# DigiShot® Ranger System
# UTM-00355 | Rev 2

## DigiShot® Ranger SVN 49945
## CE4 Tagger SVN 49945
## DigiShot® Detonator

APPROVED

# TABLE OF CONTENTS

*TABLE OF CONTENTS* ..... 2
*List of Figures* ..... 10
*List of Tables* ..... 10
1 USERS OF THIS MANUAL ..... 11
1.1. Purpose of this manual ..... 11
1.2. End User ..... 11
1.2.1. Requirements ..... 11
1.3. Training ..... 11
2 DigiShot® Ranger SYSTEM PRODUCT SAFETY ..... 12
2.1. DetNet Safety Philosophy ..... 12
2.2. User Safety ..... 12
2.3. Product Safety ..... 12
2.4. Equipment usage and handling ..... 12
2.5. Information in case of emergency ..... 13
2.6. Warning, Caution, and Note Statements ..... 14
2.7. Disclaimer ..... 14
2.8. RF compliance - FCC (USA) and ICES (Canada) ..... 15
2.8.1. Unauthorised Changes ..... 15
2.8.2. Radio Interference ..... 15
2.8.3. RF Exposure ..... 15
2.8.4. FCC Class B digital device notice ..... 15
2.8.5. Labelling Requirements for the Host device ..... 16
2.8.6. CAN ICES-3 (B) / NMB-3 (B) ..... 16
2.8.7. Use of Tablet or Handheld devices on the bench with the DigiShot Ranger control equipment ..... 16
3 DIGISHOT® RANGER SYSTEM INTRODUCTION ..... 17
3.1. DigiShot® Ranger Basic System Description ..... 17
3.1.1. Direct Blasting Configuration ..... 18
3.1.2. Remote Blasting Configuration ..... 19
3.2. DigiShot® Ranger General Description ..... 20
3.3. CE4 Tagger General Description ..... 20
3.4. DigiShot® Detonator General Description ..... 20
3.5. Near Field Cards (NFC) General Description ..... 21
3.5.1. The White Information Card ..... 21
3.5.2. The Yellow ActivateCard ..... 21
3.5.3. The Red BlastCard ..... 21
3.6. Harness Wire ..... 22


DetNet South Africa Copyright © 2022

**3.7. DigiShot® Ranger System User Application ..... 23**
3.7.1. Basic (B) Tagging Option - Users that deploy simple blast patterns. ..... 23
3.7.2. Advanced (A) Tagging Option - Users that follow a paper plan. ..... 23
3.7.3. Planned (P) Tagging Option - Users that follow a ViewShot plan. ..... 23
3.7.4. DigiShot (D) Tagging Option - Users that deploy the DigiShot method of tagging. ..... 23
**3.8. DigiShot® Ranger System Limits and Specifications ..... 24**
3.8.1. CE4 Tagger System Limits ..... 24
3.8.2. DigiShot® Ranger System Limits ..... 25
**4 DigiShot® DETONATOR ..... 27**
**4.1. Components ..... 27**
4.1.1. Crimp Plug ..... 27
4.1.2. Printed Circuit Board (PCB) ..... 27
4.1.3. Fusehead ..... 27
4.1.4. Protective H-Plug ..... 28
4.1.5. Connector ..... 28
4.1.6. Down-line wire ..... 28
**4.2. Connecting Up ..... 29**
4.2.1. Connector ..... 29
**4.3. Application of Detonator ..... 29**
**4.4. Handling Precautions ..... 29**
4.4.1. Storage ..... 30
4.4.2. DigiShot® Detonator Care ..... 30
**4.5. Specifications ..... 30**
4.5.1. Number of DigiShot® Detonators ..... 30
4.5.2. Automated detonator capacity check ..... 30
4.5.3. Decking ..... 30
4.5.4. Maximum delay times and increments ..... 31
4.5.5. Temperature Limitations ..... 31
4.5.6. Storage Life and Equipment Life ..... 31
4.5.7. Electrostatic Discharge, Over Voltage, Over Current and EMP Immunity ..... 31
**4.6. Safety ..... 32**
**4.7. Safety Warnings ..... 32**
4.7.1. User and Safety Tips ..... 32
4.7.2. Risks ..... 32
4.7.3. Destruction of 4G Detonators ..... 32
**5 CE4 TAGGER ..... 33**
**5.1. CE4 Tagger General Information ..... 33**
**5.2. CE4 Tagger Components ..... 34**
5.2.1. Harness wire terminals ..... 35
5.2.2. Pogo Pins ..... 35
5.2.3. LEDs ..... 35
5.2.4. LCD Screen ..... 35
5.2.5. SoftKeys ..... 35
5.2.6. Navigation and Numerical Keys ..... 35


DetNet South Africa Copyright © 2022

5.2.7. Enter Key ..... 35
5.2.8. Backspace Key ..... 35
5.2.9. On/Off key ..... 36
5.2.10. Esc Key ..... 36
5.2.11. Function Key ..... 36
5.2.12. USB Connector Port ..... 36
5.2.13. Battery ..... 36
5.2.14. Audio Tones ..... 36
5.2.15. Vibration Signals ..... 37
5.2.16. Visual Signals ..... 37
5.2.17. Real Time Clock (RTC) Function ..... 37
5.2.18. NFC ..... 37

**5.3. Power CE4 Tagger ON and OFF ..... 38**
5.3.1. CE4 Tagger Power-ON ..... 38
5.3.2. CE4 Tagger Power-OFF ..... 39

**5.4. CE4 Tagger Menu Navigation ..... 40**
5.4.1. CE4 Tagger Common User Interface Conventions ..... 40

**5.5. CE4 Tagger Menu Quick Reference ..... 42**

**5.6. CE4 Tagger Accessories ..... 46**
5.6.1. External Battery Pack ..... 46
5.6.2. Replaceable Top Connectors ..... 47
5.6.3. Surface Harness Wire ..... 48

**5.7. CE4 Tagger Battery ..... 49**
5.7.1. Charging the CE4 Tagger (Wired) ..... 49
5.7.2. Wireless Charging ..... 49
5.7.3. Low Battery ..... 50
5.7.4. Battery Information ..... 50

**5.8. CE4 Tagger Storage Mode ..... 51**

**6 CE4 TAGGER SYSTEM INFORMATION ..... 53**

**6.1. System Info ..... 53**
6.1.1. Regulatory Info ..... 53
6.1.2. System Info - Battery ..... 53
6.1.3. System Info - Temperature and the Relative Humidity ..... 53
6.1.4. System Info - Hardware Serial Number and SW Release Number ..... 54
6.1.5. System Info - GPS Detail ..... 54
6.1.6. System Info –User ID ..... 54

**7 CE4 TAGGER CONFIGURATION SETTINGS ..... 55**

**7.1. CE4 Tagger 4G Setup Configuration ..... 55**
7.1.1. Tag Option ..... 55
7.1.2. Site Setup ..... 56
7.1.3. Leakage Trigger ..... 59
7.1.4. Test Single on Bus ..... 59
7.1.5. Extra Info Bar ..... 60

**7.2. Device Setup ..... 62**


DetNet South Africa Copyright © 2022

7.2.1. Contrast ..... 62
7.2.2. Brightness ..... 63
7.2.3. Time Zone ..... 64
7.2.4. Timeouts ..... 65
7.2.5. Language ..... 66
7.2.6. Units ..... 67
8 CE4 TAGGER ADVANCED SETUP ..... 68
8.1. Tagger ID ..... 68
8.2. Connections ..... 70
8.2.1. Connect Tagger to PC via Wi-Fi ..... 71
8.2.2. Connect CE4 Tagger to DigiShot ® Ranger via Wi-Fi ..... 72
8.2.3. Connect CE4 Tagger to PC via USB ..... 74
8.3. Remote View ..... 75
8.3.1. Select Remote View on CE4 Tagger ..... 75
8.3.2. Initiate Remote View on PC ..... 76
8.4. Tagging Options: ..... 77
8.4.1. Clear Tags ..... 77
8.4.2. Read All Detonator Data ..... 78
8.4.3. Maximum Wire Length ..... 79
8.4.4. Detonator Product ..... 80
8.4.5. Decking Allocation - Hole Load Mode ..... 81
8.5. Device Password ..... 82
8.6. Reconciliation ..... 83
8.7. Last Assert ..... 83
9 CE4 TAGGER FACTORY SETUP ..... 84
9.1. Factory Setup Menu Options ..... 85
10 TAGGING OPERATIONS ..... 87
10.1. DIGISHOT SYSTEM TAGGING PRINCIPLE ..... 87
10.1.1. Basic ..... 88
10.1.2. DigiShot ..... 88
10.1.3. Advanced ..... 89
10.1.4. Tag by Plan ..... 89
10.2. BASIC (B) TAGGING OPTION ..... 90
10.2.1. Mark Detonators ..... 92
10.3. DIGISHOT (D) TAGGING OPTION ..... 94
10.3.1. New Design Screen ..... 94
10.3.2. Tag Detonators ..... 95
10.3.3. Right or Left side definition ..... 99
10.3.4. Special detonators ..... 100
10.3.5. Row Allocation ..... 101
10.3.6. Hole Allocation ..... 102
10.3.7. Decking Allocation ..... 103
10.3.8. Automatic Hole Increment and Decrement ..... 104


DetNet South Africa Copyright © 2022

10.3.9. MANUAL TAGGING ..... 105
10.3.10. AUTO TAGGING ..... 105
**10.4. TIMING DIGISHOT SYSTEMS ..... 106**
10.4.1. TIME A BLAST ..... 106
10.4.2. TIME SPECIALS ..... 107
10.4.3. TIME A ROW ..... 107
10.4.4. TIME ROW BY ROW ..... 108
10.4.5. APPLY TIMES ..... 109
10.4.6. VERIFY TIMES ..... 110
**10.5. LAYOUT AND TIMING DIGISHOT DETONATORS IN PLANNED MODE ..... 111**
10.5.1. MANUAL LAYOUT DETONATORS ON TAGGER ..... 111
10.5.2. SET PATH AND TIME LAYOUT ..... 114
**10.6. PLANNED (P) TAGGING OPTION (USING PLAN FROM VIEWSHOT) ..... 115**
10.6.1. Connect the CE4 Tagger to the PC ..... 116
10.6.2. Download the Plan (via ViewShot) ..... 117
10.6.3. View the downloaded design on the CE4 Tagger ..... 122
10.6.4. Select Start Position ..... 124
10.6.5. Tag by Plan Screen ..... 125
10.6.6. Assigning ViewShot Timing ..... 127
10.6.7. Verify Plan ..... 127
10.6.8. Verify Delays ..... 127
10.6.9. Show Results ..... 128
10.6.10. Merge Plan ..... 128
10.6.11. Reconciliation Menu ..... 129
**10.7. ADVANCED (A) TAGGING OPTION ..... 131**
10.7.1. Advanced Mode ..... 131
10.7.2. Edit the Hole configuration ..... 133
10.7.3. Delete the Hole Configuration ..... 134
**10.8. Advanced (A) Tagging Screen Info ..... 136**
10.8.1. Advanced Tagging Screen SoftKey Icons ..... 137
10.8.2. Toggle Increment Direction ..... 138
10.8.3. Inter Hole Delay ..... 139
10.8.4. Absolute Detonator Time ..... 139
10.8.5. Autotag / Manual Mode ..... 140
10.8.6. Test Single Detonator ..... 141
10.8.7. Tagged Detonators ..... 142
10.8.8. Review Tag Detonator Screen Parameters ..... 143
10.8.9. Advanced Screen Manual Adjustments ..... 145
**11 TEST MENU ..... 146**
**11.1. Test All ..... 146**
**11.2. Test String ..... 147**
**11.3. Test Row (DigiShot mode) ..... 148**
**11.4. Test Single Detonator ..... 149**
**11.5. Leakage Test ..... 150**


DetNet South Africa Copyright © 2022

**11.6. Untagged Test ..... 151**
**11.7. Search Detonators (Binary Search) ..... 152**
11.7.1. Search Function Results ..... 152
**12 VIEW Plan ..... 153**
**12.1. List Detonators ..... 153**
12.1.1. Search Filter ..... 154
12.1.2. Info SoftKey ..... 155
12.1.3. Sort Detonator list ..... 156
12.1.4. ViewShot Plan Summary (Heading) ..... 158
**12.2. List Missing Detonators ..... 159**
**12.3. List New Detonators ..... 162**
**12.4. List Bad Status ..... 163**
**12.5. Duplicate Location ..... 164**
**12.6. Blast Summary ..... 165**
**12.7. Tracking Detonators ..... 166**
**13 Mark Detonators ..... 168**
**14 RANGER ..... 169**
**14.1. General Information ..... 169**
**14.2. DigiShot® Ranger Components ..... 169**
14.2.1. DigiShot® Ranger Body ..... 170
14.2.2. Internal antenna ..... 170
14.2.3. Detonator Communication Channels (1 - 2) ..... 170
14.2.4. E-paper display ..... 170
14.2.5. NEXT (FUNCTION) button ..... 170
14.2.6. POWER button ..... 170
14.2.7. Mini-USB connector port ..... 171
14.2.8. BlastCard (NFC) Sensor ..... 171
**14.3. Power DigiShot® Ranger ON and OFF ..... 171**
14.3.1. Power DigiShot® Ranger ON ..... 171
14.3.2. Power DigiShot® Ranger OFF ..... 172
**14.4. DigiShot® Ranger Accessories ..... 173**
14.4.1. Battery ..... 173
14.4.2. Charging the DigiShot® Ranger ..... 174
14.4.3. Storage ..... 174
**14.5. DigiShot® Ranger Process Description ..... 175**
14.5.1. Start-up ..... 175
14.5.2. Shutdown ..... 175
14.5.3. Data Transfer Mode ..... 175
14.5.4. Pairing ..... 176
14.5.5. Aborting ..... 176
14.5.6. Blasting ..... 176
**14.6. Connecting CE4 Tagger to DigiShot® Ranger via Wi-Fi ..... 177**


DetNet South Africa Copyright © 2022

**14.7. DigiShot® System Information ..... 178**
14.7.1. System Info – Regulatory Info ..... 178
14.7.2. System Info – Battery, Temperature and Relative Humidity ..... 178
14.7.3. System Info – Hardware Serial Number and SW Release Number ..... 179
14.7.4. System Info –GPS Detail ..... 179
14.7.5. System Info –User ID ..... 179
14.7.6. System Info –Serial Number ..... 179
**14.8. DigiShot® Ranger LCD Screen Icons ..... 180**
14.8.1. DigiShot® Base Ranger Mode Icons ..... 180
14.8.2. DigiShot® Ranger Bench Mode Icons ..... 186
**14.9. NEW DESIGN ..... 193**
**14.10. TEST MENU ..... 194**
14.10.1. Test All ..... 194
14.10.2. Leakage Test ..... 195
14.10.3. Untagged Test ..... 196
**14.11. VIEW DESIGN ..... 197**
14.11.1. List Detonators ..... 197
14.11.2. List Missing Detonators ..... 199
14.11.3. List New Detonators ..... 200
14.11.4. List Bad Status Detonators ..... 201
14.11.5. Channel Summary ..... 202
**14.12. Prepare for Blast ..... 203**
14.12.1. Local Blast ..... 203
14.12.2. Remote Blast ..... 206
14.12.3. Remote Synchronized Blast ..... 211
14.12.4. Remote Non-Synchronized Blast ..... 215
**15 DigiShot® Ranger Configuration Settings ..... 219**
**15.1. 4G Setup ..... 219**
15.1.1. Det Label ..... 219
15.1.2. Leakage Trigger ..... 220
15.1.3. Blasting Method (Base Station) ..... 220
**15.2. Device Setup ..... 221**
15.2.1. Time Zone ..... 221
15.2.2. Language ..... 222
15.2.3. Timeouts ..... 223
15.2.4. Units ..... 224
**15.3. Long Range RF ..... 225**
15.3.1. Set RF Channel ..... 225
15.3.2. Set Encryption Key ..... 227
**16 Advanced Setup ..... 229**
**16.1. Device ID ..... 229**
**16.2. Device Mode ..... 230**
16.2.1. Device Mode ..... 230


DetNet South Africa Copyright © 2022

16.3. Device Password ..... 230
16.4. Last Det ..... 232
16.5. Toggle Auto Arm ..... 233
16.6. Max Wire Length ..... 234
17 Factory Setup ..... 235
17.1. Factory Setup Menu Options ..... 237
17.2. Factory Setup Menu Options ..... 237
18 Tablet Blast Application General Description ..... 239
19 Ranger System On-Bench Deployment Overview ..... 240
19.1. Blasting Overview ..... 240
19.1.1. Local blasting ..... 240
19.1.2. Remote blasting ..... 242
19.1.3. Synchronized blasting (Multiple Rangers) ..... 243
20 DigiShot® System Troubleshooting ..... 244
20.1. DigiShot® System Troubleshooting: Reprogram required ..... 250
21 Appendix A – Digishot System Practical Tips and Hints ..... 251
21.1. On Bench Delivery of Detonators ..... 251
21.2. Distributing Detonators on the Bench ..... 251
21.3. Priming with DigiShot® Detonators ..... 251
21.4. Lowering Detonators into Drilled Holes ..... 252
21.5. Charging of Drilled Holes ..... 252
21.6. Stemming of Charged Holes ..... 253
21.7. Tagging of Charged Holes with DigiShot® Detonators ..... 253
21.8. Harnessing of the Blast ..... 253
21.9. Testing of Blast Installation ..... 254
21.10. Testing lead-in wire and rolling out harness wire to Bench Ranger position ..... 254
21.11. Connecting Harness wires to Bench Ranger ..... 254
21.12. Setting Up RF Communication ..... 254
21.13. Basic causes of leakage ..... 255
21.14. Leakage table ..... 256
21.15. Binary Search ..... 257
21.16. High Leakage ..... 258
21.17. Leakage through conductive materials ..... 259
22 Appendix B – Abbreviations and Definitions ..... 260
22.1. Abbreviations ..... 260


DetNet South Africa Copyright © 2022

22.2. Definitions .....261

## List of Figures

Figure 1: DigiShot® System Composition..... 17
Figure 2: Local Blasting..... 18
Figure 3: Remote Blasting of up to 600 detonators ..... 19
Figure 5: CE4 Tagger Component Identification..... 34
Figure 6: CE4 Tagger External Battery Pack..... 46
Figure 7: CE4 Tagger Top Connector..... 47
Figure 8: Surface Harness Wire..... 48
Figure 9: DigiShot® Ranger Part Identification..... 169
Figure 10: DigiShot® Base Ranger Mode Detail Screen..... 181
Figure 11: DigiShot® Ranger Bench Mode Screen ..... 187
Figure 13: Local Blasting..... 240
Figure 14: Remote Blasting..... 242
Figure 15: Synchronized Blasting via two Rangers ..... 243

## List of Tables

Table 1: Component Description..... 18
Table 2: CE4 Tagger Icon Shortcut Keys and Ranger Icons..... 41
Table 3: CE4 Tagger Menu Reference ..... 42
Table 4: CE4 Tagger Main Menu Reference ..... 42
Table 5: CE4 Tagger Configuration Menu Reference..... 43
Table 6: CE4 Tagger SoftKey Icons – Select Position..... 124
Table 7: CE4 Tagger SoftKey Icons – Tag By Plan" Option..... 126
Table 8: CE4 Tagger SoftKey Icons – Advanced Tagging ..... 137
Table 9: DigiShot® Ranger Base Station Screen Icons ..... 181
Table 10: DigiShot® Ranger Bench Mode Screen Icons..... 187


DetNet South Africa Copyright © 2022

# 1 USERS OF THIS MANUAL

## 1.1. Purpose of this manual

This manual details the operation of the DigiShot® Ranger System.

**This manual is only to be used for the DigiShot® Ranger System and the applicable software version as displayed.**

## 1.2. End User

### 1.2.1. Requirements

- Only trained personnel, and personnel found competent, are allowed to operate the system.
- Users of the system shall be aware of the recommended procedures for using the DigiShot® Ranger System as per manufacturer's recommendations.
- These recommendations do not supersede the method as required by local mine, explosives or statutory regulations/procedures/codes of practise regarding the use of detonators. In such cases, the MOST STRINGENT set of rules between the mine, explosives or local regulations/procedures/codes of practise and the manufacturer must be followed.

## 1.3. Training

Training and software upgrades shall only be performed by a DetNet SA subject matter expert.
Contact the DetNet head office for additional information.

**ALL USERS OPERATING THE DIGISHOT® RANGER SYSTEM SHALL HAVE SUCCESSFULLY COMPLETED THE SPECIFIC TRAINING BEFORE PERFORMING ANY WORK WITH THE DEVICE(S).**


DetNet South Africa Copyright © 2022

# 2 DIGISHOT® RANGER SYSTEM PRODUCT SAFETY

## 2.1. DetNet Safety Philosophy

DetNet safety philosophy is to design, manufacturer and provide control equipment, detonators and accessories to the highest safety standards.

- Energy management in control equipment will be regulated by providing two separate circuits managing test voltage and blast voltage, through software and hardware safety interlocks.
- BlastCards remain in possession of the accountable person and should only be used to authorize the blast process at such a time as stipulated by the Mine after completion of the required Risk Assessment.
- All products must conform to local and international standards before it is sold for use.
- DetNet complies to ISO 9001, SANS 551:2009, CEN/TS 13763-27 which is acceptable to countries we operate in; in countries not subscribing to the above marks, we advise users to engage with DetNet to ensure that all equipment comply to local regulations.

## 2.2. User Safety

Safety is ensured when the user supplements the product's in-built safety systems through adequate training in the safe use of the product:

- Induction training
- Refresher training

DetNet continuously upgrades software to make the products more user friendly and to ensure that users stay abreast on latest developments, it is important that users get trained on the relevant changes before their equipment is updated.

## 2.3. Product Safety

**Inherent Safety**

- CE4 Taggers are "Inherently Safe" because they cannot produce the necessary minimum required firing voltage or encoded "Fire" command to initiate the electronic DigiShot® Detonator.
- In addition, the CE4 Tagger firmware does not contain the procedures or commands necessary to calibrate, arm or fire the detonator.

## 2.4. Equipment usage and handling

The purpose of this section is to indicate the recommended care and handling of the System's control equipment considering the environment in which it is used. Proper care and maintenance of the equipment will preserve the integrity and ensure its proper functionality. Poor handling and abuse of the equipment could result in errors and potential blast delays.

### 2.4.1. Transportation, Storage and Handling

- The DigiShot Ranger equipment must be transported, stored, handled and used in conformity with all federal, state, provincial, local laws and regulations. Control equipment and accessories should be handled with due care and not dropped, mishandled, subjected to excessive vibration or exposed to harsh chemical agents, including solvents.
- The DigiShot Ranger should always be stored in the provided suitcase when not in use, and especially during transportation.
- Connectors should be kept clean and the equipment must be kept in a safe environment to avoid misappropriation or misuse.
- The DigiShot Ranger should be lifted to at least 1.8m height for reliable RF connectivity.

DetNet South Africa Copyright © 2022

### 2.4.2. Maintenance Schedule

- All equipment in the field will need to be returned to DetNet South Africa, or an authorised repair centre, for service at the following intervals:
- When the equipment service date is due or expired.
- Handheld Equipment (Tagger, etc.) – 18 Months.
- Other equipment (DigiShot Ranger, etc., Excluding accessories) – 24 Months.
- Any unauthorised repairs, modification or tampering of the device may comprise the safe operation of DigiShot Ranger system and is prohibited.
- The DigiShot Ranger is installed with a ShockWatch which will be activated if the equipment is mishandled. In the event the ShockWatch is activated, it must be returned to DetNet SA or an authorised repair centre for assessment.

### 2.4.3. Other Care and Maintenance

- Keep USB ports sealed, using the provided rubber door, to ensure no moisture or dust ingress. Inspect the USB ports on an ongoing basis to ensure that moisture or dust / grit does not accumulate behind the rubber door as that could lead to corrosion of the connector. Should any signs of damage or poor sealing be observed, the equipment must be returned for repairs. An Air Duster can be used to remove dust from the USB charging socket.
- Periodically check the battery Cell Status indicator displayed on the System Information screen. 'Good' indicates a healthy battery state. Should the status indicate 'Low' the unit should be serviced to have the battery replaced.
- General cleaning of equipment will be required when exposed to the mining environment. Use a damp cloth or preferably baby wipes and a brush to remove dust and any residues.
- Use of cleaning solvent is not advised as this can cause degradation and permanent damage to the equipment. Refer to solvent manufacturer's TDS for compatibility information.
- Inspect the Terminals on the Tagger and Rangers ensure that the spring contacts are functional and free from dirt and residue. Excessive corrosion on the terminals can result in poor electrical connections. If damaged, the equipment must be returned for repairs.
- As the Tagger contains a Li battery, industry standards and precautions should be followed during charging of the equipment. Disposal of the equipment and battery is not permitted, and the equipment must be returned to the supplier in the country for recycling and proper disposal.

## 2.5. Information in case of emergency

Refer to https://portal.detnet.com/ http://www.portal.detnet.com/ for additional detail and documentation.


DetNet South Africa Copyright © 2022

## 2.6. Warning, Caution, and Note Statements

***WARNING***, ***CAUTION***, and ***NOTE*** statements are used throughout this manual to emphasise important and critical information. Observe these statements to ensure safety and to prevent product damage. The statements are *defined as follows:*

**A WARNING MEANS THAT INJURY OR DEATH IS POSSIBLE IF THE INSTRUCTIONS ARE NOT OBEYED.**

***Warnings*** draw special attention to anything that could injure or kill the reader/user. *Warnings* are generally placed before the step in the procedure they relate to. Warning messages are repeated wherever they apply.

**A caution means that damage to equipment is possible.**

***Cautions*** draw special attention to anything that could damage equipment or cause the loss of data and will normally describe what could happen if the caution is ignored. *Cautions* are generally placed before the step in the procedure they relate to.

**Notes are added to provide additional information.**

***Notes*** are used to emphasise important information by visually distinguishing this from the rest of the text. Notes can contain any type of information except safety information, which is always placed in cautions or warnings.

Refer to https://portal.detnet.com/ http://www.portal.detnet.com/ for additional detail and documentation.

## 2.7. Disclaimer

This document forms part of the User Manual for the DigiShot® Ranger System and is considered to be confidential. This document contains restricted information for company and channel partners' application only.
Should any of the restricted information contained in this document be disclosed to any third party either intentionally or unintentionally, DetNet South Africa will not be held responsible, accountable or liable for any resulting event and or issue.
DetNet accepts no liability in respect of any claim relating to any safety related incident, damage, loss or injury arising from the use of any software and/or control equipment supplied by DetNet. Any liability which may be lawfully attributed to DetNet shall not exceed the purchase price paid to DetNet for the software and/or control equipment which gave rise to the claim. DetNet shall not be liable for lost profits, goodwill, data or business nor any special, indirect, incidental or consequential damages under any theory of liability.


DetNet South Africa Copyright © 2022

## 2.8. RF compliance - FCC (USA) and ICES (Canada)

### 2.8.1. Unauthorised Changes

DetNet South Africa has not approved any changes or modifications to this device by the user. Any changes or modifications could void the user's authority to operate the equipment.

DetNet South Africa *n'approuve aucune modification apportée à l'appareil par l'utilisateur, quelle qu'en soit la nature. Tout changement ou modification peuvent annuler le droit d'utilisation de l'appareil par l'utilisateur.*

### 2.8.2. Radio Interference

This device complies with Part 15 of the FCC Rules and Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

*Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.*

### 2.8.3. RF Exposure

This equipment complies with FCC and IC radiation exposure limits set forth for an uncontrolled environment. The antenna should be installed and operated with minimum distance of 20 cm between the radiator and your body. Antenna gain must be below 2 dBi
This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

*Cet appareil est conforme aux limites d'exposition aux rayonnements de la IC pour un environnement non contrôlé. L'antenne doit être installé de façon à garder une distance minimale de 20 centimètres entre la source de rayonnements et votre corps. Gain de l'antenne doit être ci-dessous 2 dBi*
*L'émetteur ne doit pas être colocalisé ni fonctionner conjointement avec à autre antenne ou autre émetteur.*

### 2.8.4. FCC Class B digital device notice

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.


DetNet South Africa Copyright © 2022

### 2.8.5. Labelling Requirements for the Host device

The host device shall be properly labelled to identify the modules within the host device. The certification label of the module shall be clearly visible at all times when installed in the host device, otherwise the host device must be labelled to display the FCC ID and IC of the module, preceded by the words "Contains transmitter module", or the word "Contains", or similar wording expressing the same meaning, as follows:

Contains FCC ID: 2ARNH-15351660 (AC4490 RF module)
2ARNH-1535166A (CC1120 RF module)

*L'appareil hôte doit être étiqueté comme il faut pour permettre l'identification des modules qui s'y trouvent. L'étiquette de certification du module donné doit être posée sur l'appareil hôte à un endroit bien en vue en tout temps. En l'absence d'étiquette, l'appareil hôte doit porter une étiquette donnant le FCC ID et le IC du module, précédé des mots « Contient un module d'émission », du mot « Contient » ou d'une formulation similaire exprimant le même sens, comme suit :*

Contains IC: 24476-15351660 (AC4490 RF module)
24476-1535166A (CC1120 RF module)

### 2.8.6. CAN ICES-3 (B) / NMB-3 (B)

This Class B digital apparatus complies with Canadian ICES-003.

*Cet appareil numérique de classe B est conforme à la norme canadienne ICES-003.*

### 2.8.7. Use of Tablet or Handheld devices on the bench with the DigiShot Ranger control equipment

The table below is to be used as a guide for the recommended minimum operational and safety distances of the DetNet electronic blasting systems and detonators. This will apply for transmitters up to 100W power output within the frequency range of 150KHz to 6GHz. These are general recommendations and specific frequencies can be tested for on request if shorter distances are required. The 10V/m and 30V/m field strengths are based on ARP 1717 and EN13762-27 specifications. Protection against Electrostatic Discharge immunity (ESD) of the detonator and DetNet equipment were tested with reference to the Human Static mode and the required standards.
All DetNet equipment complies with the required standards: ARP 1717, EN 13763-27 for Initiation Devices and Initiation Device Systems.

| **Transmitter strength** | **Typical Device** | **Low voltage state (During testing and programming)** | | **High voltage state (Arming and ready to blast)** |
|---|---|---|---|---|
| | | Minimum distance to operate the system safely[1] | Minimum distance to enable full system functionalty[2] | |
| < 2 watt | Cellular phones | 0.5 m | 1.5 m | 2.0 m |
| < 5 watt | Handheld radios | 1.0 m | 2.0 m | 3.0 m |
| < 20 watt | Truck radios | 1.5 m | 4.0 m | 10 m |
| >20 watt | Other | 5 m | 10 m | 15 m |


DetNet South Africa Copyright © 2022

# 3 DIGISHOT® RANGER SYSTEM INTRODUCTION

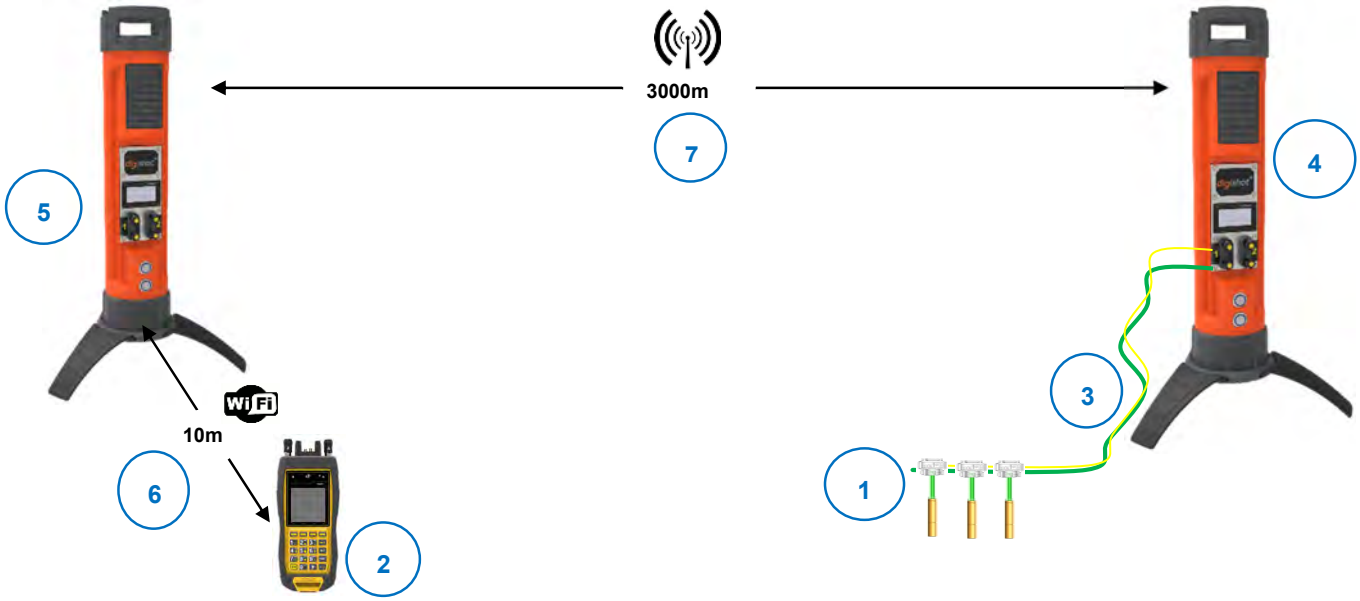
## 3.1. DigiShot® Ranger Basic System Description

The system description details a full system lay-out and also the individual component name, function and interaction between the components. The picture below shows the system components.
This 4th generation Control Equipment (CE4) that is designed and developed by DetNet South Africa consists of two main devices, namely the DigiShot® Ranger and CE4 Tagger. The DigiShot® Ranger may be set-up either as a Bench Ranger (for connection to detonators) or as a Base Ranger that is used to remotely communicate with a Bench Ranger to initiate the blast (see illustration below

The CE4 Tagger is an inherently safe device that is used on the bench to test detonators and assign delays to them. The CE4 Tagger has a dual role and may also be used to wirelessly connect to an DigiShot® Ranger thereby acting as an interface unit for the DigiShot® Ranger.

This unique design simplifies the design of the DigiShot® Ranger – which comprises of a screen and two buttons allowing the user to control the DigiShot® Ranger remotely from the comfort of a CE4 Tagger.

Peripheral devices such as a Laptop or Tablet will be COTS (Commercial Off-The-Shelf) equipment loaded with DetNet software to interact with the system.
Figure 1 (below) depicts a scaled system as would be required to perform a remote blast of 600 detonators blast using a DigiShot Ranger, as a bench Ranger with detonators, the second as a Base Station




| | | | |
|---|---|---|---|
| 1 | Detonator (Max 300 Dets per Channel) | | |
| 2 | CE4 Tagger | 5 | Base Ranger |
| 3 | Harness Wire | 6 | Short Range RF |
| 4 | Bench Ranger | 7 | Long range RF |

*Figure 1: DigiShot® System Composition*


DetNet South Africa Copyright © 2022

*Table 1: Component Description*

| # | Component | Function |
|---|---|---|
| 1 | Detonator | Detonator will initiate the blast on command from the Base Ranger |
| 2 | CE4 Tagger | Test, Write Location and/or Delay to detonator and remotely controls Rangers |
| 3 | Harness Wire | Connects the detonators to the Bench Rangers |
| 4 | DigiShot Bench Ranger | Test Detonators / Communicates with Base Ranger directly to allow remote blasting. Can also enable a local blast |
| 5 | DigiShot Base Ranger | Establish communication with Bench Ranger directly to enable remote blasting |
| 6 | Wi-Fi | Enable Wi-Fi communication (maximum 10m) |
| 7 | Long range RF | Enable RF communication (maximum of 3km) |

The following illustrations depict some of the lesser configurations possible with the system.

### 3.1.1. Direct Blasting Configuration

Direct blasting of up to 600 detonators. The CE4 Tagger can be replaced with a Tablet or PDA to communicate to the DigiShot Ranger.

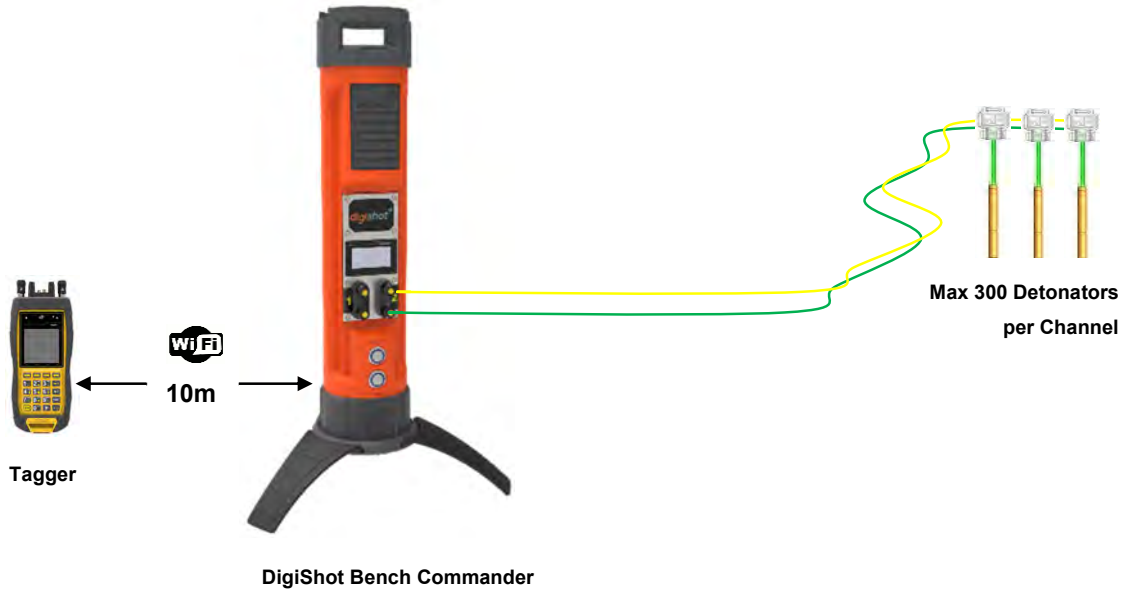



*Figure 2: Local Blasting*


DetNet South Africa Copyright © 2022

### 3.1.2. Remote Blasting Configuration

Remote blasting of up to 600 detonators using a CE4 Tagger as user-interface at the blasting point.

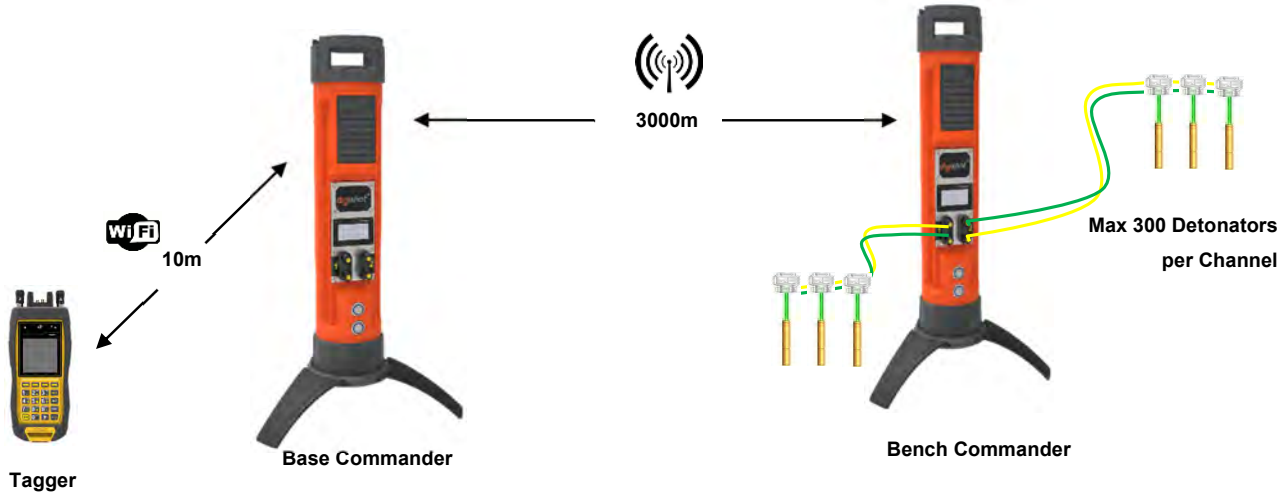



*Figure 3: Remote Blasting of up to 600 detonators*

**Maximum of two DigiShot Bench Rangers can be initiated from one Base when enabled for that purpose by using a ticket from the portal.**


DetNet South Africa Copyright © 2022

## 3.2. DigiShot® Ranger General Description

The DigiShot® Ranger is a 2-channel multi-functional device intended for use across all surface blasting applications in the DetNet portfolio. DetNet has designed the DigiShot® Ranger to incorporate an internal antenna to communicate in RF. Corresponding with the system's ease-of-use the DigiShot® Ranger has a simple user interface, which comprises a screen and two buttons. Allowing for easy inventory control, especially in the way of storing spare equipment, the DigiShot® Ranger unit may be configured to function either as:

- Bench Ranger, or
- Base Ranger

## 3.3. CE4 Tagger General Description

| | |
|---|---|
| NOTE | **In this UTM all the tagging options will be conducted with the selected detonator as DigiShot detonator. It is also essential that the user uses only one mode of tagging and not mix the different modes during tagging..** |

The CE4 Tagger is an inherently safe device that is used on the bench to test detonators and assign delays to them. The CE4 Tagger has a dual role and may also be used to wirelessly connect to an DigiShot® Ranger thereby acting as an interface unit for the DigiShot® Ranger.

## 3.4. DigiShot® Detonator General Description

The DigiShot® Detonator is a programmable detonator that is suitable for all types of blasting operations, especially those requiring precise timing.
The DigiShot® Detonator is housed in a copper tube, which protects the circuit board and the base charge.
The DigiShot® Detonator is attached to a robust black and green two wire down-line cable that is capped with a gel-filled connector that clips on a surface harness wire.

| | |
|---|---|
| WARNING | **ELECTRONIC DETONATORS ARE TOTALLY DIFFERENT TO CONVENTIONAL ELECTRIC DETONATORS AND ABSOLUTELY NO CONNECTION WITH CONVENTIONAL ELECTRIC DETONATORS OR ANY OTHER ELECTRONIC DETONATORS IS POSSIBLE AS IT CAN LEAD TO UNINTENDED INITIATION. ALL USERS OPERATING THE ELECTRONIC INITIATION SYSTEM SHALL HAVE SUCCESSFULLY COMPLETED THE SPECIFIC TRAINING BEFORE PERFORMING ANY WORK WITH THE DEVICE(S). DO NOT USE ANY DEVICES OTHER THAN THOSE SPECIALLY DESIGNED FOR THIS TYPE OF ELECTRONIC DETONATOR. NEVER CONNECT ANY THIRD PARTY OR OTHER UNAPPROVED DETONATORS TO THE DIGISHOT® SYSTEM** |


DetNet South Africa Copyright © 2022

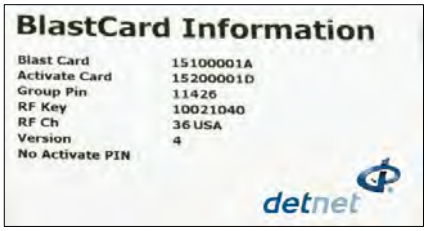
## 3.5. Near Field Cards (NFC) General Description

For safety purposes, the system is activated through a pre-programmed and unique Password (PIN code) protected Blast card System. The system deploys two types of near field communication (NFC) Cards which are the Yellow ActivateCard and the Red BlastCard. The system also deploys a white information card for the set of NFC BlastCards.

### 3.5.1. The White Information Card

The White Information Card contains information on the set of NFC cards as detailed below:

- Blast Card serial number
- Activate card serial number
- Group pin
- RF key
- RF channel
- Version number
- No Activate pin




### 3.5.2. The Yellow ActivateCard

The User will scan the Yellow ActivateCard on the DigiShot Bench Ranger after completion of the connecting and testing of the blast installation. This should only be performed after the bench has been cleared of all personnel. Scanning the ActivateCard will place the Bench Ranger in a 'waiting to arm' state and this should be undertaken in accordance with local legislation and prescribed blasting procedures on site.

A quick activation setting on the Ranger is also available. If turned ON and the unit has had a good scan and testing cycle with no errors, the user will be allowed to scan the yellow Activation Card and the DigiShot Bench Ranger will proceed to the 'waiting for arm' state without being prompted by the user; connecting the Tagger. This function is known as AutoArm.

The yellow ActivateCard can be swiped to obtain the RF setup information on the Bench and Base Rangers.

### 3.5.3. The Red BlastCard

The Red BlastCard, when scanned at the Base Ranger during an RF Multi-bench Rangers blast, or at the Bench Ranger during a local blast, will issue the Arm and Fire Commands.

The ARM and FIRE commands for detonators will not initially be known to the DigiShot® Ranger. These commands are only available from the Red BlastCard and will be issued to the DigiShot® Ranger when the BlastCard is scanned. The ARM and FIRE blasting commands are erased from the DigiShot® Ranger memory after use.


