HEWLETT hp PACKARD

OPERATING AND SERVICE MANUAL

12539C

TIME BASE GENERATOR INTERFACE KIT

(FOR THE 2100 SERIES COMPUTERS)

Printed-Circuit Assembly:

12539-60003, Series 1232, 1315

12539-90008

HEWLETT-PACKARD COMPANY
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GENERAL INFORMATION

SECTION I

1-1. INTRODUCTION.

1-2. This manual provides general information, installation and programming instructions, theory of operation, maintenance instructions, and replaceable parts information for the Hewlett-Packard 12539C Time Base Generator Interface Kit (figure 1-1).

1-3. DESCRIPTION.

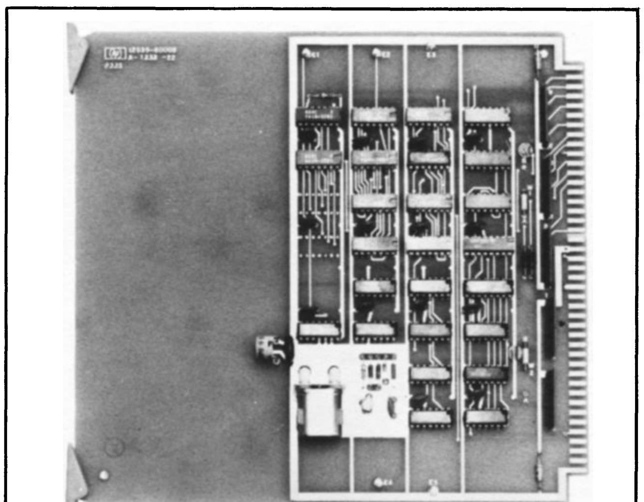
1-4. The HP 12539C Time Base Generator measures real-time intervals in decade steps from 0.1 millisecond to 1000 seconds (16.67 minutes). A three-bit control word transferred to the time base generator by programmed instruction selects the time interval to be measured. The 1-MHz crystal-controlled oscillator used as the frequency standard for the time base generator allows generation of timing signals accurate to within 2 seconds per 24-hour day.

1-5. KIT CONTENTS.

1-6. The time base generator interface kit consists of a time base generator printed-circuit assembly, part no. 12539-60003, and the operating and service manual, part no. 12539-60008.

1-7. IDENTIFICATION.

1-8. This operating and service manual is identified on the title page by interface kit designation and nomenclature, printed-circuit assembly part number and series code, manual part number, and publication date. Refer to the information presented in the following paragraphs and ensure that this manual applies to the equipment being serviced.



2238-1

Figure 1-1. HP 12539C Time Base Generator Interface Kit

1-9. Hewlett-Packard uses five digits and a letter (00000A) for standard interface kit designation. If the designation of your kit does not agree with that on the title page of this manual, there are differences between your kit and the kit described in this manual. The appropriate manual or manual supplement is available at the nearest HP Sales and Service Office listed at the back of this manual.

1-10. Printed-circuit assembly (PCA) revisions are identified by a letter, a series code, and a division code stamped on the board (e.g., A-1232-22). The letter code identifies the version of the etched trace pattern on the unloaded board. The series code (four middle digits) refers to the electrical characteristics of the loaded assembly and the positions of the components. The division code (last two digits) identifies the Hewlett-Packard division which manufactured the PCA. If the series code stamped on the PCA does not agree with the series code shown on the title page of this manual, there are differences between your PCA and the PCA described in this manual. These differences are described in change sheets and manual supplements available at the nearest HP Sales and Service Office.

1-11. SPECIFICATIONS.

1-12. Table 1-1 lists the specifications for the HP 12539C Time Base Generator Interface PCA.

Table 1-1. Time Base Generator Specifications

CHARACTERISTICS	SPECIFICATIONS
Time Base Intervals:	0.1 millisecond
	1 millisecond
	10 milliseconds
	100 milliseconds
	1 second
	10 seconds
	100 seconds
	1000 seconds
Time Base Accuracy:	2 seconds per 24-hour day
Current Requirements from Computer Power Supply:	
−2V	0.016A
+4.85V	0.75A
Logic Levels	
Logic 1 (high):	+2.4 or greater
Logic 0 (low):	+0.4V or less

INSTALLATION AND PROGRAMMING

SECTION II

2-1. INTRODUCTION.

2-2. This section provides information for unpacking and inspection, reshipment, installation, and programming the HP 12539C Time Base Generator Interface Kit.

2-3. UNPACKING AND INSPECTION.

2-4. If the shipping carton is damaged upon receipt, request that the carrier's agent be present when the card is unpacked. Inspect the PCA for damage (cracks, broken components, etc.). If the PCA is damaged and fails to meet specifications, notify the carrier and the nearest HP Sales and Service Office immediately. (Sales and Service Offices are listed at the back of this manual.) Retain the shipping container and the packing material for the carrier's inspection. The HP Sales and Service Office will arrange for repair or replacement of the damaged PCA without waiting for claims against the carrier to be settled.

2-5. RESHIPMENT.

2-6. If an item of the kit is to be shipped to Hewlett-Packard for service or repair, attach a tag to the item identifying the owner and indicating the service or repair to be accomplished. Include the model number of the kit.

2-7. Pack the item in the original factory packing material if available. If the original material is not available, standard factory packing material can be obtained from the nearest Hewlett-Packard Sales and Service Office.

2-8. If standard packing material is not used, wrap the item in Air Cap TH-240 cushioning (manufactured by Sealed Air Corporation, Hawthorn, N.J.) or equivalent and place in a corrugated carton (200 pound test material). Seal the shipping carton securely and mark it "FRAGILE" to ensure careful handling.

Note: In any correspondence, identify the kit by number. Refer any questions to the nearest Hewlett-Packard Sales and Service Office.

2-9. INSTALLATION.

2-10. The time base generator PCA obtains its operating currents from the computer power supply. Before installing the PCA, determine the current requirements of this PCA in combination with all other interface or accessory kits already installed in the computer. The computer system documentation defines the currents available from the computer and describes the procedures for calculating the total power supply current requirements. If the total current requirements exceed the limitations of the computer power supply, a Hewlett-Packard power supply extender unit or input/output extender unit must be used. See table 1-1 for the current requirements of the time base generator PCA.

2-11. After ensuring sufficient power, install the time base generator PCA as follows:

a. Turn power off at the computer.

b. Insert the time base generator PCA in the computer I/O slot corresponding to the desired select code.

c. Turn on power and perform the diagnostic test, manual part no. 12539-90011, to verify proper operation of the time base generator PCA.

d. Check the oscillator output frequency at test point E4 using a Hewlett-Packard 5244L Electronic Counter or equivalent. The frequency should be 1-MHz ± 0.5 Hz. If the frequency is not within tolerance, adjust the frequency according to the oscillator adjustment procedures given in paragraph 4-10.

2-12. PROGRAMMING.

2-13. CONTROL WORD.

2-14. The desired time interval to be measured by the time base generator is selected by transferring a three-bit control word from the computer A- or B-register to the time base generator. Table 2-1 lists the possible control word bit combinations and the time interval selected by each. Note that the time intervals are selected in increments equal to 10^{n-1} milliseconds where n is the decimal equivalent of the three-bit control word. For non-decade time intervals a decade interval must be counted by software to form the desired interval. For example, if a time interval of three milliseconds is desired, a one millisecond interval must be counted by software three times, to obtain the desired interval.

