blastweb

BCU DigiShot® Underground Mode | UTM-00227 | Rev 4

Maestro SVN 33100 | 2019

TABLE OF CONTENTS

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1 USERS OF THIS MANUAL

DetNet endeavours to upgrade BlastWeb software annually to comply with new challenges and needs faced by Centralized Blasting 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 Surface Blast Controllers as deployed on customer sites. This manual details the operation of the DigiShot® Underground BCU System

> **This manual is only to be used for the BlastWeb System and the applicable software version as displayed.**

1.1. End User

1.1.1. 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 BlastWeb BCU 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.

1.2. 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 BCU SYSTEM SHALL HAVE SUCCESSFULLY COMPLETED THE SPECIFIC TRAINING BEFORE PERFORMING ANY WORK WITH THE DEVICE(S).**

1.3. Information

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

2   BLASTWEB SYSTEM PRODUCT SAFETY

> ⚠️ **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.

2.1.   DetNet Safety Philosophy

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

- All products will fail to safe
- BlasttKeys 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.

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 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.

2.3.   Product Safety

Inherent Safety

- CE4 Taggers are "Inherently Safe" because it cannot produce the necessary minimum required firing voltage to blast the electronic 4G Detonator.
- In addition, the CE4 Tagger is not equipped to produce the "fire signal" necessary to initiate the detonator.

2.4.   Transportation, Storage and Handling

BlastWeb 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.

2.5.   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.

2.6.   Information in case of emergency

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

2.7.   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:*

⚠️ WARNING	**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.

⚠️ CAUTION	**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.

⚠️ NOTE	**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 http://www.detnet.com/ for additional detail and documentation.

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. FCC Class A digital device notice

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial 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. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

2.8.4. 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-0743337A

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: 24476-0743337A

2.8.5. CAN ICES-3 (A) / NMB-3 (A)

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

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

2.9.   DISCLAIMER

This document forms part of the User Manual for the BlastWeb 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.

3   DIGISHOT® UNDERGROUND BCU SYSTEM LIMITS

Channels	6 individual IO channels.
Dets/Channel	• Each IO channel is connected through a Terminator to a maximum of 200 detonators. • DigiShot® Underground detonators and a maximum of 50 NetShock Starters may be connected to a channel simultaneously.
Power	• Powered by 115VAC 60Hz, 230VAC 50Hz or 525 VAC 50/60Hz • Battery backup
Arming	Arming through use of Yellow, Orange or Red blast keys.
Blasting	• Centralised (Remote) blasting from Surface Blast Controller using Yellow Smart Key • Direct (Local) blasting initiated by either a Red or Orange Smart Key

4 DIGISHOT® UNDERGROUND BCU

4.1. General Description
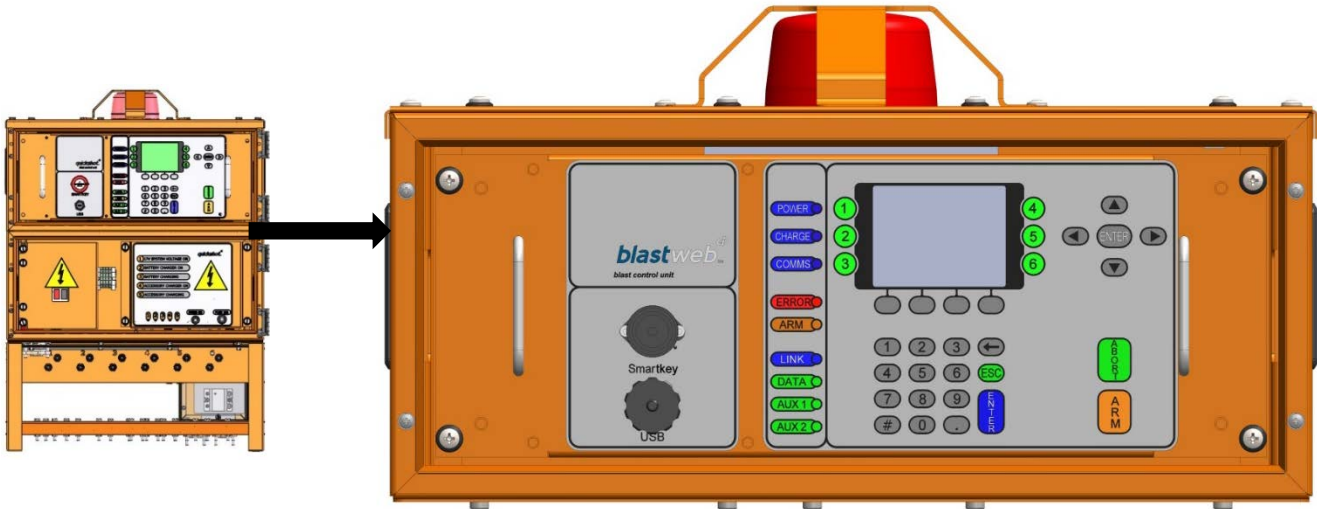
The DigiShot® Underground Blast Control Unit (BCU) controls a maximum of 6 individual IO channels. Each IO channel is connected through a Terminator to a maximum of 200 (combined) DigiShot® Underground detonators and NetShock™ detonators. The total maximum of 200 detonators per channel could consist of 200 DigiShot® Underground detonators, or 150 DigiShot® Underground detonators and 50 NetShock™ detonators, or any other combination of DigiShot® Underground and NetShock™ detonators adding up to a total of 200 detonators. NetShock™ and DigiShot® Underground detonators may be connected on the same channel.

4.2. Components

4.2.1. Status LED's

- Power LED - Blue LED indicates that mains power supply is connected (AND switched ON).
- Charge LED - Blue LED indicates the backup battery is being charged.
- Communication LED - ON/OFF Blue LED indicates communication with Surface Blast Controller (Leased Line Modem / Ethernet).
- Error LED - Red LED indicates whether there are any errors on the system.
- ARM LED – Red LED indicates the presence of blast voltage on the channel connectors as soon as the Upconverter is enabled.
- Data LED - Green LED flashes every time a data pack is received from the Ethernet network.
- Link LED - Orange LED indicates that an Ethernet connection is established.
- Aux 1 LED - Smartkey is present. If relays for shutting down air / water supply are installed, AUX_1 relay will be engaged.
- Aux 2 LED – Blast and standby relay is closed. If relays for shutting down air / water supply are installed, AUX_2 relay will be engaged.
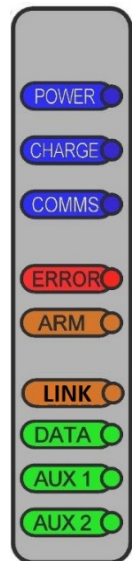
> **The Status LEDs as depicted above displays the V3 BCU.**
>
> **On the V2 BCU, the position of the Link and Data LEDs are reversed.**

4.2.2. Channel Status LEDs

- The GREEN LED will only illuminate after two identical successful background scans for a particular channel - 1 to 6.
- Green LED indicates a good installation on the applicable channel.
- No LED indicates bad installation (e.g. a detonator with an error) or blast cable damaged, or nothing connected to the channel.

4.2.3. Soft Keys

Soft key labels are displayed above the relevant Soft key. Each section will denote the specific Soft key to be pressed for certain functions. Looking at the HOME SCREEN the initial soft keys the user will see are:

- ERROR soft key (Soft key 1) - error code and a short description of error will be displayed on screen (if the ERROR light is illuminated at the time).
- PANEL soft key (Soft key 2) - will display the first IO CHANNEL STATUS screen as long as Smart Key has not been inserted.
- DEBUG soft key (Soft key 3) - only to be used by authorised personnel.

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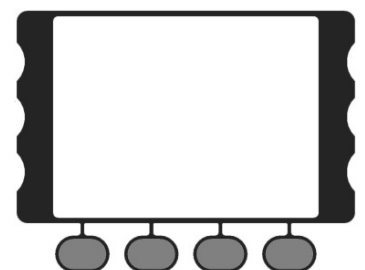
4.2.4. Arrow and Enter Keys

The arrow keys are used to navigate during actions where you may need to move left, right, up or down in an active screen.

The Left and Right arrow keys respectively, adjust the contrast of the LCD in most instances. When viewing templates and detonator lists, the Left and Right arrow keys are used for paging.

The Up and Down Navigation Keys can scroll one line at a time in certain screens.

