

driftshot[®] ϕ

BCU DriftShot[®] Mode | UTM-00300 | Rev 11

SVN 36245 | 2019



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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.

1.1. Purpose of this manual

The purpose of this manual is to guide the user through the process of getting a FIXED BCU to scan for and blast detonators.



This manual is only to be used for the DriftShot® BCU System and the applicable software version as displayed.

1.2. End User

1.2.1. Requirements

- Only trained personnel, and personnel found competent, are allowed to operate the system.
- Users of the system shall be aware of the recommended procedures for using the DriftShot® 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.

1.3. Training

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



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

1.4. Information

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

2 DRIFTSHOT[®] BCU SYSTEM PRODUCT SAFETY



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.

- SmartKeys to remain in possession of the accountable person, and should only be used to complete the blast circuit 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. Transportation, Storage and Handling

DriftShot[®] BCU System 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.

2.4. 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.

2.5. Information in case of emergency

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

2.6. Warning, Caution, and Note Statements

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

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

2.7. RF compliance - FCC (USA) and ICES (Canada)

2.7.1. 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.*

2.7.2. 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.

2.7.3. 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.

2.7.4. 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

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

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

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

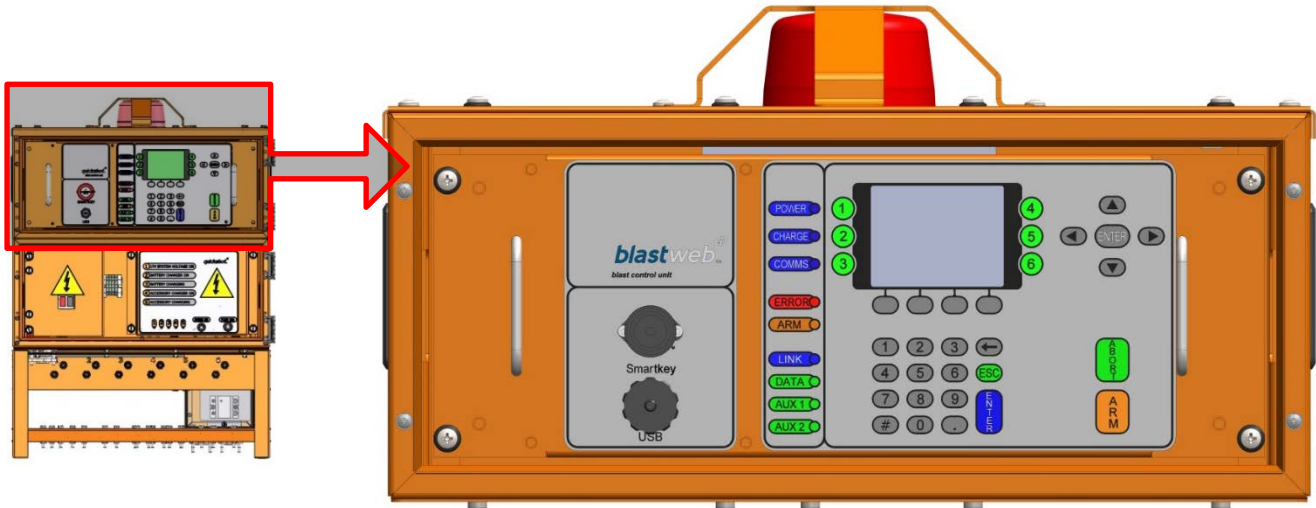
2.8. DISCLAIMER

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 DRIFTSHOT® BCU

3.1. General Description

The DriftShot® 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) DriftShot® detonators and DriftShot® Starter detonators.

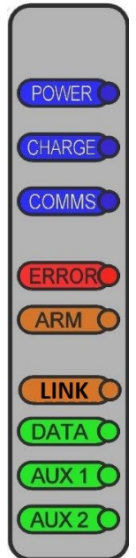


The total maximum of 200 detonators per channel could consist of 200 DriftShot detonators, or 150 DriftShot detonators and 50 Starter detonators, or any other combination of DriftShot and Starter detonators adding up to a total of 200 detonators. DriftShot Starters and DriftShot detonators may be connected on the same channel. SmartShot detonators may be connected to the BCU while in DriftShot mode; either by using a four-wire or two-wire Terminator and up to six String Starters (tagged as numbers 1-6). SmartShot detonators must be on a channel separate from the DriftShot® or Starter detonators.

