OPERATING AND SERVICE MANUAL

OPERATION AND MAINTENANCE MANUAL

MODEL 2114B
COMPUTER

VOLUME TWO

HEWLETT hp PACKARD

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SERIALS PREFIXED: 942-

NOTE

This manual applies directly to Hewlett-Packard Model 2114B Computers having serial prefix 942-. Production or manual changes affecting this and subsequent prefix numbers will be documented in updating or backdating supplements. To order additional copies of this manual, refer to Part Number 02114-90399.

HEWLETT-PACKARD COMPANY
11000 WOLFE ROAD, CUPERTINO, CALIFORNIA, U.S.A.

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APPENDIX B

SECTION I

GENERAL INFORMATION

1-1. INTRODUCTION.

1-2. Volume Two is the second in a series of three publications that document the Hewlett-Packard Model 2114B Computer (Figure 1-1). This volume contains detailed descriptions, instructions, and diagrams applicable to installation, maintenance, troubleshooting, and repair. Unless otherwise noted, or to the extent specified in future updating or backdating supplements, this publication is applicable to HP 2114B Computers having serial number prefix 930- and subsequent.

1-3. The information in Volume Two is intended for users who have been trained in, or are familiar with, the operation and maintenance of this or similar Computers in the Hewlett-Packard line. A thorough understanding of the information presented in the Specifications and Basic Operation manual, Volume One in this series of publications, is essential to using and understanding the instructions presented.

1-4. The purpose of Volume Two is twofold: first it provides general information, installation instructions, and overall maintenance data for the Computer and its accessory items; second it provides testing, troubleshooting, and repair instructions for major functional areas within the Computer (see Figure 1-2). These are the Central Processor, the Memory System, the Timing System, the Control Display System, and the Power Supply. The Input/Output System is documented separately in the Input/Output System Operation manual, Volume Three in this series of publications. Computer options are documented in separate manuals that supplement the information given in Volume Two and Three, as applicable.

1-5. The Sections and Appendixes of Volume Two contain the following information:

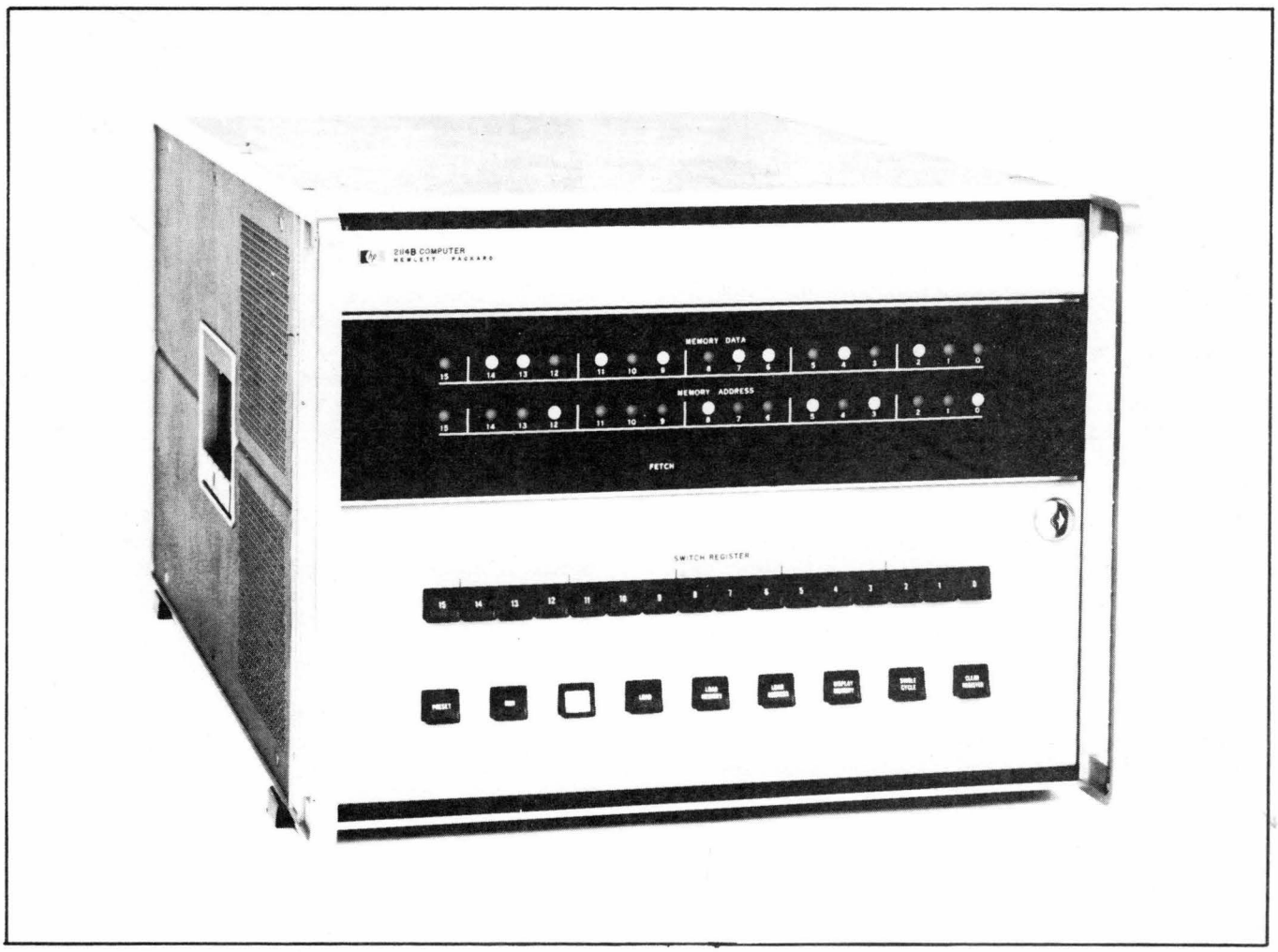


Figure 1-1. Hewlett-Packard Model 2114B Computer

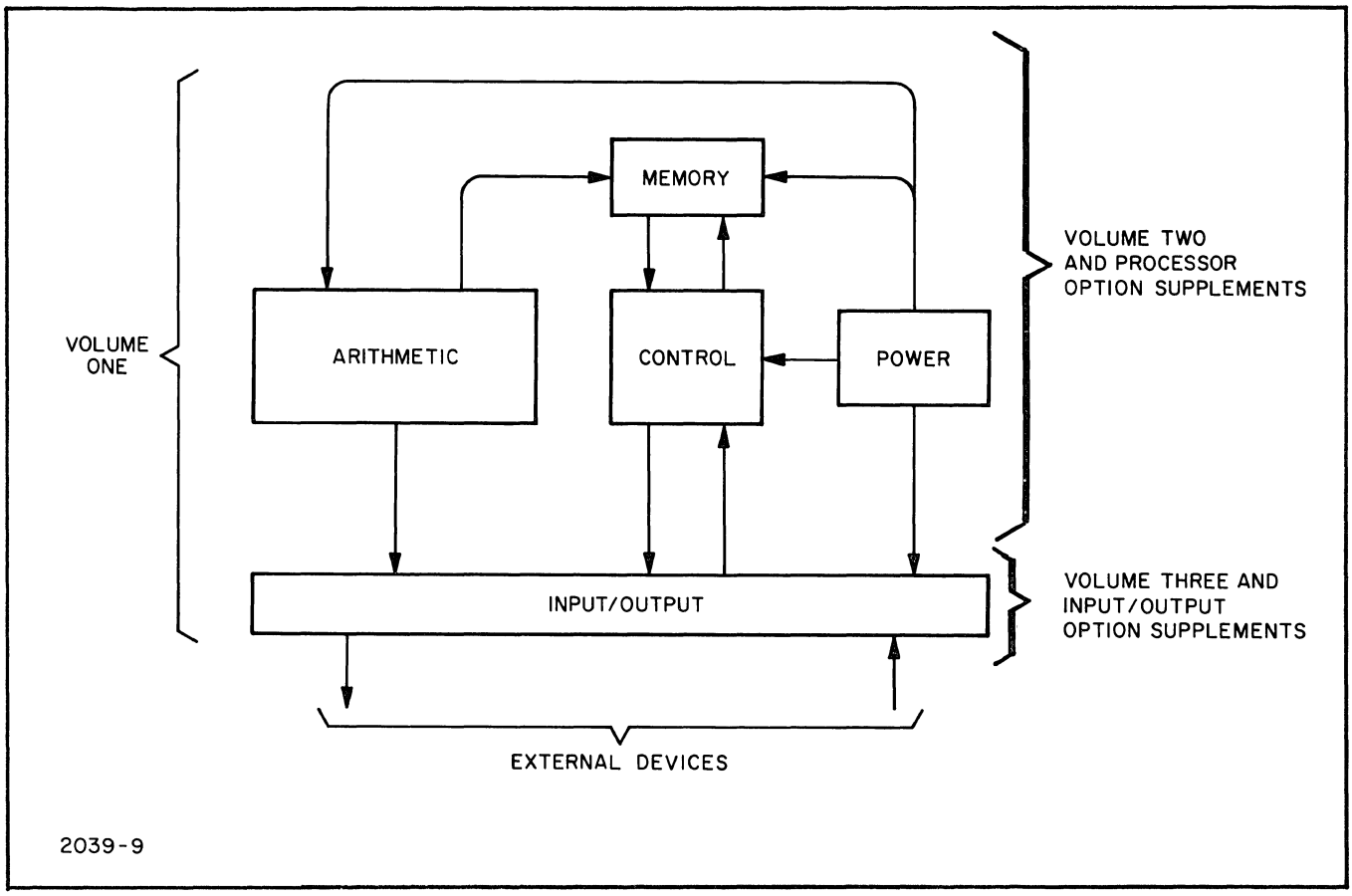


Figure 1-2. Simplified Block Diagram Showing Major Functions of the 2114B Computer

a. Section I, General Information: Section I contains information for users requiring an overall knowledge of the physical and functional makeup of the Computer. Included are a general description, a brief functional description, and a list of recommended test equipment and tools for maintenance, troubleshooting, and repair.

b. Section II, Installation: Section II contains unpacking and handling procedures, primary power data, inspection and test procedures, and other information required during installation of the Computer.

c. Section III, Theory of Operation: Section III describes the principles of operation of the Control, Arithmetic, Memory, and Input/Output functions and the Power Supply.

d. Section IV, Maintenance: Section IV contains special servicing information, preventive maintenance schedules and procedures, and adjustment procedures.

e. Section V, Diagnostics: Section V contains step-by-step procedures for checking the operation of the Computer. Instructions for using the test tapes are included. The results of these tests form the basis of troubleshooting procedures. Listings of the diagnostic tests are provided.

f. Section VI, Maintenance Documentation: Maintenance data consists of schematic diagrams, part location diagrams, wiring data, logic equations, parts descriptions, signal indexes, and other essential data required during testing, troubleshooting, maintenance and repair.

g. Section **VII, Replaceable Parts: Section VII** contains a list of replaceable parts together with the manufacturer, manufacturers part number, and total quantity listings for each part.

h. Appendix A: Appendix A provides diagrams and data for microcircuit packs, integrated circuits, and other modular components used within the Computer.

1-6. GENERAL DESCRIPTION.

1-7. COMPUTER ASSEMBLIES.

1-8. The major assemblies that make up the Computer are shown in Figure 1-3. Important features are listed in Table 1-1, and described in Paragraphs 1-9 through 1-13.

1-9. **PLUG-IN CARDS. Assemblies with reference designators** A1 through A15 make up the main portion of the Computer's logic circuits. Each assembly is located on a separate printed circuit card which fits into the Computer's card cage. A typical logic card is shown in Figure 1-4.

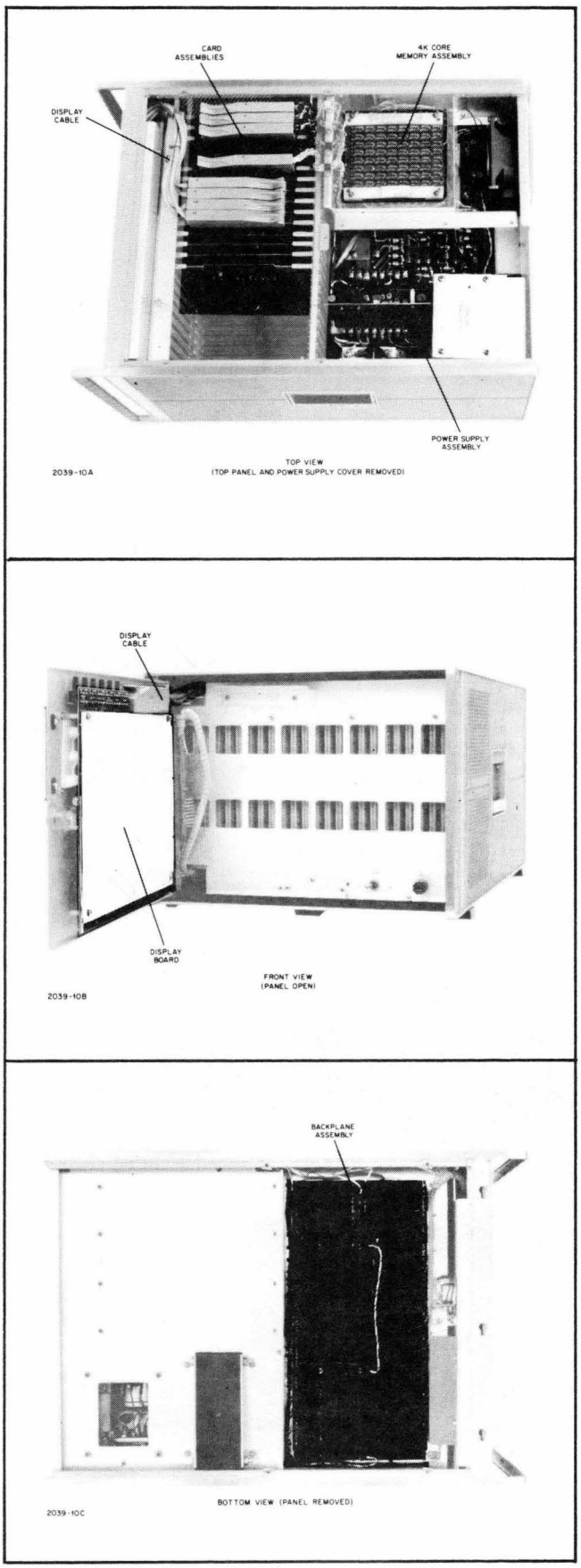


Figure 1-3. Major Computer Assemblies

Table 1-1. Major Computer Assemblies

REFERENCE	ASSEMBLY	QUANTITY	NOMENCLATURE
A1, A2	02114-60427	2	Driver Switch Card
A3	02114-60429	1	Inhibit Driver Card
A6	02114-6005	1	Sense Amplifier Card
A8,A9,A10,A11	02114-60424	4	Arithmetic Logic Card
A12	02114-60426	1	Timing Generator Card
A13	02114-60425	1	Instruction Decoder Card
A14	02114-6003	1	Shift Logic Control
A15	02114-6007	1	I/O Control Card
A24	02114-6009	1	Display Board
A25	02114-6016	1	Display Cable
A400	02115-6042	1	4K Core Memory Assembly
—	02114-60391	1	Backplane Assembly
—	02114-6020	1	Power Supply Assembly
A300	—	1	Capacitor Board Assembly
A301	02114-6013	1	Heat Sink Assembly

1-10. DISPLAY ASSEMBLIES. The Display board ia a printed circuit board mounted on the inside of the Computer front panel. The Display board contains driver circuits for the front panel lamps, and the sensing assemblies for the S-Register. The Display cable links the Display board with the Computer's logic cards.

1-11. BACKPLANE ASSEMBLY. The Computer Backplane assembly is located beneath the card cage and is accessed by removing the Computer's bottom protective cover. The Backplane contains power supply bussing and interconnecting circuitry for the plug-in cards in the card cage.

1-12. POWER SUPPLY. The Computer power supply provides regulated DC voltages to the logic circuits, indicator lamps and other computer circuitry.

1-13. 4K CORE MEMORY ASSEMBLY. The Core Memory assembly is located behind the card cage on the left side of the Computer. The core stack makes up the Computer's memory storage.

1-14. PANEL CONTROLS AND DISPLAYS.

1-15. The locations of the various panel controls and indicator displays are shown in Figures 1-5 through 1-7. Each control and indicator together with a short description is given in Table 1-2.

1-16. Major Computer maintenance features for adjustment and servicing are shown in Figures 1-7 and 1-8. Each major feature together with a short description is given in Table 1-3.

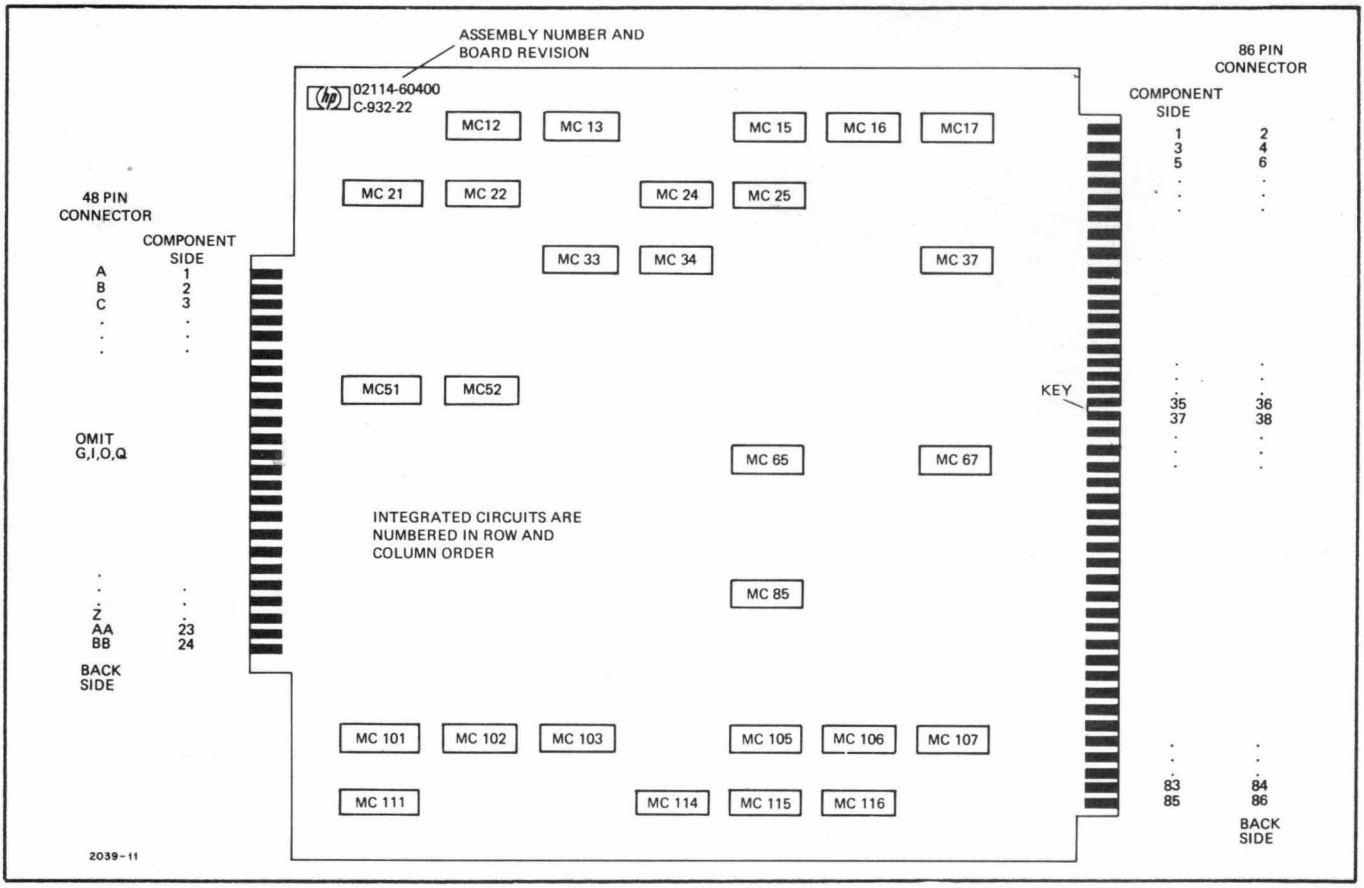


Figure 1-4. Typical Computer Logic Card

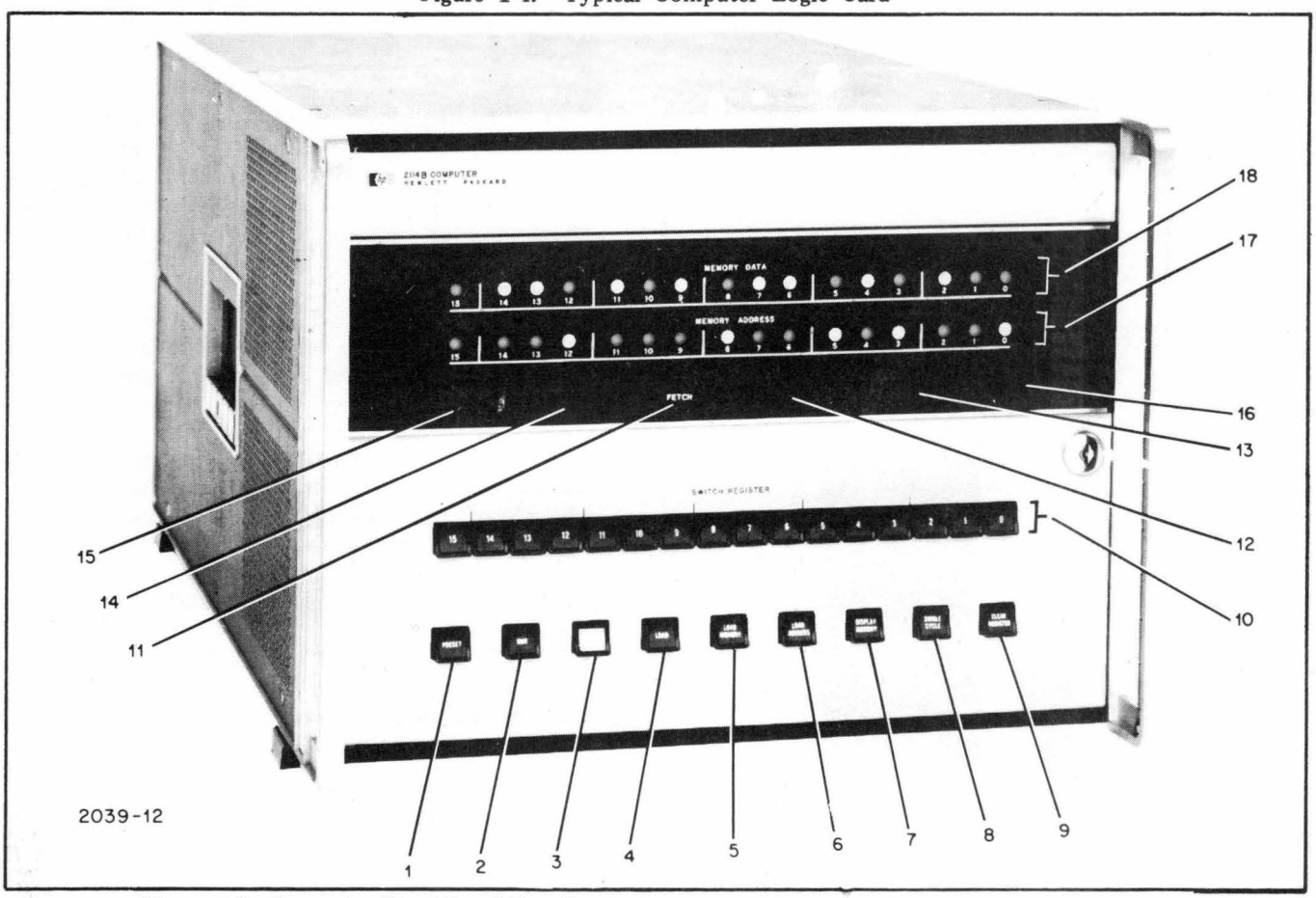


Figure 1-5. Computer Front Panel Showing the Location of Operating Controls and Indicators

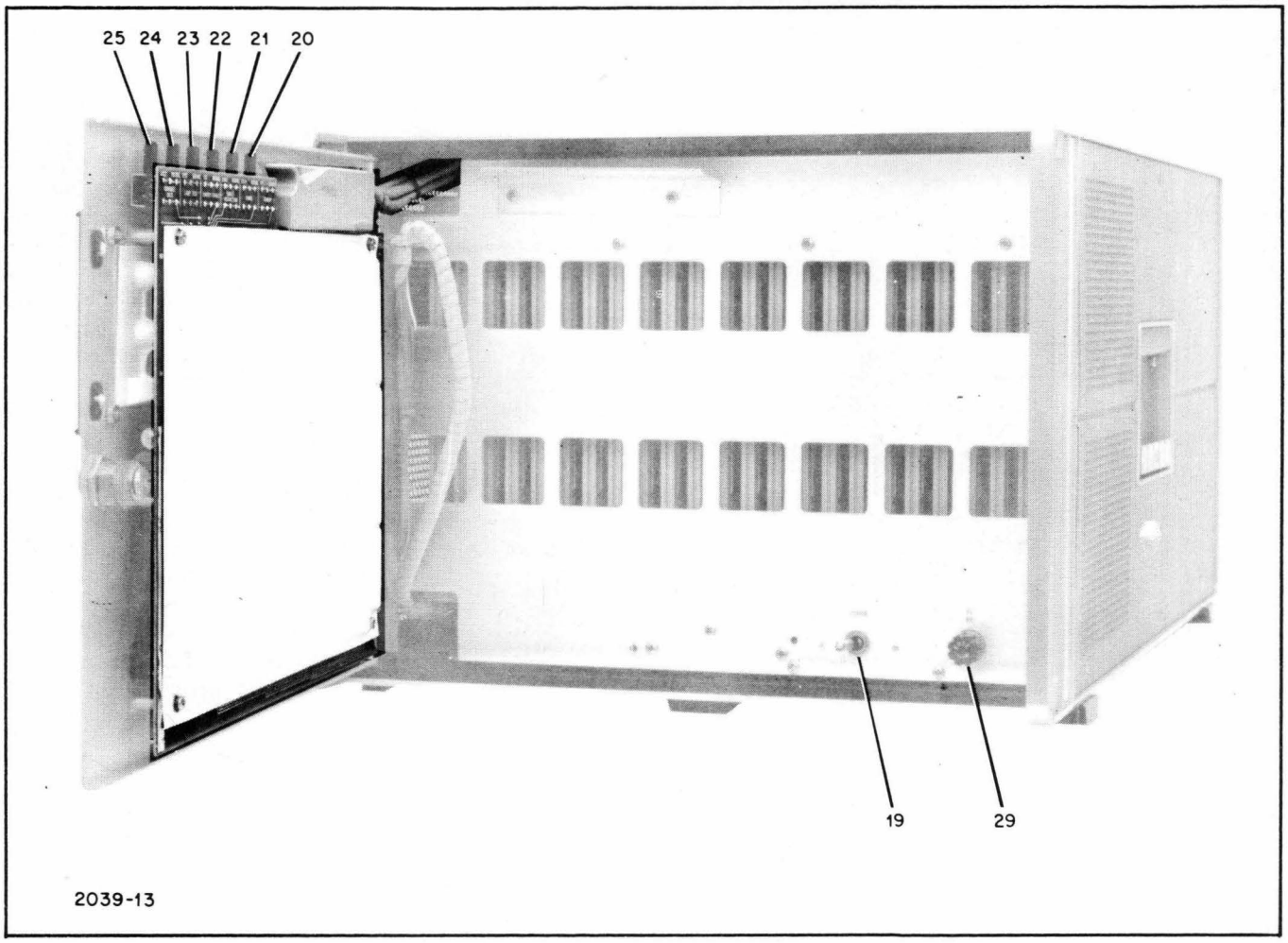


Figure 1-6. Computer Front Panel in Open Position Showing the Location of Protected Switches

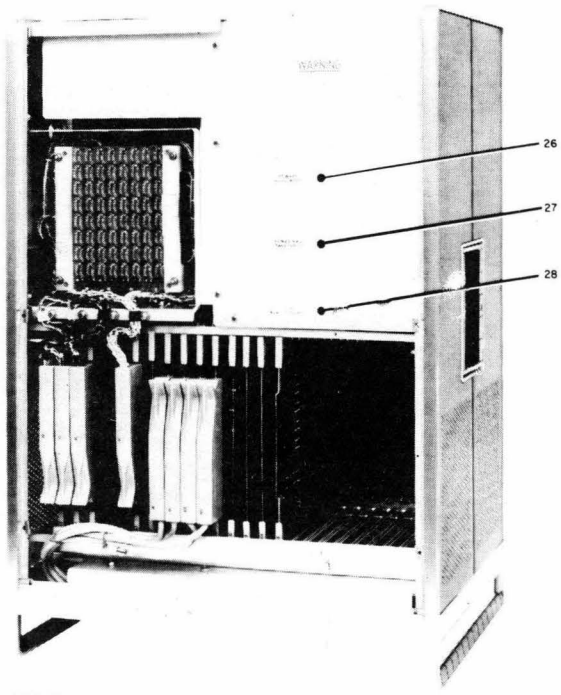


Figure 1-7. Top View of Computer Showing the Location of Power Supply Adjustments

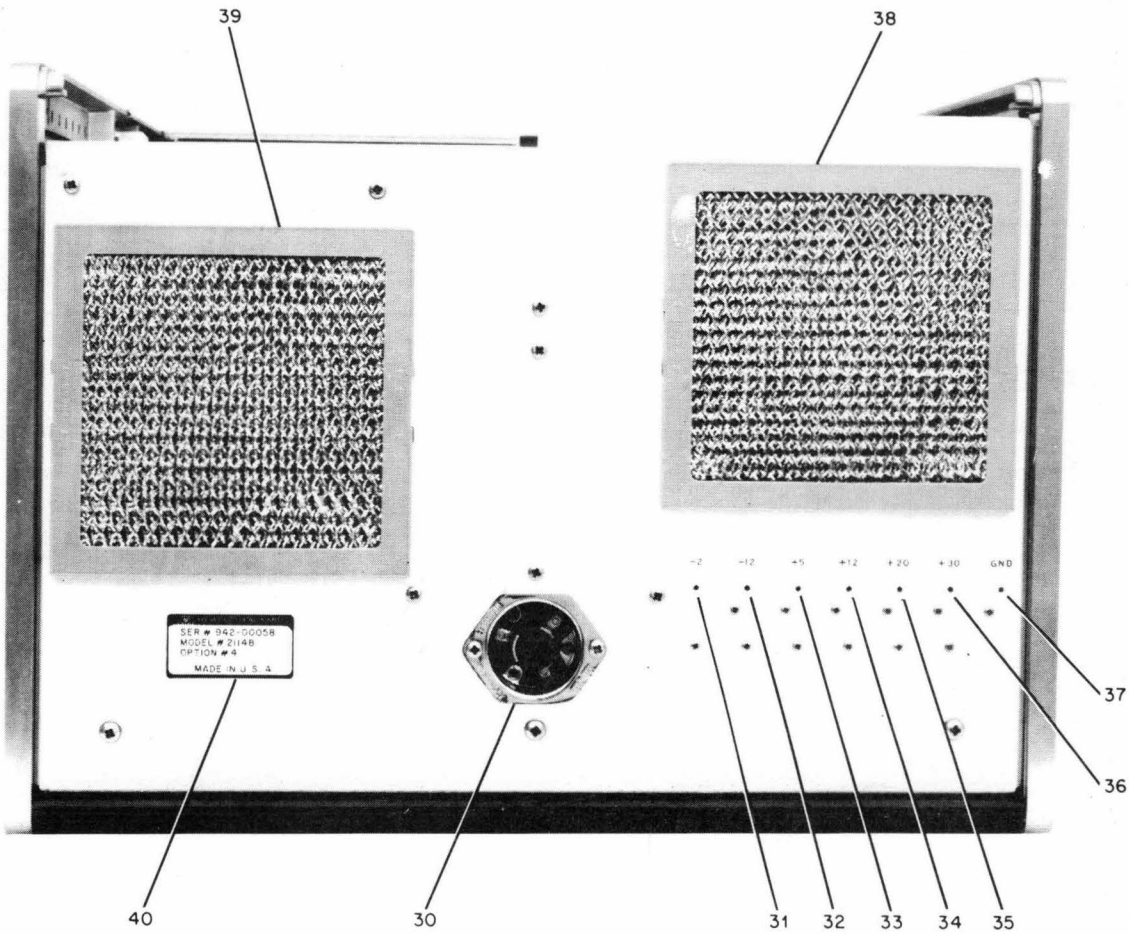
Table 1-2. Location and Description of Controls and Indicators

REFERENCE CALLOUT	REFERENCE DESIGNATION	MARKING	DESCRIPTION	USE
1, Fig.1-5	A2451	PRESET	Capacitance Actuated Proximity Switch	Presets the Computer to the Fetch phase. Turns off Computer I/O Systems. Clears Control and sets Flag bits.
2, Fig.1-5	A2452	RUN	Capacitance Actuated Proximity Switch	Starts operation at current state of the computer. Switch is lit when a program is running. When the light is on all front panel switches except HALT, and CLEAR REGISTER are disabled.
3, Fig.1-5	A2453	HALT	Capacitance Actuated Proximity Switch	Stops Computer operation at the end of the current phase. When the Computer is halted, the HALT switch is lit and all front-panel controls are enabled.
4, Fig.1-5	A2454	LOAD	Capacitance Actuated Proximity Switch	Used with PRESET to load absolute binary tapes by accessing the Computer's Binary Loader program.
5, Fig.1-5	A2455	LOAD MEMORY	Capacitance Actuated Proximity Switch	Stores contents of S-Register into memory location specified by M-Register contents.
6, Fig.1-5	A2456	LOAD ADDRESS	Capacitance Actuated Proximity Switch	Stores contents of S-Register in P- and M-Registers.
7, Fig.1-5	A2475	DISPLAY MEMORY	Capacitance Actuated Proximity Switch	Displays in the T-Register the contents of the memory location specified by the M-Register.
8, Fig.1-5	A2458	SINGLE CYCLE	Capacitance Actuated Proximity Switch	Executes one machine cycle each time the switch is pressed.
9, Fig.1-5	A2459	CLEAR REGISTER	Capacitance Actuated Proximity Switch	Resets S-Register to "zero".
10, Fig.1-5	A24516-A24531	SWITCH REGISTER	Capacitance Actuated Proximity Switch	Used to enter data manually into the Computer or to output data under program control.
11, Fig.1-5	A24DS12	FETCH	Indicator Lamp	Lights when Computer is in the Fetch phase.
12, Fig.1-5	A24DS13	INDIRECT	Indicator Lamp	Lights when Computer is in the Indirect phase.
13, Fig.1-5	A24DS14	EXECUTE	Indicator Lamp	Lights when Computer is in the Execute phase.
14, Fig.1-5	A24DS11	OVERFLOW	Indicator Lamp	Lights when the Computer's Overflow flip flop is set.
15, Fig.1-5	A24DS10	EXTEND	Indicator Lamp	Lights when the Computer's Extend flip flop is set.
16, Fig.1-5	A24DS15	PARITY	Indicator Lamp	Lights when a parity error is detected.

REFERENCE CALLOUT	REFERENCE DESIGNATION	MARKING	DESCRIPTION	USE
17, Fig.1-5	A24DS32-	MEMORY ADDRESS	Indicator Lamp	Displays contents of the M-Register.
18, Fig.1-5	A24DS48- A24DS63	MEMORY DATA	Indicator Lamp	Displays contents of the T-Register
19, Fig. 1-6	S1	POWER	Toggle Switch	Main power switch.
20, Fig.1-6	A24DS10	MEMORY	Slide Switch	Turns memory off. Makes memory locations appear as NOP instructions.
21, Fig.1-6	A24DS11	PHASE	Slide Switch	Causes Computer to remain in the phase present at the time the switch was set.
22, Fig.1-6	A24DS12	SINGLE INSTRUCTION	Slide Switch	Prevents the P-Register from being incremented, causing the same instruction to be executed over and over.
23, Fig.1-6	A24DS13	LOADER ENABLE	Slide Switch	In the "ON" position, allows access to the protected area in memory where the Binary Loader program is stored.
24, Fig.1-6	A24DS14	LAMP TEST	Slide Switch	Test front panel lamps.
25, Fig.1-6	A24DS15	CONSOLE LOCK	Slide Switch	Inhibits the operation of the front panel controls
26, Fig.1-7	A302R27	PRIMARY REGULATOR	Variable Resistor	**Used to adjust the transformer primary voltage and hence the voltages of the logic supplies.**
27, Fig.1-7	A302R42	POWER FAIL THRESHOLD	Variable Resistor	Used to adjust the voltage level at which a power failure is detected.
28, Fig.1-7	A302R36	20V MEMORY SUPPLY	Variable Resistor	Used to adjust +20 volt Memory supply.

Table 1-3. Location and Description of Computer Maintenance Features.

REFERENCE CALLOUT	REFERENCE DESIGNATION	MARKING	DESCRIPTION	USE
29, Fig.1-6	F1	F1	Fuse	Main power fuse
30, Fig.1-8	J1	—	Power Connector	Power Receptacle
31, Fig.1-8	—	-2	Test Jack	-2 volt supply test point
32, Fig.1-8	—	-12	Test Jack	-12 volt supply test point
33, Fig.1-8	—	+5	Test Jack	+5 volt supply test point
34, Fig.1-8	—	+12	Test Jack	+12 volt supply test point
35, Fig.1-8	—	+20	Test Jack	+20 volt supply test point
36, Fig.1-8	—	+30	Test Jack	+30 volt supply test point
37, Fig.1-8	—	GND	Test Jack	Reference supply test point
38, Fig.1-8	—	—	Metal Mesh Air Filter	Filters Air for Cooling
39, Fig.1-8	—	—	Metal Mesh Air Filer	Filters Air for cooling
40, Fig.1-8	—	—	Serial Identification Decal	Used to determine manual effectivity.



2039-15

Figure 1-8. Rear View of Computer Showing Maintenance Features

1-17. ACCESSORIES.

1-18. Basic accessories for the 2114B Computer are shown in Figure 1-9. Accessories include an ac power cable, an extender cable, an extender card, and a rack mounting kit. Also included is a punched tape program for loading binary programs.

1-19. AC POWER CABLE. The AC power cable is a heavy duty cable with a standard 3-prong connector (two power, one grounding).

1-20. EXTENDER CARD. The extender card allows the logic cards in the main card cage assembly to be extended out beyond the card cage for testing and troubleshooting.

1-21. EXTENDER CABLE. The extender cable allows the logic cards having a connector cable attached to their 48-pin connector (memory and arithmetic logic cards) to be used with the extender card.

1-22. RACK MOUNTING KIT. The rack mounting kit allows the Computer to be mounted in a standard 19-inch equipment rack.

1-23. TAPE LOADING INSTRUCTIONS. Instruction sheet, encased in clear plastic, used to load binary tapes into the Computer.

1-24. MAINTENANCE TOOLS AND TEST EQUIPMENT.

1-25. The tools and test equipment recommended for the maintenance, testing, troubleshooting and repair are listed in Table 1-4. Unless otherwise noted, tools or test equipment equivalent to that specified (see critical specifications in Table 1-4) may be substituted.

1-26. For the use of specific test equipment and test procesures see Section IV, Maintenance.

1-27. INSTRUMENT SERIAL NUMBERS.

1-28. Each Computer is identified by an eight-digit (000-00000) serial number on the rear panel (see Figure 1-8). The first three digits are a serial prefix number used to document instrument changes. If this prefix number on the Computer does not agree with the prefix number given on the title page of the two hardware manuals (Volumes Two and Three), look for manual changes information accompanying each volume.

1-29. Each printed circuit assembly in the Computer has printed on it an assembly week-date code or logo similar to that shown in Figure 1-4. The first letter is the revision of the assembly drawing used to manufacture the assembly. The three center numbers form a date code used to identify any circuit changes that may have been made in the assembly.

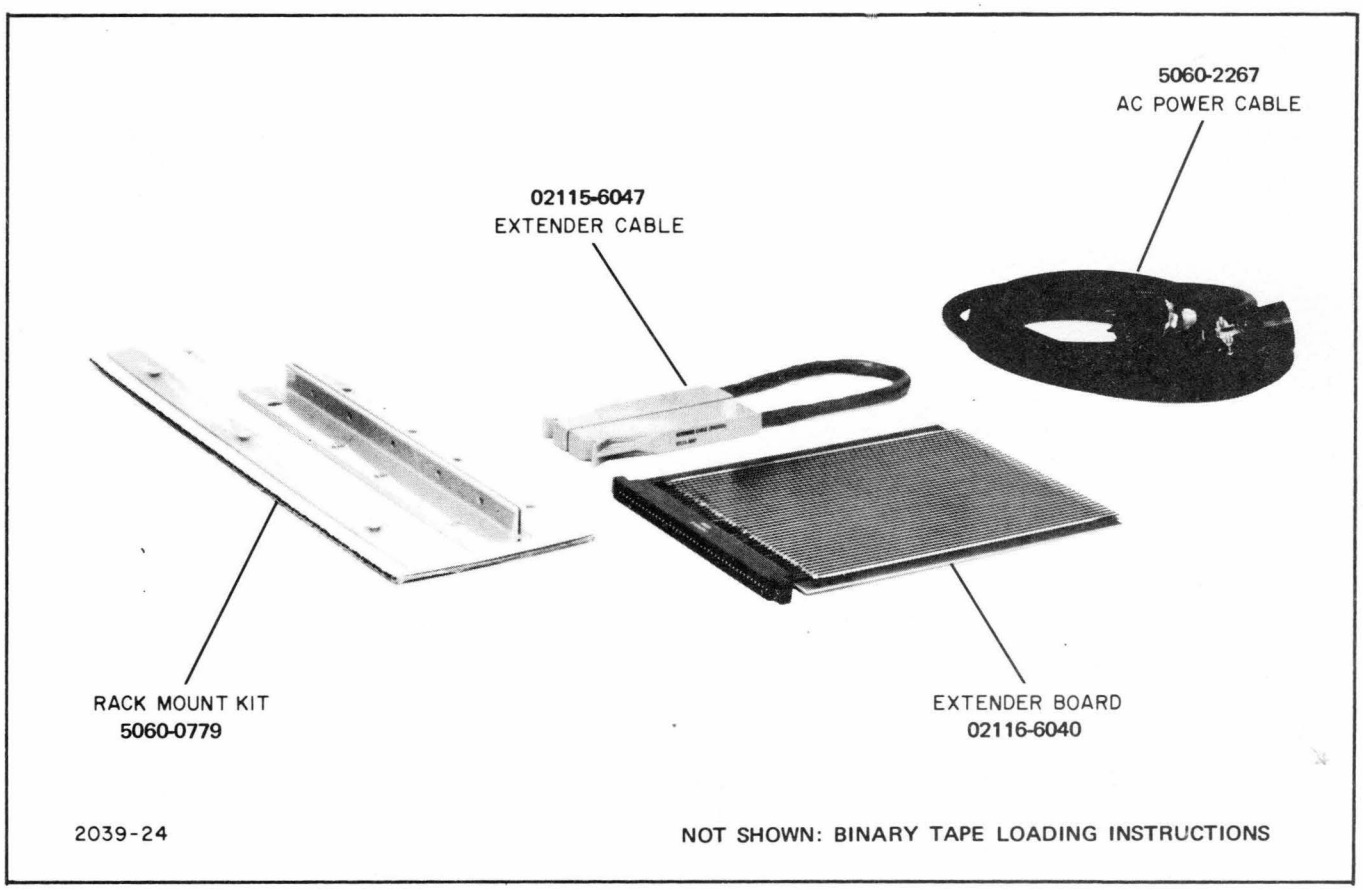


Figure 1-9. Computer Accessories

Table 1-4. Recommended Test Equipment

INSTRUMENT	CRITICAL SPECIFICATIONS	RECOMMENDED HP MODEL
Dual Trace Oscilloscope	Rise time ⩽ 10 nsecs.	HP 180A (HP 1801 vert amp, HP 1820A Time base, HP 10004A probes)
Voltmeter	Accuracy: ± 1% of full scale Input Impedance: 10 Megohms minimum Ranges: ± 1 volt to ±50 volts	HP 412A, HP 3430A
Multimeter	Accuracy: ±3% of full scale Range: ±1 volt to ±50 volts	HP 427A
Logic Probe*	Indication: logic high > +1.4 volts	HP 10525A
Isolation Transformer	115:115 volt, 800 volt-amp capacity (for 60 Hz operation only, 550 volt-amp capacity will be adequate).	
Variable Autotransformer	50/60 Hz. 7 amp capacity, 115-80 volts metered.	
*Optional.		

1-30. Factory and field assembly changes or modifications to the Computer are covered in updating supplements to the hardware manuals. When an updating change has been made to an assembly, there will normally be a corresponding change in the assembly's week date code.

1-31. Documentation changes are covered by manual updating supplements. The updating supplement covers any changes that are made to the manual to make it compatible with a later version of the Computer.

1-32. FIELD OFFICE ASSISTANCE.

1-33. Should you require assistance, contact your nearest Hewlett-Packard field service office.

SECTION II

INSTALLATION

2-1. GENERAL.

2-2. This section contains information for inspecting, setting up, and making a preliminary performance test of the Computer. Included are procedures claims and repackaging for shipment.

2-3. Under Paragraph 2-8, information regarding preparation of the Computer for use will be given. This information includes power requirements, cooling considerations and rack mounting.

2-4. The preliminary check out procedure given in Paragraph 2-18 verifies that the Computer is functioning properly and that programs may be loaded and executed.

2-5. INSPECTION.

2-6. If external damage to the shipping carton is evident, ask the carrier's agent to be present when the instrument is unpacked. Check the instrument for external damage such as broken controls or connectors, and dents or scratches on the panel surface. If damage is evident, refer to Paragraph **2-20** for recommended claim procedure and repackaging information.

2-7. If the shipping carton is not damaged, check the cushioning material and note any signs of sever stress as an indication of rough handling in transit. If the instrument appears undamaged, check for all supplied accessories, then complete the electrical performance check (Paragraph **2-18).**

2-8. INSTALLATION.

2-9. POWER.

2-10. The Computer requires a line voltage of 115 vac (7 amp.) ± 10%, with a line frequency of 50 to 60 Hz. For operation from a 230 vac source refer to Paragraph **2-12.** The main unit power consumption is 500 watts, with the maximum loading by plug-in options the power consumption is 800 watts.

2-11. Before connecting the Computer power cord to the supply voltage make sure that the Computer power switch is in the "OFF" position.

2-12. If the Computer has been ordered with option 15 enabling it to operate from a 230 vac source, a stepdown transformer, HP Part No. 9100-1240, and its power cord, HP Part No. 8120-0078, should be included with the Computer. The stepdown transformer and its power cable should then be connected as shown in Figure 2-1. If the available line voltage is subject to fluctuation it may be necessary to adjust the Computer's power fail threshold.

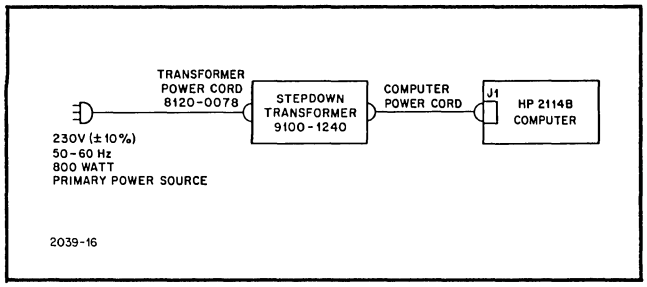


Figure 2-1. Computer Configured for 230V ac

The Computer Supply voltage may also need adjustment after installation of option 15. For adjustment information refer to Section IV, Maintenance.

2-13. ENVIRONMENT.

2-14. The 2114B Computer is designed to operate in a temperature range of from 10°C to 40°C (50°F to 104°F), and to a relative humidity of 80% at 40°C.

2-15. In order to maintain proper cooling a minimum of two inches of rear and side clearance between the Computer and any obstruction to the air flow should be maintained.

2-16. MOUNTING.

2-17. The Computer is designed for either bench installation or mounting in a standard 19-inch rack. To mount the Computer in a rack, follow the instructions contained in the rack mounting kit (HP Part No. 5060-0779) furnished with the Computer. All necessary hardware is furnished as part of the rack mounting kit.

2-18. PERFORMANCE CHECK.

2-19. The performance check consists of two parts. The first part is a pretest check out of the Computer's controls and program loading capability. The second part of the performance test is the Computer diagnostic program. Instructions for both the preliminary and diagnostic tests are given in Section V, Diagnostics.

2-20. CLAIMS.

2-21. If the instrument is damaged or fails to meet specifications, notify the carrier and the nearest Hewlett-Packard Field Office immediately. (Field Offices are listed at the back of this manual.) Retain the shipping container and the padding material for the carrier's inspection. The Hewlett-Packard Field Office will arrange for the repair or replacement of the damaged instrument without waiting for any claims against the carrier to be settled.

2-22. REPACKAGING FOR SHIPMENT.

2-23. USING ORIGINAL PACKAGING.

2-24. The same containers and materials used in factory packaging can be used to return the Computer to Hewlett-Packard for servicing (containers and packing materials may be obtained from Hewlett-Packard Field Offices). Attach a tag indicating the type of service required, return address, model number and full serial number. Also mark the container FRAGILE to assure careful handling. In any correspondence, refer to the Computer by model number and full serial number.

2-25. USING OTHER PACKAGING.

2-26. The following general instructions should be used when repackaging with commercially available materials:

a. Wrap the Computer in heavy paper or plastic. (Attach a tag indicating the type of service required, the return address, model number, and full serial number.)

b. Use a strong shipping container. A double-wall carton made of 350 pound test material is adequate.

c. Use enough shock absorbing material (3- to 4-inch layer) around all sides of the instrument to provide firm cushion and prevent movement inside the container. Protect the control panel with cardboard.

d. Seal the shipping container securely, and mark it FRAGILE to assure careful handling.

e. In any correspondence refer to the instrument by model number and full serial number.

2-27. WARRANTY.

2-28. Terms of the warranty on the 2114B Computer and all supplied accessories are described in the warranty on the inside front cover of this manual. For any additional information concerning warranty, contact the nearest Hewlett-Packard Field Office listed at the rear of this manual.

SECTION III

THEORY OF OPERATION

3-1. INTRODUCTION.

3-2. This section contains an explanation of the operation of the computer. The explanation is on a block diagram level with a **brief** discussion of the operation of major computer functions.

3-3. OVERALL OPERATION.

3-4. The computer performs five major functions. These functions are control, computation, memory storage, input/output and power. In the computer these functions are interrelated and difficult to separate. The block diagram shown in Figure 3-1 illustrates the makeup and interreaction of computer functions. Each of these functions are described in the following paragraphs.

3-5. CONTROL FUNCTION.

3-6. The control function (Figure 3-2) is made up of basic timing, memory timing, registers and control logic. The control function maintains an orderly sequence of operations in the computer through timing and control signals.

3-7. BASIC TIMING.

3-8. The computer's timing is based on the output of an 8 MHz crystal controlled oscillator. The output of the oscillator is divided by two to provide a 250nsec clock pulse. This is used to clock a ring counter which provides eight timing signals during a period of 2.0 microseconds. The eight timing signals from the ring counter, various combinations of these signals and the basic 250nsec

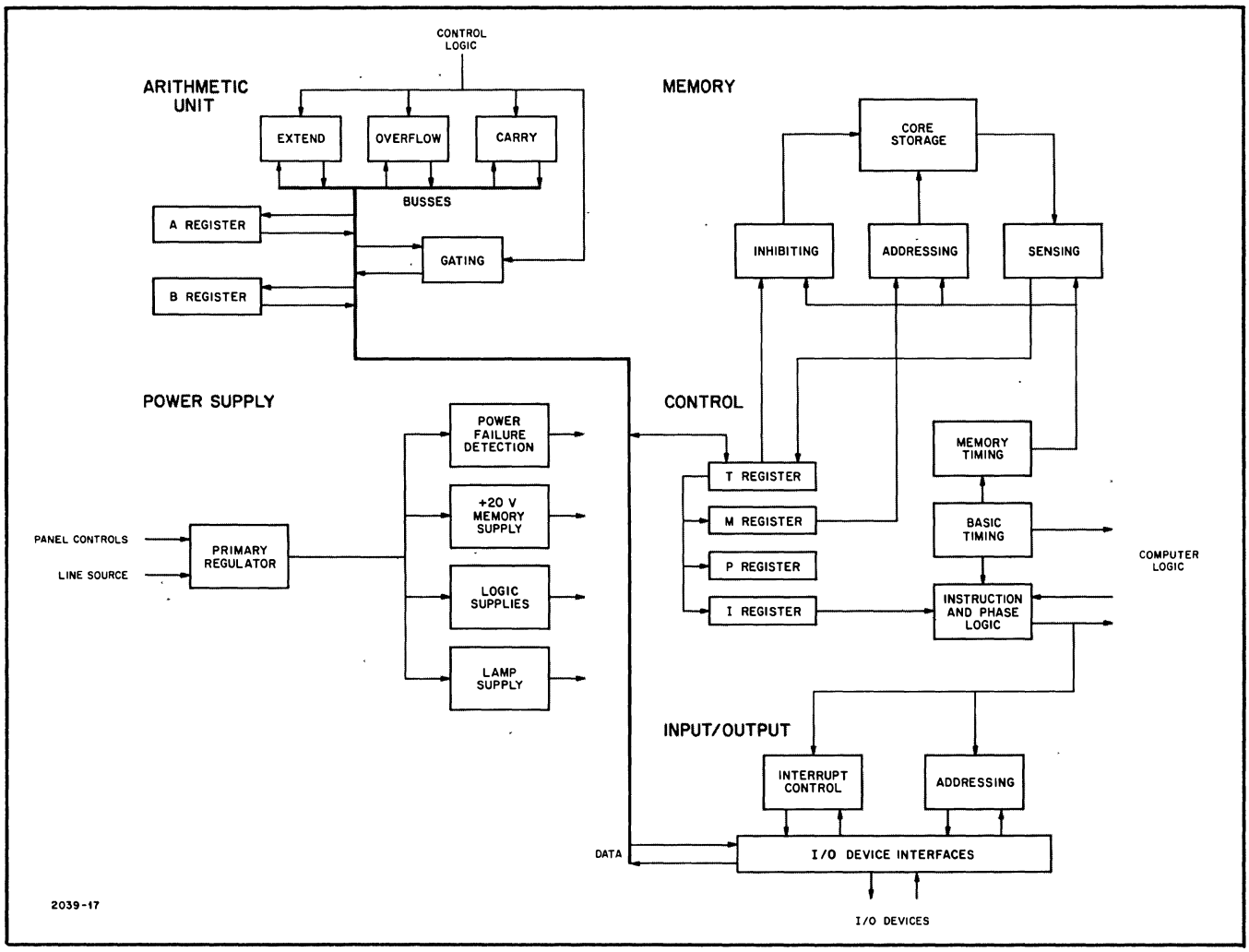


Figure 3-1. Computer Block Diagram

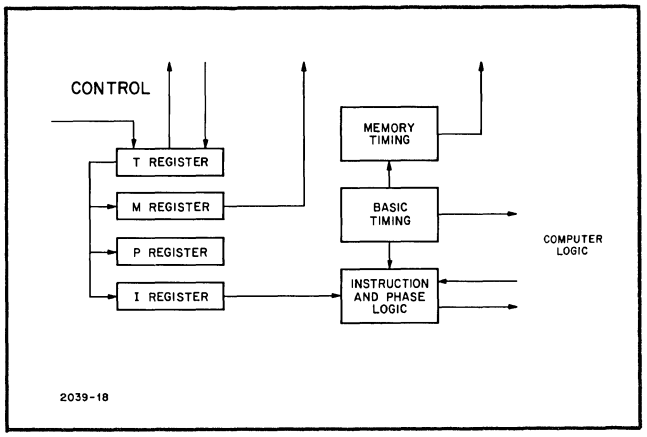


Figure 3-2. Control Block Diagram

divider output make up the computer's basic timing. These signals are routed throughout the computer to regulate operation.

3-9. MEMORY TIMING.

3-10. The memory timing circuits provide the computer memory with timing and control signals. Memory timing signals are generated from basic timing, panel control settings, and the instruction and phase logic (Paragraph 3-13). Memory timing signals are used to control the various memory processes such as addressing, reading and writing.

3-11. REGISTERS.

3-12. The registers used in the computer's control function are the Transfer, Memory Address, Program Address and the Instruction registers. The Transfer or T-register is used as a buffer for input/output and memory transfers. The Memory Address or M-register is used to hold the location in memory where data is to be stored or retrived. The Program Address or P-register performs a similar function. It holds the location in memory of the next sequential step, in a stored program, that is to be executed. The Instruction or I-register is used to hold the coded instruction bits of a computer word.

3-13. CONTROL LOGIC.

3-14. The computer's instruction logic decodes the contents of the I-register and generates appropriate control signals. These control signals, together with timing and phase signals (Paragraph 3-15) regulate the computer's operation.

3-15. The Computer's phase logic provides regulation of computer activities into four basic groups. These groups, fetch, indirect, execute, and interrupt, define areas of Computer activity. Certain control signals and operations are inhibited or enabled depending on the type of activity the Computer is performing.

3-16. ARITHMETIC FUNCTION.

3-17. The Arithmetic function (Figure 3-3) is performed by three major circuit groups; these are the accumulators, computational registers, and arithmetic gating. These circuit groups together with the Computer's data buslines perform the Computer's computations.

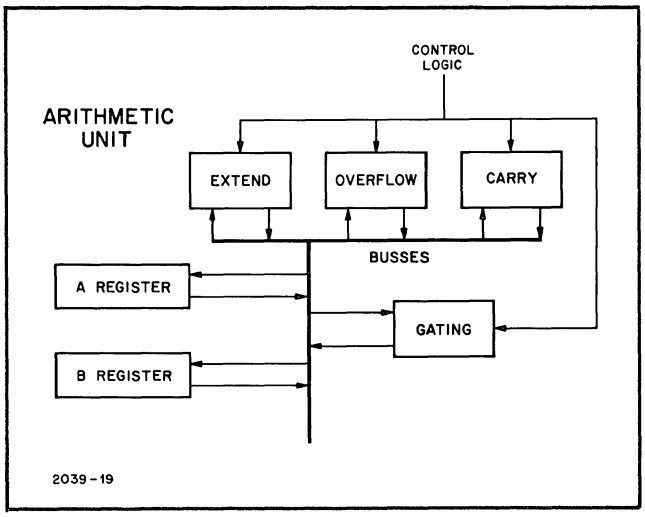


Figure 3-3. Arithmetic Block Diagram

3-18. ACCUMULATORS

3-19. The Computer has two accumulators, the A and B registers. These registers are used for holding and manipulating data. They are addressable and may be used for data storage in the same manner that normal core memory (Paragraph 3-26) is used.

3-20. COMPUTATIONAL REGISTERS

3-21. Three one bit computational registers aid in performing arithmetic operations. They are the Overflow, Extend and Carry flip-flops. The Overflow flip-flop is used to hold control information as well as positive arithmetic overflows from the accumulators. The Extend flip-flop is used to detect negative arithmetic overflows from the accumulators as well as to link the two accumulators during shift and rotate operations. The Carry flip-flop is used to detect and store certain control and bit combinations.

3-22. GATING.

3-23. The timing and control signals control the gating of the register and accumulator contents to and from the Computer bus lines. The gating circuits perform both logical and arithmetic operations.

3-24. BUSSES.

3-25. The Computer bus lines provide a means of linking the outputs of the gating circuits with the various buffer, storage and memory elements in the Computer.

3-26. MEMORY.

3-27. The Computer's memory section (Figure 3-4) provides permanent storage of data in magnetic cores. The associated memory circuits provide addressing, inhibiting and sensing for the memory read/write process.

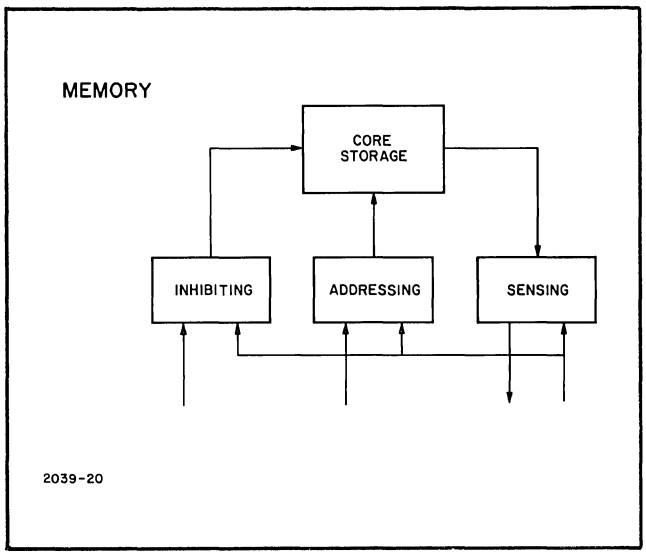


Figure 3-4. Memory Block Diagram

3-28. CORE STORAGE.

3-29. Permanent data storage in the Computer is accomplished by magnetizing small ferrite cores. The cores are strung in planes. The planes are mounted one on top of the other to form a "core stack". The basic core memory has a capacity of 4086, 16-bit words.

3-30. ADDRESSING.

3-31. The memory's addressing is accomplished by the Driver/Switch Cards. These cards take the binary memory address, contained in the M-register, and decode it into the appropriate signals required to access the desired 16-bit word.

3-32. SENSING.

3-33. The sensing operation is accomplished by the Sense Amplifier Card. When a core word has been addressed, the states of 16 cores are sent to the Sense Amplifier Card. The contents of the memory word are amplified and sent to the T-register.

3-34. INHIBITING.

3-35. The Inhibit Driver Card is responsible for writing information into the core memory. The T-register provides the states of the data bits and the Driver Switch Card provides the address. The write operation is repeated following every read operation to replace the data word read out.

3-36. INPUT/OUTPUT.

3-37. The input/output function (Figure 3-5) allows the Computer to communicate with various external devices. These devices may be sources of data input, data output or additional memory storage. The input/output function is made up of control, addressing and interface circuits.

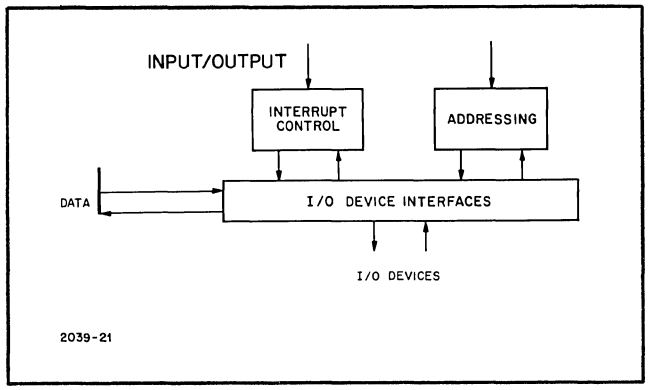


Figure 3-5. I/O Block Diagram

3-38. CONTROL.

3-39. The control circuitry for the input/output function is located on the I/O Control Card. This includes interrupt and flag control as well as priority control for the input/output function. Detailed information on the operation of the I/O Control Card is given in Volume Three.

3-40. ADDRESSING.

3-41. The address circuitry is also located on the I/O Control Card. The address circuits provide encoding and decoding of input/output select codes and interrupts.

3-42. INTERFACING.

3-43. Interfacing is the process of signal level modification and control translation that allows the Computer to communicate with a wide variety of input/output devices and instruments. Interface cards, at least one for each input/output device, are located in the Computer I/O slots. The operation of Interface Cards are covered in the respective interface kit manuals.

3-44. POWER SUPPLY.

3-45. The Computer's power supply (Figure 3-6) provides regulated and unregulated supplies for the various computer functions. The power supply monitors the voltage level of the ac power source and provides a power failure signal if the voltage drops to unsafe levels.

3-46. PRIMARY REGULATOR.

3-47. The Primary Regulator provides regulation of ac line voltage to the primary side of the power supply transformer.

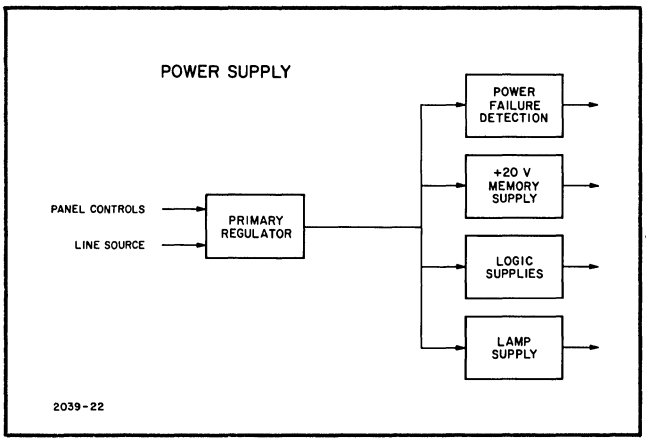


Figure 3-6. Power Supply Block Diagram

3-48. POWER FAILURE DETECTION.

3-49. The Power Failure Detection circuits monitor the voltage level of a special 12 volt supply. This supply is designed to be the first to drop its voltage level in the event of a power failure and the last supply to return to operating voltage when power is restored. When the output of this supply drops to approximately 8.2 volts, a power fail signal is generated and is used to halt or, if the autorestart option is installed, to interrupt to a power failure service routine. As long as the voltage levels remain at normal levels a "power on" signal is generated allowing normal Computer operation.

3-50. MEMORY SUPPLY.

3-51. The Computer's memory supply is further regulated to provide a temperature compensated voltage level for driving the memory circuits. The higher voltage (+20 volts) is required by the memory circuits to provide sufficient current to magnetize the ferrite cores used to store data.

3-52. LOGIC SUPPLIES.

3-53. The Computer's logic supplies provide -2, +5, +12 and -12 volt dc sources for the Computer's microcircuit logic. Regulation for these supplies is provided by the Primary Regulator as well as secondary filtering circuits.

3-54. LAMP SUPPLY.

3-55. The Computer's lamp supply is a +30 volt source for the front panel indicators. This supply is regulated only by the primary regulator.

SECTION IV

MAINTENANCE

4-1. INTRODUCTION.

4-2. This section contains special servicing notes, preventive maintenance information, adjustment procedures, and repair instructions for the HP 2114B Computer. Refer to the special servicing notes below before proceeding.

4-3. SPECIAL SERVICING NOTES.

WARNING

> Dangerous voltages are present in the computer even when the Power Switch S1 is in the OFF position. Do not attempt to remove the protective cover of the Power Supply, or attempt maintenance of any kind in the area of the Power Supply, unless the power cord has first been removed from the power source. Do not energize the Power Supply during servicing unless an isolation transformer is connected between the main power source and J1 at the rear of the Computer. Use caution when making test measurements. Failure to heed this warning could result in death or injury.

4-4. POWER SUPPLY SERVICING. As stated in the warning preceding this paragraph, special care must be taken when servicing the Power Supply. This is because the Primary Regulator circuits (located on the Heat Sink Assembly A301, Capacitor Board Assembly A300, and Regulator Card A302) are tied directly across the ac power input line, and are referenced to one side of the ac line rather than to the chassis or earth ground. Therefore these circuits present a potential hazard to personnel as long as the power cord is connected between the ac power source and J1 at the rear of the Computer. For this reason, it is imperative that the power cord be removed from the ac source before attempting to service the Power Supply.

4-5. If for any reason (except as noted in Paragraph 4-7) it is necessary to energize and test the Power Supply during servicing, the hazard explained above must be reduced by connecting an isolation transformer between the ac power source and J1 at the rear of the Computer (see Figure 4-1). This also allows the use of ground reference test equipment without danger of damage to the circuit of the test equipment.

4-6. A 115-volt ac isolation transformer with a minimum rating of 800 volt-amperes is required. This relatively high volt-ampere rating is required because the Power Supply does not present a purely resistive load to the secondary of the isolation transformer. It is important that an isolation transformer of lesser rating not be used.

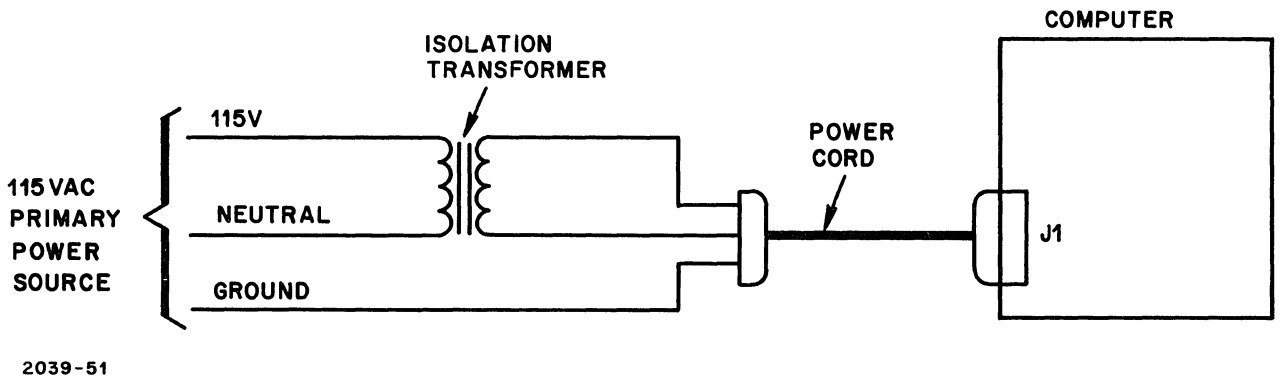


Figure 4-1. Isolation of the Computer Power Supply

4-7. The above precautions must be observed whenever contact or exposure to the Power Supply circuits, intentionally or accidentally, is a possibility. Supply voltages can be measured safely from the test jacks on the Rear Panel Assembly, at the Card Cage Assembly, and at the Front Panel Assembly without the necessity of using an isolation transformer in the ac input line.

4-8. MAINTENANCE PROCEDURES.

4-9. The HP 2114B Computer requires a minimum of routine maintenance to ensure proper Computer operation. The routine maintenance, usually performed on a monthly basis, consists of cleaning, inspection, and testing.

4-10. CLEANING.

4-11. FILTERS. The Computer's two air filters, located on the Computer rear panel, should be cleaned as part of the routine maintenance procedure, or in extreme environments (high dust or oil content in the air), as needed. To clean the filters perform the following:

a. Remove the filters from the Computer.
b. Blow the filters clean with compressed air.
c. If compressed air is not available, hot soapy water may be used as a substitute.
d. Be sure the filters are completely dry and free of grease.
e. Replace the filters.

4-12. DUSTING. Small dust particles may pass through the filters and build up in the Computer. Use a small vacuum or compressed-air hose to remove excess dust. Pay particular attention to heat dissipating areas.

4-13. INSPECTION.

4-14. Routine maintenance of the computer should include visual inspection of the mechanical parts of the Computer. Dents, scratches, or poorly operating controls may indicate damage to the Computer. Frayed, broken or burned insulation should be checked and corrected if necessary.

4-15. Refer to Section V, Diagnostics, for further mechanical and electrical inspection procedures.

4-16. SUPPLY VOLTAGES.

4-17. Check the Computer's supply voltages at the test jacks on the Computer's rear panel. The various supplies and the acceptable ranges for each are given in Table 4-1.

Table 4-1. Supply Voltages

VOLTAGE BUS	MAXIMUM *	MINIMUM **	AC RIPPLE PEAK-TO-PEAK
+ 5V	5.5V	4.3V	0.5V
+12V	13.0V	11.8V	0.3V
-12V	-13.0V	-11.9V	0.3V
- 2V	- 2.8V	- 1.9V	0.4V
+30V	32.0V	29.0V	0.5V
+30V Lamp	32.5V	28.0V	3.0V
+20V	19.5V***	19.5V	0.01V

* High ac line (127V ac), Minimum Computer Load
** Low ac line (103V ac), Maximum Computer Load
*** Depends upon ambient temperature. 19.5V dc nominal for 72° to 80°F.

4-18. If any of the Computer's supply voltages are not within tolerance, refer to Paragraph 4-26 for the appropriate adjustment procedure. Note that all logic supplies are adjusted by the +5 volt adjustment. When the +5 volt supply is properly adjusted the other supplies should be within their stated tolerances; if not, follow appropriate troubleshooting procedures. The +20 volt memory supply may be separately adjusted to compensate for variations in operating temperature.

4-19. PROXIMITY SWITCHES.

4-20. Check all proximity switches on the Computer front panel for proper operation. If erratic operation occurs, refer to Paragraph 4-26 for the appropriate adjustment procedure.

4-21. PERFORMANCE TEST.

4-22. Follow the test procedure given in Section V, Diagnostics. The Computer diagnostic program provides a thorough test of the Computer's logic and memory circuits by exercising all software instructions.

4-23. If the Computer fails to perform the diagnostic test properly, follow appropriate troubleshooting procedures.

4-24. Perform the appropriate Computer option diagnostics. If the option fails to perform properly refer to the indicated option manual for adjustment or troubleshooting information.

4-25. Successful performance of the diagnostic tests completes the preventive maintenance procedure.

4-26. ADJUSTMENTS.

4-27. There are five adjustments that may be made to the Computer. Three have to do with the Computer power supply; Primary Regulator,

Power Failure Threshold, and the +20 volt Memory Supply adjustment. The other two adjustments concern the proximity switches on the front panel.

4-28. PRIMARY REGULATOR ADJUSTMENT.

4-29. If the +5 volt supply is out of tolerance, proceed as follows:

a. Connect a voltmeter (refer to Section I, General Information, for test equipment specifications) between the GND and +5V test jacks on the Computer's rear panel.

b. Remove the Computer's top cover.

c. Using a nonmetallic tuning wand, adjust the ''PRIMARY REGULATOR'' variable resistor (R27 on the Regulator Card) to obtain a reading of +5 ± 0.03 volts.

d. If the supply fails to adjust to tolerance, follow appropriate troubleshooting procedures.

e. Recheck the other supplies.

4-30. +20 VOLT MEMORY SUPPLY ADJUSTMENT.

4-31. The correct voltage level for the +20 volt supply is dependent on the ambient temperature. The correct setting for a normal environment (72° to 80°F) is 19.5 volts. The correct setting for temperatures outside this range can be determined from the following formula:

$E = 19.5 - .05 (T - 76)$; where T is the ambient temperature in degrees Farenheit.

4-32. If the +20 volt supply is outside of its specified tolerance, proceed as follows:

a. Connect a voltmeter between the GND and +20V test jacks on the Computer's rear panel.

b. Remove the Computer's top cover.

c. Using a nonmetallic tuning wand, adjust the ''20V MEMORY SUPPLY'' variable resistor (R36 on the Regulator Card) to obtain a reading within the tolerance range specified by Table 4-1.

d. If the supply fails to adjust to tolerance, follow appropriate troubleshooting procedures.

4-33. POWER FAILURE THRESHOLD ADJUSTMENT.

4-34. The Power Failure Threshold adjustment sets the level at which a drop in the Computer's supply voltage will trigger the Computer's power failure detection circuits and cause the Computer

4-35. This adjustment is made by Hewlett-Packard before shipment of the Computer and no further adjustment should be required. If adjustment becomes necessary proceed as follows:

a. Turn the Computer off by pressing the HALT switch and turning off the POWER switch located on the chassis behind the Computer front panel.

b. Disconnect the Computer power cord from the ac line source and connect it to a variable autotransformer.

c. Remove the Computer's top cover.

d. Set the Computer POWER switch to ''ON''.

e. Insert a test loop in the Computer as follows:

(1) Set the Computer LOOP INSTRUCTION switch, located behind the front panel, to LOOP.
(2) Set the Switch Register to zero.
(3) Press the LOAD A switch.
(4) Press the LOAD ADDRESS switch.
(5) Press the RUN switch. The Computer should begin executing the test loop.

f. Using a nonmetallic tuning wand, rotate the ''POWER FAIL THRESHOLD'' variable resistor (R42 on the Regulator Card) fully counterclockwise.

g. Set the variable ac source to 98 volts.

h. Rotate R42 slowly clockwise until the computer halts.

i. Increase the voltage of the variable ac source to approximately 102 volts.

j. Press the Computer RUN switch. The Computer should begin executing the test loop. Slowly reduce the voltage from the ac source. The Computer should halt when the source voltage approaches 98 volts. If the Computer fails to halt, repeat the adjustment procedure. If repeated adjustment fails to correct the problem, follow appropriate troubleshooting procedures.

4-36. FRONT PANEL BIAS AND NULL ADJUSTMENTS.

4-37. The Bias and Null adjustments set the level at which the front panel proximity switches are actuated. The Bias adjustment sets the sensitivity of the proximity switches while the Null adjustment determines the efficiency of the switch circuit. The two adjustments interact, hence the adjustment procedures for both are combined below.

4-38. If adjustment of the front panel switches is required, proceed as follows:

a. Locate the ''BIAS'' and ''NULL'' test points on the component side of the Display Board Assembly (02114-6009). The Display Board Assembly is mounted on the inside of the Computer front panel. Refer to Figure 4-2 for the location of front panel test points.

b. Turn the Computer POWER switch located on the Computer chassis behind the front panel to ''ON''.

c. Connect a voltmeter between the BIAS test point and the GND test point.

d. Adjust the BIAS variable resistor, R128, to obtain a bias voltage of +2.40 ± 0.05 volts.

e. Connect the voltmeter between the NULL test point and the GND test point.

f. Adjust NULL capacitor C114 for a dc null.

g. Recheck and readjust the bias if necessary.

h. If improper proximity switch operation persists follow appropriate troubleshooting procedures.

4-39. REPAIR INSTRUCTIONS.

4-40. TROUBLE ANALYSIS.

4-41. Failures and malfunctions can often be traced to simple causes such as improper connections, fuse failures, or improper adjustment. Whenever trouble occurs, check the primary power lines, fuses, external circuit elements, and wiring for malfunctions as the first step in troubleshooting the equipment. Refer to the schematic and wiring diagrams as an aid in locating malfunctions.

4-42. Do not assume that malfunctions are eliminated when a faulty component has been replaced. Check the complete circuit for other faulty parts before turning on power.

4-43. COMPONENT TESTING.

4-44. When checking transistors, observe their polarity to avoid error in measurement. The leakage resistance obtained from a resistance check of a capacitor is not always an indication of a faulty capacitor. In most cases the capacitors are shunted with resistances, some of which have low values. Only a complete short is a true indication of a shorted capacitor.

4-45. Most ohmmeters can supply enough current or voltage to damage some transistors. Before using an ohmmeter to measure transistor forward or reverse resistance, check its open circuit voltage and short circuit current for the range to be used. The open circuit voltage should be less than 1.5 volts and the short circuit current should be less than 3 milliamperes.

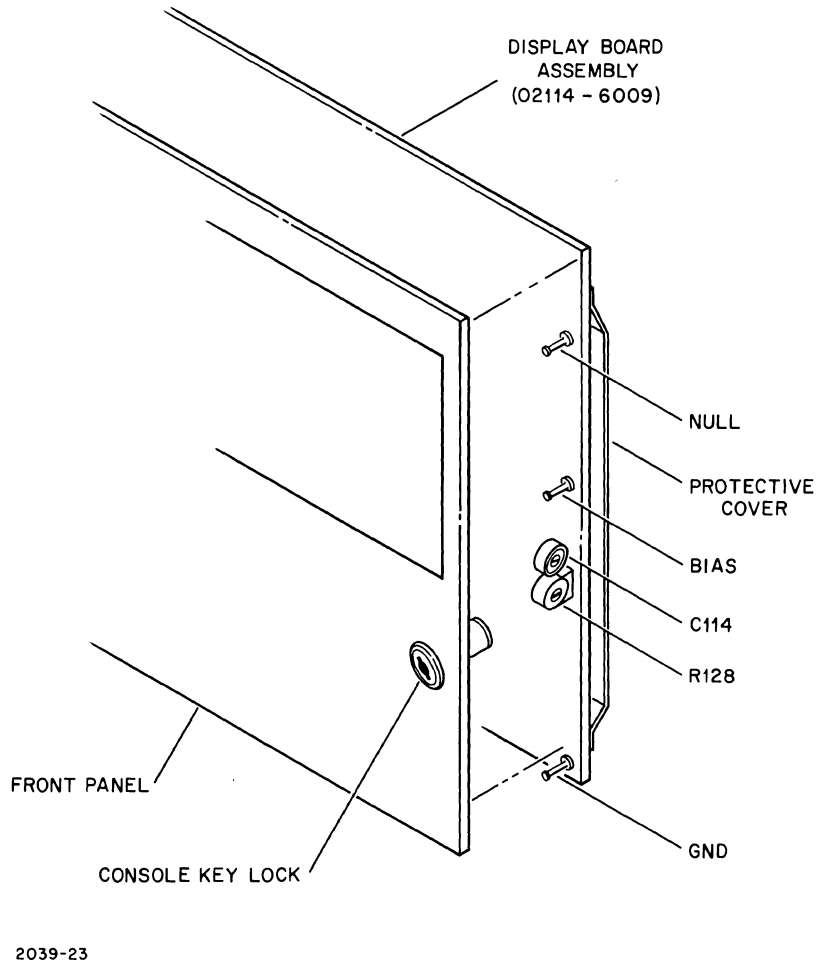


Figure 4-2. Adjustment and Test Point Locations for the Front Panel Display Board (02114-6009)

4-46. COMPONENT REPLACEMENT.

4-47. When soldering a semiconductor device, hold the leadwire between the component and the solder joint with a pair of pliers to provide an effective heat sink while soldering.

SECTION V
DIAGNOSTICS

5-1. INTRODUCTION.

5-2. This section contains instructions and data for conducting and evaluating programmed diagnostic tests of the Computer. Included are a pretest checkout procedure, instructions for loading and checking the Basic Binary Loader, instructions for loading and running the hardware diagnostic programs, and tabular listings of all programs. Unless otherwise noted, or to the extent specified in future supplementary documentation, this information is applicable to 2114B Computers bearing serial number prefix 930- and subsequent.

5-3. The hardware diagnostic programs automatically perform a confidence test of Computer operation by thoroughly exercising major portions of the Memory circuits, Logic circuits, and Input/Output circuits. The following diagnostic tests are covered in this section:

a. Alter-Skip Instruction Test
b. Memory Reference Instruction Test
c. Shift-Rotate Instruction Test
d. High Memory Address Test
e. Low Memory Address Test
f. High Memory Checkerboard Test
g. Low Memory Checkerboard Test
h. Interrupt Test

5-4. Diagnostic testing should be conducted after installation, periodically thereafter as part of a regularly scheduled preventive maintenance program, during troubleshooting, and after making repairs or modifications. The pretest checkout procedure (Paragraph 5-7) should be performed first. This procedure ensures that all required operating switches and indicators are functioning normally, that an apparent trouble is not the result of an improper switch setting, and that the Computer is capable of storing and processing the diagnostic test programs.

5-5. The Basic Binary Loader must be located in the protected area of memory (the uppermost 64 memory locations) before the selected input device can read the test tape and transfer the test program into its assigned memory locations. If the status of the Basic Binary Loader is unknown, the content of the protected area can be checked by performing the verification procedure presented in Paragraph 5-18. Required program instructions can then be manually loaded into memory by following the procedure presented in Paragraph 5-16. Be sure to follow all loading instructions carefully as it is important to use switch settings that correspond to the memory size (4K or 8K) of the computer under test, and the I/O channel of the input device used in loading the test programs.

5-6. Detailed operating instructions for loading and running all diagnostic test programs are covered in Paragraphs 5-28 through 5-118. Information and examples are included to aid in the analysis of test results. The alter-skip, memory reference, and shift-rotate test diagnostics must be performed in sequence. The remaining tests can be performed in any desired order. Refer to Section I for the location of switches and indicators referenced in this section. A summary of operating instructions and associated program listings are located at the rear of this section.

5-7. PRETEST CHECKOUT.

5-8. The pretest checkout is performed manually using operating switches and indicators to provide a basic check of Computer operation. This procedure should be performed before attempting to load and run the diagnostic test programs. If results of the checkout are normal, proceed with diagnostic testing. If results are abnormal, refer to Section IV as the first step in troubleshooting, and check related supply voltages and perform adjustments specified. The pretest checkout procedure is as follows:

a. Open the front panel and set the POWER switch to OFF.

b. On the display board located behind the front panel, set the MEMORY, PHASE, SINGLE INSTRUCTION, LOADER ENABLE, LAMP TEST, and CONSOLE LOCK switches to normal.

Note

If the Computer is equipped with the Power Fail Auto-Restart option, refer to the option manual before proceeding. Otherwise power turn-on may cause damage to memory contents.

c. Set the POWER switch to ON and then press the HALT switch. Check that both blower motors on the rear panel are operating normally. Then close and secure the front panel and check for air flow through the exhaust vents located on either side of the cabinet. If normal, proceed to the next step.

CAUTION

If either blower is inoperative, or if air flow is abnormal, set the POWER switch to OFF and take immediate corrective action. Do not operate the Computer until the trouble has been fixed.

d. Reopen the front panel and set LAMP TEST switch to TEST. Check that all front panel indicators are lit. If they are, set the LAMP TEST switch to NORMAL, set POWER switch to OFF, and proceed with the next step.

e. Set POWER switch to ON and then press HALT switch. Check that the indicators listed in Table 5-1 are in the state specified. (Indicators other than those listed may be either on or off.) Repeat this step sev-

eral times making sure that the FETCH indicator lights each time. If all indications are normal, proceed with the next step.

Table 5-1. State of Front Panel Indicators After Power Turn-On

INDICATOR	STATE
RUN	Off
HALT	On
FETCH	On
INDIRECT	Off
EXECUTE	Off

f. Set CONSOLE LOCK switch to LOCK. While observing the MEMORY DATA, MEMORY ADDRESS, SWITCH REGISTER, RUN, and HALT indicators, press all SWITCH REGISTER switches, the LOAD ADDRESS switch, the LOAD MEMORY switch, the DISPLAY MEMORY switch, the SINGLE CYCLE switch, the CLEAR REGISTER switch, and the RUN switch. All controls should be inoperative and all indicators should remain in their original state. If indication is normal, set the CONSOLE LOCK switch to NORMAL and proceed with next step.

Note

The binary displays by indicators 0 through 15 in the MEMORY DATA (T-Register) display, the MEMORY ADDRESS (M-Register) display, and SWITCH REGISTER (S-Register) display, are expressed as octal numbers. For example, the sixteen bit binary display 0 000 110 111 010 101 (indicators that are on denote "ones", indicators that are off denote "zero") is expressed either as **006725**, or simply as **6725** if bits 12 through 15 of the display are insignificant.

g. Press each S-Register indicator-switch to obtain an S-Register display indication of 177777. If indication is normal, press CLEAR REGISTER switch. This should clear the S-Register to all "zero" (all indicators off). Check the S-Register display for indication of 000000. If indication is normal, proceed with next step.

h. Press LOAD ADDRESS switch. This should load the content of the S-Register, all "zeros", into the M-Register. Check M-Register display for indication of 000000. If indication is normal, proceed with next step.

i. Enter 177777 into the S-Register. Then press LOAD MEMORY switch. This should load the content of the S-Register, all "ones", into the T-Register and increment the M-Register by one. Check the T-Register display for indication of 177777, and the M-Register display for indication of 000001. If indications are normal, proceed with next step.

j. Press LOAD ADDRESS switch. Check M-Register display for indication of **037777**. (Indicators 14 and 15 of the M-Register display are not connected and will remain off even when binary "ones" are stored in bits 14 and 15 of the M-Register.) If indication is normal, proceed with next step.

k. In turn, press CLEAR REGISTER, LOAD ADDRESS, and LOAD MEMORY switches. Check T-Register display for indication of 000000, and the M-Register display for indication of 000001. If indications are normal, proceed with next step.

l. Press LOAD ADDRESS switch. All register displays should now indicate 000000. If indication is normal, observe M-Register display and press LOAD MEMORY switch several times. Check that M-Register display increments by one each time LOAD MEMORY switch is pressed. If indication is normal, proceed with next step.

m. While observing M-Register display, press DISPLAY MEMORY switch several times. Check that M-Register display increments by one each time DISPLAY MEMORY switch is pressed. If indication is normal, proceed with next step.

n. Press CLEAR REGISTER switch. In turn, press LOAD ADDRESS switch once, and LOAD MEMORY switch ten times. Then press LOAD ADDRESS switch again. While observing M-Register display, press SINGLE CYCLE switch exactly ten times. Check that M-Register display increments by one each time SINGLE CYCLE switch is pressed. If indication is normal, proceed with next step.

o. Set MEMORY switch on back of front panel to OFF. In turn, press LOAD ADDRESS switch once, the LOAD MEMORY switch twice, and then press the RUN switch. Check that the RUN indicator is on. Then check the T-Register display for an indication of 000000, and observe the M-Register display indicators. Each succeeding indicator of this display, as viewed from bit 13 through bit 0, should appear progressively brighter. (The higher order bits should be changing states at a visible rate and have a flickering appearance; bits 14 and 15 are always off.) Then press HALT switch. Check that the HALT indicator is on, that the RUN indicator is off, and that the M-Register display indicators are in a static state, either on or off. (The numeric value now displayed by the M-Register indicators is random and of no significance. However, all indicators which are lit in this display should now appear approximately equal in brightness.) If all indications are normal, set MEMORY switch to NORMAL, and proceed with next step.

p. If the status of the Basic Binary Loader, located in the protected area of memory, is unknown, refer to Paragraph 5-18 and verify the instructions located in these memory locations. If Basic Binary Loader instructions are correct, proceed with test instructions presented in Paragraphs 5-28 through 5-118. If instructions must be added or modified, refer to Paragraph 5-16 for loading instructions.

5-9. BASIC BINARY LOADER.

5-10. DESCRIPTION.

5-11. The Basic Binary Loader loads absolute programs produced by the Assembler or the Basic Control System absolute output option. It is also used to load standard software systems that are in absolute form (e.g., FORTRAN, ALGOL, Assembler, Basic Control System, and Symbolic Editor). Familiarity with the Basic Binary Loader operating procedure is assumed in the operating procedure for all other software systems.

5-12. STORAGE.

5-13. The Basic Binary Loader is stored in the protected area of memory (the highest 64 locations). Separate versions of the Basic Binary Loader are presented for the 2752A Teleprinter and the 2737A Punched Tape Reader.

5-14. PROGRAM INSTRUCTIONS.

5-15. Tables 5-2 and 5-3 contain the absolute instructions for two versions of the Basic Binary Loader. Table 5-2 lists the instructions for an input device consisting of the 2752A Teleprinter with 12531A (serial) Teleprinter Input/Output Interface Kit. Table 5-3 lists the instructions for an input device consisting of either a 2752A Teleprinter with 12531B (parallel) Teleprinter Input/Output Interface Kit, or a 2737A Punched Tape Reader with 12532A High-Speed Punched Tape Input Interface Kit. In both tables, "m" and "n" are variables that correspond to the following memory sizes:

m = 0 for 4K memory
= 1 for 8K memory
= 2 for 12K memory
= 3 for 16K memory
n = 7 for 4K memory
= 6 for 8K memory
= 5 for 12K memory
= 4 for 16K memory

5-16. ENTERING INSTRUCTIONS.

5-17. To enter instructions into the protected area of memory, proceed as follows:

a. Set LOADER ENABLE switch to ON.

b. Enter address of desired instruction into S-Register.

c. Press LOAD ADDRESS switch.

d. Press CLEAR REGISTER switch.

e. Enter instruction into S-Register.

f. Press LOAD MEMORY switch.

g. Repeat steps "b" thru "f" for each instruction entered. Then set LOADER ENABLE switch to NORMAL.

5-18. VERIFICATION.

5-19. To verify the instructions stored in the protected area of memory, proceed as follows:

Table 5-2. Absolute Instructions for Use with 2752A Teleprinter (Serial)

ADDRESS	0	1	2	3	4	5	6	7
0m7700:	107700	006401	067771	006006	027710	106700	102077	027700
0m7710:	017752	002003	027703	003004	073772	017752	017743	070001
0m7720:	073773	063773	000040	043774	002040	027741	017743	044000
0m7730:	173773	037773	037772	027721	017743	054000	027702	102011
0m7740:	027700	102055	027700	000000	017742	001727	073775	017752
0m7750:	033775	127743	000000	063771	073776	002400	1027cc	001300
0m7760:	1031cc	1023cc	027761	1024cc	037776	027757	001222	013777
0m7770:	127752	177765	000000	000000	1n0100	000000	000000	000377

cc = channel (high select code, lower priority) of Teleprinter

Table 5-3. Absolute Instructions for Use with 2752A Teleprinter (Parallel), or 2737A Punched Tape Reader

ADDRESS	0	1	2	3	4	5	6	7
0m7700:	107700	063770	106501	004010	002400	006020	063771	073736
0m7710:	006401	067773	006006	027717	107700	102077	027700	017762
0m7720:	002003	027712	003104	073774	017762	017753	070001	073775
0m7730:	063775	043772	002040	027751	017753	044000	000000	002101
0m7740:	102000	037775	037774	027730	017753	054000	027711	102011
0m7750:	027700	102055	027700	000000	017762	001727	073776	017762
0m7760:	033776	127753	000000	1037cc	1023cc	027764	1025cc	127762
0m7770:	173775	153775	1n0100	177765	000000	000000	000000	000000

cc = channel number of Punched Tape Reader

a. Enter address of instruction to be verified into S-Register.

b. Press LOAD ADDRESS switch.

c. Set LOADER ENABLE switch to ON.

d. Press DISPLAY MEMORY switch. The contents of the memory location selected in step "a" above is now indicated by the T-Register display. Each time the DISPLAY MEMORY switch is pressed, the contents of the next consecutive memory location are displayed. (Because the M-Register is incremented by one each time the DISPLAY MEMORY switch is pressed, the address indicated by the M-Register display is always one address higher than the address of the data currently displayed by the T-Register indicators.)

e. Set LOADER ENABLE switch to Normal after all desired locations in the protected area of memory have been displayed.

5-20. TAPE LOADING PROCEDURES AND OPTIONS.

5-21. The 2737A Punched Tape Reader and the 2752A Teleprinter are typical input devices that can be used to read program data from the test tapes and transfer it into memory. If the Punched Tape Reader is used, three loading options can be selected. These options, and the entries required in bits 0 and 15 of the S-Register to select them, are specified in Table 5-4. Procedures for using each input device are presented in the following paragraphs.

5-22. PUNCHED TAPE READER. If using the Punched Tape Reader to load the diagnostic program tapes, proceed as follows:

a. At the Punched Tape Reader, set POWER switch to ON.

b. Place RUN/LOAD lever in LOAD position.

c. Carefully position program tape to be loaded in the tape reading mechanism and place the RUN/LOAD lever in the RUN position.

d. At the Computer front panel, press CLEAR REGISTER switch.

e. Refer to Table 5-4 and enter the appropriate settings for bits 0 and 15 into the S-Register.

f. Press and hold PRESET and LOAD switches, then release both switches. The Computer should go into the run mode (RUN indicator on) and the program tape should process through the tape reading mechanism of the Punched Tape Reader. When the Computer halts (RUN indicator off, HALT indicator on), check the T-Register indicators. If the test program was correctly loaded into memory, halt instruction 102077 should be displayed. (For an explanation of this and other halts encountered during program loading, refer to Table 5-5.) If indication is normal, proceed with applicable instructions for running the diagnostic test program now in memory. If indication is abnormal, refer to Table 5-5 and proceed as directed.

g. After loading, rewind the tape and return it to the appropriate storage box.

Table 5-4. Punched Tape Reader Loading Options

OPTION	SWITCH REGISTER SETTINGS	
	BIT 15	BIT 0
Load tape	0	0
Verify checksum without loading	0	1
Compare the contents of the tape with the contents of memory without loading	1	0/1

5-23. TELEPRINTER. If using the Teleprinter to load the diagnostic program tape, proceed as follows:

a. At the Teleprinter, set LINE/OFF/LOCAL switch to LINE position.

b. Carefully position program tape to be loaded in the Teleprinter tape reader.

c. Set START/STOP/FREE switch to START position.

d. At the Computer front panel, press CLEAR REGISTER switch, then press and hold PRESET and LOAD switches. Release both switches. The Computer should go into the run mode (RUN indicator on) and the program tape should process through the tape reader of the Teleprinter. When the Computer halts (RUN indicator off; HALT indicator on), check the T-Register indicators. If the test program was correctly loaded into memory, halt instruction 102077 should be displayed. (For an explanation of this and other halts encountered during program loading, refer to Table 5-5.) If indication is normal, proceed with applicable instructions for running the diagnostic test program now in memory. If indication is abnormal, refer to Table 5-5 and proceed as directed.

e. Set the Teleprinter START/STOP/FREE switch to STOP, remove tape, rewind, and return it to the appropriate storage box.

5-24. LOADING HALTS.

5-25. After all program data is read from a test tape and transferred into memory, the associated tape reader and the Computer will halt with a normal indication of 102077 (end-of-tape condition) indicated by the T-Register display. This signals the operator to continue with the applicable test instructions for the diagnostic test now stored in memory. If a halt occurs and an indication other than 102077 is present in the T-Register display, refer to Table 5-5 and proceed as directed.

5-26. PROGRAM LISTINGS.

5-27. Program listing for both versions of the Basic Binary Loader are presented at the rear of this section. The listing for the serial Loader is presented first, followed by the listing for the parallel Loader.

Table 5-5. Loading Halts

MEMORY DATA (T-REGISTER) DISPLAY	EXPLANATION	ACTION
102077	An end-of-tape condition has been detected. Ten consecutive feed frames are interpreted as end-of-tape.	This indication is normal. Proceed with applicable diagnostic test procedure.
102011	Checksum error. The A-Register contains the checksum from the tape; the B-Register contains the computed checksum.	To restart, replace tape in input device and simultaneously press PRESET and LOAD.
102055	Address error. An attempt has been made to destroy the loader or to load outside the memory limits.	To restart, replace tape in input device and simultaneously press PRESET and LOAD.
102000	The Punched Tape Reader compare option has been specified. The tape being read does not compare with memory. The A-Register contains the word from tape which did not agree.	To find the location of the corresponding word in memory, press SINGLE CYCLE twice. The contents of the T-Register minus one is the address of the desired word. To restart after displaying the contents of the address, replace tape in input device, and simultaneously press PRESET and LOAD.

5-28. ALTER-SKIP INSTRUCTION TEST.

5-29. SCOPE.

5-30. This program is a reliability test of all legitimate code combinations in the alter-skip group. The codes are tested utilizing both the A- and B-Registers, rendering a total of 2,048 legitimate combinations. This test should always be the first reliability test to be executed. If successful, more advanced reliability and diagnostic programs should be attempted. This test does not use any memory reference instructions during the first execution pass. After the first pass is successfully executed, a jump instruction to the beginning of the test is executed to allow for continuous looping until manually halted by the operator.

5-31. STORAGE.

5-32. The Alter-Skip Group program is stored in memory locations 2000 to 6041.

5-33. EXECUTION.

5-34. INITIALIZATION. This being the first in a series of reliability tests, it is necessary to manually check the A- and B-Register commands (LDA, LDB, MIA, and MIB) before attempting to load the diagnostic test program. This is accomplished from the front panel by using the S-Register to enter data patterns. Proceed as follows:

a. Press CLEAR REGISTER switch. Then enter 002000 into the S-Register and press LOAD ADDRESS switch.

b. Enter 102501 into the S-Register and press LOAD MEMORY switch.

c. Enter 106501 into the S-Register and press LOAD MEMORY switch.

d. Press CLEAR REGISTER switch. Then, in turn, press LOAD ADDRESS switch once, and LOAD MEMORY switch twice. (This procedure clears the A- and B-Registers.)

e. Enter 002000 into the S-Register and press LOAD ADDRESS switch.

f. Enter 077777 into the S-Register and press SINGLE CYCLE switch twice.

g. Check the contents of the A- and B-Registers as follows:

(1) Press CLEAR REGISTER switch. Then press LOAD ADDRESS and DISPLAY MEMORY switches. The content of memory location 00000 (A-Register) is now displayed by the T-Register indicators.

(2) Check T-Register display for indication of 077777. If indication is normal, proceed with next step. If indication is abnormal, troubleshoot the circuits associated with the A-Register commands.

(3) Press DISPLAY MEMORY switch. The content of memory location 00001 (B-Register) is now displayed by the T-Register indicators.

(4) Check T-Register display for indication of 077777. If indication is normal, proceed with next step. If indication is abnormal, troubleshoot the circuits associated with the B-Register commands.

(5) As presented, the above procedure checks the LDA and LDB commands. To check the MIA and MIB commands, repeat steps "a" through "g", except substitute 102401 and 106401 in steps "b" and "c", respectively.

5-35. LOADING. Load the Alter-Skip instruction Test Tape in accordance with the instructions presented in Paragraph 5-20.

5-36. RUN. To run the program proceed as follows:

a. Enter 002000 (starting address) into the S-Register. Then press LOAD ADDRESS switch.

b. Enter 077777 into the S-Register. Then press RUN switch.

c. The Computer should run briefly and then halt. Check that the T-Register indicators are displaying halt instruction 102001, and that the M-Register indicators are displaying address 002001. (These indications verify that the halt instruction is functioning normally.) If indications are normal, proceed with next step.

d. Press the RUN switch again. The test should loop continuously until an error condition is detected, or until the operator elects to stop the test by pressing the HALT switch. If no error conditions are detected, the Computer should be permitted to run continuously for at least one minute and 5 seconds. This allows time for at least 1000 test passes to be executed.

5-37. EXECUTION ERRORS. Errors detected by the test program cause the Computer to halt. Each program halt indicates that either a single code combination, or one of two code combinations, has failed. The expected values for the A- or B-Registers and the E-Register when the halt was encountered are contained in the program listing. After an error halt, it may be desirable to continue the test. In this case the following sequence should be followed:

a. Refer to the program listing and locate the error halt value of the P-Register.

b. Check the stated expected values for the A- or B-Registers against the actual values contained in the hardware registers. (Use the same general procedure presented in Paragraph 5-34, step "g", to determine the content of these registers.) Record the value observed, then proceed with the next step.

c. Check the stated expected value of the E-Register against the actual value by observing the status of the EXTEND indicator. If normal, proceed with next step. If the E-Register contains a "one", but should contain a "zero", enter 002100 into the S-Register, press the LOAD ADDRESS switch, and press the SINGLE CYCLE switch. (The EXTEND indicator should now be off to indicate that the E-Register has been cleared.) If the E-Register contains a "zero", but should contain a "one", enter 002300 into the S-Register, press the LOAD ADDRESS switch, and press the SINGLE CYCLE switch. (The EXTEND indicator should now be on to indicate that the E-Register has been set.) If indication is now normal, proceed with next step.

d. Enter 000000 into the S-Register and press LOAD ADDRESS switch.

e. If the correct value for the A-Register was not observed (step "b" above), enter the correct value for this register into the S-Register and press the LOAD MEMORY switch.

f. If the correct value for the B-Register was not observed (step "b" above), enter the correct value for this register into the S-Register and press the LOAD MEMORY switch.

g. Enter the P-Register value (observed in step "a" above) into the S-Register. Then press the LOAD ADDRESS switch. (This inserts the restart address into the M- and P-Registers.)

h. Enter 077777 into the S-Register, then press the RUN switch. The test should now continue.

5-38. DESCRIPTION.

5-39. The Alter-Skip Instruction Test is a minimal test of every legitimate code combination in the group. The test program was written in modules to allow for extensive looping on a particular module, or to bypass a failing module. The substitution of a jump instruction into the last location (NOP) of a particular module allows bypassing of one or more modules, or the looping of a particular module or group of modules. Each module uses the S-Register test pattern as input to the A- or B-Register. Complement and increment by-one operations are performed on this initial setting, and various skip operations are tested against the results. If the register is not set to its proper value, a skip operation will fail and an error halt will occur. Reference to the program listing will assist in the analysis of the error pattern encountered.

5-40. A list containing the octal code and initial location of each program module is presented in Table 5-6. If bypass is desirable, use this list to determine the locations requiring jump instructions. After the test using the A-Register is executed successfully, the A-Register codes are modified (internally) and the test is repeated using the B-Register.

5-41. EXAMPLES.

5-42. Assume that during the execution of the A-Register test, an error halt is encountered at location 4235. (The actual halt instruction is in memory location 4234.) The code combination that failed was CMA, CLE, SSA, SLA, SZA, RSS. The value 177777 should be in the A-Register, and 0 should be in the

E-Register. If these register values are correct, then both the SSA, SLA, RSS, and the SZA, RSS instructions failed to set the skip condition. If continuation of the test is desired, the procedure in Paragraph 5-37 should be followed. Based on this example the sequence would be:

a. Error halt location 4235; A=177777; E=0.

b. If E=0, proceed directly to step "c". If E=1, clear the E-Register as follows:

(1) Enter 001000 into the S-Register and press LOAD ADDRESS switch.

(2) Enter 002100 into the S-Register and press LOAD MEMORY switch.

(3) Repeat step (1) above. Then press the SINGLE CYCLE switch. (The EXTEND indicator should now be off indicating that the E-Register is clear.)

c. Enter 000000 into the S-Register and press LOAD ADDRESS switch.

d. Enter 177777 into the S-Register and press LOAD MEMORY switch. (The A-Register is now reset to 177777 for restart.)

e. Enter 004235 into the S-Register and press LOAD ADDRESS switch. (This inserts the restart address into the M and P Registers.)

f. Enter 077777 into the S-Register and press RUN switch. (The test program should now continue to run until another error halt is encountered or until the Computer is halted at the front panel by the operator.

5-43. Assume that during the execution of the B-Register test an error halt is encountered at location 5225. (The actual halt instruction is in memory location 5224.) One of two code combinations may have caused the error: CMB, SEZ, CLE, RSS: or CMB, SEZ, CLE, INB. If B=177777 and E=0, the first code combination skipped erroneously. If B=000001 and E=0, the second code combination failed to set the skip condition. If the register values are incorrect, then the increment or complement functions for the registers failed. By using the front panel controls, the failure can be isolated to one of the two code combinations. If it is desired to continue the test after completing the trouble analysis, the procedure in Paragraph 5-37 should be used. Based on this example the sequence would be:

a. Error halt location 5225; B=177777 or 000001; E=0.

b. If E=0, proceed directly to step "c". If E=1, use the procedure in step 5-42b to clear the E-Register.

c. Enter 005225 into the S-Register and press the LOAD ADDRESS switch. (This inserts the restart address into the P-Register.)

d. Because two code combinations are listed for this error halt, the values listed for the A-Register (the B-Register in this example) and the E-Register, as stated for the second code combination, are used. Therefore, enter 000001 into the S-Register and press the LOAD ADDRESS switch. Then press LOAD MEMORY switch. (The B-Register is now reset to 000001 for restart.)

e. Enter 005225 into the S-Register and press LOAD ADDRESS switch. (This inserts the restart address into the M and P Registers.)

f. Press the RUN switch. (The test program should now continue to run until another error halt is encountered or until the Computer is halted from the front panel by the operator.)

5-44. During execution of the test, it may be desirable to bypass one or several program modules. If code combinations 3400-3427 are to be bypassed, for example, the following procedure is used:

a. Refer to Table 5-6 and note that location 3332 is listed as the initial location of module 16 (codes 3400-3427).

b. In location 3332, a jump to location 3406 must be inserted. As listed in Table 5-6, 3406 is the initial location of module 17. Care should be taken not to violate page boundaries with a direct jump.

c. Enter 003332 into the S-Register and press LOAD ADDRESS switch. Then enter 027406 into the S-Register and press LOAD MEMORY switch.

d. Enter 002001 into the S-Register and press LOAD ADDRESS switch. Then enter 077777 into the S-Register and press RUN switch. The test will now execute, but will bypass program module 16.

5-45. PROGRAM LISTING.

5-46. The program listing for the Alter-Skip Instruction Test is presented at the rear of this section.

5-47. MEMORY REFERENCE INSTRUCTION TEST.

5-48. SCOPE.

5-49. This program is a reliability test of the 14 memory reference instructions. These instructions are tested using both the A- and B-Registers, and the E-Register when required. This test should be executed only after the Alter-Skip Instruction Test has been successfully executed, since alter-skip instructions are used in testing the memory reference instruction codes. When executed, the Memory Reference Instruction Test loops continuously until an error condition is detected, or until manually halted by the operator.

5-50. STORAGE.

5-51. The Memory Reference Group program is stored in memory locations 7642 through 7667; 1000 through 1322, 2000 through 5027, and 6000 through 6017.

Table 5-6. Alter-Skip Program Module Locations

PROGRAM MODULE NUMBER	OCTAL CODES TESTED	INITIAL LOCATION
1	2000-2027	2000
2	2040-2067	2061
3	2100-2127	2140
4	2200-2227	2224
5	2300-2327	2303
6	2400-2427	2367
7	2440-2467	2456
8	2500-2527	2541
9	2600-2627	2614
10	2700-2727	2673
11	3000-3027	2750
12	3040-3067	3032
13	3100-3127	3113
14	3200-3227	3173
15	3300-3327	3253
16	3400-3427	3332
17	3440-3467	3406
18	3500-3527	3566
19	3600-3627	3560
20	3700-3727	3635
21	2030-2037	3712
	2070-2077	3712
	2130-2137	3712
22	2230-2237	4001
	2330-2337	4001
23	2430-2437	4043
	2470-2477	4043
	2530-2537	4043
24	2630-2637	4124
	2730-2737	4124
	3030-3037	4124
	3070-3077	4124
	3130-3137	4124
25	3230-3237	4246
	3330-3337	4246
26	3430-3437	4314
	3470-3477	4314
	3530-3537	4314
	3630-3637	4314
	3730-3737	4314
27	2140-2177	4432
28	2240-2277	4530
29	2340-2377	4626
30	2540-2577	4727
31	2640-2677	5020
32	2740-2777	5112
33	3140-3177	5213
34	3240-3277	5312
35	3340-3377	5412
36	3540-3577	5505
37	3640-3677	5606
38	3740-3777	5701

5-52. EXECUTION.

5-53. INITIALIZATION. The Alter-Skip Instruction Test program (Paragraph 5-28) must be executed successfully prior to attempting execution of the Memory Reference Instruction Test Program.

5-54. LOADING. The tape for the Memory Reference Instruction Test is loaded in two steps using the following procedure:

a. Load the first part of the tape using the instructions presented in Paragraph 5-20. When the Computer halts (halt instruction 102077 displayed by the T-Register indicators), memory locations 7642 through 7667 have been loaded.

b. Enter 007642 into the S-Register and press LOAD ADDRESS switch.

c. Press RUN control. The Computer will run briefly and then halt (halt instruction 102001 displayed by the T-Register indicators). Memory locations 000100 through 007655 are now initialized to self-addressed halts (102002, 102003, etc).

d. Load the second part of the tape in accordance with the instructions presented in Paragraph 5-20. When the Computer halts (halt instruction 102077 displayed by the T-Register indicators) the remaining memory locations will have been loaded. Proceed with the run instructions in the following paragraph.

5-55. RUN. To run the program proceed as follows:

a. Enter 001000 into the S-Register and press LOAD ADDRESS switch.

b. Enter 077777 into the S-Register and press RUN switch. (The test should loop continuously until an error halt condition is detected, or until the operator elects to stop the test by pressing the HALT switch. If no error conditions are detected, the Computer should be permitted to run continuously for at least one minute and 45 seconds. This allows time for at least two test passes to be executed.

5-56. EXECUTION ERRORS. Prior to executing the entire memory reference instruction test, a basic reliability test is executed first. If errors are detected by this portion of the test program, the processor halts with the error halt location in the P-Register. Table 5-7 contains a list of the error halts for the basic test. For each error halt, the expected values for the A-, B-, and E-Registers are specified. Remedial measures should be taken prior to executing the remainder of the program. If it is desired to continue the basic test after an error halt has been encountered, press the RUN switch.

5-57. After execution of the basic test, control is passed to that portion of the program which performs the extensive test of all memory reference instructions. Errors detected by this portion of the test cause the Computer to halt with the P-Register containing 001257. The A-Register contains the location of the error-producing instruction, and the B-Register

contains the octal equivalent of the failing instruction code. After inspecting the A- and B-Registers, reset the P-Register to 001257 and press the RUN switch. The Computer will immediately halt with the P-Register containing 001262. The original contents of the A-Register and B-Register at the time of error detection are contained in the respective registers. After inspecting the A- and B-Register contents, press the RUN switch. The test will continue to cycle until additional errors are detected, or until manually halted by the operator.

Table 5-7. Memory Reference Instruction Test (Basic Portion), Error Halt Indications

LOCATION (P)	INSTRUCTION FAILURE
1003	JMP failed; A=000000, E=0
1006	JSB failed; A=000000, E=0
1010	JSB failed; B=000000, E=0
1024	JSZ failed; A=000000, B=000000, E=0
1037	ISZ failed; A=000000, B=000000, E=0
1045	CPA failed; A=077777, B=077777, E=0
1052	CPA failed; A=100000, B=100000, E=0
1057	CPA failed; A=100001, B=100001, E=0
1064	CPB failed; A=077777, B=077777, E=0
1071	CPB failed; A=100000, B=100000, E=0
1076	CPB failed; A=100001, B=100001, E=0
1106	AND failed; A=000000, B=100000, E=0
1112	AND failed; A=000000, B=100001, E=0
1114	AND failed; A=000000, B=100001, E=0
1123	XOR failed; A=000000, B=077777, E=0
1127	XOR failed; A=100000, B=100000, E=0
1131	XOR failed; A=100000, B=100000, E=0
1140	IOR failed; A=000000, B=100000, E=0
1146	LDA failed; A=077777, E=0
1154	LDB failed; B=077777, E=0
1163	STA failed; A=077777, E=0
1173	STB failed; B=077777, E=0
1203	ADA failed; A=125252, E=0
1205	ADA failed; E≠0
1214	ADA failed; A=052525
1216	ADA failed; E≠1
1225	ADB failed; B=125252
1227	ADB failed; E≠0
1237	ADB failed; B=052525
1241	ADB failed; E≠1

5-58. DESCRIPTION.

5-59. The Memory Reference Test is an extensive test of the fourteen memory reference instructions. The test begins with a simple exercise of each of the instructions; this verifies that the group basically operates successfully. The basic test utilizes the Switch Register to generate test patterns. After one successful pass through the basic test, control is transferred to the remainder of the test. During each pass through the Memory Reference Test, both the basic and extended portions of the test are executed. The Switch Register must remain set to 077777 for all passes through the test.

5-60. The extended portion of the test executes each instruction direct and indirect to each page within 4K, multi-level indirect to each page within 4K, and direct and indirect through the A- and B-Registers. After this phase is complete, iterative testing of selective instructions is executed. The modules and their locations are listed in Tables 5-8 and 5-9.

5-61. Any module can be looped continuously by inserting a jump in the NOP location preceding the initial location of the next sequential module. The entire test will loop continuously until halted from the front panel, or until an error is detected. If restart is desired, the starting address is 001000 with the Switch Register set to 077777.

Table 5-8. Memory Reference Instruction Test (Extended Portion), Module Locations and Test Functions

TJMP1	2000-2061	Jump Test
TJSB1	2061-2136	Jump Subroutine Test
TISZ1	2137-2311	Index Skip Test
TCPA1	2312-2401	Compare to A Test
TAND1	2402-2472	And to A Test
TXOR1	2570-2670	Exclusive OR to A Test
TIOR1	2671-2767	Inclusive OR to A Test
TLDA1	2770-3055	Load A Test
TLDB1	3056-3140	Load B Test
TSTA1	3141-3230	Store A Test
TSTB1	3231-3321	Store B Test
TADA1	3322-3442	Add to A Test
TADB1	3443-3560	Add to B Test

Table 5-9. Memory Reference Iterative Module Locations and Tests

TCPA2	4000-4024	Iterative CPA Test
TCPB2	4025-4051	Iterative CPB Test
TAND2	4052-4114	Iterative AND Test
TXOR2	4115-4161	Iterative XOR Test
TIOR2	4162-4240	Iterative IOR Test
TLDA2	4241-4265	Iterative LDA Test
TLDB2	4266-4312	Iterative LDB Test
TSTA2	4313-4341	Iterative STA Test
TSTB2	4342-4370	Iterative STB Test
TADA2	4371-4521	Iterative ADA Test
TADB2	4522-4652	Iterative ADB Test

5-62. EXAMPLES.

5-63. During the execution of a pass, a halt is encountered with the P-Register containing 001257. The A-Register contains 004201 and the B-Register contains 031313. After inspecting the A- and B-Registers, reset the P-Register to 001257. The RUN switch is pressed and the Computer halts with the P-Register containing 001262. The A-Register contains 000004 and the B-Register contains 000141. The initial halt values indicate that an IOR to base page location 004201 failed. The second halt indicates that it failed on the 141st octal iteration and the A-Register contained 00004 instead of 000000. This indicates that bit 2 of the A-Register was not set during the IOR operation of the following two patterns: 052525 and 125252. Since 141 octal iterations were completed successfully, it would indicate that the problem is of intermittent nature.

5-64. PROGRAM DIAGRAM AND LISTING.

5-65. A functional diagram for the Memory Reference Group Test is presented in Figure 5-1. The program listing is presented at the rear of this section.

5-66. SHIFT-ROTATE INSTRUCTION TEST.

5-67. SCOPE.

5-68. This program is a reliability test of all legitimate code combinations in the Shift-Rotate Group (SRG) and the instructions used to control and sense the overflow logic. The codes are tested utilizing both the A- and B-Registers, rendering a total of 612 legitimate, meaningful combinations. This test should be used only after the Alter-Skip Group Test and the Memory Reference Instruction Test have been successfully executed. This test uses Alter-Skip and Memory Reference instructions to execute the SRG combinations. This test will loop continuously until an error condition is detected, or until normally halted by the operator.

5-69. STORAGE.

5-70. The Shift-Rotate Group program is stored in memory locations 4500 through 7104.

5-71. EXECUTION.

5-72. INITIALIZATION. The Alter-Skip Group test program (Paragraph 5-28) and the Memory Reference Group Test program (Paragraph 5-47) must be executed successfully prior to attempting execution of the Shift-Rotate Group test program.

5-73. LOADING. Load the Shift-Rotate Group tape in accordance with the instructions presented in Paragraph 5-20.

5-74. RUN. To run the program, proceed as follows:

a. Enter 006200 into the S-Register and press LOAD ADDRESS switch.

b. Enter 077777 into the S-Register and press RUN switch. (The test should loop continuously until an error halt is detected, or until the operator elects to stop the test by pressing the HALT switch. If no error conditions are detected, the Computer should be permitted to run continuously for at least 35 seconds. This allows time for at least 1000 test passes to be executed.)

5-75. EXECUTION ERRORS. Prior to execution of the full set of SRG code combinations, a basic reliability test is executed. If errors are detected by the basic test program, the Computer halts indicating the error halt location in the P-Register. Table 5-10 contains a list of the error halts for the basic test. For each error halt listed, the expected values for the A- or B-Registers and the E-Register are also listed. These values can be used to restart the basic test after an error condition has been detected. If errors are encountered in this portion of the test, remedial measures should be attempted prior to execution of the remainder of the program. If it is desirable to continue the basic test after an error halt has been encountered, the following sequence should be followed:

a. Refer to Table 5-10 and locate the error halt value of the P-Register in the left-hand column.

Table 5-10. Shift-Rotate Instruction Test (Basic Portion) Error Halts

LOCATION (P)	INSTRUCTION FAILURE	
6204	SLA failed;	A=000000, E=1
6207	SLB failed;	B=000000, E=0
6211	CLE, SLB failed;	B=000000, E=0
6214	SLA failed;	A=000000, E=0
6216	CLE, SLA failed;	A=000000, E=0
6221	SLB failed;	B=000000, E=0
6223	CLE, SLB failed;	B=000000, E=0
6233	ALS, ARS failed;	A=000001, E=0
6235	BLS, BRS failed;	B=000001, E=0
6245	ALS failed;	A=100000, E=0
6247	BLS failed;	B=100000, E=0
6255	RAL failed;	A=000002, E=0
6257	RBL failed;	B=000002, E=0
6263	RAR failed;	A=000001, E=0
6265	RBR failed;	B=000001, E=0
6273	ALR failed;	A=077776, E=0
6275	BLR failed;	B=077776, E=0
6302	ERA failed;	A=000000, E=1
6306	ERB failed;	B=000000, E=1
6311	ELA failed;	A=000001, E=0
6315	ELB failed;	B=000001, E=0
6324	ALF failed;	A=000001, E=0
6333	BLF failed;	B=000001, E=0
6336	ARS, SLA failed;	A=000000, E=0
6341	BRS, SLB failed;	B=000000, E=0
6345	ELA, SLA failed if	A=000001, E=0
	ERA, SLA failed if	A=000000, E=1

b. Check the stated expected values of the A- or B-Registers and the E-Register against the actual value contained in the hardware registers.

c. After visual inspection has been completed, check the expected value of the E-Register. If normal, proceed directly to step "d". If the E-Register contains a "one", but should contain a "zero", enter 001000 into the S-Register and press LOAD ADDRESS switch. Then enter 002100 into the S-Register and press LOAD MEMORY switch. Finally, enter 001000 into the S-Register, press LOAD ADDRESS switch, then press SINGLE CYCLE switch. (The EXTEND indicator should now be off to indicate that the E-Register has been cleared.) If the E-Register contains a "zero", but should contain a "one", substitute 002300 in place of 002100 in the foregoing procedure. (The EXTEND indicator should then go on to indicate that the E-Register has been set.)

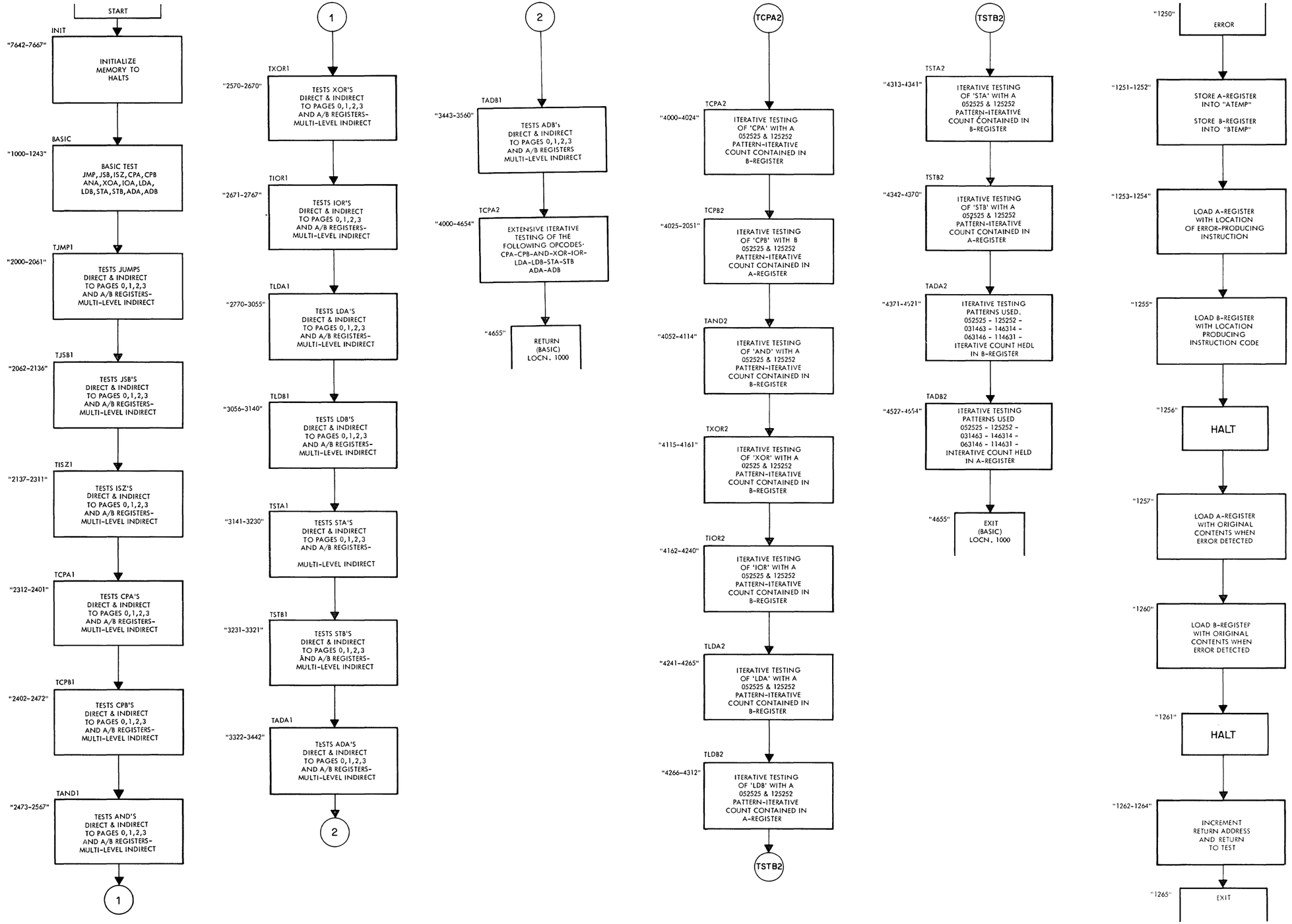


Figure 5-1. Memory Reference Instruction Test, Functional Diagram

d. The A- or B-Registers must now be reset. If the error indicates a change in the A-Register, enter 000000 into the S-Register and press LOAD ADDRESS switch. Then enter the value indicated for the error halt into the S-Register and press LOAD MEMORY switch. If the error indicates a change in the B-Register, enter 000001 into the S-Register, and press LOAD MEMORY switch. Then set the value indicated for the error halt into the S-Register and press LOAD MEMORY switch.

e. After the E-Register has been reset, enter the P-Register value stated for the error halt into the S-Register and press LOAD ADDRESS switch. (This inserts the restart address into the M- and P-Registers.

f. Enter 077777 into the S-Register and press RUN switch. The test should now continue.

5-76. After successful execution of the basic test, control is passed to that portion of the program which tests the full set of Shift-Register Group code combinations. Errors detected by this portion of test cause the processor to halt with the P-Register containing 006540. The A-Register contains the known good pattern, and the B-Register contains the resultant bad pattern after the code combination was executed. After inspecting the A- and B-Register contents, press the RUN switch. The Computer will immediately halt with the P-Register containing 006546. The A-Register contains the octal equivalent of the error-producing shift code combination. The B-Register contains the bit pattern in its original state prior to executing the code combination in error. After inspecting the A- and B-Register contents reset the P-Register to 006540 and press the RUN control. The test will continue to cycle until additional errors are detected.

5-77. DESCRIPTION.

5-78. The Shift-Rotate Group Test is an extensive test of every legitimate, meaningful code combination in the group. The test begins with a simple exercise of the basic shift codes; this verifies that the group basically operates successfully. The basic test utilizes the Switch Register to generate shift patterns. After one successful pass through the basic test, control is never returned to the basic test except if restart from the front panel is attempted. After the basic test is successfully executed, the Switch Register is not used during the remainder of the test execution.

5-79. The remainder of the test is comprised of the sections listed in Table 5-11. Each code combination contained in the shift code combination array is executed once with each of the seven patterns contained in the shift pattern array for each pass of the program. After each of these executions, a comparison is made with the known-good comparison pattern array. A complete pass is executed with each code combination using the A-Register, and the next complete pass uses the B-Register. If a comparison error is detected, a jump displaying the following information in the A- and B-Registers:

a. The octal equivalent of the failing shift code combination.

b. The original shift pattern.

c. The results of the execution of the shift code combination.

d. The good comparison pattern.

Table 5-11. Shift-Rotate Group Test Sections

LOCATION	TEST
4500-4506	Shift Pattern Array
4507-5477	Good Comparison Pattern Array
5500-6137	Shift Code Combination Array
6200-6344	Basic Reliability Test
6345-6757	Main Control Program

5-80. If the octal equivalents of the shift code combinations range between 0020-1777, the operation used the A-Register. If the range is 4020-5777, the operation used the B-Register.

5-81. A special test also exercises the overflow logic and checks instructions CLO, STO, SOS, SOS,C, and SOC. For each A-Register and B-Register pass, the special test is executed to test the octal codes specified in Table 5-12.

Table 5-12. Shift-Rotate Group Special Test Octal Codes

A-Register	B-Register
1565	5565
1566	5566
1575	5575
1576	5576
1665	5665
1666	5666
1675	5675
1676	5676

5-82. If errors are detected by the special test program, the computer halts to indicate the error halt location in the P-Register. Table 5-13 contains a list of the error halts for the special test. For each error halt listed, the expected values for the A- or B-Register and the E-Register are also listed. These values can be used to restart the special test after an error condition has been detected.

5-83. The test will loop continuously until halted from the front panel, or an error is detected. If restart is to include the basic test, the starting address is 006200 with the S-Register set to 077777. If restart without the basic test is desired, the starting address is 006345 and no S-Register setting is necessary.

5-84. EXAMPLES.

5-85. Assume that during the execution of a pass using the A-Register, a halt is encountered with the

P-Register containing 006540. The A-Register contains 125250 and the B-Register contains 125350. After inspecting the A- and B-Registers, reset the P-Register to 001257 and press the RUN switch. A halt occurs with the P-Register containing 006546. The A-Register contains 001426, and the B-Register contains 125252. The shift code combination (001426) that failed is ALR, ELA. The pattern in the A-Register before execution of the ALR, ELA was 125252. The result of execution was 125350, but it should have been 125250. The indication is that during execution of the ALR, ELA code, bit 6 of the A-Register was set erroneously. (If the shift code combination was 005426 instead of 001426, bit 6 of the B-Register was the failing element.

