Errata

Title & Document Type: 59306A Relay Actuator Operating and Service Manual

Manual Part Number: 59306-90001

Revision Date: October 1973

HP References in this Manual

This manual may contain references to HP or Hewlett-Packard. Please note that Hewlett-Packard's former test and measurement, semiconductor products and chemical analysis businesses are now part of Agilent Technologies. We have made no changes to this manual copy. The HP XXXX referred to in this document is now the Agilent XXXX. For example, model number HP8648A is now model number Agilent 8648A.

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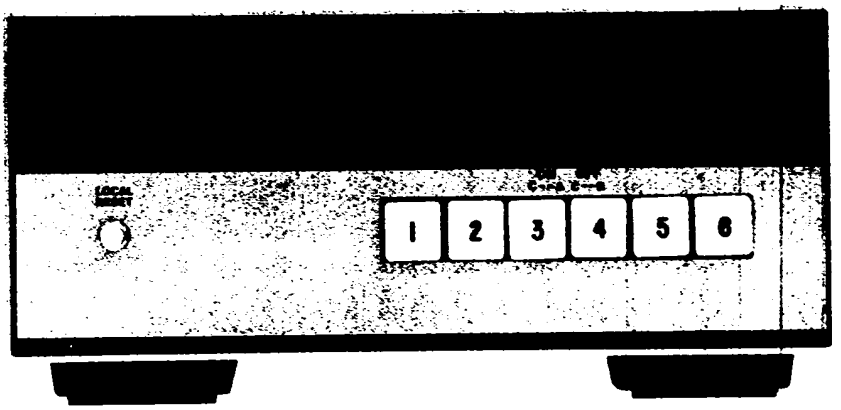
Agilent Technologies

OPERATING AND SERVICE MANUAL

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.

Printed: OCT 1973

HEWLETT PACKARD

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MANUAL CHANGES

CHANGE DATE: July 14, 1982
This change supersedes all earlier dated changes.

*** Make all corrections listed under ERRATA before making other changes.

*** Check following table for your instrument's serial prefix or series number and make listed change(s) to manual.

MANUAL DESCRIPTION

INSTRUMENT: 59306A
Relay Actuator
Operating and Service Manual

SERIAL PREFIX: 1332A

DATE PRINTED: OCT 1973
HP PART NO: 59306-90001
MICROFICHE NO: 59306-90003

# INDICATES NEW OR REVISED ITEM

> INDICATES ACTION TO BE TAKEN

SERIAL PREFIX OR SERIES NUMBER	MANUAL CHANGE(S)
1524A	1
1552A	1,2
1600A	1,2,3
1604A	1,2,3,4
1632A	1,2,3,4,5
1712A	1 thru 6
1736A	1 thru 7
1920A	1 thru 8

Information for any optional circuit boards described in this manual agrees with the series numbers on the circuit board(s) for the option, which may not be the same as the Serial Prefix Number on the rear of the instrument.

49K/L--4976-5291-5847-6121-6147-6448-6467-6607-7118-7503/9097/8246E/

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ERRATA

#Page ii:

>Insert the following SAFETY CONSIDERATIONS:

Model 59306A

SAFETY CONSIDERATIONS

The 59306A Relay Actuator is a Safety Class I instrument (provided with a protective earth terminal), designed and tested according to international safety standards. To ensure safe operation and to keep the instrument in safe condition, the user must follow the information, cautions, and warnings provided below and in the Operating and Service Manual.

****
* *
* WARNING *
* *
****

Before switching on this instrument, the protective earth terminal of the instrument must be connected to the protective conductor of the (mains) power cord. The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. The protective action must not be negated by the use of an extension cord (power cable) without a protective conductor (grounding).

Whenever it is likely that the protection has been impaired, the instrument must be made inoperative an be secured against any unintended operation.

All protective earth terminals, extension cords, autotransformers, and devices connected to this instrument should be connected to a protective earth grounded socket outlet. Any interruption of the protective earth grounding will cause a potential shock hazard that could result in personal injury.

For continued protection against fire hazard, replace the line fuse only with a 250V fuse of the same current rating and type. Do not use repaired fuses or short circuited fuseholders.

Before switching on this instrument, make sure that it is adapted to the voltage of the ac power source.

Any maintenance or service requiring removal of protective covers should be performed by service-trained personnel who are aware of the hazard involved (for example, fire and electrical shock).

Capacitors inside the instrument may still be charged even if the instrument has been disconnected from its source of supply.

ERRATA

Front Cover and Page 3-1, Figure 3-1. 59306A Relay Actuator Front Panel:
>Change "ASCII PROGRAMMABLE MODULE" label at the bottom of the front panel to "HP-IB PROGRAMMABLE MODULE".

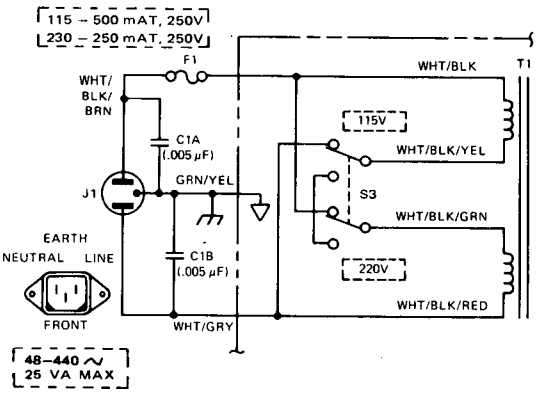
Page 5-1, Paragraph 5-6:
>Delete in second sentence "as defined in the HP Interface Bus User's Manual".

Page 5-2, Table 5-2, In-Cabinet Performance Test:
>Change first sentence step 4 to read:
"Program the Bus Controller to set REN low and apply the ASCII code (shown in 3.) to the Bus data lines."
>Change first sentence step 5 to read:
"Program the Bus Controller to apply the unlisten code to the Bus data lines, and set REN high."
>Change first sentence step 8a to read:
"Using the Bus Controller, set REN low, address the 59306A, and send code A followed by relay control codes 1 through 6."

Page 6-3, Table 6-1, A1 (59306-60001) Replaceable Parts:
>Change A1C7 through A1C10 to 0160-3879; CAPACITOR, FXD, CER, 0.01 uF 20%, 100WVDC; 28480; 0160-3879.
>Add A1CR4 1901-0040 DIODE, SWITCHING, S1, 30V MAX VRM 50 MA.
>Change The "ASCII PROGRAMMABLE MODULE" label on the bottom of the front panel to "HP-IB PROGRAMMABLE MODULE"; HP-IB is an abbreviation for "Hewlett-Packard Interface Bus".

Page 6-4, Table 6-1, Chassis Parts:
>Add C1A/B 0160-3043 C:FXD DUAL .005 uF 300WVDC; 56289; 29C147A-CDH; QTY 1.

Page 8-5, Figure 8-3, A1 (59306-60001) Schematic Diagram:
>Add C1A/B .005 uF as shown in partial schematic below.
>Add J1 as shown in partial schematic below.
>Change 115-220 conversion switch reference designation from "53" to S3 as shown in the diagram.



Page 6-4, Table 6-1, Replaceable Parts:
>Add A1J1 as reference designator for 1200-0423.
>Add A2W1; 59306-60003; CABLE ASSY, RELAY; 28480; 59306-60003.
>Add to Chassis Parts:
T1; 9100-3025; TRANSFORMER, POWER; 28480; 9100-3025.
W1; 8120-1833; CABLE ASSY, INTERCONNECT; 28480; 8120-1833.

ERRATA (Cont'd)

Page 8-3, Figure 8-2, Digital Bus Pin Summary Table:
>Add, to the DIGITAL BUS PIN SUMMARY, 17; REN; When low the 59306A is in remote operation ; when high the 59306A is in local control.

Page 8-5, Figure 8-3, A1 Schematic Diagram:
>Add A1CR4, connect cathode to junction of A1R8 and U20(1) and anode to U2(1, 2, 4,).
>Show interconnect between A1J2 and A2J1 as W1.
>Show A2 output connections as Part of A2W1.

Page 4-2, Paragraph 4-10:
>Delete third sentence pertaining to HP Interface Bus User's Manual.

Page 5-1, Paragraph 5-6:
>Delete " ,as defined in the HP Interface Bus User's Manual," from the second sentence.

Page 6-4, Table 6-1, Chassis Parts:
>Add J1; 1251-2357; CONNECTOR, POWER:MALE 3-PIN; 28480; 1251-2357.
>Add XDS1-2; 05330-40002; LAMPHOLDER, DUAL; 28480; 05330-40002.
>Add XF1; 1400-0084; FUSEHOLDER:EXTR POST BAY. CAP; 28480; 1400-0084.

#Page 6-4, Table 6-1, Chassis Parts:
>Change XF1 to 2110-0564; FUSEHOLDER-EXTR POST BODY BAYONET CU 12A 250V 28480; 2110-0564
>Add 2110-0565; FUSEHOLDER-EXTR POST CAP BAYONET CU 28480 2110-0564
>Add 2110-0569; FUSEHOLDER-MTG NUT HEX METRIC 28480 2110-0569

#Page 6-5, Table 6-2, Cabinet Parts:
>Change Mfr. Part No. for item 7 to 59306-00003

Page 8-5, Figure 8-3, A1 Schematic Diagram:
>Delete connection between U25D(12) and U15E(10).
>Connect U25D(12) to U16A(2).
>Change reference designator U27B, connected between U28D(12) and U28C(9), to U29B.

ERRATA (Cont'd)
Page 5-2, Table 5-2, In-Cabinet Performance Test:
>Add the following verification program at the end of Table 5-2.

HP-IB VERIFICATION PROGRAM USING HP MODEL 9820A OR 9830A CALCULATOR.

The following program checks the 59306A for proper operation of the HP-IB I/O only. To provide a complete functional check of the 59306A, this test must be used in combination with the In-Cabinet Performance Test.

1. Figure A is the basic flowchart for the verification program.

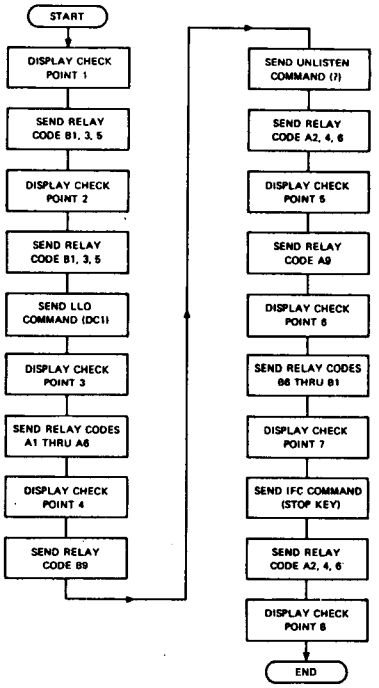


FIGURE A

2. Verification Using 9820A Calculator.

a. Set up a 9820A Calculator, 11224A PCII ROM, 59405A HP-IB Calculator Interface, 10631A HP-IB cable, and 59306A Relay Actuator for operation.

b. Set 59306A controls as follows:

Address Switch -- 10001 (1,Q)
Front Panel Relay Switches -- 1,3,5, -- IN
2,4,6, -- OUT

c. Initialize 59306A by removing AC power, then reapplying power.

ERRATA (Cont'd) Verification Using 9820A Calculator:

d. Type in program of Figure B. (NOTE: Strange character in line 5 is made by TRACE key).

```
0:
DSP "CHECK POINT
 1"⊢
1:
STP ⊢
2:
CMD "?U1","B135"
⊢
3:
DSP "CHECK POINT
 2"⊢
4:
STP ⊢
5:
CMD "?U1","B135"
,"$"⊢
6:
DSP "CHECK POINT
 3"⊢
7:
STP ⊢
8:
CMD "?U1","A"⊢
9:
1→X⊢
10:
FMT FXD *.0;WRT
13,X⊢
11:
STP ⊢
12:
X+1→X⊢
13:
IF X≤6;GTO 10⊢
14:
DSP "CHECK POINT
 4"⊢
15:
STP ⊢
16:
CMD "?U1","B9","
?","A246"⊢
17:
DSP "CHECK POINT
 5"⊢
18:
STP ⊢
19:
CMD "?U1","H9"⊢
20:
DSP "CHECK POINT
 6"⊢
21:
STP ⊢
22:
CMD "?U1","B"⊢
23:
6→Y⊢
24:
FMT FXD *.0;WRT
13,Y⊢
25:
STP ⊢
26:
Y-1→Y⊢
27:
IF Y>0;GTO 24⊢
28:
DSP "CHECK POINT
 7"⊢
29:
STP ⊢
30:
CMD "U","A246"⊢
31:
DSP "CHECK POINT
 8"⊢
32:
STP ⊢
33:
END ⊢
```

FIGURE B

e. Press END and LIST keys on 9820A. Compare listing with Figure B for accuracy.

f. Press END and RUN PROGRAM keys. As CHECK POINT's appear on calculator display, verify operation of 59306A with CHECK POINT explanations in steps 4 through 11. To continue program after each CHECK POINT, press RUN PROGRAM key.

3. Verification Using 9830A Calculator:

a. Set up a 9830A Calculator, 9866A Printer, 11272B Extended I/O ROM, 59405A HP-IB Calculator Interface, 10631A HP-IB Cable, and 59306A Relay Actuator for operation.

ERRATA (Cont'd) Verification Using 9830A Calculator:

b. Set 59306A controls as follows:

Adress Switch -- 10001 (1, Q)
Front Panel Relay Switches -- 1, 3, 5 -- IN
2, 4, 6 -- OUT

c. Initialize 59306A by removing AC power, then reapplying power.

d. Type in program of Figure C.

```
10 DISP "CHECK POINT 1"
20 STOP
30 CMD "?U1","B135"
40 DISP "CHECK POINT 2"
50 STOP
60 CMD "?U1","B135","?U"
70 FORMAT 3B
80 OUTPUT (13,70,256,17,512;
90 DISP "CHECK POINT 3"
100 STOP
110 CMD "?U1","A"
120 FORMAT F2.0
130 FOR I=1 TO 6
140 OUTPUT (13,120)I;
150 WAIT 1000
160 NEXT I
170 DISP "CHECK POINT 4"
180 STOP
190 CMD "?U1","B9","?","A246"
200 DISP "CHECK POINT 5"
210 STOP
220 CMD "?U1","A9"
230 DISP "CHECK POINT 6"
240 STOP
250 CMD "?U1","B"
260 FOR J=6 TO 1 STEP -1
270 OUTPUT (13,120)J;
280 WAIT 1000
290 NEXT J
300 DISP "CHECK POINT 7"
310 STOP
320 CMD "U","A246"
330 DISP "CHECK POINT 8"
340 STOP
350 END
```

FIGURE C

e. Press LIST and EXECUTE keys on 9830A. Compare listing with Figure C for accuracy.

f. Press RUN and EXECUTE keys. As CHECK POINTS appear on calculator display, verify operation of 59306A with CHECK POINT explanations in steps 4 through 11. To continue program after each CHECK POINT, press CONT and EXECUTE keys.