The Enter key is used to accept an on-screen activity/option.
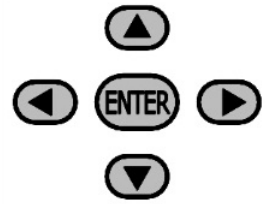
4.2.5. Numerical Key Pad

The numerical key pad is used to enter numerical key options and/or numerical values and also to make a selection from a list of commands or menus. Pressing the numerical keys 1 to 6 from the MAIN MENU will display the corresponding IO CHANNEL STATUS screen as long as a Smart Key has not been inserted.
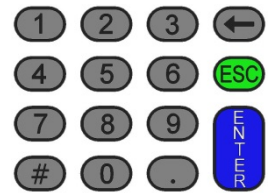
4.2.6. Abort and Arm Keys

When pressed, the abort key will immediately abort all further actions as a safety measure and will need to be re-set by removing and reinserting the Smart Key when safety protocols permit.
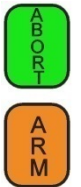
⚠️ **NOTE** **The arm key is deactivated and not in use**

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4.2.7. Smart Keys

Smart Keys are used to authorise and initiate a blast. Three types of Smart Keys are available as follows:

⚠️ NOTE	**Grace time is standardised to a minimum period of 2 minutes, regardless of whether the key is used on a FIXED or PORTABLE BCU. Users may order certain keys (typically the ORANGE key as it does not have FIRE buttons) with longer grace times, but not less than 2 minutes**

Red Smart Key initiates Local Blasting. This key is password protected and requires a PIN after key is inserted. Once the system has armed the user will need to press both FIRE buttons to send the blast command.
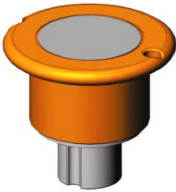
The Orange Smart Key initiates Local Blasting and requires only a PIN after key is inserted. After a grace period, the Orange Smart Key will cause the BCU to Program, Arm and Fire without any further user input i.e. no Fire buttons appear.

The Yellow Smart Key is used to initiate Centralised Blasting on a BCU connected to a Centralised Blasting Network. This is the only key that will be allowed to be inserted after a BCU is locked by the Surface Blast Controller. Note that a Surface Blast Controller lock that is issued from the controlling PC on surface is different to a detonator count lock, which is local to a particular BCU. No PIN is required for the Yellow key.

5   OPERATION

5.1.   Product Mode Selection

The mode will be displayed on the BCU LCD screen as well as on the screen of the Surface Blast-Controller.
Select the product mode to be deployed on the BCU from the following list:

1. QuickShot mode   (QS)
2. SmartShot mode   (SS)
3. DigiShot U/G mode   (DSUG / DSUG+)
4. DriftShot mode   (DRIFT)

⚠ **NOTE**	**Should the BCU not be in the DigiShot Underground mode, refer to the BCU Debug document (UTM-00301) for detailed information to select the DigiShot Underground product mode.** **For detailed information on the QuickShot, SmartShot and DriftShot modes refer to system specific documentation as this is not covered in this manual.**

With the BCU in DigiShot Underground mode, detonators are allocated a location within a zone and hole number. Zone Timing templates are assigned to each channel. Each zone fires at a sequentially calculated delay, and by using the Intra-det templates the user can assign detonator delays within a zone. The user can also select specific detonators from the detonator list and individually edit their times.

⚠ **CAUTION**	**USERS MUST VERIFY THAT THE BCU ID, IP AND MAC ADDRESSES ARE CORRECT AFTER BCU FIRMWARE WAS UPDATED**

5.2. View Main Menu

```
 BCU I.D: 600                    DSUG+      TESTING
    TIME: 09:14


                   *                        *
    93                           0
                93                          0


                   *                                    *
    0                            200
                0                                      200


                   *                        *
    0                            0
                0                           0

 FIXED BCU
 ERROR              PANEL           DEBUG
```

DISPLAY	DESCRIPTION
BCU ID	DigiShot Underground FIXED BCU Identification number (600 displayed in example above)
TIME	Local time (09:14 displayed in example above)
DSUG+	Product Mode – Indicates that BCU is in DigiShot Underground Plus mode
TESTING	Current State Engine state
93 / 93	Large font number 93 indicates 93 current detonators found on Channel 1. The small font number 93 indicates that 93 detonators have been locked in for Channel 1 which is the number of detonators that will be programmed and blasted. Should the large font number not be equal to the small font number, a HARNESS BREAK has occurred, or detonators have been removed, and the problem should be fixed before blasting
*	When the BCU is locked, an asterisk will be displayed for all channels. The channels with zero detonators will display an asterisk and a 0 to indicate zero detonators locked.
ERROR	Press ERROR soft key to view error messages
PANEL	Displays the first IO CHANNEL STATUS screen as long as Smart Key has not been inserted.
DEBUG	DEBUG Soft Key – Password Protected

5.3.   View IO Channel

Press the numerical key corresponding to the IO Channel Number to view the required channel.

Channel offset is ONLY applicable to DigiShot® Underground channels.

```
IO – CHANNEL STATUS SCREEN

Channel 1          *              OFFSET        10000ms

DESIGN DETS:                      93

Template:                         ZNE = 0       DET = 0
Det Count:                        93
Current Det:                      5
Error:                            0
Leakage / Current:                0.07 / 1.08   mA
Channel Voltage:                  8.69 V
T.Voltage / Count:                7.98 V /  20
Mode:                             TESTING

NEXT              MODE            2W_SET          EXIT
```

DISPLAY	DESCRIPTION
Channel 1	Selected Channel
*	Indicates that the channel has been locked.
Offset	Indicating Offset for selected Channel – Measured in milli-seconds
Design dets	Indicating the number of detonators the Channel was locked on.
Template	Indicating the Zone and Intra-det template number selected for a channel
Det Count	Total number of detonators connected
Current Det	Current detonator being tested
Error	Error code number
Leakage	Leakage present – Measured in milli-Ampere (mA)
Current	Current present – Measured in milli-Ampere (mA)
Channel Voltage	Voltage present – Measured in Volts (V)
T.Voltage	Voltage measured by the Terminator – Measured in Volts (V)
Count	Indicating the Terminator blast count.
Mode	Indicating current IO channel state - Idle, Testing, Arming, Blasting

5.3.1.   Soft keys

- **NEXT** – Cycles sequentially between channel number STATUS screens.
- MODE – Presents user with the BCU mode options list to select between QuickShot, SmartShot, DigiShot Underground and DriftShot mode.
- 2W_SET (Only available after first scan) – Presents the user with menu to manipulate channel settings regarding scan lock, template assignment, channel offset etc.
- EXIT – Exit from current screen and returns to Main Menu.

5.4.   Modify Channel settings – 2W_SET

From this screen the user can change certain channel settings.

From the HOME SCREEN press numerical key corresponding with required IO Channel Number, or press PANEL and press NEXT to get to the preferred channel.

- Press the **2W_SET** soft key to view the Channel settings.

The Channel setup screen will indicate the Channel Offset (channel delay) at the top.

The number of detonators recently found on the channel will be displayed next to the first menu item – "LOCK DESIGN AND SCAN". In this example, it displays 200 detonators.

```
                 CHANNEL 1

CHANNEL DELAY      = 10000ms


1. LOCK DESIGN AND SCAN  – 200
2. UNLOCK AND SCAN
3. SELECT BLAST DESIGN
4. EDIT BLAST DESIGNS
5. SELECT LAST DESIGN USED
6. ASSIGN CHANNEL START DELAY




          LIST       SUMRY        EXIT
```
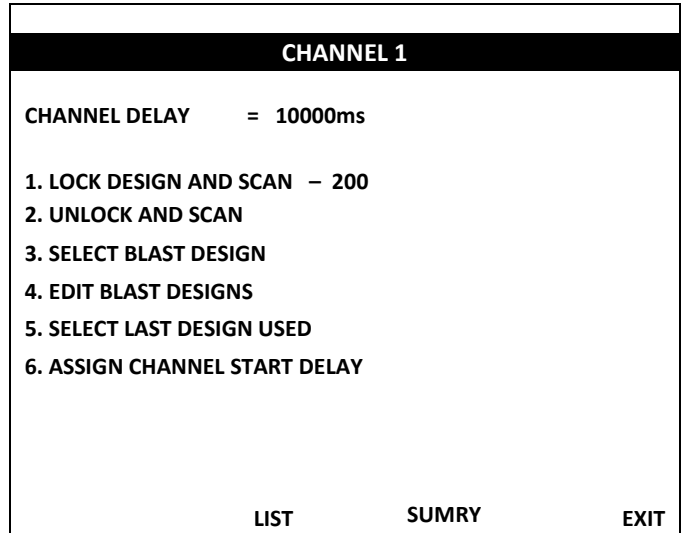
5.4.1. Soft keys

