Section 5

Central Processor Control Panels

This section describes the two kinds of operator control panels – full and basic – offered on Level 6 systems, panel options, controls and indicators, and the various functions that the operator can perform with these control panels.

PACKAGING

The physical configuration of the control panel is dependent upon the packaging of the central processor. Table-top models and systems in full (60-inch) cabinets will have protruding panels with the controls and indicators on an incline. Systems in the 30-inch "mini-rack" will have a flat control panel mounted vertically inside the front-door of the cabinet. Systems in the desk-style office packaging may have a flat control panel similar to the mini-rack, or a control panel mounted in the desk top behind the CRT keyboard. In the latter case, only a full control panel is allowed; the others may have either full or basic panels.

OEMs and system builders who wish to install a rack-mountable unit into their own cabinetry will get the protruding inclined panel unless they also order the vertical panel mounting option.

FULL CONTROL PANEL

Systems being used for program development and testing should be equipped with the full control panel (or basic control panel with the portable plug-in panel option). Full panel functionality is also required for maintenance purposes in systems that do not have a system console (CRT, teleprinter, or keyboard printer).

The full panel allows certain CP registers and the entire memory contents to be entered and displayed. It controls, in a step-by-step fashion, the system initialization sequence by single-stepping a program and stopping and starting program execution. The full control panel is standard on the Models 53 and 57.

Figure 5-1 shows the full control panel. Table 5-1 lists and describes the various controls and indicators.

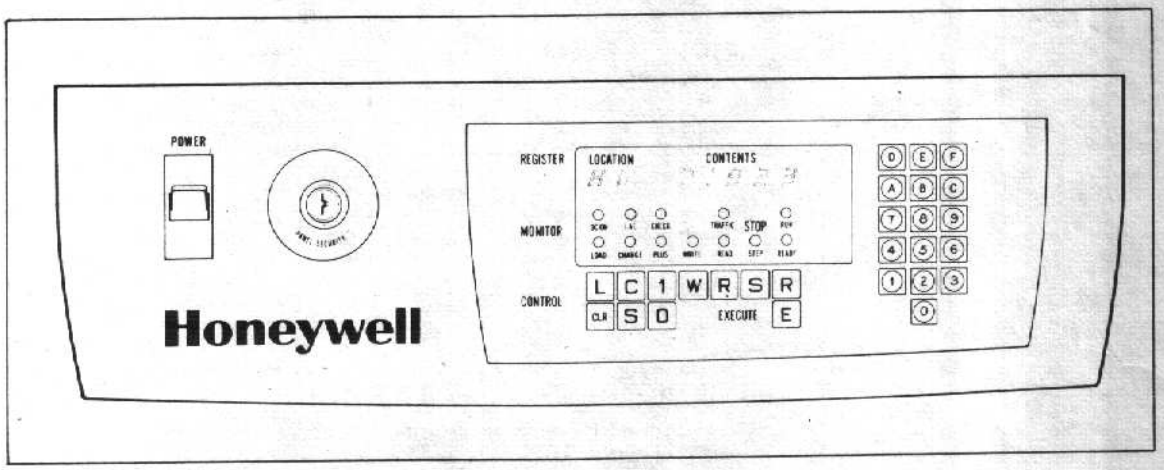


Figure 5-1. Full Control Panel

TABLE 5-1. FULL PANEL CONTROLS AND INDICATORS

Control/Indicator	Description
POWER (switch)	– Up for power on; down for power off.
PANEL SECURITY (switch)	– Left (locked) position disables panel switches and the register display (not lit) and push buttons except for POWER; right (unlocked) position enables panel switches/push buttons, and displays.
DC ON (indicator)	– Indicates dc power is applied to the CP.
CHECK (indicator)	– Indicates that one of the individual units (CP, controller, etc.) has not successfully completed QLT execution or that there is an unused bus slot not terminated.
TRAFFIC (indicator)	– Indicates that CP is executing instructions other than a Halt.
RUN (indicator)	– Indicates CP is executing any instruction, including a Halt. If TRAFFIC is off and RUN is on, the CP is continually executing a halt.
LOAD (indicator)	– Indicates the CP is in bootload mode.
CHANGE (indicator)	– Indicates control panel is in change mode, i.e., capable of modifying register contents.
PLUS (indicator)	– Indicates CP is in increment memory address mode. When off, memory address register is not modified during memory read or write mode.
WRITE (indicator)	– Indicates control panel is in memory write mode.
READ (indicator)	– Indicates control panel is in memory read mode.
STOP/STEP (indicator)	– Indicates CP is in single instruct mode.
READY (indicator)	– Indicates CP is in ready mode. Pressing the Execute key causes CP to go to run mode.
LAF (Long Address Form)[a] (indicator)	– Indicates CP is operating in the Long Address Form (i.e., 20-bit main memory addressing). It is also lit during system load independent of the setting of the LAF switch. If not lit, CP is operating in the SAF mode.
L (Load) (push button)	– Places the processor in load mode, lights Load, Check and Ready LED indicators, activates QLT, and allows bootstrapping of the bootstrap record into memory. Used in conjunction with Execute so that when Execute is pressed next, the QLT should be executed. Upon subsequent pressing of the Execute key the bootstrapping is actually performed.
C (Change) (push button)	– Places the processor in change mode. In this mode the processor is ready to accept modifications to the contents of the selected register from the control panel. NOTE: Not all visible registers are modifiable.
1 (Plus One) (push button)	– Places the processor in plus 1 mode. In this mode the processor is ready to increment its address register before reading or writing successive memory locations from the control panel. This condition is initiated only after setting the processor to either the read or write mode. When in the plus 1 mode, each pressing of Execute causes the memory address register (A0) to be incremented by 1, prior to its being used.