3.2. Components

3.2.1. 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.
- Link LED - Orange LED indicates that an Ethernet connection is established.
- Data LED - Green LED flashes every time a data pack is received from the Ethernet network
- 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.

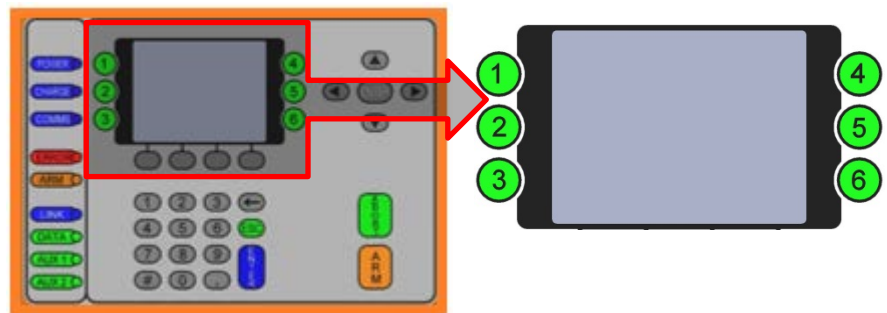


The Status LEDs as depicted in the illustration above displays the V3 BCU. On the V2 BCU, the position of the Link and Data LEDs are reversed.



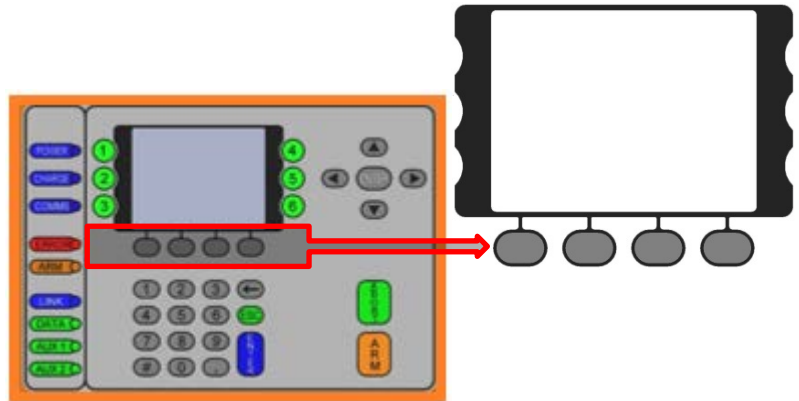
3.2.2. Channel Status LEDs

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.



3.2.3. Soft Keys

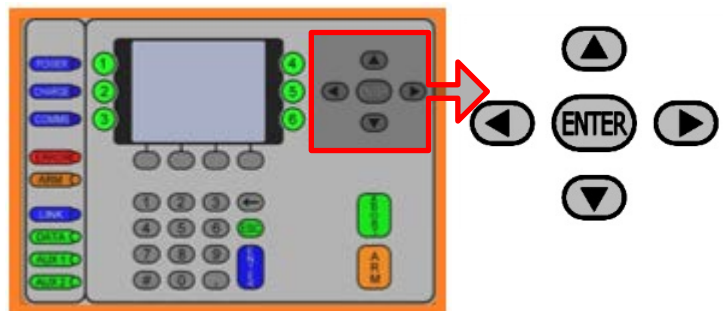
Soft key labels are displayed above the relevant Soft key. Each section will denote the specific Soft key to be pressed for certain functions. Looking at the HOME SCREEN the initial soft keys the user will see are:



- **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).
- **TIMES soft key (Soft key 2)** - depending on user permissions set, this key will only be available after BCU channel has completed two scans. When pressed, the user will be able to select the specific timing template(s) to be used either across all panels, or specify the template to be used for each individual panel.
- **DEBUG soft key (Soft key 3)** - only to be used by authorised personnel.
- **LOCK soft key (Soft key 4)** – press the LOCK soft key to lock in the number of detonators found on the harness. LOCK will ONLY be available after two good scans ON ALL CHANNELS and the user will thus be able to lock only after the GREEN channel LED on all connected channels are illuminated. A confirmation screen will be displayed after LOCK is pressed, to provide user with a summary of the detonator count per channel, and template setup (if applicable). User input for Confirmation Screen will be logged. Only SmartShot channels can be locked even when the GREEN LED is not lit. This is to make provision for “Low Talkers” where locking with an unavoidable “HARNESS BREAK” is required.

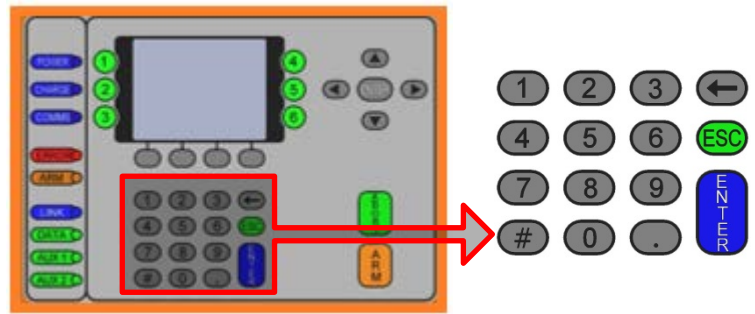
3.2.4. Arrow and Enter Keys

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, 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.



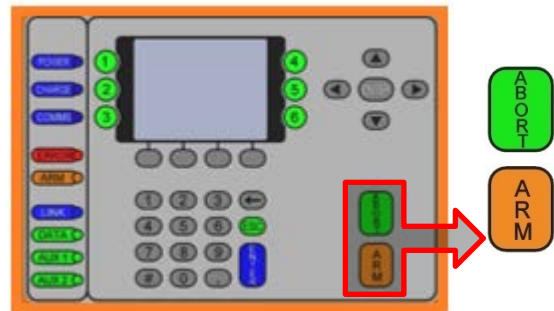
3.2.5. Numerical Key Pad


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.



3.2.6. 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 SmartKey when safety protocols permit.



	The arm key  is deactivated and not in use.
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3.3. SmartKeys

SmartKeys are used to authorise and initiate a blast.

	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.
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Three types of SmartKeys are available as detailed below.

3.3.1. Red SmartKey

Red SmartKey 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



3.3.2. Orange SmartKey



DUE TO THE AUTOMATIC INITIATION NATURE OF THE ORANGE KEY, THE USER MUST AT ALL TIMES BE AWARE OF THE CORRECT EVACUATION ROUTE FROM THE BCU TO A POINT OF PERSONNEL SAFETY WHEN HAVING TO MOVE AWAY FROM THE BCU BEFORE BLASTING.

The Orange SmartKey initiates Local Blasting and requires only a PIN after key is inserted. After a grace period, the Orange SmartKey will cause the BCU to Program, Arm and Fire without any further user input i.e. no Fire buttons appear.



3.3.3. Yellow SmartKey

The Yellow SmartKey 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.



4 OPERATION

4.1. Product Mode Selection

The mode will be displayed both on the BCU LCD screen as well as on the screen of the Surface Blast-Controller.

The product mode deployed must be selected on the BCU from the following list:

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



Should the BCU not be in the DriftShot mode, refer to the DriftShot BCU Debug document (UTM-301) for detailed information on how to select the DriftShot product mode. For detailed information on the QuickShot, SmartShot and DigiShot U/G modes refer to system specific documentation as this is not covered in this manual.

With the BCU in DriftShot® mode, detonators are allocated a location within a period. Period Timing templates are assigned to each channel. Each period fires at an absolute delay, and by using the Intra-det templates; the user can assign delays within a period.



