OPERATION AND MAINTENANCE MANUAL

MODEL 2114B
COMPUTER

VOLUME TWO

HEWLETT **hp** *PACKARD*

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OPERATION AND MAINTENANCE MANUAL

MODEL 2114B
COMPUTER

VOLUME TWO

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.

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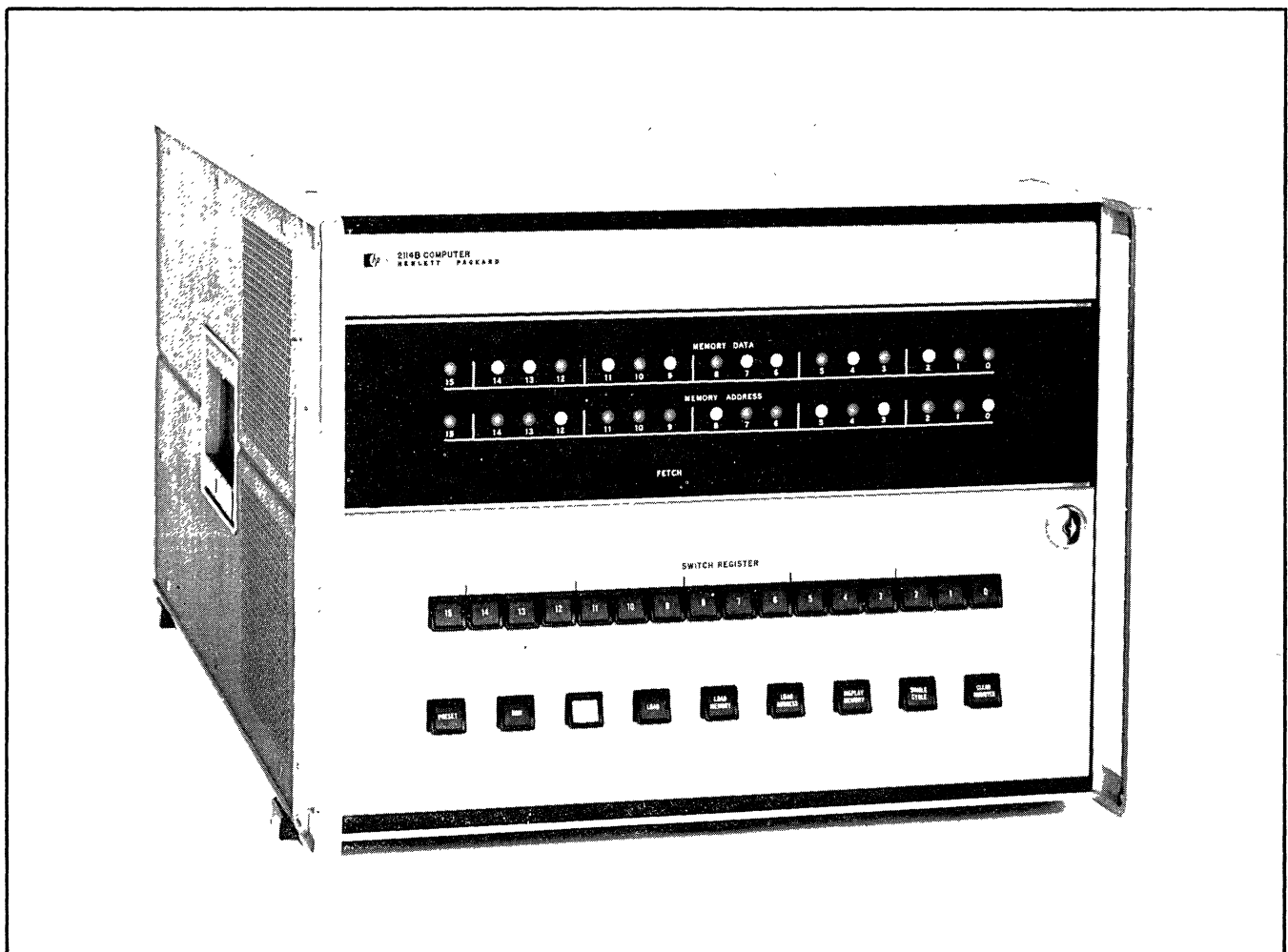
Figure 1-1. Hewlett-Packard Model 2114B Computer
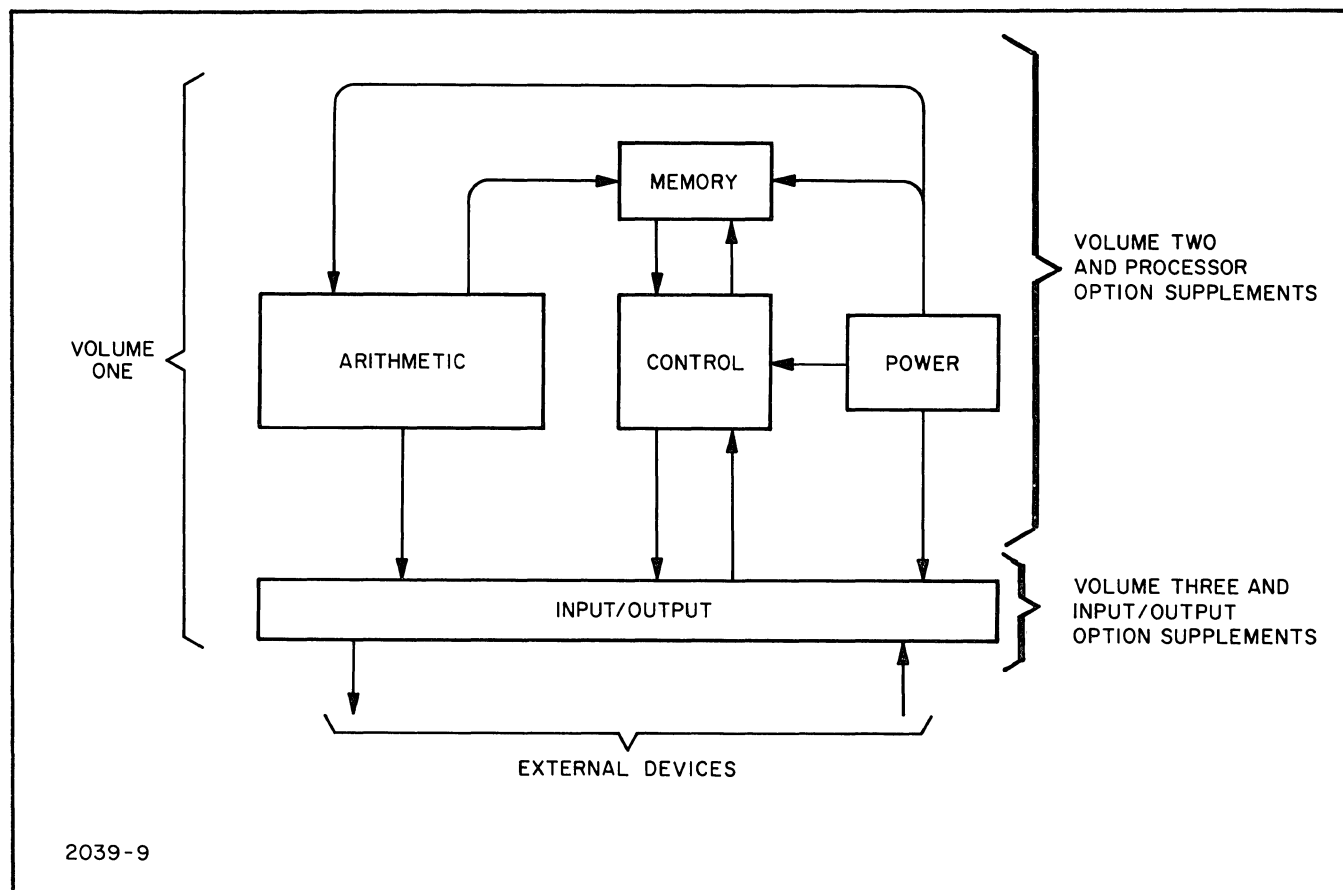
Figure 1-2. Simplified Block Diagram Showing Major Functions of the 2114B Computer

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.

TOP VIEW
(TOP PANEL AND POWER SUPPLY COVER REMOVED)
2039-10A

FRONT VIEW
(PANEL OPEN)
2039-10B

BOTTOM VIEW (PANEL REMOVED)
2039-10C

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.
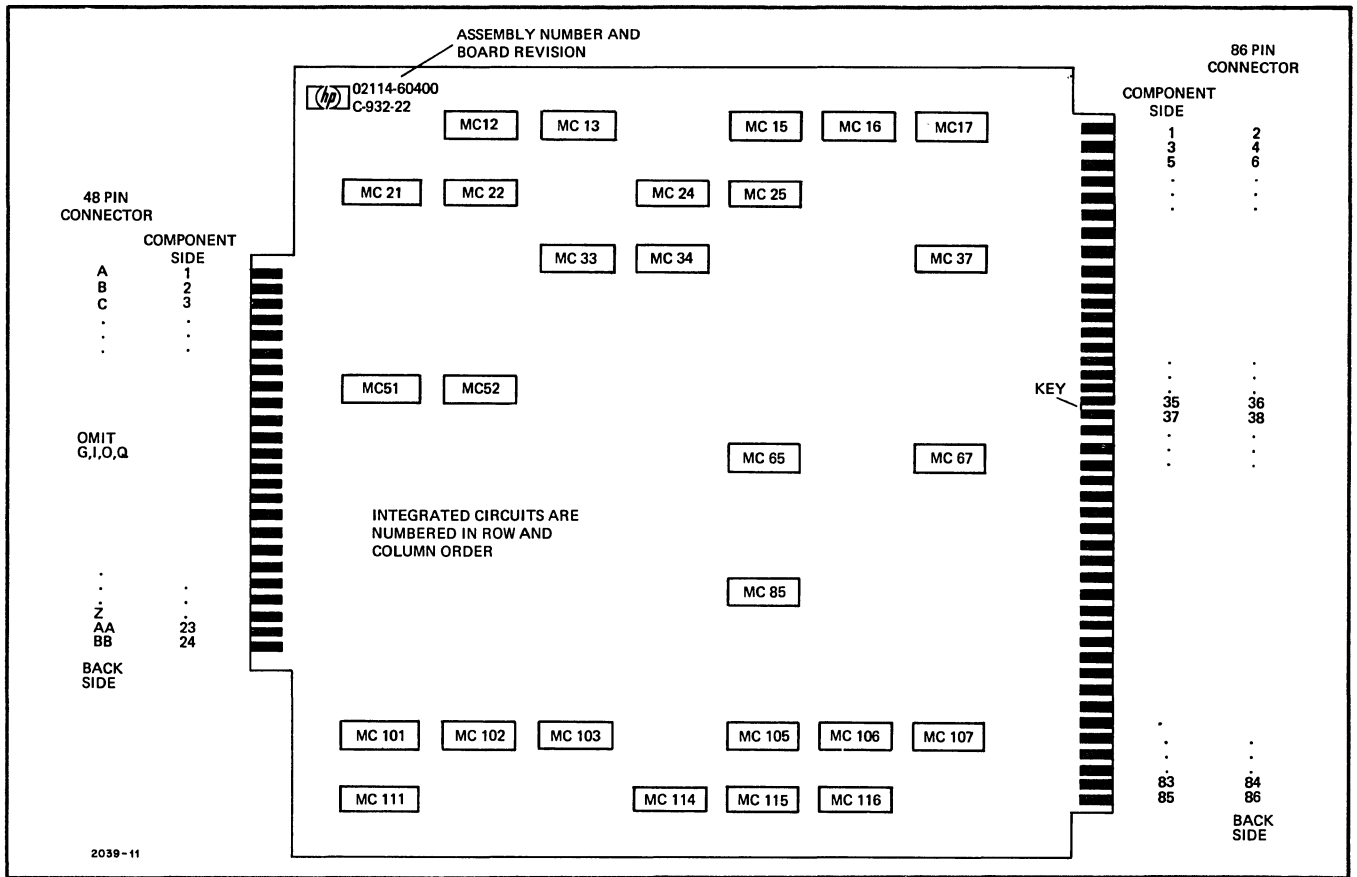
Figure 1-4.   Typical Computer Logic Card
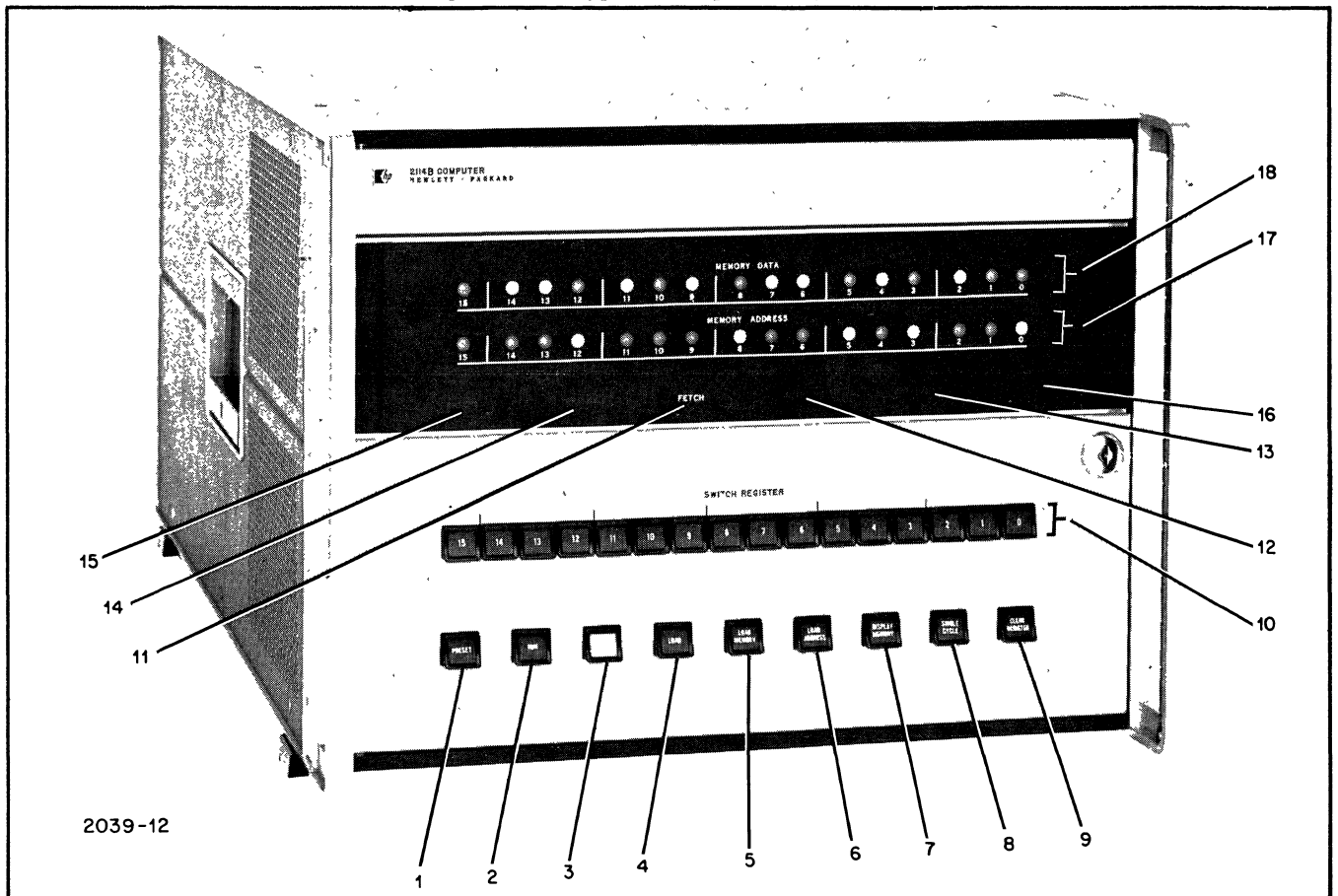
Figure 1-5. Computer Front Panel Showing the Location of Operating Controls and Indicators
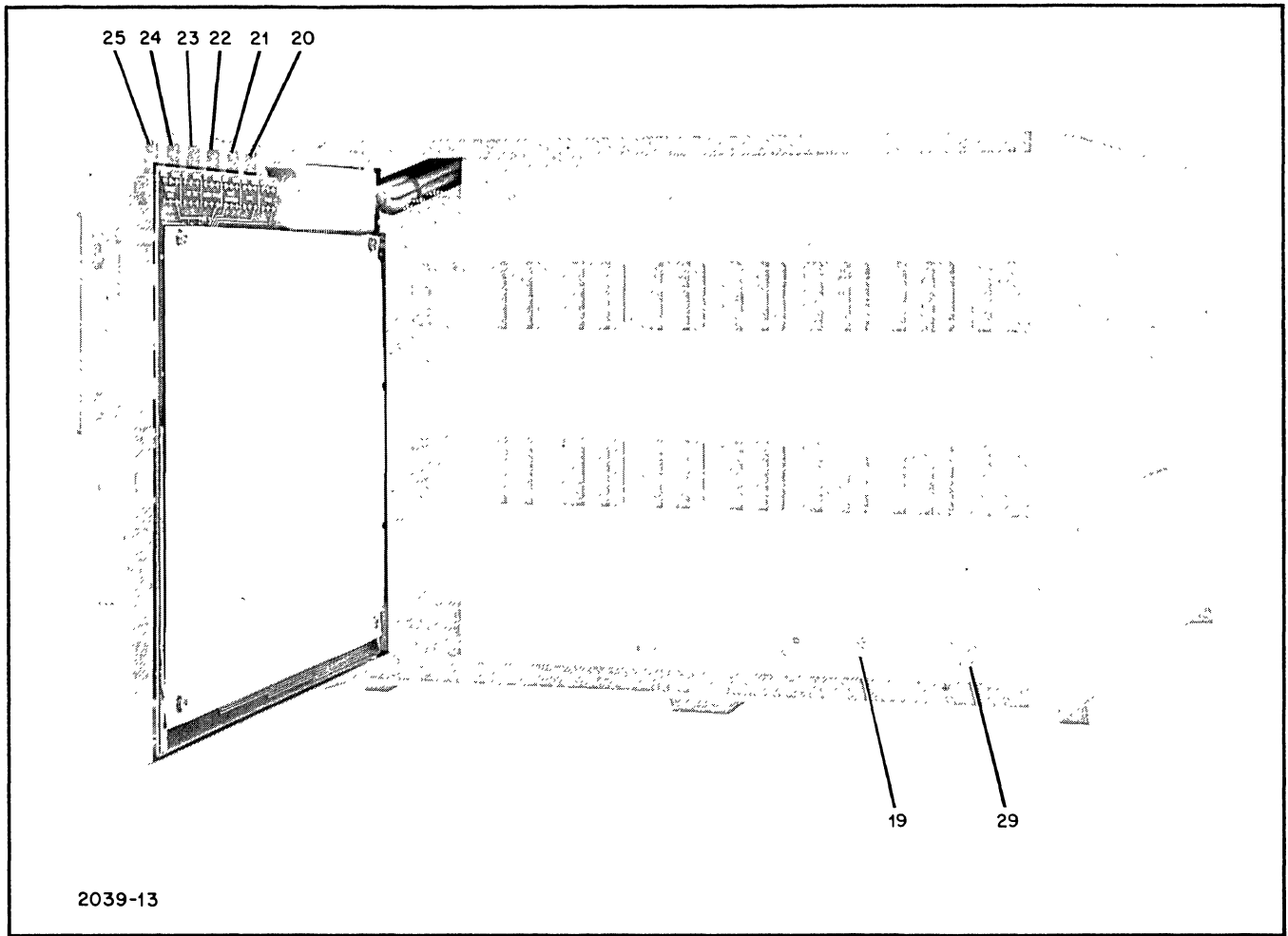
Figure 1-6. Computer Front Panel in Open Position Showing the Location of Protected Switches
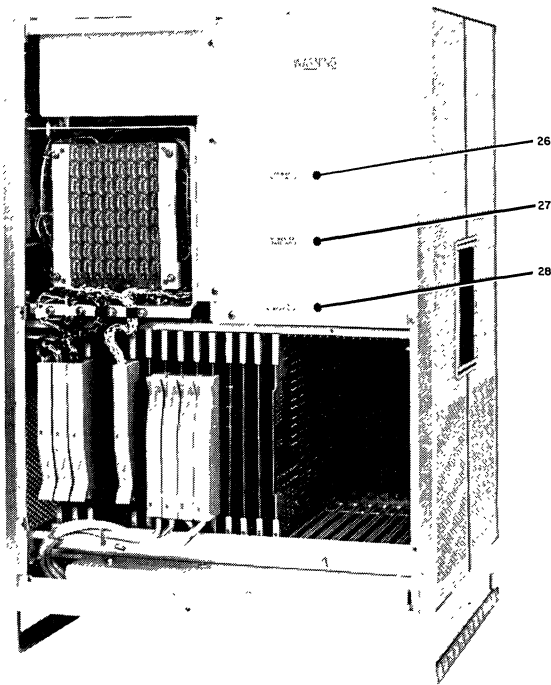
Figure 1-7. Top View of Computer Showing the Location of Power Supply Adjustments

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.
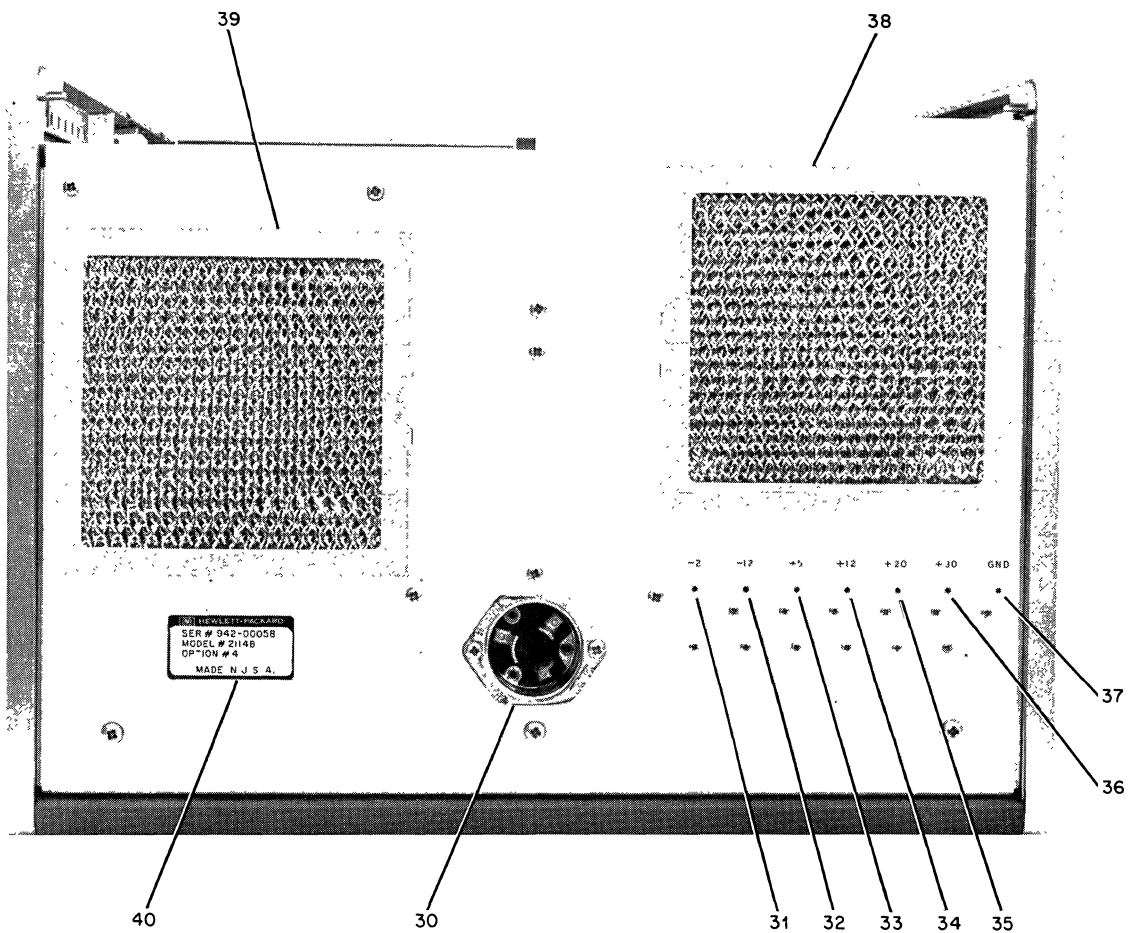
2039-15   Figure 1-8. Rear View of Computer Showing Maintenance Features

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.

5060-2267
AC POWER CABLE

02115-6047
EXTENDER CABLE

RACK MOUNT KIT
5060-0779

EXTENDER BOARD
02116-6040

2039-24   NOT SHOWN: BINARY TAPE LOADING INSTRUCTIONS
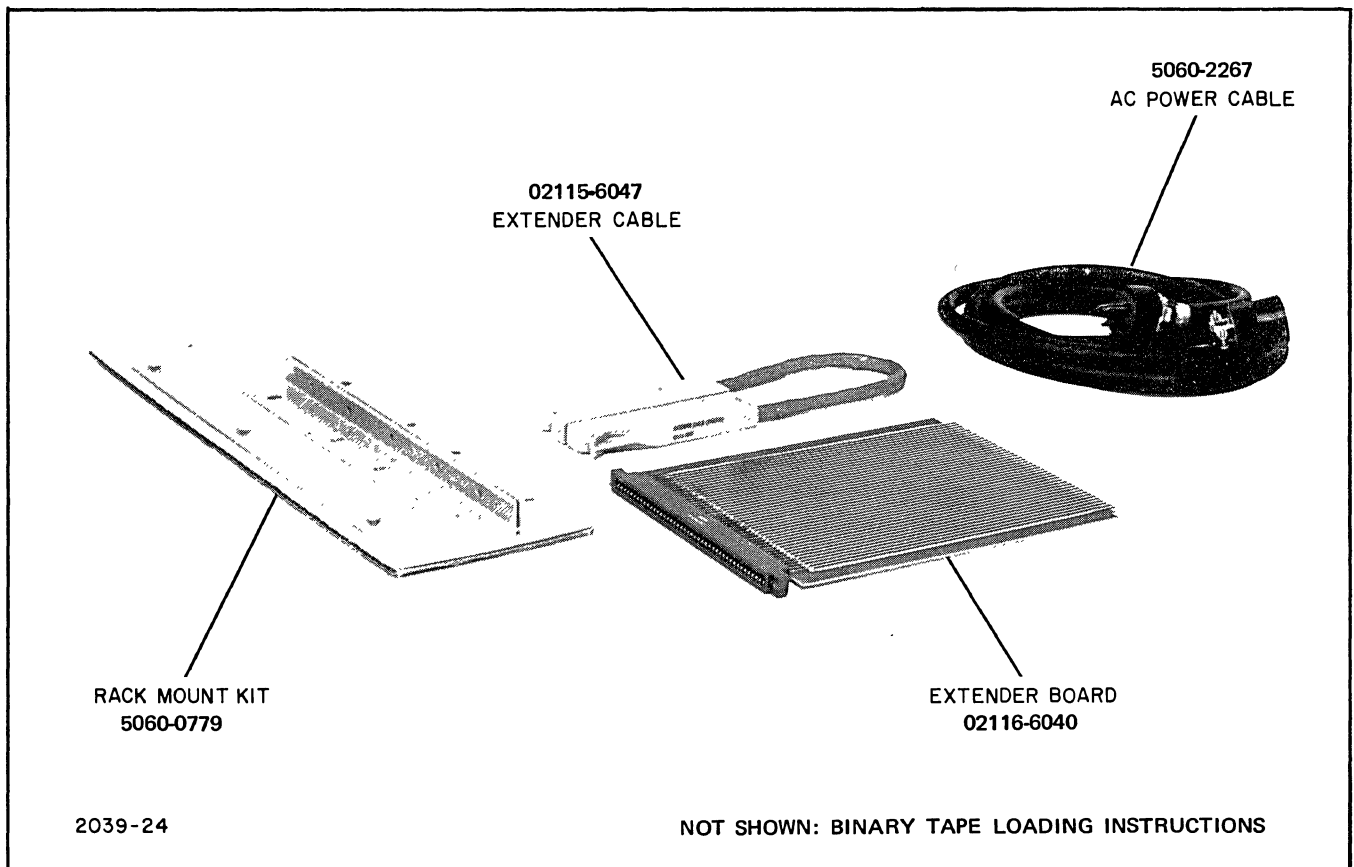
Figure 1-9. Computer Accessories

Table 1-4. Recommended Test Equipment

INSTRUMENT	CRITICAL SPECIFICATIONS	RECOMMENDED HP MODEL
Dual Trace Oscilloscope	Rise time $\leqslant$ 10 nsecs.	HP 180A (HP 1801 vert amp, HP 1820A Time base, HP 10004A probes)
Voltmeter	Accuracy: $\pm$ 1% of full scale Input Impedance: 10 Megohms minimum Ranges: $\pm$ 1 volt to $\pm$50 volts	HP 412A, HP 3430A
Multimeter	Accuracy: $\pm$3% of full scale Range: $\pm$1 volt to $\pm$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.
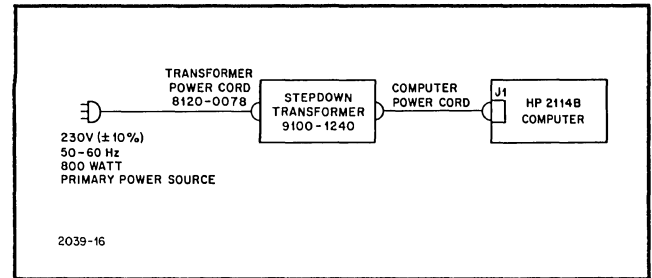
Figure 2-1. Computer Configured for 230V ac

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 inter-reaction 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
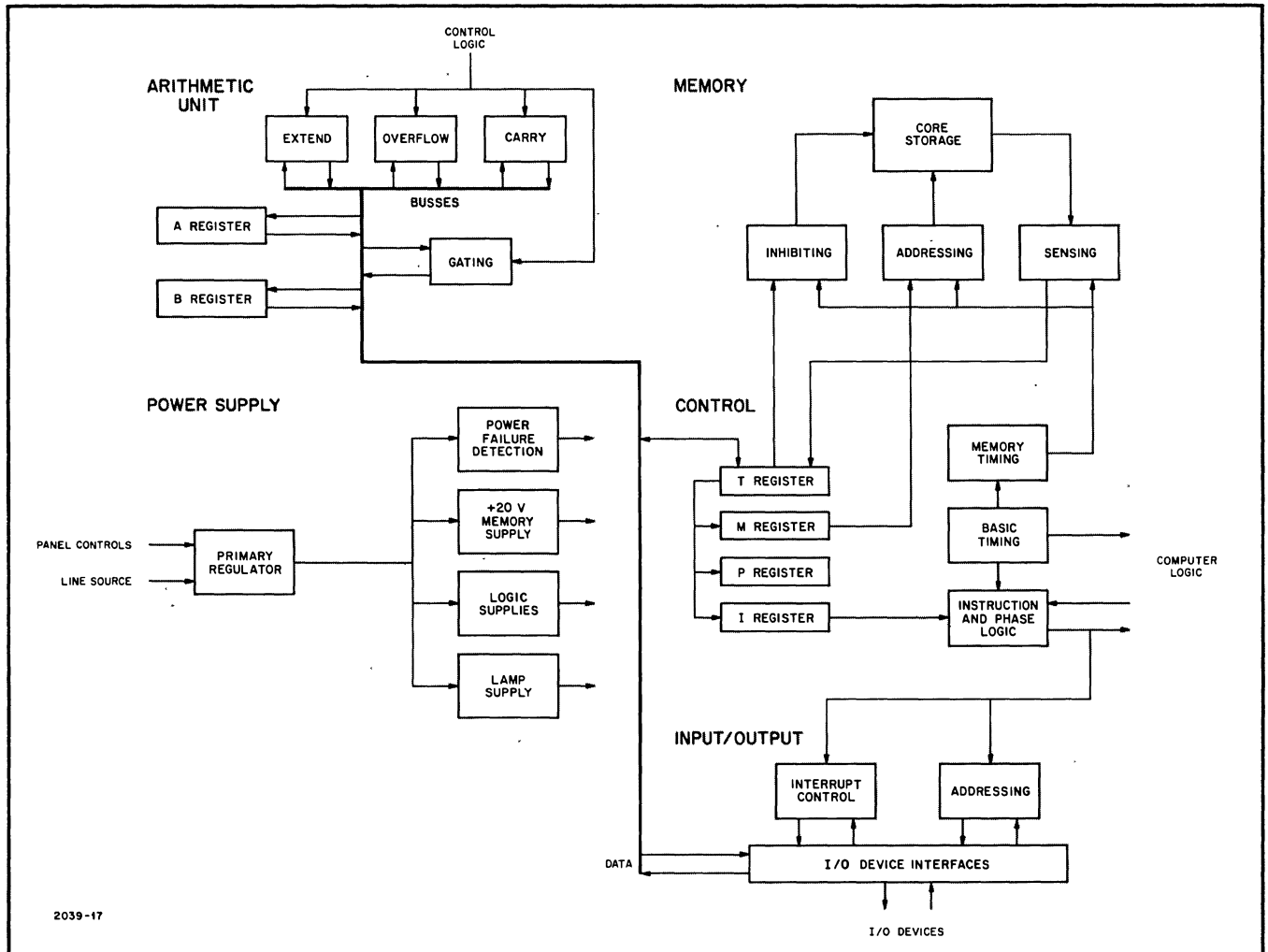

Figure 3-1. Computer Block Diagram
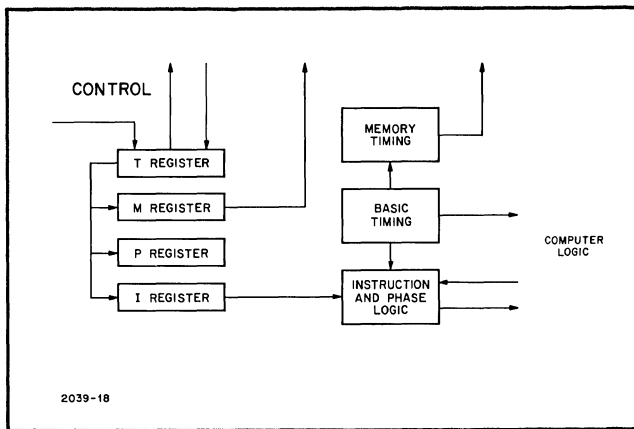
Figure 3-2. Control Block Diagram

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.

3-2

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.
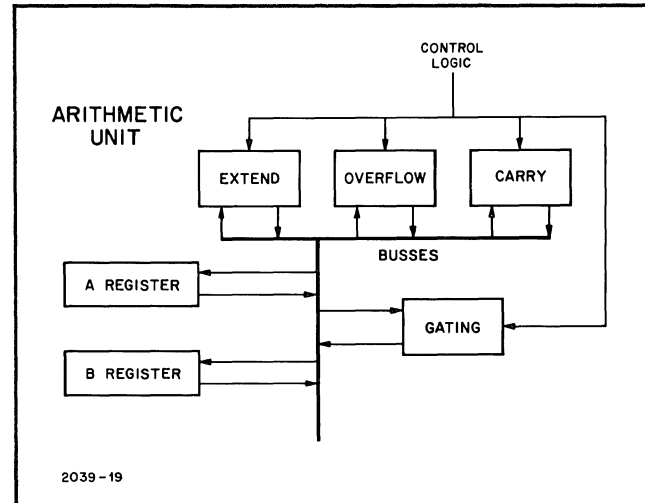
Figure 3-3. Arithmetic Block Diagram

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.
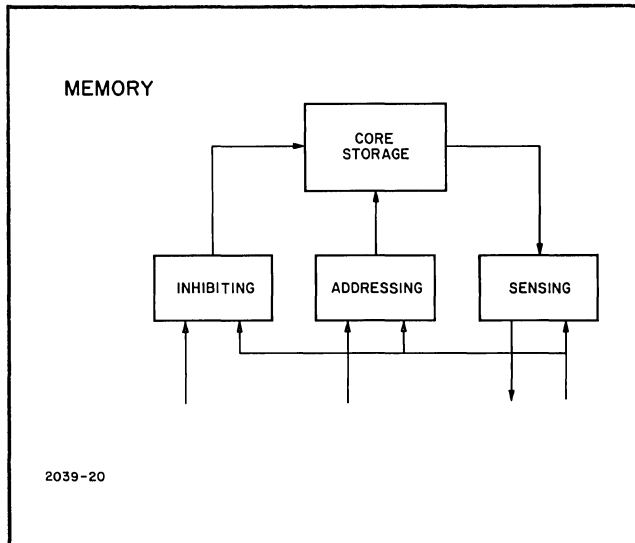
Figure 3-4. Memory Block Diagram

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.
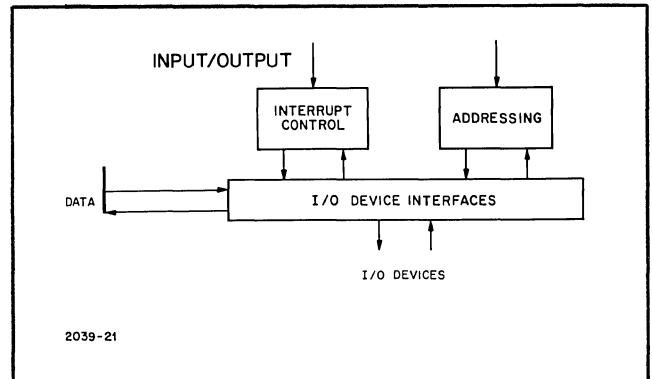

Figure 3-5. I/O Block Diagram

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.
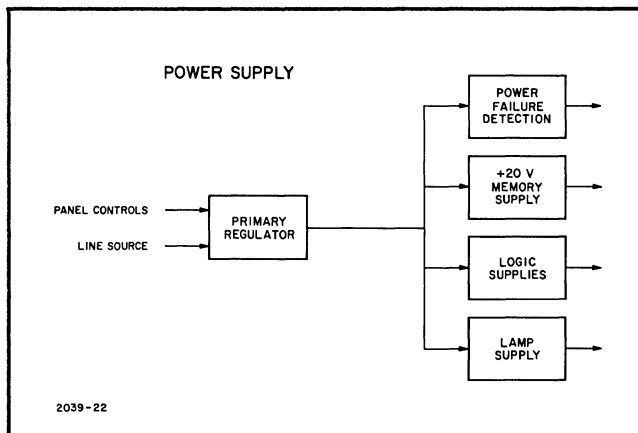
Figure 3-6. Power Supply Block Diagram

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.

ISOLATION
TRANSFORMER

115V

115 VAC
PRIMARY   NEUTRAL
POWER
SOURCE   GROUND

COMPUTER

POWER
CORD

J1
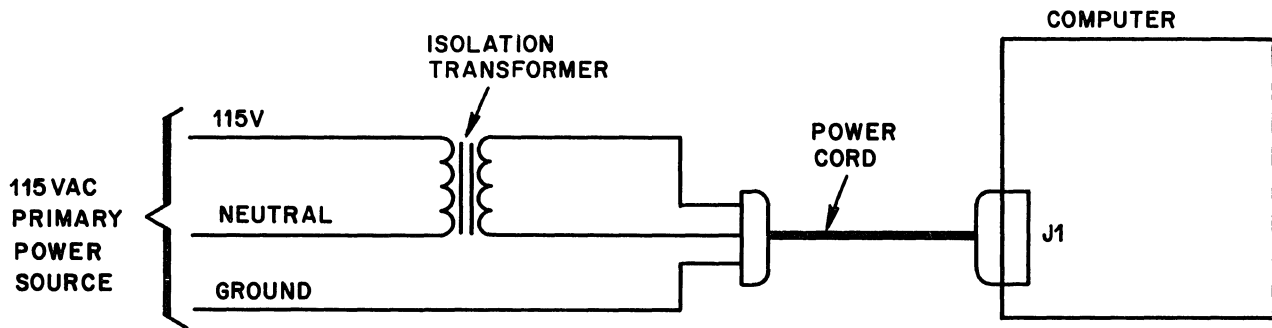
2039-51

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 mainten-ance 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 mainten-ance 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 dissi-pating 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.

DISPLAY BOARD
ASSEMBLY
(02114 - 6009)

NULL

PROTECTIVE
COVER

BIAS

C114

R128

FRONT PANEL

GND

CONSOLE KEY LOCK

2039-23
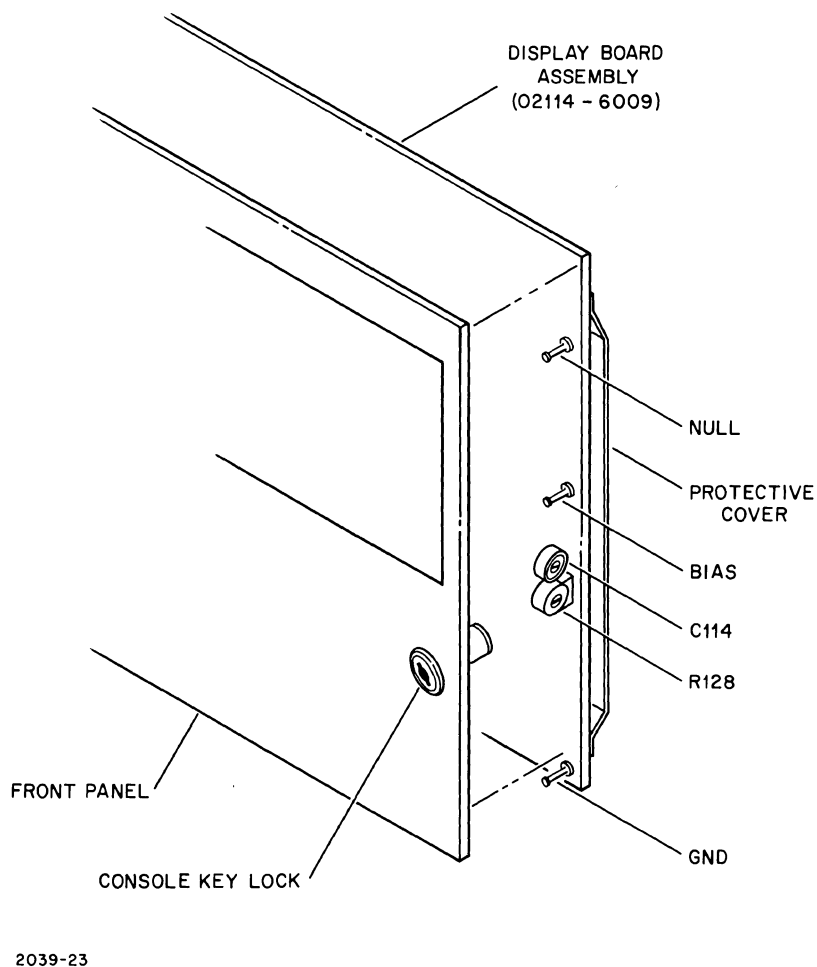
Figure 4-2. Adjustment and Test Point Locations
for the Front Panel Display Board (02114-6009)

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:

$$m = 0 \text{ for 4K memory}$$
$$= 1 \text{ for 8K memory}$$
$$= 2 \text{ for 12K memory}$$
$$= 3 \text{ for 16K memory}$$
$$n = 7 \text{ for 4K memory}$$
$$= 6 \text{ for 8K memory}$$
$$= 5 \text{ for 12K memory}$$
$$= 4 \text{ for 16K memory}$$

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

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

5-58. 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

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.)

