HEWLETT-PACKARD 9830A CALCULATOR
11206A MODEM INTERFACE

INSTALLATION and SERVICE MANUAL

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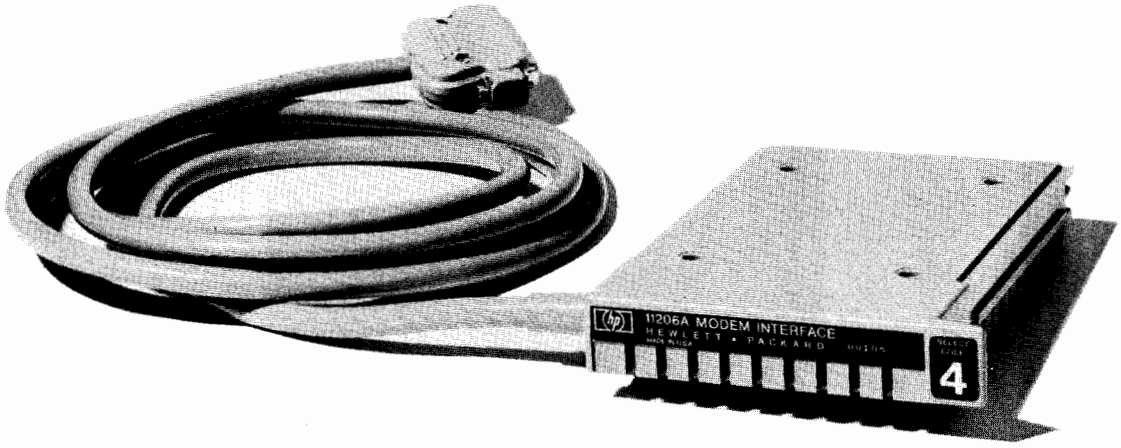
11206A MODEM INTERFACE



HEWLETT–PACKARD CALCULATOR PRODUCTS DIVISION
P.O. Box 301, Loveland, Colorado 80537, Tel. (303) 667-5000
(For World-wide Sales and Service Offices see rear of manual.)

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TABLE OF CONTENTS

Chapter 1

GENERAL INFORMATION

The 11206A Modem Interface is used to connect a Model 9830 Calculator to any one of many popular data modems that conform to EIA* specification RS-232-C.

Except for the following installation hints, this manual contains instructions on how to service the 11206A Interface. See the Terminal I ROM Operating Manual for all instructions on operating the Model 30 as a computer terminal.

HARDWARE DESCRIPTION

The interface consists of a circuit card, an I/O pac, and an eight-foot shielded cable. The I/O pac, which houses the circuit card, plugs into any one of the calculator I/O connectors. One end of the cable is connected to the circuit card and the other end is wired with a standard, 25-pin EIA connector.

INSTALLATION

1. Plug the I/O Pac into any one of the calculator I/O connectors; then connect the interface cable to the modem.
2. Set the modem to operate on 'half-duplex'.

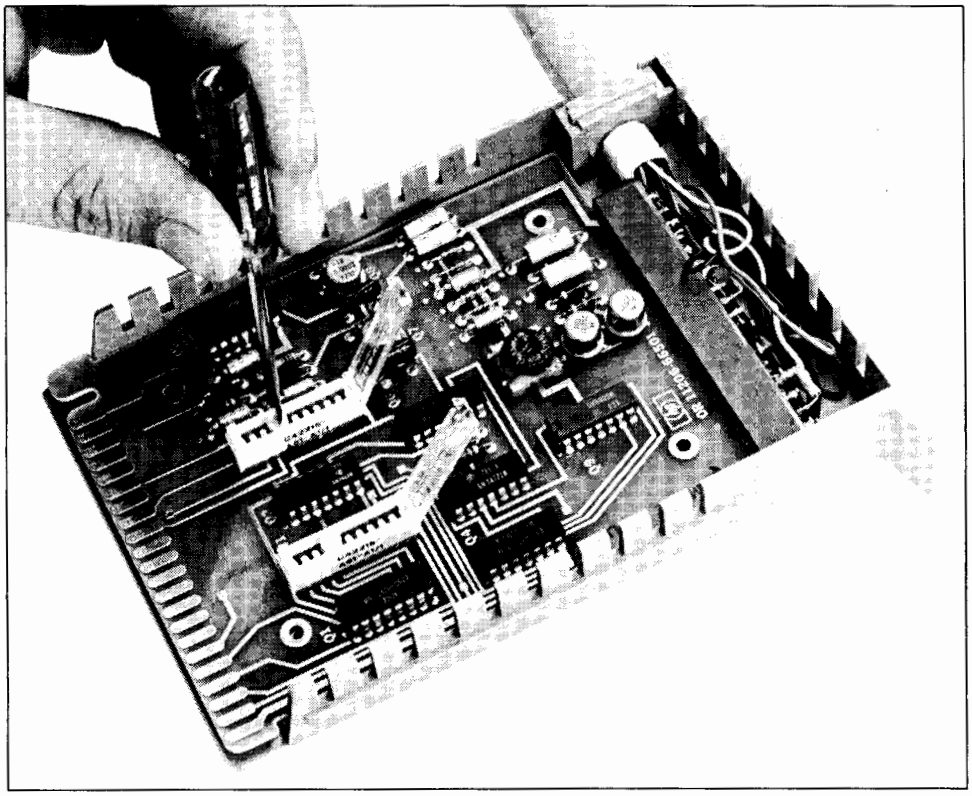
SETTING THE SELECT CODE

Since all peripheral devices are connected to the calculator in a party-line fashion, each device must have a unique address so that the calculator can specify which device must respond to each operation. This address, or 'select code', consists of a one digit number and is determined by the interface card.

*Electronic Industries Association.

Although the 11206A Interface is set to respond to select code 4 when supplied, any one of eight other select codes can be set by following this procedure:

1. Switch the calculator and the modem OFF.
2. Disconnect the interface from the calculator. Remove the four screws located on the top of the card assembly, turn the card over and lift off the bottom cover.
3. Locate the Select Code Switches (see the next photograph). Raise the hinged cover on each switch. Using a small, flat-blade screwdriver, *carefully rotate* the selector-tabs until they're both positioned at the desired select code number (numbers are printed on the side and on the top cover of each switch). Before closing each cover, be sure the slot in the selector-tab is positioned at a right angle to the length of the switch.
4. Close the switch covers and replace the interface card bottom cover. Secure the cover with the four screws which were removed in step 2.
5. Place a Select Code Label on the interface and the modem to indicate the new select code. A package of labels is supplied with the interface.
6. Reconnect the interface to the calculator, and turn the calculator and the modem ON. Verify that the desired select code is set by executing a TERM statement which specifies the new select code.