TABLE 5-1 (CONT). FULL PANEL CONTROLS AND INDICATORS

Control/Indicator	Description
W (Memory Write) (push button)	– First places the processor in a stop state (if not already in that state); clears the plus 1 mode (if in plus 1 mode); clears the load mode (if in load mode); and places the processor in write mode. In this mode the processor writes the contents of the selected register into the location addressed by the memory address register (A0), when Execute is pressed. (If A0 is selected, the contents of B0 are written.)
R (Memory Read) (push button)	– First places the processor in a stop state (if not already in that state); clears the plus 1 mode (if in plus 1 mode); and places the processor in read mode. In this mode the processor reads the contents of the location addressed by the memory address register (A0) into the selected register when Execute is pressed. (If A0 is selected, the contents are read into B0. If in *load* mode, reads the content of the Bootload ROM).
S (Stop) (push button)	– Stops instruction execution and places the processor in a stop state. When it is in the stop state, a variety of operating procedures are possible from the control panel. Also, when in the stop state, the processor is automatically in the step mode. In this mode one instruction is executed each time Execute is pressed, thus permitting single stepping through a program.
R (Ready) (push button)	– Places the processor in the ready mode. In this mode the processor is ready to execute a series of instructions constituting a program. If Execute is pressed, the processor enters the run state and commences execution of the program.
CLR (Master Clear) (push button)	– Initiated by pressing Clear but is not effective while in the run state. Pressing Clear invokes a number of clearing and initializing functions: 1. Clears to 0 the P register, the M registers, and the instruction register; does not clear to 0, but changes the SIP (P register) and SI register. 2. Clears all pending interrupts. 3. Stops the real-time clock (RTC) and the watchdog timer (WDT). 4. Sets the ring number to 0 and the interrupt priority level to 0. 5. Starts the Quality Logic Test (QLT) in each controller and SIP.
S (Select) (push button)	– Places the processor in select mode. In this mode the desired register that is to be displayed or operated on is selected by keying in the proper selection code from the hexadecimal-pad keys. The select mode may be initiated in any state.
0 (Plus Zero) (push button)	– Clears the plus 1 mode. In this mode the memory address register is not modified during a memory read or write operation.
E (Execute) (push button)	– Performs various execution functions depending on the mode that the processor is in prior to pressing Execute. In the *ready* mode, pressing Execute places the processor in a run state and it executes instructions starting with the instruction in the instruction register. If the instruction register contains a zero, execution begins at the address specified in the P register. Execution continues until Stop, Read, or Write is pressed. In the *step* mode, pressing Execute causes the execution of a single instruction. The processor returns to the stop mode after each single instruction execution. In the *read* or *write* mode, pressing Execution causes the selected memory location to be displayed or changed. In the *load* mode, pressing Execute causes initiation of a bootstrap operation.

TABLE 5-1 (CONT). FULL PANEL CONTROLS AND INDICATORS

Control/Indicator	Description
Configuration Switches[a]	— Four miniature rocker switches, located behind the full control panel on the control panel circuit board, supply configuration information to the central processing unit. Refer to Figure 5-6 for switch settings.

[a]Not used on the Model 23 or 33.

Register Display

Various registers may be accessed from the control panel. A hexadecimal display located in the upper center portion of the control panel, in the area labeled REGISTER, accommodates this capability. The register display is divided into two sections: one labeled LOCATION, the other CONTENTS.

- o LOCATION — A 2-digit hexadecimal display that indicates the coded location of the specific register selected. The selection codes assigned to access the visible registers are listed alphanumerically in Figure 5-2. A complete list of the selection codes is also stenciled on the control panel in the upper right-hand portion of the panel labeled REGISTERS.
- o CONTENTS — A 5-digit hexadecimal display that indicates the contents of the selected register. The specific visible register type/number associated with the assigned selection code is listed in the contents column of Figure 5-2.

The positional format of the location and contents display is represented by key symbols H1 through H7 at the bottom of Figure 5-2.

Hexadecimal-Pad Keys

The set of 16 hexadecimal keys in the right part of the control panel marked REGISTERS is called the hex pad. These keys provide access to the user-visible registers.

In the select mode, input from the hexadecimal-pad keys selects the register to be displayed/operated on. This input is simultaneously displayed in the LOCATION field on the display. Hexadecimal-pad keys 8 through F modify the leftmost location digit (H1); hexadecimal-pad keys 0—7 modify the rightmost location digit (H2).

In the change mode, input from the hexadecimal-pad keys changes the contents of the selected register. This input is simultaneously displayed in the CONTENTS field of the register display. Each key stroke shifts and loads the corresponding hexadecimal digit into the least significant hexadecimal position of the selected register and the display. Specifically, each hexadecimal-pad key stroke enters the new digit into the H6 (H7) position of the selected register and the CONTENT field of the register display. At the same time, the currently displayed characters (in all four/five positions) shift one position to the left.

The activity resulting from key strokes is illustrated as follows:

out ← H3 ← H4 ← H5 ← H6 ← (H7) ← enter

You may take advantage of this shifting function and key in only a limited number of digits to arrive at the contents desired. For example, if the current CONTENTS display shows 4032 and you wish to change the contents to 3275, then key in only the digits 7,5.

