

1. Introduction

This addendum to the Model 7065 Instruction Manual is being provided in order to supply you with the latest information in the least possible time. Please read over this information before using the Model 7065 Hall Effect Card and associated equipment.

Although this addendum is intended primarily for purchasers of the Model 80A Hall Effect System, those who use the Model 7065 along with their own equipment may also find this information helpful.

2. Equipment Changes

References to the Model 705 Scanner throughout the Model 7065 Instruction Manual should be changed to the Model 7001 Switch System.

The Model 80A Hall Effect System has been discontinued, but drop-in replacements for all of its constituent parts may still be purchased.

The Model 80A consisted of:

- | | |
|--|---|
| • Model 7065 Hall Effect Card | Still available |
| • Model 7001 Switch System | Still available |
| • Model 485/4853 picoammeter with IEEE-488 interface | Replace with Model 6485 picoammeter (IEEE-488 interface standard) |
| • Model 220 current source | Replace with Model 6220 or 6221 current source |
| • Model 196 DMM | Replace with Model 2000 DMM |
| • (3) Model 7008-3 IEEE-488 cables | Still available |

Each of the replacement models features an emulation mode to accept the control commands for the product it replaces, so all of the program code in this manual can be used directly with no modifications.

The main impact of this equipment change is on the example programs listed at the end of paragraph 3.8 in the Model 7065 Instruction Manual. These programs will not work with the Model 7001 Switch System and thus cannot be used with the Model 80A. Modified versions of these programs are included with this addendum.

The various test procedures discussed in Section 3 should also be changed for operation with the new switch system. The Model 7001 need not be placed in the matrix mode, but it must be configured for card type, as discussed in paragraph 5 of this addendum. In addition, you can simultaneously open or close all crosspoints for a given step in a test sequence with the OPEN and CLOSE keys. In order to do so, you must first set up a channel list, as discussed in paragraph 6.

Note that all signal connections covered in the Model 7065 Instruction Manual are still valid and can be used in setting up the Model 80A System.

3. Model 7001 Features

Some important Model 7001 features that are applicable to the Model 80A system include:

- **Multiple Crosspoint Open/Close:** All crosspoints for a given step in the test procedure can be opened or closed with a single keystroke.
- **Crosspoint Status Display:** The real-time status display monitors the state (closed or open) of all Model 7065 crosspoints.
- **Memory:** Up to 100 crosspoint patterns (pattern of open and closed crosspoints) can be saved in memory for later recall.
- **IEEE-488 Bus:** Bus operation conforms to the IEEE-488.2 and SCPI standards.

4. Installing the Card in the Model 7001 Switch System

Follow the steps below and refer to Figure 1 to install the Model 7065 Card in the Model 7001 Switch System. Note that some internal connections to the card must be made before installation. See paragraph 2.4 of the Model 7065 Instruction Manual for details on card connections.

WARNING

Internal connections and card installation should be performed only by qualified personnel who recognize potential shock hazards.

Turn off the power from all instruments (including the Model 7001 mainframe), and disconnect all line cords before installing or removing the Hall Effect Card.

CAUTION

Leave the Model 7065 in its anti-static bag until ready for installation to avoid possible static damage. After removing the card from the mainframe, store it in the anti-static bag.

Card Installation

Perform the following steps to install the Model 7065 in the Model 7001 mainframe:

1. Make the necessary internal card connections, as discussed in paragraph 2.4 of the instruction manual.
2. Facing the rear panel of the Model 7001, select the slot (CARD 1 or CARD 2) in which you wish to install the Hall effect card.

NOTE

The information and programming examples in this addendum assume that the card is installed in the CARD 1 slot. Install the Model 7065 in CARD 1 if you intend to use these examples.

3. Referring to Figure 1, slide the card assembly with the component (large shield) side up into the desired slot such that the edges of the card ride in the rails.
4. With the ejector arms in the unlocked position, push the card into the mainframe until the arms engage the ejector cups, then push both arms inward to lock the card into the mainframe.

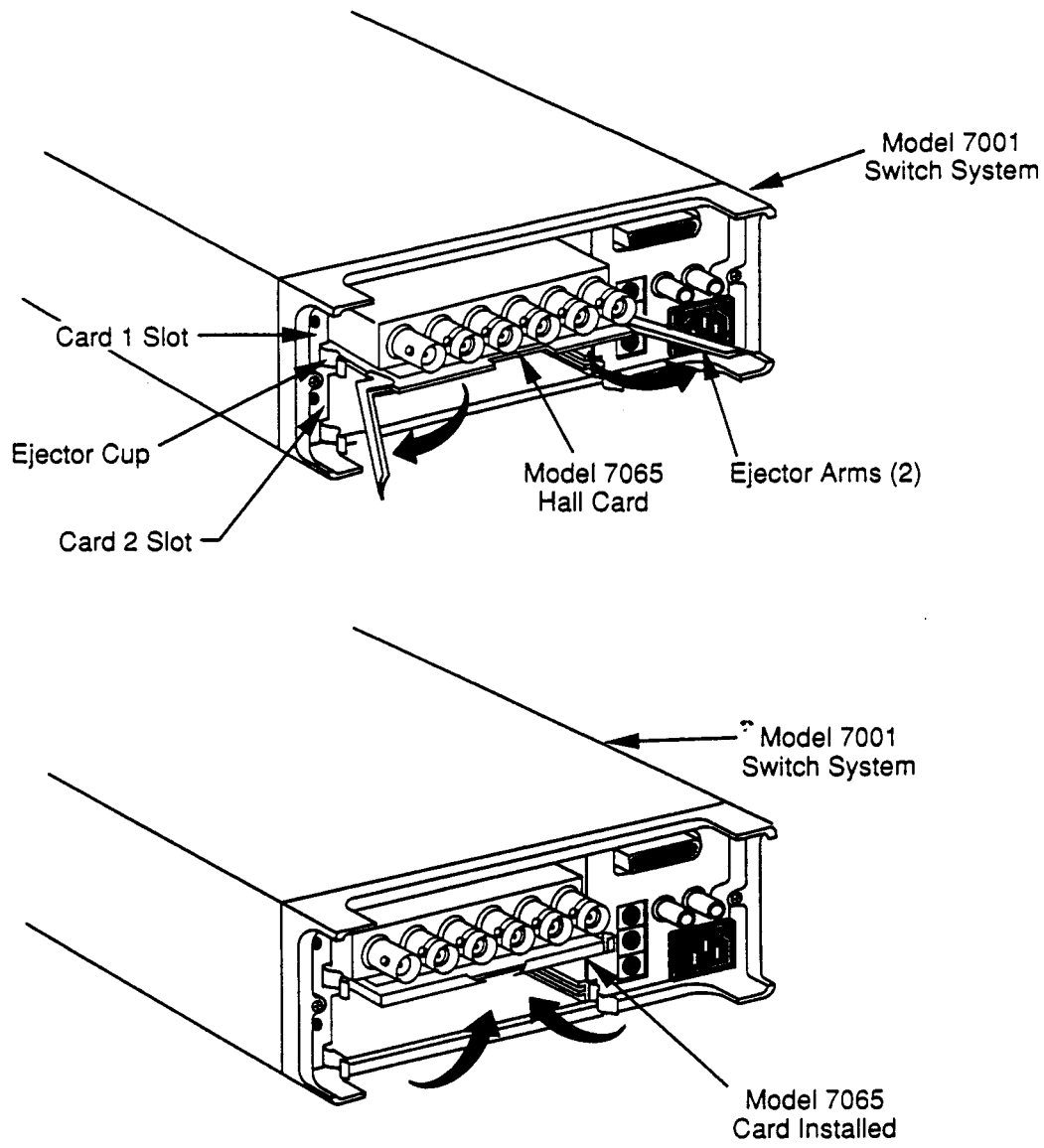


Figure 1. Installing the Model 7065 Hall Effect Card in the Model 7001 Switch System

Card Removal

To remove the card, first unlock it by pulling the ejector arms outward, then pull the card out of the mainframe. Store the card in its anti-static bag to avoid possible damage during storage.

