NOTE:

The issue state shown in the table below is the issue of the complete specification. Any changes to individual sheets must be made via RFA (MI) action, the serial number of which must be noted below and the complete specification re-issued.

Compiled: .....W H Gardiner..... **Date:** .....29.10.83.....

Approved: Geoff Lockhurst..... **Date:** 10 FEB 94.....

Issue	Date	MI
A	29 March 1984	-
B	01 November 1984	1150
C	09 May 1985	1169
D	23 June 1986	1185
E	03 November 1987	1202
F	10 March 1988	1216
G	23 January 1989	1224
H	07 March 1989	1227
J	09 February 1994	1250

164

7081 MAIN TEST SPECIFICATION

SECTION 1	ATE/PROMS
SECTION 2	BOARD 14 test in known-good unit
SECTION 3	BOARD 6 test in known-good unit
SECTION 4	Assembly check
SECTION 5	PSU + Digital checks
SECTION 6	Analogue checks
SECTION 7	Automated checks
SECTION 8	System performance
SECTION 9	SOAK, FINAL CALIBRATION

7081 TEST SPECIFICATION

Equipment required :

SECTION 1	data I/O programmer type TG 70816002 NVM test box	
SECTION 2	8032 PET + GPIB cable	
SECTION 3	oscilloscope (20 MHz bandwidth) 7060 voltmeter 5101 calibrator 8032 PET + GPIB cable	
SECTION 4		
SECTION 5	variac transformer 7060 voltmeter 8032 PET + GPIB cable SILENT 700 + RS232 cable	HP5135A frequency counter
SECTION 6	HP5135A frequency counter Oscilloscope (20MHz) 240V/400Hz PSU 7060 C or 7060G DVM	8032 PET + GPIB cable
SECTION 7	8032 PET + 3 GPIB cables 5101 Calibrator 7060 Voltmeter 10mΩ plug	10MΩ resistance PET-MINATE cable calibration cover Short circuit plug
SECTION 8	1K resistor 1MΩ resistor	240V a.c. main source 1kV d.c. calibrator 1kV a.c. calibrator

SECTION 1

7081 TEST SPECIFICATION

1. ATE

P.C.B.	1	3	14	5	6	8
In-Circuit		/	/	/	/	
Functional		/		/		
Know-good Unit	/		/		/	

2. PROMS

P.C.B. 14 5 off 2564/2764 in sockets 404/5/6/7/30

P.C.B. 5 1 off 2564/2764 in socket 802

PROMS includes identification labels when blown

Use 70815001 procedure for blowing PROMS

IC 412 = 7081 05XX
IC 413 = 7081 04XX
IC 414 = 7081 03XX
IC 415 = 7081 02XX
IC 430 = 7081 01XX
IC 802 = 7081 51XX

Where XX is status and issue of PROM

3. NVMS

NVMS (IC804 PCB5, ER3400, 510005600) to be initialised using TG 70816002

BOARD 14 CHECK SECTION 2

1. Check the following links are made : 2, 4, 6, 8, 16.

2. Check that Board 14 is connected to the following :-

Board 3	by PL1
GPIB socket	by SK412
Board 8	by SK414

3. Power up. Display should say "INITIALISED"

   Power down

   Power up. Display should say "RESUMED"

   (assumes a fully calibrated Bd5)

   Press "INITIALISE" key on front panel.
   Display should say "INITIALISED"

4. Set address switch to address 0. Press initialise key followed by local key when the display should say address 0. Change the address switch to 31. Press initialise key followed by local key when the display should say address 31. Board 14 test is now complete.

(all measurements are relative to OV "MYTCHETT")

1. Fit the board 6 under test into the 7081 test unit.

2. Power up and connect an oscilloscope to TP402 "Chopper Output". The spikes should be <2V peak and the noise <0.5V pk.

3. main Amplifier Offset.

   Monitor the dc level at TP 403 "Demod O/P". This should be between ±10V.

4. DC Ranges

   Apply inputs of 0.1V, 1V, 10V, 100V, and 1000V on the appropriate ranges, checking that the scaling is correct on each range.

