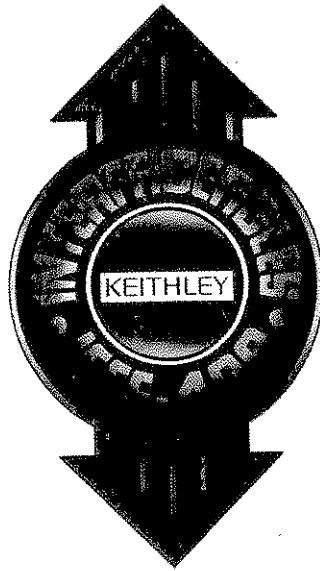# Programming Instructions

Model 195A
Digital Multimeter

INTRODUCTION

The Keithley 195A DMM is easily interfaced to common controllers using the IEEE-488 bus. This programming guide contains condensed specifications and instructional material which describes the various features of the Model 195A. Programs used in this booklet select the 2V range and obtain a reading on some common controllers.

All other parameters are left in the turn-on state. Other parameters may be programmed by expanding the programming command, entered after "TEST SETUP" appears on the CRT.

CONTENTS

CONDENSED SPECIFICATIONS

(ACCURACY - 1YR, 18°C—28°C)

VOLTAGE, RESISTANCE and CURRENT

Function	Ranges	Accuracy ± (%rdg + counts)
DC Volts	20mV	0.025 + 40
	200mV	0.025 + 6
	2 V	0.020 + 8
	20 V	0.030 + 6
	200 V	0.025 + 8
	1000 V	0.025 + 6
Ohms	20 Ω	0.025 + 25
	200 Ω	0.025 + 7
	2 kΩ	0.027 + 5
	20 kΩ	0.025 + 7
	200 kΩ	0.022 + 5
	2 MΩ	0.050 + 7
	20 MΩ	0.100 + 5
TRMS AC VOLTS (Option 1950)	200mV -700V	0.3 + 200 (45Hz-10kHz)
DC AMPS (Option 1950)	20µA	0.14 + 40
	200µA-2A	0.09 + 10
TRMS AC AMPS (Option 1950)	200µA-2A	0.6 + 250 (45Hz-10kHz)

TEMPERATURE

Scale	Span	4-Wire Accuracy ± (%rdg + counts)
°C	-200.00° to 230.00°	0.03 + 10
	230.00° to 630.00° -220.00° to -200.00°	0.03 + 40
°F	-328.00° to 446.00°	0.03 + 18
	446.00° to 1100.00° -360.00° to -328.00°	0.03 + 72

See manual for detailed specifications.

Model 195A FEATURES

ZERO MODE

The zero mode serves as a means of baseline suppression allowing a stored offset value to be subtracted from subsequent readings. When the ZERO button is pressed, the instrument will store the baseline reading with the next triggered conversion. All subsequent readings will represent the difference between the applied signal level and the stored baseline. A separate baseline can be stored for DCV, ACV, DCA, ACA and OHMS. The stored baseline can be as small as the resolution of the instrument will allow or as large as full range.

The zero mode is also controllable on the IEEE-488 bus.

FRONT PANEL FILTER

Filter 1, which is the front panel filter, filters the signal by taking the average of 64 successive reading samples. Filter 1 can also be enabled over the IEEE bus with the command P1.

DISPLAY RESOLUTION SELECTION

The display resolution of the Model 195A may be set to either 4½ or 5½ digits with the front panel RESOLN button.

TRIGGERING

FRONT PANEL TRIGGERING

Readings can be triggered from the front panel by entering Program 9. This places the Model 195A in the one-shot mode. The TRIG button or any other front panel button (except the PROGRAM buttons) will trigger the instrument in this mode.

EXTERNAL TRIGGER

External trigger operates much like front panel trigger except for the trigger stimulus itself. In this case, the trigger is applied to the rear panel BNC EXTERNAL TRIGGER connector. The input trigger pulse must conform to TTL logic levels. Trigger occurs on the negative going edge of the pulse.

VOLTMETER COMPLETE

The Model 195A has an available trigger pulse that can be used to trigger other instrumentation. A single pulse, conforming to TTL logic levels, will appear at the VOLTMETER COMPLETE output on the rear panel each time the Model 195A completes a conversion.

