

TEKTRONIX
TG 501



TEKTRONIX®

TG 501

**TIME MARK
GENERATOR**

FOR REFERENCE PURPOSES ONLY

INSTRUCTION MANUAL

Tektronix, Inc.
P.O. Box 500
Beaverton, Oregon 97005

Serial Number _____

TEK INTER-OFFICE COMMUNICATION

TO John Martin 94-540 DATE June 25, 1991
FROM Frank Gray, 50-PAT
SUBJECT GIDEP permit request

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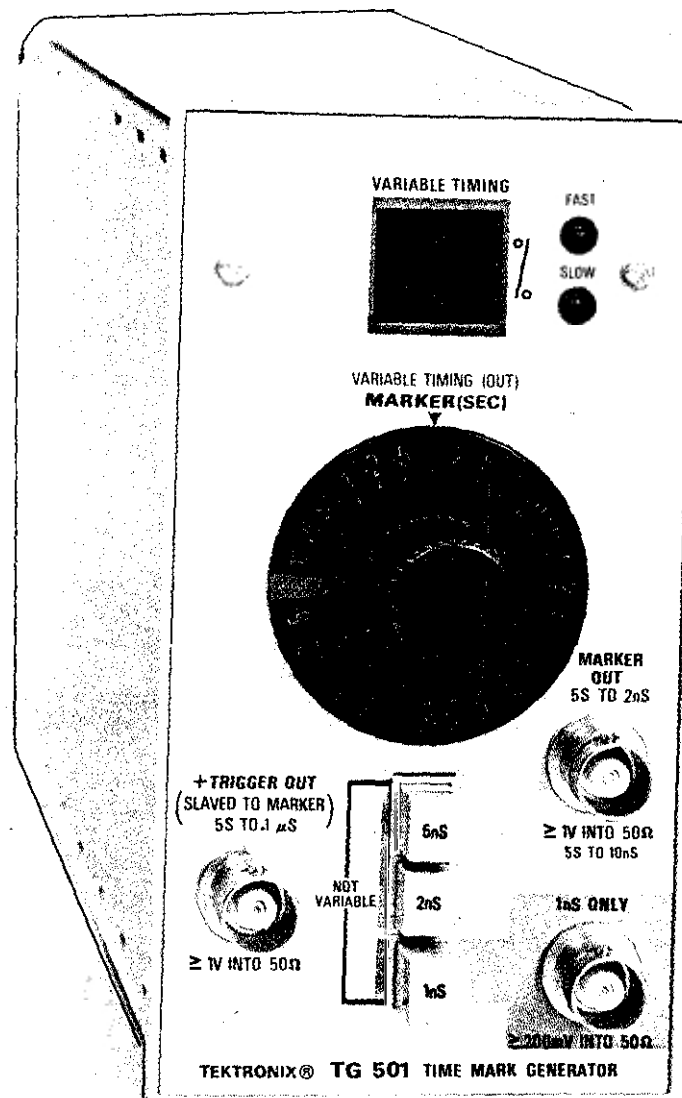
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Francis I. Gray
Group Patent Counsel

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OPERATING INSTRUCTIONS

INTRODUCTION

Description

The TG 501 is a general purpose Time Mark Generator plug-in designed to operate in a TM 500 Series Power Module. A Variable Timing Readout provides a simple, but accurate means of measuring timing errors over $\pm 7.5\%$ minimum range. Since many specifications are given in percentages, the error readout eliminates the need for computations and, additionally, lessens parallax discrepancies.

Marker selection from 5 s through 1 ns in a 1,2,5, sequence is available. 5 s through 10 ns markers are selected by a rotary switch. 5, 2, and 1 ns modified sine waves are selected by self-canceling push-buttons when the rotary switch is in the 521N position.

All outputs are available at the front-panel connectors or by modification of the interface connector, located at the back of the plug-in, and the TM 500 Series Power Module.

Power supplies are current limited. The 5 volt supply is over-voltage protected to avoid damage to the integrated circuits.

Installation

The TG 501 is calibrated and ready for use when received. Referring to Fig. 1-1, install the Generator and turn on the Power Module. Check the front-panel of the Generator to see that the knob skirt is lighted. The TG 501 is designed to operate in any compartment of a TM 500

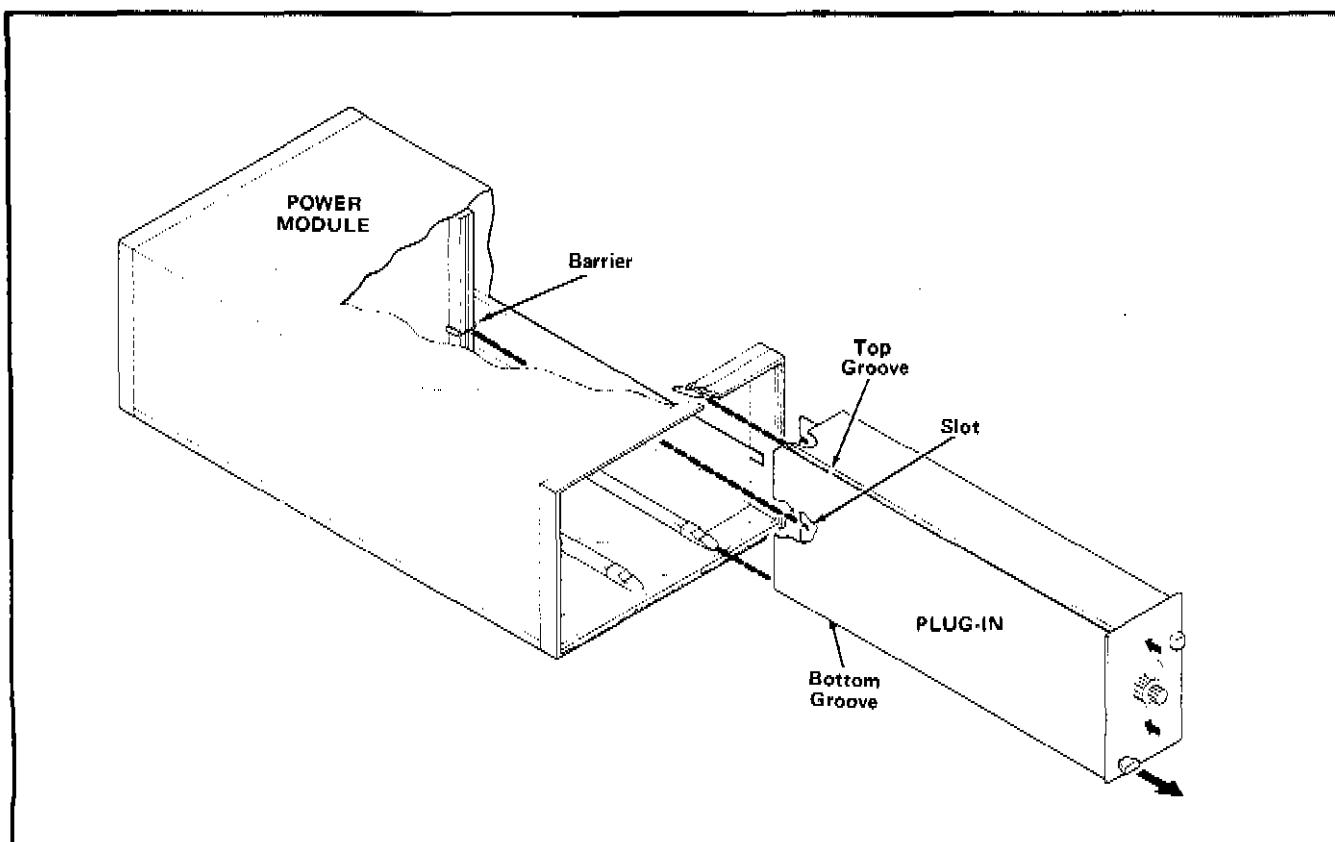


Fig. 1-1. Plug-in Installation and Removal.

Operating Instructions—TG 501

Series Power Module. Refer to the Power Module Instruction Manual for line voltage requirements and Power Module operation.

Refer to the Controls and Adjustments fold out page for front-panel controls, connectors and indicator descriptions.

CAUTION

Turn the Power Module off before inserting the plug-in; otherwise, damage may occur to the plug-in circuitry.

OPERATING CONSIDERATIONS

The internal reference of the TG 501 is a 1 MHz crystal. If Option 1 is ordered, a high accuracy 5 MHz crystal is provided and Integrated Circuit, U50 is installed on the back of the main circuit board. Provisions are made for buffered output of either 1 MHz or 5 MHz internal clock through interface connector pin 25A with associated ground on pin 26A.

External Clock Input

A 1 MHz or 10 MHz external clock can be substituted for the internal clock. Interface contact 24B is used for the external clock input with the associated ground on contact 25B.

To use an external 5 or 10 MHz clock, U50 must be installed on the back of the main circuit board (and the necessary jumpers added) to divide down the input to meet the 1 MHz internal requirement. For a 1 MHz external clock, U50 is not required but jumpers must be added.

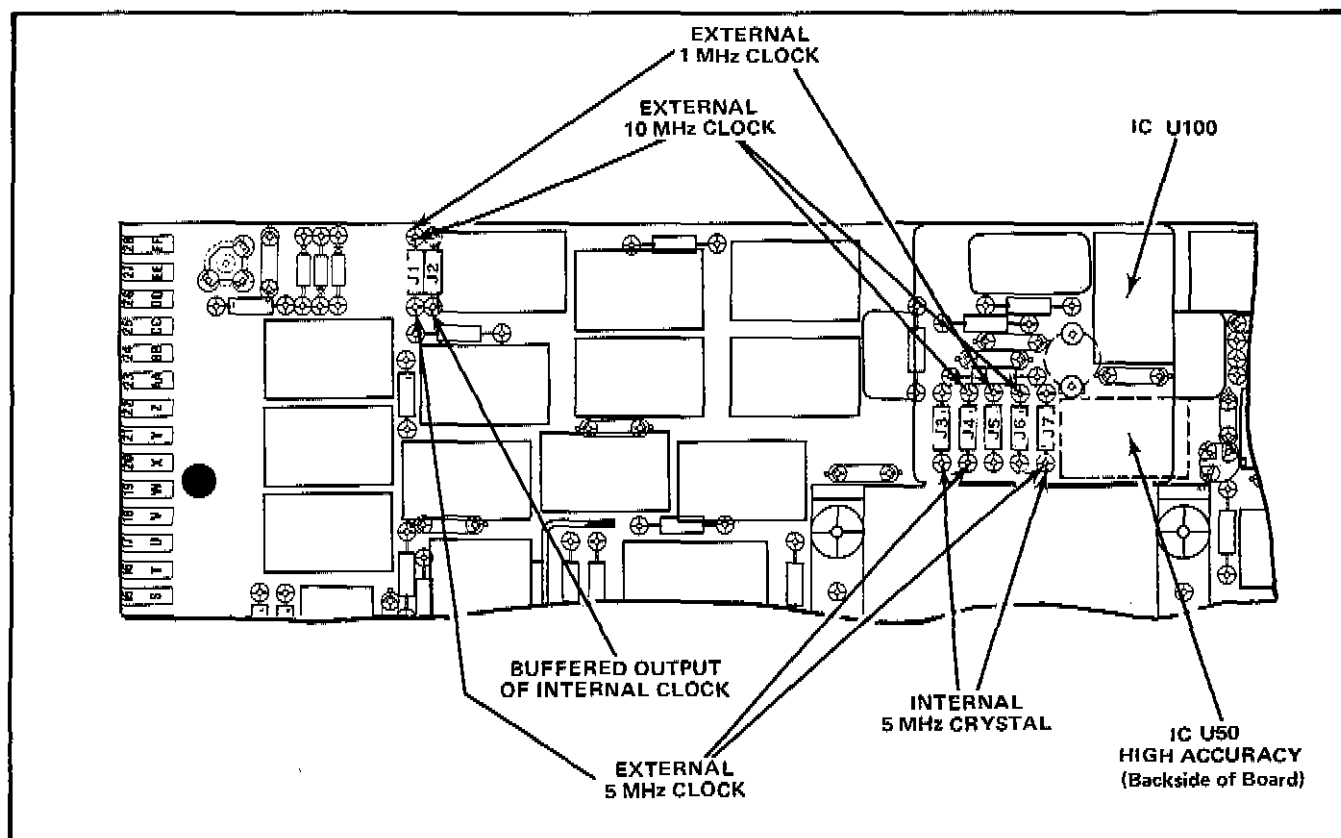


Fig. 1-2. Location of Jumpers and Integrated Circuits required for various clock choices.

Standard Clock

Remove U100 and disconnect pin 3 of U350 before using an external clock. To disconnect pin 3, remove U350, bend pin 3 out, then insert U350 back into its socket.

Option 1 Clock

Remove jumper J3 if using a 5 MHz or 10 MHz external clock. If a 1 MHz external clock is to be used, remove jumpers J3, J4, and J7.

If the external clock source is a TTL output, then remove R52. Fig. 1-2 shows the location on the main circuit board of the jumpers that must be installed to use the TG 501 with the various clock choices. The required changes are:

External 1 MHz Clock Frequency	Install J1 and J5
External 5 MHz Clock Frequency	Install J1, J4, J7 and U50
External 10 MHz Clock Frequency	Install J1, J4, J6 and U50
Standard Internal Reference 1 MHz Crystal	No Jumpers Required
Buffered Output of Internal Clocks	Install J2
Internal 5 MHz Clock (Option 1)	Install J3, J4, J7 and add U50 and Y50

OPERATING MODES

Calibrated Mode

When center-button of VARIABLE TIMING Control is pushed in, the MARKER Control selects calibrated marker intervals from 5 s to 10 ns indicated by the lighted knob skirt. To select 5, 2 or 1 ns modified sine wave markers, set MARKER Control to 521N position and depress desired pushbutton.

Variable Timing Mode

When center button of VARIABLE TIMING Control is out, output timing is faster or slower than the calibrated

marker to the percentage indicated by the VARIABLE TIMING READOUT Display and the FAST-SLOW Indicator lights. 5, 2 and 1 ns push-button controlled modified sine waves are not variable and Readout Display is turned off when MARKER Control is in 521N position.

Readout Display Test

To check the operation of the display LED's (Light-Emitting Diodes), fully depress the center button of the VARIABLE TIMING Control (push in firmly). All LED segments should light, displaying 8.8 in the Readout.

TYPICAL APPLICATIONS

The TG 501 can be used for many applications not described in the manual. Use the following examples to become familiar with the TG 501's VARIABLE TIMING READOUT. Contact your Tektronix Field Office or representative for making specific measurements with this instrument.

Time Base Measurements

To accurately determine the timing error of a time base:

1. Connect the MARKER OUT of the TG 501 to the Vertical Input of the oscilloscope. Use a 50 Ω coaxial cable terminated into 50 Ω .

2. Connect the TRIGGER OUT of the TG 501 to the External Trigger Input of the time base. Use a 50 Ω coaxial cable terminated into 50 Ω .

3. Select external trigger source on the time base.
4. Select, for example, 1 μ s sweep rate of the time base.
5. Set MARKER Control rotary switch of TG 501 to 1 μ s.
6. Make sure center button of VARIABLE TIMING Control, concentric with MARKER Control, is out (Variable Timing Mode).
7. Use Horizontal Position control of time base to make first time mark coincide with first graticule line on the oscilloscope. See Fig. 1-3.
8. Rotate VARIABLE TIMING knob until all time markers coincide with graticule lines on the oscilloscope, as shown in Fig. 1-4.

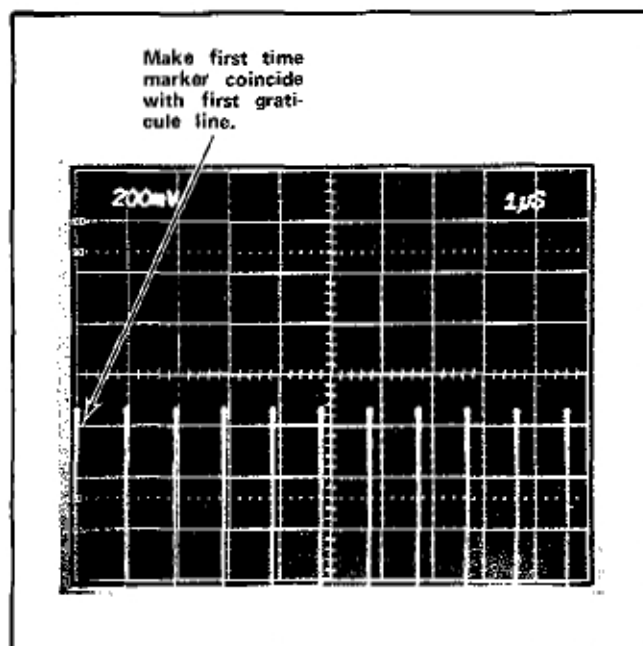


Fig. 1-3. Timing Error of Time Base.

9. Either the FAST or SLOW Indicator will light showing whether the time base is faster or slower than the calibrated markers of the TG 501. Read the percentage of error from the VARIABLE TIMING READOUT Display.

Pulse Generator Measurements

To accurately determine pulse duration or period of a Pulse Generator.

1. A dual-trace vertical oscilloscope is required. Select alternate mode.

2. Connect the MARKER OUT of the TG 501 to one channel of the dual-trace oscilloscope. Use a 50 Ω coaxial cable terminated into 50 Ω .

3. Connect the Output of the pulse generator to the other channel of the dual-trace, using a 50 Ω coaxial cable terminated into 50 Ω .

4. Set the time/div switch to display 1 cycle of a pulse in 10 divisions of the graticule on the oscilloscope, as indicated in Fig. 1-5.

5. Use the MARKER Control switch of the TG 501 to display one time marker approximately at pulse duration

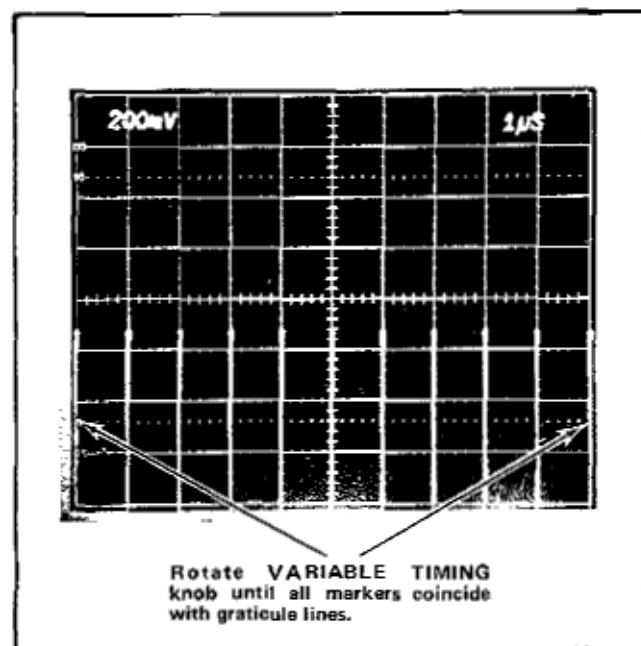


Fig. 1-4. Measuring Timing Error of Time Base.

and one at pulse period. Align first time marker with beginning of pulse wave-form. See Fig. 1-5.

6. Select Variable Timing Mode on the TG 501, VARIABLE TIMING Control center button out.

7. Use the Vertical Position control of the oscilloscope to set the peaks of the time markers at 50% amplitude of pulse shown in Fig. 1-5.

8. To check the timing of pulse duration, rotate the VARIABLE TIMING knob until time marker coincides with pulse duration, as shown in Fig. 1-6.

9. Either the FAST or SLOW Indicator will light, showing whether the pulse duration of the pulse generator is faster or slower than the calibrated time mark of the TG 501. Read the percentage of error from the VARIABLE TIMING READOUT Display.

10. To check the timing of pulse period, rotate the VARIABLE TIMING knob until time marker coincides with pulse period. See Fig. 1-7.

11. Read the VARIABLE TIMING READOUT Display and check the FAST-SLOW Indicators as described in step 9 to find the percentage of error from standard timing.

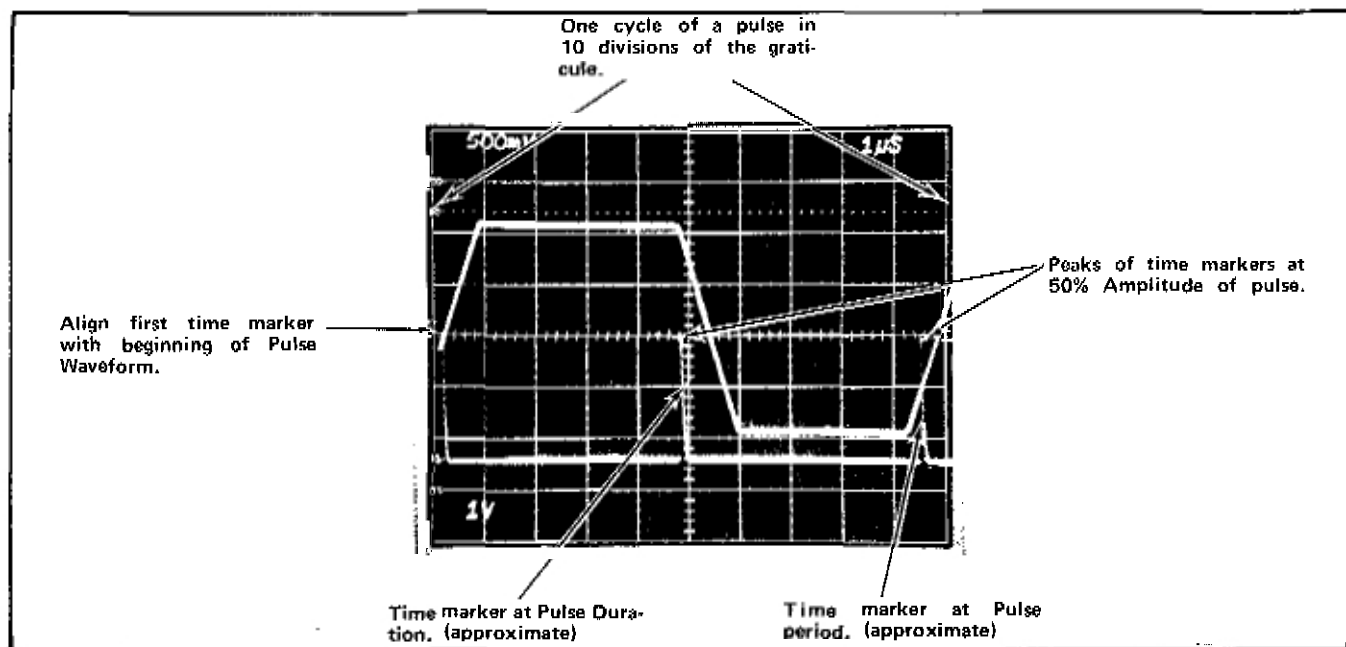


Fig. 1-5. Markers approximately at pulse duration and period.

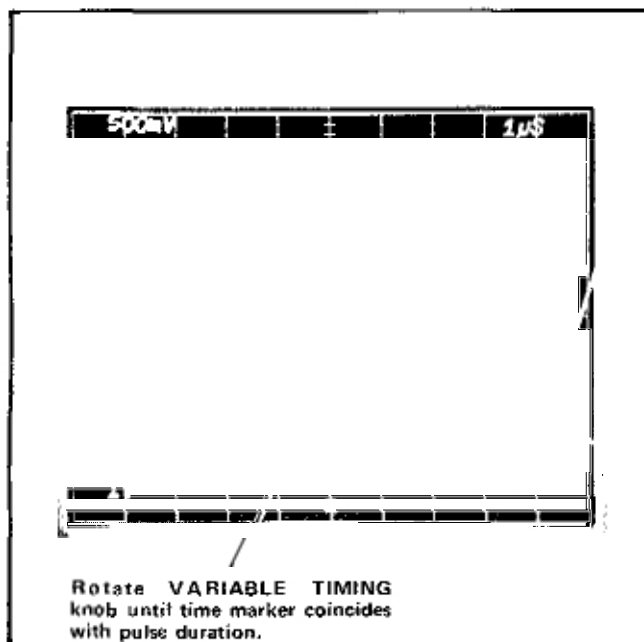


Fig. 1-6. Measuring Pulse Duration.

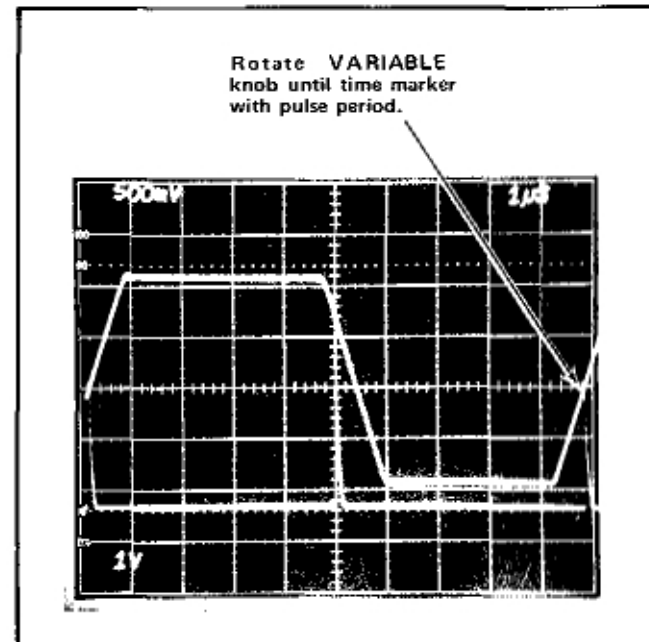


Fig. 1-7. Measuring Pulse Period.

REAR INTERFACE

Unused pins are available at the rear connector for routing signals to and from the TG 501 for specialized applications (see Rear Connector Pin Assignments in Section 2). One or more compartments of a multi-plug-in

Power Module can be wired with barriers installed to provide specific functions between compartments. See Power Module instruction manual for additional information.

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A Power Module mainframe option (Option 2) is available which provides a rear-panel, multi-pin connector to which I/O lines can be hard-wired for external access.

Also possible are intra-compartment connections with other plug-in modules in multiple-compartment mainframes.

SPECIFICATIONS

The electrical specifications are valid only if (1) the instrument has been calibrated at an ambient temperature between +20°C and +30°C; (2) the instrument is operating at an ambient temperature between 0°C and +50°C, unless

otherwise noted; (3) plug-in must be operating (fully installed) in a calibrated system.

Any conditions that are unique to a particular specification are stated as part of that specification.

TABLE 1-1
ELECTRICAL CHARACTERISTICS

Characteristics	Performance Requirements		Supplemental Information
Markers	5 s through 1 ns in a 1,2,5 sequence		5 s through 10 ns are selected by a rotary switch. 5 ns, 2 ns and 1 ns are pushbutton selected modified sine waves
Marker Amplitude	≥ 1 V peak on 5 s through 10 ns markers. ≥ 750 mV peak-to-peak into 50 Ω on 5 ns and 2 ns markers. ≥ 200 mV peak-to-peak into 50 Ω on 1 ns markers.		
Trigger Output Signal	Slaved to marker output from 5 s through 100 ns. Remains at 100 ns for all faster markers ≥ 1 V peak into 50 Ω		
Internal Reference	Standard	Option 1	
Crystal Frequency	1 MHz	5 MHz	
Stability (20°C to 50°C) after 1/2 hour Warm-Up	Within 1 part in 10^5	Within 5 parts in 10^7	
Long-Term Drift	1 part or less in 10^5 per month	1 part or less in 10^7 per month	
Accuracy	Adjustable to within 1 part in 10^7	Adjustable to within 5 parts in 10^9	
External Reference Input (Available Only if U50 and jumpers are installed and U100 is removed)			IC and jumpers for 5 or 10 MHz, 1 MHz external reference requires jumpers only
Acceptable Frequencies	1 MHz, 5 MHz, or 10 MHz		Internally hard wired so output frequencies counted down to 1 MHz
Input Amplitude	Must be TTL compatible		
Error Readout Range	To $\pm 7.5\%$		
Timing Error Measurement Accuracy	Device under test error is indicated to within one least significant digit (i.e. to within one displayed count)		Example: If DUT timing error reads 3.0% slow, the absolute accuracy will be between 2.9% and 3.1% slow.

TABLE 1-2
ENVIRONMENTAL CHARACTERISTICS

Characteristics	Performance Requirements	Supplemental Information
Temperature		
Operating	0°C to +50°C	
Storage	-40°C to +75°	
Altitude		
Operating	To 15,000 feet	
Storage	To 50,000 feet	
Vibration		
Operating and Non-Operating	With the instrument complete and operating, vibration frequency swept from 10 to 50 to 10 Hz at 1 minute per sweep. Vibrate 15 minutes in each of the three major axes at 0.015" total displacement. Hold 3 minutes at any major resonance, or if none, at 50 Hz. Total time, 54 minutes	
Shock		
Operating and Non-Operating	30 g's, 1/2 sine, 11 ms duration, 2 shocks in each direction along 3 major axes, for a total of 12 shocks	
Transportation	Qualified under National Safe Transit Committee Test Procedure 1A, Category II	

REPACKAGING FOR SHIPMENT

If the Tektronix instrument is to be shipped to a Tektronix Service Center for service or repair, attach a tag showing: owner (with address) and the name of an individual at your firm that can be contacted, complete instrument serial number and a description of the service required.