ERRATA (Cont'd) Verification Using 9830A Calculation:

4. CHECK POINT 1.

   a. ON light should be on and remain on through test.

   b. REMOTE light should be off.

   c. Relay indicator lights 1, 3, 5 should be on and relay indicator lights 2, 4, 6 should be off.

5. CHECK POINT 2.

   a. REMOTE light should be on.

   b. All relay indicator lights should be off.

   c. Press LOCAL RESET on 59306A front panel. Relay lights 1,3,5 should now be on and relay lights 2,4,5 and REMOTE light should now be off.

6. CHECK POINT 3.

   a. REMOTE light should be on and remain on through remainder of test.

   b. All relay indicator lights should be off.

   c. Press LOCAL RESET. All relay lights should remain off.

   d. When program is continued, relay lights should light sequentially 1 through 6. On 9820A, press RUN PROGRAM key after each relay indicator lights.

7. CHECK POINT 4.

   a. All relay lights should be on.

   b. When program is continued, all relay lights should go off simultaneously.

8. CHECK POINT 5.

   a. All relay lights should be off.

   b. When program is continuted, all relay lights should lights simultaneously.

9. CHECK POINT 6.

   a. All relay lights should be on.

   b. When program is continued, relay lights should go off sequentially 6 through 1. On 9820A, press RUN PROGRAM key after each relay indicator goes off.

ERRATA (Cont'd) Verification Using 9830A Calculation:

10. CHECK POINT 7.

    a. All relay lights should be off.

    b. Press STOP key on calculator.

11. CHECK POINT 8.

    a. All relay lights should be off.

CHANGE 1

Page 6-3, Table 6-1, A1 Replaceable Parts:

>Change "DESCRIPTION" column for A1 to read "BD ASSY-CONTROL (Series 1524)".
>Change A1S2 to 3101-1973; SWITCH ASSY:SLIDE DIP (7 SPST); 28480; 3101-1973.

OPERATING NOTE -- The "rocker" type ADDRESS SWITCHES (3101-1826) have been changed to slide switches (3101-1973). A black dot located in a corner is use as a reference to determine switch positions. Sliding a switch to the side with the dot opens the switch contacts for a "1" state. Sliding a switch in the opposite direction, away from the dot, closes the switch contacts for a "0" state.

Page 8-5, Figure 8-3, A1 Schematic Diagram:

>Change Series Number at the top of A1 schematic diagram to 1542.
>Mark schematic to show that seven-section switch (ADDRESS SWITCHES) is a part of A1 assembly with a Reference Designator of A1S2.

CHANGE 2

Consists of internal mechanical changes which do not change specifications, operation, or parts listed in Table 6-1. The single insulators (HP Part No. 0340-0732) on the rear of the binding posts are replaced by one insulator with 18 holes (HP Part No. 59306-60005).

CHANGE 3

The two mounting studs for the HP-IB connector are changed from 0380-0513 to 0380-0644. The 0380-0644 hex studs accommodate lock screws with ISO metric thread M3.5 X 0.6 or equivalent Optimum Metric Fastener System (OMFS) thread 3.5 PO6.

Metric hardware supplied by HP for HP-IB connectors can be identified by the black finish. If metric tools are not available, a 9/32-inch hex socket will fit the 7 mm hex stud.

Conversion Kits for converting earlier instruments to use the metric lock screws are available through any HP Sales or Service Office.

CAUTION

THE THREADS OF THE METRIC HARDWARE WILL NOT FIT THE 6-32 UNC THREADS ON HARDWARE WITH A SILVER FINISH. THE THREADS WILL STRIP IF THE HARDWARE IS INTERMIXED.

Page 1-1, Table 1-2, Specifications:

>Change "Power requirements" to 115V or 230V +/-10%, 48 to 440 Hz, 25VA max.

Page 6-4, Table 6-1, Chassis Parts:

>Add F1; 2110-0201; FUSE 250MAT 250V 1.25 X .25 UL IEC; 75915; 313.250S.

NOTE

Use 250MAT 250V fuse (2110-0201) for 115V operation or 125MAT 250V fuse (2110-0318) for 230V operation.

CHANGE 4

Page 6-4, Table 6-1, Replaceable CHASSIS PARTS:
>Change C1 to 0160-3333; CAPACITOR FXD .005 uF 0% 250WVAC CER; 28480; 0160-3333

Page 8-5, Figure 8-3, Schematic Diagram:
Replace C1A and C1B with a single .005 uF capacitor (C1) connected between the two outer terminals of the ac power connector. Remove the common connection between C1A and C1B and chassis ground. Make same corresponding change in the figure on page 2 of these MANUAL CHANGES.

Page 1-1, Table 1-1, Equipment Supplied:
>Delete 10631A Hewlett-Packard Interface Bus Interconnect Cable. This instrument is furnished less the HP-IB cable which is available as an additional cost accessory. Disregard any manual references stating the instrument is supplied with the HP-IB cable.

CHANGE 5

Page 6-3, Table 6-1, A1 (59306-60001) Replaceable Parts:
>Change A1 series number to 1632.
>Change A1C4 to 0140-0192; CAPACITOR-FXD 68PF 5% 300WVDC MICA; 72136; DM15E680J0300WV1CR.
>Change A1C6 to 0140-0192; CAPACITOR-FXD 68PF 5% 300WVDC MICA; 72136; DM15E680J0300WV1CR.
>Add A1C11; 0140-0192; CAPACITOR-FXD 68PF 5% 300WVDC MICA; 72136; DM15E680J0300WV1CR.
>Change A1R8 to 0683-1215; RESISTOR, FXD 120 Ohm 5% .250W CC TUBULAR; 01121; CB1215.
>Add A1R23; 0683-1215; RESISTOR, FXD 120 Ohm 5% .250W CC TUBULAR; 01121; CB1215.
>Change A1U3, U5, U17, U20, U24, U30 to 1820-1112; IC DIGITAL TTL LS DUAL; 01295; SN74LS74N.
>Change A1U6, U10, U15, U16, U29 to 1820-1199; IC DIGITAL TTL LS HEX1; 01295; SN74LS04N.
>Change A1U7 to 1820-1418; IC DIGITAL TTL LS 4BCD-TO-DEC; 01295; SN74LS42N.
>Change A1U11, U12, U18, U19, U25, U26, U28 to 1820-1197; IC DIGITAL TTL LS QUAD 2 NAND; 01295; SN74LS00N.

Page 8-5, Figure 8-3, A1 (59306-60001) Schematic Diagram:
>Change series number, at top of A1 diagram, to 1632.
>Change A1C4 value to 68 pF.
>Change A1C6 value to 68 pF.
>Add A1C11 (68 pF) between circuit board common and A1U22D pin 13.
>Change A1R8 value to 120 Ohm.
>Add A1R23 (120 Ohm) in series with the connection between A1U15F pin 12 and the junction of C11 (just added) A1U22D(13), A1U14A(5), and A1U8B(4).

CHANGE 6

Page 6-4, Table 6-2, A1 (59306-60002) Replaceable Parts:
>Delete all 12 HP Part No. 0160-0207 capacitors for A2C1 through A2C12.
>Add (SERIES 1712) to A2 description.

Page 8-5, Figure 8-3, A2 Schematic Diagram:
>Change A2 series number, at top of schematic, to 1712.
>Delete .01 uF capacitors A2C1 through A2C12.

CHANGE 7

Page 6-3, Table 6-1, A1 (59306-60001) Replaceable Parts:
>Change A1 series number to 1736.
>Change A1C4 an C11 to 0160-4084; CAPACITOR-FXD 0.1 uF 20% 50WVDC CER; 28480; 0160-4084.
>Change A1C6 to 0140-0149; CAPACITOR-FXD 470pF 5% 300WVDC MICA; 72136; DM15F471J0300WVICR
>Change A1R7 and R23 to 0757-0898; RESISTOR-FXD 82 Ohm 2% .125W F TC=0+/-100; 16299; C4-1/8-TO-82R0-G.
>Change A1U2 to 1820-1415; IC TTL DUAL-4; 01295; SN74LS13N.
>Change A1U8 to 1820-1202; IC TTL TRIPLE-3; 01295; SN74LS10N.
>Change A1U10, U15, and U16 to 1820-1416; IC TTL LP HEX; 01295; SN74LS14N.
>Change A1U14 to 1820-1204; IC TTL DUAL-4; 01295; SN74LS20N.
>Add A1C12; 0180-0116; CAPACITOR-FXD 6.8uF 10% 35WVDC TA; 56289; 150D685X9035B2
>Add A1C13; 0180-1735; CAPACITOR-FXD 0.22uF 10% 35WVDC TA; 56289; 150D224X9035A2.

Page 6-4, Table 6-1, CHASSIS PARTS:
>Change C1 to 0160-0676; CAPACITOR-FXD dual .0018 uF 10% CERAMIC; 28480; 0160-0676.

Page 8-5, Figure 8-3, Schematic Diagram:
>Change Series number at top of A1 (59301-60001) to 1736.
>Add pin 12 to A1J1 DIGITAL BUS and show a wire connecting this pin to the chassis.
>Change A1C4 value to 0.1uF.
>Change A1C6 value to 470pF.
>Change A1R7 and R23 value to 82 ohms.
>Add 6.8uF electrolytic capacitor A1C12 between circuit board common and +5V side of A1R4. Mark side connected to R4 with a + sign
>Add .22uF electrolytic capacitor A1C13 between pins 1 and 3 of +5V regulator A1U31. Positive side (+) to pin 1 and negative side to pin 3 (common).
>Add a wire to show the +5V line to A1DS1 thru DS6 is connected directly to A1U31 pin 2.

CHANGE 8

Page 3-2, Figure 3-2, Rear Panel View:
>Change marking over fuse to: 115V--250MAT/230V--125MAT.
>Change marking under AC input connector to: 48-440 Hertz 25VA MAX.
>Change item 1 under photograph to read "Requires a 250MAT fuse for 115-volt operation; 125MAT for 230 volt operation".

CHANGE 8 (cont'd.)

Page 6-4, Table 6-1, Replaceable Chassis Parts:

>Change F1 to 2110-0201; FUSE 250MAT 250V 1.25 X .25 (115V OPERATE); 75915; 313.250.

>Add F1 (Alternate); 2110-0318, FUSE 125MAT 250V 1.25 X .25 (230V OPERATE); 75915; 313.125.

>Delete any listing for C1 or C1A/B and add the following: C1, C2, 0160-4281; CAPACITOR-FXD 2200pF 20% 250VAC (RMS); 28480; 0160-4281.

Page 8-5, Figure 8-3, Schematic Diagram:

>Change F1 value to 115V--250MAT/230V--125MAT.

>Add 2200pF capacitor (C1) between chassis ground and the WHT-BLK-BRN wire to ac input connector J1.

>Add 2200pF capacitor (C2) between chassis ground and the WHT-GRY wire to ac input connector J1.

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

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 ± 10%, 50 to 400 Hz, 10 VA max

continued

Table 1-2. Specifications (Continued)

ENVIRONMENTAL: Operating temperature 0 to 50°C.

DIMENSIONS:
Height: 4 inches (101,6 mm) including cabinet feet.
Width: 8.38 inches (212,9 mm)
Depth: 11.6 inches (294,6 mm)

WEIGHT:
Net Weight: 5 lb. 13 oz. (2,64 kg)
Shipping Weight: 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

MNEMONIC	NAME
ADDR	Address
AORB	A or B
CLK	Clock
$\overline{\text{CLK}}$	"Not" Clock
$\overline{\text{CLR}}$	"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
$\overline{\text{LLO}}$	"Not" Local Lockout
MRE	Multiple Response Enable
$\overline{\text{MRE}}$	"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 commerical packing methods should be used. Reliable commerical 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°F (-40°C).
c. Maximum temperature: +167°F (+75°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

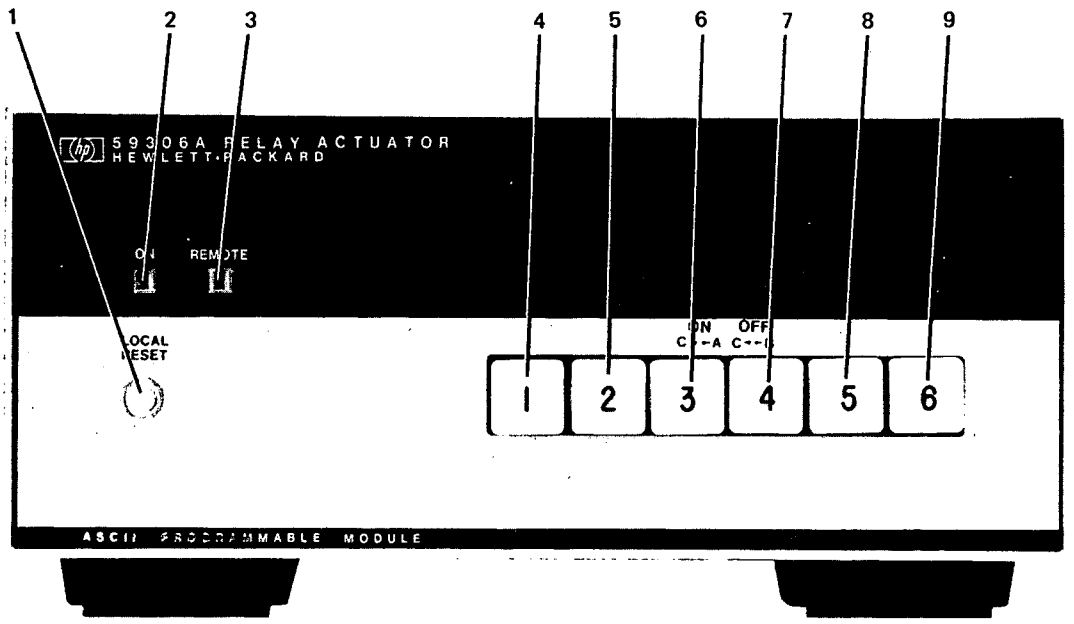
OPERATION AND PROGRAMMING

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.