Setting The Select Code

Chapter 2

SERVICING THE INTERFACE

This section contains a brief description of interface operation and instructions to help you repair the interface circuits.

PLEASE NOTE: Before trying to troubleshoot the interface, become familiar with using the Model 30 as a computer terminal by reading Chapters 1 and 2 of the Terminal ROM Operating Manual.

If you have difficulty repairing the interface or if you would rather have -hp- repair it, contact the nearest -hp- Service Representative; addresses are listed at the back of this manual.

THEORY OF OPERATION

The 11206A Modem Interface is basically a two-way data buffer. In general, it senses when input or output data is present; and then determines (using calculator instructions) which data should be transferred first. The interface doesn't process the data — rather it merely transfers data.

CONTROL LINES (refer to the circuit diagram)

NOTE

A bar above each line name indicates that the line goes low when pulsed '1'; all other lines go high when pulsed '1'.

DO0 Data Output line from calculator.

$\overline{STP}$ Stop signal from calculator — corresponds to a teleprinter 'break' command.

SO3 Calculator Status line — indicates whether the calculator is in the 'terminal' or 'calculator' mode.

CO0, **CO1**, **CO2**, **CO3** Peripheral Address lines — used to address the correct peripheral device.

$\overline{CEO}$ Control Enable line — provides the correct timing for interface operations.

DI0, **DI1**, **DI2**, **DI3**, **DI4**, **DI5**, **DI6**, **DI7**, **SI0** Service Request lines — tell the calculator the address (select code) of the peripheral that's requesting service. For example, when Select Code 3 is used, DI2 is forced low. After the Select Code is sent:

DI0 — transmits data from modem to calculator.
SI0 — tell the calculator when a carrier is detected by the modem.

THEORY OF OPERATION
(continued)

$\overline{SSI}$ Calculator Service Interrupt line – signals that data is ready for the calculator.

$\overline{SIH}$ Calculator Service Inhibit line – indicates that the calculator is busy and can't input data.

RTS Ready To Send line – tells the modem that the terminal (i.e., calculator, interface, and modem) is ready to send or receive data.

CRD Carrier Detect line – tells the calculator that the modem has detected a carrier signal.

$\overline{XMD}$ Transmit Data line – data line from Interface to modem.

$\overline{DTA}$ Modem Data line – data line from modem to the interface.

THE DATA INPUT SEQUENCE

Once a TERM statement is executed and a computer connection is established, the calculator continually monitors the $\overline{SSI}$ line; low $\overline{SSI}$ indicates that a peripheral is requesting service (in this case, the computer pulses the CRD and $\overline{DTA}$ lines to force $\overline{SSI}$ low).

When $\overline{SSI}$ goes low:

1. The calculator sets a Service Inhibit signal ($\overline{SIH}$) high to find out which peripheral is requesting service. The interface then responds by forcing a Service Request line low.
2. Now, the calculator sends a select code pulse (CO0 through CO3) and a $\overline{CEO}$ pulse simultaneously, which enables the interface to send serial data to the calculator on the DI0 line.

THE DATA OUTPUT SEQUENCE

Each time the TRANSMIT key is pressed (assuming the remote carrier signal is detected) the following sequence occurs for each bit of data sent.

1. The calculator checks $\overline{SSI}$ to see if the computer is sending data. If not:
2. One serial bit of data is sent on DO0, the select code and then $\overline{CEO}$ lines are pulsed simultaneously to transfer the bit on the $\overline{XMD}$ line.
3. This process is repeated until the entire line of data is transmitted; then $\overline{SSI}$ is checked again.

