Example 1

USE THE INTERACTIVE GPIB PROGRAM "IBIC"

This example assumes the use of an IBM PC or compatible equipped with a National Instruments GPIB interface card. The GPIB driver is left in default state so that the device name "dev4" corresponds to the GPIB address 4, the oscilloscope address. All `text` is entered by the user.

`IBIC<cr>`

program announces itself

`: ibfind<CR>`

enter board/device name: `dev4<CR>`

dev4: `ibwrt<CR>`

enter string: `"tdiv?"<CR>`

[0100] (cmpl)

count: 5

dev4: `ibrd<CR>`

enter byte count: `10<CR>`

[0100] (cmpl)

count: 10

54 44 49 56 20 35 30 45   T D I V   5 0 E

2D 39   ? 9

dev4: `ibwrt<CR>`

enter string: `"c1:cpl?"<CR>`

[0100] (cmpl)

count: 7

dev4: `ibrd<CR>`

enter byte count: `20<CR>`

[2100] (end cmpl)

count: 11

43 31 3A 43 50 4C 20 44   C 1 : C P L D

35 30 0A   5 0 z

dev4: `q<CR>` to quit the program.

Example 2

USE THE GPIB PROGRAM FOR IBM PC (HIGH-LEVEL FUNCTION CALLS)

The following BASICA program allows full interactive control of the oscilloscope using an IBM PC as GPIB controller. As in Example 1, it is assumed that the controller is equipped with a National Instruments GPIB interface card. All commands can be used following this example simply by entering the text string of the command. For example, "C1:VDIV 50 MV", without the quotation marks. The program automatically displays the information sent back by the oscilloscope in response to queries.

In addition, a few utilities have been provided for convenience. The commands ST and RC enable waveform data to be stored on, or retrieved from, a disk if the correct drive and file names are provided. The command LC returns the oscilloscope to local mode. Responses sent back by the oscilloscope are interpreted as character strings and are thus limited to a maximum of 255 characters.

```
1-99 <DECL.BAS>
100 CLS
110 PRINT "Control of the 9300 via GPIB and IBM PC"
115 PRINT ""
120 PRINT "Options : EX to exit LC local mode"
125 PRINT " ST store data RC recall data"
130 PRINT ""
140 LINE INPUT "GPIB-address of oscilloscope (1...16)? :",ADDR$
145 DEV$ = "DEV" + ADDR$
150 CALL IBFIND(DEV$,SCOPE%)
155 IF SCOPE% < 0 THEN GOTO 830
160 TMO% = 10   'timeout = 300 msec (rather than default 10 sec)
165 CALL IBTMO(SCOPE%,TMO%)
170 '
200 LOOP% = 1
205 WHILE LOOP%
210 LINE INPUT "Enter command (EX --> Exit) : ",CMD$
220 IF CMD$ = "ex" OR CMD$ = "EX" THEN LOOP% = 0 : GOTO 310
230 IF CMD$ = "st" OR CMD$ = "ST" THEN GOSUB 600 : GOTO 300
240 IF CMD$ = "rc" OR CMD$ = "RC" THEN GOSUB 700 : GOTO 300
250 IF CMD$ = "lc" OR CMD$ = "LC" THEN GOSUB 400 : GOTO 300
```

```
260 IF CMD$ = "" THEN GOTO 300
270 CALL IBWRT(SCOPE%,CMD$)
275 IF IBSTA% < 0 THEN GOTO 840
280 GOSUB 500
300 WEND
310 GOSUB 400
320 END
400 '
405 'SUBROUTINE LOCAL_MODE
410 '
420 CALL IBLOC(SCOPE%)
425 PRINT ""
430 RETURN
500 '
505 'SUBROUTINE GET_DATA
510 'If there are no data to read, simply wait until timeout occurs
515 '
520 CALL IBRD(SCOPE%,RD$)
525 I = IBCNT% 'IBCNT% is the number of characters read
530 FOR J = 1 TO I
535 PRINT MID$(RD$,J,1);
540 NEXT J
545 PRINT ""
550 RETURN
600 '
605 'SUBROUTINE STORE_DATA
610 '
615 RD1$=SPACE$(3)
620 LINE INPUT "Specify trace (TA...TD,M1...M4,C1...C4): ",TRACE$
625 LINE INPUT "Enter filename : ",FILE$
630 CMD$="WFSU NP,0,SP,0,FP,0,SN,0; CHDR SHORT"
```

```
640 CALL IBWRT(SCOPE%,CMD$)
645 CMD$=TRACE$+":WF?"
650 CALL IBWRT(SCOPE%,CMD$)
660 CALL IBRD(SCOPE%,RD1$)        'Discard first 3 chars of response
665 CALL IBRDF(SCOPE%,FILE$)
670 IF IBSTA% < 0 THEN GOTO 840
675 PRINT ""
680 RETURN
700 '
705 'SUBROUTINE RECALL_DATA
710 '
715 LINE INPUT "Specify target memory (M1...M4):",MEM$
720 LINE INPUT "Enter filename : ",FILE$
730 CMD$=MEM$+":"
735 CALL IBWRT(SCOPE%,CMD$)
740 CALL IBWRTF(SCOPE%,FILE$)
745 IF IBSTA% < 0 THEN GOTO 840
750 PRINT ""
755 RETURN
800 '
810 'ERROR HANDLER
820 '
830 PRINT "IBFIND ERROR"
835 END
840 PRINT "GPIB ERROR -- IBERR: ";IBERR%;"IBSTA: ";HEX$(IBSTA%)
END
```

NOTE:

☞ *It is assumed that the National Instruments GPIB driver GPIB.COM is in its default state. This means that the interface board can be referred to by its symbolic name 'GPIB0' and that devices on the GPIB with addresses 1 to 16 can be called by the symbolic name 'DEV1' to 'DEV16'.*

☞ *Lines 1–99 are a copy of the file DECL.BAS supplied by National Instruments. The first six lines are required for the initialization of the GPIB handler. DECL.BAS requires access to the file BIB.M during the GPIB initialization. BIB.M is one of the files supplied by National Instruments, and must exist in the directory currently in use.*

☞ *The first two lines of DECL.BAS each contain a string "XXXXX" which must be replaced by the number of bytes which determine the maximum workspace for BASICA (computed by subtracting the size of BIB.M from the currently available space in BASICA). For example, if the size of BIB.M is 1200 bytes and when BASICA is loaded it reports "60200 bytes free", "XXXXX" would be replaced by the value 59000 or less.*

☞ *The default timeout of 10 seconds is modified to 300 ms during the execution of this program. However, the default value of the GPIB handler remains unchanged. Whenever a remote command is entered by the user, the program sends it to the instrument with the function call IBWRT. Afterwards, it always executes an IBRD call, regardless of whether or not a response is expected. If a response is received it is immediately displayed. If there is no response, the program waits until time-out and then asks for the next command.*

Example 3

USE GPIB PROGRAM FOR IBM PC (LOW-LEVEL FUNCTION CALLS)

This example has the same function as Example 2, but is written with low-level function calls. The program assumes that the controller (board) and oscilloscope (device) are at addresses 0 and 4, respectively, and the decimal addresses are:

	Listener Address	Talker Address
CONTROLLER	32(ASCII \<space\>)	64 (ASCII @)
DEVICE	32+4=36 (ASCII $)	64+4=68 (ASCII D)

```
1-99 <DECL.BAS>
100 CLS
110 PRINT "Control of the 9300 (address 4) via GPIB and IBM PC"
115 PRINT "": PRINT "Options :  EX to exit        LC local mode"
120 PRINT "           ST store data    RC recall data": PRINT""
125 LOOP=1
130 CMD1$ = "?_@$" 'Unlisten, Untalk, Board talker, Device listener
135 CMD2$ = "?_ D" 'Unlisten, Untalk, Board listener, Device talker
140 BDNAME$= "GPIB0": CALL IBFIND(BDNAME$,BRD0%)
145 IF BRD0% < 0 THEN GOTO 420
150 CALL IBSIC(BRD0%): IF IBSTA% < 0 THEN GOTO 425
155 WHILE LOOP
160 LINE INPUT "Enter command (EX --> Exit) : ",CMD$
165 V% = 1: CALL IBSRE(BRD0%,V%)
170 IF CMD$ = "ex" OR CMD$ = "EX" THEN LOOP = FALSE: GOTO 205
175 IF CMD$ = "st" OR CMD$ = "ST" THEN GOSUB 285: GOTO 200
180 IF CMD$ = "rc" OR CMD$ = "RC" THEN GOSUB 365: GOTO 200
185 IF CMD$ = "lc" OR CMD$ = "LC" THEN  GOSUB 240: GOTO 200
190 IF CMD$ = "" THEN GOTO 200
195 CALL IBCMD(BRD0%,CMD1$): CALL IBWRT(BRD0%,CMD$): GOSUB 270
200 WEND
```

```
205 CALL IBSIC(BRD0%): V%=0: CALL IBSRE(BRD0%,V%)
210 CALL IBSIC(BRD0%)
215 END
220 '
230 'LOCAL MODE
235 '
240 V% = 0: CALL IBSRE(BRD0%,V%): PRINT ""
245 RETURN
250 '
260 'SUBROUTINE GET_DATA
265 '
270 CALL IBCMD(BRD0%,CMD2$): CALL IBRD(BRD0%,RD$): I=IBCNT%
275 FOR J=1 TO I: PRINT MID$(RD$,J,1);: NEXT J: PRINT ""
280 RETURN
285 '
290 'SUBROUTINE STORE_DATA
295 '
300 RD1$=SPACE$(3)
305 LINE INPUT "Specify trace (TA...TD,M1...M4,C1...C4):  ",TRACE$
310 LINE INPUT "Enter filename : ",FILE$
315 CALL IBCMD(BRD0%,CMD1$)
320 CMD$="WFSU NP,0,SP,0,FP,0,SN,0;CHDR SHORT"
321 CALL IBWRT(BRD0%,CMD$)
325 CMD$=TRACE$+":WF?": CALL IBWRT(BRD0%,CMD$)
330 CALL IBCMD(BRD0%,CMD2$): CALL IBRD(BRD0%,RD1$)
335 CALL IBRDF(BRD0%,FILE$)
340 IF IBSTA% < 0 THEN GOTO 430
345 PRINT ""
350 RETURN
355 '
360 'SUBROUTINE RECALL_DATA
```

```
365'
370LINE INPUT "Specify target memory (M1...M4): ",MEM$
375LINE INPUT "Enter filename : ",FILE$
380CALL IBCMD(BRD0%,CMD1$)
385CMD$=MEM$+":": CALL IBWRT(BRD0%,CMD$)
390CALL IBWRTF(BRD0%,FILE$)
395IF IBSTA% < 0 THEN GOTO 430
400PRINT ""
405RETURN
410'
415'ERROR HANDLER
420'
425PRINT "IBFIND ERROR": STOP
430PRINT "GPIB ERROR -- IBERR : ";IBERR%;"IBSTA : ";HEX$(IBSTA%)
435STOP
440END
```

> **NOTE: The Template also describes an array named DUAL This is**
> **simply a way to allow you to use the INSPECT? query to examine**
> **the two data arrays together.**

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