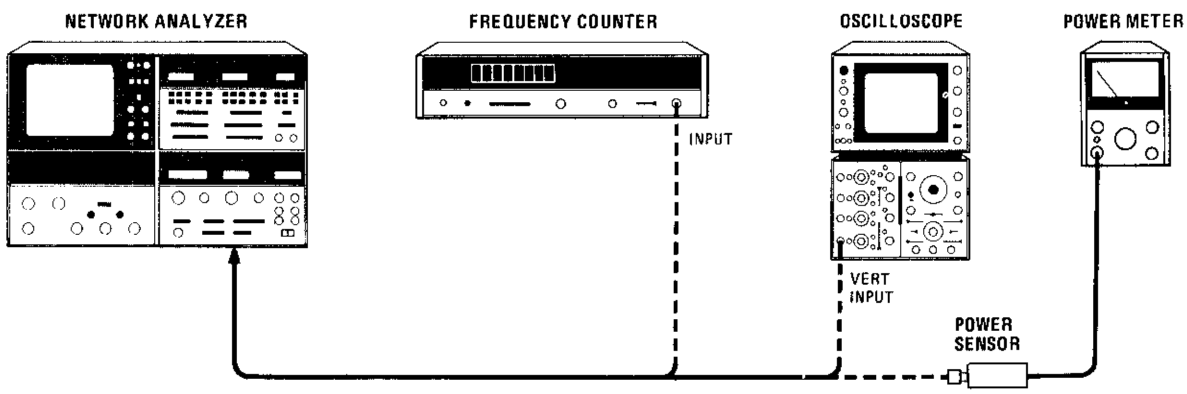


Figure C3-4. Basic Sweep Operation Troubleshooting Test Setup

EQUIPMENT:

Network Analyzer	HP 8505A
Frequency Counter	HP 5340A
Oscilloscope	HP 180C/1804A/1821A
Power Meter	HP 435A
Power Sensor	HP 8482A

CRITICAL 8505A SWITCH SETTINGS

RANGE	.5 — 1300 MHz
MODE	LIN FULL
SCAN TIME SEC	.1 — .01
TRIGGER	AUTO

Fig C3-5
sht 1 of 3

Connect equipment as shown in Figure C3-3.

Ensure green LED indicators are lit on A2A21 Negative Power Supply and A2A22 Positive Power Supply.

NO

Trouble is in respective power supply.

YES

Sweep MODE . . . . LIN FULL
Frequency RANGE. . . . . 5 – 1300 MHz
Test Point . . . . A1J1 RF OUT

A2A7TP3 Grounded . . . . .500 kHz

A2A7TP2 Grounded . . . . 1300 MHz

NO

Sweep MO
Frequency
Test Point

YES

Test Point
SCAN TI

Sweep MODE . . . . .LOG FULL
Frequency RANGE. . . . . 1 – 1000 MHz
Test Point . . . . A1J1 RF OUT

A2A7TP3 Grounded . . . . .1 MHz

A2A7TP2 Grounded . . . . 1000 MHz

NO

Trouble is in A2A8 Sweep Select Assembly or its Control Inputs. Refer to Figure C3-34 for further troubleshooting.

Sweep MO
Frequenc
Test Poin
Power Ou

A2A7TP3

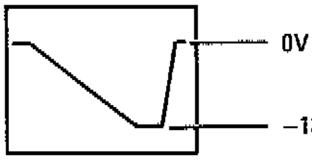
A2A7TP2

Trouble i
shooting

Fig C3-5
sht 2 of 3

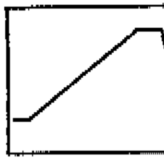
Trouble is in respective power supply.

Sweep MODE . . . . LIN FULL
Frequency RANGE. . . . . .5 – 1300 MHz
Test Point . . . . A2A8 pin 29



NO

Sweep MODE . . . .
Frequency RANGE. . . . .
Test Point . . . .

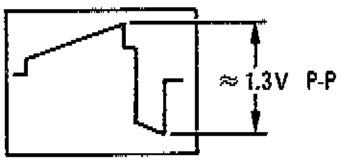


YES

Trouble is in A2A8 Sweep Sel
Control Inputs. Refer to Figur
troubleshooting.

YES

Test Point . . . . A2A11 pin 29
SCAN TIME SEC . . . . .1 – .01



NO

Trouble is in A2A11 Main D
Inputs. Refer to Figure C3-40
shooting.

uble is in A2A8 Sweep Select Assembly or its
ntrol Inputs. Refer to Figure C3-34 for further
ubleshooting.

YES

Sweep MODE . . . . LIN FULL
Frequency RANGE. . . . . .5 – 1300 MHz
Test Point A2A19J1
Power Out . . . .>+12 dBm

A2A7TP3 Grounded . . . . 4.2105 GHz

A2A7TP2 Grounded . . . . 5.510 GHz

NO

Trouble is in A2A19 YIG T

YES

Trouble is in A1 Source/Converter. Refer to Trouble-
shooting Procedure in Section B3.

Fig C3-5
Sut 3of3

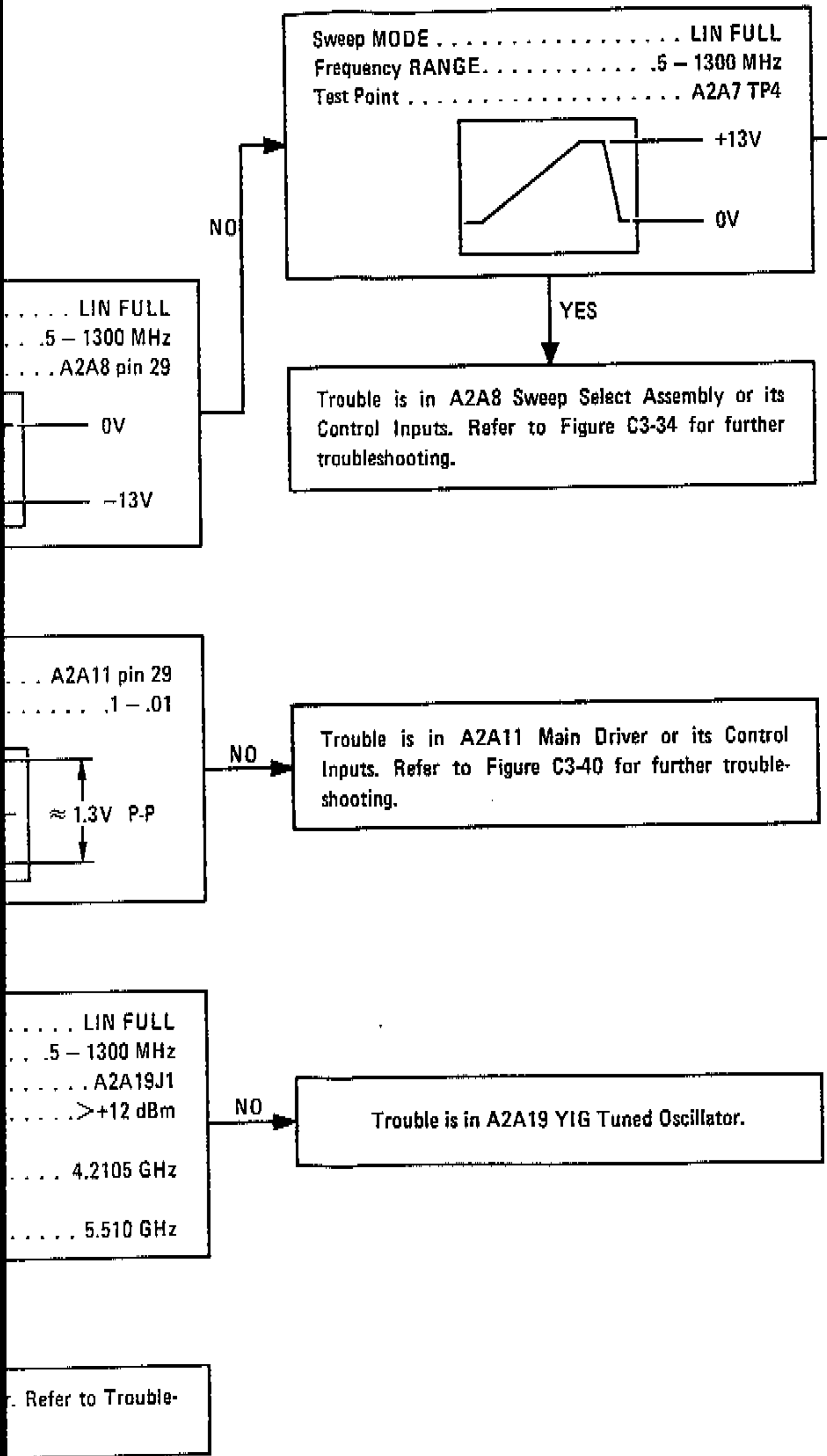


Figure C3-5. Basic Sweep Troubleshooting Procedure

C3-3. AFC TROUBLESHOOTING PROCEDURE

DESCRIPTION

This troubleshooting procedure locates problems that occur when the A2 Frequency controller is in closed loop operation. The AFC loop is shown in Figure C3-6 and is closed when the .5 — 13 MHz or .5 — 130 MHz frequency ranges are selected. Because a problem in the AFC loop affects the entire loop, troubleshooting requires opening the loop to locate the trouble.

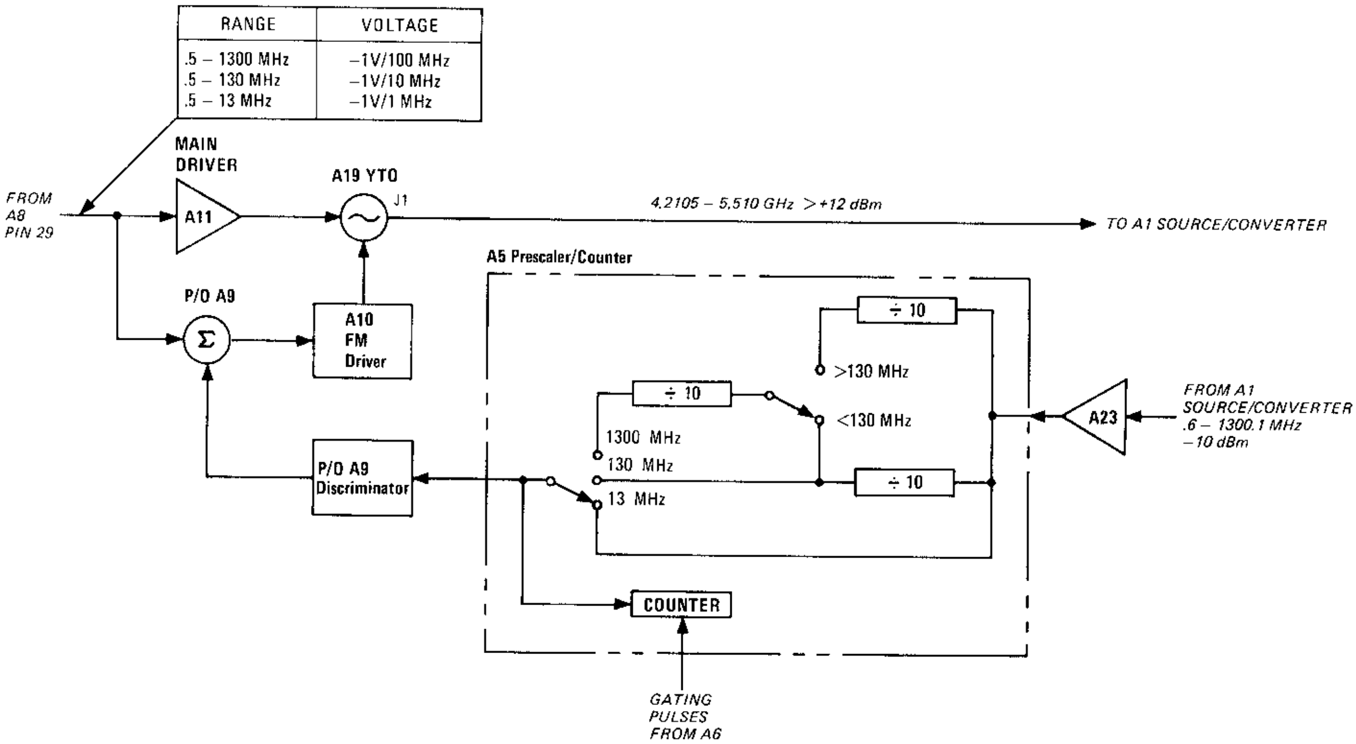


Figure C3-6. Closed Loop Operation Troubleshooting Block Diagram

C3-3. AFC TROUBLESHOOTING PROCEDURE (Cont'd)

Test Setup

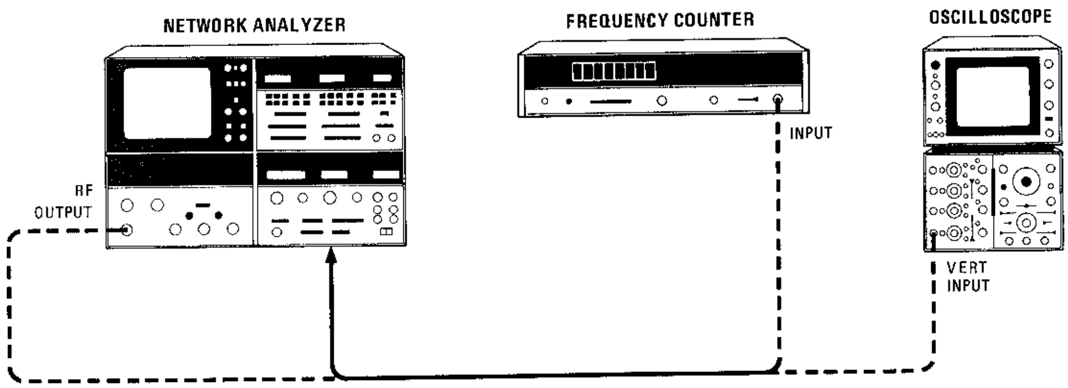


Figure C3-7. Closed Loop Operation Troubleshooting Test Setup

EQUIPMENT

Network Analyzer	HP 8505A
Frequency Counter	HP 5340A
Oscilloscope	HP 180C/1804A/1821A

CRITICAL 8505A SWITCH SETTINGS

RANGE	.5 — 1300 MHz
MODE	LIN EXPAND
WIDTH	CW±ΔF
CW FREQUENCY	As required
ΔF FREQUENCY	0 MHz
SCAN TIME SEC	.1 — .01
TRIGGER	AUTO

Fig C3-8A
Sheet 1 of 2

Connect equipment as shown in Figure C3-7.

RANGE . . . . .5 – 1300 MHz
MODE . . . . LIN EXPAND
WIDTH. . . . . .CW ±ΔF
ΔFrequency . . . . .0 MHz
CW Vernier . . . . .Fully Counterclockwise
ΔF Vernier. . . . . .Fully Counterclockwise

Tune CW FREQUENCY control from .5 MHz to 1300 MHz and ensure FREQ COUNTER display tracks the CW FREQUENCY display within ±5 MHz.

YES → A TO SHEET 2

NO →

RANGE: .5 – 1300 MHz.

Disconnect TRLO Input to A2A5J1.

Check FREQ COUNTER display for conditions below.

CW FREQUENCY	SCAN TIME SEC	FREQ COUNTER	OVERFLOW
>100 MHz	.1 – .01	≈1100 MHz	OFF
<100 MHz	.1 – .01	0000 MHz	OFF
<100 MHz	1 – .1	999.9	ON
<100 MHz	10 – 1	99.99	ON

Connect TRLO input to A2A5J1.

NO →

YES ↓

SIGNAL: TRLO
TEST POINT: W12(A2A5J1)
FREQUENCY: 100 kHz greater than signal at A1J1 RF OUT.
POWER IN: +10 dBm

NO →

YES ↓

Trouble is in A2A5 Prescaler/Counter on its control inputs. Refer to Figure C3-29 for further troubleshooting.

Fig C3-8A
Sht 2 of 2

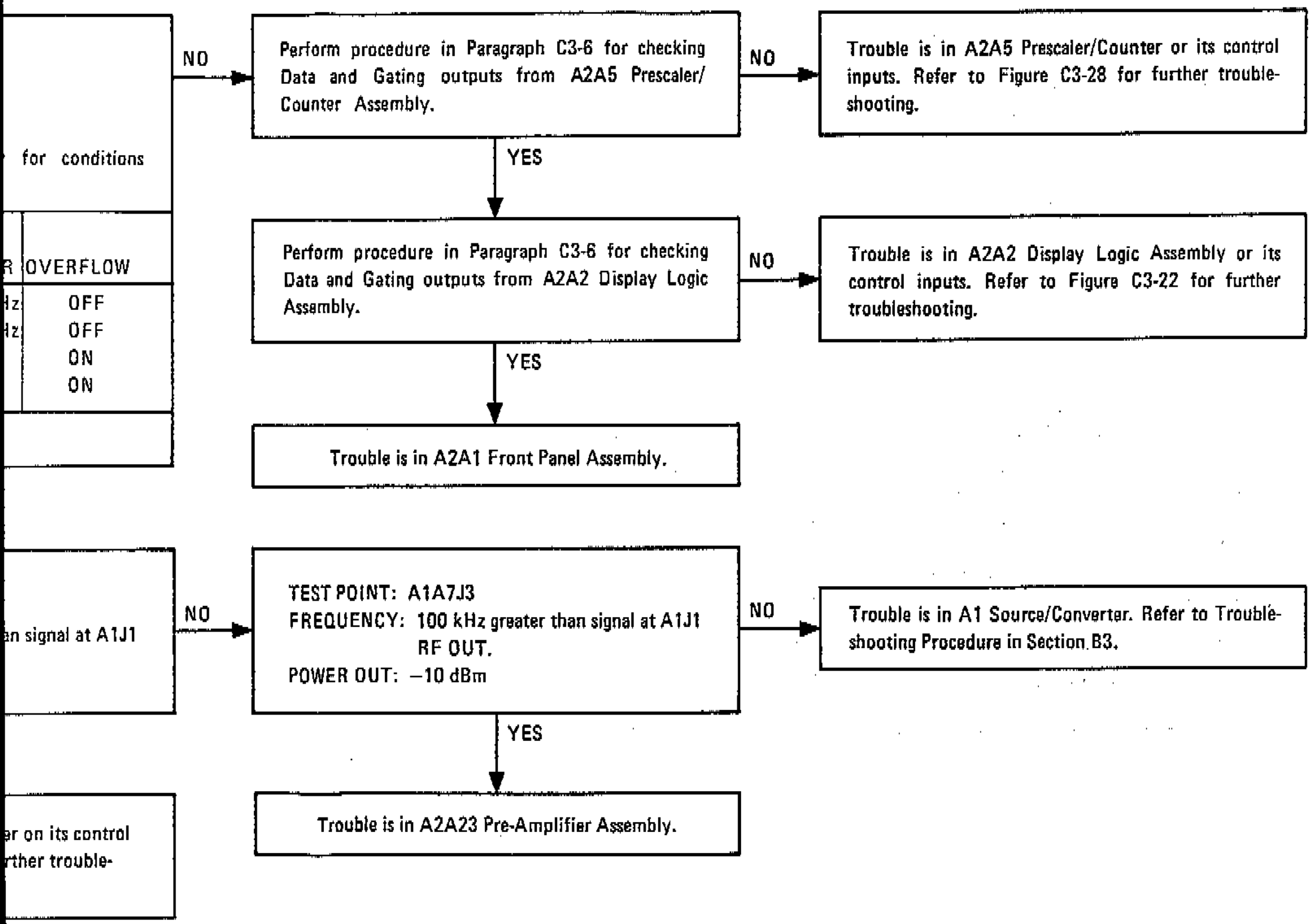


Figure C3-8. AFC Troubleshooting Procedure (1 of 2)

Fig C3-8B
Sht 1 of 4

FROM SHEET 1

A

RANGE . . . . .5 – 13 MHz
MODE . . . . LIN EXPAND
WIDTH. . . . . .CW ±ΔF
ΔF Frequency. . . . . .0 MHz
CW Vernier . . . . .Fully Counterclockwise
ΔF Vernier. . . . . .Fully Counterclockwise

Tune CW FREQUENCY control from .5 MHz to 13 MHz and ensure FREQ COUNTER display tracks the CW FREQUENCY display within .05 MHz.

NO

YES

RANGE . . . . .5 – 130 MHz
MODE . . . . LINE EXPAND
WIDTH. . . . . .CW ±ΔF
ΔF Frequency. . . . . .0 MHz
CW Vernier . . . . .Fully Counterclockwise
ΔF Vernier. . . . . .Fully Counterclockwise

Tune CW FREQUENCY control from .5 MHz to 130 MHz and ensure FREQ COUNTER display tracks the CW FREQUENCY display within .5 MHz.

NO

Test Points TRLO: A3A23J2
PTLO: A2A5J2

Check PTLO and TRLO Frequencies and ensure the following relationship:

PTLO = TRLO÷10

NO

Trouble is in
inputs. Refer
shooting.

YES

Test Point . . . . A2A11 pin 29

DC Voltage is ≈–32 V and changes 0.2 V when CW frequency is tuned from .5 to 130 MHz.

NO

Trouble is in
control inputs.
troubleshooting

YES

Trouble is in A2A9 Discriminator Assembly or its control inputs. Refer to Figure C3-36 for further troubleshooting.

Fig C3-8B
Sht 2 of 4

Check if A2A9 Discriminator NO LOCK Inidcator is lit.

NO → Trouble is i
Figure C3-3

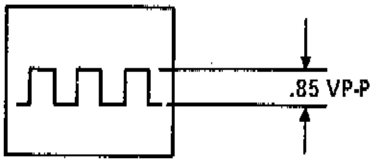
YES

RANGE . . . . .5 – 13 MHz
Disconnect PTLO input to A2A9J1 and ensure FREQ COUNTER display is searching.

NO

YES

Reconnect PTLO input to A2A9J1.
Test Point: A2A9J1
Frequency: 100 kHz greater than signal at A1J1 RF OUT.



NO → Trouble is
inputs. Ref
shooting.

YES

Trouble is in A2A9 Discriminator Assembly or its control inputs. Refer to Figure C3-36 for further troubleshooting.

NO → Trouble is in A2A5 Prescaler/Counter or its control inputs. Refer to Figure C3-28 for further trouble-shooting.

NO → Trouble is in A2A11 Main Driver Assembly or its control inputs. Refer to Figure C3-40 for further troubleshooting.

Fig C3-8B
Sht 3 of 4

K Inidcator

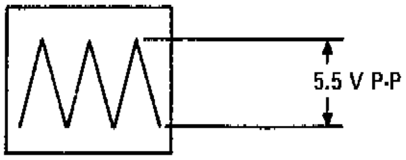
NO

Trouble is in A2A9 Discriminator Assembly. Refer to Figure C3-36 for further troubleshooting.

.5 – 13 MHz
ensure FREQ

NO

Test Point A2A10TP1
PTLO input to A2A9J1 disconnected.



NO

YES

at A1J1

NO

Trouble is in A2A5 Prescaler/Counter or its control inputs. Refer to Figure C3-28 for further troubleshooting.

Test Point A2A23J2
PTLO input to A2A9J1 disconnected TRLO frequency is searching.

NO

YES

embly or its
for further

Trouble is in A2A5 Prescaler/Counter or its control inputs. Refer to Figure C3-28 for further troubleshooting.

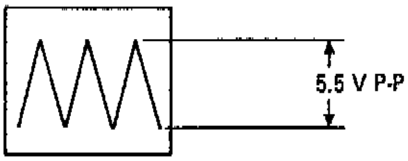
Fig C3-8B
Sht 4 of 4

. . A2A10TP1

P-P

NO

Test Point A2A10TP2
PTLO input to A2A9J1 disconnected.



NO

Trouble is in A2A9 Discriminator or its control inputs. Refer to Figure C3-36 for further troubleshooting.

YES

Trouble is in A2A10 FM Driver. Refer to Figure C3-38 for further troubleshooting.

. . A2A23J2
d TRLO freq-

NO

Trouble is in A2A19 YIG Tuned Oscillator.

r or its control
further trouble-

Figure C3-8. AFC Troubleshooting Procedure (2 of 2)

C3-4. LIN EXPAND MODE TROUBLESHOOTING PROCEDURE

DESCRIPTION

This troubleshooting procedure locates problems that occur during the LIN EXPAND mode of operation. The trouble is first isolated to the analog or digital circuitry, then the faulty assembly is located. Critical test points in the troubleshooting block diagram are designated with a letter which corresponds with the same test point on the troubleshooting tree. If a signal at a particular test point is known to be incorrect, the troubleshooting tree procedure may be started at that point.

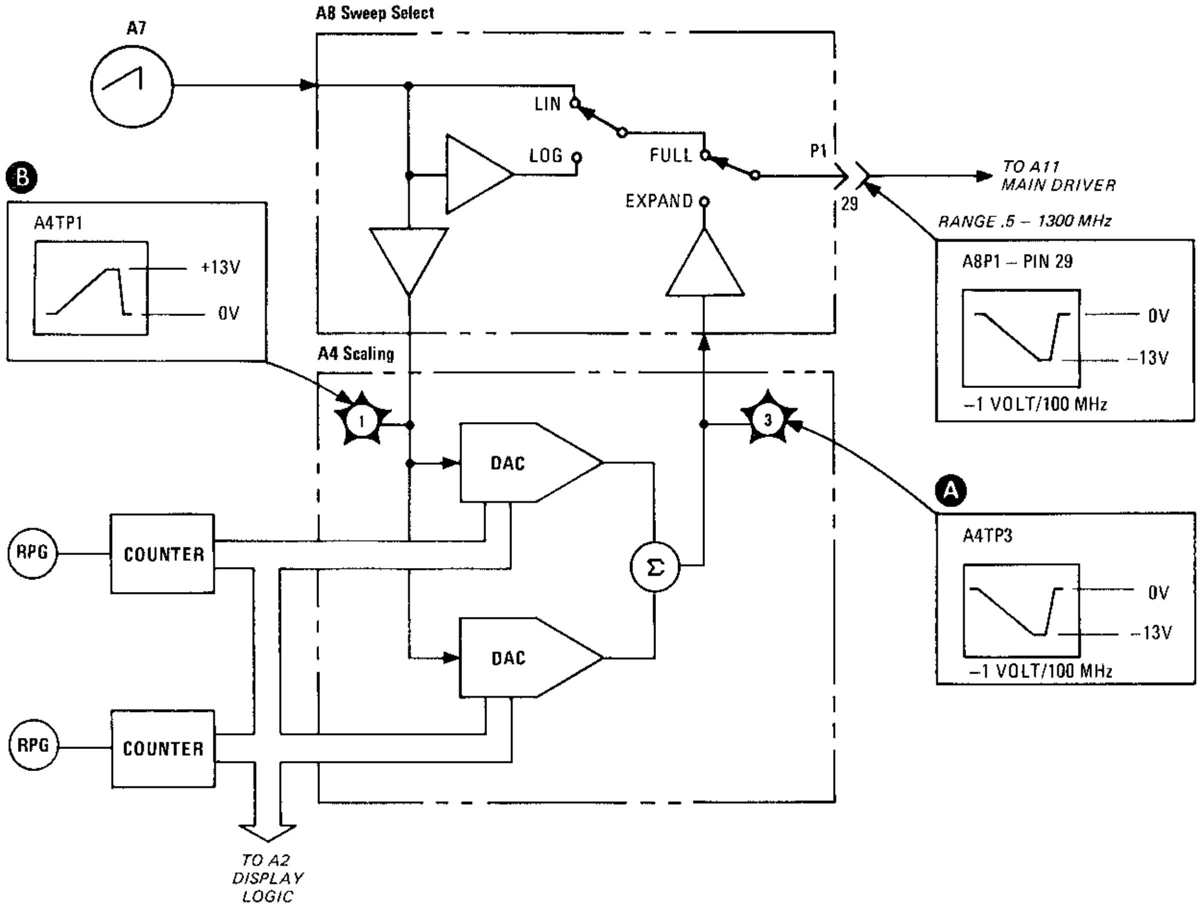


Figure C3-9. LIN EXPAND MODE Troubleshooting Block Diagram

C3-4. LIN EXPAND MODE TROUBLESHOOTING PROCEDURE (Cont'd)

Test Setup

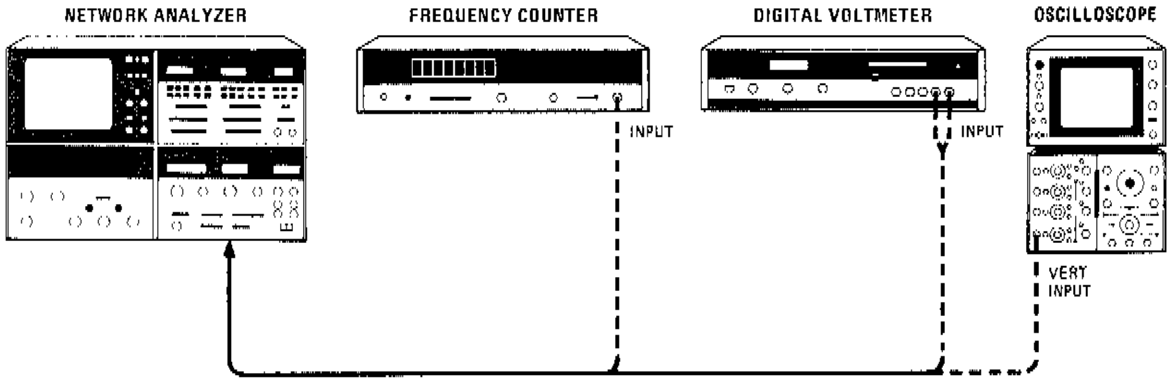


Figure C3-10. LIN EXPAND MODE Troubleshooting Test Setup

EQUIPMENT:

Network Analyzer	HP 8505A
Frequency Counter	HP 5340A
Digital Voltmeter	HP 3490A
Oscilloscope	HP 180C/1804A/1821A

CRITICAL 8505A SWITCH SETTINGS

RANGE	.5 — 1300 MHz
MODE	LIN EXPAND
WIDTH	START/STOP 1
START FREQUENCY	As required
STOP FREQUENCY	As required
SCAN TIME SEC	.1 — .01
TRIGGER	AUTO

Fig C3-11
Sht 1 of 3

Connect equipment as shown in Figure C3-10 and set 8505A LINE switch to ON. Check front panel LED displays read as follows:

START FREQUENCY . . . . 800 MHz
STOP FREQUENCY . . . . 1000 MHz

Tune START FREQUENCY control from 0 MHz to 1300 MHz and ensure LED display covers full range and counts consecutively.

Tune STOP FREQUENCY control from 0 MHz to 1300 MHz and ensure LED display covers full range and counts consecutively.

INITIAL LED DISPLAY INCORRECT

LED DISPLAY INCORRECT WHEN TUNING FREQUENCY

Refer to procedure in Paragraph C3-6 and check
Line inputs to A2A2 Display Logic Assembly.
Data Line information agree with LED Disp

YES

YES

(LED D
WHEN

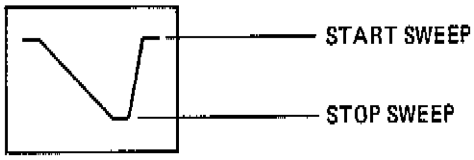
(INITIAL LED DISPLAY INCORRECT)

Trouble is in A2A3 Memory Assembly or its c
inputs. Refer to Figure C3-24 for further tr
shooting.

YES

Connect oscilloscope to A2A4TP3 and check sweep endpoints for WIDTH switch positions and FREQUENCY settings as shown below.

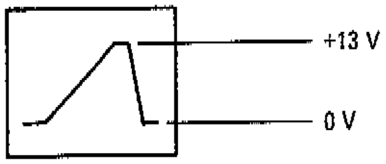
Width	Frequency Settings		Start Sweep	Stop Sweep
	START/CW	STOP/±ΔF		
START/STOP	800 MHz	1000 MHz	−8 Vdc	−10 Vdc
CW ±ΔF	500 MHz	100 MHz	−4 Vdc	−6 Vdc
CW	500 MHz	———	−5 Vdc	−5 Vdc



NO

TEST POINT

A2A



YES

Refer to procedure in Paragraph C3-6 and check
Line inputs to A2A2 Display Logic Assembly.
Data Line information agree with LED Dis

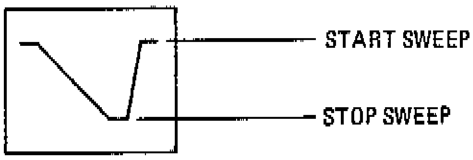
YES

Trouble is in A2A4 Scaling Assembly or its c
inputs. Refer to Figure C3-26 for further t
shooting.

YES

Connect oscilloscope to A2A8 pin 29 and check sweep endpoints for WIDTH switch positions and FREQUENCY settings as shown below.

Width	Frequency Settings		Start Sweep	Stop Sweep
	START/CW	STOP/±ΔF		
START/STOP	800 MHz	1000 MHz	−8 Vdc	−10 Vdc
CW ±ΔF	500 MHz	100 MHz	−4 Vdc	−6 Vdc
CW	500 MHz	———	−5 Vdc	−5 Vdc



NO

Trouble is in A2A8 Sweep Select Assembly
control inputs. Refer to Figure C3-34 for
Troubleshooting.

Fig C3-4
Sht 2 of 3

ISPLAY INCORRECT

Refer to procedure in Paragraph C3-6 and check Data Line inputs to A2A2 Display Logic Assembly. Does Data Line information agree with LED Displays?

NO

Re
Li
Da

YES

(INITIAL LED DISPLAY INCORRECT)

NCORRECT
FREQUENCY

Trouble is in A2A3 Memory Assembly or its control inputs. Refer to Figure C3-24 for further troubleshooting.

YES

(LED DISPLAY INCORRECT WHEN TUNING FREQUENCY)

Check each Test Point for +5 Volt pulses when tuning designated FREQUENCY control.

FREQUENCY CONTROL	SIGNAL	TEST POINT
START/CW	RPG1A	A2A3 pin 15
START/CW	RPG1B	A2A3 pin 17
STOP/±ΔF	RPG2A	A2A3 pin 27
STOP/±ΔF	RPG2B	A2A3 pin 28

NO

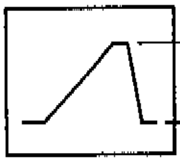
T

T
co
tr

YES

Trouble is in A2A3 Memory Assembly or its control inputs. Refer to Figure C3-24 for further troubleshooting.

TEST POINT A2A4TP1



+13 V

0 V

NO

Trouble is in A2A8 Sweep Select Assembly or its control inputs. Refer to Figure C3-34 for further troubleshooting.

YES

Refer to procedure in Paragraph C3-6 and check Data Line inputs to A2A2 Display Logic Assembly. Does Data Line information agree with LED Displays.

NO

Refer to procedure in Paragraph C3-6 and check Data Line inputs to A2A1 Front Panel Assembly. Does Data Line information agree with LED Displays?

NO

YES

Trouble is in A2A4 Scaling Assembly or its control inputs. Refer to Figure C3-26 for further troubleshooting.

YES

Trouble is in A2A2 Display Logic Assembly or its control inputs. Refer to Figure C3-22 for further troubleshooting.

Trouble is in A2A8 Sweep Select Assembly or its control inputs. Refer to Figure C3-34 for further Troubleshooting.

FigC3-11
Sht 3of3

Refer to procedure in Paragraph C3-6 and check Data Line inputs to A2A1 Front Panel Assembly. Does Data Line information agree with LED Displays?

NO → Trouble is in A2A1 Front Panel Assembly. Refer to Figure C3-20 for further troubleshooting.

YES → Trouble is in A2A2 Display Logic Assembly or its control inputs. Refer to Figure C3-22 for further troubleshooting.

t pulses when tuning

AL	TEST POINT
1A	A2A3 pin 15
1B	A2A3 pin 17
2A	A2A3 pin 27
2B	A2A3 pin 28

NO → Trouble is in respective Rotory Pulse Generator.

embly or its control
for further trouble-

ect Assembly or its
C3-34 for further

C3-6 and check Data
nel Assembly. Does
ith LED Displays?

NO → Trouble is in A2A1 Front Panel Assembly. Refer to Figure C3-20 for further troubleshooting.

gic Assembly or its
C3-22 for further

Figure C3-11. Lin Expand Mode Troubleshooting Procedure

C3-5. MARKER OPERATION TROUBLESHOOTING PROCEDURE

DESCRIPTION

This troubleshooting procedure locates problems that affect marker generation and accuracy. The trouble is first isolated to the analog or digital circuitry involved, then the faulty assembly is located. Critical test points in the troubleshooting block diagram are designated with a letter which corresponds with the same test point on the troubleshooting tree. If a signal at a particular test point is known to be incorrect, the troubleshooting tree procedure may be started at that point.

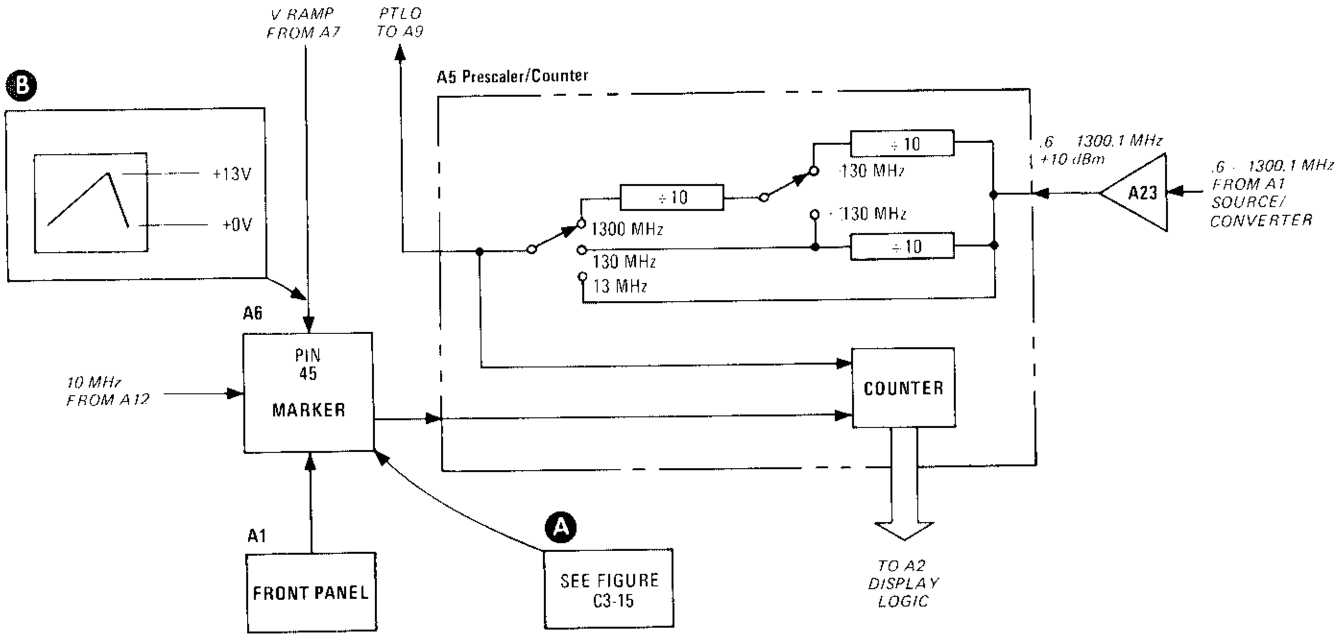


Figure C3-12. Marker Operation Troubleshooting Block Diagram

C3-5. MARKER OPERATION TROUBLESHOOTING PROCEDURE (Cont'd)

Test Setup

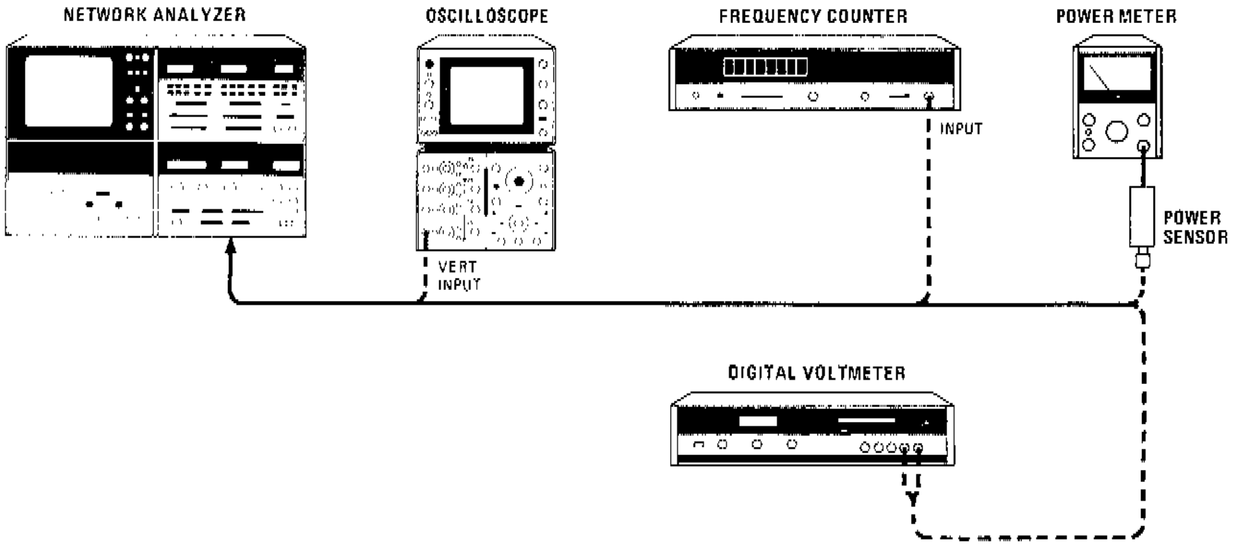


Figure C3-13. Marker Operation Troubleshooting Test Setup

EQUIPMENT:

Network Analyzer	HP 8505A
Oscilloscope	HP 180C/1804A/1821A
Frequency Counter	HP 5340A
Power Meter	HP 435A
Power Sensor	HP 8482A
Digital Voltmeter	HP 3490A

CRITICAL 8505A SWITCH SETTINGS:

RANGE	.5 — 1300 MHz
MODE	LIN EXPAND
WIDTH	CW±ΔF
CW FREQUENCY	As required
ΔF FREQUENCY	130 MHz
SCAN TIME SEC	.1 — .01
TRIGGER	AUTO
MARKERS Switch	1
MARKERS position controls (1—5)	Midrange

Fig C3-14
Cut 108 4

Connect equipment as shown in Figure C3-13.

Step MARKERS selection switch through positions 1 to 5 and check CRT dsiplay for the following:

a. Quantity of Markers displayed corresponds to MARKERS selection switch position.

b. Marker selected is displayed above the trace and adjusted with corresponding MARKERS Position control.

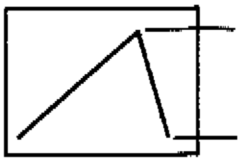
c. Marker can be adjusted over full length of CRT trace.

NO

YES

B

SIGNAL . . . . V RAMP
TEST POINT . . . . A2A6 pin 45



NO

Troub
input
shoot

YES

Check for each Marker that Marker Position (MP) can be adjusted through full range (.1 to −13.5V) by corresponding Marker Position control and Marker Select (MS1-3) is correct.

MARKER	MP (+0.1 to −13.5V)	MS1 A2A6 pin 4	MS2 A2A6 pin 3	MS3 A2A6 pin 2
1	A2A6 pin 43	+5 V	+5 V	+5 V
2	A2A6 pin 24	+5 V	0 V	+5 V
3	A2A6 pin 49	0 V	0 V	+5 V
4	A2A6 pin 23	+5 V	+5 V	0 V
5	A2A6 pin 50	0 V	+5 V	0 V

NO

Troub
Figur

MARKERS switch 5
Adjust MARKERS position controls to display Markers 1 thru 5 on CRT Display consecutively from left to right.

Step MARKERS switch from position 5 to 1 and ensure FREQ COUNTER reads a lower frequency with each step.

NO

YES

YES

Perform procedure in Figure C3-15 for checking Data Marker (DM) output form A2A6 Marker Assembly.

NO

Troub
input
shoot

YES

Trouble is in A3 Signal Processor. Refer to Troubleshooting Procedure in Section D3.

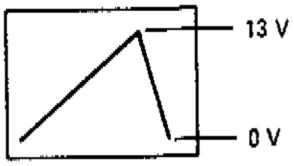
ΔF Frequency. .0 MHz
Check for each MARKERS switch position that the FREQ COUNTER and CW FREQUENCY displays correspond within 5 MHz.

NO

Fig C3-14
Cut 2084

B

SIGNAL . . . . V RAMP
TEST POINT . . . . A2A6 pin 45



NO → Trouble is in A2A7 Sweep Generator or its control inputs. Refer to Figure C3-32 for further troubleshooting.

YES ↓

Check for each Marker that Marker Position (MP) can be adjusted through full range (.1 to −13.5V) by corresponding Marker Position control and Marker Select (MS1-3) is correct.

MARKER	MP (+0.1 to −13.5V)	MS1 A2A6 pin 4	MS2 A2A6 pin 3	MS3 A2A6 pin 2
1	A2A6 pin 43	+5 V	+5 V	+5 V
2	A2A6 pin 24	+5 V	0 V	+5 V
3	A2A6 pin 49	0 V	0 V	+5 V
4	A2A6 pin 23	+5 V	+5 V	0 V
5	A2A6 pin 50	0 V	+5 V	0 V

NO → Trouble is in A2A1 Front Panel Assembly. Refer to Figure C3-20 for further troubleshooting.

YES ↓

Perform procedure in Figure C3-15 for checking Data Marker (DM) output form A2A6 Marker Assembly.

NO → Trouble is in A2A6 Marker Assembly or its control inputs. Refer to Figure C3-30 for further troubleshooting.

YES ↓

Trouble is in A3 Signal Processor. Refer to Troubleshooting Procedure in Section D3.

O

O

NO

A

Perform proce
Marker Assem
Prescaler/Cou

Perform pro
Data and Ga
bly.

Perform pr
Data and C
Assembly.

Trouble is
Figure C3-2

Fig C3-14
Cut 3 of 4

r or its control
further trouble-

A

Perform procedure in Figure C3-15 for checking A2A6 Marker Assembly outputs to the counter in A2A5 Prescaler/Counter Assembly.

NO

TEST POINT A2A6J1
FREQUENCY. . . . . .10 MHz
POWER IN. . . . . .0 dBm

NO

YES

Trouble is in A2A6 Marker Assembly or its control inputs. Refer to Figure C3-30 for further troubleshooting.

YES

sembly. Refer to
ting.

Perform procedure in Paragraph C3-6 for checking Data and Gating inputs to A2A2 Display Logic Assembly.

NO

SIGNAL: TRLO
TEST POINT: W12(A2A5J1)
FREQUENCY: 100 kHz greater than signal at A1J1 RF OUT.
POWER IN: +10 dBm

NO

YES

Trouble is in A2A5 Prescaler/Counter or its control inputs. Refer to Figure C3-28 for further troubleshooting.

YES

ly or its control
further trouble-

Perform procedure in Paragraph C3-6 for checking Data and Gating outputs from A2A2 Display Logic Assembly.

NO

Trouble is in A2A2 Display Logic Assembly or its control inputs. Refer to Figure C3-22 for further troubleshooting.

YES

Trouble is in A2A1 Front Panel Assembly. Refer to Figure C3-20 for further troubleshooting.

Fig C3-14
Sht 4 of 4

. . . .A2A6J1
. . . . 10 MHz
. . . . .0 dBm

NO

Trouble is in A2A12 10/–100 MHz Reference Oscillator. Refer to Figure C3-42 for further troubleshooting.

or its control
rther trouble-

ignal at A1J1

NO

TEST POINT: A1A7J3
FREQUENCY: .100 kHz greater than signal at A1J1 RF OUT
POWER OUT: –10 dBm

NO

Trouble is in A1 Source/Converter. Refer to Troubleshooting Procedure in Section B3.

YES

Trouble is in A2A23 Preamplifier Assembly.

or its control
rther trouble-

bly or its con-
rther trouble-

Figure C3-14. Marker Operation Troubleshooting Procedure

C3-5. MARKER OPERATION TROUBLESHOOTING PROCEDURE (Cont'd)

8505A Control Settings:

RANGE	.5 — 1300 MHz
MODE	LIN EXPAND
WIDTH	CW±ΔF
CW FREQUENCY	1248 MHz
ΔF FREQUENCY	0 MHz
SCAN TIME SEC	.1 — .01
TRIGGER	AUTO
MARKERS SELECT	1
MARKERS POSITION	Centered

Oscilloscope Control Settings:

VOLT/DIV	.5
SWEEP MODE	NORM
TIME/DIV	As required
TRIGGER	EXT
SLOPE	+
EXT INPUT Coupling	DC
TRIGGER LEVEL	As required

Connect V RAMP (A2A6-45) to oscilloscope EXT INPUT.
Adjust MARKERS Position 1 control for display shown below.

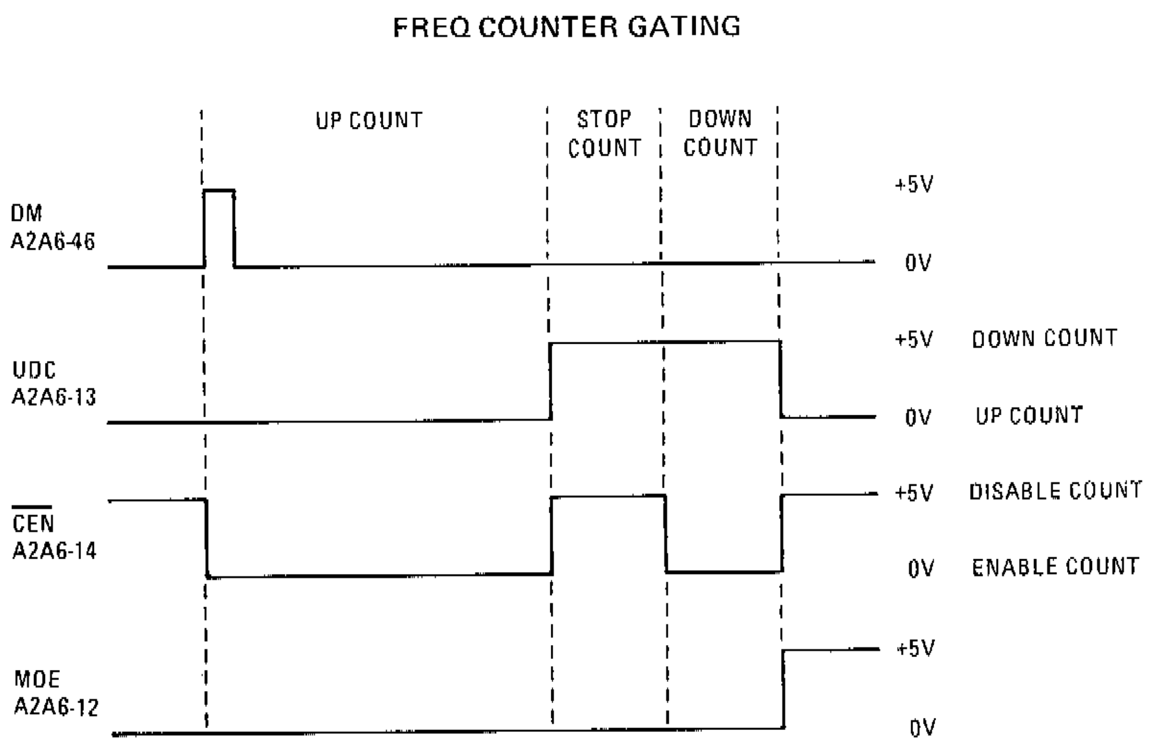


Figure C3-15. FREQ COUNTER Gating Pulses Timing Diagram

C3-6. DATA LINE TROUBLESHOOTING PROCEDURE

DESCRIPTION:

This procedure provides a method for identifying and analyzing digital information that is multiplexed on a data line. Timing diagrams are given which show the relationship in time of the gating pulses, data information and LED Display on the front panel affected by the data information. A gating pulse is selected for each timing diagram to externally trigger the oscilloscope to synchronize the data information with the oscilloscope sweep. The oscilloscope display is then divided into sections corresponding to the time intervals during which data information is fed to individual LEDs on the front panel display. The data information is displayed and, for each LED's time interval, the sum of the high pulses on the data lines (expressed as decimal equivalents) should equal the digit displayed on the LED.

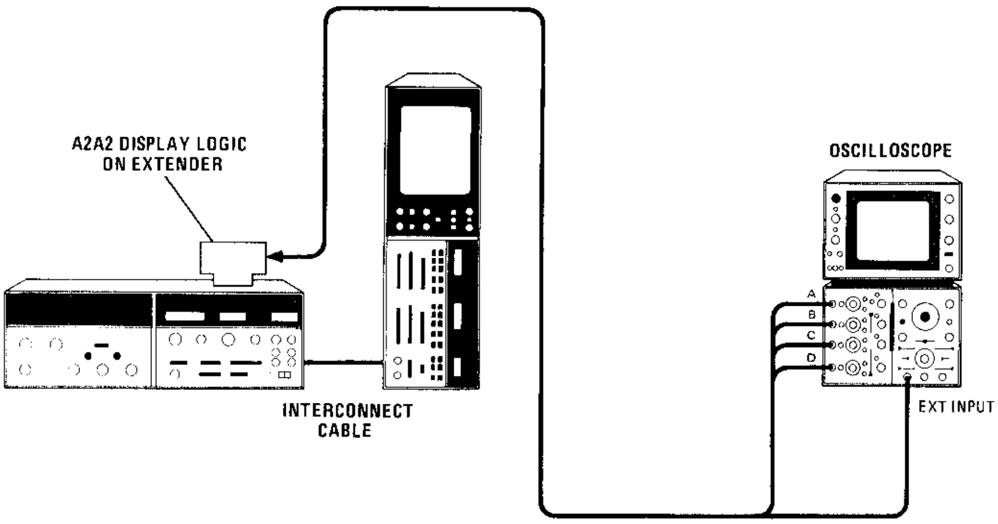


Figure C3-16. Data Line Troubleshooting Test Setup

EQUIPMENT:

Network Analyzer . . . . HP 8505A
Oscilloscope . . . . HP 180C/1804A/1821A

C3-6. DATA LINE TROUBLESHOOTING PROCEDURE (Cont'd)

PROCEDURE:

a. Set 8505A and oscilloscope controls as designated for timing diagram being checked.

b. Connect signal designated as external trigger to the oscilloscope EXT INPUT and adjust TRIGGER LEVEL for a trace on the oscilloscope.

c. Connect gating signals to oscilloscope vertical inputs and divide the oscilloscope display into columns as shown by dotted lines on the timing diagram.

d. Connect data lines to oscilloscope vertical inputs. The Data Line pulses are shown for the LED Display given in the timing diagram. Note the timing relationship between the data pulses and the gating pulses displayed in step c.

e. Check that the data information and LED Display correspond as follows:

   1. Divide oscilloscope display into columns as shown by dotted line on timing diagram.

   2. Determine which data lines are ''high'' for each column convert each ''high'' to the corresponding decimal equivalent.

   3. The sum of the decimal equivalents for each column should equal the corresponding digit on the LED Display.

8505A Control Settings:

RANGE	.5 — 1300 MHz
MODE	LIN EXPAND
WIDTH	START/STOP 1
START FREQUENCY	963 MHz
STOP FREQUENCY	1248 MHz
SCAN TIME SEC	.1 — .01
TRIGGER	AUTO

Oscilloscope Control Settings:

VOLT/DIV	.5
SWEEP MODE	NORM
TIME/DIV	As required
TRIGGER	EXT
SLOPE	+
EXT INPUT Coupling	DC
TRIGGER LEVEL	As required

DATA AND GATING INPUTS TO A2A2 and A2A4

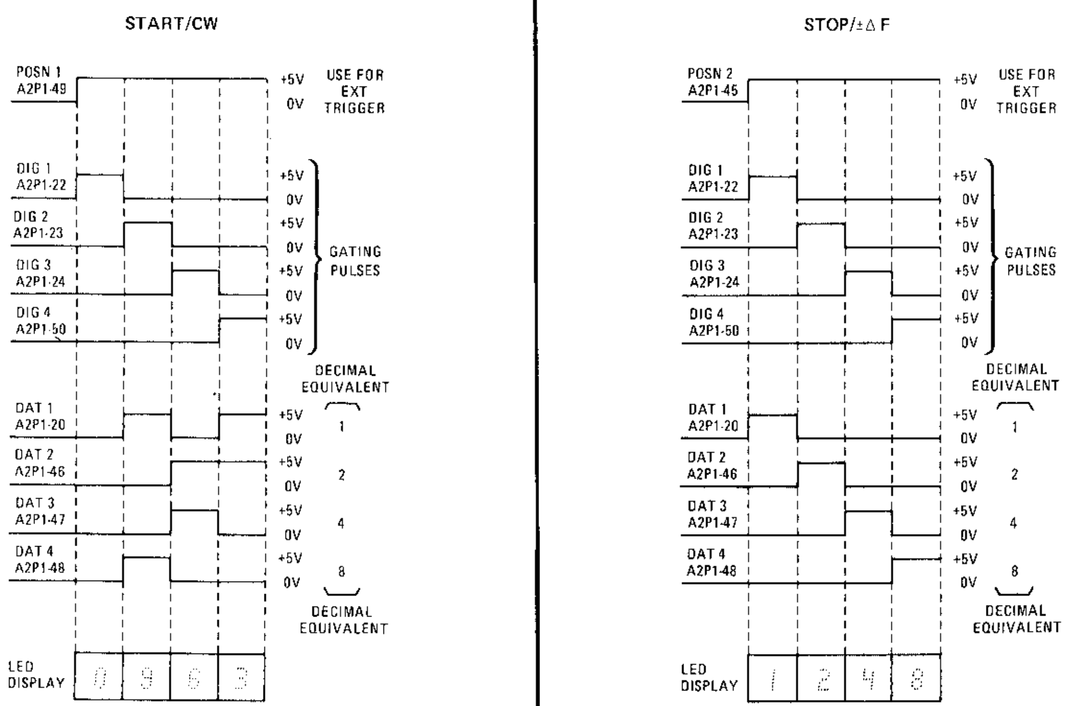


Figure C3-17. Data Line Timing Diagrams (1 of 5)

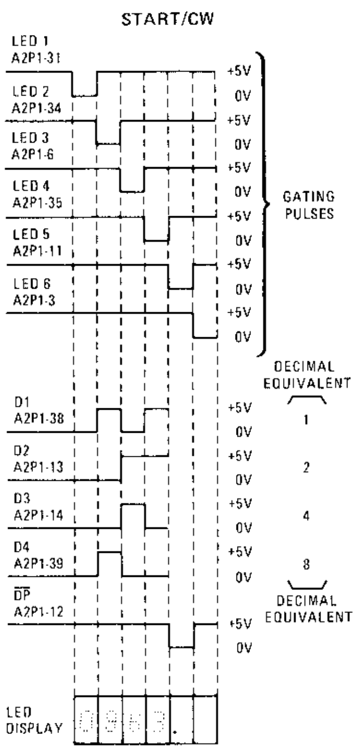
8505A Control Settings:

RANGE	.5 — 1300 MHz
MODE	LIN EXPAND
WIDTH	START/STOP 1
START FREQUENCY	963 MHz
STOP FREQUENCY	1248 MHz
SCAN TIME SEC	.1 — .01
TRIGGER	AUTO

Oscilloscope Control Settings:

VOLT/DIV	.5
SWEEP MODE	NORM
TIME/DIV	As required
TRIGGER	EXT
SLOPE	–
EXT INPUT Coupling	DC
TRIGGER LEVEL	As required

DATA AND GATING OUTPUTS FROM A2A2



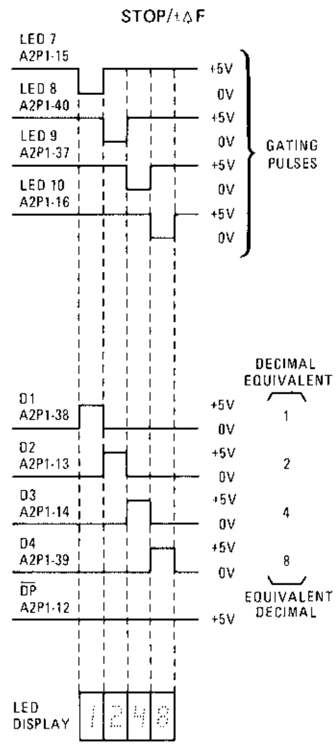


Figure C3-17. Data Line Timing Diagrams (2 of 5)

8505A Control Settings:

RANGE	.5 — 1300 MHz
MODE	LIN EXPAND
WIDTH	CW
CW FREQUENCY	1287.65 MHz
TRIGGER	AUTO

Oscilloscope Control Settings:

VOLT/DIV	.5
SWEEP MODE	NORM
TIME/DIV	As required
TRIGGER	EXT
SLOPE	+
EXT INPUT Coupling	DC
TRIGGER LEVEL	As required

DATA AND GATING INPUTS TO A2A2

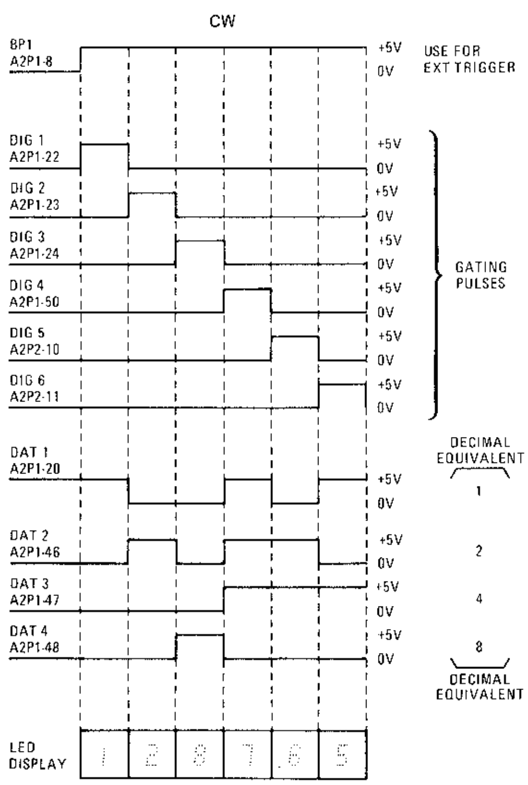


Figure C3-17. Data Line Timing Diagrams (3 of 5)

8505A Control settings:

- RANGE .... .5 — 1300 MHz
- MODE .... LIN EXPAND
- WIDTH .... CW±ΔF
- CW FREQUENCY .... 1248 MHz
- ΔF FREQUENCY .... 0 MHz
- SCAN TIME SEC .... .1 — .01
- TRIGGER .... AUTO
- MARKERS SELECT 1
- MARKERS POSITION .... Centered

Oscilloscope Control Settings:

- VOLT/DIV 5
- SWEEP MODE .... NORM
- TIME/DIV .... As required
- TRIGGER .... EXT
- SLOPE .... +
- EXT INPUT Coupling .... DC
- TRIGGER LEVEL .... As required

DATA AND GATING OUTPUTS FROM A2A5

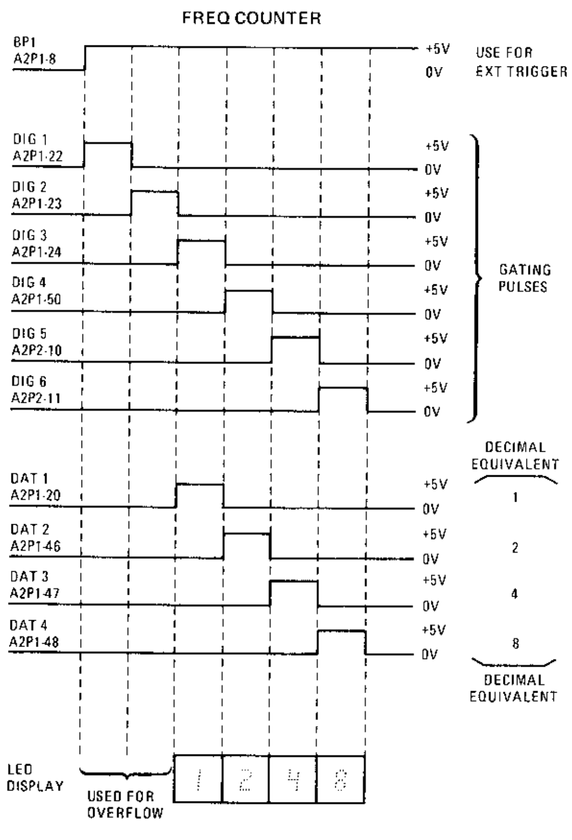


Figure C3-17. Data Line Timing Diagrams (4 of 5)

8505A Control Settings:

RANGE	.5 — 1300 MHz
MODE	LIN EXPAND
WIDTH	CW±ΔF
CW FREQUENCY	1248 MHz
ΔF FREQUENCY	0 MHz
SCAN TIME SEC	.1 — .01
TRIGGER	AUTO
MARKERS SELECT	1
MARKERS POSITION	Centered

Oscilloscope Control Settings:

VOLT/DIV	.5
SWEEP MODE	NORM
TIME/DIV	As required
TRIGGER	EXT
SLOPE	–
EXT INPUT Coupling	DC
TRIGGER LEVEL	As required

DATA AND GATING OUTPUTS FROM A2A2

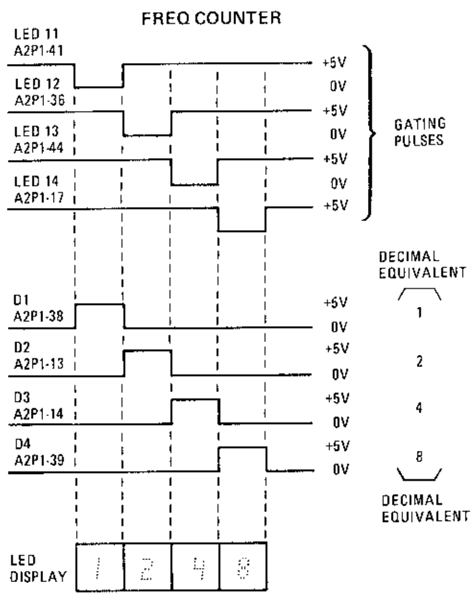


Figure C3-17. Data Line Timing Diagrams (5 of 5)

TABLE C3-1A
Sht 1/2

SIGNAL	SOURCE: LOCAL	SOURCE: REMOTE ***	DESCRIPTION	A2A1J1/A2A18J1 (TO FRONT PANEL)	A2A1J2/A2A18J2 (TO FRONT PANEL)	A2A2 DISPLAY LOGIC	A2A3 MEMORY	A2A4 SCALING	A2A5 PRESCALER/COUNTER	A2A6 MARKER	A2A7 SWEEP GEN	A2A8 SWEEP SELECT	A2A9 DISCRIMINATOR	A2A10 FM DRIVER	A2A11 MAIN DRIVER	A2A12 10/100 MHz REF	A2A13 SR STORE	A2A14 FR STO	
9.9L	A1A15A1		Phase-lock 9.9 MHz																
10L	A1A15A2		Phase-lock 10 MHz																
10 dB	A1A3U1A	A2A13-34	10 dB attenuation signal from I/O to Source/Converter.														34		
20 dB	A1A3U2A	A2A13-15	20 dB attenuation sginal from I/O to Source/Converter.														16		
40 dB	A1A3U3A	A2A13-17	40 dB attenuation signal from I/O to Source/Converter.														17		
10 MHz A	A2A12J2		10 MHz phase lock signal to Source/Converter. ≈+2 dBm.													J2			
10 MHz B	A2A12J3		10 MHz time base for counter on Marker board.							J1						J3			
10 MHz C	A2A12J4		Not used.													J4			
100 MHz	A2A12J1		100 MHz phase lock signal to Source/Converter. ≈+6 dBm.													J1			
+5VA	A2A20-2,17,9		+5 volts for Source/Converter and Frequency Control.				8,33	8,33	1,8 26,33	8,15 33,40	8,33	8,33	8,33	8,33	8,33	8,33			
+5VB	A2A20-3,18,22		+5 volts for LED's and lights.	31,32		A33											8,26	8,26	8,26
+5 BATT	A2A20-21		+5 volt battery. Stand-by for memory.				28												
+13V	A2A7-19,44		+13 volts reference voltage.					19,44	19,44		19,44	19,44	19,44						
+15V	A2A20-4,19		+15V Supply for Source/Converter and Probe Power.																
+20VA	A2A20-18		+20 volts for Frequency Control.				9,34	9,34	9,34	9,34	9,34	9,34	9,34	9,34	9,34	9,34	23	36	36
−10V	A3A21-2,17		−10 volts for Source/Converter and Frequency Control.				10,35	10,35	10,35	10,35	10,35	10,35	10,35	10,35	10,35	10,35	11,30	18	18
−12.6V	A2A21-10		−12.6V Supply for Probe Power.																
−13V	A2A7-21,26,46		−13 volts reference voltage.	3						42	21,26,46	21,46	21,46						
−18V	A2A21-7		−18 volts for Source/Converter and Frequency Control.				7,32	7,32	7,32	7,32	7,32	7,32	7,32	7,32	7,32	7,32			
−40V	A2A21-14,29		−40 volts for Frequency Control.								25,50				25,50	25,50			
AF2 A2	A2A15-6		Controls Algorithmic Flip-Flop 2 (ASM 2) flags for A2. Ø = load FF with new data.																6
AM	A2J5		AM Input. Source of external amplitude modulation.																
AN L4	A2A2-A18		REMOTE; Annunciator, light 4. 1 = light ON.		25	A18													
BP1	A2A7-37		Blanking Pulse 1 from Waveform Generator. 1 = trace blanked.			A8				36	37	12	14						
BP2	A2A9-41		Blanking Pulse 2 from Discriminator to Exponent. 1 = trace blanked.									41	41						
BP3	A2A8-50		Blanking Pulse 3 from Sweep Select to Processor. 1 = trace blanked.									50							
+ CAP	A2A11-28		Filter capacitor positive terminal, Main Driver.												28				
− CAP	A2A11-1		Filter Capacitor negative terminal, Main Driver.												1				
CON 1 A2	A2A15-3		Algorithmic State Machine Control Line 1.														3	3	3
CON 2 A2	A2A15-20		Algorithmic State Machine Control Line 2.														20	20	20
CON 3 A2	A2A15-22		Algorithmic State Machine Control Line 3.														22	22	22
CON 4 A2	Not Used		Not Used														13	15,33	15,3
D1	A2A2-A38		X1 Data for LED's. D1 = 1 for No. "1" if D2,3,4 = Ø.		2	A38													
D2	A2A2-A13		X2 Data for LED's. D2 = 1 for No. "2" if D1,3,4 = Ø.		3	A13													
D3	A2A2-A14		X4 Data for LED's. D3 = 1 for No. "4" if D1,2,4 = Ø.		4	A14													
D4	A2A2-A39		X8 Data for LED's. D4 = 1 for No. "8" if D1,2,3 = Ø.		6	A39													
DAT 1*	A2A3-39	A2A14-10	Data 1 for instrument, I/O. DAT 1 = 1 for "1" if DAT 2, 3, 4 = Ø.			A20	39	39	14									10	
DAT 2*	A2A3-16	A2A14-27	Data 2 for instrument, I/O. DAT 2 = 1 for "2" if DAT 1, 3, 4 = Ø.			A46	16	17	42									27	
DAT 3*	A2A3-43	A2A14-25	Data 4 for instrument, I/O. DAT 3 = 1 for "4" if DAT 1,2,4 = Ø.			A47	43	43	18									25	
DAT 4*	A2A3-20	A2A14-24	Data 8 for instrument, I/O. DAT 4 = 1 for "8" if DAT 1,2,3 = Ø.			A48	20	45	20									24	
DBP	A2A8-47	A2A8-47	Display Blanking Pulse. 1 = display blanking.									47							
DEP 1	A2A2-A21		Decimal Point 1 information, Logic to Prescaler Counter.			A21			15										
DEP 2	A2A2-A25		Decimal Point 2 information, Logic to Prescaler Counter. See Truth Table, A2A2 Schematic.			A25		47	22										
DEP 3	A2A2-B3		Decimal Point 3 information, Logic to Prescaler Counter. See Truth Table, A2A2 Schematic.			B3			49										
DIG 1	A2A2-A22		Digit 1 data transfer. 1 = data transfer.			A22	42	42	17										
DIG 2	A2A2-A23		Digit 2 data transfer. 1 = data transfer.			A23	44	20	43										
DIG 3	A2A2-A24		Digit 3 data transfer. 1 = data transfer.			A24	46	21	21										
DIG 4	A2A2-A50		Digit 4 data transfer. 1 = data transfer.			A50	48	48	23										
DIG 5	A2A2-B10		Digit 5 data transfer. 1 = data transfer.			B10	25		48										
DIG 6	A2A2-B11		Digit 6 data transfer. 1 = data transfer.			B11	21		47										
DM	A2A6-22		Data Marker to Signal Processor. 1 = display Marker and measure; DM stays "1" if counter counts.							22									
EXT	A2J6		External trigger voltage; triggers on positive edge.								36								
+F CAL	A2A11-24		+ Frequency Calibration, front panel to Main Driver (ground).												24 (GND)				
−F CAL	A2A11-49		−Frequency Calibration, Front Panel to Main Driver.												49				
+FM	A2A10-26		+ FM coil terminal. ± 4V.											26					
−FM	A2A10-1		−FM coil terminal (ground).											1					
FMP	A2A8-22		Full Marker Pulse. 1 = TRUE							41		22							
FR1	A2A1A1U3A	A2A13-25	Frequency Range 1. FR1 = Ø when .5 – 1300 MHz range is selected.	5		A1			2			1	1		38		25		
FR2	A2A1A1U3B	A2A13-7	Frequency Range 2. FR2 = Ø when .5 – 13 MHz range is selected.	6		A26			27			26	26		37		7		
GND A (GND)	A2A22TB1-1		Common ground plane				5,30	5,30	4,5,6 25,29 30,50	5,17 19,30 44	5,14 30,38 40	3-5,13 15,17, 20,28,30 38,40,42	3,5,28 29,30,	3,4,5 28,29, 30	3,5,30	1-5,11-24,26-31, 40-49	5	5,23	5,2
GND B (COM B)	A2A22TB1-10		Return for LED's and lights.	12,33,44			5												

*When POSN 3 = 1, SOURCE is A2A5 **Coax ***If no entry, Source is same as in LOCAL.

TABLE C3-1A
Sht 2 of 2

A2A4 SCALING	A2A5 PRESCALER/COUNTER	A2A6 MARKER	A2A7 SWEEP GEN	A2A8 SWEEP SELECT	A2A9 DISCRIMINATOR	A2A10 FR DRIVER	A2A11 MAIN DRIVER	A2A12 10/100 MHz REF	A2A13 SR STORE	A2A14 FR STORE	A2A15 I/O CONTR	A2A16 HP-IB BUFFER	A2A17 CHAR I/O	A2A20 POS VOLTAGE REG	A2A21 NEG VOLTAGE REG	COAX CABLE CONNECTORS (A2A18)	A2A18J9 (TO YIG)	A2A18J10 (TO SOURCE/CONVERTER)	A2A18J11 (TO REAR PANEL)	A2J2 (TO SOURCE/CONVERTER) PIN	WIRE COLOR	A2J3 (TO SOURCE/CONVERTER) PIN	WIRE COLOR	A2J4 SIG. PROC. INTER-CONN PIN	WIRE COLOR	A2J5 AM INPUT	A2J6 EXT TRIGGER	A2A18TB1/A2A22TB1
												17						10		13	Orn							
												18						6		12	Red							
									34									1		2	Red							
									15									15		3	Orn							
									17									2		4	Yel							
								J2												A6	Blu**							
		J1						J3																				
								J4																				
								J1												A7	Vio**							
8,33	1,8 26,33	8,15 33,40	8,33	8,33	8,33	8,33	8,33	8,33						2,17,9														5
									8,26	8,26	8,26	8,26	8,26	3,18,22								3	Wht					7
														20														9
19,44	19,44		19,44	19,44	19,44																							
														4,19								7,10	Wht					
9,34	9,34	9,34	9,34	9,34	9,34	9,34	9,34	9,34	23	36	36		16,34	1,16			3					1,2	Wht					4
10,35	10,35	10,35	10,35	10,35	10,35	10,35	10,35	10,35	11,30	18	18		15,33		2,17		6,8					6	Wht					2
															10							11	Wht					
		42	21,26,46	21,46	21,46																							
7,32	7,32	7,32	7,32	7,32	7,32	7,32	7,32	7,32							7													3
			25,50				25,50	25,50							14,29													6
											6	24																
																				16	Gray**					A2J216		
		36	37	12	14																							
				41	41																							
				50															2					5	GRN			
							28										5											
							1										13											
									3	3	3	3																
									20	20	20	20																
									22	22	22	22																
									13	15,33	15,33	14,32																
19	14									10			10															
17	42									27			27															
13	18									25			25															
15	20									24			24															
				47															3					9	Wht			
	15																											
17	22																											
	49																											
2	17												7															
0	43												8															
1	21												28															
8	23												12															
	48												31															
	47												14															
		22																	14					14	Wht/ Yel			
			36																23								A2A18 J11-23	
							24 (GND)									J8												
							49									J8												
						28											14											
						1											1											
		41		22																								
	2			1	1		36		25				20						11					2	Red			
	27			26	26		37		7				2						10					1	Brn			
30	4,5,6 25,29 30,50	5,17 19,30 44	5,14 30,38 40	3-5,13 15,17, 20,28,30 38,40,42	3,5,28 29,30,	3,4,5 28,29, 30	3,5,30	1-5,11- 24,26-31, 40-49	5	5,23	5,23	5,23	5,23		1,15,16, 22,26,30					17	Blk	8,9	Wht					1
														8,14,25, 26,29					12					17	Wht/ Vio			10

Table C3-1. A2 Mnemonic Source Interconnections (1 of 3)

TABLE C3-1B
Cut 1 of 2

SIGNAL	SOURCE LOCAL	SOURCE REMOTE ***	DESCRIPTION	A2A1J1/A2A18J1 (TO FRONT PANEL)	A2A1J2/A2A18J2 (TO FRONT PANEL)	A2A2 DISPLAY LOGIC	A2A3 MEMORY	A2A4 SCALING	A2A5 PRESCALER/COUNTER	A2A6 MARKER	A2A7 SWEEP GEN	A2A8 SWEEP SELECT	A2A9 DISCRIMINATOR	A2A10 FM DRIVER	A2A11 MAIN DRIVER	A2A12 10/100 MHz REF	A2A13 SR STORE	A2A14 FR STORE	A2A1
GND REF	Not Used		Not Used														32		
IFG	A2A1J2-13	A2A13-36	If Gain. 0 = −30 dBm IF Max Input; 1 = −10 dBm IF Max Input.														36		
IF Port A	A1A5-9		100 kHz IF input.																
IF Port B	A1A6-9		100 kHz IF input.																
IF Port R	A1A4-9		100 kHz IF input.																
I/O B1	A2A13,14,15,16		Input/Output Bus 1 (HP-IB)														1	1	1
I/O B2	A2A13,14,15,16		Input/Output Bus 2 (HP-IB)														21	21	21
I/O B3	A2A13,14,15,16		Input/Output Bus 3 (HP-IB)														19	19	19
I/O B4	A2A13, 14,15,16		Input/Output Bus 4 (HP-IB)														4	4	4
I/O CK A2	A2A15-2		Input/Output clock. Clocks A2 ASM Data Bus.														2	2	2
L AN L1	A2A2-A9		Start Stop; Low Annunciator, Light 1. 0 = light ON.	29		A9													
L AN L2	A2A2-A7		CW; Low Annunciator, light 2. 0 = light ON.	30		A7													
L AN L3	A2A2-A42		±ΔF; Low Annunciator, light 3. 0 = light ON.		24	A42													
L AN L5	A2A2-A19		OVERFLOW; Low Annunciator, light 5.		18	A19													
L CEN	A2A6-14		Low count enable. 0 = count.						39	14									
L DCP	A2A2-B6	A2A14-11	Low Decimal Point for instrument, I/O. 0 = decimal point ON.			B6												11	
L DP	A2A2-A12		Low Decimal Point for LED's. 0 = decimal point ON.			A12													
L FCH	A2A3-22		Frequency Change. L FCH = 0 if either RPG is being tuned.			B1	22												
LINE	A2T1		Line trigger voltage. ±2V								28								
L INT A2	A2A16-27		Low Interrupt A2. ASM Restart. 0 = TRUE.																9
L LED 1	A2A2-A31		Low LED 1. START/CW 1st LED (from left). 0 = No. "1" ON.	26		A31													
L LED 2	A2A2-A34		Low LED 2. START/CW, 2nd LED (from left). 0 = Data Entry Enable.	25		A34													
L LED 3	A2A2-A26		Low LED 3. START/CW, 3rd LED (from left) 0 = Data Entry Enable.	24		A6													
L LED 4	A2A2-A35		Low LED 4. START/CW, 4th LED (from left) 0 = Data Entry Enable.	21		A35													
L LED 5	A2A2-A11		Low LED 5. START/CW, 5th LED (from left) 0 = Data Entry Enable.	19		A11													
L LED 6	A2A2-A3		Low LED 6. START/CW, 6th LED (from left) 0 = Data Entry Enable.	18		A3													
L LED 7	A2A2-A15		Low LED 7. STOP/±ΔF, 1st LED (from left). 0 = No. "1" ON.		8	A15													
L LED 8	A2A2-A140		Low LED 8. STOP/±ΔF, 2nd LED (from left). 0 = Data Entry Enable.		10	A40													
L LED 9	A2A2-A37		Low LED 9. STOP/±ΔF, 3rd LED (from left). 0 = Data Entry Enabfe.		11	A37													
L LED 10	A2A2-A16		Low LED 10. STOP/±ΔF, 4th LED (from left). 0 = Data Entry Enabls.		12	A16													
L LED 11	A2A2-A41		Low LED 11. Counter, 1st LED (from left). 0 = Data Entry Enable.		14	A41													
L LED 12	A2A2-A36		Low LED 12. Counter 2nd LED (from left). 0 = Data Entry Enable.		15	A36													
L LED 13	A2A2-A44		Low LED 13. Counter 3rd LED (from left). 0 = Data Entry Enable.		17	A44													
L LED 14	A2A2A-17		Low LED 14. Counter 4th LED (from left). 0 = Data Entry Enable.		18	A17													
L MM	A2A6-21		Low Marker Measurement. 0 = 1 multiplex starts.			B12				21									
L MPR	A2A15-24		Low Marker Pulse Remote 0 = Remote Marker.							29									24
L MPX R	A2A2-A32		Low Multiplex Running. 0 = Running.			A32	29			37									28
LOCK	A2A9-A39		Locks Discriminator. 0 = AFC unlocked.										39						
L OFF 1	A3A16-5		Low Channel 1 OFF from Signal Processor. 0 = CH1 OFF; 1 = CH1 ON.				50												
L OFL	A2A5-46		Low Overflow. 0 = Counter overflow.			B5			46										
L REM	A2A16-35		Low Remote. 0 = Remote.			B2	24		45	20							35	35	35
L RES	A2A6-16		Low Reset (Counter). 0 = reset counter.						41	16									
L RTC	A2A15		Low Retrace. 0 = retrace and hold.								42								25
L SNGL (RTL)	A2A1A1U2D	A2A16-7	Low Single Sweep (Return to Local). 0 = SINGLE TRIGGER.		9						12								
LT EN	A2A2-B8		Latch Enable pulse within DIG 1-6. 1 = data accepted.			B8	49	24										28	
L UDC	A2A6-13		Up/Down Control of counter. 0 = Up counting.						38	13									
L V DIS	A2A16-16		Low Vernier Disable. 0 = no vernier.					49			20								
+ M COIL	A2A11-29		+ Main Coil (YIG). −34V												29				
− M COIL	A2A11-26		− Main Coil (YIG). −40V												26				
MD 1	A2A1A1U3D	A2A13-6	MODE 1. 0 = LIN EXPAND	9		A30				28	3	2			2		6		
MD 2	A2A1A1U5B	A2A13-24	MODE 2. 0 = LOG FULL	13								27			27		24		
MOD EN	A3A11-21		Modulation Enable. 1 = Signal Processor is in Sampling Group Delay Mode.									43			18,43				
MOE	A2A6-12		Marker Output Enable. 1 = data transfer.						37	12									
MP	A2A6-46		Marker Pulse to Signal Processor. 1=display down diamond.							46									
MP1	A2A1A1R17		Marker Potentiometer 1. Sets position of frequency Marker 1.		29					48									
MP2	A2A1A1R18		Marker Potentiometer 2. Sets position of frequency Marker 2.		34					24									
MP3	A2A1A1R19		Marker Potentiometer 3. Sets position of frequency Marker 3.		33					49									

*When POSN 3 = 1, SOURCE is A2A5 **Coax ***If no entry, Source is same as in LOCAL.

TABLE C3-1B
Set 2082

A2A4 SCALING	A2A5 PRESCALER/COUNTER	A2A6 MARKER	A2A7 SWEEP GEN	A2A8 SWEEP SELECT	A2A9 DISCRIMINATOR	A2A10 FM DRIVER	A2A11 MAIN DRIVER	A2A12 10/100 MHz REF	A2A13 SR STORE	A2A14 FR STORE	A2A15 I/O CONTR	A2A16 HP-IB BUFFER	A2A17 CHAR I/O	A2A20 POS VOLTAGE REG	A2A21 NEG VOLTAGE REG	COAX CABLE CONNECTORS (A2A18)	A2A18J9 (TO YIG)	A2A18J10 (TO SOURCE/CONVERTER)	A2A18J11 (TO REAR PANEL)	A2J2 (TO SOURCE/ CONVERTER)		A2J3 (TO SOURCE/ CONVERTER)		A2J4 SIG. PROC. INTER-CONN		A2J5 AM INPUT	A2J6 EXT TRIGGER	A2A18TB1/ A2A22TB1
																				PIN	WIRE COLOR	PIN	WIRE COLOR	PIN	WIRE COLOR			
									32									13		7	Vio							
									36									4	22	8	Gray			3	Orn			
																						A2	Gray/Red**	A2	Gray/Red**			
																						A3	Gray/Orn**	A3	Gray/Orn**			
																						A1	Gray/Brn**	A1	Gray/Brn**			
									1	1	1	1																
									21	21	21	21																
									19	19	19	19																
									4	4	4	4																
									2	2	2	2																
	39	14																										
										11			11															
			28																									8
											9	27																
		21																										
		29									24																	
		37									28																	
					39							6																
																			5					4	Yel			
	46																											
	45	20							35	35	35	35						16		1	Brn							
	41	16																										
			42								25																	
			12									7							4					16	Wht/Blu			
24										28			30															
	38	13																										
49			20									16						14		5	Grn							
							29										10											
							26										11											
		28	3	2			2		6				1															
				27			27		24				19															
				43			18,43												17						10	Wht/Blk		
	37	12																										
		46																	15					13	Wht/Orn			
		48																										
		24																										
		49																										

Table C3-1. A2 Mnemonic Source Interconnections (2 of 3)

TABLE C3-1C
Sht 1 of 2

SIGNAL	SOURCE LOCAL	SOURCE REMOTE ***	DESCRIPTION	A2A1J1/A2A1BJ1 (TO FRONT PANEL)	A2A1J2/A2A1BJ2 (TO FRONT PANEL)	A2A2 DISPLAY LOGIC	A2A3 MEMORY	A2A4 SCALING	A2A5 PRESCALER/COUNTER	A2A6 MARKER	A2A7 SWEEP GEN	A2A8 SWEEP SELECT	A2A9 DISCRIMINATOR	A2A10 FM DRIVER	A2A11 MAIN DRIVER	A2A12 10/100 MHz REF	A2A13 SR STORE	A2A14 FR STORE	A2A15 I/O	
MP4	A2A1A1R20		Marker Potentiometer 4. Sets position of frequency Marker 4.		30					23										
MP5	A2A1A1R21		Marker Potentiometer 5. Sets position of frequency Marker 5.		31					50										
MPH	A2A6-25		Marker Pot High. +0.25V		32					25										
MPL	A2A6-47		Marker Pot Low. −13.25V		27					47										
MPX H	A2A2-B4		Multiplex Hold. 1 = Hold.			B4												12	30	
MS 1	A2A1A1U2C		Marker Select 1. See Truth Table, A2A1A1 Schematic.		13					4										
MS 2	A2A1A1U2B		Marker Select 2. See Truth Table, A2A1A1 Schematic.		16					3										
MS 3	A2A1A1U2A		Marker Select 3. See Truth Table, A2A1A1 Schematic.		20				3,28	2										
OL	A1A1J1-3		R, A, or B overload.																	36
PL	A2A7-49		Pen Lift. 1 = lifted pen.								49	49								
POSN 1	A2A2-A48		Enable for START or CW data transfer. 1 = data transferred.			A49	47	22										29		
POSN 2	A2A2-A45		Enable for STOP or ±Δ F data transfer. 1 = data transferred.			A45	40	15		18								9		
POSN 3	A2A2-B9		Enable for counter data transfer. 1 = data transferred.			B9			24	43										
PRE LT EN	A2A2-A43		Pre Latch Enable. Slightly precedes LT EN pulse within DIG 1-6. 1 = TRUE.			A43	14													
PTLO	A2A5J2		Pre-scaled Tracking Local Oscillator to Discriminator for stabilization of .5 – 13 MHz and .5 – 130 MHz Ranges.						J2				J1							
PWUP	A2A20-6		Power Up. 6V at 50mA to activate Signal Processor.																	
QAL 1 A2	A2A16-29		Qualifier 1 input for Frequency Control Assembly.																11	29
QAL 2 A2	A2A16-28		Qualifier 2 input for Frequency Control Assembly.																10	28
QAL 3 A2	A2A16-25		Qualifier 3 input for Frequency Control Assembly.																7	25
REM V	A2A13-18		Remote Voltage for RF Output Level. 0V = 0 dBm; −5V = −12 dBm.														18			
RPG 1A	A2A1A2		Rotary Pulse Generator. START/CW.	15			1													
RPG 1B	A2A1A2		Rotary Pulse Generator. START/CW.	17			26													
RPG 2A	A2A1A3		Rotary Pulse Generator. STOP/±Δ F.	27			27													
RPG 2B	A2A1A3		Rotary Pulse Generator. STOP/±Δ F.	28			2													
SCT 1	A2A1A1U5A	A2A13-28	Scan Time 1. State determined by SCAN TIME SEC switch or controller (HP-IB).	11		A27				1	27						28			
SCT 2	A2A1A1U5C	A2A13-29	Scan Time 2. State determined by SCAN TIME SEC switch or controller (HP-IB).	14		A2				27	29						29			
SCT 3	A2A1A1U5D	A2A13-11	Scan Time 3. State determined by SCAN TIME SEC switch or controller (HP-IB).	16		A28				26	4						11			
SCV 1	A2A1A1R24		Scan Time Vernier 1. Fine control of SCAN TIME SEC (CW end of Pot).	1							2									
SCV 2	A2A1A1R24		Scan Time Vernier 2. Fine control of SCAN TIME SEC (Wiper of Pot).	2							1									
SINK	A2A3-23		Synchronizer (pulse) for front-panel update (memory display Log). 1 = inhibit update.			B7	23													
SW ALT	A3A16-3		Sweep Alternate, Signal Processor to Frequency counter. 1 = CH1; 0 = CH2.				4											16		
TMP	A1A13RT1		Temperature Overload.																	
TRLO	A1A9J3		Tracking Local Oscillator. 0.6 to 1300.1 MHz from Source/Converter to Pre-Scaler/Counter.										J3							
TRS 1	A2A1A1U2F	A2A13-14	Trigger Select 1. State determined by TRIGGER switch or controller (HP-IB).		1						15						14			
TRS 2	A2A1A1U2E	A2A13-31	Trigger Select 2. State determined by TRIGGER switch or controller (HP-IB).		5						13						31			
VER 1A	A2A4-26		Vernier 1A. Fine control of START and CW frequency from front panel.	4				26												
VER 1B	A2A1A1R15		Vernier 1B. CCW end of front-panel pot. Grounded on A4 Assembly.	8				1												
VER 2A	A2A4-25		Vernier 2A. Fine control of STOP and ±Δ F frequency from front panel.		26			25												
VER 2B	A2A1A1R14		Vernier 2B. CCW/end of front-panel pot. Grounded on A4 Assembly.		28			50												
V FM	A2A9-25,50		Discriminator FM Voltage to FM Driver. +1V to −1V.										25,50	25.50						
V GD	A3A11-15, 30		Group Delay Volage (modulation). −6V = −3 MHz at 1300 MHz Range.									36								
V RAMP	A2A7-45		Ramp Voltage. −1V to +14V.							45	46	45.							12	
V SW1	A2A7-39		Sweep Voltage from Sweep Generator to Sweep Select. 0 to +13V.								39	14								
V SW 2	A2A8-48		Sweep Voltage from Sweep Select to Signal Processor. 0 to +13V.									48								
V SW 3	A2A8-16		Sweep Voltage from Sweep Select to Scaling. 0 to +13V.					16				16								
V SC	A2A4-18		Scaling Voltage output to Sweep Select.					18				18								
V TN	A2A8-23,37		Tuning Voltage from Sweep Select to Signal Processor. 0 to −13V.						16			23,37								
V TUN	A2A8-29		Tuning Voltage within Frequency Control. 0 to −13V.									29	4		4					
WTH 1	A2A1A1U3E	A2A13-27	Width 1. State determined by WIDTH switch or controller (HP-IB).	20		A4	6	6		6	6	6			6	39	27	32		
WTH 2	A2A1A1U3F	A2A13-9	Width 2. State determined by WIDTH switch or controller (HP-IB).	22		A29	31	31	31	31	31	31	31	31	31	38	9	31		
WTH 3	A2A1A1U3C	A2A13-10	Width 3. State determined by WIDTH switch or Controller (HP-IB).	23		A10	11	11		11	11	11			13		10	6		

*When POSN 3 = 1, SOURCE is A2A5 **Coax ***If no entry, Source is same as in LOCAL.

TABLE C3-1C Sht 2 of 2

A2A4 SCALING	A2A5 PRESCALER/COUNTER	A2A6 MARKER	A2A7 SWEEP GEN	A2A8 SWEEP SELECT	A2A9 DISCRIMINATOR	A2A10 FM DRIVER	A2A11 MAIN DRIVER	A2A12 10/100 MHz REF	A2A13 SR STORE	A2A14 FR STORE	A2A15 I/O CONTR	A2A16 HP-IB BUFFER	A2A17 CHAR I/O	A2A20 POS VOLTAGE REG	A2A21 NEG VOLTAGE REG	COAX CABLE CONNECTORS (A2A18) A2A18J9 (TO YIG)	A2A18J10 (TO SOURCE/CONVERTER)	A2A18J11 (TO REAR PANEL)	A2J2 (TO SOURCE/CONVERTER) PIN	WIRE COLOR	A2J3 (TO SOURCE/CONVERTER) PIN	WIRE COLOR	A2J4 SIG. PROC. INTER-CONN PIN	WIRE COLOR	A2J5 AM INPUT	A2J6 EXT TRIGGER	A2A18TB1/ A2A22TB1
	23																										
	50																										
	25																										
	47																										
									12	30																	
	4																										
	3																										
3,28	2																										
											36						5		10	Blk							
		49	49															16					12	Wht/Red			
									29			29															
	18								9			9															
24	43																										
J2				J1																							
													6					24					8	Gray			11
										11	29																
										10	28																
										7	25																
								18									3		6	Blu							
	1	27						28																			
	27	29						29																			
	26	4						11																			
		2																									
		1																									
									16									13					15	Wht/Grn			
													5								17	Wht					
				J3																	A6	Gray/Blu**					
		15						14																			
		13						31																			
				25,50	25,50																						
			36															18									
	45	45	45							12																	
		39	14																								
			48															1					11	Wht/Brn			
			16												J3,J6												
			18												J4,J7												
16			23,37												J5								A6	Gray/Blu**			
			29	4		4																					
	6	6	6			8	39	27	32			36						21					6	Blu			
31	31	31	31	31	31	31	38	9	31			18						20					A5	Gray/Grn**			
	11	11	11			13		10	8			35						19					7	Vio			

Table C3-1. A2 Mnemonic Source Interconnections (3 of 3)

Table C3-2. A2 Frequency Control Coax Cables (1 of 2)

Reference Designation	HP Part No.	Description	Mnemonic	Remarks
W1	08505-60121	CABLE ASSY, BLACK; FREQ. CAL A2A18J8 to A2A1A1R21	-F CAL	
W2	08505-60123	CABLE ASSY, BLACK; 10 MHz OUT A2A12J3 to A2A6J1	10 MHz	
W3	08505-60124	CABLE ASSY, BLUE; 10 MHz OUT A2A12J2 to A2J2--A6	10 MHz	
W4	08505-60126	CABLE ASSY, GRAY/BLUE; PREAMPL IN A2J3--A6 to A2A23 (INPUT)	TRLO	
W5	08505-60127	CABLE ASSY, VIOLET; 100 MHz OUT A2A12J1 to A2J2--A7	100 MHz	
W6	08505-60128	CABLE ASSY, GRAY; AM INPUT A2J5 to A2J3--16		
W7	08505-60132	CABLE ASSY, GRAY/GREEN; REAR PANEL. A2J4--A5 to A2A18J11--18	V GD	
W8	08505-60133	CABLE ASSY, GRAY/BROWN; IF R A2J3--A1 to A2J4--A1	IF PORT R	
W9	08505-60134	CABLE ASSY, GRAY/RED; IF A A2J3--A2 to A2J4--A2	IF PORT A	
W10	08505-60135	CABLE ASSY, GRAY/ORANGE; IF B A2J3--A3 to A2J4--A3	IF PORT B	
W11	08505-60136	CABLE ASSY RED; A2A5J2 to A2A9J1	PTLO	
W13	08505-60137	CABLE ASSY, GRAY/BLUE; PREAMPL OUT. A2A23 (OUT) to A2A5J1	TRLO	
W13	08505-60138	CABLE ASSY, BROWN; A2A18J3 to A2A18J6	V SW 3	
W14	08505-60139	CABLE ASSY, RED; A2A18J4 to A2A18J7	VSC	
W15	08505-60140	CABLE ASSY, GRAY/BLUE; A2A18J5 to A2J4--A6	VTN	

Table C3-2. A2 Frequency Control Coax Cables (2 of 2)

Reference Designation	HP Part No.	Description	Mnemonic	Remarks
W16	08505-60142	CABLE ASSY, REAR PANEL; INCLUDES A2W7, A2J4, A2W16P1 (MATES WITH A2A18J11), AND CABLE STRAP.		
W17	08505-60146	CABLE ASSY, RIBBON; A2J2 to A2A18J10		
W18	08505-60147	CABLE ASSY, RIBBON;YIG SUPPLY A2A18J9 to A2A19 (YIG OSC)		
W19	08505-20140	CABLE ASSY, SEMI-RIGID COAX; YIG OSC. (A2A19) to BULKHD (A2J1)		
A1W1	08505-60141	CABLE ASSY, RIBBON; A2A18J1 to A2A1A1J1		
A1W2	08505-60141	CABLE ASSY, RIBBON; A2A18J2 to A2A1A1J2		
A1W3	08505-60149	CABLE ASSY, LINE SWITCH; FP LINE SW to RP LINE MODULE		

FUNCTIONAL DESCRIPTION
8505A NETWORK ANALYZER FREQUENCY CONTROLLER A2

The following descriptions are based on the block diagram of Frequency Controller A2, drawing number 8505-60052.