5. Card Configuration

The Model 7001 must be properly configured so that it can recognize the Model 7065 card. Follow the steps below to configure the mainframe for use with the Model 7065:

1. From normal display, press the Model 7001 CARD CONFIGURATION key.
2. Select TYPE, then press ENTER.
3. Select SLOT-1 (or SLOT-2 if the card is installed in that slot), then press ENTER.
4. Using the cursor keys, scroll through the card types until the unit displays the Model 7065 card as follows:

SLOT-1 CARD: 7065

5. Press ENTER to complete card type configuration.
6. Press EXIT twice to return to normal display.

NOTE

The #-OF-POLES and CARD-PAIR selections in the card configuration menu do not apply to Model 7065 operation. Although you can set the DELAY parameter, the delay should normally be set to zero when using the Hall Effect card. Refer to the Model 7001 Instruction Manual for more information on the delay parameter.

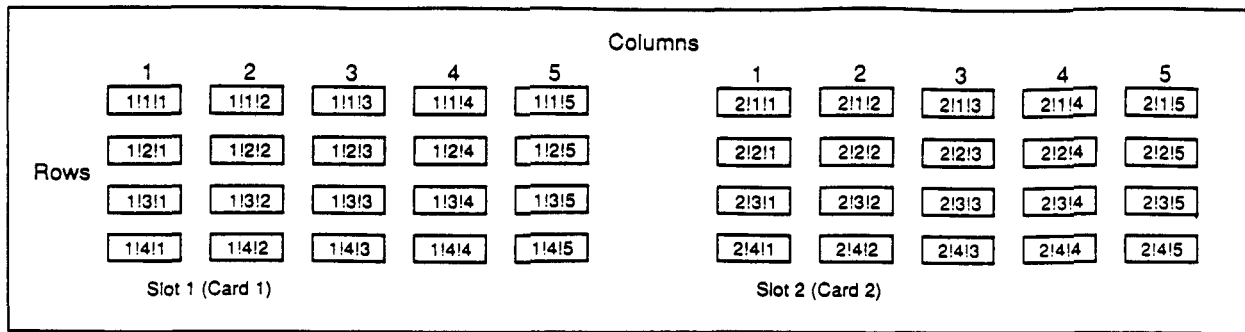
6. Front Panel Operation

The following paragraphs provide a brief overview on controlling the Model 7065 card from the front panel of the Model 7001 mainframe. For detailed front panel operation, refer to the Model 7001 Instruction Manual.

Channel Status Display

Figure 2 shows the basic format for Model 7065 channel (crosspoint) display. A three-integer format is used to express channel (crosspoint) assignments. The first (left) integer is the slot number in which the card is installed. Thus, a "1" indicates slot 1 (CARD 1), and "2" designates slot 2 (CARD 2). The second (middle) integer designates the row number, 1 through 4. The top row is Row 1, the second from the top is Row 2, the next row is Row 3, and the bottom row is Row 4. The third (right) integer identifies the column. The five matrix columns for each card are shown on the channel status display.

Examples: Channel 1!2!3 (Slot 1, Row 2, Column 3)
Channel 2!3!4 (Slot 2, Row 3, Column 4)



Examples : 1!2!3 (Slot 1, Row 2, Column 3)
 2!3!4 (Slot 2, Row 3, Column 4)

Figure 2. Model 7065/7001 Channel (Crosspoint) Display Assignments

Programming a Channel List

One of the key advantages of the Model 7001 over the older Model 705 Scanner is that you can open or close a number of crosspoints simultaneously, instead of having to open or close each crosspoint individually. In order to use this feature, you must first program a channel list, as described below.

1. If necessary, press the SCAN LIST key to display the following:

SELECT CHANNELS

2. If any channels are presently displayed in the list, press the CLEAR LIST key to clear them.
3. Using the numeric keys, enter the slot, row, and column of the first channel in the list, then press ENTER.
4. Repeat step 3 as necessary for as many channels (crosspoints) as required for the specific test. (Use the ► key to enter channel separators and terminate the channel list). While entering channels, you can use the DELETE and INSERT keys to erase or add channels in the middle of a list as necessary. You can also use the CLEAR LIST key to erase the entire displayed channel list.

Closing and Opening Channels

Once a channel list is programmed, simply press the CLOSE key to close all channels (crosspoints) in the list simultaneously. The instrument will indicate the closed channels by turning on the associated channel status indicators.

To open all channels in the list, simply press the OPEN or OPEN ALL key.

Storing and Recalling Channel Lists in Memory

Since all Hall and resistivity measurements require multiple crosspoint closure sequences, it can still become somewhat tedious to enter a separate channel list for each step in the procedure. A better way is to program channel lists, store them in memory ahead of time, and then recall them one-by-one while progressing through the test procedure. (See below for a summary of channel lists for the various tests described in the Model 7065 manual.)

Proceed as follows:

1. Program the channel list as described above.
2. Press the CLOSE key to close the channels in the channel list.
3. Press the STORE key.
4. Use the numeric keys to enter the memory location in which you wish to store the current channel list, then press ENTER.
5. Repeat steps 1 through 4 for each channel list required.

Once the channel lists are programmed, you can recall them simply by pressing the RECALL key, entering the memory location with the numeric keys, and then pressing ENTER. Note that all channels (crosspoints) in the list will be closed immediately upon recall. You can also scan through memory locations by setting up a scan list; see the next paragraph for details.

Scanning Through Channel Lists

The Model 7001 can be programmed to scan through channel lists already stored in memory by setting up a scan list of memory locations. You can then use the STEP key or other appropriate trigger stimulus to cycle through the channel lists instead of having to recall each memory location individually (see the Model 7001 Instruction Manual for more details on triggering).

Set up a scan list as follows:

1. Program your channel lists, and store them in the desired memory locations, as previously explained.
2. If necessary, press the SCAN LIST key to display the following message:

SCAN CHANNELS

3. If any channels or memory locations are presently displayed in the list, press the CLEAR LIST key to clear them.
4. Enter each memory location to be included in the scan list by pressing the "M" key followed by the memory location number; press the ENTER key after each memory location number.
5. To scan through memory locations, simply press the STEP key. As each location is recalled, the channels will be closed immediately.

7. Channel List Summary

Tables 1 through 10 provide supplemental Model 7001 channel list information for the various tests described in the Model 7065 Instruction Manual. Each table is cross-referenced to the corresponding table in the manual.

Table 1. Resistivity Select Summary

Column 5, Row 4 State*	Resistivity Setup
Open	Low resistivity
Closed	High resistivity

*Model 7001 channel list: 1!4!5 (slot 1)
2!4!5 (slot 2)

Note: The above table replaces manual Table 2-3 for Model 7001 users.