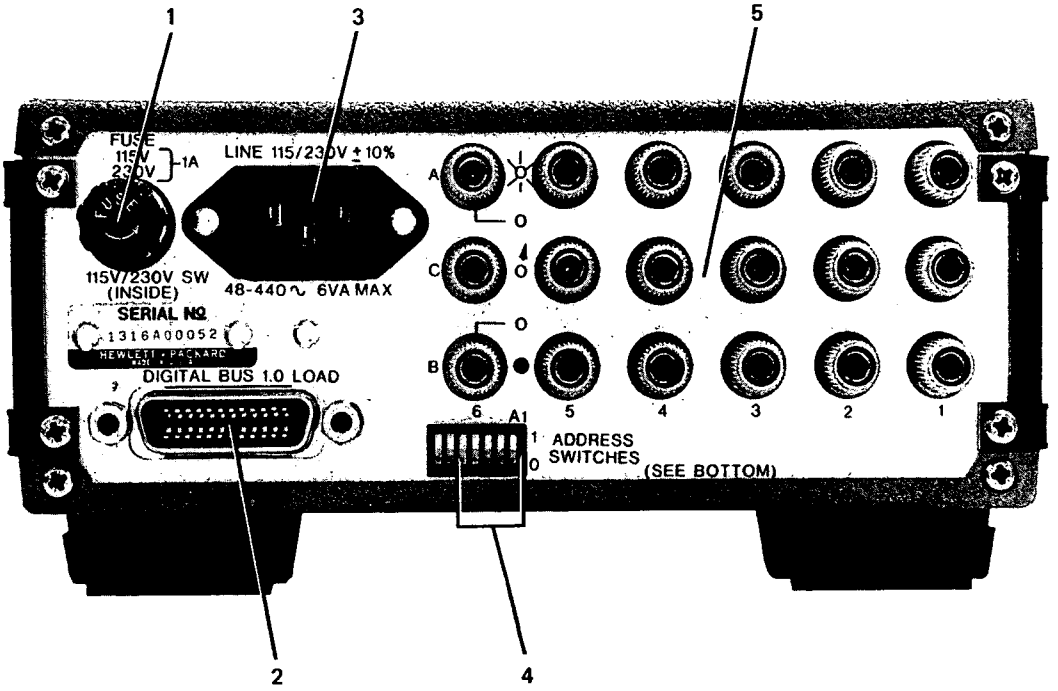
1. LOCAL RESET switch: When pushed resets the 59306A to front panel controls provided the local lockout bus command has not been sent to the 59306A (see paragraph 4-19).
2. ON indicator: When illuminated, indicates instrument has primary power applied.
3. REMOTE indicator: When illuminated, indicates the 59306A is not in local operation and has been addressed at some time; instrument is not necessarily under the control of remote programming when this indicator is illuminated (see the note that follows paragraph 4-19).
4. [1] Switch-indicator: Control for terminals A-1, B-1, and C-1 (located on rear panel). When illuminated, indicates in/out terminals C-1 and A-1 are connected together. When off, in/out terminals C-1 and B-1 are connected together.
5. [2] Switch-indicator: Control for terminals A-2, B-2, and C-2. When illuminated, in/out terminals C-2 and A-2 are connected together. When off, in/out terminals C-2 and B-2 are connected together.
6. [3] Switch-indicator: Control for terminals A-3, B-3 and C-3. When illuminated, in/out terminals C-3 and A-3 are connected together. When off, in/out terminals C-3 and B-3 are connected together.

continued

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 7	6	5	4	3	2	1	ASCII Equiv.	59306A Response
*Unlisten	L	H	0	1	1	1	1	1	1	?	Clears instrument as a listener.
Address Code	L	L	0	1	A_5†	A_4†	A_3†	A_2†	A_1†		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_5 through A_1 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 EOP	REN	MRE	DIO Lines ASCII Code	Description of Program Sequence
1	H	H	L	?	Clears all listeners.
2	H	L	L	% (see note)	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. 59306 only responds to remote programming (see Table 3-2).
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.

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 $01A_5A_4A_3A_2A_1$ where $A_5 \rightarrow A_1$ can be any combination of 1's & 0's other than 11111. $A_5 \rightarrow A_1$ 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 7	6	5	4	3	2	1	ASCII Equiv.	59306A Response
Unlisten	L	H	0	1	1	1	1	1	1	?	Clears instrument as a listener.
Address Code	L	L	0	1	A_5*	A_4*	A_3*	A_2*	A_1*		Places instrument in REMOTE. Enables 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.

*A_5 through A_1 must coincide with the code set on the 59306A address switches.

PROGRAMMING CODES

DIO Lines 7	6	5	4	3	2	1	ASCII Equiv.	59306A Response
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	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	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 EOP	REN	MRE	Data Lines ASCII Code	Description of Program Sequence
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 7 8	DAV RFD DAC	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.
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.

SECTION IV

THEORY OF OPERATION

4-1. INTRODUCTION

4-2. This section explains the operation of integrated circuits and the overall block diagram theory for the Relay Actuator.

4-3. INTEGRATED CIRCUIT OPERATION

4-4. The following paragraphs describe two of the IC's used in the actuator. The remaining IC's that are used are common gates and flip-flops which can be found in standard text books or IC catalogs.

4-5. Low-Power BCD to Decimal Decoder, 1820-0777

4-6. This IC (Figure 4-1) has a typical power dissipation of 70 milliwatts and converts BCD inputs to decimal outputs as shown in Table 4-1.

Table 4-1. BCD/Decimal Decoder 1820-0777, Truth Table

NO.	BCD INPUT				DECIMAL OUTPUT									
	D	C	B	A	0	1	2	3	4	5	6	7	8	9
0	L	L	L	L	L	H	H	H	H	H	H	H	H	H
1	L	L	L	H	H	L	H	H	H	H	H	H	H	H
2	L	L	H	L	H	H	L	H	H	H	H	H	H	H
3	L	L	H	H	H	H	H	L	H	H	H	H	H	H
4	L	H	L	L	H	H	H	H	L	H	H	H	H	H
5	L	H	L	H	H	H	H	H	H	L	H	H	H	H
6	L	H	H	L	H	H	H	H	H	H	L	H	H	H
7	L	H	H	H	H	H	H	H	H	H	H	L	H	H
8	H	L	L	L	H	H	H	H	H	H	H	H	L	H
9	H	L	L	H	H	H	H	H	H	H	H	H	H	L
INVALID	H	L	H	L	H	H	H	H	H	H	H	H	H	H
	H	L	H	H	H	H	H	H	H	H	H	H	H	H
	H	H	L	L	H	H	H	H	H	H	H	H	H	H
	H	H	L	H	H	H	H	H	H	H	H	H	H	H
	H	H	H	L	H	H	H	H	H	H	H	H	H	H
	H	H	H	H	H	H	H	H	H	H	H	H	H	H

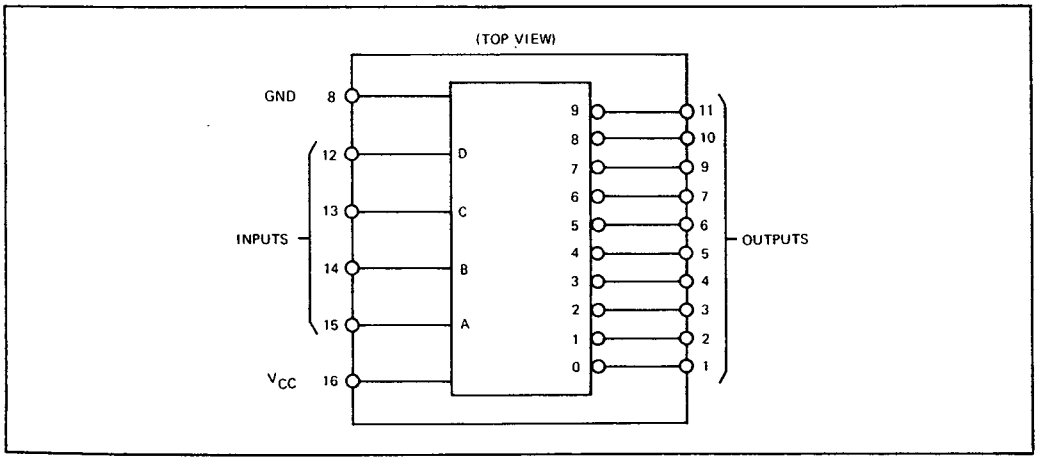


Figure 4-1. BCD/Decimal Decoder 1820-0777

4-7. Low Power TTL 5-Bit Comparator, 1820-0904

4-8. This IC (Figure 4-2) provides a comparison between two 5-bit words and gives one of three outputs; "less than", "greater than", or "equal to". A high level on the enable input forces all three outputs low. A low on the enable input allows a comparison to take place. The comparator function is shown in Table 4-2. Typical power dissipation is 52 milliwatts.

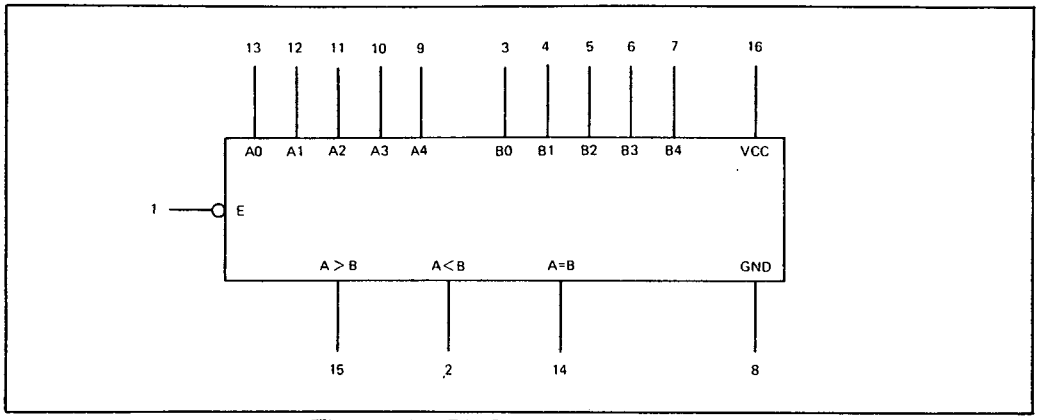


Figure 4-2. 5-Bit Comparator, 1820-0904

Table 4-2. 5-Bit Comparator 1820-0904, Truth Table

E	A B	A<B	A>B	A=B
H	X X	L	L	L
L	Word A = Word B	L	L	H
L	Word A > Word B	L	H	L
L	Word A < Word B	H	L	L

L = LOW Voltage Level
H = HIGH Voltage Level
X = Either HIGH or LOW Voltage Level

4-9. FUNCTIONAL BLOCK DIAGRAM THEORY

4-10. Figure 4-3 illustrates the functional block diagram for the 59306A Relay Actuator. The 59306A consists of six major circuit groups: handshake logic, bus logic, decode logic, local lockout logic, remote/local logic, and relay select logic. Detailed description of the operation of the HP Interface Bus is contained in the HP Interface Bus User's Manual. The signal mnemonics used in this section are listed in Table 1-3.

4-11. Handshake Logic

4-12. The three-wire handshake lines to the Handshake Logic synchronize the operation of the Relay Actuator. The lines are Ready for Data (RFD), Data Valid (DAV), and Data Accepted (DAC). The Handshake Logic processes the DAV signal and produces the Handshake Out (HSOUT) signal for use by the Bus Logic and the Local Lockout Logic. The DAV signal and the Handshake Enable (HSENABLE) signal combine to output the RFD and DAC signals on the bus. The basic purpose of this logic is to signal the other 59306 circuits that the DIO lines contain a character for possible processing and to interface the circuits to the HP Interface Bus three-wire handshake system.