DIGITAL CALIBRATION

FRONT PANEL CALIBRTION

Front panel calibration is accomplished by connecting an appropriate calibration signal to the instrument and running front panel Program 5.

IEEE-488 BUS CALIBRATION

The digital calibration command (V) performs the same operation as front panel Program 5. Through the use of this command, a calibration value can be transmitted to the instrument. The calibration command is of the form Vnnnnnn, where n represents a numeric digit.

NON-VOLATILE MEMORY STORAGE

The Model 195A uses a non-volatile (NV) RAM to store the IEEE primary address, line frequency, calibration constants, and Model 1950 option status. Once the correct parameters are entered into the machine, NVRAM storage can be done either with front panel Program 1, or with the L command over the IEEE bus.

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FRONT PANEL PROGRAMS

The front panel program mode is entered by pressing "PRGM" followed by the corresponding number.

0. CLEAR
   PRGM 0 cancels program mode.

1. NON-VOLATILE RAM STORAGE
   PRGM 1 stores parameters from Programs 3, 4, 5, 6 and 8 in non-volatile RAM. Press ENT to perform the store. (Storage occurs only if internal jumpers are set appropriately. See manual for details).

2. MULTIPLEX
   PRGM 2 defeats the multiplexing of the input amplifier. "n on" = multiplex enabled; "n off" = multiplex disabled.

3. IEEE BUS MODE
   PRGM 3 allows IEEE address entry. Enter 0-30 for primary address. Enter 40 or 41 for talk only (output formats G0 and G1 respectively).

4. LINE FREQUENCY
   PRGM 4 toggles line frequency from 60Hz to 50Hz.

5. CALIBRATION
   PRGM 5 enables digital calibration. First select range and function to be calibrated. After properly zeroing, apply calibration signal to inputs. Press PRGM 5 to display default calibration value. Press "ENT" to perform calibration. If calibration signal other than default is desired, enter new value before hitting "ENT".

6. TEMPERATURE
   PRGM 6 enables entry into the temperature function. Repeated entry of PRGM 6 toggles between °C and °F. To exit, enter another function.

7. 100 POINT DATA LOGGER
   PRGM 7 enters the data logger mode. Enter interval from 0 to 9.

0 = Maximum Rate	5 = 1 min.
1 = Maximum Rate	6 = 5 min.
2 = 1 sec.	7 = 10 min.
3 = 5 sec.	8 = 30 min.
4 = 10 sec.	9 = 1 hour

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Press "ENT" to store interval. Press "ENT" again to start data logging. Press "RECALL" to read data. In recall mode, the following is available: Press "ENT" = scroll through readings. "-ENT" = scroll reverse through readings.

0 = resume front panel operation.
1 = highest buffer reading.
2 = lowest buffer reading.
3 = average buffer reading.

8. DIAGNOSTIC

PRGM 8 performs RAM, ROM, and display test. Pressing a number performs the following tests.

1 = N1 mode	5 = ROM test
2 = N2 mode	6 = RAM test
3 = N3 mode	7 = Display test
4 = N4 mode	"-" = 1950 enable

9. TRIGGER

PRGM 9 toggles the hold mode. In the hold mode, a reading can be triggered by pressing the "TRIG" button, any front panel button, or the rear external trigger.

IEEE-488 PROGRAMMING

FUNCTION:	F0 = DCV
	F1 = ACV
	F2 = OHMS
	F3 = DCA
	F4 = ACA
	F5 = °F
	F6 = °C
RANGE:	R0 = AUTO
	R1 = 20mV, 20Ω, 20μA, < 230°C
	R2 = 200mV, 20Ω, 200μA, > 230°C
	R3 = 2V, 2kΩ, 2mA > 230°C
	R4 = 20V, 20kΩ, 20mA, > 230°C
	R5 = 200V, 200kΩ, 200mA > 230°C
	R6 = 1000VDC, 700VAC, 2MΩ, 2A > 230°C
	R7 = 1000VDC, 700VAC, 20MΩ, 2A> 230°C
TRIGGER:	T0 = Cont. on TALK
	T1 = ONE SHOT on TALK
	T2 = Cont. on GET