5. A.C. Offset Voltage

   Monitor the dc level at TP705 "Buffer O/P" on the 100mV ac range. Adjust RV701 for a minimum value between ±100μV.

6. AC Balance

   Apply inputs of 1V 1KHz on the 1V ac range and then monitor the waveform at TP752 "Chopper Balance". Adjust RV751 "balance" for the flattest trace.

7. AC Ranges

   Apply inputs of 0.1V, 1V, 10V and 100V on the appropriate ranges checking that the scaling is correct on each range.

8. AC Linearity

   Apply 1V, 1KHz, on the 1V ac range

   a) and normalise the reading to 1.00000V by adjustment of the vernier on the ac calibrator.

   b) reduce the input to 0.1V and adjust RV755 for a reading of 0.10000V.

   c) repeat a) and b) as necessary until both are correct.

   d) change the input to 0.5V and check the reading is 0.5000V ±3 bits

   AC High Frequency Checks

a) Apply an input of 1V 100KHz on the 1V ac range and adjust RV752 for a reading of 1.00000V ±20 bits.

b) Change the frequency to 1MHz and adjust RV753 for a reading of 1.00000V ±200 bits.

c) Repeat a) and b) until both are correct.

ASSEMBLY CHECK SECTION 4

1. Check Board 3 links 1, 3, 4, 5, 6, 7, 8 are all made

2. Check Board 5 (15) Split pads 201, 202
501
801, 802, 803, 804, 805, 806, 807, 808, 809
901, 902, 903, 904,

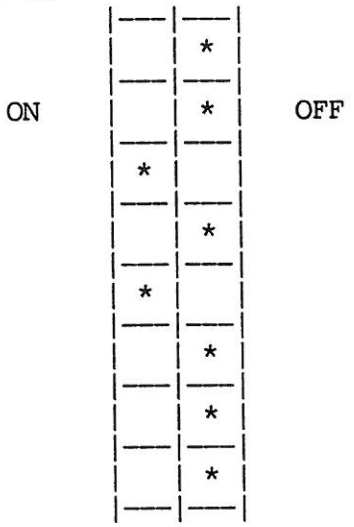
are all made

3. Set Main selector to 240V. Check fuse is 200mA.

4. Set GPIB address to 18 :

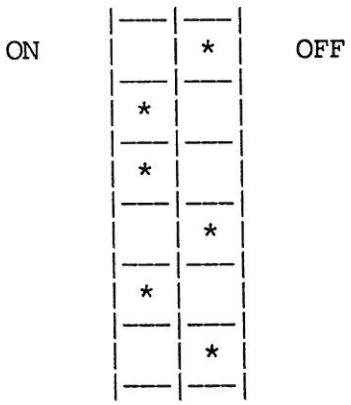
	*			*			*	ON
*		*	*		*	*		OFF

5. Set Board 3, S1



Check the shorting clip has been removed from TR2.

Set Board 5, S1 as follows:-



6. Check the following are connected to Board 3:-

RUN/CAL switch	by	PL3
Keyboard	by	PL2
Board 1	by	PL6
Board 5	by	SK51
RS232 Socket	by	PL5
Minate Socket	by	PL4
Transformer	by	PL51, PL52
Beeper	by	TP3, TP4
OV earth	by	TP53

7. Check the following are connected to Board 14:-

Board 8	by	SK414
GPIB socket	by	SK412
Board 3	by	PL1

8. Check the following are connected to Board 5 (15):-

Board 3	by	SK 901

Also check that the orientation of IC801 and IC802 is correct, as the orientation is the reverse of all other ICs. Check that shorting clips are removed from TR203, TR204, TR603, TR605, TR610.

9. Check the following are connected to Board 6:-

Board 5 (15)	by	PL501, PL502, PL504
Ratio socket (high, Low,	by	PL603 TL1 TL2)

1. Connect 7081 power input to a variac, and gradually increase the input to 240V.

   "CAL INCOMPLETE" should be displayed - but other possible messages which are also acceptable are :

   "INITIALISED" or "RESUMED"

2. Check there are no missing or additional display segments.

3. Check keyboard operation by pressing each key and listening for a "beep".

   Check LED annunicators work.