5-86. PROGRAM DIAGRAM AND LISTING.

5-87. A functional diagram for the Shift-Rotate Group Test is presented in Figure 5-2. The program listing is presented at the rear of this manual.

5-88. MEMORY ADDRESS TESTS.

5-89. SCOPE.

5-90. The Memory Address Tests (High and Low) check the Memory Address Register and a specified area of core memory. These programs are executed in three steps. The first step sets the starting and ending address for the area under test. The second step loads the memory with test data. The third step reads memory content and tests it for errors. If an error is detected, the program will halt with the error stored in the B-Register, and the correct data stored in the A-Register. The instructions presented in the following paragraphs are applicable to both the High and Low Memory Address Tests.

5-91. STORAGE.

5-92. The terms "high" and "low" refer to the relative positions in memory where the Memory Address Test programs are stored. The High Memory Address Test is stored in memory locations 7600 through 7643, and tests memory locations 0002 through 7577. The Low Memory Address Test is stored in memory locations 0100 through 0143, and tests memory locations 0144 through the upper limit of memory (excluding the protected area).

5-93. EXECUTION.

5-94. INITIALIZATION. No initialization procedure is required.

5-95. LOADING. Load either the High Memory Address Test tape or the Low Memory Address Test tape in accordance with the instructions presented in Paragraph 5-20.

5-96. RUN. After loading the desired program tape, proceed as follows:

a. If the High Memory Address Test is being run, enter 7600 into the S-Register; if the Low Memory Address Test is being run, enter 0100 into the S-Register. Then press the LOAD ADDRESS switch.

b. If High Test, enter 0002 into the S-Register; if Low Test enter 0144 into the S-Register. (This defines the lower limit of the area under test.)

c. Press the RUN switch. The Computer will run briefly and then halt with instruction 102001 indicated by the T-Register display. Proceed with next step.

d. If High Test, enter 7577 into the S-Register; if Low Test enter 07677 for 4K memory, or 17677 for 8K memory, into the S-Register. (This defines the upper limit of the memory area under test.)

e. Press the RUN switch. The test should loop continuously until an error condition is detected, or until the operator elects to stop the test by pressing the HALT switch. If no error conditions are detected, the Computer should be permitted to run continuously for at least two minutes if the High Memory Address Test is being run, or six minutes if the Low Memory Address Test is being run. This allows time for at least 1000 test passes to be executed.

5-97. EXECUTION ERRORS. The test program will run until an error is encountered. If an error occurs, record the content of the P-, A- and B-Registers. Then reset the P-Register and press the RUN switch. The program will continue to run until another error is encountered.

5-98. DESCRIPTION.

5-99. The Memory Address Tests check the addressing logic by storing a working number in an address equal to that number. The working number is then incremented by one and stored in the next memory location. The routine then checks each memory location for the correct content. If an error is detected, the Computer halts. If no errors occur, the Computer runs until manually halted.

5-100. PROGRAM DIAGRAM AND LISTING.

5-101. A functional diagram for the Memory Address Tests is presented in Figure 5-3. The program listing is presented at the rear of this section.

5-102. MEMORY CHECKERBOARD TESTS.

5-103. SCOPE.

5-104. The Memory Checkerboard Tests (High and Low) check the core memory for failures by loading an alternating pattern of all "ones" or all "zeros", and then reading these locations and checking for errors. If an error is detected, the Computer will halt on the address of the error. The instructions presented in the following paragraphs are applicable to both the Low and High Memory Checkerboard Tests.

Table 5-13. Shift-Rotate Group Special

LOCATION (P)	INSTRUCTION FAILURE
6613	ERA, CLE, ERA failed; A=000000, E=0
6615	ERA, CLE, ERA failed; A=000000, E=0
6621	ERA, CLE, ELA failed; A=000000, E=0
6623	ERA, CLE, ELA failed; A=000000, E=0
6626	ERA, CLE, SLA, ERA failed; A=000000, E=0
6630	ERA, CLE, SLA, ERA failed; A=000000, E=0
6632	ERA, CLE, SLA, ERA failed; A=000000, E=0
6635	ERA, CLE, SLA, ELA failed; A=000000, E=0
6637	ERA, CLE, SLA, ELA failed; A=000000, E=0
6641	ERA, CLE, SLA, ELA failed; A=000000, E=0
6645	ELA, CLE, ERA failed; A=000000, E=0
6647	ELA, CLE, ERA failed; A=000000, E=0
6653	ELA, CLE, ELA failed; A=000000, E=0
6655	ELA, CLE, ELA failed; A=000000, E=0
6660	ELA, CLE, SLA, ERA failed; A=000000, E=0
6662	ELA, CLE, SLA, ERA failed; A=000000, E=0
6664	ELA, CLE, SLA, ERA failed; A=000000, E=0
6667	ELA, CLE, SLA, ERA failed; A=000000, E=0
6671	ELA, CLE, SLA, ERA failed; A=000000, E=0
6673	ELA, CLE, SLA, ERA failed; A=000000, E=0
6677	STO or SOS failed
6701	SOS, C failed
6703	SOS, C or SOC failed
6706	SOS skipped when overflow is clear
6713	INA did not set overflow
6720	Unlike signs caused overflow to be set
6725	ADA did not set overflow
6732	Unlike signs caused overflow to be set
6737	Illegal set of overflow indicator
6744	Illegal set of overflow indicator
6752	ERB, CLE, ERB failed; B=000000, E=0
6754	ERB, CLE, ELB failed; B=000000, E=0
6760	ERB, CLE, ELB failed; B=000000, E=0
6762	ERB, CLE, ELB failed; B=000000, E=0
6765	ERB, CLE, SLB, ERB failed; B=000000, E=0
6767	ERB, CLE, SLB, ERB failed; B=000000, E=0
6771	ERB, CLE, SLB, ERB failed; B=000000, E=0
6774	ERB, CLE, SLB, ELB failed; B=000000, E=0
6776	ERB, CLE, SLB, ELB failed; B=000000, E=0
7000	ERB, CLE, SLB, ELB failed; B=000000, E=0
7004	ELB, CLE, ERB failed; B=000000, E=0
7006	ELB, CLE, ERB failed; B=000000, E=0
7012	ELB, CLE, ELB failed; B=000000, E=0
7014	ELB, CLE, ELB failed; B=000000, E=0
7017	ELB, CLE, SLB, ERB failed; B=000000, E=0
7021	ELB, CLE, SLB, ERB failed; B=000000, E=0
7023	ELB, CLE, SLB, ERB failed; B=000000, E=0
7026	ELB, CLE, SLB, ERB failed; B=000000, E=0
7030	ELB, CLE, SLB, ERB failed; B=000000, E=0
7032	ELB, CLE, SLB, ERB failed; B=000000, E=0
7036	STO or SOS failed
7040	SOS, C failed
7042	SOS, C or SOC failed
7045	SOS skipped when overflow is clear
7052	INB did not set overflow
7057	Unlike signs caused overflow to be set
7064	ADB did not set overflow
7071	Unlike signs caused overflow to be set
7076	Illegal set of overflow indicator
7103	Illegal set of overflow indicator

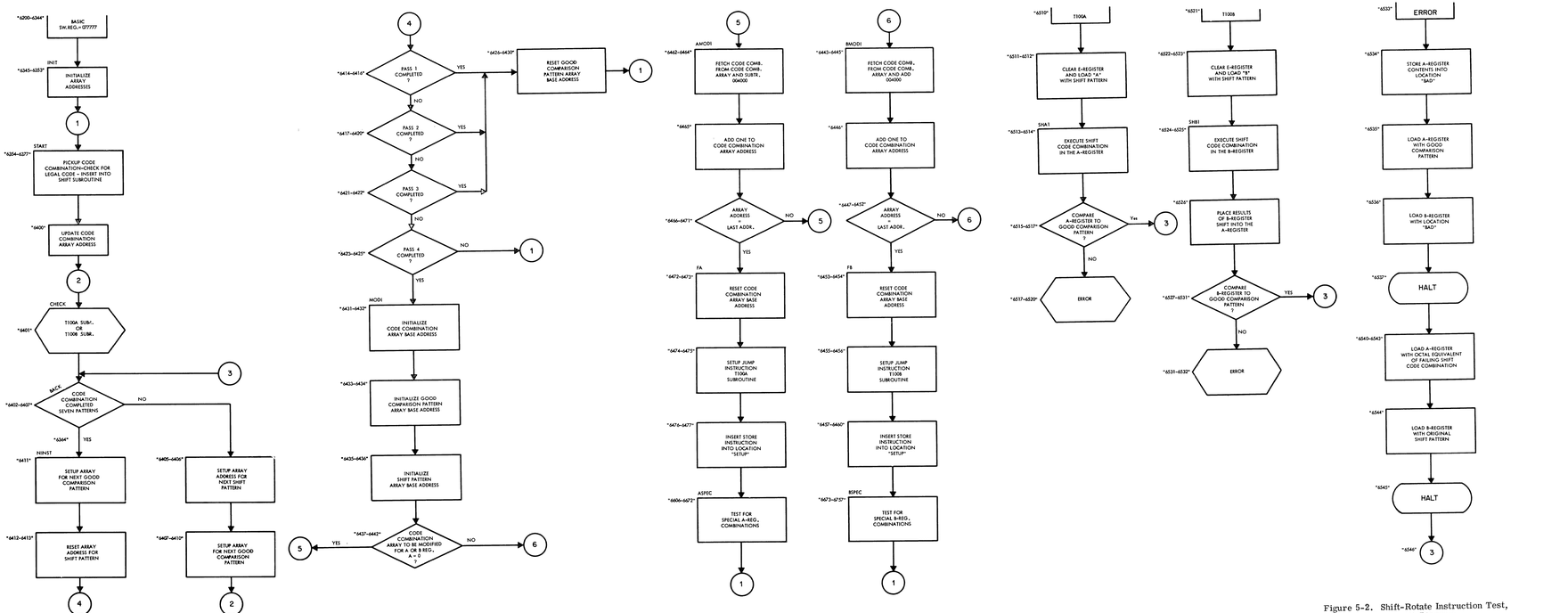


Figure 5-2. Shift-Rotate Instruction Test, Functional Diagram

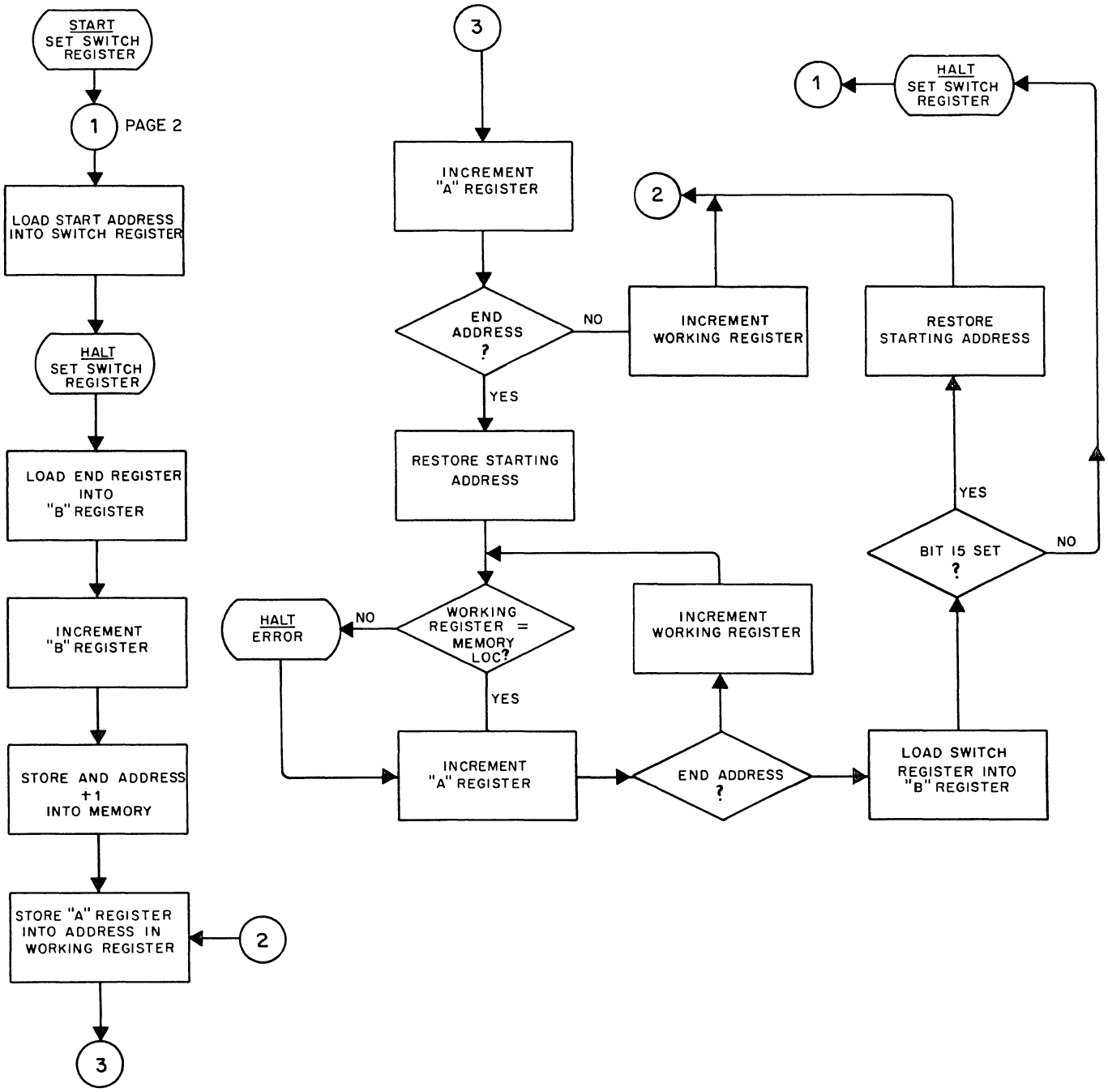


Figure 5-3. Memory Address Test Functional Diagram

5-105. STORAGE.

5-106. The terms "high" and "low" refer to the relative positions in memory where the Memory Checkerboard Test programs are stored. The High Memory Checkerboard Test is stored in memory locations 7500 through 7657, and tests memory locations 0002 through 7477. The Low Memory Checkerboard Test is stored in memory locations 0010 through 0167, and tests memory locations 0170 through the upper limit of memory (excluding the protected area).

5-107. EXECUTION.

5-108. INITIALIZATION. No initialization procedure is required.

5-109. LOADING. Load either the High Memory Checkerboard Test tape in accordance with the instructions presented in Paragraph 5-20.

5-110. RUN. After loading the desired program tape, proceed as follows:

Note

If the Memory Parity Check option is installed in the Computer (slot A5), the top hood connector must be in the interrupt position when the Memory Checkerboard Tests are conducted.

a. If the High Memory Checkerboard Test is being run, enter 7500 into the S-Register; if the Low Memory Checkerboard Test is being run, enter 0010 into the S-Register. Then press LOAD ADDRESS switch.

b. Press the RUN switch. The Computer will run briefly and then halt with halt instruction 102001 indicated by the T-Register display. Proceed with next step.

c. If High Test, enter 0002 into the S-Register; if Low Test, enter 0170 into the S-Register. (This defines the lower limit of the memory area under test.)

Note

The A- and B-Registers are hardware registers that use memory addresses 00000 and 00001, respectively. Core locations 00000 and 00001 on the base page of memory are not available for use. Therefore, the lowest possible starting core address is 00002.

d. Press the RUN switch. The Computer will run briefly and then halt with halt instruction 102001 indicated by the T-Register display. Proceed with next step.

e. If High Test, enter 7477 into the S-Register; if Low Test, enter value of upper limit of memory (07677 for 4K memory; 17677 for 8K memory). (This defines the upper limit of the memory under test.)

Note

The Low Test may be run with the LOADER ENABLE switch in the ON position. This permits testing of the core where the Basic Binary Loader is stored. However, this destroys the content of these memory locations, and the Basic Binary Loader must be restored after the test has been completed.

f. Press the RUN switch. The test should loop continuously until an error condition is detected, or until the operator elects to stop the test by pressing the HALT switch. If no error conditions are detected, the Computer should be permitted to run continuously for at least two minutes if the High Checkerboard Test is being run, or six minutes if the Low Checkerboard Test is being run. This allows time for at least three test passes to be executed.

5-111. EXECUTION ERRORS. The test program will run until an error is encountered, or until the Computer is halted manually. When an error occurs, the test will halt with the address of the error in the A-Register. Record the contents of the P- and A-Registers. Then reset the P-Register and press the RUN switch. The Computer will then halt again. The content of the error-producing address will now be contained in the B-Register, and the correct pattern will be contained in the A-Register. To continue the test at the next location, reset the P-Register and press the RUN switch.

5-112. If it is desired to redefine the area of memory tested, proceed as follows:

a. Enter a "one" into bit 15 of the S-Register. The Computer will halt; proceed with next step.

b. Enter the new starting address into the S-Register.

c. Press the RUN switch. The Computer will halt; proceed to the next step.

d. Enter the new ending address into the S-Register.

e. Press the RUN switch. The Computer will run until an error is detected or a new area of core is to be tested.

5-113. DESCRIPTION.

5-114. The beginning of the program sets the starting and ending addresses of the area to be tested. The Read/Write and the Pattern flags are cleared. The pattern is written into the area of memory defined by the starting and ending address. The program then tests each location for the correct contents. The contents are then complemented and stored again in

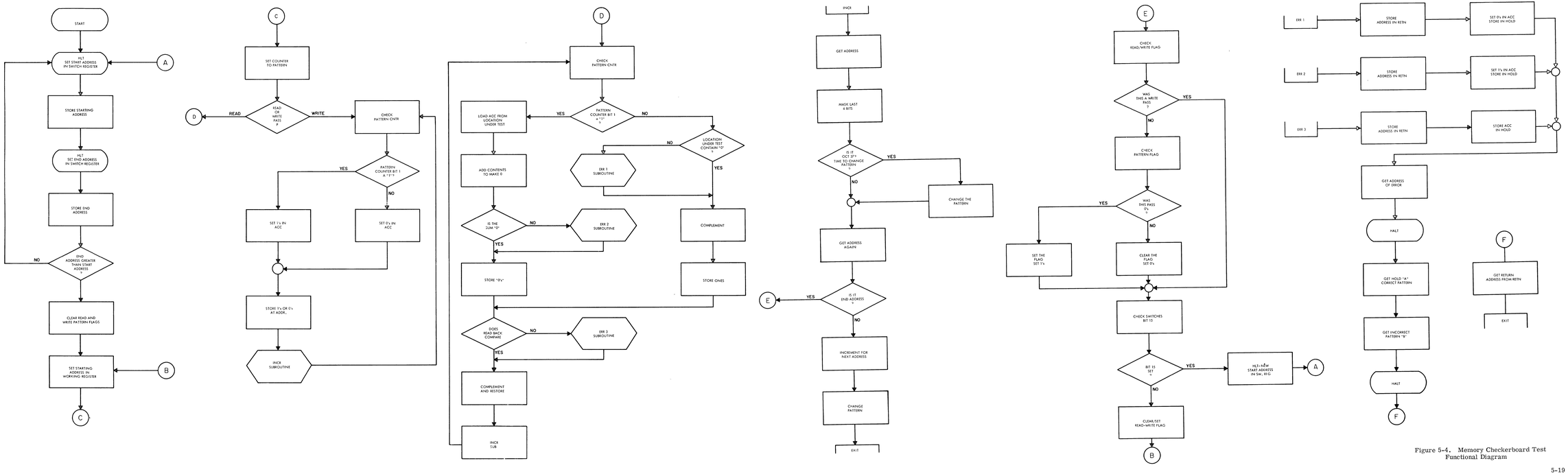


Figure 5-4. Memory Checkerboard Test Functional Diagram

the same location. It is then retested and restored to its original form, stored again and then the Computer moves on to the next location. After the entire memory is checked, the pattern is complemented and stored throughout the test area. The program then proceeds in the same fashion to check each location in such a way as to produce the greatest chance for error.

5-115. PROGRAM DIAGRAM AND LISTING.

5-116. A functional diagram for the Memory Checkerboard Tests is presented in Figure 5-4. The program listing is presented at the rear of this section.

5-117. INTERRUPT TEST.

5-118. The Interrupt Test is presented in a separate Manual Supplement supplied as part of the Computer documentation.

5-119. SUMMARY OF TEST INSTRUCTIONS.

5-120. The load and run instructions given in detail in the foregoing text, are summarized in Table 5-14. This abbreviated presentation is intended for those experienced in the operation and maintenance of the Computer. References are included to the paragraphs where the detailed instructions can be found.

Table 5-14. Summary of Test Instructions

TEST INSTRUCTIONS	PARAGRAPH
1. PRETEST CHECKOUT	5-7
2. ALTER-SKIP INSTRUCTION TEST	5-28
a. Initialize	5-34
b. Load Program	5-20
c. Load Address 002000	5-36a
d. S-Register 077777; Run	5-36b
e. Halt	5-36c
(1) T-Register 102001	
(2) M-Register 002001	
f. Run	5-36d
(1) Program Loop Continuously	
(2) Minimum Test Requirement: 1000 Test Passes (One Minute and 5 Seconds)	
3. MEMORY REFERENCE INSTRUCTION TEST	5-47
a. Load Program (First Part)	5-20
b. Load Address 007642	5-54b
c. Run; Halt	5-54c
(1) T-Register 102001	
(2) M-Register 007670	
d. Load Program (Second Part)	5-20
e. Load Address 001000	5-55a
f. S-Register 077777; Run	5-55b
(1) Program Loops Continuously	
(2) Minimum Test Requirement: Two Passes (One Minute and 45 Seconds)	
4. SHIFT-ROTATE INSTRUCTION TEST	5-66
a. Load Program	5-20
b. Load Address 006200	5-47a
c. S-Register 077777 ; Run	5-47b
(1) Program Loops Continuously	
(2) Minimum Test Requirement: 1000 Test Passes (35 Seconds)	
5. HIGH MEMORY ADDRESS TEST	5-88
a. Load Program	5-20
b. Load Address 007600	5-96a
c. S-Register 000002	5-96b
d. Run; Halt 102001	5-96c
e. S-Register 007577	5-96d
f. Run	5-96e
(1) Program Loops Continuously	
(2) Minimum Test Requirement: 1000 Test Passes (Two Minutes)	
6. LOW MEMORY ADDRESS TEST	5-88
a. Load Program	5-20
b. Load Address 000100	5-96a
c. S-Register 000144	5-96b
d. Run; Halt 102001	5-96c
e. S-Register 007677 (4K) or 017677 (8K)	5-96d
f. Run	5-96e
(1) Program Loops Continuously	
(2) Minimum Test Requirement: 1000 Test Passes (Six Minutes)	
7. HIGH MEMORY CHECKERBOARD TEST	5-102
a. Load Program	5-20
b. Load Address 007500	5-110a
c. Run; Halt 102001	5-110b
d. S-Register 000002	5-110c
e. Run; Halt 102001	5-110d
f. S-Register 007477	5-110e
g. Run	5-110f
(1) Program Loops Continuously	
(2) Minimum Test Requirement: Three Test Passes (Two Minutes)	
8. LOW MEMORY CHECKERBOARD TEST	5-102
a. Load Program	5-20
b. Load Address 000010	5-110a
c. Run; Halt 102001	5-110b
d. S-Register 000170	5-110c
e. Run; Halt 102001	5-110d
f. S-Register 007677 (4K) or 017677 (8K)	5-110e
g. Run	5-110f
(1) Program Loops Continuously	
(2) Minimum Test Requirements: Three Test Passes (Six Minutes)	

SERIAL BINARY LOADER

Listing No. HP 20310AL

```
PAGE 0001                                                    HP 20310AL

0001                ASMB,A,B,L     HP-2116A ABSOLUTE BINARY LOADER (ASR-
** NO ERRORS*
```

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PAGE 0002 #01                                                HP 20310AL

0001                ASMB,A,B,L     HP-2116A ABSOLUTE BINARY LOADER (ASR-
0002* THE ABSOLUTE BINARY LOADER IS USED TO LOAD ABSOLUTE BINARY
0003* TAPES PRODUCED BY HMAP. THE HP-2116A ASSEMBLER. FOLLOWING ARE
0004* THE HALT CONDITIONS:
0005*
0006*         T = 102077  END OF TAPE
0007*         T = 102011  CHECKSUM ERROR
0008*         T = 102055  ILLEGAL ADDRESS
0009*
0010  17700                 ORG 177B0B     THIS IS FOR AN 8K SYSTEM. FOR
0011*                                        OTHER SYSTEMS,SUBTRACT
0012*                                        100(8) FROM THE MEMORY SIZE
0013*                                        TO OBTAIN THE CORRECT ORG.
0014  17700 107700  LOAD  CLC 0,C        TURN OFF ALL I/O DEVICES & IN-
0015*                                       TERRUPT SYSTEM.
0016  17701 006401        CLB,RSS        SET B TO ZERO AS INITIAL END OF
0017*                                       TAPE COUNTER. THIS PREVENTS
0018*                                       A SPURIOUS END OF TAPE HALT
0019*                                       AT THE BEGINNING OF THE TAPE
0020  17702 067771  LOAD1 LDB MIN11      END OF TAPE COUNTER FOR BLOCKS
0021*                                       AFTER THE FIRST. 10 CONSECU-
0022*                                       TIVE FEED FRAMES SIGNAL END
0023*                                       OF TAPE.
0024  17703 006006  EOTCH INB,SZB        END OF TAPE?
0025  17704 027710        JMP LEADR      NO--CONTINUE LOOKING FOR START
0026*                                       OF BLOCK.
0027  17705 106700        CLC 0          TURN OFF DEVICES FOR EOT HALT.
0028  17706 102077        HLT 77B        EOT HALT.  T=102077.
0029  17707 027700        JMP LOAD       GO TO READ ANOTHER TAPE.
0030*
0031  17710 017752  LEADR JSB CHAR       GET NEXT CHARACTER FROM TAPE.
0032  17711 002003        SZA,RSS        IS IT A FEED FRAME ?
0033  17712 027703        JMP EOTCH      YES--GO TO CHECK FOR END OF TAPE
0034  17713 003004        CMA,INA        NEGATE & STORE AS NUMBER OF
0035  17714 073772        STA COUNT        DATA WORDS.
0036  17715 017752        JSB CHAR       SKIP THE NEXT CHARACTER.
0037  17716 017743        JSB WORD       GET BLOCK STARTING ADDRESS.
0038  17717 070001        STA 1          INITIALIZE CHECKSUM IN B.
0039  17720 073773        STA ADRES      INITIALIZE DATA ADDRESS.
0040* SECTION TO LOAD A SINGLE WORD *
0041  17721 063773  LOAD2 LDA ADRES      FIRST CHECK FOR LEGITIMATE
0042  17722 000040        CLE              ADDRESS.
0043  17723 043774        ADA MAXAD      THIS WILL SET E IF ILLEGAL ADRES
0044  17724 002040        SEZ            BAD ADDRESS TEST.
0045  17725 027741        JMP BADAD      SORRY ABOUT THAT.
0046  17726 017743        JSB WORD       GET NEXT DATA WORD.
0047  17727 044000        ADB 0          ADD TO CHECKSUM.
0048  17730 173773        STA ADRES,I    STORE DATA WORD.
0049  17731 037773        ISZ ADRES      STEP ADRES BY ONE.
0050  17732 037772        ISZ COUNT      ANY MORE WORDS IN BLOCK ?
0051  17733 027721        JMP LOAD2      YES--GO TO LOAD NEXT DATA WORD.
0052  17734 017743        JSB WORD       END OF BLOCK--READ CHECKSUM.
0053  17735 054000        CPB 0          DO CHECKSUMS AGREE ?
0054  17736 027702        JMP LOAD1      YES--GO LOAD NEXT BLOCK.
0055  17737 102011        HLT 11B        NO--CHECKSUM ERROR:
0056  17740 027700        JMP LOAD
0057*                                          T=102011
```

```
PAGE 0003 #01                                                HP 20310AL

0058*                                          A=TAPE CHECKSUM
0059*                                          B=COMPUTED CHECKSUM.
0060  17741 102055  BADAD HLT 55B        ERROR HALT FOR ILLEGAL ADDRESS.
0061  17742 027700        JMP LOAD         T=102055.
0062*
0063  17743 000000  WORD  NOP            READS A COMPLETE WORD FROM TAPE.
0064  17744 017752        JSB CHAR       GET FIRST CHARACTER.
0065  17745 001727        ALF,ALF        POSITION AT HIGH END.
0066  17746 073775        STA TEMP       SAVE IN TEMP.
0067  17747 017752        JSB CHAR       GET SECOND CHARACTER.
0068  17750 033775        IOR TEMP       PACK WITH FIRST.
0069  17751 127743        JMP WORD,I     RETURN WITH WORD IN A.
0070*
0071  17752 000000  CHAR  NOP            TELETYPE (ASR-33) DRIVER.
0072  17753 063771        LDA MIN11      INITIALIZE BIT COUNTER
0073  17754 073776        STA BITS         TO -11.
0074  17755 002400        CLA            CLEAR A FOR MERGING INPUT BITS.
0075  17756 102700        STC TTY          SET TELETYPE CONTROL
0076  17757 001300  CHAR1 MAR            BIT INPUT LOOP
0077  17760 103100        CLF TTY
0078  17761 102300        SFS TTY        WAIT UNTIL FLAG SET FOR BIT.
0079  17762 027761        JMP *-1          WAIT SOME MORE.
0080  17763 102400        MIA TTY          MERGE BIT INTO A (07)
0081*                                    ROTATE BITS IN.
0082  17764 037776        ISZ BITS       ANY MORE BITS TO READ ?
0083  17765 027757        JMP CHAR1      YES--GO GET NEXT ONE.
0084  17766 001222        RAL,RAL        POSITION CHARACTER IN A.
0085  17767 013777        AND M377       REMOVE TRAILER BITS.
0086  17770 127752        JMP CHAR,I
0087*
0088  17771 177765  MIN11 DEC -11
0089  17772 000000  COUNT BSS 1          COUNT OF DATA WORDS IN BLOCK.
0090  17773 000000  ADRES BSS 1          DATA ADDRESS.
0091  17774 160100  MAXAD ABS -LOAD      LOADER PROTECTION VALUE.
0092  17775 000000  TEMP  BSS 1
0093  17776 000000  BITS  BSS 1          BIT COUNTER.
0094  17777 000377  M377  OCT 377       CHARACTER MASK.
0095  00000         TTY    EQU 00B         THIS EQU SHOULD REFLECT THE
0096*                      INPUT LOCATION OF THE TELETYPE
0097                 END
** NO ERRORS*
```

PARALLEL BINARY LOADER

Listing No. HP 20311AL

```
0001                    ASMB,A,B,L,T
LD1     017717
LD2     017730
PR      000006
ADDRS   017775
ADERR   017751
CHAR    017762
CM11    017773
CONT    017711
COUNT   017774
CPAI    017771
EOTCH   017712
LOAD    017700
MAXAD   017772
OPTI    017736
STAI    017770
TEMP    017776
WORD    017753
** NO ERRORS*
```



```
0001                    ASMB,A,B,L,T
0002  17700             ORG 17700B
0003  17700 107700 LOAD  CLC 0,C        TURN OFF ALL DEVICES.
0004  17701 063770       LDA STAI       SET STORE INDIRECT INSTRUCTION.
0005  17702 106501       LIB 1          CHECK FOR OPTIONS.
0006  17703 004010       SLB            SR(0) = 1?
0007  17704 002400       CLA            YES: CHECKSUM VERIFY OPTION
0008  17705 006020       SSB            SR(15) = 1?
0009  17706 063771       LDA CPAI       YES: DUMP VERIFY OPTION
0010  17707 073736       STA OPTI       STORE OPTION INSTRUCTION
0011  17710 006401       CLB,RSS        BYPASS EOT CHECK FOR LEADER
0012  17711 067773 CONT  LDB CM11       SET B = -11 FOR EOT TEST
0013  17712 006006 EOTCH INB,SZB        END OF TAPE?
0014  17713 027717       JMP LD1        NO: GET NEXT CHARACTER
0015  17714 107700       CLC 0,C        TURN OFF ALL DEVICES
0016  17715 102077       HLT 77B        EOT HALT: T = 102077
0017  17716 027700       JMP LOAD       START NEXT TAPE
0018  17717 017762 LD1   JSB CHAR       GET A CHARACTER
0019  17720 002003       SZA,RSS        IS IT THE WORD COUNT?
0020  17721 027712       JMP EOTCH      NO: CHECK FOR EOT.
0021  17722 003104       CMA,CLE,INA    NEGATE & RESET E FOR OVERFLOW CH
0022  17723 073774       STA COUNT      SET WORD COUNT
0023  17724 017762       JSB CHAR       SKIP THE NEXT CHARACTER
0024  17725 017753       JSB WORD       GET STARTING ADDRESS
0025  17726 070001       STA 1          INITIALIZE CHECKSUM IN B.
0026  17727 073775       STA ADDRS      ALSO STORE IN LOADING ADDRESS PO
0027  17730 063775 LD2   LDA ADDRS      CHECK LOADING ADDRESS TO PREVENT
0028  17731 043772       ADA MAXAD        LOADER FROM SUICIDING.
0029  17732 002040       SEZ            IS LOADING ADDRESS GREATER THAN
0030  17733 027751       JMP ADERR      YES: TERMINATE LOADING
0031  17734 017753       JSB WORD       GET NEXT WORD IN A.
0032  17735 044000       ADB A          ADD IT TO THE CHECKSUM
0033  17736 000000 OPTI  NOP            OPTIONAL INSTRUCTION: STA 0,I/CP
0034  17737 002101       CLE,RSS        BYPASS FOLLOWING HALT EXCPET FOR
0035  17740 102000       HLT 0          BUMP VERIFY ERROR HALT
0036  17741 037775       ISZ ADDRS      INCREMENT LOADING ADDRESS POINTE
0037  17742 037774       ISZ COUNT      ANY MORE WORDS IN BLOCK?
0038  17743 027730       JMP LD2        YES: LOOP TO LD2 TO LOAD NEXT WO
0039  17744 017753       JSB WORD       NO:  GET CHECKSUM FROM TAPE.
0040  17745 054000       CPB 0          CHECKSUMS AGREE?
0041  17746 027711       JMP CONT       YES: CHECK FOR EOT.
0042  17747 102011       HLT 11B        NO:  CHECKSUM ERROR
0043*   T = 102011, A = TAPE CHECKSUM, B = LOADER CHECKSUM
0044  17750 027700       JMP LOAD       START OVER.
0045  17751 102055 ADERR HLT 55B        ERROR HALT FOR ILLEGAL ADDRESS
0046  17752 027700       JMP LOAD       START OVER
0047  17753 000000 WORD  NOP            READS ONE WORD FROM TAPE.
0048  17754 017762       JSB CHAR       GET FIRST CHARACTER
0049  17755 001727       ALF,ALF        POSITION IT.
0050  17756 073776       STA TEMP       SAVE IT.
0051  17757 017762       JSB CHAR       GET SECOND CHARACTER
0052  17760 033776       IOR TEMP       PACK WITH FIRST
0053  17761 127753       JMP WORD,I     RETURN WITH WORD IN A.
0054  17762 000000 CHAR  NOP            READ A CHARACTER FROM THE PHOTOR
0055  17763 103700       STC PR,C       TURN ON PHOTOREADER
0056  17764 102300       SFS PR         WAIT FOR FLAG INDICATING
0057  17765 027764       JMP *-1          DATA IS READY.
```



```
0058  17766 102500       LIA PR         LOAD CHARACTER INTO A.
0059  17767 127762       JMP CHAR,I     RETURN.
0060  17770 173775 STAI  STA ADDRS,I    NORMAL CONTENTS OF OPTIONAL INST
0061  17771 153775 CPAI  CPA ADDRS,I    DUMP VERIFY OPTIONAL INSTRUCTION
0062  17772 160100 MAXAD ABS -LOAD      LOADER PROTECTION VALUE
0063  17773 177765 CM11  DEC -11        EOT CHARACTER COUNT
0064  17774 000000 COUNT BSS 1          COUNTS WORDS IN BLOCK
0065  17775 000000 ADDRS BSS 1          LOADING ADDRESS POINTER
0066  17776 000000 TEMP  BSS 1          HOLDS UPPER CHARACTER FOR PACKIN
0067  00006       PR     EQU 6B          THIS EQU SHOULD REFLECT THE
0068*                                  INPUT LOCATION OF THE PHOTOREADER*
0069                     END
** NO ERRORS*
```

ALTER-SKIP INSTRUCTION TEST

Tape No. HP 20400A

Listing No. HP 20400AL

```
PAGE 0001                                                    HP 20400AL

0001                ASMB,A,B,L,T

OP  0001  ED
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PAGE 0001                                                    HP 20400AL

0001                ASMB,A,B,L,T
BEG     006041
CCA     003332
CCE     002303
CLA     002367
CLE     002140
CMA     002750
MOD     006002
SEZ     002061
AMASK   006036
AMOD    006021
BEGIN   002000
BMASK   006037
BMOD    006006
CASEZ   003032
CCAE    003635
CCAEZ   003405
CCALE   003466
CCAME   003560
CLACE   002673
CLAE    002541
CLAEZ   002456
CLAME   002614
CLSSL   004043
CMACE   003253
CMAE    003173
CMALE   003113
MASK    006040
MESSL   004001
MODIF   005773
RESET   026000
REST    006016
REST1   006031
RSTAR   006035
SSALE   003712
START   006034
**  NO ERRORS*
```

```
PAGE 0002 #01                                                HP 20400AL

0001                ASMB,A,B,L,T
0001  02000                ORG 2000B
0002  02000 102301  BEGIN HLT 01          TEST HALT INSTR.
0003  02001 002001        RSS
0004  02002 102001        HLT 01          UNCOND. SKIP FAILED
0005  02003 002400        CLA
0006  02004 002002        SZA
0007  02005 102001        HLT 01          A=0 SZA FAILED; A NOT=0 CLA
0008*                                       FAILED
0009  02006 002003        SZA,RSS         A=0
0010  02007 002001        RSS
0011  02010 102001        HLT 01          SZA,RSS FAILED
0012  02011 002004        INA             A=1
0013  02012 002002        SZA
0014  02013 002003        SZA,RSS
0015  02014 102001        HLT 01          INA FAILED
0016  02015 002005        INA,RSS         A=2
0017  02016 102001        HLT 01          INA,RSS FAILED
0018  02017 002006        INA,SZA         A=3
0019  02020 002007        INA,SZA,RSS     A=4
0020  02021 102001        HLT 01          A=3 INA,SZA FAILED OR,
0021*                                       A=4 INA,SZA,RSS FAILED
0022  02022 000010        SLA             A=4
0023  02023 102001        HLT 01          SLA FAILED
0024  02024 002014        SLA,INA         A=5
0025  02025 102001        HLT 01          SLA,INA FAILED
0026  02026 002011        SLA,RSS         A=5
0027  02027 102001        HLT 01          SLA,RSS FAILED
0028  02030 002012        SLA,SZA         A=5
0029  02031 002013        SLA,SZA,RSS
0030  02032 102001        HLT 01          SLA,SZA,OR SLA,SZA,RSS FAILED
0031  02033 002015        SLA,INA,RSS     A=6
0032  02034 102001        HLT 01          SLA,INA,RSS FAILED
0033  02035 002016        SLA,INA,SZA     A=7
0034  02036 102001        HLT 01          SLA,INA,SZA FAILED
0035  02037 002017        SLA,INA,SZA,RSS         A=10
0036  02040 102001        HLT 01          SLA,INA,SZA,RSS FAILED
0037  02041 102501        LIA 01          LOAD SW. REG. A=077777
0038  02042 002020        SSA
0039  02043 102001        HLT 01 SSA FAILED
0040  02044 002024        SSA,INA         A=100000
0041  02045 102001        HLT 01          SSA,INA FAILED
0042  02046 002021        SSA,RSS         A=100000
0043  02047 102001        HLT 01          SSA,RSS FAILED
0044  02050 002023        SSA,SZA,RSS
0045  02051 102001        HLT 01          SSA,SZA,RSS FAILED
0046  02052 002022        SSA,SZA
0047  02053 002025        SSA,INA,RSS     A=100001
0048  02054 102001        HLT 01          SSA,SZA,OR SSA,INA,RSS FAILED
0049  02055 002026        SSA,INA,SZA     A=10002
0050  02056 002027        SSA,INA,SZA,RSS         A=100003
0051  02057 102001        HLT 01          SSA,INA,SZA FAILED OR,
0052*                                       SSA,INA,SZA,RSS FAILED
0053  02060 000000        NOP
0054***** SEZ MODULE *****
0055  02061 102401  SEZ   LIA 01          MERGE SW. REG. A=177777
0056  02062 002004        INA             E=1,A=0
```

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PAGE 0003 #02                                                HP 20400AL

0057  02063 002040        SEZ
0058  02064 002040        SEZ
0059  02065 002041        SEZ,RSS
0060  02066 102001        HLT 01          SEZ OR SEZ,RSS FAILED
0061  02067 002042        SEZ,SZA
0062  02070 102001        HLT 01          SEZ,SZA FAILED
0063  02071 000040        CLE             E=0,A=0
0064  02072 002043        SEZ,SZA,RSS
0065  02073 002044        SEZ,INA         E=0,A=1
0066  02074 102001        HLT 01          SEZ,SZA,RSS OR SEZ,INA FAILED
0067  02075 002045        SEZ,INA,RSS     E=0,A=2
0068  02076 002046        SEZ,INA,SZA     E=0,A=3
0069  02077 102001        HLT 01          SEZ,INA,RSS FAILED IF A=2 OR,
0070*                                       SEZ,INA,SZA FAILED IF A=3
0071  02100 002047        SEZ,INA,SZA,RSS         E=0,A=4
0072  02101 102001        HLT 01          SEZ,INA,SZA,RSS FAILED
0073  02102 002050        SEZ,SLA         E=0,A=4
0074  02103 102001        HLT 01          SEZ,SLA FAILED
0075  02104 002051        SEZ,SLA,RSS
0076  02105 002052        SEZ,SLA,SZA
0077  02106 102001        HLT 01          SEZ,SLA,RSS FAILED OR,
0078*                                       SEZ,SLA,SZA FAILED
0079  02107 002053        SEZ,SLA,SZA,RSS
0080  02110 102001        HLT 01          SEZ,SLA,SZA,RSS FAILED
0081  02111 002054        SEZ,SLA,INA     E=0,A=5
0082  02112 102001        HLT 01          SEZ,SLA,INA FAILED
0083  02113 002055        SEZ,SLA,INA,RSS         E=0,A=6
0084  02114 102001        HLT 01          SEZ,SLA,INA,RSS FAILED
0085  02115 002056        SEZ,SLA,INA,SZA         E=0,A=7
0086  02116 102001        HLT 01          SEZ,SLA,INA,SZA FAILED
0087  02117 002057        SEZ,SLA,INA,SZA,RSS     E=0,A=10
0088  02120 102001        HLT 01 SEZ,SLA,INA,SZA,RSS FAILED
0089  02121 002060        SEZ,SSA         E=0,A=11
0090  02122 102001        HLT 01          SEZ,SSA FAILED
0091  02123 002061        SEZ,SSA,RSS     E=0,A=10
0092  02124 002062        SEZ,SSA,SZA
0093  02125 102001        HLT 01          SEZ,SSA,RSS OR SEZ,SSA,SZA FAIL
0094  02126 002063        SEZ,SSA,SZA,RSS         E=0,A=11
0095  02127 102001        HLT 01          SEZ,SSA,SZA,RSS FAILED
0096  02130 002064        SEZ,SSA,INA     E=0,A=12
0097  02131 102001        HLT 01          SEZ,SSA,INA FAILED
0098  02132 002065        SEZ,SSA,INA,RSS         E=0,A=13
0099  02133 002066        SEZ,SSA,INA,SZA         E=0,A=14
0100  02134 102001        HLT 01          SEZ,SSA,INA,RSS FAILED OR,
0101*                                       SEZ,SSA,INA,SZA FAILED
0102  02135 002067        SEZ,SSA,INA,SZA,RSS     E=0,A=15
0103  02136 102001        HLT 01          SEZ,SSA,INA,SZA,RSS FAILED
0104  02137 000000        NOP
0105***** CLE MODULE *****
0106  02140 102501  CLE   LIA 01          LOAD SW. INTO A=077777
0107  02141 002004        INA             A=100000
0108  02142 102401        LIA 01          MERGE SW. INTO A=177777
0109  02143 002004        INA             E=1, A=000000
0110  02144 002041        SEZ,RSS
0111  02145 102001        HLT 01          E NOT=1
0112  02146 000040        CLE             E=0, A=000000
0113  02147 002040        SEZ
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0114  02150 102001        HLT 01          E NOT=0
0115  02151 002101        CLE,RSS
0116  02152 102001        HLT 01          CLE,RSS FAILED
0117  02153 002102        CLE,SZA
0118  02154 102001        HLT 01          CLE,SZA FAILED
0119  02155 002104        CLE,INA         E=0, A=000001
0120  02156 002103        CLE,SZA,RSS
0121  02157 102001        HLT 01          CLE,INA FAILED IF A=0, OR
0122*                                        CLE,SZA,RSS FAILED IS A
0123*                                                        NOT=0
0124  02160 002105        CLE,INA,RSS     E=0, A=000002
0125  02161 102001        HLT 01          CLE,INA,RSS FAILED
0126  02162 002106        CLE,INA,SZA     A=000003
0127  02163 002107        CLE,INA,SZA,RSS         A=000004
0128  02164 102001        HLT 01          CLE,INA,SZA OR CLE,INA,SZA,RSS
0129*                                        FAILED
0130  02165 000050        CLE,SLA
0131  02166 102001        HLT 01          CLE,SLA FAILED
0132  02167 002111        CLE,SLA,RSS     A=000004
0133  02170 002112        CLE,SLA,SZA
0134  02171 102001        HLT 01          CLE,SLA,RSS OR CLE,SLA,SZA
0135*                                        FAILED
0136  02172 002113        CLE,SLA,SZA,RSS         A=000004
0137  02173 102001        HLT 01          CLE,SLA,SZA,RSS FAILED
0138  02174 002114        CLE,SLA,INA     A=000005
0139  02175 102001        HLT 01          CLE,SLA,INA FAILED
0140  02176 002115        CLE,SLA,INA,RSS         A=000006
0141  02177 102001        HLT 01          CLE,SLA,INA,RSS FAILED
0142  02200 002116        CLE,SLA,INA,SZA         A=000007
0143  02201 102001        HLT 01          CLE,SLA,INA,SZA FAILED
0144  02202 002117        CLE,SLA,INA,SZA,RSS     A=000010
0145  02203 102001        HLT 01          CLE,SLA,INA,SSZA,RSS FAILED
0146  02204 002120        CLE,SSA
0147  02205 102001        HLT 01          CLE,SSA FAILED
0148  02206 002121        CLE,SSA,RSS     A=000010
0149  02207 002122        CLE,SSA,SZA
0150  02210 102001        HLT 01          CLE,SSA,RSS OR CLE,SSA,SZA
0151*                                        FAILED
0152  02211 102501        LIA 01          LOAD SW. INTO A=077777
0153  02212 002004        INA             A=100000
0154  02213 002123        CLE,SSA,SZA,RSS
0155  02214 102001        HLT 01          CLE,SSA,SZA,RSS FAILED
0156  02215 002124        CLE,SSA,INA     A=100001
0157  02216 002125        CLE,SSA,INA,RSS         A=100002
0158  02217 102001        HLT 01          CLE,SSA,INA,FAILED IF A=100001,
0159*                                        OR CLE,SSA,INA,RSS
0160*                                        FAILED IF A= 100002
0161  02220 002126        CLE,SSA,INA,SZA         A=100003
0162  02221 002127        CLE,SSA,INA,SZA,RSS     A=100004
0163  02222 102001        HLT 01          CLE,SSA,INA,SZA FAILED IF
0164*                                        A=100003, OR CLE,SSA,
0165*                                        INA,SZA,RSS FAILED IF
0166*                                        A=100004
0167  02223 000000        NOP
0168***** CME MODULE *****
0169  02224 102501        LIA 01          LOAD SW. INTO A=077777
0170  02225 002004        INA             A=1000000
```



```
0171  02226 102401        MIA 01          MERGE SW. INTO A=177777
0172  02227 002004        INA             E=1, A=000000
0173  02230 002200        CME             E=0
0174  02231 002201        CME,RSS         E=1
0175  02232 102001        HLT 01          CME,RSS FAILED
0176  02233 002202        CME,SZA         E=0
0177  02234 102001        HLT 01          CME,SZA FAILED
0178  02235 002203        CME,SZA,RSS     E=1
0179  02236 002207        CME,INA,SZA,RSS         E=0, A=000001
0180  02237 102001        HLT 01          CME,SZA,RSS FAILED IF E=1, OR
0181*                                        CME,INA,SZA,RSS FAILED
0182*                                        IF E=0
0183  02240 002204        CME,INA         E=1, A=000002
0184  02241 002205        CME,INA,RSS     E=0, A=000003
0185  02242 102001        HLT 01          CME,INA FAILED IF A=000002 OR,
0186*                                        CME,INA,RSS FAILED IF
0187*                                        A=000003
0188  02243 002206        CME,INA,SZA     E=1, A=000004
0189  02244 002212        CME,SLA,SZA     E=0
0190  02245 102001        HLT 01          CME,INA,SZA FAILED IF E=1, OR
0191*                                        CME,SLA,SZA FAILED IF E=0
0192  02246 002211        CME,SLA,RSS     E=1, A=000004
0193  02247 002210        CME,SLA         E=0
0194  02250 102001        HLT 01          CME,SLA,RSS FAILED IF E=1, OR
0195*                                        CME,SLA FAILED IF E=0
0196  02251 002215        CME,SLA,INA,RSS         E=1, A=000005
0197  02252 002217        CME,SLA,INA,SZA,RSS     E=0, A=000006
0198  02253 102001        HLT 01          CME,SLA,INA,RSS FAILED IF E=1,
0199*                                        OR CME,SLA,INA,SZA,RSS
0200*                                        FAILED IF E=0
0201  02254 002214        CME,SLA,INA     E=1, A=000007
0202  02255 102001        HLT 01          CME,SLA,INA FAILED
0203  02256 002221        CME,SSA,RSS     E=0, A=000007
0204  02257 002220        CME,SSA         E=1
0205  02260 102001        HLT 01          CME,SSA,RSS FAILED IF E=0, OR
0206*                                        CME,SSA, FAILED IF E=1
0207  02261 002225        CME,SSA,INA,RSS         E=0, A=000010
0208  02262 002222        CME,SSA,SZA     E=1
0209  02263 102001        HLT 01          CME,SSA,INA,RSS FAILED IF E=0,
0210*                                        OR CME,SSA,SZA,FAILED IF E=1
0211  02264 002216        CME,SLA,INA,SZA         E=0, A=000011
0212  02265 102001        HLT 01          CME,SLA,INA,SZA FAILED
0213  02266 002213        CME,SLA,SZA,RSS         E=1, A=000011
0214  02267 102001        HLT 01          CME,SLA,SZA,RSS FAILED
0215  02270 002223        CME,SSA,SZA,RSS         E=0, A=000011
0216  02271 102001        HLT 01   CME,SSA,SZA,RSS FAILED
0217  02272 002224        CME,SSA,INA     E=1, A=000012
0218  02273 102001        HLT 01          CME,SSA,INA FAILED
0219  02274 002226        CME,SSA,INA,SZA         E=0, A=000012
0220  02275 102001        HLT 01          CME,SSA,INA,SZA FAILED
0221  02276 002227        CME,SSA,INA,SZA,RSS     E=1, A=000013
0222  02277 102001        HLT 01          CME,SSA,INA,SZA,PSS FAILED
0223  02300 002041        SEZ,RSS
0224  02301 102001        HLT 01          E NOT=1
0225  02302 000000        NOP
0226***** CCE MODULE *****
0227  02303 000040  CCE   CLE             E=0
```



```
0228  02304 002300        CCE             E=1
0229  02305 002041        SEZ,RSS
0230  02306 102001        HLT 01          E NOT=1
0231  02307 002301        CCE,RSS
0232  02310 102001        HLT 01          CCE,RSS FAILED
0233  02311 102501        LIA 01          LOAD SW. INTO A=077777
0234  02312 002004        INA             A=100000
0235  02313 102401        MIA 01          MERGE SW. INTO A=177777
0236  02314 002004        INA             E=1, A=000000
0237  02315 002302        CCE,SZA
0238  02316 102001        HLT 01          CCE,SZA FAILED
0239  02317 002304        CCE,INA         A=000001
0240  02320 002303        CCE,SZA,RSS
0241  02321 102001        HLT 01          CCE,INA FAILED IF A=000000 , OR
0242*                                        CCE,SZA,RSS FAILED IF
0243*                                        A=000001
0244  02322 002306        CCE,INA,SZA     A=000002
0245  02323 002305        CCE,INA,RSS     A=000003
0246  02324 102001        HLT 01          CCE,INA,SZA FAILED IF A=000002
0247*                                        OR CCE,INA,RSS IF
0248*                                        A=000003
0249  02325 002307        CCE,INA,SZA,RSS         A=000004
0250  02326 102001        HLT 01          CCE,INA,SZA,RSS FAILED
0251  02327 002310        CCE,SLA
0252  02330 102001        HLT 01          CCE,SLA FAILED
0253  02331 002311        CCE,SLA,RSS     A=000004
0254  02332 002312        CCE,SLA,SZA
0255  02333 102001        HLT 01          CCE,SLA,RSS OR CCE,SLA,SZA
0256*                                        FAILED
0257  02334 002313        CCE,SLA,SZA,RSS
0258  02335 102001        HLT 01          CCE,SLA,SZA,RSS FAILED
0259  02336 002314        CCE,SLA,INA     A=000005
0260  02337 102001        HLT 01          CCE,SLA,INA FAILED
0261  02340 002315        CCE,SLA,INA,RSS         A=000006
0262  02341 102001        HLT 01          CCE,SLA,INA,RSS FAILED
0263  02342 002316        CCE,SLA,INA,SZA         A=000007
0264  02343 102001        HLT 01          CCE,SLA,INA,SZA FAILED
0265  02344 002317        CCE,SLA,INA,SZA,RSS     A=000010
0266  02345 102001        HLT 01          CCE,SLA,INA,SZA,RSS FAILED
0267  02346 002321        CCE,SSA,RSS     A=000010
0268  02347 002320        CCE,SSA
0269  02350 102001        HLT 01 CCE,SSA,RSS OR CCE,SSA FAILED
0270  02351 002322        CCE,SSA,SZA
0271  02352 102001        HLT 01          CCE,SSA,SZA FAILED
0272  02353 002323        CCE,SSA,SZA,PSS         A=000010
0273  02354 102001        HLT 01          CCE,SSA,SZA,PSS FAILED
0274  02355 002324        CCE,SSA,INA     A=000011
0275  02356 102001        HLT 01          CCE,SSA,INA FAILED
0276  02357 002325        CCE,SSA,INA,RSS         A=000012
0277  02360 002324        CCE,SSA,INA     A=000013    E=1
0278  02361 102001        HLT 01          CCE,SSA,INA,RSS FAILED IF
0279*                                        A=000012, OR CCE,SSA,INA
0280*                                        FAILED IF A=000013
0281  02362 002327        CCE,SSA,INA,SZA,RSS     A=000014
0282  02363 102001        HLT 01          CCE,SSA,INA,SZA,RSS FAILED
0283  02364 002041        SEZ,RSS
0284  02365 102001        HLT 01          E NOT=1
```



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0285  02366 000000        NOP
0286***** CLA MODULE *****
0287  02367 102501  CLA   LIA 01          LOAD SW. REG. INTO A=077777
0288  02370 002004        INA             A=1000000
0289  02371 102401        MIA 01          MERGE SW. REG. INTO A=177777
0290  02372 002400        CLA             A=000000
0291  02373 002401        CLA,RSS
0292  02374 102001        HLT 01          CLA,RSS FAILED
0293  02375 002402        CLA,SZA
0294  02376 102001        HLT 01          CLA,SZA FAILED
0295  02377 002403        CLA,SZA,RSS
0296  02400 002407        CLA,INA,SZA,RSS
0297  02401 102001        HLT 01          CLA,SZA,RSS FAILED IF A=000000,
0298*                                        OR CLA,INA,SZA,RSS FAILED IF
0299*                                        A=000001
0300  02402 002404        CLA,INA         A=000001
0301  02403 002405        CLA,INA,RSS
0302  02404 102001        HLT 01          CLA,INA,RSS FAILED
0303  02405 002406        CLA,INA,SZA
0304  02406 002410        CLA,SLA
0305  02407 102001        HLT 01          CLA,INA,SZA FAILED IF A=000001
0306*                                        OR CLA,SLA FAILED IF
0307*                                        A=000000
0308  02410 002411        CLA,SLA,RSS
0309  02411 002412        CLA,SLA,SZA
0310  02412 102001        HLT 01          CLA,SLA,RSS OR CLA,SLA,SZA
0311*                                        FAILED
0312  02413 002413        CLA,SLA,SZA,RSS
0313  02414 002414        CLA,SLA,INA     A=000001
0314  02415 102001        HLT 01          CLA,SLA,SZA,RSS FAILED IF
0315*                                        A=000000 OR CLA,SLA,INA
0316*                                        FAILED IS A=000001
0317  02416 002415        CLA,SLA,INA,RSS         A=000001
0318  02417 002416        CLA,SLA,INA,SZA         A=000001
0319  02420 102001        HLT 01          CLA,SLA,INA,RSS OR CLA,SLA,INA,
0320*                                        SZA FAILED
0321  02421 002417        CLA,SLA,INA,SZA,RSS
0322  02422 102001        HLT 01          CLA,SLA,INA,SZA,RSS FAILED
0323  02423 002420        CLA,SSA         A=000000
0324  02424 102001        HLT 01          CLA,SSA FAILED
0325  02425 002421        CLA,SSA,RSS
0326  02426 002422        CLA,SSA,SZA
0327  02427 102001        HLT 01          CLA,SSA,RSS OR CLA,SSA,SZA
0328*                                        FAILED
0329  02430 002423        CLA,SSA,SZA,RSS
0330  02431 002424        CLA,SSA,INA     A=000001
0331  02432 102001        HLT 01          CLA,SSA,SZA,RSS FAILED IF
0332*                                        A=000000, OR CLA,SSA,INA
0333*                                        FAILED IF A=000001
0334  02433 002415        CLA,SLA,INA,RSS         A=000001
0335  02434 002416        CLA,SLA,INA,SZA         A=000001
0336  02435 102001        HLT 01          CLA,SLA,INA,RSS OR CLA,SLA,INA,
0337*                                        SZA FAILED
0338  02436 002417        CLA,SLA,INA,SZA,RSS     A=000001
0339  02437 102001        HLT 01          CLA,SLA,INA,SZA,RSS FAILED
0340  02440 002420        CLA,SSA         A=000000
0341  02441 102001        HLT 01          CLA,SSA FAILED
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PAGE 0008 #02                                   HP 20400AL

0342  02442 002421          CLA,SSA,RSS
0343  02443 002422          CLA,SSA,SZA
0344  02444 102001          HLT 01          CLA,SSA,RSS OR CLA,SSA,SZA
0345*                                           FAILED
0346  02445 002423          CLA,SSA,SZA,RSS
0347  02446 002424          CLA,SSA,INA     A=000001
0348  02447 102001          HLT 01          CLA,SSA,SZA,RSS FAILED IF
0349*                                           A=000000, OR CLA,SSA,INA
0350*                                           FAILED IF A=000001
0351  02450 002425          CLA,SSA,INA,RSS         A=000001
0352  02451 002426          CLA,SSA,INA,SZA         A=000001
0353  02452 102001          HLT 01          CLA,SSA,INA,RSS OR CLA,SSA,INA,
0354*                                           SZA FAILED
0355  02453 002427          CLA,SSA,INA,SZA,RSS     A=000001
0356  02454 102001          HLT 01          CLA,SSA,INA,SZA,RSS FAILED
0357  02455 000000          NOP
0001***** CLA,SEZ MODULE *****
0002  02456 102501  CLAEZ LIA 01           LOAD SW. REG. INTO A=077777
0003  02457 002004          INA             A=100000
0004  02460 102401          MIA 01          MERGE SW. REG. INTO A=177777
0005  02461 002004          INA             E=0, A=000000
0006  02462 102401          MIA 01          E=1, A=077777
0007  02463 002440          CLA,SEZ         A=000000
0008  02464 002441          CLA,SEZ,RSS
0009  02465 102001          HLT 01          CLA,SEZ OR CLA,SEZ,RSS FAILED
0010  02466 002442          CLA,SEZ,SZA
0011  02467 102001          HLT 01          CLA,SEZ,SZA FAILED
0012  02470 002443          CLA,SEZ,SZA,RSS
0013  02471 102001          HLT 01          CLA,SEZ,SZA,RSS FAILED
0014  02472 002444          CLA,SEZ,INA
0015  02473 002445          CLA,SEZ,INA,RSS         A=000001,  E=1
0016  02474 102001          HLT 01          CLA,SEZ,INA OR CLA,SEZ,INA,RSS
0017*                                           FAILED
0018  02475 002446          CLA,SEZ,INA,SZA
0019  02476 002447          CLA,SEZ,INA,SZA,RSS     A=000001
0020  02477 102001          HLT 01          CLA,SEZ,INA,SZA OR CLA,SEZ,INA,
0021*                                           SZA,RSS FAILED
0022  02500 002450          CLA,SEZ,SLA
0023  02501 102001          HLT 01          CLASEZ,SLA FAILED
0024  02502 002451          CLA,SEZ,SLA,RSS
0025  02503 102001          HLT 01          CLA,SEZ,SLA,RSS FAILED
0026  02504 002452          CLA,SEZ,SLA,SZA
0027  02505 102001          HLT 01          CLA,SEZ,SLA,SZA FAILED
0028  02506 002453          CLA,SEZ,SLA,SZA,RSS
0029  02507 102001          HLT 01          CLA,SEZ,SLA,SZA,RSS FAILED
0030  02510 002454          CLA,SEZ,SLA,INA         A=000001
0031  02511 102001          HLT 01          CLA,SEZ,SLA,INA FAILED
0032  02512 002455          CLA,SEZ,SLA,INA,RSS
0033  02513 102001          HLT 01          CLA,SEZ,SLA,INA,RSS FAILED
0034  02514 002456          CLA,SEZ,SLA,INA,SZA
0035  02515 102001          HLT 01          CLA,SEZ,SLA,INA,SZA FAILED
0036  02516 002457          CLA,SEZ,SLA,INA,SZA,RSS
0037  02517 102001          HLT 01          CLA,SEZ,SLA,INA,SZA,RSS FAILED
0038  02520 002460          CLA,SEZ,SSA,SZA
0039  02521 102001          HLT 01          CLA,SEZ,SSA,SZA,FAILED
0040  02522 002461          CLA,SEZ,SSA,RSS
0041  02523 102001          HLT 01          CLA,SEZ,SSA,SZA,RSS FAILED
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0042  02524 002462          CLA,SEZ,SSA,SZA
0043  02525 102001          HLT 01          CLA,SEZ,SSA,SZA FAILED
0044  02526 002463          CLA,SEZ,SSA,SZA,RSS
0045  02527 102001          HLT 01          CLA,SEZ,SSA,SZA,RSS FAILED
0046  02530 002464          CLA,SEZ,SSA,INA
0047  02531 102001          HLT 01          CLA,SEZ,SSA,INA FAILED
0048  02532 002465          CLA,SEZ,SSA,INA,RSS
0049  02533 102001          HLT 01          CLA,SEZ,SSA,INA,RSS FAILED
0050  02534 002466          CLA,SEZ,SSA,INA,SZA
0051  02535 102001          HLT 01          CLA,SEZ,SSA,INA,SZA FAILED
0052  02536 002467          CLA,SEZ,SSA,INA,SZA,RSS
0053  02537 102001          HLT 01          CLA,SEZ,SSA,INA,SZA,RSS FAILED
0054  02540 000000          NOP
0055***** CLA,CLE MODULE *****
0056  02541 102501  CLAE LIA 01         LOAD SW. REG. INTO A=077777
0057  02542 002500          CLA,CLE         A=0, E=0
0058  02543 002041          SEZ,RSS
0059  02544 002501          CLA,CLE,RSS
0060  02545 102001          HLT 01          E NOT=0 OR CLA,CLE,RSS FAILED
0061  02546 002502          CLA,CLE,SZA
0062  02547 102001          HLT 01          CLA,CLE,SZA FAILED
0063  02550 002503          CLA,CLE,SZA,RSS
0064  02551 002505          CLA,CLE,INA,RSS
0065  02552 102001          HLT 01          CLA,CLE,SZA,RSS FAILED IF
0066*                                           A=000000, OR CLA,CLE,INA,RSS
0067*                                           A=000001
0068  02553 002504          CLA,CLE,INA     A=000001
0069  02554 002003          SZA,RSS
0070  02555 102001          HLT 01          CLA,CLE,INA FAILED
0071  02556 002506          CLA,CLE,INA,SZA
0072  02557 002507          CLA,CLE,INA,SZA,RSS
0073  02560 102001          HLT 01          CLA,CLE,INA,SZA OR CLA,CLE,INA,
0074*                                           SZA,RSS FAILED
0075  02561 002510          CLA,CLE,SLA
0076  02562 102001          HLT 01          CLA,CLE,SLA FAILED
0077  02563 002511          CLA,CLE,SLA,RSS
0078  02564 002512          CLA,CLE,SLA,SZA
0079  02565 102001          HLT 01          CLA,CLE,SLA,RSS OR CLA,CLE,SLA,
0080*                                           SZA FAILED
0081  02566 002513          CLA,CLE,SLA,SZA,RSS
0082  02567 002514          CLA,CLE,SLA,INA
0083  02570 102001          HLT 01          CLA,CLE,SLA,SZA,RSS FAILED IF
0084*                                           A=000000, OR CLA,CLE,SLA,INA
0085*                                           FAILED IF A=000001
0086  02571 002515          CLA,CLE,SLA,INA,RSS
0087  02572 002516          CLA,CLE,SLA,INA,SZA
0088  02573 102001          HLT 01          CLA,CLE,SLA,INA,RSS OR CLA,CLE,
0089*                                           SLA,INA,SZA FAILED
0090  02574 002517          CLA,CLE,SLA,INA,SZA,RSS
0091  02575 102001          HLT 01          CLA,CLE,SLA,INA,SZA,RSS FAILED
0092  02576 002520          CLA,CLE,SSA
0093  02577 102001          HLT 01          CLA,CLE,SSA FAILED
0094  02600 002521          CLA,CLE,SSA,RSS
0095  02601 002522          CLA,CLE,SSA,SZA
0096  02602 102001          HLT 01          CLA,CLE,SSA,RSS OR
0097*                                           CLA,CLE,SSA,SZA FAILED
0098  02603 002523          CLA,CLE,SSA,SZA,RSS
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0099  02604 002524          CLA,CLE,SSA,INA         A=000001
0100  02605 102001          HLT 01          CLA,CLE,SSA,SZA,RSS OR CLA,CLE,
0101*                                           SSA,INA,FAILED
0102  02606 002525          CLA,CLE,SSA,INA,RSS
0103  02607 002526          CLA,CLE,SSA,INA,SZA
0104  02610 102001          HLT 01          CLA,CLE,SSA,INA,RSS OR CLA,CLE,
0105*                                           SSA,INA,SZA FAILED
0106  02611 002527          CLA,CLE,SSA,INA,SZA,RSS
0107  02612 102001          HLT 01          CLA,CLE,SSA,INA,SZA,RSS FAILED
0108  02613 000000          NOP
0109***** CLA,CME MODULE *****
0110  02614 102501  CLAME LIA 01          LOAD SW. REG. INTO A=077777
0111  02615 002004          INA             A=100000
0112  02616 102401          MIA 01          MERGE SW. REG. INTO A=077777
0113  02617 002004          INA             E=1,A=000000
0114  02620 102501          LIA 01          LOAD SW. REG. INTO A=077777
0115  02621 002600          CLA,CME         E=0
0116  02622 002043          SEZ,SZA,RSS
0117  02623 002610          CLA,CME,SLA     E=1
0118  02624 102001          HLT 01          CLA,CME OR CLA,CME,SLA FAILED
0119  02625 002621          CLA,CME,RSS     E=0
0120  02626 102001          HLT 01          CLA,CME,RSS FAILED
0121  02627 002603          CLA,CME,SZA,RSS
0122  02630 002602          CLA,CME,SZA     E=0
0123  02631 102001          HLT 01          CLA,CME,SZA,RSS FAILED IF E=1,
0124*                                           OR CLA,CME,SZA FAILED OF E=0
0125  02632 002604          CLA,CME,INA     E=1
0126  02633 002605          CLA,CME,INA,RSS         E=0
0127  02634 102001          HLT 01          CLA,CME,INA FAILED IF E=1, OR
0128*                                           CLA,CME,INA,RSS FAILED IF E=0
0129  02635 002606          CLA,CME,INA,SZA         E=1
0130  02636 002607          CLA,CME,INA,SZA,RSS     E=0
0131  02637 102001          HLT 01          CLA,CME,INA,SZA FAILED IF E=1,
0132*                                           OR CLA,CME,INA,SZA,RSS=0
0133  02640 002611          CLA,CME,SLA,RSS         E=1
0134  02641 002612          CLA,CME,SLA,SZA         E=0
0135  02642 102001          HLT 01          CLA,CME,SLA,RSS FAILED IF E=1,
0136*                                           OR CLA,CME,SLA,SZA FAILED IF
0137*                                           E=0
0138  02643 002613          CLA,CME,SLA,SZA,RSS     E=1
0139  02644 002614          CLA,CME,SLA,INA         E=0
0140  02645 102001          HLT 01          CLA,CME,SLA,SZA,RSS FAILED IF
0141*                                           E=1, OR CLA,CME,SLA,INA
0142*                                           FAILED IF E=0
0143  02646 002615          CLA,CME,SLA,INA,RSS     E=1
0144  02647 002616          CLA,CME,SLA,INA,SZA     E=0
0145  02650 102001          HLT 01          CLA,CME,SLA,INA,RSS FAILED IF
0146*                                           E=1, OR CLA,CME,SLA,INA,SZA
0147*                                           FAILED IF E=0
0148  02651 002617          CLA,CME,SLA,INA,SZA,PSS E=1
0149  02652 102001          HLT 01          CLA,CMF,SLA,INA,SZA,PSS FAILED
0150  02653 002621          CLA,CME,SSA,RSS         E=0
0151  02654 002620          CLA,CME,SSA             E=1
0152  02655 102001          HLT 01          CLA,CME,SSA,PSS FAILED IF E=0,
0153*                                           OR CLA,CME,SSA FAILED IF E=1
0154  02656 002623          CLA,CME,SSA,SZA,RSS     E=0
0155  02657 002622          CLA,CME,SSA,SZA         E=1
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0156  02660 102001          HLT 01          CLA,CME,SSA,SZA,RSS FAILED IF
0157*                                           E=0, OR CLA,CME,SSA,SZA
0158*                                           FAILED IF E=1
0159  02661 002625          CLA,CME,SSA,INA,RSS     E=0
0160  02662 002624          CLA,CME,SSA,INA         E=1
0161  02663 102001          HLT 01          CLA,CMF,SSA,INA,RSS FAILED IF
0162*                                           E=0, OR CLA,CME,SSA,INA
0163*                                           FAILED IF E=1
0164  02664 002626          CLA,CME,SSA,INA,SZA     E=0
0165  02665 102001          HLT 01          CLA,CME,SSA,INA,SZA FAILED
0166  02666 002627          CLA,CME,SSA,INA,SZA,RSS E=1
0167  02667 102001          HLT 01          CLA,CMF,SSA,INA,SZA,PSS FAILED
0168  02670 002041          SEZ,RSS
0169  02671 102001          HLT 01          E NOT=1
0170  02672 000000          NOP
0171***** CLA,CCE MODULE *****
0172  02673 102501  CLACE LIA 01          LOAD SW. REG. INTO A=077777
0173  02674 002004          INA             A=100000
0174  02675 102401          MIA 01          MERGE SW. REG. INTO A=177777
0175  02676 002004          INA             E=1, A=000000
0176  02677 102401          MIA 01          MERGE SW. REG. INTO A=077777
0177  02700 002700          CLA,CCE
0178  02701 002701          CLA,CCE,RSS
0179  02702 102001          HLT 01          CLE,CCE OR CLA,CCE,RSS FAILED
0180  02703 002703          CLA,CCE,SZA,RSS
0181  02704 002702          CLA,CCE,SZA
0182  02705 102001          HLT 01          CLA,CCE,SZA,RSS OR CLA,CCE,SZA
0183*                                           FAILED
0184  02706 002704          CLA,CCE,INA
0185  02707 002705          CLA,CCE,INA,RSS
0186  02710 102001          HLT 01          CLA,CCE,INA OR CLA,CCE,INA,RSS
0187*                                           FAILED
0188  02711 002706          CLA,CCE,INA,SZA
0189  02712 002707          CLA,CCE,INA,SZA,RSS
0190  02713 102001          HLT 01          CLA,CCE,INA,SZA OR CLA,CCE,INA,
0191*                                           SZA,RSS FAILED
0192  02714 002711          CLA,CCE,SLA,RSS
0193  02715 002710          CLA,CCE,SLA
0194  02716 102001          HLT 01          CLA,CCE,SLA,RSS OR CLA,CCE,SLA
0195*                                           FAILED
0196  02717 002713          CLA,CCE,SLA,SZA,RSS
0197  02720 002712          CLA,CCE,SLA,SZA
0198  02721 102001          HLT 01          CLA,CCF,SLA,SZA,RSS OR CLA,CCE
0199*                                           SLA,SZA FAILED
0200  02722 002715          CLA,CCE,SLA,INA,RSS
0201  02723 002714          CLA,CCE,SLA,INA
0202  02724 102001          HLT 01          CLA,CCE,SLA,INA,RSS OR CLA,CCE,
0203*                                           SLA,INA FAILED
0204  02725 002716          CLA,CCE,SLA,INA,SZA
0205  02726 102001          HLT 01          CLA,CCE,SLA,INA,SZA FAILED
0206  02727 002717          CLA,CCE,SLA,INA,SZA,RSS
0207  02730 102001          HLT 01          CLA,CCF,SLA,INA,SZA,RSS FAILED
0208  02731 002721          CLA,CCE,SSA,RSS
0209  02732 002720          CLA,CCE,SSA
0210  02733 102001          HLT 01          CLA,CCE,SSA,RSS OR CLA,CCE,SSA
0211*                                           FAILED
0212  02734 002723          CLA,CCE,SSA,SZA,RSS
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0213  02735 002722          CLA,CCE,SSA,SZA
0214  02736 102401          HLT 01          CLA,CCE,SSA,SZA,RSS OR CLA,CCE,
0215*                                           SSA,SZA FAILED
0216  02737 002725          CLA,CCE,SSA,INA,RSS
0217  02740 002724          CLA,CCE,SSA,INA
0218  02741 102001          HLT 01          CLA,CCE,SSA,INA,RSS OR CLA,CCE,
0219*                                           SSA,INA FAILED
0220  02742 002726          CLA,CCE,SSA,INA,SZA
0221  02743 102001          HLT 01          CLA,CCE,SSA,INA,SZA, FAILED
0222  02744 002727          CLA,CCE,SSA,INA,SZA,RSS
0223  02745 102001          HLT 01          CLA,CCF,SSA,INA,SZA,RSS FAILED
0224  02746 002041          SEZ,RSS         E NOT=1
0225  02747 000000          NOP
0226***** CMA MODULE *****
0227  02750 102501  CMA     LIA 01          LOAD SW. REG. INTO A=077777
0228  02751 002104          CLE,INA         A=100000
0229  02752 102401          MIA 01          MERGE SW. REG. INTO A=177777
0230  02753 003002          CMA,SZA         A=000000
0231  02754 102001          HLT 01          A NOT=0000#0
0232  02755 003000          CMA             A=177777
0233  02756 003001          CMA,RSS         A=000000
0234  02757 102001          HLT 01          CMA FAILED IF A =177777, OR CMA,
0235*                                           RSS FAILED IF A =000000
0236  02760 003003          CMA,SZA,RSS     A=177777
0237  02761 102001          HLT 01          CMA,SZA,RSS FAILED
0238  02762 003004          CMA,INA         A=000001
0239  02763 003005          CMA,INA,RSS     A=177777
0240  02764 102001          HLT 01          CMA,INA FAILED IS A=000001,  OR
0241*                                           CMA,INA,RSS FAILED IF
0242*                                           A=177777
0243  02765 003006          CMA,INA,SZA     A=000001
0244  02766 003007          CMA,INA,SZA,RSS         A=177777
0245  02767 102001          HLT 01          CMA,INA,SZA, FAILED IF A=000001
0246*                                           OR CMA,INA,SZA,RSS FAILED
0247*                                           IF A=177777
0248  02770 002410          CLA,SLA         A=000000
0249  02771 102001          HLT 01          CLA,SLA FAILED
0250  02772 003411          CMA,SLA,RSS     A=177777
0251  02773 102001          HLT 01          CMA,SLA,RSS FAILED
0252  02774 003412          CMA,SLA,SZA     A=000000
0253  02775 102001          HLT 01          CMA,SLA,SZA FAILED
0254  02776 003413          CMA,SLA,SZA,RSS         A=177777
0255  02777 102001          HLT 01          CMA,SLA,SZA,RSS FAILED
0256  03000 003014          CMA,SLA,INA     A=000001
0257  03001 102001          HLT 01          CMA,SLA,INA FAILED
0258  03002 003015          CMA,SLA,INA,RSS         A=177777
0259  03003 003016          CMA,SLA,INA,SZA         A=000001
0260  03004 102001          HLT 01          CMA,SLA,INA,RSS FAILES IF
0261*                                           A=177777, OR CMA,SLA,INA,SZA
0262*                                           FAILED IF A=100000
0263  03005 003020          CMA,SSA         A=177776
0264  03006 003017          CMA,SLA,INA,SZA,RSS     A=000002
0265  03007 102001          HLT 01          CMA,SSA, FAILED IS A=177776, OR
0266*                                           CMA,SLA,INA,SZA,RSS FAILED IF
0267*                                           A=000002
0268  03010 003021          CMA,SSA,RSS     A=177775
0269  03011 102001          HLT 01          CMA,SSA,RSS FAILED
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0270  03012 003022          CMA,SSA,SZA     A=000002
0271  03013 102001          HLT 01          CMA,SSA,SZA FAILED
0272  03014 003023          CMA,SSA,SZA,RSS         A=177775
0273  03015 102001          HLT 01          CMA,SSA,SZA,RSS FAILED
0274  03016 003024          CMA,SSA,INA     A=000003
0275  03017 102001          HLT 01          CMA,SSA,INA FAILED
0276  03020 003025          CMA,SSA,INA,RSS     A=177775
0277  03021 102001          HLT 01          CMA,SSA,INA,RSS FAILED
0278  03022 003026          CMA,SSA,INA,SZA     A=000003
0279  03023 102001          HLT 01        CMA,SSA,INA,SZA FAILED
0280  03024 003027          CMA,SSA,INA,SZA,RSS     A=177775
0281  03025 102001          HLT 01          CMA,SSA,INA,SZA,RSS FAILED
0282  03026 002400          CLA             A=000000
0283  03027 002040          SEZ
0284  03030 102001          HLT 01          E NOT=0
0285  03031 000000          NOP
0286***** CMA,SEZ MODULE *****
0287  03032 102501  CASEZ LIA 01           LOAD SW. REG. INTO A=077777
0288  03033 002004          INA             A=100000
0289  03034 102401          MIA 01          MERGE SW. REG. INTO A=177777
0290  03035 002004          INA             E=1, A=000000
0291  03036 003040          CMA,SEZ         A=177777
0292  03037 003041          CMA,SEZ,RSS     A=000000
0293  03040 102001          HLT 01          FAILURE:  CMA,SEZ IF A=1777777;
0294*                                           CMA,SEZ,RSS IF A=000000
0295  03041 003042          CMA,SEZ,SZA     A=177777
0296  03042 003043          CMA,SEZ,SZA,RSS         A=000000
0297  03043 102001          HLT 01          FAILURE:  CMA,SEZ,SZA IF
0298*                                           A=1777777;  CMA,SEZ,SZA,RSS
0299*                                           IF A=000000
0300  03044 003044          CMA,SEZ,INA     E=1, A=000000
0301  03045 003045          CMA,SEZ,INA,RSS         E=1, A=000000
0302  03046 102001          HLT 01          CMA,SEZ,INA OR CMA,SEZ,INA,RSS
0303*                                           FAILED
0304  03047 003046          CMA,SEZ,INA,SZA         E=1, A=000000
0305  03050 102001          HLT 01          CMA,SEZ,INA,SZA FAILED
0306  03051 003047          CMA,SEZ,INA,SZA,RSS     E=1, A=000000
0307  03052 102001          HLT 01          CMA,SEZ,INA,SZA,RSS FAILED
0308  03053 003050          CMA,SEZ,SLA             E=1, A=177777
0309  03054 003051          CMA,SEZ,SLA,RSS         E=1, A=000000
0310  03055 102001          HLT 01          FAILURE:  CMA,SEZ,SLA IF
0311*                                           A=1777777;  CMA,SEZ,SLA,RSS IF
0312*                                           A=000000
0313  03056 003052          CMA,SEZ,SLA,SZA         E=1, A=177777
0314  03057 003053          CMA,SEZ,SLA,SZA,RSS     E=1, A=000000
0315  03060 102001          HLT 01          FAILURE:  CMA,SEZ,SLA,SZA IF
0316*                                           A=1777777;  CMA,SEZ,SLA,SZA,
0317*                                           RSS IF A=000000
0318  03061 003054          CMA,SEZ,SLA,INA         E=1, A=000000
0319  03062 003055          CMA,SEZ,SLA,INA,RSS     E=1, A=000000
0320  03063 102001          HLT 01          CMA,SEZ,SLA,INA OR CMA,SEZ,SLA,
0321*                                           INA,RSS FAILED
0322  03064 003056          CMA,SEZ,SLA,INA,SZA     E=1, A=000000
0323  03065 102001          HLT 01          CMA,SEZ,SLA,INA,SLA FAILED
0324  03066 003057          CMA,SEZ,SLA,INA,SZA,RSS E=1, A=000000
0325  03067 102001          HLT 01          CMA,SEZ,SLA,INA,SZA,RSS FAILED
0326  03070 003060          CMA,SEZ,SSA             E=1, A=177777
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0327  03071 003061          CMA,SEZ,SSA,RSS         E=1, A=000000
0328  03072 102001          HLT 01          FAILURE:  CMA,SEZ,SSA,RSS IF
0329*                                           A=1777777;  CMA,SEZ,SSA,RSS
0330*                                           IF A=000000
0331  03073 003062          CMA,SEZ,SSA,SZA         E=1, A=177777
0332  03074 003063          CMA,SEZ,SSA,SZA,RSS     E=1, A=000000
0333  03075 102001          HLT 01          FAILURE:  CMA,SEZ,SSA,SZA IF
0334*                                           A=1777777;  CMA,SEZ,SSA,SZA,
0335*                                           RSS IF A=000000
0336  03076 003064          CMA,SEZ,SSA,INA         E=1, A=000000
0337  03077 003065          CMA,SEZ,SSA,INA,RSS     E=1, A=000000
0338  03100 102001          HLT 01          CMA,SEZ,SSA,INA OR CMA,SEZ
0339*                                           SSA,INA,RSS FAILED
0340  03101 003066          CMA,SEZ,SSA,INA,SZA     E=1, A=000000
0341  03102 102001          HLT 01          CMA,SEZ,SSA,INA,SZA FAILED
0342  03103 003067          CMA,SEZ,SSA,INA,SZA,RSS E=1, A=000000
0343  03104 102001          HLT 01          CMA,SEZ,SSA,INA,SZA,RSS FAILED
0344  03105 000040          CLE
0345  03106 002040          SEZ
0346  03107 102001          HLT 01          E NOT=0
0347  03110 002302          SZA
0348  03111 102001          HLT 01             A NOT=000000
0349  03112 000200          NOP
0350***** CMA,CLE MODULE *****
0351  03113 102501  CMALE LIA 01           LOAD SW. REG. INTO A=077777
0352  03114 002004          INA             A=100000
0353  03115 102401          MIA 01          MERGE SW. REG. INTO A=177777
0354  03116 002004          INA             E=1, A=000000
0355  03117 003100          CMA,CLE         E=0, A=177777
0356  03120 003101          CMA,CLE,RSS     E=0, A=177777
0357  03121 102001          HLT 01          FAILURE:  CMA,CLE IF A=177777;
0358*                                           CMA,CLE,RSS IF A =000000
0359  03122 003104          CMA,CLE,INA     E=1, A=000000
0360  03123 003103          CMA,CLE,SZA,RSS         E=0, A=177777
0361  03124 102001          HLT 01          FAILURE:  CMA,CLE,INA IF
0362*                                           A=1777777;  CMA,CLE,SZA,RSS IF
0363*                                           A=000000
0364  03125 003102          CMA,CLE,SZA     E=0, A=000000
0365  03126 102001          HLT 01          CMA,CLE,SZA FAILED
0366  03127 003106          CMA,CLE,INA,SZA         E=1, A=000000
0367  03130 102001          HLT 01          CMA,CLE,INA,SZA FAILED
0368  03131 003107          CMA,CLE,INA,SZA,RSS     E=1, A=000000
0369  03132 003105          CMA,CLE,INA,RSS         E=1, A=000000
0370  03133 102001          HLT 01          CMA,CLE,INA,SZA,RSS OR CMA,CLE,
0371*                                           INA, RSS FAILED
0372  03134 003111          CMA,CLE,SLA,RSS         E=0, A=177777
0373  03135 102001          HLT 01          CMA,CLE,SLA,RSS FAILED
0374  03136 003110          CMA,CLE,SLA     E=0, A=000000
0375  03137 102001          HLT 01          CMA,CLE,SLA FAILED
0376  03140 003112          CMA,CLE,SLA,SZA         E=0, A=177777
0377  03141 003114          CMA,CLE,SLA,INA         E=0, A=000001
0378  03142 102001          HLT 01          FAILURE:  CMA,CLE,SLA,SZA IF
0379*                                           A=1777777;  CMA,CLE,SLA,INA IF
0380*                                           A=000000
0381  03143 003113          CMA,CLE,SLA,SZA,RSS     E=0, A=177776
0382  03144 102001          HLT 01          CMA,CLE,SLA,SZA,RSS FAILED
0383  03145 003115          CMA,CLE,SLA,INA,RSS     E=0, A=000002
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0384  03146 102001          HLT 01          CMA,CLE,SLA,INA,RSS FAILED
0385  03147 003116          CMA,CLE,SLA,INA,SZA     E=0, A=177776
0386  03150 003117          CMA,CLE,SLA,INA,SZA,RSS E=0, A=000002
0387  03151 102001          HLT 01        FAILURE  CMA,CLE,SLA,INA,SZA IF
0388*                                           A=177776 ;  CMA,CLE,SLA,INA,
0389*                                           SZA,RSS IF A=000002
0390  03152 003121          CMA,CLE,SSA,RSS         F=0, A=177775
0391  03153 102001          HLT 01          CMA,CLE,SSA,RSS FAILED
0392  03154 003120          CMA,CLE,SSA     E=1, A=000002
0393  03155 102001          HLT 01          CMA,CLE,SSA FAILED
0394  03156 003122          CMA,CLE,SSA,SZA         E=0, A=177775
0395  03157 003123          CMA,CLE,SSA,SZA,RSS     F=0, A=000002
0396  03160 102001          HLT 01          FAILURE:  CMA,CLE,SSA,SZA IF
0397*                                           A=177775;  CMA,CLE,SSA,SZA,
0398*                                           RSS IF A=000002
0399  03161 003124          CMA,CLE,SSA,INA         E=0, A=177776
0400  03162 003126          CMA,CLE,SSA,INA,SZA     E=0,A=000002
0401  03163 102001          HLT 01          FAILURE:  CMA,CLE,SSA,INA IF
0402*                                           A=177776;  CMA,CLE,SSA,INA,
0403*                                           SZA IF A=000002
0404  03164 003125          CMA,CLE,SSA,INA,RSS     E=0, A=177776
0405  03165 102001          HLT 01          CMA,CLE,SSA,INA,RSS FAILED
0406  03166 003127          CMA,CLE,SSA,INA,SZA,RSS E=0, A=000002
0407  03167 102001          HLT 01          CMA,CLE,SSA,INA,SZA,RSS FAILED
0408  03170 002040          SEZ
0409  03171 102001          HLT 01          E NOT=0
0410  03172 000200          NOP
0001***** CMA,CME MODULE *****
0002  03173 102501  CMAE  LIA 01           LOAD SW. REG. INTO A=077777
0003  03174 002004          INA             A=100000
0004  03175 102401          MIA 01          MERGE SW. REG. INTO A=177777
0005  03176 002004          INA             E=0, A=000000
0006  03177 003200          CMA,CME         E=0, A=177777
0007  03200 003201          CMA,CME,RSS     E=1, A=000000
0008  03201 102001          HLT 01          FAILURE:  CMA,CME IF A=177777;
0009*                                           CMA,CME,RSS IF A=000000
0010  03202 003203          CMA,CME,SZA,RSS         E=0, A=177777
0011  03203 102001          HLT 01          CMA,CME,SZA,RSS FAILED
0012  03204 003202          CMA,CME,SZA     E=1, A=000000
0013  03205 102001          HLT 01          CMA,CME,SZA FAILED
0014  03206 003204          CMA,CME,INA             E=1, A=000000
0015  03207 003205          CMA,CME,INA,RSS         E=1, A=000000
0016  03210 102001          HLT 01          CMA,CME,INA OR CMA,CME,INA,RSS
0017*                                           FAILED
0018  03211 003206          CMA,CME,INA,SZA         E=1, A=000000
0019  03212 102001          HLT 01          CMA,CME,INA,SZA FAILED
0020  03213 003207          CMA,CME,INA,SZA,RSS     E=1, A=000000
0021  03214 003211          CMA,CME,SLA,RSS         E=0, A=177777
0022  03215 102001          HLT 01          FAILURE: CMA,CME,INA,SZA,RSS IF
0023*                                           A=000000;  CMA,CMF,SLA,RSS IF
0024*                                           A=177777
0025  03216 003210          CMA,CME,SLA     E=1, A=000000
0026  03217 102001          HLT 01          CMA,CME,SLA FAILED
0027  03220 003212          CMA,CME,SLA,SZA         E=0, A=177777
0028  03221 003214          CMA,CME,SLA,INA         E=1, A=000001
0029  03222 102001          HLT 01          FAILURE:  CMA,CME,SLA,SZA IF
0030*                                           A=177777   CMA,CMF,SLA,INA IF
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*                                   A=10000;
      03223 003213       CMA,CME,SLA,SZA,RSS      E=0, A=177776
      03224 102001       HLT 01         CMA,CME,SLA,SZA,RSS FAILED
      03225 003215       CMA,CME,SLA,INA,RSS      E=1, A=000002
      03226 102001       HLT 01         CMA,CME,SLA,INA,RSS FAILED
      03227 003216       CMA,CME,SLA,INA,SZA      E=0, A=177776
      03230 003217       CMA,CME,SLA,INA,SZA,RSS E=1, A=000002
      03231 102001       HLT 01         FAILURE:  CMA,CME,SLA,INA,SZA IF
*                                   A=177776;  CMA,CME,SLA,
*                                   INA,SZA,RSS IF A=000002
      03232 003221       CMA,CME,SSA,RSS          E=0, A=177775
      03233 102001       HLT 01         CMA,CME,SSA,RSS FAILED
      03234 003220       CMA,CME,SSA    E=1, A=000001
      03235 102001       HLT 01         CMA,CME,SSA FAILED
      03236 003222       CMA,CME,SSA,SZA          E=0, A=177775
      03237 003223       CMA,CME,SSA,SZA,RSS      E=1, A=000002
      03240 102001       HLT 01         FAILURE:  CMA,CME,SSA,SZA IF
*                                  A=177775;  CMA,CME,SSA,SZA,
*                                  RSS IF A=000002
      03241 003224       CMA,CME,SSA,INA          E=0, A=177776
      03242 003226       CMA,CME,SSA,INA,SZA      E=1, A=000002
      03243 102001       HLT 01         FAILURE:  CMA,CME,SSA,INA IF
*                                   A=177776;  CMA,CMF,SSA,INA.
*                                   SZA IF A=000002
      03244 003225       CMA,CME,SSA,INA,RSS      E=0, A=177776
      03245 102001       HLT 01         CMA,CME,SSA,INA,RSS FAILED
      03246 003227       CMA,CME,SSA,INA,SZA,RSS E=1, A=000002
      03247 102001       HLT 01         CMA,CME,SSA,INA,SZA,RSS FAILED
      03250 002041       SEZ,RSS
      03251 102001       HLT 01         E NOT=1
      03252 000000       NOP
****** CMA,CCE MODULE *****
      03253 102501 CMACE LIA 01         LOAD SW. REG. INTO A=077777
      03254 002004       INA            A=100000
      03255 102401       MIA 01         MERGE SW. REG. INTO A=177777
      03256 002004       INA            E=1, A=000000
      03257 003300       CMA,CCE        E=1, A=177777
      03260 003301       CMA,CCE,RSS    E=1, A=000000
      03261 102001       HLT 01         FAILURE: CMA,CCE IF A=000000;
*                                   CMA,CCE,RSS IF A=177777
      03262 003303       CMA,CCE,SZA,RSS          E=1, A=177777
      03263 102001       HLT 01         CMA,CCE,SZA,RSS FAILED
      03264 003302       CMA,CCE,SZA    E=1, A=000000
      03265 102001       HLT 01         CMA,CCE,SZA FAILED
      03266 003304       CMA,CCE,INA              E-1, A=000000
      03267 003305       CMA,CCE,INA,RSS          E-1, A=000000
      03270 102001       HLT 01         CMA,CCE,INA OR CMA,CCE,INA,RSS
*                                   FAILED
      03271 003306       CMA,CCE,INA,SZA          E=1, A=000000
      03272 102001       HLT 01         CMA,CCE,INA,SZA FAILED
      03273 003307       CMA,CCE,INA,SZA,RSS      E=1, A=000000
      03274 003311       CMA,CCE,SLA,RSS          E-1, A=177777
      03275 102001       HLT 01         FAILURE:  CMA,CCE,INA,SZA,RSS IF
*                                   A=000000; CMA,CCE,SLA,RSS IF
*                                   A=177777
      03276 003310       CMA,CCE,SLA    E=1, A=000000
      03277 102001       HLT 01         CMA,CCE,SLA FAILED
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      03300 003312       CMA,CCE,SLA,SZA          E-1, A=177777
      03301 003314       CMA,CCE,SLA,INA          E=1, A=000001
      03302 102001       HLT 01         FAILURE:  CMA,CCE,SLA,SZA IF
*                                   A=177777; CMA,CCE,SLA,INA IF
*                                   A=000000
      03303 003313       CMA,CCE,SLA,SZA,RSS      E=1, A=177776
      03304 102001       HLT 01         CMA,CCE,SLA,SZA,RSS FAILED
      03305 003316       CMA,CCE,SLA,INA,SZA      E=1, A=000002
      03306 003317       CMA,CCE,SLA,INA,SZA,RSS E=1, A=177776
      03307 102001       HLT 01         FAILURE:  CMA,CCE,SLA,INA,SZA IF
*                                   A=000002; CMA,CCE,SLA,INA,
*                                   SZA,RSS IF A =177776
      03310 003321       CMA,CCE,SSA,RSS          E-1, A=000001
      03311 003323       CMA,CCE,SSA,SZA,RSS      E-1, A=177776
      03312 102001       HLT 01         FAILURE:  CMA,CCE,SSA,RSS IF
*                                   A=000001; CMA,CCE,SSA,SZA,RSS
*                                   IF A=177776
      03313 003325       CMA,CCE,SSA,INA,RSS      E-1, A=000002
      03314 003327       CMA,CCE,SSA,INA,SZA,RSS E=1, A-177776
      03315 102001       HLT 01         FAILURE:  CMA,CCE,SSA,INA,RSS IF
*                                   A=000002; CMA,CCE,SSA,INA,SZA
*                                   RSS IF A -177776
      03316 003320       CMA,CCE,SSA    E-1, A=000001
      03317 102001       HLT 01         CMA,CCE,SSA FAILED
      03320 003322       CMA,CCE,SSA,SZA         E-1, A=177776
      03321 003324       CMA,CCE,SSA,INA         E=1, A=000002
      03322 102001       HLT 01         FAILURE:  CMA,CCE,SSA,SZA IF
*                                   A=177776; CMA,CCE,SSA,INA IF
*                                   A=000002
      03323 003315       CMA,CCE,SLA,INA,RSS      E=1, A=177776
      03324 102001       HLT 01         CMA,CCE,SLA,INA,RSS FAILED
      03325 003326       CMA,CCE,SSA,INA,SZA      E=1, A=000002
      03326 102001       HLT 01         CMA,CCE,SSA,INA,SZA FAILED
      03327 002041       SEZ,RSS
      03330 102001       HLT 01         E NOT=0
      03331 000000       NOP
****** CLA MODULE *****
      03332 102501 CCA   LIA 01         LOAD SW. REG. INTO A=077777
      03333 000040       CLE            E=0
      03334 003400       CCA            A=177777
      03335 003401       CCA,RSS
      03336 102001       HLT 01         CCA OR CCA,RSS FAILED
      03337 003402       CCA,SZA
      03340 003403       CCA,SZA,RSS
      03341 102001       HLT 01         CCAMSZA OR CCA,SZA,RSS FAILED
      03342 003404       CCA,INA        E=1, A=000000
      03343 003405       CCA,INA,RSS
      03344 102001       HLT 01         CCA,INA OR CCA,INA,RSS FAILED
      03345 003406       CCA,INA,SZA    A=000000
      03346 102001       HLT 01         CCA,INA,SZA FAILED
      03347 003407       CCA,INA,SZA,RSS          A-000000
      03350 003411       CCA,SLA,RSS    A=177777
      03351 102001       HLT 01         FAILURE:  CCA,INA,SZA,RSS IF
*                                   A=000000; CCA,SLA,RSS, IF
*                                   A=177777
      03352 003410       CCA,SLA                  A=177777
      03353 003415       CCA,SLA,INA,RSS          A=000000
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      03354 102001       HLT 01         FAILURE:  CCA,SLA IF A=177777;
*                                   CCA,SLA,INA,RSS IF A=000000
      03355 003412       CCA,SLA,SZA              A=177777
      03356 003416       CCA,SLA,INA,SZA          A=000000
      03357 102001       HLT 01         FAILURE:  CCA,SLA,SZA IF
*                                   A=177777; CCA,SLA,INA,SZA IF
*                                   A=000000
      03360 003414       CCA,SLA,INA              A-000000
      03361 003413       CCA,SLA,SZA,RSS          A-177777
      03362 102001       HLT 01         FAILURE:  CCA,SLA,INA IF
*                                   A=000000; CCA,SLA,SZA,RSS IF
*                                   A=177777
      03363 003417       CCA,SLA,INA,SZA,RSS      A=000000
      03364 102001       HLT 01         CCA,SLA,INA,RSS FAILED
      03365 003420       CCA,SSA                  A=177777
      03366 003421       CCA,SSA,RSS
      03367 102001       HLT 01         CCA,SSA OR CCA,SSA,RSS FAILED
      03370 003422       CCA,SSA,SZA              A=177777
      03371 003423       CCA,SSA,SZA,RSS
      03372 102001       HLT 01         CCA,SSA,SZA OR CCA,SSA,SZA,RSS
*                                   FAILED
      03373 003424       CCA,SSA,INA
      03374 003425       CCA,SSA,INA,RSS
      03375 102001       HLT 01         CCA,SSA,INA OR CCA,SSA,INA,RSS
*                                   FAILED
      03376 003426       CCA,SSA,INA,SZA          A=000000
      03377 102001       HLT 01         CCA,SSA,INA,SZA FAILED
      03400 003427       CCA,SSA,INA,SZA,RSS
      03401 102001       HLT 01         CCA,SSA,INA,SZA,RSS FAILED
      03402 002041       SEZ,RSS
      03403 102001       HLT 01         E NOT=1
      03404 000000       NOP
****** CCA,SEZ MODULE *****
      03405 102501 CCAEZ LIA 01         LOAD SW. REG. INTO A=077777
      03406 000040       CLE            E=0
      03407 003441       CCA,SEZ,RSS
      03410 003440       CCA,SEZ
      03411 102001       HLT 01         CCA,SEZ,RSS OR CCA,SEZ FAILED
      03412 003442       CCA,SEZ,SZA
      03413 102001       HLT 01         CCA,SEZ,SZA FAILED
      03414 003443       CCA,SEZ,SZA,RSS
      03415 102001       HLT 01         CCA,SEZ,SZA,RSS FAILED
      03416 003444       CCA,SEZ,INA    E=1, A=000000
      03417 102001       HLT 01         CCA,SEZ,INA FAILED
      03420 003445       CCA,SEZ,INA,RSS
      03421 102001       HLT 01         CCA,SEZ,INA,RSS FAILED
      03422 003446       CCA,SEZ,INA,SZA
      03423 102001       HLT 01         CCA,SEZ,INA,SZA FAILED
      03424 003447       CCA,SEZ,INA,SZA,RSS
      03425 102001       HLT 01         CCA,SEZ,INA,SZA,RSS FAILED
      03426 003450       CCA,SEZ,SLA
      03427 003451       CCA,SEZ,SLA,RSS
      03430 102001       HLT 01         CCA,SEZ,SLA OR CCA,SEZ,SLA,RSS
*                                   FAILED
      03431 003452       CCA,SEZ,SLA,SZA
      03432 003453       CCA,SEZ,SLA,SZA,RSS
      03433 102001       HLT 01         CCA,SEZ,SLA OR CCA,SEZ,SLA,RSS
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*                                   FAILED
      03434 003452       CCA,SEZ,SLA,SZA
      03435 003453       CCA,SEZ,SLA,SZA,RSS
      03436 102001       HLT 01         CCA,SEZ,SLA,SZA OR CCA,SEZ,SLA,
*                                   SZA,RSS FAILED
      03437 003454       CCA,SEZ,SLA,INA          A=000000
      03440 003455       CCA,SEZ,SLA,INA,RSS      A=000000
      03441 102001       HLT 01         CCA,SEZ,SLA,INA OR CCA,SEZ,SLA,
*                                   INA,RSS FAILED
      03442 003456       CCA,SEZ,SLA,INA,SZA
      03443 102001       HLT 01         CCA,SEZ,SLA,INA,SZA FAILED
      03444 003457       CCA,SEZ,SLA,INA,SZA,RSS
      03445 102001       HLT 01         CCA,SEZ,SLA,INA,SZA,RSS FAILED
      03446 003460       CCA,SEZ,SSA
      03447 003461       CCA,SEZ,SSA,RSS
      03450 102001       HLT 01         CCA,SEZ,SSA OR CCA,SEZ,SSA,RSS
*                                   FAILED
      03451 003462       CCA,SEZ,SSA,SZA
      03452 003463       CCA,SEZ,SSA,SZA,RSS
      03453 102001       HLT 01         CCA,SEZ,SSA,SZA OR CCA,SEZ,SSA,
*                                   SZA,RSS FAILED
      03454 003464       CCA,SEZ,SSA,INA
      03455 003465       CCA,SEZ,SSA,INA,RSS
      03456 102001       HLT 01         CCA,SEZ,SSA,INA OR CCA,SEZ,SSA,
*                                   INA,RSS FAILED
      03457 003466       CCA,SEZ,SSA,INA,SZA
      03460 102001       HLT 01         CCA,SEZ,SSA,INA,SZA FAILED
      03461 003467       CCA,SEZ,SSA,INA,SZA,RSS
      03462 102001       HLT 01         CCA,SEZ,SSA,INA,SZA,RSS FAILED
      03463 002041       SEZ,RSS
      03464 102001       HLT 01         E NOT=1
      03465 000000       NOP
****** CCA,CLE MODULE *****
      03466 102501 CCALE LIA 01         LOAD SW. REG. INTO A=077777
      03467 002004       INA            A=100000
      03470 102401       MIA 01         MERGE SW. REG. INTO A=177777
      03471 002004       INA            E=1, A=000000
      03472 003500       CCA,CLE        E=0, A=177777
      03473 003501       CCA,CLE,RSS
      03474 102001       HLT 01         CCA,CLE OR CCA,CLE,RSS FAILED
      03475 003502       CCA,CLE,SZA
      03476 003503       CCA,CLE,SZA,RSS
      03477 102001       HLT 01         CCA,CLE,SZA OR CCA,CLE,SZA,RSS
*                                   FAILED
      03500 003504       CCA,CLE,INA              E=1
      03501 003505       CCA,CLE,INA,RSS          E=1
      03502 102001       HLT 01         CCA,CLE,INA OR CCA,CLE,INA,RSS
*                                   FAILED
      03503 003506       CCA,CLE,INA,SZA          E=1
      03504 102001       HLT 01         CCA,CLE,INA,SZA FAILED
      03505 003507       CCA,CLE,INA,SZA,RSS      E=1
      03506 003511       CCA,CLE,SLA,RSS          E=0
      03507 102001       HLT 01         FAILURE:  CCA,CLE,INA,SZA,RSS IF
*                                   E=1; CCA,CLE,SLA,RSS IF E=1
      03510 003510       CCA,CLE,SLA
      03511 003513       CCA,CLE,SLA,SZA,RSS
      03512 102001       HLT 01         CCA,CLE,SLA,SZA,RSS OR CCA,CLE,
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0026*                                       SLA FAILED
0027  03513 003512          CCA,CLE,SLA,SZA          E=0
0028  03514 003515          CCA,CLE,SLA,INA,RSS      E=1
0029  03515 102001          HLT 01          FAILURE: CCA,CLE,SLA,SZA IF
0030*                                       E=0; OR CCA,CLE,SLA,INA,RSS
0031*                                       IF E=1
0032  03516 003514          CCA,CLE,SLA,INA          E=1
0033  03517 003516          CCA,CLE,SLA,INA,SZA      E=1
0034  03520 102001          HLT 01          CCA,CLE,SLA,INA OR CCA,CLE,SLA,
0035*                                       INA,SZA FAILED
0036  03521 003517          CCA,CLE,SLA,INA,SZA,RSS E=1
0037  03522 102001          HLT 01          CCA,CLE,SLA,INA,SZA,RSS FAILED
0038  03523 003521          CCA,CLE,SSA,RSS
0039  03524 102001          HLT 01          CCA,CLE,SSA,RSS FAILED
0040  03525 003520          CCA,CLE,SSA
0041  03526 003523          CCA,CLE,SSA,SZA,RSS
0042  03527 102001          HLT 01          CCA,CLE,SSA OR CCA,CLE,SSA,SZA,
0043*                                       RSS FAILED
0044  03530 003522          CCA,CLE,SSA,SZA          E=1
0045  03531 003525          CCA,CLE,SSA,INA,RSS      E=1
0046  03532 102001          HLT 01          FAILURE: CCA,CLE,SSA,SZA IF
0047*                                       E=0; CCA,CLE,SSA,INA,RSS IF
0048*                                       E=1
0049  03533 003514          CCA,CLE,SLA,INA          E=1
0050  03534 003516          CCA,CLE,SLA,INA,SZA      E=1
0051  03535 102001          HLT 01          CCA,CLE,SLA,INA OR CCA,CLE,SLA,
0052*                                       INA,SZA FAILED
0053  03536 003517          CCA,CLE,SLA,INA,SZA,RSS E=1
0054  03537 102001          HLT 01          CCA,CLE,SLA,INA,SZA,RSS FAILED
0055  03540 003521          CCA,CLE,SSA,RSS
0056  03541 102001          HLT 01          CCA,CLE,SSA,RSS FAILED
0057  03542 003520          CCA,CLE,SSA
0058  03543 003523          CCA,CLE,SSA,SZA,RSS
0059  03544 102001          HLT 01          CCA,CLE,SSA OR CCA,CLE,SSA,SZA,
0060*                                       RSS FAILED
0061  03545 003522          CCA,CLE,SSA,SZA          E=0
0062  03546 003525          CCA,CLE,SSA,INA,RSS      E=1
0063  03547 102001          HLT 01          FAILURE: CCA,CLE,SSA,SZA IF
0064*                                       E=0, CCA,CLE,SSA,INA,RSS IF
0065*                                       E=1
0066  03550 003524          CCA,CLE,SSA,INA          E=1
0067  03551 003526          CCA,CLE,SSA,INA,SZA      E=1
0068  03552 102001          HLT 01          CCA,CLE,SSA,INA OR CCA,CLE,SSA,
0069*                                       INA,SZA FAILED
0070  03553 003527          CCA,CLE,SSA,INA,SZA,RSS E=1
0071  03554 102001          HLT 01          CCA,CLE,SSA,INA,SZA,RSS FAILED
0072  03555 002041          SEZ,RSS
0073  03556 102001          HLT 01          E NOT=1
0074  03557 000000          NOP
0075***** CCA,CME MODULE *****
0076  03560 1025w1  CCAME LIA 01          LOAD SW. REG. INTO A=077777
0077  03561 002004          INA              A=100000
0078  03562 102401          MIA 01          MERGE SW. REG. INTO A=100000
0079  03563 002004          INA              E=1, A=000000
0080  03564 003600          CCA,CME          E=0, A=177777
0081  03565 003601          CCA,CME,RSS      E=1, A=177777
0082  03566 102201          HLT 01          FAILURE: CCA,CME IF E=0; CCA,
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0083*                                       CME,RSS IF E=1
0084  03567 003602          CCA,CME,SZA              E=0
0085  03570 003603          CCA,CME,SZA,RSS          E=1
0086  03571 102001          HLT 01          FAILURE: CCA,CME,SZA IF E=0
0087*                                       CCA,CME,SZA,RSS IF E=1
0088  03572 003604          CCA,CME,INA      E=1, A=000000
0089  03573 003605          CCA,CME,INA,RSS          E=1
0090  03574 102001          HLT 01          CCA,CME,INA OR CCA,CME,INA,RSS
0091*                                       FAILED
0092  03575 003607          CCA,CME,INA,SZA,RSS      E=1, A=000000
0093  03576 003606          CCA,CME,INA,SZA          E=1
0094  03577 102001          HLT 01          CCA,CME,INA,SZA,RSS OR CCA,CME,
0095*                                       INA,SZA FAILED
0096  03600 003610          CCA,CME,SLA              E=0
0097  03601 003611          CCA,CME,SLA,RSS         E=1
0098  03602 102401          HLT 01          FAILURE: CCA,CME,SLA, IF E=0;
0099*                                       CCA,CME,SLA,RSS IF E=1
0100  03603 003612          CCA,CME,SLA,SZA          E=0
0101  03604 003613          CCA,CME,SLA,SZA,RSS      E=1
0102  03605 102001          HLT 01          FAILURE: CCA,CME,SLA,SZA IF
0103*                                       E=0, CCA,CME,SLA,SZA,RSS IF
0104*                                       E=1
0105  03606 003614          CCA,CME,SLA,INA          E=1
0106  03607 003615          CCA,CME,SLA,INA,RSS      E=1
0107  03610 102001          HLT 01          CCA,CME,SLA,INA OR CCA,CME,SLA,
0108*                                       INA,RSS FAILED
0109  03611 003616          CCA,CME,SLA,INA,SZA      E=1
0110  03612 102001          HLT 01          CCA,CME,SLA,INA,SZA FAILED
0111  03613 003617          CCA,CME,SLA,INA,SZA,RSS E=1
0112  03614 102001          HLT 01          CCA,CME,SLA,INA,SZA,RSS FAILED
0113  03615 003620          CCA,CME,SSA              E=0
0114  03616 003621          CCA,CME,SSA,RSS          E=1
0115  03617 102001          HLT 01          FAILURE: CCA,CME,SSA IF E=0;
0116*                                       CCA,CME,SSA,RSS IF E=1
0117  03620 003622          CCA,CME,SSA,SZA          E=0
0118  03621 003623          CCA,CME,SSA,SZA,RSS      E=1
0119  03622 102001          HLT 01          FAILURE: CCA,CME,SSA,SZA IF
0120*                                       E=0, CCA,CME,SSA,SZA,RSS IF
0121*                                       E=1
0122  03623 003624          CCA,CME,SSA,INA          E=1
0123  03624 003625          CCA,CME,SSA,INA,RSS      E=1
0124  03625 102001          HLT 01          CCA,CME,SSA,INA OR CCA,CME,SSA,
0125*                                       INA,RSS FAILED
0126  03626 003626          CCA,CME,SSA,INA,SZA      E=1
0127  03627 102001          HLT 01          CCA,CME,SSA,INA,SZA FAILED
0128  03630 003627          CCA,CME,SSA,INA,SZA,RSS E=1
0129  03631 102001          HLT 01          CCA,CME,SSA,INA,SZA,RS#FAILED
0130  03632 002041          SEZ,RSS
0131  03633 102001          HLT 01 E NOT=1
0132  03634 000000          NOP
0133***** CCA,CCE MODULE *****
0134  03635 102501  CCAE LIA 01          LOAD SW. REG. INTO A=077777
0135  03636 002004          INA              A=100000
0136  03637 102401          MIA 01          MERGE SW. REG. INTO A=177777
0137  03640 002004          INA              E=1, A=000000
0138  03641 003700          CCA,CCE          E=1, A=177777
0139  03642 003701          CCA,CCE,RSS
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0140  03643 102201          HLT 01          CCA,CCE OR CCA,CCE,RSS FAILED
0141  03644 003702          CCA,CCF,SZA      E=1
0142  03645 003703          CCA,CCF,SZA,RSS
0143  03646 102001          HLT 01          CCA,CCF,SZA OR CCA,CCE,SZA,RSS
0144*                                       FAILED
0145  03647 003704          CCA,CCE,INA      E=1, A=000000
0146  03650 003705          CCA,CCF,INA,RSS
0147  03651 102001          HLT 01          CCA,CCE,INA OR CCA,CCE,INA,RSS
0148*                                      FAILED
0149  03652 003706          CCA,CCE,INA,SZA          A=000000
0150  03653 102001          HLT 01          CCA,CCF,INA,SZA FAILED
0151  03654 003707          CCA,CCF,INA,SZA,RSS      E=1, A=000000
0152  03655 003711          CCA,CCF,SLA,RSS          E=1, A=177777
0153  03656 102001          HLT 01          FAILURE: CCA,CCF,INA,SZA,RSS IF
0154*                                       A=000000; CCA,CCE,SLA,RSS IF
0155*                                       A=177777
0156  03657 003710          CCA,CCE,SLA      E=1, A=177777
0157  03660 003713          CCA,CCF,SLA,SZA,RSS
0158  03661 102001          HLT 01          CCA,CCF,SLA OR CCA,CCE,SLA,SZA,
0159*                                       RSS FAILED
0160  03662 003712          CCA,CCE,SLA,SZA          A=177777
0161  03663 003715          CCA,CCE,SLA,INA,RSS      A=000000
0162  03664 102001          HLT 01          FAILURE: CCA,CCE,SLA,SZA IF
0163*                                       A=177777; CCA,CCE,SLA,INA,
0164*                                       RSS IF A=000000
0165  03665 003714          CCA,CCE,SLA,INA
0166  03666 003716          CCA,CCE,SLA,INA,SZA
0167  03667 102001          HLT 01          CCA,CLE,SLA,INA OR CCA,CCE,SLA,
0168*                                       INA,SZA FAILED
0169  03670 003717          CCA,CCE,SLA,INA,SZA,RSS
0170  03671 102001          HLT 01          CCA,CCF,SLA,INA,SZA,RSS FAILED
0171  03672 003720          CCA,CCE,SSA
0172  03673 003721          CCA,CCE,SSA,RSS
0173  03674 102001          HLT 01          CCA,CCF,SSA OR CCA,CCE,SSA,RSS
0174*                                       FAILED
0175  03675 003722          CCA,CCE,SSA,SZA
0176  03676 003723          CCA,CCE,SSA,SZA,RSS
0177  03677 102001          HLT 01          CCA,CCF,SSA,SZA OR CCA,CCE,SSA,
0178*                                       SZA,RSS FAILED
0179  03700 003724          CCA,CCE,SSA,INA
0180  03701 003725          CCA,CCE,SSA,INA,RSS
0181  03702 102001          HLT 01          CCA,CCF,SSA,INA OR CCA,CCE,SSA,
0182*                                       INA,RSS FAILED
0183  03703 003726          CCA,CCE,SSA,INA,SZA
0184  03704 102001          HLT 01          CCA,CCF,SSA,INA,SZA FAILED
0185  03705 003727          CCA,CCE,SSA,INA,SZA,RSS
0186  03706 102001          HLT 01          CCA,CCF,SSA,INA,SZA,RSS FAILED
0187  03707 002041          SEZ,RSS
0188  03710 102001          HLT 01          E NOT=1
0189  03711 000000          NOP
0190***** SSA,SLA MODULE *****
0191  03712 102501  SSALE LIA 01          LOAD SW,REG. INTO A=077777
0192  03713 002004          INA              A=100000
0193  03714 102401          MIA 01          MERGE SW. REG. INTO A=177777
0194  03715 002004          INA              E=1, A=000000
0195  03716 022030          SSA,SLA
0196  03717 102001          HLT 01          SSA,SLA FAILED
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PAGE 0023 #05                                   HP 20400AL

0197  03720 002031          SSA,SLA,RSS
0198  03721 002032          SSA,SLA,SZA
0199  03722 102001          HLT 01          SSA,SLA,RSS OR SSA,SLA,SZA
0200*                                       FAILED
0201  03723 002033          SSA,SLA,SZA,RSS
0202  03724 002034          SSA,SLA,INA              E=1, A=000001
0203  03725 102001          HLT 01          FAILURE: SSA,SLA,SZA,RSS IF
0204*                                       A=000000; SSA,SLA,INA IF
0205  03726 002035          SSA,SLA,INA,RSS          A=000002
0206  03727 002036          SSA,SLA,INA,SZA          A=000003
0207  03730 102001          HLT 01          FAILURE: SSA,SLA,INA,RSS IF
0208*                                       A=000002; SSA,SLA,INA,SZA
0209*                                       IF A=000003
0210  03731 002037          SSA,SLA,INA,SZA,RSS      A=000004
0211  03732 102001          HLT 01          SSA,SLA,INA,SZA,RSS FAILED
0212  03733 002070          SEZ,SSA,SLA      E=1, A=000004
0213  03734 102001          HLT 01          SEZ,SSA,SLA FAILED
0214  03735 002071          SEZ,SSA,SLA,RSS
0215  03736 102001          HLT 01          SEZ,SSA,SLA,RSS FAILED
0216  03737 002072          SEZ,SSA,SLA,SZA
0217  03740 102001          HLT 01          SEZ,SSA,SLA,SZA FAILED
0218  03741 002073          SEZ,SSA,SLA,SZA,RSS
0219  03742 102001          HLT 01          SEZ,SSA,SLA,SZA,RSS FAILED
0220  03743 002074          SEZ,SSA,SLA,INA          E=1, A=000005
0221  03744 102001          HLT 01          SEZ,SSA,SLA,INA FAILED
0222  03745 002075          SEZ,SSA,SLA,INA,RSS      E=1, A=000006
0223  03746 102001          HLT 01          SEZ,SSA,SLA,INA,RSS
0224  03747 002076          SEZ,SSA,SLA,INA,SZA      E=1, A=000007
0225  03750 102001          HLT 01          SEZ,SSA,SLA,INA,SZA FAILED
0226  03751 002077          SEZ,SSA,SLA,INA,SZA,RSS E=1, A=000010
0227  03752 102001          HLT 01          SEZ,SSA,SLA,INA,SZA,RSS FAILED
0228  03753 002130          CLE,SSA,SLA              E=0, A=000010
0229  03754 102001          HLT 01          CLE,SSA,SLA FAILED
0230  03755 002131          CLE,SSA,SLA,RSS
0231  03756 002132          CLE,SSA,SLA,SZA
0232  03757 102001          HLT 01          CLE,SSA,SLA,RSS OR CLE,SSA,SLA,
0233*                                       SZA FAILED
0234  03760 002133          CLE,SSA,SLA,SZA,RSS
0235  03761 102001          HLT 01          CLE,SSA,SLA,SZA,RSS FAILED
0236  03762 002134          CLE,SSA,SLA,INA          E=0, A=000011
0237  03763 102001          HLT 01          CLE,SSA,SLA,INA FAILED
0238  03764 002135          CLE,SSA,SLA,INA,RSS      E=0, A=000012
0239  03765 002136          CLE,SSA,SLA,INA,SZA      E=0, A=000013
0240  03766 102001          HLT 01          FAILURE: CLE,SSA,SLA,INA,RSS IF
0241*                                       A=000012; CLF,SSA,SLLA,INA,
0242*                                       SZA IF A=000013
0243  03767 002137          CLE,SSA,SLA,INA,SZA,RSS E=0, A=000014
0244  03770 102001          HLT 01          CLE,SSA,SLA,INA,SZA,RSS FAILED
0245  03771 102501          LIA 01          LOAD SW. REG. INTO A=077777
0246  03772 002004          INA              A=100000
0247  03773 002004          INA              A=100001
0248  03774 002031          SSA,SLA,RSS
0249  03775 102001          HLT 01          SSA,SLA,RSS FAILED
0250  03776 002040          SEZ
0251  03777 102001          HLT 01          E NOT=0
0252  04000 000000          NOP
0253***** CME,SSA,SLA MODULE *****
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0254  04001 102501  MESSL LIA 01        LOAD SW. REG. INTO A=077777
0255  04002 002004        INA           A=100000
0256  04003 102401        MIA 01        MERGE SW. REG. INTO A=177777
0257  04004 002004        INA           E=1, A=000000
0258  04005 002231        CME,SSA,SLA,RSS       E=0
0259  04006 002230        CME,SSA,SLA           E=1
0260  04007 102001        HLT 01        FAILURE:  CME,SSA,SLA,RSS IF
0261*                                       E=0; CME,SSA,SLA IF E=1
0262  04010 002233        CME,SSA,SLA,SZA,RSS   E=0
0263  04011 002232        CME,SSA,SLA,SZA       E=1
0264  04012 102001        HLT 01        FAILURE:  CME,SSA,SLA,SZA,RSS IF
0265*                                       E=0; CME,SSA,SLA,SZA IF E=1
0266  04013 002235        CME,SSA,SLA,INA,RSS   E=0, A=000001
0267  04014 002234        CME,SSA,SLA,INA       E=1, A=000000
0268  04015 102001        HLT 01        FAILURE:  CME,SSA,SLA,INA,RSS IF
0269*                                       E=0, CME,SSA,SLA,INA IF E=1
0270  04016 002236        CME,SSA,SLA,INA,SZA   E=0, A=000003
0271  04017 102001        HLT 01        CME,SSA,SLA,INA,SZA FAILED
0272  04020 002237        CME,SSA,SLA,INA,SZA,RSS E=1, A=000004
0273  04021 102001        HLT 01        CME,SSA,SLA,INA,SZA,RSS FAILED
0274  04022 002331        CCE,SSA,SLA,RSS       E=1
0275  04023 002330        CCE,SSA,SLA           E=1, A=000004
0276  04024 102001        HLT 01        CCE,SSA,SLA,RSS OR CCE,SSA,SLA
0277*                                       FAILED
0278  04025 002332        CCE,SSA,SLA,SZA
0279  04026 102001        HLT 01        CCE,SSA,SLA,SZA FAILED
0280  04027 002333        CCE,SSA,SLA,SZA,RSS
0281  04030 102001        HLT 01        CCE,SSA,SLA,SZA,RSS FAILED
0282  04031 002334        CCE,SSA,SLA,INA       E=1, A=000005
0283  04032 102001        HLT 01        CCE,SSA,SLA,INA FAILED
0284  04033 002335        CCE,SSA,SLA,INA,RSS   A=000006
0285  04034 002336        CCE,SSA,SLA,INA,SZA   A=000007
0286  04035 102001        HLT 01        FAILURE:  CCE,SSA,SLA,INA,RSS IF
0287*                                       A=000006; CCE,SSA,SLA,INA,
0288*                                       SZA IF A=000007
0289  04036 002337        CCE,SSA,SLA,INA,SZA,RSS A=000010, E=1
0290  04037 102001        HLT 01        CCE,SSA,SLA,INA,SZA,RSS FAILED
0291  04040 002041        SEZ,RSS
0292  04041 102001        HLT 01        E NOT=1
0293  04042 000000        NOP
0294**** CLA,SSA,SLA MODULE ****
0295  04043 102501  CLSSL LIA 01        LOAD SW. REG. INTO A=077777
0296  04044 002004        INA           A=100000
0297  04045 102401        MIA 01        MERGE SW. REG. INTO A=1777777
0298  04046 002004        INA           E=1, A=000000
0299  04047 102501        LIA 01        A=077777
0300  04050 002430        CLA,SSA,SLA   E=1, A=000000
0301  04051 102001        HLT 01        CLA,SSA,SLA FAILED
0302  04052 002431        CLA,SSA,SLA,RSS
0303  04053 002432        CLA,SSA,SLA,SZA
0304  04054 102001        HLT 01        CLA,SSA,SLA,RSS OR CLA,SSA,SLA,
0305*                                       SZA FAILED
0306  04055 002433        CLA,SSA,SLA,SZA,RSS   A=000000
0307  04056 002434        CLA,SSA,SLA,INA       A=000001
0308  04057 102001        HLT 01        FAILURE:  CLA,SSA,SLA,SZA,RSS IF
0309*                                       A=000000; CLA,SSA,SLA,INA IF
0310*                                       A=000001
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0311  04060 002435        CLA,SSA,SLA,INA,RSS
0312  04061 002436        CLA,SSA,SLA,INA,SZA
0313  04062 102001        HLT 01        CLA,SSA,SLA,INA,RSS OR CLA,SSA,
0314*                                       SLA,INA,SZA FAILED
0315  04063 002437        CLA,SSA,SLA,INA,SZA,RSS
0316  04064 102001        HLT 01        CLA,SSA,SLA,INA,SZA,RSS FAILED
0317  04065 002470        CLA,SEZ,SSA,SLA
0318  04066 102001        HLT 01        CLA,SEZ,SSA,SLA FAILED
0319  04067 002471        CLA,SEZ,SSA,SLA,RSS
0320  04070 102001        HLT 01        CLA,SEZ,SSA,SLA,RSS FAILED
0321  04071 002472        CLA,SEZ,SSA,SLA,SZA
0322  04072 102001        HLT 01        CLA,SEZ,SSA,SLA,SZA FAILED
0323  04073 002473        CLA,SEZ,SSA,SLA,SZA,RSS
0324  04074 102001        HLT 01        CLA,SEZ,SSA,SLA,SZA,RSS FAILED
0325  04075 002474        CLA,SEZ,SSA,SLA,INA
0326  04076 102001        HLT 01        CLA,SEZ,SSA,SLA,INA
0327  04077 002475        CLA,SEZ,SSA,SLA,INA,RSS
0328  04100 102001        HLT 01        CLA,SEZ,SSA,SLA,INA,RSS FAILED
0329  04101 002476        CLA,SEZ,SSA,SLA,INA,SZA
0330  04102 102001        HLT 01        CLA,SEZ,SSA,SLA,INA,SZA FAILED
0331  04103 002477        CLA,SEZ,SSA,SLA,INA,SZA,RSS
0332  04104 102001        HLT 01        CLA,SEZ,SSA,SLA,INA,SZA,RSS
0333*                                       FAILED
0334  04105 002530        CLA,CLE,SSA,SLA       E=0,A=000000
0335  04106 102001        HLT 01        CLA,CLE,SSA,SLA
0336  04107 002531        CLA,CLE,SSA,SLA,RSS
0337  04110 002532        CLA,CLE,SSA,SLA,SZA
0338  04111 102001        HLT 01        CLA,CLE,SSA,SLA,RSS OR CLA,CLE,
0339*                                       SSA,SLA,SZA FAILED
0340  04112 002533        CLA,CLE,SSA,SLA,SZA,RSS A=000000
0341  04113 002534        CLA,CLE,SSA,SLA,INA   A=000001
0342  04114 102001        HLT 01        CLA,CLE,SSA,SLA,SZA,RSS IF A=0
0343*                                       CLA,CLE,SSA,SLA,INA IF A=000001
0344  04115 002535        CLA,CLE,SSA,SLA,INA,RSS
0345  04116 002536        CLA,CLE,SSA,SLA,INA,SZA
0346  04117 102001        HLT 01        CLA,CLE,SSA,SLA,INA,RSS OR CLA,
0347*                                       CLE,SSA,SLA,INA,SZA FAILED
0348  04120 002537        CLA,CLE,SSA,SLA,INA,SZA,RSS
0349  04121 102001        HLT 01        CLA,CLE,SSA,SLA,INA,SZA,RSS
0350*                                       FAILED
0351  04122 002040        SEZ
0352  04123 102001        HLT 01        E NOT=0
0353  04124 102501        LIA 01        LOAD SW. REG. INTO A=077777
0354  04125 002004        INA           A=100000
0355  04126 102401        MIA 01        MERGE SW. REG. INTO A=177777
0356  04127 002004        INA           E=1, A=000000
0357  04130 002631        CLA,CME,SSA,SLA,RSS   E=0
0358  04131 002630        CLA,CME,SSA,SLA       E=1
0359  04132 102001        HLT 01        FAILURE:  CLA,CME,SSA,SLA,RSS IF
0360*                                       E=0; CLA,CME,SSA,SLA IF E=1
0361  04133 002633        CLA,CME,SSA,SLA,SZA,RSS E=0
0362  04134 002632        CLA,CME,SSA,SLA,SZA   E=1
0363  04135 102001        HLT 01        FAILURE:  CLA,CME,SSA,SLA,SZA,RS
0364*                                       IF E=0; CLA,CME,SSA,SLA,SZA
0365*                                       IF E=1
0366  04136 002635        CLA,CME,SSA,SLA,INA,RSS E=0
0367  04137 002634        CLA,CME,SSA,SLA,INA   E=1
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0368  04140 102001        HLT 01        FAILURE:  CLA,CME,SSA,SLA,INA,
0369*                                       RSS IF E=0; CLA,CME,SSA,SLA,
0370*                                       INA IF E=1
0371  04141 002636        CLA,CME,SSA,SLA,INA,SZA E=0
0372  04142 102001        HLT 01        CLA,CME,SSA,SLA,INA,SZA, FAILED
0373  04143 002637        CLA,CME,SSA,SLA,INA,SZA,RSS       E=1
0374  04144 102001        HLT 01        CLA,CME,SSA,SLA,INA,SZA,RSS
0375*                                       FAILED
0376  04145 002041        SEZ,RSS
0377  04146 102001        HLT 01        E NOT=1
0378  04147 002730        CLA,CCE,SSA,SLA       E=1
0379  04150 102001        HLT 01        CLA,CCE,SSA,SLA FAILED
0380  04151 002731        CLA,CCE,SSA,SLA,RSS
0381  04152 002732        CLA,CCE,SSA,SLA,SZA
0382  04153 102001        HLT 01        CLA,CCF,SSA,SLA,RSS OR CLA,CCE,
0383*                                       SSA,SLA,SZA FAILED
0384  04154 002733        CLA,CCE,SSA,SLA,SZA,RSS A=000000
0385  04155 002734        CLA,CCE,SSA,SLA,INA   A=000001
0386  04156 102001        HLT 01        FAILURE:  CLA,CCE,SSA,SLA,SZA
0387*                                       RSS IF A=000000; CLA,CCE,
0388*                                       SSA,SLA,INA IF A=000001
0389  04157 002735        CLA,CCE,SSA,SLA,INA,RSS
0390  04160 002736        CLA,CCE,SSA,SLA,INA,SZA
0391  04161 102001        HLT 01        CLA,CCE,SSA,SLA,INA,RSS OR CLA,
0392*                                       CCF,SSA,SLA,INA,SZA FAILED
0393  04162 002737        CLA,CCE,SSA,SLA,INA,SZA,RSS
0394  04163 102001        HLT 01        CLA,CCE,SSA,SLA,INA,SZA,RSS
0395*                                       FAILED
0001  04164 002041        SEZ,RSS
0002  04165 102001        HLT 01        E NOT=1
0003  04166 003500        CCA,CLE       E=0, A=177777
0004  04167 003030        CMA,SSA,SLA   A=000000
0005  04170 102001        HLT 01        CMA,SSA,SLA FAILED
0006  04171 003031        CMA,SSA,SLA,RSS       A=177777
0007  04172 102001        HLT 01        CMA,SSA,SLA,RSS FAILED
0008  04173 003032        CMA,SSA,SLA,SZA       A=000000
0009  04174 102001        HLT 01        CMA,SSA,SLA,SZA FAILED
0010  04175 003033        CMA,SSA,SLA,SZA,RSS   A=177777
0011  04176 102001        HLT 01        CMA,SSA,SLA,SZA,RSS FAILED
0012  04177 003034        CMA,SSA,SLA,INA       A=000001
0013  04200 102001        HLT 01        CMA,SSA,SLA,INA FAILED
0014  04201 003035        CMA,SSA,SLA,INA,RSS   A=177777
0015  04202 003036        CMA,SSA,SLA,INA,SZA   A=000001
0016  04203 102001        HLT 01        FAILURE:  CMA,SSA,SLA,INA,RSS IF
0017*                                       A=177777; CMA,SSA,SLA,INA,SZA
0018*                                       IF A=000001
0019  04204 003037        CMA,SSA,SLA,INA,SZA,RSS A=177777
0020  04205 102001        HLT 01        CMA,SSA,SLA,INA,SZA,RSS FAILED
0021  04206 003070        CMA,SEZ,SSA,SLA       A=000000
0022  04207 102001        HLT 01        CMA,SEZ,SSA,SLA FAILED
0023  04210 003071        CMA,SEZ,SSA,SLA,RSS   A=177777
0024  04211 102001        HLT 01        CMA,SEZ,SSA,SLA,RSS
0025  04212 003072        CMA,SEZ,SSA,SLA,SZA   A=000000
0026  04213 102001        HLT 01        CMA,SEZ,SSA,SLA,SZA FAILED
0027  04214 003073        CMA,SEZ,SSA,SLA,SZA,RSS A=177777
0028  04215 102001        HLT 01        CMA,SEZ,SSA,SLA,SZA,RSS FAILED
0029  04216 003074        CMA,SEZ,SSA,SLA,INA   A=000001
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PAGE 0027 #06                                   HP 20400AL