2-15. ERROR CHECK.

2-16. When more than one decade time interval is required for any given timing operation, the time base generator provides a means of ensuring that all selected intervals have been acknowledged by the computer. A status word, transferred from the time base generator to the computer A- or B-register by an LIA or LIB instruction, contains a single significant bit (bit 4). If this bit is a logic 1, at least one time interval has been lost. This status word should be checked by software after each decade time interval.

2-17. Jumper W1 on the PCA can be placed in position B to make bit 5 significant also. In this way, bit 5 can be checked by software to determine if a time interval has been lost.

2-18. SAMPLE PROGRAM.

2-19. Table 2-2 is a sample program demonstrating the operation of the time base generator. Under control of this program, the time base generator will provide a measured time interval of 5 seconds. This is done by counting five 1-second intervals with a software counter. After each 1-second interval, the error status bit is checked to ensure that all of the 1-second intervals are acknowledged by the computer.

Table 2-1. Control Word Combinations and Time Intervals

CONTROL WORD			SELECTED TIME INTERVAL
BIT 2	BIT 1	BIT 0	
0	0	0	0.1 millisecond
0	0	1	1 millisecond
0	1	0	10 milliseconds
0	1	1	100 milliseconds
1	0	0	1 second
1	0	1	10 seconds
1	1	0	100 seconds
1	1	1	1000 seconds
NOTE: Bits 3 through 15 not used.			

Table 2-2. Sample Program

```
                                 ASMB,A,B,L,T
*
*   THIS IS A SAMPLE PROGRAM TO DEMONSTRATE THE OPERATION OF THE
*   TIME BASE GENERATOR. UNDER CONTROL OF THIS PROGRAM, THE TIME
*   BASE GENERATOR WILL PROVIDE A MEASURED INTERVAL OF FIVE SECONDS.
*   THIS REQUIRES THAT FIVE DECADE INTERVALS OF ONE SECOND EACH
*   BE MEASURED AND COUNTED BY SOFTWARE. AFTER EACH DECADE INTERVAL
*   IS MEASURED, THE ERROR STATUS IS CHECKED AND IF AN ERROR IS
*   DETECTED, THE COMPUTER HALTS WITH A T-REGISTER DISPLAY OF
*   102066 OCTAL.
*
    00100                     ORG     100B
*
    00100  000000   START     NOP
    00101  060121             LDA     .5          INITIALIZE COUNTER TO COUNT
    00102  070122             STA     COUNT       FIVE DECADE INTERVALS.
*
*   THIS PART OF THE PROGRAM OPERATES THE TIME BASE GENERATOR.
*
    00103  060123             LDA     CW          GET CONTROL WORD AND TRANSFER
    00104  102615             OTA     TBG         TO TIME BASE GENERATOR.
    00105  102715             STC     TBG         START TIME BASE GENERATOR
    00106  103115   GO        CLF     TBG         ENABLE FLAG LOGIC.
    00107  102315             SFS     TBG         HAS DECADE INTERVAL ELAPSED?
    00110  024107             JMP     *-1         NO. WAIT.
    00111  024112             JMP     STAT        YES. CHECK ERROR STATUS.
*
*   THIS PART OF THE PROGRAM CHECKS ERROR STATUS AND INCREMENTS
*   THE DECADE INTERVAL COUNTER.
*
    00112  102515   STAT      LIA     TBG         GET STATUS WORD FROM TIME BASE
*                                                   GENERATOR
    00113  050124             CPA     ERR         DOES STATUS WORD INDICATE AN ERROR?
    00114  102066             HLT     66B         YES. HALT COMPUTER.
    00115  034122             ISZ     COUNT       NO. INCREMENT COUNTER. IS TIME
*                                                   INTERVAL COMPLETE?
    00116  024106             JMP     GO          NO. START ANOTHER DECADE INTERVAL.
    00117  106715             CLC     TBG         YES. STOP DECADE COUNTERS.
    00120  102077             HLT     77B         HALT COMPUTER.
*
*   CONSTANT AND STORAGE INFORMATION.
*
    00121  177773   .5        DEC     -5
    00122  000000   COUNT     BSS     1
    00123  000004   CW        OCT     4
    00124  000020   ERR       OCT     20
    00015           TBG       EQU     15B
*
                              END     START
**  NO ERRORS*
```

THEORY OF OPERATION

3-1. INTRODUCTION.

3-2. This section provides functional and detailed theory of operation for the HP 12539C Time Base Generator Interface Kit.

3-3. FUNCTIONAL THEORY OF OPERATION.

3-4. Figure 3-1 is a block diagram of the time base generator PCA and a flowchart showing the functional operation of the time base generator PCA. The program instructions shown in the flowchart are the same as those used in the sample program in table 2-2 in section II of this manual.

3-5. Operation of the time base generator begins with the transfer of a three-bit control word from the computer A- or B-register to the time base selection register with an OTA or OTB instruction. The next instruction (STC,C) causes a shaped 100-kHz signal to be gated to the decade divider circuits. This marks the beginning of the time interval.

3-6. An SFS instruction is used to determine if the selected time interval has elapsed. Before the time interval has elapsed, a JMP *-1 instruction is executed followed by the SFS instruction again. This wait loop continues until the selected time interval has elapsed.

3-7. At the end of the selected time interval, the time base generator supplies an SKF signal. The SKF signal causes the computer to skip the JMP *-1 instruction and proceed with the program. The time spent in the wait loop is the time selected by the control word that was initially transferred to the time base generator.

3-8. DETAILED THEORY OF OPERATION.

3-9. Refer to the time base generator logic diagram, figure 4-2, in section IV of this manual while reading the detailed theory of operation discussion.

3-10. For an index of signals on the 86-pin edge of the time base generator PCA, refer to the computer system documentation.

3-11. All logic levels on the time base generator PCA are positive-true. The term "high" refers to a level of approximately +2.4V and "low" refers to approximately +0.4V. These signal levels vary somewhat depending on the integrated circuit package involved.

3-12. POWER-ON LOGIC.

3-13. When power is initially applied to the computer or the computer PRESET switch is pressed, the computer supplies a POPIO and a CRS signal to the time base generator PCA. The POPIO signal sets the Flag Buffer FF and the CRS signal clears the Control FF. An ENF signal at the next computer time T2 is gated with the set-side output of the Flag Buffer FF to set the Flag FF. The low set-side output of the Control FF is applied through U34D to the clear inputs of the decade dividers ensuring that they are initially in the clear state. The low set-side output of the Control FF also inhibits "and" gate U24D to prevent the 100-kHz signal from clocking the decade dividers. Also, the first ENF signal clears the IRQ FF. Because the output of the eight-to-one multiplexer circuit is low, the Time Flag FF clears when the first SIR signal is received at computer time T5.

3-14. TIME STANDARD LOGIC.

3-15. The basic component of the time standard logic is a 1-MHz crystal oscillator accurate to 20 ppm (parts per million). The 1-MHz signal is applied to decade divider U75 to obtain a 100-kHz signal. "And" gate U24D allows the control logic to control the application of this 100-kHz signal to the decade dividers as described in paragraph 3-24.

