

HP 59306A Relay Actuator



HP 1000 Computer

HEWLETT PACKARD

Programming Guide

Application Note 401-18

Device Introduction

The HP 59306A Relay Actuator¹ contains six form C relays. Each relay can be controlled locally by front-panel push button switches or remotely by programming information on the HP-IB. 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. A schematic diagram of the device is shown in Figure 18-1.

When operating the box manually, depressing a button causes the C contact to be connected to A; releasing the button connects contact C to B. When a button is in (C to A), the light on the button is on; when it is out, the light is off. Specifications for the 59306A are shown in Table 18-1.

Addressing

Figure 18-2 shows a rear panel layout of the 59306A and its HP-IB address switches. The octal address may be converted by reading the binary address off of the rear panel.

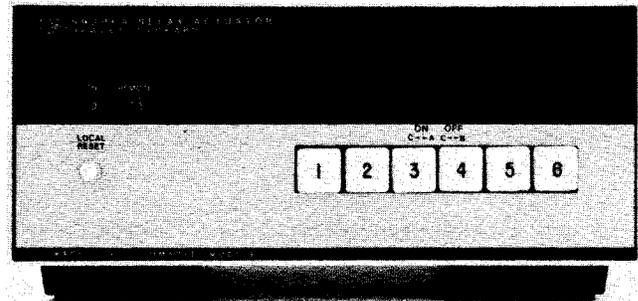


Table 18-1. 59306A Specifications

ELECTRICAL:

Load on bus: 3.3 mA per line

Relay settling time: 50 ms

Relay contacts: 0.5 amp at 28 Vdc or 115 Vac

Power requirements: 115V or 230V \pm 10%,
50 to 400 Hz, 10 VA max

ENVIRONMENTAL:

Operating temperature 0 to 50°C.

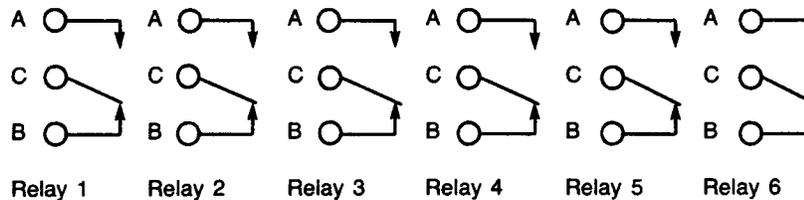


Figure 18-1. 59306A Schematic Diagram

¹The 59306A Relay Switch Operating and Service Manual (part number 59306-90001) contains complete information pertaining to the instrument. See also Application Note 401-1 (part number 5953-2800).

System Preparations²

LU Assignment

One LU will be needed for the 59306A.

:SYLU,23,11,7B

will assign LU 23 to EQT 11. The device address of the 59306A will be 7 octal.

Output Buffering

Turn off buffering until the instrument is checked out.

:SYEQ,11,UN

will unbuffer EQT 11. Switch timing should be evaluated carefully if buffering is used.

Time-Out

A time-out occurrence indicates an error condition for the 59306A. A time-out will occur if the hardware malfunctions, if the listen address is set improperly, or if the bus is inoperative. At the user's discretion, these errors may be evaluated by the operating system or the user's program.

Because operator intervention is usually required to correct 59306A problems, one alternative is to let the operating system process the time-out (i.e., set the 59306A down). The device configuration word defaults to such operating system error processing.

Configuration Word

The user program can process time-out errors when the E bit of the configuration word is set to one (see figure 18-3) and will default to the correct format when DMA has not been allocated. This can be assured by setting the D bit to zero. From File Manager,

:CN,23,25B,17400B

specifies non-DMA, and user program error checking.