- **LIST** – Can only be used once channel has been locked. After locking the user can use this to access the detonator list in order to view detonators and change timing.
- **SUMRY** – Provides the user with detonator counts for each zone as well as for NetShock detonators, and will then also give the total detonator count for that channel.
- **EXIT –** Exit from current screen and returns to Channel Status screen.

```
                 CHANNEL 1

CHANNEL DELAY      = 10000ms


1. LOCK DESIGN AND SCAN  – 200
2. UNLOCK AND SCAN
3. SELECT BLAST DESIGN
4. EDIT BLAST DESIGNS
5. SELECT LAST DESIGN USED
6. ASSIGN CHANNEL START DELAY


PANEL NOT LOCKED.  LOCK PANEL

          LIST       SUMRY        EXIT
```
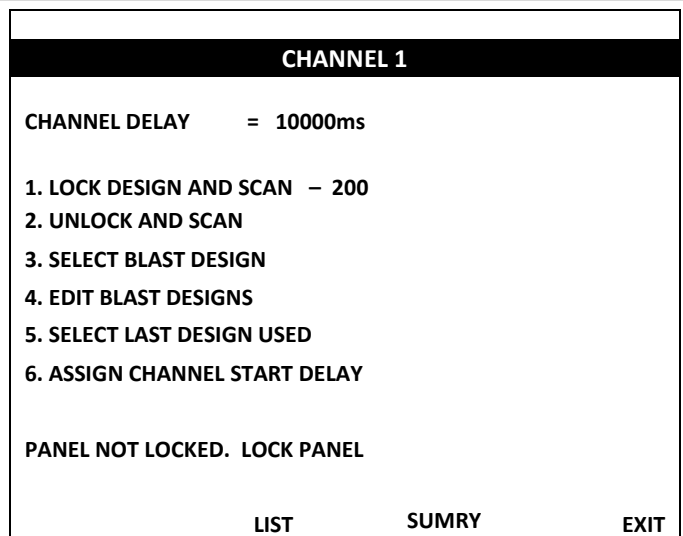
The **LIST** and **SUMRY** soft keys require the channel to be locked before attempting to use them.
A message "**PANEL NOT LOCKED. LOCK PANEL**" will be displayed in such an event.

blastweb

5.5.   Lock Design and Scan

This option will lock the channel on the number of detonators it indicates as to have found.
The channel will no longer scan for any newly connected detonators and will now only test the detonators in the list to determine whether they are still connected.

From the CHANNEL STATUS SCREEN press the 2W_SET soft key.

- Press **1** on the keypad to select **LOCK DESIGN AND SCAN**.

```
CHANNEL 1

CHANNEL DELAY       = 10000ms


1. LOCK DESIGN AND SCAN  – 200
2. UNLOCK AND SCAN
3. SELECT BLAST DESIGN
4. EDIT BLAST DESIGNS
5. SELECT LAST DESIGN USED
6. ASSIGN CHANNEL START DELAY




            LIST         SUMRY    EXIT
```

The screen will now update to display the message below the menu list:

"**DET-LIST SAVED**" and the **LOCK DESIGN AND SCAN** – **200** changed to **LOCK DESIGN AND SCAN * 200** where the asterisk (*) indicates that the channel was locked.

This indicates that the current list of detonators is now saved and will not be changed. It also indicates that the user should not add any more detonators to the channel, as those will not be detected. In order to change the detonator list now, the channel will have to be unlocked first.

Now that the channel is locked, the user can select to assign a design template to it, or modify the channel offset.

```
CHANNEL 1

CHANNEL DELAY       = 10000ms

1. LOCK DESIGN AND SCAN  * 200
2. UNLOCK AND SCAN
3. SELECT BLAST DESIGN
4. EDIT BLAST DESIGNS
5. SELECT LAST DESIGN USED
6. ASSIGN CHANNEL START DELAY


DET-LIST SAVED.

            LIST         SUMRY         EXIT
```

If any errors exist on the channel prior to locking, an **ERROR** screen will be displayed:

- Error screen will provide details about the error condition that prevents channel from being locked.
- Error has to be resolved before channel can be locked.
- In this instance there were more than 200 detonators detected on the channel.

```
ERROR


CHANNEL CANNOT BE LOCKED DUE
TO ERRORS DETECTED:


MAX DETS




PRESS ANY KEY TO RETURN
```
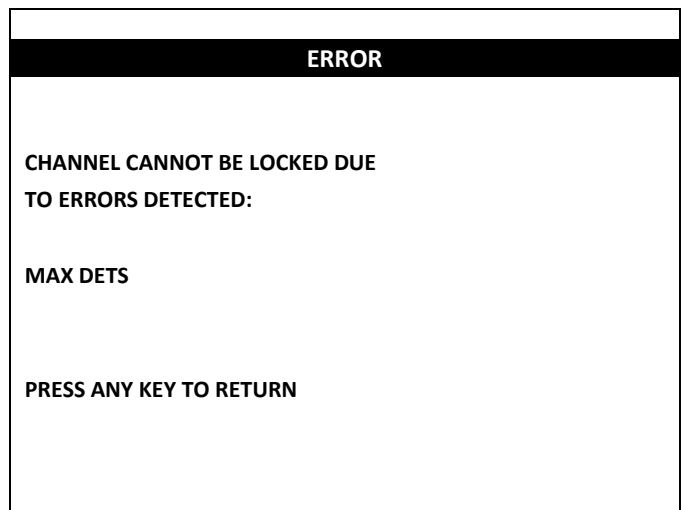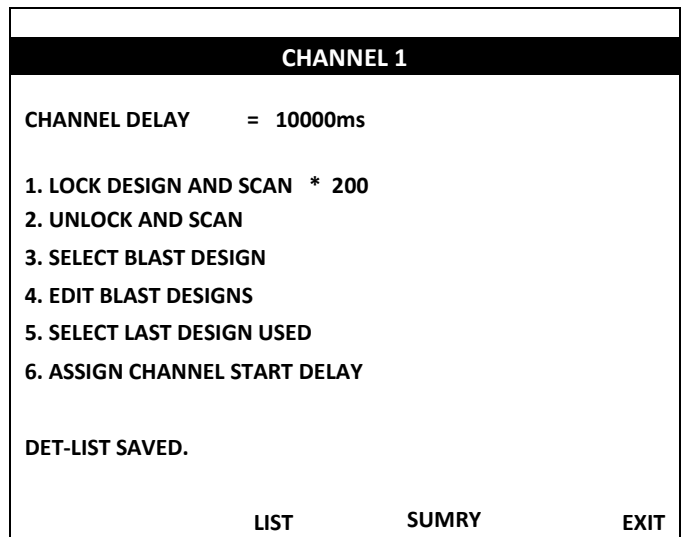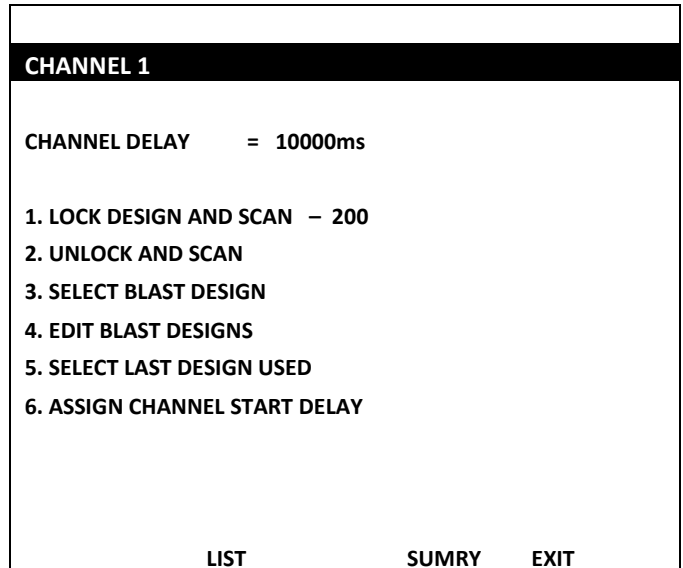
5.6.   View List

From the Channel setup screen the user can view the detonator list in a sequential fashion.
From the CHANNEL SETUP SCREEN press the **LIST** soft key after the channel has been locked.