0030  04217 102001        HLT 01        CMA,SEZ,SSA,SLA,INA FAILED
0031  04220 003075        CMA,SEZ,SSA,SLA,INA,RSS A=177777
0032  04221 003076        CMA,SEZ,SSA,SLA,INA,SZA A=000001
0033  04222 102001        HLT 01        FAILURE:  CMA,SEZ,SSA,SLA,INA,
0034*                                       SZA IF A=000001; CMA,SEZ,
0035*                                       SSA,SLA,INA,RSS IF A=177777
0036  04223 003077        CMA,SEZ,SSA,SLA,INA,SZA,RSS       A=177777
0037  04224 102001        HLT 01        CMA,SEZ,SSA,SLA,INA,SZA,RSS
0038*                                       FAILED
0039  04225 003130        CMA,CLE,SSA,SLA       E=0, A=000000
0040  04226 102001        HLT 01        CMA,CLE,SSA,SLA FAILED
0041  04227 003131        CMA,CLE,SSA,SLA,RSS   A=177777
0042  04230 102001        HLT 01        CMA,CLE,SSA,SLA,RSS FAILED
0043  04231 003132        CMA,CLE,SSA,SLA,SZA   A=000000
0044  04232 102001        HLT 01        CMA,CLE,SSA,SLA,SZA
0045  04233 003133        CMA,CLE,SSA,SLA,SZA,RSS A=177777
0046  04234 102001        HLT 01        CMA,CLE,SSA,SLA,SZA,RSS FAILED
0047  04235 003134        CMA,CLE,SSA,SLA,INA   A=000001
0048  04236 102001        HLT 01        CMA,CLE,SSA,SLA,INA FAILED
0049  04237 003135        CMA,CLE,SSA,SLA,INA,RSS A=177777
0050  04240 003136        CMA,CLE,SSA,SLA,INA,SZA A=000001
0051  04241 102001        HLT 01        FAILURE:  CMA,CLE,SSA,SLA,INA,
0052*                                       SZA IF A=000001; CMA,CLE,
0053*                                       SSA,SLA,INA,RSS IF A=177777
0054  04242 003137        CMA,CLE,SSA,SLA,INA,SZA,RSS       A=177777
0055  04243 102001        HLT 01        CMA,CLE,SSA,SLA,INA,SZA,RSS
0056*                                       FAILED
0057  04244 002040        SEZ
0058  04245 102001        HLT 01        E NOT=0
0059  04246 102501        LIA 01        LOAD SW. REG. INTO A=077777
0060  04247 002004        INA           A=100000
0061  04250 102401        MIA 01        MERGE SW. REG. INTO A=177777
0062  04251 002004        INA           E=1, A=000000
0063  04252 003231        CMA,CME,SSA,SLA,RSS   E=0, A=177777
0064  04253 102001        HLT 01        CMA,CME,SSA,SLA,RSS FAILED
0065  04254 003230        CMA,CME,SSA,SLA       E=1, A=000000
0066  04255 102001        HLT 01        CMA,CME,SSA,SLA, FAILED
0067  04256 003233        CMA,CME,SSA,SLA,SZA,RSS E=0, A=177777
0068  04257 102001        HLT 01        CMA,CME,SSA,SLA,SZA,RSS FAILED
0069  04260 003232        CMA,CME,SSA,SLA,SZA   E=1, A=000000
0070  04261 102001        HLT 01        CMA,CME,SSA,SLA,SZA, FAILED
0071  04262 003235        CMA,CME,SSA,SLA,INA,RSS E=1, A=000000
0072  04263 102001        HLT 01        CMA,CME,SSA,SLA,INA,RSS FAILED
0073  04264 003234        CMA,CME,SSA,SLA,INA   E=1, A=000000
0074  04265 003236        CMA,CME,SSA,SLA,INA,SZA E=1, A=000000
0075  04266 102001        HLT 01        CMA,CME,SSA,SLA,INA OR CMA,CME,
0076*                                       SSA,SLA,INA,SZA FAILED
0077  04267 003237        CMA,CME,SSA,SLA,INA,SZA,RSS  E=1, A=000000
0078  04270 102001        HLT 01        CMA,CME,SSA,SLA,INA,SZA,RSS
0079*                                       FAILED
0080  04271 002041        SEZ,RSS
0081  04272 102001        HLT 01        E NOT=1
0082  04273 003331        CMA,CCE,SSA,SLA,RSS   E=1, A=177777
0083  04274 102001        HLT 01        CMA,CCE,SSA,SLA,RSS FAILED
0084  04275 003330        CMA,CCE,SSA,SLA       A=000000
0085  04276 102001        HLT 01        CMA,CCE,SSA,SLA, FAILED
0086  04277 003333        CMA,CCE,SSA,SLA,SZA,PSS A=177777
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0087  04306 102001        HLT 01          CMA,CCE,SSA,SLA,SZA,RSS FAILED
0088  04307 003332        CMA,CCE,SSA,SLA,SZA     A=000000
0089  04310 102001        HLT 01          CMA,CCE,SSA,SLA,SZA FAILED
0090  04311 003335        CMA,CCE,SSA,SLA,INA,RSS A=000000
0091  04312 102001        HLT 01          CMA,CCE,SSA,SLA,INA,RSS FAILED
0092  04313 003334        CMA,CCE,SSA,SLA,INA     A=000000
0093  04314 003336        CMA,CCE,SSA,SLA,INA,SZA A=000000
0094  04315 102001        HLT 01          CMA,CCE,SSA,SLA,INA OR CMA,CLE,
0095*                                         SSA,SLA,INA,SZA FAILED
0096  04316 003337        CMA,CCE,SSA,SLA,INA,SZA,RSS     A=000000
0097  04317 102001        HLT 01          CMA,CCE,SSA,SLA,INA,SZA,RSS
0098*                                       FAILED
0099  04320 002041        SEZ,RSS
0100  04321 102001        HLT 01          E NOT=1
0101  04322 102501        LIA 01          LOAD SW. REG. INTO A=077777
0102  04323 002004        INA             A=100000
0103  04324 102401        MIA 01          MERGE SW. REG. INTO A=177777
0104  04325 002004        INA             E=1, A=000000
0105  04326 003430        CCA,SSA,SLA
0106  04327 003431        CCA,SSA,SLA,RSS
0107  04330 102001        HLT 01          CCA,SSA,SLA,RSS OR CCA,SSA,SLA
0108*                                       FAILED
0109  04331 003432        CCA,SSA,SLA,SZA
0110  04332 003433        CCA,SSA,SLA,SZA,RSS
0111  04333 102001        HLT 01          CCA,SSA,SLA,SZA OR CCA,SSA,SLA,
0112*                                       SZA,RSS FAILED
0113  04334 003434        CCA,SSA,SLA,INA
0114  04335 003435        CCA,SSA,SLA,INA,RSS
0115  04336 102001        HLT 01          CCA,SSA,SLA,INA OR CCA,SSA,SLA,
0116*                                       INA,RSS FAILED
0117  04337 003436        CCA,SSA,SLA,INA,SZA
0118  04340 102001        HLT 01          CCA,SSA,SLA,INA,SZA FAILED
0119  04341 003437        CCA,SSA,SLA,INA,SZA,RSS
0120  04342 102001        HLT 01          CCA,SSA,SLA,INA,SZA,RSS
0121  04343 003470        CCA,SEZ,SSA,SLA
0122  04344 003471        CCA,SEZ,SSA,SLA,RSS
0123  04345 102001        HLT 01          CCA,SEZ,SSA,SLA,RSS OR CCA,SEZ,
0124*                                       SSA,SLA FAILED
0125  04346 003472        CCA,SEZ,SSA,SLA,SZA
0126  04347 003473        CCA,SEZ,SSA,SLA,SZA,RSS
0127  04350 102001        HLT 01          CCA,SEZ,SSA,SLA,SZA OR CCA,SEZ,
0128*                                     SSA,SLA,SZA,RSS
0129  04351 003474        CCA,SEZ,SSA,SLA,INA
0130  04352 003475        CCA,SEZ,SSA,SLA,INA,RSS
0131  04353 102001        HLT 01    CCA,SEZ,SSA,SLA,INA OR CCA,SEZ,SSA,
0132*                                       SLA,INA,RSS FAILED
0133  04354 003476        CCA,SEZ,SSA,SLA,INA,SZA
0134  04355 102001        HLT 01          CCA,SEZ,SSA,SLA,INA,SZA FAILED
0135  04356 003477        CCA,SEZ,SSA,SLA,INA,SZA,RSS
0136  04357 102001        HLT 01          CCA,SEZ,SSA,SLA,INA,SZA,RSS
0137*                                       FAILED
0138  04360 002041        SEZ,RSS
0139  04361 102001        HLT 01          E NOT=1
0140  04362 003530        CCA,CLE,SSA,SLA
0141  04363 003531        CCA,CLE,SSA,SLA,RSS
0142  04364 102001        HLT 01          CCA,CLE,SSA,SLA OR CCA,CLE,SSA,
0143*                                       SLA,RSS FAILED
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0144  04365 003532        CCA,CLE,SSA,SLA,SZA
0145  04366 003533        CCA,CLE,SSA,SLA,SZA,RSS
0146  04367 102001        HLT 01          CCA,CLE,SSA,SLA,SZA OR CCA,CLE,
0147*                                       SSA,SLA,SZA,RSS FAILED
0148  04370 003534        CCA,CLE,SSA,SLA,INA
0149  04371 003535        CCA,CLE,SSA,SLA,INA,RSS
0150  04372 102001        HLT 01          CCA,CLE,SSA,SLA,INA OR CCA,CLE,
0151*                                     SSA,SLA,INA,RSS FAILED
0152  04373 003536        CCA,CLE,SSA,SLA,INA,SZA E=1
0153  04374 102001        HLT 01          CCA,CLE,SSA,SLA,INA SZA FAILED
0154  04375 003537        CCA,CLE,SSA,SLA,INA,SZA,RSS     E=1
0155  04376 102001        HLT 01          CLA,CLE,SSA,SLA,INA,SZA,RSS
0156*                                       FAILED
0157  04377 002041        SEZ,RSS
0158  04400 102001        HLT 01      E NOT=1
0159  04401 003630        CCA,CME,SSA,SLA         E=0
0160  04402 003631        CCA,CME,SSA,SLA,RSS     E=1
0161  04403 102001        HLT 01          FAILURE:  CCA,CME,SSA,SLA IF
0162*                                         E=0; CCA,CME,SSA,SLA,RSS IF
0163*                                         E=1
0164  04404 003632        CCA,CME,SSA,SLA,SZA     E=0
0165  04405 003633        CCA,CME,SSA,SLA,SZA,RSS E=1
0166  04406 102001        HLT 01          FAILURE:  CCA,CME,SSA,SLA,SZA IF
0167*                                         E=0; CCA,CME,SSA,SLA,SZA,RSS IF E=1
0168  04407 003634        CCA,CME,SSA,SLA,INA     E=1
0169  04410 003635        CCA,CME,SSA,SLA,INA,RSS E=1
0170  04411 102001        HLT 01          CCA,CME,SSA,SLA,INA OR CCA,CME,
0171*                                       SSA,SLA,INA,RSS FAILED
0172  04412 003636        CCA,CME,SSA,SLA,INA,SZA E=1
0173  04413 102001        HLT 01          CCA,CME,SSA,SLA,INA,SZA FAILED
0174  04414 003637        CCA,CME,SSA,SLA,INA,SZA,RSS     E=1
0175  04415 102001        HLT 01          CCA,CME,SSA,SLA,INA,SZA,RSS
0176*                                       FAILED
0177  04416 002041        SEZ,RSS
0178  04417 102001        HLT 01          E NOT=1
0179  04420 003730        CCA,CCE,SSA,SLA         E=1
0180  04421 003731        CCA,CCE,SSA,SLA,RSS
0181  04422 102001        HLT 01    CCA,CLE,SSA,SLA OR CCA,CCE,SSA,SLA,
0182*                                       RSS FAILED
0183  04423 003732        CCA,CCE,SSA,SLA,SZA
0184  04424 003733        CCA,CCE,SSA,SLA,SZA,RSS
0185  04425 102001        HLT 01          CCA,CCE,SSA,SLA,SZA OR CCA,CLE,
0186*                                       SSA,SLA,SZA,RSS FAILED
0187  04426 003734        CCA,CCE,SSA,SLA,INA
0188  04427 003735        CCA,CCE,SSA,SLA,INA,RSS
0189  04430 102001        HLT 01          CCA,CCE,SSA,SLA,INA OR CCA,CLE,
0190*                                       SSA,SLA,INA,RSS FAILED
0191  04431 003736        CCA,CCE,SSA,SLA,INA,SZA
0192  04432 102001        HLT 01          CCA,CLE,SSA,SLA,INA,SZA FAILED
0193  04433 003737        CCA,CCE,SSA,SLA,INA,SZA,RSS     E=1
0194  04434 102001        HLT 01          CCA,CCE,SSA,SLA,INA,SZA,RSS
0195*                                       FAILED
0196  04435 002040        SEZ
0197  04436 002041        SEZ,RSS
0198  04437 102001        HLT 01          E NOT=1
0199  04440 102501        LIA 01          LOAD SW. REG WITH A=077777
0200  04441 002004        INA             A=100000
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0201  04442 102401        MIA 01          MERGE SW. REG. INTO A=177777
0202  04443 002004        INA             E=1, A=000000
0203  04444 002141        SEZ,CLE,RSS     E=0, A=000000
0204  04445 102001        HLT 01          SEZ,CLE,RSS FAILED
0205  04446 002140        SEZ,CLE         E=0, A=000000
0206  04447 102001        HLT 01          SEZ,CLE FAILED
0207  04450 002143        SEZ,CLE,SZA,RSS         E=0, A=000000
0208  04451 002142        SEZ,CLE,SZA             E=0, A=000000
0209  04452 102001        HLT 01          SE,CLE,SZA,RSS OR SEZ,CLE,SZA
0210*                                       FAILED
0211  04453 002145        SEZ,CLF,INA,RSS         E=0, A=000001
0212  04454 002144        SEZ,CLE,INA             E=0, A=000002
0213  04455 102001        HLT 01          FAILURE:  SEZ,CLE,INA,RSS IF
0214*                                       A=000001; SEZ,CLE,INA IF
0215*                                       A=000002
0216  04456 002146        SEZ,CLF,INA,SZA         E=0, A=000003
0217  04457 102001        HLT 01          SEZ,CLE,INA,SZA FAILED
0218  04460 002147        SEZ,CLF,INA,SZA,RSS     E=0, A=000004
0219  04461 102001        HLT 01          SEZ,CLF,INA,SZA,RSS FAILED
0220  04462 002150        SEZ,CLE,SLA     E=0, A=000004
0221  04463 102001        HLT 01          SEZ,CLE,SLA FAILED
0222  04464 002154        SEZ,CLF,SLA,INA         E=0, A=000005
0223  04465 102001        HLT 01          SEZ,CLF,SLA,INA FAILED
0224  04466 002152        SEZ,CLF,SLA,SZA         E=0, A=000005
0225  04467 102001        HLT 01          SEZ,CLF,SLA,SZA FAILED
0226  04470 002153        SEZ,CLE,SLA,SZA,RSS     E=0, A=000005
0227  04471 102001        HLT 01          SEZ,CLF,SLA,SZA,RSS FAILED
0228  04472 002151        SEZ,CLF,SLA,RSS         E=0, A=000005
0229  04473 102001        HLT 01          SEZ,CLE,SLA,RSS FAILED
0230  04474 002155        SEZ,CLF,SLA,INA,RSS     E=0, A=000006
0231  04475 102001        HLT 01          SEZ,CLE,SLA,INA,RSS FAILED
0232  04476 002156        SEZ,CLE,SLA,INA,SZA     E=0, A=000007
0233  04477 102001        HLT 01          SEZ,CLF,SLA,INA,SZA FAILED
0234  04500 002157        SEZ,CLE,SLA,INA,SZA,RSS E=0, A=000010
0235  04501 102001        HLT 01          SEZ,CLF,SLA,INA,SZA,RSS FAILED
0236  04502 002160        SEZ,CLF,SSA     E=0, A=000011
0237  04503 102001        HLT 01          SEZ,CLE,SSA FAILED
0238  04504 002161        SEZ,CLF,SSA,RSS         E=0, A=000010
0239  04505 002162        SEZ,CLF,SSA,SZA         E=0, A=000010
0240  04506 102001        HLT 01          SEZ,CLE,SSA,RSS OR SEZ,CLE,SSA,
0241*                                       SZA FAILED
0242  04507 002163        SEZ,CLE,SSA,SZA,RSS     E=0, A=000010
0243  04510 102001        HLT 01          SEZ,CLE,SSA,SZA,RSS FAILED
0244  04511 002164        SEZ,CLF,SSA,INA         E=0, A=000011
0245  04512 102001        HLT 01          SEZ,CLF,SSA,INA, FAILED
0246  04513 002165        SEZ,CLE,SSA,INA,RSS     E=0, A=000012
0247  04514 002166        SEZ,CLF,SSA,INA,SZA     E=0, A=000013
0248  04515 102001        HLT 01          FAILURE:  SEZ,CLE,SSA,INA,RSS IF
0249*                                       A=000012; SEZ,CLE,SSA,INA,SZA
0250*                                       IF A=000013
0251  04516 002167        SEZ,CLF,SSA,INA,SZA,RSS E=0, A=000014
0252  04517 102001        HLT 01          SEZ,CLF,SSA,INA,SZA,RSS FAILED
0253  04520 002170        SEZ,CLF,SSA,SLA         E=0, A=000014
0254  04521 102001        HLT 01          SEZ,CLF,SSA,SLA FAILED
0255  04522 002171        SEZ,CLE,SSA,SLA,RSS     E=0, A=000014
0256  04523 002172        SEZ,CLE,SSA,SLA,SZA     E=0, A=000014
0257  04524 102001        HLT 01          SEZ,CLE,SSA,SLA,RSS OR SEZ,CLE,
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PAGE 0031 #06                                   HP 20400AL

0258*                                         SSA,SLA,SZA FAILED
0259  04525 002173        SEZ,CLF,SSA,SLA,SZA,RSS E=0, A=000014
0260  04526 102001        HLT 01          SEZ,CLF,SSA,SLA,SZA,RSS FAILED
0261  04527 002174        SEZ,CLF,SSA,SLA,INA     E=0, A=000015
0262  04530 102001        HLT 01          SEZ,CLF,SSA,SLA,INA FAILED
0263  04531 002175        SEZ,CLF,SSA,SLA,INA,RSS E=0, A=000016
0264  04532 002176        SEZ,CLF,SSA,SLA,INA,SZA E=0, A=000017
0265  04533 102001        HLT 01          FAILURE:  SEZ,CLE,SSA,SLA,INA,
0266*                                         RSS IF A=000016; SEZ,CLE,SSA,
0267*                                         SLA,INA,SZA IF A=000017
0268  04534 002177        SEZ,CLE,SSA,SLA,INA,SZA,RSS     E=0, A=000002
0269  04535 102001        HLT 01          SEZ,CLF,SSA,SLA,INA,SZA,RSS
0270*                                       FAILED
0271  04536 102501        LIA 01          LOAD SW. REG. INTO A=077777
0272  04537 002004        INA             A=100000
0273  04540 102401        MIA 01          MERGE SW. REG. INTO A=177777
0274  04541 002004        INA             E=1, A=000000
0275  04542 002241        SEZ,CME,RSS     E=0, A=000000
0276  04543 102001        HLT 01          SEZ,CME,RSS FAILED
0277  04544 002240        SEZ,CME         E=1, A=000000
0278  04545 102001        HLT 01          SEZ,CME FAILED
0279  04546 002242        SEZ,CME,SZA     E=0, A=000000
0280  04547 102001        HLT 01          SEZ,CME,SZA FAILED
0281  04550 002243        SEZ,CME,SZA,RSS         E=1, A=000000
0282  04551 002245        SEZ,CME,INA,RSS         E=0, A=000001
0283  04552 102001        HLT 01          FAILURE:  SEZ,CME,SZA,RSS IF
0284*                                         A=000000, SEZ,CME,INA,RSS IF
0285*                                         A=000001
0286  04553 002244        SEZ,CME,INA     E=1, A=000002
0287  04554 102001        HLT 01          SEZ,CME,INA FAILED
0288  04555 002246        SEZ,CME,INA,SZA         E=0, A=000003
0289  04556 002247        SEZ,CME,INA,SZA,RSS     E=1, A=000004
0290  04557 102001        HLT 01          FAILURE:  SEZ,CME,INA,SZA IF
0291*                                         A=000003; SEZ,CME,INA,SZA,RSS
0292*                                         IF A=000004
0293  04560 002250        SEZ,CME,SLA     E=0, A=000004
0294  04561 102001        HLT 01      SEZ,CME,SLA FAILED
0295  04562 002251        SEZ,CME,SLA,RSS         E=1, A=000004
0296  04563 002252        SEZ,CME,SLA,SZA     E=0,A=000004
0297  04564 102001        HLT 01          FAILURE:  SEZ,CME,SLA,RSS IF
0298*                                         E=1, SEZ,CME,SLA,SZA, IF E=0
0299  04565 002253        SEZ,CME,SLA,SZA,RSS     E=1, A=000004
0300  04566 102001        HLT 01          SEZ,CME,SLA,SZA,RSS FAILED
0301  04567 002254        SEZ,CME,SLA,INA         E=0, A=000005
0302  04570 102001        HLT 01          SEZ,CME,SLA,INA FAILED
0303  04571 002255        SEZ,CME,SLA,INA,RSS     E=1, A=000006
0304  04572 102001        HLT 01          SEZ,CME,SLA,INA,RSS FAILED
0305  04573 002256        SEZ,CME,SLA,INA,SZA     E=0, A=000007
0306  04574 102001        HLT 01          SEZ,CME,SLA,INA,SZA FAILED
0307  04575 002257        SEZ,CME,SLA,INA,SZA,RSS E=1, A=000010
0308  04576 102001        HLT 01          SEZ,CME,SLA,INA,SZA,RSS FAILED
0309  04577 002261        SEZ,CME,SSA,RSS         E=0, A=000010
0310  04600 102001        HLT 01          SEZ,CME,SSA,RSS FAILED
0311  04601 002260        SEZ,CME,SSA     E=1, A=000010
0312  04602 102001        HLT 01          SEZ,CME,SSA FAILED
0313  04603 002263        SEZ,CME,SSA,SZA,RSS     E=0, A=000010
0314  04604 102001        HLT 01          SEZ,CME,SSA,SZA,RSS FAILED
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0315  04577 002262        SEZ,CME,SSA,SZA          E=1, A=000010
0316  04600 102001        HLT 01          SEZ,CME,SSA,SZA FAILED
0317  04601 002264        SEZ,CME,SSA,INA          E=0, A=000011
0318  04602 102001        HLT 01          SEZ,CME,SSA,INA FAILED
0319  04603 002265        SEZ,CME,SSA,INA,RSS      E=1, A=000012
0320  04604 002266        SEZ,CME,SSA,INA,SZA      E=0, A=000013
0321  04605 102001        HLT 01          FAILURE: SEZ,CME,SSA,INA,RSS IF
0322*                                       A=000012; SEZ,CME,SSA,INA,SZA
0323*                                       IF A=000013
0324  04606 002267        SEZ,CME,SSA,INA,SZA,RSS E=1, A=000014
0325  04607 102001        HLT 01          SEZ,CME,SSA,INA,SZA,RSS FAILED
0326  04610 002270        SEZ,CME,SSA,SLA          E=0, A=000014
0327  04611 102001        HLT 01          SEZ,CME,SSA,SLA FAILED
0328  04612 002271        SEZ,CME,SSA,SLA,RSS      E=1, A=000014
0329  04613 002272        SEZ,CME,SSA,SLA,SZA      E=0, A=000014
0330  04614 102001        HLT 01          FAILURE: SEZ,CME,SSA,SLA,RSS IF
0331*                                       E=1; SEZ,CME,SSA,SLA,SZA IF
0332*                                       E=0
0333  04615 002273        SEZ,CME,SSA,SLA,SZA,RSS E=1, A=000014
0334  04616 102001        HLT 01          SEZ,CME,SSA,SLA,SZA,RSS FAILED
0335  04617 002274        SEZ,CME,SSA,SLA,INA      E=0, A=000015
0336  04620 102001        HLT 01          SEZ,CME,SSA,SLA,INA FAILED
0337  04621 002275        SEZ,CME,SSA,SLA,INA,RSS E=1, A=000016
0338  04622 002276        SEZ,CME,SSA,SLA,INA,SZA E=0, A=000017
0339  04623 102001        HLT 01          FAILURE: SEZ,CME,SSA,SLA,INA
0340*                                       RSS IF A=000016; SEZ,CME,SSA,
0341  04624 002277        SEZ,CME,SSA,SLA,INA,SZA,RSS      F=1,
0342*                                       A=000020
0343  04625 102001        HLT 01          SEZ,CME,SSA,SLA,INA,SZA,RSS
0344*                                       FAILED
0345  04626 102501        LIA 01          LOAD SW. REG. INTO A=077777
0346  04627 002004        INA             A=100000
0347  04630 102401        MIA 01          MERGE SW. REG. INTO A=177777
0348  04631 002004        INA             E=1, A=000000
0349  04632 002340        SEZ,CCE         E=1, A=000000
0350  04633 002341        SEZ,CCF,RSS     E=1, A=000000
0351  04634 102001        HLT 01          SEZ,CCF OR SEZ,CCE,RSS FAILED
0352  04635 002342        SEZ,CCE,SZA     E=1, A=000000
0353  04636 102001        HLT 01          SEZ,CCF,SZA FAILED
0354  04637 002343        SEZ,CCF,SZA,RSS          E=1, A=000000
0355  04640 102001        HLT 01          SEZ,CCF,SZA,RSS FAILED
0356  04641 002344        SEZ,CCF,INA      E=1, A=000001
0357  04642 002345        SEZ,CCE,INA,RSS          E=1, A=000002
0358  04643 102001        HLT 01          FAILURE: SEZ,CCE,INA IF
0359*                                       A=000001; SEZ,CCE,INA,RSS IF
0360*                                       A=000002
0361  04644 002346        SEZ,CCF,INA,SZA          E=1, A=000003
0362  04645 002347        SEZ,CCF,INA,SZA,RSS      E=1, A=000004
0363  04646 102001        HLT 01          FAILURE: SEZ,CCE,INA,SZA IF
0364*                                       A=000003; SEZ,CCE,INA,SZA,RSS
0365*                                       IF A=000004
0366  04647 002350        SEZ,CCE,SLA      E=1, A=000004
0367  04650 102001        HLT 01          SEZ,CCF,SLA FAILED
0368  04651 002351        SEZ,CCE,SLA,RSS          E=1, A=000004
0369  04652 102001        HLT 01          SEZ,CCE,SLA,RSS FAILED
0370  04653 002352        SEZ,CCE,SLA,SZA          E=1, A=000004
0371  04654 102001        HLT 01          SEZ,CCF,SLA,SZA FAILED
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0372  04655 002353        SEZ,CCE,SLA,SZA,RSS      E=1, A=000004
0373  04656 102001        HLT 01          SEZ,CCE,SLA,SZA,RSS FAILED
0374  04657 002354        SEZ,CCF,SLA,INA          E=1, A=000005
0375  04660 102001        HLT 01          SEZ,CCF,SLA,INA FAILED
0376  04661 002355        SEZ,CCE,SLA,INA,RSS      E=1, A=000006
0377  04662 102001        HLT 01          SEZ,CCF,SLA,INA,RSS FAILED
0378  04663 002356        SEZ,CCE,SLA,INA,SZA      E=1, A=000007
0379  04664 102001        HLT 01          SEZ,CCF,SLA,INA,SZA FAILED
0380  04665 002357        SEZ,CCE,SLA,INA,SZA,RSS E=1, A=000010
0381  04666 102001        HLT 01          SEZ,CCE,SLA,INA,SZA,RSS
0382  04667 002360        SEZ,CCE,SSA      E=1, A=000010
0383  04670 102001        HLT 01          SEZ,CCE,SSA,FAILED
0384  04671 002361        SEZ,CCE,SSA,RSS          E=1, A=000010
0385  04672 102001        HLT 01          SEZ,CCE,SSA,RSS FAILED
0386  04673 002362        SEZ,CCE,SSA,SZA          E=1, A=000010
0387  04674 102001        HLT 01          SEZ,CCF,SSA,SZA FAILED
0388  04675 002363        SEZ,CCE,SSA,SZA,RSS      E=1,A=000010
0389  04676 102001        HLT 01          SEZ,CCF,SSA,SZA,RSS FAILED
0390  04677 002364        SEZ,CCF,SSA,INA          E=1, A=000011
0391  04700 102001        HLT 01          SEZ,CCE,SSA,INA FAILED
0392  04701 002365        SEZ,CCE,SSA,INA,RSS      E=1, A=000012
0393  04702 102001        HLT 01          SEZ,CCF,SSA,INA,RSS FAILED
0394  04703 002366        SEZ,CCE,SSA,INA,SZA      E=1, A=000013
0395  04704 102001        HLT 01          SEZ,CCF,SSA,INA,SZA FAILED
0396  04705 002367        SEZ,CCE,SSA,INA,SZA,RSS E=1, A=000014
0397  04706 102001        HLT 01          SEZ,CCF,SSA,INA,SZA,RSS FAILED
0398  04707 002370        SEZ,CCE,SSA,SLA          E=1, A=000014
0399  04710 102001        HLT 01          SEZ,CCF,SSA,SLA FAILED
0400  04711 002371        SEZ,CCE,SSA,SLA,RSS      E=1, A=000014
0401  04712 102001        HLT 01          SEZ,CCE,SSA,SLA,RSS FAILED
0402  04713 002372        SEZ,CCE,SSA,SLA,SZA      E=1, A=000014
0403  04714 102001        HLT 01          SEZ,CCE,SSA,SLA,SZA FAILED
0404  04715 002373        SEZ,CCF,SSA,SLA,SZA,RSS E=1, A=000014
0405  04716 102001        HLT 01          SEZ,CCE,SSA,SLA,SZA,RSS FAILED
0406  04717 002374        SEZ,CCE,SSA,SLA,INA      E=1, A=000015
0407  04720 102001        HLT 01          SEZ,CCE,SSA,SLA,INA FAILED
0408  04721 002375        SEZ,CCE,SSA,SLA,INA,RSS E=1, A=000016
0409  04722 102001        HLT 01          SEZ,CCE,SSA,SLA,INA,RSS FAILED
0410  04723 002376        SEZ,CCE,SSA,SLA,INA,SZA E=1, A=000017
0411  04724 102001        HLT 01          SEZ,CCE,SSA,SLA,INA,SZA FAILED
0412  04725 002377        SEZ,CCE,SSA,SLA,INA,SZA,RSS E=1, A=000020
0413  04726 102001        HLT 01          SEZ,CCF,SSA,SLA,INA,SZA,RSS
0414*                                       FAILED
0415  04727 102501        LIA 01          LOAD SW. REG. INTO A=077777
0416  04730 002004        INA             A=100000
0417  04731 102401        MIA 01          MERGE SW. REG. INTO A=177777
0418  04732 002004        INA             E=1, A=000000
0419  04733 002541        CLA,SEZ,CLE,RSS          E=0, A=000000
0420  04734 102001        HLT 01          CLA,SEZ,CLE,RSS FAILED
0421  04735 002540        CLA,SEZ,CLE      E=0, A=000000
0422  04736 102001        HLT 01          CLA,SEZ,CLE FAILED
0423  04737 002542        CLA,SEZ,CLE,SZA          E=0, A=000000
0424  04740 102001        HLT 01          CLA,SEZ,CLE,SZA
0425  04741 002543        CLA,SEZ,CLE,SZA,RSS      E=0, A=000000
0426  04742 002544        CLA,SEZ,CLE,INA          E=0, A=000001
0427  04743 102001        HLT 01          CLA,SEZ,CLE,SZA,RSS FAILED IF
0428*                                       A=000000 OR CLA,SEZ,CLE,INA
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0429*                                       FAILED IF A=000001
0001  04744 002145        SEZ,CLE,INA,RSS          E=0,A=000001
0002  04745 002546        CLA,SEZ,CLE,INA,SZA      E=0, A=000001
0003  04746 102001        HLT 01          CLA,SEZ,CLE,INA,RSS OR CLA,SEZ,
0004*                                       CLE,INA,SZA FAILED
0005  04747 002547        CLA,SEZ,CLE,INA,SZA,RSS E=0, A=000001
0006  04750 102001        HLT 01          CLA,SEZ,CLE,INA,SZA,RSS FAILED
0007  04751 002550        CLA,SEZ,CLF,SLA          E=0, A=000000
0008  04752 102001        HLT 01          CLA,SEZ,CLE,SLA FAILED
0009  04753 002551        CLA,SEZ,CLF,SLA,RSS      E=0, A=000000
0010  04754 002552        CLA,SEZ,CLF,SLA,SZA      E=0, A=000000
0011  04755 102001        HLT 01          CLA,SEZ,CLE,SLA,RSS OR CLA,SEZ,
0012*                                       CLF,SLA,SZA FAILED
0013  04756 002553        CLA,SEZ,CLE,SLA,SZA,RSS E=0, A=000000
0014  04757 002554        CLA,SEZ,CLF,SLA,INA      E =0, A=000000
0015  04760 102001        HLT 01          CLA,SEZ,CLE,SLA,SZA,RSS OR CLA,
0016*                                    SEZ,CLE,SLA,INA FAILED
0017  04761 002555        CLA,SEZ,CLE,SLA,INA,RSS E=0, A=000001
0018  04762 002556        CLA,SEZ,CLF,SLA,INA,SZA E=0, A=000001
0019  04763 102001        HLT 01          CLA,SEZ,CLE,SLA,INA,RSS OR CLA,
0020*                                       SEZ,CLE,SLA,INA,SZA FAILED
0021  04764 002557        CLA,SEZ,CLE,SLA,INA,SZA,RSS  E=0, A=000001
0022  04765 102001        HLT 01          CLA,SEZ,CLE,SLA,INA,SZA,RSS
0023*                                       FAILED
0024  04766 002560        CLA,SEZ,CLF,SSA          E=0, A=000000
0025  04767 102001        HLT 01          CLA,SEZ,CLE,SSA FAILED
0026  04770 002561        CLA,SEZ,CLE,SSA,RSS      E=0, A=000000
0027  04771 002562        CLA,SEZ,CLE,SSA,SZA      E=0, A=000000
0028  04772 102001        HLT 01          CLA,SEZ,CLE,SSA,RSS OR CLA,SEZ,
0029*                                       CLE,SSA,SZA FAILED
0030  04773 002563        CLA,SEZ,CLE,SSA,SZA,RSS E=0, A=000000
0031  04774 002564        CLA,SEZ,CLE,SSA,INA      E=0, A=000001
0032  04775 102001        HLT 01          FAILURE: CLA,SEZ,CLE,SSA,SZA,
0033*                                       RSS IF A=000000; CLA,SEZ,
0034*                                       CLE,SSA,INA IF A=000001
0035  04776 002565        CLA,SEZ,CLE,SSA,INA,RSS E=0, A=000001
0036  04777 002566        CLA,SEZ,CLE,SSA,INA,SZA E=0, A=000001
0037  05000 102001        HLT 01          CLA,SEZ,CLE,SSA,INA,RSS OR CLA,
0038*                                       SEZ,CLE,SSA,INA,SZA FAILED
0039  05001 002567        CLA,SEZ,CLE,SSA,INA,SZA,RSS      E=0, A=000000
0040  05002 102001        HLT 01          CLA,SEZ,CLE,SSA,INA,SZA,RSS
0041*                                       FAILED
0042  05003 002570        CLA,SEZ,CLE,SSA,SLA      E=0, A=000000
0043  05004 102001        HLT 01          CLA,SEZ,CLE,SSA,SLA, FAILED
0044  05005 002571        CLA,SEZ,CLE,SSA,SLA,RSS E=0, A=000000
0045  05006 002572        CLA,SEZ,CLE,SSA,SLA,SZA      E=0,A=000000
0046  05007 102001        HLT 01          CLA,SEZ,CLE,SSA,SLA,RSS OR
0047*                                       CLA,SEZ,CLE,SSA,SLA,SZA,RSS
0048*                                       FAILED
0049  05010 002573        CLA,SEZ,CLE,SSA,SLA,SZA,RSS  E=0, A=000000
0050  05011 002574        CLA,SEZ,CLE,SSA,SLA,INA      E=0, A=000001
0051  05012 102001        HLT 01          FAILURE: CLA,SEZ,CLE,SSA,SLA,
0052*                                       SZA,RSS IF A=000000; CLA,SEZ,
0053*                                       CLE,SSA,SLA,INA IF A =000001
0054  05013 002575        CLA,SEZ,CLF,SSA,SLA,INA,RSS  E=0, A=000001
0055  05014 002576        CLA,SEZ,CLF,SSA,SLA,INA,SZA  E=0, A=000001
0056  05015 102001        HLT 01          CLA,SEZ,CLE,SSA,SLA,INA,RSS OR
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0057*                                       CLA,SEZ,CLE,SSA,SLA,INA,SZA
0058*                                       FAILED
0059  05016 002577        CLA,SEZ,CLE,SSA,SLA,INA,SZA,RSS   E=0
0060*                                       A=000001
0061  05017 102001        HLT 01          CLA,SEZ,CLE,SSA,SLA,INA,SZA,RSS
0062*                                       FAILED
0063  05020 102501        LIA 01          LOAD SW. REG. INTO A=077777
0064  05021 002004        INA             A=100000
0065  05022 102401        MIA 01          MERGE SW. REG. INTO A=177777
0066  05023 002004        INA             E=1, A=000000
0067  05024 002641        CLA,SEZ,CME,RSS          E=0, A=000000
0068  05025 102001        HLT 01          CLA,SEZ,CME,RSS FAILED
0069  05026 002640        CLA,SEZ,CME      E=1, A=000000
0070  05027 102001        HLT 01          CLA,SEZ,CME FAILED
0071  05030 002642        CLA,SEZ,CME,SZA          E=0, A=000000
0072  05031 102001        HLT 01          CLA,SEZ,CME,SZA FAILED
0073  05032 002643        CLA,SEZ,CMF,SZA,RSS      E=1, A=000000
0074  05033 002645        CLA,SEZ,CME,INA,RSS      E=0,A=000001
0075  05034 102001        HLT 01          FAILURE: CLA,SEZ,CME,SZA,RSS IF
0076*                                       A=000000; CLA,SEZ,CME,INA,RSS
0077*                                       IF A=000001
0078  05035 002644        CLA,SEZ,CME,INA          E=1, A=000000
0079  05036 102001        HLT 01          CLA,SEZ,CME,INA FAILED
0080  05037 002646        CLA,SEZ,CMF,INA,SZA      E=0, A=000001
0081  05040 002647        CLA,SEZ,CMF,INA,SZA,RSS      E=1,A=000001
0082  05041 102001        HLT 01          FAILURE: CLA,SEZ,CME,INA,SZA IF
0083*                                       E=0; CLA,SEZ,CME,SZA,RSS IF
0084*                                       E=1
0085  05042 002650        CLA,SEZ,CME,SLA          E=0, A=000000
0086  05043 102001        HLT 01          CLA,SEZ,CME,SLA FAILED
0087  05044 002651        CLA,SEZ,CME,SLA,RSS      E=1, A=000000
0088  05045 002652        CLA,SEZ,CMF,SLA,SZA      E=0, A=000000
0089  05046 102001        HLT 01          FAILURE: CLA,SEZ,CME,SLA,RSS IF
0090*                                       E=1; CLA,SEZ,CME,SLA,SZA IF
0091*                                       E=0
0092  05047 002653        CLA,SEZ,CME,SLA,SZA,RSS E=1, A=000000
0093  05050 002654        CLA,SEZ,CME,SLA,INA      E=0, A=000001
0094  05051 102001        HLT 01          FAILURE: CLA,SEZ,CME,SLA,SZA,
0095*                                       RSS IF E=1; CLA,SEZ,CME,SLA,
0096*                                       INA IF E=0
0097  05052 002655        CLA,SEZ,CME,SLA,INA,RSS E=1, A=000001
0098  05053 002656        CLA,SEZ,CME,SLA,INA,SZA E=0, A=000001
0099  05054 102001        HLT 01          FAILURE: CLA,SEZ,CME,SLA,INA,
0100*                                       RSS IF E=1; CLA,SEZ,CME,SLA,
0101*                                       INA,SZA IF E=0
0102  05055 002657        CLA,SEZ,CMF,SLA,INA,SZA,RSS      E=1
0103*                                       A=000001
0104  05056 102001        HLT 01          CLA,SEZ,CME,SLA,INA,SZA,RSS
0105*                                       FAILED
0106  05057 002660        CLA,SEZ,CME,SSA          E=0, A=000000
0107  05060 102001        HLT 01          CLA,SEZ,CME,SSA FAILED
0108  05061 002661        CLA,SEZ,CME,SSA,RSS      E=1, A=000000
0109  05062 002662        CLA,SEZ,CME,SSA,SZA      E=0, A=000000
0110  05063 102001        HLT 01          FAILURE: CLA,SEZ,CMF,SSA,RSS IF
0111*                                       E=1; CLA,SEZ,CME,SSA,SZA IF
0112*                                       E=0
0113  05064 002663        CLA,SEZ,CME,SSA,SZA,RSS E=1, A=000000
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0114  05065 002665        CLA,SEZ,CME,SSA,INA,RSS E=0, A=000001
0115  05066 102001        HLT 01          FAILURE: CLA,SEZ,CMF,SSA,SZA,
0116*                                       RSS IF E=1; CLA,SEZ,CME,SSA,
0117*                                       INA,RSS IF E=0
0118  05067 002664        CLA,SEZ,CME,SSA,INA     E=1, A=000001
0119  05070 102001        HLT 01          CLA,SEZ,CME,SSA,INA FAILED
0120  05071 002666        CLA,SEZ,CME,SSA,INA,SZA E=0, A=000001
0121  05072 102001        HLT 01          CLA,SEZ,CME,SSA,INA,SZA FAILED
0122  05073 002667        CLA,SEZ,CME,SSA,INA,SZA,RSS  E=1, A=000001
0123  05074 102001        HLT 01          CLA,SEZ,CME,SSA,INA,SZA,RSS
0124*                                       FAILED
0125  05075 002670        CLA,SEZ,CME,SSA,SLA     E=0, A=000000
0126  05076 102001        HLT 01          CLA,SEZ,CME,SSA,SLA
0127  05077 002671        CLA,SEZ,CMF,SSA,SLA,RSS E=1, A=000000
0128  05100 002672        CLA,SEZ,CME,SSA,SLA,SZA E=0, A=000000
0129  05101 102001        HLT 01          FAILURE: CLA,SEZ,CME,SSA,SLA,
0130*                                       RSS, IF E=1; CLA,SEZ,CME,
0131*                                       SSA,SLA,SZA IF E=0
0132  05102 002673        CLA,SEZ,CME,SSA,SLA,SZA,RSS     E=1,
0133*                                       A=000000
0134  05103 002674        CLA,SEZ,CME,SSA,SLA,INA E=0, A=000001
0135  05104 102001        HLT 01          FAILURE: CLA,SEZ,CME,SSA,SLA,
0136*                                       SZA,RSS IF E=1; CLA,SEZ,CME,
0137*                                       SSA,SLA,INA IF E=0
0138  05105 002675        CLA,SEZ,CME,SSA,SLA,INA,RSS     E=1,
0139*                                       A=000001
0140  05106 002676        CLA,SEZ,CME,SSA,SLA,INA,SZA     E=0,
0141*                                       A=000001
0142  05107 102001        HLT 01          FAILURE: CLA,SEZ,CMF,SSA,SLA,
0143*                                       INA,RSS IF E=1; CLA,SEZ,CME,
0144*                                       SSA,SLA,INA,SZA IF E=0
0145  05110 002677        CLA,SEZ,CME,SSA,SLA,INA,SZA,RSS   E=1
0146*                                       A=000001
0147  05111 102001        HLT 01          CLA,SEZ,CME,SSA,SLA,INA,SZA,RSS
0148*                                       FAILED
0149  05112 102501        LIA 01          LOAD SW. REG. INTO A=077777
0150  05113 002004        INA             A=100000
0151  05114 102401        MIA 01          MERGE SW. REG. INTO A=177777
0152  05115 002004        INA             E=1, A=000000
0153  05116 002740        CLA,SEZ,CCE     E=1, A=000000
0154  05117 002741        CLA,SEZ,CCE,RSS         E=1, A=000000
0155  05120 102001        HLT 01          CLA,SEZ,CCE OR CLA,SEZ,CCE,RSS
0156*                                       FAILED
0157  05121 002742        CLA,SEZ,CCE,SZA         E=1, A=000000
0158  05122 102001        HLT 01          CLA,SEZ,CCE,SZA FAILED
0159  05123 002743        CLA,SEZ,CCE,SZA,RSS     E=1, A=000000
0160  05124 102001        HLT 01          CLA,SEZ,CCE,SZA,RSS FAILED
0161  05125 002744        CLA,SEZ,CCE,INA         E=1, A=000001
0162  05126 002745        CLA,SEZ,CCE,INA,RSS     E=1, A=000001
0163  05127 102001        HLT 01          CLA,SEZ,CCE,INA, OR CLA,SEZ,CCE,
0164*                                       INA,RSS FAILED
0165  05130 002746        CLA,SEZ,CCE,INA,SZA     E=1, A=000001
0166  05131 002747        CLA,SEZ,CCE,INA,SZA,RSS E=1, A=000001
0167  05132 102001        HLT 01          CLA,SEZ,CCE,INA,SZA OR CLA,SEZ,
0168*                                       CCE,INA,SZA,RSS FAILED
0169  05133 002750        CLA,SEZ,CCE,SLA         E=1, A=000000
0170  05134 102001        HLT 01          CLA,SEZ,CCE,SLA FAILED

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0171  05135 002751        CLA,SEZ,CCE,SLA,RSS     E=1, A=000000
0172  05136 102001        HLT 01          CLA,SEZ,CCE,SLA,RSS FAILED
0173  05137 002752        CLA,SEZ,CCE,SLA,SZA     E=1, A=000000
0174  05140 102001        HLT 01          CLA,SEZ,CCE,SLA,SZA
0175  05141 002753        CLA,SEZ,CCE,SLA,SZA,RSS E=1, A=000000
0176  05142 102001        HLT 01          CLA,SEZ,CCE,SLA,SZA,RSS FAILED
0177  05143 002754        CLA,SEZ,CCE,SLA,INA     E=1 ,A=000001
0178  05144 102001        HLT 01          CLA,SEZ,CCE,SLA,INA FAILED
0179  05145 002755        CLA,SEZ,CCE,SLA,INA,RSS E=1, A=000001
0180  05146 102001        HLT 01          CLA,SEZ,CCE,SLA,INA,RSS FAILED
0181  05147 002756        CLA,SEZ,CCE,SLA,INA,SZA E=1, A=000001
0182  05150 102001        HLT 01          CLA,SEZ,CCE,SLA,INA,SZA FAILED
0183  05151 002757        CLA,SEZ,CCF,SLA,INA,SZA,RSS     E=1,
0184*                                       A=000001
0185  05152 102001        HLT 01          CLA,SEZ,CCE,SLA,INA,SZA,RSS
0186*                                       FAILED
0187  05153 002760        CLA,SEZ,CCF,SSA         E=1, A=000000
0188  05154 102001        HLT 01          CLA,SEZ,CCE,SSA FAILED
0189  05155 002761        CLA,SEZ,CCE,SSA,RSS     E=1, A=000000
0190  05156 102001        HLT 01          CLA,SEZ,CCE,SSA,RSS FAILED
0191  05157 002762        CLA,SEZ,CCF,SSA,SZA     E=1, A=000000
0192  05160 102001        HLT 01          CLA,SEZ,CCE,SSA,SZA FAILED
0193  05161 002763        CLA,SEZ,CCE,SSA,SZA,RSS E=1, A=000000
0194  05162 102001        HLT 01          CLA,SEZ,CCE,SSA,SZA,RSS FAILED
0195  05163 002764        CLA,SEZ,CCE,SSA,INA     E=1, A=000001
0196  05164 102001        HLT 01          CLA,SEZ,CCE,SSA,INA FAILED
0197  05165 002765        CLA,SEZ,CCE,SSA,INA,RSS E=1, A=000001
0198  05166 102001        HLT 01          CLA,SEZ,CCE,SSA,INA,RSS FAILED
0199  05167 002766        CLA,SEZ,CCE,SSA,INA,SZA     E=1,A=000001
0200  05170 102001        HLT 01          CLA,SEZ,CCE,SSA,INA,SZA FAILED
0201  05171 002767        CLA,SEZ,CCE,SSA,INA,SZA,RSS     E=1,
0202*                                       A=000001
0203  05172 102001        HLT 01          CLA,SEZ,CCE,SSA,INA,SZA,RSS
0204*                                       FAILED
0205  05173 002770        CLA,SEZ,CCE,SSA,SLA     E=1, A=000000
0206  05174 102001        HLT 01          CLA,SEZ,CCE,SSA,SLA FAILED
0207  05175 002771        CLA,SEZ,CCE,SSA,SLA,RSS E=1, A=000000
0208  05176 102001        HLT 01          CLA,SEZ,CCE,SSA,SLA,RSS FAILED
0209  05177 002772        CLA,SEZ,CCE,SSA,SLA,SZA E=1, A=000000
0210  05200 102001        HLT 01          CLA,SEZ,CCE,SSA,SLA,SZA FAILED
0211  05201 002773        CLA,SEZ,CCE,SSA,SLA,SZA,RSS     E=1,
0212*                                       A=000000
0213  05202 102001        HLT 01          CLA,SEZ,CCE,SSA,SLA,SZA,RSS
0214*                                       FAILED
0215  05203 002774        CLA,SEZ,CCE,SSA,SLA,INA E=1, A=000001
0216  05204 102001        HLT 01          CLA,SEZ,CCE,SSA,SLA,INA FAILED
0217  05205 002775        CLA,SEZ,CCE,SSA,SLA,INA,RSS     E=1,
0218*                                       A=000001
0219  05206 102001        HLT 01          CLA,SEZ,CCE,SSA,SLA,INA,RSS
0220*                                       FAILED
0221  05207 002776        CLA,SEZ,CCE,SSA,SLA,INA,SZA     E=1,
0222*                                       A=000001
0223  05210 102001        HLT 01          CLA,SEZ,CCE,SSA,SLA,INA,SZA
0224*                                       FAILED
0225  05211 002777        CLA,SEZ,CCE,SSA,SLA,INA,SZA,RSS   E=1,
0226*                                       A=000001
0227  05212 102001        HLT 01          CLA,SEZ,CCE,SSA,SLA,INA,SZA,RSS

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0228*                                       FAILED
0229  05213 102501        LIA 01          LOAD SW. REG. INTO A=077777
0230  05214 002004        INA             A=100000
0231  05215 102401        MIA 01          MERGE SW. REG. INTO A=177777
0232  05216 002004        INA             E=1, A=000000
0233  05217 003140        CMA,SEZ,CLE     E=0, A=177777
0234  05220 003142        CMA,SEZ,CLE,SZA         E=0, A=000000
0235  05221 102001        HLT 01          FAILURE: CMA,SEZ,CLE IF A=177777
0236*                                       CMA,SEZ,CLE,SZA IF A=000000
0237  05222 003141        CMA,SEZ,CLE,RSS         E=0, A=177777
0238  05223 003144        CMA,SEZ,CLE,INA         E=0, A=000001
0239  05224 102001        HLT 01          FAILURE: CMA,SEZ,CLE,RSS IF
0240*                                       A=177777; CMA,SEZ,CLE,INA IF
0241*                                       A=000001
0242  05225 003143        CMA,SEZ,CLE,SZA,RSS     E=0, A=177776
0243  05226 102001        HLT 01          CMA,SEZ,CLE,SZA,RSS FAILED
0244  05227 003145        CMA,SEZ,CLE,INA,RSS     E=0, A=000002
0245  05230 003146        CMA,SEZ,CLE,INA,SZA     E=0, A=177776
0246  05231 102001        HLT 01          FAILURE: CMA,SEZ,CLE,INA,RSS IF
0247*                                       A=000002; CMA,SEZ,CLF,INA,
0248*                                       SZA IF A=177776
0249  05232 003147        CMA,SEZ,CLE,INA,SZA,RSS E=0, A=000002
0250  05233 102001        HLT 01          CMA,SEZ,CLF,INA,SZA,RSS FAILED
0251  05234 003151        CMA,SEZ,CLE,SLA,RSS     E=0, A=177775
0252  05235 102001        HLT 01          CMA,SEZ,CLF,SLA,RSS FAILED
0253  05236 003150        CMA,SEZ,CLE,SLA         E=0, A=000002
0254  05237 102001        HLT 01          CMA,SEZ,CLE,SLA FAILED
0255  05240 003152        CMA,SEZ,CLE,SLA,SZA     E=0, A=177775
0256  05241 102001        HLT 01          CMA,SEZ,CLE,SLA,SZA FAILED
0257  05242 003153        CMA,SEZ,CLE,SLA,SZA,RSS E=0, A=000002
0258  05243 102001        HLT 01          CMA,SEZ,CLE,SLA,SZA,RSS FAILED
0259  05244 003154        CMA,SEZ,CLE,SLA,INA     E=0, A=177776
0260  05245 102001        HLT 01          CMA,SEZ,CLE,SLA,INA FAILED
0261  05246 003155        CMA,SEZ,CLE,SLA,INA,RSS E=0, A=000002
0262  05247 102001        HLT 01          CMA,SEZ,CLE,SLA,INA,RSS FAILED
0263  05250 003156        CMA,SEZ,CLE,SLA,INA,SZA E=0, A=177776
0264  05251 102001        HLT 01          CMA,SEZ,CLE,SLA,INA,SZA FAILED
0265  05252 003157        CMA,SEZ,CLE,SLA,INA,SZA,RSS     E=0,
0266*                                       A=000002
0267  05253 102001        HLT 01          CMA,SEZ,CLE,SLA,INA,SZA,RSS
0268*                                       FAILED
0269  05254 003161        CMA,SEZ,CLF,SSA,RSS     E=0, A=177775
0270  05255 102001        HLT 01          CMA,SEZ,CLE,SSA,RSS FAILED
0271  05256 003160        CMA,SEZ,CLE,SSA         E=0, A=000002
0272  05257 102001        HLT 01          CMA,SEZ,CLE,SSA FAILED
0273  05260 003162        CMA,SEZ,CLE,SSA,SZA     E=0, A=177775
0274  05261 102001        HLT 01          CMA,SEZ,CLE,SSA,SZA FAILED
0275  05262 003163        CMA,SEZ,CLE,SSA,SZA,RSS E=0, A=000002
0276  05263 102001        HLT 01          CMA,SEZ,CLE,SSA,SZA,RSS FAILED
0277  05264 003164        CMA,SEZ,CLE,SSA,INA     E=0, A=177776
0278  05265 102001        HLT 01          CMA,SEZ,CLE,SSA,INA FAILED
0279  05266 003165        CMA,SEZ,CLE,SSA,INA,RSS E=0, A=000002
0280  05267 003166        CMA,SEZ,CLF,SSA,INA,SZA E=0, A=177776
0281  05270 102001        HLT 01          FAILURE: CMA,SEZ,CLE,SSA,INA,
0282*                                       RSS IF A=000002; CMA,SEZ,
0283*                                       CLE,SSA,INA,SZA IF A=177776
0284  05271 003167        CMA,SEZ,CLE,SSA,INA,SZA,RSS     E=0,

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0285*                                       A=000002
0286  05272 102001        HLT 01          CMA,SEZ,CLE,SSA,INA,SZA,RSS
0287*                                       FAILED
0288  05273 003170        CMA,SEZ,CLF,SSA,SLA     E=0, A=177775
0289  05274 102001        HLT 01          CMA,SEZ,CLE,SSA,SLA,FAILED
0290  05275 003172        CMA,SEZ,CLE,SSA,SLA,SZA E=0, A=000002
0291  05276 102001        HLT 01          CMA,SEZ,CLE,SSA,SLA,SZA FAILED
0292  05277 003171        CMA,SEZ,CLF,SSA,SLA,RSS E=0, A=177775
0293  05300 102001        HLT 01          CMA,SEZ,CLE,SSA,SLA,RSS FAILED
0294  05301 003173        CMA,SEZ,CLE,SSA,SLA,SZA,RSS     E=0,
0295*                                       A=000002
0296  05302 102001        HLT 01          CMA,SEZ,CLE,SSA,SLA,SZA,RSS
0297*                                       FAILED
0298  05303 003174        CMA,SEZ,CLF,SSA,SLA,INA E=0, A=177776
0299  05304 102001        HLT 01          CMA,SEZ,CLE,SSA,SLA,INA FAILED
0300  05305 003175        CMA,SEZ,CLE,SSA,SLA,INA,RSS     E=0,
0301*                                       A=000002
0302  05306 003176        CMA,SEZ,CLE,SSA,SLA,INA,SZA     E=0,
0303*                                       A=177776
0304  05307 102001        HLT 01          FAILURE: CMA,SEZ,CLE,SSA,SLA,
0305*                                       INA,RSS IF A=000002; CMA,SEZ,
0306*                                       CLE,SSA,SLA,INA,SZA IF
0307*                                       A=177776
0308  05310 003177        CMA,SEZ,CLF,SSA,SLA,INA,SZA,RSS   E=0,
0309*                                       A=000002
0310  05311 102001        HLT 01          CMA,SEZ,CLE,SSA,SLA,INA,SZA,RSS
0311*                                       FAILED
0312  05312 102501        LIA 01          LOAD SW. REG. INTO A=077777
0313  05313 002004        INA             A=100000
0314  05314 102101        MIA 01          MERGE SW. REG. INTO A=177777
0315  05315 002004        INA             E=1, A=000000
0316  05316 003241        CMA,SEZ,CME,RSS         E=0, A=177777
0317  05317 102001        HLT 01          CMA,SEZ,CME,RSS FAILED
0318  05320 003240        CMA,SEZ,CME     E=1, A=000000
0319  05321 102001        HLT 01          CMA,SEZ,CME FAILED
0320  05322 003243        CMA,SEZ,CME,SZA,RSS     E=0, A=177777
0321  05323 102001        HLT 01          CMA,SEZ,CME,SZA,RSS FAILED
0322  05324 003242        CMA,SEZ,CME,SZA         E=1, A=000000
0323  05325 102001        HLT 01          CMA,SEZ,CME,SZA FAILED
0324  05326 003245        CMA,SEZ,CME,INA,RSS     E=1, A=000000
0325  05327 102001        HLT 01          CMA,SEZ,CME,INA,RSS FAILED
0326  05330 003244        CMA,SEZ,CME,INA         E=1, A=000000
0327  05331 003246        CMA,SEZ,CME,INA,SZA     E=1, A=000000
0328  05332 102001        HLT 01          CMA,SEZ,CME,INA OR CMA,SEZ,CME,
0329*                                       INA,SZA FAILED
0330  05333 003247        CMA,SEZ,CME,INA,SZA,RSS E=1, A=000000
0331  05334 102001        HLT 01          CMA,SEZ,CME,INA,SZA,RSS FAILED
0332  05335 003251        CMA,SEZ,CME,SLA,RSS     E=0, A=177777
0333  05336 102001        HLT 01          CMA,SEZ,CME,SLA,RSS FAILED
0334  05337 003250        CMA,SEZ,CME,SLA         E=1, A=000000
0335  05340 102001        HLT 01          CMA,SEZ,CME,SLA FAILED
0336  05341 003253        CMA,SEZ,CMF,SLA,SZA,RSS E=0, A=177777
0337  05342 102001        HLT 01          CMA,SEZ,CME,SLA,SZA,RSS FAILED
0338  05343 003252        CMA,SEZ,CME,SLA,SZA     E=1,A=000000
0339  05344 102001        HLT 01          CMA,SEZ,CME,SLA,SZA,RSS FAILED
0340  05345 003255        CMA,SEZ,CME,SLA,INA,RSS E=1, A=000000
0341  05346 102001        HLT 01          CMA,SEZ,CME,SLA,INA,RSS FAILED
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0342  05347 003254        CMA,SEZ,CME,SLA,INA      E=1,A=000000
0343  05350 003256        CMA,SEZ,CME,SLA,INA,SZA E=1, A=000000
0344  05351 102001        HLT 01          CMA,SEZ,CME,SLA,INA OR CMA,SEZ,
0345*                                         CME,SLA,INA,SZA FAILED
0346  05352 003257        CMA,SEZ,CME,SLA,INA,SZA,RSS      E=1,
0347*                                         A=000000
0348  05353 102001        HLT 01          CMA,SEZ,CME,SLA,INA,SZA,RSS
0349*                                         FAILED
0350  05354 003261        CMA,SEZ,CME,SSA,RSS      E=0, A=177777
0351  05355 102001        HLT 01          CMA,SEZ,CME,SSA,RSS FAILED
0352  05356 003260        CMA,SEZ,CME,SSA          E=1, A=000000
0353  05357 102001        HLT 01          CMA,SEZ,CME,SSA FAILED
0354  05360 003263        CMA,SEZ,CME,SSA,SZA,RSS E=0, A=177777
0355  05361 102001        HLT 01          CMA,SEZ,CME,SSA,SZA,RSS FAILED
0356  05362 003262        CMA,SEZ,CME,SSA,SZA      E=1, A=000000
0357  05363 102001        HLT 01          CMA,SEZ,CME,SSA,SZA FAILED
0358  05364 003265        CMA,SEZ,CME,SSA,INA,RSS E=1, A=000000
0359  05365 102001        HLT 01          CMA,SEZ,CME,SSA,INA,RSS FAILED
0360  05366 003264        CMA,SEZ,CME,SSA,INA      E=1, A=000000
0361  05367 003266        CMA,SEZ,CME,SSA,INA,SZA E=1, A=000000
0001  05370 102001        HLT 01          CMA,SEZ,CME,SSA,INA OR CMA,SEZ,
0002*                                         CME,SSA,INA,SZA
0003  05371 003267        CMA,SEZ,CME,SSA,INA,SZA,RSS      E=1,
0004*                                         A=000000
0005  05372 102001        HLT 01          CMA,SEZ,CME,SSA,INA,SZA,RSS
0006*                                         FAILED
0007  05373 003271        CMA,SEZ,CME,SSA,SLA,RSS E=0, A=177777
0008  05374 102001        HLT 01          CMA,SEZ,CME,SSA,SLA,RSS FAILED
0009  05375 003270        CMA,SEZ,CME,SSA,SLA      E=1, A=000000
0010  05376 102001        HLT 01          CMA,SEZ,CME,SSA,SLA FAILED
0011  05377 003273        CMA,SEZ,CME,SSA,SLA,SZA,RSS      E=0,
0012*                                         A=177777
0013  05400 102001        HLT 01          CMA,SEZ,CME,SSA,SLA,SZA,RSS
0014*                                         FAILED
0015  05401 003272        CMA,SEZ,CME,SSA,SLA,SZA E=1, A=000000
0016  05402 102001        HLT 01          CMA,SEZ,CME,SSA,SLA,SZA FAILED
0017  05403 003275        CMA,SEZ,CME,SSA,SLA,INA,RSS      E=1,
0018*                                         A=000000
0019  05404 102001        HLT 01          CMA,SEZ,CME,SSA,SLA,INA,RSS
0020*                                         FAILED
0021  05405 003274        CMA,SEZ,CME,SSA,SLA,INA E=1, A=000000
0022  05406 003276        CMA,SEZ,CME,SSA,SLA,INA,SZA      E=1,
0023*                                         A=000000
0024  05407 102001        HLT 01      CMA,SEZ,CME,SSA,SLA,INA, OR CMA,
0025*                                     SEZ,CME,SSA,SLA,INA,SZA
0026*                                     FAILED
0027  05410 003277        CMA,SEZ,CME,SSA,SLA,INA,SZA,RSS   E=1,
0028*                                         A=000000
0029  05411 102001        HLT 01          CMA,SEZ,CME,SSA,SLA,INA,SZA,RSS
0030*                                         FAILED
0031  05412 102501        LIA 01          LOAD SW. REG. INTO A=077777
0032  05413 002004        INA             A=100000
0033  05414 102401        MIA 01          MERGE SW. REG. INTO A=177777
0034  05415 002004        INA             E=1, A=000000
0035  05416 003341        CMA,SEZ,CCE,RSS          E=1, A=177777
0036  05417 102001        HLT 01          CMA,SEZ,CCE,RSS FAILED
0037  05420 003340        CMA,SEZ,CCE     E=1, A=000000

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0038  05421 003343        CMA,SEZ,CCE,SZA,RSS      E=1,A=177777
0039  05422 102001        HLT 01          FAILURE: CMA,SEZ,CCE IF
0040*                                         A=100000; CMA,SEZ,CCE,RSS IF
0041*                                         A=177777
0042  05423 003342        CMA,SEZ,CCE,SZA          E=1, A=000000
0043  05424 102001        HLT 01          CMA,SEZ,CCE,SZA FAILED
0044  05425 003344        CMA,SEZ,CCE,INA          E=1, A=000000
0045  05426 003345        CMA,SEZ,CCE,INA,RSS      E=1, A=000000
0046  05427 102001        HLT 01          CMA,SEZ,CCE,INA OR CMA,SEZ,CCE,
0047*                                         INA,RSS FAILED
0048  05430 003346        CMA,SEZ,CCE,INA,SZA      E=1, A=000000
0049  05431 102001        HLT 01          CMA,SEZ,CCE,INA,SZA FAILED
0050  05432 003347        CMA,SEZ,CCE,INA,SZA,RSS E=1, A=000000
0051  05433 102001        HLT 01          CMA,SEZ,CCE,INA,SZA,RSS
0052  05434 003350        CMA,SEZ,CCE,SLA          E=1, A=177777
0053  05435 003351        CMA,SEZ,CCE,SLA,RSS      E=1, A=000000
0054  05436 102001        HLT 01          FAILURE: CMA,SEZ,CCE,SLA IF
0055*                                         A=177777; CMA,SEZ,CCE,SLA,
0056*                                         RSS IF A=000000
0057  05437 003352        CMA,SEZ,CCE,SLA,SZA      E=1, A=177777
0058  05440 003353        CMA,SEZ,CCE,SLA,SZA,RSS E=1, A=000000
0059  05441 102001        HLT 01          FAILURE: CMA,SEZ,CCE,SLA,SZA IF
0060*                                         A=177777; CMA,SEZ,CCE,SLA,
0061*                                         SZA,RSS IF A=000000
0062  05442 003354        CMA,SEZ,CCE,SLA,INA      E=1,A=000000
0063  05443 003355        CMA,SEZ,CCE,SLA,INA,RSS E=1, A=000000
0064  05444 102001        HLT 01          CMA,SEZ,CCE,SLA,INA OR CMA,SEZ,
0065*                                         CCE,SLA,INA,RSS FAILED
0066  05445 003356        CMA,SEZ,CCE,SLA,INA,SZA E=1, A=000000
0067  05446 102001        HLT 01          CMA,SEZ,CCE,SLA,INA,SZA FAILED
0068  05447 003357        CMA,SEZ,CCE,SLA,INA,SZA,RSS      E=1,
0069*                                         A=000000
0070  05450 102001        HLT 01          CMA,SEZ,CCE,SLA,INA,SZA,RSS
0071*                                         FAILED
0072  05451 003361        CMA,SEZ,CCE,SSA,RSS      E=1, A=177777
0073  05452 102001        HLT 01          CMA,SEZ,CCE,SSA,RSS FAILED
0074  05453 003360        CMA,SEZ,CCE,SSA          E=1, A=000000
0075  05454 102001        HLT 01          CMA,SEZ,CCE,SSA, FAILED
0076  05455 003362        CMA,SEZ,CCE,SSA,SZA      E=1, A=177777
0077  05456 003363        CMA,SEZ,CCE,SSA,SZA,RSS E=1, A=000000
0078  05457 102001        HLT 01          FAILURE: CMA,SEZ,CCE,SSA,SZA IF
0079*                                         A=177777; CMA,SEZ,CCE,SSA,
0080*                                         SZA,RSS IF A=000000
0081  05460 003364        CMA,SEZ,CCE,SSA,INA      E=1, A=000000
0082  05461 003365        CMA,SEZ,CCE,SSA,INA,RSS E=1, A=000000
0083  05462 102001        HLT 01          CMA,SEZ,CCE,SSA,INA OR CMA,SEZ,
0084*                                         CCE,SSA,INA,RSS FAILED
0085  05463 003366        CMA,SEZ,CCE,SSA,INA,SZA E=1, A=000000
0086  05464 102001        HLT 01          CMA,SEZ,CCE,SSA,INA,SZA FAILED
0087  05465 003367        CMA,SEZ,CCE,SSA,INA,SZA,RSS      E=1,
0088*                                         A=000000
0089  05466 102001        HLT 01          CMA,SEZ,CCE,SSA,INA,SZA,RSS
0090*                                         FAILED
0091  05467 003371        CMA,SEZ,CCE,SSA,SLA,RSS E=1, A=177777
0092  05470 102001        HLT 01          CMA,SEZ,CCE,SSA,SLA,RSS FAILED
0093  05471 003370        CMA,SEZ,CCE,SSA,SLA      E=1, A=000000
0094  05472 102001        HLT 01          CMA,SEZ,CCE,SSA,SLA FAILED

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0095  05473 003372        CMA,SEZ,CCE,SSA,SLA,SZA E=1, A=177777
0096  05474 003373        CMA,SEZ,CCE,SSA,SLA,SZA,RSS      E=1,
0097*                                         A=000000
0098  05475 102001        HLT 01          FAILURE: CMA,SEZ,CCE,SSA,SLA,
0099*                                         SZA IF A=177777; CMA,SEZ,
0100*                                         CCE,SSA,SLA,SZA,RSS IF
0101*                                         A=000000
0102  05476 003374        CMA,SEZ,CCE,SSA,SLA,INA E=1, A=000000
0103  05477 003375        CMA,SEZ,CCE,SSA,SLA,INA,RSS      E=1,
0104*                                         A=000000
0105  05500 102001        HLT 01          CMA,SEZ,CCE,SSA,SLA,INA OR CMA,
0106*                                         SEZ,CCE,SSA,SLA,INA,RSS
0107*                                         FAILED
0108  05501 003376        CMA,SEZ,CCE,SSA,SLA,INA,SZA      E=1
0109*                                         A=000000
0110  05502 102001        HLT 01          CMA,SEZ,CCE,SSA,SLAA,INA,SZA
0111*                                         FAILED
0112  05503 003377        CMA,SEZ,CCE,SSA,SLA,INA,SZA,RSS   E=1,
0113*                                         A=000000
0114  05504 102001        HLT 01          CMA,SEZ,CCE,SSA,SLA,INA,SZA,RSS
0115*                                         FAILED
0116  05505 102501        LIA 01          LOAD SW. REG. INTO A=077777
0117  05506 002004        INA             A=100000
0118  05507 102401        MIA 01          MERGE SW. REG. INTO A=177777
0119  05510 002004        INA             E=1, A=000000
0120  05511 003540        CCA,SEZ,CLE     E=0, A=177777
0121  05512 003542        CCA,SEZ,CLE,SZA          E=0, A=177777
0122  05513 102001        HLT 01          CCA,SEZ,CLE OR CCA,SEZ,CLE,SZA
0123*                                         FAILED
0124  05514 003541        CCA,SEZ,CLE,RSS          E=0, A=177777
0125  05515 003543        CCA,SEZ,CLE,SZA,RSS      E=0, A=177777
0126  05516 102001        HLT 01          CCA,SEZ,CLE,RSS OR CCA,SEZ,CLE,
0127*                                         SZA,RSS FAILED
0128  05517 003544        CCA,SEZ,CLE,INA          E=1, A=000000
0129  05520 102001        HLT 01          CCA,SEZ,CLE,INA FAILED
0130  05521 003545        CCA,SEZ,CLE,INA,RSS      E=1, A=000000
0131  05522 102001        HLT 01          CCA,SEZ,CLE,INA,RSS FAILED
0132  05523 003546        CCA,SEZ,CLE,INA,SZA      E=1, A=000000
0133  05524 102001        HLT 01          CCA,SEZ,CLE,INA,SZA FIAILED
0134  05525 003547        CCA,SEZ,CLE,INA,SZA,RSS E=1, A=000000
0135  05526 102001        HLT 01          CCA,SEZ,CLE,INA,SZA,RSS FAILED
0136  05527 003551        CCA,SEZ,CLE,SLA,RSS      E=0, A=177777
0137  05530 102001        HLT 01          CCA,SEZ,CLE,SLA,RSS FAILED
0138  05531 003550        CCA,SEZ,CLE,SLA          E=0, A=177777
0139  05532 102001        HLT 01          CCA,SEZ,CLE,SLA FAILED
0140  05533 003552        CCA,SEZ,CLE,SLA,SZA      E=0, A=177777
0141  05534 102001        HLT 01          CCA,SEZ,CLE,SLA,SZA FAILED
0142  05535 003553        CCA,SEZ,CLE,SLA,SZA,RSS E=0, A=177777
0143  05536 102001        HLT 01          CCA,SEZ,CLE,SLA,SZA,RSS FIALED
0144  05537 003554        CCA,SEZ,CLE,SLA,INA      E=1, A=000000
0145  05540 102001        HLT 01          CCA,SEZ,CLE,SLA,INA FAILED
0146  05541 003555        CCA,SEZ,CLE,SLA,INA,RSS E=1, A=000000
0147  05542 102001        HLT 01          CCA,SEZ,CLE,SLA,INA,RSS FAILED
0148  05543 003556        CCA,SEZ,CLE,SLA,INA,SZA E=1, A=000000
0149  05544 102001        HLT 01          CCA,SEZ,CLE,SLA,INA,SZA FAILED
0150  05545 003557        CCA,SEZ,CLE,SLA,INA,SZA,RSS      E=1,
0151*                                         A=000000

PAGE 0043 #08                                   HP 20400AL

0152  05546 102001        HLT 01          CCA,SEZ,CLE,SLA,INA,SZA,RSS
0153*                                         FAILED
0154  05547 003561        CCA,SEZ,CLE,SSA,RSS      E=0, A=177777
0155  05550 102001        HLT 01          CCA,SEZ,CLE,SSA,RSS FAILED
0156  05551 003560        CCA,SEZ,CLE,SSA          E=0, A=177777
0157  05552 102001        HLT 01          CCA,SEZ,CLE,SSA, FAILED
0158  05553 003562        CCA,SEZ,CLE,SSA,SZA      E=0, A=177777
0159  05554 102001        HLT 01          CCA,SEZ,CLE,SSA,SZA FAILED
0160  05555 003563        CCA,SEZ,CLE,SSA,SZA,RSS E=0, A=177777
0161  05556 102001        HLT 01          CCA,SEZ,CLE,SSA,SZA,RSS FAILED
0162  05557 003564        CCA,SEZ,CLE,SSA,INA      E=1, A=000000
0163  05560 102001        HLT 01          CCA,SEZ,CLE,SSA,INAA FAILED
0164  05561 003565        CCA,SEZ,CLE,SSA,INA,RSS E=1, A=000000
0165  05562 102001        HLT 01          CCA,SEZ,CLE,SSA,INA,RSS FAILED
0166  05563 003566        CCA,SEZ,CLE,SSA,INA,SZA      F=1,A=000000
0167  05564 102001        HLT 01          CCA,SEZ,CLE,SSA,INA,SZA,RSS FAIL
0168  05565 003567        CCA,SEZ,CLE,SSA,INA,SZA,RSS      E=1,
0169*                                         A=000000
0170  05566 102001        HLT 01          CCA,SEZ,CLE,SSA,INA,SZA,RSS
0171*                                         FAILED
0172  05567 003570        CCA,SEZ,CLE,SSA,SLA      E=0, A=177777
0173  05570 003571        CCA,SEZ,CLE,SSA,SLA,RSS E=0, A=177777
0174  05571 102001        HLT 01          CCA,SEZ,CLE,SSA,SLA,RSS OR CCA,
0175*                                         SEZ,CLE,SSA,SLA FIALED
0176  05572 003572        CCA,SEZ,CLE,SSA,SLA,SZA F=0, A=177777
0177  05573 102001        HLT 01          CCA,SEZ,CLE,SSA,SLA,SZA FAILED
0178  05574 003573        CCA,SEZ,CLE,SSA,SLA,SZA,RSS      E=0,
0179*                                         A=177777
0180  05575 102001        HLT 01          CCA,SEZ,CLE,SSA,SLA,SZA,RSS
0001*                                         FAILED
0002  05576 003574        CCA,SEZ,CLE,SSA,SLA,INA E=1, A=000000
0003  05577 102001        HLT 01          CCA,SEZ,CLE,SSA,SLA,INA FAILED
0004  05600 003575        CCA,SEZ,CLE,SSA,SLA,INA,RSS      E=1,
0005*                                         A=000000
0006  05601 102001        HLT 01          CCA,SEZ,CLE,SSA,SLA,INA,RSS
0007*                                         FAILED
0008  05602 003576        CCA,SEZ,CLE,SSA,SLA,INA,SZA      E=1,
0009*                                         A=000000
0010  05603 102001        HLT 01          CCA,SEZ,CLE,SSA,SLA,INA,SZA
0011*                                         FAILED
0012  05604 003577        CCA,SEZ,CLE,SSA,SLA,INA,SZA,RSS   E=1,
0013*                                         A=000000
0014  05605 102001        HLT 01          CCA,SEZ,CLE,SSA,SLA,INA,SZA,RSS
0015*                                         FAILED
0016  05606 102501        LIA 01          LOAD SW. REG. INTO A=077777
0017  05607 002004        INA             A=000000
0018  05610 102401        MIA 01          MERGE SW. REG. INTO A=177777
0019  05611 002004        INA             E=1, A=000000
0020  05612 003641        CCA,SEZ,CME,RSS          E=0, A=177777
0021  05613 102001        HLT 01          CCA,SEZ,CME,RSS FAILED
0022  05614 003640        CCA,SEZ,CME      E=1, A=177777
0023  05615 102001        HLT 01          CCA,SEZ,CME FAILED
0024  05616 003642        CCA,SEZ,CME,SZA          F=0, A=177777
0025  05617 003643        CCA,SEZ,CME,SZA,RSS      E=1, A=177777
0026  05620 102001        HLT 01          FAILURE: CCA,SEZ,CME,SZA IF
0027*                                         E=0, CCA,SEZ,CME,SZA,RSS IF
0028*                                         E=1
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PAGE 0044 #09                                                    HP 20400AL

0029  05621 003644        CCA,SEZ,CME,INA          E=1, A=000000
0030  05622 003646        CCA,SEZ,CME,INA,SZA      E=1, A=000000
0031  05623 102001        HLT 01          CCA,SEZ,CME,INA OR CCA,SEZ,CME,
0032*                                        INA,SZA FAILED
0033  05624 003645        CCA,SEZ,CME,INA,RSS      E=1, A=000000
0034  05625 102001        HLT 01          CCA,SEZ,CME,INA,RSS FAILED
0035  05626 003647        CCA,SEZ,CME,INA,SZA,RSS E=1, A=000000
0036  05627 102001        HLT 01          CCA,SEZ,CME,INA,SZA,RSS FAILED
0037  05630 003650        CCA,SEZ,CME,SLA          E=0, A=177777
0038  05631 003651        CCA,SEZ,CME,SLA,RSS      E=1, A=177777
0039  05632 102001        HLT 01          FAILURE: CCA,SEZ,CME,SLA IF
0040*                                        E=0,  CCA,SEZ,CME,SLA,RSS IF
0041*                                        E=1
0042  05633 003652        CCA,SEZ,CME,SLA,SZA      E=0, A=177777
0043  05634 003653        CCA,SEZ,CME,SLA,SZA,RSS E=1, A=177777
0044  05635 102001        HLT 01          FAILURE: CCA,SEZ,CME,SLA,SZA IF
0045*                                        E=0, CCA,SEZ,CME,SLA,SZA,RSS
0046*                                        IF E=1
0047  05636 003654        CCA,SEZ,CME,SLA,INA      E=1, A=000000
0048  05637 003655        CCA,SEZ,CME,SLA,INA,RSS E=1, A=000000
0049  05640 102001        HLT 01          CCA,SEZ,CME,SLA,INA OR CCA,SEZ,
0050*                                        CME,SLA,INA,RSS FAILED
0051  05641 003656        CCA,SEZ,CME,SLA,INA,SZA E=1 A=000000
0052  05642 102001        HLT 01          CCA,SEZ,CME,SLA,INA,SZA FAILED
0053  05643 003657        CCA,SEZ,CME,SLA,INA,SZA,RSS      E=1,
0054*                                        A=000000
0055  05644 102001        HLT 01          CCA,SEZ,CME,SLA,INA,SZA,RSS
0056*                                        FAILED
0057  05645 003660        CCA,SEZ,CME,SSA          E=0, A=177777
0058  05646 003661        CCA,SEZ,CME,SSA,RSS      E=1, A=177777
0059  05647 102001        HLT 01          FAILURE: CCA,SEZ,CME,SSA IF
0060*                                        E=0, CCA,SEZ,CME,SSA,RSS IF
0061*                                        E=1
0062  05650 003662        CCA,SEZ,CME,SSA,SZA      E=0, A=177777
0063  05651 003663        CCA,SEZ,CME,SSA,SZA,RSS E=1, A=177777
0064  05652 102001        HLT 01          FAILURE: CCA,SEZ,CME,SSA,SZA IF
0065*                                        E=0, CCA,SEZ,CME,SSA,SZA,RSS
0066*                                        E=1
0067  05653 003664        CCA,SEZ,CME,SSA,INA      E=1, A=200000
0068  05654 003665        CCA,SEZ,CME,SSA,INA,RSS E=1, A=000000
0069  05655 102001        HLT 01          CCA,SEZ,CME,SSA,INA OR CCA,SEZ,
0070*                                        CME,SSA,INA FAILED
0071  05656 003666        CCA,SEZ,CME,SSA,INA,SZA E=1, A=000000
0072  05657 102001        HLT 01          CCA,SEZ,CME,SSA,INA,SZA FAILED
0073  05660 003667        CCA,SEZ,CME,SSA,INA,SZA,RSS      E=1,
0074*                                        A=000000
0075  05661 102001        HLT 01          CCA,SEZ,CME,SSA,INA,SZA,RSS
0076*                                        FAILED
0077  05662 003671        CCA,SEZ,CME,SSA,SLA,RSS E=0, A=177777
0078  05663 102001        HLT 01          CCA,SEZ,CME,SSA,SLA,RSS FAILED
0079  05664 003670        CCA,SEZ,CME,SSA,SLA      E=1, A=177777
0080  05665 102001        HLT 01          CCA,SEZ,CME,SSA,SLA FAILED
0081  05666 003673        CCA,SEZ,CME,SSA,SLA,SZA,RSS      E=0,
0082*                                        A=177777
0083  05667 102001        HLT 01          CCA,SEZ,CME,SSA,SLA,SZA,RSS
0084*                                        FAILED
0085  05670 003672        CCA,SEZ,CME,SSA,SLA,SZA E=1, A=177777
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PAGE 0045 #09                                                    HP 20400AL

0086  05671 102001        HLT 01          CCA,SEZ,CME,SSA,SLA,SZA FAILED
0087  05672 003674        CCA,SEZ,CME,SSA,SLA,INA E=1, A=000000
0088  05673 003675        CCA,SEZ,CME,SSA,SLA,INA,RSS      E=1,
0089*                                        A=000000
0090  05674 102001        HLT 01          CCA,SEZ,CME,SSA,SLA,INA OR CCA,
0091*                                        SEZ,CME,SSA,SLA,INA,RSS
0092*                                        FAILED
0093  05675 003676        CCA,SEZ,CME,SSA,SLA,INA,SZA      E=1,
0094*                                        A=000000
0095  05676 102001        HLT 01          CCA,SEZ,CME,SSA,SLA,INA,SZA
0096*                                        FAILED
0097  05677 003677        CCA,SEZ,CME,SSA,SLA,INA,SZA,RSS   E=1,
0098*                                        A=000000
0099  05700 102001        HLT 01          CCA,SEZ,CME,SSA,SLA,INA,RSS
0100*                                        FAILED
0101  05701 102501        LIA 01          LOAD SW. REG. INTO A=077777
0102  05702 002004        INA             A=132000
0103  05703 102401        MIA 01          MERGE SW. REG. INTO A=177777
0104  05704 002004        INA             E=1, A=000000
0105  05705 003741        CCA,SEZ,CCE,RSS
0106  05706 102001        HLT 01          CCA,SEZ,CCE,RSS FAILED
0107  05707 003740        CCA,SEZ,CCE     E=1, A=177777
0108  05710 003743        CCA,SEZ,CCE,SZA,RSS      E=1, A=177777
0109  05711 102001        HLT 01          CCA,SEZ,CCE OR CCA,SEZ,CCE,SZA,
0110*                                        RSS FAILED
0111  05712 003742        CCA,SEZ,CCE,SZA          E=1, A=177777
0112  05713 003745        CCA,SEZ,CCE,INA,RSS      E=1, A=000000
0113  05714 102001        HLT 01          FAILURE: CCA,SEZ,CCE,SZA IF
0114*                                        A=177777; CLA,SEZ,CCE,INA,RSS
0115*                                        IF A=000000
0116  05715 003744        CCA,SEZ,CCE,INA          E=1, A=000000
0117  05716 003746        CCA,SEZ,CCE,INA,SZA      E=1, A=000000
0118  05717 102001        HLT 01          CCA,SEZ,CCE,INA OR CCA,SEZ,CCE,
0119*                                        INA,SZA FAILED
0120  05720 003747        CCA,SEZ,CCE,INA,SZA,RSS E=1, A=000000
0121  05721 102001        HLT 01          CCA,SEZ,CCE,INA,SZA,RSS FAILED
0122  05722 003751        CCA,SEZ,CCE,SLA,RSS      E=1 A=177777
0123  05723 102001        HLT 01          CCA,SEZ,CCE,SLA,RSS FAILED
0124  05724 003750        CCA,SEZ,CCE,SLA          E=1, A=177777
0125  05725 003753        CCA,SEZ,CCE,SLA,SZA,RSS E=1, A=177777
0126  05726 102001        HLT 01          CCA,SEZ,CCE,SLA OR CCA,SEZ,CCE,
0127*                                        SLA,SZA,RSS FAILED
0128  05727 003752        CCA,SEZ,CCE,SLA,SZA      E=1, A=177777
0129  05730 003755        CCA,SEZ,CCE,SLA,INA,RSS E=1, A=000000
0130  05731 102001        HLT 01          FAILURE  CCA,SEZ,CCE,SLA,SZA IF
0131*                                        A=177777; CCA,SEZ,CCE,SLA,
0132*                                        INA,RSS IF A=000
0133  05732 003754        CCA,SEZ,CCE,SLA,INA      E=1, A=000000
0134  05733 003756        CCA,SEZ,CCE,SLA,INA,SZA E=1, A=000000
0135  05734 102001        HLT 01          CCA,SEZ,CCE,SLA,INA OR CCA,SEZ
0136*                                        CCE,SLA,INA,SZA FAILED
0137  05735 003757        CCA,SEZ,CCE,SLA,INA,SZA,RSS      E=1,
0138*                                        A=000000
0139  05736 102001        HLT 01          CCA,SEZ,CCE,SLA,INA,SZA,RSS
0140*                                        FAILED
0141  05737 003761        CCA,SEZ,CCE,SSA,RSS      E=1, A=177777
0142  05740 102001        HLT 01          CCA,SEZ,CCE,SSA,RSS FAILED
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PAGE 0046 #09                                                    HP 20400AL

0143  05741 003760        CCA,SEZ,CCE,SSA          E=1, A=177777
0144  05742 003763        CCA,SEZ,CCE,SSA,SZA,RSS E=1, A=177777
0145  05743 102001        HLT 01          CCA,SEZ,CCE,SSA OR CCA,SEZ,CCE,
0146*                                        SSA,SZA,RSS FAILED
0147  05744 003762        CCA,SEZ,CCE,SSA,SZA      E=1, A=177777
0148  05745 003765        CCA,SEZ,CCE,SSA,INA,RSS E=1, A=000000
0149  05746 102001        HLT 01          FAILURE: CCA,SEZ,CCE,SSA,SZA IF
0150*                                        A=177777; CCA,SEZ,CCE,SSA,
0151*                                        INA,RSS IF A=000000
0152  05747 003764        CCA,SEZ,CCE,SSA,INA      E=1, A=000000
0153  05750 003766        CCA,SEZ,CCE,SSA,INA,SZA E=1, A=000000
0154  05751 102001        HLT 01          CCA,SEZ,CCE,SSA,INA OR CCA,SEZ,
0155*                                        CCE,SSA,INA,SZA FAILED
0156  05752 003767        CCA,SEZ,CCE,SSA,INA,SZA,RSS  E=1,A=000000
0157*                                        A=000000
0158  05753 102001        HLT 01          CCA,SEZ,CCE,SSA,INA,SZA,RSS
0159*                                        FAILED
0160  05754 003771        CCA,SEZ,CCE,SSA,SLA,RSS E=1, A=177777
0161  05755 102001        HLT 01          CCA,SEZ,CCE,SSA,SLA,RSS FAILED
0162  05756 003770        CCA,SEZ,CCE,SSA,SLA      E=1, A=177777
0163  05757 003773        CCA,SEZ,CCE,SSA,SLA,SZA,RSS      E=1,
0164*                                        A=177777
0165  05760 102001        HLT 01          CCA,SEZ,CCE,SSA,SLA OR CCA,SEZ,
0166*                                        CCE,SSA,SLA,SZA,RSS FAILED
0167  05761 003772        CCA,SEZ,CCE,SSA,SLA,SZA E=1, A=177777
0168  05762 003775        CCA,SEZ,CCE,SSA,SLA,INA,RSS      E=1,
0169*                                        A=000000
0170  05763 102001        HLT 01          FAILURE: CCA,SEZ,CCE,SSA,SLA,
0171*                                        SZA IF A=177777; CCA,SEZ,CCE,
0172*                                        SSA,SLA,INA,RSS IF A=000000
0173  05764 003774        CCA,SEZ,CCE,SSA,SLA,INA E=1, A=000000
0174  05765 003776        CCA,SEZ,CCE,SSA,SLA,INA,SZA      E=1,
0175*                                        A=000000
0176  05766 102001        HLT 01          CCA,SEZ,CCE,SSA,SLA,INA OR CCA,
0177*                                        SEZ,CCE,SSA,SLA,INA,SZA
0178*                                        FAILED
0179  05767 003777        CCA,SEZ,CCE,SSA,SLA,INA,SZA,RSS   E=1,
0180*                                        A=200000
0181  05770 102001        HLT 01          CCA,SEZ,CCE,SSA,SLA,INA,SZA,RSS
0182*                                        FAILED
0183  05771 000040        CLE
0184  05772 12/773        JMP MODIF,I
0185  05773 006300  MODIF DEF RESET
0186  06000               ORG 6000B
0187  06000 062035  RESET LDA RSTAR
0188  06001 072034        STA START
0189  06002 162034  MOL   LDA START,I
0190  06003 012037        ANA BMASK
0191  06004 002002        SZA
0192  06005 026021        JMP AMOD
0193  06006 162034  BMLD  LDA START,I
0194  06007 032037        IOR BMASK
0195  06010 172034        STA START,I
0196  06011 036034        ISZ START
0197  06012 062034        LDA START
0198  06013 052040        CPA MASK
0199  06014 026016        JMP REST
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PAGE 0047 #09                                                    HP 20400AL

0200  06015 026006        JMP BMOD
0201  06016 062035  REST  LDA RSTAR
0202  06017 072034        STA START
0203  06020 126041        JMP BEG,I
0204  06021 162034  AMLD  LDA START,I
0205  06022 012036        ANA AMASK
0206  06023 172034        STA START,I
0207  06024 036034        ISZ START
0208  06025 062034        LDA START
0209  06026 052040        CPA MASK
0210  06027 026031        JMP REST1
0211  06030 026021        JMP AMOD
0212  06031 062035  REST1 LDA RSTAR
0213  06032 072034        STA START
0214  06033 126041        JMP BEG,I
0215  06034 002000  START DEF BEGIN
0216  06035 002000  RSTAR DEF BEGIN
0217  06036 173777  AMASK OCT 173777
0218  06037 004000  BMASK OCT 004000
0219  06040 005772  MASK  DEF MODIF-1
0220  06041 002001  BEG   DEF BEGIN+1
0221                      END
** NO ERRORS*
```

MEMORY REFERENCE INSTRUCTION TEST

Tape No. HP 20401B

Listing No. HP 20401BL

```
PAGE 0001                                                    HP 20401BL

0001                    ASMB,A,B,L,T
FIN      007665
FIN1     007666
HALT     007661
HALT1    007667
INIT     007642
LOOP1    007645
LOOP2    007655
PART2    007654
STAR1    007663
START    007664
** NO ERRORS*
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PAGE 0001                                                    HP 20401BL

0001                    ASMB,A,B,L,T
A2       003653
A3       003654
A4       003655
A5       003656
AA       003651
AA1      003657
A6       003652
A11      001316
C2       003640
C21      003645
C3       003641
C31      003646
C4       003642
C41      003647
C51      003650
CA       003636
CA1      003643
CB       003637
CB1      003644
D2       003717
D21      003725
D3       003720
D31      003726
D4       003721
D5       003722
DA       003715
DB       003716
DB1      003724
GD1      004010
GD2      004022
GD3      004035
GD4      004047
GD5      004064
GD6      004077
GD7      004112
GD8      004127
GD9      004143
I2       003670
I3       003671
IA       003666
IB       003667
ITE      003562
IZ1      003625
IZ2      005012
IZ3      006012
IZB      001311
L2       003674
L2B      003701
L3       003675
L3B      003702
L4       003676
L5       003677
LA       003672
LB       003673
LBB      003700
LP1      004002
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PAGE 0002 #01                                                HP 20401BL

0001                    ASMB,A,B,L,T
0001  07642                ORG 7642B
0002  07642 063663  INIT   LDA STAR1
0003  07643 073664          STA START
0004  07644 067667          LDB HALT1      PUT HALT IN B REG.
0005  07645 006004  LOOP1  INB
0006  07646 177664          STB START,I    STB IN CURRENT ADDR.
0007  07647 002004          INA            INCR. WORKING ADDR.
0008  07650 073664          STA START
0009  07651 053666          CPA FIN1       ARE INT. LOCNS. COMPLETE
0010  07652 027654          JMP PART2      YES
0011  07653 027645          JMP LOOP1      NO
0012  07654 067661  PART2  LDB HALT       102001
0013  07655 177664  LOOP2  STB START,I    STB IN CURRENT ADDR.
0014  07656 002004          INA
0015  07657 073664          STA START
0016  07660 053665          CPA FIN        IS CORE INIT. TO HALTS
0017  07661 102001  HALT   HLT 01         YES
0018  07662 027655          JMP LOOP2      NO
0019  07663 000002  STAR1  OCT 2
0020  07664 000000  START  OCT 0
0021  07665 007642  FIN    DEF INIT
0022  07666 000100  FIN1   OCT 100
0023  07667 102001  HALT1  OCT 102001
0024                    END
** NO ERRORS*
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PAGE 0002                                                    HP 20401BL

LP2      004014
LP3      004027
LP4      004041
LP5      004054
LP6      004070
LP7      004103
LP8      004117
LP9      004133
OT2      001310
S2       003711
S2B      003713
S3B      003714
SA       003707
SB       003710
SB1      003712
SI5      005003
SI6      006003
SIX      003602
T9       002101
TAG      001275
TA1      003624
X2       003662
X3       003663
X4       003664
X5       003665
XA       003660
XB       003661
ZI2      003626
ZI3      003627
ADMK     001321
ADMK1    003723
ADMKB    001322
ANS3     005021
ANS4     005023
ANS5     005025
ANS6     005027
APAT1    001273
APAT2    001274
ASEQ     003604
ASEQ1    003610
ATEMP    001266
BAD1     002147
BAD10    002354
BAD11    002445
BAD12    002554
BAD13    002654
BAD14    003042
BAD2     002164
BAD3     002201
BAD4     002216
BAD5     002233
BAD6     002246
BAD7     002260
BAD8     002273
BAD9     002305
BASE     001276
BASIC    001000
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BINST   003620
BTEMP   001267
CAN1    002502
CAN2    002511
CAN3    002520
CAN4    002527
CAN5    002537
CAN6    002556
CAN7    002565
CCAD1   003333
CCAD2   003346
CCAD3   003360
CCAD4   003373
CCAD5   003405
CCAD6   003422
CCAD7   003426
CCAD8   003440
CCAN1   002577
CCAN2   002607
CCAN3   002617
CCAN4   002627
CCAN5   002637
CCAN6   002656
CCAN7   002666
CCBD1   003454
CCBD2   003467
CCBD3   003501
CCBD4   003514
CCBD5   003526
CCBD6   003536
CCBD7   003544
CCBD8   003556
CCLB1   003063
CCLB2   003071
CCLB3   003077
CCLB4   003105
CCLB5   003113
CCLB6   003123
CCLB7   003127
CCLB8   003136
CCLN1   002775
CCLN2   003003
CCLN3   003011
CCLN4   003017
CCLN5   003025
CCLN6   003044
CCLN7   003053
CCON1   002356
CCON2   002447
CCOR1   002700
CCOR2   002710
CCOR3   002720
CCOR4   002730
CCOR5   002740
CCOR6   002751
CCOR7   002756
CCOR8   002765
```



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CCSA1   003147
CCSA2   003156
CCSA3   003165
CCSA4   003174
CCSA5   003203
CCSA6   003212
CCSA7   003217
CCSA8   003226
CCSB1   003237
CCSB2   003246
CCSB3   003255
CCSB4   003264
CCSB5   003273
CCSB6   003303
CCSB7   003310
CCSB8   003317
CONT1   002153
CONT2   002170
CONT3   002205
CONT4   002222
CONT5   002237
CONT6   002251
CONT7   002263
CONT8   002275
CONT9   002307
ERR1    003600
ERR2    005000
ERR3    006000
ERROR   001250
FIVE    003601
FIVE1   005001
FX1A    002116
FX2A    002131
GD10    004157
GD11    004174
GD12    004210
GD13    004223
GD14    004236
GD15    004251
GD16    004263
GD17    004276
GD18    004310
GD19    004324
GD20    004337
GD21    004353
GD22    004366
GD23    004405
GD24    004423
GD25    004442
GD26    004461
GD27    004500
GD28    004517
GD29    004536
GD30    004554
GD31    004573
GD32    004612
GD33    004631
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GD34    004650
IBASE   001300
IFIVE   005002
IIPA0   001315
IIPA2   005015
IIPA3   006015
IIPAT   003635
IIPS0   001320
IIPS1   005017
IIPS2   006017
IIPST   003706
IIZ0    001312
IIZ1    003630
IIZ2    005013
IIZ3    006013
INST2   003621
INST3   003622
INST4   003623
INSTR   001270
IPAT2   003633
IPAT3   003634
ISIX    006002
ITWO    003603
LP10    004147
LP11    004164
LP12    004200
LP13    004214
LP14    004227
LP15    004243
LP16    004255
LP17    004270
LP18    004302
LP19    004315
LP20    004330
LP21    004344
LP22    004357
LP23    004373
LP24    004411
LP25    004427
LP26    004446
LP27    004465
LP28    004504
LP29    004524
LP30    004542
LP31    004560
LP32    004577
LP33    004616
LP34    004635
LPAT    001271
MAR1    003424
OT12    003617
PAT1    003631
PAT2    003632
PAT3    005020
PAT4    005022
PAT5    005024
PAT5A   005014
```



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PAT6    005026
PAT6A   006014
PBT1    001313
PBT2    001314
PET1    002003
PET2    002006
PET3    002011
PET4    002014
PET5    002026
PET6    002034
PET7    002043
PET8    002054
PET9    002076
RET1    001277
RETN    004656
SIFVE   003614
SISIX   003615
SIT0    001307
SIT2    003616
SIT5    005011
SIT6    006011
SIX1    006001
SPAT    001272
SPAT0   001317
SPAT1   003703
SPAT2   005016
SPAT3   006016
SPT2    003704
SPT3    003705
STWO    001301
SUBR    001244
TADA    001175
TADA1   003322
TADA2   004371
TADB    001216
TADB1   003443
TADB2   004522
TAND    001076
TAND1   002473
TAND2   004052
TCPA    001040
TCPA1   002312
TCPA2   004000
TCPB    001057
TCPB1   002402
TCPB2   004025
TIOR    001131
TIOR1   002671
TIOR2   004162
TISZ    001012
TISZ1   002137
TJMP    001001
TJMP1   002000
TJSB    001003
TJSB1   002062
TLDA    001140
TLDA1   002770
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PAGE 0007                                                    HP 20401BL


TLDA2   004241
TLDB    001146
TLDB1   003056
TLDB2   004266
TSTA    001154
TSTA1   003141
TSTA2   004313
TSTB    001163
TSTB1   003231
TSTB2   004342
TXOR    001114
TXOR1   002570
TXOR2   004115
** NO ERRORS*
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PAGE 0009 #02                                                HP 20401BL

0057  01067 025071          JMP *+2
0058  01070 102001          HLT 01          TCPB FAILED
0059  01071 002004          INA             A=100001
0060  01072 006004          INB             B=100001
0061  01073 054000          CPB 0
0062  01074 025076          JMP TAND
0063  01075 102001          HLT 01          TCPB FAILED
0064  01076 002400  TAND    CLA
0065  01077 006400          CLB
0066  01100 102501          LIA 01          A=077777
0067  01101 106501          LIB 01          B=077777
0068  01102 006004          INB             B=100000
0069  01103 010001          ANI 1
0070  01104 002002          SZA
0071  01105 102001          HLT 01          TAND FAILED
0072  01106 006004          INB             B=100001
0073  01107 010001          ANI 1
0074  01110 002020          SSA
0075  01111 102001          HLT 01          TAND FAILED
0076  01112 000010          SLA
0077  01113 102001          HLT 01          TAND FAILED
0078  01114 002400  TXOR    CLA
0079  01115 006400          CLB
0080  01116 102501          LIA 01          A=077777
0081  01117 106501          LIB 01          B=077777
0082  01120 030001          XOR 1
0083  01121 002002          SZA
0084  01122 102001          HLT 01          TXOR FAILED
0085  01123 006004          INB             B=100000
0086  01124 030001          XOR 1
0087  01125 002021          SSA,RSS
0088  01126 102001          HLT 01          TXOR FAILED
0089  01127 000010          SLA
0090  01130 102001          HLT 01          TXOR FAILED
0091  01131 102501  TIOR    LIA 01          A=077777
0092  01132 106501          LIB 01          B=077777
0093  01133 006004          INB             B=100000
0094  01134 030001          IOR 1
0095  01135 003000          CMA             A=000000
0096  01136 002002          SZA
0097  01137 102001          HLT 01          TIOR FAILED
0098  01140 002400  TLEA    CLA
0099  01141 006400          CLB
0100  01142 051271          LDA LPAT        A=077777
0101  01143 051271          CPA LPAT
0102  01144 025146          JMP *+2
0103  01145 102001          HLT 01          TLDA FAILED
0104  01146 002400  TLEB    CLA
0105  01147 065271          LDB LPAT        B=077777
0106  01150 102501          LIA 01          A=077777
0107  01151 050001          CPA 1
0108  01152 025154          JMP *+2
0109  01153 102001          HLT 01          TLDB FAILED
0110  01154 002400  TSTA    CLA
0111  01155 006400          CLB
0112  01156 102501          LIA 01          A=077777
0113  01157 071272          STA SPAT
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PAGE 0008 #01                                                HP 20401BL

0001                ASPB,A,B,L,T
0001  001000               ORG 10008
0002  01000 002500  BASIC CLA,CLE         A=0,E=0
0003  01001 025003  TJMP  JMP TJMP+2
0004  01002 102001        HLT 01          TJMP FAILED
0005  01003 015244  TJSB  JSB SUBR
0006  01004 002011        SLA,RSS
0007  01005 102001        HLT 01          TJSB FAILED
0008  01006 000011        SLB,RSS
0009  01007 102001        HLT 01          TJSB FAILED
0010  01010 002400        CLA             A=0
0011  01011 006400        CLB             B=0
0012  01012 102501  TISZ  LIA 01          A=077777
0013  01013 106501        LIB 01          B=077777
0014  01014 034000        ISZ 0
0015  01015 025017        JMP *+2
0016  01016 025021        JMP *+3
0017  01017 006004        INB
0018  01020 025014        JMP *-4
0019  01021 006004        INB
0020  01022 006002        SZB
0021  01023 102001        HLT 01          TISZ FAILED-A
0022  01024 000040        CLE
0023  01025 102501        LIA 01          A=077777
0024  01026 106501        LIB 01          B=077777
0025  01027 034001        ISZ 1
0026  01030 025032        JMP *+2
0027  01031 025034        JMP *+3
0028  01032 002004        INA
0029  01033 025027        JMP *-4
0030  01034 002004        INA
0031  01035 002002        SZA
0032  01036 102001        HLT 01          TISZ FAILED-B
0033  01037 002500        CLA,CLE
0034  01040 102501  TCFA  LIA 01          A=077777
0035  01041 106501        LIB 01          B=077777
0036  01042 050001        CPA 1
0037  01043 025045        JMP *+2
0038  01044 102001        HLT 01          TCPA FAILED
0039  01045 002004        INA             A=100000
0040  01046 006004        INB             B=100000
0041  01047 050001        CPA 1
0042  01050 025052        JMP *+2
0043  01051 102001        HLT 01          TCPA FAILED
0044  01052 002004        INA             A=100001
0045  01053 006004        INB             B=100001
0046  01054 050001        CPA 1
0047  01055 025057        JMP TCPB
0048  01056 102001        HLT 01          TCPA FAILED
0049  01057 102501  TCFB  LIA 01          A=077777
0050  01060 106501        LIB 01          B=077777
0051  01061 054000        CPB 0
0052  01062 025064        JMP *+2
0053  01063 102001        HLT 01          TCPB FAILED
0054  01064 002004        INA             A=10000
0055  01065 006004        INB             B=10000
0056  01066 054000        CPB 0
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PAGE 0010 #02                                                HP 20401BL

0114  01160 051272          CPA SPAT
0115  01161 025163          JMP *+2
0116  01162 102001          HLT 01          TSTA FAILED
0117  01163 002400  TSTB    CLA
0118  01164 071272          STA SPAT
0119  01165 102501          LIA 01          A=077777
0120  01166 106501          LIB 01          B=077777
0121  01167 075272          STB SPAT
0122  01170 051272          CPA SPAT
0123  01171 025173          JMP *+2
0124  01172 102001          HLT 01          TSTB FAILED
0125  01173 006400          CLB
0126  01174 075272          STB SPAT
0127  01175 002500  TALA    CLA,CLE
0128  01176 061273          LDA APAT1       A=052525
0129  01177 041273          ADA APAT1       A=125252
0130  01200 051274          CPA APAT2
0131  01201 025203          JMP *+2
0132  01202 102001          HLT 01          TADA FAILED
0133  01203 002040          SEZ
0134  01204 102001          HLT 01          TADA FAILED
0135  01205 000040          CLE
0136  01206 061274          LDA APAT2       A=125252
0137  01207 041274          ADA APAT2       A=052524
0138  01210 002004          INA             A=052525
0139  01211 051273          CPA APAT1
0140  01212 025214          JMP *+2
0141  01213 102001          HLT 01          TADA FAILED
0142  01214 002041          SEZ,RSS
0143  01215 102001          HLT 01          TADA FAILED
0144  01216 000040  TALB    CLE
0145  01217 065273          LDB APAT1       B=052525
0146  01220 045273          ADB APAT1       B=125252
0147  01221 061274          LDA APAT2       A=125252
0148  01222 050001          CPA 1
0149  01223 025225          JMP *+2
0150  01224 102001          HLT 01          TADB FAILED
0151  01225 002040          SEZ
0152  01226 102001          HLT 01          TADB FAILED
0153  01227 000040          CLE
0154  01230 065274          LDB APAT2       B=125252
0155  01231 045274          ADB APAT2       B=052524,E=1
0156  01232 006004          INB             B=052525
0157  01233 061273          LDA APAT1
0158  01234 050001          CPA 1
0159  01235 025237          JMP *+2
0160  01236 102001          HLT 01          TADB FAILED
0161  01237 002041          SEZ,RSS
0162  01240 102001          HLT 01          TADB FAILED
0163  01241 002500          CLA,CLE
0164  01242 006400          CLB
0165  01243 125275          JMP TAG,I       BASIC TEST COMPLETE
0166  01244 000000  SUBR    NOP             RETURN ADDR.
0167  01245 002404          CLA,INA
0168  01246 006404          CLB,INB
0169  01247 125244          JMP SUBR,I
0170  01250 000000  ERROR   NOP             RETURN ADDRESS
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PAGE 0011 #02                                                    HP 20401BL

0171  01251 071266          STA ATEMP
0172  01252 075267          STB BTEMP
0173  01253 161250          LDA ERROR,I
0174  01254 071270          STA INSTM      A=LOCN. OF ERROR INSTR.
0175  01255 165270          LDB INSTM,I    B=BAD INSTR. CODE
0176  01256 102001          HLT 01         INSPECT A AND B REG. VALUES
0177  01257 061266          LDA ATEMP      A=ORIGINAL CONTENTS
0178  01260 065267          LDB BTEMP      B=ORIGINAL CONTENTS
0179  01261 102001          HLT 01         INSPECT A AND B REG. VALUES
0180  01262 061250          LDA ERROR
0181  01263 002004          INA
0182  01264 071250          STA ERROR
0183  01265 125250          JMP ERROR,I
0184  01266 000000  ATEMP CCT 0
0185  01267 000000  BTEMP CCT 0
0186  01270 000000  INSTM CCT 0
0187  01271 077777  LPAT  CCT 077777
0188  01272 000000  SPAT  CCT 0
0189  01273 052525  APAT1 CCT 052525
0190  01274 125252  APAT2 CCT 125252
0191  01275 002000  TAG   DEF TJMP1
0192  01276 125277  BASE  JMP RET1.I     JUMP IND. TO PAGE 1
0193  01277 002003  RET1  DEF RET1
0194  01300 102014  IBASE DEF RET4.I
0195  01301 000000  STWO  NOP
0196  01302 061301        LDA STWO
0197  01303 002004        INA
0198  01304 062004        LAA
0199  01305 071301        STA STWO
0200  01306 125301        JMP STWO.I
0201  01307 102276  SIT0  DEF RET9.I
0202  01310 000002  OT2   CCT 2
0203  01311 000001  IZB   CCT 1
0204  01312 003625  IIA0  DEF IZ1
0205  01313 052525  PBT1  CCT 052525
0206  01314 125252  PBT2  CCT 125252
0207  01315 003631  IIPA0 DEF PAT1
0208  01316 003651  AII   DEF AA
0209  01317 000000  SPAT0 CCT 0
0210  01320 003703  IIPS0 DEF SPAT1
0211  01321 136456  ADMK  CCT 136456
0212  01322 132455  ADMKB CCT 132455
0213  02000               ORG 2000H
0214  02000 025276  TJMP1 JMP BASE       JUMP TO BASE PAGE-IND. TO PAGE 1
0215  02001 117600        JSB ERR1.I
0216  02002 002000        DEF *-2
0217  02003 127601  RET1  JMP FIVE.I     JUMP TO PAGE 2 IND.
0218  02004 117600        JSB ERR1.I
0219  02005 002003        DEF *-2
0220  02006 127602  RET2  JMP SIX,I      JMP  TO PAGE 3 IND.
0221  02007 117600        JSB ERR1.I
0222  02010 002006        DEF *-2
0223  02011 127603  RET3  JMP ITWO.I     JMP IND. TO PAGE 2,3,0,1
0224  02012 117600        JSB ERR1.I
0225  02013 002011        DEF *-2
0226  02014 002017  RET4  DEF *+3        FOURTH LEVEL IS DIRECT
0227  02015 117600        JSB ERR1.I

PAGE 0012 #02                                                    HP 20401BL

0228  02016 002011        DEF *-5
0229  02017 063606        LDA ASEQ+2     A AND B JUMP TEST
0230  02020 070002        STA 2
0231  02021 063604        LDA ASEQ
0232  02022 067605        LDB ASEQ+1
0233  02023 024000        JMP 0
0234  02024 117600        JSB ERR1.I
0235  02025 002023        DEF *-2
0236  02026 063607  RET5  LDA ASEQ+3
0237  02027 070002        STA 2
0238  02030 067605        LDB ASEQ+1
0239  02031 024001        JMP 1
0240  02032 117600        JSB ERR1.I
0241  02033 002031        DEF *-2
0242  02034 063612  RET6  LDA ASEQI+2
0243  02035 070002        STA 2
0244  02036 063610        LDA ASEQI
0245  02037 067611        LDB ASEQI+1
0246  02040 124000        JMP 0,I
0247  02041 117600        JSB ERR1.I
0248  02042 002040        DEF *-2
0249  02043 002046  RET7  DEF *+3
0250  02044 117600        JSB ERR1.I
0251  02045 002040        DEF *-5
0252  02046 063613        LDA ASEQI+3
0253  02047 070002        STA 2
0254  02050 067611        LDB ASEQI+1
0255  02051 124001        JMP 1,I
0256  02052 117600        JSB ERR1.I
0257  02053 002051        DEF *-2
0258  02054 002057  RET8  DEF *+3
0259  02055 117600        JSB ERR1.I
0260  02056 002051        DEF *-5
0261  02057 002500        CLA,CLE
0262  02060 000400        CLB
0263  02061 000000        NOP            MODTLE LOOP
0264  02062 015301  TJSB1 JSB STWO       JSB TO BASE PAGE
0265  02063 117600        JSB ERR1.I
0266  02064 002062        DEF *-2
0267  02065 117614        JSB SIFVE,I    JSB IND. TO PAGE 2
0268  02066 117600        JSB ERR1.I
0269  02067 002065        DEF *-2
0270  02070 117615        JSB SISIX,I    JSB IND. TO PAGE 3
0271  02071 117600        JSB ERR1.I
0272  02072 002070        DEF *-2
0273  02073 117616        JSB SIT2.I     JSB IND. TO PAGE 1,2,3,0,1
0274  02074 117600        JSB ERR1.I
0275  02075 002073        DEF *-2
0276  02076 002101  RET9  DEF *+3
0277  02077 117600        JSB ERR1.I
0278  02100 002073        DEF *-5
0279  02101 000000  T9    NOP            P+1=002073
0280  02102 062101        LDA T9
0281  02103 043617        ADA OT12
0282  02104 072101        STA T9
0283  02105 126101        JMP T9,I
0284  02106 067620        LDB BINST      A AND B JSB TEST

PAGE 0013 #02                                                    HP 20401BL

0285  02107 063621        LDA INST2
0286  02110 070002        STA 2
0287  02111 063622        LDA INST3
0288  02112 070003        STA 3
0289  02113 063623        LDA INST4
0290  02114 070004        STA 4
0291  02115 002400        CLA
0292  02116 014000  FXIA  JSB 0          JSB TO A DIRECT
0293  02117 117600        JSB ERR1.I
0294  02120 002116        DEF *-2
0295  02121 067620        LDB BINST
0296  02122 063621        LDA INST2
0297  02123 070002        STA 2
0298  02124 063622        LDA INST3
0299  02125 070003        STA 3
0300  02126 063623        LDA INST4
0301  02127 070004        STA 4
0302  02130 002400        CLA
0303  02131 117624  FX2A  JSB TAI,I      JSB TO A INDIRECT
0304  02132 117600        JSB ERR1.I
0305  02133 002131        DEF *-2
0306  02134 002500        CLA,CLE
0307  02135 000400        CLB
0308  02136 000000        NOP            MODULE LOOP
0309  02137 035311  TISZ1 ISZ IZB        ISZ TO BASE PAGE
0310  02140 026137        JMP TISZ1
0311  02141 061311        LDA IZB
0312  02142 002002        SZA
0313  02143 026147        JMP BAD1
0314  02144 002004        INA
0315  02145 071311        STA IZB
0316  02146 026153        JMP CONT1
0317  02147 117600  BAD1  JSB ERR1.I
0318  02150 002137        DEF *-9
0319  02151 002404        CLA,INA
0320  02152 071311        STA IZB
0321  02153 002400  CONT1 CLA
0322  02154 037625        ISZ IZ1        ISZ TO CURPENT PAGE
0323  02155 026154        JMP CONT1+1
0324  02156 063625        LDA IZ1
0325  02157 002002        SZA
0326  02160 026164        JMP BAD2
0327  02161 002004        INA
0328  02162 073625        STA IZ1
0329  02163 026170        JMP CONT2
0330  02164 117600  BAD2  JSB ERR1.I
0331  02165 002154        DEF *-9
0332  02166 002404        CLA,INA
0333  02167 073625        STA IZ1
0334  02170 002400  CONT2 CLA
0335  02171 137626        ISZ IZ2,I      ISZ INDIRECT TO PAGE 2
0336  02172 026171        JMP CONT2+1
0337  02173 163626        LDA IZ2,I
0338  02174 002002        SZA
0339  02175 026201        JMP BAD3
0340  02176 002004        INA
0341  02177 173626        STA IZ2,I

PAGE 0014 #02                                                    HP 20401BL

0342  02200 026205        JMP CONT3
0343  02201 117600  BAD3  JSB ERR1.I
0344  02202 002171        DEF *-9
0345  02203 002404        CLA,INA
0346  02204 173626        STA IZ2,I
0347  02205 002400  CONT3 CLA
0348  02206 137627        ISZ IZ3,I      ISZ INDIRECT TO PAGE 3
0349  02207 026206        JMP CONT3+1
0350  02210 163627        LDA IZ3,I
0351  02211 002002        SZA
0352  02212 026216        JMP BAD4
0353  02213 002004        INA
0354  02214 173627        STA IZ3,I
0355  02215 026222        JMP CONT4
0356  02216 117600  BAD4  JSB ERR1.I
0357  02217 002206        DEF *-9
0358  02220 002404        CLA,INA
0359  02221 173627        STA IZ3,I
0360  02222 002400  CONT4 CLA
0361  02223 137630        ISZ IIZ1.I     ISZ INDIRECT TO PAGE 1,2,3,0
0362  02224 026223        JMP CONT4+1
0363  02225 063625        LDA IZ1
0364  02226 002002        SZA
0365  02227 026233        JMP BAD5
0366  02230 002004         INA
0367  02231 073625        STA IZ1
0368  02232 026237        JMP CONT5
0369  02233 117600  BAD5  JSB ERR1.I
0370  02234 002223        DEF *-9
0371  02235 002404        CLA,INA
0372  02236 073625        STA IZ1
0373  02237 002404  CONT5 CLA,INA
0374  02240 034000        ISZ 0          ISZ A DIRECT
0375  02241 026240        JMP CONT6+1
0376  02242 064000        LDB 0
0377  02243 006002        SZB
0378  02244 026246        JMP BAD6
0379  02245 026251        JMP CONT6
0380  02246 117600  BAD6  JSB ERR1.I
0381  02247 002240        DEF *-7
0382  02250 002400        CLA
0383  02251 006404  CONT6 CLB,INB
0384  02252 034001        ISZ 1          ISZ B DIRECT
0385  02253 026252        JMP CONT6+1
0386  02254 060001        LDA 1
0387  02255 002002        SZA
0388  02256 026260        JMP BAD7
0389  02257 026263        JMP CONT7
0390  02260 117600  BAD7  JSB ERR1.I
0391  02261 002252        DEF *-7
0392  02262 006400        CLB
0393  02263 002404  CONT7 CLA,INA
0394  02264 006404        CLB,INB
0395  02265 134000        ISZ 0,I        ISZ B INDIRECT
0396  02266 026265        JMP CONT7+2
0397  02267 060001        LDA 1
0398  02270 002002        SZA
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PAGE 0015 #02                                                    HP 20401BL

0399  02271 026273          JMP BAD8
0400  02272 026275          JMP CONTA
0401  02273 117600  BAD8    JSB ERR1.I
0402  02274 002265          DEF *-7
0403  02275 006400  CONT8   CLB
0404  02276 002404          CLA,INA
0405  02277 134001          ISZ 1,I          ISZ A INDIRECT
0406  02300 026277          JMP CONT8+2
0407  02301 064000          LDB 0
0408  02302 006002          SZB
0409  02303 026305          JMP BAD9
0410  02304 026307          JMP CONT9
0411  02305 117600  BAD9    JSB ERR1.I
0412  02306 002277          DEF *-7
0413  02307 002500  CONT9   CLA,CLE
0414  02310 006400          CLB
0415  02311 000000          NOP              MODULE LOOP
0416  02312 063631  TCFA1   LDA PAT1
0417  02313 051313          CPA PBT1         CPA TO BASE PAGE
0418  02314 026317          JMP *+3
0419  02315 117600          JSB ERR1.I
0420  02316 002313          DEF *-3
0421  02317 063632          LDA PAT2
0422  02320 053632          CPA PAT2         CPA TO CURRENT PAGE
0423  02321 026324          JMP *+3
0424  02322 117600          JSB ERR1.I
0425  02323 002320          DEF *-3
0426  02324 063631          LDA PAT1
0427  02325 153633          CPA IPAT2,I      CPA TO PAGE 2 INDIRECT
0428  02326 026331          JMP *+3
0429  02327 117600          JSB ERR1.I
0430  02330 002325          DEF *-3
0431  02331 063632          LDA PAT2
0432  02332 153634          CPA IPAT3,I      CPA TO PAGE 3 INDIRECT
0433  02333 026336          JMP *+3
0434  02334 117600          JSB ERR1.I
0435  02335 002332          DEF *-3
0436  02336 063631          LDA PAT1
0437  02337 153635          CPA IIPAT,I      CPA TO PAGE 1,2,3,0,1
0438  02340 026343          JMP *+3
0439  02341 117600          JSB ERR1.I
0440  02342 002337          DEF *-3
0441  02343 063640          LDA C2
0442  02344 070002          STA 2
0443  02345 063641          LDA C3
0444  02346 070003          STA 3
0445  02347 063642          LDA C4
0446  02350 070004          STA 4
0447  02351 063636          LDA CA
0448  02352 067637          LDB CB
0449  02353 024000          JMP 0            CPA TO A DIRECT
0450  02354 117600  BAD10   JSB ERR1.I
0451  02355 002353          DEF *-2
0452  02356 063643  CCCN1   LDA CAI
0453  02357 150000          CPA 0,I          CPA TO A INDIRECT
0454  02360 026363          JMP *+3
0455  02361 117600          JSB ERR1.I
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PAGE 0016 #02                                                    HP 20401BL

0456  02362 002357          DEF *-3
0457  02363 002404          CLA,INA
0458  02364 006404          CLB,INB
0459  02365 150000          CPA 0,I          CPA TO A INDIRECT (TO B)
0460  02366 026371          JMP *+3
0461  02367 117600          JSB ERR1.I
0462  02370 002365          DEF *-3
0463  02371 063632          LDA PAT2
0464  02372 067632          LDB PAT2
0465  02373 050001          CPA 1            CPA TO B DIRECT
0466  02374 026377          JMP *+3
0467  02375 117600          JSB ERR1.I
0468  02376 002373          DEF *-3
0469  02377 002500          CLA,CLE
0470  02400 006400          CLB
0471  02401 000000          NOP              MODULE LOOP
0472  02402 067631  TCPB1   LDB PAT1
0473  02403 055313          CPB PBT1         CPB TO BASE PAGE
0474  02404 026407          JMP *+3
0475  02405 117600          JSB ERR1.I
0476  02406 002403          DEF *-3
0477  02407 067632          LDB PAT2
0478  02410 057632          CPB PAT2         CPB TO CURRENT PAGE
0479  02411 026414          JMP *+3
0480  02412 117600          JSB ERR1.I
0481  02413 002410          DEF *-3
0482  02414 067631          LDB PAT1
0483  02415 157633          CPB IPAT2,I      CPB TO PAGE 2 INDIRECT
0484  02416 026421          JMP *+3
0485  02417 117600          JSB ERR1.I
0486  02420 002415          DEF *-3
0487  02421 067632          LDB PAT2
0488  02422 157634          CPB IPAT3,I      CPB TO PAGE 3 INDIRECT
0489  02423 026426          JMP *+3
0490  02424 117600          JSB ERR1.I
0491  02425 002422          DEF *-3
0492  02426 067631          LDB PAT1
0493  02427 157635          CPB IIPAT,I      CPB TO PAGE 1,2,3,0,1
0494  02430 026433          JMP *+3
0495  02431 117600          JSB ERR1.I
0496  02432 002427          DEF *-3
0497  02433 063645          LDA C21
0498  02434 070002          STA 2
0499  02435 063646          LDA C31
0500  02436 070003          STA 3
0501  02437 063647          LDA C41
0502  02440 070004          STA 4
0503  02441 063650          LDA C51
0504  02442 070005          STA 5
0505  02443 067644          LDB CB1
0506  02444 024001          JMP 1            CPB TO B DIRECT
0507  02445 117600  BAD11   JSB ERR1.I
0508  02446 002444          DEF *-2
0509  02447 067643  CCCN2   LDB CAI
0510  02450 154001          CPB 1,I          CPB TO B INDIRECT
0511  02451 026454          JMP *+3
0512  02452 117600          JSB ERR1.I
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PAGE 0017 #02                                                    HP 20401BL