	T3 = ONE SHOT on GET
	T4 = Cont. on X
	T5 = ONE SHOT on X
	T6 = Cont. on EXT TRIG
	T7 = ONE SHOT on EXT TRIG
	front panel trigger always enabled except in LLO

RATE:	INT. PD. (msec)	(Samples AVGD Per Reading)
	S0 = 3.3	1
	S1 = 16.6 (20)	1
	S2 = 16.6 (20)	2
	S3 = 16.6 (20)	4
	S4 = 16.6 (20)	8
	S5 = 16.6 (20)	16
	S6 = 100	1
	S7 = 100	2
	S8 = 100	4
	S9 = 100	8

FILTER:	P0 = No averaging
	P1 = Average 64
	P2 = Average 32
	P3 = Average 0 or 8 (default)

DISPLAY:	D------X = Display characters between D and X. DX disables the display mode.

ZERO:	Z0 = Zero off
	Z1 = Zero on

EOI:	K0 = Send EOI
	K1 = Do not send EOI

SRQ:	M1 = Reading done: overflow
	M2 = IDDC, IDDCO, no remote
	M4 = Buffer, full
	M8 = Buffer ½ full
	M16 = Self-test failed
	M32 = Trigger overrun

STATUS:	U0 = Machine status TFRKQQSMZWWA-JGBPYY
	U1 = Number of readings in buffer
	U2 = Average of buffer

6

7

	U3 = Lowest reading in buffer U4 = Highest reading in buffer U5 = Calibration value
EXECUTE:	X
DELAY:	W0 = No delay W1 = Default delays W2-W16000 = 2-16000msec delay
MULTIPLEX:	A0 = Multiplex input amplifier A1 = Multiplex off (Same as PRGM 2)
DIGITAL CALIBRATION:	Vn n = Calibration value
NV STORAGE:	L1 = Store contents in non-volatile RAM
HIT COMMAND:	Hn n = Number on front panel button
SELF TEST:	J0 = CLEAR SELF TEST J1 = RUN SELF TEST "1" in status byte = fail "2" in status byte = pass
READ MODE:	B0 = Read the display on MTA B1 = Read the buffer on MTA
TERMINATOR:	Y(m) = m is terminator Y(mn) = mn is 2 character terminator YX = No terminator
DELAY:	W0 = No delay W1 = Default delays W2-W16000 = 2-16000msec delay
BUFFER INTERVALS:	Q0 = Clear buffer Qn1 = MAX RATE Qn2 = 1 sec. Qn3 = 5 sec. Qn4 = 10 sec. Qn5 = 1 min. Qn6 = 5 min. Qn7 = 10 min. Qn8 = 30 min. Qn9 = 1 hour

n = Buffer mode
0 = Fill buffer and stop
1 = Circular buffer; stops when full until space
is cleared by reading
2 = Circular buffer; oldest data gets written
over

DATA FORMAT:

EXAMPLE

G0 = NDCV −1.23456E + 0, B014(CR LF)
G1 = −1.23456E + 0(CR LF) *
G2 = NDCV −1.23456E + 0, B014, NDCV −1.234...
G3 = 1.23456E + 0, −1.234...
G4 = NDCV −1.23456E + 0, NDCV −1.234...
G5 = NDCV −1.23456E + 0, NDCV −1.234...
* in B1 mode only

N = Normal
O = Overflow
Z = Zero

DCV
OHM
ACV
DCI
ACI

| MANTISSA ALWAYS 5½ DIGITS | | EXP | TERMI-NATOR |

| N | D | C | V | − | 1 | 2 | . | 3 | 4 | 5 | 6 | E | − | 0 | CR | LF |

DEGC
DEGF

G1 mode

G4 mode

DEFAULT: T6F0R6K0Q0S2M0Z0W1A0J0G4P3Y(CR LF)

PROGRAMS

The following programs are designed to be a simple aid to the user, and are not intended to suit specific needs. Detailed programming information can be found in the manual.