Save and re-use the package in which your instrument was shipped. If the original packaging is unfit for use or not available, repack the instrument as follows:

1. Obtain a carton of corrugated cardboard having inside dimensions of no less than six inches more than the instrument dimensions; this will allow for cushioning. Refer to the following table for carton test strength requirements.
2. Surround the instrument with polyethylene sheeting to protect the finish of the instrument.

3. Cushion the instrument on all sides by tightly packing dunnage or urethane foam between carton and instrument, allowing three inches on all sides.
4. Seal carton with shipping tape or industrial stapler.

SHIPPING CARTON TEST STRENGTH

Gross Weight (lb)	Carton Test Strength (lb)
0-10	200
10-30	275
30-120	375
120-140	500
140-160	600

SERVICE INFORMATION

SYMBOLS AND REFERENCES DESIGNATORS

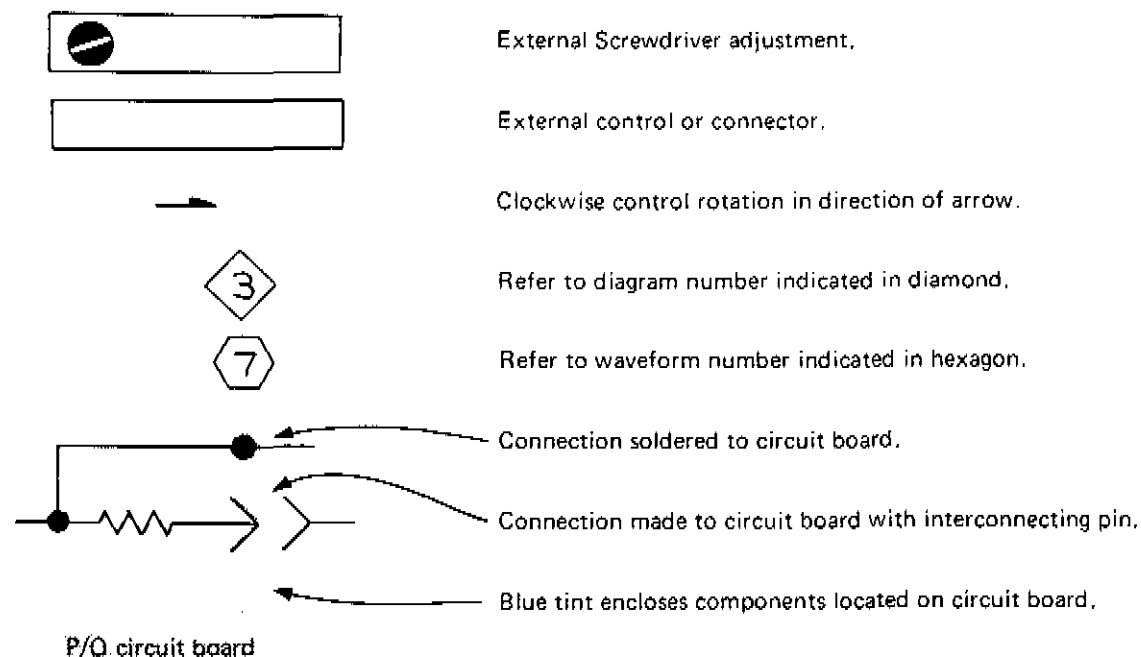
Electrical components shown on the diagrams are in the following units unless noted otherwise:

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

Symbols used on the diagrams are based on ANSI Y32.2 - 1970.

Logic symbology is based on MIL-STD-806B in terms of positive logic. Logic symbols depict the logic function performed and may differ from the manufacturer's data.

The following special symbols are used on the diagrams:



REPLACEABLE ELECTRICAL PARTS

PARTS ORDERING INFORMATION

Replacement parts are available from or through your local Tektronix, Inc. Field Office or representative.

Changes to Tektronix instruments are sometimes made to accommodate improved components as they become available, and to give you the benefit of the latest circuit improvements developed in our engineering department. It is therefore important, when ordering parts, to include the following information in your order: Part number, instrument type or number, serial number, and modification number if applicable.

If a part you have ordered has been replaced with a new or improved part, your local Tektronix, Inc. Field Office or representative will contact you concerning any change in part number.

Change information, if any, is located at the rear of this manual.

SPECIAL NOTES AND SYMBOLS

X000 Part first added at this serial number
00X Part removed after this serial number

ITEM NAME

In the Parts List, an Item Name is separated from the description by a colon (:). Because of space limitations, an Item Name may sometimes appear as incomplete. For further Item Name identification, the U.S. Federal Cataloging Handbook H6-1 can be utilized where possible.

ABBREVIATIONS

ACTR	ACTUATOR	PLSTC	PLASTIC
ASSY	ASSEMBLY	QTZ	QUARTZ
CAP	CAPACITOR	RECP	RECEPTACLE
CER	CERAMIC	RES	RESISTOR
CKT	CIRCUIT	RF	RADIO FREQUENCY
COMP	COMPOSITION	SEL	SELECTED
CONN	CONNECTOR	SEMICON	SEMICONDUCTOR
ELCTLT	ELECTROLYTIC	SENS	SENSITIVE
ELEC	ELECTRICAL	VAR	VARIABLE
INCAND	INCANDESCENT	WW	WIREWOUND
LED	LIGHT EMITTING DIODE	XFMR	TRANSFORMER
NONWIR	NON WIREWOUND	XTAL	CRYSTAL

CROSS INDEX MFR. CODE NUMBER TO MANUFACTURER

MFR.CODE	MANUFACTURER	ADDRESS	CITY,STATE,ZIP
0000C	GETTIG ENGINEERING AND MANUFACTURING CO.		SPRINGMILL, PA 16875
00853	SANGAMO ELECTRIC CO., S. CAROLINA DIV.	P. O. BOX 128	PICKENS, SC 29671
01121	ALLEN-BRADLEY CO.	1201 2ND ST. SOUTH	MILWAUKEE, WI 53204
01295	TEXAS INSTRUMENTS, INC., SEMICONDUCTOR GROUP	P. O. BOX 5012	DALLAS, TX 75222
04713	MOTOROLA, INC., SEMICONDUCTOR PRODUCTS DIV.	5005 E. MCDOWELL RD.	PHOENIX, AZ 85036
07263	FAIRCHILD SEMICONDUCTOR, A DIV. OF FAIRCHILD CAMERA AND INSTRUMENT CORP.	464 ELLIS ST.	MOUNTAIN VIEW, CA 94042
07910	TELEDYNE SEMICONDUCTOR	12515 CHADRON AVE.	HAWTHORNE, CA 90250
08806	GENERAL ELECTRIC CO., MINIATURE LAMP PRODUCTS DEPT.	NELA PK.	CLEVELAND, OH 44112
12617	HAMLIN, INC.	GROVE & LAKE STS.	LAKE MILLS, WI 53551
13715	FAIRCHILD SEMICONDUCTOR, A DIV. OF FAIRCHILD CAMERA AND INSTRUMENT CORP.	4300 REDWOOD HWY.	SAN RAFAEL, CA 94903
15818	TELEDYNE SEMICONDUCTOR	1300 TERRA BELLA AVE.	MOUNTAIN VIEW, CA 94040
18324	SIGNETICS CORP.	811 E. ARQUES	SUNNYVALE, CA 94086
27014	NATIONAL SEMICONDUCTOR CORP.	2900 SAN YSIDRO WAY	SANTA CLARA, CA 95051
28480	HEWLETT-PACKARD CO., CORPORATE HQ.	1501 PAGE MILL RD.	PALO ALTO, CA 94304
31718	FAIRCHILD MICROWAVE AND OPTOELECTRONICS, A DIV. OF FAIRCHILD CAMERA AND INSTRUMENT CORP.	4001 MIRANDA AVE.	PALO ALTO, CA 94304
32159	WEST-CAP ARIZONA	2201 E. ELVIRA ROAD	TUCSON, AZ 85706
50579	LITRONIX INC.	19000 HOMESTEAD RD.	CUPERTINO, CA 95014
56289	SPRAGUE ELECTRIC CO.		NORTH ADAMS, MA 01247
71400	BUSSMAN MFG., DIVISION OF MCGRAW- EDISON CO.	2536 W. UNIVERSITY ST.	ST. LOUIS, MO 63107
71590	CENTRALAB ELECTRONICS, DIV. OF GLOBE-UNION, INC.	5757 N. GREEN BAY AVE.	MILWAUKEE, WI 53201
72982	ERIE TECHNOLOGICAL PRODUCTS, INC.	644 W. 12TH ST.	ERIE, PA 16512
73138	BECKMAN INSTRUMENTS, INC., HELIPOT DIV.	2500 HARBOR BLVD.	FULLERTON, CA 92634
74970	JOHNSON, E. F., CO.	299 10TH AVE. S. W.	WASECA, MN 56093
75042	TRW ELECTRONIC COMPONENTS, IRC FIXED RESISTORS, PHILADELPHIA DIVISION	401 N. BROAD ST.	PHILADELPHIA, PA 19108
80009	TEKTRONIX, INC.	P. O. BOX 500	BEAVERTON, OR 97077
80294	BOURNS, INC., INSTRUMENT DIV.	6135 MAGNOLIA AVE.	RIVERSIDE, CA 92506
86684	RCA CORP., ELECTRONIC COMPONENTS	415 S. 5TH ST.	HARRISON, NJ 07029
90201	MALLORY CAPACITOR CO., DIV. OF P. R. MALLORY CO., INC.	3029 E. WASHINGTON ST.	INDIANAPOLIS, IN 46206

Electrical Parts List—TG 501

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Discont	Name & Description	Mfr Code	Mfr Part Number
A1 ¹	670-2737-00	B010100	B029999	CKT BOARD ASSY:--TIME MARK GEN	80009	670-2737-00
A1 ¹	670-2737-02	B030000	B031769	CKT BOARD ASSY:--TIME MARK GEN	80009	670-2737-02
A1 ¹	670-2737-03	B031770	B032459	CKT BOARD ASSY:--TIME MARK GEN	80009	670-2737-03
A1 ¹	670-2737-04	B032460		CKT BOARD ASSY:--TIME MARK GEN	80009	670-2737-04
A1 ²	670-3415-00	B010100	B029999	CKT BOARD ASSY:--TIME MARK GEN	80009	670-3415-00
A1 ²	670-3415-01	B030000	B031389	CKT BOARD ASSY:--TIME MARK GEN	80009	670-3415-01
A1 ²	670-3415-02	B031390	B032499	CKT BOARD ASSY:--TIME MARK GEN	80009	670-3415-02
A1 ²	670-3415-03	B032500		CKT BOARD ASSY:--TIME MARK GEN	80009	670-3415-03
A2 ¹	670-2992-00	B010100	B032459	CKT BOARD ASSY:--MULTIPLIER	80009	670-2992-00
A2 ¹	670-2992-01	B032460		CKT BOARD ASSY:--MULTIPLIER	80009	670-2992-01
A2 ²	670-2992-00	B010100	B032499	CKT BOARD ASSY:--MULTIPLIER	80009	670-2992-00
A2 ²	670-2992-01	B032500		CKT BOARD ASSY:--MULTIPLIER	80009	670-2992-01
A3	670-2878-00			CKT BOARD ASSY:--DISPLAY	80009	670-2878-00
C50	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8131N075651104M
C100 ¹	281-0628-00			CAP.,FXD,CER DI:15PF,5%,600V	72982	301-000C0G0150J
C102 ¹	281-0166-00			CAP.,VAR,AIR DI:1.9-15.7PF,250V	74970	187-0109-005
C105 ¹	281-0504-00			CAP.,FXD,CER DI:10PF,+/-1PF,500V	72982	301-055C0G0100F
C125	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8131N075651104M
C127	283-0627-00			CAP.,FXD,MICA D:0.0033UF,5%,500V	00853	D195E332J0
C137	290-0536-00			CAP.,FXD,ELCTLT:10UF,20%,25V	90201	TDC106M025NLF
C138	290-0536-00			CAP.,FXD,ELCTLT:10UF,20%,25V	90201	TDC106M025NLF
C150 ¹	283-0067-00	XB010210		CAP.,FXD,CER DI:0.001UF,10%,200V	72982	835-515B102K
C150 ²	283-0067-00	XB010260		CAP.,FXD,CER DI:0.001UF,10%,200V	72982	835-515B102K
C160	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8131N075651104M
C231	283-0156-00			CAP.,FXD,CER DI:1000PF,+100-0%,200V	72982	8111A208E102Z
C239	283-0156-00			CAP.,FXD,CER DI:1000PF,+100-0%,200V	72982	8111A208E102Z
C246	283-0156-00			CAP.,FXD,CER DI:1000PF,+100-0%,200V	72982	8111A208E102Z
C250	290-0529-00			CAP.,FXD,ELCTLT:47UF,20%,20V	56289	196D476X0020LA3
C251	290-0529-00			CAP.,FXD,ELCTLT:47UF,20%,20V	56289	196D476X0020LA3
C268	283-0000-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
C271	283-0156-00			CAP.,FXD,CER DI:1000PF,+100-0%,200V	72982	8111A208E102Z
C272	283-0156-00			CAP.,FXD,CER DI:1000PF,+100-0%,200V	72982	8111A208E102Z
C285	283-0156-00			CAP.,FXD,CER DI:1000PF,+100-0%,200V	72982	8111A208E102Z
C290	281-0628-00			CAP.,FXD,CER DI:15PF,5%,600V	72982	301-000C0G0150J
C292	283-0156-00			CAP.,FXD,CER DI:1000PF,+100-0%,200V	72982	8111A208E102Z
C295 ¹	281-0627-00	XB031770		CAP.,FXD,CER DI:1PF,+/-0.25PF,500V	72982	301-000C0K0109C
C295 ²	281-0627-00	XB031390		CAP.,FXD,CER DI:1PF,+/-0.25PF,500V	72982	301-000C0K0109C
C297	283-0156-00			CAP.,FXD,CER DI:1000PF,+100-0%,200V	72982	8111A208E102Z
C298	283-0156-00			CAP.,FXD,CER DI:1000PF,+100-0%,200V	72982	8111A208E102Z
C330	283-0000-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
C331	283-0156-00			CAP.,FXD,CER DI:1000PF,+100-0%,200V	72982	8111A208E102Z
C352	281-0511-00			CAP.,FXD,CER DI:22PF,+/-2.2PF,500V	72982	301-000C0G0220K
C355	281-0516-00			CAP.,FXD,CER DI:39PF,+/-3.9PF,500V	72982	301-000U2J0390K
C358	281-0536-00			CAP.,FXD,CER DI:1000PF,10%,500V	72982	301055X5P102K
C360	281-0536-00			CAP.,FXD,CER DI:1000PF,10%,500V	72982	301055X5P102K
C362	285-0674-00			CAP.,FXD,PLSTC:0.01UF,100V	56289	410P10391
C366	290-0572-00			CAP.,FXD,ELCTLT:0.1UF,20%,50V	56289	196D104Z0050HA1
C368	290-0534-00			CAP.,FXD,ELCTLT:1UF,20%,35V	56289	196D105X0035HA1
C370	290-0536-00			CAP.,FXD,ELCTLT:10UF,20%,25V	90201	TDC106M025NLF
C372	290-0531-00			CAP.,FXD,ELCTLT:100UF,20%,10V	90201	TDC107M010WLC
C390	281-0511-00			CAP.,FXD,CER DI:22PF,+/-2.2PF,500V	72982	301-000C0G0220K
C400	281-0511-00			CAP.,FXD,CER DI:22PF,+/-2.2PF,500V	72982	301-000C0G0220K
C404	283-0000-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
C405 ¹	290-0533-00	B010100	B010217	CAP.,FXD,ELCTLT:330UF,20%,6V	56289	196D337X006MA3
C405 ¹	290-0530-00	B010218		CAP.,FXD,ELCTLT:68UF,20%,6V	90201	TDC686M006NLF
C405 ²	290-0533-00	B010100	B010261	CAP.,FXD,ELCTLT:330UF,20%,6V	56289	196D337X006MA3
C405 ²	290-0530-00	B010262		CAP.,FXD,ELCTLT:68UF,20%,6V	90201	TDC686M006NLF
C413	283-0000-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
C415	290-0533-00			CAP.,FXD,ELCTLT:330UF,20%,6V	56289	196D337X006MA3
C416 ¹	283-0156-00	B010100	B010217X	CAP.,FXD,CER DI:1000PF,+100-0%,200V	72982	8111A208E102Z
C416 ²	283-0156-00	B010100	B010261X	CAP.,FXD,CER DI:1000PF,+100-0%,200V	72982	8111A208E102Z

¹Standard only
²Option 1 only

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Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
C4171	281-0540-00	XB032460		CAP., FXD, CER DI:51PF, 5%, 500V	72982	301-000U2J0510J
C4172	281-0540-00	XB032500		CAP., FXD, CER DI:51PF, 5%, 500V	72982	301-000U2J0510J
C430	290-0531-00			CAP., FXD, ELCTLT:100UF, 20%, 10V	90201	TDC107M010CL
C432	290-0532-00			CAP., FXD, ELCTLT:150UF, 20%, 6V	90201	TDC157M006CL
C439	281-0523-00			CAP., FXD, CER DI:100PF, +/-20PF, 350V	72982	301-000U2M0101M
C440	281-0511-00			CAP., FXD, CER DI:22PF, +/-2.2PF, 500V	72982	301-000C0G0220K
C450	281-0153-00			CAP., VAR, AIR DI:1.7-10PF, 250V	74970	187-0106-005
C452	283-0156-00			CAP., FXD, CER DI:1000PF, +100-0%, 200V	72982	8111A208E102Z
C454	283-0156-00			CAP., FXD, CER DI:1000PF, +100-0%, 200V	72982	8111A208E102Z
C455	283-0156-00			CAP., FXD, CER DI:1000PF, +100-0%, 200V	72982	8111A208E102Z
C457	283-0156-00			CAP., FXD, CER DI:1000PF, +100-0%, 200V	72982	8111A208E102Z
C458	283-0156-00			CAP., FXD, CER DI:1000PF, +100-0%, 200V	72982	8111A208E102Z
C462	283-0156-00			CAP., FXD, CER DI:1000PF, +100-0%, 200V	72982	8111A208E102Z
C465	281-0153-00			CAP., VAR, AIR DI:1.7-10PF, 250V	74970	187-0106-005
C467	281-0153-00			CAP., VAR, AIR DI:1.7-10PF, 250V	74970	187-0106-005
C481	283-0177-00			CAP., FXD, CER DI:1UF, +80-20%, 25V	72982	8131N039651105Z
C489	283-0156-00			CAP., FXD, CER DI:1000PF, +100-0%, 200V	72982	8111A208E102Z
C490	283-0156-00			CAP., FXD, CER DI:1000PF, +100-0%, 200V	72982	8111A208E102Z
C492	283-0156-00			CAP., FXD, CER DI:1000PF, +100-0%, 200V	72982	8111A208E102Z
C494	283-0156-00			CAP., FXD, CER DI:1000PF, +100-0%, 200V	72982	8111A208E102Z
C495	290-0519-00			CAP., FXD, ELCTLT:100UF, 20%, 20V	56289	196D107X0020MA3
C496	290-0531-00			CAP., FXD, ELCTLT:100UF, 20%, 10V	90201	TDC107M010CL
C498	281-0153-00			CAP., VAR, AIR DI:1.7-10PF, 250V	74970	187-0106-005
C499	281-0578-00			CAP., FXD, CER DI:18PF, 5%, 500V	72982	301-000C0G0180J
C500	281-0511-00			CAP., FXD, CER DI:22PF, +/-2.2PF, 500V	72982	301-000C0G0220K
C504	281-0153-00			CAP., VAR, AIR DI:1.7-10PF, 250V	74970	187-0106-005
C505	281-0153-00			CAP., VAR, AIR DI:1.7-10PF, 250V	74970	187-0106-005
C510	281-0168-00			CAP., VAR, AIR DI:1.3-5.4PF, 250V	74970	187-0103-035
C511	281-0168-00			CAP., VAR, AIR DI:1.3-5.4PF, 250V	74970	187-0103-035
C512	281-0168-00			CAP., VAR, AIR DI:1.3-5.4PF, 250V	74970	187-0103-035
C513	281-0168-00			CAP., VAR, AIR DI:1.3-5.4PF, 250V	74970	187-0103-035
C515	281-0168-00			CAP., VAR, AIR DI:1.3-5.4PF, 250V	74970	187-0103-035
C517	281-0168-00			CAP., VAR, AIR DI:1.3-5.4PF, 250V	74970	187-0103-035
C518	281-0168-00			CAP., VAR, AIR DI:1.3-5.4PF, 250V	74970	187-0103-035
C519	281-0168-00			CAP., VAR, AIR DI:1.3-5.4PF, 250V	74970	187-0103-035
C520	281-0168-00			CAP., VAR, AIR DI:1.3-5.4PF, 250V	74970	187-0103-035
C550	283-0156-00			CAP., FXD, CER DI:1000PF, +100-0%, 200V	72982	8111A208E102Z
C610	283-0000-00			CAP., FXD, CER DI:0.001UF, +100-0%, 500V	72982	831-516E102P
C615	290-0519-00			CAP., FXD, ELCTLT:100UF, 20%, 20V	56289	196D107X0020MA3
C616	283-0000-00			CAP., FXD, CER DI:0.001UF, +100-0%, 500V	72982	831-516E102P
C624	283-0000-00			CAP., FXD, CER DI:0.001UF, +100-0%, 500V	72982	831-516E102P
C626	290-0536-00			CAP., FXD, ELCTLT:10UF, 20%, 25V	90201	TDC106M025FL
C640	290-0531-00			CAP., FXD, ELCTLT:100UF, 20%, 10V	90201	TDC107M010CL
C641	283-0000-00			CAP., FXD, CER DI:0.001UF, +100-0%, 500V	72982	831-516E102P
C660	283-0000-00			CAP., FXD, CER DI:0.001UF, +100-0%, 500V	72982	831-516E102P
C662	283-0000-00			CAP., FXD, CER DI:0.001UF, +100-0%, 500V	72982	831-516E102P
C664	283-0000-00			CAP., FXD, CER DI:0.001UF, +100-0%, 500V	72982	831-516E102P
C666	283-0000-00			CAP., FXD, CER DI:0.001UF, +100-0%, 500V	72982	831-516E102P
C668	283-0000-00			CAP., FXD, CER DI:0.001UF, +100-0%, 500V	72982	831-516E102P
C670	283-0000-00			CAP., FXD, CER DI:0.001UF, +100-0%, 500V	72982	831-516E102P
C672	283-0000-00			CAP., FXD, CER DI:0.001UF, +100-0%, 500V	72982	831-516E102P
C674	283-0000-00			CAP., FXD, CER DI:0.001UF, +100-0%, 500V	72982	831-516E102P
C676	283-0000-00			CAP., FXD, CER DI:0.001UF, +100-0%, 500V	72982	831-516E102P
C678	283-0000-00			CAP., FXD, CER DI:0.001UF, +100-0%, 500V	72982	831-516E102P
C680	283-0000-00			CAP., FXD, CER DI:0.001UF, +100-0%, 500V	72982	831-516E102P

¹Standard only

²Option 1 only

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Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Discont	Name & Description	Mfr Code	Mfr Part Number
C682	283-0000-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
C684	283-0000-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
C686	283-0000-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
C688 ¹	283-0000-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
C690	283-0156-00			CAP.,FXD,CER DI:1000PF,+100-0%,200V	72982	8111A208E102Z
C692	283-0000-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
CR50	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152
CR52	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152
CR54	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152
CR115	152-0322-00			SEMICONV DEVICE:SILICON,15V	28480	5082-2672
CR167	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152
CR168	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152
CR350	152-0322-00			SEMICONV DEVICE:SILICON,15V	28480	5082-2672
CR358	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152
CR359	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152
CR360	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152
CR361	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152
CR363	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152
CR364	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152
CR366	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152
CR367	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152
CR369	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152
CR370	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152
CR372	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152
CR373	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152
CR375	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152
CR376	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152
CR415	152-0322-00			SEMICONV DEVICE:SILICON,15V	28480	5082-2672
CR445	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152
CR450	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152
CR468 ¹	152-0153-00	XB010218		SEMICONV DEVICE:SILICON,15V,50MA	13715	FD7003
CR468 ²	152-0153-00	XB010262		SEMICONV DEVICE:SILICON,15V,50MA	13715	FD7003
CR470	152-0153-00			SEMICONV DEVICE:SILICON,15V,50MA	13715	FD7003
CR482	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152
CR500	152-0503-00			SEMICONV DEVICE:SILICON,SNAP-OFF	80009	152-0503-00
CR515	152-0536-00			SEMICONV DEVICE:SILICON,HOT CARRIER,4V,280MW	04713	MED101
CR600	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152
CR626	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152
DS170	150-1001-01			LAMP,LED:RED,2V,100MA	50579	RL2
DS172	150-1001-01			LAMP,LED:RED,2V,100MA	50579	RL2
DS550 ¹	150-1011-00	B010100	B032559	NUM DISPLAY:GAASP,RED,7 SEG	31718	FND70
DS550 ¹	150-1011-01	B032560		LAMP,LED,RDOUT:RED,SINGLE DIGIT	07263	FND357
DS550 ²	150-1011-00	B010100	B032669	NUM DISPLAY:GAASP,RED,7 SEG	31718	FND70
DS550 ²	150-1011-01	B032670		LAMP,LED,RDOUT:RED,SINGLE DIGIT	07263	FND357
DS570 ¹	150-1011-00	B010100	B032559	NUM DISPLAY:GAASP,RED,7 SEG	31718	FND70
DS570 ¹	150-1011-01	B032560		LAMP,LED,RDOUT:RED,SINGLE DIGIT	07263	FND357
DS570 ²	150-1011-00	B010100	B032669	NUM DISPLAY:GAASP,RED,7 SEG	31718	FND70
DS570 ²	150-1011-01	B032670		LAMP,LED,RDOUT:RED,SINGLE DIGIT	07263	FND357
DS630	150-0048-00			LAMP,INCAND:5V,60MA	08806	693
F620	159-0021-00			FUSE,CARTRIDGE:3AG,2A,250V,FAST-BLOW	71400	AGC2
J3 ²	131-0566-00			LINK,TERM.CONNE:0.086 DIA X 2.375 INCH L	0000C	L-2007-1
J7 ²	131-0566-00			LINK,TERM.CONNE:0.086 DIA X 2.375 INCH L	0000C	L-2007-1
J8	131-0566-00			LINK,TERM.CONNE:0.086 DIA X 2.375 INCH L	0000C	L-2007-1
J290	131-1003-00			CONNECTOR BODY,:CKT BD MT,3 PRONG	80009	131-1003-00
J420	131-1003-00			CONNECTOR BODY,:CKT BD MT,3 PRONG	80009	131-1003-00
J435	131-1315-00			CONNECTOR,RCPT,:BNC,FEMALE	80009	131-1315-00
J450	131-1003-00			CONNECTOR BODY,:CKT BD MT,3 PRONG	80009	131-1003-00

¹Standard only²Option 1 only

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Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Discont	Name & Description	Mfr Code	Mfr Part Number
J465	131-1003-00			CONNECTOR BODY, :CKT BD MT, 3 PRONG	80009	131-1003-00
J468	131-1003-00			CONNECTOR BODY, :CKT BD MT, 3 PRONG	80009	131-1003-00
J470	131-1315-00			CONNECTOR, RCPT, :BNC, FEMALE	80009	131-1315-00
J520	131-1315-00			CONNECTOR, RCPT, :BNC, FEMALE	80009	131-1315-00
K450	108-0357-00			COIL, REED SW: REED DRIVE, 6V, SINGLE	80009	108-0357-00
L137	108-0317-00	B010100	B029999X	COIL, RF: 15UH	32159	71501M
L297	108-0317-00			COIL, RF: 15UH	32159	71501M
L458	108-0371-00			COIL, RF: 0.23UH	80009	108-0371-00
L460	108-0371-00			COIL, RF: 0.23UH	80009	108-0371-00
L462 ¹						
L465 ²	108-0509-00	XB010218		COIL, RF: 2.5UH	80009	108-0509-00
L465 ³	108-0509-00	XB010262		COIL, RF: 2.5UH	80009	108-0509-00
L486 ²	108-0371-00	XB010210		COIL, RF: 0.23UH	80009	108-0371-00
L486 ³	108-0371-00	XB010260		COIL, RF: 0.23UH	80009	108-0371-00
L490	108-0347-00			COIL, RF: 0.12UH	80009	108-0347-00
L492	108-0371-00			COIL, RF: 0.23UH	80009	108-0371-00
L494 ¹	108-0371-00			COIL, RF: 0.23UH	80009	108-0371-00
L500 ¹						
L502 ¹						
L510 ¹						
L511 ¹						
L512 ¹						
L513 ¹						
L517 ¹						
L518 ¹						
L519 ¹						
L520 ¹						
Q120	151-0220-00			TRANSISTOR: SILICON, PNP	80009	151-0220-00
Q130	151-0220-00			TRANSISTOR: SILICON, PNP	80009	151-0220-00
Q135	151-0220-00			TRANSISTOR: SILICON, PNP	80009	151-0220-00
Q140	151-0220-00			TRANSISTOR: SILICON, PNP	80009	151-0220-00
Q255	151-0221-00			TRANSISTOR: SILICON, PNP	80009	151-0221-00
Q260	151-0424-00			TRANSISTOR: SILICON, NPN	07263	2N5769
Q265	151-0221-00			TRANSISTOR: SILICON, PNP	80009	151-0221-00
Q270	151-0424-00			TRANSISTOR: SILICON, NPN	07263	2N5769
Q272	151-0221-00			TRANSISTOR: SILICON, PNP	80009	151-0221-00
Q280	151-0221-00			TRANSISTOR: SILICON, PNP	80009	151-0221-00
Q285	151-0221-00			TRANSISTOR: SILICON, PNP	80009	151-0221-00
Q290 ²	151-0424-00	B010100	B031669	TRANSISTOR: SILICON, NPN	07263	2N5769
Q290 ²	151-0472-00	B031670		TRANSISTOR: SILICON, NPN	80009	151-0472-00
Q290 ³	151-0424-00	B010100	B031389	TRANSISTOR: SILICON, NPN	07263	2N5769
Q290 ³	151-0472-00	B031390		TRANSISTOR: SILICON, NPN	80009	151-0472-00
Q330	151-0410-00			TRANSISTOR: SILICON, PNP	04713	SPS6765
Q380	151-0221-00			TRANSISTOR: SILICON, PNP	80009	151-0221-00
Q384	151-0221-00			TRANSISTOR: SILICON, PNP	80009	151-0221-00
Q390	151-0271-00			TRANSISTOR: SILICON, PNP	80009	151-0271-00
Q400	151-0271-00			TRANSISTOR: SILICON, PNP	80009	151-0271-00
Q405	151-0221-00			TRANSISTOR: SILICON, PNP	80009	151-0221-00
Q408	151-0424-00			TRANSISTOR: SILICON, NPN	07263	2N5769
Q415 ²	151-0271-00	B010100	B010217	TRANSISTOR: SILICON, PNP	80009	151-0271-00
Q415 ²	151-0221-00	B010218	B032459	TRANSISTOR: SILICON, PNP	80009	151-0221-00
Q415 ²	151-0325-00	B032460		TRANSISTOR: SILICON, PNP, SEL	80009	151-0325-00
Q415 ³	151-0271-00	B010100	B010261	TRANSISTOR: SILICON, PNP	80009	151-0271-00
Q415 ³	151-0221-00	B010262	B032499	TRANSISTOR: SILICON, PNP	80009	151-0221-00
Q415 ³	151-0325-00	B032500		TRANSISTOR: SILICON, PNP, SEL	80009	151-0325-00
Q430	151-0424-00			TRANSISTOR: SILICON, NPN	07263	2N5769
Q435	151-0424-00			TRANSISTOR: SILICON, NPN	07263	2N5769
Q440	151-0221-00			TRANSISTOR: SILICON, PNP	80009	151-0221-00