SWEEP GENERATOR A2A7

The sweep Generator Board generates the sweep voltage and the +13V and −13V reference voltages. Sweep generation is accomplished in an integrating circuit consisting of a voltage source, a variable resistor, an operation amplifier, and selectable feedback capacitors. The resistor is varied with the front-panel SCAN TIME control, and the capacitor values are selected with the SCAN TIME switch. A trigger circuit synchronizes the sweep generator to different trigger inputs. (EXT, LINE, AUTO).

SWEEP SELECT A2A8

The Sweep Select Board generates the exponential sweep voltage and controls the Scaling circuit input and the tuning voltage outputs.

The sweep voltage (VSW1) input to the Sweep Select Board is switched to one of three different signal paths in accordance with the mode seleced at the front panel. In LIN FULL mode the sweep voltage passes directly through the Sweep Select Board, becoming the VTUN (tuning voltage). In the LOG FULL mode, an exponential voltage is generated which has a value dependent on the value of the VSW1 input. In the EXPANDED SWEEP mode, the sweep voltage input (VSW1) is routed to the input of the Scaling Circuit Board, A2A4, where it becomes VSW3. The Scaling Circuit output is then routed through the tuning voltage output of the Sweep Select board.

The VSW1 and the tuning voltage are also buffered and distributed to the Signal Processor. A blanking pulse, DBP, is also generated to blank the Signal Processor sweep return. The output voltage, VTUN, from the Sweep Select Board drives the Main Coil Driver Board, A2A11, and the Discriminator Board, A2A9.

SCALING CIRCUIT BOARD A2A4

The Scaling Circuit consists of two digital-to-analog converters (DAC's) which attenuate the sweep voltage. The setting of the DAC's is performed by the digital data bus. The output of the DAC's is summed and this sum (VSC) represents a voltage dependent on the sweep voltage and the frequency setting of the instrument.

MAIN DRIVER A2A11

The Main Driver Board delivers the current for the main coil of the YIG tuned oscillator (YTO). It comprises two major parts: (1) a fixed current source to tune the YTO to 4.2105 GHz, and (2), a current source which varies in accordance with the input tuning voltage (VTUN). The sum of these two currents YTO to a maximum frequency of 5.51 GHz.

In the 130 MHz range, the input voltage (VTUN) is divided by a factor of 10. In the 13 MHz range, the input voltage is disconnected from the Main Driver Board resulting in no current change at the main coil with a change in the input voltage level. The tuning, in this case, is performed by the AFC loop only.

AUTOMATIC FREQUENCY CONTROL (AFC) LOOP OPERATION

PRESCALER/COUNTER A2A5

The RF frequency, offset by 100 kHz (0.1 to 1300.1 MHz0, supplied to the Frequency Controller from the Source Converter is amplified in a preamplifier and is applied to the input of the Prescale/Counter. This input, is divided by 100, 10, or 1, depending on the frequency range, so that the maximum output (PTLO) frequency is 13 MHz.

The second part of the Prescale/Counter is a six-digit frequency counter whose input frequency is the output of the divider circuitry (and, therefore, a maximum of 13 MHz). A gate pulse is supplied to the counter from the Marker Board, A2A6. The output of the counter is connected to the digital data bus.

DISCRIMINATOR A2A9

The Discriminator consists of three parts: the discriminator circuit which delivers an output current that is a function of its input frequency (PTLO), a summing junction which compares the discriminator current with the tuning voltage (VTUN) current. The third part is the loop amplifier which amplifies the difference between these two currents. The amplifier output (VFM) is fed to the FM Driver, A2A10. Note that the Discriminator Board output is disconnected when the instrument is operated in its 1300 MHz range.

FM DRIVER A2A10

The FM Driver consists of a low-pass filter and a power amplifier which drives the FM coil of the YTO to close the AFC loop.

MARKER A2A6

The Marker Board generates up to five marker pulses to trigger the frequency measurement and to provide markers on the Signal Processor display. The selected marker triggers the time base which generates the gating and control signals for the six-digit frequency counter. The markers are positioned individually with five control potentiometers on the front panel.

The gate time of the frequency counter is dependent on the scan time for which the instrument is set. The gate time pulse is generated by dividing 10 MHz, supplied by the 10/100 MHz Oscillator A2A12, by 500, 5000, to 50,000 in the Marker Board divider circuits.

MEMORY BOARD A2A3

The Memory Board consists of two 3½ digits decade counters and a random access memory (RAM). The counters are set by pulses generated in the two rotary pulse generators (RPG's) on the instrument front panel. The outputs from the counters represent the digital information for the frequency settings of the instrument. This digital information is used to set the DAC's on the Scaling Board, and to driver the numerical display on the front panel.

The counter outputs are connected to the digital data bus. The RAM, also connected to the digital data bus, stores the frequency settings for the different sweeps: START-STOP 1, START-STOP 2, CW, $\pm\Delta F$.

DISPLAY LOGIC A2A2

The Display Logic Board provides the sync pulses for the digital data bus and distributes the data to the numerical readouts on the front panel, including the decimal points.

FRONT PANEL A2A1

The Front Panel houses the various switches, controls, and numerical readouts. If the intrument is switched to remote control, all front-panel switches and controls are disconnected from the main instrument.

10/100 MHz OSCILLATOR A2A12

The 100 MHz reference oscillator and a decade divider provide the reference frequencies, 10 MHz and 100 MHz, for the instrument.

I/O BOARDS

These boards are used only if the instrument is to be operated under calculator control.

HP-INTERFACE BUS BUFFER A2A16 - Consists of a transceiver to provide the proper interface to the HP-Interface Bus.

I/O CONTROL A2A15 - Controls the data transfer between the I/O boards.

F STORAGE A2A14 - Consists of a random access memory (RAM) to store the digital information for the frequency setting of the instrument. It also provides a means for reading the instrument frequency setting while operating under local control in a normally calculator-controlled situation.

S-STORE A2A13 - Contains a register which stores the digital information relative to the instrument's mode of operation. It also provides a means for reading the operating mode setting while operating under local control in a normally calculator-controlled situation.

Fig C3-18
Sht 1 of 3

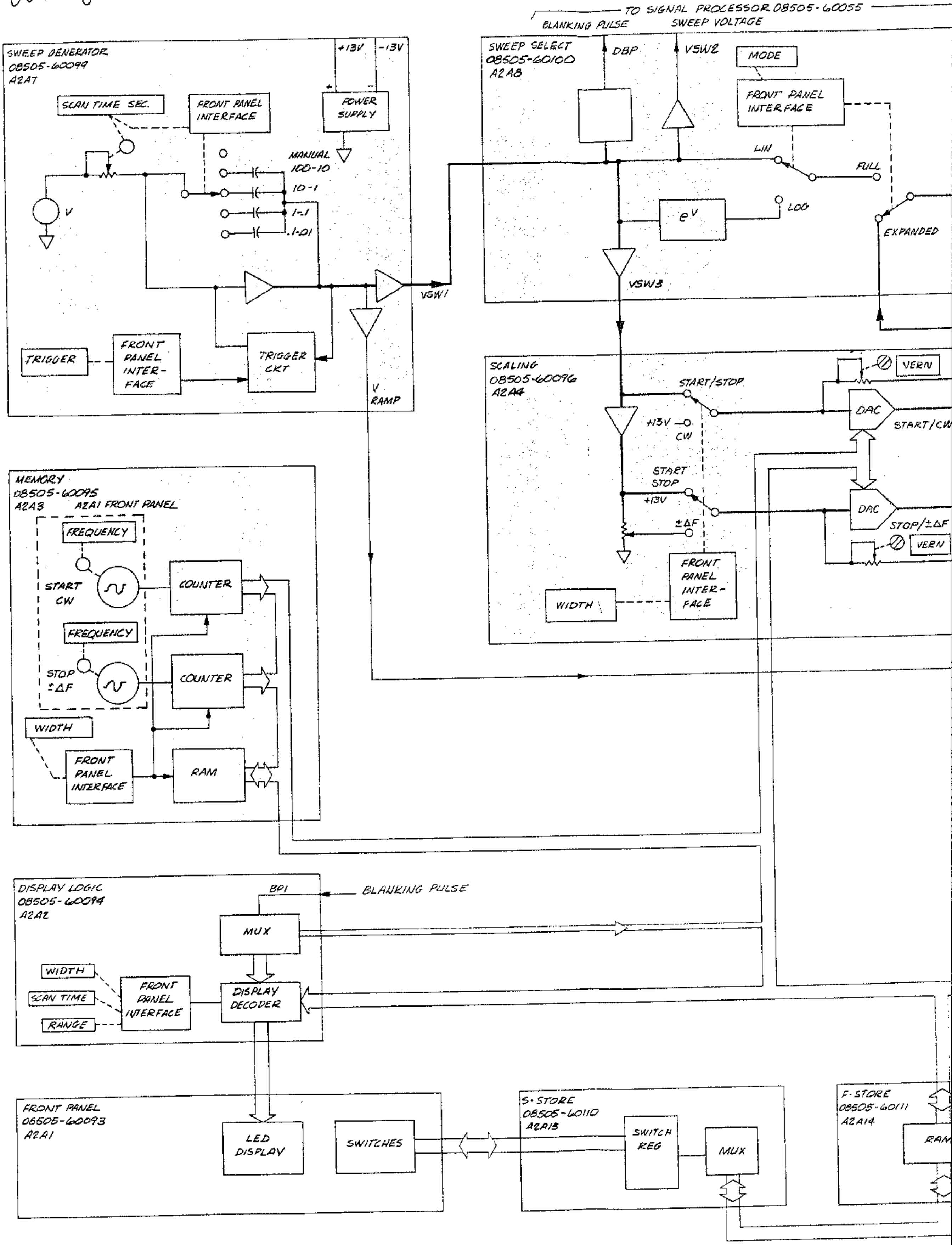


Fig C3-18
Sht 2 of 3

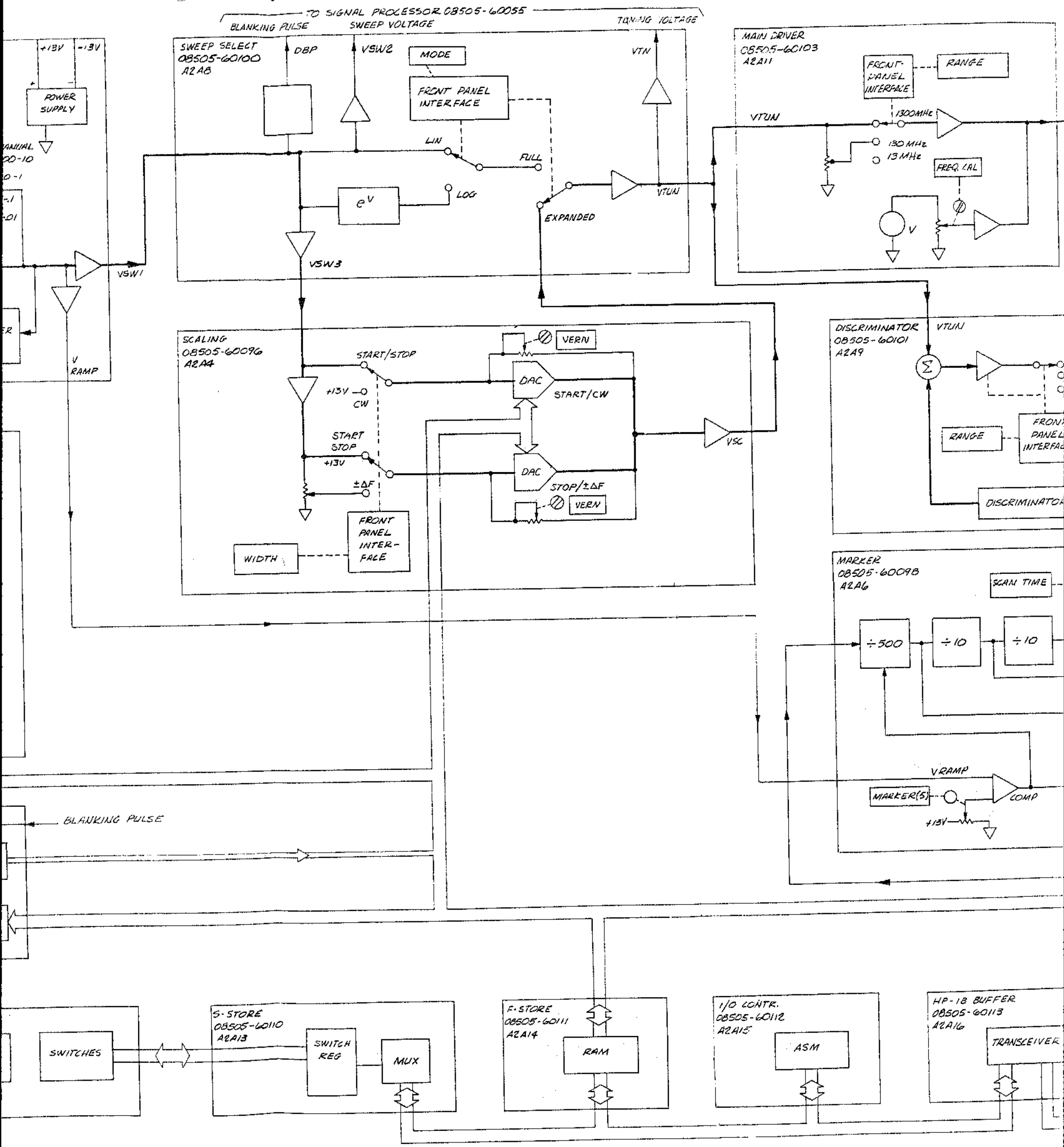
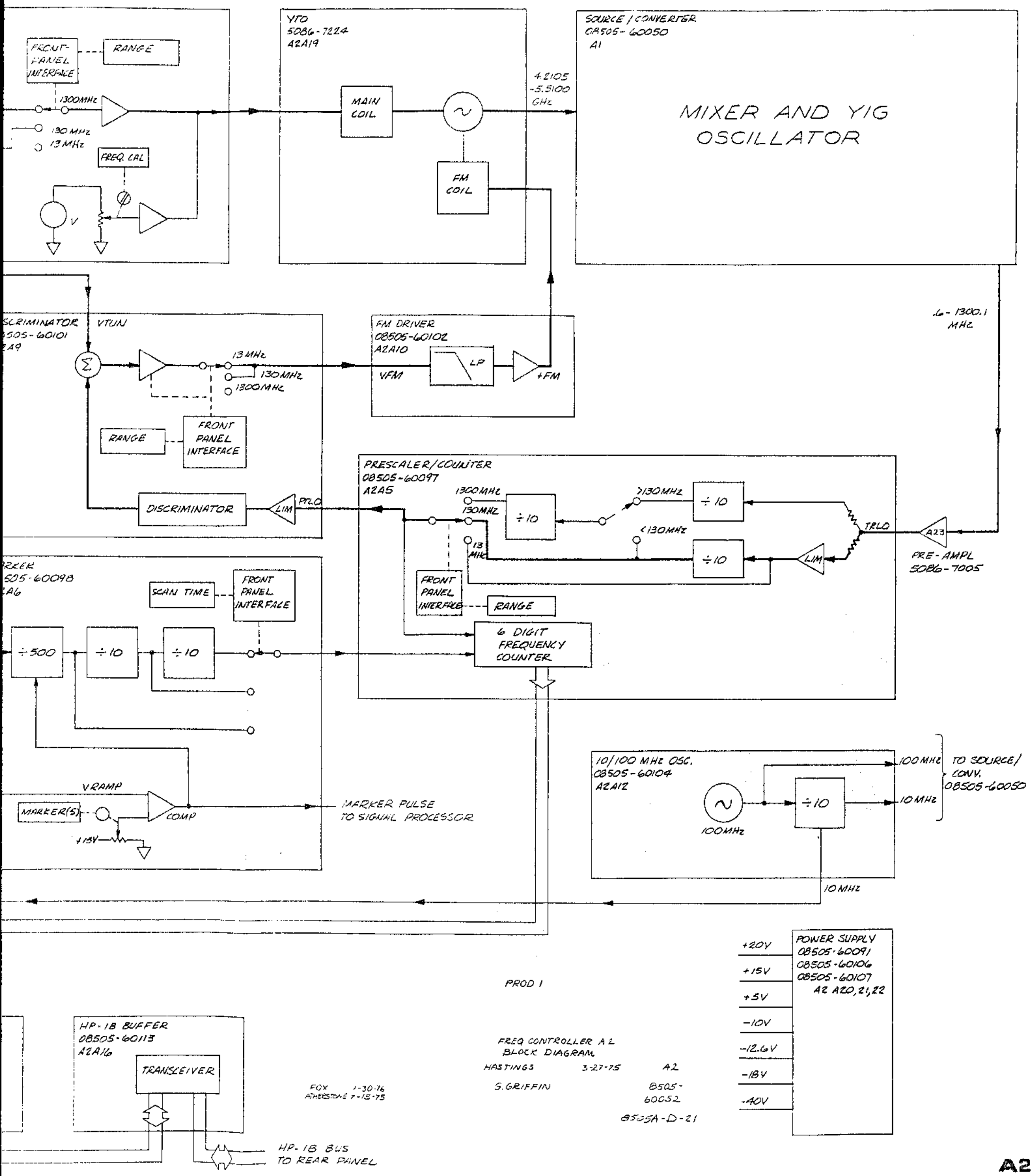


Fig C3-18
Sht 3 of 3



A2

Figure C3-18. A2 Frequency Controller, Block Diagram

A2A1 FRONT PANEL, CIRCUIT DESCRIPTION

General Description

The A2A1 Front Panel assembly consists of the A2A1A1 Front Panel Board and the A2A1A2 and A2A1A3 Rotary Pulse Generator (RPG) assemblies. The A2A1A1 Front Panel Board provides the interface with the internal instrument circuits. This board consists of: (1) switches for control of frequency range, scan time, mode, width, trigger, and markers, (2) controls for control of frequency vernier, marker positions, and scan time vernier, (3) displays for visual display of frequency settings and marker frequency, and (4) annunciators which indicate mode of operation. The A2A1A2 and A2A1A3 Rotary Pulse Generator (RPG) assemblies provide coarse frequency tuning of START/CW and STOP/±ΔF frequencies.

A2A1A1 Front Panel Board — Displays

The START/CW, STOP/±ΔF, and Frequency Counter Displays consist of LEDs DS1–DS14 which display frequency information. The START/CW Display (DS1—DS6) indicates either START or CW frequency setting as determined by mode of operation selected. The STOP/±ΔF Display (DS7—DS10) indicates either STOP or ±ΔF frequency setting as determined by mode of operation selected. The Frequency Counter Display (DS11—DS14) indicates frequency of marker selected by MARKERS switch S6. Information to be displayed is applied by the A2 Display Logic assembly to the three displays as input lines D1, D2, D3, D4, and LDP. Control input lines LED 1 through LED 14 are latch enable lines. There is one latch enable line for each LED. Information on the Data Lines (D1—D4 and LDP) is transferred to the LED and displayed when the corresponding latch enable line (LED1—LED14) goes low. Data and data transfer are both controlled by the A2 Display Logic assembly.

A2A1A1 Front Panel Board — Controls

Front-panel controls consist of frequency vernier controls, marker position controls, scan time vernier control, and coarse frequency controls. START/CW and STOP/±ΔF Frequency Verniers R14 and R15 are potentiometers which perform fine tune adjustment of START, STOP, CW, and ±ΔF frequency settings. Marker position controls R17—R21 control the position of markers selected by MARKERS switch S6. SCAN TIME SEC Vernier R16 is used to provide adjustment of scan time between switch positions of SCAN TIME SEC switch S4 and also serves as the MANUAL sweep control. Coarse frequency adjustment is performed by Rotary Pulse Generators (RPG 1 and RPG 2). Operation of the Rotary Pulse Generators is described under a separate heading in this text.

A2A1A1 Front Panel Board — Switches

Front-panel switches S1—S6 select frequency range, mode, width, scan time, trigger, and marker quantity. The output of each switch consists of two or three coded signal lines using the Gray code. Each output line is buffered with a tri-state buffer (P/O U2, U3, or U5). When the disable input of the tri-state buffer goes high the buffer is effectively open so the switch output is opened. When in remote operation, control line AN L4 is high disabling the tri-state buffers thus opening frt t-panel switches S1—S6. The outputs of switches S1—S5 are ctnnected to the I/O Boards for remote operation therefore control of the functions normally controlled by S1—S5 are controlled remotely by a programming input. MARKERS switch S6 is disconnected completely; it is not connected to the I/O Boards, therefore no remote control of lines MS1—MS3 is possible. In remote operations, pull up resistors A6R2, A6R5, and A6R7 on the A6 Marker assembly pull lines MS1—MS3 high which selects a remote marker pulse.

C3-40a

A2A1A1 Front Panel Board — Annunciators

Annunciators DS15—DS26 indicate function or mode selected as well as overflow and remote control conditions. Control lines L AN L1—L AN L5 determine which annunciators are lit. These control inputs are from the A2 Display Logic assembly.

A2A1A2 and A2A1A3 Rotary Pulse Generators (RPG) — Figure C3-20a

Rotary Pulse Generators (RPG 1 and RPG 2) consist of basically four parts: (1) a light source, (2) an opaque disk with translucent radial segments, (3) two photo transistors, and (4) a pulse shaping circuit for each photo transistor.

A circular disk with two circular rows of translucent segments is attached to one end of the RPG tuning shaft. A light bulb (lamp) is located on one side of this disk and two photo transistors are located on the other side. This disk is rotated by turning the front-panel knob (START/CW or STOP/±ΔF). When the disk is rotated, the light shines through the translucent segments striking the two photo transistors Q5 and Q6. When light strikes the transistors, they conduct until the light is removed. The output of each transistor is applied to a pulse shaping circuit (Q1/Q2/U1A or Q3/Q4/U1B) where it is shaped into a square-wave pulse train. The two photo transistors are displaced from each other physically so that the light strikes first one transistor then the other. The direction of rotation of the disk (clockwise or counterclockwise) therefore is determined by comparison of the two pulse train outputs. The pulses from one transistor leads the pulses from the other in one direction of rotation and lags in the other direction. The direction of rotation is used to determine up and down count control of the counters for the displays and is determined by the A3 Memory Assembly.

SIGNAL	FULL NAME	CONTROL INFORMATION
MD1	Mode 1	Refer to Truth Table
MD2	Mode 2	Refer to Truth Table
MP1	Marker Potentiometer 1	Refer to Truth Table
MP2	Marker Potentiometer 2	Refer to Truth Table
MP3	Marker Potentiometer 3	Refer to Truth Table
MP4	Marker Potentiometer 4	Refer to Truth Table
MP5	Marker Potentiometer 5	Refer to Truth Table
MPH	Marker Pot High	+0.1 V
MPL	Marker Pot Low	−13.8 V
MS1	Marker Select 1	Refer to Truth Table
MS2	Marker Select 2	Refer to Truth Table
MS3	Marker Select 3	Refer to Truth Table
RPG 1A	Rotary Pulse Generator	START/CW
RPG 1B	Rotary Pulse Generator	START/CW
RPG 2A	Rotary Pulse Generator	STOP/±ΔF
RPG 2B	Rotary Pulse Generator	STOP/±ΔF
SCT 1	Scan Time 1	Refer to Truth Table
SCT 2	Scan Time 2	Refer to Truth Table
SCT 3	Scan Time 3	Refer to Truth Table
SCV 1	Scan Time Vernier 1	Fine control of SCAN TIME SEC
SCV 2	Scan Time Vernier 2	Fine control of SCAN TIME SEC
TRS 1	Trigger Select 1	Refer to Truth Table
TRS 2	Trigger Select 2	Refer to Truth Table
VER 1A	Vernier 1A	Fine frequency control of START & CW
VER 1B	Vernier 1B	Fine frequency control of START & CW
VER 2A	Vernier 2A	Fine frequency control of STOP & ±ΔF
VER 2B	Vernier 2B	Fine frequency control of STOP & ±ΔF
WTH 1	Width 1	Refer to Truth Table
WTH 2	Width 2	Refer to Truth Table
WTH 3	Width 3	Refer to Truth Table

WIDTH			
	WTH 1	WTH 2	WTH 3
SS1	1	0	0
SS2	1	1	0
ALT	0	1	0
ΔF	0	1	1
CW	1	1	1

MODE		
	MD 1	MD 2
LOG FULL	1	0
LIN FULL	1	1
LIN EXPAND	0	1

RANGE MHz		
	FR 1	FR 2
.5 – 13	1	0
.5 – 130	1	1
.5 – 1300	0	1

MARKERS			
	MS1	MS2	MS3
REM*	1	1	1
1	0	1	1
1,2	1	0	1
1,2,3	0	0	1
1,2,3,4	1	1	0
1,2,3,4,5	0	1	0

SCAN TIME SEC			
	SCT1	SCT2	SCT3
MAN	1	0	0
100-10	1	1	0
10-1	0	1	0
1-.1	0	1	1
.1-.01	1	1	1

*REM is not a position of front-panel MARKERS switch. It is shown here only to indicate logic states of MS1, MS2, and MS3 in remote operation.

TRIGGER		
	TRS1	TRS2
AUTO	1	0
LINE	1	1
EXT	0	1
SINGLE	0	1

SINGLE	
	LSNGL
AUTO	1
LINE	1
EXT	1
SINGLE	0

SIGNAL	FULL NAME	CONTROL INFORMATION
AN L4	Annunciator Light 4	REMOTE – AN L4 = 1 → Light On
D1	Data 1	X1 Data for LEDs – D1 = 1 for No. "1" if D2, 3, 4 = 0
D2	Data 2	X2 Data for LEDs – D2 = 1 for No. "2" if D1, 3, 4 = 0
D3	Data 3	X4 Data for LEDs – D3 = 1 for No. "4" if D1, 2, 3 = 0
D4	Data 4	X8 Data for LEDs – D4 = 1 for No. "8" if D1, 2, 3 = 0
FR1	Frequency Range 1	Refer to Truth Table
FR2	Frequency Range 2	Refer to Truth Table
L AN L1	Annunciator Light 1	START/STOP – L AN L1= 0 → Light On
L AN L2	Annunciator Light 2	CW – L AN L2 = 0 → Light On
L AN L3	Annunciator Light 3	±ΔF – L AN L3 = 0 → Light On
L AN L5	Annunciator Light 5	OVERFLOW – L AN L5 = 0 → Light On
L DP	Decimal Point	For LEDs – LDP = 0 → Light On
L LED 1	LED 1	START/CW; 1st LED – L LED 1 = 0 → No. "1" On
L LED 2	LED 2	START/CW; 2nd LED – L LED 2 = 0 → Data Entry
L LED 3	LED 3	START/CW; 3rd LED – L LED 3 = 0 → Data Entry
L LED 4	LED 4	START/CW; 4th LED – L LED 4 = 0 → Data Entry
L LED 5	LED 5	START/CW; 5th LED – L LED 5 = 0 → Data Entry
L LED 6	LED 6	START/CW; 6th LED – L LED 6 = 0 → Data Entry
L LED 7	LED 7	STOP/±ΔF; 7th LED – L LED 7 = 0 → No. "1" On
L LED 8	LED 8	STOP/±ΔF; 8th LED – L LED 8 = 0 → Data Entry
L LED 9	LED 9	STOP/±ΔF; 9th LED – L LED 9 = 0 → Data Entry
L LED 10	LED 10	STOP/±ΔF; 10th LED – L LED 10 = 0 → Data Entry
L LED 11	LED 11	Counter's 11th LED – L LED 11 = 0 → Data Entry
L LED 12	LED 12	Counter's 12th LED – L LED 12 = 0 → Data Entry
L LED 13	LED 13	Counter's 13th LED – L LED 13 = 0 → Data Entry
L LED 14	LED 14	Counter's 14th LED – L LED 14 = 0 → Data Entry
L SINGL	Single Sweep	L SNGL = 0 → Single Sweep (Return to Local)

A2A1

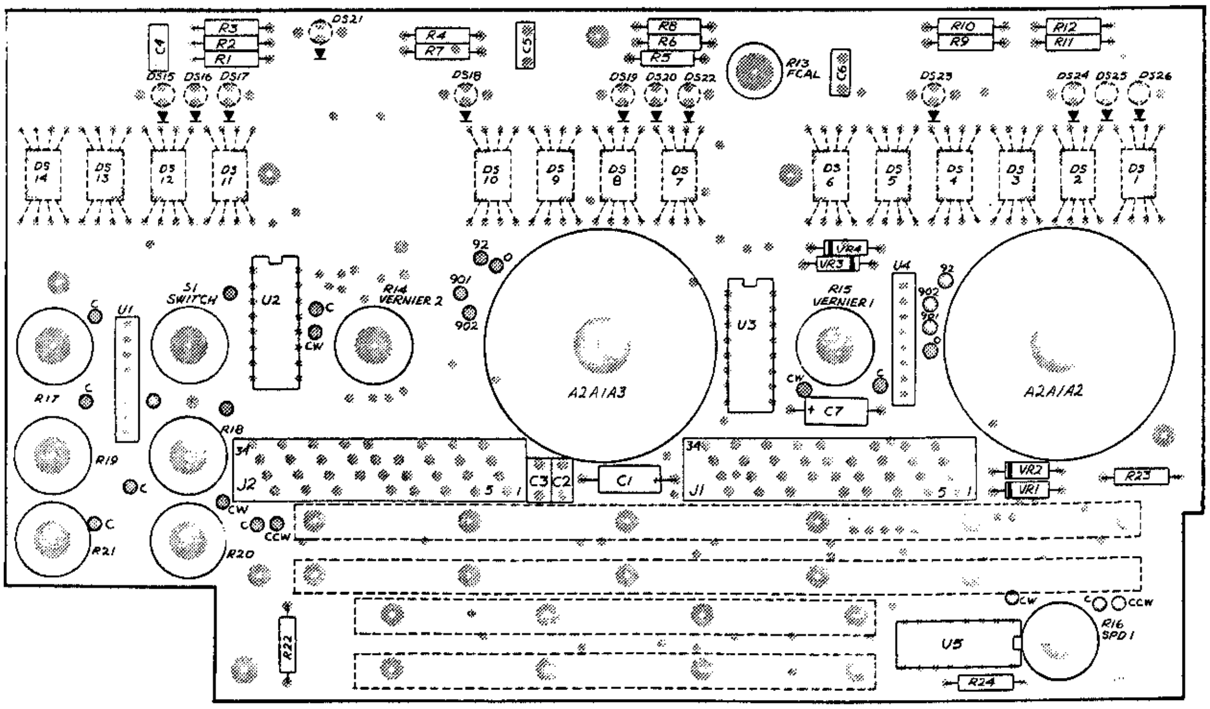


Figure C3-19. A2A1 Front Panel Parts Locations

Fig C3-20
Sht 1 of 4

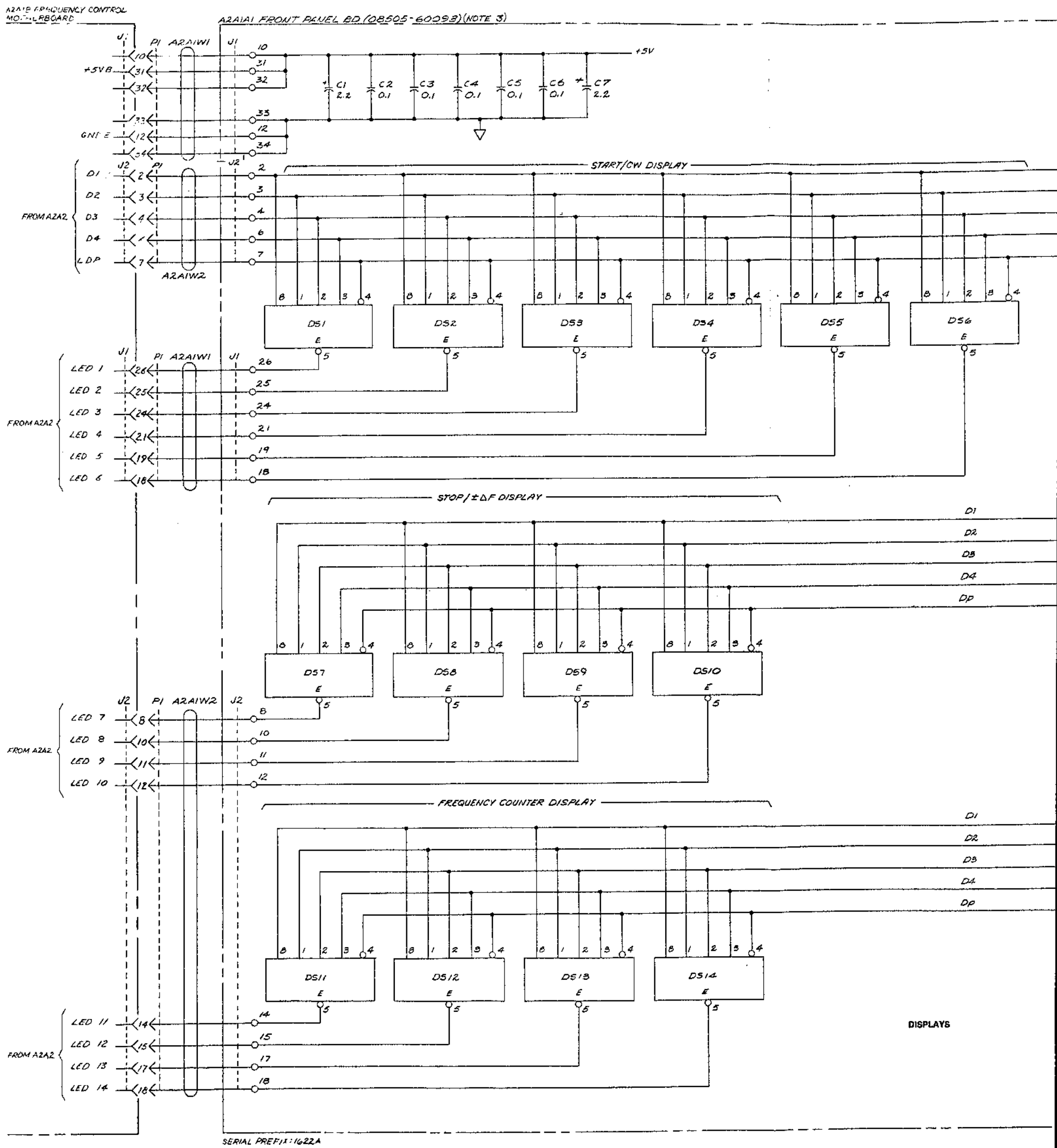


Fig C3-20
Sht 2 of 4

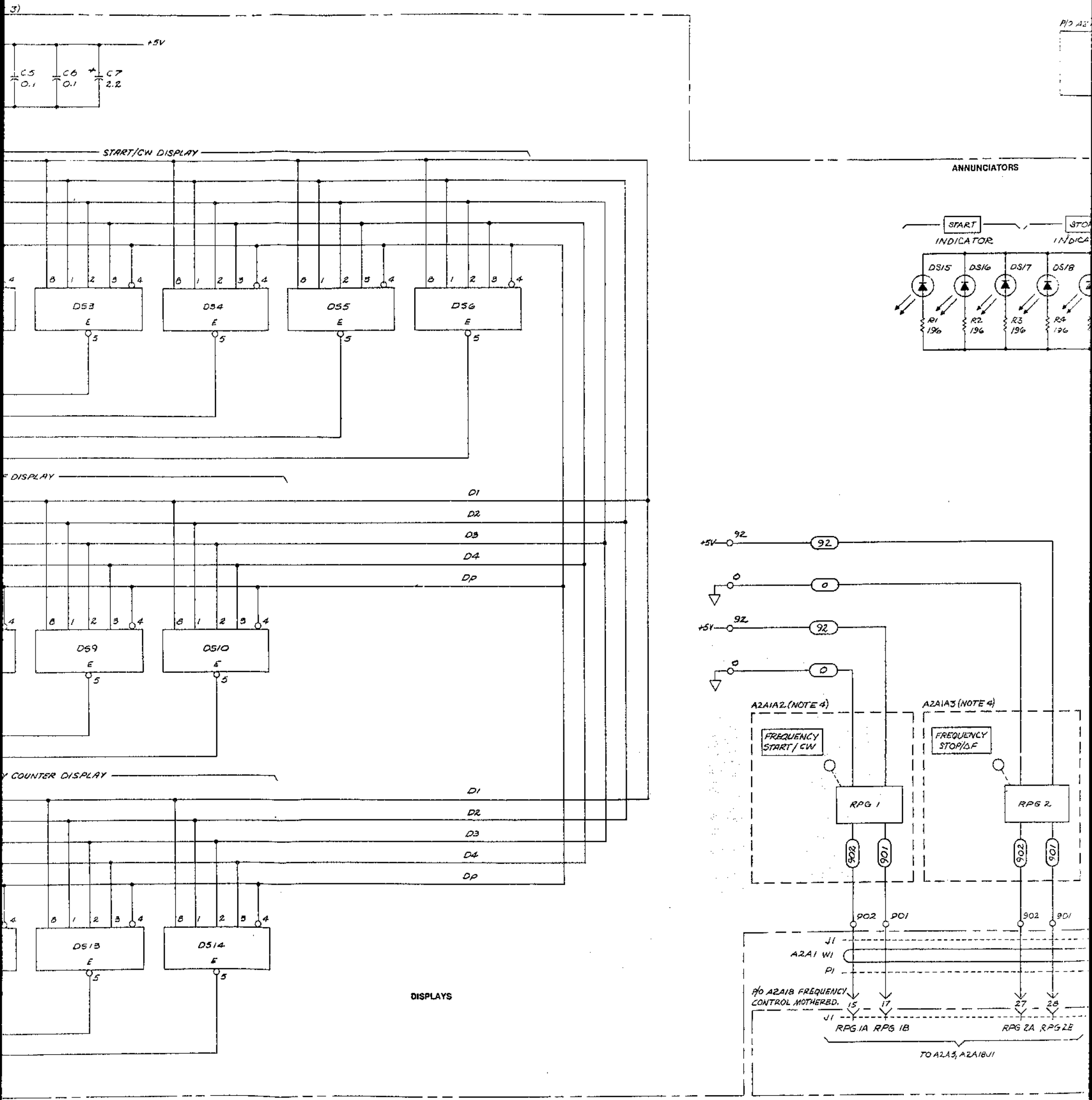


Fig C3-20
Sut 3 of 4

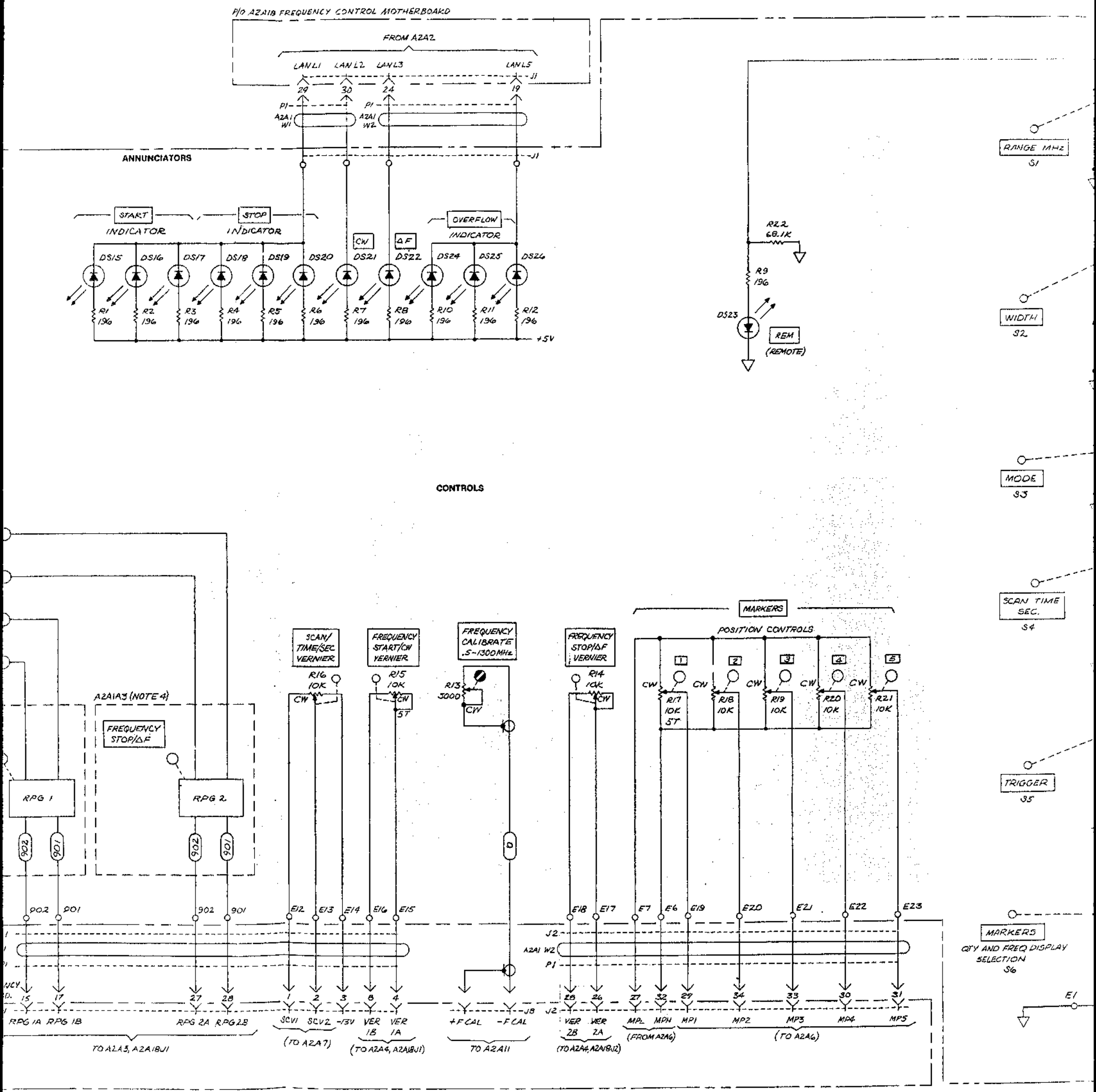


Fig C3-20
Sht 4 of 4

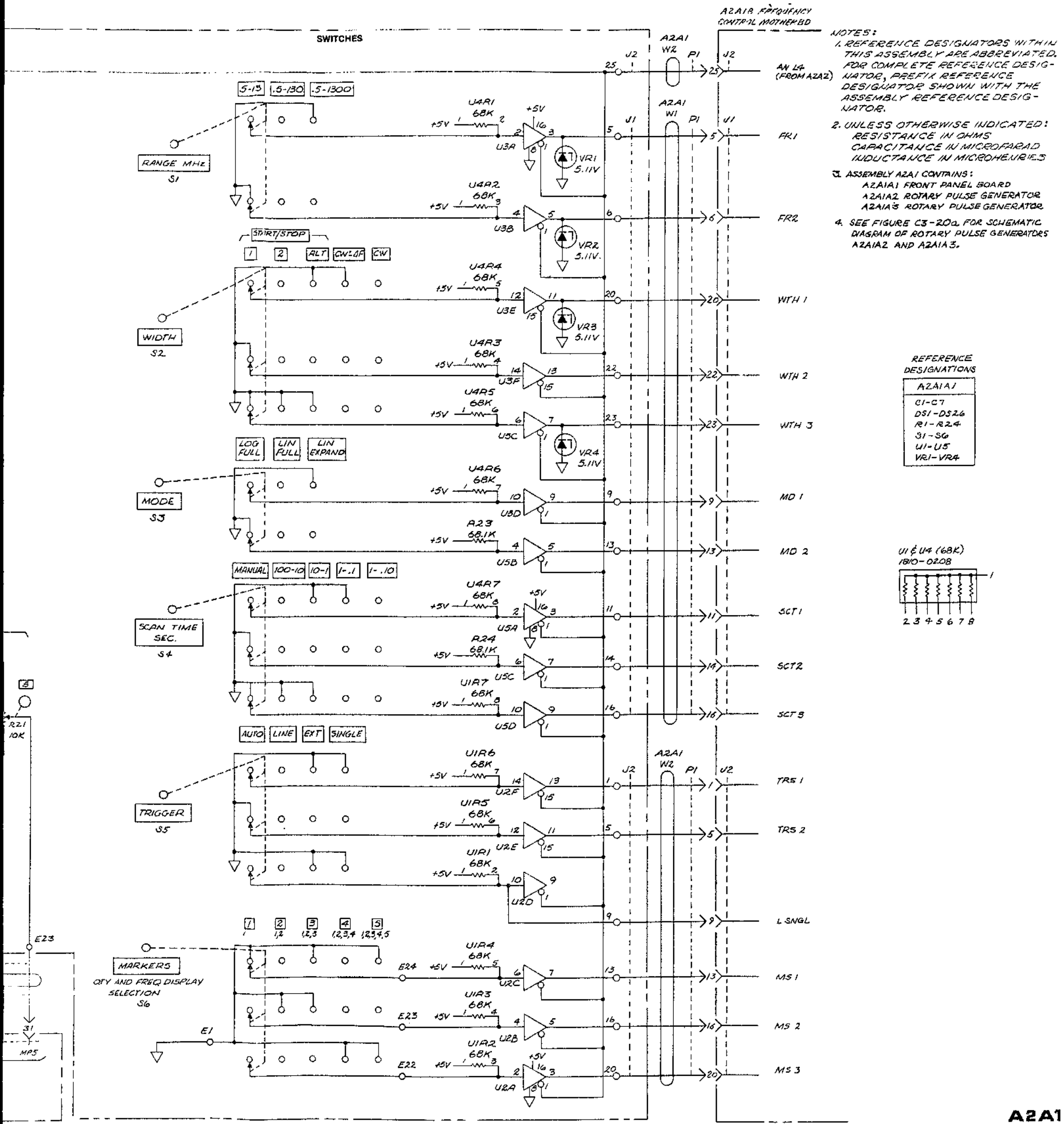


Figure C3-20. A2A1 Front Panel, Schematic

Fig 03-20A
Set 1 of 3

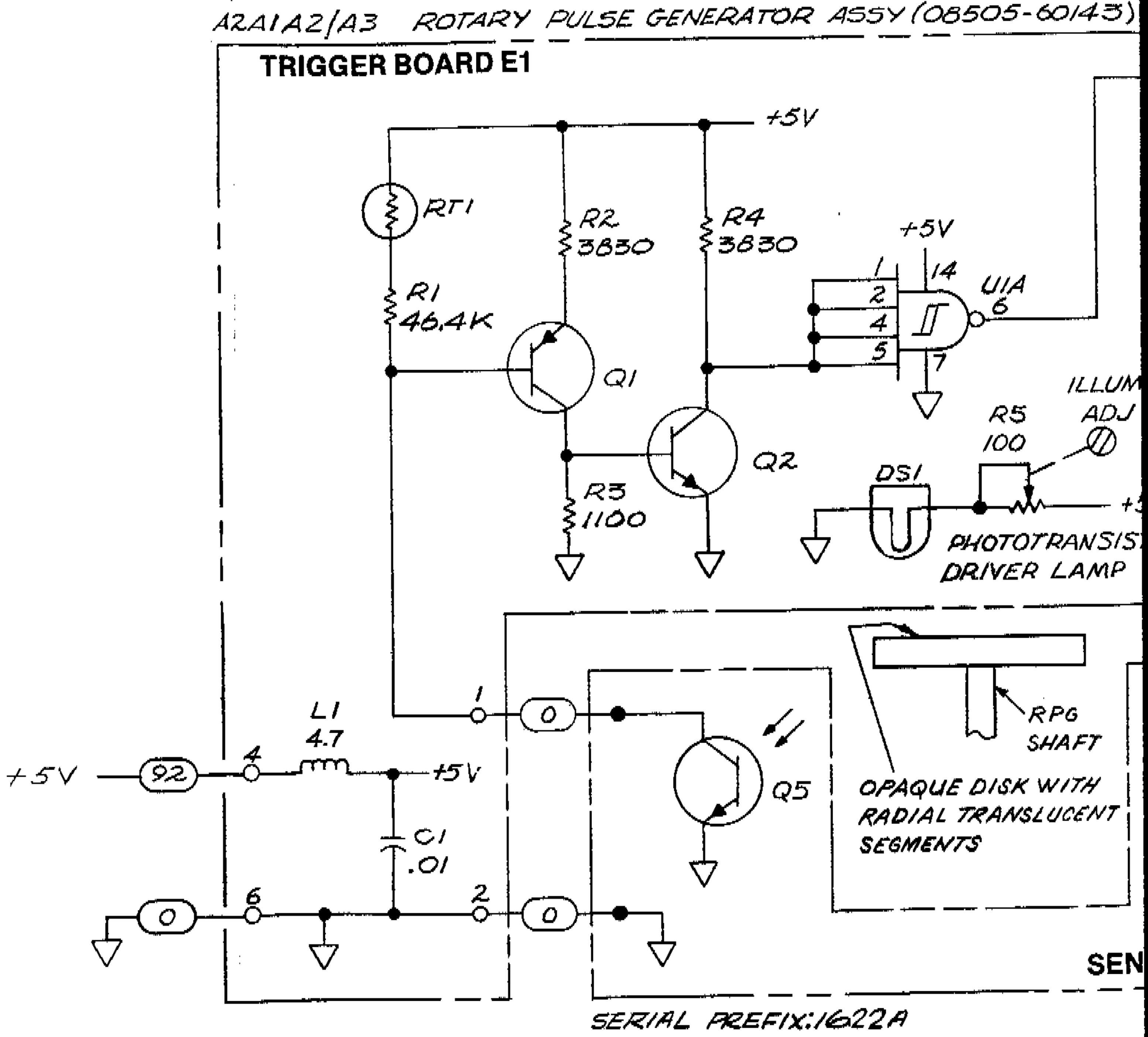


Fig C3-20A
SMT 208 3

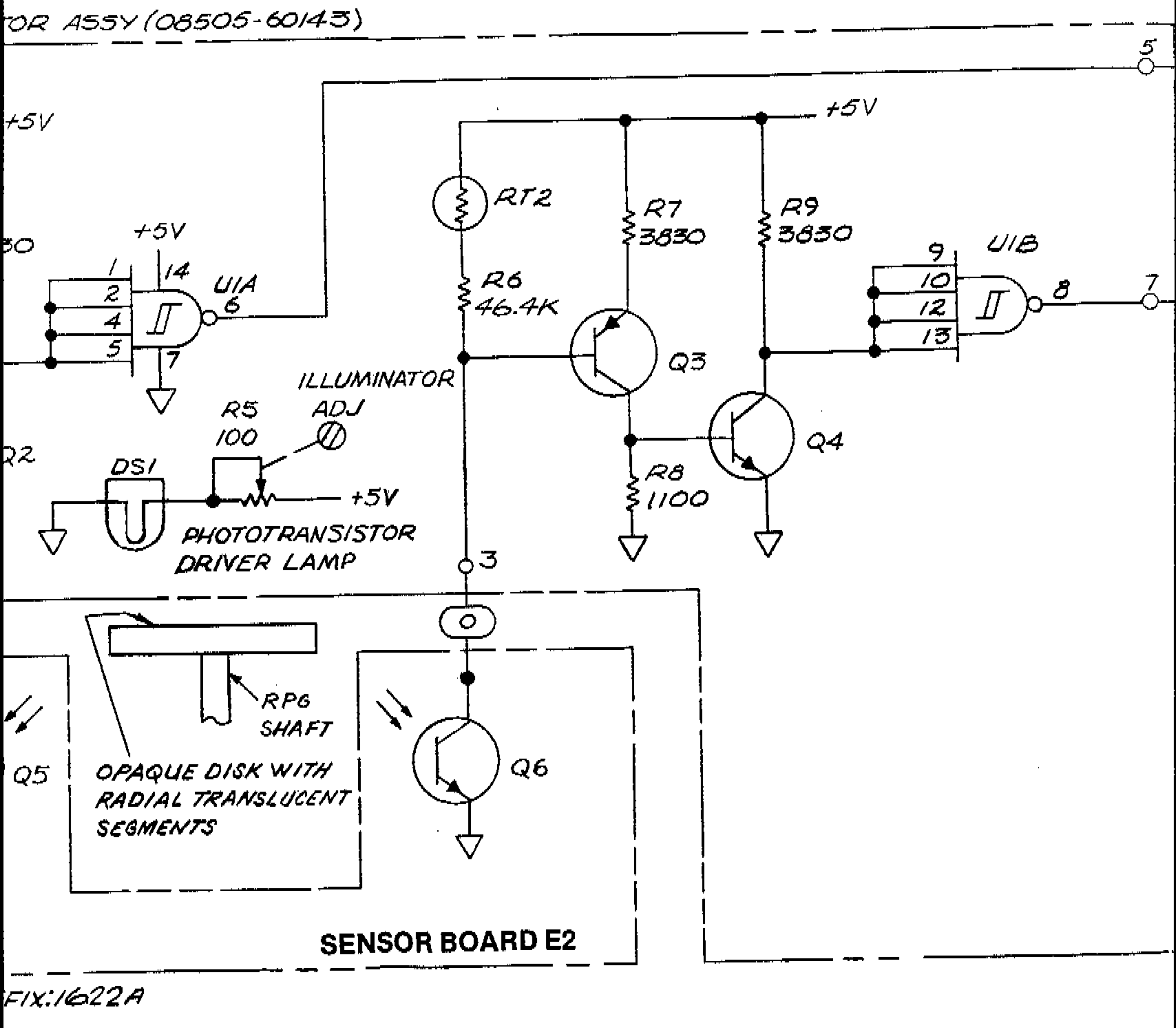
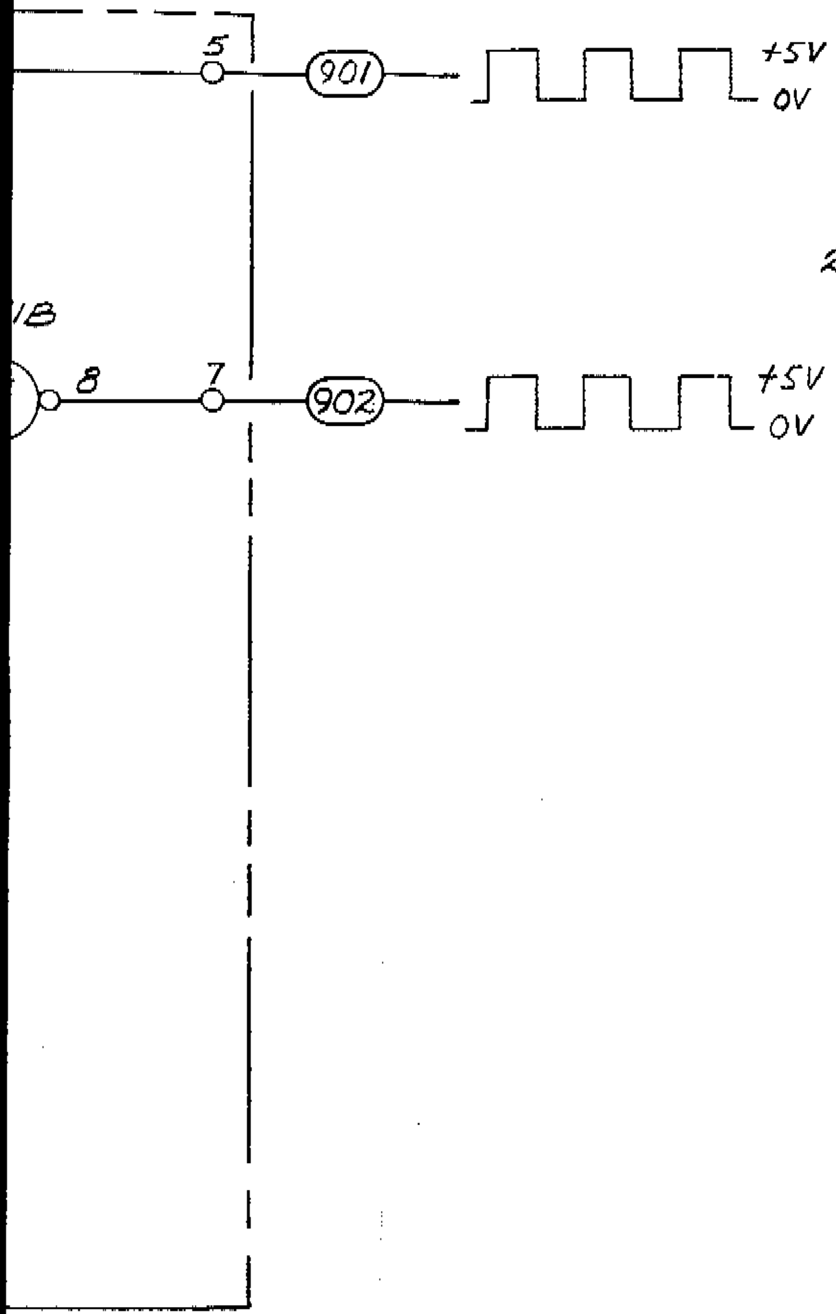


Fig C3-20A
Sht 3 of 3



NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATOR, PREFIX REFERENCE DESIGNATOR SHOWN WITH THE ASSEMBLY REFERENCE DESIGNATOR
2. UNLESS OTHERWISE INDICATED
   RESISTANCE IN OHMS
   CAPACITANCE IN MICROFARADS
   INDUCTANCE IN MICROHENRIES

REFERENCE DESIGNATORS A2A1A2/A3
C1
DS1
L1
Q1-Q6
R1-R9
RT1, RT2
U1

A2A1A2/A3

Figure C3-20a. Rotary Pulse Generator Assemblies, Schematic

A2A2 DISPLAY LOGIC

Introduction

The A2A2 Display Logic controls the transfer of digital data throughout the A2 Frequency Control Assembly (see Figure C3-20P). It interfaces with the following boards of the A2 Frequency Control Assembly:

A2A1 Front Panel Assembly
A2A3 Memory Board Assembly
A2A4 Scaling Circuit Assembly
A2A5 Prescaler/Counter Board Assembly
A2A14 Frequency Register Storage Assembly (HP-IB)

The most important circuit of the Display Logic is the Data Transfer Timing Generator, which provides the instrument with address pulses for the transfer of digital data within the instrument.

To keep the noise of the RF spectrum low, the Data Transfer Timing Generator is turned on only at appropriate times.

The Display Logic controls the front panel display of digital data appropriate to the mode of operation of the instrument. It also determines the proper positioning of the decimal points.

Digital Architecture

The digital data is used in the A2 Frequency Control Assembly to set frequencies, to display these settings on the front panel, and to display frequency counter data on the front panel.

Because the data is transferred on a four-line data bus in a time-multiplexed manner, the enabling pulses must enable one digit at a time. As shown in Figure C3-20B, the front panel displays are arranged in Positions 1, 2, and 3. Each position consists of four to six digits. To address one digit in particular, its position and digit numbers are needed. Therefore, the address portion of the data bus consists of three position lines and six digit lines. (A seventh digit line is necessary for decimal point transfer under remote control.)

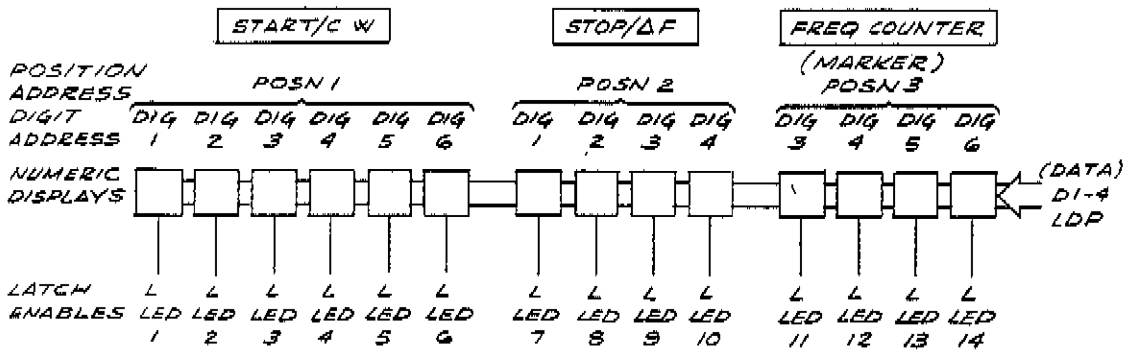


Figure C3-20B. Front Panel Numeric Displays

A latch enable pulse line is part of the data bus and carries a pulse that is centered within each digit pulse in the timing sequence. This LT EN pulse clocks the address latches. To latch data into the numeric displays of the front panel, 14 lines (L LED 1-14) are connected to the individual latch enable inputs of the numeric displays. For the timing sequence, see Figure C3-20C.

Fig C3-20c
Sht 1 of 3

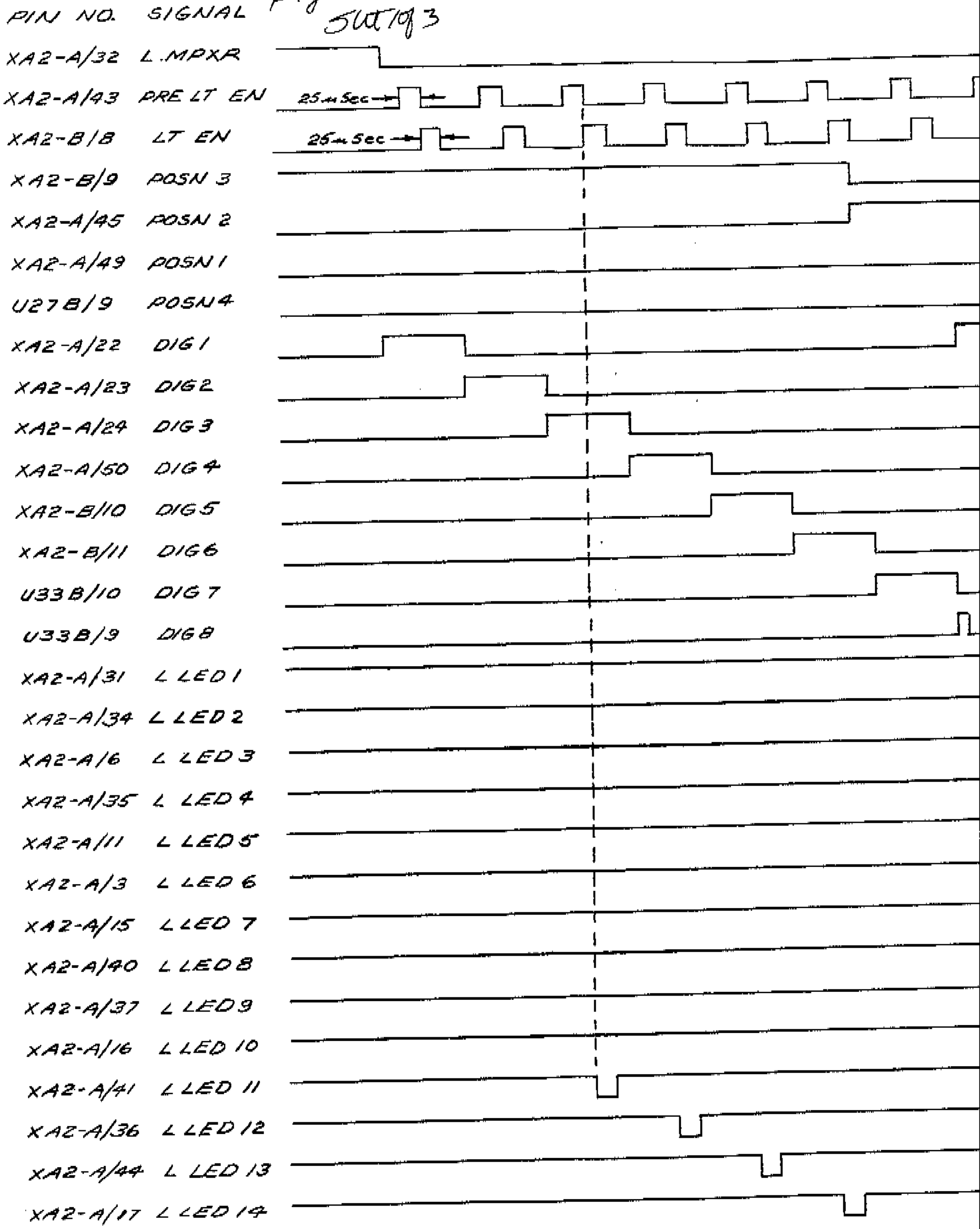


Fig C3-20C
Sht 2 of 3

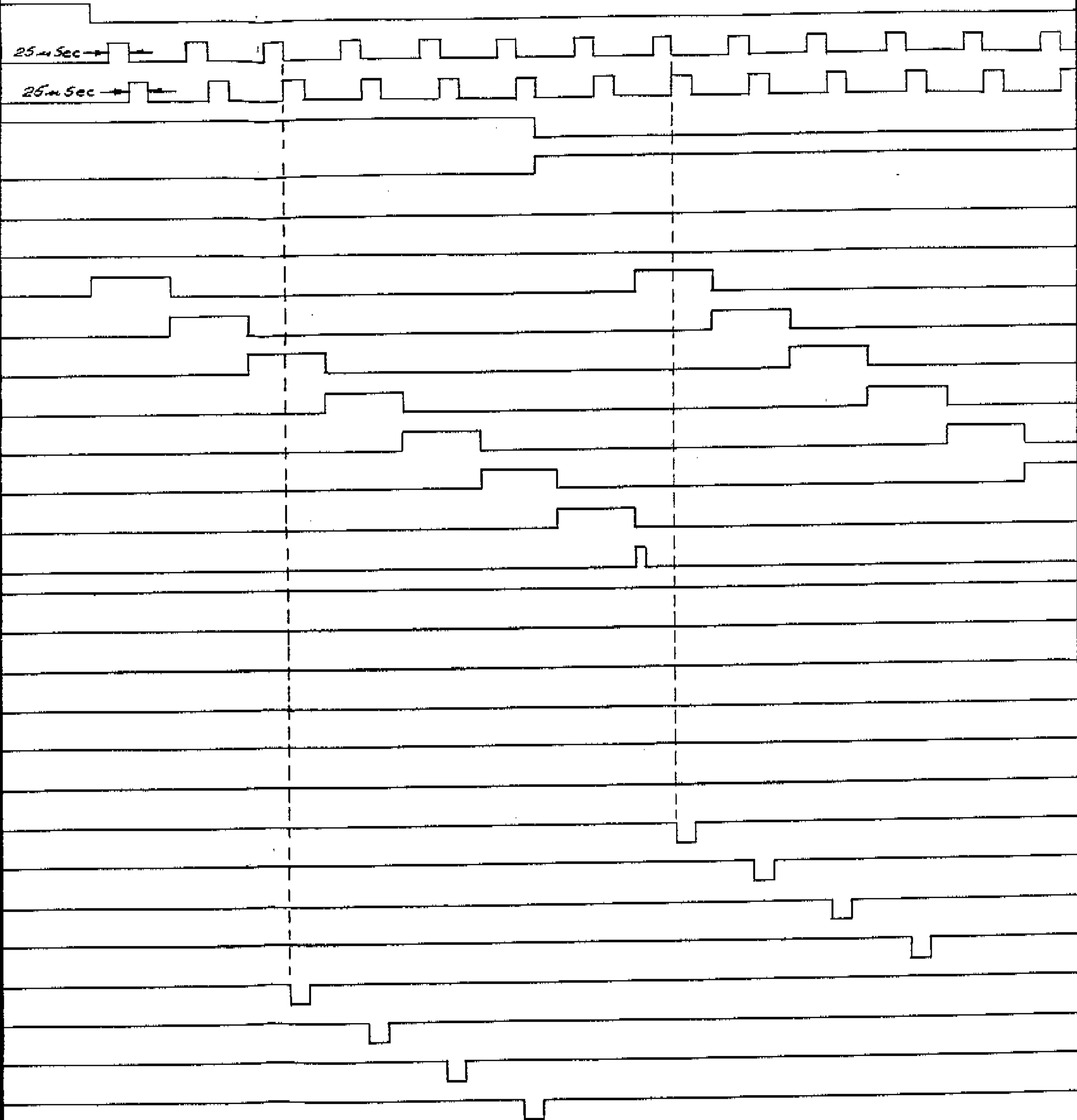


Fig C3-20C
Sat 3083

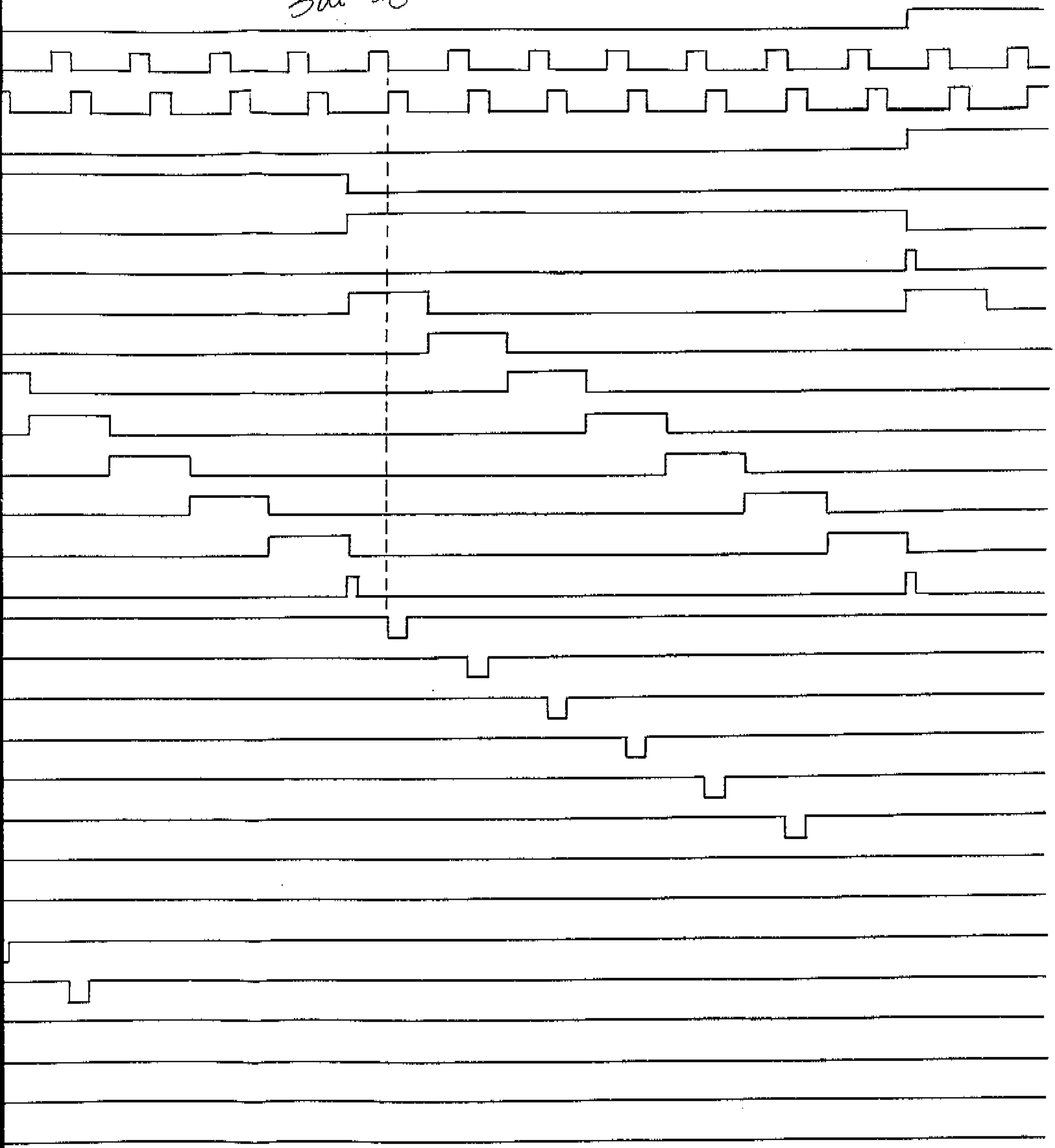


Figure C3-20C. A2A2 Display Logic, Timing Diagram

Fig C3-20D

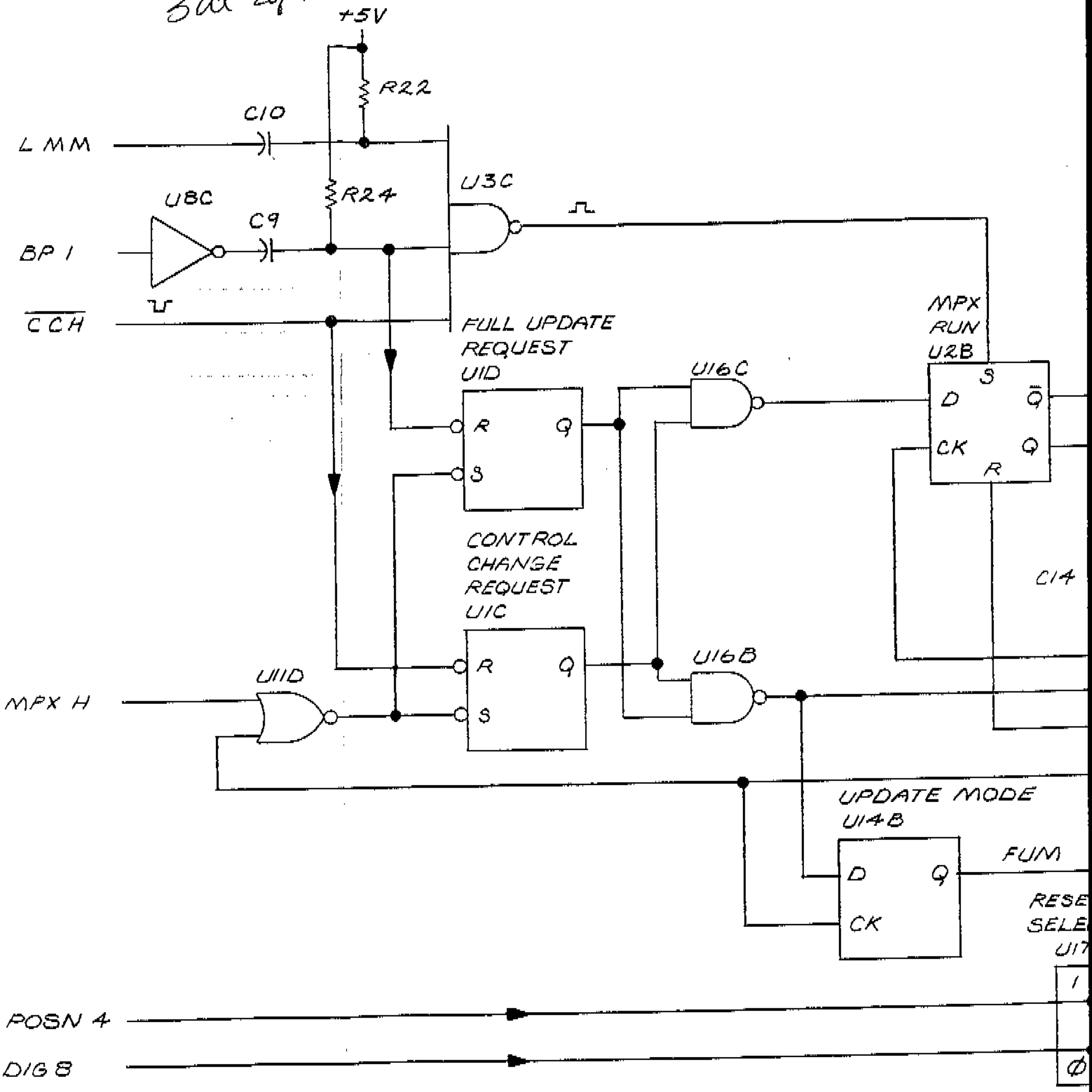
Data Transfer Enable SUT 1/83

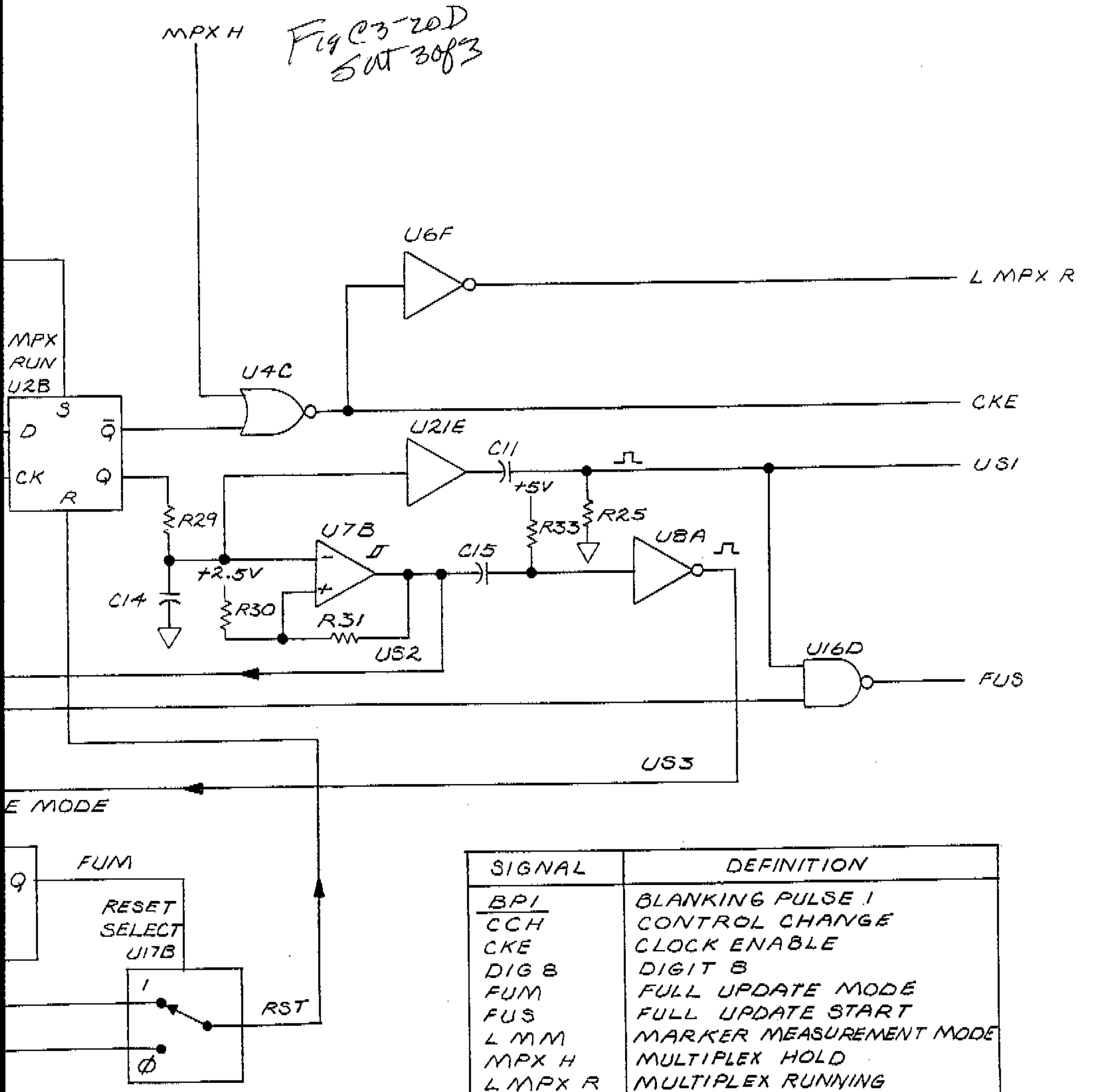
(See Figure C3-20D.) The Data Transfer Enable circuit generates the clock enable voltage (CKE) and the Update Start pulses (US 1,US 2, US 3) which are necessary for the start of a data transfer. It is started by a Blanking pulse (BP 1), a Control Change pulse ($\overline{\text{CCH}}$), or a Marker Measurement pulse (L MM). The circuit also stores an update request (BP 1 or $\overline{\text{CCH}}$), if it occurs during a data transfer, to restart the update cycle. The update mode (full or partial) is determined by the pulse initiating the update. The type of update determines which address pulse (DIG 8 or POSN 4) from the Data Transfer Timing Generator will terminate the clock enable.

A Full Update Start (FUS) pulse is generated at the beginning of each full update cycle, providing an input to the Control Change Detector circuit.

Any of these pulses (BP 1, $\overline{\text{CCH}}$, or L MM) will generate a positive-going transition at the output of U3C, which is connected to the set input of Multiplex Run flip-flop U2B. The $\overline{Q}$ output of U2B changes at this instant from 1 to 0, generating a 1 at the output of the two-input NOR gate U4C, since its second input (MPXH) is normally low. This enables the clock oscillator in the Data Transfer Timing Generator.This enable is inverted by U6F to Multiplex Running (L MPX R). The Q output of U2B is connected through a time-delay combination (R29, C14) to the inverting input of U7B. The output of U7B (US 2) drives the clock input of U2B and, after differentiation by C15 and R33, is connected to the input of the inverter U8A. This generates a positive pulse (US 3) at the output of U8A whenever the Q output of U2B changes from low to high. This output of U8A serves as a clock pulse for the Update Mode flip-flop U14B and, through the NOR gate U11D, as the set pulse for Control Change Request latch U1C and Full Update Request latch U1D. The set inputs of the latches are normally high and change to a low state only for the duration of this pulse. U1D is reset by BP 1, and U1C by $\overline{\text{CCH}}$. The outputs of the latches are ORed by the two-input NAND gates U16B and U16C, which provide the D inputs to the flip-flops U2B and U14B. These D inputs are high if one of the latches U1C or U1D is reset.

Fig C3-20D
Sht 2 of 3





SIGNAL	DEFINITION
BP1	BLANKING PULSE 1
CCH	CONTROL CHANGE
CKE	CLOCK ENABLE
DIG 8	DIGIT 8
FUM	FULL UPDATE MODE
FUS	FULL UPDATE START
L MM	MARKER MEASUREMENT MODE
MPX H	MULTIPLEX HOLD
L MPX R	MULTIPLEX RUNNING
POSN 4	POSITION 4
RST	RESET
US1-3	UPDATE START 1-3

Figure C3-20D. Data Transfer Enable Block Diagram

The Data Transfer Enable timing diagram is shown in Figure C3-20E. It is assumed that the blanking pulse BP 1 initiates the data transfer cycle. The positive transition of BP 1 causes a positive pulse on the set input of U2B, which in turn causes L MPX R to go low and generates the short US 3 pulse. The inverted and differentiated blanking pulse BP 1, which is connected to the reset input of U1D, causes the Q output of U1D to go low until it is again set to a high by US 3. This causes the D input of U2B to return to a low state.

The flip-flop U14B and switch U17B determine whether the data transfer cycle is to be for a full update (Positions 1-3), by selecting the POSN 4 pulse, or for a counter data update only (Position 3), by selecting the DIG 8 pulse. This selected pulse (RST) resets U2B, ending the data transfer cycle.

The resulting change in the state of the Q output of U2B will generate a transition from low to high at the output of U7B (US 2), which is the clock input of U2B. The flip-flop will change back to a high on the Q output if its D input is high during this clock transition. This assures a new update cycle if an update request was originated by BP 1 or $\overline{\text{CCH}}$ during the preceding data transfer cycle.

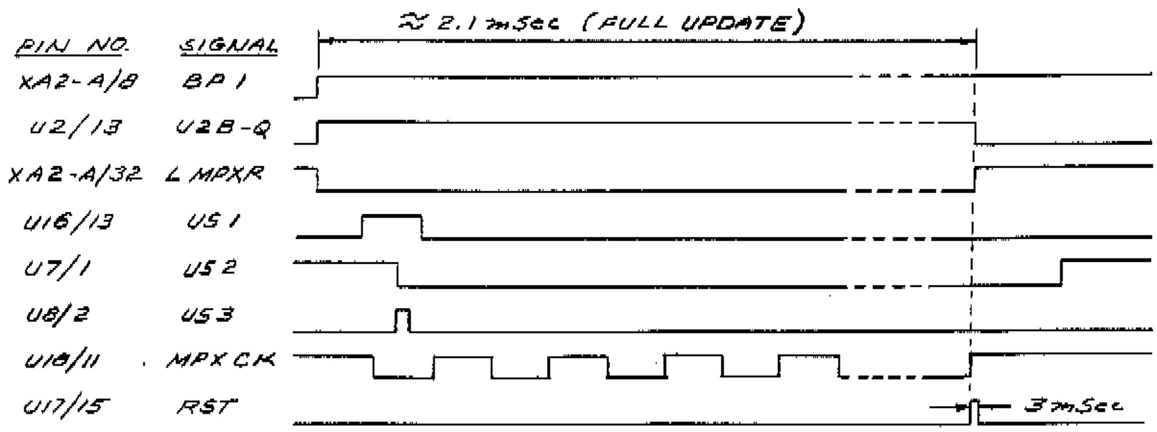


Figure C3-20E. Data Transfer Enable,Timing Diagram

Fig C3-20F
SUT /8Y

Data Transfer Timing Generator

(See Figure C3-20F.) The Data Transfer Timing Generator supplies the address pulses (DIG 1 through DIG 7, POSN 1 through POSN 3) for the Data Bus and also supplies the latch enable pulses (LT EN and PRE LT EN). These pulses are derived by division from a clock oscillator, which is enabled by the clock enable voltage CKE.

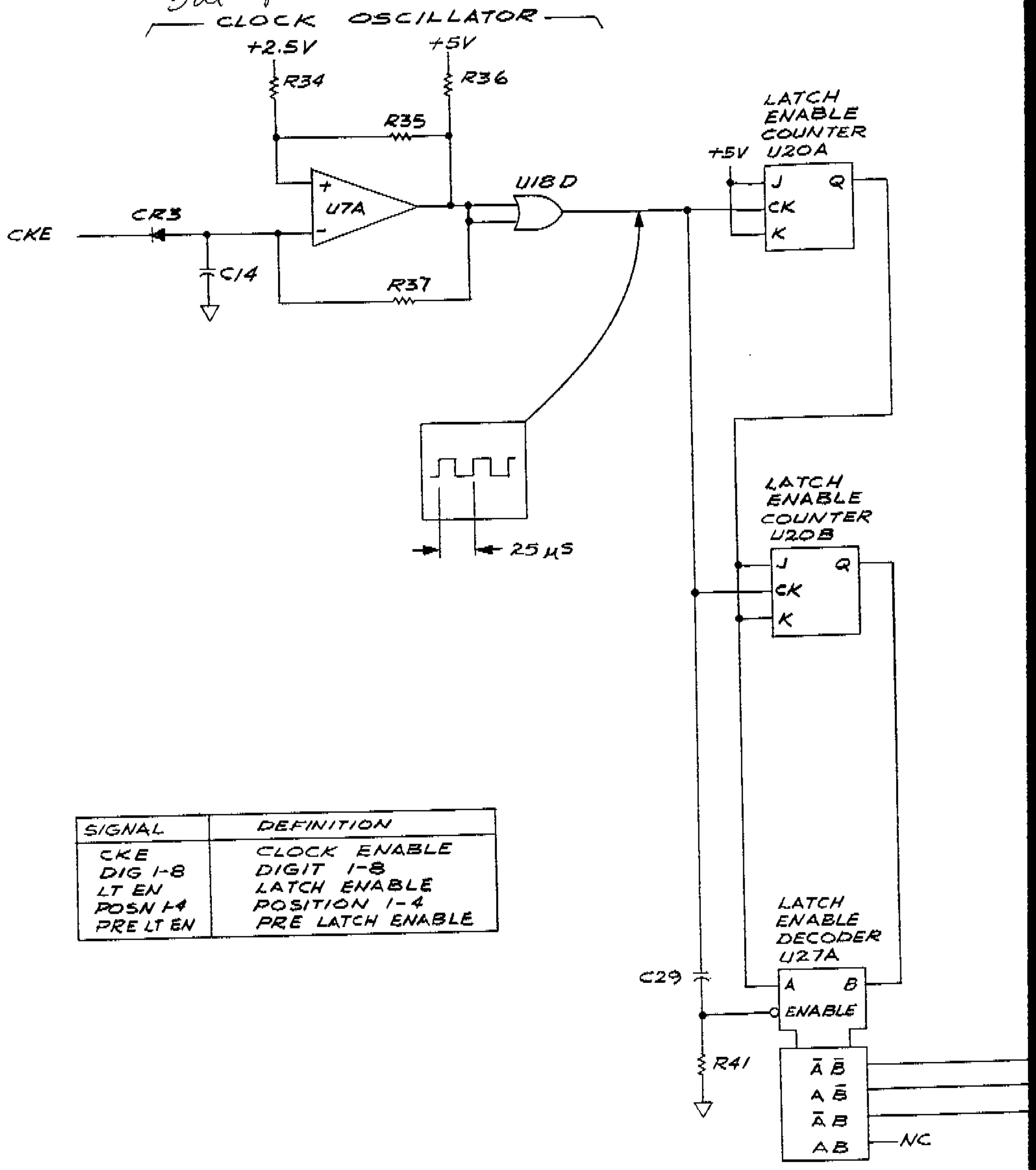
The comparator U7A, with R38 and C17, forms a 40-kHz clock oscillator. The resistors R35 and R37 provide a positive feedback for the comparator. The clock pulse is buffered by U18D and drives Latch Enable Counter flip-flops U20A and U20B. The Q outputs of the two flip-flops represent the two inputs of Latch Enable Decoder U27A. The enable input of U27A is the differentiated (C20, R41) 40-kHz clock pulse. The timing diagram is shown in Figure C3-20G.

Three output lines of U27A form the LT EN and PRE LT EN pulses and the clock input into Digit Counter U34A. This counter drives the Digit Decoders U33A and U33B, which generate at their outputs the pulses DIG 1 through DIG 8.

The DIG 8 pulse serves three purposes: (1) It resets U34A, (2) it provides a reset pulse to the Data Transfer Enable circuit, and (3) it forms the clock pulse for Position Counter U34B, whose outputs drive Position Decoder U27B.

The outputs of U27B represent the position lines POSN 1, POSN 2, and POSN 3. The Q3 output (POSN 4) of this decoder serves as the reset line for U34B and provides the other reset pulse to the Data Transfer Enable Circuit.

