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1. PURPOSE

The purpose of this Test Instruction is to detail how to perform the required tests in a safe and consistent manner.

2. SCOPE

The scope of this Test Instruction is to cover all activities relating to the testing of Electrical Assemblies detailed in the Title above.

3. DEFINITIONS AND ABBREVIATIONS

Term	Definition / Abbreviation
QMS	Quality Management System
ATE	Automated Test Equipment
UUT	Unit Under Test

4. ROLES AND RESPONSIBILITIES

Roles	Responsibilities
Operator	Ensure all aspects of this test instruction are adhered to and all equipment required to complete these tasks are within calibration.
Quality	Ensure that any records being generated by this document are retained for 15 years.

5. FORMS

Doc No:	Document Title
N/A	Not Applicable

6. RECORDS

Ref No:	Doc No:	Document Title	Location
QMS1	N/A	Test Results Database	Waters Servers

7. HEALTH & SAFETY

High Voltages (1500VDC) Present During ATE Test.

8. TESTING

8.1. Optical Inspection

8.1.1. Inspection

Tasks/Instructions

Full Automated Optical Inspection/Visual Inspection must be carried out.

*The *AOI program/Visual Inspection Documents are under the control of the supplier and can be changed as they require without informing Waters of these changes.*

8.2. In Circuit Testing

8.2.1. ICT Test

This section can not be started unless the Optical Inspection section detailed within this document has been completed satisfactorily.

Tasks/Instructions

*Full In Circuit Testing by *Bed of Nails must be carried out.*

*The*BON program is under the control of the supplier and can be changed as they require without informing Waters of these changes.*

8.3. Functional Testing – Programming Firmware

8.3.1. Functional Test 1 (FCT1)

This section can not be started unless the AOI and ICT sections detailed within this document have been completed satisfactorily.

8.3.1.1. Equipment Required

Equipment Description

PC – Set up and provided by Waters with additional keyboard (EPC keyboard)

+24V PSU (=>2A)

PICKit3 Programmer – Provided by Waters

Converter Communication Module PROTO-0712-29 – Waters part 210000947

Terminal Application for serial communication – e.g. Tera Term or Hyper Terminal using COMx (designated serial port)

Serial communication cables 2 off

Ethernet Cat 5e patch cable

USB flash drives – Provided by Waters (or use instruction document 48570 on how to create flash drives), QQ-Blind bios files and QQ VxWorks files contained in **361000626 Rev B**

Test Software + Firmware – Provided by Waters

Microchip MPLAB X IDE v3.26 Application Software – Installed and verified by Waters

PC USB power lead

8.3.1.2. Connecting the Equipment

Tasks/Instructions

Connect +24VDC from the bench top power supply to 24V_RAW and Ground to GND_RTN of the UUT (**do not turn power ON until instructed to do so**). Set the current limit (if available) on the PSU to ≥ 2 Amps.

Link the two mounting holes (one near J10 and the other near J18) using the provided grounding lead.

Connect the PicKit3 to one of the PC's USB ports.

8.3.1.3. Directing WatersFileService Services

Tasks/Instructions

Run the batch file **WDHCP_Restart_RegUpdate-Quoll.bat** from location; C:\KestrelDCC\

It is necessary to do this at least once for this particular batch run, regardless. Wait 60 seconds for services to start.

(Time required: 1 minute)

