digishot *plus*

Base Station | UTM-00232 | Rev 9
SVN 34340
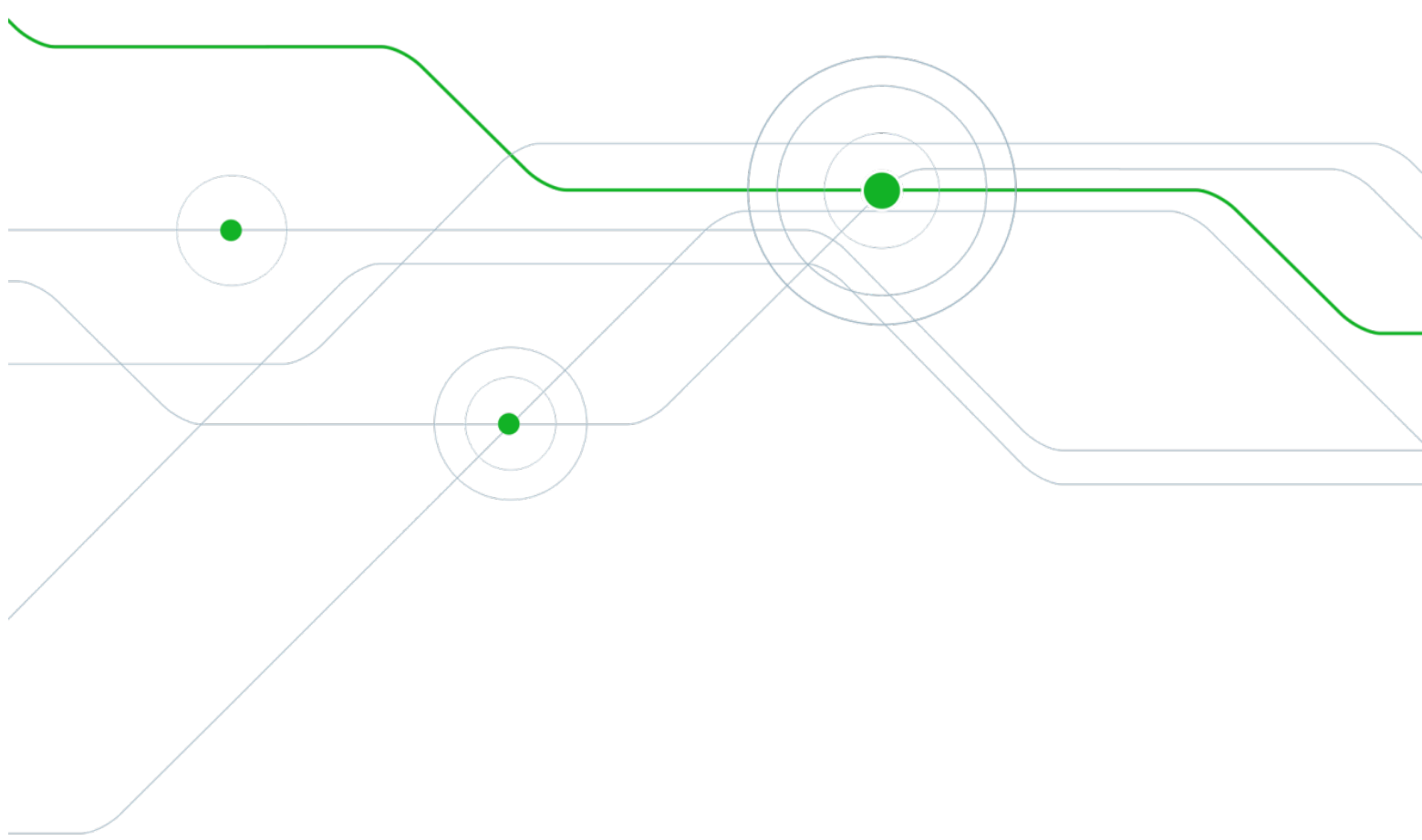
Table of Contents

1.   USERS OF THIS MANUAL

DetNet endeavours to upgrade software to comply with new challenges and needs faced by users in the market. As new software becomes available, the DetNet version control policy requires that all control equipment be upgraded to ensure support is provided on the latest software version installed on equipment as deployed on customer sites.

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

End User
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 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.

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

⚠️ WARNING	**ALL USERS OPERATING THE BCU SYSTEM SHALL HAVE SUCCESSFULLY COMPLETED THE SPECIFIC TRAINING BEFORE PERFORMING ANY WORK WITH THE DEVICE(S).**

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

2. SYSTEM PRODUCT SAFETY

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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.

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DetNet Safety Philosophy

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

SmartKeys remains 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.

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 our 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.

Transportation, Storage and Handling

Equipment must be transported, stored, handled and used in conformity with all federal, state, provincial and 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 any chemical agents. Connectors should be kept clean and the equipment must be kept in a safe environment to avoid misappropriation or misuse.

Maintenance Schedule

All equipment in the field will need to be returned to DetNet, or its repair centres, for service at the following intervals:

- Handheld Equipment (Tagger, etc.) – 18 Months.
- Other equipment (Excluding accessories) – 24 Months.

Information in case of emergency

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

3. 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.
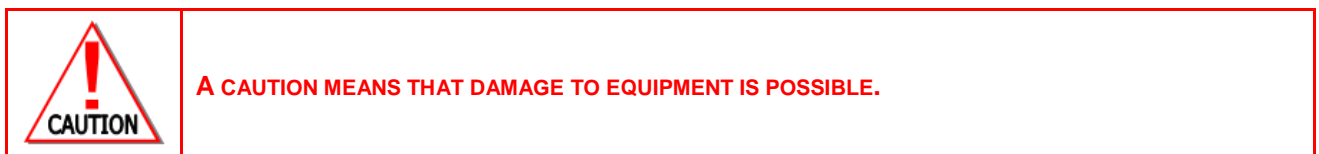
Cautions draw special attention to anything that could damage equipment or cause the loss of data and will normally describe what could happen if the caution is ignored. *Cautions* are generally placed before the step in the procedure they relate to.

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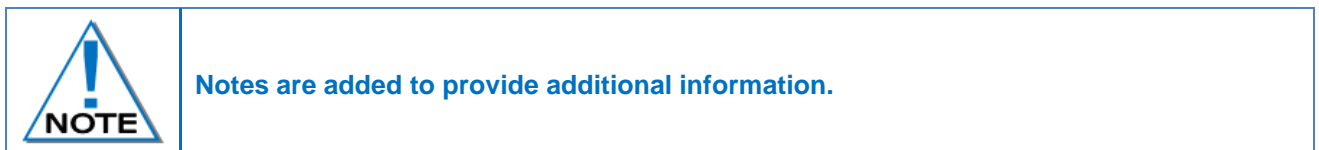
Notes are used to emphasise important information by visually distinguishing this from the rest of the text. Notes can contain any type of information except safety information, which is always placed in cautions or warnings.

DISCLAIMER

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.

4.   DIGISHOT® PLUS BASE STATION

The DigiShot® Plus Base Station is used to control and monitor one or more Bench Boxes when performing remote blasting.

The Blast command will be sent from the DigiShot® Plus Base Station via a Radio Frequency (RF) link to up to four bench Boxes.

To enable a blast, the Base Station requires a Red Smart Key with matching Yellow Smart Keys used on Bench Boxes.

The DigiShot® Plus Base Station and DigiShot® Plus Bench Box are identical. The function of a DigiShot® Plus box is configurable subject to password control and can be selected to be applied as either a Bench Box or a Base Station.