DetNet South Africa Copyright © 2022

| | |
|---|---|
| NOTE | **Always keep the BlastCards and PIN locked away in a secure place when not in use.**<br>**Always place the BlastCards in direct control of the certified user during the blast.**<br>**Always inform the supervisor and supplier immediately if a BlastCard is lost or damaged.**<br>**BlastCards are classified as blast keys and must be handled in accordance with local legislation requirements.** |

| | |
|---|---|
| CAUTION | NEVER SWIPE THE RED BLASTCARD ONTO THE DIGISHOT® RANGER WHEN IN IDLE MODE, UNLESS IT IS INTENDED TO INITIATE A BLAST AND THE SOFTWARE PROMPTS THE USER TO DO SO.<br>NEVER USE A FAULTY OR DAMAGED BLASTCARD. IF BLASTCARD IS FAULTY OR DAMAGED IT MUST BE RETURNED TO THE ORIGINAL SUPPLIER FOR DESTRUCTION.<br>NEVER STORE THE BLASTCARDS AND BLASTING PIN TOGETHER.<br>NEVER DIVULGE THE BLASTING PASSWORD/S TO ANOTHER PERSON. ONLY THE CERTIFIED USER TO WHOM THE BLASTCARDS WAS ALLOCATED SHOULD KNOW THE PASSWORD.<br>A BLAST CANNOT BE INITIATED WITHOUT THE BLASTCARDS. |

## 3.6. Harness Wire

The Surface harness wire consists of a pair of yellow and green individually sheathed copper wire, 0.63mm in diameter.

Detonators are connected to the surface harness wire to enable communication with control equipment.
The maximum length of 2-wire surface harness per channel, including the lead-in wire used to connect shall not exceed 2500m measured from the DigiShot Ranger to the furthest connected detonator.


DetNet South Africa Copyright © 2022

## 3.7. DigiShot® Ranger System User Application

There are four methods of operation for the DigiShot® Ranger System, as detailed below:

### 3.7.1. Basic (B) Tagging Option - Users that deploy simple blast patterns.

With the Basic tagging option, the user will only need to concentrate on the Time value, string number and the sequence number assigned to the detonator. This option is best suited for small, single-primed hole blasts.

**It is advised to use only one Tagger per Ranger when the Basic Tagging Option is used. If more than one Tagger need to be used then both Taggers can start at a different String number and must have different Tagger ID's.**

### 3.7.2. Advanced (A) Tagging Option - Users that follow a paper plan.

The Advanced Tagging option is used when there is emphasis on both Time and Location but no ViewShot plan is available for download.

- The Advanced Mode includes more functionality than the BASIC mode as it allows for multi-primed holes and time incremental settings.
- The user will need to define a hole configuration from the "Site Setup" screen in 4G Setup menu.

### 3.7.3. Planned (P) Tagging Option - Users that follow a ViewShot plan.

With the **Planned** (**P**) option, a location and the delay are written into the detonator.
The source for the data is received from a plan which is downloaded into the CE4 Tagger via the ViewShot blast design software.

### 3.7.4. DigiShot (D) Tagging Option - Users that deploy the DigiShot method of tagging.

With the DigiShot (**D**) option, a location of the detonator can be tagged into the detonator. Using the normal DigiShot tagging method.
The detonators can be assigned locations using Side (L/R), Row (R), Hole number (h), the Detonator number, and Special numbers can be used. These can later be timed using Tagger to assign delays.


DetNet South Africa Copyright © 2022

## 3.8. DigiShot® Ranger System Limits and Specifications

System Limits define the design parameters that users must adhere to when designing their blast to be used with DigiShot® Ranger System.

| | |
|---|---|
| Maximum harness wire per channel | 2,500m |
| Maximum accumulated down-line wire per string/channel | 5000 – 16000m |
| Maximum Bench Ranger per Base Ranger | 1 |
| Maximum detonators per Tagger | 600 DS mode |
| Maximum detonators per String/Channel | 300 |
| Maximum Rows per String/Channel | 63 |
| Maximum detonators per row per side | 127 |
| Maximum Specials | 255 |
| Maximum detonators per Bench Ranger | 600 |
| Maximum detonators RF | 600 |
| Maximum detonators standalone | 600 |
| Maximum detonators per hole | 15 |
| Maximum ViewShot design per Tagger (DS detonator is selected) | 1 |
| Maximum line-of-sight for Remote Firing | 3km |
| Maximum delay for any detonator | 20,000ms |
| Minimum delay per detonator | 0ms |
| Minimum delay increment | 1ms |
| Maximum Wi-Fi connectivity distance | 10m |
| Maximum Tagger ID's | 10 |
| Maximum DigiShot Bench Rangers ID's | 10 |

### 3.8.1. CE4 Tagger System Limits

#### 3.8.1.1. Strings/Channels

- User selectable 1 – 2 Strings in Basic, Advanced and Planned Mode. (Only 1 string can be connected and tested by the Tagger at a time if the total dets is more than a channel capacity
- When using DigiShot mode then up to 63 Rows can be used for both Channels.

#### 3.8.1.2. Maximum Dets tagged per String

- 300 Detonators using down-line wire of 40m or shorter.
- For longer lengths, see "Wire calculation table under Product Documents on DetNet Portal of down-line length versus amount of DigiShot® Detonators.

#### 3.8.1.3. Maximum Dets tagged per CE4 Tagger (1 Channel)

- 300 Detonators in storage/memory
- The Tagger can physically test only up to 300 dets (one String) at a time.

#### 3.8.1.4. Maximum Decking per Hole

- 18 Detonators per hole with 6 decks and 3 detonators per deck when Advanced or Planned tagging is selected
- 15 Detonators tagging when a DigiShot tagging mode is selected.

#### 3.8.1.5. Maximum Distance in Wi-Fi communicating to a DigiShot® Ranger

- 10 meters


DetNet South Africa Copyright © 2022

#### 3.8.1.6. CE4 Tagger Specifications

- -30°C to +60°C / -22°F to +140°F.
- Cold Temperature Battery Pack can be used to extend battery operating life in sub-zero conditions.
- The CE4 Tagger may be used for approximately 10 hours at 25°C / 77°F. At temperatures below -15°C / -5°F battery life may be reduced significantly.
- When the battery level of the CE4 Tagger reaches 9%, a warning symbol will appear on the top bar. Should the user choose to continue, the CE4 Tagger will automatically switch off when the battery level reaches 3%.
- IP 57 Ingress protection: Protected against water and dust ingress and protected against immersion between 15cm and 1m for 30 minutes.

#### 3.8.1.7. CE4 Tagger Storage

- It is recommended that the CE4 Tagger be charged to 50% when placed into long-term storage, and thereafter the unit should be charged at least every six months to 50%, to maintain the expected lifetime of the battery.
- The CE4 Tagger may be kept on charge for extended periods as the CE4 Tagger will manage the battery.

#### 3.8.1.8. Electrostatic Discharge, Over Voltage, Over Current and EMP Immunity

The system is also designed to be immune (within limits) to Radio Frequency interference (RF) but it is advised that cell phones and two-way radios be kept at least 5m away from control equipment (Blasters) during Programming, Arming and Firing as communication between the blaster and 4G detonators may be corrupted.

#### 3.8.1.9. Inherent Safety

- CE4 Taggers are “Inherently Safe” because they cannot produce the necessary minimum required firing voltage or coded “Fire” command to initiate the electronic DigiShot® Detonator.
- In addition, the CE4 Tagger firmware does not contain the procedures or commands necessary to calibrate, arm or fire the detonator.

#### 3.8.1.10. GPS

- The GPS location, and also the altitude and number of satellites found, will be displayed on the System Information screen.

### 3.8.2. DigiShot® Ranger System Limits

#### 3.8.2.1. Channels

- Maximum of 2 Channels.

#### 3.8.2.2. Maximum Dets per Channel

- 300 Detonators.

**A notification warning will be displayed when channel limits are exceeded.**

#### 3.8.2.3. Maximum Dets per Bench DigiShot® Ranger (2 Channels)

- 600 Detonators.

#### 3.8.2.4. Maximum Distance in Wi-Fi communicating to DigiShot® Ranger

- 10m


DetNet South Africa Copyright © 2022

#### 3.8.2.5. Maximum Distance in RF mode between Base Ranger and Bench Ranger

- 3000m.

#### 3.8.2.6. Maximum Harness wire between furthest DigiShot® Detonator and DigiShot® Bench Ranger

- 2500m.

#### 3.8.2.7. DigiShot® Ranger Specifications

- DigiShot® Ranger is operated by 3.7V 7.2Ah single cell Lithium Polymer battery.
- -30°C to +60°C / -22°F to +140°F. Using the optional Neoprene sleeve the Ranger can be used at -45°C / -49°F for 1 hour. It is advised that the insulating sleeve be inserted at normal room temperature / pre-heated prior to use in extreme cold conditions.
- The DigiShot® Ranger can be used for approximately 8 hours at 25°C. At temperatures below -15°C / -5°F battery life may be reduced significantly. Operating time is influenced by detonator load, backlight settings and operational temperature.
- When the battery level of the DigiShot® Ranger reaches 15%, a warning symbol will appear. Should the user choose to continue, the DigiShot® Ranger will automatically switch off when the battery level reaches 3%.

#### 3.8.2.8. DigiShot® Ranger Storage

- It is recommended that the DigiShot® Ranger be charged to 50% when placed into long-term storage, and thereafter the unit should be charged at least every six months to 50%, to maintain the expected lifetime of the battery.
- The DigiShot® Ranger may be kept on charge for extended periods of time - the DigiShot® Ranger will manage battery charging accordingly.
- The DigiShot® Ranger may draw current up to 2 Amperes during charging, and an appropriately specified charger is therefore required – it is recommended that the charger supplied with the DigiShot® Ranger be used for charging the unit.

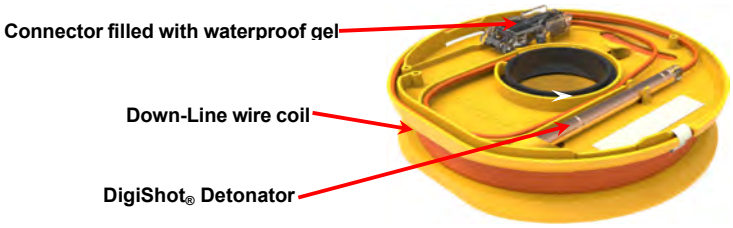
#### 3.8.2.9. GPS

GPS information displayed on System Information screen.

DetNet South Africa Copyright © 2022

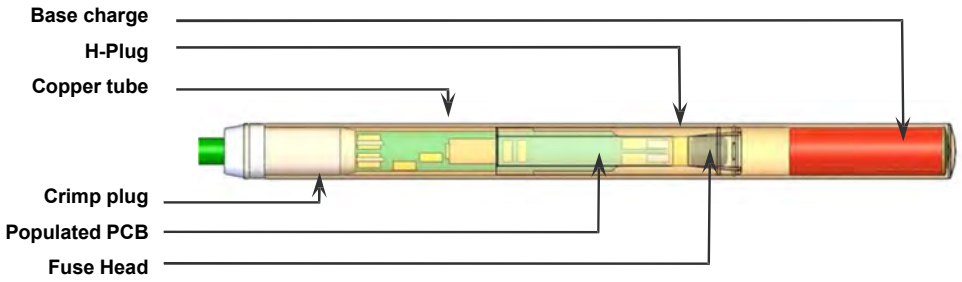
# 4 DIGISHOT® DETONATOR

The DigiShot® Detonator is a programmable detonator that is suitable for all types of blasting operations, especially those requiring precise and flexible timing and is programmable in 1ms increments from 0 to 20 000ms.
The DigiShot® Detonator is housed in a copper tube, which protects the circuit board and base charge.




The DigiShot® Detonator is attached to a robust two wire down-line cable which ends in a gel filled connector that clips on a surface harness wire.

## 4.1. Components




### 4.1.1. Crimp Plug

The crimp plug is a seal that is moulded onto the down-line wire preventing ingress of moisture and contaminants into the detonator tube between the down-line wire and crimp plug.

### 4.1.2. Printed Circuit Board (PCB)

The PCB is an electronic module that houses components such as ASIC, resistors and a capacitor.

**ASIC:**
The ASIC (Application S pecific Integrated Circuitry) controls the functions of the detonator:

**Resistors:**
The resistors protect the detonator circuitry against external influences such as:

- Over voltage,
- Over current,
- Electrostatic Discharge,
- Electromagnetic Pulse.

**Capacitor:**
The capacitor is an energy storage device that stores the required energy for the detonator to function independently after the blast signal has been sent and the connection between the control equipment and detonator has been destroyed.

### 4.1.3. Fusehead

The Fusehead is an incendiary explosive device that acts as the interface between the electronics and the explosives base charge of the detonator.

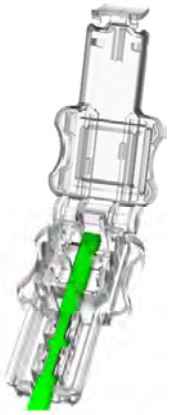

DetNet South Africa Copyright © 2022

### 4.1.4. Protective H-Plug

An anti-static H-plug that is used to centralise the PCB separates the base charge from the circuitry and prevent powder migration into the circuitry. It also protects the PCB from dynamic shock and static discharge.

The second crimp is situated around the H-Plug and provides the seal which separates the explosive powders from the circuit board.

### 4.1.5. Connector



The Connector is used to connect the detonator down-line onto the surface harness-wire bus of the installation.

The Connector has two spade connectors that ensures a secure connection on each harness-wire and has two grooves enabling the user to align each wire with these connectors and also facilitates ease of use. These connections are not polarity sensitive and can be connected in any configuration.

The transparent polycarbonate connectors allow for improved visual inspection of the wires inside the connector to ensure correct connection.

The connector is filled with a transparent gel to facilitate water resistance during use. It is advisable not to submerge connectors in water.

### 4.1.6. Down-line wire

The down-line wire is a cable comprising Bi-metal wire conductors which are individually sheathed and an outer black and green insulation.

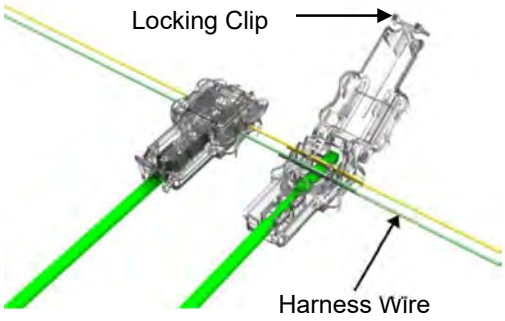
The down-line wire is manufactured in various lengths and can be supplied to the user's requirements.


DetNet South Africa Copyright © 2022

## 4.2. Connecting Up

### 4.2.1. Connector

1. Using one hand, hold the down-line wire with the connector facing away from your body.
2. With the other hand, pinch the locking clip to release the connector and release the top lid.
3. Flip the connector lid open.
4. Ensure that there are no small stones and grit inside the connector.




5. Align the harness wire with the spade connectors inside the connector. Guiding grooves on either side of the connector housing will facilitate the ease of this operation.
6. When closing the connector, ensure the connector clicks home to ensure a secure and proper connection and prevent the connector from opening

| | |
|---|---|
| NOTE | **Place connectors away from normal operational movement of vehicles and users. Walking or driving over these connectors will result in damaged connectors, requiring the replacement of detonators.**<br><br>**Avoid contamination inside the connector by keeping the connector closed at all times before final connection to the harness-wire.**<br><br>**Do not remove the gel because it assists with preventing moisture accumulating inside the connector that will lead to corrosion of the connectors and leakage. In addition, small stones and grit can cause damage to contacts causing loss of communication to the detonator.**<br><br>**A connector that is not closed correctly could result in a poor connection which may cause communication problems with the detonator and ultimate misfire.**<br><br>**Avoid contamination inside the connector by keeping the connector closed at all times.**<br><br>**A connector that is not closed correctly could result in a poor connection which may cause communication problems with the detonator.** |

## 4.3. Application of Detonator

Refer to Application document OPI-00390 for guidelines. The guideline does not supersede those required by the local mine, explosives or statutory regulations/procedures/codes of practise regarding the use of DigiShot® Detonators. In such cases, the MOST STRINGENT set of rules between the mine, explosives or local regulations/procedures/codes of practise and the manufacturer must be followed.

## 4.4. Handling Precautions

| | |
|---|---|
| NOTE | **Refer to the Electronic Detonator Material Data Sheet for detailed information on Precautions for safe handling, Conditions for safe storage, Disposal methods and** |


DetNet South Africa Copyright © 2022

| | |
|---|---|
| | **Regulatory information.** |

### 4.4.1. Storage

- Store DigiShot® Detonators in accordance with relevant regulatory/legal requirements.
- Ensure no smoking or open flames near DigiShot® Detonators.
- Always keep storage facilities clean and dry.
- Ensure rotation of stock to use product with the specified shelf life.

### 4.4.2. DigiShot® Detonator Care

- Avoid dropping or applying any physical shock to DigiShot® Detonators because all detonators are impact sensitive.
- The connector is splash proof; water inside the connector could cause leakage that could result in DigiShot® Detonators malfunctioning.
- Keep detonators a minimum of 0.1m from cellular phones and 2m away from handheld radios while priming and loading blastholes.
- Keep detonators a minimum of 2m from cellular phones and 2-way radios when preparing for blasting as interference could cause the 4G Detonator to malfunction.
- Never attempt to open the DigiShot® Detonator as it could initiate.
- Keep the connectors closed when not in use to prevent corrosion of the connector's pins.
- Grit and dirt inside the connector could damage the connector pins and result in poor connection.
- Explosives inside the connector may cause corrosion on the connector pins that could result in poor connection and leakage.

| | |
|---|---|
| | **4G DETONATORS MAY ONLY BE CONNECTED TO THE THE DIGISHOT® RANGER IN ACCORDANCE WITH LOCAL LEGISLATION AND PRESCRIBED BLASTING PRACTICES ON SITE WHICH MAY REQUIRE THE BENCH TO BE CLEARED FOR BLASTING BEFORE CONNECTION TO A BLAST DEVICE IS ALLOWED.** |

## 4.5. Specifications

### 4.5.1. Number of DigiShot® Detonators

A maximum of 300 DigiShot® Detonators (dependent on down-line wire length) can be accommodated per channel.

### 4.5.2. Automated detonator capacity check

Due to the expanded non-volatile memory capacity of the new DigiShot® Detonator, the cable length is now stored in the detonator during assembly. With this information stored in the detonator, the software on the Control Equipment will automatically verify the cumulative detonator down-line length and warn the user should the installation limits be exceeded.

### 4.5.3. Decking

The system can accommodate decking applications with up to six decks and three 4G detonators per deck while using the Advanced and Planned Tagging Options. In DigiShot tagging mode the control equipment will allow for up to 15 detonators per hole.


DetNet South Africa Copyright © 2022

### 4.5.4. Maximum delay times and increments

DigiShot® detonators can be programmed from 0ms to a maximum delay of 20 000ms in 1ms increments.

Accuracy (Coefficient of Variance) is 0.01% up to 20 000ms.

### 4.5.5. Temperature Limitations

The following temperature limitations apply to the DigiShot® Detonator:

- -40°C to +80°C
- -40°F to +176°F

### 4.5.6. Storage Life and Equipment Life

Store in a well-ventilated magazine suitably licensed for IMCO Class 1.1B or 1.4S (specified on packaging) and in accordance with specifications of the relevant Acts on the storage of explosives. The product has a 5-year shelf life from date of manufacture when stored in accordance with relevant regulatory requirements.

### 4.5.7. Electrostatic Discharge, Over Voltage, Over Current and EMP Immunity

The DigiShot® Detonators have resistors which provide the following safety features:

- Over voltage protection - Over current protection,
- Static - Electrostatic discharge (ESD) Electromagnetic Pulse (EMP),
- As per SANS 1717-1 and CEN 13763-27 requirements.


DetNet South Africa Copyright © 2022

## 4.6. Safety

The DigiShot® Detonator cannot be initiated by the CE4 Tagger. The CE4 Tagger is incapable of producing the required firing voltage and cannot produce the required 'Fire' command to initiate a DigiShot® Detonator.

**NEVER CONNECT ANY THIRD PARTY OR OTHER UNAPPROVED DETONATORS TO THE DIGISHOT® SYSTEM.**

## 4.7. Safety Warnings

### 4.7.1. User and Safety Tips

**Always keep connectors closed when not in use to avoid damage and/or contamination. Always ensure all the DigiShot® Detonators are connected to the system via the harness wire before leaving the bench.**

**DigiShot® Detonators are impact sensitive and should always be handled with care.**

### 4.7.2. Risks

**HANDLE MECHANICALLY DAMAGED 4G DETONATOR AS PER APPROVED PROCEDURES. NEVER CONNECT THE 4G DETONATOR TO ANY UNAPPROVED VOLTAGE SOURCE. NEVER CONNECT THE 4G DETONATOR TO ANY EQUIPMENT OTHER THAN A CE4 TAGGER WHILE ON THE BENCH. THE 4G DETONATOR MAY BE CONNECTED TO THE RANGER AS PER LOCAL LEGISLATIVE REQUIREMENTS AND PRESCRIBED BLASTING PRACTICES ON SITE WHICH MAY REQUIRE THE BENCH TO BE CLEARED FOR BLASTING BEFORE CONNECTION TO A BLAST DEVICE IS ALLOWED**

### 4.7.3. Destruction of 4G Detonators

Refer to Destruction of Shot Detonators document OPI-202 for guidelines. The guideline does not supersede those required by local mine, explosives or statutory regulations/procedures/codes of practise regarding the use of 4G detonators In such cases, the MOST STRINGENT set of rules between the mine, explosives or local regulations/procedures/codes of practise and the manufacturer must be followed.


DetNet South Africa Copyright © 2022

# 5 CE4 TAGGER

## 5.1. CE4 Tagger General Information

The CE4 Tagger is a lightweight device that is powered by an internal rechargeable 3.7V Lithium Polymer cell and equipped with a backlit screen and a keypad.

The CE4 Tagger is used on the bench to test and configure the detonators by tagging the location of the detonators and assigning appropriate delays.

The device is also used to establish a Wi-Fi link with an appropriate DigiShot® Ranger in order to interface with the DigiShot® Ranger.

The CE4 Tagger features various user-interface elements including separate LEDs located above the LCD screen, a buzzer and a vibration motor to draw the user's attention to the system's current state.

The CE4 Tagger is incapable of producing sufficient voltage and the coded signal required to fire any detonators, thus rendering the CE4 Tagger inherently safe.


DetNet South Africa Copyright © 2022

## 5.2. CE4 Tagger Components

*Figure 4: CE4 Tagger Component Identification*


DetNet South Africa Copyright © 2022

### 5.2.1. Harness wire terminals

The harness wire terminals are used to connect to detonator / surface harness wires.

### 5.2.2. Pogo Pins

The Pogo pins are used to connect a single detonator, while testing and tagging holes.

### 5.2.3. LEDs

- STATUS LED – A Blue circular LED ( ● ) which indicates the status of the CE4 Tagger.
- CHARGE LED – A White DetNet Swirl shaped LED ( ) which indicates that the CE4 Tagger is charging.
- ERROR LED – A Red triangular LED ( ▲ ) which indicates when an error is present.

### 5.2.4. LCD Screen

The LCD screen displays 128x128 pixels. If the device is used in environments where the temperature drops below -15°C, heating of the LCD will be necessary, and the internal heater pad will automatically switch on to heat the display.

### 5.2.5. SoftKeys

The SoftKeys will activate functions that appear at the bottom of the LCD screen, above the corresponding SoftKey, as an option in a menu.

### 5.2.6. Navigation and Numerical Keys

The Yellow arrows (↑ ↓ ← →) on the keypad are the Navigation keys.
The Up and Down Navigation Keys are also used to increase and decrease values in certain screens.
The Numerical keys are used to enter numerical values and to select a function from the list of commands or menus.
The top bar displayed on each screen will indicate the keyboard mapping mode designed for that screen.

### 5.2.7. Enter Key

The Enter key is used to accept an on-screen activity/option.

### 5.2.8. Backspace Key

The Backspace key is used to delete the character to the left of the cursor.


DetNet South Africa Copyright © 2022

### 5.2.9. On/Off key

Press key to switch ON the CE4 Tagger.
Press key while holding the key to switch the CE4 Tagger OFF.
To save battery power, the CE4 Tagger turns off automatically after a set period of idle operation. The auto power-off time may be adjusted, within limits, by the user.

### 5.2.10. Esc Key

The **Esc** key is used to cancel and escape out of selected options.

### 5.2.11. Function Key

The key is a function key that is used in conjunction with other keys to perform specific functions.

### 5.2.12. USB Connector Port

**NO DETONATOR SHALL BE CONNECTED TO THE CE4 TAGGER WHILST THE TAGGER IS CONNECTED TO A CHARGER.**

The USB connector port will allow for charging of the battery and for software upgrades and communication with a PC.

**To perform a software upgrade, plug a flash drive containing the new software version into the USB connector while the CE4 Tagger is switched off. Hold down "any key" (Except the key) and then press the power ON button This will place the CE4 Tagger in bootloader mode and start the download of the new software. Follow the on-screen instructions to complete the software upgrade.**

### 5.2.13. Battery

The CE4 Tagger uses a rechargeable 3.7V Lithium Polymer battery. Consult Section 5.7 for more details on the CE4 Tagger battery, charging and maintenance procedure.

### 5.2.14. Audio Tones

Audible feedback operates as follows:

- A specific audio sample is played during the boot-up process
- A positive acknowledgement sound accompanies successful tasks
- An error acknowledgement sound accompanies errors or automatic power-off after a software timeout
- An informational sound accompanies other noteworthy events to draw the user's attention to the screen.


DetNet South Africa Copyright © 2022

### 5.2.15. Vibration Signals

Error events are accompanied by a CE4 Tagger vibration sequence.

### 5.2.16. Visual Signals

LEDs will illuminate to visually signal a change to the user.
A round blue LED ( ● ) and a triangular red LED ( ▲ ) will illuminate under the following conditions:

- Successful tests or operations result in the blue led illuminating until a new operation is performed or until the screen is exited.
- Unsuccessful tests or operations result in the red LED flashing until a new operation is performed or until the screen is exited.
- When an error is accepted by the User, the red LED will switch off, and only if a test fails will the red LED flash.
- The red and blue LEDs will illuminate simultaneously only if the operation has completed but some error conditions (acknowledged by the user) have been encountered (example: tagging a det with a bad fuse).
- The DetNet Swirl shaped white LED will illuminate to indicate that the CE4 Tagger is charging.

### 5.2.17. Real Time Clock (RTC) Function

The CE4 Tagger contains an internal Real Time Clock (RTC), which is required for its operation and log keeping.
The user should manually confirm/set the time-zone on the CE4 Tagger.
The time is automatically updated via the internal GPS.

### 5.2.18. NFC

The CE4 Tagger (version 4 and later) is equipped with a Near Field Communication (NFC) reader located on the rear of the Tagger. NFC functionality will be activated in a future software release.


DetNet South Africa Copyright © 2022

## 5.3. Power CE4 Tagger ON and OFF

### 5.3.1. CE4 Tagger Power-ON

1. Press the ON key.
2. The splash screen will display for approximately 1.5 seconds during the CE4 Tagger boot sequence.
3. The system name will be displayed.
4. The software release and hardware version number will be displayed similar to example shown.

**ONLY TRAINED USERS SHALL BE ALLOWED TO USE THIS EQUIPMENT.**

5. Warning will be displayed to indicate that the Tagger is due for service (If applicable)
6. Press the Ok SoftKey to acknowledge and continue.

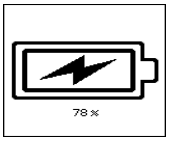
7. Warning will be displayed indicating that Tagger must have a unique number which the user must acknowledge before proceeding.
8. Press the Ok SoftKey to acknowledge and continue.

Disclaimer indicating that new software has been installed and user has press OK to acknowledge authorisation to use the software.

9. Disclaimer will be displayed which the user must acknowledge before proceeding.
10. Press the Ok SoftKey to acknowledge the Disclaimer.

DetNet South Africa Copyright © 2022

| | |
|---|---|
| NOTE | **The charging screen will only be displayed when the CE4 Tagger is connected to a USB, Wireless charger, external battery pack, or charging source. Pressing ESCAPE returns the user to the original screen and prevents this screen being shown again until the next power-on sequence.** |




Device password

11. Enter the Device password using the numerical keypad.
12. Press ↵ to continue.

| | |
|---|---|
| NOTE | **To prevent unauthorised use, the CE4 Tagger is assigned a default password by the manufacturer. The default password may be changed by the user and can be configured from the "Settings" menu. The user may reset the password with a ticket retrieved from DetNet Portal, should the password be previously set and the user does not recall the password.**<br>**Entering value 0 as a password will remove the password-required step when starting the device.** |

13. Main Menu screen will be displayed.
    The main menu screen will vary dependant on the mode of operation.

### 5.3.2. CE4 Tagger Power-OFF

14. Press and hold FN key and then press the -⏻ key to power OFF CE4 Tagger.

| | |
|---|---|
| CAUTION | **IN THE EVENT OF THE SOFTWARE NOT RESPONDING TO THE FN KEY IN COMBINATION WITH THE -⏻ KEY, IT IS POSSIBLE TO FORCE THE CE4 TAGGER TO POWER OFF BY PRESSING AND HOLDING THE -⏻ KEY FOR AT LEAST 10 SECONDS TO FORCIBLY POWER OFF THE CE4 TAGGER. NOTE THAT THIS ACTION MAY RESULT IN SETTINGS OR BLAST INFORMATION BEING LOST AND SHOULD NOT BE USED IN NORMAL PRACTICE AS HARD POWER DOWNS CAN LEAD TO DATA CORRUPTION OR LOSS.** |

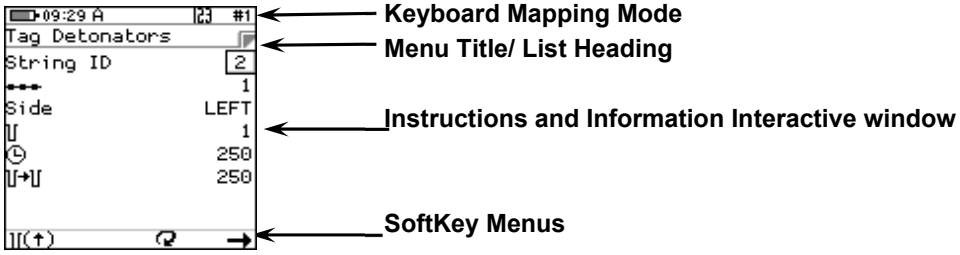

DetNet South Africa Copyright © 2022

## 5.4. CE4 Tagger Menu Navigation

Menu navigation is performed by directly pressing the associated menu item number key. This is indicated to the user by the '**123**' keyboard mode displayed in the top bar. Pressing escape will normally navigate to the previous menu. In some screens, such as Tagging, other keyboard modes may be appropriate e.g., an arrow notation may be displayed to indicate that options on the screen may be incremented or decremented using up and down arrow keys.

**NOTE**

**The charging Icon will only be displayed while the CE4 Tagger is plugged into a power.**



- Press the Numerical keys to enter numerical values or to select a function from the list of menus.
- The Yellow arrows are Navigation keys and are used to navigate during actions where it is required to move left, right, up or down in an active screen.
- The Up and Down Navigation Keys are also used to increase and decrease values in certain screens.

- Use the SoftKeys to select soft menu options. Soft menu options will appear as icons at the bottom of the LCD screen directly above the corresponding SoftKey, as an option in a menu.
- Press the corresponding SoftKey to perform the indicated function.
- Press the key to confirm an instruction.
- Press the

key to cancel an instruction.

### 5.4.1. CE4 Tagger Common User Interface Conventions

The CE4 Tagger screens support standard conventions of interaction as detailed below:

#### 5.4.1.1. CE4 Tagger Numeric input

- When a default number is displayed on the screen, any numeric keyboard input will replace the existing number entirely.
- Pressing Enter will move to the next field if any.
- Pressing Escape will exit the numeric field and consequently also the active screen if it cannot continue without the required input.
- The Backspace key will delete the rightmost character, including that of a default number if present.
- Escape will not return a changed numeric input field to the original value. Pressing escape will exit the menu.


DetNet South Africa Copyright © 2022

#### 5.4.1.2. 'Scrolled' Numeric input

Fixed range numeric input may be scrolled if indicated by up/down arrows associated with the field:

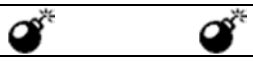
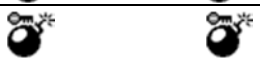
- Pressing the Up key (2) increments the number, if possible.
- Pressing the Down key (8) decrements the number, if possible.

#### 5.4.1.3. Navigation

Navigation follows the conventions to ease migration as detailed below:

- Menus are selected by pressing the appropriate numeric key directly.
- Soft keys perform the indicated function.
- Escape exits the current field or screen, as appropriate.
- Arrow keys may be used to move in selected lists or scroll selected lists e.g., the detonator list.
- Arrow keys may also jump between selected fields in specific screens, typically those involving configuration settings.

*Table 2: CE4 Tagger Icon Shortcut Keys and Ranger Icons*

| ICON / KEYSTROKES | DESCRIPTION |
|---|---|
| FN & ESC | Press both the Function & Escape keys to disconnect the Tagger from the Ranger |
| FN & ↵ | Press both Function and Enter keys while in the main menu to connect Tagger to the Ranger |
| # | Press Hash to display errors / View Notifications screen |
| | Base Ranger screen with Bench connected |
| | Number of detonators (Per Ranger) |
| ⚠ & ✉ | Errors exist. Press hash (**#**) key. |
| | Wait – Not ready yet |
| | Info |
| | Return to SAFE (Abort) |
|  | Fire Button(s) |
|  | Force fire buttons (Should the last det check fail, the User can force the blast with blast override password) |
| | Fire keys Disabled |
| | Busy with background tasks |


DetNet South Africa Copyright © 2022

## 5.5. CE4 Tagger Menu Quick Reference

*Table 3: CE4 Tagger Menu Reference*

| Info Screen | Main Menu | Configuration |
|---|---|---|
| Regulatory Info | 1. New design | 1. 4G Setup |
| Battery/Current/Cell Status/Temp/Humidity | 2. Tag detonators | 2. Device Setup |
| HW serial no/SW release/Service date | 3. Test menu | 3. Advanced Setup |
| GPS data/Satellites/Altitude | 4. View design | 4. Factory Setup |
| User ID | 5. Mark detonators | |
| | 6. Time Detonators – *Available in DigiShot (D) tagging mode* | |
| | 6. Assign ViewShot - *Available in Planned (P) tagging option only* | |
| | 7. ViewShot - *Available in Planned (P) tagging option only* | |

*Table 4: CE4 Tagger Main Menu Reference*

| | |
|---|---|
| **1-New Design** | |
| | Select Channel (DigiShot mode): ALL /Channel ½ |
| | Warning Displayed: "Clear Memory": Do you want to clear the list? Y/N |
| | Warning Displayed: Only connect one detonator at a time |
| | Tag Side: Tag on only one side? Y/N |
| | Dets per Hole: specify how detonators in one hole |
| | Main Menu is presented. This will clear the tagged detonator list and not the ViewShot design |
| | (Planned mode) Warning Displayed: Selected Plan xx<br>Only connect one detonator at a time |
| **2 -Tag detonators** | |
| | Tag on only one side? Y/N<br>Dets per Hole: specify how detonators in one hole |
| | Warning Displayed:<br>• Selected Plan xx. Connect one det at a time<br>• If No plan available. Use ViewShot 3D to download a plan! |
| | Tagging detail settings |
| **3-Test Menu** | |
| | 3.1. Test All |
| | 3.2. Test String |
| | 3.3. Test Single Det |
| | 3.4. Leakage Test |
| | 3.5. Untagged Test |
| | 3.6. Search Dets |
| **4-View Design** | |
| | 4.1. List Detonators |
| | 4.2. List Missing Dets |


DetNet South Africa Copyright © 2022

| | |
|---|---|
| | 4.3. List New Dets |
| | 4.4. List Bad Status |
| | 4.5. Duplicate Location |
| | 4.6- Blast Summary |
| **5-Mark Detonators** | |
| | 5.1. End of Line |
| | 5.2. Start of Row |
| | 5.3. End of Row |
| | 5.4. Inflection Pt. |
| | 5.5. Remove Mark |
| **6-Time Detonators** – Available in DigiShot tagging mode | Greyed-out when no detonators has been tagged |
| | 6.1. Time Blast |
| | 6.2. Time Specials |
| | 6.3. Time Row |
| | 6.4. Time Row by Row |
| | 6.5. Apply Times |
| | 6.6. Verify Times |
| **6- Assign ViewShot** - Available in Planned (P) tagging option only | |
| | **No detonators** message is displayed if the detonator list (tagged) is empty. |
| **7- ViewShot**- Available in Planned (P) tagging option only | |
| | 7.1. Verify Plan |
| | 7.2. Verify Delays |
| | 7.3. Show Results |
| | 7.4. Merge Plan |
| | 7.5. Delete ViewShot |
| | 7.6. DigiShot Layout (only when Planned tagging mode and detonator label format is set to DigiShot) |
| | 7.7. Reconciliation |

*Table 5: CE4 Tagger Configuration Menu Reference*

| | |
|---|---|
| **⚙.1: 4G Setup** | |
| | ⚙.1.1. Tag Option |
| | Select:<br>• Basic (B)<br>• DigiShot (D)<br>• Advanced (A)<br>• Planned (P) |
| | ⚙.1.2. Site Setup |
| | 1.2.1. Selections |
| | • Use Markers (B/A/P/D) |
| | • Multi-Ranger (A/B/P/D) |
| | • Autotag (A/P) |


DetNet South Africa Copyright © 2022

| | |
|---|---|
| | • Multi Primed (A) |
| | • Assign Locations (A/P) |
| | • Halt on Test (D) |
| | 1.2.2. List Hole Config |
| | 1.2.3. Det Label |
| | DigiShot Label / {NNNNN} {N} / {A} {NNNNN} {N} / (NNN),(NNN),{N} / {AA} {NNN} {N} |
| | ⚙.1.3. Leakage Trigger |
| | • Select leakage warning trigger (Between 0.1 and 1mA) |
| | ⚙.1.4. Test Single on Bus |
| | • Disable |
| | • Enable |
| | ⚙1.5. Extra Info Bar |
| | • Hide Info Bar |
| | • Show Info Bar |
| **⚙.2: Device Setup** | |
| | 2.1. Contrast |
| | 2.2. Brightness |
| | 2.3. Time Zone |
| | 2.4. Timeouts |
| | 2.5. Language |
| | 2.6. Units |
| **⚙.3: Advanced Setup** | |
| | 3.1. Tagger ID |
| | 3.2. Connections |
| | 3.3. Remote View |
| | 3.4. Tagging Options |
| | • Clear Tags |
| | • Read All Det Data |
| | • Max Wire length |
| | • Detonator Product (DigiShot/IntelliShot or DigiShot +) |
| | • Hole Load Mode (Load per Deck/Load per Hole) |
| | 3.5. Device Password |
| | 3.6. Reconciliation |
| | 3.7. Last Assert |
| **⚙.4: Factory Setup** | |
| | 4.1. Clear |
| | • Clear Tags |
| | • Clear Logs |
| | • Reset Service Date |


DetNet South Africa Copyright © 2022

| | |
|---|---|
| | 4.2. Leakage Calibrate |
| | 4.3. Start Self-Test |
| | 4.4. Experimental Menu |
| | 4.5. Storage Mode |
| | • Storage Mode |
| | • SD Card Dump |
| | 4.6. Connector Type (Old 2W / New 4/2W) |
| | 4.7. Tag Option |
| | • Basic |
| | • Planned |
| | • Advanced |
| | • DigiShot |

**The Factory Setup Menu is password protected and not for normal use. It is required to access the Factory Setup only. Tagging Mode can be set in the Factory settings under Tag Option menu by ticking or unticking.**


DetNet South Africa Copyright © 2022

## 5.6. CE4 Tagger Accessories

### 5.6.1. External Battery Pack

The External Battery Pack is an optional accessory used to increase the capacity of the internal battery when operating in sub-zero temperatures or other environments that demand extended operating times.
The Internal Heater Pad can operate with the internal polymer battery, independently of the external battery pack, and will switch ON when the temperature drops below -15°C.

External Battery Pack enclosure is attached to the back of the CE4 Tagger by four retaining screws.

Six batteries are fitted in the bottom of the External Battery Pack. A cover closes the battery bay.

| | |
|---|---|
| NOTE | **Replace using 6 x 1.5V AA Alkaline or 6 x 1.2V Ni-MH / Ni-Cd batteries only.**<br>**The battery life will decrease with extended use of heater pad at temperatures below 15°C. The CE4 control equipmet should not be exposed to severe cold tempertaures when not in use.** |

Closed External Battery Pack fitted to the CE4 Tagger.

*Figure 5: CE4 Tagger External Battery Pack*


DetNet South Africa Copyright © 2022

### 5.6.2. Replaceable Top Connectors

The Top Connector contains the pogo pins, used for tagging the detonators (one detonator at a time)
It also consists of the Harness wire terminals, used to connect to the detonator harness wire (multiple detonators on the same wire bus).

| | |
|---|---|
| CAUTION | **THIS PART SHOULD BE REPLACED IN A CLEAN ENVIRONMENT.** |

*Figure 6: CE4 Tagger Top Connector*

| | |
|---|---|
| NOTE | **Always keep the contacts clean and free of contamination.** |

The Top Connector may be ordered separately and is easily replaceable should the contacts become worn and/or damaged, through prolonged use.


DetNet South Africa Copyright © 2022

### 5.6.3. Surface Harness Wire

The Surface harness wire consists of a pair of yellow and green individually sheathed copper wire, 0.63mm in diameter.

*Figure 7: Surface Harness Wire*

DigiShot ® Detonators are connected to the surface harness wire to enable communication with control equipment. The maximum length of 2-wire surface harness per channel, including the lead-in wire used to connect shall not exceed 2500m.

| | |
|---|---|
| CAUTION | **BY EXCEEDING THIS LIMIT THE INHERENT RESISTANCE ON THE HARNESS WIRE WILL INCREASE RESULTING IN POTENTIAL MISFIRES.**<br>**ALL JOINTS SHALL BE SECURELY TWISTED AND INSULATED TO PREVENT INTERMITTENT CONNECTIONS, SHORT CIRCUITS AND EXCESSIVE LEAKAGE. THESE CAN BE A MAJOR SOURCE OF TROUBLE CAUSING POTENTIAL MISFIRES.** |


DetNet South Africa Copyright © 2022

## 5.7. CE4 Tagger Battery

The CE4 Tagger uses a rechargeable 3.7V Lithium Polymer cell battery.
The CE4 Tagger battery compartment is sealed to prevent moisture ingression and condensation which could cause corrosion and or short circuits within the CE4 Tagger resulting in a possible malfunction or an unreliable CE4 Tagger.
The CE4 Tagger is tested to an IP 57 rating.

| | |
|---|---|
| CAUTION | **NO DETONATOR SHALL BE CONNECTED TO THE CE4 TAGGER WHILST CONNECTED TO A CHARGER.** |

| | |
|---|---|
| NOTE | **The battery is not replaceable in the field and should only be replaced by a DetNet qualified technician.** |

### 5.7.1. Charging the CE4 Tagger (Wired)

- Connect the USB cable between the mini USB port on the CE4 Tagger and a Personal Computer or use a DetNet Universal charger to charge the CE4 Tagger.
- The CE4 Tagger will automatically start charging as soon as the USB connector port is plugged into a USB socket.
- A battery level indication will be displayed during charging.

The CE4 Tagger may not charge sufficiently if the CE4 Tagger is connected to a weak charger or damaged USB port.
The charging circuit of the CE4 Tagger may require as much as 1A for charging.

| | |
|---|---|
| NOTE | **It is recommended that the CE4 Tagger be charged to 100% before use, to allow for maximum operating time .** |

### 5.7.2. Wireless Charging

Wireless charging has been incorporated into the CE4 Tagger (version 4 and later) to allow the unit to be charged using a commercially available authorised Qi wireless charging pad. (An authorised Qi charger will display the Qi logo). This will allow the user to charge the Tagger without the need for USB cables, and also ensures that the protective cover on the USB connector remains closed and sealed in harsh environments.

QI Logo

The wireless charging receiver is situated on the rear of the Tagger. The receiver supports a power transfer of 5W and can charge the Tagger with a current of 1A when ideal alignment, field coupling, and matching is achieved. Note that the maximum supported power transfer rate is not guaranteed given the matching and alignment requirements that may not always be met. Therefore, the Tagger may take longer to charge wirelessly than when connected to a USB cable / charger, where a charging current of up to 1A is readily obtained.
The recommended Qi chargers are as follows:


DetNet South Africa Copyright © 2022

- Belkin wireless charger: F7U050
- Samsung wireless charger: EP-PG920I
- Samsung wireless charger: EP-NG930

| | |
|---|---|
| CAUTION | IT IS RECOMMENDED THAT THE CE4 TAGGER BE CHARGED TO 50% WHEN PLACED INTO STORAGE, AND THEREAFTER THE UNIT SHOULD BE CHARGED AT LEAST EVERY SIX MONTHS TO 50%, TO MAINTAIN THE EXPECTED LIFETIME OF THE BATTERY. REFER TO CE4 TAGGER STORAGE MODE UNDER ADVANCED SETUP FOR MORE DETAIL. |

### 5.7.3. Low Battery

Once the battery has discharged to 9%, the CE4 Tagger will display the message ✉ icon in the top bar indicating a possible low battery condition. (The message Icon is active for any fault condition).

| | |
|---|---|
| NOTE | **The CE4 Tagger will automatically switch off when the battery capacity drops below 3%.** |

- **Press** # button to view Notifications screen.
- Screen will display **Low Battery!**
- Press **Exit** SoftKey to return to previous screen.

### 5.7.4. Battery Information

The user may navigate to the System information screen (detailed in paragraph 0) to check that the CE4 Tagger is being charged and to verify the state of health of the battery.