Table 2. Channel List Summary for Resistivity Measurements

Voltage Designation	Model 7001 Channel List*	Current Applied Between	Voltage Measured Between
V ₁	1!2!1, 1!1!2, 1!3!3, 1!4!4	1-2	3-4
V ₂	1!2!2, 1!1!1, 1!3!3, 1!4!4	2-1	3-4
V ₃	1!2!2, 1!3!1, 1!4!3, 1!1!4	2-3	4-1
V ₄	1!3!2, 1!2!1, 1!4!3, 1!1!4	3-2	4-1
V ₅	1!3!2, 1!4!1, 1!1!3, 1!2!4	3-4	1-2
V ₆	1!4!2, 1!3!1, 1!1!3, 1!2!4	4-3	1-2
V ₇	1!4!2, 1!1!1, 1!2!3, 1!3!4	4-1	2-3
V ₈	1!1!2, 1!4!1, 1!2!3, 1!3!4	1-4	2-3

* Assumes Model 7065 card is in slot 1 of Model 7001. For slot 2, change first digit of each item in every list to 2.

Note: The above table replaces manual Table 3-3 for Model 7001 users.

Table 3. Channel List Summary for Hall Voltage Measurements

Voltage Designation	Flux	Model 7001 Channel List*	Current Applied Between	Voltage Measured Between
V ₁	+B	1!1!2, 1!3!1, 1!4!3, 1!2!4	1-3	4-2
V ₂	+B	1!3!2, 1!1!1, 1!4!3, 1!2!4	3-1	4-2
V ₃	+B	1!2!2, 1!4!1, 1!1!3, 1!3!4	2-4	1-3
V ₄	+B	1!4!2, 1!2!1, 1!1!3, 1!3!4	4-2	1-3
V ₅	-B	1!1!2, 1!3!1, 1!4!3, 1!2!4	1-3	4-2
V ₆	-B	1!3!2, 1!1!1, 1!4!3, 1!2!4	3-1	4-2
V ₇	-B	1!2!2, 1!4!1, 1!1!3, 1!3!4	2-4	1-3
V ₈	-B	1!4!2, 1!2!1, 1!1!3, 1!3!4	4-2	1-3

* Assumes Model 7065 card is in slot 1 of Model 7001. For slot 2, change first digit of each item in every list to 2.

Note: The above table replaces manual Table 3-4 for Model 7001 users.

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Table 4. Channel List Summary for Bar Measurements

Measurement	Model 7001 Channel List*
Resistivity	1!4!2, 1!1!3, 1!2!4
Hall Voltage	1!4!2, 1!1!3, 1!2!4, 1!3!5

* Assumes Model 7065 card is in slot 1 of Model 7001. For slot 2, change first digit of each item in every list to 2.

Note: The above table replaces manual Table 3-6 for Model 7001 users.

Table 5. Channel List Summary for 6-Contact Sample Resistivity Measurements

Voltage Designation	Model 7001 Channel List*	Current Between	Voltage Between
V ₁	1!2!3, 1!1!4	1-2	4-6
V ₂	1!3!3, 1!4!4	1-2	3-5
V ₃	1!2!3, 1!1!4	2-1**	4-6
V ₄	1!3!3, 1!4!4	2-1**	3-5

* Assumes Model 7065 card is in slot 1 of Model 7001. For slot 2, change first digit of each item in every list to 2.

** Reverse current by programming current source for opposite polarity.

Note: The above table replaces manual Table 3-7 for Model 7001 users.

Table 6. Channel List Summary for 8-Contact Sample Resistivity Measurements

Voltage Designation	Model 7001 Channel List*	Current Between	Voltage Between
V ₁	1!2!3, 1!1!4	1-2	4-6
V ₂	1!3!3, 1!4!4	1-2	5-7
V ₃	1!2!3, 1!1!4	2-1**	4-6
V ₄	1!3!3, 1!4!4	2-1**	5-7

* Assumes Model 7065 card is in slot 1 of Model 7001. For slot 2, change first digit of each item in every list to 2.

** Reverse current by programming current source for opposite polarity.

Note: The above table replaces manual Table 3-8 for Model 7001 users.

Table 7. Channel List Summary for 6-Contact Sample Hall Voltage Measurements

Voltage Designation	Flux Polarity	Model 7001 Channel List*	Current Between**	Voltage Between
V ₁	+B	1!1!3, 1!4!4	1-2	6-5
V ₂	+B	1!2!3, 1!3!4	1-2	4-3
V ₃	+B	1!1!3, 1!4!4	2-1	6-5
V ₄	+B	1!2!3, 1!3!4	2-1	4-3
V ₅	-B	1!1!3, 1!4!4	1-2	6-5
V ₆	-B	1!2!3, 1!3!4	1-2	4-3
V ₇	-B	1!1!3, 1!4!4	2-1	6-5
V ₈	-B	1!2!3, 1!3!4	2-1	4-3

* Assumes Model 7065 card is in slot 1 of Model 7001. For slot 2, change first digit of each item in every list to 2.

** Reverse current by programming current source for opposite polarity.

Note: The above table replaces manual Table 3-9 for Model 7001 users.

Table 8. Channel List Summary for 8-Contact Sample Hall Voltage Measurements

Voltage Designation	Flux Polarity	Model 7001 Channel List*	Current Between**	Voltage Between
V ₁	+B	1!1!3, 1!3!4	1-2	6-5
V ₂	+B	1!1!3, 1!3!4	2-1	6-5
V ₃	-B	1!1!3, 1!3!4	1-2	6-5
V ₄	-B	1!1!3, 1!3!4	2-1	6-5

* Assumes Model 7065 card is in slot 1 of Model 7001. For slot 2, change first digit of each item in every list to 2.

** Reverse current by programming current source for opposite polarity.

Note: The above table replaces manual Table 3-10 for Model 7001 users.

Table 9. Model 7001 Channel List for Measuring Sample Input Offset Voltage

Sample Input #	Model 7001 Channel List*
1	1!1!3
2	1!2!3
3	1!3!3
4	1!4!3

* Assumes Model 7065 card is in slot 1 of Model 7001. For slot 2, change first digit of each item in every list to 2. Note: The above table replaces manual Table 4-2 for Model 7001 users.

Table 10. Model 7001 Channel Lid for Adjusting Offsets

Sample Input #	Model 7001 Channel List*
1	1!1!3
2	1!2!3
3	1!3!3
4	1!4!3

* Assumes Model 7065 card is in slot 1 of Model 7001. For slot 2, change first digit of each item in every list to 2. Note: The above table replaces manual Table 4-2 for Model 7001 users.

8. IEEE-488 Bus Programming

The Model 7065 can be controlled over the IEEE-488 bus through the host Model 7001 Switch System, as described in the following paragraphs. For more detailed bus information, refer to the Model 7001 Instruction Manual.

Setting the Model 7001 Primary Address

The factory default primary address of the Model 7001 is set to 7 at the factory. The primary address of the Model 7001 may need to be changed to some other value that does not conflict with other instruments in the system. You can change the primary address of the Model 7001 using the following procedure:

1. From normal display, press the MENU key.
2. Select GPIB, then press ENTER.

3. Select ADDRESS, then press ENTER.
4. Using the numeric keys, enter a primary address value of 8, then press ENTER.
5. Press EXIT as necessary to return to normal display.

IEEE-488 Bus Commands

Table 11 summarizes the few basic bus commands necessary to perform basic Model 7065 operations. Some examples are provided below.