¹Part of Circuit Board

²Standard only

³Option 1 only

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Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Discont	Name & Description	Mfr Code	Mfr Part Number
Q460 ¹	151-0221-00	XB010218		TRANSISTOR:SILICON,PNP	80009	151-0221-00
Q460 ²	151-0221-00	XB010262		TRANSISTOR:SILICON,PNP	80009	151-0221-00
Q484	151-0221-00			TRANSISTOR:SILICON,PNP	80009	151-0221-00
Q486	151-0411-00			TRANSISTOR:SILICON,NPN	80009	151-0411-00
Q600	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q605	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q610	151-0301-00			TRANSISTOR:SILICON,PNP	04713	2N2907A
Q620	151-0220-00			TRANSISTOR:SILICON,PNP	80009	151-0220-00
Q635	151-0302-00			TRANSISTOR:SILICON,NPN	04713	2N2222A
Q640	151-0515-01			TRANSISTOR:50V,8A	04713	2N4441
R50	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R52	315-0510-00			RES.,FXD,CMPSN:51 OHM,5%,0.25W	01121	CB5105
R53	315-0242-00	XB030000		RES.,FXD,CMPSN:2.4K OHM,5%,0.25W	01121	CB2425
R100 ¹	315-0222-00			RES.,FXD,CMPSN:2.2K OHM,5%,0.25W	01121	CB2225
R105 ¹	315-0222-00			RES.,FXD,CMPSN:2.2K OHM,5%,0.25W	01121	CB2225
R108 ¹	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
R120	315-0431-00			RES.,FXD,CMPSN:430 OHM,5%,0.25W	01121	CB4315
R121	315-0242-00			RES.,FXD,CMPSN:2.4K OHM,5%,0.25W	01121	CB2425
R123	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R125	315-0510-00			RES.,FXD,CMPSN:51 OHM,5%,0.25W	01121	CB5105
R127	315-0681-00			RES.,FXD,CMPSN:680 OHM,5%,0.25W	01121	CB6815
R128	315-0511-00			RES.,FXD,CMPSN:510 OHM,5%,0.25W	01121	CB5115
R130	315-0751-00			RES.,FXD,CMPSN:750 OHM,5%,0.25W	01121	CB7515
R132 ¹	315-0102-00	XB030000	B031769	RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R132 ²	315-0331-00	B031770		RES.,FXD,CMPSN:330 OHM,5%,0.25W	01121	CB3315
R132 ²	315-0102-00	XB030000	B031389	RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R132 ²	315-0331-00	B031390		RES.,FXD,CMPSN:330 OHM,5%,0.25W	01121	CB3315
R134 ¹	315-0471-00	XB010302	B029999	RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
R134 ¹	315-0102-00	B030000	B031769	RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R134 ²	315-0331-00	B031770		RES.,FXD,CMPSN:330 OHM,5%,0.25W	01121	CB3315
R134 ²	315-0102-00	XB030000	B031389	RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R135	311-1416-00	B010100	B010209	RES.,VAR, NONWIR:200 OHM,20%,1W	01121	10M417A
R135	311-0169-00	B010210		RES.,VAR, NONWIR:100 OHM,20%,0.50W	01121	W-7564B
R135	311-1416-00	B010100	B010259	RES.,VAR, NONWIR:200 OHM,20%,1W	01121	10M417A
R135	311-0169-00	B010260		RES.,VAR, NONWIR:100 OHM,20%,0.50W	01121	W-7564B
R136 ¹	315-0160-00	B010100	B010217	RES.,FXD,CMPSN:16 OHM,5%,0.25W	01121	CB1605
R136 ¹	315-0180-00	B010218	B032459	RES.,FXD,CMPSN:18 OHM,5%,0.25W	01121	CB1805
R136 ¹	315-0180-00	B032460		RES.,FXD,CMPSN:18 OHM, (NOM VALUE),SEL	01121	CB1805
R136 ²	315-0160-00	B010100	B010261	RES.,FXD,CMPSN:16 OHM,5%,0.25W	01121	CB1605
R136 ²	315-0180-00	B010262	B032499	RES.,FXD,CMPSN:18 OHM,5%,0.25W	01121	CB1805
R136 ²	315-0180-00	B032500		RES.,FXD,CMPSN:18 OHM, (NOM VALUE),SEL	01121	CB1805
R137	315-0430-00			RES.,FXD,CMPSN:43 OHM,5%,0.25W	01121	CB4305
R138	307-0106-00	XB030000		RES.,FXD,CMPSN:4.7 OHM,5%,0.25W	01121	CB47G5
R140	315-0241-00			RES.,FXD,CMPSN:240 OHM,5%,0.25W	01121	CB2415
R142	315-0121-00			RES.,FXD,CMPSN:120 OHM,5%,0.25W	01121	CB1215
R143	315-0300-00			RES.,FXD,CMPSN:30 OHM,5%,0.25W	01121	CB3005
R145	311-1568-00			RES.,VAR, NONWIR:50 OHM,20%,0.50W	73138	91A-50ROOM
R150	315-0561-00			RES.,FXD,CMPSN:560 OHM,5%,0.25W	01121	CB5615
R151	315-0273-00			RES.,FXD,CMPSN:27K OHM,5%,0.25W	01121	CB2735
R153	315-0273-00			RES.,FXD,CMPSN:27K OHM,5%,0.25W	01121	CB2735
R154	315-0561-00			RES.,FXD,CMPSN:560 OHM,5%,0.25W	01121	CB5615
R158	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R159	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R162	315-0681-00			RES.,FXD,CMPSN:680 OHM,5%,0.25W	01121	CB6815
R163	315-0201-00			RES.,FXD,CMPSN:200 OHM,5%,0.25W	01121	CB2015
R165	315-0391-00			RES.,FXD,CMPSN:390 OHM,5%,0.25W	01121	CB3915
R167	315-0161-00			RES.,FXD,CMPSN:160 OHM,5%,0.25W	01121	CB1615
R172	315-0510-00			RES.,FXD,CMPSN:51 OHM,5%,0.25W	01121	CB5105

¹Standard only²Option 1 only

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Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Discont	Name & Description	Mfr Code	Mfr Part Number
R230	315-0561-00			RES.,FXD,COMP:560 OHM,5%,0.25W	01121	CB5615
R231	315-0103-00			RES.,FXD,COMP:10K OHM,5%,0.25W	01121	CB1035
R234	315-0103-00			RES.,FXD,COMP:10K OHM,5%,0.25W	01121	CB1035
R236	315-0561-00			RES.,FXD,COMP:560 OHM,5%,0.25W	01121	CB5615
R238	315-0103-00			RES.,FXD,COMP:10K OHM,5%,0.25W	01121	CB1035
R239	315-0103-00			RES.,FXD,COMP:10K OHM,5%,0.25W	01121	CB1035
R245	315-0153-00			RES.,FXD,COMP:15K OHM,5%,0.25W	01121	CB1535
R246	315-0103-00			RES.,FXD,COMP:10K OHM,5%,0.25W	01121	CB1035
R248	315-0274-00			RES.,FXD,COMP:270K OHM,5%,0.25W	01121	CB2745
R250	315-0242-00			RES.,FXD,COMP:2.4K OHM,5%,0.25W	01121	CB2425
R252	315-0102-00			RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R253	315-0272-00			RES.,FXD,COMP:2.7K OHM,5%,0.25W	01121	CB2725
R254	315-0102-00	XB010337		RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R255	315-0472-00			RES.,FXD,COMP:4.7K OHM,5%,0.25W	01121	CB4725
R256	315-0472-00			RES.,FXD,COMP:4.7K OHM,5%,0.25W	01121	CB4725
R262	315-0472-00			RES.,FXD,COMP:4.7K OHM,5%,0.25W	01121	CB4725
R263	315-0103-00			RES.,FXD,COMP:10K OHM,5%,0.25W	01121	CB1035
R265	315-0222-00			RES.,FXD,COMP:2.2K OHM,5%,0.25W	01121	CB2225
R266	315-0103-00			RES.,FXD,COMP:10K OHM,5%,0.25W	01121	CB1035
R271	315-0270-00			RES.,FXD,COMP:27 OHM,5%,0.25W	01121	CB2705
R272	315-0201-00			RES.,FXD,COMP:200 OHM,5%,0.25W	01121	CB2015
R280	315-0331-00			RES.,FXD,COMP:330 OHM,5%,0.25W	01121	CB3315
R282	315-0751-00			RES.,FXD,COMP:750 OHM,5%,0.25W	01121	CB7515
R283	315-0111-00			RES.,FXD,COMP:110 OHM,5%,0.25W	01121	CB1115
R285	315-0151-00			RES.,FXD,COMP:150 OHM,5%,0.25W	01121	CB1515
R286	315-0910-00			RES.,FXD,COMP:91 OHM,5%,0.25W	01121	CB9105
R290	317-0271-00			RES.,FXD,COMP:270 OHM,5%,0.125W	01121	BB2715
R292	315-0100-00			RES.,FXD,COMP:10 OHM,5%,0.25W	01121	CB1005
R294	315-0391-00			RES.,FXD,COMP:390 OHM,5%,0.25W	01121	CB3915
R295	315-0271-00			RES.,FXD,COMP:270 OHM,5%,0.25W	01121	CB2715
R300	315-0391-00			RES.,FXD,COMP:390 OHM,5%,0.25W	01121	CB3915
R302	315-0391-00			RES.,FXD,COMP:390 OHM,5%,0.25W	01121	CB3915
R304	315-0391-00			RES.,FXD,COMP:390 OHM,5%,0.25W	01121	CB3915
R305	315-0271-00			RES.,FXD,COMP:270 OHM,5%,0.25W	01121	CB2715
R310	315-0391-00			RES.,FXD,COMP:390 OHM,5%,0.25W	01121	CB3915
R312	315-0391-00			RES.,FXD,COMP:390 OHM,5%,0.25W	01121	CB3915
R314	315-0391-00			RES.,FXD,COMP:390 OHM,5%,0.25W	01121	CB3915
R316	315-0391-00			RES.,FXD,COMP:390 OHM,5%,0.25W	01121	CB3915
R318	315-0391-00			RES.,FXD,COMP:390 OHM,5%,0.25W	01121	CB3915
R320	315-0271-00			RES.,FXD,COMP:270 OHM,5%,0.25W	01121	CB2715
R322	315-0271-00			RES.,FXD,COMP:270 OHM,5%,0.25W	01121	CB2715
R324	315-0511-00			RES.,FXD,COMP:510 OHM,5%,0.25W	01121	CB5115
R325	315-0471-00			RES.,FXD,COMP:470 OHM,5%,0.25W	01121	CB4715
R330	315-0150-00			RES.,FXD,COMP:15 OHM,5%,0.25W	01121	CB1505
R331	315-0131-00			RES.,FXD,COMP:130 OHM,5%,0.25W	01121	CB1315
R333	315-0221-00			RES.,FXD,COMP:220 OHM,5%,0.25W	01121	CB2215
R335	315-0101-00			RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R350	315-0391-00			RES.,FXD,COMP:390 OHM,5%,0.25W	01121	CB3915
R352	315-0151-00			RES.,FXD,COMP:150 OHM,5%,0.25W	01121	CB1515
R355	315-0151-00			RES.,FXD,COMP:150 OHM,5%,0.25W	01121	CB1515
R358	315-0391-00			RES.,FXD,COMP:390 OHM,5%,0.25W	01121	CB3915
R360	315-0391-00			RES.,FXD,COMP:390 OHM,5%,0.25W	01121	CB3915
R362	315-0391-00			RES.,FXD,COMP:390 OHM,5%,0.25W	01121	CB3915

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Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Discont	Name & Description	Mfr Code	Mfr Part Number
R366	315-0391-00			RES.,FXD,COMP:390 OHM,5%,0.25W	01121	CB3915
R368	315-0391-00			RES.,FXD,COMP:390 OHM,5%,0.25W	01121	CB3915
R370	315-0391-00			RES.,FXD,COMP:390 OHM,5%,0.25W	01121	CB3915
R372	315-0391-00			RES.,FXD,COMP:390 OHM,5%,0.25W	01121	CB3915
R380	315-0102-00			RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R381	315-0122-00			RES.,FXD,COMP:1.2K OHM,5%,0.25W	01121	CB1225
R383	315-0102-00			RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R384	315-0302-00			RES.,FXD,COMP:3K OHM,5%,0.25W	01121	CB3025
R385	315-0512-00			RES.,FXD,COMP:5.1K OHM,5%,0.25W	01121	CB5125
R387	315-0471-00			RES.,FXD,COMP:470 OHM,5%,0.25W	01121	CB4715
R390	315-0271-00			RES.,FXD,COMP:270 OHM,5%,0.25W	01121	CB2715
R391	315-0271-00			RES.,FXD,COMP:270 OHM,5%,0.25W	01121	CB2715
R393	315-0182-00			RES.,FXD,COMP:1.8K OHM,5%,0.25W	01121	CB1825
R394	315-0111-00			RES.,FXD,COMP:110 OHM,5%,0.25W	01121	CB1115
R396	315-0270-00			RES.,FXD,COMP:27 OHM,5%,0.25W	01121	CB2705
R398 ¹	315-0271-00	B010100	B010217	RES.,FXD,COMP:270 OHM,5%,0.25W	01121	CB2715
R398 ¹	315-0221-00	B010218	B031769	RES.,FXD,COMP:220 OHM,5%,0.25W	01121	CB2215
R398 ¹	301-0221-00	B031770		RES.,FXD,COMP:220 OHM,5%,0.50W	01121	EB2215
R398 ²	315-0271-00	B010100	B010261	RES.,FXD,COMP:270 OHM,5%,0.25W	01121	CB2715
R398 ²	315-0221-00	B010262	B031389	RES.,FXD,COMP:220 OHM,5%,0.25W	01121	CB2215
R398 ²	301-0221-00	B031390		RES.,FXD,COMP:220 OHM,5%,0.50W	01121	EB2215
R400	315-0101-00			RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R405	315-0103-00			RES.,FXD,COMP:10K OHM,5%,0.25W	01121	CB1035
R406	315-0102-00			RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R408	315-0471-00	B010100	B010116	RES.,FXD,COMP:470 OHM,5%,0.25W	01121	CB4715
R408	315-0751-00	B010117		RES.,FXD,COMP:750 OHM,5%,0.25W	01121	CB7515
R410	315-0152-00			RES.,FXD,COMP:1.5K OHM,5%,0.25W	01121	CB1525
R412 ¹	315-0202-00			RES.,FXD,COMP:2K OHM,5%,0.25W	01121	CB2025
R413 ¹	315-0242-00	B010100	B010217	RES.,FXD,COMP:2.4K OHM,5%,0.25W	01121	CB2425
R413 ²	315-0202-00	B010218		RES.,FXD,COMP:2K OHM,5%,0.25W	01121	CB2025
R413 ²	315-0242-00	B010100	B010261	RES.,FXD,COMP:2.4K OHM,5%,0.25W	01121	CB2425
R413 ²	315-0202-00	B010262		RES.,FXD,COMP:2K OHM,5%,0.25W	01121	CB2025
R415 ¹	315-0390-00	B010100	B010217	RES.,FXD,COMP:39 OHM,5%,0.25W	01121	CB3905
R415 ¹	315-0200-00	B010218		RES.,FXD,COMP:20 OHM,5%,0.25W	01121	CB2005
R415 ²	315-0390-00	B010100	B010261	RES.,FXD,COMP:39 OHM,5%,0.25W	01121	CB3905
R415 ²	315-0200-00	B010262		RES.,FXD,COMP:20 OHM,5%,0.25W	01121	CB2005
R417	315-0471-00			RES.,FXD,COMP:470 OHM,5%,0.25W	01121	CB4715
R420	315-0221-00			RES.,FXD,COMP:220 OHM,5%,0.25W	01121	CB2215
R430	315-0270-00			RES.,FXD,COMP:27 OHM,5%,0.25W	01121	CB2705
R432	315-0271-00			RES.,FXD,COMP:270 OHM,5%,0.25W	01121	CB2715
R435	315-0221-00			RES.,FXD,COMP:220 OHM,5%,0.25W	01121	CB2215
R437	315-0471-00			RES.,FXD,COMP:470 OHM,5%,0.25W	01121	CB4715
R439	315-0221-00			RES.,FXD,COMP:220 OHM,5%,0.25W	01121	CB2215
R440	315-0103-00			RES.,FXD,COMP:10K OHM,5%,0.25W	01121	CB1035
R445	311-1565-00			RES.,VAR,NONWIR:250 OHM,20%,0.50W	73138	91A250ROM
R447	315-0102-00			RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R450	315-0391-00			RES.,FXD,COMP:390 OHM,5%,0.25W	01121	CB3915
R451	315-0391-00			RES.,FXD,COMP:390 OHM,5%,0.25W	01121	CB3915
R452	315-0181-00			RES.,FXD,COMP:180 OHM,5%,0.25W	01121	CB1815
R460 ¹	315-0102-00	XB010218		RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R460 ²	315-0102-00	XB010262		RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R461 ¹	315-0103-00	XB010218		RES.,FXD,COMP:10K OHM,5%,0.25W	01121	CB1035
R461 ²	315-0103-00	XB010262		RES.,FXD,COMP:10K OHM,5%,0.25W	01121	CB1035
R463 ¹	315-0471-00	XB010218		RES.,FXD,COMP:470 OHM,5%,0.25W	01121	CB4715
R463 ²	315-0471-00	XB010262		RES.,FXD,COMP:470 OHM,5%,0.25W	01121	CB4715

¹Standard only.²Option 1 only.

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Ckt No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
R465 ¹	315-0103-00	XB010218	RES.,FXD,COMP:10K OHM,5%,0.25W	01121	CB1035
R465 ²	315-0103-00	XB010262	RES.,FXD,COMP:10K OHM,5%,0.25W	01121	CB1035
R478	315-0391-00		RES.,FXD,COMP:390 OHM,5%,0.25W	01121	CB3915
R480	315-0391-00		RES.,FXD,COMP:390 OHM,5%,0.25W	01121	CB3915
R481	315-0391-00		RES.,FXD,COMP:390 OHM,5%,0.25W	01121	CB3915
R482	311-1563-00	B010100 B010182	RES.,VAR,NONWIR:1K OHM,20%,0.50W	73138	91A-10000M
R482	311-1225-00	B010183	RES.,VAR,NONWIR:1K OHM,20%,0.50W	80294	3389F-P31-102
R484	315-0152-00		RES.,FXD,COMP:1.5K OHM,5%,0.25W	01121	CB1525
R486 ¹	315-0510-00	B010100 B010209	RES.,FXD,COMP:51 OHM,5%,0.25W	01121	CB5105
R486 ¹	315-0151-00	B010210	RES.,FXD,COMP:150 OHM,5%,0.25W	01121	CB1515
R486 ²	315-0510-00	B010100 B010259	RES.,FXD,COMP:51 OHM,5%,0.25W	01121	CB5105
R486 ²	315-0151-00	B010260	RES.,FXD,COMP:150 OHM,5%,0.25W	01121	CB1515
R487	317-0220-00		RES.,FXD,COMP:22 OHM,5%,0.125W	01121	BB2205
R488	317-0200-00		RES.,FXD,COMP:20 OHM,5%,0.125W	01121	BB2005
R489	315-0241-00		RES.,FXD,COMP:240 OHM,5%,0.25W	01121	CB2415
R500 ¹	315-0302-00	B010100 B010217	RES.,FXD,COMP:3K OHM,5%,0.25W	01121	CB3025
R500 ¹	311-1559-00	B010218	RES.,VAR,NONWIR:10K OHM,20%,0.50W	73138	91A-10001M
R500 ²	315-0302-00	B010100 B010261	RES.,FXD,COMP:3K OHM,5%,0.25W	01121	CB3025
R500 ²	311-1559-00	B010262	RES.,VAR,NONWIR:10K OHM,20%,0.50W	73138	91A-10001M
R553	315-0271-00		RES.,FXD,COMP:270 OHM,5%,0.25W	01121	CB2715
R554	315-0271-00		RES.,FXD,COMP:270 OHM,5%,0.25W	01121	CB2715
R555	315-0271-00		RES.,FXD,COMP:270 OHM,5%,0.25W	01121	CB2715
R556	315-0271-00		RES.,FXD,COMP:270 OHM,5%,0.25W	01121	CB2715
R557	315-0271-00		RES.,FXD,COMP:270 OHM,5%,0.25W	01121	CB2715
R558	315-0271-00		RES.,FXD,COMP:270 OHM,5%,0.25W	01121	CB2715
R559	315-0271-00		RES.,FXD,COMP:270 OHM,5%,0.25W	01121	CB2715
R570	315-0271-00		RES.,FXD,COMP:270 OHM,5%,0.25W	01121	CB2715
R573	315-0271-00		RES.,FXD,COMP:270 OHM,5%,0.25W	01121	CB2715
R574	315-0271-00		RES.,FXD,COMP:270 OHM,5%,0.25W	01121	CB2715
R575	315-0271-00		RES.,FXD,COMP:270 OHM,5%,0.25W	01121	CB2715
R576	315-0271-00		RES.,FXD,COMP:270 OHM,5%,0.25W	01121	CB2715
R577	315-0271-00		RES.,FXD,COMP:270 OHM,5%,0.25W	01121	CB2715
R578	315-0271-00		RES.,FXD,COMP:270 OHM,5%,0.25W	01121	CB2715
R579	315-0271-00		RES.,FXD,COMP:270 OHM,5%,0.25W	01121	CB2715
R600	315-0472-00		RES.,FXD,COMP:4.7K OHM,5%,0.25W	01121	CB4725
R601	315-0472-00		RES.,FXD,COMP:4.7K OHM,5%,0.25W	01121	CB4725
R603	315-0682-00		RES.,FXD,COMP:6.8K OHM,5%,0.25W	01121	CB6825
R605	321-0230-00		RES.,FXD,FILM:2.43K OHM,1%,0.125W	75042	CEATO-2431F
R606 ¹	311-1262-00	XB031770	RES.,VAR,NONWIR:750 OHM,10%,0.50W	73138	62PT-3620-751K
R606 ²	311-1262-00	XB031390	RES.,VAR,NONWIR:750 OHM,10%,0.50W	73138	62PT-3620-751K
R607	315-0821-00		RES.,FXD,COMP:820 OHM,5%,0.25W	01121	CB8215
R610	302-0560-00		RES.,FXD,COMP:56 OHM,10%,0.50W	01121	EB5601
R612	315-0102-00		RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R614	308-0703-00		RES.,FXD,WW:1.8 OHM,5%,2W	75042	BWH1R80J
R616	321-0237-00		RES.,FXD,FILM:2.87K OHM,1%,0.125W	75042	CEATO-2871F
R620	315-0270-00		RES.,FXD,COMP:27 OHM,5%,0.25W	01121	CB2705
R621	308-0702-00		RES.,FXD,WW:0.33 OHM,5%,2W	75042	BWH-R3300J
R623	321-0289-00		RES.,FXD,FILM:10K OHM,1%,0.125W	75042	CEATO-1002F
R624	321-0262-00		RES.,FXD,FILM:5.23K OHM,1%,0.125W	75042	CEATO-5231F
R626	315-0102-00		RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R628	315-0272-00		RES.,FXD,COMP:2.7K OHM,5%,0.25W	01121	CB2725
R629	315-0100-00		RES.,FXD,COMP:10 OHM,5%,0.25W	01121	CB1005
R634	302-0121-00		RES.,FXD,COMP:120 OHM,10%,0.50W	01121	EB1211
R635	315-0472-00		RES.,FXD,COMP:4.7K OHM,5%,0.25W	01121	CB4725
R640	315-0102-00		RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025

¹Standard only.

²Option 1 only.

Electrical Parts List—TG 501

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Discont	Name & Description	Mfr Code	Mfr Part Number
S1	260-0817-00			SWITCH, MAG REED: SPDT	12617	1152235160
S350	263-1008-00			ACTR ASSY, CAM S: MARKER (SEC)	80009	263-1008-00
S450A,	260-1571-00			SWITCH, PUSH: 5NS/2NS/1NS	71590	2KBC030000-XXX
T450	120-0870-00			XMFR, TOROID: 2 WINDINGS	80009	120-0870-00
U50 ¹	156-0079-00			MICROCIRCUIT, DI: DECADE COUNTER, TTL	07263	9390PC
U100 ²	156-0113-00			MICROCIRCUIT, DI: QUAD 2-INPUT POS NAND GATE	01295	SN74L00N
U110	156-0043-00			MICROCIRCUIT, DI: 2-INPUT NOR GATE	01295	SN7402N
U115	156-0030-00			MICROCIRCUIT, DI: QUAD 2-INPUT POS NAND GATE	01295	SN7400N
U150	156-0039-00			MICROCIRCUIT, DI: DUAL J-K FLIP FLOP	04713	MC7473P
U160	156-0067-00			MICROCIRCUIT, LI: OPERATIONAL AMPLIFIER	07263	U6T7741393
U180	156-0129-00			MICROCIRCUIT, DI: QUAD 2-INPUT GATE	01295	SN7408N
U185	156-0079-00			MICROCIRCUIT, DI: DECADE COUNTER, TTL	07263	9390PC
U190	156-0043-00			MICROCIRCUIT, DI: 2-INPUT NOR GATE	01295	SN7402N
U195	156-0079-00			MICROCIRCUIT, DI: DECADE COUNTER, TTL	07263	9390PC
U200	156-0079-00			MICROCIRCUIT, DI: DECADE COUNTER, TTL	07263	9390PC
U210	156-0079-00			MICROCIRCUIT, DI: DECADE COUNTER, TTL	07263	9390PC
U212	156-0079-00			MICROCIRCUIT, DI: DECADE COUNTER, TTL	07263	9390PC
U215	156-0041-00			MICROCIRCUIT, DI: DUAL D-TYPE FLIP-FLOP	27014	DM7474N
U218	156-0079-00			MICROCIRCUIT, DI: DECADE COUNTER, TTL	07263	9390PC
U220	156-0079-00			MICROCIRCUIT, DI: DECADE COUNTER, TTL	07263	9390PC
U225	156-0038-00			MICROCIRCUIT, DI: J-K MASTER SLAVE FLIP-FLOP	01295	SN7472N
U230	156-0039-00			MICROCIRCUIT, DI: DUAL J-K FLIP FLOP	04713	MC7473P
U235	156-0030-00			MICROCIRCUIT, DI: QUAD 2-INPUT POS NAND GATE	01295	SN7400N
U250	156-0067-00			MICROCIRCUIT, LI: OPERATIONAL AMPLIFIER	07263	U6T7741393
U290	156-0205-00			MICROCIRCUIT, DI: QUAD 2-INPUT NOR GATE	04713	MC10102L
U300	156-0205-00			MICROCIRCUIT, DI: QUAD 2-INPUT NOR GATE	04713	MC10102L
U310	156-0230-00			MICROCIRCUIT, DI: DUAL D MA-SLAVE FLIP-FLOP	04713	MC10131L
U315	156-0230-00			MICROCIRCUIT, DI: DUAL D MA-SLAVE FLIP-FLOP	04713	MC10131L
U320	156-0100-00			MICROCIRCUIT, DI: J-K EDGE TRIGGERED FF	01295	SN74H102N
U325	156-0079-00			MICROCIRCUIT, DI: DECADE COUNTER, TTL	07263	9390PC
U330	156-0043-00			MICROCIRCUIT, DI: 2-INPUT NOR GATE	01295	SN7402N
U335	156-0178-00			MICROCIRCUIT, DI: TRIPLE 3-INPUT NOR GATE	01295	SN7427N
U350 ²	156-0030-00	B010100	B032459	MICROCIRCUIT, DI: QUAD 2-INPUT POS NAND GATE	01295	SN7400N
U350 ²	156-0180-00	B032460		MICROCIRCUIT, DI: QUAD 2-INPUT NAND GATE	01295	SN74S00N
U350 ¹	156-0030-00	B010100	B032499	MICROCIRCUIT, DI: QUAD 2-INPUT POS NAND GATE	01295	SN7400N
U350 ¹	156-0180-00	B032500		MICROCIRCUIT, DI: QUAD 2-INPUT NAND GATE	01295	SN74S00N
U355	156-0079-00			MICROCIRCUIT, DI: DECADE COUNTER, TTL	07263	9390PC
U360	156-0079-00			MICROCIRCUIT, DI: DECADE COUNTER, TTL	07263	9390PC
U362	156-0079-00			MICROCIRCUIT, DI: DECADE COUNTER, TTL	07263	9390PC
U364	156-0079-00			MICROCIRCUIT, DI: DECADE COUNTER, TTL	07263	9390PC
U366	156-0043-00			MICROCIRCUIT, DI: 2-INPUT NOT GATE	01295	SN7402N
U368	156-0079-00			MICROCIRCUIT, DI: DECADE COUNTER, TTL	07263	9390PC
U370	156-0079-00			MICROCIRCUIT, DI: DECADE COUNTER, TTL	07263	9390PC
U372	156-0079-00			MICROCIRCUIT, DI: DECADE COUNTER, TTL	07263	9390PC
U450	156-0252-00			MICROCIRCUIT, DI: TRIPLE 4-3-3 INP NOT GATE	04713	MC10106L
U455	156-0033-00			MICROCIRCUIT, DI: RF/IF AMPLIFIER	86684	CA3028A
U550	156-0379-00			MICROCIRCUIT, DI: BCD TO 7 SEGMENT DCDR/DRVR	80009	156-0379-00
U570	156-0379-00			MICROCIRCUIT, DI: BCD TO 7 SEGMENT DCDR/DRVR	80009	156-0379-00
U625	156-0067-00			MICROCIRCUIT, LI: OPERATIONAL AMPLIFIER	07263	U6T7741393
VR140	152-0280-00			SEMICONV DEVICE: ZENER, 0.4W, 6.2V, 5%	04713	1N753A
VR250	152-0279-00			SEMICONV DEVICE: ZENER, 0.4W, 5.1V, 5%	07910	1N751A
VR255	152-0279-00			SEMICONV DEVICE: ZENER, 0.4W, 5.1V, 5%	07910	1N751A
VR282	152-0279-00			SEMICONV DEVICE: ZENER, 0.4W, 5.1V, 5%	07910	1N751A
VR600	152-0278-00			SEMICONV DEVICE: ZENER, 0.4W, 3V, 5%	07910	1N4372A

¹Option 1 only.
²Standard only.

