Supersedes:
5345A-12A

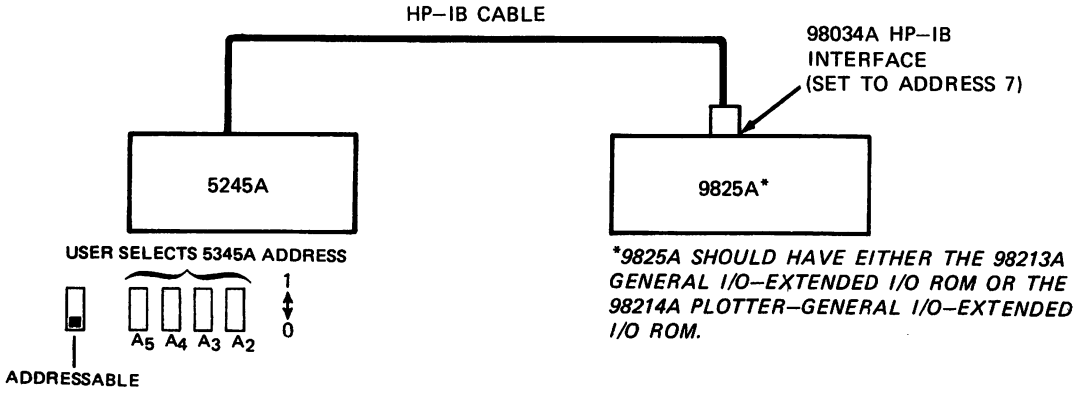
HP MODEL 5345A ELECTRONIC COUNTER
HP-IB VERIFICATION PROGRAM FOR 5345A OPTION 011

The 9825A program listed in the table exercises the 5345A through its various operating modes via the HP-IB Interface (Option 012). If the 5345A successfully completes all phases of the verification program, then there is a very high probability that the Option 012 Interface is working properly.

NOTE

Revision J or later **must** be used with 5345A Serial Prefix 2008A and later instruments. Rev. J and later can be used with instrument prefixes prior to 2008A.

To perform the verification, set up the 5345A as shown.



The program listed in the table may be keyed into the 9825A or may be loaded from the HP-IB Verification Cassette, HP P/N 59300-10001, Revision J or later, which also contains the HP-IB Verification programs for many Santa Clara Division instruments. To load the cassette program into the 9825A, insert the cassette into the 9825A and type ldpØ [EXECUTE]. Enter "5345" and push [CONTINUE] when the instrument model number is requested. Enter "12" and push [CONTINUE] when the option number is requested. The 9825A will then load into memory the 5345A Option 012 program. Power must be applied to the 5345A at sometime before the last statement is entered.

DD/mw/WN

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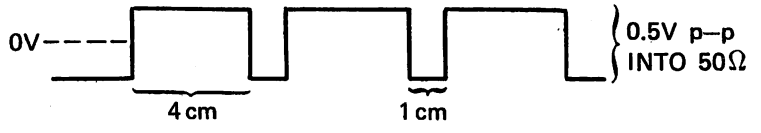
After the program is loaded, "select code ?" will appear on the 9825A display. Enter 7XX, and press CONTINUE, "XX" being the 5345A HP-IB address. The 5345A HP-IB address entered must be even. Odd addresses are for the Computer Dump mode.

When the correct 5345A address code is entered, the counter performs its first set of tests. The program will stop at the conclusion of each test. At this time, the operator verifies that the action programmed by the 9825A has occurred. To advance to the next test, simply press CONTINUE. If it is desired to repeat a test, set the variable L to 1 via the keyboard (type 1→L EXECUTE). Then enter the number of the test to be repeated by typing cont "#" EXECUTE. For example, to repeat test number 5, type 1→L EXECUTE cont "5" EXECUTE. Test 5 will repeat each time CONTINUE is pushed. To advance to the next test (to step 6 in the example), turn L to Ø when the program stops (type Ø→L EXECUTE and push CONTINUE.