   Press "INITIALISE" then "DIG FILT" :- COMPUTE LED should come on.

4. Connect the instrument to a variac source, fist set for 216V, then 264V and check each of the following test point voltages is in range, using a 7060 voltmeter:-

Board 3	Measure accross:-	Low Mains Limit Not less than	High Mains Limit Not greater than
	TP55-TP54	22	35
	TP55-D53 cathode	4.75	5.25
	TP53-TP56	22	35
	TP53-IC52 pin 2	38	44
	TP53-D58 cathode	4.75	5.25
	TP53-D60 cathode	11.0	13.0
	TP53-D61 anode	-11.0	-13.0
	TP53-D59 cathode	5.3	5.9
Board 5	Measure accross:-		
	TP903 D904 cathode	29	45
	TP903 TP901	25.6	28.4
	TP903 TP902	14.2	15.8
	TP903 TP904	-14.2	-15.8
	TP903 TP906	-25.6	-28.4
	C609	36	53
	TP604-TP606	35	39
	TP604-TP603	-23.7	-26.3

5. Connect normal 240V a.c. mains power (increase mains from zero using a variac each time).

   Measure across TP55, TP54 and check that the voltage does not fall below 22V with 198V a.c. input on the 220V a.c. setting.

   Change fuses to 400mA and repeat for 108V a.c. input on the 120V a.c. setting and 90V a.c. input on the 100V a.c. setting.

   Replace fuse with 200mA and return to 240V setting.

6. RS232 Port

   Connect a SILENT 700 to the RS232 port.

   SET NUM, LOW SPEED, HALF DUP switches OFF
   ON LINE switch ON

   Type : OUT, RS, ON: MEAS, SING (carriage return)

   One result should be printed out.

7. Set up the Non-Volatile clock.

   Connect frequency counter ground to board 3 TP2 and probe TP1.

   Adjust C3 for a frequency in the range of

   32767.98 to 32768.02 Hertz (± 1 sec/month)

   Set up date by typing

   DATE = 10, 11, 1987 (carriage return)
   (for example 10th November 1987)

   Set up the time by typing

   TIME = 14, 22 (carriage return) (for example 14:22)

   Check the values have been accepted by typing :

   TIME? : DATE? (CARRIAGE RETURN)

   Time and date should be printed out
   Press "INITIALISE" on front panel.
   Display should return with "CAL INCOMPLETE".

SECTION 6

Analogue Checks

1. PLL locking to 50Hz.
   Using a high impedance voltmeter (eg. 7060) monitor voltage across C806. Voltage should settle to 2.5V ±0.3V.

   (Adjust C807 to correct if necessary).

2. Reference Voltage

   Connect a 7060 (Vdc) between TP302 (+10V) and
   TP303 (-10V)

   Link LK301 and LK302 as necessary:-

Voltage	LK301	LK302
19.7 - 20V	OPEN	OPEN
20 - 20.31V	OPEN	BRIDGED
20.31 - 20.63	BRIDGED	OPEN
20.63 - 20.96	BRIDGED	BRIDGED

3. Check the operation of the zener current d.a. Connect a 7060 to TP305 (OV) and TP301 "CURRENT". Switch to cal.

   Now type :

   CALIBRATE, ZENER, 064 (CARRIAGE RETURN)

   Press "INITIALISE" on the front panel.

   The 7060 should read <10mV.

Now type :

CALIBRATE, ZENER, 124 (carriage return)
Press "INITIALISE" on the front panel
The 7060 should read -9.28V ±0.2V
Record voltage on test sheet.