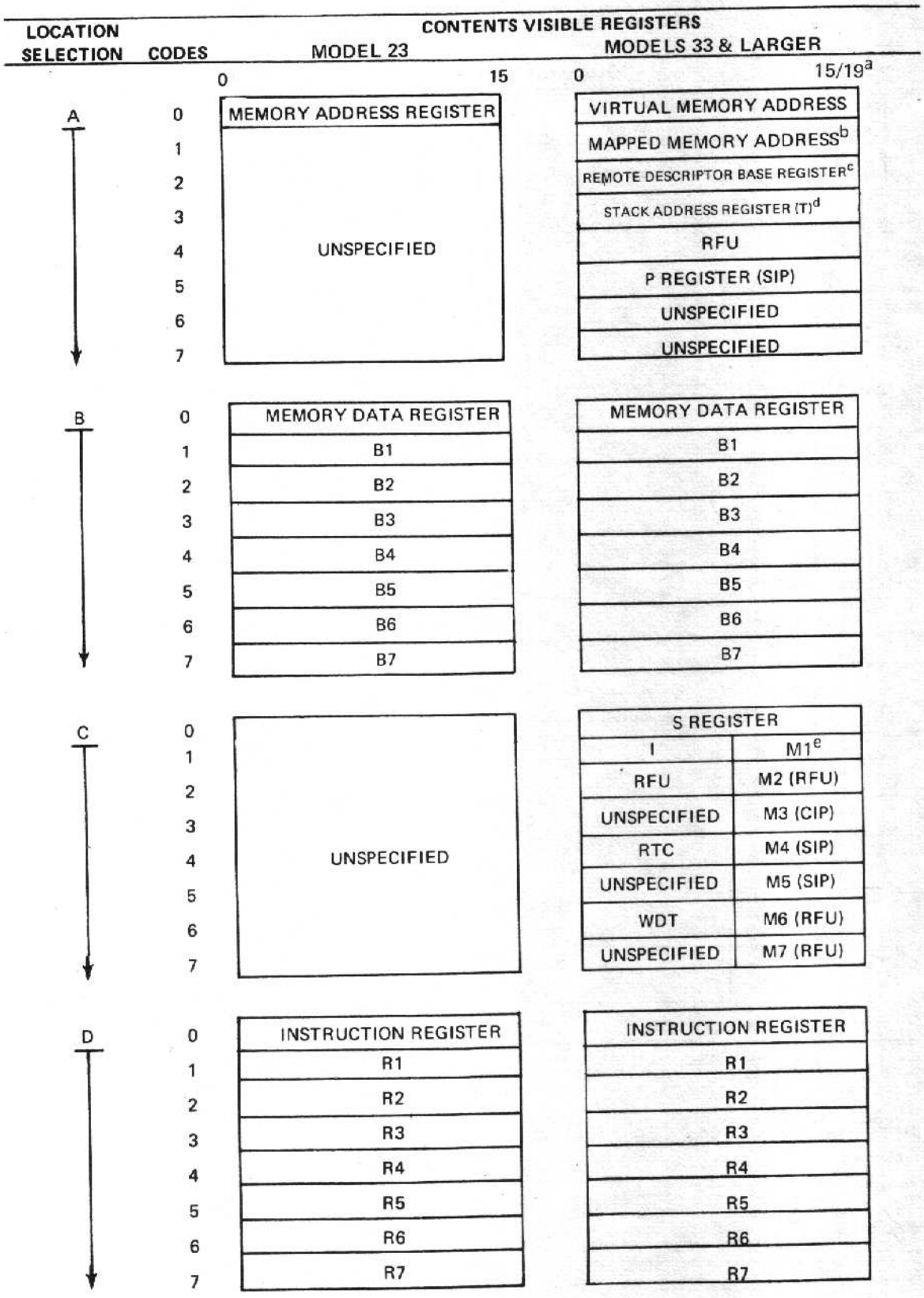
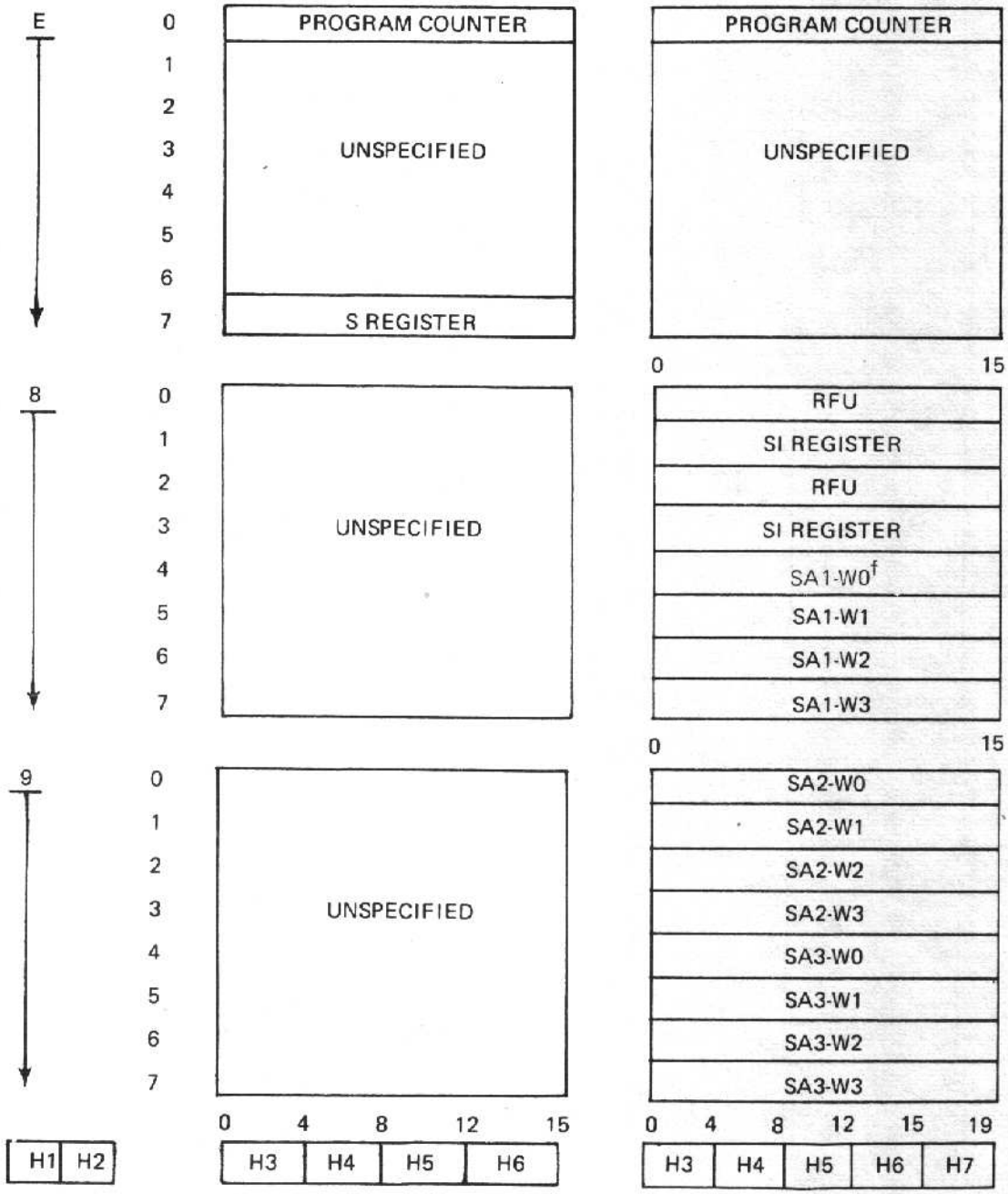


