

# 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.

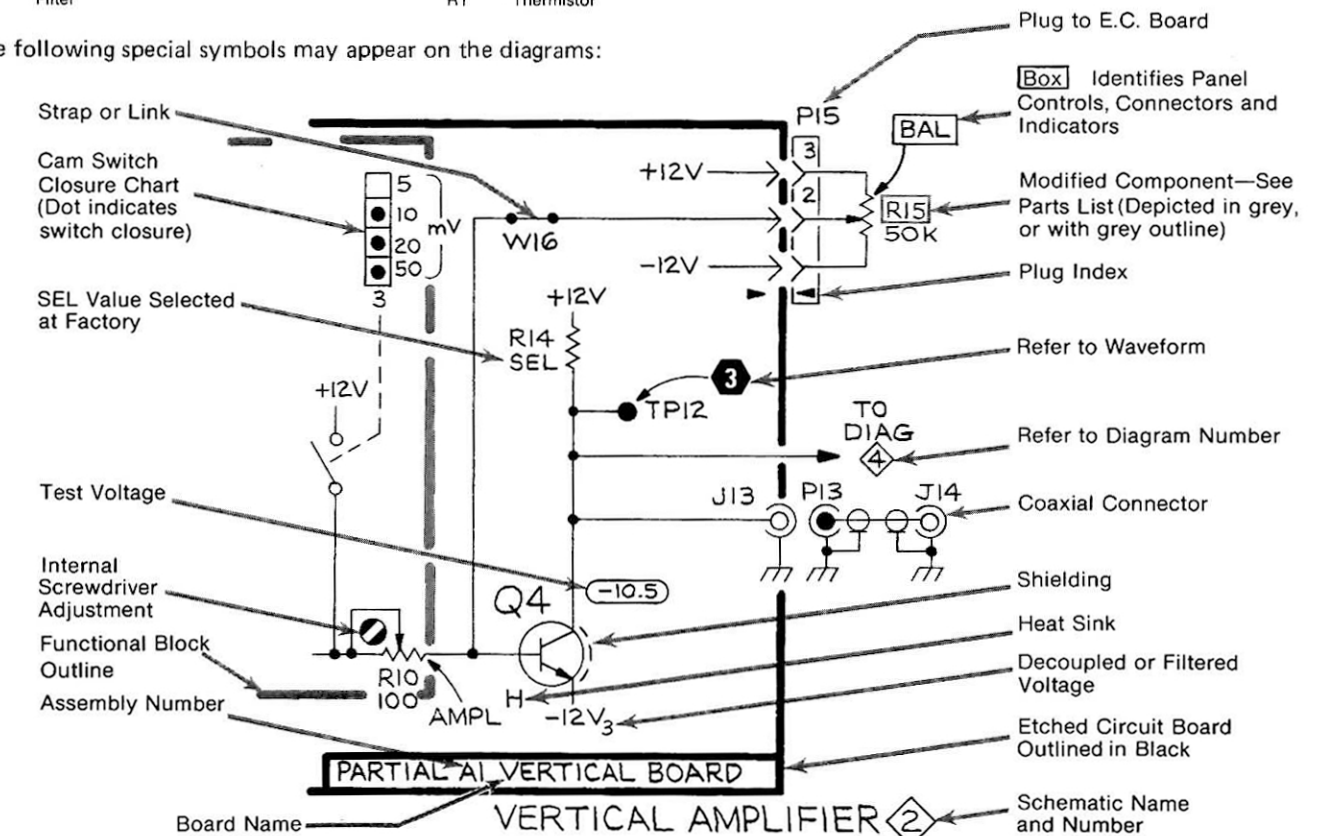
Other ANSI standards that are used in the preparation of diagrams by Tektronix, Inc. are:

- 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.

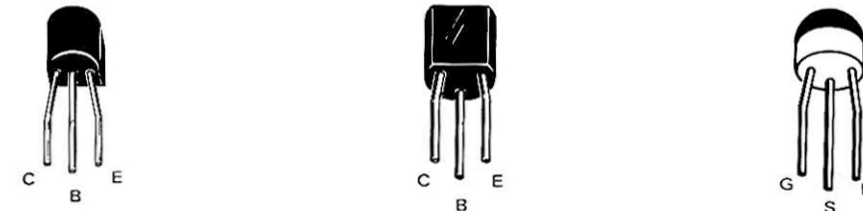
The following prefix letters are used as reference designators to identify components or assemblies on the diagrams.

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		
FL	Filter				

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.



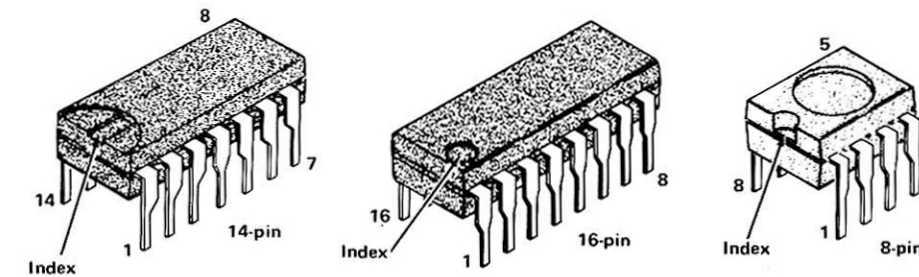
PLASTIC CASED TRANSISTORS



TRANSISTOR

INTEGRATED CIRCUIT

METAL CASED

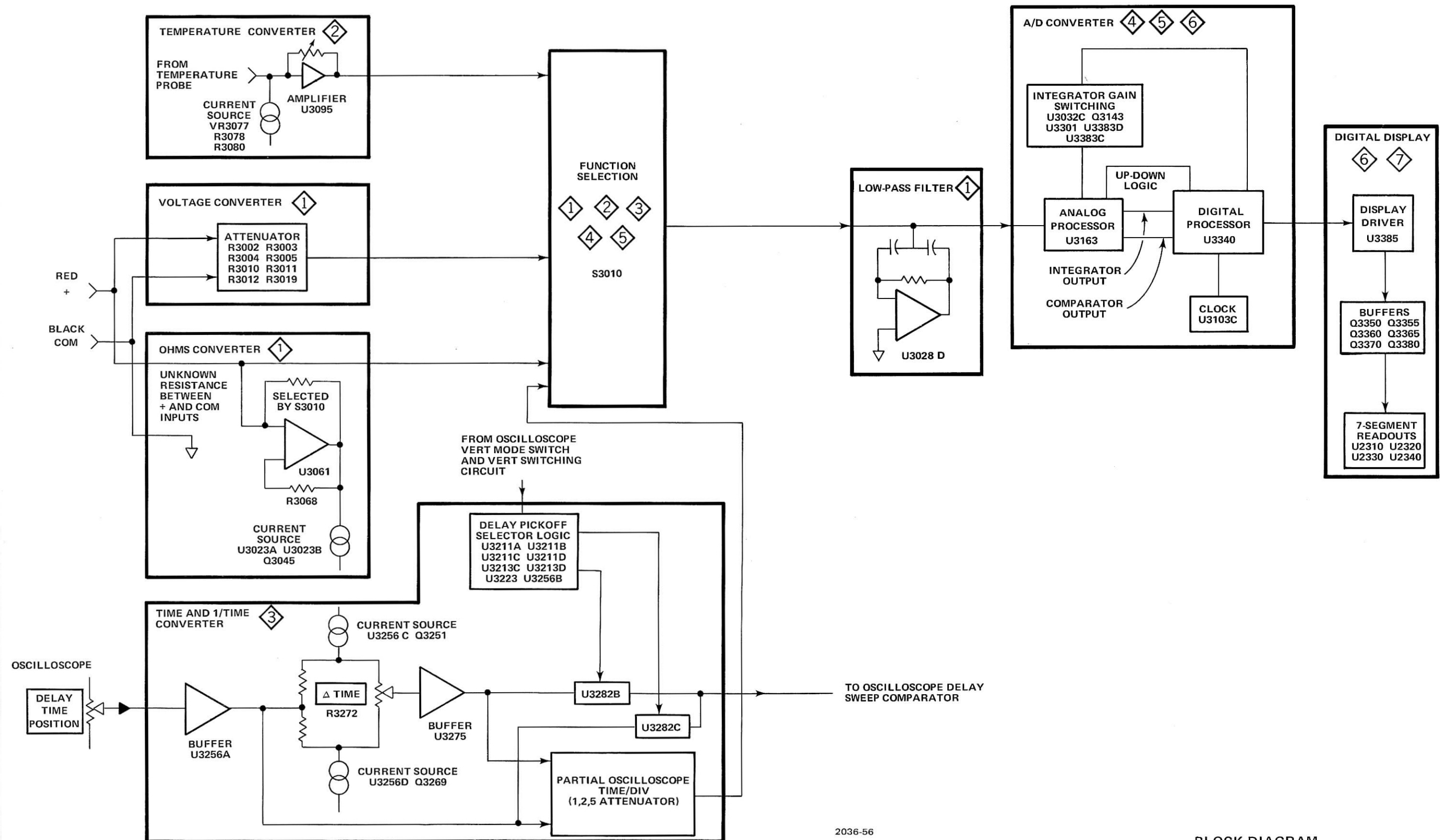


INTEGRATED CIRCUITS

1779-8A

Fig. 9-1. Semiconductor lead configurations.





BLOCK DIAGRAM

BLOCK DIAGRAM





DM44 Service

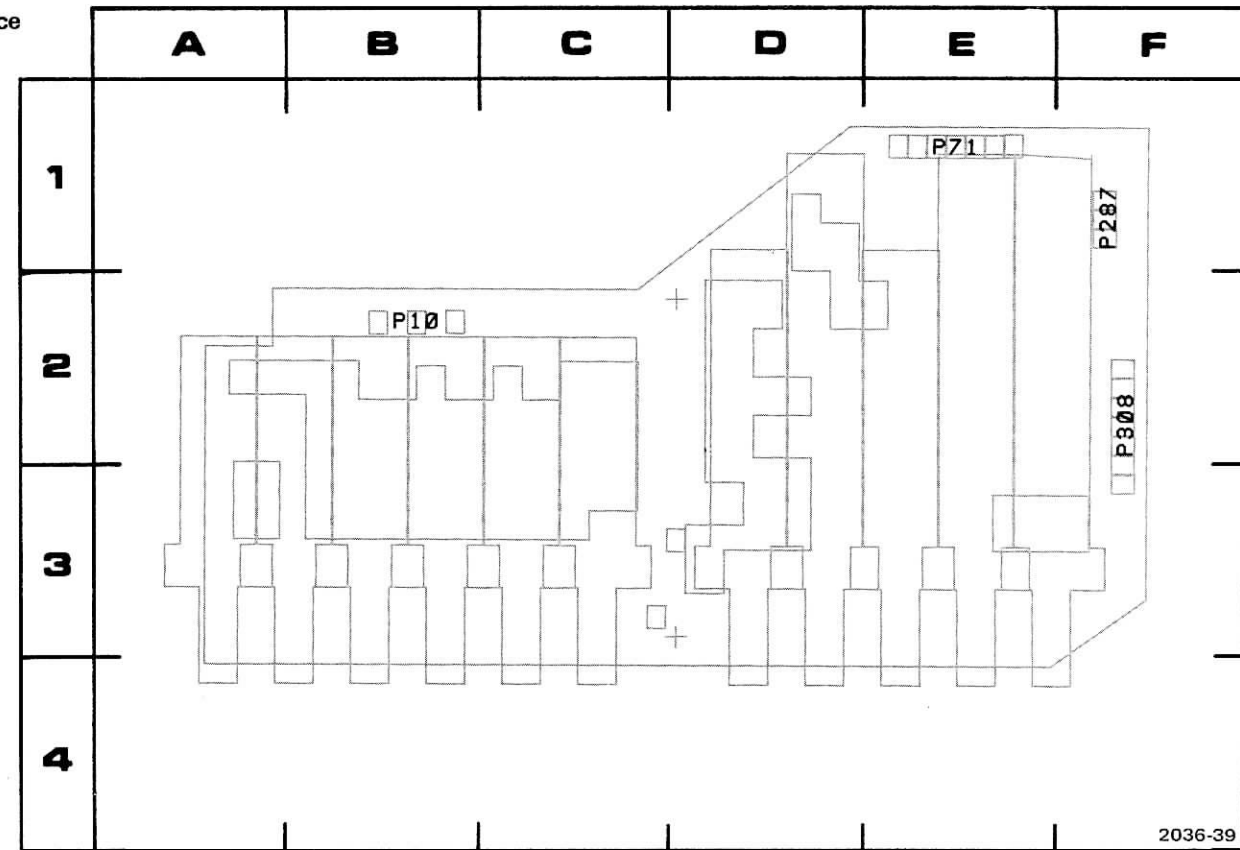


Fig. 9-4. A4 Switch board component locations.