USER MUST VERIFY THAT BCU ID, MAC ADDRESS, IP ADDRESS, BCU MODE AND TIMING TEMPLATES ARE CORRECT AFTER UPDATING BCU FIRMWARE. IN THE EVENT THAT RECOVERY FAILS, THE BCU WILL MOST LIKELY NOT BE ABLE TO COMMUNICATE WITH THE SURFACE CONTROLLER, IN WHICH CASE THE BCU WILL REQUIRE ITS SETTINGS TO BE PHYSICALLY RESET BY A USER AT THE BCU, OR REQUIRE THE USER TO RE-UPGRADE THE BCU FROM THE SBC.

4.2. View Main Menu

System parameters corrupt

- In the event that recovery of IP, MAC and ID fails, the BCU will most likely not be able to communicate with the surface controller, in which case the BCU will require its settings to be physically reset by user at the BCU, or require the user to re-upgrade the BCU from the SBC.
- Settings such as timing templates could be lost, and is a given when upgrading from a version older than 31934.

**SYSTEM PARAMETERS CORRUPT!
VERIFY ALL SYSTEMS SETTINGS
AND TEMPLATES BEFORE BLASTING !**

Attempted to recover these :

IP : 192 . 168 . 001 . 002

MAC : 123 . 085 . 086 . 087 . 088 . 089

BCU ID : 502

BCU Mode : DriftShot

Press ENTER to RESET and CONT.

R : 4

After a power cycle or software upgrade, the following flash screen will be displayed and will require the user to press ENTER to continue to the main menu screen.

DEFAULT SHUTDOWN/SCAN VALUES

**LOCKED SCAN INTERVAL SET TO
0 MINUTES**

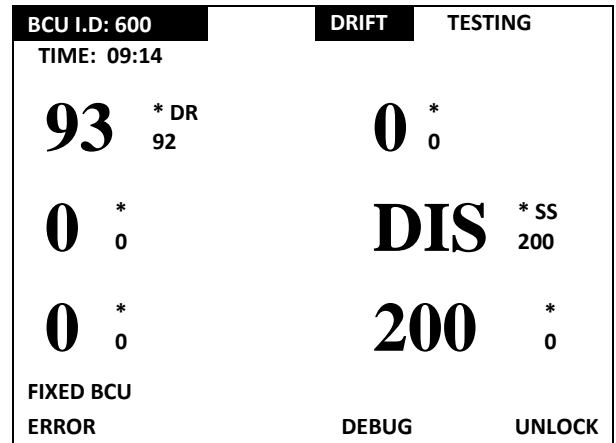
**PERIOD SKIP HOLE COUNT SET TO
20 HOLES**

PRESS ENTER TO CONTINUE .

R : 4

Main Menu will be displayed

- Refer to the table below for a short description of the fields as displayed on the Main Menu



DISPLAY	DESCRIPTION
BCU ID	DriftShot® FIXED BCU Identification number – 600 displayed in example
TIME	Local time - 09:14 displayed in example; updated to Surface Blast Controller time when connection is established
DRIFT	Product Mode - Indicates that BCU is in DriftShot 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
DIS	Indicating that a particular channel has been disabled and will not be blasted.
*DR	Denotes DriftShot detonators connected
*SS	Denotes SmartShot detonators connected
*	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
DEBUG	DEBUG Soft Key – Password Protected
UNLOCK	Press UNLOCK Soft Key to unlock found detonators after a complete scan, with all connected channel LEDs being ON

4.3. View IO Channel

Press the numerical key corresponding with the IO Channel Number to view the required channel. Channel offset is ONLY applicable to DriftShot channels. SmartShot channels do not make use of offsets.