- Press the ◀ ▶ keys to page through the list.

- Press the ▲ ▼ keys to scroll through the list

- Press the **EDIT** soft key to edit individual det times.

ZONE	HOLE	DET	TIME
1	1	1	8000 *
1	2	1	8500
1	3	1	9000
2	1	1	9500
2	2	1	10000
STR	49		200
EDIT			

5.7.   Edit Detonator Times

From the detonator list screen the user can edit detonator times or include / exclude them from the blast.

From the detonator list press the **EDIT** soft key. Note the position of the asterisk as that indicates the det that will be edited.

- Press the ◀ ▶ keys to page through the list.

- Press the ▲ ▼ keys to scroll through the list

- Press the EDIT soft key to edit individual det times.

ZONE	HOLE	DET	TIME
1	1	1	8000 *
1	2	1	8500
1	3	1	9000
2	1	1	9500 x
2	2	1	10000
STR	49		200
EDIT			EXIT

- Press **1** on keypad to change the time of the detonator selected
- Press **2** on the keypad to exclude the detonator from the blast. An "**x**" will appear next to the detonator time in the list.
- Press **3** on the keypad to include a previously excluded det. The "**x**" will be removed.

DETONATOR OPTIONS
1. TIME DET
2. EXCLUDE DET
3. INCLUDE DET
EXIT

- After 1 is pressed, user can change the time of the selected detonator.
- The location of the detonator is also shown.
- Enter the new time (the current time will be overwritten as the user is typing)
- Press ENTER to accept the new time.
- Detonator list will be displayed.

Enter delay time: 8000
LOCATION: ZONE 1   HOLE 1
EXIT

5.8. View Summary

From the Channel setup screen the user can then view the zone and det count summary.

From the CHANNEL SETUP SCREEN press the **SUMRY** soft key after the channel has been locked.

- Pressing the LIST soft key will display the detonator list.

ZONE	COUNT	ZONE	COUNT
Z01	3	Z02	4
Z03	3	Z04	0
Z05	0	Z06	0
Z07	0	Z08	0
Z09	0	Z10	1
Z11	0	Z12	0
Z13	3	Z14	0
Z15	0	Z16	1
STARTERS	5		
TOTAL DETS	20		
	LIST		EXIT

5.9. Unlock and Scan

This option will unlock the channel, discard the previous detonator list and start scanning for detonators afresh. It will then recreate a new list of detonators that can be locked (saved) at a later stage.

From the CHANNEL STATUS SCREEN press the 2W_SET soft key.

- Press **2** on the keypad to select **UNLOCK AND SCAN**.
- The channel will be unlocked and the display will be changed to show the CHANNEL STATUS SCREEN.
- This screen change will be performed whether the channel is locked or not.

```
                    CHANNEL 1

CHANNEL DELAY      = 10000ms


1. LOCK DESIGN AND SCAN   * 200
2. UNLOCK AND SCAN
3. SELECT BLAST DESIGN
4. EDIT BLAST DESIGNS
5. SELECT LAST DESIGN USED
6. ASSIGN CHANNEL START DELAY




            LIST      SUMRY      EXIT
```

5.10. Select Blast Design

This option allows the user to view the available templates and select the templates that should be applied to the specific channel.

From the CHANNEL STATUS SCREEN press the 2W_SET soft key.

- Press **3** on the keypad to select **SELECT BLAST DESIGN**.
- Channel must be locked before assigning a blast design.
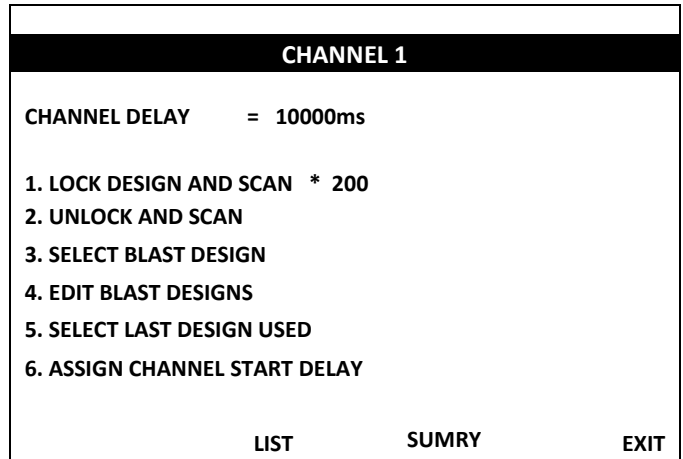
```
                    CHANNEL 1

CHANNEL DELAY        = 10000ms

1. LOCK DESIGN AND SCAN   * 200
2. UNLOCK AND SCAN
3. SELECT BLAST DESIGN
4. EDIT BLAST DESIGNS
5. SELECT LAST DESIGN USED
6. ASSIGN CHANNEL START DELAY


            LIST        SUMRY        EXIT
```

⚠ **CAUTION** — **CHANNEL DELAY MUST BE ASSIGNED BEFORE TEMPLATE IS ASSIGNED, OTHERWISE CHANNEL DELAY WILL NOT BE APPLIED TO THE DETONATOR TIMES**

If the channel is not locked, the user will receive a message requesting the channel to first be locked. Any key press will then take the user back to the CHANNEL SETUP SCREEN to be able to lock the channel.

```
CHANNEL NOT LOCKED
DETS FOUND: 200


LOCK CHANNEL BEFORE TIMING


PRESS ANY KEY TO CONTINUE
                                    EXIT
```
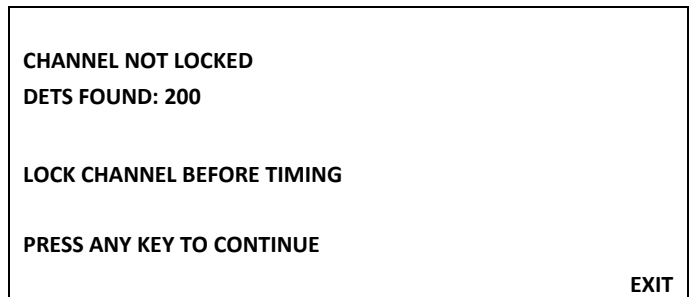
If the channel was locked, the user will be presented with templates that can be selected to be assigned to the relevant channel.

- Pressing the ASSIGN soft key will attempt to assign the ZONE and INTRA-DET templates to the channel.
- Pressing the DET soft key will toggle between INTRA-DET and ZONE templates
- Pressing the EDIT soft key will enable the changing of the current template type's number, enabling the user to select one of 10 available templates for the relevant ZONE or INTRA-DET template types.

```
            ASSIGN TEMPLATES
CHANNEL 1
ZONE DELAY TEMPLATE : 1
Z01 :              25
Z02 :             500
Z03 :             800
Z04 :            1100
ASSIGN              DET        EDIT
```

blastweb
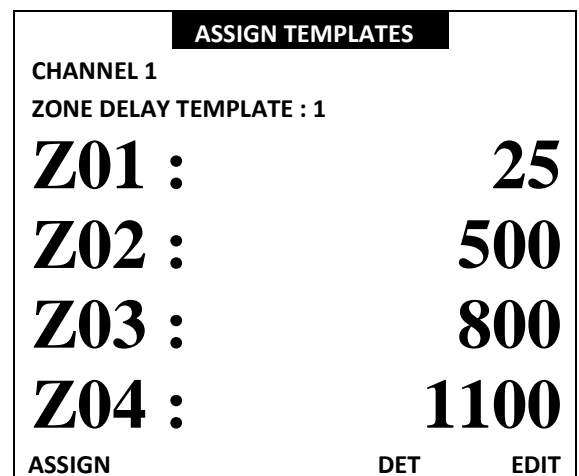
Pressing DET will toggle to ZONE, and then pressing ZONE will toggle back to DET.

ASSIGN TEMPLATES	
CHANNEL 1	
ZONE DELAY TEMPLATE : 1	
Z01 :	**25**
Z02 :	**500**
Z03 :	**800**
Z04 :	**1100**
ASSIGN	DET EDIT

ASSIGN TEMPLATES	
CHANNEL 1	
DET DELAY TEMPLATE : 1	
Z01 :	**5**
Z02 :	**10**
Z03 :	**20**
Z04 :	**200**
ASSIGN	ZONE EDIT

Pressing **EDIT** will toggle to **ACCEPT**, and then pressing **ACCEPT** will toggle back to **EDIT**.

