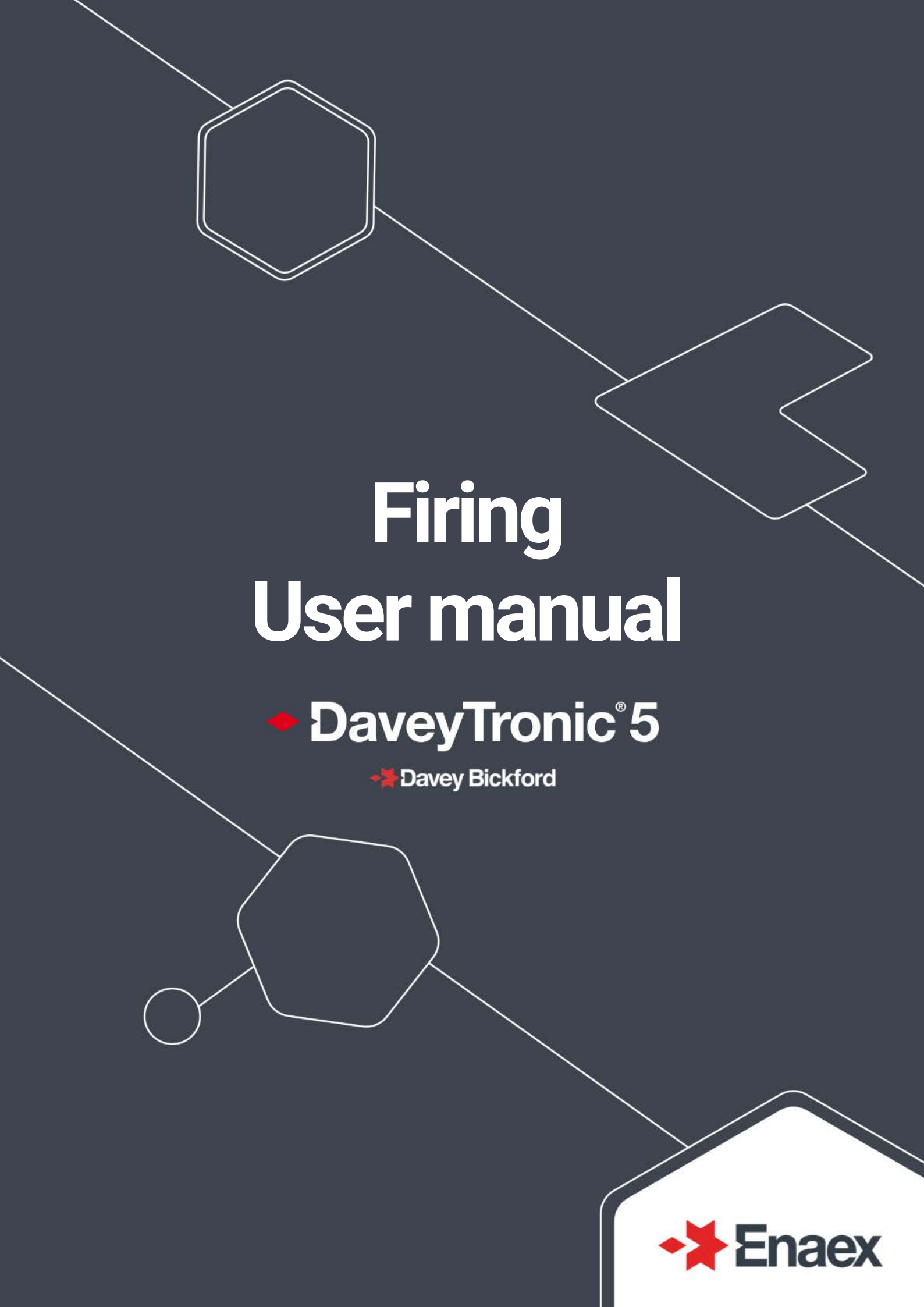




# Firing User manual

◆ DaveyTronic® 5

◆ Davey Bickford

◆ Enaex

|                |                |          |
|----------------|----------------|----------|
| System         | DaveyTronic® 5 |          |
| Language       | ENG            |          |
| Pack           | MVP 1.3.1      |          |
| Date           | 03/2024        |          |
| Revision       | 1              |          |
| Equipment      | Remote Blaster | BlastHub |
| User Interface | 1.24.3         | 1.7.1    |



Read this manual

**⚠ WARNING:** This user manual is for information only. The DaveyTronic® 5 system should only be used by personnel who have been trained and authorized to use this system.