MORE

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

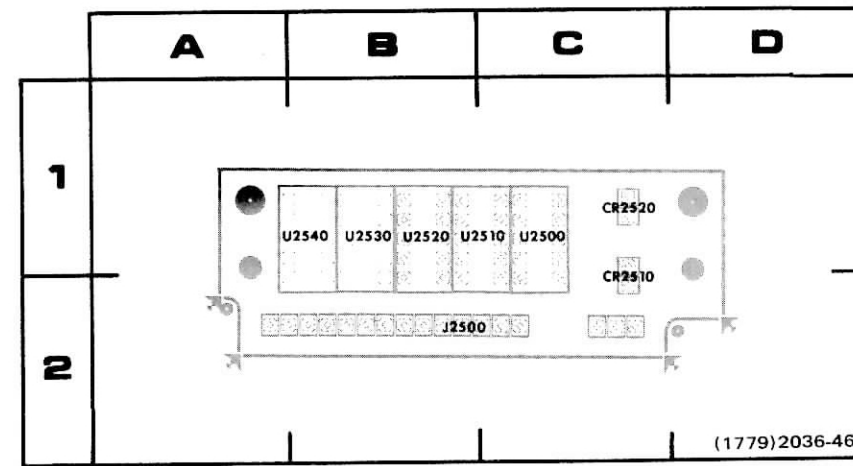


Fig. 9-5. A2 Readout board component locations.

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

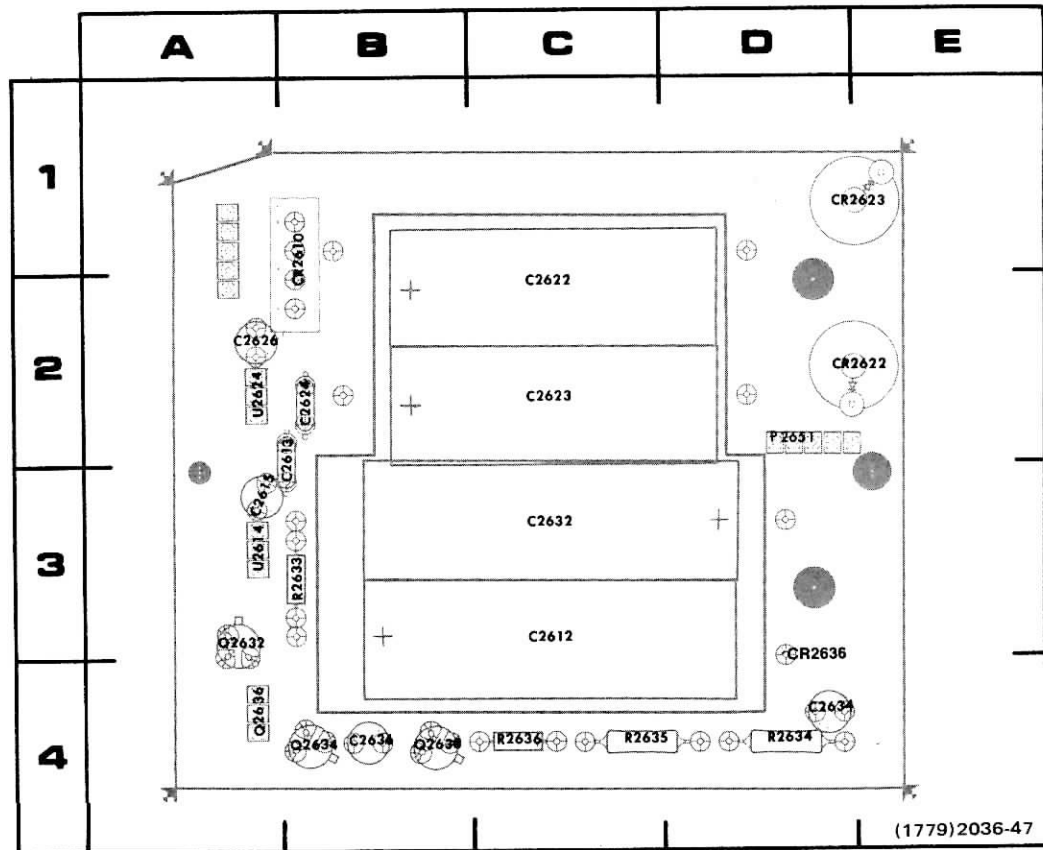


Fig. 9-6. A3 Regulator board component locations.

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

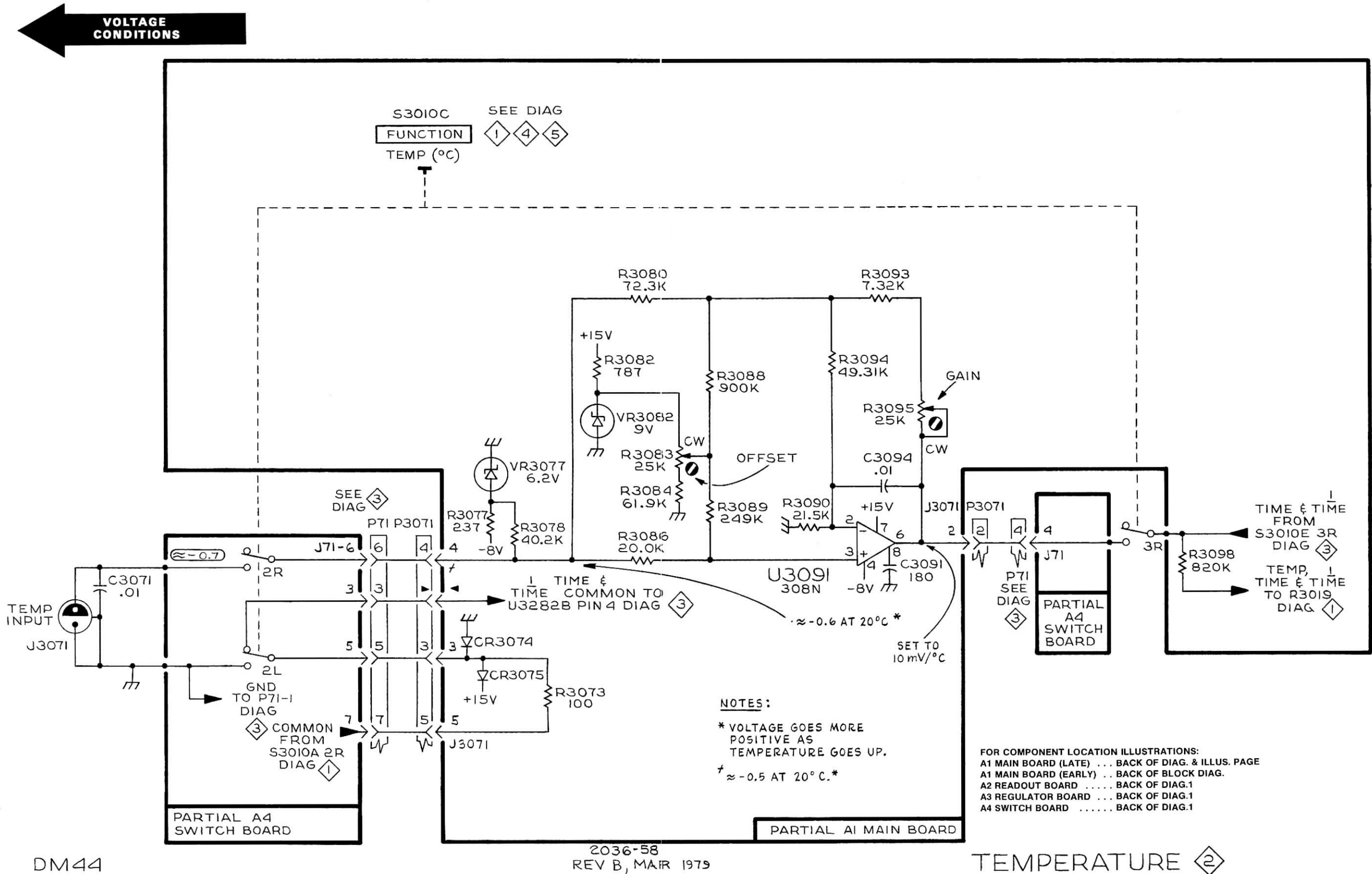
TEMP (°C)

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 $\mu$ 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**

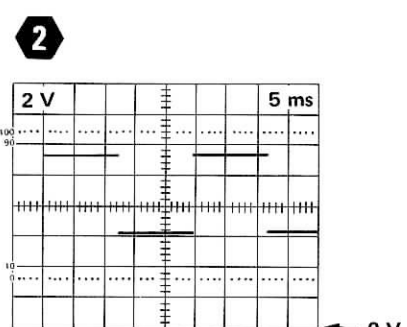
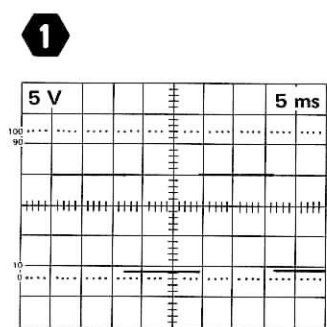
TRIGGER MODE	NORM
TRIGGER SOURCE	CH 2
VERT MODE	CH 1 (After trigger setup)
CH 2 VOLTS/DIV	1 V