Column 1

START

INIT
"7642-7667"
INITIALIZE MEMORY TO HALTS

BASIC
"1000-1243"
BASIC TEST
JMP, JSB, ISZ, CPA, CPB
ANA, XOA, IOA, LDA,
LDB, STA, STB, ADA, ADB

TJMP1
"2000-2061"
TESTS JUMPS
DIRECT & INDIRECT
TO PAGES 0,1,2,3
AND A/B REGISTERS-
MULTI-LEVEL INDIRECT

TJSB1
"2062-2136"
TESTS JSB'S
DIRECT & INDIRECT
TO PAGES 0,1,2,3
AND A/B REGISTERS-
MULTI-LEVEL INDIRECT

TISZ1
"2137-2311"
TESTS ISZ'S
DIRECT & INDIRECT
TO PAGES 0,1,2,3
AND A/B REGISTERS-
MULTI-LEVEL INDIRECT

TCPA1
"2312-2401"
TESTS CPA'S
DIRECT & INDIRECT
TO PAGES 0,1,2,3
AND A/B REGISTERS-
MULTI-LEVEL INDIRECT

TCPB1
"2402-2472"
TESTS CPB'S
DIRECT & INDIRECT
TO PAGES 0,1,2,3
AND A/B REGISTERS-
MULTI-LEVEL INDIRECT

TAND1
"2473-2567"
TESTS AND'S
DIRECT & INDIRECT
TO PAGES 0,1,2,3
AND A/B REGISTERS-
MULTI-LEVEL INDIRECT

→ 1

Column 2

1

TXOR1
"2570-2670"
TESTS XOR'S
DIRECT & INDIRECT
TO PAGES 0,1,2,3
AND A/B REGISTERS-
MULTI-LEVEL INDIRECT

TIOR1
"2671-2767"
TESTS IOR'S
DIRECT & INDIRECT
TO PAGES 0,1,2,3
AND A/B REGISTERS-
MULTI-LEVEL INDIRECT

TLDA1
"2770-3055"
TESTS LDA'S
DIRECT & INDIRECT
TO PAGES 0,1,2,3
AND A/B REGISTERS-
MULTI-LEVEL INDIRECT

TLDB1
"3056-3140"
TESTS LDB'S
DIRECT & INDIRECT
TO PAGES 0,1,2,3
AND A/B REGISTERS-
MULTI-LEVEL INDIRECT

TSTA1
"3141-3230"
TESTS STA'S
DIRECT & INDIRECT
TO PAGES 0,1,2,3
AND A/B REGISTERS-
MULTI-LEVEL INDIRECT

TSTB1
"3231-3321"
TESTS STB'S
DIRECT & INDIRECT
TO PAGES 0,1,2,3
AND A/B REGISTERS-
MULTI-LEVEL INDIRECT

TADA1
"3322-3442"
TESTS ADA'S
DIRECT & INDIRECT
TO PAGES 0,1,2,3
AND A/B REGISTERS-
MULTI-LEVEL INDIRECT

→ 2

Column 3

2

TADB1
"3443-3560"
TESTS ADB's
DIRECT & INDIRECT
TO PAGES 0,1,2,3
AND A/B REGISTERS
MULTI-LEVEL INDIRECT

TCPA2
"4000-4654"
EXTENSIVE ITERATIVE
TESTING OF THE
FOLLOWING OPCODES·
CPA-CPB-AND-XOR-IOR-
LDA-LDB-STA-STB
ADA-ADB

"4655"
RETURN
(BASIC)
LOCN. 1000

Column 4

TCPA2

TCPA2
"4000-4024"
ITERATIVE TESTING
OF 'CPA' WITH A
052525 & 125252
PATTERN-ITERATIVE
COUNT CONTAINED IN
B-REGISTER

TCPB2
"4025-2051"
ITERATIVE TESTING
OF 'CPB' WITH B
052525 & 125252
PATTERN-ITERATIVE
COUNT CONTAINED IN
A-REGISTER

TAND2
"4052-4114"
ITERATIVE TESTING
OF 'AND' WITH A
052525 & 125252
PATTERN-ITERATIVE
COUNT CONTAINED IN
B-REGISTER

TXOR2
"4115-4161"
ITERATIVE TESTING
OF 'XOR' WITH A
02525 & 125252
PATTERN-ITERATIVE
COUNT CONTAINED IN
B-REGISTER

TIOR2
"4162-4240"
ITERATIVE TESTING
OF 'IOR' WITH A
052525 & 125252
PATTERN-ITERATIVE
COUNT CONTAINED IN
B-REGISTER

TLDA2
"4241-4265"
ITERATIVE TESTING
OF 'LDA' WITH A
052525 & 125252
PATTERN-ITERATIVE
COUNT CONTAINED IN
B-REGISTER

TLDB2
"4266-4312"
ITERATIVE TESTING
OF 'LDB' WITH A
052525 & 125252
PATTERN-ITERATIVE
COUNT CONTAINED IN
A-REGISTER

→ TSTB2

Column 5

TSTB2

TSTA2
"4313-4341"
ITERATIVE TESTING
OF 'STA' WITH A
052525 & 125252
PATTERN-ITERATIVE
COUNT CONTAINED IN
B-REGISTER

TSTB2
"4342-4370"
ITERATIVE TESTING
OF 'STB' WITH A
052525 & 125252
PATTERN-ITERATIVE
COUNT CONTAINED IN
A-REGISTER

TADA2
"4371-4521"
ITERATIVE TESTING
PATTERNS USED.
052525 - 125252 -
031463 - 146314 -
063146 - 114631 -
ITERATIVE COUNT HEDL
IN B-REGISTER

TADB2
"4527-4654"
ITERATIVE TESTING
PATTERNS USED
052525 - 125252 -
031463 - 146314 -
063146 - 114631 -
INTERATIVE COUNT HELD
IN A-REGISTER

"4655"
EXIT
(BASIC)
LOCN. 1000

Column 6

"1250"
ERROR

"1251-1252"
STORE A-REGISTER
INTO "ATEMP"
STORE B-REGISTER
INTO "BTEMP"

"1253-1254"
LOAD A-REGISTER
WITH LOCATION
OF ERROR-PRODUCING
INSTRUCTION

"1255"
LOAD B-REGISTER
WITH LOCATION
PRODUCING
INSTRUCTION CODE

"1256"
HALT

"1257"
LOAD A-REGISTER
WITH ORIGINAL
CONTENTS WHEN
ERROR DETECTED

"1260"
LOAD B-REGISTEP
WITH ORIGINAL
CONTENTS WHEN
ERROR DETECTED

"1261"
HALT

"1262-1264"
INCREMENT
RETURN ADDRESS
AND RETURN
TO TEST

"1265"
EXIT

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 Mem-

ory 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
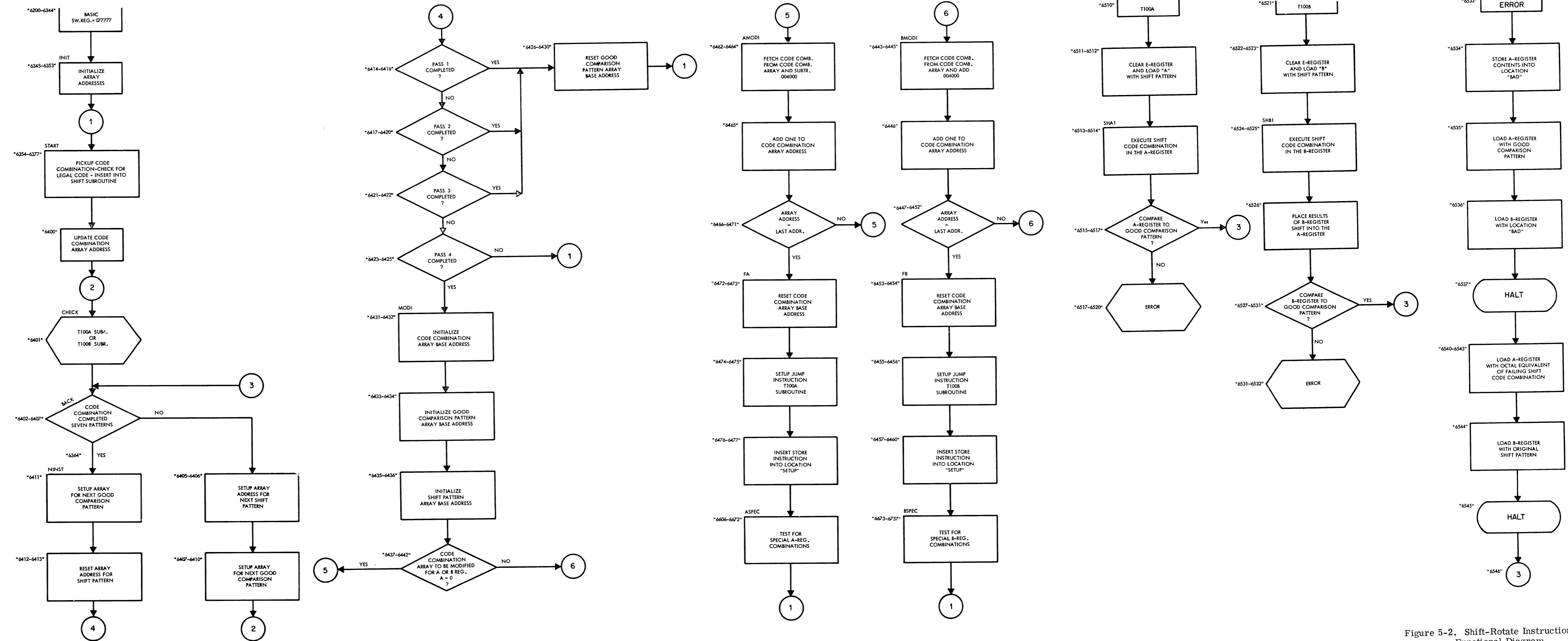
Figure 5-2. Shift-Rotate Instruction Test, Functional Diagram
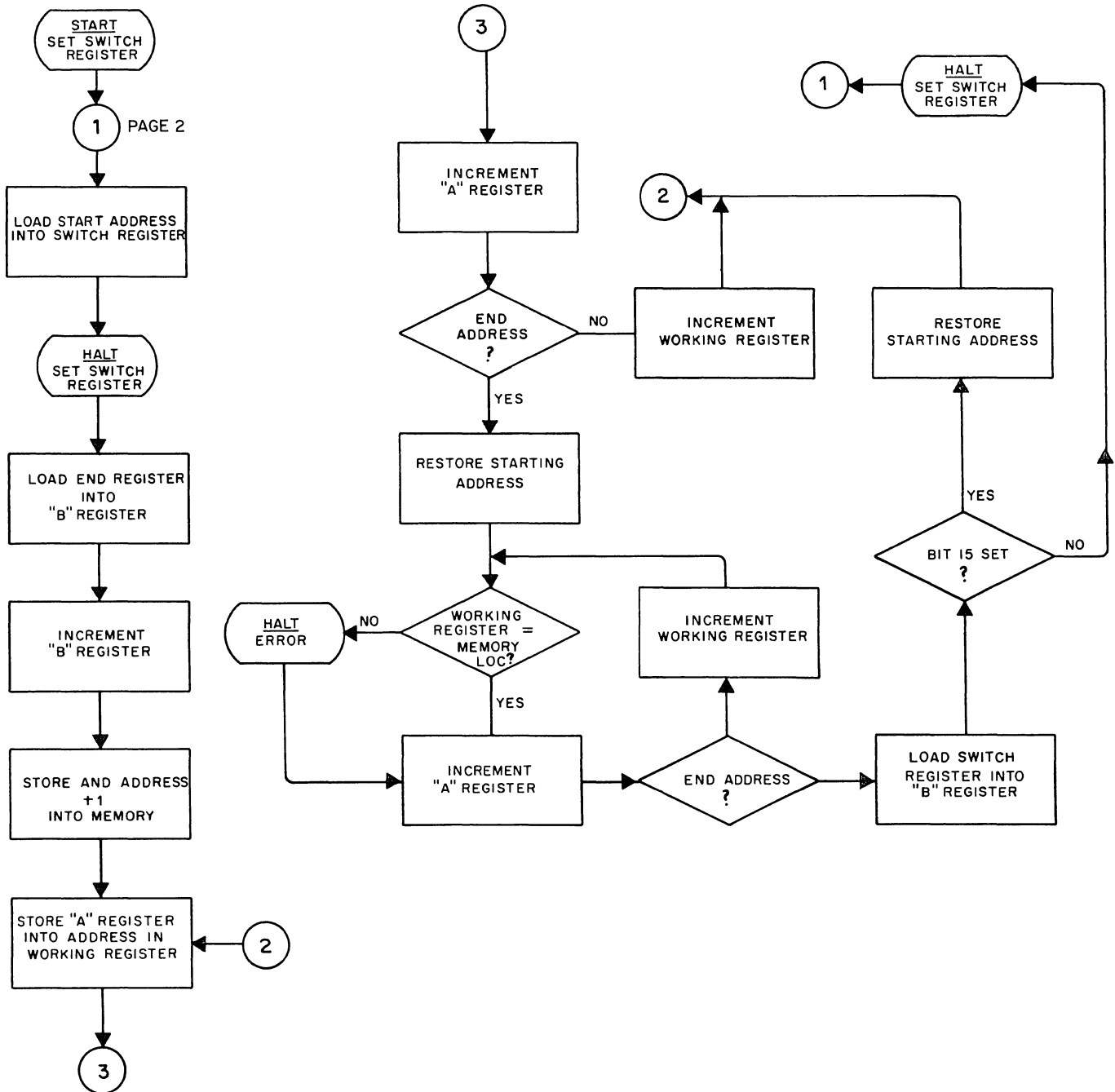
Figure 5-3. Memory Address Test Functional Diagram

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
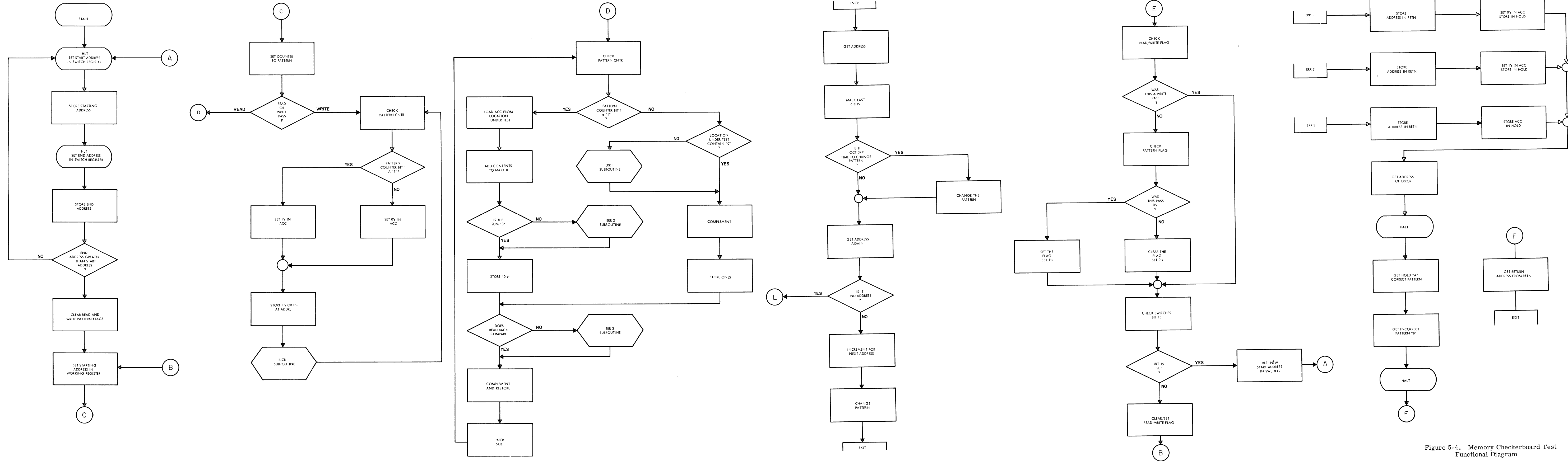
Figure 5-4. Memory Checkerboard Test Functional Diagram

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

SERIAL BINARY LOADER

Listing No. HP 20310AL

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

```
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 17700B      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
```

```
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 RAR               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       000000
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 0         ADD IT TO THE CHECKSUM
0033  17736 000000 OPTI NOP           OPTIONAL INSTRUCTION: STA 0,I/CP
0034  17737 002101      CLE,RSS       BYPASS FOLLOWING HALT EXCEPT FOR
0035  17740 102000      HLT 0         DUMP 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 ADRS BSS 1         LOADING ADDRESS POINTER
0066  17776 000000 TEMP BSS 1         HOLDS UPPER CHARACTER FOR PACKIN
0067  00000       PR   EQU 0B         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
```

PAGE 0002 #01   HP 20400AL

```
0001                    ASMB,A,B,L,T
0001   02000           ORG 2000
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 000P10      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=100002
0050   02056 002027      SSA,INA,SZA,RSS    A=100003
0051   02057 102001      HLT 01         SSA,INA,SZA FAILED OP,
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
```

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   036000
REST    006016
REST1   006031
RSTAR   006035
SSALE   003712
START   036034
** NO ERRORS*
```

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 OP,
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=10
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 062067      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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PAGE 0004 #02                                    HP 20400AL

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
```

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PAGE 0005 #02                                    HP 20400AL

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 002224      CME,SSA,SZA       E=1
0209  02263 102001      HLT 01      CME,SSA,INA,RSS FAILED IF E=0,
0210*                               OR CME,SSA,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,RSS 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
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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,RSS        A=000010
0273  02354 102001      HLT 01      CCE,SSA,SZA,RSS 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 002325      CCE,SSA,INA       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        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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PAGE 0007 #02                                    HP 20400AL

0285  02366 000000      NOP
0286***** CLA MODULE *****
0287  02367 102501      CLA  LIA 01      LOAD SW. REG. INTO A=077777
0288  02370 002004      INA               A=100000
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=000000
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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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 102004      INA           A=100000
0004  02450 102401      MIA 01        MERGE SW. REG. INTO A=177777
0005  02451 002204      INA           E=0, A=000000
0006  02452 102401      MIA 01        E=1, A=077777
0007  02453 002240      CLA,SEZ       A=000000
0008  02454 002241      CLA,SEZ,RSS
0009  02455 102001      HLT 01        CLA,SEZ OR CLA,SEZ,RSS FAILED
0010  02456 002242      CLA,SEZ,SZA
0011  02457 102001      HLT 01        CLA,SEZ,SZA FAILED
0012  02470 002243      CLA,SEZ,SZA,RSS
0013  02471 102001      HLT 01        CLA,SEZ,SZA,RSS FAILED
0014  02472 002244      CLA,SEZ,INA
0015  02473 002245      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 002246      CLA,SEZ,INA,SZA
0019  02476 002247      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 002462      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,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,SS,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  02555 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      CLE,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 002601      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
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**
0133  02640 002611      CLA,CME,SLA,RSS      E=0
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,RSS E=1
0149  02652 102001      HLT 01        CLA,CME,SLA,INA,SZA,RSS 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,RSS 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,CME,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,CME,SSA,INA,SZA,RSS 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 PR 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 102001      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 003302      CMA,SZA         A=000000
0231  02754 102001      HLT 01          A NOT=000000
0232  02755 003300      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,S7A,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,S7A     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,S7A,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 003414      CMA,SLA,INA     A=000001
0257  03001 102001      HLT 01          CMA,SLA,INA FAILED
0258  03002 003415      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=000000
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,SE7         A=177777
0292  03037 003041      CMA,SE7,RSS     A=000000
0293  03040 102001      HLT 01          FAILURE: CMA,SEZ IF A=177777;
0294*                                     CMA,SEZ,RSS IF A=000000
0295  03041 003042      CMA,SE7,SZA     A=177777
0296  03042 003043      CMA,SE7,SZA,RSS A=000000
0297  03043 102001      HLT 01          FAILURE: CMA,SEZ,SZA IF
0298*                                     A=177777; CMA,SEZ,S7A,RSS
0299*                                     IF A=000000
0300  03044 003044      CMA,SE7,INA     E=1, A=000000
0301  03045 003045      CMA,SE7,INA,RSS E=1, A=000000
0302  03046 102001      HLT 01          CMA,SEZ,INA OR CMA,INA,RSS
0303*                                     FAILED
0304  03047 003046      CMA,SE7,INA,SZA E=1, A=000000
0305  03050 102001      HLT 01          CMA,SE7,INA,SZA FAILED
0306  03051 003047      CMA,SE7,INA,SZA,RSS  E=1, A=000000
0307  03052 102001      HLT 01          CMA,SE7,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=177777; CMA,SEZ,SLA,RSS IF
0312*                                     A=000000
0313  03056 003052      CMA,SEZ,SLA,SZA E=1, A=177777
0314  03057 003053      CMA,SE7,SLA,SZA,RSS  E=1, A=000000
0315  03060 102001      HLT 01          FAILURE: CMA,SEZ,SLA,S7A IF
0316*                                     A=177777; CMA,SE7,SLA,SZA,
0317*                                     RSS IF A=000000
0318  03061 003054      CMA,SEZ,SLA,INA E=1, A=000000
0319  03062 003055      CMA,SF7,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,SE7,SLA,INA,SZA  E=1, A=000000
0323  03065 102001      HLT 01          CMA,SEZ,SLA,INA,SLA FAILED
0324  03066 003057      CMA,SE7,SLA,INA,SZA,RSS E=1, A=000000
0325  03067 102001      HLT 01          CMA,SEZ,SLA,INA,SZA,RSS FAILED
0326  03070 003060      CMA,SE7,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=177777; CMA,SE7,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=177777; CMA,SE7,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,SE7,SSA,INA,SZA,RSS FAILED
0344  03105 002040      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 000000      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=177777; CMA,CLE,S7A,RSS IF
0363*                                     A=000000
0364  03125 003102      CMA,CLE,S7A     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 F=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,S7A IF
0379*                                     A=177777; CMA,CLE,SLA,INA IF
0380*                                     A=000000
0381  03143 003113      CMA,CLE,SLA,S7A,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=0, A=000002
0393  03155 102001      HLT 01          CMA,CLF,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 F=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 000000      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=1, 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=000001; 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,S7A IF
0030*                                     A=177777  CMA,CMF,SLA,INA IF
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0031*                          A=100001
0032  03223 003213   CMA,CME,SLA,SZA,RSS    E=0, A=177776
0033  03224 102001   HLT 01        CMA,CME,SLA,SZA,RSS FAILED
0034  03225 003215   CMA,CME,SLA,INA,RSS    E=1, A=000002
0035  03226 102001   HLT 01        CMA,CME,SLA,INA,RSS FAILED
0036  03227 003216   CMA,CME,SLA,INA,SZA    E=0, A=177776
0037  03230 003217   CMA,CME,SLA,INA,SZA,RSS E=1, A=000002
0038  03231 102001   HLT 01        FAILURE: CMA,CME,SLA,INA,SZA IF
0039*                             A=177776; CMA,CME,SLA,
0040*                             INA,SZA,RSS IF A=000002
0041  03232 003221   CMA,CME,SSA,RSS        E=0, A=177775
0042  03233 102001   HLT 01        CMA,CME,SSA,RSS FAILED
0043  03234 003220   CMA,CME,SSA    E=1, A=000001
0044  03235 102001   HLT 01        CMA,CME,SSA FAILED
0045  03236 003222   CMA,CME,SSA,SZA        E=0, A=177775
0046  03237 003223   CMA,CME,SSA,SZA,RSS    E=1, A=000002
0047  03240 102001   HLT 01        FAILURE: CMA,CME,SSA,SZA IF
0048*                             A=177775; CMA,CME,SSA,SZA,
0049*                             RSS IF A=000002
0050  03241 003224   CMA,CME,SSA,INA        E=0, A=177776
0051  03242 003226   CMA,CME,SSA,INA,SZA    E=1, A=000002
0052  03243 102001   HLT 01        FAILURE: CMA,CME,SSA,INA IF
0053*                             A=177776; CMA,CME,SSA,INA,
0054*                             SZA IF A=000002
0055  03244 003225   CMA,CME,SSA,INA,RSS    E=0, A=177776
0056  03245 102001   HLT 01        CMA,CME,SSA,INA,RSS FAILED
0057  03246 003227   CMA,CME,SSA,INA,SZA,RSS E=1, A=000002
0058  03247 102001   HLT 01        CMA,CME,SSA,INA,SZA,RSS FAILED
0059  03250 002041   SEZ,RSS
0060  03251 102001   HLT 01        E NOT=1
0061  03252 000000   NOP
0062***** CMA,CCE MODULE *****
0063  03253 102501   CMACCE LIA 01   LOAD SW. REG. INTO A=077777
0064  03254 002004   INA           A=100000
0065  03255 102401   MIA 01        MERGE SW. REG. INTO A=177777
0066  03256 002004   INA           E=1, A=200000
0067  03257 003300   CMA,CCE       E=1, A=177777
0068  03260 003301   CMA,CCE,RSS   E=1, A=000001
0069  03261 102001   HLT 01        FAILURE: CMA,CCE IF A=000000;
0070*                             CMA,CCE,RSS IF A=177777
0071  03262 003303   CMA,CCE,SZA,RSS       E=1, A=177777
0072  03263 102001   HLT 01        CMA,CCE,SZA,RSS FAILED
0073  03264 003302   CMA,CCE,SZA   E=1, A=000000
0074  03265 102001   HLT 01        CMA,CCE,SZA FAILED
0075  03266 003304   CMA,CCE,INA   E=1, A=000000
0076  03267 003305   CMA,CCE,INA,RSS       E=1, A=000000
0077  03270 102001   HLT 01        CMA,CCE,INA OR CMA,CCE,INA,RSS
0078*                             FAILED
0079  03271 003306   CMA,CCE,INA,SZA       E=1, A=000000
0080  03272 102001   HLT 01        CMA,CCE,INA,SZA FAILED
0081  03273 003307   CMA,CCE,INA,SZA,RSS   E=1, A=000000
0082  03274 003311   CMA,CCE,SLA,RSS       E=1, A=177777
0083  03275 102001   HLT 01        FAILURE: CMA,CCE,INA,SZA,RSS IF
0084*                             A=000000; CMA,CCE,SLA,RSS IF
0085*                             A=177777
0086  03276 003310   CMA,CCE,SLA   E=1, A=000000
0087  03277 102001   HLT 01        CMA,CCE,SLA FAILED
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0088  03300 003312   CMA,CCE,SLA,SZA       E=1, A=177777
0089  03301 003314   CMA,CCE,SLA,INA       E=1, A=000000
0090  03302 102001   HLT 01        FAILURE: CMA,CCE,SLA,SZA IF
0091*                             A=177777; CMA,CCE,SLA,INA IF
0092*                             A=000000
0093  03303 003313   CMA,CCE,SLA,SZA,RSS   E=1, A=177777
0094  03304 102001   HLT 01        CMA,CCE,SLA,SZA,RSS FAILED
0095  03305 003316   CMA,CCE,SLA,INA,SZA   E=1, A=000002
0096  03306 003317   CMA,CCE,SLA,INA,SZA,RSS E=1, A=177776
0097  03307 102001   HLT 01        FAILURE: CMA,CCE,SLA,INA,SZA IF
0098*                             A=000002; CMA,CCE,SLA,INA,
0099*                             SZA,RSS IF A=177776
0100  03310 003321   CMA,CCE,SSA,RSS       E=1, A=000001
0101  03311 003323   CMA,CCE,SSA,SZA,RSS   E=1, A=177776
0102  03312 102001   HLT 01        FAILURE: CMA,CCE,SSA,RSS IF
0103*                             A=000001; CMA,CCE,SSA,SZA,RSS
0104*                             IF A=177776
0105  03313 003325   CMA,CCE,SSA,INA,RSS   E=1, A=000002
0106  03314 003327   CMA,CCE,SSA,INA,SZA,RSS E=1, A=177776
0107  03315 102001   HLT 01        FAILURE: CMA,CCE,SSA,INA,RSS IF
0108*                             A=000002; CMA,CCE,SSA,INA,SZA
0109*                             RSS IF A =177776
0110  03316 003320   CMA,CCE,SSA   E=1, A=000001
0111  03317 102001   HLT 01        CMA,CCE,SSA FAILED
0112  03320 003322   CMA,CCE,SSA,SZA       E=1, A=177776
0113  03321 003324   CMA,CCE,SSA,INA       E=1, A=000002
0114  03322 102001   HLT 01        FAILURE: CMA,CCE,SSA,SZA IF
0115*                             A=177776; CMA,CCE,SSA,INA IF
0116*                             A=000002
0117  03323 003315   CMA,CCE,SLA,INA,RSS   E=1, A=177777
0118  03324 102001   HLT 01        CMA,CCE,SLA,INA,RSS FAILED
0119  03325 003326   CMA,CCE,SSA,INA,SZA   E=1, A=000002
0120  03326 102001   HLT 01        CMA,CCE,SSA,INA,SZA FAILED
0121  03327 002041   SEZ,RSS
0122  03330 102001   HLT 01        E NOT=0
0123  03331 000000   NOP
0124***** CLA MODULE *****
0125  03332 102501   CCA LIA 01    LOAD SW. REG. INTO A=077777
0126  03333 000040   CLE           E=0
0127  03334 003400   CCA           A=177777
0128  03335 003401   CCA,RSS
0129  03336 102001   HLT 01        CCA OR CCA,RSS FAILED
0130  03337 003402   CCA,SZA
0131  03340 003403   CCA,SZA,RSS
0132  03341 102001   HLT 01        CCA,SZA OR CCA,SZA,RSS FAILED
0133  03342 003404   CCA,INA       E=1, A=000000
0134  03343 003405   CCA,INA,RSS
0135  03344 102001   HLT 01        CCA,INA OR CCA,INA,RSS FAILED
0136  03345 003406   CCA,INA,SZA   A=000000
0137  03346 102001   HLT 01        CCA,INA,SZA FAILED
0138  03347 003407   CCA,INA,SZA,RSS       A=000000
0139  03350 003411   CCA,SLA,RSS   A=177777
0140  03351 102001   HLT 01        FAILURE: CCA,INA,SZA,RSS IF
0141*                             A=000000; CCA,SLA,RSS, IF
0142*                             A=177777
0143  03352 003410   CCA,SLA       A=177777
0144  03353 003415   CCA,SLA,INA,RSS       A=000000
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0145  03354 102001   HLT 01        FAILURE: CCA,SLA IF A=177777;
0146*                             CCA,SLA,INA,RSS IF A=000000
0147  03355 003412   CCA,SLA,SZA   A=177777
0148  03356 003416   CCA,SLA,INA,SZA       A=000000
0149  03357 102001   HLT 01        FAILURE: CCA,SLA,SZA IF
0150*                             A=177777; CCA,SLA,INA,SZA IF
0151*                             A=000000
0152  03360 003414   CCA,SLA,INA   A=000000
0153  03361 003413   CCA,SLA,SZA,RSS       A=177777
0154  03362 102001   HLT 01        FAILURE: CCA,SLA,INA IF
0155*                             A=000000; CCA,SLA,SZA,RSS IF
0156*                             A=177777
0157  03363 003417   CCA,SLA,INA,SZA,RSS   A=000000
0158  03364 102001   HLT 01        CCA,SLA,INA,SZA,RSS FAILED
0159  03365 003420   CCA,SSA       A=177777
0160  03366 003421   CCA,SSA,RSS
0161  03367 102001   HLT 01        CCA,SSA OR CCA,SSA,RSS FAILED
0162  03370 003422   CCA,SSA,SZA   A=177777
0163  03371 003423   CCA,SSA,SZA,RSS
0164  03372 102001   HLT 01        CCA,SSA,SZA OR CCA,SSA,SZA,RSS
0165*                             FAILED
0166  03373 003424   CCA,SSA,INA
0167  03374 003425   CCA,SSA,INA,RSS
0168  03375 102001   HLT 01        CCA,SSA,INA OR CCA,SSA,INA,RSS
0169*                             FAILED
0170  03376 003426   CCA,SSA,INA,SZA       A=000000
0171  03377 102001   HLT 01        CCA,SSA,INA,SZA FAILED
0172  03400 003427   CCA,SSA,INA,SZA,RSS
0173  03401 102001   HLT 01        CCA,SSA,INA,SZA,RSS FAILED
0174  03402 002041   SEZ,RSS
0175  03403 102001   HLT 01        E NOT=1
0176  03404 000000   NOP
0177***** CCA,SEZ MODULE *****
0178  03405 102501   CCASEZ LIA 01   LOAD SW. REG. INTO A=077777
0179  03406 000040   CLE           E=0
0180  03407 003441   CCA,SEZ,RSS
0181  03410 003440   CCA,SEZ
0182  03411 102001   HLT 01        CCA,SEZ,RSS OR CCA,SEZ FAILED
0183  03412 003442   CCA,SEZ,SZA
0184  03413 102001   HLT 01        CCA,SEZ,SZA FAILED
0185  03414 003443   CCA,SEZ,SZA,RSS
0186  03415 102001   HLT 01        CCA,SEZ,SZA,RSS FAILED
0187  03416 003444   CCA,SEZ,INA   E=1, A=000000
0188  03417 102001   HLT 01        CCA,SEZ,INA FAILED
0189  03420 003445   CCA,SEZ,INA,RSS
0190  03421 102001   HLT 01        CCA,SEZ,INA,RSS FAILED
0191  03422 003446   CCA,SEZ,INA,SZA
0192  03423 102001   HLT 01        CCA,SEZ,INA,SZA FAILED
0193  03424 003447   CCA,SEZ,INA,SZA,RSS
0194  03425 102001   HLT 01        CCA,SEZ,INA,SZA,RSS FAILED
0195  03426 003450   CCA,SEZ,SLA
0196  03427 023451   CCA,SEZ,SLA,RSS
0197  03430 102001   HLT 01        CCA,SEZ,SLA OR CCA,SEZ,SLA,RSS
0198*                             FAILED
0199  03431 003452   CCA,SEZ,SLA,SZA
0200  03432 003453   CCA,SEZ,SLA,SZA,RSS
0201  03433 102001   HLT 01        CCA,SEZ,SLA OR CCA,SEZ,SLA,RSS
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0202*                             FAILED
0203  03434 003452   CCA,SEZ,SLA,SZA
0204  03435 003453   CCA,SEZ,SLA,SZA,RSS
0205  03436 102001   HLT 01        CCA,SEZ,SLA,SZA OR CCA,SEZ,SLA,
0206*                             SZA,RSS FAILED
0207  03437 003454   CCA,SEZ,SLA,INA       A=000000
0208  03440 003455   CCA,SEZ,SLA,INA,RSS   A=000000
0209  03441 102001   HLT 01        CCA,SEZ,SLA,INA OR CCA,SEZ,SLA,
0210*                             INA,RSS FAILED
0211  03442 003456   CCA,SEZ,SLA,INA,SZA
0212  03443 102001   HLT 01        CCA,SEZ,SLA,INA,SZA FAILED
0213  03444 003457   CCA,SEZ,SLA,INA,SZA,RSS
0214  03445 102001   HLT 01        CCA,SEZ,SLA,INA,SZA,RSS FAILED
0215  03446 003460   CCA,SEZ,SSA
0216  03447 003461   CCA,SEZ,SSA,RSS
0217  03450 102001   HLT 01        CCA,SEZ,SSA OR CCA,SEZ,SSA,RSS
0218*                             FAILED
0219  03451 003462   CCA,SEZ,SSA,SZA
0220  03452 003463   CCA,SEZ,SSA,SZA,RSS
0221  03453 102001   HLT 01        CCA,SEZ,SSA,SZA OR CCA,SEZ,SSA,
0222*                             SZA,RSS FAILED
0223  03454 003464   CCA,SEZ,SSA,INA
0224  03455 003465   CCA,SEZ,SSA,INA,RSS
0225  03456 102001   HLT 01        CCA,SEZ,SSA,INA OR CCA,SEZ,SSA,
0226*                             INA,RSS FAILED
0227  03457 003466   CCA,SEZ,SSA,INA,SZA
0228  03460 102001   HLT 01        CCA,SEZ,SSA,INA,SZA FAILED
0229  03461 003467   CCA,SEZ,SSA,INA,SZA,RSS
0230  03462 102001   HLT 01        CCA,SEZ,SSA,INA,SZA,RSS FAILED
0231  03463 002041   SEZ,RSS
0232  03464 102001   HLT 01        E NOT=1
0233  03465 000000   NOP
0001***** CCA,CLE MODULE *****
0002  03466 102501   CCACLE LIA 01   LOAD SW. REG. INTO A=077777
0003  03467 002004   INA           A=100000
0004  03470 102401   MIA 01        MERGE SW. REG. INTO A=177777
0005  03471 002004   INA           E=1, A=000000
0006  03472 003500   CCA,CLE       E=0, A=177777
0007  03473 003501   CCA,CLE,RSS
0008  03474 102001   HLT 01        CCA,CLE OR CCA,CLE,RSS FAILED
0009  03475 003502   CCA,CLE,SZA
0010  03476 003503   CCA,CLE,SZA,RSS
0011  03477 102001   HLT 01        CCA,CLE,SZA OR CCA,CLE,SZA,RSS
0012*                             FAILED
0013  03500 003504   CCA,CLE,INA   E=1
0014  03501 003505   CCA,CLE,INA,RSS       E=1
0015  03502 102001   HLT 01        CCA,CLE,INA OR CCA,CLE,INA,RSS
0016*                             FAILED
0017  03503 003506   CCA,CLE,INA,SZA       E=1
0018  03504 102001   HLT 01        CCA,CLE,INA,SZA FAILED
0019  03505 003507   CCA,CLE,INA,SZA,RSS   E=1
0020  03506 003511   CCA,CLE,SLA,RSS       E=0
0021  03507 102001   HLT 01        FAILURE: CCA,CLE,INA,SZA,RSS IF
0022*                             E=1; CCA,CLE,SLA,RSS IF E=1
0023  03510 003510   CCA,CLE,SLA
0024  03511 003513   CCA,CLE,SLA,SZA,RSS
0025  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 102501    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 102001    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,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 102001    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,RSS 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 102001    HLT 01        CCA,CCE OR CCA,CCE,RSS FAILED
0141  03644 003702    CCA,CCE,SZA           E=1
0142  03645 003703    CCA,CCE,SZA,RSS
0143  03646 102001    HLT 01        CCA,CCE,SZA OR CCA,CCE,SZA,RSS
0144*                                FAILED
0145  03647 003704    CCA,CCE,INA   E=1, A=000000
0146  03650 003705    CCA,CCE,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,CCE,INA,SZA FAILED
0151  03654 003707    CCA,CCE,INA,SZA,RSS   E=1, A=000000
0152  03655 003711    CCA,CCE,SLA,RSS       E=1
0153  03656 102001    HLT 01        FAILURE: CCA,CCE,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,CCE,SLA,SZA,RSS
0158  03661 102001    HLT 01        CCA,CCE,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=000004
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,CCE,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,CCE,SLA,INA,SZA,RSS FAILED
0171  03672 003720    CCA,CCE,SSA
0172  03673 003721    CCA,CCE,SSA,RSS
0173  03674 102001    HLT 01        CCA,CCE,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,CCE,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,CCE,SSA,INA OR CCA,CCE,SSA,
0182*                                INA,RSS FAILED
0183  03703 003726    CCA,CCE,SSA,INA,SZA
0184  03704 102001    HLT 01        CCA,CCE,SSA,INA,SZA FAILED
0185  03705 003727    CCA,CCE,SSA,INA,SZA,RSS
0186  03706 102001    HLT 01        CCA,CCE,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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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; CLE,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 022031    SSA,SLA,RSS
0249  03775 102001    HLT 01        SSA,SLA,RSS FAILED
0250  03776 102001    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=100200
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=000024
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=100200
0297  04045 102401        MIA 01    MERGE SW. REG. INTO A=177777
0298  04046 002004        INA       E=1, A=000000
0299  04047 102501        LIA 01    A=077777
0300  04050 002430        CLA,SSA,SLA         F=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,SF7,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 FAILED
0327  04077 002475        CLA,SEZ,SSA,SLA,INA,RSS
0328  04100 102001        HLT 01    CLA,SF7,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 FAILED
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,CLF,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,CLF,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=100200
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,SFZ,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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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,CLF,SSA,SLA FAILED
0041  04227 003131        CMA,CLF,SSA,SLA,RSS A=177777
0042  04230 102001        HLT 01    CMA,CLF,SSA,SLA,RSS FAILED
0043  04231 003132        CMA,CLE,SSA,SLA,SZA A=000000
0044  04232 102001        HLT 01    CMA,CLF,SSA,SLA,SZA
0045  04233 003133        CMA,CLE,SSA,SLA,SZA,RSS A=177777
0046  04234 102001        HLT 01    CMA,CLF,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,CLF,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 F=1, A=000000
0070  04261 102001        HLT 01    CMA,CME,SSA,SLA,SZA, FAILED
0071  04262 003235        CMA,CMF,SSA,SLA,INA,RSS E=1, A=000000
0072  04263 102001        HLT 01    CMA,CME,SSA,SLA,INA,RSS FAILED
0073  04264 003234        CMA,CCE,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,RSS A=177777
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Listing
Alter-Skip Instruction Test

