

DIAGRAMS AND CIRCUIT BOARD ILLUSTRATIONS

Symbols and Reference Designators

Electrical components shown on the diagrams are in the following units unless noted otherwise:

- Capacitors = Values one or greater are in picofarads (pF).
Values less than one are in microfarads (μF).
- Resistors = Ohms (Ω).

Graphic symbols and class designation letters are based on ANSI Standard Y32.2-1975.

Logic symbology is based on ANSI Y32.14-1973 in terms of positive logic. Logic symbols depict the logic function performed and may differ from the manufacturer's data.

The overline on a signal name indicates that the signal performs its intended function when it goes to the low state.

Abbreviations are based on ANSI Y1.1-1972.

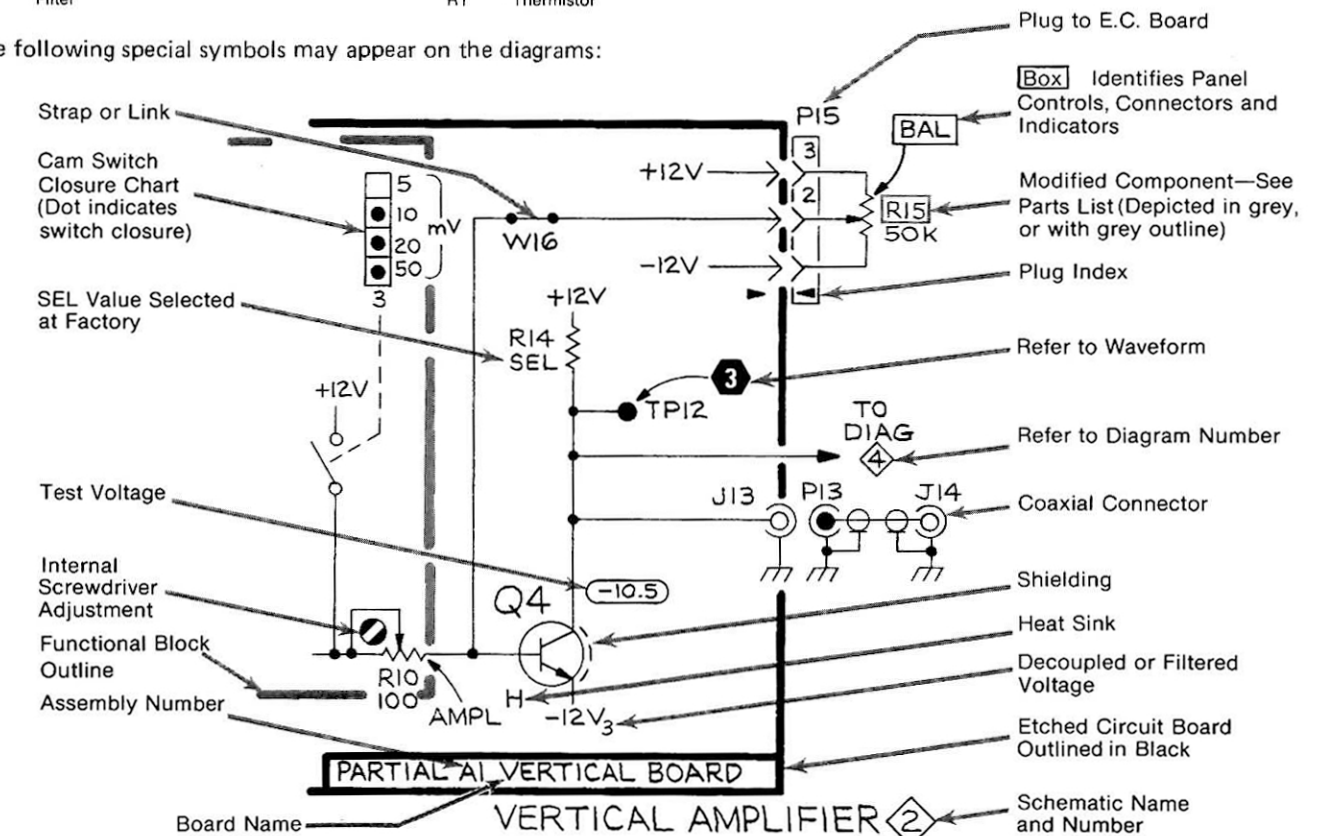
Other ANSI standards that are used in the preparation of diagrams by Tektronix, Inc. are:

- Y14.15, 1966 Drafting Practices.
- Y14.2, 1973 Line Conventions and Lettering.
- Y10.5, 1968 Letter Symbols for Quantities Used in Electrical Science and Electrical Engineering.

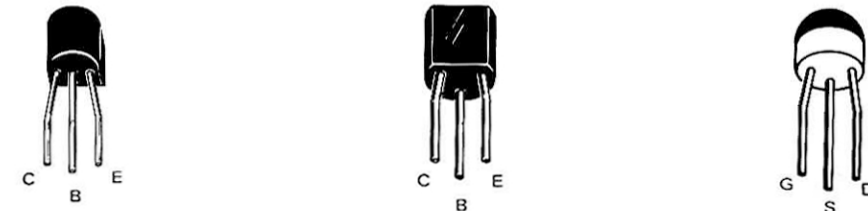
The following prefix letters are used as reference designators to identify components or assemblies on the diagrams.

A	Assembly, separable or repairable (circuit board, etc)	H	Heat dissipating device (heat sink, heat radiator, etc)	S	Switch or contactor
AT	Attenuator, fixed or variable	HR	Heater	T	Transformer
B	Motor	HY	Hybrid circuit	TC	Thermocouple
BT	Battery	J	Connector, stationary portion	TP	Test point
C	Capacitor, fixed or variable	K	Relay	U	Assembly, inseparable or non-repairable (integrated circuit, etc.)
CB	Circuit breaker	L	Inductor, fixed or variable	V	Electron tube
CR	Diode, signal or rectifier	M	Meter	VR	Voltage regulator (zener diode, etc.)
DL	Delay line	P	Connector, movable portion	W	Wiretrap or cable
DS	Indicating device (lamp)	Q	Transistor or silicon-controlled rectifier	Y	Crystal
E	Spark Gap, Ferrite bead	R	Resistor, fixed or variable	Z	Phase shifter
F	Fuse	RT	Thermistor		

The following special symbols may appear on the diagrams:



NOTE
LEAD CONFIGURATIONS AND CASE STYLES ARE TYPICAL, BUT MAY VARY DUE TO VENDOR CHANGES OR INSTRUMENT MODIFICATIONS.



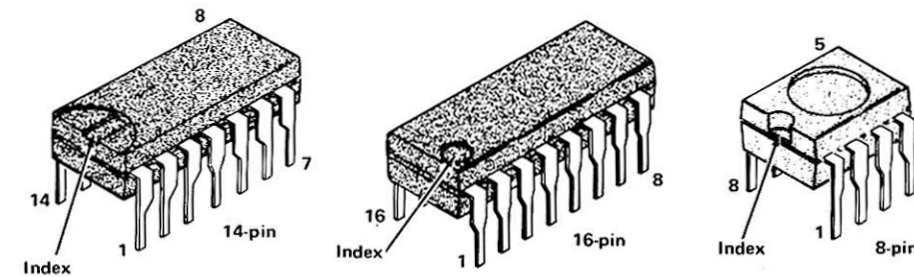
PLASTIC CASED TRANSISTORS



TRANSISTOR

INTEGRATED CIRCUIT

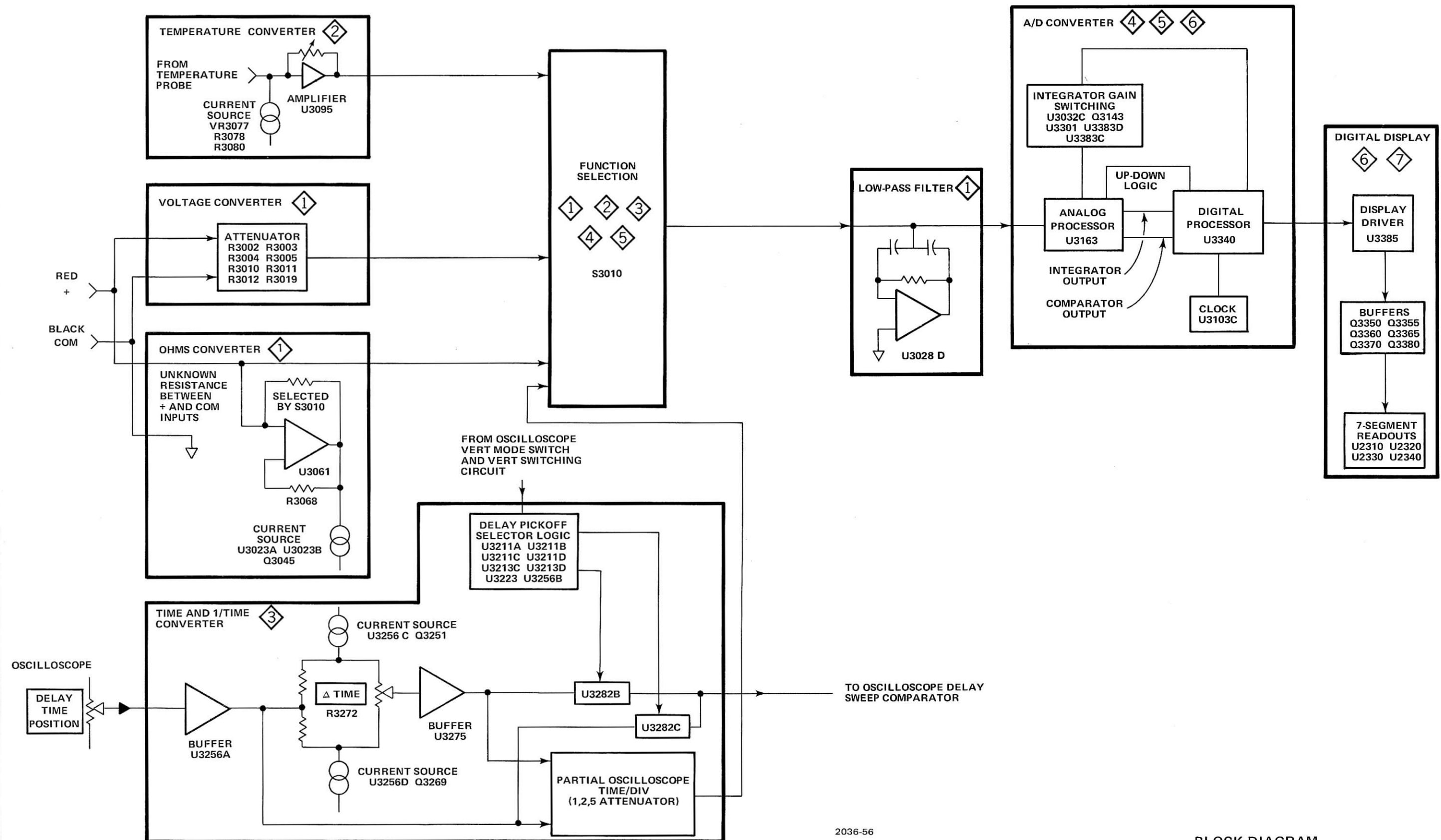
METAL CASED



INTEGRATED CIRCUITS

1779-8A

Fig. 9-1. Semiconductor lead configurations.



BLOCK DIAGRAM

BLOCK DIAGRAM

2036-56

REV B, MAR 1979

A1 MAIN BOARD COMP LOC (SN B010100-B019999)

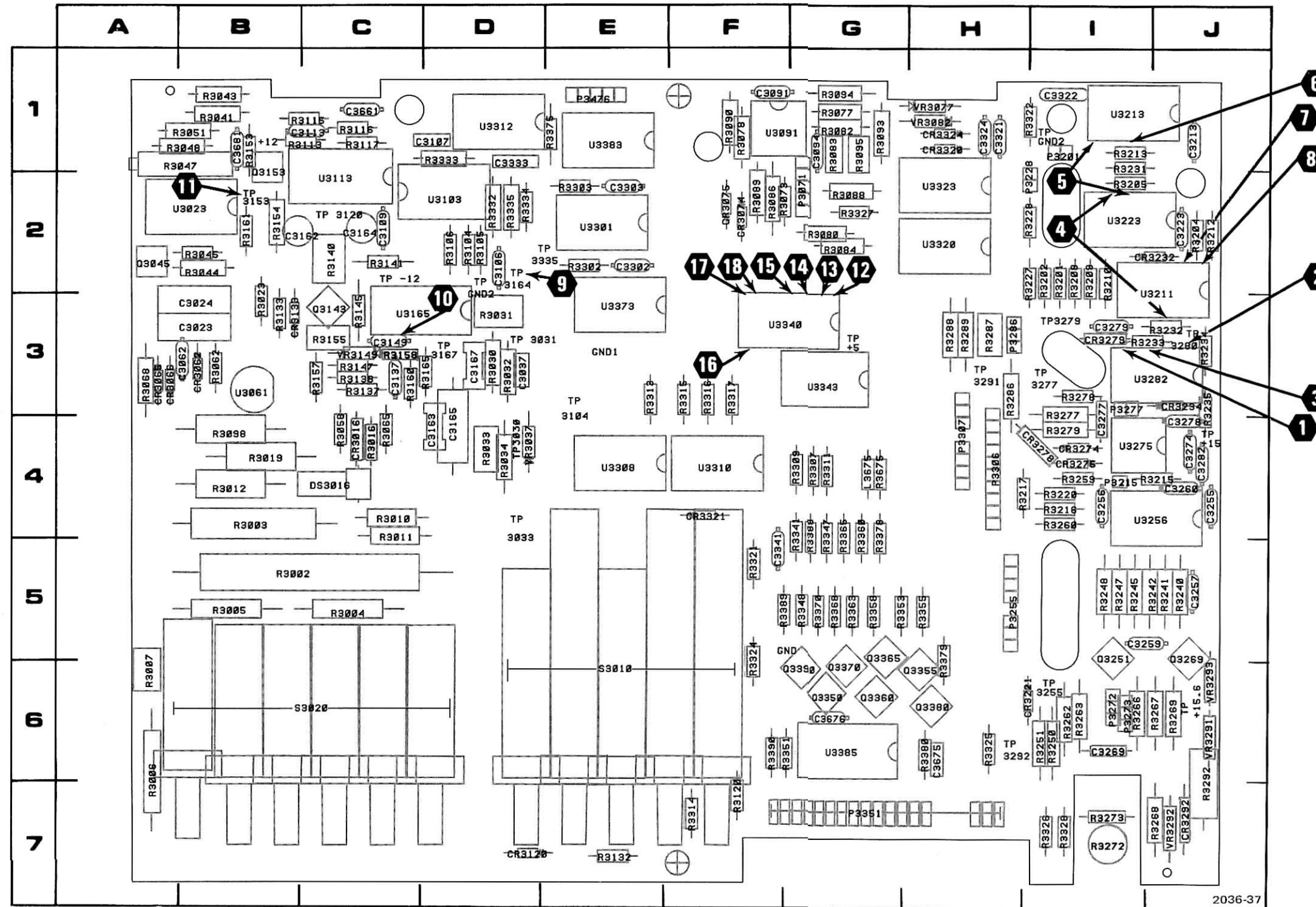


Fig. 9-3. A1 Main board component locations (SN B010100-B019999).

CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC
C3023	3B	CR3320	1H	R3058	4C	R3231	1I	R3358	5G	VR3149	3C
C3024	3B	CR3321	4F	R3062	3B	R3232	3J	R3360	4G	VR3291*	6J
C3037	3D	CR3324	1H	R3065	4C	R3233	3J	R3363	5G	VR3292	7J
C3062	3B			R3068	3A	R3234	3J	R3365	4G	VR3293*	6J
C3091	1F	DS3016	4C	R3073	2F	R3235	3J	R3368	5G		
C3094	1G			R3077	1G	R3240	5J	R3370	5G		
C3106	2D	L3675	4G	R3078	1F	R3241	5J	R3375	1E		
C3107	1D			R3080	2G	R3242	5J	R3378	4G		
C3109	2C	P3071	2G	R3082	1G	R3245	5I	R3379	5H		
C3113	1C	P3201	1I	R3083	1G	R3247	5I	R3380	6H		
C3137	3C	P3215	4I	R3084	2G	R3248	5I	R3388	4G		
C3149	3C	P3228	2I	R3086	2F	R3250	6I	R3389	5F		
C3162	2B	P3255	5H	R3088	2G	R3251	6I	R3390	6F		
C3163	4D	P3272	6I	R3089	2F	R3259	4I	R3675	4G		
C3164	2C	P3277	4I	R3090	1F	R3260	4I				
C3165	4D	P3286	3H	R3093	1G	R3262	6I	S3010	6E		
C3167	3D	P3306	4H	R3094	1G	R3263	6I	S3020	6C		
C3213	1J	P3307	4H	R3095	1G	R3266	6I				
C3223	2J	P3351	7G	R3098	4B	R3267	6J	TP3030	4D		
C3255	4J	P3476	1E	R3104	2D	R3268	7J	TP3031	3D		
C3256	4I			R3105	2D	R3269	6J	TP3033	4D		
C3257	5J	Q3045	2A	R3106	2D	R3272	7I	TP3104	3E		
C3259	5I	Q3143	3C	R3113	1C	R3273	7I	TP3120	2C		
C3260	4J	Q3153	2B	R3115	1C	R3277	4I	TP3153	2B		
C3269*	6I	Q3251	5I	R3116	1C	R3278	3I	TP3164	2D		
C3274	4J	Q3269	5J	R3117	1C	R3279	4I	TP3167	3D		
C3277*	4I	Q3350	6G	R3120	7F	R3286	3H	TP3277	3I		
C3278	4J	Q3355	6H	R3132	7E	R3287	3H	TP3279	3I		
C3279	3I	Q3360	6G	R3133	3B	R3288	3H	TP3280	3J		
C3282	4J	Q3365	5G	R3137	3C	R3289	3H	TP3335	2D		
C3302	2E	Q3370	6G	R3138	3C	R3292	6J				
C3303	2E	Q3380	6H	R3140	2C	R3302	2E	U3023	2B		
C3321	1H	Q3390	6G	R3141	2C	R3303	2E	U3061	3B		
C3322	1I			R3145	3C	R3307	4G	U3091	1F		
C3324	1H	R3002	5B	R3147	3C	R3309	4G	U3103	2D		
C3333	1D	R3003	4B	R3153	1B	R3311	4G	U3113	2C		
C3341	5F	R3004	5C	R3154	2B	R3313	3E	U3165	3C		
C3661	1C	R3005	5B	R3155	3C	R3314	7F	U3211	2J		
C3675	6H	R3006	6A	R3157	3C	R3315	3F	U3213	1I		
C3676	6G	R3007	6A	R3158	3C	R3316	3F	U3223	2I		
C3681	1B	R3010	4C	R3160	3C	R3317	3F	U3256	4J		
		R3011	5C	R3161	2B	R3321	5F	U3275	4I		
CR3016	4C	R3012	4B	R3165	3D	R3322	1I	U3282	3J		
CR3062	3B	R3016	4C	R3201	2I	R3324	5F	U3301	2E		
CR3065	3A	R3019	4B	R3202	2I	R3325	6H	U3308	4E		
CR3066	3A	R3023	3B	R3204	2J	R3326	7I	U3310	4F		
CR3074	2F	R3030	3D	R3205	2I	R3327	2G	U3312	1D		
CR3075	2F	R3031	3D	R3208	2I	R3328	7I	U3320	2H		
CR3120	7D	R3032	3D	R3209	2I	R3332	2D	U3323	2H		
CR3133	3B	R3033	4D	R3210	2I	R3333	1D	U3340	3G		
CR3221	6I	R3034	4D	R3212	2J	R3334	2D	U3343	3G		
CR3232	2J	R3041	1B	R3213	1I	R3335	2D	U3373	3E		
CR3234	3J	R3043	1B	R3215	4J	R3341	4G	U3383	1E		
CR3274*	4I	R3044	2B	R3216	4I	R3347	4G	U3385	6G		
CR3275*	4I	R3045	2B	R3217	4H	R3348	5G				
CR3278*	4I	R3047	1B	R3220	4I	R3351	6G	VR3037	4D		
CR3279*	3I	R3048	1B	R3227	2I	R3353	5G	VR3077	1H		
CR3292*	7J	R3051	1B	R3228	2I	R3355	5H	VR3082	1H		

*See Parts List for serial number ranges.

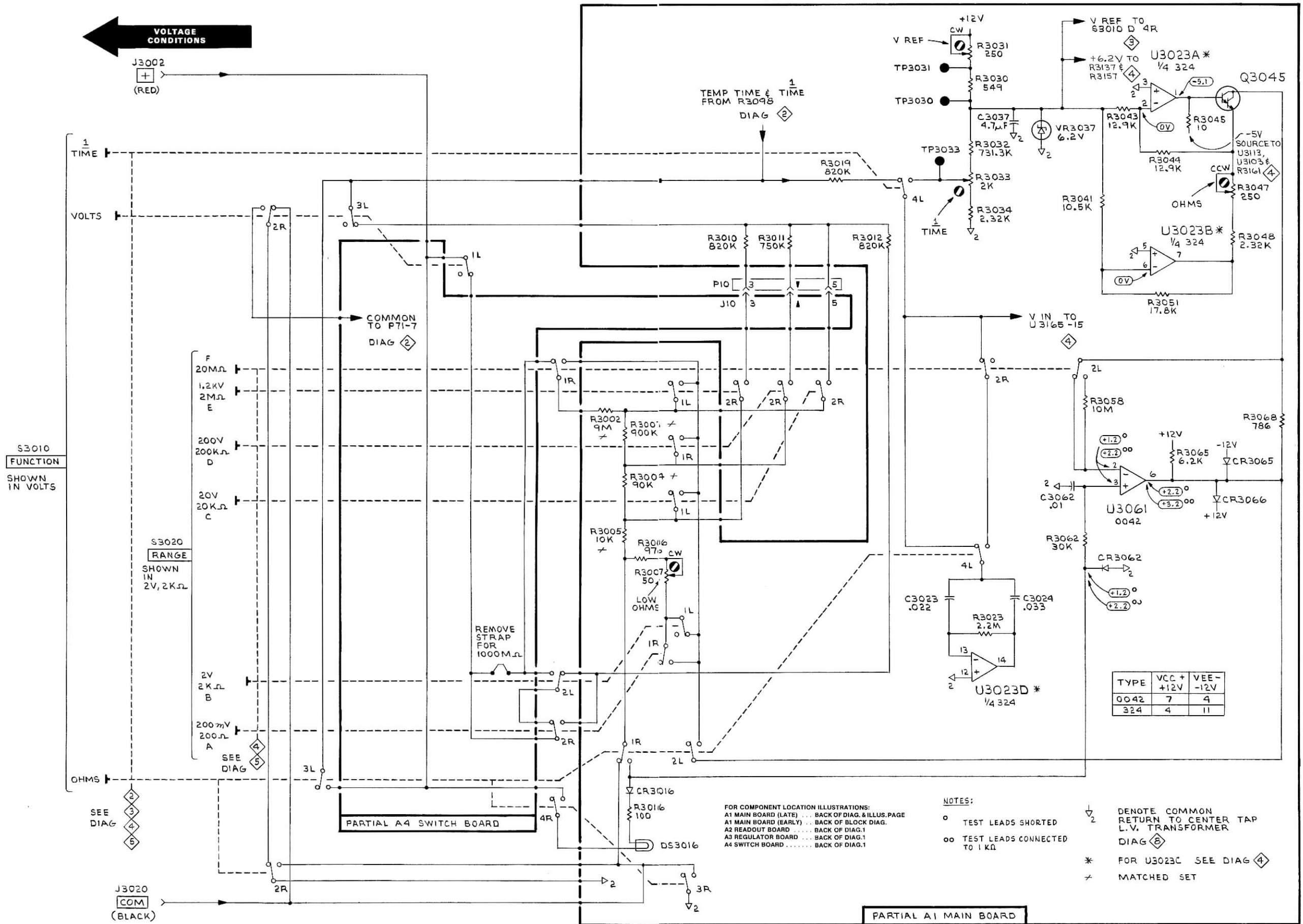
VOLTAGE CONDITIONS

DM44 FUNCTION OHMS
DM44 RANGE 2 kΩ

Voltages measured with respect to ground 2 except as noted on the diagram.

Either short the DM44 leads together or connect them to a 1 kΩ resistor as noted on the diagram.

Voltages measured with a Tektronix DM501 Digital Multimeter.



DM44 Service

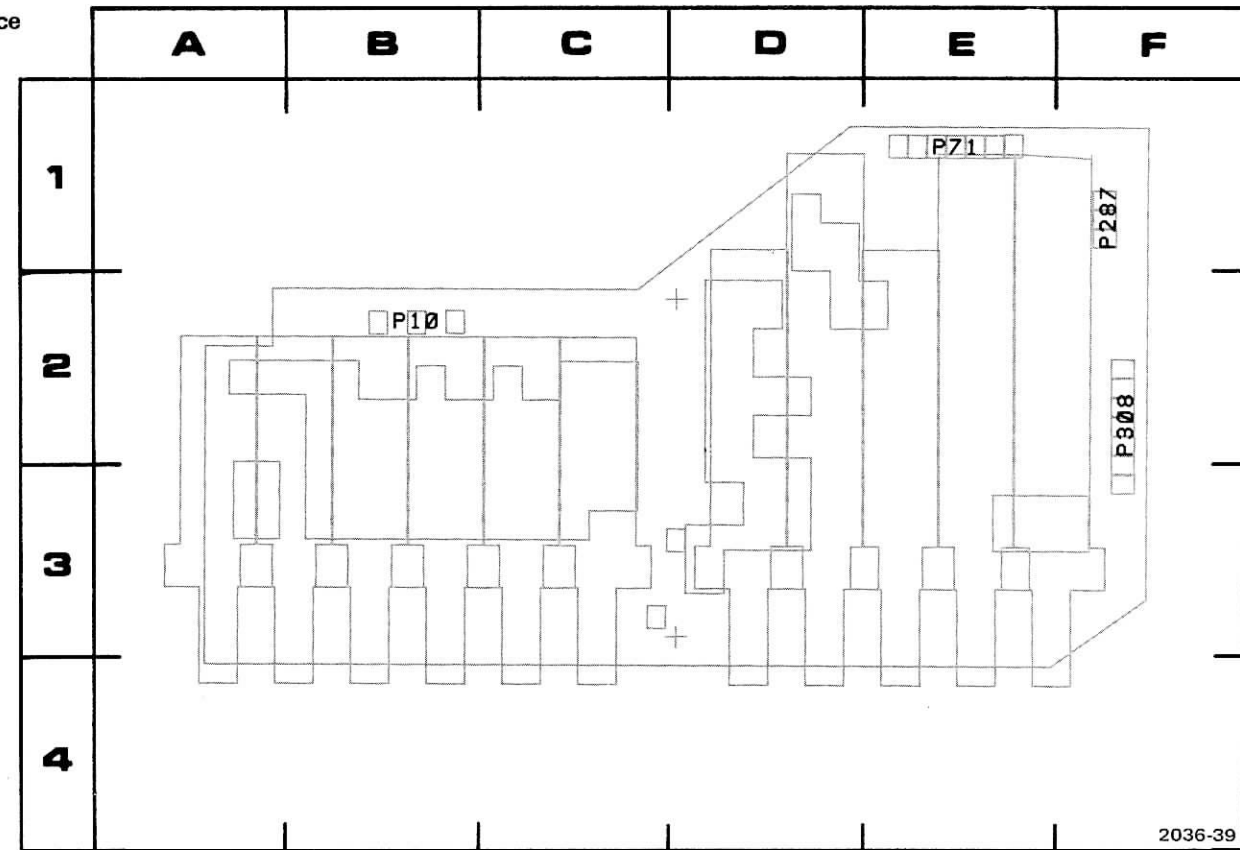


Fig. 9-4. A4 Switch board component locations.

MORE

CKT NO	GRID LOC
P10	2B
P71	1E
P287	1F
P308	2F

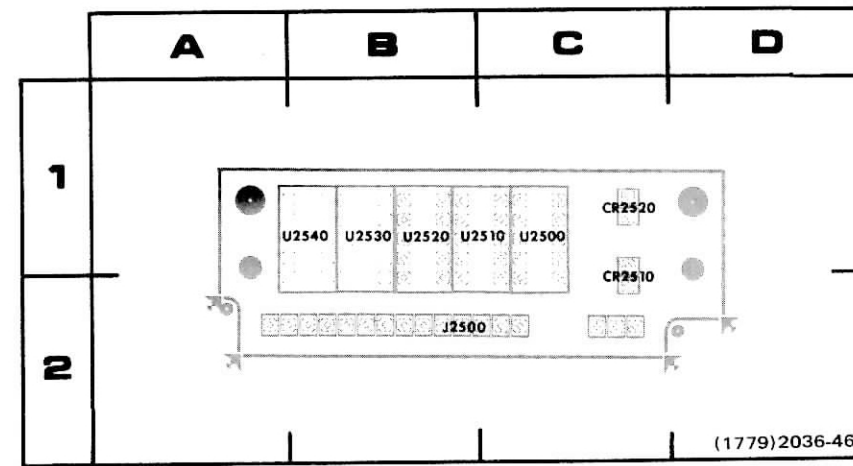


Fig. 9-5. A2 Readout board component locations.