- When **EDIT** is pressed, the user can select a template number between 1 and 10 by either using the **TMP-** and **TMP+** soft keys or directly by pressing 1 to 0 on the keypad.
- Use the ▲▼ keys to scroll through the template.
- Use the ◄► keys to page through the template.
- When **ACCEPT** is pressed, the number of the relevant template type is stored to be assigned to the relevant channel.

ASSIGN TEMPLATES	
CHANNEL 1	
ZONE DELAY TEMPLATE : 1	
Z01 :	**25**
Z02 :	**500**
Z03 :	**800**
Z04 :	**1100**
ASSIGN	DET EDIT

ASSIGN TEMPLATES	
CHANNEL 1	
ZONE DELAY TEMPLATE : 1	
Z01 :	**25**
Z02 :	**500**
Z03 :	**800**
Z04 :	**1100**
TMP-	TMP+ ACCEPT

blastweb

```
┌─────────────────────────────────────┐
│        ASSIGN TEMPLATES             │
│  CHANNEL 1                          │
│  ZONE DELAY TEMPLATE : 1            │
│                                     │
│  Z01 :              25              │
│  Z02 :             500              │
│  Z03 :             800              │
│  Z04 :            1100              │
│  ASSIGN              DET      EDIT  │
└─────────────────────────────────────┘
```

- When **ASSIGN** is pressed, both the ZONE and INTRA-DET template numbers that were chosen, are now presented to be assigned to the relevant channel.

When ASSIGN is pressed, the channel setup is first evaluated to check whether empty templates were chosen.

- If any of the chosen templates are empty, user will not be allowed to continue until each template contains at least one entry.

```
┌─────────────────────────────────────┐
│      EMPTY TEMPLATES SELECTED       │
│                                     │
│  EMPTY TEMPLATES NOT ALLOWED.       │
│  PLEASE SELECT ALTERNATIVE OR       │
│  EDIT THE SELECTED TEMPLATES:       │
│                                     │
│                                     │
│  CH 1 ZONE TEMPLATE 2               │
│  CH 1 INTRA-DET TEMPLATE 3          │
│                                     │
│                                     │
│  PRESS ANY KEY TO CONTINUE          │
│                                     │
└─────────────────────────────────────┘
```

After the empty template check is successful, user is presented with a confirmation screen to acknowledge the expected ZONE and INTRA-DET template numbers to be applied to the channel. The channel offset is also displayed.

- Pressing YES will continue with the assignment of the template times to the channel
- Pressing NO will revert back to the CHANNEL SETUP SCREEN so the user can change the templates.

```
┌─────────────────────────────────────┐
│       TEMPLATES AND OFFSET          │
│                                     │
│  ZONE TEMPLATE          :   1       │
│  INTRA-DET TEMPLATE     :   1       │
│  CHANNEL OFFSET         :   10000   │
│                                     │
│                                     │
│  DO YOU ACCEPT THE VALUES?          │
│                                     │
│                                     │
│           YES        NO             │
└─────────────────────────────────────┘
```

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```
ERROR! DET DELAY GREATER
THAN 20 SECONDS!


CHANNEL              :=        1
ZONE                 :=        3
DET# EXCEEDING       :=        11
CHANNEL OFFSET       :=        18850 ms
ZONE DELAY           :=        1103 ms  (T3)
INTRA-DET DELAY      :=        5 ms   (T2)


EXCEEDED TIME        :=        20003  ms


PRESS ENTER TO RETURN
```

> ⚠️ **CAUTION**
>
> **LIMIT WARNING SCREEN**
> **IF THE TIMES ARE EXCEEDED (OVER 20000 MS), THE WARNING SCREEN IS DISPLAYED TO LOCATE THE PROBLEM IN DIGISHOT UNDERGROUND MODE.**

BCU will display **APPLYING TEMPLATES**.

```
                        APPLYING TEMPLATES
```

BCU will display **LOADING LIST**.

```
                        LOADING LIST
```
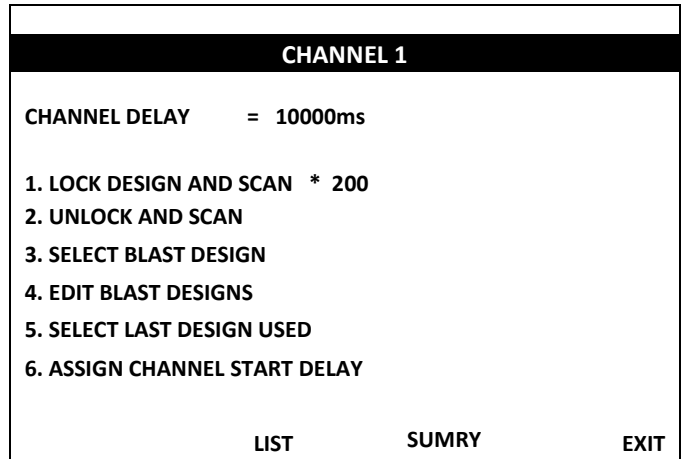
After the design was successfully loaded, the user will be presented with the detonator list.
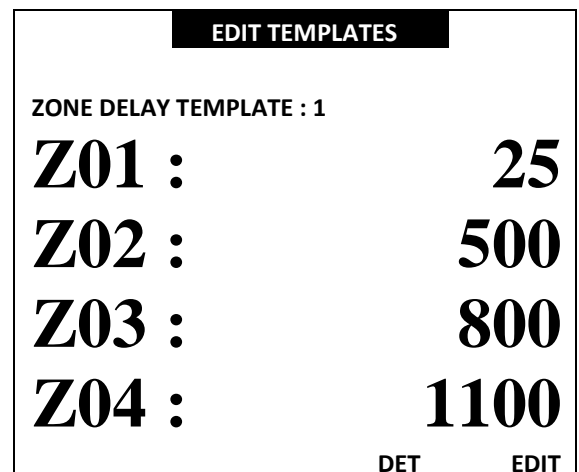
blastweb

5.11. Edit Blast Designs

The Edit Blast Designs option allows the user to edit the templates.
From the CHANNEL STATUS SCREEN press the 2W_SET soft key.

- Press **4** on the keypad to select **EDIT BLAST DESIGNS**.

```
┌────────────────────────────────────────┐
│            CHANNEL 1                    │
│                                         │
│ CHANNEL DELAY      =  10000ms           │
│                                         │
│ 1. LOCK DESIGN AND SCAN  *  200         │
│ 2. UNLOCK AND SCAN                      │
│ 3. SELECT BLAST DESIGN                  │
│ 4. EDIT BLAST DESIGNS                   │
│ 5. SELECT LAST DESIGN USED              │
│ 6. ASSIGN CHANNEL START DELAY           │
│                                         │
│            LIST    SUMRY         EXIT   │
└────────────────────────────────────────┘
```

The user will be presented with the templates that can be edited.

- Pressing the DET soft key will toggle between INTRA-DET and ZONE templates
- Pressing the EDIT soft key will enable the changing of the current template's times.

```
┌────────────────────────────────────────┐
│            EDIT TEMPLATES               │
│                                         │
│ ZONE DELAY TEMPLATE : 1                 │
│ Z01 :                  25               │
│ Z02 :                 500               │
│ Z03 :                 800               │
│ Z04 :                1100               │
│                       DET        EDIT   │
└────────────────────────────────────────┘
```

blastweb

Pressing **DET** will toggle to **ZONE**, and then pressing **ZONE** will toggle back to **DET**.

EDIT TEMPLATES	
ZONE DELAY TEMPLATE : 1	
Z01 :	**25**
Z02 :	**500**
Z03 :	**800**
Z04 :	**1100**
ASSIGN	DET EDIT

EDIT TEMPLATES	
DET DELAY TEMPLATE : 1	
Z01 :	**5**
Z02 :	**10**
Z03 :	**20**
Z04 :	**200**
ASSIGN	ZONE EDIT

Pressing **EDIT** will toggle to **ACCEPT**, and then pressing **ACCEPT** will toggle back to **EDIT**.

- When **EDIT** is pressed, the user can now select a template number between 1 and 10 by either using the **TMP-** and **TMP+** soft keys or directly by pressing **1** to **0** on the keypad.

- Use the ⬆️⬇️ keys to scroll through the template.

- Use the ◀️▶️ keys to page through the template.

EDIT TEMPLATES	
ZONE DELAY TEMPLATE : 1	
Z01 :	**25**
Z02 :	**500**
Z03 :	**800**
Z04 :	**1100**
ASSIGN	DET EDIT

EDIT TEMPLATES	
Press ENTER to change delay	
ZONE DELAY TEMPLATE : 1	
Z01 :	**25**⬅
Z02 :	**500**
Z03 :	**800**
Z04 :	**1100**
TMP- TMP+	ACCEPT

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- When **ENTER** is pressed, the current value is cleared and the user can enter new delay for relevant zone using the keypad.

EDIT TEMPLATES
Press ENTER to store delay
ZONE DELAY TEMPLATE : 1
Z01 : ←
Z02 : **500**
Z03 : **800**
Z04 : **1100**
TMP-   TMP+   ACCEPT

- When **ENTER** is pressed again without a new value being entered, the old value displayed is kept.

EDIT TEMPLATES
Press ENTER to change delay
ZONE DELAY TEMPLATE : 1
Z01 : **25**←
Z02 : **500**
Z03 : **800**
Z04 : **1100**
TMP-   TMP+   ACCEPT

- When **ENTER** is pressed again after new value was entered, the new value is stored for that zone and the next zone is selected to be editable.

EDIT TEMPLATES
Press ENTER to change delay
ZONE DELAY TEMPLATE : 1
Z01 : **60**←
Z02 : **500**
Z03 : **800**
Z04 : **1100**
TMP-   TMP+   ACCEPT

- When ACCEPT is pressed, the template values are updated and stored.