0513  02453 002450          DEF *-3
0514  02454 002404          CLA,INA
0515  02455 006404          CLB,INB
0516  02456 154000          CPB 0,I          CPB TO B INDIRECT (B TO B)
0517  02457 026462          JMP *+3
0518  02460 117600          JSB ERR1.I
0519  02461 002456          DEF *-3
0520  02462 063632          LDA PAT2
0521  02463 067632          LDB PAT2
0522  02464 054000          CPB 0            CPB TO A DIRECT
0523  02465 026470          JMP *+3
0524  02466 117600          JSB ERR1.I
0525  02467 002464          DEF *-3
0526  02470 002500          CLA,CLE
0527  02471 006400          CLB
0528  02472 000000          NOP              MODULE LOOP
0529  02473 063631  TAND1   LDA PAT1
0530  02474 011314          AND PBT2         AND WITH BASE PAGE
0531  02475 002002          SZA
0532  02476 026500          JMP *+2
0533  02477 026502          JMP CAN1
0534  02500 117600          JSB ERR1.I
0535  02501 002474          DEF *-5
0536  02502 002400  CAN1    CLA
0537  02503 063632          LDA PAT2
0538  02504 013632          AND PAT2         AND WITH CURRENT PAGE
0539  02505 053632          CPA PAT2
0540  02506 026511          JMP CAN2
0541  02507 117600          JSB ERR1.I
0542  02510 002504          DEF *-4
0543  02511 002400  CAN2    CLA
0544  02512 063631          LDA PAT1
0545  02513 113633          AND IPAT2,I      AND WITH PAGE 2 INDIRECT
0546  02514 053631          CPA PAT1
0547  02515 026520          JMP CAN3
0548  02516 117600          JSB ERR1.I
0549  02517 002513          DEF *-4
0550  02520 002400  CAN3    CLA
0551  02521 063632          LDA PAT2
0552  02522 113634          AND IPAT3,I      AND WITH PAGE 3 INDIRECT
0553  02523 053632          CPA PAT2
0554  02524 026527          JMP CAN4
0555  02525 117600          JSB ERR1.I
0556  02526 002522          DEF *-4
0557  02527 002400  CAN4    CLA
0558  02530 063632          LDA PAT2
0559  02531 113635          AND IIPAT,I      AND INDIRECT PAGE 1,2,3,0,1
0560  02532 002002          SZA
0561  02533 026535          JMP *+2
0562  02534 026537          JMP CAN5
0563  02535 117600          JSB ERR1.I
0564  02536 002531          DEF *-5
0565  02537 002400  CAN5    CLA
0566  02540 063653          LDA A2
0567  02541 070002          STA 2
0568  02542 063654          LDA A3
0569  02543 070003          STA 3
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PAGE 0018 #02                                                    HP 20401BL

0570  02544 063655          LDA A4
0571  02545 070004          STA 4
0572  02546 063656          LDA A5
0573  02547 070005          STA 5
0574  02550 063651          LDA AA
0575  02551 067652          LDB AB
0576  02552 024000          JMP 0            AND TO A DIRECT FROM A
0577  02553 000000          CCT 0
0578  02554 117600  BAI12   JSB ERR1.I
0579  02555 002553          DEF *-2
0580  02556 002400  CAN6    CLA
0581  02557 063657          LDA AAI
0582  02560 110000          AND 0,I          AND TO A INDIRECT
0583  02561 053657          CPA AAI
0584  02562 026565          JMP CAN7
0585  02563 117600          JSB ERR1.I
0586  02564 002560          DEF *-4
0587  02565 002500  CAN7    CLA,CLE
0588  02566 006400          CLB
0589  02567 000000          NOP              MODULE LOOP
0590  02570 063631  TXOR1   LDA PAT1
0591  02571 021313          XOR PBT1         XOR WITH BASE PAGE
0592  02572 002002          SZA
0593  02573 026575          JMP *+2
0594  02574 026577          JMP CCAN1
0595  02575 117600          JSB ERR1.I
0596  02576 002571          DEF *-5
0597  02577 002400  CCAN1   CLA
0598  02600 063632          LDA PAT2
0599  02601 023632          XOR PAT2         XOR WITH CURRENT PAGE
0600  02602 002002          SZA
0601  02603 026605          JMP *+2
0602  02604 026607          JMP CCAN2
0603  02605 117600          JSB ERR1.I
0604  02606 002601          DEF *-5
0605  02607 002400  CCAN2   CLA
0606  02610 063632          LDA PAT2
0607  02611 123633          XOR IPAT2,I      XOR WITH PAGE 2
0608  02612 003002          CMA,SZA
0609  02613 026615          JMP *+2
0610  02614 026617          JMP CCAN3
0611  02615 117600          JSB ERR1.I
0612  02616 002611          DEF *-5
0613  02617 002400  CCAN3   CLA
0614  02620 063631          LDA PAT1
0615  02621 123634          XOR IPAT3,I      XOR WITH PAGE 3
0616  02622 003002          CMA,SZA
0617  02623 026625          JMP *+2
0618  02624 026627          JMP CCAN4
0619  02625 117600          JSB ERR1.I
0620  02626 002621          DEF *-5
0621  02627 002400  CCAN4   CLA
0622  02630 063631          LDA PAT1
0623  02631 123635          XOR IIPAT,I      XOR WITH PAGE 1,2,3,0,1
0624  02632 003002          SZA
0625  02633 026635          JMP *+2
0626  02634 026637          JMP CCAN5
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0627  02635 117600          JSB ERR1.I
0628  02636 002631          DEF *-5
0629  02637 002400  CCAN5   CLA
0630  02640 063662          LDA X2
0631  02641 070002          STA 2
0632  02642 063663          LDA X3
0633  02643 070003          STA 3
0634  02644 063664          LDA X4
0635  02645 070004          STA 4
0636  02646 063665          LDA X5
0637  02647 070005          STA 5
0638  02650 063660          LDA XA
0639  02651 067661          LDB XB
0640  02652 024000          JMP 0               XOR TO A FROM A DIRECT
0641  02653 000000          OCT 0
0642  02654 117600  BAD13   JSB ERR1.I
0643  02655 002653          DEF *-2
0644  02656 002400  CCAN6   CLA
0645  02657 063657          LDA AAI
0646  02660 122000          XOR 0,I             XOR TO A FROM A INDIRECT
0647  02661 002002          SZA
0648  02662 026664          JMP *+2
0649  02663 026666          JMP CCAN7
0650  02664 117600          JSB ERR1.I
0651  02665 002660          DEF *-5
0652  02666 002500  CCAN7   CLA,CLE
0653  02667 006400          CLB
0654  02670 000060          NOP                 MODULE LOOP
0655  02671 063631  TICR1   LDA PAT1
0656  02672 031314          IOR PBT2            IOR TO BASE PAGE
0657  02673 003002          CMA,SZA
0658  02674 026676          JMP *+2
0659  02675 026700          JMP CCOR1
0660  02676 117600          JSB ERR1.I
0661  02677 002672          DEF *-5
0662  02700 002400  CCOR1   CLA
0663  02701 063632          LDA PAT2
0664  02702 033631          IOR PAT1            IOR TO CURRENT PAGE
0665  02703 003002          CMA,SZA
0666  02704 026706          JMP *+2
0667  02705 026710          JMP CCOR2
0668  02706 117600          JSB ERR1.I
0669  02707 002702          DEF *-5
0670  02710 002400  CCOR2   CLA
0671  02711 063632          LDA PAT2
0672  02712 133633          IOR IPAT2,I         IOR TO PAGE 2 INDIRECT
0673  02713 003002          CMA,SZA
0674  02714 026716          JMP *+2
0675  02715 026720          JMP CCOR3
0676  02716 117600          JSB ERR1.I
0677  02717 002712          DEF *-5
0678  02720 002400  CCOR3   CLA
0679  02721 063631          LDA PAT1
0680  02722 133634          IOR IPAT3,I         IOR TO PAGE 3 INDIRECT
0681  02723 003002          CMA,SZA
0682  02724 026724          JMP *+2
0683  02725 026730          JMP CCOR4
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0684  02726 117600          JSB ERR1.I          ERROR
0685  02727 002722          DEF *-5
0686  02730 002400  CCOR4   CLA
0687  02731 063632          LDA PAT2
0688  02732 133635          IOR IIPAT,I         IOR TOPAGE 1,2,3,0,1 INDIRECT
0689  02733 003002          CMA,SZA
0690  02734 026736          JMP *+2
0691  02735 026740          JMP CCOR5
0692  02736 117600          JSB ERR1.I
0693  02737 002732          DEF *-5
0694  02740 002400  CCLR5   CLA
0695  02741 063670          LDA I2
0696  02742 070002          STA 2
0697  02743 063671          LDA I3
0698  02744 070003          STA 3
0699  02745 063666          LDA IA
0700  02746 067667          LDB IB
0701  02747 024002          JMP 0
0702  02750 000000          OCT 0               IOR TO A FROM A DIRECT
0703  02751 003002  CCOR6   CMA,SZA
0704  02752 026754          JMP *+2
0705  02753 026756          JMP CCOR7
0706  02754 117600          JSB ERR1.I
0707  02755 002752          DEF *-5
0708  02756 002400  CCLR7   CLA
0709  02757 063657          LDA AAI
0710  02760 133600          IOR 0,I             IOR TO A FROM A INDIRECT
0711  02761 053657          CPA AAI
0712  02762 026765          JMP CCOR8
0713  02763 117600          JSB ERR1.I
0714  02764 002762          DEF *-4
0715  02765 002500  CCOR8   CLA,CLE
0716  02766 006400          CLB
0717  02767 000060          NOP                 MODULE LOOP
0001  02770 061313  TLIA1   LDA PBT1            LDA FROM BASE PAGE
0002  02771 053631          CPA PAT1
0003  02772 026775          JMP CCLN1
0004  02773 117600          JSB ERR1.I
0005  02774 002770          DEF *-4
0006  02775 002400  CCLN1   CLA
0007  02776 063632          LDA PAT2            LDA FROM CURRENT PAGE
0008  02777 051314          CPA PBT2
0009  03000 027003          JMP CCLN2
0010  03001 117600          JSB ERR1.I
0011  03002 002776          DEF *-4
0012  03003 002400  CCLN2   CLA
0013  03004 163633          LDA IPAT2,I         LDA FROM PAGE 2 INDIRECT
0014  03005 053631          CPA PAT1
0015  03006 027011          JMP CCLN3
0016  03007 117600          JSB ERR1.I
0017  03010 003004          DEF *-4
0018  03011 002400  CCLN3   CLA
0019  03012 163634          LDA IPAT3,I         LDA FROM PAGE 3 INDIRECT
0020  03013 053632          CPA PAT2
0021  03014 027017          JMP CCLN4
0022  03015 117600          JSB ERR1.I
0023  03016 003012          DEF *-4
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0024  03017 002400  CCLN4   CLA
0025  03020 163635          LDA IIPAT,I         LDA FROM PAGE 1,2,3,0,1
0026  03021 053631          CPA PAT1
0027  03022 027025          JMP CCLN5
0028  03023 117600          JSB ERR1.I
0029  03024 003020          DEF *-4
0030  03025 002400  CCLN5   CLA
0031  03026 063674          LDA L2
0032  03027 070002          STA 2
0033  03030 063675          LDA L3
0034  03031 070003          STA 3
0035  03032 063676          LDA L4
0036  03033 070004          STA 4
0037  03034 063677          LDA L5
0038  03035 070005          STA 5
0039  03036 063672          LDA LA              LDA TO A DIRECT
0040  03037 067673          LDB LB
0041  03040 024000          JMP 0
0042  03041 000000          OCT 0
0043  03042 117600  BAI14   JSB ERR1.I
0044  03043 003041          DEF *-2
0045  03044 002400  CCLN6   CLA
0046  03045 063633          LDA IPAT2
0047  03046 150000          LDA 0,I             LDA WITH A INDIRECT
0048  03047 053631          CPA PAT1
0049  03050 027053          JMP CCLN7
0050  03051 117600          JSB ERR1.I
0051  03052 003046          DEF *-4
0052  03053 002500  CCLN7   CLA,CLE
0053  03054 006400          CLB
0054  03055 000060          NOP                 MODULE LOOP
0055  03056 065313  TLIB1   LDB PBT1            LDB FROM BASE PAGE
0056  03057 057631          CPB PAT1
0057  03060 027063          JMP CCLB1
0058  03061 117600          JSB ERR1.I
0059  03062 003056          DEF *-4
0060  03063 006400  CCLB1   CLB
0061  03064 067632          LDB PAT2            LDB FROM CURRENT PAGE
0062  03065 055314          CPB PBT2
0063  03066 027071          JMP CCLB2
0064  03067 117600          JSB ERR1.I
0065  03070 003064          DEF *-4
0066  03071 006400  CCLB2   CLB
0067  03072 167633          LDB IPAT2,I         LDB FROM PAGE 2 INDIRECT
0068  03073 057631          CPB PAT1
0069  03074 027077          JMP CCLB3
0070  03075 117600          JSB ERR1.I
0071  03076 003072          DEF *-4
0072  03077 006400  CCLB3   CLB
0073  03100 167634          LDB IPAT3,I         LDB FROM PAGE 3 INDIRECT
0074  03101 057632          CPB PAT2
0075  03102 027105          JMP CCLB4
0076  03103 117600          JSB ERR1.I
0077  03104 003100          DEF *-4
0078  03105 006400  CCLB4   CLB
0079  03106 167635          LDB IIPAT,I         LDB FROM PAGE 1,2,3,0,1
0080  03107 057631          CPB PAT1
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0081  03110 027113          JMP CCLB5
0082  03111 117600          JSB ERR1.I
0083  03112 003106          DEF *-4
0084  03113 006400  CCLB5   CLB
0085  03114 067701          LDB L2R
0086  03115 074002          STB 2
0087  03116 067702          LDB L3R
0088  03117 074003          STB 3
0089  03120 067700          LDB LBR
0090  03121 024001          JMP 1               LDB TO B DIRECT
0091  03122 000001          OCT 1
0092  03123 057632  CCLB6   CPB PAT2
0093  03124 027127          JMP CCLB7
0094  03125 117600          JSB ERR1.I
0095  03126 003122          DEF *-4
0096  03127 006400  CCLB7   CLB
0097  03130 067634          LDB IPAT3
0098  03131 164001          LDB 1,I             LDB WITH B INDIRECT
0099  03132 057632          CPB PAT2
0100  03133 027136          JMP CCLB8
0101  03134 117600          JSB ERR1.I
0102  03135 003131          DEF *-4
0103  03136 002500  CCLB8   CLA,CLE
0104  03137 006400          CLB
0105  03140 000000          NOP                 MODULE LOOP
0106  03141 063631  TSTA1   LDA PAT1
0107  03142 071317          STA SPAT0           STA INTO BASE PAGE
0108  03143 051317          CPA SPAT0
0109  03144 027147          JMP CCSA1
0110  03145 117600          JSB ERR1.I
0111  03146 003142          DEF *-4
0112  03147 002400  CCSA1   CLA
0113  03150 063632          LDA PAT2
0114  03151 073703          STA SPAT1           STA INTO CURRENT PAGE
0115  03152 053703          CPA SPAT1
0116  03153 027156          JMP CCSA2
0117  03154 117600          JSB ERR1.I
0118  03155 003151          DEF *-4
0119  03156 002400  CCSA2   CLA
0120  03157 063631          LDA PAT1
0121  03160 173704          STA SPT2,I          STA INTO PAGE 2 INDIRECT
0122  03161 153704          CPA SPT2,I
0123  03162 027165          JMP CCSA3
0124  03163 117600          JSB ERR1.I
0125  03164 003160          DEF *-4
0126  03165 002400  CCSA3   CLA
0127  03166 063631          LDA PAT1
0128  03167 173705          STA SPT3,I          STA INTO PAGE 3 INDIRECT
0129  03170 153705          CPA SPT3,I
0130  03171 027174          JMP CCSA4
0131  03172 117600          JSB ERR1.I
0132  03173 003167          DEF *-4
0133  03174 002400  CCSA4   CLA
0134  03175 263632          LDA PAT2
0135  03176 173706          STA IIPST,I         STA INTO PAGES 1,2,3,0,1 INDIR.
0136  03177 053703          CPA SPAT1
0137  03200 027203          JMP CCSA5
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PAGE 0023 #03                                   HP 20401BL

0138  03201 117600          JSB ERR1.I
0139  03202 003176          DEF *-4
0140  03203 002400  CCSA5   CLA
0141  03204 063711          LDA S2
0142  03205 070002          STA 2
0143  03206 063707          LDA SA
0144  03207 067710          LDB SB
0145  03210 024000          JMP 0
0146  03211 000000          OCT 0           STA INTO BASE PAGE WITH A
0147  03212 063767  CCSA6   LDA SA
0148  03213 051317          CPA SPAT#
0149  03214 027217          JMP CCSA7
0150  03215 117600          JSB ERR1.I
0151  03216 003211          DEF *-5
0152  03217 002400  CCSA7   CLA
0153  03220 063643          LDA CAI
0154  03221 170000          STA 0,I         STA INDIRECT WITH A
0155  03222 053643          CPA CAT
0156  03223 027226          JMP CCSAA
0157  03224 117600          JSB ERR1.I
0158  03225 003221          DEF *-4
0159  03226 002500  CCSAB   CLA,CLE
0160  03227 006400          CLB
0161  03230 000000          NOP             MODULE LOOP
0162  03231 067631  TSTB1   LDB PAT1
0163  03232 075317          STB SPAT#       STB INTO BASE PAGE
0164  03233 055317          CPB SPAT#
0165  03234 027237          JMP CCSB1
0166  03235 117600          JSB ERR1.I
0167  03236 003232          DEF *-4
0168  03237 006400  CCSB1   CLB
0169  03240 067632          LDB PAT2
0170  03241 077703          STB SPAT1       STB INTO CURRENT PAGE
0171  03242 057703          CPB SPAT1
0172  03243 027246          JMP CCSB2
0173  03244 117600          JSB ERR1.I
0174  03245 003241          DEF *-4
0175  03246 006400  CCSB2   CLB
0176  03247 067631          LDB PAT1
0177  03250 177704          STB SPT2,I      STB INTO PAGE 2 INDIRECT
0178  03251 157704          CPB SPT2,I
0179  03252 027255          JMP CCSB3
0180  03253 117600          JSB ERR1.I
0181  03254 003252          DEF *-4
0182  03255 006400  CCSB3   CLB
0183  03256 067632          LDB PAT2
0184  03257 177705          STB SPT3,I      STB INTO PAGE 3 INDIRECT
0185  03260 157705          CPB SPT3,I
0186  03261 027264          JMP CCSB4
0187  03262 117600          JSB ERR1.I
0188  03263 003257          DEF *-4
0189  03264 006400  CCSB4   CLB
0190  03265 067631          LDB PAT1
0191  03266 177706          STB IIPST,I     STB INTO PAGES 1,2,3,0,1 INDIR.
0192  03267 057703          CPB SPAT1
0193  03270 027273          JMP CCSB5
0194  03271 117600          JSB ERR1.I
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PAGE 0024 #03                                   HP 20401BL

0195  03272 003266          DEF *-4
0196  03273 006400  CCSB5   CLB
0197  03274 067713          LDB S2B
0198  03275 074002          STB 2
0199  03276 067714          LDB S3B
0200  03277 074003          STB 3
0201  03300 067712          LDB SB1
0202  03301 024001          JMP 1           STB INTO BASE PAGE WITH B
0203  03302 000001          OCT 1
0204  03303 067712  CCSB6   LDB SB1
0205  03304 055317          CPB SPAT#
0206  03305 027310          JMP CCSB7
0207  03306 117600          JSB ERR1.I
0208  03307 003302          DEF *-5
0209  03310 006400  CCSB7   CLB
0210  03311 067643          LDB CAI
0211  03312 174001          STB 1,I         STB INDIRECT WITH B
0212  03313 057643          CPB CAI
0213  03314 027317          JMP CCSB8
0214  03315 117600          JSB ERR1.I
0215  03316 003312          DEF *-4
0216  03317 002500  CCSB8   CLA,CLE
0217  03320 006400          CLB
0218  03321 000000          NOP             MODULE LOOP
0219  03322 061313  TADA1   LDA PBT1
0220  03323 041313          ADA PBT1        ADA FROM BASE PAGE
0221  03324 053632          CPA PAT2
0222  03325 027327          JMP *+2
0223  03326 027331          JMP *+3
0224  03327 002041          SEZ,RSS         E=0
0225  03330 027333          JMP CCAD1
0226  03331 117600          JSB ERR1.I
0227  03332 003327          DEF *-7
0228  03333 002500  CCAD1   CLA,CLE
0229  03334 063632          LDA PAT2
0230  03335 043632          ADA PAT2        ADA FROM CURRENT PAGE
0231  03336 002004          INA
0232  03337 053631          CPA PAT1
0233  03340 027342          JMP *+2
0234  03341 027344          JMP *+3
0235  03342 002040          SEZ             E=1
0236  03343 027346          JMP CCAD2
0237  03344 117600          JSB ERR1.I
0238  03345 003335          DEF *-8
0239  03346 002500  CCAD2   CLA,CLE
0240  03347 063631          LDA PAT1
0241  03350 143633          ADA IPAT2,I     ADA FROM PAGE 2 INDIRECT
0242  03351 053632          CPA PAT2
0243  03352 027354          JMP *+2
0244  03353 027356          JMP *+3
0245  03354 002041          SEZ,RSS         E=0
0246  03355 027360          JMP CCAD3
0247  03356 117600          JSB ERR1.I
0248  03357 003350          DEF *-7
0249  03360 002500  CCAD3   CLA,CLE
0250  03361 063632          LDA PAT2
0251  03362 143634          ADA IPAT3,I     ADA FROM PAGE 3 INDIRECT
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PAGE 0025 #03                                   HP 20401BL

0252  03363 002004          INA
0253  03364 053631          CPA PAT1
0254  03365 027367          JMP *+2
0255  03366 027371          JMP *+3
0256  03367 002040          SEZ             E=1
0257  03370 027373          JMP CCAD4
0258  03371 117600          JSB ERR1.I
0259  03372 003362          DEF *-8
0260  03373 002500  CCAD4   CLA,CLE
0261  03374 063631          LDA PAT1
0262  03375 143635          ADA IIPAT,I     ADA FROM PAGES 1,2,3,0,1 INDIR.
0263  03376 053632          CPA PAT2
0264  03377 027401          JMP *+2
0265  03400 027403          JMP *+3
0266  03401 002041          SEZ,RSS         E=0
0267  03402 027405          JMP CCAD5
0268  03403 117600          JSB ERR1.I
0269  03404 003375          DEF *-7
0270  03405 002500  CCAD5   CLA,CLE
0271  03406 063717          LDA D2
0272  03407 070002          STA 2
0273  03410 063720          LDA D3
0274  03411 070003          STA 3
0275  03412 063721          LDA D4
0276  03413 074004          STA 4
0277  03414 063722          LDA D5
0278  03415 074005          STA 5
0279  03416 063715          LDA DA
0280  03417 067716          LDB DB
0281  03420 024000          JMP 0           ADA TO A FROM A DIRECT
0282  03421 000000          OCT 0
0283  03422 002041  CCAD6   SEZ,RSS         E=0
0284  03423 027426          JMP CCAD7
0285  03424 117600  ERR1    JSB ERR1.I
0286  03425 003421          DEF *-4
0287  03426 002500  CCAD7   CLA,CLE
0288  03427 063643          LDA CAI
0289  03430 140000          ADA 0,I         ADA TO A FROM A INDIRECT
0290  03431 053723          CPA ADMK1
0291  03432 027434          JMP *+2
0292  03433 027436          JMP *+3
0293  03434 002041          SEZ,RSS         E=0
0294  03435 027440          JMP CCADA
0295  03436 117600          JSB ERR1.I
0296  03437 003430          DEF *-7
0297  03440 002500  CCADB   CLA,CLE
0298  03441 006400          CLB
0299  03442 000000          NOP             MODULE LOOP
0300  03443 065313  TADB1   LDB PBT1
0301  03444 045313          ADB PBT1        ADB FROM BASE PAGE
0302  03445 057632          CPB PAT2
0303  03446 027450          JMP *+2
0304  03447 027452          JMP *+3
0305  03450 002041          SEZ,RSS         E=0
0306  03451 027454          JMP CCBD1
0307  03452 117600          JSB ERR1.I
0308  03453 003444          DEF *-7
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PAGE 0026 #03                                   HP 20401BL

0309  03454 006500  CCBD1   CLB,CLE
0310  03455 067632          LDB PAT2
0311  03456 047632          ADB PAT2        ADB FROM CURRENT PAGE
0312  03457 006004          INB
0313  03460 057631          CPB PAT1
0314  03461 027463          JMP *+2
0315  03462 027465          JMP *+3
0316  03463 002040          SEZ
0317  03464 027467          JMP CCBD2
0318  03465 117600          JSB ERR1.I
0319  03466 003456          DEF *-8
0320  03467 006500  CCBD2   CLB,CLE
0321  03470 067631          LDB PAT1
0322  03471 147633          ADB IPAT2,I     ADB FROM PAGE 2 INDIRECT
0323  03472 057632          CPB PAT2
0324  03473 027475          JMP *+2
0325  03474 027477          JMP *+3
0326  03475 002041          SEZ,RSS         E=0
0327  03476 027501          JMP CCBD3
0328  03477 117600          JSB ERR1.I
0329  03500 003471          DEF *-7
0330  03501 006500  CCBD3   CLB,CLE
0331  03502 067632          LDB PAT2
0332  03503 147634          ADB IPAT3,I     ADB FROM PAGE 3 INDIRECT
0333  03504 006004          INB
0334  03505 057631          CPB PAT1
0335  03506 027510          JMP *+2
0336  03507 027512          JMP *+3
0337  03510 002040          SEZ             E=1
0338  03511 027514          JMP CCBD4
0339  03512 117600          JSB ERR1.I
0340  03513 003503          DEF *-8
0341  03514 006500  CCBD4   CLB,CLE
0342  03515 067631          LDB PAT1
0343  03516 147635          ADB IIPAT,I     ADB FROM PAGES 1,2,3,0,1 INDIR.
0344  03517 057632          CPB PAT2
0345  03520 027522          JMP *+2
0346  03521 027524          JMP *+3
0347  03522 002041          SEZ,RSS         E=0
0348  03523 027526          JMP CCBD5
0349  03524 117600          JSB ERR1.I
0350  03525 003516          DEF *-7
0351  03526 006500  CCBD5   CLB,CLE
0352  03527 067725          LDB I21
0353  03530 074002          STB 2
0354  03531 067726          LDB I31
0355  03532 074003          STB 3
0356  03533 067724          LDB DB1
0357  03534 024001          JMP 1           ADB TO B FROM B DIRECT
0358  03535 000001          OCT 1
0359  03536 007002  CCBD6   CME,SZB
0360  03537 027542          JMP *+3
0361  03540 002041          SEZ,RSS         E=0
0362  03541 027544          JMP CCBD7
0363  03542 117600          JSB ERR1.I
0364  03543 003535          DEF *-6
0365  03544 006500  CCBD7   CLB,CLE
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PAGE 0027 #03                                   HP 20401BL

0366  03545 067643          LDA CAI
0367  03546 144001          ADB 1,I          ADB TO B FROM INDIRECT
0368  03547 057723          CPB ADMK1
0369  03550 027552          JMP *+2
0370  03551 027554          JMP *+3
0371  03552 002041          SEZ,RSS          E=0
0372  03553 027556          JMP CCBDA
0373  03554 117600          JSB ERR1.I
0374  03555 003546          DEF *-7
0375  03556 002500  CCBDB   CLA,CLE
0376  03557 006400          CLB
0377  03560 000000          NOP              MODULE LOOP
0378  03561 127562          JMP ITE,I
0379  03562 036000  ITE     DEF TCFA2
0380  03600                 ORG 3600B
0381  03600 001250  ERR1    DEF ERROR
0382  03601 105701  FIVE    DEF FIVE1,I
0383  03602 136001  SIX     DEF SIX1.I
0384  03603 105702  ITWO    DEF IFIVE,I
0385  03604 024001  ASEQ    JMP 1
0386  03605 124002          JMP 2,I
0387  03606 002026          DEF RET5
0388  03607 002234          DEF RET6
0389  03610 100001  ASEQ1   DEF 1,I
0390  03611 100002          DEF 2,I
0391  03612 102043          DEF RET7.I
0392  03613 102154          DEF RET8.I
0393  03614 005003  SIFVE   DEF SI5
0394  03615 006003  SISIX   DEF SI6
0395  03616 105311  SIT2    DEF SIT5.I
0396  03617 000012  CT12    OCT 12
0397  03620 064000  BINST   LDB 0
0398  03621 045310  INST2   ADB OT2
0399  03622 074000  INST3   STB 0
0400  03623 124000  INST4   JMP 0,I
0401  03624 100000  TAI     DEF 0,I
0402  03625 000001  I71     OCT 1
0403  03626 005412  I72     DEF IZ2
0404  03627 006012  I73     DEF I73
0405  03630 105313  II21    DEF II72.I
0406  03631 052525  PAT1    OCT 052525
0407  03632 125252  PAT2    OCT 125252
0408  03633 005014  IPAT2   DEF PAT5A
0409  03634 006014  IPAT3   DEF PAT6A
0410  03635 105015  IIPAT   DEF IIPA2,I
0411  03636 050004  CA      CPA 0
0412  03637 124103  C8      JMP 3,I
0413  03640 124004  C2      JMP 4,I
0414  03641 002356  C3      DEF CCON1
0415  03642 002354  C4      DEF BAD10
0416  03643 003643  CAI     DEF CAI
0417  03644 054001  C81     CPB 1
0418  03645 124004  C21     JMP 4,I
0419  03646 124005  C31     JMP 5,I
0420  03647 002447  C41     DEF CCON2
0421  03650 002445  C51     DEF BAD11
0422  03651 010000  AA      ANB 0
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PAGE 0028 #03                                   HP 20401BL

0423  03652 151316  AB      CPA AII,I
0424  03653 124004  A2      JMP 4,I
0425  03654 124005  A3      JMP 5,I
0426  03655 002556  A4      DEF CAN6
0427  03656 002554  A5      DEF BAD12
0428  03657 003657  AAI     DEF AAI
0429  03660 020000  XA      XOR 0
0430  03661 002062  XB      SZA
0431  03662 124004  X2      JMP 4,I
0432  03663 124005  X3      JMP 5,I
0433  03664 002654  X4      DEF BAD13
0434  03665 002656  X5      DEF CCAN6
0435  03666 031313  IA      IOR PBT1
0436  03667 031314  IB      IOR PBT2
0437  03670 124003  I2      JMP 3,I
0438  03671 002751  I3      DEF CCOR6
0439  03672 061314  LA      LDA PBT2
0440  03673 051314  LB      CPA PBT2
0441  03674 124004  L2      JMP 4,I
0442  03675 124005  L3      JMP 5,I
0443  03676 003044  L4      DEF CCLN6
0444  03677 003042  L5      DEF BAD14
0445  03700 065314  LBE     LDB PBT2
0446  03701 124003  L2E     JMP 3,I
0447  03702 003123  L3E     DEF CCLB4
0448  03723 000000  SPAT1   OCT 0
0449  03704 035015  SPT2    DEF SPAT2
0450  03705 036016  SPT3    DEF SPAT3
0451  03706 105017  IIPST   DEF IIPS1,I
0452  03707 071317  SA      STA SPATM
0453  03710 124002  SB      JMP 2,I
0454  03711 003212  S2      DEF CCSA6
0455  03712 075317  SB1     STB SPATM
0456  03713 124003  S2E     JMP 3,I
0457  03714 003303  S3E     DEF CCSB4
0458  03715 041321  DA      ADA ADMK
0459  03716 003002  DB      CMA,SZA
0460  03717 124004  D2      JMP 4,I
0461  03720 124005  D3      JMP 5,I
0462  03721 003424  D4      DEF NAR1
0463  03722 003422  D5      DEF CCAD6
0464  03723 007506  ADMK1   OCT 7506
0465  03724 045322  DB1     ADB ADMKB
0466  03725 124003  D21     JMP 3,I
0467  03726 003536  D31     DEF CCRD6
0468  04000                 ORG 4000B
0469  04000 002500  TCFA2   CLA,CLE
0470  04001 006404          CLB,INB
0471  04002 061313  LP1     LDA PBT1
0472  04003 051313          CPA PBT1         ITER. CPA TEST-ALTER. 1'S PATT.
0473  04004 026010          JMP GD1          GOOD
0474  04005 117000          JSB ERR2.I       ERROR
0475  04006 004003          DEF *-3
0476  04007 065267          LDB BTEMP
0477  04010 034001  GD1     ISZ 1            INCR. LOOP COUNT
0478  04011 026002          JMP LP1
0479  04012 002500          CLA,CLE          NEW TEST
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PAGE 0029 #03                                   HP 20401BL

0480  04013 006404          CLB,INB
0481  04014 061314  LP2     LDA PBT2
0482  04015 051314          CPA PBT2         ITER. CPA TEST-COMP. 1'S PATT.
0483  04016 026022          JMP GD2          GOOD
0484  04017 117000          JSB ERR2.I       ERROR
0485  04020 004015          DEF *-3
0486  04021 065267          LDB BTEMP
0487  04022 034001  GD2     ISZ 1            INCR. LOOP COUNT
0488  04023 026014          JMP LP2
0489  04024 000000          NOP              MODULE LOOP
0490  04025 002404  TCFB2   CLA,INA          NEW TEST
0491  04026 006500          CLB,CLE
0492  04027 065313  LP3     LDB PBT1
0493  04030 055313          CPB PBT1         ITER. CPB TEST-ALTER. 1'S PATT.
0494  04031 026035          JMP GD3          GOOD
0495  04032 117600          JSB ERR2.I       ERROR
0496  04033 004030          DEF *-3
0497  04034 061266          LDA ATEMP
0498  04035 034000  GD3     ISZ 0            INCR. LOOP COUNT
0499  04036 026027          JMP LP3
0500  04037 002404          CLA,INA
0501  04040 006404          CLB,INB
0502  04041 065314  LP4     LDB PBT2
0503  04042 055314          CPB PBT2         ITER. CPB TEST-COMPL. 1'S PATT.
0504  04043 026047          JMP GD4          GOOD
0505  04044 117600          JSB ERR2.I       ERROR
0506  04045 004042          DEF *-3
0507  04046 061266          LDA ATEMP
0508  04047 034000  GD4     ISZ 0            INCR. LOOP COUNT
0509  04050 026041          JMP LP4
0510  04051 000000          NOP              MODULE LOOP
0511  04052 002500  TAND2   CLA,CLE
0512  04053 006404          CLB,INB
0513  04054 061313  LP5     LDA PBT1
0514  04055 011314          ANB PBT2         ITER. AND TEST
0515  04056 002002          SZA
0516  04057 026061          JMP *+2          ERROR
0517  04060 026064          JMP GD5          GOOD
0518  04061 117600          JSB ERR2.I       ERROR
0519  04062 004055          DEF *-5
0520  04063 065267          LDB BTEMP
0521  04064 034001  GD5     ISZ 1            INCR. LOOP COUNT
0522  04065 026054          JMP LP5
0523  04066 002500          CLA,CLE
0524  04067 006404          CLB,INB
0525  04070 061313  LP6     LDA PBT1
0526  04071 011313          ANB PBT1         ITER. AND TEST
0527  04072 051313          CPA PBT1
0528  04073 026077          JMP GD6          GOOD
0529  04074 117600          JSB ERR2.I       ERROR
0530  04075 004071          DEF *-4
0531  04076 065267          LDB BTEMP
0532  04077 034001  GD6     ISZ 1            INCR. LOOP COUNT
0533  04100 026070          JMP LP6
0534  04101 002500          CLA,CLE
0535  04102 006404          CLB,INB
0536  04103 061314  LP7     LDA PBT2
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PAGE 0030 #03                                   HP 20401BL

0537  04104 011314          ANB PBT2         ITER. AND TEST
0538  04105 051314          CPA PBT2
0539  04106 026112          JMP GD7          GOOD
0540  04107 117600          JSB ERR2.I       ERROR
0541  04110 004104          DEF *-4
0542  04111 065267          LDB BTEMP
0543  04112 034001  GD7     ISZ 1
0544  04113 026103          JMP LP7
0545  04114 000000          NOP              MODULE LOOP
0546  04115 002500  TXOR2   CLA,CLE
0547  04116 006404          CLB,INB
0548  04117 061313  LP8     LDA PBT1
0549  04120 021314          XOR PBT2         ITER. XOR TEST
0550  04121 003002          CMA,SZA
0551  04122 026124          JMP *+2          ERROR
0552  04123 026127          JMP GD8          GOOD
0553  04124 117600          JSB ERR2.I       ERROR
0554  04125 004122          DEF *-5
0555  04126 065267          LDB BTEMP
0556  04127 034001  GD8     ISZ 1            INCR. LOOP COUNT
0557  04130 026117          JMP LP8
0558  04131 002500          CLA,CLE
0559  04132 006404          CLB,INB
0560  04133 061313  LP9     LDA PBT1
0561  04134 021313          XOR PBT1         ITER. XOR TEST
0562  04135 002002          SZA
0563  04136 026140          JMP *+2          ERROR
0564  04137 026143          JMP GD9          GOOD
0565  04140 117600          JSB ERR2.I       ERROR
0566  04141 004134          DEF *-5
0567  04142 065267          LDB BTEMP
0568  04143 034001  GD9     ISZ 1            INCR. LOOP COUNT
0569  04144 026133          JMP LP9
0570  04145 002500          CLA,CLE
0571  04146 006404          CLB,INB
0572  04147 061314  LP10    LDA PBT2
0573  04150 021314          XOR PBT2         ITER. XOR TEST
0574  04151 002002          SZA
0575  04152 026154          JMP *+2          ERROR
0576  04153 026157          JMP GD10         GOOD
0577  04154 117600          JSB ERR2.I       ERROR
0578  04155 004150          DEF *-5
0579  04156 065267          LDB BTEMP
0580  04157 034001  GD10    ISZ 1            INCR. LOOP COUNT
0581  04160 026147          JMP LP10
0582  04161 000000          NOP              MODULE LOOP
0583  04162 002500  TIOR2   CLA,CLE
0584  04163 006404          CLB,INB
0585  04164 061313  LP11    LDA PBT1
0586  04165 031314          IOR PBT2         ITER. IOR TEST
0587  04166 003002          CMA,SZA
0588  04167 026171          JMP *+2          ERROR
0589  04170 026174          JMP GD11         GOOD
0590  04171 117600          JSB ERR2.I       ERROR
0591  04172 004165          DEF *-5
0592  04173 065267          LDB BTEMP
0593  04174 034001  GD11    ISZ 1            INCR. LOOP COUNT
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0594  04175 026164          JMP LP11
0595  04176 002500          CLA,CLE
0596  04177 006404          CLB,INB
0597  04200 061314  LP12    LDA PBT2
0598  04201 031313          IOR PBT1        ITER. IOR TEST
0599  04202 003032          CMA,SZA
0600  04203 026205          JMP **2         ERROR
0601  04204 026210          JMP GD12        GOOD
0602  04205 117000          JSB ERR2.I      ERROR
0603  04206 004201          DEF *-5
0604  04207 065267          LDB BTEMP
0605  04210 034001  GD12    ISZ 1           INCR. LOOP COUNT
0606  04211 026200          JMP LP12
0607  04212 002500          CLA,CLE
0608  04213 006404          CLB,INB
0609  04214 061313  LP13    LDA PBT1
0610  04215 031313          IOR PBT1        ITER. IOR TEST
0611  04216 051313          CPA PBT1
0612  04217 026223          JMP GD13        GOOD
0613  04220 117000          JSB ERR2.I      ERROR
0614  04221 004215          DEF *-4
0615  04222 065267          LDB BTEMP
0616  04223 034001  GD13    ISZ 1           INCR LOOP COUNT
0617  04224 026214          JMP LP13
0618  04225 002500          CLA,CLE
0619  04226 006404          CLB,INB
0620  04227 061314  LP14    LDA PBT2
0621  04230 031314          IOR PBT2        ITER. IOR TEST
0622  04231 051314          CPA PBT2
0623  04232 026235          JMP GD14        GOOD
0624  04233 117000          JSB ERR2.I      ERROR
0625  04234 004230          DEF *-4
0626  04235 065267          LDB BTEMP
0627  04236 034001  GD14    ISZ 1           INCR. LOOP COUNT
0628  04237 026227          JMP LP14
0629  04240 000000          NOP             MODULE LOOP
0630  04241 002500  TLEA2   CLA,CLE
0631  04242 006404          CLB,INB
0632  04243 061313  LP15    LDA PBT1        ITER. LDA TEST
0633  04244 051313          CPA PBT1
0634  04245 026251          JMP GD15        GOOD
0635  04246 117000          JSB ERR2.I      ERROR
0636  04247 004243          DEF *-4
0637  04250 065267          LDB BTEMP
0638  04251 034001  GD15    ISZ 1           INCR. LOOP COUNT
0639  04252 026243          JMP LP15
0640  04253 002500          CLA,CLE
0641  04254 006404          CLB,INB
0642  04255 061314  LP16    LDA PBT2        ITER. LDA TEST
0643  04256 051314          CPA PBT2
0644  04257 026263          JMP GD16        GOOD
0645  04260 117000          JSB ERR2.I      ERROR
0646  04261 004255          DEF *-4
0647  04262 065267          LDB BTEMP
0648  04263 034001  GD16    ISZ 1           INCR. LOOP COUNT
0649  04264 026255          JMP LP16
0650  04265 000000          NOP             MODULE LOOP
```



```
0651  04266 002404  TLEB2   CLA,INA
0652  04267 006500          CLE,CLE
0653  04270 065313  LP17    LDB PBT1        ITER. LDB TEST
0654  04271 055313          CPB PBT1
0655  04272 026276          JMP GD17        GOOD
0656  04273 117000          JSB ERR2.I      ERROR
0657  04274 004270          DEF *-4
0658  04275 061266          LDA ATEMP
0659  04276 034000  GD17    ISZ 0           INCR. LOOP COUNT
0660  04277 026270          JMP LP17
0661  04300 002404          CLA,INA
0662  04301 006500          CLE,CLE
0663  04302 065314  LP18    LDB PBT2        ITER. LDB TEST
0664  04303 055314          CPB PBT2
0665  04304 026310          JMP GD18
0666  04305 117000          JSB ERR2.I      ERROR
0667  04306 004302          DEF *-4
0668  04307 061266          LDA ATEMP
0669  04310 034000  GD18    ISZ 0
0670  04311 026302          JMP LP18
0671  04312 000000          NOP             MODULE LOOP
0672  04313 002500  TSTA2   CLA,CLE
0673  04314 006404          CLB,INB
0674  04315 061313  LP19    LDA PBT1
0675  04316 071317          STA SPATM       ITER. STA TEST
0676  04317 051317          CPA SPATM
0677  04320 026324          JMP GD19        GOOD
0678  04321 117000          JSB ERR2.I      ERROR
0679  04322 004316          DEF *-4
0680  04323 065267          LDB BTEMP
0681  04324 034001  GD19    ISZ 1           INCR. LOOP COUNT
0682  04325 026315          JMP LP19
0683  04326 002500          CLA,CLE
0684  04327 006404          CLB,INB
0685  04330 061314  LP20    LDA PBT2
0686  04331 071317          STA SPATM       ITER. STA TEST
0687  04332 051317          CPA SPATM
0688  04333 026337          JMP GD20        GOOD
0689  04334 117000          JSB ERR2.I      ERROR
0690  04335 004331          DEF *-4
0691  04336 065267          LDB BTEMP
0692  04337 034001  GD20    ISZ 1           INCR. LOOP COUNT
0693  04340 026330          JMP LP20
0694  04341 000000          NOP             MODULE LOOP
0695  04342 002404  TSTB2   CLA,INA
0696  04343 006500          CLE,CLE
0697  04344 065313  LP21    LDB PBT1
0698  04345 075317          STB SPATM       ITER. STB TEST
0699  04346 055317          CPB SPATM
0700  04347 026353          JMP GD21        GOOD
0701  04350 117000          JSB ERR2.I      ERROR
0702  04351 004345          DEF *-4
0703  04352 061266          LDA ATEMP
0704  04353 034000  GD21    ISZ 0           INCR. LOOP COUNT
0705  04354 026344          JMP LP21
0706  04355 002404          CLA,INA
0707  04356 006500          CLB,CLE
```



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0708  04357 065314  LP22    LDB PBT2
0709  04360 075317          STB SPATM       ITER. STB TEST
0710  04361 055317          CPB SPATM
0711  04362 026366          JMP GD22        GOOD
0712  04363 117000          JSB ERR2.I      ERROR
0713  04364 004360          DEF *-4
0714  04365 061266          LDA ATEMP
0715  04366 034000  GD22    ISZ 0           INCR. LOOP COUNT
0716  04367 026357          JMP LP22
0717  04370 000000          NOP             MODULE LOOP
0718  04371 002400  TADA2   CLA
0719  04372 006404          CLB,INB
0720  04373 000040  LP23    CLE
0721  04374 061313          LDA PBT1
0722  04375 041314          ADA PBT2        ITER. ADA TEST-A=177777,E=0
0723  04376 003002          CMA,SZA
0724  04377 026402          JMP **3         ERROR
0725  04400 002041          SEZ,RSS
0726  04401 026405          JMP GD23        GOOD
0727  04402 117000          JSB ERR2.I      ERROR
0728  04403 004375          DEF *-5
0729  04404 065267          LDB BTEMP
0730  04405 034001  GD23    ISZ 1           INCR. LOOP COUNT
0731  04406 026373          JMP LP23
0732  04407 002400          CLA
0733  04410 006404          CLB,INB
0734  04411 000040  LP24    CLE
0735  04412 061314          LDA PBT2
0736  04413 041313          ADA PBT1        ITER. ADA TEST-A=177777,E=0
0737  04414 003002          CMA,SZA
0738  04415 026420          JMP **3         ERROR
0739  04416 002041          SEZ,RSS
0740  04417 026423          JMP GD24        GOOD
0741  04420 117000          JSB ERR2.I      ERROR
0742  04421 004413          DEF *-6
0743  04422 065267          LDB BTEMP
0744  04423 034001  GD24    ISZ 1           INCR. LOOP COUNT
0745  04424 026411          JMP LP24
0746  04425 002400          CLA
0747  04426 006404          CLB,INB
0748  04427 000040  LP25    CLE
0749  04430 063020          LDA PAT3
0750  04431 043020          ADA PAT3        ITER. ADA TEST-A=063146,E=0
0751  04432 053021          CPA ANS3
0752  04433 026435          JMP **2         GOOD
0753  04434 026437          JMP **3         ERROR
0754  04435 002041          SEZ,RSS
0755  04436 026442          JMP GD25        GOOD
0756  04437 117000          JSB ERR2.I      ERROR
0757  04440 004431          DEF *-7
0758  04441 065267          LDB BTEMP
0759  04442 034001  GD25    ISZ 1           INCR. LOOP COUNT
0760  04443 026427          JMP LP25
0761  04444 002400          CLA
0762  04445 006404          CLB,INB
0763  04446 000040  LP26    CLE
0764  04447 063022          LDA PAT4
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0765  04450 043022          ADA PAT4        ITER. ADA TEST-A=114630,E=1
0766  04451 053023          CPA ANS4
0767  04452 026454          JMP **2         GOOD
0768  04453 026456          JMP **3         ERROR
0769  04454 002040          SEZ
0770  04455 026461          JMP GD26        GOOD
0771  04456 117000          JSB ERR2.I      ERROR
0772  04457 004450          DEF *-7
0773  04460 065267          LDB BTEMP
0774  04461 034001  GD26    ISZ 1           INCR. LOOP COUNT
0775  04462 026446          JMP LP26
0776  04463 002400          CLA
0777  04464 006404          CLB,INB
0778  04465 000040  LP27    CLE
0779  04466 063024          LDA PAT5
0780  04467 043024          ADA PAT5        ITER. ADA TEST-A=146314,E=0
0781  04470 053025          CPA ANS5
0782  04471 026473          JMP **2         GOOD
0783  04472 026475          JMP **3         ERROR
0784  04473 002041          SEZ,RSS
0785  04474 026500          JMP GD27        GOOD
0786  04475 117000          JSB ERR2.I      ERROR
0787  04476 004467          DEF *-7
0788  04477 065267          LDB BTEMP
0789  04500 034001  GD27    ISZ 1           INCR. LOOP COUNT
0790  04501 026465          JMP LP27
0791  04502 002400          CLA
0792  04503 006404          CLB,INB
0793  04504 000040  LP28    CLE
0794  04505 063026          LDA PAT6
0795  04506 043026          ADA PAT6        ITER. ADA TEST-A=031462,E=1
0796  04507 053027          CPA ANS6
0797  04510 026512          JMP **2         GOOD
0798  04511 026514          JMP **3         ERROR
0799  04512 002040          SEZ
0800  04513 026517          JMP GD28        GOOD
0801  04514 117000          JSB ERR2.I      ERROR
0802  04515 004506          DEF *-7
0803  04516 065267          LDB BTEMP
0804  04517 034001  GD28    ISZ 1           INCR. LOOP COUNT
0805  04520 026504          JMP LP28
0806  04521 000000          NOP             MODULE LOOP
0807  04522 002404  TADB2   CLA,INA
0808  04523 006402          CLB
0809  04524 000040  LP29    CLE
0810  04525 065313          LDB PBT1
0811  04526 065314          LDB PBT2        ITER. ADB TEST-B=177777,E=0
0812  04527 006402          CLB,SZB
0813  04530 026533          JMP **3         ERROR
0814  04531 002041          SEZ,RSS
0815  04532 026536          JMP GD29        DH#D
0816  04533 117000          JSB ERR2.I      ERROR
0817  04534 004526          DEF *-6
0818  04535 061266          LDA ATEMP
0819  04536 034000  GD29    ISZ 0           INCR. LOOP COUNT
0820  04537 026524          JMP LP29
0821  04540 002404          CLA,INA
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PAGE 0035 #03                                                    HP 20401BL

0822  04541 006400         CLB
0823  04542 000040  LP30   CLE
0824  04543 065314         LDB PBT2
0825  04544 045313         ADB PBT1       ITER, ADB TEST-B=177777,E=0
0826  04545 007002         CMB,SZB
0827  04546 026551         JMP **3        ERROR
0828  04547 002041         SEZ,RSS
0829  04550 026554         JMP GD30       GOOD
0830  04551 117000         JSB ERR2.I     ERROR
0831  04552 004544         DEF *-6
0832  04553 061266         LDA ATEMP
0833  04554 034000  GD30   ISZ 0          INCR, LOOP COUNT
0834  04555 026542         JMP LP30
0835  04556 002404         CLA,INA
0836  04557 006400         CLB
0837  04560 000440  LP31   CLE
0838  04561 067020         LDB PAT3
0839  04562 047020         ADB PAT3       ITER, ADB TEST-B=063146,E=0
0840  04563 057021         CPB ANS3
0841  04564 026566         JMP **2        GOOD
0842  04565 026570         JMP **3        ERROR
0843  04566 002041         SEZ,RSS
0844  04567 026573         JMP GD31       GOOD
0845  04570 117000         JSB ERR2.I     ERROR
0846  04571 004562         DEF *-7
0847  04572 061266         LDA ATEMP
0848  04573 034000  GD31   ISZ 0          INCR, LOOP COUNT
0849  04574 026560         JMP LP31
0850  04575 002404         CLA,INA
0851  04576 006400         CLB
0852  04577 000040  LP32   CLE
0853  04600 067022         LDB PAT4
0854  04601 047022         ADB PAT4       ITER, ADB TEST-B=114630,E=1
0855  04602 057023         CPB ANS4
0856  04603 026605         JMP **2        GOOD
0857  04604 026607         JMP **3        ERROR
0858  04605 002040         SEZ
0859  04606 026612         JMP GD32
0860  04607 117000         JSB ERR2.I     ERROR
0861  04610 004601         DEF *-7
0862  04611 061266         LDA ATEMP
0863  04612 034000  GD32   ISZ 0          INCR, LOOP COUNT
0864  04613 026577         JMP LP32
0865  04614 002404         CLA,INA
0866  04615 006400         CLB
0867  04616 000040  LP33   CLE
0868  04617 067024         LDB PAT5
0869  04620 047024         ADB PAT5       ITER, ADB TEST-B=146314,E=0
0870  04621 057025         CPB ANS5
0871  04622 026624         JMP **2        GOOD
0872  04623 026626         JMP **3        ERROR
0873  04624 002041         SEZ,RSS
0874  04625 026631         JMP GD33       GOOD
0875  04626 117000         JSB ERR2.I     ERROR
0876  04627 004620         DEF *-7
0877  04630 061266         LDA ATEMP
0878  04631 034000  GD33   ISZ 0          INCR, LOOP COUNT
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PAGE 0036 #03                                                    HP 20401BL

0879  04632 026616         JMP LP33
0880  04633 002404         CLA,INA
0881  04634 006400         CLB
0882  04635 000040  LP34   CLE
0883  04636 067026         LDB PAT6
0884  04637 047026         ADB PAT6       ITER, ADB TEST-B=031462,E=1
0885  04640 057027         CPB ANS6
0886  04641 026643         JMP **2        GOOD
0887  04642 026645         JMP **3        ERROR
0888  04643 002040         SEZ
0889  04644 026650         JMP GD34       GOOD
0890  04645 117000         JSB ERR2.I     ERROR
0891  04646 004637         DEF *-7
0892  04647 061266         LDA ATEMP
0893  04650 034000  GD34   ISZ 0          INCR, LOOP COUNT
0894  04651 026635         JMP LP34
0895  04652 000000         NOP            MODULE LOOP
0896  04653 002500         CLA,CLE
0897  04654 006400         CLB
0898  04655 126656         JMP RETN.I
0899  04656 001P00  RETN   DEF BASIC
0900  05000                ORG 5000B
0901  05000 001250  ERR2   DEF ERROR
0902  05001 002006  FIVE1  DEF RET2
0903  05002 106002  IFIVE  DEF ISIX.I
0904  05003 000000  SI5    NOP
0905  05004 063003         LDA SI5
0906  05005 002004         INA
0907  05006 002004         INA
0908  05007 073003         STA SI5
0909  05010 127003         JMP SI5,I
0910  05011 106011  SIT5   DEF SIT6.I
0911  05012 000001  IZ2    OCT 1
0912  05013 106013  IIZ2   DEF IIZ3.I
0913  05014 052525  PAT5A  OCT 052525
0914  05015 106015  IIPA2  DEF IIPA3,I
0915  05016 000000  SPAT2  OCT 0
0916  05017 106017  IIPS1  DEF IIPS2,I
0917  05020 031463  PAT3   OCT 031463
0918  05021 063146  ANS3   OCT 063146
0919  05022 146314  PAT4   OCT 146314
0920  05023 114630  ANS4   OCT 114630
0921  05024 063146  PAT5   OCT 063146
0922  05025 146314  ANS5   OCT 146314
0923  05026 114631  PAT6   OCT 114631
0924  05027 031462  ANS6   OCT 031462
0925  06000                ORG 6000B
0926  06000 001250  ERR3   DEF ERROR
0927  06001 002011  SIXI   DEF RET3
0928  06002 101300  ISIX   DEF IBASE,I
0929  06003 000000  SI6    NOP
0930  06004 062003         LDA SI6
0931  06005 002004         INA
0932  06006 002004         INA
0933  06007 072003         STA SI6
0934  06010 126003         JMP SI6,I
0935  06011 101307  SIT6   DEF SIT0.I
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PAGE 0037 #03                                                    HP 20401BL

0936  06012 000001  IZ3    OCT 1
0937  06013 101312  IIZ3   DEF IIZ0.I
0938  06014 125252  PAT6A  OCT 125252
0939  06015 101315  IIPA3  DEF IIPA4,I
0940  06016 000000  SPAT3  OCT 0
0941  06017 101320  IIPS2  DEF IIPS0,I
0942                       END
** NO ERRORS*
```

SHIFT-ROTATE INSTRUCTION TEST

Tape No. HP 20402B

Listing No. HP 20402BL

```
PAGE 0001                                                    HP 20402BL

0001                        ORG 45000B

CS  0001        ORG 45000B
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```
PAGE 0001                                                    HP 20402BL

0001                        ASMB,A,B,L,T
BAD     006547
END     006140
FA      006472
FB      006483
JSA     006563
JSB     006564
PAT     006552
AMASK   006567
AMODI   006462
AMSK1   006606
ASPEC   006607
BACK    006482
BASIC   006200
BMASK   006570
BMODI   006443
BSPEC   006746
CHECK   006401
CON1    006555
CON2    006556
ERROR   006533
ILL1    006575
ILL2    006576
ILL3    006577
ILL4    006600
ILL5    006601
ILL6    006602
ILL7    006603
ILL8    006604
ILLC    006501
INIT    006345
INSAR   006557
LPAT    006554
MODI    006431
NINST   006411
NPASS   006426
P0020   004507
P0021   004516
P0022   004525
P0023   004534
P0024   004543
P0025   004552
P0026   004561
P0027   004570
P0224   005013
P1020   004577
P1021   004606
P1022   004615
P1023   004624
P1024   004633
P1025   004642
P1026   004651
P1027   004660
P1120   004667
P1121   004676
P1122   004705
P1123   004714
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PAGE 0002                                                    HP 20402BL

P1124   004723
P1125   004732
P1126   004741
P1127   004750
P1220   004757
P1221   004766
P1222   004775
P1223   005004
P1225   005022
P1226   005031
P1227   005040
P1320   005047
P1321   005056
P1322   005065
P1323   005074
P1324   005103
P1325   005112
P1326   005121
P1327   005130
P1420   005137
P1421   005145
P1422   005155
P1423   005164
P1424   005173
P1425   005202
P1426   005211
P1427   005220
P1520   005227
P1521   005236
P1522   005245
P1523   005254
P1524   005263
P1525   005272
P1526   005301
P1527   005310
P1620   005317
P1621   005326
P1622   005335
P1623   005344
P1624   005353
P1625   005362
P1626   005371
P1627   005400
P1720   005407
P1721   005416
P1722   005425
P1723   005434
P1724   005443
P1725   005452
P1726   005461
P1727   005470
PAS1    006571
PAS2    006572
PAS3    006573
PAS4    006574
PASS1   005500
PASS2   005610
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PAGE 0003                                                    HP 20402BL

PASS3   005720
PASS4   006030
PAT1    004500
PAT2    004501
PAT3    004502
PAT4    004503
PAT5    004504
PAT6    004505
PAT7    004506
RPAT    006551
SETUP   006377
SEVEN   006502
SHA1    006513
SHB1    006524
SMASK   006605
SOVFC   006562
SSHA1   006545
SSHB1   006556
START   006354
SUB1    006361
T1P0A   006513
T1P0B   006521
TADR    006550
TEMP    006560
TPAT    006553
** NO ERRORS *
```

```
0001                ASPB,A,B,L,T
0001  04500               ORG 4500B
0002  04500 000001 PAT1  OCT 1
0003  04501 100000 PAT2  OCT 100000
0004  04502 100001 PAT3  OCT 100001
0005  04503 074170 PAT4  OCT 074170
0006  04504 103607 PAT5  OCT 103607
0007  04505 125252 PAT6  OCT 125252
0008  04506 052525 PAT7  OCT 052525
0009  04507 000002 P0020 OCT 2
0010  04510 100000       OCT 100000
0011  04511 100002       OCT 100002
0012  04512 070360       OCT 070360
0013  04513 107416       OCT 107416
0014  04514 152524       OCT 152524
0015  04515 025252       OCT 025252
0016  04516 000000 P0021 OCT 0
0017  04517 140000       OCT 140000
0018  04520 140000       OCT 140000
0019  04521 036074       OCT 036074
0020  04522 141703       OCT 141703
0021  04523 152525       OCT 152525
0022  04524 025252       OCT 025252
0023  04525 000002 P0022 OCT 2
0024  04526 000001       OCT 1
0025  04527 000003       OCT 3
0026  04530 170360       OCT 170360
0027  04531 007417       OCT 7417
0028  04532 052525       OCT 052525
0029  04533 125252       OCT 125252
0030  04534 100000 P0023 OCT 100000
0031  04535 040000       OCT 40000
0032  04536 140000       OCT 140000
0033  04537 036074       OCT 036074
0034  04540 141703       OCT 141703
0035  04541 052525       OCT 052525
0036  04542 125252       OCT 125252
0037  04543 000002 P0024 OCT 2
0038  04544 000000       OCT 0
0039  04545 000002       OCT 2
0040  04546 070360       OCT 070360
0041  04547 007416       OCT 7416
0042  04550 052524       OCT 52524
0043  04551 025252       OCT 25252
0044  04552 000000 P0025 OCT 0
0045  04553 040000       OCT 40000
0046  04554 040000       OCT 40000
0047  04555 036074       OCT 36074
0048  04556 041703       OCT 41703
0049  04557 052525       OCT 52525
0050  04560 025252       OCT 25252
0051  04561 000002 P0026 OCT 2
0052  04562 000000       OCT 0
0053  04563 000002       OCT 2
0054  04564 170360       OCT 170360
0055  04565 007416       OCT 7416
0056  04566 052524       OCT 52524
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0057  04567 125252       OCT 125252
0058  04570 000020 P0027 OCT 20
0059  04571 000010       OCT 10
0060  04572 000030       OCT 30
0061  04573 103607       OCT 103607
0062  04574 074170       OCT 74170
0063  04575 125252       OCT 125252
0064  04576 052525       OCT 52525
0065  04577 000004 P1020 OCT 4
0066  04600 100000       OCT 100000
0067  04601 100004       OCT 100004
0068  04602 060740       OCT 60740
0069  04603 117034       OCT 117034
0070  04604 125250       OCT 125250
0071  04605 052524       OCT 52524
0072  04606 000001 P1021 OCT 1
0073  04607 140000       OCT 140000
0074  04610 140001       OCT 140001
0075  04611 034170       OCT 034170
0076  04612 143607       OCT 143607
0077  04613 165252       OCT 165252
0078  04614 012525       OCT 12525
0079  04615 000004 P1022 OCT 4
0080  04616 000001       OCT 1
0081  04617 000005       OCT 5
0082  04620 160740       OCT 160740
0083  04621 017035       OCT 17035
0084  04622 125251       OCT 125251
0085  04623 052524       OCT 52524
0086  04624 000001 P1023 OCT 1
0087  04625 040000       OCT 40000
0088  04626 040001       OCT 40001
0089  04627 034170       OCT 34170
0090  04630 043607       OCT 43607
0091  04631 065252       OCT 65252
0092  04632 012525       OCT 12525
0093  04633 000004 P1024 OCT 4
0094  04634 000000       OCT 0
0095  04635 000004       OCT 4
0096  04636 060740       OCT 60740
0097  04637 017034       OCT 17034
0098  04640 025250       OCT 25250
0099  04641 052524       OCT 52524
0100  04642 000001 P1025 OCT 1
0101  04643 040000       OCT 40000
0102  04644 040001       OCT 40001
0103  04645 034170       OCT 34170
0104  04646 043607       OCT 43607
0105  04647 065252       OCT 65252
0106  04650 012525       OCT 12525
0107  04651 000004 P1026 OCT 4
0108  04652 000000       OCT 0
0109  04653 000004       OCT 4
0110  04654 160740       OCT 160740
0111  04655 017034       OCT 17034
0112  04656 125250       OCT 125250
0113  04657 052524       OCT 52524
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0114  04660 000040 P1027 OCT 40
0115  04661 000010       OCT 10
0116  04662 000050       OCT 50
0117  04663 007407       OCT 7407
0118  04664 170350       OCT 170350
0119  04665 052515       OCT 52515
0120  04666 125242       OCT 125242
0121  04667 000000 P1120 OCT 0
0122  04670 100000       OCT 100000
0123  04671 100000       OCT 100000
0124  04672 074170       OCT 74170
0125  04673 103606       OCT 103606
0126  04674 125252       OCT 125252
0127  04675 052524       OCT 52524
0128  04676 000000 P1121 OCT 0
0129  04677 160000       OCT 160000
0130  04700 160000       OCT 160000
0131  04701 017036       OCT 17036
0132  04702 160741       OCT 160741
0133  04703 165252       OCT 165252
0134  04704 012525       OCT 12525
0135  04705 000000 P1122 OCT 0
0136  04706 100001       OCT 100001
0137  04707 100001       OCT 100001
0138  04710 074170       OCT 74170
0139  04711 103607       OCT 103607
0140  04712 125253       OCT 125253
0141  04713 052524       OCT 52524
0142  04714 000000 P1123 OCT 0
0143  04715 060000       OCT 60000
0144  04716 060000       OCT 60000
0145  04717 017036       OCT 17036
0146  04720 160741       OCT 160741
0147  04721 165252       OCT 165252
0148  04722 012525       OCT 12525
0149  04723 000000 P1124 OCT 0
0150  04724 000000       OCT 0
0151  04725 000000       OCT 0
0152  04726 074170       OCT 74170
0153  04727 003606       OCT 3606
0154  04730 025252       OCT 25252
0155  04731 052524       OCT 52524
0156  04732 000000 P1125 OCT 0
0157  04733 060200       OCT 60200
0158  04734 060000       OCT 60000
0159  04735 017036       OCT 17036
0160  04736 060741       OCT 60741
0161  04737 065252       OCT 65252
0162  04740 012525       OCT 12525
0163  04741 000000 P1126 OCT 0
0164  04742 100000       OCT 100000
0165  04743 100000       OCT 100000
0166  04744 074170       OCT 74170
0167  04745 103606       OCT 103606
0168  04746 125252       OCT 125252
0169  04747 052524       OCT 52524
0170  04750 000000 P1127 OCT 0
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0171  04751 000014       OCT 14
0172  04752 000014       OCT 14
0173  04753 141703       OCT 141703
0174  04754 036074       OCT 36074
0175  04755 052535       OCT 52535
0176  04756 125242       OCT 125242
0177  04757 000004 P1220 OCT 4
0178  04760 000002       OCT 2
0179  04761 000006       OCT 6
0180  04762 160740       OCT 160740
0181  04763 017036       OCT 17036
0182  04764 025252       OCT 25252
0183  04765 152524       OCT 152524
0184  04766 000001 P1221 OCT 1
0185  04767 000000       OCT 0
0186  04770 000001       OCT 1
0187  04771 174170       OCT 174170
0188  04772 003607       OCT 3607
0189  04773 025252       OCT 25252
0190  04774 152525       OCT 152525
0191  04775 000004 P1222 OCT 4
0192  04776 000002       OCT 2
0193  04777 000006       OCT 6
0194  05000 160741       OCT 160741
0195  05001 017036       OCT 17036
0196  05002 125252       OCT 125252
0197  05003 052525       OCT 52525
0198  05004 000001 P1223 OCT 1
0199  05005 100000       OCT 100000
0200  05006 100001       OCT 100001
0201  05007 074170       OCT 74170
0202  05010 103607       OCT 103607
0203  05011 125252       OCT 125252
0204  05012 052525       OCT 52525
0205  05013 000004 P0224 OCT 4
0206  05014 000002       OCT 2
0207  05015 000006       OCT 6
0208  05016 060740       OCT 60740
0209  05017 017036       OCT 17036
0210  05020 025252       OCT 25252
0211  05021 052524       OCT 52524
0212  05022 000001 P1225 OCT 1
0213  05023 000000       OCT 0
0214  05024 000001       OCT 1
0215  05025 074170       OCT 74170
0216  05026 003607       OCT 3607
0217  05027 025252       OCT 25252
0218  05030 052525       OCT 52525
0219  05031 000004 P1226 OCT 4
0220  05032 000002       OCT 2
0221  05033 000006       OCT 6
0222  05034 160740       OCT 160740
0223  05035 017036       OCT 17036
0224  05036 125252       OCT 125252
0225  05037 052524       OCT 52524
0226  05040 000040 P1227 OCT 40
0227  05041 000020       OCT 20
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0228  05042 000060          OCT 60
0229  05043 007417          OCT 7417
0230  05044 170360          OCT 170360
0231  05045 052525          OCT 52525
0232  05046 125252          OCT 125252
0233  05047 100000  P1320   OCT 100000
0234  05050 000000          OCT 0
0235  05051 100000          OCT 100000
0236  05052 074170          OCT 74170
0237  05053 103606          OCT 103606
0238  05054 025252          OCT 25252
0239  05055 152524          OCT 152524
0240  05056 140000  P1321   OCT 140000
0241  05057 020000          OCT 20000
0242  05060 160000          OCT 160000
0243  05061 017036          OCT 17036
0244  05062 160741          OCT 160741
0245  05063 025252          OCT 25252
0246  05064 152525          OCT 152525
0247  05065 000001  P1322   OCT 1
0248  05066 100000          OCT 100000
0249  05067 100001          OCT 100001
0250  05070 074170          OCT 74170
0251  05071 103607          OCT 103607
0252  05072 125252          OCT 125252
0253  05073 052525          OCT 52525
0254  05074 040000  P1323   OCT 40000
0255  05075 020000          OCT 20000
0256  05076 060000          OCT 60000
0257  05077 017036          OCT 17036
0258  05100 160741          OCT 160741
0259  05101 125252          OCT 125252
0260  05102 052525          OCT 52525
0261  05103 000000  P1324   OCT 0
0262  05104 000000          OCT 0
0263  05105 000000          OCT 0
0264  05106 074170          OCT 74170
0265  05107 003606          OCT 3606
0266  05110 025252          OCT 25252
0267  05111 052524          OCT 52524
0268  05112 040000  P1325   OCT 40000
0269  05113 020000          OCT 20000
0270  05114 060000          OCT 60000
0271  05115 017036          OCT 17036
0272  05116 060741          OCT 60741
0273  05117 025252          OCT 25252
0274  05120 052525          OCT 52525
0275  05121 000000  P1326   OCT 0
0276  05122 100000          OCT 100000
0277  05123 100000          OCT 100000
0278  05124 074170          OCT 74170
0279  05125 103606          OCT 103606
0280  05126 125252          OCT 125252
0281  05127 052524          OCT 52524
0282  05130 000010  P1327   OCT 10
0283  05131 000004          OCT 4
0284  05132 000014          OCT 14
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0285  05133 141703          OCT 141703
0286  05134 036074          OCT 36074
0287  05135 052525          OCT 52525
0288  05136 125252          OCT 125252
0289  05137 000004  P1420   OCT 4
0290  05140 000000          OCT 0
0291  05141 000004          OCT 4
0292  05142 060740          OCT 60740
0293  05143 017034          OCT 17034
0294  05144 025250          OCT 25250
0295  05145 052524          OCT 52524
0296  05146 000001  P1421   OCT 1
0297  05147 000000          OCT 0
0298  05150 000001          OCT 1
0299  05151 034170          OCT 34170
0300  05152 003607          OCT 3607
0301  05153 025252          OCT 25252
0302  05154 012525          OCT 12525
0303  05155 000004  P1422   OCT 4
0304  05156 000000          OCT 0
0305  05157 000004          OCT 4
0306  05160 160740          OCT 160740
0307  05161 017034          OCT 17034
0308  05162 125250          OCT 125250
0309  05163 052524          OCT 52524
0310  05164 000001  P1423   OCT 1
0311  05165 000000          OCT 0
0312  05166 000001          OCT 1
0313  05167 034170          OCT 34170
0314  05170 003607          OCT 3607
0315  05171 025252          OCT 25252
0316  05172 012525          OCT 12525
0317  05173 000004  P1424   OCT 4
0318  05174 000000          OCT 0
0319  05175 000004          OCT 4
0320  05176 060740          OCT 60740
0321  05177 017034          OCT 17034
0322  05200 025250          OCT 25250
0323  05201 052524          OCT 52524
0324  05202 000001  P1425   OCT 1
0325  05203 000000          OCT 0
0326  05204 000001          OCT 1
0327  05205 034170          OCT 34170
0328  05206 003607          OCT 3607
0329  05207 025252          OCT 25252
0330  05210 012525          OCT 12525
0331  05211 000004  P1426   OCT 4
0332  05212 000000          OCT 0
0333  05213 000004          OCT 4
0334  05214 160740          OCT 160740
0335  05215 017034          OCT 17034
0336  05216 125250          OCT 125250
0337  05217 052524          OCT 52524
0338  05220 000040  P1427   OCT 40
0339  05221 000000          OCT 0
0340  05222 000040          OCT 40
0341  05223 007407          OCT 7407
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0342  05224 170340          OCT 170340
0343  05225 052505          OCT 52505
0344  05226 125242          OCT 125242
0345  05227 000000  P1520   OCT 0
0346  05230 000000          OCT 0
0347  05231 000000          OCT 0
0348  05232 074170          OCT 74170
0349  05233 003606          OCT 3606
0350  05234 025252          OCT 25252
0351  05235 052524          OCT 52524
0352  05236 000000  P1521   OCT 0
0353  05237 020000          OCT 20000
0354  05240 020000          OCT 20000
0355  05241 017036          OCT 17036
0356  05242 020741          OCT 20741
0357  05243 025252          OCT 25252
0358  05244 012525          OCT 12525
0359  05245 000000  P1522   OCT 0
0360  05246 100000          OCT 100000
0361  05247 100000          OCT 100000
0362  05250 074170          OCT 74170
0363  05251 103606          OCT 103606
0364  05252 125252          OCT 125252
0365  05253 052524          OCT 52524
0366  05254 000000  P1523   OCT 0
0367  05255 020000          OCT 20000
0368  05256 020000          OCT 20000
0369  05257 017036          OCT 17036
0370  05260 120741          OCT 120741
0371  05261 125252          OCT 125252
0372  05262 012525          OCT 12525
0373  05263 000000  P1524   OCT 0
0374  05264 000000          OCT 0
0375  05265 000000          OCT 0
0376  05266 074170          OCT 74170
0377  05267 003606          OCT 3606
0378  05270 025252          OCT 25252
0379  05271 052524          OCT 52524
0380  05272 100000  P1525   OCT 100000
0381  05273 020000          OCT 20000
0382  05274 120000          OCT 120000
0383  05275 017036          OCT 17036
0384  05276 120741          OCT 120741
0385  05277 025252          OCT 25252
0386  05300 112525          OCT 112525
0387  05301 000001  P1526   OCT 1
0388  05302 100000          OCT 100000
0389  05303 100001          OCT 100001
0390  05304 074170          OCT 74170
0391  05305 103607          OCT 103607
0392  05306 125252          OCT 125252
0393  05307 052525          OCT 52525
0394  05310 000000  P1527   OCT 0
0395  05311 000004          OCT 4
0396  05312 000004          OCT 4
0397  05313 141703          OCT 141703
0398  05314 036064          OCT 36064
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0399  05315 052525          OCT 52525
0400  05316 125242          OCT 125242
0401  05317 000004  P1620   OCT 4
0402  05320 000000          OCT 0
0403  05321 000004          OCT 4
0404  05322 160740          OCT 160740
0405  05323 017034          OCT 17034
0406  05324 025250          OCT 25250
0407  05325 152524          OCT 152524
0408  05326 000001  P1621   OCT 1
0409  05327 000000          OCT 0
0410  05330 000001          OCT 1
0411  05331 174170          OCT 174170
0412  05332 003607          OCT 3607
0413  05333 025252          OCT 25252
0414  05334 152525          OCT 152525
0415  05335 000004  P1622   OCT 4
0416  05336 000000          OCT 0
0417  05337 000004          OCT 4
0418  05340 160741          OCT 160741
0419  05341 017034          OCT 17034
0420  05342 125250          OCT 125250
0421  05343 052525          OCT 52525
0422  05344 000001  P1623   OCT 1
0423  05345 000000          OCT 0
0424  05346 000001          OCT 1
0425  05347 074170          OCT 74170
0426  05350 003607          OCT 3607
0427  05351 025252          OCT 25252
0428  05352 052525          OCT 52525
0429  05353 000004  P1624   OCT 4
0430  05354 000000          OCT 0
0431  05355 000004          OCT 4
0432  05356 060740          OCT 60740
0433  05357 017034          OCT 17034
0434  05360 025250          OCT 25250
0435  05361 052524          OCT 52524
0436  05362 000001  P1625   OCT 1
0437  05363 100000          OCT 100000
0438  05364 100001          OCT 100001
0439  05365 074170          OCT 74170
0440  05366 103607          OCT 103607
0441  05367 125252          OCT 125252
0442  05370 052525          OCT 52525
0443  05371 000004  P1626   OCT 4
0444  05372 000001          OCT 1
0445  05373 000005          OCT 5
0446  05374 160740          OCT 160740
0447  05375 017035          OCT 17035
0448  05376 125251          OCT 125251
0449  05377 052524          OCT 52524
0450  05400 000040  P1627   OCT 40
0451  05401 000000          OCT 0
0452  05402 000040          OCT 40
0453  05403 007417          OCT 7417
0454  05404 170340          OCT 170340
0455  05405 052505          OCT 52505
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Listing
Shift-Rotate Instruction Test


```
0456  05406 125252          OCT 125252
0457  05407 000040  P1720    OCT 40
0458  05410 000020          OCT 20
0459  05411 000060          OCT 60
0460  05412 107416          OCT 107416
0461  05413 070360          OCT 70360
0462  05414 152524          OCT 152524
0463  05415 025252          OCT 25252
0464  05416 000010  P1721    OCT 10
0465  05417 000004          OCT 4
0466  05420 000014          OCT 14
0467  05421 141703          OCT 141703
0468  05422 036074          OCT 36074
0469  05423 152525          OCT 152525
0470  05424 025252          OCT 25252
0471  05425 000040  P1722    OCT 40
0472  05426 000020          OCT 20
0473  05427 000060          OCT 60
0474  05430 007417          OCT 7417
0475  05431 170360          OCT 170360
0476  05432 052525          OCT 52525
0477  05433 125252          OCT 125252
0478  05434 000010  P1723    OCT 10
0479  05435 000004          OCT 4
0480  05436 000014          OCT 14
0481  05437 141703          OCT 141703
0482  05440 036074          OCT 36074
0483  05441 052525          OCT 52525
0484  05442 125252          OCT 125252
0485  05443 000040  P1724    OCT 40
0486  05444 000020          OCT 20
0487  05445 000060          OCT 60
0488  05446 007416          OCT 7416
0489  05447 070360          OCT 70360
0490  05450 052524          OCT 52524
0491  05451 025252          OCT 25252
0492  05452 000010  P1725    OCT 10
0493  05453 000004          OCT 4
0494  05454 000014          OCT 14
0495  05455 041703          OCT 41703
0496  05456 036074          OCT 36074
0497  05457 052525          OCT 52525
0498  05460 025252          OCT 25252
0499  05461 000040  P1726    OCT 40
0500  05462 000020          OCT 20
0501  05463 000060          OCT 60
0502  05464 007416          OCT 7416
0503  05465 170360          OCT 170360
0504  05466 052524          OCT 52524
0505  05467 125252          OCT 125252
0506  05470 000400  P1727    OCT 400
0507  05471 000200          OCT 200
0508  05472 000600          OCT 600
0509  05473 074170          OCT 74170
0510  05474 103607          OCT 103607
0511  05475 125252          OCT 125252
0512  05476 052525          OCT 52525
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0513  05477 000000          OCT 0
0514  05500 000020  PASS1    OCT 20
0515  05501 000021          OCT 21
0516  05502 000022          OCT 22
0517  05503 000023          OCT 23
0518  05504 000024          OCT 24
0519  05505 000025          OCT 25
0520  05506 000026          OCT 26
0521  05507 000027          OCT 27
0522  05510 001020          OCT 1020
0523  05511 001021          OCT 1021
0524  05512 001022          OCT 1022
0525  05513 001023          OCT 1023
0526  05514 001024          OCT 1024
0527  05515 001025          OCT 1025
0528  05516 001026          OCT 1026
0529  05517 001027          OCT 1027
0530  05520 001120          OCT 1120
0531  05521 001121          OCT 1121
0532  05522 001122          OCT 1122
0533  05523 001123          OCT 1123
0534  05524 001124          OCT 1124
0535  05525 001125          OCT 1125
0536  05526 001126          OCT 1126
0537  05527 001127          OCT 1127
0538  05530 001220          OCT 1220
0539  05531 001221          OCT 1221
0540  05532 001222          OCT 1222
0541  05533 001223          OCT 1223
0542  05534 001224          OCT 1224
0543  05535 001225          OCT 1225
0544  05536 001226          OCT 1226
0545  05537 001227          OCT 1227
0546  05540 001320          OCT 1320
0547  05541 001321          OCT 1321
0548  05542 001322          OCT 1322
0549  05543 001323          OCT 1323
0550  05544 001324          OCT 1324
0551  05545 001325          OCT 1325
0552  05546 001326          OCT 1326
0553  05547 001327          OCT 1327
0554  05550 001420          OCT 1420
0555  05551 001421          OCT 1421
0556  05552 001422          OCT 1422
0557  05553 001423          OCT 1423
0558  05554 001424          OCT 1424
0559  05555 001425          OCT 1425
0560  05556 001426          OCT 1426
0561  05557 001427          OCT 1427
0562  05560 001520          OCT 1520
0563  05561 001521          OCT 1521
0564  05562 001522          OCT 1522
0565  05563 001523          OCT 1523
0566  05564 001524          OCT 1524
0567  05565 001525          OCT 1525
0568  05566 001526          OCT 1526
0569  05567 001527          OCT 1527
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0570  05570 001620          OCT 1620
0571  05571 001621          OCT 1621
0572  05572 001622          OCT 1622
0573  05573 001623          OCT 1623
0574  05574 001624          OCT 1624
0575  05575 001625          OCT 1625
0576  05576 001626          OCT 1626
0577  05577 001627          OCT 1627
0578  05600 001720          OCT 1720
0579  05601 001721          OCT 1721
0580  05602 001722          OCT 1722
0581  05603 001723          OCT 1723
0582  05604 001724          OCT 1724
0583  05605 001725          OCT 1725
0584  05606 001726          OCT 1726
0585  05607 001727          OCT 1727
0586  05610 000030  PASS2    OCT 30
0587  05611 000031          OCT 31
0588  05612 000032          OCT 32
0589  05613 000033          OCT 33
0590  05614 000034          OCT 34
0591  05615 000035          OCT 35
0592  05616 000036          OCT 36
0593  05617 000037          OCT 37
0594  05620 001030          OCT 1030
0595  05621 001031          OCT 1031
0596  05622 001032          OCT 1032
0597  05623 001033          OCT 1033
0598  05624 001034          OCT 1034
0599  05625 001035          OCT 1035
0600  05626 001036          OCT 1036
0601  05627 001037          OCT 1037
0602  05630 001130          OCT 1130
0603  05631 001131          OCT 1131
0604  05632 001132          OCT 1132
0605  05633 001133          OCT 1133
0606  05634 001134          OCT 1134
0607  05635 001135          OCT 1135
0608  05636 001136          OCT 1136
0609  05637 001137          OCT 1137
0610  05640 001230          OCT 1230
0611  05641 001231          OCT 1231
0612  05642 001232          OCT 1232
0613  05643 001233          OCT 1233
0614  05644 001234          OCT 1234
0615  05645 001235          OCT 1235
0616  05646 001236          OCT 1236
0617  05647 001237          OCT 1237
0618  05650 001330          OCT 1330
0619  05651 001331          OCT 1331
0620  05652 001332          OCT 1332
0621  05653 001333          OCT 1333
0622  05654 001334          OCT 1334
0623  05655 001335          OCT 1335
0624  05656 001336          OCT 1336
0625  05657 001337          OCT 1337
0626  05660 001430          OCT 1430
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0627  05661 001431          OCT 1431
0628  05662 001432          OCT 1432
0629  05663 001433          OCT 1433
0630  05664 001434          OCT 1434
0631  05665 001435          OCT 1435
0632  05666 001436          OCT 1436
0633  05667 001437          OCT 1437
0634  05670 001530          OCT 1530
0635  05671 001531          OCT 1531
0636  05672 001532          OCT 1532
0637  05673 001533          OCT 1533
0638  05674 001534          OCT 1534
0639  05675 001535          OCT 1535
0640  05676 001536          OCT 1536
0641  05677 001537          OCT 1537
0642  05700 001630          OCT 1630
0643  05701 001631          OCT 1631
0644  05702 001632          OCT 1632
0645  05703 001633          OCT 1633
0646  05704 001634          OCT 1634
0647  05705 001635          OCT 1635
0648  05706 001636          OCT 1636
0649  05707 001637          OCT 1637
0650  05710 001730          OCT 1730
0651  05711 001731          OCT 1731
0652  05712 001732          OCT 1732
0653  05713 001733          OCT 1733
0654  05714 001734          OCT 1734
0655  05715 001735          OCT 1735
0656  05716 001736          OCT 1736
0657  05717 001737          OCT 1737
0658  05720 000060  PASS3    OCT 60
0659  05721 000061          OCT 61
0660  05722 000062          OCT 62
0661  05723 000063          OCT 63
0662  05724 000064          OCT 64
0663  05725 000065          OCT 65
0664  05726 000066          OCT 66
0665  05727 000067          OCT 67
0666  05730 001060          OCT 1060
0667  05731 001061          OCT 1061
0668  05732 001062          OCT 1062
0669  05733 001063          OCT 1063
0670  05734 001064          OCT 1064
0671  05735 001065          OCT 1065
0672  05736 001066          OCT 1066
0673  05737 001067          OCT 1067
0674  05740 001160          OCT 1160
0675  05741 001161          OCT 1161
0676  05742 001162          OCT 1162
0677  05743 001163          OCT 1163
0678  05744 001164          OCT 1164
0679  05745 001165          OCT 1165
0680  05746 001166          OCT 1166
0681  05747 001167          OCT 1167
0682  05750 001260          OCT 1260
0683  05751 001261          OCT 1261
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0684  05752 001262          OCT 1262
0685  05753 001263          OCT 1263
0686  05754 001264          OCT 1264
0687  05755 001265          OCT 1265
0688  05756 001266          OCT 1266
0689  05757 001267          OCT 1267
0690  05760 001360          OCT 1360
0691  05761 001361          OCT 1361
0692  05762 001362          OCT 1362
0693  05763 001363          OCT 1363
0694  05764 001364          OCT 1364
0695  05765 001365          OCT 1365
0696  05766 001366          OCT 1366
0697  05767 001367          OCT 1367
0698  05770 001460          OCT 1460
0699  05771 001461          OCT 1461
0700  05772 001462          OCT 1462
0701  05773 001463          OCT 1463
0702  05774 001464          OCT 1464
0703  05775 001465          OCT 1465
0704  05776 001466          OCT 1466
0705  05777 001467          OCT 1467
0706  06000 001560          OCT 1560
0707  06001 001561          OCT 1561
0708  06002 001562          OCT 1562
0709  06003 001563          OCT 1563
0710  06004 001564          OCT 1564
0711  06005 001565          OCT 1565
0712  06006 001566          OCT 1566
0713  06007 001567          OCT 1567
0714  06010 001660          OCT 1660
0715  06011 001661          OCT 1661
0716  06012 001662          OCT 1662
0717  06013 001663          OCT 1663
0718  06014 001664          OCT 1664
0719  06015 001665          OCT 1665
0720  06016 001666          OCT 1666
0721  06017 001667          OCT 1667
0722  06020 001760          OCT 1760
0723  06021 001761          OCT 1761
0724  06022 001762          OCT 1762
0725  06023 001763          OCT 1763
0726  06024 001764          OCT 1764
0727  06025 001765          OCT 1765
0728  06026 001766          OCT 1766
0729  06027 001767          OCT 1767
0730  06030 000070  PASS4    OCT 70
0731  06031 000071          OCT 71
0732  06032 000072          OCT 72
0733  06033 000073          OCT 73
0734  06034 000074          OCT 74
0735  06035 000075          OCT 75
0736  06036 000076          OCT 76
0737  06037 000077          OCT 77
0738  06040 001070          OCT 1070
0739  06041 001071          OCT 1071
0740  06042 001072          OCT 1072
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0741  06043 001073          OCT 1073
0742  06044 001074          OCT 1074
0743  06045 001075          OCT 1075
0744  06046 001076          OCT 1076
0745  06047 001077          OCT 1077
0746  06050 001170          OCT 1170
0747  06051 001171          OCT 1171
0748  06052 001172          OCT 1172
0749  06053 001173          OCT 1173
0750  06054 001174          OCT 1174
0751  06055 001175          OCT 1175
0752  06056 001176          OCT 1176
0753  06057 001177          OCT 1177
0754  06060 001270          OCT 1270
0755  06061 001271          OCT 1271
0756  06062 001272          OCT 1272
0757  06063 001273          OCT 1273
0758  06064 001274          OCT 1274
0759  06065 001275          OCT 1275
0760  06066 001276          OCT 1276
0761  06067 001277          OCT 1277
0762  06070 001370          OCT 1370
0763  06071 001371          OCT 1371
0764  06072 001372          OCT 1372
0765  06073 001373          OCT 1373
0766  06074 001374          OCT 1374
0767  06075 001375          OCT 1375
0768  06076 001376          OCT 1376
0769  06077 001377          OCT 1377
0770  06100 001470          OCT 1470
0771  06101 001471          OCT 1471
0772  06102 001472          OCT 1472
0773  06103 001473          OCT 1473
0774  06104 001474          OCT 1474
0775  06105 001475          OCT 1475
0776  06106 001476          OCT 1476
0777  06107 001477          OCT 1477
0778  06110 001570          OCT 1570
0779  06111 001571          OCT 1571
0780  06112 001572          OCT 1572
0781  06113 001573          OCT 1573
0782  06114 001574          OCT 1574
0783  06115 001575          OCT 1575
0784  06116 001576          OCT 1576
0785  06117 001577          OCT 1577
0786  06120 001670          OCT 1670
0787  06121 001671          OCT 1671
0788  06122 001672          OCT 1672
0789  06123 001673          OCT 1673
0790  06124 001674          OCT 1674
0791  06125 001675          OCT 1675
0792  06126 001676          OCT 1676
0793  06127 001677          OCT 1677
0794  06130 001770          OCT 1770
0795  06131 001771          OCT 1771
0796  06132 001772          OCT 1772
0797  06133 001773          OCT 1773
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0798  06134 001774          OCT 1774
0799  06135 001775          OCT 1775
0800  06136 001776          OCT 1776
0801  06137 001777          OCT 1777
0802  06140 000000  ENL     OCT 0
0803  06200                 ORG 6200B
0804  06200 002700  BASIC   CLA,CCE        A=0,E=1
0805  06201 000000          NOP
0806  06202 000010          SLA
0807  06203 102001          HLT 01          SLA FAILED
0808  06204 006400          CLB             B=0
0809  06205 004050          CLE,SLB         E=0
0810  06206 102001          HLT 01          SLB FAILED
0811  06207 002040          SEZ
0812  06210 102001          HLT 01          CLE FAILED
0813  06211 002300          CCE             E=1
0814  06212 000050          CLE,SLA         E=0
0815  06213 102001          HLT 01          A NOT =0
0816  06214 002040          SEZ
0817  06215 102001          HLT 01          E NOT =0
0818  06216 002300          CCE             E=1
0819  06217 004050          CLE,SLB         E=0
0820  06220 102001          HLT 01          B NOT =0
0821  06221 002040          SEZ
0822  06222 102001          HLT 01          E NOT =0
0823  06223 002004          INA             A=1
0824  06224 006004          INB             B=1
0825  06225 001000          ALS
0826  06226 005000          BLS
0827  06227 001100          ARS             A=1
0828  06230 005100          BRS             B=1
0829  06231 002011          SLA,RSS
0830  06232 102001          HLT 01          A NOT =1
0831  06233 006011          SLB,RSS
0832  06234 102001          HLT 01          B NOT =1
0833  06235 102501          LIA 01          A=077777
0834  06236 106501          LIB 01          B=077777
0835  06237 002004          INA             A=100000
0836  06240 006004          INB             B=100000
0837  06241 001000          ALS
0838  06242 005000          BLS
0839  06243 002021          SSA,RSS
0840  06244 102001          HLT 01          ALS FAILED
0841  06245 006021          SSB,RSS
0842  06246 102001          HLT 01          BLS FAILED
0843  06247 002404          CLA,INA         A=1
0844  06250 006404          CLB,INB         B=1
0845  06251 001200          RAL             A=2
0846  06252 005200          RBL             B=2
0847  06253 000010          SLA
0848  06254 102001          HLT 01          RAL FAILED
0849  06255 004010          SLB
0850  06256 102001          HLT 01          RBL FAILED
0851  06257 001300          RAR             A=1
0852  06260 005300          RBR             B=1
0853  06261 002011          SLA,RSS
0854  06262 102001          HLT 01          RAR FAILED
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0855  06263 006011          SLB,RSS
0856  06264 102001          HLT 01          RBR FAILED
0857  06265 102501          LIA 01          A=077777
0858  06266 106501          LIB 01          B=077777
0859  06267 001000          ALS             A=077776
0860  06270 005000          BLS             B=077776
0861  06271 002030          SSA,SLA
0862  06272 102001          HLT 01          ALS FAILED
0863  06273 006030          SSB,SLB
0864  06274 102001          HLT 01          BLS FAILED
0865  06275 002404          CLA,INA         A=1
0866  06276 006404          CLB,INB         B=1
0867  06277 001500          ERA             A=0
0868  06300 002041          SEZ,RSS         E=1
0869  06301 102001          HLT 01          ERA FAILED
0870  06302 000040          CLE
0871  06303 005500          ERB             B=0
0872  06304 002041          SEZ,RSS         E=1
0873  06305 102001          HLT 01          ERB FAILED
0874  06306 001600          ELA             E=0,A=1
0875  06307 002040          SEZ
0876  06310 102001          HLT 01          ELA FAILED
0877  06311 002300          CCE             A=0,E=1
0878  06312 006600          ELB             A=1,E=0
0879  06313 006011          SLB,RSS
0880  06314 102001          HLT 01          ELB FAILED
0881  06315 001700          ALF
0882  06316 001100          ARS
0883  06317 001100          ARS
0884  06320 001100          ARS
0885  06321 001100          ARS
0886  06322 002011          SLA,RSS
0887  06323 102001          HLT 01          ALF FAILED
0888  06324 005700          BLF
0889  06325 005100          BRS
0890  06326 005100          BRS
0891  06327 005100          BRS
0892  06330 005100          BRS
0893  06331 006011          SLB,RSS
0894  06332 102001          HLT 01          BLF FAILED
0895  06333 002404          CLA,INA
0896  06334 001110          ARS,SLA
0897  06335 102001          HLT 01          ARS,SLA FAILED
0898  06336 006404          CLB,INB
0899  06337 005110          BRS,SLB
0900  06340 102001          HLT 01          BRS,SLB FAILED
0901  06341 002700          CLA,CCE
0902  06342 001610          ELA,SLA         A=1,E=0
0903  06343 001510          ERA,SLA         A=0,E=1
0904  06344 102001          HLT 01          ELA,SLA OR ERA,SLA FAILED
0905  06345 062555  INIT    LDA CON1
0906  06346 072552          STA PAT
0907  06347 062556          LDA CON2
0908  06350 072557          STA INSAR
0909  06351 062551          LDA RPAT
0910  06352 072553          STA TPAT        INITIALIZE AND MODIFY
0911  06353 026462          JMP AMODI
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0912  06354 162557  START LDA  INSAR,I
0913  06355 012606        ANE  AMSK1
0914  06356 052575        CPA  ILL1       1565=ERA,CLE,ERA
0915  06357 026501        JMP  ILLC
0916  06360 052576        CPA  ILL2       1566=ERA,CLE,ELA
0917  06361 026501        JMP  ILLC
0918  06362 052577        CPA  ILL3       1575=ERA,CLE,SLA,ERA
0919  06363 026501        JMP  ILLC
0920  06364 052600        CPA  ILL4       1576=ERA,CLE,SLA,ELA
0921  06365 026501        JMP  ILLC
0922  06366 052601        CPA  ILL5       1665=ELA,CLE,ERA
0923  06367 026501        JMP  ILLC
0924  06370 052602        CPA  ILL6       1666=ELA,CLE,ELA
0925  06371 026501        JMP  ILLC
0926  06372 052603        CPA  ILL7       1675=ELA,CLE,SLA,ERA
0927  06373 026501        JMP  ILLC
0928  06374 052604        CPA  ILL8       1676=ELA,CLE,SLA,ELA
0929  06375 026501        JMP  ILLC
0930  06376 162557        LDA  INSAR,I    PICKUP LEGAL INSTRUCTION
0931  06377 000000  SETUP NOP            STA SHA1 OR SHB1
0932  06400 036557        ISZ  INSAR      UPDATE INSTR. ARRAY ADDRESS
0933  06401 000000  CHECK NOP            SHIFT AND CHECK SUBR. JSB T100A
0934  06402 062552  BACK  LDA  PAT
0935  06403 052554        CPA  LPAT       INSTR. COMPLETED SEVEN PATTERNS?
0936  06404 026411        JMP  NINST      =
0937  06405 002004        INA             NOT = MODIFY FOR NEXT PATTERN
0938  06406 072552        STA  PAT        NEXT TEST PATTERN
0939  06407 036553        ISZ  TPAT       ADDR. OF NEXT GOOD PATTERN
0940  06410 026401        JMP  CHECK
0941  06411 036553  NINST ISZ  TPAT       ADDR. OF NEXT GOOD PATTERN
0942  06412 062555        LDA  CON1
0943  06413 072552        STA  PAT
0944  06414 062557        LDA  INSAR
0945  06415 052571        CPA  PAS1
0946  06416 026426        JMP  NPASS      =
0947  06417 052572        CPA  PAS2
0948  06420 026426        JMP  NPASS      =
0949  06421 052573        CPA  PAS3
0950  06422 026426        JMP  NPASS      =
0951  06423 052574        CPA  PAS4
0952  06424 026431        JMP  MODI       = ALL INSTR. COMPLETE FOR A OR B
0953  06425 026354        JMP  START
0954  06426 062551  NPASS LDA  RPAT
0955  06427 072553        STA  TPAT
0956  06430 026354        JMP  START
0957  06431 062556  MODI  LDA  CON2
0958  06432 072557        STA  INSAR      INIT. INSTR. ARRAY BASE ADDRESS
0959  06433 062551        LDA  RPAT
0960  06434 072553        STA  TPAT       INIT. GOOD PATT. ARRAY BASE ADDR
0961  06435 062555        LDA  CON1
0962  06436 072552        STA  PAT        INIT. PATT. ARRAY BASE ADDR.
0963  06437 162557        LDA  INSAR,I
0964  06440 012570        ANE  BMASK
0965  06441 002002        SZA             A=0 FOR BMODI
0966  06442 026462        JMP  AMODI
0967  06443 162557  BMODI LDA  INSAR,I
0968  06444 032570        IOR  BMASK      IOR 004000
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0969  06445 172557        STA  INSAR,I    INSTR. MODIFIED
0970  06446 036557        ISZ  INSAR      ADD ONE TO INSTR. ADDRESS
0971  06447 062557        LDA  INSAR
0972  06450 052574        CPA  PAS4
0973  06451 026453        JMP  FB         =
0974  06452 026443        JMP  BMODI      NOT =
0975  06453 062556  FB    LDA  CON2
0976  06454 072557        STA  INSAR      INIT. INSTR. ARRAY BASE ADDR.
0977  06455 062564        LDA  JSB
0978  06456 072401        STA  CHECK      SET UP JSB TO B SHIFT-CHECK SUBR
0979  06457 062566        LDA  SSHB1
0980  06460 072377        STA  SETUP      SETUP PROPER SHIFT INSTR.
0981  06461 026607        JMP  ASPEC
0982  06462 162557  AMODI LDA  INSAR,I
0983  06463 012567        AND  AMASK      AND 173777
0984  06464 172557        STA  INSAR,I
0985  06465 036557        ISZ  INSAR      ADD ONE TO INSTR. ADDRESS
0986  06466 062557        LDA  INSAR
0987  06467 052574        CPA  PAS4
0988  06470 026472        JMP  FA         =
0989  06471 026462        JMP  AMODI      NOT =
0990  06472 062556  FA    LDA  CON2
0991  06473 072557        STA  INSAR      RESET INSTR. ARRAY BASE ADDR.
0992  06474 062563        LDA  JSA
0993  06475 072401        STA  CHECK      SETUP JSA TO A SHIFT-CHECK SUBR.
0994  06476 062565        LDA  SSHA1
0995  06477 072377        STA  SETUP      SETUP PROPER SHIFT INSTR.
0996  06500 026746        JMP  BSPEC
0997  06501 036557  ILLC  ISZ  INSAR
0998  06502 062552  SEVEN LDA  PAT
0999  06503 052554        CPA  LPAT       SEVEN PATTERNS COMPLETED?
1000  06504 026411        JMP  NINST      =
1001  06505 036552        ISZ  PAT        NOT =
1002  06506 036553        ISZ  TPAT
1003  06507 026502        JMP  SEVEN
1004  06510 000000  T100A NOP
1005  06511 000040        CLE
1006  06512 162552        LDA  PAT,I
1007  06513 000000  SHA1  NOP
1008  06514 000000        NOP
1009  06515 152553        CPA  TPAT,I
1010  06516 126510        JMP  T100A,I    =
1011  06517 016533        JSB  ERROR      NOT =
1012  06520 126510        JMP  T100A,I    ERROR RETURN
1013  06521 000000  T100B NOP
1014  06522 000040        CLE
1015  06523 166552        LDB  PAT,I
1016  06524 000000  SHB1  NOP
1017  06525 000000        NOP
1018  06526 060001        LDA  1
1019  06527 156553        CPB  TPAT,I
1020  06530 126521        JMP  T100B,I    =
1021  06531 016533        JSB  ERROR      NOT =
1022  06532 126521        JMP  T100B,I    ERROR RETURN
1023  06533 000000  ERROR NOP
1024  06534 072547        STA  BAD
1025  06535 162553        LDA  TPAT,I     GOOD PATTERN-A
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1026  06536 066547        LDB  BAD        BAD PATTERN=B
1027  06537 102001        HLT  01         LOOK
1028  06540 062557        LDA  INSAR
1029  06541 042561        ADA  SUB1
1030  06542 072550        STA  TADR
1031  06543 162550        LDA  TADR,I     BAD INSTR. CODE
1032  06544 166552        LDB  PAT,I      ORIGINAL PATTERN
1033  06545 102001        HLT  01         LOOK
1034  06546 126533        JMP  ERROR,I
1035  06547 000000  BAD   OCT  0
1036  06550 000000  TADR  OCT  0
1037  06551 004507  RPAT  DEF  P002A
1038  06552 004520  PAT   DEF  PAT1
1039  06553 004547  TPAT  DEF  P002A
1040  06554 004526  LPAT  DEF  PAT7
1041  06555 004560  CON1  DEF  PAT1
1042  06556 005500  CON2  DEF  PASS1
1043  06557 005500  INSAR DEF  PASS1
1044  06560 000000  TEMP  OCT  0
1045  06561 177777  SUB1  OCT  177777
1046  06562 077777  SQVFC  OCT  77777
1047  06563 016510  JSA   JSB  T100A
1048  06564 016521  JSB   JSB  T100B
1049  06565 072513  SSHA1 STA  SHA1
1050  06566 072524  SSHB1 STA  SHB1
1051  06567 173777  AMASK OCT  173777
1052  06570 004000  BMASK OCT  004000
1053  06571 005610  PAS1  DEF  PASS2
1054  06572 005726  PAS2  DEF  PASS3
1055  06573 006030  PAS3  DEF  PASS4
1056  06574 006140  PAS4  DEF  END
1057  06575 001565  ILL1  OCT  1565
1058  06576 001566  ILL2  OCT  1566
1059  06577 001575  ILL3  OCT  1575
1060  06600 001576  ILL4  OCT  1576
1061  06601 001665  ILL5  OCT  1665
1062  06602 001666  ILL6  OCT  1666
1063  06603 001675  ILL7  OCT  1675
1064  06604 001676  ILL8  OCT  1676
1065  06605 100000  SMASK OCT  100000
1066  06606 001777  AMSK1 OCT  1777
1067  06607 002504  ASPEC CLA,CLE,INA
1068  06610 001565        ERA,CLE,ERA     1565
1069  06611 002002        SZA
1070  06612 102001        HLT  01         ERA,CLE,ERA FAILED
1071  06613 002040        SEZ
1072  06614 102001        HLT  01         E NOT = 0
1073  06615 002404        CLA,INA
1074  06616 001566        ERA,CLE,ELA     1566
1075  06617 002002        SZA
1076  06620 102001        HLT  01         ERA,CLE,ELA FAILED
1077  06621 002040        SEZ
1078  06622 102001        HLT  01         E NOT =0
1079  06623 002404        CLA,INA
1080  06624 001575        ERA,CLE,SLA,ERA 1575
1081  06625 102001        HLT  01         SLA FAILED
1082  06626 002002        SZA
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1083  06627 102001        HLT  01         ERA,CLE,SLA,ERA FAILED
1084  06630 002040        SEZ
1085  06631 102001        HLT  01         E NOT =0
1086  06632 002404        CLA,INA
1087  06633 001576        ERA,CLE,SLA,ELA 1576
1088  06634 102001        HLT  01         SLA FAILED
1089  06635 002002        SZA
1090  06636 102001        HLT  01         ERA,CLE,SLA,ELA FAILED
1091  06637 002040        SEZ
1092  06640 102001        HLT  01         E NOT =0
1093  06641 062605        LDA  SMASK      100000
1094  06642 001665        ELA,CLE,ERA     1665
1095  06643 002002        SZA
1096  06644 102001        HLT  01         ELA,CLE,ERA FAILED
1097  06645 002040        SEZ
1098  06646 102001        HLT  01         E NOT =0
1099  06647 062605        LDA  SMASK      100000
1100  06650 001666        ELA,CLE,ELA     1666
1101  06651 002002        SZA
1102  06652 102001        HLT  01         ELA,CLE,ELA FAILED
1103  06653 002040        SEZ
1104  06654 102001        HLT  01         E NOT =0
1105  06655 062605        LDA  SMASK      100000
1106  06656 001675        ELA,CLE,SLA,ERA 1675
1107  06657 102001        HLT  01         SLA FAILED
1108  06660 002002        SZA
1109  06661 102001        HLT  01         ELA,CLE,SLA,ERA FAILED
1110  06662 002040        SEZ
1111  06663 102001        HLT  01         E NOT =0
1112  06664 062605        LDA  SMASK      100000
1113  06665 001675        ELA,CLE,SLA,ERA 1676
1114  06666 102001        HLT  01         SLA FAILED
1115  06667 002002        SZA
1116  06670 102001        HLT  01         ELA,CLE,SLA,ERA FAILED
1117  06671 002040        SEZ
1118  06672 102001        HLT  01         E NOT =0
1119  06673 103101        CLC             CLEAR OVERFLOW INDICATOR
1120  06674 103101        STC             SET OVERFLOW INDICATOR
1121  06675 102301        SOS             SKIP ON OVERFLOW SET
1122  06676 102001        HLT  01         STO OR SOS FAILED
1123  06677 103301        SOS C           SKIP ON OVERFLOW SET AND CLEAR
1124  06700 102001        HLT  01         SOS,C FAILED
1125  06701 102201        SOC             SKIP ON OVERFLOW CLEAR
1126  06702 102001        HLT  01         SOS,C OR SOC MALFUNCTION
1127  06703 102301        SOS             SKIP ON OVERFLOW SET
1128  06704 002001        NSS             SHOULD NOT SKIP
1129  06705 102001        HLT  01         SOS SKIP WHEN OVERFLOW CLEARED
1130  06706 103101        CLC             CLEAR OVERFLOW INDICATOR
1131  06707 062562        LDA  SQVFC      A=077777
1132  06710 002004        INA             A=100000-OVERFLOW SHOULD BE SET
1133  06711 103301        SOS C           SKIP ON OVERFLOW SET
1134  06712 102001        HLT  01         INA DID NOT SET OVERFLOW
1135  06713 103101        CLC             CLEAR OVERFLOW INDICATOR
1136  06714 062561        LDA  SUB1       A=177777
1137  06715 002004        INA             A=000000,E=1-OVERFLOW CLEAR
1138  06716 102201        SOC             SKIP ON OVERFLOW CLEAR
1139  06717 102001        HLT  01         UNLIKE SIGNS CAUSED OVERFLOW TO
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PAGE 0024 #02                                                    HP 20402BL

1140*BE SET
1141  06720 103101          CLO             CLEAR OVERFLOW INDICATOR
1142  06721 062561          LDA SUB1        A=177777
1143  06722 042605          ADA SMASK       ADD 100000
1144  06723 103301          SOS C           SKIP ON OVERFLOW SET
1145  06724 102001          HLT 01          ADA DID NOT SET OVERFLOW
1146  06725 103101          CLO             CLEAR OVERFLOW INDICATOR
1147  06726 062562          LDA SOVFC       A=077777
1148  06727 042605          ADA SMASK       ADD 100000
1149  06730 102201          SOC             SKIP ON OVERFLOW CLEAR
1150  06731 102001          HLT 01          UNLIKE SIGNS CAUSED OVERFLOW TO
1151*BE SET
1152  06732 103101          CLO             CLEAR OVERFLOW INDICATOR
1153  06733 003400          CCA             A=177777
1154  06734 042561          ADA SUB1        ADD 177777
1155  06735 102201          SOC             SKIP ON OVERFLOW CLEAR
1156  06736 102001          HLT 01          ILLEGAL SET OF OVERFLOW
1157  06737 103101          CLO             CLEAR OVERFLOW INDICATOR
1158  06740 002400          CLA             A=000000
1159  06741 040000          ADA 0           ADD 000000
1160  06742 102201          SOC             SKIP ON OVERFLOW CLEAR
1161  06743 102001          HLT 01          ILLEGAL SET OF OVERFLOW
1162  06744 000040          CLE
1163  06745 026354          JMP START
1164  06746 006504  B3FEC CLB,CLE,INB
1165  06747 005565          ERB,CLE,ERB         5565
1166  06750 006002          SZB
1167  06751 102001          HLT 01          ERB,CLE,ERB FAILED
1168  06752 002040          SEZ
1169  06753 102001          HLT 01          E NOT =0
1170  06754 006404          CLB,INB
1171  06755 005566          ERB,CLE,ELB         5566
1172  06756 006002          SZB
1173  06757 102001          HLT 01          ERB,CLE,ELB FAILED
1174  06760 002040          SEZ
1175  06761 102001          HLT 01          E NOT =0
1176  06762 006404          CLB,INB
1177  06763 005575          ERB,CLE,SLB,ERB     5575
1178  06764 102001          HLT 01          SLB FAILED
1179  06765 006002          SZB
1180  06766 102001          HLT 01          ERB,CLE,SLB,ERB FAILED
1181  06767 002040          SEZ
1182  06770 102001          HLT 01          E NOT =0
1183  06771 006404          CLB,INB
1184  06772 005576          ERB,CLE,SLB,ELB     5576
1185  06773 102001          HLT 01          SLB FAILED
1186  06774 006002          SZB
1187  06775 102001          HLT 01          ERB,CLE,SLB,ELB FAILED
1188  06776 002040          SEZ
1189  06777 102001          HLT 01          E NOT =0
1190  07000 066605          LDB SMASK           100000
1191  07001 005665          ELB,CLE,ERB         5665
1192  07002 006002          SZB
1193  07003 102001          HLT 01          ELB,CLE,ERB FAILED
1194  07004 002040          SEZ
1195  07005 102001          HLT 01          E NOT =0
1196  07006 066605          LDB SMASK           100000
```

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PAGE 0025 #02                                                    HP 20402BL

1197  07007 005666          ELB,CLE,ELB         5666
1198  07010 006002          SZB
1199  07011 102001          HLT 01          ELB,CLE,ELB FAILED
1200  07012 002040          SEZ
1201  07013 102001          HLT 01          E NOT =0
1202  07014 066605          LDB SMASK           100000
1203  07015 005675          ELB,CLE,SLB,ERB     5675
1204  07016 102001          HLT 01          SLB FAILED
1205  07017 006002          SZB
1206  07020 102001          HLT 01          ELB,CLE,SLB,ERB FAILED
1207  07021 002040          SEZ
1208  07022 102001          HLT 01          E NOT
1209  07023 066605          LDB SMASK           100000
1210  07024 005675          ELB,CLE,SLB,ERB     5676
1211  07025 102001          HLT 01          SLB FAILED
1212  07026 006002          SZB
1213  07027 102001          HLT 01          ELB,CLE,SLB,ERB FAILED
1214  07030 002040          SEZ
1215  07031 102001          HLT 01          E NOT =0
1216  07032 103101          CLO             CLEAR OVERFLOW INDICATOR
1217  07033 102101          STC             SET OVERFLOW INDICATOR
1218  07034 102301          SOS             SKIP ON OVERFLOW SET
1219  07035 102001          HLT 01          STO OR SOS FAILED
1220  07036 103301          SOS C           SKIP ON OVERFLOW SET AND CLEAR
1221  07037 102001          HLT 01          SOS,C FAILED
1222  07040 102201          SOC             SKIP ON OVERFLOW CLEAR
1223  07041 102001          HLT 01          SOS,C OR SOC MALFUNCTION
1224  07042 102301          SOS             SKIP ON OVERFLOW SET
1225  07043 002001          RSS             SHOULD NOT SKIP
1226  07044 102001          HLT 01          SOS SKIP WHEN OVERFLOW CLEARED
1227  07045 103101          CLO             CLEAR OVERFLOW INDICATOR
1228  07046 066562          LDB SOVFC       B=077777
1229  07047 006004          INB             B=100000-OVERFLOW SHOULD BE SET
1230  07050 103301          SOS C           SKIP ON OVERFLOW SET
1231  07051 102001          HLT 01          INB DID NOT SET OVERFLOW
1232  07052 103101          CLO             CLEAR OVERFLOW INDICATOR
1233  07053 066561          LDB SUB1        B=177777
1234  07054 006004          INB             B=000000,E=1-OVERFLOW CLEAR
1235  07055 102201          SOC             SKIP ON OVERFLOW CLEAR
1236  07056 102001          HLT 01          UNLIKE SIGNS CAUSED OVERFLOW TO
1237*BE SET
1238  07057 103101          CLO             CLEAR OVERFLOW INDICATOR
1239  07060 066561          LDB SUB1        B=177777
1240  07061 046605          ADB SMASK       ADD=100000
1241  07062 103301          SOS C           SKIP ON OVERFLOW SET
1242  07063 102001          HLT 01          ADB DID NOT SET OVERFLOW
1243  07064 103101          CLO             CLEAR OVERFLOW INDICATOR
1244  07065 066562          LDB SOVFC       B=077777
1245  07066 046605          ADB SMASK       ADD 100000
1246  07067 102201          SOC             SKIP ON OVERFLOW CLEAR
1247  07070 102001          HLT 01          UNLIKE SIGNS CAUSED OVERFLOW TO
1248*BE SET
1249  07071 103101          CLO             CLEAR OVERFLOW INDICATOR
1250  07072 007400          CCB             B=177777
1251  07073 046561          ADB SUB1        ADD 177777
1252  07074 102201          SOC             SKIP ON OVERFLOW CLEAR
1253  07075 102001          HLT 01          ILLEGAL SET OF OVERFLOW
```

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PAGE 0026 #02                                                    HP 20402BL

1254  07076 103101          CLO             CLEAR OVERFLOW INDICATOR
1255  07077 006400          CLB             B=000000
1256  07100 044001          ADB 1           ADD 000000
1257  07101 102201          SOC             SKIP ON OVERFLOW CLEAR
1258  07102 102001          HLT 01          ILLEGAL SET OF OVERFLOW
1259  07103 000040          CLE
1260  07104 026354          JMP START
1261                        END
** NO ERRORS*
```

HIGH MEMORY ADDRESS TEST

Tape No. HP 20404A

Listing No. HP 20404AL

```
PAGE 0001                                                    HP 20404AL


0001                ASMB,A,B,L,T
BEGN    007600
FIN1    007631
GOOD    007623
LADR    007643
NEW1    007637
RADR    007642
RED1    007615
RED2    007617
SADR    007641
WRT1    007607
** NO ERRORS*
```

```
PAGE 0002 #01                                                HP 20404AL


0001                ASMB,A,B,L,T
0002**********************MEMORY ADDRESS TEST************************
0003  07600                 ORG 76000
0004  07600 102501  BEGN LIA 01          LOAD STARTING ADDR.OF BLOCK INTO
0005  07601 073641        STA SADR        STARTING ADDR. TO WOPKING STORAG
0006  07602 073642        STA RADR        ST. ADDR. RESTORE LOCN.
0007  07603 102001        HLT 01          PUT LAST ADDR. OF BLOCK INTO B
0008  07604 106501        LIB 01          LOAD LAST ADDR. OF BLOCK INTO B
0009  07605 006004        INB             LAST ADDR.+1
0010  07606 077643        STB LADR        STORE LAST ADDR.+1
0011  07607 173641  WRT1 STA SADR,I       STORE ADDRESS
0012  07610 002004        INA             INCR. TO NEXT ADDR.
0013  07611 053643        CPA LADR        IS WRITE LOOP COMPLETE?
0014  07612 027615        JMP RED1        JMP TO READ LOOP
0015  07613 037641        ISZ SADR        INCR. WORKING ADDR.
0016  07614 027607        JMP WRT1        DO NEXT ADDR.
0017  07615 063642  RED1 LDA RADR
0018  07616 073641        STA SADR        RESTORE STARTING ADDR.
0019  07617 153641  RED2 CPA SADR,I       IS ADDR. GOOD
0020  07620 027623        JMP GOOD        YES
0021  07621 167641        LDB SADR,I      NO
0022  07622 102201        HLT 01          A=GOOD ADDR.  B=BAD CONTENTS
0023  07623 063641  GOOD LDA SADR
0024  07624 002004        INA             INCR. WORKING ADDR. BY 1
0025  07625 053643        CPA LADR        IS READ LOOP COMPLETE?
0026  07626 027631        JMP FIN1        ONE PASS COMPLETE
0027  07627 037641        ISZ SADR        INCR. WORKING ADDR. BY 1
0028  07630 027617        JMP RED2        DO NEXT ADDR.
0029  07631 106501  FIN1 LIB 01          LOAD SW. REG. INTO B
0030  07632 006320        SSB
0031  07633 027637        JMP NEW1        BIT15=1
0032  07634 063642        LDA RADR        BIT15=0 -CONTINUE LOOPING
0033  07635 073641        STA SADR        RESTORE STARTING ADDR.
0034  07636 027607        JMP WRT1        DO ANOTHER PASS
0035  07637 102001  NEW1 HLT 01          PUT IN NEW STARTING ADDRESS
0036  07640 027600        JMP BEGN
0037  07641 000000  SADR UCT 0
0038  07642 000000  RADR UCT 0
0039  07643 000000  LADR UCT 0
0040                END
** NO ERRORS*
```

LOW MEMORY ADDRESS TEST

Tape No. HP 20403A

Listing No. HP 20403AL

```
PAGE 0001                                                    HP 20403AL


0001                ASMB,A,B,L,T
BEGN    000100
FIN1    000131
GOOD    000123
LADR    000143
NEW1    000137
RADR    000142
RED1    000115
RED2    000117
SADR    000141
WRT1    000107
**  NO ERRORS*
```

```
PAGE 0002 #01                                                HP 20403AL


0001                ASMB,A,B,L,T
0002**********************MEMORY ADDRESS TEST************************
0003  00100                 ORG 100B
0004  00100 102501  BEGN LIA 01          LOAD STARTING ADDR.OF BLOCK INTO
0005  00101 070141        STA SADR       STARTING ADDR. TO WORKING STORAG
0006  00102 070142        STA RADR       ST. ADDR. RESTORE LOCN.
0007  00103 102001        HLT 01         PUT LAST ADDR. OF BLOCK INTO B
0008  00104 106501        LIB 01         LOAD LAST ADDR. OF BLOCK INTO B
0009  00105 006004        INB            LAST ADDR.+1
0010  00106 074143        STB LADR       STORE LAST ADDR.+1
0011  00107 170141  WRT1 STA SADR,I      STORE ADDRESS
0012  00110 002004        INA            INCR. TO NEXT ADDR.
0013  00111 050143        CPA LADR       IS WRITE LOOP COMPLETE?
0014  00112 024115        JMP RED1       JMP TO READ LOOP
0015  00113 034141        ISZ SADR       INCR. WORKING ADDR.
0016  00114 024107        JMP WRT1       DO NEXT ADDR.
0017  00115 060142  RED1 LDA RADR
0018  00116 070141        STA SADR       RESTORE STARTING ADDR.
0019  00117 150141  RED2 CPA SADR,I      IS ADDR. GOOD
0020  00120 024123        JMP GOOD       YES
0021  00121 164141        LDB SADR,I     NO
0022  00122 102001        HLT 01         A=GOOD ADDR.  B=BAD CONTENTS
0023  00123 060141  GOOD LDA SADR
0024  00124 002004        INA            INCR. WORKING ADDR. BY 1
0025  00125 050143        CPA LADR       IS READ LOOP COMPLETE?
0026  00126 024131        JMP FIN1       ONE PASS COMPLETE
0027  00127 034141        ISZ SADR       INCR. WORKING ADDR. BY 1
0028  00130 024117        JMP RED2       DO NEXT ADDR.
0029  00131 106501  FIN1 LIB 01         LOAD SW. REG. INTO B
0030  00132 006020        SSB
0031  00133 024137        JMP NEW1       BIT15=1
0032  00134 060142        LDA RADR       BIT15=0 -CONTINUE LOOPING
0033  00135 070141        STA SADR       RESTORE STARTING ADDR.
0034  00136 024107        JMP WRT1       DO ANOTHER PASS
0035  00137 102001  NEW1 HLT 01         PUT IN NEW STARTING ADDRESS
0036  00140 024100        JMP BEGN
0037  00141 000000  SADR OCT 0
0038  00142 000000  RADR OCT 0
0039  00143 000000  LADR OCT 0
0040                END
**  NO ERRORS*
```

HIGH MEMORY CHECKERBOARD TEST

Tape No. HP 20512A

Listing No. HP 20512AL

```
0001                    ASMB,A,B,L,T
ADDR    007650
BEGN    007520
CNTR    007651
COMP    007552
END1    007652
ERR1    007620
ERR2    007626
ERR3    007634
FIXR    007657
HOLD    007655
INCR    007563
MSK1    007653
NEW1    007617
ONES    007546
OPEN    007500
PATT    007640
RDWT    007654
READ    007536
RETN    007647
STAR    007656
SWRG    007610
WRIT    007527
** NO ERRORS*
```



```
0001                    ASMB,A,B,L,T
0002*
0003*  HP 2115 MEMORY CHECKERBOARD TEST  1-8-66
0004*
0005*
0006  07500                 ORG 75008
0007  07500 102001  OPEN    HLT 01
0008  07501 102501          LIA 01          SET STARTING ADDRESS
0009  07502 073656          STA STAR
0010  07503 102001          HLT 01
0011  07504 102501          LIA 01          SET ENDING ADDRESS
0012  07505 073652          STA END1
0013  07506 003004          CMA,INA         2'S COMPLEMENT OF END
0014  07507 073655          STA HOLD
0015  07510 063652          LDA END1        GET END ADDRESS
0016  07511 043655          ADA HOLD
0017  07512 002020          SSA
0018  07513 027500          JMP OPEN        START ADDRESS GREATER THAN END
0019  07514 002400          CLA             CLEAR ACC
0020  07515 073651          STA CNTR
0021  07516 073657          STA FIXR
0022  07517 073654          STA RDWT
0023  07520 063656  BEGN    LDA STAR        LOAD THE STARTING ADDRESS
0024  07521 073650          STA ADDR
0025  07522 063657          LDA FIXR        SET UP COUNTER
0026  07523 073651          STA CNTR
0027  07524 063654          LDA RDWT
0028  07525 000010          SLA             IS THIS A READ OR WRITE PASS?
0029  07526 027536          JMP READ        READ
0030  07527 063651  WRIT    LDA CNTR        WRITE
0031  07530 000010          SLA             0'S OR 1'S
0032  07531 003401          CCA,RSS         STORE 1'S
0033  07532 002400          CLA             STORE 0'S
0034  07533 173650          STA ADDR,I
0035  07534 017563          JSB INCR        +1 THE SYSTEM
0036  07535 027527          JMP WRIT        GO WRITE NEXT LOCATION
0037  07536 063651  READ    LDA CNTR        READ 1'S OR 0'S?
0038  07537 000010          SLA
0039  07540 027546          JMP ONES        1'S
0040  07541 163650          LDA ADDR,I      0'S
0041  07542 002002          SZA
0042  07543 017620          JSB ERR1        ERROR
0043  07544 003000          CMA             SET UP TO STORE COMPLEMENT
0044  07545 027552          JMP COMP
0045  07546 002404  ONES    CLA,INA         SET UP TO READ 1'S
0046  07547 143650          ADA ADDR,I      TWO'S COMPLEMENT ADD TO MAKE 0'S
0047  07550 002002          SZA
0048  07551 017626          JSB ERR2
0049  07552 173650  COMP    STA ADDR,I      STORE THE COMPLEMENT
0050  07553 153650          CPA ADDR,I      COMPARE IT
0051  07554 027556          JMP *+2         SAME ?
0052  07555 017634          JSB ERR3
0053  07556 163650          LDA ADDR,I
0054  07557 003000          CMA             PREPARE TO RESTORE IT
0055  07560 173650          STA ADDR,I      RESTORE CONTENTS
0056  07561 017563          JSB INCR        +1 THE SYSTEM
0057  07562 027536          JMP READ        GO READ THE NEXT LOCATION
```



```
0058  07563 000000  INCR    OCT 0
0059  07564 063650          LDA ADDR
0060  07565 013653          AND MSK1        CHECK THE PATTERN
0061  07566 053653          CPA MSK1
0062  07567 037651          ISZ CNTR
0063  07570 063650          LDA ADDR        CHECK FOR END ADDRESS
0064  07571 053652          CPA END1
0065  07572 027576          JMP *+4         END
0066  07573 037650          ISZ ADDR        NOT ENT YET +1 ADDRESS
0067  07574 037651          ISZ CNTR        +1 PATTERN
0068  07575 127563          JMP INCR,I
0069  07576 063654          LDA RDWT        CHECK THE READ/WRITE FLAG
0070  07577 002011          SLA,RSS
0071  07600 027610          JMP SWRG
0072  07601 063657          LDA FIXR        CHECK THE PATTERN FLAG
0073  07602 000010          SLA
0074  07603 027606          JMP *+3
0075  07604 037657          ISZ FIXR        SET PATTERN FLAG
0076  07605 027610          JMP SWRG
0077  07606 002400          CLA
0078  07607 073657          STA FIXR        CLEAR THE PATTERN FLAG
0079  07610 102501  SWRG    LIA 01          CHECK THE SWITCH REGISTER
0080  07611 002020          SSA
0081  07612 027617          JMP NEW1        NEW ADDRESS
0082  07613 063654          LDA RDWT
0083  07614 002004          INA
0084  07615 073654          STA RDWT
0085  07616 027520          JMP BEGN        START ANOTHER PASS
0086  07617 027500  NEW1    JMP OPEN
0087  07620 000000  ERR1    OCT 0           ZERO'S ERROR
0088  07621 063620          LDA ERR1
0089  07622 073647          STA RETN
0090  07623 002400          CLA
0091  07624 073655          STA HOLD
0092  07625 027640          JMP PATT
0093  07626 000000  ERR2    OCT 0           ONE'S ERROR
0094  07627 063626          LDA ERR2
0095  07630 073647          STA RETN
0096  07631 003400          CCA
0097  07632 073655          STA HOLD
0098  07633 027640          JMP PATT
0099  07634 000000  ERR3    OCT 0           RESTORED PATTERN ERROR
0100  07635 073655          STA HOLD
0101  07636 063634          LDA ERR3
0102  07637 073647          STA RETN
0103  07640 063650  PATT    LDA ADDR        GET ADDRESS OF ERROR
0104  07641 006400          CLB
0105  07642 102001          HLT 01
0106  07643 167650          LDB ADDR,I      GET CONTENTS
0107  07644 063655          LDA HOLD        GET GOOD DATA
0108  07645 102001          HLT 01
0109  07646 127647          JMP RETN,I      JUMP BACK TO NEXT LOCATION
0110  07647 000000  RETN    OCT 0
0111  07650 000000  ADDR    OCT 0           WORKING ADDRESS
0112  07651 000000  CNTR    OCT 0           COUNTER
0113  07652 000000  END1    OCT 0           END ADDRESS
0114  07653 000077  MSK1    OCT 77          MASK
```