Step	Test	Description
1	GATE TIME	The first test sets the 5345A to remote (RMT light on) and measures the frequency of the internal 100 MHz check signal. The program varies the gate times from 1 SEC to MIN and checks for a decreasing number of displayed digits. If an incorrect number of digits is displayed and output to the calculator, "ERROR" is printed by the calculator printer. The calculator displays the current gate time as the test progresses. The test is finished when "MIN" is displayed in the calculator display. Push CONTINUE to advance to Step 2.
2	FUNCTION SWITCH	The counter is put in check and the function switch is remotely programmed in the following order: PLUG-IN, FREQ A, PERIOD A, RATIO B/A, TIME INT A TO B, START, and STOP. The operator should visually confirm that the counter's display matches the readout called for on the calculator's display. Push CONTINUE after each condition.
3	FREQ MULTIPLIER SUFFIX	This test checks the display multiplier suffix selection for frequency mode. This function, which cannot be selected by the front panel switches, allows the user to force the counter to display in a format (i.e., MHz, kHz, Hz, etc.) selected by the user instead of what the counter would normally display. The test programs the counter to display the 100 MHz check signal in terms of mHz, Hz, kHz, MHz, and GHz. The calculator display shows what the counter should display at each point. This test is completely automatic in that the calculator checks for the appropriate number of digits in the displayed answer. The operator should visually confirm operation of the suffix lights in the counter annunciator display. Push CONTINUE to adance to Test 4.

Step	Test	Description
4	DECIMAL POINT	The display position may be remotely programmed. When operated in the AUTO mode, the display is positioned with the least significant digit in the rightmost display position. In this test, the .1 GHz check signal is measured and the display position is varied. The program automatically checks for the correct display. Push CONTINUE to advance to Test 5.
5	PERIOD MULTIPLIER SUFFIX	This test checks the display multiplier suffix selection for Period/Time Interval mode. The counter is programmed to display the period of the 100 MHz check signal in terms of ks, s, ms, μs, and ns. The calculator display shows what the counter should display at each point. This test is completely automatic in that the calculator checks for the appropriate number of digits in the displayed answer. The operator should visually confirm operation of the suffix lights in the counter annunciator display. Push CONTINUE to advance to Test 6.
6	INT/EXT GATE	This checks the operation of Internal/External Gate selection (a rear panel switch does the selection in the manual mode). For EXT GATE, the counter should display 00000000000 since no external gate signal is present. Push CONTINUE for INT GATE; the counter should display the 100.00000 MHz check signal. Push CONTINUE to advance to Test 7.
7	SAMPLE RATE	This test first programs the counter for a minimum display time and then returns it to the normal sample rate. These functions are not selectable from the panel switches. In MIN DISPLAY TIME, the counter effectively bypasses the sample rate control portion of the measurement cycle, allowing measurements to be taken every 1 to 5 ms. In this mode the counter display will be blank or consist of 1 digit. The gate light on the counter annunciator display should be on. Push CONTINUE to select the normal sample rate mode which returns the counter to making measurements with 50 ms between samples. After verifying proper operation for each condition, push CONTINUE to advance to Test 8.
8	HOLD	This test checks another aspect of the sample rate control. When the counter is programmed to "HOLD", the counter displays all zeros and all gating is stopped. When the CONTINUE key is pressed, the counter is instructed to make one measurement. The "GATE" light on the counter annunciator display should momentarily light, indicating that the gate was opened. Press CONTINUE three times to make three measurements. The counter is then taken out of HOLD and the "GATE" light will flicker, indicating continual measurements and updating of the display. The calculator will display "NOT HOLD" for this condition. Push CONTINUE to proceed to Test 9.
9	ACCUMULATE	This test checks the operation of the ACCUMULATE A+B and ACCUMULATE A-B modes of operation (rear panel switch). The counter is placed in START and counts the check signal. Since the counter is in START and CHECK, the 100 MHz check signal is counted by both the event scaler (register) and time scaler (register). The display shows the sum of these two registers A+B. Push CONTINUE and the counter is placed in STOP and A-B. The counter displays the difference of these two registers (should be Ø). Push CONTINUE after visual verification of proper operation.