```
┌─────────────────────────────────────┐
│          EDIT TEMPLATES             │
│                                     │
│ ZONE DELAY TEMPLATE : 1             │
│ Z01 :                     60        │
│ Z02 :                    500        │
│ Z03 :                    800        │
│ Z04 :                   1100        │
│ ASSIGN            DET        EDIT   │
└─────────────────────────────────────┘
```

> **NOTE**
>
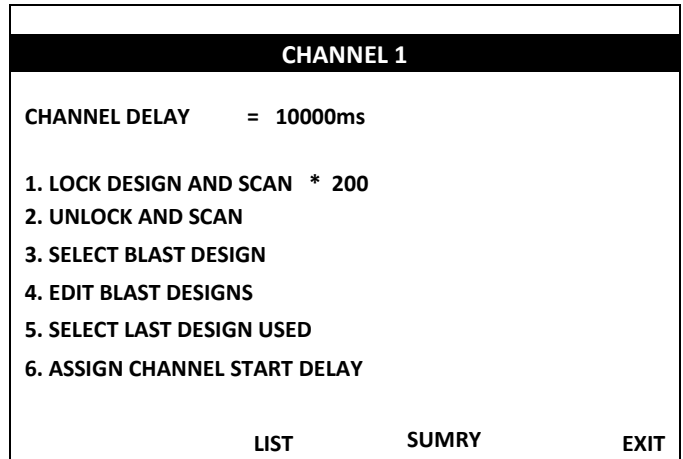> **The edited zone will shifted one line upward to enable the next zone to become editable. The arrow keys may be used to check the edited values**
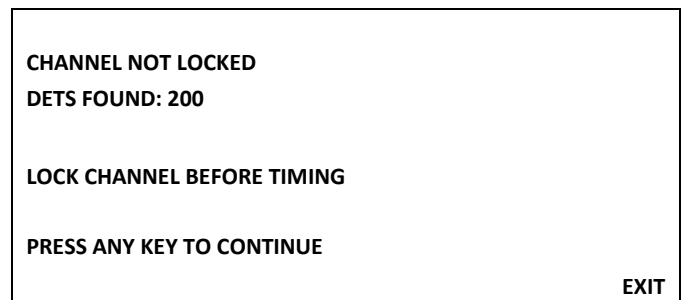
blastweb

5.12. Select Last Design Used

The select last design used option allows the user to view the available templates and to select the required templates to be applied to the specific channel.

From the CHANNEL STATUS SCREEN press the 2W_SET soft key.

- Press **5** on the keypad to select the option
- Channel must be locked before assigning a blast design.
- Channel delay must be assigned **BEFORE** template is assigned, otherwise channel delay will not be applied to the detonator times.

```
CHANNEL 1

CHANNEL DELAY        = 10000ms

1. LOCK DESIGN AND SCAN  * 200
2. UNLOCK AND SCAN
3. SELECT BLAST DESIGN
4. EDIT BLAST DESIGNS
5. SELECT LAST DESIGN USED
6. ASSIGN CHANNEL START DELAY

          LIST      SUMRY        EXIT
```
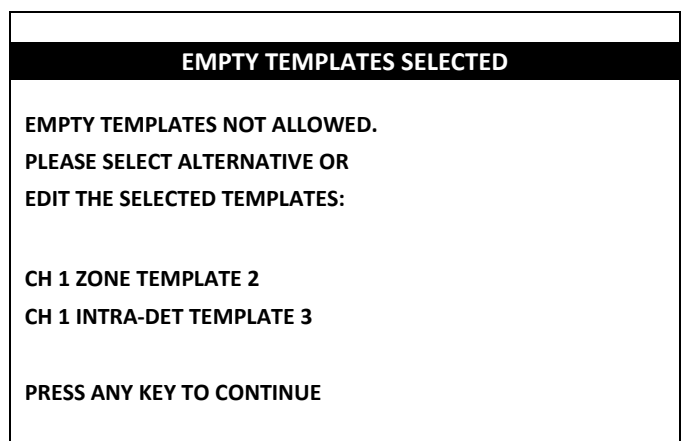
If the channel is not locked, the user will receive a message requesting the channel to be locked first. Any key press will then take the user back to the CHANNEL SETUP SCREEN to be able to lock the channel.

```
CHANNEL NOT LOCKED
DETS FOUND: 200


LOCK CHANNEL BEFORE TIMING


PRESS ANY KEY TO CONTINUE

                              EXIT
```

The channel setup is first evaluated to check whether empty templates were chosen.
- If any of the chosen templates are empty, user will not be allowed to continue until each template contains at least one entry.

```
EMPTY TEMPLATES SELECTED

EMPTY TEMPLATES NOT ALLOWED.
PLEASE SELECT ALTERNATIVE OR
EDIT THE SELECTED TEMPLATES:


CH 1 ZONE TEMPLATE 2
CH 1 INTRA-DET TEMPLATE 3


PRESS ANY KEY TO CONTINUE
```

After a successful empty template check, the user will be presented with a confirmation screen to acknowledge the expected ZONE and INTRA-DET template numbers to be applied to the channel. The channel offset will also be displayed.

- Pressing **YES** will continue with the assignment of the template times to the channel
- Pressing **NO** will revert back to the CHANNEL SETUP SCREEN so the user can change the templates.

TEMPLATES AND OFFSET

ZONE TEMPLATE	:	1
INTRA-DET TEMPLATE	:	1
CHANNEL OFFSET	:	10000

DO YOU ACCEPT THE VALUES?

YES   NO

LIMIT WARNING SCREEN

IF THE TIMES ARE EXCEEDED (OVER 20000 MS), THE WARNING SCREEN WILL BE DISPLAYED TO LOCATE THE PROBLEM IN DIGISHOT UNDERGROUND MODE.

⚠ CAUTION

ERROR! DET DELAY GREATER THAN 20 SECONDS!

CHANNEL	=	1
ZONE	=	3
DET# EXCEEDING	=	11
CHANNEL OFFSET	=	18850 ms
ZONE DELAY	=	1103 ms (T3)
INTRA-DET DELAY	=	5 ms (T2)
EXCEEDED TIME	=	20003 ms

PRESS ENTER TO RETURN

BCU will display APPLYING TEMPLATES.

APPLYING TEMPLATES

BCU will display LOADING LIST.
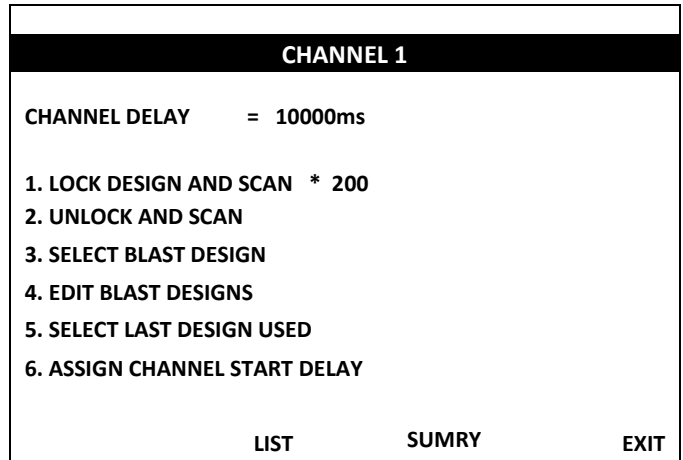
LOADING LIST

After the design was successfully loaded, the user will be presented with the detonator list.

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5.13. Assign Channel Start Delay

This option allows the user to change the channel offset for the specific channel.
From the CHANNEL STATUS SCREEN press the 2W_SET soft key.

- Press **6** on the keypad to select **ASSIGN CHANNEL START DELAY**
- Channel delay must be assigned BEFORE template is assigned, otherwise channel delay will not be applied to the detonator times.