Fig C3-20F
Sht 2 of 4



SIGNAL	DEFINITION
CKE	CLOCK ENABLE
DIG 1-8	DIGIT 1-8
LT EN	LATCH ENABLE
POSN 1-4	POSITION 1-4
PRE LT EN	PRE LATCH ENABLE

Fig C3-20F
JUL 3084

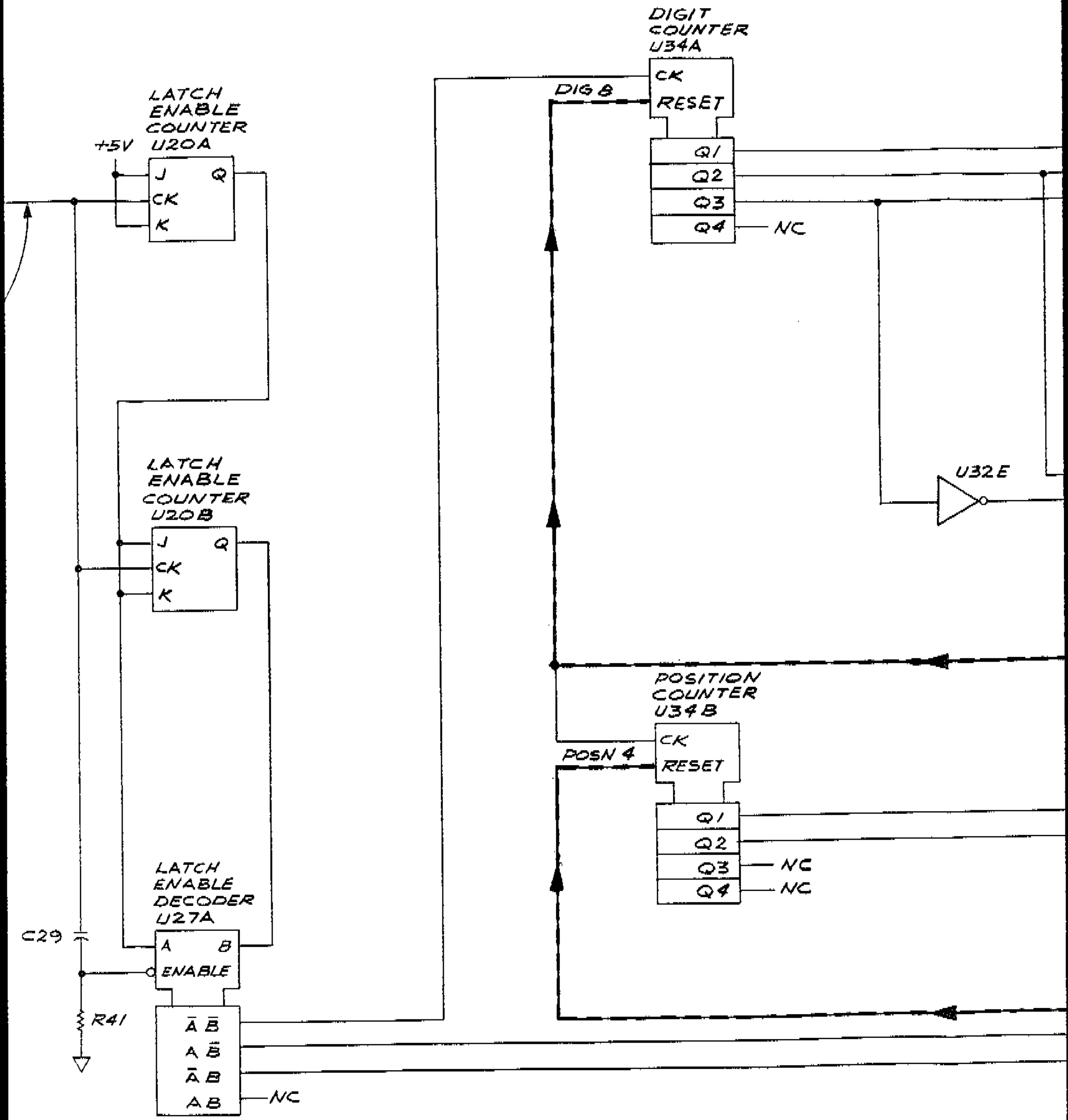


Fig C3-20F
sht 4 of 4

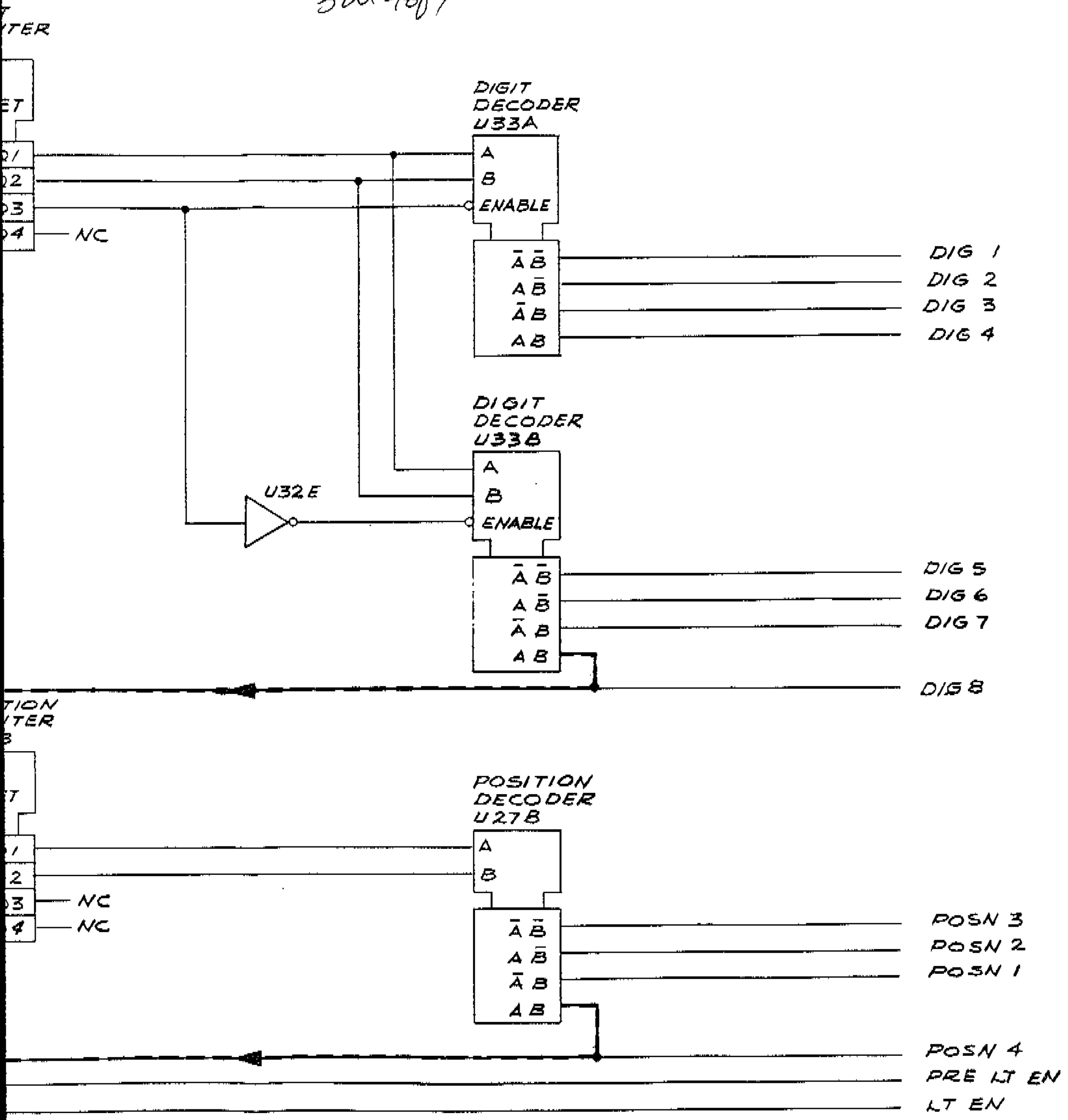
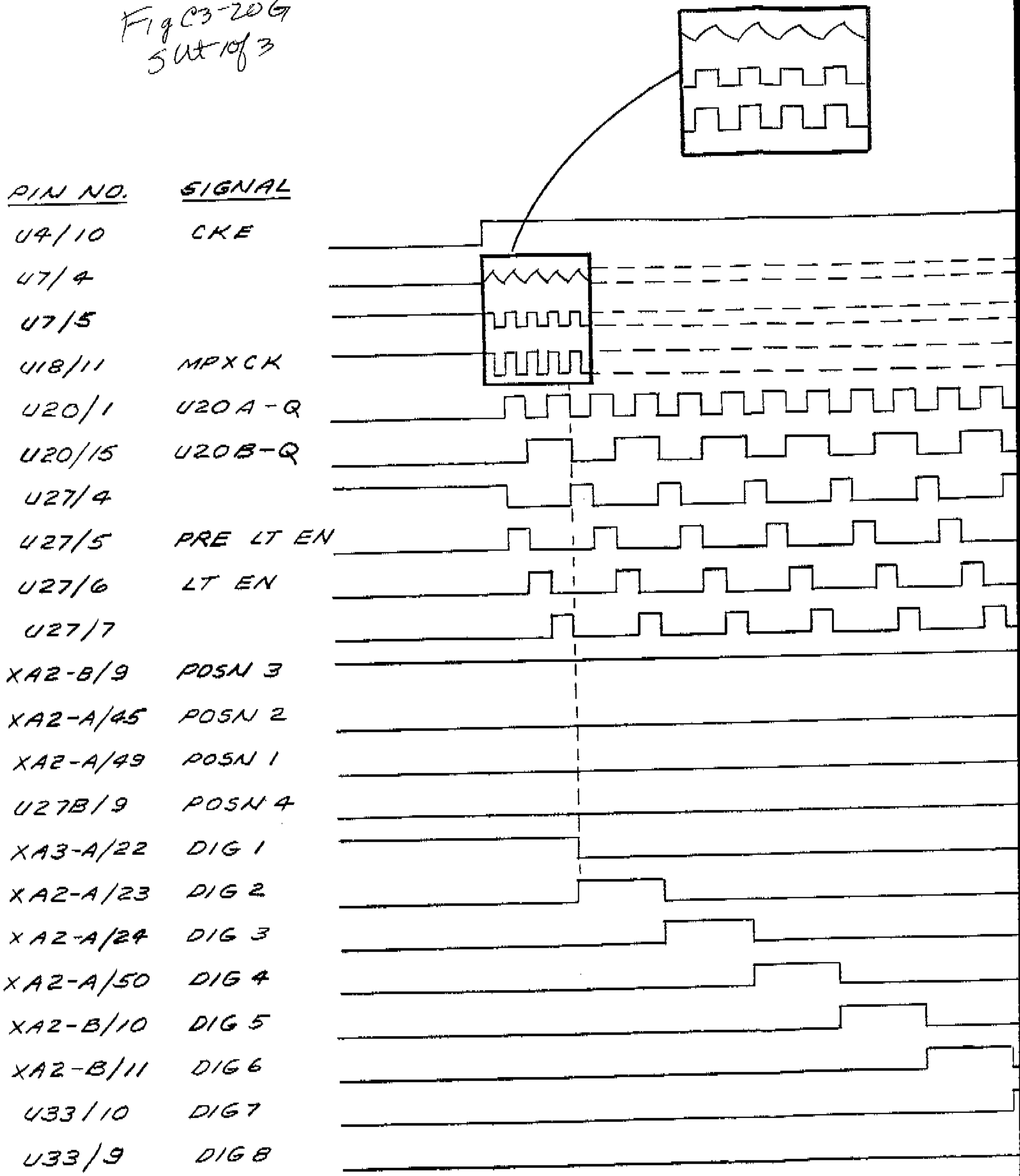


Figure C3-20F Data Transfer Timing Generator, Block Diagram

Fig C3-20G
Sht 1 of 3



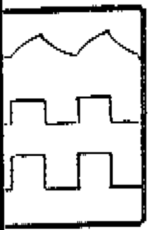


Fig C3-20G
Sht 2 of 3

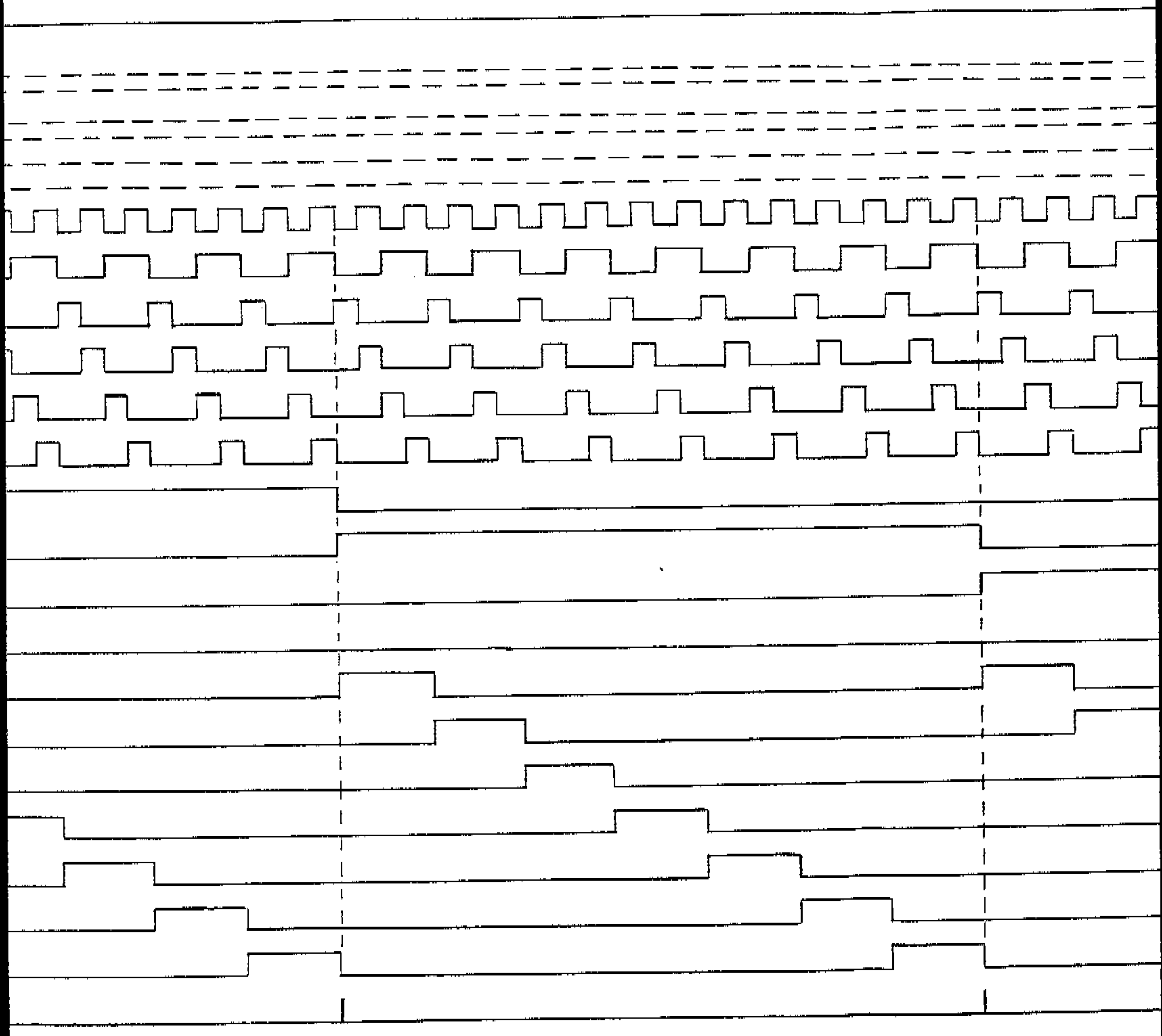


Fig C3-20G
Sht 3 of 3

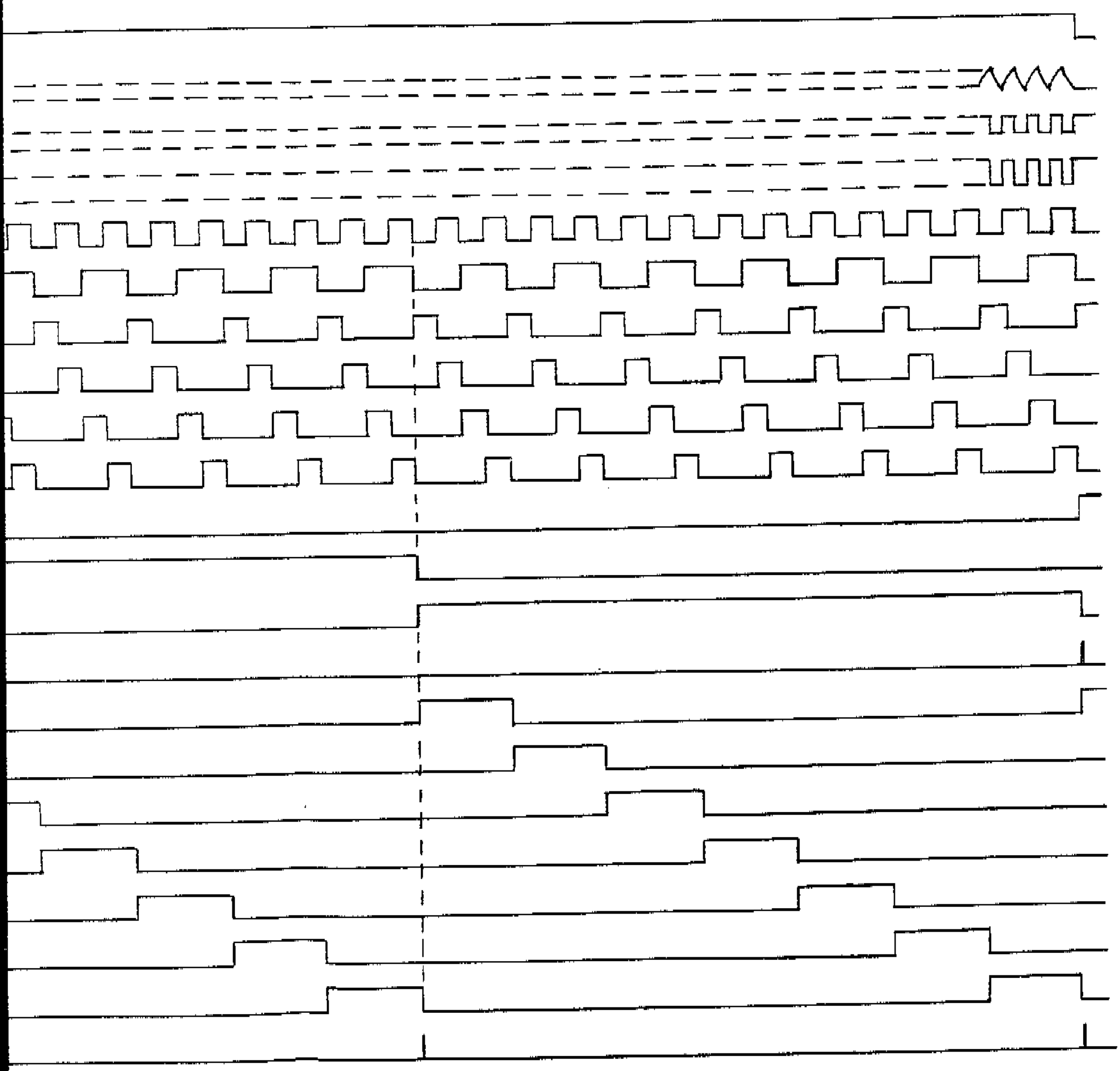


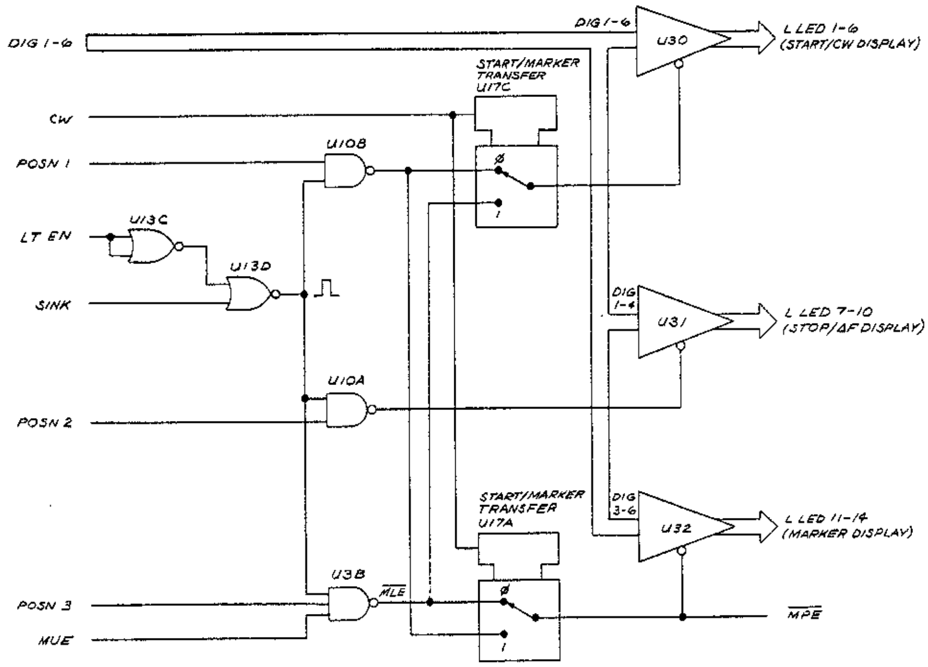
Figure C3-20G. Timing Diagram

Display Enable

(See Figure C3-20H.) The Display Enable circuit decodes the DIG 1-6 and POSN 1-3 lines to provide the L LED 1-14 lines, which enable three groups of numeric displays on the front panel: the START/CW group (L LED 1-6), the STOP/±ΔF group (L LED 7-10), and the marker (FREQ COUNTER MHz) group (L LED 11-14). The L LED 1-14 lines are inhibited by the SINK input, which is used during every second sweep in the alternate sweep mode. In the CW mode, the marker enable pulses (POSN 3) are directed to the START/CW display.

If the instrument is operating in a mode other than CW, the POSN 1 pulse is NANDed with the gated LT EN pulses by U10B, and the resulting pulses are connected through Start/Marker Transfer U17C to the enable inputs of the six inverting buffers of U30. The inputs of these six buffers are connected to the DIG 1-6 lines, and the outputs are connected to L LED 1-6. The same principle applies for the four buffers of U31, whose enable inputs are connected to the output of U10A, and whose outputs are connected to L LED 7-10. The inputs of NAND gate U10A are driven by POSN 2 and the gated LT EN. U32, which drives L LED 11-14, is connected in the same manner, except that its enable inputs are connected through U17A to the output of U3B. The inputs of U3B are driven by POSN 3, the gated LT EN pulse, and MUE. The LT EN pulses are gated by the SINK input from the memory board (A2A3).

In the CW mode, the POSN 3 data is displayed at the left-hand numeric displays (L LED 1-6). This is achieved by connecting the output of U3B through U17C to the enable inputs of U30.



SIGNAL	DEFINITION
DIG 1-6	DIGIT 1-6
L LED 1-14	LED 1-14
LT EN	LATCH ENABLE
MLE	MARKER LATCH ENABLE
MPE	MARKER POSITION ENABLE
MUE	MARKER UPDATE ENABLE
POSN 1-3	POSITION 1-3
SINK	SYNCHRONIZER

Figure C3-20H. Display Enable Block Diagram

Decimal Point Decoder

(See Figure C3-20I). The Decimal Point Decoder generates decimal point (DCP) pulses by decoding the front panel settings. It consists of two circuits; one generates the DCP pulses for Position 1 and Position 2, and the other generates DCP pulses for Position 3 and three lines, DEP 1-3, which are used for presetting of the counter.

The decimal points for Position 1 and Position 2 are provided by the multiplexer U19 (Start/Stop, CW $\pm \Delta$F, Decimal Point Select), which receives at the address inputs the RANGE MHz data CFR1 and CFR2 (see Table C3-1). The enable inputs EN Z and EN W are driven, depending on the position pulses POSN 1 and POSN 2 and the state of the ΔF line. The data inputs for Z are connected to the DIG 2-4 lines, and those for W, to the DIG 3-5 lines. The digits at which decimal points are displayed, depending on RANGE MHz and WIDTH, are shown in Figure C3-20J. The outputs of U19 are ORed through U18C. A positive pulse is present at the output of U18C to address the digit position on which the decimal point should be displayed.

The decimal point position for the FREQ COUNTER MHz display (Position 3) depends not only on the selected RANGE MHz but also on the COUNTER RESOLUTION. COUNTER RESOLUTION depends on SCAN TIME SEC, MODE, and WIDTH (see Table C3-2). The correct position for the decimal point is determined by Adder U12, which sums the binary word of CFR1 and CFR2 with the binary word of CRM and CRC resulting in the three output lines DEP 1-3. (See Table C3-3.)

Marker Decimal Point Select U26, in conjunction with DEP 1-3, selects the appropriate digit line for the Position 3 decimal point. The enable input of U26 is driven by the POSN 3 line so that a positive pulse is present at the output of U26 to address the digit position on which the decimal point should be displayed. The outputs of U18C and U26 are ORed through U18B to form the DCP pulse. The COUNTER RESOLUTION data present on the lines DEP 1-3 is also used on the Prescaler/Counter board to correctly preset the counter.

Table C3-1. Frequency Range Coding

RANGE MHz	0.5 – 13	0.5 – 130	0.5 – 1300
CFR1	0	1	0
CFR2	0	0	1

Table C3-2. Counter Resolution Coding

MODE/WIDTH	All Combinations except LIN EXP/CW					LIN EXP CW
SCAN TIME SEC	MAN	100-10	10-1	1-.1	.1-.01	All Positions
Resolution	Coarse	Fine	Fine	Med.	Coarse	Fine
CRC	1	0	0	0	1	0
CRM	0	0	0	1	0	0

Table C3-3. Decimal Point Decoding

FREQ RANGE MHz	0.5 – 13			0.5 – 130			0.5 – 1300		
CFR1	0			1			0		
CFR2	0			0			1		
Resolution	Fine	Med.	Coarse	Fine	Med.	Coarse	Fine	Med.	Coarse
CRM	0	1	0	0	1	0	0	1	0
CRC	0	0	1	0	0	1	0	0	1
DECIMAL POINT POSITION	DIG 3	DIG 4	DIG 5	DIG 4	DIG 5	DIG 6	DIG 5	DIG 6	DIG 7
DEP 1	0	1	0	1	0	1	0	1	0
DEP 2	0	0	1	0	1	1	1	1	0
DEP 3	0	0	0	0	0	0	0	0	1

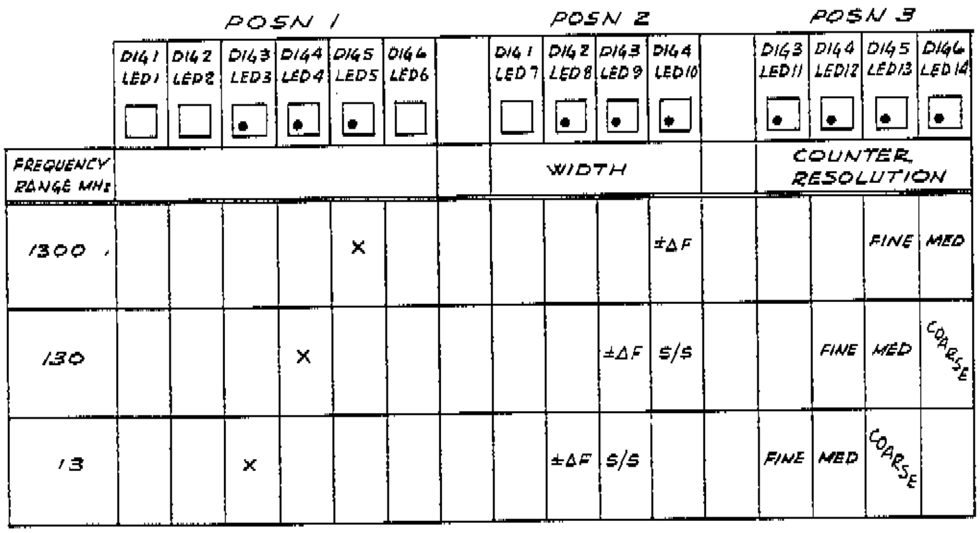


Figure C3-20I. Front Panel Decimal Point Locations

Fig 03-20J
Sht 1 of 2

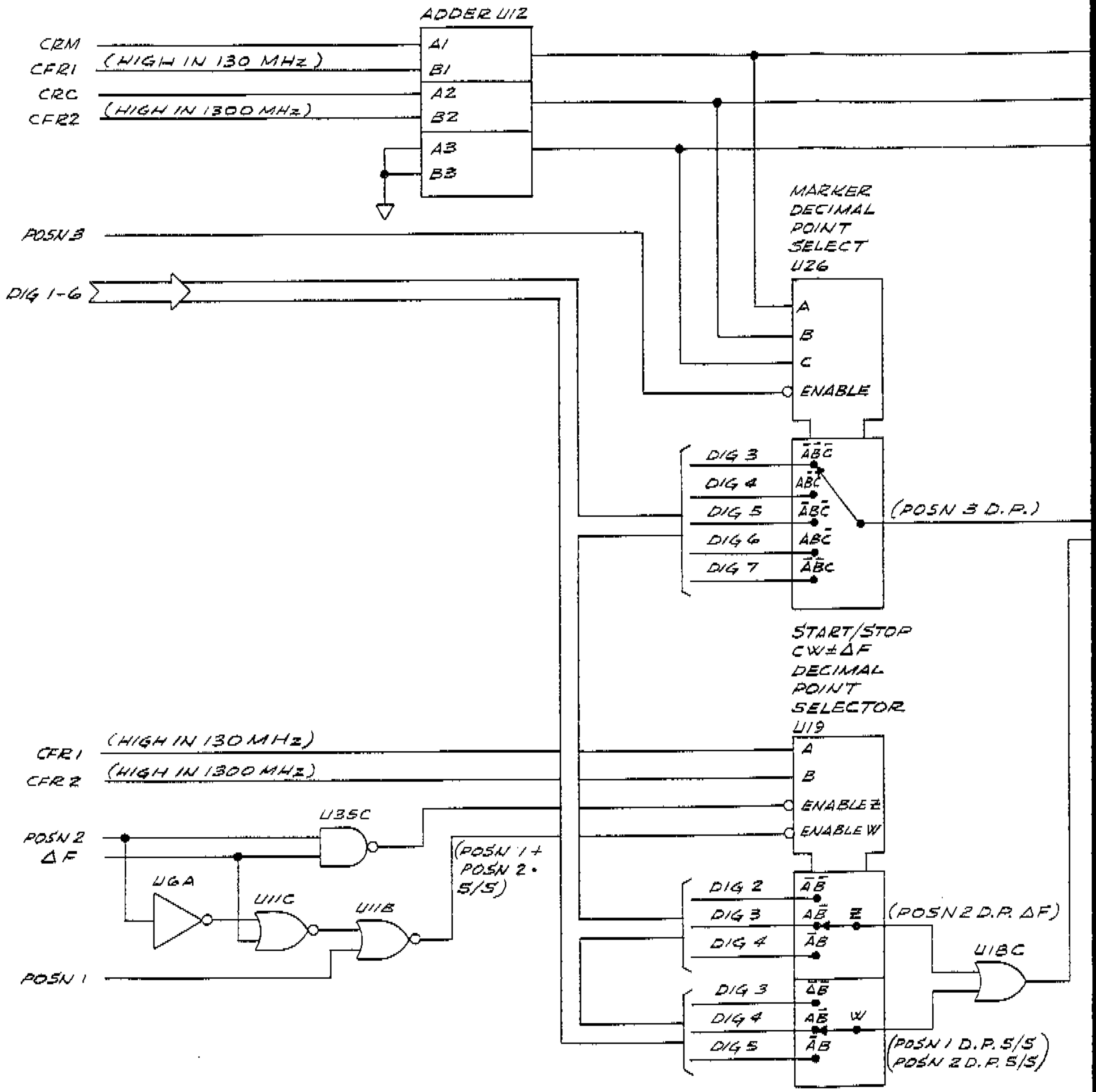
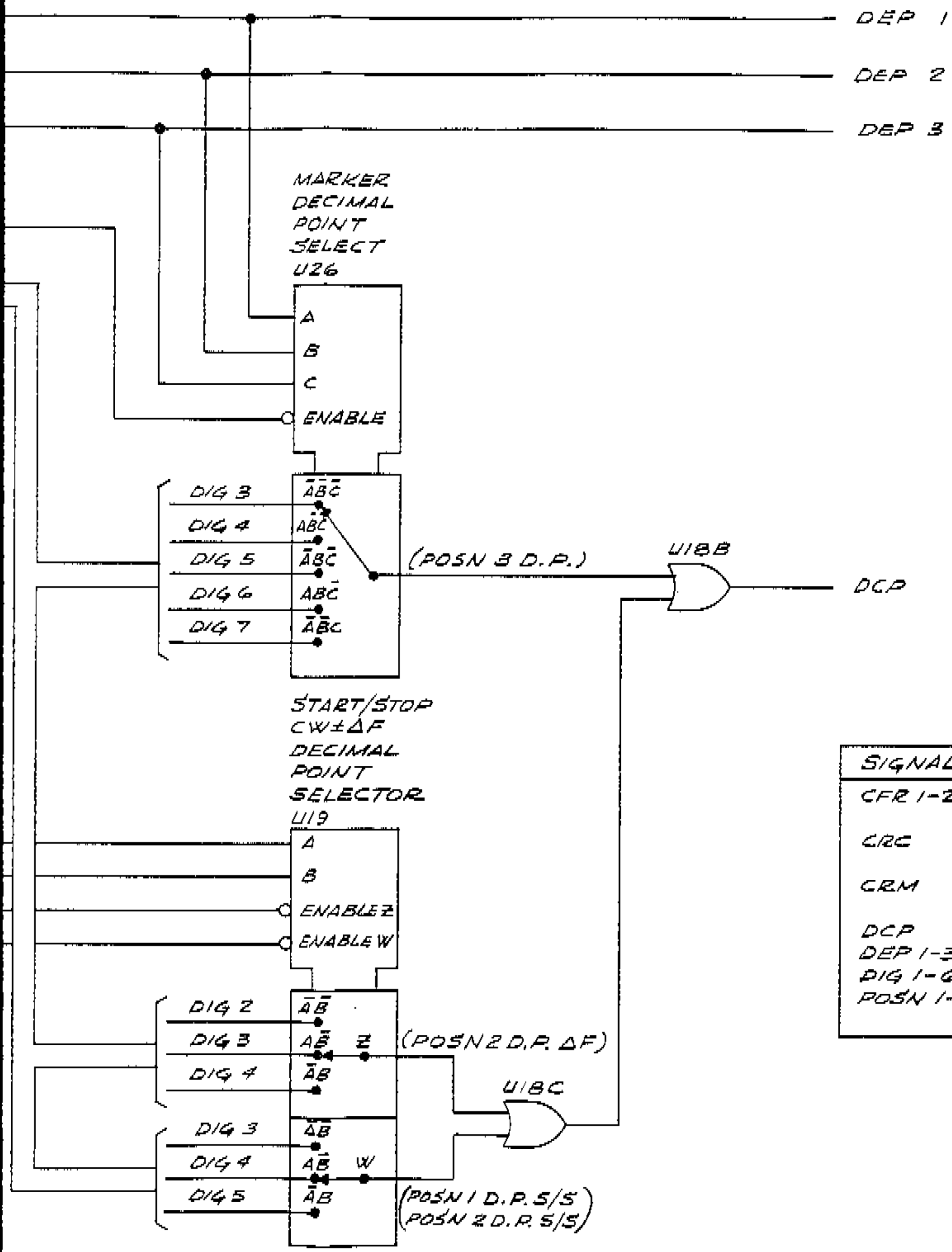


Fig C3-20J
Sht 2 of 2



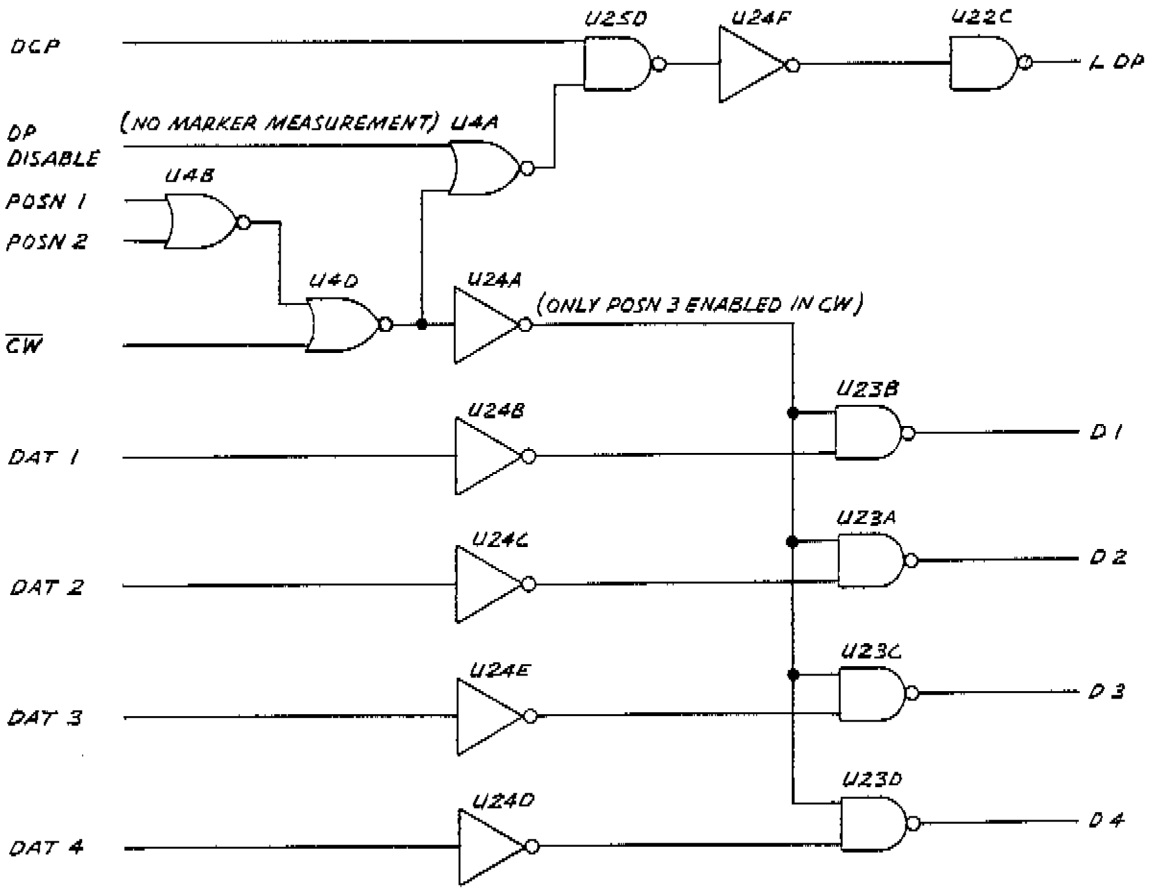
SIGNAL	DESCRIPTION
CFR 1-2	CODED FREQUENCY RANGE 1-2
CRC	COUNTER RESOLUTION COARSE
CRM	COUNTER RESOLUTION MEDIUM
DCP	DECIMAL POINT
DEP 1-3	DECIMAL POINT 1-3
DIG 1-6	DIGIT 1-6
POSN 1-3	POSITION 1-3

Figure C3-20J. Decimal Point Decoder, Block Diagram

Display Data Enable

(See Figure C3-20K.) The Display Data Enable circuit connects the Data Bus (DAT 1-4, DCP) with the data inputs of the numeric displays (D 1-4, L DP) and can force the outputs of D 1-4, L DP high, which blanks the numeric displays. This blanking is necessary in the CW mode for the STOP/±ΔF and the FREQ COUNTER MHz displays.

The NAND gates U23A through U23D are always enabled except when POSN 1 and POSN 2 are active if the instrument is operating in the CW mode. In this operation, the outputs of U23A through U23D go high during the POSN 1 and POSN 2 data transfer time, which causes the LED's on the front panel to be blanked. U4B, U4D, and U24A decode the CW, POSN 1, and POSN 2 states to give the proper enable voltage for U23A through U23D. The gates U4A, U25D, U24F, and U22C form the Decimal Point Enable circuit, which drives the decimal point input of the numeric displays. The output of U4A is high if the decimal point information should be passed on.



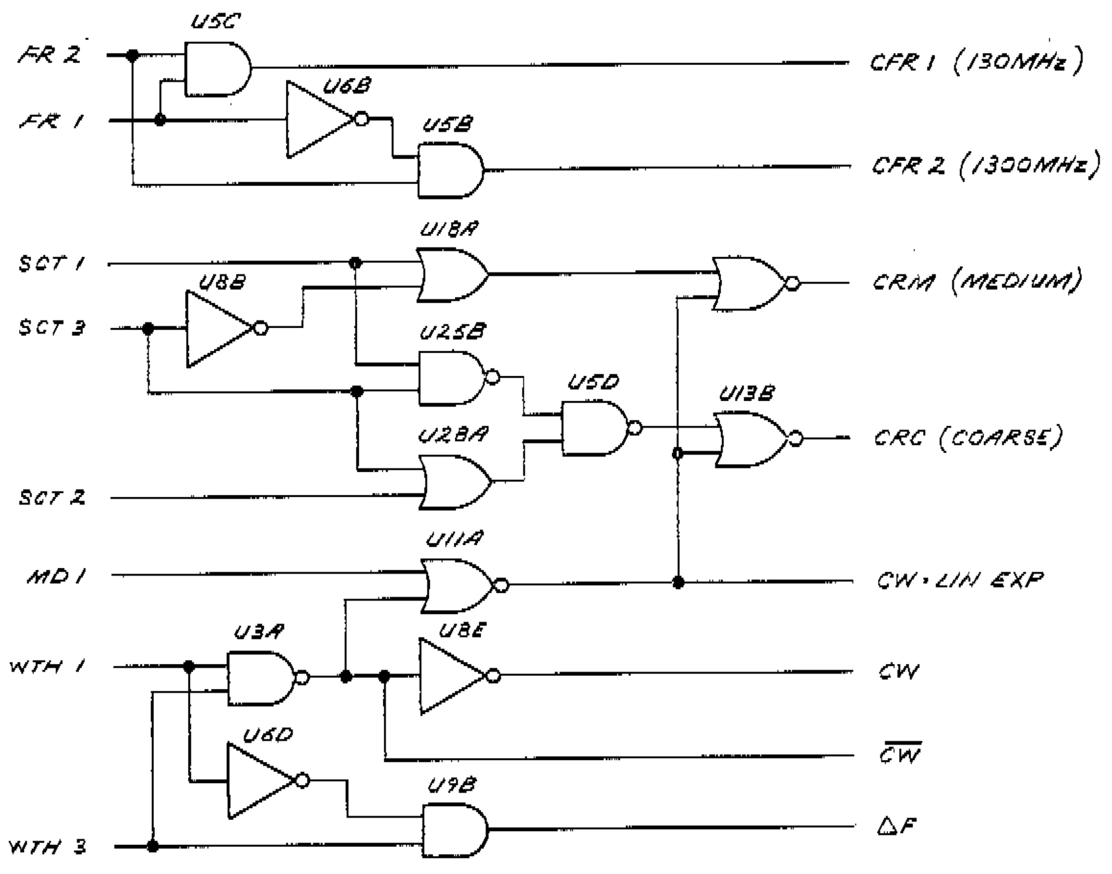
SIGNAL	DEFINITION
D1-4	DATA 1-4 (TO DISPLAYS)
DAT 1-4	DATA 1-4 (DATA BUS)
DCP	DECIMAL POINT
L DP	DECIMAL POINT (TO DISPLAYS)
DP DISABLE	DECIMAL POINT DISABLE
POSN 1-2	POSITION 1-2

Figure C3-20K. Display Data Enable, Block Diagram

The decimal point will be disabled during POSN 1 and POSN 2 data transfer if the instrument is in the CW mode or if the DP DISABLE line is high, which happens if no marker data is displayed.

Front Panel Control Logic

(See Figure C3-20L.) The Front Panel Control Logic circuit decodes the lines from the front panel controls to lines in the A2A2 Display Logic. Refer to Tables C3-1 and C3-2 for their logic states.

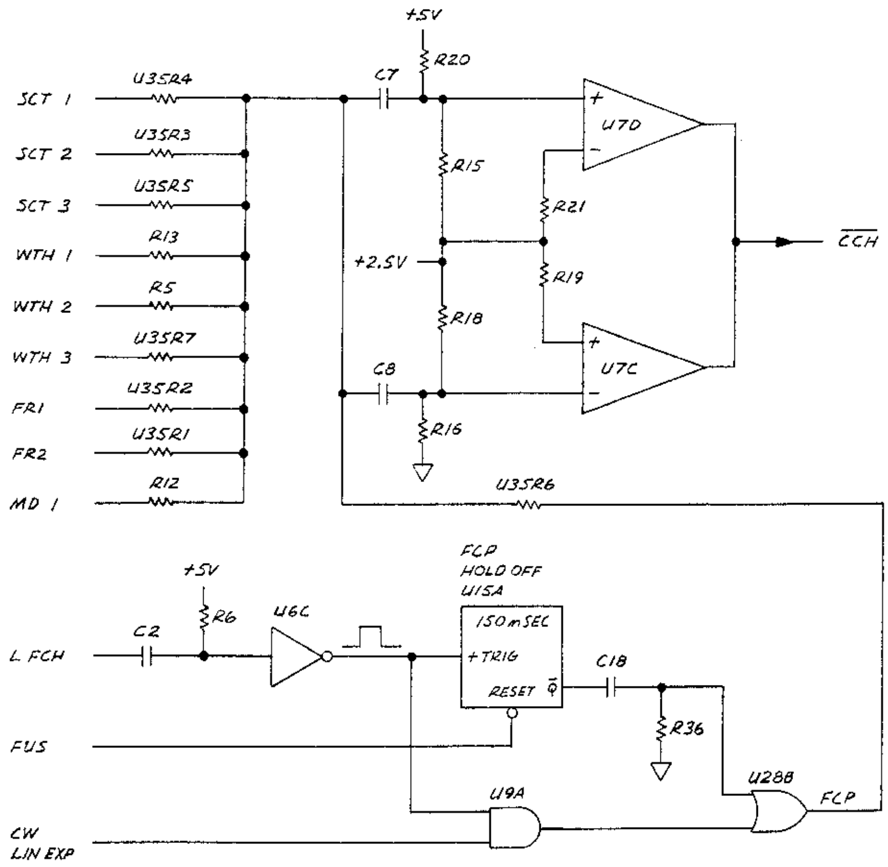


SIGNAL	DEFINITION
CFR 1-2	CODED FREQUENCY RANGE 1-2
CRC	COUNTER RESOLUTION COARSE
CRM	COUNTER RESOLUTION MEDIUM
FR 1-2	FREQUENCY RANGE 1-2
MD 1	MODE 1
SCT 1-3	SCAN TIME 1-3
WTH 1, 3	WIDTH 1, 3

Figure C3-20L. Front Panel Control Logic, Block Diagram

Front Panel Control Change Detector

(See Figure C3-20M.) The Front Panel Control Change Detector generates a Control Change ($\overline{CCH}$) pulse when it senses any change in the front panel settings that requires an update. It consists of two comparators, U7C and U7D, which detect a positive- or negative-going transition on the summing junction to which are connected the Frequency Change Pulse (FCP) line and lines from the front panel switches. The outputs of the inverting comparator U7C and the non-inverting comparator U7D are summed together to generate the $\overline{CCH}$ pulse.



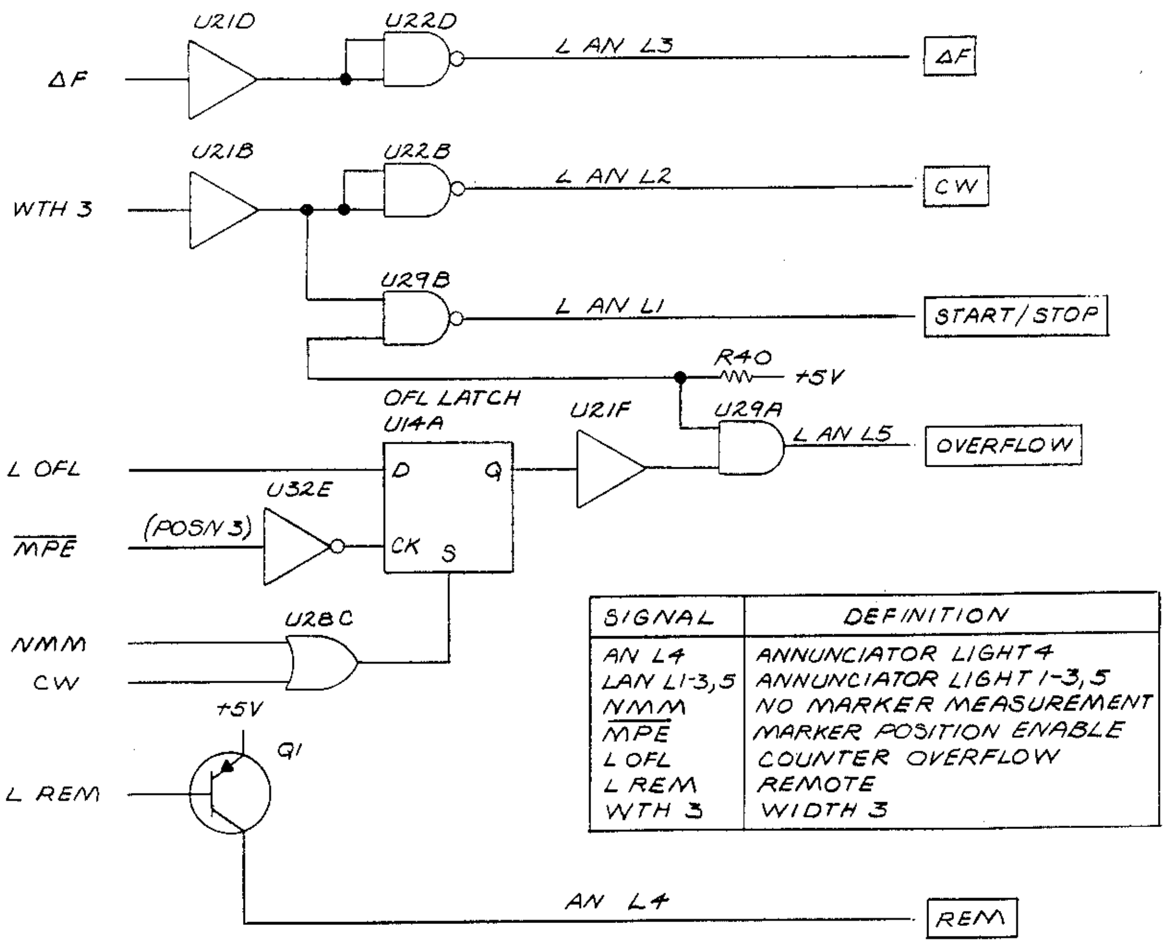
SIGNAL	DEFINITION
$\overline{CCH}$	CONTROL CHANGE
L FCH	FREQUENCY CHANGE
FCP	FREQUENCY CHANGE PULSE
FR1-2	FREQUENCY RANGE 1-2
FUS	FULL UPDATE START
MD1	MODE 1
SCT 1-3	SCAN TIME 1-3
WTH 1-3	WIDTH 1-3

Figure C3-20M. Front Panel Control Change Detector, Block Diagram

FCP Holdoff U15A prevents a new update earlier than 150 ms after the last full update. It is triggered by L FCH and reset by a Full Update Start (FUS) pulse. U15A is bypassed through U9A if the instrument is in the Linear Expand, CW (CW•LIN EXP) mode.

LED Annunciator Drivers

(See Figure C3-20N.) The LED Annunciator Drivers circuit buffers the signals from the Front Panel Control Logic to drive the annunciators. OFL Latch U14A is used to store OVERFLOW information, which is clocked by the Marker Pulse Enable (MPE line). It is set not to display if the instrument is operating in the CW mode or if no marker measurement (NMM) has been made.



SIGNAL	DEFINITION
AN L4	ANNUNCIATOR LIGHT 4
LAN L1-3,5	ANNUNCIATOR LIGHT 1-3,5
$\overline{NMM}$	NO MARKER MEASUREMENT
$\overline{MPE}$	MARKER POSITION ENABLE
L OFL	COUNTER OVERFLOW
L REM	REMOTE
WTH 3	WIDTH 3

Figure C3-20N. LED Annunciator Drivers, Block Diagram

Fig C3-20O
Sht 1 of 4

Marker Update Enable

(See Figure C3-20O.) The Marker Update Enable circuit assures a flicker-free numeric display of the marker data by holding off the update of the display. This holdoff is disabled when there is invalid marker data. In the CW • LIN EXP mode, if there is no marker measurement, the previous display is maintained by preventing an update. The Marker Update Enable circuit also disables the marker decimal point and the OVERFLOW annunciator if there is no marker measurement.

The Marker Update Enable flip-flop U2A provides a signal (MUE) to the Display Enable circuit, allowing counter data to be strobed into the FREQUENCY COUNTER MHz display if the D input is high when it is clocked by US 3. U2A is reset by DIG 8. The Marker Latch Enable (MLE) pulses from the Display Enable circuit trigger a 330-ms one-shot, Marker Update Holdoff U15B, which inhibits the following updates by changing the D input of U2A to a low. The D input remains low until the 330-ms time delay is over. U15B can be reset immediately when the Invalid Marker Data flip-flop U1A changes to a low at its Q output, which is the case for invalid marker data. The Q output of U1A goes low at a Control Change Request ($\overline{\text{CCHR}}$) or if an Update Start 1 (US 1) pulse occurs while NMM is high (no marker measurement). The Q output changes to a high when NMM is low at the time MUE occurs; that is, when the front panel display has been updated with a valid marker measurement.

In the case of no marker measurement (NMM is high), the US 1 pulse is passed through the NAND gate U25A and sets the No Marker Measurement flip-flop U1B to a high at its Q output, disabling OVERFLOW and the marker decimal point. U1B is reset by DIG 7 at the end of every update cycle.

Fig C3-22
Sht 3 of 4

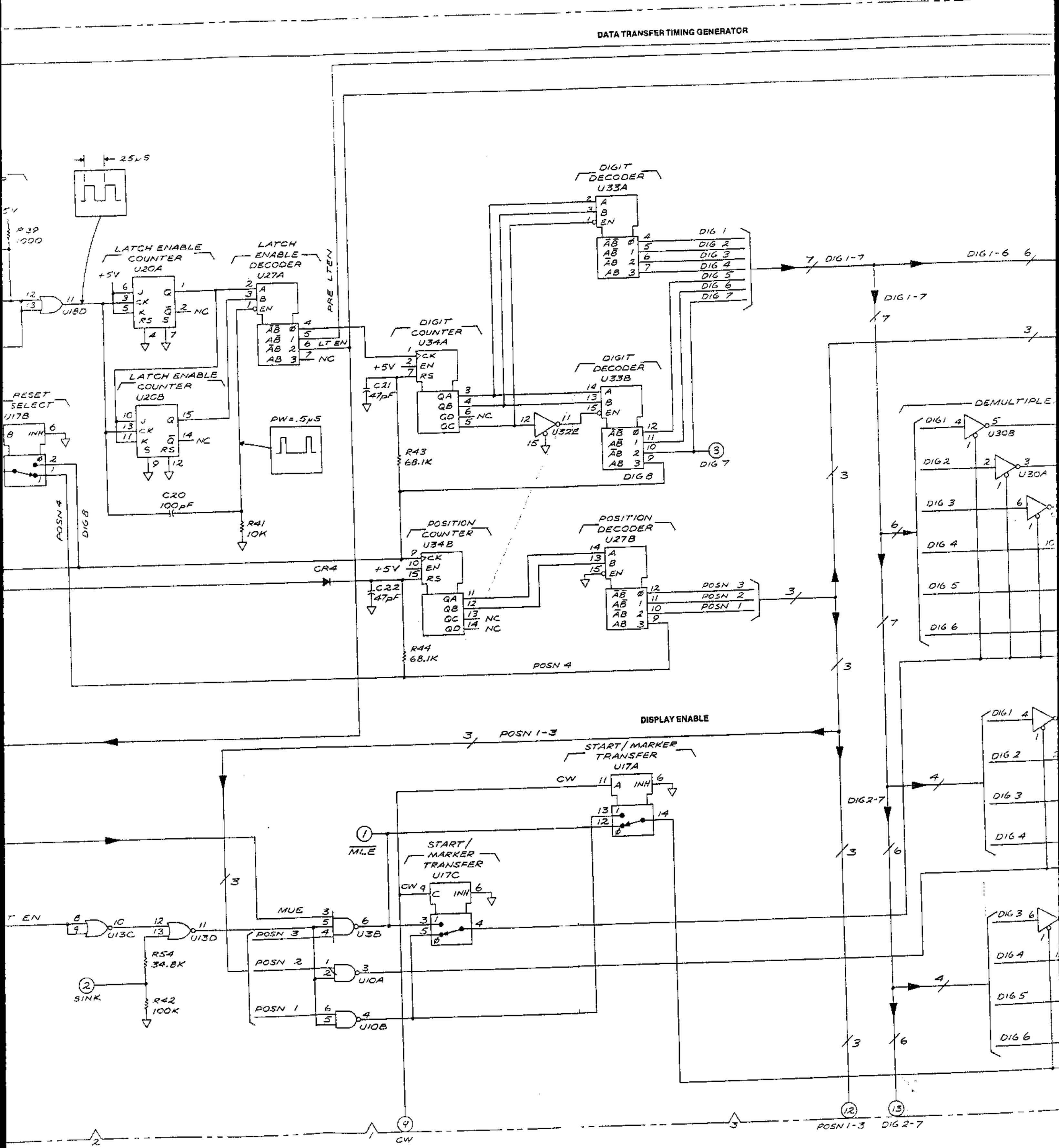


Fig. C3-2Ø0
Sht 3 of 4

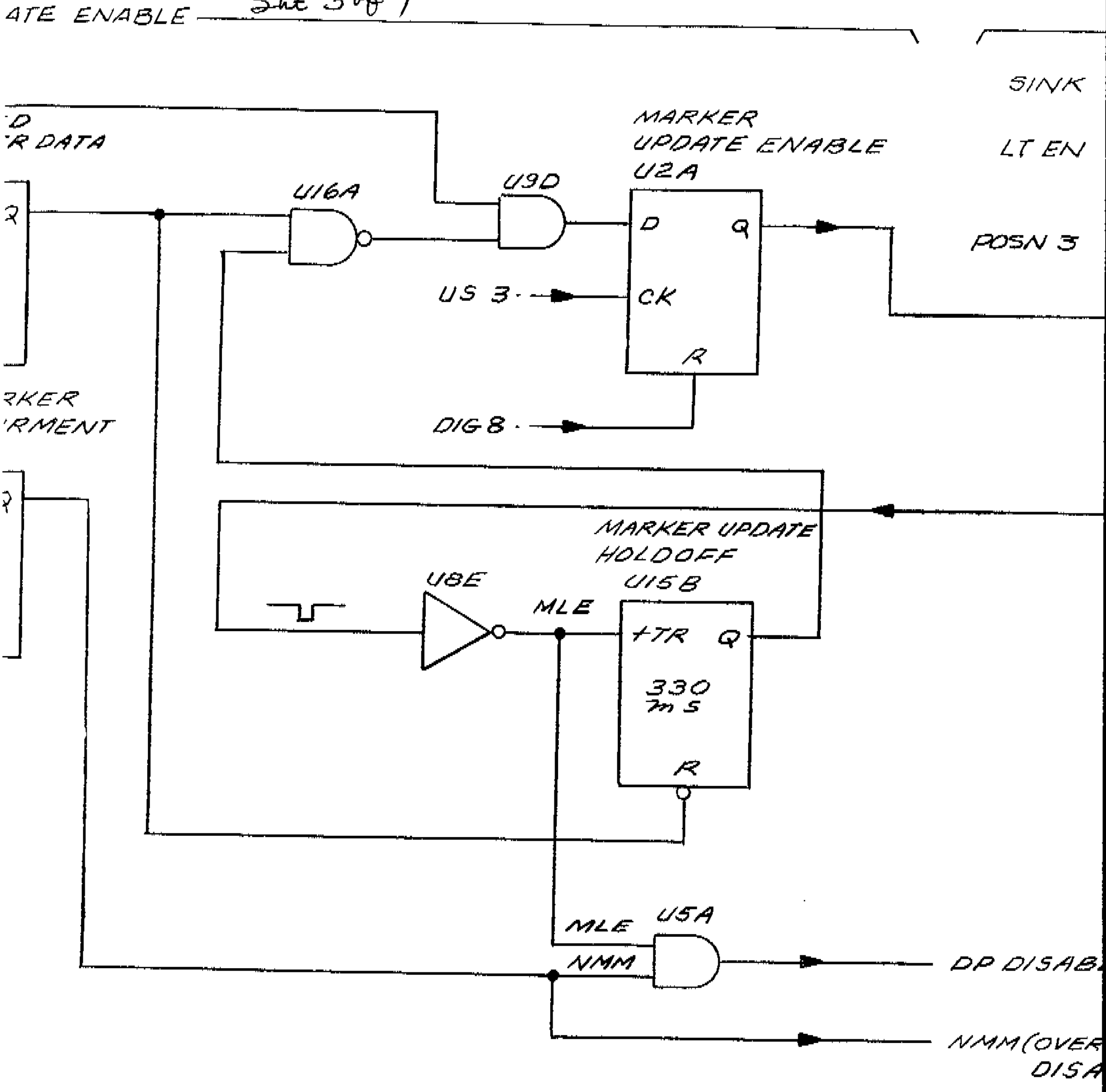
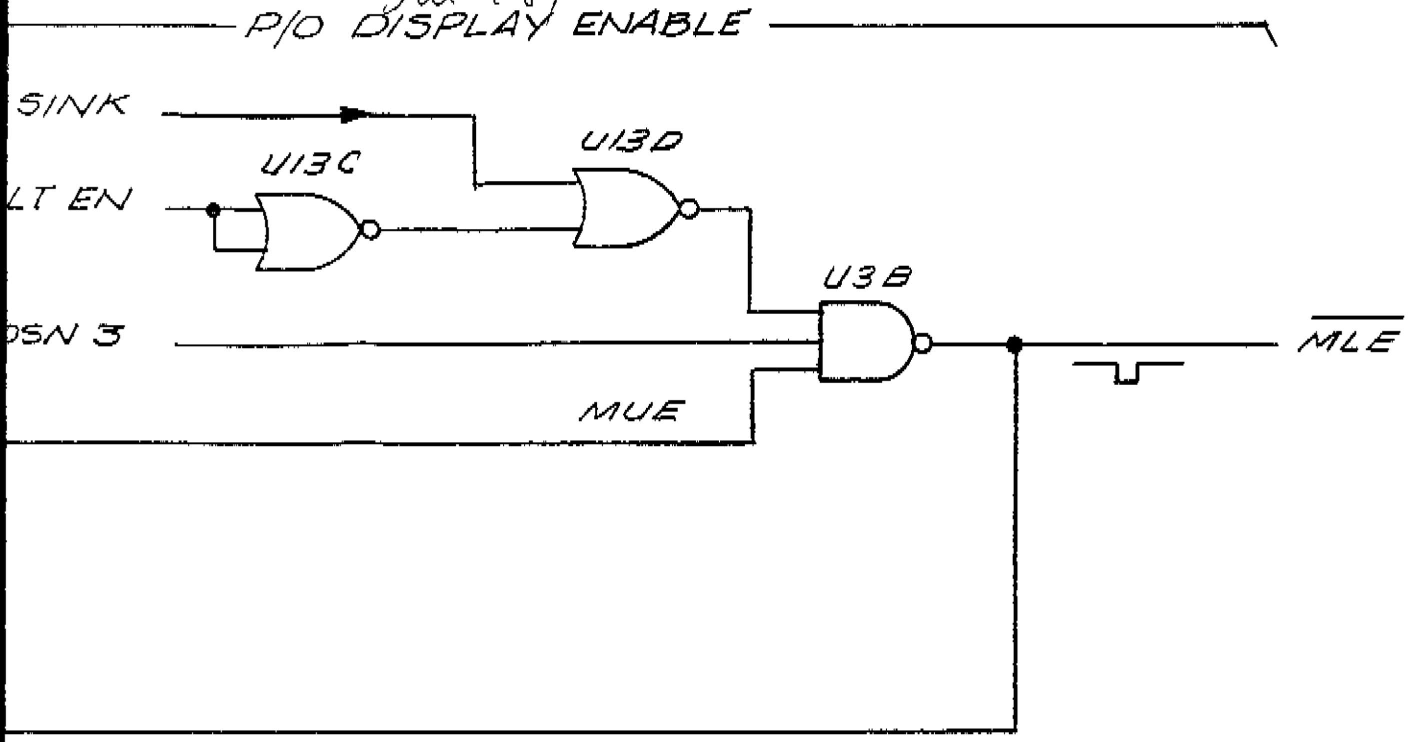


Fig C3-200
Sht 4 of 4



SIGNAL	DEFINITION
$\overline{CCHR}$	CONTROL CHANGE REQUEST
DIG 7-8	DIGIT 7-8
DP DISABLE	DECIMAL POINT DISABLE
$\overline{MLE}$	MARKER LATCH ENABLE
LMM	MARKER MEASUREMENT MADE
MUE	MARKER UPDATE ENABLE
NMM	NO MARKER MEASUREMENT
US 1, 3	UPDATE START 1, 3

Figure C3-200. Marker Enable Block Diagram

Fig C3-20
Sht 1 of 2

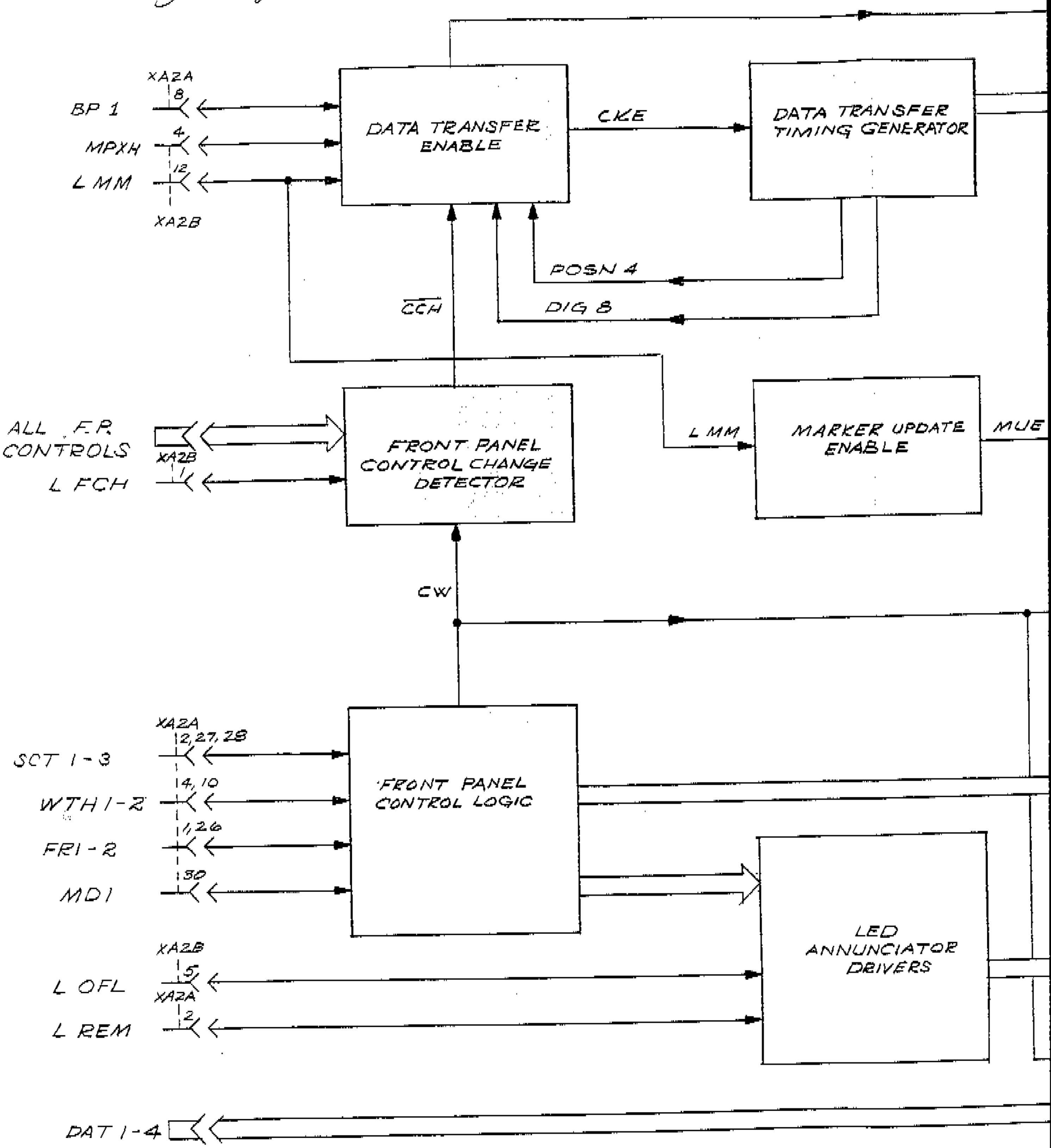


Fig C3-20
SW 2 of 2

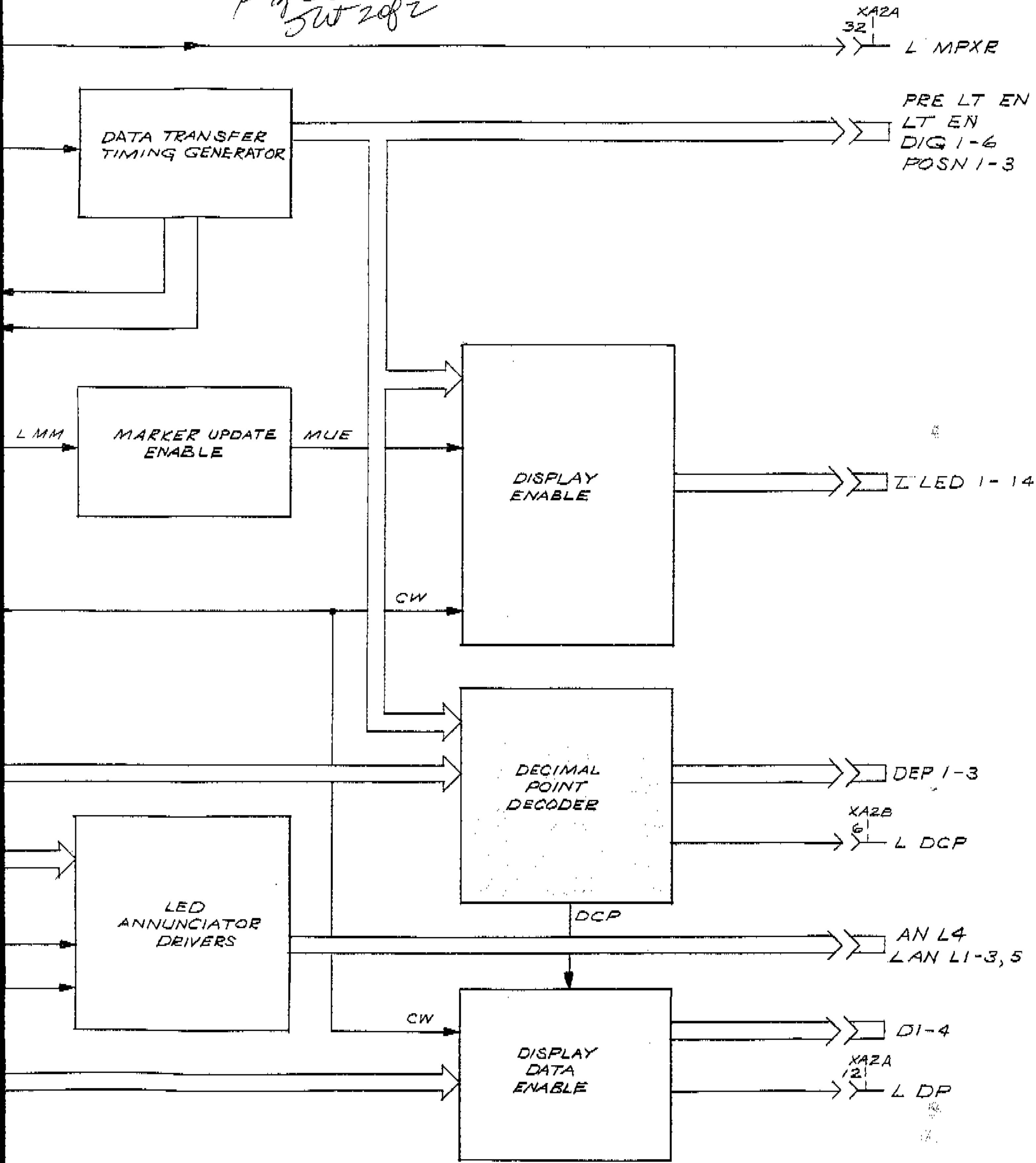


Figure C3-20. A2A2 Display Logic Block Diagram

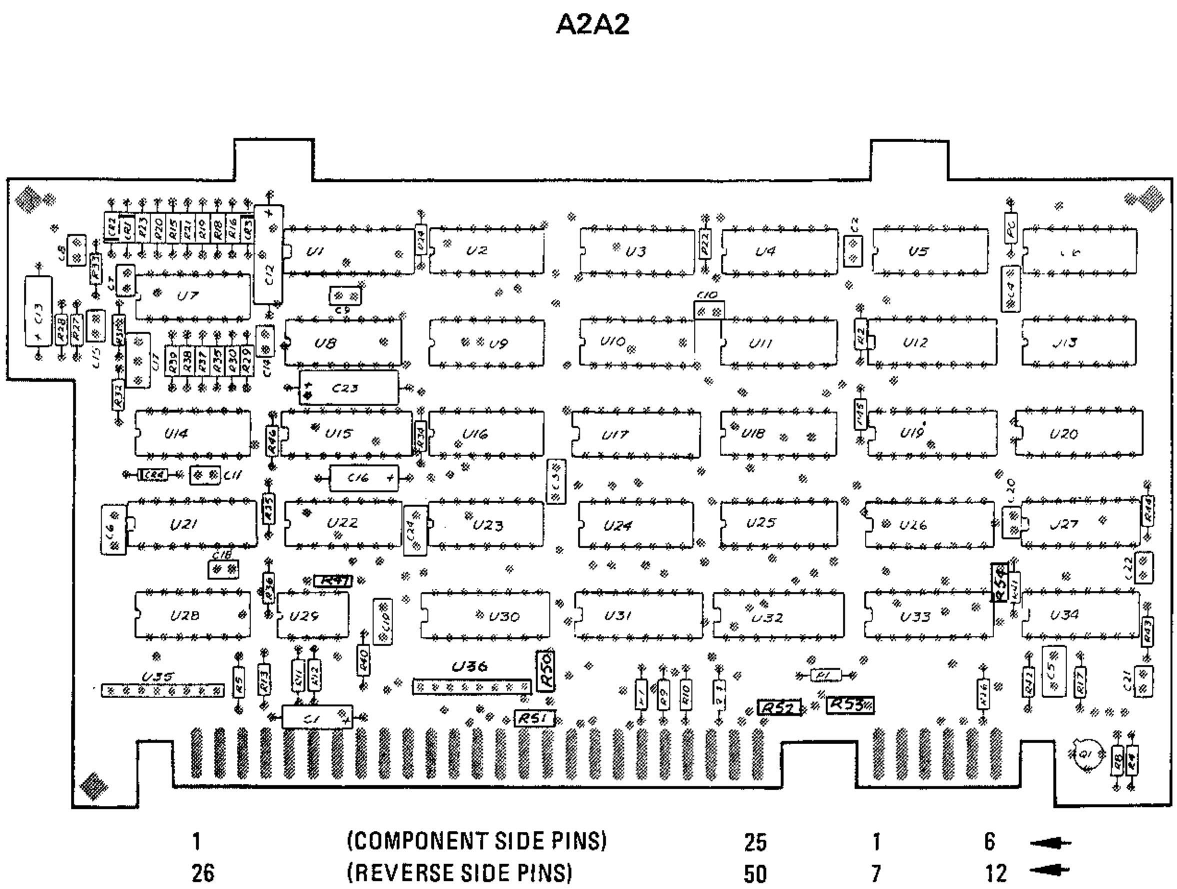


Figure C3-21. A2A2 Display Logic Board Parts Locations

Fig C3-22
Sht 1 of 4

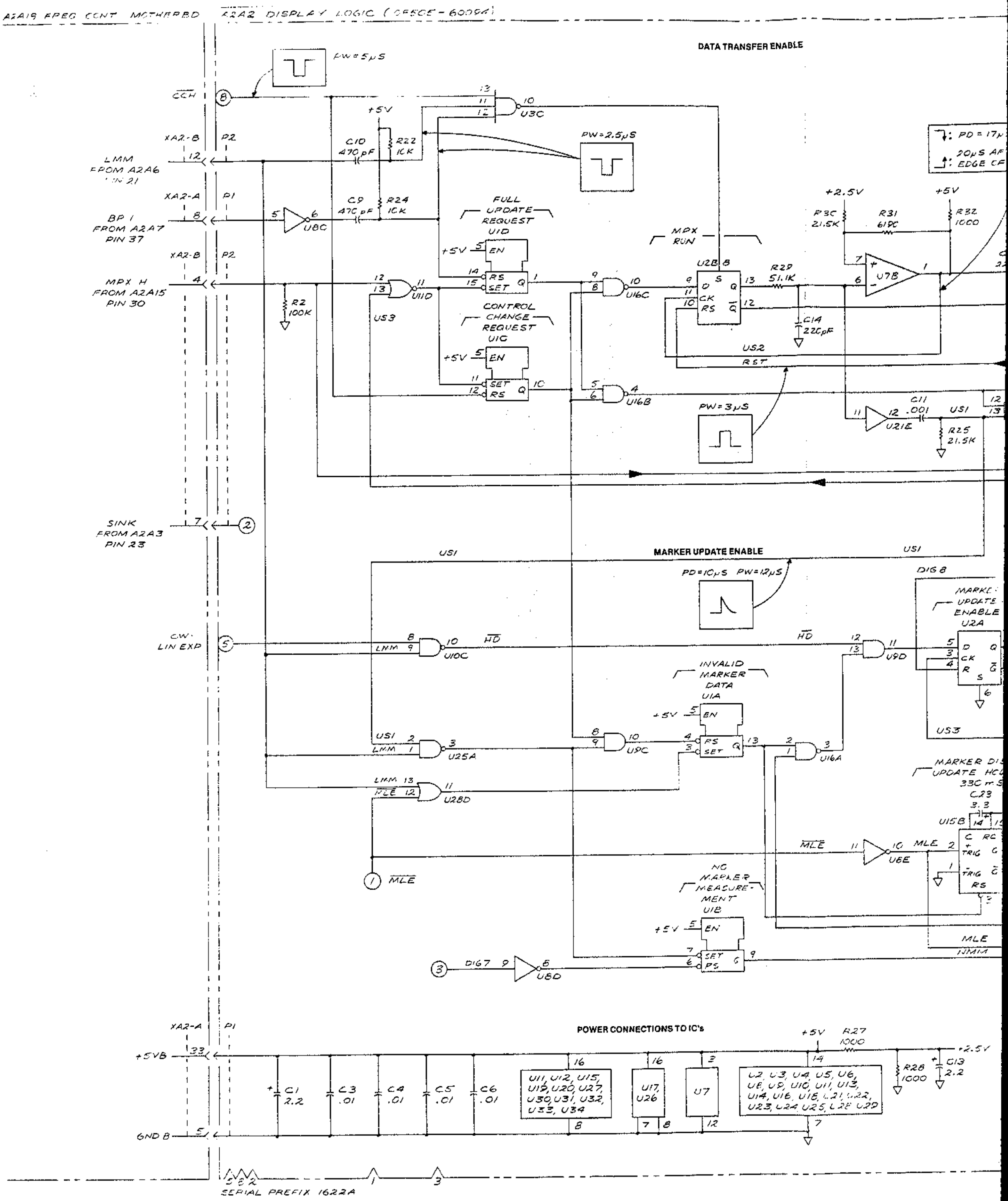


Fig 03-22
Sht 2 of 4

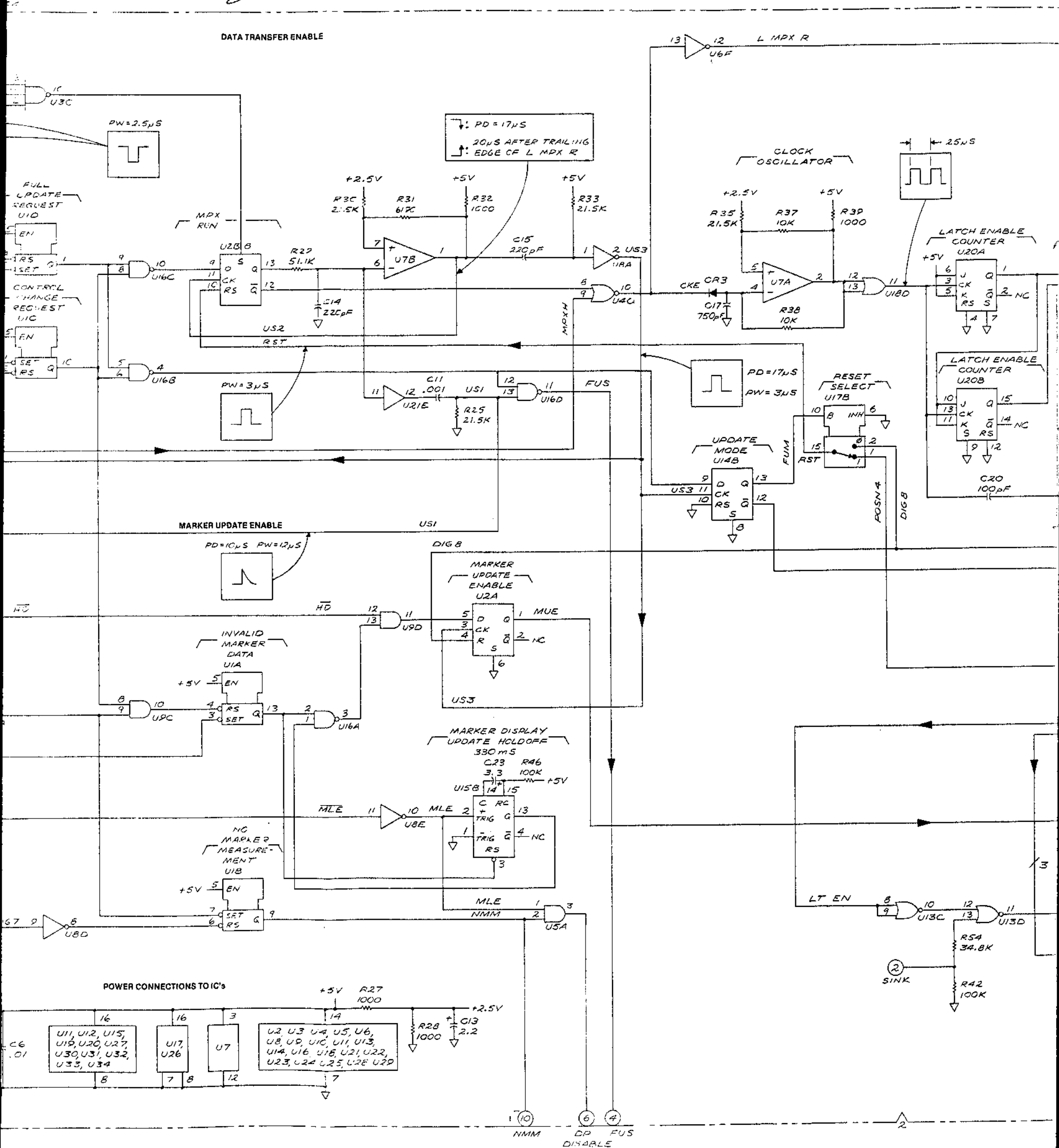


Fig C3-22
Sht 3 of 4

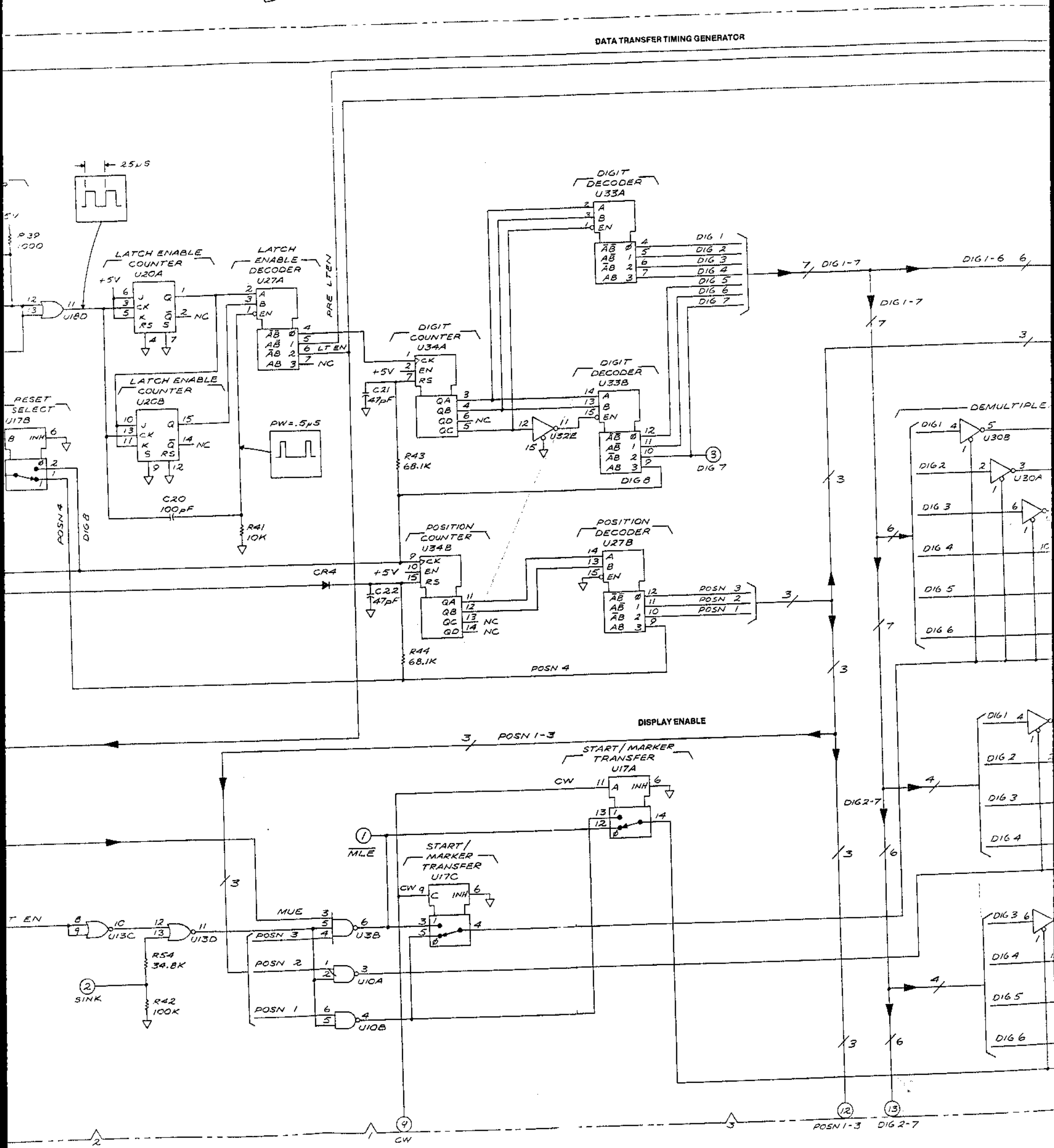
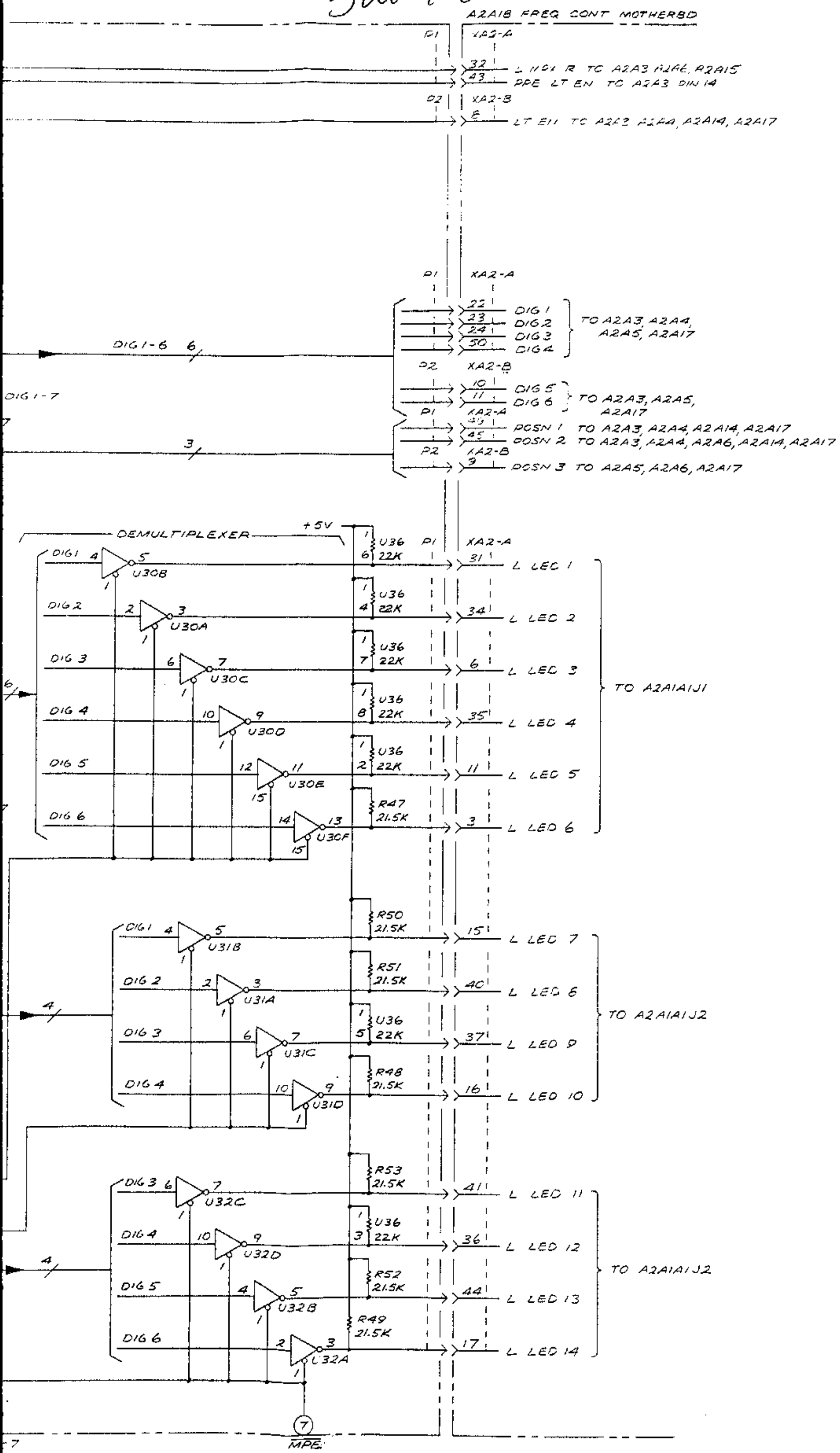
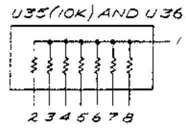


Fig C3-22
Out 4064

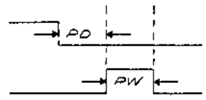


NOTES:

1. REFERENCE DESIGNATIONS WITHIN THIS ASSEMBLY ARE ABBREVIATED. ADD ASSEMBLY NUMBER TO ABBREVIATION FOR COMPLETE DESCRIPTION.
2. LOCATOR FOR INTERCONNECTION SYMBOL (1).
3. UNLESS OTHERWISE INDICATED:
   RESISTANCE IN OHMS
   CAPACITANCE IN MICROFARADS
   INDUCTANCE IN MICROHENRIES
4. RESISTORS IN RESISTOR ARRAY U35 ARE 10K OHMS; THOSE IN U36 ARE 22K OHMS.



5. LOGIC LEVELS:
   LOW = 0V
   HIGH = +5V
6. PW = PULSE WIDTH
   PD = PULSE DELAY MEASURED FROM NEGATIVE-GOING (LEADING) EDGE OF L MPXR.



7. SEE TABLE C3-1 FOR BOARD INTERCONNECTIONS.

A2A2

Figure C3-22. A2A2 Display Logic, Schematic (1 of 2)

Fig C-3-22A
Sht 1 of 4

RANGE	FR2	FR1	CFR2	CFR1
0.5-15MHz	0	1	0	0
0.5-150MHz	1	1	0	1
0.5-1500MHz	1	0	1	0

SCAN TIME	SCT3	SCT2	SCT1
MAN	0	0	1
.00-10	0	1	1
10-1	0	1	0
1-0.1	1	1	0
0.1-.01	1	1	1

MODE	MD2	MD1
LOG FULL	0	1
LIN FULL	1	1
LIN EXP	1	0

WIDTH	WTH3	WTH2	WTH1
S/S1	0	0	1
S/S2	0	1	1
ALT	0	1	0
ΔF	1	1	0
CW	1	1	1

SIGNAL	DEFINITION
ANL4	ANNUNCIATOR LIGHT 4
L ANL1-3,5	ANNUNCIATOR LIGHT 1-3, 5
D1-4	DATA 1-4 (TO DISPLAYS)
DAT 1-4	DATA 1-4 (DATA BUS)
L DCP	DECIMAL POINT (FOR I/O)
DEP 1-3	DECIMAL POINT 1-3
L DP	DECIMAL POINT (FOR INST)
L FCH	FREQUENCY CHANGE
FR1-2	FREQUENCY RANGE 1-2
MD 1-2	MODE 1-2
L OF L	OVERFLOW
L REM	REMOTE
SCT 1-3	SCAN TIME 1-3
WTH 1-3	WIDTH 1-3

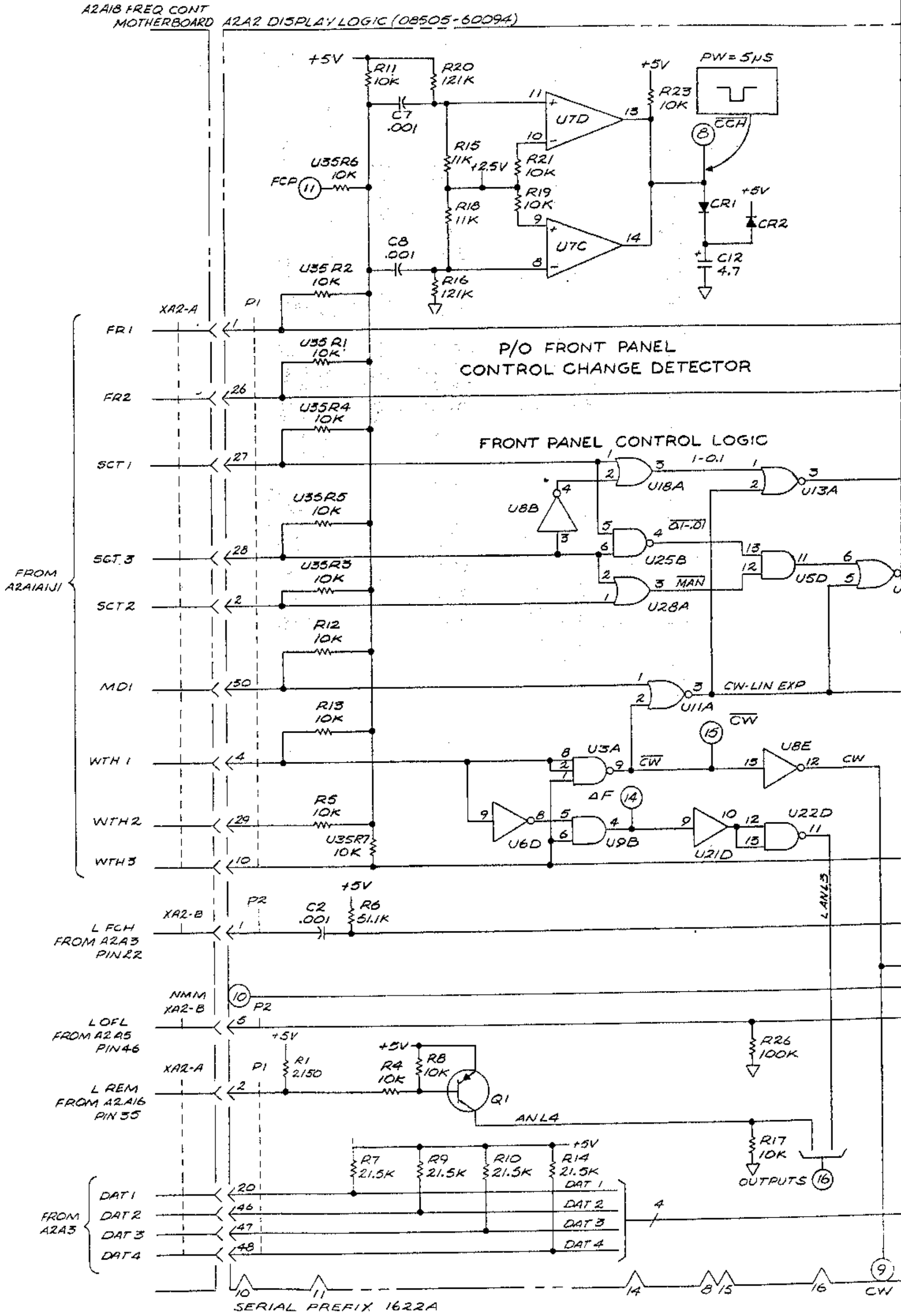


Fig C3-22A
Sut 2 of 4

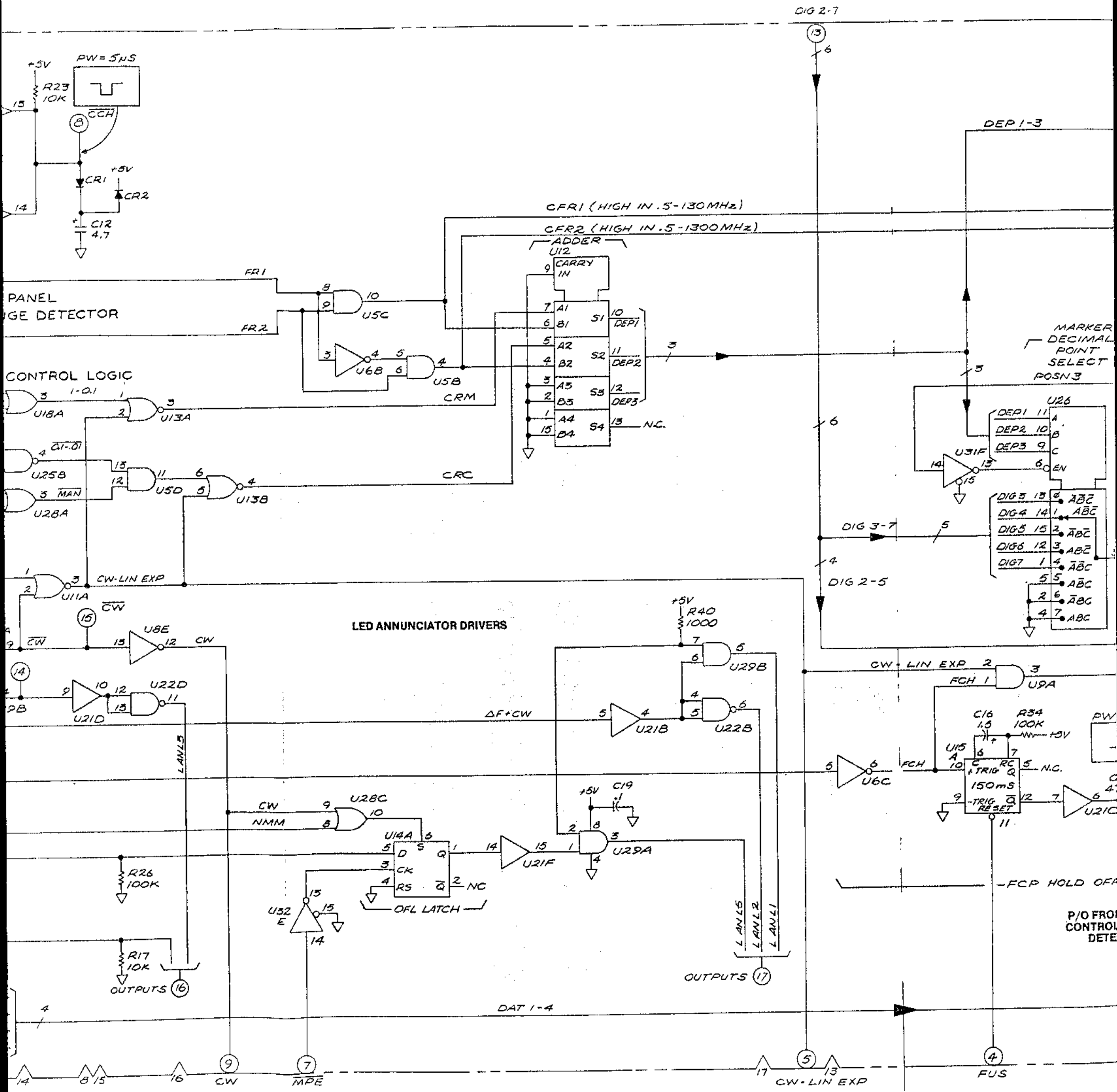


Fig C3-22A
Sut 3 of 4

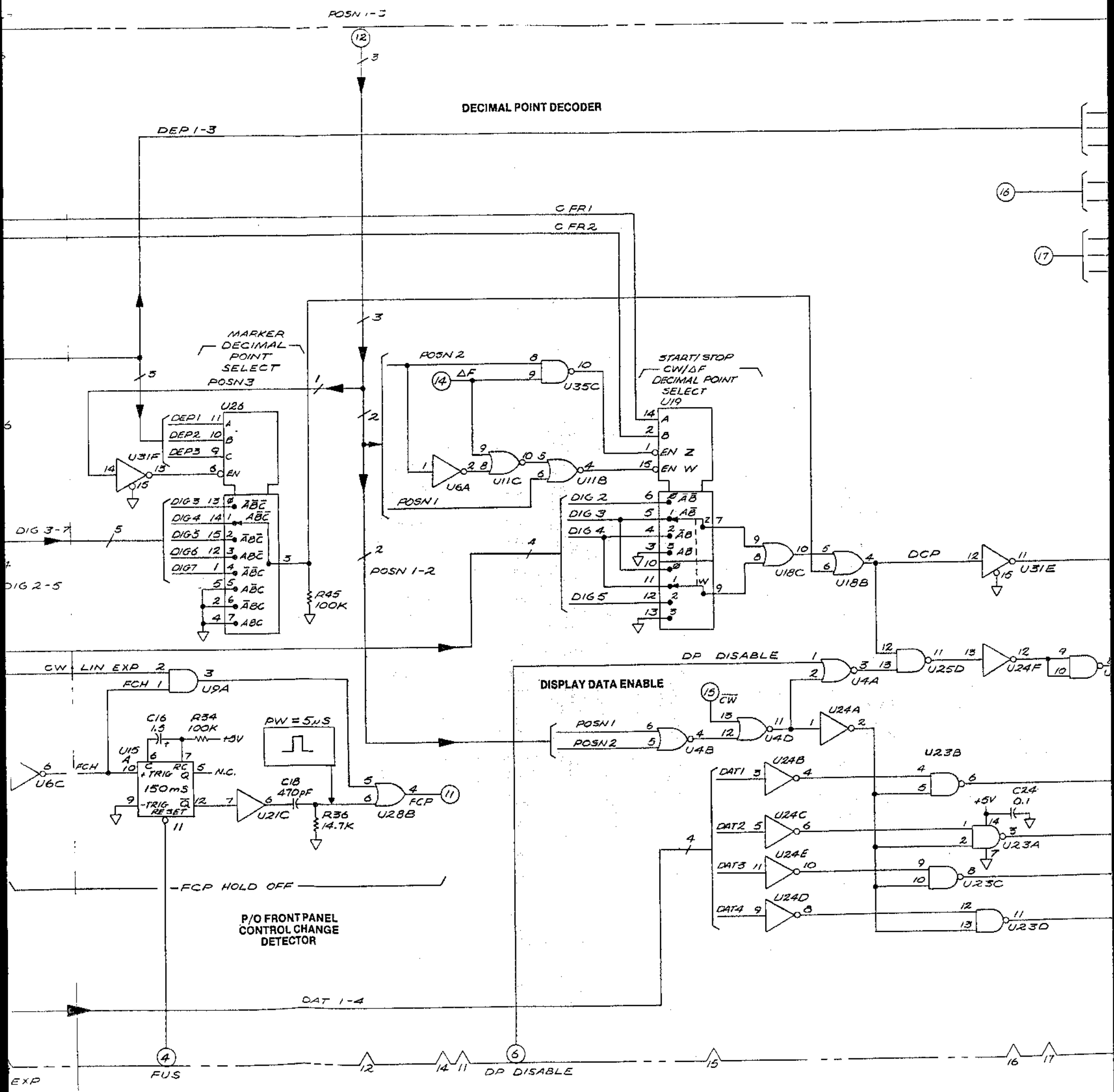
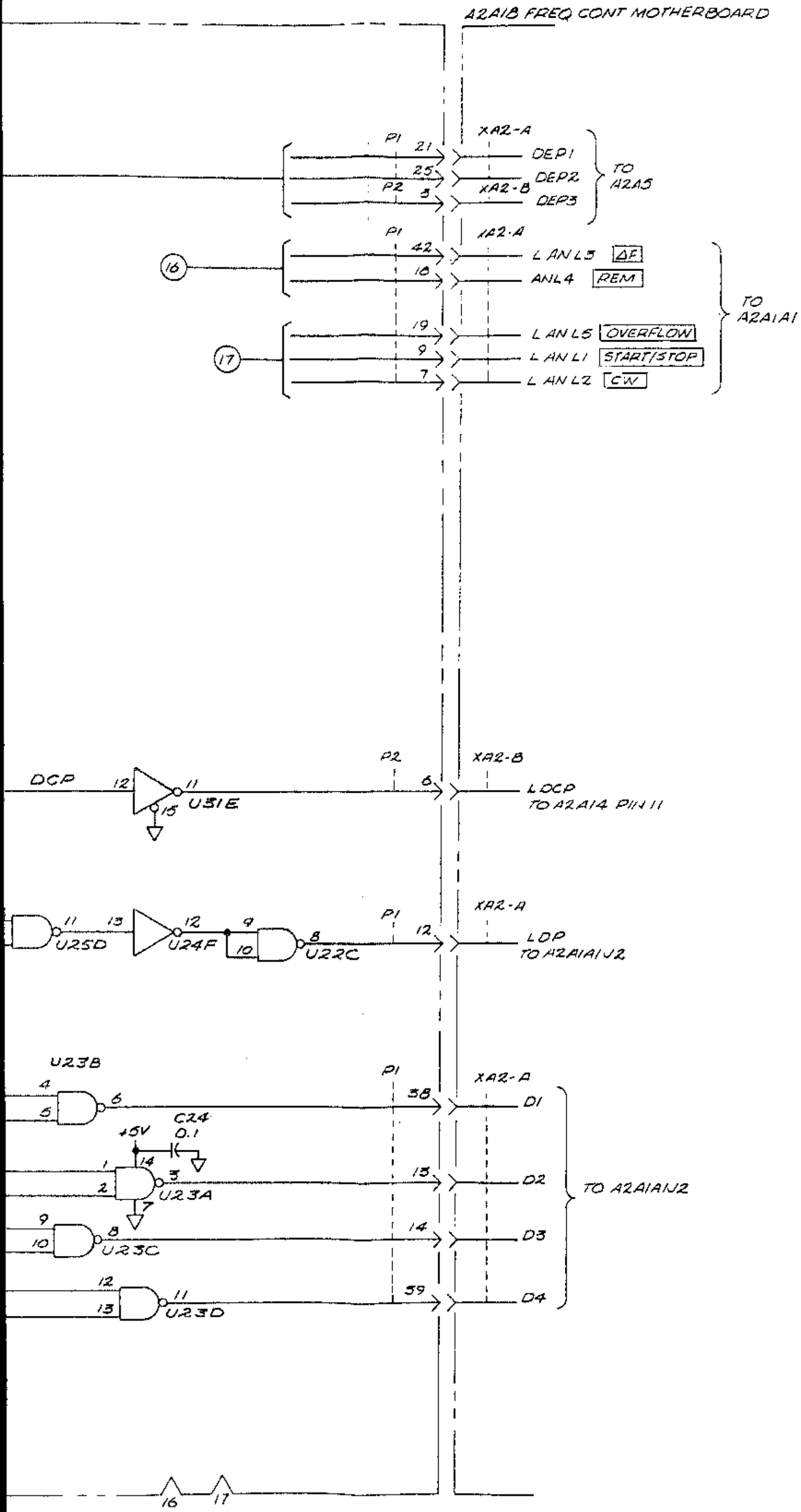


Fig C3-22A
Sat 4of4



MARKER COUNTER RESOLUTION					
MODE/WIDTH	ALL COMB. EXCEPT LIN EXP CW				LIN EXP CW
SCAN TIME SEC	MAN	100-10 10-1	1-.1	.1-.01	X
RESOLUTION	COARSE	FINE	MED	COARSE	FINE
CRC	1	0	0	1	0
CRM	0	0	1	0	0

DECIMAL POINT DECODING									
FREQ RANGE MHz	13			130			1300		
CFR1	0			1			0		
CFR2	0			0			1		
COUNTER RESOLUTION KHz	0.1	1	10	1	10	100	10	100	1000
CRM	0	1	0	0	1	0	0	1	0
CRC	0	0	1	0	0	1	0	0	1
DEP 1	0	1	0	1	0	1	0	1	0
DEP 2	0	0	1	0	1	1	1	1	0
DEP 3	0	0	0	0	0	0	0	0	1

NUMERIC DISPLAY TRUTH TABLE				
OUTPUT CONDITION				DISPLAY
D1	D3	D2	D1	
0	0	0	0	0
0	0	0	1	1
0	0	1	0	2
0	0	1	1	3
0	1	0	0	4
0	1	0	1	5
0	1	1	0	6
0	1	1	1	7
1	0	0	0	8
1	0	0	1	9
1	0	1	0	TEST
1	0	1	1	BLANK
1	1	0	0	BLANK
1	1	0	1	—
1	1	1	0	BLANK
1	1	1	1	BLANK

A2A2

Figure C3-22. A2A2 Display Logic, Schematic (2 of 2)

A2A3 MEMORY, CIRCUIT DESCRIPTION

General Description

The A2A3 Memory provides digital information for START/STOP, CW, and CW ± ΔF frequency settings. This information is delivered by decade counters whose outputs are determined by the setting of front-panel Rotary Pulse Generators (RPG). Digital information for four WIDTH settings (SS1, SS2, CW, CW ± ΔF) is stored in a Random Access Memory (RAM). The A2A3 Memory also contains circuitry for preset frequency settings: 800 for Start/CW and 1000 for STOP/± ΔF. Information provided by the A2A3 Memory is supplied to the instrument via the data bus. When operating in remote (REM) operation, the A2A3 Memory is disconnected from this data bus and information normally provided by the Memory is provided by F-Store Assembly A2A14.