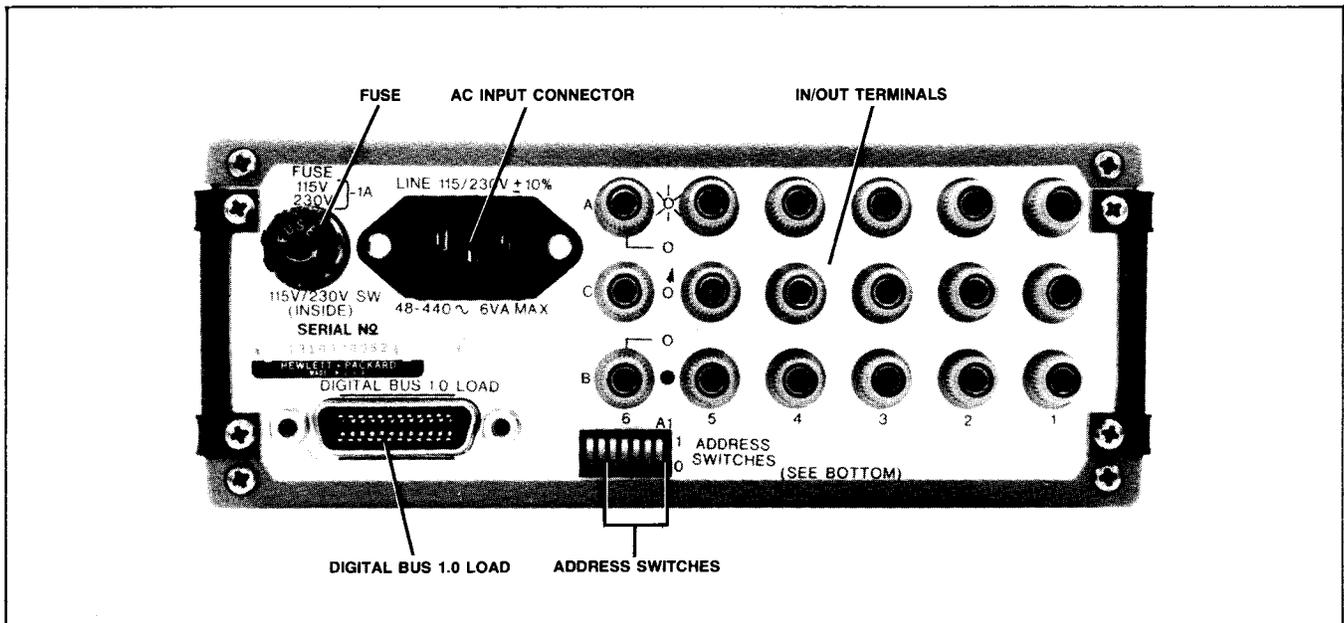


Figure 18-2. 59306A Address Switches

²An introduction to system preparations is shown in Application Note 401-1 (part number 5953-2800). With that note is included the BSC Utility which can be helpful for visualizing the instrument configuration word and other device-dependent information.

Remote

The 59306A must be set to remote before it can be programmed. From File Manager, the request,

```
: CN, 23, 16B
```

will put the 59306A, LU 23 into remote. From a FORTRAN program,

```
CALL RMOTE(23)
```

will put LU 23 into remote. Front panel operator control may be restored by pushing the local button on the front panel or by using the File Manager request,

```
: CN, IBLU, 17B
```

The FORTRAN request,

```
CALL LOCAL( IBLU)
```

will perform an identical operation.

When returning the bus to local, special care must be taken to insure that other devices on the bus are not affected. Notice that the bus logical unit (device address 0) must be

used for the request. The local request is not a device-specific command. When this command is sent, all HP-IB devices on the same bus and in remote will be returned to local.

Programming

The 59306A is a listen-only device. This means that the instrument will perform useful tasks when programmed with ASCII commands, but is not capable of returning any information to the HP 1000 computer.

Characters other than those specifically recognized for programming are accepted and ignored. Programming strings may be delimited by commas, blanks, asterisks, etc.

Table 18-2 shows a complete list of 59306A programming commands. Notice that six relays are available and may be individually set to the "A" or "B" position.