4. Connect scope ground to OV (Board 5. (5V, 2mS, AUTO)
Connect probe to "GLUGS" TP204

Short circuit 7081 input.
The waveform should have a period of 6.25 mS

Type :

NINES, 3 (Carriage return)

When the period should reduce from 6.25 mS to 1.56 mS

Set scope to (5V 100ns, AUTO)

Check that each edge has a rise or fall time of <300ns

Check that the gap time is 40μs ± 6μsec

Type : Nines, 6 (carriage return)

5. Apply approximately 10V to the input and adjust this voltage until the reading is 10.00000V.

Connect an 82KΩ ± 1% resistor between the junction R351/352 (TP306) and ±10V reference (TP302). The reading should lie within the range 9.986 to 9.994 volts.

Connect an 82 KΩ ± 1% resistor between the junction R351/352 (TP306) and -10V reference (TP303). The reading should also lie within the range 9.986 to 9.994 volts.

SECTION 7

Automated Checks

1. Use program specification number 70815503.

2. The Zener current is set up according to the colour code or other means of identification on the Zener. The figures given are for R304=3K0.

3. Minate interface - response to a hardware trigger is checked. The eight channel select lines are checked for correct functioning.

4. Non-Volatile clock - The date and time are read from the voltmeter.

5. Test Modes

TEST 0	limit = ± 20μV
TEST 10	limit = 10V - 10.2V
TEST KΩ	limit = 165k - 168k
TEST AC	limit = 101mV - 107mV

6. Input clamping - The clamping voltage for 20nA input current is measured. The value for both polarities must lie between 15.2V and 17.0V.

7. Input current - Input currents measurent limit = ±25pA

8. Input impedance - The input impedance is measured. It must be greater than 10^11 ohms.

9. Open circuit ohms voltage - Measured on the 10K range, limits +15V - +18V.

10. Reversal check - 10V, 1V and 100mV ranges are checked for reversal using the calibrator limit = 50 ppm maximum.

11. Linearity check - 10V is applied to 7081, then the input leads reversed. After taking into account zero effect, the difference must be less than 2 ppm.

12. Cal/Run switch - This is checked by response on the GPIB to a calibrate command, in each position.

13. Rear input check - Response on the GPIB to a change in the front/rear switch is checked.

    A 10KΩ resistance is measured using the front input, then the rear. The difference must be less than 3 ppm.

14 Zero check - The uncalibrated zeroes are checked.

d.c. limits are:

Range		
	100mV	5µV
	1V	6µV
	10V	30µV
	100V	600µV
	1000V	3000µV

a.c. limits are:

Range		
	100mV	0.4mV
	1V	0.4mV
	10V	40mV
	100V	40mV
	1000V	400mV

15 Uncalibrated gain:

Range	Input	Reading Min	Reading Max
100mV	100mV dc	0.10001	0.104
1V	1V dc	1.001	1.04
10V	10V dc	10.01	10.4
100V	100V dc	100.1	104
1000V	100V dc	100.1	104
100mV	100mV ac	0.1001	0.104
1V	1V ac	1.001	1.04
10V	10V ac	10.01	10.4
100V	100V ac	100.1	104
1000V	100V ac	100.1	104

16 Rounding - Correct truncation of a reading is checked for different integration times.

17 Settling - A measurement is made of +10V after a drift correct with -10V and a drift correct with +10V. The difference must be less than 2.6 ppm.

18 10V noise - The rms noise of 10 readings at 10V is measured. It must be less than 3µV.

19 10KΩ noise - the rms noise of 10 readings at 10KΩ is measured. It must be less than 3 milliOhms.

20. AC noise and linearity - the rms noise of 10 readings at 1V is measured. It must be less than 30μV.

    The reading with 0.2V input on the 1V range is taken. It must be within 30μV of 0.2V.

21. Zero calibration - All dc zeroes are calibrated.

22. Ratio - ratio is calibrated.

23. 10 Megohms - 10 meghoms range is calibrated.

24. 1000V dc - 1000V dc is calibrated

25. 1000V ac - 1000V ac range is calibrated with 750V 1KHz.

26. Vac + dc response on 1V range is also checked.
    Vac + dc response to 1V dc is checked, limit is 0.999V - 1.001V.

AC Checks Use a Fluke Calibrator

A top cover should be fitted to the 7081, and then powered up for at least 1 hour.