Up/Down Detector

There are two UP/Down Detector circuits within the A2A3 Memory; one each for POSN 1 (START/CW) and POSN 2 (STOP/± ΔF) displays. These detectors use the pulse trains from the front-panel RPGs to determine if the RPG is turning clockwise or counterclockwise. The outputs of the detectors are used to command the Counters to count either up or down.

When one of the RPGs is turned, pulse trains similar to those shown in Figure C3-22A are delivered to the Up/Down Detectors. Both pulse trains are applied to the D flip-flops; one to the clock (CK) input and one to the data (D) input. The logic states of the outputs of this flip-flop are determined by the phase relationship of the inputs as shown in Figure C3-22A. The $\overline{Q}$ output of the flip-flop is connected to the Up/Down (U/D) input to the Counters. When U/D is high (logic "1"), counters count up and when U/D is low (logic "0"), counters count down. The Q output of the flip-flop is connected to the Stop circuits.

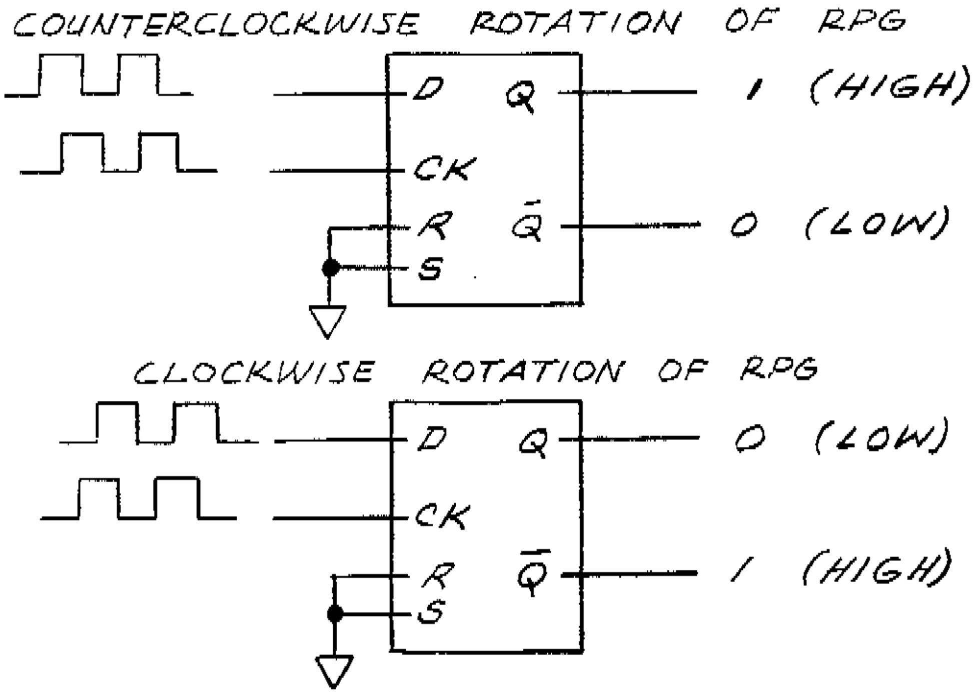


Figure C3-22A. Up/Down Detector Operation

Speed-Up Circuit

There are two Speed-Up Circuits within the A2A3 Memory; one each for POSN 1 (START/CW) and POSN 2 (STOP/±ΔF) displays. Since these circuits are identical in design, operation of only one is discussed here.

RPG Turning Slow. Figure C3-22B shows a simplified schematic of the Speed-Up Circuit with timing waveforms for both fast and slow turning speeds of RPG.

When RPG is turned slowly, constant width pulses at Q3 collector A are integrated by R11/C7. Diode CR3 presents discharge of C7 during period between pulses. Capacitor C5 also charges C during each pulse, however, since the pulses are arriving at a slow rate, has time to discharge through R5 during time between pulses. Capacitor C7 is charged by incoming pulses and, after a number of pulses, the voltage level of C7 B reaches a logic "1" level. This level is applied to the input of U14Awhich causes the output of U14A D to go to a logic "0" level providing a negative-going clock (CK) pulse to D flip-flop U15A. The data (D) input of U15A is normally low, therefore the Q output G changes to a low when U15A is clocked. When Q goes low, $\bar{Q}$ E goes high. This negative-to-positive change of the $\bar{Q}$ output is delayed by RC network R15/C9. After this delay, the set input (S) of U15A goes high setting the flip-flop back to its original state (Q = 1, $\bar{Q}$ = 0). At the same time, Q4 is turned on by the Q output G ; through R17, allowing C7 to discharge. Speed-Up Circuit has returned to original condition and operation is repeated.

RPG Turning Fast. Operation of the Speed-Up circuit when RPG is turning fast is the same as for slow turning speed except that the voltage at point B is now determined by C5/R9 rather than C7/R11 alone. Since the incoming pulses are arriving at a faster rate, C5 does not have time to discharge. The RC time constant of C5/R9 is faster than that of C7/R11 so the voltage at point B reaches a logic "1" faster.

Counters

The clock inputs to the Counters are connected in parallel therefore the Counters are connected in a parallel counting mode. Counting operation of each counter is determined by the count enable (C/E) input which is connected to the carry-out (C/O) of the previous counter. The most significant digit (DIGIT 1) is determined by the output state of flip-flop U27. The R and S inputs of U27 are normally low (logic "0"). The carry-out (C/O) of DIGIT 2 is inverted by U9B or U9D, allowing one clock pulse through AND gate U3A or U10C to clock flip-flop U27. A simplified schematic diagram of the Counter, along with timing waveforms, is shown in Figure C3-22C.

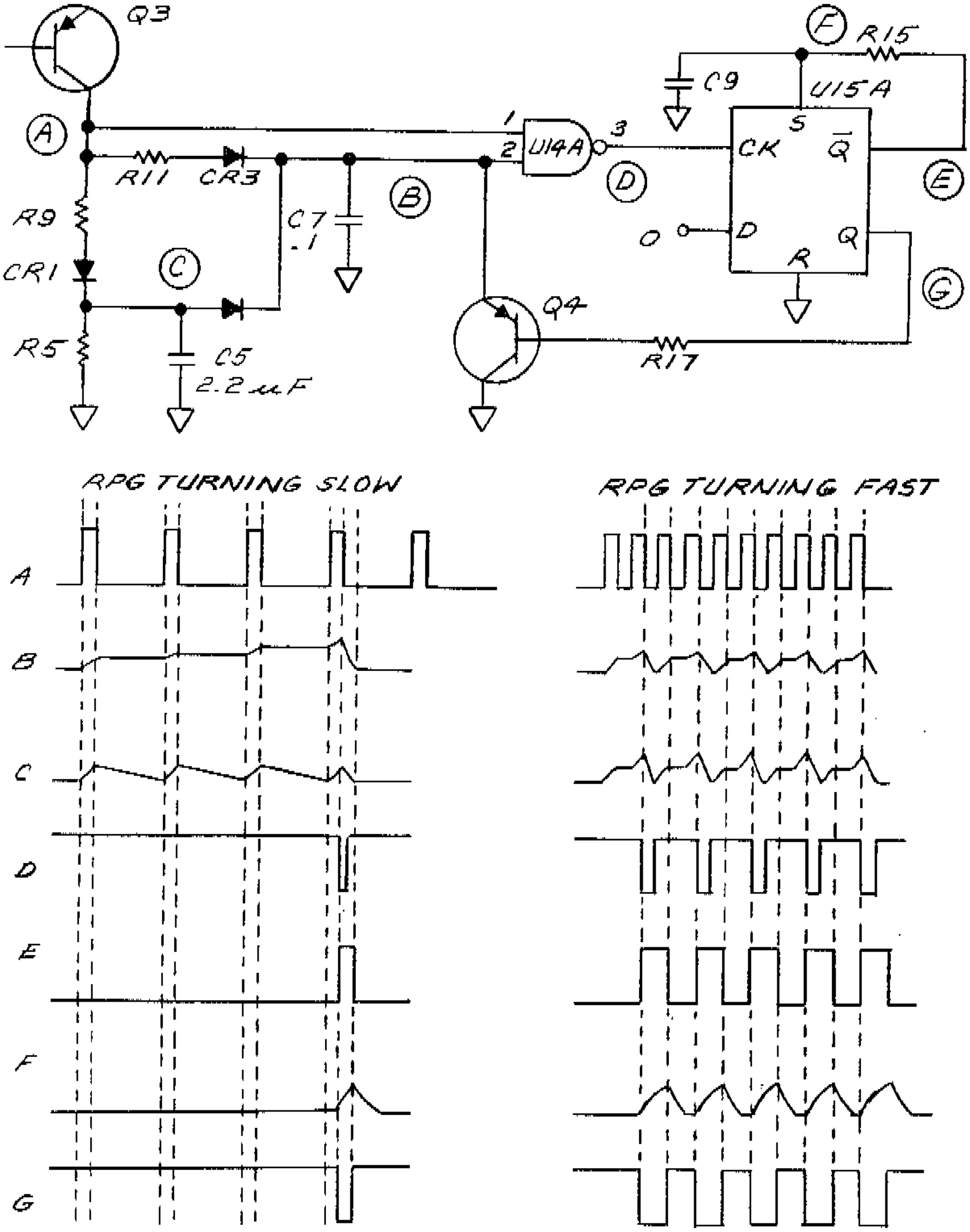


Figure C3-22B. Speed-up Circuit Operation

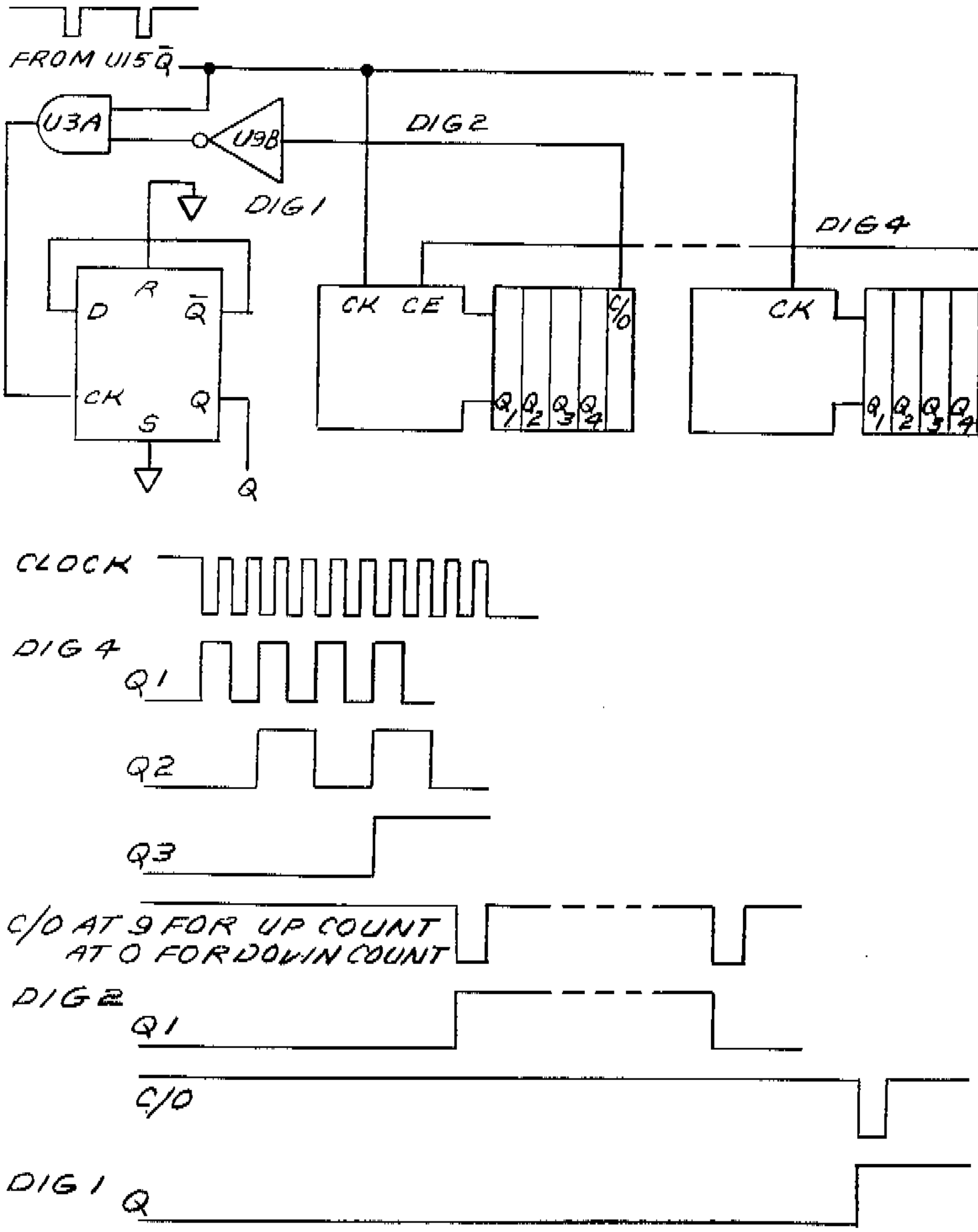


Figure C3-22C. Counter Operation

C3-50d

Stop Cricuit

The pulses from the RPGs are prevented from reaching the counter inputs whenever the counter reads 0000 MHz at the low end of 1300 MHz at the high end. This is done with a stop circuit for each display; one each for POSN 1 (START/CW) and POSN 2 (STOP/ ± ΔF). Operation of the Stop Circuit for POSN 1 only is discussed here, however, POSN 2 Stop Circuit operates in the same manner.

0000 MHz Stop Circuit. The pulses from the RPG will pass through U14 only when the other input is a logic "1". When the other input is a logic "0", the RPG pulses are prevented from reaching the Counter clock inputs, therefore the counters are disabled. The logic state of this input to U14D is controlled by the output of U4B (which is then inverted by U1C). Figure C3-22D is a simplified schematic diagram of the 0000 MHz Stop Circuit. When U4B output is a logic "1", U14D controlling input is a logic "0". The output of U4B is a logic "1" only when all inputs are logic "0". These inputs are logic "0" when counters all read zero and counting down (RPG turning counterclockwise).

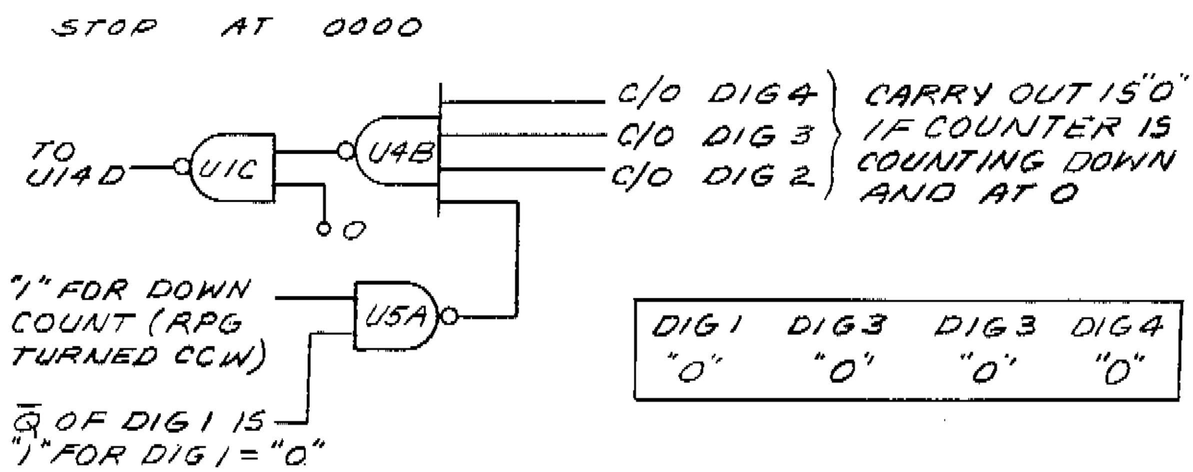


Figure C3-22D. 0000 MHz Stop Circuit Operation

1300 MHz Stop Circuit. The necessary logic state applied to U14D to prevent RPG pulses from reaching the counter is provided by U4A for the 1300 MHz Stop Circuit. When the output of U4A (which is then inverted by U1C) is a logic "1", U14D controlling input is a logic "0". The output of U4A is a logic "1" only when all inputs are logic "0". These inputs are logic "0" when Q_1 and Q_2 of DIGIT 2 (U17) are logic "1", DIGIT 1 reads logic "1" (Q output = 1, $\bar{Q}$ output = 0), and counters are counting up (RPG turned clockwise). Refer to Figure C3-22E for simplified schematic diagram of 1300 MHz Stop Circuit.

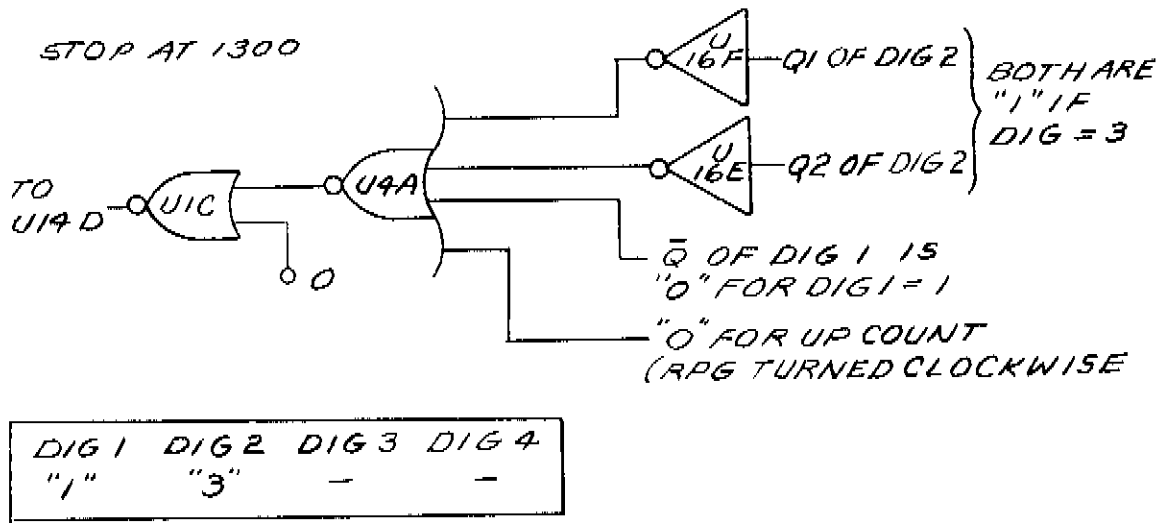


Figure C3-22E. 1300 MHz Stop Circuit Operation

Counter Output Multiplexer

The counter outputs are connected to tri-state gates which are enabled by the Counter Output Multiplexer. A simplified schematic diagram of POSN 1 Counter Output Multiplexer is shown in Figure C3-22F. When these tri-state gates are enabled, the outputs of the counters are placed on the Data Bus (DAT 1 — DAT 4). The logic states of the outputs of the multiplexer, used to enable the tri-state gates, are determined by multiplexer inputs A, B, and enable line (EN). The A and B inputs are from the Digit Coder circuit which encodes DIG 1 — DIG 3 lines into two coded digit lines (C DIG A and C DIG B). The enable line (EN) is a logic "0" if both inputs to U5D are logic "1". These two inputs are logic "1" when POSN 1 is logic "1" and $\overline{\text{WTH CHG}}$ is logic "1". When there is no WIDTH change, operating in local (not in remote) and not operating in alternate (ALT), $\overline{\text{WTH CHG}}$ is logic "1."

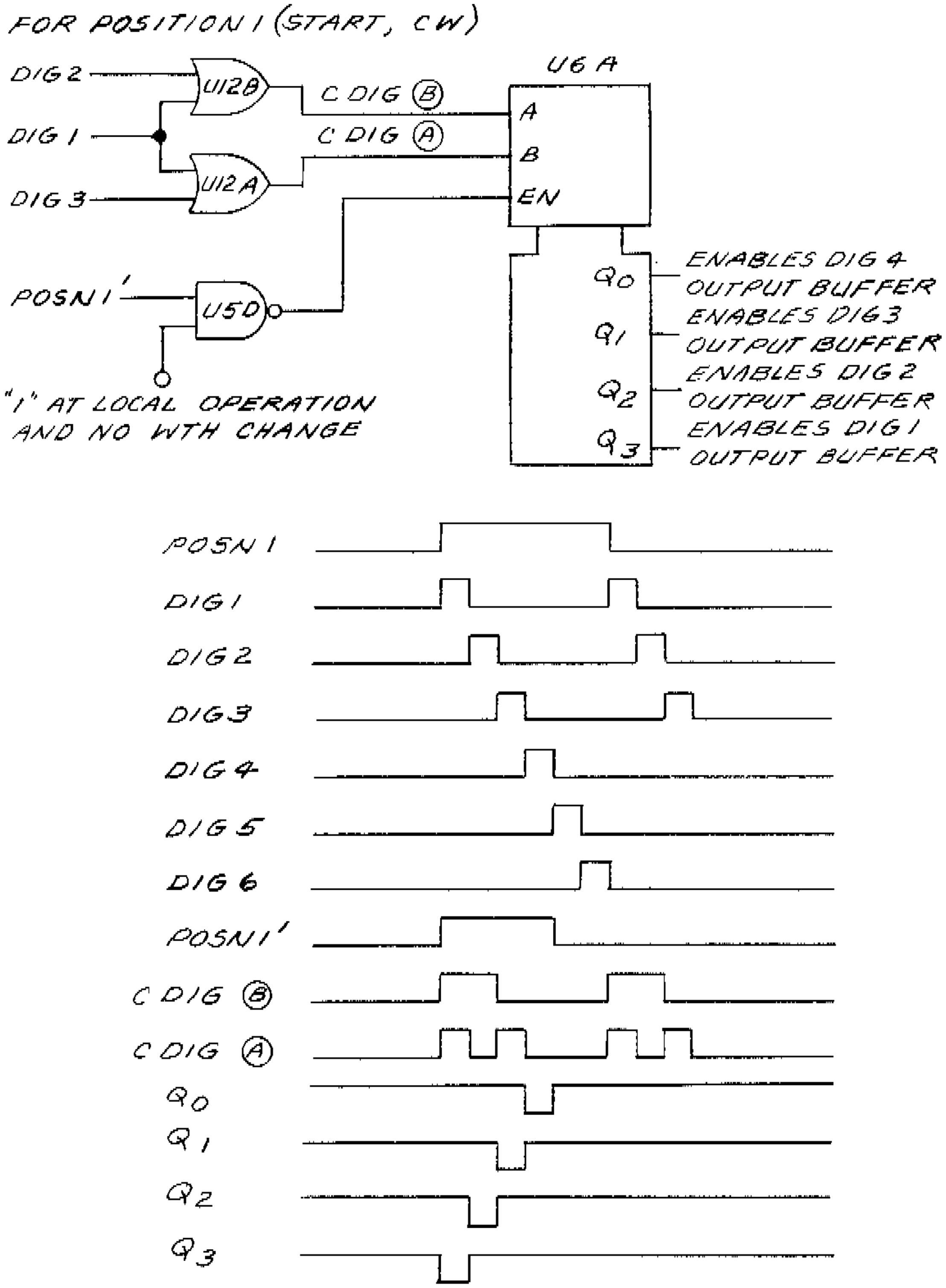


Figure C3-22F. Counter Output Multiplexer Operation

Random Access Memory (RAM)

The Random Access Memory (RAM) consists of two memory devices U34 and U35 connected in parallel but enabled at different times. Memory device U34 is enabled for POSN 1 and U35 for POSN 2. The outputs of the memory are connected directly to the Data Bus (DAT 1 — DAT 4) and the inputs are connected through inverters U9A, U9E, U16C, and U16D. Two of the four address inputs are C DIG A and C DIG B from the Digit Coder circuit. The other two address inputs are determined by front-panel WIDTH switch (WTH1 — WTH 3). Control inputs memory enable (M/E) and write enable (W/E) are derived from PRE LT EN and LT EN pulses. Figure C3-22G shows timing diagrams and simplified schematic diagram of the Random Access Memory (RAM). The RAM operates in the write mode when in local (not remote), no WIDTH change, and not in alternate (ALT).

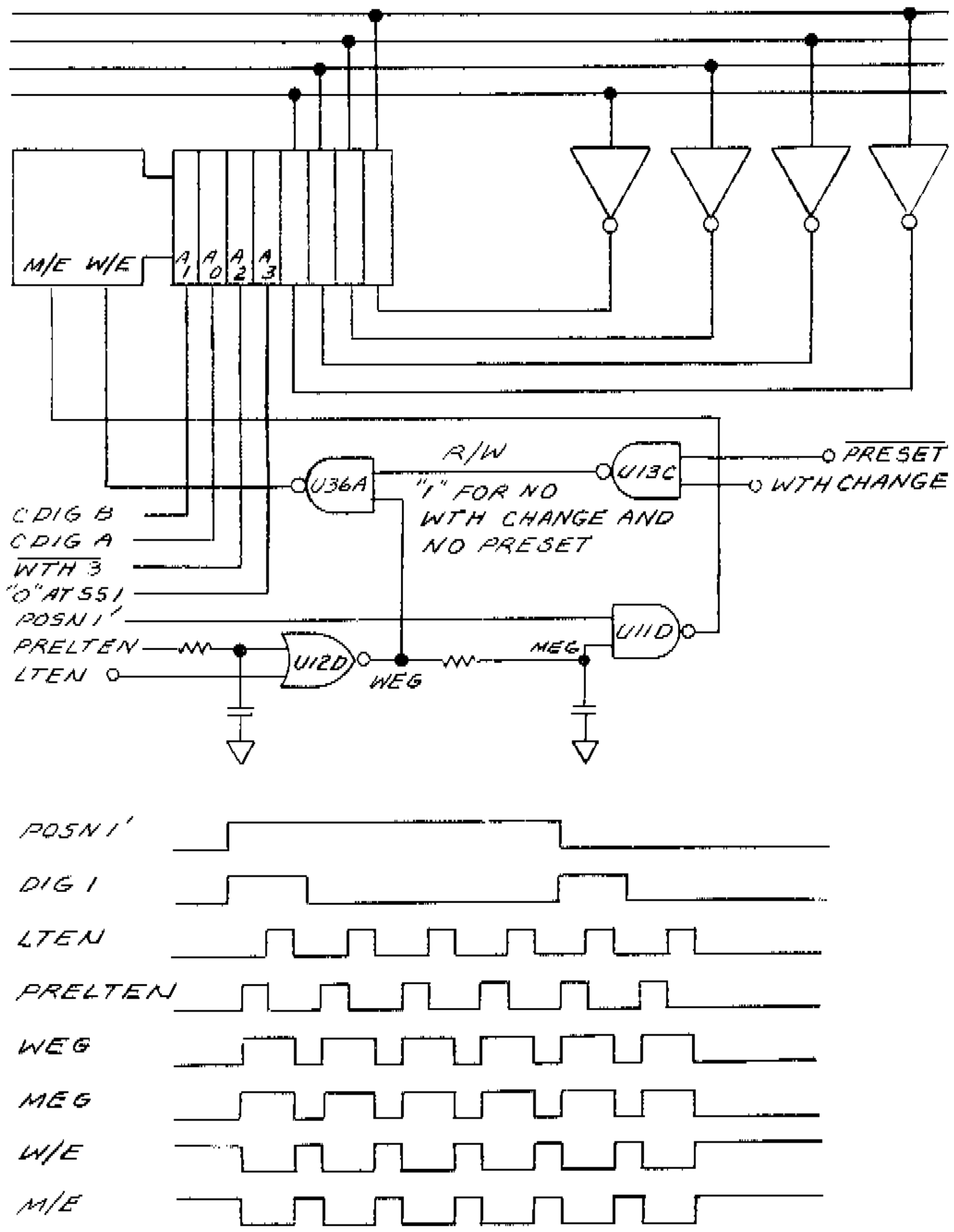


Figure C3-22G. Random Access Memory Operation

Width Change Detector

When front-panel WIDTH switch is changed to a different position, data previously stored in RAM is recalled and instrument is set to this frequency setting information. For example, if WIDTH switch is moved from S/S1 to S/S2, frequency information previously stored for S/S2 is recalled and placed on Data Bus. This information on the Data Bus is displayed as S/S2 frequency setting. Front-panel WIDTH switch may be moved at any time (asyncronous), therefore Width Change Detector assures that write cycle of RAM is complete before beginning read cycle with new information from WIDTH switch. Figure C3-22H shows a simplified schematic diagram and timing waveforms for operation of Width Change Detector during width change. The waveforms of Figure C3-22H assume that the WIDTH switch has been changed in such a manner as to change WTH 3 from a Logic "1" to logic "0". This change is detected by Width Change Detector but address input A2 of RAM does not change until POSN 2 goes high indiciating end of write cycle. The POSN 2 line is differentiated by C15/R31 and applied to D-latch U25 as a clock (CK) pulse. When this clock occurs at clock (CK) input of U25, WTH 3 level is transferred to output Q1 of U25. This causes U24B to change states, changing address input A2 of RAM. At the same time, U24C output goes high providing a low at the output of U23B ($\overline{\text{WTH CHG}}$) indicating a width change. During period of width change (U23B output low), W/E is high which sets RAM in a read condition. Also $\overline{\text{WTH CHG}}$ is inverted by U23A and applied to Counter Preset Multiplexer as WTH CHG. This line (WTH CHG) allows LT EN, POSN 1 or POSN 2 to pass through either U13A or U13B to the enable input of either U7A or U7B. The outputs of these multiplexers are connected to the preset enables of the counters. When the WTH CHG line is high (during width change) the counter preset enables are set which places the counters in preset condition. In this condition, the counters are preset by jam inputs (J1—J4) as determined by data on Data Bus (DAT1 — DAT4).

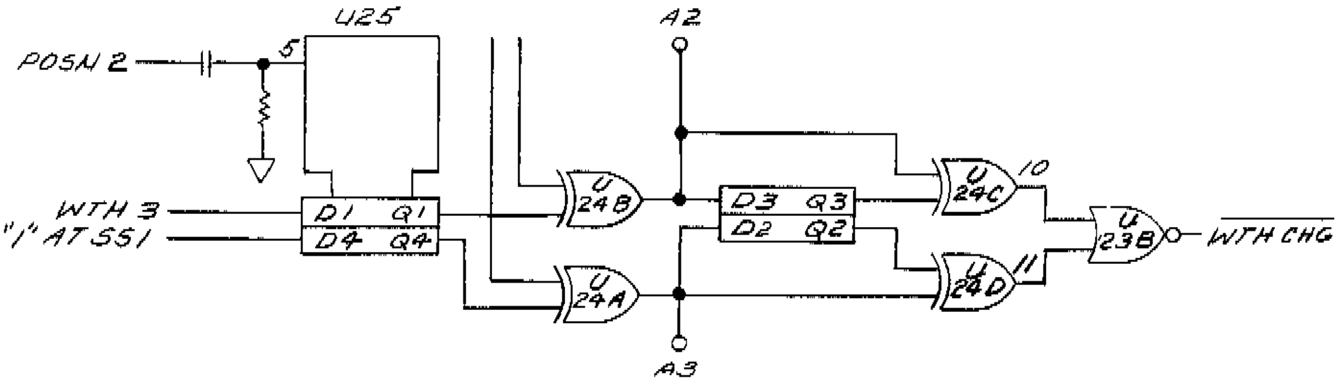
Power-On Preset Circuit/Preset Data Logic

When instrument is first turned on (power-on), flip-flop Q7-Q8 is set (PRESET = "1", $\overline{\text{PRESET}}$ = "0"). This allows POSN 1′ and POSN 2′ pulses to pass through U11B to turn on tri-state buffers U30E, U30F, U31E and U31F. These tri-state buffers are connected, along with U3B and U3D to the Data Bus (DAT 1 — DAT 4) so that POSN 1 frequency setting information is 800 and POSN 2 frequency setting information is 1000. This digital information is used to preset the RAM and the Counters. Refer to Figure C3-22I.

The four addresses required to store preset information in the RAM are provided by counter U37 along with exclusive OR gates U24A and U24B. Counter U37 is clocked by POSN 2 pulse and enabled by $\overline{\text{PRESET}}$ and is connected as a divide by four. The delay provided by C21/R39 assures that counter U37 completes a cycle after the +5V supply has reached its nominal voltage. Refer to Figure C3-22I.

To assure fast preset (even at slow sweep rates), an L FCH pulse is generated by U11A each time a POSN 2 pulse is input. This L FCH pulse is applied to the A2A2 Display Logic assembly where it is used to generate a POSN 2 pulse. Normally there would be one POSN 2 pulse generated for each sweep, however at slow sweep rates, a large amount of time would be required to preset. The first POSN 2 pulse therefore is applied to U11A which generates an L FCH pulse and another POSN 2 pulse is generated by the display logic (A2A2).

When counter U37 $\overline{\text{Q5}}$ output goes low, flip-flop Q7-Q8 is reset to its original condition which disables U37 and preset sequence is complete. Truth table of Figure C3-22I relates counter U37 count sequence and subsequent logic levels.



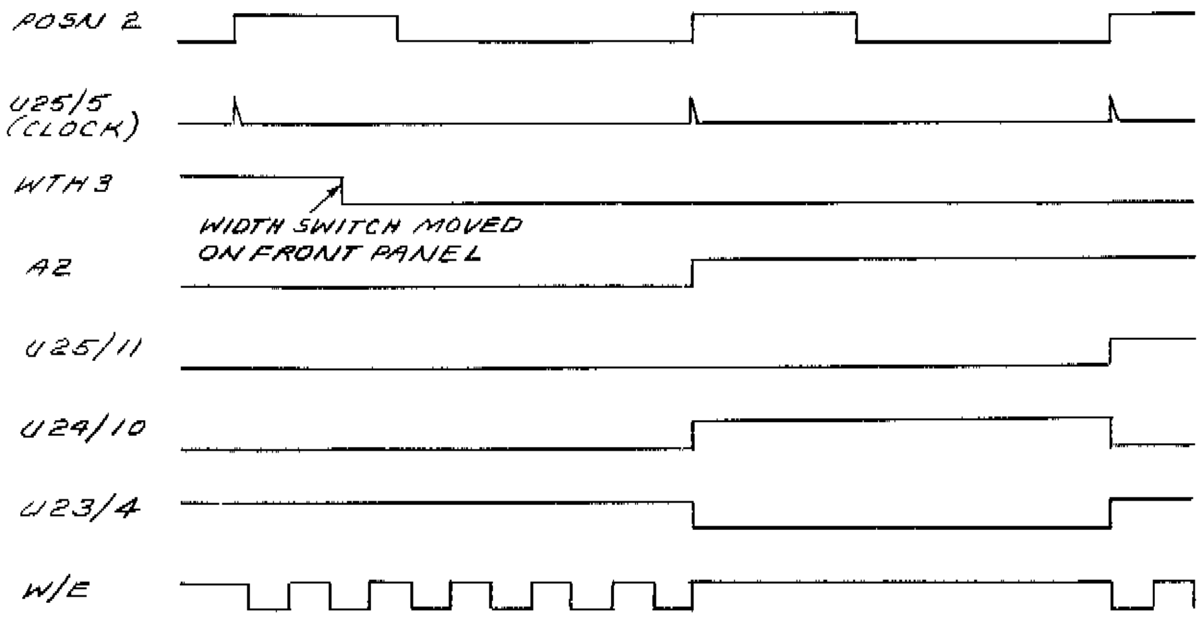
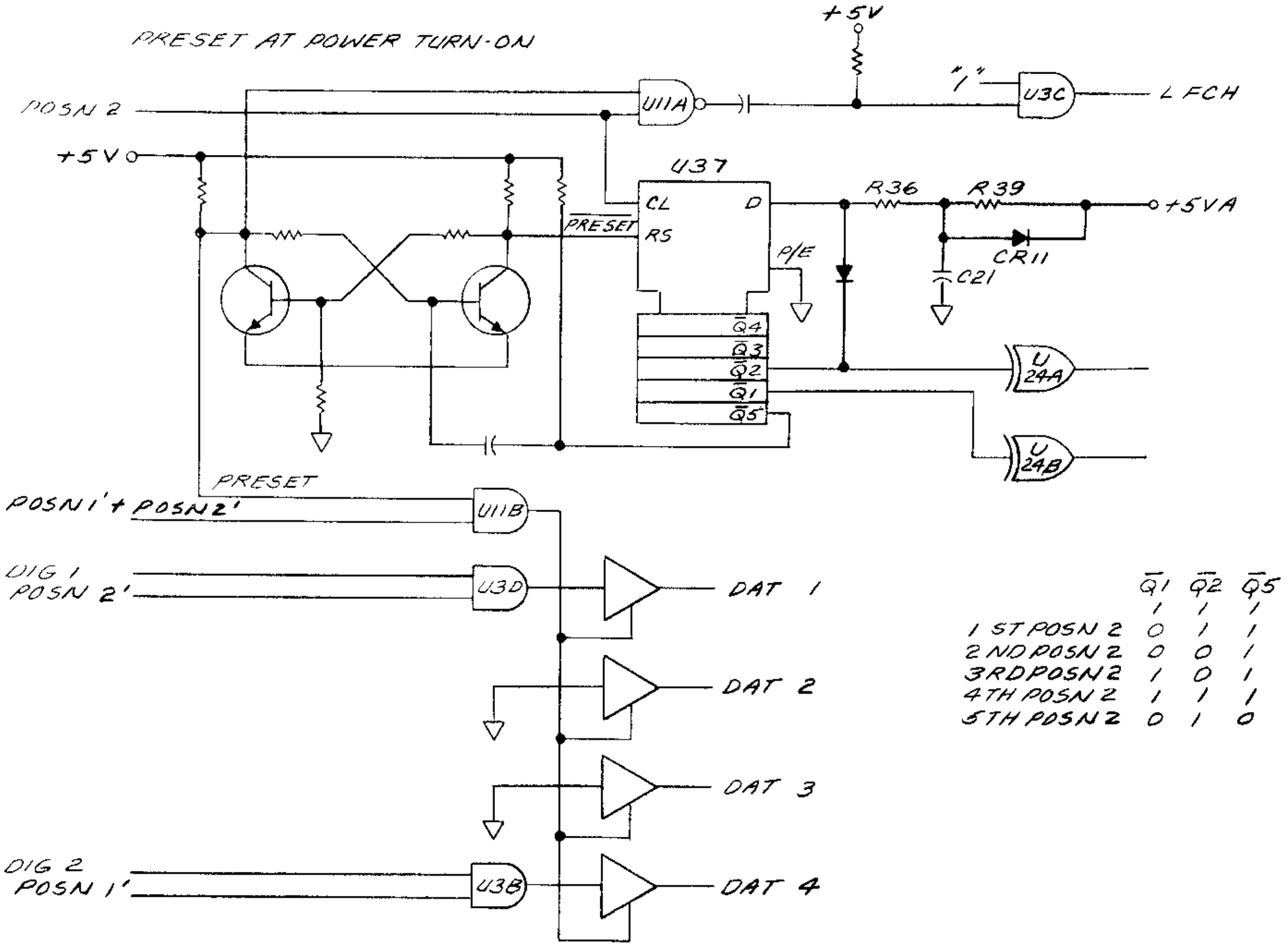


Figure C3-22H. Width Change Detector Operation



	$\overline{Q1}$	$\overline{Q2}$	$\overline{Q5}$
	1	1	1
1ST POSN 2	0	1	1
2ND POSN 2	0	0	1
3RD POSN 2	1	0	1
4TH POSN 2	1	1	1
5TH POSN 2	0	1	0

Figure C3-22I. Preset at Power-On

Frequency Change Logic

The $\overline{Q}$ outputs of flip-flops U15 and U15B of the Speed-Up circuits are applied to the clock inputs of the counters. These outputs ($\overline{Q}$) are also applied to the Frequency Change Logic circuit where they are ORed by U1D to produce an L FCH pulse. This L FCH pulse is applied to the A2A2 Display Logic assembly where it is used to generate a POSN 2 pulse which initiates an update depending on selected sweep speed.

Read/Write Enable Circuit

The Read/Write Enable Circuit produces the logic signals necessary to place the RAM and the Counters in the proper mode of operation.

Input pulses LT EN and PRE LT EN are combined by integrator C19/R3 and OR gate U12D to produce the Write Enable Gate (WEG). This pulse is then delayed by integrator C2O/R37 to produce the Memory Enable Gate (MEG). The WEG is combined with the Read Write (R/W) signal to set the RAM to either read or write. The MEG is used to enable the correct memory device for either POSN 1 or POSN 2.

The output of Width Change Detector circuit combined with the output of Power On Preset Circuit is used to set the RAM and Counters to proper mode of operation. The instrument has three basic modes of operation: normal operation, operation with a WIDTH change, and Preset at power-on. Operating mode of RAM and Counters are related to these three instrument operating modes in Figure C3-22J.

	WTH CHG U23 Pin 3	R/W U13C Pin 10
Normal Operation	0	1
WTH Change	1	0
Preset at Power-ON	1	1

WTH CHG = "1" Counter in preset mode
R/W = "1" RAM's in write mode
R/W = "0" RAM's in read mode

Figure C3-22J. Counter/RAM Operation for Instrument Operating Modes

Control Logic

Gates U1B, U10B, U10A, and U10D decode input signals POSN 1, POSN 2, REM, DIG 5 and DIG 6 to enable tri-state outputs connected to the Data Bus (DAT 1 — DAT 4).

Transistor Q1 disables flip-flop U15A and U15B of Speed-Up Circuit to prevent RPG input pulses from clocking Counters when in remote (REM) operation.

Transistor Q2 assures that RAM is in read mode when WIDTH switch is in ALT.

Gates U23D, U36C, and U36D decode inputs WTH 1, WTH 2, WTH 3, and SW ALT to provide address inputs to RAM.

Gates U36B and U23C generate SINK pulse to display correct frequency setting information for either S/S1 or S/S2 depending on which channel is selected on A3 Processor.

Signal	Full Name	Description/Control Information
DAT 1	DATA 1	For Instrument; DAT 1 = 1 for "1" if DAT 2, 3, 4 = 0
DAT 2	DATA 2	For Instrument; DAT 2 = 1 for "2" if DAT 1, 3, 4 = 0
DAT 3	DATA 3	For Instrument; DAT 3 = 1 for "4" if DAT 1, 2, 4 = 0
DAT 4	DATA 4	For Instrument; DAT 4 = 1 for "8" if DAT 1, 2, 3 = 0
DIG 1	DIGIT 1	Data transfer; DIG 1 = 1 → Data Transfer
DIG 2	DIGIT 2	Data transfer; DIG 2 = 1 → Data Transfer
DIG 3	DIGIT 3	Data transfer; DIG 3 = 1 → Data Transfer
DIG 5	DIGIT 5	Data transfer; DIG 5 = 1 → Data Transfer
DIG 6	DIGIT 6	Data transfer; DIG 6 = 1 → Data Transfer
L FCH	FREQUENCY CHANGE	L FCH = 0 if either RPG is being turned
L OFF 1	Low Channel 1 OFF	L OFF 1 = 0 → CH 1 OFF; L OFF 1 = 1 → CH 1 ON
L REM	REMOTE	MANUAL → 1; REMOTE → 0
LT EN	LATCH ENABLE	Pulse within DIG 1 – 6 LT EN = 1 → data accepted
POSN 1	POSITION 1	Enable for START or CW data transfer; POSN 1 = 1 → data transferred
POSN 2	POSITION 2	Enable for STOP/±ΔF data transfer; POSN 2 = 1 → data transferred
PRE LT EN	PRE LATCH ENABLE	Precedes LT EN pulse within DIG 1 – 6; 1 = TRUE
RPG 1A	Rotary Pulse Generator	START/CW
RPG 1B	Rotary Pulse Generator	START/CW
RPG 2A	Rotary Pulse Generator	STOP/±ΔF
RPG 2B	Rotary Pulse Generator	STOP/±ΔF
SINK	SYNCHRONIZER	Front-panel update; SINK = 1 → Inhibit Update
SW ALT	Sweep ALTERNATE	SW ALT = 1 → CH 1; SW ALT = 0 → CH 2
WTH 1	WIDTH 1	Refer to truth table
WTH 2	WIDTH 2	Refer to truth table
WTH 3	WIDTH 3	Refer to truth table

Fig C3-22K
Sht 1 of 3

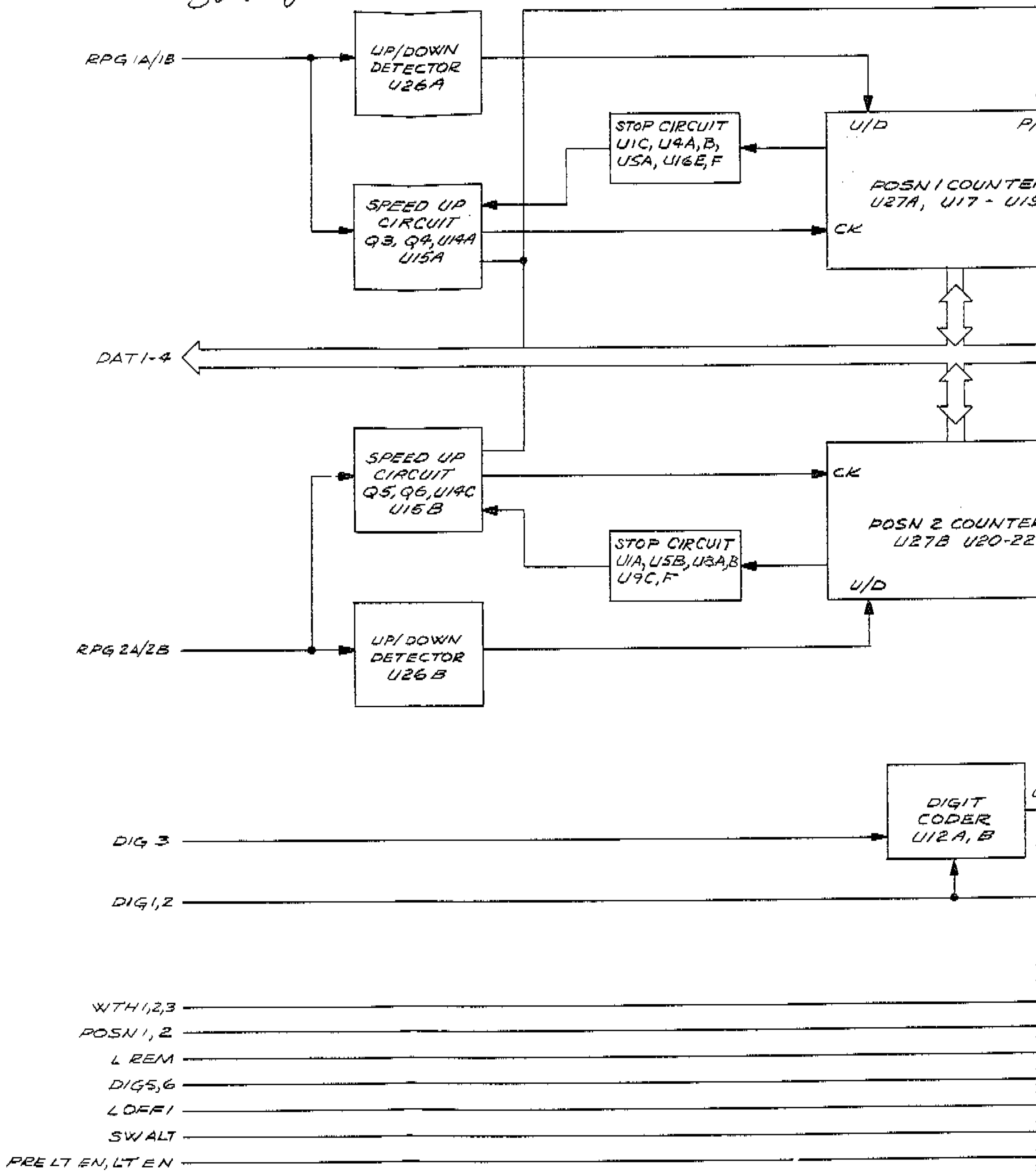


Fig. C3-22K, Sht 2 of 3

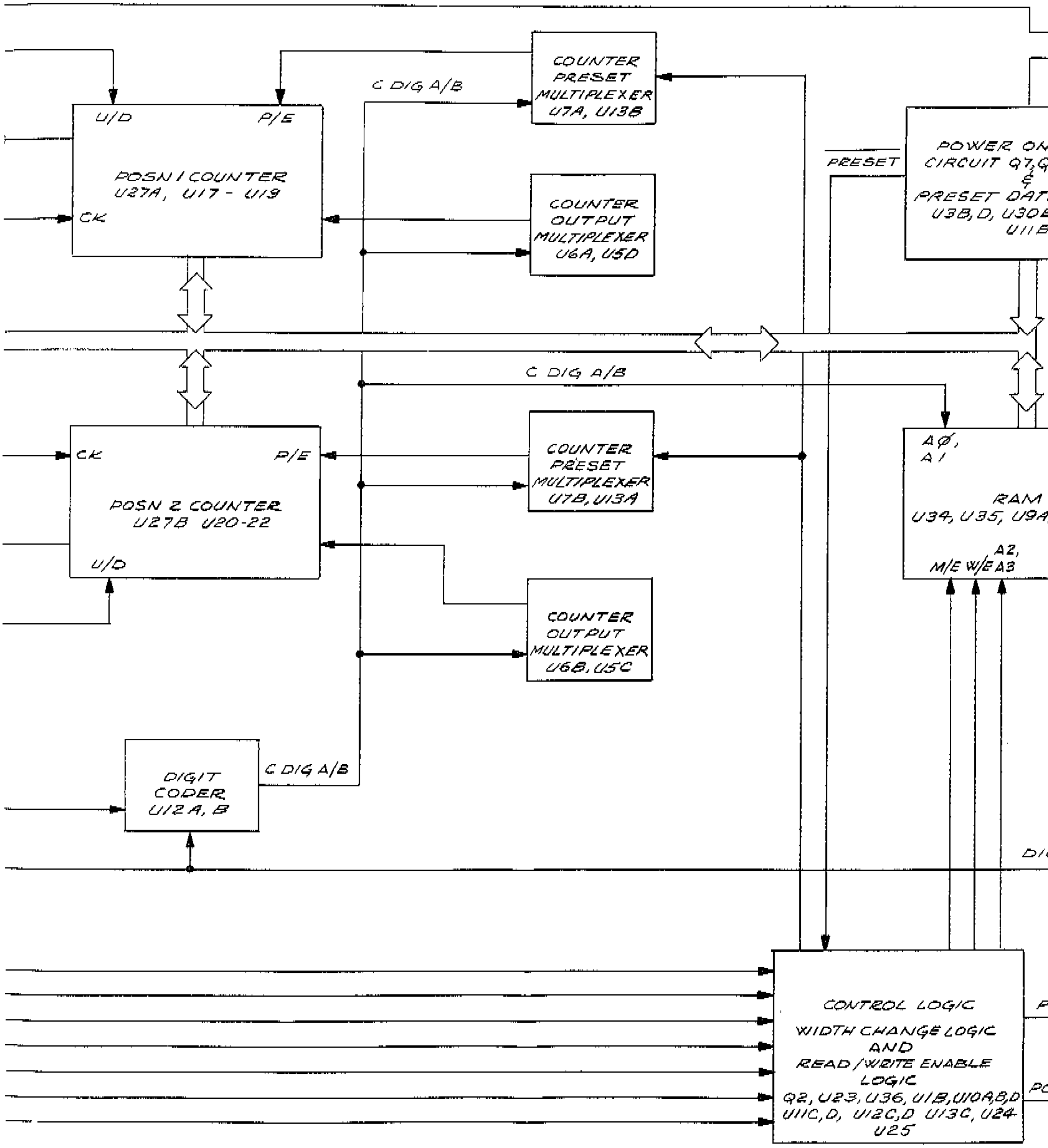


Figure C3-

Fig C3-22K, Sht 3 of 3

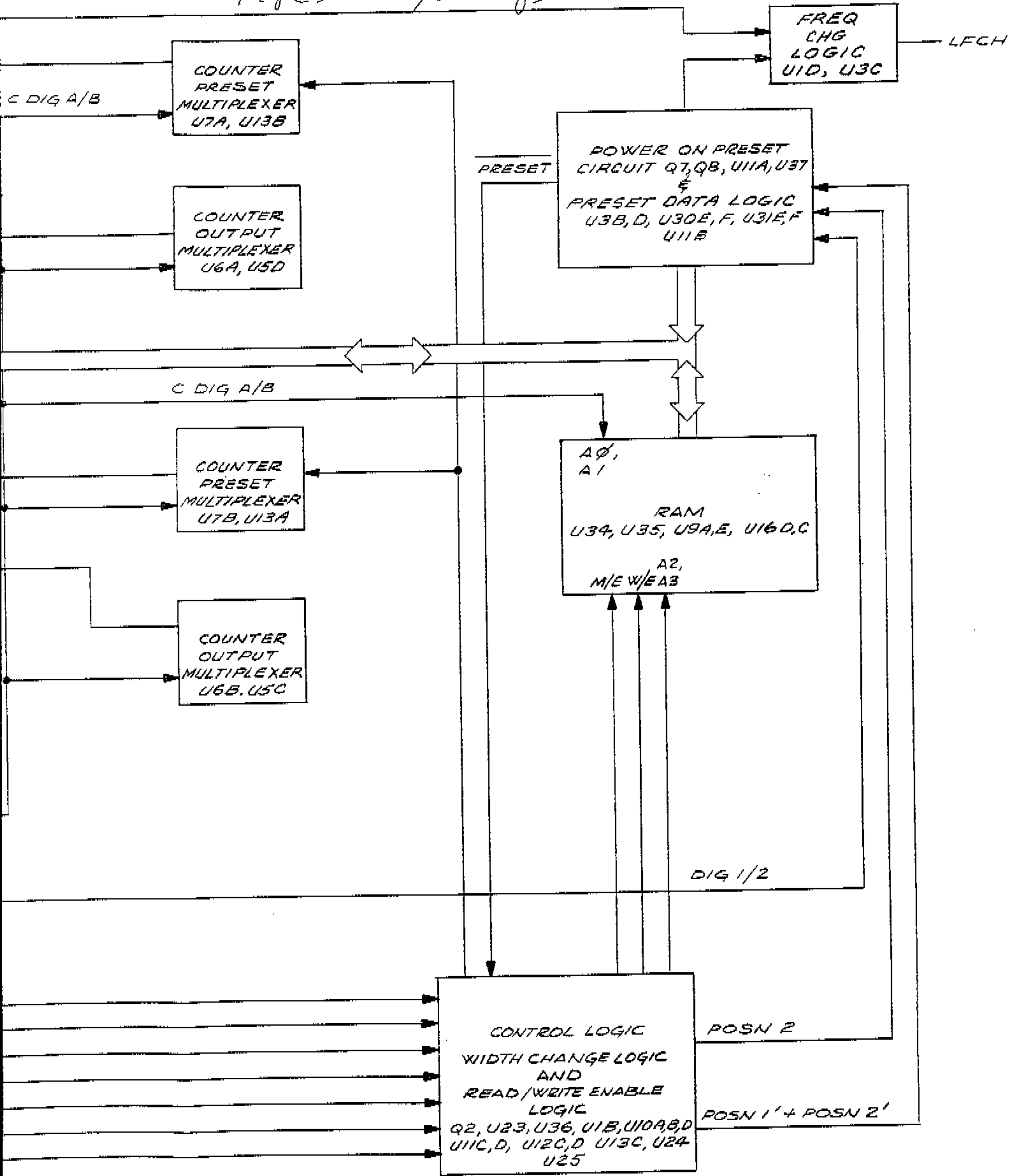


Figure C3-22K. A2A3 Memory Block Diagram

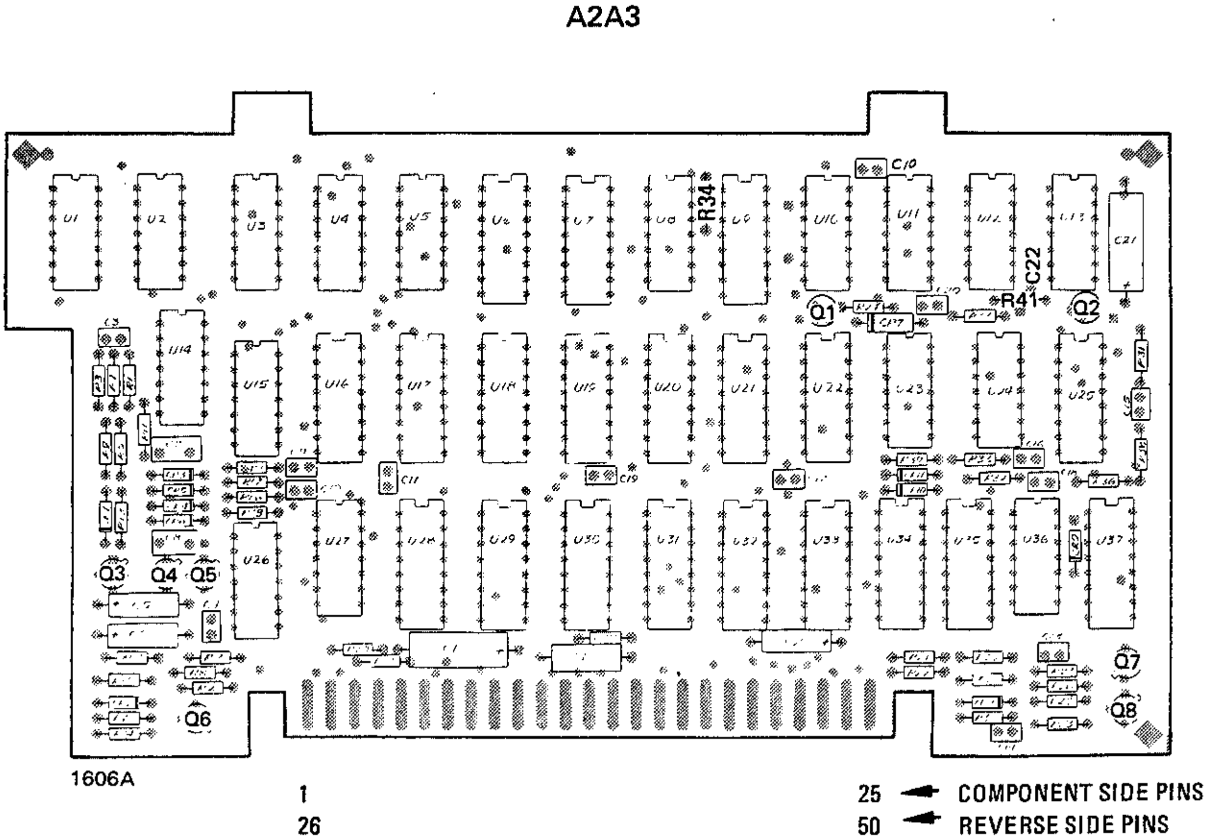


Figure C3-23. A2A3 Memory Parts Location

Fig C3-24
Sht 1 of 3

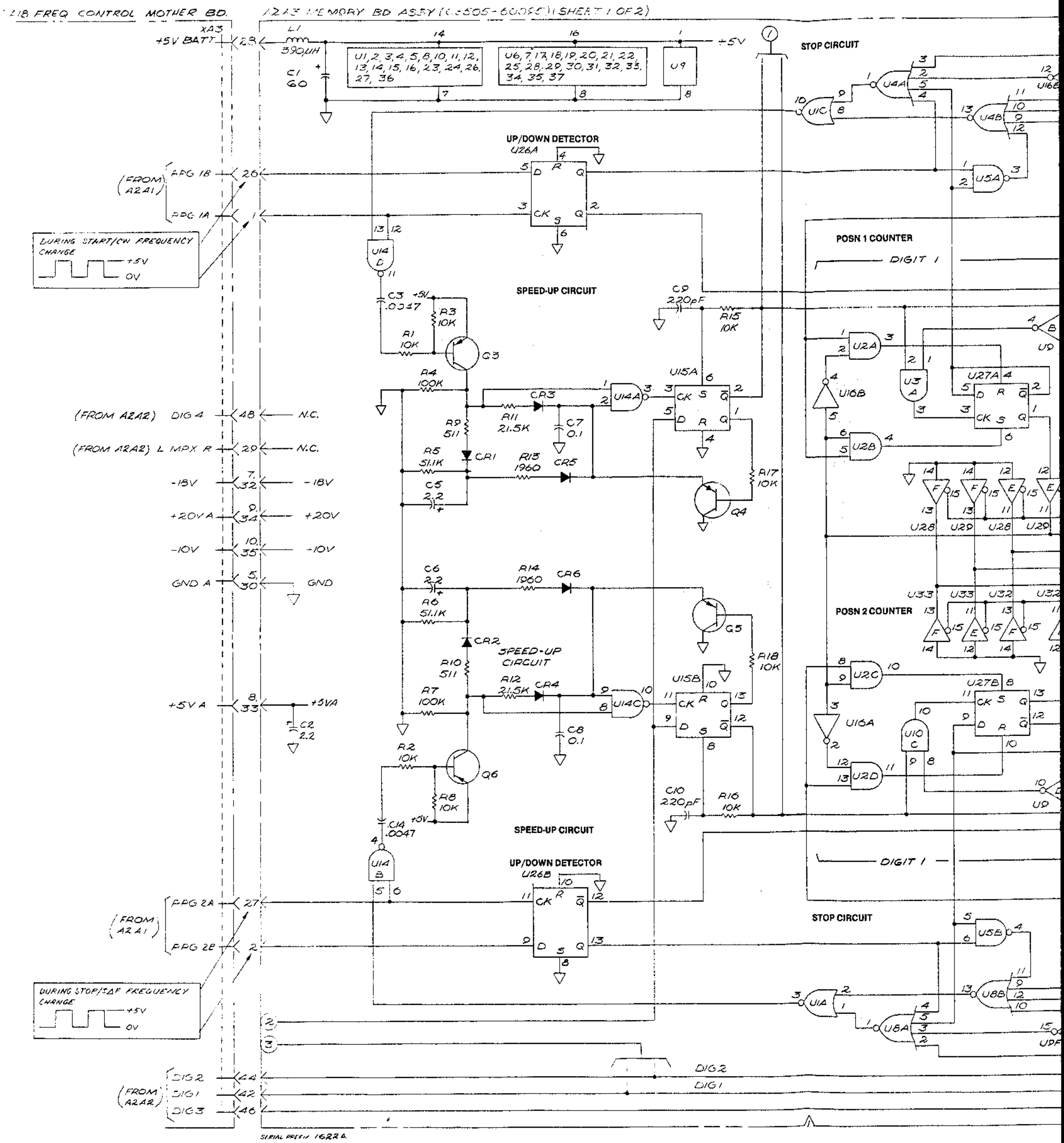


Fig C3-24
Sht 2 of 3

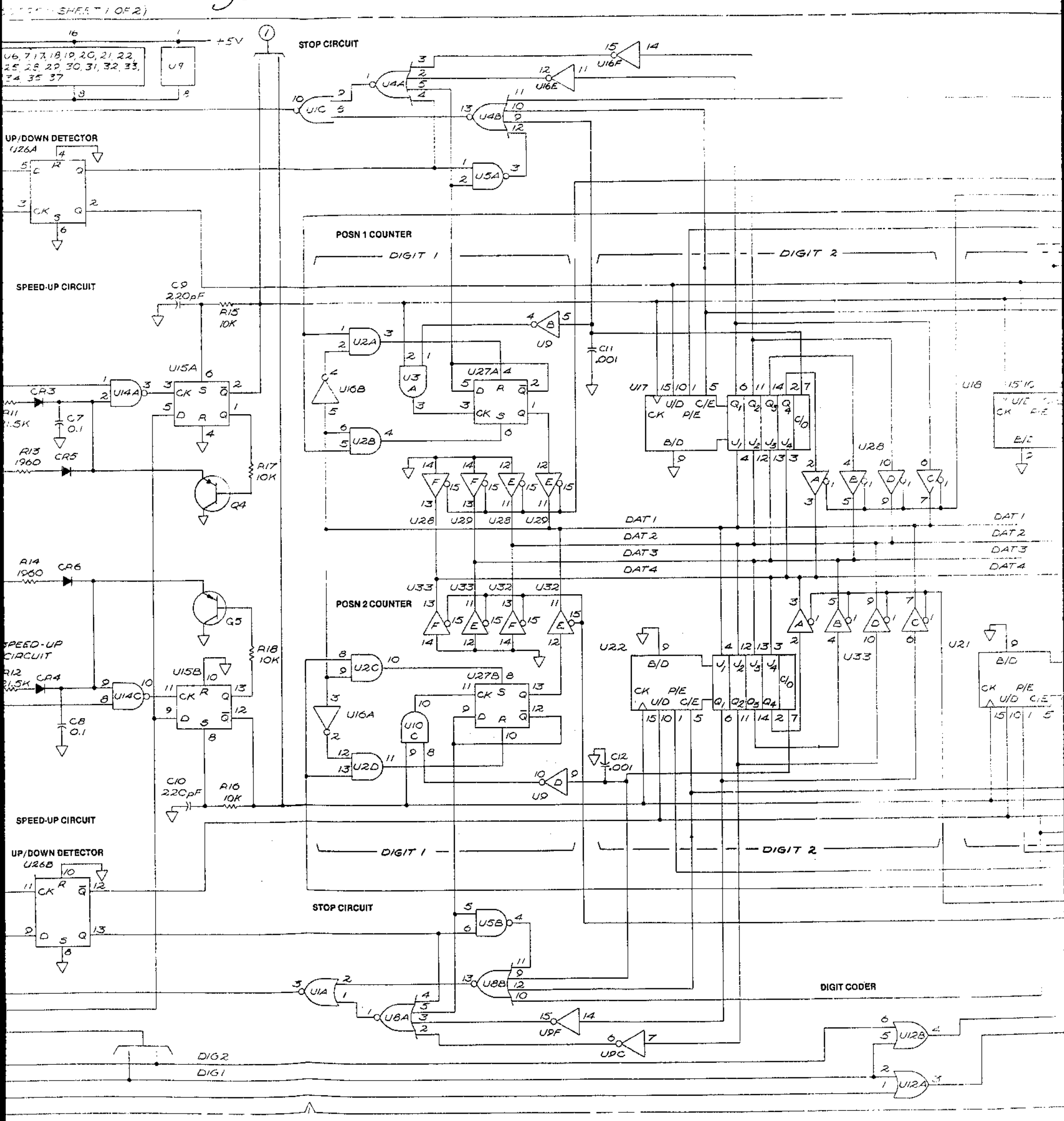
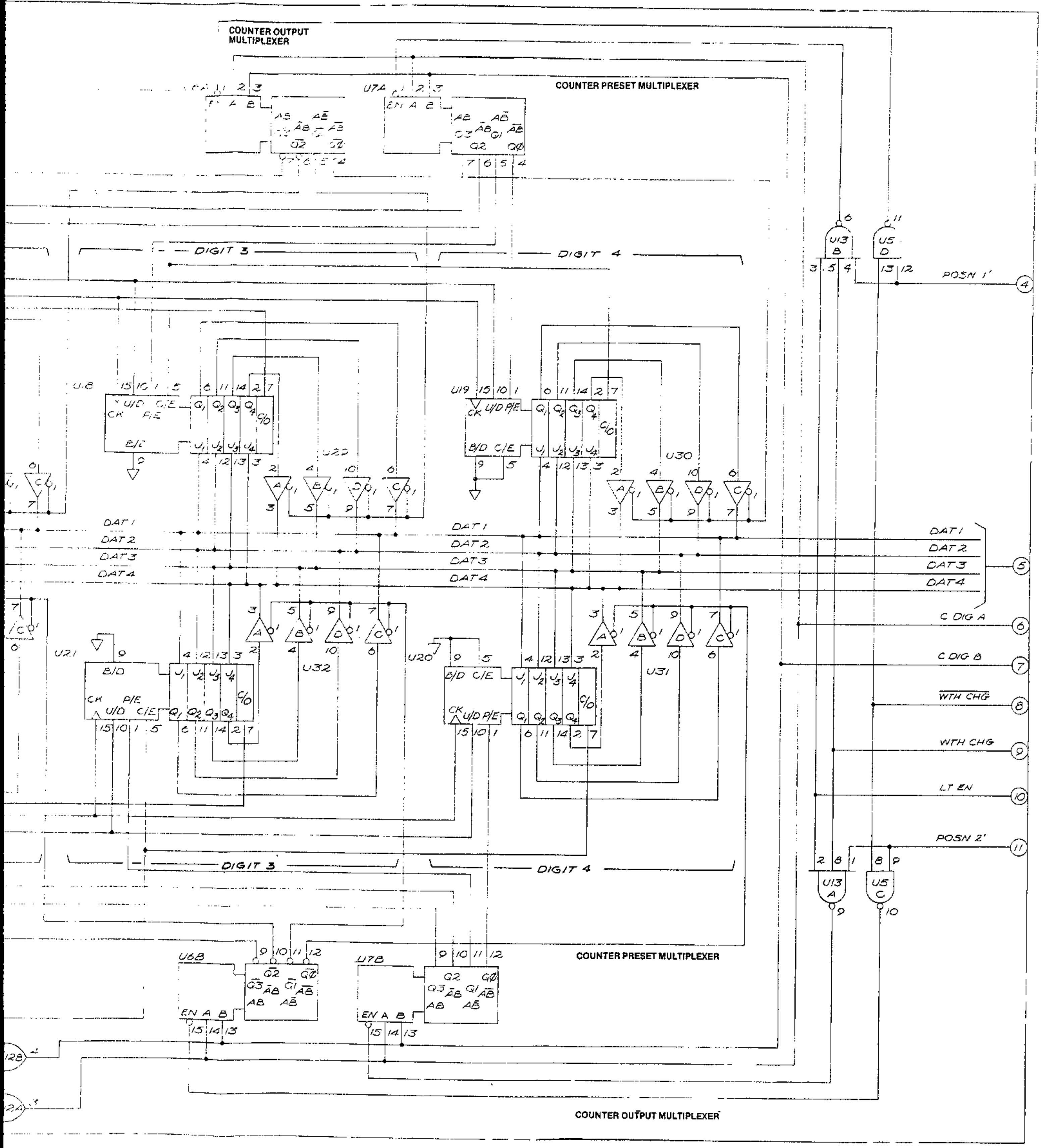


Fig C3-24
Sht 3 of 3

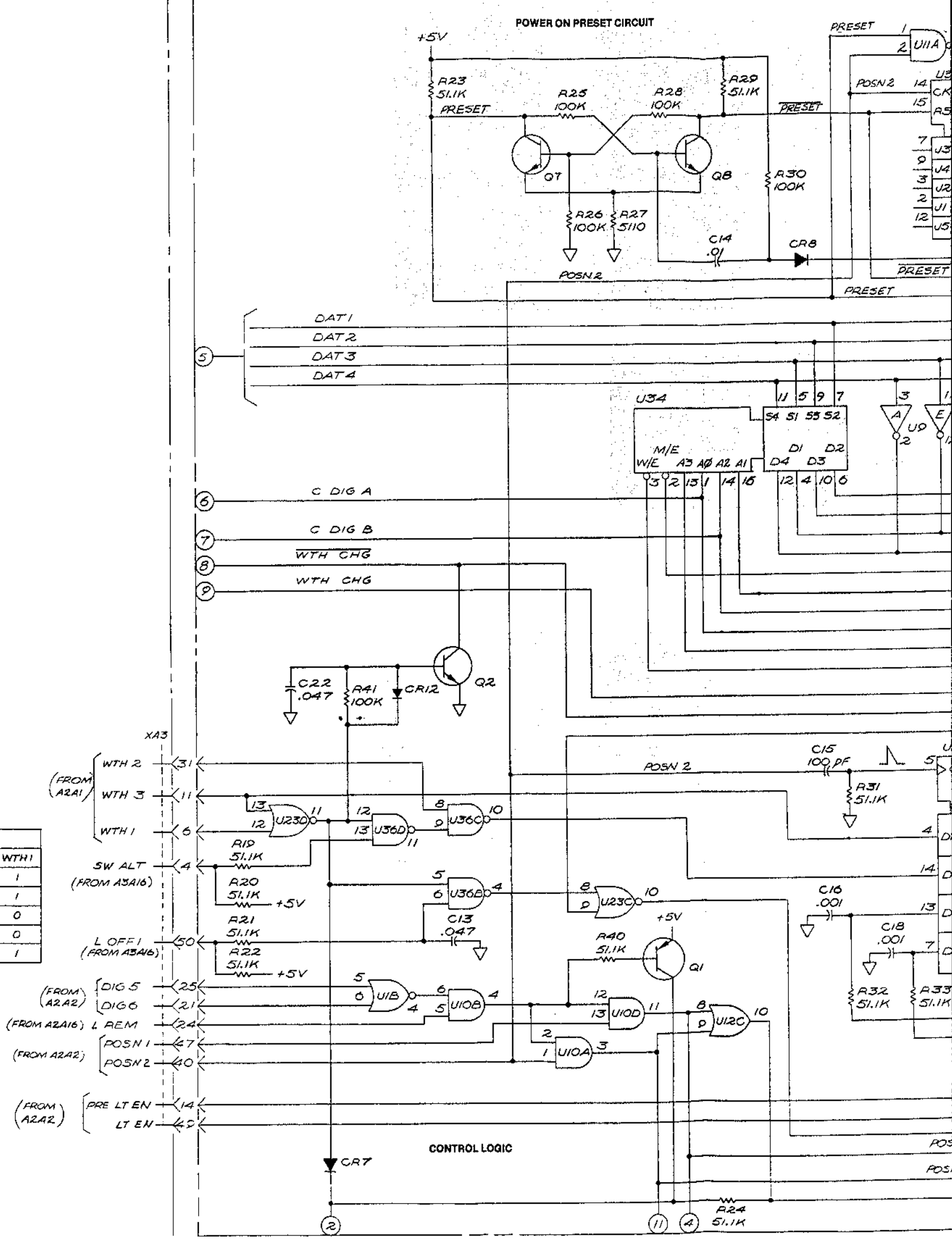


A2A3

Figure C3-24. A2A3 Memory, Schematic (Sheet 1 of 2)

Fig C3-24a
Sht 1 of 3

A2A18 FREQ CONTROL MOTHER BD   A2A3 MEMORY BD ASSY (08505-60095) (SHEET 2 OF 2)



U25 INPUTS	D1	D4
SS1	0	1
SS2	0	0
ALT	0	0: SWALT-0 1: SWALT-1
ΔF	1	0
CW	1	0

WIDTH	WTH3	WTH2	WTH1
SS1	0	0	1
SS2	0	1	1
ALT	0	1	0
ΔF	1	1	0
CW	1	1	1

SERIAL PREFIX 1622A

Fig C3-24a
Set 2 of 3

(08505-60095)(SHEET 2 OF 2)

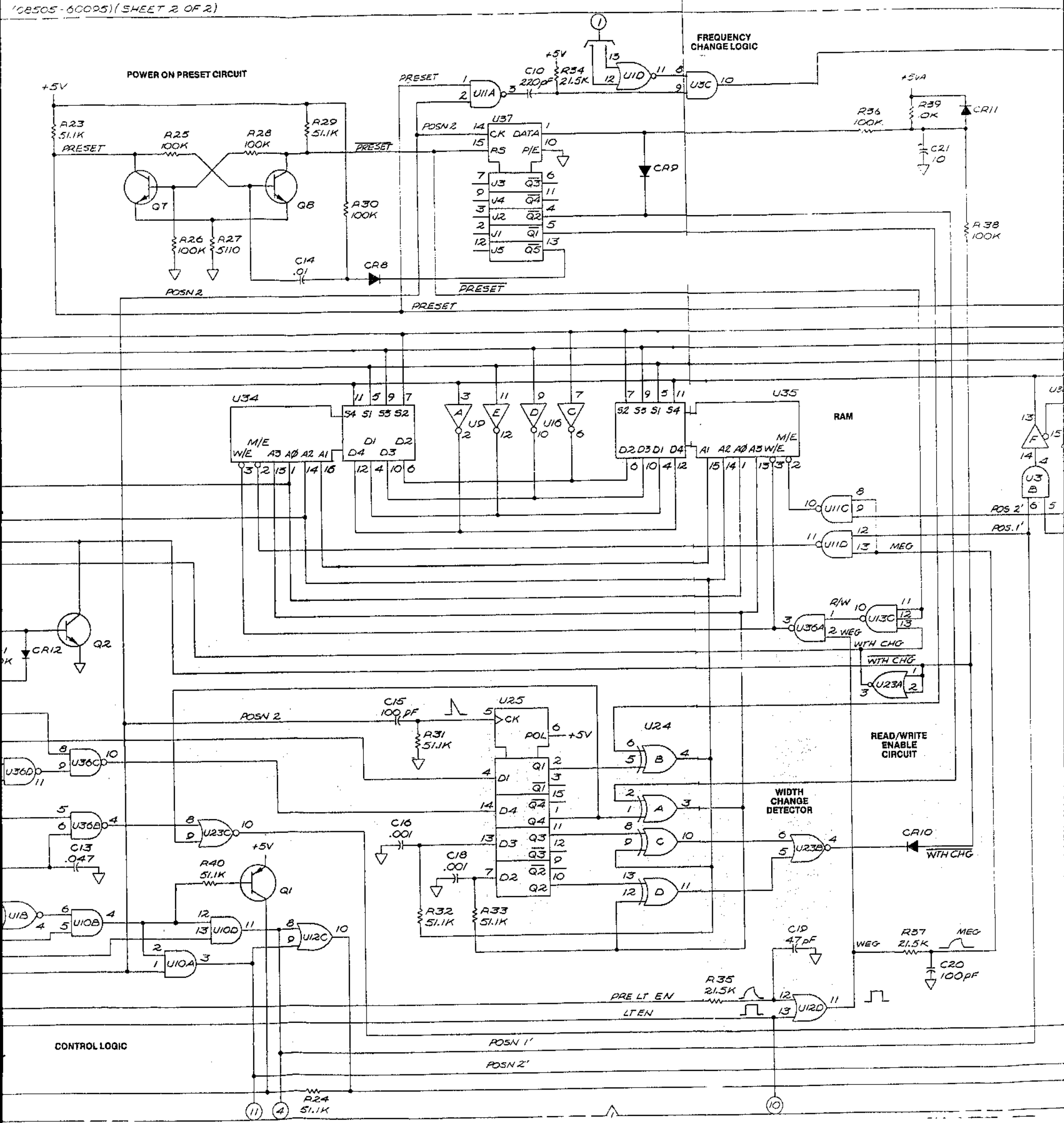
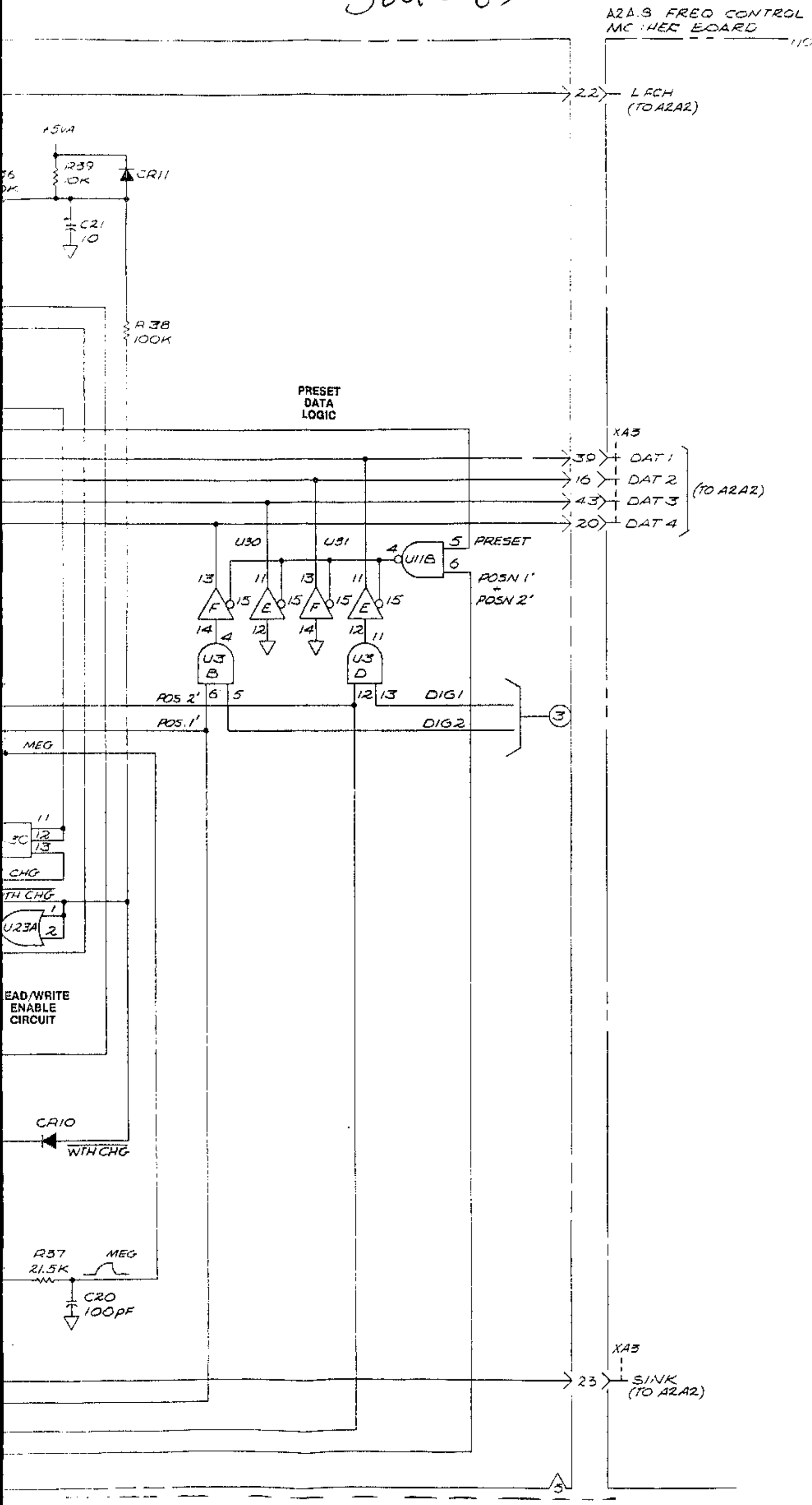


Fig C3-24a
Sut 3083



NOTES:

1. UNLESS OTHERWISE INDICATED,
   RESISTANCE IN OHMS
   CAPACITANCE IN MICROFARADS
2. ON U25, AND U37 PIN
   16 CONNECTS TO +5V AND PIN
   8 CONNECTS TO GND.
3. ON U9A, U10A, U11A, U23A, U24A, AND U36A
   PIN 14 CONNECTS TO +5V AND
   PIN 7 CONNECTS TO GND.
4. MNEMONICS USED WITHIN THIS SCHEMATIC
   ONLY- NO INTERCONNECTION TO OTHER ASSEMBLIES:
   - POSN 1' - POSN 1 ANDed WITH DIG 5, DIG 6, AND L REM
   - POSN 2' - POSN 2 ANDed WITH DIG 5, DIG 6, AND L REM
   - C DIG. - CODED DIGIT; OUTPUT OF DIGIT ADDRESS CODER
   - WTH CHG - WIDTH CHANGE; OUTPUT OF WIDTH CHANGE DETECTOR.
   - MEG - MEMORY ENABLE GATE
   - WEG - WRITE ENABLE GATE
   - PRESET - PRESET; OUTPUT POWER ON PRESET CIRCUIT.
   - R/W - READ/WRITE; OUTPUT OF U13C

REFERENCE DESIGNATORS A2A3
C1-C21
CR1-CR12
L1
Q1-Q8
R1-R40
U1-U37

A2A3

Figure C3-24. A2A3 Memory, Schematic (Sheet 2 of 2)

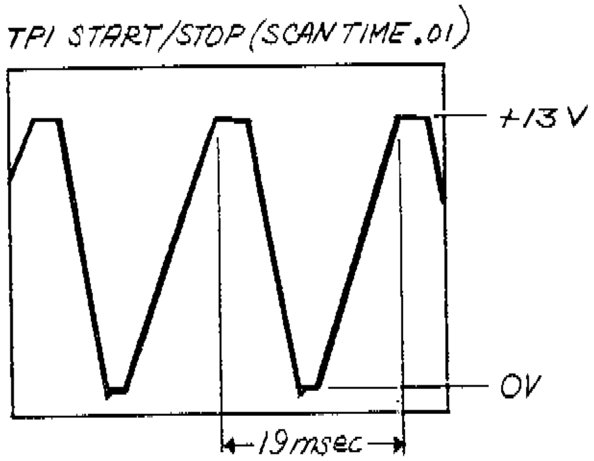
A2A4 SCALING CIRCUIT

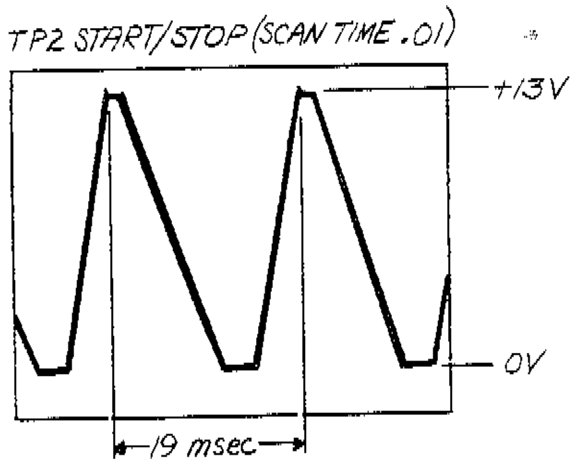
Description

The Scaling Circuit consists of two digital-to-analog (D/A) converters which attenuate the sweep voltage. Each D/A converter is set by the digital data bus. The output of the D/A converters is summed and this sum, VSC, is dependent on the sweep voltage and the frequency setting of the instrument.

START/STOP Operation

The sweep voltage, VSW3, enters the board on Pin 16, TP1, and is switched through U3, R21, and R25 to the inverting input of U2. The +13V reference voltage enters the board on Pin 19 and 44, TP4, and is switched through U3 to the noninverting input of U2. R22, R23, and R24, connected to the noninverting input of U2, are a voltage divider that provides a constant offset. A feedback network consisting of R25 and R27 is connected to the inverting input of U2. The output of U2 can be monitored at TP2.





Waveforms at TP1 (VSW3) and at TP2 (Inverted and Offset from TP1)

The waveform at test point 2 is the inverted and offset waveform of the input voltage at TP1.

Each sweep signal, the inverted and the non-inverted sweep voltage, is applied to a separate D/A converter by switches U3 and U4. One D/A converter consisting of U1, U8, U9, U10 and U11 is connected to the inverted sweep voltage TP2, and sets the START frequency. The second D/A converter, consisting of U6, U14, U15, U16, and U17, is connected to the sweep voltage, TP1, and sets the STOP frequency. The current from both D/A converters is summed and connected to the inverting input of U5. The output voltage of U5, VSC, is dependent on the settings of the D/A converters and the value of the sweep voltage.

CW Operation

The reference voltage of +13V, TP4, is switched through U4 and R20 and is the input voltage to the D/A converter consisting of U1 and U8 through U11. The current of the D/A converter is transformed to the output voltage, VSC (TP3), by summing amplifier U5.

C11 is switched across U5 to limit the bandwidth in CW.

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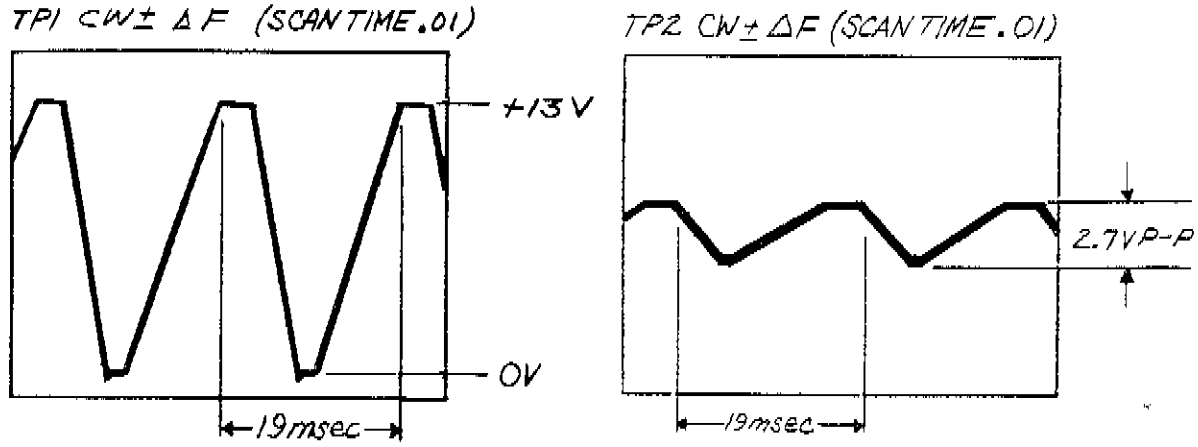
CW±ΔF Operation

The CW setting of CW ± ΔF operation functions exactly like the CW operation described. The ± ΔF function is similar to the START/STOP operation. The sweep voltage, VSW3 (TP1), is switched through U3 and resistors R16, R19, R22, R23, and R24 to the noninverting input of U2. The reference voltage, + 13V (TP4), is connected through U3 and resistors R14, R18, R21, and R25 to the inverting input of U2. The output of U2 is the sweep voltage scaled by a factor of ten and centered around zero.