CKT NO	GRID LOC
CR2510	2C
CR2520	1C
J2500	2B
U2500	1C
U2510	1B
U2520	1B
U2530	1B
U2540	1B

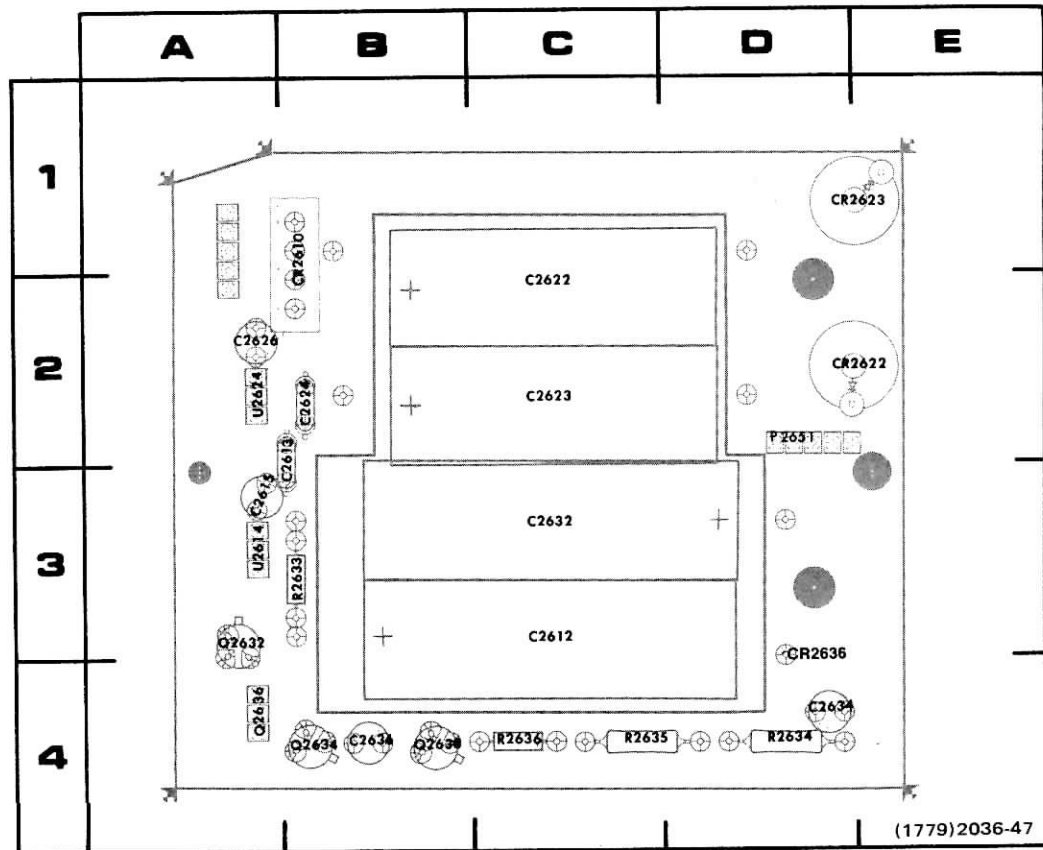


Fig. 9-6. A3 Regulator board component locations.

CKT NO	GRID LOC	CKT NO	GRID LOC
C2612	3C	P2651	2D
C2613	2B		
C2615	3A	Q2632	3A
C2622	2C	Q2634	4B
C2623	2C	Q2636	4A
C2624	2B	Q2638	4B
C2626	2A		
C2632	3C	R2633	3B
C2634	4D	R2634	4D
C2636*	4B	R2635	4C
		R2636	4C
CR2610	1B		
CR2622	2E	U2614	3A
CR2623	1E	U2624	2A
CR2636	3D		

*See Parts List for serial number ranges.

VOLTAGE CONDITIONS

DM44 FUNCTION

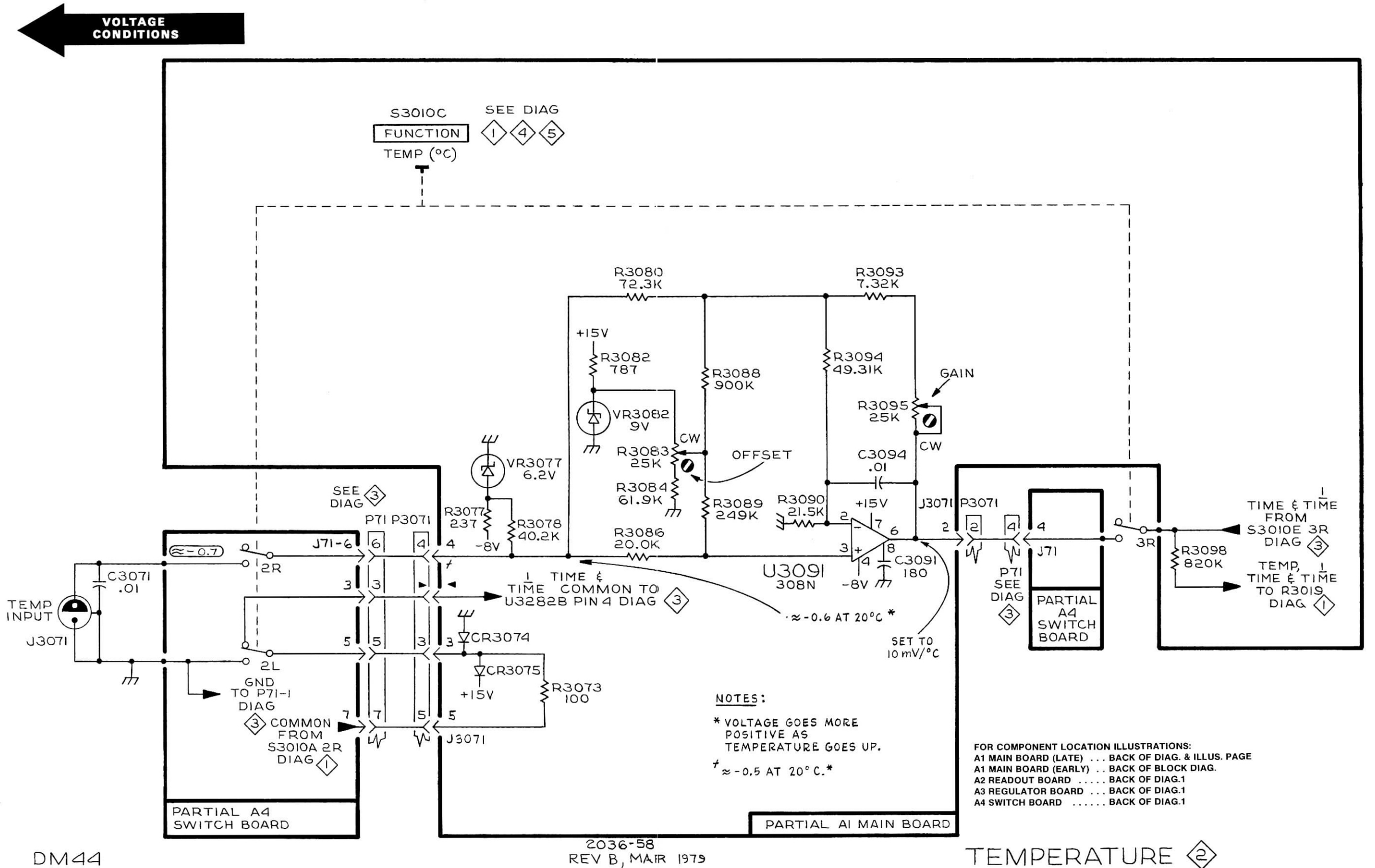
TEMP (°C)

Temperature probe connected to DM44.

Ambient temperature about 20 °C.

Voltages measured with respect to chassis ground.

Voltages measured with a Tektronix DM501 Digital Multimeter.



WAVEFORM CONDITIONS

DM44 FUNCTION	TIME
A TIME/DIV	1 ms
B TIME/DIV	5 μ s
HORIZ DISPLAY	A INTEN
VERT MODE	ALT*
DELAY TIME POSITION	To set reference point to the third vertical graticule line
TIME	For a DM44 reading of about 06.00

*Must be set to ALT for stable triggering of test oscilloscope.

TEST OSCILLOSCOPE

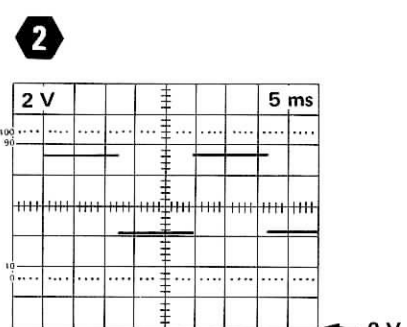
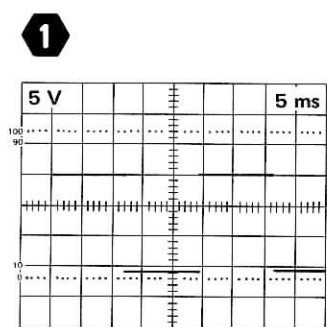
TRIGGER MODE	NORM
TRIGGER SOURCE	CH 2
VERT MODE	CH 1 (After trigger setup)
CH 2 VOLTS/DIV	1 V

TRIGGER SETUP

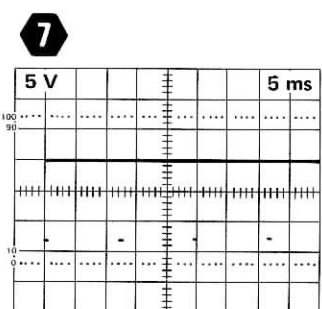
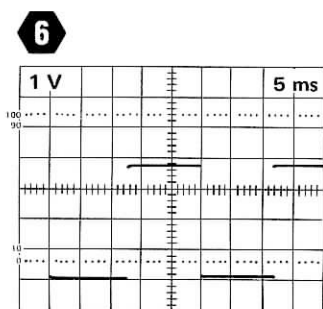
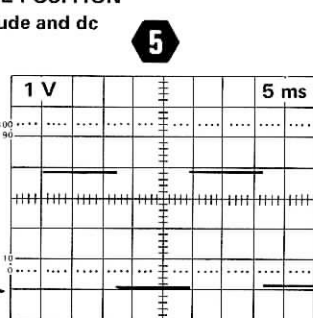
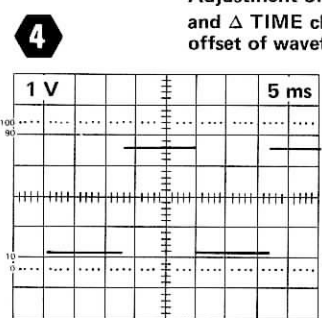
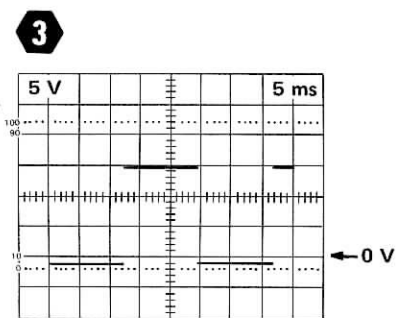
1. Connect CH 2 probe to pin 1 of U3211 (or one lead of R3212).
2. Set VERT MODE to CH 2.
3. Set TRIGGER SLOPE as indicated with desired waveform.
4. Adjust TRIGGER LEVEL for a stable display triggered on the slope selected in step 3.
5. Set VERT MODE to CH 1 (do not readjust TRIGGER controls).
6. Make measurement with CH 1 probe.

VOLTAGE CONDITIONS

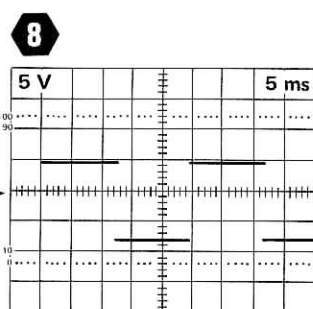
DM44 FUNCTION	TIME
RECOMMENDED TEST EQUIPMENT	
Tektronix 465 Oscilloscope with two 10X probes for waveforms.	
Tektronix DM501 or DM502 Digital Multimeter for voltages.	



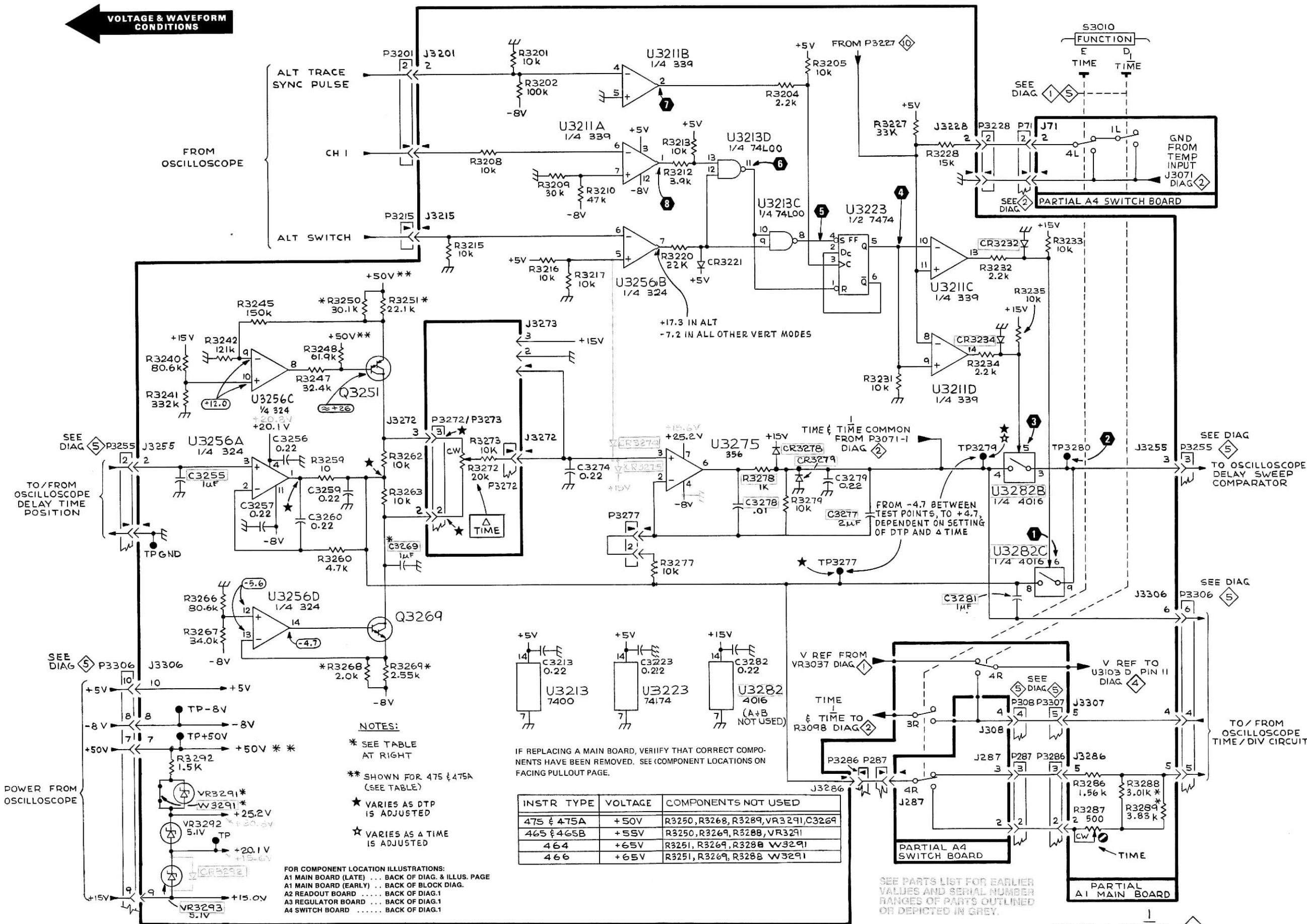
Adjustment of DELAY TIME POSITION and Δ TIME changes amplitude and dc offset of waveform.