DetNet South Africa Copyright © 2022

## 5.8. CE4 Tagger Storage Mode

The CE4 Tagger storage process is to be followed when the CE4 Tagger will be stored for an extended period of time.

| | |
|---|---|
| NOTE | **It is recommend that the CE4 Tagger be charged to 50% when put into storage and thereafter the unit should be charged at least every six months to 50%, to maintain the expected lifetime of the battery. Store the CE4 Tagger in a cool, dry place when not in use.** |

1. Main Menu
   - Press SoftKey below to select **Configuration** Settings Menu.

2. From Configuration Settings Menu
   - Press 4 to select **Factory Setup.**

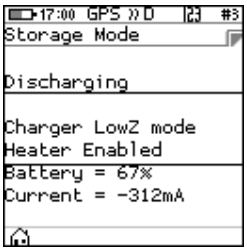
3. Factory Password
   - Enter Factory Password
   - Press to select Factory Setup Menu

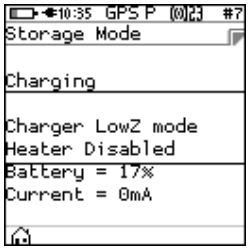
4. Factory Setup Menu
   - Press key 5 to select **Storage Mode**.

DetNet South Africa Copyright © 2022

5. Storage Mode

- When the battery capacity is more than 50%, the CE4 Tagger will discharge the battery by activating various battery consuming functions such as the heating pad, to accelerate the discharge level to the required 50% charge level.
- When the battery capacity is less than 50%, the CE4 Tagger will prompt the user to connect a charger to attain the required 50% charge level.
- When the CE4 Tagger reaches the 50% battery storage capacity as required, it will switch off automatically allowing for safe storage.





DetNet South Africa Copyright © 2022

# 6 CE4 TAGGER SYSTEM INFORMATION

This function enables the user to view battery charge information, current consumption, state-of-health of the battery, temperature information, hardware and software serial numbers, GPS detail and User ID.

## 6.1. System Info

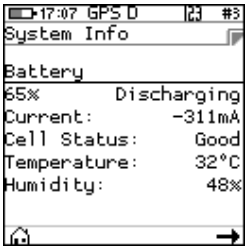
From the Main Menu, press ⓘ SoftKey to view the CE4 Tagger System Information

### 6.1.1. Regulatory Info

- Regulatory information will be displayed.

### 6.1.2. System Info - Battery

- **95%:** Battery charge information Charging will be indicated by **(USB)** when a USB charger is used or **(AUX)** when a wireless charger is used. Should the charger not be able to supply enough power to charge the CE4 Tagger, 'Weak Charger' will be indicated as the charging status, instead of 'Charging (USB)'.
- **Current Consumption:** By convention, a negative value indicates that current is being drawn from the battery.
- **Cell Status:** (Good) indicates the state of health of the battery. Should the status indicate 'Low' the unit should be serviced to have the battery replaced.



**The CE4 Tagger will switch OFF automatically when the battery capacity drops below 3%. (The CE4 Tagger will display a warning at 9% and switch OFF at 3%).**

### 6.1.3. System Info - Temperature and the Relative Humidity

The Temperature and the Relative Humidity as measured inside the CE4 Tagger are displayed as follows:

- **Temperature:** The Temperature is displayed in degrees Celsius or Fahrenheit (Dependant on Units Setting under Device Setup).
- **Humidity:** The Relative Humidity is displayed as a percentage.
- Press ➡ to select next page.


DetNet South Africa Copyright © 2022

### 6.1.4. System Info - Hardware Serial Number and SW Release Number

- Hardware Serial Number will be displayed, and
- Software Release Number will be displayed.
- Service will display the required date for servicing. Should the date be exceeded, an Error message will be displayed stating “Device service due”.
- Press ➡ to select next page.

**Hardware Serial number is required when Challenge Response tickets are required from the DetNet Portal.**

### 6.1.5. System Info - GPS Detail

- The GPS location will be displayed.
- Altitude and the number of satellites found will also be displayed.
- Press ➡ to select next page.

### 6.1.6. System Info –User ID

- Press SoftKey to enter or edit User ID.
- Use alphanumeric characters to enter a User ID.
- Press ➡ to select next page.

**The User ID may be used to identify ownership of the CE4 Tagger such as the User name or Site name/code where used. Clearing the USER ID will result in NO USER to be displayed after saving/enter is pressed.**


DetNet South Africa Copyright © 2022

# 7 CE4 TAGGER CONFIGURATION SETTINGS

## 7.1. CE4 Tagger 4G Setup Configuration

### 7.1.1. Tag Option

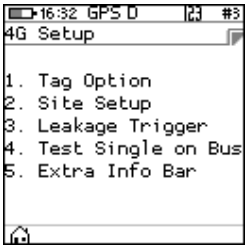
The Tag Option will allow the User to select one of the following four tagging options:

- Basic (B)
- DigiShot (D)
- Advanced (A)
- Planned (P)
- A corresponding symbol (B, D, A or P) will be displayed in the top bar once the tag option is set.

1. Main Menu
   - Press SoftKey to select Configuration Settings.

2. Configuration Settings Menu
   - Press 1 to select **4G Setup**

3. 4G Setup
   - Press 1 to select **Tag Option**




4. Tag Option
   - Use 2 8 navigational keys to scroll up/down and display the required selection as follows:
   - Press SoftKey to save option as required.
   - Press SoftKey to return to Main Menu.

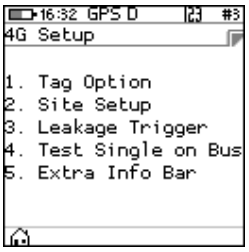
DetNet South Africa Copyright © 2022

### 7.1.2. Site Setup

1. Main Menu
   - Press SoftKey to select Configuration Settings.

2. Configuration Settings Menu
   - Press 1 to select **4G Setup**

3. 4G Setup
   - Press 2 to select **Site Setup**




| | |
|---|---|
| NOTE | **The Site Setup is dependent on the Tagging Option and in this menu, the user may allow certain functions to be active when tagging.**<br>**Advanced mode has more advanced features and can be used with multi-primed or decked holes. Detail about decking and hole configuration can be found further in this document where Advanced mode is detailed** |

4. Site Setup

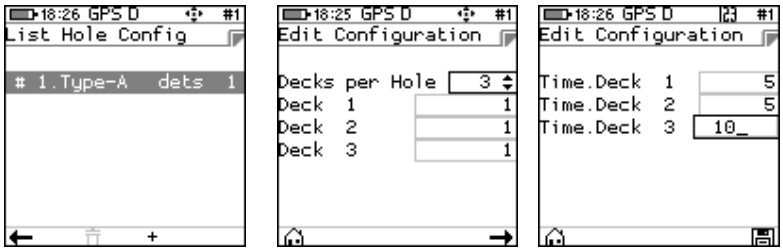
Site Setup screen for DigiShot, Advanced and Planned are similar to the left screen depicted below while Basic tagging mode is depicted by right hand side picture below.

DetNet South Africa Copyright © 2022

**Selections:** When 1 is pressed then the Tagger will display the following:

- **Use Markers:** When the Use Markers option is enabled (Black filled rectangle) the tagging screen will contain a SoftKey to allow the simultaneous marking and tagging of a detonator. "Mark detonators" menu includes more types of markers besides "End of Line" which typically is assigned to the detonator connected last on a wire harness
- **Multi-Ranger:** When this option is selected, the user may tag more than 2 channels and up to 1200 detonators on a single Tagger. If not selected it will stop and provide a warning when more than 4 channels are allocated, and more than 1200 detonators are being tagged.
- **Autotag:** If the Autotag option is disabled (White filled rectangle), tagging can only be performed on the pogo pins, and not by connecting a detonator onto the harness wire. (It is not practical to connect and then remove the detonator from the harness wires).
- **Multi-Primed**: When this item is enabled one can load more than one detonator per hole and tagging can also be restricted to a deck only if necessary.
- **Assign Locations**: With large blast designs, the plan may not be complete at the time of tagging and to speed up the process, tagging can be conducted in parallel with drilling. If this item is checked, the "Tag Detonators" menu will only write the locations in the detonator.
- **Halt on Test**: When this option is enabled (Black filled rectangle) this allows for Tagger to stop during testing processes when an error has taken place until the user acknowledge.

**When the plan is available later, the tagging must be completed using the tagger to "Assign Delays" (as the Ranger does not have the option to time dets) in order to prepare the detonators for the blast.**




- **List Hole Configuration**: Allows users to define a hole configuration.
  A hole configuration consists of the number of decks in a hole, the number of detonators in each deck and the time offset of each deck.
  The system allows more than one hole configuration to be defined but only one can be employed at the time of tagging.


DetNet South Africa Copyright © 2022

- **Det Label**: The label defines how the hole (det) is referred to throughout the system.
  The following choices are available:
  1. DigiShot Label
  2. Row number, hole number, det number
  3. Literal row, hole number, det number
  4. Hole Number, det number
  5. Numeric sequence (used internally in basic mode)

| | |
|---|---|
| NOTE | **Refer to individual Tag Options in the Tagging Operation section (Chapter 10) of this manual where detail is provided regarding the Site Setup. This will differ according to the type of Tagging Option selected.** |


DetNet South Africa Copyright © 2022

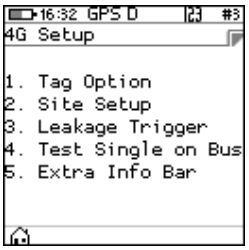
### 7.1.3. Leakage Trigger

The user could set the maximum limit where the leakage warning is triggered. This limit could be set from 0.1 mA to 1mA in increments of 0.1mA. Note that the default leakage limit is 0.5 mA

1. Main Menu
   - Press SoftKey to select **Configuration Settings**.

2. Configuration Settings Menu
   - Press 1 to select **4G Setup.**

3. 4G Setup
   - Press 3 to select **Leakage Trigger.**




   - Use 2 8 navigational keys to scroll up/down and display the required selection.
   - Set warning trigger between 0.1 and 1mA.
   - Press SoftKey to save.

### 7.1.4. Test Single on Bus

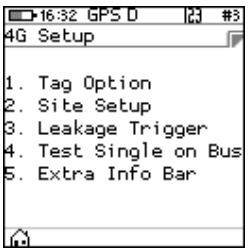
The user may test a single detonator while the harness wire is connected on the CE4 Tagger terminals. The user must first enable test single on bus by following these steps:

4. Main Menu
   - Press SoftKey to select Configuration Settings.

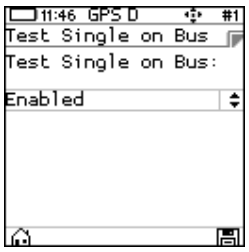
DetNet South Africa Copyright © 2022

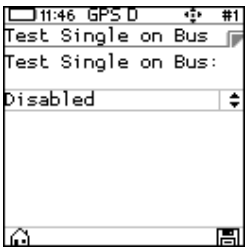
5. Configuration Settings Menu
   - Press 1 to select 4G Setup.

6. 4G Setup
   - Press 4 to select **Test Single on Bus**




   - Use 2 8 navigational keys to scroll up/down and display the required selection.
   - Set enabled or disabled.
   - Press SoftKey to save.




### 7.1.5. Extra Info Bar

The user may show or hide extra info when testing detonators. The user must first show or hide extra info bar by following these steps:

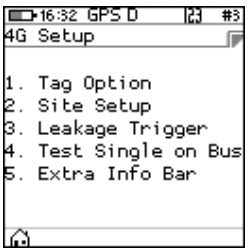
7. Main Menu
   - Press SoftKey to select Configuration Settings.

8. Configuration Settings Menu
   - Press 1 to select **4G Setup**

DetNet South Africa Copyright © 2022

9. 4G Setup

- Press 5 to select **Extra Info Bar**




- Use 2 8 navigational keys to scroll up/down and display the required selection.
- Set show info bar or hide info bar.
- Press SoftKey to save.

DetNet South Africa Copyright © 2022

## 7.2. Device Setup

This menu will allow the user to adjust device specific settings. The following options are available:

1. Contrast
2. Brightness
3. Time Zone
4. Time Outs
5. Language
6. Units

### 7.2.1. Contrast

This function enables the user to adjust the LCD screen contrast.

**The contrast adjusts as the value changes but the setting will only be saved permanently when the SoftKey is pressed.**

1. Main Menu
- Press SoftKey to select Configuration Settings.

2. Configuration Settings Menu
- Press 2 to select **Device Setup**.

3. Device Setup
- Press 1 to select **Contrast**.

4. Contrast
- Use the arrow key 4 6 to adjust contrast.
- Adjust to ensure the displayed contrast 'blocks' are distinguishable to allow viewing 'greyed out' versus 'bold' items. If the contrast is either too high or too low, these font differences will not be notable.
- Press SoftKey to save.
- Press SoftKey to return to Main Menu.

DetNet South Africa Copyright © 2022

### 7.2.2. Brightness

The Brightness menu allows the LCD screen display brightness to be adjusted using the 4 6 arrow keys.

> **NOTE**
>
> **The Brightness adjusts as the value changes but the setting will only be saved permanently when the SoftKey is pressed.**

1. Main Menu
   - Press SoftKey to select Configuration Settings.

2. Configuration Settings Menu
   - Press 2 to select **Device Setup**.

3. Device Setup
   - Press 2 to select **Brightness**.

4. Adjusting the Brightness
   - Use the arrow 4 6 keys to adjust brightness.
   - Press SoftKey to save.
   - Press SoftKey to return to Main Menu.

DetNet South Africa Copyright © 2022

### 7.2.3. Time Zone

This function enables the user to define the time zone. Date/time settings are controlled by GPS GMT data but, since the time **zone** is not configured automatically, it should always be set by the user in order to ensure the correct time display. The time zones may be adjusted in 0.5-hour increments.

1. Main Menu
   - Press SoftKey to select Configuration Settings.

2. Configuration Settings Menu
   - Press 2 to select **Device Setup**.

3. Device Setup
   - Press 3 to select **Time Zone**.

4. Set Time Zone
   - Use the arrow key 2 8 to navigate the Time Zone options (Time zone can be adjusted in 0.5h increments).
   - Press SoftKey to save.
   - Press SoftKey to return to Main Menu.

DetNet South Africa Copyright © 2022

### 7.2.4. Timeouts

This function enables the user to set a time period of inactivity before the CE4 Tagger will automatically power off to conserve battery power. The user can set the idle time between 2 to 360 minutes.

1. Main Menu
   - Press SoftKey to select Configuration Settings.

2. Configuration Settings Menu
   - Press 2 to select Device Setup.

3. Device Setup
   - Press 4 to select **Timeouts.**

4. Auto Shutdown
   - Use 2 8 navigational keys to navigate selection.
     - Minimum of 2 minutes.
     - Maximum of 360 minutes.
   - Press SoftKey to save.
   - Press SoftKey to return to Main Menu.

DetNet South Africa Copyright © 2022

### 7.2.5. Language

This function enables the user to select a language preference for the CE4 Tagger menus.

1. Main Menu
   - Press SoftKey to select Configuration Settings.

2. Configuration Settings Menu
   - Press 2 to select **Device Setup**.

3. Device Setup
   - Press 5 to select **Language.**

4. Language
   - Press 1 on the keypad to select English.
   - Press 2 on the keypad to select Español.
   - Press 3 on the keypad to select Français.
   - Press 4 on the keypad to select Bahasa.
   - Press SoftKey to return to Main Menu.

DetNet South Africa Copyright © 2022

### 7.2.6. Units

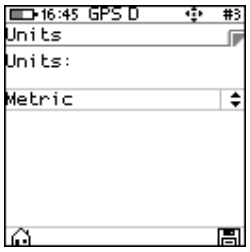
This function enables the user to select either the Imperial or Metric Units of Measure as preferred.

1. Main Menu
   - Press SoftKey to select Configuration Settings.

2. Configuration Settings Menu
   - Press 2 to select **Device Setup**.

3. Device Setup
   - Press 6 to select **Units.**

4. Units
   - Use 2 8 navigational keys to toggle selection.
   - Press ↵ to select either Imperial or Metric.
   - Press SoftKey to save.





DetNet South Africa Copyright © 2022

# 8 CE4 TAGGER ADVANCED SETUP

The Advanced Setup Menu displays the following options:

1. Tagger ID
2. Connections
3. Remote View
4. Tagging Options
    a. Clear Tags
    b. Read All Det Data
    c. Max Wire length
    d. Detonator Product
    e. Hole Load Mode (Load per deck or Load per hole)
5. Device Password
6. Reconciliation
7. Last Assert

## 8.1. Tagger ID

This function enables the user to set a unique Tagger ID that is used for device identification and RF communication. The Tagger ID should be unique amongst all Taggers at a site. IDs from 1 to 10 are supported.

**The current CE4 Tagger ID is displayed on the right side of the top bar on the screen (#1 in the screen depicted below).**

**WHEN USING MULTIPLE TAGGERS ON THE SAME BLAST, ENSURE THAT TAGGER IDS ARE UNIQUE AS TAGGERS USING THE SAME ID WILL CAUSE ERRORS ON THE BLAST.**

1. Main Menu
    - Press SoftKey to select Configuration Settings.

2. Configuration Settings Menu
    - Press 3 to select Advanced Setup.

DetNet South Africa Copyright © 2022

3. Advanced Setup
   - Press 1 to select **Tagger ID**.

4. Tagger ID
   - Use numerical keypad to enter Unique Tagger ID between 1 and 10.
   - Press SoftKey to **save**.
   - Press SoftKey to return to Main Menu.

DetNet South Africa Copyright © 2022

## 8.2. Connections

This function enables the user to activate the Wi-Fi and/or USB module allowing the Tagger to communicate with other equipment.

| | |
|---|---|
| NOTE | **Additional software for a PC may be required from the manufacturer to support this feature. USB cable or Wi-Fi must be connected, and the PC software must be configured and activated before this function can be used.** |

1. Main Menu
   - Press SoftKey to select **Configuration Settings.**

2. Configuration Settings Menu
   - Press 3 to select **Advanced Setup**.

3. Advanced Setup Menu
   - Press 2 to select **Connections**.

4. Connections
   - Press 1 on the keypad to connect Tagger to **PC via Wi-Fi**.
   - Press 2 on the keypad to connect Tagger to **Ranger/Commander via Wi-Fi**
   - Press 3 on the keypad to connect Tagger to **PC via USB**

| | |
|---|---|
| NOTE | **During initial connection with a PC, the device will be displayed on the PC Wi-Fi List and will require a Password to connect. Use Generic Password: 145634235. Subsequent connections will connect automatically.** |


DetNet South Africa Copyright © 2022

### 8.2.1. Connect Tagger to PC via Wi-Fi

**To establish Wi-Fi connectivity between the CE4 Tagger and a PC, the PC must be equipped with the required Wi-Fi functionality and corresponding software.**

1. Main Menu
   - Press SoftKey to select **Configuration Settings**.

2. Configuration Settings Menu
   - Press 3 to select **Advanced Setup**.

3. Advanced Setup Menu
   - Press 2 select **Connections**.

4. Connections
   - Press 1 on the keypad to connect CE4 Tagger to **PC via Wi-Fi**.

5. PC via Wi-Fi
   - CE4 Tagger will search for access point on PC.
   - CE4 Tagger will connect to the PC.
   - Follow on-screen prompts to connect to CE4 Tagger Access point Wi-Fi.

DetNet South Africa Copyright © 2022

### 8.2.2. Connect CE4 Tagger to DigiShot ® Ranger via Wi-Fi

1. Main Menu
   - Press SoftKey to select **Configuration Settings**.

2. Configuration Settings Menu
   - Press 3 to select **Advanced Setup**.

3. Advanced Setup Menu
   - Press 2 to select **Connections**.

4. Connect to
   - Press 2 on the keypad to connect CE4 Tagger to DigiShot® **Ranger via Wi-Fi**.

5. Ranger via Wi-Fi
   - Enter the Ranger's ID using the keypad to connect.
   - Press to continue.
   - **Enter Ranger's ID** will also be displayed if Ranger is not found while attempting to connect.

| | |
|---|---|
| NOTE | **Only one Ranger with selected ID must be active when connected.**<br>**When connectivity is established between the CE4 Tagger and the Ranger an audible "Bling" and subsequent "Tock" sound should be heard for every button press.** |


DetNet South Africa Copyright © 2022

CE4 Tagger will connect to the selected DigiShot® Ranger.

NOTE

**Shortcut key combination is available from the Tagger main menu to connect the CE4 Tagger to DigiShot® Ranger via Wi-Fi menu as follows:**

- **Press and hold FN key and then press the ↵ key to connect.**
- **Press and hold FN key and then press the ESC key to disconnect.**


DetNet South Africa Copyright © 2022

### 8.2.3. Connect CE4 Tagger to PC via USB

1. Main Menu
   - Press SoftKey to select **Configuration Settings.**

2. Configuration Settings Menu
   - Press 3 to select **Advanced Setup**.

3. Advanced Setup Menu
   - Press 2 to select **Connections**.

4. Connections
   - Press 3 on the keypad to connect CE4 Tagger to **PC via USB**.

5. USB Link with PC
   - The CE4 Tagger will wait for the connection to be established and the following messages will appear:
     - Ready for PC – Connect USB cable between PC and CE4 Tagger
     - Connected to PC

DetNet South Africa Copyright © 2022

## 8.3. Remote View

This function enables the user to demonstrate the CE4 Tagger in action by replicating the screen on a PC. It may be used by trainers, product presenters and document writers.

| | |
|---|---|
| NOTE | **Additional PC software may be required from the manufacturer to support this feature. USB cable or Wi-Fi must be connected, and the PC software must be configured and activated before the Remote View function can be used.** |

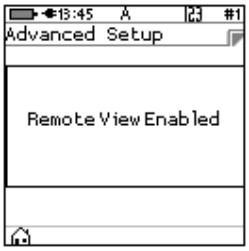
### 8.3.1. Select Remote View on CE4 Tagger

1. Main Menu
   - Press SoftKey to select **Configuration Settings.**

2. Configuration Settings Menu
   - Press 3 to select **Advanced Setup**.

3. Advanced Setup Menu
   - Press 3 to select **Remote View**.

4. Screen Capture
   - Press 1 to Enable on USB when prompted.
   - CE4 Tagger actions will be replicated on the PC screen.
   - Press 1 to disable remote view.

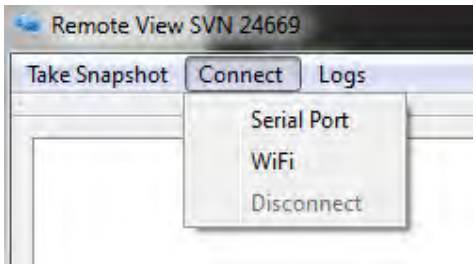


DetNet South Africa Copyright © 2022

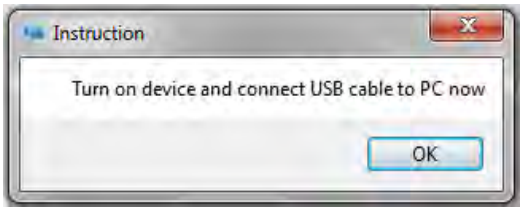
### 8.3.2. Initiate Remote View on PC

1. Open the Remote View software application on the PC.

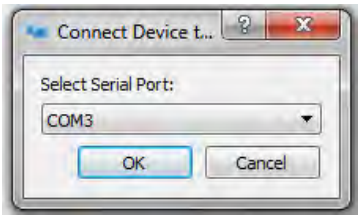
2. Click on **Connect** tab
3. Select either **Serial Port** or **Wi-Fi** as required from option – note that when Wi-Fi is used then the PC should be connected to the Tagger via Wi-Fi.



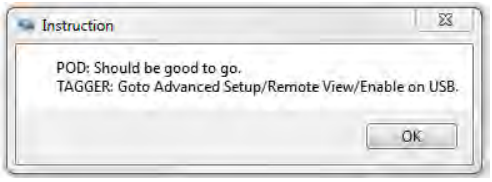

4. Ensure CE4 Tagger is switched ON.
   - Connect USB cable between CE4 Tagger and PC
   - Click OK to continue



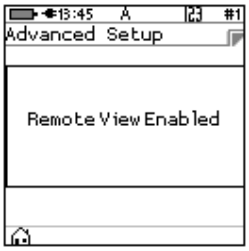

Connect Device when connecting via USB.
- Select Serial (COM) Port from dropdown list.
- Click OK to continue.




5. Navigate to Advanced Setup/ Remote View on CE4 Tagger
6. Press 3 to select **Remote View.**



7. Press 1 to enable Remote View on **PC via USB**
8. Remote View will be displayed on PC.





DetNet South Africa Copyright © 2022

## 8.4. Tagging Options:

The tagging Options menu provides five options that can be accessed by user. The five options are Clear Tags, Read All Det Data, Max Wire Length, Detonator Product and Hole Load Mode.

1. Main Menu
   - Press SoftKey to select **Configuration Settings**.

2. Configuration Settings Menu
   - Press 3 to select **Advanced Setup**.

3. Advanced Setup Menu
   - Press 4 to select **Tagging Options.**
   - The Tagging Options will be displayed.

### 8.4.1. Clear Tags

This function enables the user to clear the detonator memory and remove the tag that was assigned. After the process completes the detonators will contain the factory ID that they were shipped with.
Connect the harness wire to the Harness wire terminals of the CE4 Tagger. The detonators should remain connected to the Harness wire during the process.

1. In **Tagging Options** Menu
   - Press 4 to select **Tagging Options.**
   - In Tagging Options menu Press 1 to **Clear Tags**

DetNet South Africa Copyright © 2022

2. Clear Tags
   - An information screen will be displayed.
   - Press [Yes] SoftKey to erase all detonators tags for connected detonators.
   - Press [No] SoftKey to exit without clearing detonators.

When [Yes] SoftKey was selected, the Tagger will display Busy… to ensure that all the dets are clear and then **Det tags cleared** message will be displayed to indicate that Tags have been cleared.

3. Press [Ok] SoftKey to return to Advanced Setup Menu.

**Use this feature with caution. Once all det tags are cleared, the detonators will need to be re-tagged from the start, which will be time consuming.**

### 8.4.2. Read All Detonator Data

This function was designed for debug purposes and it captures the data from a single detonator in the Tagger logs.

1. Advanced Setup Menu
   - Press 4 to select **Tagging Options.**
   - Press 2 to select **Read All Det Data.**

2. Read All Det Data
   - Connect a single detonator to the pogo pins or spring terminals.
   - Tagger will indicate the test progress.
   - Detonator information will be recorded in the Tagger logs.
   - Press SoftKey to return to Main Menu.

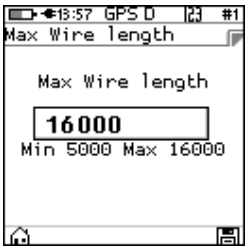
DetNet South Africa Copyright © 2022

### 8.4.3. Maximum Wire Length

This function enables the user to set the maximum detonator wire length on a particular string. When the total detonator wire length on a particular string exceeds the set maximum wire limit, a system notification warning will be triggered.

1. Advanced Setup Menu
   - Press 4 to select **Tagging Options.**
   - Press 3 to select **Max Wire length.**

2. Max Wire length
   - Use numerical keypad to enter maximum wire length.
   - Default is 10000m.



DetNet South Africa Copyright © 2022

### 8.4.4. Detonator Product

This function enables the user to select a detonator product in order to tag it in accordance with its mode. The DigiShot or IntelliShot or DigiShot Plus 4G can be selected from the Tagger. This will allow certain features especially when DigiShot is selected that will allow the user use familiar tagging functions and options.

**All Plans including plan names and the Design (Detlist) will be cleared if the Detonator product is changed.**

**Changing plans will not be available when DigiShot Plan 1 is the default and current plan.**

**The detonator product should be set to DigiShot to be compatible with DigiShot Ranger.**

1. Main Menu
   - Press SoftKey to select **Configuration Settings**.

2. Configuration Settings Menu
   - Press 3 to select **Advanced Setup**.

3. Advanced Setup Menu
   - Press 4 to select **Tagging Options.**
   - Press 4 to select **Detonator Product.**

1. Use 2 8 navigational keys to toggle between IntelliShot or DigiShot Plus 4G and DigiShot.
2. Press SoftKey to save.

DetNet South Africa Copyright © 2022

### 8.4.5. Decking Allocation - Hole Load Mode

This option enables the user to perform multiple deck blasting where more than one detonator is allocated per hole.
In a blast plan a hole can be set up for decking up to a maximum of 15 DigiShot® detonators per hole.
Decking allocation refers to the position of a DigiShot® detonator inside a hole.

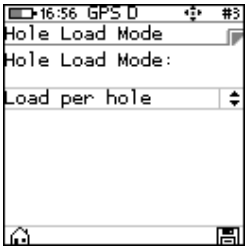
When more than one detonator is placed into a hole, two tagging modes are available.

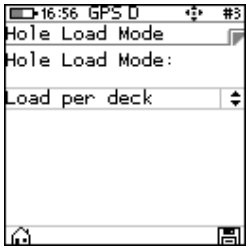
1. Main Menu
   - Press SoftKey to select **Configuration Settings**.

2. Configuration Settings Menu
   - Press 3 to select **Advanced Setup**.

3. Advanced Setup Menu
   - Press 4 to select **Tagging Options.**
   - Press 5 to select **Hole Load Mode.**

1. Use 2 8 navigational keys to toggle between Load per hole and Load per deck.
2. Press SoftKey to save.





DetNet South Africa Copyright © 2022

## 8.5. Device Password

The CE4 Tagger is protected from unauthorised use by assigning a password.
This function enables the user to change the default password by assigning a new unique password that is known only to the user.

1. Main Menu
   - Press SoftKey to select **Configuration Settings.**

2. Configuration Settings Menu
   - Press 3 to select **Advanced Setup**.

3. Advanced Setup Menu
   - Press 5 to select **Device Password.**

4. Passwords
   - Use the numerical keypad to enter **Current Password.**
   - Press ↵ to confirm.
   - Use the numerical keypad to enter **New Password.** Leave blank and press ↵ for NO password requirement during start-up of the Tagger.
   - Press ↵ to confirm.

5. Passwords
   - Information message confirming password changed will be displayed briefly.
   - CE4 Tagger will display Passwords Screen.
   - Press ESC to return to Advanced Menu.
   - Press SoftKey to return to Main Menu.

| | |
|---|---|
| NOTE | **The Password should be changed regularly to maintain security.**<br>**Unlike conventional password entry, the chosen password is visible to the user (rather than ****) to enable the user to see if any typing errors are being made.** |


DetNet South Africa Copyright © 2022

## 8.6. Reconciliation

This function enables the user to reconcile the total amount of detonators tagged using more than one Tagger. The main Tagger will be set as a Master Tagger which will provide access point to the other Taggers. This function must be carried out after tagging has been conducted and all the other detonators that were not tagged should be deleted from the Taggers.

1. Select Reconciliation function to be Enabled or Disabled.
2. Press Softkey to save.

Refer to Para 10.6.11 for more detail on the use of the Reconciliation function.

## 8.7. Last Assert

This function allows the user to read the last assert that the device had. This is a debugging tool.

3. Press 7 to select Last Assert
4. The Internal error screen will be displayed. Press ESC Softkey to revert to Advanced Setup.

DetNet South Africa Copyright © 2022

# 9 CE4 TAGGER FACTORY SETUP

**The Factory Setup is password protected and may only be accessed by designated maintenance teams.**

1. Main Menu
   - Press SoftKey to select **Configuration Settings**.

2. Configuration Settings Menu
   - Press 4 to select **Factory Setup**.

3. Use numerical keypad to enter the Factory Password.
   - Press **ENTER** to continue.

4. Factory Setup Menu
   - Factory Setup will be displayed.
   - Press ▶ to go to next page.
   - Press ◀ to return to previous page.

5. Factory Setup Menu
   - When 1 is pressed the Clear Menu will be displayed
   - When Storage is pressed the Storage Menu will be displayed

DetNet South Africa Copyright © 2022

6. Web Ticket
   - Press required Menu option.
   - Obtain Ticket to continue.

**With the exception of the storage mode function, each option is protected by its own web-based ticket system. If no active ticket is available for the chosen option (as stored on the tagger), the user is prompted for a ticket issued by portal.detnet.com. The ticket is comprised of two 10-digit numbers that need to be entered before continuing. If the ticket is valid, access will be granted to the given function. Tickets can be issued for a selected number of repeated uses before a given expiry date. Tickets issued are specific to a given CE4 Tagger as determined by the hardware serial number, thus allowing flexible control over protected features.**

## 9.1. Factory Setup Menu Options

1. Main Menu
   - Press SoftKey to select **Configuration Settings.**

2. Configuration Settings Menu
   - Press 4 to select **Factory Setup**.

3. Use numerical keypad to enter Unique Tagger Password.
   - Press **ENTER** to continue.

DetNet South Africa Copyright © 2022

4. Factory Setup Menu
   - Factory Setup will be displayed.
   - Press ▶ to go to next page.
   - Press ◀ to return to previous page.

5. Each Factory menu option is described below:
   - **Clear:**
     - **Clear Tags (Factory)** The factory clear tags option allows any connected detonators to be rewritten to the factory untagged ID.
     - **Clear Logs (Factory)** The clear logs option erases the internal log and will display a confirmation dialog briefly.
     - **Reset Service Date (Factory)** The option will reset the maintenance schedule warning.
   - **Leakage Calibrate (Factory)** The Leakage Calibration option recalculates the leakage and current offsets by measuring the current and leakage with no detonators connected. It functions in the same fashion as the leakage test screen, except that it initially shows a leakage calibrate dialog briefly and then proceeds to the leakage screen.
   - **Start Self-Test (Factory)** The self-test function starts a factory self-test of the device.
   - **Experimental Menu (Factory)** The Experimental Menu option will contain any experimental functions that are required by the engineering team only.
   - **Storage**
     - **Storage Mode** This item is not web-ticket protected. Please refer to Chapter 5.8 for detail.
     - **SD Card Dump (Factory)** This option will dump all content on the SD card via the USB.
   - **Connector Type (Factory)** This option will allow the user to select the replaceable Top Connector Type as fitted to the CE4 Tagger.
   - **Tag Option** This option allows enablement of the different types of tagging modes. Tagging modes are selected by pressing a digit corresponding to the mode. If the block is selected, the Tagger will be enabled to tag in that selected mode.

DetNet South Africa Copyright © 2022

# 10 TAGGING OPERATIONS

**Always clear the tagged detonator list whenever a new tagging process is started. From the Main Menu, select NEW DESIGN and confirm that the list needs to be cleared.**

**Tagger must be replaced in the event a Tagger reset is experienced.**

From the Main Menu, select NEW DESIGN, select channel and confirm that the list needs to be cleared.

**Tagging allows the User to tag detonators in various configurations. To cater for specific user requirements, refer to Chapter 7.1.1 - CE4 Tagger Setup Configuration to configure the required Tag Option as some features displayed on-screen may not be applicable to a particular tagging option.**

**WHEN TAGGING WITH DIGISHOT CE4 TAGGER USER MUST NOT CHANGE BETWEEN LABEL FORMATS AS DIGISHOT LABEL FORMAT IS NOT COMPATIBLE WITH OTHER LABELS.**
**A COMBINATION OF DIGISHOT, DIGISHOT PLUS AND OR INTELLISHOT DETONATORS ARE NOT SUPPORTED.**
**SO USER SHOULD SELECT A DETONATOR TYPE AND REMAIN IN THAT DETONATOR TYPE.**

## 10.1. DIGISHOT SYSTEM TAGGING PRINCIPLE

The main principle of tagging in the DigiShot® System is to assign a delay for each detonator tagged.
To make the detonator uniquely identifiable in the blast, the CE4 Tagger writes an ID in the detonator.
A part of the ID written in the detonator reveals the CE4 Tagger ID involved in the assignment. The tagging process for the entire blast may be shared by more than one CE4 Tagger.
Each CE4 Tagger MUST be uniquely identified, i.e. no two CE4 Taggers may have the same Device ID.
Based on the Detonator Product setting:
When DigiShot product is selected the 300 detonators per channel
When DigiShot + 4G (Dyno Nobel) or IntelliShot (AECI Mining) detonator is selected then 400 detonators per channel
Each CE4 Tagger can contain a maximum of 1200 Detonators in a Multi-mode storage/memory. Only 300 dets (one String) could physically be tested at a time on a Tagger when DigiShot product is selected or otherwise 400.
For tracking and troubleshooting purposes, the CE4 Tagger can also write a location in the detonator memory. This location can be a number only (referred to as “sequence”) or may be a fully descriptive position of a detonator in the blast as Side (L/R), Row (number), Hole (number) and Det (number) in a hole.
When tagging a detonator, the record is automatically appended to an internal list and saved on the persistent data storage card.


DetNet South Africa Copyright © 2022

### 10.1.1. Basic

The BASIC tagging option (**B**) is offered to make the tagging simpler and also suitable for smaller applications.

### 10.1.2. DigiShot

The DigiShot tagging option (**D**) allows the user to tag with sides, rows, hole number and detonator number. This option allows the user to tag detonators and then later send delays to the detonators via the Tagger when all detonators per string are connected on harness wire.


DetNet South Africa Copyright © 2022

### 10.1.3. Advanced

The Advanced Mode option is more complex than the Basic Mode as it allows for multi-primed holes and the user will need to control several parameters within this mode. To define a hole configuration the “Site Setup” screen will need to be accessed. The Advanced (**A**) Tagging option also allows the user to tag detonators using Detonator Label methods as follows:

- Method 1: {NNNNN} {N}, a hole number and det number is assigned.
- DigiShot Label
- Method 2: {NNN} {NNN} {N} a group number depicted as Row number, hole number and det number is used.
- Method 3: {AA} {NNN} {N}, a user configurable 2 letter group number, hole number and det number is assigned.
- Method 4: {A} {NNNNN} {N}, a user configurable single letter group number, hole number and det number is assigned.

### 10.1.4. Tag by Plan

With the Planned (P) tagging option, both the location and a delay will be written into the detonator.
The data written into the detonator is taken from a plan downloaded into the CE4 Tagger via ViewShot.
When exporting the design from ViewShot as the connection sequence and blasthole numbers will be exported to the tagger.
Manual locations can also be deployed separately from delays by using Advanced mode with “Assign Location” setting checked. This feature can be used when the delays are not yet known.
Delays can be deployed to the tagged detonators later in Planned mode, using the available plan based on location matching.


DetNet South Africa Copyright © 2022

## 10.2. BASIC (B) TAGGING OPTION

With the BASIC tagging option, the user needs to only concentrate on the Delay value assigned to the detonator. The String and starting hole numbers can be set-up in the beginning of tagging.
The BASIC option is best suited for single primed hole blasts.

**It is advised to use only one Tagger per Ranger when the Basic Tagging Option is used. Dets tagged in Basic mode have no location allocated and cannot be merged with a plan.**

**It is recommended that only one tagging mode be used when tagging and users not alternate between the tagging options.**

1. From the Main Menu
   - Press 1 to select New Design.

Clear the list acknowledgement. Select yes to clear and no to continue from previous list.
- Tag Detonators Warning
- Press OK SoftKey to acknowledge warning.

**This detonator warning message will only be displayed when the user opens the tagging screen on the initial start-up of the device.**

2. From the Tag Detonators Option

The user will be prompted to configure the Tagger with the desired String ID and new starting Sequence Number when tagging.
- Observe String ID (**1** depicted on screen)
- Enter new String ID (**2** depicted on next screen)
- Press ↵ to save new String ID
- Enter new starting Sequence # as required
- Press ↵ to save new starting Sequence #

**The User may bypass the above procedure if required and Press the → SoftKey to display the following Enter Delay screen.**


DetNet South Africa Copyright © 2022

3. Enter desired delay.
   - Use the keypad to enter the delay in ms

   - Connect detonator and press ↵ to continue.
   - **ST2** String Number 2.
   - **#1** Total Count of detonators tagged.
   - **100m** Total down wire length.
   - Detonator number and delay entered will be displayed.
   - Tagger will be ready state to enter next detonator delay.

4. Enter desired delay for following detonators.
   - Use the keypad to enter the delay in ms.
   - Connect next detonator and press ↵ to continue.
   - Detonator number and delay entered will be displayed.
   - Tagger will be ready state to enter next detonator delay.

5. Enter the required delay values for all detonators to be tagged and press ↵ after each entry to save and move to next field.

DetNet South Africa Copyright © 2022

### 10.2.1. Mark Detonators

With the DigiShot® Ranger System it is recommended that the user mark the detonator that will be placed at the end of the harness wire, as the Bench Ranger will verify the voltage level of this detonator just before presenting firing buttons.
Each String should have 1 detonator marked as End of Line.

**The other types of marking are not explicitly used in this version of the system although it is planned to use it in a future release of the software. They would typically indicate that specific points of the blast have been captured and also indicate if a change of plan (delays and increments) is required.**

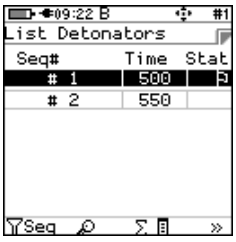
1. From the Main Menu
   - Press 5 to select **Mark Detonators.**

2. **From Mark Detonators Menu**
   - Press 1 to select/deselect **End of Line.**
   - Press 2 to select/deselect **Start of Row.**
   - Press 3 to select/deselect **End of Row.**
   - Press 4 to select/deselect **Inflection Point.**
   - Press 5 to **Remove Mark** from previously marked Detonator.
   - Press Cancel SoftKey to return to Main Menu.
   - Press Apply SoftKey to apply the setting.

DetNet South Africa Copyright © 2022

### 10.2.1.1. Multiple Last-Det assignment

**From List Detonators Menu**




- Select detonators to be assigned as Last Det.
- Press detonators to be assigned as Last Det.
- Press
- Connect det onto Pogo pins.

- Press Set as Last Det SoftKey.
- Multiple last detonators will be set and displayed.

**SHOULD THE LAST DET NOT BE SET AND THE HARNESS WIRE IS BEING COMPROMISED, THE SYSTEM WILL NOT SUCCESSFULLY DETECT THE FAILURE WHICH CAN RESULT IN A SEGMENT OF THE BLAST NOT FIRING.**


DetNet South Africa Copyright © 2022

## 10.3. DIGISHOT (D) TAGGING OPTION

### 10.3.1. New Design Screen

This function enables the user to erase the existing detonator list in order to start a new blast. Before tagging a new installation, the memory must be cleared of the previous detonator list to avoid conflicts with the new detonator list.

1. Main Menu
   - Press 1 to select **New Design**.

#### 10.3.1.1. Delete Detonator List Per Channel

1. Clear Memory

An option allows the User to delete either ALL or to delete the detonator list per individual channel, when multiple channel mode is selected.

- Press 2 8 to select required channel or ALL channels.
- Press Soft Key to Accept and Soft Key to return to Main Menu.

2. Clear Memory
   - Press Yes Soft Key to clear detonator list.
   - Press No Soft Key to exit option.

3. Warning.
   - If YES was selected, the selected **Channel/ Det List Cleared** message will be displayed briefly.
   - The **Only connect one det at a time** warning screen message will be displayed once only during tagger power-up and must be acknowledged by the user.

Select to tag on only one side or both sides.

- Press Yes Soft Key to select only one side.
- Press No Soft Key to select tag on both sides.

If Yes is pressed then user will need to:

- Press Left to tag on left side only.
- Press Right to ta on right side only.

DetNet South Africa Copyright © 2022

- Type the number of dets per hole and press ↵ to continue

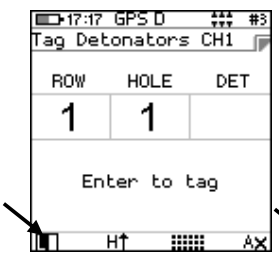
## 10.3.2. Tag Detonators

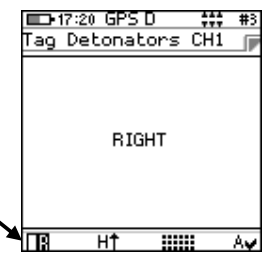
This function enables the user to assign a position to one detonator at a time.
The position is either a combination of a side (left/right), a row number (1-63), a hole number (1-127) and detonator number in a decked hole (1-15) OR a Special – an out-of-pattern detonator (1-255).

| | |
|---|---|
| CAUTION | **MAXIMUM OF 15 DETONATORS PER HOLE .** |

### 10.3.2.1. Tagging Screen Soft Key Options

**Left / Right Mode** - This function enables the user to select the side being tagged based on the blast plan.
Select L / R Soft Key to toggle between Left and Right side. The Tagger will display the selected side.

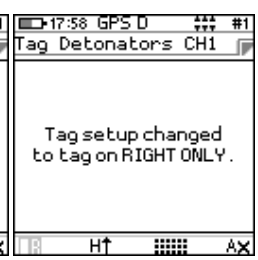


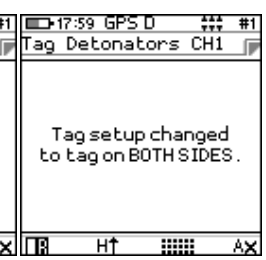




| | |
|---|---|
| NOTE | **This screen will only be displayed if the option to tag on both sides was selected.** |

The **Function** key may be used to select the required side while in the Tagging mode as follows:

Press and hold FN key while pressing the / R Soft Key to toggle between Sides.