8.3.1.4. Downloading Firmware to U13

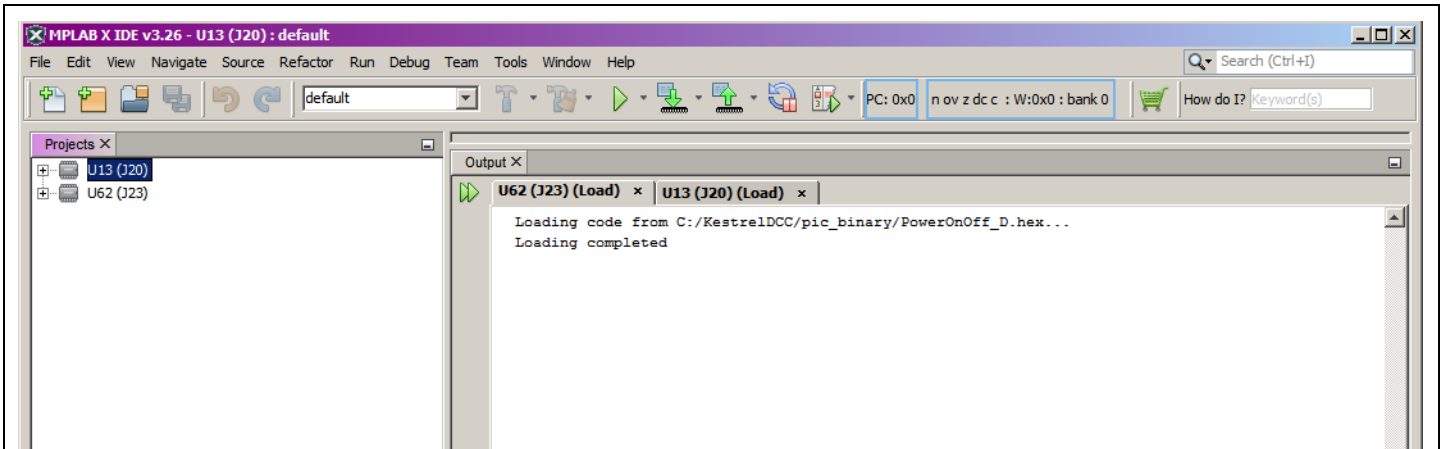
Tasks/Instructions

Connect PicKit3 to J20 (as shown below) of the UUT and switch on POWER.



Invoke MPLAB application. The application will be set up to program U13 and U62.

Application should start up to show below windows.



Highlight the Project [U13 (J20)] and press RUN [▶] key. This will program U13 with appropriate messages. Switch off the power to the UUT and remove PickKit3 from J20.

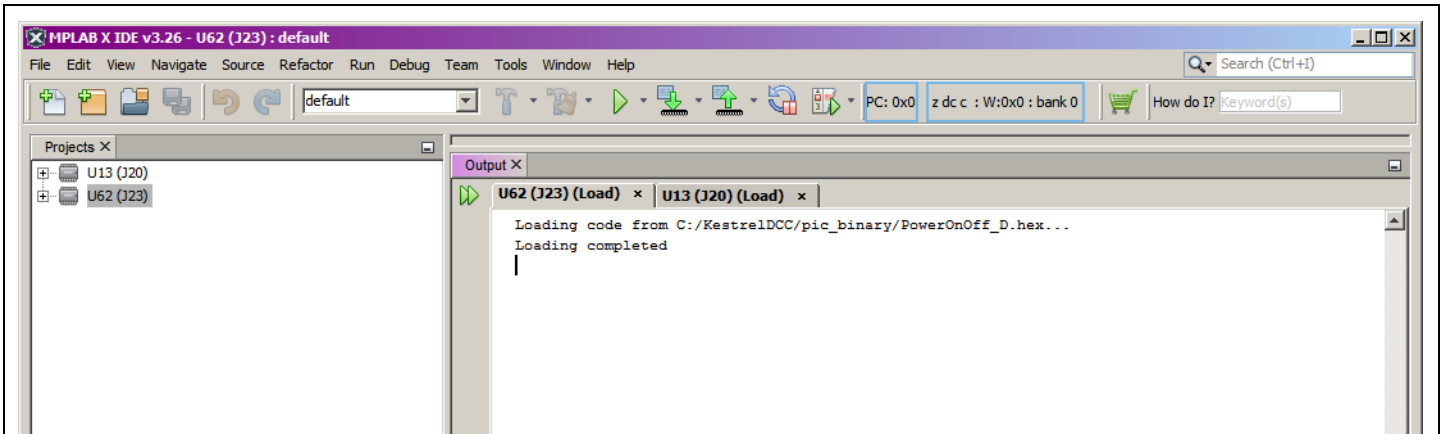
8.3.1.5. Downloading Firmware to U62

Tasks/Instructions

Connect the PickKit3 to J23 of the UUT, as shown below.



