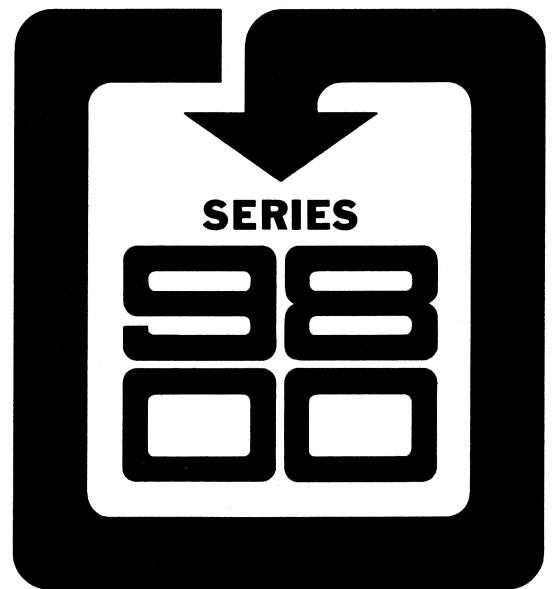
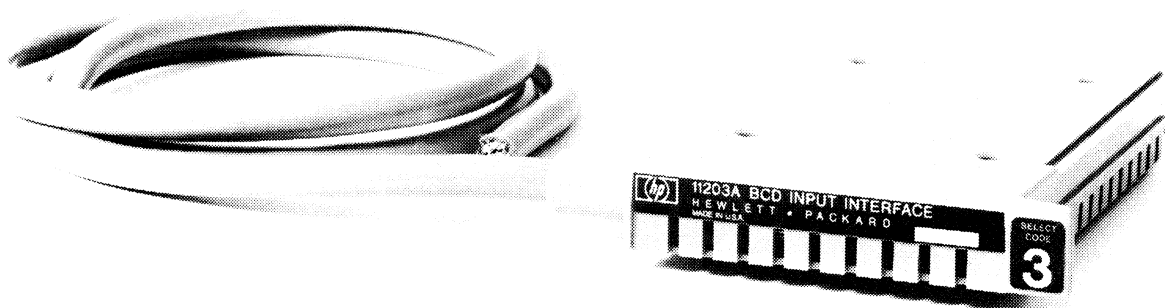




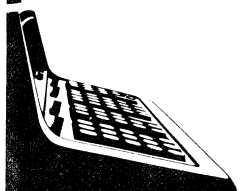
HEWLETT-PACKARD CALCULATOR

HEWLETT-PACKARD COMPANY
11203A BCD INTERFACE
PRELIMINARY INSTALLATION
AND SERVICE MANUAL



PART NO. 09810-90056

AUG. 1972





FINAL MANUAL REQUEST

IMPORANT

The Operating Manual for this instrument is currently being prepared. Rather than delay shipment of your equipment, we have supplied the enclosed preliminary information. As the final manual becomes available, we will send you two copies at no extra charge.

To receive your copies of the final Operating Manual, please fill out, detach, and return the self-addressed card below (no postage is necessary, if mailed in the United States). The final manual cannot be shipped until the address card is received.

(please print or type)

MODEL NO. **11203A BCD INTERFACE**

YOUR NAME _____

COMPANY _____

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STATE _____ ZIP _____

PLEASE FILL OUT
AND MAIL NOW.



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CALCULATOR PRODUCTS DIVISION

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LOVELAND, COLORADO 80537

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Chapter 1

GENERAL INFORMATION

The -hp- 11203A BCD Interface provides a 9800-Series Calculator with an interface to one of a variety of instruments having parallel Binary Coded Decimal outputs. A direct interface is possible to a large number of -hp- digital voltmeters, frequency counters, etc. (see the list of Options shown below. When used with an appropriate Peripheral Control Block (e.g., the -hp- 11264A for the Model 10 or the -hp- 11220A for the Model 20) the interface can transfer data points up to nine digits long and also function, range, sign, and overload information to the calculator.

Refer to the Peripheral Control Block Operating Manual for a description of the calculator input operation which is available when using the peripheral block and this interface. That manual also describes the data formats which are available for data input operation.

PHYSICAL DESCRIPTION

The BCD Interface consists of a circuit card, an I/O pac, and a 6' shielded cable. The I/O pac, which houses the circuit card, can be plugged into any one of the I/O slots at the back of the calculator. One end of the cable connects to the circuit card. The other end of the cable has been left open; this permits the interface to be connected to a peripheral device.

AVAILABLE INTERFACE OPTIONS

Each of the following options consists of a standard BCD Interface which is prewired with a connector suitable for use with the corresponding -hp- instrument. A wiring diagram of the added connector for each of these options is supplied when the Interface is ordered with the option.

11203A-	Interfaces with:
Option A01	5326/27 Counters
Option A02	5300 Counter
Option A03	3480A/B DVM (3482A or 3484A Plug-in)
Option A04	3450 DVM
Option A06	3480A/B - 3485A Scanner

 SPECIFICATIONS Levels

Levels are standard (control lines) or low power (data lines) transistor-transistor logic with binary "1" state high ($> + 2.0$ volts) and binary "0" state low (< 0.7 volts) on all lines. The interface card can be specially wired for inverted levels (see the 'Installation Considerations' section).

Input Format

Data is serialized on the card into a sixteen-character sequence as follows: Function (or range), delimiter, mantissa sign, nine digits of data, exponent sign, overload, exponent, delimiter.

- the first delimiter separates function (or range) and data into separate registers.
- the second delimiter terminates the entry sequence.
- overload condition sets the most significant exponent digit to eight and sets exponent sign positive. (i.e., a large positive exponent is output).
- all unused lines must be connected for zeroes (grounded on positive-true card).

Codes

- Data - '1248' Binary Coded Decimal weighting; codes '0' through '9' decimal are entered as numbers. Codes '14' or '15' binary are accepted and entered as a decimal point if they occur in a data digit.
- Function and Exponent = '1248' Binary Coded Decimal weighting; codes '0' through '9' decimal only.
- Mantissa Sign - One binary bit, '0' gives positive mantissa, '1' gives negative mantissa.
- Exponent Sign - One binary bit, '0' gives positive exponent, '1' gives negative exponent unless overload condition exists.
- Overload - One binary bit, '1' gives overload condition.

Data-Sample Control Lines

- Control 1 - Normal control line; leading edge should initiate the data sample, and the trailing edge is triggered by the Flag returning low from the BCD source.
- Control 2 - A negative going command from the Interface signals the BCD source to initiate a data sample; can be used if the BCD source returns FLAG high to recognize control command.
- Flag - Returned low by the BCD source to signal that the data sample is complete and that data is ready.

 SPECIFICATIONS

(Cont.)

Power

The 11203A is powered from the calculator.

Temperature

0°C to 45°C Ambient.

Dimensions

4-3/4" (12.06 cm) x 6-1/4" (15.87 cm) with a six foot (1.82 M) unterminated cable.