IO – CHANNEL STATUS SCREEN			
Channel 1	*DR	OFFSET	1000ms
Design Dets		93	
Template:		PER = 0	DET = 0
Det Count:		93	
Current det:		5	
Error:		0	
Leakage / Current:		0.07 /	0.13 mA
Channel Voltage:		8.66 V	
T.Voltage / Count:		0.00 V /	-
Mode:		TESTING	
LIST	TIMES		EXIT

DISPLAY	DESCRIPTION
Channel 1	Selected Channel
Offset	Indicating Offset for selected Channel – Measured in milli-seconds. Only applicable to DriftShot Channels.
Design dets	Indicating the number of detonators the Channel was locked on.
Template	Indicating the Period 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/Current	Leakage and Current measurement on channel – Measured in milli-Ampere (mA)
Channel Voltage	Indicates the measured voltage for the particular channel
T.Voltage/Count	Terminator voltage (low voltage only) / Indicating the Terminator blast count.
Mode	Indicating current BCU mode - Idle, Testing, Arming, Blasting.

4.3.1. Soft keys

- **LIST** (Only available after first scan) – Activates a view of the firing time for detonator in the Detonator List.
- **TIMES** (Dependant on the set user permissions) – Provides the user access to the template selection for each channel.
- **EXIT** – Exit from current screen and returns to Main Menu.

4.4. View Period List

This function enables the user to view the period list and times at which the period will start firing. The user can drill down to see the detonator list for each non-empty period and each detonator's time within that period.

- From Main Menu press numerical key corresponding with required IO Channel Number.
- Press the **LIST** soft key to view the period list.

IO – CHANNEL STATUS SCREEN			
Channel 1	*DR	OFFSET	1000ms
Design Dets		93	
Template:		PER = 0	DET = 0
Det Count:		93	
Current det:		5	
Error:		0	
Leakage / Current:		0.07 /	0.13 mA
Channel Voltage:		8.66 V	
T.Voltage / Count:		0.00 V /	-
Mode:		TESTING	
LIST	TIMES		EXIT



LIMIT WARNING SCREEN

IF THE TIMES ARE EXCEEDED (OVER 20 000 MS), THE WARNING SCREEN IS DISPLAYED TO LOCATE THE PROBLEM IN DRIFTSHOT MODE.

ERROR! DET DELAY GREATER THAN 20 SECONDS!			
CHANNEL	=	1	
PERIOD	=	3	
DET# EXCEEDING	=	11	
CHANNEL OFFSET	=	18850 ms	
PERIOD 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

4.4.1. Period delays



- Use the keys to scroll line by line
- Using **PREV** or **NEXT** soft keys to page through the list.
- Press **ENTER** to display the allocated delays in the period according to the Intra-det times.

CHANNEL 1		Offset 4000ms
PERIOD	DET COUNT	DELAY
PERIOD 15 :	30	8000 *
PERIOD 16 :	10	8500
PERIOD 17 :	0	9000
PERIOD 18 :	0	9500
STARTER	0	0
PREV	NEXT	



An asterisk (*) indicates the selected period.

4.4.2. Intra-det delay



- Use the keys to scroll line by line
- Use **PREV** or **NEXT** soft keys to page through the list displayed.

CHANNEL 1			
PERIOD	DET	DELAY	TIME
PERIOD 15 :	1		8000 *
PERIOD 15 :	2		8010
PERIOD 15 :	3		8020
PERIOD 15 :	4		8030
PREV	NEXT		

4.5. Lock Design and Scan

Before a design is locked, the BCU will scan for all possible detonators connected per channel. This includes the scanning of SmartShot detonators on a separate channel where scanning will continue until an end-plug is detected. Once all connected detonators are found, the design must be locked.



THE DETONATORS, AS FOUND DURING THE SCAN AT THE TIME OF BEING LOCKED, WILL BE RESCANNED. ANY DETONATORS CONNECTED AFTER A DESIGN WAS LOCKED WILL BE IGNORED. SMARTSHOT CANNOT FOLLOW THE SAME LOCK-SCAN EXCLUSION AND WILL SCAN FROM START TO END-PLUG.

4.5.1. Display Main Menu

Press the **LOCK** soft key to lock the detonators found during the scan.

BCU I.D: 600	DRIFT	TESTING
TIME: 09:14		
93	0	
0	200	
0	0	
FIXED BCU		
ERROR	DEBUG	LOCK



IT IS EXTREMELY IMPORTANT THAT A DESIGN IS LOCKED ONLY WHEN ALL DETONATORS HAVE BEEN SUCCESSFULLY SCANNED.