1. Select AC mode and apply 1V, 1KHz to 7081 on 1V range and normalise the reading by adjustment on the Fluke calibrator.

2. Apply 1V, 100KHz and adjust RV752 pcb 6 for a reading of 1.00000V ± 20bits.

3. Apply 1V, 1MHz and adjust RV753 pcb 6 for a reading of 1.00000V ± 200 bits.

4. Repeat 2 and 3 until both are correct.

5. Apply 100mV, 1MHz on the 100mV range and check the reading is 100.000mV ± 1,000 bits. If necessary share the error with 1V range.

6. Apply 10V, 1MHz, on the 10V range and adjust C706 pcb 6 for a reading of 10.0000V ± 1,000 bits. It may be necessary to adjust the position of R703.

7. Apply the inputs shown in the table below, checking the readings are within the limits given. Select the filter below 1KHz and use the 6 x 9 display. Normalise the reading at 1KHz on each range except at the 10 mV level.

Input	Range	10Hz	1K	10K	100K	(200K, 600K, 1MHz)
100mV	100mV	±58	Norm	±12	± 60	±2400
10mV	100mV	±13	± 7	± 7	± 44	±1500
1V	1V	±58	Norm	±12	± 60	±2400
10V	10V	±58	Norm	±19	± 90	
100V	100V	±68	Norm	±24	±240	

8. AC common MR - Select DC AUTO. Use test box and apply 240V AC common mode when the reading on the 7081 should not exceed 24μV.

9. DC common MR - Select DC auto. Connect a 1Megohm between input low and high and apply high to 500V DC. Check that the reading does not exceed 50mV.

10. Ohms protection - Select Ω, 10K and 6 x 9. Apply a 10KΩ standard resistance to the 7081 and check that the readings obtained on both ohms and true ohms are within 10 bits. Select Ω and note the reading with 10KΩ applied. Remove the 10KΩ and apply 240V mains from the test box for ten seconds.

    Apply the 10KΩ resistance again when the reading should be within 10 bits.

11. Auto range check - Select DC auto. Change the input between OV and -300V checking that the 7081 upranges correctly to the 1000V range. repeat the test between 0V and +300V.

12. 1000V Transient input - Select DC auto. Apply a 1000V step function from the test box and check that the 7081 reaches the 1000V range correctly without restarting or breakdown in any way. Use 5ma current limit from voltage source.

13. Self test - Press self test on the 7081 and check that the sequence completes correctly with PASS indicated.

SECTION 9

1. Carry out 1.5kV flash test to Solartron specification 09/00/105-02. When complete stamp the route card.

2. The instrument is now ready for environmental checks using environmental test procedures 70818003 or 70818011.

3. After the instrument has been cased up, switch on and check that RESUMED is displayed. Check the SELF TEST mode and that PASS is displayed. When satisfactory set the address switch for address 18. Finally enter the serial number and day of entry to the calibration room on to a buff label and affix to the instrument panel. Stamp the route card final test entry.

4. Convey the instrument to the calibration room. Calibration to be carried out using final calibration procedure 70818004.

5. After sucessful completion of the Calibration Procedure, Final Inspection procedure 70818012 must be carried out prior to shipment.

Note:

The issue shown in the table below is the issue of the complete specification. Any changes to individual sheets must be made via RFA (MI), the MI number must be noted below and the complete specification re-issued.

Compiled... W.H. Gardiner ..... Date.. 11-10-84 ....

Approved... J.A. Murphy ..... Date... 14/1/89 ....

Issue	Date	MI No.
A	29.03.84	-
B	01.11.84	7081/1150
C	24.06.86	7081/1185
D	04.12.87	7081/1206
E	23.01.89	7081/1224
F	09.03.89	7081/1226

7071/7081 FINAL CALIBRATION PROCEDURE

Note: Final Calibration and Verification is performed with latest issue of program 70815506 Status A.

1. The instrument to be calibrated is to be put in the calibration room at 20°C, switched on, and left to stabilise for 7 days. A calibration cover must be fitted.