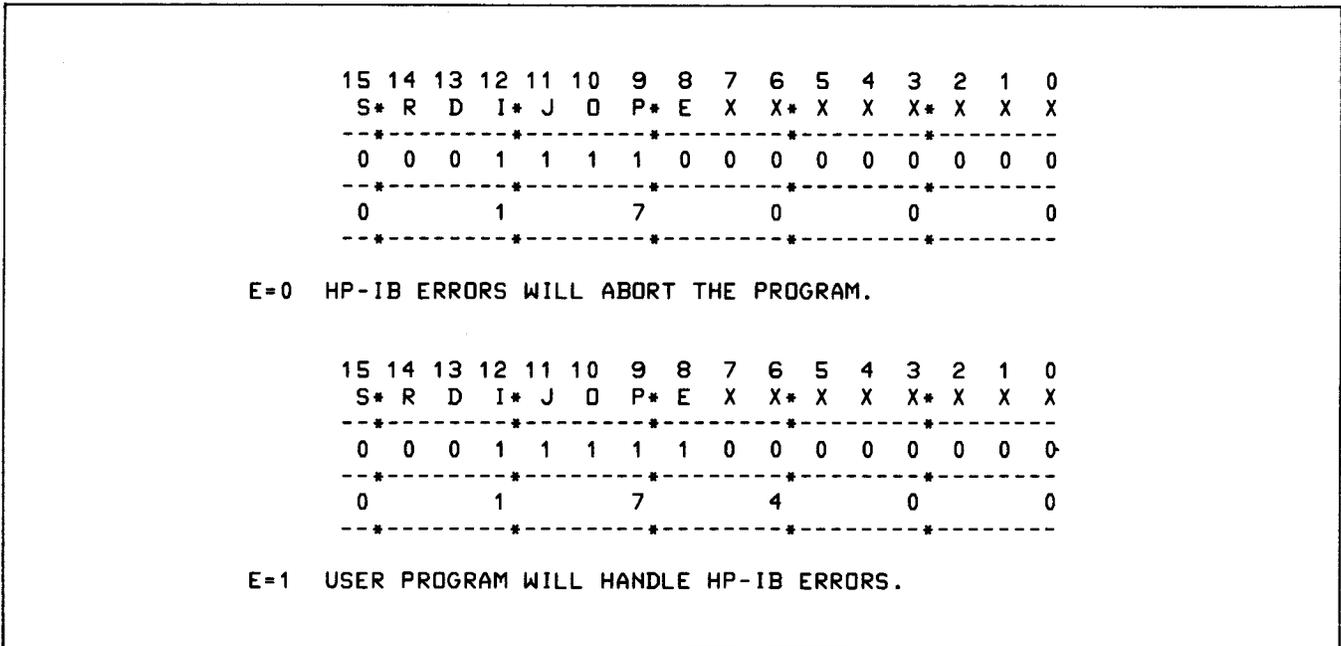


Figure 18-3. Example Device Configuration Words

Table 18-2. 59306A Programming Commands

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	

The File Manager may be used to exercise the 59306A. Setting relay 1 to the "A" position and relay 2 to the "B" position would require the programming string "A1B2" from File Manager. This could be accomplished by sending,

```
:LL,23
:AN,A1B2
```

The switch position need only be specified once for a series of relays. For example,

```
:AN,A123456
```

will set all relays to the "A" position.

Figure 18-4 shows a File Manager transfer file which can be used to rotate relays, and switch each from A to B.

Figure 18-5 shows the corresponding FORTRAN program to do the same operation.

0001	:SV,4,,IH	Set severity code so this won't be printed during execution.
0002	:LL,23	Set the list LU to the instrument.
0003	:SE,,A	Set FMGR global 2G to A.
0004	:CA,1,1	Set FMGR global 1G to 1.
0005	:AN,2G,1G	Send "Ax" or "Bx" where x goes from 1 to 6.
0006	:CA,1,1G,+,1	Increment 1G.
0007	:IF,1G,LT,7,-3	Check limits.
0008	:IF,2G,EQ,B,-6	If true, start over.
0009	:SE,,B	Reset 2G to B.
0010	:IF,,EQ,,-7	Unconditional return to statement 4.

Figure 18-4. Example File Manager Transfer File

```

0001 :SV,1,9,IH
0002 :RU,AUTLU,,59306
0003 :RU,A306,2P,3P
0004 :SV,9G,,IH
0005 ::

0001 FTN4,L
0002 PROGRAM A306(3),03-28-79 (GWG) TEST THE 59306A
0003 INTEGER INPRM
0004 COMMON ILU,ILST,IDLU
0005 IF(INPRM(ID).EQ.NO)STOP

0006 10 IC=2HA
0007 20 DO 40 I=1,6
0008 WRITE(IDLU,30)IC,I
0009 30 FORMAT(A2,I1)
0010 40 CONTINUE
0011 IF(IC.EQ.2HB)GO TO 10
0012 IC=2HB
0013 GO TO 20
0014 END
    
```

This transfer file determines the 59306A device LU and schedules the test program "A306". See AN 401-1 (5953-2800).