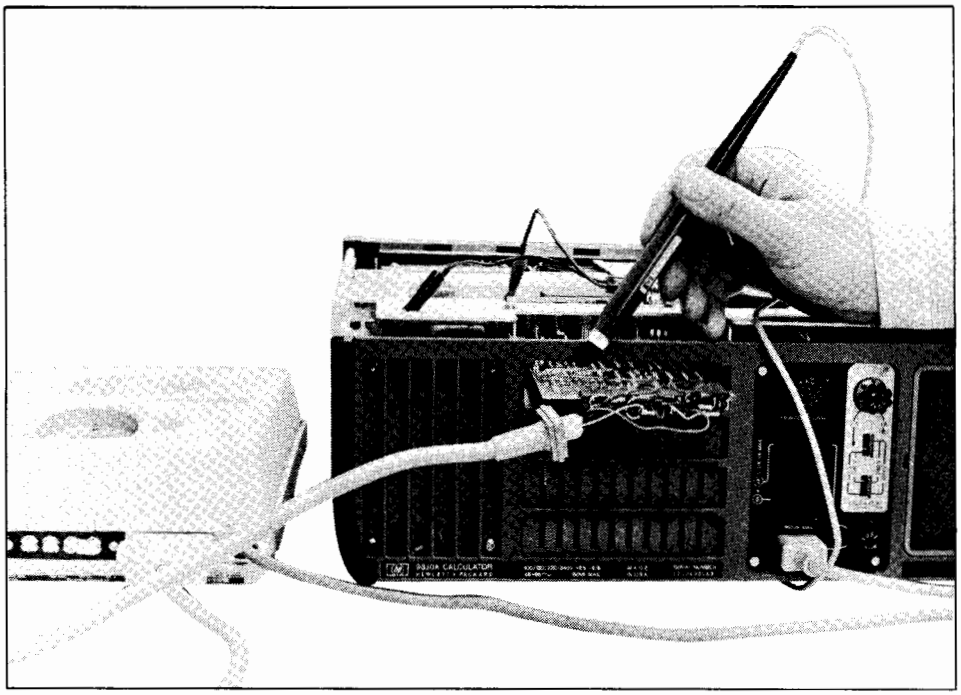
TROUBLESHOOTING AND REPAIR

EQUIPMENT REQUIRED

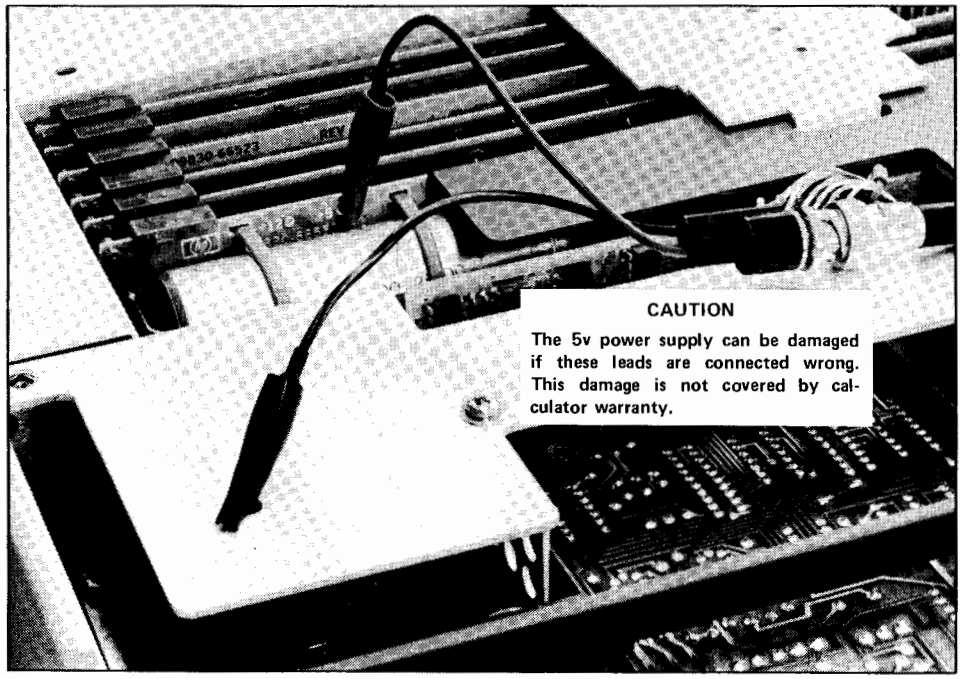
- Logic Probe: -hp- 10525A or equivalent
- DC Voltmeter: -hp- 427A or equivalent
- 9830 Calculator with the 11277F(B) Terminal I ROM installed.

EQUIPMENT SET-UP

1. Set up the equipment as shown below. You can power the logic probe from the calculator by connecting the probe power leads as shown in photograph B.



A. Equipment Set-up for Troubleshooting



B. Power Lead Connections for the Logic Probe

2. Once the equipment is set up, switch the calculator and modem ON. If the modem has a 'duplex' switch, set it to 'HALF'. *IMPORTANT: DO NOT place a telephone receiver on the modem!*

TROUBLESHOOTING AND REPAIR
(continued)

3. On the calculator:
   a. Define key [f6] as *TERM 4,3*
   b. Define key [f1] as *EXIT*

POWER SUPPLY CHECKOUT

1. Check the interface 9v power supplies at the points shown on the component locator. If 9v±10% and -9v±10% are not measured check the calculator 5v supply. If 5v±2% is measured, troubleshoot the interface 9v power supply (Q_1, Q_2, etc.). But if the 5v supply is out of range, the calculator power supply is probably defective; contact an -hp- Service Representative for assistance.

CALCULATOR CONTROL CHECKOUT

Before checking the interface beyond its power supply, use the following 'checklist' to verify that the calculator interface control lines are OK. If any step fails, you can assume that the calculator is defective.

STEP	MONITOR PIN (with probe)	PRESS (and watch probe)	STATE*
1	U3pin 2	[f6]	high
2	U5pin 3	[STOP]	low
3	U6pin 5	[f6]	low
4	U4pin 1	[f6]	high
5	U3pin 12	[f6]	high

INTERFACE CLOCK CHECKOUT

Place the probe at U3pin 3 and, while watching the probe, press [f6].

1. If the probe flashes 'high', the clock is OK, go to the 'Break Circuit Checkout'.
2. If the probe doesn't flash, monitor U6pin 6 and press [f6] again. If the probe doesn't flash, replace either U1 or SW1 (see below).
   NOTE: The contacts on SW1 and SW2 may become intermittent. To check either switch, rotate the selector-tab back and forth a few times and then try checking U3pin 3 again.
3. To check U1, monitor the correct pin for the select code being used (e.g., U1pin 9 for Select Code 4) and press [f6]; if the probe doesn't flash 'high', replace U1.

*Probe either flashes-on (high) or blanks-out (low), and then stays in an intermediate state.

BREAK CIRCUIT CHECKOUT

Monitor U5pin 6 while pressing the STOP key; if the probe doesn't flash 'high' when STOP is pressed, replace U5.

CHECKING DISCRETE COMPONENTS

The rest of this section lists a series of checkouts to locate individual component failures. You should:

- perform the checks in the order shown,
- replace the component you're monitoring (unless indicated otherwise) if the check fails.

STEP	MONITOR PIN (with probe)	PRESS (and watch probe)	STATE
1	U3pin 6	f6	
2	U3pin 6	f1	high
3	U6pin 10	f6	high
4	U6pin 10	f1	low
5	U7pin 6	f6	low
6	U7pin 6	f1	high
7	U3pin 8	f6	low
8	U3pin 8	f1	high
9	U3pin 9	f6	low
10	U3pin 9	f1	high
11	U8pin 6	f6	high
12	U8pin 6	f1	low

Connect a jumper from U9pin 1 to +5v.

