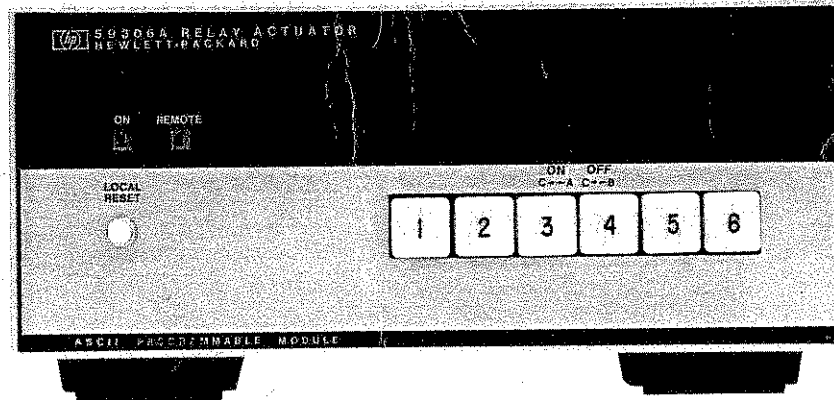


# RELAY ACTUATOR

## 59306A



HEWLETT  PACKARD

# RELAY ACTUATOR

## 59306A

**SERIAL PREFIX: 1332A**

This manual applies directly to the Hewlett-Packard Model 59306A with serial prefix 1332A. For instruments with serial prefixes above 1332A, a manual change sheet is supplied. For instruments with serial prefixes below 1332A, refer to Section VII.

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## SECTION I GENERAL INFORMATION

### 1-1. INTRODUCTION

1-2. This section provides general information on the HP 59306A Relay Actuator including an instrument description, equipment supplied, instrument specifications, and signal mnemonics.

### 1-3. DESCRIPTION

1-4. The HP 59306A Relay Actuator contains six relays. The state of each relay can be controlled locally by front-panel pushbutton switches or remotely by programming information on the HP Interface Bus. Using either method, the relays may be used to control external devices such as electrically controlled attenuators, switches, or other devices. The front-panel pushbuttons illuminate or extinguish to indicate the state of each relay.

### 1-5. INSTRUMENT IDENTIFICATION

1-6. Each Hewlett-Packard instrument has a ten-character serial number (e.g., 0000A00000). The four-digit serial prefix identifies a group of identical instruments, and the five digit suffix is a serial number unique to each instrument. If the serial prefix on your instrument is not on the title page of this manual, your instrument is different from this manual. A manual change sheet is included with this manual to describe the differences. If the manual change sheet is missing, request one from the nearest Hewlett-Packard Sales and Service office listed at the back of this manual.

### 1-7. EQUIPMENT SUPPLIED

1-8. Table 1-1 lists the equipment supplied with the 59306A.

Table 1-1. Equipment Supplied

Description	HP Part Number
Detachable Power Cord 7½ ft. (231 cm) long	8120-1378
HP Interface Bus Interconnect Cable	10631A

### 1-9. SPECIFICATIONS

1-10. Specifications for the 59306A are given in Table 1-2.

Table 1-2. Specifications

<b>ELECTRICAL:</b> <b>Load on bus:</b> 3.3 mA per line <b>Relay settling time:</b> 50 ms <b>Relay contacts:</b> 0.5 amp at 28 Vdc or 115 Vac <b>Power requirements:</b> 115V or 230V ± 10%, 50 to 400 Hz, 10 VA max <i>continued</i>
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Table 1-2. Specifications (Continued)

<b>ENVIRONMENTAL:</b> Operating temperature 0 to 50°C.
<b>DIMENSIONS:</b>
<b>Height:</b> 4 inches (101,6 mm) including cabinet feet.
<b>Width:</b> 8.38 inches (212,9 mm)
<b>Depth:</b> 11.6 inches (294,6 mm)
<b>WEIGHT:</b>
<b>Net Weight:</b> 5 lb. 13 oz. (2,64 kg)
<b>Shipping Weight:</b> 7 lb. 2 oz. (3,23 kg)

**1-11. SIGNAL MNEMONICS**

1-12. Table 1-3 is a list of signal mnemonics for the 59306A.