3-16. The gated 100-kHz signal is applied to the first of the eight decade dividers. The decade dividers are wired externally to operate as binary coded decimal counters with a count added each time the input signal (pin 14) swings low. The output signal (pin 11) swings high on the eighth count then low on the tenth count. The low swing adds one count to the next divider stage. The output signals from each of the decade dividers are applied to the time base selection logic.

3-17. TIME BASE SELECTION LOGIC.

3-18. The time base selection logic consists of three Time Base Selection FF's (BIT 0-3 FF's) and an eight-to-one multiplexer circuit.

3-19. The desired time interval to be measured by the time base generator PCA is encoded into a three-bit control word. This control word is transferred from the computer A- or B-register to the Time Base Selection FF's by an OTA or OTB instruction with the select code of the time base generator. Either of these instructions supply high SCM, SCL, IOG, and IOO signals and the three-bit control word (IOBO 0, IOBO 1, and IOBO 2) to the time base generator.

3-20. When the IOO signal goes high at computer time T3, the three-bit control word is stored in the Time Base Selection FF's. The IOO signal also clears all nine decade dividers and the Control FF at this time.

3-21. The outputs of the Time Base Selection FF's control the eight-to-one multiplexer circuit. This circuit decodes the control word so that one of the eight decade dividers is selected as the time base (for time interval).

3-22. CONTROL LOGIC.

3-23. After the control word has been loaded into the Time Base Selection FF's, the time base generator is ready to begin measuring the time period. An STC,C instruction with the select code of the time base generator marks the beginning of the time period. As a result of this instruction, the time base generator PCA receives high IOG, SCM, SCL, STC, and CLF signals from the computer.

3-24. The STC signal sets the Control FF. The high set-side output of the Control FF gates the 100-kHz signal to the decade dividers and provides one of the enabling signals to the time flag gate (U36C).

3-25. The CLF signal clears the Flag Buffer and Flag FF's. The high clear-side output of the Flag FF provides another enabling signal to the time flag gate. (Because the clear-side output of the Time Flag FF is also high, the output of the time flag gate goes high at this time. However, this has no effect since the CLF signal provides an overriding clear signal to the Flag Buffer FF.) The decade dividers are now counting the 100-kHz signal and continue to count until the selected time interval has elapsed.

3-26. FLAG LOGIC.

3-27. The flag logic monitors the output of the eight-to-one multiplexer circuit for a signal indicating the end of the desired time interval.

3-28. For discussion purposes, assume that the control word specifies a time interval of one second. In this instance, the eight-to-one multiplexer selects the U86 decade divider as the time base. When the decade dividers have counted 0.8 second, the output of divider U86 goes high (paragraph 3-16). This signal is gated through the eight-to-one multiplexer circuit to the set input of the Time Flag FF. At the next computer time T5 (SIR), the Time Flag FF sets causing the output of the time flag gate to go low. At the count of one second, the output of divider U86 goes low. The Time Flag FF clears at the next SIR signal causing the output of the time flag gate to go high, setting the Flag Buffer FF. At the next computer time T2 (ENF), the Flag FF sets.

3-29. When the Flag FF is in the set state, the time base generator PCA generates an SRQ signal and, if programmed to do so, generates FLG and IRQ signals or an SKF signal. These signals indicate to the computer that the requested time interval has ended. The following paragraphs describe how these signals are generated and how they are used by the computer.

3-30. SKIP-ON-FLAG SIGNAL. If the computer is programmed to wait for the Flag FF to be set (SFS instruction followed by a JMP *-1 instruction for example), the resulting SFS signal gated with the set side of the Flag FF generates an SKF signal. This causes the computer to skip the next programmed instruction (JMP *-1) and proceed with the program. Figure 3-2 illustrates the generation of an SKF signal by the time base generator PCA. Notice that SKF signal can also be generated when the Flag FF is in the clear state by programming a SFC instruction. Either way, the state of the Flag FF is being tested and the computer must be programmed to respond accordingly.

3-31. INTERRUPT SIGNALS. If the computer interrupt system has been enabled by an STF 00 instruction, the time base generator can be used to generate timed interrupts. Figure 3-3 illustrates the functions involved in an interrupt operation. To interrupt the main program at the end of a measured time interval, the following conditions must be met at the time base generator PCA:

a. Control FF set (paragraph 3-24).

b. Flag Buffer FF set (paragraph 3-28).

c. Flag FF set (paragraph 3-28).

d. IEN signal high (interrupt system enabled).

e. PRH signal high (no higher priority interrupts).

3-32. When all of these conditions are established, an SIR signal at time T5 sets the IRQ FF which generates true FLG and IRQ signals. These signals are used by the computer I/O control and addressing circuits to generate an interrupt signal.

3-33. At time T2 following the interrupt, an ENF signal clears the IRQ FF. An SIR signal again sets the IRQ FF if the PRH signal is still high at time T5. The FLG and IRQ signals this time are used by the computer I/O control and addressing circuits to encode the interrupt address.

3-34. The next machine cycle will be under control of the instruction located at the interrupt address in memory. During this machine cycle, an IAK signal at time T6 clears the Flag Buffer FF and an ENF signal at time T2 clears the IRQ FF. The Flag FF remains set to inhibit lower priority interrupts by providing a low PRL signal.

3-35. At this point, the computer normally enters an interrupt subroutine. A CLC instruction is required at the beginning of the subroutine to disable the decade dividers and prevent the Error FF (paragraph 3-37) from being set. Also, just before leaving the subroutine, a CLF instruction is required to enable lower priority interrupts.