TROUBLESHOOTING AND REPAIR

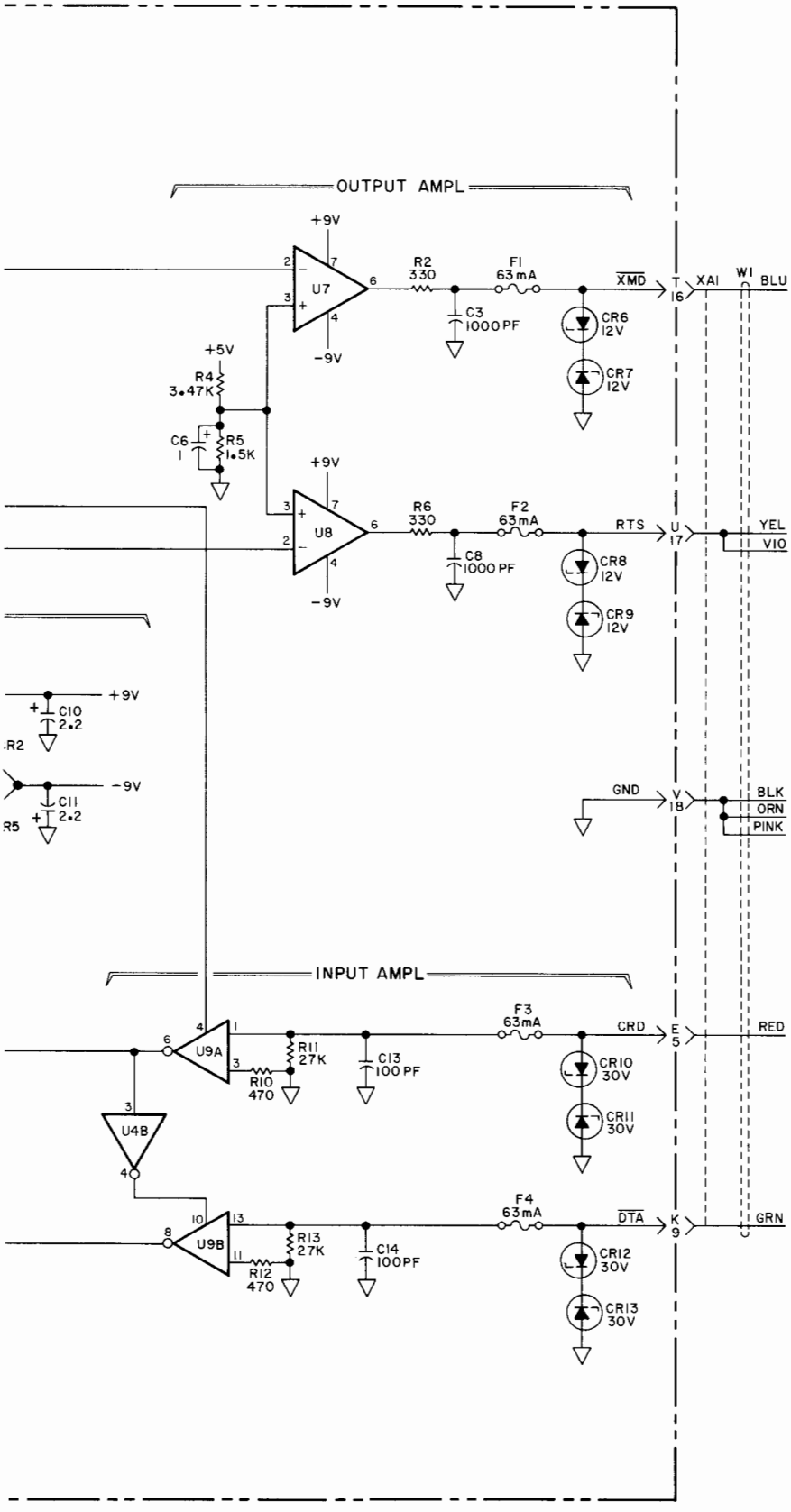
STEP	MONITOR PIN (with probe)	PRESS (and watch probe)	STATE
13	U9pin 6	f6	low
14	U9pin 6	f1	high
15	U9pin 10	f6	high
16	U9pin 10	f1	low
Connect U9pin 13 to –9v.		—	
17	U9pin 8	f6	low
Remove –9v from U9pin 13.			
18	U9pin 8	—	high
Connect U9pin 13 to –9v.			
19	U4pin 6	f6	high
Remove –9v from U9pin 13.			
20	U4pin 6	—	low
Connect U6pins 2&3 to gnd.			
21	U6pin 1	—	high
22	U2pin 8	—	low
Connect U6pins 5&6 to gnd.			
23	U6pin 4	—	high
Connect U2pin 4 to +5v.			
24	U2pin 6	—	low

If the preceding checks all pass but the interface is still inoperative, try checking the interface (or the modem) for an intermittent problem.

NOTES

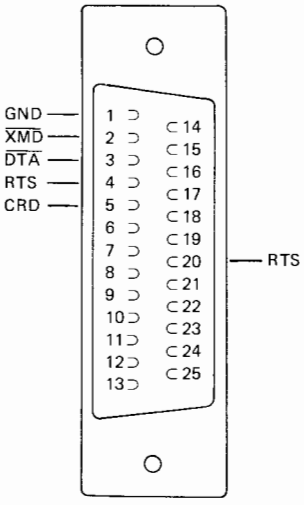
REPLACEABLE PARTS LIST

REFERENCE DESIGNATOR	-hp- PART NO.	TQ	DESCRIPTION
A1	11206-66501	1	Printed Circuit Board, Rev. B
C1	0180-1701	3	Cap. 6.8μfd,6v.
C2	0150-0093	1	Cap. .01μfd,100v.
C3	0160-0938	2	Cap. 1000pf,100v.
C4	0180-1701		Cap. 6.8μfd,6v.
C5	0180-0229	2	Cap. 33μfd,10v.
C6	0180-0291	1	Cap. 1μfd,35v.
C7	0160-3847	1	Cap. .01μfd,25v.
C8	0160-0938		Cap. 1000pf,100v.
C9	0180-0229		Cap. 33μfd,10v.
C10,11	0180-0197	2	Cap. 2.2μfd,20v.
C13,14	0150-0073	2	Cap. 100pf,1000v.
CR1	1901-0045	1	Diode, Si,75A,100v.
CR2,3,4,5	1901-0040	4	Diode, SI,05A,30v.
CR6,7,8,9	1902-0029	4	Diode, Breakdown 12.1v.
CR10,11,12,13	1902-0244	4	Diode, Breakdown 30.1v.
F1,2,3,4	2110-0384	4	Fuse, .062A.
L1	9140-0114	1	Inductor, 10μhy.
Q1,2	1954-0547	2	Transistor, Si,NPN.
R1	0698-3449	1	Res. 28.7K,1%,1/8w.
R2	0684-3311	2	Res. 330,10%,¼w.
R3	0684-2731	3	Res, 27K,10%,¼w.
R4	0698-3152	1	Res, 3.48,1%,1/8w.
R5	0757-0427	1	Res, 1.5K,1%,1/8w.
R6	0684-3311		Res, 330,10%,¼w.
R7	0684-5621	1	Res, 5.6K,10%,¼w.
R8,9	0684-1021	2	Res, 1K,10%,¼w.
R10,12	0684-4711	2	Res, 470,10%,¼w.
R11,13	0684-2731		Res, 27K,10%,¼w.
SW1,2	3101-1677	2	Switch, 10 position.
T1	9100-3403	1	Transformer, inverting.
U1	1820-0627	1	IC, U7B93LO159X
U2	1820-0269	1	IC, SN7403N
U3	1820-0596	1	IC, DM74L74N
U4	1820-0586	1	IC, DM74LO4N
U5	1820-0261	1	IC, 74L21N
U6	1820-0584	1	IC, SN74L02
U7,8	1820-0203	2	IC, Op. Amp,741C
U9	1820-1115	1	IC, DM8822
	5040-5911	1	BTM Boot, I/O PAC
	11200-04101	1	Cover, I/O PAC
	11206-61601	1	I/O Cable w/connectors
	11206-90000	1	Manual, Install. & Service
	7120-2940	1	Select Code labels (Pkg.)