Increase test oscilloscope intensity to make negative-going pulse visible.



VOLTAGE & WAVEFORM CONDITIONS



WAVEFORM CONDITIONS

DM44

FUNCTION OHMS
RANGE 2 k

OSCILLOSCOPE (TO WHICH DM44 IS ATTACHED)

Has no effect on display;

TEST OSCILLOSCOPE

TRIGGER MODE NORM
TRIGGER SOURCE CH 2
VERT MODE CH 1 (After trigger setup)
CH 2 VOLTS/DIV 1 V

TRIGGER SETUP

1. Connect CH 2 probe to TP3164.
2. Set VERT MODE to CH 2.
3. Set TRIGGER SLOPE as indicated with desired waveform).
4. Adjust TRIGGER LEVEL for a stable display triggered on the slope selected in step 3.
5. Set VERT MODE to CH 1 (do not readjust TRIGGER controls).

6. Make measurement with CH 1 probe.

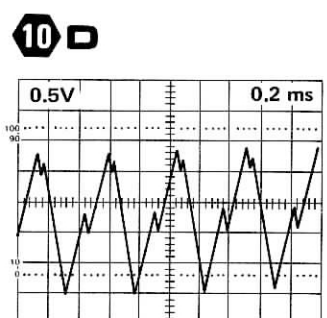
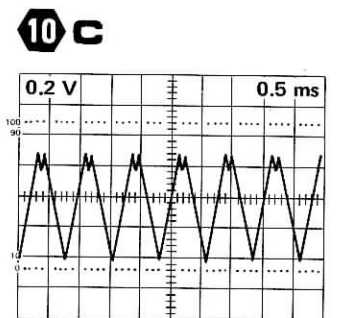
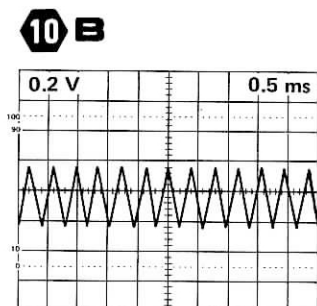
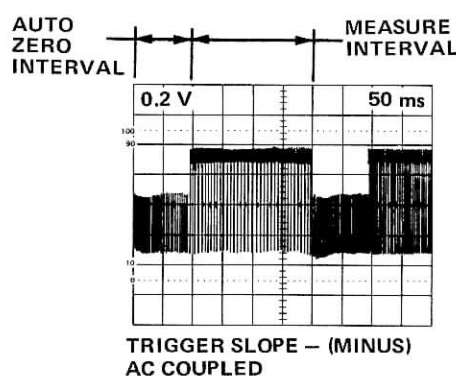
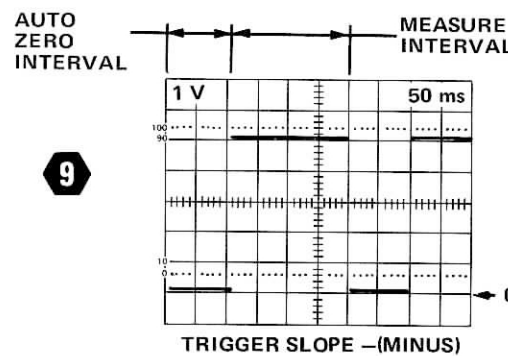
VOLTAGE CONDITIONS

DM44 FUNCTION TIME
A TIME/DIV 1 ms
B TIME/DIV 5 μ s
A INTEN To position reference point to the third vertical graticule line
DELAY TIME POSITION For a DM44 reading of about 06.00

TIME

RECOMMENDED TEST EQUIPMENT

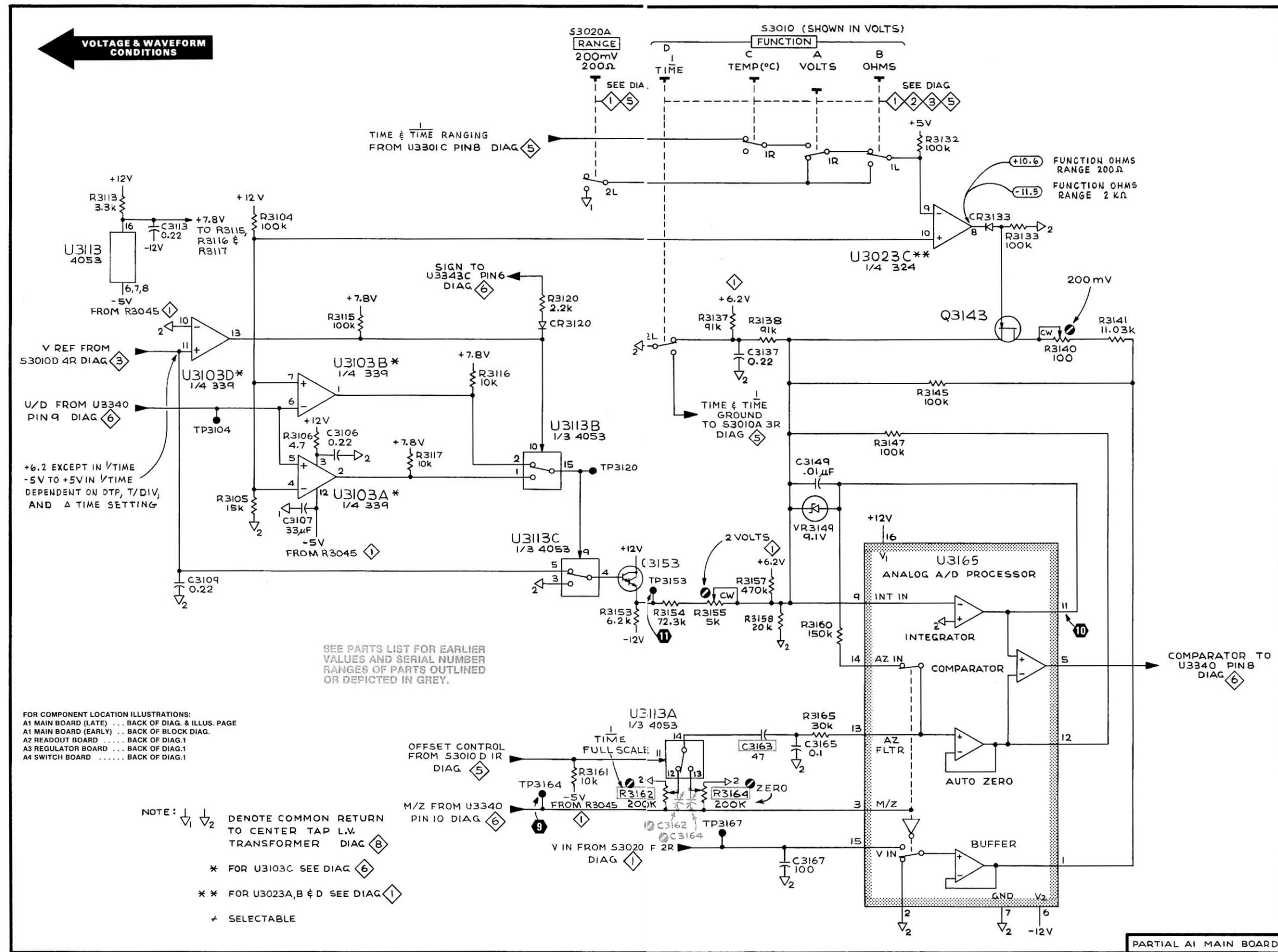
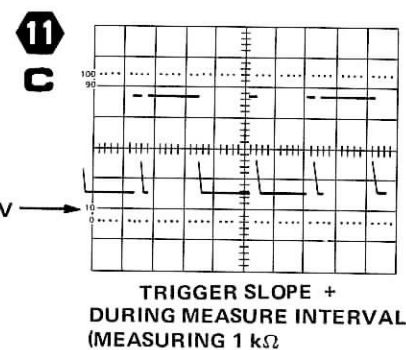
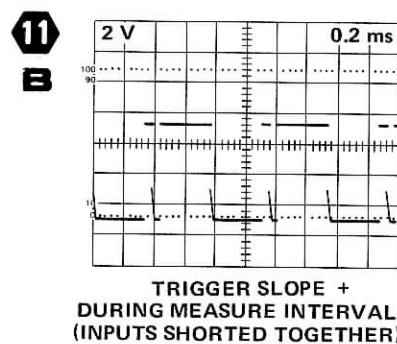
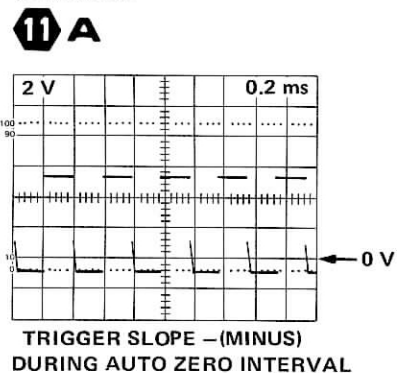
Tektronix 465 Oscilloscope with two 10X probes for waveforms.
Tektronix DM501 or DM502 Digital Multimeter for voltages.



TRIGGER SLOPE - (MINUS) AC COUPLED PORTION OF AUTO ZERO INTERVAL EXPANDED

TRIGGER SLOPE + AC COUPLED PORTION OF MEASURE INTERVAL EXPANDED (INPUTS SHORTED)

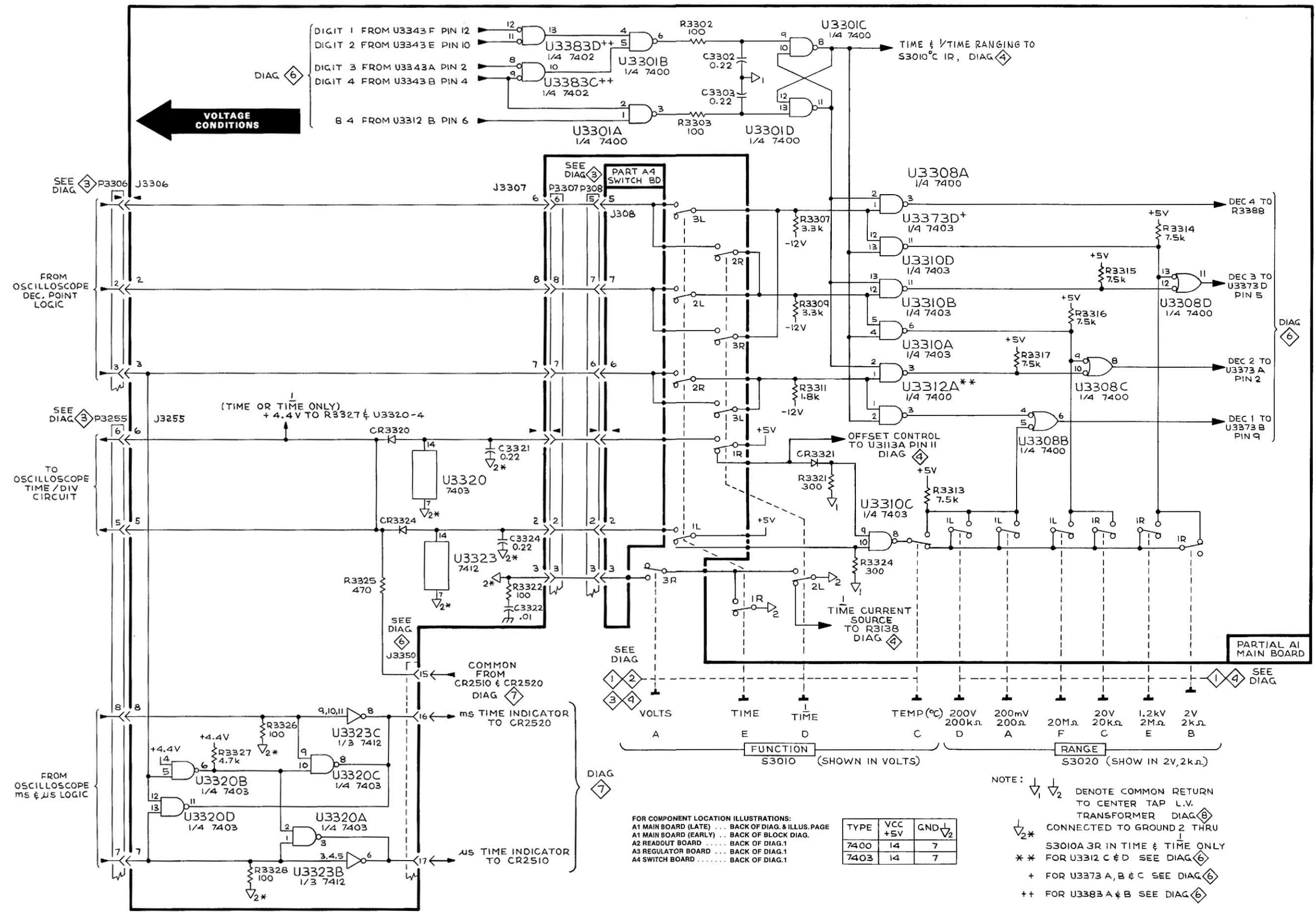
TRIGGER SLOPE + AC COUPLED PORTION OF MEASURE INTERVAL EXPANDED (MEASURING 1 k Ω)



VOLTAGE CONDITIONS

DM44 FUNCTION VOLTS
DM44 RANGE As noted on diagram 5

Voltages measured with a Tektronix DM501 Digital Multimeter.