Waveform at TP1 and TP2 in CW±KF Operation

This output voltage is switched through U4 and U3 to the input of the D/A Converter consisting of U6 and U14 through U17. The currents of both D/A Converters, the constant CW portion and the swept ± ΔF portions, are summed at U5 and transformed to the output voltage, VSC (TP3).

Verniers

Each D/A converter is bypassed by a resistor network with adjustable attenuation. These networks consist of R28, R29, and A2A1A1R15 for the first D/A converter and R33, R34, and A2A1A1R14 for the second D/A converters.

Both verniers are disconnected by U4A if the instrument is in LOCAL LOCKOUT operation. In this mode, it is possible to fine adjust the frequency under remote control in CW operation, where the second D/A converter acts as the vernier. The + 13V reference voltage is divided by R13 and R15, and is connected to the second D/A converter through U3.

Switching Control

The switches U3 and U4 are controlled by the decoders U22, U23 and the drivers Q2, Q3, Q4, and Q6.

Digital Data Transfer

The digital data information is present in multiplexed form on the data bus, DAT1 through DAT4 (Pins 17, 39, 43 and 45). These four data lines are connected to the inputs of the latches U19, U20, U21, U28, U29, and U30 and flip-flop U24. The synchronization information is transmitted on lines DIG1, DIG2, DIG3, DIG4, POSN1, POSN2, and LTEN (Pins 42, 20, 21, 48, 22, 15 and 24).

This synchronization information is decoded by U25, U26, and U27 which drive the enable lines of the latches and the flip-flop U24. The multiplexed data information is held at the outputs of the latches and the flip-flop until the next up-date cycle. These outputs are connected to the digital inputs of the current switches U8, U9, U10, U11, U14, U15, U16, and U17. U7, U12, U13, and U18 are BCD (binary-coded-decimal)-to-Binary converters.

Fig C3-24A
Jut 1 of 3

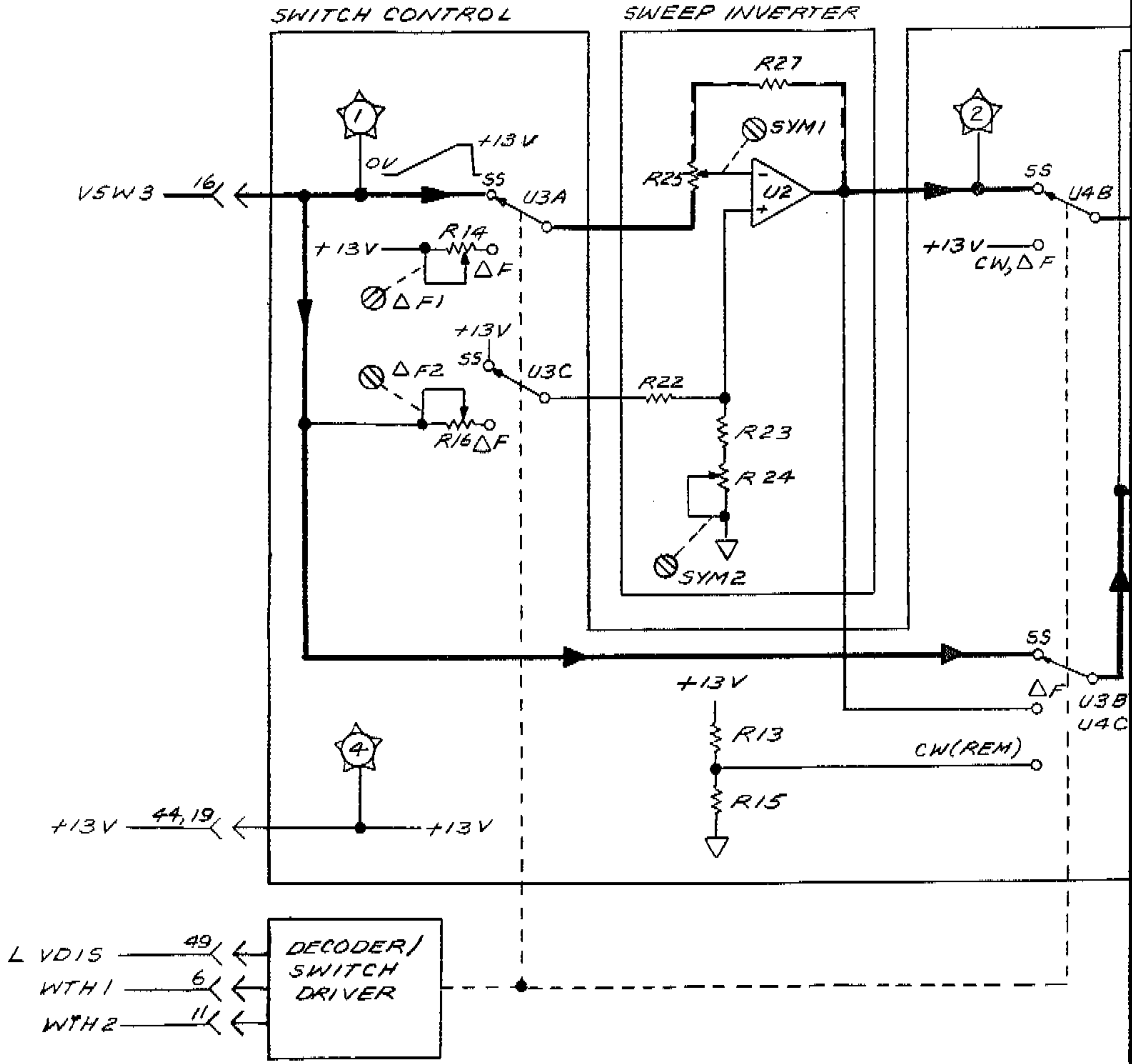


Fig C3-24A
Set 2 of 3

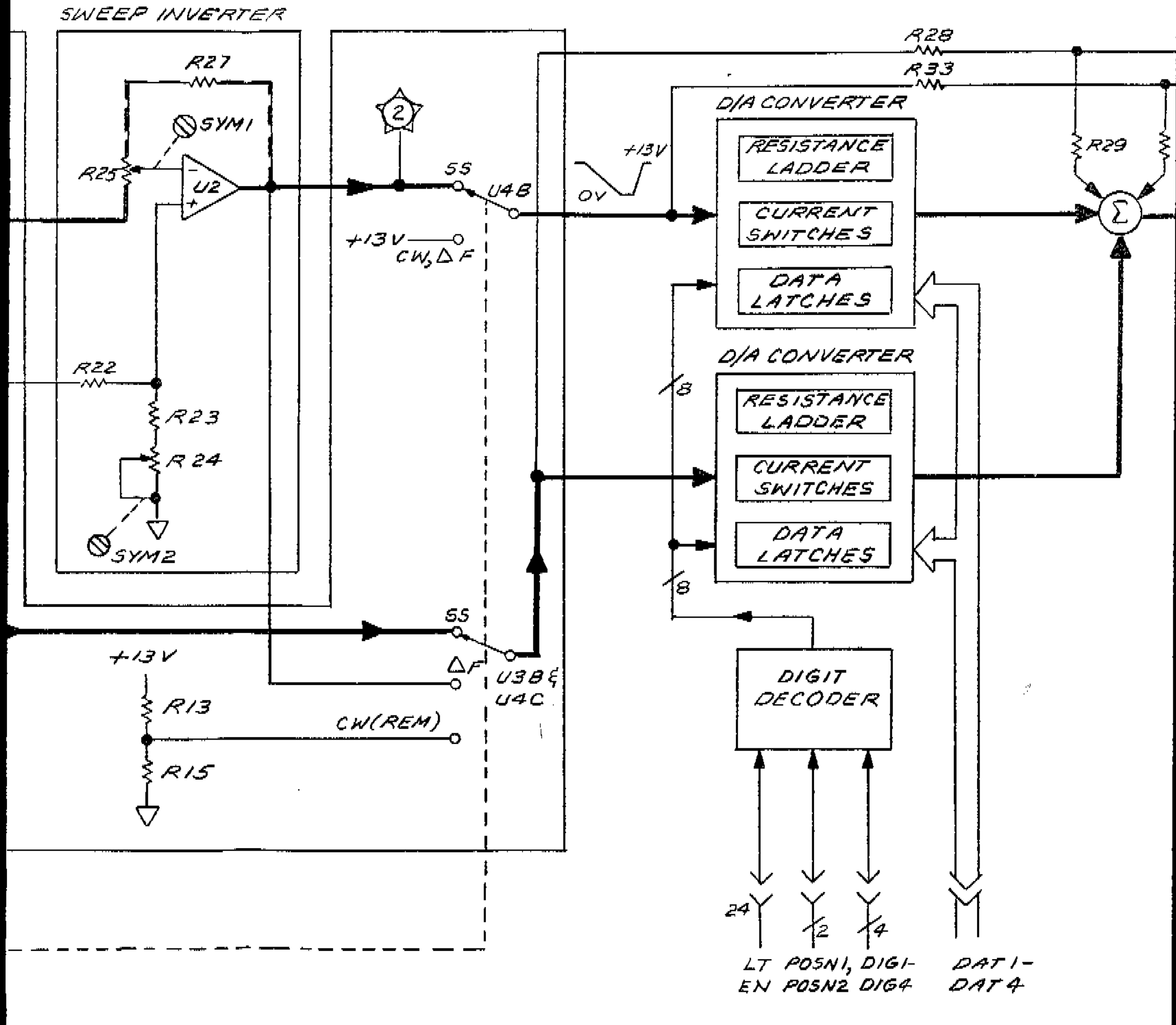


Fig C3-24A
Sht 3 of 3

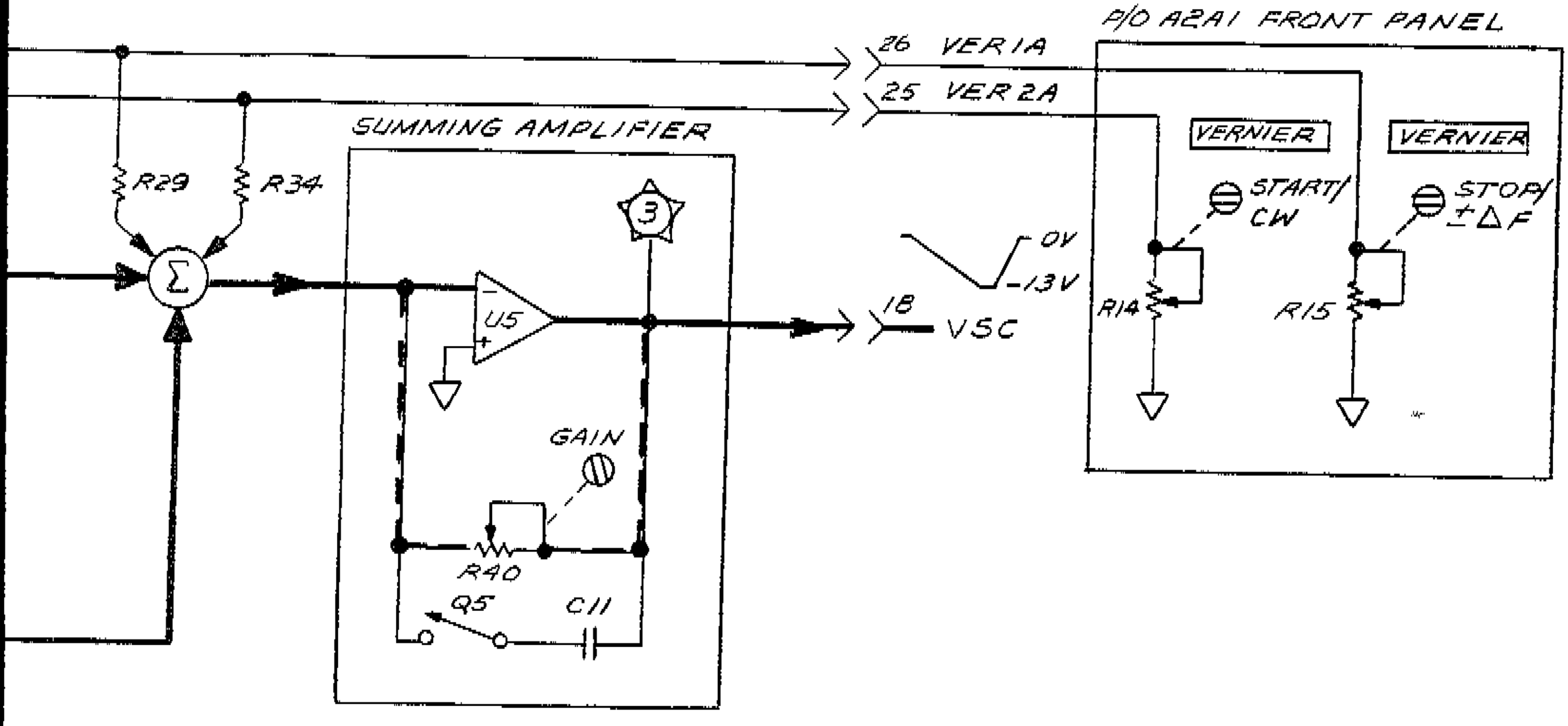


Figure C3-24A. A2A4 Scaling Block Diagram

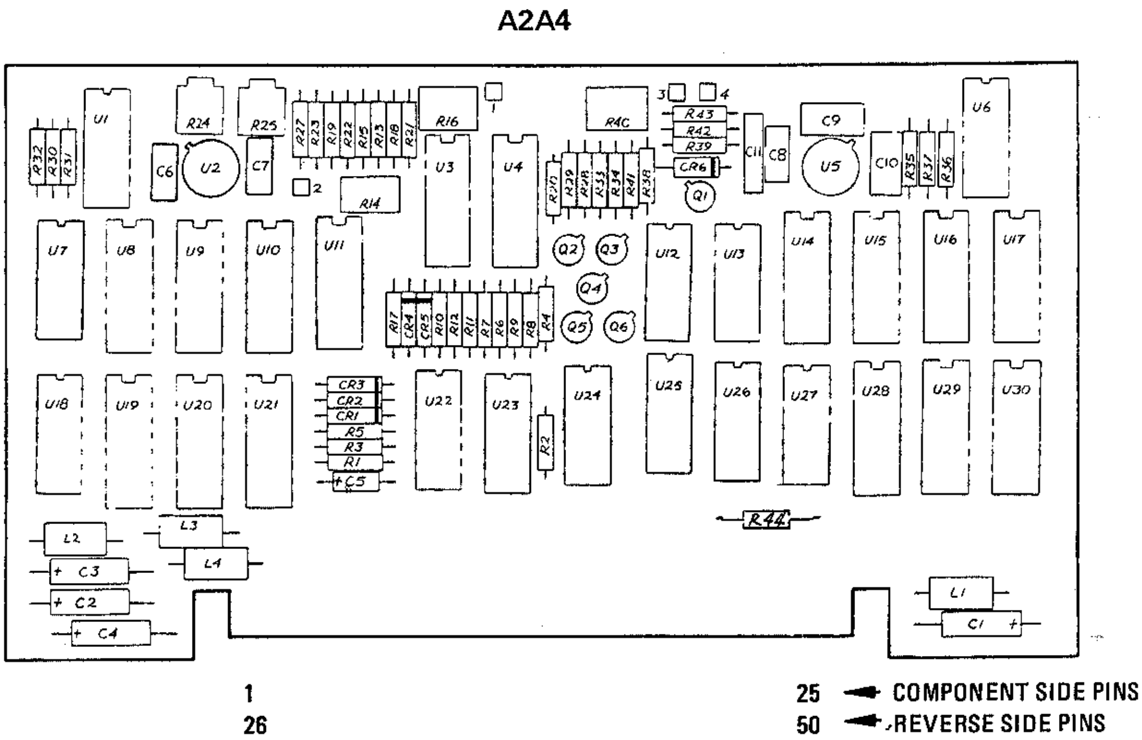
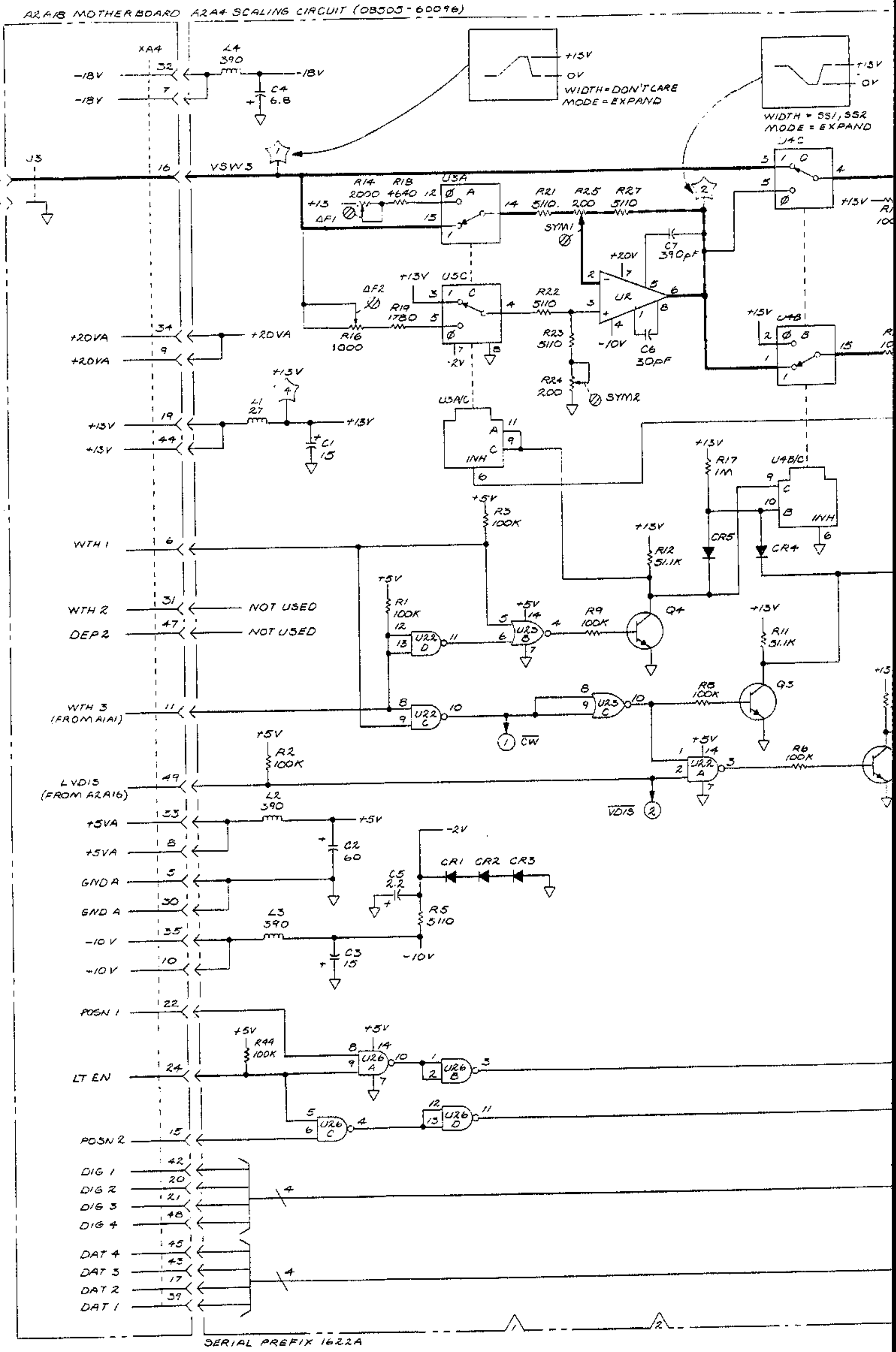


Figure C3-25. A2A4 Scaling Parts Location

Fig C3-26
Set 1 of 5

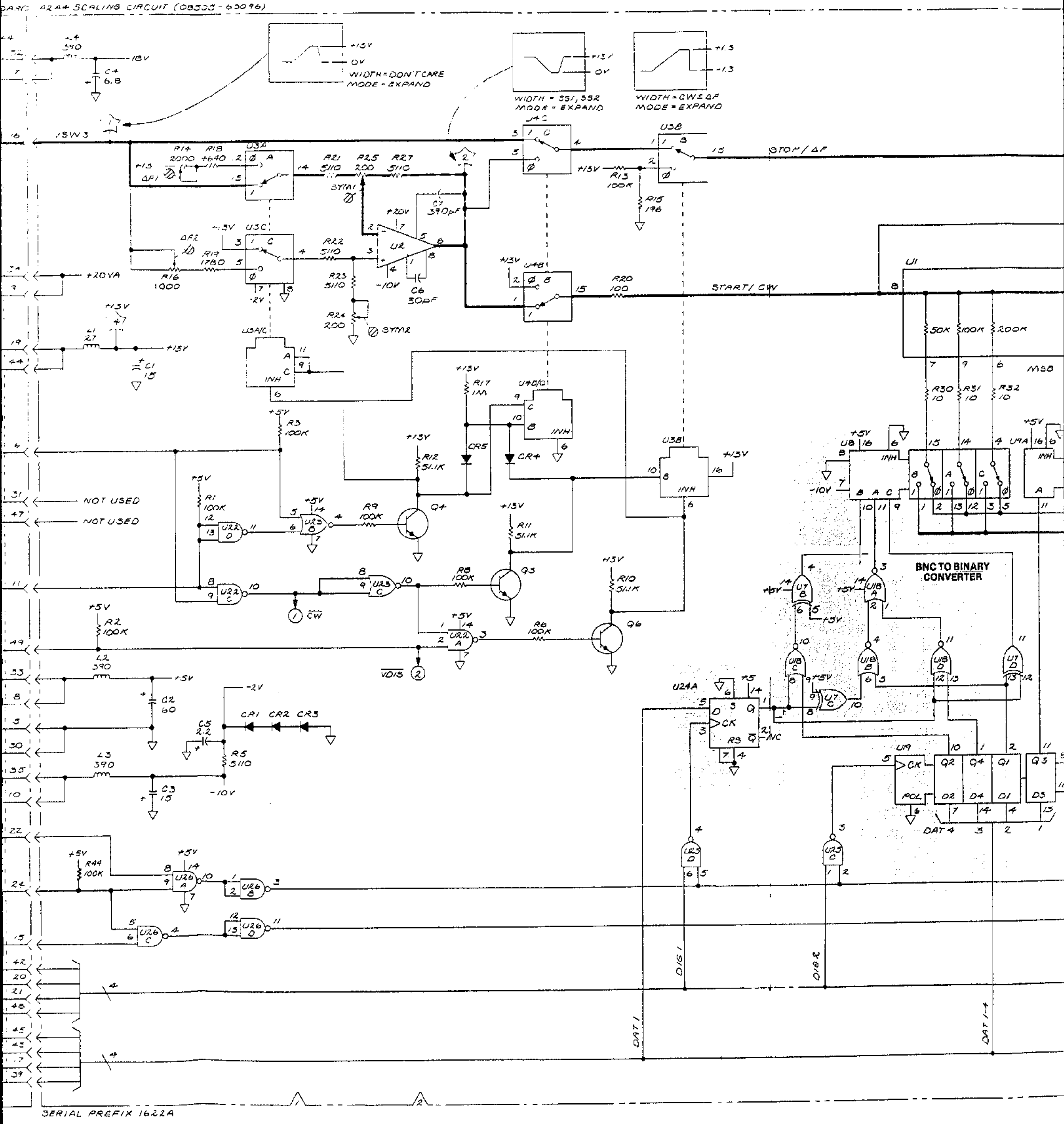


SIGNAL	DEFINITION
DAT 1	DATA 1 FOR INSTRUMENT I/O
DAT 2	DATA 2 FOR INSTRUMENT I/O
DAT 3	DATA 3 FOR INSTRUMENT I/O
DAT 4	DATA 4 FOR INSTRU-
DIG 1	DIGIT 1
DIG 2	DIGIT 2
DIG 3	DIGIT 3
DIG 4	DIGIT 4
LT EN	LATCH ENABLE
POSN 1	POSITION 1 (START/CW)
POSN 2	POSITION 2 (STOP/ΔF)
LVDIS	VERNIER DISABLE (0=NO VERNIER)
WTH 1	WIDTH 1
WTH 3	WIDTH 3
VSC	SCALING VOLTAGE

WIDTH		
	WTH1	WTH3
SS1	1	0
SS2	1	0
ALT	0	0
ΔF	0	1
CW	1	1

SWITCH CONTROL					
	U5			U4B	
	A	B	C	B	C
SS1	1	1	1	1	1
SS2	1	1	1	1	1
ALT	1	1	1	1	1
ΔF	0	1	0	0	0
CW	OPEN	—	—	0	1

Fig C3-26
Sht 2 of 5



FigC3-26
Sht 3 of 5

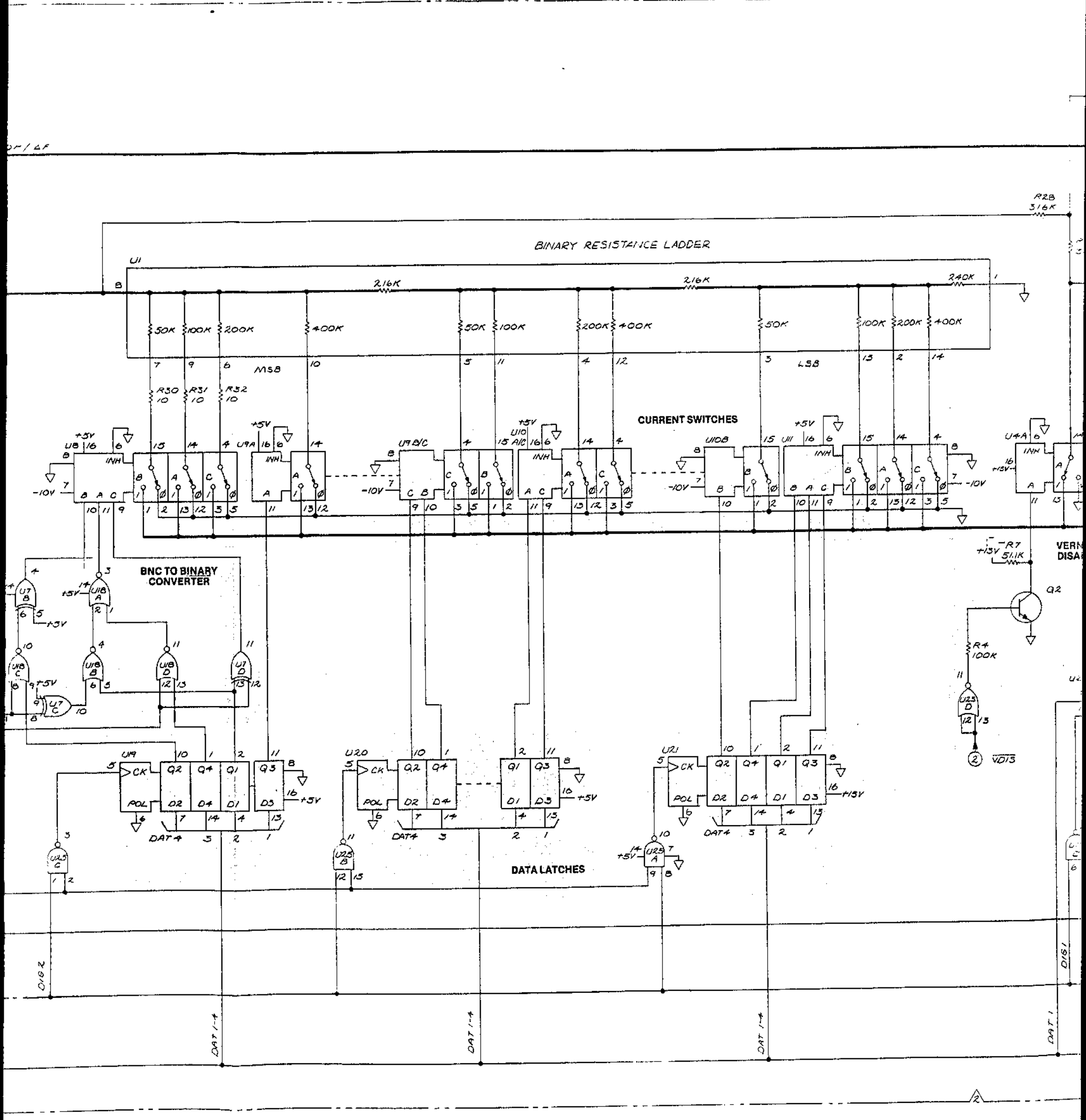


Fig C3-26
Sht 4 of 5

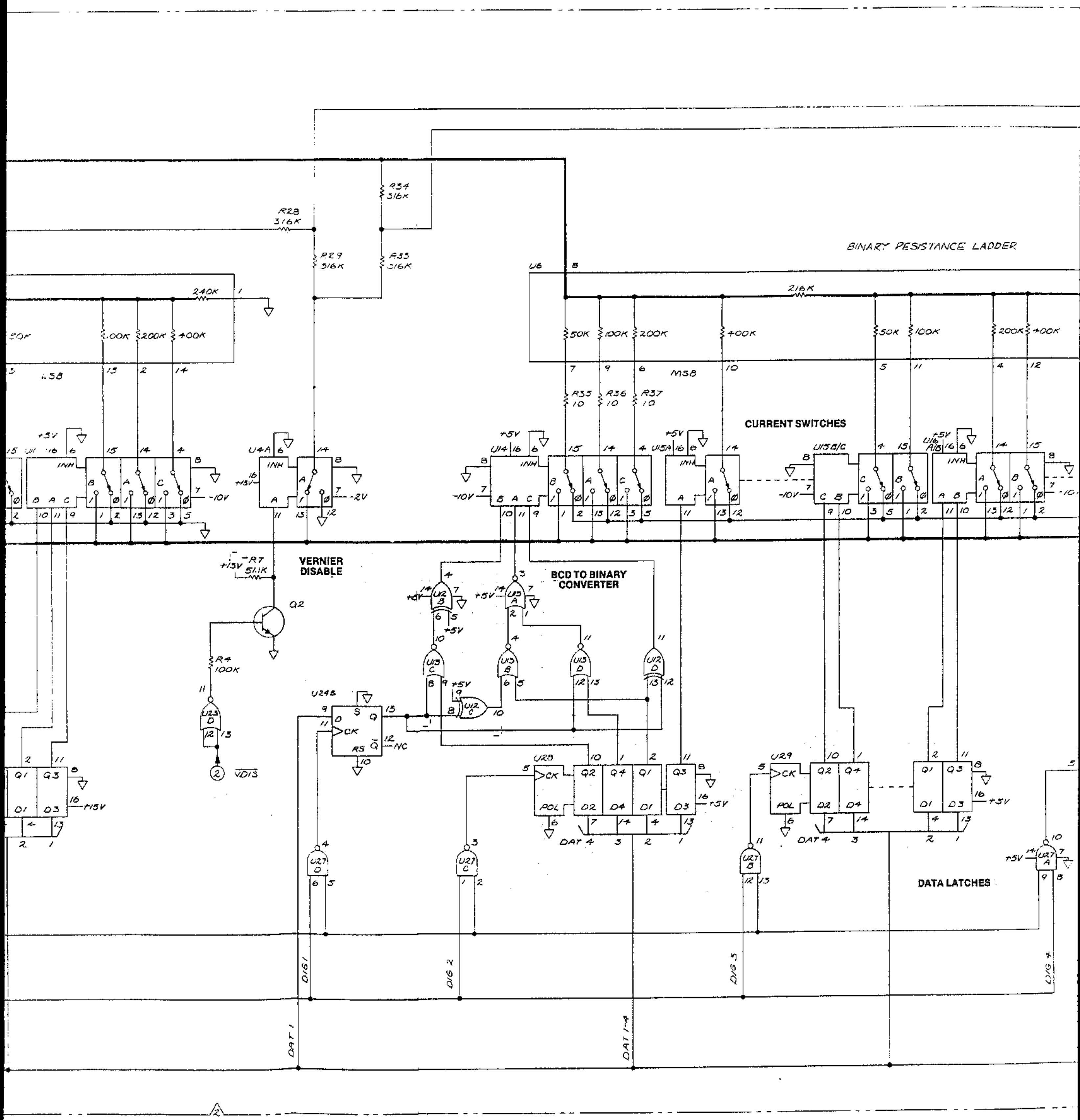


Fig C3-26
Set 5 of 5

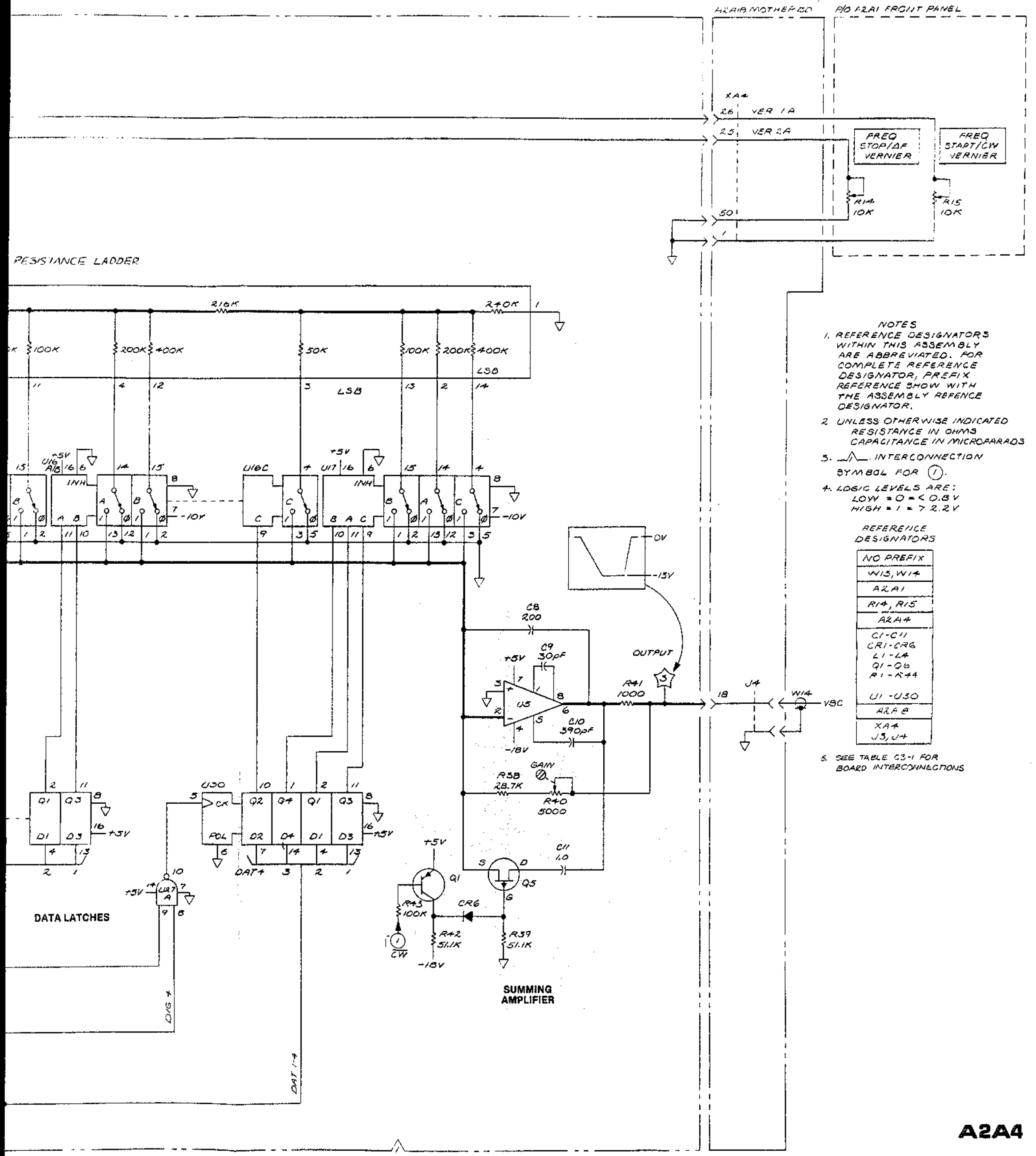


Figure C3-26. A2A4 Scaling, Schematic

A2A5 PRESCALER / COUNTER

General Description

The Prescaler/Counter has two functions: (1) it divides the RF frequency supplied to the Frequency Control by the Source/Converter so that the maximum freuqency of the output signal (PTLO) to the Discriminator, A2A9, is 13 MHz, and (2) it counts the prescaled RF frequency to provide frequency data for the digital data bus. The two major sections of the Prescaler/Counter are described below.

Prescaler

The Prescaler divides the frequency of the input (TRLO) by 1, 10, or 100 when the instrument is in the 13, 130, or 1300 MHz ranges, respectively. It consists of ten parts, three of which are dividers (Divide by 10). The other seven parts are: Attenuator, Attenuator Control, Amplifier/Limiter, Divider Select, Divider Select Control, Range Select, and Range Select Control.

The frequency of the input signal (TRLO) can vary from 600 kHz to 1300.1 MHz. The Attenuator adjusts the level of the input signal according to frequency to meet the input requirements of the divider U1, attenuating the signal below 650 MHz. A frequency-dependent voltage from the Attenuator Control determines when the diodes (CR1 and CR2) in the Attenuator conduct.

The Amplifier/Limiter, U2, is an ECL dual NOR gate. U2A is connected as an amplifier, and U2B acts as a Schmitt trigger to shape and limit the input pulses to the divider U9.

When the instrument is in the 13 MHz range, the pulses from U2 are switched to the output (PTLO) via U19B and no frequency division takes place. In the 130 MHz range, division by 10 is achieved with U9. The divided signal is switched to the output through U17B. If the instrument is in the 1300 MHz range the input frequency is divided by 100. This division takes place in U1 and U18 at frequencies above about 100 MHz and in U9 and U18 at frequencies below about 100 MHz. The switchover from U1 to U9 is accomplished by the Divider Select gates under the control of comparator U27A. The divided signal is switched to the output through U19A.

The selection of division ratio (1, 10, or 100) is controlled by inputs FR1 and FR2, which drive, through the Range Select Control, the inputs of U17B, U19A, and U19B, the Range Select gates. The output of the Range Select, which has a maximum frequency of 13 MHz in all frequency ranges, is buffered by U19C to yield the Prescaler output, PTLO.

Counter

The Counter measures the source RF frequency for marker and CW frequency measurements. There are four parts: Counter Gate, Frequency Counter, Counter Preset Control, and Data Multiplex Control.

The Counter Gate insures that all pulses received by the Frequency Counter are of uniform width, particularly those occuring at the beginning or end of a counting period. Since flip-flop U3 divides the pulse frequency by two, the ECL line receiver U20 is used to multiply the pulse frequency by two, so that the Counter Gate does not alter the frequency of the signal. Pin 11 of U20 supplies a common bias voltage for the inputs of the differential amplifiers U20A and U20B. ECL NOR gate U19D provides a differential output for U20. The

C3-68a

gate time is controlled by Board input L CEN, which originates on the Marker Board (A2A6).

LS Decade Counters U4 and U5 and CMOS Decade Counters U6, U7, U8 and U16 form a 6-digit frequency counter. The Frequency Counter will count up or down, depending on the state of L UDC. L RES resets the Frequency Counter. Both L UDC and L RES come from the Marker Board.

Because the input to the Prescaler (TRLO) is offset by + 100 kHz from the actual frequency of the source RF output, provisions are made to subtract 100 kHz from the counted frequency. This is done by presetting the Frequency Counter to – 100 kHz, – 10 kHz, or – 1 kHz, depending on the frequency range of the instrument (13 MHz, 130 MHz, or 1300 MHz, respectively) and the selected scan time. The presetting is accomplished by preloading the counter with the ones complement (for exact preloading, see table on schematic). Counter presetting is controlled by inputs DEP 1 through DEP 3, which drive the "1" and "8" preset inputs of the decade counters through the Counter Preset Decoder.

Flip-flop U3 acts as a pulse stretcher to ensure that CMOS counter U6 is properly clocked by LS counter U5.

The BCD outputs of the decade counters are switched by three-state buffers (U12 through U15) to the digital data bus (DAT 1 through DAT 4). Multiplexing of the decade counter outputs is controlled by the Data Multiplex Control gates, which drive the enable inputs of the tri-state buffers. The Data Multiplex Control is driven by DIG 1 through DIG 6 and MOE (Marker Output Enable).

If any of the output lines of the counters for the two most significant digits (U8 and U16) are high when MOE is high, the state of board output L OFL will be low, indicating counter overflow.

Fig C3-26A
Jut 1 of 3

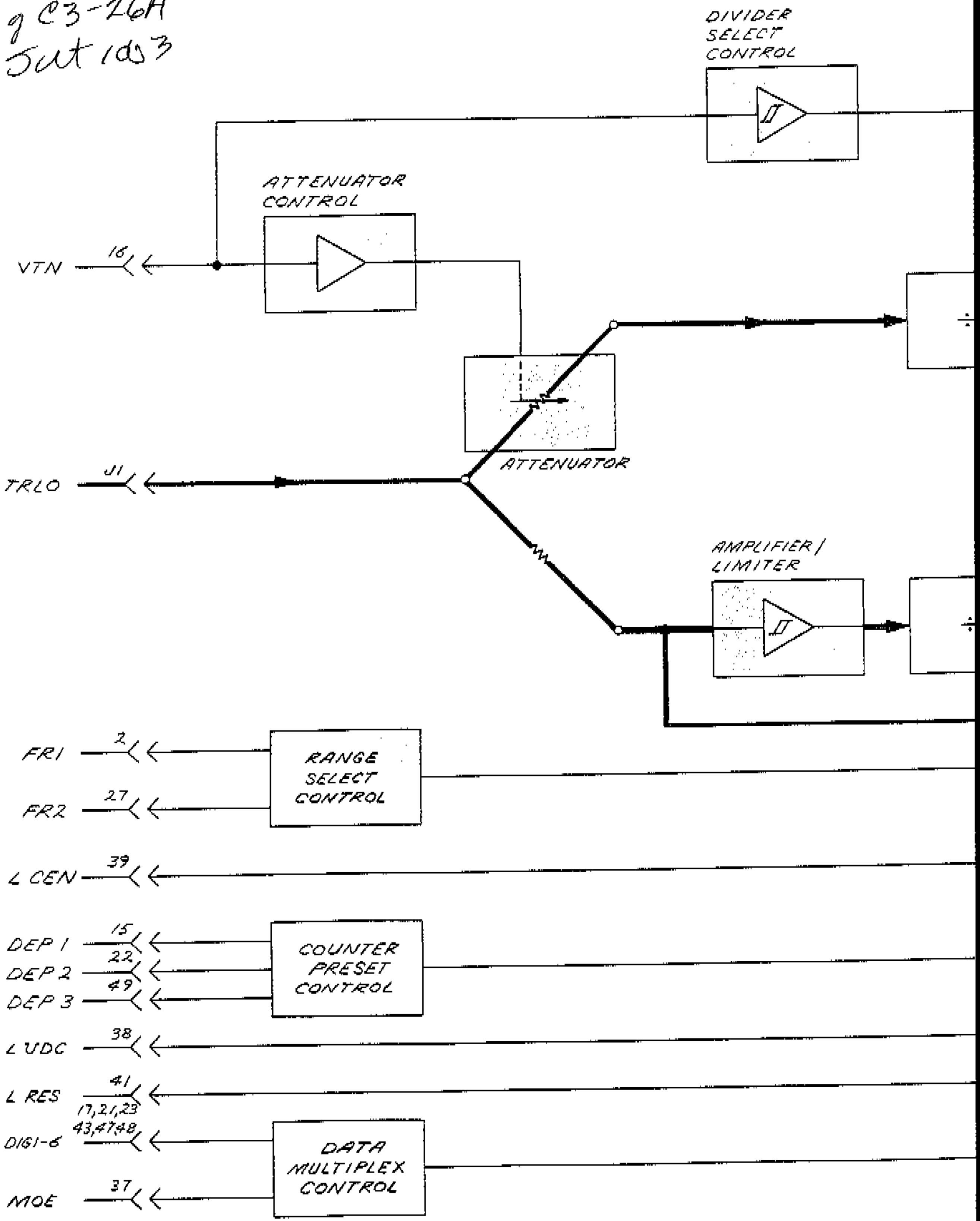


Fig C-26A
Sht 2 of 3

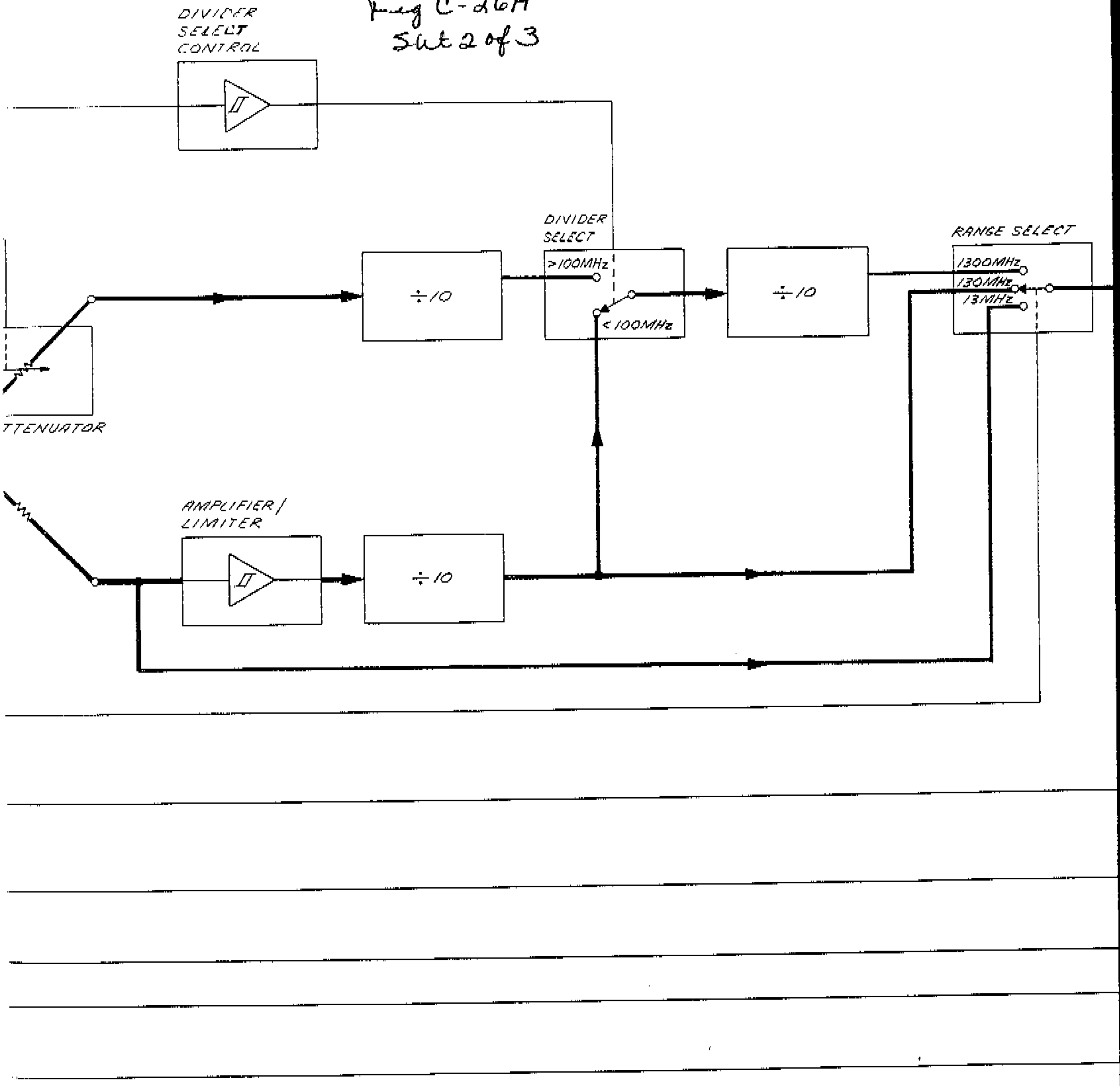


Fig C3-26A
Sht 3 of 3

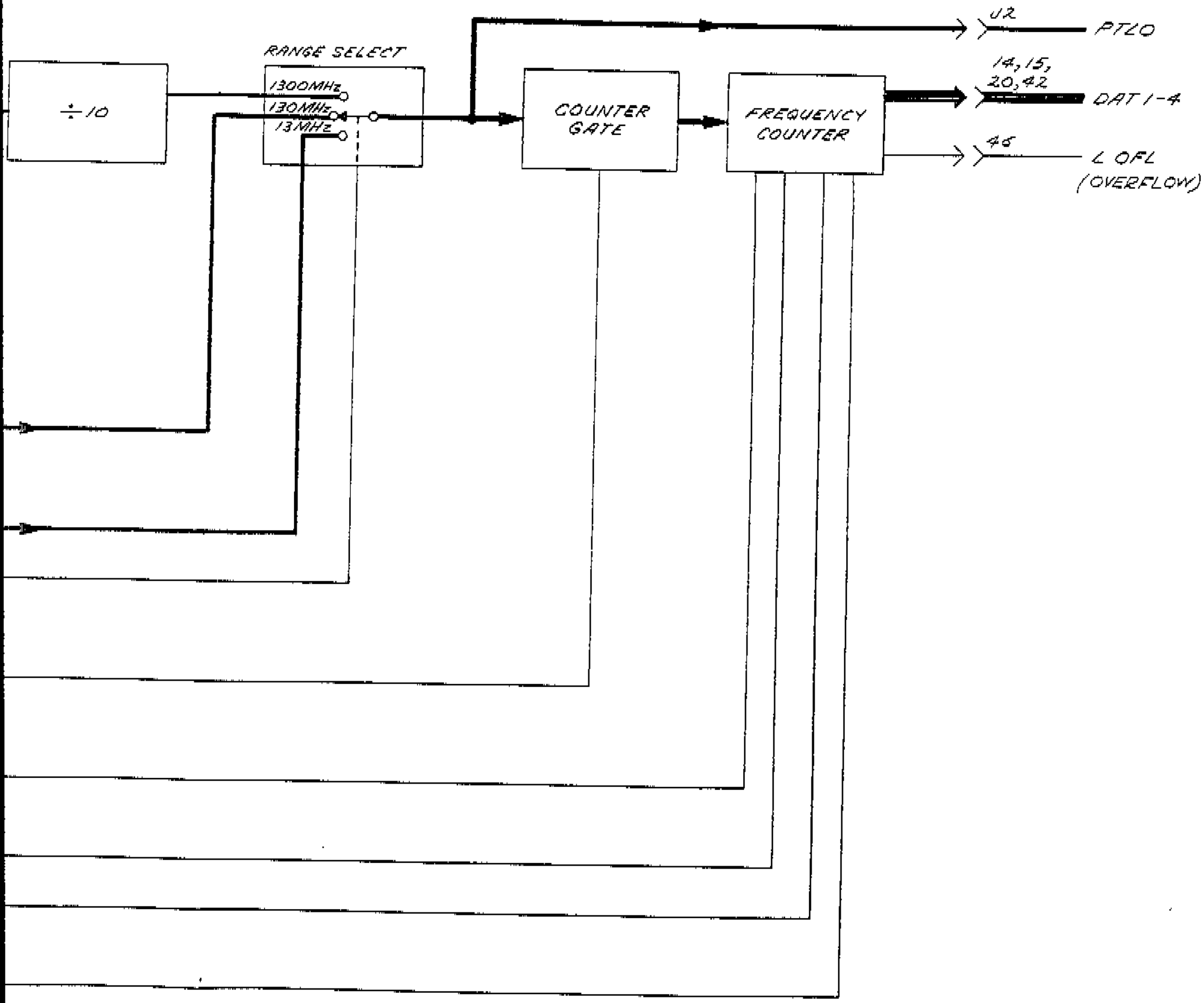


Figure C3-26A. A2A5 Prescaler/Counter, Block Diagram

A2A5

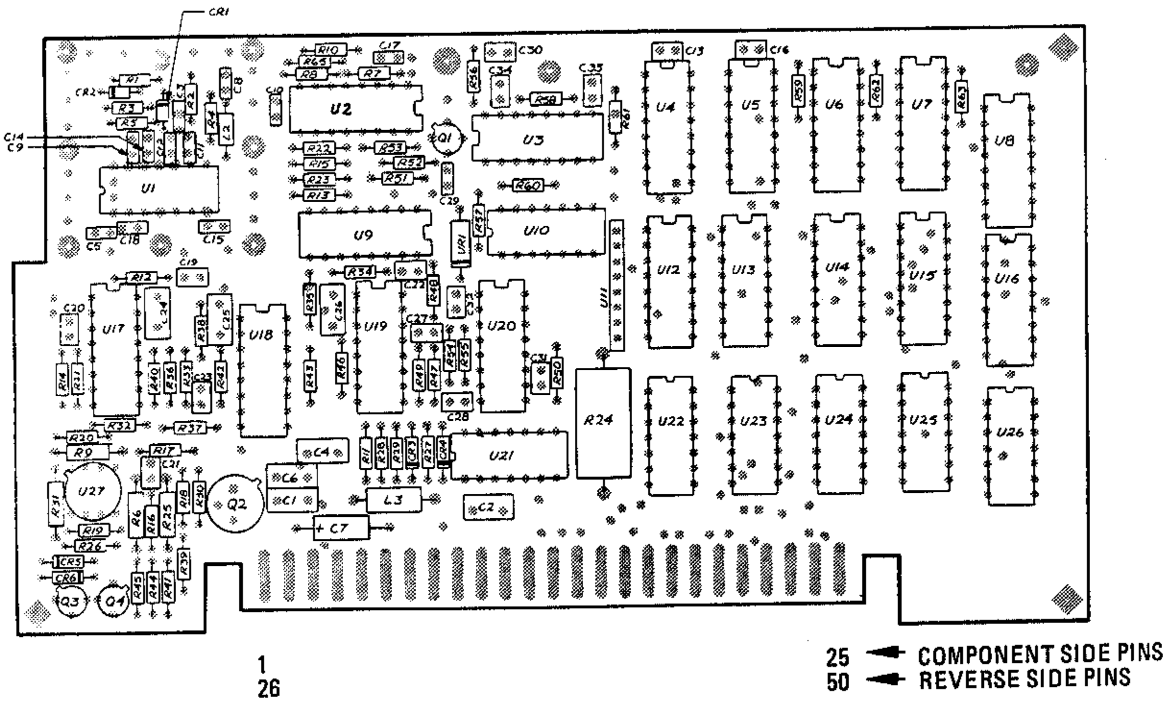
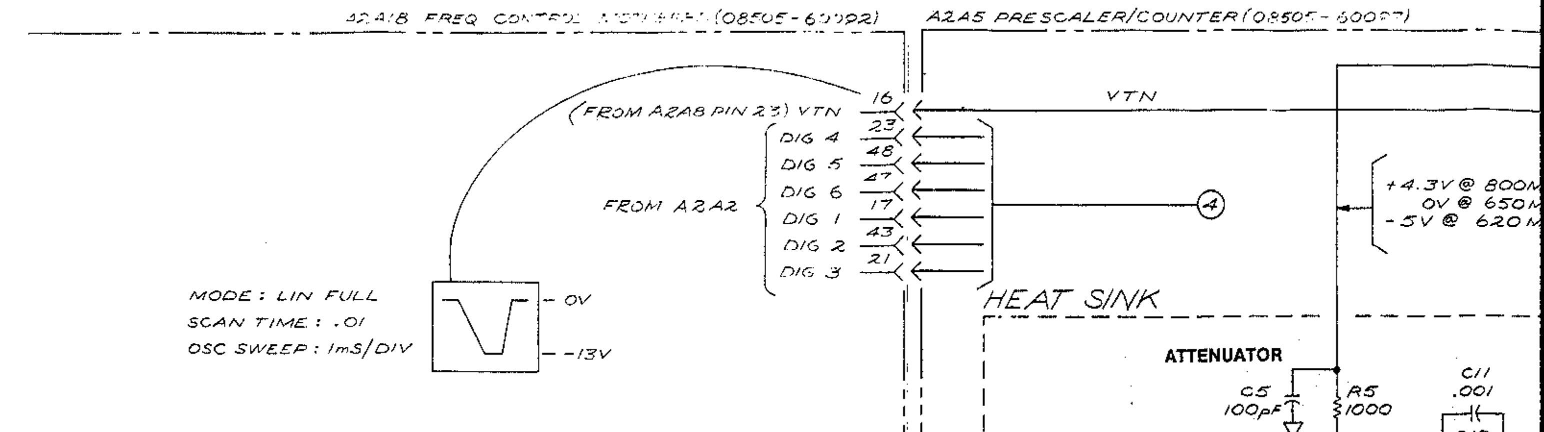


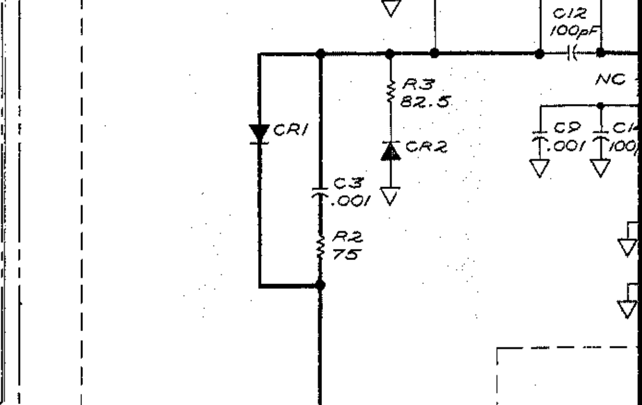
Figure C3-27. A2A5 Prescaler/Counter Parts Locations

Model 8505A Fig 03-28 Sht 1 of 5



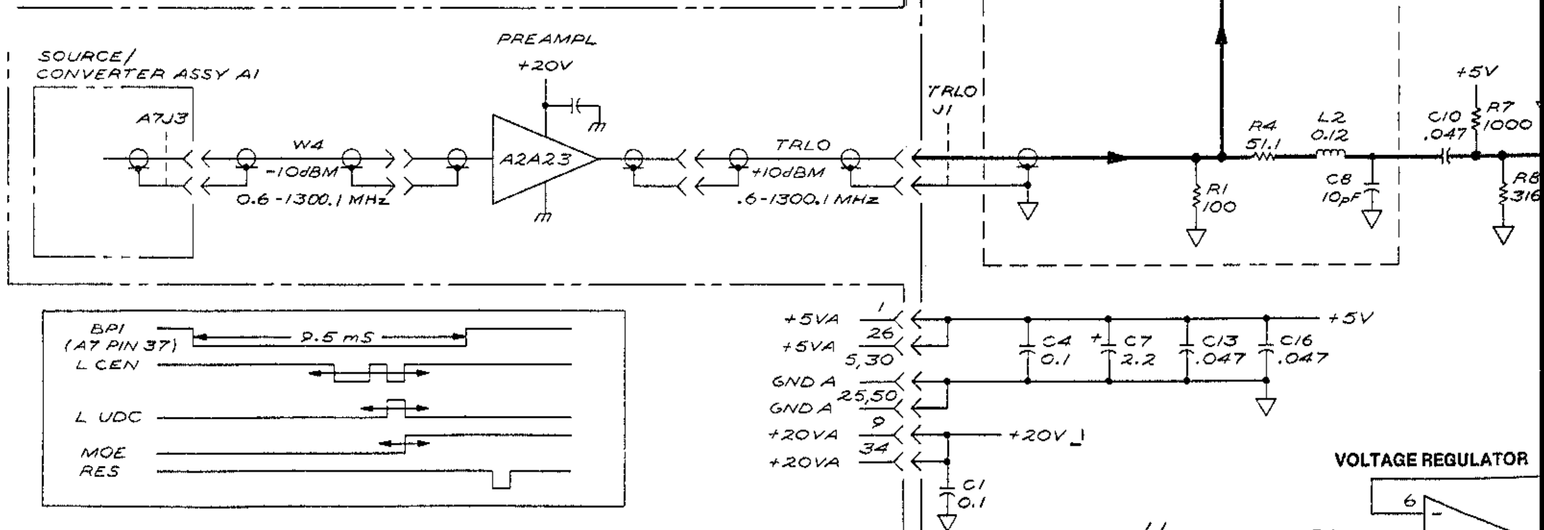
RANGE TRUTH TABLE

RANGE MHz	FR1	FR2
.5 — 1300	0	1
.5 — 130	1	1
.5 — 13	1	0



COUNTER PRESET DECODER TABLE

FREQ RANGE	13 MHz			130 MHz			1300 MHz		
SCAN TIME	10-1	1-.1	.1-.01	10-1	1-.1	.1-.01	10-1	1-.1	.1-.01
DEP 1	0	1	0	1	0	1	0	1	0
DEP 2	0	0	1	0	1	1	1	1	0
DEP 3	0	0	0	0	0	0	0	0	1
COUNTER PRESET	999000	999900	999990	999900	999990	999999	999990	999999	000000



MNEMONICS TABLE

SIGNAL	DEFINITION
L CEN	COUNT ENABLE
DAT 1-4	DATA 1-4
DEP 1-3	DECIMAL POINT 1-3
DIG 1-6	DIGIT 1-6
FR 1-2	FREQUENCY RANGE 1-2
MOE	MARKER OUTPUT ENABLE
L OFL	OVERFLOW
PTLO	PRESCALED TRACKING LOCAL OSC.
L RES	RESET (COUNTER)
TRLO	TRACKING LOCAL OSC.
L UDC	UP/DOWN CONTROL (COUNTER)
VTN	TUNING VOLTAGE

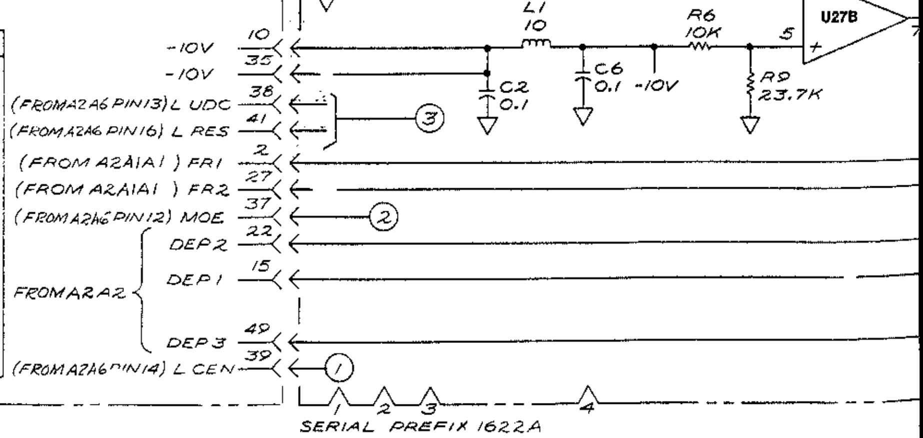


Fig 3-28
Sht 2 of 5

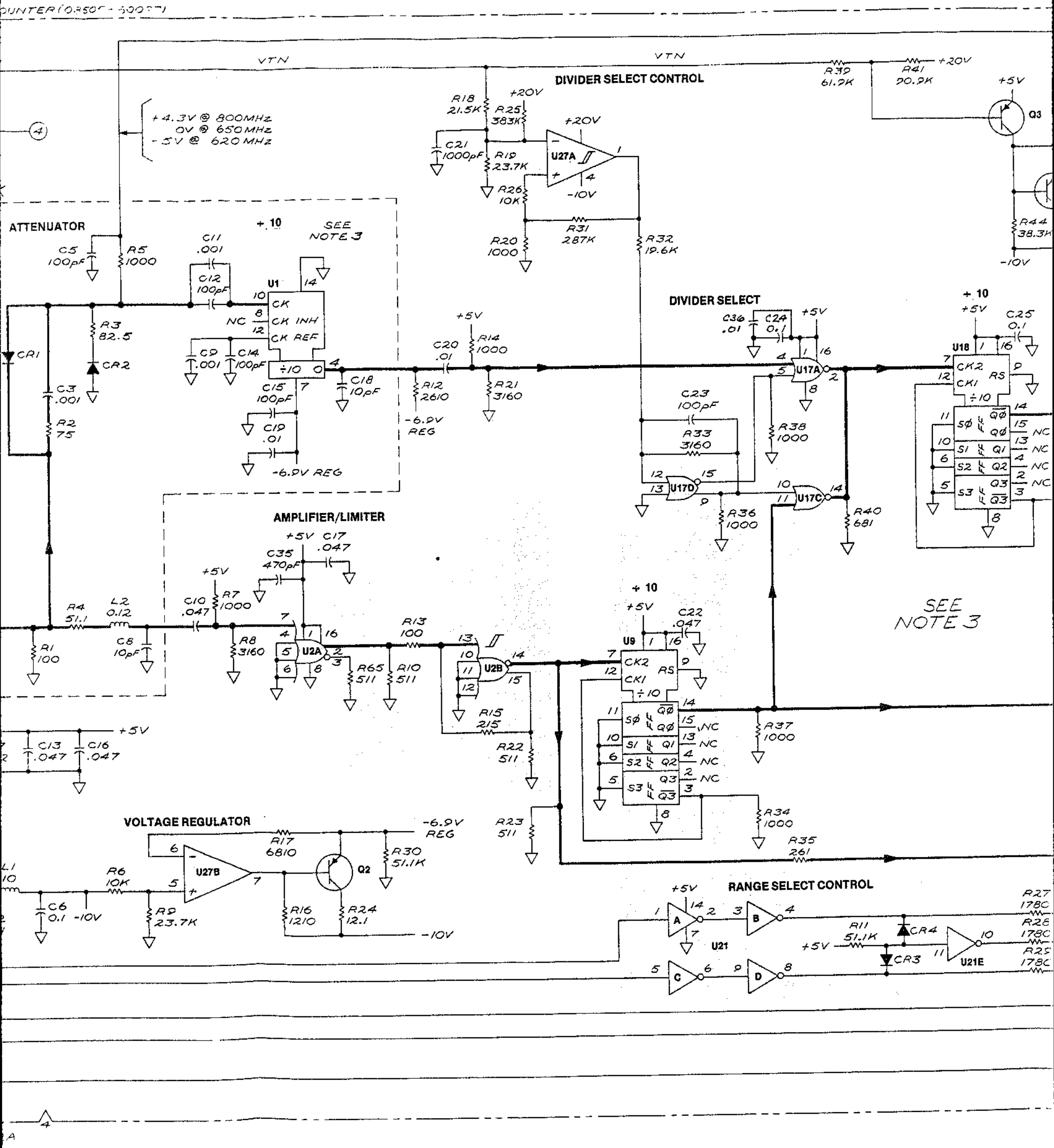


Fig C3-28
Sht 3 of 5

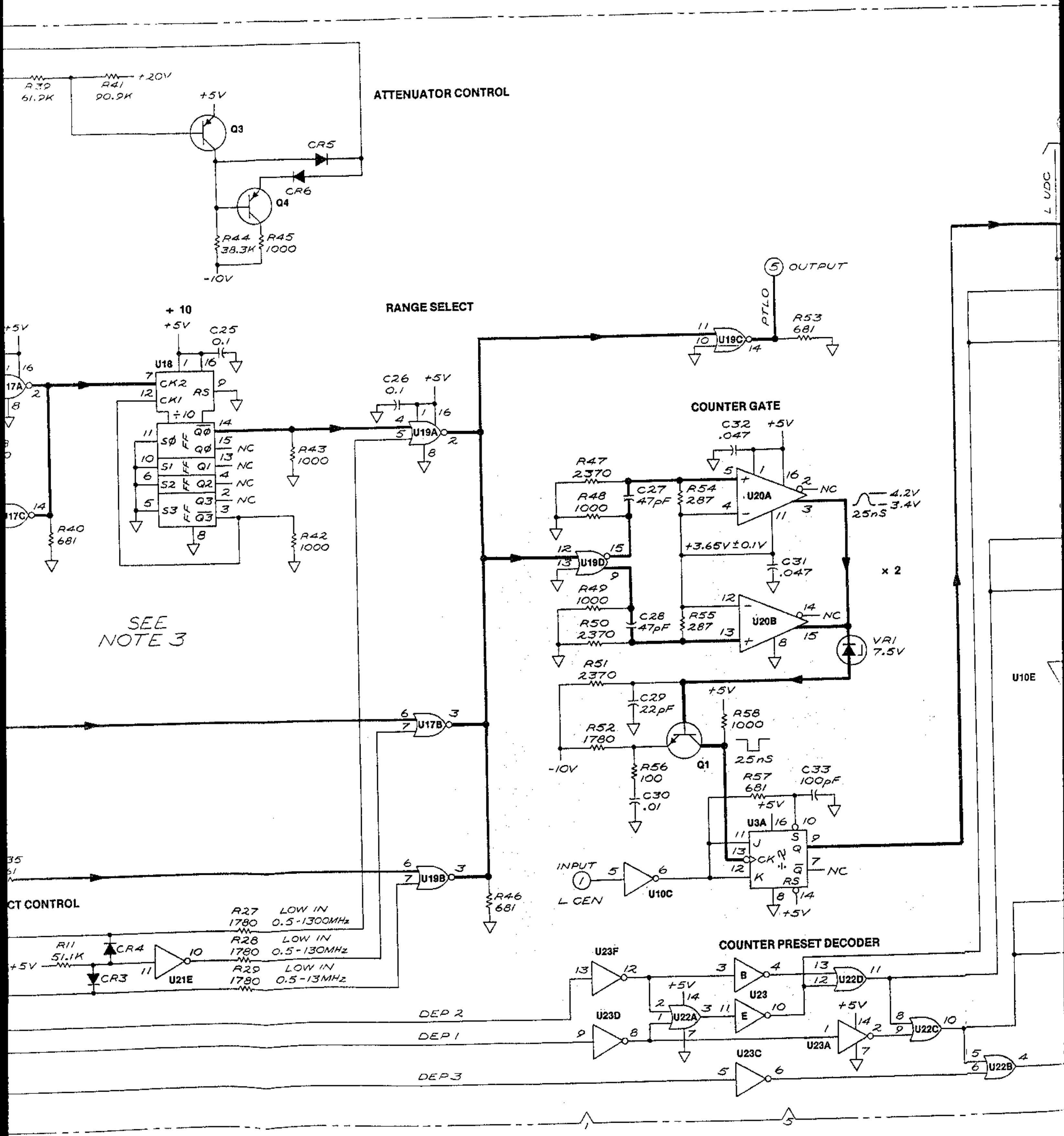


Fig C3-28
Sht 4of5

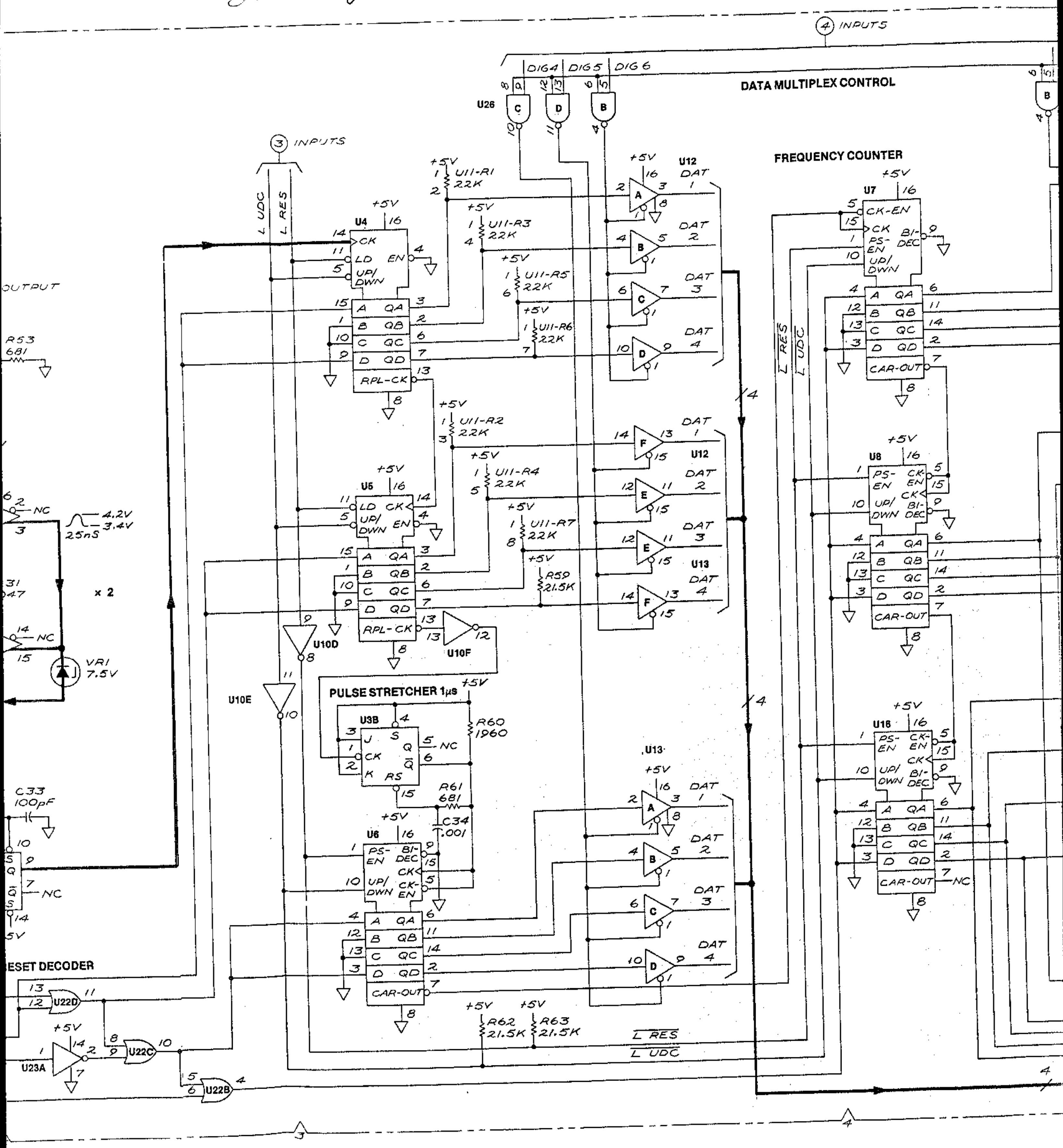
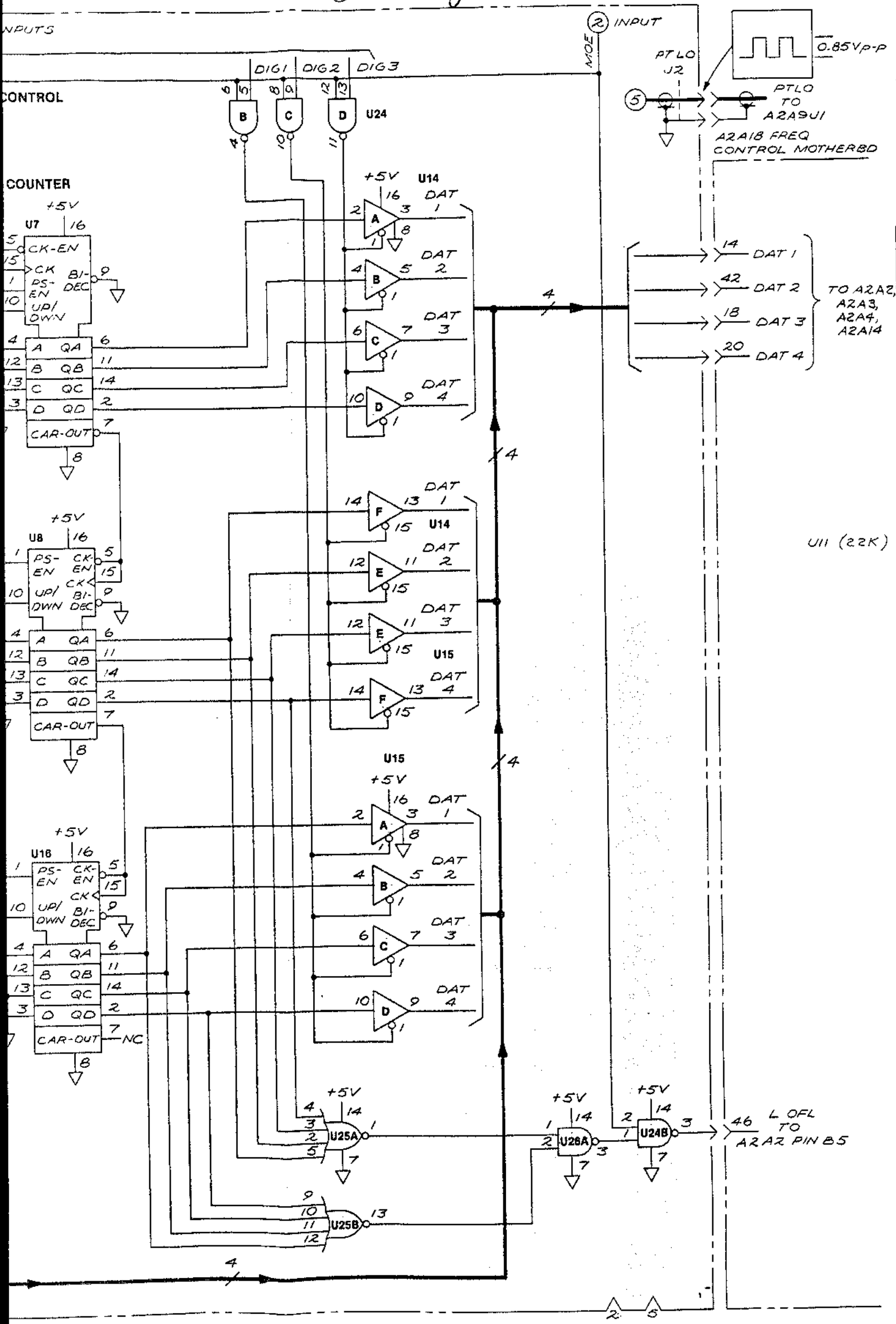


Fig C3-28 Sht 5 of 5



NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATOR, PREFIX REFERENCE DESIGNATOR SHOWN WITH THE ASSEMBLY REFERENCE DESIGNATOR.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IN OHMS CAPACITANCE IN MICROFARADS INDUCTANCE IN MICROHENRIES
3. LOGIC LEVELS:

IC	HIGH	LOW
U1 (ECL)	-0.8V	-1.6V
U2, 9, 17-19 (ECL)	+4.2	+3.4
U3, 10C (TTL)	+2.5	+0.8
U4, 5, 10D, 10E, 10F (TTL)	+4.5	+0.8
U6, 7, 16, 21-26 (MOS)	+4.5	+0.5

4. LOCATOR FOR INTERCONNECTION SYMBOL (1).
5. RESISTORS IN RESISTOR ARRAY U11 ARE 22K OHMS.
6. ⟶ INDICATES PRIMARY SIGNAL FLOW PATH.

U11 (22K)

7. SEE TABLE C3-1 FOR BOARD INTERCONNECTIONS.

REFERENCE DESIGNATORS

A2A5
C1-34
CR1-CR6
L1-L2
Q1-Q4
R1-R63
U1-U27
VR1

A2A5
A2A23

Figure C3-28. A2A5 Prescaler/Counter, Schematic

A2A6 MARKER, CIRCUIT DESCRIPTION

General Description

The A2A6 Marker assembly triggers measurement of the RF frequency and provides a data marker pulse (DM) for display of the point of measurement. It also provides marker pulses (MP) for display of up to six additional points on CRT display. Also provided by the A2A6 Marker assembly are timing and control signals necessary for control of the frequency counter on the A2A5 Prescaler/Counter assembly and also a signal indicating the completion of a marker measurement for the A2A2 Display Logic assembly.

Data Marker (DM)

The data marker (DM) pulse is used 1) to trigger the marker diamond generation circuitry on the A3A17 Marker I assembly to produce an up-diamond CRT display and 2) to enable the time-base counters on the A2A6 Marker assembly. This data marker (DM) is enabled only during the active portion of the sweep cycle (BP1 = low) and is triggered by one of four sources: a) the outputs of the five Marker Position Comparators (MP1 — MP5), b) the remote marker pulse (LMPR), c) the blanking pulse (BP1), or d) the full scale marker pulse (FMP). The Data Marker (DM) is reset at the completion of the count sequence. The time of the Data Marker is equal to the total time of the count sequence as determined by the selected resolution.

Marker Position Comparators. The dc voltages (+0.1 to −13.8 volts) set by front-panel marker position controls A2A1A1R17 — A2A1A1R21 are summed with V RAMP (−.5 to +13.5 volts) and applied to the inverting inputs of Marker Position Comparators U25A, U25B, U5C, U25D and U26. When the ramp voltage (V RAMP) rises to a level greater than that set by MP1 — MP5, the comparator output changes states (from a high of −5V to a low of −10V). This voltage swing is differentiated, level shifted (to a high of +5V and a low of 0V), and applied to the Data Marker Control and Marker Pulse Control circuits as a negative-going (+5V to 0V) 5μS pulse.

Data Marker Control. The Data Marker Control circuit selects the trigger to be used for generation of the data marker (DM) pulse as determined by front-panel switch settings. Refer to table at TPA on schematic diagram to determine source of this trigger for different front-panel switch settings.

Run flip-flop U17A generates the data marker $\overline{\text{DM}}$ pulse when clocked by the output pulse of U19C and enabled by the blanking pulse ($\overline{\text{BP1}}$ high at J input), and is reset upon completion of the count sequence. The source of the output pulse of U19C is controlled by front-panel switch settings as noted in table at TPA on schematic. One of the outputs of the Marker Position Comparators or the remote merker pulse (LMPR) is selected by U14 and provides the output pulse of U19C in all modes except CW and MANUAL. The positive-to-negative transition of the blanking pulse (BP1) at the beginning of the unblanked portion of the sweep cycle provides the output pulse of U19C in MANUAL or CW EXPAND. The full marker pulse (FMP) generated by the A2A8 Sweep Select and A2A4 Scaling assemblies provides the output pulse of U19C in CW FULL.

Marker Pulse (MP)

The marker pulse (MP) is used to trigger the diamond generation circuitry on the A3A17 Marker I assembly to produce a down-diamond CRT display. Up to six points on the CRT trace may be displayed with marker pulses (down-diamonds). The outputs of the five Marker Position Comparators provide four of these down-diamonds (one of the outputs is always used to generate the up-diamond). The other two down-diamonds are generated by the full marker pulse (FMP) in START/STOP FULL sweep modes. In CW FULL, only one full marker pulse is generated indicating setting of CW frequency.

Marker Pulse Control. The Marker Pulse Control circuit selects from one to five of the outputs of the Marker Position Comparators to be used to generate marker pulses (MP). The selection of the pulses is controlled by the coding of signal lines MS1 — MS3 from front-panel MARKERS switch. The full marker pulse (FMP) is applied to U6D to be used also as a marker pulse (MP). In CW operation, the outputs of the five Marker Position Comparators are disabled at U6C, thus only the full marker pulse (FMP) becomes a marker pulse (MP). In MANUAL operation, all pulses are disabled at U6B, thus no marker pulses.

Counter Control

The counter control circuitry consists of four main circuit areas: 1) Run flip-flop U17A, 2) Time-Base, 3) count sequence circuitry, and 4) count completion circuitry.

1. Run flip-flop U17A enables the Time-Base and generates the Data Marker (DM) pulse upon receipt of a data marker trigger (DMT) providing the trigger occurs during the unblanked portion of the sweep cycle (BP1 low).

2. The Time-Base circuitry consists of Time-Base counters U1 — U5 and Resolution Control and Resolution Select circuits. The Time-Base provides an accurate clock signal which is referenced to a 10 MHz reference signal from the A2A12 10/100 MHz Oscillator assembly. The frequency of this clock signal is determined by the Resolution Control and Resolution Select circuits which are controlled by front-panel SCAN TIME SEC, MODE, and WIDTH switches. This clock signal is used to advance the state of the Sequence Counter U18. The Time-Base counters are enabled by the output of Run flip-flop U17A.

3. The count sequence circuitry consists of the Sequence Counter, Sequence Decoder, Up/Down Control, and Count Enable. This circuitry generates the control signals which cause the frequency counter (on the A2A5 Prescaler/Counter Assembly) to count up for three periods, wait one period, then count down one period. It also generates the signal to reset Run flip-flop U17A to end the count sequence.

4. The count completion circuitry consists of Valid Count Complete, Measurement Made, Reset Inhibit, and Marker Output Enable circuits. These circuits check the validity of the measurement (count sequence), synchronizes the measurement made (MM) and data output enable (MOE) signals with the frequency data transfer, and inhibits the reset of the frequency counter if a measurement is in progress or if a measurement has been completed, but data has not been transferred.

Run Flip-Flop. The Run flip-flop U17A is set when clocked by a data marker trigger (DMT) pulse while enabled by BP1 at the J input. When the Run flip-flop is set, the Time-Base is enabled and a Data Marker (DM) pulse is generated. The Run flip-flop is reset by a pulse generated by Sequence Decoder U10 indicating the end of the count sequence. This disables the Time-Base and terminates the Data Marker (DM) pulse.

Time Base. The Time-Base consists of counters U1 — U5 which are clocked by a 10 MHz reference signal from the A2A12 10/100 MHz Oscillator assembly. The first counter is a divide by five and the other four are divide by ten. The output of each counter is connected to the input of the next counter, therefore the outputs of the last three counters are 20 kHz, 2 kHz, and 0.2 kHz. These three outputs are applied to the Resolution Select circuit. The counters are enabled when the output of Run flip-flop U17A goes high. When the output of U17A goes low, the counters are placed in the load condition, at which time the first counter

C3-72b

(U5) is preset to "5" and the other four to "9." When the counters are enabled again, the first negative transition of the 10 MHz reference signal causes the counters to advance, producing immediately the first clock signal output of the count sequence.

Resolution Control and Resolution Select. The Resolution Select circuit determines or selects the frequency of the clock signal to be applied to Sequence Counter U18. One of the three outputs of the Time-Base (20 kHz, 2 kHz, or 0.2 kHz) is selected as determined by Resolution Control circuit. The Resolution Control circuit decodes the output of front-panel SCAN-TIME SEC switch to control the selection of one of these three frequencies. (Refer to Marker Counter Resolution table on schematic diagram.) The output of the Resolution Select circuit (20 kHz, 2 kHz, or 0.2 kHz) is used to clock Sequence Counter U18.

Sequence Counter, Sequence Decoder, Up/Down Control, and Count Enable. Control of the frequency counter on the A2A5 Prescaler/Counter assembly is divided into five equal time periods which are generated by the Sequence Counter and Sequence Decoder. When clocked by the clock signal output of the Resolution Select circuit (20 kHz, 2 kHz, or 0.2 kHz), the Sequence Counter U18 begins counting. The output of U18 is connected to input of Sequence Decoder U10. The outputs of U10 are used to control the Up/Down Control and Count Enable circuits. The first five counts of U18 are decoded by U10 to provide the five time periods of the count sequence. These five outputs of U10 are used to set/reset the Up/Down Control flip-flop and enable the setting/resetting of the Count Enable flip-flop. The actual set/reset of the Count Enable flip-flop occurs when clocked by the clock signal output of the Resolution select circuit used to clock Sequence Counter U18. The Up/Down Control and Count Enable flip-flop are set/reset in such a manner as to cause the frequency counter to count up for three periods, wait one period, then count down one period. (Refer to Figure C3-29a for timing waveforms.) The sixth count of the Sequence Counter U18 is decoded by U10 and used to reset both the Sequence Counter U18 and the Run flip-flop U17A and also to trigger the Valid Count Complete flip-flop U20B.

Count Completion

The count completion circuitry consists of the Valid Count Complete, Measurement Made, Reset Inhibit, and Marker Output Enable circuits. These circuits check to see that the count was completed during the unblanked portion of the sweep cycle, indicate the completion of a marker measurement, enable the output of the frequency counter to be displayed on the A2A1 front-panel frequency counter LEDs, and allow the frequency counter to be reset.

Valid Count Complete, Measurement Made, and Marker Output Enable. The Valid Count Complete flip-flop U20B is used to determine if the five period count sequence was completed during the unblanked portion of the sweep cycle. The flip-flop is clocked by the reset pulse from Sequence Decoder U10. If the D input is high ($\overline{BP1}$ high) when this clock occurs, a valid count is indicated and the output of U20B sets the Measurement Made flip-flop U28B/C unless inhibited by the LMPXR control line, indicating that data is currently being transferred. The output of the Measurement Made flip-flop (LMM) is applied to the A2A2 Display Logic assembly to indicate completion of a valid measurement. At the same time the LMM signal is used to enable U11A to allow the POSN 3 pulse to enable the frequency counter output data to be displayed on the front-panel LEDs.

Reset Inhibit

The frequency counter (on the A2A5 Prescaler/Counter assembly), Valid Count Complete flip-flop, and Measurement Made flip-flop are all reset by a pulse generated from the trailing edge of the POSN 2 pulse by C21/R45. This reset pulse is inhibited by the Reset Inhibit circuit if a count sequence is in progress or if a valid count has been completed but the data has not been transferred as indicated by U20B set but U28B/C not set.