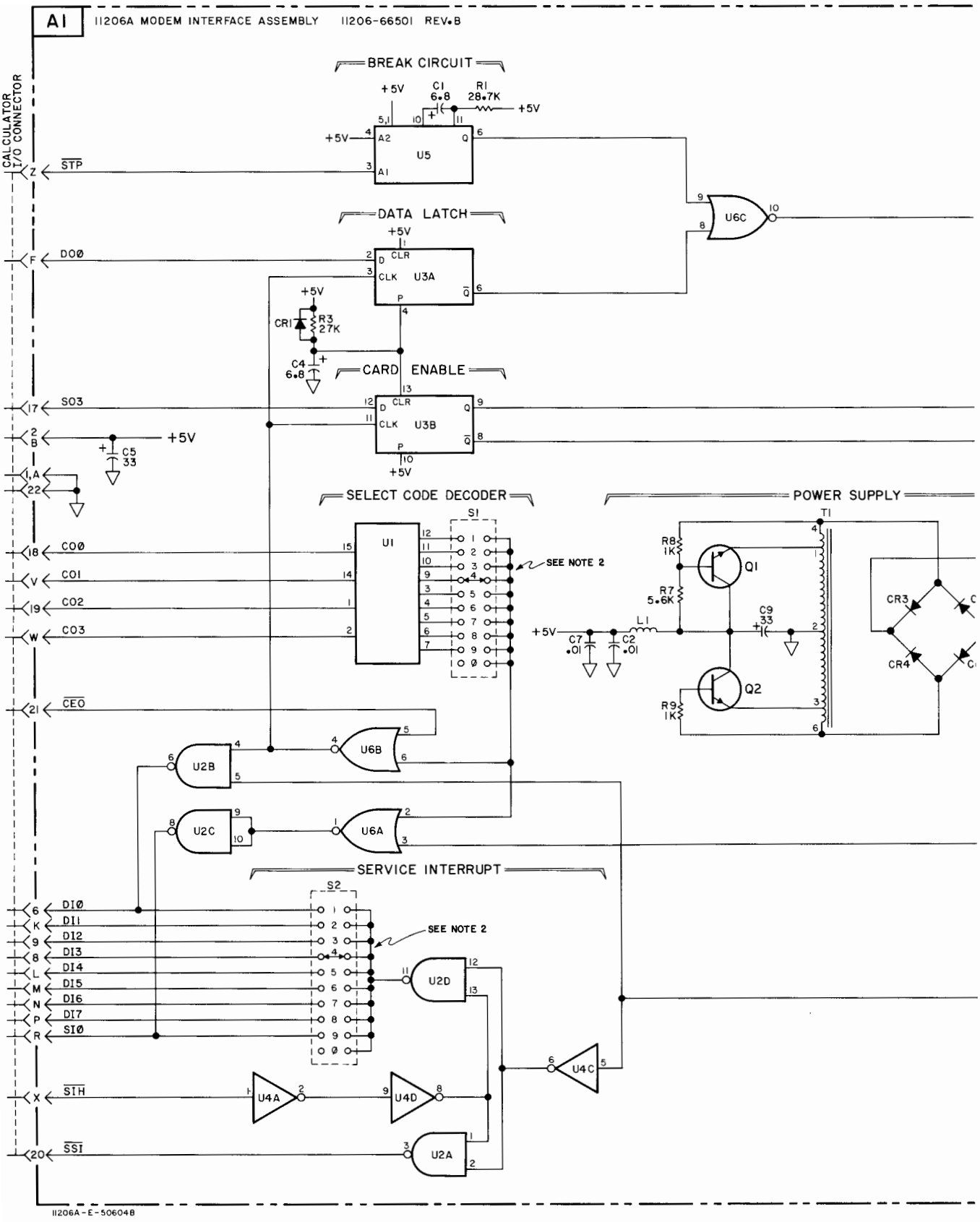


CONNECTOR TO MODEM

(rear view)



11206A Modem Interface Circuit Diagram Rev. B.