Figure 5-2. Register Selection Codes



[a]16 bits in SAF mode; 20 bits in LAF mode.
[b]If MMU is present; otherwise unspecified.
[c]Used with CIP instruction.
[d]Models 43 and larger.
[e]On Model 33 only, M1 = bits 0–8 and I = bits 9–15.
[f]Contains exponent, sign and high-order 8 bits of mantissa.
RFU = Reserved for future use.

Figure 5-2 (cont). Register Selection Codes

Panel Display Interpretation

The CONTENTS field on the display panel is shown in hexadecimal notation. The 4-(5-) digit hexadecimal display value represents the binary value of the 16-(20-) bit visible register. Each hexadecimal digit is equivalent to a binary value of four bits. Thus if the display shows a value of (0)4CA2, this hexadecimal value represents the stored binary value of:

(0000)	0100	1100	1010	0010
0	4	C	A	2

For most registers, the display value is usable in hexadecimal form and does not need to be converted to binary. However, the exceptions are the M1–M7, I, and S registers. These registers specify various status, security, and control indicators on a bit basis. Therefore, to properly interpret these registers, you must convert their hexadecimal displays to binary. Refer to Table 5-2 for a list of hexadecimal/binary/decimal conversions for the first 16 digit values.

TABLE 5-2. HEXADECIMAL/BINARY/DECIMAL CONVERSION

Hexadecimal	Binary	Decimal
0	0000	0
1	0001	1
2	0010	2
3	0011	3
4	0100	4
5	0101	5
6	0110	6
7	0111	7
8	1000	8
9	1001	9
A	1010	10
B	1011	11
C	1100	12
D	1101	13
E	1110	14
F	1111	15

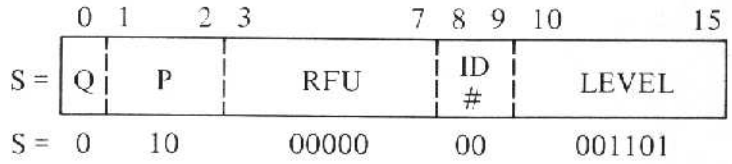
As an example, assume you wish to analyze the contents of the S register, e.g., on a Model 23. After you have selected and keyed in the proper selection code (E7), the display panel shows the following hexadecimal digit display:

LOCATION	CONTENTS
E7	400D

For meaningful interpretation of its contents, you must first convert the hexadecimal value to binary:

hexadecimal	=	binary
400D		0100 0000 0000 1101

Next, you must overlay this binary value onto the bit fields structured for the S register:



You can now analyze the system status and security indicators:

- o Q = QLT Indicator
  - 0 = QLT successfully completed
  - 1 = QLT either still running or failed
- o P = Privilege State (Ring Number)
  - 11 = Ring 0 (Privilege)
  - 10 = Ring 1 (Privilege)
  - 01 = Ring 2 (User)
  - 00 = Ring 3 (User)

  NOTE: Privileges and access rights accorded the various rings are in inverse order to the ring number (i.e., Ring 0 is the most privileged).

- o RFU = reserved for future use.
- o ID# (processor identity) = 00 indicates CP channel 0
- o LEVEL (interrupt priority level) = 001101 when converted to decimal (binary 001101 = decimal 13) indicates the actual priority level.

BASIC CONTROL PANEL

The basic control panel is an important feature for customers who do not want their operators at remote locations to be able to modify the software. It is also less expensive than the full panel. As an option to the basic control panel, Honeywell offers a portable plug-in panel for Models 33, 43, and 47. By plugging this unit into the basic panel, full panel functionality is effected. A single portable plug-in panel can support a multitude of systems with basic control panels.

For security, the basic panel does not allow visibility to CP registers or main memory. Its only control capability is to initiate and control the system initialization procedure. This includes clearing the system, running quality logic tests (QLTs), and invoking bootload. Displays indicate gross system status. The basic panel also provides a connector to facilitate interfacing the portable plug-in panel. Figure 5-3 shows the basic panel layout for Model 33 and larger models and Figure 5-4 for Model 23. Table 5-3 describes its controls and indicators. Table 5-4 illustrates and interprets various LED indicator combinations.