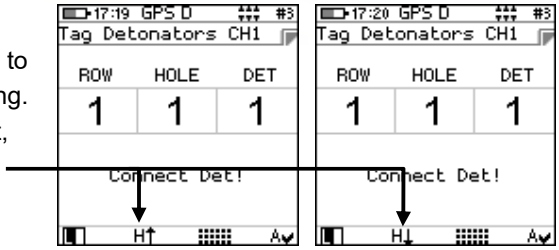


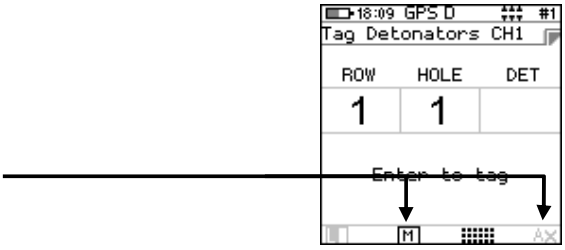





DetNet South Africa Copyright © 2022

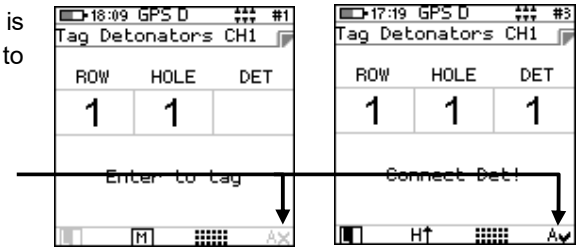
**Hole Increment and Decrement** - This function enables the user to auto increment and decrement of hole numbering while tagging. Press H↓ / H↑ / M Soft Key to toggle between Increment, Decrement and Manual mode.



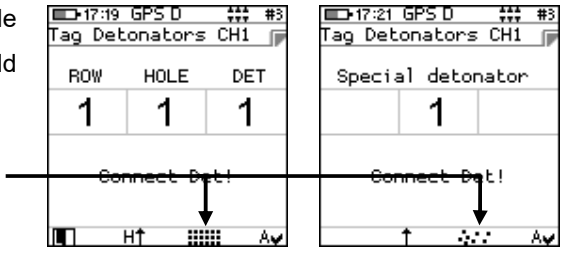




> **NOTE**
>
> **Manual mode M can only be selected when manual tagging mode Ax is selected.**

**Tagging Mode** - When **A✓ is** displayed Auto tagging mode is active. Pressing the Soft Key again will toggle the mode to manual mode indicated by **Ax.**




**Special detonators** - Press the **Pattern** Soft Key to toggle between **IN-** and **OUT**-of-pattern holes to add Special detonators.



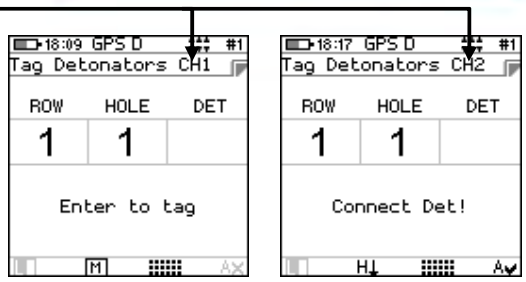


DetNet South Africa Copyright © 2022

## Select Channel Function

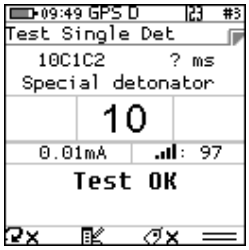
The Function key may be used to select Channels while in the Tagging mode, only if multiple channel mode is enabled, as follows:

Press and hold FN key while pressing 1 or 7 key to toggle up or down between Channels.




## Test Single Det

While in the Tagging menu, the user has the option to test a single detonator (Connected to the pogo pin connector) by pressing the minus/power key. During this test, any detonators connected via the harness wire terminal posts will be temporarily disconnected, and there will thus be no need to disconnect the bus-line when the Test Single Det option is activated. This feature is permanently enabled.




## Test All

While in the Tagging menu, the user has the option to test All detonators in the list, to verify that they are present.

- Press the 6 key to test all detonators.


DetNet South Africa Copyright © 2022

**Maximum Dets per Hole**

The maximum dets per hole setting is requested when the user enters the tagging menu but can also be changed while in the tagging menu.

Press and hold the FN key while pressing the 3 or 9 key to adjust this setting.

A message will display the new **Maximum Dets per hole** setting.

**View Det List**

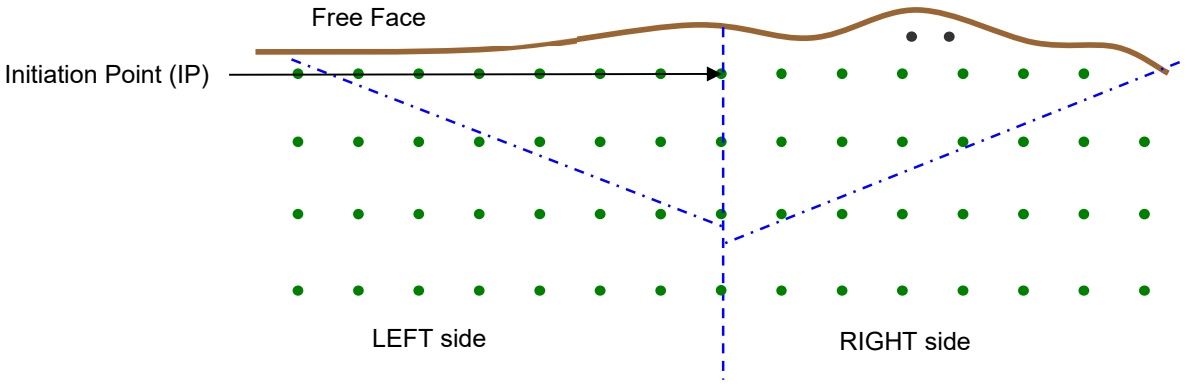
While in the Tagging menu, the user has the option to view the detonator list.

- Press the ‘0’ key to display the list.


DetNet South Africa Copyright © 2022

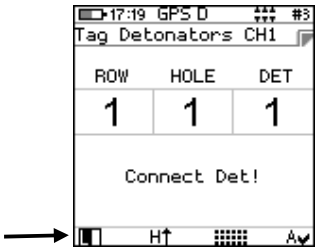
### 10.3.3. Right or Left side definition

This function enables the user to select the side being tagged based on the blast plan. The location of the Initiation Point is determined, and the blast divided according to a left-right convention or single side convention.




To change sides of Initiation Point

- Press L / R Soft Key to toggle between Left and Right side
- L Tagging left-hand side
- R Tagging right-hand side



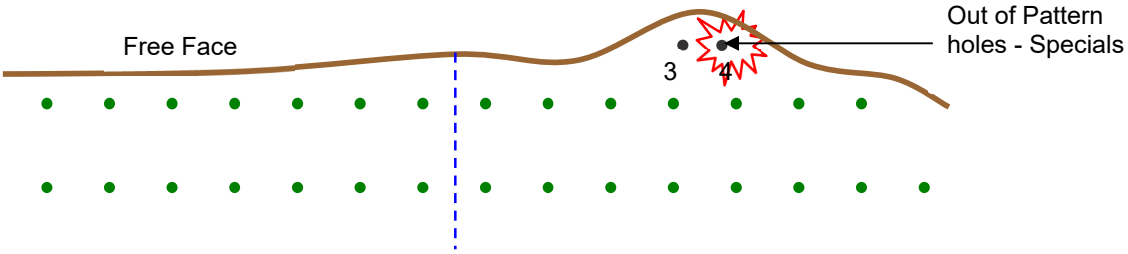

- The Tagger will display the side selected.

**When tagging, ensure the correct side of the Initiation Point is selected according to the blast plan. Tagging the incorrect location will result in retagging and valuable time being lost or even an out of sequence hole or mismatch with the blaster design pattern.**


DetNet South Africa Copyright © 2022

### 10.3.4. Special detonators

This function enables the user to tag detonators in out of pattern holes or out of sequence holes.
The DigiShot® detonators in those holes are referred to as **SPECIALS**. They are treated as a separate group and are numbered sequentially.
Absolute delays must be manually assigned to Special detonators according to the blast plan.
When tagging Specials, it is important to mark their location and delays clearly on the blast plan. This will ensure that correct delays are assigned later.




Adding Special detonators

- Use the **Pattern** Soft Key to toggle between **IN** and **OUT** of pattern holes to add Special detonators.

- Press 2 / 8 to adjust the detonator number manually if required.
- Connect detonator.
- Press ↵ to assign a location to a detonator.
- One beep will sound and the blue LED will illuminate to confirm detonator successfully labelled.
- Continue to next detonator.

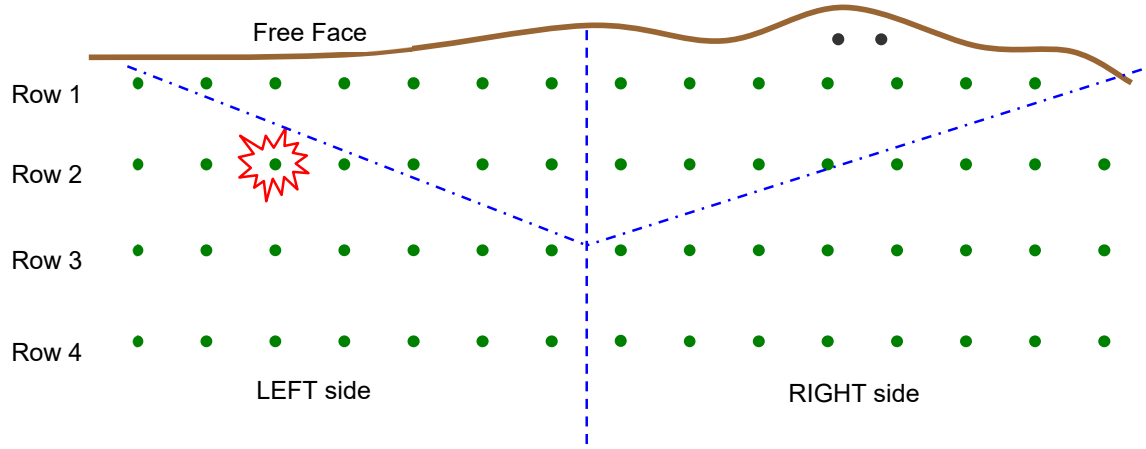
**Ensure the correct hole number is being allocated when tagging, as it will change the location of the DigiShot® detonator in relation to the Blast Plan.**

**Do not remove the DigiShot® detonator from the Tagger until the LABELLED OK message appears, to ensure that the detonator is correctly tagged.**


DetNet South Africa Copyright © 2022

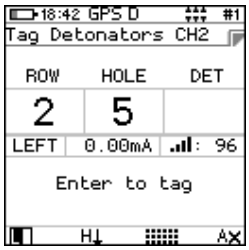
### 10.3.5. Row Allocation

In a blast plan that allows for multiple rows, row allocation refers to the particular row that a DigiShot® detonator is located in.




Rows can be tagged in any order. Row numbers have to be manually changed.
**ROW** denotes row number being tagged.

- Press 1 to increase row number.
- Press 7 to decrease row number.



**When tagging, ensure the row number is selected according to the blast plan.**

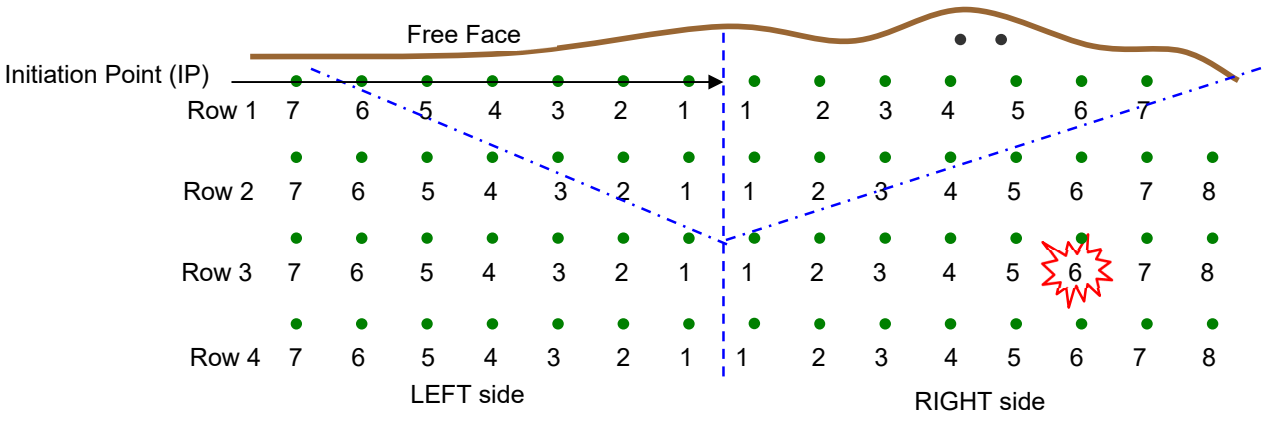
**Tagging the incorrect location, due to the wrong row being selected, will result in retagging, lost time and possibly out of sequence firing.**


DetNet South Africa Copyright © 2022

### 10.3.6. Hole Allocation

In a blast plan each hole is allocated a position number in each row. Hole allocation refers to the particular hole a DigiShot® detonator is located in.

**All holes should be tagged in order to ensure detonators are not excluded during the tagging process.**




All Holes should be tagged in order to ensure detonators are not excluded during the tagging process.
Hole numbers on the Tagger may change automatically once a detonator is successfully tagged depending on the tagging mode chosen.

**Lower hole numbers are closer to the initiation point and higher numbers are further away from the initiation point, as with chevron blasting practices.**

- **HOLE** denotes the hole number being tagged.
- Press 2 to increase hole number manually.
- Press 8 to decrease hole number manually.
- **LABELED OK** indicates a successfully tagged detonator.

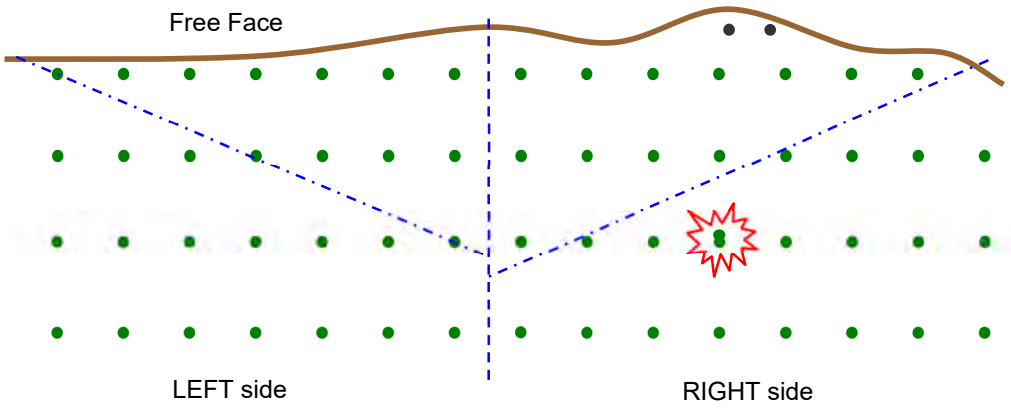
**When tagging, ensure the row number is selected according to the blast plan.**

**Tagging the incorrect location, due to the wrong row being selected, will result in retagging, lost time and possibly out of sequence firing.**


DetNet South Africa Copyright © 2022

### 10.3.7. Decking Allocation

This option enables the user to perform multiple deck blasting where more than one detonator is allocated per hole. In a blast plan a hole can be set up for decking up to a maximum of 15 DigiShot® detonators per hole. Decking allocation refers to the position of a DigiShot® detonator inside a hole.




When more than one detonator is placed into a hole, two tagging modes are available:

- Load per hole, and
- Load per deck.

**Ensure the DigiShot® detonator deck positions are clearly marked on the detonator label to avoid wrong position tagging.**

**Decked DigiShot® detonators also need to be clearly marked on the blast plan to ensure their locations are correctly assigned.**

**Refer to the Advanced Setup section in this manual where the Hole Load Mode is detailed.**

The DigiShot® Tagger allocates a unique tag to each detonator. When more than one detonator is allocated per hole (Decking), the user has the following options (hole load mode as selected in advanced setup):

1. Load per hole - Tag all the detonators decked in a hole before moving over to the next hole

Load per deck - Tag only one detonator per hole (one deck at a time) until all holes have been completed (the first deck) thereafter, return to the first hole to tag the second detonator (deck) etc.

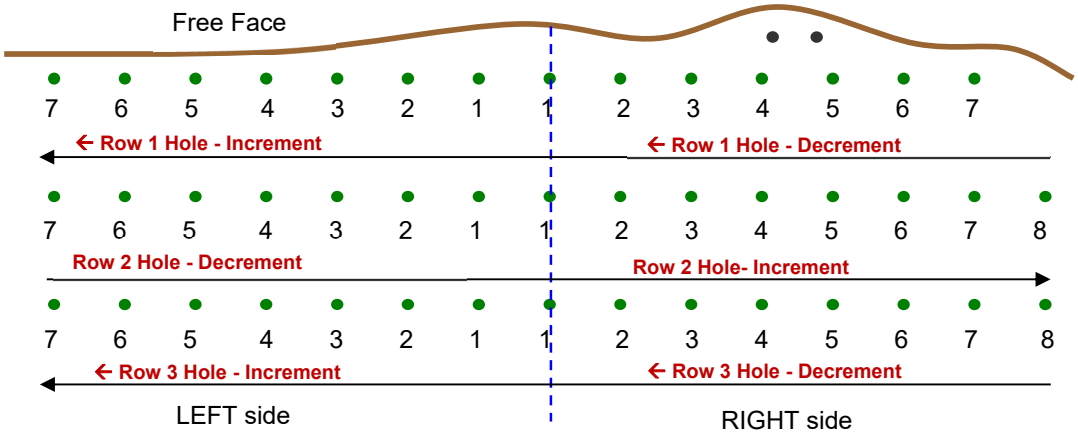

DetNet South Africa Copyright © 2022

### 10.3.8. Automatic Hole Increment and Decrement

This function enables the user to auto increment and decrement hole numbering while tagging i.e. after a hole is completed the location hole number will increment or decrement automatically as selected in anticipation of the next hole to be tagged.
Manual mode enables the user to manually increment and decrement the hole numbering for each hole.

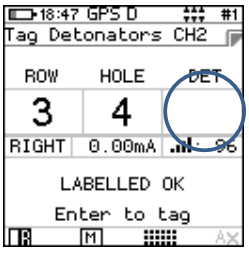
**NOTE**

**At the end of a row, the row number and increment/decrement may need to be manually adjusted before tagging the next row.**




To change hole increment and decrement:

- Press H↓ / H↑ / M Soft Key to toggle between Increment, Decrement and Manual mode



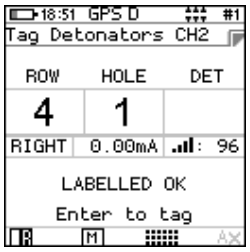

**NOTE**

**When only 1 detonator is used per hole, the DET number is not displayed.**


DetNet South Africa Copyright © 2022

### 10.3.9. MANUAL TAGGING

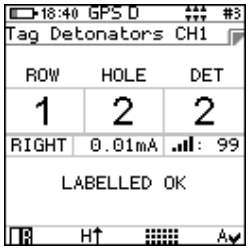
This function enables the user to Tag one detonator at a time by connecting the detonator to the top connector on the DigiShot® CE4 Tagger as follows:




- Connect detonator.
- Press ↵ to tag detonator.
- **LABELLED OK** indicates detonator successfully tagged; followed by a single beep and the blue LED will illuminate.
- Continue to next detonator by adjusting the position using the navigation keys as desired.

### 10.3.10. AUTO TAGGING

This function enables the user to Autotag detonators by connecting the DigiShot® CE4 Tagger to one end of the Harness wire and untagged detonators are connected one at a time. The tagger will automatically tag the location as each detonator is connected. The existing tagged detonators will remain connected to the Harness wire. It is advisable to use a blast plan when tagging the DigiShot® detonators to ensure that all detonators are tagged in a systematic and organised manner.



**DO NOT REMOVE DETONATOR FROM THE TAGGER BEFORE TAGGER CONFIRMS A SUCCESSFUL TAG BY DISPLAYING LABELLED OK MESSAGE .**

**The Autotag function cannot be used in Manual Mode. In the event of an error occurring while tagging, the Tagger will halt and display a Fail message and the Error LED will flash. Refer to Fault Finding section for error details.**


DetNet South Africa Copyright © 2022

## 10.4. TIMING DIGISHOT SYSTEMS

### 10.4.1. TIME A BLAST

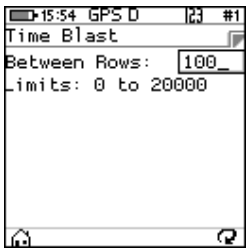
This function is used to time a pattern with constant delay between rows and between holes. It also allows timing of the decking detonator/s and allows timing of the offset delay to ensure that timing on the initiating point are not the same.

1. From the Main Menu

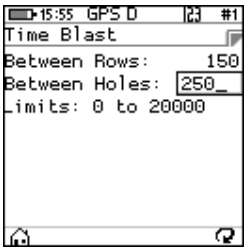
- Press 6 to select **Time Detonators**

- In Time Detonators menu press 1 to select **Time a Blast**

- Insert **Between Rows** delay in ms



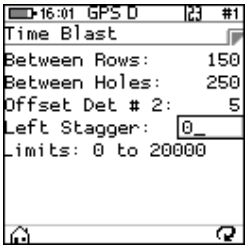

- Insert Between Holes delay in ms

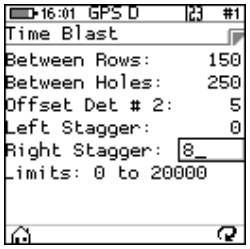



- Insert Offset delay for decking detonators

DetNet South Africa Copyright © 2022

- Insert Offset delay for one side to ensure both sides of the IP are not initiating at the same time. Ensure that both offset delays are not the same to be able to stagger the pattern.




## 10.4.2. TIME SPECIALS

This function is used to time each Special detonators on the Tagger list.

- From Time Detonators menu press 2 to select **Time Specials**

- Insert time for the individual Specials and press ↵ until all Specials are timed.

## 10.4.3. TIME A ROW

This function is used to time each row on its own individually.

- From Time Detonators menu press 3 to select **Time a Row**

- Insert row number you want to time and press ↵
- Insert first hole that you want to time and press ↵
- Insert the last hole number and press ↵

DetNet South Africa Copyright © 2022

- Insert the start time which will be assign to the first hole and press
- Insert inte-Hole delay and press

Insert the offset delay for the decks in a hole and press

### 10.4.4. TIME ROW BY ROW

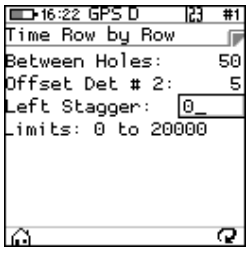
This function is used to time a pattern of rows which have a different starting times for each row.

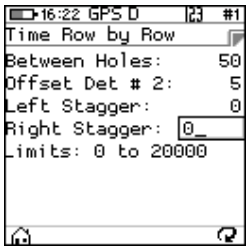
- From Time Detonators menu press 2 to select **Time Row by Row**

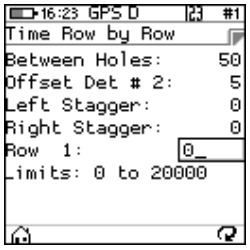
- Insert Between Holes delay in ms and Press
- Insert Offset Det delay in ms and press

DetNet South Africa Copyright © 2022

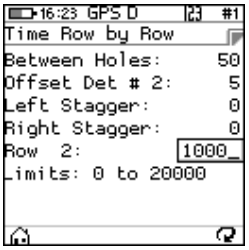
- Insert Left Stagger in ms and press ↵
- Insert Right Stagger in ms and press ↵
- Insert starting time for Row 1 and press ↵

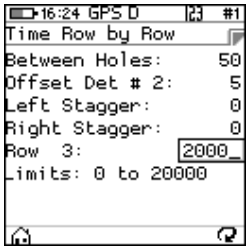



- Then insert starting time of the next row and continue with the following rows until all rows are timed.
- All detonators will be timed automatically.




### 10.4.5. APPLY TIMES

Once all detonators on the Tagger have been timed and the user has reviewed all the delays and is satisfied then this function Apply Times can be used by connecting the harness wire that connects to all the detonators in the channel to the Tagger and sending the delays to the detonators using the Apply Timing function.

- User must connect all the detonators to the Harness wire and perform test all
- From Time Detonators menu press 5 JKL to select **Apply Times**

- The Tagger will require confirmation that channel with detonators is connected.
- When the channel is connected then press OK to continue
- Tagger will then start with applying the times to the detonators.

- Once all the detonators are timed then a message All dets have times assigned will be displayed by the Tagger. Press OK soft key to continue.

DetNet South Africa Copyright © 2022

### 10.4.6. VERIFY TIMES

Verify times can be used to confirm the delays from detonators or it can also be used to change the delays as the user has determined.

- User must connect all the detonators to the Harness wire.
- From Time Detonators menu press 6 to select **Verify Times**

- The Tagger will require confirmation that channel with detonators is connected.
- When the channel is connected then press YES to continue
- Tagger will then start with assigning the new delays and verifying the current delays of the detonators.

- Once all the detonators are timed and verified then a message All dets have times assigned will be displayed by the Tagger. Press OK soft key to continue.
- Total number of detonators verified will be displayed. Press OK soft key to continue.

DetNet South Africa Copyright © 2022

## 10.5. LAYOUT AND TIMING DIGISHOT DETONATORS IN PLANNED MODE

### 10.5.1. MANUAL LAYOUT DETONATORS ON TAGGER

This function allows a user to manually layout a design on the CE4 Tagger before proceeding to time and tag detonators. In order to perform this function, the user must select tagging mode as planned and the detonator product as DigiShot. Layout can be performed in the office before going into the bench before tagging.

From the Main Menu

- Press 7 to select **ViewShot.**
- In ViewShot menu press 7 to select **DigiShot Layout.**

Erase previous Layout

- In DigiShot Layout menu press 1 to **Erase Layout** from previous design.
- Press Yes to erase previous list on the Tagger.

- Tagger will display Layout erased to confirm.

Add Specials

- Press 2 to add number of **Specials** on the layout (maximum of 255 Specials can be added). Press ↵ to continue.
- Insert the String number to add the specials on and press ↵.. When Multi-Ranger is selected in Site setup the 4 strings can be selected and 2 strings when not selected

- Total number of Specials added will be displayed.

DetNet South Africa Copyright © 2022

Set Dets per Hole

- Set amount of Detonators per hole and press ↵ to accept and proceed

Layout holes

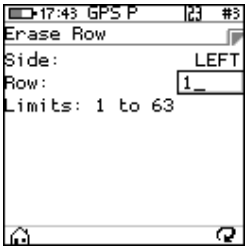
- Insert amount of dets per hole
- Select side by pressing 2 / 8
- Insert Row to be layout

Add number of holes in a Row

- Insert the String number
- Layout of dets summary will be reflected as inserted on the Tagger.

Erase Row

- From DigiShot Layout screen press 5 to select Erase Row function.
- Select the side L/R by pressing 2 / 8
- Select Row to erase

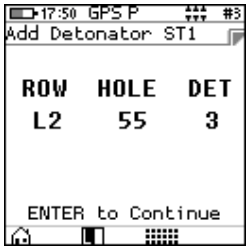



- The Tagger will erase that rows and side detonators that are added.
- Screen will display total amount of Erased Dets

DetNet South Africa Copyright © 2022

Add Detonator

- Press 6 to add a detonator
- Ensure the correct side, row and det number is selected and press ↵ to continue
- Confirmation message will be displayed Detonator added

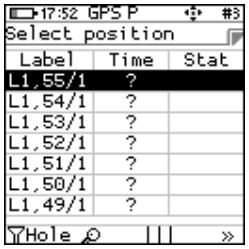


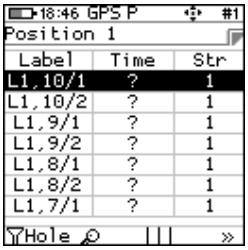
Add Special

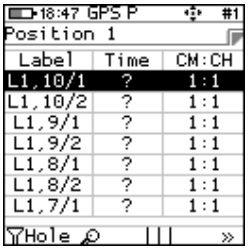
- In the Add detonator menu press pattern to change to Special detonator
- Change the Special detonator ID by pressing 2 8
- Press ↵ to add a Special.
- Detonator Added message will be displayed

Blast Summary

- In DigiShot Layout menu press 7 to view Blast Summary
- When soft key is pressed then List will be displayed





DetNet South Africa Copyright © 2022

### 10.5.2. SET PATH AND TIME LAYOUT

This function allows a user to manually layout a design on the CE4 Tagger before proceeding to time and tag detonators. In order to perform this function, the user must select tagging mode as planned and the detonator product as DigiShot. Layout can be performed in the office before going onto the bench before tagging.

From the Main Menu

- Press 7 to select **ViewShot**
- In ViewShot menu press 6 to select **DigiShot Layout**

Set Path

- In DigiShot Layout menu press 7 to **Set Path**

- Select a Start Side L/R by using 2 8 press ↵ to continue.
- Select the Start Row options First and Last by using 2 8 press ↵ to continue.

Time Layout in DigiShot follow same process as detailed in Section 10.4.1. to 10.4.4.

Once Time Layout is done then Verify Design:

Verify Design will re-time or time the layout detonators.

- In Time Layout menu press 5 to Verify design
- The Tagger will verify the delays of detonators in the layout.
- Once done a report will be provided.
- Press OK to finish complete.

**Verify Design will only check that all the dets in the layout have times and that the times follow rules. The times are not assigned to the physical dets as with Apply Times in Time Detonators detailed in Chapter 10.4**


DetNet South Africa Copyright © 2022

## 10.6. PLANNED (P) TAGGING OPTION (USING PLAN FROM VIEWSHOT)

With the **Planned** (**P**) tagging option, both the location and a delay must be written into the detonator.
The data written into the detonator is taken from a plan downloaded into the CE4 Tagger via ViewShot.
If the delay plan is not yet known, but the holes are drilled at known locations one can tag the blast in 2 steps.
The first step is to deploy the known locations by exporting the pattern from ViewShot 3D as Plan Location Only.
Delays can be deployed or updated to the tagged dets later using an updated ViewShot plan.
To assign/update the delays, one must enter “Assign ViewShot” menu which is on the main menu.

**The user needs to ensure that he/she is at the correct location before tagging the detonator.**

From the Main Menu

- Press 2 to select **Tag Detonators**

- If the CE4 Tagger does not detect a downloaded ViewShot plan, the user will be prompted to download a plan.

DetNet South Africa Copyright © 2022

### 10.6.1. Connect the CE4 Tagger to the PC

Once the desired Plan has been selected, the user can download ViewShot design to Tagger.

1. From Main Menu
   - Press SoftKey to select Configuration Settings.

2. Configuration Settings Menu
   - Press 3 to select **Advanced Setup**.

3. Advanced Setup Menu
   - Press 2 to select **Connections**.

4. Connections
   - Press 3 on the keypad to connect CE4 Tagger to **PC via USB**.

5. USB Link with PC
   - Ready for PC – Connect USB cable between PC and CE4 Tagger
   - Connected to PC

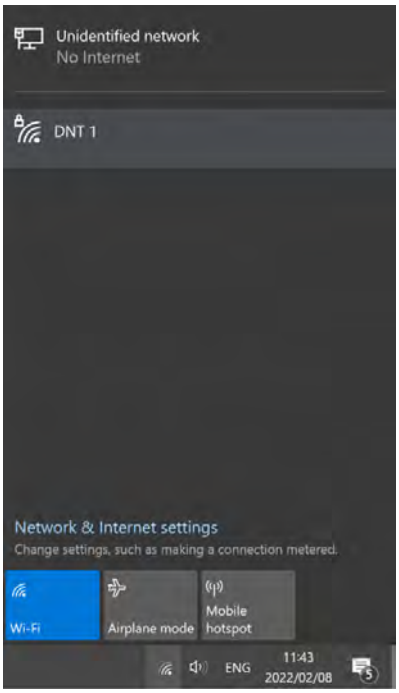
DetNet South Africa Copyright © 2022

### 10.6.2. Download the Plan (via ViewShot)

Download the Plan (via ViewShot on the PC/Tablet) onto the CE4 Tagger to enable the use of the Tag by Plan option.

| | |
|---|---|
| NOTE | **Refer to the ViewShot User Manual for detail on the App** |

1. If connecting for the first time, Open the Wi-Fi configuration on your device with ViewShot and connect to DNT 1 – insert Wi-Fi password 145634235 and press connect.
2. When connecting for the second time activate Wi-Fi on the Tagger and then navigate to Wi-Fi configuration on your device and select DNT 1 (The numeric value will correspond to the Tagger ID) and press connect

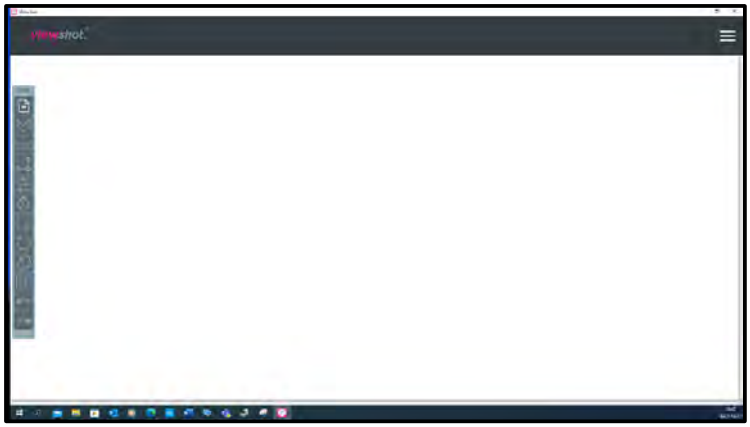


3. Navigate to the ViewShot icon and open it.

DetNet South Africa Copyright © 2022

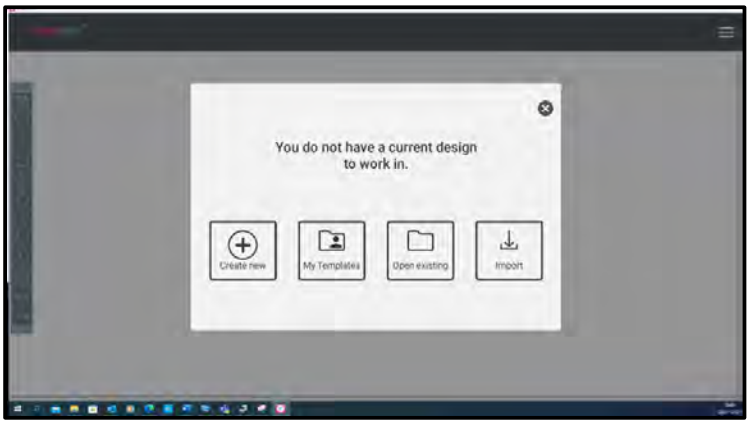
NEW DESIGN AND TIMING

- Select new design



- New window: select Create New

to start a new design:



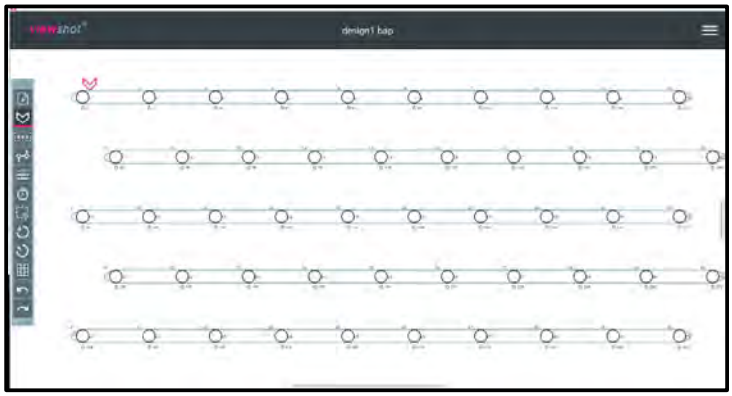

- New Design Pattern Settings window:
  - Setup layout according design by inserting
  - Number of Rows
  - Number of Holes
  - Dets per hole (Decking)
  - Burden in meters
  - Spacing in meters
  - Pattern type: Square or Staggered tick a relevant option
  - Select Hole Configuration will select how many dets per hole
  - Press next when done

DetNet South Africa Copyright © 2022

- New Design – Timing Settings
  - Set initial hole
  - Set first hole delay
  - Set Inter-hole delay
  - Set Inter-Row delay
  - Set Stagger

- Main drop down Menu
  - Save: used to save current design before sending to the Tagger
  - Connect – used to connect Tagger to the PC for sending a design
  - Preview Mode: used simulate the blasts
  - Analysis Mode: used to analyse design
  - Verify Design: used to verify design
  - Export Design: Used to send design to the Tagger
  - Settings: Used to alter settings
  - About: used to view software version
  - Press next

- View Delays
  - Ensure the delays are correct
  - Ensure hole allocation and rows are correct

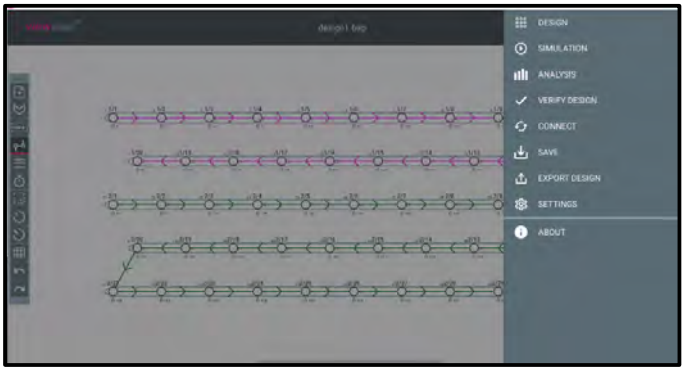



DetNet South Africa Copyright © 2022

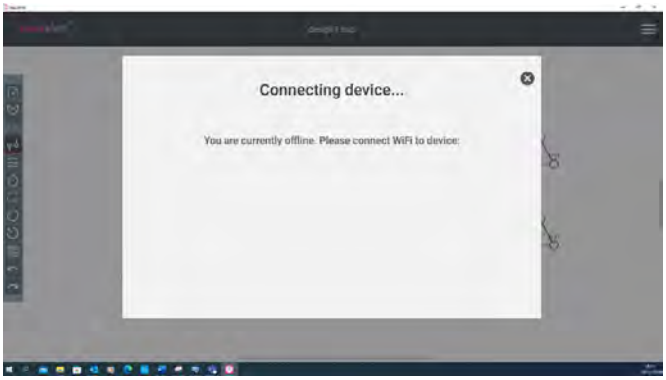
- Assign Tag Path:
    - Click option to select and assign tagging path
    - Ensure all holes are assigned to the tagging path

4. Sending Design to Tagger

- Select File open icon on the ViewShot screen
    - Select on Connect to connect to the Tagger




- If the Wi-Fi is not connected the following message will be displayed

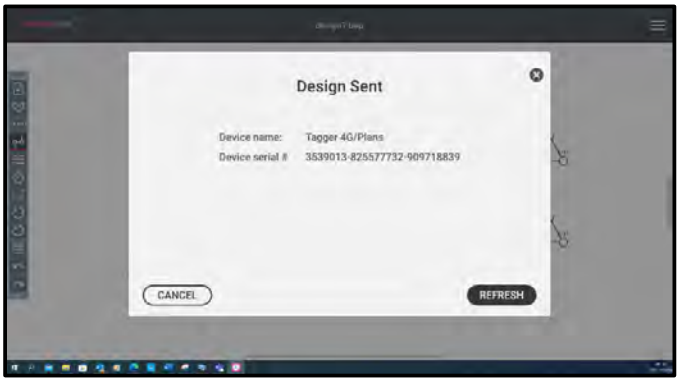




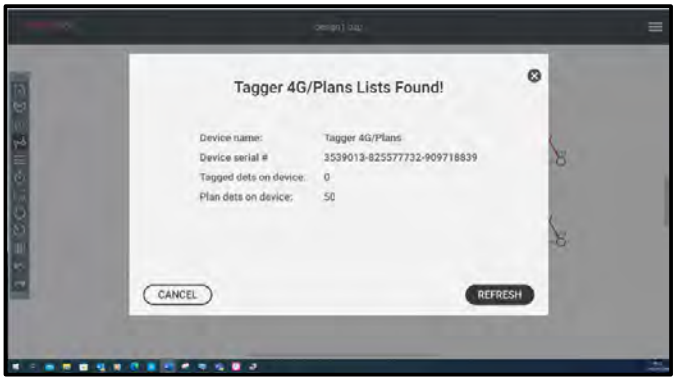
DetNet South Africa Copyright © 2022

- Select Send design to Tagger on the App


- Once the design is sent to the Tagger the App will display Design Sent screen with Tagger Hardware number



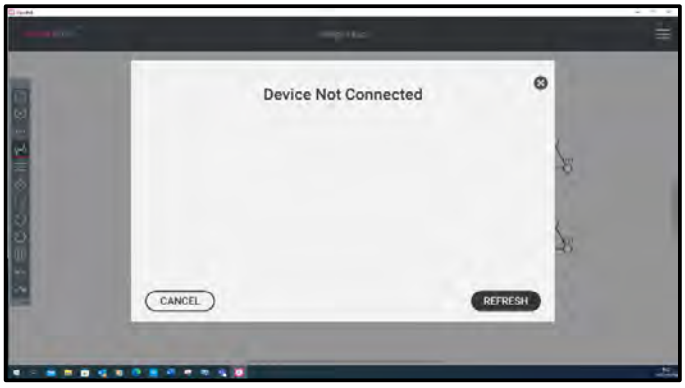

- When Reconcile with Tagger on the App is selected
- Once the design has been reconciled the App will display Tagger 4G/Plans Lists Found!





DetNet South Africa Copyright © 2022

- If not then a Not Connected screen will be displayed and user will need to setup and connect the Tagger

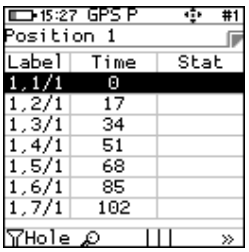


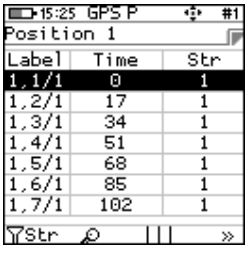

### 10.6.3. View the downloaded design on the CE4 Tagger

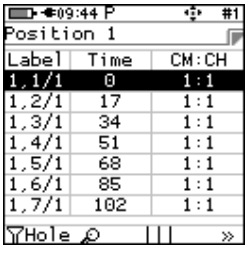
Once the Tagger is disconnected from the PC/Tablet device after sending design, the screen will be displayed by the Tagger

1. From the Main Menu
   - Press 4 to select **View Plan**.

2. View Plan
   - The ViewShot plan will be displayed as a list.



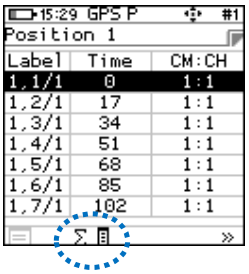




3. Users may also sort the list into the different orders as displayed by selecting the sorting Soft-Key.

DetNet South Africa Copyright © 2022

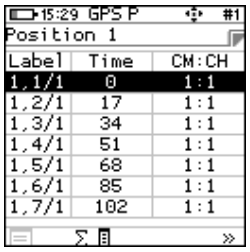
4. Users may exercise the functions on the Soft-Keys such as “Plan Summary” to check that all the detonators are captured in the plan.




5. Plan Summary screen will be displayed.

DetNet South Africa Copyright © 2022

### 10.6.4. Select Start Position




When tagging by following a plan, the user is expected to follow the path determined by a row or a tagging path as performed via ViewShot app.
To allow the user to select a starting position / Row, Hole and Det number, the planned list is displayed.
Only the remaining (untagged) positions will be displayed in this list.
The screen presented here can also be recalled in the Tagging screen / configuration SoftKey.
The user will be prompted to select the starting position from the list. Only the detonator situated at the top position in the list can be selected.
Selection in a list is displayed as white text on black background.

The keyboard mapping mode at the top of the screen indicates navigation by arrows.

- Use 2 8 keys to navigate by one up/down.
- Use keys 4 and 6 to navigate to previous/next page (6 locations displayed per page).
- Press ↵ or ESC key once the selected position is made to return to tagging screen.

*Table 6: CE4 Tagger SoftKey Icons – Select Position*

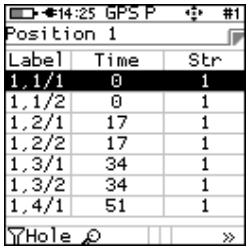
| | |
|---|---|
| **Filter the list:**<br>The list may be filtered by Row, String, Channel or Hole | |
| **Search the list:**<br>Search for the number within the parameter as set by the Filter # | |
| **Sort in Tag order**:<br>TagPath Forward (according to Tag path), TagPath Reversed (starting at the end of the string), Acending (starting at the lowest hole number and tagging forward in sequencial hole numbers) or Decending (starting at the highest hole number and tagging backwards in sequencial hole numbers) . | |


DetNet South Africa Copyright © 2022

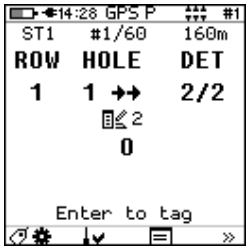
### 10.6.5. Tag by Plan Screen

1. From main menu, select 2 to Tag detonators
2. Acknowledge warning for selected plan and to connect one detonator at a time

3. Select tagging starting position
4. Connect the detonator and press the ↵ key to tag

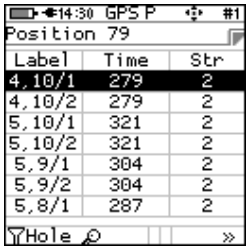


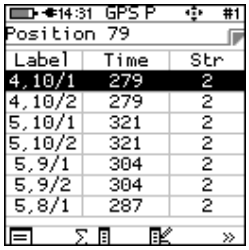
5. The screen will confirm the tagged detonator and display details as tagged.
   - Observe Autotag status
   - Screen Instruction: Press ↵ to tag next “detonator”
   - From this screen, the user will have two options:
   - Return to the list, or
   - Stay in the current screen (Waiting for user to connect the next detonator).