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

4.1. Components

On/Off Power Switch

Battery Charging Socket

Smart key Socket

Siren

Ethernet Connection

RS232 Connection

USB Connection

Harness Wire Terminals

Status LEDs

LCD Display and soft keys

Numerical Numbering pad

Abort and Arm keys

Arrow keys
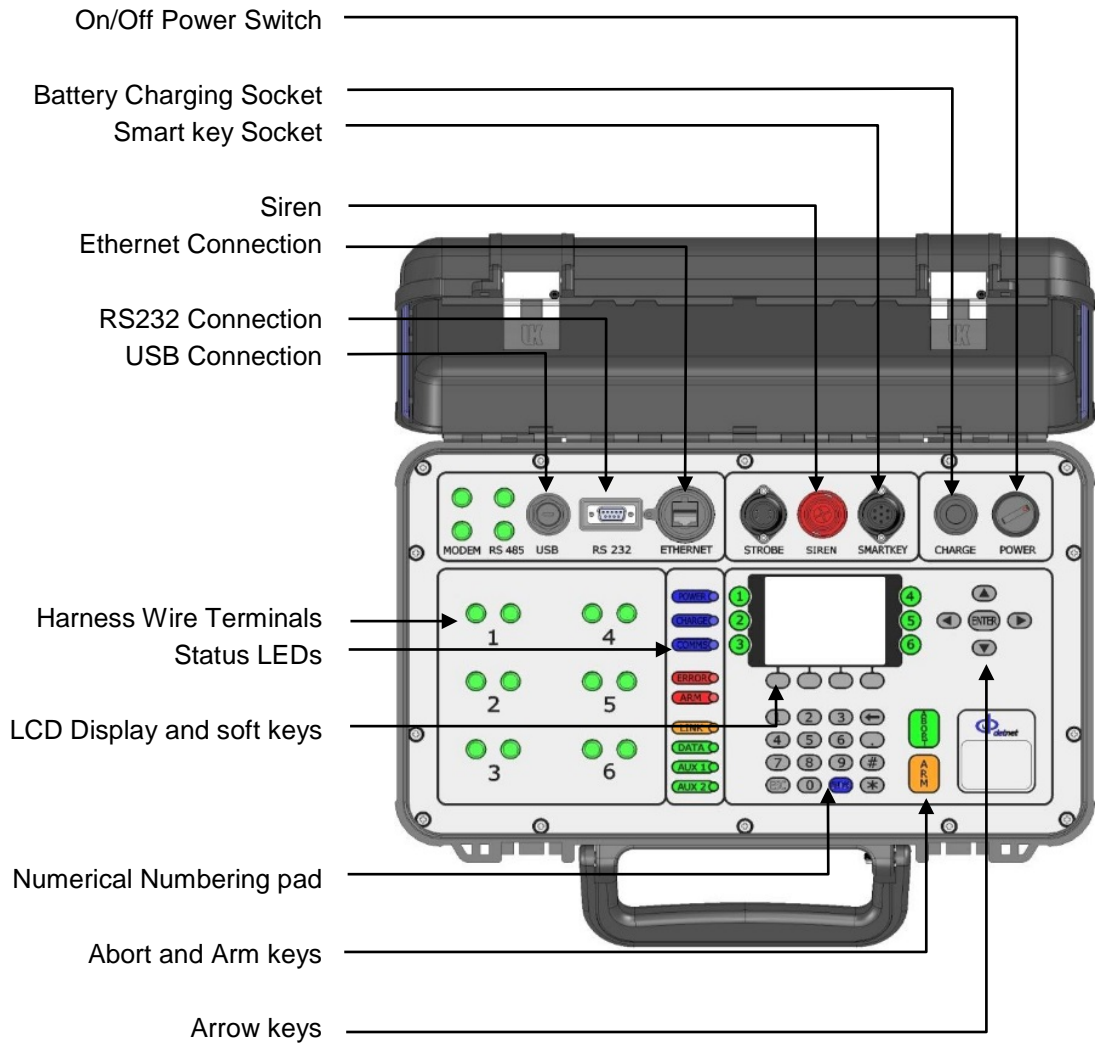
4.1.1. Communication Interface
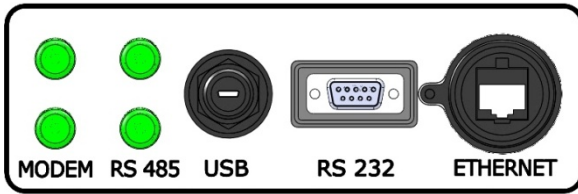
RS 485 Terminals – intended for future use.
USB Socket – Used to upgrade software
RS 232 Socket – Used to extract logs and download ViewShot patterns.
Ethernet Socket – intended for future use
Modem Terminals – intended for future use

4.1.2. Blasting Interface

Siren – Warning Siren, sounds during Arming and Firing cycle.
Smart Key Socket – Insert Smart Key to prepare for Blasting.
Strobe Socket – intended for future use.
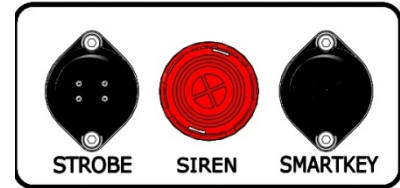
Power Interface
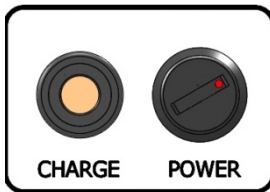
Charge Socket – Used to connect an external mains charger to charge the internal 12V battery
Power Switch – Turn switch clockwise to power ON DigiShot® Plus Base Station. Turn Anti-clockwise to power OFF DigiShot® Plus Base Station.

Status LEDs
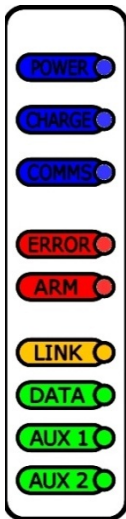
Power LED - Blue LED indicates the Bench Box powered ON
Charge LED - Blue LED indicates the battery is being charged
Communication - ON/OFF Blue LED indicates communication with the DigiShot® Plus Bench Box

Error LED - Red LED indicates errors on the system
Arm LED – Red LED indicates the DigiShot® Plus Base Station is ARMED for blasting when Smart key is inserted
Link LED – intended for future use
Data LED –intended for future use.
AUX 1 – Disabled
AUX 2 – Disabled

Communication with Bench Boxes

LEDs 1 to 4 will indicate the Bench Boxes that are present.
LEDs will blink if there is a problem with the Bench Box.

LCD Display and Soft Keys

The LCD screen can display up to thirteen lines of text at a time, each with a maximum of 26 characters.

All Errors and Status reports are displayed on the LCD Display.

The Soft keys will activate functions displayed above the soft key as an option in a menu
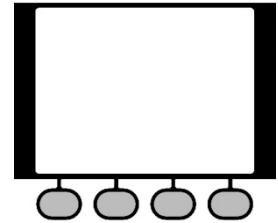
Navigation Arrow Keys
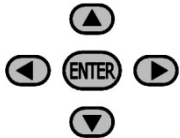
The Navigational keys are used to navigate during actions where one may need to move left, right, up or down in an active screen.

ENTER key

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

Numerical Key Pad

The Numerical Key pad is used to enter numerical key options and or numerical values.
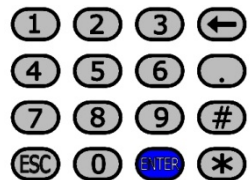
Abort Key and Arm Key

Abort Key will immediately abort all further actions during blasting operations. As a safety measure after the Abort Key is pressed, the blast will need to be re-set by removing the Smart Key, restarting the Bench Box and Base Station and re-inserting the Smart key when prompted. ARM key is disabled and not in use as the system is armed by means of a soft-key.

Smart Key

- The keys are issued in matching sets (one red and four yellow) determined by the serial number and are password protected, with the ID number displayed on the stem of the Smart Keys.
- Smart Keys provide a physical electrical link without which the blast voltage cannot be routed to the detonators connected to the Bench Box.
- The Smart Key houses an electronic device which stores the required commands as well as other data to allow the blast command between the DigiShot® Plus Bench Box and the DigiShot® Plus Base Station
- The Yellow key is used to activate the DigiShot® Plus Bench Box(es) and the matched Red Smart Key is used to activate the DigiShot® Plus Base Station during remote blasting. The Red key can also be used individually with a DigiShot® Plus Bench Box when blasting directly, in standalone mode.

⚠️ **WARNING**	**The Smart Key must ALWAYS be in possession of the holder of a valid Blasting Certificate appointed by the Manager.**

⚠️ **CAUTION**	**NEVER insert the Smart Key into the DigiShot® Plus Base Station when in use, unless the intention is to initiate a blast, and only when prompted by the software.** **NEVER use a faulty or damaged Smart Key.** **NEVER store the Smart Key and blasting password together.** **NEVER divulge the blasting password/s to another person. Only the certified user to whom the Smart Key was allocated should be in possession of the password.** **A blast CANNOT be initiated without the Smart Key.** **NEVER split paired Smart Keys across different blasts unless blasting multiple Bench Boxes from one Base Station.**

5.   BASE STATION ACCESSORIES
5.1.   RF Antennae

868MHz Aerial

Only to be used in the following regions:

North America

South America

Canada

Asia Pacific

Africa

⚠ NOTE	**Maximum Range- 3 km direct line of sight**
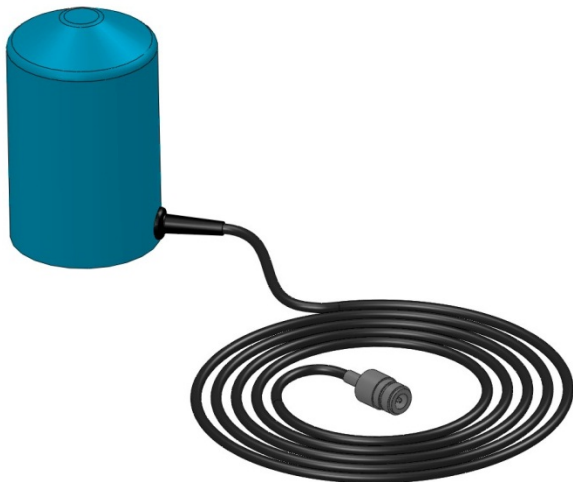
2.4GHz Aerial

Only to be used in the following regions:

Europe

Indonesia

⚠ NOTE	**Maximum Range- 1 km direct line of sight**

⚠ CAUTION	**The 2.4GHz Aerial has to be used with caution to not interfere with wireless networks in the surrounding areas. NEVER split paired Smart Keys across different blasts unless blasting multiple Bench Boxes from one Base Station**

6. SETUP AND CONFIGURING DIGISHOT® PLUS BASE STATION

6.1. Charging the DigiShot® Plus Base Station

⚠ CAUTION	THE DIGISHOT® PLUS BASE STATION SHOULD NEVER BE CONNECTED TO THE DIGISHOT® PLUS DETONATORS OR THE LEAD-IN HARNESS WIRE, AND ESPECIALLY WHILST THE DIGISHOT® PLUS BASE STATION IS CONNECTED TO A DIGISHOT® CHARGER.

