KEITHLEY INSTRUMENTS

MODEL 705
SCANNER

QUICK REFERENCE GUIDE

Introduction

The Keithley 705 Scanner is easily interfaced to common controllers using the IEEE-488 bus. This application note gives programs which close channel 1 and reads data on the following controllers:

APPLE II; DEC LSI 11; HP 85; HP 9825A; HP 9826; HP 9845B; PET/CBM 2001; TEK 4052.

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

Program Codes

FRONT PANEL OPERATION

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

FRONT PANEL PROGRAMS

0   DIGITAL I/O PORT
PRGM 0 allows viewing of the 8 digital INPUT lines, and prompts for changing of the 8 digital OUTPUT lines. Format is ooo.iii where ooo is OUTPUT in octal and iii is INPUT in octal.

1*   AMERICAN/EUROPEAN DATE FORMAT
PRGM 1 allows the date display mode to display either MONTH. DAY or DAY. MONTH.
0 = AMERICAN — MONTH.DAY
1 = EUROPEAN — DAY.MONTH
FACTORY VALUE = 0

2*   RELAY SETTLING TIME
PRGM 2 allows entry of SETTLE time. Used on rear panel and IEEE bus. Time is in seconds from 0.005 to 999.999.
FACTORY VALUE = 000.005

3*   SET IEEE ADDRESS
PRGM 3 allows IEEE address entry. Enter 0-31 for primary address.
FACTORY VALUE = 17

4*   SAVE RELAY SETUP
PRGM 4 allows the present relay status, including FIRST and LAST information to be saved in buffers 1 to 5. Enter buffer number and press ENTER.
FACTORY VALUE = All open, FIRST = LAST = Channel 1

5*   RESTORE RELAY SETUP
PRGM 5 allows the user to restore a previously save relay setup from a numbered buffer. Enter buffer number and press ENTER.
FACTORY VALUE = All open, FIRST = LAST = Channel 1

6*   POLES
PRGM 6 allows changing the POLE mode between 1, 2, or 4 pole switching.
FACTORY VALUE = 2

7   ALARM TIME SET
PRGM 7 allows an alarm to be entered. Format is hh.mm.ss. Alarm time triggers rear panel and IEEE bus. Occurs daily except no output when equal to 00.00.00

8   DIAGNOSTIC, SELF TEST
PRGM 8 performs RAM, ROM, and display test.

90* STAND ALONE
PRGM 90 sets the unit to perform without using the DAISY CHAIN feature for multiple units.
FACTORY VALUE IS STAND ALONE

91* MASTER
PRGM 91 sets the unit to perform as the MASTER or controller in a multiple unit DAISY CHAINED configuration.

92* SLAVE
PRGM 92 sets the unit to perform as the SLAVE in a multiple unit DAISY CHAINED configuration.

99 RESET
PRGM 99 resets all internal parameters including the battery backed up ones but excluding the clock to factory values. It then performs a start-up sequence. Unit is set to STAND ALONE.

*denotes battery backed up

IEEE-488 PROGRAMMING

POLES:	A1 – 1 POLE
	A2 – 2 POLE
	A3 or A4 = 4 POLE
	When changed: First Channel – 1
	Last Channel = highest available channel
	Display Channel – 1
SRQ:	Mnnn
	MSB7 = N/A
	MSB6 = N/A
	MSB5 = Broken serial loop
	MSB4 = End of settling time
	MSB3 = End of dwell time
	MSB2 = End of scan
	MSB1 = Timer alarm
	MSB0 = IDDC, IDDCO, or no remote
I/O PORTS:	Onnn = In octal
PROGRAM:	P0 = Step
	P1 = Single
	P2 – Continuous
RESET:	R0 – Open all channels and display channel
	= first channel
DATE FORMAT:	E0 = American date format mm.dd
	E1 = European date format dd.mm
DATE:	Vmm:dd = Date (Vdd:mm in Europe)
TIME:	Shh:mm:ss = Set time
ALARM TIME:	Qhh:mm:ss
DEBUGGING:	J0 = ROM and LED test

| EOI: | K0 = EOI is transmitted on the last byte out |
| | K1 = EOI is not transmitted |

CHANNEL:

DISPLAY:	Bnnn	CHANNEL TO DISPLAY
CLOSE:	Cnnn	CLOSE CHANNEL #nnn
FIRST:	Fnnn	SET FIRST CHANNEL TO #nnn
LAST:	Lnnn	SET LAST CHANNEL TO #nnn
OPEN:	Nnnn	OPEN CHANNEL #nnn
INTERVAL TIME:	Wnnn.nnn	SET INTERVAL TIME IN SECONDS
SETTLING TIME:	Hnnn.nnn	SET SETTLING TIME IN SECONDS
SAVE:	I1,2,3,4,5	SAVE PRESENT SET-UP BUFFERS 1,2,3,4,5
RESTORE:	Z1,2,3,4,5	RESTORE SAVED SET-UP BUFFERS 1,2,3,4,5