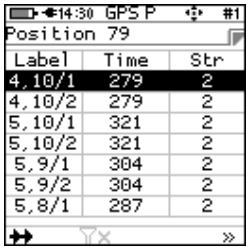


**Observe that the current implementation remains in the tagging screen and adjusts the parameters according to the next position in the list which can be verified by pressing on “tag configuration” SoftKey.**

6. Press “tag configuration” SoftKey from the tagging screen to return to the list.



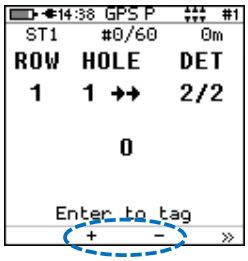



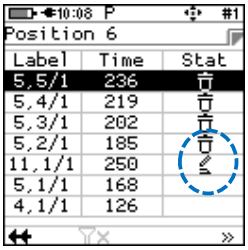





DetNet South Africa Copyright © 2022

7. To skip a position (mark as deleted) while tagging, the user must navigate to the panel of SoftKeys that contains the Add/Delete **+** and **-** Icons. Press the '–' indicated SoftKey to mark the current location as deleted in the tagging list, the tagging screen will be updated with the next location as illustrated in this example. The Deleted screen will be displayed.
8. To skip over the current location without deleting it, scroll up or down the lagging list by using the buttons.
9. To add a detonator Press '+' indicated in SoftKey to add a new detonator to the plan by specifying String ID, Row number, hole ID, dets, Delay and press Enter to add detonator. Bottom of the screen will indicate the closest det and its delay that can be used as reference.
10. The screen displaying deleted dets and new added det on the design.





**Inserting a detonator while tagging by plan and using the + softkey, will not be identified as an unplanned detonator and will become part of the plan. There will thus be no need to merge it with the plan later.**

*Table 7: CE4 Tagger SoftKey Icons – Tag By Plan" Option*

| | |
|---|---|
| ***Tag Configuration*** | |
| ***Toggle Autotag** ** | AutoX |
| ***Tagging Screen Information*** | ? |
| ***Test Single Det with harness connected*** | |
| ***Display the current tagged list*** | |
| ***Undo the last detonator tagged*** | **Undo** |
| ***Add det(+) and delete hole(-)*** | **+ -** |
| ***Next Page*** | **>>** |
| ***String Statistics*** | |


DetNet South Africa Copyright © 2022

### 10.6.6. Assigning ViewShot Timing

1. From the Main Menu
   - Press 6 to select **Assign ViewShot**.
   - If Assign delays is selected after verifying the design then the warning will be displayed as shown

When the locations have been tagged separately, the detonators will not be ready to be connected to the Ranger.
To deploy the delays, the Tagger needs a plan (with updated delays) that matches the actual locations already deployed.
By executing “Assign ViewShot” from the main menu, the Tagger will check every detonator recorded in the “tagged list” against the ViewShot plan (loaded on the Tagger). If the delay in the detonator does not match the plan, the new delay will be tagged in the detonator and the ViewShot plan will be updated with a checked mark against the matching record.

### 10.6.7. Verify Plan

This menu option is only available for the “Planned” mode context.

2. From the Main Menu
   - Press 7 to select **ViewShot**
   - Press 1 to select **Verify Plan**.

The list of tagged detonators is compared with the actual plan. The user can view the updates in the “View Plan “ menu. All detonators that do not match the plan are flagged in the list (Listed as new and indicated by asterisk). Matching positions are also marked as completed, (a checked sign) if location and delay are matched and a tag symbol if only location is matched but not the delay.

### 10.6.8. Verify Delays

Times as in the Plan correspond to detlist.

3. From the Main Menu
   - Press 7 to select **ViewShot.**
   - Press 2 to select **Verify Delays**.

DetNet South Africa Copyright © 2022

### 10.6.9. Show Results

Actioned Delay results are displayed.

4. From the Main Menu
   - Press 7 to select **ViewShot**
   - Press 3 to select **Show Results**.

### 10.6.10. Merge Plan

The Merge Plan option will merge all deleted/added detonators to the plan.

5. From the Main Menu
   - Press 7 to select **ViewShot**
   - Press 4 to select **Merge Plan**.

DetNet South Africa Copyright © 2022

### 10.6.11. Reconciliation Menu

1. Main Menu
   - Press SoftKey to select **Configuration Settings**.

2. Configuration Settings Menu
   - Press 3 to select **Advanced Setup**.

3. Advanced Setup Menu
   - Press 6 to select **Reconciliation**

### 10.6.11.1. Master Tagger

1. Reconciliation Tagger Menu
   - Press 6 SoftKey to select **Reconciliation** in ViewShot menu.
   - Press 1 SoftKey to select **Master Tagger.**

2. Reconciliation Menu
   - Tagger activates as an Access Point.
   - Tagger will display Access Point Ok
   - Master Tagger will wait for Slave Tagger to connect with a timeout of 120 seconds.

3. Reconciliation Menu
   - Once connected the Tagger will start syncing detonators.

DetNet South Africa Copyright © 2022

- When complete, the Tagger will disconnect and display the total detonators synced.

### 10.6.11.2. Syncing to Master Tagger

1. Reconciliation Tagger Menu
   - Press 2 SoftKey to select **Sync to Master** in Reconciliation menu**.**

2. Reconciliation Menu
   - Warning *"Do not switch off the Tagger until the Reconciliation process is complete"* will be displayed on the Syncing Tagger.
   - Press OK Softkey to continue
   - The available Syncing Taggers ID will be displayed, and Tagger can connect to one Tagger at a time by Pressing the ↵ Button on Tagger.

3. Reconciliation Menu
   - Syncing Tagger will connect to the Master Tagger.

- When connected, the Taggers will start syncing lists.
- After syncing the Syncing Tagger will disconnect.

DetNet South Africa Copyright © 2022

## 10.7. ADVANCED (A) TAGGING OPTION

The Advanced Tagging option is used in situations where there is only a paper plan available and when holes are decked or multi-primed.

| | |
|---|---|
| NOTE | **Always clear the list when starting a new tagging process. From the Main Menu, select New Design and confirm that list needs to be cleared.** |

### 10.7.1. Advanced Mode

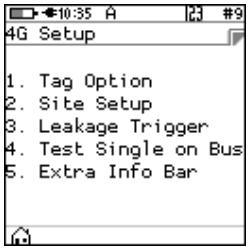
The Advanced Mode option, as the name suggests, includes more features than the Basic Mode as it allows for multi-primed holes and the user will need to control several parameters within this mode. To define a hole configuration the “Site Setup” screen needs to be accessed.

| | |
|---|---|
| NOTE | **The Advanced Mode option is NOT recommended if the user does NOT have a paper plan. The emphasis with this tagging option is on DELAY, since location is used for tracking purposes.** |

1. From Main Menu
   - Press SoftKey to go to **Configuration Menu**

2. From Configuration Menu
   - Press 1 to select **4G Setup**

3. From 4G Setup Menu
   - Press 2 to select **Site Setup**



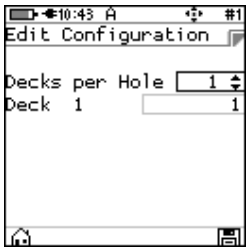

4. From Site Setup Menu
   - Press 2 to select **List Hole Config** (Configuration)

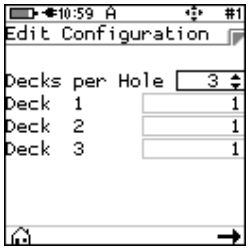
DetNet South Africa Copyright © 2022

5. Press **+** SoftKey to add to the list of hole templates
   - Note that the Default hole type cannot be edited

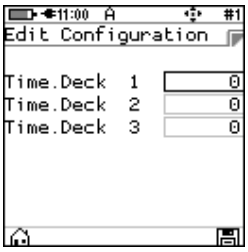
6. Press **up/down** arrows to select the required List
   - Press key to continue

7. Press **up/down** arrows to select the number of **Decks per Hole** (Maximum of 6 allowed)
   - Press to save
   - Press ➔ key to continue




   - Use Keypad to enter Time per deck
   - Press to continue to next Time
   - Press to save



**The detonators should be counted from the bottom of the hole up i.e. Detonator 1 is located at the bottom of the hole or in the bottom deck by convention.**

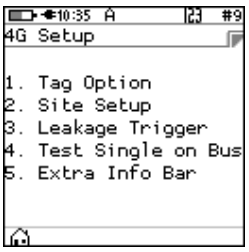

DetNet South Africa Copyright © 2022

### 10.7.2. Edit the Hole configuration

1. From Main Menu
   - Press SoftKey to go to Configuration Menu

2. From Configuration Menu
   - Press 1 to select **4G Setup**

3. From 4G Setup Menu
   - Press 2 to select **Site Setup**

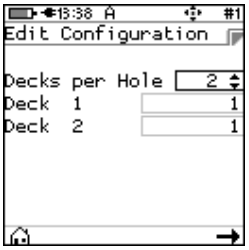



4. From Site Setup Menu
   - Press 2 to select **List Hole Config** (Configuration)

5. List Hole Config screen will be displayed (after creation)
   - Use 2 / 8 keys to select the required option
   - Press ↵ to select.

**Selection in a list will be displayed as white text on black background**

6. Edit Configuration screen will be displayed
   - Edit as required.
   - Press SoftKey to save





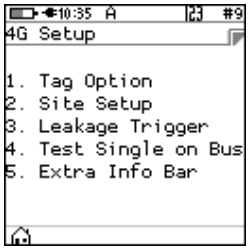
DetNet South Africa Copyright © 2022

### 10.7.3. Delete the Hole Configuration

1. From Main Menu
   - Press SoftKey to go to Configuration Menu

2. From Configuration Menu
   - Press 1 to select **4G Setup**

3. From 4G Setup Menu
   - Press 2 to select **Site Setup**




4. From Site Setup Menu
   - Press 2 to select **List Hole Config** (Configuration)

DetNet South Africa Copyright © 2022

5. From List Hole Config screen

   - Use 2 8 up/down keys to select the required option.
   - Delete the Hole configuration by selecting the required option.
   - Press the dustbin SoftKey to delete.

| | |
|---|---|
| NOTE | **Default hole type can NOT be edited and a message will be displayed if attempted** |

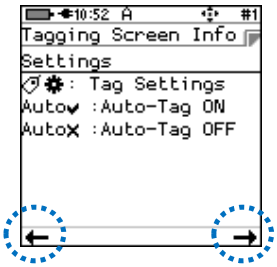

DetNet South Africa Copyright © 2022

## 10.8. Advanced (A) Tagging Screen Info

The User may check the “Tagging Screen Info” to browse through a brief description of the active keys in the tagging screen.

1. From the Main Menu
   - Press 2 to select **Tag Detonators.**

2. From Advanced Tagging Screen
   - Press ? SoftKey to select Tagging Screen Info
   - Press ← or → SoftKeys to navigate to Previous/Next screens following Information:




**Location**

The sequence tracked as location may be adjusted in real time by using the first set of up/down 1 7 arrow keys.

**Timing**

The time can be adjusted with the increment value in real time by using the last set of up/down 3 9 arrow keys.

The row increment may be applied to the absolute time using the second set of up/down arrow keys 2 8.

**Settings**

The user can navigate to the configuration from the tagging screen.

Should Autotag be allowed, this function may be switched off when a detonator has to be re-tagged

**Tools**

Users can test any detonator without leaving the tagging screen.

The “tagged detonators” list may be checked from the tagging screen.

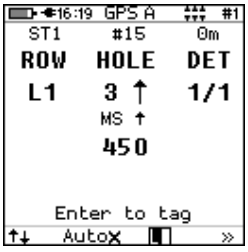
Statistical data is accumulated as tagging is performed.

DetNet South Africa Copyright © 2022

### 10.8.1. Advanced Tagging Screen SoftKey Icons

The following table contains a detailed list of SoftKey icons that are used in the Advanced Tagging Screens.

*Table 8: CE4 Tagger SoftKey Icons – Advanced Tagging*

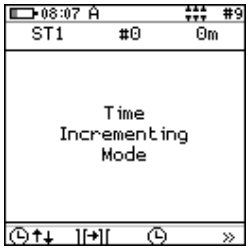
| Advanced Screen | Icon | Description |
|---|---|---|
| | | Toggle Delay Increment Direction |
| | | Inter-hole Delay increment |
| | | Absolute Delay |
| | >> | Next Page |
| | | Tag Configuration |
| | | Test Single Det on Harness connected |
| | | Tagged List |
| | >> | Next Page |
|  | | Change Tagging order |
| | AutoX | Toggle Autotag |
| | / | Select Side |
| | >> | Next Page |
| | | Statistics |
| | ? | Tagging Screen Information |
| | >> | Next Page |

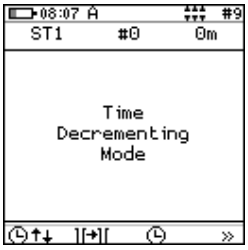
*Items marked with an asterisk ***** are subject to "Site Setup" selected options.*


DetNet South Africa Copyright © 2022

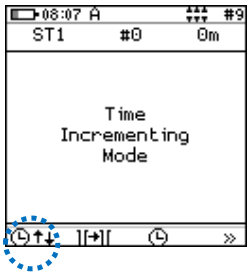
### 10.8.2. Toggle Increment Direction

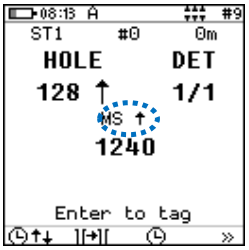
1. Press SoftKey to toggle between Time Increment, Decrement and Manual modes.



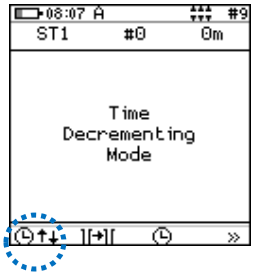



2. Auto Incrementing Mode displayed
   - Increasing time - arrow displayed next to time value points upwards

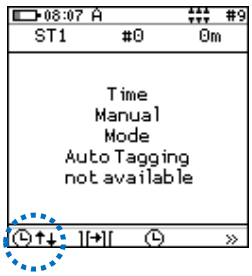



3. Auto-Decrementing Mode displayed
   - Decreasing arrow displayed next to time value points downwards



4. User (Manual) Input Mode displayed
   - User is prompted to enter the absolute time with each tag



DetNet South Africa Copyright © 2022

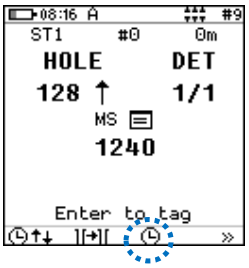
### 10.8.3. Inter Hole Delay

1. From Advanced Tagging Screen
   - Press ][→][ to select Inter Hole delay

2. From Time Increment Screen
   - Use numeric keypad to enter Inter-Hole delay
   - Press Enter to return

### 10.8.4. Absolute Detonator Time

1. From Advanced Tagging Screen
   - Press to select Inter Hole delay

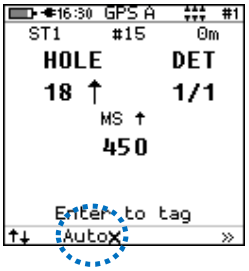



2. From Detonator Time Screen
   - Use numeric keypad to enter value
   - Press Enter to return

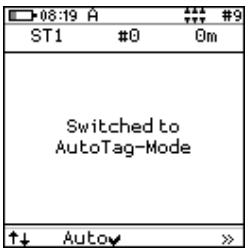
DetNet South Africa Copyright © 2022

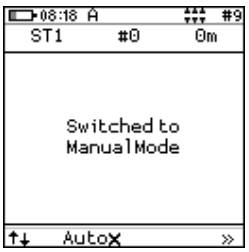
### 10.8.5. Autotag / Manual Mode

1. From Advanced Tagging Screen
   - Press either the **AutoX** (Auto OFF) or **Auto✓** (Auto ON) SoftKey as displayed to toggle the Autotag Mode




   - Press AutoX SoftKey to toggle between Autotag and Manual Mode
     - **Auto✓** indicates Autotag ON
     - **AutoX** indicates Manual Mode (Autotag OFF)





| | |
|---|---|
| NOTE | **When using Autotag ON mode, the detonators may be directly connected to the wire bus and only untagged detonators will be searched for.**<br>**When Autotag is OFF, connect the detonator to the pogo pins to tag. In Autotag OFF mode, any detonator can be re-tagged (i.e. any detonator can be detected).**<br>**Retagging is not possible if Autotag is turned ON.** |

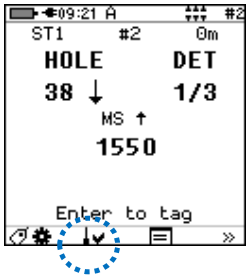

DetNet South Africa Copyright © 2022

### 10.8.6. Test Single Detonator

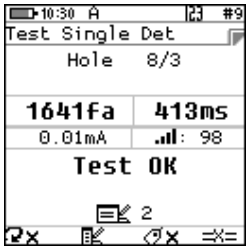
At times it is useful to allow testing of detonators from the tagging screen, and to check if a detonator has previously been tagged or if it is untagged, without disturbing the setup of the current tagging context.
The information displayed with this test contains the location, the time the detonator was tagged to, the length of the detonator and also the mark allocated to the detonator.

1. From the Main Menu
   - Press 2 to select **Tag Detonators**

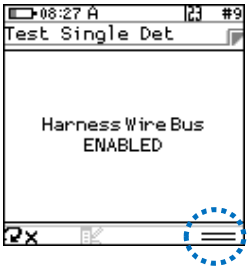
2. From Advanced Tagging Screen
   - Connect a detonator to the Tagger
   - Press ↓✓ SoftKey to select Test Single Det

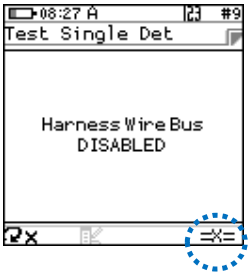



3. From Test Single Det screen
   - Press ✓✗ or ✓✓ to toggle between options
   - ✓✗ indicates single test
   - ✓✓ indicates continuous test




   - Press =x= or ═══ SoftKey to toggle between Disabling and Enabling Harness Bus wire:
     - =x= indicates Harness Wire Bus disabled
     - ═══ indicates Harness Wire Bus enabled





DetNet South Africa Copyright © 2022

### 10.8.7. Tagged Detonators

1. From the Main Menu
   - Press 2 to select **Tag Detonators**

2. From Advanced Tagging Screen
   - Press Σ SoftKey to select **String Statistics**

3. String Statistics screen will display:
   - Total tagged dets with highest delay time
   - Total Planned detonators
   - String ID
   - Total wire length
   - Tagged total dets

DetNet South Africa Copyright © 2022

### 10.8.8. Review Tag Detonator Screen Parameters

The user may review the parameters at any time in the tagging screen.

1. From Advanced Tagging Screen
   - Press Tag Configuration SoftKey to select Tag Detonators Screen

2. From **Tag Detonators Screen**, check the following:

Should the value be correct, press key to move to the next field. When DigiShot label is selected the Tagger will indicate the side selected

**a) String**

Check that the correct String number is being tagged; if not, adjust it as follows:

- Use numeric keypad to enter new Row number, and
- Press to continue

**b) Row**

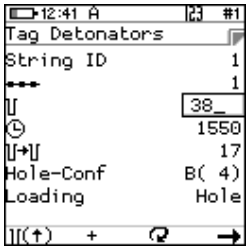
Check that the correct Row is being tagged; if not, adjust it as follows:

- Use numeric keypad to enter new Row number, and
- Press to continue

**c) Hole number**

Ability to modify the hole to be tagged

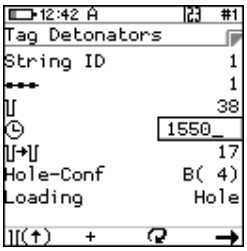
- Use numeric keypad to set the first hole number to be tagged
- Press to continue




**d) Initial Time**

Ability to modify the Initial time

- Use numeric keypad to set the starting time of the first hole
- Press to continue



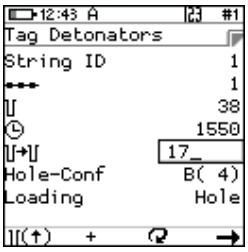


DetNet South Africa Copyright © 2022

**e) Inter-hole Increment**

Ability to modify the Dealy time from one hole to the next.

- Use numeric keypad to set the inter-hole increment
- Press ↵ to continue




**f) Hole –Conf(iguration)**

Ability to switch to a user defined hole configuration

- Use 2 8 to toggle (Available options as configured during the initial setup)
- Press ↵ to continue

**g) Loading mode**

- Set the Loading mode.
- Use 2 8 to toggle between available options.
- Press ↵ to continue

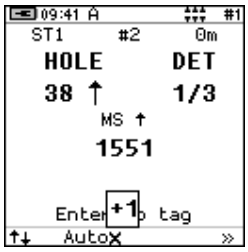
DetNet South Africa Copyright © 2022

### 10.8.9. Advanced Screen Manual Adjustments

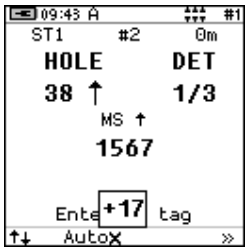
1. The user may set:
   - Absolute time (at any time)
   - Hole number but not counting direction.
   - Det number (if multiple primed and not loading per deck)
   - Increment values and if increments are to be factored in for the next hole (Incrementing /Decrementing / Manual)

*2.* The Up/Down arrow keys may be used as follows:

- Middle **UP/DOWN** arrow 2 / 8 functions:
- Used to increment/decrement the delay with 1ms offset value.



- Right **UP/DOWN** arrow 3 / 9 functions:
- Used to increment/decrement the delay with inter-hole offset value.



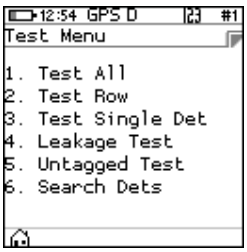
- Side Arrow keys
- Only available when tagging group/row hole and det. This key will change the det number.
- FN & 8 or FN & 2
- Adjust the hole number and corresponding delay of that hole.


DetNet South Africa Copyright © 2022

# 11 TEST MENU

The Test Menu will allow the user to perform the following tests:

1. Test All,
2. Test String/Row (DigiShot mode)
3. Test Single Det
4. Leakage Test,
5. Untagged Test
6. Search Dets



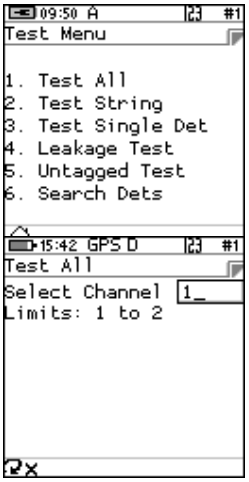
## 11.1. Test All

From the test menu, the user will have the option to test all the tagged detonators per string.

Although the Tagger detonator list capacity is equal to a Full Blast Design which can be a maximum of 600 dets if DigiShot detonator is selected, the Tagger will only test one string at a time with large blast designs.

1. Main Menu
   - Press 3 Key to select **Test Menu**.

2. Test Menu
   - Press 1 Key to select **Test All**.




3. Select Channel
   If detonators were tagged in more than one channel then user will have to select the Channel number to be tested (maximum 2 channels)

4. Test All
   - CE4 Tagger will Test All Detonators
   - **Done** will be displayed when test all is complete.

5. User may use the following SoftKeys:
   - Press ✓ SoftKey to continuously repeat test.
   - Press ✗ SoftKey to stop continuously repeating test
   - After Testing press the View SoftKey to View the design or,
   - Press the ESC Key to return to the Test Menu
   - Press the Key to return to the Main Menu.

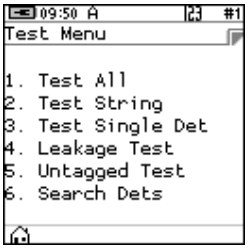

DetNet South Africa Copyright © 2022

## 11.2. Test String

From the test menu, the user will have the option to test all the detonators connected to a String

1. Main Menu
   - Press 3 SoftKey to select **Test Menu**.

2. Test Menu
   - Press 2 SoftKey to select **Test String**.




3. Test String
   - Enter required String number
   - Press ← to clear and re-enter required string number
   - Press ↵ to continue

   - CE4 Tagger will Test All Detonators in the selected String.
   - **Done** will be displayed when test all is complete.

4. User may use the following SoftKeys:
   - Press ↻✓ SoftKey to continuously repeat test.
   - Press ↻✗ SoftKey to stop continuously repeating test

   - Press to View Design
   - After Testing press the ESC Key to return to the Test Menu

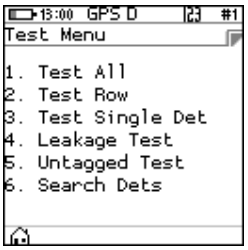
DetNet South Africa Copyright © 2022

## 11.3. Test Row (DigiShot mode)

From the test menu, the user will have the option to test all the detonators connected to a String

1. Main Menu
   - Press 3 SoftKey to select **Test Menu**.

2. Test Menu
   - Press 2 SoftKey to select **Test Row**
     **(NOTE: only available in DigiShot Mode).**




3. Test Row
   - Enter Start row
   - Press ← to clear and re-enter required row number
   - Press ↵ to continue
   - Enter Last row
   - Press ← to clear and re-enter required row number
   - Press ↵ to continue

   - CE4 Tagger will Test All Detonators in the selected Row.
   - **Done** will be displayed when test all is complete.

4. User may use the following SoftKeys:
   - Press ↻✓ SoftKey to continuously repeat test.
   - Press ↻✗ SoftKey to stop continuously repeating test

   - Press to View Design
   - After Testing press the ESC Key to return to the Test Menu

DetNet South Africa Copyright © 2022

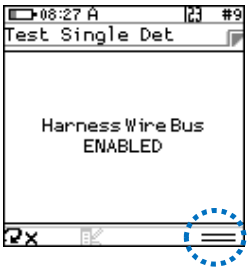
## 11.4. Test Single Detonator

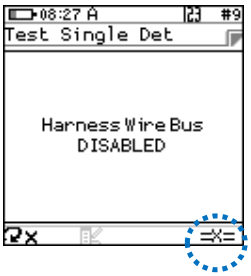
From the test menu, the user will have the option to test a single detonator connected either to the POGO Pins Only or to the POGO Pins and Harness wire.

1. Main Menu
   - Press 3 SoftKey to select **Test Menu**.

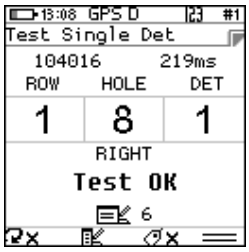
2. Test Menu
   - Press 3 SoftKey to select **Test Single Det**.

3. Test Single Det
   - Connect Detonator to CE4 Tagger
   - Press ═ to test single det on det on pogo pins without string of dets connected or =X= to test a single det on pogo pin with the string of dets connected. Press the soft key to toggle
   - Connect the required single detonator to be tested
   - Press ↵ to test




   - Detonator will be tested
   - Results will be displayed
   - Press ↻✓ SoftKey to continuously repeat test.
   - Press ▭ SoftKey to stop continuously repeating test
   - Press ✓✗ SoftKey to untag the detonator



DetNet South Africa Copyright © 2022

## 11.5. Leakage Test

This function enables the user to perform a current measurement and a leakage measurement test.
Leakage is measured in milli-amps (mA) and low leakage is considered to be below 0.5mA.
Leakage higher than 1mA is considered high leakage and may result in blasting problems (potential misfires) and should therefore be addressed and resolved prior to arming. The user can set the maximum limit where the leakage warning is triggered from 0.1mA to 1mA in increments of 0.1mA. Note that the default leakage limit is 0.5 mA. A warning will be displayed when the leakage level exceeds the leakage warning trigger level as set by the user.

| | |
|---|---|
| WARNING | **HIGH LEAKAGE LEVELS CAN RESULT IN POTENTIAL MISFIRES OF THE DIGISHOT® DETONATORS.** |

1. Main Menu
   - Press 3 SoftKey to select **Test Menu**.

2. Test Menu
   - Press 4 SoftKey to select **Leakage Test**.

3. Leakage Test
   - CE4 Tagger will Test Leakage on all Channels
   - Press ✓ SoftKey to continuously repeat test.
   - Press ✗ SoftKey to stop continuously repeating test

4. CE4 Tagger will display leakage test results
   - Press ↵ to test for leakage again.
   - After Testing, press the ESC Key to return to the Test Menu

DetNet South Africa Copyright © 2022

## 11.6. Untagged Test

This function enables the user to test for Untagged Detonators connected to the harness wire.

1. Main Menu
   - Press 3 SoftKey to select **Test Menu**.

2. Test Menu
   - Press 5 SoftKey to select **Untagged Test**

3. Untagged Test
   - OK message will be displayed when no untagged detonators are found.
   - Error message will be displayed when untagged detonators are found, and the number of untagged detonators found will be displayed at the bottom right of the screen.

4. User may use the following SoftKeys:
   - Press SoftKey to continuously repeat test.
   - Press SoftKey to stop continuously repeating test
5. After Testing press the ESC Key to return to the Test Menu

**Use a binary search to locate untagged detonator(s)**


DetNet South Africa Copyright © 2022

## 11.7. Search Detonators (Binary Search)

This function enables the user to search for detonators connected to the harness wire. It can be conducted with any CE4 Tagger and no prior tagged list is necessary. This same function will be performed by the Bench Ranger to discover detonators. The detonators found will be compared with the detonators in the tagged list and the tagged list will be amended with new detonators if any are found.

1. Main Menu
   - Press 3 SoftKey to select **Test Menu**.

2. Test Menu
   - Press 6 SoftKey to select **Search Dets**

3. Search Dets
   - Enter required String ID or Channel number
   - Press ↵ to continue

   - CE4 Tagger will search for detonators and display the message “please wait! Building summaries”. Once finished testing **Done** will be displayed
   - Press ESC to return to the Test Menu
   - Press to View Design

### 11.7.1. Search Function Results

Press the SoftKey to check the “Search” results

- The View Design Menu will be displayed
- Refer to Chaper 12 - VIEW in this manual for more information.

DetNet South Africa Copyright © 2022

# 12 VIEW PLAN

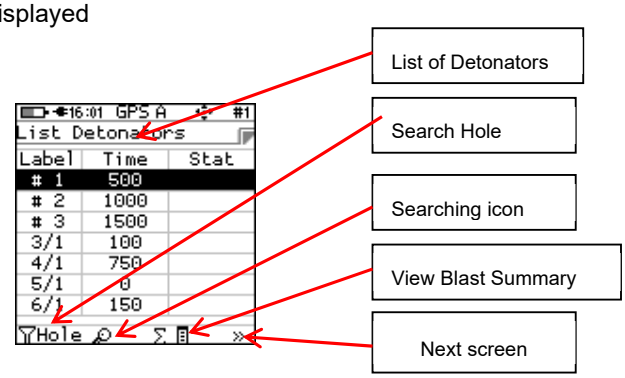
The View Plan Menu will display the planned ViewShot List when the tag option is set to “Tag by Plan”.
The Basic and Advanced options will allow the user to view the list of tagged detonators filtered by various important characteristics.

## 12.1. List Detonators

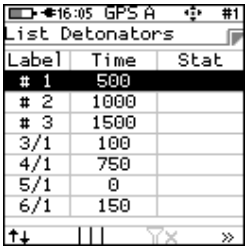
**1.** From Main Menu

- Press 4 to select **View Plan**

**2.** View design screen will be displayed




- Detonator position in String Plan will be displayed in the page header.
- A tick mark ✓ will be displayed under **Stat** when the plan contains tagged detonators



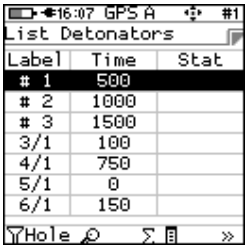


DetNet South Africa Copyright © 2022

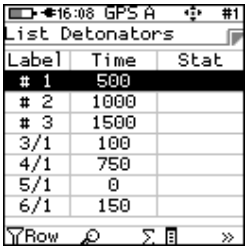
### 12.1.1. Search Filter

Press the Search Filter SoftKey to toggle between options as detailed below:

- Hole Number,



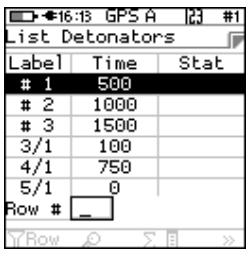

- Row number,

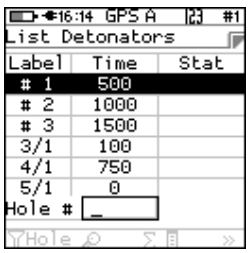


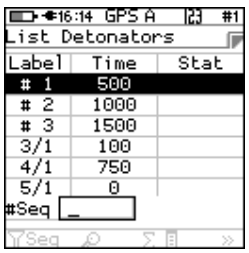

- Sequence Number,

- Side L/R.

- Press Search SoftKey and insert the Side (use 2 8 to select side) , Row, Hole Sequence or number to be searched
- Press Enter to search



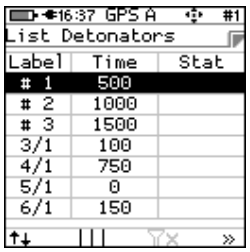


DetNet South Africa Copyright © 2022

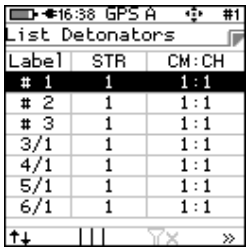
### 12.1.2. Info SoftKey

Press the Information **| | |** SoftKey to display **o**ptions as detailed below.

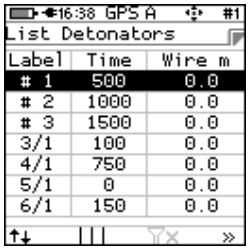
- Detonator Timing and Status



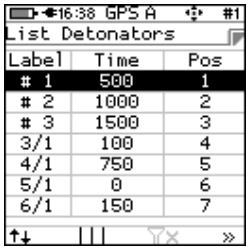

- Allocation to Ranger and Channel



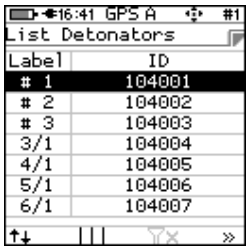

- Wire Length




- Detonator Position




- Detonator ID

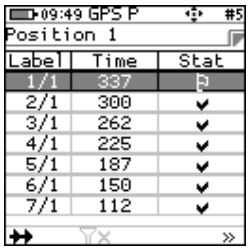




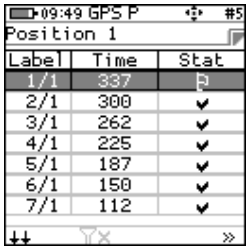
DetNet South Africa Copyright © 2022

### 12.1.3. Sort Detonator list

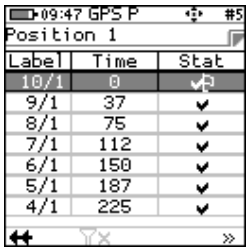
1. Press Sort Detonator List ⇻ SoftKey to display the detonator list in the order as required:
   - Tag Path Forward
   - Ascending Order
   - Descending Order
   - Tag Path Reversed
   - Tag Path Forward



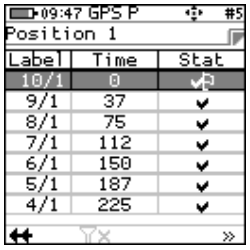

- Ascending Order




- Descending order



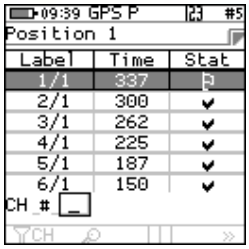

- Tag Path Reversed



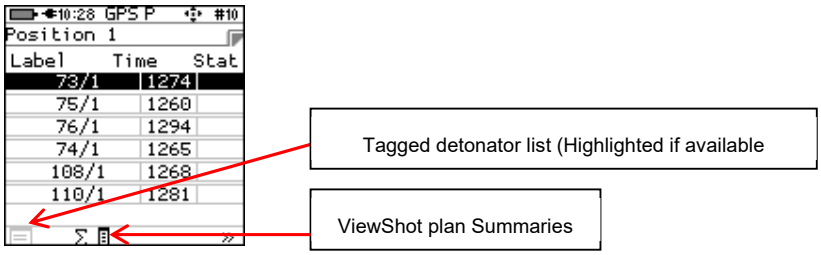


DetNet South Africa Copyright © 2022

2. Press Search SoftKey (criteria based on previous filter settings will be selected)




- Press the Next page » SoftKey and observe the follow set of SoftKeys displayed.

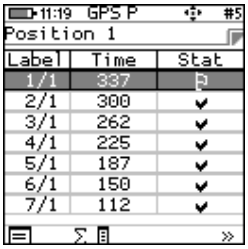


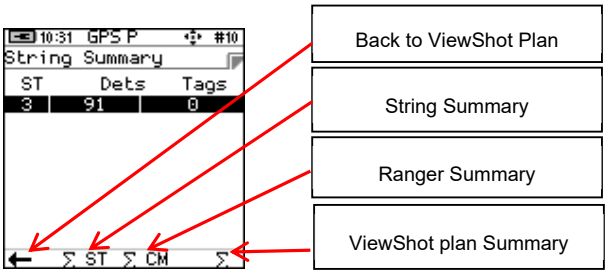


DetNet South Africa Copyright © 2022

### 12.1.4. ViewShot Plan Summary (Heading)

Press the Summary Σ SoftKey to page to the following set of SoftKeys.




Press the String Summary Σ ST SoftKey to display the string statistics as follows:

- String number,
- Number of Detonators per string
- Number of Detonators tagged on that string.
- Press ← SoftKey to return to ViewShot Plan

Press the Ranger Summary Σ CM SoftKey to display the Ranger statistics as follows:

- Ranger number,
- Channel number per Ranger,
- Number of detonators in plan per channel,
- Number of detonators tagged per channel.
- Press ← SoftKey to return to ViewShot Plan

Press the ViewShot plan summary Σ SoftKey to display the summary

- Press ← SoftKey to return to ViewShot Plan

DetNet South Africa Copyright © 2022

## 12.2. List Missing Detonators

This screen lists the detonators that were not found during testing.

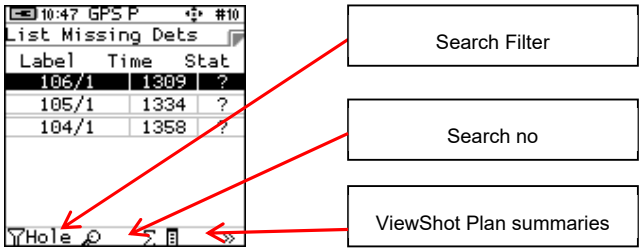
1. Main Menu
   - Press 4 to select **View Design**

2. View Design Menu
   - Press 2 to select **List Missing Detonators**

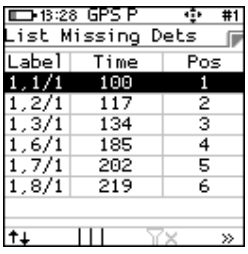
3. List Missing Dets

The List Missing Detonators screen will be displayed.

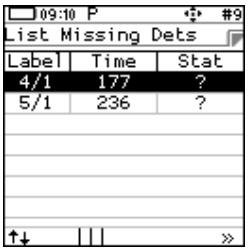
- Soft keys will be available as displayed
- Search Filter,
- Search Number,
- ViewShot Plan Summaries
- Next Page




- Press Next Page » SoftKey to display
  - List order,
  - Information Toggle



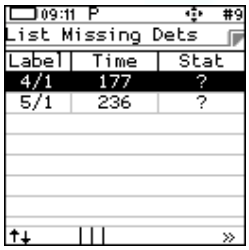

- List Order
  - Sorted by **Time**



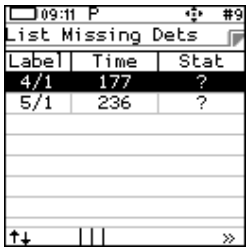


DetNet South Africa Copyright © 2022

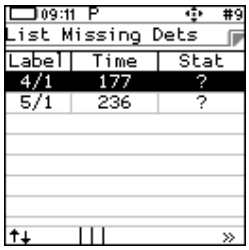
- Sorted by **Channel**




- **Unsorted**




- Sorted by **Location**




- Toggle Information to view
  - **Wire m** - Wire length information

  - String number,
  - Channel number,
  - Ranger number

  - Det position in ViewShot Plan Info

DetNet South Africa Copyright © 2022

- Detonator ID
- GPS information of highlighted detonator (if available)

DetNet South Africa Copyright © 2022

## 12.3. List New Detonators

This screen will list the new detonators found during testing.

1. Main Menu
   - Press 4 to select **View Design**

2. View Design Menu
   - Press 3 to select **List New Detonators**

3. List New Dets
   - The List New Detonators screen will be displayed
   - Press SoftKey to un-mark the detonators as new (*).

DetNet South Africa Copyright © 2022

## 12.4. List Bad Status

This screen will list the detonators that were found to have an error status during the test. (A bad status indicates the detonator may have a bad fuse or another internal problem).

**This List does NOT include untagged detonators.**

**Failures may be the result of cable damage, connector other problems.**

**A bad status detonator must be replaced even if subsequent test results indicate a good result**

1. Main Menu
   - Press 4 to select **View Design**

2. View Design Menu
   - Press 4 SoftKey to select **List Bad Status Detonators**

3. List Bad Status
   - The List Bad Status screen will be displayed
   - Use SoftKeys to sort/filter or display other information as required.

DetNet South Africa Copyright © 2022

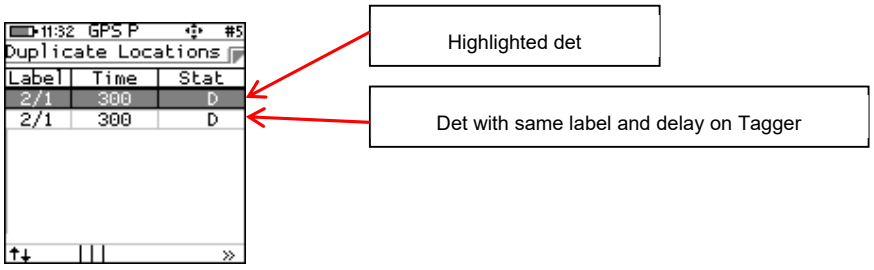
## 12.5. Duplicate Location

This screen will list the detonators that were found to be tagged with the same location.
The system does not rely on the location data to communicate with the dets and provided that the detonator has been tagged with a delay, all detonators can be fired.
However, a duplicate location means that either the user has assigned the same location when tagging, or another user with another CE4 Tagger has assigned this same location to a detonator. Note that this error is flagged when the user attempts to assign the same location on the same Tagger.

1. Main Menu
   - Press 4 to select **View Design**

2. View Design Menu
   - Press 5 Key to select **Duplicate Location**
   - The duplicated location will be displayed

3. List Duplicate Location
   - The Duplicate Location screen will be displayed





DetNet South Africa Copyright © 2022

## 12.6. Blast Summary

The Blast Summary function enables the user to view a blast summary per channel.

1. Main Menu
   - Press 4 to select **View Design**

2. View Design Menu
   - Press 6 SoftKey to select **Blast Summary**

3. The Blast Summary screen will be displayed
4. Press the Back SoftKey ← to page back to previous screen
5. Press the Info SoftKey ||| to toggle display a summary as indicated as follows:
   - **New** - New Detonators
   - **Mis** - Missing Detonators
   - **EOL** - End of Line Detonators
   - **Bad** - Bad Detonators

DetNet South Africa Copyright © 2022

## 12.7. Tracking Detonators

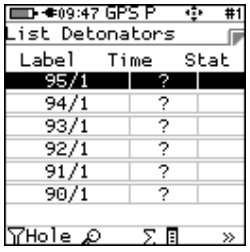
This option will allow the user to track detonators that have been tagged, the user will be directed to the location of the tagged detonator.

**The detonators can only be tracked using the same Tagger that it was tagged with and a GPS signal was available during the initial tagging, and is available to track the detonator.**

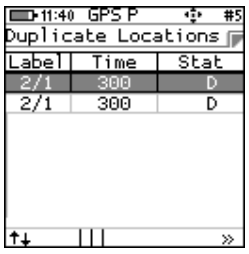
1. From Main Menu
   - Press 4 to select **View Design**

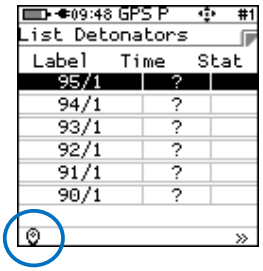
2. From View Design Menu
   - Press 1 to select **List Detonators**

3. Detonator list will be displayed
   - Hold the tagger in upright position
   - Highlight the Detonator to be tracked from the list. (Selected detonator will be displayed as highlighted in the top position of the screen).




   - Press SoftKey 4 » to scroll to next page
   - Scroll until the location SoftKey is displayed.
   - Press the location SoftKey to select





DetNet South Africa Copyright © 2022

- Start walking towards the bench
- Tagger will detect the direction and distance to the selected detonator.

- The distance and direction to the detonator will be displayed
- Proceed in the direction as indicated.