Switch off the DigiShot® Plus Base Station.
- Connect charger to DigiShot® Plus Base Station
- Connect DigiShot® Plus charger to a 220VAC power supply
- Charge for at least 6 hours
- To test the Base Station battery:
    - Switch On Base Station and allow the battery levels to stabilize. Take reading after 2 minutes and leave the Base Station On for 20 minutes then take another reading. Compare the voltage percentage drop. If the voltage dropped by 10% or more it indicates that the battery is faulty and needs to be replaced.
    - Alternatively the Base Station can be switched On for 5 – 10 minutes and the voltage reading taken. Perform a dummy blast and then compare the reading to determine if the voltage dropped by 10% or more which will indicate that the battery is faulty and needs to be replaced.

6.2. Battery Errors

Displayed messages related to low battery state

When the battery drops below 45% the Battery Low message is displayed in certain states.
The warning check is performed at the start of programming and arming only.

```
WARNING BATTERY LOW

BAT LEVEL 17%

ENTER TO ACCEPT
```

When the battery drops to 0%, the Battery Low message appears and the Base Station switches off immediately afterwards.

```
 BATTERY LOW 

TURNING OFF
```

6.3. Power Base Station On

Turn **POWER** switch clockwise to the ON position

1. System name displayed
2. Software version number displayed
3. Hardware version number displayed
4. Use the numerical keypad to enter password
5. Press **ENTER** to continue

```
DIGISHOT+ BASE STATION
RELEASE 34340
HARDWARE VERSION 3

PASSWORD? ****
```

⚠ CAUTION	**Assigning a password protects the DigiShot® Plus Base Station from unauthorised use. The DigiSHOT® PLUS BASE STATION IS ASSIGNED A SPECIFIC PASSWORD, WHICH IS SUPPLIED BY THE MANUFACTURER. THE BLASTER MUST CHANGE THE DEFAULT PASSWORD BY ASSIGNING A NEW UNIQUE PASSWORD THAT IS ONLY KNOWN TO THE BLASTER.**

⚠ NOTE	**Also observe that the Software Release Number is identical on all DigiShot® Plus Bench Boxes, and Base Station where applicable.**

6. Select Bench Boxes?
   - Use numerical keys 1-4 to select required Bench Boxes that will participate in the blast
   - Press **ENTER** to continue

   An asterisk next to the box number confirms that the required Bench box is selected

Only selected Bench Boxes will blast

```
SELECT BENCH BOXES

WHICH BENCH BOXES?

BENCH BOX 1:        < - >
BENCH BOX 2:        < * >
BENCH BOX 3:        < - >
BENCH BOX 4:        < * >

(1-4) TO TOGGLE
ENTER TO ACCEPT
```

7. Synchronised Blasting
   - Using numerical keys to toggle **ON** or **OFF**
   - Press **ENTER** to continue

```
SYNCHRONISED BLASTING?
ON
```

⚠ NOTE	**When only one Bench Box is selected, the system defaults to unsynchronised blasting Synchronized blasting mode synchronizes all Bench Boxes to the same time so that the Bench Boxes receive the blast command at the same time to ensure millisecond timing across all Bench Boxes.** **Unsynchronised blasting mode sends the blast command to the first selected Bench Box then waits for a reply before sending the blast command to the next Bench Box causing a delay between each firing Bench Box.**

User to take note of the current RF MODE settings – The RF settings must be identical to settings on the Bench Box(es). The RF key and Channel will be shown on start up only when RF link is enabled.

- Update if required
- Press **ENTER** to continue.

```
RF  KEY: 01234567890123

RF CHANNEL: 7

PRESS ANY KEY TO ACCEPT
```

NOTE	**Also observe that the Software Release Number is identical on all DigiShot® Plus Bench Boxes, and Base Station where applicable.**

CAUTION	**Unsynchronised blasting should only be selected if the benches are completely separate, since the detonators connected to each Bench Box receive the fire command at different times. A lead-in harness cut-off before the fire command is sent will result in the bench misfiring.**

6.4. Power OFF DigiShot® Plus Base Station

Powering the Base Station OFF when not in use will help extend the life time of the battery. Settings are saved when Base Station is powered off.

- Turn the POWER switch anti-clockwise to the OFF position

```
ID DETS MODE        RF E
 1    0 UNKNOWN         N
 2    0 UNKNOWN       0 N
 3    0 UNKNOWN         N
 4   21 UNKNOWN      10 N


TIME LEFT:  00:00:00

PRESS (1-4) FOR DETAIL
PRESS ESC FOR MAIN MENU
BAT LEVEL 100%
```

6.5. Menu Navigation

Only use numerical keypad to select menu options

Greyed out menu items indicate functions currently not available.

Header ————————————→

Instructions and Information Interactive window ————————————→

Footer, Soft Key Menu option ————————————→

```
ID DETS MODE        RF E
 1    0 UNKNOWN        N
 2    0 UNKNOWN      0 N
 3    0 UNKNOWN        N
 4   21 UNKNOWN     10 N

TIME LEFT:  00:00:00

PRESS (1-4) FOR DETAIL
PRESS ESC FOR MAIN MENU
BAT LEVEL 100%


FIRE             FIRE
```

- Use numerical keypad to select menu options
- Use soft keys to select soft menu options
- Use **ENTER** key to confirm an instruction
- Use **ESC** key to cancel an instruction and or exit the current screen

7.   SYSTEM SETTINGS

1. Display Remote Status Screen
- Press **ESC** on the keypad to toggle to Options Menu

```
ID DETS MODE        RF E
 1    0 UNKNOWN         N
 2    0 UNKNOWN       0 N
 3    0 UNKNOWN         N
 4   21 POWERED      10 N


TIME LEFT:  00:00:00
PRESS (1-4) FOR DETAIL
PRESS ESC TO CHANGE MENU
BAT LEVEL: 100%
```

2. From OPTIONS Menu
- Press **1** to select system settings

```
OPTIONS MENU
1. SYSTEM SETTINGS
2. COMMS SETTINGS
3. DUMP LOGS
4. DEBUG
```

3. From SYSTEM SETTINGS Menu
The following options are available:
- SET DATE/TIME
- CONTRAST
- PASSWORDS
- LANGUAGE

```
SYSTEM SETTINGS
1. SET DATE/TIME
2. CONTRAST
3. PASSWORDS
4. LANGUAGE
```

7.1.   Date and Time

The Date and Time function enables the user to set the date and time on the DigiShot® Plus Base Station. Always ensure that the date and time is set correctly as date and time logs will be based on the date and time settings.

⚠ NOTE	**If the software detects that the date may be set incorrectly, it will prompt the user on start-up to correct the date .**

1. Display Remote Status Screen
   - Press **ESC** on the keypad to toggle to Options Menu

```
ID DETS MODE        RF E
 1    0 UNKNOWN         N
 2    0 UNKNOWN       0 N
 3    0 UNKNOWN         N
 4   21 POWERED      10 N


TIME LEFT:  00:00:00
PRESS (1-4) FOR DETAIL
PRESS ESC TO CHANGE MENU
BAT LEVEL: 100%
```
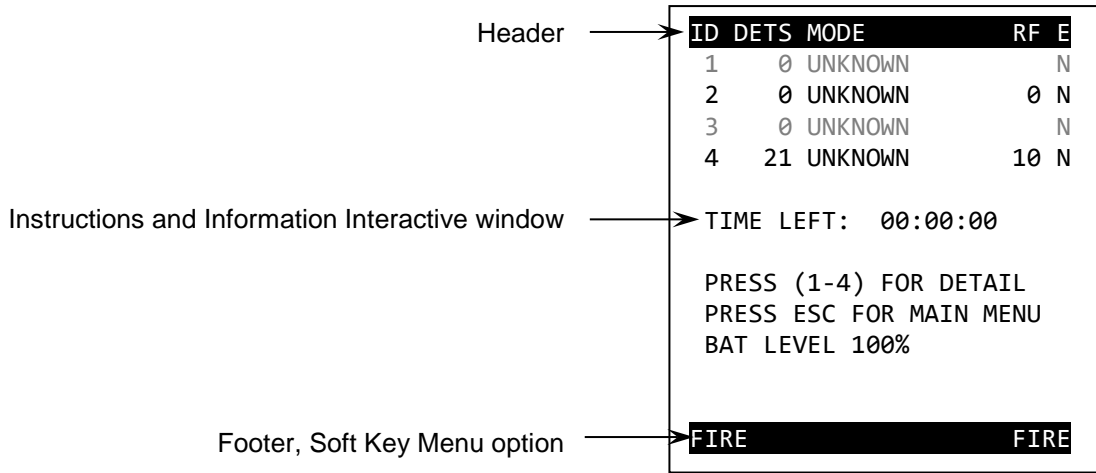
2. From OPTIONS Menu
   - Press **1** to select **SYSTEM SETTINGS**

```
OPTIONS MENU
1. SYSTEM SETTINGS
2. COMMS SETTINGS
3. DUMP LOGS
4. DEBUG
```

3. From SYSTEM SETTINGS Menu
   - Press **1** to select **Set Date / Time**

```
SYSTEM SETTINGS
1. SET DATE/TIME
2. CONTRAST
3. PASSWORDS
4. LANGUAGE
```

4. Set Date and time
   - Use numerical keys enter the following:
     - Year
     - Month
     - Day
     - Hour – 24 hours
     - Minute
     - Seconds

   - Press **ENTER** to confirm each entry
   - Press **ESC** to make a correction

```
SET DATE/TIME

YEAR? 2010
MONTH? 9
DAY? 7
HOUR? 13
MINUTES? 49
SECONDS? 46
```

7.2.   Contrast

The contrast function enables the user to adjust the LCD screen brightness. Contrast adjustment may be required in extreme environmental conditions.