Step	Test	Description
10	OUTPUT	This test checks the operation of the output modes "WAIT until addressed" and "ONLY IF addressed". In the "WAIT until addressed" output mode, the counter waits in the output phase of the measurement cycle until a command to output is received. Consequently, the display cycle is not entered and the counter display will be blank. Push CONTINUE to select the "ONLY IF addressed" mode. In this mode, the output phase of the measurement cycle is bypassed until an output command is received. Hence, the display cycle is entered after each measurement and the counter display continues (START, A+B mode). Pushing CONTINUE causes the counter to output the current reading to the calculator which display the reading. The two displays should agree. Push CONTINUE and the calculator causes the counter to make and output 10 readings, each one momentarily displayed on the calculator. The last reading is held in both displays. Push CONTINUE and END OF TEST will be displayed.
11	TRIGGER LEVEL	This test check the interface's ability to correctly set the trigger levels. Connect a DVM to the rear panel CHAN A TRIG LVL jack and press CONTINUE. As the program sets the trigger levels to different voltages, compare the programmed voltage displayed on the 9825A to the measured value displayed on the DVM. Accuracy = ±22 mV. Once CHAN A test is complete, connect DVM to CHAN B TRIG LVL jack and push CONTINUE. At the conclusion of Channel B tests, press CONTINUE to advance to Step 12.
12	SLOPE	This test checks the remote setting of the slope switches. Set the counter's front panel controls as described on the printout, and connect an input signal as shown below.



OSCILLOSCOPE TIME BASE: 0.2 ms/div

The slope switches are first set to A– and B +, which yields a measurement of 200 μs. The slope switches are then set to A+ and B–, which yields a measurement of 800 μs.

To repeat the program push RUN.

SAMPLE PRINTOUT

```
        5345A OPT 012
          HP-IB Test

----------------


1-GATE TIME TEST
Each GATE TIME
code is
automatically
sent to 5345A.
Check Mode set.
Output verified.


2-FUNCTION TEST
Plug-in
Frequency
Period
Ratio
Time Interval
Start
Stop


3-FREQ MULT
SUFFIX TEST
Function=Freq.
Each MULT SUFFIX
is automatically
sent to 5345A
Check mode set.
Output verified
and displayed
on the 9825A.


4-DECIMAL POINT
TEST (FREQ MODE)
Each DISPLAY
POSITION code
is automatically
sent to 5345A
Check mode set.
9825A shows
position of
the dec point
digit 10 on left
digit 0 on right


5-PERIOD MULT
SUFFIX TEST
Function=Period.
Each MULT SUFFIX
is automatically
sent to 5345A.
Check mode set.
Output verified
and displayed
on the 9825A.


6-INT/EXT GATE
     TEST
External Gate
Internal Gate


7-SAMPLE RATE
     TEST
Sample rate
 control
 bypassed.
Max Sample Rate


8-HOLD TEST
HOLD sent to
5345A. Send
Sample Trigger
Command each
time CONTINUE
is pressed.
Sample count is
dsplyd on 9825A.


9-ACCUMULATE
     TEST
A+B code sent
A-B code sent
```