```
0115  07654 000000  RDWT    OCT 0           READ-WRITE FLAG
0116  07655 000000  HOLD    OCT 0           STORAGE FOR GOOD CONTENTS
0117  07656 000000  STAR    OCT 0           STARTING ADDRESS
0118  07657 000000  FIXR    OCT 0           COUNTER SETUP
0119                        END
** NO ERRORS*
```

LOW MEMORY CHECKERBOARD TEST

Tape No. HP 20513A
Listing No. HP 20513AL

```
PAGE 0001                                                    HP 20513AL


0001                ASMB,A,B,L,T
ADDR    000160
BEGN    000030
CNTR    000161
COMP    000062
END1    000162
ERR1    000130
ERR2    000136
ERR3    000144
FIXR    000167
HOLD    000165
INCR    000073
MSK1    000163
NEW1    000127
ONES    000056
OPEN    000010
PATT    000150
RDWT    000164
READ    000046
RETN    000157
STAR    000166
SWRG    000120
WRIT    000037
**  NO ERRORS*
```

```
PAGE 0002                                                    HP 20513AL


0001                ASMB,A,B,L,T
0002*
0003*  HP 2115 MEMORY CHECKERBOARD TEST 1-8-68
0004*
0005*
0006  00010                 ORG 0010B
0007  00010 102001  OPEN    HLT 01
0008  00011 102501          LIA 01          SET STARTING ADDRESS
0009  00012 070166          STA STAR
0010  00013 102001          HLT 01
0011  00014 102501          LIA 01          SET ENDING ADDRESS
0012  00015 070162          STA END1
0013  00016 003004          CMA,INA         2'S COMPLEMENT OF END
0014  00017 070165          STA HOLD
0015  00020 060162          LDA END1        GET END ADDRESS
0016  00021 040165          ADA HOLD
0017  00022 002020          SSA
0018  00023 024010          JMP OPEN        START ADDRESS GREATER THAN END
0019  00024 002400          CLA             CLEAR ACC
0020  00025 070161          STA CNTR
0021  00026 070167          STA FIXR
0022  00027 070164          STA RDWT
0023  00030 060166  BEGN    LDA STAR        LOAD THE STARTING ADDRESS
0024  00031 070160          STA ADDR
0025  00032 060167          LDA FIXR        SET UP COUNTER
0026  00033 070161          STA CNTR
0027  00034 060164          LDA RDWT
0028  00035 000010          SLA             IS THIS A READ OR WRITE PASS?
0029  00036 024046          JMP READ        READ
0030  00037 060161  WRIT    LDA CNTR        WRITE
0031  00040 000010          SLA             0'S OR 1'S
0032  00041 003401          CCA,RSS         STORE 1'S
0033  00042 002400          CLA             STORE 0'S
0034  00043 170160          STA ADDR,I
0035  00044 014073          JSB INCR        +1 THE SYSTEM
0036  00045 024037          JMP WRIT        GO WRITE NEXT LOCATION
0037  00046 060161  READ    LDA CNTR        READ 1'S OR 0'S?
0038  00047 000010          SLA
0039  00050 024056          JMP ONES        1'S
0040  00051 160160          LDA ADDR,I      0'S
0041  00052 002202          SZA
0042  00053 014130          JSB ERR1        ERROR
0043  00054 003000          CMA             SET UP TO STORE COMPLEMENT
0044  00055 024062          JMP COMP
0045  00056 002404  ONES    CLA,INA         SET UP TO READ 1'S
0046  00057 140160          ADA ADDR,I      TWO'S COMPLEMENT ADD TO MAKE 0'S
0047  00060 002002          SZA
0048  00061 014136          JSB ERR2
0049  00062 170160  COMP    STA ADDR,I      STORE THE COMPLEMENT
0050  00063 150160          CPA ADDR,I      COMPARE IT
0051  00064 024066          JMP *+2         SAME ?
0052  00065 014144          JSB ERR3
0053  00066 160160          LDA ADDR,I
0054  00067 003000          CMA             PREPARE TO RESTORE IT
0055  00070 170160          STA ADDR,I      RESTORE CONTENTS
0056  00071 014073          JSB INCR        +1 THE SYSTEM
0057  00072 024046          JMP READ        GO READ THE NEXT LOCATION
```

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PAGE 0003 #01                                                HP 20513AL


0058  00073 000000  INCR    OCT 0
0059  00074 060160          LDA ADDR
0060  00075 010163          AND MSK1        CHECK THE PATTERN
0061  00076 050163          CPA MSK1
0062  00077 034161          ISZ CNTR
0063  00100 060160          LDA ADDR        CHECK FOR END ADDRESS
0064  00101 050162          CPA END1
0065  00102 024106          JMP **4         END
0066  00103 034160          ISZ ADDR        NOT END YET +1 ADDRESS
0067  00104 034161          ISZ CNTR        +1 PATTERN
0068  00105 124073          JMP INCR,I
0069  00106 060164          LDA RDWT        CHECK THE READ/WRITE FLAG
0070  00107 002011          SLA,RSS
0071  00110 024120          JMP SWRG
0072  00111 060167          LDA FIXR        CHECK THE PATTERN FLAG
0073  00112 030010          SLA
0074  00113 024116          JMP **3
0075  00114 034167          ISZ FIXR        SET PATTERN FLAG
0076  00115 024120          JMP SWRG
0077  00116 002402          CLA
0078  00117 070167          STA FIXR        CLEAR THE PATTERN FLAG
0079  00120 102501  SWRG    LIA 01          CHECK THE SWITCH REGISTER
0080  00121 002020          SSA
0081  00122 024127          JMP NEW1        NEW ADDRESS
0082  00123 060164          LDA RDWT
0083  00124 002004          INA
0084  00125 070164          STA RDWT
0085  00126 024030          JMP BEGN        START ANOTHER PASS
0086  00127 024013  NEW1    JMP OPEN
0087  00130 000000  ERR1    OCT 0           ZERO'S ERROR
0088  00131 060130          LDA ERR1
0089  00132 070157          STA RETN
0090  00133 002400          CLA
0091  00134 070165          STA HOLD
0092  00135 024150          JMP PATT
0093  00136 000000  ERR2    OCT 0           ONE'S ERROR
0094  00137 060136          LDA ERR2
0095  00140 070157          STA RETN
0096  00141 003400          CCA
0097  00142 070165          STA HOLD
0098  00143 024150          JMP PATT
0099  00144 000000  ERR3    OCT 0           RESTORED PATTERN ERROR
0100  00145 070165          STA HOLD
0101  00146 060144          LDA ERR3
0102  00147 070157          STA RETN
0103  00150 060160  PATT    LDA ADDR        GET ADDRESS OF ERROR
0104  00151 006400          CLB
0105  00152 102001          HLT 01
0106  00153 164163          LDB ADDR,I      GET CONTENTS
0107  00154 060165          LDA HOLD        GET GOOD DATA
0108  00155 102001          HLT 01
0109  00156 124157          JMP RETN,I      JUMP BACK TO NEXT LOCATION
0110  00157 000000  RETN    OCT 0
0111  00160 000000  ADDR    OCT 0           WORKING ADDRESS
0112  00161 000000  CNTR    OCT 0           COUNTER
0113  00162 000000  END1    OCT 0           END ADDRESS
0114  00163 000077  MSK1    OCT 77          MASK
```

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0115  00164 000000  RDWT    OCT 0           READ-WRITE FLAG
0116  00165 000000  HOLD    OCT 0           STORAGE FOR GOOD CONTENTS
0117  00166 000000  STAR    OCT 0           STARTING ADDRESS
0118  00167 000000  FIXR    OCT 0           COUNTER SETUP
0119                        END
**  NO ERRORS*
```

SECTION VI

MAINTENANCE DATA

6-1. INTRODUCTION.

6-2. This section contains diagrams and tables that provide essential data for troubleshooting, maintenance, and repair. Included are signal indexes, wiring information, logic equations, schematic diagrams, and parts information. The scope and purpose of this data is discussed in the paragraphs which follow.

6-3. ABBREVIATIONS AND MNEMONICS.

6-4. The abbreviated terms used in expressing reference designations, electrical values, and part descriptions are included in Section VII, Replaceable Parts. Signal abbreviations, commonly referred to as mnemonics, are listed and defined in the signal index presented in Table 6-1. This index lists all signals and supply voltages routed through the connector pins on the plug-in cards installed in the Card Cage Assembly, and the Display Board located behind the Front Panel Assembly. Pertinent reference data for each signal is also included.

6-5. Reference numbers are listed in Table 6-1 for those signals routed through the sockets on the Backplane Assembly. These numbers (typically 015 associated with signal AAF) provides a cross-reference to the sequential line numbers listed in the reference column of the Backplane Wiring List, Table 6-2. By referring to line 015 in Table 6-2, complete wiring and interconnection information can be found for signal AAF (refer to Paragraph 6-13).

6-6. Those signals routed through interconnecting cables, rather than through the Backplane, are designated by asterisks in the reference number column of Table 6-1. Signals routed between I/O Control Card A15 (refer to Volume Three) and an external device are designated by a single asterisk (*); signals routed between the Core Memory Stack Assembly and associated plug-in cards in the Card Cage Assembly are designated by a double asterisk (**); signals routed through the Display Board Cable Assembly are designated by a triple asterisk (***).

6-7. The source column of Table 6-1 lists the reference designation and pin number of the assembly on which each signal originates. This source is useful as a test point reference, or as a reference to the assembly schematic diagram that provides circuit level coverage for the signal.

6-8. EQUATIONS.

6-9. Logic equations are provided for all signals listed in the Signal Index, Table 6-1. Two operators are used. A "+" is used to indicate a logical "OR" condition. For example C = A + B states that if either A or B is true then C is true. (The exclusive OR condition is not used.) A "*" is used to indicate a logical "AND" condition. For example C = A*B states that both A and B must be true for C to be true. Consequently if either A or B is false C will be false. When parentheses are used the quantity within the parentheses is treated as a single term. A bar over a quantity is used to indicate a logical inverse or negative quantity.

6-10. The equations in Table 6-3 are written to indicate input conditions required to produce a given output signal. The equations have been arranged with a minimum of "OR" conditions to facilitate trouble shooting. When a given signal is shown with several equations, any one of the given equations can produce the desired signal. The equations are in a reduced form and do not necessarily reflect the logic hardware.

6-11. INTERCONNECTIONS AND WIRING DATA.

6-12. INTERCONNECTION DIAGRAM. The overall interconnection diagram presented in Figure 6-1 shows the relationships and primary interconnections between major Computer assemblies. Detailed interconnection and wiring data presented within this section is described below.

6-13. BACKPLANE WIRING LIST. Wiring data for the plug-in card sockets located on the Backplane Assembly are presented in Table 6-2. This information must be used in conjunction with the schematic diagrams within this section to determine signal and power interconnections for the plug-in cards installed in the Card Cage Assembly and the Display Board located behind the Front Panel Assembly.

6-14. The quickest means of tracing a signal (either physically or schematically) is to first determine the reference number of the signal. This can be done by using the pin number indexes (if included on the schematic diagram), or by referring to the signal index presented in Table 6-1. Once the reference number is established, the signal can be located in the Backplane Wiring List by referring directly to the corresponding line number listed in the reference column of Table 6-2. For example, assume that interconnecting or wiring information is desired for signal AAF. By referring to the mnemonic listing in Table 6-1, it can be established that 015 is the reference number for signal AAF. This number provides a direct reference to line 015 in Table 6-2 where signal AAF is listed.

6-15. The following data for signal AAF is presented on this line:

a. As specified in the source column, signal AAF originates on assembly A14, the Shift Logic Card installed in slot 14 of the Card Cage Assembly.

b. As specified by numerical entry "14" at the

intersection of line 015 and column A14, signal AAF is routed through pin 14 of the Shift Logic Card to pin 14 of socket XA14 on the Backplane Assembly.

c. As specified by the numerical entries at the intersection of line 015 with columns A5, A12, and A13, signal AAF is routed from pin 14 of the Shift Logic Card to the pins specified for the Instruction Decoder Card, the Timing Generator Card, and the optional Parity Error Card.

d. Three wires are used to route signal AAF through the Backplane. One wire is connected from pin 14 of XA14 (the socket for Shift Logic Card A14) to pin 14 of XA13 (the socket for Instruction Decoder Card A13); another wire is connected from pin14 of XA13 to pin 56 of XA12 (the socket for Timing Generator Card A12); a third wire is connected from pin 56 of XA12 to pin 55 of XA5 (the socket for optional Parity Error Card A5).

e. Signal AAF can be checked on the Backplane at any one of the four socket pins listed (XA14-14, XA13-14, XA12-56, or XA5-55), or at a corresponding pin number on any of the four associated plug-in cards (A14-14, A12-14, A12-56, or A5-55). (The Extender Card must be employed to gain access to pins on the plug-in cards.)

f. By referring to the schematic diagrams for assemblies A5, A12, A13, and A14, signal AAF can be traced to all associated circuit components.

6-16. It should be noted that the layout of the Backplane Wiring List is similar to the actual physical layout of the Backplane and Card Cage. However, signal mnemonics and associated pin numbers are not listed alpha-numerically. For this reason, reference numbers are used for locating data, rather than attempting to locate mnemonics or pin numbers at random.

6-17. WIRING DIAGRAMS. Wiring diagrams are included in this section for the following items:

a. Backplane Assembly

b. Display Board Cable Assembly

c. Rear Panel Assembly

d. Capacitor Board Assembly

e. Heat Sink Assembly

6-18. SCHEMATIC DIAGRAMS.

6-19. Schematic diagrams are included in this section for all electrical assemblies comprising the basic Computer, with the exception of I/O Control Card A15 which is covered in Volume Three. These diagrams are arranged according to reference designation prefix.

6-20. Where applicable, a partial assembly configuration code is included on each schematic diagram for identification purposes. As an example, Board Revision 916 specified at the upper left hand corner of Figure 6-9, is the assembly configuration code for Sense Amplifier Card 02114-6005. Unless otherwise noted herein, or to the extend specified in supplementary documentation hereto, this schematic diagram is applicable to all such assemblies bearing Board Revision number 916 or subsequent. (Refer to Paragraph 6-24 for a further explanation of assembly configuration codes.)

6-21. When using the schematic diagrams, be sure to observe all notes. If included on the diagram, use the pin number index to determine signal reference numbers when locating information in the Backplane Wiring List presented in Table 6-2.

6-22. PARTS INFORMATION.

6-23. This section contains diagrams and tabular data used in locating, identifying, and ordering replacement parts and assemblies. Included are part location diagrams, reference designation indexes, replaceable parts numbers, and manufacturers code numbers. For a complete list of replaceable parts and manufacturers' codes refer to Section VII, Replaceable Parts.

6-24. PART LOCATION DIAGRAMS. Part location diagrams identify parts by reference designation and show the relative location of each part on the assembly to which it attaches. Where applicable, an assembly configuration code is included on each part location diagram for purposes of identification. For example, A-916-22 specified at the upper left hand corner of Figure 6-8, is the assembly configuration code for Sense Amplifier Card 02114-6005. Unless otherwise noted herein, or to the extent specified in supplementary documentation hereto, this part location diagram is applicable to all such assemblies bearing assembly configuration code A-916-22 or subsequent. (Note that "916" is that portion of the code used in identifying the Sense Amplifier Card schematic diagram presented in Figure 6-9.)

6-25. REFERENCE DESIGNATION INDEXES. The reference designation indexes (typical of which is Table 6-7) lists parts alpha-numerically by reference designation. A separate index is presented for each major assembly. Each index provides HP stock number, general description, manufacturer's part number, and manufacturer's code for each part.

6-26. REPLACEABLE PARTS TABLE. Replaceable parts are listed alpha-numerically by HP stock numbers in Table 7-2 of Section VII, Replaceable Parts. This table summarizes the information presented in the reference designation indexes, and provides the following additional information for each part:

a. Typical manufacturer of the part expressed as a five-digit code (refer to the code list of manufacturers presented in Table 7-3).

b. Manufacturer's part, stock or drawing number.

c. Total quantities of each part used in the Computer.

6-27. ORDERING INSTRUCTIONS. When ordering replacement parts, each part must be identified by the Hewlett-Packard stock number. To order a part that is not listed in the tables, include the following information:

a. Instrument model number.

b. Instrument serial number.

c. Description of the part.

d. Function and location of the part.

6-28. Address your order or inquiry to your local Hewlett-Packard field office (listed at the rear of this manual).

Table 6-1. Signal Index

SIGNAL MNEMONIC	REF. NO.	SOURCE	DEFINITION
AAF	015	A14-14	A Addressable Flip-Flop
ADD	028	A13-17	Add instruction, decoded
ADF	029	A13-25	Add Function
ANF	031	A13-23	AND Function
ASG	030	A13-4	Alter-Skip Group, decoded
BAF	016	A14-4	B Addressable Flip-Flop
C0	022	A14-57	Carry bit 0
C4	105	A11-80	Carry bit 4
C8	131	A10-80	Carry bit 8
C12	155	A9-80	Carry bit 12
C16	177	A8-80	Carry bit 16
C0-X	**	A2-17, U	Common line for memory address XX0X, decoded X-function
C0-Y	**	A1-17, U	Common line for memory address 0XXX, decoded Y-function
C1-X	**	A2-18, V	Common line for memory address XX1X, decoded X-function
C1-Y	**	A1-18, V	Common line for memory address 1XXX, decoded Y-function
C2-X	**	A2-19, W	Common line for memory address XX2X, decoded X-function
C2-Y	**	A1-19, W	Common line for memory address 2XXX, decoded Y-function

Note: Reference numbers denote signals routed through 86-pin connectors; asterisks denote signals routed through 48-pin connectors (refer to Paragraphs 6-3 thru 6-7).

Table 6-1. Signal Index (Cont)

SIGNAL MNEMONIC	REF. NO.	SOURCE	DEFINITION
C3-X	**	A2-20,X	Common line for memory address XX3X, decoded X-function
C3-Y	**	A1-20,X	Common line for memory address 3XXX, decoded Y-function
C4-X	**	A2-21,Y	Common line for memory address XX4X, decoded X-function
C4-Y	**	A1-21,Y	Common line for memory address 4XXX, decoded Y-function
C5-X	**	A2-22,Z	Common line for memory address XX5X, decoded X-function
C5-Y	**	A1-22,Z	Common line for memory address 5XXX, decoded Y-function
C6-X	**	A2-23,AA	Common line for memory address XX6X, decoded X-function
C6-Y	**	A1-23,AA	Common line for memory address 6XXX, decoded Y-function
C7-X	**	A2-24,BB	Common line for memory address XX7X, decoded X-function
C7-Y	**	A1-24,BB	Common line for memory address 7XXX, decoded Y-function
CA0-X	**	A2-2,B	Common Anode line for memory address XXX0, decoded X-function
CA0-Y	**	A1-2,B	Common Anode line for memory address X0XX, decoded Y-function
CA1-X	**	A2-4,D	Common Anode line for memory address XXX1, decoded X-function
CA1-Y	**	A1-4,D	Common Anode line for memory address X1XX, decoded Y-function
CA2-X	**	A2-6,F	Common Anode line for memory address XXX2, decoded X-function
CA2-Y	**	A1-6,F	Common Anode line for memory address X2XX, decoded Y-function
CA3-X	**	A2-8,J	Common Anode line for memory address XXX3, decoded X-function
CA3-Y	**	A1-8,J	Common Anode line for memory address X3XX, decoded Y-function
CA4-X	**	A2-10,L	Common Anode line for memory address XXX4, decoded X-function
CA4-Y	**	A1-10,L	Common Anode line for memory address X4XX, decoded Y-function
CA6-X	**	A2-14,R	Common Anode line for memory address XXX6, decoded X-function
CA6-Y	**	A1-14,R	Common Anode line for memory address X6XX, decoded Y-function
CA7-X	**	A2-16,T	Common Anode line for memory address XXX7, decoded X-function
CA7-Y	**	A1-16,T	Common Anode line for memory address X7XX, decoded Y-function
CC0-X	**	A2-1,A	Common Cathode line for memory address XXX0, decoded X-function
CC0-Y	**	A1-1,A	Common Cathode line for memory address X0XX, decoded Y-function
CC1-X	**	A2-3,C	Common Cathode line for memory address XXX1, decoded X-function
CC1-Y	**	A1-3,C	Common Cathode line for memory address X1XX, decoded Y-function

Table 6-1. Signal Index (Cont)

SIGNAL MNEMONIC	REF. NO.	SOURCE	DEFINITION
CC2-X	**	A2-5,E	Common Cathode line for memory address XXX2, decoded X-function
CC2-Y	**	A1-5,E	Common Cathode line for memory address X2XX, decoded Y-function
CC3-X	**	A2-7,H	Common Cathode line for memory address XXX3, decoded X-function
CC3-Y	**	A1-7,H	Common Cathode line for memory address X3XX, decoded Y-function
CC4-X	**	A2-9,K	Common Cathode line for memory address XXX4, decoded X-function
CC4-Y	**	A1-9,K	Common Cathode line for memory address X4XX, decoded Y-function
CC5-X	**	A2-11,M	Common Cathode line for memory address XXX5, decoded X-function
CC5-Y	**	A1-11,M	Common Cathode line for memory address X5XX, decoded Y-function
CC6-X	**	A2-13,P	Common Cathode line for memory address XXX6, decoded X-function
CC6-Y	**	A1-13,P	Common Cathode line for memory address X6XX, decoded Y-function
CC7-X	**	A2-15,S	Common Cathode line for memory address XXX7, decoded X-function
CC7-Y	**	A1-15,S	Common Cathode line for memory address X7XX, decoded Y-function
CKR	-	A24J1-24	Clicker signal
CLC	014	A14-23	Clear Control signal
CLF	013	A14-17	Clear Flag signal
CLR	272	A24-81	Clear switch Register
CMF	032	A13-22	Complement Function
CPA	033	A13-36	Compare instruction, decoded
CRS	234	A15-13	Control Reset to I/O
$\overline{\text{CSR}}$	005	A14-50	Clear Switch Register (negative-true)
DML	259	A24-84	Display Memory switch output
DSCY	320	A2-1	Driver Switch Control, Y-function
EDT	526	A16-62	End of Data Transfer
EFF	349		Enable Flag Flip-Flop
EIR	065	A12-83	Enable Instruction Register
ENF	067	A12-34	Enable Flag (T2 buffered)
EOF	034	A13-24	Exclusive OR Function
EPH	308		Enable Phase
ESR	—	A15	Enable Service Request
EXECUTE	104	A12-17	Execute Phase (PH3 display)
EXT	316	A12-65	External Clock input
EXTEND	292	A14-62	Extend Indicator

Table 6-1. Signal Index (Cont)

SIGNAL MNEMONIC	REF. NO.	SOURCE	DEFINITION
FETCH	102	A12-20	Fetch phase (PH1 display)
FLG 0	323	A16-4	Flag signal 0
FLG 1	242 *	A17-A23-4/49 A15-2	Flag signal 1
FLG 2	243 *	A15-35 A15-3	Flag signal 2
FLG 3	324	A15-53	Flag signal 3
GND	337	Power Supply	Ground
GND	338	Power Supply	Ground
GND	339	Power Supply	Ground
GND	340	Power Supply	Ground
GND	352	Power Supply	Ground
$\overline{\text{HIN}}$	024	A14-64	Halt Instruction, decoded (negative-true)
$\overline{\text{HIS}}$	312	A16-82	Hold Interrupt System (negative-true)
HLL	264	A24-80	Halt switch output
$\overline{\text{IA0}}$	*	A15-E	Interrupt Address 0 (negative-true)
$\overline{\text{IA1}}$	*	A15-D	Interrupt Address 1 (negative-true)
$\overline{\text{IA2}}$	*	A15-5	Interrupt Address 2 (negative-true)
$\overline{\text{IA3}}$	*	A15-7	Interrupt Address 3 (negative-true)
$\overline{\text{IA4}}$	*	A15-F	Interrupt Address 4 (negative-true)
$\overline{\text{IA5}}$	*	A15-G	Interrupt Address 5 (negative-true)
IAK	232	A15-10	Interrupt Acknowledge
ID0	**	A3-1	P/O Inhibit Drive current line (0-3K), bit 0
ID0	**	A4-1	P/O Inhibit Drive current line (4-7K), bit 0
ID1	**	A3-2	P/O Inhibit Drive current line (0-3K), bit 1
ID1	**	A4-2	P/O Inhibit Drive current line (4-7K), bit 1
ID2	**	A3-3	P/O Inhibit Drive current line (0-3K), bit 2
ID2	**	A4-3	P/O Inhibit Drive current line (4-7K), bit 2
ID3	**	A3-4	P/O Inhibit Drive current line (0-3K), bit 3
ID3	**	A4-4	P/O Inhibit Drive current line (4-7K), bit 3
ID4	**	A3-5	P/O Inhibit Drive current line (0-3K), bit 4
ID4	**	A4-5	P/O Inhibit Drive current line (4-7K), bit 4
ID5	**	A3-6	P/O Inhibit Drive current line (0-3K), bit 5
ID5	**	A4-6	P/O Inhibit Drive current line (4-7K), bit 5
ID6	**	A3-7	P/O Inhibit Drive current line (0-3K), bit 6
ID6	**	A4-7	P/O Inhibit Drive current line (4-7K), bit 6
ID7	**	A3-8	P/O Inhibit Drive current line (0-3K), bit 7
ID7	**	A4-8	P/O Inhibit Drive current line (4-7K), bit 7
ID8	**	A3-11	P/O Inhibit Drive current line (0-3K), bit 8
ID8	**	A4-11	P/O Inhibit Drive current line (4-7K), bit 8

Table 6-1. Signal Index (Cont)

SIGNAL MNEMONIC	REF. NO.	SOURCE	DEFINITION
ID9	**	A3-17	P/O Inhibit Drive current line (0-3K), bit 9
ID9	**	A4-17	P/O Inhibit Drive current line (4-7K), bit 9
ID10	**	A3-18	P/O Inhibit Drive current line (0-3K), bit 10
ID10	**	A4-18	P/O Inhibit Drive current line (4-7K), bit 10
ID11	**	A3-19	P/O Inhibit Drive current line (0-3K), bit 11
ID11	**	A4-19	P/O Inhibit Drive current line (4-7K), bit 11
ID12	**	A3-20	P/O Inhibit Drive current line (0-3K), bit 12
ID12	**	A4-20	P/O Inhibit Drive current line (4-7K), bit 12
ID13	**	A3-21	P/O Inhibit Drive current line (0-3K), bit 13
ID13	**	A4-21	P/O Inhibit Drive current line (4-7K), bit 13
ID14	**	A3-22	P/O Inhibit Drive current line (0-3K), bit 14
ID14	**	A4-22	P/O Inhibit Drive current line (4-7K), bit 14
ID15	**	A3-23	P/O Inhibit Drive current line (0-3K), bit 15
ID15	**	A4-23	P/O Inhibit Drive current line (4-7K), bit 15
ID16	**	A3-24	P/O Inhibit Drive current line (0-3K), bit 16
ID16	**	A4-24	P/O Inhibit Drive current line (4-7K), bit 16
$\overline{ID0}$	**	A3-A	P/O Inhibit Drive current line (0-3K), bit 0
$\overline{ID0}$	**	A4-A	P/O Inhibit Drive current line (4-7K), bit 0
$\overline{ID1}$	**	A3-B	P/O Inhibit Drive current line (0-3K), bit 1
$\overline{ID1}$	**	A4-B	P/O Inhibit Drive current line (4-7K), bit 1
$\overline{ID2}$	**	A3-C	P/O Inhibit Drive current line (0-3K), bit 2
$\overline{ID2}$	**	A4-C	P/O Inhibit Drive current line (4-7K), bit 2
$\overline{ID3}$	**	A3-D	P/O Inhibit Drive current line (0-3K), bit 3
$\overline{ID3}$	**	A4-D	P/O Inhibit Drive current line (4-7K), bit 3
$\overline{ID4}$	**	A3-E	P/O Inhibit Drive current line (0-3K), bit 4
$\overline{ID4}$	**	A4-E	P/O Inhibit Drive current line (4-7K), bit 4
$\overline{ID5}$	**	A3-F	P/O Inhibit Drive current line (0-3K), bit 5
$\overline{ID5}$	**	A4-F	P/O Inhibit Drive current line (4-7K), bit 5
$\overline{ID6}$	**	A3-H	P/O Inhibit Drive current line (0-3K), bit 6
$\overline{ID6}$	**	A4-H	P/O Inhibit Drive current line (4-7K), bit 6
$\overline{ID7}$	**	A3-J	P/O Inhibit Drive current line (0-3K), bit 7
$\overline{ID7}$	**	A4-J	P/O Inhibit Drive current line (4-7K), bit 7
$\overline{ID8}$	**	A3-R	P/O Inhibit Drive current line (0-3K), bit 8
$\overline{ID8}$	**	A4-R	P/O Inhibit Drive current line (4-7K), bit 8
$\overline{ID9}$	**	A3-U	P/O Inhibit Drive current line (0-3K), bit 9
$\overline{ID9}$	**	A4-U	P/O Inhibit Drive current line (4-7K), bit 9
$\overline{ID10}$	**	A3-V	P/O Inhibit Drive current line (0-3K), bit 10
$\overline{ID10}$	**	A4-V	P/O Inhibit Drive current line (4-7K), bit 10
$\overline{ID11}$	**	A3-W	P/O Inhibit Drive current line (0-3K), bit 11
$\overline{ID11}$	**	A4-W	P/O Inhibit Drive current line (4-7K), bit 11

Table 6-1. Signal Index (Cont)

SIGNAL MNEMONIC	REF. NO.	SOURCE	DEFINITION
$\overline{\text{ID12}}$	**	A3-X	P/O Inhibit Drive current line (0-3K), bit 12
$\overline{\text{ID12}}$	**	A4-X	P/O Inhibit Drive current line (4-7K), bit 12
$\overline{\text{ID13}}$	**	A3-Y	P/O Inhibit Drive current line (0-3K), bit 13
$\overline{\text{ID13}}$	**	A4-Y	P/O Inhibit Drive current line (4-7K), bit 13
$\overline{\text{ID14}}$	**	A3-Z	P/O Inhibit Drive current line (0-3K), bit 14
$\overline{\text{ID14}}$	**	A4-Z	P/O Inhibit Drive current line (4-7K), bit 14
$\overline{\text{ID15}}$	**	A3-AA	P/O Inhibit Drive current line (0-3K), bit 15
$\overline{\text{ID15}}$	**	A4-AA	P/O Inhibit Drive current line (4-7K), bit 15
$\overline{\text{ID16}}$	**	A3-BB	P/O Inhibit Drive current line (0-3K), bit 16
$\overline{\text{ID16}}$	**	A4-BB	P/O Inhibit Drive current line (4-7K), bit 16
IEN	233	A15-8	Interrupt Enable
IFF	350		Inhibit Flag Flip-Flop
$\overline{\text{IIR}}$	309		Inhibit Instruction Register
INDIRECT	103	A12-18	Indirect phase (PH2 display)
INT	254	A15-33	Interrupt
IOB 1	106	A11-50	Input/Output Bus, bit 0
IOB 1	107	A11-46	Input/Output Bus, bit 1
IOB 2	108	A11-42	Input/Output Bus, bit 2
IOB 3	109	A11-44	Input/Output Bus, bit 3
IOB 4	132	A10-50	Input/Output Bus, bit 4
IOB 5	133	A10-46	Input/Output Bus, bit 5
IOB 6	134	A10-42	Input/Output Bus, bit 6
IOB 7	135	A10-44	Input/Output Bus, bit 7
IOB 8	156	A9-50	Input/Output Bus, bit 8
IOB 9	157	A9-46	Input/Output Bus, bit 9
IOB 10	158	A9-42	Input/Output Bus, bit 10
IOB 11	159	A9-44	Input/Output Bus, bit 11
IOB 12	178	A8-50	Input/Output Bus, bit 12
IOB 13	179	A8-46	Input/Output Bus, bit 13
IOB 14	180	A8-42	Input/Output Bus, bit 14
IOB 15	181	A8-44	Input/Output Bus, bit 15
IOCO	027	A14-19	I/O Control, Output
IOF	037	A13-21	Inclusive OR Function
IOG	038	A13-52	Input/Output Group, decoded
IOI	019	A14-77	I/O Input
IOO	020	A14-13	I/O Output
IOS	314	A14-61	I/O Switch Address
$\overline{\text{IR-15}}$	035	A13-12	Instruction Register, bit 15 (negative-true)
IRQ 1	235 *	A22-6 A23-33 A15-14	Interrupt Request 1

Table 6-1. Signal Index (Cont)

SIGNAL MNEMONIC	REF. NO.	SOURCE	DEFINITION
IRQ 2	236	A21-6	Interrupt Request 2
		A22-33	
	*	A15-15	
IRQ 3	237	A20-6	Interrupt Request 3
		A21-33	
	*	A15-16	
IRQ 4	238	A19-6	Interrupt Request 4
		A20-33	
	*	A15-17	
IRQ 5	239	A18-6	Interrupt Request 5
		A19-33	
	*	A15-18	
IRQ 6	240	A17-6	Interrupt Request 6
		A18-33	
	*	A15-19	
IRQ 7	241	A15-20	Interrupt Request 7
	*		
ISG	315	A12-50/86	Inhibit Strobe Generator
ISR	018	A14-73	Input Switch Register
ISZ	036	A13-61	Increment, Skip if Zero
JMP	039	A13-84	Jump instruction, decoded
JSB	040	A13-7	Jump Subroutine instruction, decoded
LA0	***	A25P4-18	Loader Address, bit 0
LA1	***	A25P4-19	Loader Address, bit 1
LA2	***	A25P4-W	Loader Address, bit 2
LA3	***	A25P4-V	Loader Address, bit 3
LA4	***	A25P3-18	Loader Address, bit 4
LA5	***	A25P3-19	Loader Address, bit 5
LA6	***	A25P3-W	Loader Address, bit 6
LA7	***	A25P3-V	Loader Address, bit 7
LA8	***	A25P2-18	Loader Address, bit 8
LA9	***	A25P2-19	Loader Address, bit 9
LA10	***	A25P2-W	Loader Address, bit 10
LA11	***	A25P2-V	Loader Address, bit 11
LA12	***	A25P1-18	Loader Address, bit 12
LA13	***	A25P1-19	Loader Address, bit 13
LA14	***	A25P1-W	Loader Address, bit 14
LA15	***	A25P1-V	Loader Address, bit 15
LAL	260	A24-79	Load Address switch output
LAMP COM	347	Power Supply	Lamp Common ground
LAMP COM	348	Power Supply	Lamp Common ground
LDL	267	A24-73	Load switch output
LES	271	A24-11	Loader Enable Switch output

Table 6-1. Signal Index (Cont)

SIGNAL MNEMONIC	REF. NO.	SOURCE	DEFINITION
LML	263	A24-82	Load Memory switch output
LNS	261	A24-7	Phase Loop Switch output
LRS	017	A14-72	Least significant bit Right to Sign bit
M12	503	A2-8	Memory address bit 12
$\overline{M0}$	295	A2-16	Memory address bit 0 (negative-true)
$\overline{M1}$	296	A2-26	Memory address bit 1 (negative-true)
$\overline{M2}$	297	A2-20	Memory address bit 2 (negative-true)
$\overline{M3}$	298	A2-70	Memory address bit 3 (negative-true)
$\overline{M4}$	299	A2-72	Memory address bit 4 (negative-true)
$\overline{M5}$	300	A2-66	Memory address bit 5 (negative-true)
$\overline{M6}$	301	A1-16	Memory address bit 6 (negative-true)
$\overline{M7}$	302	A1-26	Memory address bit 7 (negative-true)
$\overline{M8}$	303	A1-20	Memory address bit 8 (negative-true)
$\overline{M9}$	304	A1-70	Memory address bit 9 (negative-true)
$\overline{M10}$	305	A1-72	Memory address bit 10 (negative-true)
$\overline{M11}$	306	A1-66	Memory address bit 11 (negative-true)
$\overline{M12}$	217	A2-14	Memory address bit 12 (negative-true)
MCJ	351	A1-74	
MIL	061	A12-61	Memory Interlock
MIT	071	A12-77	Memory Inhibit Time
MMD2	215	A7-49	Memory Module Decode
MON	268	A24-5	Memory On
MOR	026	A14-16	M-register OR output
MPT	216	A7-45/83	Memory Protect bit
MR0	110	A11-45	M Register bit 0
MR1	111	A11-37	M Register bit 1
MR2	112	A11-41	M Register bit 2
MR3	113	A11-49	M Register bit 3
MR4	136	A10-45	M Register bit 4
MR5	137	A10-37	M Register bit 5
MR6	138	A10-41	M Register bit 6
MR7	139	A10-49	M Register bit 7
MR8	160	A9-45	M Register bit 8
MR9	161	A9-37	M Register bit 9
MR10	162	A9-41	M Register bit 10
MR11	163	A9-49	M Register bit 11
MR12	182	A8-45	M Register bit 12
MRD0	***	A11-10	M Register Display, bit 0
MRD1	***	A11-L	M Register Display, bit 1
MRD2	***	A11-11	M Register Display, bit 2
MRD3	***	A11-M	M Register Display, bit 3

Table 6-1. Signal Index (Cont)

SIGNAL MNEMONIC	REF. NO.	SOURCE	DEFINITION
MRD4	***	A10-10	M Register Display, bit 4
MRD5	***	A10-L	M Register Display, bit 5
MRD6	***	A10-11	M Register Display, bit 6
MRD7	***	A10-M	M Register Display, bit 7
MRD8	***	A9-10	M Register Display, bit 8
MRD9	***	A9-L	M Register Display, bit 9
MRD10	***	A9-11	M Register Display, bit 10
MRD11	***	A9-M	M Register Display, bit 11
MRD12	***	A8-10	M Register Display, bit 12
MRD13	***	A8-L	M Register Display, bit 13
MRD14	***	A8-11	M Register Display, bit 14
MRD15	***	A8-M	M Register Display, bit 15
MRT	069	A12-82	Memory Read Time
MRT0	072	A12-75	Memory Read Time T0
MST	070	A12-84	Memory Strobe Time
MTE	064	A12-81	Memory Timing Enable
MWL	066	A12-80	Memory Write Level
MWT	068	A12-73	Memory Write Time
$\overline{\text{OPO}}$	041	A13-53	One Phase Operation (negative-true)
OVF	291	A14-8	Overflow Flip-Flop
P1235	502	A12-78	PH1, PH2, PH3, or PH5
P123	077	A12-11	PH1, PH2, or PH3
$\overline{\text{PEH}}$	218	A5-62, A15-83	Parity Error Halt (negative-true)
PEI	269	A5-61	Parity Error Indicator
PH1	073	A12-16	Phase 1, Fetch
PH2	074	A12-15	Phase 2, Indirect
PH3	075	A12-26	Phase 3, Execute
PH4	076	A12-22	Phase 4, Interrupt
PH5	333		Phase 5
$\overline{\text{PH5}}$	313	A16-83	Phase 5 (negative-true)
$\overline{\text{PINT}}$	307	A5-50	Parity Interrupt (negative-true)
PIRQ		A15	Power Failure Interrupt Request
PON	257	A15-3	Power On Pulse
POPIO	078	A12-42	Power On Pulse to I/O
PRH 10	244	A15-74	Priority High on Select Code 10
PRH 11/PRL 10	245	A23-3	Priority High to Select Code 11/Priority Low on Select Code 10
PRH 12/PRL 11	246	A22-3	Priority High to Select Code 12/Priority Low on Select Code 11
PRH 13/PRL 12	247	A21-3	Priority High to Select Code 13/Priority Low on Select Code 12
PRH 14/PRL 13	248	A20-3	Priority High to Select Code 14/Priority Low on Select Code 13
PRH 15/PRL 14	249	A19-3	Priority High to Select Code 15/Priority Low on Select Code 14

Table 6-1. Signal Index (Cont)

SIGNAL MNEMONIC	REF. NO.	SOURCE	DEFINITION
PRH 16/PRL 15	250	A17-23	Priority High to Select Code 16/Priority Low on Select Code 15
PRH 17/PRL 16	251	A17-23	Priority High to Select Code 17/Priority Low on Select Code 16
PRL 4	255	A15-24	Priority Low on Select Code 4
PRL 5	258	A5-52	Priority Low on Select Code 5
PRL 6	334	A16-3	Priority Low on Select Code 6
PRS	266	A24-77	Preset Switch output
PWF	322	Power Supply	Power Fail detect signal
RARB	049	A13-72	Read A into R Bus
RB 0	114	A11-53	R Bus, Bit 0
$\overline{\text{RB 0}}$	042	A13-20	R Bus, Bit 0 (negative-true)
RB 1	115	A11-59	R Bus, Bit 1
RB 2	116	A11-57	R Bus, Bit 2
RB 3	117	A11-70	R Bus, Bit 3
RB 4	140	A10-53	R Bus, Bit 4
RB 5	141	A10-59	R Bus, Bit 5
RB 6	142	A10-57	R Bus, Bit 6
RB 7	143	A10-70	R Bus, Bit 7
RB 8	164	A9-53	R Bus, Bit 8
RB 9	165	A9-59	R Bus, Bit 9
RB 10	166	A9-57	R Bus, Bit 10
RB 11	167	A9-70	R Bus, Bit 11
RB 12	183	A8-53	R Bus, Bit 12
RB 13	184	A8-59	R Bus, Bit 13
RB 14	185	A8-57	R Bus, Bit 14
RB 15	186	A8-70	R Bus, Bit 15
RBRB	043	A13-71	Read B into R Bus
$\overline{\text{RF 2}}$	079	A12-64	Run Flip-Flop 2 (negative-true)
RL 4	023	A14-80	Rotate Left 4
RMSB	044	A13-62	Read M into S Bus
RNL	265	A24-76	Run switch output
RPRB	045	A13-65	Read P into R Bus
$\overline{\text{RSM 0-5}}$	311	A11-12/19	Reset M Register bits 0-5 (negative -true)
$\overline{\text{RSM 6-9}}$	047	A13-32	Reset M Register bits 6-9 (negative-true)
$\overline{\text{RSM 10-15}}$	048	A13-35	Reset M Register bits 10-15 (negative-true)
$\overline{\text{RSP}}$	256	A15-6	Restart Pulse (negative-true)
RTS	501	A13-27	Internal Read T into S Bus
RTSB	046	A3-34	Read T into S Bus
RUN	095	A12-63	Run Signal

Table 6-1. Signal Index (Cont)

SIGNAL MNEMONIC	REF. NO.	SOURCE	DEFINITION
S0	**	A6-A	P/O Sense current line (0-3K), bit 0
S0	**	A7-A	P/O Sense current line (4-7K), bit 0
S1	**	A6-B	P/O Sense current line (0-3K), bit 1
S1	**	A7-B	P/O Sense current line (4-7K), bit 1
S2	**	A6-C	P/O Sense current line (0-3K), bit 2
S2	**	A7-C	P/O Sense current line (4-7K), bit 2
S3	**	A6-D	P/O Sense current line (0-3K), bit 3
S3	**	A7-D	P/O Sense current line (4-7K), bit 3
S4	**	A6-E	P/O Sense current line (0-3K), bit 4
S4	**	A7-E	P/O Sense current line (4-7K), bit 4
S5	**	A6-F	P/O Sense current line (0-3K), bit 5
S5	**	A7-F	P/O Sense current line (4-7K), bit 5
S6	**	A6-H	P/O Sense current line (0-3K), bit 6
S6	**	A7-H	P/O Sense current line (4-7K), bit 6
S7	**	A6-J	P/O Sense current line (0-3K), bit 7
S7	**	A7-J	P/O Sense current line (4-7K), bit 7
S8	**	A6-K	P/O Sense current line (0-3K), bit 8
S8	**	A7-K	P/O Sense current line (4-7K), bit 8
S9	**	A6-U	P/O Sense current line (0-3K), bit 9
S9	**	A7-U	P/O Sense current line (4-7K), bit 9
S10	**	A6-V	P/O Sense current line (0-3K), bit 10
S10	**	A7-V	P/O Sense current line (4-7K), bit 10
S11	**	A6-W	P/O Sense current line (0-3K), bit 11
S11	**	A7-W	P/O Sense current line (4-7K), bit 11
S12	**	A6-X	P/O Sense current line (0-3K), bit 12
S12	**	A7-X	P/O Sense current line (4-7K), bit 12
S13	**	A6-Y	P/O Sense current line (0-3K), bit 13
S13	**	A7-Y	P/O Sense current line (4-7K), bit 13
S14	**	A6-Z	P/O Sense current line (0-3K), bit 14
S14	**	A7-Z	P/O Sense current line (4-7K), bit 14
S15	**	A6-AA	P/O Sense current line (0-3K), bit 15
S15	**	A7-AA	P/O Sense current line (4-7K), bit 15
S16	**	A6-BB	P/O Sense current line (0-3K), bit 16
S16	**	A7-BB	P/O Sense current line (4-7K), bit 16
$\overline{S0}$	**	A6-1	P/O Sense current line (0-3K), bit 0
$\overline{S0}$	**	A7-1	P/O Sense current line (4-7K), bit 0
$\overline{S1}$	**	A6-2	P/O Sense current line (0-3K), bit 1
$\overline{S1}$	**	A7-2	P/O Sense current line (4-7K), bit 1
$\overline{S2}$	**	A6-3	P/O Sense current line (0-3K), bit 2
$\overline{S2}$	**	A7-3	P/O Sense current line (4-7K), bit 2

Table 6-1. Signal Index (Cont)

SIGNAL MNEMONIC	REF. NO.	SOURCE	DEFINITION
$\overline{S3}$	**	A6-4	P/O Sense current line (0-3K), bit 3
$\overline{S3}$	**	A7-4	P/O Sense current line (4-7K), bit 3
$\overline{S4}$	**	A6-5	P/O Sense current line (0-3K), bit 4
$\overline{S4}$	**	A7-5	P/O Sense current line (4-7K), bit 4
$\overline{S5}$	**	A6-6	P/O Sense current line (0-3K), bit 5
$\overline{S5}$	**	A7-6	P/O Sense current line (4-7K), bit 5
$\overline{S6}$	**	A6-7	P/O Sense current line (0-3K), bit 6
$\overline{S6}$	**	A7-7	P/O Sense current line (4-7K), bit 6
$\overline{S7}$	**	A6-8	P/O Sense current line (0-3K), bit 7
$\overline{S7}$	**	A7-8	P/O Sense current line (4-7K), bit 7
$\overline{S8}$	**	A6-9	P/O Sense current line (0-3K), bit 8
$\overline{S8}$	**	A7-9	P/O Sense current line (4-7K), bit 8
$\overline{S9}$	**	A6-17	P/O Sense current line (0-3K), bit 9
$\overline{S9}$	**	A7-17	P/O Sense current line (4-7K), bit 9
$\overline{S10}$	**	A6-18	P/O Sense current line (0-3K), bit 10
$\overline{S10}$	**	A7-18	P/O Sense current line (4-7K), bit 10
$\overline{S11}$	**	A6-19	P/O Sense current line (0-3K), bit 11
$\overline{S11}$	**	A7-19	P/O Sense current line (4-7K), bit 11
$\overline{S12}$	**	A6-20	P/O Sense current line (0-3K), bit 12
$\overline{S12}$	**	A7-20	P/O Sense current line (4-7K), bit 12
$\overline{S13}$	**	A6-21	P/O Sense current line (0-3K), bit 13
$\overline{S13}$	**	A7-21	P/O Sense current line (4-7K), bit 13
$\overline{S14}$	**	A6-22	P/O Sense current line (0-3K), bit 14
$\overline{S14}$	**	A7-22	P/O Sense current line (4-7K), bit 14
$\overline{S15}$	**	A6-23	P/O Sense current line (0-3K), bit 15
$\overline{S15}$	**	A7-23	P/O Sense current line (4-7K), bit 15
$\overline{S16}$	**	A6-24	P/O Sense current line (0-3K), bit 16
$\overline{S16}$	**	A7-24	P/O Sense current line (4-7K), bit 16
SAL	084	A12-35	Set Address of Loader
$\overline{SB0}$	060	A13-19	S Bus, bit 0 (negative-true)
SB15	197	A8-31	S Bus, bit 15
SCL	262	A24-83	Single Cycle switch output
SCL 0	220	A15-61	Select Code Least significant digit, octal 0
SCL 1	221	A15-64	Select Code Least significant digit, octal 1
SCL 2	222	A15-63	Select Code Least significant digit, octal 2
SCL 3	223	A15-59	Select Code Least significant digit, octal 3
SCL 4	224	A15-62	Select Code Least significant digit, octal 4
SCL 5	225	A15-67	Select Code Least significant digit, octal 5
SCL 6	226	A15-65	Select Code Least significant digit, octal 6
SCL 7	227	A15-68	Select Code Least significant digit, octal 7
SCM 0	228	A15-81	Select Code Most significant digit, octal 0

Table 6-1. Signal Index (Cont)

SIGNAL MNEMONIC	REF. NO.	SOURCE	DEFINITION
SCM 1	229	A15-80	Select Code Most significant digit, octal 1
SCM 2	230	A15-72	Select Code Most significant digit, octal 2
SCM 3	321	A15-84	Select Code Most significant digit, octal 3
SCO	062	A12-24	Single Cycle Output
SEO	085	A12-51	Switch Exclusive OR
SFC	010	A14-21	Skip if Flag Clear, decoded
SFS	012	A14-27	Skip if Flag Set, decoded
SIN	270	A24-9	Single Instruction switch output
SIR	231	A12-25	Set Interrupt Request (T5 buffered)
SKF	252	A15-12	Skip on Flag signal
SL 14	021	A14-71	Shift Left, bit 14
SLM	007	A14-75	Shift Left Magnitude
SL 0	009	A14-69	Shift Left Zero
SPARE	063		
SPARE	253		
SRD 0	***	A11-16	Switch Register Display, bit 0
SRD 1	***	A11-T	Switch Register Display, bit 1
SRD 2	***	A11-17	Switch Register Display, bit 2
SRD 3	***	A11-U	Switch Register Display, bit 3
SRD 4	***	A10-16	Switch Register Display, bit 4
SRD 5	***	A10-T	Switch Register Display, bit 5
SRD 6	***	A10-17	Switch Register Display, bit 6
SRD 7	***	A10-U	Switch Register Display, bit 7
SRD 8	***	A9-16	Switch Register Display, bit 8
SRD 9	***	A9-T	Switch Register Display, bit 9
SRD 10	***	A9-17	Switch Register Display, bit 10
SRD 11	***	A9-U	Switch Register Display, bit 11
SRD 12	***	A8-16	Switch Register Display, bit 12
SRD 13	***	A8-T	Switch Register Display, bit 13
SRD 14	***	A8-17	Switch Register Display, bit 14
SRD 15	***	A8-U	Switch Register Display, bit 15
SRG	052	A13-59	Shift Rotate Group, decoded
SRM	008	A14-78	Shift Right Magnitude
SRQ 10	325	A23-19	Service Request from Select Code Address 10
SRQ 11	326	A22-19	Service Request from Select Code Address 11
SRQ 12	327	A21-19	Service Request from Select Code Address 12
SRQ 13	328	A20-19	Service Request from Select Code Address 13
SRQ 14	329	A19-19	Service Request from Select Code Address 14
SRQ 15	330	A18-19	Service Request from Select Code Address 15
SRQ 16	331	A17-19	Service Request from Select Code Address 16
SRQ 17	332	A16-19	Service Request from Select Code Address 17

Table 6-1. Signal Index (Cont)

SIGNAL MNEMONIC	REF. NO.	SOURCE	DEFINITION
SSPM	082	A12-74	Switch Store in P and M registers
SSR	025	A14-42	Set Switch Register
$\overline{\text{ST 0}}$	198	A6,A7-4	Set T Register bit 0 (negative-true)
$\overline{\text{ST 1}}$	199	A6,A7-8	Set T Register bit 1 (negative-true)
$\overline{\text{ST 2}}$	200	A6,A7-12	Set T Register bit 2 (negative-true)
$\overline{\text{ST 3}}$	201	A6,A7-16	Set T Register bit 3 (negative-true)
$\overline{\text{ST 4}}$	202	A6,A7-20	Set T Register bit 4 (negative-true)
$\overline{\text{ST 5}}$	203	A6,A7-24	Set T Register bit 5 (negative-true)
$\overline{\text{ST 6}}$	204	A6,A7-28	Set T Register bit 6 (negative-true)
$\overline{\text{ST 7}}$	205	A6,A7-32	Set T Register bit 7 (negative-true)
$\overline{\text{ST 8}}$	206	A6,A7-36	Set T Register bit 8 (negative-true)
$\overline{\text{ST 9}}$	207	A6,A7-52	Set T Register bit 9 (negative-true)
$\overline{\text{ST 10}}$	208	A6,A7-56	Set T Register bit 10 (negative-true)
$\overline{\text{ST 11}}$	209	A6,A7-60	Set T Register bit 11 (negative-true)
$\overline{\text{ST 12}}$	210	A6,A7-64	Set T Register bit 12 (negative-true)
$\overline{\text{ST 13}}$	211	A6,A7-68	Set T Register bit 13 (negative-true)
$\overline{\text{ST 14}}$	212	A6,A7-72	Set T Register bit 14 (negative-true)
$\overline{\text{ST 15}}$	213	A6,A7-76	Set T Register bit 15 (negative-true)
$\overline{\text{ST 16}}$	214	A6,A7-80	Set T Register bit 16 (negative-true)
STBA	053	A13-73	Store T Bus in A
STBB	050	A13-74	Store T Bus in B
STBT	051	A13-26	Store T Bus in T
STC	011	A14-25	Set Control, decoded
STF	006	A14-15	Set Flag, decoded
STM 0-5	055	A13-58	Store T bus bits 0-5 in M
STM 6-9	056	A13-63	Store T bus bits 6-9 in M
STM 10-15	057	A13-66	Store T bus bits 10-15 in M
STP 0-9	058	A13-68	Store T bus bits 0-9 in M
STP 10-15	059	A13-67	Store T bus bits 10-15 in M
STR	054	A13-64	Store instruction, decoded
SWR 0	273	A24-46	Switch Register input bit 0
SWR 1	274	A24-33	Switch Register input bit 1
SWR 2	275	A24-34	Switch Register input bit 2
SWR 3	276	A24-45	Switch Register input bit 3
SWR 4	277	A24-48	Switch Register input bit 4
SWR 5	278	A24-31	Switch Register input bit 5
SWR 6	279	A24-36	Switch Register input bit 6
SWR 7	280	A24-47	Switch Register input bit 7
SWR 8	281	A24-32	Switch Register input bit 8
SWR 9	282	A24-35	Switch Register input bit 9
SWR 10	283	A24-50	Switch Register input bit 10

Table 6-1. Signal Index (Cont)

SIGNAL MNEMONIC	REF. NO.	SOURCE	DEFINITION
SWR 11	284	A24-26	Switch Register input bit 11
SWR 12	285	A24-37	Switch Register input bit 12
SWR 13	286	A24-49	Switch Register input bit 13
SWR 14	287	A24-51	Switch Register input bit 14
SWR 15	288	A24-78	Switch Register input bit 15
SWSA	080	A12-43	Switch Store in A
SWSB	081	A12-37	Switch Store in B
SWST	083	A12-36	Switch Store in T
T0	087	A12-3	Time period 0
T1	088	A12-10	Time period 1
T2	089	A12-9	Time period 2
T3	090	A12-14	Time period 3
T4	091	A12-19	Time period 4
T5	092	A12-21	Time period 5
T7	093	A12-44	Time period 7
T1M	086	A12-76	Time period 1 to Memory
T3IO	101	A12-31	Time period 3 to I/O
T1T2	096	A12-66	Time periods 1 and 2
T3T4	097	A12-54	Time periods 3 and 4
T4T5	098	A12-53	Time periods 4 and 5
T6T7	099	A12-33	Time periods 6 and 7
T7S	100	A12-29	Time period 7, Strobed
TS	094	A12-68	Time Strobe
TAN 2	144	A10-54	T Bus bits 4-7 ANDED
TAN 3	168	A14-5	T Bus bits 8-11 ANDED
TAN 4	187	A8-54	T Bus bits 12-15 ANDED
TAN 1	118	A11-54	T Bus bits 0-3 ANDED
$\overline{\text{TB0}}$	127	A11-62 A15-49	T Bus bit 0 (negative-true)
$\overline{\text{TB1}}$	128	A11-61 A15-50	T Bus bit 1 (negative-true)
$\overline{\text{TB2}}$	129	A11-64 A15-51	T Bus bit 2 (negative-true)
$\overline{\text{TB3}}$	130	A11-63 A15-36	T Bus bit 3 (negative-true)
$\overline{\text{TB4}}$	153	A10-62 A15-52	T Bus bit 4 (negative-true)
$\overline{\text{TB5}}$	154	A10-61 A15-54	T Bus bit 5 (negative-true)
$\overline{\text{TB12}}$	317	A8-62	T Bus bit 12 (negative-true)
$\overline{\text{TB13}}$	318	A8-61	T Bus bit 13 (negative-true)
$\overline{\text{TB14}}$	319	A8-64	T Bus bit 14 (negative-true)

Table 6-1. Signal Index (Cont)

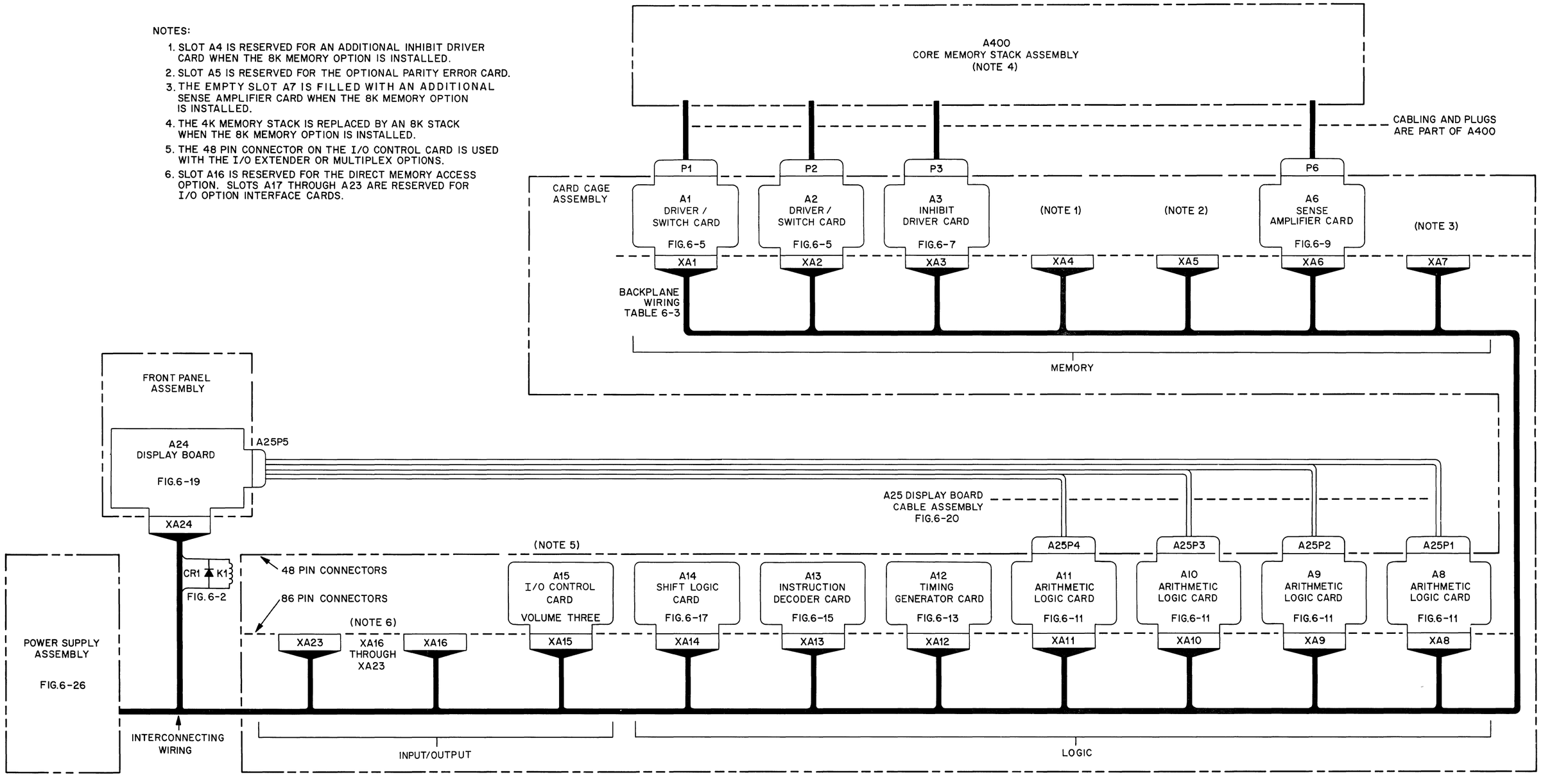
SIGNAL MNEMONIC	REF. NO.	SOURCE	DEFINITION
$\overline{\text{TB15}}$	196	A8-63	T Bus bit 15 (negative-true)
TR0	119	A11-15	T Register bit 0
TR1	120	A11-36	T Register bit 1
TR2	121	A11-25	T Register bit 2
TR3	122	A11-30	T Register bit 3
TR4	145	A10-15	T Register bit 4
TR5	146	A10-36	T Register bit 5
TR6	147	A10-25	T Register bit 6
TR7	148	A10-30	T Register bit 7
TR8	169	A9-15	T Register bit 8
TR9	170	A9-36	T Register bit 9
TR10	171	A9-25	T Register bit 10
TR11	172	A9-30	T Register bit 11
TR12	188	A8-15	T Register bit 12
TR13	189	A8-36	T Register bit 13
TR14	190	A8-25	T Register bit 14
TR15	191	A8-30	T Register bit 15
$\overline{\text{TR0}}$	123	A11-14	T Register bit 0 (negative-true)
$\overline{\text{TR1}}$	124	A11-16	T Register bit 1 (negative-true)
$\overline{\text{TR2}}$	125	A11-24	T Register bit 2 (negative-true)
$\overline{\text{TR3}}$	126	A11-26	T Register bit 3 (negative-true)
$\overline{\text{TR4}}$	149	A10-14	T Register bit 4 (negative-true)
$\overline{\text{TR5}}$	150	A10-16	T Register bit 5 (negative-true)
$\overline{\text{TR6}}$	151	A10-24	T Register bit 6 (negative-true)
$\overline{\text{TR7}}$	152	A10-26	T Register bit 7 (negative-true)
$\overline{\text{TR8}}$	173	A9-14	T Register bit 8 (negative-true)
$\overline{\text{TR9}}$	174	A9-16	T Register bit 9 (negative-true)
$\overline{\text{TR10}}$	175	A9-24	T Register bit 10 (negative-true)
$\overline{\text{TR11}}$	176	A9-26	T Register bit 11 (negative-true)
$\overline{\text{TR12}}$	192	A8-14	T Register bit 12 (negative-true)
$\overline{\text{TR13}}$	193	A8-16	T Register bit 13 (negative-true)
$\overline{\text{TR14}}$	194	A8-24	T Register bit 14 (negative-true)
$\overline{\text{TR15}}$	195	A8-26	T Register bit 15 (negative-true)
$\overline{\text{TR16}}$	219	A5-52	Parity output (negative-true)
TRD 0	***	A11-13	T Register Display, bit 0
TRD 1	***	A11-P	T Register Display, bit 1
TRD 2	***	A11-14	T Register Display, bit 2
TRD 3	***	A11-R	T Register Display, bit 3
TRD 4	***	A10-13	T Register Display, bit 4
TRD 5	***	A10-P	T Register Display, bit 5
TRD 6	***	A10-14	T Register Display, bit 6

Table 6-1 Signal Index (Cont)

SIGNAL MNEMONIC	REF. NO.	SOURCE	DEFINITION
TRD 7	***	A10-R	T Register Display, bit 7
TRD 8	***	A9-13	T Register Display, bit 8
TRD 9	***	A9-P	T Register Display, bit 9
TRD 10	***	A9-14	T Register Display, bit 10
TRD 11	***	A9-R	T Register Display, bit 11
TRD 12	***	A8-13	T Register Display, bit 12
TRD 13	***	A8-P	T Register Display, bit 13
TRD 14	***	A8-14	T Register Display, bit 14
TRD 15	***	A8-R	T Register Display, bit 15
XDSCY	527	Power Supply	External Driver Switch Control
$\overline{\text{XINT}}$	*	A15-C	External Interrupt (negative-true)
XMR0	512	A16-19	External Memory Register Bit 0
XMR1	513	A16-18	External Memory Register Bit 1
XMR2	514	A16-11	External Memory Register Bit 2
XMR3	515	A16-26	External Memory Register Bit 3
XMR4	516	A16-28	External Memory Register Bit 4
XMR5	517	A16-27	External Memory Register Bit 5
XMR6	518	A16-29	External Memory Register Bit 6
XMR7	519	A16-30	External Memory Register Bit 7
XMR8	520	A16-31	External Memory Register Bit 8
XMR9	521	A16-36	External Memory Register Bit 9
XMR10	522	A16-36	External Memory Register Bit 10
XMR11	523	A16-32	External Memory Register Bit 11
XMR12	524	A16-59	External Memory Register Bit 12
$\overline{\text{XPH4}}$	310	A12-13	External Phase 4 (negative-true)
$\overline{\text{XRTS}}$	525	A16-84	External Read T into S Bus (negative-true)
YN7	293	A1-58	XX7XX
Y7N	294	A1-50	X7XXX
-2V	336	Power Supply	Supply Voltage
-12V	003	Power Supply	Supply Voltage
-12V	345	Power Supply	Supply Voltage
-12V	346	Power Supply	Supply Voltage
+5V	335	Power Supply	Supply Voltage
+5V	341	Power Supply	Supply Voltage
+5V	342	Power Supply	Supply Voltage
+12V	002	Power Supply	Supply Voltage
+12V	343	Power Supply	Supply Voltage
+12V	344	Power Supply	Supply Voltage
+20V	001	Power Supply	Supply Voltage
+30V	004	Power Supply	Supply Voltage
+30V	289	Power Supply	Supply Voltage
+30V	290	Power Supply	Supply Voltage

NOTES:

1. SLOT A4 IS RESERVED FOR AN ADDITIONAL INHIBIT DRIVER CARD WHEN THE 8K MEMORY OPTION IS INSTALLED.
2. SLOT A5 IS RESERVED FOR THE OPTIONAL PARITY ERROR CARD.
3. THE EMPTY SLOT A7 IS FILLED WITH AN ADDITIONAL SENSE AMPLIFIER CARD WHEN THE 8K MEMORY OPTION IS INSTALLED.
4. THE 4K MEMORY STACK IS REPLACED BY AN 8K STACK WHEN THE 8K MEMORY OPTION IS INSTALLED.
5. THE 48 PIN CONNECTOR ON THE I/O CONTROL CARD IS USED WITH THE I/O EXTENDER OR MULTIPLEX OPTIONS.
6. SLOT A16 IS RESERVED FOR THE DIRECT MEMORY ACCESS OPTION. SLOTS A17 THROUGH A23 ARE RESERVED FOR I/O OPTION INTERFACE CARDS.



2039-1 **Figure 6-1. Overall Interconnection Diagram**

Table 6-2. Backplane Wiring List

			MEMORY							LOGIC							INPUT/OUTPUT									FRONT PANEL
			DRIVER/ SWITCH-Y	DRIVER/ SWITCH-X	INHIBIT DRIVER 0	INHIBIT DRIVER 1	PARITY ERROR	SENSE AMPLIFIER 0	SENSE AMPLIFIER 1	ARITHMETIC LOGIC 12-15	ARITHMETIC LOGIC 8-11	ARITHMETIC LOGIC 4-7	ARITHMETIC LOGIC 0-3	TIMING GENERATOR	INSTRUCTION DECODER	SHIFT LOGIC	I/O CONTROL	DMA	I/O-16	I/O-15	I/O-14	I/O-13	I/O-12	I/O-11	I/O-10	
REF	SIGNAL	SOURCE	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20	A21	A22	A23	A24
001	+20V	PS	43/44	43/44	43/44	43/44																				
002	+12V	PS						43/44	43/44										43/44	←	BUSS	BAR	→		43/44	
003	-12V	PS						69/70	69/70										69/70	←	BUSS	BAR	→		69/70	
004	+30V	PS																	36	←					36	
005	$\overline{CSR}$	A14								79	79	79	79			50										
006	STF	↓					19									15	9	9	←						9	
007	SLM									75/77	74/77 75	74/77 75	74/75			75										
008	SRM									76	76/72	76/72	76/72			78										
009	SL0												77			69										
010	SFC															21	5	5	←						5	
011	STC															25	22	22	←						22	
012	SFS															27	25	25	←						25	
013	CLF						32									17	7	7	←						7	
014	CLC															23	21	21	←						21	
015	AAF						55							56	14	14										
016	BAF						56							55	11	4										
017	LRS									72						72										
018	ISR									21	21	21	21			73										
019	IOI						64			43	43	43	43			77	66	24	←						24	
020	IOO															13		20	←						20	
021	SL14									74						71										
022	C0												78			57										
023	RL4									73	73	73	73			80										
024	$\overline{HIN}$													71		64										
025	SSR									22	22	22	22			42										
026	MOR	↓								10/38	10/20 38	10/20 38	20/38			16										
027	IOCO	A14								84	84	84	84			19		70								
028	ADD	A13													17	76										
029	ADF	↑								58	58	58	58		25											
030	ASG														4	28										
031	ANF									65	65	65	65		23											
032	CMF									55	55	55	55		22											
033	CPA														36	31										
034	EOF									60	60	60	60		24											
035	$\overline{IR15}$													12	69											
036	ISZ						28							23	61	32										
037	IOF									56	56	56	56		21											
038	IOG						57								52	56	69									
039	JMP													4	84											
040	JSB													32	7											
041	$\overline{OP0}$													8	53											
042	$\overline{RB0}$												51		20											
043	RBRB									7	7	7	7		71											
044	RMSB	↓								34	34	34	34		62											
045	RPRB	A13								29	29	29	29		65											
046	RTSB	A3			34					32	32	32	32													
047	$\overline{RSM6-9}$	A13									12	19			32		26									
048	$\overline{RSM10-15}$	↑								19/12	19				35											
049	RARB									5	5	5	5		72											
050	STBB									6	6	6	6		74											
051	STBT									3	3	3	3		26											
052	SRG														59	63										
053	STBA									4	4	4	4		73											
054	STR													46	64											
055	STM0-5	↓										11	11/18		58											
056	STM6-9	A13									11	18			63		16									

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Table 6-2. Backplane Wiring List (Continued)

			MEMORY							LOGIC							INPUT/OUTPUT									
			DRIVER/ SWITCH Y	DRIVER/ SWITCH X	INHIBIT DRIVER 0	INHIBIT DRIVER 1	PARITY ERROR	SENSE AMPLIFIER 0	SENSE AMPLIFIER 1	ARITHMETIC LOGIC 12 15	ARITHMETIC LOGIC 8 11	ARITHMETIC LOGIC 4 7	ARITHMETIC LOGIC 0 3	TIMING GENERATOR	INSTRUCTION DECODER	SHIFT LOGIC	I/O CONTROL	DMA	I/O-16	I/O 15	I/O 14	I/O-13	I/O 12	I/O-11	I/O-10	FRONT PANEL
REF	SIGNAL	SOURCE	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20	A21	A22	A23	A24
057	STM10-15	A13								11 18	18				66											
058	STP0-9	↓									9	9 28	9 28		68											
059	STP10-15	↓								9 28	28				67											
060	$\overline{SB0}$	A13											35		19											
061	MIL	A12			56	56								61												
062	SCO	↓												24	28											
063	SPARE																		59	←				→	59	
064	MTE						49							81												
065	EIR													83	44											
066	MWL						54							80												
067	ENF						22							34			46	46	←					→	46	
068	MWT		12	12										73												
069	MRT		18	18										82												
070	MST							41	41					84												
071	MIT		30	30	54	54								77												
072	MRT0		22	22										75												
073	PH1													16	56		15									
074	PH2													15	77											
075	PH3						30							26	5	37										
076	PH4													22	50		34	81								
077	P123													11		26										
078	POPIO						45							42			17	←						→	17	
079	$\overline{RF2}$													64												75
080	SWSA													43	57											
081	SWSB													37	80											
082	SSPM													74	75											
083	$\overline{SWST}$													36	15			69								
084	SAL									8	8	8	8	35												
085	SEO													51	13	81										
086	T1M						46							76												
087	T0													3	54	18	19									
088	T1													10	9		18									
089	T2													9	10	84										
090	T3						51							14	29	65										
091	T4													19	37	34										
092	T5													21	6	58										
093	T7													44	31	79		60								
094	TS													68	78	36	20									
095	RUN													63					50	←				→	50	
096	T1T2													66	3											
097	T3T4													54	38	49		78								
098	T4T5													53	42	51		80								
099	T6T7													33	41	83										
100	T7S													29	76											
101	T3IO													31			11		11	←				→	11	
102	FETCH													20												25
103	INDIRECT	↓												18												28
104	EXECUTE	A12												17												27
105	C4	A11										78	80													
106	IOB0						7						50					35	26/35	←				→	26/35	
107	IOB1						5						46					38	29/38	←				→	29/38	
108	IOB2						9						42					41	30/41	←				→	30/41	
109	IOB3						8						44					45	45/64	←				→	45/64	
110	MR0			60									45			12										
111	MR1	↓		64									37													
112	MR2	A11		38									41													

Table 6-2. Backplane Wiring List (Continued)

			MEMORY							LOGIC							INPUT/OUTPUT									FRONT PANEL
			DRIVER/ SWITCH-Y	DRIVER/ SWITCH-X	INHIBIT DRIVER 0	INHIBIT DRIVER 1	PARITY ERROR	SENSE AMPLIFIER 0	SENSE AMPLIFIER 1	ARITHMETIC LOGIC 12 15	ARITHMETIC LOGIC 8-11	ARITHMETIC LOGIC 4-7	ARITHMETIC LOGIC 0-3	TIMING GENERATOR	INSTRUCTION DECODER	SHIFT LOGIC	I/O CONTROL	DMA	I/O-16	I/O-15	I/O-14	I/O-13	I/O-12	I/O-11	I/O-10	
REF	SIGNAL	SOURCE	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20	A21	A22	A23	A24
113	MR3	A11		84									49													
114	RB0									71		69	53			55										
115	RB1											67	59													
116	RB2											68	57													
117	RB3											66	70													
118	TAN1												54			22										
119	TR0						41						15			60	57									
120	TR1						38						36			66	58									
121	TR2						35						25		16	59	55									
122	TR3						37						30			53	77									
123	$\overline{TR0}$				6	6							14													
124	$\overline{TR1}$				4	4							16			10										
125	$\overline{TR2}$				14	14							24			44										
126	$\overline{TR3}$	A11			8	8							26			6										
127	$\overline{TB0}$	A11/A15											62			82	49									
128	$\overline{TB1}$	A11/A15											61				50									
129	$\overline{TB2}$	A11/A15											64				51									
130	$\overline{TB3}$	A11/A15											63				36									
131	C8	A10									78	80														
132	IOB4						81					50					42	42/77	←						42/77	
133	IOB5						82					46					51	51/80	←						51/80	
134	IOB6						84					42					53	53/81	←						53/81	
135	IOB7						83					44					52	52/84	←						52/84	
136	MR4			82								45														
137	MR5			78								37														
138	MR6		60									41														
139	MR7		64									49														
140	RB4										69	53	71													
141	RB5										67	59														
142	RB6										68	57														
143	RB7										66	70														
144	TAN2											54				11										
145	TR4						25					15			46	54	78									
146	TR5						24					36				52	75									
147	TR6						26					25														
148	TR7						23					30				70										
149	$\overline{TR4}$				22	22						14				7										
150	$\overline{TR5}$				12	12						16				9										
151	$\overline{TR6}$				28	28						24			82	43										
152	$\overline{TR7}$	A10			20	20						26			45											
153	$\overline{TB4}$	A10/A11										62					52									
154	$\overline{TB5}$	A10/A11										61					54									
155	C12	A9								78	80															
156	IOB8						75				50							54	27/54	←					27/54	
157	IOB9						76				46							56	31/56	←					28/56	
158	IOB10						73				42							58	31/58	←					31/58	
159	IOB11						74				44							55	55/60	←					55/60	
160	MR8		38								45															
161	MR9		84								37															
162	MR10		82								41															
163	MR11		78								49															
164	RB8									69	53	71														
165	RB9									67	59															
166	RB10									68	57															
167	RB11									66	70															
168	TAN3	↓														5										

Table 6-2. Backplane Wiring List (Continued)

			MEMORY							LOGIC							INPUT/OUTPUT									
			DRIVER/ SWITCH Y	DRIVER/ SWITCH X	INHIBIT DRIVER 0	INHIBIT DRIVER 1	PARITY ERROR	SENSE AMPLIFIER 0	SENSE AMPLIFIER 1	ARITHMETIC LOGIC 12-15	ARITHMETIC LOGIC 8-11	ARITHMETIC LOGIC 4-7	ARITHMETIC LOGIC 0-3	TIMING GENERATOR	INSTRUCTION DECODER	SHIFT LOGIC	I/O CONTROL	DMA	I/O 16	I/O 15	I/O 14	I/O 13	I/O 12	I/O 11	I/O 10	FRONT PANEL
REF	SIGNAL	SOURCE	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20	A21	A22	A23	A24
169	TR8						17				15				79	46										
170	TR9						15				36				18	29										
171	TR10						16				25				34											
172	TR11						18				30				33	33										
173	$\overline{TR8}$				30	30					14				83	68										
174	$\overline{TR9}$				60	60					16				70											
175	$\overline{TR10}$	↓			58	58					24															
176	$\overline{TR11}$	A9			68	68					26					30										
177	C16	A8								80						35										
178	IOB12						34			50								57	$^{57}/_{58}$ ←					→ $^{57}/_{58}$	
179	IOB13									46								61	$^{61}/_{79}$ ←					→ $^{61}/_{79}$	
180	IOB14									42								65	$^{65}/_{82}$ ←					→ $^{65}/_{82}$	
181	IOB15						33			44								74	$^{74}/_{83}$ ←					→ $^{74}/_{83}$	
182	MR12					25				45																
183	RB12									53	71		69													
184	RB13									59			67													
185	RB14									57			68													
186	RB15									70			66			45										
187	TAN4									54						20										
188	TR12						10			15					55											
189	TR13						4			36					49											
190	TR14						6			25					43											
191	TR15						3			30				5	30											
192	$\overline{TR12}$				66	66				14																
193	$\overline{TR13}$				76	76				16																
194	$\overline{TR14}$				74	74				24																
195	$\overline{TR15}$				82	82				26				7	81											
196	$\overline{TB15}$	↓								63						24										
197	SB15	A8								31						3										
198	$\overline{ST0}$	A6/A7						4	4				13													
199	$\overline{ST1}$							8	8				17													
200	$\overline{ST2}$							12	12				23													
201	$\overline{ST3}$							16	16				27													
202	$\overline{ST4}$							20	20			13														
203	$\overline{ST5}$							24	24			17														
204	$\overline{ST6}$							28	28			23														
205	$\overline{ST7}$							32	32			27														
206	$\overline{ST8}$							36	36		13															
207	$\overline{ST9}$							52	52		17															
208	$\overline{ST10}$							56	56		23															
209	$\overline{ST11}$							60	60		27															
210	$\overline{ST12}$							64	64	13																
211	$\overline{ST13}$							68	68	17																
212	$\overline{ST14}$							72	72	23																
213	$\overline{ST15}$	↓						76	76	27																
214	$\overline{ST16}$	A6/A7					60	80	80																	
215	MMD2	A4		10		23																				
216	MPT	A4				50								70												
217	$\overline{MI2}$	A2		14	52		42	50																		
218	$\overline{PEH}$	A5					62							27			83									
219	$\overline{TR16}$	A5			80	80	52																			
220	SCL0	A15															61	75							16	
221	SCL1																64	76						16	34	
222	SCL2																63	16					16	34		
223	SCL3	↓															59	71				16	34			
224	SCL4	A15															62	50			16	34				

Table 6-2. Backplane Wiring List (Continued)

			MEMORY							LOGIC							INPUT/OUTPUT									FRONT PANEL
			DRIVER/ SWITCH-Y	DRIVER/ SWITCH-X	INHIBIT DRIVER 0	INHIBIT DRIVER 1	PARITY ERROR	SENSE AMPLIFIER 0	SENSE AMPLIFIER 1	ARITHMETIC LOGIC 12-15	ARITHMETIC LOGIC 8-11	ARITHMETIC LOGIC 4-7	ARITHMETIC LOGIC 0-3	TIMING GENERATOR	INSTRUCTION DECODER	SHIFT LOGIC	I/O CONTROL	DMA	I/O-16	I/O-15	I/O-14	I/O-13	I/O-12	I/O-11	I/O-10	
REF	SIGNAL	SOURCE	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20	A21	A22	A23	A24
225	SCL5	A15					66										67	49		16	34					
226	SCL6																65	34	16	34						
227	SCL7																68		34							
228	SCM0						59										81	14								
229	SCM1	↓															80	37	14/37	←				→	14/37	
230	SCM2	A15															72									
231	SIR	A12					53							25			32		32	←				→	32	
232	IAK	A15					20										10	←						→	10	
233	IEN	A15															8	←						→	8	
234	CRS	A15															13	←						→	13	
235	IRQ1	A22/A23															31							6	33	
236	IRQ2	A21/A22															29						6	33		
237	IRQ3	A20/A21															41					6	33			
238	IRQ4	A19/A20															42				6	33				
239	IRQ5	A18/A19					29										37			6	33					
240	IRQ6	A17/A18															45	6	6	33						
241	IRQ7	A17															38		33							
242	FLG1	A17-A23															4		4/49	←				→	4/49	
243	FLG2	Not Used															35									
244	PRH10	A15															74								23	
245	PRH11/PRL10	A23																						23	3	
246	PRH12/PRL11	A22																					23	3		
247	PRH13/PRL12	A21																				23	3			
248	PRH14/PRL13	A20																			23	3				
249	PRH15/PRL14	A19																		23	3					
250	PRH16/PRL15	A18																	23	3						
251	PRH17/PRL16	A17																	3							
252	SKF	A15-A23														38	12	←						→	12	
253	SPARE																		68	←				→	68	
254	INT	A15												6			33									
255	PRL4	A15					63										24	72								
256	$\overline{\text{RSP}}$	A15												30			6									
257	PON	A15	46	46										38			3		66	←				→	66	
258	PRL5	A5					58										73	23								
259	DML	A24												60												84
260	LAL													62												79
261	LNS													45												7
262	SCL													57												83
263	LML													59												82
264	HLL													28	8											80
265	RNL													41												76
266	PRS													49			23									77
267	LDL	↓												52												73
268	MON	A24												79												5
269	PEI	A5					61																			29
270	SIN	A24													60											9
271	LES													67												11
272	CLR															41										81
273	SWR0												33													46
274	SWR1												82													33
275	SWR2												52													34
276	SWR3												83													45
277	SWR4											33														48
278	SWR5											82														31
279	SWR6											52														36
280	SWR7	↓										83														47

Table 6-2. Backplane Wiring List (Continued)

			MEMORY							LOGIC							INPUT/OUTPUT									
			DRIVER/ SWITCH Y	DRIVER/ SWITCH X	INHIBIT DRIVER 0	INHIBIT DRIVER 1	PARITY ERROR	SENSE AMPLIFIER 0	SENSE AMPLIFIER 1	ARITHMETIC LOGIC 12-15	ARITHMETIC LOGIC 8-11	ARITHMETIC LOGIC 4-7	ARITHMETIC LOGIC 0-3	TIMING GENERATOR	INSTRUCTION DECODER	SHIFT LOGIC	I/O CONTROL	DMA	I/O-16	I/O-15	I/O-14	I/O-13	I/O-12	I/O-11	I/O-10	FRONT PANEL
REF	SIGNAL	SOURCE	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20	A21	A22	A23	A24
281	SWR8	A24									33															32
282	SWR9	↓									82															35
283	SWR10										52															50
284	SWR11										83															26
285	SWR12									33																37
286	SWR13									82																49
287	SWR14	↓								52																51
288	SWR15	A24								83																78
289	+30V	PS																								21/67
290	+30V	PS																								22/68
291	OVF	A14														8										23
292	EXTEND	A14														62										30
293	YN7	A1	58											69												
294	Y7N	A1	50											72												
295	$\overline{M0}$	A2		16			14																			
296	$\overline{M1}$	A2		26			13																			
297	$\overline{M2}$	A2		20			12																			
298	$\overline{M3}$	A2		70			11																			
299	$\overline{M4}$	A2		72			79																			
300	$\overline{M5}$	A2		66			80																			
301	$\overline{M6}$	A1	16				77																			
302	$\overline{M7}$	A1	26				78																			
303	$\overline{M8}$	A1	20				71																			
304	$\overline{M9}$	A1	70				72																			
305	$\overline{M10}$	A1	72				67																			
306	$\overline{M11}$	A1	66				68																			
307	$\overline{PINT}$	A5	74/76				50										70									
308	EPH	Not Used																								
309	$\overline{IIR}$	Not Used																								
310	$\overline{XPH4}$	A12												13				77								
311	$\overline{RSM0-5}$	A11										12/40	12/19													
312	$\overline{HIS}$	A16															79	82								
313	$\overline{PH5}$	A16	32	32										58			76	83								
314	IOS	A14														61										
315	ISG	A12												50				73								
316	EXT	External												65												
317	$\overline{TB12}$	A8								62																
318	$\overline{TB13}$	A8								61																
319	$\overline{TB14}$	A8								64																
320	DSCY	A2	10	1																						
321	SCM3	A15															84									
322	PWF	PS															27									
323	FLG0	A16															30	4								
324	FLG3	Not Used															53									
325	SRQ10	A17-A23																66							19	
326	SRQ11	↑																64						19		
327	SRQ12																	44					19			
328	SRQ13																	68				19				
329	SRQ14																	63			19					
330	SRQ15	↓																67		19						
331	SRQ16	A17-A23																43	19							
332	SRQ17	Not Used																								
333	PH5	A2		75			21																			
334	PRL6	A16															71	3								
335	+5V	PS	39/40 ←									→	BUSS	BAR ←										→	39/40	
336	-2V	PS	47/48 ←									→	BUSS	BAR ←										→	47/48	

Table 6-2. Backplane Wiring List (Continued)

			MEMORY							LOGIC							INPUT/OUTPUT									
			DRIVER/ SWITCH-Y	DRIVER/ SWITCH X	INHIBIT DRIVER 0	INHIBIT DRIVER 1	PARITY ERROR	SENSE AMPLIFIER 0	SENSE AMPLIFIER 1	ARITHMETIC LOGIC 12-15	ARITHMETIC LOGIC 8-11	ARITHMETIC LOGIC 4-7	ARITHMETIC LOGIC 0-3	TIMING GENERATOR	INSTRUCTION DECODER	SHIFT LOGIC	I/O CONTROL	DMA	I/O-16	I/O-15	I/O-14	I/O-13	I/O-12	I/O-11	I/O-10	FRONT PANEL
REF	SIGNAL	SOURCE	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20	A21	A22	A23	A24
337	GND	PS	1/2	←								►	BUSS	BAR	←									►	1/2	
338	GND	PS	85/86	←								►	BUSS	BAR	←									►	85/86	
339	GND	PS	2/86	2																						2/42 86
340	GND	PS	1/85	86																						1/41 85
341	+5V	PS	39																							39
342	+5V	PS		39																						40
343	+12V	PS							43									43								43
344	+12V	PS							44									44								44
345	-12V	PS							69									69								69
346	-12V	PS							70									70								70
347	LAMP COM	PS																								17/71 85
348	LAMP COM	PS																								18/72 86
349	EFF	Not Used																								
350	IFF	Not Used																								
351	MCJ	A1	74/76																							
352	GND	PS															2/14									
501	RTS	A13			32										27											
502	P1235	A12												78	51											
503	M12	A2		8		52			50																	
512	XMR0	A16		68														19								
513	XMR1	▲		81														18								
514	XMR2			79														11								
515	XMR3			56														26								
516	XMR4			80														28								
517	XMR5			54														27								
518	XMR6		68															29								
519	XMR7		81															30								
520	XMR8		79															31								
521	XMR9		56															36								
522	XMR10		80															33								
523	XMR11		54															32								
524	XMR12					17												59								
525	$\overline{\text{XRTS}}$	▼			36													84								
526	EDT	A16																62	←					→	62	
527	XDSCY	GND	62	85																						
529	IOGIO	A13													12			15	←					→	15	
530	XMMD0	A4		62		15																				

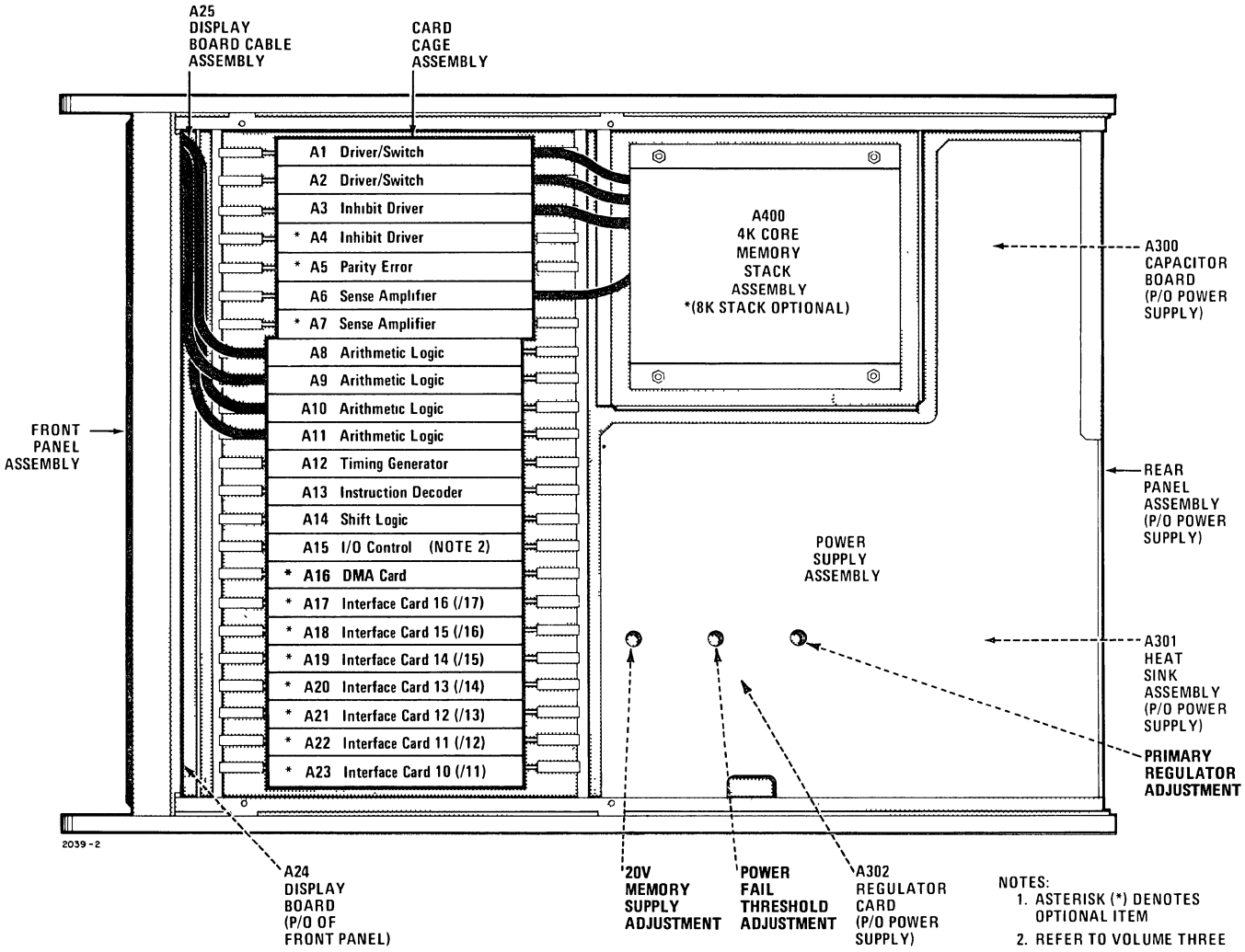


Figure 6-2. Top View of Computer Showing Assembly Locations

Table 6-1. Logic Equations

AAF = $\overline{AAFF}$

AAF FLIP FLOP

DATA = $\overline{MOR*MR0}$

CLOCK = P123*T0*TS

A REGISTER

AR0 FF

DATA = $\overline{TB0}$

CLOCK = STBA

AR1 FF

DATA = $\overline{TB1}$

CLOCK = STBA

AR2 FF

DATA = $\overline{TB2}$

CLOCK = STBA

AR3 FF

DATA = $\overline{TB3}$

CLOCK = STBA

AR4 FF

DATA = $\overline{TB4}$

CLOCK = STBA

AR5 FF

DATA = $\overline{TB5}$

CLOCK = STBA

AR6 FF

DATA = $\overline{TB6}$

CLOCK = STBA

AR7 FF

DATA = $\overline{TB7}$

CLOCK = STBA

AR8 FF

DATA = $\overline{TB8}$

CLOCK = STBA

AR9 FF

DATA = $\overline{TB9}$

CLOCK = STBA

AR10 FF

DATA = $\overline{TB10}$

CLOCK = STBA

AR11 FF

DATA = $\overline{TBI1}$

CLOCK = STBA

AR12 FF

DATA = $\overline{TBI2}$

CLOCK = STBA

AR13 FF

DATA = $\overline{TBI3}$

CLOCK = STBA

AR14 FF

DATA = $\overline{TBI4}$

CLOCK = STBA

AR15 FF

DATA = $\overline{TBI5}$

CLOCK = STBA

ADD = EIR*IR14*$\overline{IRI3}$*$\overline{IRI2}$

ADF = ADD*PH3*T34

ADF = ASG*T45

ADF = ISZ*PH3*T34

ADF = JSB*PH3*T12

ADF = P123*T67

ADF = PH4*T34

ANA = $\overline{IRI4}$*$\overline{IRI3}$*IR12*$\overline{IRI1}$

ANF = ANA*PH3*T34

ASG = OP0*$\overline{IRI5}$*IR10

B REGISTER

BR0 FF

DATA = $\overline{TB0}$

CLOCK = STBB

BR1 FF

DATA = $\overline{TB1}$

CLOCK = STBB

BR2 FF

DATA = $\overline{TB2}$

CLOCK = STBB

BR3 FF

DATA = $\overline{TB3}$

CLOCK = STBB

BR4 FF

DATA = $\overline{TB4}$

CLOCK = STBB

BR5 FF

DATA = $\overline{TB5}$

CLOCK = STBB

BR6 FF

DATA = $\overline{TB6}$

CLOCK = STBB

BR7 FF

DATA = $\overline{TB7}$

CLOCK = STBB

BR8 FF

DATA = $\overline{TB8}$

CLOCK = STBB

BR9 FF

DATA = $\overline{TB9}$

CLOCK = STBB

BR10 FF

DATA = $\overline{TB10}$

CLOCK = STBB

BR11 FF

DATA = $\overline{TB11}$

CLOCK = STBB

BR12 FF

DATA = $\overline{TB12}$

CLOCK = STBB

BR13 FF

DATA = $\overline{TB13}$

CLOCK = STBB

BR14 FF

DATA = $\overline{TB14}$

CLOCK = STBB

BR15 FF

DATA = $\overline{TB15}$

CLOCK = STBB

BAF = $\overline{BAFF}$

BAF FF

DATA = MOR*MR0

CLOCK = P123*T0*TS

DIRECT SET = T7

COF FLIP FLOP

DATA = ASG*SOR*T1*TS*TR0

DATA = ASG*T3*TR5*TR0*E

DATA = ASG*T3*TR5*$\overline{TR0}$*$\overline{E}$

DATA = ASG*T4*TR4*TR3*TR0*RB15*RB0

DATA = ASG*T4*TR4*$\overline{TR0}$*$\overline{RB15}$

DATA = ASG*T4*TR3*$\overline{TR0}$*$\overline{RB0}$

DATA = ASG*T4*TR4*$\overline{TR3}$*TR0*RB15

DATA = ASG*T4*$\overline{TR4}$*TR3*TR0*RB0

DATA = ASG*SOR*T5*TR1*TR0

DATA = ASG*$\overline{SOR}$*T5*TR1*$\overline{TR0}$

DATA = ASG*T5*$\overline{TR5}$*$\overline{TR4}$*$\overline{TR3}$*$\overline{TR1}$*TR0

DATA = CPA*SOR*PH3*T4

DATA = IOS*SFS*T4*OVF

DATA = IOS*SFC*T4*$\overline{OVF}$

DATA = ISZ*PH3*T4*C16

DATA = SKF*T4

DATA = SRG*T4*TR3*$\overline{RB0}$

CLOCK = TS

DIRECT CLR = T0

DIRECT SET = $\overline{COF}$

C0 = COF*T67

C1 = RB0*SB0+RB0*C0+SB0*C0

C2 = RB1*SB1+RB1*C1+SB1*C1

C3 = RB2*SB2+RB2*C2+SB2*C2

C4 = RB3*SB3+RB3*C3+SB3*C3

C5 = RB4*SB4+RB4*C4+SB4*C4

C6 = RB5*SB5+RB5*C5+SB5*C5

C7 = RB6*SB6+RB6*C6+SB6*C6

C8 = RB7*SB7+RB7*C7+SB7*C7

C9 = RB8*SB8+RB8*C8+SB8*C8

C10 = RB9*SB9+RB9*C9+SB9*C9

C11 = RB10*SB10+RB10*C10+SB10*C10

C12 = RB11*SB11+RB11*C11+SB11*C11

C13 = RB12*SB12+RB12*C12+SB12*C12

C14 = RB13*SB13+RB13*C13+SB13*C13

C15 = RB14*SB14+RB14*C14+SB14*C14

C16 = RB15*SB15+RB15*C15+SB15*C15

C0X = PON*(MWT*$\overline{MI2}$+MRT*M12)*$\overline{MRI1}$*$\overline{MRI0}$*$\overline{MR9}$

C1X = PON*(MWT*$\overline{MI2}$+MRT*M12)*$\overline{MRI1}$*$\overline{MRI0}$*MR9

C2X = PON*(MWT*$\overline{MI2}$+MRT*M12)*$\overline{MRI1}$*MR10*$\overline{MR9}$

C3X = PON*(MWT*$\overline{MI2}$+MRT*M12)*$\overline{MRI1}$*MR10*MR9

C4X = PON*(MWT*$\overline{MI2}$+MRT*M12)*MR11*$\overline{MRI0}$*$\overline{MR9}$

C5X = PON*(MWT*$\overline{MI2}$+MRT*M12)*MR11*$\overline{MRI0}$*MR9

C6X = PON*(MWT*$\overline{MI2}$+MRT*M12)*MR11*MR10*$\overline{MR9}$

C7X = PON*(MWT*$\overline{MI2}$+MRT*M12)*MR11*MR10*MR9

C0Y = PON*(MIT*$\overline{MI2}$+MRT0*M12)*$\overline{MR5}$*$\overline{MR4}$*$\overline{MR3}$

C1Y = PON*(MIT*$\overline{MI2}$+MRT0*M12)*$\overline{MR5}$*$\overline{MR4}$*MR3

C2Y = PON*(MIT*$\overline{MI2}$+MRT0*M12)*$\overline{MR5}$*MR4*$\overline{MR3}$

C3Y = PON*(MIT*$\overline{MI2}$+MRT0*M12)*$\overline{MR5}$*MR4*MR3

C4Y = PON*(MIT*$\overline{MI2}$+MRT0*M12)*MR5*$\overline{MR4}$*$\overline{MR3}$

C5Y = PON*(MIT*$\overline{MI2}$+MRT0*M12)*MR5*$\overline{MR4}$*MR3

C6Y = PON*(MIT*$\overline{MI2}$+MRT0*M12)*MR5*MR4*$\overline{MR3}$

C7Y = PON*(MIT*$\overline{MI2}$+MRT0*M12)*MR5*MR4*MR3

CA0-X = PON*MRT0*($\overline{MI2}$+M12)*$\overline{MR2}$*$\overline{MR1}$*$\overline{MR0}$

CA1-X = PON*MRT0*($\overline{MI2}$+M12)*$\overline{MR2}$*$\overline{MR1}$*MR0

CA2-X = PON*MRT0*($\overline{MI2}$+M12)*$\overline{MR2}$*MR1*$\overline{MR0}$

CA3-X = PON*MRT0*($\overline{MI2}$+M12)*$\overline{MR2}$*MR1*MR0

CA4-X = PON*MRT0*($\overline{MI2}$+M12)*MR2*$\overline{MR1}$*$\overline{MR0}$

CA5-X = PON*MRT0*($\overline{MI2}$+M12)*MR2*$\overline{MR1}$*MR0

CA6-X = PON*MRT0*($\overline{MI2}$+M12)*MR2*MR1*$\overline{MR0}$

CA7-X = PON*MRT0*($\overline{MI2}$+M12)*MR2*MR1*MR0

CA0-Y = PON*MRT0*($\overline{MI2}$+M12)*$\overline{MR6}$*$\overline{MR5}$*$\overline{MR4}$

CA1-Y = PON*MRT0*($\overline{MI2}$+M12)*$\overline{MR6}$*$\overline{MR5}$*MR4

CA2-Y = PON*MRT0*($\overline{MI2}$+M12)*$\overline{MR6}$*MR5*$\overline{MR4}$

CA3-Y = PON*MRT0*($\overline{MI2}$+M12)*$\overline{MR6}$*MR5*MR4

CA4-Y = PON*MRT0*($\overline{MI2}$+M12)*MR6*$\overline{MR5}$*$\overline{MR4}$

CA5-Y = PON*MRT0*($\overline{MI2}$+M12)*MR6*$\overline{MR5}$*MR4

CA6-Y = PON*MRT0*($\overline{MI2}$+M12)*MR6*MR5*$\overline{MR4}$

CA7-Y = PON*MRT0*($\overline{MI2}$+M12)*MR6*MR5*MR4

CC0-X = (MIT*M12+MRT*$\overline{MI2}$)*$\overline{MR2}$*$\overline{MR1}$*$\overline{MR0}$

CC1-X = (MIT*M12+MRT*$\overline{MI2}$)*$\overline{MR2}$*$\overline{MR1}$*MR0

CC2-X = (MIT*M12+MRT*$\overline{MI2}$)*$\overline{MR2}$*MR1*$\overline{MR0}$

CC3-X = (MIT*M12+MRT*$\overline{MI2}$)*$\overline{MR2}$*MR1*MR0

CC4-X = (MIT*M12+MRT*$\overline{MI2}$)*MR2*$\overline{MR1}$*$\overline{MR0}$

CC5-X = (MIT*M12+MRT*$\overline{MI2}$)*MR2*$\overline{MR1}$*MR0

CC6-X = (MIT*M12+MRT*$\overline{MI2}$)*MR2*MR1*$\overline{MR0}$

CC7-X = (MIT*M12+MRT*$\overline{MI2}$)*MR2*MR1*MR0

CC0-Y = (MIT*M12+MRT*$\overline{MI2}$)*$\overline{MR6}$*$\overline{MR5}$*$\overline{MR4}$

CC1-Y = (MIT*M12+MRT*$\overline{MI2}$)*$\overline{MR6}$*$\overline{MR5}$*MR4

CC2-Y = (MIT*M12+MRT*$\overline{MI2}$)*$\overline{MR6}$*MR5*$\overline{MR4}$

CC3-Y = (MIT*M12+MRT*$\overline{MI2}$)*$\overline{MR6}$*MR5*MR4

CC4-Y = (MIT*M12+MRT*$\overline{MI2}$)*MR6*$\overline{MR5}$*$\overline{MR4}$

CC5-Y = (MIT*M12+MRT*$\overline{MI2}$)*MR6*$\overline{MR5}$*MR4

CC6-Y = (MIT*M12+MRT*$\overline{MI2}$)*MR6*MR5*$\overline{MR4}$

CC7-Y = (MIT*M12+MRT*$\overline{MI2}$)*MR6*MR5*MR4

CI0 FF

DATA = $\overline{IA0}$+$\overline{IRQ7}$+$\overline{IRQ5}$+$\overline{IRQ3}$+$\overline{IRQ1}$

CLOCK = RSM6-9

CI1 FF

DATA = $\overline{IA1}$+$\overline{IRQ7}$+$\overline{IRQ6}$+$\overline{IRQ3}$+$\overline{IRQ2}$

CLOCK = RSM6-9

CI2 FF

DATA = $\overline{IA2}$+$\overline{IRQ7}$+$\overline{IRQ6}$+$\overline{IRQ5}$+$\overline{IRQ4}$+$\overline{POWER\_FAIL\_IRQ}$

CLOCK = RSM6-9

CI3 FF

DATA = $\overline{IA3}$+$\overline{FLG1}$

CLOCK = RSM6-9

CI4 FF

DATA = $\overline{IA4}$+$\overline{FLG3}$

CLOCK = RSM6-9

CI5 FF

DATA = $\overline{IA5}$+$\overline{FLG3}$

CLOCK = RSM6-9

CLC = T4*TR11*TR8*TR7*TR6

CLF = T4*TR9

CFF FLIP FLOP

DATA = $\overline{CFF}$

CLOCK = CP+EXT

CMF = ASG*T3*TR9

CMF = PH4*T12

CMF = PH4*T5

CPA = EIR*IR14*$\overline{IR13}$*IR12

CRS = CLC*SCM0*SCL0

$\overline{CSR}$ = $\overline{CLR}$*$\overline{IOG}$*$\overline{IOO}$*$\overline{IOS}$

DMLF FLIP FLOP

DATA = DML

CLOCK = $\overline{RF2}$

E FF

J = ADD*PH3*T4*C16

J = ASG*T3*TR7

J = ASG*T5*TR2*C16

J = SRG*T3*TR8*TR7*$\overline{TR6}$*RB15

J = SRG*T3*TR8*$\overline{TR7}$*TR6*RB0

J = SRG*T5*TR2*TR1*TR0*RB0

J = SRG*T5*TR2*TR1*$\overline{TR0}$*RB15

K = ASG*T3*TR7*$\overline{TR6}$

K = ASG*T3*$\overline{TR7}$*TR6

K = SR6*T3*TR8*TR7*$\overline{TR6}$*$\overline{RB15}$

K = SRG*T3*TR8*$\overline{TR7}$*TR6*$\overline{RB0}$

K = SRG*T4*TR5

K = SRG*T5*TR2*TR1*$\overline{TR0}$*$\overline{RB15}$

K = SRG*T5*TR2*$\overline{TR1}$*TR0*$\overline{RB0}$

CLOCK = TS

EIR = $\overline{PH3}$*$\overline{PH5}$

EIR = $\overline{PH5}$*$\overline{LMLF}$*$\overline{DMLF}$

ENF = T2

EOF = ASG*T3*$\overline{TR9}$

EOF = EIR*CPA*PH3*T34

EOF = EIR*JSB*PH3*T34

EOF = EIR*XOA*PH3*T34

EOF = LOD*PH3*T34

EOF = STR*SE0*PH3*T2

EOF = P123*T1

ESR = IEN*$\overline{HIS}$*INTERRUPT CONTROL

EXECUTE = PH3 FF

EXTEND = E*DELAY

FETCH = $\overline{PH1\ FF}$

$\overline{HIN}$ = IOG*$\overline{TR8}$*$\overline{TR7}$*$\overline{TR6}$

IAK = INTERRUPT CONTROL*PH1*T1

ID0 = MIL*MIT*($\overline{MI2}$+MR12)*$\overline{TR0}$

ID1 = MIL*MIT*($\overline{MI2}$+MR12)*$\overline{TR1}$

ID2 = MIL*MIT*($\overline{MI2}$+MR12)*$\overline{TR2}$

ID3 = MIL*MIT*($\overline{MI2}$+MR12)*$\overline{TR3}$

ID4 = MIL*MIT*($\overline{MI2}$+MR12)*$\overline{TR4}$

ID5 = MIL*MIT*($\overline{MI2}$+MR12)*$\overline{TR5}$

ID6 = MIL*MIT*($\overline{MI2}$+MR12)*$\overline{TR6}$

ID7 = MIL*MIT*($\overline{MI2}$+MR12)*$\overline{TR7}$

ID8 = MIL*MIT*($\overline{MI2}$+MR12)*$\overline{TR8}$

ID9 = MIL*MIT*($\overline{MI2}$+MR12)*$\overline{TR9}$

ID10 = MIL*MIT*($\overline{MI2}$+MR12)*$\overline{TR10}$

ID11 = MIL*MIT*($\overline{MI2}$+MR12)*$\overline{TR11}$

ID12 = MIL*MIT*($\overline{MI2}$+MR12)*$\overline{TR12}$

ID13 = MIL*MIT*($\overline{MI2}$+MR12)*$\overline{TR13}$

ID14 = MIL*MIT*($\overline{MI2}$+MR12)*$\overline{TR14}$

ID15 = MIL*MIT*($\overline{MI2}$+MR12)*$\overline{TR15}$

ID16 = MIL*MIT*($\overline{MI2}$+MR12)*$\overline{TR16}$

INDIRECT = PH2 FF

INSTRUCTION REGISTER

IR10 FF

DATA = TR10

CLOCK = PH1*T2*TS

DIRECT CLR = $\overline{PHI*TI}$

IR11 FF

DATA = TR11

CLOCK = PH1*T2*TS

DIRECT CLR = $\overline{PHI*TI}$

IR12 FF

DATA = TR12

CLOCK = PH1*T2*TS

DIRECT CLR = $\overline{PHI*TI}$

IR13 FF

DATA = TR13

CLOCK = PH1*T2*TS

DIRECT CLR = $\overline{PHI*TI}$

IR14 FF

DATA = TR14

CLOCK = PH1*T2*TS

DIRECT CLR = $\overline{PHI*TI}$

IR15 FF

DATA = TR15

CLOCK = PH1*T2*TS

DIRECT CLR = $\overline{PHI*TI}$

INTERRUPT ENABLE FF

SET = STF*SCM0*SCL0

CLEAR = CLF*SCM0*SCL0

INT = PINT+ESR*(FLG0+FLG1+FLG2+IRQ4+XINT+POWER FAIL IRQ)

INTERRUPT CONTROL FF

DATA = 1

CLOCK = $\overline{STM}$+T0*TS

DIRECT CLR = STF+CLF+CLC+STC+CRS+PH4*T3IO

IOA = EIR*$\overline{IRI4}$*IR13*IR12*$\overline{IRTI}$

IOB0 = IOC0*(RB0+SB0)

IOB1 = IOC0*(RB1+SB1)

IOB2 = IOC0*(RB2+SB2)

IOB3 = IOC0*(RB3+SB3)

IOB4 = IOC0*(RB4+SB4)

IOB5 = IOC0*(RB5+SB5)

IOB6 = IOC0*(RB6+SB6)

IOB7 = IOC0*(RB7+SB7)

IOB8 = IOC0*(RB8+SB8)

IOB9 = IOC0*(RB9+SB9)

IOB10 = IOC0*(RB10+SB10)

IOB11 = IOC0*(RB11+SB11)

IOB12 = IOC0*(RB12+SB12)

IOB13 = IOC0*(RB13+SB13)

IOB14 = IOC0*(RB14+SB14)

IOB15 = IOC0*(RB15+SB15)

IOC0 = T45*TR8*TR7*$\overline{TR6}$

IOF = IOA*PH3*T34

IOF = IOG*T45

IOG = OPO*IR15*IR10

IOI = IOG*SE0*T2

IOI = IOG*T45*TR8*$\overline{TR7}$

IOO = IOG*T34*TR8*TR7*$\overline{TR6}$

IOS = IOG*P123*$\overline{TR5}$*$\overline{TR4}$*$\overline{TR3}$*$\overline{TR2}$*$\overline{TRI}$*TR0

ISR = IOI*IOS

ISR = IOI*SE0

```
ISZ         = EIR*IRI4*IR13*IR12*IR11
JMP         = EIR*IRI4*IR13*IRI2*IR11
JSB         = EIR*JRI4*IRI3*IR12*IR11
LALF  FLIP FLOP
DATA        = LAL
CLOCK       = RF2

LDLF  FLIP FLOP
DATA        = LDL
CLOCK       = RF2*LAC*LMC

LMLF  FLIP FLIP
DATA        = LML
CLOCK       = RF2
LOD         = EIR*IR14*IR13*IR12
LRS         = SRG*T5*TR2*TR1*TR0
MIL         = 1
LRS         = SRG*T3*TR8*TR7*TR6
MIT         = ISZ*MTE*PH3*T5*DELAY

MIT FF
SET         = MTE*T3*TS*ISZ
SET         = MTE*PH3*T3*TS
SET         = MTE*ISZ*PH3*T5*TS
CLEAR       = T6

MOR         = MRI4+MRI3+MRI2+MRII+MRI0+MR9+MR8+MR7+MR6+MR5+MR4+MR3+MR2+MRI

M REGISTER
MR0 FF
DATA        = TB0
CLOCK       = STM0-5
DIRECT SET  = RSM0-5

MR1 FF
DATA        = TBI
CLOCK       = STM0-5
DIRECT SET  = RSM0-5

MR2 FF
DATA        = TB2
CLOCK       = STM0-5
DIRECT SET  = RSM0-5
```

MR3 FF

DATA = $\overline{TB3}$

CLOCK = STM0-5

DIRECT SET = RSM0-5

MR4 FF

DATA = $\overline{TB4}$

CLOCK = STM0-5

DIRECT SET = RSM0-5

MR5 FF

DATA = $\overline{TB5}$

CLOCK = STM0-5

DIRECT SET = RSM0-5

MR6 FF

DATA = $\overline{TB6}$

CLOCK = STM6-9

DIRECT SET = RSM6-9

MR7 FF

DATA = $\overline{TB7}$

CLOCK = STM6-9

DIRECT SET = RSM6-9

MR8 FF

DATA = $\overline{TB8}$

CLOCK = STM6-9

DIRECT SET = RSM6-9

MR9 FF

DATA = $\overline{TB9}$

CLOCK = STM6-9

DIRECT SET = RSM6-9

MR10 FF

DATA = $\overline{TB10}$

CLOCK = STM10-15

DIRECT SET = RSM10-15

MR11 FF

DATA = $\overline{TB11}$

CLOCK = STM10-15

DIRECT SET = RSM10-15

MR12 FF

DATA = $\overline{TBI2}$

CLOCK = STM10-15

DIRECT SET = RSM10-15

MR13 FF

DATA = $\overline{TBI3}$

CLOCK = STM10-15

DIRECT SET = RSM10-15

MR14 FF

DATA = $\overline{TBI4}$

MR15 FF

DATA = $\overline{TBI5}$

DIRECT SET = RSM10-15

CLOCK = STM10-15

CLOCK = STM10-15

DIRECT SET = RSM10-15

MRD0 = MR0

MRD1 = MR1

MRD2 = MR2

MRD3 = MR3

MRD4 = MR4

MRD5 = MR5

MRD6 = MR6

MRD7 = MR7

MRD8 = MR8

MRD9 = MR9

MRD10 = MR10

MRD11 = MR11

MRD12 = MR12

MR0 = $\overline{MR0\ FF}$

MR1 = $\overline{MR1\ FF}$

MR2 = $\overline{MR2\ FF}$

MR3 = $\overline{MR3\ FF}$

MR4 = $\overline{MR4\ FF}$

MR5 = $\overline{MR5\ FF}$

MR6 = $\overline{MR6\ FF}$

MR7 = $\overline{MR7\ FF}$

MR8 = $\overline{MR8\ FF}$

MR9 = $\overline{MR9\ FF}$

MR10 = $\overline{MR10\ FF}$

MR11 = $\overline{MR11\ FF}$

$\overline{MR0}$ = $\overline{(\overline{PH5}*MR0+PH5*XMR0)}$

$\overline{MR1}$ = $\overline{(\overline{PH5}*MR1+PH5*XMR1)}$

$\overline{MR2}$ = $\overline{(\overline{PH5}*MR2+PH5*XMR2)}$

$\overline{MR3}$ = $\overline{(\overline{PH5}*MR3+PH5*XMR3)}$

$\overline{MR4}$ = $\overline{(\overline{PH5}*MR4+PH5*XMR4)}$

$\overline{MR5}$ = $\overline{(\overline{PH5}*MR5+PH5*XMR5)}$

$\overline{MR6}$ = $\overline{(\overline{PH5}*MR6+PH5*XMR6)}$

$\overline{MR7}$ = $\overline{(\overline{PH5}*MR7+PH5*XMR7)}$

$\overline{MR8}$ = $\overline{(\overline{PH5}*MR8+PH5*XMR8)}$

$\overline{MR9}$ = $\overline{(\overline{PH5}*MR9+PH5*XMR9)}$

$\overline{MR10}$ = $\overline{(\overline{PH5}*MR10+PH5*XMR10)}$

$\overline{MR11}$ = $\overline{(\overline{PH5}*MR11+PH5*XMR11)}$

$\overline{MI2}$ = MMD*$\overline{PH5}$

MRT FF

SET = T0*TS*MTE

CLEAR = T2*TS

MRT0 FF

SET = MTE*T0

CLEAR = T2*TS

MS FLIP FLOP

DATA = MRT*$\overline{TSG}$*$\overline{SE0}$*$\overline{AAF}$*$\overline{BAF}$*($\overline{STR}$*$\overline{PH3}$)*($\overline{JSB}$*$\overline{PH3}$)*T1

CLOCK = TS

MST = MS*$\overline{CFF}$*T2

$\overline{MST}$ = JSB*PH3

$\overline{MST}$ = STR*PH3

MTE = MON*P1235*$\overline{CES}$

MTE = MON*P1235*$\overline{CDCF}$

MTE = MON*P1235*$\overline{MPT}$

MTE = MON*P1235*$\overline{Y7N}$

```
MTE          = MON*P1235*YN7
MWL          = MTE*AAF
MWL          = MTE*BAF
MWL          = MTE*ISG
MWL          = MTE*ISZ*PH3
MWL          = MTE*JSB*PH3
MWL          = MTE*SEO
MWL          = MTE*STR*PH3
MWT FF
SET          = MTE*ISZ*T4
SET          = MTE*ISZ*PH3*T6E
SET          = MTE*PH3*T4
CLEAR        = T6
OPO          = EIR*PH1*IRI4*IRI3*IRI2

OVERFLOW FLIP FLOP
DATA         = ADD*PH3*T4*TB15*SB15*SB15*RBI5
DATA         = ADD*PH3*T4*TBI5*SB15*RB15
DATA         = ASG*T5*TR2*TB15*SB15*RB15
DATA         = ASG*T5*TR2*TB15*SBI5*RB15
DATA         = IOG*STF*P123*TR5*TR4*TR3*TR2*TRI*TRO
CLOCK        = TS
DIRECT SET   = OVFF
DIRECT CLR   = IOG*CLF*P123*TS*TR5*TR4*TR3*TR2*TRI*TR0
OVF          = OVFF*DELAY
OVF          = IOG*STF*TS*SCM0*SCL1
OVF          = IOG*CLF*SCM0*SCL1
PEH          = PWF*XPF
PH1          = RF2*PHI FF*PH5
PH2          = RF2*PH2 FF*PH5
PH3          = RF2*PH3 FF*PH5
PH4          = RF2*PH4 FF*PH5
PH4          = XPH4
P123         = PH1+PH2+PH3
P1235        = PH1+PH2+PH3+PH5
PH1 FLIP FLOP
J            = SET PH2 FF
J            = SET PH3 FF
J            = SET PH4 FF

K            = LDLF*STEP1*STEP2
```

K = LPMF

K = PH2*JMP*$\overline{\text{SET PH4 FF}}$*$\overline{\text{TRI5}}$

K = PH3*$\overline{\text{SET PH4 FF}}$

K = PH4

CLOCK = LNS*T7*TS

DIRECT CLR = $\overline{\text{PON}}$+PRSF

PH2 FLIP FLOP

J = PH1*$\overline{\text{SET PH4 FF}}$*$\overline{\text{OPO}}$*TR15

J = PH2*TR15

K = SET PH1 FF

K = SET PH3 FF

K = SET PH4 FF

CLOCK = LNS*T7*TS

DIRECT CLR = $\overline{\text{PON}}$+RSF

PH3 FLIP FLOP

J = DMLF*STEP1*$\overline{\text{STEP2}}$

J = LMLF*STEP1*$\overline{\text{STEP2}}$

J = PH1*$\overline{\text{SET PH4 FF}}$*$\overline{\text{OPO}}$*$\overline{\text{JMP}}$*$\overline{\text{TRI5}}$

J = PH1*$\overline{\text{SET PH4 FF}}$*$\overline{\text{OPO}}$*RSP*$\overline{\text{TRI5}}$

J = PH2*$\overline{\text{SET PH4 FF}}$*$\overline{\text{JMP}}$*$\overline{\text{TRI5}}$

J = PH2*$\overline{\text{SET PH4 FF}}$*RSP*$\overline{\text{TRI5}}$

K = SET PH1 FF

K = SET PH4 FF

CLOCK = LNS*T7*TS

DIRECT CLR = $\overline{\text{PON}}$+PRSF

PH4 FLIP FLOP

J = RF1*INT*$\overline{\text{JMP}}$*$\overline{\text{JSB}}$

J = RF1*INT*RSP

J = RF1*INT*$\overline{\text{IRT5}}$

K = SET PH1 FF

CLOCK = LNS*T7*TS

DIRECT CLR = $\overline{\text{PON}}$+PRSF

PON = PWF*XPF*DELAY

POPIO = ($\overline{\text{PON}}$+PRSF)*T5

P REGISTER

PR0 FF

DATA = $\overline{\text{TB0}}$

CLOCK = STP0-9

PR1 FF

DATA = $\overline{TBI}$

CLOCK = STP0-9

PR2 FF

DATA = $\overline{TB2}$

CLOCK = STP0-9

PR3 FF

DATA = $\overline{TB3}$

CLOCK = STP0-9

PR4 FF

DATA = $\overline{TB4}$

CLOCK = STP0-9

PR5 FF

DATA = $\overline{TB5}$

CLOCK = STP0-9

PR6 FF

DATA = $\overline{TB6}$

CLOCK = STP0-9

PR7 FF

DATA = $\overline{TB7}$

CLOCK = STP0-9

PR8 FF

DATA = $\overline{TB8}$

CLOCK = STP0-9

PR9 FF

DATA = $\overline{TB9}$

CLOCK = STP0-9

PR10 FF

DATA = $\overline{TBI0}$

CLOCK = STP10-15

PR11 FF

DATA = $\overline{TBII}$

CLOCK = STP10-15

PR12 FF

DATA = $\overline{TBI2}$

CLOCK = STP10-15

PR13 FF

DATA = $\overline{TBI3}$

CLOCK = STP10-15

PR14 FF

DATA = $\overline{TBI4}$

CLOCK = STP10-15

PR15 FF

DATA = $\overline{TBI5}$

CLOCK = STP10-15

PRH10 = PRL6*PRL5*PRL4

PRL4 = POWER FAIL CONTROL

PRSF FLIP FLOP

DATA = PRS

CLOCK = $\overline{RF2}$*$\overline{LAL}$*$\overline{LML}$

PWF = 12 VOLTS

RARB = AAF*$\overline{JSB}$*P123*T1

RARB = AAF*$\overline{PH3}$*P123*T1

RARB = ADD*PH3*T34*$\overline{IRTI}$

RARB = ASG*T3*$\overline{TRB}$

RARB = ASG*T45*$\overline{IRTI}$

RARB = CPA*PH3*T34*$\overline{IRTI}$

RARB = EIR*PH3*T34*$\overline{IRI4}$*$\overline{IRTI}$

RARB = IOG*T45*$\overline{TR6}$*$\overline{IRTI}$

RARB = OPO*T3*$\overline{IRI5}$*$\overline{IRTI}$*$\overline{IRI0}$

RARB = OPO*T45*$\overline{IRI5}$*$\overline{IRTI}$*$\overline{IRI0}$

RARB = STR*PH3*T2*$\overline{IRTI}$

RBRB = ADD*PH3*T34*IR11

RBRB = ASG*T3*$\overline{TRB}$*IR11

RBRB = ASG*T45*IR11

RBRB = BAF*P123*$\overline{PH3}$*T1

RBRB = BAF*$\overline{JSB}$*P123*T1

RBRB = CPA*PH3*T34*IR11

RBRB = IOG*T3*$\overline{TR6}$*IR11

RBRB = IOG*T45*$\overline{TR6}$*IR11

RBRB = OPO*T3*$\overline{IRI5}$*IR11*$\overline{IRI0}$

RBRB = OPO*T45*$\overline{IRI5}$*IR11*$\overline{IRI0}$

RBRB = EIR*PH3*T34*$\overline{IRI4}$*IR11

RBRB = STR*PH3*T2*IR11

RB0 = ISZ*PH3*T34

RB0 = RPRB*$\overline{PR0}$+RARB*$\overline{AR0}$+RBRB*$\overline{BR0}$

RB1 = RPRB*$\overline{PR1}$+RARB*$\overline{AR1}$+RBRB*$\overline{BR1}$

RB2 = RPRB*$\overline{PR2}$+RARB*$\overline{AR2}$+RBRB*$\overline{BR2}$

RB3 = RPRB*$\overline{PR3}$+RARB*$\overline{AR3}$+RBRB*$\overline{BR3}$

RB4 = RPRB*$\overline{PR4}$+RARB*$\overline{AR4}$+RBRB*$\overline{BR4}$

RB5 = RPRB*$\overline{PR5}$+RARB*$\overline{AR5}$+RBRB*$\overline{BR5}$

RB6 = RPRB*$\overline{PR6}$+RARB*$\overline{AR6}$+RBRB*$\overline{BR6}$

RB7 = RPRB*$\overline{PR7}$+RARB*$\overline{AR7}$+RBRB*$\overline{BR7}$

RB8 = RPRB*$\overline{PR8}$+RARB*$\overline{AR8}$+RBRB*$\overline{BR8}$

RB9 = RPRB*$\overline{PR9}$+RARB*$\overline{AR9}$+RBRB*$\overline{BR9}$

RB10 = RPRB*$\overline{PR10}$+RARB*$\overline{AR10}$+RBRB*$\overline{BR10}$

RB11 = RPRB*$\overline{PR11}$+RARB*$\overline{AR11}$+RBRB*$\overline{BR11}$

RB12 = RPRB*$\overline{PR12}$+RARB*$\overline{AR12}$+RBRB*$\overline{BR12}$

RB13 = RPRB*$\overline{PR13}$+RARB*$\overline{AR13}$+RBRB*$\overline{BR13}$

RB14 = RPRB*$\overline{PR14}$+RARB*$\overline{AR14}$+RBRB*$\overline{BR14}$

RB15 = RPRB*$\overline{PR15}$+RARB*$\overline{AR15}$+RBRB*$\overline{BR15}$

$\overline{RF1}$ = HIN*T5

RF2 = $\overline{RF1}$*T7S

RF1 FLIP FLOP

J = STEP1*$\overline{STEP2}$*RSP

J = STEP1*$\overline{STEP2}$*RNL

J = STEP1*$\overline{STEP2}$*LDLF

K = HIN+HLL+PEH

CLOCK = T5

DIRECT CLR = $\overline{PON}$

RF2 FLIP FLOP

J = STEP1*$\overline{STEP2}$

K = $\overline{RF1}$

CLOCK = T7S

DIRECT CLR = $\overline{PON}$

RL4 = SRG*T3*TR8*TR7*TR6

RL4 = SRG*T5*TR2*TR1*TR0

RMSB = JSB*PH3*T34

RPRB = JSB*PH3*T12

RPRB = PH3*T67

RPRB = PH4*T12

RPRB = PH4*T34

RPRB = PH4*T5

RPRB = OPO*T67

$\overline{RSM6-9}$ = PH4*T7

RSM10-15 = $\overline{OPO}$*PH1*T7S*IR10

RSM10-15 = $\overline{OPO}$*PH1*T7S*$\overline{IR10}$

$\overline{RSMI0-I5}$ = PH4*T7

RTSB = EIR*$\overline{CPA}$*PH3*T5*IR12

RTSB = EIR*$\overline{JSB}$*PH3*T34

RTSB = EIR*$\overline{OPO}$*PH1*T67

RTSB = EIR*PH2*T67

$\overline{RSP}$ = PON*POWER FAIL FLAG*POWER FAIL DIRECTION

RUN = RF2

SAL = LDLF*STEP1*$\overline{STEP2}$*T2

SCLF FLIP FLOP

DATA = SCL

CLOCK = $\overline{RF2}$

SB0 = ASG*T45*TR2

SB0 = JSB*PH3*T12

SB0 = PH3*T67

$\overline{SB0}$ = PH4*T34

SB0 = $\overline{SIN}$*$\overline{HLL}$*OPO*T67

SB0 = RTSB*TR0+RMSB*MR0+ISR*SR0

SB0 = $\overline{SIN}$*$\overline{SC0}$*OPO T67

SB1 = RTSB*TR1+RMSB*MR1+ISR*SR1

SB2 = RTSB*TR2+RMSB*MR2+ISR*SR2

SB3 = RTSB*TR3+RMSB*MR3+ISR*SR3

SB4 = RTSB*TR4+RMSB*MR4+ISR*SR4

SB5 = RTSB*TR5+RMSB*MR5+ISR*SR5

SB6 = RTSB*TR6+RMSB*MR6+ISR*SR6

SB7 = RTSB*TR7+RMSB*MR7+ISR*SR7

SB8 = RTSB*TR8+RMSB*MR8+ISR*SR8

SB9 = RTSB*TR9+RMSB*MR9+ISR*SR9

SB10 = RTSB*TR10+RMSB*MR10+ISR*SR10

SB11 = RTSB*TR11+RMSB*MR11+ISR*SR11

SB12 = RTSB*TR12+RMSB*MR12+ISR*SR12

SB13 = RTSB*TB13+RMSB*MR13+ISR*SR13

SB14 = RTSB*TR14+RMSB*MR14+ISR*SR14

SB15 = RTSB*TR15+RMSB*MR15+ISR*SR15

SCL0 = $\overline{TR2}$*$\overline{TR1}$*$\overline{TR0}$

SCL1 = $\overline{TR2}$*$\overline{TR1}$*TR0

SCL2 = $\overline{TR2}$*TR1*$\overline{TR0}$

SCL3 = $\overline{TR2}$*TR1*TR0

SCL4 = TR2*$\overline{TR1}$*$\overline{TR0}$

SCL5 = TR2*$\overline{TR1}$*TR0

SCL6 = TR2*TR1*$\overline{TR0}$

SCL7 = TR2*TR1*TR0

SCM0 = $\overline{TR5}$*$\overline{TR4}$*$\overline{TR3}$

SCM1 = $\overline{TR5}$*$\overline{TR4}$*TR3

SCM2 = $\overline{TR5}$*TR4*$\overline{TR3}$

SCM3 = $\overline{TR5}$*TR4*TR3

SCM4 = TR5*$\overline{TR4}$*$\overline{TR3}$

SCM5 = TR5*$\overline{TR4}$*TR3

SCM6 = TR5*TR4*$\overline{TR3}$

SCM7 = TR5*TR4*TR3

SCO = $\overline{RNL}$*$\overline{RSP}$*$\overline{LDLF}$*LMLF

SCO = $\overline{RNL}$*$\overline{RSP}$*$\overline{LDLF}$*DMLF

SCO = $\overline{RNL}$*$\overline{RSP}$*$\overline{LDLF}$*SCLF

SEO = LALF+LMLF

SFC = $\overline{TR8}$*TR7*$\overline{TR6}$

SFS = $\overline{TR8}$*TR7*TR6

SIR = T5

SKF(XX) = IOG*SFC*SCM(X)*SCL(X)

SKF = SFC*$\overline{INTERRUPT\ ENABLE}$*SCM0*SCL0

SKF = IEN*SFS

SKF = $\overline{IEN}$*SFC

SKF = SFC*$\overline{POWER\ FAIL\ DIRECTION}$*SCM0*SCL0

SL0 = SRG*T5*$\overline{TR2}$*TR1*$\overline{TR0}$

SL0 = SRG*T3*$\overline{TR8}$*TR7*$\overline{TR6}$

SL14 = SRG*T5*TR1*$\overline{TR0}$

SL14 = SRG*T3*TR7*$\overline{TR6}$

SLM = SRG*T3*$\overline{TR6}$

SLM = SRG*T5*$\overline{TR0}$

S REGISTER

SR0 FF

DATA = $\overline{SR0}$

CLOCK = SWR0

DIRECT SET = SSR*RB0

DIRECT CLR = CSR

SR1 FF

DATA = $\overline{SR1}$

CLOCK = SWR1

DIRECT SET = SSR*RB1

DIRECT CLR = CSR

SR2 FF

DATA = $\overline{SR2}$
CLOCK = SWR2
DIRECT SET = SSR*RB2
DIRECT CLR = CSR

SR3 FF
DATA = $\overline{SR3}$
CLOCK = SWR3
DIRECT SET = SSR*RB3
DIRECT CLR = CSR

SR4 FF
DATA = $\overline{SR4}$
CLOCK = SWR4
DIRECT SET = SSR*RB4
DIRECT CLR = CSR

SR5 FF
DATA = $\overline{SR5}$
CLOCK = SWR5
DIRECT SET = RB5*SSR
DIRECT CLR = CSR

SR6 FF
DATA = $\overline{SR6}$
CLOCK = SWR6
DIRECT SET = SSR*RB6
DIRECT CLR = CSR

SR7 FF
DATA = $\overline{SR7}$
CLOCK = SWR7
DIRECT SET = SSR*RB7
DIRECT CLR = CSR

SR8 FF
DATA = $\overline{SR8}$
CLOCK = SWR8
DIRECT SET = SSR*RB8
DIRECT CLR = CSR
SR9 FF
DATA = $\overline{SR9}$
CLOCK = SWR9