- When the Tagger is within 3 meters of the selected detonator, "**Near Location**" will be displayed
- The user will now have tracked the selected detonator to be within 3 meters of the current vicinity.

DetNet South Africa Copyright © 2022

# 13 MARK DETONATORS

With the DigiShot® System it is recommended that the user mark the detonator that will be placed at the end of the harness wire, as the Bench Ranger will verify the voltage level of this detonator just before firing.
Each String should have 1 detonator marked as End of Line.

**The other types of marking are not explicitly used in this version of the system although it is planned to use it in a future release of the software. They would typically indicate that specific points of the blast have been captured and also indicate if a change of plan (delays and increments) is required.**

1. From the Main Menu
   - Press 5 to select **Mark Detonators**

2. **From Mark Detonators Menu**
   - Press 1 to select/deselect **End of Line**
   - Press 2 to select/deselect **Start of Row**
   - Press 3 to select/deselect **End of Row**
   - Press 4 to select/deselect **Inflection Point**
   - Press 5 to **Remove Mark** from previously marked Detonator
   - Press Cancel SoftKey to return to Main Menu
   - Press Apply SoftKey to apply the setting.

DetNet South Africa Copyright © 2022

# 14 RANGER

## 14.1. General Information

The DigiShot® Ranger is a 2-channel blasting device intended for use across all surface blasting platforms in the DetNet portfolio. These devices are controlled from a CE4 Tagger or an optional tablet device / PC loaded with the DetNet Android Application.

The DigiShot® Ranger can be configured to operate in different modes as follows:

- The Bench Ranger,
- Base Ranger,

## 14.2. DigiShot® Ranger Components

The following illustration depicts a front and rear view of the DigiShot® Ranger indicating the major components.

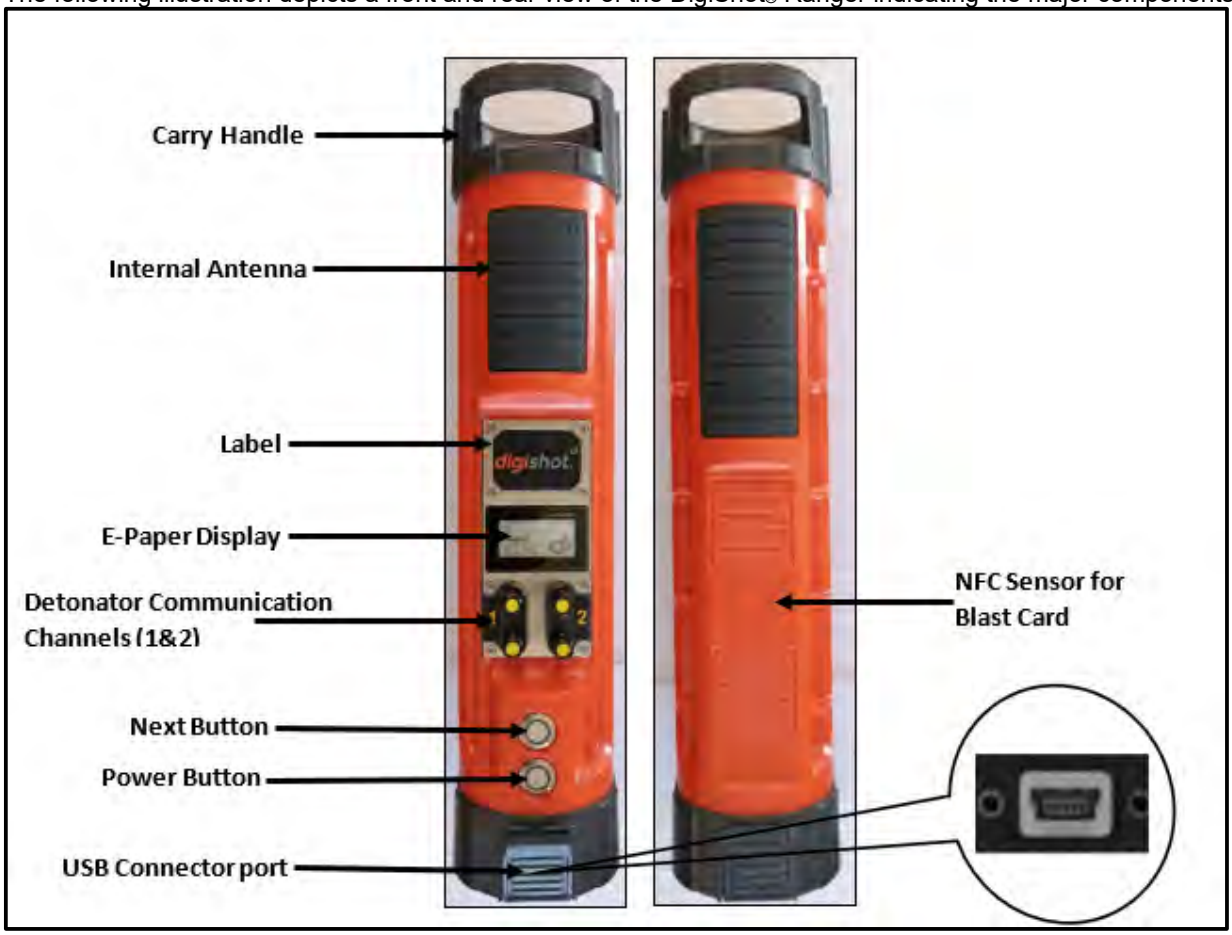



*Figure 8: DigiShot® Ranger Part Identification*


DetNet South Africa Copyright © 2022

### 14.2.1. DigiShot® Ranger Body

The DigiShot® Ranger housing body contains all the electronic components in a durable environment equipped with a carry handle.

### 14.2.2. Internal antenna

- RF – long range: 3000m (900MHz data radio, internal antenna)
- RF – short range: 10m (Wi-Fi, internal antenna)

**The DigiShot® Ranger must be placed on a tripod or otherwise elevated during use; elevating it to approximately 1.5m above ground level ensures that the internal antenna will operate at optimum levels. Future versions of the DigiShot® Ranger will also include a connection to accommodate external antennae which should also be at least 1.5m above ground level. The Ranger will be able to make use of either the 869MHz or 915MHz ISM band in the region in which it operates.**

### 14.2.3. Detonator Communication Channels (1 - 2)

The two detonator communication channels on the front panel are clearly marked 1 – 2.
Harness wire terminals on each channel are used to connect to 300 detonators per surface harness lead-in wires.

### 14.2.4. E-paper display

The e-paper display reflects light unlike conventional backlit flat panel displays that emit light. This makes it more comfortable to read, and provide a wider viewing angle than most light-emitting displays

**The display remains visible even if the device is off – thus the last screen that was visible before shut-down will be displayed while in off mode until the Ranger is booted-up again. The e-paper display should never be exposed to direct sunlight for long periods.**

### 14.2.5. NEXT (FUNCTION) button

The NEXT (*FUNCTION)* button is used in conjunction with other keys to perform specific functions.

### 14.2.6. POWER button

The POWER button is used to switch the DigiShot® Ranger ON and OFF.
It is also used, in conjunction with the NEXT (FUNCTION) button, to enter the bootloading mode from where software updates can be performed.
While the Ranger is plugged in and charging the Power button can be used to toggle between low and high charge rates. This function is useful when charging from a less powerful charger.
Turn Off by disconnecting the charge cable, waiting a few seconds and then pressing the Power button.


DetNet South Africa Copyright © 2022

#### 14.2.7. Mini-USB connector port

The USB connector port allows charging of the rechargeable battery and is also used to upgrade software and downloading logs.

#### 14.2.8. BlastCard (NFC) Sensor

A Near Field Communication (NFC) Sensor located inside the back of the DigiShot® Ranger makes use of technology that enables the NFC BlastCard to establish communication with the DigiShot® Ranger by touching the devices together or bringing them into proximity to a distance of 5cm (2in) or less.

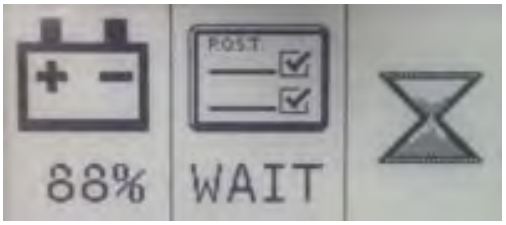
## 14.3. Power DigiShot® Ranger ON and OFF

#### 14.3.1. Power DigiShot® Ranger ON

1. While the DigiShot® Ranger is in an OFF state, it will display the following information:
   - DigiShot® Ranger ID (2)
   - Mode (BENCH)
   - Hardware version (HW Ver. 5)
   - Software version (SW Ver.46658)
   - RF version (RF Ver. AC4490)

2. Press the POWER **ON** Button.

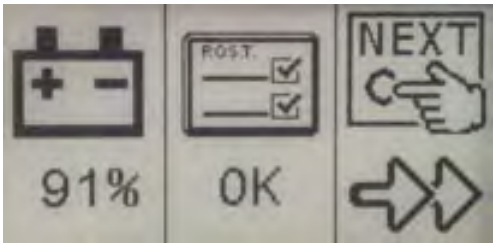
- Screen with DigiShot will be displayed.
- A two-part splash screen will be displayed. The first part will request the user to WAIT during power-on.
- Battery Percentage will be displayed
- Power On Self-Test (P.O.S.T.) will be displayed





DetNet South Africa Copyright © 2022

- Shortly after the previous screen, the second-part splash screen will be displayed requesting user to press the NEXT button.
- Battery Percentage will be displayed




3. Press the **NEXT** Button to continue.

### 14.3.2. Power DigiShot® Ranger OFF

4. Press the POWER Button to power **OFF** the DigiShot® Ranger. The DigiShot® Ranger will power off after a second or two.

DetNet South Africa Copyright © 2022

## 14.4. DigiShot® Ranger Accessories

### 14.4.1. Battery

The DigiShot® Ranger uses a non-user replaceable, rechargeable 3.7V single cell Lithium Polymer battery.
The DigiShot® Ranger factory is fitted with one of the following battery options depending on the requirements from the user regarding battery life and shipping constraints:

- 7.2Ah = 26.64Wh option
- 5Ah = 18.5Wh option

The DigiShot® Ranger fitted with the 7.2Ah battery can be used for approximately 8 hours at 25°C. At temperatures below -15°C / 5°F battery life may be reduced significantly. Operating time is influenced by detonator load, backlight settings and operational temperature.
5-6 hours battery life is expected on DigiShot® Rangers fitted with the 5Ah battery.
When the battery capacity drops below 15%, a warning will be displayed.
The low battery error will clear once Ranger is charged to 35%.
When the battery capacity drops below 3%, the DigiShot® Ranger will shut down.

**The battery should only be replaced by a DetNet qualified technician and is not field replaceable.**

**THE DIGISHOT ® RANGER MUST NOT BE CONNECTED TO THE DIGISHOT® DETONATORS OR THE LEAD-IN HARNESS WIRE WHILST THE DIGISHOT® RANGER IS CONNECTED TO A CHARGER.**


DetNet South Africa Copyright © 2022

### 14.4.2. Charging the DigiShot® Ranger

- Connect charger to DigiShot® Ranger.
- Connect charger to correct power supply.
- Detonators should never be connected while charging.
- The DigiShot® Ranger should be charged for at least six hours prior to a blast.

**While the Ranger is plugged in and charging, the Power button can be used to toggle between low (500mA) and high (2A) charge rates. The low option (500mA) is the default charging rate.**

**Turn Off by disconnecting the charge cable, wait a few seconds and then press the Power button.**

**THE RANGER SOFTWARE WILL DISABLE CHARGING OF THE BATTERY BELOW 0 DEGREES C TO PROTECT THE BATTERY. BATTERIES WILL NEED TO BE WARMED UP TO ABOVE 0 DEGREES CELSIUS BEFORE INITIATING CHARGING.**

**NOTE THAT THE INTERNAL TEMPERATURE AS DISPLAYED ON THE INFORMATION SCREEN IS OBTAINED FROM A SENSOR THAT IS LOCATED BEHIND THE SCREEN, WHICH IS HEATED IN COLD CONDITIONS. THE BATTERY IS LOCATED TOWARD THE BACK OF THE UNIT, WHERE THE TEMPERATURE IS LIKELY COLDER THAN THE VALUE DISPLAYED. TAKE INTO ACCOUNT THAT A VALUE HIGHER THAN 0 DEG C MAY NEED TO BE DISPLAYED AND A POWER CYCLE MAY ALSO BE NECESSARY BEFORE CHARGING IS RE-ENABLED.**

### 14.4.3. Storage

Store the DigiShot® Ranger in a cool, dry place, with an ambient temperature of approximately 21 °C.
It is recommended that the DigiShot® Ranger be charged to 50% when placed into long-term storage, and thereafter the unit should be charged to 50%, at least every six months to maintain the expected lifetime of the battery.
The DigiShot® Ranger may be kept on charge for extended periods as the DigiShot® Ranger will manage the battery.
The DigiShot® Ranger can draw current of up to 2 Amperes during charging.


DetNet South Africa Copyright © 2022

## 14.5. DigiShot® Ranger Process Description

The following paragraphs contain a detailed description of User-interaction and safety features designed into the DigiShot® Ranger.

### 14.5.1. Start-up

Press the POWER button briefly to switch ON the device.

### 14.5.2. Shutdown

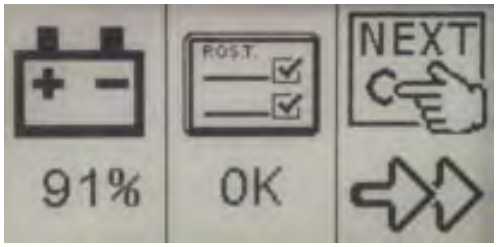
Press-and-hold the POWER button for 2 seconds to switch the device OFF.
In case of malfunction, press-and-hold the POWER button for 10 seconds to force the device OFF.

While the Ranger is plugged in and charging, the Power button can also be used to toggle between low (500mA)

and high (2A) charge rates.
Turn Off by disconnecting the charge cable, waiting a few seconds and then pressing the Power button.

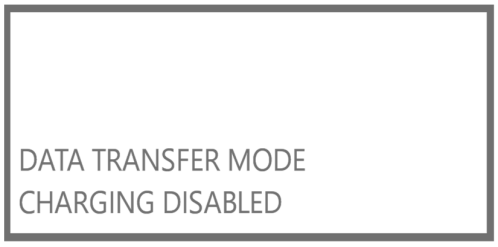
### 14.5.3. Data Transfer Mode

Some laptops are not able to sustain the charge current required by the Ranger especially while users are downloading logs off the Ranger from their laptops. In such cases users can disable charging to assist in data transfer to their computers.




- To enable data transfer mode the user must be in the ‘press next’ screen on start-up and must ensure that the Ranger is not charging.
- Hold in the power button until the Ranger beeps to activate Data Transfer Mode which will disable the charging function.
- Press next or connect via WiFi to restore charging (to the ‘low current’ level).

- A short press of the power button will also turn off data transfer mode.





DetNet South Africa Copyright © 2022

### 14.5.4. Pairing

After the start-up sequence the identification number (1-10) will be displayed. Remote control of the DigiShot® Ranger is now possible from a CE4 Tagger within range (or a tablet loaded with the required software).

Press and hold the FN button and press ↵ from the Main Menu on the CE4 Tagger to start the pairing function. Select the appropriate DigiShot® Ranger ID (1-10). The CE4 Tagger will establish a communication link with one DigiShot® Ranger at a time. Rangers will clearly indicate their pairing status on the E-paper display.

**NOTE**

**All DigiShot® Rangers have a default ID of 1. Users will have to change these IDs if intending to use multiple Rangers in a single setup.**

### 14.5.5. Aborting

Choosing the ABORT option will return all devices in the setup to a safe state. No further activities can be initiated remotely before cycling the power ON, on all said devices. Aborting is typically accomplished by pressing escape and confirming the abort action when in an active blasting screen.

- Pressing the ESC button after arming will display a warning with three options:
- Yes – this option will return to the main menu
- Abort – the blast will be aborted, and the user then prompted to turn off Ranger
- No – this option will return to the blast menu

### 14.5.6. Blasting

Refer to the Blasting Overview contained in Chapter 19 of this document.


DetNet South Africa Copyright © 2022

## 14.6. Connecting CE4 Tagger to DigiShot® Ranger via Wi-Fi

| | |
|---|---|
| CAUTION | **ENSURE THAT THE BENCH IS CLEARED BEFORE THE DETONATORS OR CE4 TAGGER IS CONNECTED TO THE BENCH RANGER.** |

1. Switch both the DigiShot® Ranger and the CE4 Tagger ON
2. Press and hold FN key and then press the ↵ key to connect CE4 Tagger to DigiShot® Ranger via Wi-Fi

| | |
|---|---|
| NOTE | **Observe the Ranger ID** |

3. Enter the DigiShot® Ranger ID
4. Press ↵ key to connect to DigiShot® Ranger

5. CE4 Tagger will connect to Ranger

6. Enter device password when prompted
7. Press ↵ key to continue

| | |
|---|---|
| NOTE | **Device password will be required only during first connection to the DigiShot® Ranger. The default password may be changed by the user and can be configured from the "Settings" menu. The user may reset the password with a ticket retrieved from DetNet Portal, should the password be previously set and the user does not recall the password.** |


DetNet South Africa Copyright © 2022

8. DigiShot® Ranger Main Menu will be displayed for the Bench Rangers and the Select Bench's Menu will be displayed for Base Ranger.

## 14.7. DigiShot® System Information

This function enables the user to view the battery charge information, current consumption, state-of-health of the battery, temperature information, hardware and software serial numbers, GPS detail and User ID.

1. Main Menu
   - Press SoftKey to view **System Info**

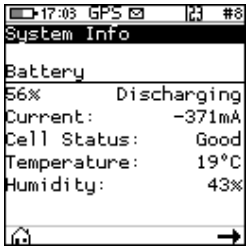
### 14.7.1. System Info – Regulatory Info

- Regulatory information will be displayed

### 14.7.2. System Info – Battery, Temperature and Relative Humidity

**Battery**

- **94%**: Battery charge Information
- **Current Consumption**: By convention a negative value indicates that current is being drawn from the battery.
- **Cell Status**: (Good) indicates the state of health of the battery. Should the status indicate 'Low' the unit should be serviced to have the battery replaced.



**The DigiShot® Ranger will display a warning at 15% and switch OFF at 3% battery life.**

**Temperature and the Relative Humidity** as measured inside the DigiShot® Ranger are displayed as follows:

- Temp: The Temperature is displayed in degrees Celsius and Fahrenheit.
- Humidity: The Relative Humidity is displayed as a percentage.


DetNet South Africa Copyright © 2022

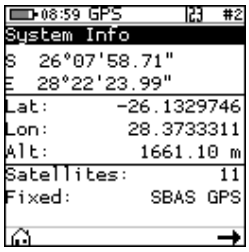
### 14.7.3. System Info – Hardware Serial Number and SW Release Number

- Press ▶ to select page right.
- Hardware Serial Number will be displayed.
- Software Release Number will be displayed
- Hardware Serial number is required when tickets are required from the DetNet Portal.
- Service: Next service due date will be displayed.

**Hardware Serial number is required when Web tickets are required from the DetNet Portal. Web tickets are not needed in normal use.**

### 14.7.4. System Info –GPS Detail

- Press ▶ to select page right.
- The GPS location will be displayed.
- The number of satellites found and Altitude and will also be displayed.




### 14.7.5. System Info –User ID

- Press SoftKey to enter or edit User ID.
- Use alphanumeric characters to enter a User ID. Clearing the User ID will result in NO USER to be displayed after saving/enter is pressed.
- Press ▶ to select next page.

### 14.7.6. System Info –Serial Number

- Serial numbers of the internal circuit boards will be displayed.

DetNet South Africa Copyright © 2022

## 14.8. DigiShot® Ranger LCD Screen Icons

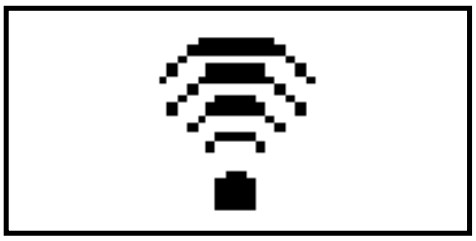
The Icons as displayed on the DigiShot® Ranger will differ according to the selected mode. Each of the following modes will display icons that are applicable to the selected mode:

- Base Mode,
- Bench Mode

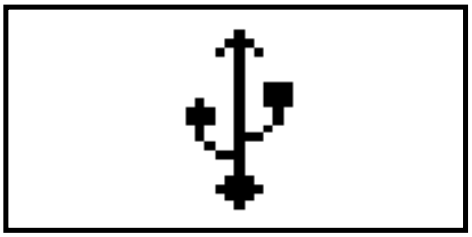
Press the NEXT button to display a detail screen that will be displayed for 30 seconds before reverting back to the main screen.

### 14.8.1. DigiShot® Base Ranger Mode Icons

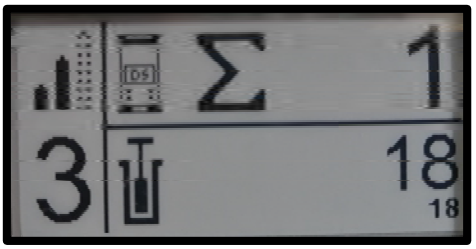
When the DigiShot® Ranger is connected to a CE4 Tagger / Laptop / Tablet via Wi-Fi, it will display only the Wi-Fi symbol on the screen. This icon will replace all other screens.



When the DigiShot® Ranger is connected via USB rather than Wi-Fi, the USB symbol will be displayed



When the Base Ranger is connected via RF, it will display the RF symbol in the main screen




Press the NEXT button to display a detail screen that will be displayed for 30 seconds before reverting to the main screen.


DetNet South Africa Copyright © 2022

**NOTE**

**The Detail screen is displayed as a black layout on a white background. The illustration below has a black background only to improve the visibility of the icons in this manual.**

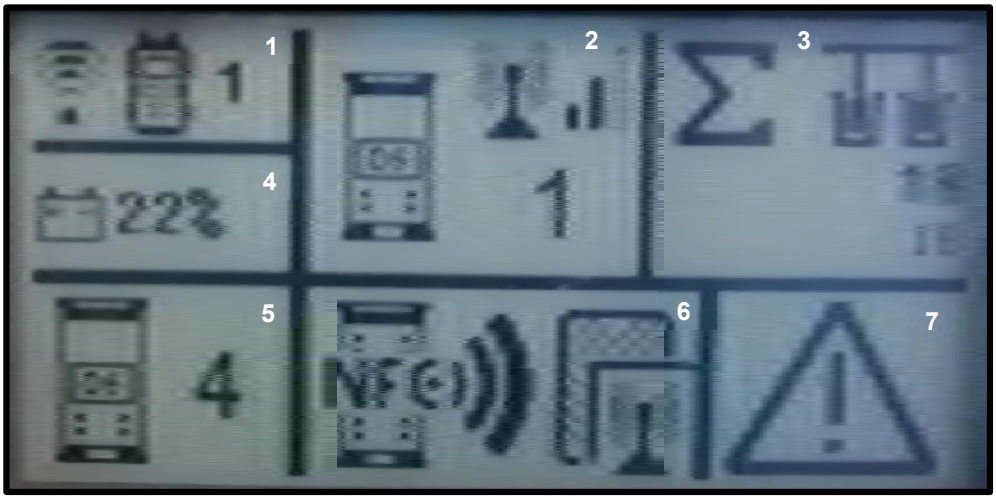
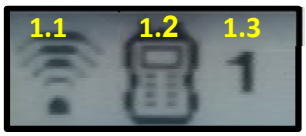
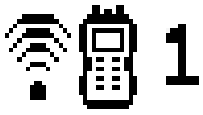
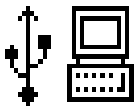
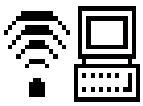
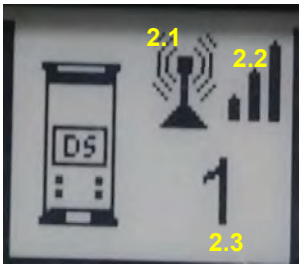



*Figure 9: DigiShot® Base Ranger Mode Detail Screen*

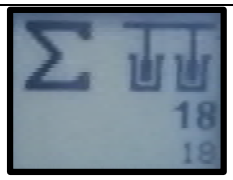
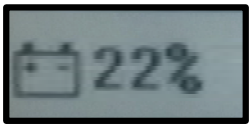
*Table 9: DigiShot® Ranger Base Station Screen Icons*

| Item # | Description | Detail | Indication | Icon | Options / Variants / Description |
|---|---|---|---|---|---|
| 1 | Wi-Fi/USB connectivity indication area (CE4 Tagger or PC) | Indicates whether Ranger is connected via Wi-Fi or USB Indicates whether Ranger is connected to CE4 Tagger or PC | Connected to something |   | As simultaneous Wi-Fi and USB connections are allowed (one of each), this section can indicate a combination of connections. Refer to 1.4 below for possible combinations. |
| 1.1 | Connection type | Indicates the connection type and will also show the last active connection type when disconnected | Connected via Wi-Fi | | |
| | | | Connected via USB | | |
| 1.2 | Type of device connected to | Indicates the type of device / driving unit that Ranger is connected to. | Connected to CE4 Tagger | | |


DetNet South Africa Copyright © 2022

| Item # | Description | Detail | Indication | Icon | Options / Variants / Description |
|---|---|---|---|---|---|
| | | | Connected to PC | | |
| 1.3 | CE4 Tagger ID to which the Ranger is connected to | Indicates the CE4 Tagger ID to which the Ranger is connected.<br>CE4 Tagger connections to Ranger is always via Wi-Fi.<br>Whenever a non-zero value is indicated, that value represents an active Wi-Fi connection to the relevant CE4 Tagger. | CE4 Tagger ID connected to | 1…10 | |
| 1.4 | Possible connection combinations | Wi-Fi and USB connections, and combinations thereof. | CE4 Tagger ID 1 connected via Wi-Fi |  | |
| | | | PC connected via USB |  | |
| | | | PC connected via Wi-Fi |  | |
| | | | PC connected via USB AND CE4 Tagger ID 1 connected via Wi-Fi | | |
| 2 | RF connectivity indication area | Indicates whether the RF module on this Base is active<br>Indicates whether Base Ranger is connected to one or more Benches via RF<br>Indicates the signal quality of the RF connection | Connected to Bench (In this case depicted, connected to 1 Bench – Refer to section 2.3 below) |  | |
| 2.1 | RF active and waiting for Base connection | | RF active | | |

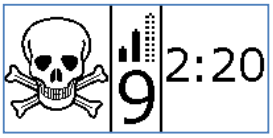
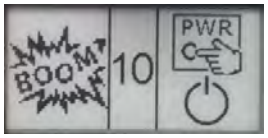
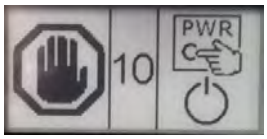

DetNet South Africa Copyright © 2022

| Item # | Description | Detail | Indication | Icon | Options / Variants / Description |
|---|---|---|---|---|---|
| 2.2 | RF signal quality | | Signal low | | |
| | | | Signal medium | | |
| | | | Signal high | | |
| 2.3 | Number of Bench Rangers connected to this Base | | RF-connected Bench Ranger count | 1…10 | |
| 3 | Total detonator count | Indicates the total number of detonators that this Base can detect.<br>It includes all the detonators found on all the Bench Rangers connected to this Base. | |  | |
| 4 | Battery percentage indicator | Indicates the remaining battery life as a percentage | |  | |
| 5 | DigiShot® Ranger ID | DigiShot® Ranger ID used to connect to over Wi-Fi. | DigiShot® Ranger ID | 1…10 | |
| | | Base directly connects to Benches | Only Base | | |
| 6 | DigiShot® System state | Indicates the current system state the DigiShot® Ranger is in.<br>The state shown on the base is simply the 'least advanced' of all the benches that are involved in the blast. | State = UNKNOWN | ? | Undefined DigiShot® Ranger state |


DetNet South Africa Copyright © 2022

| Item # | Description | Detail | Indication | Icon | Options / Variants / Description |
|---|---|---|---|---|---|
| | | | State = IDLE | | Idle state, DigiShot® Ranger waiting for processes to commence, start-up to finish |
| | | | State = SCAN BLASTCARD | | Waiting for user to scan NFC BlastCard at the back (NFC area) of the CE4 Ranger. |
| | | | State = ENTER BLASTCARD PIN | | Waiting for user to enter the scanned BlastCard's PIN on the connected CE4 Tagger / PC. |
| | | | State = PRESS NEXT WITHIN 2sec | | Waiting for user to depress the Ranger's NEXT button for at least 2 sec. |
| 6.1 | Indicating last (lagging) connected Bench Ranger state | Indicates the system state of the lagging Bench Ranger. If all other connected Benches are in e.g. state "Ready to Charge" and the lagging Bench is still in state "Awaiting Grace", then that state will be indicated along with the icon identifying Bench state. See previous comments re clarity of description. | Lagging Bench state = Grace | | |
| | | | Lagging Bench state = Charging | | |
| | | | Bench-state-on-base icon | | |


DetNet South Africa Copyright © 2022

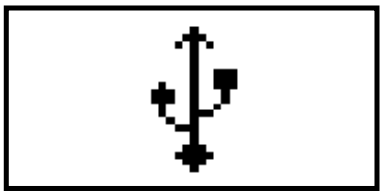
| Item # | Description | Detail | Indication | Icon | Options / Variants / Description |
|---|---|---|---|---|---|
| 7 | Error notification area | DigiShot® Ranger will indicate any error condition it has by printing the exclamation triangle. Holds for errors reported on the connected Bench Rangers as well. | | | |
| | | If Base is in ? state after Function button was pressed to ARM and the Wi-Fi / USB connection is severed / lost / disconnected, then this display indicates the Bench with the first occurring shutdown time. | |  | |
| | | If Base is ready to blast and Wi-Fi / USB connection is severed / lost / disconnected, then this display indicates the Base is in READY_TO_BLAST state. | | | |
| | | When blasted, to request user to turn off power, when Wi-Fi/USB connection lost | |  | |
| | | when in ABORTED state, to also turn off power, when Wi-Fi/USB connection lost. | |  | |


DetNet South Africa Copyright © 2022

### 14.8.2. DigiShot® Ranger Bench Mode Icons

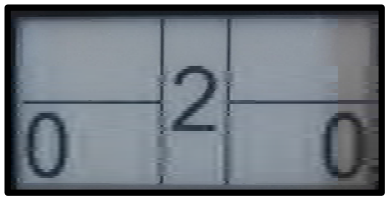
When the DigiShot® Ranger, in Bench Mode, is connected to a CE4 Tagger / Laptop / Tablet via Wi-Fi, it will display only the Wi-Fi symbol on the screen. This icon will replace all other screens.

When the Bench Ranger is connected via USB rather than Wi-Fi, the USB symbol will be displayed



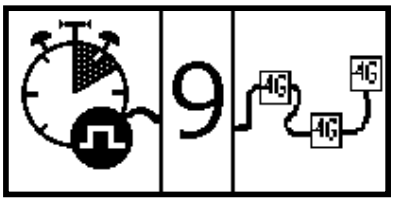
When the Bench Ranger is connected via RF, it will display the RF symbol in the main screen

When the Bench Ranger NOT is connected via RF, it will display the following main screen




Swipe SmartKey for AutoArm
Bench Ranger will perform programming and then go to the waiting for next key press state.

Programming screen




Waiting for next button press screen
Press the NEXT button to display a detail screen that will be displayed for 30 seconds before reverting back to the main screen.

DetNet South Africa Copyright © 2022

**The Detail screen below is displayed as a black layout on a white background. The illustration below has a black background only to improve the visibility of the icons in this manual.**

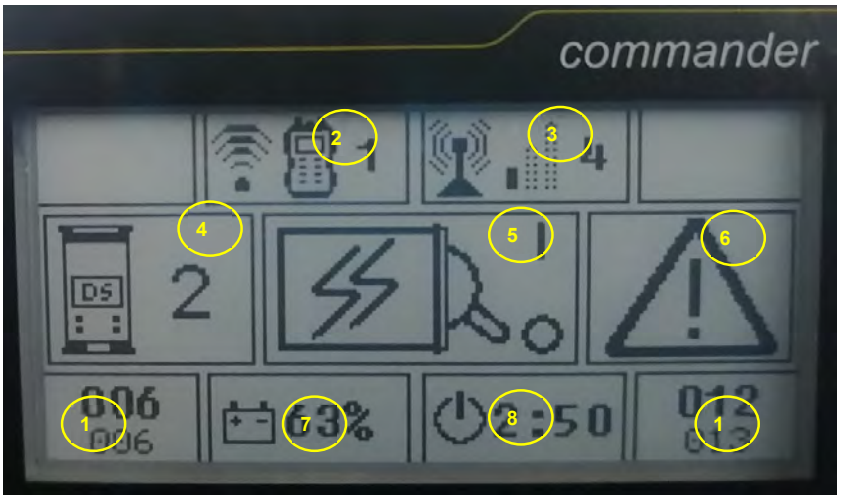
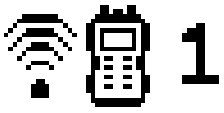
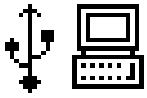
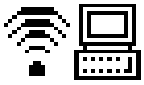



*Figure 10: DigiShot® Ranger Bench Mode Screen*

*Table 10: DigiShot® Ranger Bench Mode Screen Icons*

| Item # | Description | Detail | Indication | Icon | Options / Variants / Description |
|---|---|---|---|---|---|
| 1 | Detonator count of each of the Bench Ranger's channels | Indicates the total number of dets known to the Ranger for this channel. Not all of the dets are necessarily good. | Detcount | | Det count; Min = 000, Max = 400 |
| 2 | Wi-Fi / USB connectivity indication area (CE4 Tagger or PC) | Indicates whether Ranger is connected via Wi-Fi or USB | Connected to something | | As simultaneous Wi-Fi and USB connections are allowed (one of each), this section can indicate a combination of connections. |
| 2.1 | Connection type | Indicates the connection type and will also show the last active connection type when disconnected | Connected via Wi-Fi | | |
| | | | Connected via USB | | |

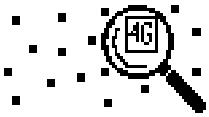
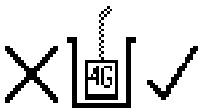
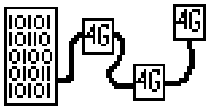

DetNet South Africa Copyright © 2022

| Item # | Description | Detail | Indication | Icon | Options / Variants / Description |
|---|---|---|---|---|---|
| 2.2 | Type of device connected to | Indicates the type of device the DigiShot® Ranger is connected to. | Connected to CE4 Tagger | | |
| | | | Connected to PC | | |
| 2.3 | CE4 Tagger ID to which the Ranger is connected to | Indicates the CE4 Tagger ID to which the Ranger is connected to.<br>CE4 Tagger connections to Ranger is always via Wi-Fi.<br>Whenever a non-zero value is indicated here that value represents an active Wi-Fi connection to the relevant CE4 Tagger. | CE4 Tagger ID connected to | 1…10 | |
| 2.4 | Possible connection combinations | Wi-Fi and USB connections, and combinations thereof. | CE4 Tagger ID 1 connected via Wi-Fi |  | |
| | | | PC connected via USB |  | |
| | | | PC connected via Wi-Fi |  | |
| | | | PC connected via USB<br>AND<br>CE4 Tagger ID 1 connected via Wi-Fi | | |

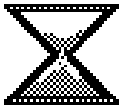
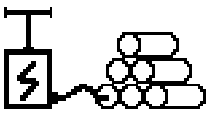

DetNet South Africa Copyright © 2022

| Item # | Description | Detail | Indication | Icon | Options / Variants / Description |
|---|---|---|---|---|---|
| 3 | RF connectivity indication area | Indicates whether the RF module on this Bench is active<br>Indicates whether Bench Ranger is connected to Base via RF<br>Indicates the signal quality of the RF connection | Connected to Base | | |
| 3.1 | RF active and waiting for Base connection | | RF active | | |
| 3.2 | RF signal quality | | Signal low | | |
| | | | Signal medium | | |
| | | | Signal high | | |
| 3.3 | ID of the RF-connected Base Ranger | | Base Ranger ID | 1…10 | |
| 4 | Ranger ID | Ranger ID used to connect to over Wi-Fi. | Ranger ID | 1…10 | |
| 5 | Ranger system state | Indicates the current system state of the Ranger | State = UNKNOWN | ? | Undefined Ranger state |
| | | | State = IDLE | | Idle state, Ranger waiting for processes to commence, start-up to finish |

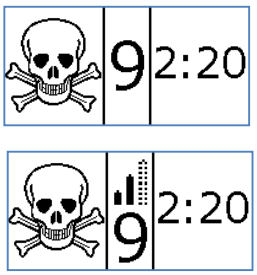
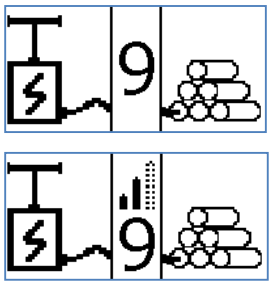
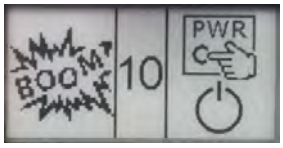

DetNet South Africa Copyright © 2022

| Item # | Description | Detail | Indication | Icon | Options / Variants / Description |
|---|---|---|---|---|---|
| | | | State = ABORTED | | Aborted state. User issued blast abort command. STATE IS LATCHED and requires Ranger Power Cycle. Communication channels and testing functions still active, but blasting cannot be performed anymore. |
| | | | State = SEARCHING |  | Searching for new detonators |
| | | | State = TESTING |  | Testing detonators found during previous search. Testing detonators as a user request. |
| | | | State = PROGRAMMING |  | Programming detonators |
| | | | State = PROGRAMMED | | Detonator programming completed |
| | | | State = SCAN BLASTCARD | | Waiting for user to scan NFC BLAST / ACTIVATE card at the back of the CE4 Ranger. |
| | | | State = ENTER BLASTCARD PIN | | Waiting for user to enter PIN of scanned BlastCard on the connected CE4 Tagger/PC. Not applicable to BlastCard with no PIN |
| | | | State = PRESS NEXT WITHIN 2sec | | Waiting for user to depress the NEXT button for at least 2 sec. |

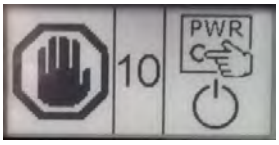

DetNet South Africa Copyright © 2022

| Item # | Description | Detail | Indication | Icon | Options / Variants / Description |
|---|---|---|---|---|---|
| | | | State = AWAITING GRACE TIMEOUT |  | Ranger waiting for GRACE timer to expire |
| | | | State = READY TO CHARGE | | Ranger waiting for the CHARGING command to be received |
| | | | State = CHARGING | | Ranger blast voltage charging |
| | | | State = LAST DET TEST | | Testing the detonators specified as end-of-line / end-of-row in the blast layout |
| | | | State = READY TO BLAST |  | Ranger ready to receive blast instruction and transmit blast command to detonators. |
| | | | State = BLASTED | | Blasted state. Blast command sent. STATE IS LATCHED and requires Ranger Power Cycle. Communication channels still active. |
| 6 | Error notification area | Ranger will indicate any error condition by displaying the exclamation triangle | | | |
| 7 | Battery percentage indicator | Indicates the remaining battery life as a percentage | | | |
| 8 | Blast shutdown timer indicator | Once the Ranger passed the "PRESS NEXT" state, the shutdown timer is started.<br>When timer expires, the Ranger will shut down.<br>Timer indicates hours and minutes | Timer inactive | | Blast shutdown timer inactive.<br>Ranger will be turned off if Auto Shutdown timer (inactivity timer) expires. |


DetNet South Africa Copyright © 2022

| Item # | Description | Detail | Indication | Icon | Options / Variants / Description |
|---|---|---|---|---|---|
| | | | Timer active | | Blast shutdown timer active. Auto Shutdown timer deactivated when Blast shutdown timer is started, and Ranger will shut down after Blast shutdown timer expires 2hrs 51 minutes as per this displayed icon. |
| | | If Bench is in GRACE after Function button was pressed to ARM and the Wi-Fi/USB connection is severed / lost / disconnected, this display indicates the Bench grace time counting down, | | | |
| | | If Bench is in state after GRACE is timed out and the Wi-Fi/USB connection is severed / lost / disconnected, then this display indicates the Bench is in a potentially dangerous state, awaiting ARM command either from CE4 Tagger or from Base | |   | The top figure indicates a local blast, where RF is not used or for remote, when RF is not connected. Bottom figure indicates RF signal |
| | | If Base is ready to blast and Wi-Fi/USB connection is severed / lost / disconnected, this display indicates the Base is in READY_TO_BLAST state | |   | The top figure indicates a local blast, where RF is not used or for remote, when RF is not connected. Bottom figure indicates RF signal |
| | | When blasted, to request user to turn off power, when Wi-Fi/USB connection lost | |   | |


DetNet South Africa Copyright © 2022

| Item # | Description | Detail | Indication | Icon | Options / Variants / Description |
|---|---|---|---|---|---|
| | | When in ABORTED state, and also to turn off power, when Wi-Fi/USB connection lost | |   | |

## 14.9. NEW DESIGN

**It is a good practice to clear the list when starting a new blasting process as the Ranger retains original detonator details from the previous blast. From the Main Menu, select new design and confirm that list needs to be cleared.**

1. Main Menu
   - Press 4 SoftKey to select **New Design**.

2. Clear Memory Menu
   - Press Yes SoftKey to Clear Memory.
   - Det List Cleared will be displayed briefly

DetNet South Africa Copyright © 2022

## 14.10. TEST MENU

The Test Menu will allow the user to perform the following tests:

1. Test All,
2. Leakage Test,
3. Untagged Test.

### 14.10.1. Test All

From the test menu, the user will have the option to test all the detonators known to the DigiShot® Ranger to check if they are still connected to the Harness wire

1. Main Menu
   - Press 1 SoftKey to select **Test Menu**.

2. Test Menu
   - Press 1 SoftKey to select **Test All**.

3. Test All
   - DigiShot® Ranger will test all known detonators
   - **Done** will be displayed when test all is complete.

4. User may use the following SoftKeys:
   - Press SoftKey to continuously repeat test.
   - Press SoftKey to stop continuously repeating test
   - to View Design

**Failures are detonators that are known to the Ranger but have not responded to the test command. These detonators might not be connected to the harness for example.**

- After Testing press the ESC Key to return to the Test Menu.


DetNet South Africa Copyright © 2022

### 14.10.2. Leakage Test

This function enables the user to perform a current measurement and a leakage measurement test.
Leakage is measured in milli-amps (mA) and low leakage is considered to be below 0.5mA.
Leakage higher than 1mA is considered high leakage and may result in blasting problems (potential misfires) and should therefore be addressed and resolved prior to arming. The user can set the maximum limit where the leakage warning is triggered from 0.1mA to 1mA in increments of 0.1mA. Note that the default leakage limit is 0.5 mA. A warning will be displayed when the leakage level exceeds the leakage warning trigger level as set by the user.

| | |
|---|---|
| WARNING | **HIGH LEAKAGE LEVELS CAN RESULT IN POTENTIAL MISFIRES OF THE DIGISHOT ® DETONATORS.** |

1. Main Menu
   - Press 1 SoftKey to select **Test Menu**.

2. Test Menu
   - Press 2 SoftKey to select **Leakage Test**.

3. Leakage Test
   - DigiShot® Ranger will Test Leakage on all Channels
   - Press SoftKey to continuously repeat test.
   - Press SoftKey to stop continuously repeating test

4. CE4 Tagger will display leakage test results
5. After Testing press the ESC Key to return to the Test Menu
   - Refer to basic causes of leakage as detailed in the CE4 Tagger section

DetNet South Africa Copyright © 2022

### 14.10.3. Untagged Test

This function enables the user to test for Untagged Detonators connected to the harness wire.

1. Main Menu
   - Press 1 SoftKey to select **Test Menu**.

2. Test Menu
   - Press 3 SoftKey to select Untagged Test.

3. Untagged Test
   - The Channel and Result will be displayed
   - OK message will be displayed when no untagged detonators are found.
   - Error message will be displayed when untagged detonators are found.

4. User may use the following SoftKeys:
   - Press SoftKey to continuously repeat test.
   - Press SoftKey to stop continuously repeating test
5. After Testing press the ESC Key to return to the Test Menu

**Use a binary search to locate untagged detonator(s).**
**Refer to Appendix A for details to perform binary search.**


DetNet South Africa Copyright © 2022

## 14.11. VIEW DESIGN

The View Design Menu will allow the user to view detonator lists sorted or filtered as desired. The following menu options are available:

1. List Detonators,
2. List Missing Detonators,
3. List New Detonators,
4. List Bad Status Detonators,
5. Channel Summary.

### 14.11.1. List Detonators

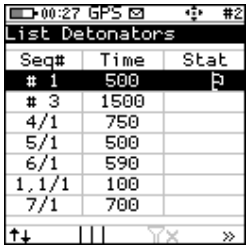
**The Lists do NOT include untagged detonators.**

**Viewing the detonator list will stop and restart the current detonator search process. Note that detonator programming can only be started once the search process was completed at least once after power-on.**

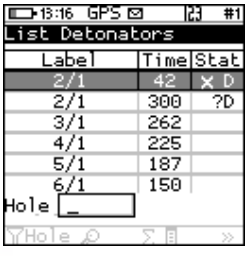
1. Main Menu
   - Press 2 Key to select **View Design**.