Obtain input parameters ILU, ILST, and IDLU from the run statement.

Figure 18-5. 59306A Transfer File and Test Program

Local Lockout

The 59306A has a "LOCAL" switch on its front panel for manually returning the box to front panel control. When the switch is pressed, the 59306A defaults to the "A" or "B" switch positions (1,2,3,4,5,6) manually selected on the panel. Note that during this time, the relay actuator will continue accepting HP-IB information but ignores programming instructions. The front panel button "LOCAL" may be "locked out" (disabled) by sending the local lockout command from FORTRAN:

```
CALL LLO( IBLU )
```

This prevents an operator from manually changing the relay positions. Note that the message must be sent to the bus logical unit (device address zero) and not the device logical unit. Local lockout is a device-independent function. All HP-IB devices (addressed or not addressed) which recognize this message will respond.

Performance

Relay actuator switching time is limited by the specifications shown in Table 18-1. Relay settling time is 50 msec, which limits switching to 20/second. The HP 1000 is capable of forcing the 59306A to switch at a faster rate. This rate may be limited, by using the method shown in figure 18-6.

The "CALL EXEC"³ statement in line 17 forces the user program to wait for the amount of time determined by "IRES" and "IOF" (shown in figure 18-7).

³See the RTE Programmer's Manual (for RTE IV, part number 92067-90001).

```

0001  FTN4,L
0002      PROGRAM B306(3,32767),01-29-79 (GWG) 59306A DELAY
0003      INTEGER      INPRM,GTDLU,IPRG(3)
0004      COMMON      ILU,ILST,IDLU
0005      COMMON      /IEROR/YES,NO
0006      IF(INPRM(ID).EQ.YES) GO TO 20      Obtain input parameters from the run statement.
0007      DNAM=59306.
0008      IN=1
0009      IF(GTDLU(DNAM,IN,IDLU).EQ.NO)STOP  IDLU was not supplied, find it (see AN 401-1,
                                           part no. 5932-2800).

0010      IRES=1
0011      IOF=1
0012      5 IC=2HA
0013      DO 15 J=1,2
0014      DO 10 I=1,6
0015      WRITE(IDLU,20)IC,I
0016      20 FORMAT(A1,I1)
0017      CALL EXEC(12,0,IRES,0,-IOF)      FORTRAN wait statement.

0018      10 CONTINUE
0019      IC=2HB
0020      15 CONTINUE
0021      WRITE(ILU,30)
0022      30 FORMAT(" ENTER: IRES,IOF: ")
0023      READ(ILU,)IRES,IOF
0024      IF(IRES.LT.0) GO TO 40
0025      GO TO 5
0026      40 STOP
0027      END
    
```

Figure 18-6. FORTRAN Program to Select 59306A Channels

The EXEC(12) statement requests that the RTE operating system suspend B306 and resume execution with the next statement after the time specified by IRES and IOF. The value of IRES is the time resolution (figure 18-7). The value IOF indicates the number of time units determined by IRES. For example, if IRES is set to 2, and IOF is set to 5, the program will begin execution again in 5 seconds. Remember that a given offset of time is required to initiate an I/O request in the RTE operating system.⁴ Before the 59306A may be switched, this "setup" time will be incurred.

When using the 59306A with a measurement device such as a digital voltmeter, the statements to trigger the meter and input a reading to the HP 1000 should be entered after the EXEC(12) appearing in the program.

CALL EXEC(12,IPRG,IRES,0,-IOF)	
IRES	Resolution
1	tens of milliseconds
2	seconds
3	minutes
4	hours
IOF in the range 0-4096	

Figure 18-7. Program Scheduling Using Timed Offset

⁴See AN201-4, "Performance Evaluation of HP-IB Using RTE Operating Systems."

NOTES