## Content

|             |                                    |           |
|-------------|------------------------------------|-----------|
| <b>I.</b>   | <b>System overview</b>             | <b>4</b>  |
| A.          | Programming Unit (PU)              | 5         |
| B.          | BlastHub (BH)                      | 5         |
| 1.          | BH overview                        | 5         |
| 2.          | Getting started                    | 6         |
| 3.          | LED indicators                     | 6         |
| C.          | Remote Blaster (RB)                | 7         |
| D.          | DaveyTronic® 5 detonator           | 7         |
| E.          | DaveyTronic® software suite (DSS)  | 8         |
| <b>II.</b>  | <b>Remote Blaster</b>              | <b>8</b>  |
| A.          | Remote Blaster overview            | 8         |
| B.          | Getting started                    | 9         |
| 1.          | Turn ON/OFF                        | 9         |
| 2.          | Main environments                  | 9         |
| 3.          | Status indicators                  | 10        |
| C.          | Home                               | 11        |
| 1.          | Content                            | 11        |
| 2.          | Communication test                 | 11        |
| 3.          | Safety lockout                     | 12        |
| D.          | Monitoring                         | 12        |
| E.          | Blast                              | 13        |
| 1.          | Blast plan list                    | 13        |
| 2.          | Blast plan details                 | 13        |
| F.          | Settings                           | 14        |
| <b>III.</b> | <b>Firing</b>                      | <b>15</b> |
| A.          | Multiblast                         | 15        |
| 1.          | Blast set up                       | 15        |
| 2.          | Firing procedure                   | 15        |
| B.          | Synchroblast                       | 16        |
| <b>IV.</b>  | <b>Dealing with errors</b>         | <b>17</b> |
| A.          | System errors                      | 17        |
| B.          | BlastHub errors                    | 17        |
| C.          | Errors during the Firing procedure | 18        |
| 1.          | Special procedure                  | 18        |
| 2.          | Detonator defects                  | 18        |
| 3.          | Procedure errors                   | 20        |

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# I. System overview



DaveyTronic® 5  
detonator



PU



BlastHub



Remote Blaster



DaveyTronic® Software  
Suite

|                           |                                           |                  |
|---------------------------|-------------------------------------------|------------------|
| PROGRAMMING UNIT          | <b>Version</b>                            | <b>MVP 1.3.1</b> |
|                           | Type of product                           | DaveyTronic® 5   |
|                           | <b>Release</b>                            | Mar 2020         |
|                           |                                           |                  |
|                           | <b>System</b>                             |                  |
|                           | Languages                                 | ENG, PORT        |
|                           | DaveyTronic® 5 detonator ms delay         | 0 - 30 000 ms    |
|                           |                                           |                  |
|                           | <b>PU</b>                                 |                  |
|                           | <b>Programming</b>                        |                  |
|                           | Max number of dets per blast plan         | 1 000            |
|                           | Manual programming                        | ●                |
|                           | Auto programming                          | ●                |
|                           | GPS assisted auto programming             | ●                |
|                           | Easy blast plan import from DSS           | ●                |
| BLASTHUB - REMOTE BLASTER | Manual BPEX blast plan import from laptop | ●                |
|                           | Live line status during programming       | ○                |
|                           |                                           |                  |
|                           | <b>Toolbox</b>                            |                  |
|                           | Global test                               | ●                |
|                           | Read det                                  | ●                |
|                           | Count det                                 | ●                |
|                           | Average time to count 300 dets            | 3'00             |
|                           |                                           |                  |
|                           | <b>Firing capabilities</b>                |                  |
|                           | Wireless blasting                         | ●                |
|                           | Monoblast                                 | ●                |
|                           | Multiblast                                | ●                |
|                           | One-touch multiblast                      | ○                |
|                           | Synchroblast                              | ●                |
|                           | Max nbr of BlastHub per Synchroblast      | 2                |
|                           | Max nb of dets per BlastHub               | 2 000            |
|                           | Communication check test                  | ●                |
|                           | Safety Lockout                            | ●                |
|                           | Max number of blast plan in Multiblast    | 5                |
|                           | Max number of dets in Multiblast          | 10 000           |
|                           | Max number of repeaters per blast plan    | ○                |

## A. Programming Unit (PU)



The DaveyTronic® 5 Programming Unit (PU) allows to program up to 1 000 detonators per blast plan in either manual or auto mode.

## B. BlastHub (BH)

### 1. BH overview



The DaveyTronic® 5 BlastHub manages its physically connected detonator network. It is remotely controlled by the Remote Blaster during the **Firing procedure**. This equipment can be put either in **Monitoring** mode or act as a **Repeater**.

When in **Operational** mode during a **Firing procedure**, this unit executes entire internal detonator checks and provides both the necessary energy and firing commands necessary for the blast.

Each BlastHub can fire up to 2 000 detonators.

Note: When no blast plan has been associated with a BlastHub yet, its serial number serves as an identification. The number can be found on the unit label, located at the bottom of the device.

## 2. Getting started

### a) Turn ON/OFF

Press and hold the ON/OFF button for 4 seconds.