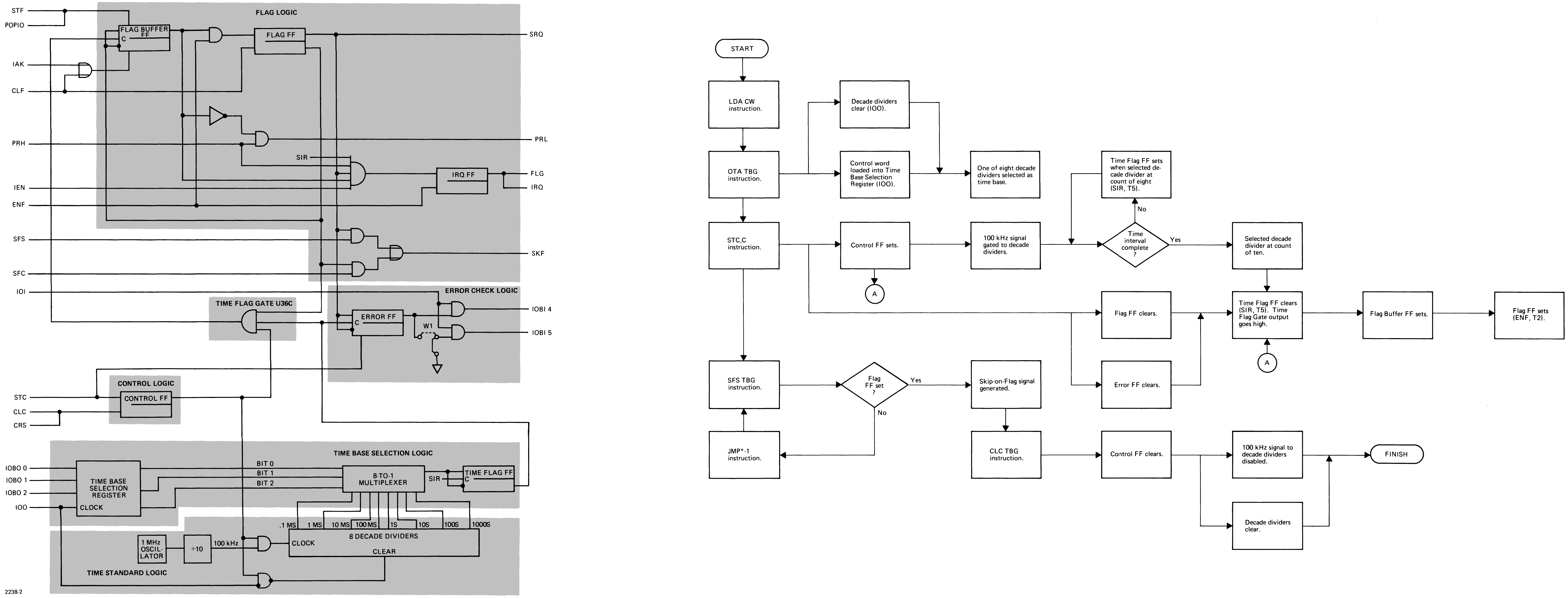


Figure 3-1. Time Base Generator Simplified Logic Diagram and Functional Operation Flowchart

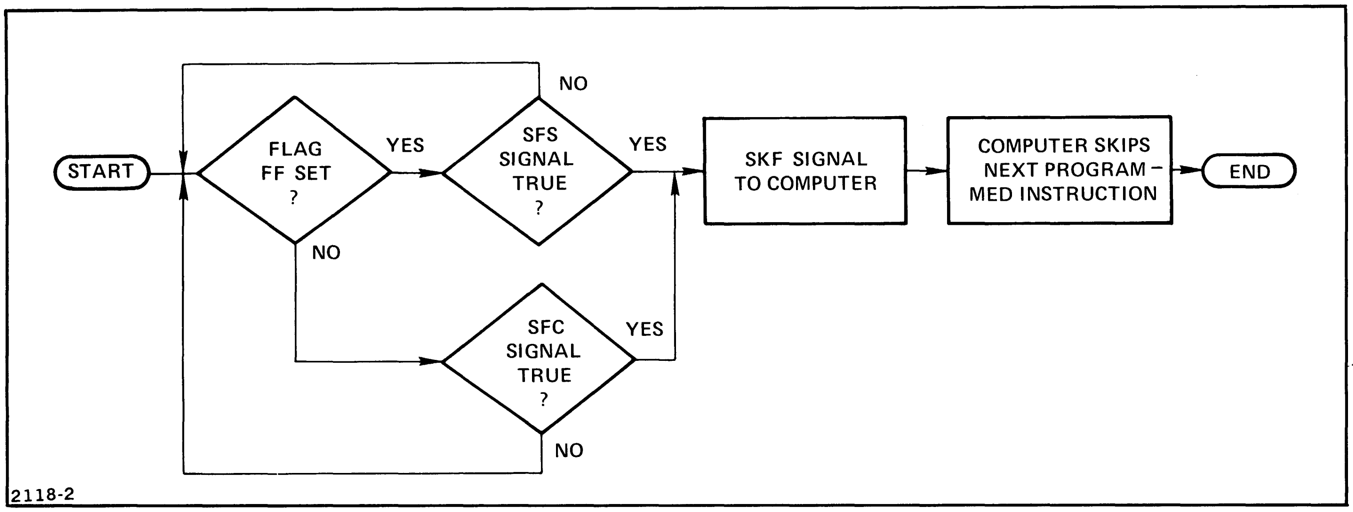


Figure 3-2. Skip-On-Flag Signal Generation Flowchart

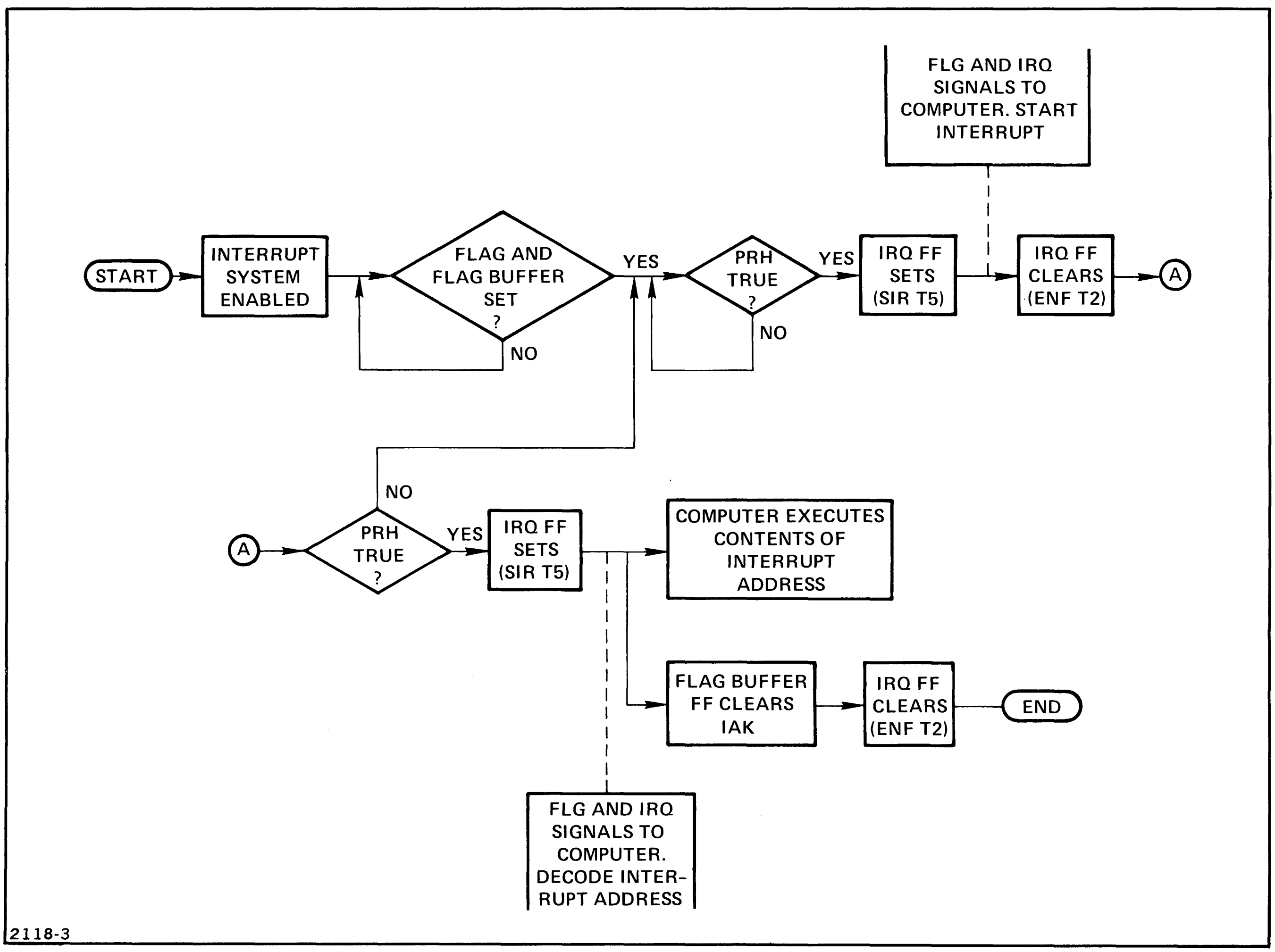


Figure 3-3. Interrupt Operation Flowchart

3-36. ERROR CHECK LOGIC.