These programs display one reading at the output of the controller. The program provides an ASCII string variable output of the form:

NDCV + 0.00000E + 0 CR LF

The note at the end of each program indicates modifications to provide a numeric variable (A) in exponential form:

+ 0.00000E + 0

APPLE II (APPLE Interface)

The program below obtains one reading from the Model 195A DMM and displays the reading on the APPLE II screen, using an APPLE IEEE-488 interface.

DIRECTIONS

1. Using front panel Program 3, enter primary address 16.
2. Connect the Model 195A to APPLE II and APPLE IEEE-488 interface.
3. Enter the program below using the RETURN key after each line. Type in line numbers.
4. Type in RUN and depress RETURN key.
5. The display will read "TEST SETUP".
6. To program the Model 195A to the 2V range and take a reading, type in F0R3P0T1X and depress the RETURN key.
7. Display will read NDCV + 0.00000E + 0 for "0" volts in. (Short Input)

PROGRAM	COMMENTS
10 Z$ = CHR$(26)	
20 INPUT "TEST SETUP?" ;B$	Enter programming command. (Example: 2V range = F0R3X).
30 PR#3	Send output to IEEE bus.
40 IN#3	Get input from IEEE bus.
50 PRINT "RA"	Turn remote ON.
60 PRINT "LF1"	Linefeed on.
70 PRINT "WT0";Z$;B$	Output programming command to 195A.
80 PRINT "RDP";Z$: INPUT "";A$	Read data from 195A.
90 PRINT "UT"	Untalk.

10

100 PR#0	Send output to CRT.
110 IN#0	Get input from keyboard.
120 PRINT A$	Display data string.
130 GO TO 20	Repeat

NOTE: If conversion to numeric variable is desired, add the following:

124 A = VAL(MID$(A$,5,11))	Convert string to numeric value.
126 PRINT A	

DEC LSI 11

The program below obtains one reading from the Model 195A DMM and displays the reading on the DEC LSI 11 microcomputer CRT terminal. The LSI 11 must be configured with 16k words of RAM and an IBV 11 IEEE interface. The software must be configured with IB software as well as the FORTRAN and the RT 11 operating system.

DIRECTIONS

1. Using front panel Program 3, enter primary address 16.
2. Connect the Model 195A to the IBV 11 IEEE cable.
3. Enter the program below, using the editor under RT 11 and the name IPHILD.
4. Compile using the fortran compiler as follows: FORTRAN IPHILD.
5. Link with the system and IB Libraries as follows: LINK IPHILD,IBLIB.
6. Type RUN IPHILD and depress the RETURN key.
7. The display will read "ENTER ADDRESS".
8. Type in 16 and depress RETURN key.
9. The display will read "TEST SETUP".
10. To program the Model 195A to the 2V range and take a reading, type in F0R3T1X and depress the RETURN key.
11. Display will read NDCV + 0.00000E + 0 for "0" volts in. (Short Input)

PROGRAM	COMMENTS
INTEGER*2 PRIADR	
LOGICAL*1 MSG(80), INPUT(80)	
DO 2 I = 1, 10	
CALL IBSTER (I,0)	!Turn off IB errors.
2 CONTINUE	
CALL IBSTER (15,5)	!Allow 5 error 15's.
CALL IBTIMO (120)	!Allow 1 sec. bus timeout.
CALL IBTERM (″10)	!Set LF as terminator.
CALL IBREN	!Turn remote on.

11

```
4 TYPE 5
5 FORMAT (1X,'ENTER ADDRESS',$)    !Input the address 16.
  ACCEPT 10, PRIADR
10 FORMAT (214)
12 TYPE 15
15 FORMAT (1X,'TEST SETUP',$)       !Prompt for the test setup.
   CALL GETSTR (5,MSG,72)           !Get the test setup.
   CALL IBSEOI (MSG,-1,PRIADR)      !Program the 195A.
18 I = IBRECV (INPUT,80,PRIADR)     !Get the data from the
                                     195A.

   INPUT (I + 1) = 0
   CALL PUTSTR (7,INPUT,'0')
   CALL IBUNT                        !Untalk the 195A.
   GO TO 12                          !Repeat.
   END
```

HP 85

The program below obtains one reading from the Model 195A DMM
and displays the reading on the HP-85 CRT screen, using the 82937A
GPIB interface and an I/O ROM.