Table 1-3. Signal Mnemonics

<b>MNEMONIC</b>	<b>NAME</b>
ADDR .....	Address
AORB .....	A or B
CLK .....	Clock
<u>CLK</u> .....	"Not" Clock
<u>CLR</u> .....	"Not" Clear
DAC .....	Data Accepted
DAV .....	Data Valid
DIO .....	Data Input/Output
ENABLE .....	Enable
EOP .....	End Output
HSENABLE .....	Handshake Enable
HSOUT .....	Handshake Out
LLO .....	Local Lockout
<u>LLO</u> .....	"Not" Local Lockout
MRE .....	Multiple Response Enable
<u>MRE</u> .....	"Not" Multiple Response Enable
REMOTE .....	Remote
REN .....	Remote Enable
RFD .....	Ready for Data

## SECTION II INSTALLATION

### 2-1. INTRODUCTION

2-2. This section contains information for unpacking, inspection, repacking, storage, and installation.

### 2-3. UNPACKING AND INSPECTION

2-4. If the shipping carton is damaged, ask that the carrier's agent be present when the instrument is unpacked. Inspect the instrument for damage. If the instrument is damaged or fails to meet electrical specifications, notify the carrier and the nearest Hewlett-Packard Sales and Service office immediately (offices are listed at the back of this manual). Retain the shipping carton and padding material for the carrier's inspection. The Sales and Service office will arrange for the repair or replacement of your instrument without waiting for the claim against the carrier to be settled.

### 2-5. STORAGE AND SHIPMENT

2-6. To protect the 59306A during storage or shipment, good commercial packing methods should be used. Reliable commercial packing and shipping companies have the facilities and materials to adequately repack an instrument.

#### NOTE

Before returning an instrument to Hewlett-Packard, contact the nearest Hewlett-Packard Sales and Service office for instructions.

2-7. Conditions during storage and shipment should normally be limited as follows:

- a. Maximum altitude: 25,000 feet.
- b. Minimum temperature:  $-40^{\circ}\text{F}$  ( $-40^{\circ}\text{C}$ ).
- c. Maximum temperature:  $+167^{\circ}\text{F}$  ( $+75^{\circ}\text{C}$ ).

### 2-8. POWER REQUIREMENTS

2-9. The 59306A operates from either 115 or 230 volts, 50 to 400 Hz. Before applying power, the screwdriver-operated switch mounted inside the instrument must be set to the correct position (115 or 230) and the correct fuse (as labeled on the rear panel) must be installed.

## SECTION III

### OPERATION AND PROGRAMMING

#### 3-1. INTRODUCTION

3-2. This section contains operating information including a description of controls and indicators, programming, and programming examples.

#### 3-3. CONTROLS, INDICATORS, AND CONNECTORS

3-4. Figure 3-1 identifies and describes the front panel controls and indicators. Figure 3-2 shows the rear panel connectors and controls.