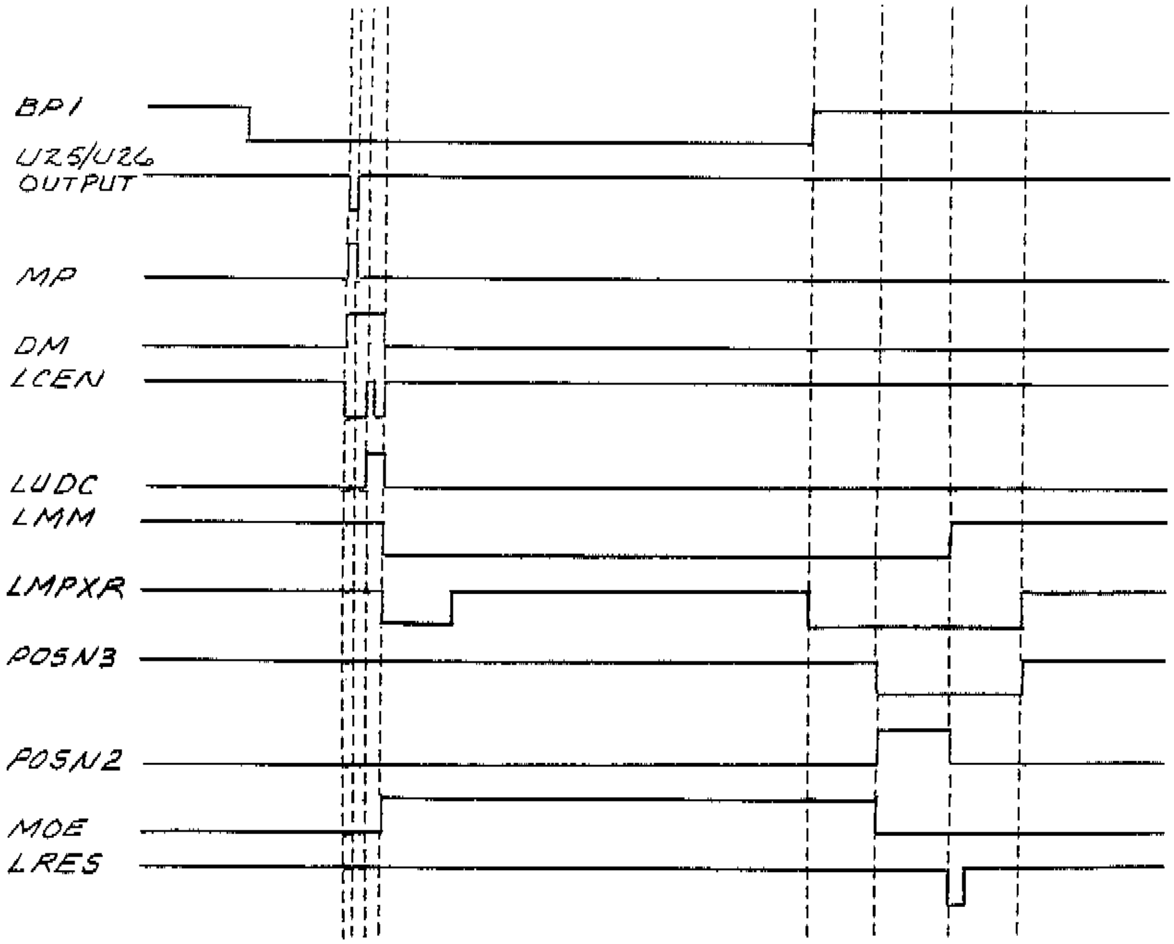


Figure C3-28A. A2A6 MAR' ¯R, Timing Diagrams

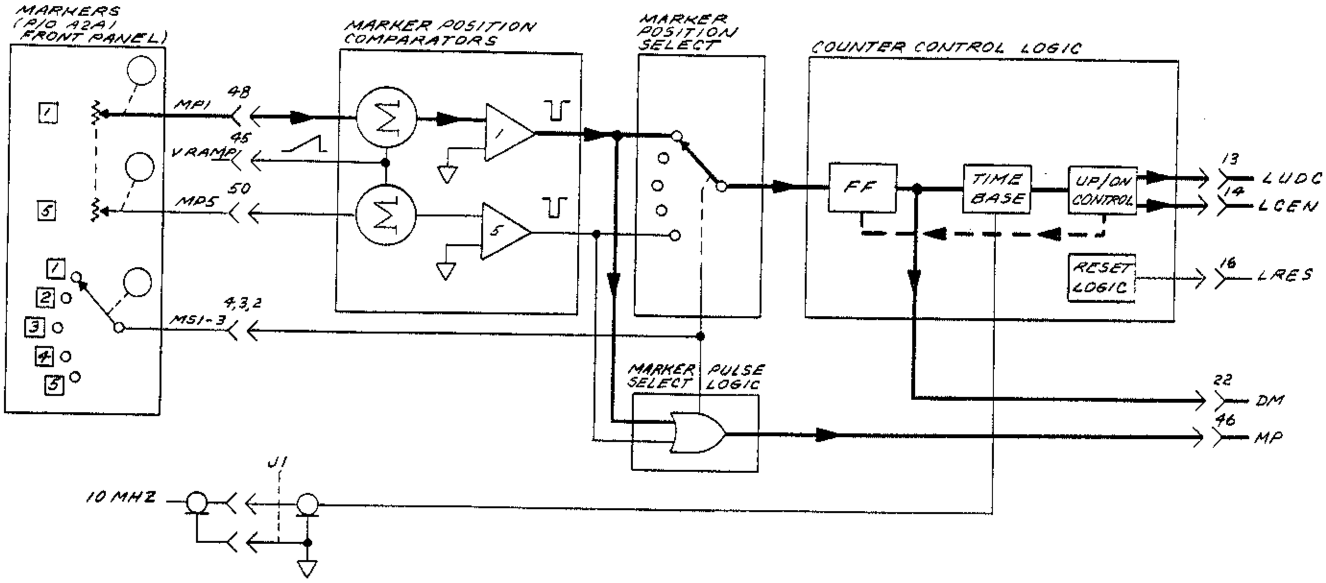
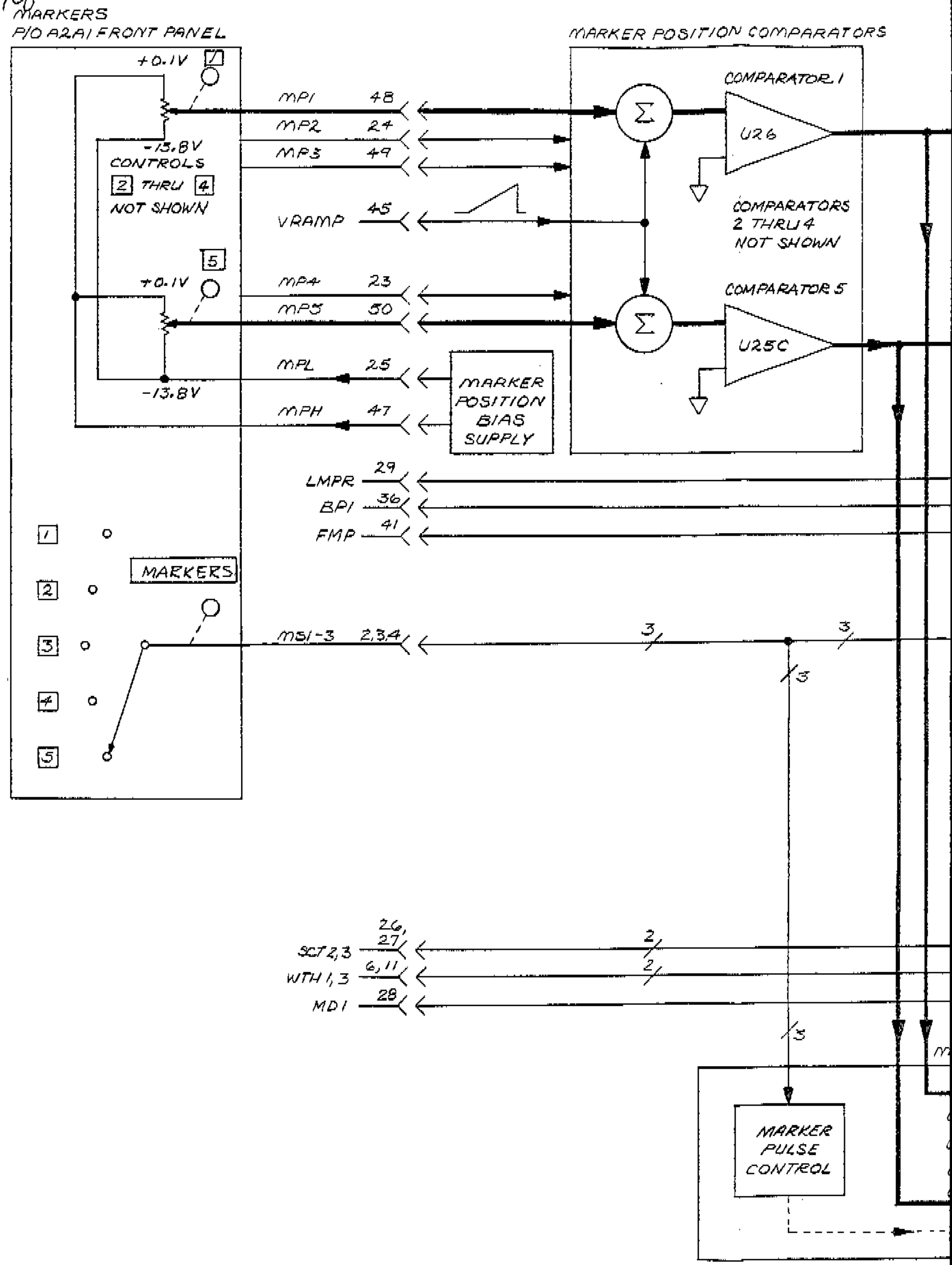


Figure C3-28B. A2A6 MARKER, Overall Block Diagram

Fig 3-28C
Sht 1 of 2



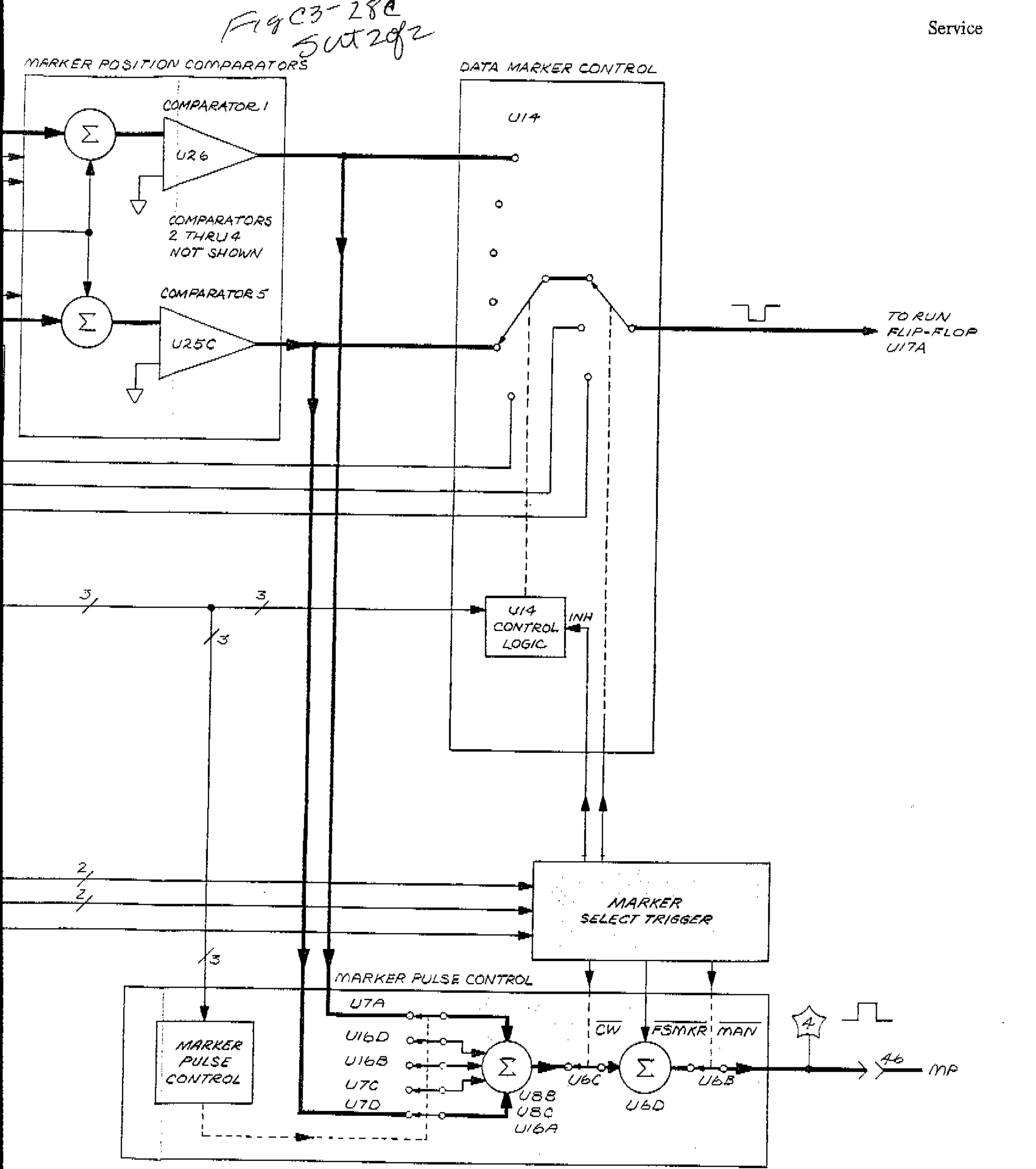
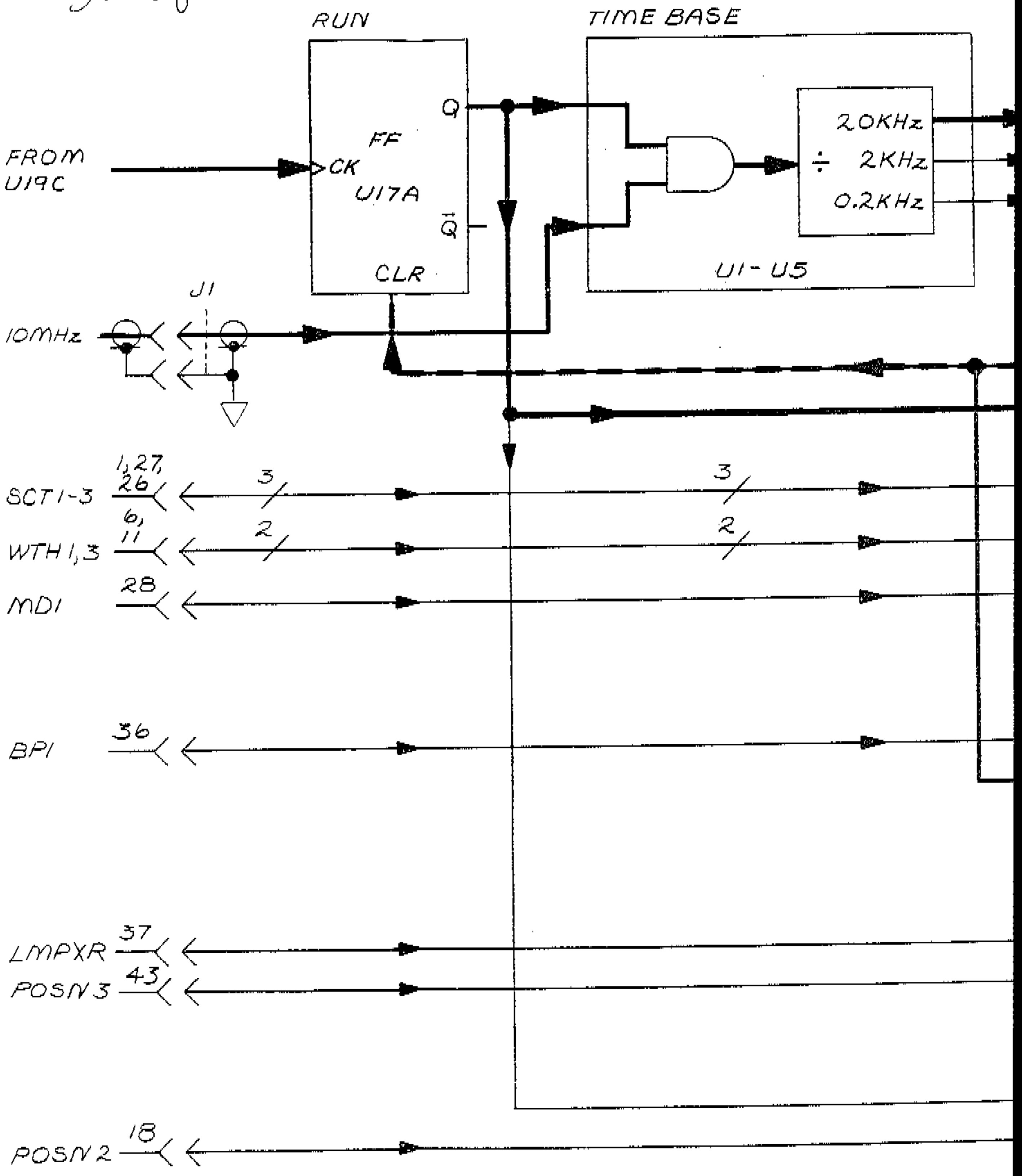
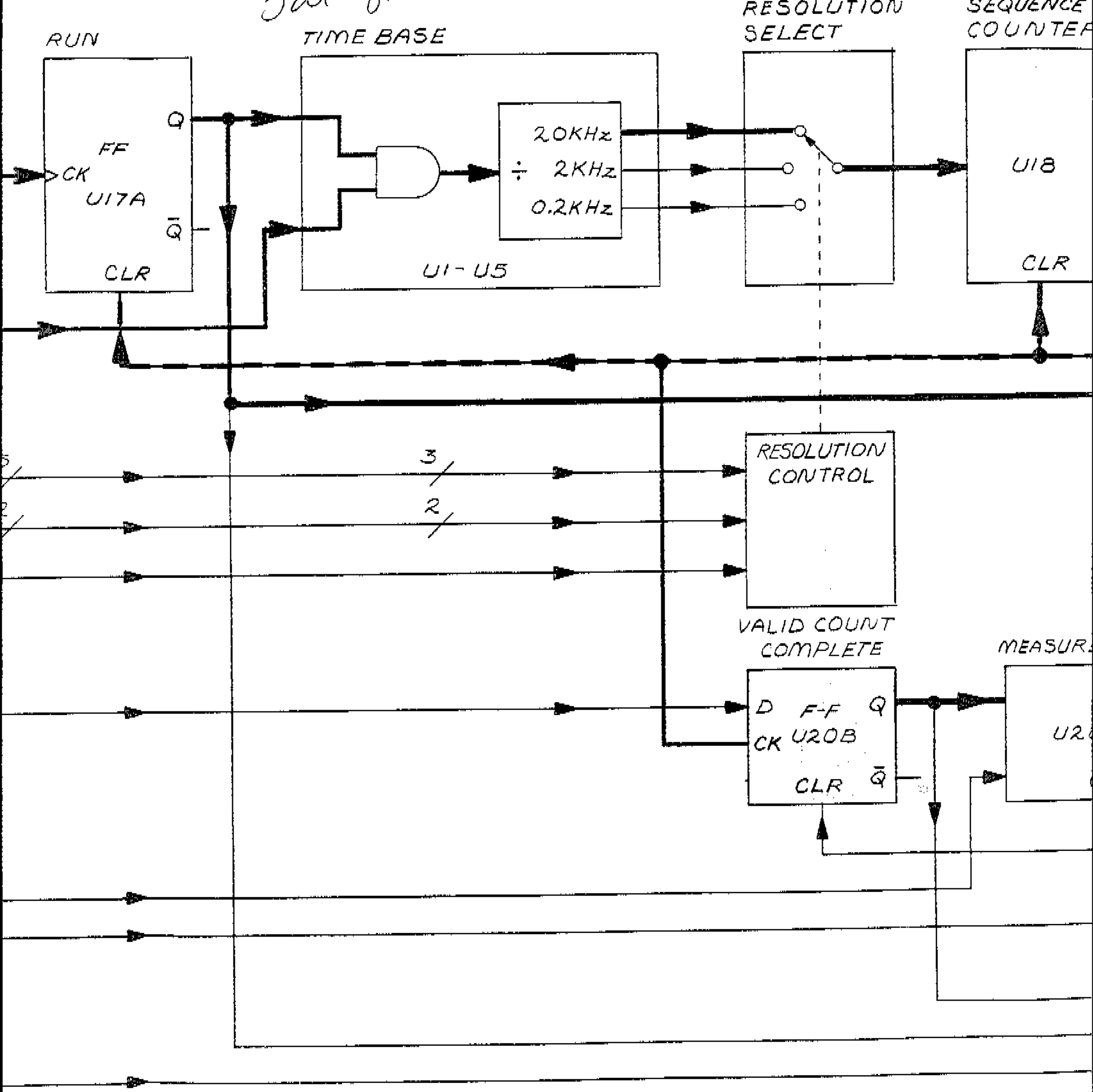


Figure C3-28C. A2A6 Marker Block Diagram (1 of 2)

Fig C3-28C a
Sht 1 of 3



Figc3-28ca
Set 2 of 3



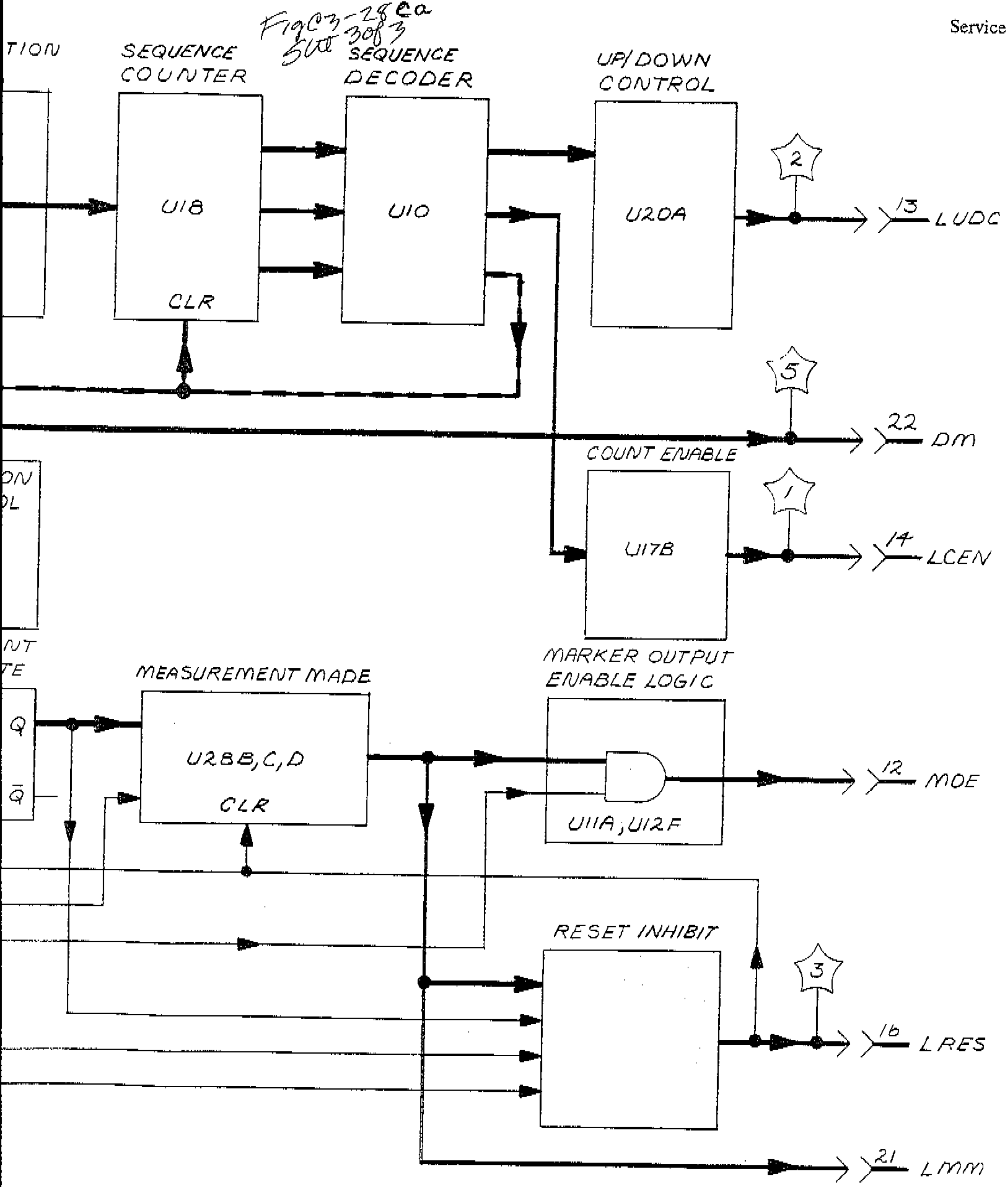


Figure C3-28C. A2A6 Marker Block Diagram (2 of 2)

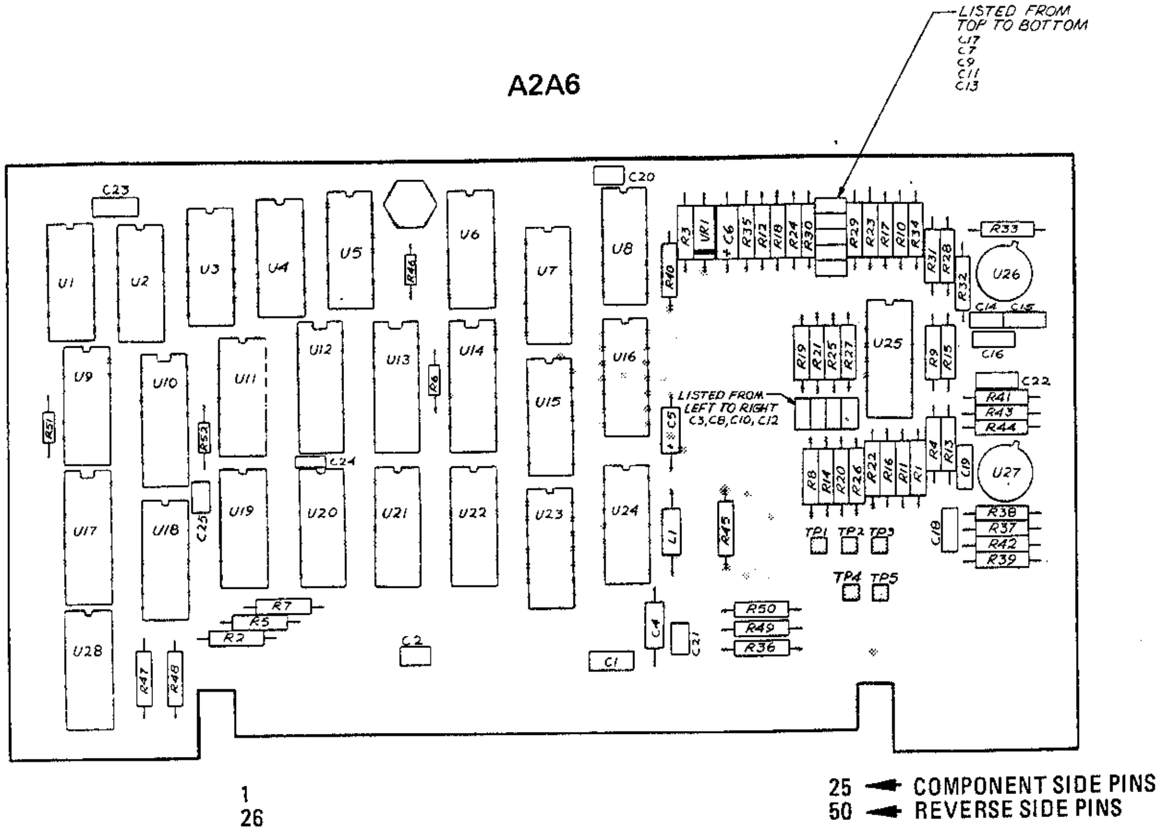


Figure C3-29. A2A6 Marker Parts Location

Signal	Description	Signal	Description
BP 1	Blanking Pulse 1	MP 4	Marker Potentiometer 4
LCEN	Count Enable (0 = count)	MP 5	Marker Potentiometer 5
DM	Data Marker	MPL	Marker Pot Low
FMP	Full Marker Pulse	MPH	Marker Pot High
LMM	Marker Measurement	MS 1	Marker Select 1
LMPR	Marker Pulse Remote	MS 2	Marker Select 2
LMPXR	Multiplex Running	MS 3	Marker Select 3
LRES	Reset (Counter)	POSN 2	Position 2 (STOP/±ΔF)
LUDC	Up/Down Control	POSN 3	Position 3 (Counter)
MD 1	Mode 1	SCT 1	Scan Time 1
MOE	Marker Output Enable	SCT 2	Scan Time 2
MP	Marker Pulse	SCT 3	Scan Time 3
MP 1	Marker Potentiometer 1	VRAMP	Ramp Voltage
MP 2	Marker Potentiometer 2	WTH 1	Width 1
MP 3	Marker Potentiometer 3	WTH 3	Width 3

	MD 1
LOG FULL	1
LIN FULL	1
LIN EXP	0

	WTH1	WTH3
SS 1	1	0
SS 2	1	0
ALT	0	0
ΔF	0	1
CW	1	1

	SCT1	SCT2	SCT3
MAN	1	0	0
100-10	1	1	0
10-1	0	1	0
1-.1	0	1	1
.1-.01	1	1	1

	MS1	MS2	MS3
0	1	1	1
1	0	1	1
1,2	1	0	1
1,2,3	0	0	1
1,2,3,4	1	1	0
1,2,3,4,5	0	1	0

Fig C3-30
Sht 1 of 4

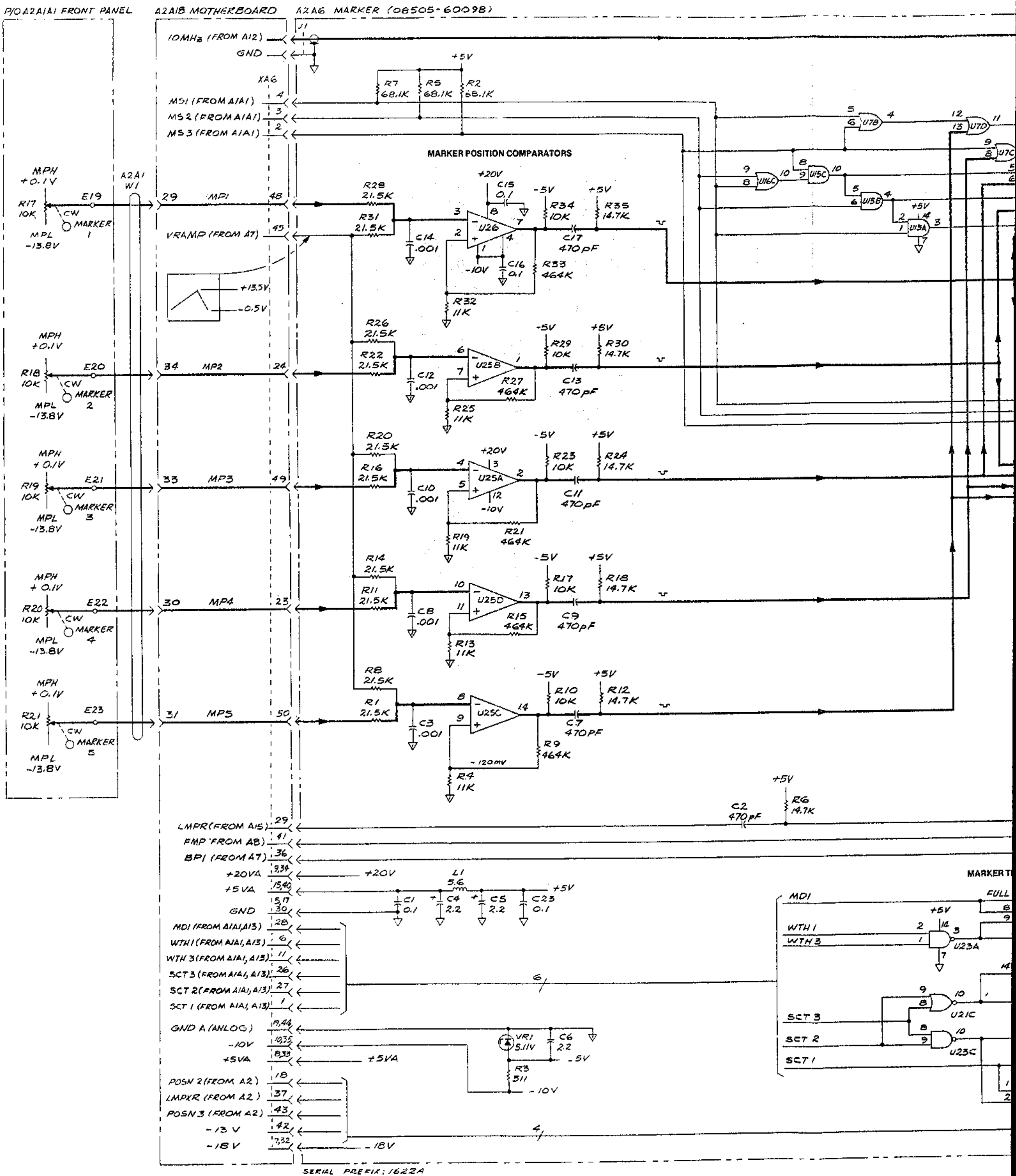


Fig C3-30
Sht 2 of 4

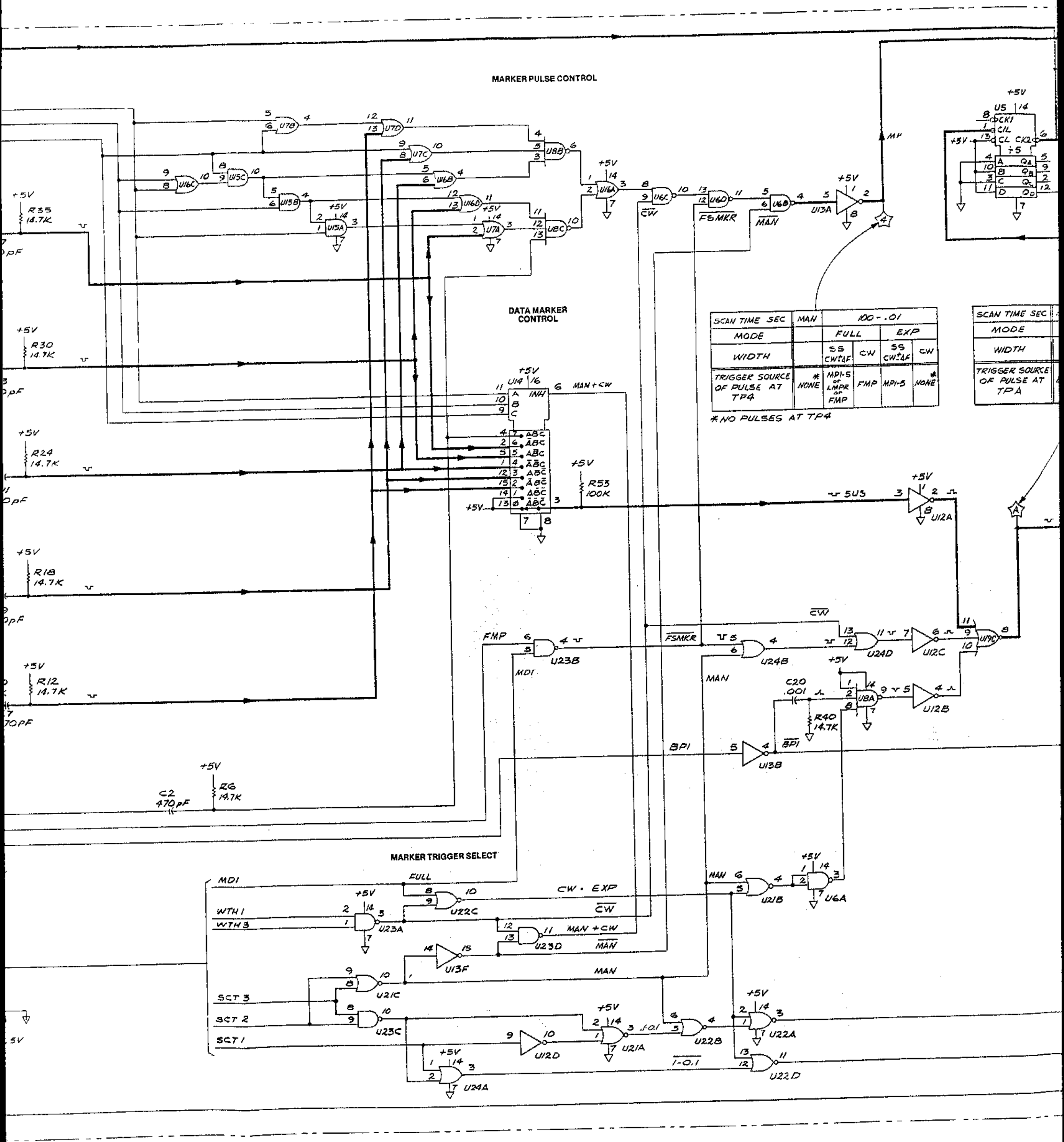
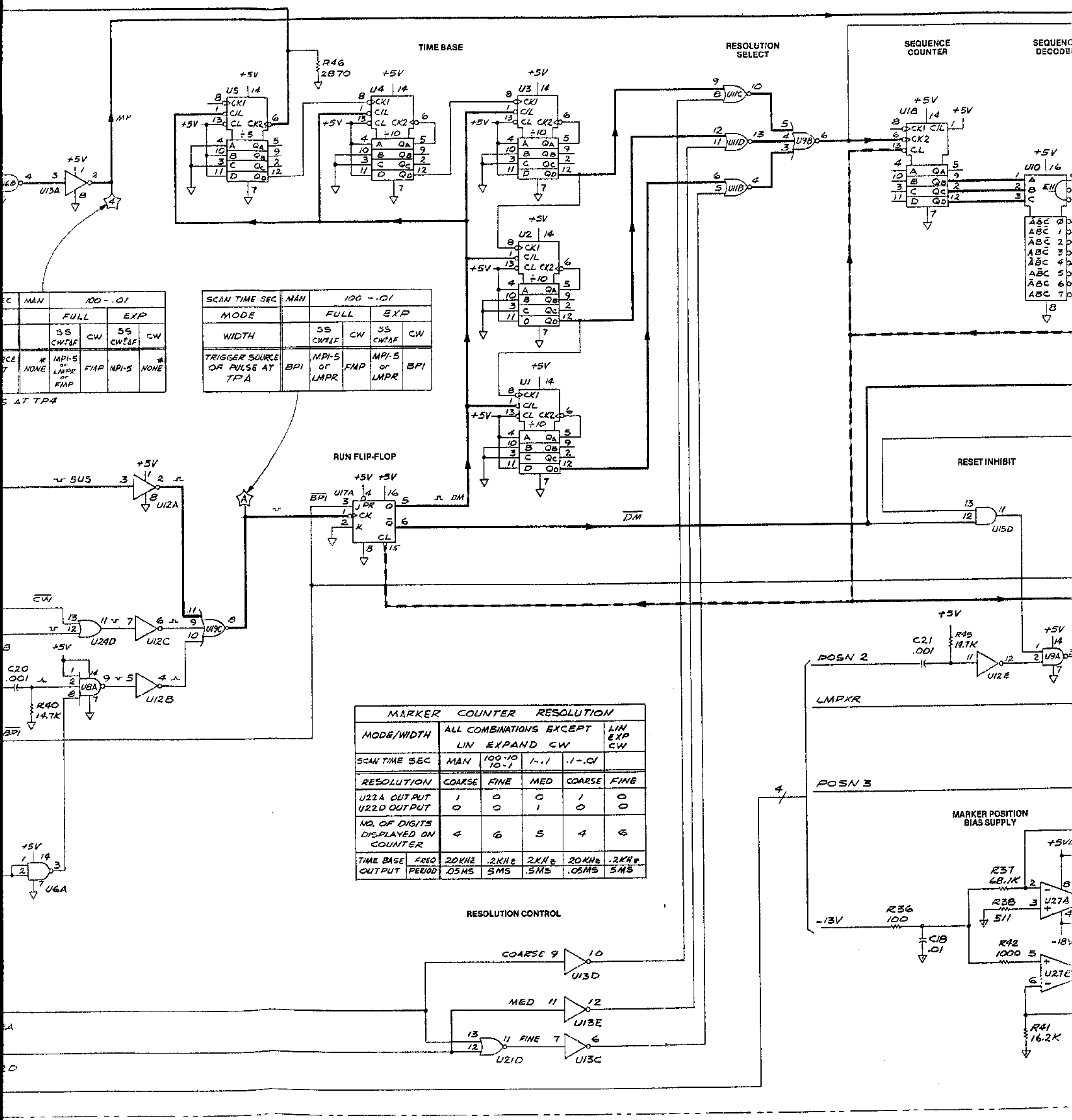


Fig C3-30
Sht 3 of 4



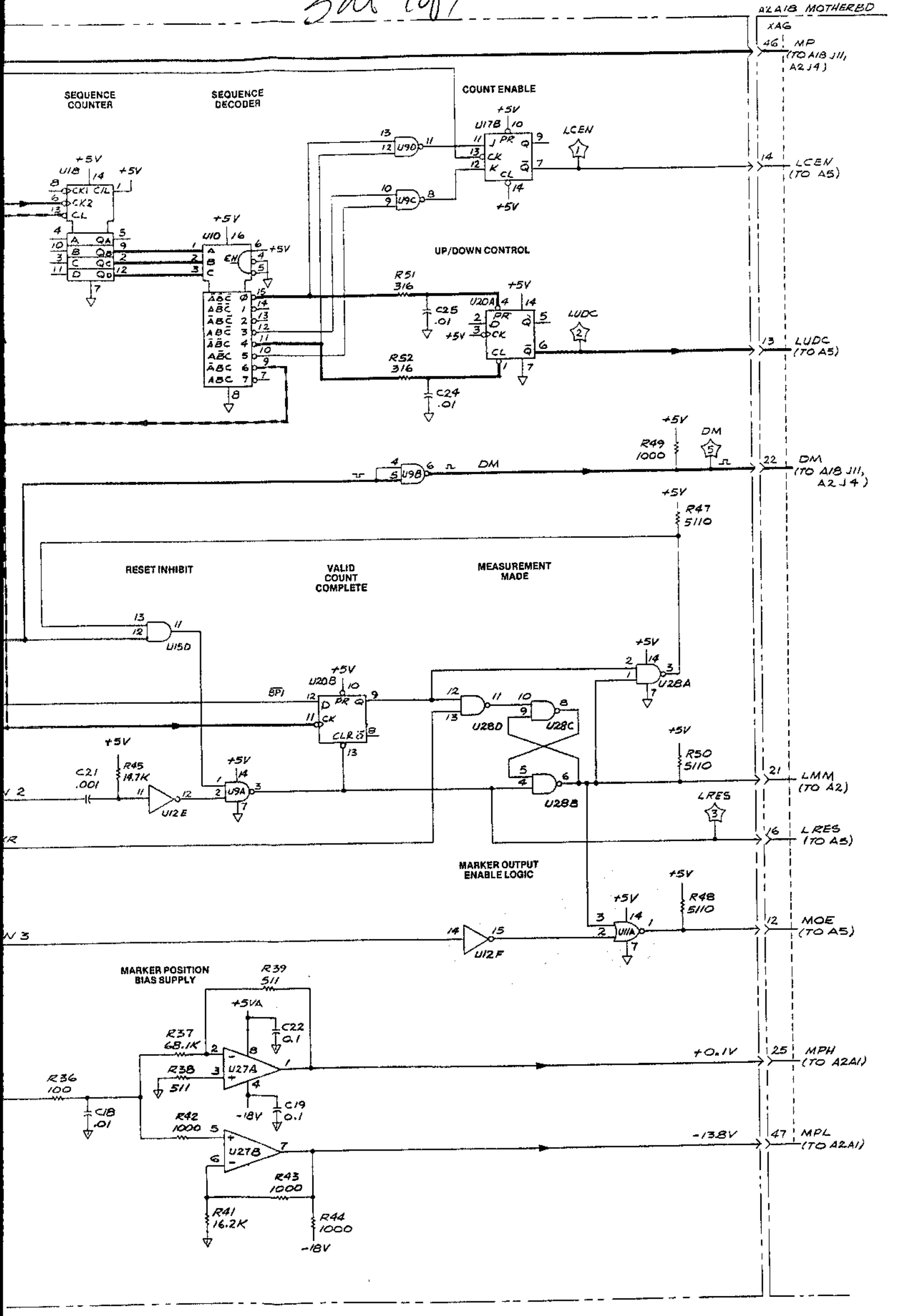
...C	MAN	100 - .01			
		FULL		EXP	
		SS CW±ΔF	CW	SS CW±ΔF	CW
...RCE ...T	* NONE	MPI-5 or LMPR or FMP	FMP	MPI-5	* NONE

...S AT TP4

SCAN TIME SEC	MAN	100 - .01			
MODE		FULL		EXP	
WIDTH		SS CW±ΔF	CW	SS CW±ΔF	CW
TRIGGER SOURCE OF PULSE AT TPA	BPI	MPI-5 or LMPR	FMP	MPI-5 or LMPR	BPI

MARKER COUNTER RESOLUTION						
MODE/WIDTH		ALL COMBINATIONS EXCEPT LIN EXPAND CW				LIN EXP CW
SCAN TIME SEC		MAN	100-10 10-1	1-.1	.1-.01	
RESOLUTION		COARSE	FINE	MED	COARSE	FINE
U22A OUTPUT		1	0	0	1	0
U22D OUTPUT		0	0	1	0	0
NO. OF DIGITS DISPLAYED ON COUNTER		4	6	5	4	6
TIME BASE OUTPUT	FREQ	20KHz	.2KHz	2KHz	20KHz	.2KHz
	PERIOD	.05MS	5MS	.5MS	.05MS	5MS

Fig C3-30
Sht 4 of 4



NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATORS, PREFIX REFERENCE DESIGNATOR SHOWN WITH THE ASSEMBLY REFERENCE DESIGNATOR.
2. UNLESS OTHERWISE INDICATED RESISTANCE IN OHMS CAPACITANCE IN MICROFARADS INDUCTANCE IN MICROHENRIES
3. LOGIC LEVELS FOR U1-5, 9-11, 17-20, 28 ARE: LOW = 0 = < 0.8V HIGH = 1 = > 2.2V
4. LOGIC LEVELS FOR U6-8, 12-16, 21-24 ARE: LOW = 0 = < 1.5V HIGH = 1 = > 3.5V
5. SEE TABLE C3-1 FOR BOARD INTERCONNECTIONS.

REFERENCE DESIGNATORS

A2A6
C1-25
J1
L1
R1-R53
U1-U28
VR1

A2A6

Figure C3-30. A2A6 Marker, Schematic

A2A7 SWEEP GENERATOR

General Description

The Sweep Generator A2A7 generates the voltage ramp which is used to drive the horizontal deflection of the CRT and the frequency sweep circuits. The Sweep Generator also provides the pulses necessary for blanking, penlift, and synchronization of the data transfer. Sweep generator circuits include the Integrator, Retrace Circuit, Penlift and Blanking Circuit, Output Buffer Amplifiers, Trigger Logic, Scan Time Logic, and the ±13V Reference Supplies.

Integrator

The Integrator, U2, is an operational amplifier with capacitive feedback. This circuit (Figure C3-30A) transforms a constant current at the operational amplifier input into a positive, linear voltage ramp at its output. The slope of the ramp, and hence the sweep speed, is controlled by the amount of current at the operational amplifier input and the size of the feedback capacitor. The capacitor size is selected by the Scan Time Logic. The current is set by the front-panel SCAN TIME SEC vernier control and resistors R11 and R15. The front-panel vernier is disabled in the CW mode. In MANUAL, the SCAN TIME SEC vernier is a voltage divider providing a dc voltage for tuning and CRT deflection.

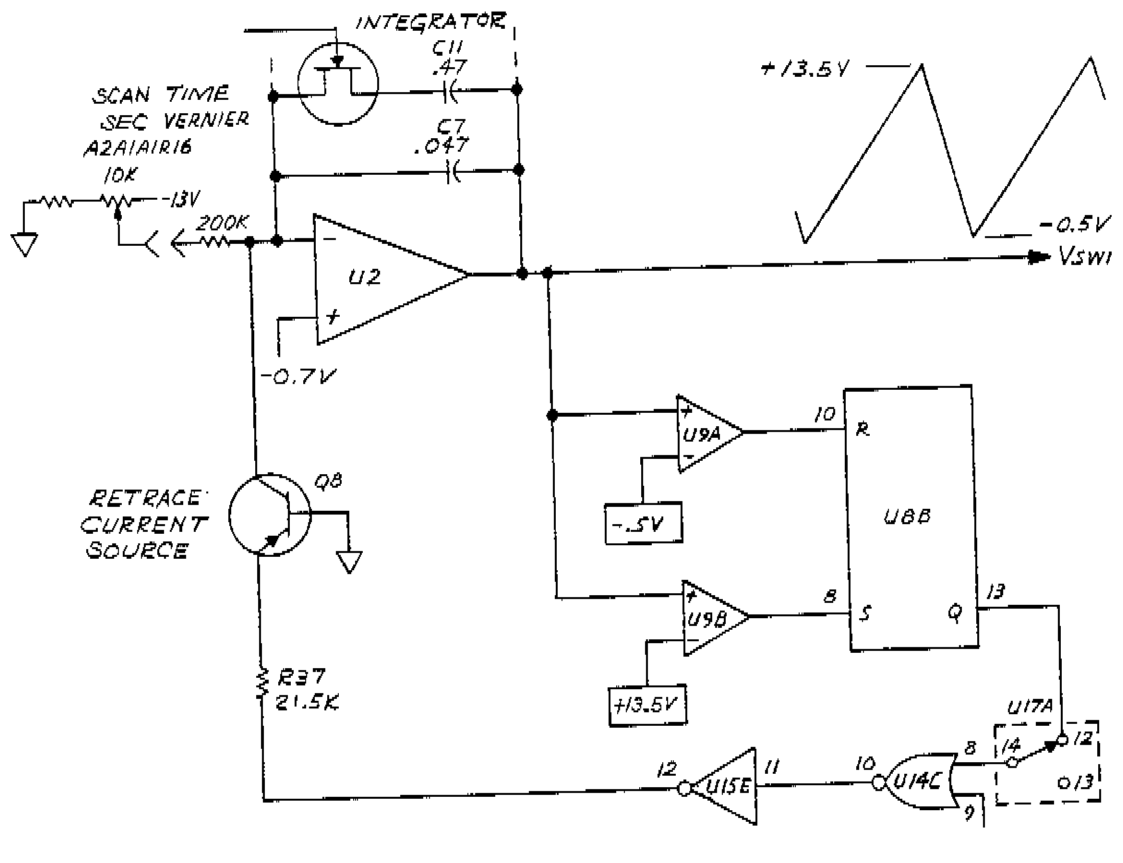


Figure C3-30A. Integrator, Simplified Schematic

Retrace Circuit

The retrace ramp is generated by the retrace circuit components R37 and Q8. The current generated through R37 overrides the forward trace current. The result is a net current into the input of operational amplifier U1 forcing the output to go negative. Operational amplifiers U9A and U9B are comparators used to detect when the ramp reaches −.5V or +13.5V. When the ramp reaches +13.5V, the output of U9B goes to a logic high and sets the "Q" output of flip-flops U8A and U8B high. This high output is transmitted through U17A, U14C, and U15E which generate the retrace current through R37 and Q8. This forces the voltage ramp to go negative. At −.5V the output of U9A goes high and resets U8B. In the auto trigger mode, selected by U17A, the "Q" output of U8B controls the retrace circuit. When the "Q" output of U8B goes low after the reset, the retrace current goes to zero allowing the ramp to again go positive.

Line or External ramp control signals are also selected by U17B. In these modes when the output of U9A goes high (TRACE, TP3) it drives pin 2 of U7A high. The output of U7A then becomes dependent on the signal at Pin 11 of U7D. This signal is a pulse generated either by a line or external input. This pulse resets the output of flip-flop U8A, which in turn drops the retrace current to zero. The rest of the retrace cycle is the same as in the auto trigger mode.

The single trigger command has a dual function. In any trigger mode during the trace condition (positive going ramp), it generates an immediate retrace. In the external mode, single trigger acts like an external input as described above. The single trigger command is discussed further in the trigger logic section.

Penlift and Blanking Circuit

The penlift and blanking circuits generate the blanking pulse (BP1), the penlift (PL), and clamps the voltage ramp out of the Integrator to the desired full sweep voltage range of 0 to +13V. U9C operates as a clamp which actuates when the sweep output V SW1 goes above +13V. U9D likewise clamps V SW1 to above 0 volts. The outputs of U9C and U9D are "ORed" together with the retrace signal from the output of U14C to provide the blanking function. The inverted retrace command is used as the penlift command. The output signals of U9C and U9D produce the waveforms shown in Figure C3-30B.

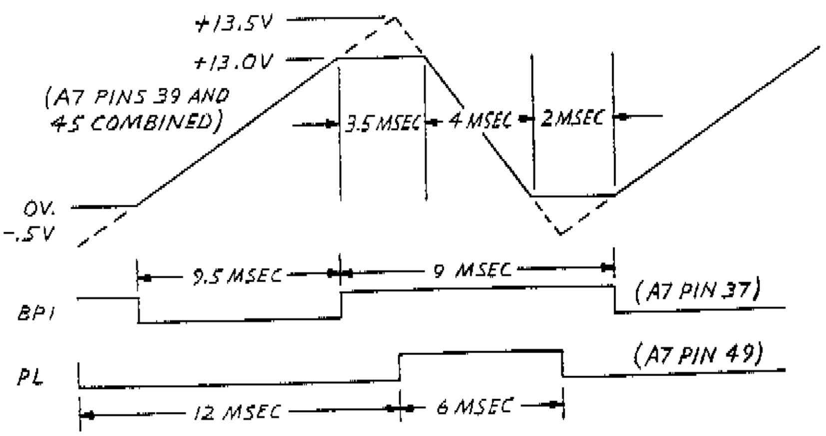


Figure C3-30B. A2A7 Sweep Generator, Timing Diagram

Output Buffer Amplifiers

There are two Buffer Amplifier outputs from the Sweep Generator, V SW1 and V RAMP. V SW1 is the sweep voltage supplied to the A2A8 Sweep Select circuit through U12. V RAMP is the ramp voltage supplied to the A2A6 Marker circuit through U11 and the I/O board A2A15.

The offset adjust (SWEEP ADJ A7R61) on U12 is used to compensate for the offset of both U12 and of the voltage clamps U9C and U9D.

Trigger Logic

The trigger logic selects one of four possible trigger modes: AUTO, LINE, EXT (external), or SINGLE.

AUTO mode operation is selected by U17A, which is controlled by the TRS2 signal. When TRS2 is low, U17A connects the output of U8B, the AUTO sweep flip-flop. In LINE and EXT trigger modes, TRS2 goes high causing U17A to connect U8A, the External line sweep flip-flop.

Line or external trigger is selected by TRS1. With TRS1 high U17B enables the line signal to NAND gate U7D. U7D drives U7A which resets flip-flop U8A when the trace request is high (U9A pin 1), and allows a sweep to begin. When TRS1 drops low U17B selects the external signal. The external signal, shaped by Q10, is applied to U7D where it triggers the trace in the same manner as a line trigger.

There are two special cases to the trigger logic: Single (SNGL) and retrace. As described in retrace circuit, single trigger has a dual function. In normal operation, single trigger starts a trace when the CRT is blanked, and after a trace has started the single trigger will cause an immediate retrace.

In AUTO mode, when single (SNGL) trigger occurs, U7D output goes high. This is converted to a pulse by C12 and R34 which sets flip-flop U8B causing the retrace to start. If the voltage ramp is in retrace, the single trigger pulse is ignored.

In external (EXT) trigger mode, when a single (SNGL) trigger occurs, pin 5 of U14B is pulled low and if the output of U9A (TP3) is high, the output of U14 is held low while U7 resets flip-flop U8A and causes a trace to start. If the output of U9A (TP3) is low, U7A is held high while U14B goes high setting flip flop U8A causing a retrace.

Retrace (RTC) behaves similar to single (SNGL) trigger except, as long as retrace is held low, the ramp will be held low. A trace will be allowed to start only after retrace goes high.

Scan Time Logic

The scan time logic decodes the front panel controls and selects the correct range of sweep speed.

Under all conditions, except CW, the scan time logic decodes the front panel control logic and drives the collectors of Q1, Q2, or Q3 high, turning on the FETs which select the integrating capacitor.

In CW, all sweep ranges are defeated and the instrument is forced into the 1 to .1 msec sweep with the front-panel vernier disabled to full clockwise. This sets the timing required for the marker to display the counted frequency to 6 digit accuracy.

When CW and FULL sweep are selected, the FULL sweep mode overrides the CW and the instrument reverts to normal operation.

MANUAL sweep disables the scan time vernier, but allows the sweep range to be selected by the other front-panel conditions, ie: when the instrument is not in CW, the shortest scan time is 10 msec. When CW is selected, the scan time is 100 msec.

± 13V Reference Supplies

The −13V supply is derived from a stack of low noise temperature compensated zener diodes, VR2 — VR4. This voltage is divided by R46 and R49 through R52 and then buffered by U1. The +13V supply is derived by inverting the −13V supply through U3. Q7 is used to boost the output current capability of the +13V supply.

C3-79/80a

Fig C3-30C
Sht 1 of 2

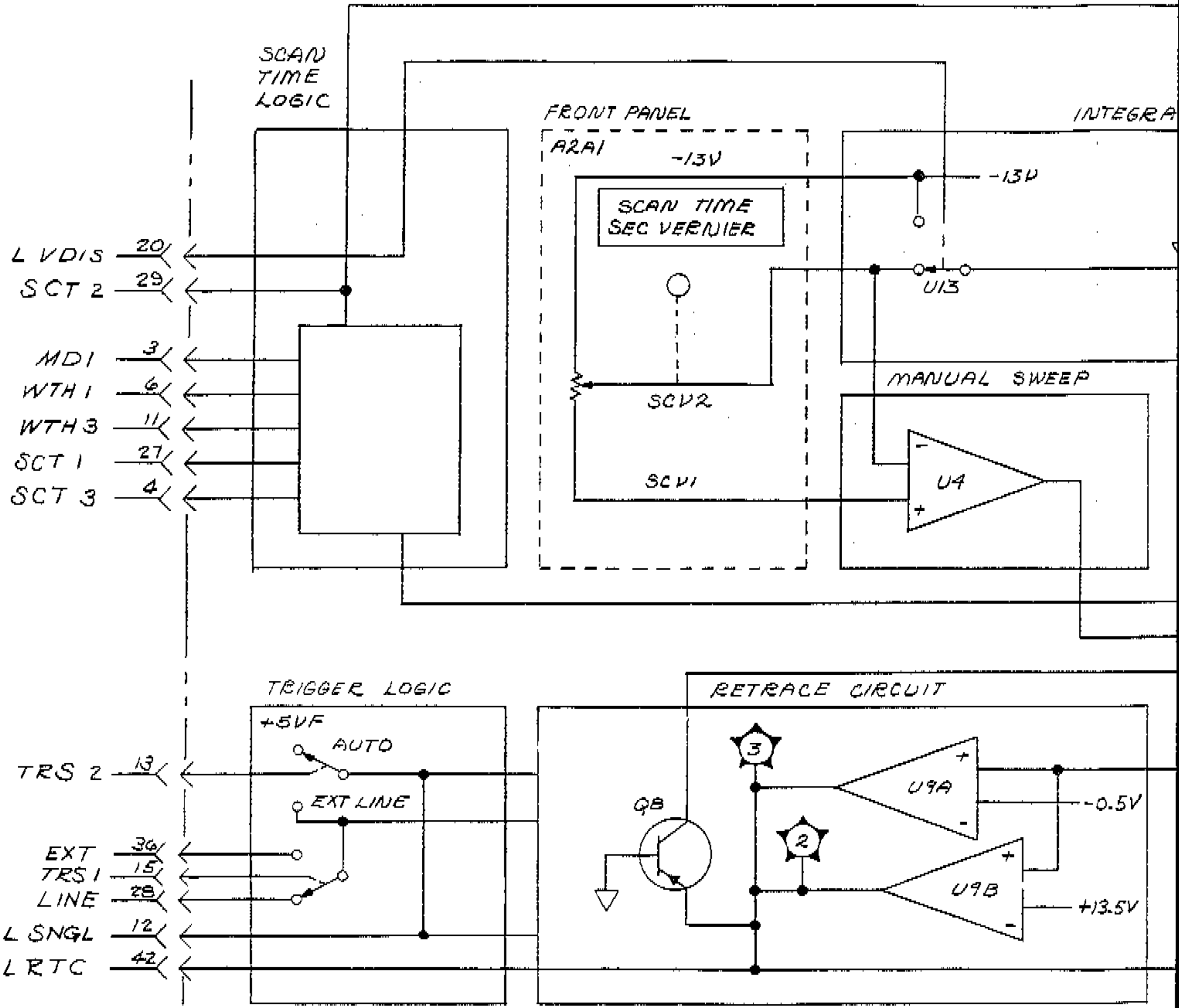


Fig C3-30C
Sht 2 of 2

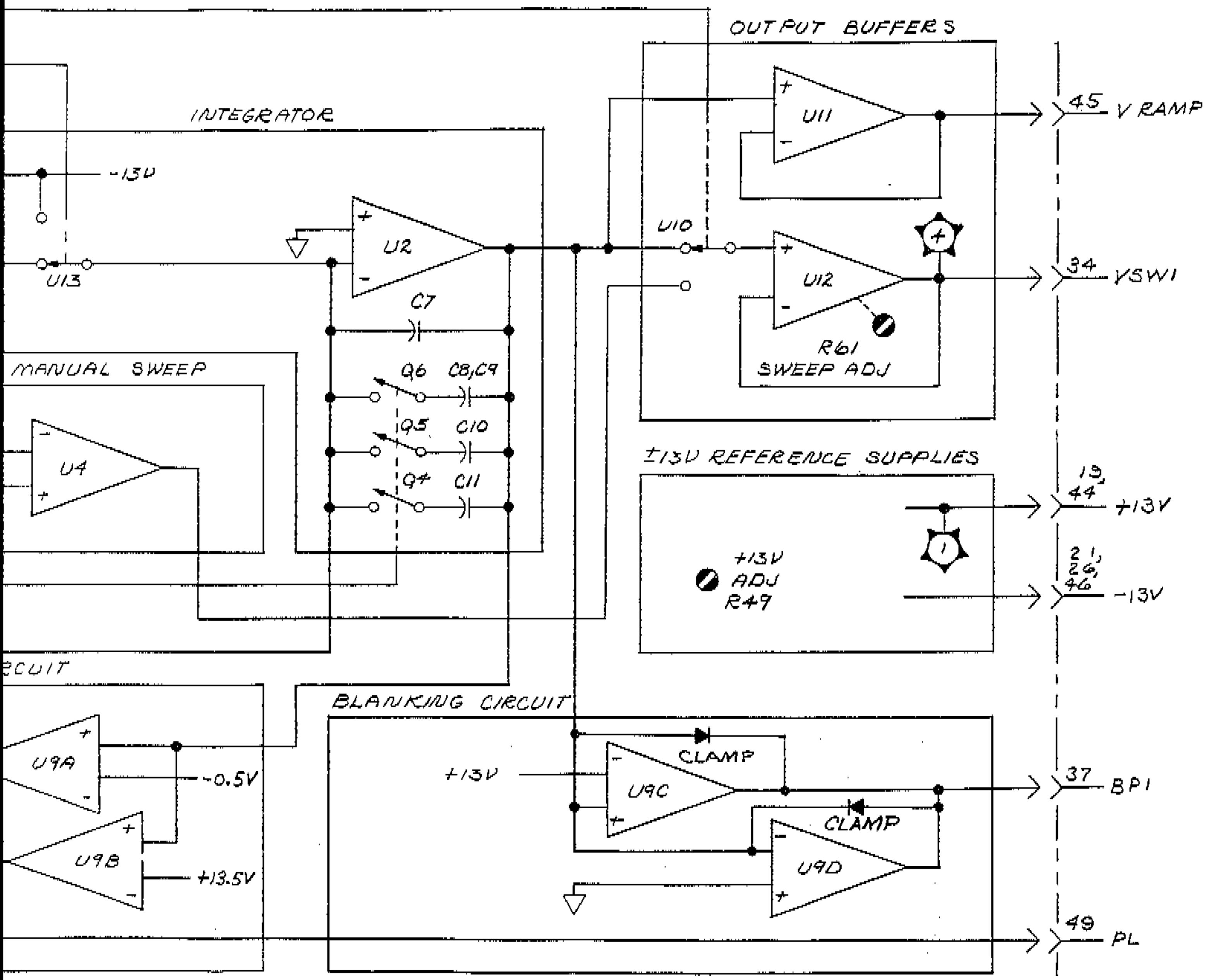


Figure C3-30C. A2A7 Sweep Generator Block Diagram

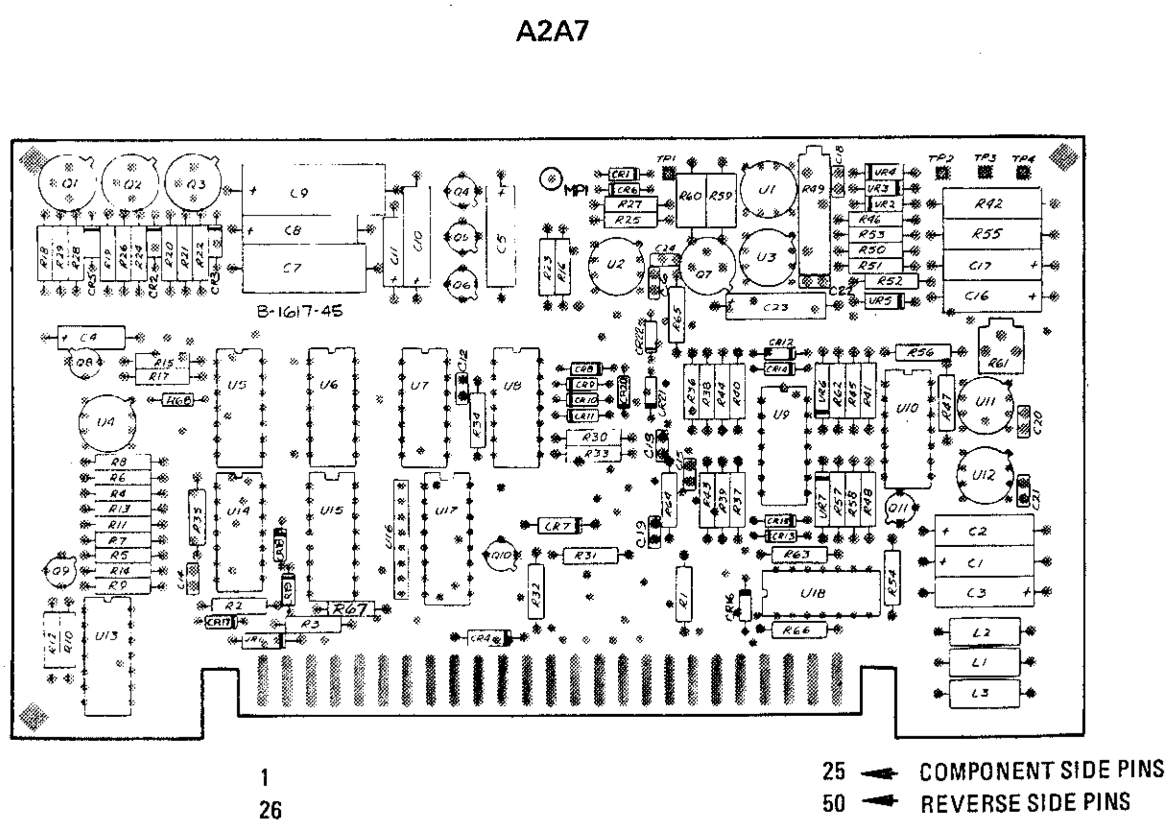
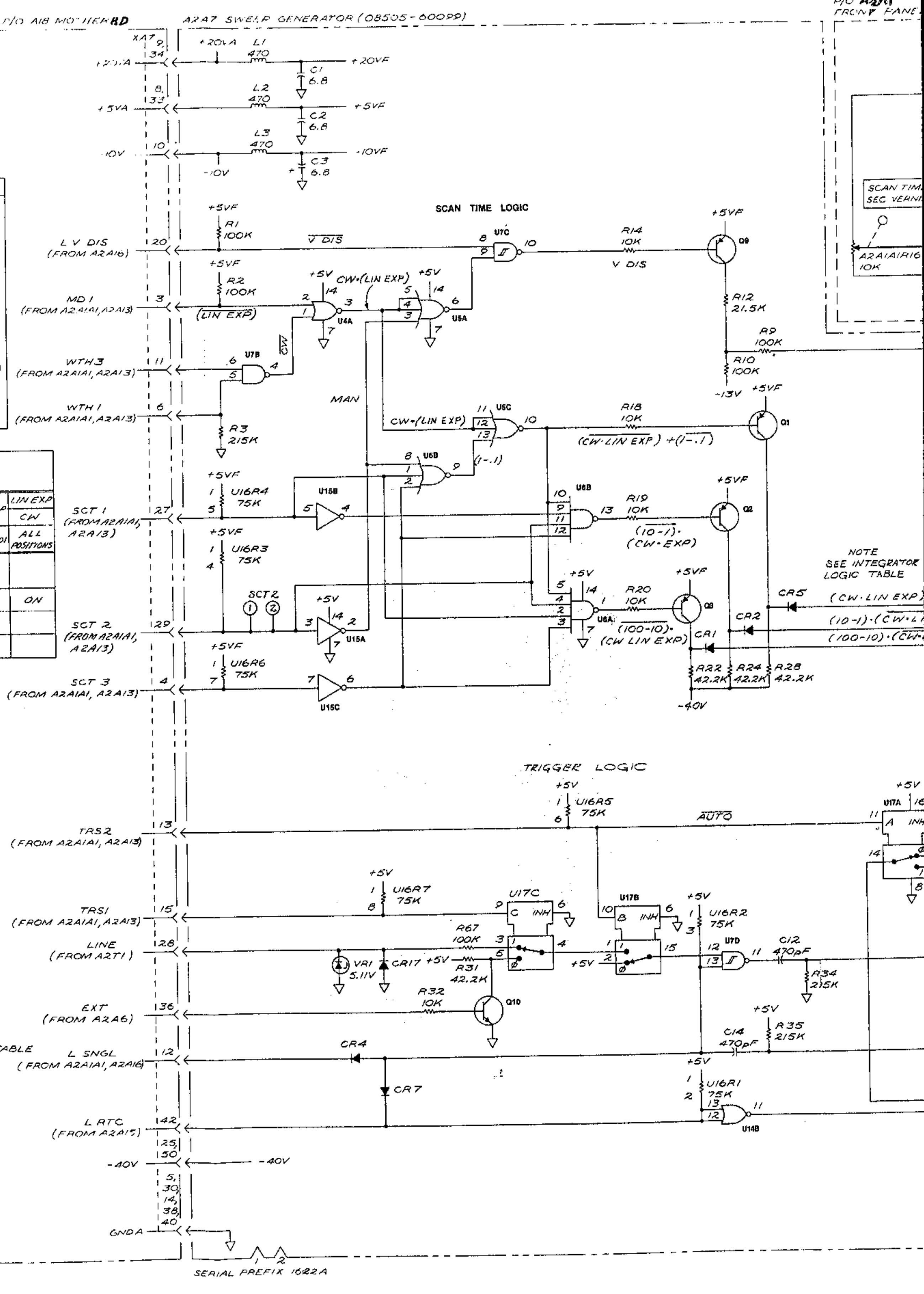


Figure C3-31. A2A7 Sweep Generator, Parts Locations

Fig C3-32
Sht 1 of 3



MNEMONICS TABLE

SIGNAL	DEFINITION
LVDIS	VERNIER DISABLE (0 = NO VERNIER)
MD1	MODE 1
WTH1	WIDTH 1
WTH3	WIDTH 3
SCT1	SCAN TIME 1
SCT2	SCAN TIME 2
SCT3	SCAN TIME 3
TRS1	TRIGGER SELECT 1
TRS2	TRIGGER SELECT 2
EXT	EXTERNAL (TRIGGER)
LINE	LINE (TRIGGER)
LSNGL	SINGLE SWEEP
L RTC	RETRACE (REMOTE)

INTEGRATOR SWITCH LOGIC

FRONT PANEL SWITCHES	SETTING					
MODE	ALL COMBINATIONS EXCEPT MODE = LIN EXP AND WIDTH = CW					LIN EXP
WIDTH						CW
SCAN TIME	MAN	100-10	10-1	1-.1	.1-.01	ALL POSITIONS
INTEGRATOR SWITCHES						
Q4				ON		ON
Q5			ON			
Q6		ON				

MODE TRUTH TABLE

	MD1
LOG FULL	1
LIN FULL	1
LIN EXP	0

WIDTH TRUTH TABLE

	WTH1	WTH3
SS1	1	0
SS2	1	0
ALT	0	0
ΔF	0	1
CW	1	1

SCAN TIME TRUTH TABLE

	SCT1	SCT2	SCT3
MAN	1	0	0
.00-10	1	1	0
10-1	0	1	0
1-0.1	0	1	1
0.1-0.1	1	1	1

TRIGGER SELECT TRUTH TABLE

	TRS1	TRS2
AUTO	1	0
LINE	1	1
EXT	0	1
SNGL	0	1

Fig C3-32
Sht 2 of 3

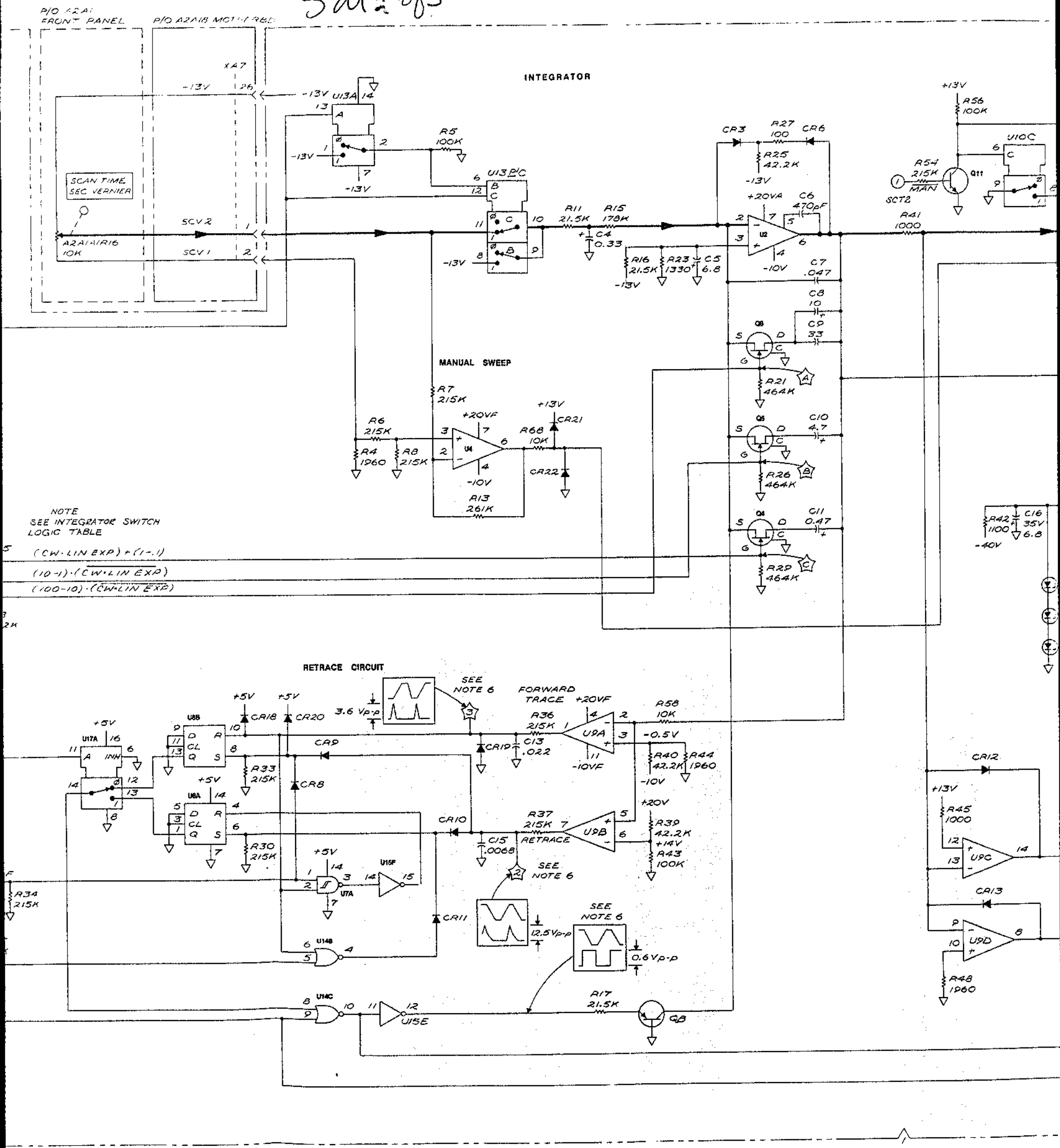


Fig C3-32 Set 3 of 3

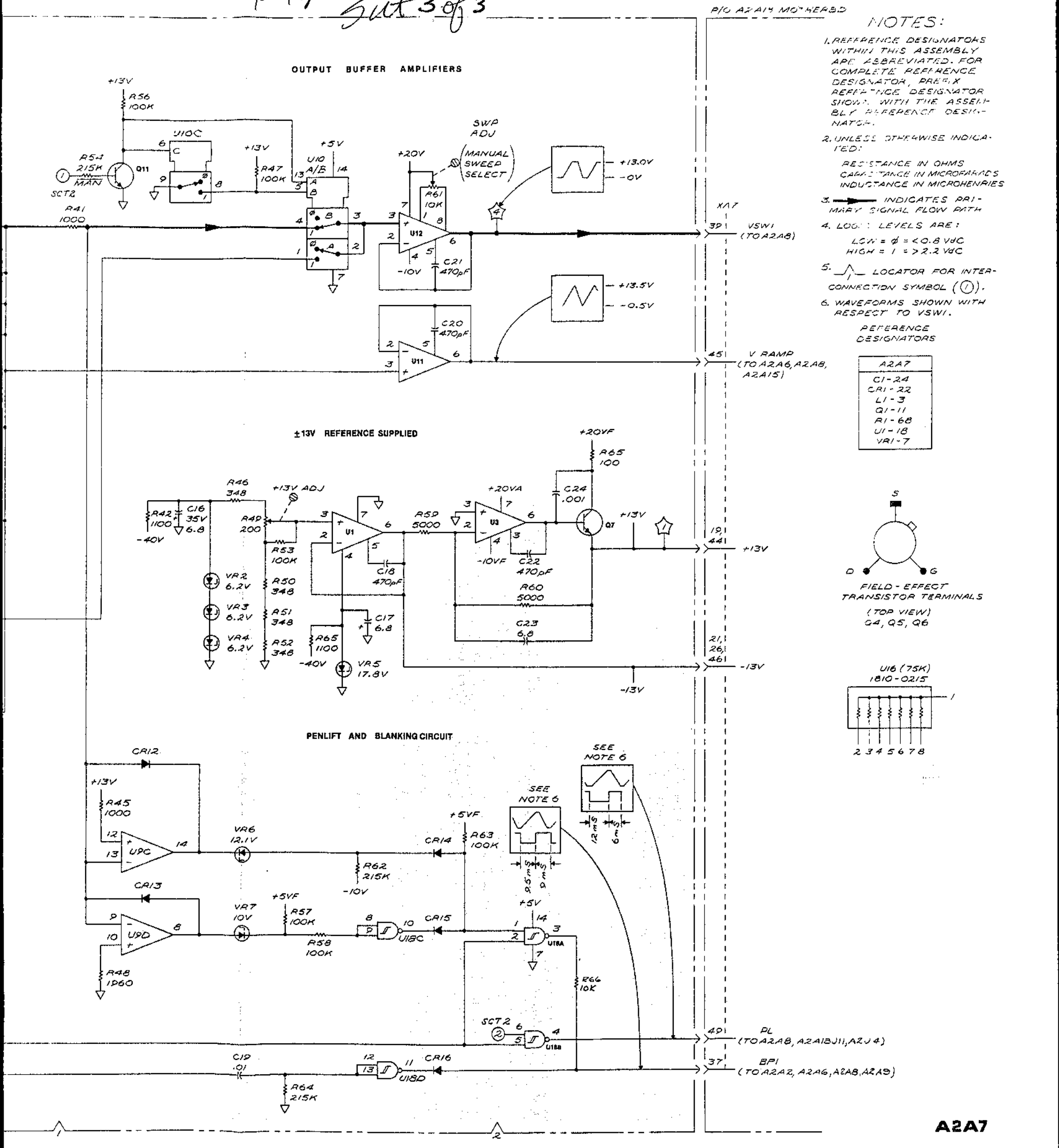


Figure C3-32. A2A7 Sweep Generator, Schematic

A2A8 SWEEP SELECT BOARD

Description

The sweep select board determines the sweep mode (log full, lin full, lin expand) of the 8505A. It also generates the full sweep markers, log full sweep voltage, linear full sweep voltage, and the display blanking pulse. This board also sums the group delay modulation into the tuning voltage.

Sweep Select Circuit (Lin Full, Log Full, Lin Expand)

The sweep mode is selected by U16. Controlled by MD1 and MD2 signals, U16 will select log full (from U4), linear full (from U10B), and linear expand (VSC) (from the A4 scaling circuit).

In CW, the input to the scaling circuit is held high by U18B which is driven by Q14 in the emitter of Q12. At the same time U11 is turned off preventing double markers when full sweep CW is selected.

The group delay modulation signal is enabled by the MOD EN (Group Delay) signal through U15C, which drives Q9 and U16. U16 switches the VGD to U17 where it is summed with the tuning voltage.

Display Blanking Circuit

The display blanking pulse is an "ORed" combination of BP1 from the sweep generator, BP2 from the discriminator, and a signal from clamps U9A and U9B. U9A and U9B in the Display Blanking Circuit clamp the scaling circuit output voltage to just above zero volts and slightly below −13V. This prevents damage to the logic switches and prevents driving the instrument out of its specified frequency range. (This would occur in CW ± Δ width with CW = 0 or 1300, °F Δ 130.) When these clamps turn on, their output is "ORed' with blanking pulses BP1 and BP2. This causes the display blanking pulse (DBP) to go high, blanking the display.

Log Sweep Generator

The log sweep generator produces 1, 2 or 3 decade log sweeps for the FULL LOG sweep modes. In order to produce a log sweep, the source tuning voltage must be an exponential of the form $V_{TUN} = V_{START} \exp(K\, V_{SWEEP})$. The V_{START} voltage is selected by U13 and R60, R65, R66, R62 and R59. These resistors produce a current to Amplifier U5 through Q1A. This current establishes V_{be} and is applied to Q1B, producing a current through Q1B equal to that in Q1A. The current through Q1B is applied to U4, the current to voltage converter, producing a start voltage at test point 1.

The sweep voltage V_{SW1} is scaled by U6 and R61, R63, R64, R67, R57 and R58. This scaled voltage is applied to the base of Q1A changing V_{be}. This change in V_{be} is reflected into Q1B, causing the current through Q1B, $I_e \alpha \exp V_{be}$, to be an exponential of the sweep voltage. Amplifier U4 will convert this current to the log full sweep voltage. Since the sensitivity of the instrument is 1 MHz/v, 10 MHz/v, and 100 MHz/v in the three frequency ranges, the voltages at test point 1 will vary exponentially from 1—10v, .1—10v, and .01—10v for the three log sweep ranges.

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Linear-Full Sweep Inverter

The linear full sweep voltage is the input sweep voltage VSW1 inverted by amplifier U10B.

Full Marker Pulse Circuit

The full sweep markers are used to show the end points of the linear expand sweep. The idea is to drive the scaling circuit to each end of the expanded setting, sample each end, and compare this with the full sweep voltage. The crossover points of the sampled voltage and the full sweep voltage are the marker positions.

The clock for the sample and hold is formed by U12C, a Schmitt inverter with R8 and C7 as feedback. The square wave output drives Q13 which controls U18C to supply the 0 and +13v to the scaling circuit. This 0 and +13v drives the scaling circuit to the end points determined by the front panel frequency settings. At the same time, the clock is delayed by R11 and C8 and applied to the sample and hold switch drivers Q7 and Q8. Q7 and Q8 drive the SAMPLE/HOLD switches in U11. The sampled voltage is compared to the full sweep by U1 and U2. The outputs of U1 and U2 are inverted by U12A and U12B, differentiated by C14 and C15, then "ORed" together in U8D. In the expanded mode, the pulse circuit is turned off in two ways — Q6 turns off the clock while U7A, the pulse output, is held low.

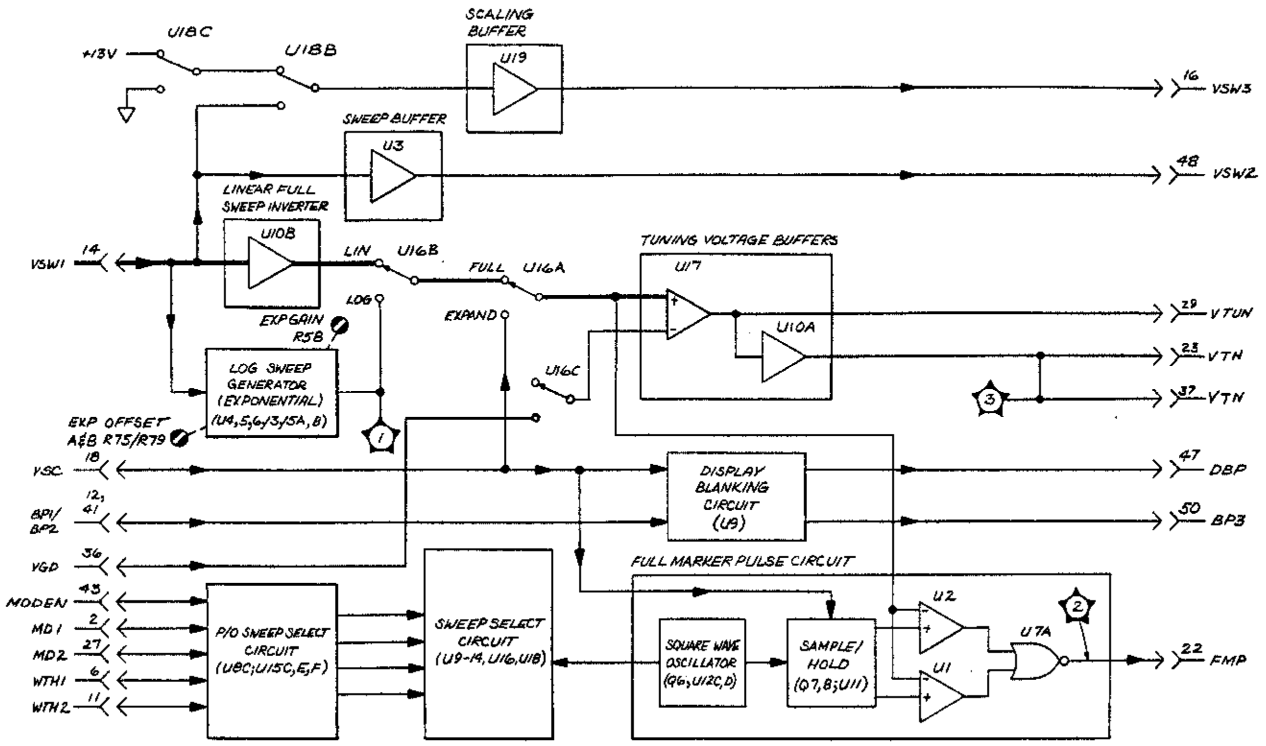


Figure C3-32A. A2A8 Sweep Select Block Diagram

A2A8

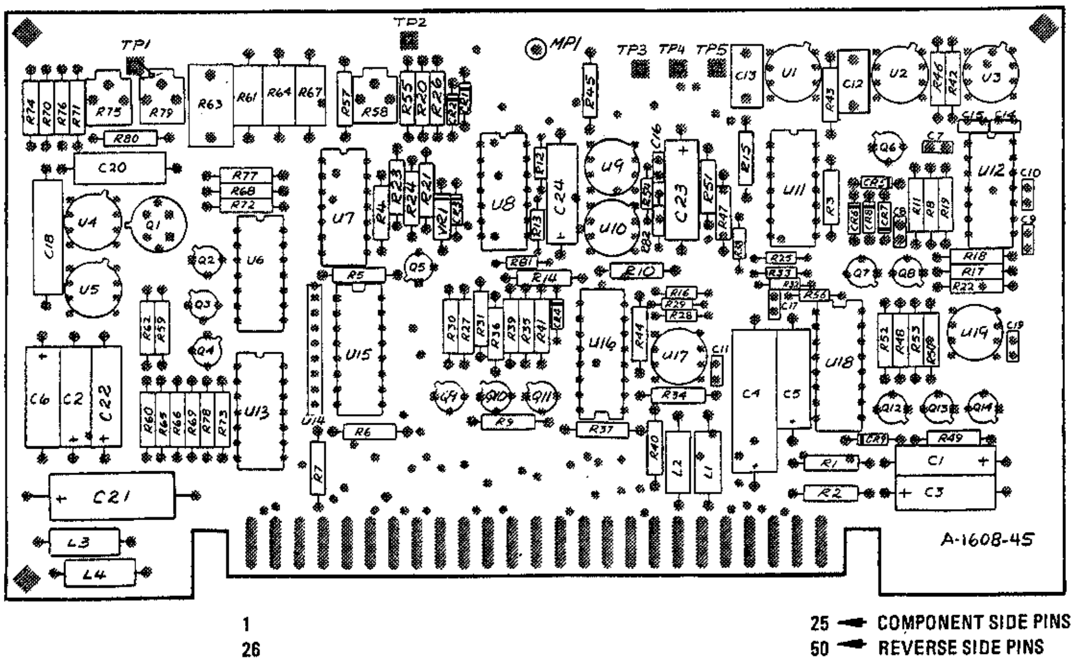
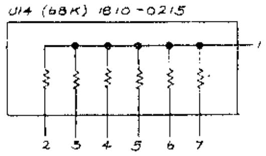


Figure C3-33. A2A8 Sweep Select Parts Locations

Fig C3-34
Sht 1 of 4

SIGNAL	DEFINITION
VSW 1	SWEEP VOLTAGE 1
VSW 2	SWEEP VOLTAGE 2
VSW 3	SWEEP VOLTAGE 3
VTUN	TUNING VOLTAGE
VSC	SCALING VOLTAGE
VGD	VOLTAGE GROUP DELAY
FR1	FREQUENCY RANGE 1
FR2	FREQUENCY RANGE 2
MOD EN	MODULATION ENABLE (GROUP DELAY)
MD 1	MODE 1
MD 2	MODE 2
WTH 1	WIDTH 1
WTH 3	WIDTH 3
VTN	TUNING VOLTAGE
DBP	DISPLAY BLANKING PULSE
FMP	FULL MARKER PULSE
BP1	BLANKING PULSE 1
BP2	BLANKING PULSE 2
BP3	BLANKING PULSE 3

U14 (68K) 1810-0215



FREQUENCY RANGE TRUTH TABLE

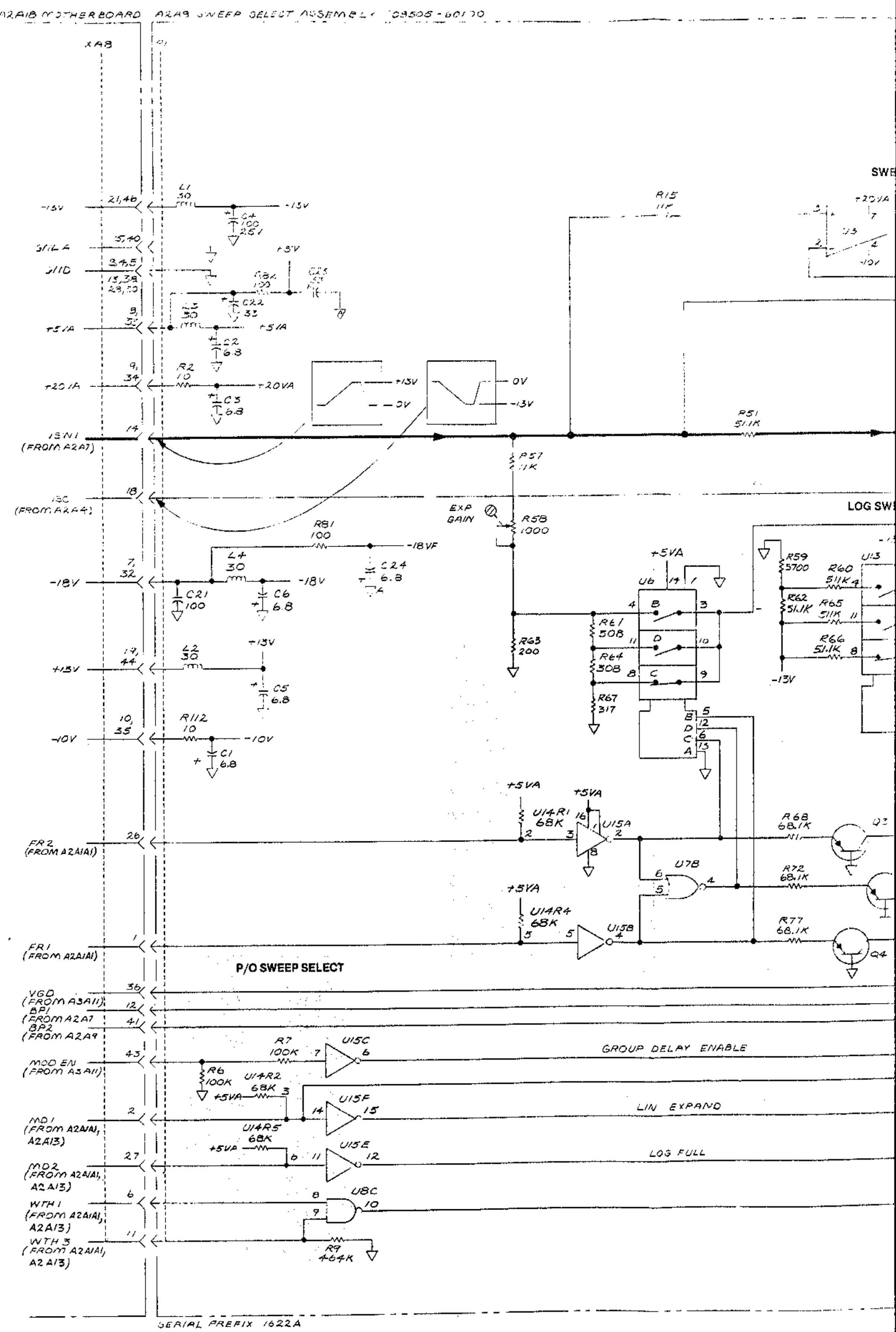
	FR1	FR2
.5-13	1	0
.5-130	1	1
.5-1300	0	1

MODE TRUTH TABLE

	MD1	MD2
LOG FULL	1	0
LIN FULL	1	1
LIN EXP	0	1

SWEEP WIDTH TRUTH TABLE

	WTH 1	WTH 3
SS 1	1	0
SS 2	1	0
ALT	0	0
ΔF	0	1
CW	1	1



FigC3-34
Sht 2 of 4

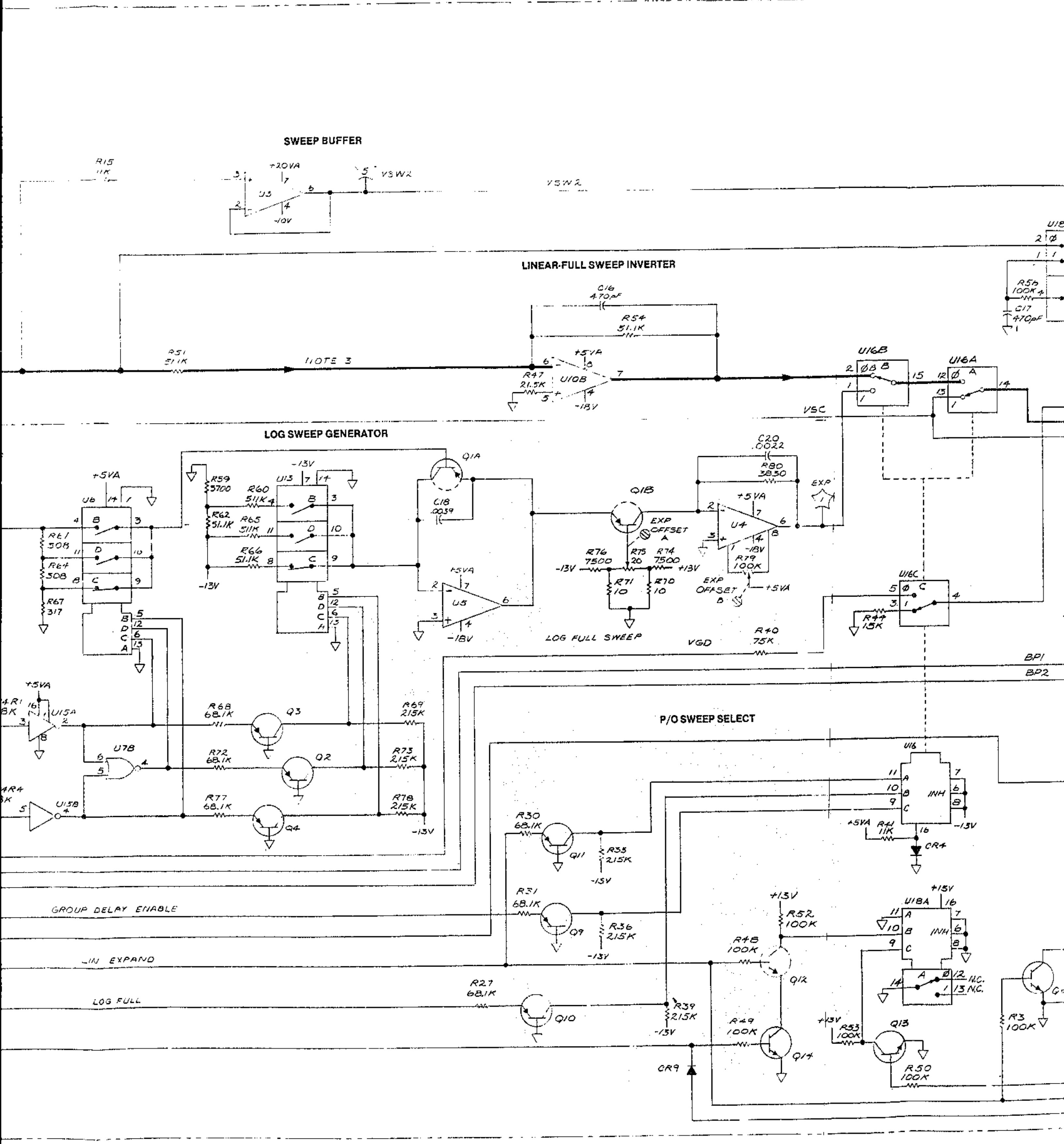


Fig C3-34
Sut 3 of 4

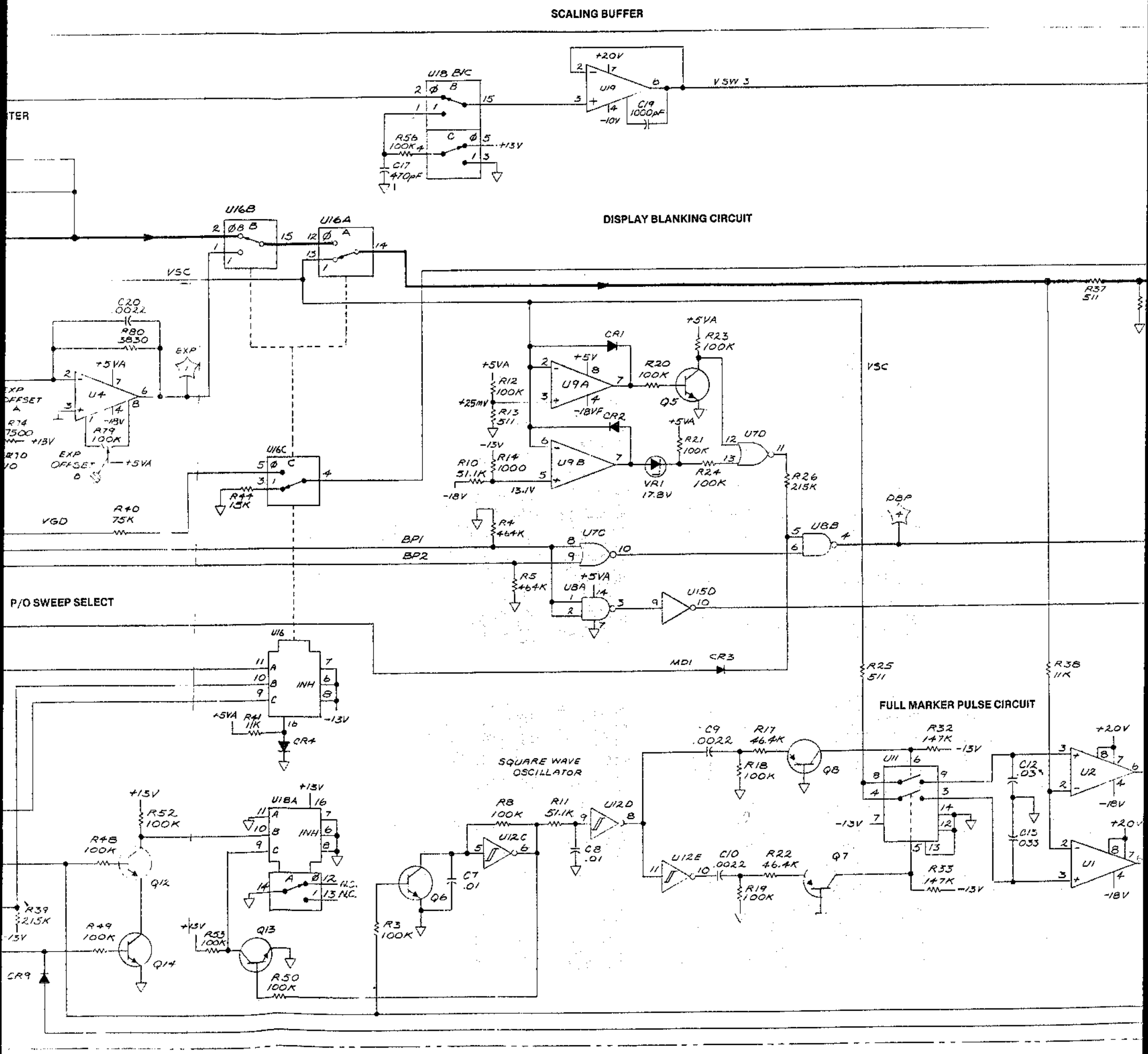
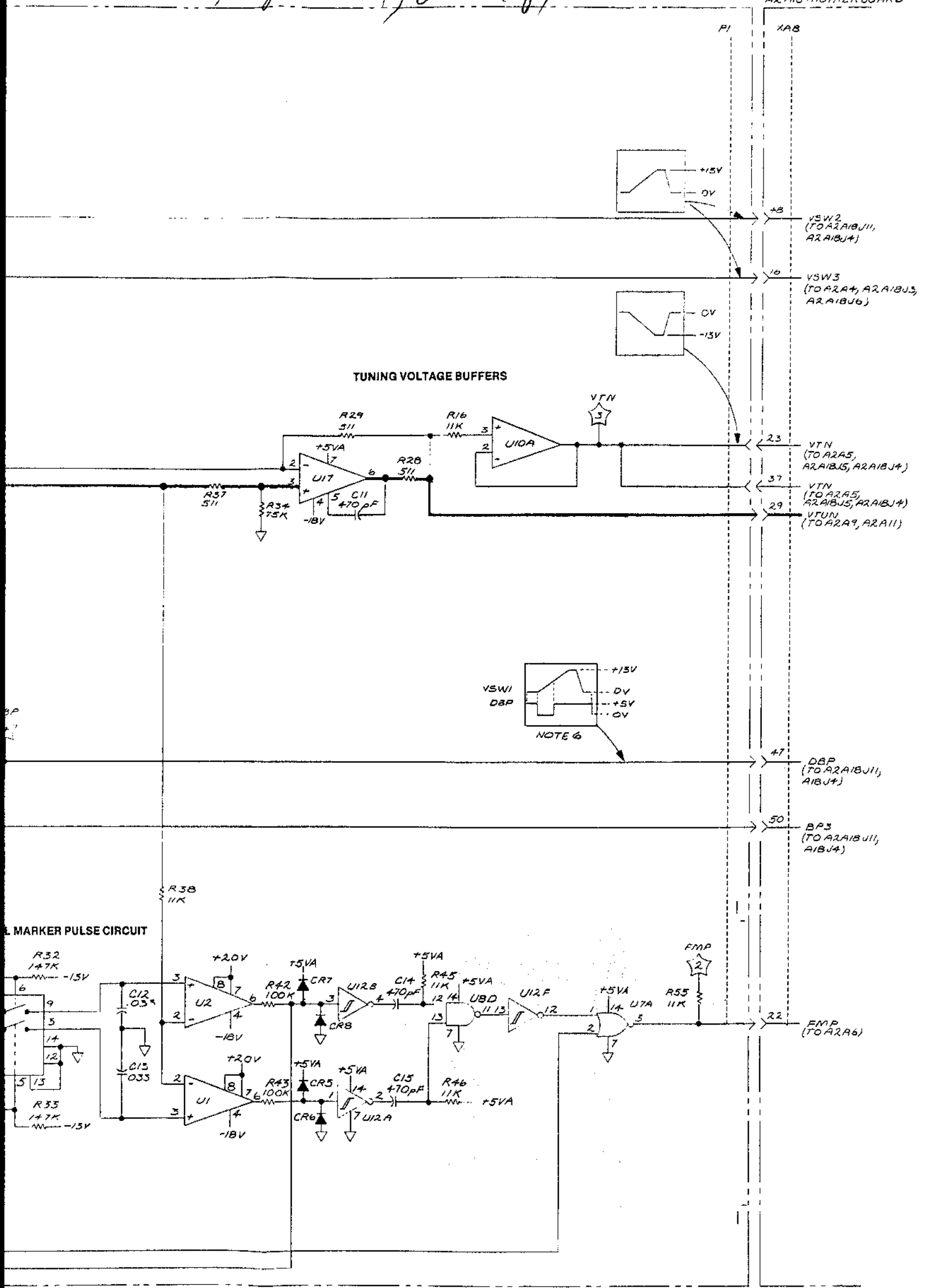


Fig C3-34, Sht 4 of 4



NOTES.
1. REFERENCE DESIGNATORS WITH THIS ASSEMBLY ARE ABBREVIATED FOR COMPLETE REFERENCE DESIGNATOR, PREFIX REFERENCE DESIGNATOR SHOWN WITH THIS ASSEMBLY REFERENCE DESIGNATOR
2. UNLESS OTHERWISE INDICATED:
RESISTANCE IN OHMS
CAPACITANCE IN MICROFARAD
INDUCTANCE IN MICROHENRIES
3. ——▶ INDICATES PRIMARY SIGNAL FLOW PATH IF INSTRUMENT SWITCHED TO LINEAR-FULL MODE.
4. SWITCHES SHOWN IN UN EXPAND, .5-15 MHz RANGE.
5. LOGIC LEVELS ARE TTL
LOW = 0 = <0.8V
HIGH = 1 = >2.2V
6. RANGE: .5-1500 MHz
MODE: LIN EXPAND
WIDTH: CW ± ΔF
CW FREQ: 1300 MHz
± ΔF: 130 MHz

REFERENCE DESIGNATORS
A2A8
C1-C23
CR1-CR9
L1-L4
Q1-Q14
R1-R82
U1-U19
VR1

A2A8

Figure C3-34. A2A8 Sweep Select, Schematic

A2A9 DISCRIMINATOR

General Description

The Discriminator is part of the Automatic Frequency Control (AFC) Loop, which also includes the Prescaler/Counter (A2A5) and FM Driver (A2A10). The RF output of the Source/Converter is first fed to the Prescaler/Counter, where its frequency is prescaled, and then applied to the input (PTLO) of the Discriminator. The Discriminator generates a current proportional to the frequency of the RF input and compares it with a current which is proportional to the Tuning Voltage (V TUN). The difference between these currents, a measure of the frequency error of the Source/Converter, is amplified and fed to the FM Driver (A2A10) as V FM. The FM Driver further amplifies this error signal to drive the FM coil of the YIG-tuned Oscillator (A2A19), thereby closing the AFC loop. This feedback reduces the drift and residual FM of the Source/Converter. The AFC loop operates only in the 13 MHz and 130 MHz ranges; in the 1300 MHz range the Discriminator output is disconnected from the FM Driver.