Table 11. Model 7001 Bus Commands Necessary for Basic Model 7065 Operation

Command	Description
[[:ROUTE]	
:CLOSE <list> :STATE?	Close channels. Request closed channels.
:OPEN <list> ALL	Open selected or all channels.
:CONFigure :SLOT1 :CTYPE C7065 :CTYPE? :SLOT2 :CTYPE C7065 :CTYPE?	Configuration command path Path to slot 1. Configure slot 1. Request card type. Path to slot 2 Configure slot 2. Request card type.
:MEMory :SAVe M<num> :RECall M<num>	Path to program memory. Saves channel pattern to memory location (1-100). Recalls channel pattern to memory location (1-100).

Notes:

1. Command short form is indicated by upper case letters. For example, instead of sending :MEMORY:RECALL M1, you can send :MEM:REC M1.
2. Commands surrounded by brackets [] are optional and need not be included in the command string.
3. Sending the OPEN ALL command will put the card in the low-resistivity mode.

Command Examples

Example 1: Configure Card Type

In order to configure the Model 7001 for use with a Model 7065 in slot 1, send the following command over the bus:

```
:CONF:SLOT1:CTYPE C7065
```

Example 2: Close Channels

In order to close Row 1, Column 2, and Row 2, Column 3 of a card located in slot 1, the following command would be sent:

```
:CLOSE (@1!1!2,1!2!3)
```

Note that the channel list must be enclosed in parentheses and preceded by the @ symbol.

Example 3: Open Channels

Specific channels can be opened by including them in the channel list, as in the following example:

```
:OPEN (@1!1!2,1!2!3)
```

To open all closed channels simultaneously, simply send the following command:

```
:OPEN ALL
```

NOTE

Be careful when using the OPEN ALL command. Recall that the card low/high resistivity configuration is determined by the state of Row 4, Column 5. Thus, sending OPEN ALL will automatically place the card in the low-resistivity mode.

Example Program

The example program below demonstrates basic programming techniques for controlling the Model 7065 through the Model 7001. The program configures the card type (Model 7065), closes a channel list, and then opens all channels.

The program is written in Hewlett-Packard BASIC. Note that the program assumes that the Model 7065 is installed in slot 1 of the Model 7001.

Program	Comments
10 REMOTE 708	! Put 7001 in remote.
20 OUTPUT 708; ":CONF:SLOT1:CTYPE C7065"	! Slot 1 = 7065 card.
30 OUTPUT 708; ":CLOS (@1!1!1,1!2!2)"	! Close 1,1 and 2,2.
40 PRINT "PRESS 'CONT' TO OPEN"	
50 PAUSE	
60 OUTPUT 708; ":OPEN ALL"	! Open all channels.

9. Example Resistivity and Hall Voltage Programs

Four example programs are included with this addendum. These programs are modified versions of those included in the Model 7065 manual, and they are intended to run only with a Model 80A Hall Effect System. Refer to Section 3 of the Model 7065 Instruction Manual for detailed test descriptions.

NOTE

The models 2000, 6485, and 622x have emulation modes to accept the command sets used for 196/199, 485, and 220 respectively. If it is desired to use the following programs, see the product manuals for the 2000, 6485, and 622x for instructions on using them in emulation mode.

The programs and test configurations include:

- Program 1, Hall coefficient: see Figure 3.
- Program 2, van der Pauw resistivity: see Figure 3.
- Program 3, bar sample resistivity: see Figure 4.
- Program 4,6- and 8-contact sample resistivity: see Figure 5.

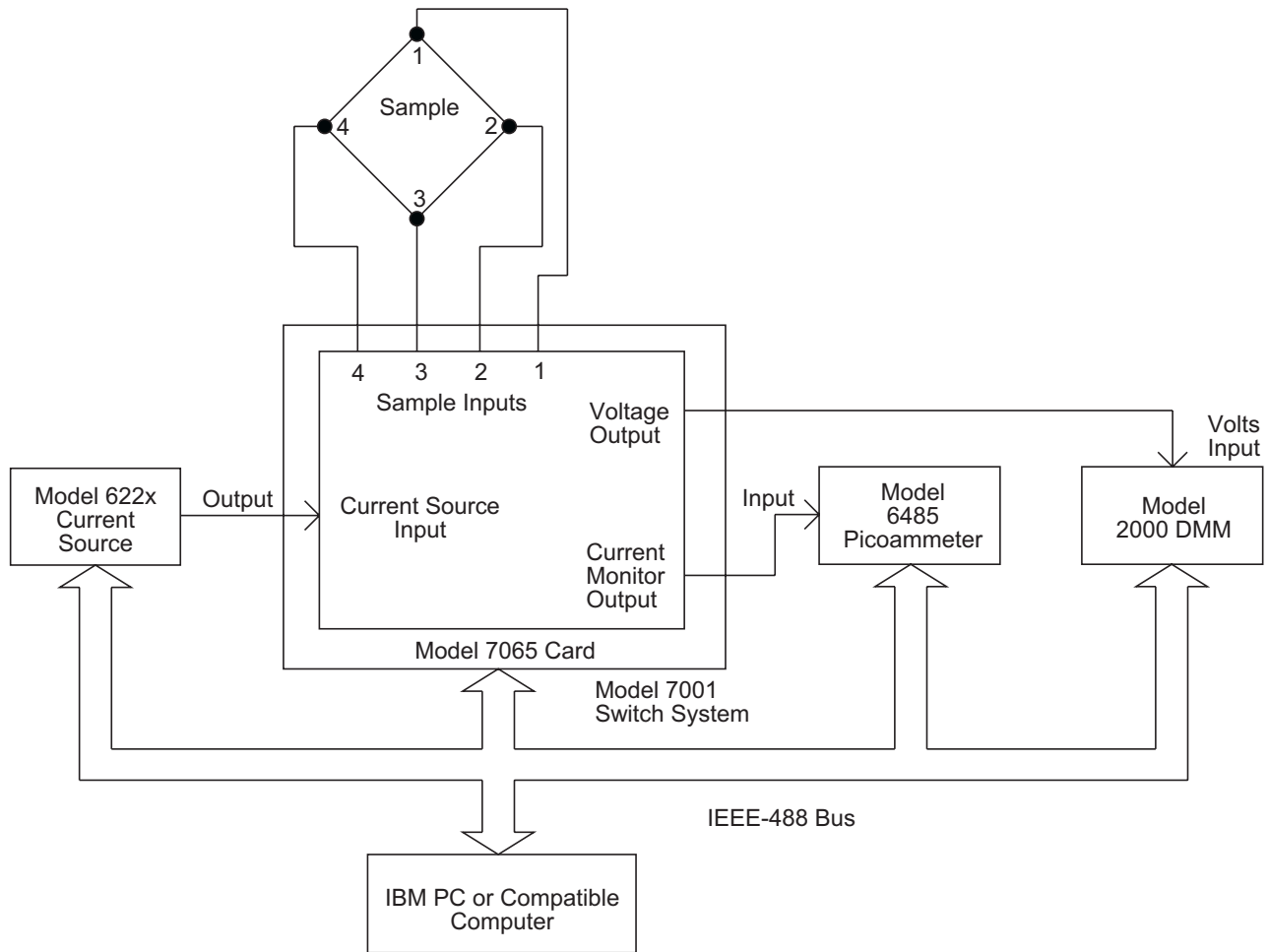


Figure 3. Test Configuration for Programs 1 and 2

Program Requirements

The following computer software and hardware is necessary to use these example programs:

- IBM PC, AT, or compatible computer.
- IOtech Personal488, CEC PC-488, or National Instruments PC-II or PC-IIA IEEE-488 interface card for the computer.
- MS-DOS or PC-DOS version 3.3 or later.
- Microsoft QuickBASIC version 4.0 or later.
- IOtech Driver488 bus driver, rev. 2.3 or later. (NOTE: recent versions of Driver488 may not support other manufacturers' interface cards.)