Electrical Parts List—TG 501

Ckt No.	Tektronix Part No.	Serial/Model No.		Name & Description	Mfr	
		Eff	Dscont		Code	Mfr Part Number
VR605	152-0280-00			SEMICON D DEVICE:ZENER,0.4W,6.2V,5%	04713	1N753A
VR640	152-0280-00			SEMICON D DEVICE:ZENER,0.4W,6.2V,5%	04713	1N753A
Y50 ¹	119-0262-00			OSCILLATOR,RF:XTAL CONTROLLED,5MHZ ADJ	80009	119-0262-00
X100 ²	158-0079-00			XTAL UNIT,QTZ:1 MHZ,+/-0.001%	80009	158-0079-00

¹Option 1 only.
²standard only.

REAR CONNECTOR PIN ASSIGNMENTS

TABLE 2-1

	B		A	Will drive 5 TTL loads
Trigger Out Common	28		28	Marker Out
Trigger Out	27		27	Marker Out Common
Data Good	26	Signal source barrier slot	26	Buffered Internal Clock Output Common
External Clock Input Common	25		25	Buffered Internal Clock Output
External Clock Input	24		24	BCD 1
Not Used	23		23	BCD 2
Data Good Common	22		22	BCD 4
Not Used	21		21	BCD 8
Not Used	20	Reserved }	20	BCD 1
Not Used	19		19	BCD 2
Not Used	18		18	BCD 4
Not Used	17		17	BCD 8
Not Used	16		16	Fast-Slow
Not Used	15		15	Not Used
Not Used	14		14	Not Used
25 VAC Winding	13		13	25 VAC Winding
*+33.5 V Filtered DC	12		12	*+33.5 V Filtered DC
*Collector of Series Pass Transistor	11		11	*Base of Series Pass Transistor
Transformer Shield	10		10	*Emitter of Series Pass Transistor
*33.5 V Common	9		9	*33.5 V Common
-33.5 V Filtered DC	8	TM 500 barrier slot	8	-33.5 V Filtered DC
*Collector of Series Pass Transistor	7		7	*Emitter of Series Pass Transistor
Not Used	6		6	*Base of Series Transistor
17.5 VAC Winding	5		5	17.5 VAC Winding
+11.5 V Common	4		4	+11.5 V Common
*+11.5 V Common	3		3	*+11.5 V Common
*+11.5 V Filtered DC	2		2	*+11.5 V Filtered DC
25 VAC Winding	1		1	25 VAC Winding
	B		A	

Rear-view of plug-in

Assignments listed for pins 1A-13A and 1B-13B are available in all power modules; however only those pins marked with an asterisk (*) are used by the TG 501.

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CONTROLS AND CONNECTORS

VARIABLE TIMING Readout

Indicates timing variation from standard timing. First digit is in percent units, second indicates one-tenth percent units.

FAST-SLOW Indicators

Light when variable timing control is used. Fast lights when timing is faster than the standard indicated by lighted knob skirt. Slow lights when timing is slower. Percentage faster or slower is read from VARIABLE TIMING Readout.

MARKER Control

Rotary switch selects individual marker intervals from 5 s to 10 ns. Should be set to 521N position when using push buttons for 5 ns, 2 ns and 1 ns. Readout Display is turned off in 521N position.

5 ns, 2 ns AND 1 ns PUSHBUTTON

Self-canceling pushbuttons select modified sine waves for 5, 2, and 1 ns when MARKER control is in 521N position. 1 ns marker has separate output connector. These are not variable.

TRIGGER OUT Connector

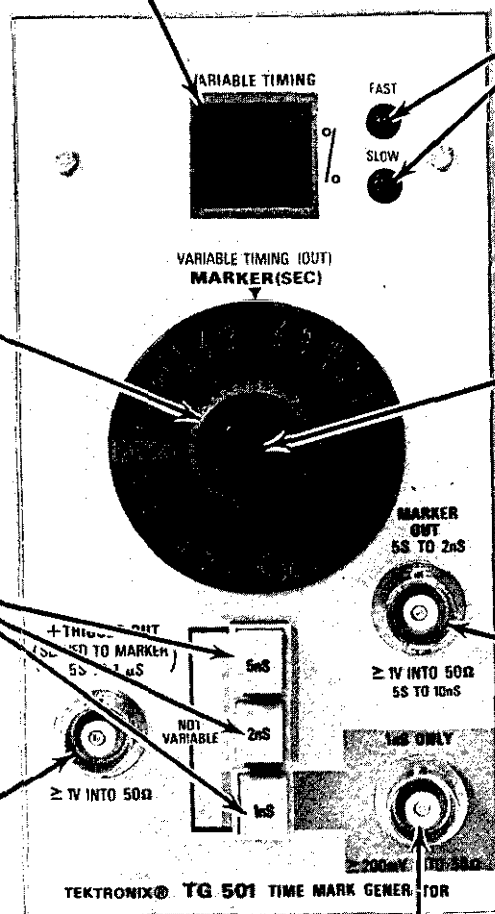
Provides trigger pulses slaved to Marker Output from 5 s through 100 ns. Remains at 100 ns for all faster markers. Pulse amplitude is ≥ 1 volt into 50 Ω .

VARIABLE TIMING Control

Concentric with MARKER Control switch. Markers are calibrated when center button is pushed in allowing selection as indicated by the lighted knob skirt. When center button is out, output timing is fast or slow to the percentage indicated by the Readout Display.

MARKER OUT Connector

Provides positive markers of ≥ 1 volt peak amplitude into 50 Ω for 5 s through 10 ns selected by MARKER Control rotary switch. Provides markers of ≥ 1 volt peak to peak amplitude into 50 Ω for 5 ns and 2 ns modified sine waves, selected by self-canceling push buttons when MARKER Control is in 521N position.



1 ns ONLY Connector

Provides ≥ 0.5 volts peak to peak amplitude into 50 Ω of 1 ns modified sine wave selected by the 1 ns push button when MARKER Control is in 521N position.

MAIN CIRCUIT BOARD
Sht. 1 of 2

TG 501

ADJUSTMENTS

Adjustment is generally required after a repair has been made, or after long time intervals in which normal aging of components may affect instrument accuracy.

Before complete calibration, thoroughly clean and inspect this instrument as outlined in the service section of the Power Module manual. The Power Module manual also contains information for general maintenance of this instrument, including preventive maintenance, component identification and replacement, etc.

Services Available

Tektronix, Inc. provides complete instrument repair and calibration at local Field Service Centers and at the Factory Service Center. Contact your local Tektronix Field Office or representative for further information.

Equipment Required

1. Correctly functioning TM500-Series Power Module.

2. Plug-In Extension. Tektronix Calibration Fixture 067-0645-01.

3. Real-Time Test Oscilloscope. Must have a minimum bandpass of 10 MHz and a deflection factor of 0.5 V/div. For example a 5403/D40 Oscilloscope with 5B42 Delaying Time Base and 5A48 Dual Trace Amplifier plug-ins.

4. 1 MHz Frequency Standard. The over-all accuracy of the standard used will determine the accuracy of the internal time base adjustment. For maximum obtainable accuracy of adjustment, the frequency standard should be better than 2 parts in 10^8 (1 part in 10^9 for Option 1).

Preliminary Procedure

NOTE

The performance of this instrument can be checked at any temperature within the 0°C to $+50^{\circ}\text{C}$ range. Make any adjustment at a temperature of $+25^{\circ}\text{C} \pm 5^{\circ}\text{C}$.

2. Adjust Variable Timing Center R145

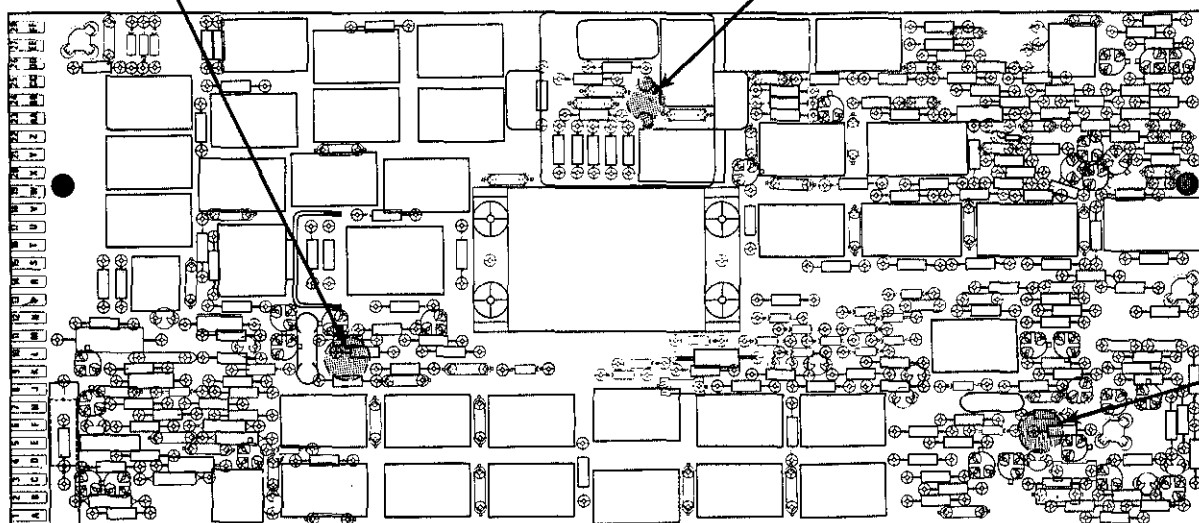
Extend the push-to release VARIABLE TIMING control. Set R145, Variable Timing Center, to its approximate mechanical center. Rotate VARIABLE TIMING control fully CW then fully CCW. Note the OUTPUT TIMING % readout displayed at each limit.

Adjust R145 Variable Timing Center, until the same reading is displayed on the OUTPUT TIMING % readout at the CW and CCW limits of the VARIABLE TIMING control.

1. Adjust Time Reference Set C100

Connect the TG 501 MARKER OUT connector to the input of a counter using a coaxial cable and a $50\ \Omega$ termination. Set the frequency for $1\ \mu\text{s}$. The counter should display 1 MHz or 1000.0 kHz.

Adjust C100, Time Ref. Set, until the counter indicates exactly 1 MHz or 1000.0 kHz. Disconnect the counter.



MAIN CIRCUIT BOARD

ADJUSTMENTS

2. Plug-In Extension. Tektronix Calibration Fixture 067-0645-01.

3. Real-Time Test Oscilloscope. Must have a minimum bandpass of 10 MHz and a deflection factor of 0.5 V/div. For example a 5403/D40 Oscilloscope with 5B42 Delaying Time Base and 5A48 Dual Trace Amplifier plug-ins.

4. 1 MHz Frequency Standard. The over-all accuracy of the standard used will determine the accuracy of the internal time base adjustment. For maximum obtainable accuracy of adjustment, the frequency standard should be better than 2 parts in 10^8 (1 part in 10^9 for Option 1).

Preliminary Procedure

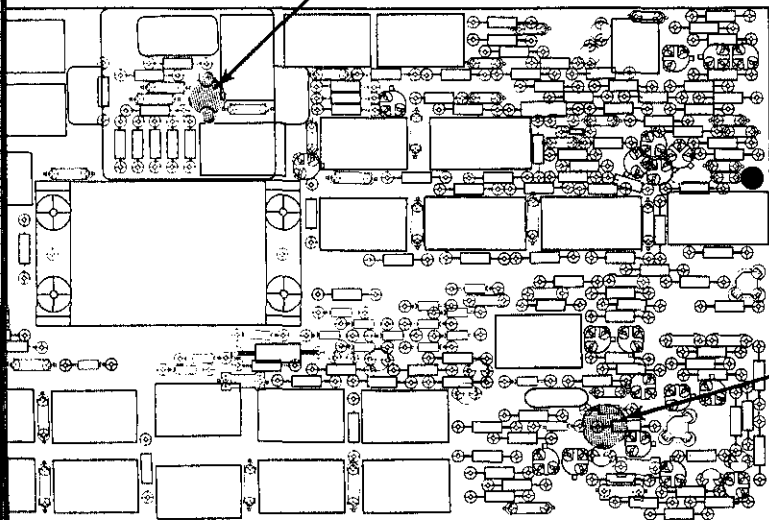
NOTE

The performance of this instrument can be checked at any temperature within the 0°C to $+50^{\circ}\text{C}$ range. Make any adjustment at a temperature of $+25^{\circ}\text{C} \pm 5^{\circ}\text{C}$.

1. Adjust Time Reference Set C100

Connect the TG 501 MARKER OUT connector to the input of a counter using a coaxial cable and a $50\ \Omega$ termination. Set the frequency for $1\ \mu\text{s}$. The counter should display 1 MHz or 1000.0 kHz.

Adjust C100, Time Ref. Set, until the counter indicates exactly 1 MHz or 1000.0 kHz. Disconnect the counter.



a. Check that the correct nominal line-selector block (110 VAC or 220 VAC) has been installed on the line selector pins and that the regulating range selected includes the input line voltage, see Installation section of Power Module manual.

b. Remove the TG 501 side covers and connect the Time Mark Generator to the Power Module using the plug-in extension.

c. Connect the Power Module to the line voltage source and apply power to the TG 501.

d. Set the following controls:

MARKER	$1\ \mu\text{s}$
VARIABLE TIMING	Pushed in

NOTE

Adjustment step 1 on this foldout page must be accomplished before starting the multiplier circuit board adjustments. Step 1 may be ignored if the 1 MHz crystal reference is known to be correct.

3. Adjust High Speed Trigger Amplitude R445

Connect the TG 501 + TRIGGER OUT connector to the vertical input of the real-time test oscilloscope using a coaxial cable and a 50 ohm termination. Also put a 50 ohm termination on the MARKER OUT connector to load it. Set the test oscilloscope vertical sensitivity for 0.2 V/div, the sweep rate to $.1\ \mu\text{s}/\text{div}$, and the triggering controls for an internal, AC coupled, triggered display.

Switch the TG 501 MARKER switch back and forth from $.1\ \mu\text{s}$ to 50 ns noting the marker amplitude at both switch positions.

Adjust R445, Hi Speed Trig Ampl so that the marker amplitude at both switch positions is approximately the same.

MULTIPLIER CIRCUIT BOARD

Sht. 10F2

ADJUSTMENTS

Equipment Required

1. Correctly functioning TM 500-Series Power Module.
2. Plug-In Extension. Tektronix Calibration Fixture 067-0645-01.
3. Sampling Test Oscilloscope. Must have an equivalent bandpass of at least 1 GHz and a deflection factor of 0.2 V/div. For example a 5403/D40 Oscilloscope with a 5S14N Dual Trace Delayed Sweep Sampler.

Preliminary Procedure

NOTE

The performance of this instrument can be checked at any temperature within the 0°C to +50°C range. Make any adjustment at a temperature of +25°C ±5°C.

- a. Check that the correct nominal line-selector block (110 VAC or 220 VAC) has been installed on the line selector pins and that the regulating range selected includes the input line voltage, see Installation section of Power Module manual.

5. Adjust 1 ns/2 ns Output Amplitude C515

With the coaxial cable from the sampling test oscilloscope connected to MARKER OUT and the 2 ns pushbutton depressed as stated in steps 2, 3, and 4, adjust C515 so that amplitude of 2 ns markers is at least 1 V. Disconnect cable from MARKER OUT and connect it to 1 ns ONLY. Depress 1 ns pushbutton. The amplitude of 1 ns markers should be at least 0.5 V. If not, adjust C515 again, then switch the cable back to MARKER OUT, depress 2 ns pushbutton and verify that the amplitude is at least 1 V.

Set C515 so that the amplitudes of both the 2 ns markers and 1 ns markers are proportional.

6. Adjust 1 ns Tuned Stub Filter C517, C518, C519, and C520

Depress the TG 501 1 ns pushbutton.

Connect the sampling test oscilloscope to the TG 501 1 ns ONLY connector using a coaxial cable. Set the test oscilloscope vertical sensitivity for 0.2 V/div,

time/div to 1 ns and the triggering controls for an internal triggered display.

Adjust C517, C518, C519, and C520 in the order of the arrow for maximum marker amplitude on the sampling test oscilloscope.

Disconnect the test oscilloscope.

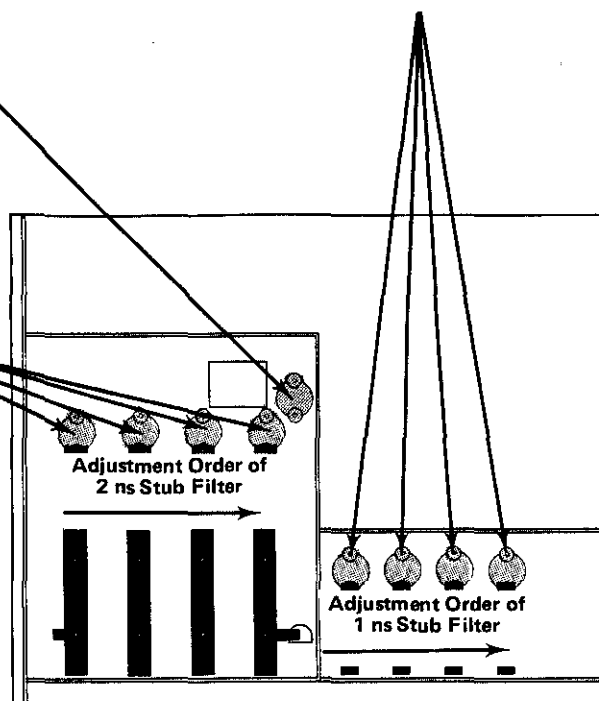
3. Adjust 2 ns Ring Circuit acitors C505 and C504

With sampling test oscilloscope still connected and controls set as in step 2, adjust C505 and C504 for maximum marker amplitude on the test oscilloscope.

4. Adjust 2 ns Tuned Stub Filter C510, C511, C512, and C513

Sampling test oscilloscope is still connected and controls set as stated in steps 2 and 3.

Adjust C510, C511, C512, and C513 in the order of the arrow for maximum marker amplitude on the sampling test oscilloscope.



NOTE

Step 1 on the main circuit board adjustments foldout must be accomplished before proceeding with the adjustments on this foldout.

ADJUSTMENTS

Preliminary Procedure

NOTE

The performance of this instrument can be checked at any temperature within the 0°C to $+50^{\circ}\text{C}$ range. Make any adjustment at a temperature of $+25^{\circ}\text{C} \pm 5^{\circ}\text{C}$.

a. Check that the correct nominal line-selector block (110 VAC or 220 VAC) has been installed on the line selector pins and that the regulating range selected includes the input line voltage, see Installation section of Power Module manual.

b. Remove the TG 501 side covers and connect the Time Mark Generator to the Power Module using the plug-in extension.

c. Connect the Power Module to the line voltage source and apply power to the TG 501.

d. Set the following controls:

MARKER
5 ns (pushbutton)

521N
Pushed in

Just 1 ns Tuned Stub Filter
C518, C519, and C520
press the TG 501 1 ns push-

connect the sampling test
scope to the TG 501 1 ns
connector using a coaxial
Set the test oscilloscope
al sensitivity for 0.2 V/div,

time/div to 1 ns and the triggering
controls for an internal triggered
display.

Adjust C517, C518, C519, and
C520 in the order of the arrow
for maximum marker amplitude
on the sampling test oscilloscope.

Disconnect the test oscillo-
scope.

3. Adjust 2 ns Ring Circuit Cap-
acitors C505 and C504

With sampling test oscillo-
scope still connected and controls
set as in step 2, adjust C505 and
C504 for maximum marker am-
plitude on the test oscilloscope.

2. Adjust 2 ns Output
Tank Capacitance C498
and Amp Bias R482.

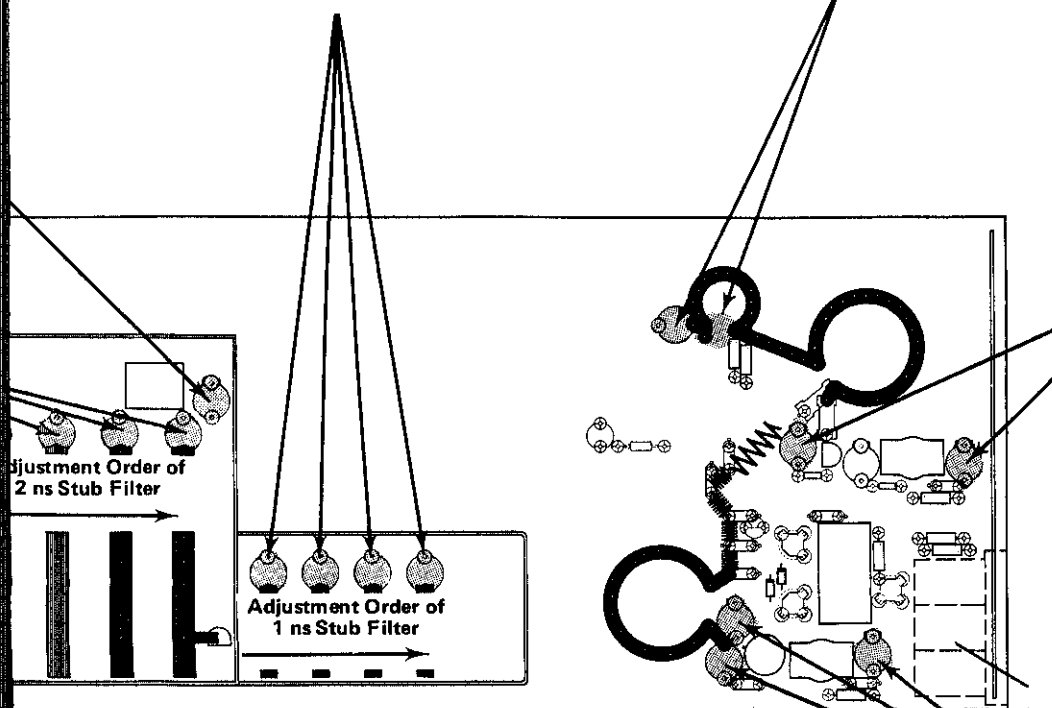
With the sampling test
oscilloscope still connected
as in step 1, depress the
TG 501 2 ns pushbutton.
Set the sampling test oscil-
loscope time/div switch to
2 ns and adjust the trig-
gering controls for a stable
display.

Adjust C498 and R482
for maximum marker
amplitude on the sampling
test oscilloscope.

1. Adjust 5 ns Output Tank Capacitance C465,
5 ns Output Series Capacitance C467, and 5 ns
100 MHz Drive Tank Capacitance C450

Connect the TG 501 MARKER OUT con-
nector to the vertical input of the sampling test
oscilloscope using a coaxial cable. Connect a
coaxial cable from the TRIGGER OUT connec-
tor of the TG 501 to external trigger input of
the test oscilloscope. Set the sampling test
oscilloscope vertical sensitivity for 0.2 V/div,
time/div to 5 ns and the triggering controls for
an externally triggered display.

Adjust C450, C465, and C467 for maximum
marker amplitude on the sampling test oscillo-
scope.



MULTIPLIER CIRCUIT BOARD

ents foldout
ng with the

PHASE LOCK LOOP

1 MHz Crystal Reference and Enable Gate

The reference frequency is supplied by the 1 MHz crystal reference circuitry of Y100, U100 and U350A. The output of the crystal reference circuit is supplied to pin 12 of U110D, which is part of the enable gate circuit. The enable gate circuit, which determines whether the 1 MHz crystal reference or the 1 MHz variable clock is connected to the phase lock loop, is composed of U110A, U110B, U110D, and U115D. When the VARIABLE TIMING (OUT) knob is pushed in and locked, a low is on pin 11 of U110D, allowing the crystal reference oscillator to be available at pin 13 of U110D. A low is also created at pins 12 and 13 of U115D, resulting in a high at pin 11 of U115D and at pin 3 of U110A. The high at pin 3 of U110A causes a low at pin 5 of U110B, which allows U110B to pass the crystal reference oscillator signal to pin 1 of U230A.

100 MHz Voltage Controlled Oscillator, Divide-By-Five Counter ECL-To T²L Translator, and Divide-By-Two Counter

The voltage controlled oscillator is composed of an astable multivibrator Q280-Q285-Q290, etched capacitor, and Q272, which supplies the charge current for the etched circuit board capacitor. U290D acts as a buffer for the voltage controlled oscillator. The NOR output of U290D is connected to the Divide-By-Five Counter. The ÷5 counter contains U310A, U310B, and U315A. The output of the ÷5 counter is translated from ECL into T²L logic levels by Q330, then supplied to ÷2 counter U320.

Divide-By-Five counter, Divide-By-Two counter, Phase Comparator, and Loop Amplifier/Filter

The output of ÷2 counter U320 is supplied to the input of U325. The output, pin 11 of U325 is applied to ÷2 counter U225 pin 12. The Q output of U225 is supplied to pin 5 of U230B.

U230A pin 1 receives 1 MHz from either the crystal reference or the variable clock. U230B pin 5 receives the counted down (÷100) 100 MHz signal from the VCO (Voltage-Controlled Oscillator). Pin 9 and 12 of U230 go high if the negative edges of the input signals coincide; this occurs when the 100 MHz VCO is operating on frequency. The high inputs to U235A produces a low output that clears U230A and U230B. The transition to a low that occurs at pin 12 of U230A is integrated by R231 and C231; the transition to a high level that occurs at pin 8 of U230B is integrated by R239 and C239. The two integrated output levels are summed by R234 and R239. This summation is then fed to the negative input of the loop amplifier/filter.

The input signal to the loop amplifier/filter is amplified and inverted by operational amplifier U250. The output of U250 is kept from changing rapidly by C250 and C251. The slow change in the output of U250 causes it to be an apparent DC level. VR250 level-shifts the output of U250 to a level that can be used to control the current flow through Q272.

Frequency Regulation of the 100 MHz Voltage Controlled Oscillator

Assume that the frequency has been correct up to this cycle, and that pins 9 and 12 of U230 are low. When the 100 MHz VCO frequency is slower than 100 MHz the negative edge to the phase comparator will toggle U230A first. This results in a high at pins 8 and 12 of U230 and a more negative voltage at the output of U250. This more negative voltage causes Q272 to conduct harder, which allows the etched circuit board capacitor to charge more quickly, to increase the oscillator frequency.