DIRECTIONS

1. Using front panel Program 3, enter primary address 16.
2. Connect the Model 195A to the HP 82937A IEEE interface.
3. Enter the program below using the END LINE key after each line is
   typed.
4. Depress the RUN key.
5. The display will read "TEST SETUP".
6. To program the Model 195A to the 2V range and take a reading, type
   in F0R3T1X and depress the END LINE key.
7. Display will read NDCV + 0.00000E + 0 for "0" volts in. (Short In-
   put)

PROGRAM	COMMENTS
10 REMOTE 716	Set to remote.
20 DISP "TEST SETUP"	Prompt for test setup.
30 INPUT B$	
40 OUTPUT 716; B$	Program the 195A.
50 ENTER 716; A$	Get the data from the 195A DMM.
60 DISP A$	
70 GO TO 20	Repeat
80 END	

12

NOTE: If conversion to numeric variable is needed, change line 60 as
      follows:
60 DISP VAL (A$[5])

HP 9825A

The program below obtains one reading from the Model 195A DMM
and displays the reading on the HP 9825A using a 98034A HPIB inter-
face and a 9872A extended I/O ROM.

DIRECTIONS

1. Using front panel Program 3 enter primary address 16.
2. Connect the Model 195A to HP 9825A and 98034A HPIB interface.
3. Enter the program below, using the STORE key after each line is
   typed. Line numbers are automatically assigned by the 9825A.
4. Depress the RUN key.
5. The display will read "TEST SETUP".
6. To program the Model 195A to the 2V range and take a reading, type
   in F0R3T1X and depress the CONT key.
7. Display will read NDCV + 0.00000E + 0 for "0" volts in. (Short In-
   put)

PROGRAM	COMMENTS
0 dim A$[20], B$[20]	To dimension data string.
1 dev "195",716	Define Model 195A address 16.
2 rem "195"	Set to remote.
3 ent "TEST SETUP",B$	Enter programming command. (Example: 2VDC range = F0R3X.)
4 wrt "195",B$	Output program command to Model 195A via IEEE bus.
5 red "195" A$	Read data from Model 195A via IEEE bus.
6 prt A$	Print data on hard copy printer.
7 gto 3	Repeat.

NOTE: If conversion to numeric variable is desired, omit lines 6 and 7 and
      substitute:

6 "e" → A$[13, 13]; flt5	Convert to numeric value.
7 prt val (A$[5])	
8 gto 3	Repeat

13
```
```

HP 9816

The following program sends a command string to the Model 195A, reads data, and displays it on the HP 9816 display, using BASIC 2.0.

DIRECTIONS

1. Using front panel Program 3, enter primary address 16.
2. With the power off, connect the Model 195A to the HP 9816.
3. Enter the program below using the ENTER key after each line is typed.
4. Press the HP 9816 RUN key.
5. The display will read "TEST SETUP".
6. To program the Model 195A to the 2VDC range, type in F0T1R3X and press the ENTER key.
7. The display will read NDCV + 0.00000E + 0 for "0" volts in.

PROGRAM	COMMENTS
10 REMOTE 716	Set to remote.
20 INPUT "TEST SETUP",A$	Prompt for test setup.
30 OUTPUT 716;A$	Send command string to 195A.
40 ENTER 716;B$	Get data string from 195A.
50 PRINT B$	Display data string.
60 GOTO 20	Repeat
70 END	

NOTE: If conversion to numeric variable is needed, change lines 40 and 50 as follows:
40 ENTER 716;B
50 PRINT B

HP 9845B

The program below obtains one reading from the Model 195A DMM and displays the reading on the HP 9845B screen using a 98034A HPIB interface and an I/O ROM.

DIRECTIONS

1. Using front panel Program 3, enter primary address 16.
2. Connect the Model 195A to HP 9845B and 98034A interface.
3. Enter the progam below using the STORE key after each line.
4. Depress the RUN key.
5. The display will read "TEST SETUP" in the lower left corner.