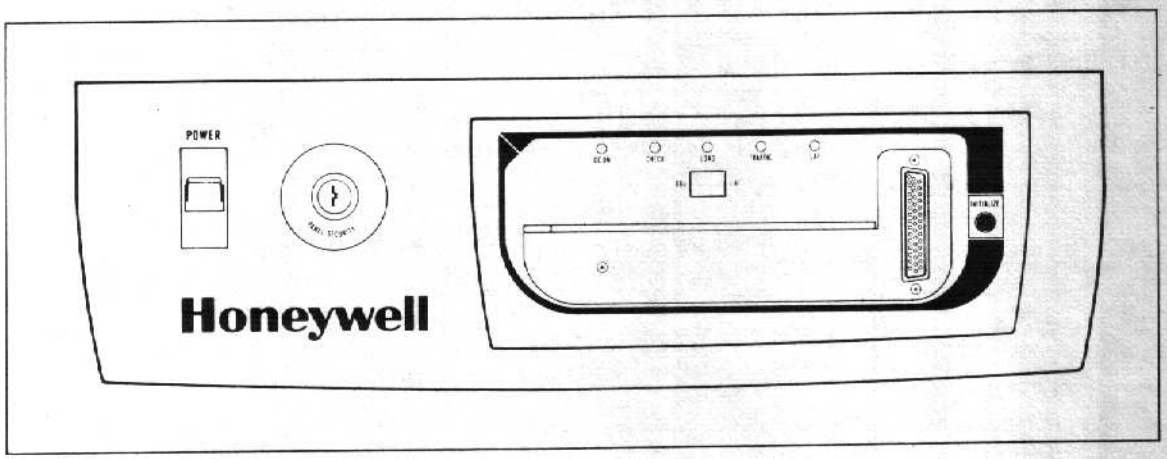


Figure 5-3. Basic Control Panel for Models 33, 43, and 47

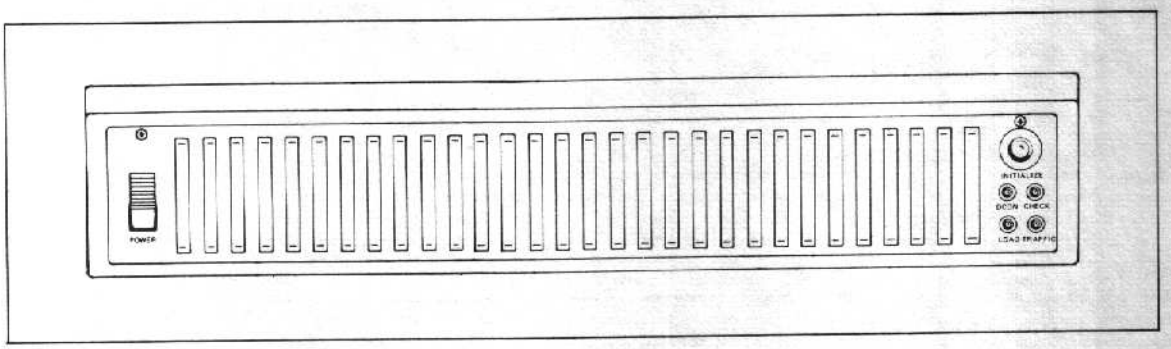


Figure 5-4. Basic Control Panel for Model 23

TABLE 5-3. BASIC PANEL CONTROLS AND INDICATORS

Control/Indicator	Description
POWER (switch)	– Up for power on; down for power off.
PANEL SECURITY (switch)	– Left (locked) position disables Initialize button and portable panel connector; right (unlocked) position enables Initialize button and portable panel connector.
LOAD (indicator)	– Indicates CP is in bootload mode.
DC ON (indicator)	– Indicates dc power is applied to the system.
CHECK (indicator)	– Indicates unsuccessful execution of QLTs due to a detected board failure, a board not properly "seated," or an unused bus slot not terminated.
TRAFFIC (indicator)	– Indicates CP is executing instructions other than a Halt.

TABLE 5-3 (CONT). BASIC PANEL CONTROLS AND INDICATORS

Control/Indicator	Description
INITIALIZE (push button)	– When pressed and the panel is locked, nothing happens. When pressed and the panel is unlocked, the following sequence occurs: o DC clear of system o QLTs are initiated and run o Bootload is performed over channel 0400_{16} into location 0100_{16} o CP begins instruction execution at location 0100_{16}
LAF[a] (indicator)	– Indicates CP is operating in the long address form.
CONFIGURATION SWITCHES[a]	– Four miniature rocker switches, located behind a sliding door on the front of the panel (see Figure 5-4), supply configuration information to the central processing unit. NOTE: If the portable plug-in panel is inserted, it must be removed to access these switches. The portable plug-in panel also has configuration switches; however, they must all be set to OFF. Refer to Figure 5-7 for switch settings.

[a]Not used on Model 33.

TABLE 5-4. BASIC CONTROL PANEL INDICATOR INTERPRETATION

State/Occurrence	Indicators Check	Load	Traffic
Normal Halt State	●	●	●
Normal Run State	●	●	○
Peripheral QLT Fault	○	●	◐
Load Fault	●[a]	○	●
Load in Process	●[a]	○	○
Memory Fault Detected	○	○	●
CP QLT Fault	○	○	○

LEGEND:
○ = ON ● = OFF ◐ = EITHER

[a]Could be ON if a particular peripheral controller QLT has a QLT fault condition stored in it.

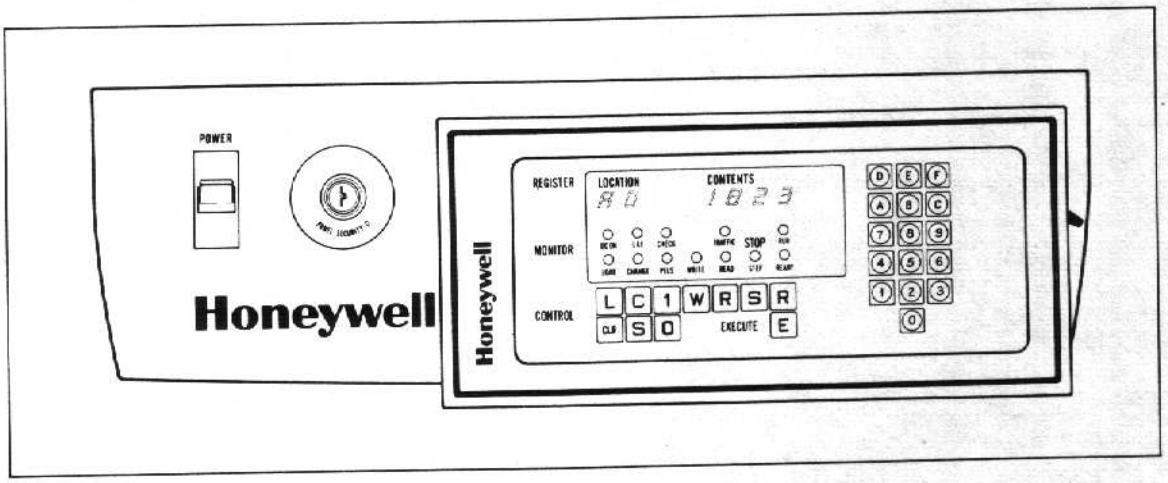


Figure 5-5. Portable Plug-In Panel (Installed in Basic Panel)

CONTROL PANEL OPERATING PROCEDURES

The functions that can be performed from the full control panel are governed by the operation of the processor in its two major states. For example, in relation to program execution, when the processor is in the run state, only the limited actions of displaying registers and executing programs are possible from the control panel. When the processor is in the stop state, the actions possible are much more extensive; they consist of displaying/changing memory, displaying/changing registers, executing single instructions, restarting programs, and master clearing the processor.