Note: Calibration of the instrument will involve removal from the soak rack and placement on the calibration bench. This operation MUST be carried out with the power removed for the shortest time; and ten minutes allowed before calibration commences.

When the INITIAL calibration of a 7081 or FINAL calibration of a 7071 is being carried out, it will be necessary after the AC high frequency adjustments have been made, to replace the calibration cover with the final one to be despatched with the 7071/81 on completion. However, after fitting the new top cover, recheck the 10V 1Mhz reading to ensure calibration is still within specification. If necessary, some small final adjustments may have to be made by removing, then replacing the new cover.

If the top cover is removed for any reason other than for AC checks above, a period of 12 hours minimum must elapse before any checking or recalibration is carried out.

2. To calibrate a 7081 use 'a)' on the program selection, "INITIAL CAL/VERIFY"

Note: Para. 3, 4, 8 and 9 should be carried out using the Fluke 10V standard and the Mann 10 Kohm resistance standard. Deviations should be recorded in p.p.m.

3. For the 7081 measure 10V and 10 Kilohms over 2 to 7 days and record the figures on the calibration sheet.

4. Over the next 14 days, carry out the above measurements at least twice and record the figures.

5. After a minimum of 21 days carry out a full "VERIFICATION ONLY" check 'b)' on the program selection and if the 7081 passes all limits, carry out a "FINAL CAL/VERIFICATION" check using 'd)'.
The FINAL calibration of the 7071/81 must be carried out using the input cable that will be supplied with the instrument.
After completion of the FINAL calibration, 1 copy of the calibration constants, and 2 copies of the final calibration certificate are required. The route card should then be stamped, and the tested input cable placed in the accessory bag. The 7071/81 is now complete.

6. If at any stage the 7081/71 becomes defective or if any of the verification limits are exceeded, reference must be made to the "HISTORY SHEET" (page 4) raised for each 7081/71 to record the action taken and decide the point of re-entry of the 7081/71 into the calibration cycle.

7. To calibrate a 7071 instrument use 'd)' "FINAL CAL/VERIFICATION" on the program selection.

8. After 24 hours, record the 10V and 10 Kilohms readings on the 7071 print sheet.

9. After a further 24 hours, measure the 10V and 10 Kilohms again and if within the specified limits the 7071 is now complete.

10. LONG TERM DRIFT CHECK

Hold back all 7081 instruments with a serial number ending in 0 (zero).

Re-verify these instuments, also recording the HF measurements as detailed on the verification sheet after 8 weeks and 13 weeks.

Produce 3 copies of the verification sheet for each verification and circulate :

1 for Marketing
1 for R & D
1 for file

After the 13 weeks, the verification sheets to be analysed, and if satisfactory, carry out 'd)' FINAL CALIBRATION on the program selection and pass as complete.

If any failures occur, refer to para. 6.

7071/7081 CALIBRATION ROOM HISTORY

7071

7 Days Min.

1 Date To Cal Room	2 Date Of Initial Cal	3 Weekly min Checks	4 Verification Date	5 Final Cal Date	Pass To
P	>7 Day	1 2 3 4 5	>21 Day	P	Q.C.

P=Pass
F=Fail

NB
Where a failure occurs the re-entry must be made on a new sheet.

If unit failing 2nd time it will be removed for rework and entered as a new instrument.

Fault Analysis

Out of Test Spec. limits on any of the below listed classifications.

1	2	3(1)	3(2)	3(3)	4
> 7days	2-7days	7-14days	14-21day	> 21days	

Failure affecting TC & Cal Precision Comps Etc	Failure affecting Cal only	Failure not affecting Cal or TC	Failure where verification limit is exceeded by more than 20%	Failure where verification limits are exceeded by less than 20%
Rep Environmental checks & return to 1 Fault:	Return to 2 Fault:	Return to point of failure Fault:	Problem must be diagnosed follow by return to 1 Fault:	Verify again after further 21 days and then compare the results. Forward to 5 or rework as necessary.

Environmental or 1

SOLARTRON CALIBRATION PROCEDURE

EQUIPMENT: 7081/7071

70818004