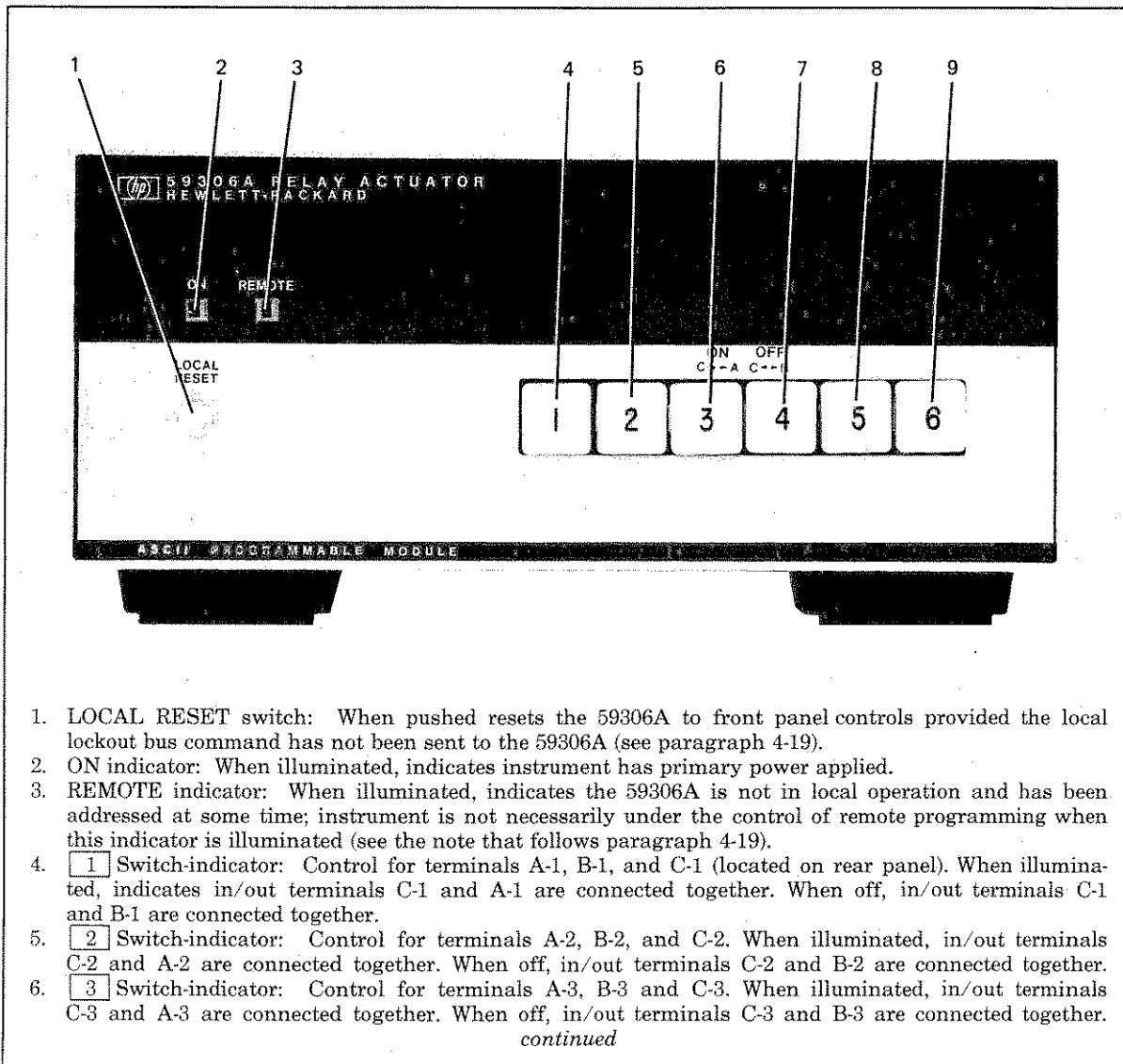
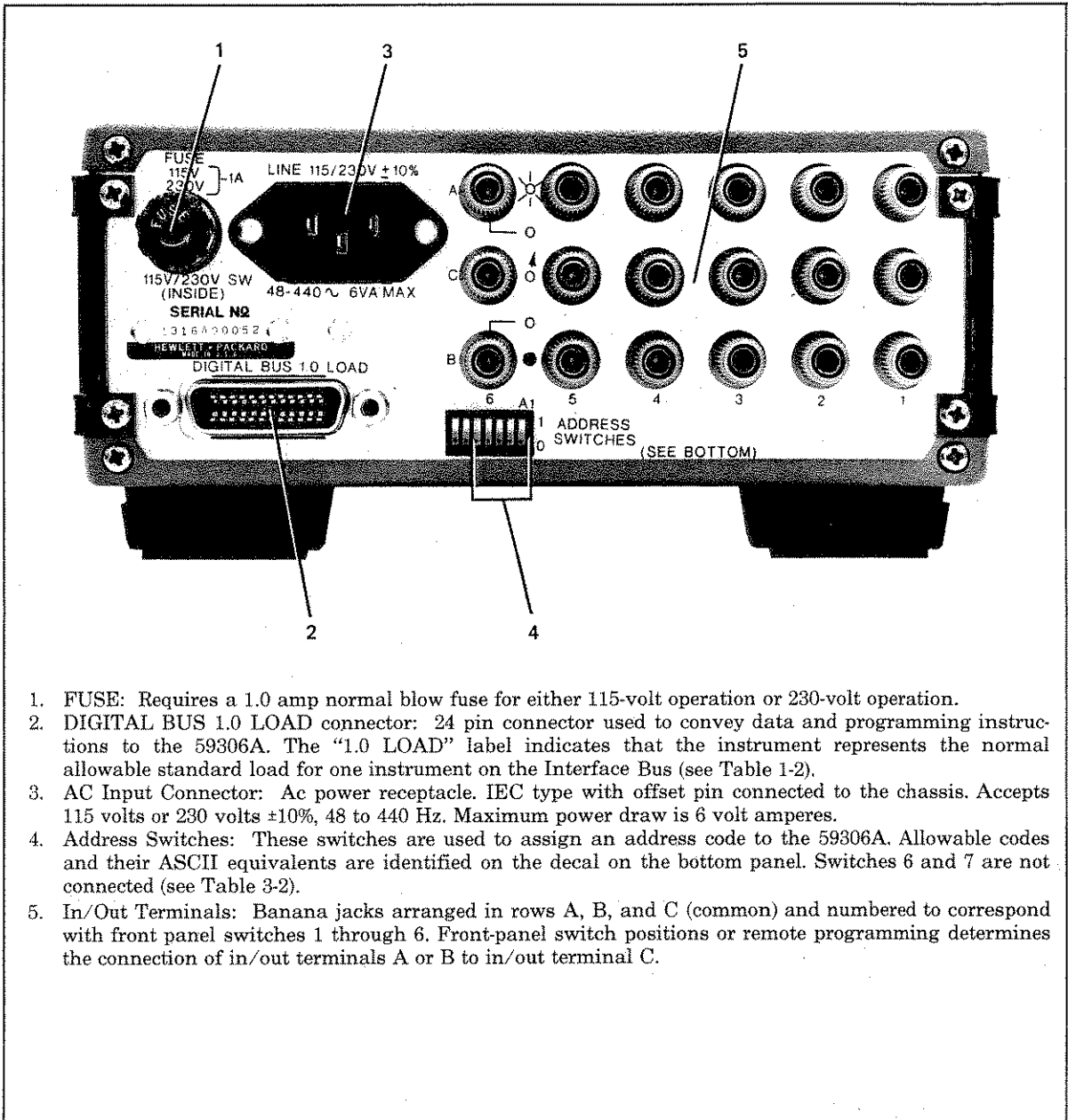