 SELECT CODE

The select code (or address) of the peripheral device which is interfaced to the calculator through the interface can be selected on the interface card. Refer to the Peripheral Control Block Operating Manual for a further description of the select code.

The BCD Interface is set to select code 3 at the factory. Use the procedure given below when changing the select code setting.

1. Switch the calculator and the peripheral device OFF.
2. Disconnect the interface from the calculator. Remove the four screws located on the top of the card assembly; then, turn the card over and lift off the bottom cover.
3. Locate the Select Code Switch (see Figure 1). Raise the hinged cover on the switch. Using a small, flat-blade screwdriver, carefully rotate the selector-tab until it is positioned at the desired select code number (numbers are printed on the side and on the top cover of the switch). Before closing the cover, be sure the slot in the selector-tab is positioned at a right angle with respect to the length of the switch.
4. Close the switch cover 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 peripheral device 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 peripheral device ON. Verify that the desired select code is set by executing a data request operation (or running a program) which specifies the new select code.

◆◆◆◆◆ SELECT CODE ◆◆◆◆◆

(Cont.)

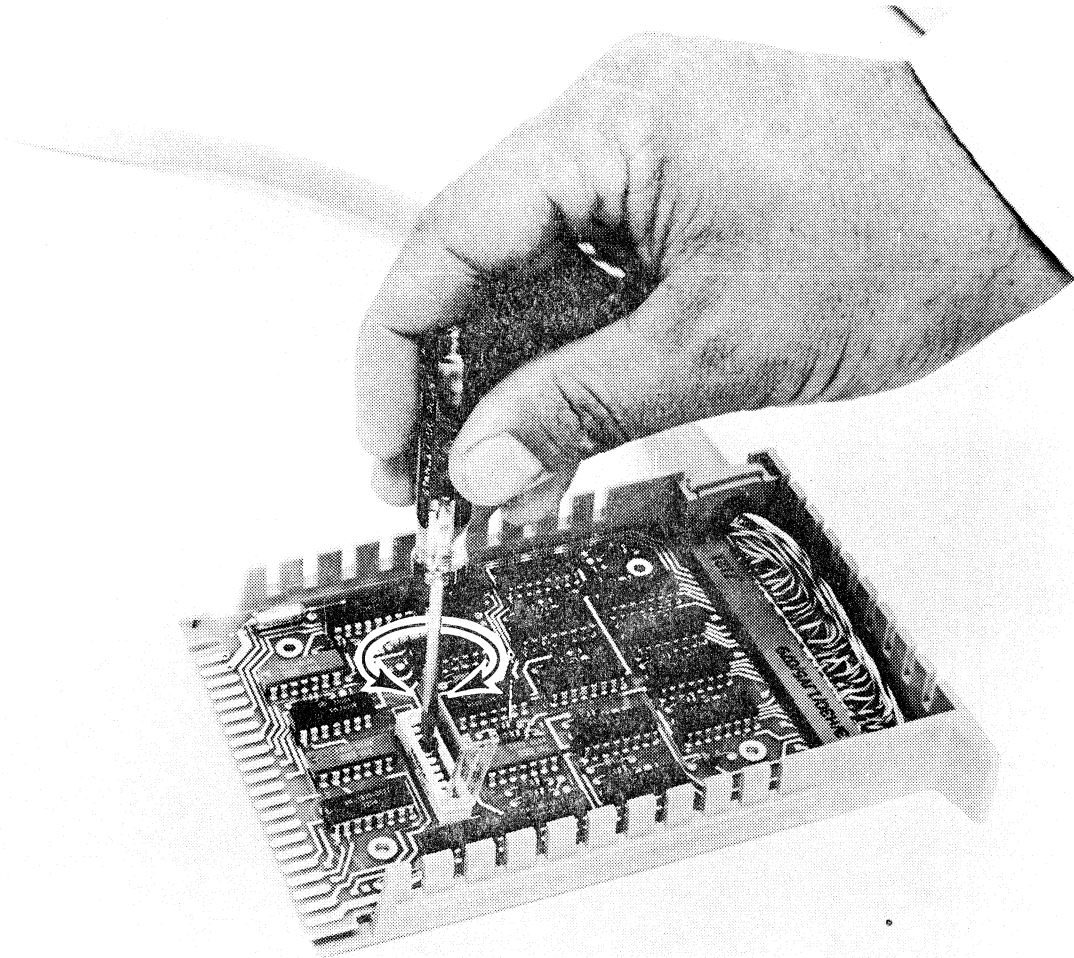


Figure 1. Setting the Select Code

◆◆◆◆◆ INSTALLATION CONSIDERATIONS ◆◆◆◆◆

The following information may be helpful when using the BCD Interface to connect any device other than those listed in the Appendix to a 9800-Series Calculator.

The + and - Reference Lines

One of the reference lines (see the upper-right corner of the circuit diagram) must be connected to ground; which line is grounded depends upon the input logic level used.

- When positive-true logic is used, the '-' line must be grounded and the '+' line must be left open.
- When using negative-true logic, the '+' line must be grounded and the '-' line must be left open.

Pin 3B on the card-to-cable connector (XA1) may be used for connecting the correct reference line to ground.

INSTALLATION CONSIDERATIONS

Changing Logic Levels

(Cont.)

The BCD Interface is wired for positive-true logic (i.e., "1" state = $\geq 2.0V$, "0" state = $\leq 0.7V$) on all data input lines and positive-true logic on the Flag line. The data logic can be rewired to respond to negative-true logic (i.e., "1" state = $\leq 0.7V$, "0" state = $\geq 2.0V$) by removing one lead of each of the resistors, R7 through R14 and R16 through R20, from the "+" pad and soldering the lead to the "-" pad. Likewise, the Flag line can be rewired to respond to negative-true logic by relocating the lead to R1.

IMPORTANT

When rewiring the input data lines, be sure to connect the correct reference line to ground (see the preceding paragraph).

Maximum Data Entry Rate

The maximum data entry rate when using the BCD Interface depends upon the calculator, the peripheral device, and the program execution time. The maximum rate possible with a Model 10 Calculator is approximately 40 samples per second, whereas the maximum rate possible with the Model 20 Calculator is approximately 4 samples per second*.

Stability of Input Data

The time needed for input data to remain stable on the input lines depends upon the data entry rate. For instance, if the system is sampling at 40 samples per second, the data must remain on the lines for a minimum of 20 msec, whereas a sample rate of 4 samples per second requires that each data sample remain stable for not less than 250 msec.

Programming Unused Input Lines

The following table lists the sequence in which data is input and identifies the wires on the interface cable. The interface transfers data beginning with the most significant digit. If less than 9 digits of data are used, leading zeroes should be programmed by connecting the most significant digit lines to ground. Also, if any of the lines for function, polarity, overload, or range are not used, they must be connected to ground.

*This rate is possible when using the PC I Block; the maximum sample rate is considerable faster when using the PC II Block.