1. Display Remote Status Screen
   • Press **ESC** on the keypad to toggle to Options Menu

```
ID DETS MODE        RF E
 1    0 UNKNOWN         N
 2    0 UNKNOWN       0 N
 3    0 UNKNOWN         N
 4   21 POWERED      10 N


TIME LEFT:  00:00:00
PRESS (1-4) FOR DETAIL
PRESS ESC TO CHANGE MENU
BAT LEVEL: 100%
```

2. From OPTIONS Menu
   • Press **1** to select system settings

```
OPTIONS MENU
1. SYSTEM SETTINGS
2. COMMS SETTINGS
3. DUMP LOGS
4. DEBUG
```

3. From SYSTEM SETTINGS Menu
   • Press **2** to select **Contrast**

```
SYSTEM SETTINGS
1. SET DATE/TIME
2. CONTRAST
3. PASSWORDS
4. LANGUAGE
```

4. Set Contrast
- Use the arrow keys (↑ and ↓) to adjust contrast
- Press **ESC** to exit

```
TO ADJUST CONTRAST
PRESS UP/DOWN
ESCAPE TO QUIT
```

7.3. Main Password

The DigiShot® Plus Base Station is protected from unauthorised use by assigning a password. A specific password is assigned which is supplied by the manufacturer. The User must change the default password assigning a new unique password that is only known to the user before starting to use the Bench Box.

1. Display Remote Status Screen
   - Press **ESC** on the keypad to toggle to Options Menu

```
ID DETS MODE        RF E
 1    0 UNKNOWN         N
 2    0 UNKNOWN       0 N
 3    0 UNKNOWN         N
 4   21 POWERED      10 N


TIME LEFT:  00:00:00
PRESS (1-4) FOR DETAIL
PRESS ESC TO CHANGE MENU
BAT LEVEL: 100%
```

2. From OPTIONS Menu
   - Press **1** to select system settings

```
OPTIONS MENU
1. SYSTEM SETTINGS
2. COMMS SETTINGS
3. DUMP LOGS
4. DEBUG
```

3. From SYSTEM SETTINGS Menu
   - Press **3** to select Passwords

```
SYSTEM SETTINGS
1. SET DATE/TIME
2. CONTRAST
3. PASSWORDS
4. LANGUAGE
```

4. From CHANGE PASSWORDS Menu
- Press **1** on the keypad to select **Main Password** Option
- Press **2** on the keypad to select **Debug Password** Option

```
CHANGE PASSWORDS
1. MAIN PASSWORD
2. DEBUG PASSWORD
```

4. Main Password
- Use numerical keys to enter the **old** password.
- Press **ENTER** to confirm

```
OLD PASSWORD? ****
```

- Use numerical keys to enter the **new** password.
- Press **ENTER** to confirm

```
NEW PASSWORD? ****
MAX PIN IS 65535
```

7.4.   Language

This function enables the user to select a language preference for the DigiShot® Plus Bench Box menus.

1. Display Remote Status Screen
   - Press **ESC** on the keypad to toggle to Options Menu

```
ID DETS MODE         RF E
 1    0 UNKNOWN          N
 2    0 UNKNOWN        0 N
 3    0 UNKNOWN          N
 4   21 POWERED       10 N


TIME LEFT:  00:00:00
PRESS (1-4) FOR DETAIL
PRESS ESC TO CHANGE MENU
BAT LEVEL: 100%
```

2. Under Options Menu
   - Press **1** on the keypad to select **SYSTEM SETTINGS.**

```
 OPTIONS MENU
1. SYSTEM SETTINGS
2. COMMS SETTINGS
3. DUMP LOGS
4. DEBUG
```

3. Under System Settings
   - Press **4** on the keypad to select **LANGUAGE.**

```
SYSTEM SETTINGS
1. SET DATE/TIME
2. CONTRAST
3. PASSWORDS
4. LANGUAGE
5. TUNE SEARCH PARAMETERS
6. USE STARTER DETS
7. CHECK WIRE LENGTH
```

4. Select the required Language
   - Use the keypad to toggle between:
     o   English,
     o   Spanish,
     o   French.
   - Press **ENTER** to select.
   - Press **ESC** to exit without changing the selection.

```
PICK LANGUAGE
ENGLISH
```

8.   COMMUNICATIONS SETTINGS

1. Display Remote Status Screen
   - Press **ESC** on the keypad to toggle to Options Menu

```
ID DETS MODE        RF E
 1    0 UNKNOWN         N
 2    0 UNKNOWN       0 N
 3    0 UNKNOWN         N
 4   21 POWERED      10 N


TIME LEFT:  00:00:00
PRESS (1-4) FOR DETAIL
PRESS ESC TO CHANGE MENU
BAT LEVEL: 100%
```

2. From OPTIONS MENU
   - Press **2** to select Comms settings

```
OPTIONS MENU
1. SYSTEM SETTINGS
2. COMMS SETTINGS
3. DUMP LOGS
4. DEBUG
```

3. From COMMS SETTINGS Menu
The following options are available:
   - COMMUNICATIONS LINK
   - SET RF CHANNEL
   - SET RF KEY

```
COMMS SETTINGS
1. COMMUNICATION LINK
2. SET RF CHANNEL
3. SET RF KEY
```

8.1. Set Communications Link

From COMMS SETTINGS Menu
- Press **1** to select Communications Link

```
COMMS SETTINGS
1. COMMUNICATIONS LINK
2. SET RF CHANNEL
3. SET RF KEY
```

From COMMUNICATIONS LINK Menu, select the desired option from the list displayed.
- Press **1** on the keypad to select RF Link
- Press **2** on the keypad to select MODEM Link (not active)
- Press **3** on the keypad to select SERIAL LINK (only active on special order)

An asterisk (*) will indicate selected option   Press **ESC** to exit

```
COMMUNICATIONS LINK
1. RF LINK*
2. MODEM LINK
3. SERIAL LINK
```

8.2. Set RF Channel

This function enables the user to set the RF Channel applicable to the specific region. The DigiShot® Plus Bench Box and Base Station need to be set on the same RF Channel in order to communicate.

3. Under Comms Setting
- Press **2** on the keypad to select **SET RF CHANNEL.**

```
 COMMS SETTINGS
1. COMMUNICATION LINK
2. SET RF CHANNEL
3. SET RF KEY
```

4. Under Channel Setup Menu
- Press **1** on the keypad to SET CHANNEL

```
 CHANNEL SETUP MENU
1. SET CHANNEL
2. SET REPEATER CHANNEL
```

5. Set RF Channel
- Use numerical keys to enter RF Channel.
- Press **ENTER** to confirm.
- Press **ESC** to exit.

```
 SET CHANNE 1 - 7

 RF CHANNEL? 7
```

8.2.1. Communicating via a Repeater

From any Channel Setup Menu, Select option 2 (Set Repeater Channel) and the RF Channel will automatically be selected as 7 for a Bench Box

NOTE	**Select RF Channels between 1 – 7.** **When connecting to a Base Station through a Repeater, the Bench will select Channel 7 and a Base Station will select Channel 6.**

CAUTION	**Digishot® plus bench boxes and digishot® plus base station must comply with the following to ensure communication can be established between the base station and bench boxes:** **1. Use the same rf channel to enable communication with each other,** **2. Have the same firmware version, and** **3. Have the same encryption key.** **Unique rf channels guarantee communication between bench boxes without outside interference or cross-communication with bench boxes in surrounding areas.** **Should multiple systems be deployed at a location (more than one base station), it is essential to use different rf channels for each system. In such a setup it is recommended that the channel separation between systems be greater than 4 channels, to mitigate interfgerence or cross-communication.**

8.3. Set RF Encryption Key

This function enables the user to set the RF Encryption key. The DigiShot® Plus Bench Box and DigiShot® Plus Base Station must use the same RF Encryption Key to maintain communication. The encryption key used must be unique to a specific set of boxes.

> **Equipment exposed to high levels of static electricity may experience loss of functionality. The user is required to power cycle the affected unit. There is no danger and it is a fail-safe mechanism to protect the user and the equipment.**

1. Display Remote Status Screen
   • Press **ESC** on the keypad to toggle to Options Menu

```
ID DETS MODE        RF E
 1    0 UNKNOWN         N
 2    0 UNKNOWN       0 N
 3    0 UNKNOWN         N
 4   21 POWERED      10 N

TIME LEFT:  00:00:00
PRESS (1-4) FOR DETAIL
PRESS ESC TO CHANGE MENU
BAT LEVEL: 100%
```

2. From OPTIONS MENU
   • Press **2** to select Comms settings

```
OPTIONS MENU
1. SYSTEM SETTINGS
2. COMMS SETTINGS
3. DUMP LOGS
4. DEBUG
```

3. From COMMS SETTINGS Menu
- Press **3** to select SET RF KEY

```
COMMS SETTINGS
1. COMMUNICATIONS LINK
2. SET RF CHANNEL
3. SET RF KEY
```

4. Set RF Key
- Use a 14 digit RF Encryption Key that will be unique to each set of blasting equipment for security and safety purposes.

```
RF KEY? 01234567890123
```

- Use numerical keypad to enter the RF Encryption Key
- Press **ENTER** to confirm
- Press **ESC** to exit
- When a new RF Encryption Key is entered, the user will be prompted to turn the box off and on again to save the change.

```
RF KEY? 1111345678901234


 YOU MUST TURN OFF AND
 ON AGAIN FOR THE CHANGE
 TO TAKE EFFECT
```

DigiShot® Plus Base Station and DigiShot® Plus Bench Boxes must comply with the following to ensure communication can be established between the Base Station Bench Boxes:
- **Use the same RF Channel to enable communication with each other,**
- **Have the same firmware version, and**
- **Have the same encryption key.**

Do not use continuous numbers or repetitive numbering sequences when creating RF Encryption Keys, so as to create a unique key. Unique number sequences guarantee communication between Bench Boxes without outside interference or cross communication with Bench Boxes in surrounding areas.

