SPARK DIGITAL BOARD TEST PROCEDURE

1.0   PURPOSE AND SCOPE

This document describes the test procedure for verifying that the Spark digital board is functioning within specified parameters. All employees who have responsibility for testing this component are required to follow the instructions detailed in this procedure.

2.0   AFFECTED DEPARTMENTS

Manufacturing

3.0   REFERENCE DOCUMENTS

- Current revision schematics and assembly drawings for the digital board (A705.11, A705.21 or A706.11).
- Current SPARK & BLAZE user manual.

4.0   RESPONSIBILITIES & AUTHORITY

The technician has the following responsibilities and authority:
- Verify compliance of the product under test to specifications.
- Troubleshoot and correct product as required.
- Communicate concerns to the Supervisor of Quality Assurance.
- Request management review of product concerns.
- Follow established ESD standards.

5.0   DEFINITIONS

The term "digital board" will be used in this document to refer to board assemblies A705.11, A705.21 or A706.11.

6.0   SAFETY PRECAUTIONS

Safety glasses are required when soldering, lead clipping, or testing power supplies.

7.0   EQUIPMENT AND MATERIALS

- DC Power Supply.
- Spark Programming Cable (AVRISP mkII) or equivalent.
- IR Communications interface module (DVX008 IR Dongle) or equivalent.
- IRTest.exe Windows Software (In the Engineering Firmware folder for the Spark family).
- Current BLAZE Windows Software.
- Oscilloscope with DC Voltmeter and Frequency Counter or equivalent instruments.
- Computer (PC that is compatible with Windows ME, 2000, XP or later).
- Current revision digital board.

8.0   INSTRUCTIONS

8.1   Measure the Current Draw of the Digital Board

A. Setup the DC power supply with the voltage = 3V and the current limit = 1.0A (Do this if the power supply used has current limiting capability). Connect the power supply leads to the battery-input terminals of the digital board. Tin the terminals as necessary. If the digital board is drawing more than 10mA shut off the power supply and fix the problem before proceeding.

8.2   Load Firmware

8.2.1 Using AVRISP mkII (ATmega128 chip)

A.   To load firmware the AVRISP mkII programmer is connected to the PC using the supplied USB cable. Connect AVRISP mkII to the Spark Digital board using the constructed programmer cable.

B.   If not already installed, run the AVRCommandlineTools.exe in the SparkProgrammer folder on the shared network drive to install the programming software and drivers.

C.   Using the SparkProgrammer.exe tool found in the same directory, select proper Spark model. Only the most common models are listed. If another model version is needed click the IC icon to open it.

D.   NOTE: new boards with a blank ATmega128 chip require additional fuse bits to be programmed. Check the **New Chip** checkbox to program the fuse bits during the programming.

E.   Instruments with the ATmega103 chip cannot be programmed with this tool and must use the other programmer.

8.2.2 Using Kanda AVRISP-U (ATmega103 chip)

A. Connect the programming cable to the Spark Digital board's 20 pin connector, P1. Make sure pin 1 of the cable's male connector matches pin 1 of the digital board 20 pin female connector.

B. Set the power supply from 3.3V to 4.5V. Older ATmega103 chip may require higher voltage to properly program, adjust the power supply accordingly. Connect the power supply to the DC barrel connector of the programming cable.

C. Using AVRISP-U program supplied with the programmer:

- If not already selected, select AVRISP-U from the Hardware drop down menu.
- If not already selected, select ATmega103 from the Device drop down menu.
- Open the firmware file with **File > Load > Flash... (Ctrl+O)**
- Verify the Flash memory display is updated.
- Click on the **Fuses & Lock Bits** tab.
- Select **Mode 3 - No Further Reads or Writes** from the Lock bits drop down menu.
- If not already set, open the **Device -> Auto Program Options…** and ensure only the following check boxes are checked:
  - Reload Files
  - Erase Device
  - Program Flash Memory
  - Flash Verification
  - Program Lockbits
  - Run
- Program the chip with **Device > Auto Program (F5)**

Note: Some custom firmware versions have different part numbers. Refer to the custom firmware in the directory for these part numbers.

<u>If programming fails, or errors are reported, fix the problem before proceeding.</u>

Version 2.XX is located in the Engineering Firmware Directory\Spark

Model		Firmware
703	703-ATEX	703.a90
703+	703+-ATEX	703P.a90
704	704-ATEX	704.a90
705	705-ATEX	705.a90
705+, 705M+	705+-ATEX	705P.a90
706	706-ATEX	706.a90
706RC	706RC-ATEX	706RC.a90

NOTE: 2.XX is the currently released firmware version.

8.3 Setup the Digital Board for Communication with IRTest.exe

A. Setup the DC power supply with the voltage = 3.0V and the current limit = 1.0A. (Do this if the power supply used has current limiting capability). Connect the power supply leads to the battery-input terminals of the digital board.

B. Short pins 1 and 2 of the digital board 20 pin female connector in one of two ways:

- Use a jumper wire.
- Connect the digital board to an analog board. Use the analog board that this digital board will be paired with permanently.

This jumper wire or analog board will enable IR communications.