◆◆◆◆◆ INSTALLATION CONSIDERATIONS ◆◆◆◆◆

(Cont.)

Input Sequence	Data Item	Cable Wire Color			
		'8'	'4'	'2'	'1'
#1	Function Code	903	98	92	6
2	Comma*	-	-	-	-
3	Polarity	-	-	-	901
4	Digit 1 (MSD)	946	935	926	918
5	Digit 2	947	936	927	923
6	Digit 3	948	937	928	924
7	Digit 4	956	938	934	925
8	Digit 5	912	902	91	5
9	Digit 6	904	93	7	4
10	Digit 7	905	94	8	3
11	Digit 8	906	95	9	2
12	Digit 9	907	96	90	1
13	Exponent Sign	-	-	-	916
14	Overload	-	-	-	914
15	Exponent Digit	908	97	913	0
16	Delimiter*	-	-	-	-

*These characters are generated by the interface.

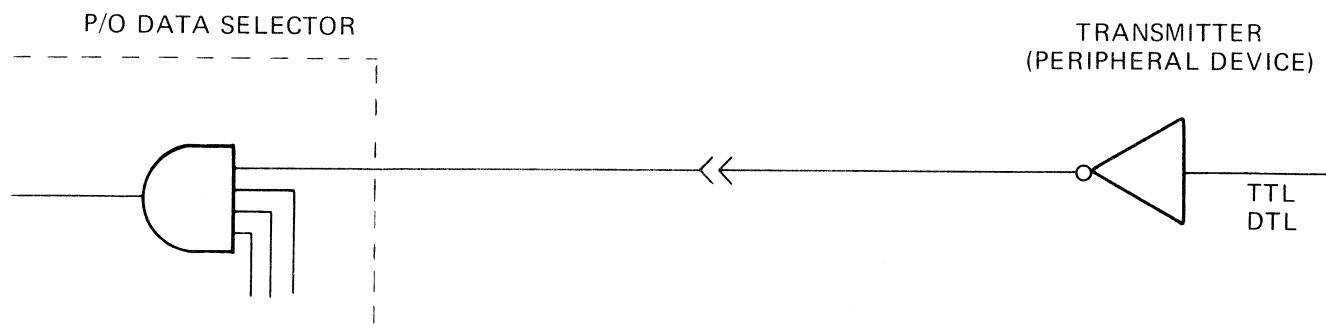
± Cable wire color code same as resistor color code: First number identifies base color, second number identifies wider strip, third number identifies narrower strip. (e.g., 924 = White, Red, Yellow.)

Recommended Input Circuits

Each data input line is connected to a TTL AND gate which is internal to the data selector. To ensure proper operation, the transmitting circuit (on the peripheral end of the cable) must allow the receiver to source at least 0.2ma.

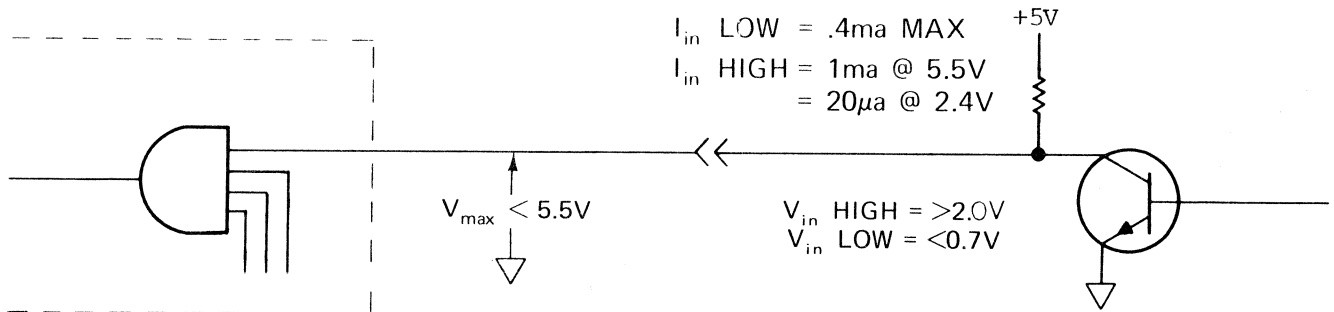
The input voltage must not exceed 5.5V.

Typical data transmitter circuits are shown below:



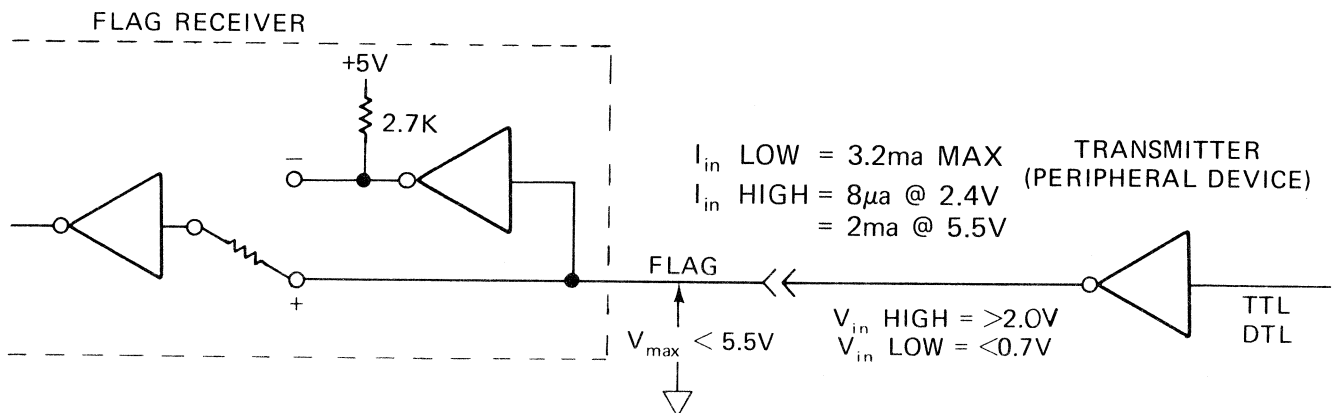
INSTALLATION CONSIDERATIONS

(Cont.)



The flag receiver consists of two TTL inverters (P/O TI 7405N). For proper operation the transmitting circuit must allow the receiver to source at least 0.4 ma and the input voltage must not exceed 5.5V.

A typical data transmitter circuit is shown below:



Chapter 2

THEORY OF OPERATION

This chapter contains a brief description of the circuits used in the BCD Interface. Refer to the block diagram on the following page and the circuit diagram at the back of this manual when reading the following paragraphs. A table of logic symbols used in this circuit diagram is on Page 11.

GENERAL THEORY

The BCD Interface converts positive-true* BCD coded data to negative-true ASCII coded data, which is usable by 9800-Series calculators.

The calculator supplies all power required for the BCD Interface. All data input receivers are either low-power TTL inverters (TI 93L12) or low-power TTL inverters (TI 74L04). The drivers for the Control 1 and Control 2 lines are TTL inverters (TI 7405). The input Flag receiver is also a TTL inverter (TI 7405).