Note: The BlastHub forgets all the information previously transferred by the PU every time it is turned OFF. In case of mistake, simply turn it OFF and ON again to re-start fresh.

### b) Modes

The BlastHub can be put in 2 modes on the field:

- **Monitoring:** the unit will have a network of programmed detonators connected, will be put in **Ready** mode and will be able to participate to a **Firing procedure (Operational mode)**.
- **Repeater:** the unit will simply expand the wireless coverage between a BlastHub in **Monitoring** mode (so with a network of detonators connected) and a Remote Blaster. Only 1 BlastHub can be placed in repeater mode per Blast plan.

When turned on, the equipment is in **Monitoring** mode per default.

To switch between **Monitoring** and **Repeater** modes, double click on the ON/OFF key. The **Maintenance** mode is enabled by a triple click.

## 3. LED indicators

The BlastHub displays its status via colored LED indicators as presented below.

|                                                                                     |                                                                                                                                                                                                   |
|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <b>ON/OFF indicator</b>                                                                                                                                                                           |
|  | White slow flashing: the unit is turning ON.                                                                                                                                                      |
|  | White: the unit is ON.                                                                                                                                                                            |
|  | Red: error. The unit didn't pass the self-test, an error occurred while starting up. Restart the BlastHub and try again. If the issue persists, contact your Davey Bickford Enaex representative. |

|                                                                                     |                                 |
|-------------------------------------------------------------------------------------|---------------------------------|
|  | <b>Battery indicator</b>        |
|  | Green: good level of battery.   |
|  | Orange: low level of battery.   |
|  | Red: very low level of battery. |

|                                                                                     |                                                              |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------|
|  | <b>Mode indicator</b>                                        |
|  | Blue: Repeater mode.                                         |
|  | White: Monitoring mode.                                      |
|  | White slow flashing: device in pre or post operational mode. |

|                                                                                   |                                              |
|-----------------------------------------------------------------------------------|----------------------------------------------|
|  | <b>Mine communication indicator</b>          |
|  | Blue slow flashing: no PU paired.            |
|  | Blue: unit connected.                        |
|  | Red: connection failure. Check your network. |

#### Notes:

When the device is OFF, all LEDs will be OFF 

When charging, the battery LED will flash with its associated level color   

When the device is participating to a Firing Procedure, the front LEDs indicators (battery, mode and communication) will all display a red pulsing pattern 

## C. Remote Blaster (RB)



The DaveyTronic® 5 Remote Blaster allows to wirelessly control BlastHub(s) whether it's for communication tests or Firing procedures.

A set of RFID tags for Testing a Firing are provided with the Remote Blaster.

## D. DaveyTronic® 5 detonator



The DaveyTronic® 5 electronic detonator is fully programmable from 0 to 30 000 milliseconds (with programming steps of 0.1 ms).

Each unit is composed of a detonator shell (containing the electronic module, fusehead etc...), a wire and a connector.

The detonator connector is designed to be used with the DaveyLine wire. During connection it is important that the wire is placed flat into the connector and clipped in securely to ensure a good connection.

**⚠ WARNING:** The DaveyTronic® 5 detonators are made of a different technology than conventional electric detonators. They can only be used with dedicated equipment approved by Davey Bickford Enaex and cannot be initiated by or with any other initiation systems (conventional or else).

The DaveyTronic® 5 Programming Unit, BlastHub and Remote Blaster can only be used with DaveyTronic® 5 detonators and must never be connected to any other kind of detonator (conventional, from another manufacturer...).

An improper use of the system as described above can lead to misfires or unplanned initiation.

## E. DaveyTronic® software suite (DSS)



The DaveyTronic® Software Suite is a Windows compatible software allowing to create blast plans, manage equipment and RFID tags.

## II. Remote Blaster

### A. Remote Blaster overview





Note: The serial number serves as an identification of the Remote Blaster. It can be found on the unit label, located on the bottom edge of the device.

## B. Getting started

### 1. Turn ON/OFF

Press and hold the ON/OFF button for 1 second to turn the device ON. To turn it OFF, confirm the displayed warning modal after pressing the key.