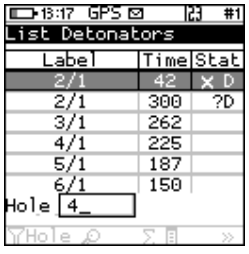
2. View Design
   - Press 1 Key to select List Detonators.

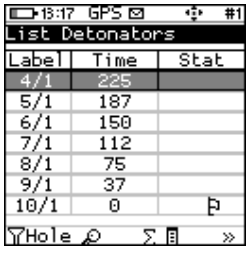
3. Detonator list will be displayed
   - Press **>>** SoftKey to cycle between various views as required
   - Press SoftKey to filter




   - Press SoftKey to search Hole
     - Enter Hole number
     - Press ENTER to filter the list and place the required detonator at the top of the list



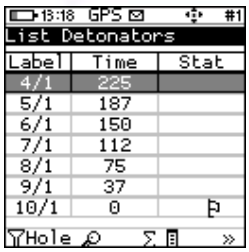



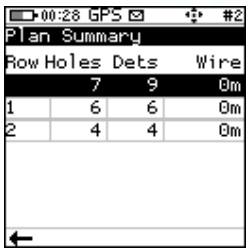





DetNet South Africa Copyright © 2022

- Press Σ SoftKey to view Plan Summary




- Press ↑↓ SoftKey to select:
  - Sort By Channel
  - Sort by Location

  - Sort by Time view.
  - Sort in Tag order.

NOTE

**In the List Detonator screens, make use of the 2 8 keys to navigate up or down, and press ↵ to view the selected detonator's details. The following icons may be displayed under the Status column:**

*** indicates a "New Det"**

**⚐ indicates a "Last Det"**

**? indicates a "Missing Det"**

**X Bad Status det**

**D Duplicate dets**

**Start row marker**

**End row marker**

**Inflection point**

4. Press the ESC Key to return to the View Design Menu


DetNet South Africa Copyright © 2022

### 14.11.2. List Missing Detonators

This screen will list the detonators that were not found during testing.

1. Main Menu
   - Press 2 Key to select **View Design**.

2. View Design
   - Press 2 Key to select **List Missing Detonators**.

3. List Missing Dets
   - The List Missing Detonators screen will be displayed
   - Press the applicable SoftKey as required.
4. Press the ESC Key to return to the View Design Menu


DetNet South Africa Copyright © 2022

### 14.11.3. List New Detonators

New detonators are detonators that were not found when the Ranger completed the original search but were found when it repeated the search later (i.e. the detonators are “new”). Once programming is done, the detonators are considered to be accepted as part of the design and will not be shown as new anymore.

1. Main Menu
   - Press 2 Key to select **View Design**.

2. View Design
   - Press 3 Key to select **List New Detonators**.

3. List New Detonators
   - New detonator(s) found will be displayed

DetNet South Africa Copyright © 2022

### 14.11.4. List Bad Status Detonators

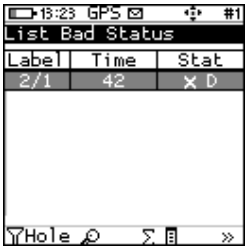
This screen lists the detonators that were found to be bad during the test. (A bad status indicates the detonator may have a bad fuse or other internal problem).

**This List does NOT include untagged detonators.**

1. Main Menu
   - Press 2 Key to select **View Design**.

2. View Design
   - Press 4 Key to select List Bad Status Detonators.

3. List Bad Status
   - The List Bad Status screen will be displayed
   - Use SoftKeys to navigate pages and sort/filter the view as required.
   - X indicates Bad status detonators
   - D indicates duplicate detonators





DetNet South Africa Copyright © 2022

### 14.11.5. Channel Summary

The Channel Summary menu allows the user to view summaries of the number of detonators on each Channel.

1. Main Menu
   - Press 2 Key to select **View Design**.

2. View Design
   - Press 5 Key to select Channel Summary.

3. Channel Summary screen
   - Press the following SoftKeys to toggle display as follows:
   - EOL = End of Line
   - Bad = Bad Detonators
   - New = New Detonators
   - Mis = Bad Detonators

DetNet South Africa Copyright © 2022

## 14.12. Prepare for Blast

This function prepares for either a Local Blast or a Remote Blast

### 14.12.1. Local Blast

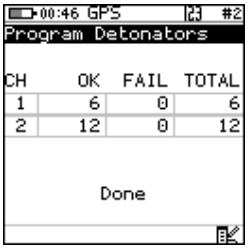
1. Main Menu
   - Press 3 SoftKey to select **Prepare for Blast**.

2. Warning for **last det not set**

   User is enforced to select last dets on all channels. A warning will appear where the user may:
   - Press Auto to automatically select last det, which is the last det on the list for each channel
   - Press to have the list of detonators displayed and select the last dets manually
   - Press to return to main menu
   - If the user selects the last det automatically, a warning will appear to ensure that all dets are connected before proceeding to programming.

3. Prepare for Blast
   - Press 1 Key to select **Program Detonators**.

4. Program Detonators
   - Detonators will be programmed
   - Press ESC button to return to **Prepare for Blast Menu**
   - Press to continue.





DetNet South Africa Copyright © 2022

5. Check Blast Design
   - Press 4 from main Menu to view Design to view

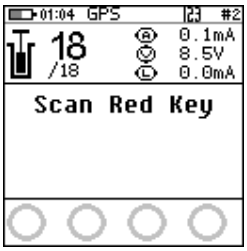
6. Prepare for Blast
   - Press 2 button to select **Arm**.

7. Arm
   - Press 1 button to select **Local Blast**

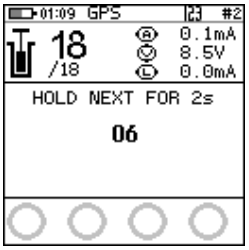
**ARM AND FIRE COMMANDS FOR DETONATORS WILL NOT INITIALLY BE KNOWN TO THE DIGISHOT® RANGER AT POWER ON. THESE COMMANDS ARE ONLY AVAILABLE FROM THE BLASTING (RED) BLASTCARD AND WILL BE ISSUED TO THE DIGISHOT® RANGER WHEN NECESSARY, EITHER DIRECTLY FROM THE RED BLASTCARD (IN CASE OF A LOCAL BLAST) OR REMOTELY FROM THE BASE RANGER. ARM AND FIRE BLASTING COMMANDS WILL BE ERASED FROM THE RANGER MEMORY AFTER USE.**

8. Local Blast
   - User will be prompted to **Scan Key**
   - Scan the **Red BlastCard** at the back of the DigiShot® Ranger
   - Enter the associated PIN
   - Press ↵ to continue.

**BLAST CARD NFC SENSOR**



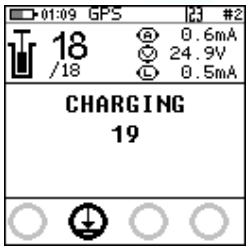
   - The screen will alternate between displaying awaiting high voltage and prompting the User to press next.
   - The time displayed indicates the time remaining to press next before it 'disarms'.



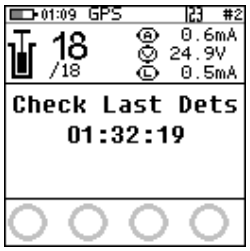


DetNet South Africa Copyright © 2022

9. Local Blast
    - Press and hold the NEXT button on the front of the DigiShot® Ranger for 2 seconds

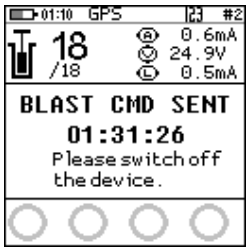



10. Local Blast
    - The DigiShot® Ranger will initiate a 30-second high-voltage charging period followed by a 120-second blast window.
    - Should there be detonators marked as “last det”, the last det test will be performed between the charge and blast window




11. Local Blast
    - Press both FIRE-buttons (SoftKeys) on the CE4 Tagger simultaneously to fire

12. Local Blast
    - Blast Command sent
    - Switch Off Ranger and Tagger





DetNet South Africa Copyright © 2022

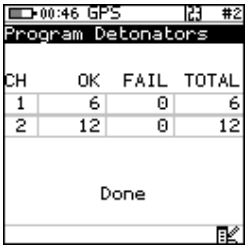
### 14.12.2. Remote Blast

| | |
|---|---|
| NOTE | **The following Remote Blast description details the manual process to arm the system. The user is also provided with an option to Arm the Ranger without the need to connect the Tagger via an AutoArm function. The AutoArm function will allow the user to scan a no-PIN yellow BlastCard and if there are no errors present; program and move to the waiting for next press state. The user will then have to press next for 2 seconds and the unit will then be ready to arm. The Ranger (Bench and Base) should be mounted on the supplied foot or a tripod for reliable RF connectivity.** |

1. Main Menu
   - Press 3 SoftKey to select **Prepare for Blast**.

2. Prepare for Blast
   - Press 1 SoftKey to select **Program Detonators**.

3. Program Detonators
   - Detonators will be programmed
   - Press ESC or ↵ button to return to Prepare for Blast Menu.




4. Prepare for Blast
   - Press 2 button to select **Arm**.

DetNet South Africa Copyright © 2022

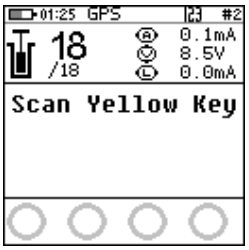
5. Arm
   - Press 2 button to select **Remote Blast**

**ARM AND FIRE COMMANDS FOR DETONATORS WILL NOT INITIALLY BE KNOWN TO THE DIGISHOT® RANGER AT POWER ON. THESE COMMANDS ARE ONLY AVAILABLE FROM THE BLASTING (RED) BLASTCARD AND WILL BE ISSUED TO THE RANGER WHEN NECESSARY, EITHER DIRECTLY FROM THE RED BLASTCARD (IN CASE OF A LOCAL BLAST) OR REMOTELY FROM THE BASE DIGISHOT® RANGER. ARM AND FIRE BLASTING COMMANDS WILL BE ERASED FROM THE RANGER MEMORY AFTER USE.**

6. Remote Blast
   - Press → SoftKey to initialise RF communication
   - User may change RF settings by selecting corresponding numbers. Refer to 15.3 for detailed RF settings procedure.

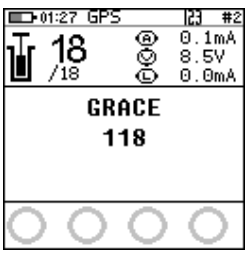
7. Remote Blast
   - User will be prompted to **Scan Key**
   - Scan the **Yellow BlastCard** at the back of the DigiShot® Ranger

**BLAST CARD NFC SENSOR**




**Yellow NFC card must be from the same group as Red NFC card for RF communication to take place.**

8. Remote Blast
   - Press and hold the NEXT button on the front of the DigiShot® Ranger for 2 seconds
   - The DigiShot® Ranger will initiate a Grace period of 2 minutes.

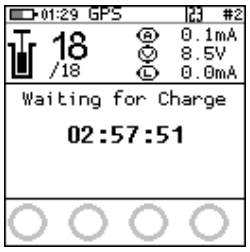




DetNet South Africa Copyright © 2022

**Disconnect the CE4 Tagger from the Bench Ranger. CE4 Tagger will automatically disconnect from the Bench Ranger during charging.**

9. Remote Blast
   - The Bench Ranger will await a command from the Base Ranger




**Connect the CE4 Tagger via Wi-Fi to the Base Ranger.**

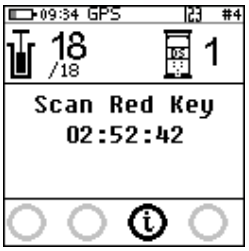
- Select the applicable Bench Ranger by pressing corresponding number on the keypad. Select Bench 10 by pressing **0** on the keypad. (Bench 1 is selected as indicated by the tick mark ✓ in example shown).
- Applicable Bench Ranger will be Indicated by ✓
- Press ↵ to continue

10. To remove a Ranger from the blast:
    - Press ⓘ button
    - Highlight Ranger to be removed
    - Press ↵
    - Then press 亠 Soft button to remove

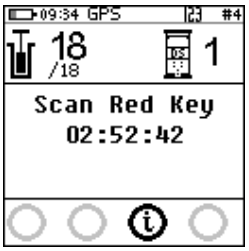
11. To add a removed Ranger
    - Press + Button
    - Press ✎ button to View Det Errors
    - Press corresponding numbers to view the different lists

DetNet South Africa Copyright © 2022

12. Remote Blast
    - Wait if message “Not ready yet” is displayed and when connected to the bench the base will display Grace and the time left for grace period to elapse



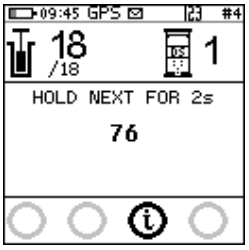

13. User will be prompted to **Scan Key** once all the bench Rangers are out of grace period and ready to blast.



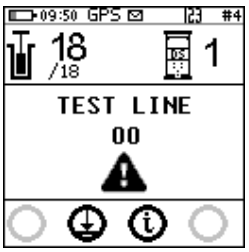
**The user is also provided with an option to Arm the Ranger without the need to connect the tagger via an AutoArm function. The AutoArm function will allow the user to scan a no PIN yellow BlastCard and if there are no errors present; program and move to the waiting for next press state. The user will then have to press next for 2 seconds and the unit will then be ready to arm.**

14. Scan Key
    - Scan the RED BlastCard at the back of the DigiShot® Ranger
    - Enter the corresponding PIN
    - Press to continue

    - Press and Hold the NEXT button on the front of the DigiShot® Ranger for 2 seconds




    - The DigiShot® Ranger will initiate arming and a 30-second high-voltage charging period followed by Testing Line and the 120-second blast window.

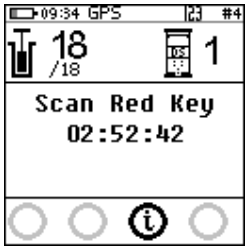



15. To disarm the blast


DetNet South Africa Copyright © 2022

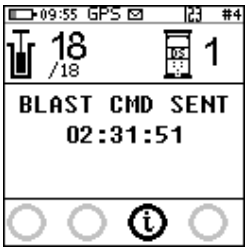
- From the Base Ranger press the button

- The Base will return to “Scan Red Key”



- Press both FIRE-buttons (SoftKeys) on the CE4 Tagger simultaneously to fire

- BLASTING WILL TAKE PLACE
- Blast Command sent message will be displayed





DetNet South Africa Copyright © 2022

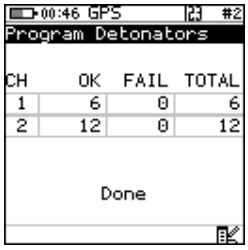
### 14.12.3. Remote Synchronized Blast

**The following Remote Synchronized Blast description details the manual process to arm the system. The user is also provided with an option to Arm each Bench Ranger without the need to connect the Tagger via an AutoArm function. The AutoArm function will allow the user to scan a no-PIN yellow BlastCard and if there are no errors present; program and move to the waiting for press Next state. The user will then have to press Next for 2 seconds and the unit will then be ready to arm. Synchronized blast should be conducted when the RF signal strength is 80% and above. When conducting a synchronized blast, the detonators will be initiated approximately 5 seconds after fire buttons were pressed provided that RF signal strength is good.**

16. Main Menu
    - Press 3 SoftKey to select **Prepare for Blast**.

17. Prepare for Blast
    - Press 1 SoftKey to select **Program Detonators**.

18. Program Detonators
    - Detonators will be programmed
    - Press ESC or ↵ button to return to Prepare for Blast Menu.




19. Prepare for Blast
    - Press 2 button to select **Arm**.

DetNet South Africa Copyright © 2022

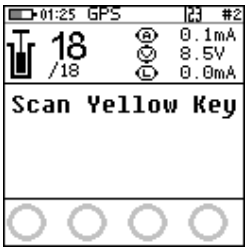
20. Arm
    - Press 2 button to select **Remote Blast**

**ARM AND FIRE COMMANDS FOR DETONATORS WILL NOT INITIALLY BE KNOWN TO THE DIGISHOT® RANGER AT POWER ON. THESE COMMANDS ARE ONLY AVAILABLE FROM THE BLASTING (RED) BLASTCARD AND WILL BE ISSUED TO THE RANGER WHEN NECESSARY, EITHER DIRECTLY FROM THE RED BLASTCARD (IN CASE OF A LOCAL BLAST) OR REMOTELY FROM THE BASE DIGISHOT® RANGER. ARM AND FIRE BLASTING COMMANDS WILL BE ERASED FROM THE RANGER MEMORY AFTER USE.**

21. Remote Blast
    - Press → SoftKey to initialise RF communication
    - User may change RF settings by selecting corresponding numbers. Refer to 15.3 for detailed RF settings procedure.

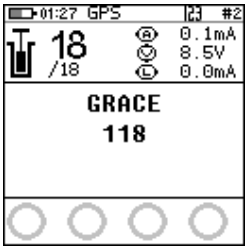
22. Remote Blast
    - User will be prompted to **Scan Key**
    - Scan the **Yellow BlastCard** at the back of the DigiShot® Ranger

**BLAST CARD NFC SENSOR**




**Yellow NFC card must be from the same group as Red NFC card for RF communication to take place.**

23. Remote Blast
    - Press and hold the NEXT button on the front of the DigiShot® Ranger for 2 seconds
    - The DigiShot® Ranger will initiate a Grace period of 2 minutes.

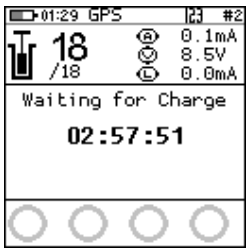




DetNet South Africa Copyright © 2022

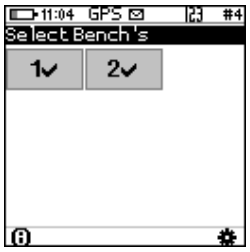
**Disconnect the CE4 Tagger from the Bench Ranger. CE4 Tagger will automatically disconnect from the Bench Ranger during charging.**

24. Remote Blast
    - The Bench Ranger will await a command from the Base Ranger



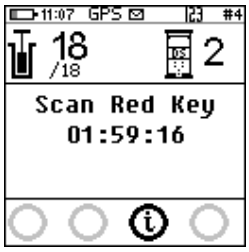

**Connect the CE4 Tagger via Wi-Fi to the Base Ranger.**

- elect the applicable Bench Rangers by pressing corresponding numbers on the keypad. Select Bench 10 by pressing **0** on the keypad. (Bench 1 is selected as indicated by the tick mark ✓ in example shown).
- Applicable Bench Ranger will be Indicated by ✓
- Press ↵ to continue




25. Synchronized or Non-Synchronized blasting
    - Press for 1△ synchronized

26. Remote Synchronized Blast
    - Wait if message “Not ready yet” is displayed ensure all Benches and Base Rangers RF settings are set the same
    - User will be prompted to **Scan Key** once all the bench Rangers are out of grace period and ready to blast.

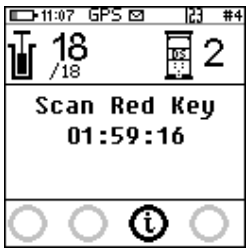




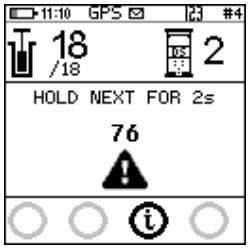
DetNet South Africa Copyright © 2022

| | |
|---|---|
| NOTE | **Once all the applicable Bench Rangers are Armed and no fault has been detected then user can proceed with Synchronized blasting of all Bench Rangers from Base. It is important that the user ensures good RF communication level between the Base and all Rangers.**<br><br>**Synchronized blast is performed in instances where the same bench is blasted with 2 Bench Rangers or when delays of adjacent benches will affect each other if the order of blasting is altered. Also useful when there is a possibility of the rock from one bench possibly cutting off the harness wire to the other bench during blasting.** |

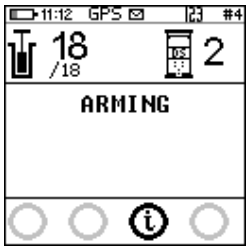
27. Scan Key
    - Scan the RED BlastCard at the back of the DigiShot® Ranger
    - Enter the corresponding PIN
    - Press ↵ to continue



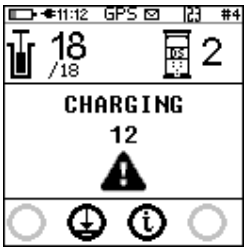
- Press and Hold the NEXT button on the front of the DigiShot® Ranger for 2 seconds

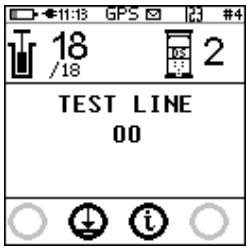



- The DigiShot® Ranger will initiate arming and a 30-second high-voltage charging period followed by the 90-second blast window.




28. To disarm the blast
    - From the Base Ranger press the ⏻ button



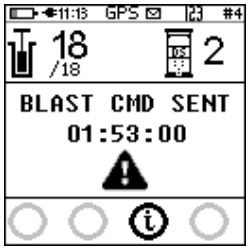





DetNet South Africa Copyright © 2022

- Press both FIRE-buttons (SoftKeys) on the CE4 Tagger simultaneously to fire
- The Ranger will count down from 5 seconds to allow for the synchronisation of all Bench Rangers and will blast at 0 seconds

- BLASTING WILL TAKE PLACE
- Blast Command sent message will be displayed




### 14.12.4. Remote Non-Synchronized Blast

**The following shows how to setup an un-synchronized blast of more than one Bench Rangers from one Base Ranger.**

**This is not recommended unless the benches are far from each other and it does not matter which one will fire first.**

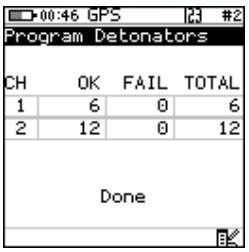
**Unsynchronized blast should be conducted when the RF signal strength is 60% and above. The maximum time difference during an unsynchronized blast between bench Rangers is 15 seconds.**

29. Main Menu
    - Press 3 SoftKey to select **Prepare for Blast**.

30. Prepare for Blast
    - Press 1 SoftKey to select **Program Detonators**.

DetNet South Africa Copyright © 2022

31. Program Detonators
    - Detonators will be programmed
    - Press ESC or ↵ button to return to Prepare for Blast Menu.




32. Prepare for Blast
    - Press 2 button to select **Arm**.

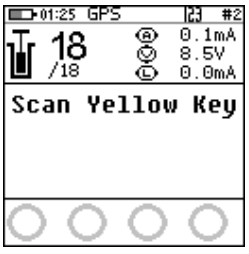
33. Arm
    - Press 2 button to select **Remote Blast**

**ARM AND FIRE COMMANDS FOR DETONATORS WILL NOT INITIALLY BE KNOWN TO THE DIGISHOT® RANGER AT POWER ON. THESE COMMANDS ARE ONLY AVAILABLE FROM THE BLASTING (RED) BLASTCARD AND WILL BE ISSUED TO THE RANGER WHEN NECESSARY, EITHER DIRECTLY FROM THE RED BLASTCARD (IN CASE OF A LOCAL BLAST) OR REMOTELY FROM THE BASE DIGISHOT® RANGER. ARM AND FIRE BLASTING COMMANDS WILL BE ERASED FROM THE RANGER MEMORY AFTER USE.**

34. Remote Blast
    - Press → SoftKey to initialise RF communication
    - User may change RF settings by selecting corresponding numbers. Refer to 15.3 for detailed RF settings procedure.

35. Remote Blast
    - User will be prompted to **Scan Key**
    - Scan the **Yellow BlastCard** at the back of the DigiShot® Ranger

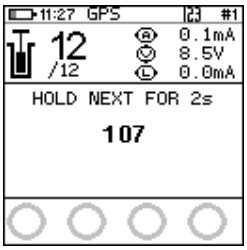
**BLAST CARD NFC SENSOR**

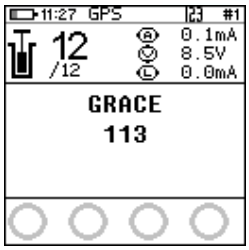


**Yellow NFC card must be from the same group as Red NFC card for RF communication to take place. The same NFC card will be used in all the Bench that are going o initiated from the same Base**


DetNet South Africa Copyright © 2022

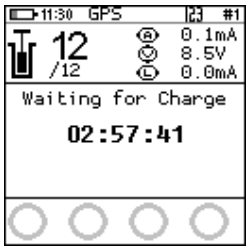
36. Remote Blast
    - Press and hold the NEXT button on the front of the DigiShot® Ranger for 2 seconds
    - The DigiShot® Ranger will initiate a Grace period of 2 minutes.




**Disconnect the CE4 Tagger from the Bench Ranger. CE4 Tagger will automatically disconnect from the Bench Ranger during charging.**

37. Remote Blast
    - The Bench Ranger will await a command from the Base Ranger

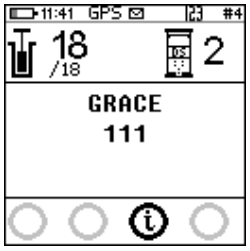



**Connect the CE4 Tagger via Wi-Fi to the Base Ranger.**

- Select the applicable Bench Rangers by pressing their corresponding numbers on the keypad. Select Bench 10 by pressing **0** on the keypad and Bench 1 by pressing 1 on the keypad and all selected Benches will be shown as indicated by the tick mark ✓ .
- Applicable Bench Ranger will be Indicated by ✓
- Press ↵ to continue

38. Synchronized or Non–Synchronized blasting
    - Press for 2 non-synchronized

39. Remote Non-Synchronized Blast
    - Wait if message “Not ready yet” is displayed
    - User will be prompted to **Scan Key** once all the bench Rangers are out of grace period and ready to blast.
    - Once all the Bench Rangers are finished with grace countdown then

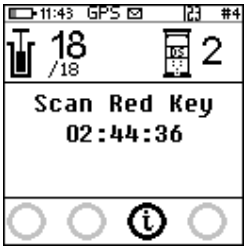




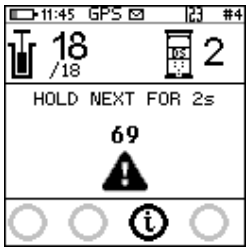
DetNet South Africa Copyright © 2022

user will prompted to scan the Red keys

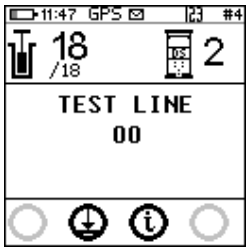
40. Scan Key
    - Scan the RED BlastCard at the back of the DigiShot® Ranger
    - Enter the corresponding PIN
    - Press ↵ to continue



- Press and Hold the NEXT button on the front of the DigiShot® Ranger for 2 seconds




- The DigiShot® Ranger will initiate arming and a 30-second high-voltage charging period followed by the 120-second blast window.

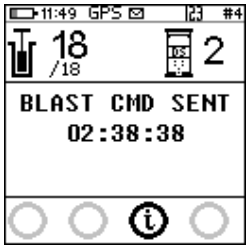



41. To disarm the blast
    - From the Base Ranger press the ⏚ button to disarm the blast and resolve any issues

42. Press both FIRE-buttons (SoftKeys) on the CE4 Tagger simultaneously to fire
    - The Ranger will send the blast command in numerical Ranger ID order.

**BLASTING WILL TAKE PLACE**

- Blast Command sent message will be displayed





DetNet South Africa Copyright © 2022

# 15 DIGISHOT® RANGER CONFIGURATION SETTINGS

The configuration menu presents a variety of informational screens and configurable options for the following:

1. 4G Setup
2. Device Setup
3. Long Range RF
4. Advanced Setup
5. Factory Setup.

## 15.1. 4G Setup

The 4G Setup menu will allow the user to set the det labelling that was used when tagging to ensure that the Ranger is able to interpret the locations tagged on the detonators.

1. Main Menu
   - Press to select Configuration

2. Configuration Menu
   - Press 1 to select **4G Setup**

### 15.1.1. Det Label

The Det label configuration defines how the hole (det) is referred to throughout the system.

1. Configuration Menu
   - Press 1 to select **4G Setup**
   - Press 1 to select **Det. label**

2. Det. Label

Use numerical keys 2 8 to toggle between the different Det. Label options. The following choices are available:

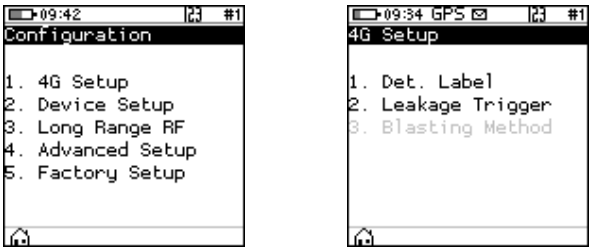
- Row number, hole number, det number
- Literal row, hole number, det number
- Hole number, det number
- Numeric sequence (used internally in basic mode)*
- DigiShot Label (side, row, hole and det number)


DetNet South Africa Copyright © 2022

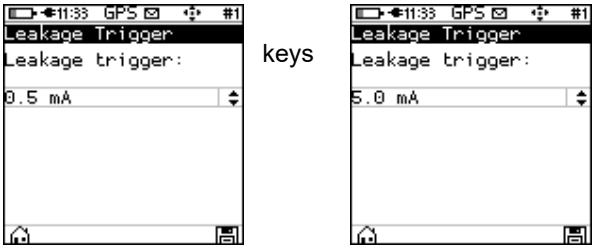
- Press Softkey to save

### 15.1.2. Leakage Trigger

1. Configuration Menu
   - Press 1 to select **4G Setup**
   - Press 2 to select **Leakage Trigger**



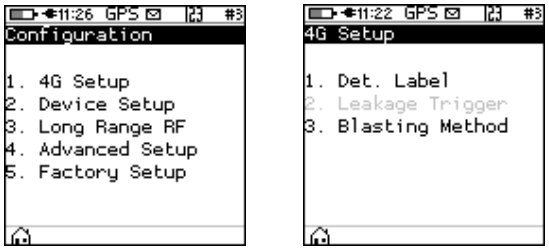

2. Leakage Trigger
   - Select leakage warning trigger level using numerical 2 8 to move up or down (0.5mA to 5.0mA)
   - Press Softkey to save




### 15.1.3. Blasting Method (Base Station)

Blasting Method Configuration is only available on the Base Station. This setup allows the user to enforce synchronized blasting when conducting remote blasting with more than one Bench Ranger by selecting Sync only in the blasting method configuration. This setup also allows the user to select between non- synchronized blasting or synchronized blasting by configuring the blasting method to Sync and Non-Sync.

1. Configuration Menu
   - Press 1 to select **4G Setup**
   - Press 3 to select **Blasting Method**

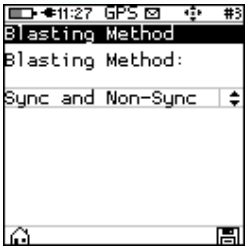




DetNet South Africa Copyright © 2022

2. Blasting Method

- Use numerical keys 2 and 8 to toggle between Sync and Non-Sync or Sync only
- Press Softkey to save



## 15.2. Device Setup

The Device Setup menu will allow the user to adjust device specific settings.
The following options are available:

1. Time Zone
2. Language
3. Time Outs
4. Units

### 15.2.1. Time Zone

This function enables the user to define the time zone. Date/time settings are controlled by GPS GMT time data but since the time zone cannot be configured automatically, it should always be set by the user in order to ensure the correct local time display. The time zones may be adjusted in 0.5 hour increments.

1. cMain Menu
   - Press to select Configuration

2. Configuration Menu
   - Press 2 to select **Device Setup**

3. Device Setup
   - Press 1 to select **Time Zone**

DetNet South Africa Copyright © 2022

4. Set Time Zone

- Use the arrow key 2 / 8 to navigate the TIME ZONE options.
- Press SoftKey to save.
- Press SoftKey to return to Main Menu.

### 15.2.2. Language

This function enables the user to select a language preference for the DigiShot ® Ranger menus.

**This version of software does not have complete translations of all languages other than English. The additional languages will be included in a later software release.**

1. Main Menu

- Press to select Configuration

2. Configuration Menu

- Press 2 to select **Device Setup**

3. Device Setup

- Press 2 to select **Language**

4. Language

- Press 1 on the keypad to select English.
- Press 2 on the keypad to select Español (Spanish).
- Press 3 on the keypad to select Français (French).
- Press 4 on the keypad to select Bahasa (Bahasa).
- A confirmation screen will be displayed when the language is changed.

Press SoftKey to return to Main Menu.


DetNet South Africa Copyright © 2022

### 15.2.3. Timeouts

This function enables the user to set a time-period of inactivity before the Ranger will automatically power off to conserve battery power. The user can set the idle time between 2 and 300 minutes.

1. Main Menu
   - Press to select Configuration

2. Configuration Menu
   - Press 2 to select **Device Setup**

3. Device Setup
   - Press 3 to select **Timeouts**

4. Auto Shutdown

   Use 2 8 navigational keys to navigate selection.
   - Minimum of 2 minutes.
   - Maximum of 300 minutes.
   - Press SoftKey to save.
   - Press SoftKey to return to Main Menu

DetNet South Africa Copyright © 2022

### 15.2.4. Units

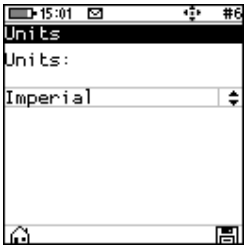
This function enables the user to select either the Imperial or Metric Units of Measure as preferred.

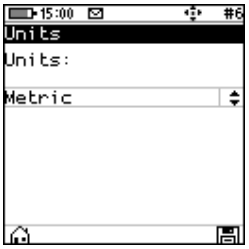
1. Main Menu
   - Press to select Configuration

2. Configuration Menu
   - Press 2 to select **Device Setup**

3. Device Setup
   - Press 4 to select **Unit**

4. Units
   - Use 2 8 navigational keys to toggle selection.
   - Press to select either Imperial or Metric.
   - Press SoftKey to save.





DetNet South Africa Copyright © 2022

## 15.3. Long Range RF

This function enables the user to manually select the region where the DigiShot® Ranger will be deployed, set the region specific RF Channel and set the Encryption Key.

| | |
|---|---|
| NOTE | **Communication will NOT be possible unless the channel, encryption key settings and firmware version are the same on Base and Bench Rangers. This will be automated when the RF settings from NFC card is enabled, and the onus will thus not be on the user to ensure matching settings, unless it needs to be altered. When the option to obtain RF settings from card is enabled, simply swipe a yellow blast card in idle state and the system will obtain the RF settings** |

### 15.3.1. Set RF Channel

1. Main Menu
   - Press ⚙ to select Configuration

2. Configuration Menu
   - Press 3 to select **Long Range RF**

3. RF Setup Menu
   - Press 1 to select **RF Channel Setup**
   - Press 2 to select **Encryption Key Setup**
   - The current RF settings will be displayed at the bottom of the screen

4. RF Channel Setup
   - Select 1 to change source
   - The current source will be displayed at the top of the screen

DetNet South Africa Copyright © 2022

- Use keys 2 / 8 to toggle between From NFC and From Settings

- Press 2 to manually set RF Channel if source is From Settings

- Use numerical keypad to enter Unique RF Channel within the range as follows:
- Between 16 and 47 for Americas
- Between 48 and 55 for Australia.
- Press ↵ to continue
- Press SoftKey to return to Main Menu

| | |
|---|---|
| NOTE | **Communication will NOT be possible unless the channel and encryption key settings are the same on Base and Bench Rangers. The channel range will also change to reflect the available allocated RF channels for each specific region** |


DetNet South Africa Copyright © 2022

### 15.3.2. Set Encryption Key

1. Main Menu
   - Press ⚙ to select Configuration

2. Configuration Menu
   - Press 3 to select **Long Range RF**

3. RF Setup
   - Press 2 to select Encryption Key Setup

4. Encryption Key Setup
   - Select 1 to change source
   - The current source will be displayed at the top of the screen

   - Use keys 2 8 to toggle between From NFC and From Settings

   - Press 2 to manually set RF Channel if source is From Settings

DetNet South Africa Copyright © 2022

Use numerical keypad to enter Unique Encryption key

- Press or to continue
- Press SoftKey to return to Main Menu

**Communication will NOT be possible unless the channel and encryption key settings are the same on Base and Bench Rangers. Note that this function is automated, and the onus is not on the user to ensure matching settings, unless they need to alter them..**


DetNet South Africa Copyright © 2022

# 16 ADVANCED SETUP

The Advanced Setup menu presents configurable options for the following:

1. Device ID
2. Device Mode
3. Device Password
4. Last Det
5. Toggle Auto Arm
6. Max Wire length

## 16.1. Device ID

1. Main Menu
   - Press to select **Configuration**

2. Configuration Menu
   - Press 4 to select **Advanced Setup**

3. Advanced Setup
   - Press 1 to select **Device ID**

4. Device ID
   - Use numerical keypad to enter desired Device ID
   - Press to continue
   - Press SoftKey to save.
   - Press SoftKey to return to Main Menu
   - Power cycle the Ranger for the change to take effect.

**All devices must have unique IDs. The Rangers may be set to IDs ranging from 1 to 10.**


DetNet South Africa Copyright © 2022

## 16.2. Device Mode

The Base Station Mode menu allows the initiating of detonators remotely from a Bench Ranger.

**The Ranger unit will turn off automatically when the mode change is selected. User will need to switch the Ranger off and On.**

1. Main Menu
   - Press to select **Configuration**

2. Configuration Menu
   - Press 4 to select **Advanced Setup**

3. Advanced Setup
   - Press 2 to select **Device Mode**

### 16.2.1. Device Mode

The Device Mode menu presents configurable options for the following:

- Press 1 to select **Bench Box Mode**
- Press 2 to select **Base Station Mode**

## 16.3. Device Password

This function enables the user to change the device password by assigning a new unique password that is known only to the user.


DetNet South Africa Copyright © 2022

1. Main Menu
   - Press ⚙ to select **Configuration**

2. Configuration Menu
   - Press 4 to select **Advanced Setup**

3. Advanced Setup
   - Press 3 to select **Device Password**

4. Passwords
   - Use the numerical keypad to enter Current Password.
   - Press ↵ to confirm.

**Unlike conventional password entry, the chosen password is visible to the user (rather than ****) to enable the user to see if any typing errors are being made.**
**Leaving the new password 'blank' disables the password request when the Ranger is switched on.**

   - Use the numerical keypad to enter New Password.
   - Press ↵ to confirm.
   - Information message confirming password changed will be displayed briefly.
   - Advanced Menu will be displayed.

DetNet South Africa Copyright © 2022

## 16.4. Last Det

This function enables the user to enable or disable the last det test.

1. Main Menu
   - Press to select **Configuration**

2. Configuration Menu
   - Press 4 to select **Advanced Setup**

3. Advanced Setup
   - Press 4 to select **Last Det**

4. Last Det
   - Press 2 8 key to toggle between Last Det Enabled and select Last Det Preferred

   - Last det preferred indicates that the last det test will be used in preference to the normal current measurement checks in blasting
   - Press to select and save the setting.

DetNet South Africa Copyright © 2022

## 16.5. Toggle Auto Arm

This function enables the user to enable arming automatically or manually.

1. Main Menu
   - Press ⚙ to select **Configuration**

2. Configuration Menu
   - Press 4 to select **Advanced Setup**

3. Advanced Setup
   - Press 5 to select **Toggle Auto Arm**

4. Toggle Auto Arm

   User may select to:
   - Enable – this will allow user to read the information (RF encryption key and RF channel) stored on the NFC cards when in idle mode and arming the Bench Ranger when it is ready to blast.
   - Disable – this will only allow the user to arm the Bench Ranger manually.

DetNet South Africa Copyright © 2022

## 16.6. Max Wire Length

1. Main Menu
   - Press to select **Configuration**

2. Configuration Menu
   - Press 4 to select **Advanced Setup**

3. Press 6 to select **Max Wire length**

4. Max Wire length
   - Insert the max wire length between 5000 and 16000m.

DetNet South Africa Copyright © 2022

# 17 FACTORY SETUP

**The Factory Setup is password protected and may only be accessed by designated maintenance teams.**

1. Main Menu
   - Press ⚙ to select **Configuration**

2. Configuration Menu
   - Press 5 to select **Factory Setup**

3. Factory Password
   - The factory setup menu will prompt for a password, after which the factory options will be displayed.
   - Use numerical keypad to enter Unique CE4 Tagger Password.
   - Press ↵ to continue.

4. Factory Setup
   - Factory Setup will be displayed.

DetNet South Africa Copyright © 2022

| | |
|---|---|
| NOTE | **Each option is further protected by its own web-based ticket system. If no active ticket is available for the chosen option (as stored on the CE4 Tagger), the user is prompted for a ticket issued by portal.detnet.com. The ticket is comprised of two 10-digit numbers that need to be entered before continuing. If the ticket is valid, access will be granted to the given function. Tickets can be issued for a selected number of repeated uses before a given expiry date. Tickets issued are specific to a given CE4 Tagger or Ranger as determined by the hardware serial number, thus allowing flexible control over protected features.** |

5. Web Ticket
   - Press required Menu option.
   - Obtain Ticket to continue

DetNet South Africa Copyright © 2022

## 17.1. Factory Setup Menu Options

Each Factory menu option is described below. Many of the screens are common to several CE4 products and are shared between them.

**NOTE**

**Only Storage Mode will be accessible without a Web Ticket. All other Menu items will need a Web Ticket to be accessed.**

## 17.2. Factory Setup Menu Options

1. **Factory Service:**
   a. **Clear Logs (Factory)**
   The clear logs function erases the internal log and will displays a confirmation dialog briefly.
   b. **Leakage Calibration (Factory)**
   The Leakage Calibration menu recalculates the leakage and current offsets by measuring the current and leakage with no detonators connected. It functions in the same fashion as the leakage test screen except that it initially shows a leakage calibrate dialog briefly and then proceeds to the leakage screen.

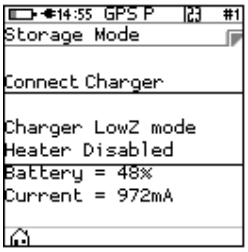
   c. **Reset Service Date**
      - This function will allow the user to reset the service schedule.
   d. **IO Setup (Factory)** (Only available in the Bench Ranger)
      - The IO Setup function is used to setup experimental IO parameters.
   e. **Migrate NFC Key**
      - The Migrate NFC Key function is used to migrate an outdated key to the new structures.

   f. **Benches (Only available in the Base Ranger)**
      - Used to enable more than one Bench box. (This will require a ticket).

2. **Start Self-Test**
   - The option allows Ranger to perform self test
3. **Experimental Menu (Factory)**

This menu option will contain any experimental functions that are required in engineering only.

4. **Storage Mode**
   - Press 6 MNO Key to select **Storage Mode**
   - When the battery capacity is more than 50%, the CE4 Tagger will discharge the battery by activating additional battery draining functions such as the heating pad, to accelerate the discharge level to the required 50% charge level, and
   - When the battery capacity is less than 50%, it will prompt the user to connect a charger to attain the required 50% charge level.





DetNet South Africa Copyright © 2022

- When the CE4 Tagger reaches the required 50% battery storage capacity it will switch off automatically allowing for safe storage

5. **Toggle Authorise**
   - Used to toggle between automatically authorising the scanning of the yellow NFC card to program detonators.


DetNet South Africa Copyright © 2022

# 18 TABLET BLAST APPLICATION GENERAL DESCRIPTION

**Please refer to UTM-00346 for the Ranger System Tablet Blast Application details**


DetNet South Africa Copyright © 2022

# 19 RANGER SYSTEM ON-BENCH DEPLOYMENT OVERVIEW

1. Configure all equipment
2. Prepare for tagging
3. Tag detonators
4. Test detonators
5. View Design

| | |
|---|---|
| WARNING | LOCAL MINE, EXPLOSIVES OR STATUTORY REGULATIONS, PROCEDURES, OR CODES OF PRACTISE REGARDING SAFETY TAKE PRECEDENCE OVER ANY OF THE TIPS AND HINTS DESCRIBED IN THIS DOCUMENT. THE MINE, EXPLOSIVES OR LOCAL REGULATIONS, PROCEDURES OR CODES OF PRACTISE MUST BE FOLLOWED AT ALL TIMES. |

## 19.1. Blasting Overview

The DigiShot® Ranger can be used for Local Blasting, Remote Blasting and Synchronized blasting. The description below provides a high-level overview of the steps required to operate the DigiShot® Ranger during each of the blasting processes.