Each data request command from the calculator consists of a series of 17 identical signals. The command is initiated by a 'data sample signal'; then after the peripheral device has taken a data sample and has presented the data on the '1248' BCD input lines, the calculator sends the remaining 16 characters. Each of these signals causes the interface to send one ASCII-coded character to the calculator. The data input sequence is shown in the table on Page 6.

SAMPLE CONTROL

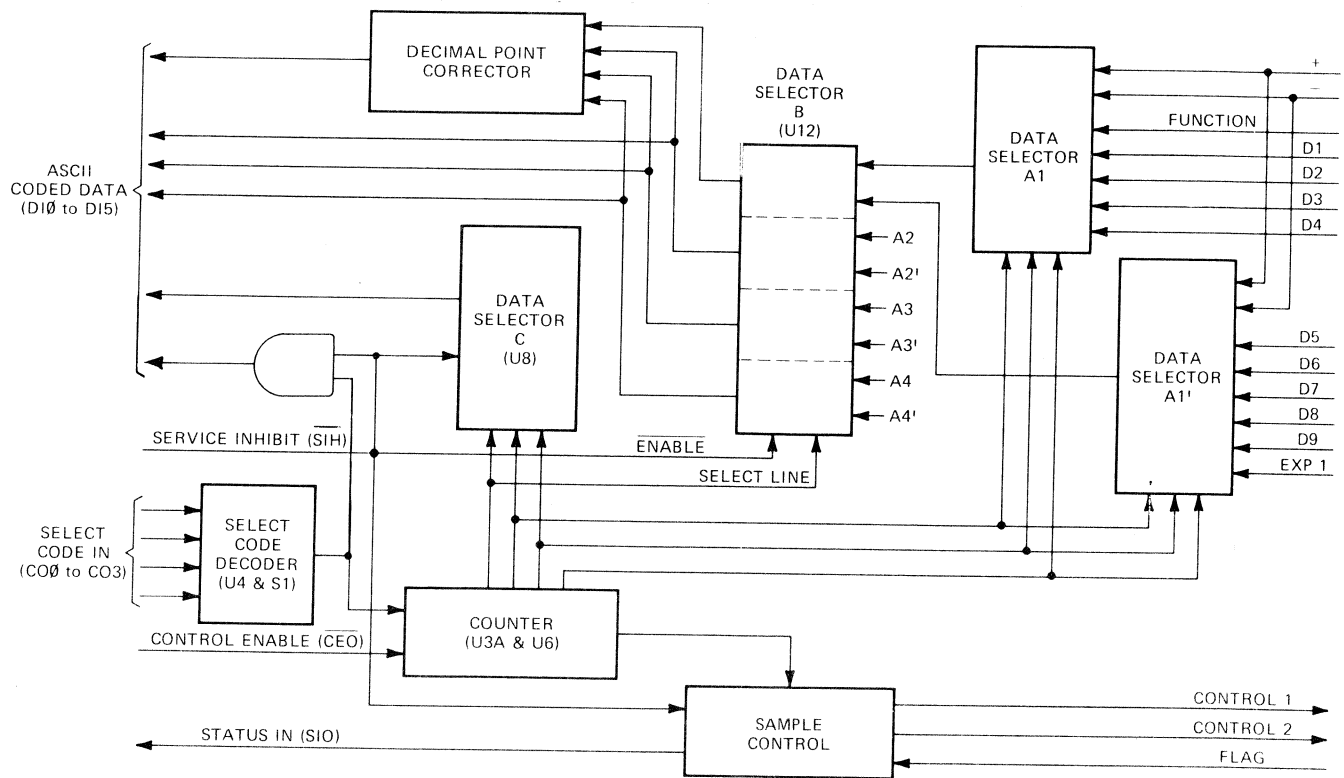
The data sample signal consists of a Select Code signal (on lines CO0 through CO3) and a Control Enable signal (on the $\overline{\text{CEO}}$ line). If the Select Code signal corresponds to the setting of S1, the data sample signal resets the counter (U6) and causes the Control 1 and Control 2 lines to go low (see the Timing Diagram on Page 10). After the peripheral device has taken a data sample, it indicates 'data ready' by forcing the Flag line low. The falling edge of the data ready signal causes the Status IN (SI0 line) to also go low which, in turn, causes the calculator to send the remaining 16 data request signals.

*The interface can be rewired to accept negative-true BCD data and/or a positive-true signal; see 'NOTE 1' on the circuit diagram on Page 23.

SAMPLE CONTROL

(Cont.)

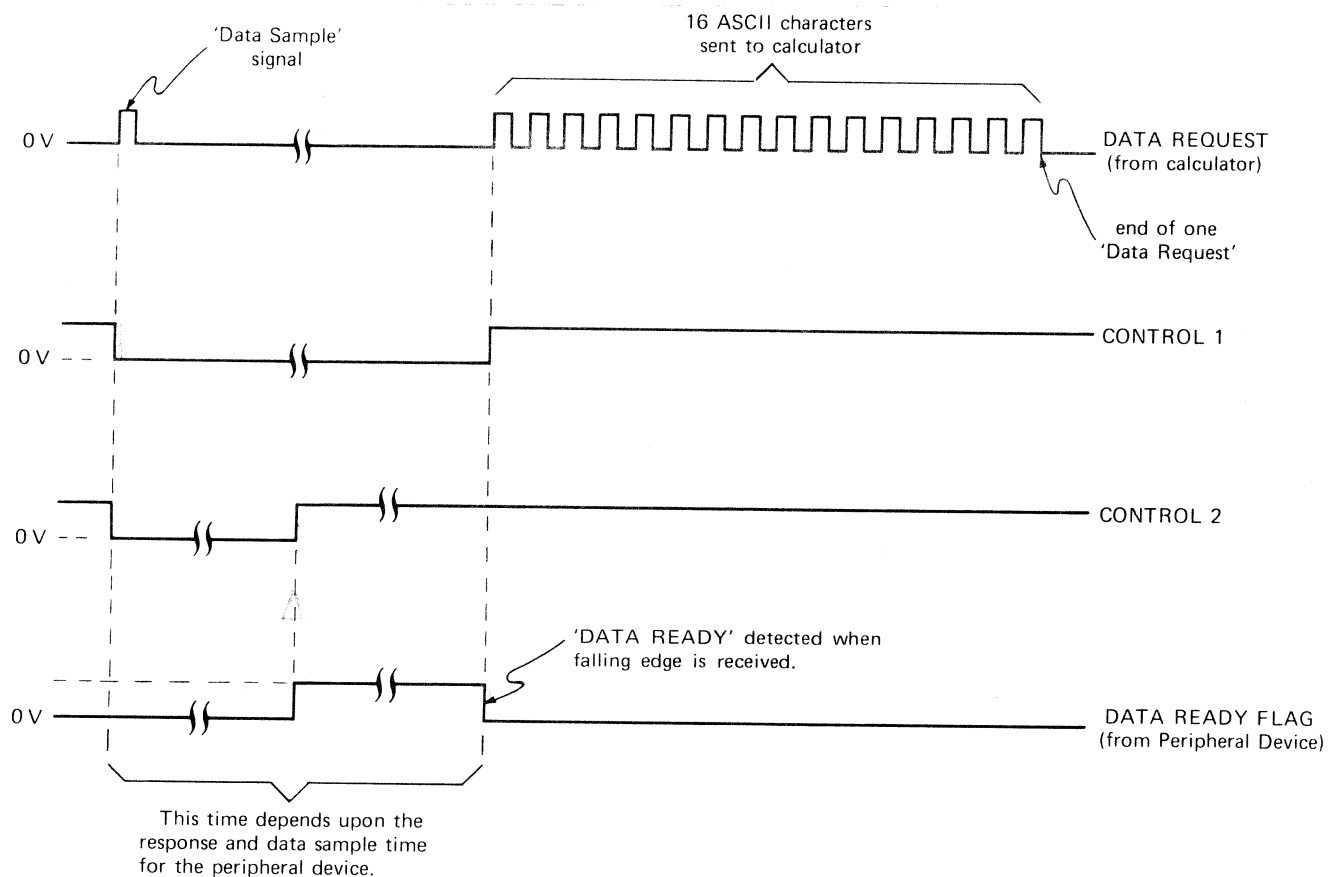
Either the Control 1 or the Control 2 line may be used to signal 'data sample' to the peripheral device. As shown in the Timing Diagram, the Control 1 line remains low until a falling edge is 'seen' on the Flag line; whereas, the Control 2 line remains low only until the Flag line goes high. Thus, the Control 1 line can be used when the peripheral device must maintain a low level during the entire data sampling period. Also, the Control 1 line must be used when the Flag line must be held high during the entire data sample period.