```
                    CHANNEL 1

CHANNEL DELAY        =  10000ms


1. LOCK DESIGN AND SCAN   *  200
2. UNLOCK AND SCAN
3. SELECT BLAST DESIGN
4. EDIT BLAST DESIGNS
5. SELECT LAST DESIGN USED
6. ASSIGN CHANNEL START DELAY


            LIST          SUMRY            EXIT
```

User will be presented with the current channel delay and provided with an opportunity to change the value.
- Enter a new channel delay using the keypad.
- Pressing **ENTER** will assign the new delay and take the user back to the CHANNEL SETUP SCREEN.

```
CURRENT CHANNEL DELAY    :    10000
ENTER NEW CHANNEL DELAY  :
```

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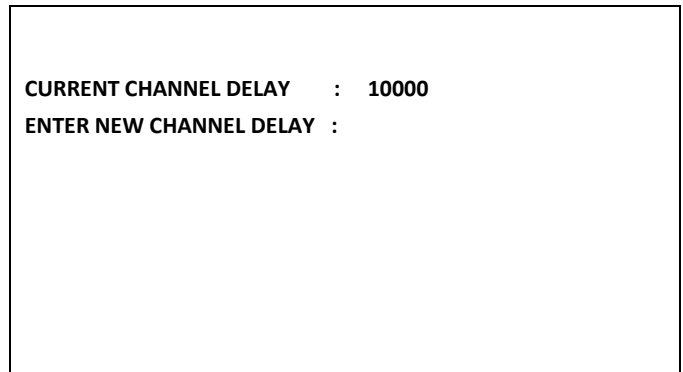
6 DEBUG

From the Main Menu, press the DEBUG soft key to open the DEBUG menu.

BCU I.D: 600	DSUG+	TESTING
TIME: 09:14		

93 *93	0 *0
0 *0	200 *200
0 *0	0 *0

FIXED BCU

ERROR	PANEL	DEBUG

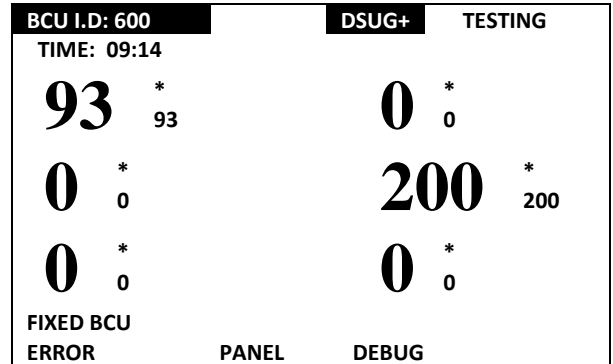| ⚠ NOTE	**Refer to the BCU Debug document – UTM-00301 for detailed debugging information.**

7 FAULT FINDING

7.1. Error Soft Key

This function will display errors that are present on the system.

Display Main Menu

- Press **ERROR** soft key to select Error Menu.

BCU I.D: 600		DSUG+	TESTING

TIME: 09:14

93 *93   0 *0

0 *0   200 *200

0 *0   0 *0

FIXED BCU

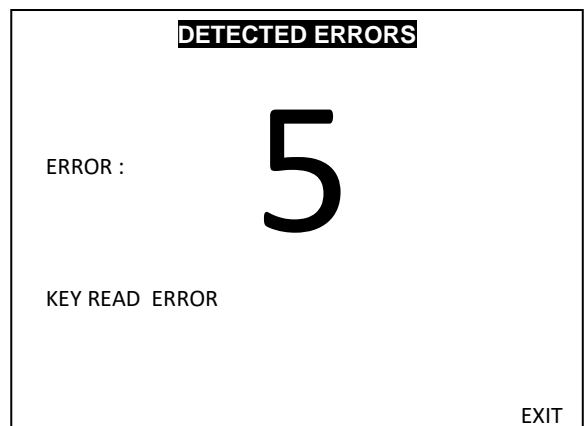| ERROR	PANEL	DEBUG

Detected Error Display per Channel

- Errors detected will be visible per channel.
- NO ERROR will be displayed when no errors are found.
- Errors related to specific channels will be displayed.

DETECTED ERRORS

NO ERROR	NO ERROR
NO ERROR	NO ERROR
NO ERROR	SHORT CIRCUIT

EXIT
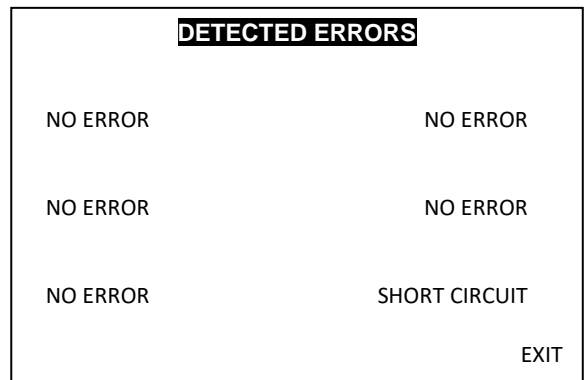
> **NOTE**
>
> **When an error occurs, the ERROR LED will illuminate with the exception of the Battery Low Error. BCU Error Codes.**

- Error code and description will be displayed.
- The following error messages may be displayed:
  - o Key Read Error.
  - o High leakage.
  - o Short circuit.
  - o Det internal.
  - o High current.
  - o Incorrect End Plug.
  - o Harness Break.
  - o Untagged Det.

DETECTED ERRORS

ERROR :   5

KEY READ ERROR

EXIT

7.2. BCU Error Codes

BCU ERROR CODES	CAUSES OF ERRORS	REMEDIAL ACTIONS
ERROR 1	This error is caused by a communication problem between the Maestro (main processor) and one of the following devices: • IO channels, • Powerlock (interlock processor), • Keypad, • Real Time Clock.	This is an internal error within the UI. 1. Reset the UI by switching of main power supply and then pressing the re-set button for 10 seconds. 2. If the error remains, replace the complete UI.
ERROR 2	This error is caused when there is a synchronisation error between the Maestro and Powerlock.	This is an internal error within the UI. 1. Reset the UI by switching of main power supply and then pressing the re-set button for 10 seconds. 2. If the error remains, replace the complete UI.
ERROR 3	This error is displayed when Maestro cannot communicate with the on-board flash memory and thus cannot read and/or save logs.	This is an internal error within the UI. 1. Reset the UI by switching of main power supply and then pressing the re-set button for 10 seconds. 2. If the error remains, replace the complete UI.
ERROR 4	This error is caused by a Faulty Relay when either the STANDBY or ARM relay is in the incorrect state at a specific stage of the blast cycle.	This is an internal error within the UI. 1. Reset the UI by switching of main power supply and then pressing the re-set button for 10 seconds. 2. If the error remains, replace the complete UI.
ERROR 5	This error is caused by a faulty Smart Key. It occurs when the key cannot be read or if the data in the key is corrupt or incorrect.	This is caused by a faulty Smart Key. 1. Replace faulty key with a spare key from surface. 2. The faulty key must be returned to DetNet to be repaired or replaced.
ERROR 6	This error is caused by either the UI or UPCONVERTER. This flag is raised when either Maestro cannot communicate to UI (Unable to read key-presses and/or write to the screen), or if the Upconverter has not supplied the required blast voltage at the time of firing a blast.	This is an internal error within the UI. 1. Reset the UI by switching of main power supply and then pressing the re-set button for 10 seconds. 2. A test blast must be performed after replacing the UI to ensure that error is no longer present. 3. If the error remains, replace the complete UI.
ERROR 7	This is an IO error and will be present if any of the IO-channels do not enter a DONE-STATE within a time period of three minutes.	This is an internal error within the UI. 1. Reset the UI by switching of main power supply and then pressing the re-set button for 10 seconds. 2. If the error remains, replace the complete UI.
ERROR 8 (Auto display)	BCU not locked. Automatically displays on the LCD screen once detected.	Error message is displayed when ANY Smart Key is inserted before the BCU is locked.
ERROR 9	Blast window expired.	Error message is displayed when user has not pressed the FIRE buttons within the 60 second blast window.

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7.3. BCU Error Display Per Channel

BCU ERROR DISPLAY	CAUSES OF ERRORS	REMEDIAL ACTIONS
SHORT	This is caused when at least one IO-channel has detected a short circuit on the respective IO-channel (Short in this case is defined as more than 30mA).	Check the blast cable for damage towards the face and also the harness wire and initiator connections.
HIGH CURRENT	This is caused when High Current is consumed and indicates a consumption in excess of 7mA on any IO-channel.	Check the blast cable for damage towards the face and also the harness wire and initiator connections.
HIGH LEAKAGE	This is caused when the blast cable is drawing more than 3mA of current leakage. High leakage may be detected on any IO-channel.	Check the blast cable for damage towards the face and also the harness wire and initiator connections.
DET INTERNAL ERROR	This is caused by a faulty Initiator. This Error occurs when any IO-channel detects that a detonator has an internal fault.	1. Identify the faulty initiator and replace with a functional unit. 2. Program un-programmed initiators. 3. Fix initiator using the Tagger.
UNTAGGED DET(S)	Untagged detonators on specific channel.	Untagged detonator(s) detected on the specific channel. Misfires will occur if the user does not correct the problem.
SPI BUS ERROR	The Serial Peripheral Interface bus is faulty. This means that logs cannot be stored in the non-volatile memory.	Reset the BCU and or return to factory if problem persists
I2C ERROR	The main processor was not able to communicate with at least one other device on the I2C bus.	Reset the BCU and or return to factory if problem persists
HARNESS BREAK	SmartShot Channel does not see an endplug, or DigiShot Underground channel found detonator count after LOCK that is different to detonator count before LOCK	Check the harness wire and blast cable connections; unlock the BCU to restart scanning and fix broken detonator connections, endplugs etc.
DET NOT TIMED	SmartShot detonator that has not been assigned a time by the Tagger	Isolate and time detonator or reapply the blast plan from the Tagger.

8   BLASTING

> ⚠️ **NOTE**
>
> **Grace time is standardised to 2 minutes minimum, regardless of the key used on the FIXED or PORTABLE BCUs. Users may order keys with longer grace times (Typically the ORANGE key as it does not include FIRE buttons), but not less than 2 minutes.**

If all channels were not locked and templates assigned at the time of inserting a Smart Key, the following screen will be displayed to notify user that some channels have not been locked or timed.

- Pressing **ENTER** will lock all untimed channels with a zero-det-count and will not blast them.
- The **Smart Key** will have to be removed in order to rectify the problem.
- If the channels displayed were locked and times were not assigned, the user will now have the opportunity to assign templates.