FOR COMPONENT LOCATION ILLUSTRATIONS:
A1 MAIN BOARD (LATE) ... BACK OF DIAG. & ILLUS. PAGE
A1 MAIN BOARD (EARLY) ... BACK OF BLOCK DIAG.
A2 READOUT BOARD ... BACK OF DIAG. 1
A3 REGULATOR BOARD ... BACK OF DIAG. 1
A4 SWITCH BOARD ... BACK OF DIAG. 1

TYPE	VCC	GND
7400	14	7
7403	14	7

NOTE: $\nabla_1 \nabla_2$ DENOTE COMMON RETURN TO CENTER TAP L.V. TRANSFORMER DIAG. 6
 ∇_2^* CONNECTED TO GROUND 2 THRU S3010A 3R IN TIME & TIME ONLY
** FOR U3312 C & D SEE DIAG. 6
+ FOR U3373 A, B & C SEE DIAG. 6
++ FOR U3383 A & B SEE DIAG. 6

TIME AND TIME DECIMAL POINT LOGIC

WAVEFORM CONDITIONS

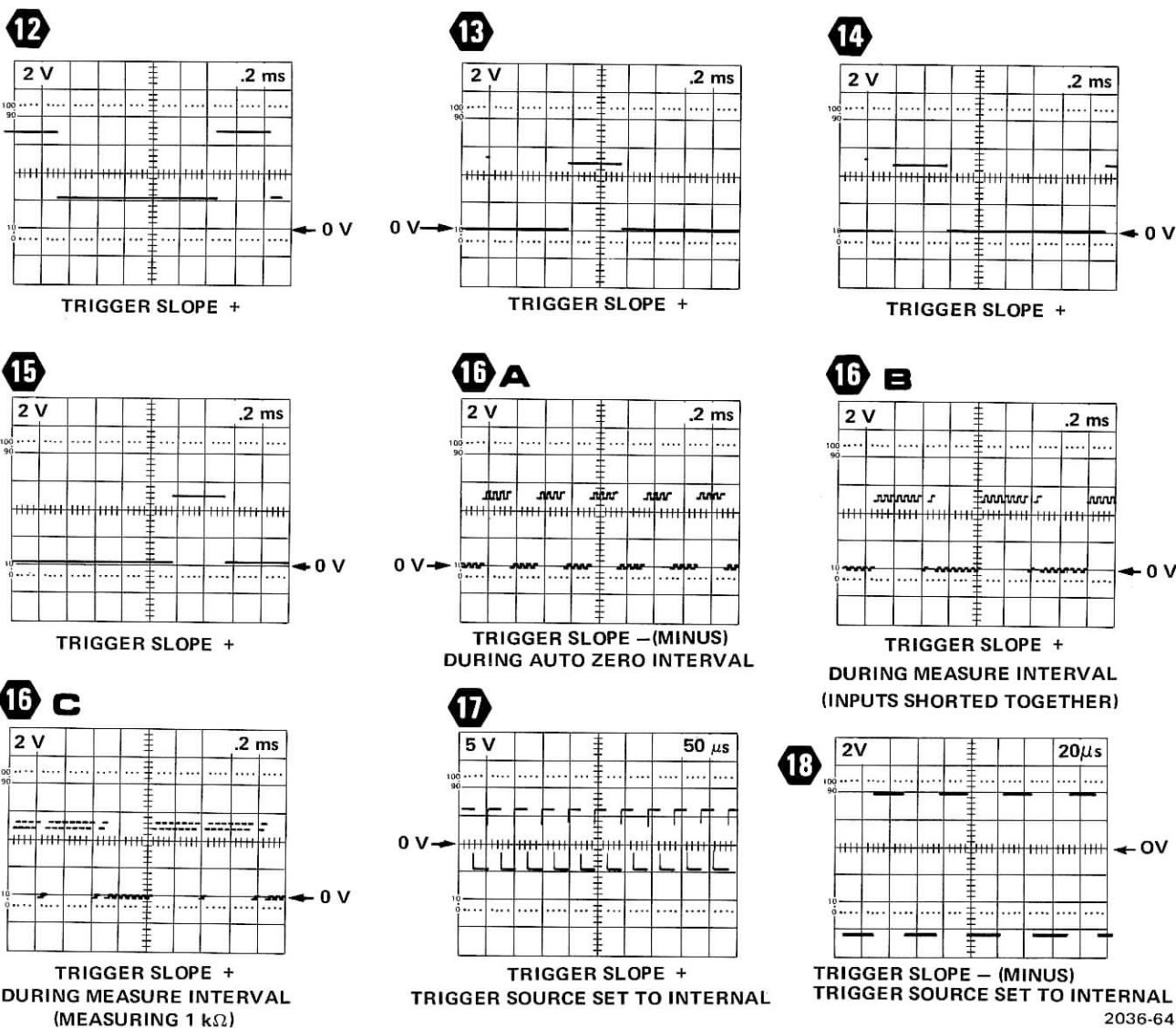
DM44

FUNCTION	TIME
OSCILLOSCOPE (TO WHICH DM44 IS ATTACHED)	
A TIME/DIV	1 ms
B TIME/DIV	5 μ s
HORIZ DISPLAY	A INTEN
VERT MODE	ALT*
DELAY TIME POSITION	To set reference point to the third vertical graticule line
TIME	For a DM44 reading of about 06.00
	*Must be set to ALT for stable triggering of test oscilloscope.

TEST OSCILLOSCOPE	
TRIGGER MODE	NORM
TRIGGER SOURCE	CH 2
VERT MODE	CH 1 (After trigger setup)
CH 2 VOLTS/DIV	1 V

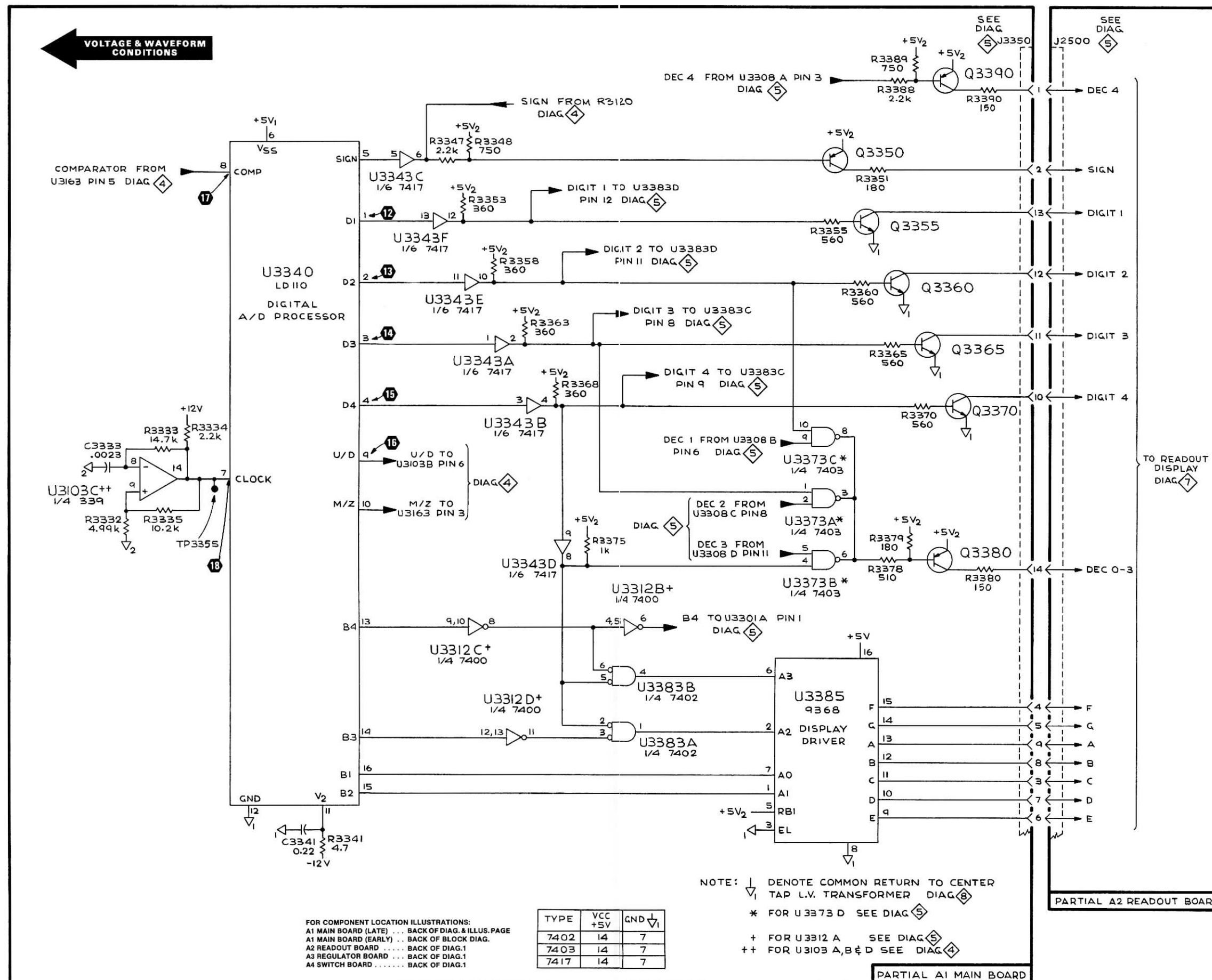
VOLTAGE CONDITIONS RECOMMENDED TEST EQUIPMENT

DM44 FUNCTION TIME
Tektronix 465 Oscilloscope for waveforms. Tektronix DM501 or DM502 Digital Multimeter for voltages.



TRIGGER SETUP

1. Connect CH 2 probe to TP3164.
2. Set VERT MODE to CH 2.
3. Set TRIGGER SLOPE as indicated with desired waveform.
4. Adjust TRIGGER LEVEL for a stable display triggered on the slope selected in step 3..
5. Set VERT MODE to CH 1 (do not readjust TRIGGER controls).
6. Make measurement with probe connected to CH 1.