Before you perform any operation from the panel (except for power on/off), you must first unlock the control panel using the panel security switch.

The portable plug-in panel also has a lock (toggle switch on right-hand side) that must be activated in the proper sequence in conjunction with the lock on the basic panel. Prior to inserting the portable panel, the basic panel should be locked. The portable panel with the toggle switch in the "up" (locked) position can then be plugged in. If the "traffic" states between the two panels do not correspond, the portable panel is unlocked by setting the toggle switch to the "down" position and pressing the run or execute key (as appropriate) and relocking it. The basic panel is unlocked followed by the portable panel and then the desired operations are performed.

NOTE: In order for the Autorestart option to be initiated after a power failure, the control panel must be locked. For systems without this option, a rebootstrap will occur after a power failure if the control panel is locked or if the system has a basic control panel either locked or unlocked. In addition to automatically rebootstrapping from the device on channel 0400_{16}, the system will also start executing the program.

Display Registers

The contents of any one of the visible registers may be displayed on the control panel. A register may be displayed when the processor is in any state unless the panel is locked.

The following procedure describes a method for displaying the contents of one register. The same procedure applies regardless of the processor state.

1. Press Select.
   Places the processor in select mode as a necessary preliminary to selecting the register to be displayed.

2. Key in, via the hexadecimal-pad keys, the 2-digit selection code (per Figure 5-2) for the desired register to be displayed. If one of the digits is already at the desired setting, only the other need be keyed in (e.g., to display the seven base registers in sequence, key B, then 1, 2, 3, 4, 5, 6, 7).
   The selection code appears in the LOCATION field of the register display. When the desired selection code is keyed in, the data contents of the selected register are displayed in the CONTENTS field of the REGISTER display.

   NOTE: After a register in the run state is selected, its updated contents are displayed continuously (updated every 8 ms).

Change Registers

The contents of the visible registers may be changed from the control panel (the M, I, S, and T registers cannot be modified from the control panel). A register may be changed only when the processor is in a stop state. The following procedure describes a method for changing the contents of one register.

1. Press Stop if the processor is in the run state.
   The STOP/STEP indicator lights when the Stop control key is pressed.
2. Press Select.
   Places the processor in the select mode as a necessary preliminary to selecting the register to be changed.
3. Key in, via the hexadecimal-pad keys, the 2-digit selection code (per Figure 5-2) for the desired register to be changed.
   The selection code appears in the LOCATION field of the REGISTER display. When the desired selection code is keyed in, the current data contents of the selected register are displayed in the CONTENTS field of the REGISTER display.
4. Press Change.
   Places the processor in change mode preparatory to keying in the data to the register that is to be changed. The CHANGE indicator lights when the Change control key is pressed.
5. Key in, via the hexadecimal-pad keys, the hexadecimal value representing the new data that is to be entered into the selected register.
   The data entered appears in the CONTENTS field of the REGISTER display and is shifted into the selected register.

Display Memory

Any memory location may be accessed and displayed on the control panel. However, memory can be displayed only when the processor is in a stop state. The memory address register (A0) is the only visible register that can be used to access memory locations from the control panel. Any visible data register may be used for reading/displaying memory data, but by convention the memory data register (B0) is usually used for this purpose to preserve program integrity and will be so used in the procedure.

The following procedure describes a method for displaying the contents of one memory location and, as an option, displaying the contents of subsequent memory locations.

1. Press Read.
   Places the processor in the read state. The READ indicator lights when the Read control key is pressed.
2. Select register A0.
3. Press Change.
   Places the processor in change mode preparatory to keying in the address of the memory location to be displayed. The CHANGE indicator lights when the Change control key is pressed.

4. Key in, via the hexadecimal-pad keys, the 4- or 5-digit hexadecimal value representing the address of the memory location to be read. (For Model 43 and larger models, note that 5 digits must be used even in SAF mode, in which case the most significant digit must be set to zero.)
   This address appears in the CONTENTS field of the REGISTER display.
5. Select register B0.
6. Press Execute.
   The data contents of the selected memory location are loaded into the selected register (B0) and displayed on the CONTENTS field of the REGISTER display.
7. If successive memory locations are to be displayed using the current address in the memory address register as a base, press Plus 1.
   The PLUS indicator lights when the Plus 1 control key is pressed.
8. Press Execute.
   The memory address register is incremented by 1 before accessing memory and the memory data of the succeeding memory location appears in the CONTENTS field of the REGISTER display.
9. Repeat step 10 for each sequential memory location to be displayed.

Change Memory

Any memory location may be accessed and changed from the control panel. However, memory can be changed only when the processor is in a stop state. As mentioned previously, the memory address register (A0) is the only visible register that can be used to access memory locations from the control panel. Any visible data register may be used for writing/changing memory data, but by convention the memory data register (B0) is usually used for this purpose to preserve program integrity and will be so used in this procedure.

The following procedure describes a method for changing the contents of one memory location and, as an option, changing the contents of subsequent memory locations.