```
THE FOLLOWING CHANNELS ARE
NOT TIMED:

CHANNEL 2
CHANNEL 3
CHANNEL 4
CHANNEL 5


PRESS ENTER TO DISABLE NO-TIME
CHANNELS (WILL NOT BLAST)
OR REMOVE KEY TO CONTINUE.
```

In the event of a short-circuit, low blast voltage or high blast current, the BCU will flag an error screen that the user has to acknowledge before continuing the blast, or the key should be removed to rectify the error before attempting to blast again.

- Depending on the Blast Policy (see UTM-301 for setting the blast policy) the user will either be allowed to acknowledge the errors and continue blasting, or be required to remove the Smart Key and fix the problem before being able to blast.

```
                        ERROR
IO-CHANNEL ERROR


CHANNEL NUMBERS WITH ERRORS:
DISABLED       :  1
LOW VOLTAGE    :  2,3
HIGH CURRENT   :  4,6


PRESS ENTER TO CONTINUE
```

```
                        ERROR
BLASTING POLICY DOES NOT ALLOW
DISABLED CHANNELS ON BCU!


USER SHOULD CORRECT ERROR ON
DISABLED CHANNELS OR CHANGE
POLICY SETTINGS ACCORDINGLY!


CHANNEL NUMBERS WITH ERRORS:
DISABLED       :  1
LOW VOLTAGE    :  2,3
HIGH CURRENT   :  4,6


REMOVE SMARTKEY TO CONTINUE.
```

blast**web**

8.1. Local blast

A Local blast can be initiated by either a Red or Orange Smart Key as detailed below:

8.1.1. Using the RED Smart Key:

- When the **RED** Smart Key is inserted after BCU Channels have been locked, the user is prompted to enter a PIN and on acceptance the countdown starts and activates the SIREN and STROBE.
- LCD displays a status of AWAITING GRACE PERIOD.
- Once the Grace Period is complete, the BCU goes into a Programming window.
- LCD displays a status of LOCAL BLAST.
- BCU sends ARM command to all channels.
- BCU waits 30 seconds for all detonators to charge after which BCU displays FIRE buttons and requires the user to press both FIRE Soft Keys simultaneously within the 60 second blast window.
- If FIRE buttons are not pressed within the blast window, the BCU will go into an error state and will turn off high voltage.
- After the blast the BCU will return to test mode and create a blast report on the Surface Blast Controller.

⚠ **NOTE**	**The blast key should not be removed after the blast before the message the "Blast Report was reset" is displayed in the event log.**

8.1.2. Using the ORANGE Smart Key:

- When the **ORANGE** Smart Key is inserted after BCU Channels have been locked, the user is prompted to enter a PIN.
- The Orange Smart Key will initiate Local Blast sequence on acceptance of PIN.
- LCD displays a status of ORANGE KEY TIMED BLAST.
- LCD backlight will start flashing and siren tone will sound as blasting tone to draw attention that automatic firing capability has been initiated. (The flashing screen can be stopped by pressing ENTER)
- After the grace period, the Orange Smart Key will cause the BCU to Program, Arm and Fire without any further user input.
- After the blast, the BCU will return to test mode and create a blast report that is made available on the Surface Blast Controller.

⚠ **NOTE**	**The blast key should not be removed after the blast before the message the "Blast Report was reset" is displayed in the event log.**

blastweb

8.2. Centralised Blasting

- Insert a **YELLOW** Smart Key on completion of locking channels.
- The BCU will start counting down the specified grace window and activate the SIREN and STROBE.
- During the grace window the user must exit to a safe point; during this period the BCU does not accept commands from surface to blast. Once the grace window has expired the BCU allows remote blasting.
- When the grace period expires, the BCU will display READY TO ARM.
- When the ARM command from Surface Blast Controller is received by the BCU, the channels will be programmed and indicate READY TO BLAST.
- LCD displays a status of CENTRALISED BLAST.
- The BLAST command will be issued from the Surface Blast Controller.
- BCU status will change to BLASTING.
- After the blast the BCU will return to test mode and create a blast report on the Surface Blast Controller.

⚠️ **NOTE**	**The blast key should not be removed after the blast before the message the "Blast Report was reset" is displayed in the event log.**

8.3. Surface Lock Override

Should the DigiShot Underground™ BCU be locked (restricted from arming / blasting) from the Surface Blast Controller, the **BCU LOCKED FROM SURFACE** screen will be displayed when user inserts a Red or Orange SmartKey. Yellow Smartkeys will be allowed to be inserted – after BCU was locked for Blasting by performing the LOCK routine – either before or after the BCU was locked from Surface.

BCU LOCKED FROM SURFACE

BCU LOCKED FROM SURFACE CENTRAL BLAST CONTROLLER!

REMOVE KEY, WAIT FOR UNLOCK FROM SURFACE, WAIT FOR BCU TO COMPLETE SCANS AND THEN REINSERT KEY TO CONT. BLAST!

⚠️ **NOTE**	**Only in the event that communication between BCU and Surface Controller cannot be re-established and the BCU absolutely has to be blasted locally, refer to the BCU Debug document (UTM-00301) for detailed information to override the surface lock.**

9   RISKS

- Ensure that the armoured cables are properly earthed.
- Connect the supply voltage correctly.
- Ensure all Strobes and Sirens on the BCU, which form part of the blast warning system, are in working condition.
- Ensure all LED's are in working condition.
- Ensure the Backup Battery is kept in good condition and is regularly maintained. Regular testing is performed by switching the mains OFF for 20 minutes and observing whether the battery stores sufficient charge to power the system. Should it fail, replace the battery.
- Ensure all error codes are attended to before leaving the BCU.