The Discriminator has five major parts: Frequency-to-Current Converter, Summing Amplifier, Frequency Range Logic and FET Drivers, Low-Frequency Clamp, and Search Control (See Figure C3-34E).

Frequency-to-Current Converter

The Frequency-to-Current Converter generates a current which is proportional to the frequency of the RF signal from the Source/Converter. There are four elements: Amplifier-Limiter, Delay Line Driver, Delay Line, and Current Switch.

Two differential amplifiers from an ECL line receiver (U2) make up the Amplifier-Limiter, which shapes the RF pulses (PTLO) from the Prescaler/Counter (A2A5). The first amplifier is connected as a single-input amplifier with a differential output. The second amplifier is a Schmitt trigger whose differential output is ac-coupled to the Delay Line Driver. The base bias supply of the differential amplifiers is tapped at U2 pin 11 to provide a stable reference voltage for the input (pin 4) of the first stage.

The Delay Line Driver consists of the differential pair Q4 and Q5 with positive feedback. Positive feedback causes the driver to act as the second Schmitt trigger in the input chain. The normal state of the driver is Q5 ON, Q4 OFF, with the base of Q4 biased near 0 volts ($V_{be}4 = 0$ volts). When the input to the driver causes Q4 to turn ON, the current flowing through Q5 is diverted to the Delay Line. This causes the voltage at the collector of Q5 to rise, which turns Q4 on harder. Because of this positive feedback, the state of the driver changes rapidly to Q4 ON, Q5 OFF. The exact inverse occurs when Q4 is turned OFF by the input. The output of the driver is thus a square wave of current into the Delay Line.

The Delay Line, consisting of L4-6, C21, C22, and C24, is a lumped approximation of a shorted transmission line with an 11 nsec delay. The current wave applied to the Delay Line by the Driver is converted to constant width voltage pulses (see Figure C3-34A). These pulses are then applied to the Current Switch.

The Current Switch, Q2A and Q2B, is a differential pair with emitter current fixed by VR3, CR7, R61, and R68. The emitter current is adjusted with R68 for a high frequency reading of 20.000 MHz ± 0.2 MHz on the FREQ COUNTER readout . The normal state of the Current Switch is Q2A ON, Q2B OFF. When the voltage pulse from the Delay Line goes

* See adjustment procedure, paragraph A5-21.

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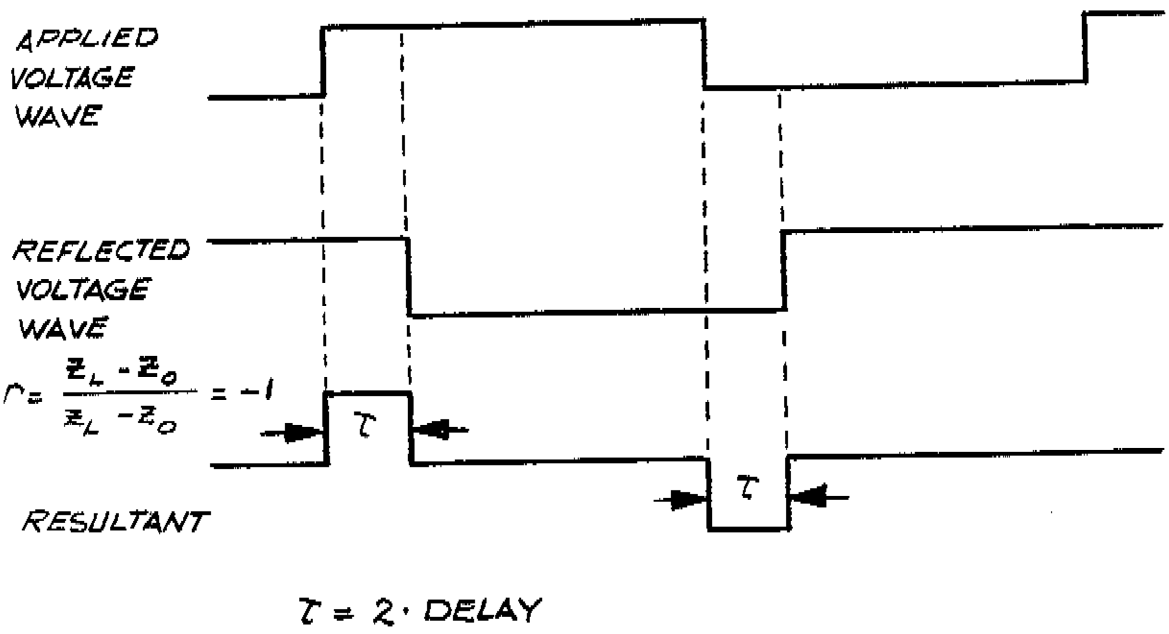


Figure C3-34A. Shorted Delay Line Principle

high, Q2A is turned OFF and Q2B is turned ON, switching the emitter current to C28, L7, and R54, the low-pass filter. The average current through the filter is proportional to the frequency of the input signal, PTLO.

Summing Amplifier

The Tuning Voltage, V TUN, is converted by R51 to a current and summed with the output of the Frequency-to-Current Converter by U4. The difference between these two currents is amplified by U4 to produce the output voltage V FM. V FM drives the FM Driver to correct any frequency errors of the YTO. Feedback capacitors C25 and C26 set the AFC loop compensation and bandwidth. The capacitors are selected by Q16, which is driven by the Frequency Range Logic. The offset voltage at U4 pin 3 is changed by FET Q7 when the frequency range of the instrument is changed; the offset is approximately +100 mV in the 13 MHz range and about +10 mV in the 130 MHz range. In the 1300 MHz (undiscriminated) range, the Frequency Range Logic turns FET Q8 on, reducing the gain of U4 to zero. R57 is used to adjust the offset for a low frequency indication of 5.000 MHz ±0.010 MHz on the FREQ COUNTER readout.*

Frequency Range Logic and FET Drivers

The Frequency Range Logic consists of CMOS NAND Gates (U6) connected as inverters driving level shifters Q13—Q16. The level shifters turn on and off the FET's (Q7, Q8, Q9, Q17, and Q18) used as switches in the Summing Amplifier and Low-Frequency Clamp.

The Frequency Range Logic detects the frequency range of the instrument and adjusts the AFC loop compensation capacitors (C25, C26), offset voltages at U4 pin 3, and V TUN clamp voltages for proper operation of the AFC loop. The offset voltages are required because the RF input to the Discriminator, PTLO, is offset by 100 kHz from the RF output of the source. Compensation changes are needed because the source RF frequency is divided by one in the 13 MHz range and by 10 in the 130 MHz range before it reaches the Discriminator. The change in division ratio is an effective change in AFC loop gain and bandwidth which is compensated for by the change in feedback capacitance.

* See adjustment procedure, paragraph A5-21.

Low-Frequency Clamp

A Low-Frequency Clamp is used to accurately set the low frequency of the RF source and prevent the RF from going through zero frequency (where the instrument is unspecified and the Discriminator is unlocked). U7 clamps the tuning voltage, V TUN, to about −400 mV in the 13 MHz range and −40 mV in the 130 MHz range. The clamp voltage is selected by Q17, which is driven by the Frequency Range Logic. This voltage is applied to pin 3 of U7. When V TUN, at pin 2 of U7, is more negative than pin 3, the output of U7 is high, back-biasing CR6. When V TUN goes above the voltage at pin 3, the output of U7 goes low, forward-biasing CR6 and pulling V TUN more negative. The output of U7 also drives Q19, which generates one of the blanking pulses (BP2) to the Sweep Select board, A2A8.

When the instrument is put in the 1300 MHz range, Q14 drives FET Q18 ON, pulling U7 pin 3 up to +1.5 volts. Since V TUN cannot go this positive, the Low-Frequency Clamp is effectively removed from the circuit in the 1300 MHz range.

Search Control

A detailed block diagram of the Search Control is shown in Figure C3-34F. This block diagram will be referred to in the following description.

The function of the Search Control is to keep the Discriminator output, V FM, in the range where the AFC loop will lock. The Search Control detects when V FM goes above or below an allowable range (about −3V to +3V). If V FM goes too positive, the positive limit detector (VR4 and Q21) sets flip-flop U8A, turning Q11 ON; this injects a search current into the summing junction which causes the output of U4 to slew in the negative direction. When V FM reaches the negative limit, the negative limit detector (VR5 and Q22) sets flip-flop U8B. Since the outputs of the two flip-flops are ANDed to drive both of their reset inputs, flip-flop U8A is reset at this point; flip-flop U8B remains set since its set input is held high by the negative limit detector. The high output of U8B turns Q12 ON, injecting a search current into the summing junction which causes V FM to slew in the positive direction. As V FM goes through +1.5V, the output of the reset comparator goes high, applying a reset pulse to flip-flop U8B and turning off the search current. With V FM at this reset voltage (+1.5V) the AFC loop will lock.

The no-lock state (either flip-flop set) turns on the no-lock indicator DS1. In the 130 MHz range, FET Q9 is driven ON in the no-lock state to increase the feedback capacitance of U4 and thus decrease the slope of V FM during the search. Capacitor C9 keeps Q9 ON for a period following the search current reset (both flip-flops reset) to allow the AFC loop to stabilize before the bandwidth is increased.

Typical search waveforms and a description of Search Control operation are presented in the Troubleshooting section which follows.

A2A9 Discriminator — Troubleshooting Information

Equipment:

Oscilloscope

Frequency-to-Current Converter

The Frequency-to-Current Converter produces a current which is proportional to the frequency of the prescaled source RF signal, PTLO, in all frequency ranges.

The operation of this portion of the Discriminator may be checked by setting the front panel controls of the Frequency Control as follows:

RANGE MHz .... 0.5—1300
SCAN TIME SEC................................ .01
MODE ....LIN FULL

Connect the oscilloscope to TP4. Set TIME/DIV to 2 msec and VOLTS/DIV to 0.2V. The voltage at test point 4 should look like the waveform of Figure C3-34B.

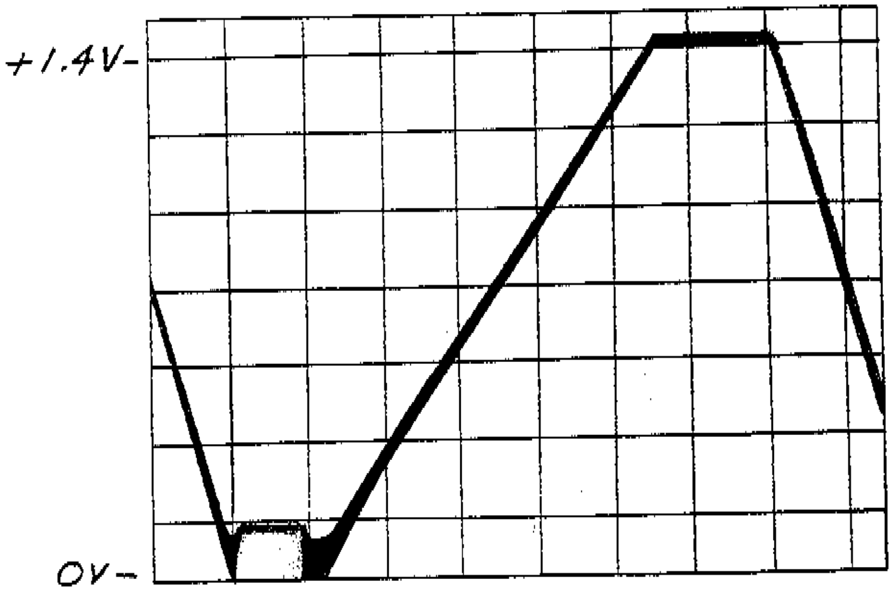


Figure C3-34B. Output of Frequency-to-Current Converter (TP 4)

The voltage at TP4 is proportional to the average current output of the Current Switch and thus to the frequency of the RF input signal, PTLO, as it varies from 600 kHz to 1300.1 MHz.

If this waveform is not present, then one or more of the following components may be faulty: 1) Current Switch: Q2, 2) Delay Line Driver: Q4, Q5, or VR2, 3) Amplifier-Limiter: U2. Also, operational amplifier U4 may not be maintaining a virtual ground at U4 pin 2.

Search Control

The operation of the Search Control may be checked in the two discriminated frequency ranges as described below.

0.5 — 13 MHz Range

1. Set the front-panel controls as follows:

RANGE MHz .... 0.5 — 13
MODE ....LIN EXP
WIDTH.................................CW±ΔF
SCAN TIME SEC.............................. .01
CW FREQUENCY MHz......................... 0
ΔF FREQUENCY MHz......................... 0

2. Disconnect PTLO at J1.

With PTLO disconnected, frequency feedback is prevented from reaching the summing junction of the Discriminator and the AFC loop will be unable to lock. The Tuning Voltage (V TUN) should be clamped at -400 mV by the Low-Frequency Clamp and the voltage offset at U4 pin 3 should be $+100$ mV.

Connect the oscilloscope to pin 25 or 50. Set TIM/DIV to 0.5 msec and VOLT/DIV to 1 volt. Since there is no frequency feedback, the Discriminator output (V FM) should look like the search waveform of Figure C3-34C.

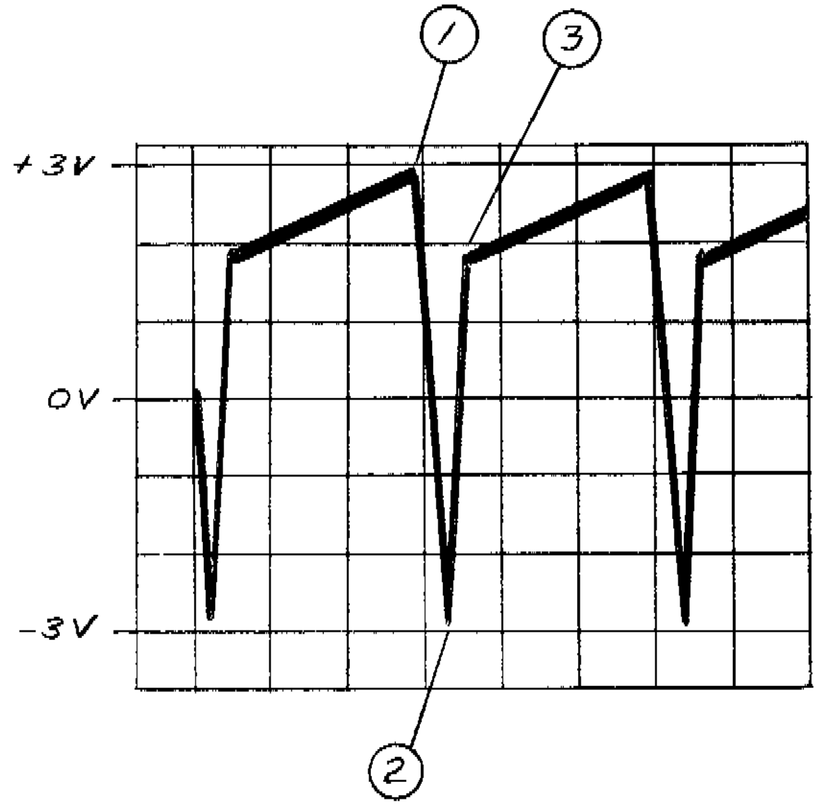


Figure C3-34C. Search Waveform, 0.5 – 13 MHz Range (Pin 25, 50)

The waveform of Figure C3-34C is generated by the Search Control as it attempts to keep V FM in the allowable range and bring it to $+1.5$ volts, where the AFC loop will lock if there is frequency feedback. The numbered points of the waveform are described below:

Point 1: Positive limit detector (VR4 and Q21) turns on Q11, causing V FM to slew in the negative direction.

Point 2: Negative limit detector (VR5 and Q22) turns on Q12 (Q11 is turned off since U9A and U9B apply a reset to flip-flop U8A at this point), causing V FM to slew in the positive direction.

Point 3: Reset comparator (U5) turns off Q12 so that no search current is injected into the summing junction. The only current flowing into the summing junction is due to the clamped Tuning Voltage. V FM slews in the positive direction at the reduced slope determined by the Tuning Voltage (clamped at -400 mV), the offset voltage at U4 pin 3 ($+100$ mV), and the feedback capacitance on U4 (Q9 should be on, providing maximum feedback capacitance.

0.5 — 130 MHz Range

The front panel controls should be set as for the 0.5 — 13 MHz range except that the RANGE MHz control should be set to 0.5 — 130. The RF input, PTLO, should be disconnected at J1.

With these control settings, the tuning voltage (V TUN) should be clamped at − 40 mV and the offset at U4 pin 3 should be + 10 mV.

Connect the oscilloscope to pin 25 or 50. Set TIM/DIV to 1 msec and VOLT/DIV to 1 volt. The absence of frequency feedback should cause the Search Control and Summing Amplifier to generate the search waveform of Figure C3-34D at the Discriminator output (pin 25, 50).

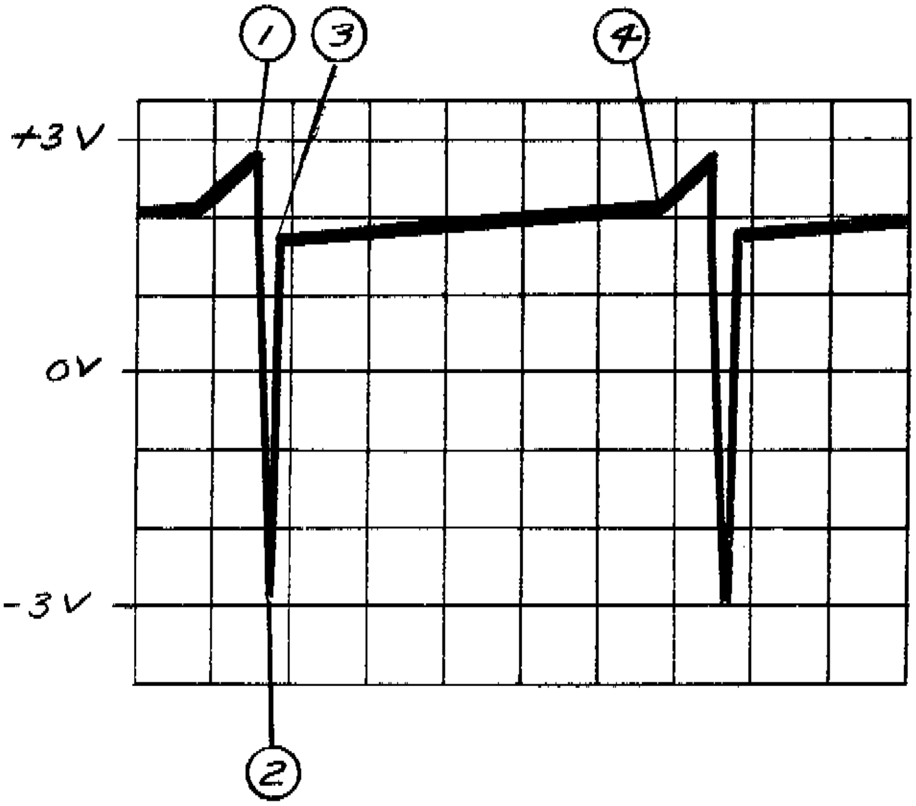


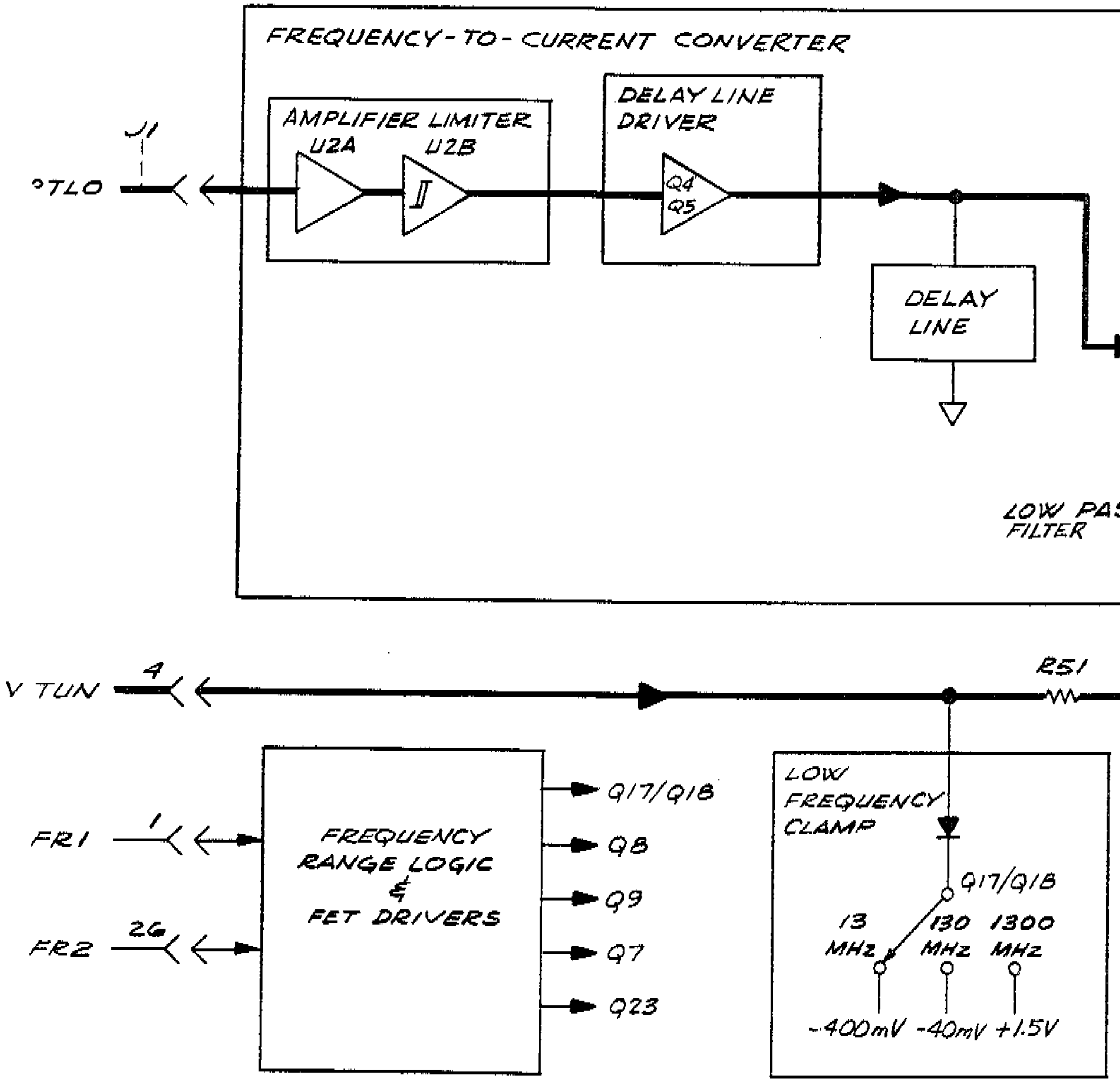
Figure C3-34D. Search Waveform, 0.5 – 130 MHz Range (Pin 25, 50)

Points 1 and 2 of the search waveform in Figure C3-34D correspond exactly to points 1 and 2 in Figure C3-34C, described above. Points 3 and 4 are described below:

Point 3: Reset comparator (U5) turns off Q12 so that no search current is injected into the summing junction. The only current flowing into the summing junction is due to the clamped Tuning Voltage. V FM slews in the positive direction with a reduced slope determined by the Tuning Voltage (clamped at − 40 mV), the offset voltage at U4 pin 3 (+ 10 mV), and the feedback capacitance on U4 (since C9 has been discharged by Q20, Q9 should be on, providing maximum capacitance.

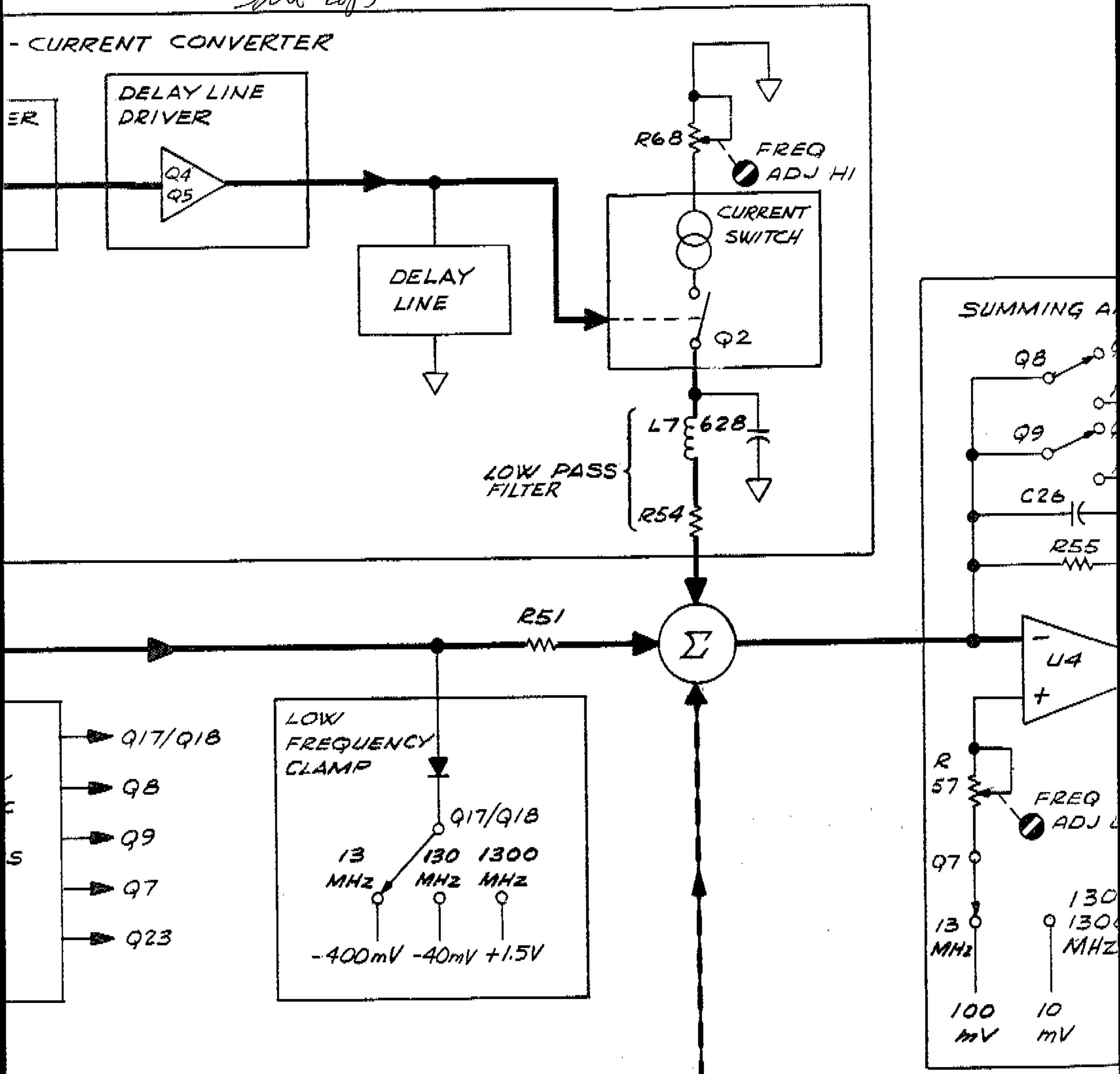
Point 4: FET Q9 is turned off by Q16 (C9 is now charged), reducing the feedback capacitance on U4. This causes V FM to slew with an increased slope until the positive limit is reached.

FIg C3-43E
Sht 1 of 5



RANGE MHz	Q17/Q18	Q8	Q9	Q7	Q23
0.5–13	-400mV	0	1	100mV	1
0.5–130	-40 mV	0	0	10mV	1
0.5–1300	+1.5V	1	—	—	0

Fig C3-43E
Sht 2 of 5



8	Q8	Q9	Q7	Q23
1	0	1	100mV	1
1	0	0	10mV	1
	1	—	—	0

Fig C3-43E
Sht 3 of 5

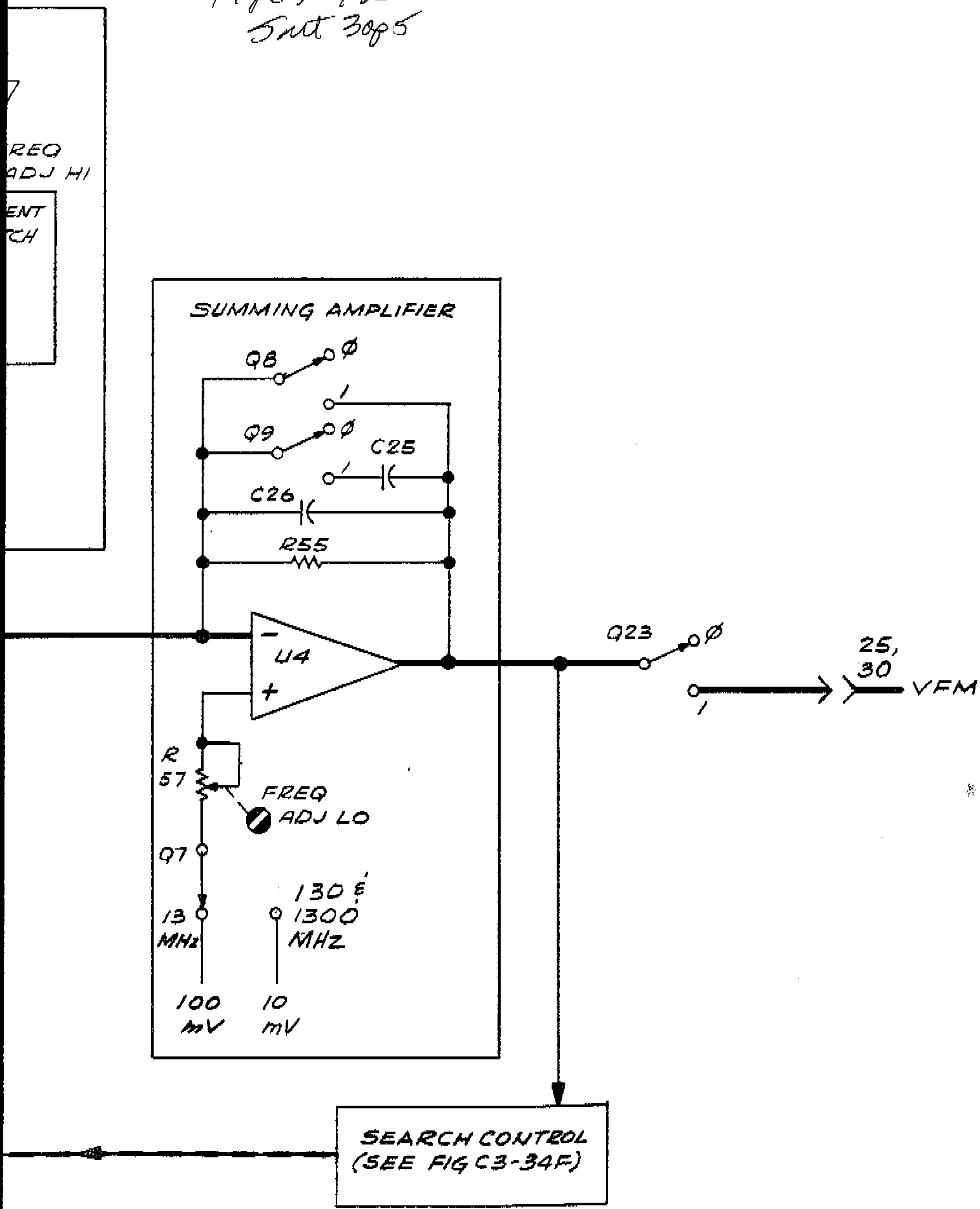


Figure C3-43e. A2A9 Discriminator, Block Diagram (1 of 2)

Fig C3-43E
Sht 4 of 5

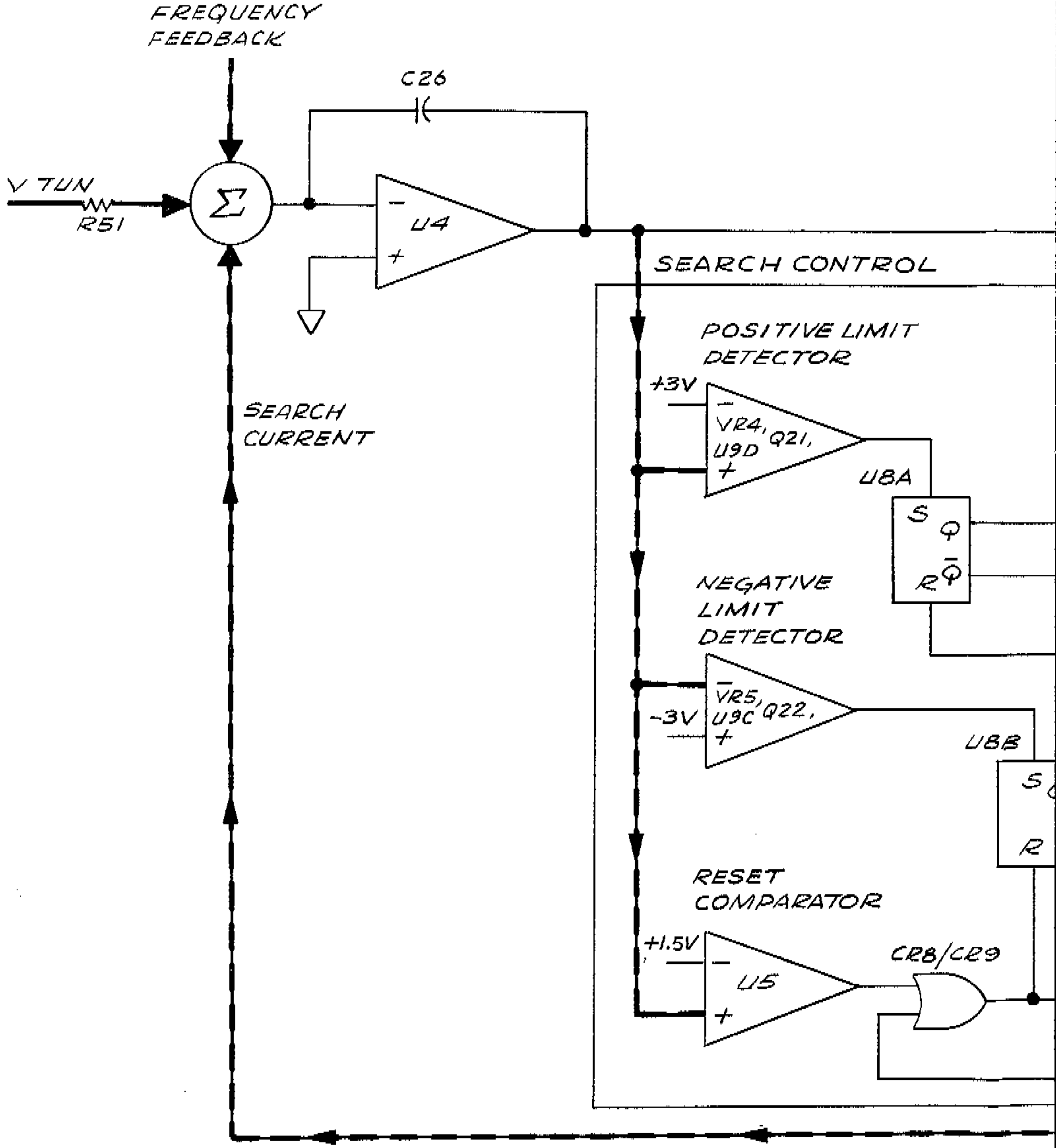


Fig C3-43E
Subst 50/5

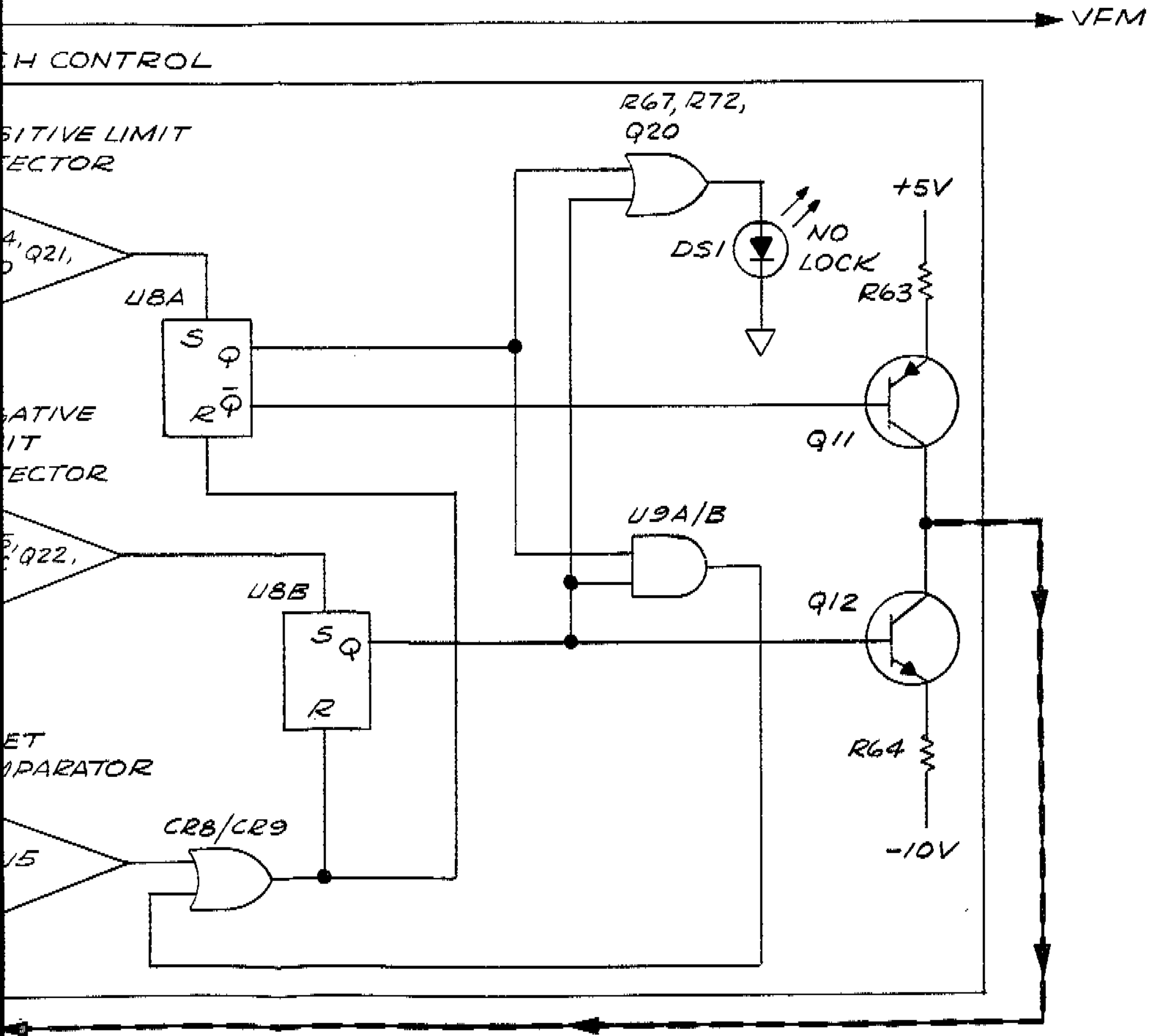


Figure C3-43e. A2A9 Discriminator, Block Diagram (2 of 2)

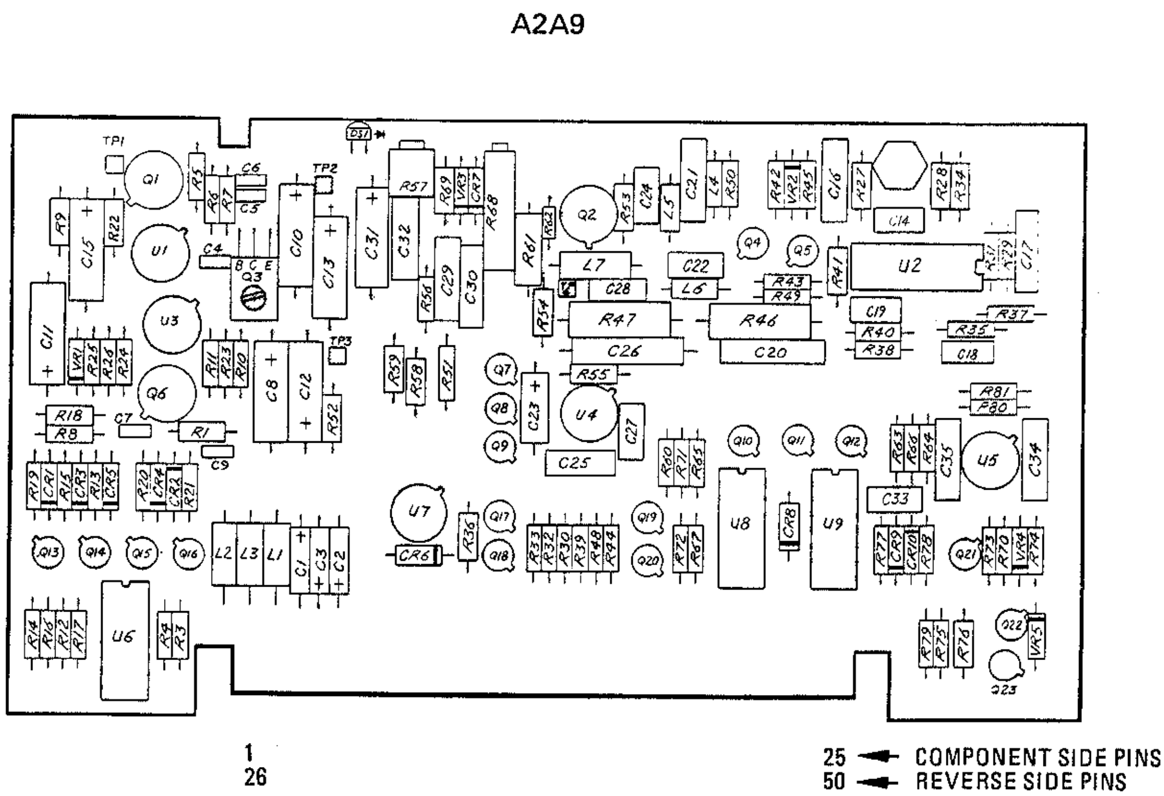
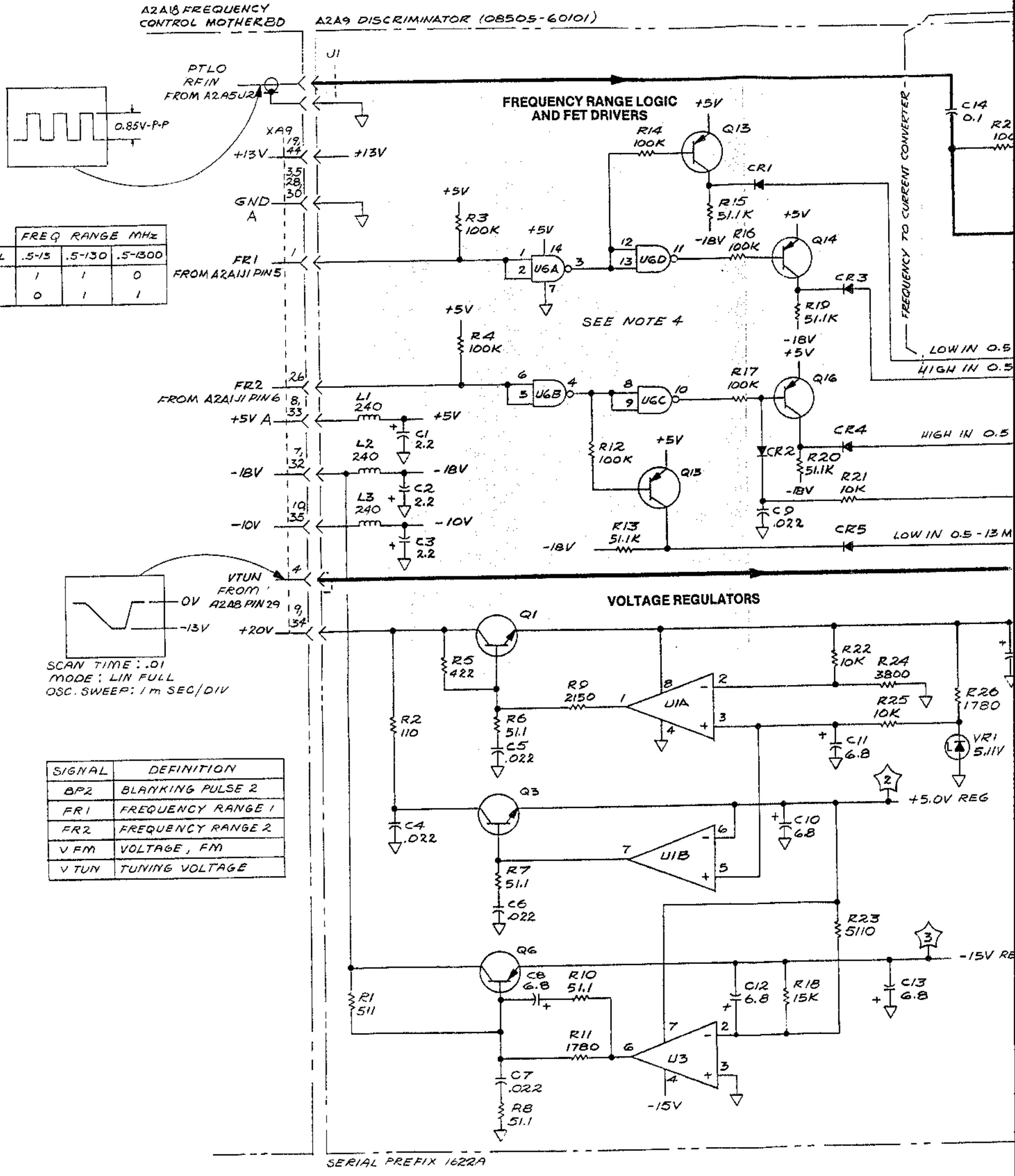


Figure C3-35. A2A9 Discriminator Parts Locations

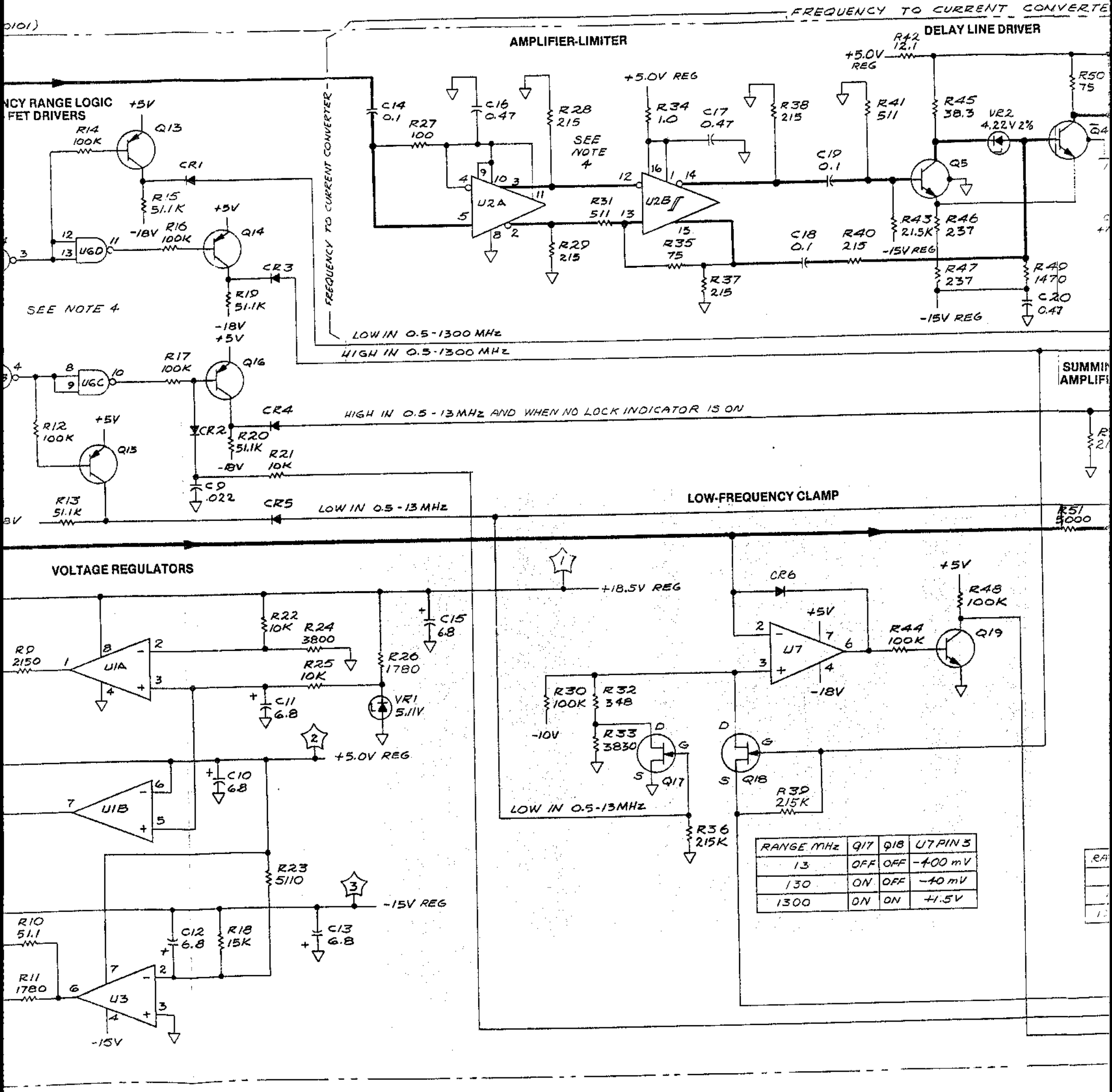
Fig C3-36
Sht 1 of 4



	FREQ RANGE MHz		
SIGNAL	.5-13	.5-130	.5-1300
FR1	1	1	0
FR2	0	1	1

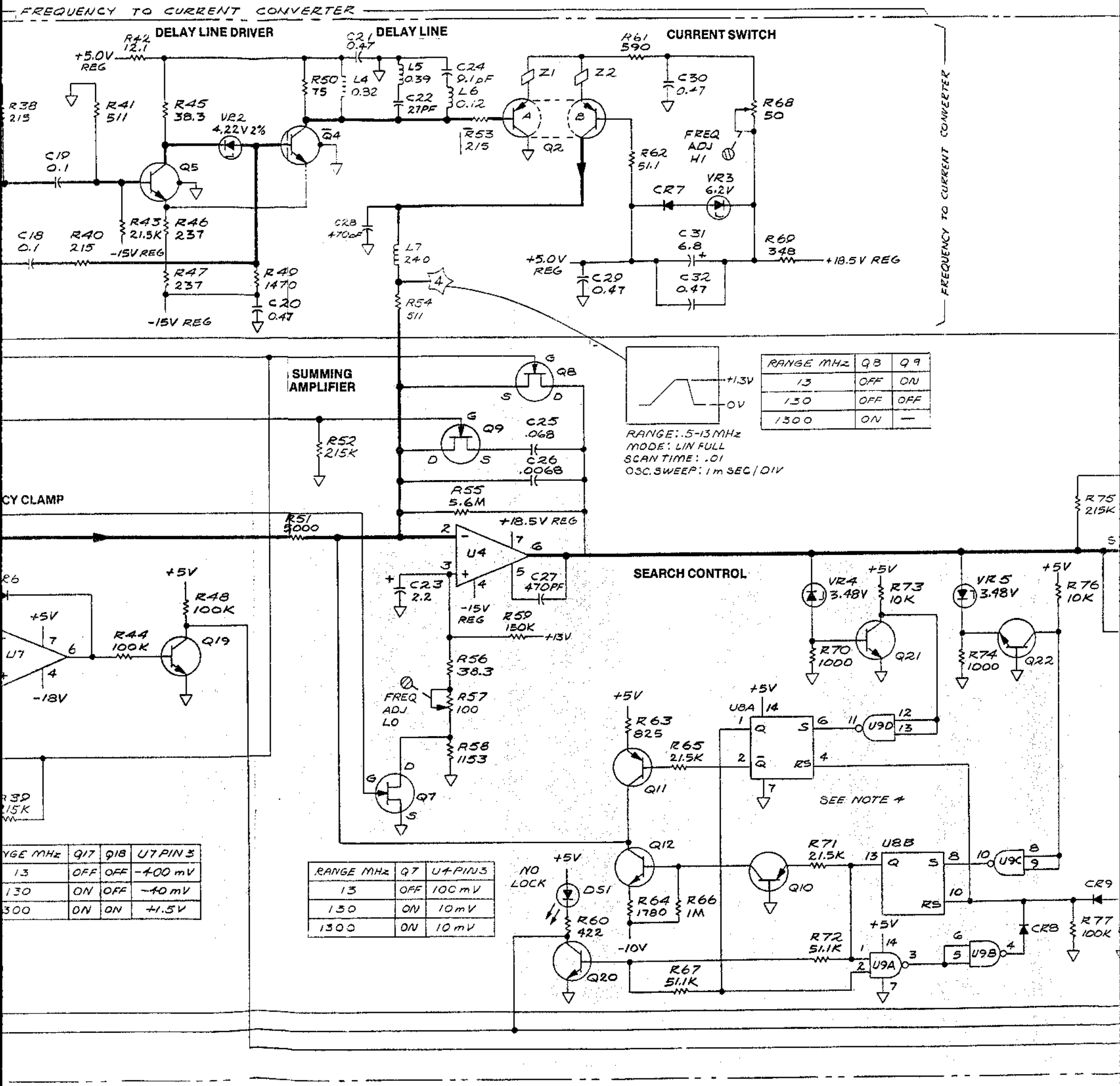
SIGNAL	DEFINITION
BP2	BLANKING PULSE 2
FR1	FREQUENCY RANGE 1
FR2	FREQUENCY RANGE 2
V FM	VOLTAGE, FM
V TUN	TUNING VOLTAGE

Fig C3-36
Sht 2 of 4



RANGE MHz	Q17	Q18	U7 PIN 3
13	OFF	OFF	-400 mV
130	ON	OFF	-40 mV
1300	ON	ON	+1.5V

Figc 3-36
Sht 3 of 4



RANGE MHz	Q8	Q9
13	OFF	ON
130	OFF	OFF
1300	ON	—

RANGE MHz	Q7	U4 PIN 3
13	OFF	100 mV
130	ON	10 mV
1300	ON	10 mV

[N]GE MHz	Q17	Q18	U7 PIN 3
13	OFF	OFF	-400 mV
130	ON	OFF	-40 mV
[1]300	ON	ON	+1.5 V

Fig C3-36
Sht 4 of 4

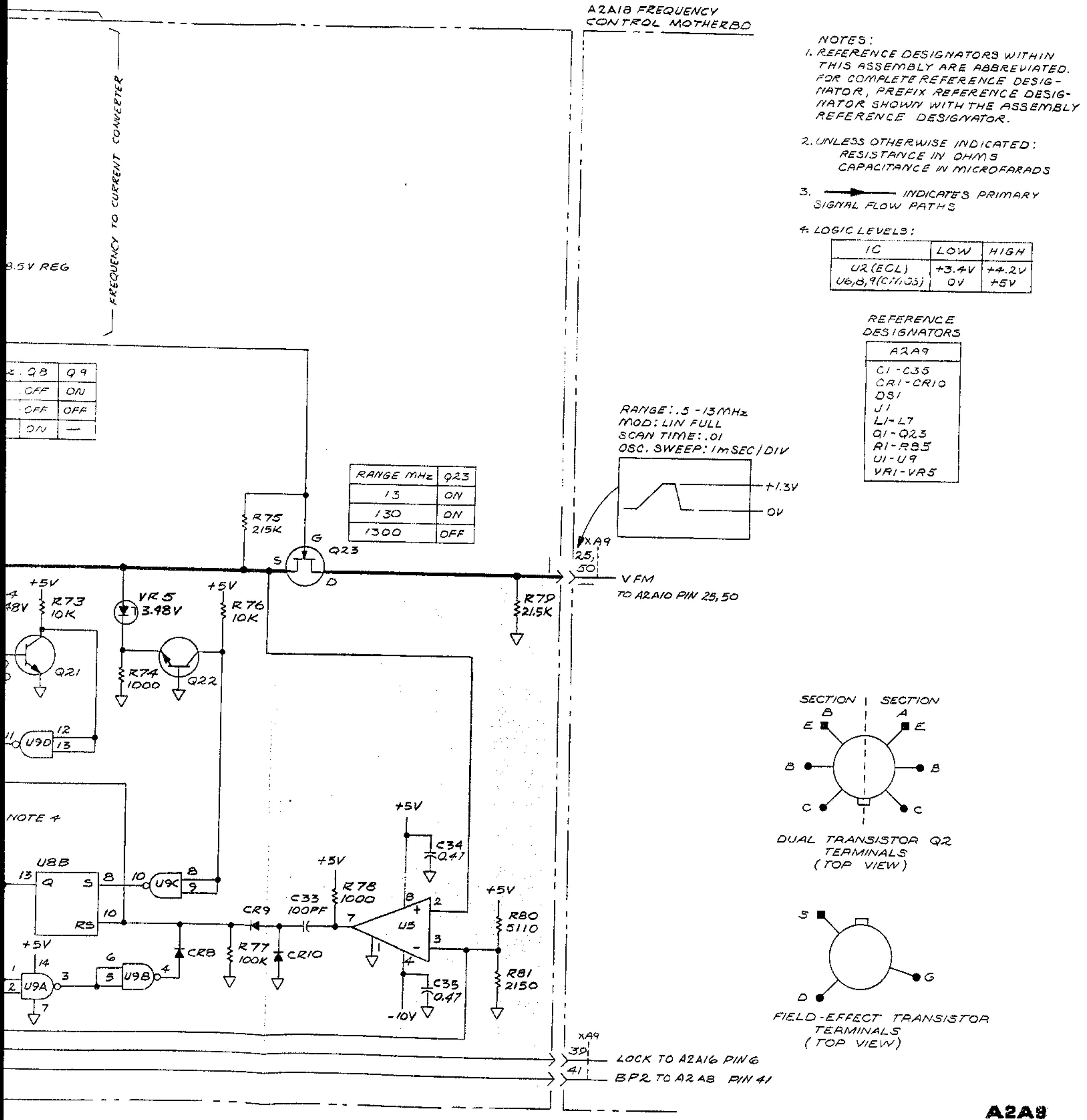


Figure C3-36. A2A9 Discriminator, Schematic

A2A10 FM DRIVER

General Description

The FM Driver is part of the automatic frequency control (AFC) loop and drives the YIG oscillator FM coil.

Buffer Amplifier

The input voltage of the FM Driver (VFM) is derived from the discriminator circuit A2A9. This voltage is amplified by operational amplifier U1.

Low Pass Filter

Capacitors C2, C3, C4, C5, C6 and C7 and inductors L1 and L2 form a 15 kHz low pass filter. This low pass filter attenuates the noise and residual pulses which are outside the AFC loop bandwidth.

FM Driver

The FM Driver is a unity gain voltage follower with high drive current capability. It consists of dual transistor amplifier Q5 and push-pull output transistors Q1, Q2, Q3 and Q4. The FM Driver output current to the YIG oscillator FM coil is driven through R21 to pin 26 of the FM Driver Assembly.

Test point 1 is available to measure the output voltage and test point 2 is used to measure the input voltage.

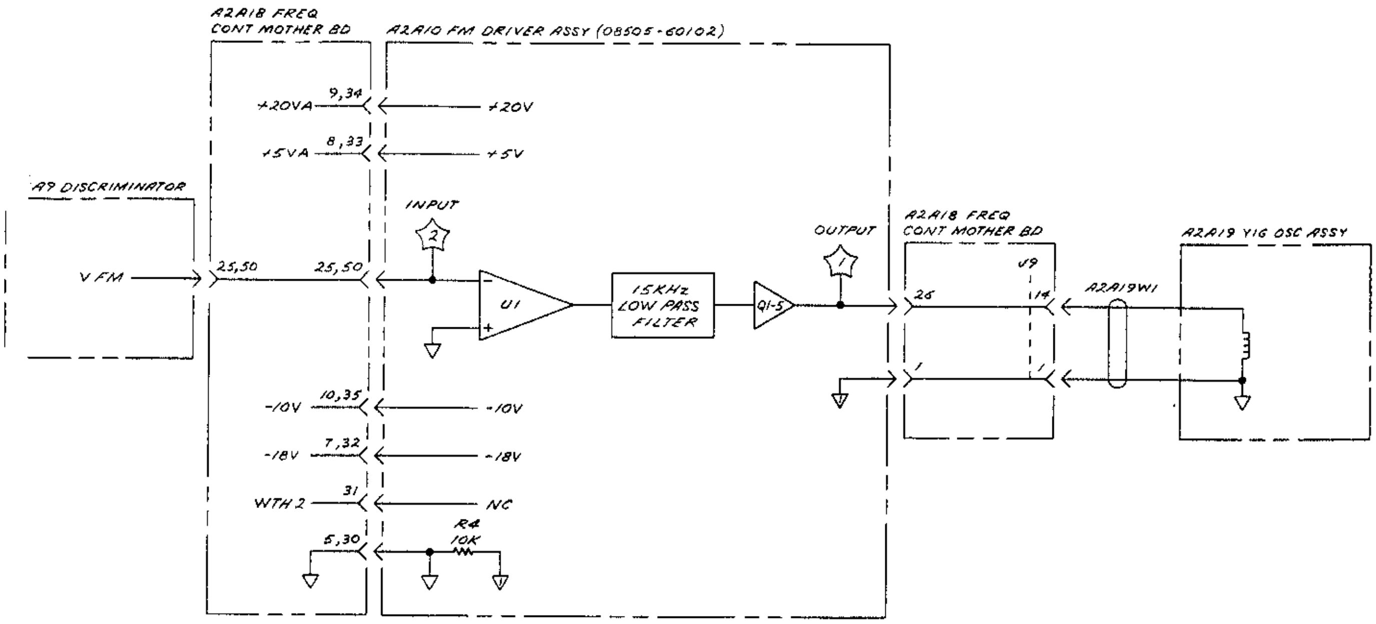


Figure C3-36A. A2A10 FM Driver Block Diagram

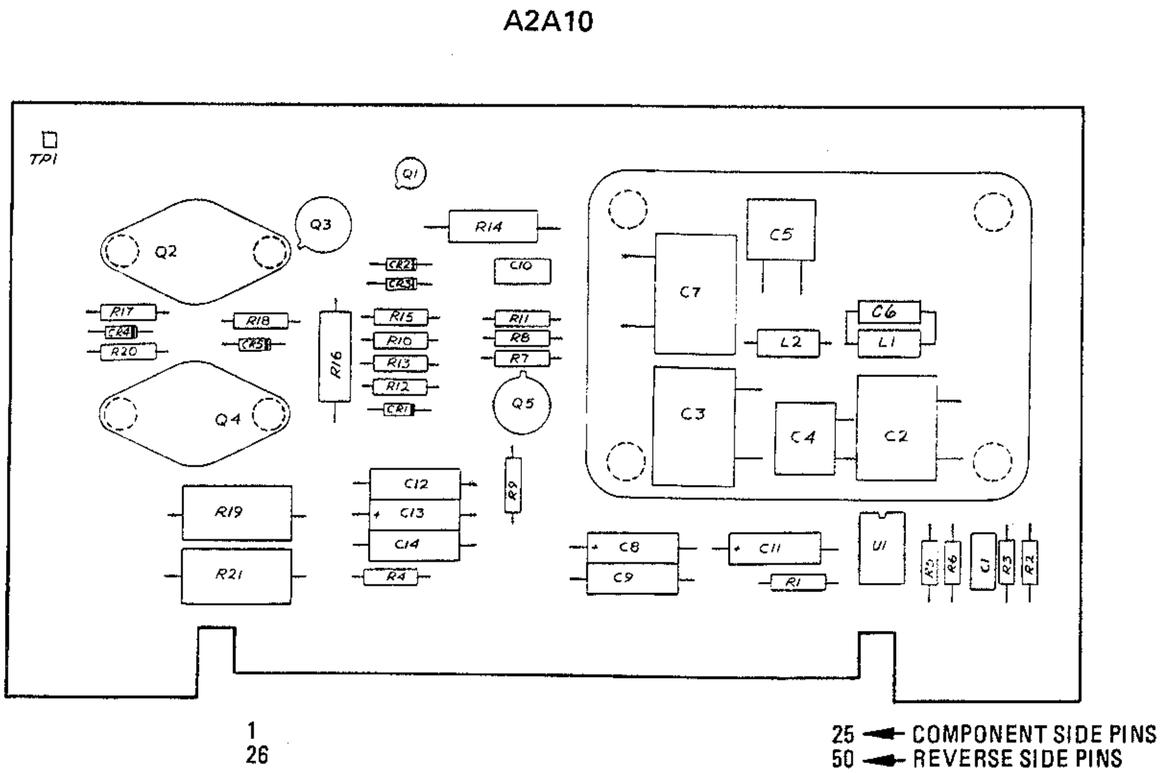
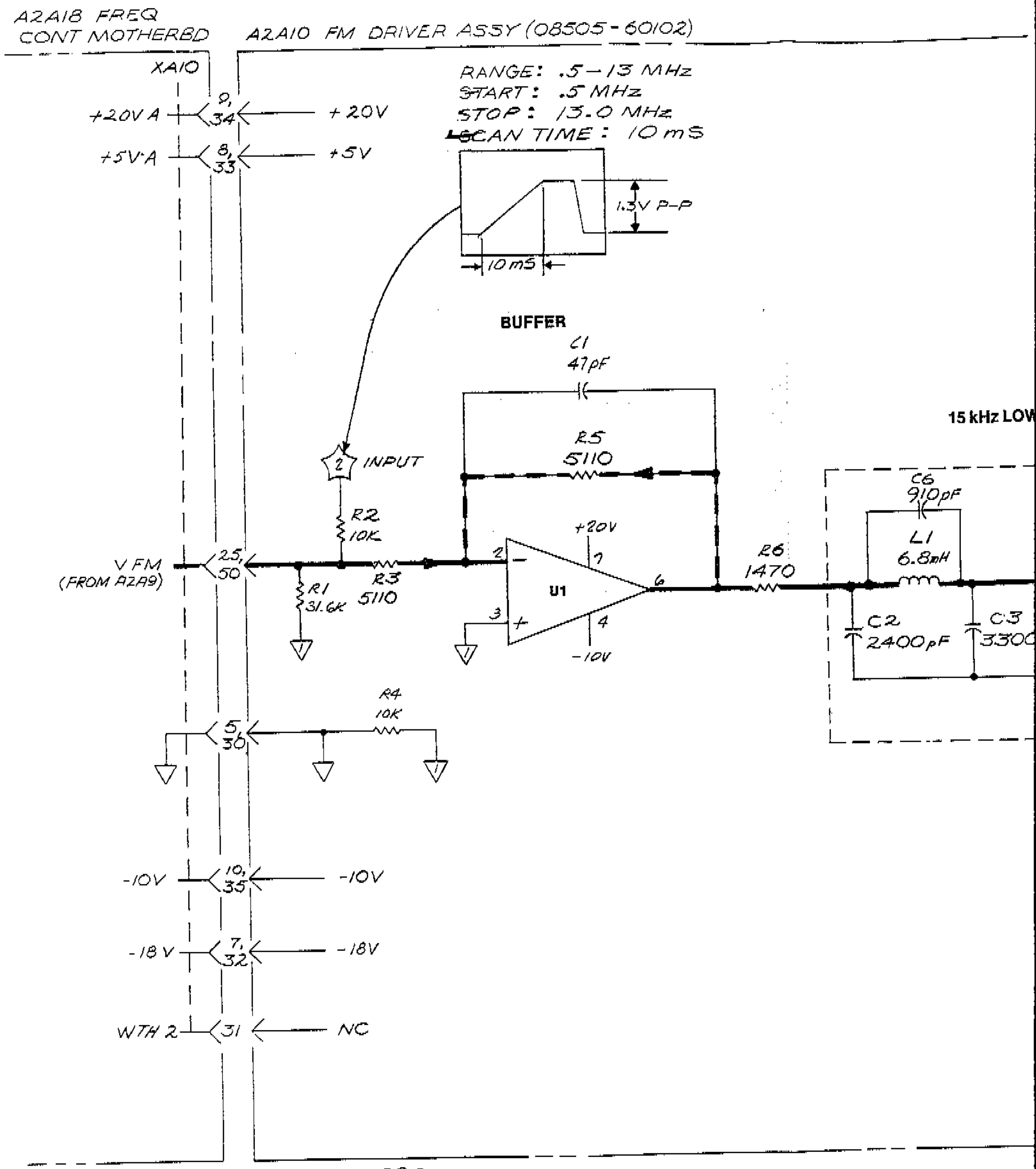


Figure C3-37. A2A10 FM Driver Parts Locations

Fig C3-38
Slt 10f4



SERIAL PREFIX 1622A

Fig C3-38
Sht 2 of 4

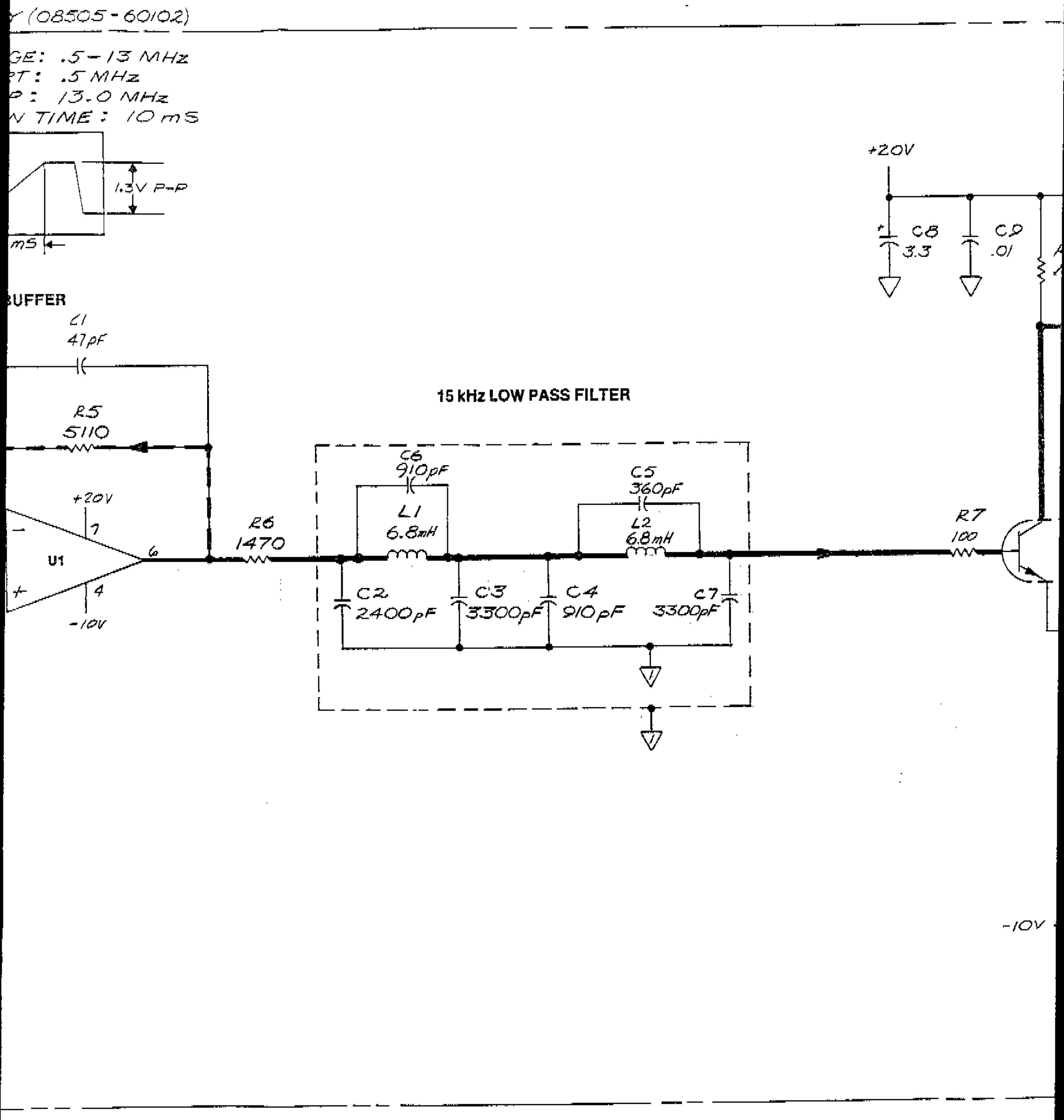


Fig 8.3-38
Sht 3 of 4

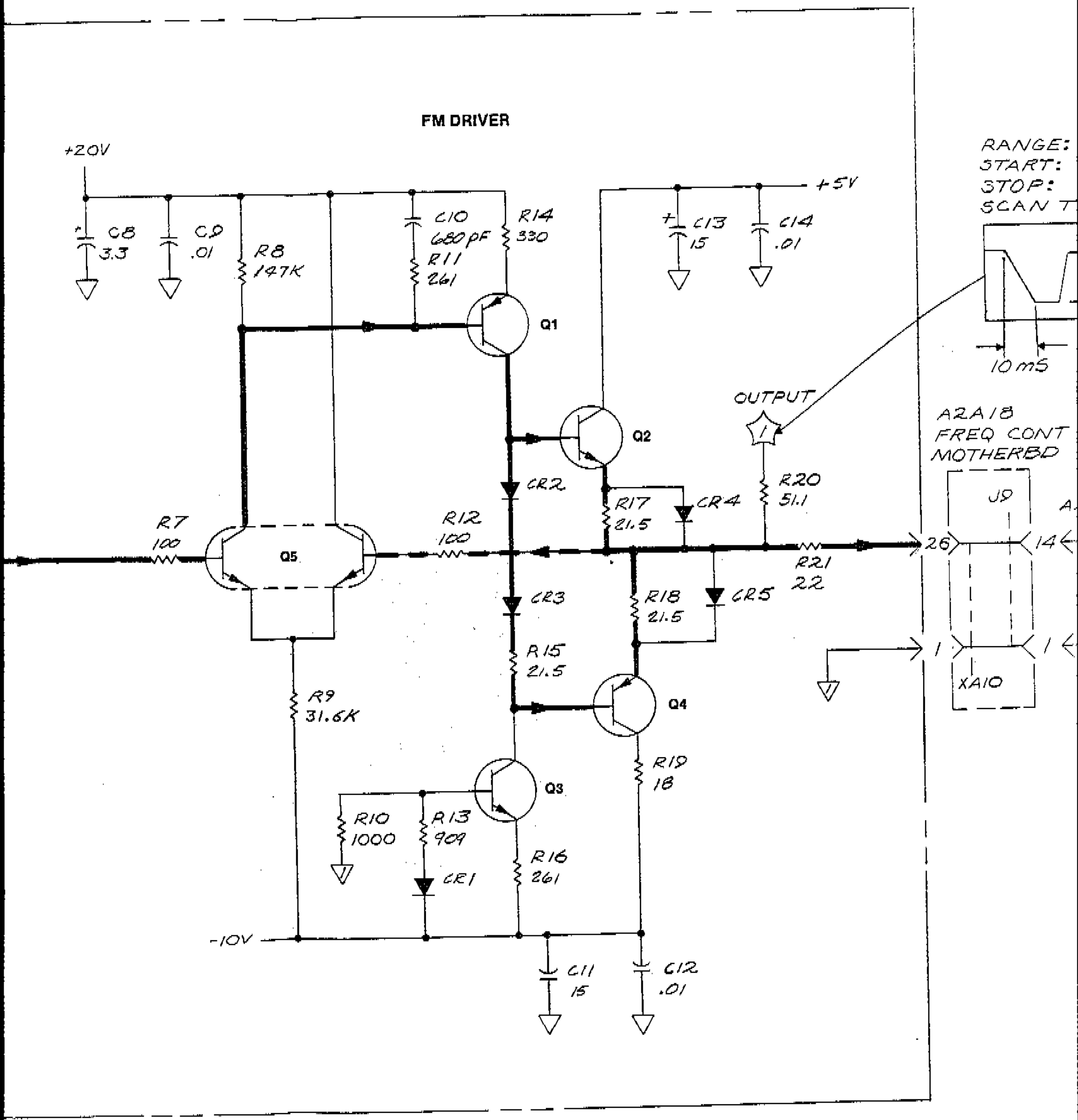
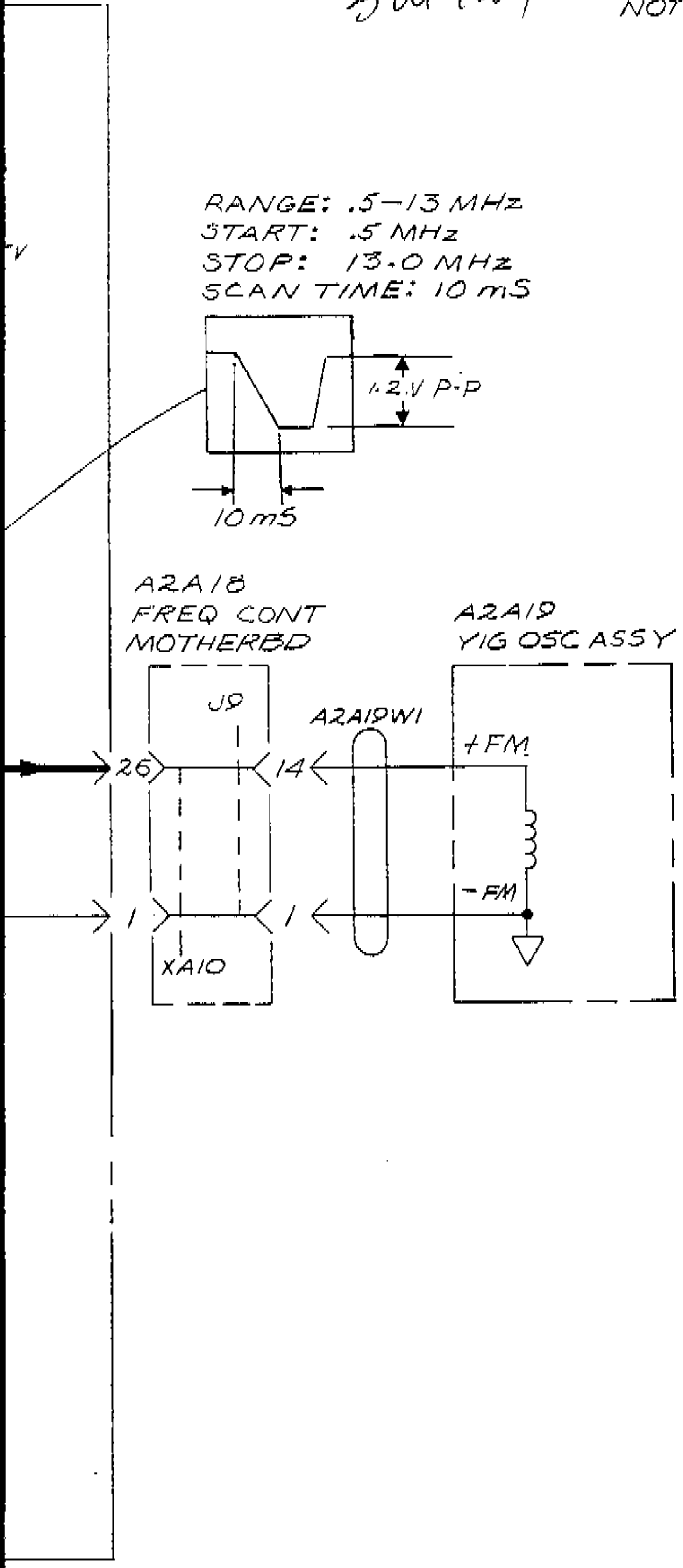


Fig C3-38
5Ut4064



NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATOR, PREFIX REFERENCE DESIGNATOR SHOWN WITH THE ASSEMBLY REFERENCE DESIGNATOR.
2. UNLESS OTHERWISE INDICATED,
   RESISTANCE IN OHMS
   CAPACITANCE IN MICROFARADS

REFERENCE DESIGNATIONS

A2A10
C1-C14
CR1-CR5
L1, L2
Q1-Q5
R1-R21
U1

3. ——▶—— INDICATES PRIMARY SIGNAL FLOW PATH. — —◀— — INDICATES PRIMARY FEEDBACK PATH.

A2A10

Figure C3-83. A2A10 FM Driver, Schematic

A2A11 MAIN DRIVER

General Description

The Main Driver assembly provides the current for the main coil of the YIG-Tuned Oscillator (YTO) in the 130 MHz and 1300 MHz ranges. It comprises three major parts: (1) a Tuning Current Source whose output current varies according to the input tuning voltage (VTUN); (2) an Offset Current Source that tunes the YTO to 4.2105 GHz (corresponding to 500 kHz at the RF port); and (3) a logic-controlled Tuning Coil Filter.

Tuning Current Source

The Tuning Current Source consists of a voltage-to-current converter driven by the tuning voltage (VTUN). The tuning voltage, whose waveform may be observed at test point 1, is switched to the non-inverting input of U1 if the FET Q5 is conducting. This voltage is divided by a factor of ten by the voltage divider R8 and R9 and switched to the non-inverting input of U1 if FET Q7 is conducting. The states of Q5 and Q7 are determined by the selected frequency range of the instrument (0.5 — 13 MHz, 0.5 — 130 MHz, 0.5 — 1300 MHz). The input voltage of U1 is converted into a tuning current for the YTO by a voltage-to-current converter consisting of U1, Q3, Q1, and R28. The current for the maximum frequency of the YTO (5.5100 GHz, corresponding to 1300 MHz at the RF port) is set by selecting R22 and adjusting R17.* The Zener diode VR1 and the resistor R21 compensate for a non-linearity of the YTO tuning characteristic at high frequencies. Capacitors C7 and C9 and resistors R37 and R43 form a high-pass filter to compensate for the eddy current delay of the YTO at fast sweep speeds. The collector current of Q1 and Q3 is added to the constant collector current of Q2 and Q4 to provide the total tuning current for the YTO. The main tuning coil of the YTO is connected to PIN 29 of the Main Driver Board.

Offset Current Source

The Offset Current Source consists of a constant voltage source and a voltage-to-current converter. The constant voltage is generated across zener diodes (VR2, VR3, VR4) with series resistors R31 and R34, which are connected to the −40 V power supply. This constant voltage is divided by a voltage divider consisting of R36, R39, and R40. The value of R40 is selected to produce the offset frequency of 4.2105 GHz.* The voltage division also depends on the position of the FREQUENCY CAL potentiometer on the front panel, which is connected to the voltage divider via R41. The voltage divider provides the constant input voltage for a voltage-to-current converter consisting of U2, Q4, Q2, and R30. The voltage across R30 is fed back to the inverting input of U2; it is also present at test point 2. The collector current of the Darlington pair Q2 and Q4 is the constant offset current which causes the YTO to generate the 4.2105 GHz frequency.

Tuning Coil Filter

In CW operation or at small frequency sweep widths a capacitor (C6) is connected in parallel with the main tuning coil of the YTO. This capacitor is switched by Q10 and Q9, which are driven by the Control Logic decoder formed by U3, U4, and U5. The decoder is driven by logic lines and controls the state of Q10. (Refer to Control Logic Decoding table on schematic diagram.)

*See Adjustment Procedure, Paragraph A5-20.

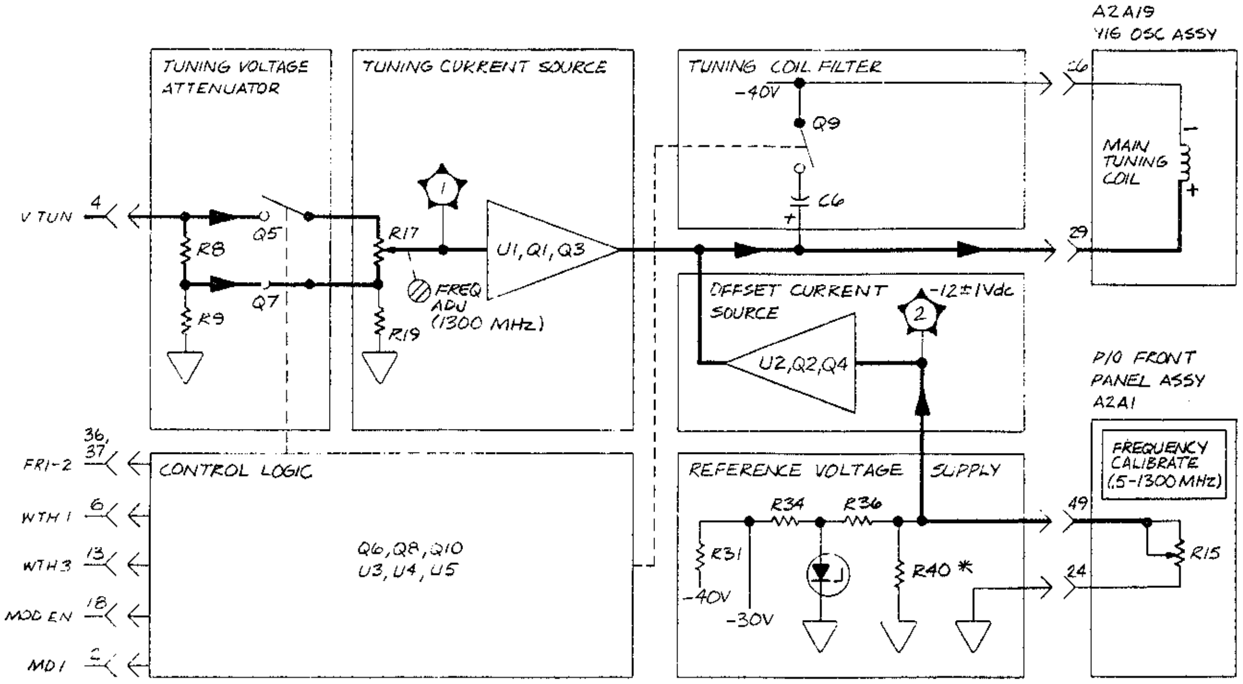


Figure C3-38A. A2A11 Main Driver Block Diagram

A2A11

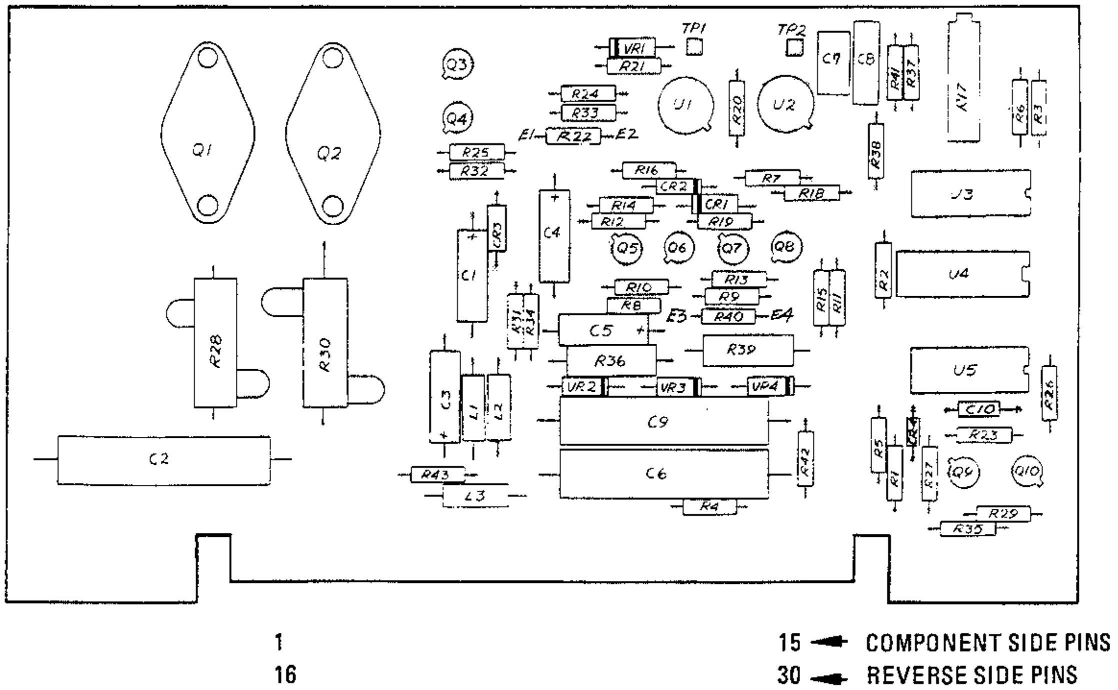


Figure C3-39. A2A11 Main Driver Parts Locations

Figc3-40, Sct/Q4

MODE SWITCH TABLE

FRONT PANEL SWITCH	SIGNAL	
MODE	MD 1	MD 2
LOG FULL	1	0
LIN FULL	1	1
LIN EXPAND	0	1

RANGE SWITCH TABLE

FRONT PANEL SWITCH	SIGNAL	
RANGE MHz	FR1	FR2
.5-13	1	0
.5-130	1	1
.5-1300	0	1

WIDTH SWITCH TABLE

FRONT PANEL SWITCH	SIGNAL		
WIDTH	WTH 3	WTH 2	WTH 1
S/S 1	0	0	1
S/S 2	0	1	1
ALT	0	1	0
ΔF	1	1	0
CW	1	1	1

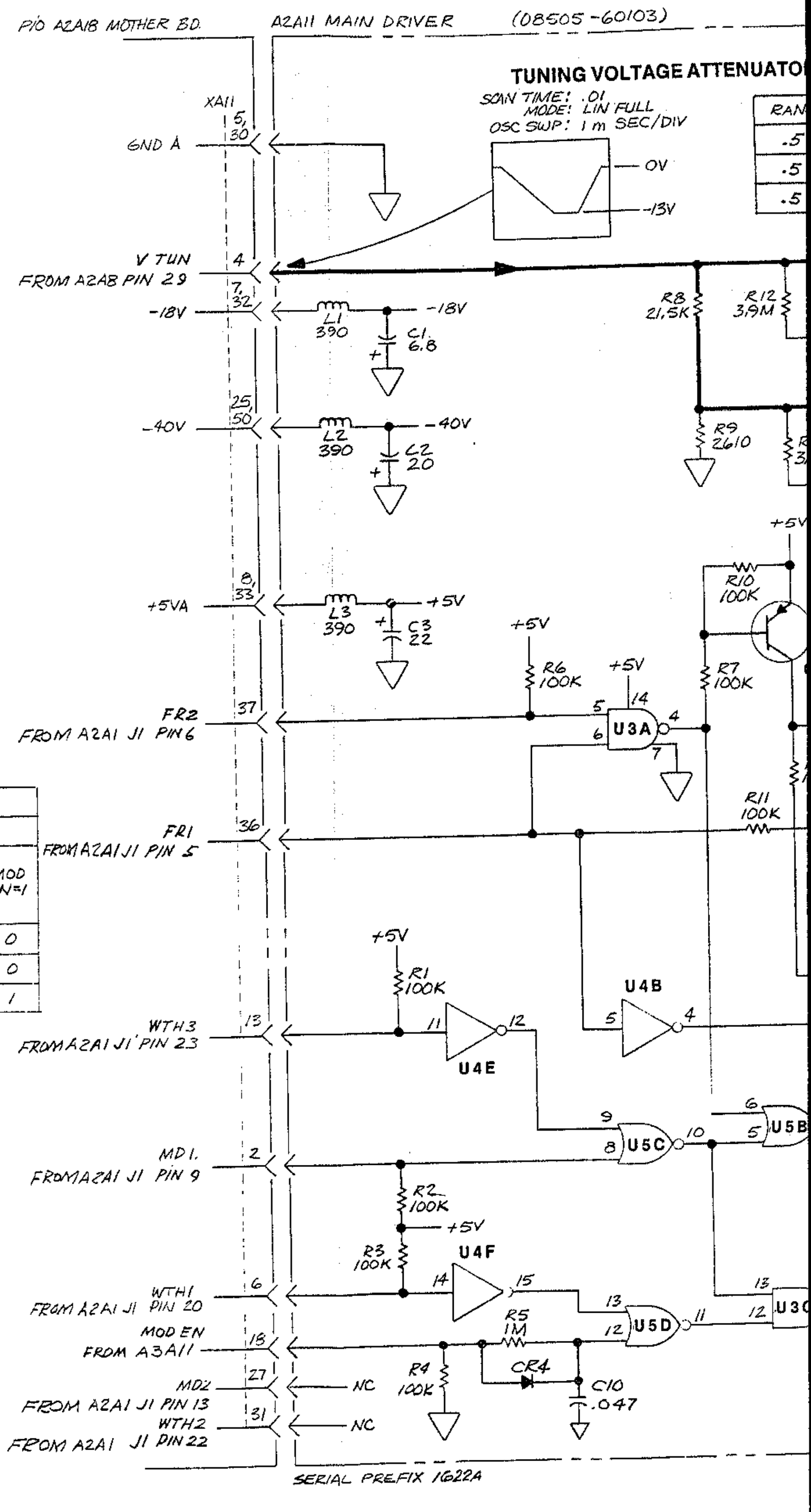
CONTROL LOGIC DECODING

FRONT PANEL SWITCH SETTINGS	STATE OF U4 PIN 10					
	LOG FULL	LIN FULL	LIN EXPAND			
			WIDTH			MOD EN=1
RANGE MHz			S/S	CW ± ΔF	CW	
.5-13	0	0	0	0	0	0
.5-130	1	1	1	0	0	0
.5-1300	1	1	1	1	0	1

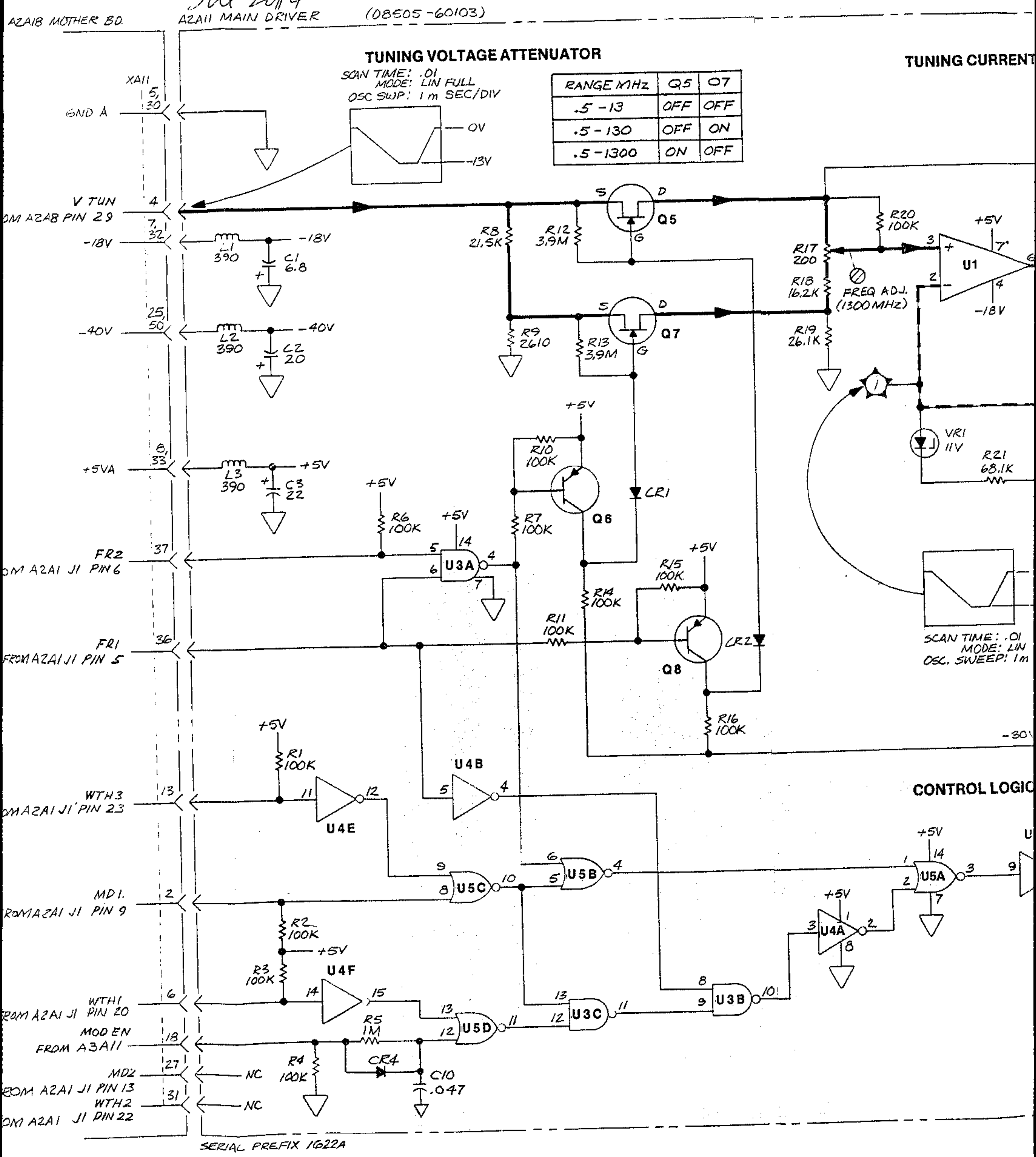
MNEMONIC TABLE

SIGNAL	DEFINITION
FR1	FREQUENCY RANGE 1
FR2	FREQUENCY RANGE 2
MD1	MODE 1
MD2	MODE 2
MOD EN	MODULATION ENABLE
V TUN	TUNING VOLTAGE
WTH 1	WIDTH 1
WTH 2	WIDTH 2
WTH 3	WIDTH 3

MOD EN = 1 IF SIGNAL PROCESSOR IS IN SAMPLING GROUP DELAY MODE



Figc3-40
Sht 2 of 4



RANGE MHz	Q5	Q7
.5 - 13	OFF	OFF
.5 - 130	OFF	ON
.5 - 1300	ON	OFF

Fig 3-40
Sht 3 of 4

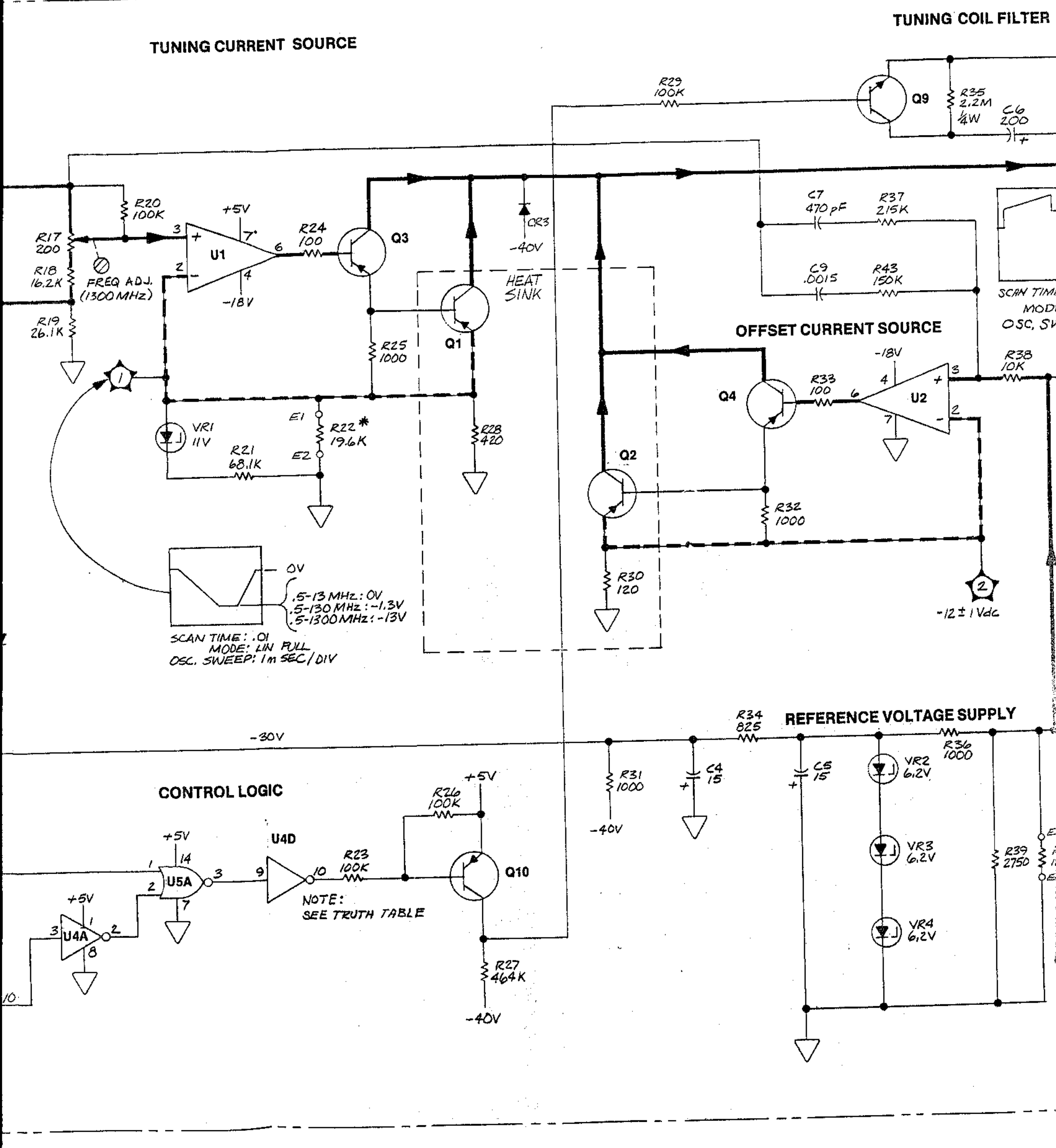
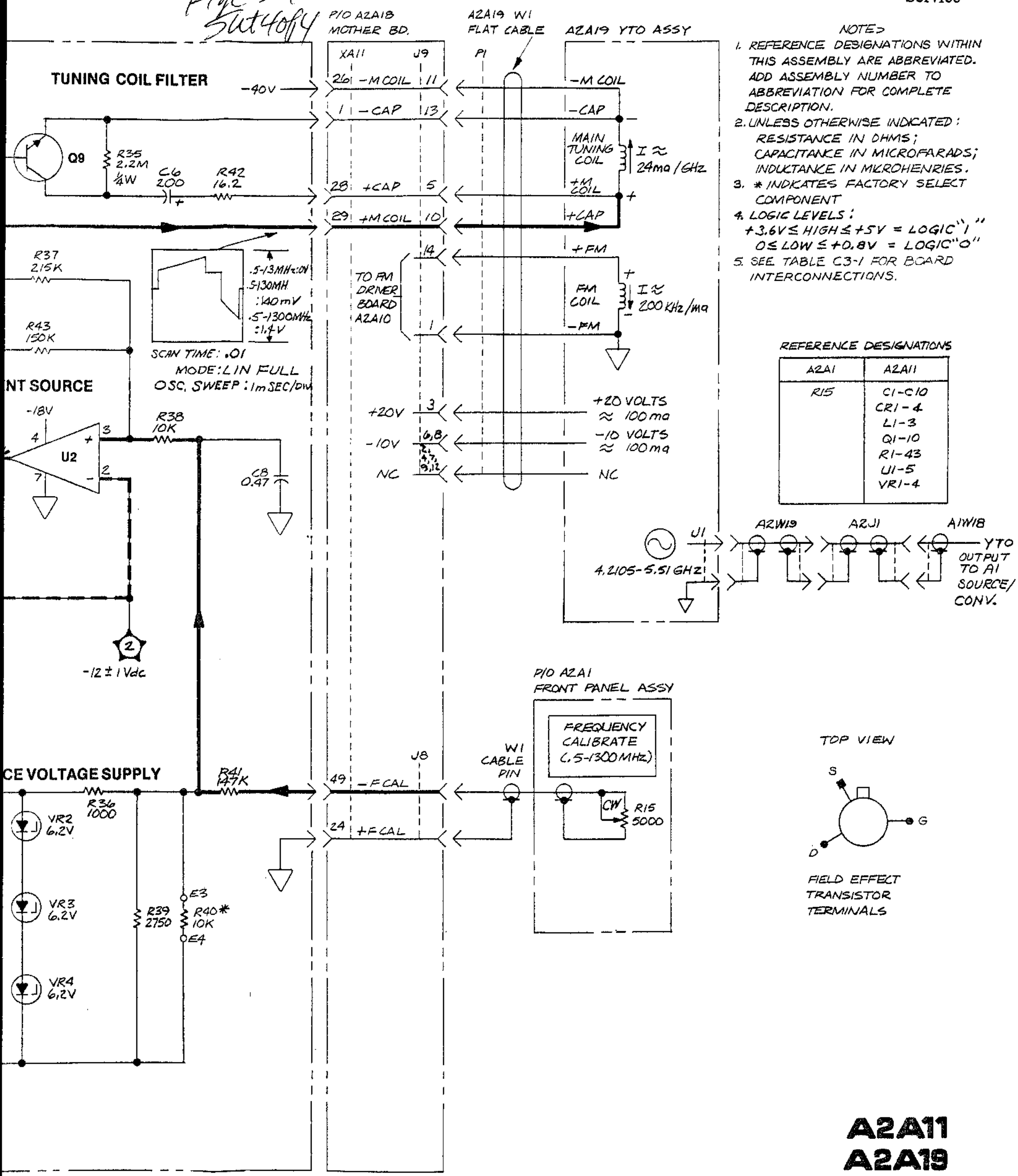


Fig C3-40
Sht 4 of 4



NOTES:
1. REFERENCE DESIGNATIONS WITHIN THIS ASSEMBLY ARE ABBREVIATED. ADD ASSEMBLY NUMBER TO ABBREVIATION FOR COMPLETE DESCRIPTION.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IN OHMS; CAPACITANCE IN MICROFARADS; INDUCTANCE IN MICROHENRIES.
3. * INDICATES FACTORY SELECT COMPONENT
4. LOGIC LEVELS:
   $+3.6V \leq HIGH \leq +5V$ = LOGIC "1"
   $0 \leq LOW \leq +0.8V$ = LOGIC "0"
5. SEE TABLE C3-1 FOR BOARD INTERCONNECTIONS.