1. Press Write.
   Initially places the processor in the write state. The WRITE indicator lights when the Write control key is pressed.
2. Select register A0 and change to desired memory address.
3. Select register B0.
4. Press Change.
   Places the processor in change mode preparatory to keying in the data for the memory location that is to be changed. The CHANGE indicator lights when the Change control key is pressed.
5. Key in, via the hexadecimal-pad keys, the hexadecimal value representing the new data that is to be entered into the memory location to be changed.
   The data entered appears in the CONTENTS field of the REGISTER display.
6. Press Execute.
   When this action is initiated, the new data contents are loaded into the selected memory location.
7. If successive memory locations are to be changed using the current address in the memory address register as a base, press Plus 1.
   The PLUS indicator lights when the Plus 1 control key is pressed.
8. Repeat steps 5 and 6 for each sequential memory location to be changed.
   Note that while in the plus 1 mode (PLUS indicator lit), each pressing of the Execute key causes the memory address register to be incremented by 1 before the new data contents are loaded into the new incremented memory location.

Stop Program Execution

While a program is running, program execution can be stopped at any time by pressing Stop. The STOP/STEP indicator lights and the RUN, READY, and TRAFFIC indicators turn off. When this action is initiated, the processor completes the execution of the current instruction and enters the stop state. After this state is achieved, the following pertinent conditions exist.

1. The processor is automatically placed in a step mode; i.e., ready to execute one instruction at a time.
2. The instruction register (D0) contains the instruction to be executed next.
3. The P register (E0) contains an address incremented by 1 from the location of the instruction to be executed next.

Note that when a program is running and a Halt instruction is encountered (RUN indicator remains lit, but TRAFFIC indicator turns off), the processor does *not* enter the stop state but rather enters idle condition. In this condition, the Halt instruction is continuously re-executing and the processor is subject to external interrupts, etc. You must press the Stop control key in order to set the processor into a stop state.

Execute Single Instruction(s)

When running a program, you may wish to stop processing and step through the execution of one or more instructions. This procedure is accomplished from the control panel, as follows:

1. Press Stop.
   Refer to the previous procedure, "Stop Program Execution," for relevant information concerning processor/panel status after a stop state is attended.
2. Determine whether the processor has stopped at a point (address) from which you wish to begin executing single instructions. Display and view the contents of the P register (E0) using the procedure previously described for displaying registers.
   The P register (E0) contains an address incremented by 1 from the address of the instruction to be executed next. If this address is *one more* than the point at which you wish to start executing single instructions, proceed to step 5. However, if a new starting point is desired, continue to the next step.
3. Press CLeaR.
   Sets the instruction register (D0), the P register (E0), indicators, etc., to zero as a necessary preliminary to specifying a new starting address.

   NOTE: In an online environment, do not press CLeaR. Instead, select the instruction register (D0) and change its contents to 0000_{16} so as not to affect peripherals.

4. Select the P register (E0) and change to hexadecimal value representing the address of the next instruction to be executed.
5. Press Execute.
   An attempt is made first to execute the instruction contained in the instruction register (D0). If the instruction register contains an executable instruction, then this one instruction is executed. After it is executed, the next succeeding instruction is placed in the instruction register, the P register (E0) is incremented by 1, and the processor is returned to the step mode. If the instruction register (D0) contains the value zero, the one instruction addressed by the P register (E0) is fetched. The contents of the P register are incremented by 1 and the instruction addressed by the P register is placed into the instruction register.

6. Repeat step 5 for each successive instruction to be executed singly. At any time after executing a single instruction, you may return to the run state (see the next procedure on restarting programs).

Restart Program

A program may be restarted from the control panel at any time and at any point after it has been stopped during execution. However, when you are restarting a program, it is your responsibility to ensure that:

- o No I/O was pending at the time the machine was halted.
- o All registers are stored to the context the program requires.

The restart procedure is as follows:

1. Determine whether the current start address is the point at which you wish to restart the program. Display the contents of the P register (E0), using the procedure previously described for displaying registers. The P register contains an address incremented by 1 from the address of the instruction to be executed next. If this address is *one more* than the point at which you wish to restart the program, then proceed to step 4. However, if a new starting point is desired, continue to the next step.
2. Press CLeaR.
   Sets the instruction register (D0) and the P register (E0) to the value zero as a necessary preliminary to specifying a new starting address.

   NOTE: Privilege mode, indicators, etc., are all changed by CLeaR and must be reinstated by software.

3. Select the P register (E0) and change to the hexadecimal value representing the restart address.
4. Press Ready.
   Places the processor in ready mode; i.e., instructs the processor that program execution is to begin when the Execute key is pressed. The READY indicator lights and the STOP indicator turns off when the Ready control key is pressed.
5. Press Execute.
   The processor is placed in a run state and attempts to start executing the program beginning with the instruction contained in the instruction register (D0). If the instruction register contains the value zero, program execution begins with the instruction addressed by the P register (E0).
   The RUN and TRAFFIC indicators light when the Execute key is pressed. Program execution continues until a software Halt is encountered or the Stop, Read or Write key is pressed.

Master Clear

The master clear procedure is used to set or restore the processor to a standard initialized state as a prelude to certain functions such as a bootstrap procedure. The following procedure indicates the master clearing operation:

1. Press Stop if the processor is not already in the stop state. Master clear is not operative when the processor is in the run state. The STOP/STEP indicator lights when the Stop control key is pressed.
2. Press CLeaR.
   The specific functions that are activated by pressing CLeaR are listed in Table 5-1, under the description of the CLeaR control key.

Run Quality Logic Tests (QLTs)

The following procedures describe how to run the QLTs from both the basic control panel and the full control panel. The QLTs should be run regularly upon powering up the system and when a system malfunction is suspected (in this case, even the successful completion of the QLTs should be further followed by the running of the Test and Verification programs as described in the *Level 6 Model 23 T&V Operating Instruction* manual, Order No. FW80 or the *Level 6 Model 3X, 4X, 5X System Checkout T&V Operator's Guide*, Order No. AW94.