⚠️ NOTE	The Comm's LED on the Bench Box and Base Station will be illuminated when a communications link exists. Should there be a mismatch in the Channel or the RF Key, the LED will be OFF.

9.   OPERATION

9.1.   Testing and Programming Detonators

1. Remote Status Screen

The following columns are displayed:

- ID – Bench Box number and current connection status
- Dets – Number of detonators connected to Bench Box
- Mode – Powered, detonators are powered
- RF - Communication Level – Ratio of messages received to messages sent expressed as a percentage. Minimum acceptable level of 75 percent, anything below 60 percent could result in communication problems between boxes when attempting a synchronised blast.
- E – Errors detected Y(es) or N(o)

```
ID DETS MODE        RF E
 1    0 UNKNOWN         N
 2    0 UNKNOWN       0 N
 3    0 UNKNOWN         N
 4   21 POWERED      10 N


TIME LEFT:  00:00:00
PRESS (1-4) FOR DETAIL
PRESS ESC TO CHANGE MENU
BAT LEVEL: 100%
```

```
BOX 4  -CONNECTED
DETCOUNT:     21
STATUS:       POWERED
PROG ERROR:  0
CURRENT LIM:
BACK SCAN:   OK
BOUNDARY CHECK: OK
VOLTAGE:      7V
LEAKAGE:     1.07mA
CURRENT:     1.49mA
CHANNEL:      1 2 3 4 5 6
HARNESS ERR  - - - - - -

                   PAGE 2
```

```
BOX 4  -CONNECTED
REMOTE KEY:  DISABLED
GRACE:       -
UPCONV OUT:  6V
BATTERY OUT: 89%
INTERLOCKS:  OFF OFF OFF







PAGE 1
```

```
BOX 4  -CONNECTED
REMOTE KEY:  PRESENT
GRACE:       00:01:53
UPCONV OUT:  6V
BATTERY:     89%
INTERLOCKS:  OFF OFF OFF







PAGE 1
```

2. Box Detail from Remote Status Screen
- Press **Bench Box number (1-4)** on the keypad to view the Detailed Bench Box screen

DETCOUNT	Number of dets connected to the Bench Box
STATUS	Mode of the Bench Box
REMOTE KEY	Remote key is present or not
GRACE	Grace period count down time
PROG ERROR	Number of programming errors. These detonators will misfire!
CURRENT LIM	A list of channels where the current limiter has triggered. Current limit errors point to potential leakage that could prevent blasting
BACK SCAN	Indicates background scan is successful or not. Background scan errors will prevent blasting. The user may proceed after reprogramming, but the detonators with errors will misfire
BOUNDARY CHECK	The boundary check found an extra detonator on the end of a row or beyond the last row in the design that was not part of the detonator list
HARNESS ERROR	Relates to monitoring of the last dets defined on the Bench Box. If the defined last dets cannot be reached during ARMING then an error is generated. The user may override this error by entering a specific password. Two last dets may be defined for each channel
UPCONV OUT	The output voltage from the upconverter. The voltage in the example is low indicating that the high voltage supply is off.
VOLTAGE	Output voltage to the detonators
LEAKAGE	Leakage path present on the detonator harness, which could result in voltage loss at blasting
CURRENT	Current consumption of the detonators connected
INTERLOCKS	All on, system safe, all off indicates ready to blast

- ESC to return

Main Screen during Programming of detonators
Programming is completed at the Bench Box.

```
ID DETS MODE       RF E
 1    0 UNKNOWN        N
 2  200 PROGRAMMING 89 Y
 3    0 UNKNOWN        N
 4    0 UNKNOWN        N

TIME LEFT:  00:59:15
PRESS (1-4) FOR DETAIL
PRESS ESC TO CHANGE MENU
BAT LEVEL: 100%
```

```
 BOX 4        CONNECTED
DETCOUNT:      200
STATUS:        PROGRAM 57%
PROG ERROR:    0
CURRENT LIM:   2
BACK SCAN:     OK
BOUNDARY CHECK:OK
VOLTAGE:       7V
LEAKAGE:       0.05mA
CURRENT:       0.11mA
CHANNEL        1 2 3 4 5 6
HARNESS ERR    - - X - - -


                   PAGE 2 >
```

```
 BOX 4        CONNECTED
REMOTE KEY:  DISABLED
GRACE:       -
UPCONV OUT:  6V
BATTERY:     89%



INTERLOCKS:  OFF OFF OFF


< PAGE 1
```

After programming all detonators, a background scan starts scanning all programmed detonators to ensure that states of all programmed detonators remain unchanged. Should any detonator state change, an error will be displayed. This is indicated by BACK SCAN in the display.
Refer to Troubleshooting Error codes for causes and recommended remedial action.

9.2. Reprogramming Bench Box(es)

Re-programming may be necessary when programming errors are detected on the Bench Box. Detonators that have not been successfully programmed will misfire. This function enables the user to reprogram from the Base Station to eliminate programming errors.

- Press **PROGRAM** soft key to reprogram Bench Boxes

```
ID DETS MODE          RF E
 1    0 UNKNOWN           N
 2  200 BACKGROUND    89 N
 3    0 UNKNOWN           N
 4    0 UNKNOWN           N


TIME LEFT:  00:45:37
PRESS (1-4) FOR DETAIL
PRESS ESC TO CHANGE MENU
BAT LEVEL: 100%
```

- Use numerical keys to enter selected Bench Box number
- Press **ENTER** to confirm
- Press **PROGRAM ALL** to program all the bench boxes connected to the Base Station

```
BOX NUMBER? 1




PROGRAM ALL
```

All detonators connected to selected Bench Box(es) are reprogrammed
- Bench Box returns to previous (programmed) state

Reprogramming the detonators is recommended should the Bench Boxes i.e. Bench Boxes subjected to high voltage and then back to low voltage a

Reprogramming the detonators just prior to blasting also improves the ti

```
ID DETS MODE          RF E
 1    0 UNKNOWN           N
 2  200 GRACE 01:00  80 N
 3    0 UNKNOWN           N
 4    0 UNKNOWN           N

TIME LEFT:  00:45:23
PRESS (1-4) FOR DETAIL
PRESS ESC TO CHANGE MENU
BAT LEVEL: 100%
```

9.3. Blast RF Mode

Blasting in a RF mode enables the user to blast from a DigiShot® Plus Base Station using a radio frequency wireless link to the DigiShot® Plus Bench Box.

The minimum re-entry period is ten minutes after disconnecting the lead in wires.
The mine or local legal procedures for the blasting at the designated site must be adhered to.
These site-specific rules must be referred to before re-entry!

Display Remote Status Screen
- Mode indicates Grace period countdown
- Grace period – time to allow all personnel to move to a point of safety before the voltage is allowed to be raised.

```
ID DETS MODE          RF E
 1    0 UNKNOWN           N
 2   99 GRACE     00:36 80 N
 3    0 UNKNOWN           N
 4    0 UNKNOWN           N

TIME LEFT:  00:55:47
PRESS (1-4) FOR DETAIL
PRESS ESC TO CHANGE MENU
BAT LEVEL 100%
```

The RF signal strength should be as high as possible to avoid communication issues (the figure is calculated on % of recent successful messages).

For synchronised blasting it is recommended that the communication percentage be above 75%. Communication levels below this value could result in synchronisation failures during blasting.