3-37. The Error FF monitors the set-side output of the Flag FF and is clocked by the clear-side output of the Time Base FF. If the Flag FF is set (indicating that the desired time interval has elapsed) and the selected divider output goes low a second time (causing the Time Flag FF to clear), the Error FF sets.

3-38. The state (set or cleared) of the Error FF is read onto the IOBI 4 line (and the IOBI 5 line if selected by jumper W1) and loaded into the computer A- or B-register by an LIA or LIB instruction addressed to the time base generator. Bit 4 (or 5) of the A- or B-register can then be checked by software for a possible error condition.

MAINTENANCE SECTION IV

4-1. INTRODUCTION.

4-2. This section provides maintenance information for the HP 12539C Time Base Generator Interface Kit. Included are preventive maintenance instructions, troubleshooting instructions, and maintenance data consisting of integrated circuit pin connections (figure 4-1), a time base generator PCA replaceable parts list (table 4-1), and a time base generator PCA parts location and logic diagram (figure 4-2).

4-3. PREVENTIVE MAINTENANCE.

4-4. Incorporate preventive maintenance for the time base generator with the preventive maintenance routines for the computer system. Inspect the time base generator PCA for cracked, broken, or burned components, insulation, and connections.

4-5. TROUBLESHOOTING.

4-6. Most malfunctions on the time base generator PCA can be traced by performing the diagnostic test, manual part no. 12539-90011, and analyzing error halts as they occur. Use the maintenance data contained in this section to isolate malfunctions to the component level.

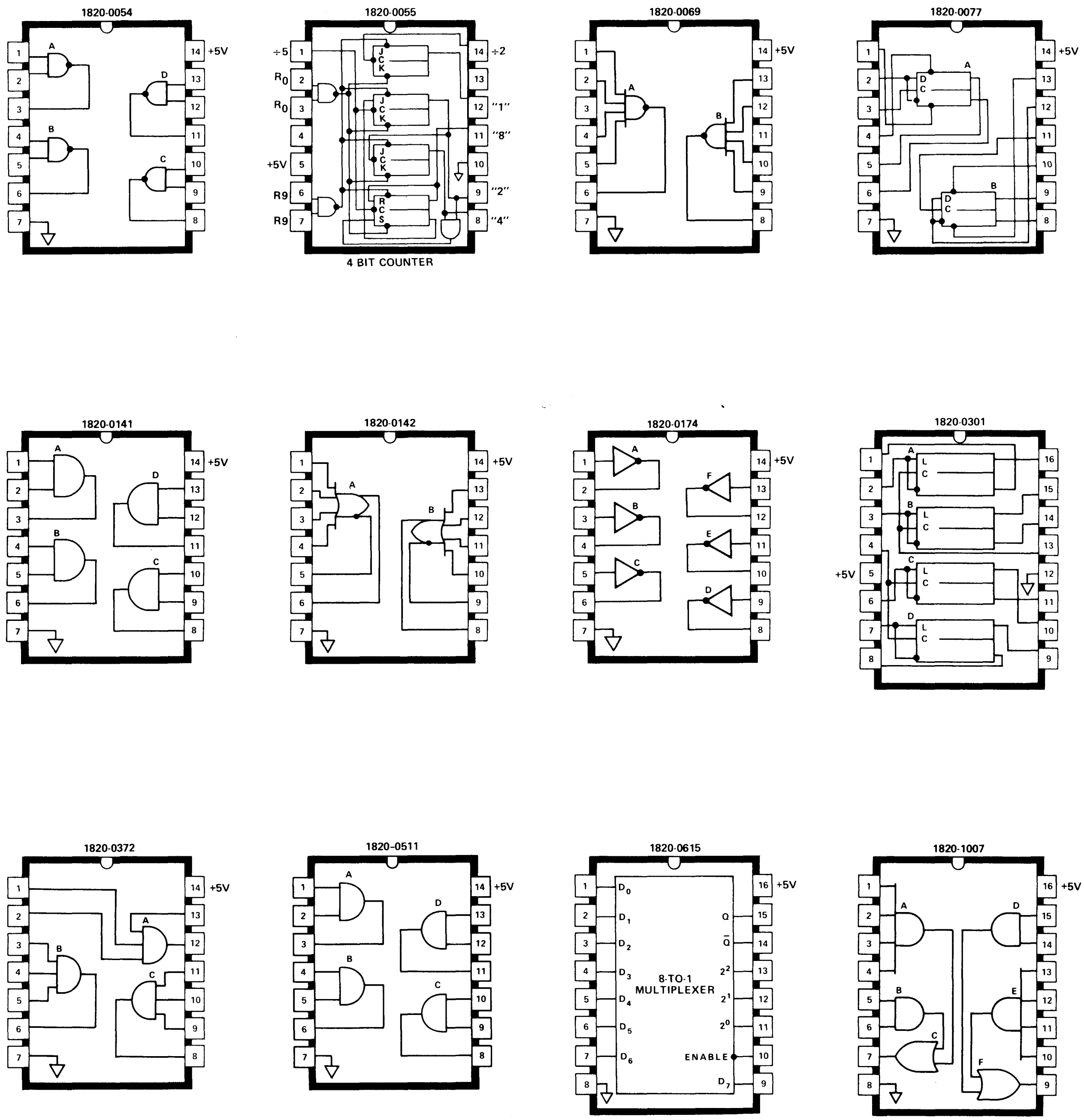
4-7. To facilitate testing the decade dividers, jumper W2 can be moved to position B. This reduces the time interval required to operate the last four divider circuits. With jumper W2 in position B, the decade dividers for 0.1 millisecond (U77), 1 millisecond (U87), 10 milliseconds (U97), and 100 milliseconds (U96) operate normally. However, with jumper W2 in position B, the last four decade dividers operate at 1 millisecond (U86), 10 milliseconds (U76), 100 milliseconds (U66), and 1 second (U65).

Note: If jumper W2 is moved to position B, be sure to return jumper W2 to position A when testing is completed.

4-8. If crystal Y1 is replaced, check the oscillator output frequency at test point E4 using a Hewlett-Packard 5244L Electronic Counter or equivalent. The frequency should be 1-MHz ± 0.5 Hz. If the frequency is not within tolerance, adjust the frequency according to the oscillator adjustment procedures given in paragraph 4-10.

4-9. OSCILLATOR ADJUSTMENT.

4-10. Using a Hewlett-Packard 5244L Electronic Counter or equivalent frequency measuring device, observe the oscillator output frequency at test point E4. Adjust capacitor C19 to obtain an output frequency of 1-MHz ±0.5 Hz.