Basic Control Panel

1. Press INITIALIZE button and observe indicator LEDs.
2. If QLTs ran successfully (all LEDs except DC ON extinguished), proceed with normal operations. If QLTs did not run successfully (CHECK LED illuminated) refer to Table 5-4 and the appropriate T&V manual.

Full Control Panel

1. Ensure PANEL SECURITY lock switch on system control panel is in enabled position by turning key clockwise.
2. Ensure STEP/STOP LED is illuminated. If it is not illuminated, press S (STEP/STOP) button.
3. Press CLR (master clear) button to run controller QLTs.
4. After running controller QLTs (QLTs run in less than 16 seconds), the CHECK LED should be extinguished and program sequence register (E0) and instruction register (D0) should contain 0000 (hex). If either condition is not present, check that boards are seated properly, and are inserted in correct slots (refer to appropriate T&V manual).
5. Press L (LOAD) button.
6. Observe that following conditions exist:
   a. LOAD LED illuminated.
   b. READY LED illuminated.
   c. CHECK LED illuminated.
   d. STEP/STOP LED extinguished.
7. Press E (EXECUTE) button to run CP and memory QLTs.
8. Observe that following conditions exist:
   a. TRAFFIC LED illuminates for several seconds.
   b. CHECK LED illuminates for several seconds.
   c. RUN LED illuminated.
   d. LOAD LED illuminated.
9. To verify that QLTs ran successfully, check that following conditions exist:
   a. CHECK LED extinguished.
   b. TRAFFIC LED extinguished.
   c. E0 = 0002 (hex).
   d. D0 = 0000.
   e. D1 = 0400 (hex).
   f. RUN LED illuminated.
   g. READY LED illuminated.
   h. LOAD LED illuminated.
10. If QLTs ran successfully, proceed with normal operations.
11. If the QLTs did not run successfully, there is a problem in the system. If the CHECK LED on the control panel is illuminated, check that memory and CPU boards are properly seated (refer to appropriate T&V manual).

Change Configuration Switch

Full Control Panel

1. Press Stop.
2. Open control panel and access configuration switches located on control panel circuit board.
3. Change switch setting.

   NOTE: Use the tip of a ball point pen with the writing point retracted or some similar object. Exert only enough pressure to cause the switch arm to move to the alternate position. See Figure 5-6.

4. Close control panel.
5. Press CLR.
6. Press Ready.
7. Press Execute.

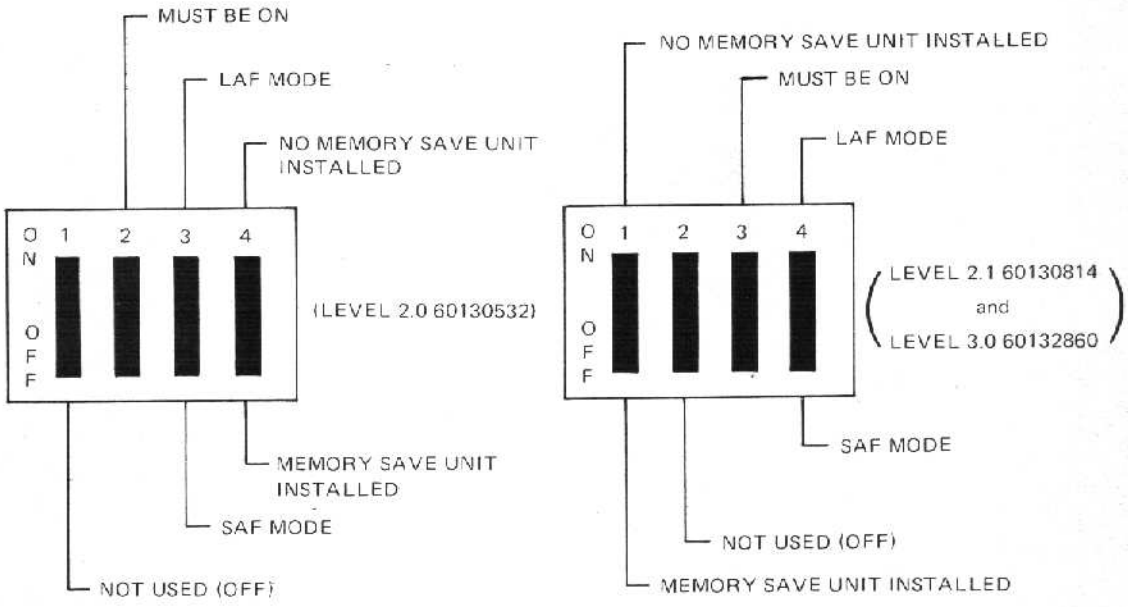


Figure 5-6. Miniature Configuration Switches – Full Control Panel

1. Unlock panel security switch.
2. Open slide door exposing configuration switches (see Figure 5-3).
3. Change switch setting.

   NOTE: Use the tip of a ball point pen with the writing point retracted or some similar object. Exert only enough pressure to cause the switch arm to move to the alternate position. See Figure 5-7.

4. Press INITIALIZE.
5. Lock panel security switch.

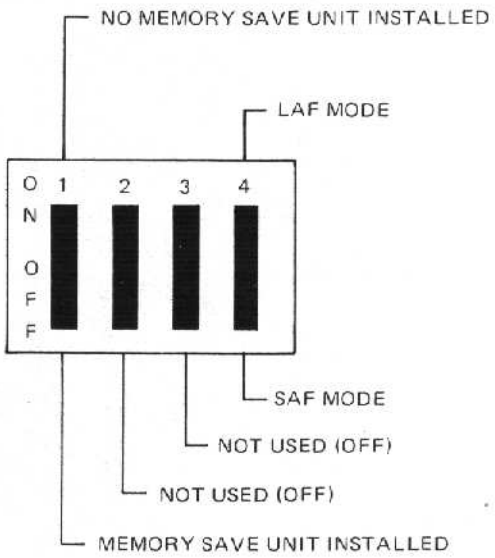


Figure 5-7. Miniature Configuration Switches – Basic Control Panel