Again assume that the frequency has been correct up to this cycle, but this time the voltage controlled oscillator is faster than 100 MHz. The negative edge of the next cycle will toggle U230B first, resulting in a low at pins 8 and 12 of U230. This in turn causes a more positive voltage at the output of U250 which reduces the conduction of Q272. The etched circuit board capacitor now requires longer to charge since its available charging current has been reduced by Q272.

Out of Lock Detector

Ground via the cam switch for all the marker output enable logic gates is via Q270. If the 100 MHz voltage controlled oscillator is running quite slowly (out of specifications), the voltage at the output of the loop amplifier/filter operational amplifier U250 will be quite low. This low voltage will turn on Q255 and Q260, which will turn off Q270, stopping the marker output.

On the other hand, if the 100 MHz VCO is running very fast (out of specifications), the voltage at the output of U250 will be very high. This high voltage will turn off normally conducting Q65, which in turn will turn off Q270, breaking the ground on the enable logic gates ground. Without ground there is no marker output.

20 ns AND .2 μ s DIVIDE-BY-TWO COUNTERS,

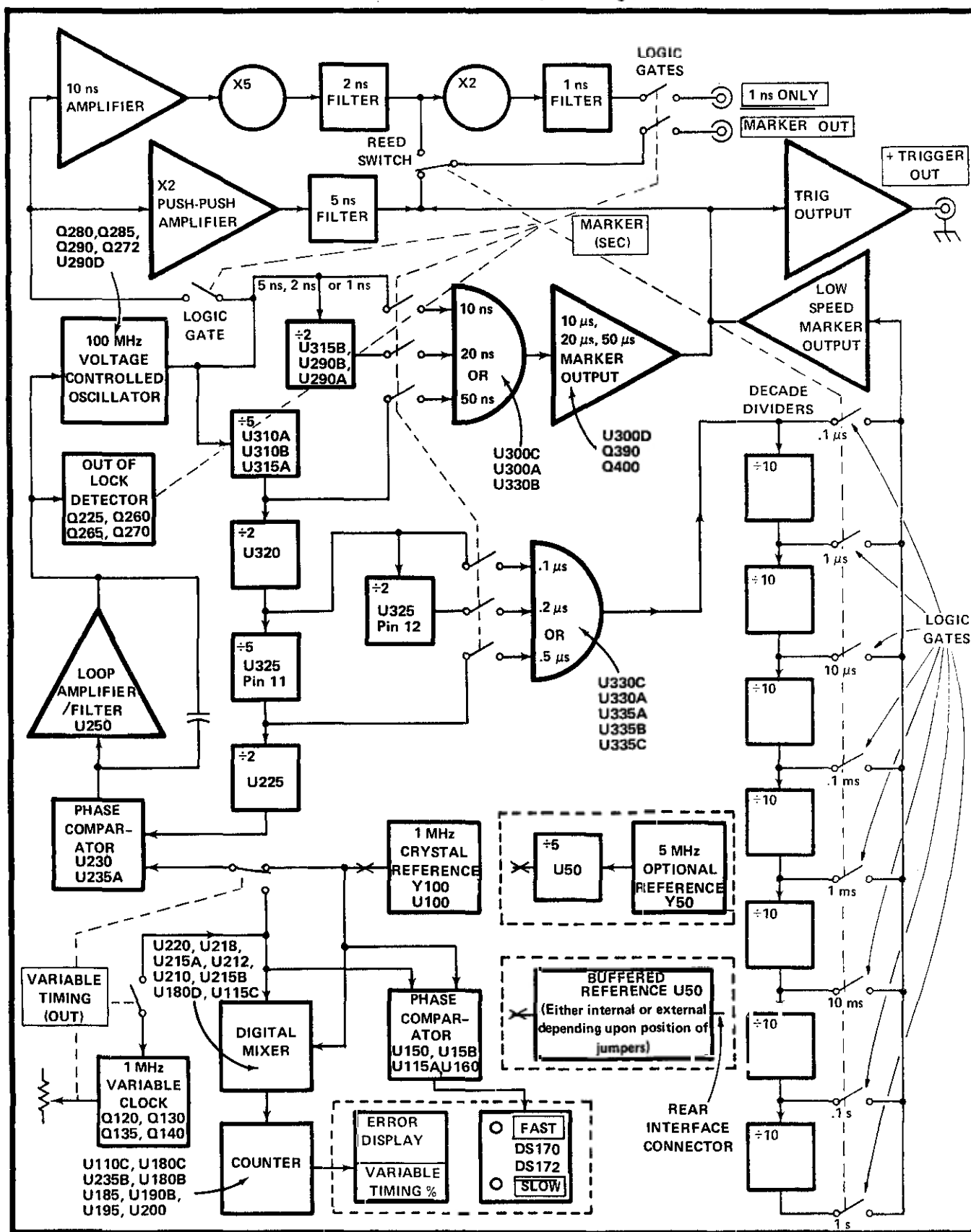
10 ns, 20 ns, or 50 ns AND .1 μ s, OR .5 μ s ENABLE GATES

The 20 ns ÷2 counter contains U315B, U290B and 4290A. The input to the counter is the output of the

THEORY OF OPERATION

DIAGRAMS

1 & 2



THEORY OF OPERATION DIAGRAMS

Sht 3 of 3

100 MHz VCO. The 20 ns markers from the $\div 2$ counter are coupled to enable gate U300B.

The $.2 \mu s \div 2$ counter is part of U325. The $\div 2$ counter output is pin 12 of the integrated circuit, which is supplied to enable gate U330A.

Enable gates for the 10 ns, 20 ns, and 50 ns markers are U300C, U300B, and U300A respectively, while the enable gates for the $.1 \mu s$, $.2 \mu s$, and $15 \mu s$ markers are U330C, U330A, and U335A-U335B respectively. U335C is an OR gate that couples the selected $.1 \mu s$, $.2 \mu s$, or $.5 \mu s$ markers to the decade dividers.

1 MHz VARIABLE CLOCK

The 1 MHz variable clock circuit is an emitter-coupled astable multivibrator. Temperature compensation transistor Q120, which is the same type of transistor of Q130 and Q135, establishes the power supply voltage for the multivibrator. Q130, Q135 and Q140 are the multivibrator transistors, with Q130 controlling the charge current available to timing capacitor C127. VR140 provides level shifting for the Q130 base voltage. R135 controls the frequency of the multivibrator by controlling the conduction of Q130. The lower end of R135 is the higher frequency end while the top reduces the frequency. R145, Variable Timing Center, is used to set the frequency of the multivibrator to 1 MHz when R135 is set to its mechanical midrange position.

PHASE COMPARATOR AND FAST-SLOW LED'S

Description

1 MHz is fed to pin 1 of U150A by either the crystal reference or the variable clock. The 1 MHz crystal reference is fed to pin 5 of U150B. Pins 12 and 9 of U150 will go high if the negative edges of the two 1 MHz input signals coincide. This occurs when the 1 MHz variable clock is on frequency. With these inputs high, U115A produces a low that clears U150A and U150B. The low now at pin 9 of U150B and the high now at pin 13 of U150A are summed by R152 and R153. The output of the summing resistors is then fed to the negative input of amplifier U160.

The input signal to U160 is amplified and inverted by the operational amplifier. The output of U160 is kept from changing rapidly by C160. The slow change in the output of U160 causes it to be an apparent DC level. If U115B has been enabled by releasing the VARIABLE TIMING (OUT) control, the output voltage level of U160 is applied to the junction of DS170 and DS172.

Fast-Slow Indication (VARIABLE TIMING (OUT) Control released)

Assume that the frequency has been correct up this cycle, pins 9 and 12 of U150 are low. When the 1 MHz variable clock frequency is slower than 1 MHz, the negative edge to the phase comparator will toggle U150B first. This results in a high at pins 9 and 13 of U150 and a more positive voltage at the output of U115B. This more positive voltage causes DS172 to conduct and become illuminated.

Again assume that the frequency has been correct up to this cycle, but this time the 1 MHz variable clock frequency is faster than 1 MHz. The negative edge of the next cycle will toggle U150A first, resulting in a low at pins 9 and 13 of U150. This in turn causes a more negative voltage at the output of U115B, which results in the conduction and illumination of DS170.

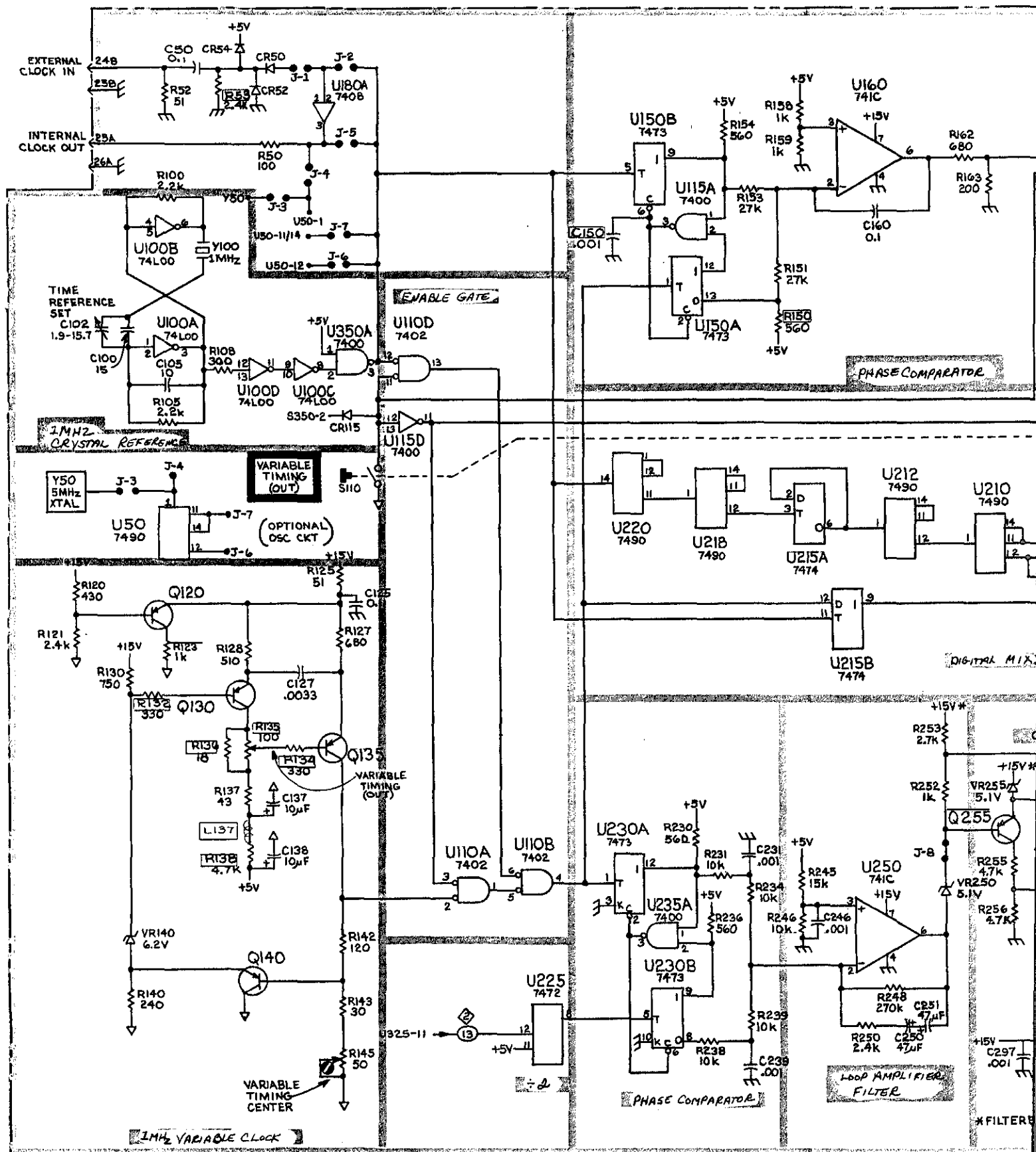
DIGITAL MIXER AND COUNTER

The 1 MHz Crystal reference is counted down by 2×10^4 using gate chain interval decade counters U220, U218, U212, and U210 and flip-flop U215A. The resultant 50 Hz gate frequency (20 ms gate period) available at the outputs of U210 is used to control the VARIABLE TIMING % LED display time. Pin 11 of U210 is the $\div 5$ output; pin 12 is the $\div 2$ output. The two outputs of U210 are ANDed by U180D to produce a 2 ms pulse, which is used to clear BCD counters U185 (0.01% digit, which is not displayed), U195 (0.1% digit) and U200 (units % digit).

The 1 MHz Crystal Reference and the 1 MHz variable clock output frequencies are compared by digital mixer U215B, with only the frequency difference of the two input frequencies appearing at the output. The output of U215B is ANDed in U180C with the inverted $\div 2$ output (10 ms wide gate) of U210. The output of U180C goes to the first of the three BCD counters. Inverter U190B, located between U185 and U195, provides averaging so that U195 (0.1% digit) changes on the count of five instead of nine.

The 2 ms output pulse of U180D and the 10 ms output pulse of U115C go to NOR gate U110C. The output of U110C (which is an 8 ms pulse that determines LED display time) is one input to AND gate U180B. The other input to U180B must be a high from U235B to enable U180B and cause the LED display to be unblanked. A high out of U235B is caused by either depressing the VARIABLE TIMING % Control fully in to check the LEDs, or by releasing the VARIABLE TIMING % control to its out position. The low to pin 5 of U235B in the out position of the VARIABLE TIMING % control is from pull-up resistor R450 via CR115 and inverter U115D. In the 521N position of the MARKER Control, the cathode of CR115 is connected to ground via S350 to disable the variable timing circuit, since the 1 ns, 2 ns, or 5 ns markers are not variable.

1
Sht. 10 F8

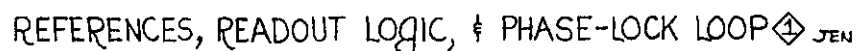


SEE PARTS LIST FOR EARLIER
VALUES AND SERIAL NUMBER
RANGES OF PARTS OUTLINED
OR DEPICTED IN BLUE.

TG501

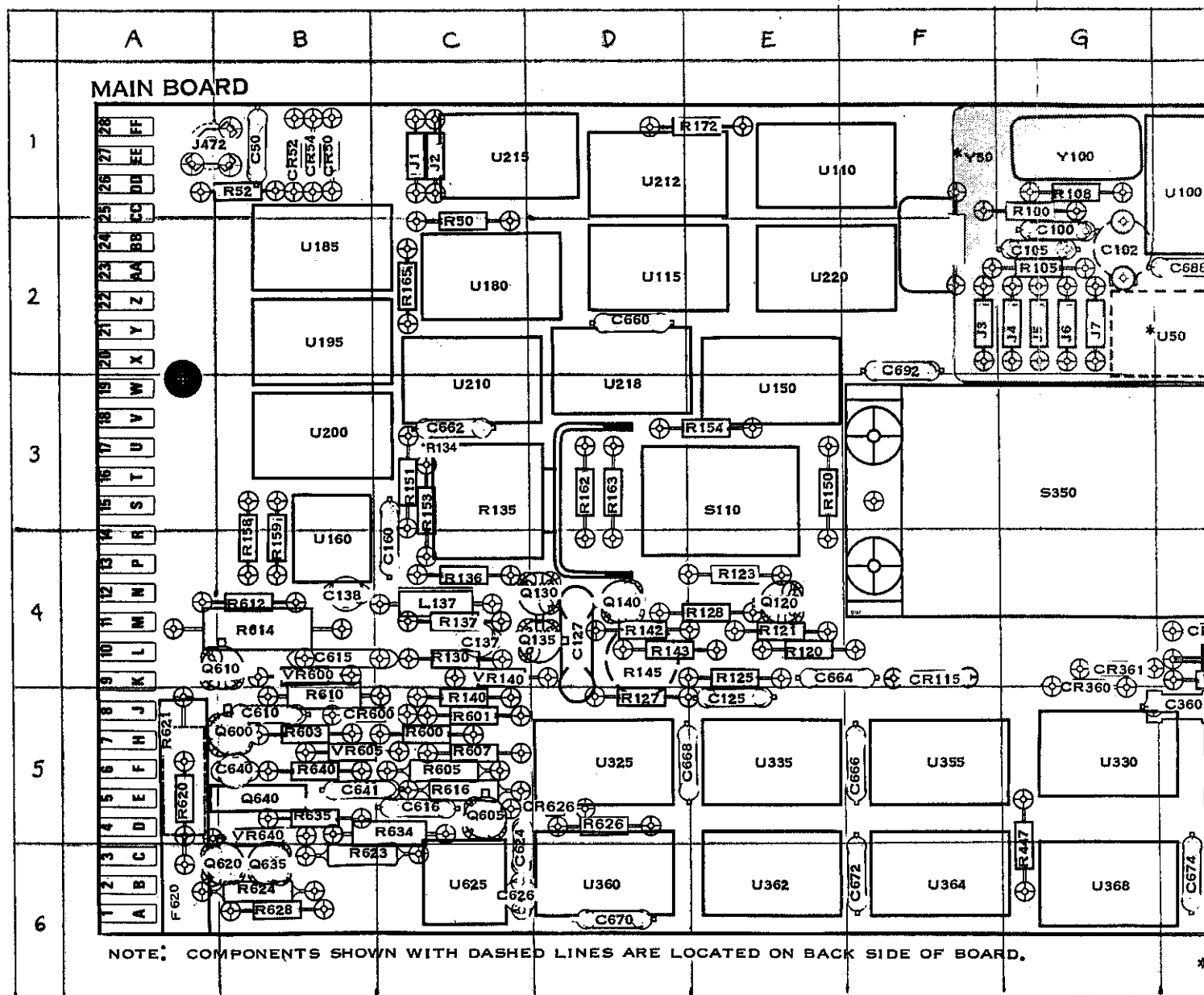
REV. E, JAN 1977

A1 MAIN BOARD



PARTS LOCATION GRID
MAIN BOARD
Sht. 1 of 3

PARTS LOCATION



Added to back of board

* R53
* R132
* R606

† Replaced by R138 at SN B030000

* See Parts List for
serial number ranges.

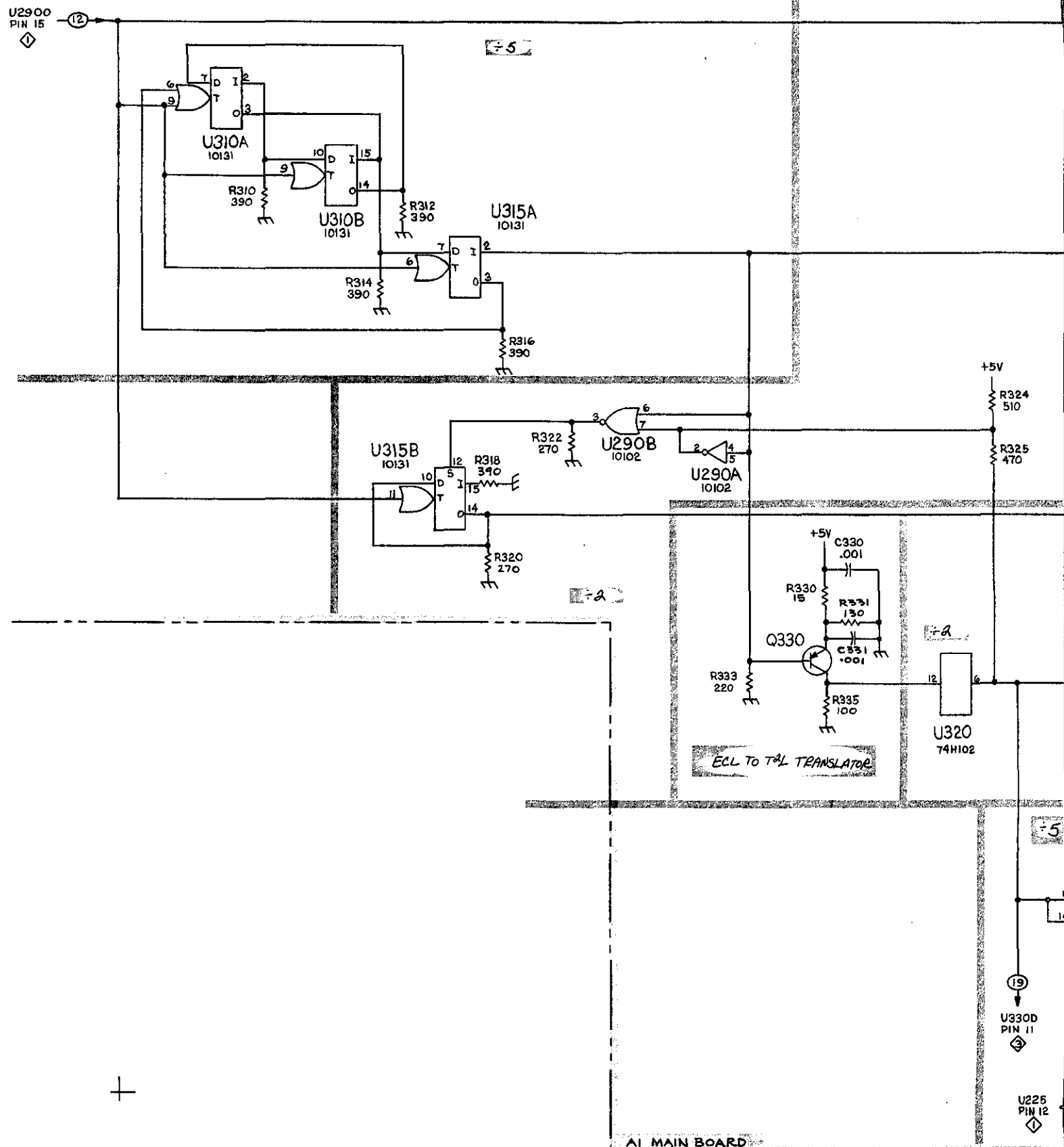
RTS LOCATION GRID



Sht. 30F3

CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC
C60	B-1	C670	D-6	Q120	E-4	R159	B-4	R380	H-4	S110	E-3				
C100	G-2	C672	F-6	Q130	D-4	R162	D-3	R382	H-5	S350	G-3				
C102	G-2	C674	H-6	Q135	D-4	R163	D-3	R366	I-5						
C105	G-2	C676	I-6	Q140	D-4	R165	C-2	R368	J-4	U100	H-1				
C125	E-5	C678	L-3	Q255	M-1	R172	E-1	R370	I-4	U110	E-1				
C127	D-4	C680	K-3	Q260	M-1	R282	E-1	R372	J-5	U115	D-2				
C137	C-4	C682	I-3	Q265	L-1	R230	J-1	R380	L-4	U150	E-3				
C138	B-4	C684	I-3	Q270	H-2	R231	J-1	R381	L-4	U160	B-4				
C160	C-4	C686	I-2	Q272	L-2	R234	K-1	R383	L-4	U180	C-2				
C231	J-1	C688	H-2	Q280	L-2	R236	I-1	R384	L-4	U185	B-2				
C235	K-2	C690	M-2	Q285	L-2	R238	J-1	R385	L-4	U190	H-5				
C239	K-1	C692	F-2	Q290	L-2	R239	J-1	R387	H-3	U195	B-2				
C246	L-1			Q330	I-2	R246	M-1	R390	M-5	U200	B-3				
C250	K-1	CR50	B-1	Q380	L-4	R245	M-1	R393	M-5	U210	C-3				
C251	K-1	CR52	B-1	Q384	K-4	R248	K-2	R394	M-5	U212	D-1				
C268	H-2	CR54	B-1	Q390	M-5	R250	K-1	R396	M-5	U215	C-1				
C290	K-2	CR115	F-4	Q400	L-5	R252	L-2	R397	L-4	U218	D-3				
C271	M-2	CR350	K-5	Q405	L-5	R253	L-2	R398	L-4	U220	E-2				
C272	M-2	CR358	J-4	Q408	K-5	R255	L-2	R400	M-5	U225	I-1				
C285	K-2	CR359	J-4	Q415	K-5	R256	M-1	R405	K-5	U230	J-1				
C295*	L-2	CR360	G-4	Q430	L-5	R262	L-2	R406	J-5	U235	I-3				
C297	J-2	CR361	G-4	Q435	M-6	R263	M-2	R408	J-6	U250	L-1				
C298	K-2	CR363	H-4	Q440	L-6	R265	M-1	R410	J-5	U290	M-3				
C330	I-1	CR364	I-4	Q605	C-5	R266	K-2	R412	J-6	U300	K-3				
C333	M-3	CR366	I-4	Q610	B-4	R271	M-2	R413	J-6	U315	J-2				
C340	M-5	CR367	I-4	Q620	B-6	R272	M-2	R415	K-5	U320	I-2				
C352	L-4	CR369	J-4	Q635	B-6	R280	K-2	R420	L-5	U325	D-5				
C355	K-4	CR370	J-4	Q640	B-5	R283	L-3	R430	L-5	U330	G-5				
C358	J-4	CR372	I-4			R285	K-2	R432	L-6	U335	E-5				
C360	H-5	CR373	I-4	R50	C-1	R286	K-3	R435	M-6	U350	K-4				
C362	H-4	CR375	J-4	R52	B-1	R290	K-2	R437	L-6	U355	F-5				
C366	I-4	CR376	J-4	R100	G-1	R292	L-2	R439	L-6	U360	D-6				
C368	J-4	CR415	K-5	R105	G-2	R294	M-4	R440	L-6	U362	E-6				
C370	I-4	CR445	K-5	R106	F-2	R295	I-3	R445	K-5	U364	F-6				
C372	J-5	CR600	B-5	R108	G-1	R302	I-3	R447	G-5	U366	I-5				
C390	M-4	CR626	D-5	R120	E-4	R304	L-3	R450	M-3	U368	G-6				
C400	L-4			R121	E-4	R305	K-3	R600	C-5	U370	H-6				
C404	K-5			R123	E-4	R310	K-3	R601	C-5	U372	I-6				
C405	K-5	F820	A-6	R125	E-4	R312	J-3	R603	B-5	U625	C-6				
C413	K-6	J1	C-1	R127	D-5	R314	J-3	R605	C-5						
C415	K-5	J2	C-1	R128	E-4	R316	J-2	R607	C-5						
C417*	K-5	J3	F-2	R130	C-4	R318	J-3	R610	B-5						
C440	L-6	J4	G-2	R134	C-3	R320	K-2	R612	B-4						
C432	M-6	J5	G-2	R135	C-3	R322	K-2	R614	B-4	VR140	C-4				
C610	B-5	J6	G-2	R136	C-4	R324	L-4	R616	C-5	VR250	K-1				
C615	B-4	J7	G-2	R137	C-4	R325	L-3	R620	A-5	VR255	L-2				
C616	C-5	J8	L-2	R138	C-4	R300	I-4	R621	A-5	VR282	L-3				
C624	C-6	J290	M-4	R140	C-5	R330	I-2	R623	B-6	VR600	B-4				
C626	C-6	J420	L-5	R142	D-4	R331	I-2	R624	B-6	VR605	B-5				
C840	B-5	J472	B-1	R143	D-4	R333	I-2	R626	D-5	VR640	B-5				
C641	B-5			R145	D-4	R335	J-2	R628	B-6						
C660	D-2			R150	E-3	R350	J-4	R634	C-5						
C662	C-3	L137+	C-4	R151	C-3	R352	K-4	R635	B-5						
C664	E-4	L297	K-2	R153	C-3	R355	I-5	R640	B-5	Y100	G-1				
C666	F-5			R154	E-3	R358	K-4								
C668	D-5			R158	B-4										

2
Sht. 10F2

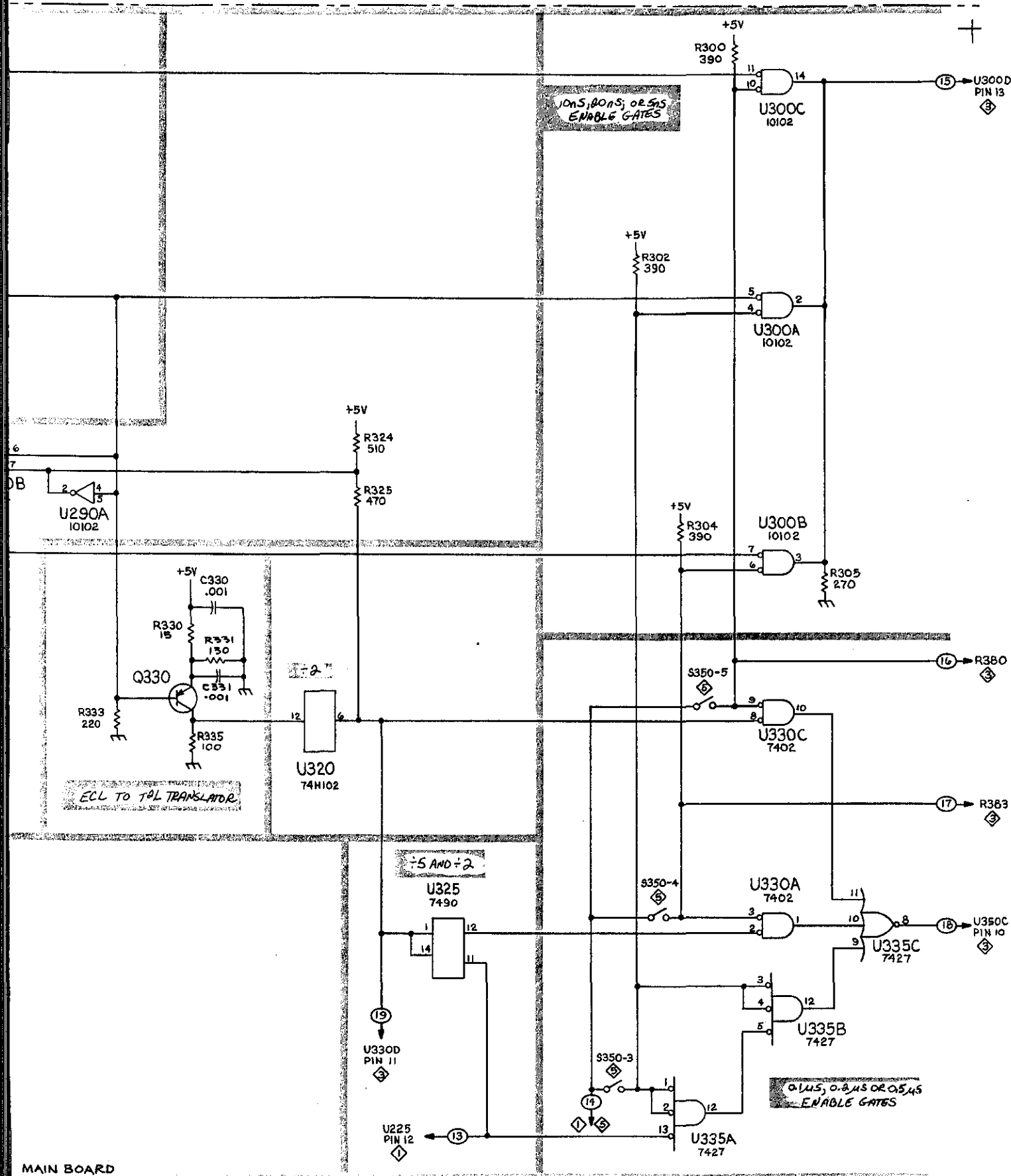


TG501

(A)

HIGH

2
Sht. 2 of 2



(A)

HIGH SPEED DIVIDERS & 5, 2, 1 SEQUENCING LOGIC 2

REV. FEB. 1974
JEN

THEORY OF OPERATION DIAGRAM 3

Sht. 10F2

DECADE DIVIDERS

The decade dividers operate continuously; however, the output is selected by enabling the appropriate enable logic gate with a low via the cam switch S350. The $\div 10$ dividers are U355, U360, U362, U364, U368, and U372. The NAND enable logic gates are U330B, U350C, U190A-C-D and U366A-B-C-D. The square-wave pulse from the logic gates is differentiated by an RC circuit using capacitors C358, C360, C362, C366, C368, C370 and C372. The resistance for the RC circuit is selected by cam switch S350 via the 5-2-1 sequence logic gates, depending upon the timing position in the 5-2-1 sequence.