Ready to Arm – DigiShot® Plus Bench Box automatically shuts down after approximately 60 minutes (minimum 50 minutes and maximum 70 minutes), after the Smart Key is inserted, if no fire command is issued from the DigiShot® Plus Base Station
- Mode indicates Base Station is ready to arm
- Press **ARM** soft key to arm the blast

```
ID DETS MODE          RF E
 1    0 UNKNOWN           N
 2   99 READY TO ARM  80 N
 3    0 UNKNOWN           N
 4    0 UNKNOWN           N

TIME LEFT:  00:53:15
PRESS (1-4) FOR DETAIL
PRESS ESC TO CHANGE MENU
BAT LEVEL: 100%



       PROGRM      ARM
```

User may be required to reprogram the Bench Boxes. Reprogramming the detonators should preferably be done under the following circumstances:
- **Reprogramming is strongly recommended when the system has been armed and disarmed for longer than 15 minutes.**

```
INSERT RED KEY
```

```
PIN? *****
```

- Insert Red Smart Key
- Use numerical keys to enter Smart Key Pin
- Press ENTER to continue

- Arming mode – during this time the blast voltage is raised and the detonator's capacitors are charged to blast voltage
- Armed, 60 second window to push both FIRE soft keys simultaneously.
- When DigiShot® Plus Base Station times out, the process on the Base Station has to be restarted from programming onwards.
- Press both FIRE soft keys simultaneously to fire the blast and release your fingers immediately

```
ID DETS MODE          RF E
1     0 UNKNOWN           N
2    70 ARMED          85 N
3   100 ARMED          95 N
4     0 UNKNOWN           N

TIME LEFT:  00:53:15
PRESS (1-4) FOR DETAIL
PRESS ESC TO CHANGE MENU
BAT LEVEL 100%


 FIRE              FIRE
```

```
ID DETS MODE          RF E
1     0 UNKNOWN           N
2    70 ARMED          85 N
3   100 ARMED          95 N
4     0 UNKNOWN           N

TIME LEFT:  00:53:15
PRESS (1-4) FOR DETAIL
PRESS ESC TO CHANGE MENU
BAT LEVEL: 100%


       SYNC IN PROGRESS
```

```
ID DETS MODE          RF E
1     0 UNKNOWN           N
2    70 ARMED          85 N
3   100 ARMED          95 N
4     0 UNKNOWN           N

TIME LEFT:  00:53:15
PRESS (1-4) FOR DETAIL
PRESS ESC TO CHANGE MENU
BAT LEVEL: 100%


       SYNC DONE, WAIT
```

- Synchronising the internal clocks in the Bench Boxes to the same blast instant
- Synchronisation successful – the user must wait for blasting.

- Blasting in progress, user must wait until the blast has ended.

```
ID DETS MODE       RF E
1    0 UNKNOWN         N
2   70 ARMED       85 N
3  100 ARMED       95 N
4    0 UNKNOWN         N

TIME LEFT:  00:53:15
PRESS (1-4) FOR DETAIL
PRESS ESC TO CHANGE MENU
BAT LEVEL: 100%


        BLASTING...
```

- Blast complete – as indicated by 'BLAST ENDED
- Remove Smart Key and turn DigiShot® Plus Base Station off.

```
ID DETS MODE       RF E
1    0 UNKNOWN         N
2   70 BLAST ENDED 85 N
3  100 BLAST ENDED 95 N
4    0 UNKNOWN         N

TIME LEFT:  00:00:00
PRESS (1-4) FOR DETAIL
PRESS ESC TO CHANGE MENU
BAT LEVEL: 100%
```

9.4. Exit the blast sequence without firing (disarming)

The user can exit a blast sequence on the Base Station using one of the following methods without having to re-initiate the blast sequence from the Bench Box:

- Press ESC key (will not end but will give the user the option to exit the blast sequence or return to the current sequence)
- Remove Smart Key (will not allow a blast to take place but will allow the user to retry)
- If the "Fire" command is not sent within 60 second window, due to the user not pressing the fire buttons, the blast will time out but give the user the chance to blast again as long as the blast windows on the Bench Boxes have not expired (the blast window is 60 minutes from when the Smart Key is inserted).

When the blast sequence is ended as described here the user may restart the sequence by pressing the 'arm' soft-key.

9.5. Permanent Abort

The user can abort the blast sequence permanently using the following method; the user will have to reinitiate the blast sequence from the Bench Box (power will need to be cycled and the Smart Key re-inserted etc.):

- Press the Abort key (this will abort the Base Station and the remote Bench Boxes as well)

The user will have to re-initiate remote Bench Boxes to resume blasting.

In the case of disarming control equipment strict adherence to the process specific to the site must be adhered to.

9.6. Programming Errors before Arming

Before Arming the Base Station, a programming error is detected from the Bench Box.

- Press ARM soft key to arm the blast

```
ID DETS MODE        RF E
1    0 UNKNOWN         N
2   70 READY TO BLAST  Y
3    0 UNKNOWN         N
4    0 UNKNOWN         N


TIME LEFT:  00:53:15
PRESS (1-4) FOR DETAIL
PRESS ESC TO CHANGE MENU
BAT LEVEL 100%


        PROGRM    ARM
```

- Error code and brief description of error is displayed. Press **ENTER** to override error code and continue to blast, press any other key to abort Arming.

Errors should never be ignored and could result in misfires. Remove Smart Keys and power off Base Station and Bench Box, resolve errors before re-attempting to blast.
- Insert Red Smart Key
- Use numerical keys to enter Smart Key Pin
- Press **ENTER** to continue

```
    WARNING

E13: PROGRAMMING ERRORS
WILL CAUSE MISFIRES

ENTER ACCEPTS. ANY
OTHER KEY ABORTS
```

- After overriding recommendation, continue with the blast by pressing the **ARM** soft keys.
- Press both **FIRE** soft keys simultaneously to fire the blast.

```
ID DETS MODE        RF E
1    0 UNKNOWN         N
2   90 ARMING 00:00:26 Y
3    0 UNKNOWN         N
4    0 UNKNOWN         N

TIME LEFT:  00:53:15
PRESS (1-4) FOR DETAIL
PRESS ESC TO CHANGE MENU
BAT LEVEL: 100%


        PROGRM    ARM
```

9.7. High Leakage during Arming

During the Arming phase of blasting, high leakage is detected from the Bench Box.

- Error condition present on Bench Box 2.
- Fire buttons are greyed out indicating a high leakage error.
- Press both (greyed-out) FIRE soft keys simultaneously to continue with blast or to see further details regarding present errors.
- Should errors be present on a particular Bench Box, the user may navigate to the detail screen to view the error in more detail.

```
ID DETS MODE          RF E
 1    0 UNKNOWN           N
 2   70 ARMED 00:00:38    N
 3    0 UNKNOWN           N
 4    0 UNKNOWN           N

TIME LEFT:  00:53:15
PRESS (1-4) FOR DETAIL
PRESS ESC TO CHANGE MENU
BAT LEVEL: 100%


FIRE               FIRE
```

Error code and brief description of error is displayed i.e. the required blast voltage could not be maintained for 20 seconds and hence misfires could result.
- Press **any** numerical key to exit the screen.

Errors should never be ignored and could result in misfires. Remove Smart Keys and power off Base Station and Bench Box, resolve errors before reattempting to blast.
- An override password now needs to be entered to allow blasting to continue with error conditions and risk of misfires.

```
E23: VOLTAGES NOT HIGH
FOR 20 SECONDS
PRESS ANY KEY, THEN ENTER
CODE TO OVERRIDE

BOX 1      : OK
BOX 2      : OK
BOX 3      : OK
BOX 4      : X
```

After overriding the warning by entering the override password, the greyed out **FIRE** soft keys will become bold and the user will be allowed to fire.

Overriding the blast could result in misfires

```
ID DETS MODE          RF E
 1    0 UNKNOWN           N
 2   70 ARMED 00:00:38    N
 3    0 UNKNOWN           N
 4    0 UNKNOWN           N

TIME LEFT:  00:53:15
PRESS (1-4) FOR DETAIL
PRESS ESC TO CHANGE MENU
BAT LEVEL: 100%
VOLTAGE CHECK DISABLED
E22: POSSIBLE MISFIRES
FIRE               FIRE
```

9.8. Last Det Check

During last 4 Seconds of charging/arming, immediately before buttons are presented/displayed, the Bench Box will check the last dets set. If the last dets are NOT found, the user may follow the following procedure to override the error and perform the blast.

Error condition present on Bench Box 2.
- Fire buttons are greyed out indicating a high leakage error.
- Press both (greyed-out) FIRE soft keys simultaneously to continue with blast or to see further details regarding present errors.
- Should errors be present on a particular Bench Box, the user may navigate to the detail screen to view the error in more detail.

```
ID DETS MODE          RF E
 1    0 UNKNOWN          N
 2   70 ARMED 00:00:38   N
 3    0 UNKNOWN          N
 4    0 UNKNOWN          N


TIME LEFT:  00:53:15
PRESS (1-4) FOR DETAIL
PRESS ESC TO CHANGE MENU
BAT LEVEL: 100%




FIRE                FIRE
```

Should the Bench Box NOT be able to communicate with the last dets, an ERROR screen will be displayed.

Error code and brief description of error is displayed. Errors should never be ignored and could result in misfires. Remove Smart Keys and power off Base Station and Bench Box, resolve errors before reattempting to blast
- An X will indicate on which the bench box the error occurred.
- Press ESCAPE to abort, or
- Press Enter to continue,

Overriding the blast could result in misfires
- Obtain and enter the override code
- Press ENTER to continue

```
E48: HARNESS BREAK ERROR

BOX 1     :
BOX 2     : X
BOX 3     :
BOX 4     :

POSSIBLE MISFIRES
PRESS ESCAPE TO ABORT OR
PRESS ENTER KEY THEN,
INPUT CODE TO OVERRIDE
```

FIRE buttons will no longer be greyed-out
- Press the two FIRE buttons simultaneously to perform the blast

```
ID DETS MODE          RF E
 1    0 UNKNOWN          N
 2   70 ARMED          80 Y
 3    0 UNKNOWN          N
 4    0 UNKNOWN          N

 TIME LEFT:  00:00:15
 PRESS (1-4) FOR DETAIL
 PRESS ESC TO CHANGE MENU
 BAT LEVEL: 100%

HARNESS TEST ERROR IGNORED
E22: POSSIBLE MISFIRES
FIRE                FIRE
```

After the blast, the information screen will be displayed indicating BLAST ENDED and also HARNESS TEST ERROR IGNORED E22: POSSIBLE MISFIRES

```
ID DETS MODE        RF E
 1    0 UNKNOWN         N
 2   70 BLAST ENDED  80 Y
 3    0 UNKNOWN         N
 4    0 UNKNOWN         N


 TIME LEFT:  00:00:00
 PRESS (1-4) FOR DETAIL
 PRESS ESC TO CHANGE MENU
 BAT LEVEL: 100%


HARNESS TEST ERROR IGNORED
E22: POSSIBLE MISFIRES
```

9.9. Synchronisation Errors

Synchronisation errors are triggered during synchronisation process: for example, the Base Station cannot communicate with all Bench Boxes successfully.