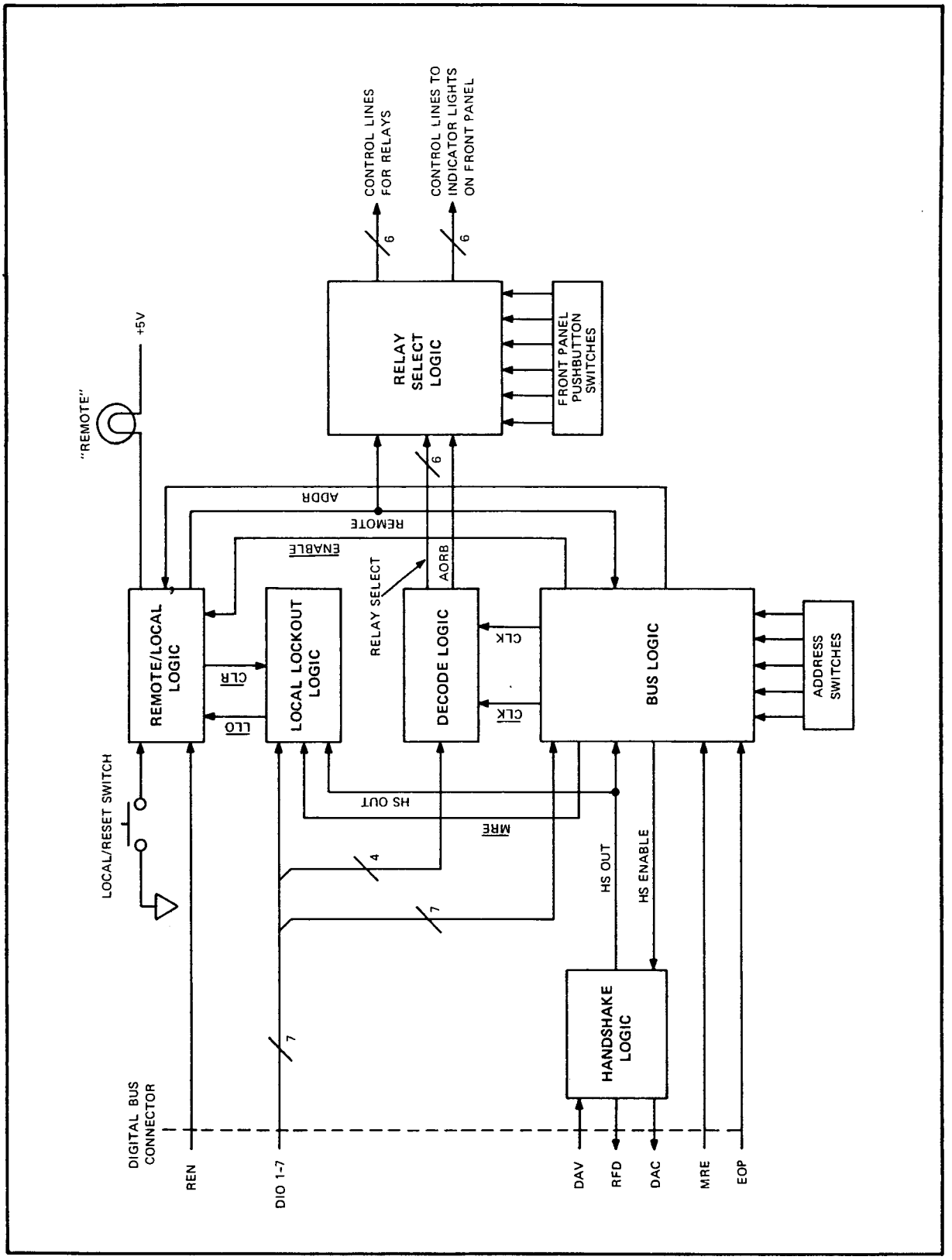


Figure 4-3. 59306A Relay Actuator, Functional Block Diagram

4-13. Bus Logic

4-14. The Bus Logic accepts inputs from the Data Input/Output (DIO) lines and the Multiple Response Enable (MRE) signal from the Interface Bus. These inputs, in conjunction with the HSOUT signal enable the Remote/Local Logic and the Local Lockout Logic. In addition, the Bus Logic processes the relay state codes and relay select codes present on the DIO lines, combined with the HSOUT and REMOTE signals to output the CLK and $\overline{\text{CLK}}$ signals to the Decode Logic.

4-15. The Bus Logic serves the additional function, in conjunction with the Remote/Local Logic, to place the 59306 into remote operation or take it out of remote operation on command from instructions on the Interface Bus.

4-16. Decode Logic

4-17. The Decode Logic receives the CLK and $\overline{\text{CLK}}$ signals from the Bus Logic and receives relay state codes and relay select codes from the DIO lines. To set a relay select line high, the relay select code corresponding to that line must be present on the DIO lines and the $\overline{\text{CLK}}$ signal must go low. To set the AORB line to a particular state, (which in turn will determine whether the selected relay is in the A or B state) the proper state code must be present on the DIO lines and the CLK signal must go high (see Table 3-1). The Decode Logic takes the place of the front panel pushbutton switches to control the Relay Select Logic when the 59306 is in remote operation.

4-18. Remote/Local Logic

4-19. The Remote/Local Logic receives the Remote Enable (REN) signal from the Interface Bus along with the ENABLE and ADDR signals from the Bus Logic to produce the REMOTE signal. This action puts the 59306 in remote operation. When the REMOTE signal is removed (by closing the LOCAL/RESET switch or setting REN high) the 59306 is taken out of remote operation. The LOCAL/RESET swtich is disabled and cannot take the 59306 out of remote operation when the $\overline{\text{LLO}}$ signal is received from the Local Lockout Logic.

NOTE

When the REMOTE indicator is illuminated the 59306 front-panel relay control switches are disabled. Illumination does not indicate whether or not the 59306 is under control of the interface bus. This indicator may be illuminated even though the 59306 is not under remote control such as after the instrument automatically unaddresses itself (see note that follows paragraph 3-6).

4-20. Local Lockout Logic

4-21. The Local Lockout Logic locks the 59306 in remote operation by disabling the LOCAL/RESET switch with the $\overline{\text{LLO}}$ signal. The function of this logic is to hold the 59306 in remote until an instruction from the Interface Bus (REN high) returns it to local operation. The logic monitors the DIO lines for the ASCII DC1 character which is processed along with the $\overline{\text{MRE}}$ and HSOUT signals to produce $\overline{\text{LLO}}$. $\overline{\text{LLO}}$ is cleared by the $\overline{\text{CLR}}$ signal from the Remote/Local Logic. The Local Lockout Logic will lock the 59306 in remote operation only when the unit is already in remote. If the 59306 is not in remote, this logic will have no effect on the operation or programming.

4-22. Relay Select Logic

4-23. The Relay Select Logic controls the state of the six relays in the 59306A. The state of a relay is defined by which in/out terminals are connected together, i.e., state A is in/out terminal A connected to in/out terminal C and state B is in/out terminal B connected to in/out terminal C. Control is accomplished by signals from the Decode Logic or by the front panel pushbutton switches. The state of the REMOTE signal determines whether the pushbutton signals or the Decode Logic signals control the Relay Select Logic.

4-24. FLOW DIAGRAMS

4-25. The 59306 processes are shown by the flow diagrams, Figures 4-4 through 4-7.