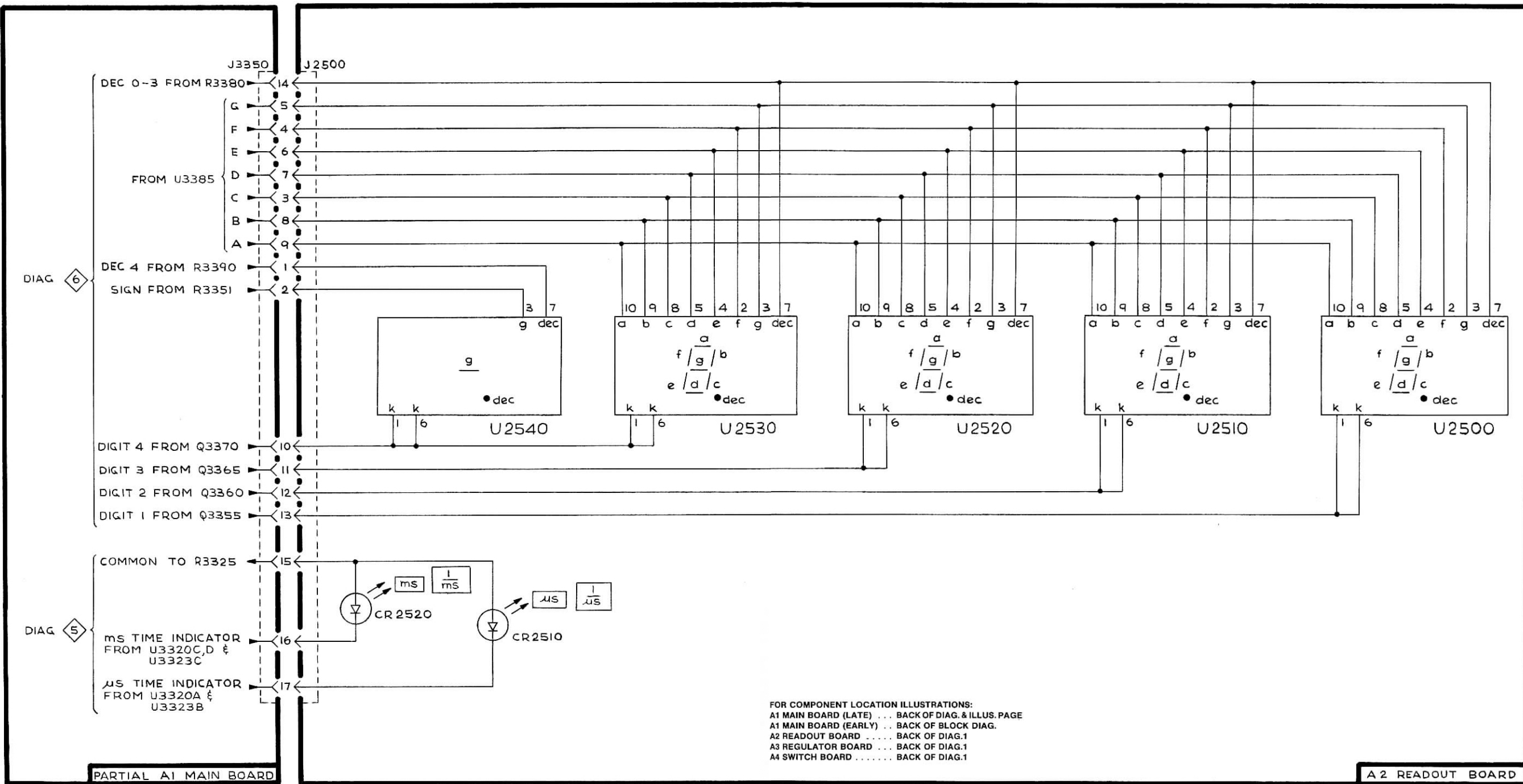


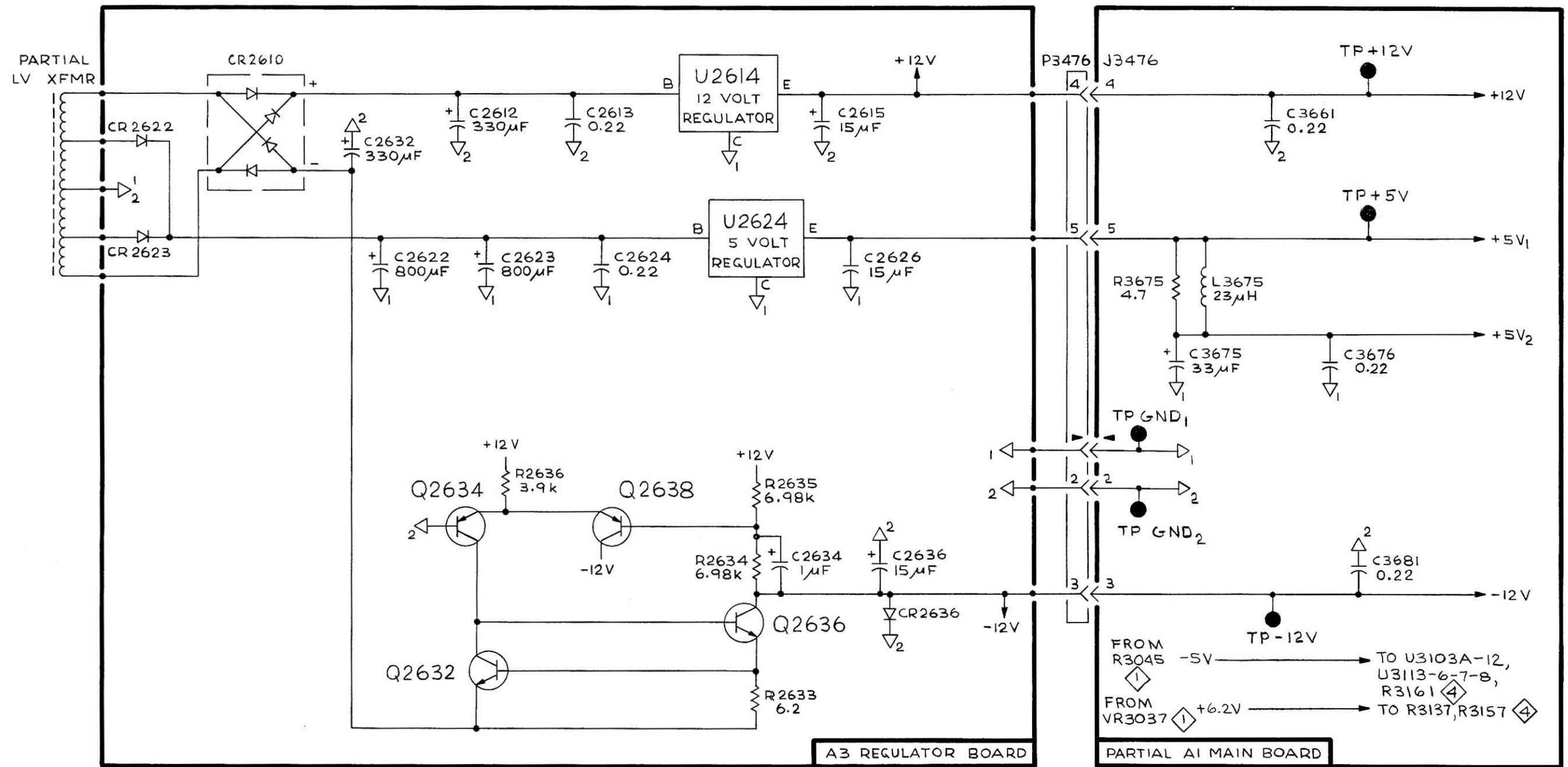
DM44

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READOUT LOGIC 6

READOUT LOGIC





FOR COMPONENT LOCATION ILLUSTRATIONS:
 A1 MAIN BOARD (LATE) ... BACK OF DIAG. & ILLUS. PAGE
 A1 MAIN BOARD (EARLY) ... BACK OF BLOCK DIAG.
 A2 READOUT BOARD ... BACK OF DIAG.1
 A3 REGULATOR BOARD ... BACK OF DIAG.1
 A4 SWITCH BOARD ... BACK OF DIAG.1

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DM44

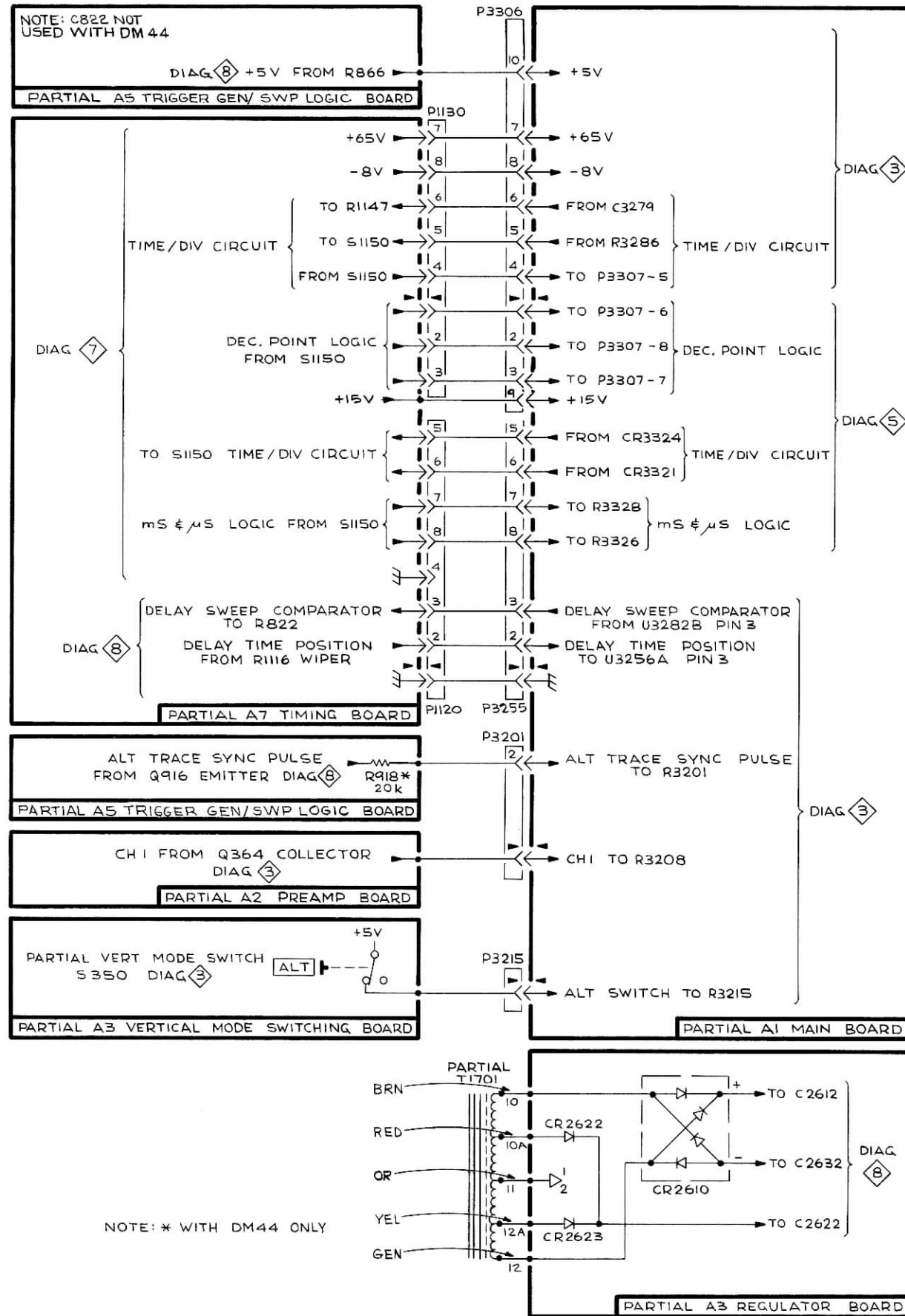
POWER SUPPLY 8

DM44 POWER SUPPLY

8

464 OR 466 OSCILLOSCOPE

DM 44

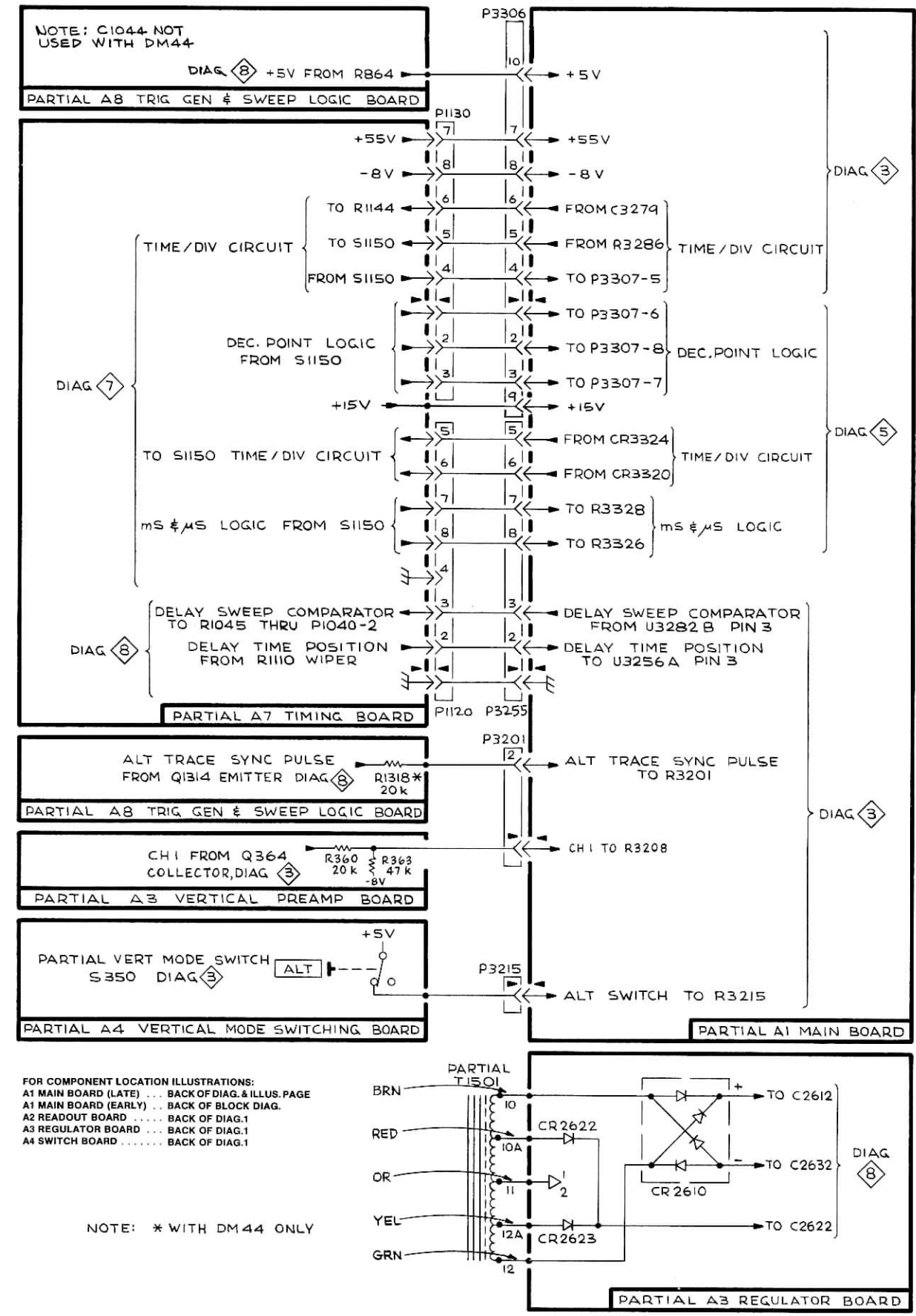


NOTE: * WITH DM44 ONLY

DM44

465 OSCILLOSCOPE

DM 44

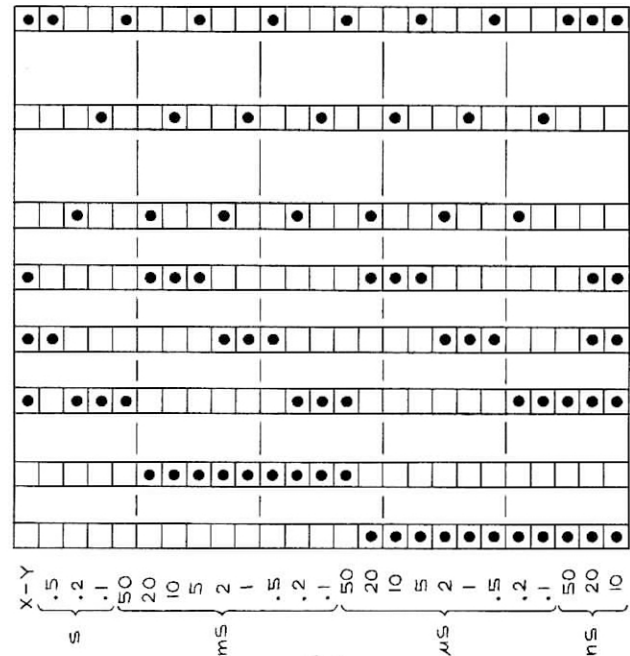


FOR COMPONENT LOCATION ILLUSTRATIONS:
 A1 MAIN BOARD (LATE) ... BACK OF DIAG. 8 ILLUSTR. PAGE
 A1 MAIN BOARD (EARLY) ... BACK OF BLOCK DIAG.
 A2 READOUT BOARD ... BACK OF DIAG. 1
 A3 REGULATOR BOARD ... BACK OF DIAG. 1
 A4 SWITCH BOARD ... BACK OF DIAG. 1