Figure 3-1. 59306A Relay Actuator Front Panel

7. **4** Switch-indicator: Control for terminals A-4, B-4, and C-4. When illuminated, in/out terminals C-4 and A-4 are connected together. When off, in/out terminals C-4 and B-4 are connected together.
8. **5** Switch-indicator: Control for terminals A-5, B-5, and C-5. When illuminated, in/out terminals C-5 and A-5 are connected together. When off, in/out terminals C-5 and B-5 are connected together.
9. **6** Switch-indicator: Control for terminals A-6, B-6, and C-6. When illuminated, in/out terminals C-6 and A-6 are connected together. When off, in/out terminals C-6 and B-6 are connected together.

Figure 3-1. 59306A Relay Actuator Front Panel (Continued)



1. FUSE: Requires a 1.0 amp normal blow fuse for either 115-volt operation or 230-volt operation.
2. DIGITAL BUS 1.0 LOAD connector: 24 pin connector used to convey data and programming instructions to the 59306A. The "1.0 LOAD" label indicates that the instrument represents the normal allowable standard load for one instrument on the Interface Bus (see Table 1-2).
3. AC Input Connector: Ac power receptacle. IEC type with offset pin connected to the chassis. Accepts 115 volts or 230 volts ±10%, 48 to 440 Hz. Maximum power draw is 6 volt amperes.
4. Address Switches: These switches are used to assign an address code to the 59306A. Allowable codes and their ASCII equivalents are identified on the decal on the bottom panel. Switches 6 and 7 are not connected (see Table 3-2).
5. In/Out Terminals: Banana jacks arranged in rows A, B, and C (common) and numbered to correspond with front panel switches 1 through 6. Front-panel switch positions or remote programming determines the connection of in/out terminals A or B to in/out terminal C.

Figure 3-2. 59306A Relay Actuator Rear Panel

### 3-5. PROGRAMMING

3-6. The 59306A operates in response to a specific set of programming codes. These codes, shown in Table 3-1, determine whether in/out terminal A or in/out terminal B is connected to in/out terminal C (terminals located on the rear panel). The 59306A also responds to a set of special action codes. These codes, shown in Table 3-2, determine the operating state (i.e., local or remote) of the 59306A. A sample program depicting the use of both sets of codes is shown in Table 3-3.

#### NOTE

The 59306A automatically unaddresses itself (clears its Listen FF) whenever MRE is low and the code present on the DIO lines is not its own address-to-listen code.

3-7. When the 59306A is switched to remote operation (as listed in Sequence 2, Table 3-3) all the relays stay in the state they were in under LOCAL. If other states are desired, they must be programmed. When switched to LOCAL from REMOTE, (as listed in Sequence 10, Table 3-3) all relays assume states indicated by the position of the front panel switches.