Block Diagram of the BCD Interface

SAMPLE CONTROL

(Cont.)



Input Cycle Timing Diagram

DATA TRANSFER

The BCD coded data from the peripheral device is converted to ASCII coded data and sent to the calculator, one character at a time, by controlling the data selectors A, B, and C (see the block diagram on Page 9). The data selectors are controlled by the counter (U6) and the Service Inhibit signal ($\overline{\text{SIH}}$ line); this latter signal is sent each time the calculator can accept the ASCII character. The counter is 'clocked' by the 16 sets of Control Enable and Select Code signals. Data selectors A1 and A1' (see the block diagram) represent one of four sets of BCD input line selectors. Each selector passes data from one of eight input lines to data selector B. Data selector B is a quad, two-input multiplexer which selects data from either the A1 or the A1' selector. When each ASCII character is required, data selector B is enabled by the Service Inhibit signal. Data selector C (U8) sets the value of data line 4. Data line 5 is set low whenever an ASCII character is sent to the calculator.

◆◆◆◆◆ DECIMAL POINT CORRECTOR ◆◆◆◆◆

The decimal point corrector circuit monitors the nine numerical data characters and outputs an ASCII decimal point character if the BCD code '14' or '15' is present*.

◆◆◆◆◆ OVERLOAD DETECTOR ◆◆◆◆◆

The overload circuit (see U9A, U9C, and U10B on the circuit diagram) cause a large positive exponent to be output whenever the Overload line is high. If the Exponent Sign line is also high (indicating a negative exponent) the overload signal will still cause a large positive exponent to be output.

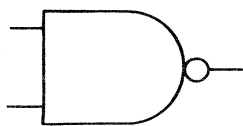
NOTE

For proper operation the correct reference line must be grounded (i.e., the '-' line must be grounded for positive-true logic and the '+' line must be grounded for negative-true logic), and the other line must be left open.

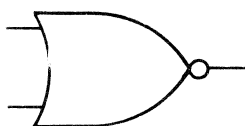
◆◆◆◆◆ LOGIC SYMBOLS ◆◆◆◆◆

LOW = 0V to +0.5V.

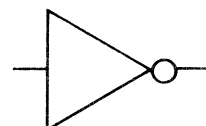
HIGH = 2.4V to 5.5V.



NAND GATE



NOR GATE



INVERTER

All inputs must be HIGH to produce a LOW output.

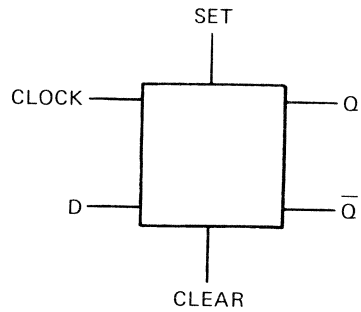
If any input is HIGH, output will be LOW.

If input is HIGH, output is LOW, or LOW input produces HIGH output.

*If consecutive BCD coded 14's and/or 15's are present, the data request operation is immediately terminated and the calculator program is halted.

LOGIC SYMBOLS

(Cont.)

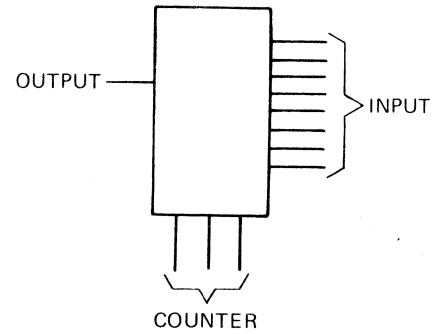


FLIP-FLOP

(positive-edge triggered)

Low input to Set sets Q HIGH.

Low input to Clear sets Q LOW.



DATA SELECTOR

One of the input signals is passed to the output, depending upon the state of the counter.

TRUTH TABLE

Input (D)	Q	$\overline{Q}$
L	L	H
H	H	L

Chapter 3

INTERFACE REPAIR

The following procedures assume that the calculator, ROM block(s) and peripheral device are operating correctly: You should perform all applicable test procedures before assuming that the BCD Interface is defective.

Equipment Required:

an -hp- 180A Oscilloscope (or equivalent)
 an -hp- 10525A Logic Probe
 a small phillips screwdriver

INITIAL CHECKOUT

After ensuring that the system is correctly installed, load and run the appropriate program shown below.

Model 10 System:

```
0000--FMT--42
0001-- 3 ---00
0002-- 3 ---00 Select Code
0003-- . ---21
0004-- UP---27
0005--FMT---42
0006-- 3 ---00
0007-- 3 ---00 Select Code
0008-- . ---21
0009--PSE---57
0010--PSE---57
0011--GTO---44
0012-- 0 ---00
0013--END---46
```

Model 20 System:

```
0:      Select Code
      RED 3,A,B;DSP A;
      DSP ;DSP ;DSP B;
      DSP ;DSP F
1:
      GTO 0F
2:
      END F
      R137
```

If the program does not run successfully (i.e., the peripheral device does not continuously sample and send data to the calculator) press STOP and check the setting of the select code switch (see Page 3). If the correct select code is not set, the program will halt at the point where the select code is specified. Also, rotate the selector-tab back and forth to ensure proper switch contact (the switch may be intermittent).