**TRIGGER SETUP**

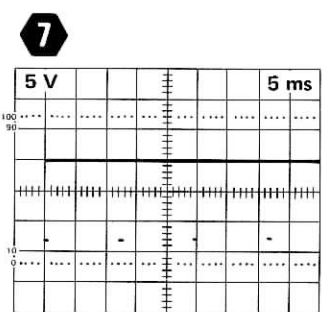
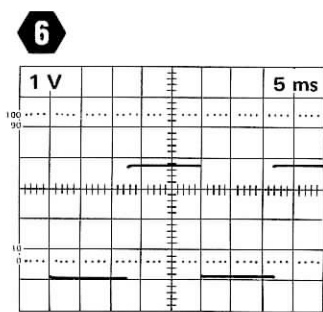
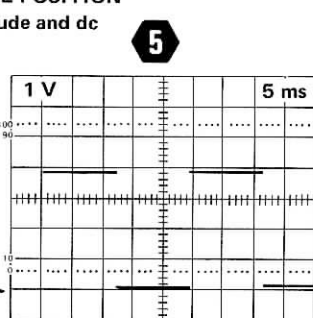
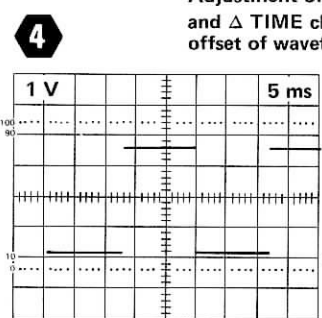
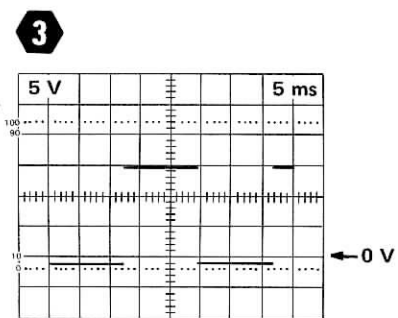
1. Connect CH 2 probe to pin 1 of U3211 (or one lead of R3212).
2. Set VERT MODE to CH 2.
3. Set TRIGGER SLOPE as indicated with desired waveform.
4. Adjust TRIGGER LEVEL for a stable display triggered on the slope selected in step 3.
5. Set VERT MODE to CH 1 (do not readjust TRIGGER controls).
6. Make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

**VOLTAGE CONDITIONS**

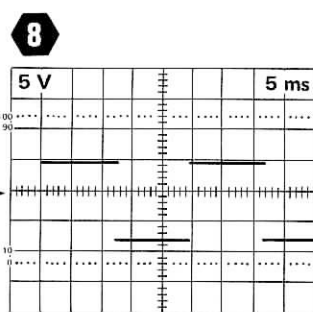
DM44 FUNCTION	TIME
<b>RECOMMENDED TEST EQUIPMENT</b>	
Tektronix 465 Oscilloscope with two 10X probes for waveforms.	
Tektronix DM501 or DM502 Digital Multimeter for voltages.	



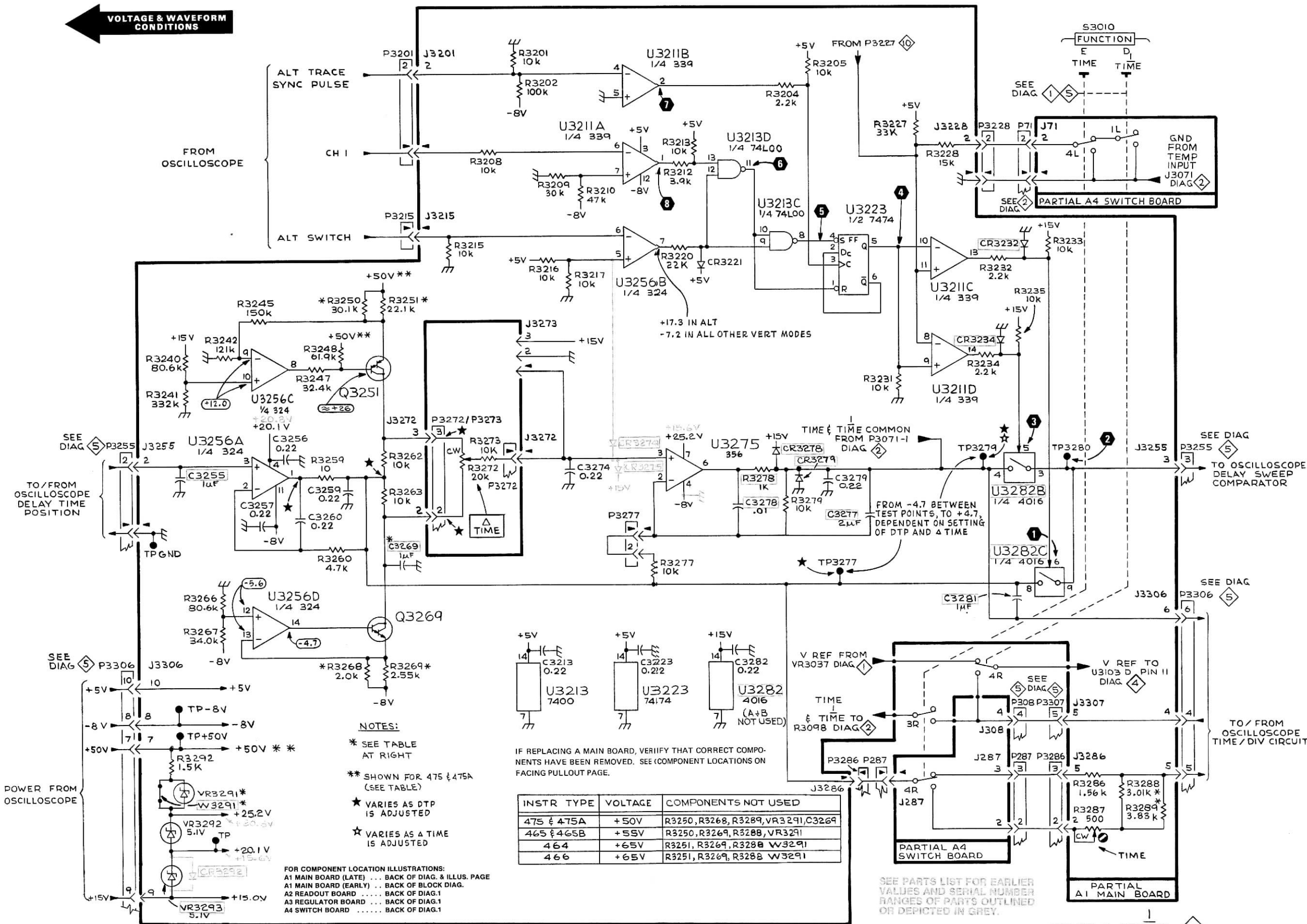
Adjustment of DELAY TIME POSITION and  $\Delta$  TIME changes amplitude and dc offset of waveform.



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



**VOLTAGE & WAVEFORM CONDITIONS**



INSTR TYPE	VOLTAGE	COMPONENTS NOT USED
475 & 475A	+50V	R3250, R3268, R3289, VR3291, C3269
465 & 465B	+55V	R3250, R3269, R3288, VR3291
464	+65V	R3251, R3269, R3288, W3291
466	+65V	R3251, R3269, R3288, W3291

WAVEFORM CONDITIONS

DM44

FUNCTION OHMS  
RANGE 2k

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 1V

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

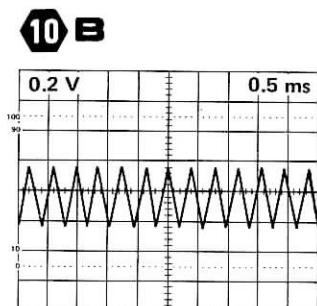
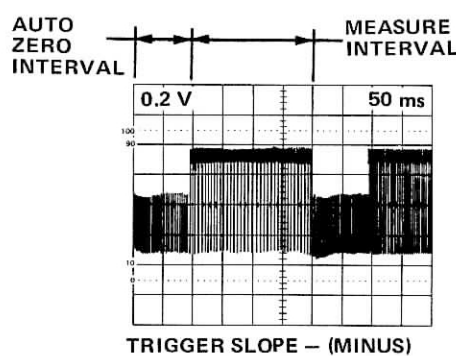
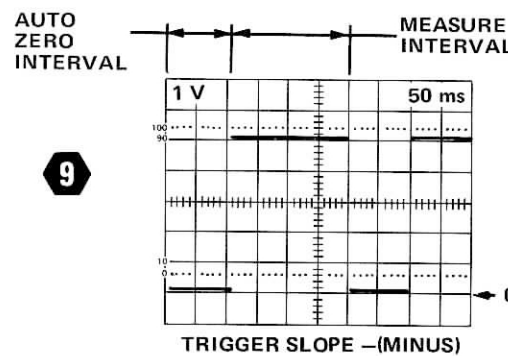
DM44 FUNCTION TIME  
A TIME/DIV 1 ms  
B TIME/DIV 5  $\mu$ s  
HORIZ DISPLAY A INTEN  
DELAY TIME POSITION To position reference point to the third vertical graticule line

TIME

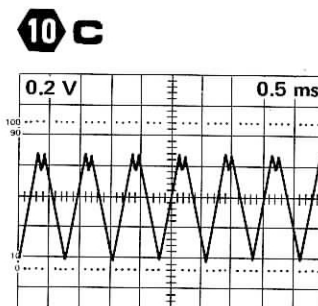
For a DM44 reading of about 06.00

RECOMMENDED TEST EQUIPMENT

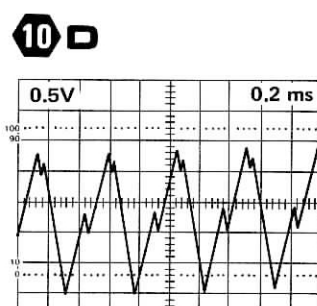
Tektronix 465 Oscilloscope with two 10X probes for waveforms.  
Tektronix DM501 or DM502 Digital Multimeter for voltages.



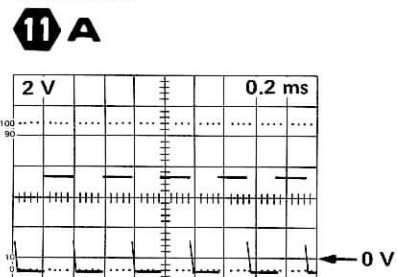
TRIGGER SLOPE - (MINUS) AC COUPLED PORTION OF AUTO ZERO INTERVAL EXPANDED



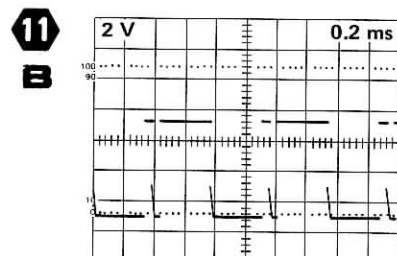
TRIGGER SLOPE + AC COUPLED PORTION OF MEASURE INTERVAL EXPANDED (INPUTS SHORTED)



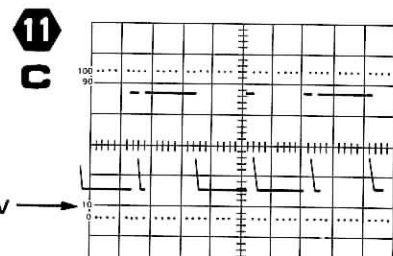
TRIGGER SLOPE + AC COUPLED PORTION OF MEASURE INTERVAL EXPANDED (MEASURING 1 k $\Omega$ )