- **DRIFTSHOT CHANNELS: ONLY THE LOCKED NUMBER OF DETONATORS WILL BE PROGRAMMED AND BLASTED.**
- **SMARTSHOT CHANNELS: WILL SCAN / PROGRAM ALL DETONATORS UP TO END-PLUG.**
- **A DESIGN INCLUDING SMARTSHOT DETONATORS CAN BE LOCKED WITHOUT THE USE OF AN END-PLUG THUS EFFECTIVELY LOCKING AND ACCEPTING THE HARNESS BREAK WARNING.**

4.5.2. Confirmation screen

- Press the **YES** soft key to lock.
- Press the **NO** soft key to rescan.
- Press the **ERROR** soft key to view the ERROR SCREEN when ERROR light is on.

An asterisk (*) is displayed to indicate the locked channels.

CONFIRMATION!!!				
CH	DETS	TYPE	PER/DET	LEAKAGE
1	93	DR	1/1	0.12mA
2	0		0/0	
3	0		0/0	
4	0		0/0	
5	200	SS-HB	-/-	0.12mA
6	0		0/0	

Press YES to confirm and LOCK
 Press NO to decline and RESCAN

ERROR YES NO

- SS-HB displayed under Type indicates a HARNESS BREAK indicating that SmartShot Channel will be locked with a reported Harness Break warning.
- While the Confirmation screen is displayed, the BCU will update the channel status until either YES or NO is selected.
- Should any change occur on the DriftShot channels, the YES soft key will be hidden and a Channel Status warning screen will be displayed. A new scan yielding the same results will be necessary before YES soft key will be displayed again, indicating permission to LOCK
- If further scans continue to show different detonator counts, with the 'YES' soft-key hidden the user will need to press 'NO' and force the BCU to reset channels and start a new scan, or proceed to the detonator panel to fix the problem.

BCU I.D: 600		DRIFT	TESTING
TIME: 09:14			
93	* DR 92	0	* 0
0	* 0	200	* SS 200
0	* 0	0	* 0
FIXED BCU		DEBUG	UNLOCK
ERROR			

Missing detonators and faulty harness connections are easily detected once a channel is locked. The locked channel will indicate the maximum detonator count it was locked on (Small font number) which may be compared to the actual detonator count (Large font number).

4.6. Unlock Design and Scan

To change a locked design, the user must unlock and rescan all connected detonators. The user shall use this option when adding or removing detonators from the detonator string.

4.6.1. Display Main Menu

- Press the **UNLOCK** soft key to unlock detonators.
- When no asterisk (*) is displayed, it indicates that the channel is unlocked.

BCU I.D: 600		DRIFT	TESTING
TIME: 09:14			
93	* DR 92	0	*
0	*	200	* SS 200
0	*	0	*
FIXED BCU		DEBUG	UNLOCK
ERROR			

- Channels have been reset to restart scanning.

BCU I.D: 600		DRIFT	TESTING
TIME: 09:14			
0		0	
0		0	
0		0	
FIXED BCU		DEBUG	
ERROR			

UNLOCKING THE CHANNELS WILL ERASE ALL SCANNED INFORMATION AND RESCAN ALL CHANNELS.

FIXED BCU: Will automatically unlock channels on power-up after complete power shut down.
The BCU will also unlock when a SmartKey is removed, either before or after a blast.
In the event of a bad power-cycle (power dip or bad battery) the channels will also be automatically unlocked on the next good start-up.

5 DEBUG

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

BCU I.D: 600	DRIFT	TESTING
TIME: 09:14		
93 * DR 93	0 *	
0 *	200 * SS	200
0 *	0 *	
FIXED BCU	DEBUG	UNLOCK
ERROR		



Refer to the DriftShot BCU Debug document – UTM-301 for detailed debugging information.