Table 3-1. Programming Codes

DIO Lines							ASCII	59306A Response
7	6	5	4	3	2	1		
1	0	0	0	0	0	1	A	Relay state code. Programs instrument to connect any of the A in/out terminals to the appropriate C in/out terminal. Specific terminal connection depends on the succeeding code in program sequence.
1	0	0	0	0	1	0	B	Relay state code. Programs instrument to connect any of the B in/out terminals to the appropriate C in/out terminal. Specific terminal connection depends on the succeeding code in program sequence.
0	1	1	0	0	0	1	1	Relay select code. These codes select which A or B terminal is to be connected to the appropriate C in/out terminal. For example, if an ASCII A code is succeeded by an ASCII 2, terminals A-2 and C-2 are connected together.
0	1	1	0	0	1	0	2	
0	1	1	0	0	1	1	3	
0	1	1	0	1	0	0	4	
0	1	1	0	1	0	1	5	
0	1	1	0	1	1	0	6	



Table 3-2. Special Action Codes

Name	MRE	REN	DIO Lines							ASCII Equiv.	59306A Response
			7	6	5	4	3	2	1		
*Unlisten	L	H	0	1	1	1	1	1	1	?	Clears instrument as a listener.
Address Code	L	L	0	1	A <sub>5</sub> †	A <sub>4</sub> †	A <sub>3</sub> †	A <sub>2</sub> †	A <sub>1</sub> †		Addresses instrument as a listener and enables it to respond to data on DIO lines.
‡Local Lockout	L	L	0	0	1	0	0	0	1	DC1	Disables LOCAL RESET switch on front panel. Unit responds to remote programming only.

\*The 59306 automatically unaddresses itself (clears its Listen FF) whenever MRE is low and the code present on the DIO lines is not its own address-to-listen code.

†A<sub>5</sub> through A<sub>1</sub> must coincide with the code set on the 59306A address switches.

‡Local lockout is used primarily as a troubleshooting aid and can be overridden by setting REN high.

Table 3-3. 59306A Programming Example

Sequence	Control Lines			DIO Lines ASCII Code	Description of Program Sequence
	EOP	REN	MRE		
1	H	H	L	?	<p>Clears all listeners.</p> <p>59306A addressed to listen. REN = L sets 59306A in remote. Front panel REMOTE indicator illuminates.</p> <p>Local lockout command disables LOCAL RESET switch. 59306 only responds to remote programming (see Table 3-2).</p> <p>Programs 59306A to connect in/out terminal A to in/out terminal C when instructed to do so.</p> <p>In/out terminal A-3 connects to in/out terminal C-3. Number 3 front panel switch/indicator illuminates.</p> <p>In/out terminal A-5 connects to in/out terminal C-5. Number 5 front panel switch/indicator illuminates.</p> <p>Programs 59306A to connect in/out terminal B to in/out terminal C when instructed to do so.</p> <p>In/out terminal B-3 connects to in/out terminal C-3. Number 3 front panel switch/indicator extinguishes.</p> <p>In/out terminal B-5 connects to in/out terminal C-5. Number 5 front panel switch/indicator extinguishes.</p> <p>REN = H; 59306A resets to local control (front panel switch/indicators control outputs). REMOTE light extinguishes.</p>
2	H	L	L	% (see note)	
3	H	L	L	DC1	
4	H	L	H	A	
5	H	L	H	3	
6	H	L	H	5	
7	H	L	H	B	
8	H	L	H	3	
9	H	L	H	5	
10	H	H	H		

NOTE: Bits 1 thru 5 must correspond with switch settings of address switch on rear panel.

## PROGRAMMING SUMMARY SHEET

**Possible Listen Addresses:** Any ASCII code of the form 01A<sub>5</sub>A<sub>4</sub>A<sub>3</sub>A<sub>2</sub>A<sub>1</sub> where A<sub>5</sub> - A<sub>1</sub> can be any combination of 1's & 0's other than 11111. A<sub>5</sub> - A<sub>1</sub> are set by address switches on the back panel of the 59306. 0=DOT IN, 1=DOT OUT on address switches.