If the program still does not run properly, perform the following procedures. However, if the program runs but the data received is incorrect, perform only the 'Equipment Setup' and 'Data Selector Checkout' procedures.

EQUIPMENT SET UP

1. Switch the calculator OFF, disconnect both ends of the BCD Interface and remove the four screws which secure the cover of the interface card. Then remove the interface card (P.C. Board) from the I/O Pac.
2. Remove the four screws which secure the calculator top cover, then remove the top cover.

NOTE

The following procedures assume all rewirable resistors (R1 - R3, R4 - R16) are wired to the '+' pads on the P.C. board.

3. Plug the interface card back into the top I/O connector (the circuit-side MUST be up). Do not reconnect the interface cable, as it may affect the results during the checkout procedures.
4. Switch the calculator ON and reload the appropriate program (see the previous page); then proceed to the checkout procedure(s).

CONTROL LOGIC CHECKOUT

The control logic circuits can be checked by performing the signal checks listed in the following table. The checkout must be done in the order listed in the table (begin with U3 pin 3). The pin number indicated where the logic probe (or oscilloscope probe) should be placed. The '(operation) result' information indicates what kind of signal should be seen and when it should be seen. If an oscilloscope is used, the ON and OFF terms refer to 'high' and 'low' signals.

CONTROL LOGIC CHECKOUT

(Cont.)

CONTROL LOGIC TROUBLESHOOTING PROCEDURE

IC (PIN #)	(OPERATION)* RESULT S = STOP KEY R = RUN-PROGRAM or CONTINUE	REPLACE COMPONENT (if result cannot be obtained).
U3 (3)	(S-R) FLASHING OFF	U4
U3 (1)	(S-R) FLASHES ON	U3
U6 (9)	(S/R) OFF/OFF	
U6 (10)	(S/R) OFF/OFF	
U6 (12)	(S/R) OFF/OFF	U6
U6 (13)	(S/R) OFF/ON	
U11 (2)	(S/R) ON/OFF	
U11 (4)	(S/R) ON/ON	
U11 (6)	(S/R) ON/ON	
U11 (8)	(S/R) ON/ON	U11
U11 (10)	(S/R) ON/ON	
U11 (12)	(S/R) ON/OFF	
U10 (1)	(S/R) ON/ON	
U10 (10)	(S/R) OFF/ON	U10
U7 (6)	(S/R) ON/OFF	U7
U1 (4)	(S-R) FLASHING OFF	
U1 (10)	(S-R) FLASHING OFF	CR1 and/or C3
U1 (5)	(S/R) OFF/ON	
U1 (6)	(S/R) ON/OFF	
U1 (8)	(S/R) ON/OFF	U1
U1 (9)	(S/R) OFF/ON	
U2 (6)	(S/R) ON/OFF	
U2 (8)	(S/R) ON/OFF	
U2 (10)	(S/R) OFF/OFF	
U2 (11)	(S/R) ON/ON	U2
U2 (12)	(S/R) OFF/OFF	
U2 (13)	(S/R) ON/ON	
U3 (10)	9810A: (S-R) FLASHING ON 9820A: (S/R) ON dim/OFF	U3
U2 (2)	9810A: (S-R) FLASHES ON 9820A: (S/R) ON dim/ON bright	U2

* (S-R): Monitor probe when calculator key is being pressed. (S/R): Monitor probe when program is either stopped or running. The indicated result corresponds to the respective calculator operation (e.g., for U6 pin 13, the probe is OFF when the program is stopped and the probe is ON when the program is running.

DATA SELECTOR CHECKOUT

In order to test the 'data selector' circuits, the card must be wired so that the calculator continuously asks for and receives data from the interface. The wiring schemes for two 9800-Series calculators are given below. The connections must be maintained for all testing in this section.

MODEL 10 CALCULATOR:

1. Connect either end of R3 to ground
2. Connect interface pin 6B to ground

MODEL 20 CALCULATOR:

1. Connect either end of R3 to ground
2. Connect all of the following interface pins to ground (use a method which permits any one pin to be disconnected and reconnected): 1A through 28A, 1B through 4B, 6B, 8B through 11B, 13B through 16B, 18B through 21B, and 23B through 26B.

Before troubleshooting the data selector circuits, check to ensure that the counter is operating properly. To do this, load and run one of the following programs.

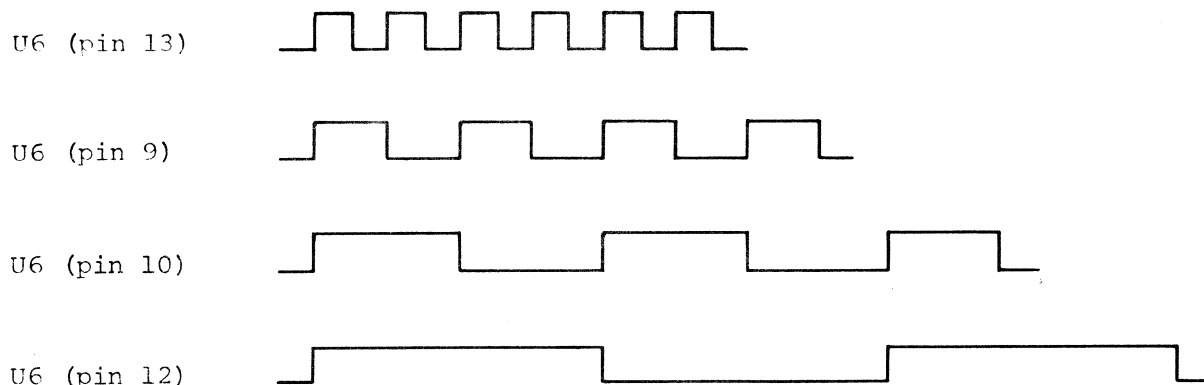
Model 10:

```
0000--FMT---42
0001-- 3 ---03
0002-- 3 ---03
0003-- . ---21
0004-- UP---27
0005--FMT---42
0006-- 3 ---03
0007-- 3 ---03
0008-- . ---21
0009--GTO---44
0010-- 0 ---00
0011--END---46
```

Model 20:

```
0:
RED 3,A,B;DSP A;
DSP ;DSP ;DSP B;
DSP ;DSP F
1:
GTO 0F
2:
END F
```

Then, while using an oscilloscope, compare the signals on the interface with those shown below (you should verify that the pulse width is doubled on each successive pin).



DATA SELECTOR CHECKOUT

(Cont.)

If the program will not run, return to the 'Control Logic Checkout' section (the data selectors cannot be checked unless the control logic circuits are operating correctly). If the program runs but the waveforms are incorrect, replace U6. Press STOP (if the program is running) and check the signals at the indicated pin numbers with a logic probe or oscilloscope. If the result is not found, replace the respective component.