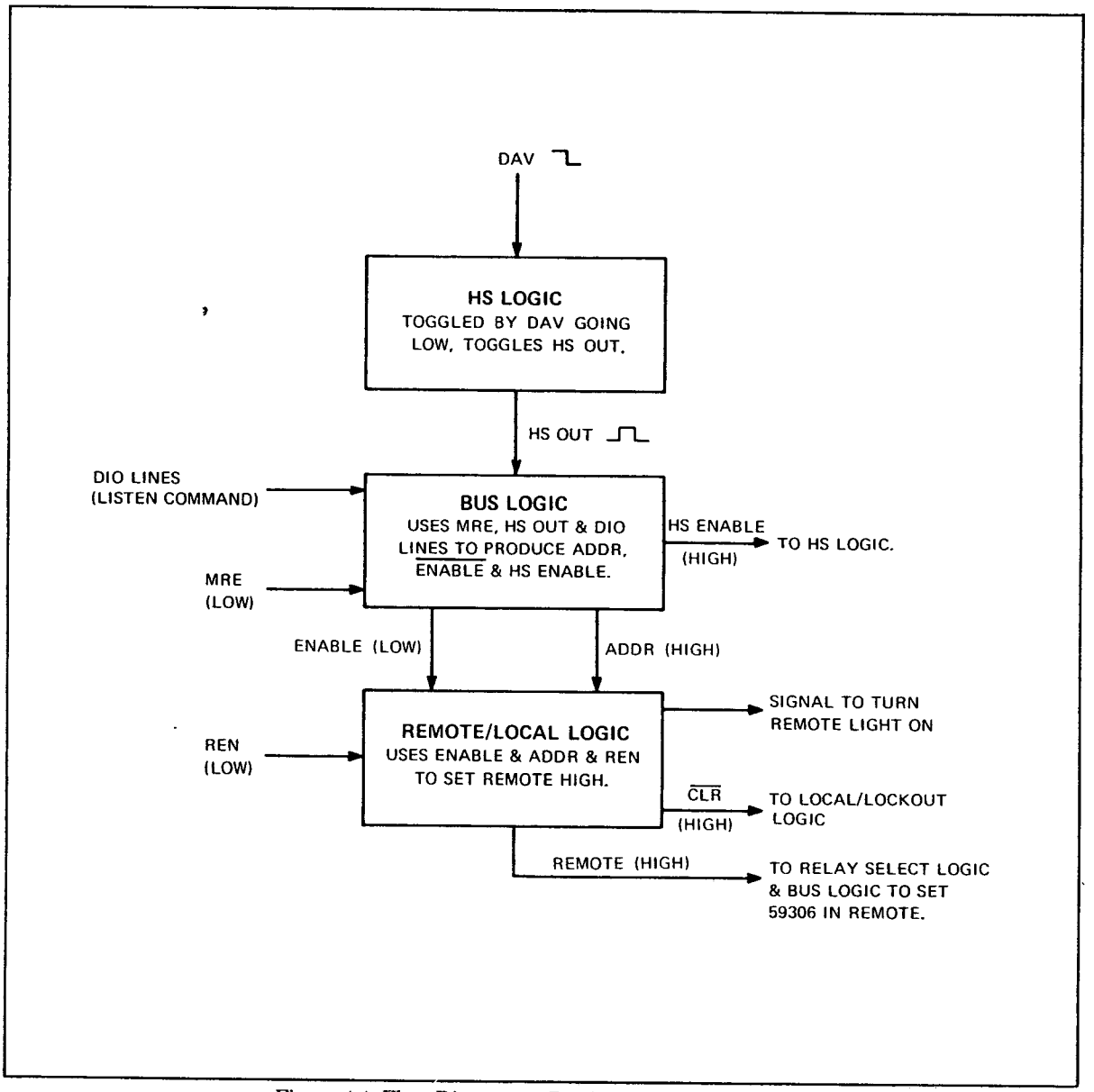


Figure 4-4. Flow Diagram 1, Putting 59306 in REMOTE

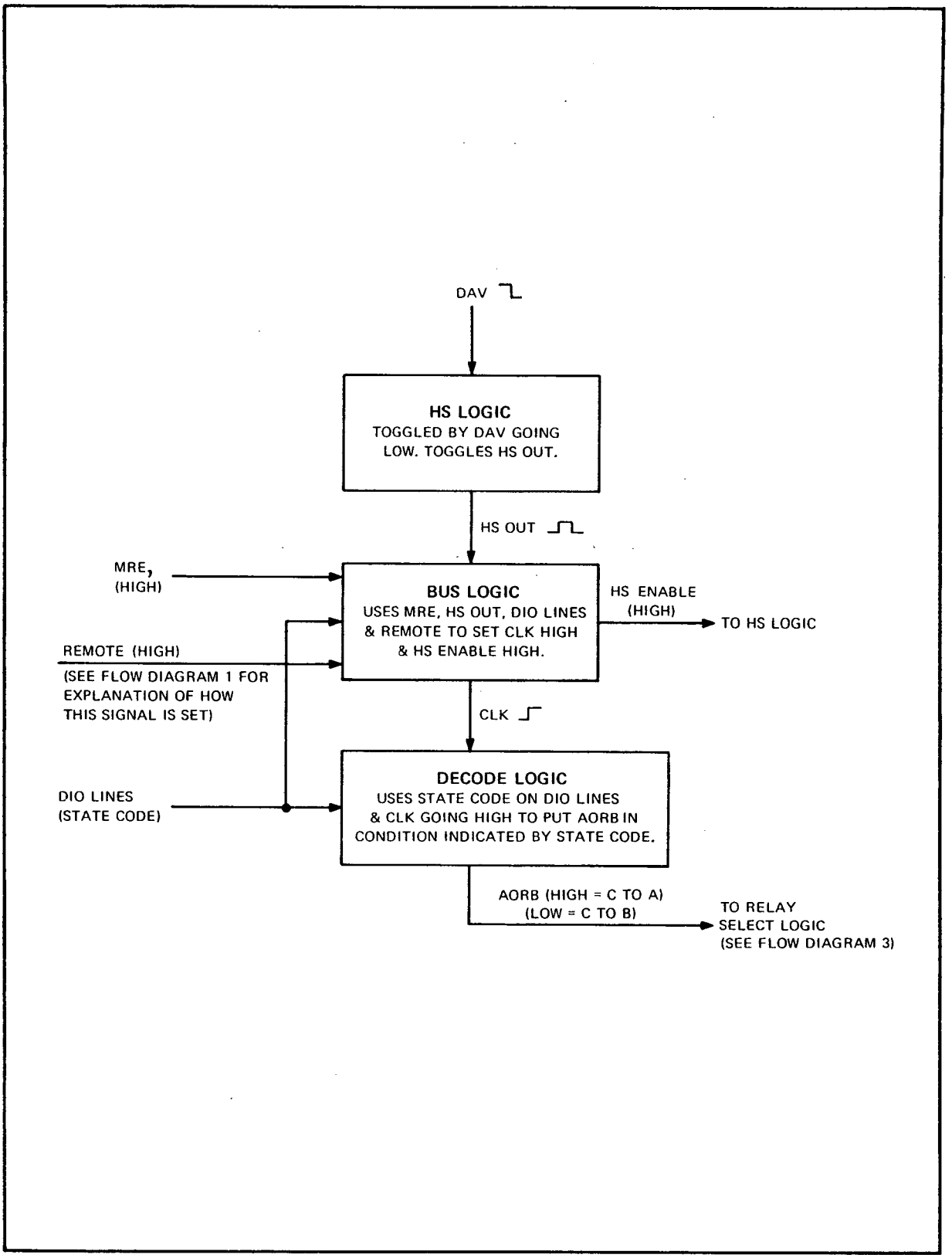


Figure 4-5. Flow Diagram 2, Processing Relay State Codes

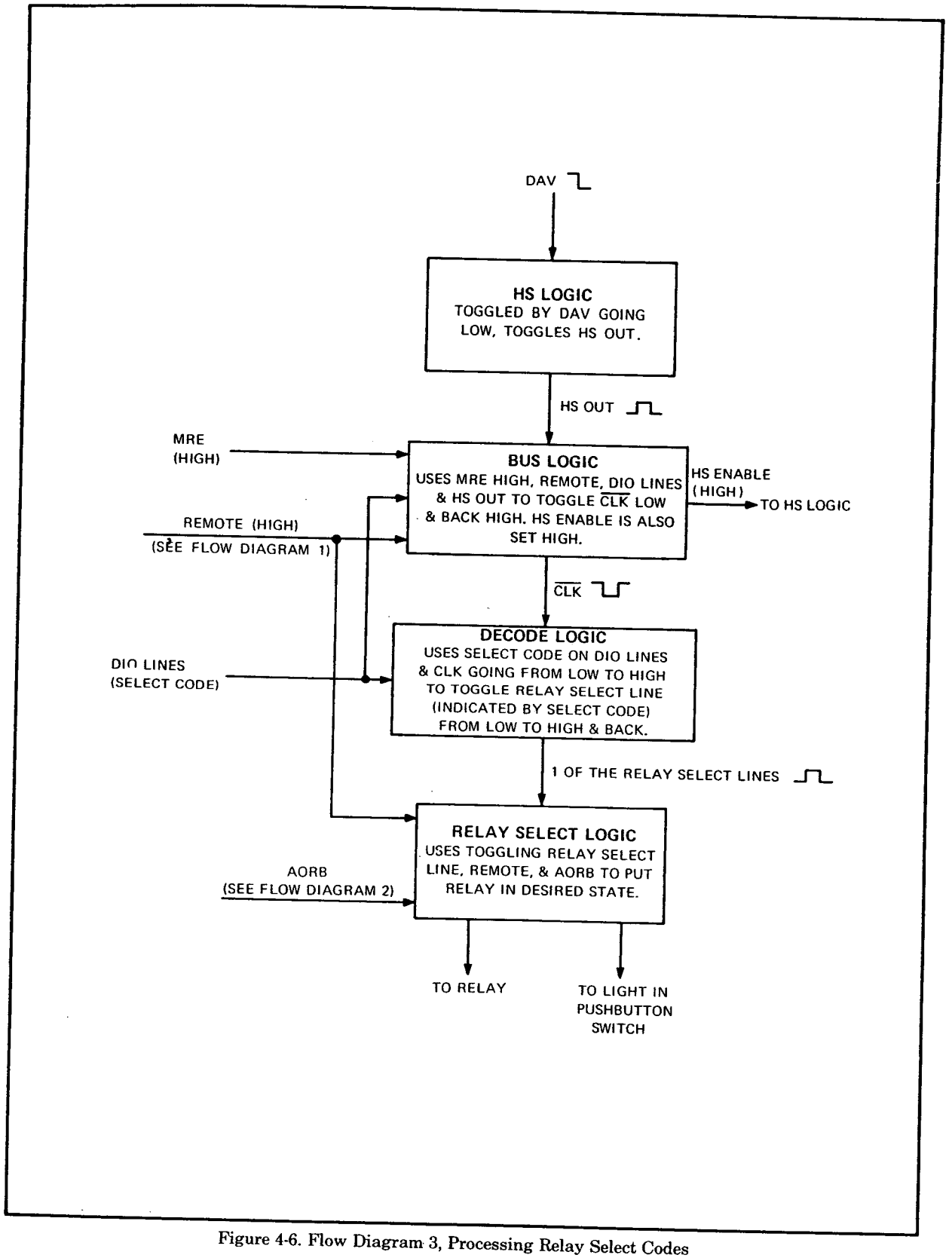


Figure 4-6. Flow Diagram 3, Processing Relay Select Codes

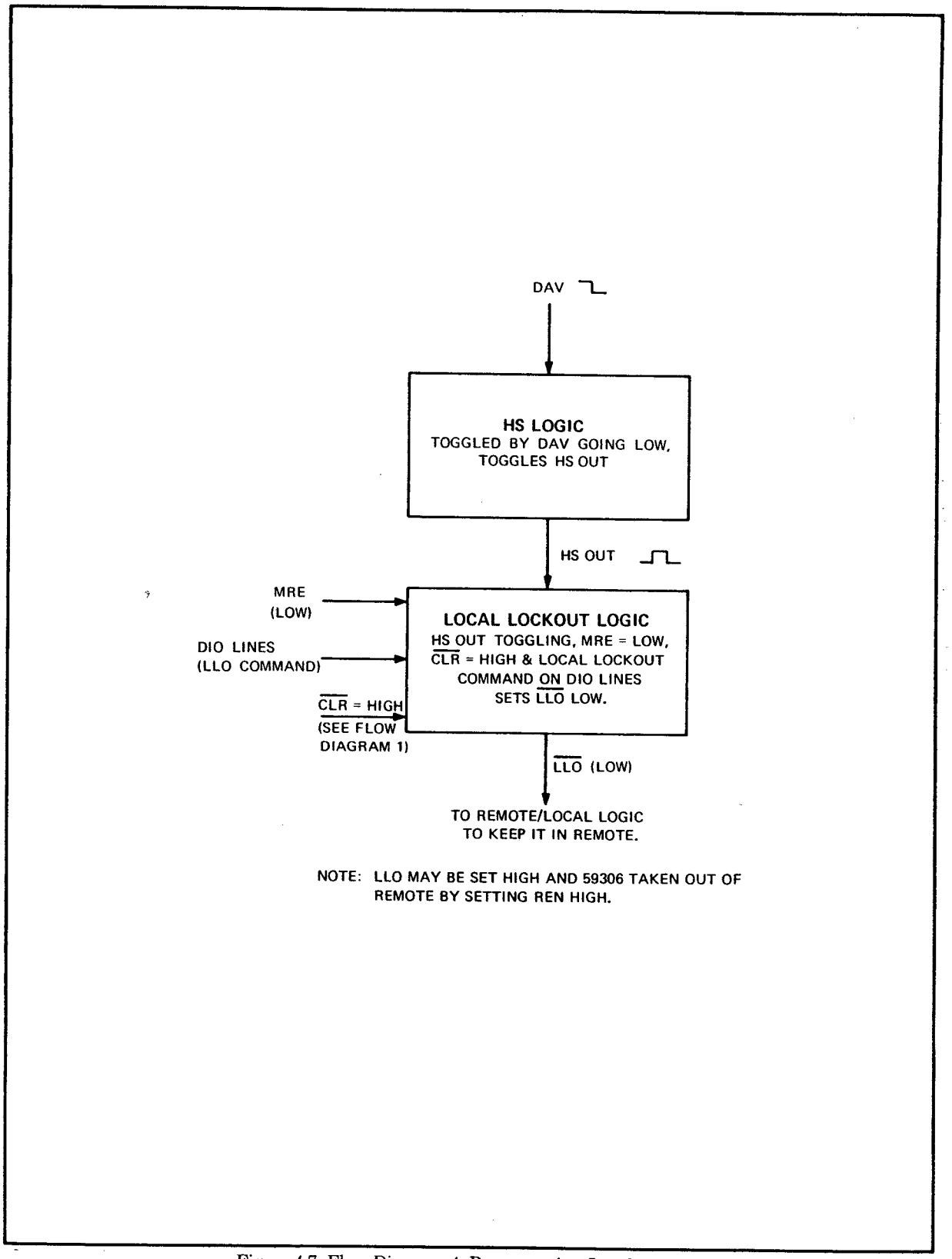


Figure 4-7. Flow Diagram 4, Programming Local Lockout

SECTION V

MAINTENANCE

5-1. INTRODUCTION

5-2. This section contains maintenance and service information including a table of recommended test equipment, in-cabinet performance check, and troubleshooting.

5-3. TEST EQUIPMENT

5-4. Table 5-1 lists test equipment recommended for maintaining and checking the performance of the 59306A. Test equipment having equivalent characteristics may be substituted for the equipment listed.

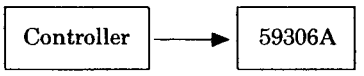
Table 5-1. Recommended Test Equipment

Instrument	Required Characteristics	Recommended
Logic Probe	Test TTL signal levels	HP 10525T
Logic Pulser	Pulse in-circuit IC's	HP 10526T
Digital Voltmeter	0 to + 175 volts Accuracy 0.3%	HP 3480A and HP 3482A

5-5. IN-CABINET PERFORMANCE CHECK

5-6. Table 5-2 contains the in-cabinet performance check. An HP Interface Bus Controller, as defined in the HP Interface Bus User's Manual, is required to provide signal inputs to the 59306A.

Table 5-2. In-cabinet Performance Test



1. Prior to connecting the 59306 to a power source, ensure that the voltage selector switch inside the unit is set to correspond with the line voltage to be used (115V or 230V). Install correct line fuse and connect 59306A to power source. The ON light should illuminate.
2. Connect equipment as illustrated in the above diagram.
3. Set the address switch on the back panel of the 59306A to the following code:

A_5	A_4	A_3	A_2	A_1	ASCII Equivalent
0	0	0	0	0	SP

Table 5-2. In-cabinet Performance Test (Continued)

4. Program the Bus controller to apply the ASCII code (shown in 3.) to the Bus data lines. The 59306A REMOTE light should illuminate.

5. Program the Bus controller to apply the unlisten code to the Bus data lines.

A_5	A_4	A_3	A_2	A_1	ASCII Equivalent
1	1	1	1	1	?

The REMOTE light should extinguish.

6. Repeat steps 4 and 5 for the following codes:

A_5	A_4	A_3	A_2	A_1	ASCII Equivalent
0	0	0	0	1	!
0	0	0	1	1	#
0	0	1	1	1	'
0	1	1	1	1	/
1	1	1	1	1	>

7. Relay Control, Manual Mode Check

   a. Using the Bus Controller, program the 59306A in the manual mode by pulling REN high. Check that REMOTE indicator extinguishes.

   b. Press front panel switch [1] to the latched (ON) position. Check that switch [1] indicator illuminates.

   c. Connect a continuity checker or ohmmeter to rear panel in/out terminals A-1 and C-1 and check for continuity.

   d. Disengage switch [1] to OFF position and check for continuity between in/out terminals B-1 and C-1.

   Repeat steps b through d for switches [2] through [6].

8. Relay Control, Remote Mode Check

   a. Using the Bus Controller, address the 59306A, send state code A followed by relay control codes 1 through 6. Check that all front panel switch indicators illuminate independent of the switch settings. Check that all rear panel terminals have continuity from in/out terminals A to C.

   b. Using the Bus Controller, send state code B followed by relay codes 1 through 6. Check that all front panel switch indicators extinguish. Check that all rear panel terminals have continuity from in/out terminals B to C.

PERFORMANCE CHECK TEST CARD

Hewlett-Packard Model 59306A

Test performed by _____

Instrument Serial No. _____

Date _____

1. REMOTE indicator illuminates and extinguishes per steps 1 through 6, Table 5-2. _____

2. Relays and indicator lights function properly in manual mode per step 7, Table 5-2. _____

3. Relays and indicator lights function properly in remote mode per step 8, Table 5-2. _____

SECTION VI

REPLACEABLE PARTS

6-1. INTRODUCTION

6-2. This section contains information for ordering replaceable parts. Table 6-1 lists replaceable parts for the Relay Actuator. Table 6-2 lists the mechanical parts. Figure 6-1 identifies the cabinet parts. Table 6-3 contains a list of manufacturers and their respective codes.

6-3. Parts are listed in alpha-numerical order of their reference designator starting with A1 and ending with chassis and miscellaneous parts. The replaceable parts table includes the following information.

a. Reference designator (when applicable).
b. HP part number.
c. Total quantity (Qty) used in the instrument.
d. Description of the part (see abbreviations below).

6-4. ORDERING INFORMATION

6-5. To obtain replacement parts, address order of inquiry to your local Hewlett-Packard Sales and Service Office. Identify parts by their Hewlett-Packard part number.

6-6. To obtain a part that is not listed, include:

a. Instrument model number.
b. Instrument serial number.
c. Description of the part.
d. Function and location of the part.

REFERENCE DESIGNATIONS

A	= assembly	E	= miscellaneous electrical part	P	= electrical connector (movable portion); plug	U	= integrated circuit; microcircuit
AT	= attenuator; isolator; termination	F	= fuse	Q	= transistor; SCR; triode thyristor	V	= electron tube
B	= fan; motor	FL	= filter	R	= resistor	VR	= voltage regulator; breakdown diode
BT	= battery	H	= hardware	RT	= thermistor	W	= cable; transmission path; wire
C	= capacitor	HY	= circulator	S	= switch	X	= socket
CP	= coupler	J	= electrical connector (stationary portion); jack	T	= transformer	Y	= crystal unit–piezoelectric
CR	= diode; diode thyristor; varactor	K	= relay	TB	= terminal board	Z	= tuned cavity; tuned circuit
DC	= directional coupler	L	= coil; inductor	TC	= thermocouple		
DL	= delay line	M	= meter	TP	= test point		
DS	= annunciator; signaling device (audible or visual); lamp; LED	MP	= miscellaneous mechanical part				

ABBREVIATIONS

A	= ampere	avg	= average	CHAN	= channel	dc	= direct current
ac	= alternating current	AWG	= American wire gauge	cm	= centimeter	deg	= degree (temperature interval or difference)
ACCESS	= accessory	BAL	= balance	CMO	= cabinet mount only	...°	= degree (plane angle)
ADJ	= adjustment	BCD	= binary coded decimal	COAX	= coaxial	°C	= degree Celsius (centigrade)
A/D	= analog-to-digital	BD	= board	COEF	= coefficient	°F	= degree Fahrenheit
AF	= audio frequency	BE CU	= beryllium copper	COM	= common	°K	= degree Kelvin
AFC	= automatic frequency control	BFO	= beat frequency oscillator	COMP	= composition	DEPC	= deposited carbon
AGC	= automatic gain control	BH	= binder head	COMPL	= complete	DET	= detector
AL	= aluminum	BKDN	= breakdown	CONN	= connector	diam	= diameter
ALC	= automatic level control	BP	= bandpass	CP	= cadmium plate	DIA	= diameter (used in parts list)
AM	= amplitude modulation	BPF	= bandpass filter	CRT	= cathode-ray tube	DIFF AMPL	= differential amplifier
AMPL	= amplifier	BRS	= brass	CTL	= complementary transistor logic	div	= division
APC	= automatic phase control	BWO	= backward-wave oscillator	CW	= continuous wave	DPDT	= double-pole, double-throw
ASSY	= assembly	CAL	= calibrate	cw	= clockwise	DR	= drive
AUX	= auxiliary	ccw	= counterclockwise	cm	= centimeter		
		CER	= ceramic	D/A	= digital-to-analog		
				dB	= decibel		
				dBm	= decibel referred to 1 mW		