6.2. 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: <ul style="list-style-type: none"> • IO channels, • Powerlock (interlock processor), • Keypad, • Real Time Clock. 	This is an internal error within the UI. <ol style="list-style-type: none"> 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. <ol style="list-style-type: none"> 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. <ol style="list-style-type: none"> 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. <ol style="list-style-type: none"> 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 SmartKey. 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 SmartKey. <ol style="list-style-type: none"> 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 UP CONVERTER. 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. <ol style="list-style-type: none"> 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. <ol style="list-style-type: none"> 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.

BCU ERROR CODES	CAUSES OF ERRORS	REMEDIAL ACTIONS
ERROR 8 (Auto display)	BCU not locked. Automatically displays on the LCD screen once detected.	Error message is displayed when ANY SmartKey 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.

6.3. 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.	<ol style="list-style-type: none"> 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 DriftShot 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.
OPEN TERMINATOR	When only Terminators are connected with no dets connected to them, the ERROR screen will not display HARNESS BREAK, but will display OPEN TERMINATOR	NO Detonators connected – User to verify terminator open/Not
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.

7 BLASTING



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

7.1. Local blast

A Local blast can be initiated by either a Red or Orange SmartKey as detailed below. The errors below only apply to the red smartkey and the yellow smart key. However the BCU will not require the user to acknowledge errors when using the yellow smartkey. Such errors will have to be acknowledged on the SBC.

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.

```
ERROR

IO-CHANNEL ERROR

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

PRESS ENTER TO CONTINUE
```

- 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	
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.	

7.1.1. Using the RED SmartKey:

- When the RED SmartKey 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 indicates the LOCAL BLAST blasting mode.
- 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.

7.1.2. Using the ORANGE SmartKey:

- When the ORANGE SmartKey is inserted after BCU Channels have been locked, the user is prompted to enter a PIN.
- The Orange SmartKey will initiate Local Blast sequence on acceptance of PIN.
- LCD indicates the ORANGE KEY TIMED BLAST blasting mode.
- 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 SmartKey will cause the BCU to Program, Arm and Fire without any further user input.
- In the event of channels encountering an error that results in particular channels being disabled, the BCU will not halt for user acknowledgement as is the case with RED and YELLOW keys (YELLOW to require acknowledgement on Surface Blast Controller) and will continue blasting channels that were not disabled.
- After the blast, the BCU will return to test mode and create a blast report that is made available on the Surface Blast Controller.

7.2. Centralised Blasting

- Insert a YELLOW SmartKey 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.
- LCD indicates the CENTRALISED BLAST blasting mode.
- 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.
- 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.

7.3. Surface Lock Override

Should the DriftShot® 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.

<p>BCU LOCKED FROM SURFACE</p> <p>BCU LOCKED FROM SURFACE CENTRAL BLAST CONTROLLER !</p> <p>REMOVE KEY, WAIT FOR UNLOCK FROM SURFACE, WAIT FOR BCU TO COMPLETE SCANS AND THEN REINSERT KEY TO CONT. BLAST !</p>
--



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 DriftShot BCU Debug document (UTM-301) for detailed information to override the surface lock.

8 RISKS

- Ensure that the armoured cables are properly earthed.
- Connect the supply voltage correctly.
- Ensure all Strobes and Sirens on the BCU are in working condition, as this is part of the blast warning system.
- Ensure all LED's are in working condition.
- Ensure the Backup Battery is kept in good condition and is maintained regularly. Regular testing is performed by switching OFF the mains 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.

9 DRIFTSHOT® BCU SYSTEM LIMITS

Channels	6 individual IO channels.
Dets/Channel	<ul style="list-style-type: none"> • Each IO channel is connected through a Terminator to maximum 200 detonators. • DriftShot® detonators and a maximum of 50 DriftShot Starters may be connected to a channel simultaneously. • SmartShot detonators may be connected to the BCU while in DriftShot mode; either by using a four-wire Terminator or two-wire Terminator and up to six String Starters (tagged from 1 to 6). They should be on a channel separate from the DriftShot or Starter detonators
Power	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Centralised (Remote) blasting from Surface Blast Controller using Yellow SmartKey • Direct (Local) blasting initiated by either a Red or Orange SmartKey