COMPONENT (PIN #)	SIGNAL LEVEL
U9(2)	ON (high)
U9(4)	OFF (low)
U9(6)	OFF (low)
U9(8)	OFF (low)
U10(4)	OFF (low)

If you are using a Model 10 Calculator, use the following procedure to check the data selectors. If you are using a Model 20 Calculator, use the procedure beginning on Page 19. In either case, perform the 'Final Selector Test' on Page after finishing one of the following procedures.

Checkout with the Model 10

1. Load the following program:

```

0000--FMT---42
0001-- 3 ---03
0002-- 3 ---03 Select Code
0003-- . ---21
0004-- UP---27
0005--FMT---42
0006-- 3 ---03
0007-- 3 ---03 Select Code
0008-- . ---21
0009--PSE---57
0010--PSE---57
0011--CTD---44
0012-- 0 ---00
0013--END---46
    
```

2. Connect the interface card as described on one of the lines in the following table.
3. Press END, CONTINUE; the program causes the display to flash continuously (check periodically to ensure that the program is running).

DATA SELECTOR CHECKOUT

(Cont.)

4. Monitor the signal on U19 pin 15. If the probe is flashing, recheck all connections (the signal on U19 pin 15 should be low unless any one of the pins is disconnected).
5. Change the connection of each pin and verify that the signal on U19 pin 15 flashes, (only one pin connection must be altered at a time). If the signal does not flash when any one pin connection is altered, replace the component indicated.
6. Reconnect all pins to ground as described on Page 16, and perform, in succession, each test in the table.
7. After completing the tests in the table, reconnect all pins to ground EXCEPT 6B and proceed to the Final Selector Test.

TEST SEQUENCE	INITIAL TEST CONDITIONS	REPLACE (if test fails):
1	GND: 4B, 6B, 7A, 8B, 9B, 10B, 11B.	U20
2*	GND: 6B, 13A, 13B, 14B, 15B, 16B, OPEN: 20A	U19
3**	GND: 4B, 18A, 19A, 19B, 20A, 20B, 21B.	U18
4**	GND: 4B, 22A, 23B, 24B, 25B, 26B.	U17
5	GND: 1A, 2A, 3A, 4A, 4B, 5A, 6A, 6B.	U16
6*	GND: 1B, 2B, 6B, 8A, 9A, 10A, 11A, 12A.	U15
7*	GND: 6B, 14A, 15A, 16A, 17A, 18A, 21A, OPEN: 2B	U14
8**	GND: 4B, 23A, 24A, 25A, 26A, 27A, 28A.	U13

*Pin 4B must be grounded throughout test.

** Pin 6B must be grounded throughout test.

DATA SELECTOR CHECKOUT

(Cont.)

Checkout with the Model 20

1. Load the following program:

```

0:      Select Code
      RED 3,A,B,C,X,Y,
      ZJMP 0F
1:
      END F
    
```

2. Connect the interface card as described on Page 16.
3. Press RUN-PROGRAM: the program should cause the display to flash continuously.
4. Each data selector is checked by placing the logic probe on pin 15 of the appropriate selector and individually removing each interface pin from ground. When this is done, the probe should flash. If the probe does not flash when an input has been opened, the selector must be replaced. After an input has been checked, reconnect the interface pin to ground. Also, if the probe flashes before any interface pin is disconnected from ground (except during tests 3 and 5), the selector must be replaced.
5. Perform each test described in the table. Be sure to reconnect all pins as described on Page 16 after completing each test.
6. After completing all eight tests, proceed to the Final Selector Test. Be sure to reconnect all pins to ground (except pins 4B and 11A), as described on Page 16, before performing the Final Selector Test.

DATA SELECTOR CHECKOUT

(Cont.)

TEST SEQUENCE	INITIAL TEST CONDITIONS	MONITOR PIN 15 OF SELECTOR:
1	GND: 2B, 4B, 25A, 26A, 27A, 28A.	U13
2	GND: 4B, 22A, 23B, 24B, 25B, 26B.	U17
3*	GND: 14A, 15A, 16A, 17A, 18A, 21A.	U14
4	GND: 4B, 18B, 19B, 20A, 20B, 21B.	U18
5	GND: 1B, 2B, 6B, 8A, 9A, 10A, 11A, 12A.	U15
6**	GND: 6B, 13A, 13B, 14B, 15B, 16B.	U19
7	GND: 1A, 2A, 3A, 4A, 4B, 5A, 6A, 6B.	U16
8	GND: 4B, 6B, 7A, 8B, 9B, 10B, 11B.	U20

*Pin 2B must be left open during test 3.

**Pin 20A must be left open during test 6.

◆◆◆◆◆ FINAL SELECTOR TEST ◆◆◆◆◆

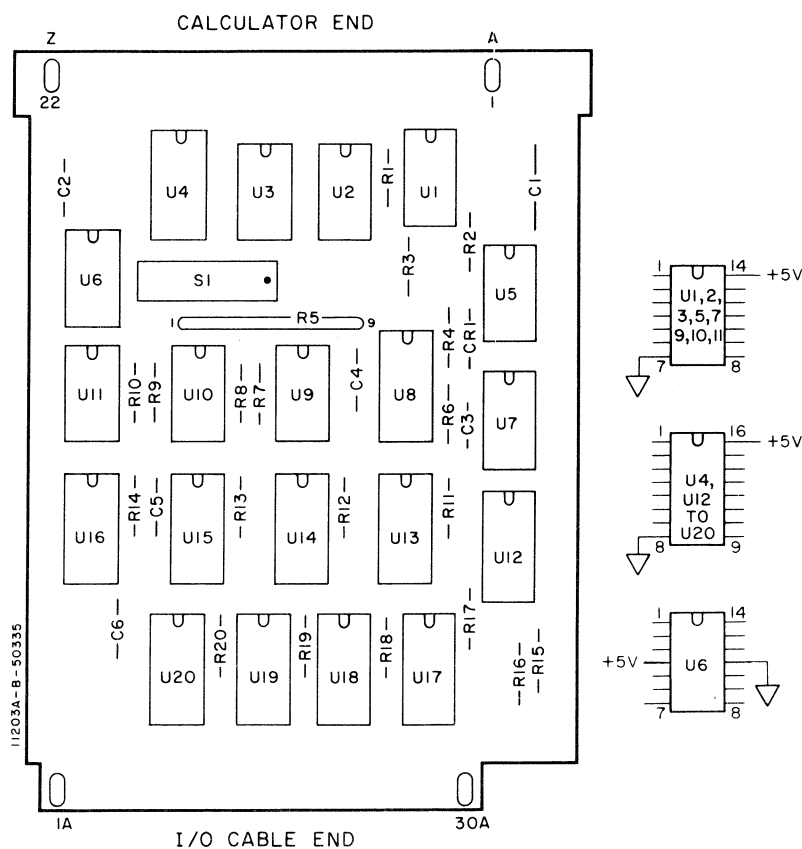
1. While running the test program, check pin 15 of selectors U13 through U20; the signal on each pin 15 must be present (indicated by a flashing probe).
2. Verify that the pins are grounded as per the list on Page 16 (when using the Model 20, do not ground pins 4B or 11A).
3. Check the signals on each of the pins listed below (while running the preceding program). If a signal is not present on each pin (indicated by a flashing probe) the respective component must be replaced.