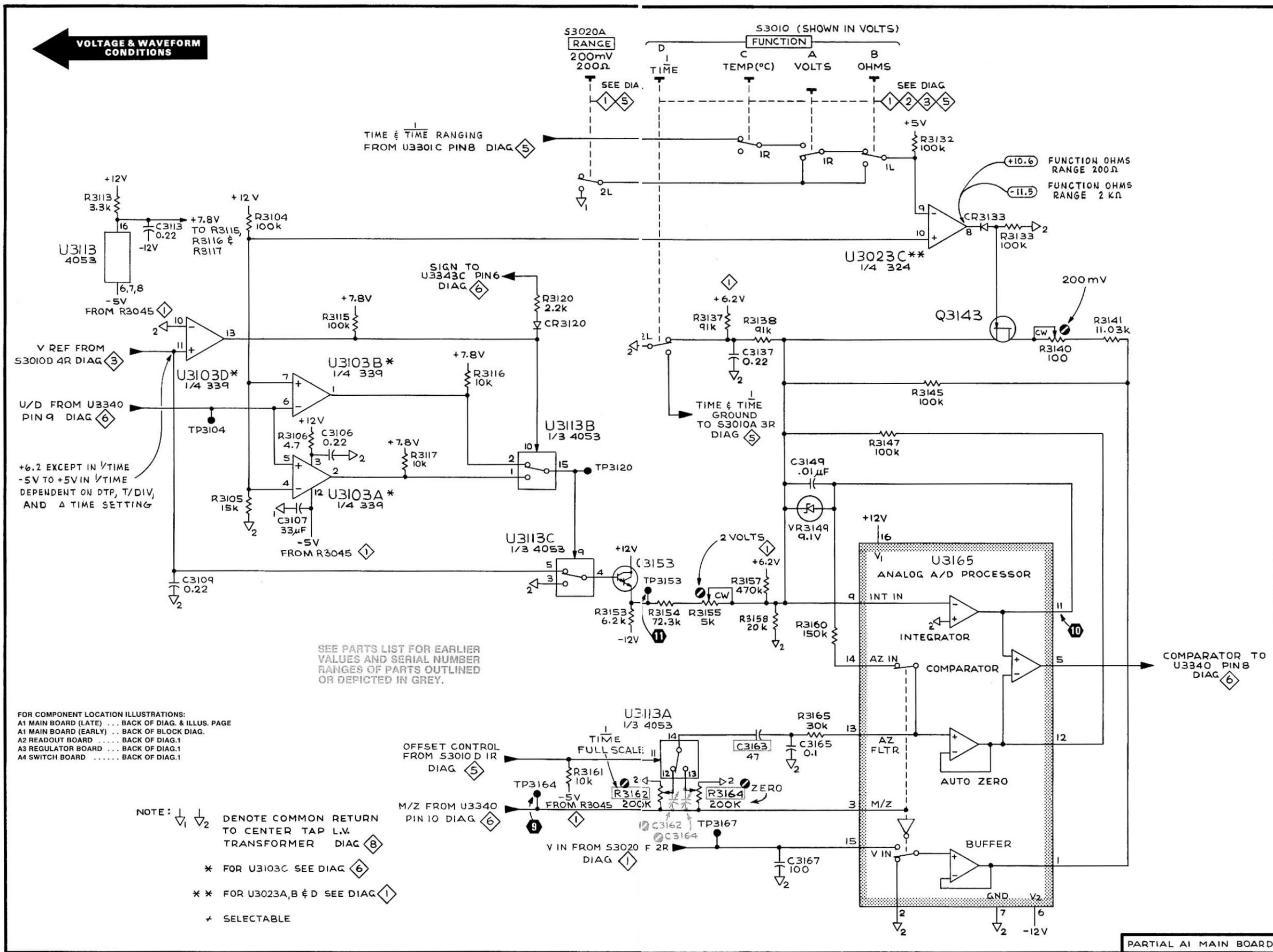
TRIGGER SLOPE - (MINUS) DURING AUTO ZERO INTERVAL



TRIGGER SLOPE + DURING MEASURE INTERVAL (INPUTS SHORTED TOGETHER)



TRIGGER SLOPE + DURING MEASURE INTERVAL (MEASURING 1 k $\Omega$ )



2036-62  
REV D, MAR 1979







### WAVEFORM CONDITIONS

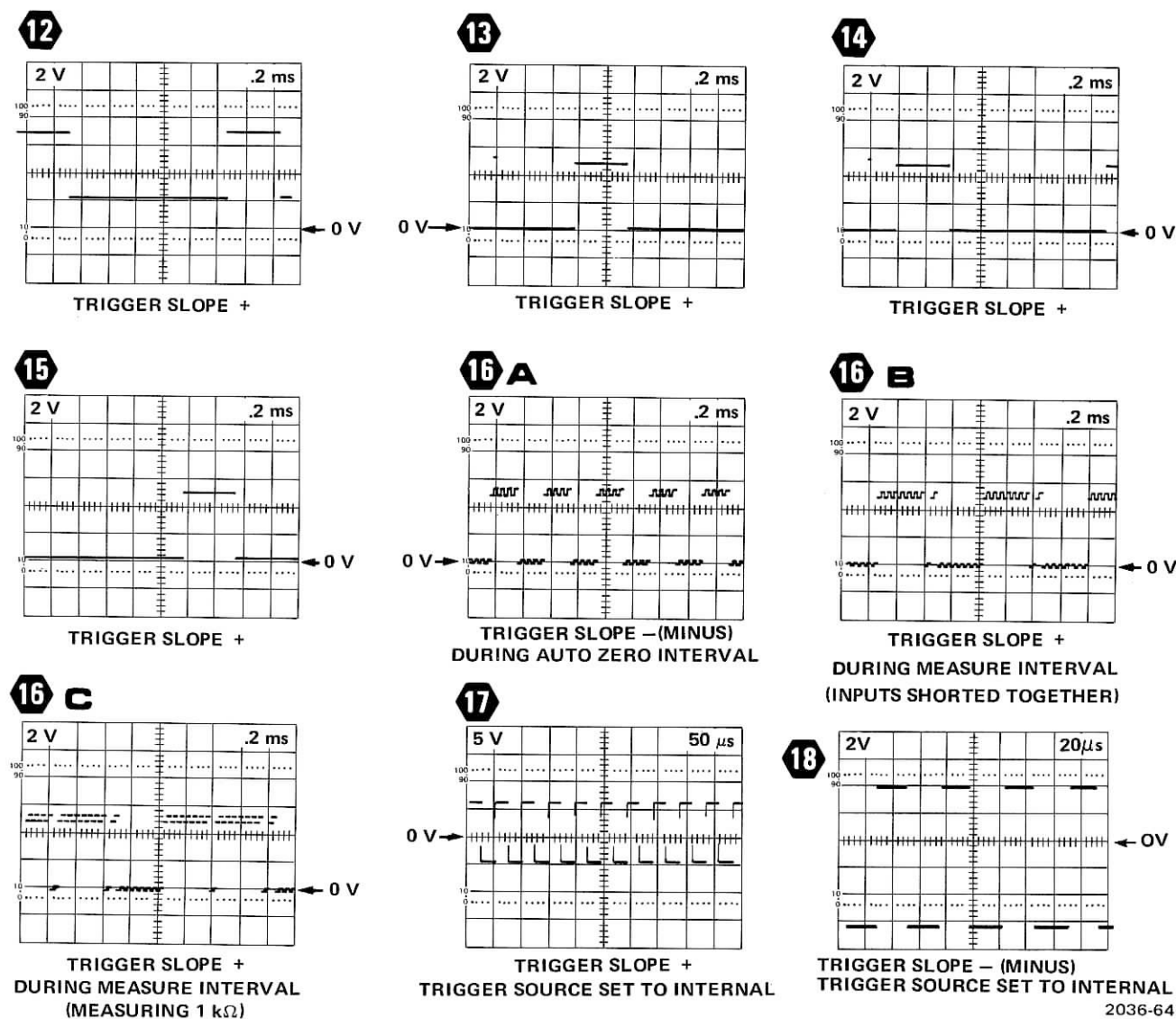
#### DM44

FUNCTION	TIME
<b>OSCILLOSCOPE (TO WHICH DM44 IS ATTACHED)</b>	
A TIME/DIV	1 ms
B TIME/DIV	5 $\mu$ 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

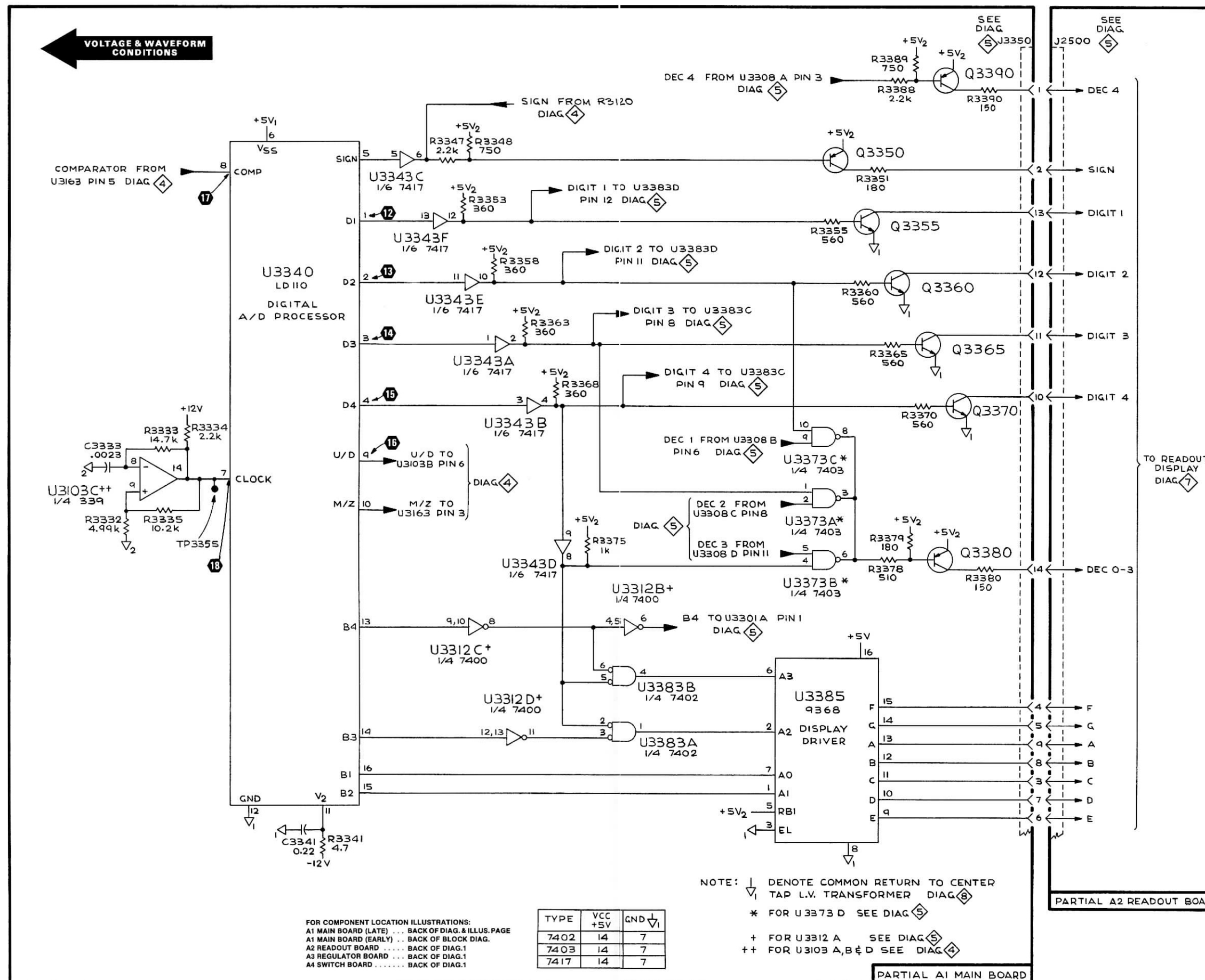
### VOLTAGE CONDITIONS RECOMMENDED TEST EQUIPMENT

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.