6. To program the Model 195A to the 2V range and take a reading, type in F0R3T1X and depress the EXECUTE key.
7. Display will read NDCV + 0.00000E + 0 for "0" volts in. (Short Input)

PROGRAM	COMMENTS
10 DIM A$[20], B$ [20]	To dimension data string.
20 E195 = 716	Define Model 195A address 16.
30 INPUT "TEST SETUP",B$	Enter programming command (Example: 2VDC range = F0R3X).
40 OUTPUT E195; B$	Output program command to Model 195A via IEEE bus.
50 ENTER E195; A$	Read data from Model 195A via IEEE bus.
60 PRINT A$	Print data on 9845B CRT.
70 GO TO 30	Repeat.

NOTE: If conversion to numeric variable is desired, omit line 60 and substitute:

60 PRINT VAL(A$[5,11])	Convert string to numeric value.
70 GO TO 30	Repeat

PET/CBM 2001

The program below obtains one reading from the Model 195A DMM and displays the reading on the PET/CBM 2001 Series.

DIRECTIONS

1. Using front panel Program 3, enter primary address 16.
2. Connect the Model 195A to PET/CBM 2001 IEEE interface.
3. Enter the program below using the RETURN key after each line.
4. Type RUN and depress the RETURN key.
5. The display will read "TEST SETUP".
6. To program the Model 195A to the 2V range and take a reading, type in F0R3T1X and depress the RETURN key.
7. Display will read NDCV + 0.00000E + 0 for "0" volts in. (Short Input)

PROGRAM	COMMENTS
10 OPEN 6,16	Open file 6, primary address 16.
20 INPUT "TEST SETUP";B$	Enter programming command. (Example: 2VDC range = F0R3X.)

```
30 PRINT#6,B$              Output to the IEEE bus.
40 INPUT#6,A$              Read data from Model 195A via IEEE
                           bus.
50 IF ST = 2 THEN 40       If time out, input again.
60 PRINT A$                Print data.
70 GO TO 20                Repeat
```
NOTE: If conversion to numeric variable is desired, omit line 70 and type the following:
```
70 A = VAL(MID$(A$,5,15))  Convert string to numeric value.
80 PRINT "A =";A
90 GO TO 20                Repeat
```

TEK 4052

The program below obtains one reading from the Model 195A DMM and displays the reading on the TEK 4052 graphics terminal, with a 4051 GPIB interface.

DIRECTIONS

1. Using front panel Program 3, enter primary address 16.
2. Connect the Model 195A to TEK 4051 IEEE interface.
3. Enter the program below using the RETURN key after each line.
4. Type in RUN.
5. The display will read "TEST SETUP".
6. To program the Model 195A to the 2V range and take a reading, type in F0R3T1X and depress the RETURN key.
7. Display will read NDCV + 0.00000E + 0 for "0" volts in. (Short Input)

PROGRAM	COMMENTS
5 PRINT @ 37, 0: 10, 255, 13	
10 PRINT "TEST SETUP"	Prompt for the test setup.
20 INPUT B$	
30 PRINT @ 16: B$	Program the 195A DMM.
40 INPUT % 16: A$	Get the data from the 195A DMM.
50 PRINT A$	
60 GO TO 10	Repeat

NOTE: If conversion to numeric value is needed change 40 and 50 to:
```
40 INPUT % 16: A
50 PRINT A
```

IBM PERSONAL COMPUTER XT or PC
(National Instruments GPIB-PC)

The following program sends a command string to the Model 195A from an IBM PC or XT computer and displays the instrument reading on the CRT. The computer must be equipped with a National Instrument Model GPIB-PC IEEE-488 interface, and the B.0 software must be installed and configured as outlined in the interface instruction manual.

DIRECTIONS

1. Using front panel Program 3, set the Model 195A primary address to 16.
2. With the power off, connect the Model 195A to the IEEE-488 interface installed in the IBM computer.
3. Using the interface software IBCONF program, set up the GPIB. COM handler so that "DEV16" has a primary address of 16. Again, consult the interface board instruction manual for complete details.
4. Place the interface software disc in the default drive type LOAD "DECL", and press the return key.
5. Enter the program below into the computer, pressing the return key after each line is typed. Lines 1-6 are part of the DECL program previously loaded and need not be typed in.
6. Run the program and type in the desired command string when prompted. For example, to place the Model 195A in the one-shot on talk trigger mode and in the 2VDC range, type in T1F0R3X and press the return key.
7. The display will show the Model 195A reading string on the CRT. For example, with 0 volts in, the display will show NDCV + 0.00000E + 0.