C. Refer to the SPARK/BLAZE user manual to configure com port settings for the IR communications interface module. Place the digital board in front of the IR interface module and open IRTest.exe.

Note: Steps 8.4 through 8.6 can be performed automatically with the SparkIRDigiTest.exe tool in the SparkProgrammer folder of the shared network drive.

8.4 Test the Digital Board Flash Data Memory

A. Verify that the data flash ICs are functioning properly by using the following commands in IR Test.
Send **R07** to test the data flash. The response should be as shown in the following table.

Model	R07 Response
704, 704-ATEX	0, 0
703, 703-ATEX	4194304, 0
703+, 703+-ATEX	
705, 705-ATEX	
705+, 705+-ATEX	
706, 706-ATEX	
706RC,706RC-ATEX	

If the response to the R07 command doesn't match the number shown in the table above, then memory is already being stored in the chips, or one or both flash ICs are not functioning properly (i.e. bad solder joint, bad IC, defective PC board, etc.).

If a number other than "0" is shown on the right, and the two numbers add to 4194304, there is data stored in memory. Repair any problems.

8.5   Program Digital Board Serial Number

A. Store the next available serial number in the digital board with following commands. The commands are sent via the IRTest.exe program.

   A.1   Send **R03** and verify that the current production firmware version has been loaded in the instrument.
   A.2   Send **u82xxxxx** – xxxxx is the serial number. The new serial number will be shown in the result window.
   A.3   Press the **Refresh** button on the IRTest program and verify that the serial number has changed to the desired number.
   A.4   Send **u42** to store the serial number in the micro-controller's EEPROM. If successful, a zero will show in the result window and the correct serial number will be showing.

   Specified Serial Number Ranges are found in the following table.

Product	Serial Numbers
703 version 1.XX	10000 – 10299
706 version 1.XX	00000 – 00299
Version 2.XX Products	
703	10300 – 11999
703-ATEX	12000 – 13999
703+	20000 – 23999
703+-ATEX	24000 – 29999
704	14000 – 15999
704-ATEX	16000 – 16999
705	30000 – 31999
705-ATEX	32000 – 33999
705+	40000– 41999, 44000– 49999
705+-ATEX	42000 – 43999
705M+	50000-50999
706	00300 – 03999
706-ATEX	04000 – 09999
706RC	17000 – 18999
706RC-ATEX	19000 – 19999

8.6 Verify the Real Time Clock Operation (Not necessary for 704)

A. Use the Windows Blaze software to set the time and date on the digital board. Connect to Blaze and set the instrument time to match the computer time (Synchronize to computer time).

B. Verify that the "Instrument time" is set and within a second of the "Computer time". If the instrument time does not set, or loses synchronization after a few seconds, fix the problem before proceeding.

C. Disconnect from Blaze.

8.7 Check IR Current Draw (Only required for 705 / 705+ (-ATEX))

A. With an analog board connected in Blaze, calibrate the unit and measure the current draw while calibrating. If the average current draw while calibrating is measured with an Agilent 34410A, or equivalent, is greater than the limits in the table below, replace the 4937.1R00 current limiting resistor with a 4937.5R10 resistor. (R4 on an A705.11 and R52 on an ATEX A705.21).

[Handwritten annotation: 9/27/18 — Not Allowed! — Alex Bloggerfy IsMay. — Replace IR transmir with one that has a lower current draw.]

Model	Power Supply		Maximum Allowed Average Current
	Voltage	Current Limit	
705	1.50V	500mA	61mA
705+			
705-ATEX	1.50V	500mA	62mA
705+-ATEX			

9.0 INSPECTION

No further inspection of the digital board is required at this time.

10.0 RECORDS

The serial number that was loaded into the digital board will be recorded when a serial record is created for this instrument.

11.0 DISTRIBUTION

This instruction is available electronically in the online Document Control area.

12.0 ATTACHMENTS

Not applicable to this procedure.

13.0   REVISION HISTORY

DCO #	REV	DATE	INITIALS	CHANGES MADE
	A	8/16/00	CBS	Initial Version
0540	B	5/19/03	CBS	Modified for new versions of AVRPROG.exe and IRTEST.exe
621	C	9/22/03	CBS	Added note to clarify meaning of version 1.XX and 2.XX
876A	D	6/23/05	EO	Updated to new procedure
1217A	E	7/6/09	DJ/KO	Changed the title of the document. Made document compatible with all digital boards (Including ATEX). Updated procedures to current process.
1299a	F	10/27/10	NR	Included 705M+ and firmware process updates. Added Blaze calibration current draw testing, to test for over current problems with IR.
1332	G	29Apr2011	AJR	Added instruction on using AVRISP mkII programmer. Added instructions regarding the programmer and firmware version differences for the ATmega103 vs the ATmega128 processors.
	H	25Oct2016	NR	Documented the SparkProgrammer tool and the AVRISP-U programming instructions for the ATmega128 and ATmega103 chips, respectively. Documented the SparkIRDigiTest tool. Clarified the Work instruction process.

H-1   27Sept2018   AB   *Temporary remove unapproved Resistor change pending DCO modification.*