General Program Instructions

1. With all power turned off, connect all instruments to the IEEE-488 bus, and make the necessary signal connections, as covered in the Model 7065 Instruction Manual.
2. Turn on the computer and all instruments, and allow them to warm up for their prescribed warm-up periods for rated accuracy.
3. Make sure the instruments are set for the following primary addresses:

Model 2000: 7 (default is 16)

Model 622x: 12

Model 6485: 22 (default is 14)

Model 7001: 8 (default is 7)

All the above addresses are factory default with the exception of the Model 7001 address, which must be changed to avoid address conflicts. (See the instructions in paragraph 8 for details on changing the Model 7001 address.)

4. Make sure the IEEE-488 bus driver software is properly initialized.
5. Enter the QuickBASIC editor by typing in the following while in the QuickBASIC directory:

QB <Enter>

6. Type in the desired program, then check it for errors. Save the program under a convenient filename.
7. Run the program by pressing <Shift> + <F5>. Follow the prompts on the screen to run the test.

Program 1. Hall Voltage Coefficient

```
'Hall voltage program using Model 7001 Switch System.
OPEN "\DEV\IEEEOUT" FOR OUTPUT AS #1      ' Open IEEE-488 output path.
OPEN "\DEV\IEEEIN" FOR INPUT AS #2       ' Open IEEE-488 input path.
IOCTL #1, "BREAK"                        ' Reset interface.
PRINT #1, "RESET"                         ' Warm start interface
PRINT #1, "CLEAR"                         ' Send device clear.
CLS                                       ' Clear CRT.
DIM V(8)                                  ' Dimension reading array.
PRINT "This program measures Hall voltages and computes the"
PRINT "coefficients. The Hall card must be in the CARD 1 location."
PRINT
PRINT "Press any key to continue..."
DO WHILE INKEY$ = "": LOOP
SelRes:
CLS
PRINT "Select card resistivity setup:"
PRINT
PRINT "(1) Low resistivity"
PRINT "(2) High resistivity"
PRINT : INPUT "Selection"; A
IF A < 1 OR A > 2 THEN GOTO SelRes
Start: PRINT "Initializing instruments."
PRINT #1, "REMOTE 07,08,12,22"           ' Put instruments in remote.
' ***** INITIALIZE THE 7001 *****
PRINT #1, "OUTPUT 08;*RST"               ' Reset 7001.
PRINT #1, "OUTPUT 08;:CONF:SLOT1:CTYPE C7065" ' Slot 1= 7065 card.
PRINT #1, "OUTPUT 08;:CONF:SLOT2:CTYPE NONE" ' No card in slot 2.
PRINT #1, "OUTPUT 08;:OPEN ALL"         ' Open crosspoints.
IF A = 2 THEN PRINT #1, "OUTPUT 08;:CLOSE (@1!4!5)"
' ***** INITIALIZE THE 485 *****
PRINT #1, "OUTPUT 22;R1X"                ' Select 2nA range.
DL = 1: GOSUB Dly                        ' Settling time.
PRINT #1, "OUTPUT 22;C1X"                ' Zero check on.
GOSUB Dly                                ' Settling time.
PRINT #1, "OUTPUT 22;Z1X"                ' REL on.
GOSUB Dly                                ' Settling time.
PRINT #1, "OUTPUT 22;COX"                ' Zero check off.
PRINT #1, "OUTPUT 22;ROG1X"              ' Autorange, no prefix.
' ***** INITIALIZE THE 196 *****
PRINT #1, "OUTPUT 07;ROFOS3G1X"          ' Auto,DCV,rate,no prefix.
' ***** INITIALIZE THE 220 *****
PRINT #1, "OUTPUT 12;V10X"                ' 10V compliance.
InCurr: INPUT "220 current (500fA-2mA)"; I ' Input 220 current.
I = ABS(I)                               ' Positive current only.
IF I < 5E-13 OR I > .002 THEN GOTO InCurr ' Check current limits.
PRINT #1, "OUTPUT 12;I"; I; "X"          ' Program 220 current.
INPUT "Enter sample thickness (cm)"; T   ' Input sample thickness.
T = ABS(T)
INPUT "Enter flux density (gauss)"; B    ' Input flux density.
B = ABS(B)
CLS
PRINT "Apply +B, press any key to continue..."
DO WHILE INKEY$ = "": LOOP
' ***** MAIN MEASUREMENT LOOP *****
RESTORE: DL = 5                          ' Set 5 second delay.
CLS
PRINT "Measuring..."
```



```

PRINT "Measuring..."
FOR J = 1 TO 4
IF J <> 3 THEN GOTO RevCurr
RESTORE
PRINT #1, "OUTPUT 12;I"; I2; "X"
RevCurr: READ CS: C1$ = ":CLOS (@" + CS + ")"
PRINT #1, "OUTPUT 08;"; C1$
PRINT #1, "OUTPUT 12;F1X"
GOSUB Dly
PRINT #1, "ENTER 07"
INPUT #2, V(J)
IF ABS(V(J)) > 8 THEN GOTO Limit
IF J <> 1 THEN GOTO NoAmp
PRINT #1, "ENTER 22"
INPUT #2, I1
NoAmp: PRINT #1, "OUTPUT 12;F0X"
C1$ = ":OPEN (@" + CS + ")"
PRINT #1, "OUTPUT 08;"; C1$
NEXT J
BEEP
PRINT #1, "CLEAR"
CLS
PRINT "Measurements complete."
PRINT "Measured current: "; I1
PRINT : PRINT "Measured voltages:"
FOR J = 1 TO 4
PRINT "V"; J; "="; V(J)
NEXT J
PRINT
PA = W * T / (2 * I1 * D1) * (V(1) - V(3))
PB = W * T / (2 * I1 * D2) * (V(2) - V(4))
PRINT "Resistivity calculations:"
PAVG = (PA + PB) / 2
PRINT "PA="; PA
PRINT "PB="; PB
PRINT "PAVG="; PAVG
PRINT
INPUT "Repeat test (Y/N)"; AS
IF LEFT$(AS, 1) = "Y" OR LEFT$(AS, 1) = "y" THEN CLS : GOTO Start
PRINT #1, "OUTPUT 08;:OPEN ALL"
CLOSE 1: CLOSE 2: END '
Limit:
CLS : BEEP
PRINT #1, "CLEAR"
PRINT #1, "OUTPUT 08;:OPEN ALL"
PRINT "Sample voltage is over 8V 7065 limit."
PRINT "Do you wish to:"
PRINT "(1) Restart the measurement"
PRINT "(2) Abort the program"
PRINT
INPUT "Enter choice: "; A
IF A < 1 OR A > 2 THEN GOTO Limit
IF A = 1 THEN CLS : GOTO Start
CLOSE 1: CLOSE 2: END
Dly:
TI = TIMER
Lp: IF (TIMER - TI) < DL THEN GOTO Lp
RETURN
' ***** 7001 CHANNEL LISTS *****
DATA "1!2!3,1!1!4", "1!3!3,1!4!4"

```

```

' Reverse current.
' Build command string.
' Close crosspoints.
' Turn on 220 output.
' Wait for reading to settle.
' Address 196 to talk.
' Get 196 reading.
' Check voltage limit.
' Address 485 to talk.
' Input current reading.
' Turn off 220 output.
' Build command string.
' Open crosspoints.
' Loop back for next point.
' Send device clear.