PROGRAM

```
1 CLEAR ,60000!
2 IBINIT1 = 60000!
3 IBINIT2 = IBINIT1 + 3 '
4 BLOAD "bib.m",IBINIT1
5 CALL IBINIT1(IBFIND%,IBTRG%,IBCLR%,IBPCT%,IBSIC%,
  IBLOC%,IBPPC%,IBBNA%,IBONL%,IBRSC%,IBSRE%,
  IBRSV%,IBPAD%,IBSAD%,IBIST%,IBDMA%,IBEOS%,
  IBTMO%,IBEOT%)
6 CALL IBINIT2(IBGTS%,IBCAC%,IBWAIT%,IBPOKE%,
  IBWRT%,IBCMD%,IBRD%,IBRPP%,IBRSP%,IBDIAG%,
  IBXTRC%,IBSTA%,IBERR%,IBCNT%)
```

```
10 N$ = "GPIB0":CALL IBFIND%(N$,BRD0%) 'FIND THE BOARD
   NUMBER
20 N$ = "DEV16":CALL IBFIND%(N$,M195%) 'FIND THE DEVICE
   NUMBER
30 V% = 1:CALL IBONL%(BRD0%,V%):CALL IBONL%(M195%,
   V%)
40 V% = 1:CALL IBSRE%(BRD0%,V%) 'SEND REMOTE ENABLE
50 CALL IBCLR%(M195%) 'SEND SDC
60 CLS
70 INPUT "195A COMMAND";CMD$ 'PROMPT FOR 195A
   COMMAND
80 CALL IBWRT%(M195%,CMD$) 'SEND COMMAND STRING TO
   195A
90 RD$ = SPACE$(25) 'DEFINE READING INPUT BUFFER
100 CALL IBRD%(M195%,RD$) 'GET THE READING FROM THE
    195A
110 PRINT RD$ 'PRINT THE READING ON THE CRT
120 GOTO 70 'REPEAT
```

NOTE: First six lines need not be typed in.

E-H 7000 COMPUTER

The following program sends a data string from the E-H computer to the Model 195A and then displays the instrument reading on the computer CRT. The E-H 7000 must be configured with MS-DOS, IO-SYS, and BASICA as outlined in its instruction manual.

DIRECTIONS

1. Using front panel Program 3, program the Model 195A for a primary address of 16.
2. With the power off, connect the Model 195A to PORT 1 of the computer.
3. While in BASICA, type LOAD "EHE488.CMP" to load the GPIB handler software.
4. Add the lines below to the front of the program now in memory; press the return key after each line is typed. The complete program, including the GPIB handler software may now be saved in the usual manner.
5. Press the computer F2 key to run the program. The CRT will prompt with COMMAND?
6. Type in the desired command. For example, to program the instrument to the 2VDC range and take a reading, type in F0R2X and press return.

7. The computer CRT will then display the instrument's data string on the CRT. For example, on the 2VDC range the display will read NDCV + 0.00000E + 0 for "0" volts in.

PROGRAM	COMMENTS
10 CLS	
20 GOSUB 65010	'INITIALIZE HANDLER SOFTWARE
30 CALL PORT1	'INITIALIZE PORT 1
40 CALL INIT	'INITIALIZE INTERFACE
50 DEV$ = "16 "	'PRIMARY ADDRESS = 16
60 INPUT "COMMAND";C$	' PROMPT FOR COMMAND STRING
70 IF C$ = "" THEN 60	' IF NULL INPUT GO BACK
80 IN$ = SPACE (20)	' DEFINE READING BUFFER
90 CALL SNDSTR(DEV$,C$)	' SEND COMMAND STRING TO 195A
100 CALL RCVSTR(DEV$,IN$)	'GET READING FROM 195A
110 PRINT IN$	'DISPLAY READING STRING ON CRT
120 GOTO 60	'REPEAT

NOTE: For conversion to numeric variable, change line 110 to:
```
110 PRINT VAL(MID$(IN$,5,
    16))
```