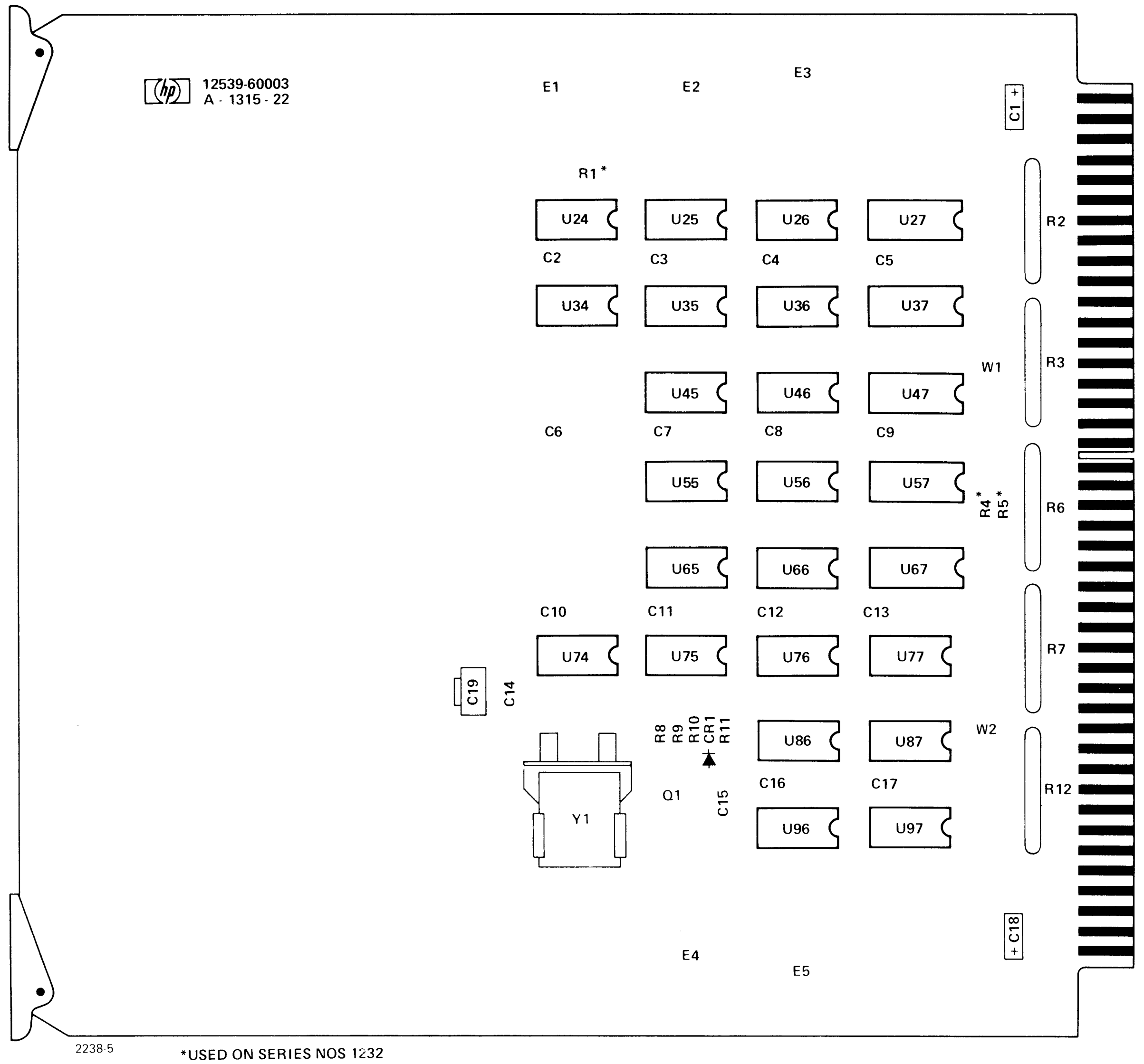
1820-0615: Data on one of the 8 input lines is transferred to the output line when the ENABLE line goes false. The specific input line to be transferred is determined by the three select lines.

Figure 4-1. Integrated Circuit Pin Connections

Table 4-1. Time Base Generator PCA Replaceable Parts

REFERENCE DESIGNATION	HP PART NO.	DESCRIPTION	MFR CODE	MFR PART NO.
	12539-60003	TIME BASE GENERATOR PCA	28480	12539-60003
C1, 18	0180-0197	CAPACITOR, fxd, elect, 2.2 μF, 10%, 20 Vdcw	56289	150D225X9020A2-DYS
C2 thru C13, C15 thru C17	0160-2055	CAPACITOR, fxd, cer, 0.01 μF, +80 -20%, 100 Vdcw	56289	C023F101F103ZS22-CD
C14	0160-2198	CAPACITOR, fxd, mica, 20 pF, 5%	72136	RDM15C200J3C
C19	0121-0036	CAPACITOR, var, cer, 5.5-18 pF	28480	0121-0036
CR1	1901-0040	DIODE, Si, 30 mA, 30WV	07263	FDG1088
Q1	1850-0158	TRANSISTOR, Ge, PNP	80131	2N2635
R1*	0757-0416	RESISTOR, fxd, flm, 511 ohms, 1%, 1/8W	28480	0757-0416
R2, 3, 6	1810-0020	RESISTOR NETWORK, flm (7 resistor)	28480	1810-0020
R4, 5*	0757-0420	RESISTOR, fxd, flm, 750 ohms, 1%, 1/8W	28480	0757-0420
R7, 12	1810-0030	RESISTOR NETWORK, flm (7 resistor 1k, 5%, 0.15W each)	28480	1810-0030
R8	0698-3444	RESISTOR, fxd, flm, 316 ohms, 1%, 1/8W	28480	0698-3444
R9	0757-0280	RESISTOR, fxd, flm, 1k, 1%, 1/8W	28480	0757-0280
R10	0698-3440	RESISTOR, fxd, flm, 196 ohms, 1%, 1/8W	28480	0698-3440
R11	0698-3441	RESISTOR, fxd, flm, 215 ohms, 1%, 1/8W	28480	0698-3441
U24	1820-0141	INTEGRATED CIRCUIT, TTL	04713	MC3001P
U25, 46	1820-0077	INTEGRATED CIRCUIT, TTL	01295	SN7474N
U26, 34, 35	1820-0054	INTEGRATED CIRCUIT, TTL	01295	SN7400N
U27, 37, 47	1820-1007	INTEGRATED CIRCUIT	28480	1820-1007
U36	1820-0372	INTEGRATED CIRCUIT	28480	1820-0372
U45	1820-0069	INTEGRATED CIRCUIT, TTL	01295	SN7420N
U55	1820-0174	INTEGRATED CIRCUIT, TTL	01295	SN7404N
U56	1820-0511	INTEGRATED CIRCUIT, TTL	01295	SN7408N
U57	1820-0301	INTEGRATED CIRCUIT, TTL	01295	SN7475N
U65, 66, U75 thru U77, 86, 87, 96, 97,	1820-0055	INTEGRATED CIRCUIT, TTL	01295	SN7490N
U67	1820-0615	INTEGRATED CIRCUIT, TTL	28480	1820-0615
U74	1820-0142	INTEGRATED CIRCUIT	04713	MC1004P
W1, 2	8159-0005	JUMPER, wire	28480	8159-0005
Y1	0410-0478	CRYSTAL, quartz, 1.0 MHz, 32 pF	28480	0410-0478

*Used on series no. 1232.