TEST SEQUENCE	CHECK COMPONENT (pin #)
1	U12 (pins 4, 7, 9, 12)
2	U2 (pin 4)
3	U7 (pin 8)
4	U9 (pin 12)
5	U3 (pin 13)
6	U7 (pin 17)
7	U8 (pin 15)
8	U5 (pins 2, 4, 6, 8, 10, 12)
9	U3 (pin 4)
10	U9 (pin 4)

◆◆◆◆◆ COMPONENT LOCATOR ◆◆◆◆◆

CIRCUIT CHANGE

Delete C4 as shown on the following circuit diagram and add C4 (the same component) from U2 pin 11 to ground. C4 is now used as a filter capacitor on the Flag line.

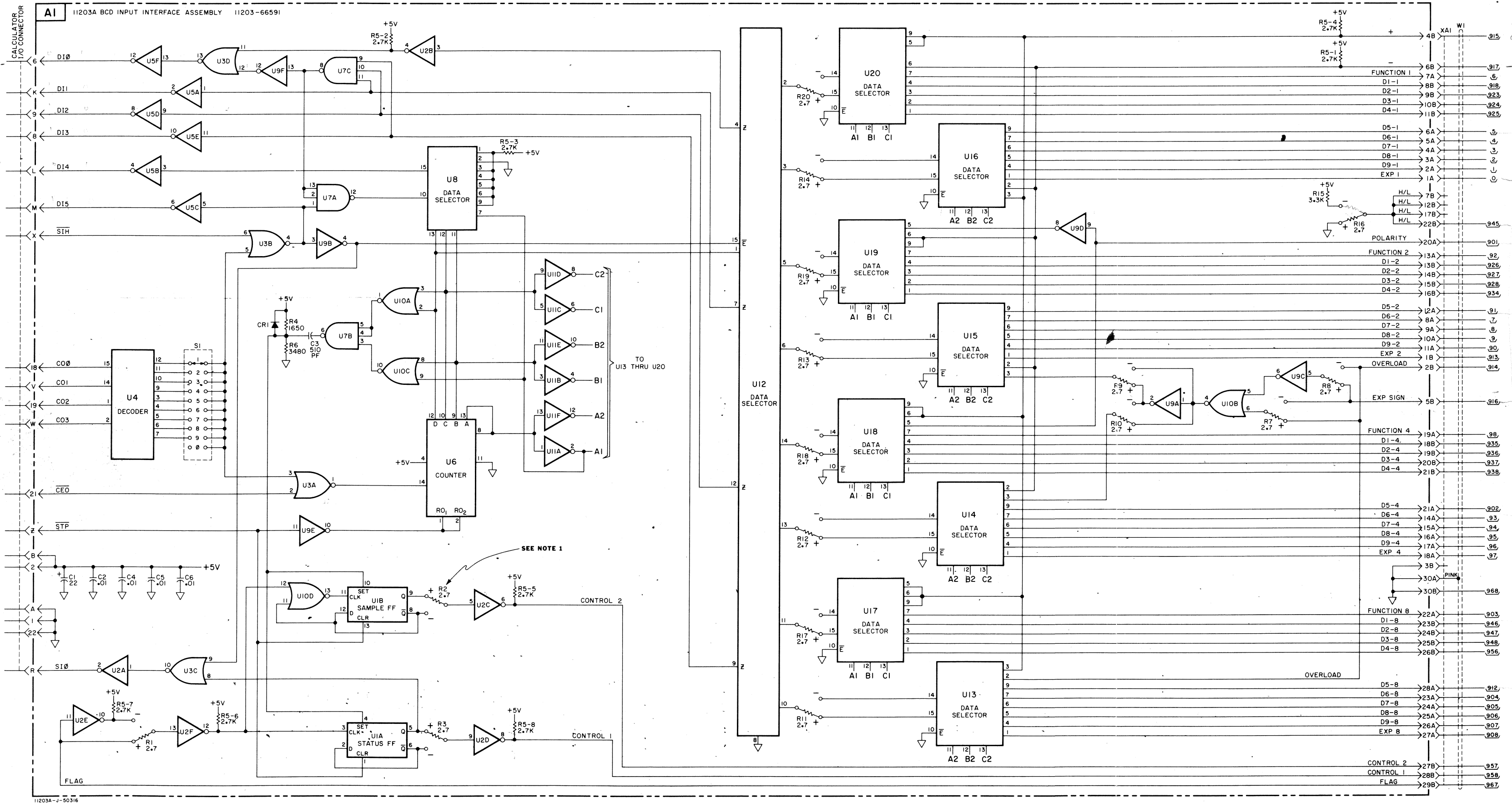


A1

hp Part No. 11203-66591

NOTE 1 (See Circuit Diagram)

Connect R7-R14 and R16-R20 to the '-' pads for negative-true data logic. Connect R1 to the '-' pad for negative-true Flag logic. Connect R2 and R3 to the '-' pads for positive-true Control logic. See 'Installation Considerations' for further information.



REPLACEABLE PARTS LIST

REFERENCE DESIGNATOR	-hp- PART NO.	TO	DESCRIPTION		
A1	11200-04101	1	Cover - I/O		
	11203-61601	1	Cable Assembly		
	11203-66591	1	P.C. Assembly - BCD		
	C1	1	C - Fixed 22uf 15V		
	C2	4	C - Fixed .01uf 25V		
	C3	1	C - Fixed 510pf 300V		
	C4 - C6		C - Fixed .01uf 25V		
	CR1	1	Diode - Si .05A 30V		
	R1 - R3	16	R - Fixed 2.7ohm .1		
	R4	1	R - Fixed 1650ohm .01		
	R5	1	Ntwk - Encap res		
	R6	1	R - Fixed 3480ohm .01		
	R7 - R14		R - Fixed 2.7ohm .1		
	R15	1	R - Fixed 3300ohm .1		
	R16-R20		R - Fixed 2.7ohm .01		
	S1	1	Switch - Program		
	U1	1	IC - Digital DM74L74N		
	U2	2	IC - SN7405N		
	U3	2	IC - DM74L02N		
	U4	1	IC - U7893L0159X		
	U5		IC - SN7405N		
XA1	U6	1	IC - SN74L93N		
	U7	1	IC - Digital DM74L10N		
	U8	9	IC - U7893L1259X		
	U9	2	IC - Digital DM74L04N		
	U10		IC - DM74L02N		
	U11		IC - Digital DM74L04N		
	U12	1	IC - U7B93L2259X		
	U13-U20		IC - U7893L1259X		
	5040-5911	1	Boot - Bottom		
	7120-2940	1	Label - Select Code (one set)		
XA1	7120-3093	1	Plate - ID		
	1251-3334	1	Connector, P.C. (60 contact)		



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