The selection of the resistance for the RC circuit determines the slope of the falling edge of the marker and hence controls the marker brightness. R385, the largest resistance, is selected in all positions of the 5-2-1 sequence. In the 2 position, a low from the 5-2-1 sequence logic gate turns on Q384 and connects R384 in parallel with R385, reducing the resistance and the marker brightness. In the 1 position, Q380 turns on and R381 parallels R385 to reduce the resistance and brightness from that obtained in the 2 position.

Q405 provides a stage of isolation between the decade dividers and the low speed marker output amplitude. The isolation stage increases the impedance seen by the input to the low speed marker output operational amplifier.

LOW SPEED MARKER OUTPUT AMPLIFIER

The low speed marker output amplifier is an operational amplifier having a gain of 1.5. The amplifier consists of Q408 and Q415 with R406 and R410 being the input resistor and feedback resistor respectively.

10 ns, 20 ns, 50 ns MARKER OUTPUT AMPLIFIER

Q390 and Q400 form an emitter coupled switch which is controlled by U300D, an ECL enable logic gate. U300D requires a low from the 10 ns, 20 ns, or 50 ns logic gate to pass the square-wave. The square-wave at output pins 15 and 9 of U300D is differentiated by RC networks C390-R394 and C400-R400. The differentiated signal is coupled through Q400 as long as pin 13 of U300D remains low. The output from Q400 is summed with the output from the low speed marker output amplifier and supplied to the MARKER OUT connector J470.

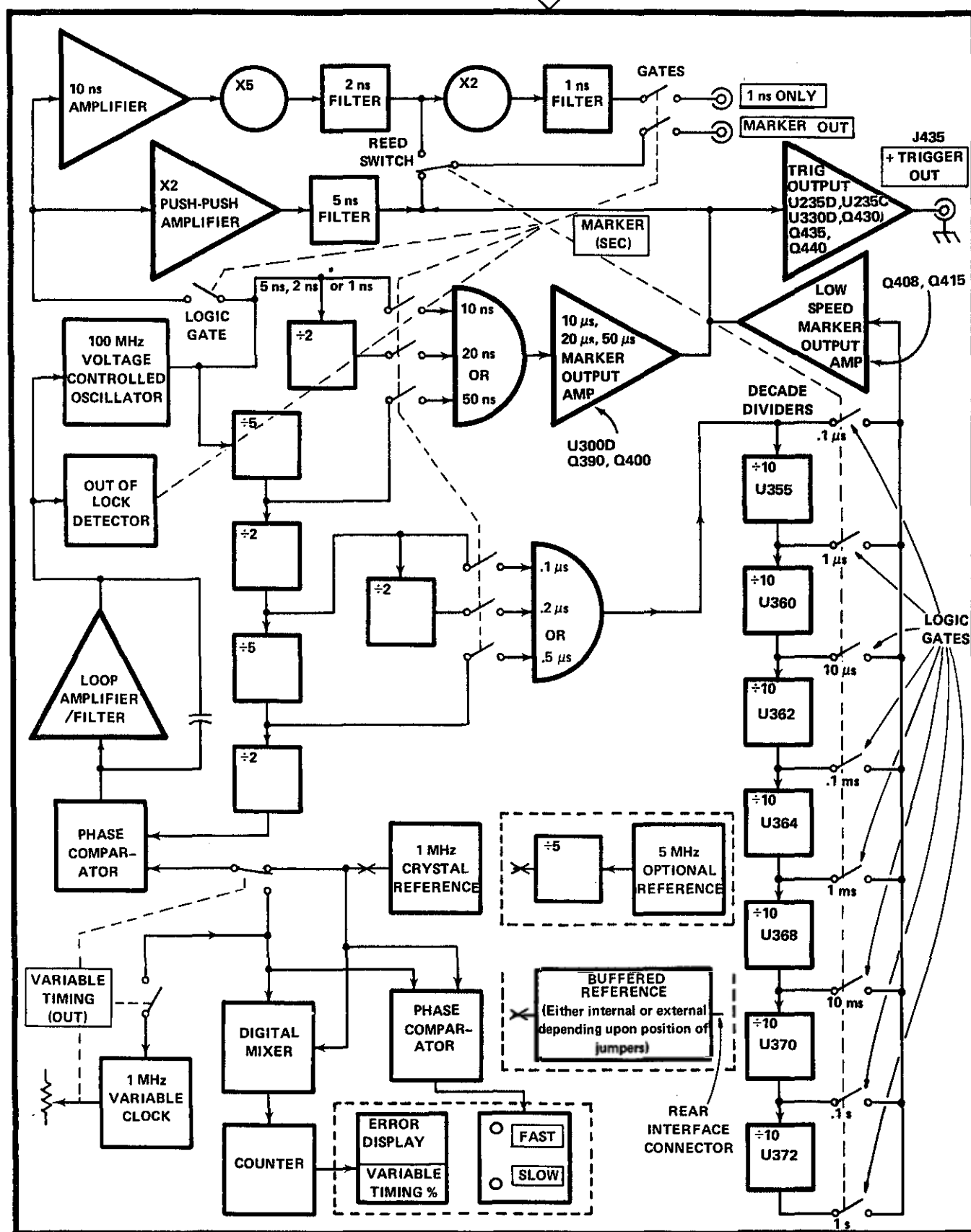
TRIGGER OUTPUT

At MARKER Control settings of 5 s through $.1 \mu s$ the marker available at the MARKER OUT connector is used as a slave trigger. The slave trigger from the low speed marker output amplifier is coupled through emitter followers Q430 and Q435 and made available at + TRIGGER OUT connector J435.

At Marker Control settings of 50 ns and faster, the trigger signal rate available at the + TRIGGER OUT connector remains $.1 \mu s$. The $1 \mu s$ output is obtained by enabling logic gates U235C and U330D. Enabling U330D allows the output square-wave from U320 to be differentiated by RC network R400-R445-C440, then amplified by Q440 before being coupled to the + TRIGGER OUT connector via emitter follower Q435. The RC network determines the width and amplitude of the trigger signal, while R439-C439 network in the emitter of Q440 controls the signal gain. R445 High Speed trigger amplitude provides a means of adjusting the high speed trigger amplitude to match the low speed trigger amplitude.

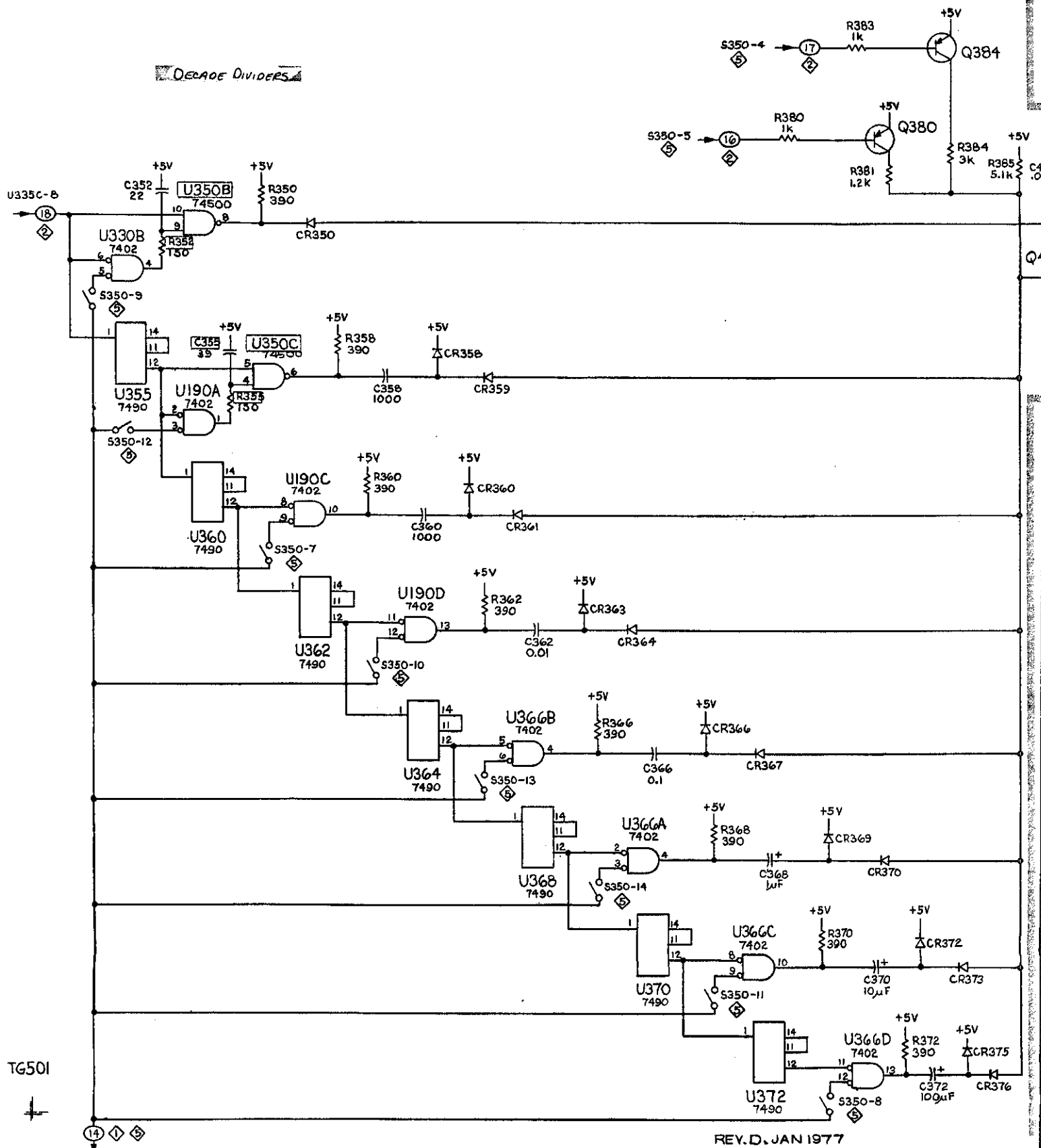
DIAGRAM

3



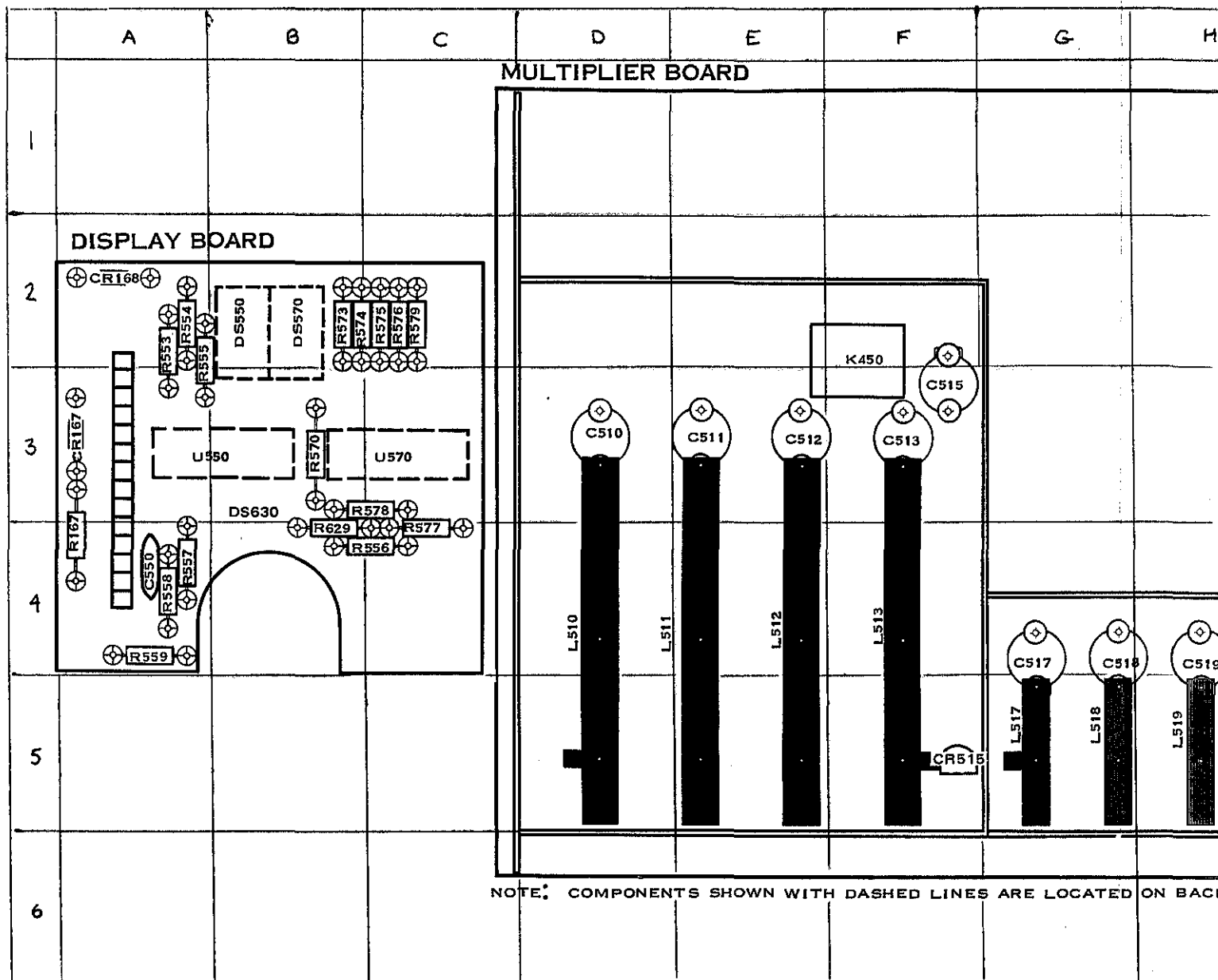
3
Sht. 1 of 2

DECADE DIVIDERS



REV.D, JAN 1977

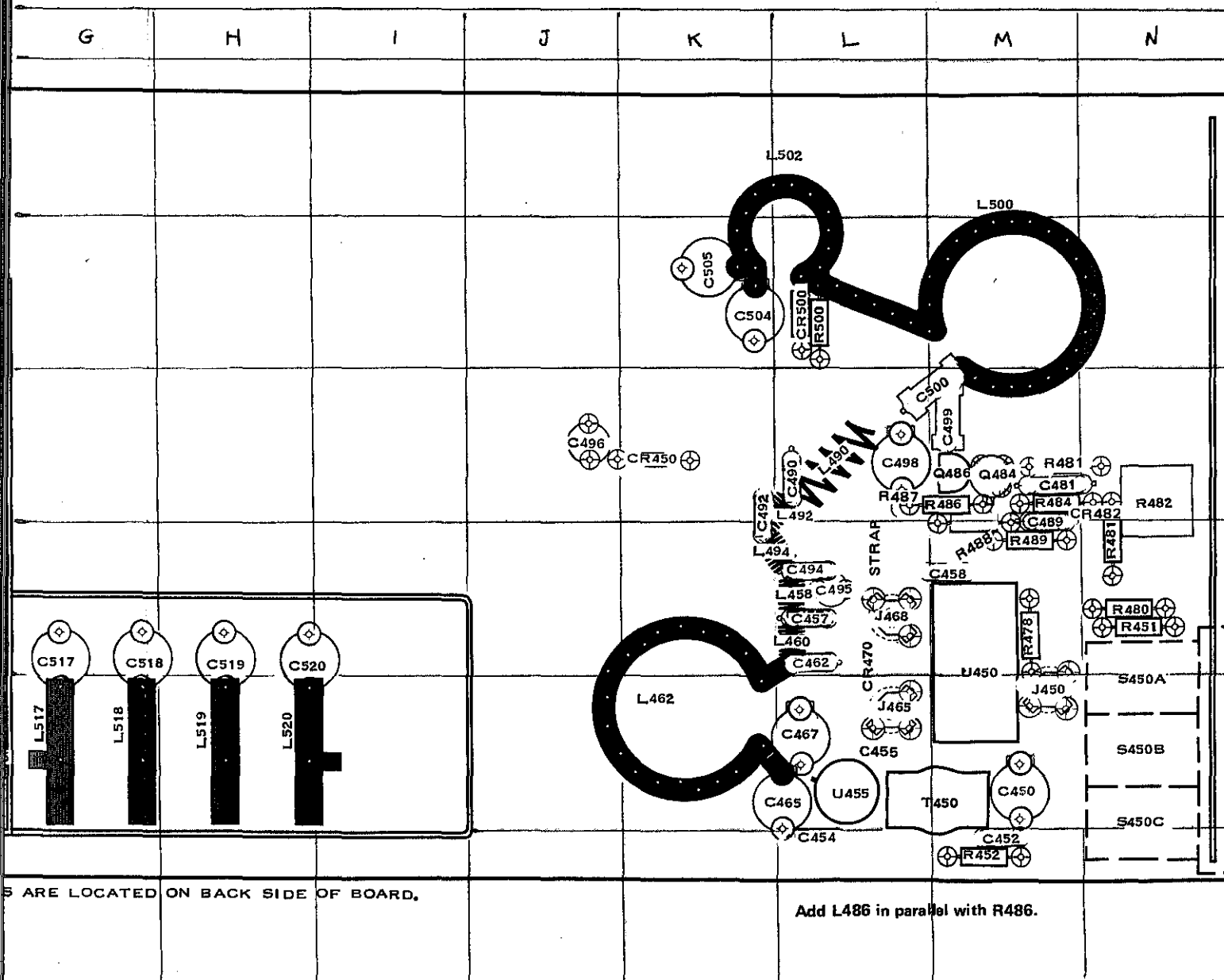
PARTS LOCATION



CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC
C450	M-5	C492	K-3	C515	F-3	DS550	B-2	L492	L-3
C452	M-6	C494	L-4	C517	G-4	DS570	B-2	L494	L-4
C454	L-4	C495	L-4	C518	G-4	DS630	B-3	L500	M-2
C455	L-5	C496	J-3	C519	H-4	J450	M-5	L502	L-1
C457	L-4	C498	L-3	C520	H-4	J465	L-5	L510	D-4
C458	M-4	C499	M-3	C550	A-4	J468	L-4	L511	E-4
C462	L-4	C500	L-3	CR51	F-5			L512	E-4
C465	L-5	C504	K-2	CR167	A-3	K450	F-2	L513	F-4
C467	L-5	C505	K-2	CR168	A-2			L517	G-5
C481	M-3	C510	D-3	CR450	K-3	L458	L-4	L518	G-5
C489	M-3	C511	E-3	CR470	L-5	L460	L-4	L519	H-5
C490	L-3	C512	E-3	CR482	M-3	L462	K-5	L520	H-5
		C513	F-3	CR500	L-2	L490	L-3	Q484	M-3

PARTS LOCATION GRID: THEORY OF OPERATION
Sht. 20F3

PARTS LOCATION GRID



CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC
DS550	B-2	L492	L-3	Q486	M-3	R553	A-2	R629	B-4
DS570	B-2	L494	L-4	R167	A-4	R554	A-2	R578	C-3
DS630	B-3	L500	M-2	R451	N-4	R555	A-2	R579	C-2
J450	M-5	L502	L-1	R452	M-6	R556	C-4	S450A	N-5
J465	L-5	L510	D-4	R478	M-4	R557	A-4	S450B	N-5
J468	L-4	L511	E-4	R480	N-4	R558	A-4	S450C	N-5
		L512	E-4	R481	N-4	R559	A-4		
K450	F-2	L513	F-4	R482	N-3	R570	B-3	T450	M-5
		L517	G-5	R484	M-3	R573	B-2	U450	M-4
L458	L-4	L518	G-5	R486	M-3	R574	B-2	U455	L-5
L460	L-4	L519	H-5	R488	M-3	R575	C-2	U550	B-3
L462	K-5	L520	H-5	R489	M-4	R576	C-2	U570	C-3
L490	L-3	Q484	M-3	R500	L-2	R577	C-4		

THEORY OF OPERATION

DIAGRAM



X2 PUSH-PUSH AMPLIFIER AND 5 ns FILTER

Placing the MARKER Control at its 521N position enables ECL logic gate U290C, which allows the 100 MHz signal to pass to J450. Pushing the 5 ns pushbutton enables ECL logic gate U450B, applying the 100 MHz (10 ns) signal to the primary of T450.

T450 is a toroidal transformer having a center-tapped primary and secondary winding. C450 tunes the resonance frequency of the T450 primary to 100 MHz. The secondary of T450 connects to a push-push amplifier U455, which effectively acts as a frequency doubler. The output of U455 connects to the 5 ns filter, which contains a parallel resonant (as seen at the output) tank circuit consisting of L462, part of the etched circuit board, and C465. C465 is used to tune the tank circuit to 5 ns (200 MHz). C467 acts as an amplitude adjustment for the 5 ns markers. From the output of the 5 ns filter, the 5 ns markers connect to the MARKER OUT connector, J470.

10 ns AMPLIFIER, X5 2 ns FILTER, X2 and 1 ns FILTER

Placing the Marker control at its 521N position enables ECL logic gate U290C, which allows the 100 MHz signal to pass to J450. Pushing the 2 ns or 1 ns pushbutton enables ECL logic gate U450C, applying the 100 MHz (10 ns) signal to the base of Q484.

Q484 and Q486 compose a Class C amplifier. R482, CR482, and U450C make up a temperature compensation network for the amplifier. R482, Amp Bias, is used to peak the amplifier gain.

The output of the amplifier connects to a parallel resonant tank circuit consisting of L490 and C498. C498 is used to tune the tank circuit to 10 ns (100 MHz). L500, part of the etched circuit board, and C500 make up a matching network for the input to varactor CR500.

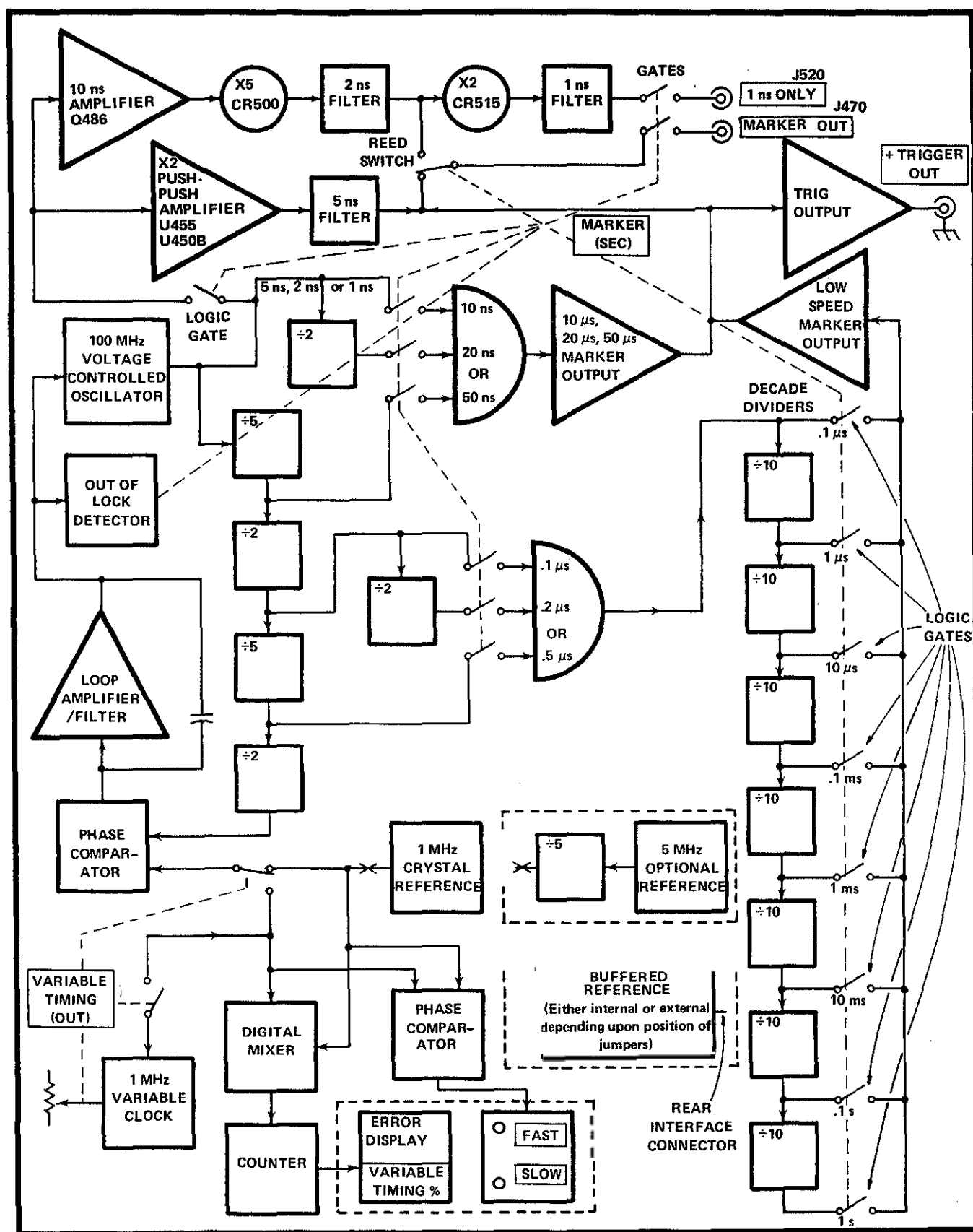
CR500 is a snap type varactor, i.e. a varactor that snaps off. The varactor is triggered at a 100 MHz rate. The sudden current change that occurs when CR500 snaps off at its 100 MHz rate causes L502, part of the etched circuit board, and C504 to ring at a 2 ns (500 MHz) rate. C504 tunes the ring circuit to resonant at a 2 ns rate.

The 2 ns filter is a tuned stub comb filter with each stub tuned successively to resonance. The input to the filter is a damped sine-wave, which is then electromagnetically coupled between the sections of the filter.

The 2 ns output sine-wave is hard-wired to CR515 and connected to J470 the MARKER OUT connector only if K450 has been enabled by depressing the 2 ns pushbutton.

The 2 ns sine-wave input to CR515 is distorted by the non-linear device (diode) to achieve a 1 ns sinewave. The 1 ns sinewave is then filtered by the 1 ns filter which is similar in operation to the 2 ns filter discussed previously. The output from the filter is available through the 1 ns ONLY connector. The 1 ns markers are available from the 1 ns ONLY connector whenever the MARKER Control is set to 521N and either the 2 ns or 1 ns pushbutton has been depressed.