Sending messages error
- Check the RF signal strength, ensure that it is at least above 60%, and preferably above 75% across all the boxes, and retry.
- Adjust antennae position to improve signal strength.
- Rearm Base Station and reattempt to blast.

```
        ERROR


SYNC MASK ERROR
```

Receiving Messages error
- Check the RF signal strength, ensure that it is at least above 60%, and preferably above 75% across all the boxes, and retry.
- Adjust antennae position to improve signal strength.
- Rearm Base Station and reattempt to blast.

```
        ERROR


SYNC TIMEOUT ERROR
```

10. SPECIFICATIONS

Number of Detonators

A maximum of 1800 detonators (dependent on down-hole wire length) can be accommodated per DigiShot® Plus Base Station.

Maximum delay times and increments

Detonators can be programmed from 0 ms with 1 ms increments to a maximum delay of
20 000 ms.
The blast duration can be of a maximum period of 20 000ms

Temperature Limitations

The following temperature limitations apply to the DigiShot® Plus Base Station:

-10˚C / -14˚F   +55˚C / +122˚F

The DigiShot® Plus Base Station should never be exposed to direct sunlight for longer than an hour.

Battery Life

Battery life is influenced by the conditions in which the DigiShot® Plus Base Station operates.
When the battery level of the Base Station is below 11.1 V the box will turn off automatically to protect the battery
The DigiShot® Plus Base Station has a 12 V 7.2AH rechargeable battery. The units must be switched off whilst charging. Charging will not take place if the units are switched on.
The DigiShot® Plus Base Station should be charged for at least six hours prior to a blast.
The battery lasts 5-7 hours depending on condition of the battery and usage of the system – for example, when testing detonators all the time, more power is used than when the box is in idle.
Never allow the DigiShot® Plus Base Station battery to discharge completely for a period of more than 1 month as this may cause permanent damage to the battery

Storing Base Station

Store the Base Station in a cool, dry place, with an ambient temperature

Cleaning Base Station

When cleaning the Base Station, wipe gently with a soft, dry cloth.
Dust on the screen should be blown off before gently wiping with a soft, dry cloth to avoid scratches.
Ensure all terminals and connectors are clean and dust free

Electrostatic Discharge, Over Voltage, Over Current and EMP Immunity

The system is designed to be reasonably immune to Radio Frequency Interference (RFI) but it is advised that two-way radios be kept at least 5 m away from control equipment during Programming, Arming and Firing as communication between the Base Station and detonators may be corrupted.

Safety Warnings

Do not expose the battery to an open flame or excessive heat.
Do not apply pressure to the LCD screen, as this could cause damage or malfunction.
Should the LCD screen break, care should be taken to avoid injury from broken screen cover and to prevent liquid crystal from the screen touching the skin or entering the eyes and mouth.

11. TROUBLESHOOTING ERROR CODES

ERROR	CAUSES OF ERRORS	REMEDIAL ACTIONS
E1: LOCATION EXISTS	Attempting to add a detonator to the detonator list, but that detonator's location already exists in the detonator list. Duplicate detonator locations are not allowed	Check the selected detonator's location
E2: NO DETS IN LIST	Testing detonators against the detonator list but the detonator list has no entries	Add detonators to the list or Autosearch to find detonators
E3: NO DETS ON ROW	Testing detonators against the detonator list but the list has no entries for a specific row	Add detonators to the list or Autosearch to find detonators
E4: NO SPECIAL DETS	Testing detonators against the detonator list but the list has no special detonator entries	Add detonators to the list or Autosearch for detonators
E5: TOO MANY DETS	Exceeded the maximum number of detonators in the system. A warning is issued when the recommended 300 dets per channel is exceeded. The maximum allowed will depend on surface and down-wire lengths, however 450 dets per channel is the absolute maximum.	Remove detonators to reduce total number of connected detonators
E6: EXTRA DET FOUND	The boundary search during programming has found an extra detonator on the end of a row or beyond the last row in the design that was not part of the detonator list. The extra detonator will be visible in the detonator list with no time assigned.	Check your blast design carefully – there may be other errors too. Assign a time to extra det and reprogram
E7: MAX PIN IS 65535	Enter password pin that is too high	Use a password number less than 65535
E8: KEY BAD. REINSERT	The Smart Key could not be read properly 1. Incompatible or incorrect product 2. Broken	Re-inserting the Smart key or replace Smart Key
E9: MUST LAYOUT FIRST	Detonator list is empty. No detonators to assign timing to, view or test.	Enter layout before continuing with timing the blast
E10: DET TIMES NOT SET YET	During programming, Bench box found a detonator(s) that has not been assigned timing	Assign timing to all detonators before programming detonators
E11: EXTRA DETS. RETIME	Extra detonators have been found and timing to be assigned before programming	Assign timing to all detonators before programming detonators. Check blast design carefully – there could be other errors too.
E12: PROGRAM ABORTED	Programming sequence aborted by pressing ESCAPE	Reprogram to blast

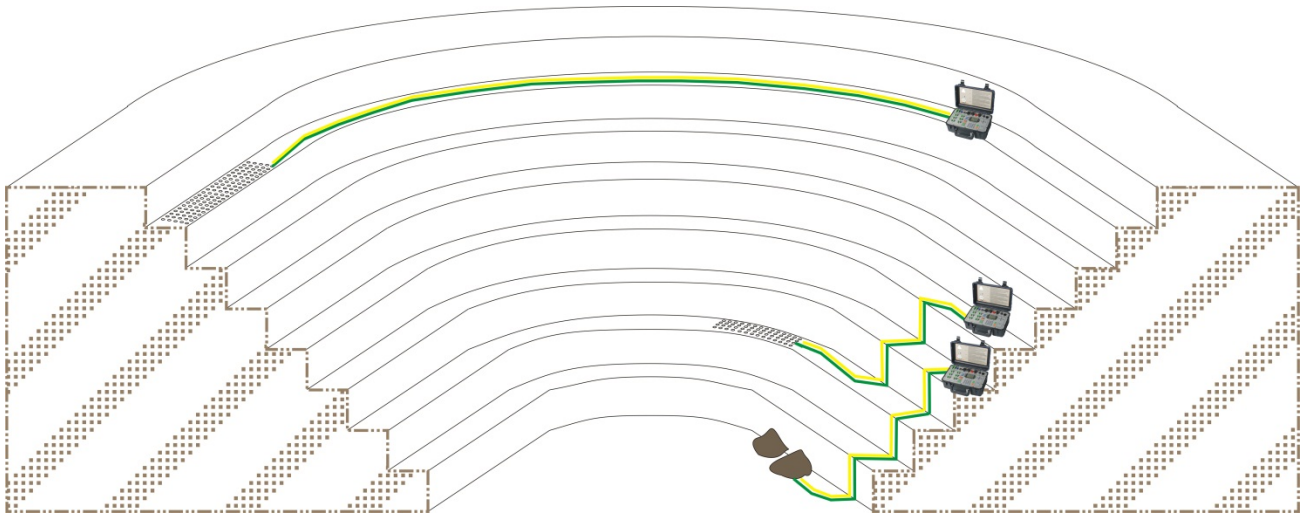| ERROR	CAUSES OF ERRORS	REMEDIAL ACTIONS
E13: PROGRAMMING ERRORS WILL CAUSE MISFIRES	Errors during programming. Errors will result in misfires	Resolve errors in order to avoid misfires
E14: BLAST WAS ABORTED	The blast was aborted due to the user pressing the abort button.	Remove Smart Key, switch off Bench Box to reset. Switch Bench Box on and continue reprogramming before blasting
E15: MEMORY CORRUPT	The memory has been corrupted. All settings and data have been lost.	Try re-entering your blast plan if the problem persists report the incident for further analysis
E16: OPEN MEMORY FAIL	Internal hardware failure	Return Bench Box to for repair
E17: SPI WRITE FAIL	Internal hardware failure	Return Bench Box to for repair
E18: SPI READ FAIL	Internal hardware failure	Return Bench Box to for repair
E19: CURRENT LIMIT CHAN %1d	The current limit has been reach on the given channel. 1. Wires briefly shorted 2. String was disconnected and reconnected. 3. Excessive current consumption on the detonator string	If shorted or disconnected, ensure the string is reconnected properly and reprogram. Otherwise use the current test on a tagger to search for leakage/excessive current on the channel.
E20: INCOMPATIBLE SOFTWARE	Internal error –has been incorrectly loaded	Arrange for loading of correct version of software.
E21: TIMER MISMATCH	Internal error	Return Bench Box for repair
E22: POSSIBLE MISFIRES	Override internal checks for minimum required output voltage and maximum allowed current consumption. As a result when blasting the detonators may not have sufficient voltage and some detonators may misfire	Locate the cause of the low voltage/high current and address the problem, and then try blasting again.
E23: VOLTAGES NOT HIGH	The detonators require high voltage for at least 20 seconds before firing.	Wait until the fire keys appear or find the source of the low voltage/high current before trying to blast again.