A1
11206A MODEM INTERFACE ASSEMBLY 11206-66501 REV.B
CALCULATOR I/O CONNECTOR
BREAK CIRCUIT
+5V
C1 6.8
R1 28.7K
+5V
U5
STP
DATA LATCH
DO0
U3A
CR1
R3 27K
C4 6.8
CARD ENABLE
SO3
U3B
+5V
C5 33
SELECT CODE DECODER
S1
U1
SEE NOTE 2
CO0
CO1
CO2
CO3
CEO
POWER SUPPLY
T1
Q1
Q2
R8 1K
R7 5.6K
R9 1K
C9 33
C7 .01
C2 .01
L1
CR3
CR4
U6C
U6B
U6A
U2B
U2C
SERVICE INTERRUPT
S2
SEE NOTE 2
DI0
DI1
DI2
DI3
DI4
DI5
DI6
DI7
SI0
U2D
U4C
U4A
U4D
U2A
SIH
SSI
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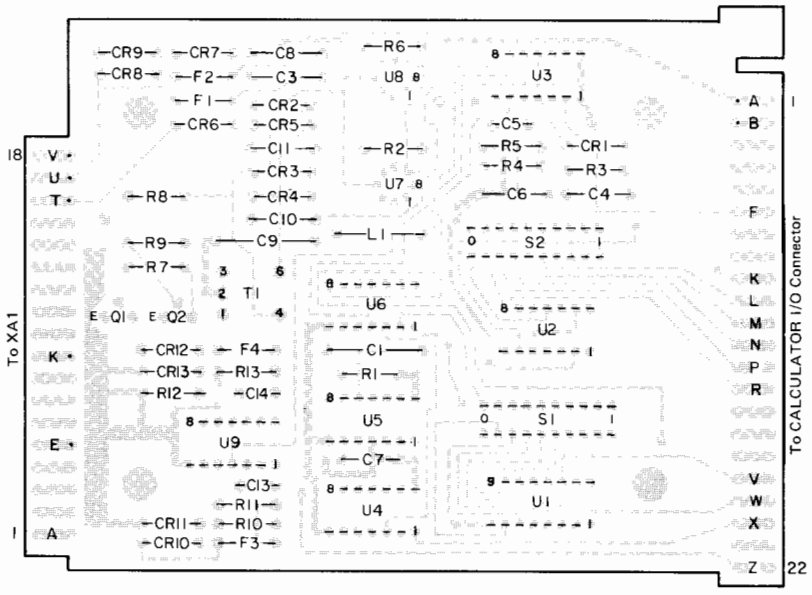
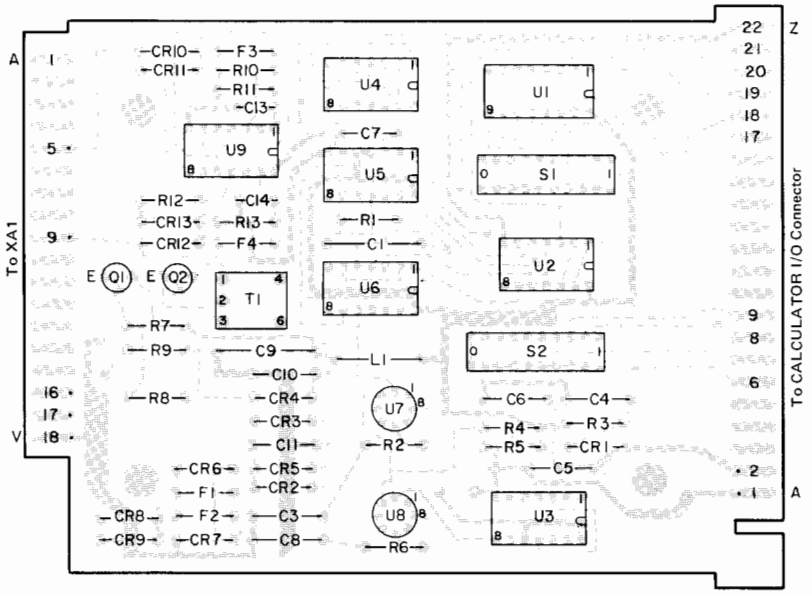
11206A-A-50605 Rev. B



CIRCUIT SIDE



COMPONENT SIDE

A1

-hp- Part No. 11206-66501 Rev B

Schematic Notes:

1. Unless noted otherwise, resistor values are shown in ohms and capacitor values are shown in microfarads.

2. S1 and S2 must be set to same position to specify the modem select code. See page 1-2 before changing the positions of these switches.