### 19.1.1. Local blasting

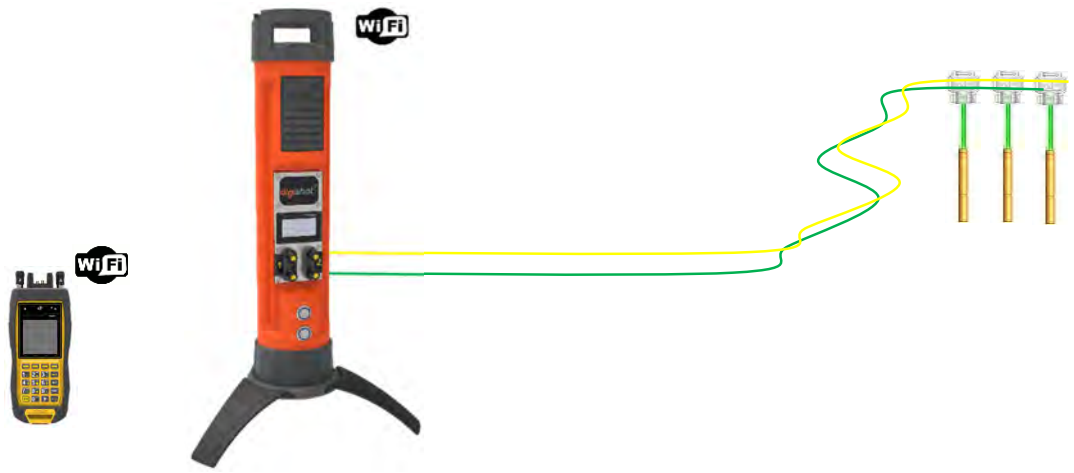



*Figure 11: Local Blasting*

a. Connect detonator lead-in wires to the detonator channel(s) on the front panel of the DigiShot® Ranger. Channels are clearly marked 1 – 2.
b. Switch ON both the CE4 Tagger and DigiShot® Ranger.
c. Establish a Wi-Fi link between the CE4 Tagger and appropriate DigiShot® Ranger. Both devices will confirm connected status on the respective displays.
d. Initiate the necessary tests using the CE4 Tagger as a 'remote control'. All associated results will be displayed in detail on the CE4 Tagger screen while a summarized result will be displayed on the DigiShot® Ranger.
e. Initiate the program functions to ensure all detonators are timed appropriately.
f. Select ARM and scan the RED BlastCard to the designated NFC Sensor area on the back of the DigiShot® Ranger.
g. ARM/Activate the DigiShot® Ranger from the CE4 Tagger.
h. Enter the associated PIN on the CE4 Tagger.


DetNet South Africa Copyright © 2022

i. Press and hold the next button for 2 seconds
j. The DigiShot® Ranger will initiate a 30-second high-voltage charging period followed by a 90-second blast window.
k. Press both FIRE-keys (soft buttons) on the CE4 Tagger to fire.

**SHOULD THE FIRE BUTTONS NOT BE PRESSED BEFORE 120 SECONDS ELAPSED THE USER WILL NEED TO RE-ARM THE SYSTEM.**


DetNet South Africa Copyright © 2022

### 19.1.2. Remote blasting

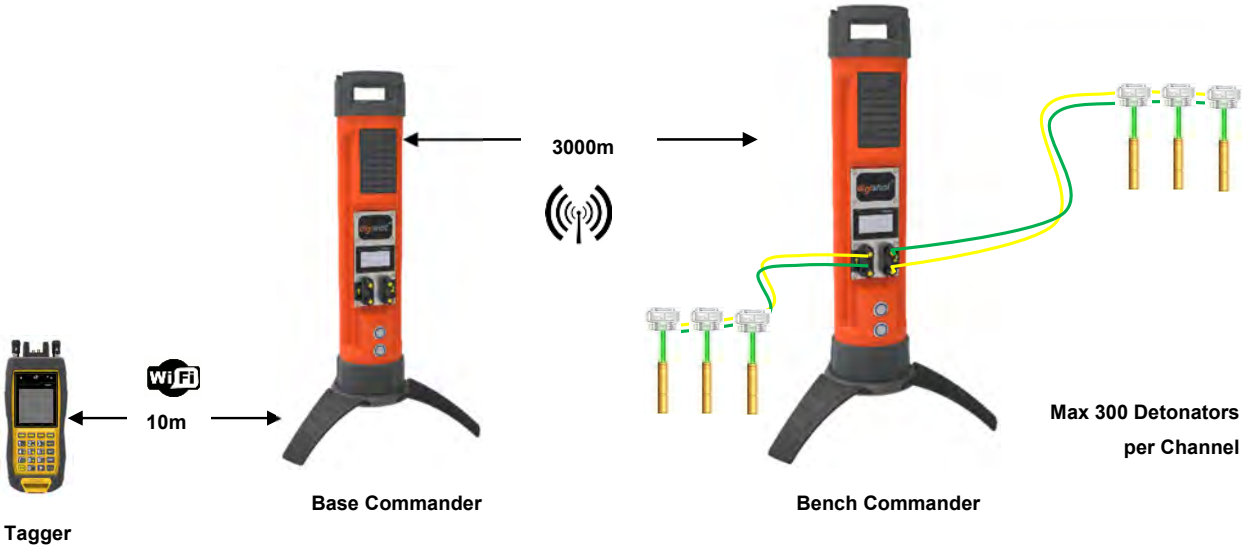



*Figure 12: Remote Blasting*

a. Repeat steps a – f as specified for local blasting.
- Connect detonator lead-in wires to any / each available detonator channel on the front panel. Channels are clearly marked 1 – 2.
- Switch both CE4 Tagger and DigiShot® Ranger ON.
- Establish a Wi-Fi link between the CE4 Tagger and appropriate Bench Ranger. Both devices will confirm connected status on the respective displays.
- Initiate the necessary tests using the CE4 Tagger as an interface unit. All associated results will be displayed in detail on the CE4 Tagger screen while a summarized result will be displayed on the Bench Ranger.
- Initiate the program functions to ensure all detonators are timed appropriately.
- ARM/Activate the Bench Ranger from the CE4 Tagger.

b. Scan the Yellow BlastCard to the designated NFC Sensor area on the Bench Ranger and to Arm the Bench Ranger.
c. Press next for 2 seconds.
d. The Bench Ranger will initiate the grace period as specified in the BlastCard. Evacuate the bench.
e. Set up a Base Ranger at a safe location within RF range from the Bench Ranger.
f. Establish a Wi-Fi link between CE4 Tagger and Base Ranger. Both devices will confirm connected status on displays.
g. Confirm which Bench Rangers to proceed with.
h. Apply the RED BlastCard to the designated area on the Base Ranger.
i. Enter the associated PIN on the CE4 Tagger and press next.
j. The Base Ranger will instruct the selected Bench Ranger(s) to apply high voltage for 30 seconds before allowing a 90-second firing window. In Synchronise mode the firing window will be 60 seconds).
k. Press both FIRE-keys (SoftKeys) on the CE4 Tagger to fire.

| | |
|---|---|
| CAUTION | **SHOULD THE FIRE BUTTONS NOT BE PRESSED BEFORE 120 SECONDS ELAPSED THE USER WILL NEED TO RE-ARM THE SYSTEM.** |


DetNet South Africa Copyright © 2022

### 19.1.3. Synchronized blasting (Multiple Rangers)

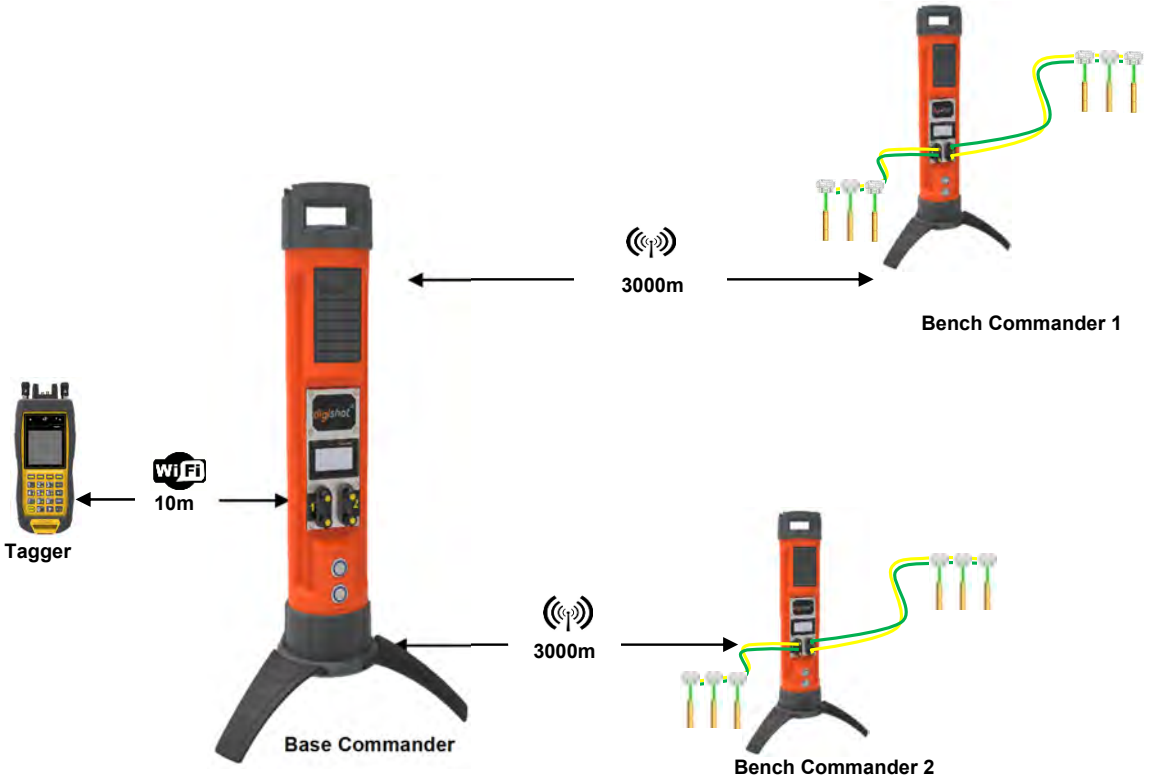


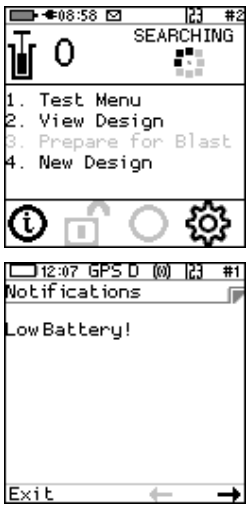
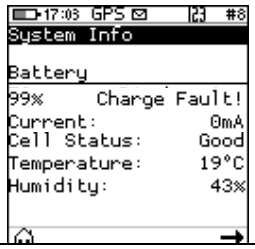

*Figure 13: Synchronized Blasting via two Rangers*

a. Repeat steps a – d as specified for remote blasting.
b. When configuring the base and selecting the bench Rangers to be blasted, select the sync option
c. A sync-management period will automatically be applied at step l to ensure 1ms synchronization between Rangers.

| | |
|---|---|
| CAUTION | **ARM AND FIRE COMMANDS FOR DETONATORS WILL NOT INITIALLY BE KNOWN TO THE DIGISHOT® RANGER. THESE COMMANDS ARE ONLY AVAILABLE FROM THE BLASTCARD (RED) AND WILL BE ISSUED TO THE RANGER WHEN NECESSARY, EITHER DIRECTLY FROM THE BLASTCARD (IN CASE OF A LOCAL BLAST) OR REMOTELY FROM THE BASE RANGER. ARM AND FIRE BLASTING COMMANDS WILL BE ERASED FROM THE RANGER MEMORY AFTER USE.** |
| NOTE | **Note that two Rangers can only be used when enabled via ticket from DetNet portal.** |


DetNet South Africa Copyright © 2022

# 20 DIGISHOT® SYSTEM TROUBLESHOOTING

| Fault Condition | Error Screen | Troubleshooting / Remedial Action |
|---|---|---|
| Low Battery |  | When Envelope is displayed, Press **#** to display Error Screen<br><br>Ensure that the Ranger is fully charged before it is deploying in a blast. Should this error trigger, charge the Ranger before using or alternatively use another Ranger that has been sufficiently charged. |
| Charge fault |  | The Charge Fault will be displayed to indicate that the Ranger is not charging from the connected charger. Ensure that the charging cable is connected securely to the Ranger. Also ensure that the charger has sufficient output power to charge the Ranger. A charger capable of supplying 2A or greater is preferred. |
| Design Changed | <br>or | This error will occur when the Ranger detects that the design has changed. This indicates that, either a new detonator has been found, or a detonator has gone missing. When this error occurs, the user is encouraged to examine the list to ensure that the total detonator count is correct. Once the list has been examined and the detonator count has been confirmed to be correct, the user must reprogram the Ranger. Should there be a missing detonator, it must be found and corrected |

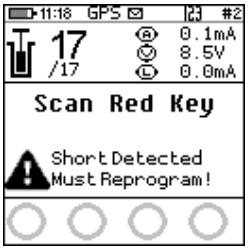

DetNet South Africa Copyright © 2022

| Fault Condition | Error Screen | Troubleshooting / Remedial Action |
|---|---|---|
| | | |
| Detonator(s) Missing | | This warning is triggered when the Ranger detects that a previously connected detonator is no longer present on the line. When this error occurs, the user is encouraged to examine the list to determine which detonator is missing. The user will then need to return to the bench to identify and correct the fault. |
| High Leakage | | Leakage is tested during various stages, including testing and programming. Should a high leakage warning be triggered, the user will need to find the source of the leakage – this is performed most effectively by using a Tagger. The user is encouraged to disconnect the string from the Ranger and divide the string into two equal halves and test each half with a Tagger. The leakage should be present on only one half and this process can be repeated until the source of the leakage is discovered. Some of the reasons for leakage include damage to the down-line wire of a detonator unit, moisture in the connector of a detonator unit and damage to the surface harness wire insulation.<br>It is recommended that the user resolve all leakage sources to have a leakage of 0 mA, however, should it not be possible to eradicate all leakage sources, the system may be able to cope with leakage sources up to 1 mA per channel. |
| Last detonator not set | | Each channel on the Ranger needs to discover at least one detonator that has been marked as the 'last detonator' on the string. To ensure that there is connectivity to the last unit on the harness, this 'last detonator' will be searched for just after charging. The Ranger will also check the voltage supplied to the last detonator to ensure that sufficient energy has been transferred to allow for successful blasting.<br>Should the Ranger not find a detonator marked as the 'last detonator' on a channel, the 'Last detonator not set' notification will be displayed – note that the channel affected will also be indicated. |

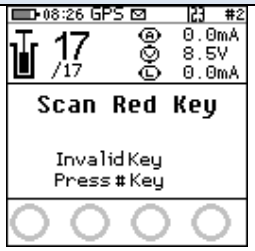
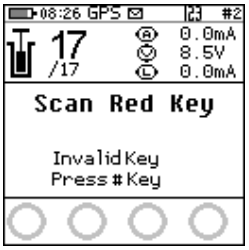

DetNet South Africa Copyright © 2022

| Fault Condition | Error Screen | Troubleshooting / Remedial Action |
|---|---|---|
| Last detonator error | | This error occurs when communication to the last detonator is unsuccessful after charging and just prior to firing. If the last detonator is not found it indicates a harness break or the last detonator does not have sufficient voltage to initiate. The user is encouraged to disarm and return to safe voltage. After waiting the minimum of 10 minutes re-entry time as per the manufacturer requirement, proceed to the string in question to identify the source of the fault.<br>A Tagger may be used to aid in this process. The first step would be to check if there is a leakage problem on the string. Once this is resolved the user will need to test the string to check if all the expected detonators are present on the line. |
| Wire limit exceeded | <br> | This warning will trigger when the cumulative detonator wire length for a channel is exceeded. The down-line wire length of each detonator is stored in memory, and the software can thus calculate the total down-wire length per channel. If this total length exceeds the set max wire limit setting the warning will be triggered. It is recommended that the user decrease the down-wire length on the channel in question by moving detonators to another channel. |
| Misfires Expected | <br> | This warning will be displayed during the firing window if the voltage at the last detonator is too low for successful blasting. In such a case the user is encouraged to disarm and return to safe voltage. After waiting the appropriate amount of time, the user may proceed to the channel in question to identify the source of the fault.<br>A Tagger may be used to aid in this process. The first step would be to check if there is a leakage problem on the string. Once this is resolved the user will need to test the string to check if all the expected detonators are present on the line |

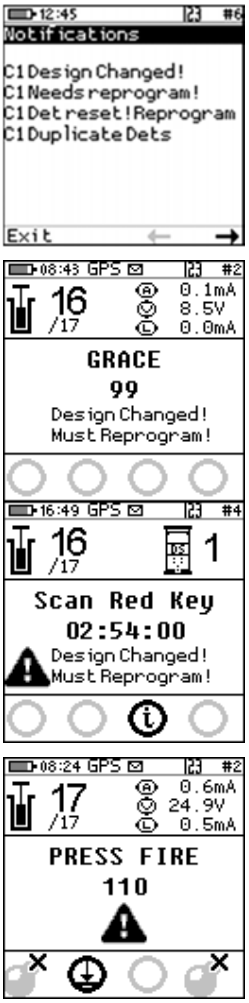

DetNet South Africa Copyright © 2022

| Fault Condition | Error Screen | Troubleshooting / Remedial Action |
|---|---|---|
| Current limiter has activated |  | This error may trigger at any point during the testing, programming or firing process. The error points to excessively high leakage or a short circuit on the channel. The Tagger may be used to identify the source of leakage using the binary search technique. If this error occurs after programming the user will need to reprogram the channel |
| Untagged detonator found | Test All<br> <br>Untagged test<br> <br>Test Single det<br> | When the Ranger detects a detonator that still has the internally recorded factory ID, which means that it has not been successfully tagged, it will trigger the untagged warning.<br>The Tagger may be used to find the untagged detonator on a string using the binary search technique.<br>Once the untagged detonator has been found, it must be tagged with a delay or location (or both) as per the blast plan. |
| Wrong / Invalid Card | | This error will be displayed either when the user scans a Red BlastCard when a Yellow BlastCard is expected or vice versa. The error will also be displayed if the BlastCard is invalid. The user must scan the correct BlastCard or replace the BlastCard if it is invalid or not working correctly |


DetNet South Africa Copyright © 2022

| Fault Condition | Error Screen | Troubleshooting / Remedial Action |
|---|---|---|
| |  | |
| Low Battery / Link Down / Check RF Settings | | The low battery warning will be displayed when the battery has depleted to a point where blasting may be jeopardized. Recharge the battery before continuing with blasting.<br>When the RF link is down at the Base Ranger, the 'link down' error will be displayed. The number (B4 in example) refers to the Bench Ranger with which communication has been lost.<br>The RF connection warnings will indicate that either the RF channel or the Encryption key does not match. Adjust settings to ensure that these parameters match on the Base Ranger and all the Bench Rangers. |
| Card Not paired |  <br> | The Invalid Key / Card not paired error will be displayed if the BlastCard used to arm the Base Ranger is from a different group (set) of BlastCards to the BlastCard used to arm the Bench Ranger/s. Use only the BlastCards from the same set as shipped together |
| Last det not set | | The last det not set error will occur when arming if the last dets were not set on the connected channels. The user may select to select last dets automatically where the system will assume that the last detonator in the last is the last det or the user may manually select the last det. |

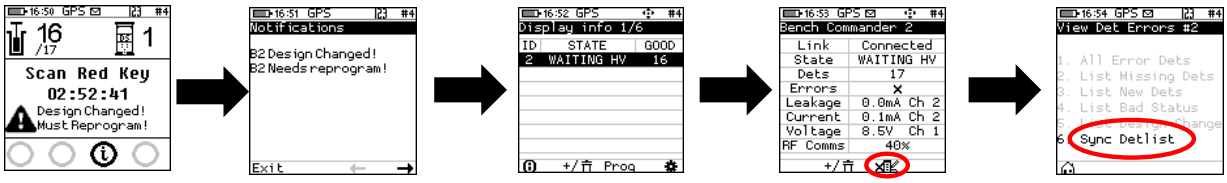

DetNet South Africa Copyright © 2022

| Fault Condition | Error Screen | Troubleshooting / Remedial Action |
|---|---|---|
| Missing dets after programming and reconnected |  | The system will display a reprogram error should dets be disconnected after programming and reconnected afterwards. The user can view the errors on the Bench Ranger by pressing the # button. The system will allow the user to continue with arming on the Base Ranger, but the Ranger will display the error message in grace, charging but the fire buttons will be greyed out in the fire menu. |

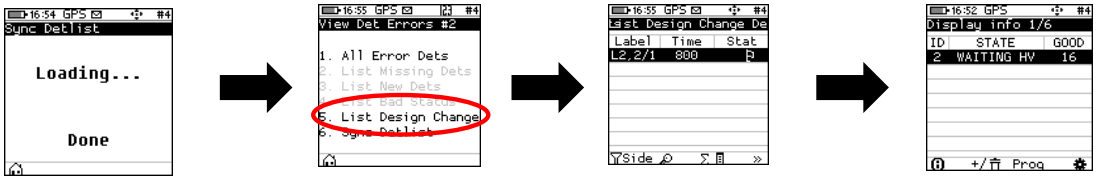
**All detonator errors encountered after programming on the Bench Ranger will be synced and displayed on the Base Ranger with the relevant Bench Ranger ID.**


DetNet South Africa Copyright © 2022

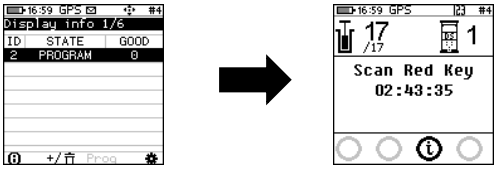
## 20.1. DigiShot® System Troubleshooting: Reprogram required




**Missing Det** | **Press # to identify** | **Select correct Bench Commander** | **Select Detlist** | **Select Sync Detlist**




**List Design Change** | **Identify Det causing** | **If OK to continue Re-Program**




**Program Completed** | **Continue with Blasting**


DetNet South Africa Copyright © 2022

# 21 APPENDIX A – DIGISHOT SYSTEM PRACTICAL TIPS AND HINTS

This section provides some practical tips and hints based on previous on-bench experience to assist new users with their learning and ensure a successful deployment of the system on the bench. This document must not be regarded as a replacement for Training manuals or Quick Guides but rather as supplementary to other documentation. To ensure that this document remains useful, receiving feedback and suggestions from DetNet Channel partners and end users is important.

**LOCAL MINE, EXPLOSIVES OR STATUTORY REGULATIONS, PROCEDURES, OR CODES OF PRACTISE REGARDING SAFETY TAKE PRECEDENCE OVER ANY OF THE TIPS AND HINTS DESCRIBED IN THIS DOCUMENT. THE MOST STRINGENT SET OF RULES BETWEEN THE MINE, EXPLOSIVES OR LOCAL REGULATIONS/PROCEDURES/CODES OF PRACTISE AND THE MANUFACTURER MUST BE FOLLOWED.**

Refer to https://portal.detnet.com/http://www.portal.detnet.com/ for additional detail on Quick Guides, Channel Leakage and other documents of interest.

## 21.1. On Bench Delivery of Detonators

When Rangers of DigiShot® Detonators are delivered, ensure to place Rangers at a point of safety to prevent on-bench vehicles from driving over the Rangers and damaging detonators.

**IT IS IMPORTANT TO NOTE THAT ALL DETONATORS ARE IMPACT SENSITIVE AND CAN INITIATE IF EXPOSED TO EXCESSIVE MECHANICAL IMPACT.**

## 21.2. Distributing Detonators on the Bench

When distributing detonators on the bench the following points are important:

- Ensure that all connectors are properly closed to prevent ingress of moisture and/or dirt when placing detonators at holes to be primed.
- Place detonators in line with the direction of drilled holes to minimise people treading or vehicles driving over detonator coils. Place coiled detonators far enough from the hole collar to prevent detonators rolling down drilled holes.
- If different lengths are used for decking purposes, then place coils in the sequence of charging to reduce time and minimise confusion for the charging crew.

## 21.3. Priming with DigiShot® Detonators

During priming (inserting the detonator into a booster) the following points are important:

- When removing the detonator from the coil ensure that it is removed from the opposite end of the connector to prevent tangling of the down-line wire.
- Pull out sufficient length to thread the detonator through the booster and to be left with approximately 300mm of down-line wire between booster and coil.
- Remove helix by gently pulling the cable between thumb and forefinger to prevent inner-cores from taking on different orientations. This could exert unnecessary tension on the crimp area.
- Thread the detonator through the booster and ensure it is properly seated.
- Pull on the incoming cable to ensure that the down-line wire is tightly placed and properly seated in the booster saddle. Check to ensure that it is not kinked or damaged when the booster is lowered down the hole.
- Place primed detonator in a safe place to minimise the chance of treading on the primer and ensure that the connector is still in the closed position.


DetNet South Africa Copyright © 2022

## 21.4. Lowering Detonators into Drilled Holes

When lowering booster down the drilled hole it is important to note the following:

- Pillow loading is advisable to prevent the down-line wire being exposed to unnecessary tension when augering explosives down the hole. It also helps to prevent the down-line wire being damaged when the booster strikes the bottom of the hole.
- When lowering the booster down the drilled hole, hold coil in one hand and use the thumb and forefinger of the other hand to guide the booster down the hole. At the same time uncoil the helix that is formed in the cable during coiling.
- When the booster hits the bottom of the hole, raise it off the bottom and tighten the cable to ensure that no kinking or coiling of the down-line wires has occurred in the hole. Kinking/coiling could cause damage during loading or slumping.
- There are two schools of thought on how to tie the down-line wire to the stake that must always be placed in line with the row of holes as follows:
- The first one is to take the down-line wire protruding from the hole and coil it three or four times around the stake, leaving sufficient slack on the fourth coil to pull the coil through the loop and then carefully tighten the down-line wire without causing any sharp kinks in the cable.
- The second one is advisable in areas that are known for slumping of holes. Treat same as above with the exception that instead of using the down-line wire protruding from the hole, place the remaining coil next to the stake and then coil a sufficient length from the connector side and tie in same manner as above, ensuring that tension is exerted on the down-line wire and not on the connector interface by allowing sufficient slack between knot and connectors. It is believed that if slumping appears, the down-line wire will have sufficient slack in the coil to compensate for the slumping without the wire pulling directly on the stake. Both methods as described above have been successfully deployed globally.

**ENSURE THAT CONNECTOR IS PROPERLY CLOSED TO PREVENT INGRESS OF MOISTURE AND DIRT.**

## 21.5. Charging of Drilled Holes

When charging drilled holes, it is important to keep the following in mind:

- Ensure that the connector is properly closed to prevent ingress of explosives which could result in the corrosion of tines inside the connector. Corrosion of the tines will cause increased resistance during blasting.
- If Pillow loading was not done during auguring, lift the booster an appropriate distance from the drilled hole bottom and keep the down-line wire tight to prevent it from kinking. Kinks in the wire can lead to pocket loading of the explosives; these pockets will, through time, slide down the hole and cause insufficient explosive charge per hole. Kinks may also lead to damage of the inner cores in the downline if tension is exerted on the downline wire. On completion of charging, ensure that connectors are properly closed and ensure that the down hole lead is still tied to the stake
- If Pillow loading was done, keep down-line wire tight to prevent kinks from forming inside the hole and keep down-line wire towards middle of the hole to prevent the charging hose from pushing the down-line wire against rock surface of the hole which might result in down-line wire damage. Ensure that the stake is still in place and connector still closed.


DetNet South Africa Copyright © 2022

## 21.6. Stemming of Charged Holes

When stemming holes with aggregate it is important to do the following:

- Position the down-line wire to mitigate damage as much as possible.
- Pull down-line wire away from the side from which stemming material is being poured down the hole.

Ensure that all slack is taken-up to prevent kinking inside the stemming column. Kinking will result in the cable snapping if slumping is experienced.

## 21.7. Tagging of Charged Holes with DigiShot® Detonators

Tagging according to a plan and ensuring all Users adhere to this plan is important to reduce errors during blasting:

- Always ensure that a proper blast and tagging plan is available and that all personnel partaking have a clear understanding of the tagging method and channel allocation. Duplicate, missing or extra detonators and/or detonators on the wrong channel will have a negative impact at blasting time if discovered on the Bench Ranger.
- Ensure that CE4 Tagger head is clean and free of water droplets or emulsion especially between the two Pogo-pin connectors. This helps to prevent a conductive path between the connectors that will add leakage during tagging and testing.
- When tagging using the “through holes” ensure that the CE4 Tagger head is regularly cleaned and connectors closed and placed properly on the stake.
- When tagging directly on the tines, inspect the tines for alignment with harness wire guiding groves, that the spade gap is in good repair and ensure that connector is properly closed and placed on the stake
- Ensure that Tagging is performed according to tagging plan and that all detonators are tagged to prevent the system discovering extra or missing detonators during blasting
- When the connector is damaged or does not make proper contact and needs to be removed, cut the down-line wires and strip the insulation sufficient in length to fit into the Back-to Back Connector without protruding on either side of the connector as this can result in a short circuit.

**ALWAYS USE BACK-TO-BACK CONNECTORS AS A CONNECTOR REPLACEMENT KIT.**

## 21.8. Harnessing of the Blast

Harnessing according to the blast design will reduce fault diagnostics. Also take note of the following:

- Always use the correct harness wire as specified in the UTM’s.
- Test roll of harness wire with CE4 Tagger to ensure it is in good repair and that no short circuits are present inside coil.
- When uncoiling the harness wire, ensure that it is uncoiled from the inside out to prevent tangling of wire.
- Where possible, connect harness wire in the same sequence as tagging, keep to the system limits and to the tagging plan.
- Open detonator connector and ensure it is free of dirt or moisture as well as being in a good condition, separate twisted pair with thumb, place harness wire onto connector aligning it with the guiding grooves and corresponding tines. Next, tighten wire over connector ensuring that harness wires are properly aligned and close connector until it clicks shut. If both wires are pushed into the same tine it will result in a short circuit. If the harness wire is not properly positioned it can become trapped between the closing lid of the connector and the top of the tine which will result in a harness break or intermittent connection, which will be time consuming when doing fault diagnostics
- When joining of the harness wire is required, always use a Back-to Back Connector to ensure a proper


DetNet South Africa Copyright © 2022

joint. Strip the harness wire insulation a sufficient length to fit into the connector of the Back-to Back Connector without protruding on either side of the connector as this can result in a short circuit

- Always trim harness wire ends at the end of each channel leaving no bare conductors that could touch or lie in a conducting solution as this will create a leak path and have a negative impact on the leakage measurement.

## 21.9. Testing of Blast Installation

Testing the blast installation with the CE4 Tagger is the last on bench verification that the system deployment is within the required parameters:

- When a channel is completely harnessed connect the CE4 Tagger to detonator string and perform a “test all” comparing the number of detonators with the blast plan to ensure all detonators are accounted for. Check that holes not connected are treated as misfires and marked on the plan. A good rule of thumb is if leakage exceeds 0.2mA, locate the source and fix before proceeding.
- If the leakage is isolated to a single detonator, remove this detonator from the string and connect this detonator to a separate harness wire and to its own channel. During programming assign the absolute time to detonator.
- Ensure that all channels are properly tested and within system limits before connecting to lead-in harness wire.
- Ensure that all detonators are connected to the correct channels.

## 21.10. Testing lead-in wire and rolling out harness wire to Bench Ranger position

Key points to note in testing of the Lead-in wire before rolling it out to the Bench Ranger:

- Test total length of lead-in harness wire for short circuits and leakage before connecting to strings of detonators.
- Make use of Back-to-Back Connectors when joining harness wires.
- When rolling out to the Bench Ranger position ensure that wires do not cross blasts or harness wires that are connected to detonators deployed to the blast, pre-split or near big rocks that might cut harness wire before the blast signal is sent.
- Keep away from high wall to prevent rolling rocks severing harness wire during deployment or rocks that may become dislodged by vibration or air blast from other blasts in vicinity.
- If lead-in harness wire requires extension, always use Back-to-Back Connectors ensuring that ends do not touch, as this could result in leakage or short circuits.

## 21.11. Connecting Harness wires to Bench Ranger

Based on errors that have been observed during the connecting of the harness wire to the Bench Ranger, the following is important to note:

- Ensure that connection points on the Bench Ranger are clean and in good condition to ensure a proper connection.
- Trim Harness wire ends to prevent it from touching the connector face plate to avoid short circuits.
- Fold copper portion double to have a bigger connection area.
- Wrap harness wire around large rocks to provide slack on the harness wire connections to prevent these from being pulled out by accidental bumping or people traveling.

## 21.12. Setting Up RF Communication

When deciding on a suitable blast point and setting up multiple Base stations for blasting, the following must be noted:

- Ensure that all spare Rangers and CE4 Taggers in the transporting vehicles are switched OFF to prevent RF interference with Rangers used in the blast.


DetNet South Africa Copyright © 2022

- If more than one Base Ranger is in use, ensure that they are further than 10 metres apart to eliminate RF communication interference.

## 21.13. Basic causes of leakage

- Poorly made joints when joining Harness Wire.
- Re-using Harness Wire.
- Leakage occurs when a damaged Harness Wire lies in water or emulsion. The water and emulsion are both conductive substances that can result in leakage. The same can occur if a connector is left submerged in water or emulsion indefinitely. It is advisable to raise the connectors off the ground, or at least away from standing water, if the ground conditions are very wet.
- Detonator down hole wire – holes not correctly de-sludged, rubbing of down hole line against hole wall, bent cable when lowering booster into a hole
- Detonator cable damaged around the insulation exposing the steel wire
- Ingress of water or moisture into connector
- Harness wire not properly secured inside connectors
- Short circuits occur when the harness wires are exposed and touch each other.
- SHORTS are typically identified by very high leakage errors - >19mA

**IT IS ADVISED THAT ONCE THE SYSTEM IS TAGGED, TESTED AND FOUND TO BE READY FOR BLASTING THAT THE CONNECTED CONTROL EQUIPMENT IS SWITCHED OFF UNTIL BLASTING TIME TO REDUCE THE LIKELIHOOD OF LEAKAGE CAUSED BY CORROSION.**

**These errors can be located and rectified using the Leakage Test in conjunction with a Binary Search.**


DetNet South Africa Copyright © 2022

## 21.14. Leakage table

Maximum Surface Wire Length 2500m - 4G

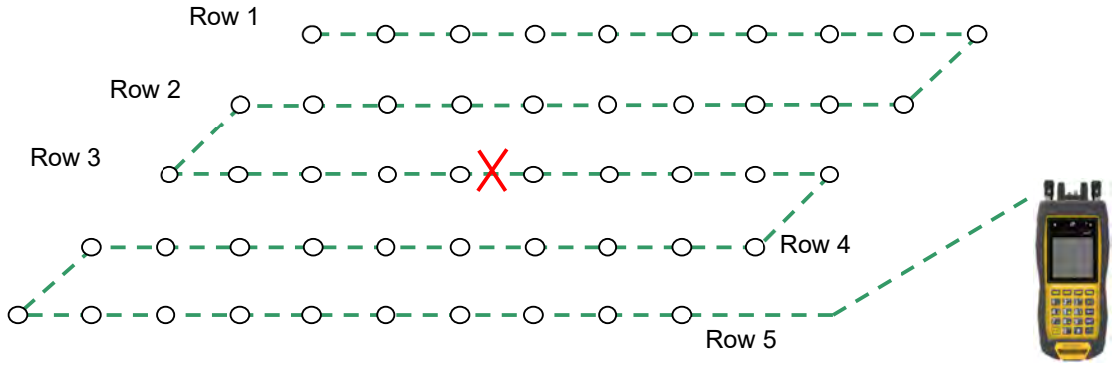
| ←Capacitance | Detonator length (m) | Max number of dets vs Leakage (per channel) | | | | | |
|---|---|---|---|---|---|---|---|
| | | Dets (0mA) | Dets (1mA) | Dets (2mA) | Dets (3mA) | Dets (4mA) | Dets (5mA) |
| | 10 | 400 | 320 | 320 | 229 | 229 | 178 |
| | 20 | 400 | 320 | 320 | 229 | 229 | 178 |
| | 30 | 400 | 320 | 320 | 229 | 229 | 178 |
| | 40 | 400 | 320 | 320 | 229 | 229 | 178 |
| | 50 | 320 | 320 | 320 | 229 | 229 | 178 |
| | 60 | 267 | 267 | 267 | 229 | 229 | 178 |
| | 70 | 229 | 229 | 229 | 229 | 229 | 178 |
| | 80 | 200 | 200 | 200 | 200 | 200 | 178 |
| | 90 | 178 | 178 | 178 | 178 | 178 | 178 |
| | 100 | 160 | 160 | 160 | 160 | 160 | 160 |
| | Voltage starvation → | | | | | | |


DetNet South Africa Copyright © 2022

## 21.15. Binary Search

Untagged Detonators

Conduct a binary search by breaking down the blast into manageable sections, to locate untagged detonators.




The Binary Search is conducted as follows:

1. Assume Row 1 above has an untagged detonator connected but its location is unknown, and it needs to be found.
2. Divide the blast in half and cut the surface harness at mid-point.
3. Connect the Tagger and check the back half for untagged detonators. Should the Tagger display NO UNTAGGGED DETONATORS, proceed with following step.
4. Connect the Tagger and check front half for untagged detonators. Should the Tagger now display UNTAGGGED DETONATORS it can be deduced that the problem is located in the front half of the blast. Repeat the partitioning process there.
5. Divide the front half and test backward and forward from the centre to narrow down the search area.
6. By repeating this process, the fault is narrowed down to a small and manageable area. At this point detonators may be disconnected from the surface harness and tested one at a time using the **TEST SINGLE DETONATOR** facility to locate the untagged detonator.
7. Once the untagged detonator is found, tag the detonator according to blast plan and ensure all broken wires are correctly reconnected and insulated with tape to prevent leakage problems.
8. Test Harness Wire to ensure all detonators have been identified and detected.

**Alternative method:**

If an existing blast plan is available, use the search function and check the blast summary against the blast plan to determine which row has a problem. The detonator count on that row will be incorrect.

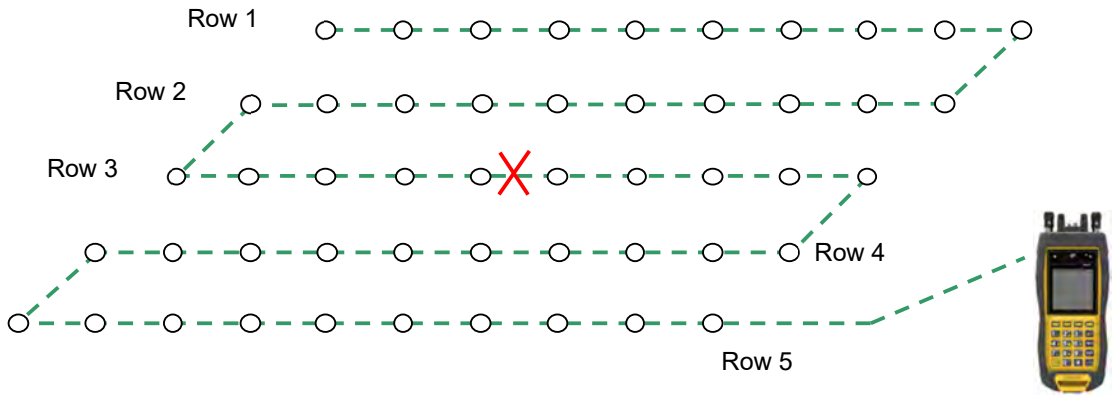
Examine the detonator list for that row to determine which detonator in that row is missing.

There is a strong possibility that this is the untagged detonator thus checking for the untagged detonator as detailed in this alternative method may be easier than performing the binary search.


DetNet South Africa Copyright © 2022

## 21.16. High Leakage

Conduct a binary search by breaking down the blast into manageable sections to locate high leakage.



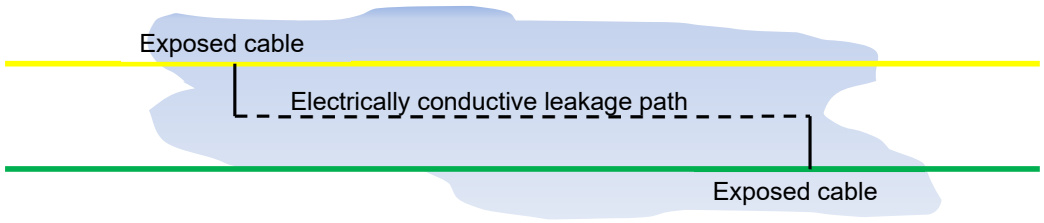

The Binary Search is conducted as follows:
Assume Row 5 has an exposed wire in surface harness in water causing a high leakage reading on the Tagger.

1. Divide the blast in half and cut the surface harness at mid-point.
2. Connect the Tagger and check back half for leakage. Should the Tagger display high leakage it indicates a fault present.
3. Connect Tagger and check front half for leakage. Should the Tagger display satisfactory leakage it indicates no fault present.
4. Divide the front half and test backward and forward from the centre to narrow down the search area.
5. By repeating this process, the fault is narrowed down to a small and manageable area.
6. Conduct a visual inspection of the surface harness to locate the fault.
7. Fix the problem ensuring all wires are correctly sealed with insulation tape to prevent further leakage problems.
8. Test the surface harness to ensure all faults have been fixed

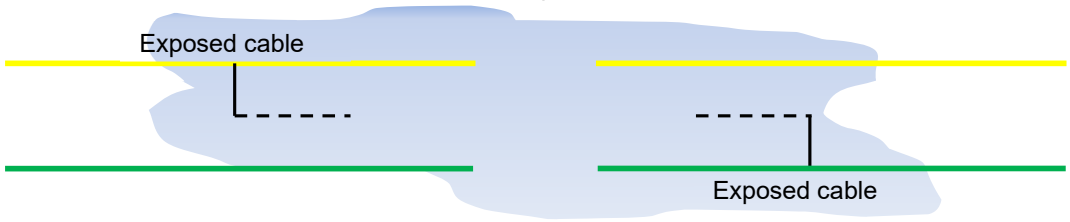

DetNet South Africa Copyright © 2022

## 21.17. Leakage through conductive materials

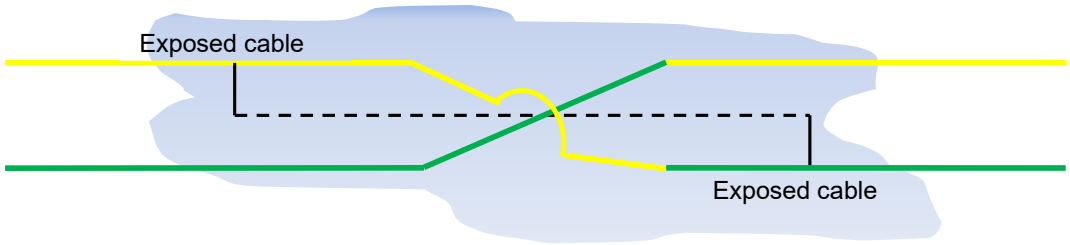
When an individual string of detonators is tested with a Tagger, the leakage reading is within specification, however, when all strings are connected together, the leakage value is outside the acceptable limit indicating that the accumulative leakage value is now outside acceptable parameters. The sum of the leakage on all the strings is greater than the acceptable level.
Damaged surface harness wire insulation and/or detonators cables cause resistance between the surface harness wires when lying in an electrically conductive material which results in high leakage.




The best way of resolving this problem is by conducting a binary search as follows.
Divide the blast in half, cut the surface harness at mid-point.




Connect DigiShot® Plus Tagger and check the rear half of the installation for leakage, Tagger displays satisfactory leakage.
Connect DigiShot® Plus Tagger and check front half of the installation for leakage, Tagger displays satisfactory leakage.
Reconnect the break in the surface wire / bus and retest surface harness, DigiShot® Plus Tagger displays high leakage indicating fault present.
Return to mid-point break, remove joint in surface harness.




Re-join the surface harness wire by crossing over the wires, **yellow wire** to **green** and **green wire** to **yellow**. High leakage is reduced because the exposed wires A and B are now on the same line.
Ensure all wires are correctly insulated with tape to prevent further leakage problems.
Test surface harness wire to ensure leakage is within acceptable limits.
If high leakage is still present, split the blast onto separate channels in the middle of the blast.


DetNet South Africa Copyright © 2022

# 22 APPENDIX B – ABBREVIATIONS AND DEFINITIONS

## 22.1. Abbreviations

| | |
|---|---|
| Ah | Amp-hours |
| CE4 | 4th Generation Control Equipment |
| DC | Direct Current |
| Det(s) | Detonator(s) |
| GMT | Greenwich Mean Time |
| in | Inch |
| IP | Ingress Protection (IP-67 = totally protected against ingress of dust; and protected against the effects of immersion between 15cm and 1m for 30 minutes) |
| LCD | Liquid Crystal Display |
| LED | Light Emitting Diode |
| Long-range | Maximum distance: 3km (<3km) |
| Med-range | Maximum distance: 1km (<1km) |
| mm | millimetre |
| ms | millisecond |
| NFC | Near Field Communication |
| OTS | Off The Shelf |
| PC | Personal Computer |
| PCB | Printed circuit board |
| PVC | Polyvinyl chloride |
| RF | Radio Frequency |
| RH | Relative Humidity |
| RTC | Real time clock |
| Short-range | Maximum distance: 10m (<10m) |
| UI | User Interface |
| USB | Universal Serial Bus |
| W | Watt |


DetNet South Africa Copyright © 2022

## 22.2. Definitions

| | |
|---|---|
| DigiShot® Detonator | An electronic detonator that has been designed and developed by DetNet South Africa |
| Initiation point | This is the location where the blast is initiated. The initiation point is always at a place-of-safety (see below). |
| Initiation time | Time delays that are programmed into detonators. |
| Detonator harness | The cable that attaches to the detonator that allows detonators to be connected one after another. The harness has two parameters: an inter-hole length and a down-line length. |
| Place-of-safety | A location specified by the main blasting authority that guarantees human safety with respect to fly rock, fumes, concussion and fall of ground. |
| Equipment safe | This is an area close to the bench, where equipment can be located with reasonable assurance that it will not be damaged during or immediately after blast. |
| Blast voltage | The principal requirements for firing an DigiShot® Detonator are a minimum supply voltage and the fire command. The minimum voltage required to fire an DigiShot® Detonator is known as 'blast voltage'. |
| Inherently safe | Equipment that is unable to transfer sufficient energy to the detonator to cause it to initiate, even in the event of failure of certain safety interlocks in the detonator and test equipment. |


DetNet South Africa Copyright © 2022