Ensure USB lead (provided) is connected to J12, as shown. The other end of this lead is connected PC USB port.



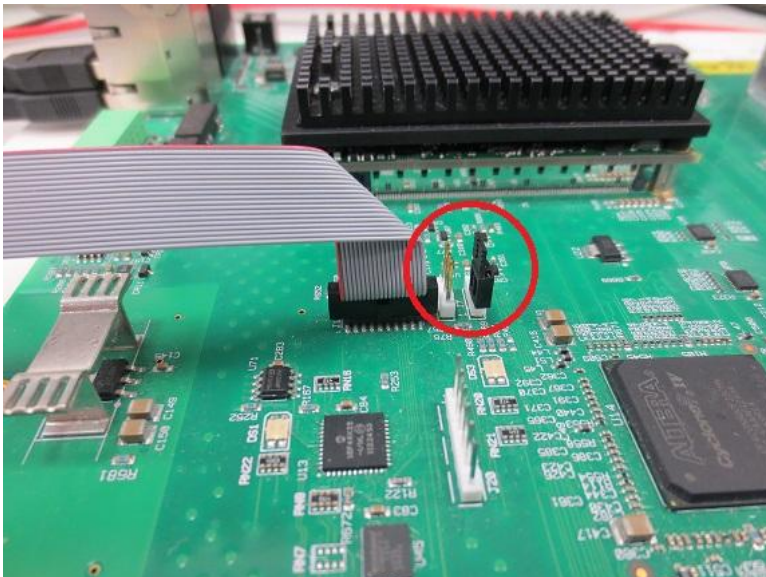
Highlight the Project [U62 (J23)] and press RUN [▶] key. This will program U62 with appropriate messages.
Remove PicKit3 from J23.

8.3.1.6. Downloading Firmware to FPGA

Tasks/Instructions

Run the batch file **FPGA_failsafe_H.bat** from location; C:\KestrelDCC\fpga_binary\ and follow the on screen instructions.

Ensure connections are made as shown below.



Note: - This will take a few minutes to complete. Make sure that "Image Sent Successfully" message appears on the console window at the end of the download.

8.3.1.7. Configuring the EPC

Tasks/Instructions

- If the EPC is NEW and UNCONFIGURED, continue from section 8.3.1.7.1.
- If the EPC has already been configured, complete instructions in [Appendix](#) and continue from section 8.3.1.7.2.

8.3.1.7.1. Configuring NEW UNCONFIGURED EPC

Tasks/Instructions

Custom BIOS:

Make sure the UUT is switched off

- Connect the **EPC Keyboard** and "**Quoll Quad Blind BIOS**" USB stick to J3 of the UUT
- Connect COMx from the PC to J18 of the UUT
- Fit a jumper link between pins 1 & 2 of J2
- Open TeraTerm from the desktop (make sure that the application is set-up as below)
- Port - COMx, Baud - 115200, Data - 8bit, Parity - none, Stop - 1bit, Flow Control - none
- Switch on power to the UUT and allow it to boot up
- D61 on the UUT will start to flash RED/GREEN for approximately 30 seconds
- Wait for another 30 seconds
- PRESS <ENTER> key TWICE on EPC keyboard**
- WAIT ANOTHER 2 MINUTES BEFORE POWERING OFF DCC**
- Remove "**Quoll Quad Blind BIOS**" USB stick

8.3.1.7.2. Partitioning Drive

Tasks/Instructions

Partitioning Drive:

Make sure the UUT is switched off

- Connect the "**Quoll Quad VxWorks**" USB stick to J3 of the UUT
- Switch on power to the UUT and allow it to boot up
- D61 on the UUT will start to flash RED/GREEN for approximately 35 seconds
- Following MAIN menu will appear in the Tera Term window

F2 = Setup F5 = Boot Menu 40

**FreeCom version 0.84-pre2 XMS_Swap [Aug 28 2006 00:29:00]
Booted FreeDOS succesfully from the USB port.**

```
Trying to redirect to the serial console.
- This line should appear on the serial console.
- USB boot of FreeDOS.
-
-----
- Welcome to FreeDOS. -
-----
This batch file is designed to configure the EPC on one of
the following assemblies...
- Quoll Kestrel DCC [210001039 or 210001115]
- Quoll Raven DCC [210001013]
- Quoll Harrier DCC [210001012]
- Beacon DCC [210001014]
Do not use to configure other assemblies unless
explicitly instructed to by Waters.
-
Main Menu
1 = Partition onboard drive
2 = Configure D: with VxWorks
3 = Reboot
4 = Exit to DOS
-----
[1,2,3,4]?
```

- Press "1" on **PC keyboard** to select "Partition onboard drive"

Note:

If prompted "GDISK (Q) A primary partition exists... create another YN", press "**N**" key on **PC keyboard**. Press "4" key to 'Exit to DOS' and type at prompt C:> "**gdisk**" to see all partitions.. Type at prompt C:> "**gdisk 2 /del /all**" to remove everything on **EPC**. ('**Disk 2**' refers to **EPC** partition) Reboot using <Ctrl-Alt-Del> keys on **EPC** keyboard and press "1" again on keyboard to partition drive.

...when complete, EPC will reboot and MAIN menu will appear

- Press "2" on **PC keyboard** to select "Configure D: with VxWorks"
... press "y" when message "That's hard disk! Are you sure (y/n)?" appears, wait for completion
- Press "3" on **PC keyboard** to select "Reboot" the EPC to display MAIN menu
- Press "4" on **PC keyboard** to select "Exit to DOS"
- Power down UUT
- Remove "**Quoll Quad VxWorks**" USB stick and **EPC** keyboard

8.3.1.8. Booting to VxWorks

Tasks/Instructions

Switch power OFF to the UUT

- **Make sure there is a jumper link fitted on pins 1 & 2 of J2 of the UUT**
- **Ensure there is no USB flash drive and keyboard in J3 of UUT**

- Connect the network port from the PC to J3 of the UUT
- Switch power ON to the UUT.
- Wait for UUT to boot up with D61 flashing RED/GREEN and make sure that the UUT has booted up to the prompt "->" in the TeraTerm window

Note:- The network connection may connect/disconnect a few times before any text will appear on the TeraTerm window. At the end of boot up, if the "->" prompt doesn't appear on TeraTerm window, press <ENTER> once to get the prompt "->"

- On TeraTerm, goto FILE->SEND FILE and select **ModeCheck.txt** from the location C:\KestrelDCC\
- Following message will be displayed:

—>diag_cli

0x3e51c48 (tShell0): pcieKestrelDrvOpen: Inside the Function...

Opened pcieSpi Driver File /pcieKestrel with fd : 11

cli: PCIe Device Access : Done

cli: Version = 0.1

Waters_EPC>>

Waters_EPC>>write 0x0018 0x70000002

write 0x0018 0x70000002

Address : 0x18 (24)

Data : 0x70000002 (1879048194)

Waters_EPC>>

Waters_EPC>>read 0xA1B4

read 0xA1B4

Address : 0xA1B4 (41396)

Data : 0x226 (550) ← ENSURE THIS NUMBER REPORTED IS 0x226

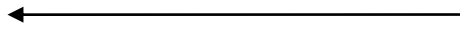
Waters_EPC>>

Waters_EPC>>read 0x0180

read 0x0180

Address : 0x180 (384)

Data : 0x4800 (18432)



ENSURE THIS NUMBER REPORTED IS 0x4800

Waters_EPC>>

Waters_EPC>>exit

exit

value = 0 = 0x0

—>

8.3.1.9. Updating PCIE Firmware

Tasks/Instructions

Make sure that "->" prompt is present on TeraTerm window

- On TeraTerm, goto FILE->SEND FILE and select **FPGA_runtime_V.txt** from the location C:\KestrelDCC\
- Wait until the update is complete - this will take a few minutes.
- On success, the following message will be displaced on the terminal window.