ERROR	CAUSES OF ERRORS	REMEDIAL ACTIONS
E25: ERROR: RESPONSE MISMATCH	User is trying to access a protected function	Contact local supplier
E26: YOU MAY GET MISFIRES	Untagged detonators found or the current limiter has been reached.	Find and fix the untagged detonators or resolve the current issue. See E19.
E27: KEYS DON'T MATCH	The Smart Key inserted into the Base Station and Bench Box are not part of a matching pair of Smart Keys	Only use matching pairs of Smart key
E28: WRONG STATE TO PROGRAM	Not implemented in current software version	
E29: NOT PROGRAMMED YET	Arming or firing a blast before programming	Program the blast first
E30: NOT READY TO ARM YET	Attempting to arm the Base Station when Bench Box is not out of the grace period yet	Wait for the grace period to finish
E31: INTERNAL STATE ERROR	Internal error	Return Bench Box for repair
E32: POWERLOCK ERROR	Internal error	Return Bench Box for repair
E33: UNEXPECTED DET TIME	Not implemented in current software version	
E34: DUPLICATE DET FOUND	You have two detonators in the detonator list with the same location	Remove one of the duplicates. Confirm deletion against Tagger's detonator list and blast plan
E35: BACKGROUND SCAN ERROR	After programming, the Bench Box continues to communicate with all detonators that were successfully programmed. If communication fails, then something has gone wrong e.g. wires removed, shorted, detonator faulty etc.	Try reprogramming to see which detonator is at fault and then debug as normal for programming errors. Check wiring for shorts, intermittence etc. before doing so.
E36: NOT IMPLEMENTED YET	Trying to use a feature that is not implemented in the version of software being used.	The feature may be available in future software updates
E37: WRONG KEY COLOUR	Incorrect colour Smart Key inserted	Remove Smart Key. Press a button and insert the correct key

ERROR	CAUSES OF ERRORS	REMEDIAL ACTIONS
E38: NOT AVAILABLE	Trying to use a feature that is not available on the Base Station e.g. tuning Autosearch parameters	Feature only available on Bench Box
E39: RF SETUP FAILURE	Internal error	Return Base Station for repair
E40: UNKNOWN ERROR	Internal error	Return Base Station for repair
E42: UNTAGGED DETS CHAN x	Untagged detonator on the channel	Find and fix the untagged detonator before continuing. In rare circumstances, external noise can also cause this error in which case the noise source should be eliminated e.g. running wires too close to power lines
E43: HIGH LEAKAGE	Leakage of more than 0.5mA has been detected. Possible cable damage, may prevent blasting or communicating with detonators	If the leakage is less than 1mA, blasting may still be possible but it's still advisable to find and fix the source of the leakage
E44: VOLTAGES TOO LOW TO FIRE	The detonators require high voltage for at least 20 seconds before it is fired. Shorted output wire, too many detonators or excessive leakage can cause the voltage to be too low to fire reliably.	Find and fix the source of the problem e.g. leakage, shorted wires etc.
E45: BOX MODE CORRUPT	Internal settings for the Bench Box have been corrupted.	Return Base Station for repair
E47: BOOT FAIL x	One of the internal processors has either failed to boot or is in the incorrect mode. Can occur when Bench Box is reset with a Smart Key inserted due to high static discharge.	Power off Base Station, wait a few seconds, power on Base Station on again. If the problem persists, return Base Station to for repair
E48: HARNESS BREAK ERROR	Last Det set did not reply	Check harness wire integrity
DETLIST PAGE CORUPT	Switching between Base Station and Bench Box Detonator list is erased.	Redo your blast plan, if any, as the detonator list has have been deleted. Report the problem to your supplier.
LAST DET NOT SET	Per channel the user can define two detonators at the end of the line e.g. one left and one right, which will be checked at the point of arming the detonators.	If the last det is not detected during arming, then an error will be flagged on the Base Station or Bench Box giving the user an option to carry on with the blast with possible misfires or to abort the blast.

| ABORT FAILURE MESSAGE	PROBABLE CAUSE	SUGGESTED ACTION
ABORT PRESSED	User pressed abort	The box aborted as requested. Turn off and on to start over
POWERLOCK ADC ERROR	Internal error has occurred	Return Base Station for repair
KEY NOT EXPECTED	Smart Key inserted at the wrong time	Only insert the Smart Key when prompted. Remove Smart Key, switch off Base Station to reset. Switch Base Station on
RELAY ERROR	Internal error has occurred	Return Base Station for repair
IO VOLTAGE	The voltage on the IO channel outputs is higher than expected. There may be an external voltage source connected or the box may have a fault	Return Base Station for repair
REMOTE ABORT	Does not apply to the Base Station	Does not apply to the Base Station
CHARGER INSERTED	You inserted a charger while the box was on.	The Base Station should be off and disconnected from any detonators when it is connected to a charger
I2C FAILURE	Internal error has occurred	Return Base Station for repair
TIMER FAILURE	Internal error has occurred	Return Base Station for repair
POWERLOCK SHUTDOWN	Internal error has occurred	Turn the box off, wait a few seconds, turn the box on again. If the problem persists, return the box to the supplier for repair.
COMMUNICATION SPEED ERROR	Internal error has occurred	Return Base Station for repair
BOX MODE CORRUPT	See E45	
UNKNOWN	See E40	

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12. BLAST LAYOUT
12.1. Unsynchronised Multiple Bench Box Blasting

- Connect up to four different benches with individual timing.
- All Bench Boxes will receive fire commands separately and fire one after another, in order of their assigned ID, Bench Box 1 before Bench Box 2 etc.
- Should one Bench Box fail before the blast is initiated, the problematic Bench Box will return to are-arming state. All other Bench Boxes will continue to blast. After the blast, the problematic Bench Box can be reset before reattempting to blast.

Note that unsynchronised blasting should only be attempted if the benches are completely separate, since the detonators connected to each Bench Box receive the fire command at different times. A lead-in harness cut-off before the fire command is sent will result in the bench misfiring!

12.2. Synchronised Multiple Bench Box Blasting
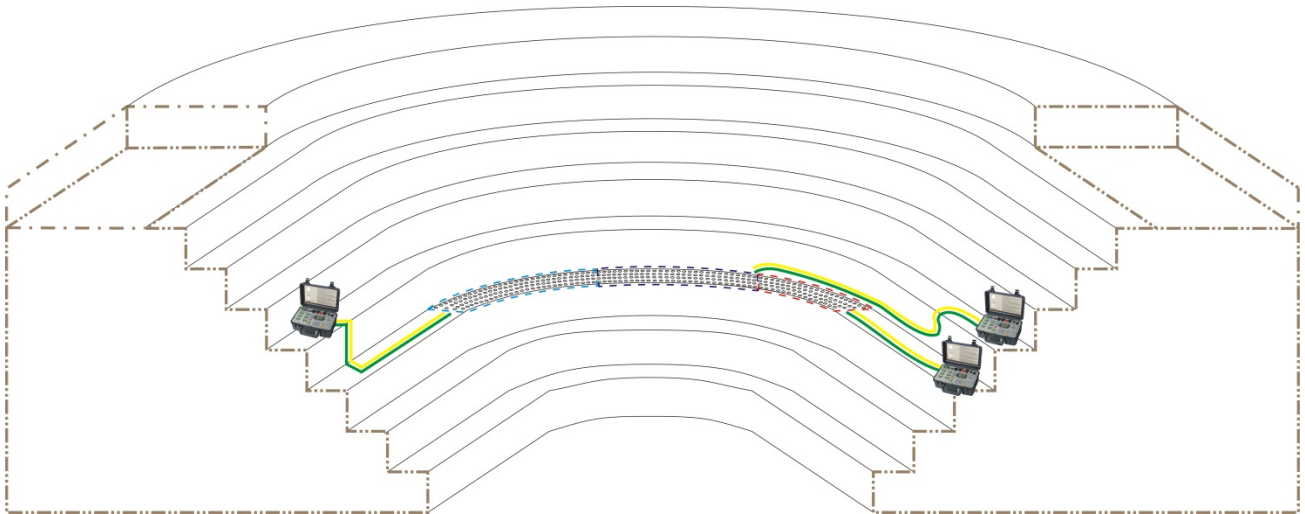
- Connect up to four different benches with sequential timing across all connected Bench Boxes.
- Detonator timing is set as one bench, connected to up to four Bench Boxes.
- When splitting the bench onto multiple Bench Boxes, take into consideration:
  - system limits,
  - leakage
  - and the load required to fire all Bench Boxes successfully.
- All Bench Boxes will receive the fire command at the same time.
- Should one Bench Box fail before the blast is initiated, the problematic Bench Box will send a message to the Base Station and return to a rearming state. The Base Station will stop the entire blast.
- The user may attempt re-blasting after improving the communication strength to the Bench Boxes.

It is recommended that RF communication strength be greater than 75%, with the minimum of 60%, for all Bench Boxes when attempting a synchronised blast – this figure is displayed on the Base Station.