4
Sht. 1 of 3

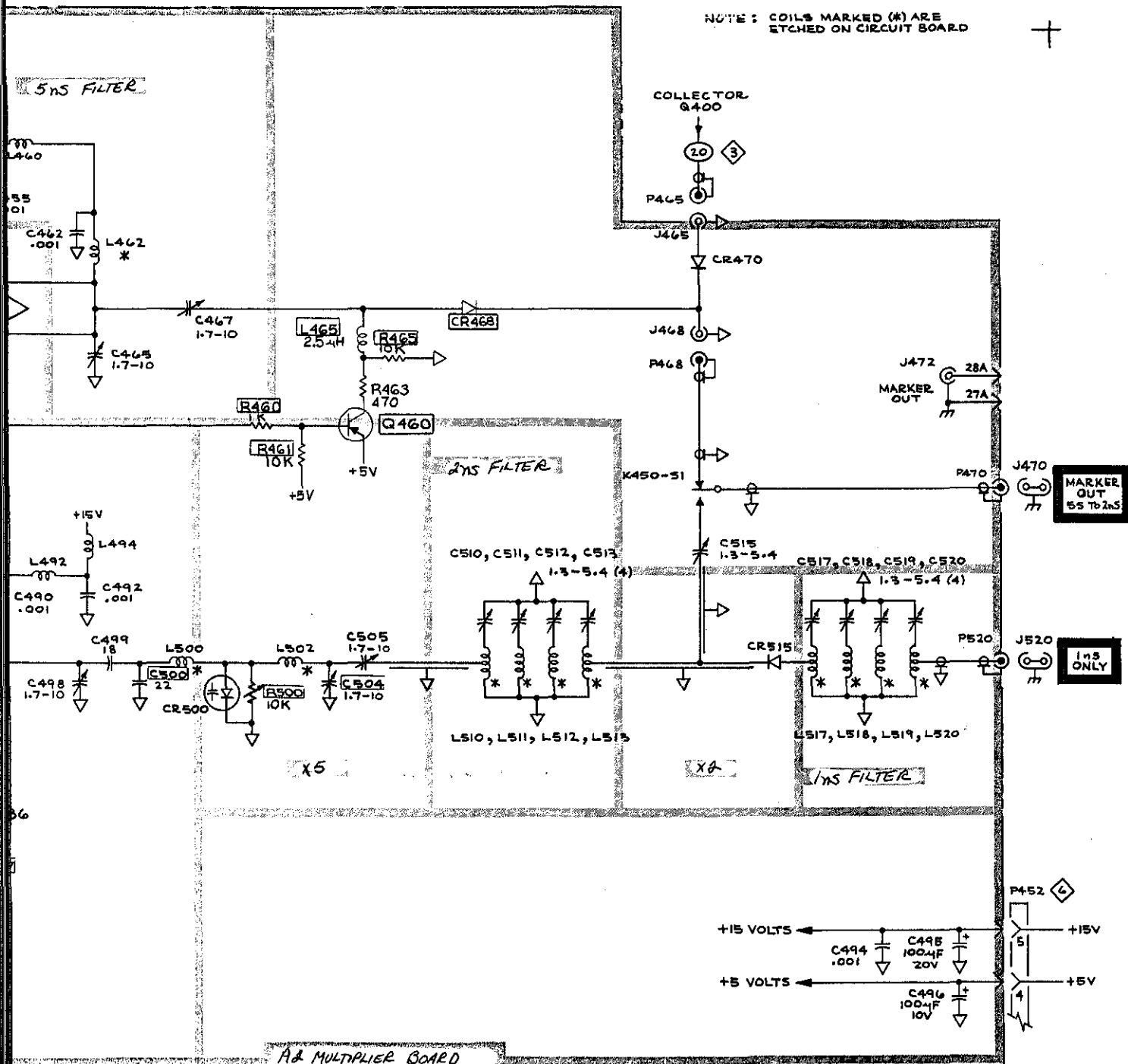


AI MAIN BOARD



4
SH-30F3

NOTE: COILS MARKED (*) ARE ETCHED ON CIRCUIT BOARD



SEE PARTS LIST FOR EARLIER
VALUES AND SERIAL NUMBER
RANGES OF PARTS MARKED
WITH BLUE OUTLINE.

REV. C, JUNE 1975

MULTIPLIER 4 D&H
REV. FEB 1974

THEORY OF OPERATION DIAGRAM 5
Sht. 10F2

THEORY OF OPERATION

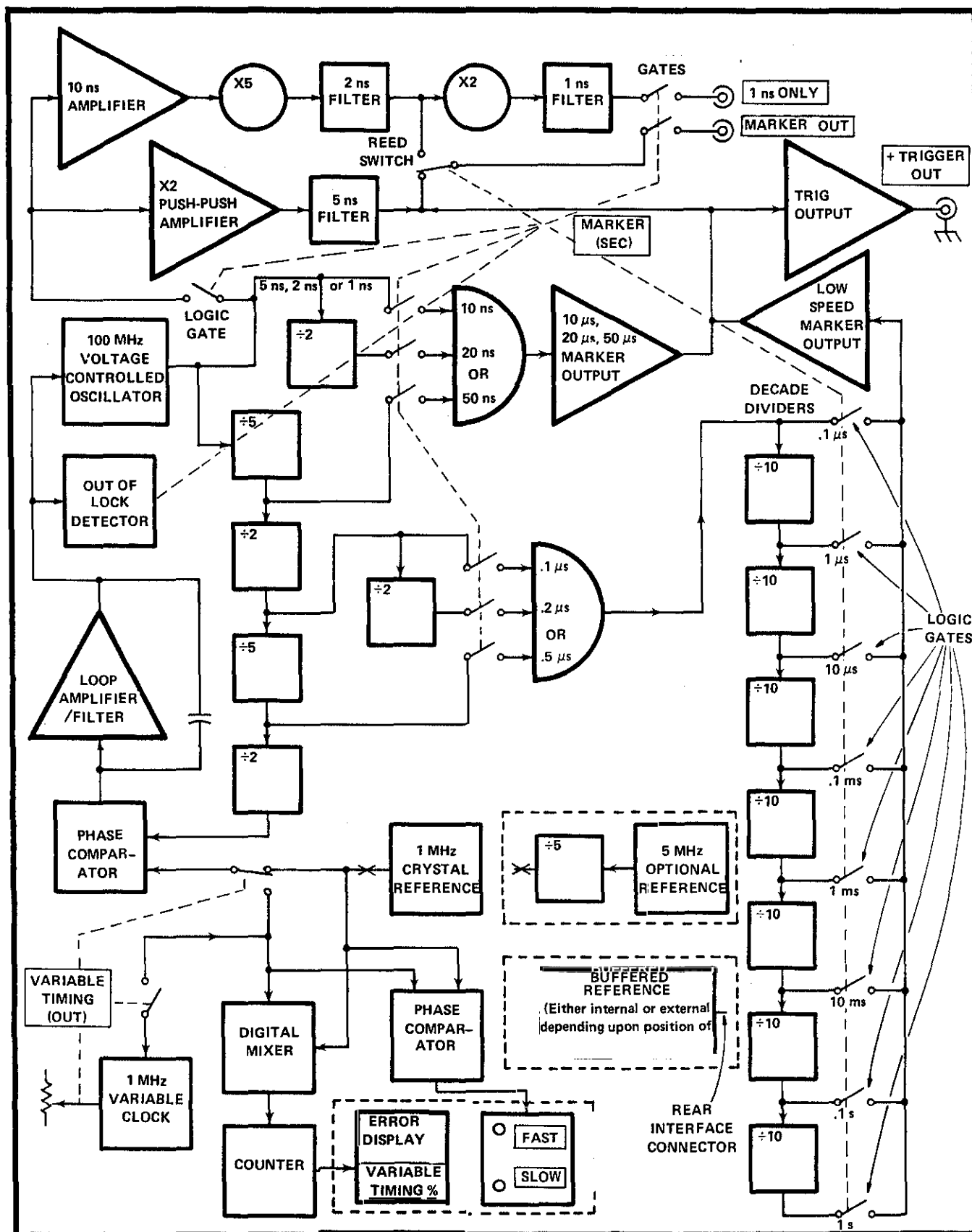
DIAGRAM 5

ERROR DISPLAY

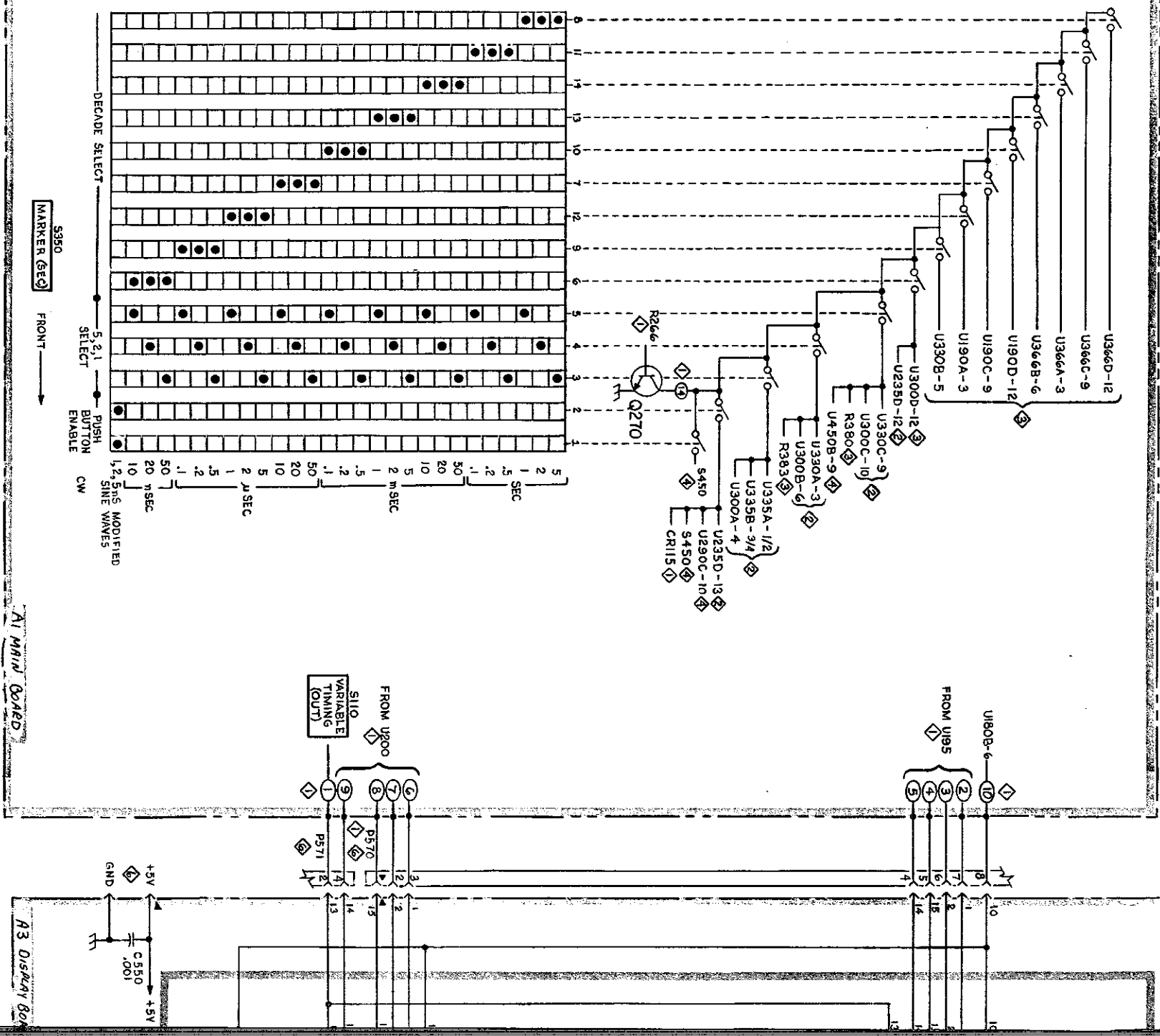
The decoder drives U550 and U570 are driven by the output signals of the counter circuitry. U550 output drives the .1% LED display device DS550 while U570 output drives the 1% LED display device DS570.

THEORY OF OPERATION DIAGRAM 5

SH-20F2



5
Sht 10F2



T8501

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2 } 2
4 }
35D-13 2
90C-10 4
50 4
115 1



0873
JEN

THEORY OF OPERATION

DIAGRAM

6

POWER SUPPLY

+15-Volt Supply

The regulator for the +15 volt supply consists of short circuit protection and error sensing amplifier transistor Q605, error amplifier transistor Q600, Reference Zener diode VR605, and a Darlington transistor pair (Q610 and a series-pass transistor located in the power module mainframe). The supply voltage is established by comparing the supply voltage sample (which is established by the R616-R605 divider at the base of Q605) with the reference voltage established by VR605 at the emitter of Q605. Any difference between the Q605 base and emitter is amplified by Q605 and Q600, and used to change the conduction of the series-pass transistor to correct the output voltage. VR605 is temperature compensated by the base-emitter junction of Q605. R614 provides current limiting for the series pass transistor. R603 and Zener diode VR600 establish the operating voltage range for Q600.

If the +15 V output is shorted (i.e., output goes low), Q605 starts to turn off which pulls the base of Q600 high through R600. Consequently, transistor Q600 saturates against the voltage established by 3 V Zener VR600 and R603. Thus, the voltage at the collector of Q600 is nearly 3 V below the unregulated line. The 3 V is reduced by the voltage drops at the base-emitter of Q610 and the base-emitter of the series-pass transistor in the power module mainframe to a maximum of approximately 1.6 V across R614. The 1.6 V across R614 establishes the maximum current that can be drawn from the +15 V supply.

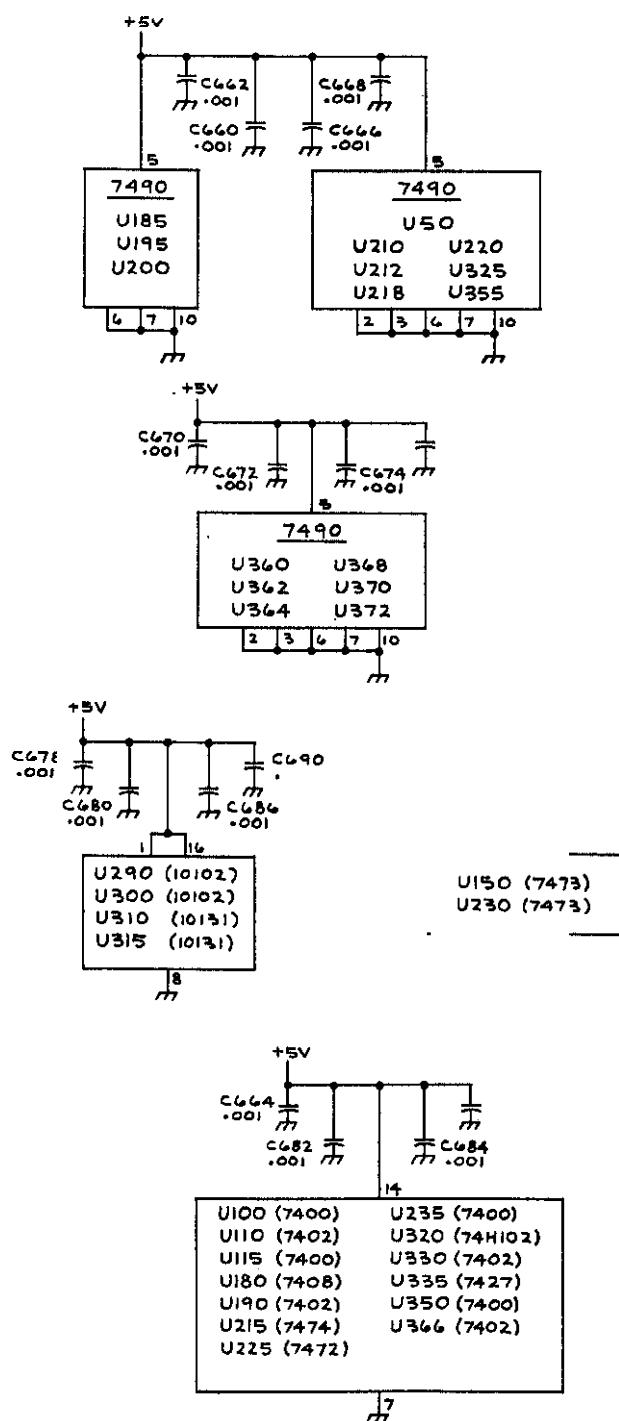
+5-Volt Supply

The regulator for the +5 volt supply consists of error sensing amplifier integrated circuit U625, short circuit protection transistor Q620, over-voltage protection circuit VR640-Q640 and a Darlington transistor pair (Q635 and a series-pass transistor in the power module mainframe). The supply voltage is established by comparing the supply voltage sample at the negative input to U625 with the reference at the positive input to U625. Any difference between the inputs to U625 causes an amplified correction voltage to be sent to the base of Q635, which in turn will cause a change in the conduction of the series pass transistor to correct the output voltage. R621 provides current limiting for the series pass transistor.

If the +5 V output is shorted (i.e., output goes low), the increased voltage drop across R621 causes Q620 to turn on. This pulls the negative input of U625 positive, which turns off Q635 and the series pass transistor. Fuse F620 protects Q620 if the short causes excessive current to be drawn from the supply.

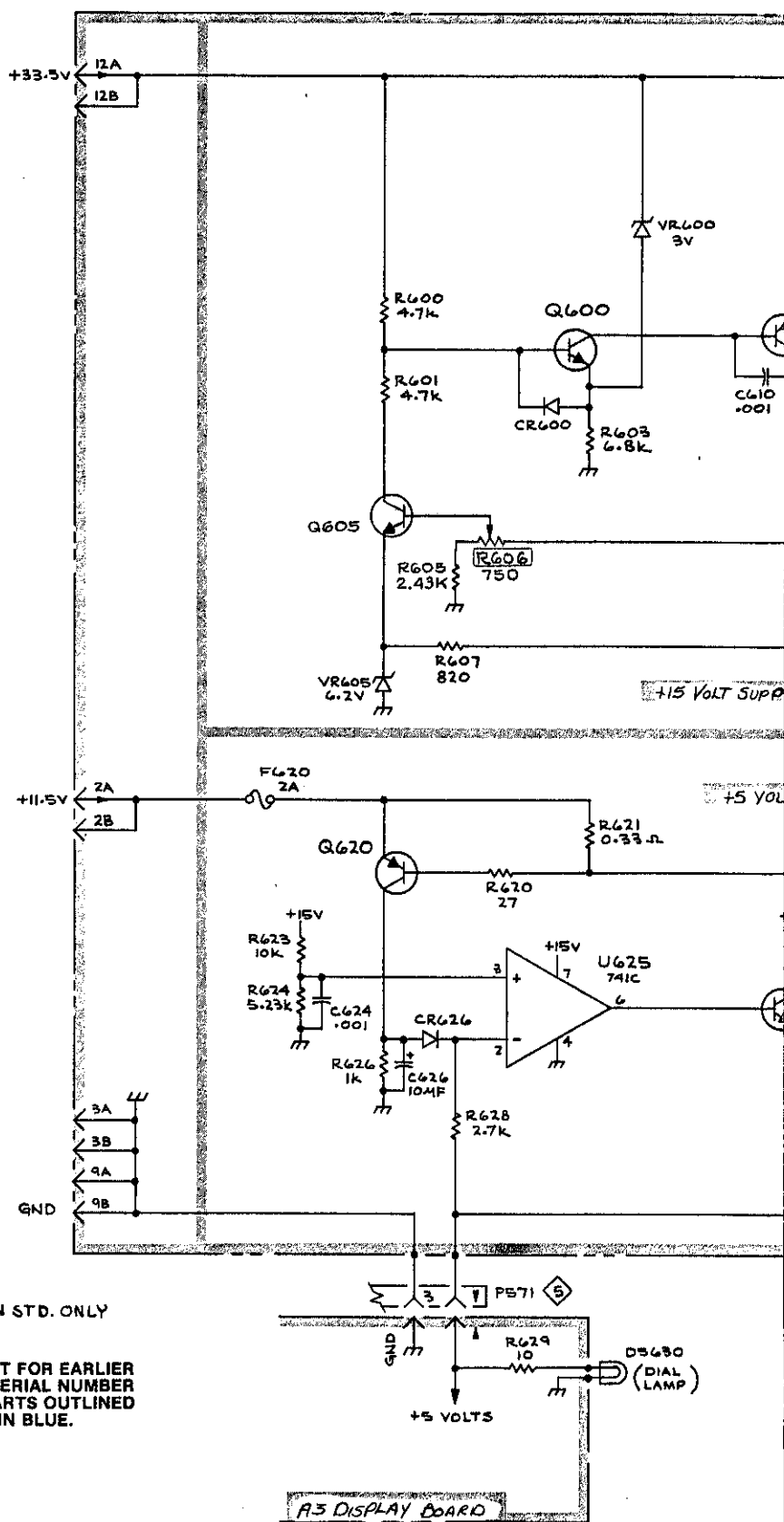
In case the regulator causes the voltage to become more positive (i.e., +7 V or more), silicon controlled rectifier (SCR) will fire and short the +5 V output to ground.

6
Sht. 1 of 2



* C688 USED ON STD. ONLY

SEE PARTS LIST FOR EARLIER
VALUES AND SERIAL NUMBER
RANGES OF PARTS OUTLINED
OR DEPICTED IN BLUE.



Shr. 20F2



REPLACEABLE MECHANICAL PARTS

PARTS ORDERING INFORMATION

Replacement parts are available from or through your local Tektronix, Inc. Field Office or representative.

Changes to Tektronix instruments are sometimes made to accommodate improved components as they become available, and to give you the benefit of the latest circuit improvements developed in our engineering department. It is therefore important, when ordering parts, to include the following information in your order: Part number, instrument type or number, serial number, and modification number if applicable.

If a part you have ordered has been replaced with a new or improved part, your local Tektronix, Inc. Field Office or representative will contact you concerning any change in part number.

Change information, if any, is located at the rear of this manual.

SPECIAL NOTES AND SYMBOLS

X000 Part first added at this serial number
00X Part removed after this serial number

FIGURE AND INDEX NUMBERS

Items in this section are referenced by figure and index numbers to the illustrations.

INDENTATION SYSTEM

This mechanical parts list is indented to indicate item relationships. Following is an example of the indentation system used in the description column.

```

1 2 3 4 5      Name & Description
Assembly and/or Component
Attaching parts for Assembly and/or Component
-----
Detail Part of Assembly and/or Component
Attaching parts for Detail Part
-----
Parts of Detail Part
Attaching parts for Parts of Detail Part
-----

```

Attaching Parts always appear in the same indentation as the item it mounts, while the detail parts are indented to the right. Indented items are part of, and included with, the next higher indentation. The separation symbol ---*--- indicates the end of attaching parts.

Attaching parts must be purchased separately, unless otherwise specified.

ITEM NAME

In the Parts List, an Item Name is separated from the description by a colon (:). Because of space limitations, an Item Name may sometimes appear as incomplete. For further Item Name identification, the U.S. Federal Cataloging Handbook H6-1 can be utilized where possible.

ABBREVIATIONS

#	INCH	ELCTRN	ELECTRON	IN	INCH	SE	SINGLE END
ACTR	NUMBER SIZE	ELEC	ELECTRICAL	INCAND	INCANDESCENT	SECT	SECTION
ADPTR	ACTUATOR	ELCTLT	ELECTROLYTIC	INSUL	INSULATOR	SEMICOND	SEMICONDUCTOR
ALIGN	ADAPTER	ELEM	ELEMENT	INTL	INTERNAL	SHLD	SHIELD
AL	ALIGNMENT	EPL	ELECTRICAL PARTS LIST	LPHLDR	LAMPHOLDER	SHLDR	SHOULDERED
ALU	ALUMINUM	EQPT	EQUIPMENT	MACH	MACHINE	SKT	SOCKET
ASSEM	ASSEMBLED	EXT	EXTERNAL	MECH	MECHANICAL	SL	SLIDE
ASSY	ASSEMBLY	FIL	FILLISTER HEAD	MTG	MOUNTING	SLFLKG	SELF-LOCKING
ATTEN	ATTENUATOR	FLEX	FLEXIBLE	NIP	NIPPLE	SLVG	SLEEVE
AWG	AMERICAN WIRE GAGE	FLH	FLAT HEAD	NON WIRE	NOT WIRE WOUND	SPR	SPRING
BD	BOARD	FLTR	FILTER	ORD	ORDER BY DESCRIPTION	SQ	SQUARE
BRKT	BRACKET	FR	FRAME or FRONT	OD	OUTSIDE DIAMETER	SST	STAINLESS STEEL
BRS	BRASS	FSTNR	FASTENER	OVH	OVERHEAD	STL	STEEL
BRZ	BRONZE	FT	FOOT	PH BRZ	PHOSPHOR BRONZE	SW	SWITCH
BSHG	BUSHING	FXD	FIXED	PL	PLAIN or PLATE	T	TUBE
CAB	CABINET	GSKT	GASKET	PLSTC	PLASTIC	TERM	TERMINAL
CAP	CAPACITOR	HDL	HANDLE	PN	PART NUMBER	THD	THREAD
CER	CERAMIC	HEX	HEXAGON	PNH	PAN HEAD	THK	THICK
CHAS	CHASSIS	HEX HD	HEXAGONAL HEAD	PWR	POWER	TNSN	TENSION
CKT	CIRCUIT	HEX SOC	HEXAGONAL SOCKET	RCPT	RECEPTACLE	TPG	TAPPING
COMP	COMPOSITION	HLCP	HELICAL COMPRESSION	RES	RESISTOR	TRH	TRUSS HEAD
CONN	CONNECTOR	HLEXT	HELICAL EXTENSION	RIGD	RIGID	V	VOLTAGE
COV	COVER	HV	HIGH VOLTAGE	RLF	RELIEF	VAR	VARIABLE
CPLG	COUPLING	IC	INTEGRATED CIRCUIT	RTNR	RETAINER	W/	WITH
CRT	CATHODE RAY TUBE	ID	INSIDE DIAMETER	SCH	SOCKET HEAD	WSHR	WASHER
DEG	DEGREE	IDENT	IDENTIFICATION	SCOPE	OSCILLOSCOPE	XFMR	TRANSFORMER
DWR	DRAWER	IMPLR	IMPELLER	SCR	SCREW	XSTR	TRANSISTOR

CROSS INDEX MFR. CODE NUMBER TO MANUFACTURER

MFR.CODE	MANUFACTURER	ADDRESS	CITY,STATE,ZIP
0000C	GETTIG ENGINEERING AND MANUFACTURING CO.		SPRINGMILL, PA 16875
01295	TEXAS INSTRUMENTS, INC., SEMICONDUCTOR GROUP	P. O. BOX 5012	DALLAS, TX 75222
08261	SPECTRA-STRIP CORP.	7100 LAMPSON AVE.	GARDEN GROVE, CA 92642
12327	FREEWAY CORP.	9301 ALLEN DR.	CLEVELAND, OH 44125
22526	BERG ELECTRONICS, INC.	YOUK EXPRESSWAY	NEW CUMBERLAND, PA 17070
23499	GAVITT WIRE AND CABLE, DIVISION OF RSC INDUSTRIES, INC.	455 N. QUINCE ST.	ESCONDIDO, CA 92025
45722	USM CORP., PARKER-KALON FASTENER DIV.	1 PEEKAY DRIVE	CLIFTON, NJ 07014
70276	ALLEN MFG. CO.	P. O. DRAWER 570	HARTFORD, CT 06101
71159	BRISTOL SOCKET SCREW, DIV. OF AMERICAN CHAIN AND CABLE CO., INC.	40 BRISTOL ST.	WATERBURY, CT 06720
71590	CENTRALAB ELECTRONICS, DIV. OF GLOBE-UNION, INC.	5757 N. GREEN BAY AVE.	MILWAUKEE, WI 53201
71785	TRW ELECTRONIC COMPONENTS, CINCH CONNECTOR OPERATIONS	1501 MORSE AVE.	ELK GROVE VILLAGE, IL 60007
73743	FISCHER SPECIAL MFG. CO.	446 MORGAN ST.	CINCINNATI, OH 45206
74445	HOLO-KROME CO.	31 BROOK ST. WEST	HARTFORD, CT 06110
78189	ILLINOIS TOOL WORKS, INC. SHAKEPROOF DIVISION	ST. CHARLES ROAD	ELGIN, IL 60120
79807	WROUGHT WASHER MFG. CO.	2100 S. O BAY ST.	MILWAUKEE, WI 53207
80009	TEKTRONIX, INC.	P. O. BOX 500	BEAVERTON, OR 97077
82647	TEXAS INSTRUMENTS, INC., CONTROL PRODUCTS DIV.	34 FOREST ST.	ATTLEBORO, MA 02703
83385	CENTRAL SCREW CO.	2530 CRESCENT DR.	BROADVIEW, IL 60153
83501	GAVITT WIRE AND CABLE, DIVISION OF RSC INDUSTRIES, INC.	CENTRAL ST.	BROOKFIELD, MA 01506
97464	INDUSTRIAL RETAINING RING CO.	57 CORDIER ST.	IRVINGTON, NJ 07111