```
DIRECT SET = SSR*RB9
DIRECT CLR = CSR

SR10 FF
DATA       = SRI0
CLOCK      = SWR10
DIRECT SET = SSR*RB10
DIRECT CLR = CSR

SR11 FF
DATA       = SRI1
CLOCK      = SWR11
DIRECT SET = SSR*RB11
DIRECT CLR = CSR

SR12 FF
DATA       = SRI2
CLOCK      = SWR12
DIRECT SET = SSR*RB12
DIRECT CLR = CSR

SR13 FF
DATA       = SRI3
CLOCK      = SWR13
DIRECT SET = SSR*RB13
DIRECT CLR = CSR

SR14 FF
DATA       = SRI4
CLOCK      = SWR14
DIRECT SET = SSR*RB14
DIRECT CLR = CSR
SR15 FF
DATA       = SRI5
CLOCK      = SWR15
DIRECT SET = SSR*RB15
DIRECT CLR = CSR

SRD0       = SR0
SRD1       = SR1
SRD2       = SR2
SRD3       = SR3
SRD4       = SR4
```

SRD5 = SR5

SRD6 = SR6

SRD7 = SR7

SRD8 = SR8

SRD9 = SR9

SRD10 = SR10

SRD11 = SR11

SRD12 = SR12

SRD13 = SR13

SRD14 = SR14

SRD15 = SR15

SRG = OP0*$\overline{IRI5}$*$\overline{IRI0}$

SRM = SRG*T3*$\overline{TR7}$*TR6

SRM = SRG*T5*$\overline{TRI}$*TR0

SRM = SRG*T5*$\overline{TR2}$*TR0

SSPM = LDLF*STEP1*S$\overline{TEP2}$*T2

SSPM = LDMF*T2

SSR = I00*I0S

$\overline{ST0}$ = (MST*($\overline{MI2}$+M12)*S0)

$\overline{STI}$ = (MST*($\overline{MI2}$+M12)*S1)

$\overline{ST2}$ = (MST*($\overline{MI2}$+M12)*S2)

$\overline{ST3}$ = (MST*($\overline{MI2}$+M12)*S3)

$\overline{ST4}$ = (MST*($\overline{MI2}$+M12)*S4)

$\overline{ST5}$ = (MST*($\overline{MI2}$+M12)*S5)

$\overline{ST6}$ = (MST*($\overline{MI2}$+M12)*S6)

$\overline{ST7}$ = (MST*($\overline{MI2}$+M12)*S7)

$\overline{ST8}$ = (MST*($\overline{MI2}$+M12)*S8)

$\overline{ST9}$ = (MST*($\overline{MI2}$+M12)*S9)

$\overline{STI0}$ = (MST*($\overline{MI2}$+M12)*S10)

$\overline{STII}$ = (MST*($\overline{MI2}$+M12)*S11)

$\overline{STI2}$ = (MST*($\overline{MI2}$+M12)*S12)

$\overline{STI3}$ = (MST*($\overline{MI2}$+M12)*S13)

$\overline{STI4}$ = $\overline{(MST*(\overline{MI2}+M12)*S14)}$

$\overline{STI5}$ = $\overline{(MST*(\overline{MI2}+M12)*S15)}$

$\overline{STI6}$ = $\overline{(MST*(\overline{MI2}+M12)*S16)}$

STBA = AAF*$\overline{CPA}$*EIR*PH3*T5*TS*IR12
STBA = ADD*PH3*T4*TS*$\overline{IRII}$
STBA = ASG*T3*TS*TR11
STBA = ASG*T5*TS*TR2*$\overline{IRII}$
STBA = EIR*PH3*T4*TS*$\overline{IRI4}$*$\overline{IRII}$
STBA = IOG*T5*TS*TR8*$\overline{TR7}$*$\overline{IRII}$
STBA = LOD*PH3*T4*TS*$\overline{IRII}$
STBA = SRG*T3*TS*$\overline{TRII}$*TR9
STBA = SRG*T5*TS*TR4*$\overline{IRII}$
STBA = SWSA*TS

STBB = ADD*PH3*T4*TS*IR11
STBB = ASG*T3*TS*IR11
STBB = ASG*T5*TS*TR2*IR11
STBB = BAF*CPA*$\overline{EIR}$*PH3*T5*TS*IR12
STBB = EIR*PH3*T4*TS*IR11
STBB = IOG*T5*TS*TR8*$\overline{TR7}$*IR11
STBB = LOD*PH3*T4*TS*IR11
STBB = SRG*T3*TS*IR11*TR9
STBB = SRG*T5*TS*TR4*IR11
STBB = SWSB*TS

STBT = AAF*P123*T1*TS
STBT = BAF*P123*T1*TS
STBT = ISZ*PH3*T4*TS
STBT = JSB*PH3*T2*TS
STBT = P123*T0*TS
STBT = STR*PH3*T2*TS
STBT = SWST*TS
STC = T4*$\overline{TRII}$*TR8*TR7*TR6

STEP1 FLIP FLOP
DATA = RNL+RSP+LDLF+LMLF+DMLF+SCLF
CLOCK = T2
DIRECT CLR = $\overline{PON}$+PRSF

STEP 2 FLIP FLOP

DATA = STEP 1

CLOCK = T1

DIRECT CLR = $\overline{PON}$*PRSF

STF = T3*$\overline{TR8}$*$\overline{TR7}$*TR6

STM0-5 = EIR*$\overline{OPO}$*PH1*T7S

STM0-5 = PH2*T7S

STM0-5 = PH3*T7S

STM0-5 = PH4*T7S

STM0-5 = OPO*T7S

STM0-5 = SSPM*TS

STM6-9 = PH2*T7S

STM6-9 = PH3*T7S

STM6-9 = OPO*T7S

STM6-9 = $\overline{OPO}$*EIR*PH1*T7S

STM6-9 = SSPM*TS

STM10-15 = PH2*T7S

STM10-15 = PH3*T7S

STM10-15 = OPO*T7S

STM10-15 = SSPM*TS

STP0-9 = JMP*PH1*T5*TS*$\overline{IRI0}$

STP0-9 = JMP*PH1*T7S*$\overline{TRI5}$

STP0-9 = JMP*PH2*T7S*$\overline{TRI5}$

STP0-9 = JSB*PH3*T4*TS

STP0-9 = PH3*T7S

STP0-9 = PH4*T2*TS

STP0-9 = PH4*T45*TS

STP0-9 = OPO*T7S

STP0-9 = SSPM*TS

STP10-15 = JMP*PH1*T5*TS*$\overline{IRI0}$

STP10-15 = JMP*PH1*T7S*$\overline{TRI5}$

STP10-15 = JMP*PH2*T7S*$\overline{TRI5}$

STP10-15 = JSB*PH3*T4*TS

STP10-15 = PH3*T7S

STP10-15 = PH4*T2*TS

STP10-15 = PH4*T45*TS

STP10-15 = OPO*T7S

STP10-15 = SSPM*TS

STR = EIR*IR14*IR13*IR12

SWSA = AAF*LMLF*T2

SWSB = BAF*LMLF*T2

SWST = LMLF*T2

T1M = P1235*T1

$\overline{TB0}$ = SRG*E*T3*TR8*TR7*$\overline{TR6}$

$\overline{TB0}$ = (SCM0*SCL4*IOI+RSM6-9)*$\overline{CI0}$

$\overline{TB1}$ = (SCM0*SCL4*IOI+RSM6-9)*$\overline{CI1}$

$\overline{TB2}$ = (SCM0*SCL4*IOI+RSM6-9)*$\overline{CI2}$

$\overline{TB3}$ = (SCM0*SCL4*IOI+RSM6-9)*$\overline{CI3}$

$\overline{TB4}$ = (SCM0*SCL4*IOI+RSM6-9)*$\overline{CI4}$

$\overline{TB5}$ = (SCM0*SCL4*IOI+RSM6-9)*$\overline{CI5}$

$\overline{TBI5}$ = SRG*E*T3*TR8*$\overline{TR7}$*TR6

T0 FLIP FLOP

DATA = $\overline{T0}$*$\overline{T1}$*$\overline{T2}$*$\overline{T3}$*$\overline{T4}$*$\overline{T5}$*$\overline{T6\ EXTEND}$*$\overline{T7\ EXTEND}$*$\overline{T6}$

CLOCK = $\overline{CFF}$

T1 FLIP FLOP

DATA = T0

CLOCK = $\overline{CFF}$

T2 FLIP FLOP

DATA = T1

CLOCK = $\overline{CFF}$

T3 FLIP FLOP

DATA = T2

CLOCK = $\overline{CFF}$

T4 FLIP FLOP

DATA = T3

CLOCK = $\overline{CFF}$

T5 FLIP FLOP

DATA = T4

CLOCK = $\overline{CFF}$

T6 EXTEND FLIP FLOP

DATA = T5

CLOCK = $\overline{CFF}$

DIRECT SET = $\overline{ISZ}$*T5+$\overline{PH3}$*T5

DIRECT CLR = $\overline{ISZ}$*$\overline{T5}$+$\overline{PH3}$*$\overline{T5}$

T7 EXTEND FF

DATA = PH1•T6 EXTEND
CLOCK = $\overline{CFF}$
DIRECT SET = $\overline{ISZ}$*T5+$\overline{PH3}$*T5
DIRECT CLR = $\overline{ISZ}$*$\overline{T5}$+$\overline{PH3}$*$\overline{T5}$

T6 FLIP FLOP
DATA = T7 EXTEND
CLOCK = $\overline{CFF}$

T7 FLIP FLOP
DATA = T6
CLOCK = $\overline{CFF}$

T12 = T1+T2
T34 = T3+T4
T45 = T4+T5
T67 = T6+T7
T7S = T7*TS
TS = CFF*DELAY
T310 = T3

TAN1 = $\overline{TB0}$*$\overline{TB1}$*$\overline{TB2}$*$\overline{TB3}$
TAN2 = $\overline{TB7}$*$\overline{TB6}$*$\overline{TB5}$*$\overline{TB4}$
TAN3 = $\overline{TB11}$*$\overline{TB10}$*$\overline{TB9}$*$\overline{TB8}$
TAN4 = $\overline{TB15}$*$\overline{TB14}$*$\overline{TB13}$*$\overline{TB12}$

TB0 = ADF*RB0*SB0*C0
TB0 = ADF*RB0*$\overline{SB0}$*$\overline{C0}$
TB0 = ADF*$\overline{RB0}$*SB0*$\overline{C0}$
TB0 = ADF*$\overline{RB0}$*$\overline{SB0}$*C0
TB0 = ANF*RB0*SB0
TB0 = CMF*$\overline{RB0}$
TB0 = EOF*RB0*$\overline{SB0}$
TB0 = EOF*$\overline{RB0}$*SB0
TB0 = IOF*RB0
TB0 = IOF*SB0
TB0 = IOI*IOB0
TB0 = RLF*RB12
TB0 = SAL*LA0
TB0 = SL0*RB15
TB0 = SRG*T5*TR2*TR1*$\overline{TR0}$
TB0 = SRM*RB1

TB1 = ADF*RB1*SB1*C1
TB1 = ADF*RB1*$\overline{SB1}$*$\overline{C1}$
TB1 = ADF*$\overline{RB1}$*SB1*$\overline{C1}$
TB1 = ADF*$\overline{RB1}$*$\overline{SB1}$*C1
TB1 = ANF*RB1*SB1
TB1 = CMF*$\overline{RB1}$
TB1 = EOF*RB1*$\overline{SB1}$
TB1 = EOF*$\overline{RB1}$*SB1
TB1 = IOF*RB1
TB1 = IOF*SB1
TB1 = IOI*IOB1
TB1 = RLF*RB13
TB1 = SAL*LA1
TB1 = SLM*RB0
TB1 = SRM*RB2

TB2 = ADF*RB2*SB2*C2
TB2 = ADF*RB2*$\overline{SB2}$*$\overline{C2}$
TB2 = ADF*$\overline{RB2}$*SB2*$\overline{C2}$
TB2 = ADF*$\overline{RB2}$*$\overline{SB2}$*C2
TB2 = ANF*RB2*SB2
TB2 = CMF*$\overline{RB2}$
TB2 = EOF*RB2*$\overline{SB2}$
TB2 = EOF*$\overline{RB2}$*SB2
TB2 = IOF*RB2
TB2 = IOF*SB2
TB2 = IOI*IOB2
TB2 = RL4*RB14
TB2 = SAL*LA2
TB2 = SLM*RB1
TB2 = SRM*RB3

TB3 = ADF*RB3*SB3*C3
TB3 = ADF*RB3*$\overline{SB3}$*$\overline{C3}$
TB3 = ADF*$\overline{RB3}$*SB3*$\overline{C3}$
TB3 = ADF*$\overline{RB3}$*$\overline{SB3}$*C3
TB3 = ANF*RB3*SB3
TB3 = CMF*$\overline{RB3}$
TB3 = EOF*RB3*$\overline{SB3}$
TB3 = EOF*$\overline{RB3}$*SB3
TB3 = IOF*RB3

TB3 = IOF*SB3

TB3 = IOI*IOB3

TB3 = RL4*RB15

TB3 = SAL*LA3

TB3 = SLM*RB2

TB3 = SRM*RB4

TB4 = ADF*RB4*SB4*C4

TB4 = ADF*RB4*$\overline{SB4}$*$\overline{C4}$

TB4 = ADF*$\overline{RB4}$*SB4*$\overline{C4}$

TB4 = ADF*$\overline{RB4}$*$\overline{SB4}$*C4

TB4 = ANF*RB4*SB4

TB4 = CMF*$\overline{RB4}$

TB4 = EOF*RB4*$\overline{SB4}$

TB4 = EOF*$\overline{RB4}$*SB4

TB4 = IOF*RB4

TB4 = IOF*SB4

TB4 = IOI*IOB4

TB4 = RL4*RB0

TB4 = SAL*LA4

TB4 = SLM*RB3

TB4 = SRM*RB5

TB5 = ADF*RB5*SB5*C5

TB5 = ADF*RB5*$\overline{SB5}$*$\overline{C5}$

TB5 = ADF*$\overline{RB5}$*SB5*$\overline{C5}$

TB5 = ADF*$\overline{RB5}$*$\overline{SB5}$*C5

TB5 = ANF*RB5*SB5

TB5 = CMF*$\overline{RB5}$

TB5 = EOF*RB5*$\overline{SB5}$

TB5 = EOF*$\overline{RB5}$*SB5

TB5 = IOF*RB5

TB5 = IOF*SB5

TB5 = IOI*IOB5

TB5 = RL4*RB1

TB5 = SAL*LA5

TB5 = SLM*RB4

TB5 = SRM*RB6

TB6 = ADF*RB6*SB6*C6

TB6 = ADF*RB6*$\overline{SB6}$*$\overline{C6}$

TB6 = ADF*$\overline{RB6}$*SB6*$\overline{C6}$

TB6 = ADF*$\overline{RB6}$*$\overline{SB6}$*C6

TB6 = ANF*RB6*SB6

TB6 = CMF*$\overline{RB6}$

TB6 = EOF*RB6*$\overline{SB6}$

TB6 = EOF*$\overline{RB6}$*SB6

TB6 = IOF*RB6

TB6 = IOF*SB6

TB6 = IOI*IOB

TB6 = RL4*RB2

TB6 = SAL*LA6

TB6 = SLM*RB5

TB6 = SRM*RB7

TB7 = ADF*RB7*SB7*C7

TB7 = ADF*RB7*$\overline{SB7}$*$\overline{C7}$

TB7 = ADF*$\overline{RB7}$*SB7*$\overline{C7}$

TB7 = ADF*$\overline{RB7}$*$\overline{SB7}$*C7

TB7 = ANF*RB7*SB7

TB7 = CMF*$\overline{RB7}$

TB7 = EOF*RB7*$\overline{SB7}$

TB7 = EOF*$\overline{RB7}$*SB7

TB7 = IOF*RB7

TB7 = IOF*SB7

TB7 = IOI*IOB7

TB7 = RL4*RB3

TB7 = SAL*LA7

TB7 = SLM*RB6

TB7 = SRM*RB8

TB8 = ADF*RB8*SB8*C8

TB8 = ADF*RB8*$\overline{SB8}$*$\overline{C8}$

TB8 = ADF*$\overline{RB8}$*SB8*$\overline{C8}$

TB8 = ADF*$\overline{RB8}$*$\overline{SB8}$*C8

TB8 = ANF*RB8*SB8

TB8 = CMF*$\overline{RB8}$

TB8 = EOF*RB8*$\overline{SB8}$

TB8 = EOF*$\overline{RB8}$*SB8

TB8 = IOF*RB8

TB8 = IOF*SB8

TB8 = IOI*IOB8

TB8 = RL4*RB4

TB8 = SAL*LA8

TB8 = SLM*RB7

TB8 = SRM*RB9

TB9 = ADF*RB9*SB9*C9

TB9 = ADF*RB9*$\overline{SB9}$*$\overline{C9}$

TB9 = ADF*$\overline{RB9}$*SB9*$\overline{C9}$

TB9 = ADF*$\overline{RB9}$*$\overline{SB9}$*C9

TB9 = ANF*RB9*SB9

TB9 = CMF*$\overline{RB9}$

TB9 = EOF*RB9*$\overline{SB9}$

TB9 = EOF*$\overline{RB9}$*SB9

TB9 = IOF*RB9

TB9 = IOF*SB9

TB9 = IOI*IOB9

TB9 = RL4*RB5

TB9 = SAL*LA9

TB9 = SLM*RB8

TB9 = SRM*RB10

TB10 = ADF*RB10*SB10*C10

TB10 = ADF*RB10*$\overline{SB10}$*$\overline{C10}$

TB10 = ADF*$\overline{RB10}$*SB10*$\overline{C10}$

TB10 = ADF*$\overline{RB10}$*$\overline{SB10}$*C10

TB10 = ANF*RB10*SB10

TB10 = CMF*$\overline{RB10}$

TB10 = EOF*RB10*$\overline{SB10}$

TB10 = EOF*$\overline{RB10}$*SB10

TB10 = IOF*RB10

TB10 = IOF*SB10

TB10 = IOI*IOB10

TB10 = RL4*RB6

TB10 = SAL*LA10

TB10 = SLM*RB9

TB10 = SRM*RB11

TB11 = ADF*RB11*SB11*C11

TB11 = ADF*RB11*$\overline{SB11}$*$\overline{C11}$

TB11 = ADF*$\overline{RB11}$*SB11*$\overline{C11}$

TB11 = ADF*$\overline{RB11}$*$\overline{SB11}$*C11

TB11 = ANF*RB11*SB11

TB11 = CMF*$\overline{RBTT}$

TB11 = EOF*RB11*$\overline{SBTT}$

TB11 = EOF*$\overline{RBTT}$*SB11

TB11 = IOF*RB11

TB11 = IOF*SB11

TB11 = IOI*IOB11

TB11 = RL4*RB7

TB11 = SAL*LA11

TB11 = SLM*RB10

TB11 = SRM*RB12

TB11 = ADF*RB12*SB12*C12

TB12 = ADF*RB12*$\overline{SBT2}$*$\overline{CT2}$

TB12 = ADF*$\overline{RBT2}$*SB12*$\overline{CT2}$

TB12 = ADF*$\overline{RBT2}$*$\overline{SBT2}$*C12

TB12 = ANF*RB12*SB12

TB12 = CMF*$\overline{RBT2}$

TB12 = EOF*RB12*$\overline{SBT2}$

TB12 = EOF*$\overline{RBT2}$*SB12

TB12 = IOF*RB12

TB12 = IOF*SB12

TB12 = IOI*IOB12

TB12 = RL4*RB8

TB12 = SAL*LA12

TB12 = SLM*RB11

TB12 = SRM*RB13

TB13 = ADF*RB13*SB13*C13

TB13 = ADF*RB13*$\overline{SBT3}$*$\overline{CT3}$

TB13 = ADF*$\overline{RBT3}$*SB13*$\overline{CT3}$

TB13 = ADF*$\overline{RBT3}$*$\overline{SBT3}$*C13

TB13 = ANF*RB13*SB13

TB13 = CMF*$\overline{RBT3}$

TB13 = EOF*RB13*$\overline{SBT3}$

TB13 = EOF*$\overline{RBT3}$*SB13

TB13 = IOF*RB13

TB13 = IOF*SB13

TB13 = IOI*IOB13

TB13 = RL4*RB9

TB13 = SAL*LA13

TB13 = SLM*RB12

TB13 = SRM*RB14

TB14 = ADF*RB14*SB14*C14
TB14 = ADF*RB14*$\overline{SB14}$*$\overline{C14}$
TB14 = ADF*$\overline{RB14}$*SB14*$\overline{C14}$
TB14 = ADF*$\overline{RB14}$*$\overline{SB14}$*C14
TB14 = ANF*RB14*SB14
TB14 = CMF*$\overline{RB14}$
TB14 = EOF*RB14*$\overline{SB14}$
TB14 = EOF*$\overline{RB14}$*SB14
TB14 = IOF*RB14
TB14 = IOF*SB14
TB14 = IOI*IOB14
TB14 = RL4*RB10
TB14 = SAL*LA14
TB14 = SLM*RB13
TB14 = SRM*RB15

TB15 = ADF*RB15*SB15*C15
TB15 = ADF*RB15*$\overline{SB15}$*$\overline{C15}$
TB15 = ADF*$\overline{RB15}$*SB15*$\overline{C15}$
TB15 = ADF*$\overline{RB15}$*$\overline{SB15}$*C15
TB15 = ANF*RB15*SB15
TB15 = CMF*$\overline{RB15}$
TB15 = EOF*RB15*$\overline{SB15}$
TB15 = EOF*$\overline{RB15}$*SB15
TB15 = IOF*RB15
TB15 = IOF*SB15
TB15 = IOI*IOB15
TB15 = RL4*RB11
TB15 = SAL*LA15
TB15 = SLM*RB14
TB15 = SRG*T3*$\overline{TR8}$*$\overline{TR7}$*RB15
TB15 = SRG*T5*$\overline{TR2}$*$\overline{TR1}$*RB15
TB15 = SRG*E*T5*TR2*TR1*TR0
TB15 = SRM*RB0

T REGISTER

TR0 FF

DATA = $\overline{TB0}$

DIRECT CLR = $\overline{ST0}$

TR1 FF

DATA = $\overline{TBI}$

DIRECT CLR = $\overline{STI}$

TR2 FF

DATA = $\overline{TB2}$

DIRECT CLR = $\overline{ST2}$

TR3 FF

DATA = $\overline{TB3}$

DIRECT CLR = $\overline{ST2}$

TR4 FF

DATA = $\overline{TB4}$

DIRECT CLR = $\overline{ST4}$

TR5 FF

DATA = $\overline{TB5}$

DIRECT CLR = $\overline{ST5}$

TR6 FF

DATA = $\overline{TB6}$

DIRECT CLR = $\overline{ST6}$

TR7 FF

DATA = $\overline{TB7}$

DIRECT CLR = $\overline{ST6}$

TR8 FF

DATA = $\overline{TB8}$

DIRECT CLR = $\overline{ST8}$

TR9 FF

DATA = $\overline{TB9}$

DIRECT CLR = $\overline{ST9}$

TR10 FF

DATA = $\overline{TBI0}$

DIRECT CLR = $\overline{STI0}$

TR11 FF

DATA = $\overline{TBII}$

DIRECT CLR = $\overline{STII}$

TR12 FF

DATA = $\overline{TBI2}$

DIRECT CLR = $\overline{STI2}$

TR13 FF

DATA = $\overline{TBI3}$
DIRECT CLR = $\overline{STI3}$
TR14 FF
DATA = $\overline{TBI4}$
DIRECT CLR = $\overline{STI4}$

TR15 FF
DATA = $\overline{TBI5}$
DIRECT CLR = $\overline{STI5}$
CLOCK = STBT

TR0 = $\overline{TR0\ FF}$
TR1 = $\overline{TR1\ FF}$
TR2 = $\overline{TR2\ FF}$
TR3 = $\overline{TR3\ FF}$
TR4 = $\overline{TR4\ FF}$
TR5 = $\overline{TR5\ FF}$
TR6 = $\overline{TR6\ FF}$
TR7 = $\overline{TR7\ FF}$
TR8 = $\overline{TR8\ FF}$
TR9 = $\overline{TR9\ FF}$
TR10 = $\overline{TR10\ FF}$
TR11 = $\overline{TR11\ FF}$
TR12 = $\overline{TR12\ FF}$
TR13 = $\overline{TR13\ FF}$
TR14 = $\overline{TR14\ FF}$
TR15 = $\overline{TR15\ FF}$

$\overline{TR0}$ = TR0 FF
$\overline{TR1}$ = TR1 FF
$\overline{TR2}$ = TR2 FF
$\overline{TR3}$ = TR3 FF
$\overline{TR4}$ = TR4 FF
$\overline{TR5}$ = TR5 FF
$\overline{TR6}$ = TR6 FF
$\overline{TR7}$ = TR7 FF
$\overline{TR8}$ = TR8 FF
$\overline{TR9}$ = TR9 FF
$\overline{TR10}$ = TR10 FF
$\overline{TR11}$ = TR11 FF
$\overline{TR12}$ = TR12 FF

$\overline{TRI3}$ = TR13 FF

$\overline{TRI4}$ = TR14 FF

$\overline{TRI5}$ = TR15 FF

TRD0 = TR0

TRD1 = TR1

TRD2 = TR2

TRD3 = TR3

TRD4 = TR4

TRD5 = TR5

TRD6 = TR6

TRD7 = TR7

TRD8 = TR8

TRD9 = TR9

TRD10 = TR10

TRD11 = TR11

TRD12 = TR12

TRD13 = TR13

TRD14 = TR14

TRD15 = TR15

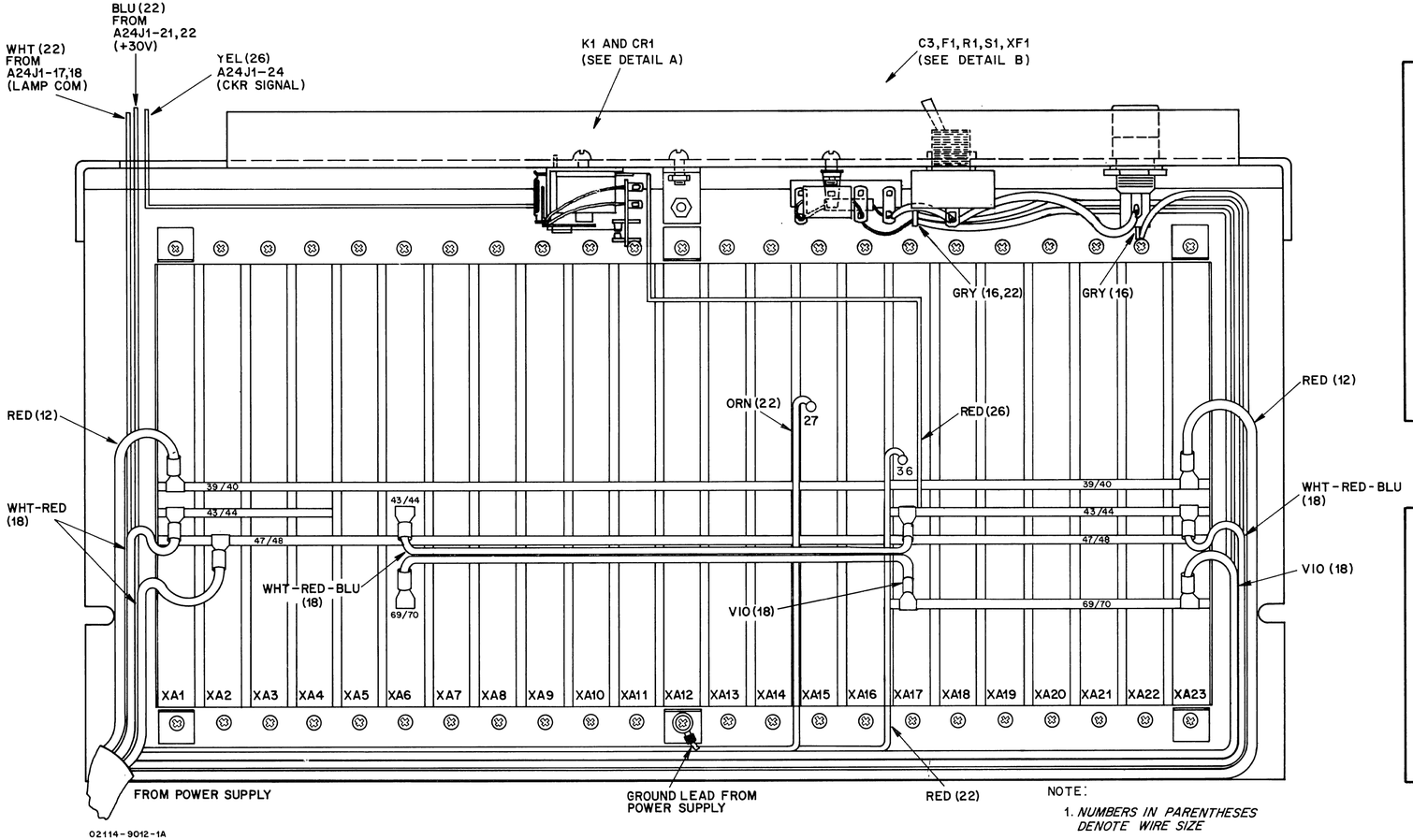
Y7N = $\overline{MRII*MRI0*MR9}$

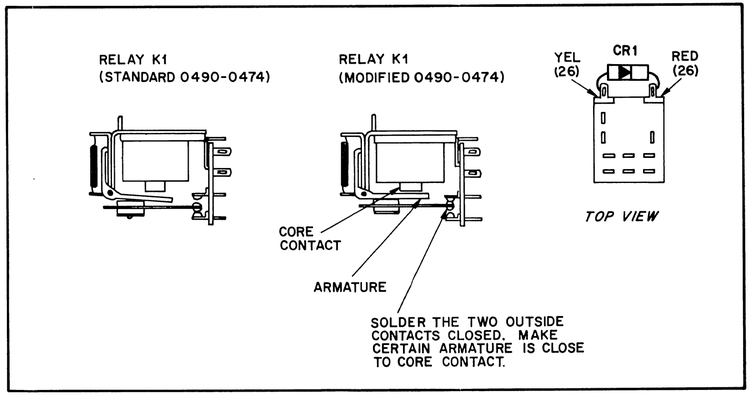
YN7 = $\overline{MR8*MR7*MR6}$

XOA = EIR*$\overline{IRI4}$*IR13*$\overline{IRI2}$*$\overline{IRII}$

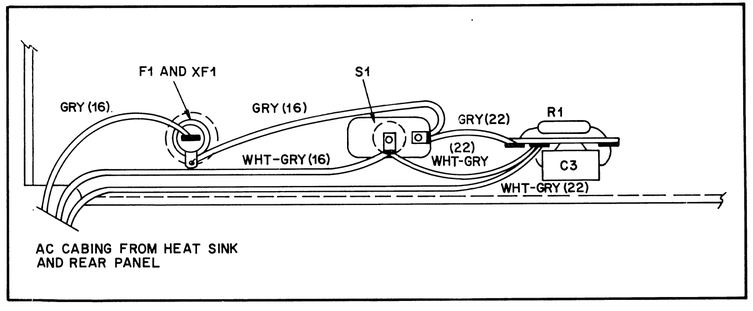
Table 6-4. Backplane Assembly (02114-6022) and Chassis Mounted Parts, Reference Designation Index

REFERENCE DESIGNATION	HP PART NO.	DESCRIPTION	MFR. CODE NO.	MFR. PART NO.
C3	0170-0022	C: FXD MY 0.1 UF 20% 600 VDCW	09134	TYPE 24
CR1	1901-0033	DIODE: SILICON 100 MA 180 WV	28480	1901-0033
F1	2110-0036	FUSE: CARTRIDGE 8 AMP 125V	75915	312008
K1	0490-0474	RELAY: 3 PDT 10A/115A 32 VDC	94696	W88X11
R1	0757-0984	R: FXD MET FLM 10.0 OHM 1% 1/2W	28480	0757-0984
S1	3101-0030	SWITCH: TOG SPST 15 AMP 125 VAC	88140	8906K368
XA1-23	1251-1387	CONN: PC 86 (2 x 43) CONTACTS	83315	7556-G
XF1	1400-0084	FUSEHOLDER: EXTRACTOR POST TYPE	79515	342014





DETAIL A



DETAIL B

Figure 6-3. Partial Bottom View of Computer Showing Backplane Assembly (02114-6022) and Chassis Mounted Parts, Part Location and Wiring Diagram

REFERENCE DESIGNATION*	HP PART NO.	DESCRIPTION	MFR. CODE NO.	MFR. PART NO.
C1-C16	0160-0154	C: FXD MYLAR 2200 PF 10%	28480	0160-0154
C35,C36	0160-0134	C: FXD MICA 200 PF 5% 300 VDCW	14655	RDM15F221J3C
C37	0140-0210	C: FXD MICA 270 PF 5%	28480	0140-0210
C39	0140-0151	C: FXD MICA 820 PF 2%	28480	0140-0151
C41,C42	0160-0363	C: FXD MICA 620 PF 5%	28480	0150-0363
C43	0170-0019	C: FXD MY 0.1 UF 5% 200 VDCW	28480	0170-0019
C44	0180-0142	C: FXD ELECT 20 UF -10+100% 25 VDCW	56289	TYPE 40D D36039
C50-C64	0160-2055	C: FXD CER 0.01 UF +80-20% 100 VDCW	91418	TA
CR1,2,4,6,7,9,11,12,14,16,17, 19,21,22,24,26,27,29,31,32, 34,36,37,39,42,47,52,57,62, 67,72,77	1901-0040	DIODE: SILICON 30 MA 30 MV	07263	FDG 1088
CR3,8,13,18,23,28,33,38,41, 46,51,56,61,66,71,76	1910-0034	DIODE: GERMANIUM 25V	28480	1910-0034
CR90,CR91	1901-0050	DIODE: SILICON 75V	28480	1901-0050
MC16,36,47,56,76,96,107,116	1820-0130	INTEGRATED CIRCUIT: TTL	28480	1820-0130
MC17,67	1820-0063	INTEGRATED CIRCUIT: TTL	56289	USN 7451A
MC26,37,46,66,86,97,106,126	1820-0374	INTEGRATED CIRCUIT: TTL	28480	1820-0374
MC27,57	1820-0370	INTEGRATED CIRCUIT: TTL	28480	1820-0370
MC77	1820-0127	INTEGRATED CIRCUIT: TTL	28480	1820-0127
MC87	1820-0372	INTEGRATED CIRCUIT: TTL	01295	SN 74H11N
MC115,117,125,127	1820-0378	INTEGRATED CIRCUIT: TTL	28480	1820-0378
Q1,2,4,5,7,8,10,11,13,14,16,17, 19,20,22,23,25,26,28,29,31, 32,34,35,37,38,40,41,43,44, 46,47,56	1854-0246	TRANSISTOR: SILICON NPN	07263	2N3643
Q3,6,9,12,15,18,21,24,27,30, 33,36,39,42,45,48	1854-0013	TRANSISTOR: NPN SILICON 2N2218A	04713	2N2218A
Q50,51,52	1854-0094	TRANSISTOR: SILICON NPN	07263	YPE2N3646
Q53	1853-0012	TRANSISTOR: PNP SILICON 2N2904A	04713	2N2904A
Q55	1853-0016	TRANSISTOR: SILICON PNP 2N3638	07263	2N3638
R1,6,11,16,21,26,31,36,41,46, 51,56,61,66,71,76	0698-3435	R: FXD MET FLM 38.3 OHM 1% 1/8W	28480	0698-3435
R2,7,12,17,22,27,32,37,42,47, 52,57,62,68,72,77	0757-0401	R: FXD MET FLM 100 OHM 1% 1/8W	28480	0757-0401
R3,4,8,9,13,14,18,19,23,24,28, 29,33,34,38,39,43,48,53,58, 63,67,73,78,104	0757-0280	R: FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
R79	0698-3429	R: FXD MET FLM 19.6 OHM 1% 1/8W	28480	0698-3429
R86	0698-4099	R: FXD MET FLM 139 OHM 1% 1/8W	28480	0698-4099
R87	0698-3530	R: FXD MET FLM 470 OHM 0.5% 1/8W	28480	0698-3530
R88,R89	0698-5513	R: FXD MET FLM 391 OHM 1% 1/8W	28480	0698-5513
R90	0757-1060	R: FXD MET FLM 196 OHM 1% 1/2W	28480	0757-1060
R92	0698-3690	R: FXD MET OX 22 OHM 5% 1W	28480	0698-3690
R96,R97	0811-2084	R: FXD WW 43 OHM 1% 5W	28480	0811-2084
R98,R99	0757-0984	R: FXD MET FLM 10.0 OHM 1% 1/2W	28480	0757-0984
R101	0757-0284	R: FXD MET FLM 150 OHM 1% 1/8W	28480	0757-0284
R102	0698-3132	R: FXD MET FLM 261 OHM 1% 1/8W	28480	0698-3132
R103	0757-0417	R: FXD MET FLM 562 OHM 1% 1/8W	28480	0757-0417
R105,R106	0683-1025	R: FXD MET FLM 1K OHM 5% 1/4W	01121	CB 1025
T1-T16	9100-1226	TRANSFORMER: PULSE	28480	9100-1226
W1-W4	8159-0005	JUMPER WIRE	28480	8159-0005

*Reference Designation Prefix A1 and A2

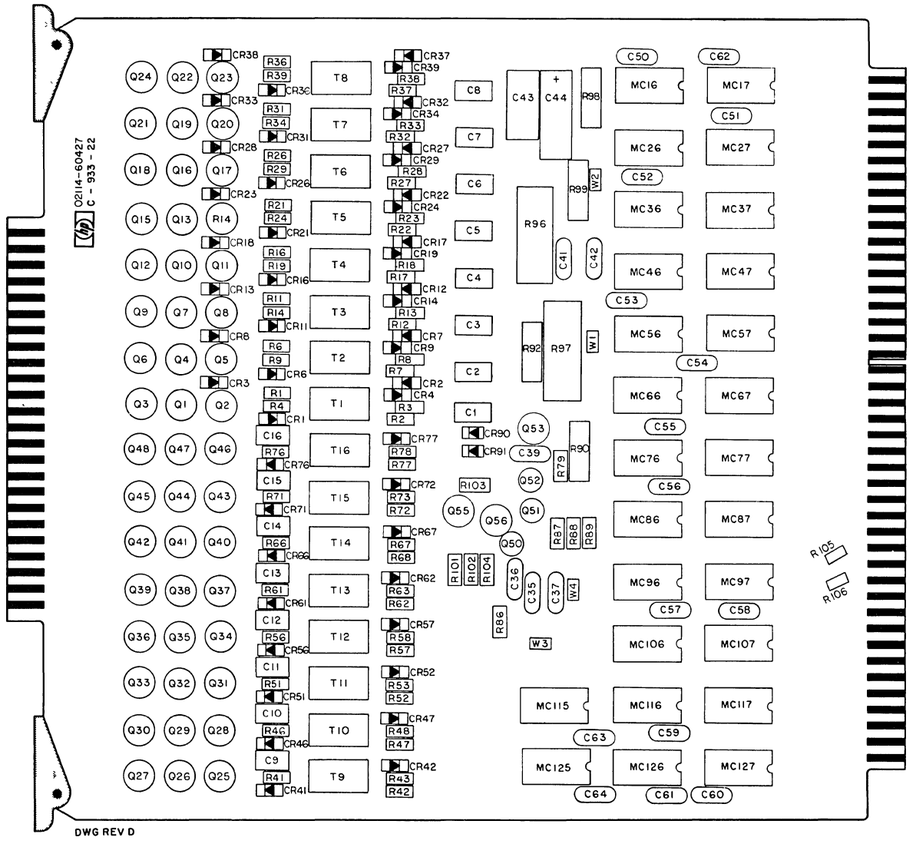


Figure 6-4. Driver/Switch Card (02114-60427), Part Location Diagram

Pin Index (48-Pin Connector)

PIN NO.	SIGNAL	A1(Y)		A2(X)	
		TO/FROM	ADDRESSING FUNCTION	TO/FROM	ADDRESSING FUNCTION
1, A	CC0	A40UJ1-1	X0XX READ	A40UJ2-A	XXX0 READ 4K/WRITE 8K
2, B	CA0	A40UJ1-2	X0XX WRITE	A40UJ2-B	XXX0 WRITE 4K/READ 8K
3, C	CC1	A40UJ1-3	X1XX READ	A40UJ2-C	XXX1 READ 4K/WRITE 8K
4, D	CA1	A40UJ1-4	X1XX WRITE	A40UJ2-D	XXX1 WRITE 4K/READ 8K
5, E	CC2	A40UJ1-5	X2XX READ	A40UJ2-E	XXX2 READ 4K/WRITE 8K
6, F	CA2	A40UJ1-6	X2XX WRITE	A40UJ2-F	XXX2 WRITE 4K/READ 8K
7, H	CC3	A40UJ1-7	X3XX READ	A40UJ2-H	XXX3 READ 4K/WRITE 8K
8, J	CA3	A40UJ1-8	X3XX WRITE	A40UJ2-J	XXX3 WRITE 4K/READ 8K
9, K	CC4	A40UJ1-9	X4XX READ	A40UJ2-K	XXX4 READ 4K/WRITE 8K
10, L	CA4	A40UJ1-10	X4XX WRITE	A40UJ2-L	XXX4 WRITE 4K/READ 8K
11, M	CC5	A40UJ1-11	X5XX READ	A40UJ2-M	XXX5 READ 4K
12, N	CA5	A40UJ1-12	X5XX WRITE	A40UJ2-N	XXX5 WRITE 4K
13, P	CC6	A40UJ1-13	X6XX READ	A40UJ2-P	XXX6 READ 4K
14, R	CA6	A40UJ1-14	X6XX WRITE	A40UJ2-R	XXX6 WRITE 4K
15, S	CC7	A40UJ1-15	X7XX READ	A40UJ2-S	XXX7 READ 4K
16, T	CA7	A40UJ1-16	X7XX WRITE	A40UJ2-T	XXX7 WRITE 4K
17, U	C0	A40UJ1-17	0XXX READ/WRITE	A40UJ2-U	XX0X READ/WRITE
18, V	C1	A40UJ1-18	1XXX READ/WRITE	A40UJ2-V	XX1X READ/WRITE
19, W	C2	A40UJ1-19	2XXX READ/WRITE	A40UJ2-W	XX2X READ/WRITE
20, X	C3	A40UJ1-20	3XXX READ/WRITE	A40UJ2-X	XX3X READ/WRITE
21, Y	C4	A40UJ1-21	4XXX READ/WRITE	A40UJ2-Y	XX4X READ/WRITE
22, Z	C5	A40UJ1-22	5XXX READ/WRITE	A40UJ2-Z	XX5X READ/WRITE
23, AA	C6	A40UJ1-23	6XXX READ/WRITE	A40UJ2-AA	XX6X READ/WRITE
24, BB	C7	A40UJ1-24	7XXX READ/WRITE	A40UJ2-BB	XX7X READ/WRITE

Pin Index (86-Pin Connector)

	A1(Y)		A2(X)	
PIN NO.	SIGNAL	REF NO.	SIGNAL	REF NO.
1	GND	337	GND	337
3	NC	-	NC	-
5	NC	-	NC	-
7	NC	-	NC	-
9	NC	-	NC	-
11	NC	-	NC	-
13	NC	-	NC	-
15	NC	-	NC	-
17	NC	-	NC	-
19	NC	-	NC	-
21	NC	-	NC	-
23	NC	-	NC	-
25	NC	-	NC	-
27	NC	-	NC	-
29	NC	-	NC	-
31	NC	-	NC	-
33	NC	-	NC	-
35	NC	-	NC	-
37	NC	-	NC	-
39	+5V	335	+5V	335
41	NC	-	NC	-
43	+20V	001	+20V	001
45	NC	-	NC	-
47	-2V	336	-2V	336
49	NC	-	NC	-
51	NC	-	NC	-
53	NC	-	NC	-
55	NC	-	NC	-
57	NC	-	NC	-
59	NC	-	NC	-
61	NC	-	NC	-
63	NC	-	NC	-
65	NC	-	NC	-
67	NC	-	NC	-
69	NC	-	NC	-
71	NC	-	NC	-
73	NC	-	NC	-
75	NC	-	PH5	333
77	NC	-	NC	-
79	XMR8	520	XMR2	514
81	XMR7	519	XMR1	513
83	NC	-	NC	-
85	GND	338	GND	338

	A1(Y)		A2(X)	
PIN NO.	SIGNAL	REF NO.	SIGNAL	REF NO.
2	GND	337	GND	337
4	NC	-	NC	-
6	NC	-	NC	-
8	NC	-	M12	503
10	DSCY	320	MMD2	215
12	MWT	068	MWT	068
14	NC	-	MI3	217
16	MI	301	MO	295
18	MRT	069	MRT	069
20	MB	303	M2	297
22	MRT0	072	MRT0	072
24	NC	-	NC	-
26	MT	302	MI	296
28	NC	-	NC	-
30	MIT	030	MIT	030
32	PH5	313	PH5	313
34	NC	-	NC	-
36	NC	-	NC	-
38	MR8	160	MR2	112
40	+5V	335	+5V	335
42	NC	-	NC	-
44	+20V	001	+20V	001
46	PON	257	PON	257
48	-2V	336	-2V	336
50	YTN	294	NC	-
52	NC	-	NC	-
54	XMR11	523	XMR5	517
56	XMR9	521	XMR3	515
58	YN7	293	NC	-
60	MR6	138	MR0	110
62	GND	-	XMMD2	530
64	MRT	139	MR1	111
66	MT1	306	MI	200
68	XMR6	518	XMR0	512
70	MI0	304	MI	298
72	MI0	305	MH	299
74	NC	-	NC	-
76	NC	-	NC	-
78	MR11	163	MR5	137
80	XMR10	522	XMR4	516
82	MR10	162	MR4	136
84	MR9	161	MR3	113
86	GND	338	GND	338

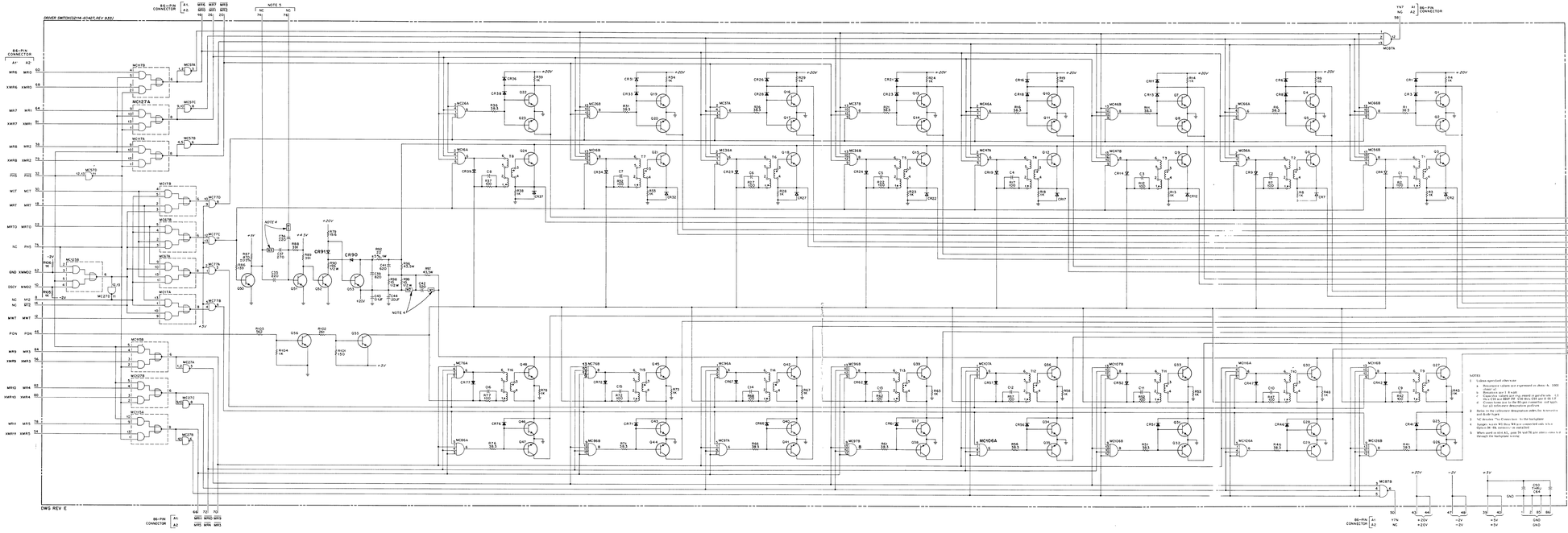


Figure 6-5. Driver/Switch Card (02114-60427), Schematic Diagram

Table 6-6. Inhibit Driver Card (02114-60429), Reference Designation Index

REFERENCE DESIGNATION *	HP PART NO.	DESCRIPTION	MFR. CODE NO.	MFR. PART NO.
C1-C17	0160-0938	C: FXD MICA 1000 PF 5%	28480	0160-0938
C50-C53	0180-0142	C: FXD ELECT 20 UF -10+100% 25 VDCW	56289	TYPE40DD36039
C54-C58	0180-0155	C: FXD ELECT 2.2 UF 20% 20 VDCW	28480	0180-0155
C59	0140-0208	C: FXD MICA 680 PF 5%	28480	0140-0208
CR1,3,5,7,9,11,13,15,17,19,21, 23,25,27,29,31,33	1910-0034	DIODE: GERMANIUM 25V	28480	1910-0034
CR2,4,6,8,10,12,14,16,18,20, 22,24,26,28,30,32,34	1901-0050	DIODE: SILICON 75V	28480	1901-0050
MC16,26,36,46,56,66,36,96,106	1820-0054	INTEGRATED CIRCUIT: TTL	01295	SN 7400N
MC57	1820-0071	INTEGRATED CIRCUIT: TTL	01295	SN 7440N
MC76	1820-0068	INTEGRATED CIRCUIT: TTL	56289	USN 7410A
Q1-Q34	1854-0246	TRANSISTOR: SILICON NPN	07263	2N3643
R1-R17	0811-2084	R: FXD WW 43 OHM 1% 5W	28480	0811-2084
R25	0683-1025	R: FXD COMP 1000 OHM 5% 1/4W	01121	CB 1025
R26	0757-0407	R: FXD MET FLM 200 OHM 1% 1/8W	28480	0757-0407

*Reference Designation Prefix A3 (A4 Optional)

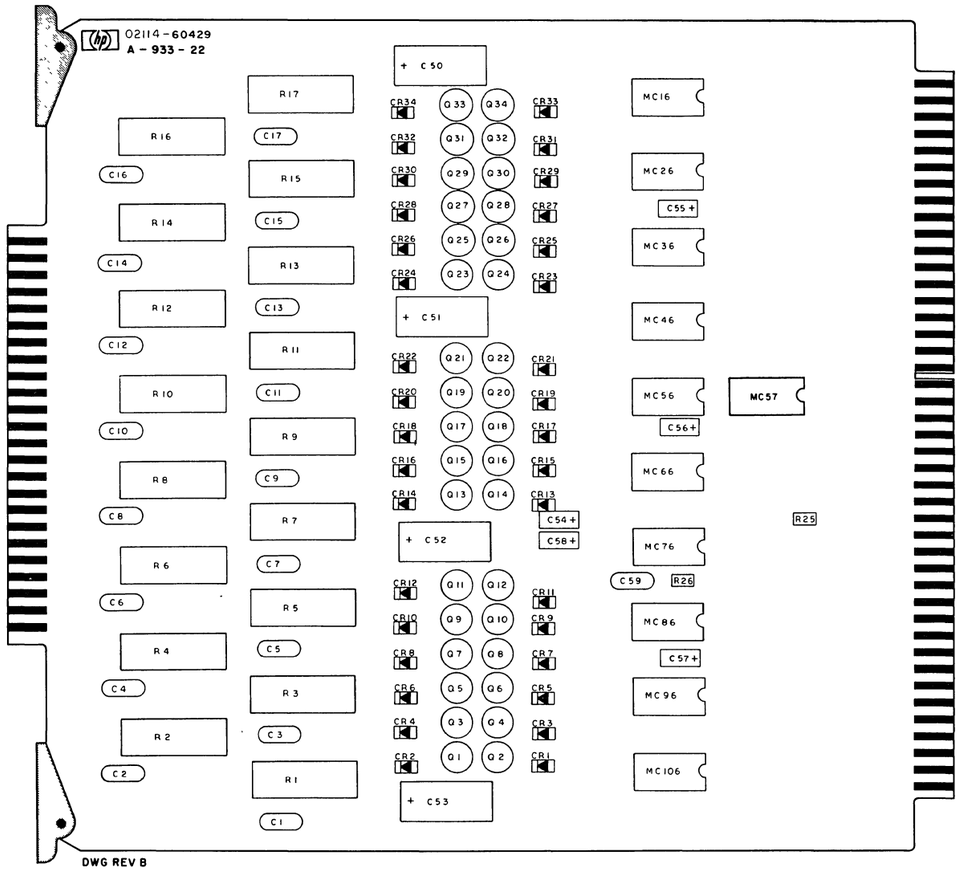


Figure 6-6. Inhibit Driver Card (02114-60429), Part Location Diagram

Pin Index (48-Pin Connector)

PIN NO.	SIGNAL	A3 (0-3K) TO/FROM	A3 (0-3K) INHIBIT LINE	A4 (4-7K) TO/FROM	A4 (4-7K) INHIBIT LINE
1	ID0	A400J3-1	Bit 0	A400J4-1	Bit 0
2	ID1	A400J3-2	Bit 1	A400J4-2	Bit 1
3	ID2	A400J3-3	Bit 2	A400J4-3	Bit 2
4	ID3	A400J3-4	Bit 3	A400J4-4	Bit 3
5	ID4	A400J3-5	Bit 4	A400J4-5	Bit 4
6	ID5	A400J3-6	Bit 5	A400J4-6	Bit 5
7	ID6	A400J3-7	Bit 6	A400J4-7	Bit 6
8	ID7	A400J3-8	Bit 7	A400J4-8	Bit 7
9	NC	-	-	-	-
10	NC	-	-	-	-
11	ID8	A400J3-11	Bit 8	A400J4-11	Bit 8
12	NC	-	-	-	-
13	NC	-	-	-	-
14	NC	-	-	-	-
15	NC	-	-	-	-
16	NC	-	-	-	-
17	ID9	A400J3-17	Bit 9	A400J4-17	Bit 9
18	ID10	A400J3-18	Bit 10	A400J4-18	Bit 10
19	ID11	A400J3-19	Bit 11	A400J4-19	Bit 11
20	ID12	A400J3-20	Bit 12	A400J4-20	Bit 12
21	ID13	A400J3-21	Bit 13	A400J4-21	Bit 13
22	ID14	A400J3-22	Bit 14	A400J4-22	Bit 14
23	ID15	A400J3-23	Bit 15	A400J4-23	Bit 15
24	ID16	A400J3-24	Parity	A400J4-24	Parity

PIN NO.	SIGNAL	A3 (0-3K) TO/FROM	A3 (0-3K) INHIBIT LINE	A4 (4-7K) TO/FROM	A4 (4-7K) INHIBIT LINE
A	ID0	A400J3-A	Bit 0	A400J4-A	Bit 0
B	ID1	A400J3-B	Bit 1	A400J4-B	Bit 1
C	ID2	A400J3-C	Bit 2	A400J4-C	Bit 2
D	ID3	A400J3-D	Bit 3	A400J4-D	Bit 3
E	ID4	A400J3-E	Bit 4	A400J4-E	Bit 4
F	ID5	A400J3-F	Bit 5	A400J4-F	Bit 5
H	ID6	A400J3-H	Bit 6	A400J4-H	Bit 6
J	ID7	A400J3-J	Bit 7	A400J4-J	Bit 7
K	NC	-	-	-	-
L	NC	-	-	-	-
M	NC	-	-	-	-
N	NC	-	-	-	-
P	NC	-	-	-	-
R	ID8	A400J3-R	Bit 8	A400J4-R	Bit 8
S	NC	-	-	-	-
T	NC	-	-	-	-
U	ID9	A400J3-U	Bit 9	A400J4-U	Bit 9
V	ID10	A400J3-V	Bit 10	A400J4-V	Bit 10
W	ID11	A400J3-W	Bit 11	A400J4-W	Bit 11
X	ID12	A400J3-X	Bit 12	A400J4-X	Bit 12
Y	ID13	A400J3-Y	Bit 13	A400J4-Y	Bit 13
Z	ID14	A400J3-Z	Bit 14	A400J4-Z	Bit 14
AA	ID15	A400J3-AA	Bit 15	A400J4-AA	Bit 15
BB	ID16	A400J3-BB	Parity	A400J4-BB	Parity

Pin Index (86-Pin Connector)

PIN NO.	A3 (0-3K) SIGNAL	A3 (0-3K) REF NO.	A4 (4-7K) SIGNAL	A4 (4-7K) REF NO.
1	GND	337	GND	337
3	NC	-	NC	-
5	NC	-	NC	-
7	NC	-	NC	-
9	NC	-	NC	-
11	NC	-	NC	-
13	NC	-	NC	-
15	NC	-	XMMD2	530
17	NC	-	XMR12	524
19	NC	-	NC	-
21	NC	-	NC	-
23	NC	-	MMD2	215
25	NC	-	MR12	182
27	NC	-	NC	-
29	NC	-	NC	-
31	NC	-	NC	-
33	NC	-	NC	-
35	NC	-	NC	-
37	NC	-	NC	-
39	+5V	335	+5V	335
41	NC	-	NC	-
43	+20V	001	+20V	001
45	NC	-	NC	-
47	-2V	336	-2V	336
49	NC	-	NC	-
51	NC	-	NC	-
53	NC	-	NC	-
55	NC	-	NC	-
57	NC	-	NC	-
59	NC	-	NC	-
61	NC	-	NC	-
63	NC	-	NC	-
65	NC	-	NC	-
67	NC	-	NC	-
69	NC	-	NC	-
71	NC	-	NC	-
73	NC	-	NC	-
75	NC	-	NC	-
77	NC	-	NC	-
79	NC	-	NC	-
81	NC	-	NC	-
83	NC	-	NC	-
85	GND	338	GND	338

PIN NO.	A3 (0-3K) SIGNAL	A3 (0-3K) REF NO.	A4 (4-7K) SIGNAL	A4 (4-7K) REF NO.
2	GND	337	GND	337
4	TR1	124	TR1	124
6	TR0	123	TR0	123
8	TR3	126	TR3	126
10	NC	-	NC	-
12	TR5	150	TR5	150
14	TR2	125	TR2	125
16	NC	-	NC	-
18	NC	-	NC	-
20	TR7	152	TR7	152
22	TR4	149	TR4	149
24	NC	-	NC	-
26	NC	-	NC	-
28	TR6	151	TR6	151
30	TR8	173	TR8	173
32	RTS	501	NC	-
34	RTSB	046	NC	-
36	XRTS	525	NC	-
38	NC	-	NC	-
40	+5V	335	+5V	335
42	NC	-	NC	-
44	+20V	001	+20V	001
46	NC	-	NC	-
48	-2V	336	-2V	336
50	NC	-	MPT	-
52	MI2	217	MR12	182
54	MIT	071	MIT	071
56	MIL	061	MIL	061
58	TR10	175	TR10	175
60	TR9	174	TR9	174
62	NC	-	NC	-
64	NC	-	NC	-
66	TR12	192	TR12	192
68	TR11	176	TR11	176
70	NC	-	NC	-
72	NC	-	NC	-
74	TR14	194	TR14	194
76	TR13	193	TR13	193
78	NC	-	NC	-
80	TR16	219	TR16	219
82	TR15	195	TR15	195
84	NC	-	NC	-
86	GND	338	GND	338

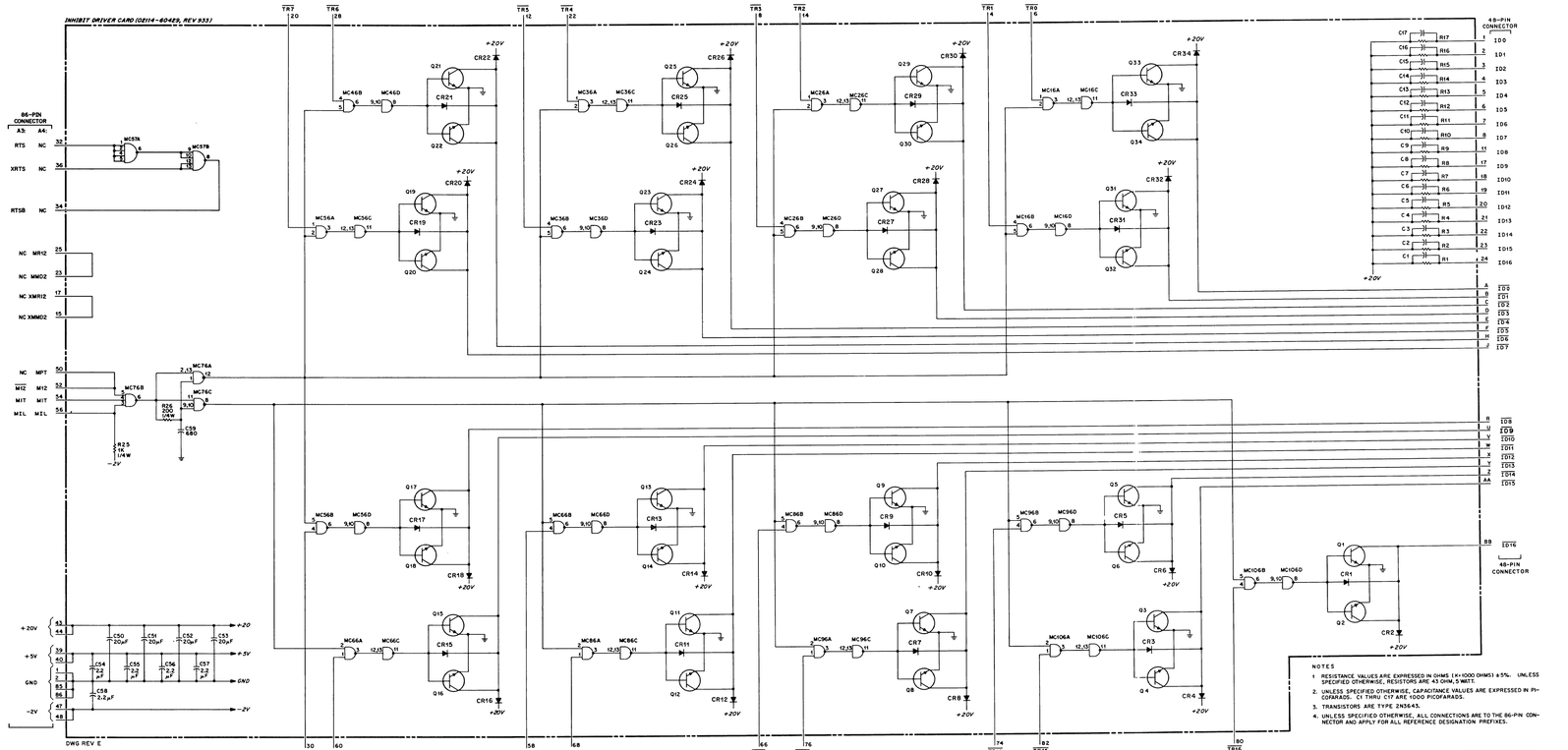


Figure 6-7. Inhibit Driver Card (02114-60429), Schematic Diagram

Table 6-7. Sense Amplifier Card (02114-6005), Reference Designation Index

REFERENCE DESIGNATION *	HP PART NO.	DESCRIPTION	MFR. CODE NO.	MFR. PART NO.
C20-C25	0160-2055	C: FXD CER 0.01 UF +80-20% 100 VDCW	91418	TA
C26-C31	0180-0155	C: FXD ELECT 2.2 UF 20% 20 VDCW	28480	0180-0155
MC1,11,21,31,41,51,61,71,81, 91,101,111,121,131,141, 151,161	1820-0137	INTEGRATED CIRCUIT	28480	1820-0137
MC37,47,57,77,87	1820-0327	INTEGRATED CIRCUIT: TTL	01295	SN7401N
MC67	1820-0071	INTEGRATED CIRCUIT: TTL	01295	SN7440N
Q1,2,4,5,7,8,10,11,13,14,16, 17,19,20,22,23,25,26,28, 29,31,32,34,35,37,38,40, 41,43,44,46,47,49,50	1853-0036	TRANSISTOR: SILICON PNP	04713	SP-3612
Q3,6,9,12,15,18,21,24,27,30, 33,36,39,42,45,48,51,52	1854-0215	TRANSISTOR: SILICON NPN	04713	SPS3611
R1,2,11,12,21,22,31,32,41,42, 51,52,61,62,71,72,81,82,91, 92,101,102,111,112,121, 122,131,132,141,142,151, 152,161,162,171	0757-0401	R: FXD MET FLM 100 OHM 1% 1/8W	28480	0757-0401
R3,13,23,33,43,53,63,73,83, 93,103,113,123,133,143,153, 163	0757-0280	R: FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
R4,14,24,34,44,54,64,74,84, 94,104,114,124,134,144, 154,164	0757-0419	R: FXD MET FLM 681 OHM 1% 1/8W	28480	0757-0419
R5,7,15,17,25,27,35,37,45,47, 55,57,65,67,75,77,85,87, 95,97,105,107,115,117, 125,127,135,137,145,147, 155,157,165,167	0698-7310	R: FXD FLM 1.65K OHM 25% 1/8W	28480	0698-7310
R8,18,28,38,48,58,68,78,88, 98,108,118,128,138,148, 158,168	0698-3155	R: FXD MET FLM 4.64K OHM 1% 1/8W	28480	0698-3155
R9,19,29,39,49,59,69,79,89, 99,109,119,129,139,149, 159,169	0757-0440	R: FXD MET FLM 7.50K OHM 1% 1/8W	28480	0757-0440
R172	0757-0416	R: FXD MET FLM 511 OHM 1% 1/8W	28480	0757-0416
R173	0698-3446	R: FXD MET FLM 383 OHM 1% 1/8W	28480	0698-3446
R174	0757-0419	R: FXD MET FLM 681 OHM 1% 1/8W	28480	0757-0419

*Reference Designation Prefix A6 (A7 Optional)

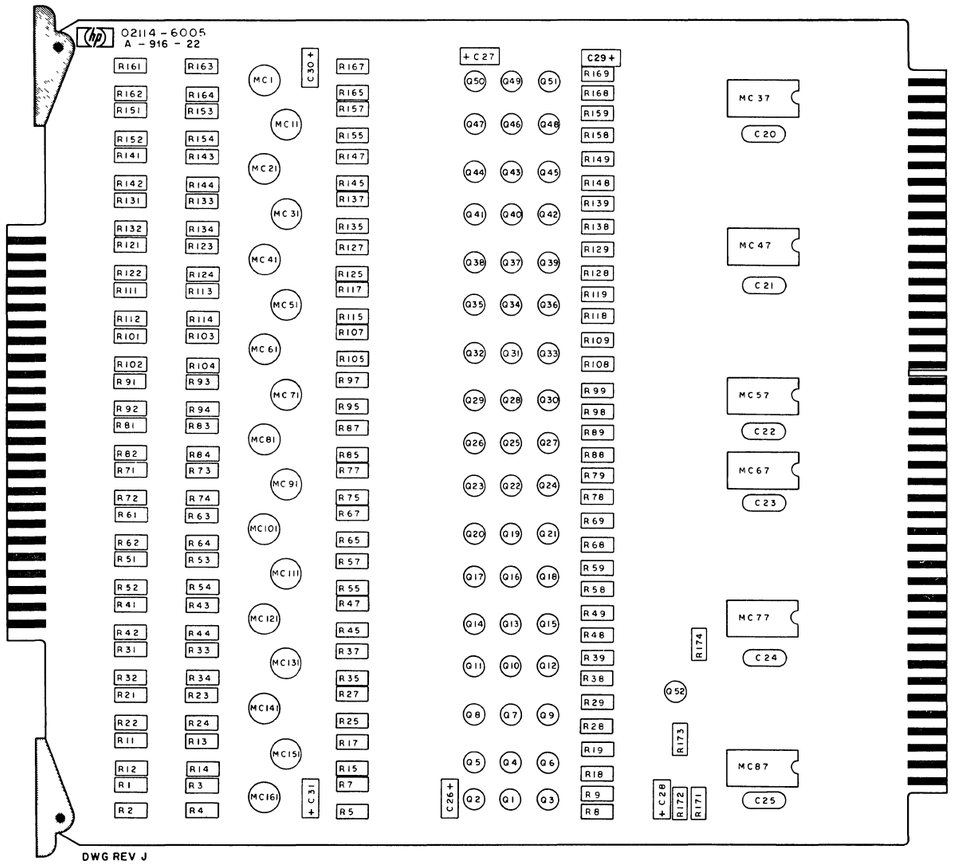


Figure 6-8.. Sense Amplifier Card (02114-6005), Part Location Diagram

Pin Index (48-Pin Connector)

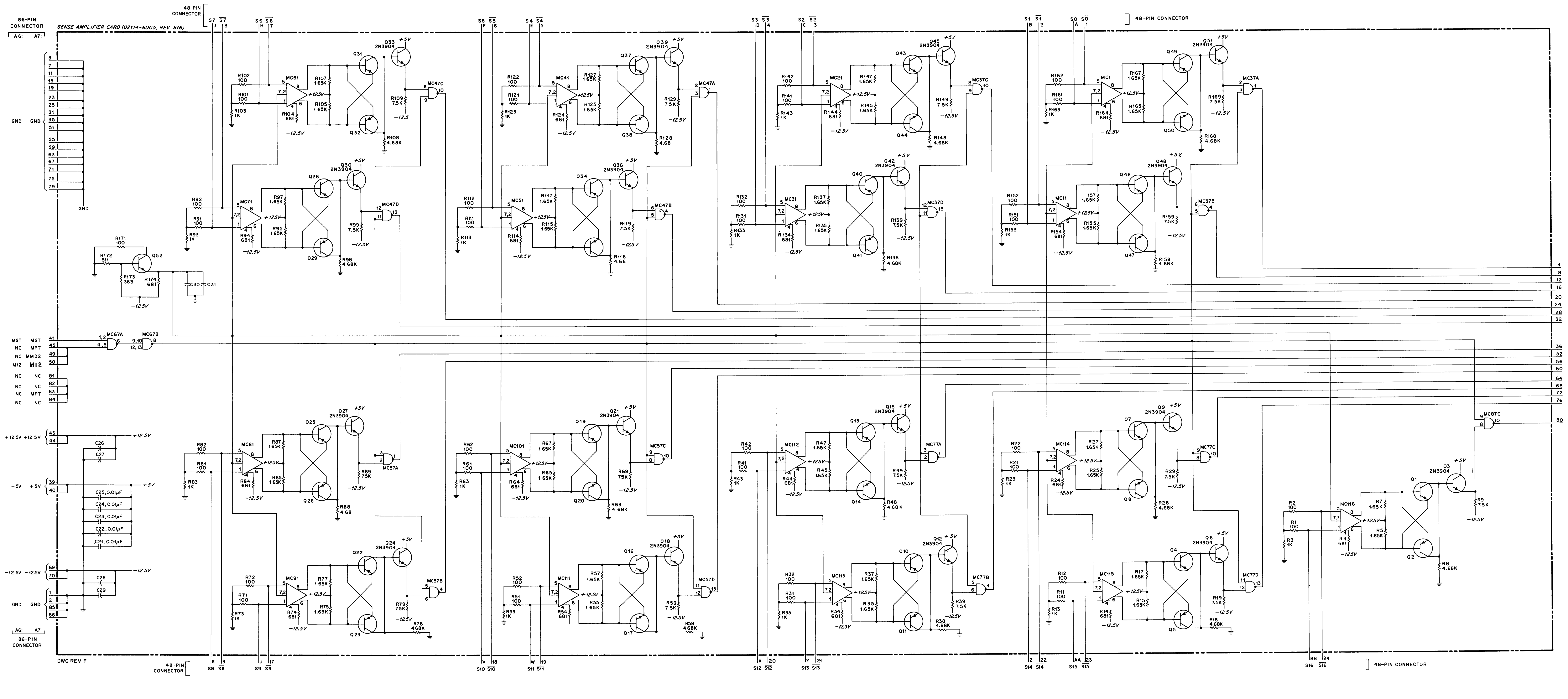
PIN NO.	SIGNAL	A6 (0-3K) TO/FROM	A6 (0-3K) SENSE LINE	A7 (4-7K) TO/FROM	A7 (4-7K) SENSE LINE
1	$\overline{S0}$	A400J6-1	Bit 0	A400J7-1	Bit 0
2	$\overline{S1}$	A400J6-2	Bit 1	A400J7-2	Bit 1
3	$\overline{S2}$	A400J6-3	Bit 2	A400J7-3	Bit 2
4	$\overline{S3}$	A400J6-4	Bit 3	A400J7-4	Bit 3
5	$\overline{S4}$	A400J6-5	Bit 4	A400J7-5	Bit 4
6	$\overline{S5}$	A400J6-6	Bit 5	A400J7-6	Bit 5
7	$\overline{S6}$	A400J6-7	Bit 6	A400J7-7	Bit 6
8	$\overline{S7}$	A400J6-8	Bit 7	A400J7-8	Bit 7
9	$\overline{S8}$	A440J6-9	Bit 8	A400J7-9	Bit 8
10	NC	-	-	-	-
11	NC	-	-	-	-
12	NC	-	-	-	-
13	NC	-	-	-	-
14	NC	-	-	-	-
15	NC	-	-	-	-
16	NC	-	-	-	-
17	$\overline{S9}$	A400J6-17	Bit 9	A400J7-17	Bit 9
18	$\overline{S10}$	A400J6-18	Bit 10	A400J7-18	Bit 10
19	$\overline{S11}$	A400J6-19	Bit 11	A400J7-19	Bit 11
20	$\overline{S12}$	A400J6-20	Bit 12	A400J7-20	Bit 12
21	$\overline{S13}$	A400J6-21	Bit 13	A400J7-21	Bit 13
22	$\overline{S14}$	A400J6-22	Bit 14	A400J7-22	Bit 14
23	$\overline{S15}$	A400J6-23	Bit 15	A400J7-23	Bit 15
24	$\overline{S16}$	A400J6-24	Parity	A400J7-24	Parity

PIN NO.	SIGNAL	A6 (0-3K) TO/FROM	A6 (0-3K) SENSE LINE	A7 (4-7K) TO/FROM	A7 (4-7K) SENSE LINE
A	S0	A400J6-A	Bit 0	A400J7-A	Bit 0
B	S1	A400J6-B	Bit 1	A400J7-B	Bit 1
C	S2	A400J6-C	Bit 2	A400J7-C	Bit 2
D	S3	A400J6-D	Bit 3	A400J7-D	Bit 3
E	S4	A400J6-E	Bit 4	A400J7-E	Bit 4
F	S5	A400J6-F	Bit 5	A400J7-F	Bit 5
H	S6	A400J6-H	Bit 6	A400J7-H	Bit 6
J	S7	A400J6-J	Bit 7	A400J7-J	Bit 7
K	S8	A400J6-K	Bit 8	A400J7-K	Bit 8
L	NC	-	-	-	-
M	NC	-	-	-	-
N	NC	-	-	-	-
P	NC	-	-	-	-
R	NC	-	-	-	-
S	NC	-	-	-	-
T	NC	-	-	-	-
U	S9	A400J6-U	Bit 9	A400J7-U	Bit 9
V	S10	A400J6-V	Bit 10	A400J7-V	Bit 10
W	S11	A400J6-W	Bit 11	A400J7-W	Bit 11
X	S12	A400J6-X	Bit 12	A400J7-X	Bit 12
Y	S13	A400J6-Y	Bit 13	A400J7-Y	Bit 13
Z	S14	A400J6-Z	Bit 14	A400J7-Z	Bit 14
AA	S15	A400J6-AA	Bit 15	A400J7-AA	Bit 15
BB	S16	A400J6-BB	Parity	A400J7-BB	Parity

Pin Index (86-Pin Connector)

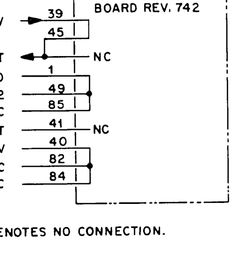
PIN NO.	A6 (0-3K) SIGNAL	A6 (0-3K) REF NO.	A7 (4-7K) SIGNAL	A7 (4-7K) REF NO.
1	GND	337	GND	337
3	GND	INT	GND	INT
5	NC	-	NC	-
7	GND	INT	GND	INT
9	NC	-	NC	-
11	GND	INT	GND	INT
13	NC	-	NC	-
15	GND	INT	GND	INT
17	NC	-	NC	-
19	GND	INT	GND	INT
21	NC	-	NC	-
23	GND	INT	GND	INT
25	GND	INT	GND	INT
27	NC	-	NC	-
29	NC	-	NC	-
31	GND	INT	GND	INT
33	NC	-	NC	-
35	GND	INT	GND	INT
37	NC	-	NC	-
39	+5V	335	+5V	335
41	MST	070	MST	070
43	+12V	002	+12V	343
45	NC	-	MPT	216
47	-2V	336	-2V	336
49	NC	-	MMD2	215
51	GND	INT	GND	INT
53	NC	-	NC	-
55	GND	INT	GND	INT
57	NC	-	NC	-
59	GND	INT	GND	INT
61	NC	-	NC	-
63	GND	INT	GND	INT
65	NC	-	NC	-
67	GND	INT	GND	INT
69	-12V	003	-12V	345
71	GND	INT	GND	INT
73	NC	-	NC	-
75	GND	INT	GND	INT
77	NC	-	NC	-
79	GND	INT	GND	INT
81	NC	-	NC	-
83	NC	-	MPT	216
85	GND	338	GND	338

PIN NO.	A6 (0-3K) SIGNAL	A6 (0-3K) REF NO.	A7 (4-7K) SIGNAL	A7 (4-7K) REF NO.
2	GND	337	GND	337
4	$\overline{ST0}$	198	$\overline{ST0}$	198
6	NC	-	NC	-
8	$\overline{ST1}$	199	$\overline{ST1}$	199
10	NC	-	NC	-
12	$\overline{ST2}$	200	$\overline{ST2}$	200
14	NC	-	NC	-
16	$\overline{ST3}$	201	$\overline{ST3}$	201
18	NC	-	NC	-
20	$\overline{ST4}$	202	$\overline{ST4}$	202
22	NC	-	NC	-
24	$\overline{ST5}$	203	$\overline{ST5}$	203
26	NC	-	NC	-
28	$\overline{ST6}$	204	$\overline{ST6}$	204
30	NC	-	NC	-
32	$\overline{ST7}$	205	$\overline{ST7}$	205
34	NC	-	NC	-
36	$\overline{ST8}$	206	$\overline{ST8}$	206
38	NC	-	NC	-
40	+5V	335	+5V	335
42	NC	-	NC	-
44	+12V	002	+12V	344
46	NC	-	NC	-
48	-2V	336	-2V	336
50	$\overline{M12}$	217	M12	503
52	$\overline{ST9}$	207	$\overline{ST9}$	207
54	NC	-	NC	-
56	$\overline{ST10}$	208	$\overline{ST10}$	208
58	NC	-	NC	-
60	$\overline{ST11}$	209	$\overline{ST11}$	209
62	NC	-	NC	-
64	$\overline{ST12}$	210	$\overline{ST12}$	210
66	NC	-	NC	-
68	$\overline{ST13}$	211	$\overline{ST13}$	211
70	-12V	003	-12V	346
72	$\overline{ST14}$	212	$\overline{ST14}$	212
74	NC	-	NC	-
76	ST15	213	ST15	213
78	NC	-	NC	-
80	$\overline{ST16}$	214	$\overline{ST16}$	214
82	NC	-	NC	-
84	NC	-	NC	-
86	GND	338	GND	338



NOTES

1. RESISTANCE VALUES ARE EXPRESSED IN OHMS (K=1000 OHMS) ± 1%. ALL RESISTORS ARE 1/8 WATT.
2. ALL CAPACITORS ARE 2.2 MICROFARADS, UNLESS OTHERWISE SPECIFIED.
3. UNLESS SPECIFIED OTHERWISE, TRANSISTORS ARE TYPE 1853-0036
4. UNLESS OTHERWISE SPECIFIED, ALL CONNECTIONS ARE TO THE 86-PIN CONNECTOR AND APPLY FOR ALL REFERENCE DESIGNATION PREFIXES.
   IF JUMPER CARD 02115-6009 IS LOCATED IN SLOT A7, THE SCHEMATIC AND RELATED CONNECTIONS ARE AS FOLLOWS:



5. NC DENOTES NO CONNECTION.

Figure 6-9. Sense Amplifier Card (02114-6005), Schematic Diagram

CHANGE	REFERENCE	REVISION/PREFIX
A	ORIG	A-831-6
B	22-1057	A-914-22
C	22-1057	A-916-22
D	ERRATA	N/C
E	PPC.E	A-914-22
F	PPC.E	A-916-22

W.R. GUTZKA — 1 OF 1
SENSE AMPLIFIER CARD (SA) SCHEMATIC DIAGRAM
02114-6005-L
PALO ALTO DIVISION • HEWLETT PACKARD CO

Table 6-8. Arithmetic Logic Card (02114-60424), Reference Designation Index

REFERENCE DESIGNATION *	HP PART NO.	DESCRIPTION	MFR. CODE NO.	MFR. PART NO.
C1	0180-0155	C: FXD ELECT 2.2 UF 20% 20 VDCW	28480	0180-0155
C11-C13,C15-C17,21-23,25-27, 31-33,35-37,62,81-83,85-87, 91-93,95-97,101-103,105-107	0160-2055	C: FXD CER 0.01 UF +80-20% 100 VDCW	91418	TA
CR1-CR4	1910-0022	DIODE: GERMANIUM 5 WIV	28480	1910-0022
CR5-CR8	1901-0040	DIODE: SILICON 30 MA 30 MV	07263	FDG 1088
MC11	1820-0374	INTEGRATED CIRCUIT: TTL	28480	1820-0374
MC12,13,15-17,32,33,35-37, 97,107	1820-0077	INTEGRATED CIRCUIT: TTL	01295	SN7474N
MC14,22,23,25-27,81-83,92, 93,95,103-105	1820-0327	INTEGRATED CIRCUIT: TTL	01295	SN7401N
MC21,31,87,91	1820-0127	INTEGRATED CIRCUIT: TTL	28480	1820-0127
MC62,101	1820-0956	INTEGRATED CIRCUIT: CTL	07263	SL 3459
MC85	1820-0305	INTEGRATED CIRCUIT: TTL	01295	SN7483N
MC86,96,102,106	1820-0310	INTEGRATED CIRCUIT: DTL	07263	U6A996259X
Q1-Q12	1854-0215	TRANSISTOR: SILICON NPN	04713	SPS3611
R1,2,5,21,22,25,41,42,45,61, 62,65,101-104	0683-4715	R: FXD COMP 470 OHM 5% 1/4W	01121	CB 4715
R87-94	0686-2215	R: FXD COMP 220 OHM 5% 1/2W	01121	EB 2215
R3,23,43,63	0683-3015	R: FXD COMP 300 OHM 5% 1/4W	01121	CB 3015
R4,24,44,64,71-74,95-98	0683-1015	R: FXD COMP 100 OHM 5% 1/4W	01121	CB 1015
R6-8,10,26-28,30,46-48,50, 66-68,70,75-86,100,105-108	0683-1025	R: FXD COMP 1000 OHM 5% 1/4W	01121	CB 1025
R9,29,49	0683-5615	R: FXD COMP 560 OHM 5% 1/4W	01121	CB 5615
R69	0683-8215	R: FXD COMP 820 OHM 5% 1/4W	01121	CB 8215

*Reference Designation Prefix A8, A9, A10, and A11

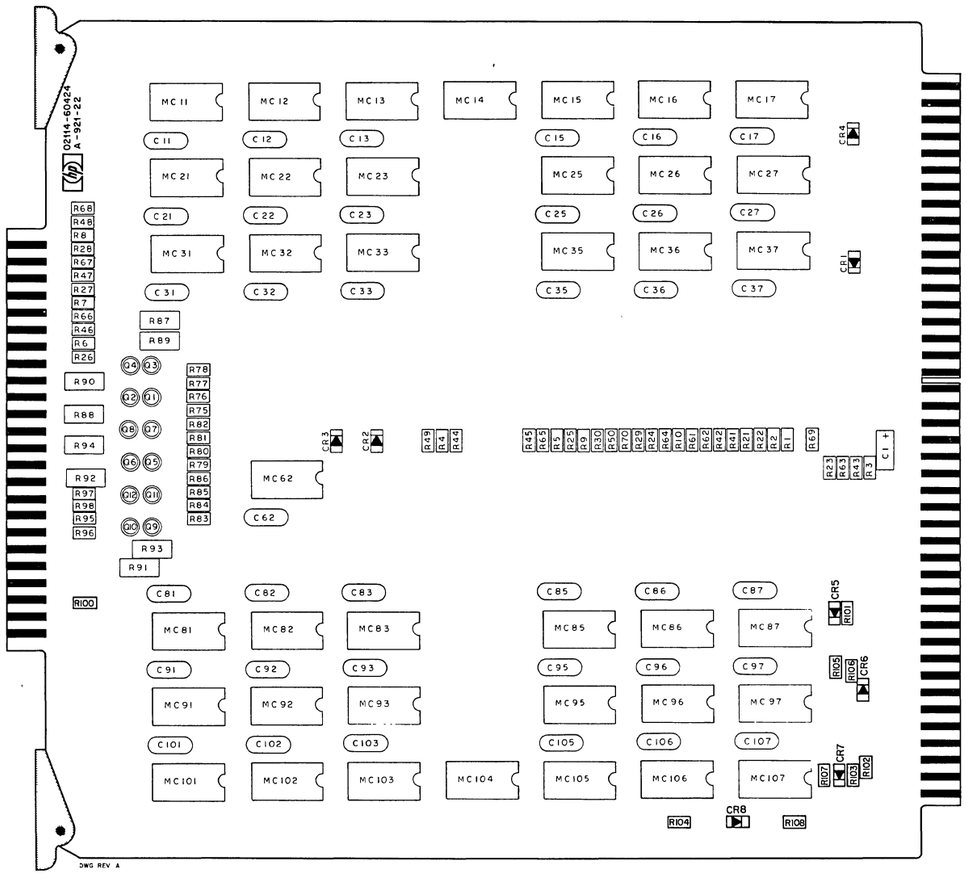


Figure 6-10. Arithmetic Logic Card (02114-60424), Part Location Diagram

Pin Index (86-Pin Connector)

PIN NO.	A8(12-15) SIGNAL	A8 REF NO.	A9(8-11) SIGNAL	A9 REF NO.	A10(4-7) SIGNAL	A10 REF NO.	A11(0-3) SIGNAL	A11 REF NO.
1	GND	337	GND	337	GND	337	GND	337
2	GND	337	GND	337	GND	337	GND	337
3	STBT	051	STBT	051	STBT	051	STBT	051
4	STBA	053	STBA	053	STBA	053	STBA	053
5	RARB	049	RARB	049	RARB	049	RARB	049
6	STBB	050	STBB	050	STBB	050	STBB	050
7	RBRB	043	RBRB	043	RBRB	043	RBRB	043
8	SAL	084	SAL	084	SAL	084	SAL	084
9	STP10-15	059	STP0-9	058	STP0-9	058	STP0-9	058
10	MOR	026	MOR	026	MOR	026	NC	-
11	STM10-15	057	STM6-9	056	STM0-5	055	STM0-5	055
12	RSM10-15	048	RSM6-9	047	RSM0-5	311	RSM0-5	311
13	ST12	210	ST8	206	ST4	204	ST0	198
14	TR12	192	TR8	173	TR4	149	TR0	123
15	TR12	188	TR8	169	TR4	145	TR0	119
16	TR13	193	TR9	174	TR5	150	TR1	124
17	ST13	211	ST9	207	ST5	203	ST1	199
18	STM10-15	057	STM10-15	057	STM6-9	056	STM0-5	055
19	RSM10-15	048	RSM10-15	048	RSM6-9	047	RSM0-5	311
20	NC	-	MOR	026	MOR	026	MOR	026
21	ISR	018	ISR	018	ISR	018	ISR	018
22	SSR	025	SSR	025	SSR	025	SSR	025
23	ST14	212	ST10	208	ST6	204	ST2	200
24	TR14	194	TR10	175	TR6	151	TR2	125
25	TR14	190	TR10	171	TR6	147	TR2	121
26	TR15	195	TR11	176	TR7	152	TR3	126
27	ST15	213	ST11	209	ST7	205	ST3	201
28	STP10-15	059	STP10-15	059	STP0-9	058	STP0-9	058
29	RPRB	045	RPRB	045	RPRB	045	RPRB	045
30	TR15	191	TR11	172	TR7	148	TR3	122
31	SB15	197	NC	-	NC	-	NC	-
32	RTSB	046	RTSB	046	RTSB	046	RTSB	046
33	SWR12	285	SWR8	281	SWR4	277	SWR0	273
34	RMSB	044	RMSB	044	RMSB	044	RMSB	044
35	NC	-	NC	-	NC	-	SB0	060
36	TR13	189	TR9	170	TR5	146	TR1	120
37	NC	-	MR9	161	MR5	137	MR1	111
38	MOR	026	MOR	026	MOR	026	MOR	026
39	+5V	335	+5V	335	+5V	335	+5V	335
40	+5V	335	+5V	335	**+5V**	**335**	+5V	335
41	NC	-	MR10	162	MR6	138	MR2	112
42	IOB14	180	IOB10	158	IOB6	134	IOB2	108
43	IOI	019	IOI	019	IOI	019	IOI	019
44	IOB15	181	IOB11	159	IOB7	135	IOB3	109
45	MR12	182	MR8	160	MR4	136	MR0	110
46	IOB13	179	IOB9	157	IOB5	133	**IOB1**	107
47	-2V	336	-2V	336	-2V	336	-2V	336
48	-2V	336	-2V	336	-2V	336	-2V	336
49	NC	-	MR11	163	MR7	139	MR3	113
50	IOB12	178	IOB8	156	IOB4	132	IOB0	106
51	NC	-	NC	-	NC	-	**RBO**	**042**
52	SWR14	287	SWR10	283	SWR6	279	SWR2	275
53	RB12	183	RB8	164	RB4	140	RB0	114
54	TAN4	187	TAN3	168	TAN2	144	TAN1	118
55	CMF	032	CMF	032	CMF	032	CMF	032
56	IOF	037	IOF	037	IOF	037	IOF	037
57	RB14	185	RB10	166	RB6	142	RB2	116
58	ADF	029	ADF	029	ADF	029	ADF	029
59	RB13	184	RB9	165	RB5	141	RB1	115
60	EOF	034	EOF	034	EOF	034	EOF	034
61	NC	-	NC	-	TB5	154	TB1	128
62	NC	-	NC	-	TB4	153	TB0	127
63	TB15	196	NC	-	NC	-	TB3	130
64	NC	-	NC	-	NC	-	TB2	129
65	ANF	031	ANF	031	ANF	031	ANF	031
66	RB11	167	RB7	143	RB3	117	RB15	186
67	RB9	165	RB5	141	RB1	115	RB13	184
68	RB10	166	RB6	142	RB2	116	RB14	185
69	RB8	164	RB4	140	RB0	114	RB12	183
70	RB15	186	RB11	167	RB7	143	RB3	117
71	RB0	114	RB12	183	RB8	164	RB4	140
72	LRS	017	SRM	008	SRM	008	SRM	008
73	RL4	023	RL4	023	RL4	023	RL4	023
74	SL14	021	SLM	007	SLM	007	SLM	007
75	SLM	007	SLM	007	SLM	007	SLM	007
76	SRM	008	SRM	008	SRM	008	SRM	008
77	SLM	007	SLM	007	SLM	007	SL0	009
78	C12	155	C8	131	C4	105	C0	022
79	CSR	005	CSR	005	CSR	005	CSR	005
80	C16	177	C12	155	C8	131	C4	105
81	NC	-	NC	-	NC	-	NC	-
82	SWR13	286	SWR9	282	SWR5	278	SWR1	274
83	SWR15	288	SWR11	284	SWR7	280	SWR3	276
84	IOCO	027	IOCO	027	IOCO	027	IOCO	027
85	GND	338	GND	338	GND	338	GND	338
86	GND	338	GND	338	GND	338	GND	338

Pin Index (48-Pin Connector)

PIN NO.	A8 (12-15) SIGNAL	A8 TO/FROM	A9 (8-11) SIGNAL	A9 TO/FROM	A10 (4-7) SIGNAL	A10 TO/FROM	A11 (0-3) SIGNAL	A11 TO/FROM
1	NC	-	NC	-	NC	-	NC	-
2	NC	-	NC	-	NC	-	NC	-
3	NC	-	NC	-	NC	-	NC	-
4	NC	-	NC	-	NC	-	NC	-
5	NC	-	NC	-	NC	-	NC	-
6	NC	-	NC	-	NC	-	NC	-
7	NC	-	NC	-	NC	-	NC	-
8	NC	-	NC	-	NC	-	NC	-
9	NC	-	NC	-	NC	-	NC	-
10	MRD12	A25P1-10	MRD8	A25P2-10	MRD4	A25P3-10	MRD0	A25P4-10
11	MRD14		MRD10	A25P2-11	MRD6	A25P3-11	MRD2	A25P4-11
12	NC	-	NC	-	NC	-	NC	-
13	TRD12	A25P1-13	TRD8	A25P2-13	TRD4	A25P3-13	TRD0	A25P4-13
14	TRD14	A25P1-14	TRD10	A25P2-14	TRD6	A25P3-14	TRD2	A25P4-14
15	NC	-	NC	-	NC	-	NC	-
16	SRD12	A25P1-16	SRD8	A25P2-16	SRD4	A25P3-16	SRD0	A25P4-16
17	SRD14	A25P1-17	SRD10	A25P2-17	SRD6	A25P3-17	SRD2	A25P4-17
18	LA12	A25P1-18	LA8	A25P2-18	LA4	A25P3-18	LA0	A25P4-18
19	LA13	A25P1-19	LA9	A25P2-19	LA5	A25P3-19	LA1	A25P4-19
20	NC	-	NC	-	NC	-	NC	-
21	NC	-	NC	-	NC	-	NC	-
22	+5V	A25P1-22	+5V	A25P2-22	+5V	A25P3-22	+5V	A25P4-22
23	LAMP COM	A25P1-23	LAMP COM	A25P2-23	LAMP COM	A25P3-23	LAMP COM	A25P4-23
24	GND	A25P1-24	GND	A25P2-24	GND	A25P3-24	GND	A25P4-24
A	NC	-	NC	-	NC	-	NC	-
B	NC	-	NC	-	NC	-	NC	-
C	NC	-	NC	-	NC	-	NC	-
D	NC	-	NC	-	NC	-	NC	-
E	NC	-	NC	-	NC	-	NC	-
F	NC	-	NC	-	NC	-	NC	-
H	NC	-	NC	-	NC	-	NC	-
J	NC	-	NC	-	NC	-	NC	-
K	NC	-	NC	-	NC	-	NC	-
L	MRD13	A25P1-L	MRD9	A25P2-L	MRD5	A25P3-L	MRD1	A25P4-L
M	MRD15		MRD11	A25P2-M	MRD7	A25P3-M	MRD3	A25P4-M
N	NC	-	NC	-	NC	-	NC	-
P	TRD13	A25P1-P	TRD9	A25P2-P	TRD5	A25P3-P	TRD1	A25P4-P
R	TRD15	A25P1-R	TRD11	A25P2-R	TRD7	A25P3-R	TRD3	A25P4-R
S	NC	-	NC	-	NC	-	NC	-
T	SRD13	A25P1-T	SRD9	A25P2-T	SRD5	A25P3-T	SRD1	A25P4-T
U	SRD15	A25P1-U	SRD11	A25P2-U	SRD7	A25P3-U	SRD3	A25P4-U
V	LA15	A25P1-V	LA11	A25P2-V	LA7	A25P3-V	LA3	A25P4-V
W	LA14	A25P1-W	LA10	A25P2-W	LA6	A25P3-W	LA2	A25P4-W
X	NC	-	NC	-	NC	-	NC	-
Y	NC	-	NC	-	NC	-	NC	-
Z	+5V	A25P1-Z	+5V	A25P2-Z	+5V	A25P3-Z	+5V	A25P4-Z
AA	LAMP COM	A25P1-AA	LAMP COM	A25P2-AA	LAMP COM	A25P3-AA	LAMP COM	A25P4-AA
BB	GND	A25P1-BB	GND	A25P2-BB	GND	A25P3-BB	GND	A25P4-BB

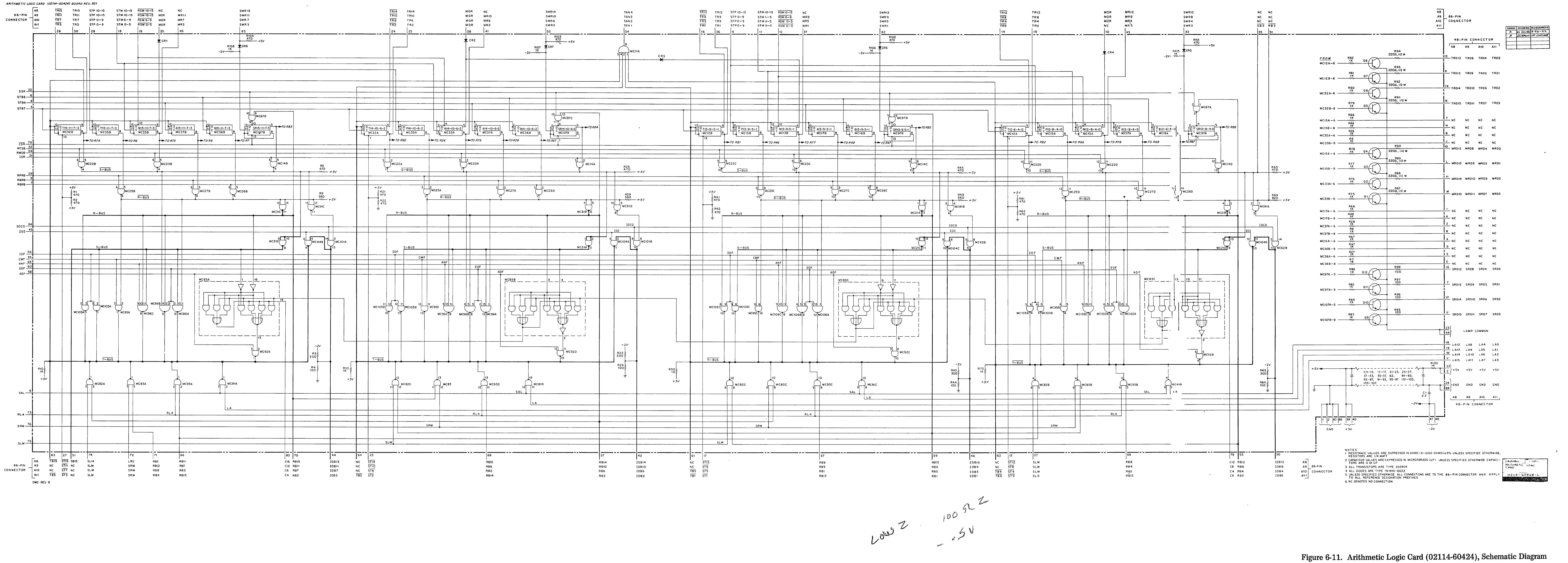


Figure 6-11. Arithmetic Logic Card (02114-60424), Schematic Diagram

Table 6-9. Timing Generator Card (02114-60426), Reference Designation Index

REFERENCE DESIGNATION *	HP PART NO.	DESCRIPTION	MFR. CODE NO.	MFR. PART NO.
C1	0140-0198	C: FXD MICA 200 PF 5%	28480	0140-0198
C2	0140-0192	C: FXD MICA 68 PF 5%	28480	0140-0192
C6-C9	0160-2204	C: FXD MICA 100 PF 5%	28480	0160-2204
C101-153,159**	0160-2055	C: FXD CER 0.01 UF +80-20% 100 VDCW	91418	TA
CR1-10,41,50	1910-0022	DIODE: GERMANIUM 5 WIV	28480	1910-0022
DS1	2140-0217	LAMP: INCD 2.7V 0.06A	92966	2303
MC12,21,22,31,32,92,102	1820-0077	INTEGRATED CIRCUIT: TTL	01295	SN7474N
MC13,14,17,23,24,27,41,42,72, 74,81	1820-0071	INTEGRATED CIRCUIT: TTL	01295	SN7440N
MC15,16,33,43,44,75,91,94,95	1820-0127	INTEGRATED CIRCUIT: TTL	28480	1820-0127
MC25,34,35,93,107	1820-0130	INTEGRATED CIRCUIT: TTL	28480	1820-0130
MC26,73,84,96,103	1820-0129	INTEGRATED CIRCUIT: TTL	28480	1820-0129
MC36,46,82	1820-0075	INTEGRATED CIRCUIT: TTL	01295	SN7473N
MC37,47	1820-0956	INTEGRATED CIRCUIT: TTL	07263	SL3459
MC45	1820-0070	INTEGRATED CIRCUIT: TTL	01295	SN7430A
MC71	1820-0370	INTEGRATED CIRCUIT: TTL	28480	1820-0370
MC76	1820-0328	INTEGRATED CIRCUIT: TTL	01295	SN7402N
MC77,87	1820-0301	INTEGRATED CIRCUIT: TTL	01295	SN7475N
MC83,86,104-106	1820-0372	INTEGRATED CIRCUIT: TTL	01295	SN74H11N
MC85,97	1820-0327	INTEGRATED CIRCUIT: TTL	01295	SN7401N
Q1	1854-0246	TRANSISTOR: SILICON NPN	07263	2N3643
R1,4,82	0683-1825	R: FXD COMP 1800 OHM 5% 1/4W	01121	CB 1825
R2,3,10,11,13,16,18, 55-57, 80,81	0683-1025	R: FXD COMP 1000 OHM 5% 1/4W	01121	CB 1025
R5,31,40,59	0683-4715	R: FXD COMP 470 OHM 5% 1/4W	01121	CB 4715
R12,15,17,30	0683-3315	R: FXD COMP 330 OHM 5% 1/4W	01121	CB 3315
R14,70,75	0683-1015	R: FXD COMP 100 OHM 5% 1/4W	01121	CB 1015
R41,79	0683-3915	R: FXD COMP 390 OHM 5% 1/4W	01121	CB 3915
R58	0683-3905	R: FXD COMP 39 OHM 5% 1/4W	01121	CB 3905
W1,2	8159-0005	JUMPER WIRE	28480	8159-0005
Y1	0410-0173	CRYSTAL: QUARTZ 25 OHM	28480	0410-0173
XY1	1200-0199	SOCKET: CRYSTAL	91506	8000-AG9

*Reference Designation Prefix A12 ** For Revision 933 delete C147.

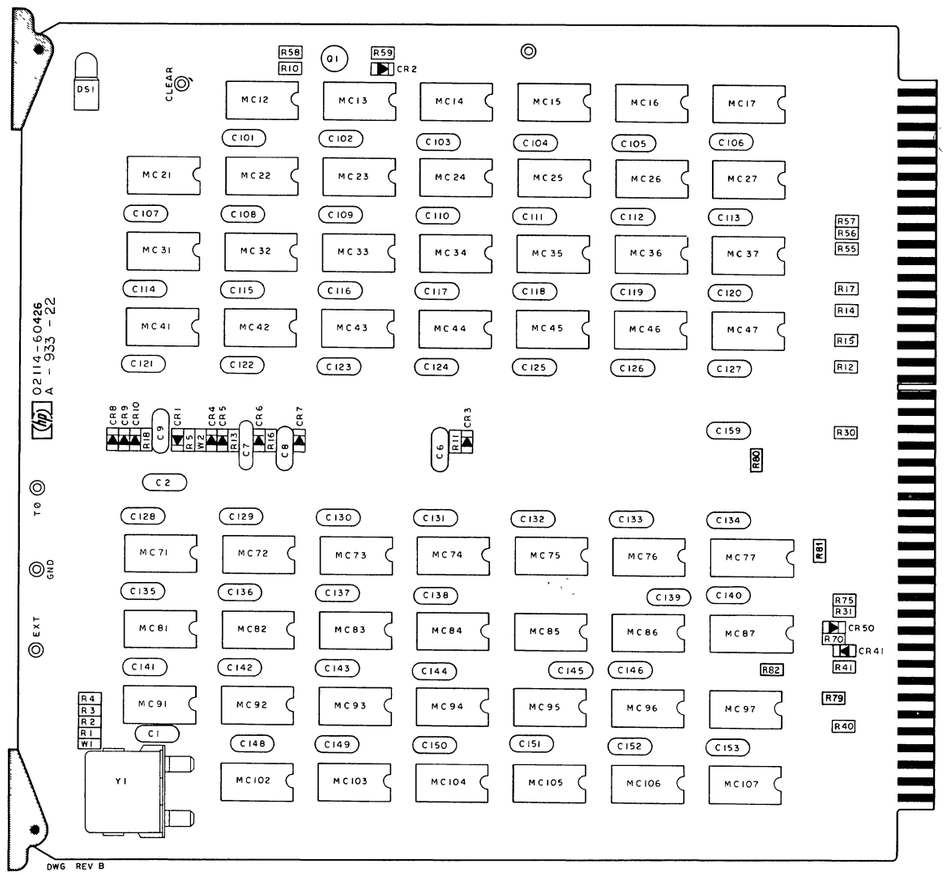


Figure 6-12. Timing Generator Card (02114-60426), Part Location Diagram

Pin Index

PIN NO.	SIGNAL	REF NO.
1	GND	337
3	T0	087
5	TR15	119
7	$\overline{\text{TR15}}$	195
9	T2	089
11	P123	077
13	$\overline{\text{XPH}}$	310
15	PH2	074
17	EXECUTE	104
19	T4	091
21	T5	092
23	ISZ	036
25	SIR	231
27	$\overline{\text{PEH}}$	218
29	T7S	100
31	T3IO	101
33	T6T7	099
35	SAL	084
37	SWSB	081
39	+5V	335
41	RNL	265
43	SWSA	080
45	LNS	261
47	-2V	336
49	PRS	266
51	SEO	085
53	T4T5	098
55	BAF	016
57	SCL	262
59	LML	263
61	MIL	061
63	RUN	095
65	EXT	316
67	LES	271
69	YNT	293
71	$\overline{\text{HIN}}$	024
73	MWT	068
75	MRT0	072
77	MIT	071
79	MON	268
81	MTE	064
83	EIR	065
85	GND	338

PIN NO.	SIGNAL	REF NO.
2	GND	337
4	JMP	039
6	INT	254
8	$\overline{\text{OF0}}$	041
10	T1	088
12	$\overline{\text{IR15}}$	035
14	T3	090
16	PH1	073
18	INDIRECT	103
20	FETCH	102
22	PH4	076
24	SCO	062
26	PH3	075
28	HLL	264
30	$\overline{\text{RSP}}$	256
32	JSB	040
34	ENF	067
36	$\overline{\text{SWST}}$	083
38	PON	257
40	+5V	335
42	POPIO	078
44	T7	093
46	STR	054
48	-2V	336
50	ISG	315
52	LDL	267
54	T3T4	097
56	AAF	015
58	PH5	313
60	DML	259
62	LAL	260
64	$\overline{\text{HT2}}$	079
66	T1T2	096
68	TS	094
70	MPT	216
72	YTN	294
74	SSPM	082
76	TIM	086
78	P1235	502
80	MWL	066
82	MRT	069
84	MST	070
86	GND	338

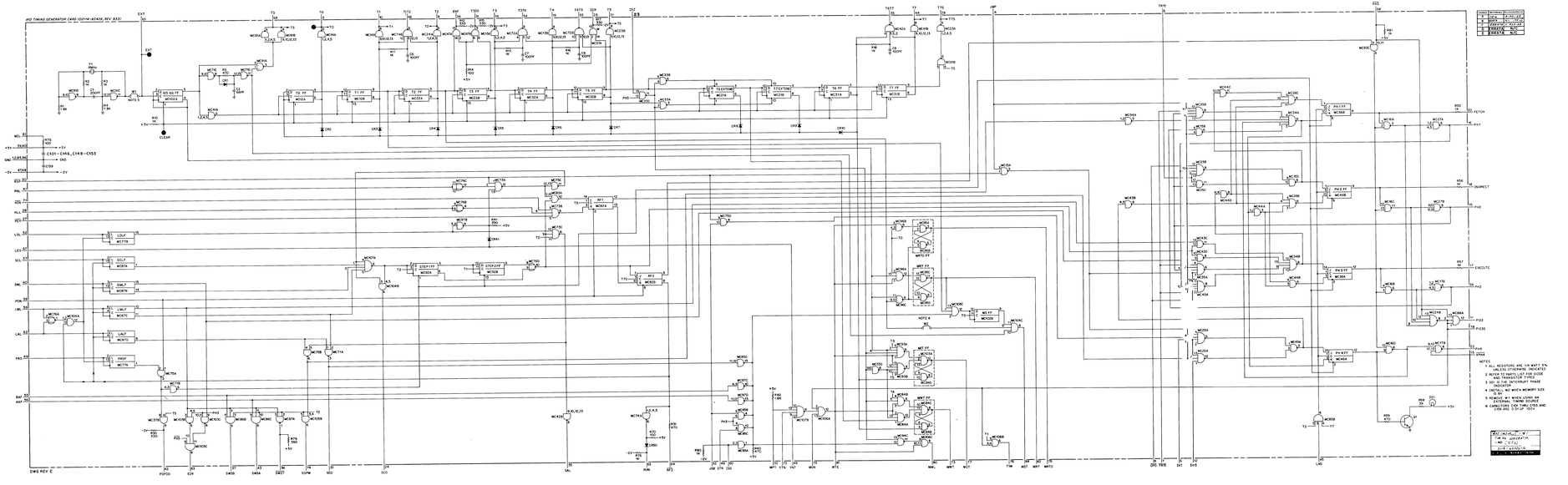


Figure 6-13. Timing Generator Card (02114-60426), Schematic Diagram

Table 6-10. Instruction Decoder Card (02114-60425), Reference Designation Index

REFERENCE DESIGNATION*	HP PART NO.	DESCRIPTION	MFR. CODE NO.	MFR. PART NO.
C1	0140-0198	C: FXD MICA 200 PF 5%	28480	0140-0198
C2-C55	0160-2055	C: FXD CER 0.01 UF +80-20% 100 VDCW	91418	TA
MC11	1820-0074	INTEGRATED CIRCUIT: TTL	01295	SN7454N
MC12	1820-0370	INTEGRATED CIRCUIT: TTL	28480	1820-0370
MC13	1820-0371	INTEGRATED CIRCUIT: TTL	28480	1820-0371
MC14,27,44,47,51,71,74,96,106	1820-0127	INTEGRATED CIRCUIT: TTL	28480	1820-0127
MC15,35,55,57,81,82,83,86, 92,95,105	1820-0130	INTEGRATED CIRCUIT: TTL	28480	1820-0130
MC16,26,34,36,46,56,87,97,107	1820-0071	INTEGRATED CIRCUIT: TTL	01295	SN7440N
MC17	1820-0381	INTEGRATED CIRCUIT: TTL	28480	1820-0381
MC21	1820-0085	INTEGRATED CIRCUIT: TTL	28480	1820-0085
MC22	1820-0084	INTEGRATED CIRCUIT: TTL	01295	SN7453N
MC23,85	1820-0379	INTEGRATED CIRCUIT: TTL	28480	1820-0379
MC24,33,43,52,77	1820-0327	INTEGRATED CIRCUIT: TTL	01295	SN7401N
MC25,45,84,93,94,104	1820-0129	INTEGRATED CIRCUIT: TTL	28480	1820-0129
MC31,41,42	1820-0077	INTEGRATED CIRCUIT: TTL	01295	SN7474N
MC32	1820-0384	INTEGRATED CIRCUIT: TTL	28480	8120-0384
MC37	1820-0956	INTEGRATED CIRCUIT: CTL	07263	SL3459
MC53	1820-0383	INTEGRATED CIRCUIT: TTL	28480	1820-0383
MC54	1820-0380	INTEGRATED CIRCUIT: TTL	28480	1820-0380
MC73,91,102	1820-0374	INTEGRATED CIRCUIT: TTL	28480	1820-0374
MC75	1820-0382	INTEGRATED CIRCUIT: TTL	28480	1820-0382
MC76	1820-0310	INTEGRATED CIRCUIT: DTL	07263	U6A996259X
MC103	1820-0070	INTEGRATED CIRCUIT: TTL	01295	SN7430A
R1,3	0683-3315	R: FXD COMP 330 OHM 5% 1/4W	01121	CB 3315
R2	0683-4715	R: FXD COMP 470 OHM 5% 1/4W	01121	CB 4175
R4	0683-1025	R: FXD COMP 1000 OHM 5% 1/4W	01121	CB 1025
R5,31	0683-3915	R: FXD COMP 390 OHM 5% 1/4W	01121	CB 3915
R6	0683-8215	R: FXD COMP 820 OHM 5% 1/4W	01121	CB 8215

*Reference Designation Prefix A13

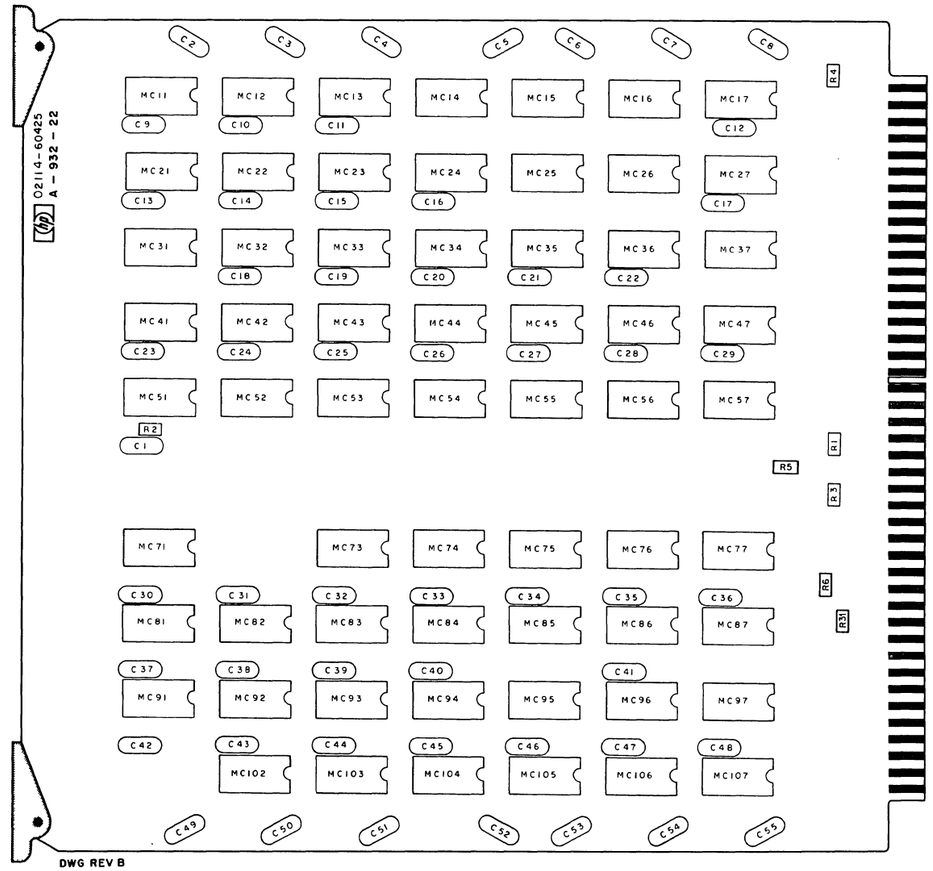


Figure 6-14. Instruction Decoder Card (02114-60425), Part Location Diagram

Pin Index

PIN NO.	SIGNAL	REF NO.
1	GND	337
3	T1T2	096
5	PH3	075
7	JSB	040
9	T1	088
11	BAF	016
13	SEO	085
15	SWST	083
17	ADD	028
19	$\overline{SE0}$	060
21	IOF	037
23	ANF	031
25	ADF	029
27	RTS	501
29	T3	090
31	T7	093
33	TR11	172
35	$\overline{RSM10-15}$	048
37	T4	091
39	+5V	335
41	T6T7	099
43	TR14	190
45	$\overline{TR7}$	152
47	-2V	336
49	TR13	189
51	P1235	502
53	$\overline{OPO}$	041
55	TR12	188
57	SWSA	080
59	SRG	052
61	ISZ	036
63	STM6-9	056
65	RPRB	045
67	STP10-15	059
69	$\overline{IR15}$	035
71	RBRB	043
73	STBA	053
75	SSPM	082
77	PH2	074
79	TR8	169
81	$\overline{TR15}$	195
83	$\overline{TR8}$	173
85	GND	338

PIN NO.	SIGNAL	REF NO.
2	GND	337
4	ASG	030
6	T5	092
8	HLL	264
10	T2	089
12	IOGIO	529
14	AAF	015
16	TR2	121
18	TR9	170
20	$\overline{RB0}$	042
22	CMF	032
24	EOF	034
26	STBT	051
28	SCO	062
30	TR15	191
32	$\overline{RSM6-9}$	047
34	TR10	171
36	CPA	033
38	T3T4	097
40	+5V	335
42	T4T5	098
44	EIR	065
46	TR4	145
48	-2V	336
50	PH4	076
52	IOG	038
54	T0	087
56	PH1	073
58	STM0-5	055
60	SIN	270
62	RMSB	044
64	STR	054
66	STM10-15	057
68	STP0-9	058
70	TR9	174
72	RARB	049
74	STBB	050
76	T7S	100
78	TS	094
80	SWSB	081
82	TR5	151
84	JMP	039
86	GND	338

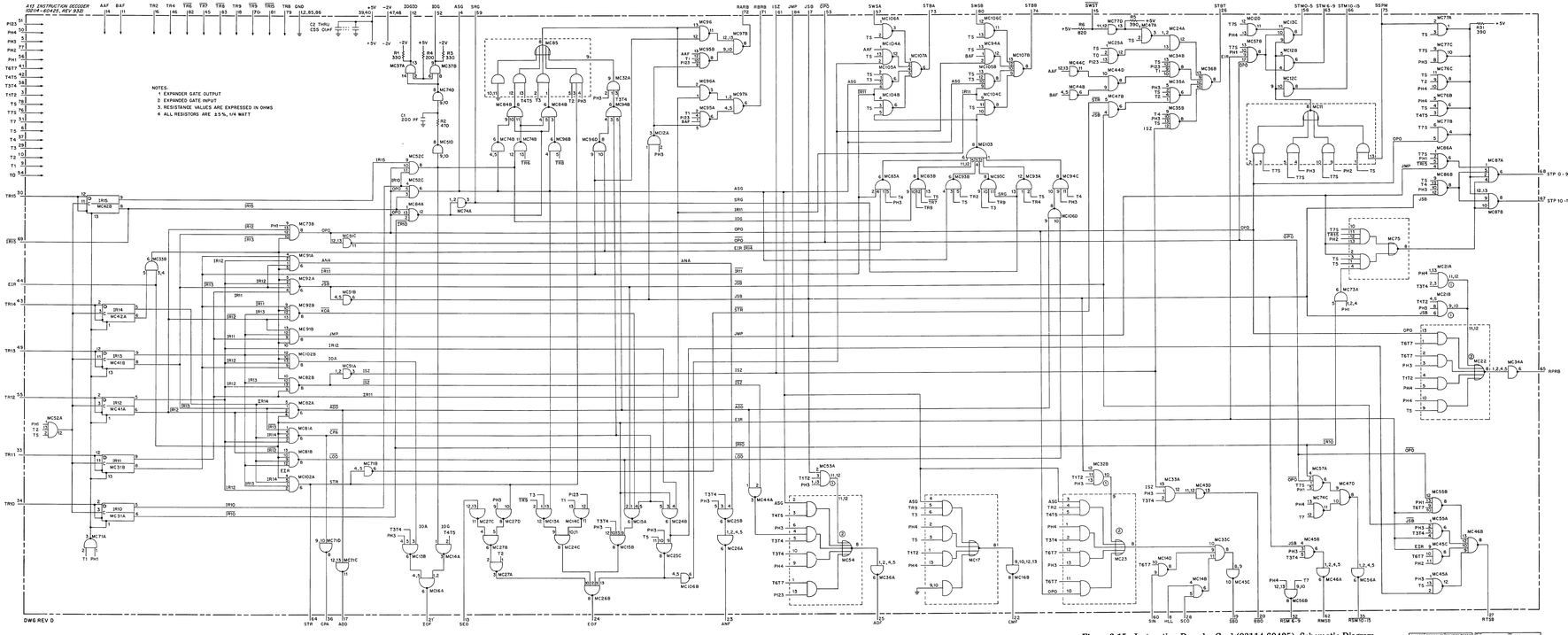


Figure 6-15. Instruction Decoder Card (02114-60425), Schematic Diagram

Table 6-11. Shift Logic Card (02114-6003), Reference Designation Index

REFERENCE DESIGNATION *	HP PART NO.	DESCRIPTION	MFR. CODE NO.	MFR. PART NO.
C1-59,81,82	0160-2055	C: FXD CER 0.01 UF +80-20% 100 VDCW	91418	TA
C101,102	0180-0155	C: FXD ELECT 2.2 UF 20% 20 VCDW	28480	0180-0155
MC11,13,17,25,33,67,95,97,106	1820-0127	INTEGRATED CIRCUIT: TTL	28480	1820-0127
MC12,34,35,43,62,72,105	1820-0125	INTEGRATED CIRCUIT	07263	U5F771139X
MC15,56,64,75	1820-0383	INTEGRATED CIRCUIT: TTL	28480	1820-0383
MC16,26	1820-0077	INTEGRATED CIRCUIT: TTL	01295	SN7474N
MC21,31,61,82,86,87,92,103, 104	1820-0130	INTEGRATED CIRCUIT: TTL	28480	1820-0130
MC22,41,51,52,53,55,57,65,74, 96	1820-0372	INTEGRATED CIRCUIT: TTL	01295	SN74H11N
MC27,42	1820-0374	INTEGRATED CIRCUIT: TTL	28480	1820-0374
MC32	1820-0377	INTEGRATED CIRCUIT: TTL	28480	1820-0377
MC36,37,45,46,47	1820-0956	INTEGRATED CIRCUIT: CTL	07263	SL3459
MC63,76	1820-0382	INTEGRATED CIRCUIT: TTL	28480	1820-0382
MC66,71,94	1820-0071	INTEGRATED CIRCUIT: TTL	01295	SN7440N
MC73,77,81,85,91,93,101,102	1820-0070	INTEGRATED CIRCUIT: TTL	01295	SN7430A
MC83	1820-0065	INTEGRATED CIRCUIT: TTL	01295	SN7470N
MC84	1820-0370	INTEGRATED CIRCUIT: TTL	28480	1820-0370
MC107	1820-0327	INTEGRATED CIRCUIT: TTL	01295	SN7401N
R1,30	0683-1025	R: FXD COMP 1000 OHM 5% 1/4W	01121	CB 1025
R31	0683-3315	R: FXD COMP 330 OHM 5% 1/4W	01121	CB 3315
R19,41	0683-4715	R: FXD COMP 470 OHM 5% 1/4W	01121	CB 4715
R10-18	0683-1015	R: FXD COMP 100 OHM 5% 1/4W	01121	CB 1015

*Reference Designation Prefix A14

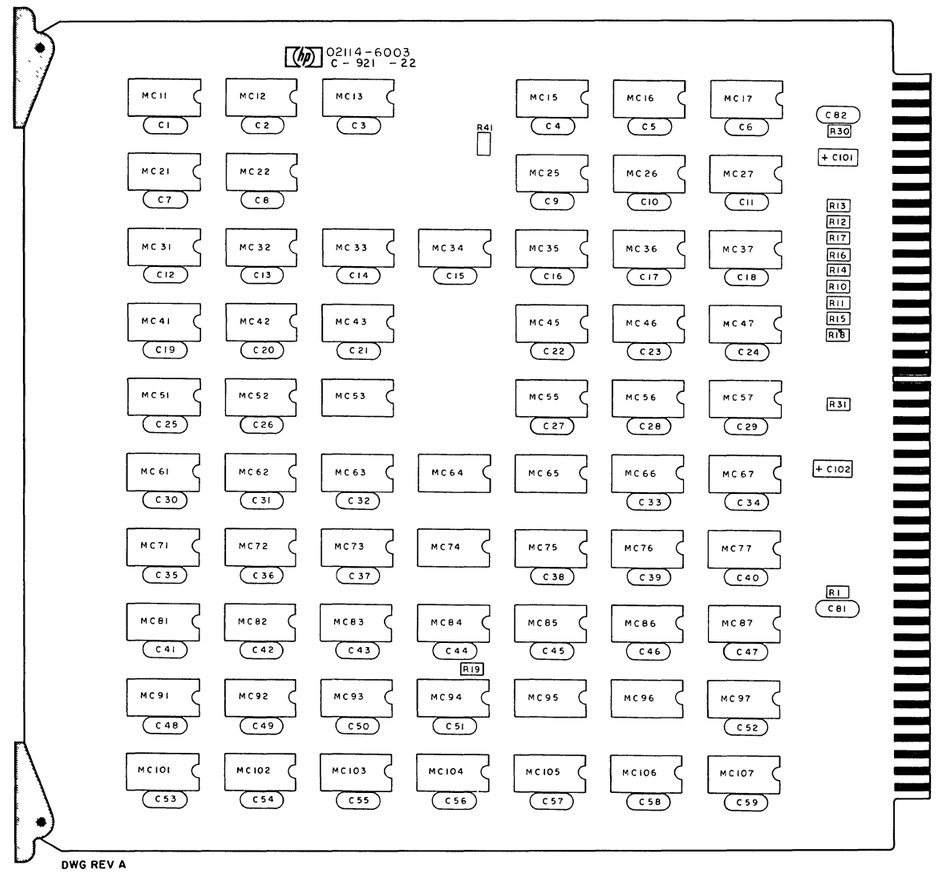


Figure 6-16. Shift Logic Card (02114-6003), Part Location Diagram

Pin Index

PIN NO.	SIGNAL	REF NO.
1	GND	337
3	SB15	197
5	TAN3	168
7	$\overline{TR4}$	149
9	$\overline{TR5}$	150
11	TAN2	144
13	IOO	020
15	STF	006
17	CLF	013
19	IOCO	027
21	SFC	010
23	CLC	014
25	STC	011
27	SFS	012
29	TR9	170
31	CPA	033
33	TR11	172
35	C16	177
37	PH3	075
39	-5V	335
41	CLR	272
43	$\overline{TR6}$	151
45	RB15	186
47	-2V	336
49	T3T4	097
51	T4T5	098
53	TR3	122
55	RB0	114
57	C0	022
59	TR2	121
61	IOS	314
63	SRG	052
65	T3	090
67	NC	-
69	SL0	009
71	SL14	021
73	ISR	018
75	SLM	007
77	IOI	019
79	T7	093
81	SEO	085
83	T6T7	099
85	GND	338

PIN NO.	SIGNAL	REF NO.
2	GND	337
4	BAF	016
6	$\overline{TR3}$	126
8	OVF	291
10	$\overline{TR1}$	124
12	MR0	110
14	AAF	015
16	MOR	026
18	T0	087
20	TAN4	187
22	TAN1	118
24	$\overline{TR15}$	196
26	P123	077
28	ASG	030
30	$\overline{TR11}$	176
32	ISZ	036
34	T4	091
36	TS	094
38	SKF	252
40	+5V	335
42	SSR	025
44	$\overline{TR2}$	125
46	TR8	169
48	-2V	336
50	$\overline{CSR}$	005
52	TR5	146
54	TR4	145
56	IOG	038
58	T5	092
60	TR0	119
62	EXTEND	292
64	$\overline{HTS}$	024
66	TR1	120
68	$\overline{TR8}$	173
70	TR7	148
72	LRS	017
74	NC	-
76	ADD	028
78	SRM	008
80	RL4	023
82	$\overline{TB0}$	127
84	T2	089
86	GND	338

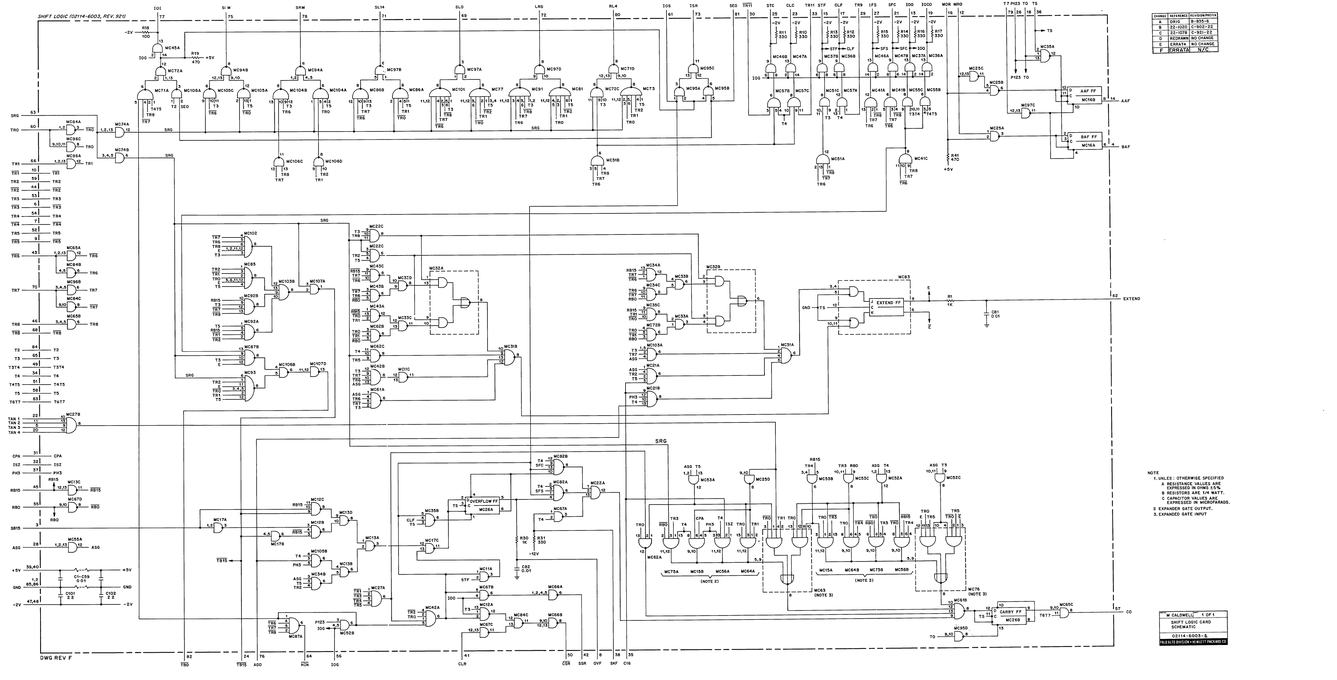


Figure 6-17. Shift Logic Card (02114-6003), Schematic Diagram

Table 6-12. Display Board (02114-6009), Reference Designation Index (Continued)

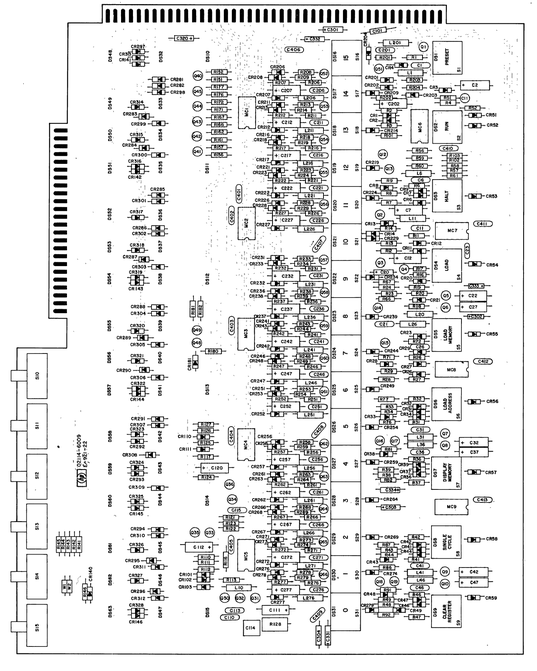
REFERENCE DESIGNATION*	HP PART NO.	DESCRIPTION	MFR. CODE NO.	MFR. PART NO.
R3,8,13,24,28,33,43,48,203, 208,213,218,223,228,233, 238,243,248,253,258,263, 268,273,278	0757-0289	R: FXD MET FLM 13.3K OHM 1% 1/8W	28480	0757-0289
R4,9,14,23,29,34,39,44,49, 102,204,209,214,219,224, 229,234,239,244,249,254, 259,264,269,274,279	0698-5490	R: FXD MET FLM 2K OHM 1% 1/8W	28480	0698-5490
R16,17	0683-1025	R: FXD COMP 1000 OHM 5% 1/4W	01121	CB 1025
R20,52,58,61,67,72,77,82,87, 92,101,111,152,157,162,167, 172,177	0757-0401	R: FXD MET FLM 100 OHM 1% 1/8W	28480	0757-0401
R51,56,60,66,71,76,81,86,91, 112,122-125,141,144,151, 156,161,166,171,176,181, 182	0757-0280	R: FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
R57,59,117,146,180	0757-0442	R: FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
R103	0757-1094	R: FXD MET FLM 1.47K OHM 1% 1/8W	28480	0757-1094
R110,121	0757-0465	R: FXD MET FLM 100 K OHM 1% 1/8W	28480	0757-0465
R113	0757-0458	R: FXD MET FLM 51.1K OHM 1% 1/8W	28480	0757-0458
R116	0698-3155	R: FXD MET FLM 4.64K OHM 1% 1/8W	28480	0698-3155
R126,127	0698-3429	R: FXD MET FLM 19.6 OHM 1% 1/8W	28480	0698-3429
R128	2100-1755	R: VAR WW 100 OHM 10% LIN 1/2W	28480	2100-1755
R145	0757-0346	R: FXD MET FLM 10 OHM 1% 1/8W	28480	0757-0346
S1-S9, 16-31	02114-6021	PROXIMITY SWITCH ASSY	28480	02114-6021
S10-S15	3101-0932	SWITCH: SLIDE ASSY	79727	GG350-0001
W1,2	8159-0005	JUMPER WIRE	28480	8159-0005

*Reference Designation Prefix A24

Table 6-12. Display Board (02114-6009), Reference Designation Index

REFERENCE DESIGNATION*	HP PART NO.	DESCRIPTION	MFR. CODE NO.	MFR. PART NO.
C1,6,11,21,26,31,36,41,46,201, 206,211,216,221,226,231, 236,241,246,251,256,261, 266,271,276	0160-2198	C: FXD MICA 20 PF 5%	28480	0160-2198
C2,7,12,22,27,32,37,42,47,202, 207,212,217,222,227,232, 237,242,247,252,257,262, 267,272,277	0180-0374	C: FXD ELECT 10 UF 10% 20 VDCW	28480	0180-0374
C20	0180-1743	C: FXD ELECT 0.1 UF 10% 35 VDCW	28480	0180-1743
C23	0160-2139	C: FXD CER 220 PF +80-20% 1000 VDCW	91418	TYPE B
C101,110,113,115,401-413	0160-2055	C: FXD CER 0.01 UF +80-20% 100 VDCW	91418	TA
C111	0180-0106	C: FXD ELECT TA 60 UF 20% 6 VDCW	28480	0180-0106
C112,120	0180-1746	C: FXD ELECT 15 UF 10% 20 VDCW	28480	0180-1746
C114	0121-0105	C: VAR CER 9-35 PF NPO	28480	0121-0105
C301-304,331-334	0180-0197	C: FXD ELECT 2.2 UF 10% 20 VDCW	28480	0180-0116
C320	0180-0116	C: FXD ELECT 6.8 UF 10% 35 VDCW	28480	0180-0116
CR1,2,6,7,11,12,21,26,27,31, 32,36,37,41,42,46,47,201, 202,206,207,211,212,216, 217,221,222,226,227,231, 232,236,237,241,242,246, 247,251,252,256,257,261, 262,266,267,271,272,276, 277	1910-0022	DIODE: GERMANIUM 5 WIV	28480	1910-0022
CR3,4,8,9,13,14,20,23,28,29, 33,34,38,39,43,44,48,49, 103,110,111,181,203,204, 208,209,213,214,218,219, 223,224,228,229,233,234, 238,239,243,244,248,249, 253,254,258,259,263,264, 268,269,273,274,278,279	1901-0040	DIODE: SILICON 30 MA 30 WV	07263	FDG 1088
CR51-59,141-146,281-328	1901-0025	DIODE: SILICON 100 MA 100 WV	28480	1901-0025
CR101	1902-3048	DIODE: BREAKDOWN SILICON 3.48V 5%	28480	1902-3048
CR102	1902-3104	DIODE: BREAKDOWN 5.62V 5%	28480	1902-3104
CR140	1902-3182	DIODE: BREAKDOWN SILICON 12.1V 5%	28480	1902-3182
DS1-DS63	2140-0240	LAMP: INCD 28V 0.04A	71744	CM-385
L1,6,11,20,26,31,36,41,46,101, 201,206,211,216,221,226, 231,236,241,246,251,256, 261,266,271,276	9140-0137	COIL: FXD RF 1 MH 5%	28480	9140-0137
MC1-MC9	1820-0327	INTEGRATED CIRCUIT: TTL	01295	SN7401N
Q1-Q3,5-10,34,48,51-66	1853-0036	TRANSISTOR: SILICON PNP	04713	SP-3612
Q4,11-19,30-33,40-45,49	1854-0215	TRANSISTOR: SILICON NPN 2N3904	04713	SPS8611
Q35	1853-0013	TRANSISTOR: SILICON PNP 2N2904	01295	2N2904
Q36	1854-0053	TRANSISTOR: SILICON NPN 2N2218	04713	2N2218
R1,6,11,18,26,31,36,41,46,201, 206,211,216,221,226,231, 236,241,246,251,256,261, 266,271,276	0757-0449	R: FXD MET FLM 20K OHM 1% 1/8W	28480	0757-0449
R2,7,12,19,27,32,37,42,47,202, 207,212,217,222,227,232, 237,242,247,252,257,262, 267,272,277	0757-0288	R: FXD MET FLM 9.09K OHM 1% 1/8W	28480	0757-0288

*Reference Designation Prefix A24



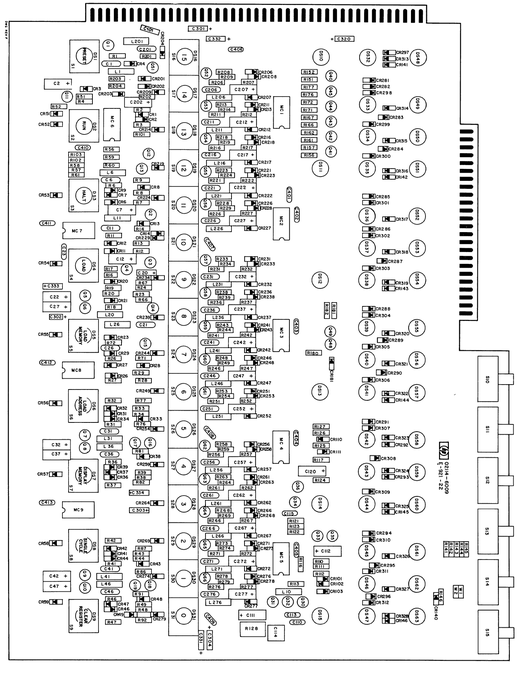


Figure 6-18. Display Board (02114-6009), Part Location Diagram

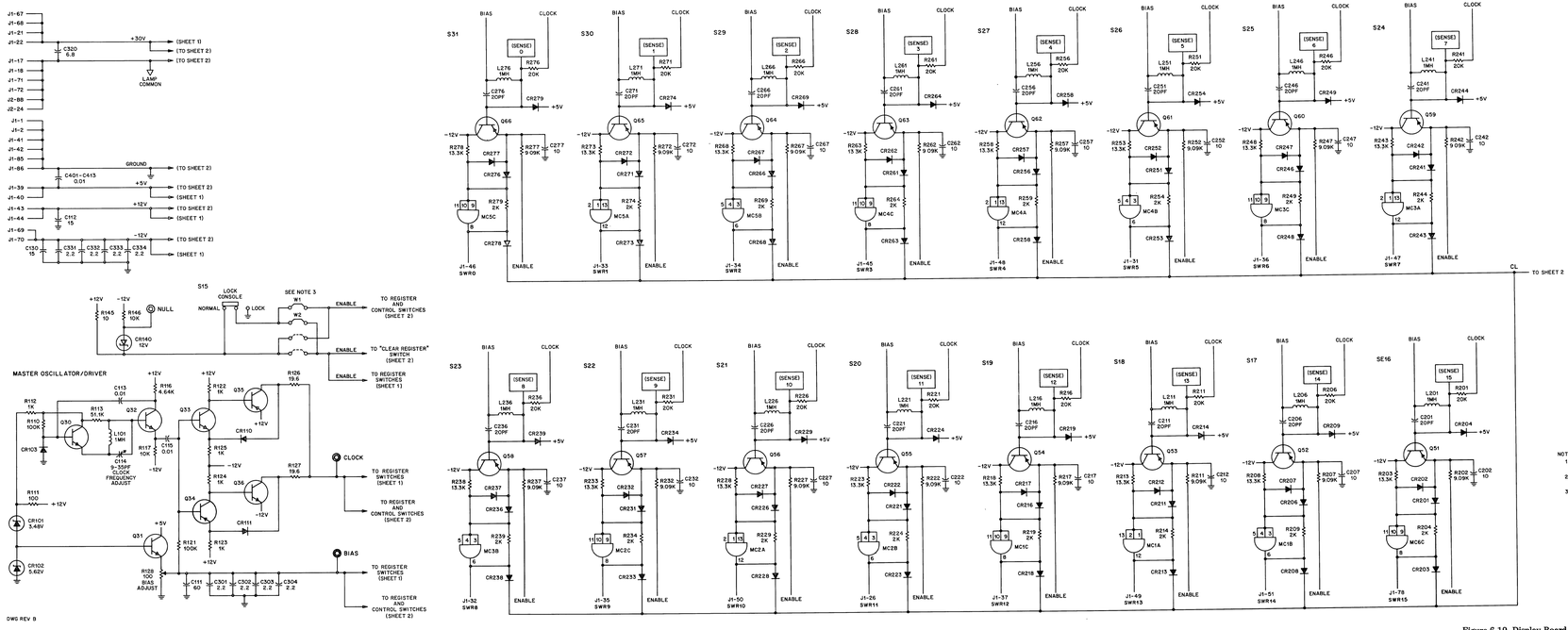
Pin Index (86-Pin Connector)

PIN NO.	SIGNAL	REF NO.	PIN NO.	SIGNAL	REF NO.
1	GND	340	2	GND	339
3	NC	-	4	NC	-
5	MON	268	6	NC	-
7	LNS	261	8	NC	-
9	SIN	270	10	NC	-
11	LES	271	12	NC	-
13	NC	-	14	NC	-
15	NC	-	16	NC	-
17	LAMP COM	347	18	LAMP COM	348
19	NC	-	20	NC	-
21	+30V	289	22	+30V	290
23	OVF	291	24	CKR	K1
25	FETCH	102	26	SWR11	284
27	EXECUTE	104	28	INDIRECT	103
29	PEI	269	30	EXTEND	292
31	SWR5	278	32	SWR8	281
33	SWR1	274	34	SWR2	275
35	SWR9	282	36	SWR6	279
37	SWR12	285	38	NC	-
39	+5V	341	40	+5V	342
41	GND	340	42	GND	339
43	+12V	343	44	+12V	344
45	SWR3	276	46	SWR0	273
47	SWR7	280	48	SWR4	277
49	SWR13	286	50	SWR10	283
51	SWR14	287	52	NC	-
53	NC	-	54	NC	-
55	NC	-	56	NC	-
57	NC	-	58	NC	-
59	NC	-	60	NC	-
61	NC	-	62	NC	-
63	NC	-	64	NC	-
65	NC	-	66	NC	-
67	+30V	289	68	+30V	290
69	-12V	345	70	-12V	346
71	LAMP COM	347	72	LAMP COM	348
73	LDL	267	74	NC	-
75	RF2	079	76	RNL	265
77	PBS	266	78	SWR15	288
79	LAL	260	80	HLL	264
81	CLR	272	82	LML	263
83	SCL	262	84	DML	259
85	GND	340	86	GND	339

Pin Index (48-Pin Connector)

PIN NO.	SIGNAL	TO/FROM
1	SRD0	A25P5-1
2	MRD0	A25P5-2
3	TRD0	A25P5-3
4	SRD6	A25P5-4
5	MRD6	A25P5-5
6	SRD6	A25P5-6
7	TRD7	A25P5-7
8	MRD7	A25P5-8
9	SRD7	A25P5-9
10	TRD8	A25P5-10
11	MRD8	A25P5-11
12	SRD8	A25P5-12
13	MRD9	A25P5-13
14	SRD9	A25P5-14
15	MRD10	A25P5-15
16	SRD10	A25P5-16
17	MRD11	A25P5-17
18	SRD11	A25P5-18
19	MRD12	A25P5-19
20	SRD12	A25P5-20
21	SRD13	A25P5-21
22	TRD14	A25P5-22
23	SRD15	A25P5-23
24	LAMP COM	A25P5-24
A	TRD1	A25P5-A
B	MRD1	A25P5-B
C	SRD1	A25P5-C
D	TRD2	A25P5-D
E	MRD2	A25P5-E
F	SRD2	A25P5-F
H	TRD3	A25P5-H
J	MRD3	A25P5-J
K	SRD3	A25P5-K
L	TRD4	A25P5-L
M	MRD4	A25P5-M
N	SRD4	A25P5-N
P	TRD5	A25P5-P
R	MRD5	A25P5-R
S	SRD5	A25P5-S
T	TRD9	A25P5-T
U	TRD10	A25P5-U
V	TRD11	A25P5-V
W	TRD12	A25P5-W
X	TRD13	A25P5-X
Y	MRD13	A25P5-Y
Z	SRD14	A25P5-Z
AA	TRD15	A25P5-AA
BB	LAMP COM	A25P5-BB

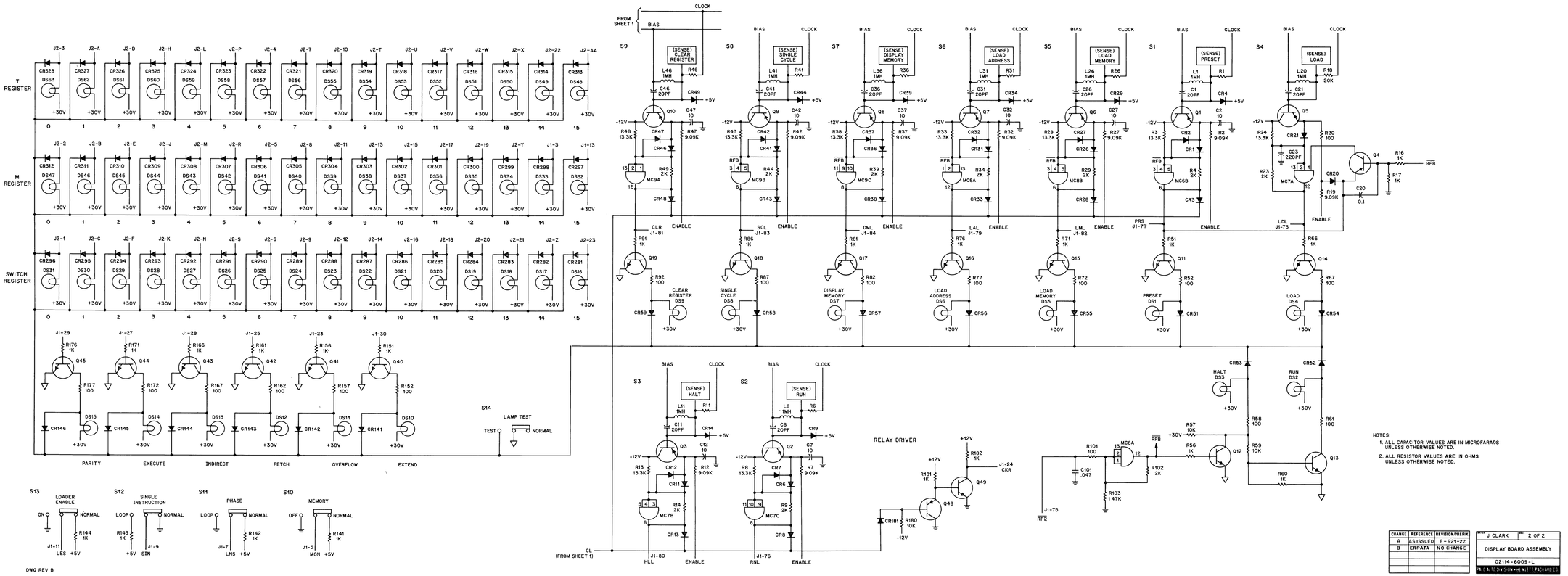
CHANGE	REFERENCE	REVISION/PREFIX
A	AS ISSUED	E-921-22
B	ERRATA	NO CHANGE



NOTES:
1. ALL CAPACITOR VALUES ARE IN MICROFARADS UNLESS OTHERWISE NOTED.
2. ALL RESISTOR VALUES ARE IN OHMS UNLESS OTHERWISE NOTED.
3. JUMPER POSITIONS CORRESPOND TO THEIR PHYSICAL LOCATIONS AS VIEWED FROM THE FRONT OF THE DISPLAY BOARD ASSEMBLY.

J. CLARK | 1 OF 2
DISPLAY BOARD ASSEMBLY
02114-6009-L
HEWLETT-PACKARD

Figure 6-19. Display Board (02114-6009), Schematic Diagram (Sheet 1 of 2)



NOTES:
1. ALL CAPACITOR VALUES ARE IN MICROFARADS UNLESS OTHERWISE NOTED.
2. ALL RESISTOR VALUES ARE IN OHMS UNLESS OTHERWISE NOTED.

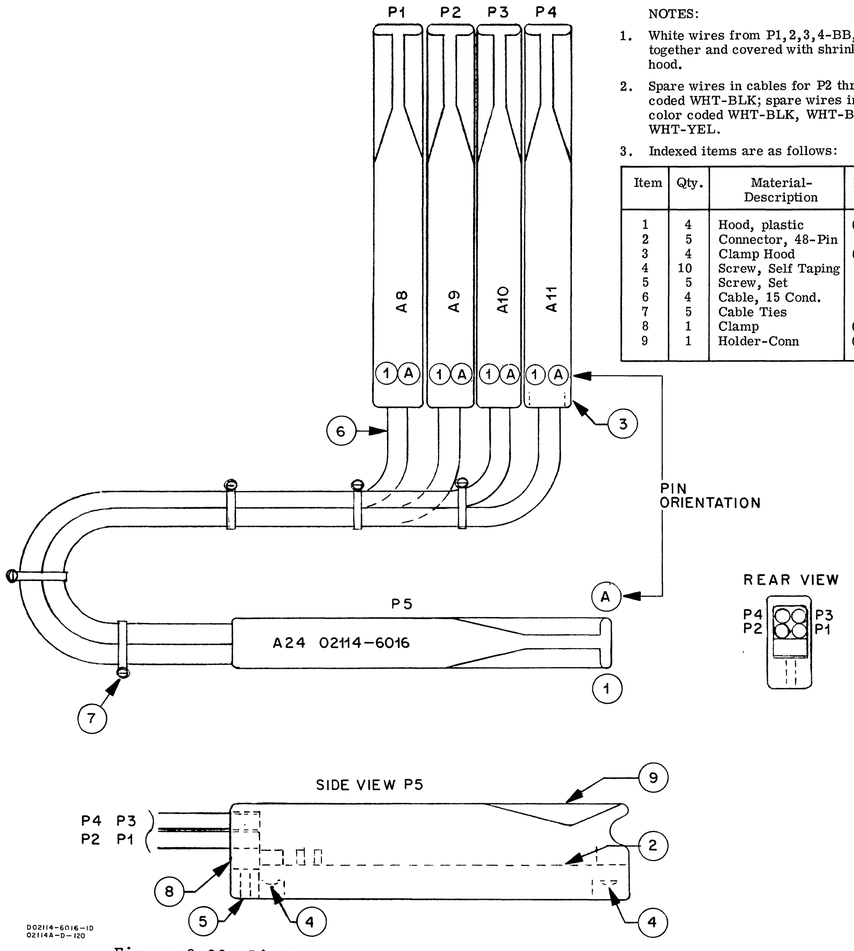
CHANGE	REFERENCE	REVISION/PREFIX
A	AS ISSUED	E-921-22
B	ERRATA	NO CHANGE

J CLARK | 2 OF 2

DISPLAY BOARD ASSEMBLY

02114-6009-L

Figure 6-19. Display Board (02114-6009), Schematic Diagram (Sheet 2 of 2)



NOTES:

1. White wires from P1,2,3,4-BB,24 are soldered together and covered with shrink tubing in P5 hood.
2. Spare wires in cables for P2 thru P4 are color coded WHT-BLK; spare wires in P1 cable are color coded WHT-BLK, WHT-BRN, and WHT-YEL.
3. Indexed items are as follows:

Item	Qty.	Material-Description	Matl-Part No.
1	4	Hood, plastic	02116-4001
2	5	Connector, 48-Pin	1251-0335
3	4	Clamp Hood	02116-4004
4	10	Screw, Self Taping	0624-0096
5	5	Screw, Set	3030-0143
6	4	Cable, 15 Cond.	8120-1281
7	5	Cable Ties	1400-0249
8	1	Clamp	02114-2008
9	1	Holder-Conn	02114-2009

Figure 6-20. Display Board Cable Assembly (02114-6016), Wiring Index and Part Location Diagram

Pin Index (P1)

CABLE ASSEMBLY A25				INTERCONNECTION	
FROM	SIGNAL	WIRE COLOR	TO	FROM	TO
P1-10	MRD12	BLU	P5-19	A8-10	A24J2-19
P1-11	MRD14	-	NC		
P1-13	TRD12	BRN	P5-W	A8-13	A24J2-W
P1-14	TRD14	WHT-RED	P5-22	A8-14	A24J2-22
P1-16	SRD12	VIO	P5-20	A8-16	A24J2-20
P1-17	SRD14	YEL	P5-Z	A8-17	A24J2-Z
P1-18	LA12	*	P1-19	A8-22, Z	A8-18
P1-19	LA13	*	P1-18, P1-22	A8-22, Z	A8-19
P1-22	+5V	*	P1-19, P1-Z	A8-22, Z	A8-18, 19
P1-23	LAMP COM	BLK	P5-24, P1-AA	A8-23, AA	A24J2-24, BB
P1-24	GND	*	P1-BB	A8-24, BB	A8-V
P1-L	MRD13	ORN	P5-Y	A8-L	A24J2-Y
P1-M	MRD15	-	NC		
P1-P	TRD13	RED	P5-X	A8-P	A24J2-X
P1-R	TRD15	GRN	P5-AA	A8-R	A24J2-AA
P1-T	SRD13	GRY	P5-21	A8-T	A24J2-21
P1-U	SRD15	WHT-ORN	P5-23	A8-U	A24J2-23
P1-V	LA15	*	P1-BB	A8-24, BB	A8-V
P1-W	LA14	-	NC		
P1-Z	+5V	*	P1-22	A8-22, Z	A8-18, 19
P1-AA	LAMP COM	*	P1-23	A8-23, AA	A24J2-24, BB
P1-BB	GND	WHT	P1-24	A8-24, BB	A8-V

Pin Index (P2)

CABLE ASSEMBLY A25				INTERCONNECTION	
FROM	SIGNAL	WIRE COLOR	TO	FROM	TO
P2-10	MRD8	GRN	P5-11	A9-10	A24J2-11
P2-11	MRD10	WHT-BRN	P5-15	A9-11	A24J2-15
P2-13	TRD8	YEL	P5-10	A9-13	A24J2-10
P2-14	TRD10	RED	P5-U	A9-14	A24J2-U
P2-16	SRD8	BLU	P5-12	A9-16	A24J2-12
P2-17	SRD10	WHT-RED	P2-17	A9-17	A24J2-16
P2-18	LA8	*	P2-19, P2-V	A9-22, Z	A9-18
P2-19	LA9	*	P2-18	A9-22, Z	A9-19
P2-22	+5V	*	P2-Z	A9-22, Z	A9-18, 19, V, W
P2-23	LAMP COM	BLK	P5-24, P2-AA	A9-23, AA	A24J2-24, BB
P2-24	GND	WHT	P2-BB	A9-24	A9-BB
P2-L	MRD9	VIO	P5-13	A9-L	A24J2-13
P2-M	MRD11	WHT-ORN	P5-17	A9-M	A24J2-17
P2-P	TRD9	BRN	P5-T	A9-P	A24J2-T
P2-R	TRD11	ORN	P5-V	A9-R	A24J2-V
P2-T	SRD9	GRY	P5-14	A9-T	A24J2-14
P2-U	SRD11	WHT-YEL	P5-18	A9-U	A24J2-18
P2-V	LA11	*	P2-18, P2-W	A9-22, Z	A9-V
P2-W	LA10	*	P2-V, P2-Z	A9-22, Z	A9-W
P2-Z	+5V	*	P2-22, P2-W	A9-22, Z	A9-V, W
P2-AA	LAMP COM	*	P2-23	A9-23, AA	A24J2-24, BB
P2-BB	GND	WHT	P2-24	A9-BB	A9-24

* Denotes internal connection in hood.

Pin Index (P3)

CABLE ASSEMBLY A25				INTERCONNECTION	
FROM	SIGNAL	WIRE COLOR	TO	FROM	TO
P3-10	MRD4	RED	P5-M	A10-10	A24J2-M
P3-11	MRD6	GRY	P5-5	A10-11	A24J2-5
P3-13	TRD4	BRN	P5-L	A10-13	A24J2-L
P3-14	TRD6	VIO	P5-4	A10-14	A24J2-4
P3-16	SRD4	ORN	P5-N	A10-16	A24J2-N
P3-17	SRD6	WHT-BRN	P5-16	A10-17	A24J2-16
P3-18	LA4	*	P3-19	A10-24;BB	A10-18
P3-19	LA5	*	P3-24, P3-18	A10-24, BB	A10-19
P3-22	+5V	-	NC		
P3-23	LAMP COM	BLK	P5-BB, P3-AA	A10-23, AA	A24J2-24, BB
P3-24	GND	WHT	P3-19 P3-BB	A10-24, BB	A10-18, 19
P3-L	MRD5	GRN	P5-R	A10-L	A24J2-R
P3-M	MRD7	WHT-ORN	P5-8	A10-M	A24J2-8
P3-P	TRD5	YEL	P5-P	A10-P	A24J2-P
P3-R	TRD7	WHT-RED	P5-7	A10-R	A24J2-7
P3-T	SRD5	BLU	P5-S	A10-T	A24J2-S
P3-U	SRD7	WHT-YEL	P5-9	A10-U	A24J2-9
P3-V	LA7	*	P3-W	A10-22, Z	A10-V
P3-W	LA6	*	P3-V, P3-Z	A10-22, Z	A10-W
P3-Z	+5V	*	P3-W	A10-22	A10-V, W
P3-AA	LAMP COM	*	P3-23	A10-23, AA	A24J2-24, BB
P3-BB	GND	*	P3-24	A10-24, BB	A11-18, 19

Pin Index (P4)

CABLE ASSEMBLY A25				INTERCONNECTION	
FROM	SIGNAL	WIRE COLOR	TO	FROM	TO
P4-10	MRD0	WHT-ORN	P5-2	A11-10	A24J2-2
P4-11	MRD2	GRN	P5-E	A11-11	A24J2-E
P4-13	TRD0	WHT-YEL	P5-3	A11-13	A24J2-3
P4-14	TRD2	YEL	P5-D	A11-14	A24J2-D
P4-16	SRD0	WHT-RED	P5-1	A11-16	A24J2-1
P4-17	SRD2	BLU	P5-F	A11-17	A24J2-F
P4-18	LA0	*	P4-19, P4-V	A11-24, BB	A11-18
P4-19	LA1	*	P4-18, P4-24	A11-24, BB	A11-19
P4-22	+5V	-	NC		
P4-23	LAMP COM	BLK	P5-BB, P4-AA	A11-23, AA	A24J2-24, BB
P4-24	GND	WHT	P4-19, P4-BB	A11-24, BB	A11-18, 19, V, W
P4-L	MRD1	RED	P5-B	A11-L	A24J2-B
P4-M	MRD3	GRY	P5-J	A11-M	A24J2-J
P4-P	TRD1	BRN	P5-A	A11-P	A24J2-A
P4-R	TRD3	VIO	P5-H	A11-R	A24J2-H
P4-T	SRD1	ORN	P5-C	A11-T	A24J2-C
P4-U	SRD3	WHT-BRN	P5-K	A11-U	A24J2-K
P4-V	LA3	*	P4-18, P4-W	A11-24, BB	A11-V
P4-W	LA2	*	P4-V	A11-24, BB	A11-W
P4-Z	+5V	-	NC		
P4-AA	LAMP COM	*	P4-23	A11-23, AA	A24J2-24, BB
P4-BB	GND	*	P4-24	A11-24, BB	A11-18, 19, V, W

Pin Index (P5)

CABLE ASSEMBLY A25				INTERCONNECTION	
FROM	SIGNAL	WIRE COLOR	TO	FROM	TO
P5-1	SRD0	WHT-RED	P4-16	A24J2-1	A11-16
P5-2	MRD0	WHT-ORN	P4-10	A24J2-2	A11-10
P5-3	TRD0	WHT-YEL	P4-13	A24J2-3	A11-13
P5-4	TRD6	VIO	P3-14	A24J2-4	A10-14
P5-5	MRD6	GRY	P3-11	A24J2-5	A10-11
P5-6	SRD6	WHT-BRN	P3-17	A24J2-6	A10-17
P5-7	TRD7	WHT-RED	P3-R	A24J2-7	A10-R
P5-8	MRD7	WHT-ORN	P3-M	A24J2-8	A10-M
P5-9	SRD7	WHT-YEL	P3-U	A24J2-9	A10-U
P5-10	TRD8	YEL	P2-13	A24J2-10	A9-13
P5-11	MRD8	GRN	P2-10	A24J2-11	A9-10
P5-12	SRD8	BLU	P2-16	A24J2-12	A9-16
P5-13	MRD9	VIO	P2-L	A24J2-13	A9-L
P5-14	SRD9	GRY	P2-T	A24J2-14	A9-T
P5-15	MRD10	WHT-BRN	P2-11	A24J2-15	A9-11
P5-15	SRD10	WHT-RED	P2-17	A24J2-16	A9-17
P5-17	MRD11	WHT-ORN	P2-M	A24J2-17	A9-M
P5-18	SRD11	WHT-YEL	P2-U	A24J2-18	A9-U
P5-19	MRD12	BLU	P1-10	A24J2-19	A8-10
P5-20	SRD12	VIO	P1-16	A24J2-20	A8-16
P5-21	SRD13	GRY	P1-T	A24J2-21	A8-T
P5-22	TRD14	WHT-RED	P1-14	A24J2-22	A8-14
P5-23	SRD15	WHT-ORN	P1-U	A24J2-23	A8-U
P5-24	LAMP COM	BLK	P1-23, P2-23, P5-BB	A24J2-24, BB	A8-23, AA; A9-23, AA
P5-A	TRD1	BRN	P4-P	A24J2-A	A11-P
P5-B	MRD1	RED	P4-L	A24J2-B	A11-L
P5-C	SRD1	ORN	P4-T	A24J2-C	A11-T
P5-D	TRD2	YEL	P4-14	A24J2-D	A11-14
P5-E	MRD2	GRN	P4-11	A24J2-E	A11-11
P5-F	SRD2	BLU	P4-17	A24J2-F	A11-17
P5-H	TRD3	VIO	P4-R	A24J2-H	A11-R
P5-J	MRD3	GRY	P4-M	A24J2-J	A11-M
P5-K	SRD3	WHT-BRN	P4-U	A24J2-K	A11-U
P5-L	TRD4	BRN	P3-13	A24J2-L	A10-13
P5-M	MRD4	RED	P3-10	A24J2-M	A10-10
P5-N	SRD4	ORN	P3-16	A24J2-N	A10-16
P5-P	TRD5	YEL	P3-P	A24J2-P	A10-P
P5-R	MRD5	GRN	P3-L	A24J2-R	A10-L
P5-S	SRD5	BLU	P3-T	A24J2-S	A10-T
P5-T	TRD9	BRN	P2-P	A24J2-T	A9-P
P5-U	SRD-11	WHT-YEL	P2-U	A24J2-18	A9-U
P5-V	TRD11	ORN	P2-R	A24J2-V	A9-R
P5-W	TRD12	BRN	P1-13	A24J2-W	A8-13
P5-X	TRD13	RED	P1-P	A24J2-X	A8-P
P5-Y	MRD13	ORN	P1-L	A24J2-Y	A8-L
P5-Z	SRD14	YEL	P1-17	A24J2-Z	A8-17
P5-AA	TRD15	GRN	P1-R	A24J2-AA	A8-R
P5-BB	LAMP COM	BLK	P3-23, P4-24, P5-24	A24J2-24, BB	A10-23, AA; A11-23, AA

Table 6-13. Power Supply Assembly (02114-6020), Overall Reference Designation Index

REFERENCE DESIGNATION		HP PART NO.	DESCRIPTION	MFR. CODE NO.	MFR. PART NO.
A300	(see fig. 6-21)	02114-6013	CAPACITOR BOARD	28480	02114-6013
A301	(see fig. 6-23)	-	HEAT SINK ASSEMBLY	-	-
A302	(see fig. 6-24)	02114-6010	REGULATOR CARD	28480	02114-6010
B1,2	(see fig. 6-25)	3160-0072	FAN: TUBE AXIAL 115V 60 Hz	28480	3160-0072
C1,2	(see fig. 6-25)	0160-3043	C: FXD CER 2X 0.005 UF 20% 250 VAC	56289	29C147A-CDH
C4,5	(see fig. 6-22)	0180-0228	C: FXD ELECT 22 UF 10% 15 VDCW	28480	0180-0228
C21,70	(see fig. 6-21)	0180-2224	C: FXD ELECT 13,000 UF +75-10% 50 VDCW	56289	36D133G050BF2A-DQB
C31,33	(see fig. 6-21)	0180-2223	C: FXD ELECT 160,000 UF +75-10% 10 VDCW	56289	36D164G010DF2A-DQB
C41,42	(see fig. 6-21)	0180-1875	C: FXD ELECT 100,000 UF +75-10% 20 VDCW	28480	0180-1875
C51	(see fig. 6-21)	0180-2225	C: FXD ELECT 270,000 UF +75-10% 3 VDCW	56289	36D274G003DF2A-DQB
C52	(see fig. 6-21)	0180-1868	C: FXD ELECT 4900 UF +75-10% 40 VDCW	28480	0180-1868
CR8,9	(see fig. 6-22)	1901-0344	DIODE: SILICON	28480	1901-0344
CR17,18	(see fig. 6-22)	1901-0495	DIODE: SILICON 50 PIV 12A	28480	1901-0495
F2,6	(see fig. 6-21)	2110-0055	FUSE: CARTRIDGE 4 AMP 250V	75915	312006
F3,4	(see fig. 6-21)	2110-0010	FUSE: CARTRIDGE 3 AG 5 AMP 250V MAX	75915	312005
F5	(see fig. 6-21)	2110-0036	FUSE: CARTRIDGE 8 AMP 125V	75915	312008
FL1	(see fig. 6-25)	9100-1934	INDUCTOR: FILTER 20 AAC	28480	9100-1934
J1	(see fig. 625)	1251-0315	CONN: MALE 3 WIRE 250V 10A	83315	7556-G
R61	(see fig. 6-25)	0811-2649	R: FXD WW 2 OHM 3% 12.5W	91637	RH-10
R62,63	(see fig. 6-25)	0811-2650	R: FXD WW 50 OHM 3% 12.5W	91637	RH-10
R64	(see fig. 6-25)	0811-2648	R: FXD WW 5 OHM 3% 12.5W	91637	RH-10
R65,66	(see fig. 6-25)	0811-2647	R: FXD WW 200 OHM 3% 12.5W	91637	RH-10
S302	(see fig. 6-22)	0440-0069	SWITCH: THERMOSTAT 43° C ± 2°	28480	0440-0069
T1	(see fig. 6-22)	9100-1235	TRANSFORMER: POWER	28480	9100-1235

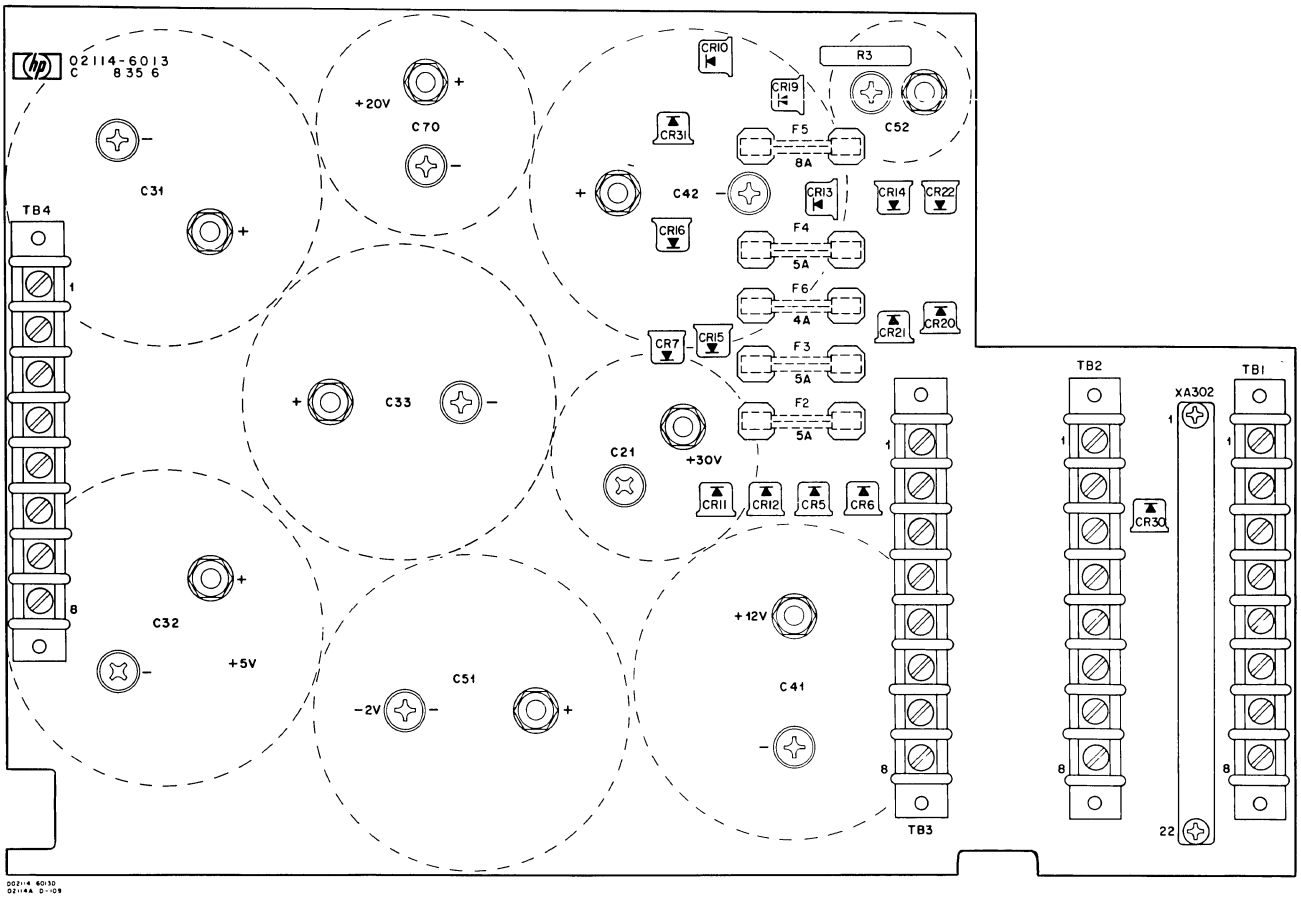
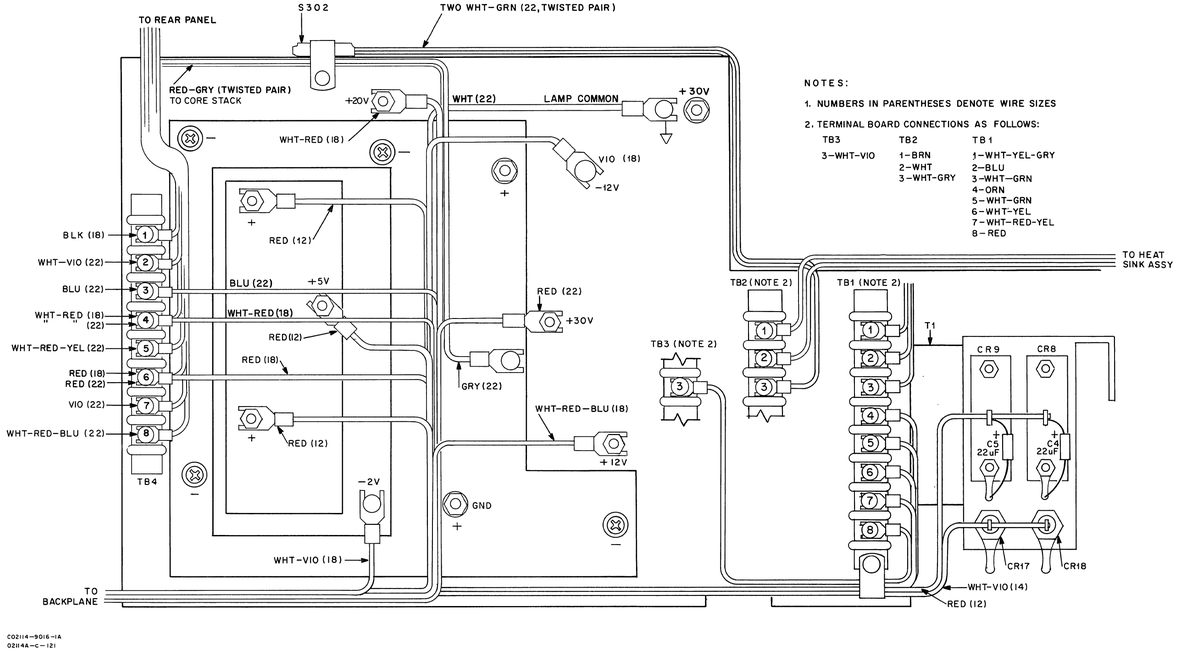


Figure 6-21. Capacitor Board (02114-6013), Part Location Diagram

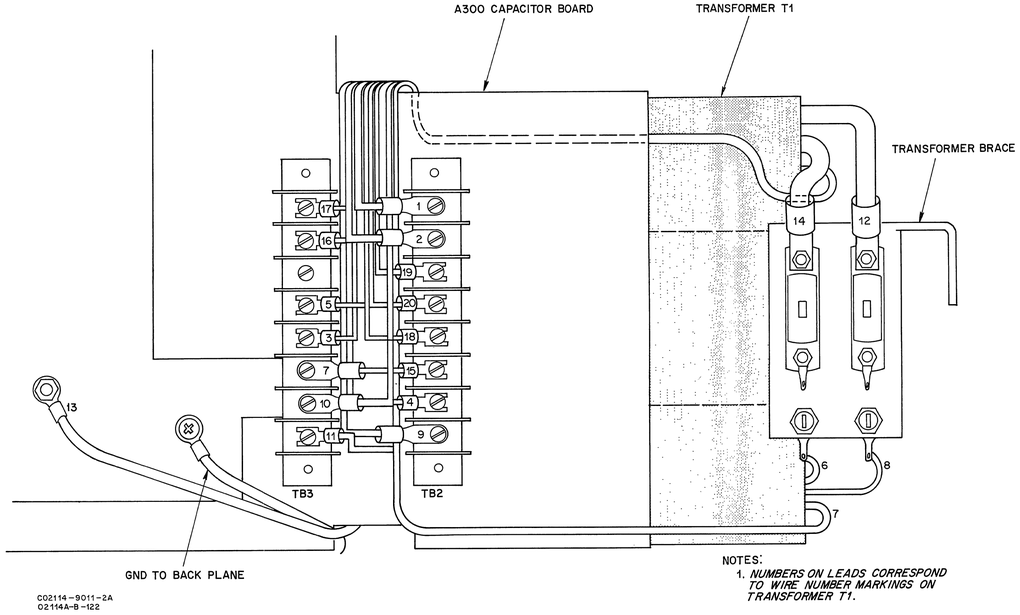
Table 6-14. Capacitor Board (02114-6013), Reference Designation Index

REFERENCE DESIGNATION *	HP PART NO.	DESCRIPTION	MFR. CODE NO.	MFR. PART NO.
CR5-7,10-16,19-22,30,31	1901-0164	DIODE: SILICON 200 PIV 3A	04713	1N4721
R3	0811-1857	R: FXD WW 400.OHM 5% 5W	28480	0811-1857
XA302	1251-0498	CONNECTOR: PC 22 CONTACTS	28480	1251-0498

*Reference Designation Prefix A300



C02114-9016-1A
02114A-C-121



C02114-9011-2A
02114A-B-122

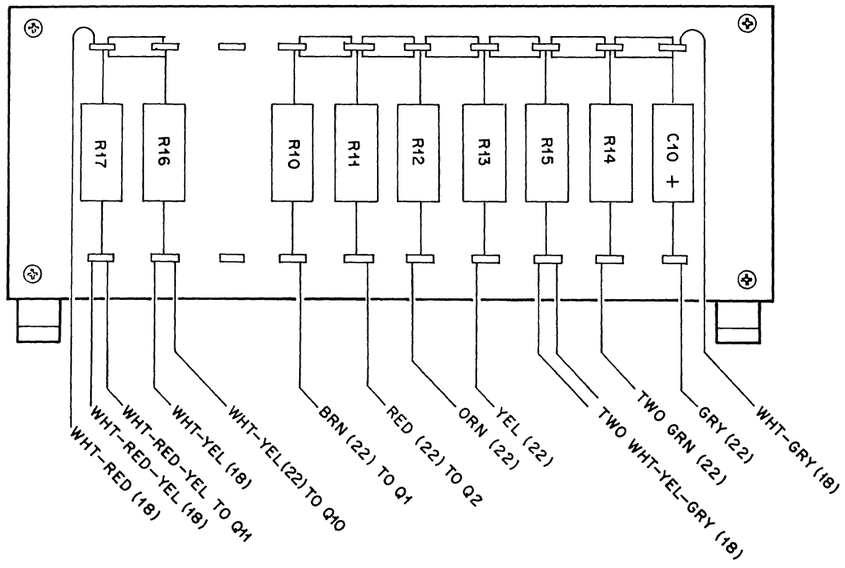
Figure 6-22. Capacitor Board (02114-6013) and Transformer T1, Part Location and Wiring Diagram

Table 6-15. Heat Sink Assembly, Reference Designation Index

REFERENCE DESIGNATION *	HP PART NO.	DESCRIPTION	MFR. CODE NO.	MFR. PART NO.
C10	0180-0229	C: FXD ELECT 330F 10% 10 VDCW	28480	0180-0229
CR1-CR4	1901-0499	DIODE: SILICON 400 PIV 12A	04713	MR1124
Q1-Q5	1854-0410	TRANSISTOR: SILICON NPN	04713	SJ 2017
Q10,11	1854-0264	TRANSISTOR: SILICON NPN	04713	2N3715
R2	0811-2646	R: FXD WW 250 OHM 3% 50W	91637	RH-50
R10-R13	0811-1661	R: FXD WW 0.39 OHM 5% 2W	28480	0811-1661
R14	0757-9084	R: FXD MET FLM 10.0 OHM 1% 1/2W	28480	0757-0984
R15	0811-2490	R: FXD WW 0.1 OHM 3% 5W	28480	0811-2490
R16,17	0811-0040	R: FXD WW 1 OHM 1% 5W	28480	0811-0040
RV1	0842-0001	VARISTOR: 110 VDC	04773	RY-58
S301	0440-0065	SWITCH: THERMOSTAT SPST 75° C ± 5°	38643	120M

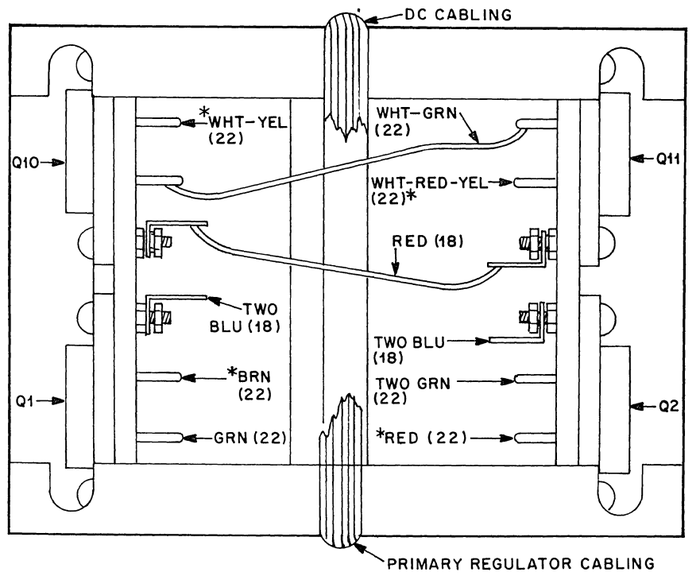
*Reference Designation Prefix A301

DETAIL "A"
(SEE BELOW)



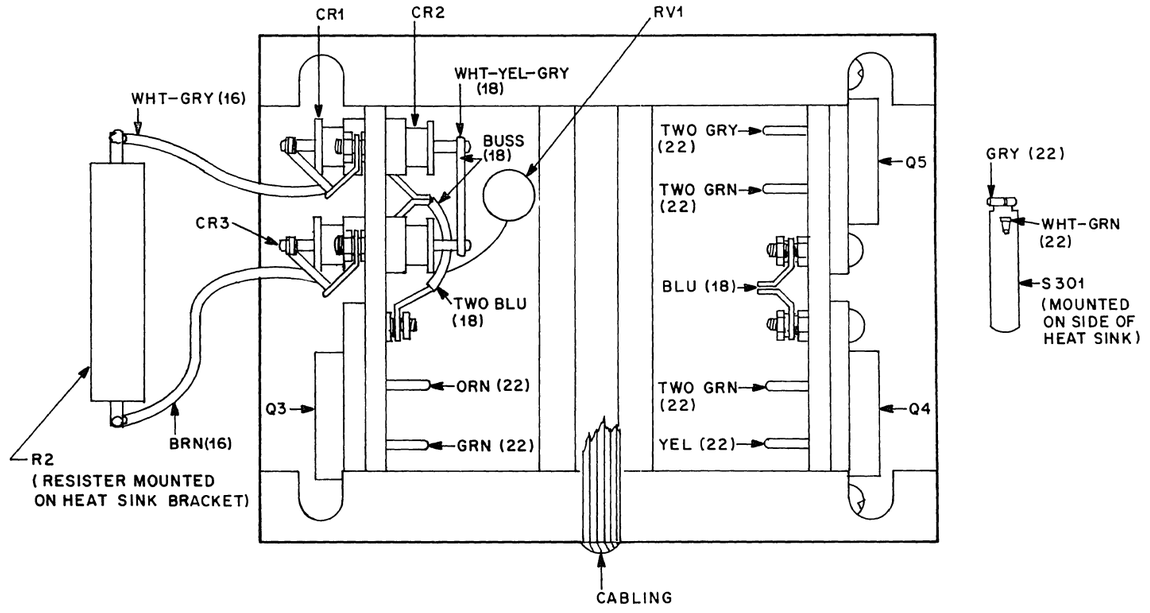
TOP VIEW

(SEE DETAIL "A" FOR KINGMAN BOARD)



02114A-C-123
A02114-9017-1A
C02114-9013-2A

BOTTOM VIEW



NOTES:

1. NUMBERS IN PARENTHESES DENOTE WIRE SIZES.
2. ASTERISK (*) DENOTES WIRING FROM KINGMAN BOARD.

Figure 6-23. Heat Sink Assembly, Part Location and Wiring Diagram

Table 6-16. Regulator Card (02114-6010), Reference Designation Index

REFERENCE DESIGNATION *	HP PART NO.	DESCRIPTION	MFR. CODE NO.	MFR. PART NO.
C71	0180-0291	C: FXD ELECT 1 UF 10% 35 VDCW	28480	0180-0291
C72	0180-0159	C: FXD ELECT 220 UF 10% 10 VDCW	28480	0180-0159
C73	0160-0168	C: FXD MY 0.1 UF 10% 200 VDCW	28480	0160-0168
C74	0160-2307	C: FXD MICA 47 PF 5%	28480	0160-2307
C75	0180-1714	C: FXD ELECT 330 UF 10% 6 VDCW	28480	0180-1714
CR41,42,51-53	1901-0028	DIODE: SILICON 0.75A 400 PIV	28480	1901-0028
CR43,44,45,56	1901-0040	DIODE: SILICON 30 MA 30 MV	07263	FDG 1088
CR45	1902-3104	DIODE: BREAKDOWN 5.62V 5%	28480	1902-3104
CR46	1902-0049	DIODE BREAKDOWN: 6.19V 5%	28480	1902-0049
MC1	1820-0105	INTEGRATED CIRCUIT: VOLTAGE REGULATOR	28480	1820-0105
MC2	1820-0054	INTEGRATED CIRCUIT: TTL	01295	SN7400N
Q6,7,23,24	1854-0053	TRANSISTOR: SILICON NPN 2N2218	04713	2N2218
Q12	1853-0052	TRANSISTOR: SILICON PNP	04713	2N3740
R21,41	0757-1000	R: FXD MET FLM 51.1 OHM 1% 1/2W	28480	0757-1000
R22	0698-3415	R: FXD MET FLM 19.6K OHM 1% 1/2W	28480	0698-3415
R23,26,44,46,49	0757-0198	R: FXD MET FLM 100 OHM 1% 1/2W	28480	0757-0198
R24	0757-0839	R: FXD MET FLM 10K OHM 1% 1/2W	28480	0757-0839
R25	0757-1090	R: FXD MET FLM 261 OHM 1% 1/2W	28480	0757-1090
R27	2100-1755	R: VAR WW 100 OHM 10% LIN 1/2W	28480	2100-1755
R28,37	0698-3405	R: FXD MET FLM 422 OHM 1% 1/2W	28480	0698-3405
R31,32	0698-3400	R: FXD MET FLM 147 OHM 1% 1/2W	28480	0698-3400
R33	0757-0819	R: FXD MET FLM 090 OHM 1% 1/2W	28480	0757-0819
R34	0698-3407	R: FXD MET FLM 1.96K OHM 1% 1/2W	28480	0698-3407
R35	0757-0833	R: FXD MET FLM 5.11K OHM 1% 1/2W	28480	0757-0833
R36	2100-1761	R: VAR WW 10K OHM 10% LIN 1/2W	28480	2100-1761
R38,51	0757-0159	R: FXD MET FLM 1000 OHM 1% 1/2W	28480	0757-0159
R40	0698-3390	R: FXD MET FLM 19.6 OHM 1% 1/2W	28480	6098-3390
R42	2100-1756	R: VAR WW 200 OHM 10% LIN 1/2W	28480	2100-1756
R43,50	0757-1078	R: FXD MET FLM 1.47K OHM 1% 1/2W	28480	0757-1078
R45,47	0683-1025	R: FXD COMP 1000 OHM 5% 1/4W	01121	CB 1025
R48	0683-0475	R: FXD COMP 4.7 OHM 5% 1/4W	01121	CB 0475
R52	0698-0090	R: FXD MET FLM 464 OHM 1% 1/2W	28480	0698-0090
R53	0683-4715	R: FXD COMP 470 OHM 5% 1/4W	01121	CB 4715

*Reference Designation Prefix A302

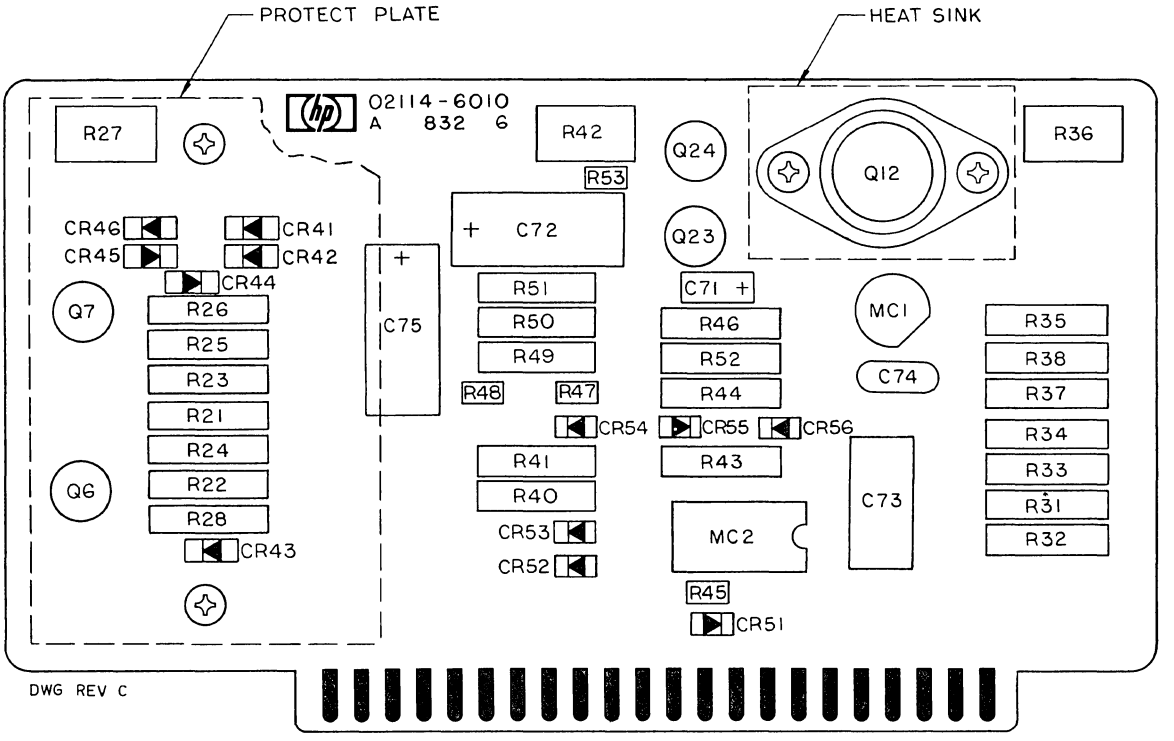
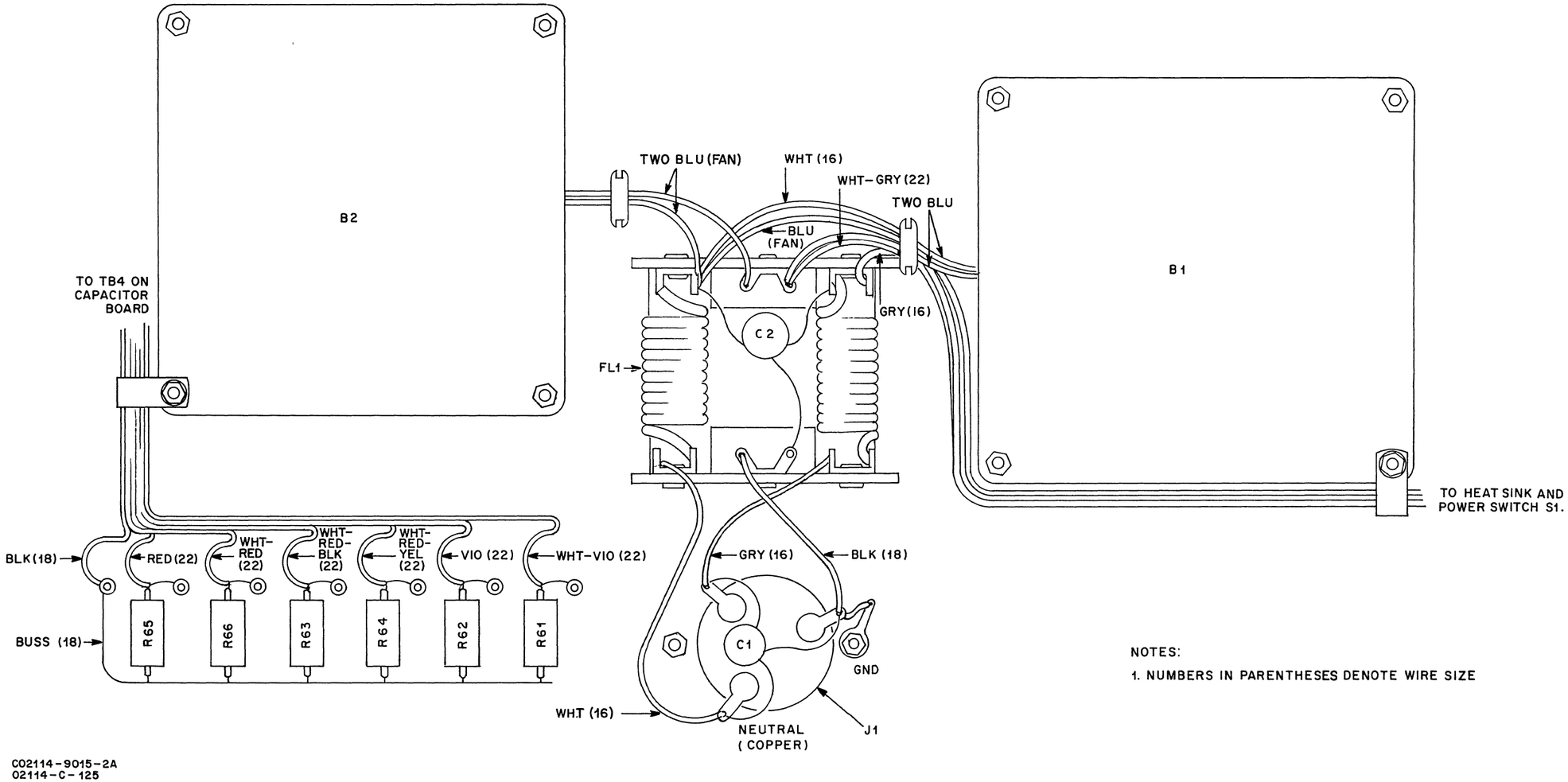


Figure 6-24. Regulator Card (02114-6010), Part Location Diagram



NOTES:

1. NUMBERS IN PARENTHESES DENOTE WIRE SIZE

Figure 6-25. Rear Panel Assembly (02114-0009), Part Location Diagram and Wiring Diagram

WARNING

Dangerous line voltage is present in the Power Supply even when Power switch S1 is in the Off position. Do not attempt to remove the protective cover over the Power Supply, or attempt any maintenance whatsoever in the area of the Power Supply, unless the power cord has first been removed from the power source. Do not connect any grounded test equipment to the Power Supply unless an isolation transformer is connected between the main power source and J1 at the rear of the Computer. Then use caution when making test measurements. Failure to heed this warning could result in death or injury.

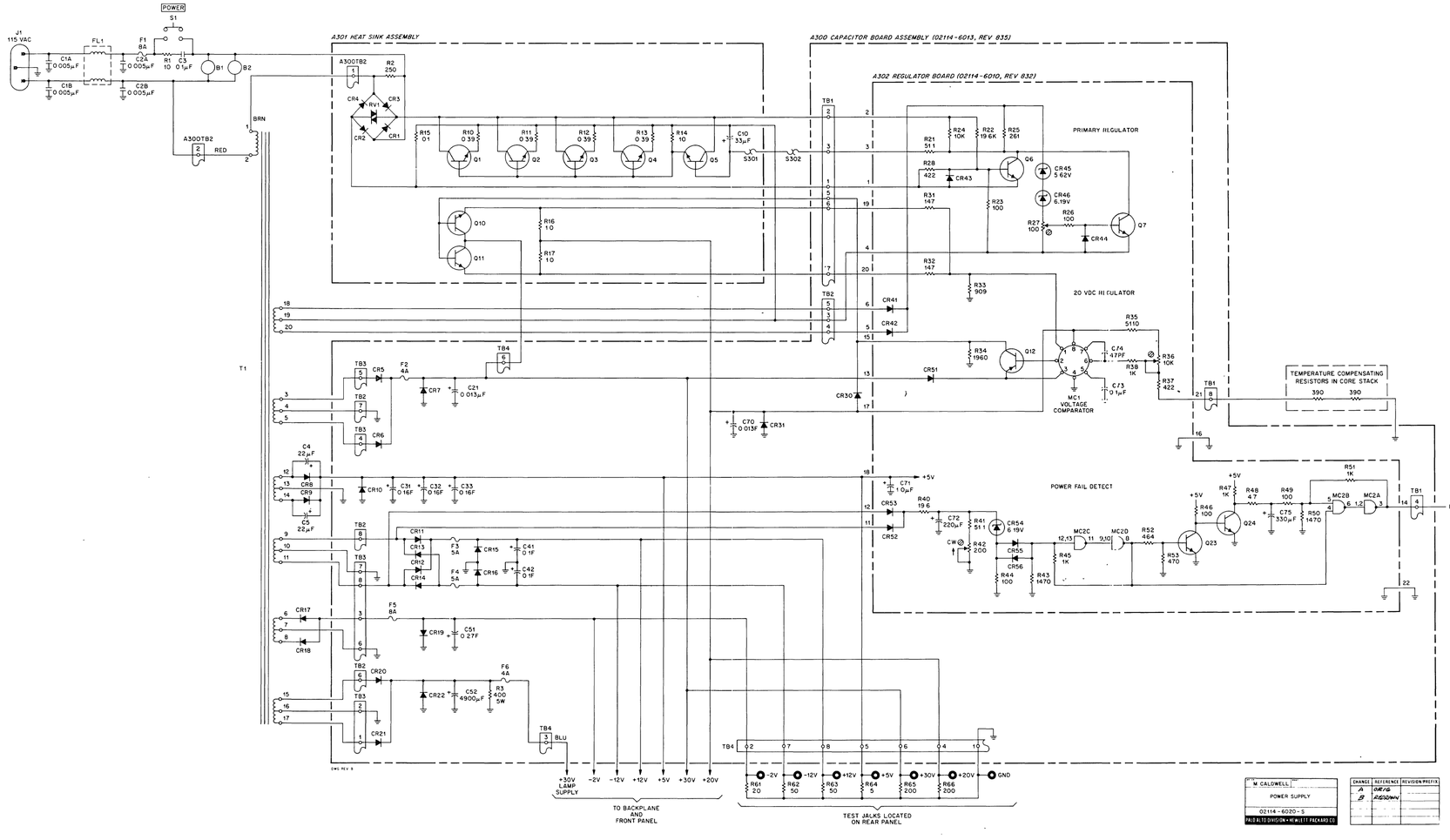


Figure 6-26. Power Supply Assembly (02114-6020), Schematic Diagram

SECTION VII

REPLACEABLE PARTS

7-1. INTRODUCTION.

7-2. This section contains information for ordering replacement parts for the HP 2114B Computer. Table 7-1 contains reference designations and abbreviations used in this manual. Table 7-2 contains a list of replaceable parts in alphanumeric order of their HP stock number. Table 7-3 provides a code list of manufacturers.

7-3. Table 7-2 provides the following information:

a. Part description (refer to Table 7-1 for an explanation of abbreviations used in the DESCRIPTION column).

b. Typical manufacturer of the part given in a five-digit code (refer to Table 7-3 for a list of manufacturers' codes).

c. Manufacturer's part number.

d. Total quantity of each part used in the HP 2114B Computer.

7-4. A separate parts list and part location diagram for each assembly with the exception of the I/O Control card 02114-6007 (refer to Volume Three, I/O System Operation) is given in Section VI of this manual. This section lists the parts in alphanumeric order of their reference designations.

7-5. ORDERING INFORMATION.

7-6. To order replacement parts, address the order or inquiry to the local Hewlett-Packard field office. See the list at the rear of this manual for field office addresses.

7-7. Specify the following information for each part when ordering:

a. Instrument model and serial number.

b. Hewlett-Packard part number.

c. Description.

d. Circuit reference designation.

7-8. To order a part not listed in Table 7-2 give a complete description of the part and include its function and location.

Table 7-1. Reference Designations and Abbreviations

REFERENCE DESIGNATIONS

A = assembly	J = receptacle connector	TB = terminal board
B = motor	K = relay	TP = test point
BT = battery	L = inductor	U = integrated circuit
C = capacitor	M = meter	V = vacuum tube, neon bulb, photocell, etc.
CP = coupler	MC = microcircuit	
CR = diode	P = plug connector	VR = voltage regulator
DL = delay line	Q = transistor	W = cable, jumper
DS = device signaling (lamp)	R = resistor	X = socket
E = misc hardware	RT = thermistor	Y = crystal
F = fuse	S = switch	Z = tuned cavity, network
FL = filter	T = transformer	

ABBREVIATIONS

A = amperes	IMPG = impregnated	P/O = part of
AC = alternating current	IN. = inch, inches	POLY = polystyrene
AFC = automatic frequency control	INCD = incandescent	PORC = porcelain
ALUM = aluminum	INCL = include(s)	POS = position(s)
AL-ELECT = aluminum electrolytic	INS = insulation(ed)	POT = potentiometer
ASSY = assembly	INT = internal	PP = peak-to-peak
	I/O = input/output	PT = point
BFO = beat frequency oscillator		PWV = peak working voltage
BE CU = beryllium copper	K = kilo = 1000	
BH = binder head		R = resistor
BP = bandpass	LH = left hand	RECT = rectifier
BRS = brass	LIN = linear taper	RF = radio frequency