*USED ON SERIES NOS 1232

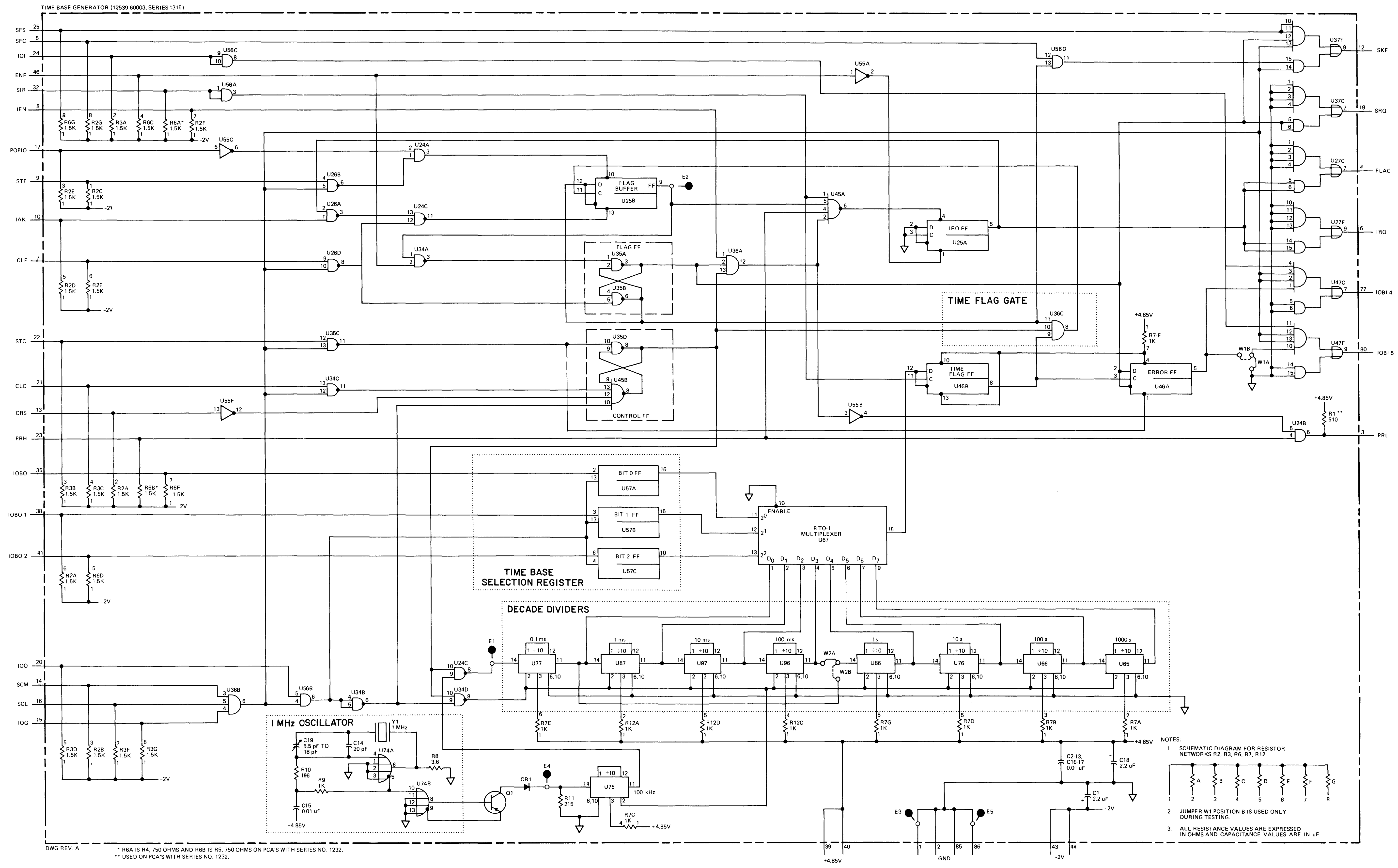


Figure 4-2. Time Base Generator PCA Parts Location and Logic Diagrams

REPLACEABLE PARTS

5-1. INTRODUCTION.

5-2. This section provides information for ordering replacement parts for the HP 12539C Time Base Generator Interface Kit. Table 5-1 is a numerical listing of all replaceable parts in the interface kit.

5-3. A time base generator PCA replaceable parts list (table 4-1) and a parts location diagram (figure 4-2) are provided in section IV of this manual.

5-4. Tables 4-1 and 5-1 list the following information for each replaceable part:

a. Reference designation of the part (table 4-1 only). (Refer to table 5-3 for an explanation of the designations used in the REFERENCE DESIGNATION column.)

b. Hewlett-Packard part number.

c. Description of the part. (Refer to table 5-3 for an explanation of the abbreviations used in the DESCRIPTION column.)

d. A five digit code that corresponds to the manufacturer of the part. (Refer to table 5-2 for the code list of manufacturers.)

e. Manufacturers part number.

f. Total quantity (TQ) of each part used in the kit or assembly (table 5-1 only).

5-5. ORDERING INFORMATION.

5-6. To order replacement parts, address the order or inquiry to the nearest Hewlett-Packard Sales and Service Office. Refer to the list at the back of this manual for addresses. Specify the following information for each part ordered:

a. Identification of the kit or assembly containing the part (refer to paragraphs 1-8 through 1-10).

b. Hewlett-Packard part number for each part.

c. Description of each part.

d. Circuit reference designation for each part (if applicable).