TERMINATOR: Y(LF) = CR LF
Y(CR) = LF CR
Y( ) = Any ASCII character except: All captial letters and numbers, (blank), +, −, /, ,, ., e, and:

DISPLAY MODE: D0 = Channel
D1 = Interval time
D2 = Time
D3 = Date
D4 = Messages
D5 = Front panel program entry

ALTERNATE OUTPUT: U0 = Channel
U1 = All channels
U2 = I/O
U3 = Date
U4 = Status
U5 = Settling
U6 = Alarm
U7 = Interval
U8 = First/Last

TRIGGER MODE: T0 = Start on TALK
T1 = Stop on TALK
T2 = Start on GET
T3 = Stop on GET
T4 = Start on "X"
T5 = Stop on "X"
T6 = Start on EXTERNAL
T7 = Stop on EXTERNAL

PREFIX: G0 = Channel data transmitted with prefil
G1 = Channel data transmitted without prefix
G2 = Entire channel buffer state transmitted with prefix
G3 = Entire channel buffer state transmitted without prefix
G4 = I/O status port transmitted with prefix
G5 = I/O status port transmitted without prefix
G6 = Time/Date transmitted with prefix
G7 = Time/Date transmitted without prefix
G8 = Status word transmitted with prefix
G9 = Status word transmitted without prefix
G10 = Channel settling time transmitted with prefix
G11 = Channel settling time transmitted without prefix
G12 = Alarm time transmitted with prefix
G13 = Alarm time transmitted without prefix
G14 = Interval time transmitted with prefix
G15 = Interval time transmitted without prefix
G16 = First/Last transmitted with prefix
G17 = First/Last transmitted without prefix

Output once on the next read

SRQ BYTE:

BITS:	DATA	ERROR
MSB7 =	N/A	N/A
MSB6 =	SRQ	SRQ
MSB5 =	0	1
MSB4 =	End of settling time	N/A
MSB3 =	End of dwell time	Broken serial loop
MSB2 =	End of scan	No remote
MSB1 =	Timer alarm	IDDCO
MSB0 =	N/A	IDDC

SRQ byte cleard on a read of the serial poll byte if an SRQ was generated

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 close channel 1 and display one reading at the output of the controller. The program provides an ASCII string variable output of the form:

C001,S1 CR LF

APPLE II (APPLE Interface)

The program below closes channel 1, reads data from the Model 705 Scanner and displays the reading on the APPLE II screen, using an APPLE IEEE-488 Interface.

DIRECTION

1. Using front panel program 3, enter primary address 17.
2. Connect 705 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 705 to close channel 1 and read data, type in B1C1X and depress the RETURN key.
7. Display will read C001,S1 for channel 1 closed.

PROGRAM		COMMENTS
10	Z$ = CHR$(26)	
20	INPUT "TEST SETUP?";B$	Enter programming command. (Example : Channel 1 closed = B1C1X)
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 "WT1";Z$;B$	Output programming command to 705.
80	PRINT "RDQ";Z$;: INPUT " ";A$,C$	Read data from 705.
90	PRINT "UT"	Untalk.

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

DEC LSI 11

The program below closes channel 1, reads data from the Model 705 Scanner 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 17.
2. Connect 705 to the IBV II 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 17 and depress RETURN key.
9. The display will read "TEST SETUP".
10. To program the 705 to close channel 1 and read data, type in B1C1X and depress RETURN key.
11. Display will read C001,S1 for channel 1 closed.

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.
4 TYPE 5	
5 FORMAT (1X, 'ENTER ADDRESS',$)	!Input the address 17.
ACCEPT 10,PRIADR	
10 FORMAT (2I4)	
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 705.
18 I = IBRECV (INPUT,80,PRIADR)    !Get the data from the 705.
   INPUT (I + 1) = 0
   CALL PUTSTR (7, INPUT,'0')
   CALL IBUNT                      !Untalk the 705.
   GO TO 12                        !Repeat.
   END
```

HP 85

The program below closes channel 1, reads data from the Model 705 Scanner 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 17.
2. Connect 705 to the HP 82937A IEEE Interface..
3. Depress SHIFT SCRATCH and then depress END LINE to erase the previous program.
4. Enter the program below using the END LINE key after each line is typed. (Type in line numbers.)
5. Depress RUN key.
6. The display will read "TEST SETUP".
7. To program the 705 to close channel 1 and read data, type in B1C1X and depress END LINE key.
8. Display will read C001,S1 for channel 1 closed.

PROGRAM   COMMENTS