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0087  04300 102001   HLT 01      CMA,CCF,SSA,SLA,SZA,RSS FAILED
0088  04301 003332               CMA,CCF,SSA,SLA,SZA    A=000000
0089  04302 102001   HLT 01      CMA,CCF,SSA,SLA,SZA FAILED
0090  04303 003335               CMA,CCE,SSA,SLA,INA,RSS A=000000
0091  04304 102001   HLT 01      CMA,CCF,SSA,SLA,INA,RSS FAILED
0092  04305 003333               LMA,CCF,SSA,SLA,INA    A=000000
0093  04306 003336               LMA,CCF,SSA,SLA,INA,SZA A=000000
0094  04307 102001   HLT 01      CMA,CCF,SSA,SLA,INA OR CMA,CLE,
                                   SSA,SLA,INA,SZA FAILED
0095*
0096  04310 003337               CMA,CCE,SSA,SLA,INA,SZA,RSS    A=000000
0097  04311 102001   HLT 01      CMA,CCE,SSA,SLA,INA,SZA,RSS
                                   FAILED
0098*
0099  04312 002041               SEZ,RSS
0100  04313 102001   HLT 01      E NOT=1
0101  04314 102501   LIA 01      LOAD SW. REG. INTO A=077777
0102  04315 002004               INA          A=100000
0103  04316 102401   MIA 01      MERGE SW. REG. INTO A=177777
0104  04317 002004               INA          E=1, A=000000
0105  04320 003430               CCA,SSA,SLA
0106  04321 003431               CCA,SSA,SLA,RSS
0107  04322 102001   HLT 01      CCA,SSA,SLA,RSS OR CCA,SSA,SLA
                                   FAILED
0108*
0109  04323 003432               CCA,SSA,SLA,SZA
0110  04324 003433               CCA,SSA,SLA,SZA,RSS
0111  04325 102001   HLT 01      CCA,SSA,SLA,SZA OR CCA,SSA,SLA,
                                   SZA,RSS FAILED
0112*
0113  04326 003434               CCA,SSA,SLA,INA
0114  04327 003435               CCA,SSA,SLA,INA,RSS
0115  04330 102001   HLT 01      CCA,SSA,SLA,INA OR CCA,SSA,SLA,
                                   INA,RSS FAILED
0116*
0117  04331 003436               CCA,SSA,SLA,INA,SZA
0118  04332 102001   HLT 01      CCA,SSA,SLA,INA,SZA FAILED
0119  04333 003437               CCA,SSA,SLA,INA,SZA,RSS
0120  04334 102001   HLT 01      CCA,SSA,SLA,INA,SZA,RSS
0121  04335 003474               CCA,SEZ,SSA,SLA
0122  04336 003471               CCA,SEZ,SSA,SLA,RSS
0123  04337 102001   HLT 01      CCA,SEZ,SSA,SLA,RSS OR CCA,SEZ,
                                   SSA,SLA FAILED
0124*
0125  04340 003472               CCA,SEZ,SSA,SLA,SZA
0126  04341 003473               CCA,SEZ,SSA,SLA,SZA,RSS
0127  04342 102001   HLT 01      CCA,SEZ,SSA,SLA,SZA OR CCA,SEZ,
                                   SSA,SLA,SZA,RSS
0128*
0129  04343 003474               CCA,SEZ,SSA,SLA,INA
0130  04344 003475               CCA,SEZ,SSA,SLA,INA,RSS
0131  04345 102001   HLT 01      CCA,SEZ,SSA,SLA,INA OR CCA,SEZ,SSA,
                                   SLA,INA,RSS FAILED
0132*
0133  04346 003476               CCA,SEZ,SSA,SLA,INA,SZA
0134  04347 102001   HLT 01      CCA,SEZ,SSA,SLA,INA,SZA FAILED
0135  04350 003477               CCA,SEZ,SSA,SLA,INA,SZA,RSS
0136  04351 102001   HLT 01      CCA,SEZ,SSA,SLA,INA,SZA,RSS
                                   FAILED
0137*
0138  04352 002041               SEZ,RSS
0139  04353 102001   HLT 01      E NOT=1
0140  04354 003530               CCA,CLE,SSA,SLA
0141  04355 003531               CCA,CLF,SSA,SLA,RSS
0142  04356 102001   HLT 01      CCA,CLE,SSA,SLA OR CCA,CLE,SSA,
                                   SLA,RSS FAILED
0143*
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0144  04357 003532               CCA,CLE,SSA,SLA,SZA
0145  04360 003533               CCA,CLF,SSA,SLA,SZA,RSS
0146  04361 102001   HLT 01      CCA,CLE,SSA,SLA,SZA OR CCA,CLE,
                                   SSA,SLA,SZA,RSS FAILED
0147*
0148  04362 003534               CCA,CLE,SSA,SLA,INA
0149  04363 003535               CCA,CLE,SSA,SLA,INA,RSS
0150  04364 102001   HLT 01      CCA,CLE,SSA,SLA,INA OR CCA,CLE,
                                   SSA,SLA,INA,RSS FAILED
0151*
0152  04365 003536               CCA,CLF,SSA,SLA,INA SZA E=1
0153  04366 102001   HLT 01      CCA,CLF,SSA,SLA,INA SZA FAILED
0154  04367 003537               CCA,CLE,SSA,SLA,INA,SZA,RSS   E=1
0155  04370 102001   HLT 01      CCA,CLE,SSA,SLA,INA,SZA,RSS
                                   FAILED
0156*
0157  04371 002041               SEZ,RSS
0158  04372 102001   HLT 01      E NOT=1
0159  04373 003630               CCA,CMF,SSA,SLA        E=0
0160  04374 003631               CCA,CMF,SSA,SLA,RSS    E=1
0161  04375 102001   HLT 01      FAILURE: CCA,CME,SSA,SLA IF
                                   E=0; CCA,CME,SSA,SLA,RSS IF
                                   E=1
0162*
0163*
0164  04376 003632               CCA,CMF,SSA,SLA,SZA    E=0
0165  04377 003633               CCA,CMF,SSA,SLA,SZA,RSS E=1
0166  04400 102001   HLT 01      FAILURE: CCA,CME,SSA,SLA,SZA IF
                                   E=0; CCA,CME,SSA,SLA,SZA,RSS IF E=1
0167*
0168  04401 003634               CCA,CMF,SSA,SLA,INA    E=1
0169  04402 003635               CCA,CME,SSA,SLA,INA,RSS E=1
0170  04403 102001   HLT 01      CCA,CMF,SSA,SLA,INA OR CCA,CME,
                                   SSA,SLA,INA,RSS FAILED
0171*
0172  04404 003636               CCA,CME,SSA,SLA,INA,SZA E=1
0173  04405 102001   HLT 01      CCA,CME,SSA,SLA,INA,SZA FAILED
0174  04406 003637               CCA,CME,SSA,SLA,INA,SZA,RSS E=1
0175  04407 102001   HLT 01      CCA,CMF,SSA,SLA,INA,SZA,RSS
                                   FAILED
0176*
0177  04410 002041               SEZ,RSS
0178  04411 102001   HLT 01      E NOT=1
0179  04412 003730               CCA,CCF,SSA,SLA        E=1
0180  04413 003731               CCA,CCF,SSA,SLA,RSS
0181  04414 102001   HLT 01      CCA,CCE,SSA,SLA OR CCA,CCE,SSA,SLA,
                                   RSS FAILED
0182*
0183  04415 003732               CCA,CCE,SSA,SLA,SZA
0184  04416 003733               CCA,CCE,SSA,SLA,SZA,RSS
0185  04417 102001   HLT 01      CCA,CCE,SSA,SLA,SZA OR CCA,CLE,
                                   SSA,SLA,SZA,RSS FAILED
0186*
0187  04420 003734               CCA,CCE,SSA,SLA,INA
0188  04421 003735               CCA,CCE,SSA,SLA,INA,RSS
0189  04422 102001   HLT 01      CCA,CCF,SSA,SLA,INA OR CCA,CLE,
                                   SSA,SLA,INA,RSS FAILED
0190*
0191  04423 003736               CCA,CCE,SSA,SLA,INA,SZA
0192  04424 102001   HLT 01      CCA,CLE,SSA,SLA,INA,SZA FAILED
0193  04425 003737               CCA,CCE,SSA,SLA,INA,SZA,RSS   E=1
0194  04426 102001   HLT 01      CCA,CCE,SSA,SLA,INA,SZA,RSS
                                   FAILED
0195*
0196  04427 002040               SEZ
0197  04430 002041               SEZ,RSS
0198  04431 102001   HLT 01      E NOT=1
0199  04432 102501   LIA 01      LOAD SW. REG WITH A=077777
0200  04433 002004               INA          A=100000
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0201  04434 102401   MIA 01      MERGE SW. REG. INTO A=177777
0202  04435 002004               INA          E=1, A=000000
0203  04436 002141               SEZ,CLE,RSS  E=0, A=000000
0204  04437 102001   HLT 01      SEZ,CLE,RSS FAILED
0205  04440 002140               SEZ,CLE      E=0, A=000000
0206  04441 102001   HLT 01      SEZ,CLE FAILED
0207  04442 002143               SEZ,CLF,SZA,RSS    E=0, A=000000
0208  04443 002142               SEZ,CLF,SZA  E=0, A=000000
0209  04444 102001   HLT 01      SEZ,CLE,SZA,RSS OR SEZ,CLE,SZA
                                   FAILED
0210*
0211  04445 002145               SEZ,CLF,INA,RSS    E=0, A=000001
0212  04446 002144               SEZ,CLE,INA  E=0, A=000002
0213  04447 102001   HLT 01      FAILURE: SEZ,CLE,INA,RSS IF
                                   A=000001; SEZ,CLE,INA IF
                                   A=000002
0214*
0215*
0216  04450 002146               SEZ,CLF,INA,SZA    E=0, A=000003
0217  04451 102001   HLT 01      SEZ,CLE,INA,SZA FAILED
0218  04452 002147               SEZ,CLF,INA,SZA,RSS E=0, A=000004
0219  04453 102001   HLT 01      SEZ,CLF,INA,SZA,RSS FAILED
0220  04454 002150               SEZ,CLE,SLA  E=0, A=000004
0221  04455 102001   HLT 01      SEZ,CLE,SLA FAILED
0222  04456 002154               SEZ,CLF,SLA,INA    E=0, A=000005
0223  04457 102001   HLT 01      SEZ,CLF,SLA,INA FAILED
0224  04460 002152               SEZ,CLF,SLA,SZA    E=0, A=000005
0225  04461 102001   HLT 01      SEZ,CLF,SLA,SZA FAILED
0226  04462 002153               SEZ,CLE,SLA,SZA,RSS E=0, A=000005
0227  04463 102001   HLT 01      SEZ,CLF,SLA,SZA,RSS FAILED
0228  04464 002151               SEZ,CLF,SLA,RSS    E=0, A=000005
0229  04465 102001   HLT 01      SEZ,CLE,SLA,RSS FAILED
0230  04466 002155               SEZ,CLF,SLA,INA,RSS E=0, A=000006
0231  04467 102001   HLT 01      SEZ,CLF,SLA,INA,RSS FAILED
0232  04470 002156               SEZ,CLE,SLA,INA,SZA E=0, A=000007
0233  04471 102001   HLT 01      SEZ,CLE,SLA,INA,SZA FAILED
0234  04472 002157               SEZ,CLE,SLA,INA,SZA,RSS E=0, A=000010
0235  04473 102001   HLT 01      SFZ,CLF,SLA,INA,SZA,RSS FAILED
0236  04474 002160               SEZ,CLF,SSA  E=0, A=000010
0237  04475 102001   HLT 01      SEZ,CLE,SSA FAILED
0238  04476 002161               SEZ,CLF,SSA,RSS    E=0, A=000010
0239  04477 002162               SEZ,CLF,SSA,SZA    E=0, A=000010
0240  04500 102001   HLT 01      SEZ,CLE,SSA,RSS OR SFZ,CLE,SSA,
                                   SZA FAILED
0241*
0242  04501 002163               SEZ,CLE,SSA,SZA,RSS E=0, A=000010
0243  04502 102001   HLT 01      SEZ,CLE,SSA,SZA,RSS FAILED
0244  04503 002164               SEZ,CLF,SSA,INA    E=0, A=000011
0245  04504 102001   HLT 01      SEZ,CLF,SSA,INA, FAILED
0246  04505 002165               SEZ,CLE,SSA,INA,RSS E=0, A=000012
0247  04506 002166               SEZ,CLE,SSA,INA,SZA E=0, A=000013
0248  04507 102001   HLT 01      FAILURE: SEZ,CLE,SSA,INA,RSS IF
                                   A=000012; SEZ,CLE,SSA,INA,SZA
                                   IF A=000013
0249*
0250*
0251  04510 002167               SEZ,CLE,SSA,INA,SZA,RSS E=0, A=000014
0252  04511 102001   HLT 01      SEZ,CLF,SSA,INA,SZA,RSS FAILED
0253  04512 002170               SEZ,CLE,SSA,SLA    E=0, A=000014
0254  04513 102001   HLT 01      SEZ,CLF,SSA,SLA FAILED
0255  04514 002171               SEZ,CLE,SSA,SLA,RSS L=0, A=000014
0256  04515 002172               SEZ,CLE,SSA,SLA,SZA E=0, A=000014
0257  04516 102001   HLT 01      SEZ,CLE,SSA,SLA,RSS OR SEZ,CLE,
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0258*                            SSA,SLA,SZA FAILED
0259  04517 002173               SEZ,CLF,SSA,SLA,SZA,RSS E=0, A=000014
0260  04520 102001   HLT 01      SEZ,CLE,SSA,SLA,SZA,RRS FAILED
0261  04521 002174               SEZ,CLF,SSA,SLA,INA    E=0, A=000015
0262  04522 102001   HLT 01      SEZ,CLE,SSA,SLA,INA FAILED
0263  04523 002175               SEZ,CLF,SSA,SLA,INA,RSS E=0, A=000016
0264  04524 002172               SEZ,CLE,SSA,SLA,INA,SZA E=0, A=000017
0265  04525 102001   HLT 01      FAILURE: SEZ,CLE,SSA,SLA,INA,
                                   RSS IF A=000016; SEZ,CLE,SSA,
                                   SLA,INA,SZA IF A=000017
0266*
0267*
0268  04526 002177               SEZ,CLE,SSA,SLA,INA,SZA,RSS E=0, A=000002
0269  04527 102001   HLT 01      SEZ,CLE,SSA,SLA,INA,SZA,RSS
                                   FAILED
0270*
0271  04530 102501   LIA 01      LOAD SW. REG. INTO A=077777
0272  04531 002004               INA          A=100000
0273  04532 102401   MIA 01      MERGE SW. REG. INTO A=177777
0274  04533 002004               INA          E=1, A=000000
0275  04534 002241               SEZ,CME,RSS  E=0, A=000000
0276  04535 102001   HLT 01      SEZ,CME,RSS FAILED
0277  04536 002240               SEZ,CME      E=1, A=000000
0278  04537 102001   HLT 01      SEZ,CME FAILED
0279  04540 002242               SEZ,CMF,SZA  E=0, A=000000
0280  04541 102001   HLT 01      SEZ,CME,SZA FAILED
0281  04542 002243               SEZ,CMF,SZA,RSS    E=1, A=000000
0282  04543 002245               SEZ,CME,INA,RSS    E=0, A=000000
0283  04544 102001   HLT 01      FAILURE: SEZ,CME,SZA,RSS IF
                                   A=000000; SEZ,CMF,INA,RSS IF
                                   A=000001
0284*
0285*
0286  04545 002244               SEZ,CME,INA  E=1, A=000002
0287  04546 102001   HLT 01      SEZ,CME,INA FAILED
0288  04547 002246               SEZ,CMF,INA,SZA    E=0, A=000003
0289  04550 002247               SEZ,CME,INA,SZA,RSS E=1, A=000004
0290  04551 102001   HLT 01      FAILURE: SEZ,CME,INA,SZA IF
                                   A=000003; SEZ,CME,INA,SZA,RSS
                                   IF A=000004
0291*
0292*
0293  04552 002250               SEZ,CME,SLA  E=0, A=000004
0294  04553 102001   HLT 01      SEZ,CMF,SLA FAILED
0295  04554 002251               SEZ,CME,SLA,RSS    E=1, A=000004
0296  04555 002252               SEZ,CME,SLA,SZA    E=0, A=000004
0297  04556 102001   HLT 01      FAILURE: SEZ,CME,SLA,RSS IF
                                   E=1, SEZ,CME,SLA,SZA, IF E=0
0298*
0299  04557 002253               SEZ,CMF,SLA,SZA,RSS E=1, A=000004
0300  04560 102001   HLT 01      SEZ,CME,SLA,SZA,RSS FAILES
0301  04561 002254               SEZ,CME,SLA,INA    L=0, A=000005
0302  04562 102001   HLT 01      SEZ,CMF,SLA,INA FAILED
0303  04563 002255               SEZ,CMF,SLA,INA,RSS E=1, A=000006
0304  04564 102001   HLT 01      SEZ,CMF,SLA,INA,RSS FAILED
0305  04565 002256               SEZ,CMF,SLA,INA,SZA E=0, A=000007
0306  04566 102001   HLT 01      SFZ,CME,SLA,INA,SZA FAILED
0307  04567 002257               SEZ,CMF,SLA,INA,SZA,RSS E=1, A=000010
0308  04570 102001   HLT 01      SEZ,CMF,SLA,INA,SZA,RSS FAILED
0309  04571 002261               SEZ,CMF,SSA,RSS    E=0, A=000010
0310  04572 102001   HLT 01      SEZ,CMF,SSA,RSS FAILED
0311  04573 002260               SEZ,CMF,SSA  E=1, A=000010
0312  04574 102001   HLT 01      SEZ,CMF,SSA FAILED
0313  04575 002263               SEZ,CMF,SSA,SZA,RSS E=0, A=000010
0314  04576 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=000016
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       E=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,CCE,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,CCE,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,CCF,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,CCE,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,SZA,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,CLE,SLA   E=0, A=000000
0008 04752 102001  HLT 01       CLA,SEZ,CLE,SLA FAILED
0009 04753 002551  CLA,SEZ,CLE,SLA,RSS   E=0, A=000000
0010 04754 002552  CLA,SEZ,CLE,SLA,SZA   E=0, A=000000
0011 04755 102001  HLT 01       CLA,SEZ,CLE,SLA,RSS OR CLA,SEZ,
0012*                            CLE,SLA,SZA FAILED
0013 04756 002553  CLA,SEZ,CLE,SLA,SZA,RSS E=0, A=000000
0014 04757 002554  CLA,SEZ,CLE,SLA,INA   E=0, A=000000
0015 04760 102001  HLT 01       CLA,SEZ,CLE,SLA,INA,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,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,CME,SZA,RSS   E=1, A=000000
0074 05033 002665  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=000000
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,CMF,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,CMF,SSA,SZA   E=0, A=000000
0110 05063 102001  HLT 01       FAILURE: CLA,SEZ,CME,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,CME,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,CME,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,RSS E=0, A=000000
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,CME,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 002000   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,CCF,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,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=000000
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,CLF,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,CLF,INA         E=0, A=000000
0239  05224 102001   HLT 01      FAILURE: CMA,SEZ,CLF,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,CLF,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,CLF,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,CLF,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,SFZ,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 102401   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=0, 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,CMF,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,SZA 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=0, 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,CMF,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
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0152 05546 102001  HLT 01    CCA,SEZ,CLE,SLA,INA,SZA,RSS
0153*                        FAILED
0154 05547 003561  CCA,SEZ,CLF,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,CLF,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=1, A=000000
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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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=200000
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=200000
0048  05637 003655   CCA,SEZ,CME,SLA,INA,RSS E=1, A=003000
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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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 F=1,
0098*                              A=000000
0099  05700 102001   HLT 01        CCA,SEZ,CME,SSA,SLA,INA,RSS
0100*                              FAILED
0101  05701 102054   LIA 01        LOAD SW. REG. INTO A=077777
0102  05702 002004   INA           A=100000
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
```

```
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,SZA 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=000000
0181  05770 102001   HLT 01        CCA,SEZ,CCE,SSA,SLA,INA,SZA,RSS
0182*                              FAILED
0183  05771 000040   CLE
0184  05772 127773   JMP MODIF,I
0185  05773 006300   MODIF DEF RESET
0186  06000           ORG 6000H
0187  06000 062035   RESET LDA RSTAR
0188  06001 072034   STA START
0189  06002 162034   MOL LDA START,I
0190  06003 012437   ANI BMASK
0191  06004 002402   SZA
0192  06005 026021   JMP AMOD
0193  06006 162034   BMLO 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 PEST
```

```
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   ANI 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 REST
0211  06030 026021   JMP AMOD
0212  06031 062035   RESTI LDA RSTAR
0213  06032 072034   STA START
0214  06033 126041   JMP BEG,I
0215  06034 062060   START DEF BEGIN
0216  06035 002000   RSTAR DEF BEGIN
0217  06036 173777   AMASK OCT 173777
0218  06037 004040   BMASK OCT 004040
0219  06040 005772   MASK DEF MODIF-1
0220  06041 002061   BEC 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*
```

PAGE 0001   HP 20401BL

```
0001            ASMB,A,B,L,T
A2      003653
A3      003654
A4      003655
A5      003656
AA      003651
AAI     003657
AB      003652
AI1     001316
C2      003640
C21     003645
C3      003641
C31     003646
C4      003642
C41     003647
C51     003650
CA      003636
CAI     003643
CB      003637
CB1     003644
D2      003717
D21     003725
D3      003720
D31     003726
D4      003721
D5      003722
DA      003715
DB      003716
DB1     003724
GC1     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
```

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 CCT   0
0021  07665 007642 FIN  DEF   INIT
0022  07666 000100 FIN1 CCT   100
0023  07667 102001 HALT1 CCT   102001
0024                     END
** NO ERRORS*
```

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
S15     005003
S16     006003
SIX     003702
T9      002101
TAG     001275
TA1     003624
X2      003662
X3      003663
X4      003664
X5      003665
XA      003660
XB      003661
Z12     003626
Z13     003627
ADMK    001321
ADMK1   003723
ADMKB   001322
ANS3    005021
ANS4    005023
ANS5    005025
ANS6    005027
APAT1   001273
APAT2   001274
ASEW    003604
ASEQI   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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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
IFAT2	003633
IFAT3	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
LFAT	001271
NAR1	003424
OT12	003617
PAT1	003631
PAT2	003632
PAT3	005020
PAT4	005022
PAT5	005024
PAT5A	005014

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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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PAT6	005026
PAT6A	006014
PBT1	001313
PBT2	001314
PET1	002003
RET2	002006
RET3	002011
RET4	002014
RET5	002026
RET6	002034
PET7	002043
PET8	002054
RET9	002076
RETI	001277
RETN	004656
SIFVE	003614
SISIX	003615
SIT0	001307
SIT2	003616
SIT5	005011
SIT6	006011
SIXI	006001
SFAT	001272
SPAT0	001317
SPAT1	003703
SPAT2	005016
SFAT3	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

PAGE 0007   HP 20401BL

```
TLDA2  204241
TLDB   001146
TLDB1  003056
TLDB2  304266
TSTA   001154
TSTA1  003141
TSTA2  304313
TSTB   001163
TSTB1  003231
TSTB2  304342
TXOR   001114
TXOR1  002570
TXOR2  034115
** NO ERRORS*
```

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        AND 1
0070  01104 002002        SZA
0071  01105 102001        HLT 01       TAND FAILED
0072  01106 006004        INB          B=100001
0073  01107 010001        AND 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 020001        XOR 1
0083  01121 002002        SZA
0084  01122 102001        HLT 01       TXOR FAILED
0085  01123 006004        INB          B=100000
0086  01124 020001        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 TLIA   CLA
0099  01141 006400        CLB
0100  01142 061271        LDA LPAT     A=077777
0101  01143 051271        CPA LPAT
0102  01144 025146        JMP *+2
0103  01145 102001        HLT 01       TLDA FAILED
0104  01146 002400 TLIB   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
```

PAGE 0008 #01   HP 20401BL

```
0001                      ASPB,A,B,L,T
0001  01000               ORG 1000B
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 TCPB   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
```

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=052525
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 000400        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
```

Listing
Memory Reference Instruction Test

```
0171  01251 071266        STA ATEMP
0172  01252 075267        STB BTEMP
0173  01253 161250        LDA ERROR,I
0174  01254 071270        STA INSTR        A=LOCN. OF ERROR INSTR.
0175  01255 165270        LDB INSTR,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  INSTR 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 002200  TAG   DEF TJMP1
0192  01276 125277  BASE  JMP RETI.I       JUMP IND. TO PAGE 1
0193  01277 002003  REII  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 002004        INA
0199  01305 071301        STA STWO
0200  01306 125301        JMP STWO.I
0201  01307 102076  SIT0  DEF RET9.I
0202  01310 000002  OT2   CCT 2
0203  01311 000001  IZB   CCT 1
0204  01312 003625  IIZB  DEF IZ1
0205  01313 052525  PBT1  CCT 052525
0206  01314 125252  PB12  CCT 125252
0207  01315 003631  IIPA0 DEF PAT1
0208  01316 003651  AII   DEF AA
0209  01317 000000  SPAT0 CCT 0
0210  01320 003703  IIFS0 DEF SPAT1
0211  01321 136456  ADPK  CCT 136456
0212  01322 132455  ADPKB 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 127205  REI1  JMP FIVE.I       JUMP TO PAGE 2 IND.
0218  02004 117600        JSB ERR1.I
0219  02005 002003        DEF *-2
0220  02006 127202  RET2  JMP SIX,I        JMP TO PAGE 3 IND.
0221  02007 117600        JSB ERR1.I
0222  02010 002006        DEF *-2
0223  02011 127603  REI3  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  PEI4  DEF *+3          FOURTH LEVEL IS DIRECT
0227  02015 117600        JSB ERR1.I
```

```
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 006400        CLB
0263  02061 000000        NOP              MODTLE LOOP
0264  02062 015301  TJEB1 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 1,2,0,1
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
```

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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  FX1A  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 117600  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 006400        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 002464        CLA,INA
0320  02152 071311        STA IZB
0321  02153 002400  CONT1 CLA
0322  02154 037625        ISZ IZ1          ISZ TO CURRENT 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 ZI2,I        ISZ INDIRECT TO PAGE 2
0336  02172 026171        JMP CONT2+1
0337  02173 163626        LDA ZI2,I
0338  02174 002002        SZA
0339  02175 026201        JMP BAD3
0340  02176 002004        INA
0341  02177 173626        STA ZI2,I
```

```
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 ZI2,I
0347  02205 002400  CONT3 CLA
0348  02206 137627        ISZ ZI3,I        ISZ INDIRECT TO PAGE 3
0349  02207 026206        JMP CONT3+1
0350  02210 163627        LDA ZI3,I
0351  02211 002002        SZA
0352  02212 026216        JMP BAD4
0353  02213 002004        INA
0354  02214 173627        STA ZI3,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 ZI3,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 002464  CONT5 CLA,INA
0374  02240 034000        ISZ 0            ISZ A DIRECT
0375  02241 026240        JMP CONT5+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 134001        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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0399  02271 026273           JMP BAD8
0400  02272 026275           JMP CONTA
0401  02273 117600  BAI8     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           LDA 0
0408  02302 006002           SZB
0409  02303 026305           JMP BAD9
0410  02304 026307           JMP CONTV
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  BAI10    JSB ERR1.I
0451  02355 002353           DEF *-2
0452  02356 063643  CCON1    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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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  TCPB1    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  CCON2    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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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 025537           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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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  TXCR1    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 002002           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  BAC13 JSB ERR1.I
0643  02655 002653      DEF *-2
0644  02656 002400  CCAN6 CLA
0645  02657 063657      LDA AA1
0646  02660 123000      XOR 0,I        XOR TO A FROM A INDIRECT
0647  02661 002002      SZA
0648  02662 026666      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 000000      NOP            MODULE LOOP
0655  02671 063651  TIOR1 LDA PAT1
0656  02672 051314      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 *+P
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  CCOR5 CLA
0695  02741 063670      LDA 12
0696  02742 070002      STA 2
0697  02743 063671      LDA 13
0698  02744 070003      STA 3
0699  02745 063666      LDA 1A
0700  02746 067667      LDB 1B
0701  02747 024002      JMP P
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 002750      DEF *-5
0708  02756 002400  CCOR7 CLA
0709  02757 063657      LDA AA1
0710  02760 133000      IOR 0,I        IOR TO A FROM A INDIRECT
0711  02761 053657      CPA AA1
0712  02762 026765      JMP CCOR8
0713  02763 117600      JSB ERR1.I
0714  02764 002760      DEF *-4
0715  02765 002500  CCOR8 CLA,CLE
0716  02766 006400      CLB
0717  02767 000000      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 163533      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 027011      JMP CCLN4.I
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 063574      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  BAC14 JSB ERR1.I
0044  03043 003041      DEF *-2
0045  03044 002400  CCLN6 CLA
0046  03045 063633      LDA IPAT2
0047  03046 163000      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 000000      NOP            MODULE LOOP
0055  03056 065313  TLIB1 LDB PBT1     LDB FROM BASE PAGE
0056  03057 057631      CPB PAT1
0057  03060 027163      JMP CCLB1
0058  03061 117600      JSB ERR1.I
0059  03062 003056      DEF *-4
0060  03063 006400  CCLB1 CLB          LDB FROM CURRENT PAGE
0061  03064 067632      LDB PAT2
0062  03065 055314      CPB PBT2
0063  03066 027071      JMP CCLB2
0064  03067 117600      JSB ERR1.I
0065  03070 003064      DEF *-4
0066  03071 006400      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      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 L2B
0086  03115 074002      STB 2
0087  03116 067702      LDB L3B
0088  03117 074003      STB 3
0089  03120 067703      LDB LBB
0090  03121 024001      JMP 1          LDB TO B DIRECT
0091  03122 000061      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 167634      LDB IPAT3       LDB WITH B INDIRECT
0098  03131 164001      LDB 1,I
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 SPAT4      STA INTO BASE PAGE
0108  03143 051317      CPA SPAT4
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 063632      LDA PAT2
0135  03176 173703      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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```
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 063707 CCSA6  LDA SA
0148 03213 051317        CPA SPATW
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 CCSA8  CLA,CLE
0160 03227 006400        CLB
0161 03230 000000        NOP           MODULE LOOP
0162 03231 067631 TSTB1  LDB PAT1
0163 03232 075317        STB SPATW      STB INTO BASE PAGE
0164 03233 055317        CPB SPATW
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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```
0195 03272 003266        DEF *-4
0196 03273 006400 CCSB5  CLB
0197 03274 067713        LDB S28
0198 03275 074002        STB 2
0199 03276 067714        LDB S38
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 SPATW
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 TAIA1  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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```
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 070004        STA 4
0277 03414 063722        LDA D5
0278 03415 070005        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 ..R1   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 CCAD8
0295 03436 117600        JSB ERR1.I
0296 03437 003430        DEF *-7
0297 03440 002500 CCAD8  CLA,CLE
0298 03441 006400        CLB
0299 03442 000000        NOP           MODULE LOOP
0300 03443 065313 TAIB1  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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```
0309 03454 006500 CCBD1  CLB,CLE
0310 03455 067632        LDB PAT2
0311 03456 047632        ADB PAT2       ADB FROM CURRENT PAGE
0312 03457 006404        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 006404        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 D21
0353 03530 074002        STB 2
0354 03531 067726        LDB D31
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  CMB,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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0366  03545 067643       LDA CAI
0367  03546 144041       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 CCRDA
0373  03554 117660       JSB ERP1.I
0374  03555 003546       LEF *-7
0375  03556 002050  CCRDB CLA,CLE
0376  03557 006440       CLE
0377  03560 000640       AOF              MODULE LOOP
0378  03561 127560       JMP ITE,I
0379  03562 034700  ITE  DEF TCPA2
0380  03600            ORG 3600B
0381  03600 001250  ERB1 DEF ERROR
0382  03601 105001  FIVE DEF FIVE1,I
0383  03602 105001  SIX  DEF SIX1.I
0384  03603 105002  ITF0 DEF IFIVF,I
0385  03604 024001  ASEQ JMP 1
0386  03605 124002       JMP 2,I
0387  03606 002026       LEF RET5
0388  03607 002334       LEF RET6
0389  03610 100001  ASEQ1 DEF 1,I
0390  03611 100002       DEF 2,I
0391  03612 102043       DEF RET7.I
0392  03613 102154       DEF PFT8.I
0393  03614 035003  SIFVE DEF SI5
0394  03615 006203  SISIX DEF SI6
0395  03616 105311  SIT2  LEF SIT5.I
0396  03617 000012  CTI2  CCT 12
0397  03620 064000  EINST LDB 0
0398  03621 045310  INST2 ADB OT2
0399  03622 074000  INST3 STB 0
0400  03623 124000  INST4 JMP 0,I
0401  03624 100000  TA1  REF 0,I
0402  03625 000001  ITI  CCI 1
0403  03626 005412  ZI2  LEF IZ2
0404  03627 006012  ZI3  DEF I73
0405  03630 105013  II21 REF II72.I
0406  03631 052525  PA11 OCT 052525
0407  03632 125252  PA12 OCT 125252
0408  03633 005014  IPAT2 DEF PAT5A
0409  03634 006014  IPAT3 DFF PAT6A
0410  03635 105015  IIPAT DEF IIPA2,I
0411  03636 050004  CA   CPA 0
0412  03637 124003  CB   JMP 3,I
0413  03640 124004  C2   JMP 4,I
0414  03641 002356  C3   DEF CCON1
0415  03642 002354  C4   DFF BADI0
0416  03643 003643  CAI  DEF CAI
0417  03644 054001  CB1  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 BADI1
0422  03651 010000  PA   ANA 0
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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 BADI2
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 002656  X4   DEF BADI3
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   LEF CCLN6
0444  03677 003042  L5   DEF BADI4
0445  03700 065314  LB6  LDB PBT2
0446  03701 124003  L2B  JMP 3,I
0447  03702 003123  L3B  DEF CCLB6
0448  03723 000000  SPAT1 OCT 0
0449  03704 035016  SPT2 DEF SPAT3
0450  03705 006016  SPT3 DEF SPAT3
0451  03706 105017  IIPST REF IIPS1,I
0452  03707 071317  SA   STA SPAT4
0453  03710 124002  SB   JMP 2,I
0454  03711 003212  S2   DEF CCSA6
0455  03712 075317  SB1  STB SPAT4
0456  03713 124003  S2E  JMP 3,I
0457  03714 003303  S3E  DEF CCSB6
0458  03715 041321  EA   ADA ADMK
0459  03716 003002  EB   CMA,SZA
0460  03717 124004  E2   JMP 4,I
0461  03720 124005  E3   JMP 5,I
0462  03721 003424  E4   DEF NAR1
0463  03722 003422  E5   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 4000H
0469  04000 002500  TCPA2 CLA,CLE
0470  04001 006404       CLE,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       REF *-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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0480  04013 006404       CLE,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       REF *-3
0486  04021 065267       LDB BTEMP
0487  04022 034001  GD2  ISZ 1             INCR. LOOP COUNT
0488  04023 026014       JMP LP2
0489  04024 000000       AOF               MODULE LOOP
0490  04025 002404  TCPB2 CLA,INA          NEW TEST
0491  04026 006500       CLE,CLF
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 117000       JSB ERR2.I        ERROR
0496  04033 004030       LEF *-3
0497  04034 061266       LDA ATEMP
0498  04035 034001  GD3  ISZ 1             INCR. LOOP COUNT
0499  04036 026027       JMP LP3
0500  04037 002404       CLA,INA
0501  04040 006404       CLE,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 117000       JSB ERR2.I        ERROR
0506  04045 004042       LEF *-3
0507  04046 061266       LDA ATEMP
0508  04047 034000  GD4  ISZ 0             INCR. LOOP COUNT
0509  04050 026041       JMP LP4
0510  04051 000000       AOF               MODULE LOOP
0511  04052 002506  TAND2 CLA,CLF
0512  04053 006404       CLE,INB
0513  04054 061313  LP5  LDA PBT1
0514  04055 011314       ANA PBT2          ITER. AND TEST
0515  04056 002002       SZA
0516  04057 026002       JMP *+2           ERROR
0517  04060 026064       JMP GD5           GOOD
0518  04061 117000       JSB ERR2.I        ERROR
0519  04062 004055       REF *-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       CLE,INB
0525  04070 061313  LP6  LDA PBT1
0526  04071 011313       ANA PBT1          ITER. AND TEST
0527  04072 051313       CPA PBT1
0528  04073 026077       JMP GD6           GOOD
0529  04074 117000       JSB ERR2.I        ERROR
0530  04075 004071       REF *-4
0531  04076 065267       LDB BTEMP
0532  04077 034001  GD6  ISZ 1             INCR. LOOP COUNT
0533  04100 026070       JMP LP6
0534  04101 002500       CLA,CLF
0535  04102 006404       CLE,INB
0536  04103 061314  LP7  LDA PBT2
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0537  04104 011314       ANA PBT2          ITER. AND TEST
0538  04105 051314       CPA PBT2
0539  04106 026112       JMP GD7           GOOD
0540  04107 117000       JSB ERR2.I        ERROR
0541  04110 004104       LEF *-4
0542  04111 065267       LDB BTEMP
0543  04112 034001  GD7  ISZ 1             INCR. LOOP COUNT
0544  04113 026103       JMP LP7
0545  04114 000000       AOF               MODULE LOOP
0546  04115 002500  TXCR2 CLA,CLF
0547  04116 006404       CLE,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 117000       JSB ERR2.I        ERROR
0554  04125 004122       LEF *-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       CLE,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 117000       JSB ERR2.I        ERROR
0566  04141 004134       REF *-5
0567  04142 065267       LDB BTEMP
0568  04143 034001  GD9  ISZ 1             INCR. LOOP COUNT
0569  04144 026133       JMP LP9
0570  04145 002500       CLA,CLF
0571  04146 006404       CLE,INB
0572  04147 061314  LP10 LDA PBT2          ITER. XOR TEST
0573  04150 021314       XOR PBT2
0574  04151 002002       SZA
0575  04152 026154       JMP *+2           ERROR
0576  04153 026157       JMP GD10          GOOD
0577  04154 117000       JSB ERR2.I        ERROR
0578  04155 004150       LEF *-5
0579  04156 065267       LDB BTEMP
0580  04157 034001  GD10 ISZ 1             INCR. LOOP COUNT
0581  04160 026147       JMP LP10
0582  04161 000000       AOF               MODULE LOOP
0583  04162 002500  TICR2 CLA,CLE
0584  04163 006404       CLE,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 117000       JSB ERR2.I        ERROR
0591  04172 004165       REF *-5
0592  04173 065267       LDB BTEMP
0593  04174 034001  GD11 ISZ 1             INCR. LOOP COUNT
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0594  04175  026164        IMF LP11
0595  04176  002500        CLA,CLE
0596  04177  006404        CLE,INB
0597  04200  061314   LP12 LDA PBT2
0598  04201  031313        IOR PBT1      ITER. IOR TEST
0599  04202  003202        CMA,SZA
0600  04203  026205        JMF *+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        CLE,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        CLE,INB
0620  04227  061314   LP14 LDA PBT2
0621  04230  031314        IOR PBT2      ITER. IOR TEST
0622  04231  051314        CPA PBT2
0623  04232  026236        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        JMF LP14
0629  04240  000000        NOP           MODULE LOOP
0630  04241  002500   TLEA2 CLA,CLE
0631  04242  006404        CLE,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        CLE,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


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0651  04266  002404   TLEB2 CLA,INA
0652  04267  006500        CLB,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        CLB,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        CLE,INB
0674  04315  061313   LP19 LDA PBT1
0675  04316  071317        STA SPATA     ITER. STA TEST
0676  04317  051317        CPA SPATA
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        CLE,INB
0685  04330  061314   LP20 LDA PBT2
0686  04331  071317        STA SPATA     ITER. STA TEST
0687  04332  051317        CPA SPATA
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        CLB,CLE
0697  04344  065313   LP21 LDB PBT1
0698  04345  075317        STB SPATA     ITER. STB TEST
0699  04346  055317        CPB SPATA
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 SPATA     ITER. STB TEST
0710  04361  055317        CPB SPATA
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  002420   TADA2 CLA
0719  04372  006404        CLE,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  003202        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  002420        CLA
0733  04410  006404        CLE,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  003202        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  002420        CLA
0747  04426  006404        CLE,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        JMF *+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  002420        CLA
0762  04445  006404        CLE,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        JMF *+3       ERROR
0769  04454  002040        SEZ
0770  04455  026461        JMF 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        CLE,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        JMF *+2       GOOD
0783  04472  026475        JMF *+3       ERROR
0784  04473  002041        SEZ,RSS
0785  04474  026500        JMF 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        JMF 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        JMF *+3       ERROR
0799  04512  002040        SEZ
0800  04513  026517        JMF GD28      GOOD
0801  04514  117000        JSB EPR2.I    ERROR
0802  04515  004506        DEF *-7
0803  04516  065267        LDB ETEMP
0804  04517  034001   GD28 ISZ 1         INCR. LOOP COUNT
0805  04520  026504        JMF LP28
0806  04521  000000        NOP           MODULE LOOP
0807  04522  002404   TAEB2 CLA,INA
0808  04523  006400        CLB
0809  04524  000040        CLE
0810  04525  065313   LP29 LDB PBT1
0811  04526  065314        LDB PBT2      ITER. ADB TEST-B=177777,E=0
0812  04527  006402        CLB,SZB
0813  04530  026533        JMF *+3       ERROR
0814  04531  002341        SEZ,RSS
0815  04532  026536        JMF GD29      GOOD
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        JMF LP29
0821  04540  002404        CLA,INA
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Listing
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0822  04541 006400         CLF
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 000040  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
```

```
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 001000  RETN   DEF BASIC
0900  05000                ORG 5000H
0901  05000 001250  ERR2   DEF ERROR
0902  05001 002006  FIVEI  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  IIFS1  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 6000H
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
```

```
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  IIFS2  DEF IIPS0,I
0942                       END
** NO ERRORS*
```

SHIFT-ROTATE INSTRUCTION TEST

Tape No. HP 20402B
Listing No. HP 20402BL

HP 20402BL

```
0001                    ORG 4500B

C8  0001      ORG 4500B
```

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    005146
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
PA91     006571
PA92     006572
PA93     006573
PA94     006574
PASS1    005500
PASS2    005610
```

HP 20402BL

```
0001                    ASMB,A,B,L,T
BAD      006547
END      006148
FA       006472
FB       006453
JSA      006563
JSB      006564
PAT      006552
AMASK    006567
AMODI    006462
AMSK1    006606
ASPEC    006607
BACK     006422
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     006581
INIT     006345
INSAR    006557
LPAT     006554
MODI     006431
MINST    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
```

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
SHASK    006605
SOVFC    006562
SSHA1    006565
SSHB1    006566
START    006154
SUB1     006361
TIPBA    006510
TIPBB    006521
TADR     006550
TEMP     006560
TPAT     006553
** NO ERRORS**
```

Listing
Shift-Rotate Instruction Test

```
0001                          ASPB,A,B,L,T
0001  04500                        ORG 45000
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
```

```
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 103606            OCT 3606
0154  04730 025252            OCT 25252
0155  04731 052524            OCT 52524
0156  04732 000000  P1125     OCT 0
0157  04733 060000            OCT 60000
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
```