[=====]100%

Firmware successfully updated.

Note: - If the PCIE firmware is already up to date, this will be reported as "Firmware current and has not been updated". In this case further action is not required.

- Switch OFF power to the UUT
- Remove jumper link on J2
- Switch ON power to the UUT
- Wait for UUT to boot up with D61 flashing GREEN ONLY and make sure that the UUT has booted up to the prompt "->" in the TeraTerm window

Note:- The network connection may connect/disconnect a few times before any text will appear on the TeraTerm window. At the end of boot up, if the "->" prompt doesn't appear on TeraTerm window, press ENTER once to get the prompt "->"

- On TeraTerm, goto FILE->SEND FILE and select **ModeCheck.txt** from the location C:\KestrelDCC\
- Following message will be displayed:

—>diag_cli

0x38e1c20 (tShell0): pcieKestrelDrvOpen: Inside the Function...

Opened pcieSpi Driver File /pcieKestrel with fd : 11

cli: PCIe Device Access : Done

cli: Version = 0.1

Waters_EPC>>

Waters_EPC>>write 0x0018 0x70000002

write 0x0018 0x70000002

Address : 0x18 (24)

Data : 0x70000002 (1879048194)

Waters_EPC>>

Waters_EPC>>read 0xA1B4

read 0xA1B4

Address : 0xA1B4 (41396)

Data : 0x204 (516)

← ENSURE THIS NUMBER REPORTED IS 0x204

Waters_EPC>>

Waters_EPC>>read 0x0180

read 0x0180

Address : 0x180 (384)

Data : 0x5600 (22016)

← ENSURE THIS NUMBER REPORTED IS 0x5600

Waters_EPC>>

Waters_EPC>>exit

exit

value = 0 = 0x0

→

8.3.1.10. Programming Complete

If the UUT has failed one or more of the tests detailed in this section, the material is to be assessed and where appropriate reworked and retested/reprogrammed.

If the UUT has passed all tests detailed in this section, mark the board using suitable indicator.

8.4. Functional Test 2 (FCT2)

8.4.1. Functional Automated Test (Pre Conformal Coating)

8.4.1.1. Equipment Required

Equipment Number:	Equipment Description
TE82988-x	WAT2 (Waters Automated Tester) set and up ready for testing
279002953-x	Test Box/Fixture for testing UUT

8.4.2. Running ATE Test

Tasks/Instructions
Carefully Attach Test Fixture to WAT2, if not already done. Attach UUT inside Test Fixture as instructed and shown during ATE test. Run the Test Sequence which can be found in Start Program Files Waters Test Programs 210001115HVC Rev_B. Follow any on screen instructions during the test. Once testing is complete remove the UUT from the test box. If the UUT has failed one or more of the tests detailed in this section, the material is to be assessed and where appropriate reworked and retested/reprogrammed. If the UUT has passed all tests detailed in this section, mark the board using suitable indicator.

8.5. Functional Test 3 (FCT3)

8.5.1. Functional Automated Test (Post Conformal Coating)

8.5.1.1. Equipment Required

Equipment Number:	Equipment Description
TE82988-x	WAT2 (Waters Automated Tester) set up and ready for testing
279002953-x	Test Box/Fixture for testing UUT

8.5.2. Running ATE Test

Tasks/Instructions

Carefully Attach Test Fixture to WAT2, if not already done.