```

```

' Display measured voltages.

```

```

' Open all crosspoints.

```

```

' Send device clear.
' Open crosspoints.

```

```

' End program.
' Delay subroutine.

```

Program 4. Resistivity of 6- and 8-Contact Samples

```

' 6 and 8-contact sample resistivity program using
' Model 7001 Switch System.
OPEN "\DEV\IEEEOUT" FOR OUTPUT AS #1      ' Open IEEE-488 output path.
OPEN "\DEV\IEEEIN" FOR INPUT AS #2      ' Open IEEE-488 input path.
IOCTL #1, "BREAK"                        ' Reset interface.
PRINT #1, "RESET"                        ' Warm start interface
PRINT #1, "CLEAR"                        ' Send device clear.
CLS                                       ' Clear CRT.
DIM V(4)                                  ' Dimension reading array.
PRINT "This program measures the resistivity 6- and 8-contact samples."
PRINT "The Hall card must be in the CARD 1 location."
PRINT
PRINT "Press any key to continue..."
DO WHILE INKEY$ = "": LOOP
SelRes:
CLS
PRINT "Select card resistivity setup:"
PRINT
PRINT "(1) Low resistivity"
PRINT "(2) High resistivity"
PRINT : INPUT "Selection"; A
IF A < 1 OR A > 2 THEN GOTO SelRes
Start: PRINT "Initializing instruments."
PRINT #1, "REMOTE 07,08,12,22"           ' Put instruments in remote.
' ***** INITIALIZE THE 7001 *****
PRINT #1, "OUTPUT 08;*RST"               ' Reset 7001.
PRINT #1, "OUTPUT 08;:CONF:SLOT1:CTYPE C7065" ' Slot 1= 7065 card.
PRINT #1, "OUTPUT 08;:CONF:SLOT2:CTYPE NONE" ' No card in slot 2.
PRINT #1, "OUTPUT 08;:OPEN ALL"         ' Open crosspoints.
IF A = 2 THEN PRINT #1, "OUTPUT 08;:CLOSE (@1!4!5)"
' ***** INITIALIZE THE 485 *****
PRINT #1, "OUTPUT 22;R1X"                ' Select 2nA range.
DL = 1: GOSUB Dly                        ' Settling time.
PRINT #1, "OUTPUT 22;C1X"                ' Zero check on.
GOSUB Dly                                ' Settling time.
PRINT #1, "OUTPUT 22;Z1X"                ' REL on.
GOSUB Dly                                ' Settling time.
PRINT #1, "OUTPUT 22;COX"                ' Zero check off.
PRINT #1, "OUTPUT 22;ROG1X"              ' Autorange, no prefix.
' ***** INITIALIZE THE 196 *****
PRINT #1, "OUTPUT 07;ROF0S3G1X"          ' Auto,DCV,rate,no prefix.
' ***** INITIALIZE THE 220 *****
PRINT #1, "OUTPUT 12;V10X"               ' 10V compliance.
InCurr: INPUT "220 current (500fA-2mA)"; I ' Input 220 current.
I = ABS(I)                               ' Positive current only.
IF I < 5E-13 OR I > .002 THEN GOTO InCurr ' Check current limits.
I2 = -I
PRINT #1, "OUTPUT 12;I"; I; "X"          ' Program 220 current.
INPUT "Enter sample thickness (cm)"; T   ' Input sample dimensions.
INPUT "Enter sample width (cm)"; W
INPUT "Enter sample D1 dimension (cm)"; D1
INPUT "Enter sample D2 dimension (cm)"; D2
T = ABS(T): W = ABS(W): D1 = ABS(D1): D2 = ABS(D2)
CLS
' ***** MAIN MEASUREMENT LOOP *****
RESTORE: DL = 5                          ' Set 5 second delay.
CLS

```

```

INPUT #2, V                                ' Get 196 reading.
IF ABS(V) > 8 THEN GOTO Limit                ' Check voltage limit.
PRINT #1, "ENTER 22"                         ' Address 485 to talk.
INPUT #2, I1                                 ' Input current reading.
PRINT #1, "OUTPUT 12;FOX"                   ' Turn off 220 output.
PRINT #1, "OUTPUT 08;:OPEN (@1!4!2,1!1!3,1!2!4)" ' Open channels.
BEEP
PRINT #1, "CLEAR"                            ' Send device clear.
CLS
PRINT "Measurements complete."
PRINT "Measured current:"; I1
PRINT "Measured voltage:"; V
PRINT
P = V * Y * X / (X * I1)                    ' Calculate resistivity.
PRINT "Resistivity="; P; "ohm-cm"
PRINT
INPUT "Repeat test (Y/N)"; AS
IF LEFTS(AS, 1) = "Y" OR LEFTS(AS, 1) = "y" THEN CLS : GOTO Start
PRINT #1, "OUTPUT 08;:OPEN ALL"              ' Open all crosspoints.
CLOSE 1: CLOSE 2: END
Limit:
CLS : BEEP
PRINT #1, "CLEAR"                            ' Send device clear.
PRINT #1, "OUTPUT 08;:OPEN ALL"              ' Open crosspoints.
PRINT "Sample voltage is over 8V 7065 limit."
PRINT "Do you wish to:"
PRINT "(1) Restart the measurement"
PRINT "(2) Abort the program"
PRINT
INPUT "Enter choice: "; A
IF A < 1 OR A > 2 THEN GOTO Limit
IF A = 1 THEN CLS : GOTO Start
CLOSE 1: CLOSE 2: END                        ' End program.
Dly:                                         ' Delay subroutine.
TI = TIMER
Lp: IF (TIMER - TI) < DL THEN GOTO Lp
RETURN