ABBREVIATIONS

DSB	= double sideband
DTL	= diode transistor logic
DVM	= digital voltmeter
ECL	= emitter coupled logic
EMF	= electromotive force
EDP	= electronic data processing
ELECT	= electrolytic
ENCAP	= encapsulated
EXT	= external
F	= farad
FET	= field-effect transistor
F/F	= flip-flop
FH	= flat head
FIL H	= fillister head
FM	= frequency modulation
FP	= front panel
FREQ	= frequency
FXD	= fixed
g	= gram
GE	= germanium
GHz	= gigahertz
GL	= glass
GND	= ground(ed)
H	= henry
h	= hour
HET	= heterodyne
HEX	= hexagonal
HD	= head
HDW	= hardware
HF	= high frequency
HG	= mercury
HI	= high
HP	= Hewlett-Packard
HPF	= high pass filter
HR	= hour (used in parts list)
HV	= high voltage
Hz	= Hertz
IC	= integrated circuit
ID	= inside diameter
IF	= intermediate frequency
IMPG	= impregnated
in	= inch
INCD	= incandescent
INCL	= include(s)
INP	= input
INS	= insulation
INT	= internal
kg	= kilogram
kHz	= kilohertz
kΩ	= kilohm
kV	= kilovolt
lb	= pound
LC	= inductance-capacitance
LED	= light-emitting diode
LF	= low frequency
LG	= long
LH	= left hand
LIM	= limit
LIN	= linear taper (used in parts list)
lin	= linear
LK WASH	= lock washer
LO	= low; local oscillator
LOG	= logarithmic taper (used in parts list)
log	= logarithm(ic)
LPF	= low pass filter
LV	= low voltage
m	= meter (distance)
mA	= milliampere
MAX	= maximum
MΩ	= megohm
MEG	= meg (10^6) (used in parts list)
MET FLM	= metal film
MET OX	= metal oxide
MF	= medium frequency; microfarad (used in parts list)
MFR	= manufacturer
mg	= milligram
MHz	= megahertz
mH	= millihenry
mho	= mho
MIN	= minimum
min	= minute (time)
... '	= minute (plane angle)
MINAT	= miniature
mm	= millimeter
MOD	= modulator
MOM	= momentary
MOS	= metal-oxide semiconductor
ms	= millisecond
MTG	= mounting
MTR	= meter (indicating device)
mV	= millivolt
mVac	= millivolt, ac
mVdc	= millivolt, dc
mVpk	= millivolt, peak
mV p-p	= millivolt, peak-to-peak
mVrms	= millivolt, rms
mW	= milliwatt
MUX	= multiplex
MY	= mylar
μA	= microampere
μF	= microfarad
μH	= microhenry
μmho	= micromho
μs	= microsecond
μV	= microvolt
μVac	= microvolt, ac
μVdc	= microvolt, dc
μVpk	= microvolt, peak
μVp-p	= microvolt, peak-to-peak
μVrms	= microvolt, rms
μW	= microwatt
nA	= nanoampere
NC	= no connection
N/C	= normally closed
NE	= neon
NEG	= negative
nF	= nanofarad
NI PL	= nickel plate
N/O	= normally open
NOM	= nominal
NORM	= normal
NPN	= negative-positive-negative
NPO	= negative-positive zero (zero temperature coefficient)
NRFR	= not recommended for field replacement
NSR	= not separately replaceable
ns	= nanosecond
nW	= nanowatt
OBD	= order by description
OD	= outside diameter
OH	= oval head
OP AMPL	= operational amplifier
OPT	= option
OSC	= oscillator
OX	= oxide
oz	= ounce
Ω	= ohm
P	= peak (used in parts list)
PAM	= pulse-amplitude modulation
PC	= printed circuit
PCM	= pulse-code modulation; pulse-count modulation
PDM	= pulse-duration modulation
pF	= picofarad
PH BRZ	= phosphor bronze
PHIL	= Phillips
PIN	= positive-instrinsic-negative
PIV	= peak inverse voltage
pk	= peak
PL	= phase lock
PLO	= phase lock oscillator
PM	= phase modulation
PNP	= positive-negative-positive
P/O	= part of
POLY	= polystyrene
PORC	= porcelain
POS	= positive; position(s) (used in parts list)
POSN	= position
POT	= potentiometer
p-p	= peak-to-peak
PP	= peak-to-peak (used in parts list)
PPM	= pulse-position modulation
PREAMPL	= preamplifier
PRF	= pulse-repetition frequency
PRR	= pulse repetition rate
ps	= picosecond
PT	= point
PTM	= pulse-time modulation
PWM	= pulse-width modulation
PWV	= peak working voltage
RC	= resistance capacitance
RECT	= rectifier
REF	= reference
REG	= regulated
REPL	= replaceable
RF	= radio frequency
RFI	= radio frequency interference
RH	= round head; right hand
RLC	= resistance-inductance-capacitance
RMO	= rack mount only
rms	= root-mean-square
RND	= round
ROM	= read-only memory
R&P	= rack and panel
RWV	= reverse working voltage
S	= scattering parameter
s	= second (time)
..."	= second (plane angle)
S-B	= slow-blow (fuse) (used in parts list)
SCR	= silicon controlled rectifier; screw
SE	= selenium
SECT	= sections
SEMICON	= semiconductor
SHF	= superhigh frequency
SI	= silicon
SIL	= silver
SL	= slide
SNR	= signal-to-noise ratio
SPDT	= single-pole, double-throw
SPG	= spring
SR	= split ring
SPST	= single-pole, single-throw
SSB	= single sideband
SST	= stainless steel
STL	= steel
SQ	= square
SWR	= standing-wave ratio
SYNC	= synchronize
T	= timed (slow-blow fuse)
TA	= tantalum
TC	= temperature compensating
TD	= time delay
TERM	= terminal
TFT	= thin-film transistor
TGL	= toggle
THD	= thread
THRU	= through
TI	= titanium
TOL	= tolerance
TRIM	= trimmer
TSTR	= transistor
TTL	= transistor-transistor logic
TV	= television
TVI	= television interference
TWT	= traveling wave tube
U	= micro (10^{-6}) (used in parts list)
UF	= microfarad (used in parts list)
UHF	= ultrahigh frequency
UNREG	= unregulated
V	= volt
VA	= voltampere
Vac	= volts, ac
VAR	= variable
VCO	= voltage-controlled oscillator
Vdc	= volts, dc
VDCW	= volts, dc, working (used in parts list)
V(F)	= volts, filtered
VFO	= variable-frequency oscillator
VHF	= very-high frequency
Vpk	= volts, peak
Vp-p	= volts, peak-to-peak
Vrms	= volts, rms
VSWR	= voltage standing wave ratio
VTO	= voltage-tuned oscillator
VTVM	= vacuum-tube voltmeter
V(X)	= volts, switched
W	= watt
W/	= with
WIV	= working inverse voltage
WW	= wirewound
W/O	= without
YIG	= yttrium-iron-garnet
Zo	= characteristic impedance

NOTE

All abbreviations in the parts list will be in upper case.

MULTIPLIERS

Abbreviation	Prefix	Multiple
T	tera	10^{12}
G	giga	10^9
M	mega	10^6
k	kilo	10^3
da	deka	10
d	deci	10^{-1}
c	centi	10^{-2}
m	milli	10^{-3}
μ	micro	10^{-6}
n	nano	10^{-9}
p	pico	10^{-12}
f	femto	10^{-15}
a	atto	10^{-18}

Table 6-1. Replaceable Parts, 59306A Relay Actuator

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1	**59306-60001**	**1**	**BOARD ASSY: CONTROL**	**28480**	**59306-60001**
C1	0180-1701	1	CAPACITOR-FXD, 6.8UF+-20% 6VDC TA-SOLID	56289	150D685X0006A2
C2	0180-2101	1	CAPACITOR-FXD, 4000UF+75-10% 15VDC AL	56289	39D408G015JL4
C3	0140-0192	2	CAPACITOR,FXD, 68PF+-5% 300WVDC	72136	DM15E680J0300WV1CR
C4	0140-0191	2	CAPACITOR,FXD, 56PF+-5% 300WVDC	72136	DM15E560J0300WV1CR
C5	0140-0192		CAPACITOR,FXD, 68PF+-5% 300WVDC	72136	DM15E680J0300WV1CR
C6	0160-2150	1	CAPACITOR,FXD, 33PF+-5% 300WVDC	28480	0160-2150
C7	0160-3277	4	CAPACITOR, FXD, CER, 0.01 UF 20% 50 VDCW	96733	G504BX103M
C8	0160-3277		CAPACITOR, FXD, CER, 0.01 UF 20% 50 VDCW	96733	G504BX103M
C9	0160-3277		CAPACITOR, FXD, CER, 0.01 UF 20% 50 VDCW	96733	G504BX103M
C10	0160-3277		CAPACITOR, FXD, CER, 0.01 UF 20% 50 VDCW	96733	G504BX103M
CR1	1901-0040	1	DIODE, SWITCHING, SI, 30V MAX VRM 50MA	28480	1901-0040
CR2	1901-0327	2	DIODE, PWR RECT, SI, 200V MAX VRM 1A	03508	A14B
CR3	1901-0327		DIODE, PWR RECT, SI, 200V MAX VRM 1A	03508	A14B
DS1-6	2140-0311	6	LAMP, INCAND, BULB T-1-3/4, 5V	71744	CM8783
J1	1251-3283	1	CONNECTOR, 24-CONT, FEM, MICRORIBBON	28480	1251-3283
Q1	1854-0071	1	TRANSISTOR, NPN SI	28480	1854-0071
R1	1810-0136	2	RESISTIVE NETWORK:	28480	1810-0136
R2	1810-0136		RESISTIVE NETWORK:	28480	1810-0136
R3	1810-0041	1	CIRCUIT, PSIV, NON-RPRABLE IN	28480	1810-0041
R4	0683-2035	3	RESISTOR, FXD, 20K5% .25W CC TUBULAR	01121	CB2035
R5	0683-2035		RESISTOR, FXD, 20K5% .25W CC TUBULAR	01121	CB2035
R6	0683-5125	10	RESISTOR, FXD, 5.1K5% .25W CC TUBULAR	01121	CB5125
R7	0683-1215	1	RESISTOR, FXD, 120 OHM5% .25W CC	01121	CB1215
R8	0683-3915	1	RESISTOR, FXD, 390 OHM5% .25W CC	01121	CB3915
R9	0683-2035		RESISTOR, FXD, 20K5% .25W CC TUBULAR	01121	CB2035
R10	0683-5125		RESISTOR, FXD, 5.1K5% .25W CC TUBULAR	01121	CB5125
R11	0683-5125		RESISTOR, FXD, 5.1K5% .25W CC TUBULAR	01121	CB5125
R12	0683-1025	1	RESISTOR, FXD, 1K5% .25W CC TUBULAR	01121	CB1025
R13	0683-5125		RESISTOR, FXD, 5.1K5% .25W CC TUBULAR	01121	CB5125
R14	0683-5125		RESISTOR, FXD, 5.1K5% .25W CC TUBULAR	01121	CB5125
R15	0683-5125		RESISTOR, FXD, 5.1K5% .25W CC TUBULAR	01121	CB5125
R16	0683-5125		RESISTOR, FXD, 5.1K5% .25W CC TUBULAR	01121	CB5125
R17	0683-5125		RESISTOR, FXD, 5.1K5% .25W CC TUBULAR	01121	CB5125
R18	0683-5125		RESISTOR, FXD, 5.1K5% .25W CC TUBULAR	01121	CB5125
R19	0683-5125		RESISTOR, FXD, 5.1K5% .25W CC TUBULAR	01121	CB5125
R20	0683-4715	7	RESISTOR, FXD, 470 OHM5% .25W CC	01121	CB4715
R21	0683-1525	1	RESISTOR, FXD, 1.5K5% .25W CC TUBULAR	01121	CB1525
R22	0683-2725	1	RESISTOR, FXD, 2.7K5% .25W CC TUBULAR	01121	CB2725
S1	3101-0571	1	SWITCH, PB -STA DPDT	82389	67067-506
S2	3101-1826	1	SWITCH ASSY: ROCKER D.I.P. (7) SPST	00779	435166-1
S3	3101-0537	1	SWITCH, SL, DPDT NS, 3A 125 VAC	28480	3101-0537
U1	1820-1056	1	INTEGRATED CIRCUIT, DGTL, TTL QUAD 2	01295	SN74132N
U2	1820-0537	2	INTEGRATED CIRCUIT, DGTL, TTL DUAL 4	01295	SN7413N
U3	1820-0596	6	INTEGRATED CIRCUIT, DGTL, TTL LP DUAL D	27014	DM74L74N
U4	1820-0904	1	INTEGRATED CIRCUIT, DGTL, TTL LP 5-BIT	07263	U7893L2459X
U5	1820-0596		INTEGRATED CIRCUIT, DGTL, TTL LP DUAL D	27014	DM74L74N
U6	1820-0586	5	INTEGRATED CIRCUIT, DGTL, TTL LP HEX	27014	DM74L04N
U7	1820-0777	1	INTEGRATED CIRCUIT, DGTL, TTL LP	01295	SN74L42N
U8	1820-0068	1	INTEGRATED CIRCUIT, DGTL, TTL TRIPLE 3	01295	SN7410N
U9	1820-0070	1	INTEGRATED CIRCUIT, DGTL, TTL 8-INPUT	01295	SN7430N
U10	1820-0586		INTEGRATED CIRCUIT, DGTL, TTL LP HEX	27014	DM74L04N
U11	1820-0583	7	INTEGRATED CIRCUIT, DGTL, TTL LP QUAD	27014	DM74L00N
U12	1820-0583		INTEGRATED CIRCUIT, DGTL, TTL LP QUAD	27014	DM74L00N
U13	1820-0515	1	INTEGRATED CIRCUIT, DGTL, TTL DUAL RE	07263	U6B960259X
U14	1820-0537		INTEGRATED CIRCUIT, DGTL, TTL DUAL 4	01295	SN7413N
U15	1820-0586		INTEGRATED CIRCUIT, DGTL, TTL LP HEX	27014	DM74L04N
U16	1820-0586		INTEGRATED CIRCUIT, DGTL, TTL LP HEX	27014	DM74L04N
U17	1820-0596		INTEGRATED CIRCUIT, DGTL, TTL LP DUAL D	27014	DM74L74N
U18	1820-0583		INTEGRATED CIRCUIT, DGTL, TTL LP QUAD	27014	DM74L00N
U19	1820-0583		INTEGRATED CIRCUIT, DGTL, TTL LP QUAD	27014	DM74L00N
U20	1820-0596		INTEGRATED CIRCUIT, DGTL, TTL LP DUAL D	27014	DM74L74N
U21	1820-0621	3	INTEGRATED CIRCUIT, DGTL, TTL QUAD 2	01295	SN7436N
U22	1820-0621		INTEGRATED CIRCUIT, DGTL, TTL QUAD 2	01295	SN7436N
U23	1820-0471	1	INTEGRATED CIRCUIT, DGTL, TTL HEX	01295	SN7406N
U24	1820-0596		INTEGRATED CIRCUIT, DGTL, TTL LP DUAL D	27014	DM74L74N
U25	1820-0583		INTEGRATED CIRCUIT, DGTL, TTL LP QUAD	27014	DM74L00N
U26	1820-0583		INTEGRATED CIRCUIT, DGTL, TTL LP QUAD	27014	DM74L00N
U27	1820-0621		INTEGRATED CIRCUIT, DGTL, TTL QUAD 2	01295	SN7436N
U28	1820-0583		INTEGRATED CIRCUIT, DGTL, TTL LP QUAD	27014	DM74L00N
U29	1820-0586		INTEGRATED CIRCUIT, DGTL, TTL LP HEX	27014	DM74L04N
U30	1820-0596		INTEGRATED CIRCUIT, DGTL, TTL LP DUAL D	27014	DM74L74N
U31	1826-0122	1	INTEGRATED CIRCUIT, LIN, FIXED VOLTAGE	07263	UGH7805393