Table 5-1. Numerical List of Replaceable Parts

HP PART NO.	DESCRIPTION	MFR CODE	MFR PART NO.	TQ
0121-0036	CAPACITOR, var, cer, 5.5-18 pF	28480	0121-0036	1
0160-2055	CAPACITOR, fxd, cer, 0.01 μF, +80 -20%, 100 Vdcw	56289	C023F101F103ZS22-CD	15
0160-2198	CAPACITOR, fxd, mica, 20 pF, 5%	72136	RDM15C200J3C	1
0180-0197	CAPACITOR, fxd, elect, 2.2 μF, 10%, 20 Vdcw	56289	150D225X9020A2-DYS	2
0410-0478	CRYSTAL, quartz, 1.0 MHz, 32 pF	28480	0410-0478	1
0698-3440	RESISTOR, fxd, flm, 196 ohms, 1%, 1/8W	28480	0698-3440	1
0698-3441	RESISTOR, fxd, flm, 215 ohms, 1%, 1/8W	28480	0698-3441	1
0698-3444	RESISTOR, fxd, flm, 316 ohms, 1%, 1/8W	28480	0698-3444	1
0757-0280	RESISTOR, fxd, flm, 1k, 1%, 1/8W	28480	0757-0280	1
0757-0416	RESISTOR, fxd, flm, 511 ohms, 1%, 1/8W	28480	0757-0416	1
0757-0420	RESISTOR, fxd, flm, 750 ohms, 1%, 1/8W	28480	0757-0420	2
1810-0020	RESISTOR NETWORK, flm (7 resistor)	28480	1810-0020	3
1810-0030	RESISTOR NETWORK, flm (7 resistor 1k, 5%, 0.15W each)	28480	1810-0030	2
1820-0054	INTEGRATED CIRCUIT, TTL	01295	SN7400N	3
1820-0055	INTEGRATED CIRCUIT, TTL	01295	SN7490N	9
1820-0069	INTEGRATED CIRCUIT, TTL	01295	SN7420N	1
1820-0077	INTEGRATED CIRCUIT, TTL	01295	SN7474N	2
1820-0141	INTEGRATED CIRCUIT, TTL	04713	MC3001P	1
1820-0142	INTEGRATED CIRCUIT	04713	MC1004P	1
1820-0174	INTEGRATED CIRCUIT, TTL	01295	SN7404N	1
1820-0301	INTEGRATED CIRCUIT, TTL	01295	SN7475N	1
1820-0372	INTEGRATED CIRCUIT, TTL	28480	1820-0372	1
1820-0511	INTEGRATED CIRCUIT, TTL	01295	SN7408N	1
1820-0615	INTEGRATED CIRCUIT, TTL	28480	1820-0615	1
1820-1007	INTEGRATED CIRCUIT	28480	1820-1007	3
1850-0158	TRANSISTOR, Ge, PNP	80131	2N2635	1
1901-0040	DIODE, Si, 30 mA, 30 WV	07263	FDG1088	1
8159-0005	JUMPER, wire	28480	8159-0005	2
5040-6001	EXTRACTOR, PC	28480	5040-6001	2
12539-60003	TIME BASE GENERATOR	28480	12539-60003	1
12539-90008	OPERATING AND SERVICE MANUAL	28480	12539-90008	1

Table 5-2. Code list of Manufacturers

The following code numbers are from the Federal Supply Code for Manufacturers Cataloging Handbooks H4-1 and H4-2, and the latest supplements.

Code No.	Manufacturer	Address	Code No.	Manufacturer	Address
01295	Texas Instruments, Inc., Transistor Products Div.	Dallas, Texas	28480	Hewlett-Packard Co.	Palo Alto, Cal.
04713	Motorola, Inc., Semiconductor Prod. Div.	Phoenix, Arizona	56289	Sprague Electric Co.	North Adams, Mass.
07263	Fairchild Camera & Instr. Corp., Semiconductor Div.	Mountain View, Cal.	72136	Electro Motive Mfg. Co., Inc.	Willimantic, Conn.
			80131	Electronic Industries Association. Any brand part meeting EIA Standards	Washington, D.C.

Table 5-3. Reference Designations and Abbreviations

REFERENCE DESIGNATIONS

A	= assembly
B	= motor, synchro
BT	= battery
C	= capacitor
CB	= circuit breaker
CR	= diode
DL	= delay line
DS	= indicator
E	= Misc electrical parts
F	= fuse
FL	= filter
J	= receptacle connector
K	= relay
L	= inductor
M	= meter
P	= plug connector
Q	= semiconductor device other than diode or integrated circuit
R	= resistor
RT	= thermistor
S	= switch
T	= transformer
TB	= terminal board
TP	= test point
U	= integrated circuit, non-repairable assembly
V	= vacuum tube, photocell, etc.
VR	= voltage regulator
W	= jumper wire
X	= socket
Y	= crystal
Z	= tuned cavity, network

ABBREVIATIONS

A	= amperes
ac	= alternating current
Ag	= silver
Al	= aluminum
ar	= as required
adj	= adjust
assy	= assembly
b	= base
bp	= bandpass
bpi	= bits per inch
blk	= black
blu	= blue
brn	= brown
brs	= brass
Btu	= British thermal unit
Be Cu	= beryllium copper
cpi	= characters per inch
coll	= collector
cw	= clockwise
ccw	= counterclockwise
cer	= ceramic
com	= common
crt	= cathode-ray tube
CTL	= complementary-transistor logic
cath	= cathode
Cd pl	= cadmium plate
comp	= composition
conn	= connector
compl	= complete
dc	= direct current
dr	= drive
DTL	= diode-transistor logic
depc	= deposited carbon
dpdt	= double-pole, double-throw
dpst	= double-pole, single-throw
em	= emitter
ECL	= emitter-coupled logic
ext	= external
encap	= encapsulated
elctlt	= electrolytic
F	= farads
FF	= flip-flop
flh	= flat head
flm	= film
fxd	= fixed
filh	= fillister head
G	= giga (10^9)
Ge	= germanium
gl	= glass
gnd	= ground(ed)
gra	= gray
grn	= green
H	= henries
Hg	= mercury
hr	= hour(s)
Hz	= hertz
hdw	= hardware
hex	= hexagon, hexagonal
ID	= inside diameter
IF	= intermediate frequency
in.	= inch, inches
I/O	= input/output
int	= internal
incl	= include(s)
insul	= insulation, insulated
impgrg	= impregnated
incand	= incandescent
ips	= inches per second
k	= kilo (10^3), kilohm
lp	= low pass
m	= milli (10^{-3})
M	= mega (10^6), megohm
My	= Mylar
mfr	= manufacturer
mom	= momentary
mtg	= mounting
misc	= miscellaneous
met. ox.	= metal oxide
mintr	= miniature
n	= nano (10^{-9})
nc	= normally closed or no connection
Ne	= neon
no.	= number
n.o.	= normally open
np	= nickel plated
NPN	= negative-positive-negative
NPO	= negative-positive zero (zero temperature coefficient)
NSR	= not separately replaceable
NRFR	= not recommended for field replacement
OD	= outside diameter
OBD	= order by description
orn	= orange
ovh	= oval head
oxd	= oxide
p	= pico (10^{-12})
PC	= printed circuit
PCA	= printed-circuit assembly
PWB	= printed-wiring board
phh	= phillips head
pk	= peak
p-p	= peak-to-peak
pt	= point
prv	= peak inverse voltage
PNP	= positive-negative-positive
pwv	= peak working voltage
porc	= porcelain
posn	= position(s)
pozi	= pozidrive
rf	= radio frequency
rdh	= round head
rms	= root-mean-square
rwv	= reverse working voltage
rect	= rectifier
r/min	= revolutions per minute
RTL	= resistor-transistor logic
s	= second
SB, TT	= slow blow
Se	= selenium
Si	= silicon
scr	= silicon controlled rectifier
sst	= stainless steel
stl	= steel
spcl	= special
spdt	= single-pole, double-throw
spst	= single-pole, single-throw
Ta	= tantalum
td	= time delay
Ti	= titanium
tgl	= toggle
thd	= thread
tol	= tolerance
TTL	= transistor transistor logic
U(μ)	= micro (10^{-6})
V	= volt(s)
var	= variable
vio	= violet
Vdcw	= direct current working volts
W	= watts
ww	= wirewound
wht	= white
WIV	= working inverse voltage
yel	= yellow

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The Hewlett-Packard Company certifies that this instrument was thoroughly tested and inspected and found to meet its published specifications when it was shipped from the factory. The Hewlett-Packard Company further certifies that its calibration measurements are traceable to the U.S. National Bureau of Standards to the extent allowed by the Bureau's calibration facility.

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