SAMPLE PRINTOUT (Continued)

```
10-OUTPUT TEST
Wait 'til addrsd
Only if addrsd
*Takes 1 readng.
*Stops. When
*CONTINUE is
*pressed, takes
*10 more readngs
*and displays
*them on 9825A.
*Stops and
*displays the
*11th reading.


11-TRIG LVL TEST

A TRIGGER LVLS

 Connect DC volt
meter to rear pa
nel CHAN A TRIG
LEVEL BNC and
monitor trigger
level voltages.-


VOLTS-2.0 +-22mV
VOLTS       -1.50
VOLTS       -1.00
VOLTS       -0.50
VOLTS        0.00
VOLTS        0.50
VOLTS        1.00
VOLTS        1.30

B TRIGGER LVLS

 Connect DC volt
meter to rear pa
nel CHAN B TRIG
LEVEL BNC and
monitor trigger
level voltages.-


VOLTS-2.0 +-22mV
VOLTS       -1.50
VOLTS       -1.00
VOLTS       -0.50
VOLTS        0.00
VOLTS        0.50
VOLTS        1.00
VOLTS        1.30


12-SLOPE TEST

      SETUP:

Insert 1KHZ rep
rate,80 percent
duty cycle,0.5V
pulse centering
on zero volts
into CHNL A.
Set 5345A front
panel CHNLS A&B
switches to DC
coupling,COMA,X1
ATTEN,50 Ohm InZ
LEVELS A&B to
PRESET.-


CHNL A,-SLOPE
CHNL B,+SLOPE

Counter should
display approx
 200.0000 usec


CHNL A,+ SLOPE
CHNL B,-SLOPE

Counter should
display approx
800.0000 usec



END OF TEST
```

PROGRAM LISTING

```
0: dsp "5345A Opt012 Verification Test"
1: prt "  5345A OPT 012","    HP-IB Test    "
2: prt "----------------";spc 2
3: "code":wait 2000;ent "select code?",S
4: if S=721;dsp "error: calculator address";gto "code"
5: if S>730;dsp "out of address range→high";gto "code"
6: if S<700;dsp "out of address range→low";gto "code"
7: dim C$[40];dev "ctr",S
8: "1":prt "1-GATE TIME TEST","Each GATE TIME","code is","automatically"
9: prt "sent to 5345A.","Check mode set.","Output verified.";spc 2
10: wrt "ctr","I2E?I1"
11: 9→A;gsb "ECHK"
12: dsp "1 SEC GATE";beep;wait 3000
13: wrt "ctr","G?I1";8→A;gsb "ECHK"
14: dsp "100 MSEC GATE";beep;wait 2000
15: wrt "ctr","G>I1";7→A;gsb "ECHK"
16: dsp "10 MSEC GATE";beep;wait 1000
17: wrt "ctr","G=I1";6→A;gsb "ECHK"
18: dsp "1 MSEC GATE";beep;wait 1000
19: wrt "ctr","G<I1";5→A;gsb "ECHK"
20: dsp "100 USEC GATE";beep;wait 1000
21: wrt "ctr","G;I1";4→A;gsb "ECHK"
22: dsp "10 USEC GATE";beep;wait 1000
23: wrt "ctr","G:I1";3→A;gsb "ECHK"
24: dsp "1 USEC GATE";beep;wait 1000
25: wrt "ctr","G9I1";2→A;gsb "ECHK"
26: dsp "100 NSEC GATE";beep;wait 1000
27: wrt "ctr","G5I1";1→A;gsb "ECHK"
28: dsp "MIN GATE-Press CONTINUE";stp
29: if L=1;gto "1"
30: "2":prt "2-FUNCTION TEST";wrt "ctr","I2E?G?F2I1"
31: prt "Plug-in"
32: dsp "Verify 5345A display: 00000000000";stp
33: wrt "ctr","F0I1";1e8→A;gsb "READ"
34: prt "Frequency"
35: dsp "Verify 5345A: 100.00000 MHz";stp
36: wrt "ctr","F1I1";1e-8→A;gsb "READ"
37: prt "Period"
38: dsp "Verify 5345A: 10.000000 nSEC";stp
39: wrt "ctr","F5I1";1→A;gsb "READ"
40: prt "Ratio"
41: dsp "Verify 5345A: 1.0000000";stp
42: wrt "ctr","F3I1";prt "Time Interval"
43: dsp "Verify 5345A: 10.000000 nSEC";stp
44: wrt "ctr","F4I1";prt "Start"
```