NOTE: * WITH DM44 ONLY

464, 465 & 466 INTERFACE

475 OR 475A OSCILLOSCOPE DM44

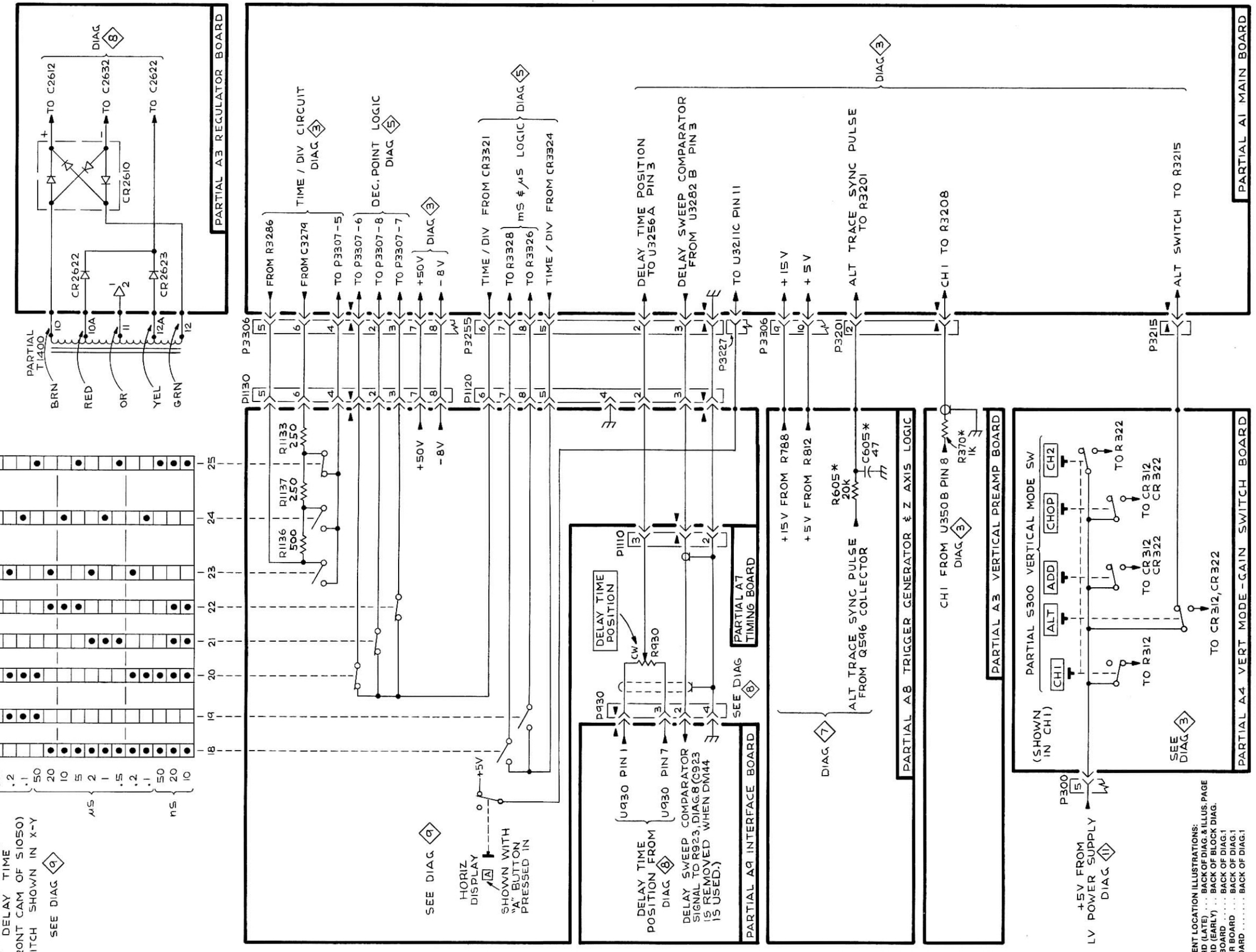


PARTIAL S1050
A & B TIME/DIV AND
DELAY TIME
(FRONT CAM OF S1050)
SWITCH SHOWN IN X-Y
SEE DIAG 6

HORIZ
DISPLAY
+5V
/√A
SHOWN WITH
"A" BUTTON
PRESSED IN

DM 44

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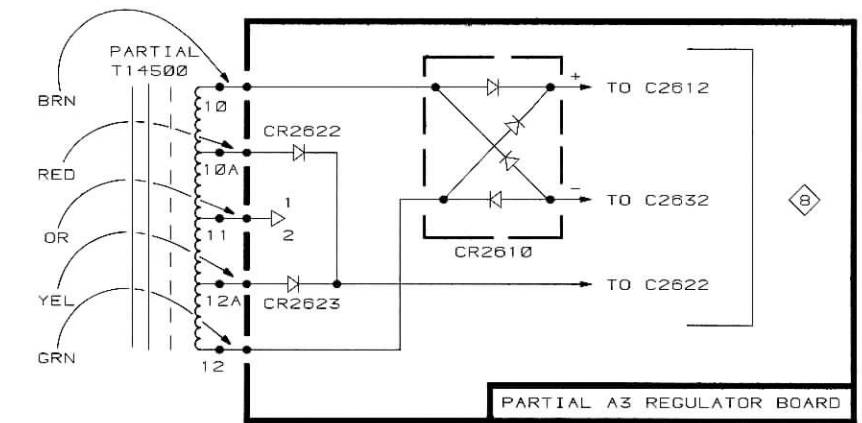


FOR COMPONENT LOCATION ILLUSTRATIONS:
A1 MAIN BOARD (LATE) ... BACK OF DIAG. & ILLUS. PAGE
A1 MAIN BOARD (EARLY) ... BACK OF BLOCK DIAG.
A2 BOARD ... BACK OF DIAG. 1
A3 REGULATOR BOARD ... BACK OF DIAG. 1
A4 SWITCH BOARD ... BACK OF DIAG. 1

NOTE: * WITH DM44 ONLY

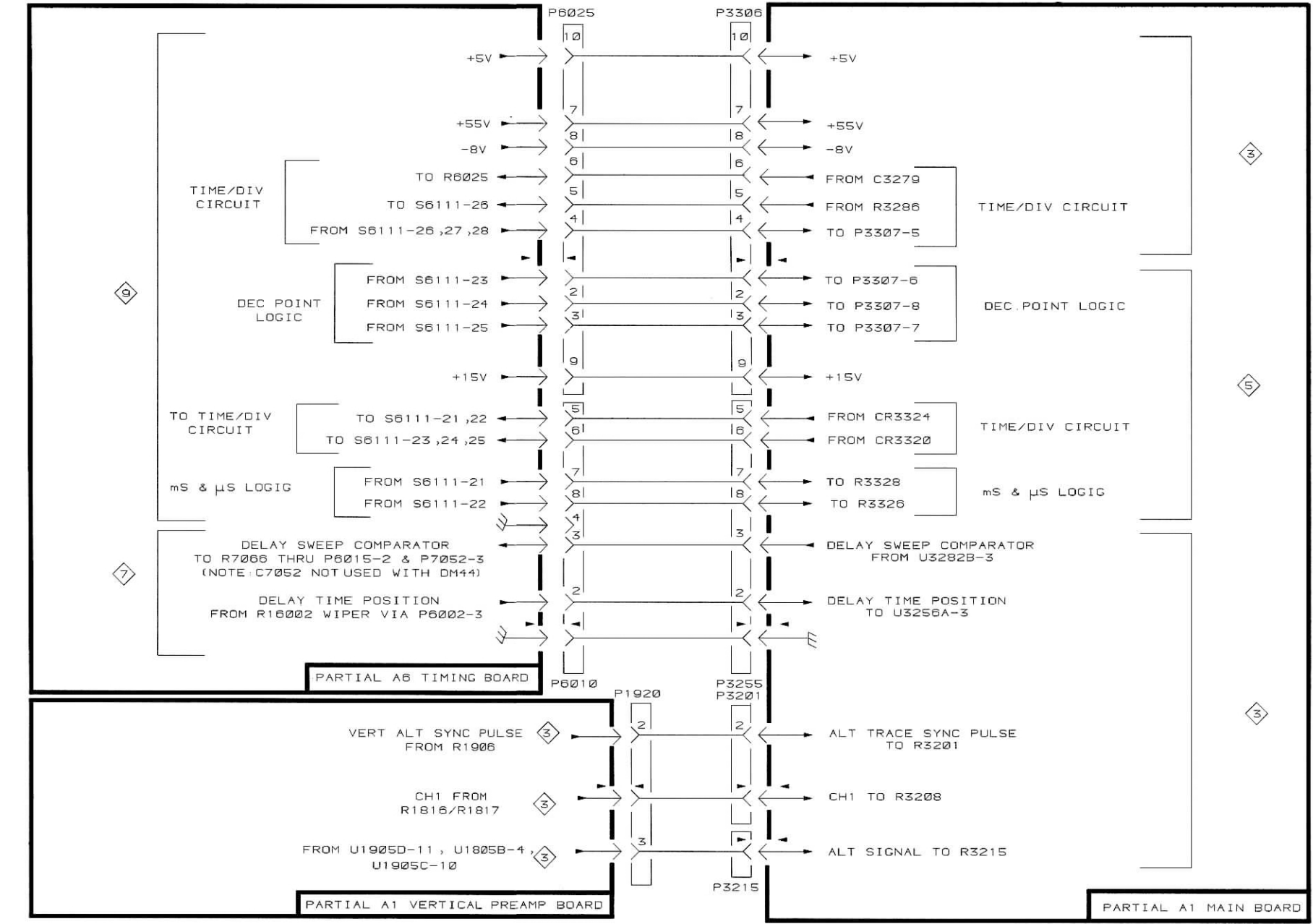
475 & 475A INTERFACE 10

475 & 475A INTERFACE



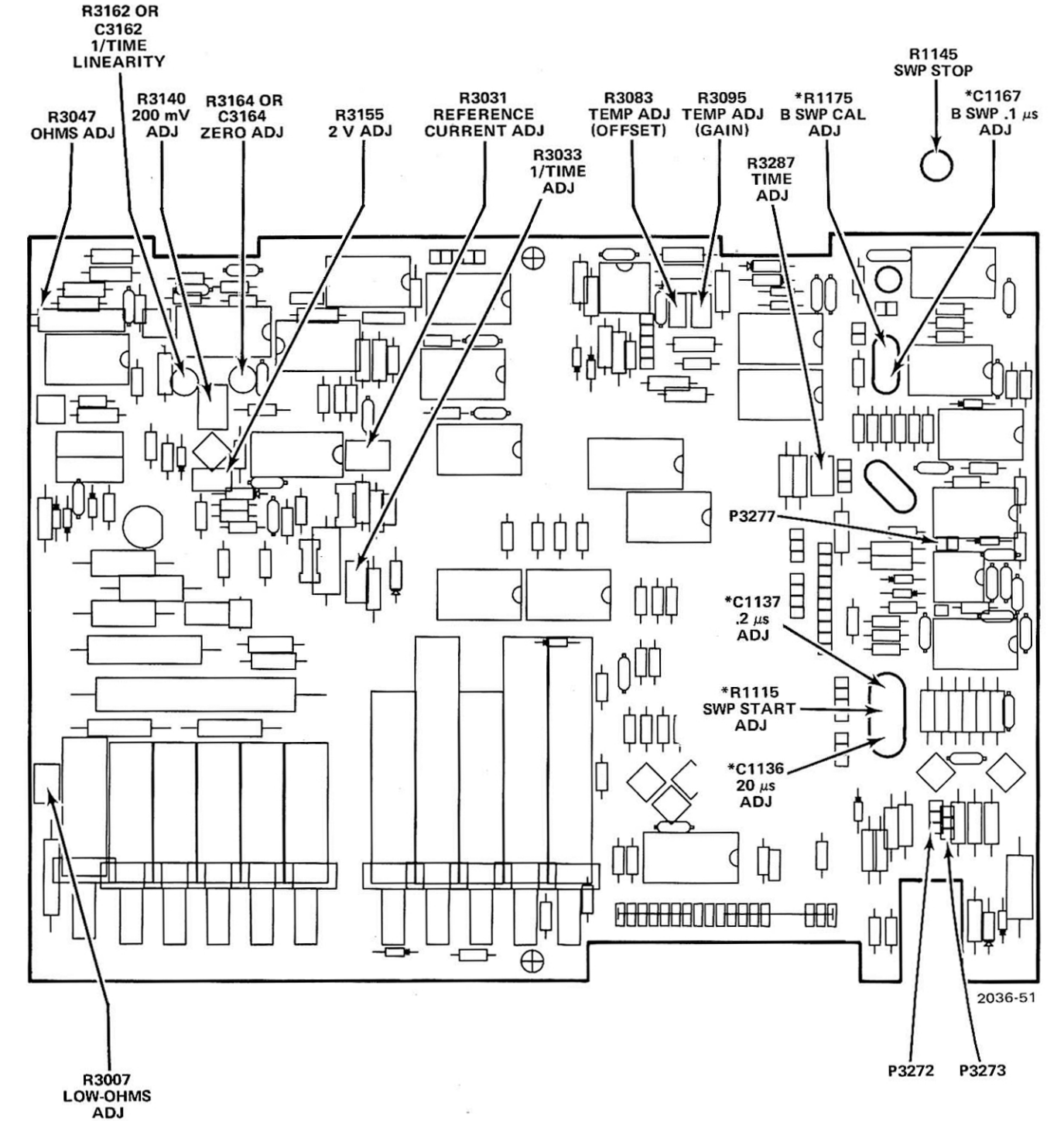
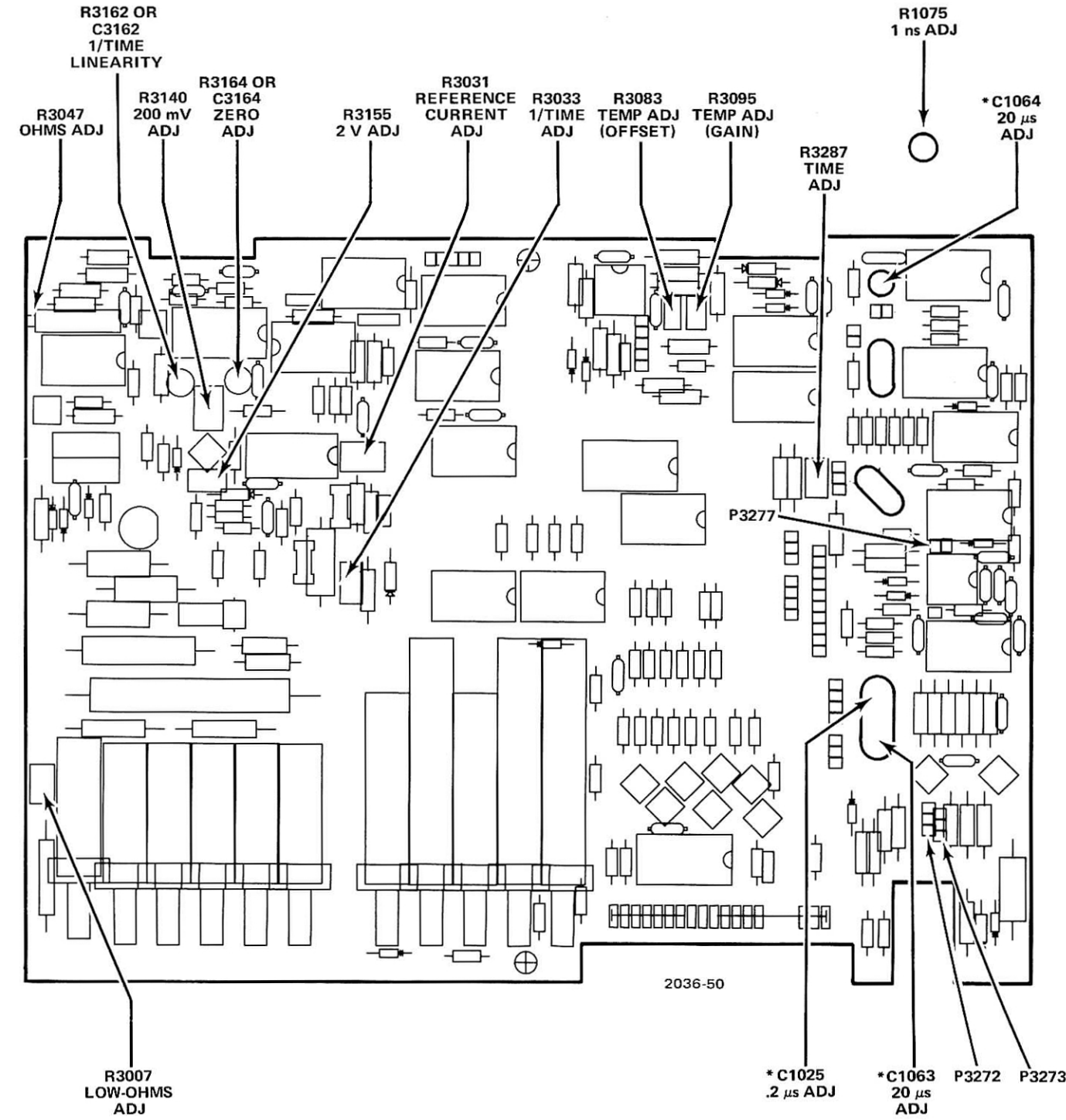
465B OSCILLOSCOPE