Attach UUT inside Test Fixture as instructed and shown during ATE test.

Run the Test Sequence which can be found in **Start|Program Files|Waters Test Programs|210001115|Rev_B.**

Follow any on screen instructions during the test.

Once testing is complete remove the UUT from the test box.

If the UUT has failed one or more of the tests detailed in this section, the material is to be assessed and where appropriate reworked and retested/reprogrammed.

9. SIGNING OFF

If the UUT has failed one or more of the tests detailed in this document, the material is to be assessed and where appropriate reworked. If a repair is required within the conformal coating area (see latest version of PCB Document 210001039.pdf) it must be re-conformal coated before retesting.

If the UUT has passed all tests detailed in this document please fill in the information box on the PCBA as per drawing below.

Test By	
Date	

Insert your name here

Insert date ALL tests completed here

If there is a label printed automatically from the test solution, please attach this label as per the latest drawings for the Unit Under Test found in SAP.

10. APPENDICES

10.1. Appendix 1

10.1.1. Re-configuring Configured EPC

Tasks/Instructions

- Boot up with **"Quoll Quad Blind BIOS"** USB stick and the following menus should appear

F2 = Setup F5 = Boot Menu 40

Remove disks or other media.

Press any key to restart ... (press <RETURN> on EPC keyboard once/twice to blank display and then display following)

EFI Shell version 2.31 [4660.22136]

Current running mode 1.1.2

Device mapping table

fs0 :Removable HardDisk - Alias hd33a0b0b blk0

Acpi(PNP0A03,0)/Pci(1D|0)/Usb(0,0)/Usb(1,0)/HD(Part1,SigA93BA547)

blk0 :Removable HardDisk - Alias hd33a0b0b fs0

Acpi(PNP0A03,0)/Pci(1D|0)/Usb(0,0)/Usb(1,0)/HD(Part1,SigA93BA547)

blk1 :BlockDevice - Alias (null)

Acpi(PNP0A03,0)/Pci(10|0)/Ctrl(0)

blk2 :Removable BlockDevice - Alias (null)

Acpi(PNP0A03,0)/Pci(1D|0)/Usb(0,0)/Usb(1,0)

Press ESC in 1 seconds to skip startup.nsh, any other key to continue.

startup.nsh> fs0:

startup.nsh> flash.nsh

+flash.nsh> fpt64.efi -f QuollQuad2

Intel (R) Flash Programming Tool. Version: 1.0.2.1062

Copyright (c) 2007 - 2013, Intel Corporation. All rights reserved.

Platform: Bay Trail

SpiLoadDevicesFile(fparts.txt)...

Reading HSFSTS register... Flash Descriptor: Valid

fs0:\>

--- Flash Devices Found ---

S25FL164K ID:0x014017 Size: 8192KB (65536Kb)

PDR Region does not exist.

Could not communicate with the HECI.

- Reading Flash [0x800000] 8192KB of 8192KB - 100% complete.

- Erasing Flash Block [0x721000] - 100% complete.

- Programming Flash [0x721000] 80KB of 80KB - 100% complete.

- Verifying Flash [0x800000] 8192KB of 8192KB - 100% complete.

RESULT: The data is identical.

FPT Operation Passed

- Press 'CTRL_ALT_DEL' keys on **EPC keyboard** to exit
- Power down UUT
- Remove "**Quoll Quad Blind BIOS**" USB stick

HISTORY PAGE

VERSION:	01	ORIGINATOR:	Sadiq Mohsin	DAR:	59237
COMMENTS: <i>New Document</i> This is a copy of 48492, only the part number has changed.					
VERSION:	02	ORIGINATOR:	Sadiq Mohsin	DAR:	61082
COMMENTS: This document revision changed to 02. Photo images added to aid programming. Section 8.4.2 – TSW call revision changed to 210001115HVC\Rev_B . Section 8.5.2 – TSW call revision changed to 210001115\Rev_B .					