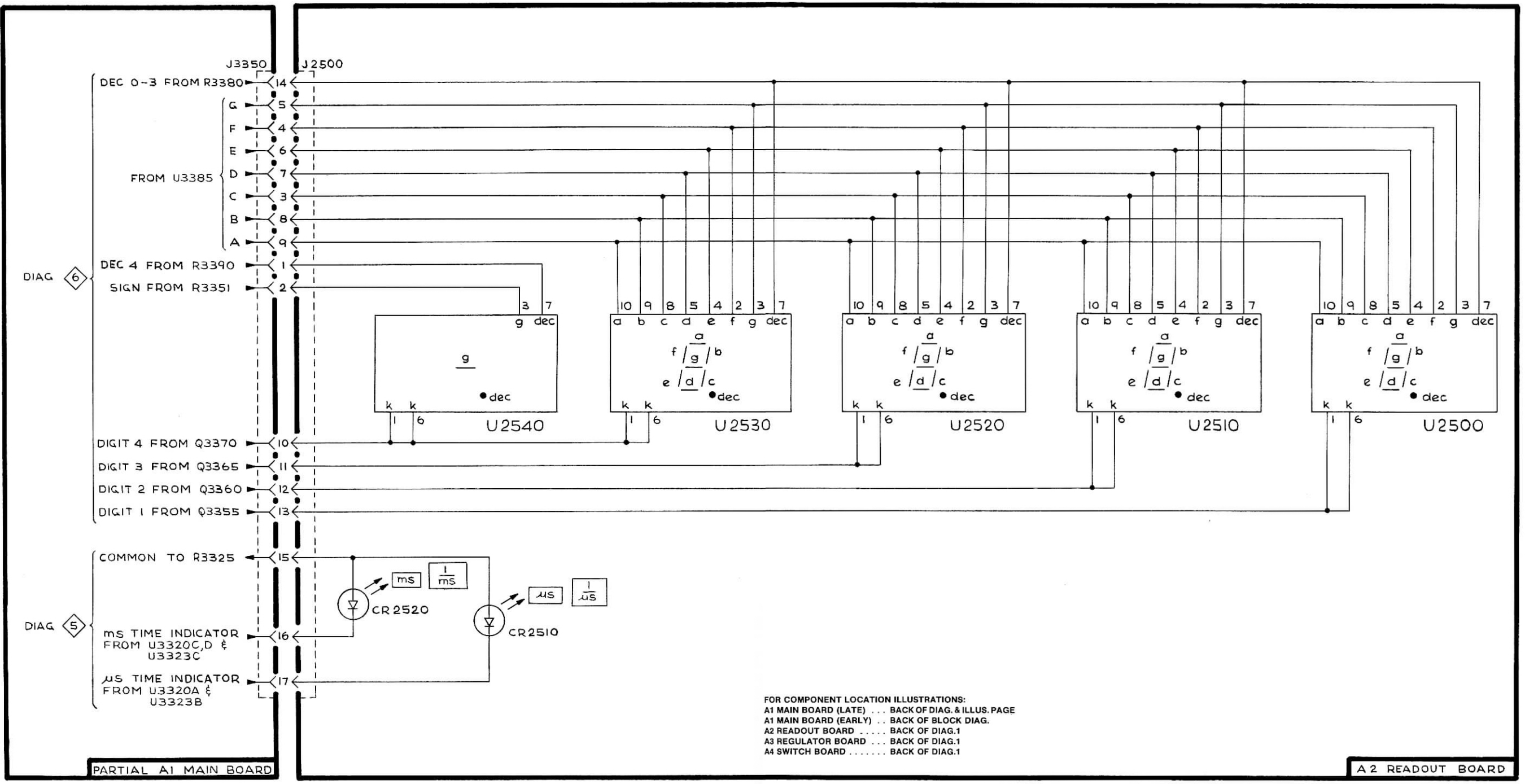
DM44

2036-65  
REV B, MAR 1979

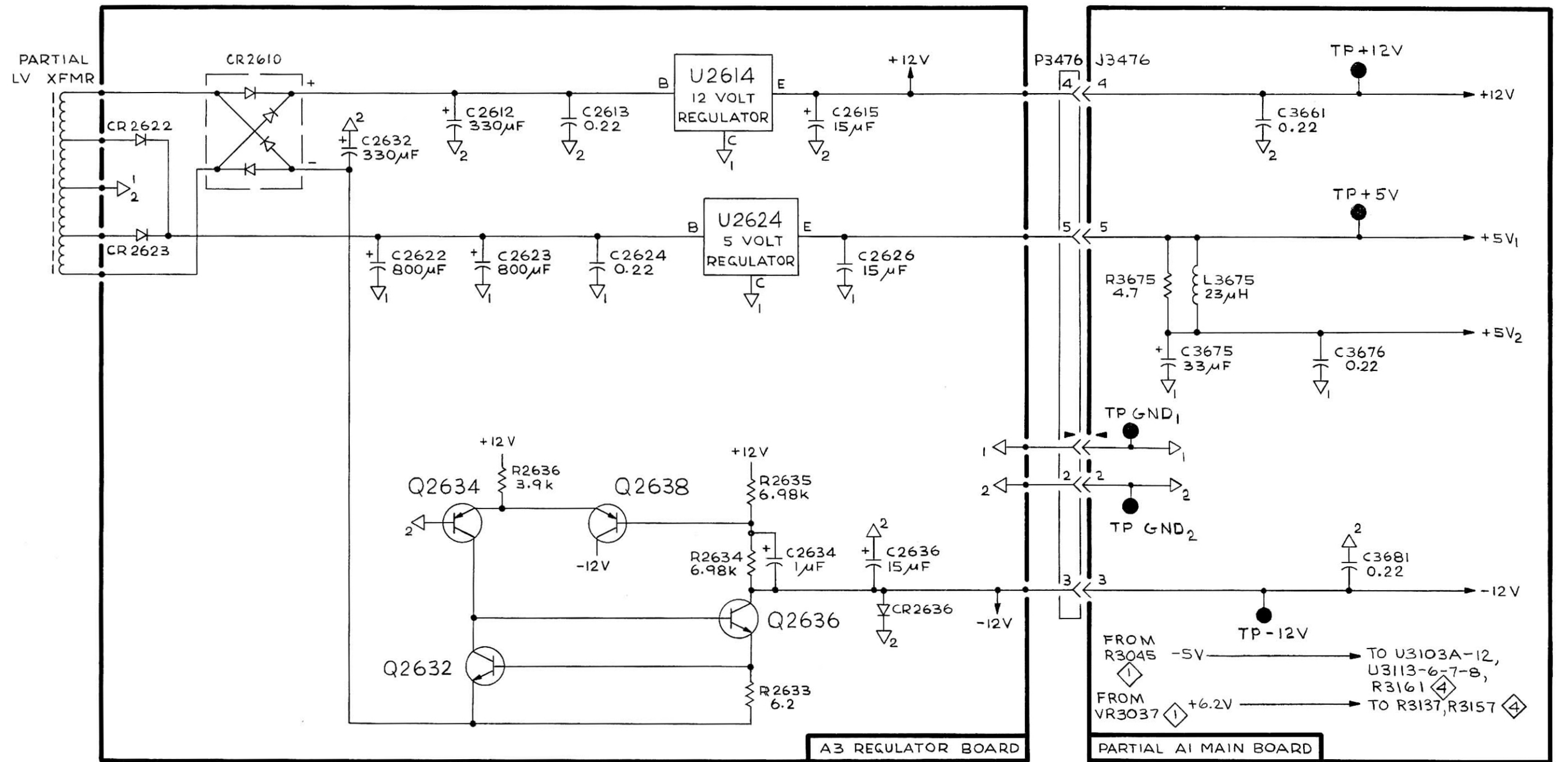
READOUT LOGIC 6

READOUT LOGIC

6



2036-66  
REV. A, MARCH 1977



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

DM44

2036-67  
 REV B, MAR 1979

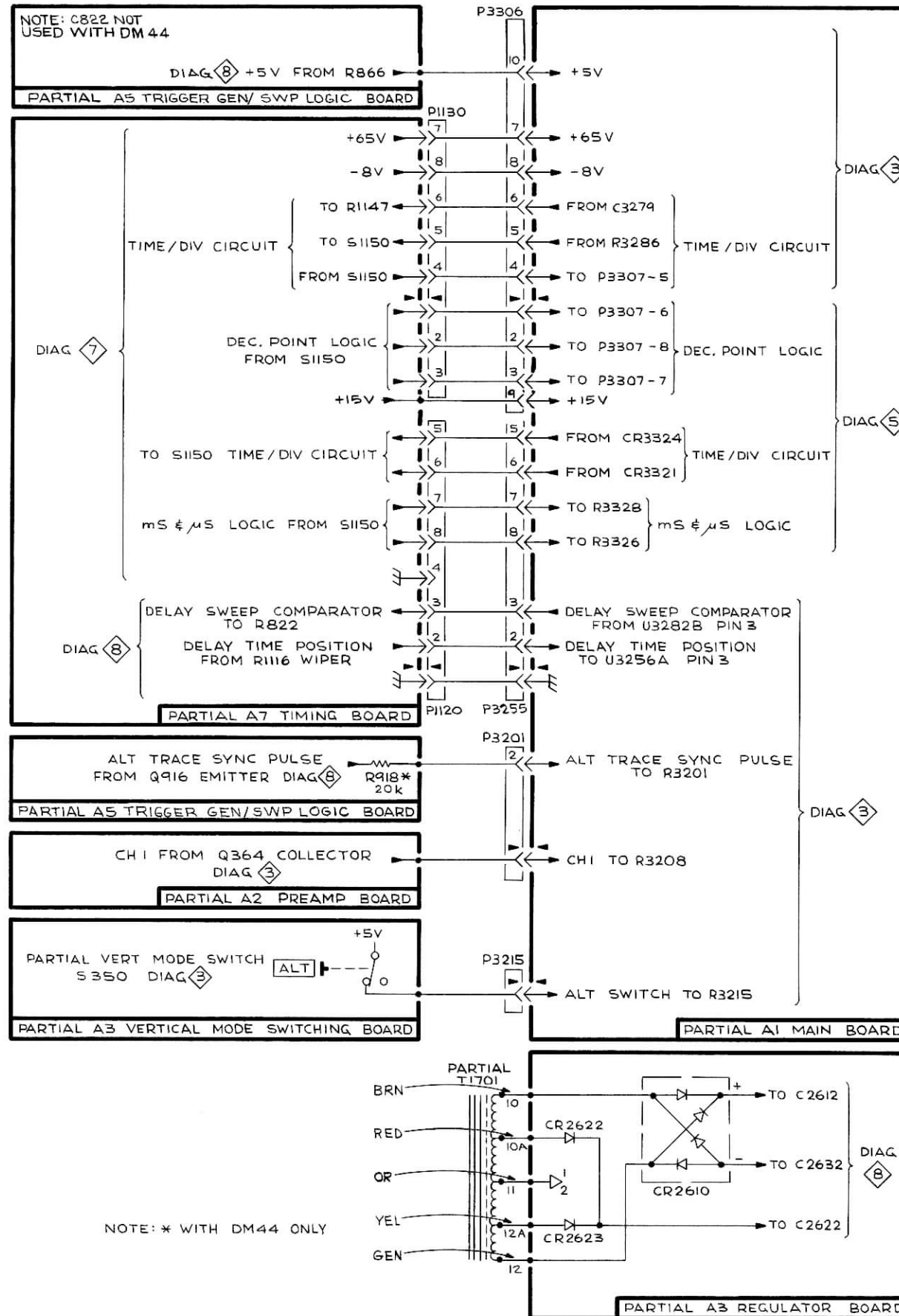
POWER SUPPLY 8

DM44 POWER SUPPLY

8

464 OR 466 OSCILLOSCOPE