```
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
```

```
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
```

```
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          CCT 1262
0685  05753 001263          OCT 1263
0686  05754 001264          CCT 1264
0687  05755 001265          GCT 1265
0688  05756 001266          UCT 1266
0689  05757 001267          OCT 1267
0690  05760 001360          CCT 1360
0691  05761 001361          CCT 1361
0692  05762 001362          CCT 1362
0693  05763 001363          CCT 1363
0694  05764 001364          CCT 1364
0695  05765 001365          CCT 1365
0696  05766 001366          CCT 1366
0697  05767 001367          CCT 1367
0698  05770 001460          CCT 1460
0699  05771 001461          CCT 1461
0700  05772 001462          CCT 1462
0701  05773 001463          GCT 1463
0702  05774 001464          GCT 1464
0703  05775 001465          OCT 1465
0704  05776 001466          GCT 1466
0705  05777 001467          OCT 1467
0706  06000 001560          CCT 1560
0707  06001 001561          CCT 1561
0708  06002 001562          CCT 1562
0709  06003 001563          OCT 1563
0710  06004 001564          OCT 1564
0711  06005 001565          CCT 1565
0712  06006 001566          CCT 1566
0713  06007 001567          OCT 1567
0714  06010 001660          CCT 1660
0715  06011 001661          CCT 1661
0716  06012 001662          CCI 1662
0717  06013 001663          OCT 1663
0718  06014 001664          CCT 1664
0719  06015 001665          CCT 1665
0720  06016 001666          CCT 1666
0721  06017 001667          CCT 1667
0722  06020 001760          CCT 1760
0723  06021 001761          CCT 1761
0724  06022 001762          UCT 1762
0725  06023 001763          OCT 1763
0726  06024 001764          UCT 1764
0727  06025 001765          CCT 1765
0728  06026 001766          OCT 1766
0729  06027 001767          OCT 1767
0730  06030 000070  PASS4   OCT 70
0731  06031 000071          CCT 71
0732  06032 000072          CCT 72
0733  06033 000073          CCT 73
0734  06034 000074          CCT 74
0735  06035 000075          GCT 75
0736  06036 000076          GCT 76
0737  06037 000077          CCT 77
0738  06040 001070          CCT 1070
0739  06041 001071          CCT 1071
0740  06042 001072          CCT 1072
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0741  06043 001073          CCT 1073
0742  06044 001074          CCT 1074
0743  06045 001075          OCT 1075
0744  06046 001076          OCT 1076
0745  06047 001077          OCT 1077
0746  06050 001170          CCI 1170
0747  06051 001171          CCT 1171
0748  06052 001172          CCT 1172
0749  06053 001173          CCT 1173
0750  06054 001174          CCT 1174
0751  06055 001175          CCT 1175
0752  06056 001176          CCT 1176
0753  06057 001177          OCT 1177
0754  06060 001270          CCT 1270
0755  06061 001271          OCT 1271
0756  06062 001272          OCT 1272
0757  06063 001273          CCT 1273
0758  06064 001274          GCT 1274
0759  06065 001275          CCT 1275
0760  06066 001276          CCT 1276
0761  06067 001277          OCT 1277
0762  06070 001370          OCT 1370
0763  06071 001371          CCT 1371
0764  06072 001372          CCT 1372
0765  06073 001373          CCT 1373
0766  06074 001374          CCT 1374
0767  06075 001375          CCT 1375
0768  06076 001376          CCT 1376
0769  06077 001377          CCT 1377
0770  06100 001470          CCT 1470
0771  06101 001471          CCT 1471
0772  06102 001472          CCT 1472
0773  06103 001473          CCT 1473
0774  06104 001474          CCT 1474
0775  06105 001475          OCT 1475
0776  06106 001476          CCT 1476
0777  06107 001477          OCT 1477
0778  06110 001570          CCT 1570
0779  06111 001571          CCT 1571
0780  06112 001572          CCT 1572
0781  06113 001573          GCT 1573
0782  06114 001574          CCT 1574
0783  06115 001575          CCT 1575
0784  06116 001576          CCT 1576
0785  06117 001577          CCT 1577
0786  06120 001670          CCT 1670
0787  06121 001671          CCT 1671
0788  06122 001672          CCT 1672
0789  06123 001673          CCT 1673
0790  06124 001674          CCT 1674
0791  06125 001675          CCT 1675
0792  06126 001676          CCT 1676
0793  06127 001677          CCT 1677
0794  06130 001770          CCT 1770
0795  06131 001771          CCT 1771
0796  06132 001772          CCT 1772
0797  06133 001773          CCT 1773
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0798  06134 001774          CCT 1774
0799  06135 001775          OCT 1775
0800  06136 001776          OCT 1776
0801  06137 001777          OCT 1777
0802  06140 000000  ENE     OCT 0
0803  06200           ORG 6200H
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          CLE,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 001540          ERA           A=0
0868  06300 002041          SEZ,RSS       E=1
0869  06301 102001          HLT 01        ERA FAILED
0870  06302 000040          CLE
0871  06303 005540          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 005600          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       A=1
0896  06334 001110          ARS,SLA
0897  06335 102001          HLT 01        ARS,SLA FAILED
0898  06336 006404          CLB,INB       B=1
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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Listing
Shift-Rotate Instruction Test

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0912  06354 162557 START LDA INSAR,I
0913  06355 012606       AND 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 036510       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       AND BMASK
0965  06441 002002       SZA          A=0 FOR BMODI
0966  06442 026462       JMP AMODI
0967  06443 162557 BMODI LDA INSAR,I  IOR 004000
0968  06444 032570       IOR BMASK
```

```
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 035552       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
```

```
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   CCT 0
1036  06550 000000 TADR  CCT 0
1037  06551 004507 RPAT  DEF P0026
1038  06552 004560 PAT   DEF PAT1
1039  06553 004567 TPAT  DEF P0026
1040  06554 004506 LPAT  DEF PAT7
1041  06555 004560 CON1  DEF PAT1
1042  06556 005500 CON2  DEF PASS1
1043  06557 005500 INSAR DEF PASS1
1044  06560 000000 IEPP  CCT 0
1045  06561 177777 SUB1  CCT 177777
1046  06562 077777 SOVFC CCT 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 CCT 173777
1052  06570 004000 BMASK CCT 004000
1053  06571 005720 PAS1  DEF PASS2
1054  06572 005720 PAS2  DEF PASS3
1055  06573 006030 PAS3  DEF PASS4
1056  06574 006140 PAS4  DEF END
1057  06575 001565 ILL1  CCT 1565
1058  06576 001566 ILL2  CCT 1566
1059  06577 001575 ILL3  CCT 1575
1060  06600 001576 ILL4  CCT 1576
1061  06601 001665 ILL5  CCT 1665
1062  06602 001666 ILL6  CCT 1666
1063  06603 001675 ILL7  CCT 1675
1064  06604 001676 ILL8  CCT 1676
1065  06605 100000 SMASK CCT 100000
1066  06606 001777 AMSK1 CCT 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
```

```
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 102101       STC          SET OVERFLOW INDICATOR
1121  06675 102001       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       RSS          SHOULD NOT SKIP
1129  06705 102001       HLT 01       SOS SKIP WHEN OVERFLOW CLEARED
1130  06706 103101       CLC          CLEAR OVERFLOW INDICATOR
1131  06707 062562       LDA SOVFC    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
```

```
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       CLC           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                 5565
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
```

```
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       CLC           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       CLC           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       CLC           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       CLC           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       CLC           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
```

```
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

```
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*
```

```
0001                    ASMB,A,B,L,T
0002**************************MEMORY ADDRESS TEST**************************
0003    07600           URG 76308
0004    07600 102501 BEGN LIA 01        LOAD STARTING ADDR.OF BLOCK INTO
0005    07601 073641      STA SADR      STARTING ADDR. TO WORKING 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 OCT 0
0038    07642 000000 RADR OCT 0
0039    07643 000000 LADR OCT 0
0040                    END
**  NO ERRORS*
```

LOW MEMORY ADDRESS TEST

Tape No. HP 20403A
Listing No. 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*
```

```
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 3LOCK 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

Listing
5-73/5-74

```
0001
ADDR     007650
BEGN     007520
CNTR     007651
COMP     007552
ENDI     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*
```

            ASMB,A,B,L,T

```
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 ENDI
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  ENDI  OCT 0         END ADDRESS
0114  07653 000077  MSK1  OCT 77        MASK
```

```
0001                    ASMB,A,B,L,T
0002*
0003*  HP 2115 MEMORY CHECKERBOARD TEST  1-8-68
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        SET ENDING ADDRESS
0011  07504 102501        LIA 01
0012  07505 073652        STA ENDI
0013  07506 003004        CMA,INA       2'S COMPLEMENT OF END
0014  07507 073655        STA HOLD
0015  07510 063652        LDA ENDI      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 117563        JSB INCR      +1 THE SYSTEM
0057  07562 027536        JMP READ      GO READ THE NEXT LOCATION
```

```
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 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 034157        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 024010  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 164160        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 000003  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
```

```
                                       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 002002        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 0004 #01                          HP 20513AL

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 alphanumerically. 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	$\overline{}$	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
ID12	**	A3-X	P/O Inhibit Drive current line (0-3K), bit 12
ID12	**	A4-X	P/O Inhibit Drive current line (4-7K), bit 12
ID13	**	A3-Y	P/O Inhibit Drive current line (0-3K), bit 13
ID13	**	A4-Y	P/O Inhibit Drive current line (4-7K), bit 13
ID14	**	A3-Z	P/O Inhibit Drive current line (0-3K), bit 14
ID14	**	A4-Z	P/O Inhibit Drive current line (4-7K), bit 14
ID15	**	A3-AA	P/O Inhibit Drive current line (0-3K), bit 15
ID15	**	A4-AA	P/O Inhibit Drive current line (4-7K), bit 15
ID16	**	A3-BB	P/O Inhibit Drive current line (0-3K), bit 16
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
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
IR-15	035	A13-12	Instruction Register, bit 15 (negative-true)
IRQ 1	235	A22-6 A23-33	Interrupt Request 1
	*	A15-14	

Table 6-1. Signal Index (Cont)

SIGNAL MNEMONIC	REF. NO.	SOURCE	DEFINITION
IRQ 2	236 *	A21-6 A22-33 A15-15	Interrupt Request 2
IRQ 3	237 *	A20-6 A21-33 A15-16	Interrupt Request 3
IRQ 4	238 *	A19-6 A20-33 A15-17	Interrupt Request 4
IRQ 5	239 *	A18-6 A19-33 A15-18	Interrupt Request 5
IRQ 6	240 *	A17-6 A18-33 A15-19	Interrupt Request 6
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
$\overline{RB\ 0}$	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
$\overline{RF\ 2}$	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
$\overline{RSM\ 0\text{-}5}$	311	A11-12/19	Reset M Register bits 0-5 (negative -true)
$\overline{RSM\ 6\text{-}9}$	047	A13-32	Reset M Register bits 6-9 (negative-true)
$\overline{RSM\ 10\text{-}15}$	048	A13-35	Reset M Register bits 10-15 (negative-true)
$\overline{RSP}$	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
$\overline{ST\ 0}$	198	A6,A7-4	Set T Register bit 0 (negative-true)
$\overline{ST\ 1}$	199	A6,A7-8	Set T Register bit 1 (negative-true)
$\overline{ST\ 2}$	200	A6,A7-12	Set T Register bit 2 (negative-true)
$\overline{ST\ 3}$	201	A6,A7-16	Set T Register bit 3 (negative-true)
$\overline{ST\ 4}$	202	A6,A7-20	Set T Register bit 4 (negative-true)
$\overline{ST\ 5}$	203	A6,A7-24	Set T Register bit 5 (negative-true)
$\overline{ST\ 6}$	204	A6,A7-28	Set T Register bit 6 (negative-true)
$\overline{ST\ 7}$	205	A6,A7-32	Set T Register bit 7 (negative-true)
$\overline{ST\ 8}$	206	A6,A7-36	Set T Register bit 8 (negative-true)
$\overline{ST\ 9}$	207	A6,A7-52	Set T Register bit 9 (negative-true)
$\overline{ST\ 10}$	208	A6,A7-56	Set T Register bit 10 (negative-true)
$\overline{ST\ 11}$	209	A6,A7-60	Set T Register bit 11 (negative-true)
$\overline{ST\ 12}$	210	A6,A7-64	Set T Register bit 12 (negative-true)
$\overline{ST\ 13}$	211	A6,A7-68	Set T Register bit 13 (negative-true)
$\overline{ST\ 14}$	212	A6,A7-72	Set T Register bit 14 (negative-true)
$\overline{ST\ 15}$	213	A6,A7-76	Set T Register bit 15 (negative-true)
$\overline{ST\ 16}$	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
$\overline{TB0}$	127	A11-62 A15-49	T Bus bit 0 (negative-true)
$\overline{TB1}$	128	A11-61 A15-50	T Bus bit 1 (negative-true)
$\overline{TB2}$	129	A11-64 A15-51	T Bus bit 2 (negative-true)
$\overline{TB3}$	130	A11-63 A15-36	T Bus bit 3 (negative-true)
$\overline{TB4}$	153	A10-62 A15-52	T Bus bit 4 (negative-true)
$\overline{TB5}$	154	A10-61 A15-54	T Bus bit 5 (negative-true)
$\overline{TB12}$	317	A8-62	T Bus bit 12 (negative-true)
$\overline{TB13}$	318	A8-61	T Bus bit 13 (negative-true)
$\overline{TB14}$	319	A8-64	T Bus bit 14 (negative-true)

Table 6-1. Signal Index (Cont)

SIGNAL MNEMONIC	REF. NO.	SOURCE	DEFINITION
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
$\overline{TR0}$	123	A11-14	T Register bit 0 (negative-true)
$\overline{TR1}$	124	A11-16	T Register bit 1 (negative-true)
$\overline{TR2}$	125	A11-24	T Register bit 2 (negative-true)
$\overline{TR3}$	126	A11-26	T Register bit 3 (negative-true)
$\overline{TR4}$	149	A10-14	T Register bit 4 (negative-true)
$\overline{TR5}$	150	A10-16	T Register bit 5 (negative-true)
$\overline{TR6}$	151	A10-24	T Register bit 6 (negative-true)
$\overline{TR7}$	152	A10-26	T Register bit 7 (negative-true)
$\overline{TR8}$	173	A9-14	T Register bit 8 (negative-true)
$\overline{TR9}$	174	A9-16	T Register bit 9 (negative-true)
$\overline{TR10}$	175	A9-24	T Register bit 10 (negative-true)
$\overline{TR11}$	176	A9-26	T Register bit 11 (negative-true)
$\overline{TR12}$	192	A8-14	T Register bit 12 (negative-true)
$\overline{TR13}$	193	A8-16	T Register bit 13 (negative-true)
$\overline{TR14}$	194	A8-24	T Register bit 14 (negative-true)
$\overline{TR15}$	195	A8-26	T Register bit 15 (negative-true)
$\overline{TR16}$	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.
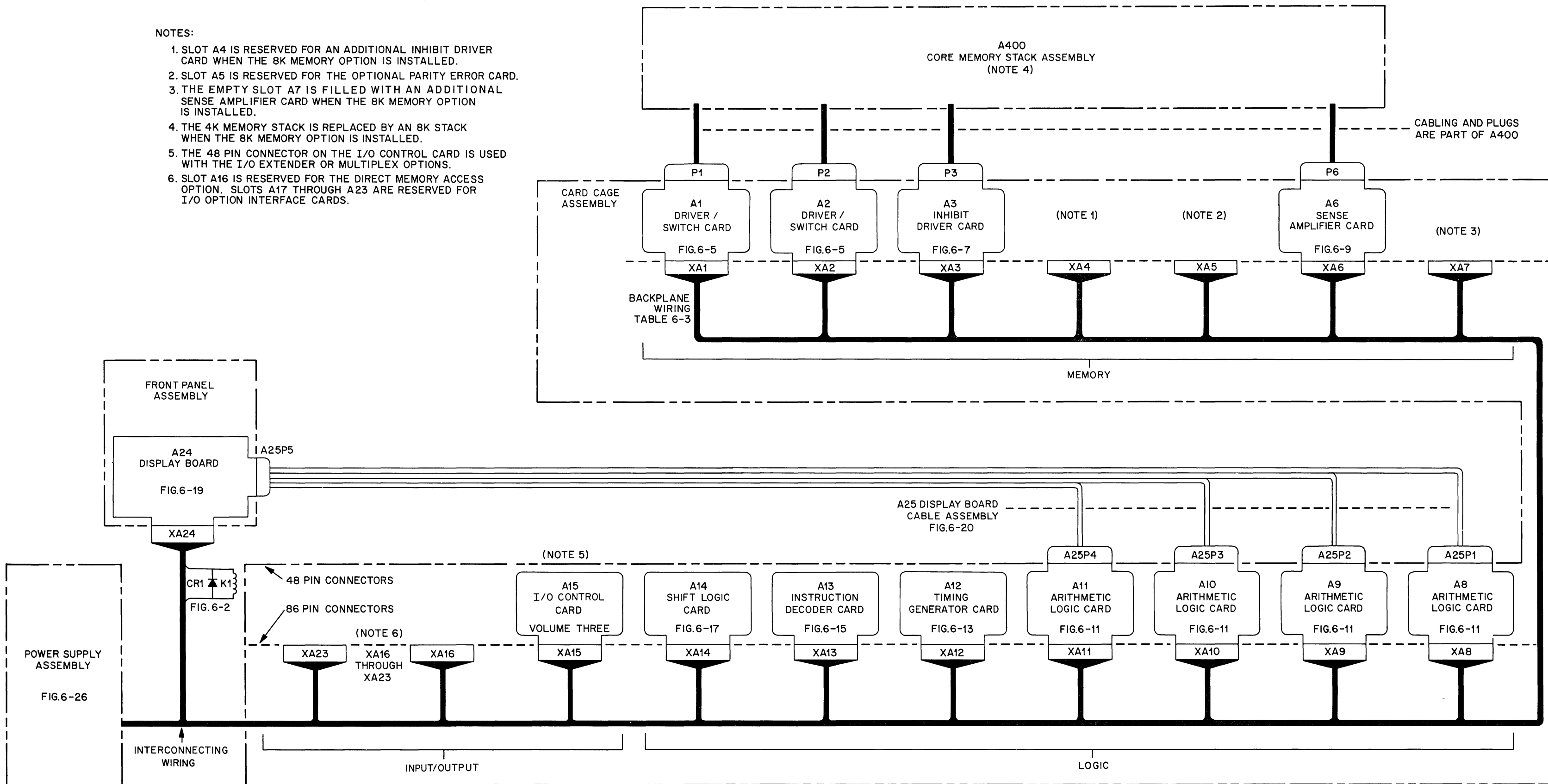
Figure 6-1. Overall Interconnection Diagram

Table 6-2. Backplane Wiring List

Column key (from multi-row header):

MEMORY — A1 Driver/Switch-Y · A2 Driver/Switch-X · A3 Inhibit Driver 0 · A4 Inhibit Driver 1 · A5 Parity Error · A6 Sense Amplifier 0 · A7 Sense Amplifier 1
LOGIC — A8 Arithmetic Logic 12-15 · A9 Arithmetic Logic 8-11 · A10 Arithmetic Logic 4-7 · A11 Arithmetic Logic 0-3 · A12 Timing Generator · A13 Instruction Decoder · A14 Shift Logic
INPUT/OUTPUT — A15 I/O Control · A16 DMA · A17 I/O-16 · A18 I/O-15 · A19 I/O-14 · A20 I/O-13 · A21 I/O-12 · A22 I/O-11 · A23 I/O-10
A24 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
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	C̄S̄R̄	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	H̄ĪN̄														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	Ī R̄15													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	Ō P̄0̄														8	53										
042	R̄B̄0̄													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	R̄S̄M̄6-9	A13									12	19				32	26									
048	R̄S̄M̄10-15									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									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
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)

REF	SIGNAL	SOURCE	A1 DRIVER/SWITCH-Y	A2 DRIVER/SWITCH-X	A3 INHIBIT DRIVER 0	A4 INHIBIT DRIVER 1	A5 PARITY ERROR	A6 SENSE AMPLIFIER 0	A7 SENSE AMPLIFIER 1	A8 ARITHMETIC LOGIC 12-15	A9 ARITHMETIC LOGIC 8-11	A10 ARITHMETIC LOGIC 4-7	A11 ARITHMETIC LOGIC 0-3	A12 TIMING GENERATOR	A13 INSTRUCTION DECODER	A14 SHIFT LOGIC	A15 I/O CONTROL	A16 DMA	A17 I/O-16	A18 I/O-15	A19 I/O-14	A20 I/O-13	A21 I/O-12	A22 I/O-11	A23 I/O-10	A24 FRONT PANEL
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	$\overline{\text{TR0}}$				6	6							14												'	
124	$\overline{\text{TR1}}$				4	4							16			10										
125	$\overline{\text{TR2}}$				14	14							24			44										
126	$\overline{\text{TR3}}$	A11			8	8							26			6										
127	$\overline{\text{TB0}}$	A11/A15											62			82	49									
128	$\overline{\text{TB1}}$	A11/A15											61				50									
129	$\overline{\text{TB2}}$	A11/A15											64				51									
130	$\overline{\text{TB3}}$	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	$\overline{\text{TR4}}$				22	22							14			7										
150	$\overline{\text{TR5}}$				12	12							16			9										
151	$\overline{\text{TR6}}$				28	28							24		82	43										
152	$\overline{\text{TR7}}$	A10			20	20							26		45											
153	$\overline{\text{TB4}}$	A10/A11											62				52									
154	$\overline{\text{TB5}}$	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)

REF	SIGNAL	SOURCE	MEMORY — A1 DRIVER/SWITCH Y	A2 DRIVER/SWITCH X	A3 INHIBIT DRIVER 0	A4 INHIBIT DRIVER 1	A5 PARITY ERROR	A6 SENSE AMPLIFIER 0	A7 SENSE AMPLIFIER 1	LOGIC — A8 ARITHMETIC LOGIC 12-15	A9 ARITHMETIC LOGIC 8-11	A10 ARITHMETIC LOGIC 4-7	A11 ARITHMETIC LOGIC 0-3	A12 TIMING GENERATOR	A13 INSTRUCTION DECODER	A14 SHIFT LOGIC	INPUT/OUTPUT — A15 I/O CONTROL	A16 DMA	A17 I/O 16	A18 I/O 15	A19 I/O 14	A20 I/O-13	A21 I/O 12	A22 I/O 11	A23 I/O 10	A24 FRONT PANEL
169	TR8						17				15				79	46										
170	TR9						15				36				18	29										
171	TR10						16				25				34											
172	TR11						18				30				33	33										
173	T̄R̄8̄				30	30					14				83	68										
174	T̄R̄9̄				60	60					16				70											
175	T̄R̄1̄0̄				58	58					24															
176	T̄R̄1̄1̄	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	T̄R̄1̄2̄				66	66				14																
193	T̄R̄1̄3̄				76	76				16																
194	T̄R̄1̄4̄				74	74				24																
195	T̄R̄1̄5̄				82	82				26				7	81											
196	T̄B̄1̄5̄									63						24										
197	SB15	A8								31						3										
198	S̄T̄0̄	A6/A7						4	4				13													
199	S̄T̄1̄							8	8				17													
200	S̄T̄2̄							12	12				23													
201	S̄T̄3̄							16	16				27													
202	S̄T̄4̄							20	20			13														
203	S̄T̄5̄							24	24			17														
204	S̄T̄6̄							28	28			23														
205	S̄T̄7̄							32	32			27														
206	S̄T̄8̄							36	36		13															
207	S̄T̄9̄							52	52		17															
208	S̄T̄1̄0̄							56	56		23															
209	S̄T̄1̄1̄							60	60		27															
210	S̄T̄1̄2̄							64	64	13																
211	S̄T̄1̄3̄							68	68	17																
212	S̄T̄1̄4̄							72	72	23																
213	S̄T̄1̄5̄							76	76	27																
214	S̄T̄1̄6̄	A6/A7					60	80	80																	
215	MMD2	A4		10		23																				
216	MPT	A4				50									70											
217	M̄1̄2̄	A2		14	52		42			50																
218	P̄Ē̄H̄	A5					62								27		83									
219	T̄R̄1̄6̄	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)

REF	SIGNAL	SOURCE	DRIVER/SWITCH-Y (A1)	DRIVER/SWITCH-X (A2)	INHIBIT DRIVER 0 (A3)	INHIBIT DRIVER 1 (A4)	PARITY ERROR (A5)	SENSE AMPLIFIER 0 (A6)	SENSE AMPLIFIER 1 (A7)	ARITHMETIC LOGIC 12-15 (A8)	ARITHMETIC LOGIC 8-11 (A9)	ARITHMETIC LOGIC 4-7 (A10)	ARITHMETIC LOGIC 0-3 (A11)	TIMING GENERATOR (A12)	INSTRUCTION DECODER (A13)	SHIFT LOGIC (A14)	I/O CONTROL (A15)	DMA (A16)	I/O-16 (A17)	I/O-15 (A18)	I/O-14 (A19)	I/O-13 (A20)	I/O-12 (A21)	I/O-11 (A22)	I/O-10 (A23)	FRONT PANEL (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	RSP̄	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									FRONT PANEL
REF	SIGNAL	SOURCE	A1 DRIVER/ SWITCH Y	A2 DRIVER/ SWITCH X	A3 INHIBIT DRIVER 0	A4 INHIBIT DRIVER 1	A5 PARITY ERROR	A6 SENSE AMPLIFIER 0	A7 SENSE AMPLIFIER 1	A8 ARITHMETIC LOGIC 12-15	A9 ARITHMETIC LOGIC 8-11	A10 ARITHMETIC LOGIC 4-7	A11 ARITHMETIC LOGIC 0-3	A12 TIMING GENERATOR	A13 INSTRUCTION DECODER	A14 SHIFT LOGIC	A15 I/O CONTROL	A16 DMA	A17 I/O-16	A18 I/O-15	A19 I/O-14	A20 I/O-13	A21 I/O-12	A22 I/O-11	A23 I/O-10	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	M̄0	A2		16			14																			
296	M̄1	A2		26			13																			
297	M̄2	A2		20			12																			
298	M̄3	A2		70			11																			
299	M̄4	A2		72			79																			
300	M̄5	A2		66			80																			
301	M̄6	A1	16				77																			
302	M̄7	A1	26				78																			
303	M̄8	A1	20				71																			
304	M̄9	A1	70				72																			
305	M̄10	A1	72				67																			
306	M̄11	A1	66				68																			
307	P̄INT	A5	74/76				50										70									
308	EPH	Not Used																								
309	ĪĪR	Not Used																								
310	X̄PH4	A12												13				77								
311	R̄SM0-5	A11										12/40	12/19													
312	H̄IS	A16															79	82								
313	P̄H5	A16	32	32										58			76	83								
314	IOS	A14														61										
315	ISG	A12												50				73								
316	EXT	External												65												
317	T̄B12	A8								62																
318	T̄B13	A8								61																
319	T̄B14	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)

REF	SIGNAL	SOURCE	MEMORY · A1 DRIVER/SWITCH-Y	A2 DRIVER/SWITCH X	A3 INHIBIT DRIVER 0	A4 INHIBIT DRIVER 1	A5 PARITY ERROR	A6 SENSE AMPLIFIER 0	A7 SENSE AMPLIFIER 1	LOGIC · A8 ARITHMETIC LOGIC 12-15	A9 ARITHMETIC LOGIC 8-11	A10 ARITHMETIC LOGIC 4-7	A11 ARITHMETIC LOGIC 0-3	A12 TIMING GENERATOR	A13 INSTRUCTION DECODER	A14 SHIFT LOGIC	INPUT/OUTPUT · A15 I/O CONTROL	A16 DMA	A17 I/O-16	A18 I/O-15	A19 I/O-14	A20 I/O-13	A21 I/O-12	A22 I/O-11	A23 I/O-10	A24 FRONT PANEL
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	XRTS	↓			36													84								
526	EDT	A16																62	◄						►	62
527	XDSCY	GND	62	85																						
529	IOGIO	A13													12		15	◄							►	15
530	XMMD0	A4			62		15																			

A25
DISPLAY
BOARD CABLE
ASSEMBLY

CARD
CAGE
ASSEMBLY

A1	Driver/Switch
A2	Driver/Switch
A3	Inhibit Driver
* A4	Inhibit Driver
* A5	Parity Error
A6	Sense Amplifier
* A7	Sense Amplifier
A8	Arithmetic Logic
A9	Arithmetic Logic
A10	Arithmetic Logic
A11	Arithmetic Logic
A12	Timing Generator
A13	Instruction Decoder
A14	Shift Logic
A15	I/O Control (NOTE 2)
* A16	DMA Card
* A17	Interface Card 16 (/17)
* A18	Interface Card 15 (/16)
* A19	Interface Card 14 (/15)
* A20	Interface Card 13 (/14)
* A21	Interface Card 12 (/13)
* A22	Interface Card 11 (/12)
* A23	Interface Card 10 (/11)

A400
4K CORE
MEMORY
STACK
ASSEMBLY
*(8K STACK OPTIONAL)

A300
CAPACITOR
BOARD
(P/O POWER
SUPPLY)

FRONT
PANEL
ASSEMBLY

REAR
PANEL
ASSEMBLY
(P/O POWER
SUPPLY)

POWER
SUPPLY
ASSEMBLY

A301
HEAT
SINK
ASSEMBLY
(P/O POWER
SUPPLY)

PRIMARY
REGULATOR
ADJUSTMENT

2039-2

A24
DISPLAY
BOARD
(P/O OF
FRONT PANEL)

20V
MEMORY
SUPPLY
ADJUSTMENT

POWER
FAIL
THRESHOLD
ADJUSTMENT

A302
REGULATOR
CARD
(P/O POWER
SUPPLY)

NOTES:
1. ASTERISK (*) DENOTES
   OPTIONAL ITEM
2. REFER TO VOLUME THREE

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

Table 6-1. Logic Equations

AAF   = $\overline{\text{AAFF}}$

AAF FLIP FLOP

DATA   = $\overline{\text{MOR}*\text{MR0}}$

CLOCK = P123*T0*TS

A REGISTER

AR0 FF

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

CLOCK = STBA

AR1 FF

DATA   = $\overline{\text{TB1}}$

CLOCK = STBA

AR2 FF

DATA   = $\overline{\text{TB2}}$

CLOCK = STBA

AR3 FF

DATA   = $\overline{\text{TB3}}$

CLOCK = STBA

AR4 FF

DATA   = $\overline{\text{TB4}}$

CLOCK = STBA

AR5 FF

DATA   = $\overline{\text{TB5}}$

CLOCK = STBA

AR6 FF

DATA   = $\overline{\text{TB6}}$

CLOCK = STBA

AR7 FF

DATA   = $\overline{\text{TB7}}$

CLOCK = STBA

AR8 FF

DATA   = $\overline{\text{TB8}}$

CLOCK = STBA

AR9 FF

DATA   = $\overline{\text{TB9}}$

CLOCK = STBA

AR10 FF

DATA   = $\overline{\text{TB10}}$

CLOCK = STBA

```
AR11  FF
DATA          = $\overline{TB11}$
CLOCK         = STBA
AR12  FF
DATA          = $\overline{TB12}$
CLOCK         = STBA
AR13  FF
DATA          = $\overline{TB13}$
CLOCK         = STBA
AR14  FF
DATA          = $\overline{TB14}$
CLOCK         = STBA
AR15  FF
DATA          = $\overline{TB15}$
CLOCK         = STBA

ADD           = EIR*IR14*$\overline{IR13}$*$\overline{IR12}$
ADF           =  ADD*PH3*T34
ADF           = ASG*T45
ADF           = ISZ*PH3*T34
ADF           = JSB*PH3*T12
ADF           = P123*T67
ADF           = PH4*T34

ANA           = $\overline{IR14}$*$\overline{IR13}$*IR12*$\overline{IR11}$
ANF           = ANA*PH3*T34
ASG           = OPO*$\overline{IR15}$*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          = TB4
CLOCK         = STBB
BR5 FF
DATA          = TB5
CLOCK         = STBB
BR6 FF
DATA          = TB6
CLOCK         = STBB
BR7 FF
DATA          = TB7
CLOCK         = STBB

BR8 FF
DATA          = TB8
CLOCK         = STBB

BR9 FF
DATA          = TB9
CLOCK         = STBB

BR10 FF
DATA          = TB10
CLOCK         = STBB

BR11 FF
DATA          = TB11
CLOCK         = STBB

BR12 FF
DATA          = TB12
CLOCK         = STBB

BR13 FF
DATA          = TB13
CLOCK         = STBB

BR14 FF
DATA          = TB14
CLOCK         = STBB

BR15 FF
DATA          = TB15
CLOCK         = STBB
```

```
BAF           = B̶A̶F̶F̶
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*T̶R̶0̶*E̶
DATA          = ASG*T4*TR4*TR3*TR0*RB15*RB0
DATA          = ASG*T4*TR4*T̶R̶0̶*R̶B̶1̶5̶
DATA          = ASG*T4*TR3*T̶R̶0̶*R̶B̶0̶
DATA          = ASG*T4*TR4*T̶R̶3̶*TR0*RB15
DATA          = ASG*T4*T̶R̶4̶*TR3*TR0*RB0
DATA          = ASG*SOR*T5*TR1*TR0
DATA          = ASG*S̶O̶R̶*T5*TR1*T̶R̶0̶
DATA          = ASG*T5*T̶R̶5̶*T̶R̶4̶*T̶R̶3̶*T̶R̶1̶*TR0
DATA          = CPA*SOR*PH3*T4
DATA          = IOS*SFS*T4*OVF
DATA          = IOS*SFC*T4*O̶V̶F̶
DATA          = ISZ*PH3*T4*C16
DATA          = SKF*T4
DATA          = SRG*T4*TR3*R̶B̶0̶
CLOCK         = TS
DIRECT CLR = T0
DIRECT SET = C̶O̶F̶
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
```

$$C14 = RB13*SB13+RB13*C13+SB13*C13$$
$$C15 = RB14*SB14+RB14*C14+SB14*C14$$
$$C16 = RB15*SB15+RB15*C15+SB15*C15$$

$$C0X = PON*(MWT*\overline{M12}+MRT*M12)*\overline{MR11}*\overline{MR10}*\overline{MR9}$$
$$C1X = PON*(MWT*\overline{M12}+MRT*M12)*\overline{MR11}*\overline{MR10}*MR9$$
$$C2X = PON*(MWT*\overline{M12}+MRT*M12)*\overline{MR11}*MR10*\overline{MR9}$$
$$C3X = PON*(MWT*\overline{M12}+MRT*M12)*\overline{MR11}*MR10*MR9$$
$$C4X = PON*(MWT*\overline{M12}+MRT*M12)*MR11*\overline{MR10}*\overline{MR9}$$
$$C5X = PON*(MWT*\overline{M12}+MRT*M12)*MR11*\overline{MR10}*MR9$$
$$C6X = PON*(MWT*\overline{M12}+MRT*M12)*MR11*MR10*\overline{MR9}$$
$$C7X = PON*(MWT*\overline{M12}+MRT*M12)*MR11*MR10*MR9$$
$$C0Y = PON*(MIT*\overline{M12}+MRT0*M12)*\overline{MR5}*\overline{MR4}*\overline{MR3}$$
$$C1Y = PON*(MIT*\overline{M12}+MRT0*M12)*\overline{MR5}*\overline{MR4}*MR3$$
$$C2Y = PON*(MIT*\overline{M12}+MRT0*M12)*\overline{MR5}*MR4*\overline{MR3}$$
$$C3Y = PON*(MIT*\overline{M12}+MRT0*M12)*\overline{MR5}*MR4*MR3$$
$$C4Y = PON*(MIT*\overline{M12}+MRT0*M12)*MR5*\overline{MR4}*\overline{MR3}$$

$$C5Y = PON*(MIT*\overline{M12}+MRT0*M12)*MR5*\overline{MR4}*MR3$$
$$C6Y = PON*(MIT*\overline{M12}+MRT0*M12)*MR5*MR4*\overline{MR3}$$
$$C7Y = PON*(MIT*\overline{M12}+MRT0*M12)*MR5*MR4*MR3$$
$$CA0-X = PON*MRT0*(\overline{M12}+M12)*\overline{MR2}*\overline{MR1}*\overline{MR0}$$
$$CA1-X = PON*MRT0*(\overline{M12}+M12)*\overline{MR2}*\overline{MR1}*MR0$$
$$CA2-X = PON*MRT0*(\overline{M12}+M12)*\overline{MR2}*MR1*\overline{MR0}$$
$$CA3-X = PON*MRT0*(\overline{M12}+M12)*\overline{MR2}*MR1*MR0$$
$$CA4-X = PON*MRT0*(\overline{M12}+M12)*MR2*\overline{MR1}*\overline{MR0}$$
$$CA5-X = PON*MRT0*(\overline{M12}+M12)*MR2*\overline{MR1}*MR0$$
$$CA6-X = PON*MRT0*(\overline{M12}+M12)*MR2*MR1*\overline{MR0}$$
$$CA7-X = PON*MRT0*(\overline{M12}+M12)*MR2*MR1*MR0$$
$$CA0-Y = PON*MRT0*(\overline{M12}+M12)*\overline{MR6}*\overline{MR5}*\overline{MR4}$$
$$CA1-Y = PON*MRT0*(\overline{M12}+M12)*\overline{MR6}*\overline{MR5}*MR4$$
$$CA2-Y = PON*MRT0*(\overline{M12}+M12)*\overline{MR6}*MR5*\overline{MR4}$$
$$CA3-Y = PON*MRT0*(\overline{M12}+M12)*\overline{MR6}*MR5*MR4$$
$$CA4-Y = PON*MRT0*(\overline{M12}+M12)*MR6*\overline{MR5}*\overline{MR4}$$
$$CA5-Y = PON*MRT0*(\overline{M12}+M12)*MR6*\overline{MR5}*MR4$$
$$CA6-Y = PON*MRT0*(\overline{M12}+M12)*MR6*MR5*\overline{MR4}$$
$$CA7-Y = PON*MRT0*(\overline{M12}+M12)*MR6*MR5*MR4$$
$$CC0-X = (MIT*M12+MRT*\overline{M12})*\overline{MR2}*\overline{MR1}*\overline{MR0}$$
$$CC1-X = (MIT*M12+MRT*\overline{M12})*\overline{MR2}*\overline{MR1}*MR0$$
$$CC2-X = (MIT*M12+MRT*\overline{M12})*\overline{MR2}*MR1*\overline{MR0}$$

```
CC3-X      = (MIT*M12+MRT*M̅1̅2̅)*M̅R̅2̅*MR1*MR0
CC4-X      = (MIT*M12+MRT*M̅1̅2̅)*MR2*M̅R̅1̅*M̅R̅0̅
CC5-X      = (MIT*M12+MRT*M̅1̅2̅)*MR2*M̅R̅1̅*MR0
CC6-X      = (MIT*M12+MRT*M̅1̅2̅)*MR2*MR1*M̅R̅0̅
CC7-X      = (MIT*M12+MRT*M̅1̅2̅)*MR2*MR1*MR0
CC0-Y      = (MIT*M12+MRT*M̅1̅2̅)*M̅R̅6̅*M̅R̅5̅*M̅R̅4̅
CC1-Y      = (MIT*M12+MRT*M̅1̅2̅)*M̅R̅6̅*M̅R̅5̅*MR4
CC2-Y      = (MIT*M12+MRT*M̅1̅2̅)*M̅R̅6̅*MR5*M̅R̅4̅
CC3-Y      = (MIT*M12+MRT*M̅1̅2̅)*M̅R̅6̅*MR5*MR4
CC4-Y      = (MIT*M12+MRT*M̅1̅2̅)*MR6*M̅R̅5̅*M̅R̅4̅
CC5-Y      = (MIT*M12+MRT*M̅1̅2̅)*MR6*M̅R̅5̅*MR4
CC6-Y      = (MIT*M12+MRT*M̅1̅2̅)*MR6*MR5*M̅R̅4̅
CC7-Y      = (MIT*M12+MRT*M̅1̅2̅)*MR6*MR5*MR4
CI0 FF
DATA       = I̅A̅0̅+I̅R̅Q̅7̅+I̅R̅Q̅5̅+I̅R̅Q̅3̅+I̅R̅Q̅1̅
CLOCK      = RSM6-9
CI1 FF
DATA       = I̅A̅1̅+I̅R̅Q̅7̅+I̅R̅Q̅6̅+I̅R̅Q̅3̅+I̅R̅Q̅2̅
CLOCK      = RSM6-9
CI2 FF
DATA       = I̅A̅2̅+I̅R̅Q̅7̅+I̅R̅Q̅6̅+I̅R̅Q̅5̅+I̅R̅Q̅4̅+P̅O̅W̅E̅R̅ ̅F̅A̅I̅L̅ ̅I̅R̅Q̅
CLOCK      = RSM6-9
CI3 FF
DATA       = I̅A̅3̅+F̅L̅G̅1̅
CLOCK      = RSM6-9
CI4 FF
DATA       = I̅A̅4̅+F̅L̅G̅3̅
CLOCK      = RSM6-9
CI5 FF
DATA       = I̅A̅5̅+F̅L̅G̅3̅
CLOCK      = RSM6-9

CLC        = T4*TR11*TR8*TR7*TR6
CLF        = T4*TR9
CFF FLIP FLOP

DATA       = C̅F̅F̅
CLOCK      = CP+EXT
CMF        = ASG*T3*TR9
CMF        = PH4*T12
CMF        = PH4*T5
```

```
CPA         = EIR*IR14*IR̄13*IR12
CRS         = CLC*SCM0*SCL0
C̄S̄R̄         = C̄L̄R̄*Ī̄ŌḠ*Ī̄ŌŌ*Ī̄ŌS̄

DMLF   FLIP FLOP
DATA        = DML
CLOCK       = R̄F̄2̄

E FF
J           = ADD*PH3*T4*C16
J           = ASG*T3*TR7
J           = ASG*T5*TR2*C16
J           = SRG*T3*TR8*TR7*T̄R̄6̄*RB15
J           = SRG*T3*TR8*T̄R̄7̄*TR6*RB0
J           = SRG*T5*TR2*TR1*TR0*RB0
J           = SRG*T5*TR2*TR1*T̄R̄0̄*RB15
K           = ASG*T3*TR7*T̄R̄6̄
K           = ASG*T3*T̄R̄7̄*TR6
K           = SR6*T3*TR8*TR7*T̄R̄6̄*R̄B̄1̄5̄
K           = SRG*T3*TR8*T̄R̄7̄*TR6*R̄B̄0̄
K           = SRG*T4*TR5
K           = SRG*T5*TR2*TR1*T̄R̄0̄*R̄B̄1̄5̄
K           = SRG*T5*TR2*T̄R̄1̄*TR0*R̄B̄0̄
CLOCK       = TS

EIR         = P̄H̄3̄*P̄H̄5̄
EIR         = P̄H̄5̄*C̄M̄L̄F̄*D̄M̄L̄F̄
ENF         = T2

EOF         = ASG*T3*T̄R̄9̄
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*H̄Ī̄S̄*INTERRUPT CONTROL
EXECUTE     = PH3 FF
EXTEND      = E*DELAY

FETCH       = P̄H̄Ī̄ FF
H̄Ī̄N̄         = IOG*T̄R̄8̄*T̄R̄7̄*T̄R̄6̄
```

IAK = $\overline{INTERRUPT\ CONTROL}$*PH1*T1

ID0   . = MIL*MIT*($\overline{MT2}$+MR12)*$\overline{TR0}$

ID1 = MIL*MIT*($\overline{MT2}$+MR12)*$\overline{TR1}$

ID2 = MIL*MIT*($\overline{MT2}$+MR12)*$\overline{TR2}$

ID3 = MIL*MIT*($\overline{MT2}$+MR12)*$\overline{TR3}$

ID4 = MIL*MIT*($\overline{MT2}$+MR12)*$\overline{TR4}$

ID5 = MIL*MIT*($\overline{MT2}$+MR12)*$\overline{TR5}$

ID6 = MIL*MIT*($\overline{MT2}$+MR12)*$\overline{TR6}$

ID7 = MIL*MIT*($\overline{MT2}$+MR12)*$\overline{TR7}$

ID8 = MIL*MIT*($\overline{MT2}$+MR12)*$\overline{TR8}$

ID9 = MIL*MIT*($\overline{MT2}$+MR12)*$\overline{TR9}$

ID10 = MIL*MIT*($\overline{MT2}$+MR12)*$\overline{TR10}$

ID11 = MIL*MIT*($\overline{MT2}$+MR12)*$\overline{TR11}$

ID12 = MIL*MIT*($\overline{MT2}$+MR12)*$\overline{TR12}$

ID13 = MIL*MIT*($\overline{MT2}$+MR12)*$\overline{TR13}$

ID14 = MIL*MIT*($\overline{MT2}$+MR12)*$\overline{TR14}$

ID15 = MIL*MIT*($\overline{MT2}$+MR12)*$\overline{TR15}$

ID16 = MIL*MIT*($\overline{MT2}$+MR12)*$\overline{TR16}$

INDIRECT = PH2 FF

INSTRUCTION REGISTER

IR10 FF

DATA = TR10

CLOCK = PH1*T2*TS

DIRECT CLR = $\overline{PH1*T1}$

IR11 FF

DATA = TR11

CLOCK = PH1*T2*TS

DIRECT CLR = $\overline{PH1*T1}$

IR12 FF

DATA = TR12

CLOCK = PH1*T2*TS

DIRECT CLR = $\overline{PH1*T1}$

IR13 FF

DATA = TR13

CLOCK = PH1*T2*TS

DIRECT CLR = $\overline{PH1*T1}$

IR14 FF

DATA = TR14

CLOCK = PH1*T2*TS