REFERENCE DESIGNATIONS

A2A1	A2A11
R15	C1-C10 CR1-4 L1-3 Q1-10 R1-43 U1-5 VR1-4

A2A11
A2A19

Figure C3-40. A2A11 Main Driver, Schematic

A2A12 10/100 MHz OSCILLATOR, CIRCUIT DESCRIPTION

General Description

The 10/100 MHz Oscillator assembly provides stable 100 MHz and 10 MHz reference frequencies for the A1 Source Converter and a 10 MHz reference frequency for the frequency counter time-base on the A2A6 Marker assembly.

The 100 MHz Oscillator is comprised of Q1, a common-base amplifier, Q2, an emitter-follower, and Y1, a 100 MHz crystal. The collector circuit of Q2 is tuned to 100 MHz. Capacitor C10 provides adjustment of the 100 MHz Oscillator frequency with a range of approximately 2500 Hz. The 100 MHz crystal is matched with the 9.9 MHz crystal A1A15A1Y1, in the A1 Source Converter, to provide tracking within ±2 ppm.

Transistor Q2 drives a 6 dB Power Splitter T1 which feeds two separate signal paths. One path consists of Q3 and a 3 dB pad (R27, R29, R30) which provides buffering of the 100 MHz applied to the A1 Source Converter.

The other path consists of a buffer amplifier Q4, a divide by ten, and three output buffers. Buffer Q4 is a common-base amplifier used to drive U1 which is an ECL divide by ten. The output of U1 (10 MHz) is applied through three low-pass filters (L8/C26, L9/C28, L10/C30) to three common-emitter buffer amplifiers Q5, Q6, and Q7.

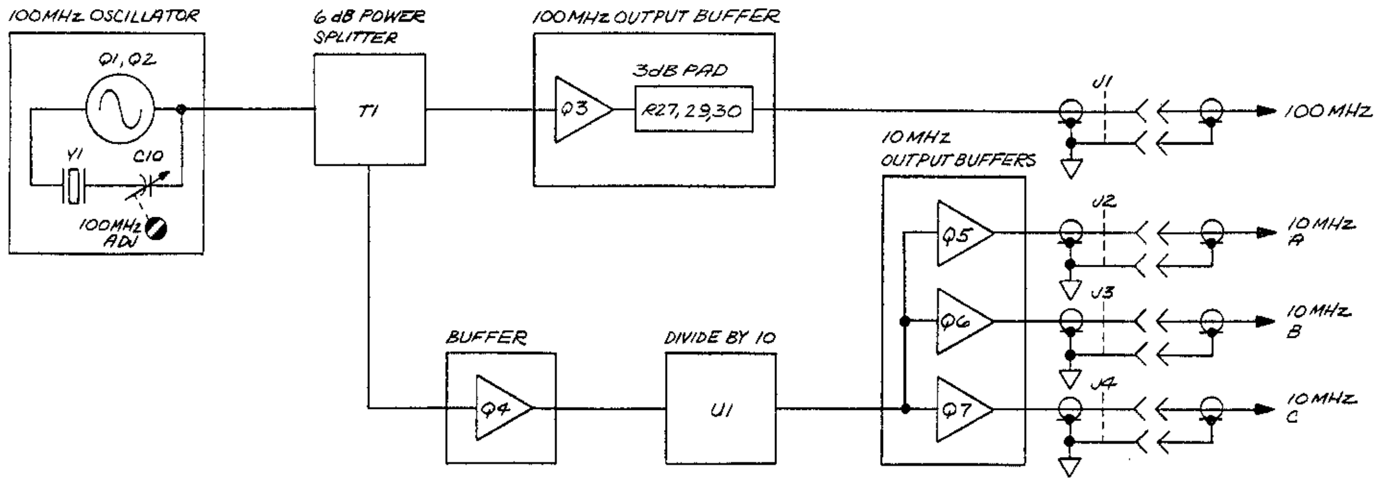


Figure C3-40A. A2A12 10/100 MHz Oscillator Block Diagram

A2A12

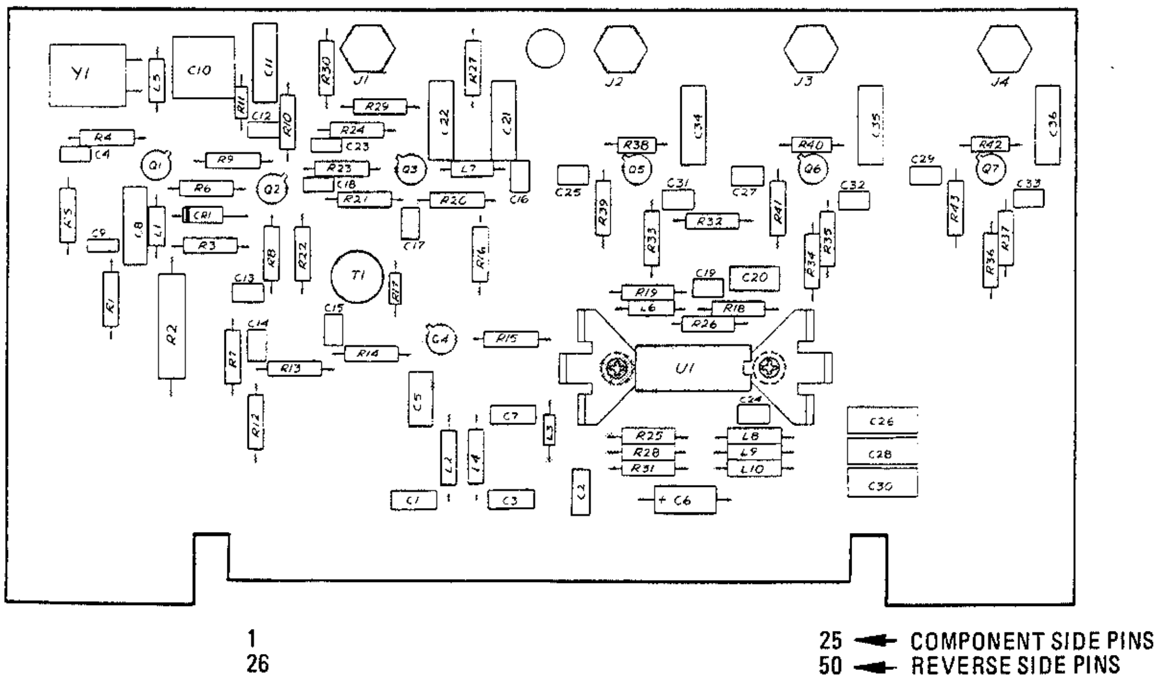
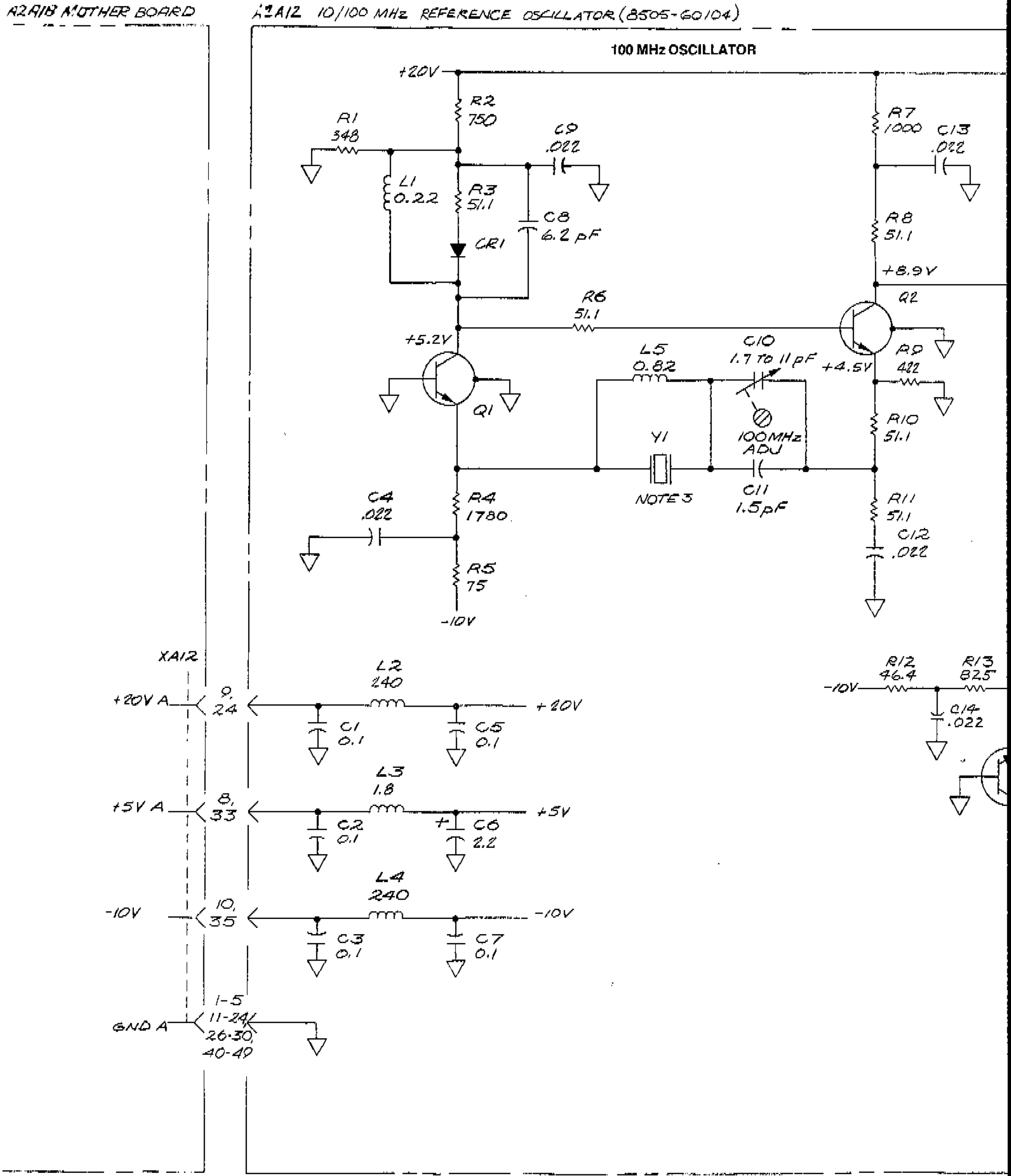


Figure C3-41. A2A12 10/100 MHz Oscillator Parts Locations

Fig C3-42, Sht 1 of 3



SERIAL PREFIX 1602A

Fig C3-42
Sht 2 of 3

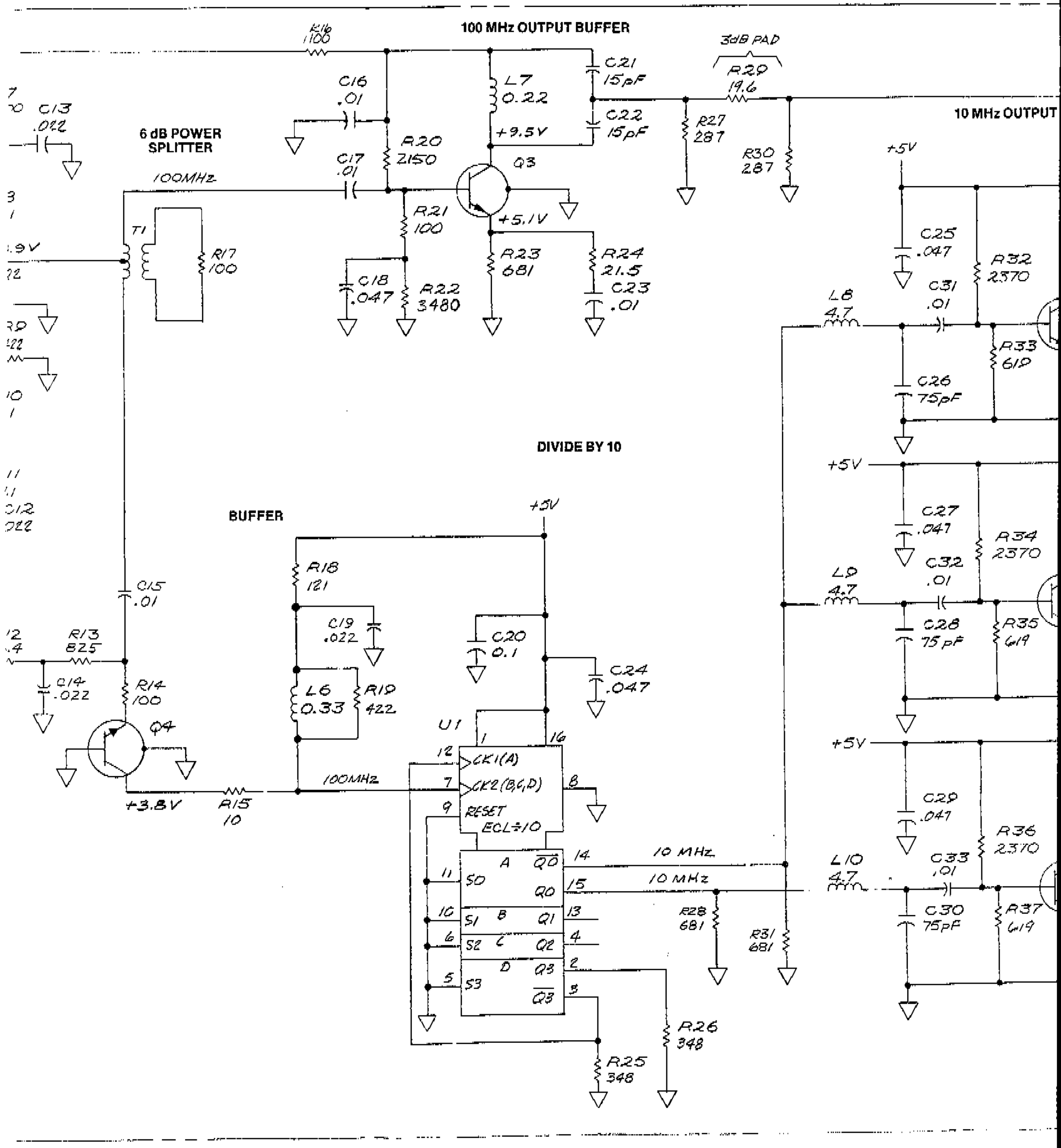
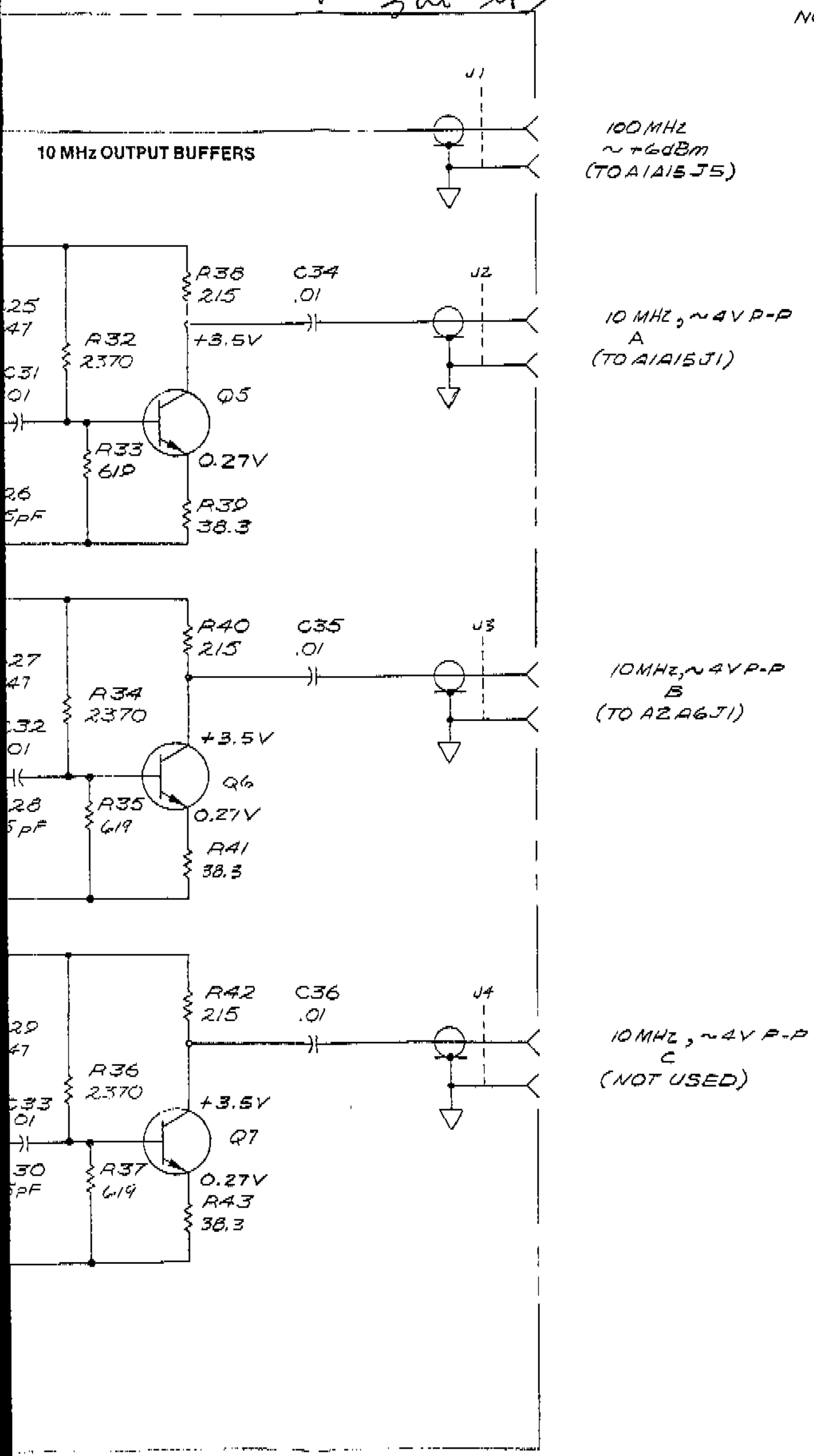


Fig C3-42 Sht 3 of 3



NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATOR, PREFIX REFERENCE DESIGNATOR SHOWN WITH THE ASSEMBLY REFERENCE DESIGNATOR.
2. UNLESS OTHERWISE INDICATED, RESISTANCE IN OHMS CAPACITANCE IN MICROFARADS INDUCTANCE IN MICROHENRIES
3. Y1 100MHz CRYSTAL IS MATCHED WITH A15A1Y1 9.9MHz CRYSTAL IN A1 SOURCE CONVERTER. THESE CRYSTALS MUST BE ORDERED AS A MATCHED SET.

REFERENCE DESIGNATIONS

A2A12
C1 - C36
CR1
J1 - J4
L1 - L10
Q1 - Q7
R1 - R43
T1
U1
Y1

A2A12

Figure C3-42. A2A12 10/100 MHz Oscillator, Schematic

Fig 3-42A
Sht 1 of 2

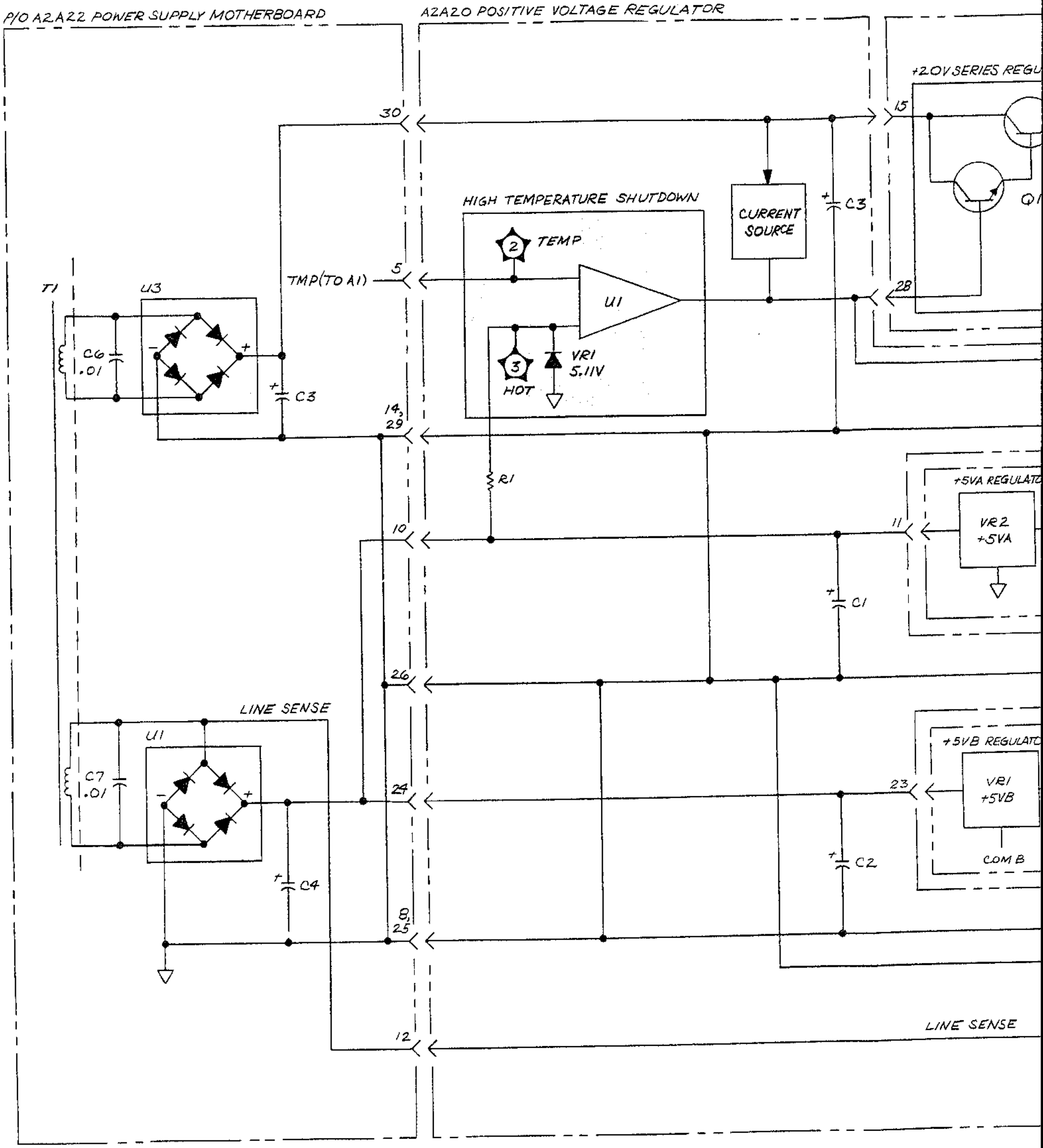


Fig C3-42A
Sht 2 of 2

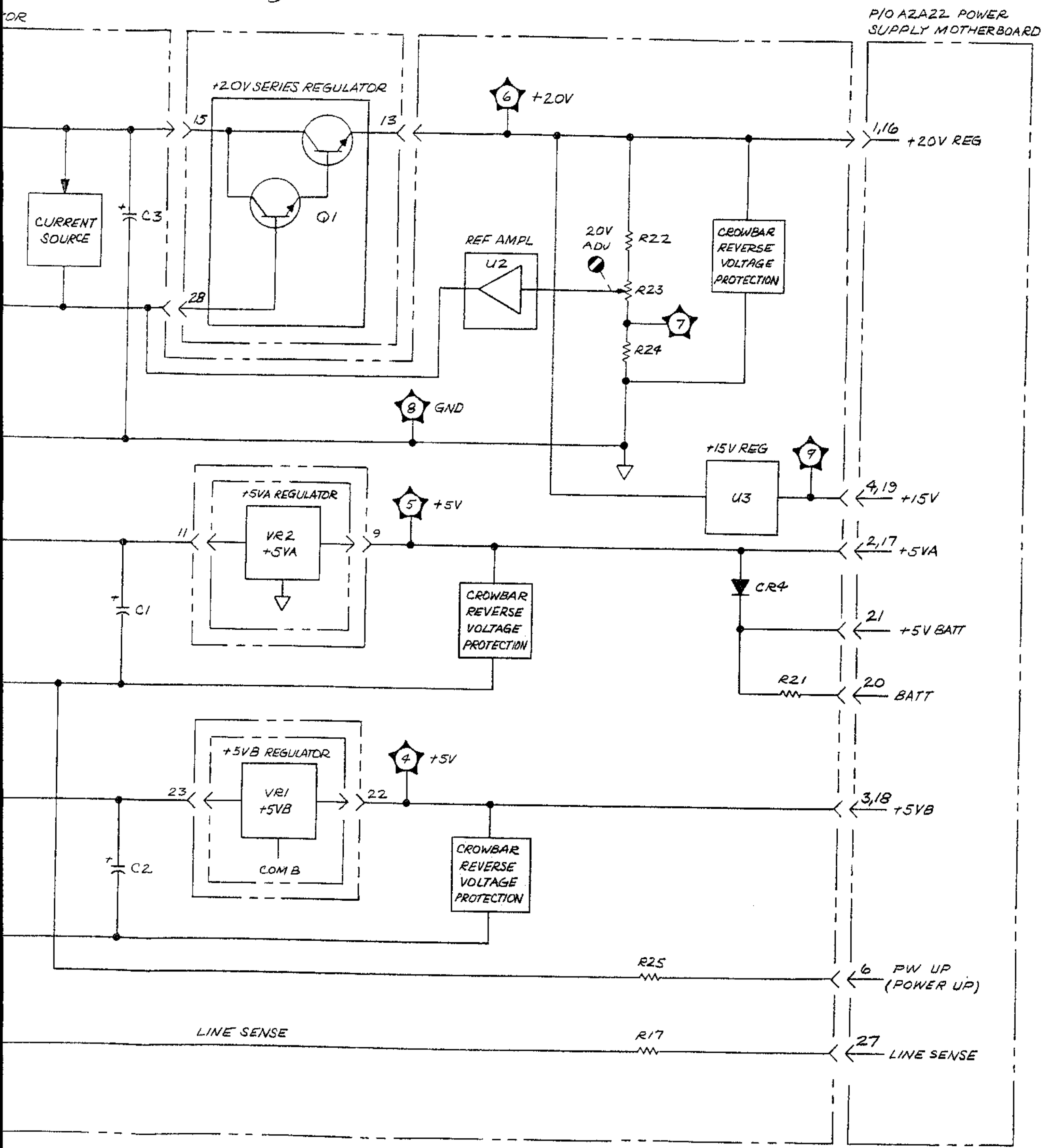


Figure C3-42A. A2A20 Positive Voltage Regulator Block Diagram

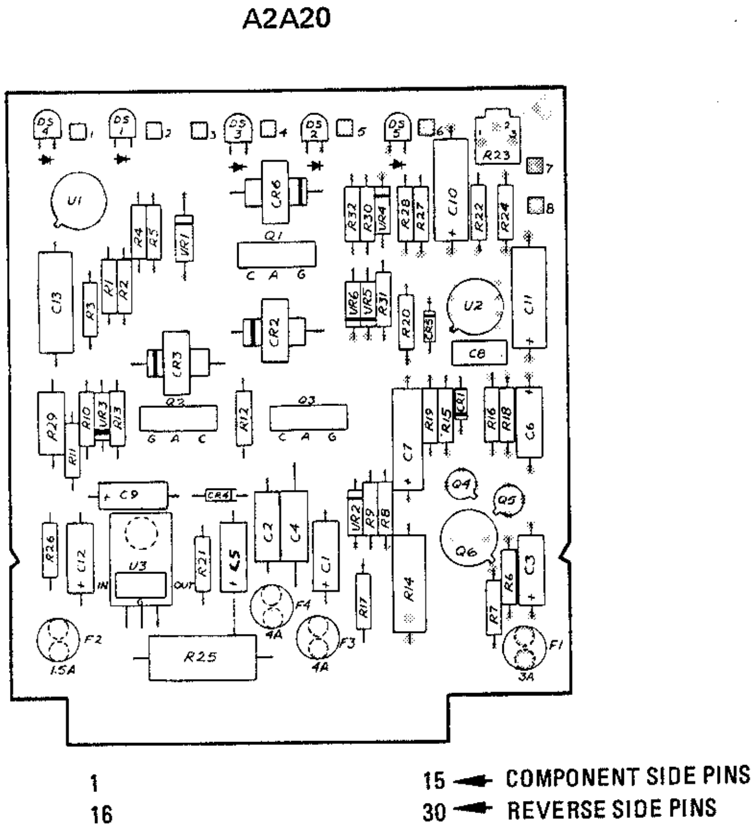
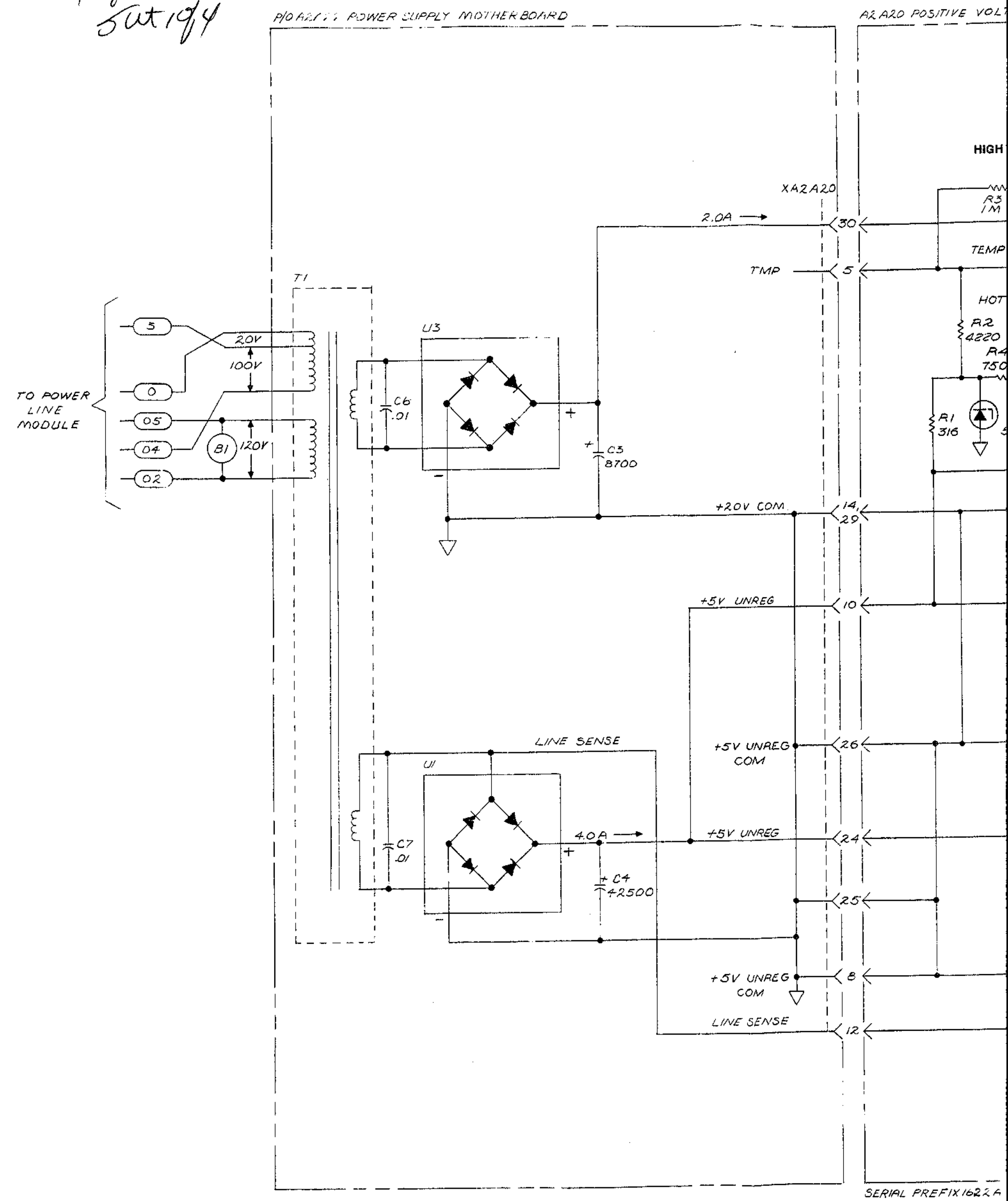


Figure C3-43. A2A20 Positive Voltage Regulator Parts Locations

Fig C3-44
Sut 1/4



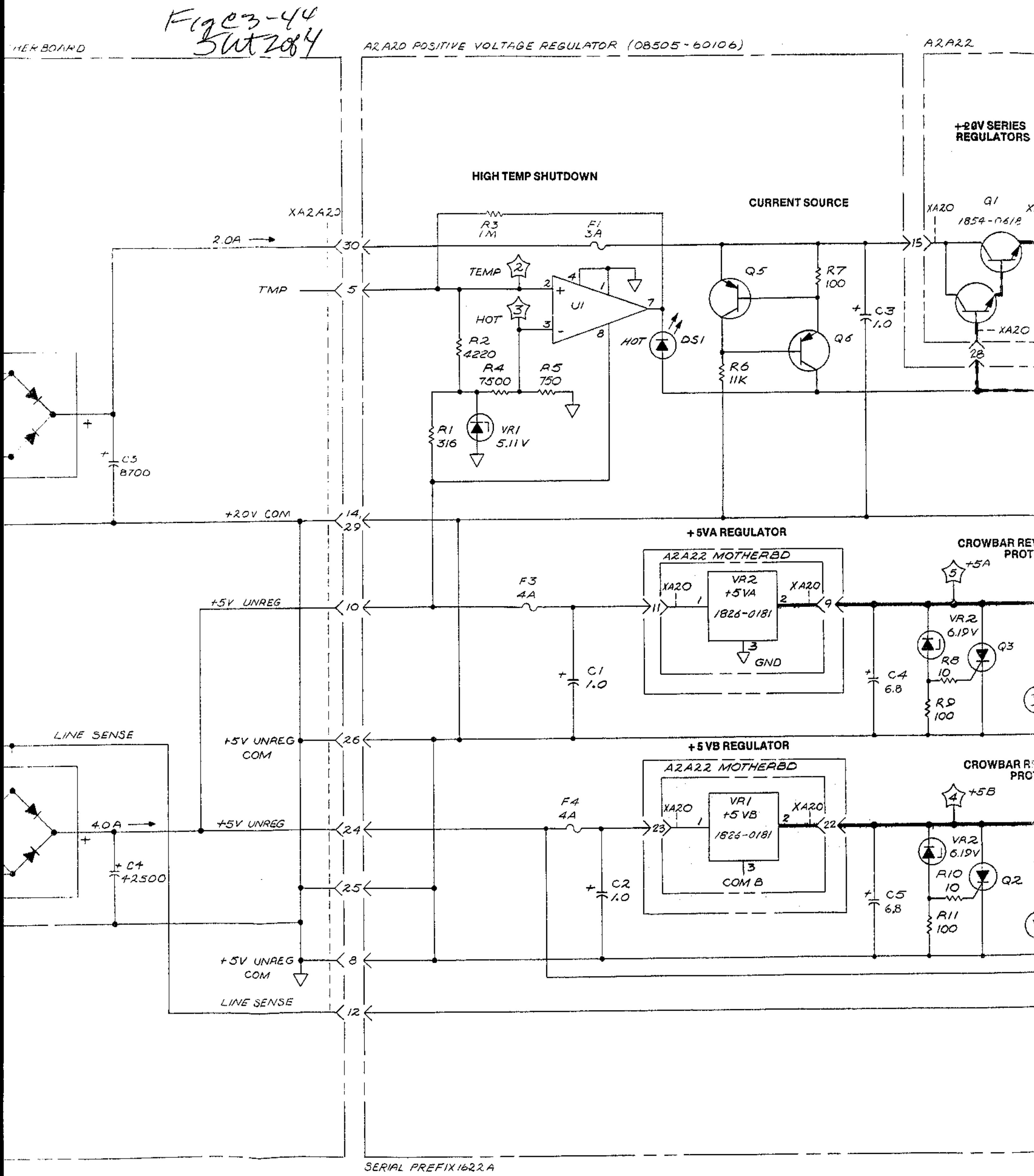


Fig 3-44
Sht 2 of 4
A2A20 POSITIVE VOLTAGE REGULATOR (08505-60106)
A2A22
HIGH TEMP SHUTDOWN
CURRENT SOURCE
+20V SERIES REGULATORS
+5VA REGULATOR
+5VB REGULATOR
A2A22 MOTHERBD
CROWBAR REV PROT
LINE SENSE
+20V COM
+5V UNREG
+5V UNREG COM
TMP
TEMP
HOT
SERIAL PREFIX 1622A

Fig C3-44
Sht 3 of 4

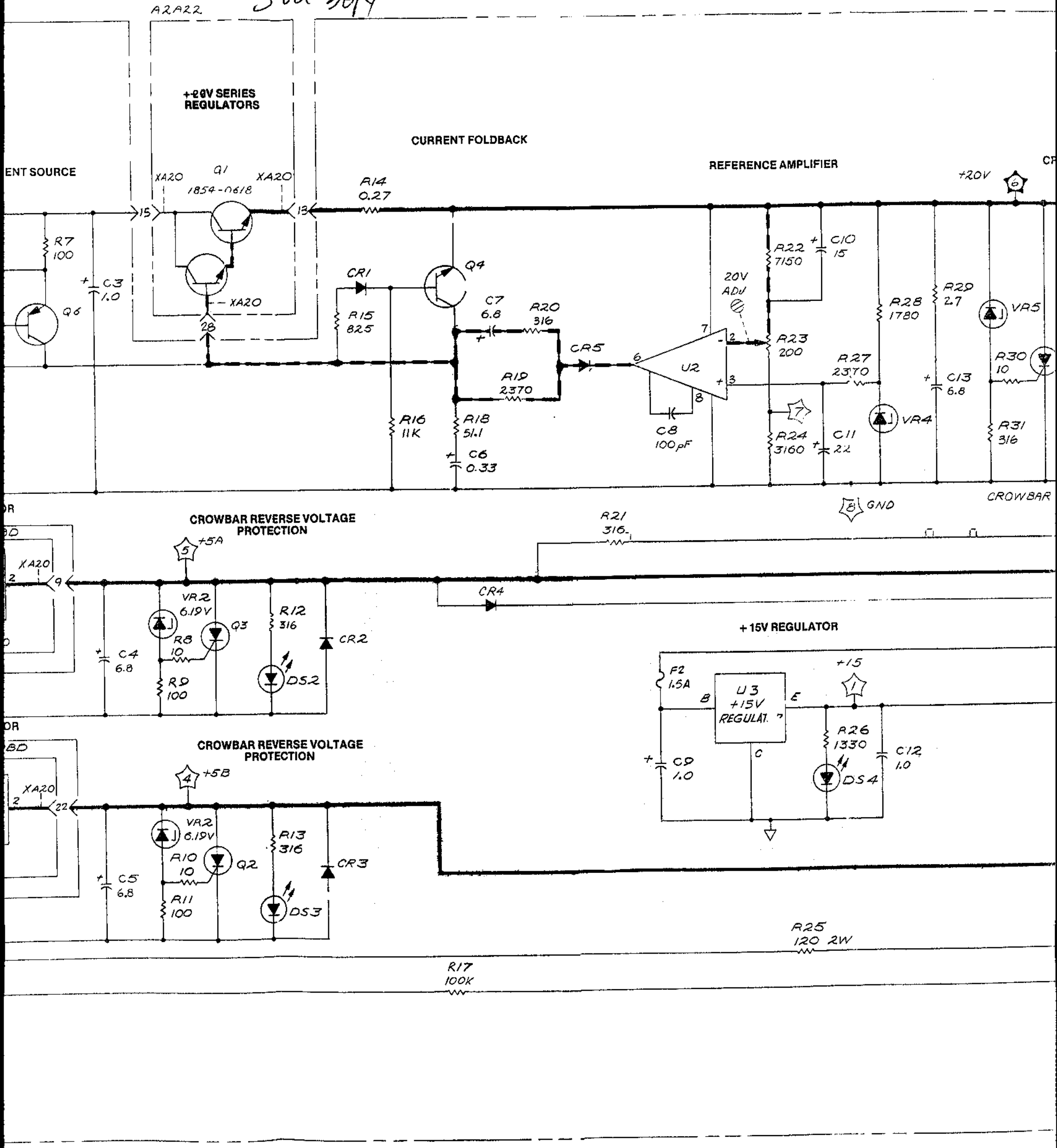
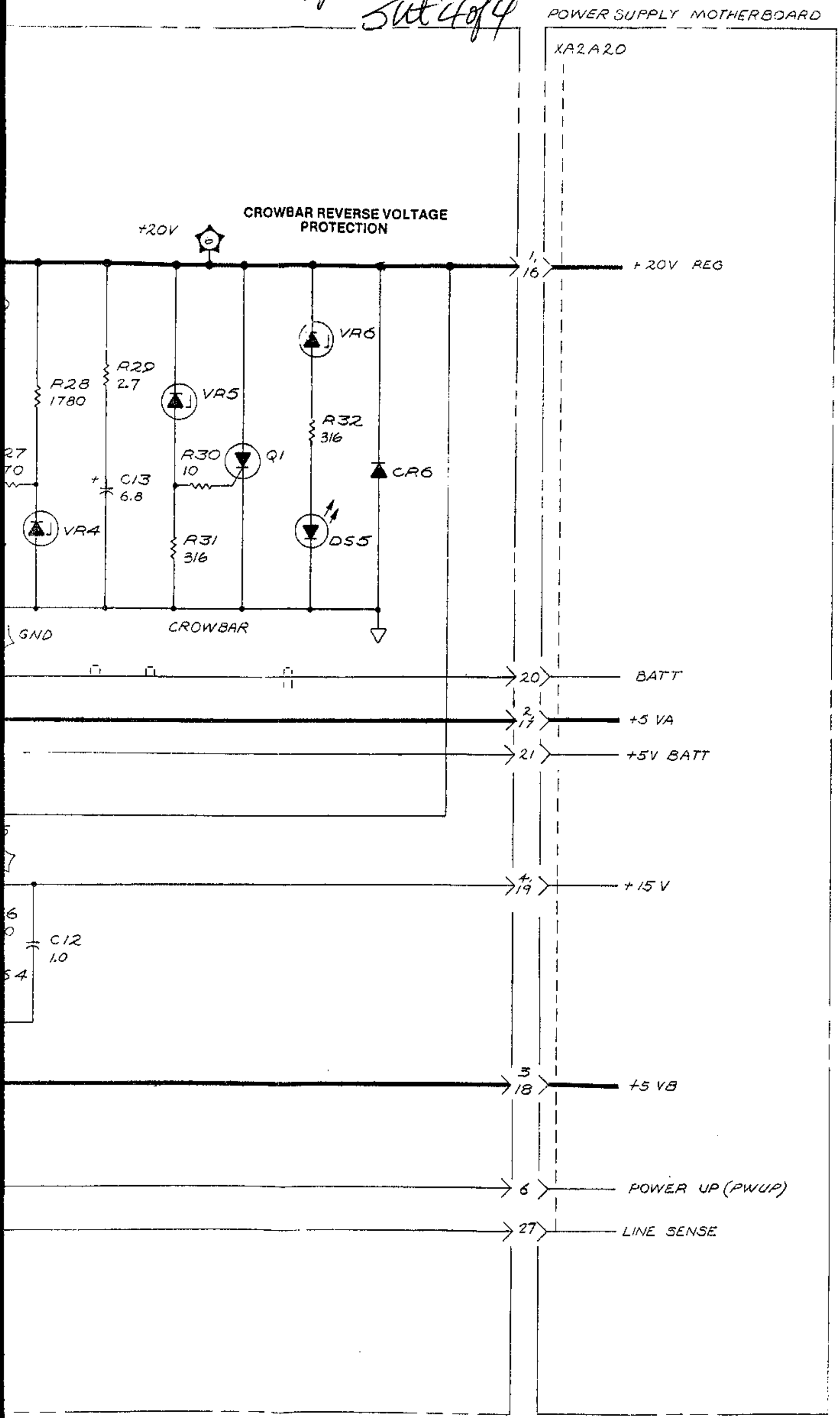


Fig C3-44
Sht 4 of 4



NOTES:
1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATOR, PREFIX REFERENCE DESIGNATOR SHOWN WITH THE ASSEMBLY REFERENCE DESIGNATOR.
2. UNLESS OTHERWISE INDICATED:
RESISTANCE IN OHMS
CAPACITANCE IN MICROFARADS
INDUCTANCE IN MICROHENRIES

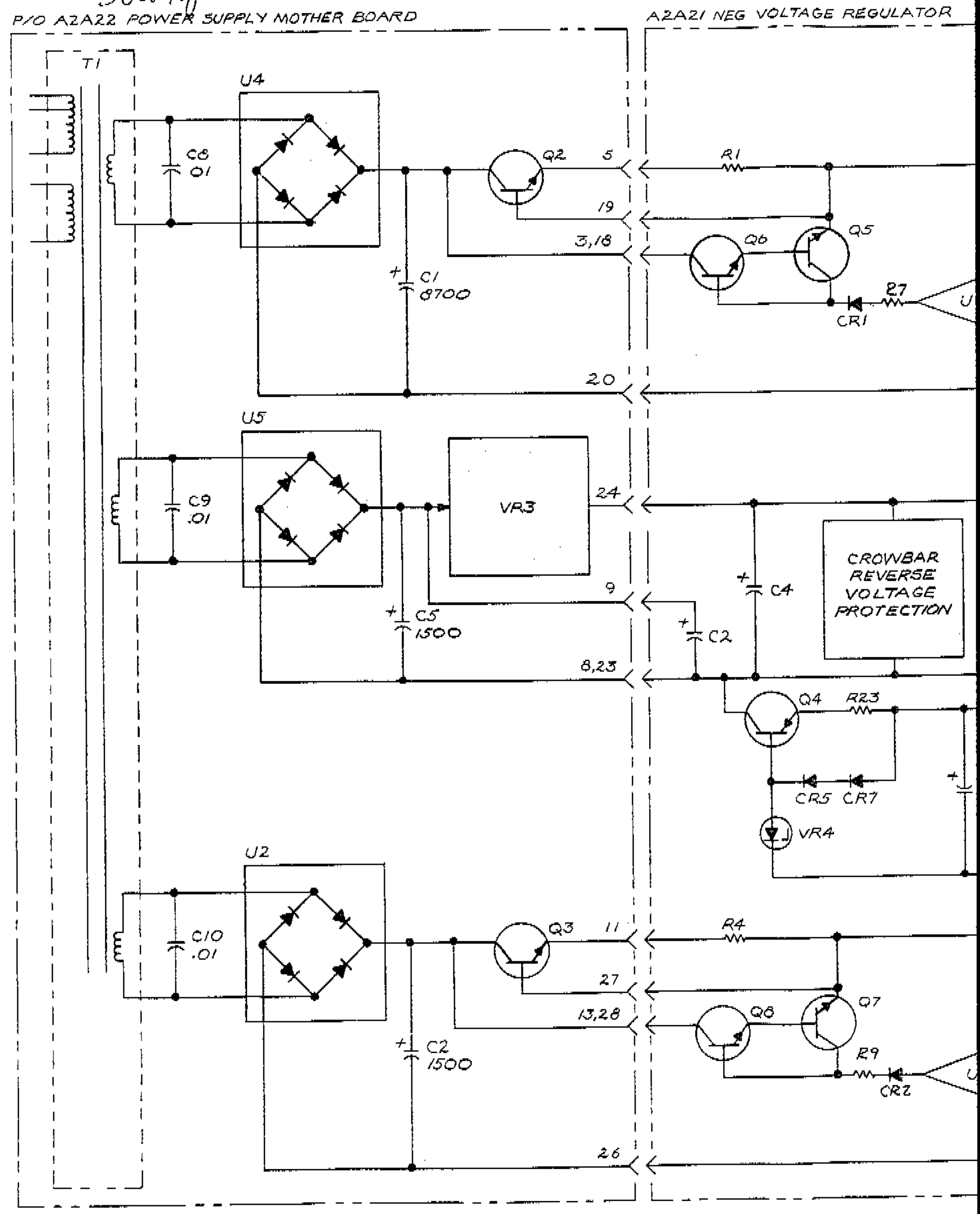
REFERENCE DESIGNATIONS

A2A20
C1-C13
CR1-CR6
DS1-DS5
F1-F4
Q1-Q6
R1-R32
U1-U3
VR1-VR6

A2A20

Figure C3-44. A2A20 Positive Voltage Regulator, Schematic

Fig C3-44A
Sht 1 of 2



Figc344A
JNt2f2

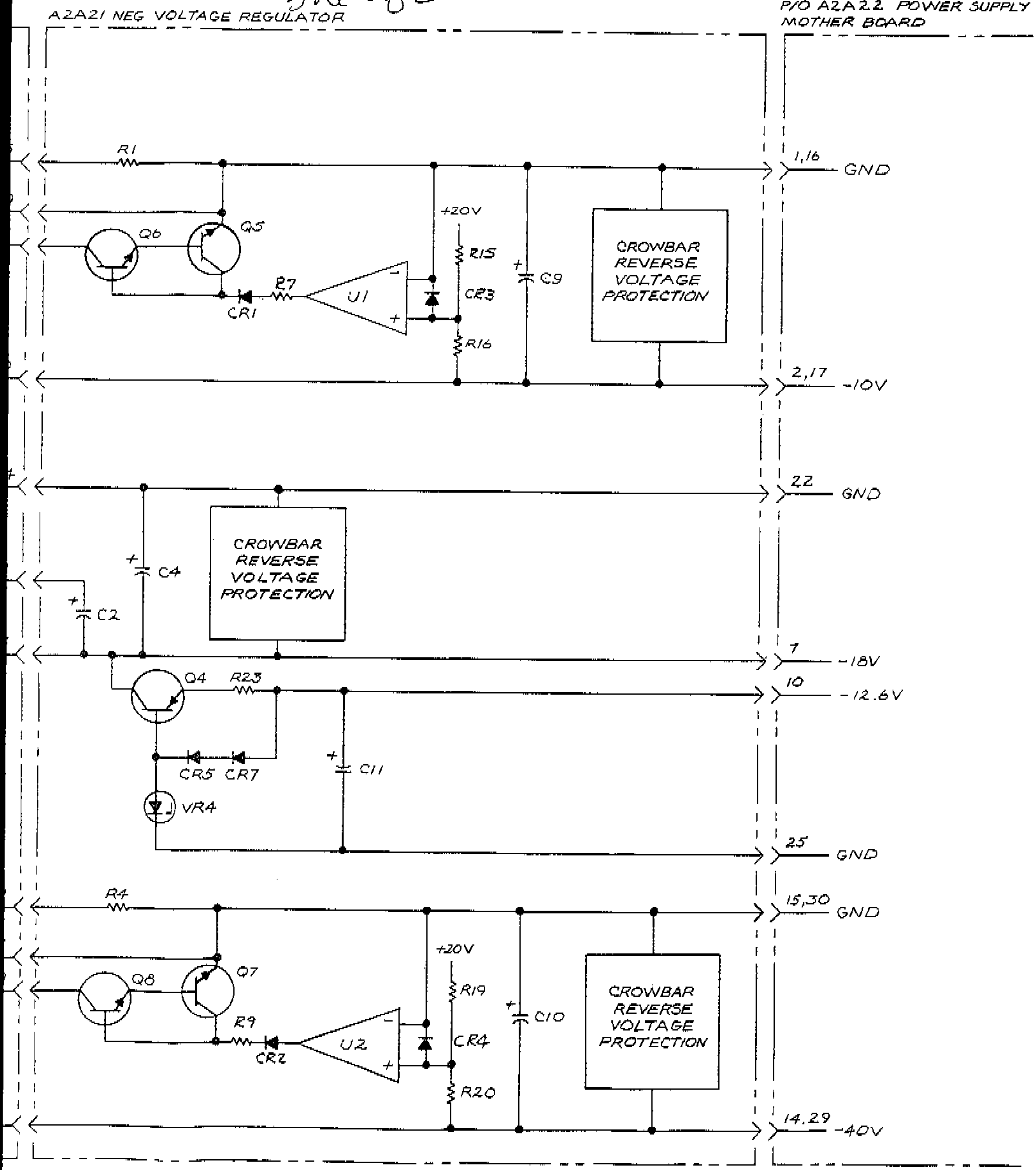


Figure C3-44A. A2A21 Negative Voltage Regulator Block Diagram

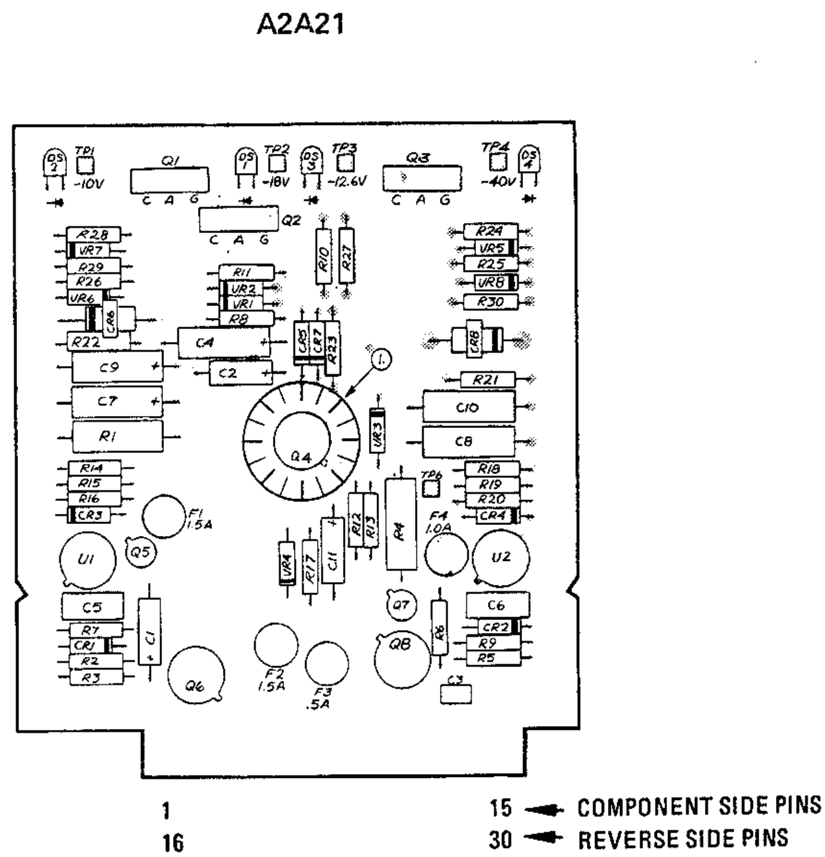


Figure C3-45. A2A21 Negative Voltage Regulator Parts Locations

Fig C3-46
Sht 1 of 3

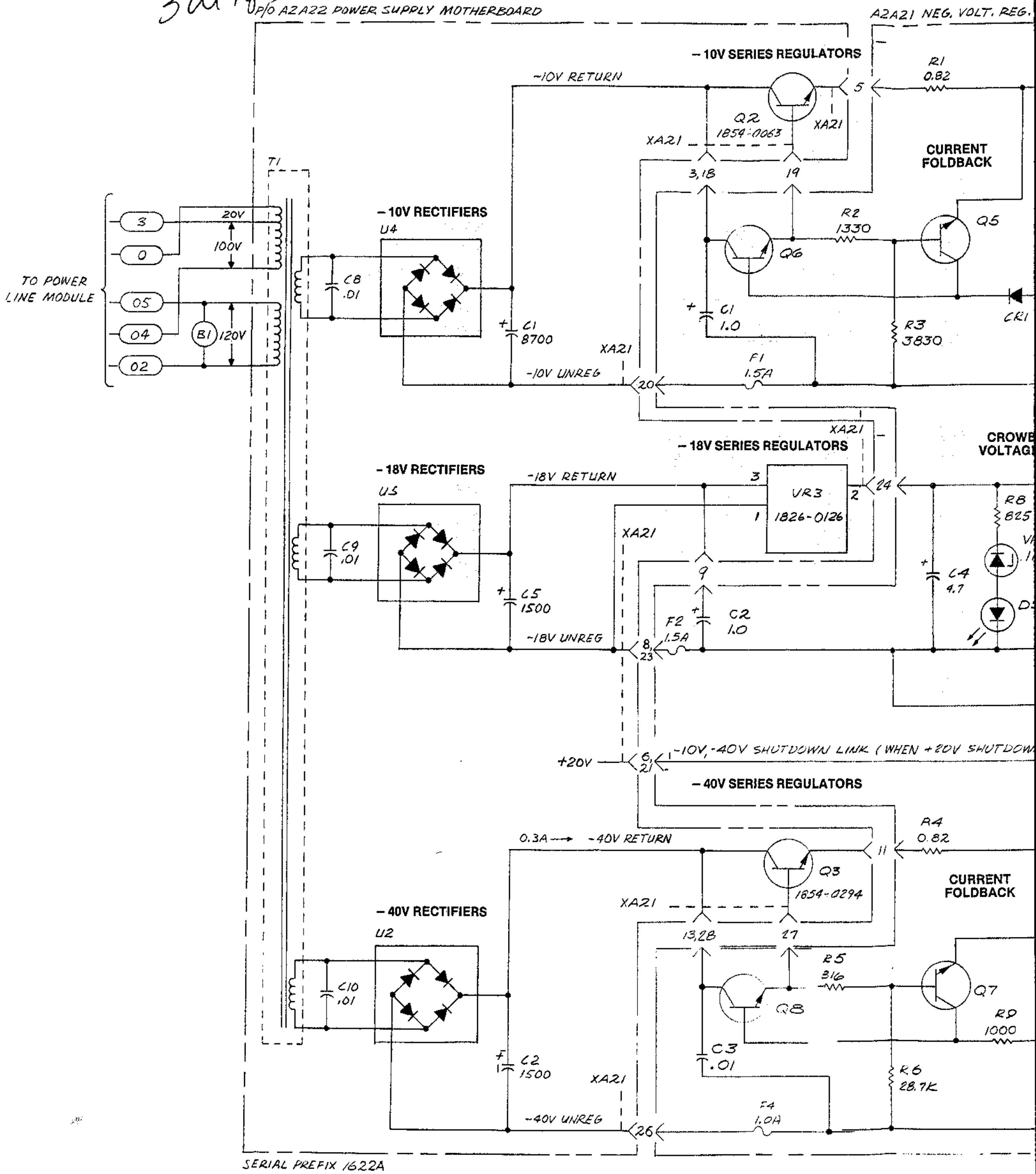


Fig 3-46
Sht 2 of 3

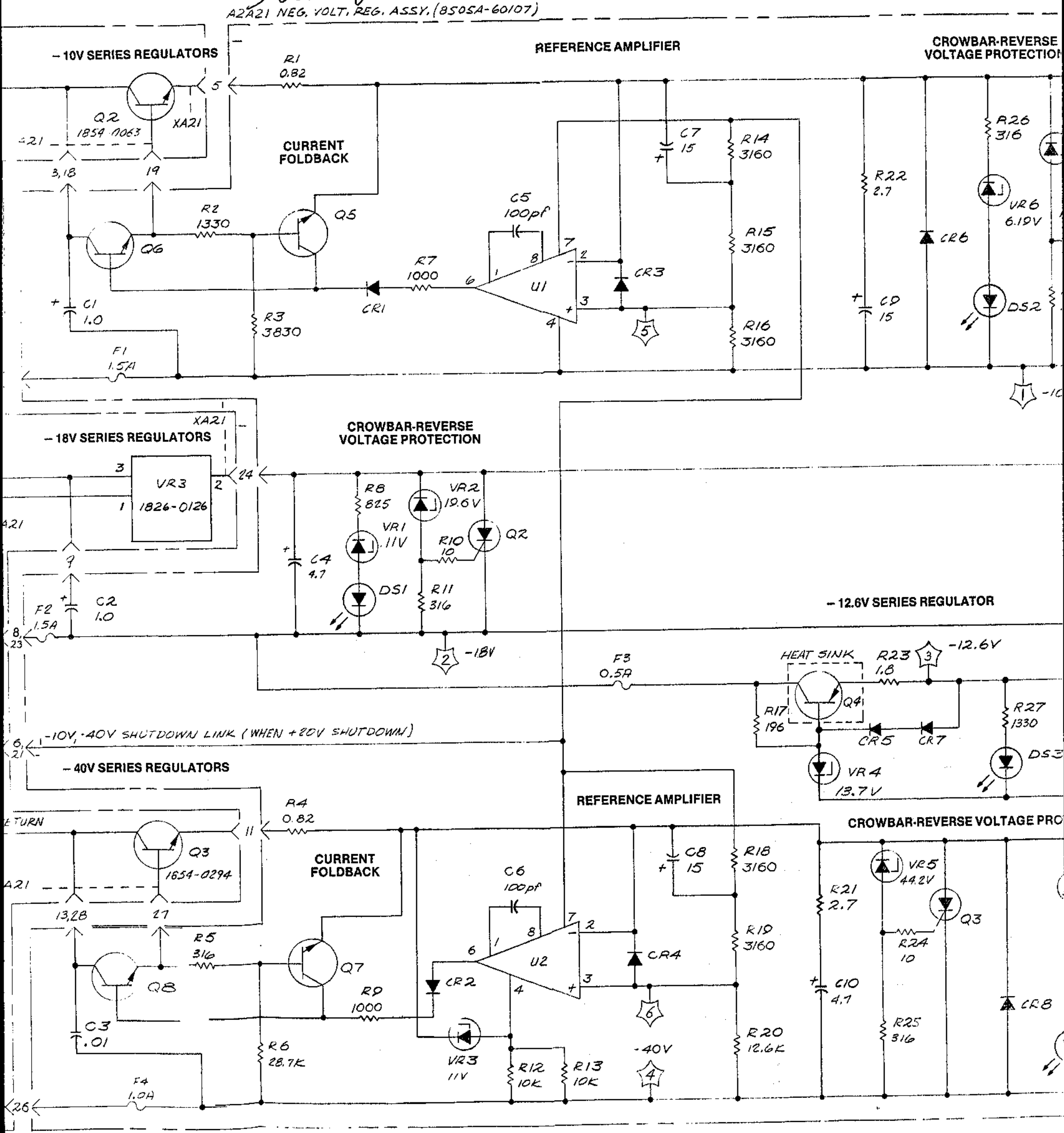
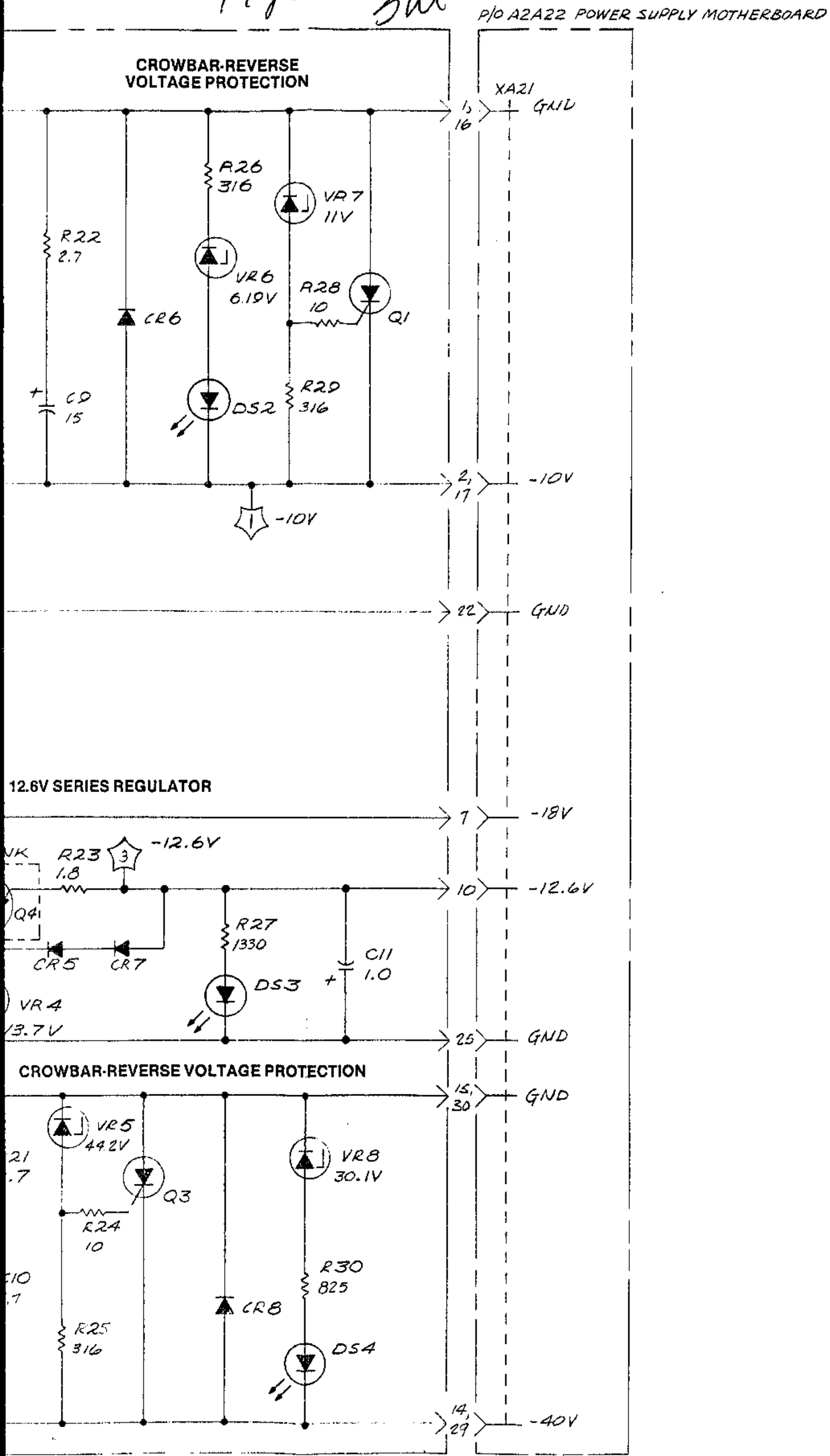


Fig C3-46 sht 3 of 3



NOTES:

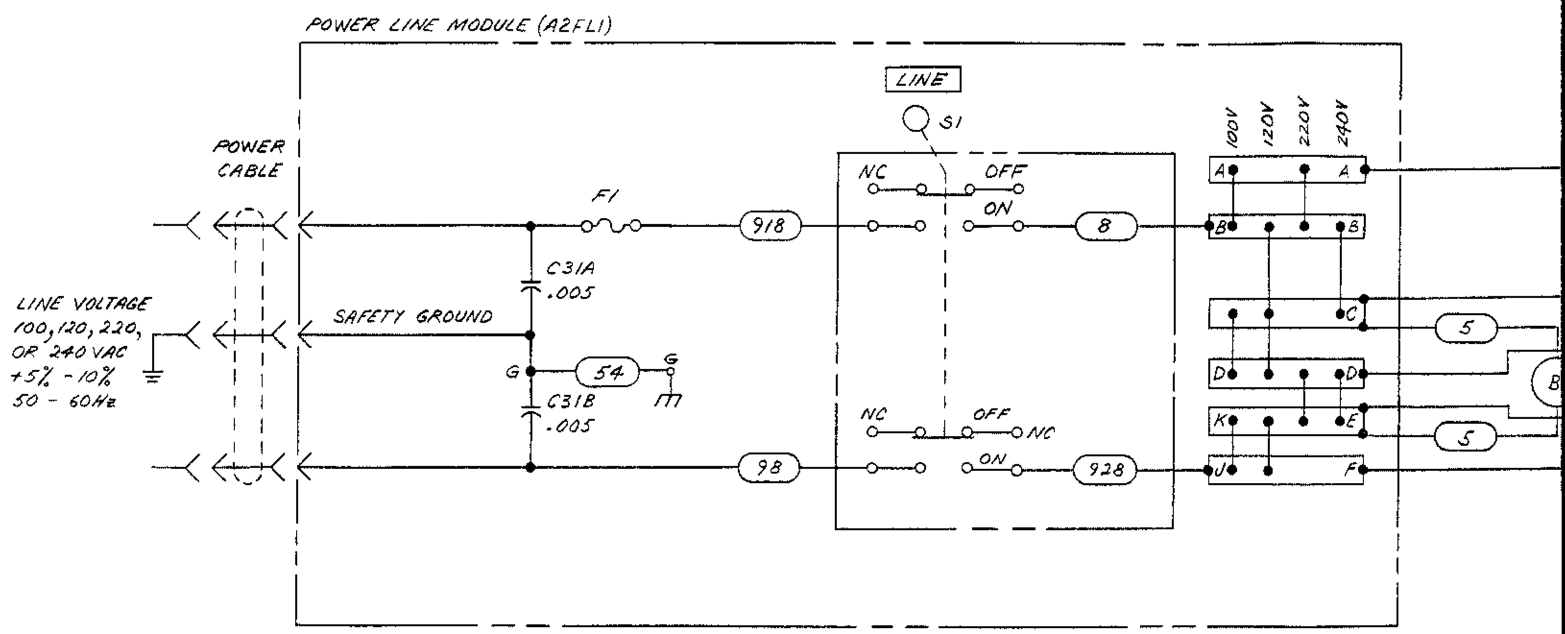
1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATOR, PREFIX REFERENCE DESIGNATOR SHOWN WITH THE ASSEMBLY REFERENCE DESIGNATOR.
2. UNLESS OTHERWISE INDICATED:
   RESISTANCE IN OHMS
   CAPACITANCE IN MICROFARADS
   INDUCTANCE IN MICROHENRIES

REFERENCE DESIGNATORS A2A21
C1-C11
CR1-CR8
DS1-DS4
F1-F4
Q1-Q8
R1-R30
U1, U2
VR1-VR8

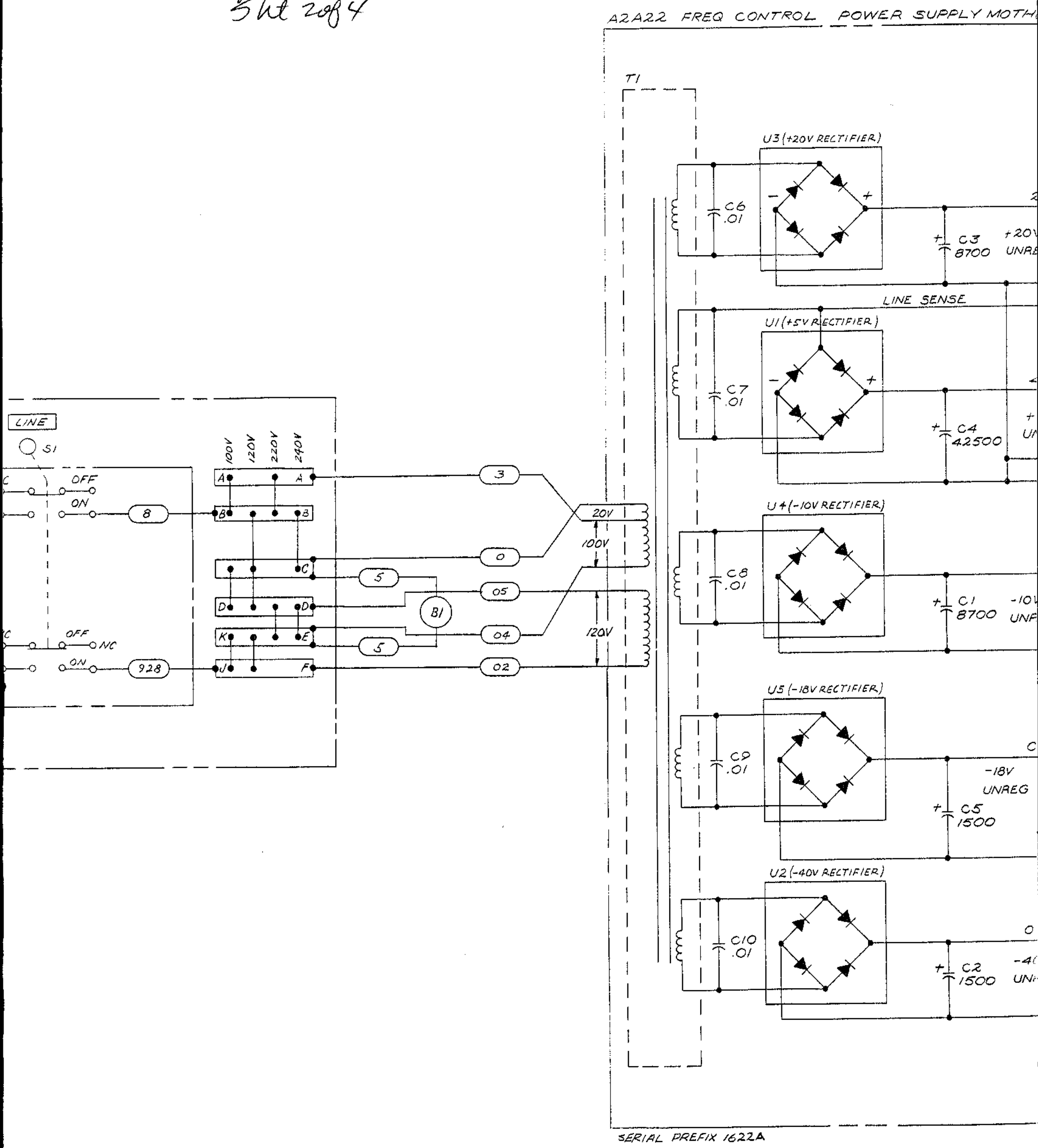
A2A21

Figure C3-46. A2A21 Negative Voltage Regulator, Schematic

Fig C3-47
Sht 1 of 4



FigC3-47
Sht 2of4



Figc3-47, Slt 3of4

L POWER SUPPLY MOTHERBOARD (08505-60091)

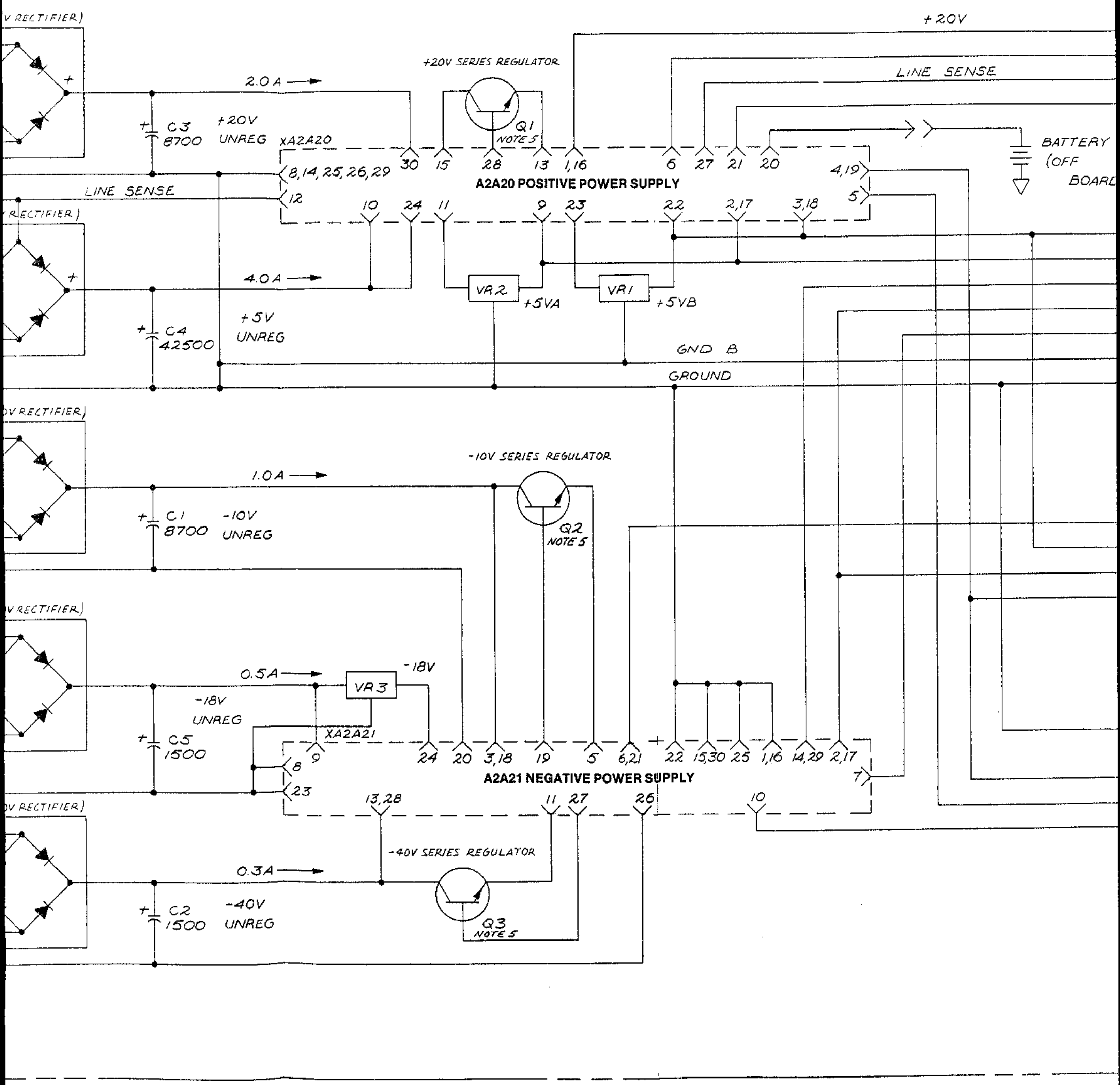
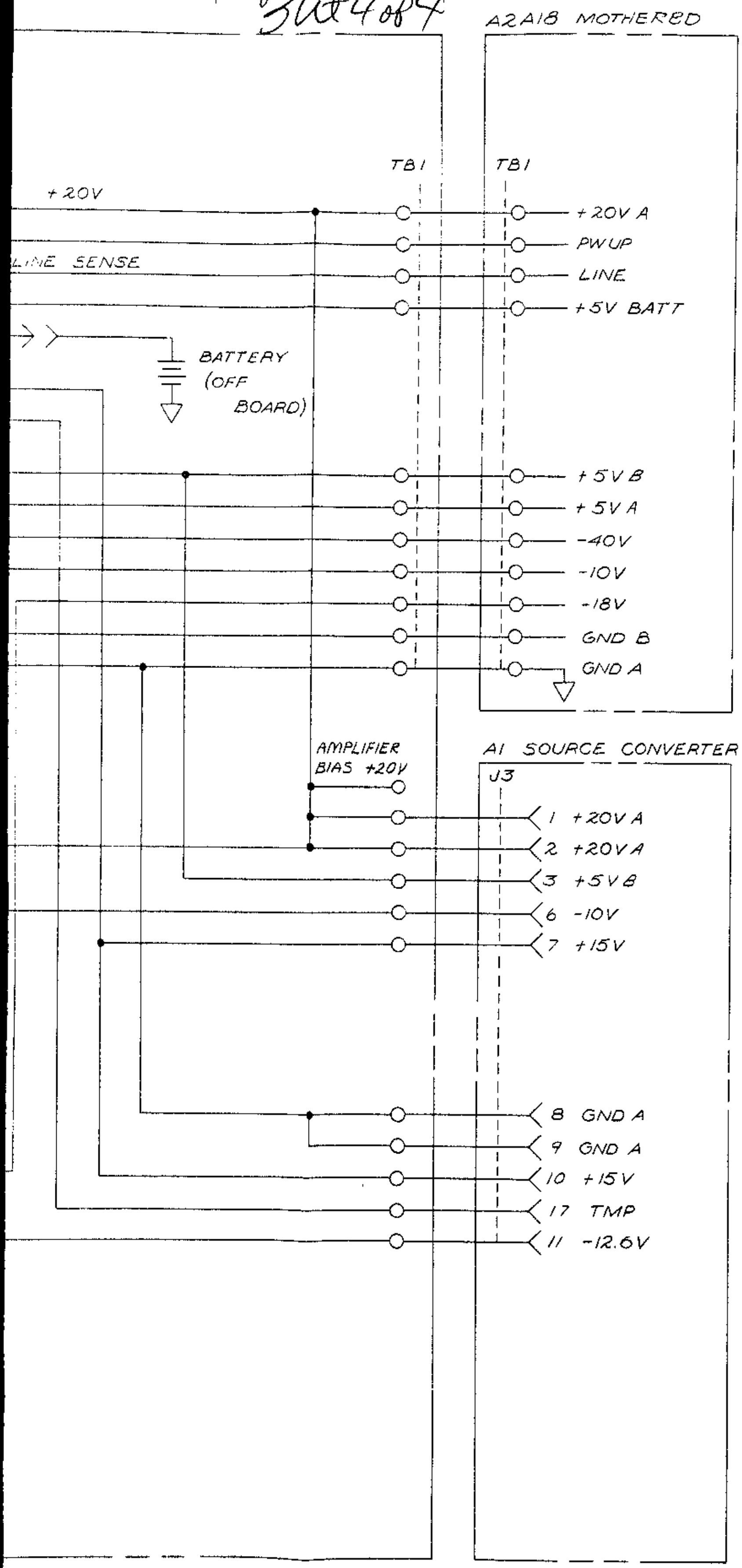


Fig C3-47 Sht 4 of 4



NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATOR, PREFIX REFERENCE DESIGNATOR SHOWN WITH THE ASSEMBLY REFERENCE DESIGNATOR.
2. UNLESS OTHERWISE INDICATED, CAPACITANCE IN MICROFARADS
3. SERIES REGULATORS Q1, Q2, AND Q3 ARE MOUNTED ON CENTER PANEL.

REFERENCE DESIGNATORS

A2A22
C1-C10
Q1-Q3
T1
U1-U5
VR1-VR3
XA20
XA21

A2A22

Figure C3-47. A2A22 Frequency Control Power Supply, Schematic

CHAPTER C
FREQUENCY CONTROL

SECTION IV
MANUAL CHANGES

C4-1 INTRODUCTION

C4-2. This section contains instructions for adapting this chapter of the manual to 8505A Network Analyzers having serial numbers lower than those listed on the title page. To adapt this chapter to your 8505A, refer to Table C4-1 and make all the changes listed opposite the serial number or serial number prefix indicated on the serial number plates on the top and bottom units of your 8505A.

Table C4-1. Chapter C Changes by 8505A Serial Number

Serial Number Prefix	Make Changes
1625A, 1622A	No Change
1618A	A
1614A	A, B
1610A0131, 133, 136, 139	A, B, C
1610A00132, 134, 135, 137, 138, 140; 1606A	A, B, C, D
1602A	A, B, C, D, E,

C4-3. CHAPTER C CHANGE INSTRUCTIONS

CHANGE A

Page C2-22, Table C2-2:
Change A2A11R30 to HP Part Number 0811-3353 RESISTOR 120 7.5W, Mfr. Code 12463, Mfr. Part Number HT-5.

CHANGE B

Page C2-14, Table C2-2:
Delete A2A7CR21 and A2A7CR22.

Page C2-15, Table C2-2:
Delete A2A7R68.

Page C3-81, Figure C3-31:
Delete CR21, CR22, and R68.

Page C3-81, Figure C3-32:
Delete CR21, CR22, and R68. Connect jumper across R68 resistor circuit.

CHANGE C

Page C2-7, Table C2-2:
Delete A2A2R47 thru A2A2R54.
Delete A2A2U36.

Page C3-47/48, Figure C3-22:
Delete pullup resistors A2A2R47 thru A2A2R53.
Delete pull-up resistors A2A2U36.
Delete resistor A2A2R54 and jumper across resistor circuit.

CHANGE D

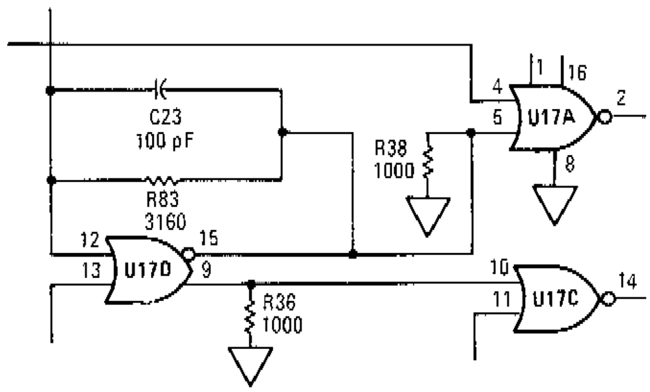
Page C2-13, Table C2-2:
Delete A2A6R53.

Page C2-14, Table C2-2:
Change A2A7C19 to HP Part No. 0160-0571, CAPACITOR-FXD 470 pF + −20% 100WVDC CER.

Page C2-21, Table C2-2:
Delete A2A11C10.
Delete A2A11CR4.

Page C2-22, Table C2-2:
Change A2A11R5 to HP Part No. 0757-0465, RESISTOR 100K 1% .125W TC = 0 + −100.

Page C3-71, Figure C3-28:
Change connections to U17D as shown below in partial schematic.



Page C3-77, Figure C3-30:
Delete Resistor A2A6R53.

Page C3-81, Figure C3-32:
Change value of A2A7C19 to 470 PF.

Page C3-93, Figure C3-40:
Change value of A2A11R5 to 100K.
Delete A2A11C10.
Delete A2A11CR4.

CHANGE E

Page C2-7, Table C2-2:
Delete A2A3C22 and A2A3CR12.

CHANGE E (Cont'd)

Page C2-8, Table C2-2:
Delete A2A3Q2 and A2A3R41.
Change A2A3Q3 to A2A3Q2, A2A3Q4 to A2A3Q3, A2A3Q5 to A2A3Q4, A2A3Q6 to A2A3Q5, A2A3Q7 to A2A3Q6, and A2A3Q8 to A2A3Q7.

Page C2-12, Table C2-2:
Change A2A6C2, C7, C9, C11, C13, and C17 to HP Part No. 0160-3878, CAPACITOR-FXD 1000PF + 20% 100WVDC CER.

Page C3-61/62, Figure C3-23:
Delete C22, CR12, Q2, and R41.
Change Q3 to Q2, Q4 to Q3, Q5 to Q4, Q6 to Q5, Q7 to Q6, and Q8 to Q7.

Page C3-61/62, Figure C3-24:
Change A2A3Q3 to Q2, Q4 to Q3, Q5 to Q4, and Q6 to Q5.

Page C3-63, Figure C3-24:
Delete C22, CR12, Q2, and R41.
Change Q7 to Q6, and Q8 to Q7.

Page C3-77, Figure C3-30:
Change capacitors A2A6C2, C7, C9, C11, C13, and C17 to 1000PF.