BWO = backward wave oscillator	LK WASH = lock washer	RH = round head or right hand
	LOG = logarithmic taper	RMO = rack mount only
C = capacitor	LPF = low pass filter	RMS = root-mean square
CCW = counterclockwise		RWV = reverse working voltage
CER = ceramic	M = milli = 10^{-3}	
CMO = cabinet mount only	MEG = mega = 10^{6}	S-B = slow-blow
COEF = coefficient	MET FLM = metal film	SCR = screw
COM = common	MET OX = metal oxide	SE = selenium
COMP = composition	MFR = manufacturer	SECT = section(s)
COMPL = complete	MHz = megahertz	SEMICON = semiconductor
CONN = connector	MINAT = miniature	SI = silicon
CP = cadmium plate	MOM = momentary	SIL = silver
CRT = cathode-ray tube	MTG = mounting	SL = slide
CTL = capacitor-transistor logic	MY = Mylar	SPDT = single-pole, double-throw
CW = clockwise		SPG = spring
	N = nano (10^{-9})	SPL = special
DC = direct current	N/C = normally closed	SPST = single-pole, single-throw
DEPC = deposited carbon	NE = neon	SR = split ring
DPDT = double-pole, double-throw	NI PL = nickel plate	SST = stainless steel
DPST = double-pole, single-throw	NO. = number	STL = steel
DR = drive	N/O = normally open	
	NPN = negative-positive-negative	TA = tantalum
ELECT = electrolytic		TD = time delay
ENCAP = encapsulated	NPO = negative positive zero (zero temperature coefficient)	TGL = toggle
EXT = external		THD = thread
	NRFR = not recommended for field replacement	TI = titanium
F = farads		TOL = tolerance
FH = flat head	NSR = not separately replaceable	TRIM = trimmer
FIL H = fillister head		TTL = transistor-transistor logic
FXD = fixed	OBD = order by description	TWT = traveling wave tube
	OD = outer diameter	
G = giga (10^{9})	OH = oval head	U (μ) = micro = 10^{-6}
GE = germanium	OX = oxide	
GL = glass		VAR = variable
GND/GRD = ground(ed)	P = peak	VDCW = direct current working volts
	PC = printed circuit	
H = henries	PF = picofarads = 10^{-12} farads	W/ = with
HDW = hardware	PH = Phillips head	W = watts
HEX = hexagonal	PH BRZ = phosphor bronze	WIV = working inverse voltage
HG = mercury	PHL = Phillips	WW = wirewound
HR = hour(s)	PIV = peak inverse voltage	W/O = without
HZ = hertz	PNP = positive-negative-positive	
ID = inner diameter		
IF = intermediate frequency		

Table 7-2. Replaceable Parts

℗ Part No.	Description #	Mfr.	Mfr. Part No.	TQ
				40
0121-0105	C:VAR CER 9-35 PF NPO	28480	0121-0105	1
0140-0151	C:FXD MICA 820 PF 2%	28480	0140-0151	2
0140-0192	C:FXD MICA 68 PF 5%	28480	0140-0192	1
0140-0198	C:FXD MICA 200 PF 5%	28480	0140-0198	2
0140-0208	C:FXD MICA 680 PF 5%	28480	0140-0208	1
0140-0210	C:FXD MICA 270 PF 5%	28480	0140-0210	2
0160-0134	C:FXD MICA 220PF 5% 300VDCW	14655	RDM15F221J3C	4
0160-0154	C:FXD MYLAR 2200PF 10%	28480	0160-0154	32
0160-0168	C:FXD MY 0.1 UF 10% 200VDCW	28480	0160-0168	1
0160-0363	C:FXD MICA 620PF 5%	28480	0160-0363	4
0160-0938	C:FXD MICA 1000PF 5%	28480	0160-0938	17
0160-2055	C:FXD CER 0.01 UF +80-20% 100VDCW	91418	TA	372
0160-2139	C:FXD CER 220 PF +80-20% 1000VDCW	91418	TYPE B	1
0160-2198	C:FXD MICA 20 PF 5%	28480	0160-2198	25
0160-2204	C:FXD MICA 100 PF 5%	28480	0160-2204	4
0160-2307	C:FXD MICA 47 PF 5%	28480	0160-2307	1
0160-3043	C:FXD CER 2 X 0.005 UF 20% 250VAC	56289	29C147A-CDH	2
0170-0019	C:FXD MY 0.1 UF 5% 200VDCW	28480	0170-0019	2
0170-0022	C:FXD MY 0.1UF 20% 600VDCW	09134	TYPE 24	1
0180-0100	C:FXD ELECT 4.7 UF 10% 35VDCW	28480	0180-0100	1
0180-0106	C:FXD ELECT 60 UF 20% 6VDCW	28480	0180-0106	1
0180-0116	C:FXD ELECT 0.8 UF 10% 35VDCW	28480	0180-0116	1
0180-0142	C:FXD ELECT 20UF -10+100% 25VDCW	56289	TYPE 40D D36039	6
0180-0155	C:FXD ELECT 2.2 UF 20% 20VDCW	28480	0180-0155	17
0180-0159	C:FXD ELECT 220 UF 20% 10VDCW	28480	0180-0159	1
0180-0197	C:FXD ELECT 2.2 UF 10% 20VDCW	28480	0180-0197	8
0180-0228	C:FXD ELECT 22 UF 10% 15VDCW	28480	0180-0228	2
0180-0229	C:FXD ELECT 33 UF 10% 10VDCW	28480	0180-0229	1
0180-0291	C:FXD ELECT 1.0 UF 10% 35VDCW	28480	0180-0291	1
0180-0374	C:FXD ELECT 10 UF 10% 20VDCW	28480	0180-0374	25
0180-1714	C:FXD ELECT 330 UF 10% 6VDCW	28480	0180-1714	1
0180-1743	C:FXD ELECT 0.1 UF 10% 35VDCW	28480	0180-1743	1
0180-1746	C:FXD ELECT 15 UF 10% 20VDCW	28480	0180-1746	2
0180-1868	C:FXD ELECT 4900UF +75-10% 40VDCW	28480	0180-1868	1
0180-1875	C:FXD ELECT 100,000UF +75-10% 20VDCW	28480	0180-1875	2
0180-2223	C:FXD ELECT 100,000 UF +75-10% 10VDCW	56289	36D164G010DF2A-DQB	3
0180-2224	C:FXD ELECT 13,000 UF +75-10% 50VDCW	56289	36D133G050BF2A-DQB	2
0180-2225	C:FXD ELECT 270,000 UF +75-10% 3VDCW	56289	36D274G003DF2A-DQB	1
0410-0173	CRYSTAL:QUARTZ 25 OHM	28480	0410-0173	1
0440-0065	SWITCH:THERMOSTAT SPST 75 DEG C	38643	120M	1
0440-0069	SWITCH:THERMOSTAT 43 DEG C	28480	0440-0069	1
0490-0474	RELAY:3PDT 10A 115/32VDC	94696	W88X11	1
0683-0475	R:FXD COMP 4.7 OHM 5% 1/4W	01121	CB 0475	1
0683-1005	R:FXD COMP 10 OHM 5% 1/4W	01121	CB 1005	1
0683-1015	R:FXD COMP 100 OHM 5% 1/4W	01121	CB 1015	49
0683-1025	R:FXD COMP 1000 OHM 5% 1/4W	01121	CB 1025	174
0683-1525	R:FXD COMP 1500 OHM 5% 1/4W	01121	CB 1525	1
0683-1825	R:FXD COMP 1800 OHM 5% 1/4W	01121	CB 1825	3
0683-3015	R:FXD COMP 300 OHM 5% 1/4W	01121	CB 3015	16
0683-3315	R:FXD COMP 330 OHM 5% 1/4W	01121	CB 3315	23
0683-3905	R:FXD COMP 39 OHM 5% 1/4W	01121	CB 3905	1
0683-3915	R:FXD COMP 390 OHM 5% 1/4W	01121	CB 3915	6

 # See introduction to this section for ordering information

Table 7-2. Replaceable Parts (Continued)

Part No.	Description #	Mfr.	Mfr. Part No.	TQ
0683-4715	R:FXD COMP 470 OHM 5% 1/4W	01121	CB 4715	97
0683-5615	R:FXD COMP 560 OHM 5% 1/4W	01121	CB 5615	12
0683-8215	R:FXD COMP 820 OHM 5% 1/4W	01121	CB 8215	5
0686-2215	R:FXD COMP 220 OHM 5% 1/2W	01121	EB 2215	32
0698-0090	R:FXD MET FLM 464 OHM 1% 1/2W	28480	0698-0090	1
0698-3132	R:FXD MET FLM 261 OHM 1% 1/8W	28480	0698-3132	2
0698-3155	R:FXD MET FLM 4.64K OHM 1% 1/8W	28480	0698-3155	18
0698-3390	R:FXD MET FLM 19.6 OHM 1% 1/2W	28480	0698-3390	1
0698-3394	R:FXD MET FLM 31.6 OHM 1% 1/2W	28480	0698-3394	1
0698-3400	R:FXD MET FLM 147 OHM 1% 1/2W	28480	0698-3400	2
0698-3405	R:FXD MET FLM 422 OHM 1% 1/2W	28480	0698-3405	2
0698-3407	R:FXD MET FLM 1.96K OHM 1% 1/2W	28480	0698-3407	1
0698-3415	R:FXD MET FLM 19.6K OHM 1% 1/2W	28480	0698-3415	1
0698-3429	R:FXD MET FLM 19.6 OHM 1% 1/8W	28480	0698-3429	4
0698-3435	R:FXD MET FLM 38.3 OHM 1%1/8W	28480	0698-3435	33
0698-3446	R:FXD MET FLM 383 OHM 1% 1/8W	28480	0698-3446	1
0698-3530	R:FXD MET FLM 470 OHM 0.5% 1/8W	28480	0698-3530	2
0698-3690	R:FXD MET OX 22 OHM 5% 1W	28480	0698-3690	2
0698-4099	R:FXD MET FLM 139 OHM 1% 1/8W	28480	0698-4099	2
0698-5490	R:FXD MET FLM 2K OHM 1% 1/8W	28480	0698-5490	26
0698-5513	R:FXD MET FLM 391 OHM 1% 1/8W	28480	0698-5513	4
0698-7310	R:FXD FLM 1.65K 25% 1/8W	28480	0698-7310	34
0757-0159	R:FXD MET FLM 1000 OHM 1% 1/2W	28480	0757-0159	2
0757-0198	R:FXD MET FLM 100 OHM 1% 1/2W	28480	0757-0198	6
0757-0280	R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280	93
0757-0284	R:FXD MET FLM 150 OHM 1% 1/8W	28480	0757-0284	2
0757-0288	R:FXD MET FLM 9.09K OHM 1% 1/8W	28480	0757-0288	25
0757-0289	R:FXD MET FLM 13.3K OHM 1% 1/8W	28480	0757-0289	24
0757-0346	R:FXD MET FLM 10 OHM 1% 1/8W	28480	0757-0346	1
0757-0401	R:FXD MET FLM 100 OHM 1% 1/8W	28480	0757-0401	85
0757-0407	R:FXD MET FLM 200 OHM 1% 1/8W	28480	0757-0407	1
0757-0416	R:FXD MET FLM 511 OHM 1% 1/8W	28480	0757-0416	1
0757-0417	R:FXD MET FLM 562 OHM 1% 1/8W	28480	0757-0417	2
0757-0419	R:FXD MET FLM 681 OHM 1% 1/8W	28480	0757-0419	18
0757-0440	R:FXD MET FLM 7.50K OHM 1% 1/8W	28480	0757-0440	17
0757-0442	R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442	5
0757-0449	R:FXD FLM 20K OHM 1% 1/8W	28480	0757-0449	25
0757-0458	R:FXD MET FLM 51.1K OHM 1% 1/8W	28480	0757-0458	1
0757-0465	R:FXD MET FLM 100K OHM 1% 1/8W	28480	0757-0465	2
0757-0819	R:FXD MET FLM 909 OHM 1% 1/2W	28480	0757-0819	1
0757-0833	R:FXD MET FLM 5.11K OHM 1% 1/2W	28480	0757-0833	1
0757-0839	R:FXD MET FLM 10K OHM 1% 1/2W	28480	0757-0839	1
0757-0984	R:FXD MET FLM 10.0 OHM 1% 1/2W	28480	0757-0984	6
0757-1000	R:FXD MET FLM 51.1 OHM 1% 1/2W	28480	0757-1000	2
0757-1060	R:FXD MET FLM 196 OHM 1% 1/2W	28480	0757-1060	2
0757-1078	R:FXD MET FLM 1.47K OHM 1% 1/2W	28480	0757-1078	2
0757-1090	R:FXD MET FLM 261 OHM 1% 1/2W	28480	0757-1090	1
0757-1094	R:FXD MET FLM 1.47K OHM 1% 1/8W	28480	0757-1094	1
0811-0040	R:FXD WW 1 OHM 1% 5W	28480	0811-0040	2
0811-1661	R:FXD WW 0.39 OHM 5% 2W	28480	0811-1661	4
0811-1857	R:FXD WW 400 OHM 5% 5W	28480	0811-1857	1
0811-2084	R:FXD WW 43 OHM 1% 5W	28480	0811-2084	21
0811-2490	R:FXD WW 0.1 OHM 3% 5W	28480	0811-2490	1
0811-2646	R:FXD WW 250 OHM 3% 50W	91637	RH-50	1

 # See introduction to this section for ordering information

Table 7-2. Replaceable Parts (Continued)

Part No.	Description #	Mfr.	Mfr. Part No.	TQ
0811-2647	R:FXD WW 200 OHM 3% 12.5W	91637	RH-10	2
0811-2648	R:FXD WW 5 OHM 3% 12.5W	91637	RH-10	1
0811-2649	R:FXD WW 2 OHM 3% 12.5W	91637	RH-10	1
0811-2650	R:FXD WW 50 OHM 3% 12.5W	91637	RH-10	2
0842-0001	VARISTOR:110 VDC	04773	RY-58	1
1200-0199	SOCKET:CRYSTAL	91506	8000-AG9	1
1251-0315	CONN:MALE 3 WIRE 250V 10A	83315	7556-G	1
1251-0498	CONNECTOR:PC 22 CONTACTS	28480	1251-0498	1
1400-0084	FUSEHOLDER:EXTRACTOR POST TYPE	79515	342014	1
1820-0054	INTEGRATED CIRCUIT:QUAD2-INPUT NAND	01295	SN7400N	10
1820-0063	INTEGRATED CIRCUIT: TTL	56289	USN7451A	4
1820-0065	INTEGRATED CIRCUIT: TTL	01295	SN7470N	1
1820-0068	INTEGRATED CIRCUIT: TTL	56289	USN7410A	1
1820-0070	INTEGRATED CIRCUIT: TTL	01295	SN7430A	10
1820-0071	INTEGRATED CIRCUIT:4-INPUT DR NAND	01295	SN7440N	25
1820-0074	INTEGRATED CIRCUIT:4WIDE,2INPT INVERT	01295	SN7454N	1
1820-0075	INTEGRATED CIRCUIT:JK MASTER SLAVE F/F	01295	SN7473N	3
1820-0077	INTEGRATED CIRCUIT:"D"EDGE TRIGGER F/F	01295	SN7474N	62
1820-0084	INTEGRATED CIRCUIT: TTL	01295	SN7453N	1
1820-0085	INTEGRATED CIRCUIT:TTL	28480	1820-0085	1
1820-0105	INTEGRATED CIRCUIT:VOLTAGE REGULATOR	28480	1820-0105	1
1820-0111	INTEGRATED CIRCUIT:TTL	28480	1820-0111	2
1820-0125	INTEGRATED CIRCUIT:DUAL COMPARATOR	07263	U5F771139X	7
1820-0127	INTEGRATED CIRCUIT:TTL	28480	1820-0127	50
1820-0129	INTEGRATED CIRCUIT:TTL	28480	1820-0129	12
1820-0130	INTEGRATED CIRCUIT:TTL	28480	1820-0130	41
1820-0132	INTEGRATED CIRCUIT: TTL	07263	U6A901659X	4
1820-0137	INTEGRATED CIRCUIT	28480	1820-0137	17
1820-0301	INTEGRATED CIRCUIT:QUAD BISTABLE LATCH	01295	SN7475N	4
1820-0305	INTEGRATED CIRCUIT:BINARY FULL ADDER	01295	SN7483N	4
1820-0310	INTEGRATED CIRCUIT: DTL	07263	U6A996259X	17
1820-0327	INTEGRATED CIRCUIT:QUAD 2-INPT NAND	01295	SN7401N	92
1820-0328	INTEGRATED CIRCUIT:QUAD 2-INPT NOR	01295	SN7402N	1
1820-0370	INTEGRATED CIRCUIT:TTL	28480	1820-0370	7
1820-0371	INTEGRATED CIRCUIT:TTL	28480	1820-0371	1
1820-0372	INTEGRATED CIRCUIT: TTL	01295	SN74H11N	20
1820-0374	INTEGRATED CIRCUIT:TTL	28480	1820-0374	25
1820-0377	INTEGRATED CIRCUIT:TTL	28480	1820-0377	1
1820-0378	INTEGRATED CIRCUIT:TTL	28480	1820-0378	8
1820-0379	INTEGRATED CIRCUIT:TTL	28480	1820-0379	2
1820-0380	INTEGRATED CIRCUIT:TTL	28480	1820-0380	1
1820-0381	INTEGRATED CIRCUIT:TTL	28480	1820-0381	1
1820-0382	INTEGRATED CIRCUIT:TTL	28480	1820-0382	3
1820-0383	INTEGRATED CIRCUIT:TTL	28480	1820-0383	5
1820-0384	INTEGRATED CIRCUIT:TTL	28480	1820-0384	1
1820-0956	INTEGRATED CIRCUIT: CTL	07263	SL3459	25
1853-0012	TRANSISTOR:PNP SILICON 2N2904A	04713	2N2904A	2
1853-0013	TRANSISTOR:2N2904	01295	2N2904	1
1853-0016	TRANSISTOR:SILICON PNP 2N3638	07263	2N3638	2
1853-0036	TRANSISTOR:SILICON PNP	04713	SP-3612	61
1853-0052	TRANSISTOR:SILICON PNP	04713	2N3740	1
1854-0013	TRANSISTOR:NPN SILICON 2N2218A	04713	2N2218A	32

 # See introduction to this section for ordering information

Table 7-2. Replaceable Parts (Continued)

hp Part No.	Description #	Mfr.	Mfr. Part No.	TQ
1854-0053	TRANSISTOR:SILICON NPN 2N2218	04713	2N2218	5
1854-0094	TRANSISTOR:SILICON NPN	07263	YPE2N3646	6
1854-0215	TRANSISTOR:SILICON NPN	04713	SPS3611	93
1854-0246	TRANSISTOR:SILICON NPN	07263	2N3643	101
1854-0264	TRANSISTOR:SILICON NPN	04713	2N3715	2
1854-0410	TRANSISTOR:SILICON NPN	04713	SJ2017	5
1901-0025	DIODE:SILICON 100WV 100MA	28480	1901-0025	16
1901-0028	DIODE:SILICON 0.75A 400PIV	28480	1901-0028	5
1901-0033	DIODE:SILICON 100MA 180WV	28480	1901-0033	1
1901-0040	DIODE:SILICON 30MA 30WV	07263	FDG1088	138
1901-0050	DIODE:SILICON 75V	28480	1901-0050	21
1901-0164	DIODE:SILICON 200PIV 3A	04713	1N4721	15
1901-0344	DIODE:SILICON	28480	1901-0344	2
1901-0495	DIODE:SILICON 50PIV 12A	28480	1901-0495	2
1901-0499	DIODE:SILICON 400 PIV 12A	04713	MR1124	4
1902-0049	DIODE,BREAKDOWN: 6.19V 5%	28480	1902-0049	2
1902-3043	DIODE:BREAKDOWN 3.32V 2% 400MW	28480	1902-3043	1
1902-3048	DIODE BREAKDOWN:SILICON 3.48V 5%	28480	1902-3048	1
1902-3104	DIODE BREAKDOWN:5.62V 5%	28480	1902-3104	2
1902-3182	DIODE BREAKDOWN:SILICON 12.1V 5%	28480	1902-3182	1
1910-0022	DIODE:GERMANIUM 5 WIV	28480	1910-0022	78
1910-0034	DIODE:GERMANIUM 25V	28480	1910-0034	49
2100-1755	R:VAR WW 100 OHM 10% LIN 1/2W	28480	2100-1755	2
2100-1756	R:VAR WW 200 OHM 10% LIN 1/2W	28480	2100-1756	1
2100-1761	R:VAR WW 10K OHM 10% LIN 1/2W	28480	2100-1761	1
2110-0010	FUSE:CARTRIDGE 3 AG 5 AMP 250V MAX	75915	312005	2
2110-0036	FISE:CARTRIDGE 8 AMP 125V	75915	312008	2
2110-0055	FUSE:CARTRIDGE 4 AMP 250V	75915	312006	2
2140-0217	LAMP:INCD 2.7V 0.06A	92966	2303	1
2140-0240	LAMP:INCD 28V 0.04A	71744	CM-385	63
3101-0030	SWITCH:TOG SPST 15 AMP 125 VAC	88140	8906K368	1
3101-0932	SWITCH:SLIDE DPDT 0.5A 125V AC/DC	79727	GG350-0001	6
3160-0072	FAN:TUBEAXIAL 115V 60 HZ	28480	3160-0072	2
8159-0005	JUMPER WIRE	28480	8159-0005	23
9100-1226	TRANSFORMER:PULSE	28480	9100-1226	16
9100-1235	TRANSFORMER:POWER	28480	9100-1235	1
9100-1934	LINEFILTER	28480	9100-1943	1
9140-0137	COIL:FXD RF 1 MH 5%	28480	9140-0137	26
02114-6003	SHIFT LOGIC	04404	02114-6003	1
02114-6005	SENSE AMPLIFIER	04404	02114-6005	2
02114-6007	I/O CONTROL	28480	02114-6007	1
02114-6009	DISPLAY CARD	04404	02114-6009	1
02114-6010	REGULATOR CARD	04404	02114-6010	1
02114-6013	CAPACITOR BOARD	04404	02114-6013	1
02114-6021	PROXIMITY SWITCH ASSY.	28480	02114-6021	25
02114-60424	ARITHMETIC LOGIC	28480	02114-60424	4
02114-60425	INSTRUCTION DECODER	28480	02114-60425	1
02114-60426	TIMING GENERATOR	28480	02114-60426	1
02114-60427	DRIVER SWITCH	28480	02114-60427	2
02114-60429	INHIBIT DRIVER	28480	02114-60429	1
02115-6042	CORE MEMORY STACK ASSY (4K)	04404	02115-6042	1

 # See introduction to this section for ordering information

Table 7-3. Code List of Manufacturers

The following code numbers are from the Federal Supply Code for Manufacturers Cataloging Handbooks H4-1 (Name to Code) and H4-2 (Code to Name) and their latest supplements. The date of revision and the date of the supplements used appear at the bottom of each page. Alphabetical codes have been arbitrarily assigned to suppliers not appearing in the H4 Handbooks.

Code No.	Manufacturer	Address
00000	U. S. A. Common	Any supplier of U.S.
00136	McCoy Electronics	Mount Holly Springs, Pa.
00213	Sage Electronics Corp.	Rochester, N.Y.
00287	Cemco Inc.	Danielson, Conn
00334	Humidial	Colton, Calif.
00348	Microtron Co., Inc.	Valley Stream, N.Y.
00373	Garlock Inc	Cherry Hill, N.J.
00656	Aerovox Corp.	New Bedford, Mass.
00779	Amp Inc.	Harrisburg, Pa.
00781	Aircraft Radio Corp.	Boonton, N.J.
00815	Northern Engineering Laboratories, Inc.	Burlington, Wis.
00853	Sangamo Electric Co , Pickens Div.	Pickens, S.C.
00866	Goe Engineering Co.	City of Industry, Cal.
00891	Carl E. Holmes Corp.	Los Angeles, Calif.
00929	Microlab Inc.	Livingston, N.J.
01002	General Electric Co., Capacitor Dept.	Hudson Falls, N.Y.
01009	Alden Products Co	Brockton, Mass.
01121	Allen Bradley Co.	Milwaukee, Wis.
01255	Litton Industries, Inc.	Beverly Hills, Calif.
01281	TRW Semiconductors, Inc.	Lawndale, Calif.
01295	Texas Instruments, Inc., Transistor Products Div.	Dallas, Texas
01349	The Alliance Mfg. Co.	Alliance, Ohio
01589	Pacific Relays, Inc.	Van Nuys, Calif.
01670	Gudebrod Bros Silk Co.	New York, N.Y.
01930	Amerock Corp.	Rockford, Ill.
01961	Pulse Engineering Co.	Santa Clara, Calif.
02114	Ferroxcube Corp. of America	Saugerties, N.Y.
02116	Wheelock Signals, Inc.	Long Branch, N.J.
02286	Cole Rubber and Plastics Inc.	Sunnyvale, Calif.
02660	Amphenol-Borg Electronics Corp.	Broadview, Ill.
02735	Radio Corp. of America, Semiconductor and Materials Div	Somerville, N.J.
02771	Vocaline Co. of America, Inc.	Old Saybrook, Conn.
02777	Hopkins Engineering Co	San Fernando, Calif.
02875	Hudson Tool & Die Co	Newark, N.J.
03508	G E. Semiconductor Prod. Dept.	Syracuse, N.Y.
03705	Apex Machine & Tool Co.	Dayton, Ohio
03797	Eldema Corp	Compton, Calif.
03818	Parker Seal Co	Los Angeles, Calif.
03877	Transitron Electric Corp	Wakefield, Mass.
03888	Pyrofilm Resistor Co., Inc.	Cedar Knolls, N.J.
03954	Singer Co., Diehl Div. Finderne Plant	Sumerville, N.J.
04009	Arrow, Hart and Hegeman Elect. Co.	Hartford, Conn.
04013	Taurus Corp.	Lambertville, N.J.
04062	Arco Electronic Inc	Great Neck, N.Y.
04222	Hi-Q Division of Aerovox	Myrtle Beach, S.C.
04354	Precision Paper Tube Co	Wheeling, Ill.
04404	Dymec Division of Hewlett-Packard Co.	Palo Alto, Calif.
04651	Sylvania Electric Products, Microwave Device Div.	Mountain View, Calif.
04673	Dakota Engr. Inc.	Culver City, Calif.
04713	Motorola, Inc , Semiconductor Prod. Div.	Phoenix, Arizona
04732	Filtron Co., Inc. Western Div.	Culver City, Calif.
04773	Automatic Electric Co	Northlake, Ill.
04796	Sequoia Wire Co	Redwood City, Calif.
04811	Precision Coil Spring Co.	El Monte, Calif.
04870	P.M. Motor Company	Westchester, Ill.
04919	Component Mfg. Service Co.	W. Bridgewater, Mass.
05006	Twentieth Century Plastics, Inc.	Los Angeles, Calif.
05245	Components Corp.	Chicago, Ill.
05277	Westinghouse Electric Corp. Semi-Conductor Dept	Youngwood, Pa.
05347	Ultronix, Inc.	San Mateo, Calif.
05397	Union Carbide Corp., Elect. Div.	New York, N.Y.
05574	Viking Ind. Inc	Canoga Park, Calif.
05593	Icore Electro-Plastics Inc.	Sunnyvale, Calif.
05616	Cosmo Plastic (c/o Electrical Spec. Co.)	Cleveland, Ohio
05624	Barber Colman Co.	Rockford, Ill.
05728	Tiffen Optical Co	Roslyn Heights, Long Island, N.Y.
05729	Metro-Tel Corp.	Westbury, N.Y.
05783	Stewart Engineering Co.	Santa Cruz, Calif.
05820	Wakefield Engineering Inc.	Wakefield, Mass.
06004	Bassick Co., Div. of Stewart Warner Corp.	Bridgeport, Conn.
06090	Raychem Corp	Redwood City, Calif.
06175	Bausch and Lomb Optical Co.	Rochester, N.Y.
06402	E.T.A. Products Co. of America	Chicago, Ill.
06540	Amatom Electronic Hardware Co , Inc.	New Rochelle, N.Y.
06555	Beede Electrical Instrument Co., Inc.	Penacook, N.H.
06666	General Devices Co., Inc.	Indianapolis, Ind.
06751	Components Inc., Ariz. Div.	Phoenix, Ariz.
06812	Torrington Mfg. Co , West Div.	Van Nuys, Calif.
06980	Varian Assoc Eimac Div.	San Carlos, Calif.
07088	Kelvin Electric Co.	Van Nuys, Calif.
07126	Digitran Co.	Pasadena, Calif.
07137	Transistor Electronics Corp.	Minneapolis, Minn.
07138	Westinghouse Electric Corp Electronic Tube Div.	Elmira, N.Y.
07149	Filmohm Corp.	New York, N.Y.
07233	Cinch-Graphik Co	City of Industry, Calif.
07256	Silicon Transistor Corp.	Carle Place, N.Y.
07261	Avnet Corp	Culver City, Calif.
07263	Fairchild Camera & Inst Corp. Semiconductor Div.	Mountain View, Calif.
07322	Minnesota Rubber Co	Minneapolis, Minn.
07387	Birtcher Corp , The	Monterey Park, Calif.
07397	Sylvania Elect Prod. Inc., Mt. View Operations	Mountain View, Calif.
07700	Technical Wire Products Inc	Cranford, N.J.
07829	Bodine Elect. Co.	Chicago, Ill.
07910	Continental Device Corp	Hawthorne, Calif.
07933	Raytheon Mfg Co., Semiconductor Div.	Mountain View, Calif.
07980	Hewlett-Packard Co., Boonton Radio Div.	Rockaway, N J.
08145	U.S Engineering Co	Los Angeles, Calif.
08289	Blinn, Delbert Co	Pomona, Calif.
08358	Burgess Battery Co.	Niagara Falls, Ontario, Canada
08524	Deutsch Fastener Corp.	Los Angeles, Calif.
08664	Bristol Co , The	Waterbury, Conn.
08717	Sloan Company	Sun Valley, Calif.
08718	ITT Cannon Electric Inc , Phoenix Div.	Phoenix, Arizona
08727	National Radio Lab Inc	Paramus, N.J.
08792	CBS Electronics Semiconductor Operations, Div of C.B S. Inc.	Lowell, Mass.
08806	General Electric Co. Minat. Lamp Dept.	Cleveland, Ohio
08984	Mel-Rain	Indianapolis, Ind.
09026	Babcock Relays Div	Costa Mesa, Calif.
09134	Texas Capacitor Co.	Houston, Texas
09145	Tech Ind Inc Atohm Elect.	Burbank, Calif.
09250	Electro Assemblies, Inc.	Chicago, Ill
09353	C & K Components Inc.	Newton, Mass.
09569	Mallory Battery Co. of Canada, Ltd.	Toronto, Ontario, Canada
09922	Burndy Corp.	Norwalk, Conn.
10214	General Transistor Western Corp.	Los Angeles, Calif.
10411	Ti-Tal, Inc.	Berkeley, Calif.
10646	Carborundum Co	Niagara Falls, N.Y.
11236	CTS of Berne, Inc.	Berne, Ind.
11237	Chicago Telephone of California, Inc.	So. Pasadena, Calif.
11242	Bay State Electronics Corp.	Waltham, Mass.
11312	Teledyne Inc , Microwave Div.	Palo Alto, Calif.
11314	National Seal	Downey, Calif.
11453	Precision Connector Corp.	Jamaica, N.Y.
11534	Duncan Electronics Inc.	Costa Mesa, Calif.
11711	General Instrument Corp., Semiconductor Div., Products Group	Newark, N.J.
11717	Imperial Electronic, Inc.	Buena Park, Calif.
11870	Melabs, Inc	Palo Alto, Calif.
12040	National Semiconductor	Danbury, Conn
12136	Philadelphia Handle Co.	Camden, N.J.
12361	Grove Mfg. Co., Inc.	Shady Grove, Pa.
12574	Gulton Ind. Inc. Data System Div.	Albuquerque, N.M.
12697	Clarostat Mfg Co.	Dover, N.H.
12728	Elmar Filter Corp.	W. Haven, Conn.
12859	Nippon Electric Co , Ltd.	Tokyo, Japan
12881	Metex Electronics Corp.	Clark, N.J.
12930	Delta Semiconductor Inc.	Newport Beach, Calif.
12954	Dickson Electronics Corp.	Scottsdale, Arizona
13103	Thermalloy	Dallas, Texas
13396	Telefunken (GmbH)	Hanover, Germany
13835	Midland-Wright Div. of Pacific Industries, Inc.	Kansas City, Kansas
14099	Sem-Tech	Newbury Park, Calif.
14193	Calif. Resistor Corp	Santa Monica, Calif.
14298	American Components, Inc.	Conshohocken, Pa.
14433	ITT Semiconductor, A Div. of Int. Telephone & Telegraph Corp.	West Palm Beach, Fla.
14493	Hewlett-Packard Company	Loveland, Colo
14655	Cornell Dubilier Electric Corp.	Newark, N.J.
14674	Corning Glass Works	Corning, N.Y.
14752	Electro Cube Inc	San Gabriel, Calif.
14960	Williams Mfg. Co.	San Jose, Calif.
15203	Webster Electronics Co.	New York, N.Y.
15287	Scionics Corp	Northridge, Calif.
15291	Adjustable Bushing Co.	N. Hollywood, Calif.
15558	Micron Electronics	Garden City, Long Island, N.Y.
15566	Amprobe Inst. Corp.	Lynbrook, N.Y.
15631	Cabletronics	Costa Mesa, Calif.
15772	Twentieth Century Coil Spring Co.	Santa Clara, Calif.
15801	Fenwal Elect. Inc.	Framingham, Mass.
15818	Amelco Inc.	Mt. View, Calif.
16037	Spruce Pine Mica Co.	Spruce Pine, N.C.
16179	Omni-Spectra Inc	Farmington, Mich.
16352	Computer Diode Corp.	Lodi, N.J.
16585	Boots Aircraft Nut Corp.	Pasadena, Calif.
16688	Ideal Prec Meter Co., Inc. De Jur Meter Div.	Brooklyn, N.Y.
16758	Delco Radio Div. of G.M. Corp.	Kokoma, Ind.
17109	Thermonetics Inc.	Canoga Park, Calif.
17474	Tranex Company	Mountain View, Calif.
17554	Components Inc.	Biddeford, Ma.
17675	Hamlin Metal Products Corp.	Akron, Ohio
17745	Angstrohm Prec. Inc.	No Hollywood, Calif.

Table 7-3. Code List of Manufacturers (Continued)

Code No.	Manufacturer	Address
17870	McGraw-Edison Co.	Manchester, N.H.
18042	Power Design Pacific Inc.	Palo Alto, Calif.
18083	Clevite Corp., Semiconductor Div.	Palo Alto, Calif.
18324	Signetics Corp.	Sunnyvale, Calif.
18476	Ty-Car Mfg. Co., Inc.	Holliston, Mass.
18486	TRW Elect Comp. Div.	Des Plaines, Ill.
18583	Curtis Instrument, Inc.	Mt. Kisco, N.Y.
18612	Vishay Instruments Inc.	Malvern, Pa.
18873	E.I. DuPont and Co., Inc.	Wilmington, Del.
18911	Durant Mfg. Co.	Milwaukee, Wis.
19315	The Bendix Corp., Navigation & Control Div.	Teterboro, N.J.
19500	Thomas A. Edison Industries, Div. of McGraw-Edison Co.	West Orange, N.J.
19589	Concoa	Baldwin Park, Calif.
19644	LRC Electronics	Horseheads, N.Y.
19701	Electra Mfg. Co.	Independence, Kansas
20183	General Atronics Corp.	Philadelphia, Pa.
21226	Executone, Inc.	Long Island City, N.Y.
21335	Fafnir Bearing Co., The	New Britain, Conn.
21520	Fansteel Metallurgical Corp.	N. Chicago, Ill.
23042	Texscan Corp.	Indianapolis, Ind.
23783	British Radio Electronics Ltd.	Washington, D.C.
24455	G.E. Lamp Division	Nela Park, Cleveland, Ohio
24655	General Radio Co.	West Concord, Mass.
24681	Memcor Inc., Comp. Div.	Huntington, Ind.
24796	Parelco Inc.	San Juan Capistrano, Calif.
26365	Gries Reproducer Corp.	New Rochelle, N.Y.
26462	Grobet File Co of America, Inc.	Carlstadt, N.J.
26851	Compac/Hollister Co.	Hollister, Calif.
26992	Hamilton Watch Co.	Lancaster, Pa.
27251	Specialities Mfg. Co, Inc.	Stratford, Conn.
28480	Hewlett-Packard Co.	Palo Alto, Calif.
28520	Heyman Mfg. Co.	Kenilworth, N.J.
30817	Instrument Specialties Co., Inc.	Little Falls, N.J.
33173	G.E. Receiving Tube Dept.	Owensboro, Ky.
35434	Lectrohm Inc.	Chicago, Ill.
36196	Stanwyck Coil Products Ltd.	Hawkesbury, Ontario, Canada
36287	Cunningham, W.H. & Hill, Ltd.	Toronto Ontario, Canada
37942	P.R. Mallory & Co. Inc.	Indianapolis, Ind.
39543	Mechanical Industries Prod. Co.	Akron, Ohio
40920	Miniature Precision Bearings, Inc.	Keene, N.H.
42190	Muter Co.	Chicago, Ill.
43990	C.A. Norgren Co.	Englewood, Colo.
44655	Ohmite Mfg. Co.	Skokie, Ill.
46384	Penn Eng. & Mfg. Corp.	Doylestown, Pa.
47904	Polaroid Corp.	Cambridge, Mass.
48620	Precision Thermometer & Inst. Co.	Southampton, Pa.
49956	Microwave & Power Tube Div.	Waltham, Mass.
52090	Rowan Controller Co.	Westminster, Md.
52983	Sanborn Company	Waltham, Mass.
54294	Shallcross Mfg. Co.	Selma, N.C.
55026	Simpson Electric Co.	Chicago, Ill.
55933	Sonotone Corp	Elmsford, N.Y.
55938	Raytheon Co. Commercial Apparatus & Systems Div	So. Norwalk, Conn.
56137	Spaulding Fibre Co., Inc.	Tonawanda, N.Y.
56289	Sprague Electric Co.	North Adams, Mass.
59446	Telex Corp.	Tulsa, Okla.
59730	Thomas & Betts Co.	Elizabeth, N.J.
60741	Triplett Electrical Inst. Co.	Bluffton, Ohio
61775	Union Switch and Signal, Div. of Westinghouse Air Brake Co.	Pittsburgh, Pa.
62119	Universal Electric Co	Owosso, Mich.
63743	Ward-Leonard Electric Co.	Mt. Vernon, N.Y.
64959	Western Electric Co., Inc.	New York, N.Y.
65092	Weston Inst. Inc. Weston-Newark	Newark, N.J.
66295	Wittek Mfg. Co.	Chicago, Ill.
66346	Minnesota Mining & Mfg. Co. Revere Mincom Div.	St. Paul, Minn.
70276	Allen Mfg Co.	Hartford, Conn
70309	Allied Control	New York, N.Y.
70318	Allmetal Screw Product Co., Inc.	Garden City, N.Y.
70417	Amplex, Div. of Chrysler Corp.	Detroit, Mich.
70485	Atlantic India Rubber Works, Inc	Chicago, Ill.
70563	Amperite Co , Inc.	Union City, N.J.
70674	ADC Products Inc.	Minneapolis, Minn.
70903	Belden Mfg. Co.	Chicago, Ill.
70998	Bird Electronic Corp	Cleveland, Ohio
71002	Birnbach Radio Co	New York, N.Y.
71034	Birley Electric Co., Inc.	Erie, Pa.
71041	Boston Gear Works Div. of Murray Co of Texas	Quincy, Mass.
71218	Bud Radio, Inc.	Willoughby, Ohio
71279	Cambridge Thermionics Corp.	Cambridge, Mass.
71286	Camloc Fastener Corp.	Paramus, N.J.
71313	Cardwell Condenser Corp.	Lindenhurst L.I., N.Y.
71400	Bussmann Mfg. Div. of McGraw-Edison Co.	St. Louis, Mo.
71436	Chicago Condenser Corp.	Chicago, Ill.
71447	Calif. Spring Co , Inc.	Pico-Rivera, Calif.
71450	CTS Corp.	Elkhart, Ind.
71468	ITT Cannon Electric Inc.	Los Angeles, Calif.
71471	Cinema, Div. Aerovox Corp.	Burbank, Calif.
71482	C.P. Clare & Co.	Chicago, Ill.
71590	Centralab Div. of Globe Union Inc.	Milwaukee, Wis.
71616	Commercial Plastics Co	Chicago, Ill.
71700	Cornish Wire Co., The	New York, N.Y.
71707	Coto Coil Co., Inc.	Providence, R.I.
71744	Chicago Miniature Lamp Works	Chicago, Ill.
71785	Cinch Mfg. Co., Howard B. Jones Div.	Chicago, Ill.
71984	Dow Corning Corp.	Midland, Mich
72136	Electro Motive Mfg. Co., Inc.	Willimantic, Conn.
72619	Dialight Corp.	Brooklyn, N.Y
72656	Indiana General Corp , Electronics Div.	Keasby, N.J.
72699	General Instrument Corp., Cap. Div.	Newark, N.J.
72765	Drake Mfg Co.	Harwood Heights, Ill.
72825	Hugh H. Eby Inc.	Philadelphia, Pa.
72928	Gudeman Co	Chicago, Ill.
72962	Elastic Stop Nut Corp.	Union, N.J.
72964	Robert M. Hadley Co.	Los Angeles, Calif.
72982	Erie Technological Products, Inc.	Erie, Pa.
73061	Hansen Mfg. Co., Inc.	Princeton, Ind.
73076	H.M. Harper Co.	Chicago, Ill.
73138	Helipot Div. of Beckman Inst., Inc.	Fullerton, Calif.
73293	Hughes Products Division of Hughes Aircraft Co.	Newport Beach, Calif.
73445	Amperex Elect Co.	Hicksville, L.I., N.Y.
73506	Bradley Semiconductor Corp	New Haven, Conn
73559	Carling Electric, Inc	Hartford, Conn.
73586	Circle F Mfg. Co.	Trenton, N.J.
73682	George K Garrett Co., Div MSL Industries Inc.	Philadelphia, Pa.
73734	Federal Screw Products Inc.	Chicago, Ill.
73743	Fischer Special Mfg. Co.	Cincinnati, Ohio
73793	General Industries Co , The	Elyria, Ohio
73846	Goshen Stamping & Tool Co.	Goshen, Ind.
73899	JFD Electronics Corp	Brooklyn, N.Y.
73905	Jennings Radio Mfg. Corp.	San Jose, Calif.
73957	Groov-Pin Corp.	Ridgefield, N.J.
74276	Signalite Inc.	Neptune, N.J.
74455	J.H. Winns, and Sons	Winchester, Mass.
74861	Industrial Condenser Corp.	Chicago, Ill.
74868	R F. Products Division of Amphenol-Borg Electronics Corp.	Danbury, Conn.
74970	E.F Johnson Co.	Waseca, Minn.
75042	International Resistance Co.	Philadelphia, Pa.
75263	Keystone Carbon Co., Inc.	St. Marys, Pa.
75378	CTS Knights Inc.	Sandwich, Ill.
75382	Kulka Electric Corporation	Mt Vernon, N.Y.
75818	Lenz Electric Mfg Co.	Chicago, Ill.
75915	Littlefuse, Inc.	Des Plaines, Ill.
76005	Lord Mfg. Co.	Erie, Pa.
76210	C.W Marwedel	San Francisco, Calif.
76433	General Instrument Corp., Micamold Division	Newark, N.J.
76487	James Millen Mfg Co., Inc.	Malden, Mass.
76493	J.W Miller Co.	Los Angeles, Calif.
76530	Cinch-Monadnock, Div. of United Carr Fastener Corp.	San Leandro, Calif.
76545	Mueller Electric Co.	Cleveland, Ohio
76703	National Union	Newark, N.J.
76854	Oak Manufacturing Co.	Crystal Lake, Ill.
77068	The Bendix Corp., Electrodynamics Div.	N. Hollywood, Calif.
77075	Pacific Metals Co.	San Francisco, Calif.
77221	Phanostran Instrument and Electronic Co.	South Pasadena, Calif.
77252	Philadelphia Steel and Wire Corp.	Philadelphia, Pa.
77342	American Machine & Foundry Co. Potter & Brumfield Div	Princeton, Ind.
77630	TRW Electronic Components Div.	Camden, N.J
77638	General Instrument Corp., Rectifier Div.	Brooklyn, N Y
77764	Resistance Products Co.	Harrisburg, Pa
77969	Rubbercraft Corp. of Calif.	Torrance, Calif.
78189	Shakeproof Division of Illinois Tool Works	Elgin, Ill.
78277	Sigma	So. Braintree, Mass.
78283	Signal Indicator Corp.	New York, N.Y.
78290	Struthers-Dunn Inc.	Pitman, N.J.
78424	Specialty Leather Prod. Co	Newark, N.J.
78452	Thompson-Bremer & Co.	Chicago, Ill.
78471	Tilley Mfg. Co.	San Francisco, Calif.
78488	Stackpole Carbon Co.	St. Marys, Pa.
78493	Standard Thomson Corp.	Waltham, Mass.
78553	Tinnerman Products, Inc.	Cleveland, Ohio
78790	Transformer Engineers	San Gabriel, Calif.
78947	Ucinite Co.	Newtonville, Mass.
79136	Waldes Kohinoor Inc.	Long Island City, N.Y.
79142	Veeder Root, Inc.	Hartford, Conn.
79251	Wenco Mfg Co.	Chicago, Ill.
79727	Continental-Wirt Electronics Corp.	Philadelphia, Pa.
79963	Zierick Mfg. Corp	New Rochelle, N.Y.
80031	Mepco Division of Sessions Clock Co.	Morristown, N.J.
80120	Schnitzer Alloy Products Co.	Elizabeth, N.J.
80131	Electronic Industries Association. Any brand Tube meeting EIA Standards-Washington, DC.	
80207	Unimax Switch, Div. Maxon Electronics Corp.	Wallingford, Conn.
80223	United Transformer Corp	New York, N.Y.
80248	Oxford Electric Corp.	Chicago, Ill.
80294	Bourns Inc.	Riverside, Calif.
80411	Acro Div. of Robertshaw Controls Co.	Columbus, Ohio

Table 7-3. Code List of Manufacturers (Continued)

Code No.	Manufacturer	Address
80486	All Star Products Inc.	Defiance, Ohio
80509	Avery Label Co.	Monrovia, Calif.
80583	Hammarlund Co., Inc.	Mars Hill, N.C.
80640	Stevens, Arnold, Co., Inc.	Boston, Mass.
80813	Dimco Gray Co.	Dayton, Ohio
81030	International Instruments Inc.	Orange, Conn.
81073	Grayhill Co.	LaGrange, Ill.
81095	Triad Transformer Corp.	Venice, Calif.
81312	Winchester Elec. Div. Litton Ind., Inc.	Oakville, Conn.
81349	Military Specification	. . . . .
81483	International Rectifier Corp.	El Segundo, Calif.
81541	Airpax Electronics, Inc.	Cambridge, Maryland
81860	Barry Controls, Div. Barry Wright Corp.	Watertown, Mass.
82042	Carter Precision Electric Co.	Skokie, Ill.
82047	Sperti Faraday Inc., Copper Hewitt Electric Div.	Hoboken, N.J.
82116	Electric Regulator Corp.	Norwalk, Conn.
82142	Jeffers Electronics Division of Speer Carbon Co.	Du Bois, Pa.
82170	Fairchild Camera & Inst. Corp. Space & Defense System Div.	Paramus, N.J.
82209	Maguire Industries, Inc.	Greenwich, Conn.
82219	Sylvania Electric Prod. Inc. Electronic Tube Division	Emporium, Pa.
82376	Astron Corp.	East Newark, Harrison, N,J,
82389	Switchcraft, Inc.	Chicago, Ill.
82647	Metals & Controls Inc. Spencer Products	Attleboro, Mass.
82768	Phillips-Advance Control Co.	Joliet, Ill.
82866	Research Products Corp.	Madison, Wis.
82877	Rotron Mfg. Co., Inc.	Woodstock, N.Y.
82893	Vector Electronic Co.	Glendale, Calif.
83014	Hartwell Corp	Los Angeles, Calif.
83058	Carr Fastener Co.	Cambridge, Mass.
83086	New Hampshire Ball Bearing, Inc.	Peterborough, N.H.
83125	General Instrument Corp., Capacitor Div.	Darlington, S.C.
83148	ITT Wire and Cable Div.	Los Angeles, Calif.
83186	Victory Eng. Corp.	Springfield, N.J.
83298	Bendix Corp., Red Bank Div.	Red Bank, N.J.
83315	Hubbell Corp.	Mundelein, Ill.
83324	Rosan Inc.	Newport Beach, Calif.
83330	Smith, Herman H., Inc.	Brooklyn, N.Y.
83332	Tech Labs	Palisade's Park, N.J.
83385	Central Screw Co.	Chicago, Ill.
83501	Gavitt Wire and Cable Co. Div. of Amerace Corp.	Brookfield, Mass.
83594	Burroughs Corp. Electronic Tube Div.	Plainfield, N.J.
83740	Union Carbide Corp. Consumer Prod. Div.	New York, N.Y.
83777	Model Eng. and Mfg., Inc.	Huntington, Ind.
83821	Loyd Scruggs Co.	Festus, Mo.
83942	Aeronautical Inst. & Radio Co.	Lodi, N.J.
84171	Arco Electronics Inc.	Great Neck, N.Y.
84396	A.J. Glesener Co., Inc.	San Francisco, Calif.
84411	TRW Capacitor Div.	Ogallala, Neb.
84970	Sarkes Tarzian, Inc.	Bloomington, Ind.
85454	Boonton Molding Company	Boonton, N.J.
85471	A.B. Boyd Co.	San Francisco, Calif.
85474	R.M. Bracamonte & Co.	San Francisco, Calif.
85660	Koiled Kords, Inc.	Hamden, Conn.
85911	Seamless Rubber Co.	Chicago, Ill.
86174	Fafnir Bearing Co.	Los Angeles, Calif.
86197	Clifton Precision Products Co., Inc.	Clifton Heights, Pa.
86579	Precision Rubber Products Corp.	Dayton, Ohio
86684	Radio Corp. of America, Electronic Comp. & Devices Div.	Harrison, N.J.
86928	Seastrom Mfg. Co.	Glendale, Calif.
87034	Marco Industries	Anaheim, Calif.
87216	Philco Corporation (Lansdale Division)	Lansdale, Pa.
87473	Western Fibrous Glass Products Co.	San Francisco, Calif.
87664	Van Waters & Rogers Inc.	San Francisco, Calif.
87930	Tower Mfg. Corp.	Providence, R.I.
88140	Cutler-Hammer, Inc.	Lincoln, Ill.
88220	Gould-National Batteries, Inc.	St. Paul, Minn.
88698	General Mills, Inc.	Buffalo, N.Y.
89231	Graybar Electric Co.	Oakland, Calif.
89473	G.E. Distributing Corp.	Schenectady, N.Y.
89665	United Transformer Co.	Chicago, Ill.
90030	United Shoe Machinery Corp.	Beverly, Mass.
90179	US Rubber Co., Consumer Ind. & Plastics Prod. Div.	Passaic, N.J.
90970	Bearing Engineering Co.	San Francisco, Calif.
91146	ITT Cannon Elect, Inc., Salem Div.	Salem, Mass.
91260	Connor Spring Mfg. Co.	San Francisco, Calif.
91345	Miller Dial & Nameplate Co.	El Monte, Calif.
91418	Radio Materials Co.	Chicago, Ill.
91506	Augat Inc.	Attleboro, Mass.
91637	Dale Electronics, Inc.	Columbus, Nebr.
91662	Elco Corp.	Willow Grove, Pa.
91737	Gremar Mfg. Co., Inc.	Wakefield, Mass.
91827	K F Development Co.	Redwood City, Calif.
91886	Malco Mfg. Co., Inc.	Chicago, Ill.
91929	Honeywell Inc., Micro Switch Div.	Freeport, Ill.
91961	Nahm-Bros. Spring Co.	Oakland, Calif.
92180	Tru-Connector Corp.	Peabody, Mass.
92367	Elgeet Optical Co. Inc.	Rochester, N.Y.
92607	Tensolite Insulated Wire Co., Inc.	Tarrytown, N.Y.
92702	IMC Magnetics Corp.	Wesbury Long Island, N.Y.
92966	Hudson Lamp Co.	Kearney, N.J.
93332	Sylvania Electric Prod. Inc. Semiconductor Div.	Woburn, Mass.
93369	Robbins & Myers Inc.	Palisades Park, N.J.
93410	Stemco Controls, Div. of Essex Wire Corp.	Mansfield, Ohio
93632	Waters Mfg. Co.	Culver City, Calif.
93929	G V. Controls	Livingston, N.J.
94137	General Cable Corp.	Bayonne, N.J.
94142	Phelps Dodge	Yonkers, N.Y.
94144	Raytheon Co., Comp. Div., Ind. Comp. Operations	Quincy, Mass.
94148	Scientific Electronics Products, Inc.	Loveland, Colo.
94154	Wagner Elect. Corp., Tung-Sol Div.	Newark, N.J.
94197	Curtiss-Wright Corp. Electronics Div.	East Paterson, N.J.
94222	South Chester Corp.	Chester, Pa.
94330	Wire Cloth Products, Inc.	Bellwood, Ill.
94375	Automatic Metal Products Co.	Brooklyn, N.Y.
94682	Worcester Pressed Aluminum Corp.	Worcester, Mass.
94696	Magnecraft Electric Co.	Chicago, Ill.
95023	George A. Philbrick Researchers, Inc.	Boston, Mass.
95236	Allies Products Corp.,	Dania, Fla.
95238	Continental Connector Corp.	Woodside, N.Y.
95263	Leecraft Mfg. Co., Inc.	Long Island, N.Y.
95265	National Coil Co.	Sheridan, Wyo.
95275	Vitramon, Inc.	Bridgeport, Conn.
95348	Gordos Corp.	Bloomfield, N.J.
95354	Methode Mfg. Co.	Rolling Meadows, Ill.
95566	Arnold Engineering Co.	Marengo, Ill.
95712	Dage Electric Co., Inc.	Franklin, Ind.
95984	Siemon Mfg. Co.	Wayne, Ill.
95987	Weckesser Co.	Chicago, Ill.
96067	Microwave Assoc., West Inc.	Sunnyvale, Calif.
96095	Hi-Q Div. of Aerovox Corp.	Olean, N.Y.
96256	Thordarson-Meissner Inc.	Mt. Carmel, Ill.
96296	Solar Manufacturing Co.	Los Angeles, Calif.
96306	Microswitch, Div. of Minn.-Honeywell	Freeport, Ill.
96330	Carlton Screw Co.	Chicago, Ill.
96341	Microwave Associates, Inc.	Burlington, Mass.
96501	Excel Transformer Co.	Oakland, Calif.
96733	San Fernando Elect. Mfg. Co.	San Fernando, Calif.
96881	Thomson Ind. Inc.	Long Is., N.Y.
97464	Industrial Retaining Ring Co.	Irvington, N.J.
97539	Automatic & Precision Mfg.	Englewood, N.J.
97979	Reon Resistor Corp.	Yonkers, N.Y.
97983	Litton System Inc., Adler-Westrex Commun. Div.	New Rochelle, N.Y.
98141	R-Troncis, Inc.	Jamaica, N.Y.
98159	Rubber Teck, Inc.	Gardena, Calif.
98220	Hewlett-Packard Co., Moseley Div.	Pasadena, Calif.
98278	Microdot, Inc.	So. Pasadena, Calif.
98291	Sealectro Corp.	Mamaroneck, N.Y.
98376	Zero Mfg. Co.	Burbank, Calif.
98410	Etc Inc.	Cleveland, Ohio
98731	General Mills Inc., Electronics Div.	Minneapolis, Minn.
98734	Paeco Div. of Hewlett-Packard Co.	Palo Alto, Calif.
98821	North Hills Electronics, Inc.	Glen Cove, N Y.
98978	International Electronic Research Corp.	Burbank, Calif.
99109	Columbia Technical Corp.	New York, N.Y.
99313	Varian Associates	Palo Alto, Calif.
99378	Atlee Corp.	Winchester, Mass.
99515	Marshall Ind., Capacitor Div.	Monrovia, Calif.
99707	Control Switch Division, Controls Co. of America	El Segundo, Calif.
99800	Delevan Electronics Corp.	East Aurora, N.Y.
99848	Wilco Corporation	Indianapolis, Ind.
99928	Branson Corp.	Whippany, N.J.
99934	Renbrandt, Inc.	Boston, Mass.
99942	Hoffman Electronics Corp. Semiconductor Div	El Monte, Calif.
99957	Technology Instrument Corp. of Calif.	Newbury Park, Calif.

THE FOLLOWING HP VENDORS HAVE NO NUMBER ASSIGNED IN THE LATEST SUPPLEMENT TO THE FEDERAL SUPPLY CODE FOR MANUFACTURERS HANDBOOK.

0000F	Malco Tool and Die	Los Angeles, Calif.
0000Z	Willow Leather Products Corp.	Newark, N.J.
000AB	ETA	England
000BB	Precision Instrument Components Co.	Van Nuys, Calif.
000CS	Hewlett-Packard Co., Colorado Springs	Colorado Springs, Colorado
000MM	Rubber Eng. & Development	Hayward, Calif.
000NN	A "N" D Mfg. Co.	San Jose, Calif.
000QQ	Cooltron	Oakland, Calif.
000WW	California Eastern Lab.	Burlington, Calif.
000YY	S.K Smith Co.	Los Angeles, Calif.

APPENDIX A

BASIC LOGIC SYMBOLS

A-1. GENERAL CLASSIFICATIONS.

A-2. Three basic symbol shapes distinguish the major classes of logic circuits. These classes are gates, regenerative switching elements, and amplifiers. Each symbol, and a brief explanation of its operation, is given below. Additional markings on the basic symbols provide additional information, making possible the determination of actual circuit operation.

A-3. INVERSION.

A-4. Logic inversion is indicated by an inversion dot at the input or output of a logic symbol. When this dot appears at the input of a logic symbol, the input will be effective when the input signal is of the opposite polarity to that normally required. When the dot appears at the output of a logic symbol, the output will be of the opposite polarity to that normally delivered.

A-5. GATES.

A-6. A gate is a circuit which produces a binary output when certain input conditions are met. The gate symbol has input lines connecting to the flat side of the symbol, and output lines connecting to the curved side (see Figure A-1). Since the inputs and outputs are easily identifiable, the symbol may be shown left-facing, right-facing, or facing up or down. There are four basic types of gates, AND, OR, NAND, and NOR, each named for the logic function that it performs. Each of these gates is described below.

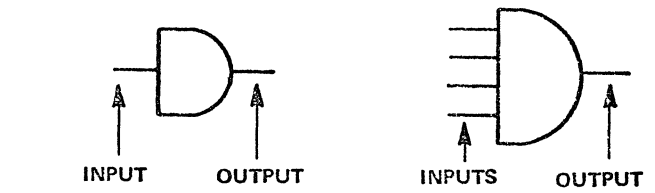
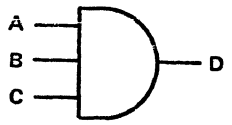


Figure A-1. Gate Symbols

A-7. AND GATE.

A-8. The AND gate performs a logical "and" function. It will produce a logical "true" output only when all of its input lines are true. Input A and input B and input C must be true for a true output to be generated. See Figure A-2 and Table A-1.



2039-26

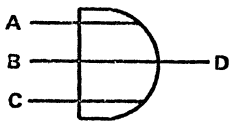
Figure A-2. Three Input "AND" Gate

A	B	C	D
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	1

Table A-1. Truth Table For Three Input ''And'' Gate

A-9. OR GATE.

A-10. The OR gate performs a logical "or" function. It will produce a logical "true" output if one or more of its input lines are true. Input A or input B or input C must be true for a true output to be generated. See Figure A-3 and Table A-2.



2039-27

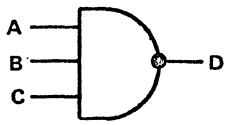
Figure A-3. Three Input "OR" Gate

A	B	C	D
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	1

Table A-2. Truth Table For Three Input ''Or'' Gate

A-11. NAND GATE.

A-12. The NAND gate is similar to the AND gate described above except that its output is inverted. The gate will generate a logical "true" output if one or more of its inputs is false. See Figure A-4 and Table A-3.



2039-28

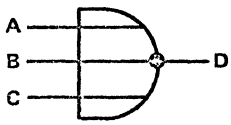
Figure A-4. Three Input "NAND" Gate

A	B	C	D
0	0	0	1
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	0

Table A-3. Truth Table for Three Input ''Nand'' Gate

A-13. NOR GATE.

A-14. The NOR gate is similar to the OR gate described above except that its output is inverted. The gate will generate a logical "false" if one or more of its input lines is true. See Figure A-5 and Table A-4.



2039-29

Figure A-5. Three Input "NOR" Gate

A	B	C	D
0	0	0	1
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	0

Table A-4. Truth Table for Three Input ''Nor'' Gate

A-15. EXPANDER GATES.

A-16. To increase the number of inputs to logic gates an "expander gate is used. To simplify the presentation of a logic gate with an expanded input the symbols shown in Figure A-6 are used. Figure A-7 shows the actual logic configuration. The X and $\overline{X}$ lines are not logical opposites but do carry a voltage differencial. When the expander gate is not conducting (the input conditions A, B, or C false) there is a voltage differential of a few volts across the outputs X and $\overline{X}$. When the expander gate is conducting (the input conditions A, B, and C being true) the differential between the two outputs drops. The two outputs of the expander then act as a true input to the expanded gate. When more than one expander gate is used the expander gate outputs are tied in parallel as shown in Figure A-7.

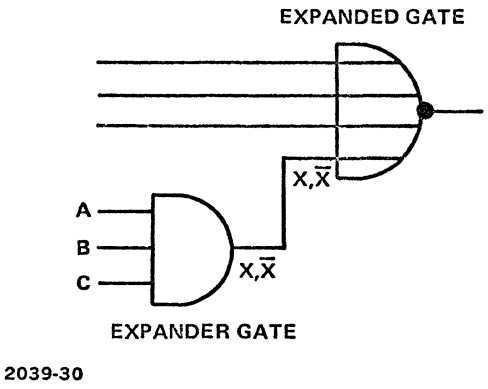


Figure A-6. Simplified Expander Gate Presentation

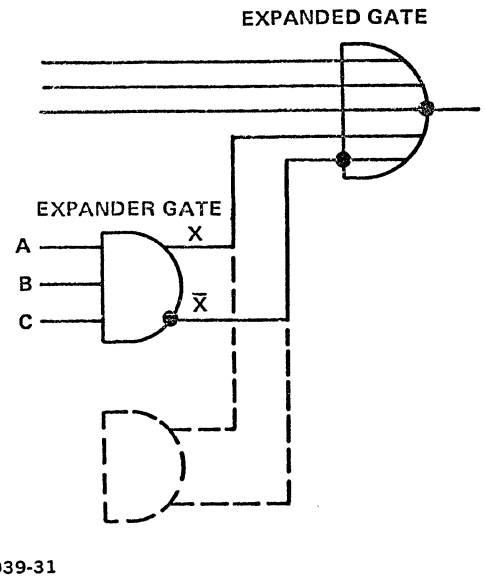


Figure A-7. Actual Expander Gate Configuration

A-17. REGENERATIVE SWITCHING ELEMENTS.

A-18. Regenerative switching elements include the various forms of multivibrator circuits: bistable (flip-flop), monostable (one-shot), and astable (multivibrator). According to the type of circuit, inputs cause the state of the circuit to switch, reversing the outputs (i.e., an output formerly true switches to false, and vice versa). The symbol for regenerative switching circuits is a horizontal rectangle, divided horizontally, with the upper portion representing the "set side" and the lower portion representing the "clear side". A switching element is said to be "set" when the output from the set side is true. It is "clear" when the output from the clear side is true. Inputs are on the left and outputs are on the right (see Figure A-8). To avoid confusion, these switching elements are always drawn facing the same way.

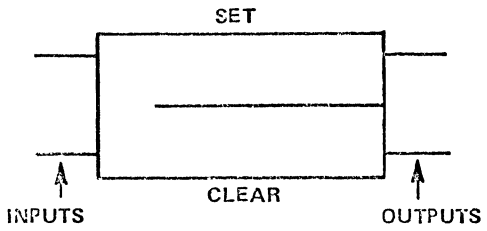


Figure A-8. Switching Element

A-19. FLIP-FLOPS.

A-20. A flip-flop is a bistable switching device, meaning that it takes an external signal to set the flip-flop, and another to clear it. It will remain in its current state until switched to the opposite state by the appropriate external signal. Various forms of flip-flops exist, of which six are described here. The R-S, R-S with clock, J-K, toggle, latch, and delay flip-flops are shown below with their individual switching characteristics. The rules governing the representation of flip-flops allow the type of flip-flop used to be identified. General rules for flip-flops are as follows:

a. A flip-flop is assumed to be the simple R-S type if no toher identification information is provided. When a clock input is added, identifying letters are placed inside the symbol to tell what kind of flip-flop the device is.

b. An input shown connected to the center of the input side of the symbol is a "clock" input, parallel-connected to both the set and clear inputs. This input is effective on the transition of the clocking signal; i.e., on the positive going or negative going edge of the clock pulse. No inversion dot indicates that the input is effective on the positive going edge of the clock pulse, while an inverting dot indicates that the input is effective on the negative going edge of the clock pulse (see Figure A-9).

c. An input to the top of the flip-flop at the input end indicates a direct set input. This input provides a preset or direct set to the flip-flop and operates independently of the flip-flop's clocking signal. An input to the bottom of the flip-flop at the input end indicates a direct clear input. The direct clear allows the flip-flop to be cleared independently of the flip-flop's clocking signal.

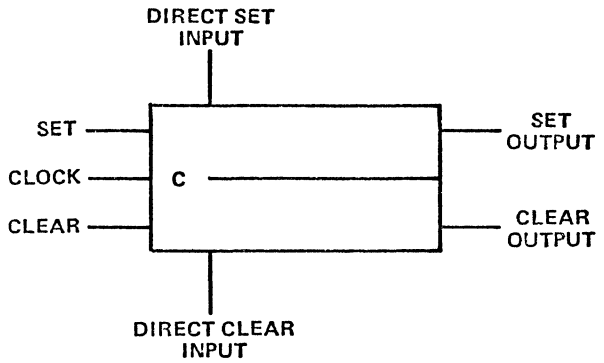


Figure A-9. Flip-Flop (General)

A-21. R-S FLIP-FLOP.

A-22. The R-S flip-flop has a minimum of two inputs, set and clear (A and B), and usually two outputs, set output and clear output (Q and $\overline{Q}$), see Figure A-10. The $\overline{Q}$ letter indicates that the clear output, whether a 1 or a 0, is always the complement of the set output. When Q is true, then $\overline{Q}$ is false and the flip-flop is defined as being in the set state. With Q false and $\overline{Q}$ true, the flip-flop is in the clear state. The flip-flop is set by a true input to A (assuming no inversion dot on the symbol), and is cleared by a true input to B. False inputs have no effect. Simultaneous true inputs to A and B are a forbidden combination, since an indeterminate output state would result. A truth table for the three allowable input combinations is shown in Table A-5.

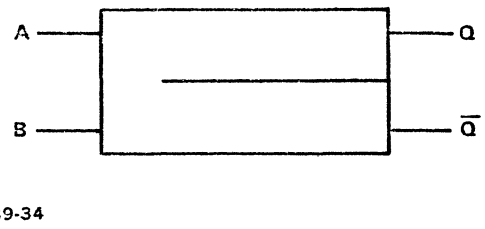


Figure A-10. R-S Flip-Flop

A	B	Q	$\overline{Q}$
0	0	No	Change
1	0	1	0
0	1	0	1

Table A-5. Truth Table for R-S Flip-Flop

A-23. R-S FLIP-FLOP WITH CLOCK.

A-24. This flip-flop is the same as the R-S type described in the preceding paragraph, except for the addition of a clock input (see Figure A-11). A positive input to both A and C is required to set the flip-flop, and a positive input to B and C is required to clear

the flip-flop. Since the clock input operates on a pulse edge, the setting or clearing signals must be present at A or B before the clock pulse transition occurs (see figure A-12).

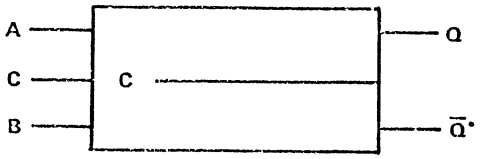


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Figure A-11. R-S Flip-Flop With Clock

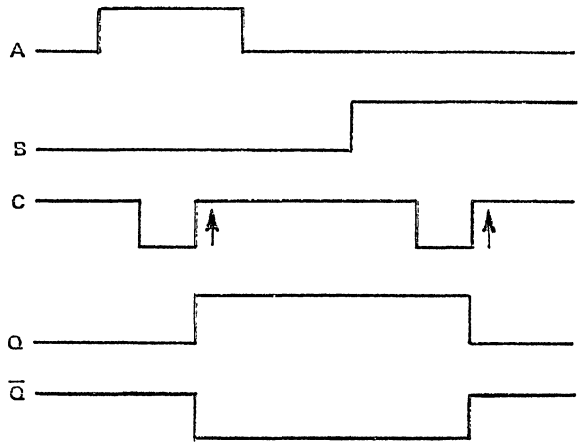

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Figure A-12. Clocked R-S Flip-Flop Switching Waveforms

A-25. When the R-S flip-flop is used with an inverted clock input, the flip-flop switches on the negative going transition of the clock pulse(see paragraph A-20b). The symbol for an R-S flip-flop with an inverted clock is shown in Figure A-13, and the resulting switching waveforms are shown in Figure A-14.

2039-37

Figure A-13. R-S Flip-Flop With an Inverted Clock

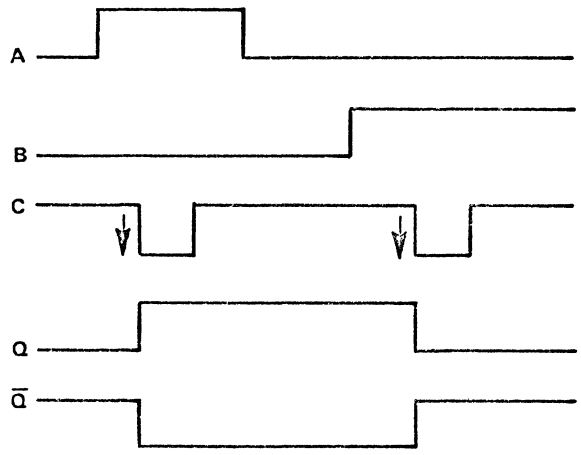

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Figure A-14. Waveforms for R-S Flip-Flop with an Inverted Clock

A-26. J-K FLIP-FLOP.

A-27. In the J-K flip-flop, simultaneous true inputs for both set and clear will reverse the existing state of the flip-flop. This

requires some method of storing two conditions, the previous output state and the new output state, until the clock pulse time. The set and clear inputs are labeled J and K respectively. Two flip-flops are combined in a dual rank configuration to provide the output storage, together with the necessary gates to form a single logic element. For simplicity the internal dual rank arrangement of the flip-flop is not usually shown (see Figure A-15 and Table A-6). The overall operation of the J-K flip-flop is as follows:

a. True input at A only. The positive going edge of clock pulse C stores the input information at A. The negative going edge of the clock pulse then sets the flip-flop.

b. True input at B only. The positive going edge of clock pulse C stores the input information at B. The negative going edge of the clock pulse clears the flip-flop.

c. True inputs at A and B. The positive going edge of clock pulse C stores the input information at A and B. The negative going edge of the clock pulse switches the existing state of the flip-flop.

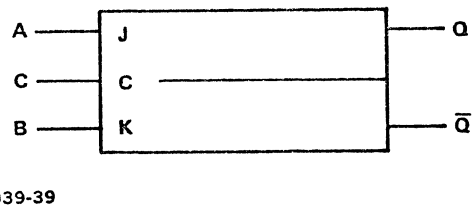

Figure A-15. J-K Flip-Flop

		Initial State		Final State	
A	B	Q	$\overline{Q}$	Q	$\overline{Q}$
1	0			1	0
0	1			0	1
1	1	0	1	1	0
1	1	1	0	0	1
0	0			No	Change

Table A-6. Truth Table For Clocked J-K Flip-Flop

A-28. TOGGLE FLIP-FLOP.

A-29. The toggle flip-flop is distinguished by having a single input. Each time input A goes true, outputs Q and $\overline{Q}$ switch states. Since two input pulses or cycles are required to produce one complete cycle of the output, the toggle flip-flop acts as a divide-by-two element, and is commonly used in counting circuits. The letter T inside the symbol identifies the toggle flip-flop. Figures A-16 and A-17 show the symbol and switching waveforms for a toggle flip-flop.

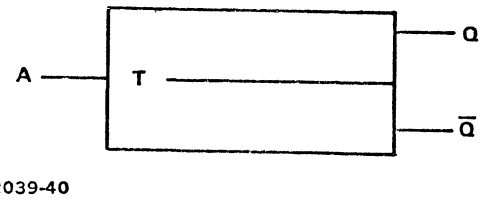

Figure A-16. Toggle Flip-Flop

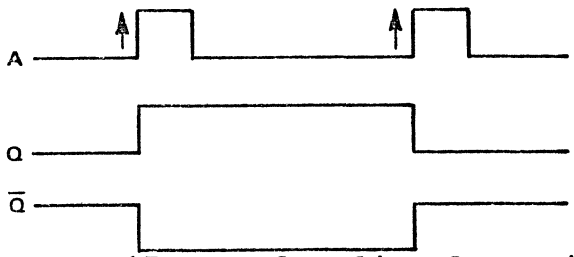

Figure A-17. Toggle Flip-Flop Switching Waveforms

A-30. For a toggle flip-flop with an inverted input at A the flip-flop would switch on the negative going transition of A (see Figures A-18 and A-19).

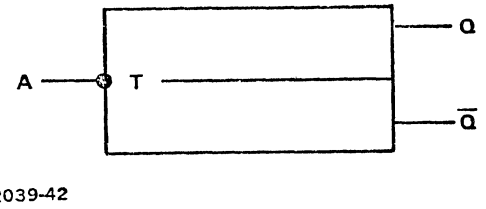

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Figure A-18. Toggle Flip-Flop With Inverted Clock

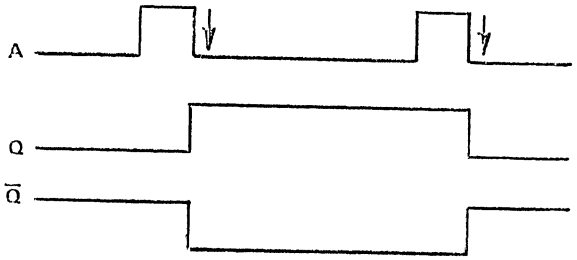

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Figure A-19. Switching Waveforms For Toggle Flip-Flop With an Inverted Clock

A-31. LATCHING FLIP-FLOP.

A-32. The latching flip-flop has a single signal input and a clock input. The flip-flop is identified by the letter L inside the symbol as shown (see Figure A-20). Note that the set input is responsive to positive signal levels at A, and the clear input is responsive to negative signal levels at A. When the clock input is true, the output will ''follow'' the input. When the clock input is false, the output is ''latched'' to the input state present when the clock went false.

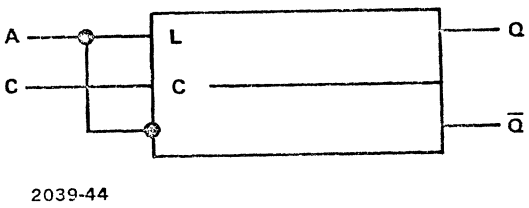

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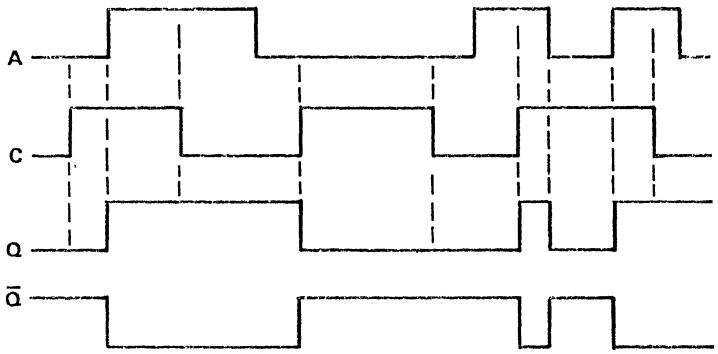
Figure A-20. Latching Flip-Flop



2039-45

Figure A-21. Latching Flip-Flop Waveforms

A-33. DELAY FLIP-FLOP.

A-34. The delay flip-flop has a single data input and a clock input. The flip-flop is identified by the letter ''D'' inside the symbol as shown in Figure A-22. The flip-flop performs two functions: it stores the input data and sets the output of the flip-flop. The delay flip-flop differs from the latch flip-flop previously defined

in that it performs the storing and setting functions on the same edge of the clock pulse. In the example shown in Figure A-22 the flip-flop sets on the leading or true going edge of the clock pulse.

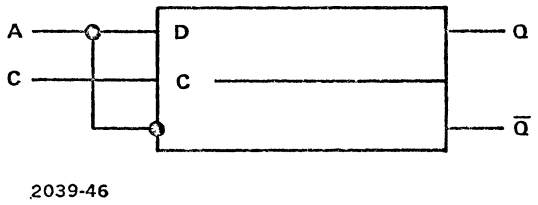


Figure A-22. Delay Flip-Flop

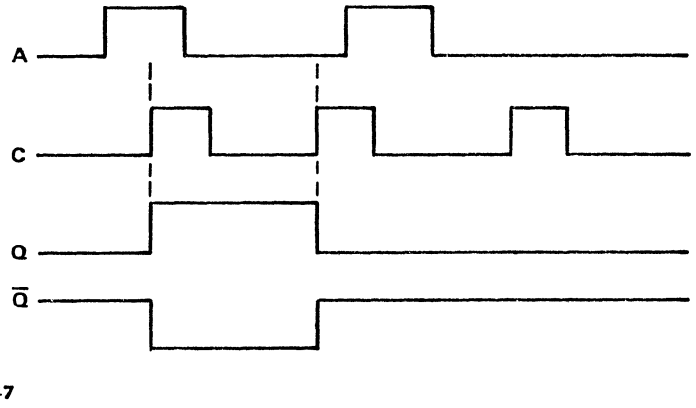


Figure A-23. Delay Flip-Flop Switching Waveforms

A-35. GATE FLIP-FLOP.

A-36. The gate flip-flop is made up of a combination of logic gates. When the gates are connected as shown in Figure A-24 they form a storage or switching element. In the example shown the flip-flop will be set by a false input at either A or B. The flip-flop will be cleared by a false input at either C or D. The gate flip-flop is normally used so that a false input does not occur at the set and clear inputs simultaneously. The gate flip-flop may be made up of several combinations of logic gates, each with its own switching properties. The gate flip-flop should always be shown with the set output at the upper right and the clear output at the lower right.

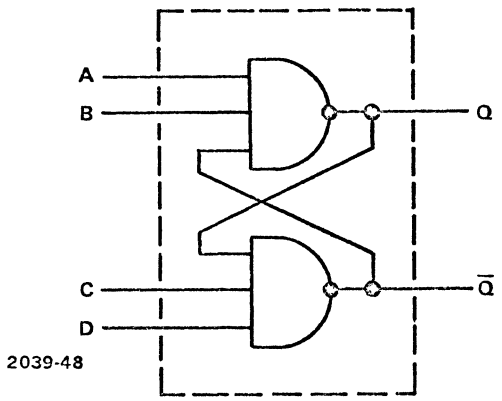


Figure A-24. Gated Flip-Flop

A-37. AMPLIFIERS.

A-38. Amplifiers are not necessarily binary in nature; however, in logic circuits the driving signals will normally be binary and the output of the amplifier will be an amplified or modified form of the

binary input. The amplifier symbol is an equilateral triangle with the input applied to the center of one side, and the output connected to the opposite point of the triangle (see Figure A-25). Like gates, the amplifier may be shown in any of four positions.

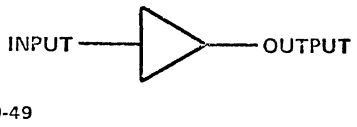


Figure A-25. Amplifier Symbol

A-39. A variation of the amplifier, in the form of a dual input/output (differential amplifier) is shown in Figure A-26. An inversion dot would indicate the inversion of an output with respect to the corresponding input (not with respect to the inputs on the opposite side of the amplifier).

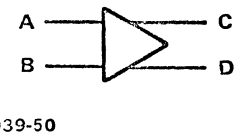
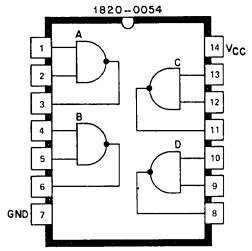
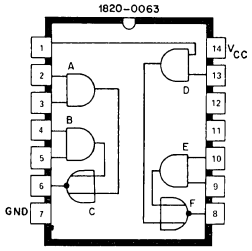


Figure A-26. Differential Amplifier



CHARACTERISTIC 2



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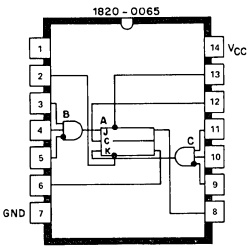

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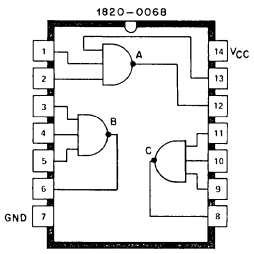

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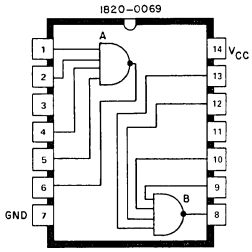

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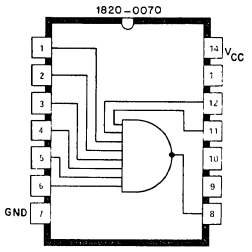

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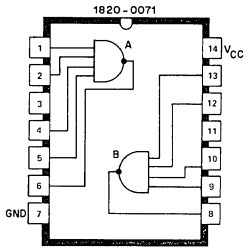

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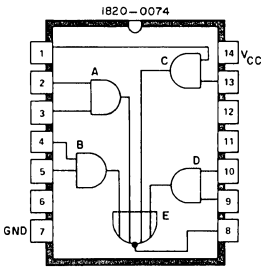

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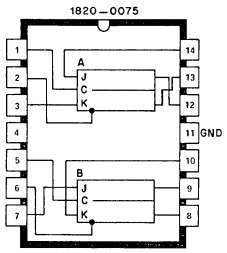

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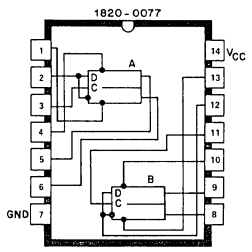

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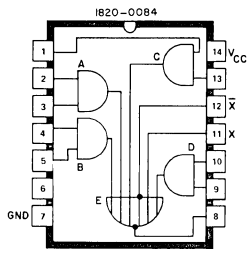

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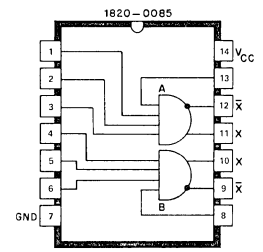

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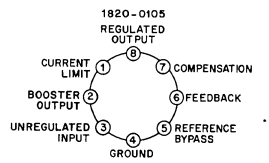

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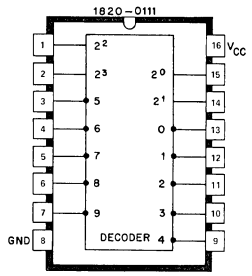

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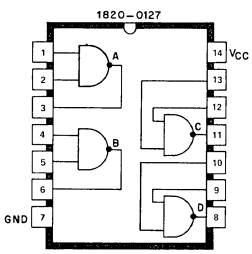

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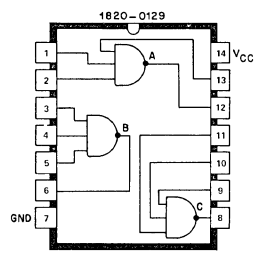

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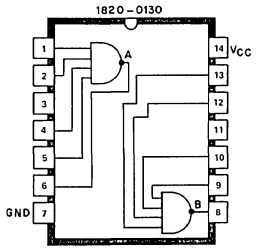
Figure A-27. Microcircuit Diagrams



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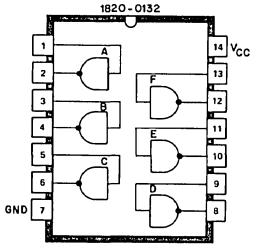

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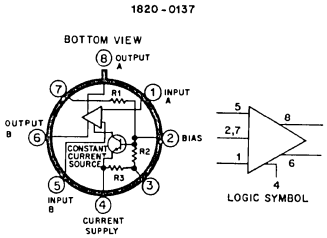

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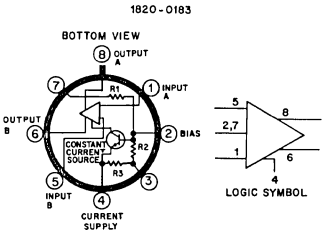
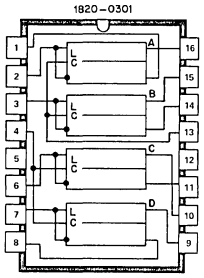


CHARACTERISTIC 27



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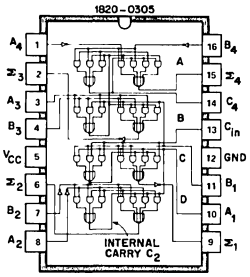

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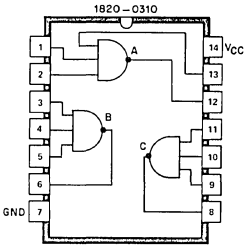

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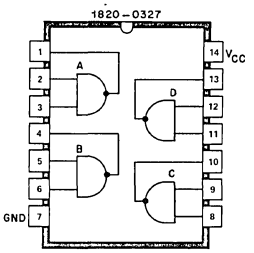

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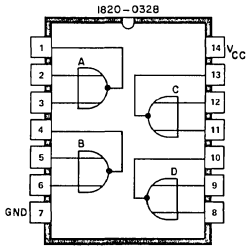

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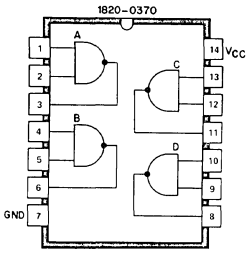

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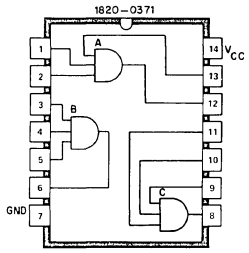

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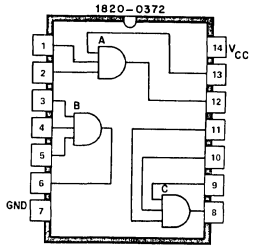
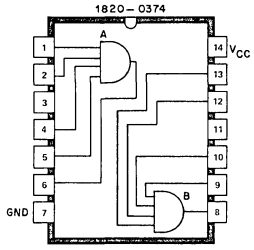
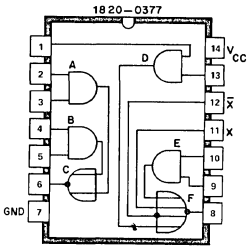


CHARACTERISTIC 1



CHARACTERISTIC 1



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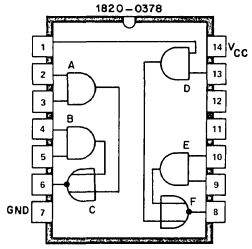

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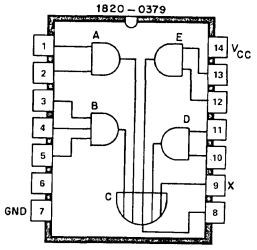
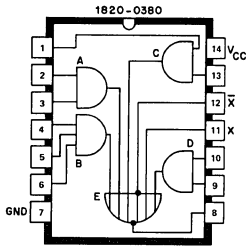


CHARACTERISTIC 1

Figure A-27. Microcircuit Diagrams (Cont'd)



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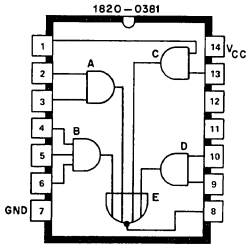

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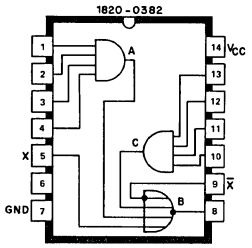

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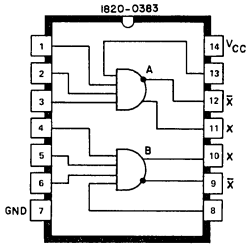
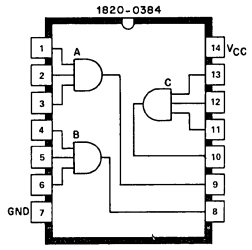
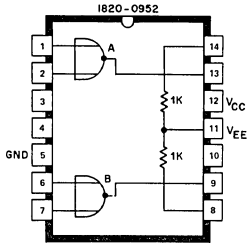


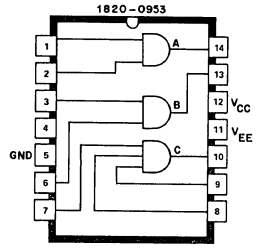
CHARACTERISTIC 11



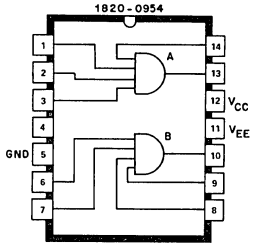
CHARACTERISTIC 14



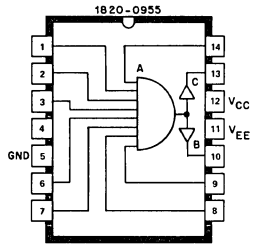
CHARACTERISTIC 15



CHARACTERISTIC 16



CHARACTERISTIC 16



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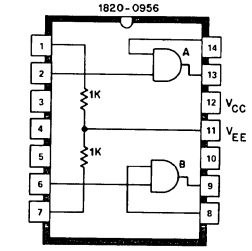
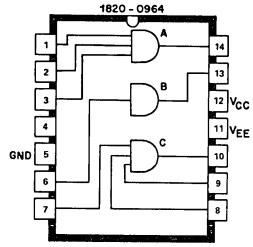


CHARACTERISTIC 17



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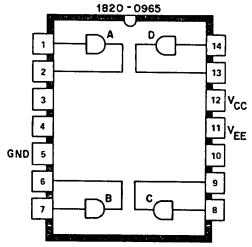
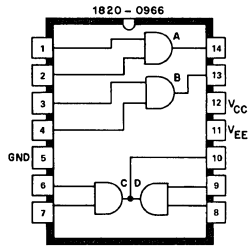
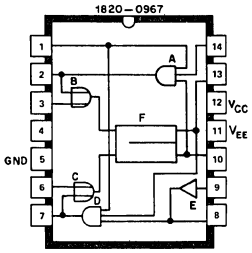


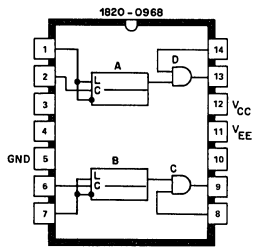
CHARACTERISTIC 16



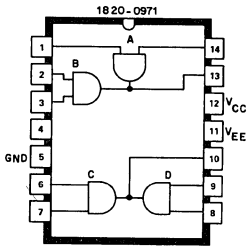
CHARACTERISTIC 16



CHARACTERISTIC 18

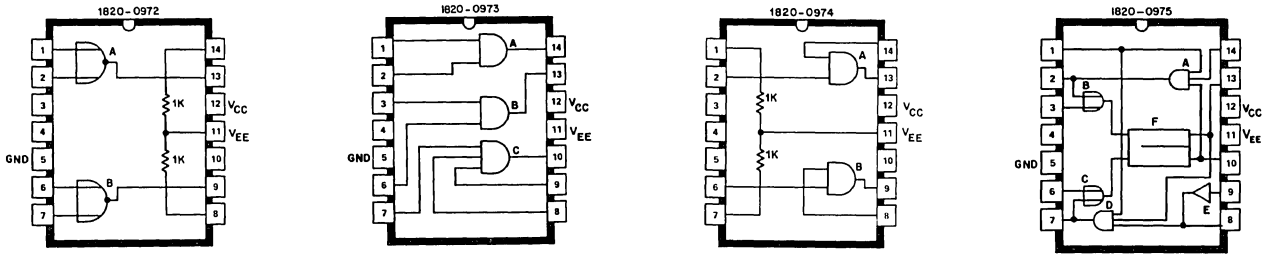


CHARACTERISTIC 21



CHARACTERISTIC 16

Figure A-27. Microcircuit Diagrams (Cont'd)



CHARACTERISTIC 20 CHARACTERISTIC 19 CHARACTERISTIC 22 CHARACTERISTIC 23

Figure A-27. Microcircuit Diagrams (Cont'd)

Table A-7.
MICROCIRCUIT CHARACTERISTICS

1. Input open = 1
Input 1 = +2.0V min. Output 1 = +2.4V min.
Input 0 = +0.8V max. Output 0 = +0.4V max.
Propagation delay = 15nsec. max.

2. Input open = 1
Input 1 = +2.0V min. Output 1 = +2.4V min. (3.3 nom)
Input 0 = +0.8V max. Output 0 = +0.4V max. (0.2 nom)
Propagation Delay: To 0 = 15nsec max.; to 1 = 29ns max.

3. Input open = 1
Input 1 = +2.0V min. Output 1 = +2.4V min. (2.7V nom)
Input 0 = +0.8V max. Output 0 = +0.4V max. (0.2V nom)
Propagation delay: to 0 = 10ns max; to 1 = 12ns max.

4. Input open = 1
Input 1 = +1.9V min. Output 1 = +2.4V min. (3.0V nom)
Input 0 = +0.8V max. Output 0 = +0.45V max.(0.2V nom)
Propagation delay: to 0 = 13ns max.; to 1 = 15nsec max.

5. Input open = 1 Output open= 0
Input 1 = +2.0V min. Output 0 = +0.4V max.
Input 0 = +0.8V max. Output 1 = depends on loads.
Propagation delay: to 0 = 15ns max.; to 1 = 45nsec max.

6. Input open = 1
Input 1 = +2.0V min. Output 1 = +2.4V min.
Input 0 = +0.8V max. Output 0 = +0.4V max.
Propagation delay = 10ns max.

7. Input open = 1
Input 1 = +2.0V min. Output 1 = +2.4V min. (+3.5V nom)
Input 0 = +0.8V max. Output 0 = +0.4V max. (+0.2V nom)
Propagation delay = 50ns max.
Required pulse widths: Clock = 20ns min.; Set-clear = 25ns min.

8. Input open = 1
Input 1 = +2.0V min. Output 1 = +2.4V min. (+3.3V nom)
Input 0 = +0.8V max. Output 0 = +0.4V max. (+0.2V nom)
Propagation delay: to 0 = 50ns max.; to 1 = 35nsec max.
Required pulse widths = 30 nsec min.

9. Input open = 1
Input 1 = +2.0V min. Output 1 = +2.4V min.
Input 0 = +0.8V max. Output 0 = +0.4V max.
Propagation delay: to 0 = 25ns max.; to 1 = 40ns max.
Required pulse widths: Clock = 30ns min.; Data = 75ns min.

10. Input open = 1
Input 1 = +2.0V min. Output ON max.+0.4V
Input 0 = +0.8V max. across X & $\overline{X}$
Propagation delay (thru expanded gate): to 0 = 20ns max; to 1 = 34ns max.

Table A-7. Microcircuit Characteristics (Cont'd)

11. Input open = 1
Input 1 = +2.0V min. Output ON max. 0.4V
Input 0 = +0.8V max. across X & $\overline{X}$
Propagation delay (thru expanded gate): to 0 = 13ns max.;
to 1 = 17ns max.

12. Input open = 1
Input 1 = +2.0V min. Output 1 = +2.4V min. (+2.7V nom)
Input 0 = +0.8V max. Output 0 = +0.40 max.(+0.2V nom)
Propagation delay: to 0 = 30ns max.; to 1 = 35ns max.
Input (BCD0 - BCD9) only one output = 0
Input (BCD > 9) all outputs = 1

13. Input open = 1
Input 1 = +2.0V min. Output 1 = +2.4V min.
Input 0 = +0.8V max. Output 0 = +0.4V max.
Propagation delay: A or B thru Σ to 0 = 35ns max.; to 1 = 40ns max.
Cin thru Σ to 0 = 60 ns max; to 1 = 55ns max.
Cin thru C_4 to 0 = 32ns max.; to 1 = 48ns max.

14. Input open = 1
Input 1 = +2.0V min. Output open= 0.0V
Input 0 = +0.8V max. Output on = 1.0V max.
Propagation delay through expanded gate = 19ns max.

15. Input open = 0
Input 1 = +1.25V min. Output 1 = +2.35V min. (+2.5V nom)
Input 0 = +0.5V max. Output 0 = -0.36V max. (-0.5V nom)
Propagation delay: to 0 = 12ns max; to 1 = 14ns max.

16. Input open = 0
Input 1 = +1.8V min. Output 1 = +1.5V min. (+2.0V nom)
Input 0 = +0.0V max. Output 0 = +0.22V max.(-0.4V nom)
Propagation delay: to 0 = 4ns max.; to 1 = 4.5ns max.

17. Input open = 0
Input 1 = +1.25V min. Output 1 = +2.25V min.(+2.5V nom)
Input 0 = +0.5V max. Output 0 = -0.36V max.(-0.5V nom)
Propagation delay = 18 nsec max.

18. Input open = 0
J & K Input 1 =+1.33V min. Output 1 = +2.35V min.(+2.5V nom)
Set & Clear Input 1=+1.25V min. Output 0 = -0.36V max.(-0.5V nom)
Input 0 = +0.5V max.
Propagation delay: through J & K to 1 = 15nsec max.;
to 0 = 25nsec max.
through Set & Clear to 1 = 25ns max.;
to 0 = 38ns max.
Required pulse width = 16ns min.

19. Input open = 0
Input 1 = +1.8V min. Output 1 = +1.5V min. (+2.0V nom)
Input 0 = +0.0V max. Output 0 = +0.22V max.(-0.4V nom)
Propagation delay: to 1 = 5.5ns max.; to 0 = 6.0ns max.

Table A-7. Microcircuit Characteristics (Contd)

20. Input open = 0
Input 1 = +1.5V min. Output 1 = +2.25V min. (+2.5V nom)
Input 0 = +0.4V max. Output 0 = -0.3V max. (-0.5V nom.)
Propagation delay: to 0 = 12ns max.; to 1 = 24ns max.

21. Input open = 0
Input 1 = +1.8V min. Output 1 = +2.0V min.(+2.3V nom)
Input 0 = +0.0V min. Output 0 = -0.16V max.(-0.4V nom)
Propagation delay through WRITE = 25ns max.; through READ = 4ns max.

22. Input open = 0 Output open= 1
Input 1 = +1.5V min. Output 1 = +2.2V min. (+2.5V nom)
Input 0 = +0.4V max. Output 0 = -0.3V max. (-0.5V nom)
Propagation delay = 24ns max.

23. Input open = 0
Input 1 = Output 1 = +2.2V min. (+2.5V nom)
Input 0 = Output 0 = -0.3V max. (-0.5V nom)
Propagation delay: Through J & K to 1 = 20ns max,
to 0 = 25ns max.
Through Set & Clear to 1 = 25ns max.;
to 0 = 38ns max.
Required Pulse Width = 30ns min.

24. Input open = 1
Input 1 = +2.0V min. Output 1 = +2.6V min.
Input 0 = +0.9V max. Output 0 = +0.5V max.
Propagation delay to 0 = 30ns max.; to 1 = 80ns max.

25. Input Voltage = +35V max.
Output Voltage = +25V max.
Output Current = 20ma max., 3.0ma min.

26. Voltage gain 32 db typical.

27. Voltage gain 40 db typical.

APPENDIX B

BACKDATING INFORMATION

This backdating appendix makes Volume Two of the Operation and Maintenance Manual for the HP 2114B Computer, serial prefix 942- applicable to earlier instruments. Refer to the table below for the serial prefix of your instrument. Make the indicated changes to the manual to make the manual applicable to your instrument.

INSTRUMENT CHANGES

Serial Prefix	Change No.
930-	1-5

Ref Des	Description	HP Part No.	Rev	Change No.
A1, A2	Driver Switch Card	02114-60427	A-933 -22	1
A6, A7	Sense Amplifier Card	02114-6005	A-914 -22	2, 3, 4
A24	Display Board	02114-6009	D-910 -22	5

CHANGE

DESCRIPTION

1. Page 6-40, Figure 6-4. Change the revision code in the upper left to ''A-933-22''.

2. Page 6-44, Table 6-7. Change the entry for resistors R5, 7, 15, 17, 25, 27, 35, 37, 45, 47, 55, 57, 65, 67, 75, 77, 85, 87, 95, 97, 105, 107, 115, 117, 125, 127, 135, 137, 145, 147, 155, 157, 165, and 167 to: 0757-0428, R: FXD MET FLM 1.62K OHM 1%, 28480, 0757-0428. Part no. 0698-7310 is interchangeable with 0757-0428 and should be used if replacement is necessary.

3. Page 6-44, Figure 6-8. Change the revision code in the upper left to ''A914-22''.

4. Page 6-45, Figure 6-9. Change the value of the resistors called out in Change 2 to 1.62K. Change the revision code in the upper left to ''914''.

5. Page 6-56, Figure 6-18. Make the changes shown in Figure B-1.

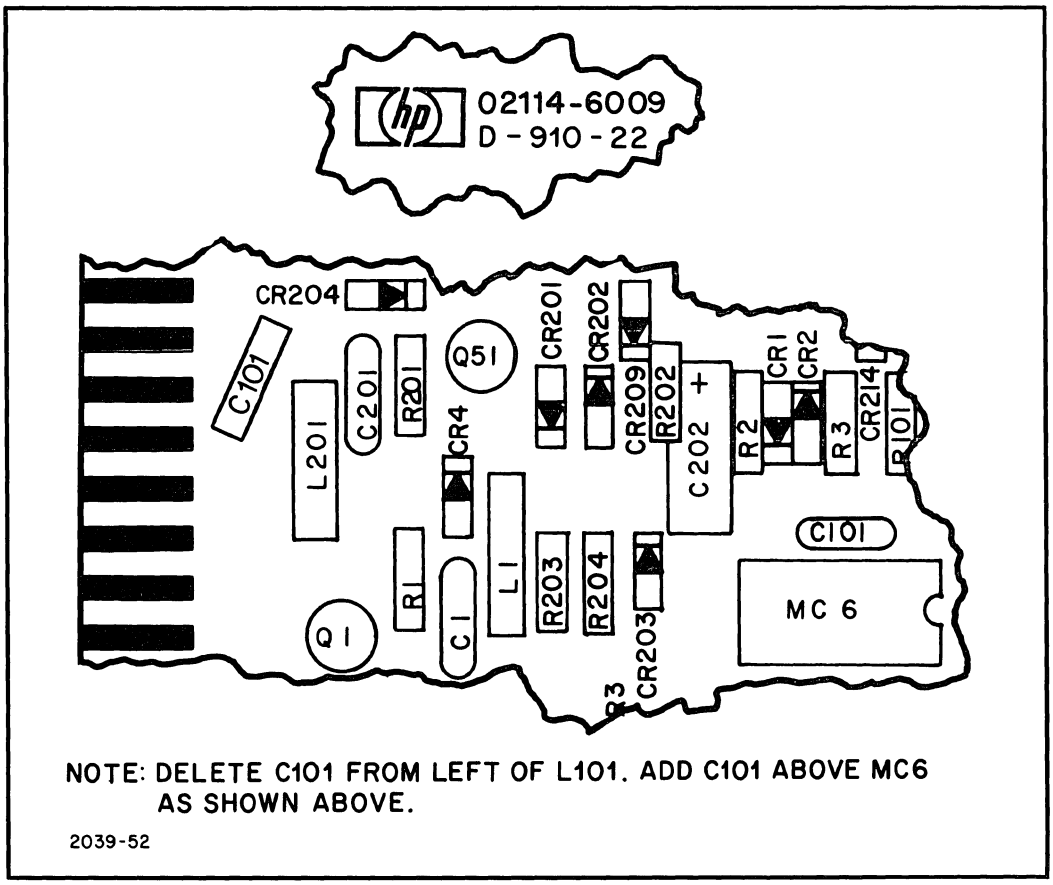


Figure B-1. Display Board (02114-6009), Partial Parts Location Diagram Showing Changes for Board Revision D-910-22

HEWLETT hp PACKARD

2114B
COMPUTER
(VOLUME TWO)

UPDATING SUPPLEMENT FOR OPERATING AND SERVICE MANUAL

1 MAY 1970

MANUAL IDENTIFICATION

Manual Serial No. Prefix: 942-

Manual Printed: October 1969

Manual Part Number: 02114-90399

SUPPLEMENT DESCRIPTION

The purpose of this supplement is to adapt the manual to instruments containing production improvements made subsequent to the printing of the manual and to correct manual errors. Enter the new information (or the Change Number, if more convenient) into the appropriate places in the manual, identified at left.

INSTRUMENT CHANGES

Serial No. Prefix	Change
ALL	1-3, 14-18
930-	4
943-	5
947-	6-9
949-	10-13
972-	17,18

ASSEMBLY CHANGES

Ref Des	Description	HP Part No.	Rev	Changes
A24	Display Board	02114-6009	E-944-22	6-9
A302	Regulator Board	02114-6010	A-949-22	10-13

NOTE:

Changes 1 through 9 dated 5 December 1969

Changes 10 through 16 dated 1 February 1970

Changes 17 through 18 dated 1 May 1970

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Printed in U.S.A.

CHANGE	DESCRIPTION

1 If Shift Rotate Group Test Hardward Diagnostic Program Tape No. 20402D is used, make the following corrections to the diagnostic test procedures:

a. Page 5-10, Table 5-10. Make the following additional entries at the bottom of the table:

Table 5-10. Shift-Rotate Instruction Test (Basic Portion) Error Halts

LOCATION (P)	INSTRUCTION FAILURE
6350	E did not clear after ERA
6354	ELB, SLB failed if B=000001, E=0
	ERB, SLB failed if B=000000, E=1
6357	E did not clear after ERB
6363	E did not set after ERA
6366	E did not set after ELA
6372	E did not set after ERB
6375	E did not set after ELB

b. Page 5-13, Paragraph 5-76. In line 6, change "006540" to read "006570". In line 11, change "006546" to read "006576". In line 17, change "006540" to read "006570".

c. Page 5-13, Table 5-11. Correct the table to read as follows:

Table 5-11. Shift-Rotate Group Test Sections

LOCATION	TEST
4500-4506	Shift Pattern Array
4507-5477	Good Comparison Pattern Array
5500-6137	Shift Code Combination Array
6200-6374	Basic Reliability Test
6375-7104	Main Control Program

CHANGE	DESCRIPTION

d. Page 5-13, Paragraph 5-83. In the last line, change "006345" to read "006375".

e. Page 5-14, Paragraph 5-85. In the third line, change "006540" to read "006570". In the seventh line change "006546" to read "006576".

f. Page 5-15/5-16, Figure 5-2. Delete Figure 5-2 from the manual. Note that Table 5-13 is also included on page 5-15/5-16 and should be retained.

g. Page SR-1 through SR-10. Replace the Shift Rotate Group Diagnostic listings with the revised pages attached to the back of this supplement.

CHANGE

DESCRIPTION

2 Page 6-23, table 6-2. At the intersection of REF. NO. 168 and column A9 add pin 54.

3 Page 6-54, table 6-12. Make the additional entries given below.

S1-S9,16-32 S10-S15 W1,2	02114-6021** 3101-0932 8159-0005	PROXIMITY SWITCH ASSY SWITCH: SLIDE ASSY JUMPER WIRE	28480 79727 28480	02114-6021 GG350-0001 8159-0005
**For individual switch replacement order as follows:				
S1	02114-80463	Proximity Switch Assy - PRESET	28480	02114-80463
S2	02114-80464	Proximity Switch Assy - RUN	28480	02114-80464
S3	02114-80465	Proximity Switch Assy - HALT	28480	02114-80465
S4	02114-80466	Proximity Switch Assy - LOAD	28480	02114-80466
S5	02114-80468	Proximity Switch Assy - LOAD MEMORY	28480	02114-80468
S6	02114-80467	Proximity Switch Assy - LOAD ADDRESS	28480	02114-80467
S7	02114-80469	Proximity Switch Assy - DISPLAY MEMORY	28480	02114-80469
S8	02114-80470	Proximity Switch Assy - SINGLE-CYCLE	28480	02114-80470
S9	02114-80471	Proximity Switch Assy - CLEAR REGISTER	28480	02114-80471
S16	02114-80462	Proximity Switch Assy - 15	28480	02114-80462
S17	02114-80461	Proximity Switch Assy - 14	28480	02114-80461
S18	02114-80460	Proximity Switch Assy - 13	28480	02114-80460
S19	02114-80459	Proximity Switch Assy - 12	28480	02114-80459
S20	02114-80458	Proximity Switch Assy - 11	28480	02114-80458
S21	02114-80457	Proximity Switch Assy - 10	28480	02114-80457
S22	02114-80456	Proximity Switch Assy - 9	28480	02114-80456
S23	02114-80455	Proximity Switch Assy - 8	28480	02114-80455
S24	02114-80454	Proximity Switch Assy - 7	28480	02114-80454
S25	02114-80453	Proximity Switch Assy - 6	28480	02114-80453
S26	02114-80452	Proximity Switch Assy - 5	28480	02114-80452
S27	02114-80451	Proximity Switch Assy - 4	28480	02114-80451
S28	02114-80450	Proximity Switch Assy - 3	28480	02114-80450
S29	02114-80449	Proximity Switch Assy - 2	28480	02114-80449
S30	02114-80448	Proximity Switch Assy - 1	28480	02114-80448
S31	02114-80447	Proximity Switch Assy - 0	28480	02114-80447

4 Backdating information for instruments with serial number prefix 930- is given in appendix B of the manual.

5 No changes to the manual are required to make it applicable to instruments with serial number prefix 943-.

6 Page 6-54, table 6-12. Change the entry "C101,110,113,115, 401-413" in the REFERENCE DESIGNATION column to "C101,110, 113,115,401-414".

CHANGE	DESCRIPTION
7	Page 6-54, figure 6-18. Make the changes indicated in figure 1 of this supplement.
8	Page 6-55, figure 6-19. Make the changes indicated in figure 2 of this supplement.
9	Page 7-3, table 7-2. Change the entry in the TQ column for HP Part No. 0160-2055, to "373".
10	Page 6-64, table 6-16. Change the part number for MC1 to "1820-0247". Add an entry for "C76, 0160-2055, C:FXD CER 0.01UF +80 -20% 100VDCW, 28480, 0160-2055".
11	Page 6-65, figure 6-24. Make the changes indicated in figure 3 of this supplement.
12	Page 6-67/6-68, figure 6-26. Make the changes indicated in figure 4 of this supplement.
13	Page 7-3, table 7-2. Change the entry in the TQ column for part number 0160-2055 to "374". Delete the entry for part number 1820-0105. For part number 1820-0247 add "INTEGRATED CIRCUIT VOLTAGE REGULATOR, 28480, 1820-0247, 1".
14	Page 6-59, table 6-13. In the REFERENCE DESIGNATION column change the entry for part no. 2110-0055 to "F6", and the entry for part no. 2110-0010 to "F2, F3, F4".
15	Page 6-67/6-68, figure 6-26. Change the value of F2 to "5A".
16	Page 7-6, table 7-2. Change the entry in the TQ column for part no. 2110-0010 to "3". Change the entry in the TQ column for part no. 2110-0055 to "1".
17	Page 6-59, table 6-13. Change the entry for F2, F3, and F4 to: "FUSE: CARTRIDGE 5 AMP 125V, 75915, 313005".
18	Page 7-6, table 7-2. Delete the entry for part no. 2110-0010 and add the following entry for part no. 2110-0030: "FUSE: CARTRIDGE 5 AMP 125V, 75915, 313005, 3".

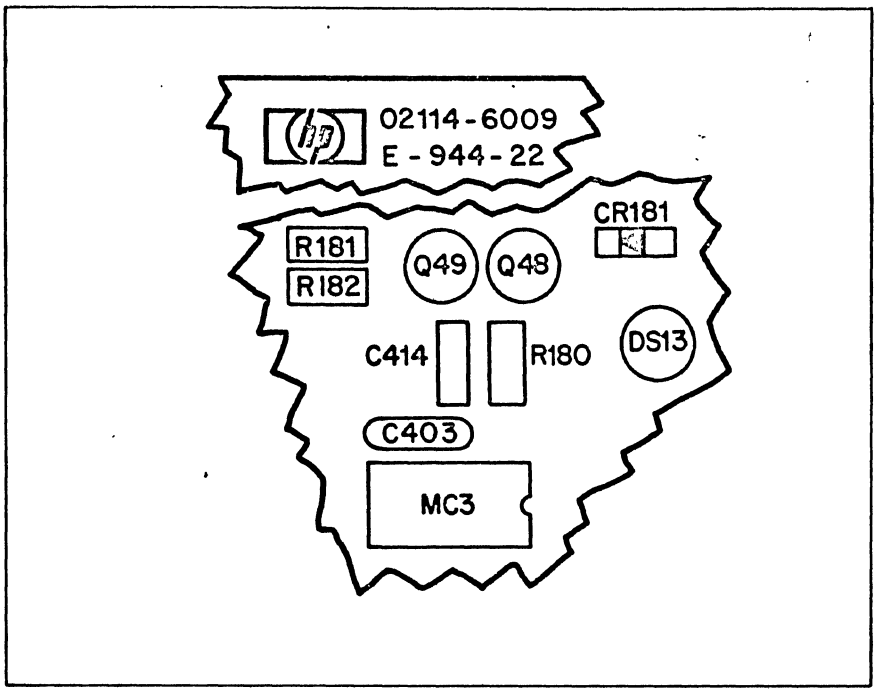

Figure 1. Display Board (02114-6009), Partial Part Location Diagram Showing Changes for Board Revision E-944-22

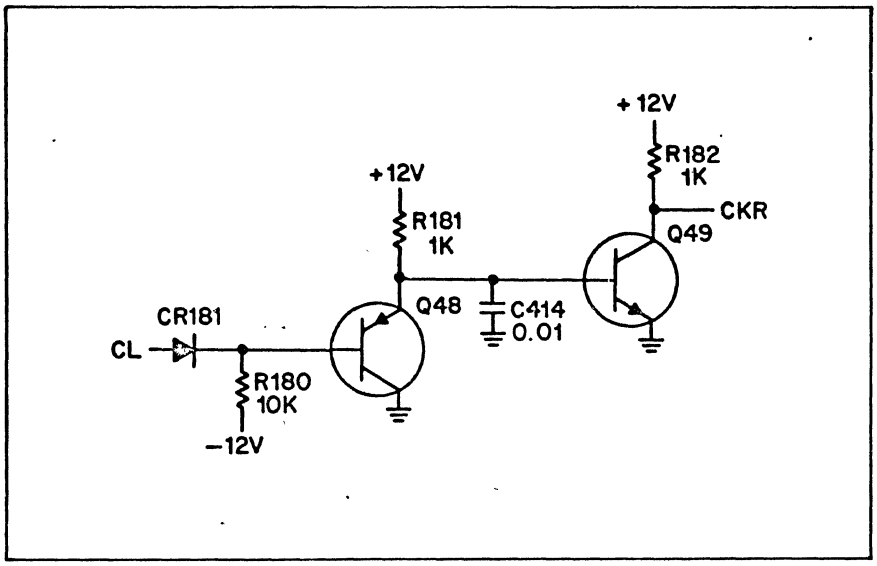

Figure 2. Display Board (02114-6009), Partial Schematic Diagram Showing Changes for Board Revision E-944-22

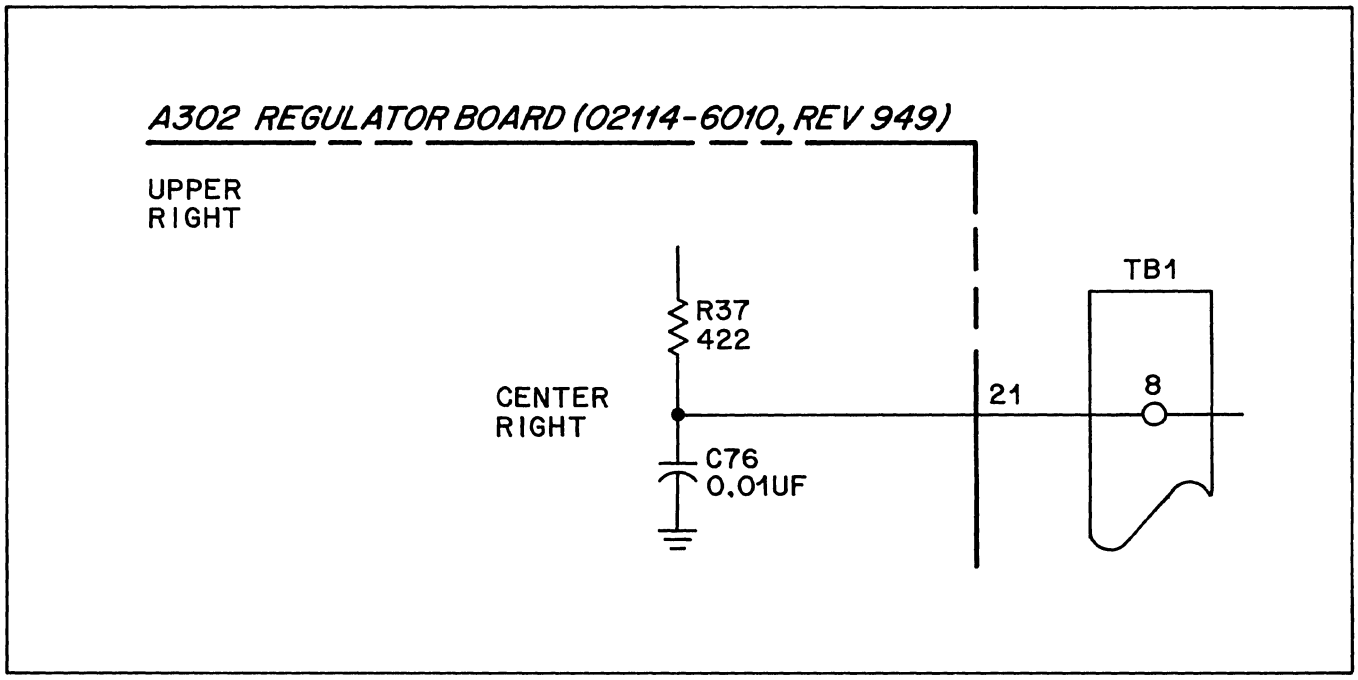

Figure 3. Voltage Regulator Card (02114-6010), Partial Part Location Diagram Showing Changes for Board Revision A-949-22.

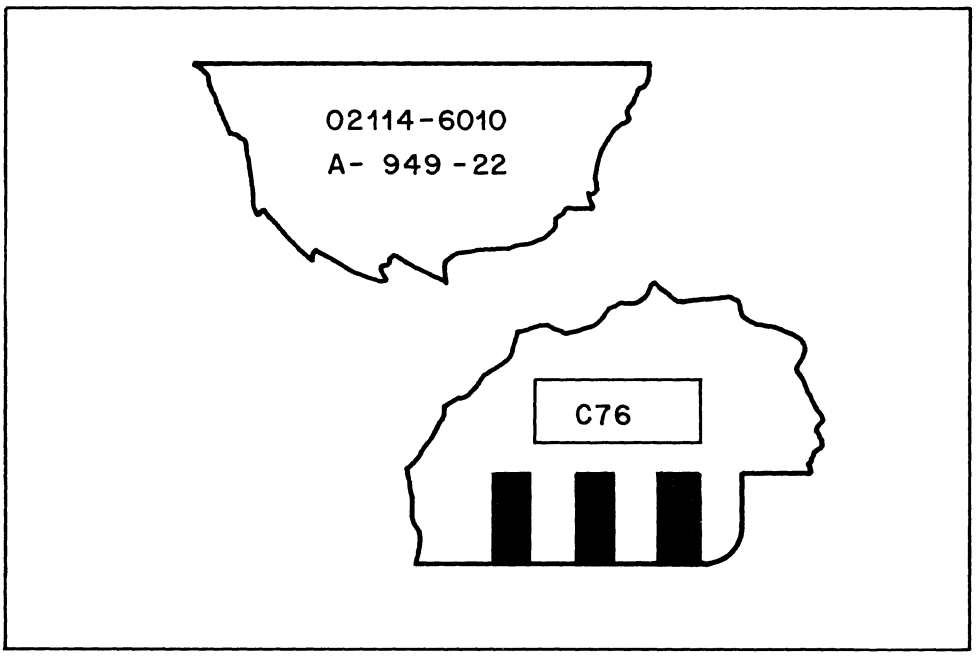

Figure 4. Voltage Regulator Card (02114-6010), Partial Schematic Diagram Showing Changes for Board Revision A-949-22.

SHIFT-ROTATE INSTRUCTION TEST

Tape No. HP 20402D

Listing No. HP 20402D-