```
DIRECT CLR = PHI*TI
IR15 FF
DATA        = TR15
CLOCK       = PH1*T2*TS
DIRECT CLR = 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       = STM+T0*TS
DIRECT CLR = STF+CLF+CLC+STC+CRS+PH4*T3IO
IOA         = EIR*IR14*IR13*IR12*IR11
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*TR6
IOF         = IOA*PH3*T34
IOF         = IOG*T45
IOG         = OP0*IR15*IR10
IOI         = IOG*SE0*T2
IOI         = IOG*T45*TR8*TR7
IOO         = IOG*T34*TR8*TR7*TR6
IOS         = IOG*P123*TR5*TR4*TR3*TR2*TR1*TR0
ISR         = IOI*IOS
ISR         = IOI*SE0
```

```
ISZ           = EIR*IR14*IR13*IR12*IR11
JMP           = EIR*IR14*IR13*IR12*IR11
JSB           = EIR*IR14*IR13*IR12*IR11
LALF   FLIP FLOP
DATA          = LAL
CLOCK         = RF2

LDLF   FLIP FLOP
DATA          = LDL
CLOCK         = RF2*LAL*CML

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           = MR14+MR13+MR12+MR11+MR10+MR9+MR8+MR7+MR6+MR5+MR4+MR3+MR2+MR1

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

MR1 FF
DATA          = TB1
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          = TBI2
CLOCK         = STM10-15
DIRECT SET    = RSM10-15
MR13 FF
DATA          = TBI3
CLOCK         = STM10-15
DIRECT SET    = RSM10-15

MR14 FF
DATA          = TBI4
MR15 FF
DATA          = 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           = MR0 FF
MR1           = MR1 FF
MR2           = MR2 FF
MR3           = MR3 FF
MR4           = MR4 FF
MR5           = MR5 FF
MR6           = MR6 FF
MR7           = MR7 FF
```

```
MR8             = $\overline{MR8}$ FF
MR9             = $\overline{MR9}$ FF
MR10            = $\overline{MR10}$ FF
MR11            = $\overline{MR11}$ FF
                ─────────────────────────────
$\overline{MR0}$     = ($\overline{PH5}$*MR0+PH5*XMR0)
                ─────────────────────────────
$\overline{MR1}$     = ($\overline{PH5}$*MR1+PH5*XMR1)
                ─────────────────────────────
$\overline{MR2}$     = ($\overline{PH5}$*MR2+PH5*XMR2)
                ─────────────────────────────
$\overline{MR3}$     = ($\overline{PH5}$*MR3+PH5*XMR3)
                ─────────────────────────────
$\overline{MR4}$     = ($\overline{PH5}$*MR4+PH5*XMR4)
                ─────────────────────────────
$\overline{MR5}$     = ($\overline{PH5}$*MR5+PH5*XMR5)
                ─────────────────────────────
$\overline{MR6}$     = ($\overline{PH5}$*MR6+PH5*XMR6)
                ─────────────────────────────
$\overline{MR7}$     = ($\overline{PH5}$*MR7+PH5*XMR7)
                ─────────────────────────────
$\overline{MR8}$     = ($\overline{PH5}$*MR8+PH5*XMR8)
                ─────────────────────────────
$\overline{MR9}$     = ($\overline{PH5}$*MR9+PH5*XMR9)
                ─────────────────────────────
$\overline{MR10}$    = ($\overline{PH5}$*MR10+PH5*XMR10)
                ─────────────────────────────
$\overline{MR11}$    = ($\overline{PH5}$*MR11+PH5*XMR11)
$\overline{MT2}$     = 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*$\overline{TSG}$*$\overline{SE0}$*$\overline{AAF}$*$\overline{BAF}$*($\overline{STR*PH3}$)*($\overline{JSB*PH3}$)*T1
CLOCK           = TS

MST             = MS*$\overline{CFF}$*T2
$\overline{MST}$     = JSB*PH3
$\overline{MST}$     = STR*PH3
MTE             = MON*P1235*$\overline{LES}$
MTE             = MON*P1235*$\overline{CDCF}$
MTE             = MON*P1235*$\overline{MPT}$
MTE             = MON*P1235*$\overline{Y7N}$
```

```
MTE             = MON*P1235*YN7̄

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*ĪSZ̄*T4

SET             = MTE*ISZ*PH3*T6E

SET             = MTE*P̄H̄3̄*T4

CLEAR           = T6

OPO             = EIR*PH1*ĪR̄T̄4̄*ĪR̄T̄3̄*ĪR̄T̄2̄


OVERFLOW FLIP FLOP

DATA            = ADD*PH3*T4*TB15*SB15*SB15*R̄B̄T̄5̄

DATA            = ADD*PH3*T4*T̄B̄T̄5̄*SB15*RB15

DATA            = ASG*T5*TR2*TB15*SB15*RB15

DATA            = ASG*T5*TR2*TB15*S̄B̄T̄5̄*RB15

DATA            = IOG*STF*P123*T̄R̄5̄*T̄R̄4̄*T̄R̄3̄*T̄R̄2̄*T̄R̄T̄*T̄R̄0̄

CLOCK           = TS

DIRECT SET      = OVFF

DIRECT CLR      = IOG*CLF*P123*TS*T̄R̄5̄*T̄R̄4̄*T̄R̄3̄*T̄R̄2̄*T̄R̄T̄*TR0

OVF             = OVFF*DELAY

OVF             = IOG*STF*TS*SCM0*SCL1

ŌV̄F̄             = IOG*CLF*SCM0*SCL1

P̄Ē H̄           = PWF*XPF

PH1             = RF2*P̄H̄T̄ FF*P̄H̄5̄

PH2             = RF2*PH2 FF*P̄H̄5̄

PH3             = RF2*PH3 FF*P̄H̄5̄

PH4             = RF2*PH4 FF*P̄H̄5̄

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*S̄T̄ĒP̄2̄
```

K = LPMF
K = PH2*JMP*$\overline{\text{SET PH4 FF}}$*TR15
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*$\overline{\text{SET PH4 FF}}$*$\overline{\text{OPO}}$*JMP*TR15
J = PH1*$\overline{\text{SET PH4 FF}}$*$\overline{\text{OPO}}$*RSP*TR15
J = PH2*$\overline{\text{SET PH4 FF}}$*JMP*TR15
J = PH2*$\overline{\text{SET PH4 FF}}$*RSP*TR15
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*$\overline{\text{TR15}}$
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        = TB1
CLOCK       = STP0-9
PR2 FF
DATA        = TB2
CLOCK       = STP0-9
PR3 FF
DATA        = TB3
CLOCK       = STP0-9
PR4 FF
DATA        = TB4
CLOCK       = STP0-9
PR5 FF
DATA        = TB5
CLOCK       = STP0-9
PR6 FF
DATA        = TB6
CLOCK       = STP0-9
PR7 FF
DATA        = TB7
CLOCK       = STP0-9
PR8 FF
DATA        = TB8
CLOCK       = STP0-9
PR9 FF
DATA        = TB9
CLOCK       = STP0-9
PR10 FF
DATA        = TB10
CLOCK       = STP10-15
PR11 FF
DATA        = TB11
CLOCK       = STP10-15
PR12 FF
DATA        = TB12
CLOCK       = STP10-15
PR13 FF
DATA        = TB13
CLOCK       = STP10-15
PR14 FF
```

```
DATA        = $\overline{TBT4}$
CLOCK       = STP10-15
PR15 FF
DATA        = $\overline{TBT5}$
CLOCK       = STP10-15
PRH10       = PRL6*PRL5*PRL4
PRL4        = POWER FAIL CONTROL

PRSF  FLIP FLOP
DATA        = PRS
CLOCK       = $\overline{RF2}$*$\overline{CAC}$*$\overline{CMC}$
PWF         = 12 VOLTS
RARB        = AAF*$\overline{JSB}$*P123*T1
RARB        = AAF*$\overline{PH3}$*P123*T1
RARB        = ADD*PH3*T34*$\overline{IR11}$
RARB        = ASG*T3*$\overline{TR8}$
RARB        = ASG*T45*$\overline{IR11}$
RARB        = CPA*PH3*T34*$\overline{IR11}$
RARB        = EIR*PH3*T34*$\overline{IR14}$*$\overline{IR11}$
RARB        = IOG*T45*$\overline{TR6}$*$\overline{IR11}$
RARB        = OPO*T3*$\overline{IR15}$*$\overline{IR11}$*$\overline{IR10}$
RARB        = OPO*T45*$\overline{IR15}$*$\overline{IR11}$*$\overline{IR10}$
RARB        = STR*PH3*T2*$\overline{IR11}$

RBRB        = ADD*PH3*T34*IR11
RBRB        = ASG*T3*$\overline{TR8}$*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*$\overline{IR15}$*IR11*$\overline{IR10}$
RBRB        = OPO*T45*$\overline{IR15}$*IR11*$\overline{IR10}$
RBRB        = EIR*PH3*T34*$\overline{IR14}$*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*$\overline{BR2}$
```

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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*$\overline{IR10}$

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 = $\overline{SIN}$*$\overline{SCO}$*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 = $\overline{RNC}$*$\overline{RSP}$*$\overline{CDCF}$*LMLF

SCO = $\overline{RNC}$*$\overline{RSP}$*$\overline{CDCF}$*DMLF

SCO = $\overline{RNC}$*$\overline{RSP}$*$\overline{CDCF}$*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        = SR10
CLOCK       = SWR10
DIRECT SET = SSR*RB10
DIRECT CLR = CSR

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

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

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

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

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

```
SRD 5      =  SR5
SRD 6      =  SR6
SRD 7      =  SR7
SRD 8      =  SR8
SRD 9      =  SR9
SRD 10     =  SR10
SRD 11     =  SR11
SRD 12     =  SR12
SRD 13     =  SR13
SRD 14     =  SR14
SRD 15     =  SR15
SRG        =  OPO*TR15*TR10
SRM        =  SRG*T3*TR7*TR6
SRM        =  SRG*T5*TR1*TR0
SRM        =  SRG*T5*TR2*TR0
SSPM       =  LDLF*STEP1*STEP2*T2

SSPM       =  LDMF*T2
SSR        =  IOO*IOS

ST0        =  (MST*(M12+M12)*S0)

ST1        =  (MST*(M12+M12)*S1)

ST2        =  (MST*(M12+M12)*S2)

ST3        =  (MST*(M12+M12)*S3)

ST4        =  (MST*(M12+M12)*S4)

ST5        =  (MST*(M12+M12)*S5)

ST6        =  (MST*(M12+M12)*S6)

ST7        =  (MST*(M12+M12)*S7)

ST8        =  (MST*(M12+M12)*S8)

ST9        =  (MST*(M12+M12)*S9)

ST10       =  (MST*(M12+M12)*S10)

ST11       =  (MST*(M12+M12)*S11)

ST12       =  (MST*(M12+M12)*S12)

ST13       =  (MST*(M12+M12)*S13)
```

$\overline{STI4}$ = (MST*($\overline{M12}$+M12)*S14)

$\overline{STI5}$ = (MST*($\overline{M12}$+M12)*S15)

$\overline{STI6}$ = (MST*($\overline{M12}$+M12)*S16)

STBA = AAF*$\overline{CPA}$*EIR*PH3*T5*TS*IR12

STBA = ADD*PH3*T4*TS*$\overline{IR11}$

STBA = ASG*T3*TS*TR11

STBA = ASG*T5*TS*TR2*$\overline{IR11}$

STBA = EIR*PH3*T4*TS*$\overline{IR14}$*$\overline{IR11}$

STBA = IOG*T5*TS*TR8*$\overline{TR7}$*$\overline{IR11}$

STBA = LOD*PH3*T4*TS*$\overline{IR11}$

STBA = SRG*T3*TS*$\overline{IR11}$*TR9

STBA = SRG*T5*TS*TR4*$\overline{IR11}$

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*$\overline{IR11}$*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*$\overline{TR10}$
STP0-9   = JMP*PH1*T7S*$\overline{TR15}$
STP0-9   = JMP*PH2*T7S*$\overline{TR15}$
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*$\overline{TR10}$
STP10-15   = JMP*PH1*T7S*$\overline{TR15}$
STP10-15   = JMP*PH2*T7S*$\overline{TR15}$
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
TB0̅         = SRG*E*T3*TR8*TR7*TR6̅
TB0̅         = (SCM0*SCL4*IOI+RSM6-9)*C̅T0̅
TB1̅         = (SCM0*SCL4*IOI+RSM6-9)*C̅T1̅
TB2̅         = (SCM0*SCL4*IOI+RSM6-9)*C̅T2̅
TB3̅         = (SCM0*SCL4*IOI+RSM6-9)*C̅T3̅
TB4̅         = (SCM0*SCL4*IOI+RSM6-9)*C̅T4̅
TB5̅.        = (SCM0*SCL4*IOI+RSM6-9)*C̅T5̅
TB1̅5̅        = SRG*E*T3*TR8*TR7̅*TR6
```

T0 FLIP FLOP

```
DATA        = T0̅*T1̅*T2̅*T3̅*T4̅*T5̅*T6̅ EXTEND*T7̅ EXTEND*T6̅
CLOCK       = C̅F̅F̅
```

T1 FLIP FLOP

```
DATA        = T0
CLOCK       = C̅F̅F̅
```

T2 FLIP FLOP

```
DATA        = T1
CLOCK       = C̅F̅F̅
```

T3 FLIP FLOP

```
DATA        = T2
CLOCK       = C̅F̅F̅
```

T4 FLIP FLOP

```
DATA        = T3
CLOCK       = C̅F̅F̅
```

T5 FLIP FLOP

```
DATA        = T4
CLOCK       = C̅F̅F̅
```

T6 EXTEND FLIP FLOP

```
DATA        = T5
CLOCK       = C̅F̅F̅
DIRECT SET  = T̅S̅Z̅*T5+P̅H̅3̅*T5
DIRECT CLR  = T̅S̅Z̅*T̅5̅+P̅H̅3̅*T̅5̅
```

T7 EXTEND FF

DATA $= \text{PH1} + \text{T6 EXTEND}$

CLOCK $= \overline{\text{CFF}}$

DIRECT SET $= \overline{\text{ISZ}}*\text{T5} + \overline{\text{PH3}}*\text{T5}$

DIRECT CLR $= \overline{\text{ISZ}*\text{T5}} + \overline{\text{PH3}*\text{T5}}$

T6 FLIP FLOP

DATA $= \text{T7 EXTEND}$

CLOCK $= \overline{\text{CFF}}$

T7 FLIP FLOP

DATA $= \text{T6}$

CLOCK $= \overline{\text{CFF}}$

T12 $= \text{T1} + \text{T2}$

T34 $= \text{T3} + \text{T4}$

T45 $= \text{T4} + \text{T5}$

T67 $= \text{T6} + \text{T7}$

T7S $= \text{T7}*\text{TS}$

TS $= \text{CFF}*\text{DELAY}$

T310 $= \text{T3}$

TAN 1 $= \overline{\text{TB0}}*\overline{\text{TB1}}*\overline{\text{TB2}}*\overline{\text{TB3}}$

TAN 2 $= \overline{\text{TB7}}*\overline{\text{TB6}}*\overline{\text{TB5}}*\overline{\text{TB4}}$

TAN 3 $= \overline{\text{TB11}}*\overline{\text{TB10}}*\overline{\text{TB9}}*\overline{\text{TB8}}$

TAN 4 $= \overline{\text{TB15}}*\overline{\text{TB14}}*\overline{\text{TB13}}*\overline{\text{TB12}}$

TB0 $= \text{ADF}*\text{RB0}*\text{SB0}*\text{C0}$

TB0 $= \text{ADF}*\text{RB0}*\overline{\text{SB0}}*\overline{\text{C0}}$

TB0 $= \text{ADF}*\overline{\text{RB0}}*\text{SB0}*\overline{\text{C0}}$

TB0 $= \text{ADF}*\overline{\text{RB0}}*\overline{\text{SB0}}*\text{C0}$

TB0 $= \text{ANF}*\text{RB0}*\text{SB0}$

TB0 $= \text{CMF}*\overline{\text{RB0}}$

TB0 $= \text{EOF}*\text{RB0}*\overline{\text{SB0}}$

TB0 $= \text{EOF}*\overline{\text{RB0}}*\text{SB0}$

TB0 $= \text{IOF}*\text{RB0}$

TB0 $= \text{IOF}*\text{SB0}$

TB0 $= \text{IOI}*\text{IOB0}$

TB0 $= \text{RLF}*\text{RB12}$

TB0 $= \text{SAL}*\text{LA0}$

TB0 $= \text{SL0}*\text{RB15}$

TB0 $= \text{SRG}*\text{T5}*\text{TR2}*\text{TR1}*\overline{\text{TR0}}$

TB0 $= \text{SRM}*\text{RB1}$

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*S̅B̅4̅*C̅4̅
TB4        = ADF*R̅B̅4̅*SB4*C̅4̅
TB4        = ADF*R̅B̅4̅*S̅B̅4̅*C4
TB4        = ANF*RB4*SB4
TB4        = CMF*R̅B̅4̅
TB4        = EOF*RB4*S̅B̅4̅
TB4        = EOF*R̅B̅4̅*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*S̅B̅5̅*C̅5̅
TB5        = ADF*R̅B̅5̅*SB5*C̅5̅
TB5        = ADF*R̅B̅5̅*S̅B̅5̅*C5
TB5        = ANF*RB5*SB5
TB5        = CMF*R̅B̅5̅
TB5        = EOF*RB5*S̅B̅5̅
TB5        = EOF*R̅B̅5̅*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*S̅B̅6̅*C̅6̅
```

$$TB6 = ADF * \overline{RB6} * SB6 * \overline{C6}$$
$$TB6 = ADF * \overline{RB6} * \overline{SB6} * C6$$
$$TB6 = ANF * RB6 * SB6$$
$$TB6 = CMF * \overline{RB6}$$
$$TB6 = EOF * RB6 * \overline{SB6}$$
$$TB6 = EOF * \overline{RB6} * SB6$$
$$TB6 = IOF * RB6$$
$$TB6 = IOF * SB6$$
$$TB6 = IOI * IOB$$
$$TB6 = RL4 * RB2$$
$$TB6 = SAL * LA6$$
$$TB6 = SLM * RB5$$
$$TB6 = SRM * RB7$$

$$TB7 = ADF * RB7 * SB7 * C7$$
$$TB7 = ADF * RB7 * \overline{SB7} * \overline{C7}$$
$$TB7 = ADF * \overline{RB7} * SB7 * \overline{C7}$$
$$TB7 = ADF * \overline{RB7} * \overline{SB7} * C7$$
$$TB7 = ANF * RB7 * SB7$$
$$TB7 = CMF * \overline{RB7}$$
$$TB7 = EOF * RB7 * \overline{SB7}$$
$$TB7 = EOF * \overline{RB7} * SB7$$
$$TB7 = IOF * RB7$$
$$TB7 = IOF * SB7$$
$$TB7 = IOI * IOB7$$
$$TB7 = RL4 * RB3$$
$$TB7 = SAL * LA7$$
$$TB7 = SLM * RB6$$
$$TB7 = SRM * RB8$$