```

Program 3. Resistivity of Bar Samples

```
' Bar sample resistivity program using Model 7001 Switch System.
OPEN "\DEV\IEEEOUT" FOR OUTPUT AS #1          ' Open IEEE-488 output path.
OPEN "\DEV\IEEEIN" FOR INPUT AS #2           ' Open IEEE-488 input path.
IOCTL #1, "BREAK"                            ' Reset interface.
PRINT #1, "RESET"                            ' Warm start interface
PRINT #1, "CLEAR"                            ' Send device clear.
CLS                                           ' Clear CRT.
PRINT "This program measures the resistivity of bar type samples."
PRINT "The Hall card must be in the CARD 1 location."
PRINT
PRINT "Press any key to continue..."
DO WHILE INKEY$ = "": LOOP
SelRes:
CLS
PRINT "Select card resistivity setup:"
PRINT
PRINT "(1) Low resistivity"
PRINT "(2) High resistivity"
PRINT : INPUT "Selection"; A
IF A < 1 OR A > 2 THEN GOTO SelRes
Start: PRINT "Initializing instruments."
PRINT #1, "REMOTE 07,08,12,22"                ' Put instruments in remote.
' ***** INITIALIZE THE 7001 *****
PRINT #1, "OUTPUT 08;*RST"                    ' Reset 7001.
PRINT #1, "OUTPUT 08;;CONF:SLOT1:CTYPE C7065" ' Slot 1= 7065 card.
PRINT #1, "OUTPUT 08;;CONF:SLOT2:CTYPE NONE" ' No card in slot 2.
PRINT #1, "OUTPUT 08;;OPEN ALL"              ' Open crosspoints.
IF A = 2 THEN PRINT #1, "OUTPUT 08;;CLOSE (@1!4!5)"
' ***** INITIALIZE THE 485 *****
PRINT #1, "OUTPUT 22;R1X"                    ' Select 2nA range.
DL = 1: GOSUB Dly                            ' Settling time.
PRINT #1, "OUTPUT 22;C1X"                   ' Zero check on.
GOSUB Dly                                    ' Settling time.
PRINT #1, "OUTPUT 22;Z1X"                   ' REL on.
GOSUB Dly                                    ' Settling time.
PRINT #1, "OUTPUT 22;COX"                   ' Zero check off.
PRINT #1, "OUTPUT 22;ROG1X"                 ' Autorange, no prefix.
' ***** INITIALIZE THE 196 *****
PRINT #1, "OUTPUT 07;ROF0S3G1X"             ' Auto,DCV,rate,no prefix.
' ***** INITIALIZE THE 220 *****
PRINT #1, "OUTPUT 12;V10X"                  ' 10V compliance.
InCurr: INPUT "220 current (500fA-2mA)"; I   ' Input 220 current.
I = ABS(I)                                  ' Positive current only.
IF I < 5E-13 OR I > .002 THEN GOTO InCurr    ' Check current limits.
PRINT #1, "OUTPUT 12;I"; I; "X"             ' Program 220 current.
INPUT "Enter sample thickness (cm)"; Z      ' Input dimensions.
INPUT "Enter sample X dimension (cm)"; X
INPUT "Enter sample Y dimension (cm)"; Y
Z = ABS(Z): X = ABS(X): Y = ABS(Y)
' ***** MAKE MEASUREMENTS *****
DL = 5                                       ' Set 5 second delay.
CLS
PRINT "Measuring..."
PRINT #1, "OUTPUT 08;;CLOS (@1!4!2,1!1!3,1!2!4)" ' Close channels.
PRINT #1, "OUTPUT 12;F1X"                   ' Turn on 220 output.
GOSUB Dly                                    ' Wait for reading to settle.
PRINT #1, "ENTER 07"                         ' Address 196 to talk.
```

```

GOSUB Dly
PRINT #1, "ENTER 07"
INPUT #2, V(J)
IF ABS(V(J)) > 8 THEN GOTO Limit
IF J <> 1 THEN GOTO NoAmp
PRINT #1, "ENTER 22"
INPUT #2, I1
NoAmp: PRINT #1, "OUTPUT 12;FOX"
C1$ = ":OPEN (@" + C$ + ")"
PRINT #1, "OUTPUT 08;"; C1$
NEXT J
BEEP
PRINT #1, "CLEAR"
CLS
PRINT "Measurements complete."
PRINT "Measured current: "; I1
PRINT : PRINT "Measured voltages:"
FOR J = 1 TO 8
PRINT "V"; J; "="; V(J)
NEXT J
PRINT
PA = 1.1331 * T / I1 * (V(2) + V(4) - V(1) - V(3))
PB = 1.1331 * T / I1 * (V(6) + V(8) - V(5) - V(7))
PRINT "Resistivity calculations:"
PAVG = (PA + PB) / 2
PRINT "PA="; PA
PRINT "PB="; PB
PRINT "PAVG="; PAVG
PRINT
INPUT "Repeat test (Y/N)"; AS
IF LEFT$(AS, 1) = "Y" OR LEFT$(AS, 1) = "y" THEN CLS : GOTO Start
PRINT #1, "OUTPUT 08;:OPEN ALL"
CLOSE 1: CLOSE 2: END
Limit:
CLS : BEEP
PRINT #1, "CLEAR"
PRINT #1, "OUTPUT 08;:OPEN ALL"
PRINT "Sample voltage is over 8V 7065 limit."
PRINT "Do you wish to:"
PRINT "(1) Restart the measurement"
PRINT "(2) Abort the program"
PRINT
INPUT "Enter choice: "; A
IF A < 1 OR A > 2 THEN GOTO Limit
IF A = 1 THEN CLS : GOTO Start
CLOSE 1: CLOSE 2: END
Dly:
TI = TIMER
Lp: IF (TIMER - TI) < DL THEN GOTO Lp
RETURN
' ***** 7001 CHANNEL LISTS *****
DATA "1!2!1,1!1!2,1!3!3,1!4!4","1!2!2,1!1!1,1!3!3,1!4!4"
DATA "1!2!2,1!3!1,1!4!3,1!1!4","1!3!2,1!2!1,1!4!3,1!1!4"
DATA "1!3!2,1!4!1,1!1!3,1!2!4","1!4!2,1!3!1,1!1!3,1!2!4"
DATA "1!4!2,1!1!1,1!2!3,1!3!4","1!1!2,1!4!1,1!2!3,1!3!4"