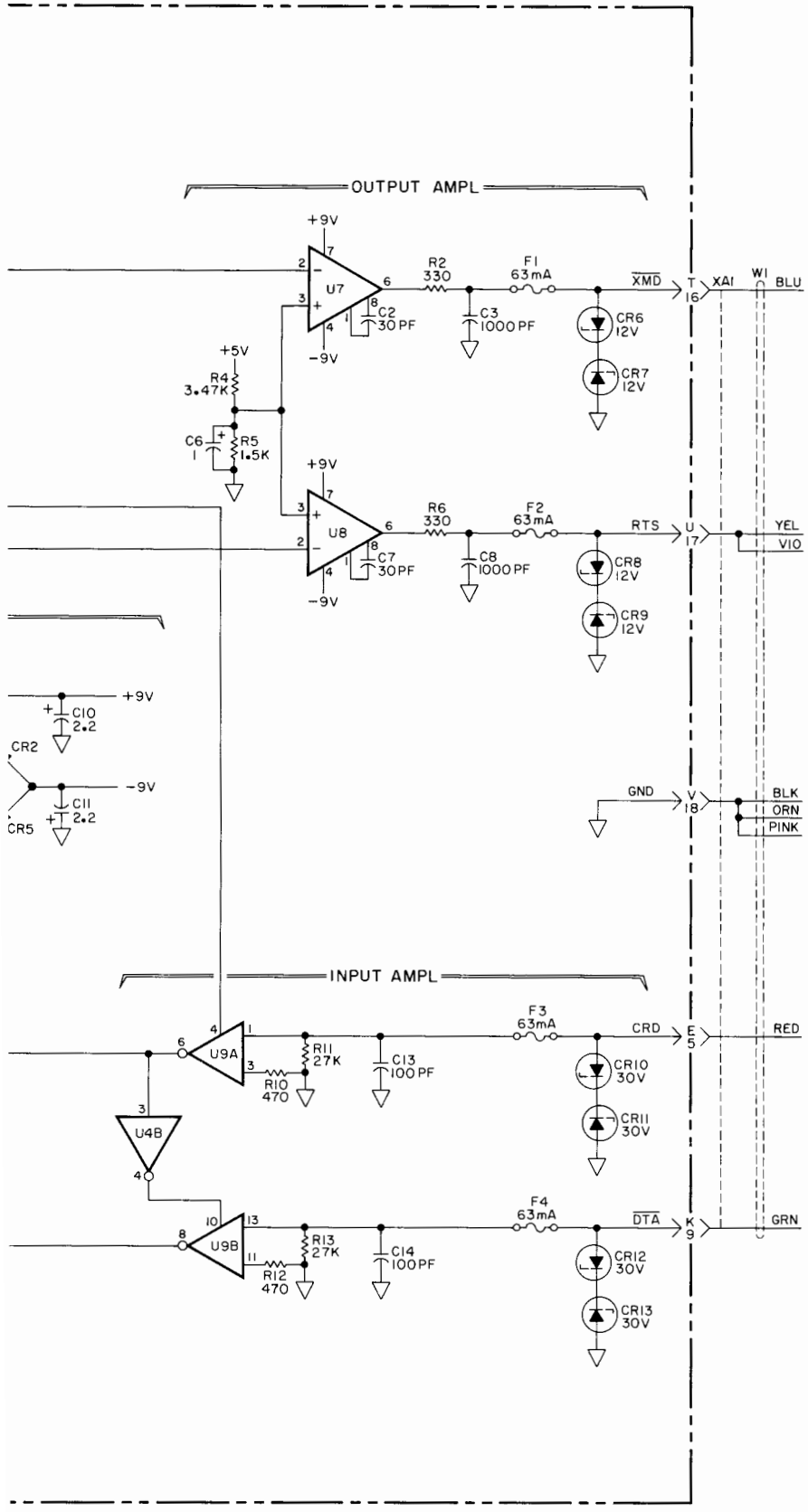
MANUAL CHANGES

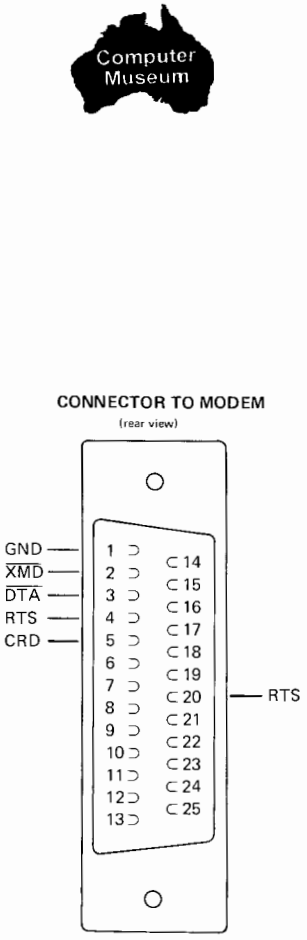
The following parts list, component locators, and circuit diagram apply to 11206A Interface circuit boards with 'REV.A' designation. Those boards were delivered before February 1974.

Since interfacing specifications and requirements are identical for revision A and B boards, either revision board can be substituted for the other.