**NOTE:** The 59306A automatically unaddresses itself (clears its Listen FF) whenever MRE is low and the code present on the DIO lines is not its own address-to-listen code. When the 59306A is switched to remote operation (as listed in Sequence 2 of programming example below) all the relays stay in the state they were in

under LOCAL. If other states are desired, they must be programmed. When switch to LOCAL from REMOTE, (as listed in Sequence 10 of programming example below) all relays assume states indicated by the position of the front panel switches.

**SPECIFICATIONS:**

**Electrical:** 1.0 Bus Loads; Relay settling time, 50 ms; Relay contacts, 0.5 amp at 28 Vdc or 115 Vac; Power requirements, 115V or 230V ±10%, 50 to 400 Hz, 10 VA max.

**SPECIAL ACTION CODES**

Name	MRE	REN	DIO Lines							ASCII Equiv.	59306A Response
			7	6	5	4	3	2	1		
Unlisten	L	H	0	1	1	1	1	1	1	?	Clears instrument as a listener. Places instrument in REMOTE. Enables to respond to data on DIO lines.
Address Code	L	L	0	1	A <sub>5</sub> *	A <sub>4</sub> *	A <sub>3</sub> *	A <sub>2</sub> *	A <sub>1</sub> *		
Local Lockout	L	L	0	0	1	0	0	0	1	DC1	Disables LOCAL RESET switch on front panel.

\*A<sub>5</sub> through A<sub>1</sub> must coincide with the code set on the 59306A address switches.

**PROGRAMMING CODES**

DIO Lines	ASCII Equiv.	59306A Response
7   6   5   4   3   2   1		
1   0   0   0   0   0   1	A	Programs instrument to connect any of the A in/out terminals to the appropriate C in/out terminal. Specific terminal connection depends on the succeeding code in program sequence.
1   0   0   0   0   1   0	B	
0   1   1   0   0   0   1	1	These codes select which A or B terminal is to be connected to the appropriate C in/out terminal. For example, if an ASCII A code is succeeded by an ASCII 2, terminals A-2 and C-2 are connected together.
0   1   1   0   0   1   0	2	
0   1   1   0   0   1   1	3	
0   1   1   0   1   0   0	4	
0   1   1   0   1   0   1	5	
0   1   1   0   1   1   0	6	

**59306A PROGRAMMING EXAMPLE**

Sequence	Control Lines			Data Lines	Description of Program Sequence
	EOP	REN	MRE	ASCII Code	
1	H	H	L	?	Clears all listeners.
2	H	L	L	%	59306A addressed to listen. REN = L, sets 59306A in remote. Front panel REMOTE indicator illuminates.
3	H	L	L	DC1	Local lockout command disables LOCAL RESET switch. 59306A only responds to remote programming.
4	H	L	H	A	Programs 59306A to connect in/out terminal A to in/out terminal C when instructed to do so.
5	H	L	H	3	In/out terminal A-3 connects to in/out terminal C-3. Number 3 front panel switch/indicator illuminates.
6	H	L	H	5	In/out terminal A-5 connects to in/out terminal C-5. Number 5 front panel switch indicator illuminates.
7	H	L	H	B	Programs 59306A to connect in/out terminal B to in/out terminal C when instructed to do so.
8	H	L	H	3	In/out terminal B-3 connects to in/out terminal C-3. Number 3 front panel switch/indicator extinguishes.
9	H	L	H	5	In/out terminal B-5 connects to in/out terminal C-5. Number 5 front panel switch/indicator extinguishes.
10	H	H	H		REN = H; 59306A resets to local control (front panel switch/indicators control outputs). REMOTE light extinguishes.

**DIGITAL BUS PIN SUMMARY**

Digital Bus Connector Pin Number	Line Name	Use
1-4, 13-15	DIO1-7	Carries characters to 59306A for relay control or for processing as Bus commands.
16	DIO8	Not monitored or driven, terminated by resistive network.
6	DAV	These three lines make up the "handshake" system on the HP Interface Bus. DAV is monitored and RFD and DAC are driven by 59306 to control rate of data transferred on DIO lines.
7	RFD	
8	DAC	
9	EOP	Unconditionally clears Listen F/F, halting remote operation. Does not return control to front panel pushbuttons.
11	MRE	Indicates to 59306 whether character on DIO lines is Bus command or for relay control.
5	EOI	Not monitored or driven, terminated by resistive network.
10	SRQ	Not monitored or driven, terminated by resistive network.
12	Shield	Not connected.
18-24	Grounds	Connected to chassis ground.

**PROGRAMMING SUMMARY SHEET**