```
10    REMOTE 717            Set to remote.
20    DISP "TEST SETUP"     Prompt for test setup.
30    INPUT B$
40    OUTPUT 717; B$        Program the 705.
50    ENTER 717; A$         Get the data from the 705
                            Scanner.
60    DISP A$
70    GO TO 20              Repeat.
80    END
```

HP 9825A

The program below closes channel 1, reads data from the Model 705 Scanner and displays the reading on the HP 9825A using a 9803A HPIB Interface and a 9872A extended I/O ROM.

DIRECTIONS

1. Using front panel program 3 enter primary address 17.
2. Connect 705 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 705 to close channel 1 and read data, type in B1C1X and depress the CONT key.
7. Printed will read C001,S1 for channel 1 closed.

PROGRAM	COMMENTS
0 dim A$[20], B$[20]	To dimension data string.
1 dev "705", 717	Define Model 705 address 17.
2 rem "705"	Set to remote.
3 ent "TEST SETUP", B$	Enter programming command.
4 wrt "705", B$	Output program command to Model 705 via IEEE bus.
5 read "705",A$	Read data from Model 705 via IEEE bus.
6 prt A$	Print data on hard copy printer.
7 gto 3	Repeat.

HP 9826

The program below closes channel 1, reads data from the Model 705 Scanner and displays the reading on the HP 9826 screen, using the basic ROMs.

DIRECTIONS

1. Using front panel program 3, enter primary address 17.
2. Connect 705 to the HP 9826.
3. Enter the program below using the EXECUTE key after each line is typed.
4. Depress the RUN key.
5. The display will read "TEST SETUP".

6. To program the 705 to close channel 1 and read data, type in B1C1X and depress the RETURN key.
7. Display will read C001,S1 for channel 1 closed.

PROGRAM		COMMENTS
10	REMOTE 717	Set to remote.
20	PRINT "TEST SETUP"	Prompt for test setup.
30	INPUT A$	
40	OUTPUT 717; A$	Program the 705.
50	ENTER 717; B$	Read the data from the 705 Scanner.
60	PRINT B$	
70	GO TO 20	Repeat.
80	END	

HP 9845B

The program below closes channel 1, reads data from the Model 705 Scanner and displays the reading on the HP 9845B screen using a 98034A HPIB Interface and an I/O PROM.

DIRECTIONS

1. Using front panel program 3, enter primary address 17.
2. Connect 705 to HP 9845B and 98034A Interface.
3. Enter the program 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 705 to close channel 1 and read data, type in B1C1X and depress the RETURN key.
7. Display will read C0001,S1 for channel 1 closed.

PROGRAM		COMMENTS
10	DIM A$[20], B$[20]	To dimension data string.
20	E705 = 717	Define Model 705 address 17.
30	INPUT "TEST SETUP", B$	Enter programming command (Example: Channel 1 closed = B1C1X)
40	OUTPUT E705; B$	Output program command to Model 705 via IEEE bus.
50	ENTER E705; A$	Read data from Model 705 via IEEE bus.
60	PRINT A$	Print data on 9845B CRT.
70	GO TO 30	Repeat.

PET/CBM 2001

The program below closes channel 1, reads data from the Model 705 Scanner and displays the reading on the PET/CBM 2001 Series.

DIRECTIONS

1. Using front panel program 3, enter primary address 17.
2. Connect 705 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 705 close channel 1 and read data, type in B1C1X and depress the RETURN key.
7. Display will read C001,S1 for channel 1 closed.

PROGRAM

		COMMENTS
10	OPEN 6,17	Open file 6, primary address 17.
20	INPUT "TEST SETUP"; B$	Enter programming command. (Example: Channel 1 closed = B1C1X)
30	PRINT#6,B$	Output to the IEEE bus.
40	INPUT#6,A$,C$	Read data from Model 705 via IEEE bus.
50	IF ST = 2 THEN 40	If time out, input again.
60	PRINT A$;",";C$	Print data.
70	GO TO 20	Repeat.

TEK 4052

The program below closes channel 1, reads data from the Model 705 Scanner and displays the reading on the TEK 4052 graphics terminal, with an 4051 GPIB Interface.

DIRECTIONS

1. Using front panel program 3, enter primary address 17.
2. Connect 705 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 705 to close channel 1 and read data, type in B1C1X and depress the RETURN key.
7. Display will read C001,S1 for channel 1 closed.

PROGRAM	COMMENTS
5 PRINT @ 37, 0: 10, 255, 13	
10 PRINT "TEST SETUP"	Prompt for the test setup.
20 INPUT B$	
30 PRINT @ 17: B$	Program the 705 Scanner.
40 INPUT % 17: A$	Read the data from the 705 Scanner.
50 PRINT A$	
60 GO TO 10	Repeat.