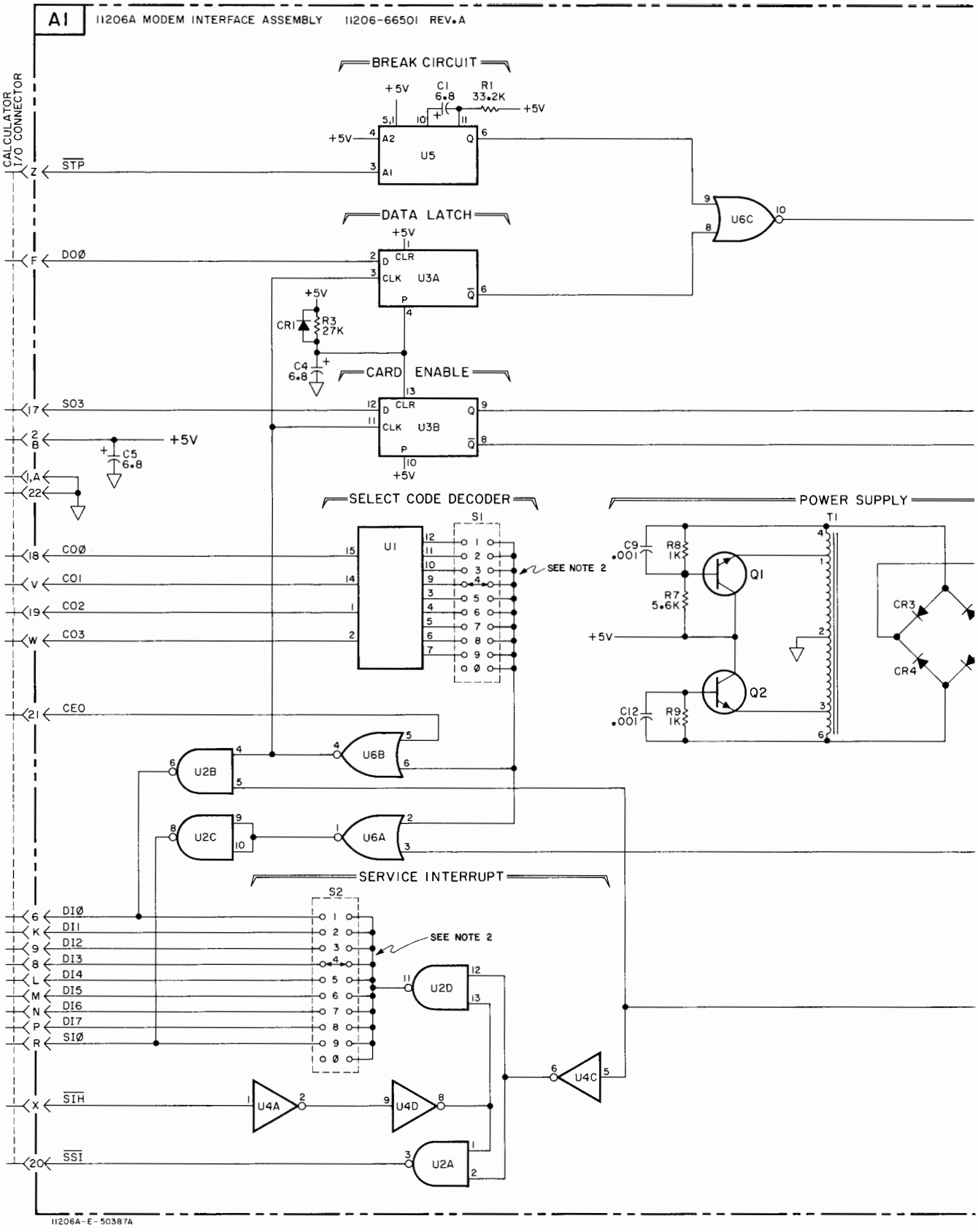
REPLACEABLE PARTS LIST

REFERENCE DESIGNATOR	-hp- PART NO.	TQ	DESCRIPTION
A1	11206-66501	1	Printed Circuit Board
C1	0180-1701	3	Cap. 6-8μfd, 6v.
C2	0160-2199	2	Cap. 30pf, 300v.
C3	0160-0938	2	Cap. 1000pf, 100v.
C4,5	0180-1701		Cap. 6.8μfd, 6v.
C6	0180-0291	1	Cap. 1μfd, 35v.
C7	0160-2199		Cap. 30pf, 300v.
C8	0160-0938		Cap. 1000pf, 100v.
C9	0160-0153	2	Cap. .001μfd, 200v.
C10,11	0180-0197	2	Cap. 2.2μfd, 20v.
C12	0160-0153		Cap. .001μfd, 200v.
C13,14	0150-0073	2	Cap. 100pf, 1000v.
CR1	1901-0045	1	Diode, Si,75A, 100v.
CR2,3,4,5	1901-0040	4	Diode, Si,05A, 30v.
CR6,7,8,9	1902-0029	4	Diode, Breakdown 12.1v.
CR10,11,12,13	1902-0244	4	Diode, Breakdown 30.1v.
F1,2,3,4	2110-0384	4	Fuse, .062A.
Q1,2	1954-0556	2	Transistor, Si, NPN
R1	0757-0454	I	Res, 33.2K,1%,1/8w.
R2	0684-3311	2	Res, 330, 10% ¼w
R3	0684-2731	3	Res, 27K, 10% ¼w
R4	0698-3152	1	Res, 3.48K, 1% 1/8w
R5	0757-0427	1	Res, 1.5K 1% 1/8w
R6	0684-3311		Res, 330, 10% ¼w
R7	0684-5621	1	Res, 5.6K 10% ¼w
R8,9	0684-1021	2	Res, 1K, 10% ¼w
R10,12	0684-4711	2	Res, 470 10% ¼w
R11,13	0684-2731		Res, 27K, 10% ¼w
SW1,2	3101-1677	2	Switch, 10 position
T1	9100-3403	1	Transformer, inverting
U1	1820-0627	1	IC, U7B93LO159X
U2	1820-0269	1	IC, SN7403N
U3	1820-0596	1	IC, DM74L74N
U4	1820-0586	1	IC, DM74LO4N
U5	1820-0261	1	IC, 74L21N
U6	1820-0584	1	IC, SN74L02
U7,8	1820-0203	2	IC, Op. Amp, 741C
U9	1820-1115	1	IC,DM8822
	5040-5911	1	BTM Boot, I/O PAC
	11200-04101	1	Cover, I/O PAC
	11206-61601	1	I/O Cable w/connectors
	11206-90000	1	Manual,Install.&Service
	7120-2940	1	Select Code labels (Pkg.)





11206A Modem Interface Circuit Diagram Rev. A.


A1
11206A MODEM INTERFACE ASSEMBLY 11206-66501 REV.A
CALCULATOR I/O CONNECTOR
BREAK CIRCUIT
+5V
C1 6.8
R1 33.2K
U5
STP
DATA LATCH
DOØ
U3A
CR1
R3 27K
C4 6.8
CARD ENABLE
SO3
U3B
C5 6.8
SELECT CODE DECODER
U1
S1
SEE NOTE 2
COØ
CO1
CO2
CO3
CEO
U2B
U6B
U2C
U6A
POWER SUPPLY
T1
C9 .001
R8 1K
Q1
R7 5.6K
Q2
C12 .001
R9 1K
CR3
CR4
SERVICE INTERRUPT
S2
DIØ
DI1
DI2
DI3
DI4
DI5
DI6
DI7
SIØ
U2D
U4C
SIH
U4A
U4D
SSI
U2A
11206A-E-50387A

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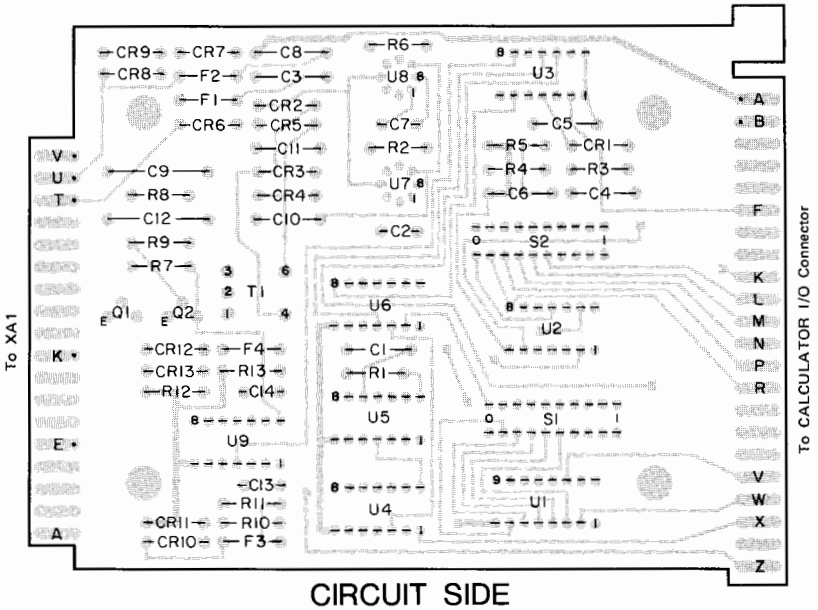
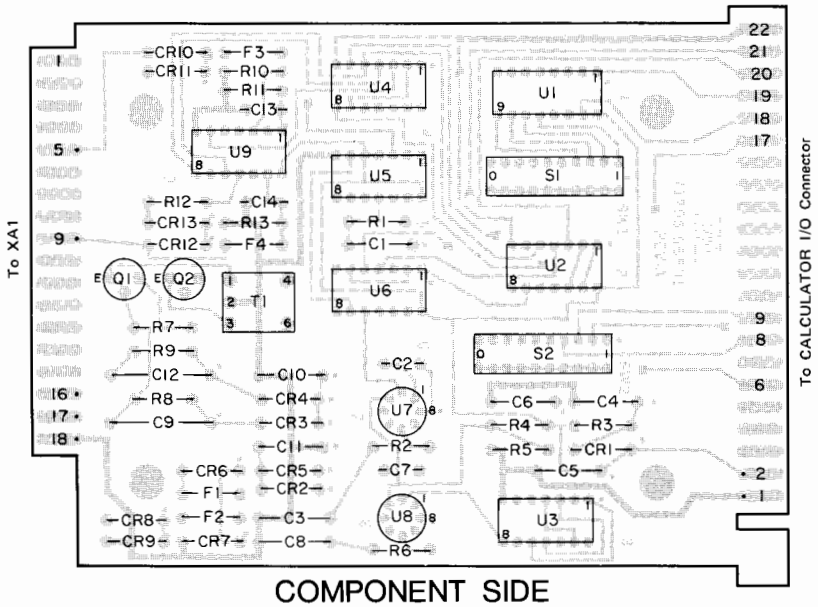


11206A-A-50388 sh 1



A1

hp Part No. 11206-66501

Schematic Notes:

1. Unless noted otherwise, resistor values are shown in ohms and capacitor values are shown in microfarads.

2. S1 and S2 must be set to same position to specify the modem select code. See page 1-2 before changing the positions of these switches.

11206A MODEM INTERFACE

INSTALLATION and SERVICE MANUAL

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PART NO. 11206-90000
MICROFICHE NO. 11206-99000