```

Program 2. Resistivity of van der Pauw Samples

```
' Van der Pauw resistivity program using Model 7001 Switch System.
OPEN "\DEV\IEEEOUT" FOR OUTPUT AS #1          ' Open IEEE-488 output path.
OPEN "\DEV\IEEEIN" FOR INPUT AS #2          ' Open IEEE-488 input path.
IOCTL #1, "BREAK"                          ' Reset interface.
PRINT #1, "RESET"                          ' Warm start interface
PRINT #1, "CLEAR"                          ' Send device clear.
CLS                                         ' Clear CRT.
DIM V(8)                                    ' Dimension reading array.
PRINT "This program measures the resistivity of van der Pauw samples."
PRINT "The Hall card must be in the CARD 1 location."
PRINT
PRINT "Press any key to continue..."
DO WHILE INKEY$ = "": LOOP
SelRes:
CLS
PRINT "Select card resistivity setup:"
PRINT
PRINT "(1) Low resistivity"
PRINT "(2) High resistivity"
PRINT : INPUT "Selection"; A
IF A < 1 OR A > 2 THEN GOTO SelRes
Start: PRINT "Initializing instruments."
PRINT #1, "REMOTE 07,08,12,22"             ' Put instruments in remote.
' ***** INITIALIZE THE 7001 *****
PRINT #1, "OUTPUT 08;*RST"                 ' Reset 7001.
PRINT #1, "OUTPUT 08;:CONF:SLOT1:CTYPE C7065" ' Slot 1= 7065 card.
PRINT #1, "OUTPUT 08;:CONF:SLOT2:CTYPE NONE" ' No card in slot 2.
PRINT #1, "OUTPUT 08;:OPEN ALL"           ' Open crosspoints.
IF A = 2 THEN PRINT #1, "OUTPUT 08;:CLOSE (@1!4!5)"
' ***** INITIALIZE THE 485 *****
PRINT #1, "OUTPUT 22;R1X"                  ' Select 2nA range.
DL = 1: GOSUB Dly                          ' Settling time.
PRINT #1, "OUTPUT 22;C1X"                  ' Zero check on.
GOSUB Dly                                  ' Settling time.
PRINT #1, "OUTPUT 22;Z1X"                  ' REL on.
GOSUB Dly                                  ' Settling time.
PRINT #1, "OUTPUT 22;C0X"                  ' Zero check off.
PRINT #1, "OUTPUT 22;R0G1X"                ' Autorange, no prefix.
' ***** INITIALIZE THE 196 *****
PRINT #1, "OUTPUT 07;R0F0S3G1X"           ' Auto,DCV,rate,no prefix.
' ***** INITIALIZE THE 220 *****
PRINT #1, "OUTPUT 12;V10X"                ' 10V compliance.
InCurr: INPUT "220 current (500fA-2mA)"; I ' Input 220 current.
I = ABS(I) ' Positive current only.
IF I < 5E-13 OR I > .002 THEN GOTO InCurr ' Check current limits.
PRINT #1, "OUTPUT 12;I"; I; "X"           ' Program 220 current.
INPUT "Enter sample thickness (cm)"; T    ' Input sample thickness.
T = ABS(T)
CLS
' ***** MAIN MEASUREMENT LOOP *****
RESTORE: DL = 5                            ' Set 5 second delay.
CLS
PRINT "Measuring..."
FOR J = 1 TO 8
READ C$: C1$ = ":CLOS (@" + C$ + ")"      ' Build command string.
PRINT #1, "OUTPUT 08;"; C1$              ' Close crosspoints.
PRINT #1, "OUTPUT 12;F1X"                ' Turn on 220 output.
```

```

FOR J = 1 TO 8
IF J <> 5 THEN GOTO RevFlux
RESTORE: PRINT "Reverse field (-B), press any key to continue": BEEP
DO WHILE INKEY$ = "": LOOP
RevFlux: READ C$: C1$ = ":CLOS (@" + C$ + ")"           ' Build command string.
PRINT #1, "OUTPUT 08;"; C1$                             ' Close crosspoints.
PRINT #1, "OUTPUT 12;F1X"                               ' Turn on 220 output.
GOSUB Dly                                               ' Wait for reading to settle.
PRINT #1, "ENTER 07"                                    ' Address 196 to talk.
INPUT #2, V(J)                                          ' Get 196 reading.
IF ABS(V(J)) > 8 THEN GOTO Limit                        ' Check voltage limit.
IF J <> 1 THEN GOTO NoAmp
PRINT #1, "ENTER 22"                                    ' Address 485 to talk.
INPUT #2, I1                                           ' Input current reading.
NoAmp: PRINT #1, "OUTPUT 12;FOX"                       ' Turn off 220 output.
C1$ = ":OPEN (@" + C$ + ")"                           ' Build command string.
PRINT #1, "OUTPUT 08;"; C1$                           ' Open crosspoints.
NEXT J                                                 ' Loop back for next point.
BEEP
PRINT #1, "CLEAR"                                       ' Send device clear.
CLS
PRINT "Measurements complete."
PRINT "Measured current:"; I1
PRINT : PRINT "Measured voltages:"
FOR J = 1 TO 8                                         ' Display measured voltages.
PRINT "V"; J; "="; V(J)
NEXT J
PRINT
RHC = 2.5E+07 * T / (B * I1) * (V(2) - V(1) + V(5) - V(6))
RHD = 2.5E+07 * T / (B * I1) * (V(4) - V(3) + V(7) - V(8))
RHAVG = (RHC + RHD) / 2
PRINT "Hall coefficients:"
PRINT "RHC="; RHC
PRINT "RHD="; RHD
PRINT "RHAVG="; RHAVG
PRINT
INPUT "Repeat test (Y/N)"; A$
IF LEFT$(A$, 1) = "Y" OR LEFT$(A$, 1) = "y" THEN CLS : GOTO Start
PRINT #1, "OUTPUT 08;:OPEN ALL"                       ' Open all crosspoints.
CLOSE 1: CLOSE 2: END
Limit:
CLS : BEEP
PRINT #1, "CLEAR"                                       ' Send device clear.
PRINT #1, "OUTPUT 08;:OPEN ALL"                       ' Open crosspoints.
PRINT "Sample voltage is over 8V 7065 limit."
PRINT "Do you wish to:"
PRINT "(1) Restart the measurement"
PRINT "(2) Abort the program"
PRINT
INPUT "Enter choice: "; A
IF A < 1 OR A > 2 THEN GOTO Limit
IF A = 1 THEN CLS : GOTO Start
CLOSE 1: CLOSE 2: END                                 ' End program.
Dly:                                                  ' Delay subroutine.
TI = TIMER
Lp: IF (TIMER - TI) < DL THEN GOTO Lp
RETURN
' ***** 7001 CHANNEL LISTS *****
DATA "1!1!2,1!3!1,1!4!3,1!2!4","1!3!2,1!1!1,1!4!3,1!2!4"
DATA "1!2!2,1!4!1,1!1!3,1!3!4","1!4!2,1!2!1,1!1!3,1!3!4"

```

Program 1. Hall Voltage Coefficient

```
'Hall voltage program using Model 7001 Switch System.
OPEN "\DEV\IEEEOUT" FOR OUTPUT AS #1      ' Open IEEE-488 output path.
OPEN "\DEV\IEEEIN" FOR INPUT AS #2       ' Open IEEE-488 input path.
IOCTL #1, "BREAK"                        ' Reset interface.
PRINT #1, "RESET"                        ' Warm start interface
PRINT #1, "CLEAR"                        ' Send device clear.
CLS                                       ' Clear CRT.
DIM V(8)                                  ' Dimension reading array.
PRINT "This program measures Hall voltages and computes the"
PRINT "coefficients. The Hall card must be in the CARD 1 location."
PRINT
PRINT "Press any key to continue..."
DO WHILE INKEY$ = "": LOOP
SelRes:
CLS
PRINT "Select card resistivity setup:"
PRINT
PRINT "(1) Low resistivity"
PRINT "(2) High resistivity"
PRINT : INPUT "Selection"; A
IF A < 1 OR A > 2 THEN GOTO SelRes
Start: PRINT "Initializing instruments."
PRINT #1, "REMOTE 07,08,12,22"           ' Put instruments in remote.
' ***** INITIALIZE THE 7001 *****
PRINT #1, "OUTPUT 08;*RST"               ' Reset 7001.
PRINT #1, "OUTPUT 08;:CONF:SLOT1:CTYPE C7065" ' Slot 1= 7065 card.
PRINT #1, "OUTPUT 08;:CONF:SLOT2:CTYPE NONE" ' No card in slot 2.
PRINT #1, "OUTPUT 08;:OPEN ALL"         ' Open crosspoints.
IF A = 2 THEN PRINT #1, "OUTPUT 08;:CLOSE (@1!4!5)"
' ***** INITIALIZE THE 485 *****
PRINT #1, "OUTPUT 22;R1X"                ' Select 2nA range.
DL = 1: GOSUB Dly                        ' Settling time.
PRINT #1, "OUTPUT 22;C1X"               ' Zero check on.
GOSUB Dly                                ' Settling time.
PRINT #1, "OUTPUT 22;Z1X"               ' REL on.
GOSUB Dly                                ' Settling time.
PRINT #1, "OUTPUT 22;COX"               ' Zero check off.
PRINT #1, "OUTPUT 22;ROG1X"             ' Autorange, no prefix.
' ***** INITIALIZE THE 196 *****
PRINT #1, "OUTPUT 07;ROF0S3G1X"         ' Auto,DCV,rate,no prefix.
' ***** INITIALIZE THE 220 *****
PRINT #1, "OUTPUT 12;V10X"              ' 10V compliance.
InCurr: INPUT "220 current (500fA-2mA)"; I ' Input 220 current.
I = ABS(I)                               ' Positive current only.
IF I < 5E-13 OR I > .002 THEN GOTO InCurr ' Check current limits.
PRINT #1, "OUTPUT 12;I"; I; "X"         ' Program 220 current.
INPUT "Enter sample thickness (cm)"; T  ' Input sample thickness.
T = ABS(T)
INPUT "Enter flux density (gauss)"; B   ' Input flux density.
B = ABS(B)
CLS
PRINT "Apply +B, press any key to continue..."
DO WHILE INKEY$ = "": LOOP
' ***** MAIN MEASUREMENT LOOP *****
RESTORE: DL = 5                          ' Set 5 second delay.
CLS
PRINT "Measuring..."
```