$$TB8 = ADF * RB8 * SB8 * C8$$
$$TB8 = ADF * RB8 * \overline{SB8} * \overline{C8}$$
$$TB8 = ADF * \overline{RB8} * SB8 * \overline{C8}$$
$$TB8 = ADF * \overline{RB8} * \overline{SB8} * C8$$
$$TB8 = ANF * RB8 * SB8$$
$$TB8 = CMF * \overline{RB8}$$
$$TB8 = EOF * RB8 * \overline{SB8}$$
$$TB8 = EOF * \overline{RB8} * SB8$$
$$TB8 = IOF * RB8$$
$$TB8 = IOF * SB8$$
$$TB8 = IOI * IOB8$$

```
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*RB̅1̅1̅
TB11    = EOF*RB11*S̅B̅1̅1̅
TB11    = EOF*R̅B̅1̅1̅*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*S̅B̅1̅2̅*C̅1̅2̅
TB12    = ADF*R̅B̅1̅2̅*SB12*C̅1̅2̅
TB12    = ADF*R̅B̅1̅2̅*S̅B̅1̅2̅*C12
TB12    = ANF*RB12*SB12
TB12    = CMF*R̅B̅1̅2̅
TB12    = EOF*RB12*S̅B̅1̅2̅
TB12    = EOF*R̅B̅1̅2̅*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*S̅B̅1̅3̅*C̅1̅3̅
TB13    = ADF*R̅B̅1̅3̅*SB13*C̅1̅3̅
TB13    = ADF*R̅B̅1̅3̅*S̅B̅1̅3̅*C13
TB13    = ANF*RB13*SB13
TB13    = CMF*R̅B̅1̅3̅
TB13    = EOF*RB13*S̅B̅1̅3̅
TB13    = EOF*R̅B̅1̅3̅*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   = $\overline{TB1}$
DIRECT CLR = $\overline{ST1}$
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   = $\overline{TB10}$
DIRECT CLR = $\overline{ST10}$
TR11 FF
DATA   = $\overline{TB11}$
DIRECT CLR = $\overline{ST11}$

TR12 FF
DATA   = $\overline{TB12}$
DIRECT CLR = $\overline{ST12}$
TR13 FF

DATA = $\overline{TBT3}$
DIRECT CLR = $\overline{STT3}$
TR14 FF
DATA = $\overline{TBT4}$
DIRECT CLR = $\overline{STT4}$

TR15 FF
DATA = $\overline{TBT5}$
DIRECT CLR = $\overline{STT5}$
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
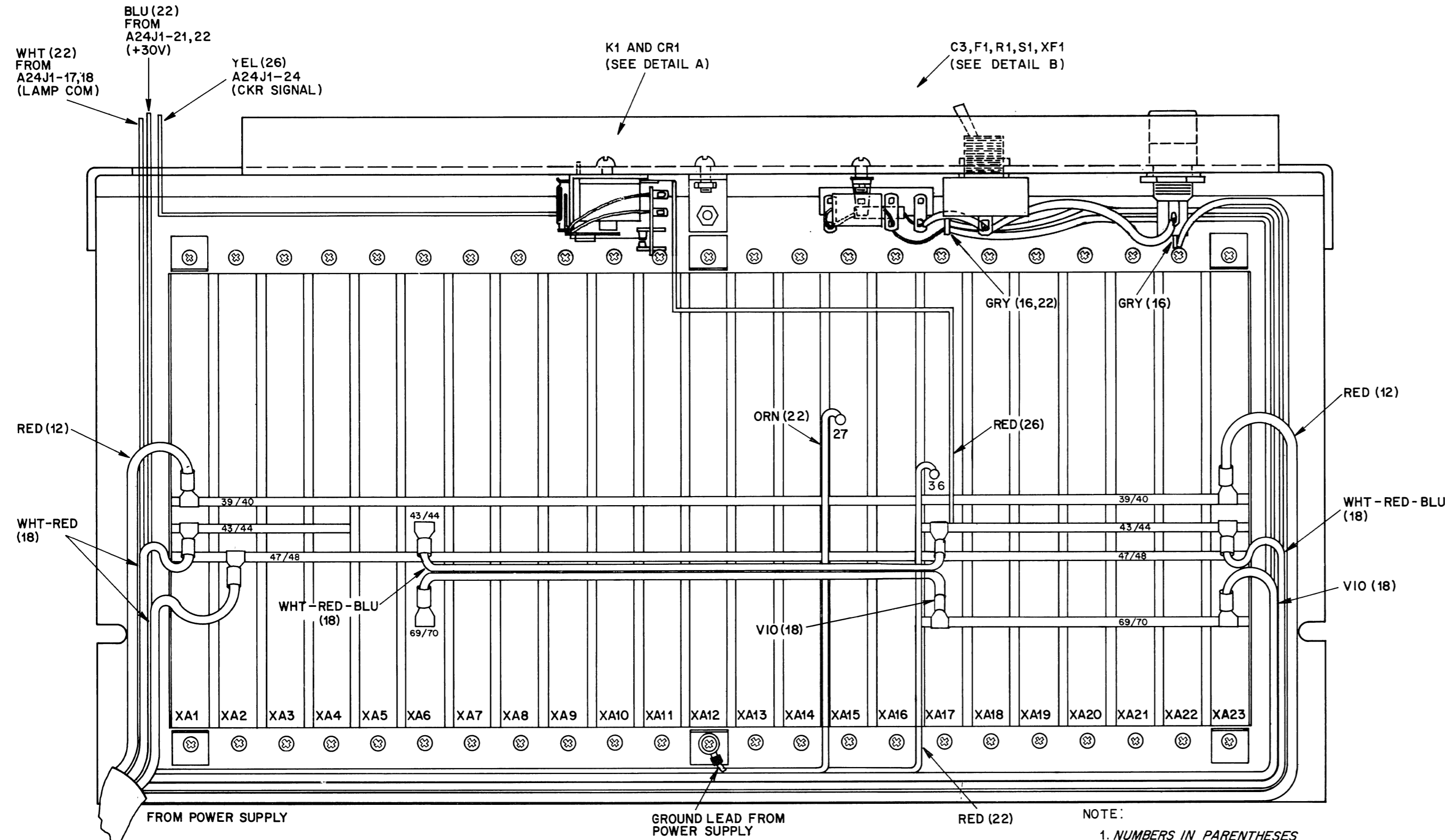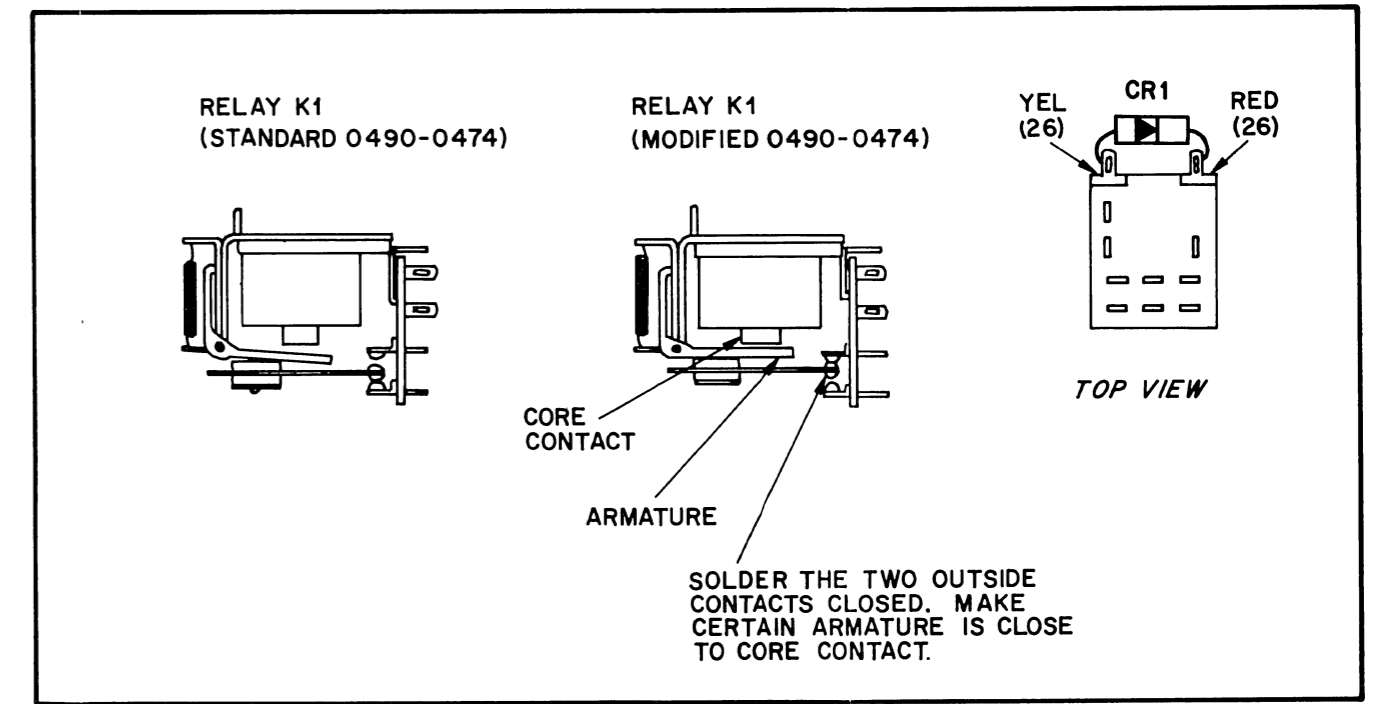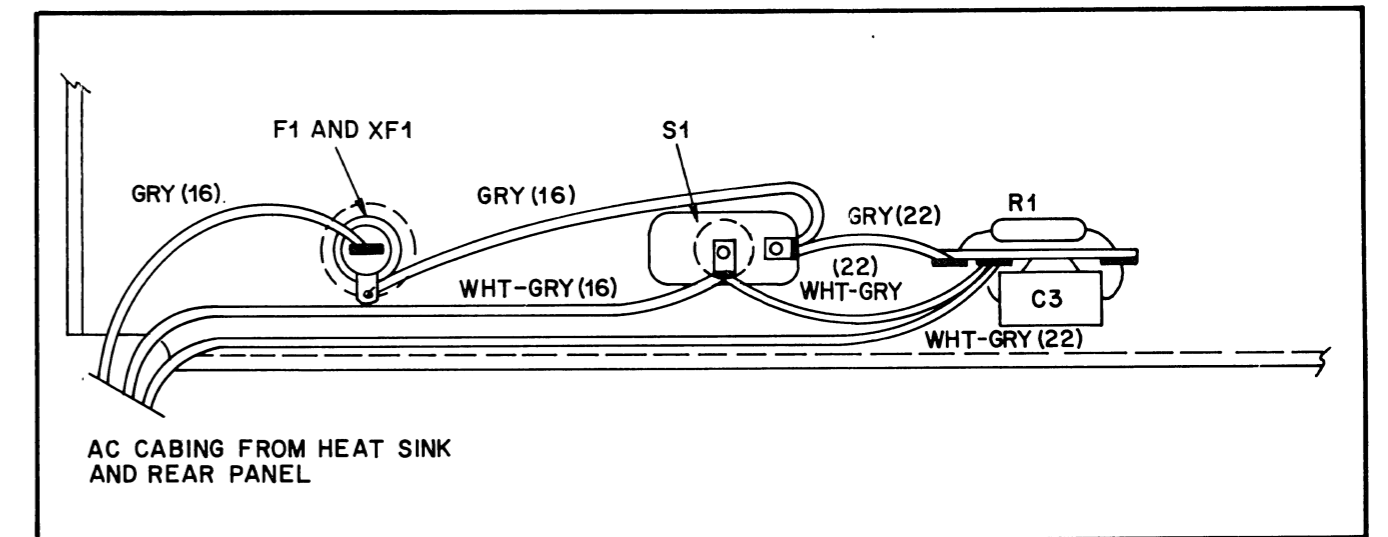
Figure 6-3. Partial Bottom View of Computer
Showing Backplane Assembly (02114-6022) and
Chassis Mounted Parts, Part Location
and Wiring Diagram

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	TYPE40DD36039
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) TO/FROM	A1(Y) ADDRESSING FUNCTION	A2(X) TO/FROM	A2(X) ADDRESSING FUNCTION
1,A	CC0	A400J1-1	X0XX READ	A400J2-A	XXX0 READ 4K/WRITE 8K
2,B	CA0	A400J1-2	X0XX WRITE	A400J2-B	XXX0 WRITE 4K/READ 8K
3,C	CC1	A400J1-3	X1XX READ	A400J2-C	XXX1 READ 4K/WRITE 8K
4,D	CA1	A400J1-4	X1XX WRITE	A400J2-D	XXX1 WRITE 4K/READ 8K
5,E	CC2	A400J1-5	X2XX READ	A400J2-E	XXX2 READ 4K/WRITE 8K
6,F	CA2	A400J1-6	X2XX WRITE	A400J2-F	XXX2 WRITE 4K/READ 8K
7,H	CC3	A400J1-7	X3XX READ	A400J2-H	XXX3 READ 4K/WRITE 8K
8,J	CA3	A400J1-8	X3XX WRITE	A400J2-J	XXX3 WRITE 4K/READ 8K
9,K	CC4	A400J1-9	X4XX READ	A400J2-K	XXX4 READ 4K/WRITE 8K
10,L	CA4	A400J1-10	X4XX WRITE	A400J2-KD	XXX4 WRITE 4K/READ 8K
11,M	CC5	A400J1-11	X5XX READ	A400J2-M	XXX5 READ 4K
12,N	CA5	A400J1-12	X5XX WRITE	A400J2-N	XXX5 WRITE 4K
13,P	CC6	A400J1-13	X6XX READ	A400J2-P	XXX6 READ 4K
14,R	CA6	A400J1-14	X6XX WRITE	A400J2-R	XXX6 WRITE 4K
15,S	CC7	A400J1-15	X7XX READ	A400J2-S	XXX7 READ 4K
16,T	CA7	A400J1-16	X7XX WRITE	A400J2-T	XXX7 WRITE 4K
17,U	C0	A400J1-17	0XXX READ/WRITE	A400J2-U	XX0X READ/WRITE
18,V	C1	A400J1-18	1XXX READ/WRITE	A400J2-V	XX1X READ/WRITE
19,W	C2	A400J1-19	2XXX READ/WRITE	A400J2-W	XX2X READ/WRITE
20,X	C3	A400J1-20	3XXX READ/WRITE	A400J2-X	XX3X READ/WRITE
21,Y	C4	A400J1-21	4XXX READ/WRITE	A400J2-Y	XX4X READ/WRITE
22,Z	C5	A400J1-22	5XXX READ/WRITE	A400J2-Z	XX5X READ/WRITE
23,AA	C6	A400J1-23	6XXX READ/WRITE	A400J2-AA	XX6X READ/WRITE
24,BB	C7	A400J1-24	7XXX READ/WRITE	A400J2-BB	XX7X READ/WRITE

Pin Index (86-Pin Connector)

PIN NO.	A1(Y) SIGNAL	A1(Y) REF NO.	A2(X) SIGNAL	A2(X) 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

PIN NO.	A1(Y) SIGNAL	A1(Y) REF NO.	A2(X) SIGNAL	A2(X) 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	-	MI2	217
16	MG	301	M0	295
18	MRT	069	MRT	069
20	M8	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	MIT	306	MS	300
68	XMR6	518	XMR0	512
70	MG	304	M5	298
72	M10	305	M4	299
74	NC	-	NC	-
76	NC	-	NC	-
78	MR11	163	MR5	137
80	XMR10	522	XMR4	516
82	XMR10	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
MC16,26,36,46,56,66,86,96,106	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)
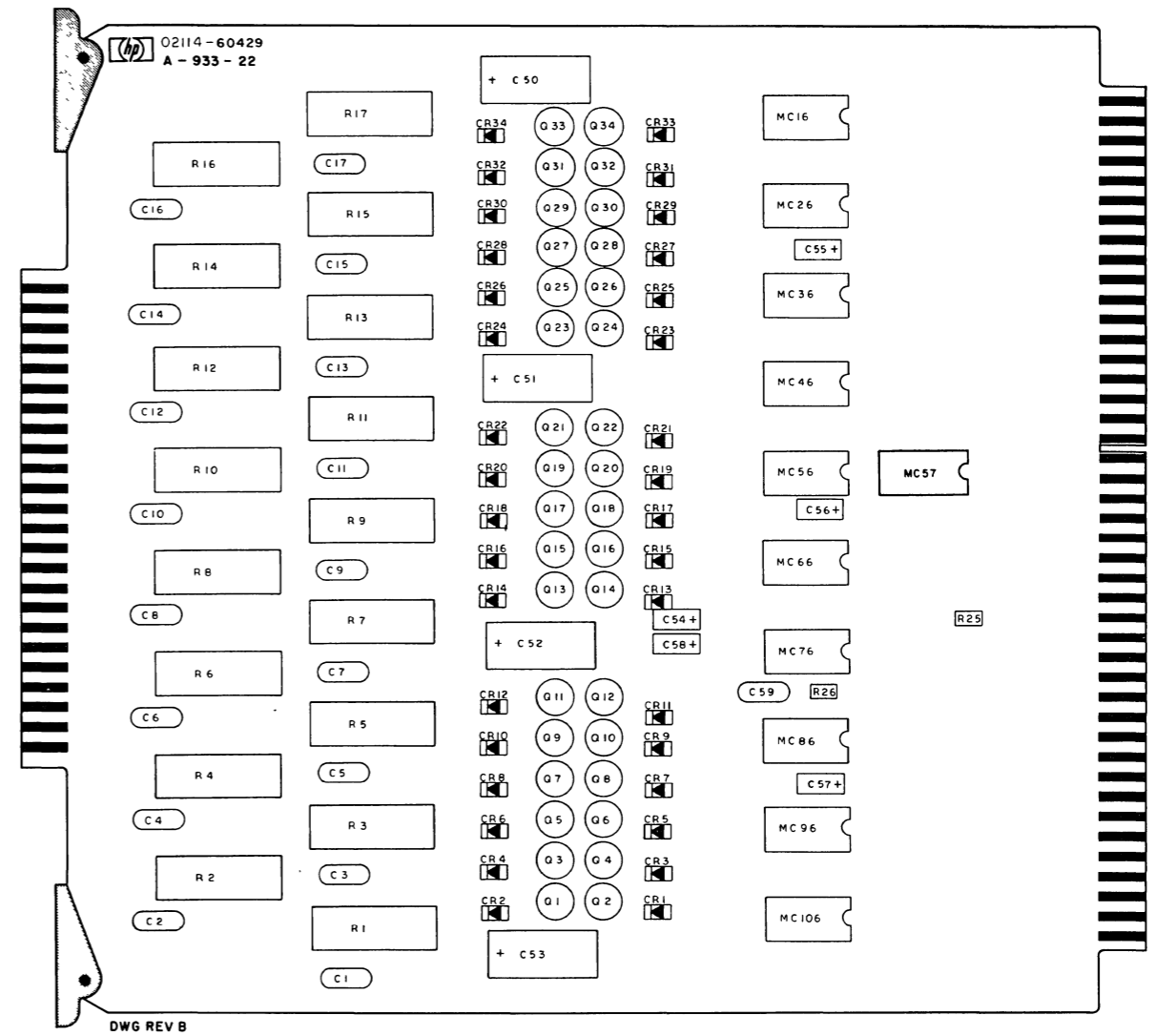
Figure 6-6. Inhibit Driver Card (02114-60429), Part Location Diagram

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	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	A	ID0	A400J3-A	Bit 0	A400J4-A	Bit 0
2	ID1	A400J3-2	Bit 1	A400J4-2	Bit 1	B	ID1	A400J3-B	Bit 1	A400J4-B	Bit 1
3	ID2	A400J3-3	Bit 2	A400J4-3	Bit 2	C	ID2	A400J3-C	Bit 2	A400J4-C	Bit 2
4	ID3	A400J3-4	Bit 3	A400J4-4	Bit 3	D	ID3	A400J3-D	Bit 3	A400J4-D	Bit 3
5	ID4	A400J3-5	Bit 4	A400J4-5	Bit 4	E	ID4	A400J3-E	Bit 4	A400J4-E	Bit 4
6	ID5	A400J3-6	Bit 5	A400J4-6	Bit 5	F	ID5	A400J3-F	Bit 5	A400J4-F	Bit 5
7	ID6	A400J3-7	Bit 6	A400J4-7	Bit 6	H	ID6	A400J3-H	Bit 6	A400J4-H	Bit 6
8	ID7	A400J3-8	Bit 7	A400J4-8	Bit 7	J	ID7	A400J3-J	Bit 7	A400J4-J	Bit 7
9	NC	-	-	-	-	K	NC	-	-	-	-
10	NC	-	-	-	-	L	NC	-	-	-	-
11	ID8	A400J3-11	Bit 8	A400J4-11	Bit 8	M	NC	-	-	-	-
12	NC	-	-	-	-	N	NC	-	-	-	-
13	NC	-	-	-	-	P	NC	-	-	-	-
14	NC	-	-	-	-	R	ID8	A400J3-R	Bit 8	A400J4-R	Bit 8
15	NC	-	-	-	-	S	NC	-	-	-	-
16	NC	-	-	-	-	T	NC	-	-	-	-
17	ID9	A400J3-17	Bit 9	A400J4-17	Bit 9	U	ID9	A400J3-U	Bit 9	A400J4-U	Bit 9
18	ID10	A400J3-18	Bit 10	A400J4-18	Bit 10	V	ID10	A400J3-V	Bit 10	A400J4-V	Bit 10
19	ID11	A400J3-19	Bit 11	A400J4-19	Bit 11	W	ID11	A400J3-W	Bit 11	A400J4-W	Bit 11
20	ID12	A400J3-20	Bit 12	A400J4-20	Bit 12	X	ID12	A400J3-X	Bit 12	A400J4-X	Bit 12
21	ID13	A400J3-21	Bit 13	A400J4-21	Bit 13	Y	ID13	A400J3-Y	Bit 13	A400J4-Y	Bit 13
22	ID14	A400J3-22	Bit 14	A400J4-22	Bit 14	Z	ID14	A400J3-Z	Bit 14	A400J4-Z	Bit 14
23	ID15	A400J3-23	Bit 15	A400J4-23	Bit 15	AA	ID15	A400J3-AA	Bit 15	A400J4-AA	Bit 15
24	ID16	A400J3-24	Parity	A400J4-24	Parity	BB	ID16	A400J3-BB	Parity	A400J4-BB	Parity

Pin Index (86-Pin Connector)

PIN NO.	A3 (0-3K) SIGNAL	A3 REF NO.	A4 (4-7K) SIGNAL	A4 REF NO.	PIN NO.	A3 (0-3K) SIGNAL	A3 REF NO.	A4 (4-7K) SIGNAL	A4 REF NO.
1	GND	337	GND	337	2	GND	337	GND	337
3	NC	-	NC	-	4	TR1	124	TR1	124
5	NC	-	NC	-	6	TR0	123	TR0	123
7	NC	-	NC	-	8	TR3	126	TR3	126
9	NC	-	NC	-	10	NC	-	NC	-
11	NC	-	NC	-	12	TR5	150	TR5	150
13	NC	-	NC	-	14	TR2	125	TR2	125
15	NC	-	XMMD2	530	16	NC	-	NC	-
17	NC	-	XMR12	524	18	NC	-	NC	-
19	NC	-	NC	-	20	TR7	152	TR7	152
21	NC	-	NC	-	22	TR4	149	TR4	149
23	NC	-	MMD2	215	24	NC	-	NC	-
25	NC	-	MR12	182	26	NC	-	NC	-
27	NC	-	NC	-	28	TR6	151	TR6	151
29	NC	-	NC	-	30	TR8	173	TR8	173
31	NC	-	NC	-	32	RTS	501	NC	-
33	NC	-	NC	-	34	XRTS	525	NC	-
35	NC	-	NC	-	36	RTSB	046	NC	-
37	NC	-	NC	-	38	NC	-	NC	-
39	+5V	335	+5V	335	40	+5V	335	+5V	335
41	NC	-	NC	-	42	NC	-	NC	-
43	+20V	001	+20V	001	44	+20V	001	+20V	001
45	NC	-	NC	-	46	NC	-	NC	-
47	-2V	336	-2V	336	48	-2V	336	-2V	336
49	NC	-	NC	-	50	NC	-	MPT	182
51	NC	-	NC	-	52	MI2	217	MR12	182
53	NC	-	NC	-	54	MIT	071	MIT	071
55	NC	-	NC	-	56	MIL	061	MIL	061
57	NC	-	NC	-	58	TR10	175	TR10	175
59	NC	-	NC	-	60	TR9	174	TR9	174
61	NC	-	NC	-	62	NC	-	NC	-
63	NC	-	NC	-	64	NC	-	NC	-
65	NC	-	NC	-	66	TR13	192	TR13	192
67	NC	-	NC	-	68	TR11	176	TR11	176
69	NC	-	NC	-	70	NC	-	NC	-
71	NC	-	NC	-	72	NC	-	NC	-
73	NC	-	NC	-	74	TR14	194	TR14	194
75	NC	-	NC	-	76	TR13	193	TR13	193
77	NC	-	NC	-	78	NC	-	NC	-
79	NC	-	NC	-	80	TR16	219	TR16	219
81	NC	-	NC	-	82	TR15	195	TR15	195
83	NC	-	NC	-	84	NC	-	NC	-
85	GND	338	GND	338	86	GND	338	GND	338
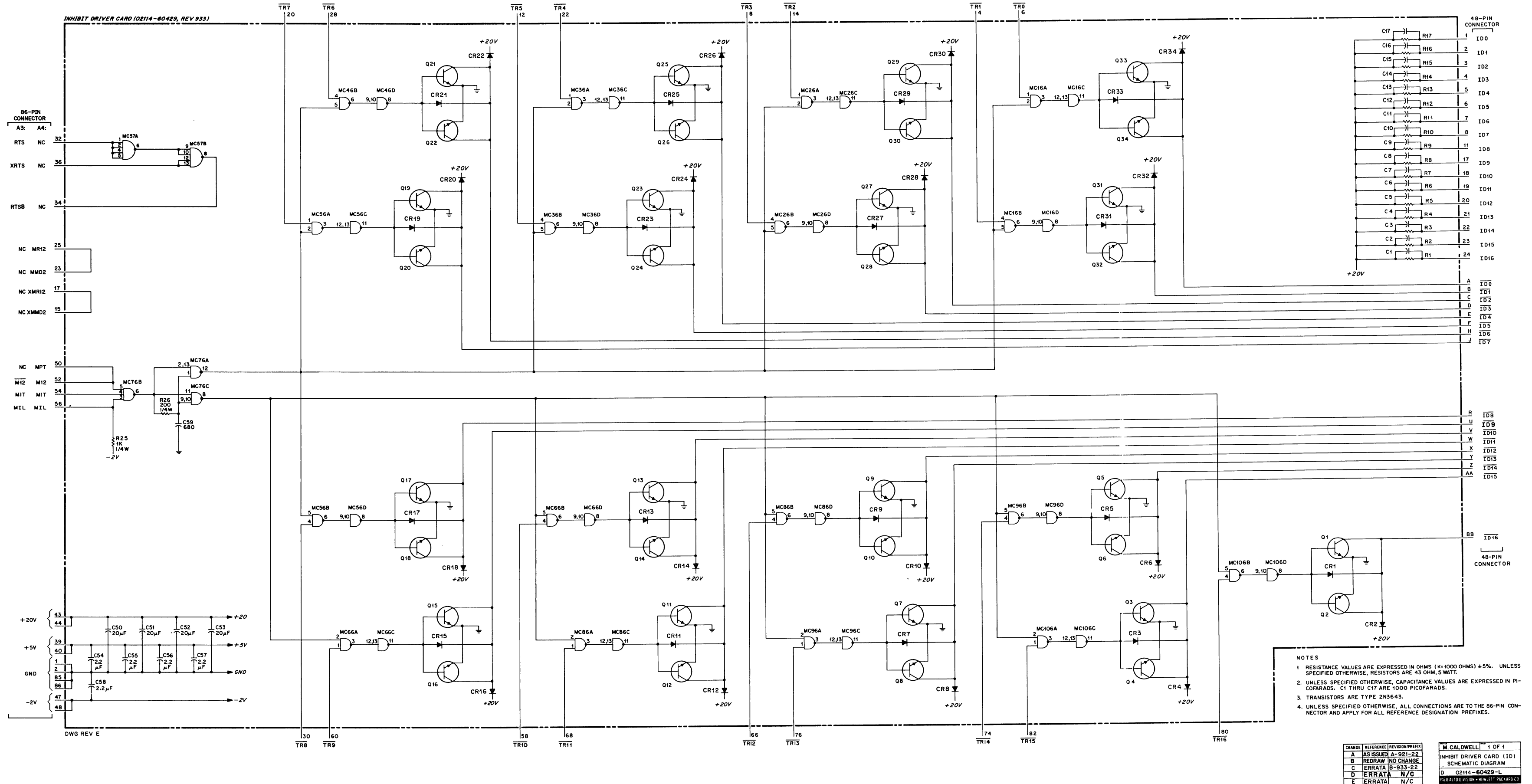
NOTES

1. RESISTANCE VALUES ARE EXPRESSED IN OHMS (K=1000 OHMS) ±5%. UNLESS SPECIFIED OTHERWISE, RESISTORS ARE 43 OHM, ½ WATT.
2. UNLESS SPECIFIED OTHERWISE, CAPACITANCE VALUES ARE EXPRESSED IN PICOFARADS. C1 THRU C17 ARE 100 PICOFARADS.
3. TRANSISTORS ARE TYPE 2N5643.
4. UNLESS SPECIFIED OTHERWISE, ALL CONNECTIONS ARE TO THE 86-PIN CONNECTOR AND APPLY FOR ALL REFERENCE DESIGNATION PREFIXES.

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, 165,157,165,167	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)
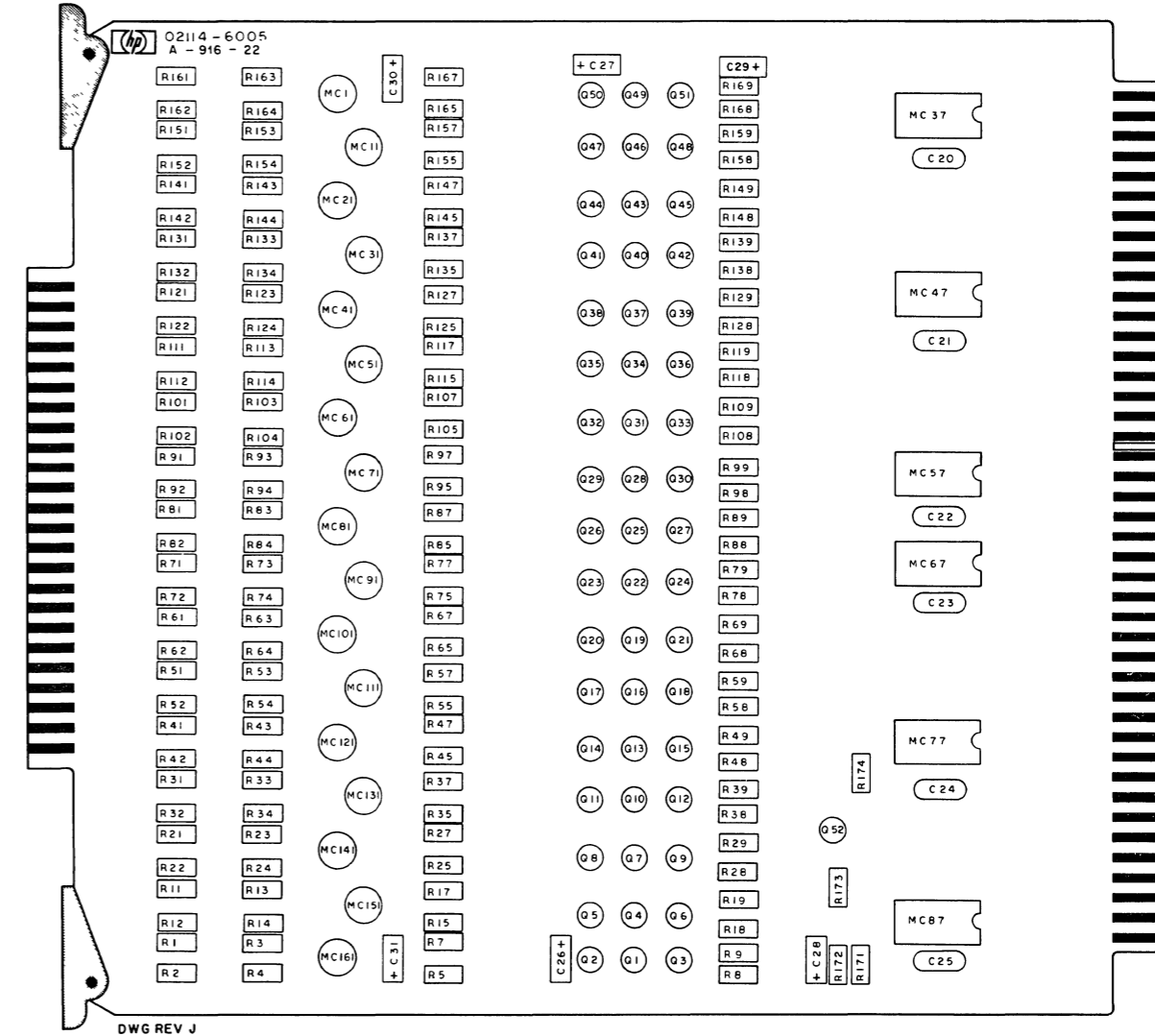
Figure 6-8.. Sense Amplifier Card (02114-6005), Part Location Diagram

Pin Index (48-Pin Connector)

PIN NO.	SIGNAL	A6 (0-3K) TO/FROM	SENSE LINE	A7 (4-7K) TO/FROM	SENSE LINE	PIN NO.	SIGNAL	A6 (0-3K) TO/FROM	SENSE LINE	A7 (4-7K) TO/FROM	SENSE LINE
1	S5	A400J6-1	Bit 0	A400J7-1	Bit 0	A	S0	A400J6-A	Bit 0	A400J7-A	Bit 0
2	S7	A400J6-2	Bit 1	A400J7-2	Bit 1	B	S1	A400J6-B	Bit 1	A400J7-B	Bit 1
3	S1	A400J6-3	Bit 2	A400J7-3	Bit 2	C	S2	A400J6-C	Bit 2	A400J7-C	Bit 2
4	S3	A400J6-4	Bit 3	A400J7-4	Bit 3	D	S3	A400J6-D	Bit 3	A400J7-D	Bit 3
5	S2	A400J6-5	Bit 4	A400J7-5	Bit 4	E	S4	A400J6-E	Bit 4	A400J7-E	Bit 4
6	S4	A400J6-6	Bit 5	A400J7-6	Bit 5	F	S5	A400J6-F	Bit 5	A400J7-F	Bit 5
7	S6	A400J6-7	Bit 6	A400J7-7	Bit 6	H	S6	A400J6-H	Bit 6	A400J7-H	Bit 6
8	S9	A400J6-8	Bit 7	A400J7-8	Bit 7	J	S7	A400J6-J	Bit 7	A400J7-J	Bit 7
9	S8	A400J6-9	Bit 8	A400J7-9	Bit 8	K	S8	A400J6-K	Bit 8	A400J7-K	Bit 8
10	NC	-	-	-	-	L	NC	-	-	-	-
11	NC	-	-	-	-	M	NC	-	-	-	-
12	NC	-	-	-	-	N	NC	-	-	-	-
13	NC	-	-	-	-	P	NC	-	-	-	-
14	NC	-	-	-	-	R	NC	-	-	-	-
15	NC	-	-	-	-	S	NC	-	-	-	-
16	NC	-	-	-	-	T	NC	-	-	-	-
17	S9	A400J6-17	Bit 9	A400J7-17	Bit 9	U	S9	A400J6-U	Bit 9	A400J7-U	Bit 9
18	S10	A400J6-18	Bit 10	A400J7-18	Bit 10	V	S10	A400J6-V	Bit 10	A400J7-V	Bit 10
19	S11	A400J6-19	Bit 11	A400J7-19	Bit 11	W	S11	A400J6-W	Bit 11	A400J7-W	Bit 11
20	S12	A400J6-20	Bit 12	A400J7-20	Bit 12	X	S12	A400J6-X	Bit 12	A400J7-X	Bit 12
21	S13	A400J6-21	Bit 13	A400J7-21	Bit 13	Y	S13	A400J6-Y	Bit 13	A400J7-Y	Bit 13
22	S14	A400J6-22	Bit 14	A400J7-22	Bit 14	Z	S14	A400J6-Z	Bit 14	A400J7-Z	Bit 14
23	S15	A400J6-23	Bit 15	A400J7-23	Bit 15	AA	S15	A400J6-AA	Bit 15	A400J7-AA	Bit 15
24	S16	A400J6-24	Parity	A400J7-24	Parity	BB	S16	A400J6-BB	Parity	A400J7-BB	Parity

Pin Index (86-Pin Connector)

PIN NO.	A6 (0-3K) SIGNAL	REF NO.	A7 (4-7K) SIGNAL	REF NO.	PIN NO.	A6 (0-3K) SIGNAL	REF NO.	A7 (4-7K) SIGNAL	REF NO.
1	GND	337	GND	337	2	GND	337	GND	337
3	INT		INT		4	ST0	198	ST0	198
5	NC	-	NC	-	6	NC	-	NC	-
7	GND	INT	GND	INT	8	ST1	199	ST1	199
9	NC	-	NC	-	10	NC	-	NC	-
11	GND	INT	GND	INT	12	ST2	200	ST2	200
13	NC	-	NC	-	14	NC	-	NC	-
15	GND	INT	GND	INT	16	ST3	201	ST3	201
17	NC	-	NC	-	18	NC	-	NC	-
19	GND	INT	GND	INT	20	ST4	202	ST4	202
21	NC	-	NC	-	22	NC	-	NC	-
23	GND	INT	GND	INT	24	ST5	203	ST5	203
25	NC	-	NC	-	26	NC	-	NC	-
27	GND	INT	GND	INT	28	ST6	204	ST6	204
29	NC	-	NC	-	30	NC	-	NC	-
31	GND	INT	GND	INT	32	ST7	205	ST7	205
33	NC	-	NC	-	34	NC	-	NC	-
35	GND	INT	GND	INT	36	ST8	206	ST8	206
37	NC	-	NC	-	38	NC	-	NC	-
39	+5V	335	+5V	335	40	+5V	335	+5V	335
41	MST	070	MST	070	42	NC	-	NC	-
43	+12V	002	+12V	343	44	+12V	002	+12V	344
45	NC	-	MPT	216	46	NC	-	NC	-
47	-2V	336	-2V	336	48	-2V	336	-2V	336
49	NC	-	MMI2	215	50	ST9	207	ST9	207
51	NC	-	NC	-	52	ST9	207	ST9	207
53	NC	-	NC	-	54	NC	-	NC	-
55	GND	INT	GND	INT	56	ST10	208	ST10	208
57	NC	-	NC	-	58	NC	-	NC	-
59	GND	INT	GND	INT	60	ST11	209	ST11	209
61	NC	-	NC	-	62	NC	-	NC	-
63	GND	INT	GND	INT	64	ST12	210	ST12	210
65	NC	-	NC	-	66	NC	-	NC	-
67	GND	INT	GND	INT	68	ST13	211	ST13	211
69	-12V	0X3	-12V	345	70	-12V	003	-12V	346
71	NC	-	NC	-	72	ST14	212	ST14	212
73	NC	-	NC	-	74	NC	-	NC	-
75	GND	INT	GND	INT	76	ST15	213	ST15	213
77	NC	-	NC	-	78	NC	-	NC	-
79	NC	-	NC	-	80	ST16	214	ST16	214
81	NC	-	NC	-	82	NC	-	NC	-
83	NC	-	MPT	216	84	NC	-	NC	-
85	GND	338	GND	338	86	GND	338	GND	338

Figure 6-9. Sense Amplifier Card (02114-6005), Schematic Diagram

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
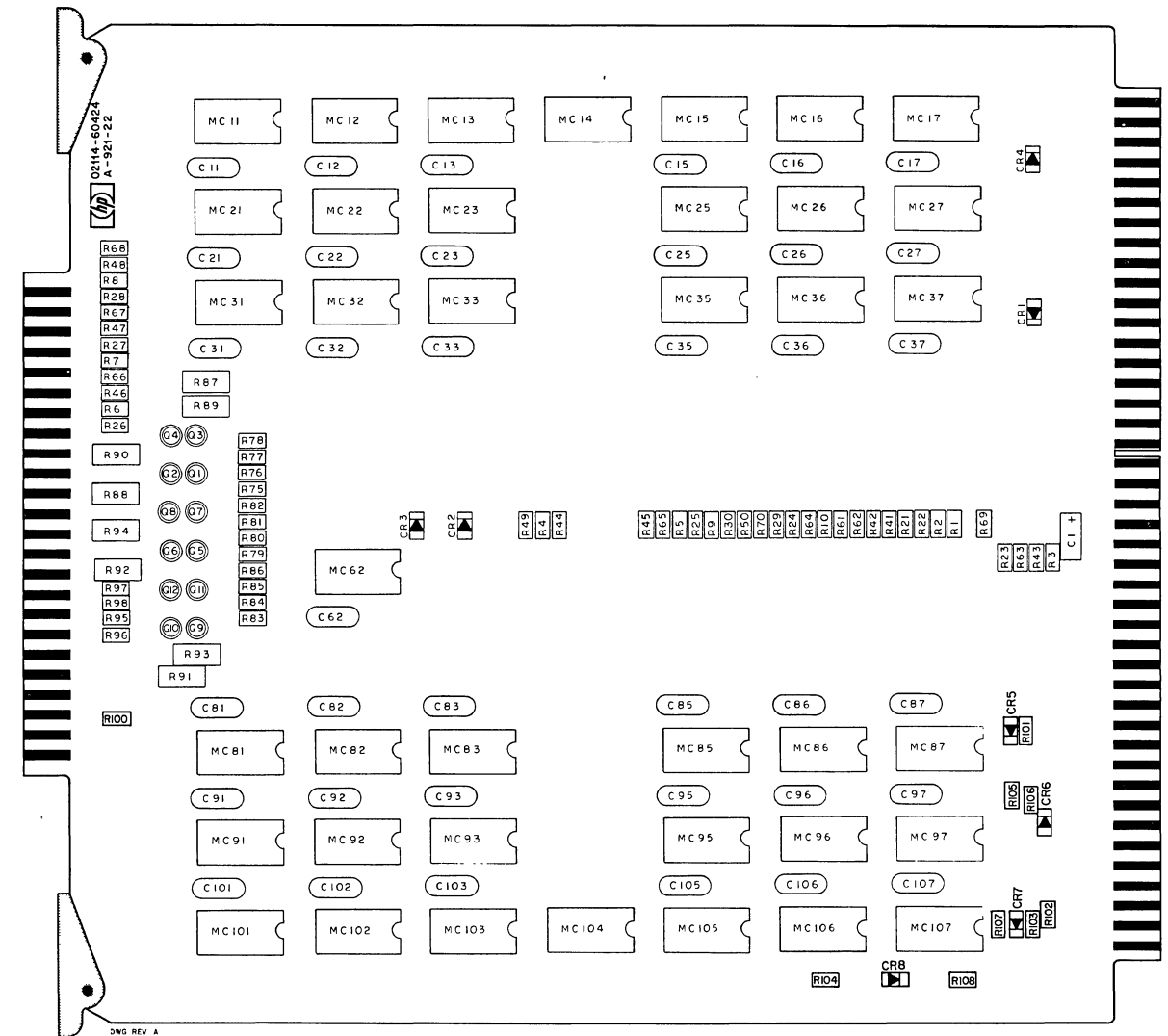
Figure 6-10. Arithmetic Logic Card (02114-60424), Part Location Diagram

Pin Index (86-Pin Connector)

Pin Index (48-Pin Connector)

ARITHMETIC LOGIC CARD (02114-60424) BOARD REV KEY

Figure 6-11. Arithmetic Logic Card (02114-60424), Schematic Diagram

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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.
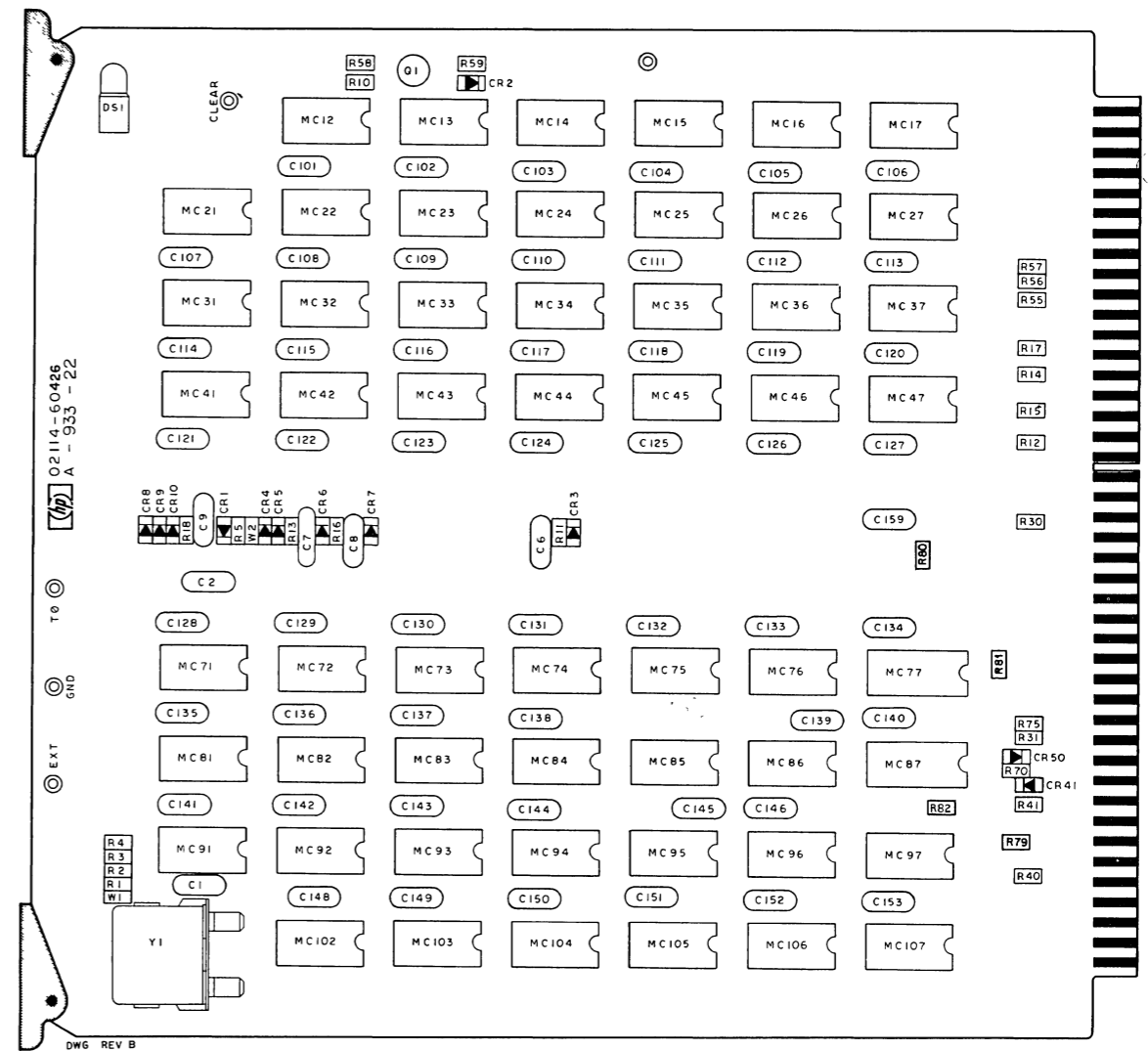
Figure 6-12. Timing Generator Card (02114-60426), Part Location Diagram

Pin Index

PIN NO.	SIGNAL	REF NO.	PIN NO.	SIGNAL	REF NO.
1	GND	337	2	GND	337
3	T0	087	4	JMP	039
5	TRI15	119	6	INT	254
7	TRI5	195	8	OP0	041
9	T2	089	10	T1	088
11	P123	077	12	IRI5	035
13	XPH4	310	14	T3	090
15	PH2	074	16	PHI	073
17	EXECUTE	104	18	INDIRECT	103
19	T4	091	20	FETCH	102
21	T5	092	22	PH4	076
23	ISZ	036	24	SCO	062
25	SIR	231	26	PH3	075
27	PEH	218	28	HLL	264
29	T7S	100	30	RSP	256
31	T3IO	101	32	JSB	040
33	T6T7	099	34	ENF	067
35	SAL	084	36	SWST	083
37	SWSB	081	38	PON	257
39	+5V	335	40	+5V	335
41	RNL	265	42	POPIO	078
43	SWSA	080	44	TT	093
45	LNS	261	46	STR	054
47	-2V	336	48	-2V	336
49	PRS	266	50	ISG	315
51	SEO	085	52	LDL	267
53	T4T5	098	54	T3T4	097
55	BAF	016	56	AAF	015
57	SCL	262	58	PH5	313
59	LML	263	60	DML	259
61	MIL	061	62	LAL	260
63	RUN	095	64	RF2	079
65	EXT	316	66	T1T2	096
67	LES	271	68	TS	094
69	YN7	293	70	MPT	216
71	HIN	024	72	Y7N	294
73	MWT	068	74	SSPM	082
75	MRT0	072	76	T1M	086
77	MIT	071	78	P1235	502
79	MON	268	80	MWL	066
81	MTE	064	82	MRT	069
83	EIR	065	84	MST	070
85	GND	338	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
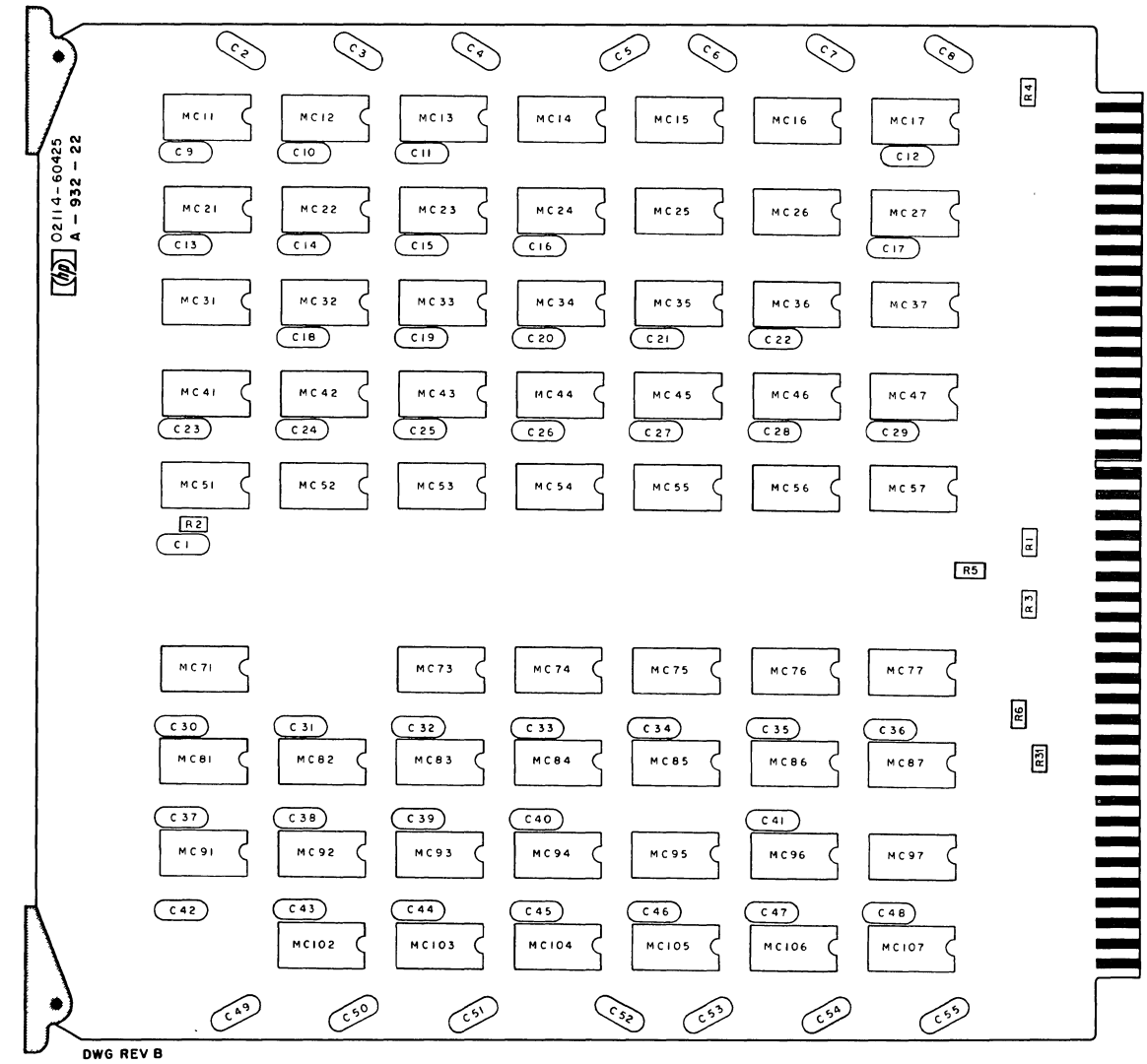
Figure 6-14. Instruction Decoder Card (02114-60425), Part Location Diagram

Pin Index

PIN NO.	SIGNAL	REF NO.	PIN NO.	SIGNAL	REF NO.
1	GND	337	2	GND	337
3	T1T2	096	4	ASG	030
5	PH3	075	6	T5	092
7	JSB	040	8	HLL	264
9	T1	088	10	T2	089
11	BAF	016	12	IOGIO	529
13	SEO	085	14	AAF	015
15	ADD	083	16	TR2	121
17	ADD	028	18	TR9	170
19	SBO	060	20	RB0	042
21	IOF	037	22	CMF	032
23	ANF	031	24	EOF	034
25	ADF	029	26	STBT	051
27	RTS	501	28	SCO	062
29	T3	090	30	TR15	191
31	T7	093	32	RSM6-9	047
33	TR11	172	34	TR10	171
35	RSM10-15	048	36	CPA	033
37	T4	091	38	T3T4	097
39	+5V	335	40	+5V	335
41	T6T7	099	42	T4T5	098
43	TR14	190	44	EIR	065
45	TR7	152	46	TR4	145
47	-2V	336	48	-2V	336
49	TR13	189	50	PH4	076
51	P1235	502	52	IOG	038
53	OPO	041	54	T0	087
55	TR12	188	56	PH1	073
57	SWSA	080	58	STM0-5	055
59	SRG	052	60	SIN	270
61	ISZ	036	62	RMSB	044
63	STM6-9	056	64	STR	054
65	RPRB	045	66	STM10-15	057
67	STP10-15	059	68	STP0-9	058
69	IR15	035	70	TR9	174
71	RBRB	043	72	RARB	049
73	STBA	053	74	STBB	050
75	SSPM	082	76	T7S	100
77	PH2	074	78	TS	094
79	TR8	169	80	SWSB	081
81	TR15	195	82	TR6	151
83	TR8	173	84	JMP	039
85	GND	338	86	GND	338

NOTES:
1. EXPANDER GATE OUTPUT
2. EXPANDED GATE INPUT
3. RESISTANCE VALUES ARE EXPRESSED IN OHMS
4. ALL RESISTORS ARE ±5%, 1/4 WATT
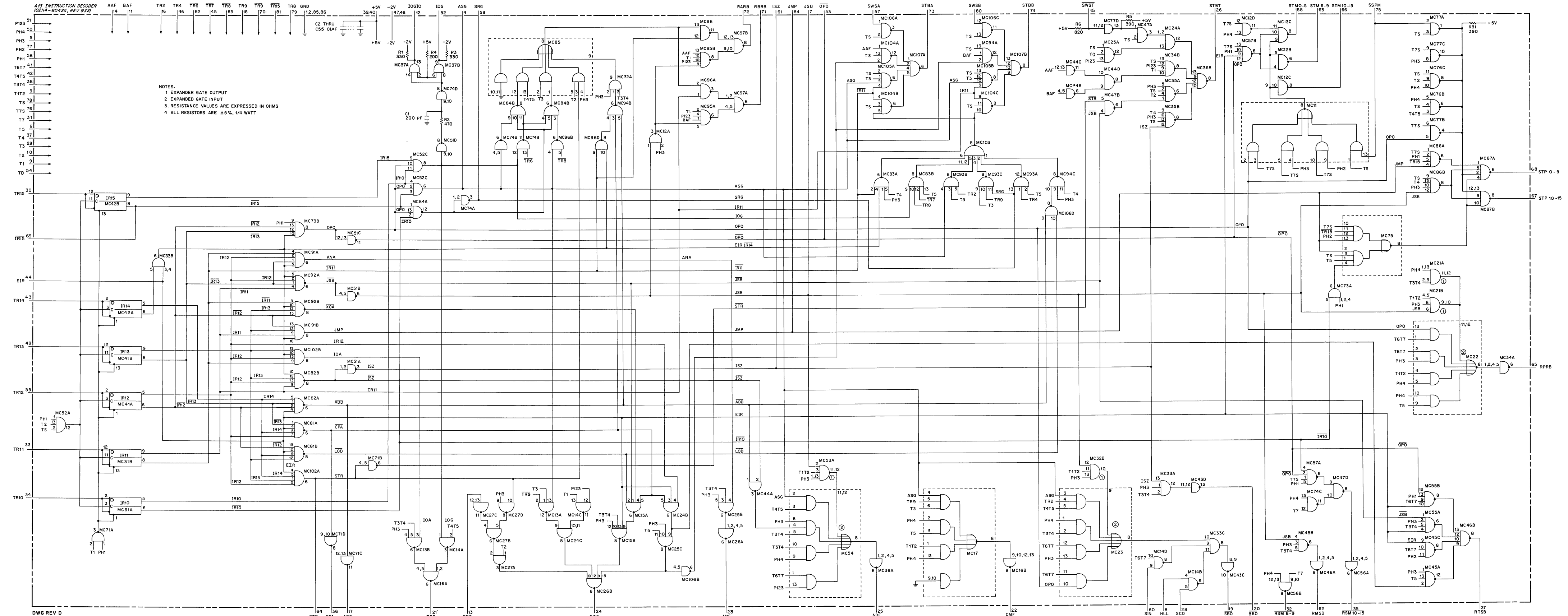
Figure 6-15. Instruction Decoder Card (02114-60425), Schematic Diagram

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.	PIN NO.	SIGNAL	REF NO.
1	GND	337	2	GND	337
3	SB15	197	4	BAF	016
5	TAN3	168	6	TR3	126
7	TR4	149	8	OVF	291
9	TR5	150	10	TR1	124
11	TAN2	144	12	MR0	110
13	IOO	020	14	AAF	015
15	STF	006	16	MOR	026
17	CLF	013	18	T0	087
19	IOCO	027	20	TAN4	187
21	SFC	010	22	TAN1	118
23	CLC	014	24	TB15	196
25	STC	011	26	P123	077
27	SFS	012	28	ASG	030
29	TR9	170	30	TR11	176
31	CPA	033	32	ISZ	036
33	TR11	172	34	T4	091
35	C16	177	36	TS	094
37	PH3	075	38	SKF	252
39	+5V	335	40	+5V	335
41	CLR	272	42	SSR	025
43	TR6	151	44	TR2	125
45	RB15	186	46	TR8	169
47	-2V	336	48	-2V	336
49	T3T4	097	50	CSR	005
51	T4T5	098	52	TR5	146
53	TR3	122	54	TR4	145
55	RB0	114	56	IOG	038
57	C0	022	58	T5	092
59	TR2	121	60	TR0	119
61	IOS	314	62	EXTEND	292
63	SRG	052	64	HIN	024
65	T3	090	66	TR1	120
67	NC	–	68	TR6	173
69	SL0	009	70	TR7	148
71	SL14	021	72	LRS	017
73	ISR	018	74	NC	–
75	SLM	007	76	ADD	028
77	IOI	019	78	SRM	008
79	T7	093	80	RL4	023
81	SEO	085	82	TB0	127
83	T6T7	099	84	T2	089
85	GND	338	86	GND	338

Figure 6-17. Shift Logic Card (02114-6003), Schematic Diagram

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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	2114-6021
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	0180-0197
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	SPS3611
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
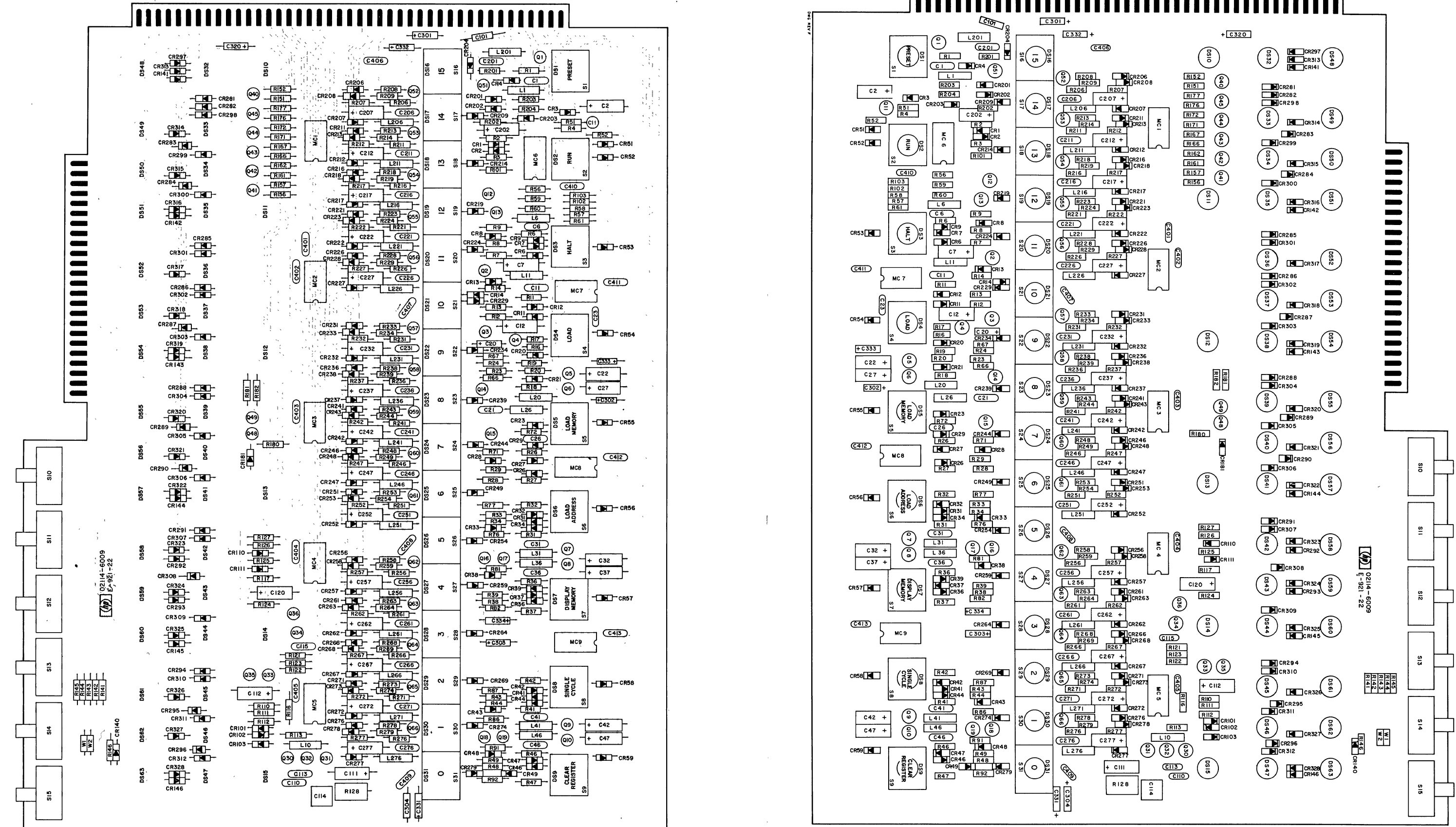
Figure 6-18. Display Board (02114-6009), Part Location Diagram

CHANGE	REFERENCE	REVISION/PREFIX
A	AS ISSUED	E-921-22
B	ERRATA	NO CHANGE

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	SWR2	281
33	SWR1	274	34	SWR6	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	PRS	266	78	SWR15	288
79	LAL	264	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	TRD6	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
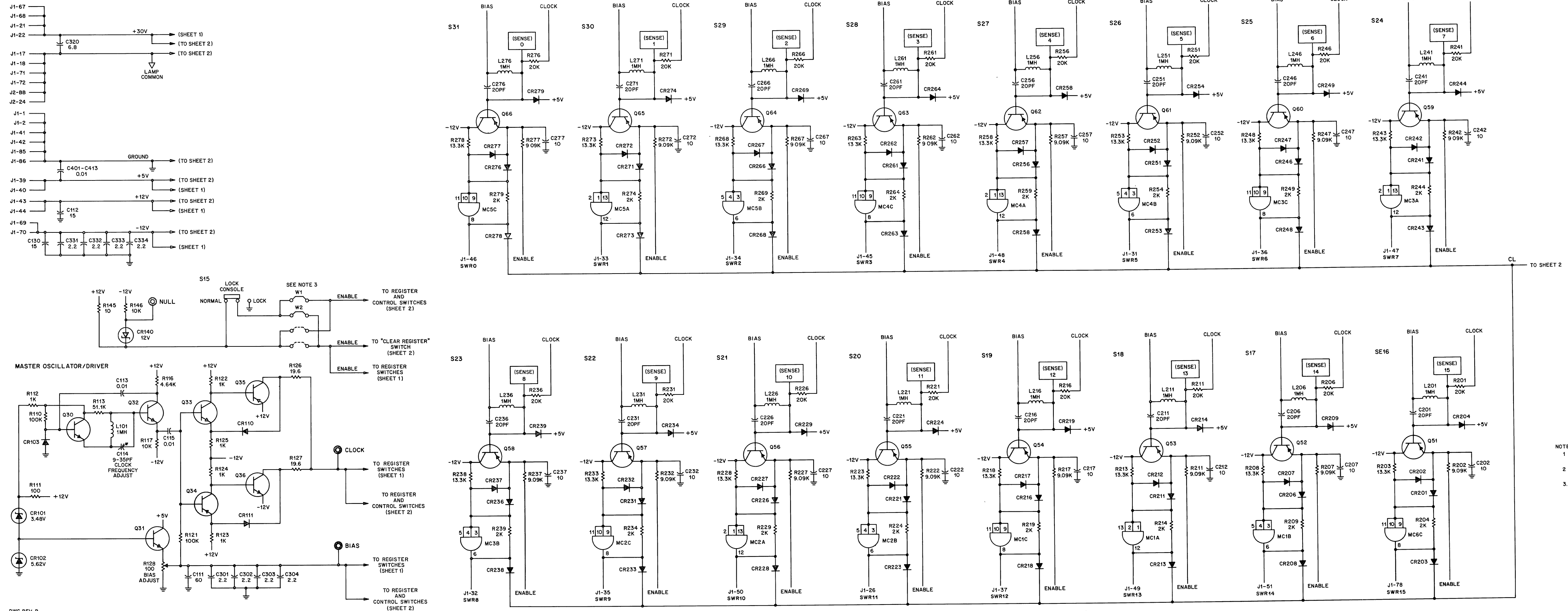
MASTER OSCILLATOR/DRIVER

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	

DWG REV B

Figure 6-19. Display Board (02114-6009), Schematic Diagram (Sheet 1 of 2)

Figure 6-19. Display Board
(02114-6009),
Schematic Diagram
(Sheet 2 of 2)

NOTES:
1. ALL CAPACITOR VALUES ARE IN MICROFARADS UNLESS OTHERWISE NOTED.
2. ALL RESISTOR VALUES ARE IN OHMS UNLESS OTHERWISE NOTED.

DWG REV B

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

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	A24J2-21
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 (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	*	P3-22, Z	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 (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	A24J2-16	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
P5-16	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	P2-18	A24J2-U	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

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

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

* Denotes internal connection in hood.

Figure 6-20. Display Board Cable Assembly (02114-6016), Wiring Index and Part Location Diagram

D02114-6016-10
02114A-D-120

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
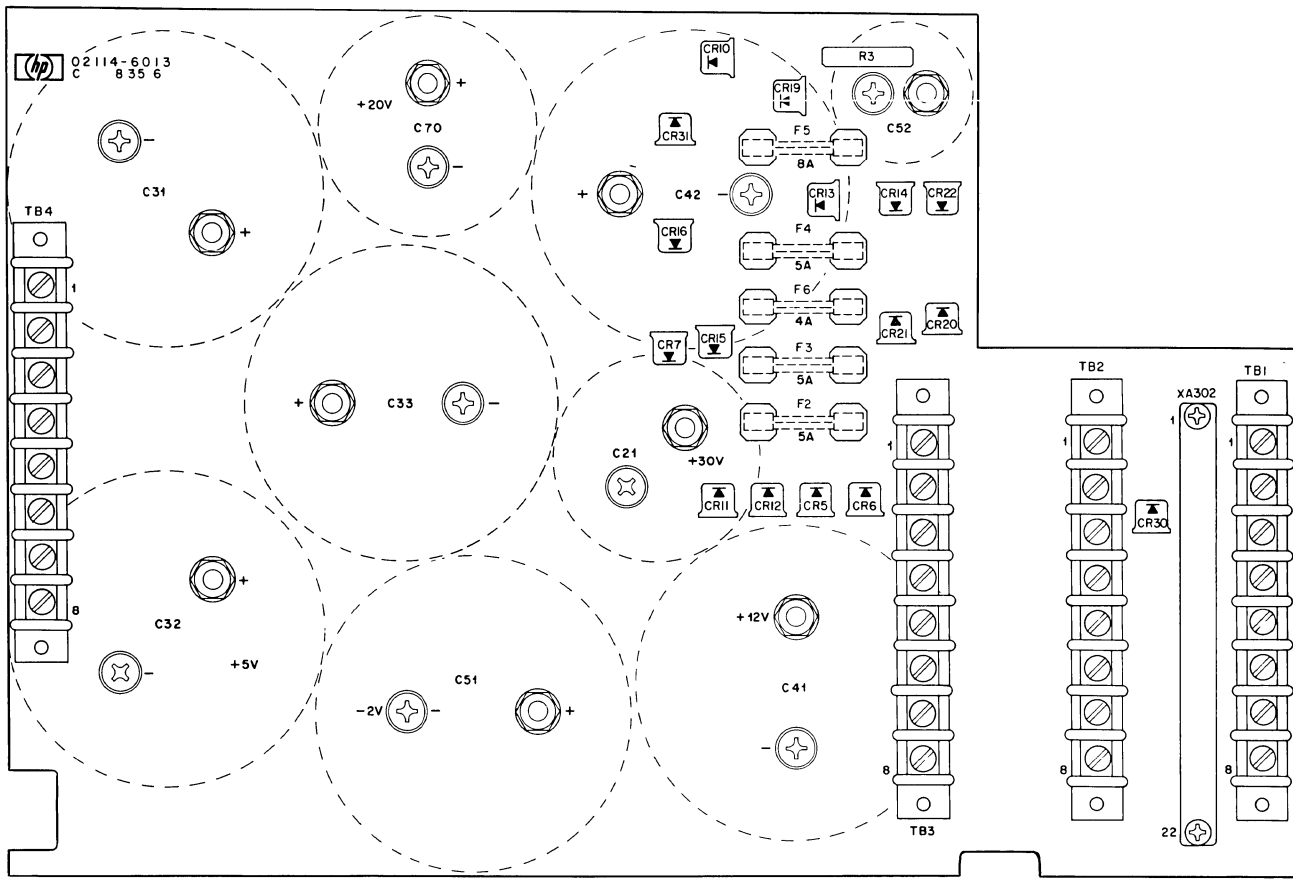
Figure 6-21. Capacitor Board (02114-6013), Part Location Diagram

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

NOTES:

1. NUMBERS IN PARENTHESES DENOTE WIRE SIZES

2. TERMINAL BOARD CONNECTIONS AS FOLLOWS:

TB3	TB2	TB1
3—WHT-VIO	1—BRN	1—WHT-YEL-GRY
	2—WHT	2—BLU
	3—WHT-GRY	3—WHT-GRN
		4—ORN
		5—WHT-GRN
		6—WHT-YEL
		7—WHT-RED-YEL
		8—RED
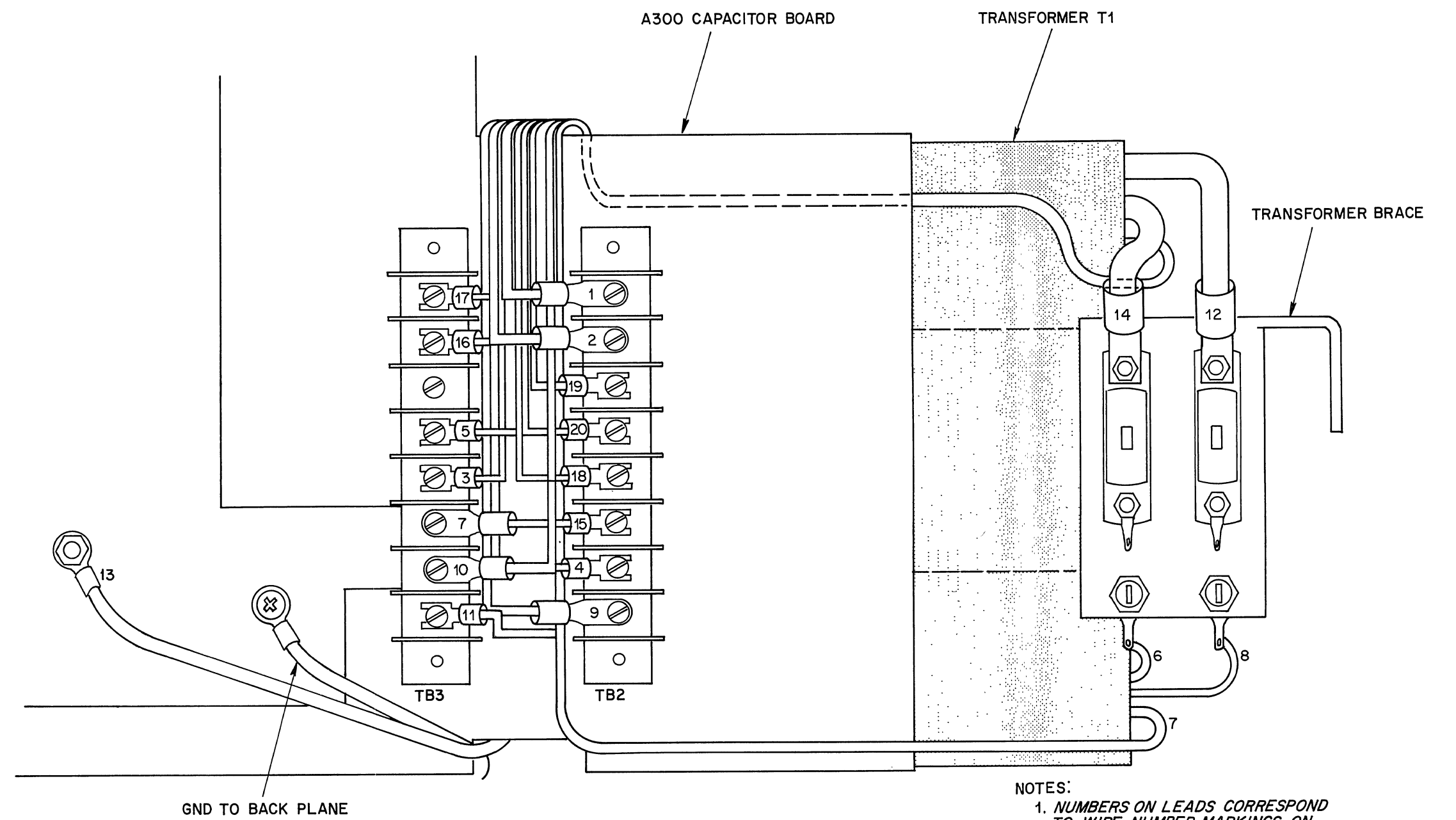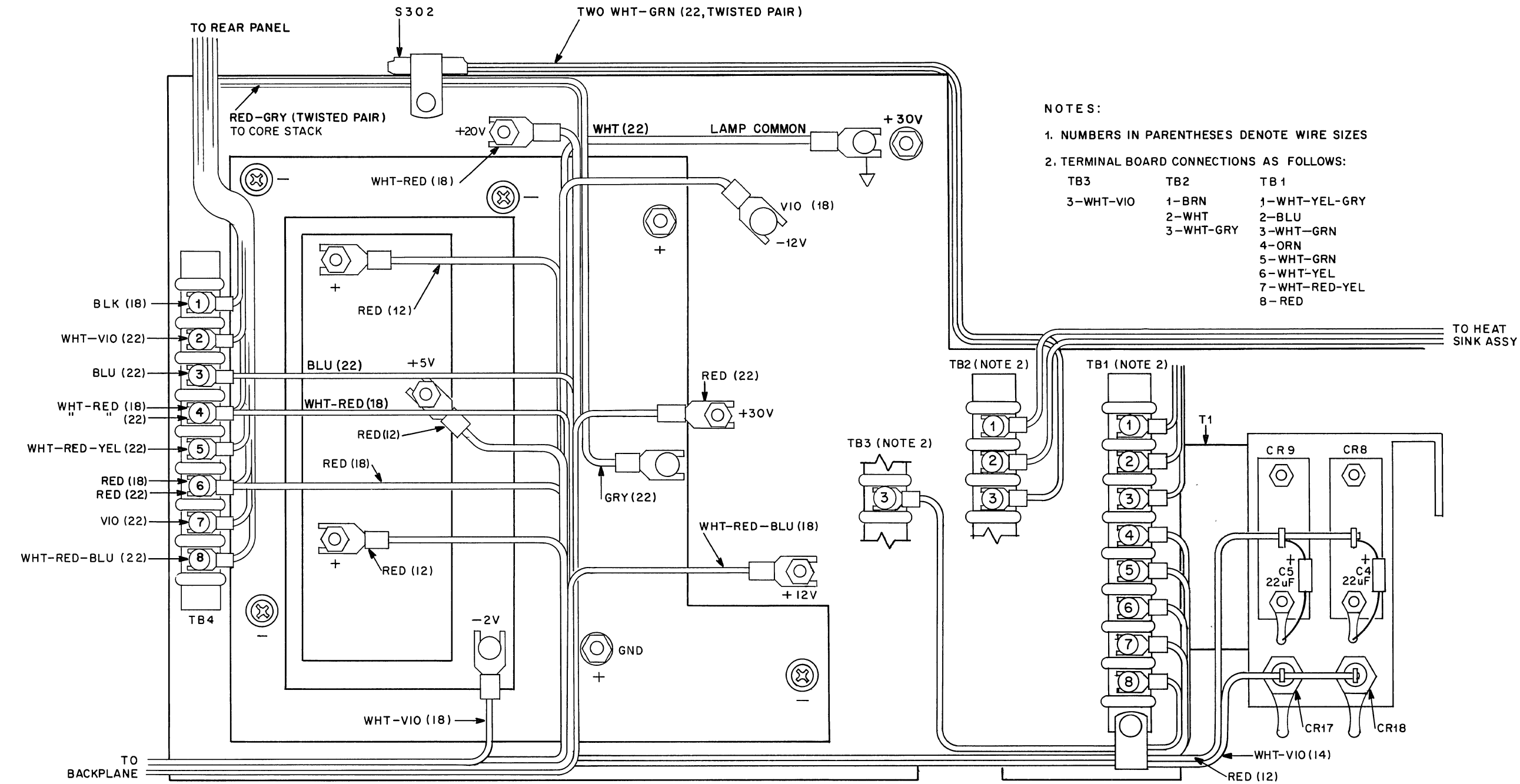
NOTES:
1. NUMBERS ON LEADS CORRESPOND TO WIRE NUMBER MARKINGS ON TRANSFORMER T1.

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)

R17 R16 R10 R11 R12 R13 R15 R14 C10 +

WHT-RED (18)
WHT-RED-YEL (18)
WHT-RED-YEL TO Q11
WHT-YEL (18)
WHT-YEL (22) TO Q10
BRN (22) TO Q10
RED (22) TO Q1
ORN (22)
YEL (22)
TWO GRN (22)
TWO WHT-YEL-GRY (18)
GRY (22)
WHT-GRY (18)

TOP VIEW
(SEE DETAIL "A" FOR KINGMAN BOARD)

DC CABLING

Q10
*WHT-YEL (22)
WHT-GRN (22)
WHT-RED-YEL (22)*
Q11
RED (18)
TWO BLU (18)
TWO BLU (18)
*BRN (22)
TWO GRN (22)
Q1
GRN (22)
*RED (22)
Q2

PRIMARY REGULATOR CABLING

02114A-C-123
A02114-9017-1A
C02114-9013-2A

BOTTOM VIEW

CR1 CR2 RV1
WHT-GRY (16)
WHT-YEL-GRY (18)
BUSS (18)
TWO GRY (22)
TWO GRN (22)
GRY (22)
WHT-GRN (22)
BLU (18)
S 301 (MOUNTED ON SIDE OF HEAT SINK)
CR3
TWO BLU (18)
Q3
ORN (22)
TWO GRN (22)
Q5
YEL (22)
Q4
R2 (RESISTER MOUNTED ON HEAT SINK BRACKET)
BRN (16)
GRN (22)
CABLING

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
QJ2	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
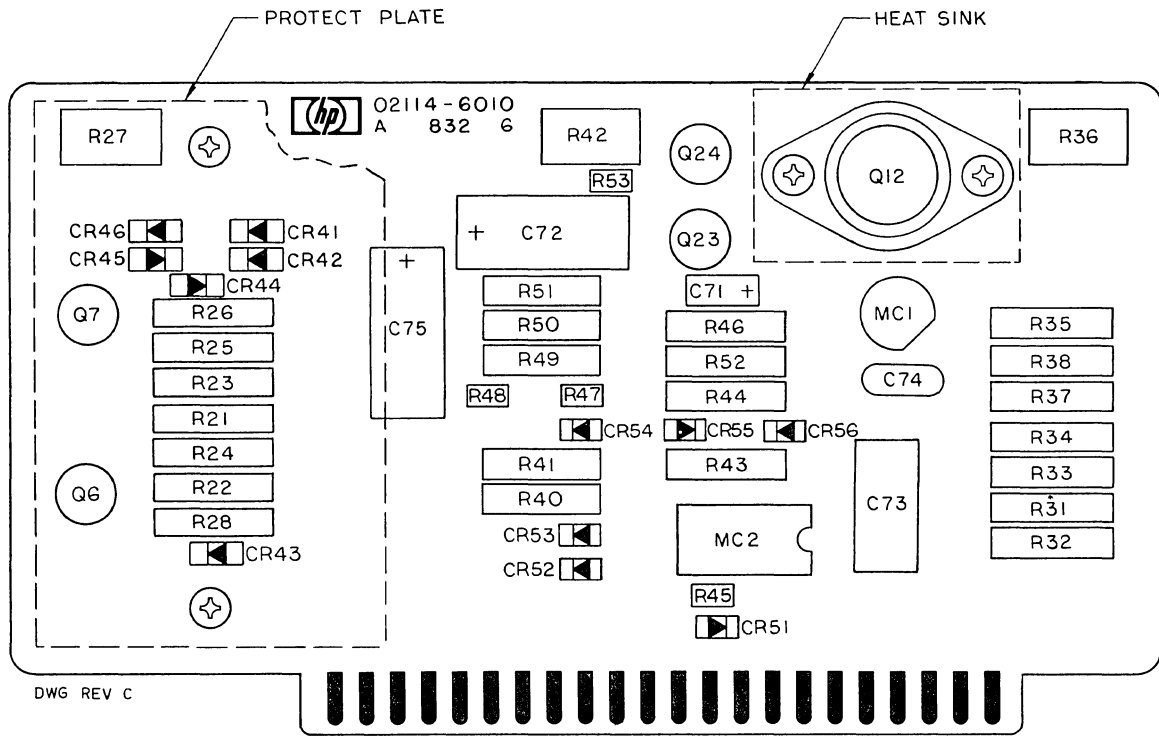
Figure 6-24. Regulator Card (02114-6010), Part Location Diagram
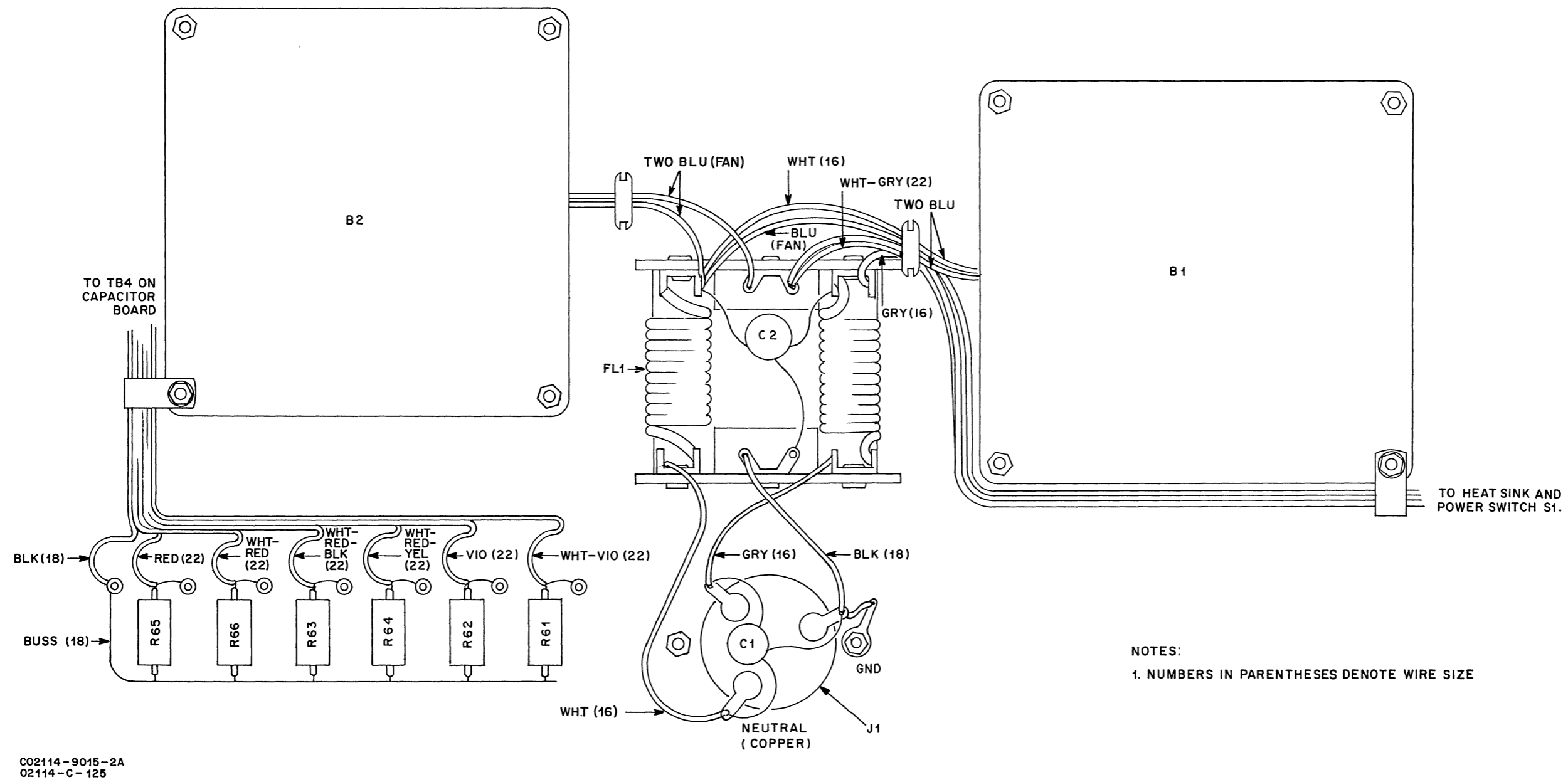
Figure 6-25. Rear Panel Assembly (02114-0009),
Part Location Diagram and Wiring Diagram

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.
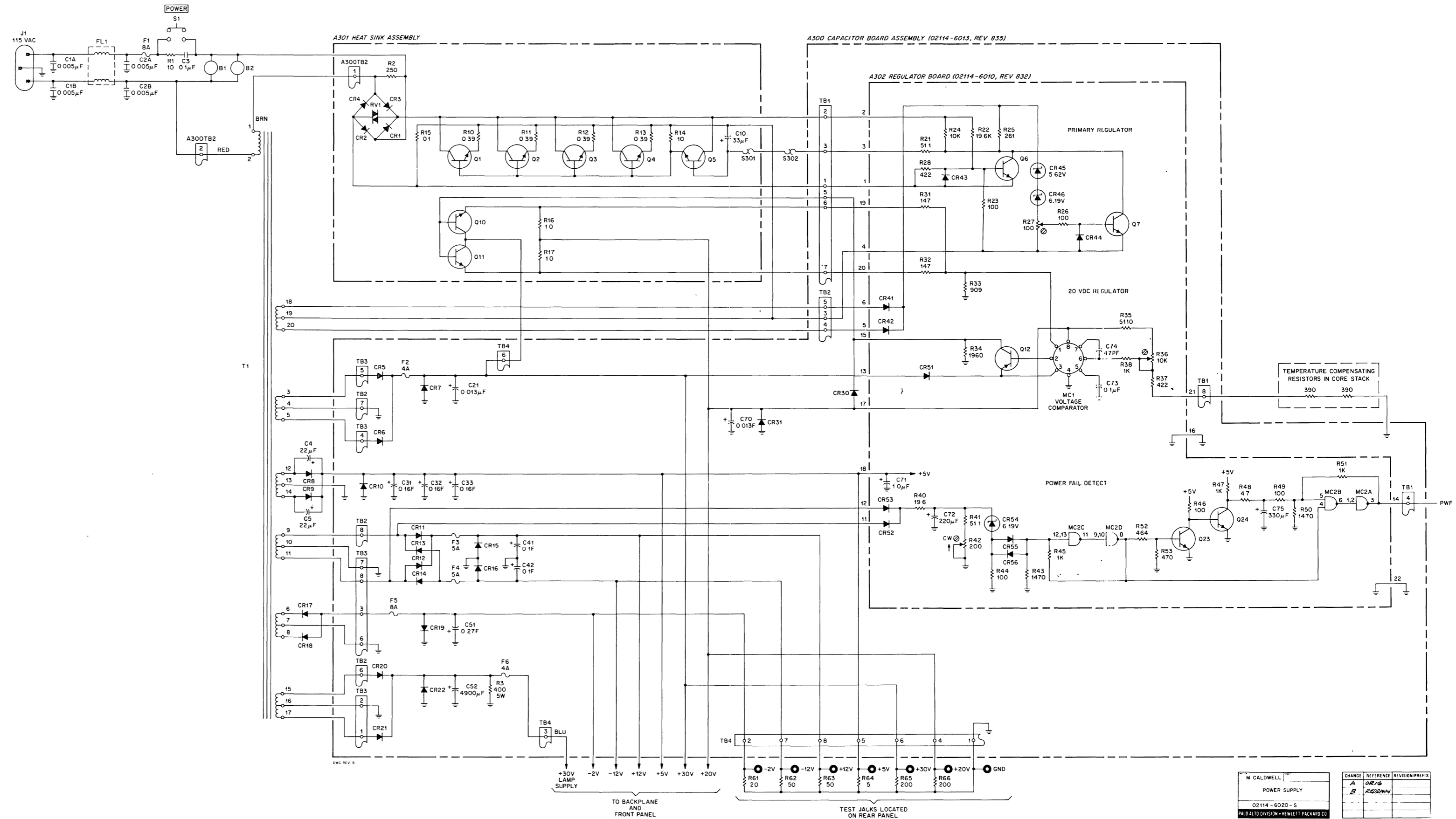
Figure 6-26. Power Supply Assembly (02114-6020), Schematic Diagram

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 B = motor BT = battery C = capacitor CP = coupler CR = diode DL = delay line DS = device signaling (lamp) E = misc hardware F = fuse FL = filter	J = receptacle connector K = relay L = inductor M = meter MC = microcircuit P = plug connector Q = transistor R = resistor RT = thermistor S = switch T = transformer	TB = terminal board TP = test point U = integrated circuit V = vacuum tube, neon bulb, photocell, etc. VR = voltage regulator W = cable, jumper X = socket Y = crystal Z = tuned cavity, network

ABBREVIATIONS		
A = amperes AC = alternating current AFC = automatic frequency control ALUM = aluminum AL-ELECT = aluminum electrolytic ASSY = assembly BFO = beat frequency oscillator BE CU = beryllium copper BH = binder head BP = bandpass BRS = brass BWO = backward wave oscillator C = capacitor CCW = counterclockwise CER = ceramic CMO = cabinet mount only COEF = coefficient COM = common COMP = composition COMPL = complete CONN = connector CP = cadmium plate CRT = cathode-ray tube CTL = capacitor-transistor logic CW = clockwise DC = direct current DEPC = deposited carbon DPDT = double-pole, double-throw DPST = double-pole, single-throw DR = drive ELECT = electrolytic ENCAP = encapsulated EXT = external F = farads FH = flat head FIL H = fillister head FXD = fixed G = giga (10^9) GE = germanium GL = glass GND/GRD = ground(ed) H = henries HDW = hardware HEX = hexagonal HG = mercury HR = hour(s) HZ = hertz ID = inner diameter IF = intermediate frequency	IMPG = impregnated IN. = inch, inches INCD = incandescent INCL = include(s) INS = insulation(ed) INT = internal I/O = input/output K = kilo = 1000 LH = left hand LIN = linear taper LK WASH = lock washer LOG = logarithmic taper LPF = low pass filter M = milli = 10^{-3} MEG = mega = 10^6 MET FLM = metal film MET OX = metal oxide MFR = manufacturer MHz = megahertz MINAT = miniature MOM = momentary MTG = mounting MY = Mylar N = nano (10^{-9}) N/C = normally closed NE = neon NI PL = nickel plate NO. = number N/O = normally open NPN = negative-positive- negative NPO = negative positive zero (zero temperature coefficient) NRFR = not recommended for field replacement NSR = not separately replaceable OBD = order by description OD = outer diameter OH = oval head OX = oxide P = peak PC = printed circuit PF = picofarads = 10^{-12} farads PH = Phillips head PH BRZ = phosphor bronze PHL = Phillips PIV = peak inverse voltage PNP = positive-negative- positive	P/O = part of POLY = polystyrene PORC = porcelain POS = position(s) POT = potentiometer PP = peak-to-peak PT = point PWV = peak working voltage R = resistor RECT = rectifier RF = radio frequency RH = round head or right hand RMO = rack mount only RMS = root-mean square RWV = reverse working voltage S-B = slow-blow SCR = screw SE = selenium SECT = section(s) SEMICON = semiconductor SI = silicon SIL = silver SL = slide SPDT = single-pole, double-throw SPG = spring SPL = special SPST = single-pole, single-throw SR = split ring SST = stainless steel STL = steel TA = tantalum TD = time delay TGL = toggle THD = thread TI = titanium TOL = tolerance TRIM = trimmer TTL = transistor-transistor logic TWT = traveling wave tube U (μ) = micro = 10^{-6} VAR = variable VDCW = direct current working volts W/ = with W = watts WIV = working inverse voltage WW = wirewound W/O = without

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 6.8 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 160,000 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)

⑰ Part No.	Description #	Mfr.	Mfr. Part No.	TQ
0683-4715	R:FXD CUMP 470 OHM 5% 1/4W	01121	CB 4715	97
0683-5615	R:FXD CUMP 560 UHM 5% 1/4W	01121	CB 5615	12
0683-8215	R:FXD CUMP 820 OHM 5% 1/4W	01121	CB 8215	5
0686-2215	R:FXD CUMP 220 UHM 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 UHM 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 UHM 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 UX 22 UHM 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 UHM 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 UHM 1% 1/8W	28480	0757-0289	24
0757-0346	R:FXD MET FLM 10 UHM 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 UHM 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 UHM 1% 5W	28480	0811-0040	2
0811-1661	R:FXD WW 0.39 UHM 5% 2W	28480	0811-1661	4
0811-1857	R:FXD WW 400 UHM 5% 5W	28480	0811-1857	1
0811-2084	R:FXD WW 43 UHM 1% 5W	28480	0811-2084	21
0811-2490	R:FXD WW 0.1 UHM 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 OR 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)

ⓗ Part No.	Description #	Mfr.	Mfr. Part No.	TQ
1854-0C53	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-C049	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-C034	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	FUSE: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. Y.