See introduction to this section for ordering information

Table 6-1. Replaceable Parts, 59306A Relay Actuator (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A2	**59306-60002**	**1**	**BOARD ASSY: RELAY**	**28480**	**59306-60002**
C1	0160-0207	12	CAPACITOR,FXC, .01UF+-5% 200WVDC	56289	292P10352
C2	0160-0207		CAPACITOR,FXD, .01UF+-5% 200WVDC	56289	292P10352
C3	0160-0207		CAPACITOR,FXD, .01UF+-5% 200WVDC	56289	292P10352
C4	0160-0207		CAPACITOR,FXC, .01UF+-5% 200WVDC	56289	292P10352
C5	0160-0207		CAPACITOR,FXC, .01UF+-5% 200WVDC	56289	292P10352
C6	0160-0207		CAPACITOR,FXC, .01UF+-5% 200WVDC	56289	292P10352
C7	0160-0207		CAPACITOR,FXD, .01UF+-5% 200WVDC	56289	292P10352
C8	0160-0207		CAPACITOR,FXD, .01UF+-5% 200WVDC	56289	292P10352
C9	0160-0207		CAPACITOR,FXD, .01UF+-5% 200WVDC	56289	292P10352
C10	0160-0207		CAPACITOR,FXD, .01UF+-5% 200WVDC	56289	292P10352
C11	0160-0207		CAPACITOR,FXD, .01UF+-5% 200WVDC	56289	292P10352
C12	0160-0207		CAPACITOR,FXD, .01UF+-5% 200WVDC	56289	292P10352
C13	0170-0055	1	CAPACITOR,FXC, .1UF+-20% 200WVDC	56289	292P10402
CR1	1902-3311	6	DIODE, VREG, 38.3V VZ, .4W MAX	28480	1902-3311
CR2	1902-3311		DIODE, VREG, 38.3V VZ, .4W MAX	28480	1902-3311
CR3	1902-3311		DIODE, VREG, 38.3V VZ, .4W MAX	28480	1902-3311
CR4	1902-3311		DIODE, VREG, 38.3V VZ, .4W MAX	28480	1902-3311
CR5	1902-3311		DIODE, VREG, 38.3V VZ, .4W MAX	28480	1902-3311
CR6	1902-3311		DIODE, VREG, 38.3V VZ, .4W MAX	28480	1902-3311
K1	0490-0509	6	RELAY, 6VDC, CONT 10A 120VAC FORM 1C	12300	5A5DG-6
K2	0490-0509		RELAY, 6VDC, CONT 10A 120VAC FORM 1C	12300	5A5DG-6
K3	0490-0509		RELAY, 6VDC, CONT 10A 120VAC FORM 1C	12300	5A5DG-6
K4	0490-0509		RELAY, 6VDC, CONT 10A 120VAC FORM 1C	12300	5A5DG-6
K5	0490-0509		RELAY, 6VDC, CONT 10A 120VAC FORM 1C	12300	5A5DG-6
K6	0490-0509		RELAY, 6VDC, CONT 10A 120VAC FORM 1C	12300	5A5DG-6
Q1	1854-0039	6	TRANSISTOR, 2N3053 NPN SI	04713	2N3053
Q2	1854-0039		TRANSISTOR, 2N3053 NPN SI	04713	2N3053
Q3	1854-0039		TRANSISTOR, 2N3053 NPN SI	04713	2N3053
Q4	1854-0039		TRANSISTOR, 2N3053 NPN SI	04713	2N3053
Q5	1854-0039		TRANSISTOR, 2N3053 NPN SI	04713	2N3053
Q6	1854-0039		TRANSISTOR, 2N3053 NPN SI	04713	2N3053
R1	0683-4715		RESISTOR, FXD, 470 OHM5% .25W CC	01121	CB4715
R2	0683-4715		RESISTOR, FXD, 470 OHM5% .25W CC	01121	CB4715
R3	0683-4715		RESISTOR, FXD, 470 OHM5% .25W CC	01121	CB4715
R4	0683-4715		RESISTOR, FXD, 470 OHM5% .25W CC	01121	CB4715
R5	0683-4715		RESISTOR, FXD, 470 OHM5% .25W CC	01121	CB4715
R6	0683-4715		RESISTOR, FXD, 470 OHM5% .25W CC	01121	CB4715
R7	0686-1505	6	RESISTOR, FXD, 15 OHM5% .5W CC TUBULAR	01121	EB1505
R8	0686-1505		RESISTOR, FXD, 15 OHM5% .5W CC TUBULAR	01121	EB1505
R9	0686-1505		RESISTOR, FXD, 15 OHM5% .5W CC TUBULAR	01121	EB1505
R10	0686-1505		RESISTOR, FXD, 15 OHM5% .5W CC TUBULAR	01121	EB1505
R11	0686-1505		RESISTOR, FXD, 15 OHM5% .5W CC TUBULAR	01121	EB1505
R12	0686-1505		RESISTOR, FXD, 15 OHM5% .5W CC TUBULAR	01121	EB1505
	0380-0336	2	SPACER, RIVET-ON, .312 L	28480	0380-0336
	1200-0423		SOCKET:IC BLK 16 CONTACT	23880	CSA2900-16B
			CHASSIS PARTS		
DS1, 2	2140-0043	2	LAMP, INCAND, BULB T-1-3/4, 6V	28480	2140-0043
F1	2110-0202	1	FUSE, .5A, 250V, SLO-BLO	75915	313.500S
S1	3101-1261	1	SWITCH, PB 1-STA RECT SPDT	09353	P8121

See introduction to this section for ordering information

Table 6-2. 59306A Cabinet Parts

	HP PART NO.	QTY	DESCRIPTION	MFR. CODE	MFR. PART NO.
1	59306-00001	1	PANEL, FRONT	28480	59306-00001
2	5040-7203	1	TRIM-TOP	28480	5040-7203
3	5020-8813	1	FRAME, FRONT	28480	5020-8813
4	5040-7201	4	FOOT	28480	5040-7201
5	5040-7209	1	COVER-BOTTOM	28480	5040-7209
6	5040-7212	2	COVER-SIDES	28480	5040-7212
7	59306-00003	1	PANEL, REAR	28480	59306-00002
8	5040-7208	1	COVER-TOP	28480	5040-7208

Table 6-3. Manufacturers Code List

MFR. NO.	MANUFACTURER NAME	ADDRESS	ZIP CODE
00779	AMP, INC. (AIRCRAFT MARINE PROD.)	HARRISBURG, PA.	17101
00866	GOE ENGINEERING CO. INC.	CITY OF INDUSTRY, CA.	91746
01121	ALLEN BRADLEY CO.	MILWAUKEE, WIS.	53204
01295	TEXAS INSTRUMENTS INC. SEMICONDUCTOR COMPONENTS DIV.	DALLAS, TEX.	75231
03508	G.E. CO. SEMICONDUCTOR PROD. DEPT.	SYRACUSE, N.Y.	13201
04713	MOTOROLA SEMICONDUCTOR PROD. INC.	PHOENIX, ARIZ.	85008
07263	FAIRCHILD CAMERA & INST. CORP. SEMI-CONDUCTOR DIV.	MOUNTAIN VIEW, CALIF.	94040
09353	C & K COMPONENTS INC.	NEWTON, MASS.	02158
12300	POTTER AND BRUMFIELD DIV. AMF CANADA LTD.	GUELPH ONTARIO	CAN
23880	STANFORD APPLIED ENGINEERING	SANTA CLARA, CALIF.	95050
27014	NATIONAL SEMI-CONDUCTOR CORP.	SANTA CLARA, CALIF.	95051
28480	HEWLETT-PACKARD CO. CORPORATE HQ.	YOUR NEAREST HP OFFICE	
56289	SPRAGUE ELECTRIC CO.	N. ADAMS, MASS.	01247
70903	BELDEN CORP.	CHICAGO, ILL.	60644
71279	CAMBRIDGE THERMIONICS CORP.	CAMBRIDGE, MASS.	02138
71744	CHICAGO MINIATURE LAMP WORKS	CHICAGO, ILL.	60640
72136	ELECTRO MOTIVE MFG. CO. INC.	WILLIMANTIC, CONN.	06226
75915	LITTELFUSE INC.	DES PLAINES, ILL.	60016
82389	SWITCHCRAFT INC.	CHICAGO, ILL.	60630
95987	WECKESSER CO. INC.	CHICAGO, ILL.	60641

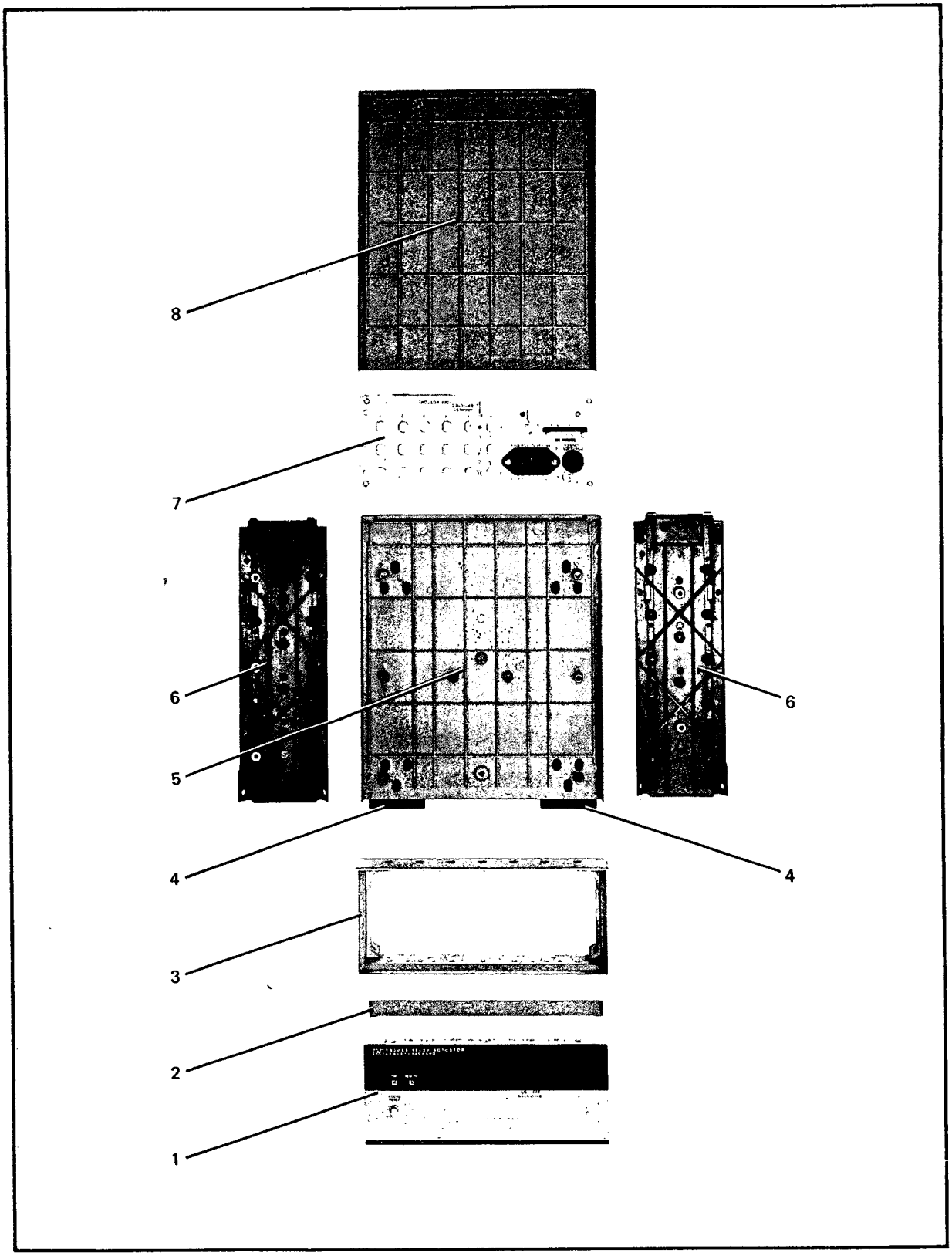


Figure 6-1. 59306A Cabinet Parts

SECTION VII

OPTIONS AND MANUAL CHANGES

7-1. INTRODUCTION

7-2. This section contains information necessary to adapt this manual to older instruments. As options are made available for this instrument, operating and installation instructions will be provided.

7-3. MANUAL CHANGES

7-4. This manual applies directly to Model 59306A having serial prefix 1332A (refer to paragraph 1-6).