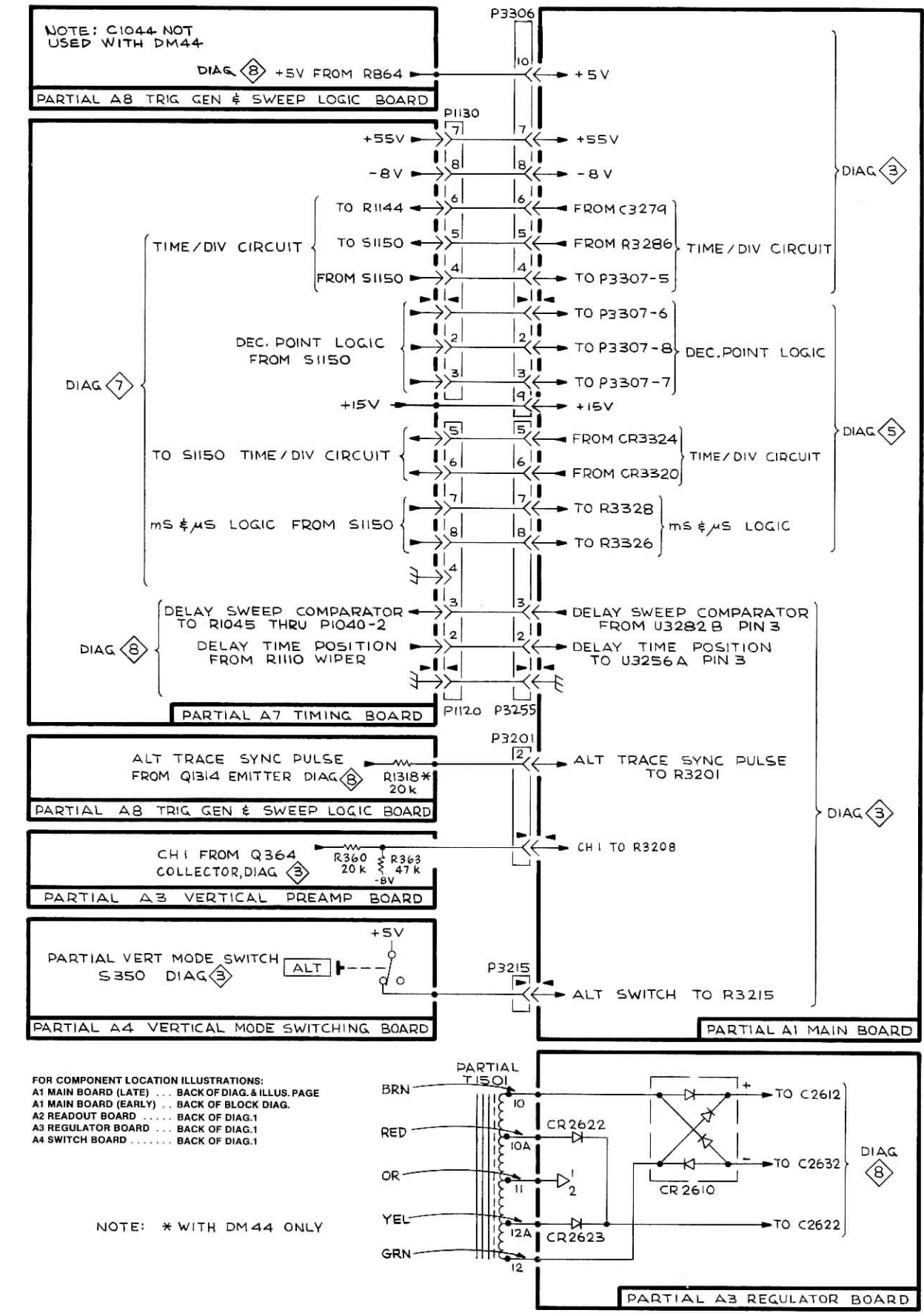
DM 44



DM 44

465 OSCILLOSCOPE

DM 44

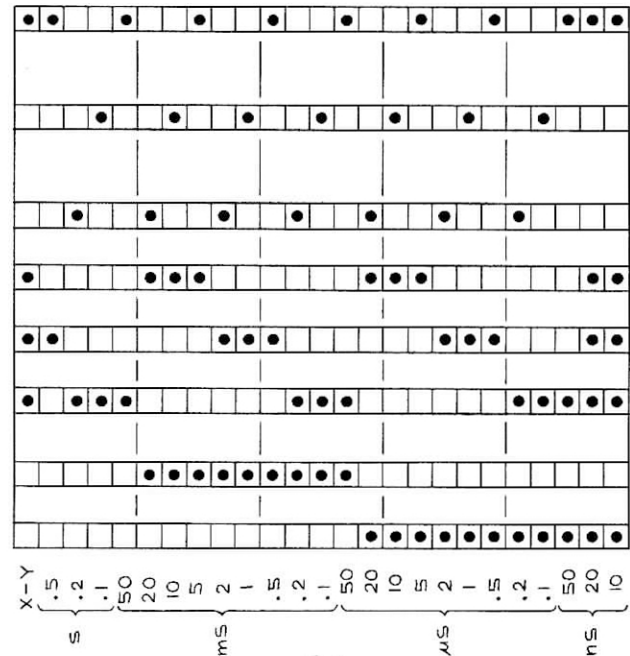


464, 465 & 466 INTERFACE

2036-68  
REV C, MAR 1979

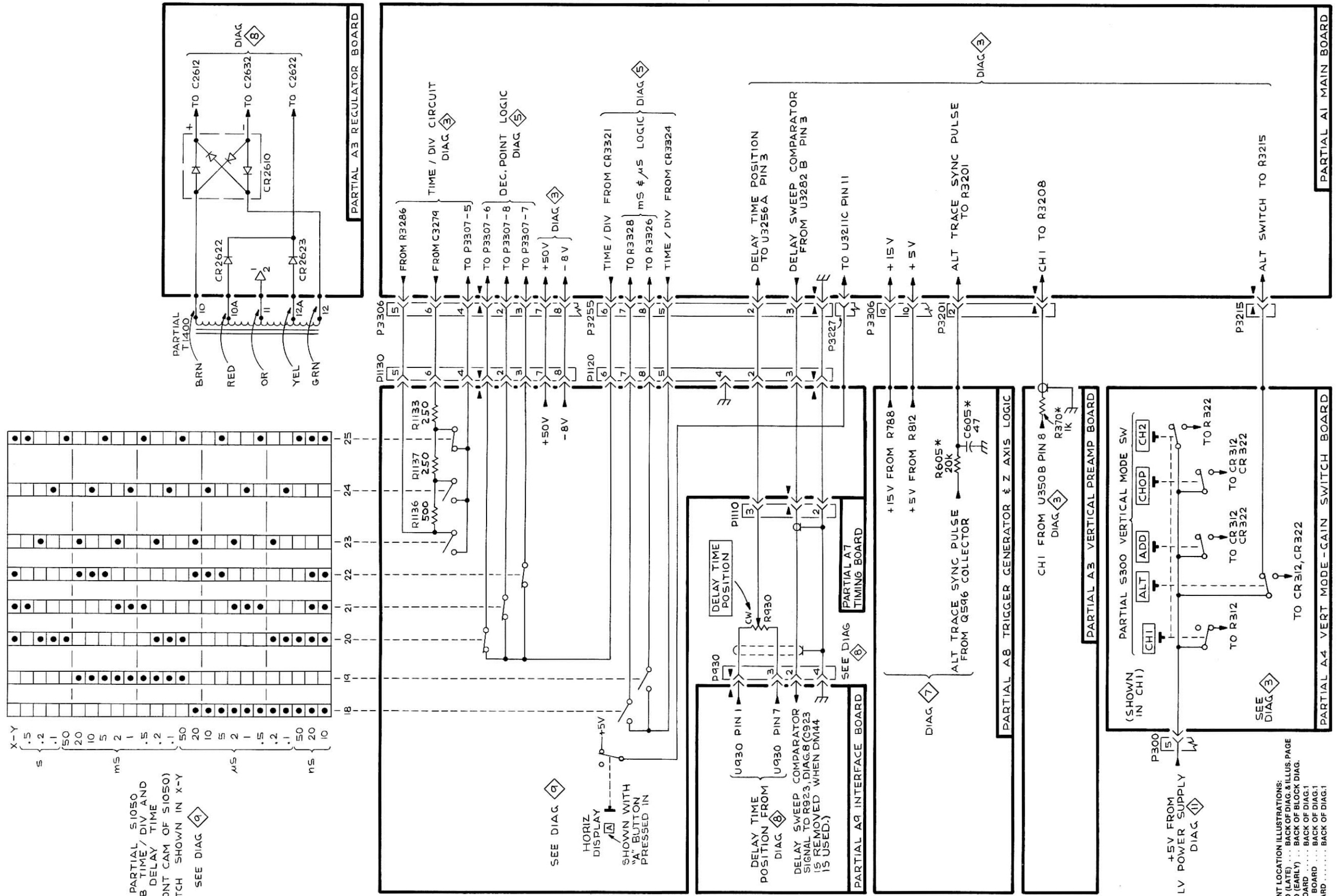


475 OR 475A OSCILLOSCOPE DM44



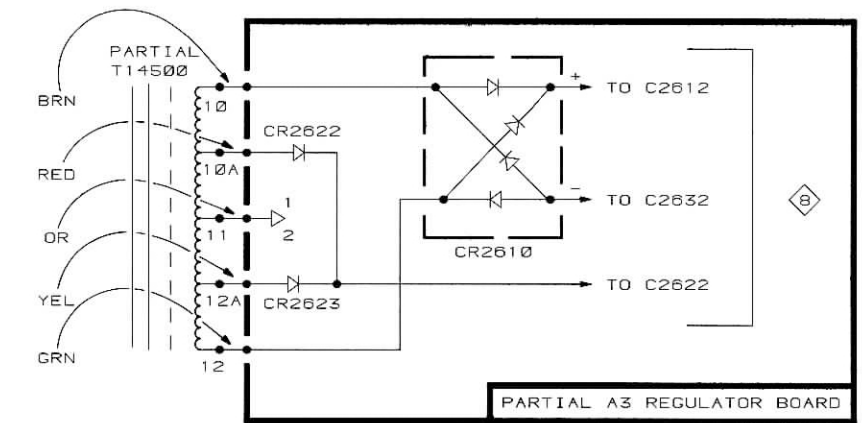
PARTIAL S1050  
A & B TIME/DIV AND  
DELAY TIME  
(FRONT CAM OF S1050)  
SWITCH SHOWN IN X-Y  
SEE DIAG 6