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	Somerville, 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. Miniat. 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	Thermolloy	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 Dublier 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.	Kokomo, 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	Code No.	Manufacturer	Address	Code No.	Manufacturer	Address
17870	McGraw-Edison Co.	Manchester, N.H.	62119	Universal Electric Co	Owosso, Mich.	73899	JFD Electronics Corp	Brooklyn, N.Y.
18042	Power Design Pacific Inc.	Palo Alto, Calif.	63743	Ward-Leonard Electric Co.	Mt. Vernon, N.Y.	73905	Jennings Radio Mfg. Corp.	San Jose, Calif.
18083	Clevite Corp., Semiconductor Div.		64959	Western Electric Co., Inc.	New York, N.Y.	73957	Groov-Pin Corp.	Ridgefield, N.J.
		Palo Alto, Calif.	65092	Weston Inst. Inc. Weston-Newark	Newark, N.J.	74276	Signalite Inc.	Neptune, N.J.
18324	Signetics Corp.	Sunnyvale, Calif.	66295	Wittek Mfg. Co.	Chicago, Ill.	74455	J.H. Winns, and Sons	Winchester, Mass.
18476	Ty-Car Mfg. Co., Inc.	Holliston, Mass.	66346	Minnesota Mining & Mfg. Co. Revere Mincom Div.		74861	Industrial Condenser Corp.	Chicago, Ill.
18486	TRW Elect Comp. Div.	Des Plaines, Ill.			St. Paul, Minn.	74868	R F. Products Division of Amphenol-Borg	
18583	Curtis Instrument, Inc.	Mt. Kisco, N.Y.	70276	Allen Mfg Co.	Hartford, Conn		Electronics Corp.	Danbury, Conn.
18612	Vishay Instruments Inc.	Malvern, Pa.	70309	Allied Control	New York, N.Y.	74970	E. F Johnson Co.	Waseca, Minn.
18873	E.I. DuPont and Co., Inc.	Wilmington, Del.	70318	Allmetal Screw Product Co., Inc.		75042	International Resistance Co.	Philadelphia, Pa.
18911	Durant Mfg. Co.	Milwaukee, Wis.			Garden City, N.Y.	75263	Keystone Carbon Co., Inc.	St. Marys, Pa.
19315	The Bendix Corp., Navigation & Control Div.		70417	Amplex, Div. of Chrysler Corp.	Detroit, Mich.	75378	CTS Knights Inc.	Sandwich, Ill.
		Teterboro, N.J.	70485	Atlantic India Rubber Works, Inc	Chicago, Ill.	75382	Kulka Electric Corporation	Mt Vernon, N.Y.
19500	Thomas A. Edison Industries, Div. of		70563	Amperite Co , Inc.	Union City, N.J.	75818	Lenz Electric Mfg Co.	Chicago, Ill.
	McGraw-Edison Co.	West Orange, N.J.	70674	ADC Products Inc.	Minneapolis, Minn.	75915	Littlefuse, Inc.	Des Plaines, Ill.
19589	Concoa	Baldwin Park, Calif.	70903	Belden Mfg. Co.	Chicago, Ill.	76005	Lord Mfg. Co.	Erie, Pa.
19644	LRC Electronics	Horseheads, N.Y.	70998	Bird Electronic Corp	Cleveland, Ohio	76210	C.W Marwedel	San Francisco, Calif.
19701	Electra Mfg. Co.	Independence, Kansas	71002	Birnbach Radio Co	New York, N.Y.	76433	General Instrument Corp., Micamold Division	
20183	General Atronics Corp.	Philadelphia, Pa.	71034	Bliley Electric Co., Inc.	Erie, Pa.			Newark, N.J.
21226	Executone, Inc.	Long Island City, N.Y.	71041	Boston Gear Works Div. of Murray Co		76487	James Millen Mfg Co., Inc.	Malden, Mass.
21335	Fafnir Bearing Co., The	New Britain, Conn.		of Texas	Quincy, Mass.	76493	J.W Miller Co.	Los Angeles, Calif.
21520	Fansteel Metallurgical Corp.	N. Chicago, Ill.	71218	Bud Radio, Inc.	Willoughby, Ohio	76530	Cinch-Monadnock, Div. of United Carr	
23042	Texscan Corp.	Indianapolis, Ind.	71279	Cambridge Thermionics Corp.	Cambridge, Mass.		Fastener Corp.	San Leandro, Calif.
23783	British Radio Electronics Ltd.	Washington, D.C.	71286	Camloc Fastener Corp.	Paramus, N.J.	76545	Mueller Electric Co.	Cleveland, Ohio
24455	G.E. Lamp Division		71313	Cardwell Condenser Corp.		76703	National Union	Newark, N.J.
		Nela Park, Cleveland, Ohio			Lindenhurst L.I., N.Y.	76854	Oak Manufacturing Co.	Crystal Lake, Ill.
24655	General Radio Co.	West Concord, Mass.	71400	Bussmann Mfg. Div. of McGraw-Edison Co.		77068	The Bendix Corp., Electrodynamics Div.	
24681	Memcor Inc., Comp. Div.	Huntington, Ind.			St. Louis, Mo.			N. Hollywood, Calif.
24796	Parelco Inc.	San Juan Capistrano, Calif.	71436	Chicago Condenser Corp.	Chicago, Ill.	77075	Pacific Metals Co.	San Francisco, Calif.
26365	Gries Reproducer Corp.	New Rochelle, N.Y.	71447	Calif. Spring Co , Inc.	Pico-Rivera, Calif.	77221	Phanostran Instrument and Electronic Co.	
26462	Grobet File Co of America, Inc.		71450	CTS Corp.	Elkhart, Ind.			South Pasadena, Calif.
		Carlstadt, N.J.	71468	ITT Cannon Electric Inc.	Los Angeles, Calif.	77252	Philadelphia Steel and Wire Corp.	
26851	Compac/Hollister Co.	Hollister, Calif.	71471	Cinema, Div. Aerovox Corp.	Burbank, Calif.			Philadelphia, Pa.
26992	Hamilton Watch Co.	Lancaster, Pa.	71482	C.P. Clare & Co.	Chicago, Ill.	77342	American Machine & Foundry Co. Potter	
27251	Specialties Mfg. Co , Inc.	Stratford, Conn.	71590	Centralab Div. of Globe Union Inc.			& Brumfield Div	Princeton, Ind.
28480	Hewlett-Packard Co.	Palo Alto, Calif.			Milwaukee, Wis.	77630	TRW Electronic Components Div.	Camden, N.J
28520	Heyman Mfg. Co.	Kenilworth, N.J.	71616	Commercial Plastics Co	Chicago, Ill.	77638	General Instrument Corp., Rectifier Div.	
30817	Instrument Specialties Co., Inc.		71700	Cornish Wire Co., The	New York, N.Y.			Brooklyn, N Y
		Little Falls, N.J.	71707	Coto Coil Co., Inc.	Providence, R.I.	77764	Resistance Products Co.	Harrisburg, Pa
33173	G.E. Receiving Tube Dept.	Owensboro, Ky.	71744	Chicago Miniature Lamp Works	Chicago, Ill.	77969	Rubbercraft Corp. of Calif.	Torrance, Calif.
35434	Lectrohm Inc.	Chicago, Ill.	71785	Cinch Mfg. Co., Howard B. Jones Div.		78189	Shakeproof Division of Illinois Tool Works	
36196	Stanwyck Coil Products Ltd.				Chicago, Ill.			Elgin, Ill.
		Hawkesbury, Ontario, Canada	71984	Dow Corning Corp.	Midland, Mich	78277	Sigma	So. Braintree, Mass.
36287	Cunningham, W.H. & Hill, Ltd.		72136	Electro Motive Mfg. Co., Inc.	Willimantic, Conn.	78283	Signal Indicator Corp.	New York, N.Y.
		Toronto Ontario, Canada	72619	Dialight Corp.	Brooklyn, N.Y	78290	Struthers-Dunn Inc.	Pitman, N.J.
37942	P.R. Mallory & Co. Inc.	Indianapolis, Ind.	72656	Indiana General Corp , Electronics Div.		78424	Specialty Leather Prod. Co	Newark, N.J.
39543	Mechanical Industries Prod. Co.	Akron, Ohio			Keasby, N.J.	78452	Thompson-Bremer & Co.	Chicago, Ill.
40920	Miniature Precision Bearings, Inc.	Keene, N.H.	72699	General Instrument Corp., Cap. Div. Newark, N.J.		78471	Tilley Mfg. Co.	San Francisco, Calif.
42190	Muter Co.	Chicago, Ill.	72765	Drake Mfg Co.	Harwood Heights, Ill.	78488	Stackpole Carbon Co.	St. Marys, Pa.
43990	C.A. Norgren Co.	Englewood, Colo.	72825	Hugh H. Eby Inc.	Philadelphia, Pa.	78493	Standard Thomson Corp.	Waltham, Mass.
44655	Ohmite Mfg. Co.	Skokie, Ill.	72928	Gudeman Co	Chicago, Ill.	78553	Tinnerman Products, Inc.	Cleveland, Ohio
46384	Penn Eng. & Mfg. Corp.	Doylestown, Pa.	72962	Elastic Stop Nut Corp.	Union, N.J.	78790	Transformer Engineers	San Gabriel, Calif.
47904	Polaroid Corp.	Cambridge, Mass.	72964	Robert M. Hadley Co.	Los Angeles, Calif.	78947	Ucinite Co.	Newtonville, Mass.
48620	Precision Thermometer & Inst. Co.		72982	Erie Technological Products, Inc.	Erie, Pa.	79136	Waldes Kohinoor Inc.	Long Island City, N.Y.
		Southampton, Pa.	73061	Hansen Mfg. Co., Inc.	Princeton, Ind.	79142	Veeder Root, Inc.	Hartford, Conn.
49956	Microwave & Power Tube Div.	Waltham, Mass.	73076	H.M. Harper Co.	Chicago, Ill.	79251	Wenco Mfg Co.	Chicago, Ill.
52090	Rowan Controller Co.	Westminster, Md.	73138	Helipot Div. of Beckman Inst., Inc.		79727	Continental-Wirt Electronics Corp.	
52983	Sanborn Company	Waltham, Mass.			Fullerton, Calif.			Philadelphia, Pa.
54294	Shallcross Mfg. Co.	Selma, N.C.	73293	Hughes Products Division of Hughes		79963	Zierick Mfg. Corp	New Rochelle, N.Y.
55026	Simpson Electric Co.	Chicago, Ill.		Aircraft Co.	Newport Beach, Calif.	80031	Mepco Division of Sessions Clock Co.	
55933	Sonotone Corp	Elmsford, N.Y.	73445	Amperex Elect Co.	Hicksville, L.I., N.Y.			Morristown, N.J.
55938	Raytheon Co. Commercial Apparatus &		73506	Bradley Semiconductor Corp	New Haven, Conn	80120	Schnitzer Alloy Products Co.	Elizabeth, N.J.
	Systems Div	So. Norwalk, Conn.	73559	Carling Electric, Inc	Hartford, Conn.	80131	Electronic Industries Association. Any brand	
56137	Spaulding Fibre Co., Inc.	Tonawanda, N.Y.	73586	Circle F Mfg. Co.	Trenton, N.J.		Tube meeting EIA Standards-Washington, DC.	
56289	Sprague Electric Co.	North Adams, Mass.	73682	George K Garrett Co., Div MSL		80207	Unimax Switch, Div. Maxon Electronics Corp.	
59446	Telex Corp.	Tulsa, Okla.		Industries Inc.	Philadelphia, Pa.			Wallingford, Conn.
59730	Thomas & Betts Co.	Elizabeth, N.J.	73734	Federal Screw Products Inc.	Chicago, Ill.	80223	United Transformer Corp	New York, N.Y.
60741	Triplett Electrical Inst. Co.	Bluffton, Ohio	73743	Fischer Special Mfg. Co.	Cincinnati, Ohio	80248	Oxford Electric Corp.	Chicago, Ill.
61775	Union Switch and Signal, Div. of		73793	General Industries Co , The	Elyria, Ohio	80294	Bourns Inc.	Riverside, Calif.
	Westinghouse Air Brake Co.	Pittsburgh, Pa.	73846	Goshen Stamping & Tool Co.	Goshen, Ind.	80411	Acro Div. of Robertshaw Controls Co.	
								Columbus, Ohio

Table 7-3. Code List of Manufacturers (Continued)

Code No.	Manufacturer	Address	Code No.	Manufacturer	Address	Code No.	Manufacturer	Address
80486	All Star Products Inc.	Defiance, Ohio	86684	Radio Corp. of America, Electronic Comp. & Devices Div.	Harrison, N.J.	95566	Arnold Engineering Co.	Marengo, Ill.
80509	Avery Label Co.	Monrovia, Calif.				95712	Dage Electric Co., Inc.	Franklin, Ind.
80583	Hammarlund Co., Inc.	Mars Hill, N.C.	86928	Seastrom Mfg. Co.	Glendale, Calif.	95984	Siemon Mfg. Co.	Wayne, Ill.
80640	Stevens, Arnold, Co., Inc.	Boston, Mass.	87034	Marco Industries	Anaheim, Calif.	95987	Weckesser Co.	Chicago, Ill.
80813	Dimco Gray Co.	Dayton, Ohio	87216	Philco Corporation (Lansdale Division)	Lansdale, Pa.	96067	Microwave Assoc., West Inc.	Sunnyvale, Calif.
81030	International Instruments Inc.	Orange, Conn.				96095	Hi-Q Div. of Aerovox Corp.	Olean, N.Y.
81073	Grayhill Co.	LaGrange, Ill.	87473	Western Fibrous Glass Products Co.	San Francisco, Calif.	96256	Thordarson-Meissner Inc.	Mt. Carmel, Ill.
81095	Triad Transformer Corp.	Venice, Calif.	87664	Van Waters & Rogers Inc.	San Francisco, Calif.	96296	Solar Manufacturing Co.	Los Angeles, Calif.
81312	Winchester Elec. Div. Litton Ind., Inc.	Oakville, Conn.	87930	Tower Mfg. Corp.	Providence, R.I.	96306	Microswitch, Div. of Minn.–Honeywell	Freeport, Ill.
81349	Military Specification	. . . . . .	88140	Cutler-Hammer, Inc.	Lincoln, Ill.	96330	Carlton Screw Co.	Chicago, Ill.
81483	International Rectifier Corp.	El Segundo, Calif.	88220	Gould-National Batteries, Inc.	St. Paul, Minn.	96341	Microwave Associates, Inc.	Burlington, Mass.
81541	Airpax Electronics, Inc.	Cambridge, Maryland	88698	General Mills, Inc.	Buffalo, N.Y.	96501	Excel Transformer Co.	Oakland, Calif.
81860	Barry Controls, Div. Barry Wright Corp.	Watertown, Mass.	89231	Graybar Electric Co.	Oakland, Calif.	96733	San Fernando Elect. Mfg. Co.	San Fernando, Calif.
82042	Carter Precision Electric Co.	Skokie, Ill.	89473	G.E. Distributing Corp.	Schenectady, N.Y.	96881	Thomson Ind. Inc.	Long Is., N.Y.
82047	Sperti Faraday Inc., Copper Hewitt Electric Div.	Hoboken, N.J.	89665	United Transformer Co.	Chicago, Ill.	97464	Industrial Retaining Ring Co.	Irvington, N.J.
82116	Electric Regulator Corp.	Norwalk, Conn.	90030	United Shoe Machinery Corp.	Beverly, Mass.	97539	Automatic & Precision Mfg.	Englewood, N.J.
82142	Jeffers Electronics Division of Speer Carbon Co.	Du Bois, Pa.	90179	US Rubber Co., Consumer Ind. & Plastics Prod. Div.	Passaic, N.J.	97979	Reon Resistor Corp.	Yonkers, N.Y.
82170	Fairchild Camera & Inst. Corp. Space & Defense System Div.	Paramus, N.J.	90970	Bearing Engineering Co.	San Francisco, Calif.	97983	Litton System Inc., Adler-Westrex Commun. Div.	New Rochelle, N.Y.
82209	Maguire Industries, Inc.	Greenwich, Conn.	91146	ITT Cannon Elect., Inc., Salem Div.	Salem, Mass.	98141	R-Troncis, Inc.	Jamaica, N.Y.
82219	Sylvania Electric Prod. Inc. Electronic Tube Division	Emporium, Pa.	91260	Connor Spring Mfg. Co.	San Francisco, Calif.	98159	Rubber Teck, Inc.	Gardena, Calif.
82376	Astron Corp.	East Newark, Harrison, N.J.	91345	Miller Dial & Nameplate Co.	El Monte, Calif.	98220	Hewlett-Packard Co., Moseley Div.	Pasadena, Calif.
82389	Switchcraft, Inc.	Chicago, Ill.	91418	Radio Materials Co.	Chicago, Ill.	98278	Microdot, Inc.	So. Pasadena, Calif.
82647	Metals & Controls Inc. Spencer Products	Attleboro, Mass.	91506	Augat Inc.	Attleboro, Mass.	98291	Sealectro Corp.	Mamaroneck, N.Y.
82768	Phillips-Advance Control Co.	Joliet, Ill.	91637	Dale Electronics, Inc.	Columbus, Nebr.	98376	Zero Mfg. Co.	Burbank, Calif.
82866	Research Products Corp.	Madison, Wis.	91662	Elco Corp.	Willow Grove, Pa.	98410	Etc Inc.	Cleveland, Ohio
82877	Rotron Mfg. Co., Inc.	Woodstock, N.Y.	91737	Gremar Mfg. Co., Inc.	Wakefield, Mass.	98731	General Mills Inc., Electronics Div.	Minneapolis, Minn.
82893	Vector Electronic Co.	Glendale, Calif.	91827	K F Development Corp.	Redwood City, Calif.	98734	Paeco Div. of Hewlett-Packard Co.	Palo Alto, Calif.
83014	Hartwell Corp	Los Angeles, Calif.	91886	Malco Mfg. Co., inc.	Chicago, Ill.	98821	North Hills Electronics, Inc.	Glen Cove, N.Y.
83058	Carr Fastener Co.	Cambridge, Mass.	91929	Honeywell Inc., Micro Switch Div.	Freeport, Ill.	98978	International Electronic Research Corp.	Burbank, Calif.
83086	New Hampshire Ball Bearing, Inc.	Peterborough, N.H.	91961	Nahm-Bros. Spring Co.	Oakland, Calif.	99109	Columbia Technical Corp.	New York, N.Y.
83125	General Instrument Corp., Capacitor Div.	Darlington, S.C.	92180	Tru-Connector Corp.	Peabody, Mass.	99313	Varian Associates	Palo Alto, Calif.
83148	ITT Wire and Cable Div.	Los Angeles, Calif.	92367	Elgeet Optical Co. Inc.	Rochester, N.Y.	99378	Atlee Corp.	Winchester, Mass.
83186	Victory Eng. Corp.	Springfield, N.J.	92607	Tensolite Insulated Wire Co., Inc.	Tarrytown, N.Y.	99515	Marshall Ind., Capacitor Div.	Monrovia, Calif.
83298	Bendix Corp., Red Bank Div.	Red Bank, N.J.	92702	IMC Magnetics Corp.	Wesbury Long Island, N.Y.	99707	Control Switch Division, Controls Co. of America	El Segundo, Calif.
83315	Hubbell Corp.	Mundelein, Ill.	92966	Hudson Lamp Co.	Kearney, N.J.	99800	Delevan Electronics Corp.	East Aurora, N.Y.
83324	Rosan Inc.	Newport Beach, Calif.	93332	Sylvania Electric Prod. Inc. Semiconductor Div.	Woburn, Mass.	99848	Wilco Corporation	Indianapolis, Ind.
83330	Smith, Herman H., Inc.	Brooklyn, N.Y.	93369	Robbins & Myers Inc.	Palisades Park, N.J.	99928	Branson Corp.	Whippany, N.J.
83332	Tech Labs	Palisade's Park, N.J.	93410	Stemco Controls, Div. of Essex Wire Corp.	Mansfield, Ohio	99934	Renbrandt, Inc.	Boston, Mass.
83385	Central Screw Co.	Chicago, Ill.	93632	Waters Mfg. Co.	Culver City, Calif.	99942	Hoffman Electronics Corp. Semiconductor Div	El Monte, Calif.
83501	Gavitt Wire and Cable Co. Div. of Amerace Corp.	Brookfield, Mass.	93929	G V. Controls	Livingston, N.J.	99957	Technology Instrument Corp. of Calif.	Newbury Park, Calif.
83594	Burroughs Corp. Electronic Tube Div.	Plainfield, N.J.	94137	General Cable Corp.	Bayonne, N.J.			
83740	Union Carbide Corp. Consumer Prod. Div.	New York, N.Y.	94142	Phelps Dodge	Yonkers, N.Y.			
83777	Model Eng. and Mfg., Inc.	Huntington, Ind.	94144	Raytheon Co., Comp. Div., Ind. Comp. Operations	Quincy, Mass.			
83821	Loyd Scruggs Co.	Festus, Mo.	94148	Scientific Electronics Products, Inc.	Loveland, Colo.			
83942	Aeronautical Inst. & Radio Co.	Lodi, N.J.	94154	Wagner Elect. Corp., Tung-Sol Div.	Newark, N.J.	THE FOLLOWING HP VENDORS HAVE NO NUMBER ASSIGNED IN THE LATEST SUPPLEMENT TO THE FEDERAL SUPPLY CODE FOR MANUFACTURERS HANDBOOK.		
84171	Arco Electronics Inc.	Great Neck, N.Y.	94197	Curtiss-Wright Corp. Electronics Div.	East Paterson, N.J.			
84396	A.J. Glesener Co., Inc.	San Francisco, Calif.	94222	South Chester Corp.	Chester, Pa.			
84411	TRW Capacitor Div.	Ogallala, Neb.	94330	Wire Cloth Products, Inc.	Bellwood, Ill.			
84970	Sarkes Tarzian, Inc.	Bloomington, Ind.	94375	Automatic Metal Products Co.	Brooklyn, N.Y.	0000F	Malco Tool and Die	Los Angeles, Calif.
85454	Boonton Molding Company	Boonton, N.J.	94682	Worcester Pressed Aluminum Corp.	Worcester, Mass.	0000Z	Willow Leather Products Corp.	Newark, N.J.
85471	A.B. Boyd Co.	San Francisco, Calif.	94696	Magnecraft Electric Co.	Chicago, Ill.	000AB	ETA	England
85474	R.M. Bracamonte & Co.	San Francisco, Calif.	95023	George A. Philbrick Researchers, Inc.	Boston, Mass.	000BB	Precision Instrument Components Co.	Van Nuys, Calif.
85660	Koiled Kords, Inc.	Hamden, Conn.	35236	Allies Products Corp.,	Dania, Fla.	000CS	Hewlett-Packard Co., Colorado Springs	Colorado Springs, Colorado
85911	Seamless Rubber Co.	Chicago, Ill.	95238	Continental Connector Corp.	Woodside, N.Y.	000MM	Rubber Eng. & Development	Hayward, Calif.
86174	Fafnir Bearing Co.	Los Angeles, Calif.	95263	Leecraft Mfg. Co., Inc.	Long Island, N.Y.	000NN	A "N" D Mfg. Co.	San Jose, Calif.
86197	Clifton Precision Products Co., Inc.	Clifton Heights, Pa.	95265	National Coil Co.	Sheridan, Wyo.	000QQ	Cooltron	Oakland, Calif.
86579	Precision Rubber Products Corp.	Dayton, Ohio	95275	Vitramon, Inc.	Bridgeport, Conn.	000WW	California Eastern Lab.	Burlington, Calif.
			95348	Gordos Corp.	Bloomfield, N.J.	000YY	S.K Smith Co.	Los Angeles, Calif.
			95354	Methode Mfg. Co.	Rolling Meadows, Ill.			

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 con-
necting 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.
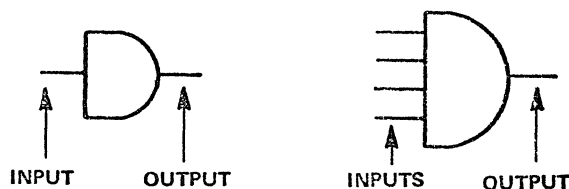
2039-25

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.
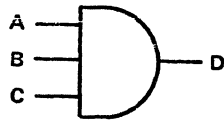
2039-26

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.
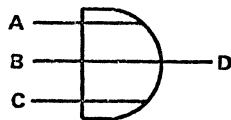
203S-27

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
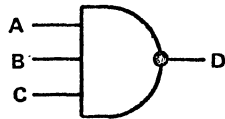
A	B	C	D
0	0	0	1
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	0

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
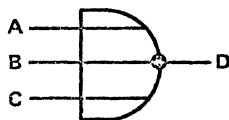
A	B	C	D
0	0	0	1
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	0

Table A-4. Truth Table for Three Input ''Nor'' Gate

A-15.   <u>EXPANDER GATES</u>.

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.
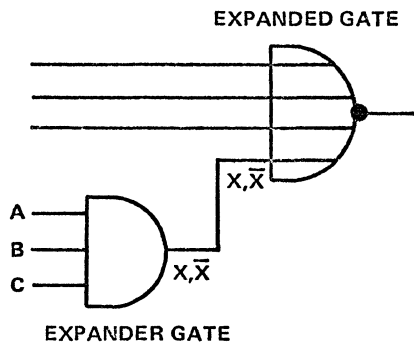
Figure A-6. Simplified Expander
Gate Presentation
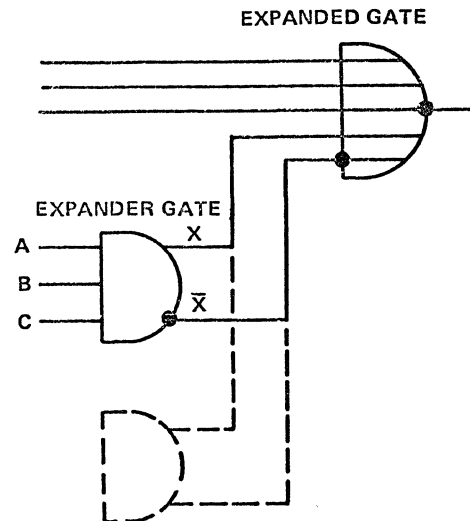
Figure A-7. Actual Expander
Gate Configuration

A-17.   <u>REGENERATIVE SWITCHING ELEMENTS</u>.

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.
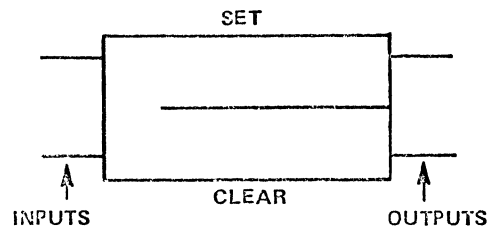
2039-32

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).   A-5

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.

DIRECT SET
INPUT

SET ——————   SET
                                                        OUTPUT
CLOCK ————   C

CLEAR ————   CLEAR
                                                        OUTPUT

DIRECT CLEAR
INPUT
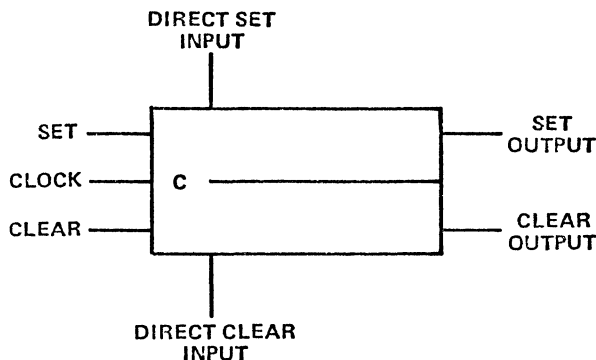
2039-33

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 inver-
sion 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 for-
bidden combination, since an indeterminate output state would result.
A truth table for the three allowable input combinations is shown
in Table A-5.

A ——————   —————— Q

B ——————   —————— $\overline{Q}$
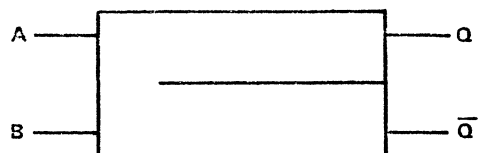
2039-34

A	B	Q	$\overline{Q}$
0	0	No	Change
1	0	1	0
0	1	0	1

Figure A-10. R-S Flip-Flop   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).
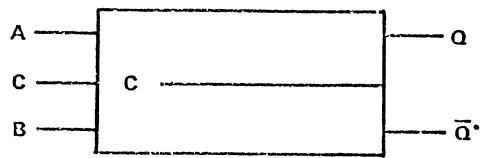
2039-35

Figure A-11. R-S Flip-Flop
          With Clock
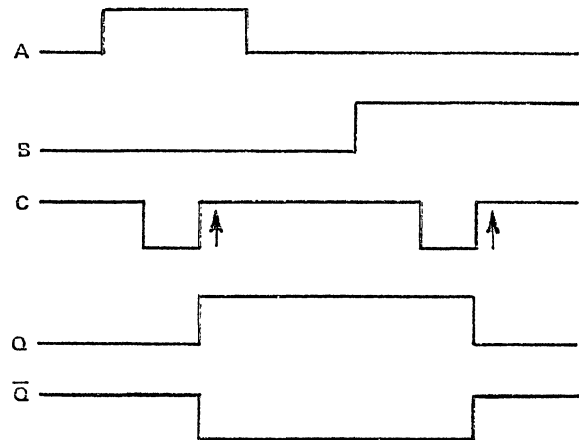
2039-36

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.
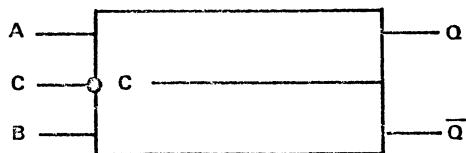
2039-37

Figure A-13. R-S Flip-Flop With
          an Inverted Clock
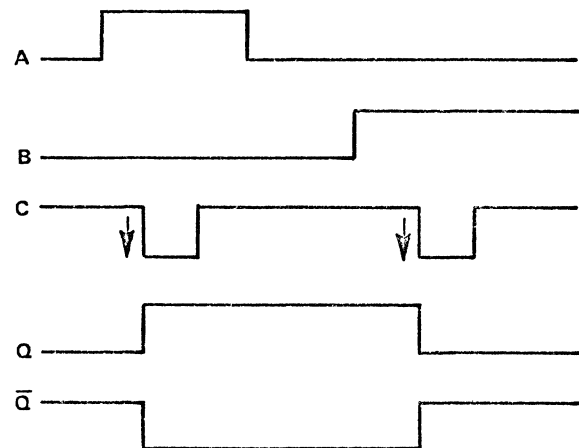
2039-38

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 out-
put 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.

2039-39
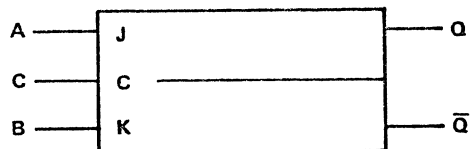
Figure A-15. J-K Flip-Flop

		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.

2039-40

Figure A-16. Toggle Flip-Flop
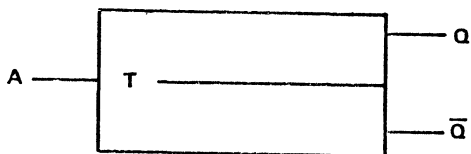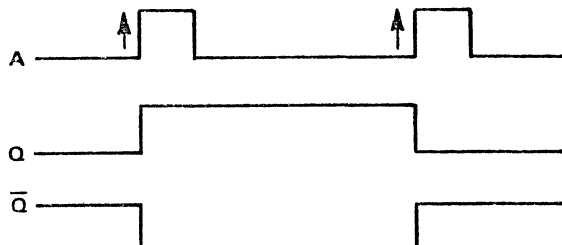
Figure A-17. Toggle Flip-Flop Switching
Waveforms

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).
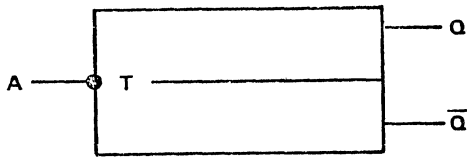
Figure A-18. Toggle Flip-Flop With Inverted Clock
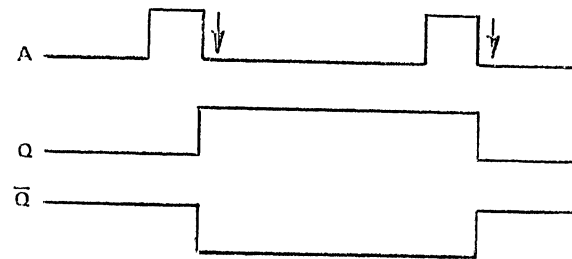
Figure A-19. Switching Waveforms For Toggle Flip-Flop With an Inverted Clock

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.
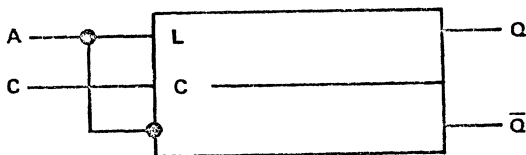
Figure A-20. Latching Flip-Flop
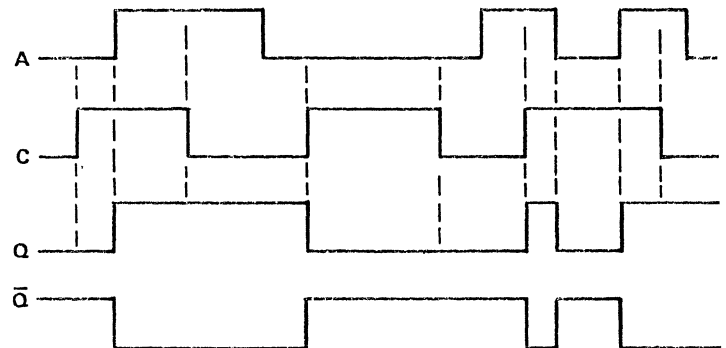
Figure A-21. Latching Flip-Flop Waveforms

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.

2039-46
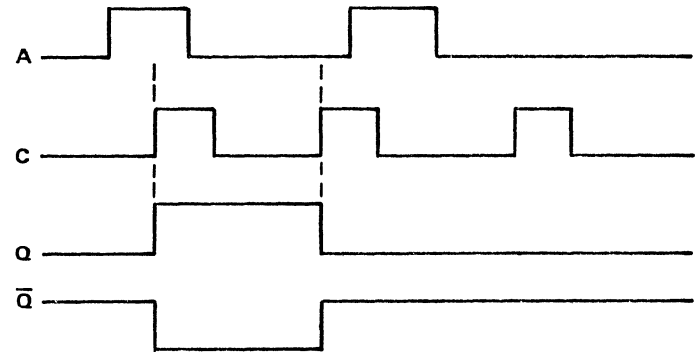
2039-47

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.
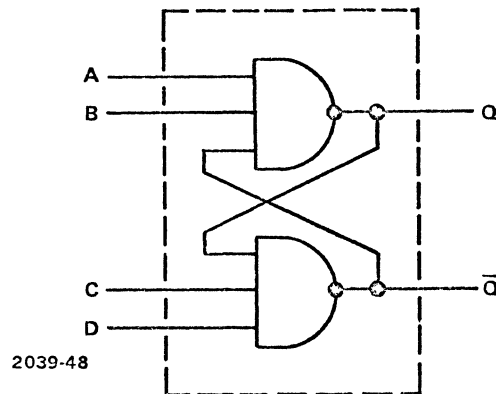
2039-48

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.

INPUT ————————▷———— OUTPUT

2039-49
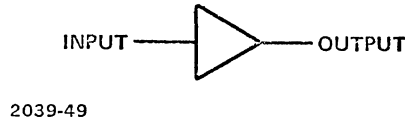
Figure A-25. Amplifier Symbol

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).

A ————▷———— C
B ————————— D

2039-50
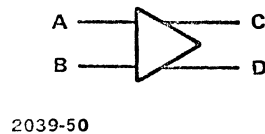
Figure A-26. Differential Amplifier
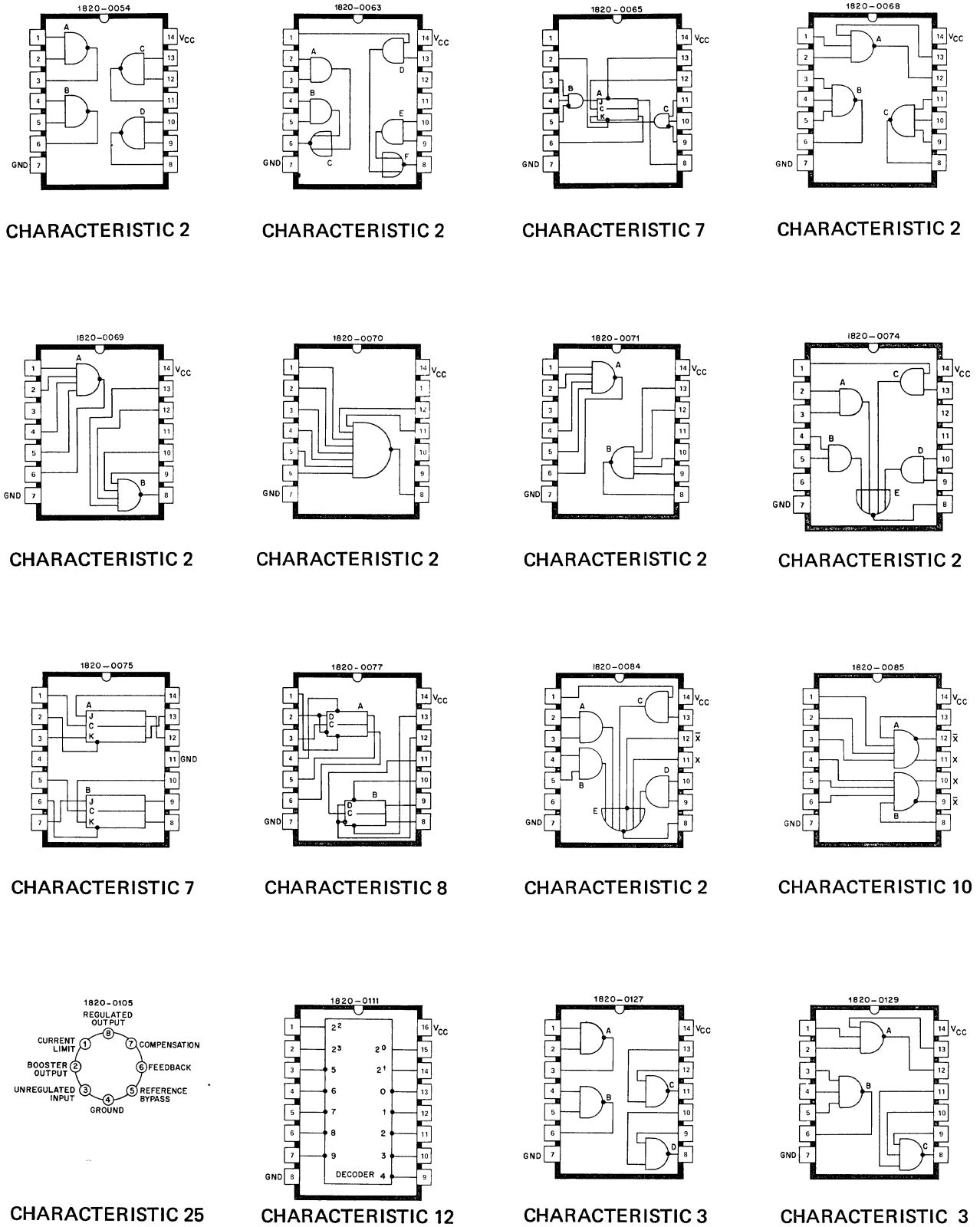
Figure A-27. Microcircuit Diagrams
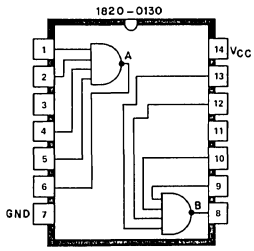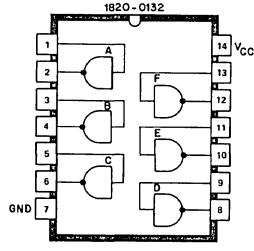
CHARACTERISTIC 3   CHARACTERISTIC 4   CHARACTERISTIC 26   CHARACTERISTIC 27
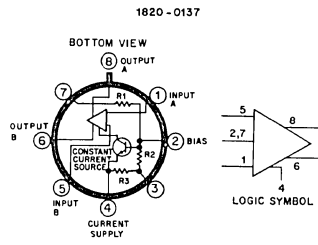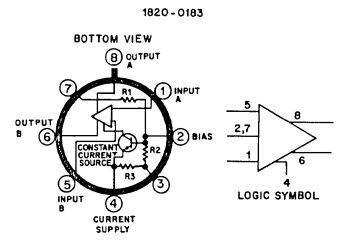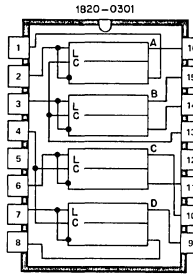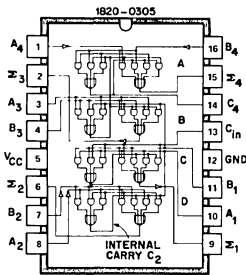
CHARACTERISTIC 9   CHARACTERISTIC 13   CHARACTERISTIC 24   CHARACTERISTIC 5
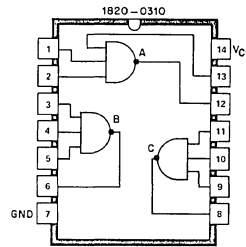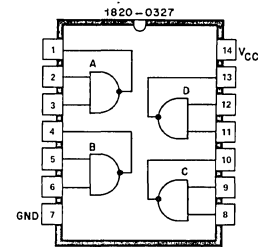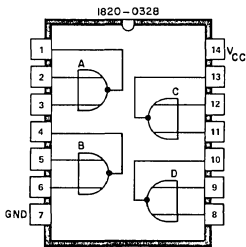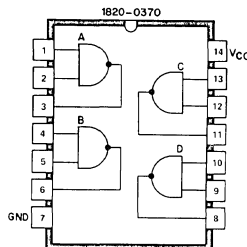
CHARACTERISTIC 2   CHARACTERISTIC 6   CHARACTERISTIC 6   CHARACTERISTIC 1
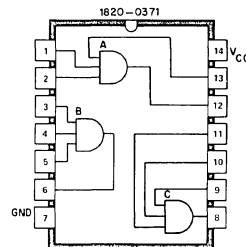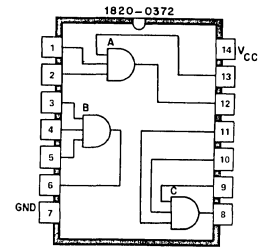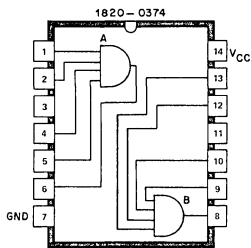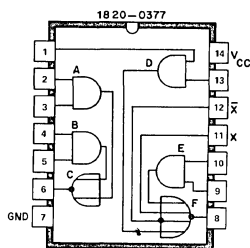
CHARACTERISTIC 1   CHARACTERISTIC 3   CHARACTERISTIC 3   CHARACTERISTIC 1
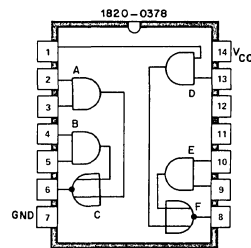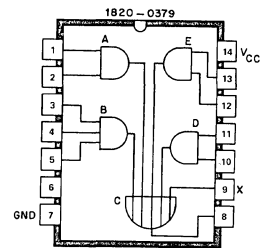
Figure A-27. Microcircuit Diagrams (Cont'd)
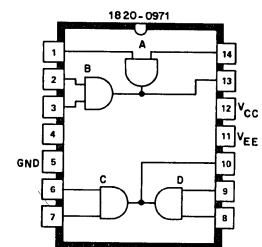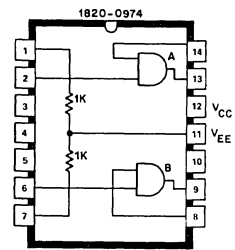
Figure A-27. Microcircuit Diagrams (Cont'd)
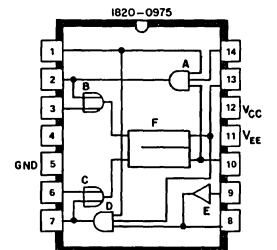
Figure A-27. Microcircuit Diagrams (Cont'd)

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 E to 0 = 35ns max.; to 1 = 40ns max.
                          Cin thru E 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   Output 0   = -0.36V max.(-0.5V nom)
                     min.
      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., 30ma 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.

NOTE: DELETE C101 FROM LEFT OF L101. ADD C101 ABOVE MC6
      AS SHOWN ABOVE.

2039-52
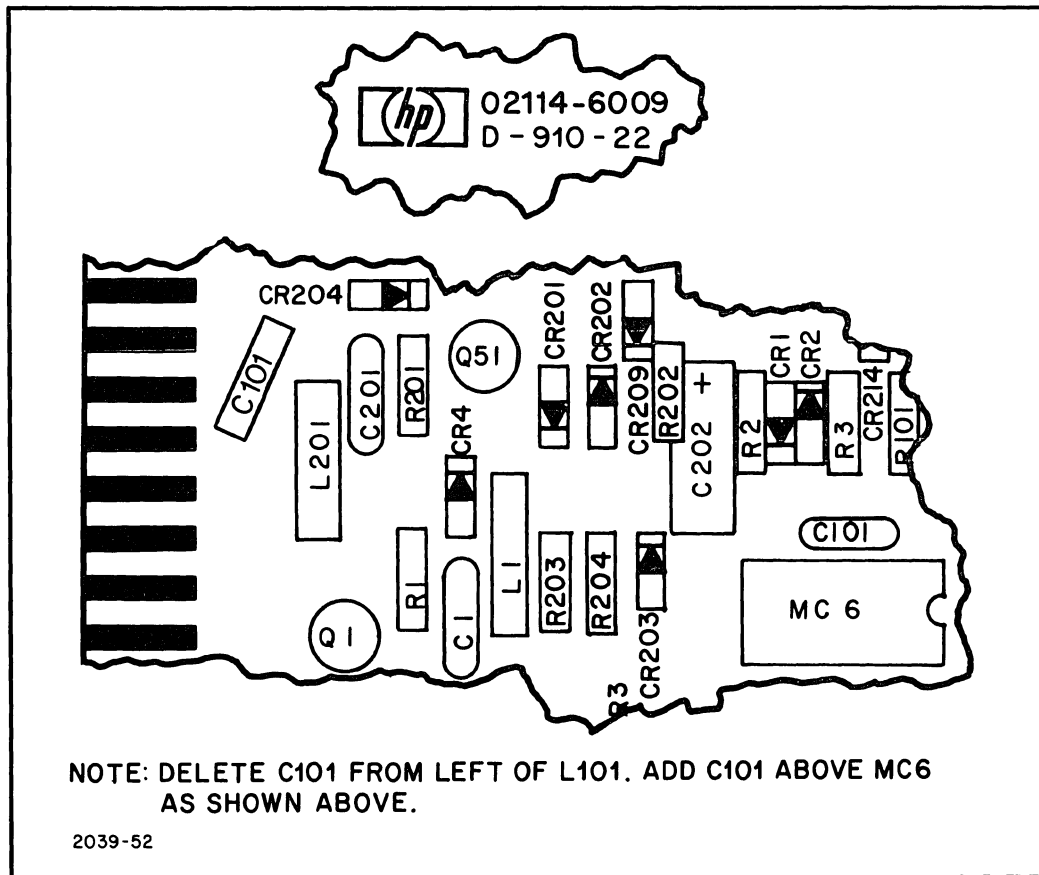
Figure B-1. Display Board (02114-6009), Partial Parts Location Diagram
        Showing Changes for Board Revision D-910-22

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

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

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	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
**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".
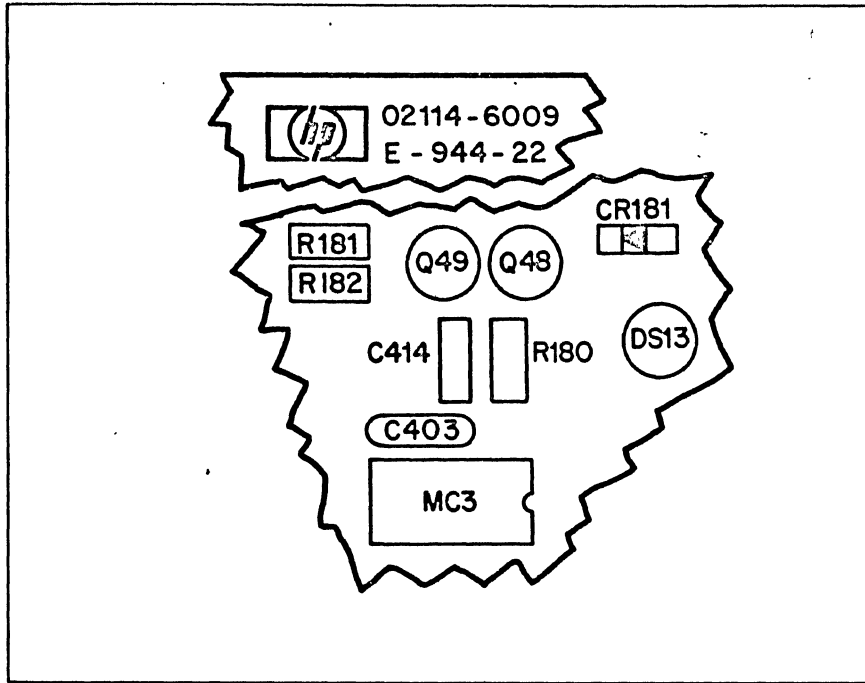
Figure 1. Display Board (02114-6009), Partial Part Location Diagram
Showing Changes for Board Revision E-944-22
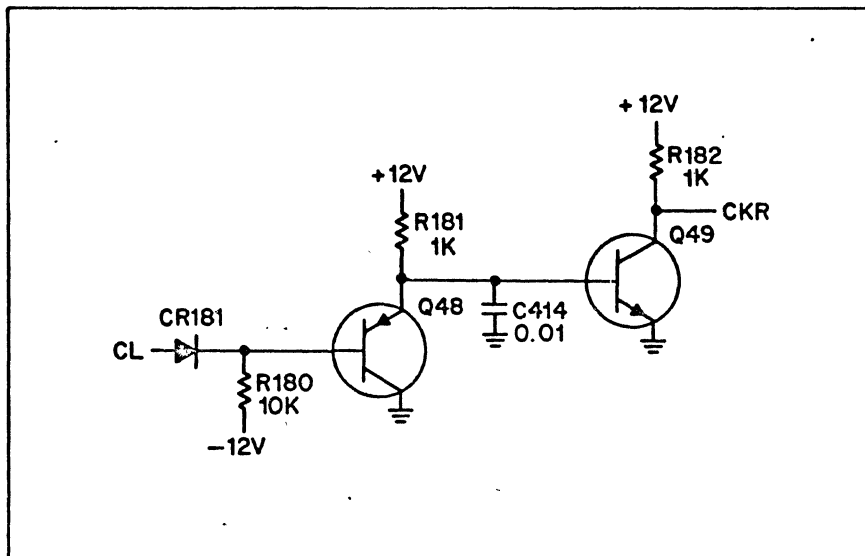
Figure 2. Display Board (02114-6009), Partial Schematic Diagram Showing
Changes for Board Revision E-944-22
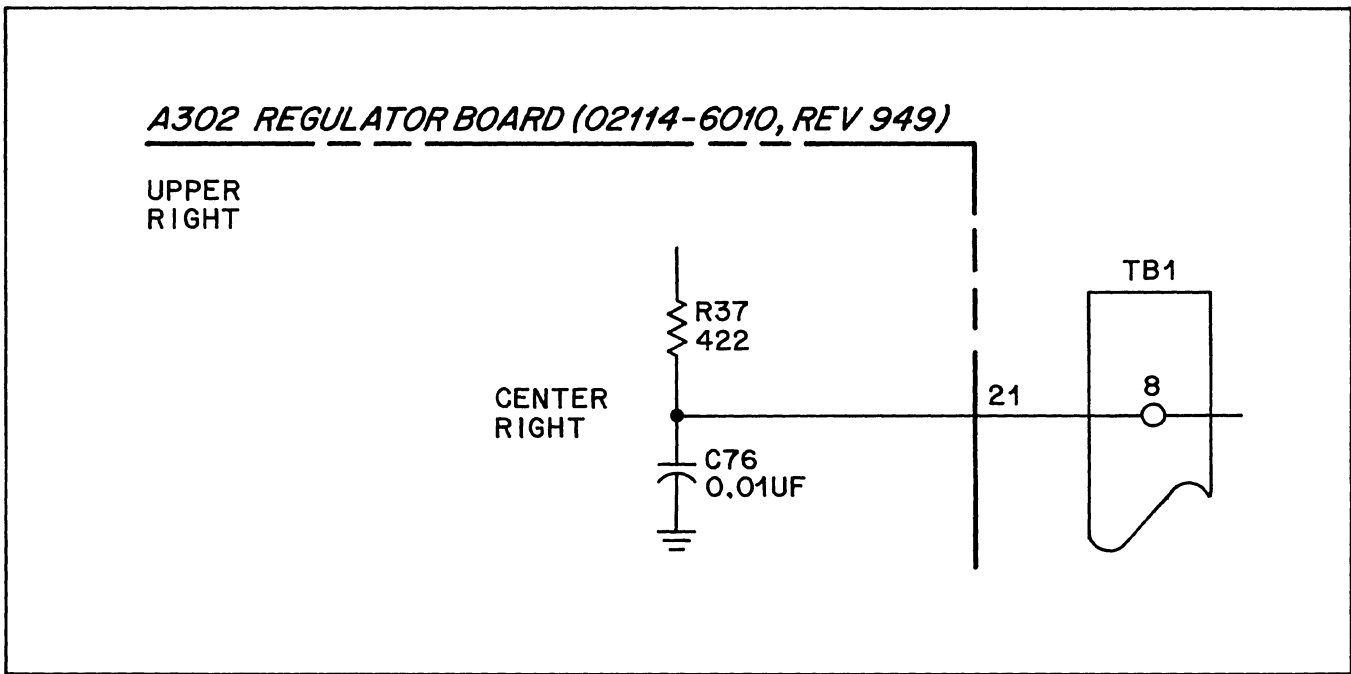
Figure 3. Voltage Regulator Card (02114-6010), Partial Part Location
Diagram Showing Changes for Board Revision A-949-22.
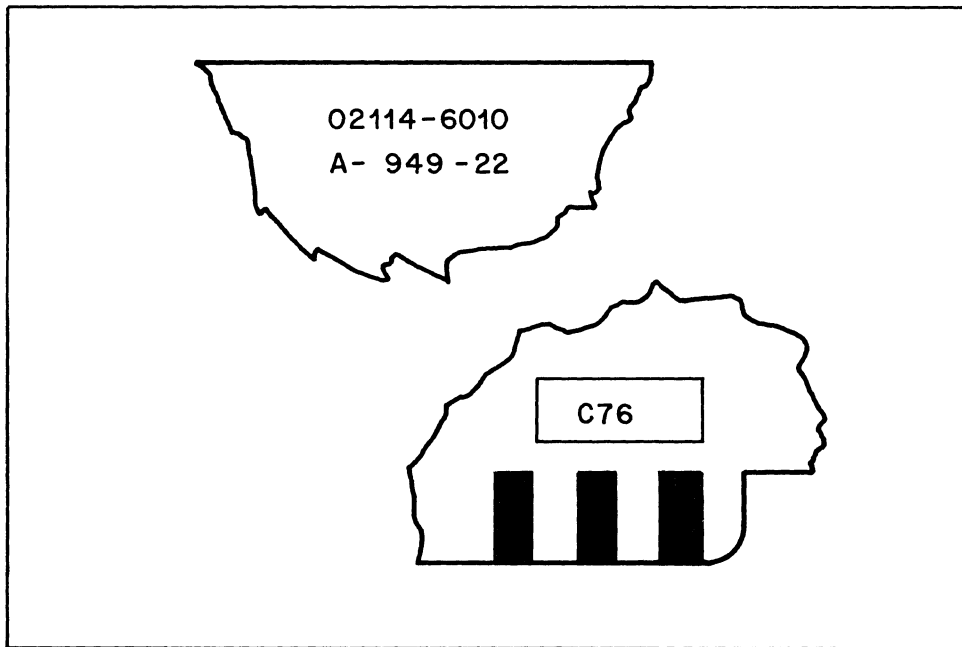
Figure 4. Voltage Regulator Card (02114-6010), Partial Schematic
Diagram Showing Changes for Board Revision A-949-22.

SHIFT-ROTATE INSTRUCTION TEST
Tape No. HP 20402D
Listing No. HP 20402D-