7-5. Newer Instruments

7-6. As changes are made, newer instruments may have serial prefixes that are not listed in this manual. The manuals for these instruments are supplied with a manual change sheet, containing the required information. Contact the nearest Hewlett-Packard Sales and Service Office for information if this sheet is missing.

7-7. Older Instruments

7-8. To adapt this manual to instruments with serial prefix 1316A, make the following manual changes.

a. In Table 6-1, change the parts lists as follows:

1. Delete capacitors A1C7, A1C8, A1C9, and A1C10.

b. In Figure 8-3, make the following changes:

1. Delete capacitors A1C7, A1C8, A1C9, and A1C10.

SECTION VIII

SCHEMATIC DIAGRAMS

8-1. INTRODUCTION

8-2. This section includes schematic diagram notes (Figure 8-1), digital bus connector pin designations, component location and schematic diagrams for the 59306A Relay Actuator.

SYMBOLS

FRONT PANEL

REAR PANEL

INTERIOR AND PC BOARDS

WIPER MOVES TOWARD "CW" WHEN CONTROL IS ROTATED CLOCKWISE

POWER LINE GROUND

CIRCUIT COMMON GROUND

FLOATING GROUND

CHASSIS GROUND

KNOB CONTROL

SCREWDRIVER ADJUST

MAIN SIGNAL PATH

FEEDBACK PATH

TEST POINT

"AND" GATE

"OR" GATE

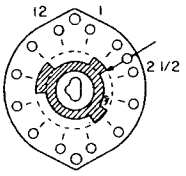
INVERTER

NAND GATE

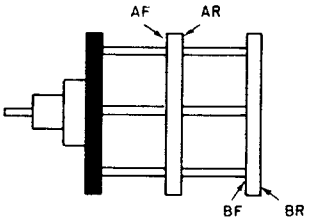
NOR GATE

EXCLUSIVE NOR

SWITCH DESIGNATIONS



A3S1	SWITCH S1 WITHIN ASSEMBLY A3
B	2ND WAFER FROM FRONT (A=1ST, ETC)
R	REAR OF WAFER (F=FRONT)
A3S1BR(2-1/2)	**(2-1/2)**	TERMINAL LOCATION ($2\frac{1}{2}$) (VIEWED FROM FRONT)



REFERENCE DESIGNATIONS

REFERENCE DESIGNATIONS WITHIN ASSEMBLIES ARE ABBREVIATED. ADD ASSEMBLY NUMBER TO ABBREVIATION FOR COMPLETE DESCRIPTION. JACKS ARE THE STATIONARY CONNECTORS AND PLUGS ARE THE MORE MOVEABLE OF TWO CONNECTORS.

ASSEMBLY	ABBREVIATION	COMPLETE DESCRIPTION
A25	C1	A25C1
A25A1	CR1	A25A1CR1
NO PREFIX	J3	J3

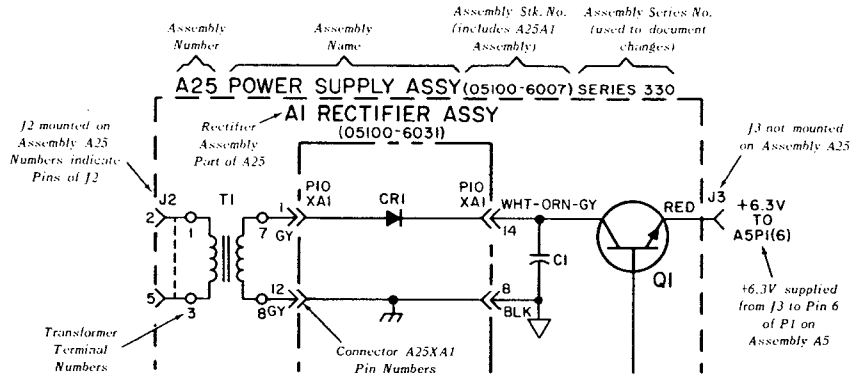
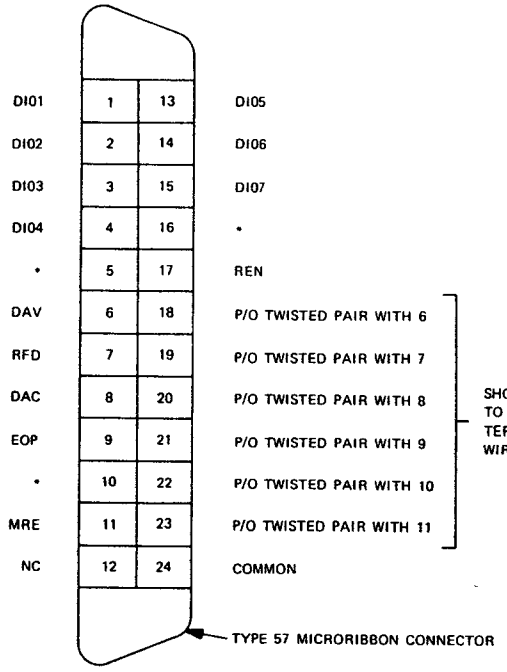


Figure 8-1. Schematic Diagram Notes



*THESE PINS ARE TERMINATED WITH RESISTIVE NETWORKS (SEE SCHEMATIC) AND NORMALLY FLOAT AT APPROXIMATELY 3V.

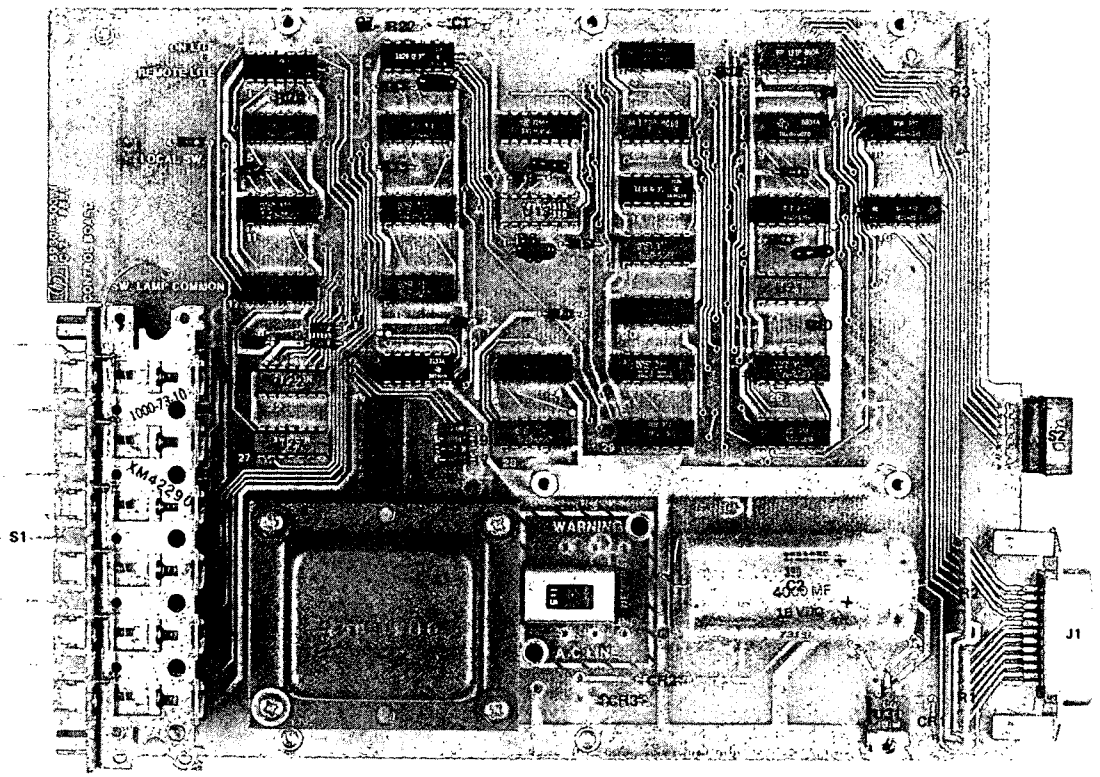
NOTE 1: PINS 18 THROUGH 23 SHOULD BE CONNECTED TO COMMON NEAR THE TERMINATION OF THE OTHER WIRE OF ITS TWISTED PAIR. PIN 12 IS CONNECTED TO COMMON ONLY AT THE CONTROLLER.

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 7 8	DAV RFD DAC	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.
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.

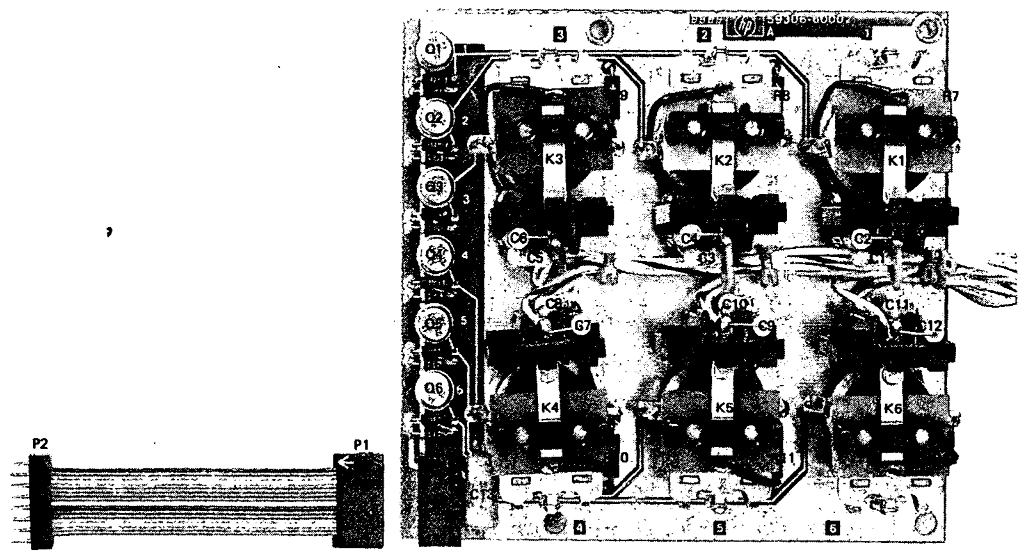
Figure 8-2. Digital Bus Connector Pin Designations

A1



P/O Figure 8-3. 59306A Schematic Diagram (Component Locator)

A2



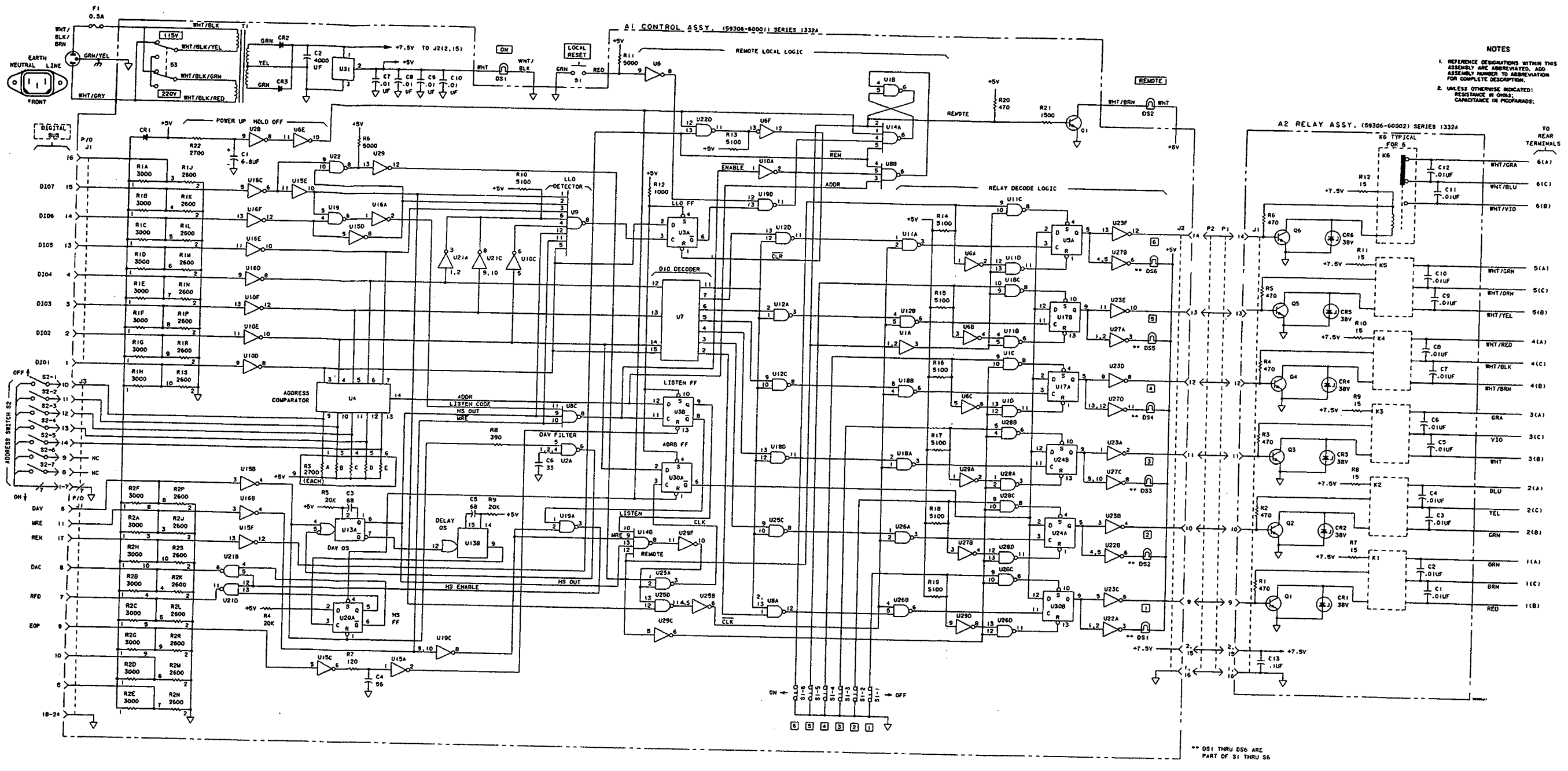


Figure 8-3
59306A SCHEMATIC DIAGRAM