SEE DIAG 9  
HORIZ  
DISPLAY  
+5V  
/√A  
SHOWN WITH  
"A" BUTTON  
PRESSED IN



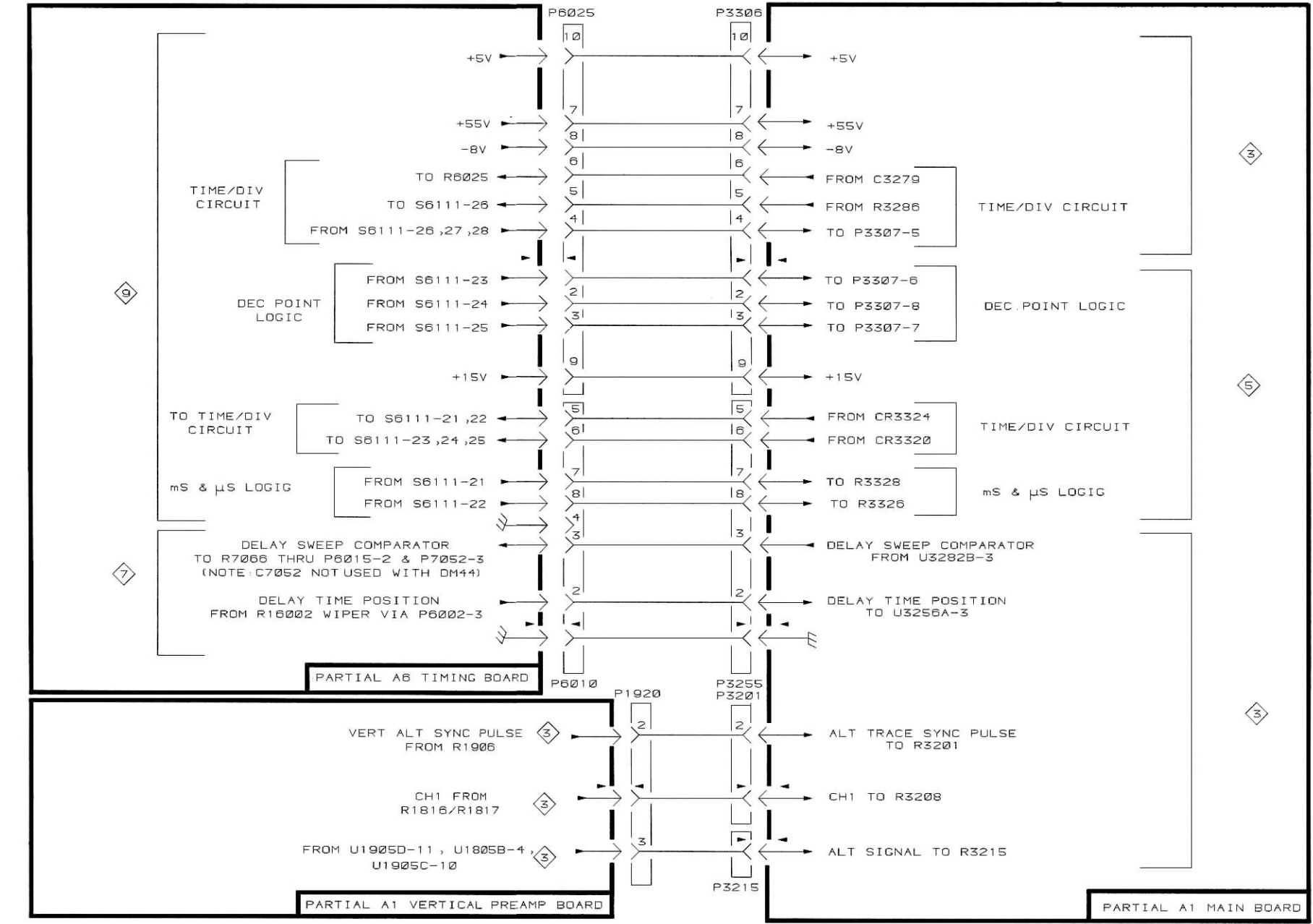
FOR COMPONENT LOCATION ILLUSTRATIONS:  
A1 MAIN BOARD (LATE) ... BACK OF DIAG. & ILLUS. PAGE  
A1 MAIN BOARD (EARLY) ... BACK OF BLOCK DIAG.  
A2 MAIN BOARD ... BACK OF DIAG. 1  
A3 REGULATOR BOARD ... BACK OF DIAG. 1  
A4 SWITCH BOARD ... BACK OF DIAG. 1

NOTE: \* WITH DM44 ONLY



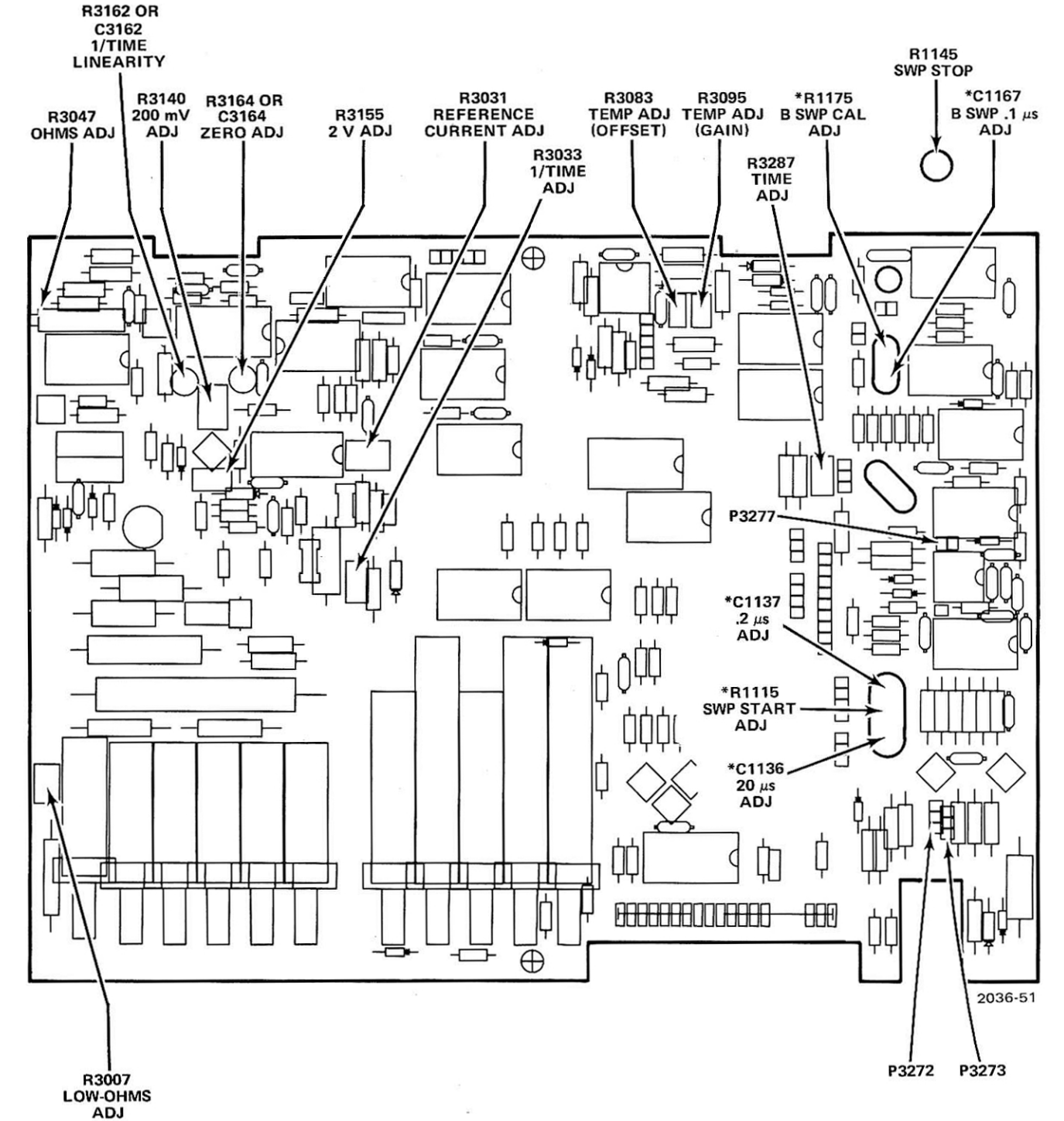
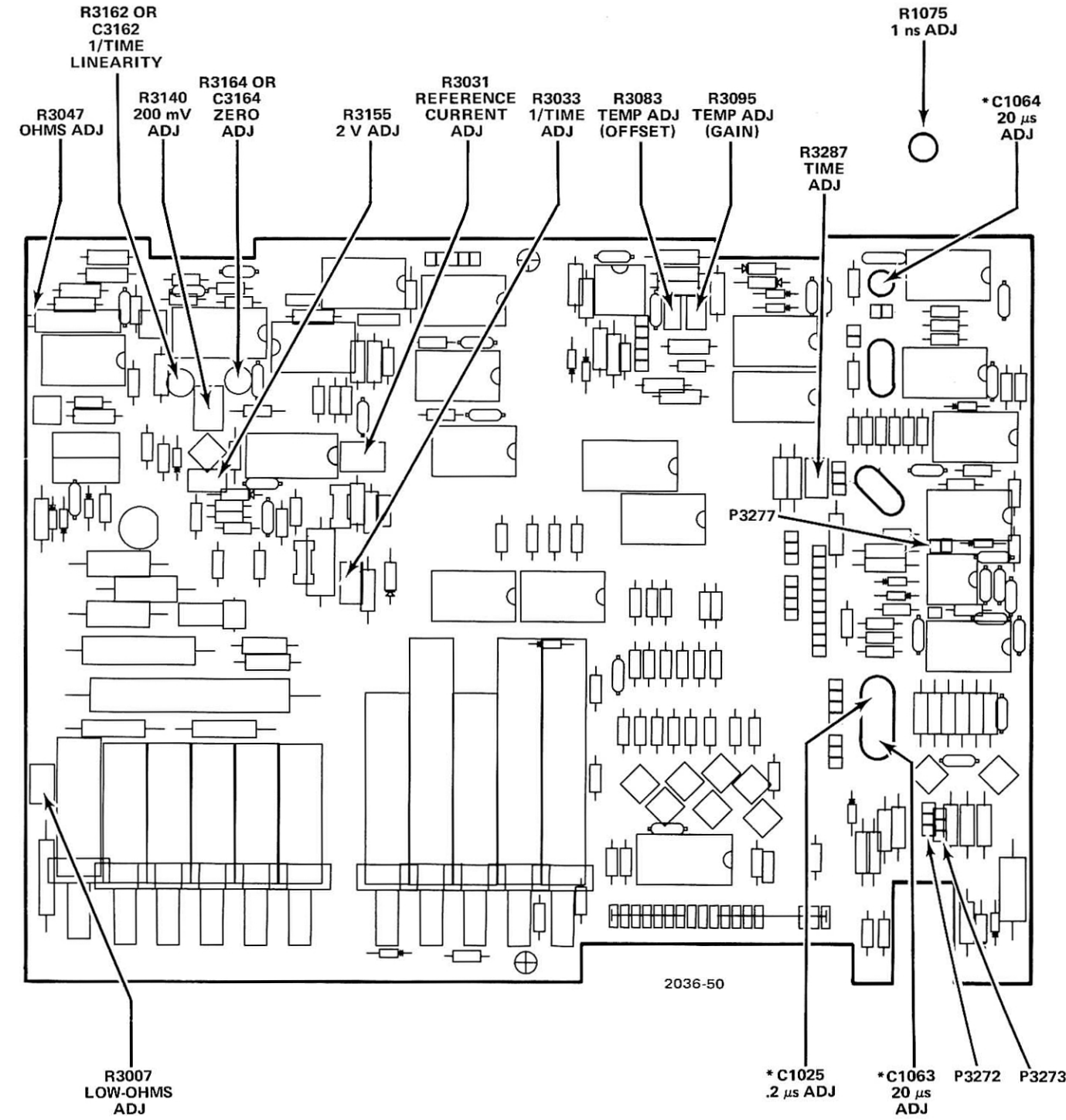
465B OSCILLOSCOPE

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  
 © MAR 1979



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.