```
PAGE 0001

0001
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
INSAR   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
SH31    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*
```

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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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PAGE 0005 #01

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  P1020 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  P1021 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  P1022 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  P1023 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  P1024 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  P1025 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  P1026 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  P1027 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  000020  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  160740        OCT 160740
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  052515        OCT 52515
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 000020        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 000000        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 70
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 002304        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 002011        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 002311        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 002040        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        CCB,CCE     B=177777,E=1
0948  06367 005500        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
0984  06433 052146         CPA LPAT      INSTR. COMPLETED SEVEN PATTERNS?
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 026466         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
1048  06533 052146         CPA LPAT      SEVEN PATTERNS COMPLETED?
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 060001         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 066144         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 062150         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 102001         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 062600         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 062577         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 062577         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 062600         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 000040    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 002040    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 002040    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 006202    SZB
1205  06766 102001    HLT 01           ERB,CLE,SLB,ERB FAILED
1206  06767 002040    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 002040    SEZ
1214  06777 102001    HLT 01           E NOT =0
1215  07000 066167    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 002040    SEZ
1220  07005 102001    HLT 01           E NOT =0
1221  07006 066167    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 002040    SEZ
1226  07013 102001    HLT 01           E NOT =0
1227  07014 066167    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 002040    SEZ
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1233  07022 102001    HLT 01           E NOT
1234  07023 066167    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 002040    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 066600    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 066577    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 066577    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 066600    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 000040    CLE
1285  07104 026404    JMP START
1286                  END
** NO ERRORS*
```