PROGRAM LISTING (Continued)

```
45: dsp "Verify 5345A: Accumulating";stp
46: wrt "ctr","F6";prt "Stop";spc 2
47: dsp "Verify 5345A: Stopped acc'ltng";stp
48: if L=1;gto "2"
49: "3":prt "3-FREQ MULT","SUFFIX TEST","Function=Freq."
50: prt "Each MULT SUFFIX","is automatically","sent to 5345A"
51: prt "Check mode set.","Output verified","and displayed"
52: prt "on the 9825A.";spc 2
53: wrt "ctr","I2G?D;C3E?I1";11→A;gsb "PCHK"
54: dsp "000000000000.MHZ*";beep;wait 3000
55: wrt "ctr","C4I1";9→A;gsb "PCHK"
56: dsp "100000000.HZ*";beep;wait 3000
57: wrt "ctr","C5";6→A;gsb "PCHK"
58: dsp "100000.KHZ*";beep;wait 3000
59: wrt "ctr","C6";3→A;gsb "PCHK"
60: dsp "100.MHZ";beep;wait 3000
61: wrt "ctr","G5D0C7";0→A;gsb "PCHK"
62: dsp ".1 GHZ--Press CONTINUE";beep;stp
63: if L=1;gto "3"
64: "4":prt "4-DECIMAL POINT","TEST (FREQ MODE)"
65: prt "Each DISPLAY","POSITION code","is automatically"
66: prt "sent to 5345A","Check mode set.","9825A shows"
67: prt "position of","the dec point","digit 10 on left"
68: prt "digit 0 on right";spc 2
69: wrt "ctr","I2G5E?C7D1";10→A;fxd 0
70: gsb "ECHK"
71: beep;dsp "5345A digit # ",A;wait 1000
72: wrt "ctr","D2";9→A;gsb "ECHK"
73: beep;dsp "5345A digit # ",A;wait 1000
74: wrt "ctr","D3";8→A;gsb "ECHK"
75: beep;dsp "5345A digit # ",A;wait 1000
76: wrt "ctr","D<";7→A;gsb "ECHK"
77: beep;dsp "5345A digit # ",A;wait 1000
78: wrt "ctr","D=";6→A;gsb "ECHK"
79: beep;dsp "5345A digit # ",A;wait 1000;wrt "ctr","D>";5→A;gsb "ECHK"
80: beep;dsp "5345A digit # ",A;wait 1000;wrt "ctr","D?";4→A;gsb "ECHK"
81: beep;dsp "5345A digit # ",A;wait 1000;wrt "ctr","D8";3→A;gsb "ECHK"
82: beep;dsp "5345A digit # ",A;wait 1000;wrt "ctr","D9";2→A;gsb "ECHK"
83: beep;dsp "5345A digit # ",A;wait 1000;wrt "ctr","D:";1→A;gsb "ECHK"
84: beep;dsp "5345A digit # ",A;wait 1000;wrt "ctr","D;";0→A;gsb "ECHK"
85: beep;dsp "5345A digit # ",A,"--PRESS CONT";stp
86: wrt "ctr","I0"
87: if L=1;gto "4"
88: "5":prt "5-PERIOD MULT","SUFFIX TEST"
89: prt "Function=Period.","Each MULT SUFFIX","is automatically"
```