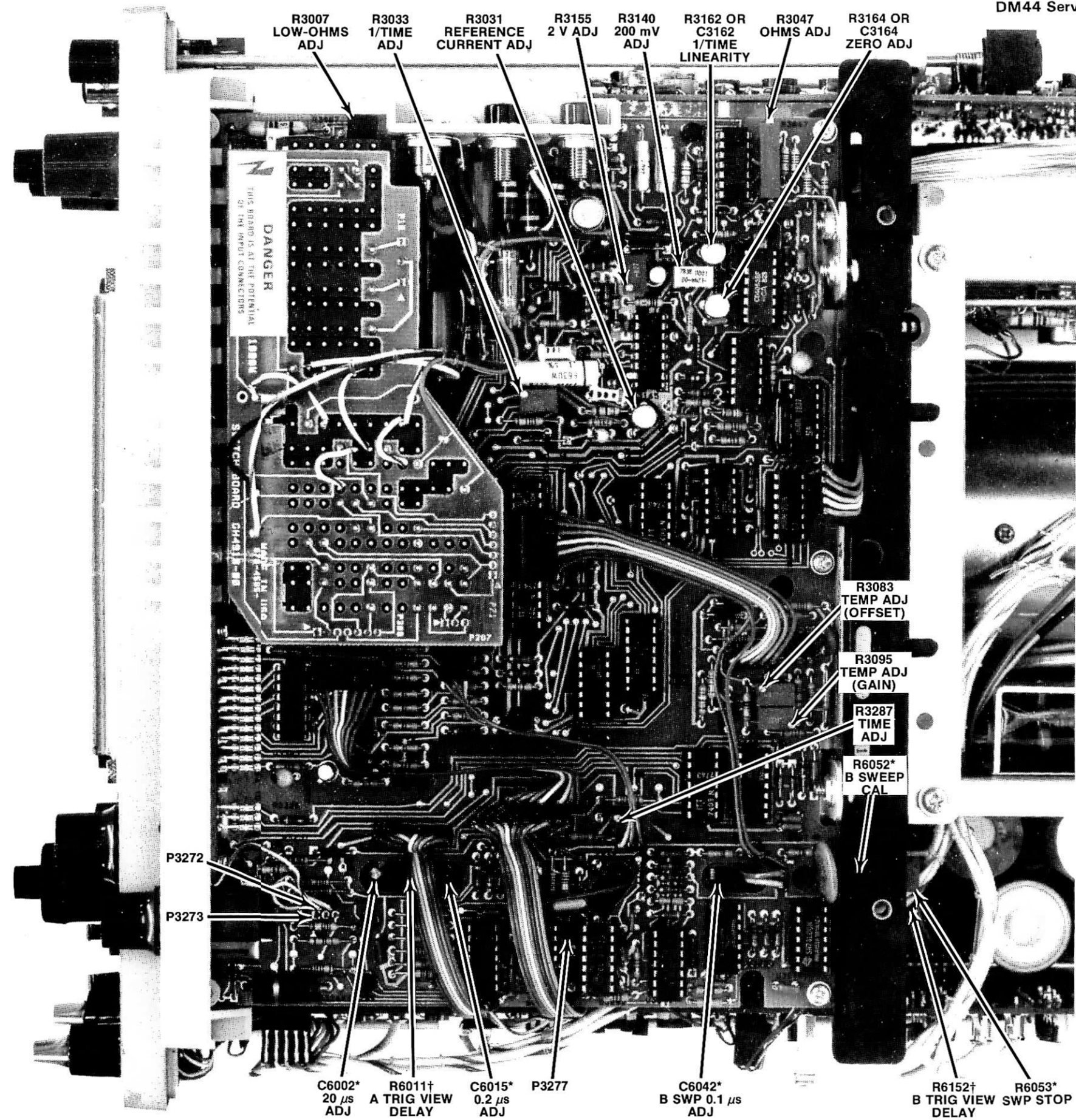
\*PARTS MOUNTED ON OSCILLOSCOPE TIMING BOARD, ACCESSIBLE THROUGH HOLE IN DM44 MAIN BOARD.

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

REV C, MAR 1979

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.



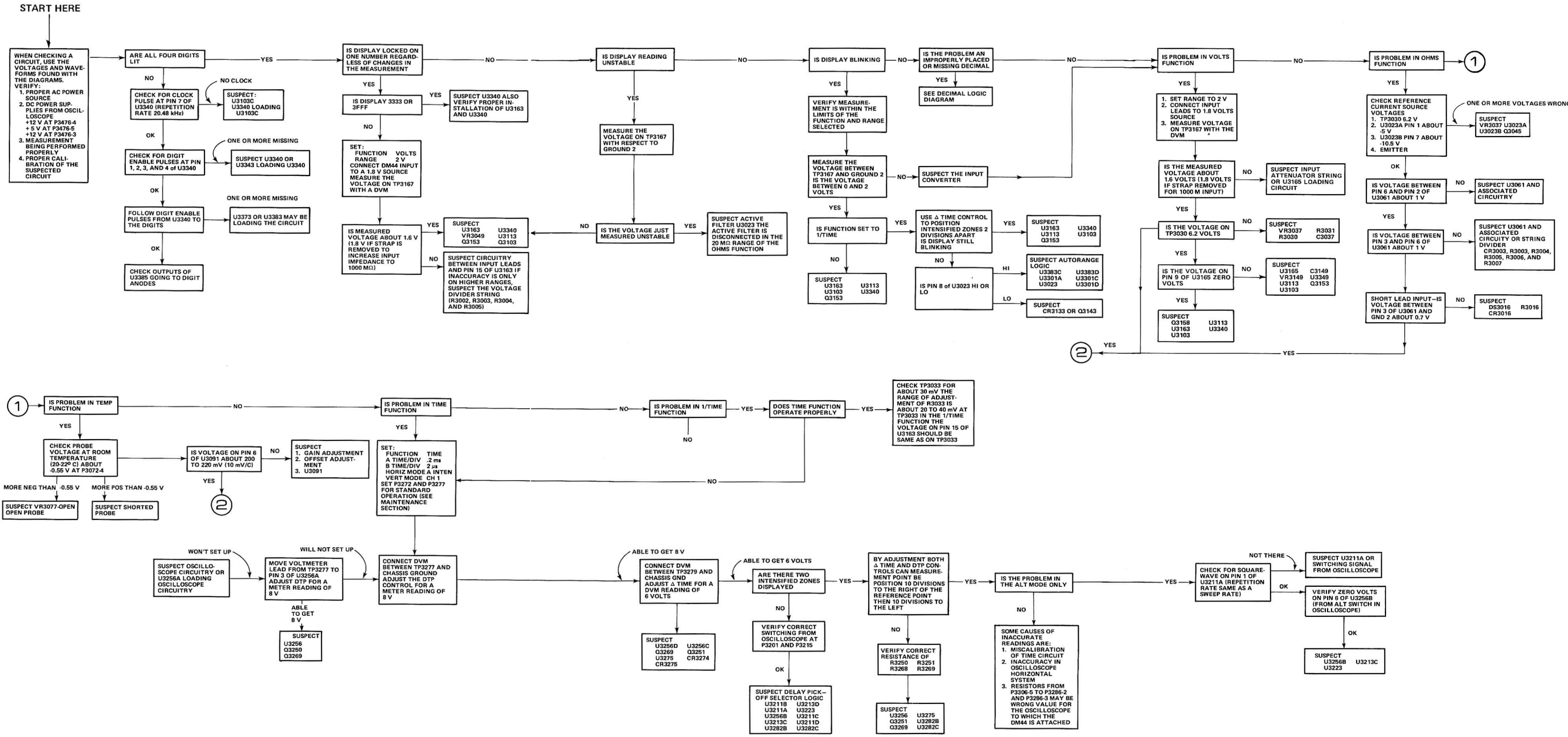
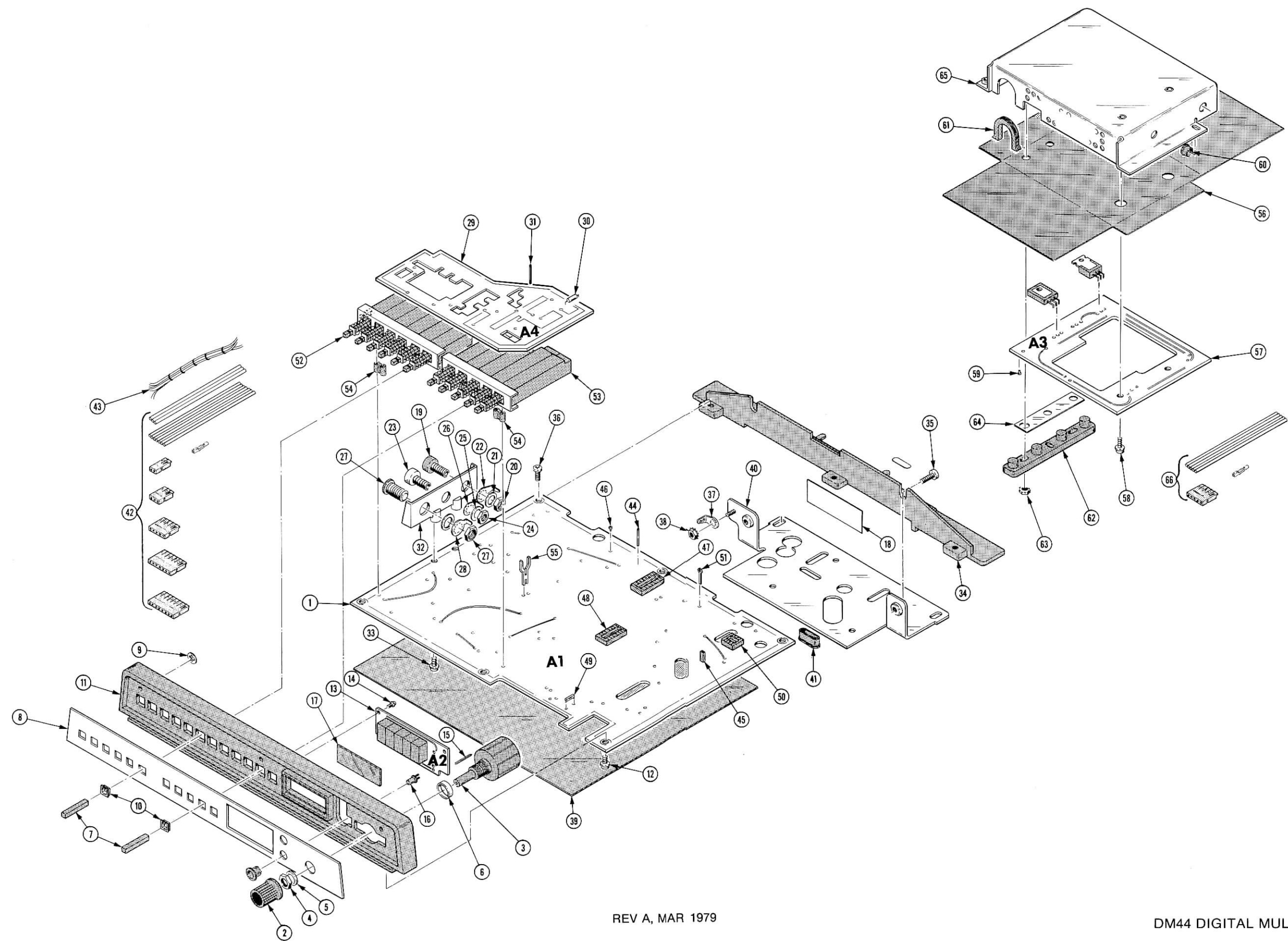


Fig. 9-9. Troubleshooting chart.



REV A, MAR 1979

DM44 DIGITAL MULTIMETER