DM44



FOR DM44 COMPONENT LOCATION ILLUSTRATIONS:
 A1 MAIN BOARD (LATE) ... BACK OF BLOCK DIAG
 A2 READOUT BOARD ... BACK OF DIAG. 1
 A3 REGULATOR BOARD ... BACK OF DIAG. 1
 A4 SWITCH BOARD ... BACK OF DIAG. 1

2036-75
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NOTE

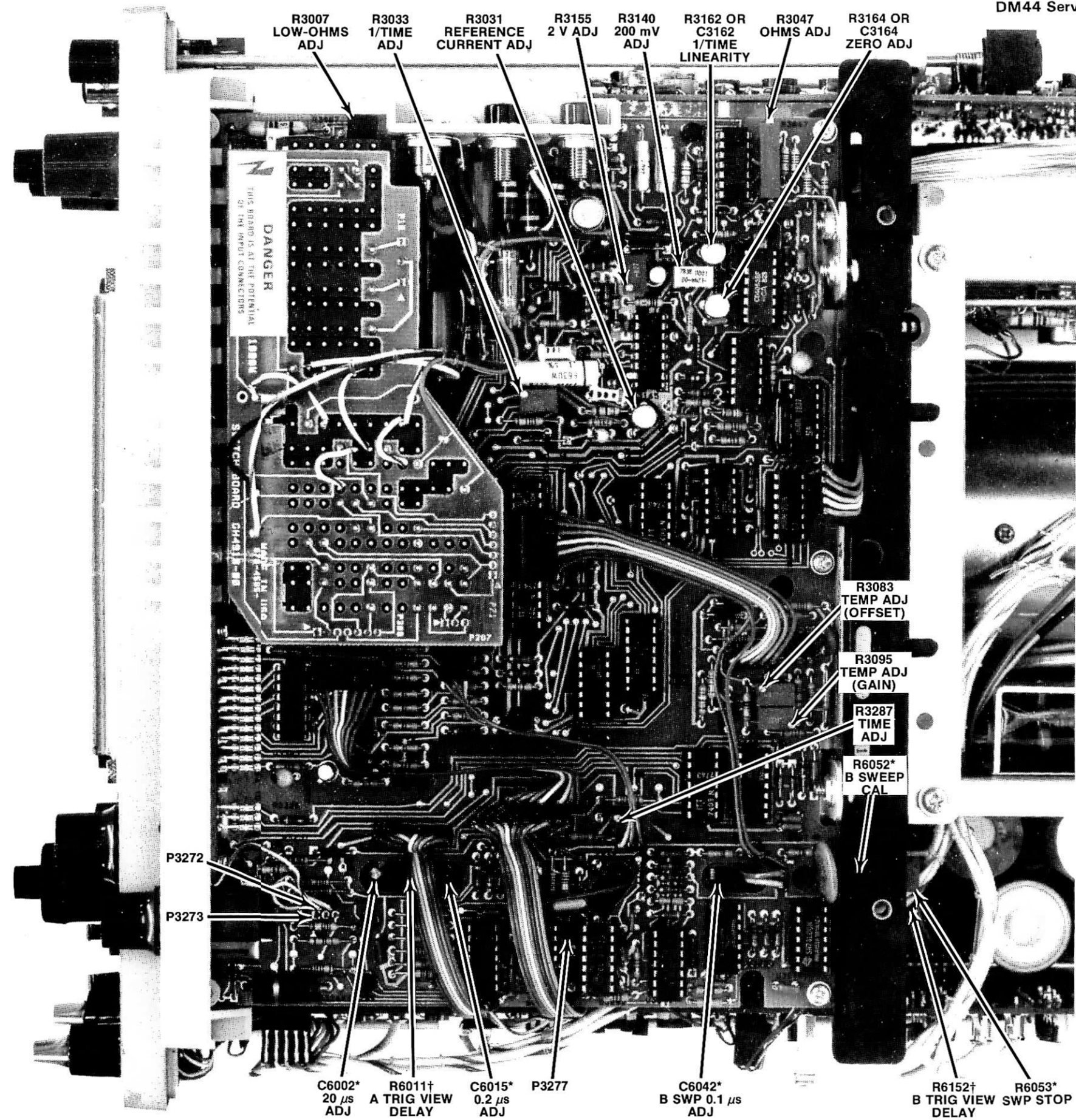
FIGURE 9-7A, 9-7B AND 9-8 SHOW DM44 ADJUSTMENTS AND OSCILLOSCOPE ADJUSTMENTS LOCATED UNDER THE DM44 MAIN BOARD. FOR OTHER ADJUSTMENTS, SEE THE OSCILLOSCOPE SERVICE OR INSTRUCTION MANUAL.

*PARTS MOUNTED ON OSCILLOSCOPE TIMING BOARD, ACCESSIBLE THROUGH HOLE IN DM44 MAIN BOARD.

Fig. 9-7A. Adjustment locations 475 DM44 & 475A DM44.

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Fig. 9-7B. Adjustment locations 464 DM44, 465 DM44, & 466 DM44.



ADJUSTMENT LOCATIONS 2
465B DM44

* Parts located on 465B Timing board and accessible through holes in DM44 Main board or support or at the end of support.

† Located on 465B Timing board and accessible through holes in DM44 Main board or support or at the end of support. Adjusted in 465B manual Vertical section Adjustment Procedure.

Fig. 9-8. Adjustment locations 465B DM44.

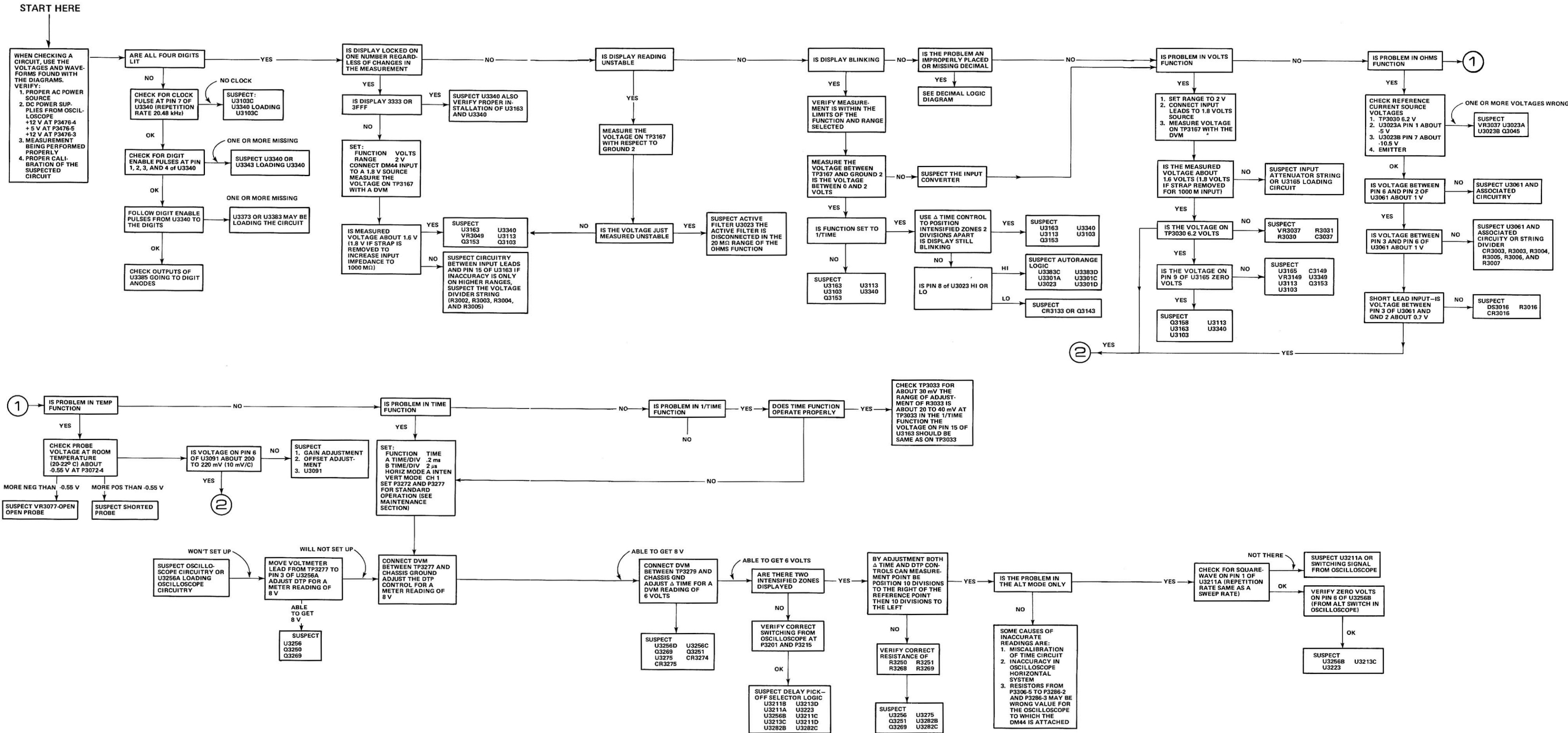
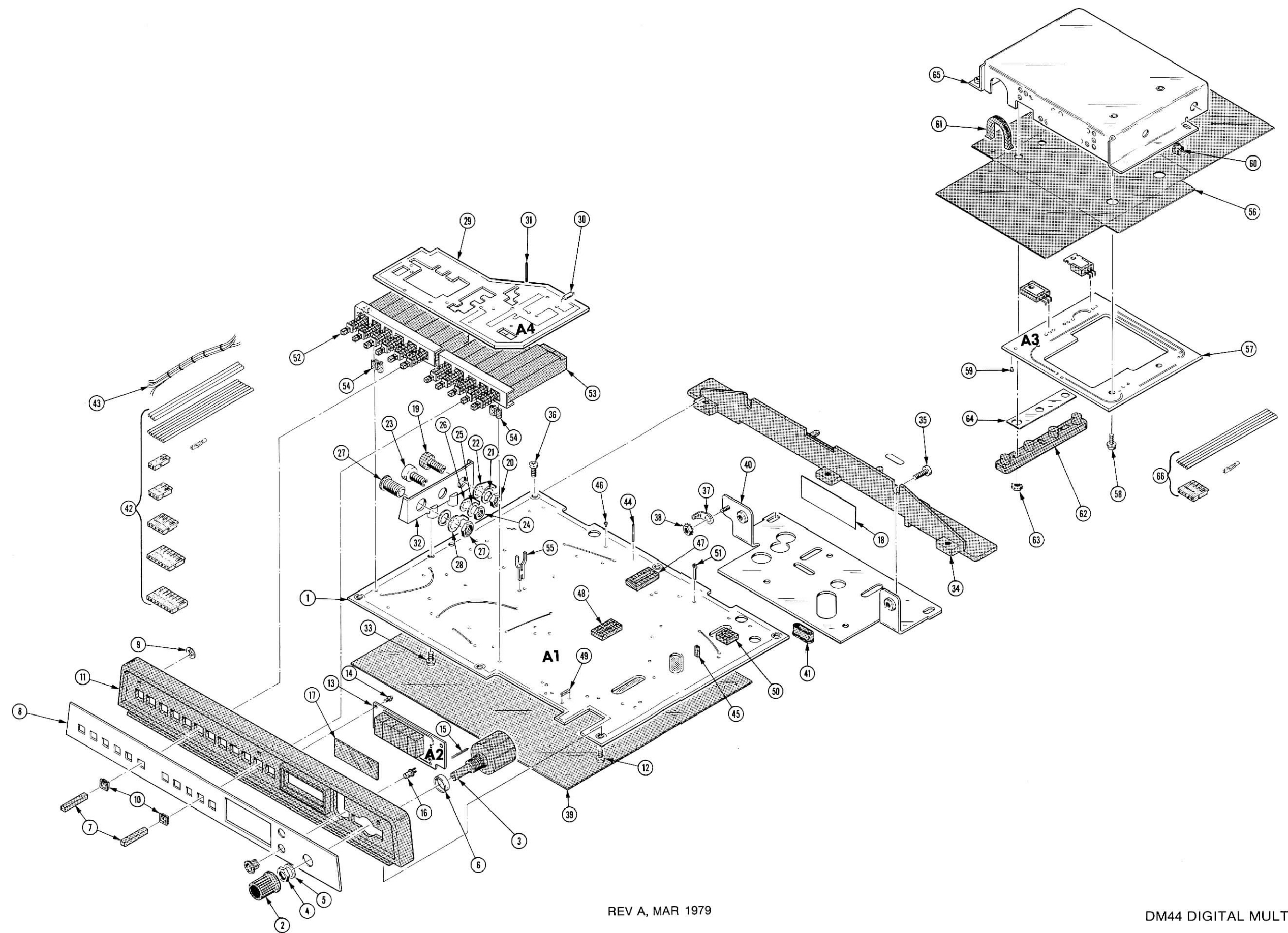


Fig. 9-9. Troubleshooting chart.



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DM44 DIGITAL MULTIMETER