```
PAGE 0001


0001                ASMB,A,B,L,T        DECEMBER 23,1969
PAT1    004500
PAT2    004501
PAT3    004502
PAT4    004503
PAT5    004504
PAT6    004505
PAT7    004506
P0020   004507
P0021   004516
P0022   004525
P0023   004534
P0024   004543
P0025   004552
P0026   004561
P0027   004570
P1020   004577
P1021   004606
P1022   004615
P1023   004624
P1024   004633
P1025   004642
P1026   004651
P1027   004660
P1120   004667
P1121   004676
P1122   004705
P1123   004714
P1124   004723
P1125   004732
P1126   004741
P1127   004750
P1220   004757
P1221   004766
P1222   004775
P1223   005004
P0224   005013
P1225   005022
P1226   005031
P1227   005040
P1320   005047
P1321   005056
P1322   005065
P1323   005074
P1324   005103
P1325   005112
P1326   005121
P1327   005130
P1420   005137
P1421   005146
P1422   005155
P1423   005164
P1424   005173
P1425   005202
P1426   005211
P1427   005220
```

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PAGE 0002


P1520   005227
P1521   005236
P1522   005245
P1523   005254
P1524   005263
P1525   005272
P1526   005301
P1527   005310
P1620   005317
P1621   005326
P1622   005335
P1623   005344
P1624   005353
P1625   005362
P1626   005371
P1627   005400
P1720   005407
P1721   005416
P1722   005425
P1723   005434
P1724   005443
P1725   005452
P1726   005461
P1727   005470
PASS1   005500
PASS2   005610
PASS3   005720
PASS4   006030
END     006140
BAD     006141
TADR    006142
RPAT    006143
PAT     006144
TPAT    006145
LPAT    006146
CON1    006147
CON2    006150
INBAR   006151
TEMP    006152
PAS1    006153
PAS2    006154
PAS3    006155
PAS4    006156
ILL1    006157
ILL2    006160
ILL3    006161
ILL4    006162
ILL5    006163
ILL6    006164
ILL7    006165
ILL8    006166
SMASK   006167
AMSK1   006170
BASIC   006200
INIT    006375
START   006404
```

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PAGE 0003


SETUP   006427
CHECK   006431
BACK    006432
NINST   006441
NPASS   006456
MODI    006461
BMODI   006473
FB      006503
AMODI   006512
FA      006522
ILLC    006531
SEVEN   006532
T100A   006540
SHA1    006543
T100B   006551
SHB1    006554
ERROR   006563
SUB1    006577
SOVFC   006600
JSA     006601
JSB     006602
SSHA1   006603
SSHB1   006604
AMASK   006605
BMASK   006606
ASPEC   006607
BSPEC   006746
**  NO ERRORS*
```

```
PAGE 0004 #01


0001                ASMB,A,B,L,T        DECEMBER 23,1969
0002  04500             ORG 4500B
0003  04500 000001 PAT1  OCT 1
0004  04501 100000 PAT2  OCT 100000
0005  04502 100001 PAT3  OCT 100001
0006  04503 074170 PAT4  OCT 074170
0007  04504 103607 PAT5  OCT 103607
0008  04505 125252 PAT6  OCT 125252
0009  04506 052525 PAT7  OCT 052525
0010  04507 000002 P0020 OCT 2
0011  04510 100000       OCT 100000
0012  04511 100002       OCT 100002
0013  04512 070360       OCT 070360
0014  04513 107416       OCT 107416
0015  04514 152524       OCT 152524
0016  04515 025252       OCT 025252
0017  04516 000000 P0021 OCT 0
0018  04517 140000       OCT 140000
0019  04520 140000       OCT 140000
0020  04521 036074       OCT 036074
0021  04522 141703       OCT 141703
0022  04523 152525       OCT 152525
0023  04524 025252       OCT 025252
0024  04525 000002 P0022 OCT 2
0025  04526 000001       OCT 1
0026  04527 000003       OCT 3
0027  04530 170360       OCT 170360
0028  04531 007417       OCT 7417
0029  04532 052525       OCT 052525
0030  04533 125252       OCT 125252
0031  04534 100000 P0023 OCT 100000
0032  04535 040000       OCT 40000
0033  04536 140000       OCT 140000
0034  04537 036074       OCT 036074
0035  04540 141703       OCT 141703
0036  04541 052525       OCT 052525
0037  04542 125252       OCT 125252
0038  04543 000002 P0024 OCT 2
0039  04544 000000       OCT 0
0040  04545 000002       OCT 2
0041  04546 070360       OCT 070360
0042  04547 007416       OCT 7416
0043  04550 052524       OCT 52524
0044  04551 025252       OCT 25252
0045  04552 000000 P0025 OCT 0
0046  04553 040000       OCT 40000
0047  04554 040000       OCT 40000
0048  04555 036074       OCT 36074
0049  04556 041703       OCT 41703
0050  04557 052525       OCT 52525
0051  04560 025252       OCT 25252
0052  04561 000002 P0026 OCT 2
0053  04562 000000       OCT 0
0054  04563 000002       OCT 2
0055  04564 170360       OCT 170360
0056  04565 007416       OCT 7416
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0057  04566 052524          OCT 52524
0058  04567 125252          OCT 125252
0059  04570 000020  P0027 OCT 20
0060  04571 000010          OCT 10
0061  04572 000030          OCT 30
0062  04573 103607          OCT 103607
0063  04574 074170          OCT 74170
0064  04575 125252          OCT 125252
0065  04576 052525          OCT 52525
0066  04577 000004  P1220 OCT 4
0067  04600 100000          OCT 100000
0068  04601 100004          OCT 100004
0069  04602 060740          OCT 60740
0070  04603 117034          OCT 117034
0071  04604 125250          OCT 125250
0072  04605 052524          OCT 52524
0073  04606 000001  P1221 OCT 1
0074  04607 140000          OCT 140000
0075  04610 140001          OCT 140001
0076  04611 034170          OCT 034170
0077  04612 143607          OCT 143607
0078  04613 165252          OCT 165252
0079  04614 012525          OCT 12525
0080  04615 000004  P1222 OCT 4
0081  04616 000001          OCT 1
0082  04617 000005          OCT 5
0083  04620 160740          OCT 160740
0084  04621 017035          OCT 17035
0085  04622 125251          OCT 125251
0086  04623 052524          OCT 52524
0087  04624 000001  P1223 OCT 1
0088  04625 040000          OCT 40000
0089  04626 040001          OCT 40001
0090  04627 034170          OCT 34170
0091  04630 043607          OCT 43607
0092  04631 065252          OCT 65252
0093  04632 012525          OCT 12525
0094  04633 000004  P1224 OCT 4
0095  04634 000000          OCT 0
0096  04635 000004          OCT 4
0097  04636 060740          OCT 60740
0098  04637 017034          OCT 17034
0099  04640 025250          OCT 25250
0100  04641 052524          OCT 52524
0101  04642 000001  P1225 OCT 1
0102  04643 040000          OCT 40000
0103  04644 040001          OCT 40001
0104  04645 034170          OCT 34170
0105  04646 043607          OCT 43607
0106  04647 065252          OCT 65252
0107  04650 012525          OCT 12525
0108  04651 000004  P1226 OCT 4
0109  04652 000000          OCT 0
0110  04653 000004          OCT 4
0111  04654 160740          OCT 160740
0112  04655 017034          OCT 17034


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0113  04656 125250          OCT 125250
0114  04657 052524          OCT 52524
0115  04660 000040  P1227 OCT 40
0116  04661 000010          OCT 10
0117  04662 000050          OCT 50
0118  04663 007407          OCT 7407
0119  04664 170350          OCT 170350
0120  04665 052515          OCT 52515
0121  04666 125242          OCT 125242
0122  04667 000000  P1120 OCT 0
0123  04670 100000          OCT 100000
0124  04671 100000          OCT 100000
0125  04672 074170          OCT 74170
0126  04673 103606          OCT 103606
0127  04674 125252          OCT 125252
0128  04675 052524          OCT 52524
0129  04676 000000  P1121 OCT 0
0130  04677 160000          OCT 160000
0131  04700 160000          OCT 160000
0132  04701 017036          OCT 17036
0133  04702 160741          OCT 160741
0134  04703 165252          OCT 165252
0135  04704 012525          OCT 12525
0136  04705 000000  P1122 OCT 0
0137  04706 100001          OCT 100001
0138  04707 100001          OCT 100001
0139  04710 074170          OCT 74170
0140  04711 103607          OCT 103607
0141  04712 125253          OCT 125253
0142  04713 052524          OCT 52524
0143  04714 000000  P1123 OCT 0
0144  04715 060000          OCT 60000
0145  04716 060000          OCT 60000
0146  04717 017036          OCT 17036
0147  04720 160741          OCT 160741
0148  04721 165252          OCT 165252
0149  04722 012525          OCT 12525
0150  04723 000000  P1124 OCT 0
0151  04724 000000          OCT 0
0152  04725 000000          OCT 0
0153  04726 074170          OCT 74170
0154  04727 003606          OCT 3606
0155  04730 025252          OCT 25252
0156  04731 052524          OCT 52524
0157  04732 000000  P1125 OCT 0
0158  04733 060000          OCT 60000
0159  04734 060000          OCT 60000
0160  04735 017036          OCT 17036
0161  04736 060741          OCT 60741
0162  04737 065252          OCT 65252
0163  04740 012525          OCT 12525
0164  04741 000000  P1126 OCT 0
0165  04742 100000          OCT 100000
0166  04743 100000          OCT 100000
0167  04744 074170          OCT 74170
0168  04745 103606          OCT 103606


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0169  04746 125252          OCT 125252
0170  04747 052524          OCT 52524
0171  04750 000000  P1127 OCT 0
0172  04751 000014          OCT 14
0173  04752 000014          OCT 14
0174  04753 141703          OCT 141703
0175  04754 036074          OCT 36074
0176  04755 052535          OCT 52535
0177  04756 125242          OCT 125242
0178  04757 000004  P1220 OCT 4
0179  04760 000002          OCT 2
0180  04761 000006          OCT 6
0181  04762 160740          OCT 160740
0182  04763 017036          OCT 17036
0183  04764 025252          OCT 25252
0184  04765 152524          OCT 152524
0185  04766 000001  P1221 OCT 1
0186  04767 000000          OCT 0
0187  04770 000001          OCT 1
0188  04771 174170          OCT 174170
0189  04772 003607          OCT 3607
0190  04773 025252          OCT 25252
0191  04774 152525          OCT 152525
0192  04775 000004  P1222 OCT 4
0193  04776 000002          OCT 2
0194  04777 000006          OCT 6
0195  05000 160741          OCT 160741
0196  05001 017036        OCT 17036
0197  05002 125252          OCT 125252
0198  05003 052525          OCT 52525
0199  05004 000001  P1223 OCT 1
0200  05005 100000          OCT 100000
0201  05006 100001          OCT 100001
0202  05007 074170          OCT 74170
0203  05010 103607          OCT 103607
0204  05011 125252          OCT 125252
0205  05012 052525          OCT 52525
0206  05013 000004  P0224 OCT 4
0207  05014 000002          OCT 2
0208  05015 000006          OCT 6
0209  05016 060740          OCT 60740
0210  05017 017036          OCT 17036
0211  05020 025252          OCT 25252
0212  05021 052524          OCT 52524
0213  05022 000001  P1225 OCT 1
0214  05023 000000          OCT 0
0215  05024 000001          OCT 1
0216  05025 074170          OCT 74170
0217  05026 003607          OCT 3607
0218  05027 025252          OCT 25252
0219  05030 052525          OCT 52525
0220  05031 000004  P1226 OCT 4
0221  05032 000002          OCT 2
0222  05033 000006          OCT 6
0223  05034 160740          OCT 160740
0224  05035 017036          OCT 17036


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0225  05036 125252          OCT 125252
0226  05037 052524          OCT 52524
0227  05040 000040  P1227 OCT 40
0228  05041 000020          OCT 20
0229  05042 000060          OCT 60
0230  05043 007417          OCT 7417
0231  05044 170360          OCT 170360
0232  05045 052525          OCT 52525
0233  05046 125252          OCT 125252
0234  05047 100000  P1320 OCT 100000
0235  05050 000000          OCT 0
0236  05051 100000          OCT 100000
0237  05052 074170          OCT 74170
0238  05053 103606          OCT 103606
0239  05054 025252          OCT 25252
0240  05055 152524          OCT 152524
0241  05056 140000  P1321 OCT 140000
0242  05057 020000          OCT 20000
0243  05060 160000          OCT 160000
0244  05061 017036          OCT 17036
0245  05062 160741          OCT 160741
0246  05063 025252          OCT 25252
0247  05064 152525          OCT 152525
0248  05065 000001  P1322 OCT 1
0249  05066 100000          OCT 100000
0250  05067 100001          OCT 100001
0251  05070 074170          OCT 74170
0252  05071 103607          OCT 103607
0253  05072 125252          OCT 125252
0254  05073 052525          OCT 52525
0255  05074 040000  P1323 OCT 40000
0256  05075 020000          OCT 20000
0257  05076 060000          OCT 60000
0258  05077 017036          OCT 17036
0259  05100 160741          OCT 160741
0260  05101 125252          OCT 125252
0261  05102 052525          OCT 52525
0262  05103 000000  P1324 OCT 0
0263  05104 000000          OCT 0
0264  05105 000000          OCT 0
0265  05106 074170          OCT 74170
0266  05107 003606          OCT 3606
0267  05110 025252          OCT 25252
0268  05111 052524          OCT 52524
0269  05112 040000  P1325 OCT 40000
0270  05113 020000          OCT 20000
0271  05114 060000          OCT 60000
0272  05115 017036          OCT 17036
0273  05116 060741          OCT 60741
0274  05117 025252          OCT 25252
0275  05120 052525          OCT 52525
0276  05121 000000  P1326 OCT 0
0277  05122 100000          OCT 100000
0278  05123 100000          OCT 100000
0279  05124 074170          OCT 74170
0280  05125 103606          OCT 103606
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0281  05126 125252        OCT 125252
0282  05127 052524        OCT 52524
0283  05130 000010  P1327 OCT 10
0284  05131 000004        OCT 4
0285  05132 000014        OCT 14
0286  05133 141703        OCT 141703
0287  05134 036074        OCT 36074
0288  05135 052525        OCT 52525
0289  05136 125252        OCT 125252
0290  05137 000004  P1420 OCT 4
0291  05140 000000        OCT 0
0292  05141 000004        OCT 4
0293  05142 060740        OCT 60740
0294  05143 017034        OCT 17034
0295  05144 025250        OCT 25250
0296  05145 052524        OCT 52524
0297  05146 000001  P1421 OCT 1
0298  05147 000000        OCT 0
0299  05150 000001        OCT 1
0300  05151 034170        OCT 34170
0301  05152 003607        OCT 3607
0302  05153 025252        OCT 25252
0303  05154 012525        OCT 12525
0304  05155 000004  P1422 OCT 4
0305  05156 000000        OCT 0
0306  05157 000004        OCT 4
0307  05160 160740        OCT 160740
0308  05161 017034        OCT 17034
0309  05162 125250        OCT 125250
0310  05163 052524        OCT 52524
0311  05164 000001  P1423 OCT 1
0312  05165 000000        OCT 0
0313  05166 000001        OCT 1
0314  05167 034170        OCT 34170
0315  05170 003607        OCT 3607
0316  05171 025252        OCT 25252
0317  05172 012525        OCT 12525
0318  05173 000004  P1424 OCT 4
0319  05174 000000        OCT 0
0320  05175 000004        OCT 4
0321  05176 060740        OCT 60740
0322  05177 017034        OCT 17034
0323  05200 025250        OCT 25250
0324  05201 052524        OCT 52524
0325  05202 000001  P1425 OCT 1
0326  05203 000000        OCT 0
0327  05204 000001        OCT 1
0328  05205 034170        OCT 34170
0329  05206 003607        OCT 3607
0330  05207 025252        OCT 25252
0331  05210 012525        OCT 12525
0332  05211 000004  P1426 OCT 4
0333  05212 000000        OCT 0
0334  05213 000004        OCT 4
0335  05214 160740        OCT 160740
0336  05215 017034        OCT 17034


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0337  05216 125250        OCT 125250
0338  05217 052524        OCT 52524
0339  05220 000040  P1427 OCT 40
0340  05221 000000        OCT 0
0341  05222 000040        OCT 40
0342  05223 007407        OCT 7407
0343  05224 170340        OCT 170340
0344  05225 052505        OCT 52505
0345  05226 125242        OCT 125242
0346  05227 000000  P1520 OCT 0
0347  05230 000000        OCT 0
0348  05231 000000        OCT 0
0349  05232 074170        OCT 74170
0350  05233 003606        OCT 3606
0351  05234 025252        OCT 25252
0352  05235 052524        OCT 52524
0353  05236 000000  P1521 OCT 0
0354  05237 020000        OCT 20000
0355  05240 020000        OCT 20000
0356  05241 017036        OCT 17036
0357  05242 020741        OCT 20741
0358  05243 025252        OCT 25252
0359  05244 012525        OCT 12525
0360  05245 000000  P1522 OCT 0
0361  05246 100000        OCT 100000
0362  05247 100000        OCT 100000
0363  05250 074170        OCT 74170
0364  05251 103606        OCT 103606
0365  05252 125252        OCT 125252
0366  05253 052524        OCT 52524
0367  05254 000000  P1523 OCT 0
0368  05255 020000        OCT 20000
0369  05256 020000        OCT 20000
0370  05257 017036        OCT 17036
0371  05260 120741        OCT 120741
0372  05261 125252        OCT 125252
0373  05262 012525        OCT 12525
0374  05263 000000  P1524 OCT 0
0375  05264 000000        OCT 0
0376  05265 020000        OCT 0
0377  05266 074170        OCT 74170
0378  05267 003606        OCT 3606
0379  05270 025252        OCT 25252
0380  05271 052524        OCT 52524
0381  05272 100000  P1525 OCT 100000
0382  05273 020000        OCT 20000
0383  05274 120000        OCT 120000
0384  05275 017036        OCT 17036
0385  05276 120741        OCT 120741
0386  05277 025252        OCT 25252
0387  05300 112525        OCT 112525
0388  05301 000001  P1526 OCT 1
0389  05302 100000        OCT 100000
0390  05303 100001        OCT 100001
0391  05304 074170        OCT 74170
0392  05305 103607        OCT 103607


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0393  05306 125252        OCT 125252
0394  05307 052525        OCT 52525
0395  05310 000000  P1527 OCT 0
0396  05311 000004        OCT 4
0397  05312 000004        OCT 4
0398  05313 141703        OCT 141703
0399  05314 036064        OCT 36064
0400  05315 052525        OCT 52525
0401  05316 125242        OCT 125242
0402  05317 000004  P1620 OCT 4
0403  05320 000000        OCT 0
0404  05321 000004        OCT 4
0405  05322 160740        OCT 160740
0406  05323 017034        OCT 17034
0407  05324 025250        OCT 25250
0408  05325 152524        OCT 152524
0409  05326 000001  P1621 OCT 1
0410  05327 000000        OCT 0
0411  05330 000001        OCT 1
0412  05331 174170        OCT 174170
0413  05332 003607        OCT 3607
0414  05333 025252        OCT 25252
0415  05334 152525        OCT 152525
0416  05335 000004  P1622 OCT 4
0417  05336 000000        OCT 0
0418  05337 000004        OCT 4
0419  05340 160741        OCT 160741
0420  05341 017034        OCT 17034
0421  05342 125250        OCT 125250
0422  05343 052525        OCT 52525
0423  05344 000001  P1623 OCT 1
0424  05345 000000        OCT 0
0425  05346 000001        OCT 1
0426  05347 074170        OCT 74170
0427  05350 003607        OCT 3607
0428  05351 025252        OCT 25252
0429  05352 052525        OCT 52525
0430  05353 000004  P1624 OCT 4
0431  05354 000000        OCT 0
0432  05355 000004        OCT 4
0433  05356 060740        OCT 60740
0434  05357 017034        OCT 17034
0435  05360 025250        OCT 25250
0436  05361 052524        OCT 52524
0437  05362 000001  P1625 OCT 1
0438  05363 100000        OCT 100000
0439  05364 100001        OCT 100001
0440  05365 074170        OCT 74170
0441  05366 103607        OCT 103607
0442  05367 125252        OCT 125252
0443  05370 052525        OCT 52525
0444  05371 000004  P1626 OCT 4
0445  05372 000001        OCT 1
0446  05373 000005        OCT 5
0447  05374 160740        OCT 160740
0448  05375 017035        OCT 17035


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0449  05376 125251        OCT 125251
0450  05377 052524        OCT 52524
0451  05400 000040  P1627 OCT 40
0452  05401 000000        OCT 0
0453  05402 000040        OCT 40
0454  05403 007417        OCT 7417
0455  05404 170340        OCT 170340
0456  05405 052505        OCT 52505
0457  05406 125252        OCT 125252
0458  05407 000040  P1720 OCT 40
0459  05410 000020        OCT 20
0460  05411 000060        OCT 60
0461  05412 107416        OCT 107416
0462  05413 070360        OCT 70360
0463  05414 152524        OCT 152524
0464  05415 025252        OCT 25252
0465  05416 000010  P1721 OCT 10
0466  05417 000004        OCT 4
0467  05420 000014        OCT 14
0468  05421 141703        OCT 141703
0469  05422 036074        OCT 36074
0470  05423 152525        OCT 152525
0471  05424 025252        OCT 25252
0472  05425 000040  P1722 OCT 40
0473  05426 000020        OCT 20
0474  05427 000060        OCT 60
0475  05430 007417        OCT 7417
0476  05431 170360        OCT 170360
0477  05432 052525        OCT 52525
0478  05433 125252        OCT 125252
0479  05434 000010  P1723 OCT 10
0480  05435 000004        OCT 4
0481  05436 000014        OCT 14
0482  05437 141703        OCT 141703
0483  05440 036074        OCT 36074
0484  05441 052525        OCT 52525
0485  05442 125252        OCT 125252
0486  05443 000040  P1724 OCT 40
0487  05444 000020        OCT 20
0488  05445 000060        OCT 60
0489  05446 007416        OCT 7416
0490  05447 070360        OCT 70360
0491  05450 052524        OCT 52524
0492  05451 025252        OCT 25252
0493  05452 000010  P1725 OCT 10
0494  05453 000004        OCT 4
0495  05454 000014        OCT 14
0496  05455 041703        OCT 41703
0497  05456 036074        OCT 36074
0498  05457 052525        OCT 52525
0499  05460 025252        OCT 25252
0500  05461 000040  P1726 OCT 40
0501  05462 000020        OCT 20
0502  05463 000060        OCT 60
0503  05464 007416        OCT 7416
0504  05465 170360        OCT 170360
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0505  05466 052524          OCT 52524
0506  05467 125252          OCT 125252
0507  05470 000400  P1727    OCT 400
0508  05471 000200          OCT 200
0509  05472 000600          OCT 600
0510  05473 074170          OCT 74170
0511  05474 103607          OCT 103607
0512  05475 125252          OCT 125252
0513  05476 052525          OCT 52525
0514  05477 000000          OCT 0
0515  05500 000020  PASS1    OCT 20
0516  05501 000021          OCT 21
0517  05502 000022          OCT 22
0518  05503 000023          OCT 23
0519  05504 000024          OCT 24
0520  05505 000025          OCT 25
0521  05506 000026          OCT 26
0522  05507 000027          OCT 27
0523  05510 001020          OCT 1020
0524  05511 001021          OCT 1021
0525  05512 001022          OCT 1022
0526  05513 001023          OCT 1023
0527  05514 001024          OCT 1024
0528  05515 001025          OCT 1025
0529  05516 001026          OCT 1026
0530  05517 001027          OCT 1027
0531  05520 001120          OCT 1120
0532  05521 001121          OCT 1121
0533  05522 001122          OCT 1122
0534  05523 001123          OCT 1123
0535  05524 001124          OCT 1124
0536  05525 001125          OCT 1125
0537  05526 001126          OCT 1126
0538  05527 001127          OCT 1127
0539  05530 001220          OCT 1220
0540  05531 001221          OCT 1221
0541  05532 001222          OCT 1222
0542  05533 001223          OCT 1223
0543  05534 001224          OCT 1224
0544  05535 001225          OCT 1225
0545  05536 001226          OCT 1226
0546  05537 001227          OCT 1227
0547  05540 001320          OCT 1320
0548  05541 001321          OCT 1321
0549  05542 001322          OCT 1322
0550  05543 001323          OCT 1323
0551  05544 001324          OCT 1324
0552  05545 001325          OCT 1325
0553  05546 001326          OCT 1326
0554  05547 001327          OCT 1327
0555  05550 001420          OCT 1420
0556  05551 001421          OCT 1421
0557  05552 001422          OCT 1422
0558  05553 001423          OCT 1423
0559  05554 001424          OCT 1424
0560  05555 001425          OCT 1425
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0561  05556 001426          OCT 1426
0562  05557 001427          OCT 1427
0563  05560 001520          OCT 1520
0564  05561 001521          OCT 1521
0565  05562 001522          OCT 1522
0566  05563 001523          OCT 1523
0567  05564 001524          OCT 1524
0568  05565 001525          OCT 1525
0569  05566 001526          OCT 1526
0570  05567 001527          OCT 1527
0571  05570 001620          OCT 1620
0572  05571 001621          OCT 1621
0573  05572 001622          OCT 1622
0574  05573 001623          OCT 1623
0575  05574 001624          OCT 1624
0576  05575 001625          OCT 1625
0577  05576 001626          OCT 1626
0578  05577 001627          OCT 1627
0579  05600 001720          OCT 1720
0580  05601 001721          OCT 1721
0581  05602 001722          OCT 1722
0582  05603 001723          OCT 1723
0583  05604 001724          OCT 1724
0584  05605 001725          OCT 1725
0585  05606 001726          OCT 1726
0586  05607 001727          OCT 1727
0587  05610 000030  PASS2    OCT 30
0588  05611 000031          OCT 31
0589  05612 000032          OCT 32
0590  05613 000033          OCT 33
0591  05614 000034          OCT 34
0592  05615 000035          OCT 35
0593  05616 000036          OCT 36
0594  05617 000037          OCT 37
0595  05620 001030          OCT 1030
0596  05621 001031          OCT 1031
0597  05622 001032          OCT 1032
0598  05623 001033          OCT 1033
0599  05624 001034          OCT 1034
0600  05625 001035          OCT 1035
0601  05626 001036          OCT 1036
0602  05627 001037          OCT 1037
0603  05630 001130          OCT 1130
0604  05631 001131          OCT 1131
0605  05632 001132          OCT 1132
0606  05633 001133          OCT 1133
0607  05634 001134          OCT 1134
0608  05635 001135          OCT 1135
0609  05636 001136          OCT 1136
0610  05637 001137          OCT 1137
0611  05640 001230          OCT 1230
0612  05641 001231          OCT 1231
0613  05642 001232          OCT 1232
0614  05643 001233          OCT 1233
0615  05644 001234          OCT 1234
0616  05645 001235          OCT 1235
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0617  05646 001236          OCT 1236
0618  05647 001237          OCT 1237
0619  05650 001330          OCT 1330
0620  05651 001331          OCT 1331
0621  05652 001332          OCT 1332
0622  05653 001333          OCT 1333
0623  05654 001334          OCT 1334
0624  05655 001335          OCT 1335
0625  05656 001336          OCT 1336
0626  05657 001337          OCT 1337
0627  05660 001430          OCT 1430
0628  05661 001431          OCT 1431
0629  05662 001432          OCT 1432
0630  05663 001433          OCT 1433
0631  05664 001434          OCT 1434
0632  05665 001435          OCT 1435
0633  05666 001436          OCT 1436
0634  05667 001437          OCT 1437
0635  05670 001530          OCT 1530
0636  05671 001531          OCT 1531
0637  05672 001532          OCT 1532
0638  05673 001533          OCT 1533
0639  05674 001534          OCT 1534
0640  05675 001535          OCT 1535
0641  05676 001536          OCT 1536
0642  05677 001537          OCT 1537
0643  05700 001630          OCT 1630
0644  05701 001631          OCT 1631
0645  05702 001632          OCT 1632
0646  05703 001633          OCT 1633
0647  05704 001634          OCT 1634
0648  05705 001635          OCT 1635
0649  05706 001636          OCT 1636
0650  05707 001637          OCT 1637
0651  05710 001730          OCT 1730
0652  05711 001731          OCT 1731
0653  05712 001732          OCT 1732
0654  05713 001733          OCT 1733
0655  05714 001734          OCT 1734
0656  05715 001735          OCT 1735
0657  05716 001736          OCT 1736
0658  05717 001737          OCT 1737
0659  05720 000060  PASS3    OCT 60
0660  05721 000061          OCT 61
0661  05722 000062          OCT 62
0662  05723 000063          OCT 63
0663  05724 000064          OCT 64
0664  05725 000065          OCT 65
0665  05726 000066          OCT 66
0666  05727 000067          OCT 67
0667  05730 001060          OCT 1060
0668  05731 001061          OCT 1061
0669  05732 001062          OCT 1062
0670  05733 001063          OCT 1063
0671  05734 001064          OCT 1064
0672  05735 001065          OCT 1065
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0673  05736 001066          OCT 1066
0674  05737 001067          OCT 1067
0675  05740 001160          OCT 1160
0676  05741 001161          OCT 1161
0677  05742 001162          OCT 1162
0678  05743 001163          OCT 1163
0679  05744 001164          OCT 1164
0680  05745 001165          OCT 1165
0681  05746 001166          OCT 1166
0682  05747 001167          OCT 1167
0683  05750 001260          OCT 1260
0684  05751 001261          OCT 1261
0685  05752 001262          OCT 1262
0686  05753 001263          OCT 1263
0687  05754 001264          OCT 1264
0688  05755 001265          OCT 1265
0689  05756 001266          OCT 1266
0690  05757 001267          OCT 1267
0691  05760 001360          OCT 1360
0692  05761 001361          OCT 1361
0693  05762 001362          OCT 1362
0694  05763 001363          OCT 1363
0695  05764 001364          OCT 1364
0696  05765 001365          OCT 1365
0697  05766 001366          OCT 1366
0698  05767 001367          OCT 1367
0699  05770 001460          OCT 1460
0700  05771 001461          OCT 1461
0701  05772 001462          OCT 1462
0702  05773 001463          OCT 1463
0703  05774 001464          OCT 1464
0704  05775 001465          OCT 1465
0705  05776 001466          OCT 1466
0706  05777 001467          OCT 1467
0707  06000 001560          OCT 1560
0708  06001 001561          OCT 1561
0709  06002 001562          OCT 1562
0710  06003 001563          OCT 1563
0711  06004 001564          OCT 1564
0712  06005 001565          OCT 1565
0713  06006 001566          OCT 1566
0714  06007 001567          OCT 1567
0715  06010 001660          OCT 1660
0716  06011 001661          OCT 1661
0717  06012 001662          OCT 1662
0718  06013 001663          OCT 1663
0719  06014 001664          OCT 1664
0720  06015 001665          OCT 1665
0721  06016 001666          OCT 1666
0722  06017 001667          OCT 1667
0723  06020 001760          OCT 1760
0724  06021 001761          OCT 1761
0725  06022 001762          OCT 1762
0726  06023 001763          OCT 1763
0727  06024 001764          OCT 1764
0728  06025 001765          OCT 1765
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0729  06026 001766          OCT 1766
0730  06027 001767          OCT 1767
0731  06030 000073  PASS4    OCT 73
0732  06031 000071          OCT 71
0733  06032 000072          OCT 72
0734  06033 000073          OCT 73
0735  06034 000074          OCT 74
0736  06035 000075          OCT 75
0737  06036 000076          OCT 76
0738  06037 000077          OCT 77
0739  06040 001070          OCT 1070
0740  06041 001071          OCT 1071
0741  06042 001072          OCT 1072
0742  06043 001073          OCT 1073
0743  06044 001074          OCT 1074
0744  06045 001075          OCT 1075
0745  06046 001076          OCT 1076
0746  06047 001077          OCT 1077
0747  06050 001170          OCT 1170
0748  06051 001171          OCT 1171
0749  06052 001172          OCT 1172
0750  06053 001173          OCT 1173
0751  06054 001174          OCT 1174
0752  06055 001175          OCT 1175
0753  06056 001176          OCT 1176
0754  06057 001177          OCT 1177
0755  06060 001270          OCT 1270
0756  06061 001271          OCT 1271
0757  06062 001272          OCT 1272
0758  06063 001273          OCT 1273
0759  06064 001274          OCT 1274
0760  06065 001275          OCT 1275
0761  06066 001276          OCT 1276
0762  06067 001277          OCT 1277
0763  06070 001370          OCT 1370
0764  06071 001371          OCT 1371
0765  06072 001372          OCT 1372
0766  06073 001373          OCT 1373
0767  06074 001374          OCT 1374
0768  06075 001375          OCT 1375
0769  06076 001376          OCT 1376
0770  06077 001377          OCT 1377
0771  06100 001470          OCT 1470
0772  06101 001471          OCT 1471
0773  06102 001472          OCT 1472
0774  06103 001473          OCT 1473
0775  06104 001474          OCT 1474
0776  06105 001475          OCT 1475
0777  06106 001476          OCT 1476
0778  06107 001477          OCT 1477
0779  06110 001570          OCT 1570
0780  06111 001571          OCT 1571
0781  06112 001572          OCT 1572
0782  06113 001573          OCT 1573
0783  06114 001574          OCT 1574
0784  06115 001575          OCT 1575


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0785  06116 001576          OCT 1576
0786  06117 001577          OCT 1577
0787  06120 001670          OCT 1670
0788  06121 001671          OCT 1671
0789  06122 001672          OCT 1672
0790  06123 001673          OCT 1673
0791  06124 001674          OCT 1674
0792  06125 001675          OCT 1675
0793  06126 001676          OCT 1676
0794  06127 001677          OCT 1677
0795  06130 001770          OCT 1770
0796  06131 001771          OCT 1771
0797  06132 001772          OCT 1772
0798  06133 001773          OCT 1773
0799  06134 001774          OCT 1774
0800  06135 001775          OCT 1775
0801  06136 001776          OCT 1776
0802  06137 001777          OCT 1777
0803  06140 000000  END      OCT 0
0804  06141 000000  BAD      OCT 0
0805  06142 000000  TADR     OCT 0
0806  06143 004507  RPAT     DEF P0020
0807  06144 004500  PAT      DEF PAT1
0808  06145 004507  TPAT     DEF P0020
0809  06146 004506  LPAT     DEF PAT7
0810  06147 004500  CON1     DEF PAT1
0811  06150 005500  CON2     DEF PASS1
0812  06151 005500  INSAR    DEF PASS1
0813  06152 000000  TEMP     OCT 0
0814  06153 005610  PAS1     DEF PASS2
0815  06154 005720  PAS2     DEF PASS3
0816  06155 006030  PAS3     DEF PASS4
0817  06156 006140  PAS4     DEF END
0818  06157 001565  ILL1     OCT 1565
0819  06160 001566  ILL2     OCT 1566
0820  06161 001575  ILL3     OCT 1575
0821  06162 001576  ILL4     OCT 1576
0822  06163 001665  ILL5     OCT 1665
0823  06164 001666  ILL6     OCT 1666
0824  06165 001675  ILL7     OCT 1675
0825  06166 001676  ILL8     OCT 1676
0826  06167 100000  SMASK    OCT 100000
0827  06170 001777  AMSK1    OCT 1777
0828  06200                 ORG 6200B
0829  06200 002700  BASIC    CLA,CCE         A=0,E=1
0830  06201 000000           NOP
0831  06202 000010           SLA
0832  06203 102001           HLT 01          SLA FAILED
0833  06204 006400           CLB             B=0
0834  06205 004050           CLE,SLB         E=0
0835  06206 102001           HLT 01          SLB FAILED
0836  06207 002040           SEZ
0837  06210 102001           HLT 01          CLE FAILED
0838  06211 002300           CCE             E=1
0839  06212 000050           CLE,SLA         E=0
0840  06213 102001           HLT 01          A NOT =0


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0841  06214 002040           SEZ
0842  06215 102001           HLT 01          E NOT =0
0843  06216 002300           CCE             E=1
0844  06217 004050           CLE,SLB         E=0
0845  06220 102001           HLT 01          B NOT =0
0846  06221 002040           SEZ
0847  06222 102001           HLT 01          E NOT =0
0848  06223 002004           INA             A=1
0849  06224 006004           INB             B=1
0850  06225 001000           ALS
0851  06226 005000           BLS
0852  06227 001100           ARS             A=1
0853  06230 005100           BRS             B=1
0854  06231 002011           SLA,RSS
0855  06232 102001           HLT 01          A NOT =1
0856  06233 006011           SLB,RSS
0857  06234 102001           HLT 01          B NOT =1
0858  06235 102501           LIA 01          A=077777
0859  06236 106501           LIB 01          B=077777
0860  06237 002004           INA             A=100000
0861  06240 006004           INB             B=100000
0862  06241 001000           ALS
0863  06242 005000           BLS
0864  06243 002021           SSA,RSS
0865  06244 102001           HLT 01          ALS FAILED
0866  06245 006021           SSB,RSS
0867  06246 102001           HLT 01          BLS FAILED
0868  06247 002404           CLA,INA         A=1
0869  06250 006404           CLB,INB         B=1
0870  06251 001200           RAL             A=2
0871  06252 005200           RBL             B=2
0872  06253 000010           SLA
0873  06254 102001           HLT 01          RAL FAILED
0874  06255 004010           SLB
0875  06256 102001           HLT 01          RBL FAILED
0876  06257 001300           RAR             A=1
0877  06260 005300           RBR             B=1
0878  06261 002011           SLA,RSS
0879  06262 102001           HLT 01          RAR FAILED
0880  06263 006011           SLB,RSS
0881  06264 102001           HLT 01          RBR FAILED
0882  06265 102501           LIA 01          A=077777
0883  06266 106501           LIB 01          B=077777
0884  06267 001000           ALS             A=077776
0885  06270 005000           BLS             B=077776
0886  06271 002030           SSA,SLA
0887  06272 102001           HLT 01          ALS FAILED
0888  06273 006030           SSB,SLB
0889  06274 102001           HLT 01          BLS FAILED
0890  06275 002404           CLA,INA         A=1
0891  06276 006404           CLB,INB         B=1
0892  06277 001500           ERA             A=0
0893  06300 002041           SEZ,RSS         E=1
0894  06301 102001           HLT 01          ERA FAILED
0895  06302 000040           CLE
0896  06303 005500           ERB             B=0


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0897  06304 002041           SEZ,RSS         E=1
0898  06305 102001           HLT 01          ERB FAILED
0899  06306 001600           ELA             E=0,A=1
0900  06307 002040           SEZ
0901  06310 102001           HLT 01          ELA FAILED
0902  06311 002300           CCE             A=0,E=1
0903  06312 005600           ELB             A=1,E=0
0904  06313 026011           SLB,RSS
0905  06314 102001           HLT 01          ELB FAILED
0906  06315 001700           ALF
0907  06316 001100           ARS
0908  06317 001100           ARS
0909  06320 001100           ARS
0910  06321 001100           ARS
0911  06322 002011           SLA,RSS
0912  06323 102001           HLT 01          ALF FAILED
0913  06324 005700           BLF
0914  06325 005100           BRS
0915  06326 005100           BRS
0916  06327 005100           BRS
0917  06330 005100           BRS
0918  06331 006011           SLB,RSS
0919  06332 102001           HLT 01          BLF FAILED
0920  06333 002404           CLA,INA
0921  06334 001110           ARS,SLA
0922  06335 102001           HLT 01          ARS,SLA FAILED
0923  06336 006404           CLB,INB
0924  06337 005110           BRS,SLB
0925  06340 102001           HLT 01          BRS,SLB FAILED
0926  06341 002700           CLA,CCE
0927  06342 001610           ELA,SLA         A=1,E=0
0928  06343 001510           ERA,SLA         A=0,E=1
0929  06344 102001           HLT 01          ELA,SLA OR ERA,SLA FAILED
0930  06345 001500           ERA             A15=1,E=0
0931  06346 002440           SEZ
0932  06347 102001           HLT 01          E DID NOT CLEAR AFTER ERA
0933  06350 006700           CLB,CCE         B=0,E=1
0934  06351 005610           ELB,SLB         B=1,E=0
0935  06352 005510           ERB,SLB         B=0,F=1
0936  06353 102001           HLT 01          ELB,SLB OR ERB,SLB FAILED
0937  06354 005500           ERB             B15=1,E=0
0938  06355 002040           SEZ
0939  06356 102001           HLT 01          E DID NOT CLEAR AFTER ERB
0940  06357 003700           CCA,CCE         A=177777,E=1
0941  06360 001500           ERA
0942  06361 002041           SEZ,RSS         E=1
0943  06362 102001           HLT 01          E NOT SET AFTER ERA
0944  06363 001600           ELA
0945  06364 002041           SEZ,RSS         E=1
0946  06365 102001           HLT 01          E NOT SET AFTER ELA
0947  06366 007700           CCA,CCE         B=177777,E=1
0948  06367 005600           ERB
0949  06370 002041           SEZ,RSS         E=1
0950  06371 102001           HLT 01          E NOT SET AFTER ERB
0951  06372 005600           ELB
0952  06373 002041           SEZ,RSS         E=1
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0953  06374 102001        HLT 01          E NOT SET AFTER ELB
0954  06375 062147  INIT  LDA CON1
0955  06376 072144        STA PAT
0956  06377 062150        LDA CON2
0957  06400 072151        STA INSAR
0958  06401 062143        LDA RPAT
0959  06402 072145        STA TPAT        INITIALIZE AND MODIFY
0960  06403 026512        JMP AMODI
0961  06404 162151  START LDA INSAR,I
0962  06405 012170        AND AMSK1
0963  06406 052157        CPA ILL1        1565-ERA,CLE,ERA
0964  06407 026531        JMP ILLC
0965  06410 052160        CPA ILL2        1566-ERA,CLE,ELA
0966  06411 026531        JMP ILLC
0967  06412 052161        CPA ILL3        1575-ERA,CLE,SLA,ERA
0968  06413 026531        JMP ILLC
0969  06414 052162        CPA ILL4        1576-ERA,CLE,SLA,ELA
0970  06415 026531        JMP ILLC
0971  06416 052163        CPA ILL5        1665-ELA,CLE,ERA
0972  06417 026531        JMP ILLC
0973  06420 052164        CPA ILL6        1666-ELA,CLE,ELA
0974  06421 026531        JMP ILLC
0975  06422 052165        CPA ILL7        1675-ELA,CLE,SLA,ERA
0976  06423 026531        JMP ILLC
0977  06424 052166        CPA ILL8        1676-ELA,CLE,SLA,ELA
0978  06425 026531        JMP ILLC
0979  06426 162151        LDA INSAR,I     PICKUP LEGAL INSTRUCTION
0980  06427 000000  SETUP NOP             STA SHA1 OR SHB1
0981  06430 036151        ISZ INSAR       UPDATE INSTR. ARRAY ADDRESS
0982  06431 000000  CHECK NOP             SHIFT AND CHECK SUBR. JSB T100A
0983  06432 062144  BACK  LDA PAT         INSTR. COMPLETED SEVEN PATTERNS?
0984  06433 052146        CPA LPAT
0985  06434 026441        JMP NINST       =
0986  06435 002004        INA             NOT = MODIFY FOR NEXT PATTERN
0987  06436 072144        STA PAT         NEXT TEST PATTERN
0988  06437 036145        ISZ TPAT        ADDR. OF NEXT GOOD PATTERN
0989  06440 026431        JMP CHECK
0990  06441 036145  NINST ISZ TPAT        ADDR. OF NEXT GOOD PATTERN
0991  06442 062147        LDA CON1
0992  06443 072144        STA PAT
0993  06444 062151        LDA INSAR
0994  06445 052153        CPA PAS1
0995  06446 026456        JMP NPASS       =
0996  06447 052154        CPA PAS2
0997  06450 026456        JMP NPASS       =
0998  06451 052155        CPA PAS3
0999  06452 026456        JMP NPASS       =
1000  06453 052156        CPA PAS4
1001  06454 026461        JMP MODI        = ALL INSTR. COMPLETE FOR A OR B
1002  06455 026404        JMP START
1003  06456 062143  NPASS LDA RPAT
1004  06457 072145        STA TPAT
1005  06460 026404        JMP START
1006  06461 062150  MODI  LDA CON2
1007  06462 072151        STA INSAR       INIT. INSTR. ARRAY BASE ADDRESS
1008  06463 062143        LDA RPAT


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1009  06464 072145        STA TPAT        INIT. GOOD PATT. ARRAY BASE ADDR
1010  06465 062147        LDA CON1
1011  06466 072144        STA PAT         INIT. PATT. ARRAY BASE ADDR.
1012  06467 162151        LDA INSAR,I
1013  06470 012606        AND BMASK
1014  06471 002002        SZA             A=0 FOR BMODI
1015  06472 026512        JMP AMODI
1016  06473 162151  BMODI LDA INSAR,I
1017  06474 032606        IOR BMASK       IOR 004000
1018  06475 172151        STA INSAR,I     INSTR. MODIFIED
1019  06476 036151        ISZ INSAR       ADD ONE TO INSTR. ADDRESS
1020  06477 062151        LDA INSAR
1021  06500 052156        CPA PAS4
1022  06501 026503        JMP FB          =
1023  06502 026473        JMP BMODI       NOT =
1024  06503 062150  FB    LDA CON2
1025  06504 072151        STA INSAR       INIT. INSTR. ARRAY BASE ADDR.
1026  06505 062602        LDA JSB
1027  06506 072431        STA CHECK       SET UP JSB TO B SHIFT-CHECK SUBR
1028  06507 062604        LDA SSHB1
1029  06510 072427        STA SETUP       SETUP PROPER SHIFT INSTR.
1030  06511 026607        JMP ASPEC
1031  06512 162151  AMODI LDA INSAR,I
1032  06513 012605        AND AMASK       AND 173777
1033  06514 172151        STA INSAR,I
1034  06515 036151        ISZ INSAR       ADD ONE TO INSTR. ADDRESS
1035  06516 062151        LDA INSAR
1036  06517 052156        CPA PAS4
1037  06520 026522        JMP FA          =
1038  06521 026512        JMP AMODI       NOT =
1039  06522 062150  FA    LDA CON2
1040  06523 072151        STA INSAR       RESET INSTR. ARRAY BASE ADDR.
1041  06524 062601        LDA JSA
1042  06525 072431        STA CHECK       SETUP JSA TO A SHIFT-CHECK SUBR.
1043  06526 062603        LDA SSHA1
1044  06527 072427        STA SETUP       SETUP PROPER SHIFT INSTR.
1045  06530 026746        JMP BSPEC
1046  06531 036151  ILLC  ISZ INSAR
1047  06532 062144  SEVEN LDA PAT         SEVEN PATTERNS COMPLETED?
1048  06533 052146        CPA LPAT
1049  06534 026441        JMP NINST       =
1050  06535 036144        ISZ PAT         NOT =
1051  06536 036145        ISZ TPAT
1052  06537 026532        JMP SEVEN
1053  06540 000000  T100A NOP
1054  06541 000040        CLE
1055  06542 162144        LDA PAT,I
1056  06543 000000  SHA1  NOP
1057  06544 000000        NOP
1058  06545 152145        CPA TPAT,I
1059  06546 126540        JMP T100A,I     =
1060  06547 016563        JSB ERROR       NOT =
1061  06550 126540        JMP T100A,I     ERROR RETURN
1062  06551 000000  T100B NOP
1063  06552 000040        CLE
1064  06553 166144        LDB PAT,I


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1065  06554 000000  SHB1  NOP
1066  06555 000000        NOP
1067  06556 062001        LDA 1
1068  06557 156145        CPB TPAT,I
1069  06560 126551        JMP T100B,I     =
1070  06561 016563        JSB ERROR       NOT =
1071  06562 126551        JMP T100B,I     ERROR RETURN
1072  06563 000000  ERROR NOP
1073  06564 072141        STA BAD
1074  06565 162145        LDA TPAT,I      GOOD PATTERN=A
1075  06566 066141        LDB BAD         BAD PATTERN=B
1076  06567 102001        HLT 01          LOOK
1077  06570 062151        LDA INSAR
1078  06571 042577        ADA SUB1
1079  06572 072142        STA TADR
1080  06573 162142        LDA TADR,I      BAD INSTR. CODE
1081  06574 166144        LDB PAT,I       ORIGINAL PATTERN
1082  06575 102001        HLT 01          LOOK
1083  06576 126563        JMP ERROR,I
1084  06577 177777  SUB1  OCT 177777
1085  06600 077777  SOVFC OCT 77777
1086  06601 016540  JSA   JSB T100A
1087  06602 016551  JSB   JSB T100B
1088  06603 072543  SSHA1 STA SHA1
1089  06604 072554  SSHB1 STA SHB1
1090  06605 173777  AMASK OCT 173777
1091  06606 004000  BMASK OCT 004000
1092  06607 002504  ASPEC CLA,CLE,INA
1093  06610 001565        ERA,CLE,ERA       1565
1094  06611 002002        SZA
1095  06612 102001        HLT 01          ERA,CLE,ERA FAILED
1096  06613 002040        SEZ
1097  06614 102001        HLT 01          E NOT = 0
1098  06615 002404        CLA,INA
1099  06616 001566        ERA,CLE,ELA       1566
1100  06617 002002        SZA
1101  06620 102001        HLT 01          ERA,CLE,ELA FAILED
1102  06621 002040        SEZ
1103  06622 102001        HLT 01          E NOT =0
1104  06623 002404        CLA,INA
1105  06624 001575        ERA,CLE,SLA,ERA   1575
1106  06625 102001        HLT 01          SLA FAILED
1107  06626 002002        SZA
1108  06627 102001        HLT 01          ERA,CLE,SLA,ERA FAILED
1109  06630 002040        SEZ
1110  06631 102001        HLT 01          E NOT =0
1111  06632 002404        CLA,INA
1112  06633 001576        ERA,CLE,SLA,ELA   1576
1113  06634 102001        HLT 01          SLA FAILED
1114  06635 002002        SZA
1115  06636 102001        HLT 01          ERA,CLE,SLA,ELA FAILED
1116  06637 002040        SEZ
1117  06640 102001        HLT 01          E NOT =0
1118  06641 062167        LDA SMASK         100000
1119  06642 001665        ELA,CLE,ERA     1665
1120  06643 002002        SZA


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1121  06644 102001        HLT 01          ELA,CLE,ERA FAILED
1122  06645 002040        SEZ
1123  06646 102001        HLT 01          E NOT =0
1124  06647 062167        LDA SMASK         100000
1125  06650 001666        ELA,CLE,ELA       1666
1126  06651 002002        SZA
1127  06652 102001        HLT 01          ELA,CLE,ELA FAILED
1128  06653 002040        SEZ
1129  06654 102001        HLT 01          E NOT =0
1130  06655 062167        LDA SMASK         100000
1131  06656 001675        ELA,CLE,SLA,ERA   1675
1132  06657 102001        HLT 01          SLA FAILED
1133  06660 002002        SZA
1134  06661 102001        HLT 01          ELA,CLE,SLA,ERA FAILED
1135  06662 002040        SEZ
1136  06663 102001        HLT 01          E NOT =0
1137  06664 062167        LDA SMASK         100000
1138  06665 001676        ELA,CLE,SLA,ERA   1676
1139  06666 102001        HLT 01          SLA FAILED
1140  06667 002002        SZA
1141  06670 102001        HLT 01          ELA,CLE,SLA,ERA FAILED
1142  06671 002040        SEZ
1143  06672 102001        HLT 01          E NOT =0
1144  06673 103101        CLO             CLEAR OVERFLOW INDICATOR
1145  06674 102101        STO             SET OVERFLOW INDICATOR
1146  06675 102301        SOS             SKIP ON OVERFLOW SET
1147  06676 102001        HLT 01          STO OR SOS FAILED
1148  06677 103301        SOS C           SKIP ON OVERFLOW SET AND CLEAR
1149  06700 102001        HLT 01          SOS,C FAILED
1150  06701 102201        SOC             SKIP ON OVERFLOW CLEAR
1151  06702 102001        HLT 01          SOS,C OR SOC MALFUNCTION
1152  06703 102301        SOS             SKIP ON OVERFLOW SET
1153  06704 002001        RSS             SHOULD NOT SKIP
1154  06705 102001        HLT 01          SOS SKIP WHEN OVERFLOW CLEARED
1155  06706 103101        CLO             CLEAR OVERFLOW INDICATOR
1156  06707 052600        LDA SOVFC       A=077777
1157  06710 002004        INA             A=100000-OVERFLOW SHOULD BE SET
1158  06711 103301        SOS C           SKIP ON OVERFLOW SET
1159  06712 102001        HLT 01          INA DID NOT SET OVERFLOW
1160  06713 103101        CLO             CLEAR OVERFLOW INDICATOR
1161  06714 052577        LDA SUB1        A=177777
1162  06715 002004        INA             A=000000,E=1-OVERFLOW CLEAR
1163  06716 102201        SOC             SKIP ON OVERFLOW CLEAR
1164  06717 102001        HLT 01          UNLIKE SIGNS CAUSED OVERFLOW TO
1165*BE SET
1166  06720 103101        CLO             CLEAR OVERFLOW INDICATOR
1167  06721 052577        LDA SUB1        A=177777
1168  06722 042167        ADA SMASK       ADD 100000
1169  06723 103301        SOS C           SKIP ON OVERFLOW SET
1170  06724 102001        HLT 01          ADA DID NOT SET OVERFLOW
1171  06725 103101        CLO             CLEAR OVERFLOW INDICATOR
1172  06726 052600        LDA SOVFC       A=077777
1173  06727 042167        ADA SMASK       ADD 100000
1174  06730 102201        SOC             SKIP ON OVERFLOW CLEAR
1175  06731 102001        HLT 01          UNLIKE SIGNS CAUSED OVERFLOW TO
1176*BE SET
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1177  06732 103101        CLO             CLEAR OVERFLOW INDICATOR
1178  06733 003400        CCA             A=177777
1179  06734 042577        ADA SUB1        ADD 177777
1180  06735 102201        SOC             SKIP ON OVERFLOW CLEAR
1181  06736 102001        HLT 01          ILLEGAL SET OF OVERFLOW
1182  06737 103101        CLO             CLEAR OVERFLOW INDICATOR
1183  06740 002400        CLA             A=000000
1184  06741 040000        ADA 0           ADD 000000
1185  06742 102201        SOC             SKIP ON OVERFLOW CLEAR
1186  06743 102001        HLT 01          ILLEGAL SET OF OVERFLOW
1187  06744 000340        CLE
1188  06745 026404        JMP START
1189  06746 006564  BSPEC CLB,CLE,INB
1190  06747 005565        ERB,CLE,ERB         5565
1191  06750 006002        SZB
1192  06751 102001        HLT 01          ERB,CLE,ERB FAILED
1193  06752 002340        SEZ
1194  06753 102001        HLT 01          E NOT =0
1195  06754 006404        CLB,INB
1196  06755 005566        ERB,CLE,ELB         5566
1197  06756 006002        SZB
1198  06757 102001        HLT 01          ERB,CLE,ELB FAILED
1199  06760 002340        SEZ
1200  06761 102001        HLT 01          E NOT =0
1201  06762 006404        CLB,INB
1202  06763 005575        ERB,CLE,SLB,ERB     5575
1203  06764 102001        HLT 01          SLB FAILED
1204  06765 006002        SZB
1205  06766 102001        HLT 01          ERB,CLE,SLB,ERB FAILED
1206  06767 002340        SEZ
1207  06770 102001        HLT 01          E NOT =0
1208  06771 006404        CLB,INB
1209  06772 005576        ERB,CLE,SLB,ELB     5576
1210  06773 102001        HLT 01          SLB FAILED
1211  06774 006002        SZB
1212  06775 102001        HLT 01          ERB,CLE,SLB,ELB FAILED
1213  06776 002340        SEZ
1214  06777 102001        HLT 01          E NOT =0
1215  07000 006167        LDB SMASK           100000
1216  07001 005665        ELB,CLE,ERB         5665
1217  07002 006002        SZB
1218  07003 102001        HLT 01          ELB,CLE,ERB FAILED
1219  07004 002340        SEZ
1220  07005 102001        HLT 01          E NOT =0
1221  07006 006167        LDB SMASK           100000
1222  07007 005666        ELB,CLE,ELB         5666
1223  07010 006002        SZB
1224  07011 102001        HLT 01          ELB,CLE,ELB FAILED
1225  07012 002340        SEZ
1226  07013 102001        HLT 01          E NOT =0
1227  07014 006167        LDB SMASK           100000
1228  07015 005675        ELB,CLE,SLB,ERB     5675
1229  07016 102001        HLT 01          SLB FAILED
1230  07017 006002        SZB
1231  07020 102001        HLT 01          ELB,CLE,SLB,ERB FAILED
1232  07021 002340        SEZ


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1233  07022 102001        HLT 01          E NOT
1234  07023 006167        LDB SMASK           100000
1235  07024 005675        ELB,CLE,SLB,ERB     5676
1236  07025 102001        HLT 01          SLB FAILED
1237  07026 006002        SZB
1238  07027 102001        HLT 01          ELB,CLE,SLB,ERB FAILED
1239  07030 002340        SEZ
1240  07031 102001        HLT 01          E NOT =0
1241  07032 103101        CLO             CLEAR OVERFLOW INDICATOR
1242  07033 102101        STO             SET OVERFLOW INDICATOR
1243  07034 102301        SOS             SKIP ON OVERFLOW SET
1244  07035 102001        HLT 01          STO OR SOS FAILED
1245  07036 103301        SOS C           SKIP ON OVERFLOW SET AND CLEAR
1246  07037 102001        HLT 01          SOS,C FAILED
1247  07040 102201        SOC             SKIP ON OVERFLOW CLEAR
1248  07041 102001        HLT 01          SOS,C OR SOC MALFUNCTION
1249  07042 102301        SOS             SKIP ON OVERFLOW SET
1250  07043 002001        RSS             SHOULD NOT SKIP
1251  07044 102001        HLT 01          SOS SKIP WHEN OVERFLOW CLEARED
1252  07045 103101        CLO             CLEAR OVERFLOW INDICATOR
1253  07046 056600        LDB SOVFC       B=077777
1254  07047 006004        INB             B=100000-OVERFLOW SHOULD BE SET
1255  07050 103301        SOS C           SKIP ON OVERFLOW SET
1256  07051 102001        HLT 01          INB DID NOT SET OVERFLOW
1257  07052 103101        CLO             CLEAR OVERFLOW INDICATOR
1258  07053 056577        LDB SUB1        B=177777
1259  07054 006004        INB             B=000000,E=1-OVERFLOW CLEAR
1260  07055 102201        SOC             SKIP ON OVERFLOW CLEAR
1261  07056 102001        HLT 01          UNLIKE SIGNS CAUSED OVERFLOW TO
1262*BE SET
1263  07057 103101        CLO             CLEAR OVERFLOW INDICATOR
1264  07060 056577        LDB SUB1        B=177777
1265  07061 046167        ADB SMASK       ADD=100000
1266  07062 103301        SOS C           SKIP ON OVERFLOW SET
1267  07063 102001        HLT 01          ADB DID NOT SET OVERFLOW
1268  07064 103101        CLO             CLEAR OVERFLOW INDICATOR
1269  07065 056600        LDB SOVFC       B=077777
1270  07066 046167        ADB SMASK       ADD 100000
1271  07067 102201        SOC             SKIP ON OVERFLOW CLEAR
1272  07070 102001        HLT 01          UNLIKE SIGNS CAUSED OVERFLOW TO
1273*BE SET
1274  07071 103101        CLO             CLEAR OVERFLOW INDICATOR
1275  07072 007400        CCB             B=177777
1276  07073 046577        ADB SUB1        ADD 177777
1277  07074 102201        SOC             SKIP ON OVERFLOW CLEAR
1278  07075 102001        HLT 01          ILLEGAL SET OF OVERFLOW
1279  07076 103101        CLO             CLEAR OVERFLOW INDICATOR
1280  07077 006400        CLB             B=000000
1281  07100 044001        ADB 1           ADD 000000
1282  07101 102201        SOC             SKIP ON OVERFLOW CLEAR
1283  07102 102001        HLT 01          ILLEGAL SET OF OVERFLOW
1284  07103 000340        CLE
1285  07104 026404        JMP START
1286                      END
**  NO ERRORS*
```