PROGRAM LISTING (Continued)

```
90: prt "sent to 5345A.","Check mode set.","Output verified"
91: prt "and displayed","on the 9825A.";spc 2
92: wrt "ctr","I2F1G?D1C3E?I1";10→A;gsb "ICHK"
93: dsp ".00000000 0KSEC*";beep;wait 2000
94: wrt "ctr","C4I1";7→A;gsb "1CHK"
95: dsp ".0000000100SEC";beep;wait 2000
96: wrt "ctr","C5I1";4→A;gsb "1CHK"
97: dsp ".0001000000MSEC";beep;wait 2000
98: wrt "ctr","C6I1";1→A;gsb "1CHK"
99: dsp ".0100000000USEC";beep;wait 2000
100: wrt "ctr","C7D3I1";2→A;gsb "ICHK"
101: dsp "10.000000 NSEC--Press CONTINUE";beep;stp
102: if L=1;gto "5"
103: "6":spc 1;prt "6-INT/EXT GATE","     TEST"
104: wrt "ctr","I2G?G?E;I1";0→A
105: prt "External Gate"
106: dsp "Verify 5345A: 00000000000";stp
107: wrt "ctr","E3";1e3→A;gsb "READ"
108: prt "Internal Gate";spc 2
109: dsp "Vrfy 5345A: 100.00000 MHz Gating";stp
110: if L=1;gto "6"
111: "7":prt "7-SAMPLE RATE ","     TEST"
112: wrt "ctr","I2G<E<?";prt "Sample rate"," control"," bypassed."
113: dsp "Verify 5345A: Blank MHz & GATE";stp
114: wrt "ctr","E4";prt "Max Sample Rate";spc 2
115: dsp "Vrfy 5345A: 100.00 MHz Gating";stp
116: if L=1;gto "7"
117: "8":prt "8-HOLD TEST"
118: prt "HOLD sent to","5345A. Send","Sample Trigger","Command each"
119: prt "time CONTINUE","is pressed. ","Sample count is","displyd on 9825A.
120: spc 2
121: wrt "ctr","I2E?G?"
122: wrt "ctr","E9" dsp "Verify 5345A: 100.00 MHz No GATE";stp
123: wrt "ctr","J1";beep;dsp "SAMPLE 1--Press CONTINUE";stp
124: wrt "ctr","J1";beep;dsp "SAMPLE 2--Press CONTINUE";stp
125: wrt "ctr","J1";beep;dsp "SAMPLE 3--Press CONTINUE";stp
126: wrt "ctr","E1";dsp "NOT HOLD--Verify 5345A: gating";stp
127: if L=1;gto "8"
128: "9":spc 1;prt "9-ACCUMULATE","     TEST"
129: wrt "ctr","I2F4E?1=G?I1"
130: prt "A+B code sent"
131: dsp "Verify 5345A: Accumulating":stp
132: wrt "ctr","F6E7";0→A;gsb "READ"
133: prt "A-B code sent";spc 2
134: dsp "Verify 5345A: 00000000000";stp
135: if L=1;gto "9"
```