Mechanical Parts List—TG 501

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
1-1	337-1399-00	B010100 B010209	2		SHLD,ELECTRICAL:SIDE	80009	337-1399-00
	337-2107-00	B010210 B032459X	1		SHLD,ELECTRICAL:SIDE	80009	337-2107-00
	337-1399-02	B010210	1		SHLD,ELECTRICAL:SIDE WITH INSULATOR	80009	337-1399-02
-2	366-1166-00		1		KNOB:GRAY	80009	366-1166-00
	213-0153-00		1		. SETSCREW:5-40 X 0.125 INCH,HEX SOC STL	74445	OBD
-3	366-1509-00		1		KNOB:GRAY	80009	366-1509-00
	213-0153-00		2		. SETSCREW:5-40 X 0.125 INCH,HEX SOC STL	74445	OBD
-4	358-0029-00		1		BSHG,MACH.THD:HEX,0.375-32 X 0.438" LONG (ATTACHING PARTS)	80009	358-0029-00
-5	210-0590-00		1		NUT,PLAIN,HEX.:0.375 X 0.438 INCH,STL	73743	2X28269-402
-6	210-0012-00		1		WASHER,LOCK:INTL,0.375 ID X 0.50" OD STL - - - * - - -	78189	1220-02-00-0541C
-7	366-1489-33		1		PUSH BUTTON:--5NS	80009	366-1489-33
-8	366-1489-34		1		PUSH BUTTON:--2NS	80009	366-1489-34
-9	366-1489-35		1		PUSH BUTTON:--1NS	80009	366-1489-35
-10	426-0681-00		3		FR,PUSH BUTTON:GRAY PLASTIC	80009	426-0681-00
-11	214-1840-00		1		PIN,KNOB SECRG:	80009	214-1840-00
-12	366-1422-01		1		KNOB:LATCH	80009	366-1422-01
-13	131-1315-00		3		CONNECTOR,RCPT,:BNC,FEMALE	80009	131-1315-00
-14	333-1778-00		1		PANEL,FRONT:TG501 (ATTACHING PARTS)	80009	333-1778-00
-15	213-0055-00	B010100 B031769	2		SCR,TPG,THD FOR:2-32 X 0.188 INCH,PNH STL	83385	OBD
	211-0034-00	B031770	2		SCREW,MACHINE:2-56 X 0.50 INCH,PNH - - - * - - -	83385	OBD
-16	378-1742-00		1		LENS IND LIGHT:CLEAR	80009	378-1742-00
-17	214-1513-01		1		LCH,PLUG-IN RET: (ATTACHING PARTS)	80009	214-1513-01
-18	213-0254-00		1		SCR,TPG,THD CTG:2-56X0.25"100 DEG,FLH STL - - - * - - -	45722	OBD
-19	386-2673-00		1		SUBPANEL,FRONT:PLASTIC (ATTACHING PARTS)	80009	386-2673-00
-20	213-0229-00		4		SCR,TPG,THD FOR:6-20 X 0.375"100 DEG,FLH STL - - - * - - -	83385	OBD
-21	-----		1		CKT BOARD ASSY:--MULTIPLIER(SEE A3 EPL) (ATTACHING PARTS)		
-22	213-0138-00	B010100 B031769	4		SCR,TAP.,THD FO:4-40 X 0.188 INCH,PNH STL	83385	OBD
	213-0138-00	B031770	2		SCR,TAP.,THD FO:4-40 X 0.188 INCH,PNH STL	83385	OBD
	210-0405-00	B031770	2		NUT,PLAIN,HEX:2-56 X 0.188 INCH,BRS - - - * - - -	73743	2X1216-402
-23	131-0608-00		14		. CONTACT,ELEC:0.365 INCH LONG	22526	47357
-24	136-0252-04		40		. CONTACT,ELEC:0.188 INCH LONG	22526	75060
-25	337-1873-00		1		SHIELD,ELEC:FRONT SUBPANEL	80009	337-1873-00
-26	337-1915-00		1		SHIELD,ELEC:COVER	80009	337-1915-00
-27	-----		1		CKT BOARD ASSY:--DISPLAY(SEE A2 EPL) (ATTACHING PARTS)		
-28	211-0014-00		2		SCREW,MACHINE:4-40 X 0.50 INCH,PNH STL	83385	OBD
-29	211-0116-00		4		SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH BRS - - - * - - -	83385	OBD
-30	136-0252-04		39		. CONTACT,ELEC:0.188 INCH LONG	22526	75060
-31	131-1003-00		3		. CONNECTOR BODY,:CKT BD MT,3 PRONG	80009	131-1003-00
-32	260-1571-00		1		. SWITCH,PUSH:	71590	2KBC030000-XXX
-33	361-0383-00	B010100 B032459	4		. SPACER,PB SW:CHARCOAL,0.33 INCH LONG	80009	361-0383-00
	361-0382-00	B032460	4		. SPACER,PB SW:BROWN,0.275 INCH LONG	80009	361-0382-00
	361-0542-00	B032460	4		. SPACER,SWITCH:PLASTIC	80009	361-0542-00
-34	337-1436-00		1		. SHIELD,ELEC:	80009	337-1436-00
-35	337-1894-00		2		. SHIELD,ELEC:3.90 X 0.60"H,STRAIGHT	80009	337-1894-00
-36	337-1892-00		1		. SHIELD,ELEC:2.48 X 1.26 X 0.60"U SHAPE	80009	337-1892-00
-37	337-1891-00		1		. SHIELD,ELEC:2.96 X 2.53 X 0.60"U SHAPE	80009	337-1891-00
-38	337-1895-00	B010100 B032459X	2		. SHIELD,ELEC:	80009	337-1895-00
-39	337-1893-00	B010100 B032459	1		. SHIELD,ELEC:2.48 X 1.26 X 0.24" U SHAPE	80009	337-1893-00
	337-2311-00	B032460	1		. SHIELD,ELEC:1 NAND SEC COMB FILTER	80009	337-2311-00
-40	337-1890-00	B010100 B032459X	1		. SHIELD,ELEC:2.50 X 2.96 X 0.24" U SHAPE	80009	337-1890-00
	337-2312-00	B032460	1		. SHIELD,ELEC:2 NAND SEC COMB FILTER	80009	337-2312-00
-41	337-1875-00	B010100 B032459	1		SHIELD,ELEC:CIRCUIT BOARD	80009	337-1875-00
	337-1875-01	B032460	1		SHIELD,ELEC:CIRCUIT BOARD (ATTACHING PARTS)	80009	337-1875-01
-42	211-0008-00		2		SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL - - - * - - -	83385	OBD

Mechanical Parts List—TG 501

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
	672-0068-00 ¹			1		CKT BOARD ASSY:--SWITCH,TIMING	80009	672-0068-00
	672-0441-00 ¹			1		CKT BOARD ASSY:--SWITCH,TIMING (ATTACHING PARTS)	80009	672-0068-01
-43	211-0008-00			2		SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
-44	129-0123-00			2		POST,METALLIC:0.688 INCH LONG	80009	129-0123-00
-45	213-0146-00			2		SCR,TPG,THD FOR:6-20 X 0.313 INCH,PNH STL	83385	OBD
						- - - * - - -		
-46	384-1219-00			1		. EXTENSION SHAFT:8.20 INCH LONG	80009	384-1219-00
-47	214-1190-00			1		. EXTENDER-RETR:8.2 INCHES LONG	80009	214-1190-00
	213-0075-00			1		. . SETSCREW:4-40 X 0.094 INCH,HEX SOC STL	70276	OBD
	213-0239-00			1		. . SETSCREW:3-48 X 0.062 INCH,HEX SOC STL	71159	NOTE
-48	214-1136-00			1		. ACTUATOR,SL SW:	80009	214-1136-00
-49	-----			1		. RESISTOR,VAR:(SEE R135 EPL (ATTACHING PARTS)		
-50	210-0583-00			1		. NUT,PLAIN,HEX.:0.25-32 X 0.312 INCH,BRS	73743	2X20319-402
-51	210-0046-00			1		. WASHER,LOCK:INTL,0.26 ID X 0.40" OD,STL	78189	1214-05-00-0541C
-52	210-0940-00			1		. WASHER,FLAT:0.25 ID X 0.375 INCH OD,STL	79807	OBD
-53	210-0583-00			1		. NUT,PLAIN,HEX.:0.25-32 X 0.312 INCH,BRS	73743	2X20319-402
-54	407-1393-00			1		. BRKT,CMPNT MTG:RESISTOR	80009	407-1393-00
						- - - * - - -		
	263-1008-00			1		. ACTR ASSY,CAM S: (ATTACHING PARTS)	80009	263-1008-00
-55	211-0116-00			4		. SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH BRS	83385	OBD
						- - - * - - -		
-56	200-1571-00			1		. . COVER,CAM SW:	80009	200-1571-00
-57	354-0391-00			1		. . RING,RETAINING:0.395"FREE ID X 0.025" STL	97464	3100-43-CD
-58	214-1139-03			1		. . SPRING,FLAT:RED COLORED	80009	214-1139-03
-59	214-1139-00			1		. . SPRING,FLAT:GOLD COLORED	80009	214-1139-00
-60	214-1127-00			2		. . ROLLER,DETENT:0.125 DIA X 0.125 INCH L	80009	214-1127-00
-61	210-0406-00			6		. . NUT,PLAIN,HEX.:4-40 X 0.188 INCH,BRS	73743	2X12161-402
-62	131-0963-00			2		. . CONTACT,ELEC:GROUNDING	80009	131-0963-00
-63	401-0082-01			1		. . BEARING,CAM SW:FRONT	80009	401-0082-01
-64	105-0424-00			1		. . ACTUATOR,CAM SW:	80009	105-0424-00
-65	401-0146-00			1		. . BEARING,CAM SW:REAR	80009	401-0146-00
-66	-----			1		. CKT BOARD ASSY:--TIMING(SEE A1 EPL)		
-67	131-1003-00			3		. . CONNECTOR BODY,:CKT BD MT,3 PRONG	80009	131-1003-00
-68	136-0514-00			3		. . SOCKET,PLUG-IN:MICROCIRCUIT,8 CONTACT	82647	C930802
-69	136-0269-00	B010100 B010182		27		. . SOCKET,PLUG-IN:14 PIN DUAL INLINE	71785	133-59-02-073
	136-0269-02 ¹	B010183		27		. . SOCKET,PLUG-IN:14 CONTACT,LOW CLEARANCE	01295	C931402
	136-0269-00 ¹	B010100 B010182		27		. . SOCKET,PLUG-IN:14 PIN DUAL INLINE	71785	133-59-02-073
	136-0269-02 ¹	B010183		27		. . SOCKET,PLUG-IN:14 CONTACT,LOW CLEARANCE	01295	C931402
-70	136-0252-04			109		. . CONTACT,ELEC:0.188 INCH LONG	22526	75060
-71	131-0608-00	B010100 B029999		20		. . CONTACT,ELEC:0.365 INCH LONG	22526	47357
	131-0608-00	B030000		6		. . CONTACT,ELEC:0.365 INCH LONG	22526	47357
	131-0589-00	B030000		14		. . CONTACT,ELEC:0.46 INCH LONG	22526	47350
	131-0566-00	XB010336		2		. . LINK,TERM.CONNE:0.086 DIA X 2.375 INCH L	0000C	L-2007-1
-72	131-0604-00			16		. . CONTACT,ELEC:0.025 SQ X 0.365 INCH LONG	80009	131-0604-00
-73	344-0154-00			2		. . CLIP ELECTRICAL:FOR 0.25 INCH DIA FUSE	80009	344-0154-00
-74	131-0566-00			1		. . LINK,TERM.CONNE:0.086 DIA X 2.375 INCH L	0000C	L-2007-1
-75	351-0180-00			1		. . SLIDE,GUIDE:SWITCH ACTUATOR	80009	351-0180-00
	214-1808-00	XB010183 B010336X		1		. SPRING,GROUNDING:PLUG-IN	80009	214-1808-00
	210-1002-00	XB010336		2		. WASHER,FLAT:0.125 ID X 0.25 INCH OD,BRS	12327	OBD
-76	426-0724-04			1		. FR SECT,PLUG-IN:BOTTOM	80009	426-0724-04
-77	214-1061-00			1		. SPRING,GROUND:FLAT	80009	214-1061-00
-78	426-0725-05			1		. FR SECT,PLUG-IN:TOP	80009	426-0725-05
-79	131-0707-00			20		. CONTACT,ELEC:0.48"L,22-26 AWG WIRE	22526	47439
-80	175-0827-00			FT		. WIRE,ELECTRICAL:4 WIRE RIBBON	08261	TEK-175-0827-00
-81	175-0829-00			FT		. WIRE,ELECTRICAL:6 WIRE RIBBON	83501	TEK-175-0829-00
-82	175-0833-00			FT		. WIRE,ELECTRICAL:10 WIRE RIBBON	23499	TEK-175-0833-00
-83	210-0774-00			4		. EYELET,METALLIC:0.152 OD X 0.245 INCH L,BRS	80009	210-0774-00
-84	210-0775-00			4		. EYELET,METALLIC:0.126 OD X 0.23 INCH L,BRS	80009	210-0775-00
-85	352-0162-01			1		. HOLDER,TERM.CON:4 WIRE BROWN	80009	352-0162-01
-86	352-0164-02			1		. HOLDER,TERM.CON:6 WIRE RED	80009	352-0164-02
-87	352-1068-00			1		. HOLDER,TERM.CON:10 WIRE BLACK	80009	352-1068-00

¹Option 1 only.

Fig. 1 EXPLODED
Sht. 10F2

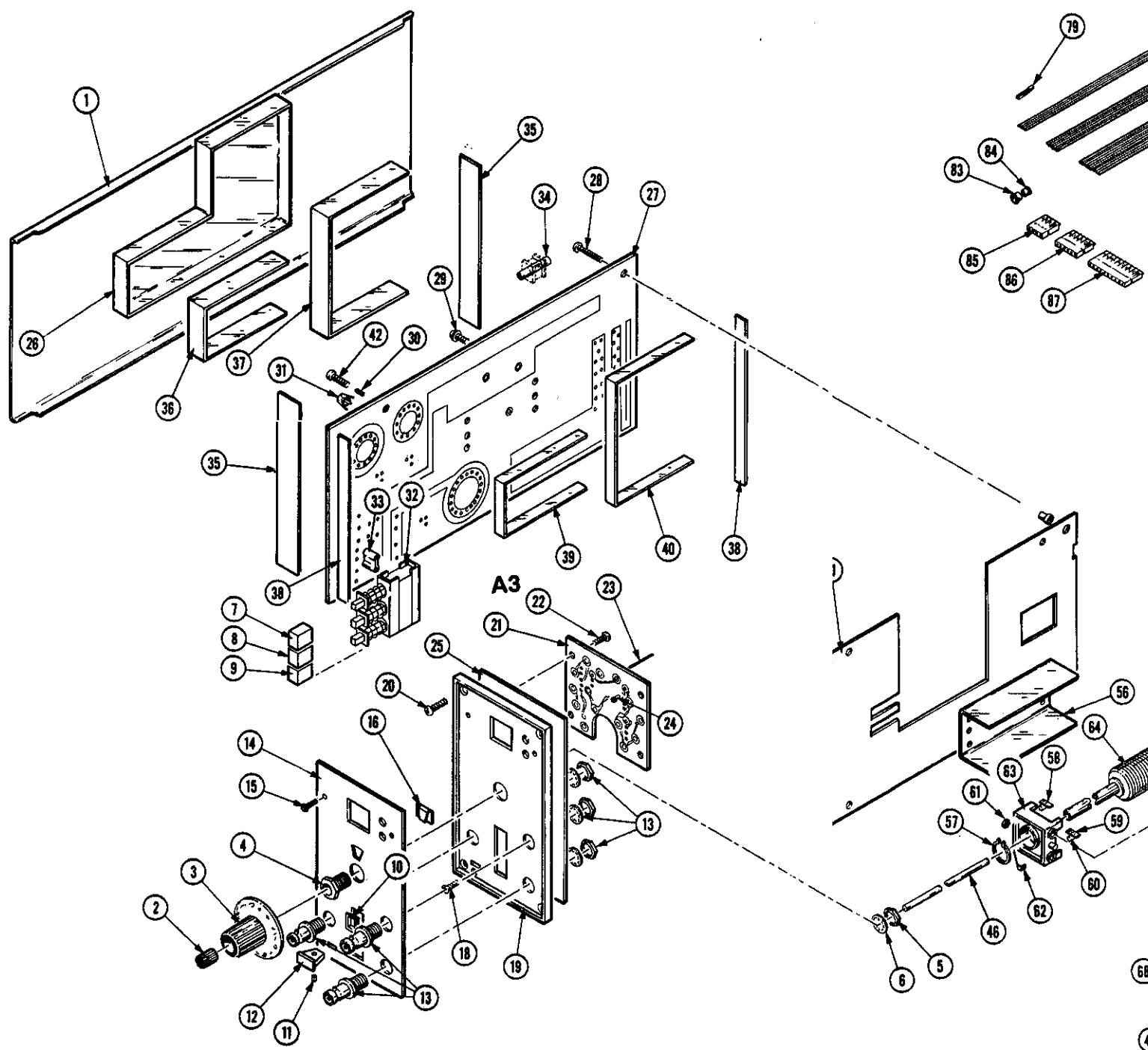
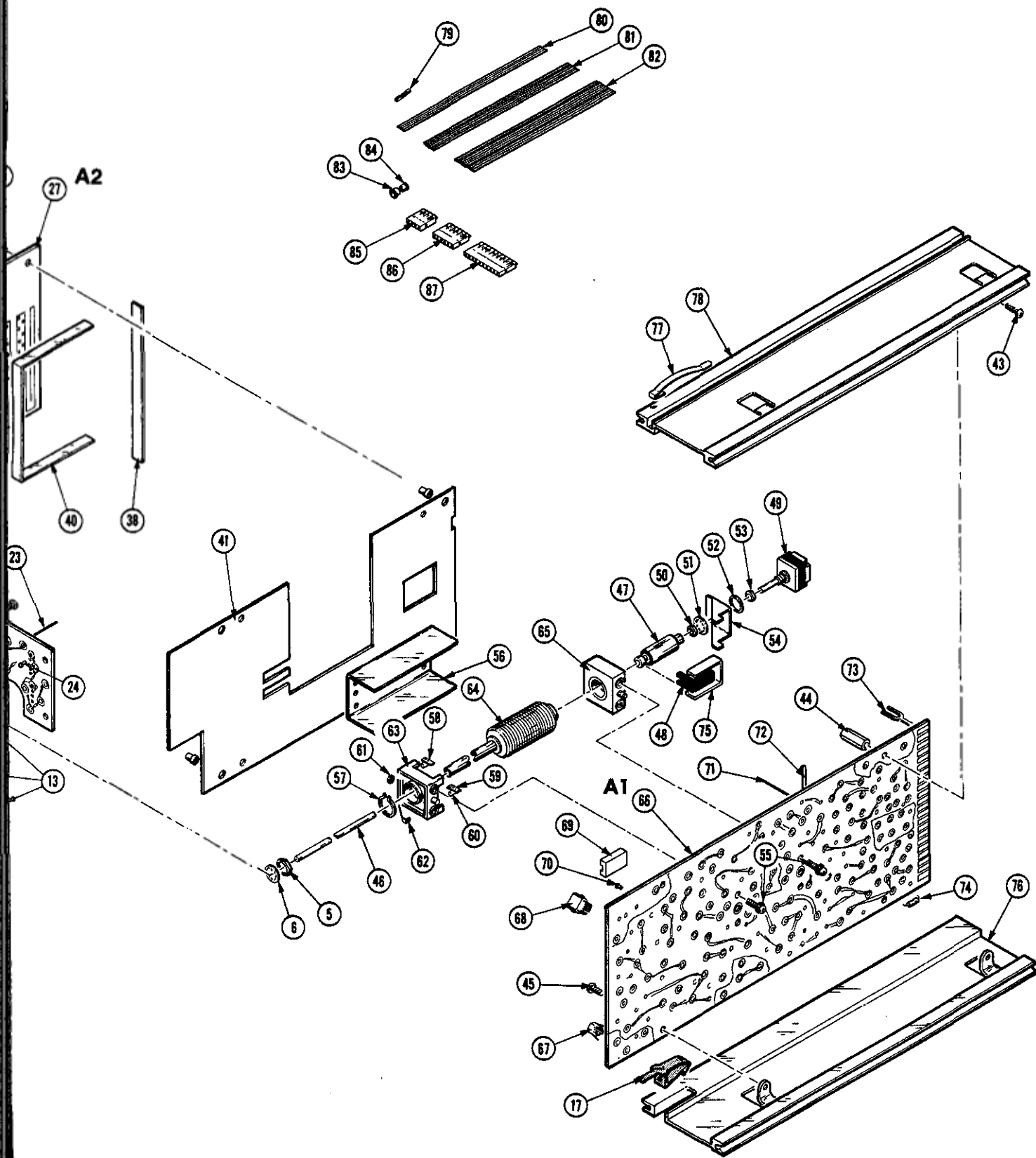


Fig. 1 EXPLODED
Sht. 2 of 2



ACCESSORIES

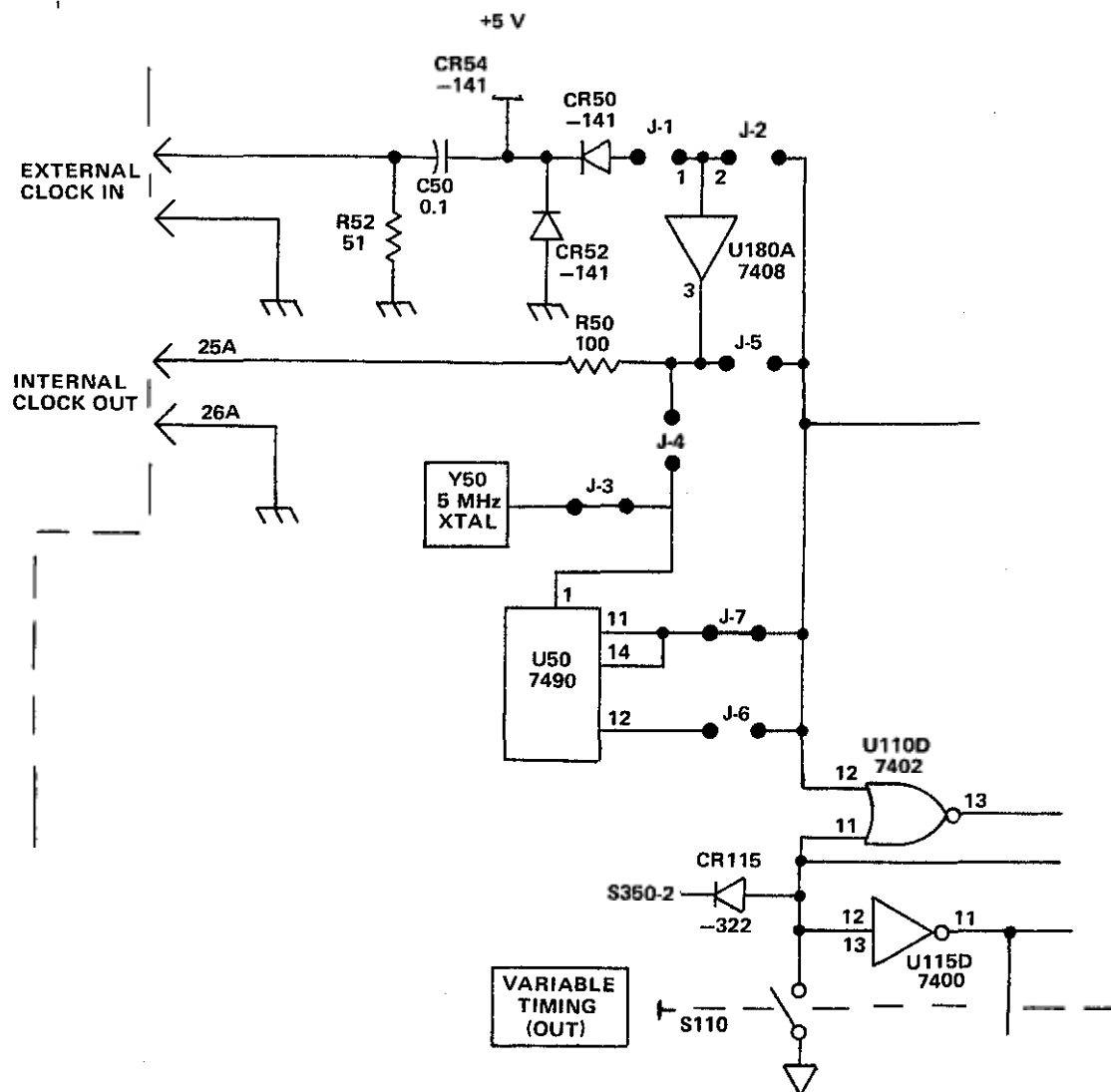
Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	1	2	3	4	5	Name & Description	Mfr Code	Mfr Part Number
	070-1339-00		1						MANUAL, TECH: INSTRUCTION	80009	070-1339-00

OPTION 1

The TG 501 Option 1 is equipped with a temperature-compensated, 5 MHz crystal oscillator for a highly stable and precise internal clock. U50 provides countdown circuitry for the 5 MHz crystal.

Remove U100 and disconnect Pin 3 of U350 before using external clocks. To disconnect Pin 3 remove U350, bend pin 3 out then insert U350 back into circuit board.

The main circuit board jumpers that must be installed for Option 1 are: J3 and J7 (see Fig. 1-2 for jumper location).



REV. JUNE 1974

CALIBRATION TEST EQUIPMENT REPLACEMENT

Calibration Test Equipment Chart

This chart compares TM 500 product performance to that of older Tektronix equipment. Only those characteristics where significant specification differences occur, are listed. In some cases the new instrument may not be a total functional replacement. Additional support instrumentation may be needed or a change in calibration procedure may be necessary.

Comparison of Main Characteristics

DM 501 replaces 7D13		
PG 501 replaces 107	PG 501 - Risetime less than 3.5 ns into 50 Ω .	107 - Risetime less than 3.0 ns into 50 Ω .
108	PG 501 - 5 V output pulse; 3.5 ns Risetime.	108 - 10 V output pulse; 1 ns Risetime.
111	PG 501 - Risetime less than 3.5 ns; 8 ns Pretrigger pulse delay.	111 - Risetime 0.5 ns; 30 to 250 ns Pretrigger Pulse delay.
114	PG 501 - ± 5 V output.	114 - ± 10 V output. Short proof output.
115	PG 501 - Does not have Paired, Burst, Gated, or Delayed pulse mode; ± 5 V dc Offset. Has ± 5 V output.	115 - Paired, Burst, Gated, and Delayed pulse mode; ± 10 V output. Short-proof output.
PG 502 replaces 107		
108	PG 502 - 5 V output	108 - 10 V output.
111	PG 502 - Risetime less than 1 ns; 10 ns Pretrigger pulse delay.	111 - Risetime 0.5 ns; 30 to 250 ns Pretrigger pulse delay.
114	PG 502 - ± 5 V output	114 - ± 10 V output. Short proof output.
115	PG 502 - Does not have Paired, Burst, Gated, Delayed & Undelayed pulse mode; Has ± 5 V output.	115 - Paired, Burst, Gated, Delayed & Undelayed pulse mode; ± 10 V output. Short-proof output.
2101	PG 502 - Does not have Paired or Delayed pulse. Has ± 5 V output.	2101 - Paired and Delayed pulse; 10 V output.
PG 506 replaces 106	PG 506 - Positive-going trigger output signal at least 1 V; High Amplitude output, 60 V.	106 - Positive and Negative-going trigger output signal, 50 ns and 1 V; High Amplitude output, 100 V.
067-0502-01	PG 506 - Does not have chopped feature.	0502-01 - Comparator output can be alternately chopped to a reference voltage.
SG 503 replaces 190, 190A, 190B, 191, 067-0532-01	SG 503 - Amplitude range 5 mV to 5.5 V p-p. SG 503 - Frequency range 250 kHz to 250 MHz. SG 503 - Frequency range 250 kHz to 250 MHz.	190B - Amplitude range 40 mV to 10 V p-p. 191 - Frequency range 350 kHz to 100 MHz. 0532-01 - Frequency range 65 MHz to 500 MHz.
TG 501 replaces 180, 180A	TG 501 - Marker outputs, 5 sec to 1 ns. Sinewave available at 5, 2, and 1 ns. Trigger output - slaved to marker output from 5 sec through 100 ns. One time-mark can be generated at a time.	180A - Marker outputs, 5 sec to 1 μ s. Sinewave available at 20, 10, and 2 ns. Trigger pulses 1, 10, 100 Hz; 1, 10, and 100 kHz. Multiple time-marks can be generated simultaneously.
181	TG 501 - Marker outputs, 5 sec to 1 ns. Sinewave available at 5, 2, and 1 ns.	181 - Marker outputs, 1, 10, 100, 1000, and 10,000 μ s, plus 10 ns sinewave.
184	TG 501 - Marker outputs, 5 sec to 1 ns. Sinewave available at 5, 2, and 1 ns. Trigger output - slaved to marker output from 5 sec through 100 ns. One time-mark can be generated at a time.	184 - Marker outputs, 5 sec to 2 ns. Sinewave available at 50, 20, 10, 5, and 2 ns. Separate trigger pulses of 1 and .1 sec; 10, 1, and .1 ms; 10 and 1 μ s. Marker amplifier provides positive or negative time marks of 25 V min. Marker intervals of 1 and .1 sec; 10, 1, and .1 ms; 10 and 1 μ s.
2901	TG 501 - Marker outputs, 5 sec to 1 ns. Sinewave available at 5, 2, and 1 ns. Trigger output - slaved to marker output from 5 sec through 100 ns. One time-mark can be generated at a time.	2901 - Marker outputs, 5 sec to 0.1 μ s. Sinewave available to 50, 10, and 5 ns. Separate trigger pulses, from 5 sec to 0.1 μ s. Multiple time-marks can be generated simultaneously.

NOTE: All TM 500 generator outputs are short-proof. All TM 500 plug-in instruments require TM 500-Series Power Module.