PROGRAM LISTING (Continued)

```
136: "10":prt "10-OUTPUT TEST";wrt "ctr","12E4E?:15G?11"
137: prt "Wait 'til addrsd"
138: dsp "Verify 5345A: Blank & GATE";stp
139: wrt "ctr","E2I1";prt "Only if addrsd"
140: dsp "Verify 5345A: accumulating";stp
141: prt "*Takes 1 readng.","*Stops. When","*CONTINUE is","*pressed, takes"
142: prt "*10 more readngs","*and displays","*them on 9825A.","*Stops and"
143: prt "*displays the","*11th reading.";spc 2
144: wrt "ctr","F6";red "ctr",A;cmd 7,"_";fxd 0
145: dsp "Verify 5345A:",A;stp
146: wrt "ctr","12E?:AI1";0→A
147: wait 1000;wrt "ctr","F6";red "ctr",A;cmd 7,"_";dsp A:beep
148: wait 1000;if (A+1→A)>9;gto +2
149: wrt "ctr","F4";gto -2
150: fxd 0;dsp "Verify 5345A:",A;stp
151: if L=1;gto "10"
152: "11":prt "11-TRIG LVL TEST";spc 1
153: prt "A TRIGGER LVLS";spc 1
154: prt " Connect DC volt","meter to rear pa"
155: prt "nel CHAN A TRIG","LEVEL BNC and"
156: prt "monitor trigger","level voltages.-";spc 2
157: dsp "A TRIGGER LVLS-PRESS CONTINUE";stp
158: wrt "ctr","A000I1"
159: dsp " -2.00 VOLTS";prt "VOLTS-2.0 +-22mV";wait 3000
160: fmt 1,"A",f.0,"I"
161: for I=125 to 750 by 125
162: wrt "ctr.1",I
163: I/250-2→T;fxd 2
164: dsp T,"VOLTS";prt "VOLTS",T;wait 3000
165: next I
166: wrt "ctr","A825I1"
167: dsp "1.30 VOLTS";prt "VOLTS        1.30";spc 1;wait 3000
168: prt "B TRIGGER LVLS";spc 1
169: prt " Connect DC volt","meter to rear pa"
170: prt "nel CHAN B TRIG","LEVEL BNC and"
171: prt "monitor trigger","level voltages.-";spc 2
172: dsp "B TRIGGER LVLS-PRESS CONTINUE";stp
173: wrt "ctr","B000I1"
174: dsp " -2.00 VOLTS";prt "VOLTS-2.0 +-22mV";wait 3000
175: fmt 1,"B",f.0,"I"
176: for I=125 to 750 by 125
177: wrt "ctr.1",I
178: I/250-2→T;fxd 2
179: dsp T,"VOLTS";prt "VOLTS",T;wait 3000
180: next I
```

PROGRAM LISTING (Continued)

```
181: wrt "ctr","E825I1"
182: dsp "1.30 VOLTS";prt "VOLTS        1.30";spc 2;wait 3000
183: dsp "TRIGGER LVL TEST-PRESS CONTINUE";beep;stp
184: if L=1;gto "11"
185: "12":prt "12-SLOPE TEST";spc 3;dsp "SLOPE TEST"
186: prt "      SETUP:      "
187: prt "Insert 1KHZ rep","rate,80 percent"
188: prt "duty cycle,0.5v","pulse centering","on zero volts"
189: prt "into CHNL A.","Set 5345A front","panel CHNLS A&B"
190: prt "switches to DC","coupling,COM A,X1"
191: prt "ATTEN,50 ohm In2","LEVELS A&B to","PRESET.-";spc 2
192: dsp "SETUP-PRESS CONTINUE";stp
193: wrt "ctr","I2F3G>5>0A5C0>500"
194: prt "CHNL A,-SLOPE","CHNL B,+SLOPE";spc 1
195: prt "Counter should","display approx"
196: prt " 200.0000 usec";spc 2
197: dsp "CHNLS A-,B+ PRESS CONTINUE";stp
198: wrt "ctr","E68I1"
199: prt "CHNL A,+ SLOPE","CHNL B,-SLOPE";spc 1
200: prt "Counter should","display approx"
201: prt "800.0000 usec";spc 2
202: dsp "CHNLS A+,B- PRESS CONTINUE";stp
203: if L=1;gto "12"
204: "END":spc 2;prt "END OF TEST";dsp "END";spc 4;stp
205: "ECHK":wait 50;69→R;-2→C
206: gsb "CNT"
207: wrt "ctr","I1"
208: ret
209: "PCHK":wait 50;46→R;-1→C
210: gsb "CNT"
211: wrt "ctr","I1"
212: ret
213: "ICHK":wait 50;49→R;-2→C
214: gsb "CNT"
215: wrt "ctr","I1"
216: ret
217: "CNT":rdb("ctr")→B
218: if B=R;gto +2
219: C+1→C;gto -2
220: if A≠C;prt "ERROR C=",C,A
221: ret
222: "READ":wait 50;red "ctr",C;red "ctr",C
223: if A≠C;prt "ERROR"
224: wrt "ctr","I1"
225: ret
226: end
*b442
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