### 2. Main environments

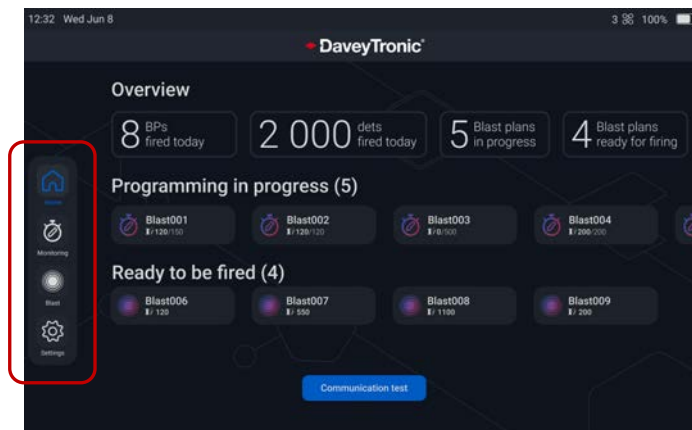
a) **Home** 🏠 allows for a complete overview of all the detected BlastHubs in range.

b) **Monitoring** 🕒 only displays the BlastHubs in non-operational mode for monitoring purposes. Those devices are not associated to a blast plan yet.

c) **Blast** 🎯 only displays the blast plans Ready to be fired and provides an access to the Firing procedure.

d) **Settings** ⚙️

The main environments of the Remote Blaster are accessible on the side navigation bar on the left side of the screen (as shown below).



### 3. Status indicators

#### a) Action trackers

Different icons are used as action trackers throughout the entire system. They should be understood as described below:

|  |                                                                                       |
|--|---------------------------------------------------------------------------------------|
|  | Pending: the system awaits a user action                                              |
|  | Waiting: this icon appears when an action or a lag of more than a few seconds occurs. |
|  | Valid: no issue occurred during the last action                                       |
|  | Warning: the system requires the user's attention or validation on a matter           |
|  | Error: the system has encountered an event that cannot be bypassed                    |

#### b) Wireless signal strength indicators

The wireless communication between the Remote Blaster and the BlastHubs (in monitoring or ready to be fired modes) is qualified with the following 5 signal strength indicators. They should be understood as described below:

|  |                                                                                                                                |
|--|--------------------------------------------------------------------------------------------------------------------------------|
|  | Excellent signal reception: strong and stable connection                                                                       |
|  | Good signal reception: slightly reduced but still reliable connection.                                                         |
|  | Poor and moderate signal reception: maintained connection with possible instances of slower speeds or potential interruptions. |
|  | Bad and weak signal reception: sporadic connectivity and slower data speeds.                                                   |
|  | No signal reception: inability to establish any connection.                                                                    |

### c) GPS signal indicators

The GPS signal indicators are used for the Safety Lockout and Synchroblast functionalities for both Remote Blaster and BlastHub. They should be understood as described below:

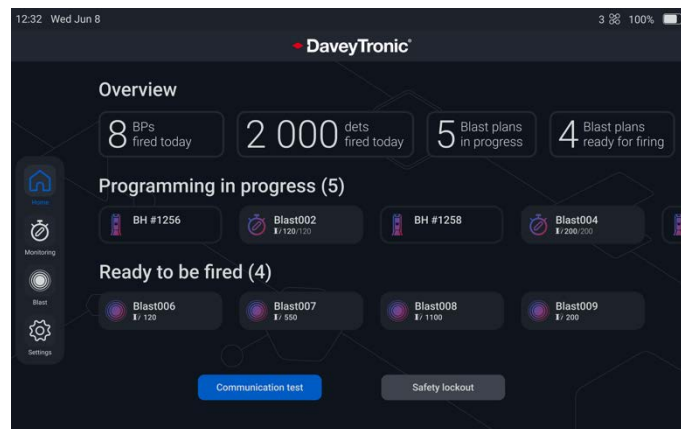
|   |                                                                    |
|---|--------------------------------------------------------------------|
| ✓ | Good signal reception, the dependent functionalities can be used.  |
| ✗ | No signal reception, the dependent functionalities cannot be used. |

## C. Home

### 1. Content

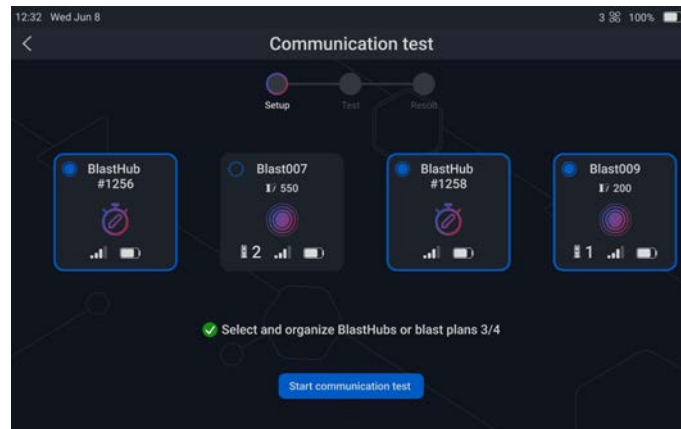
The **Home**  section offers a global view of all the equipment detected by the Remote Blaster according to their status: monitoring or ready to be fired. To view more details for each equipment, go to **Monitoring**  or **Blast**  according to their status.

**Home**  also provides an access to launch a **Communication test** and view the **Safety Lockout**.



## 2. Communication test

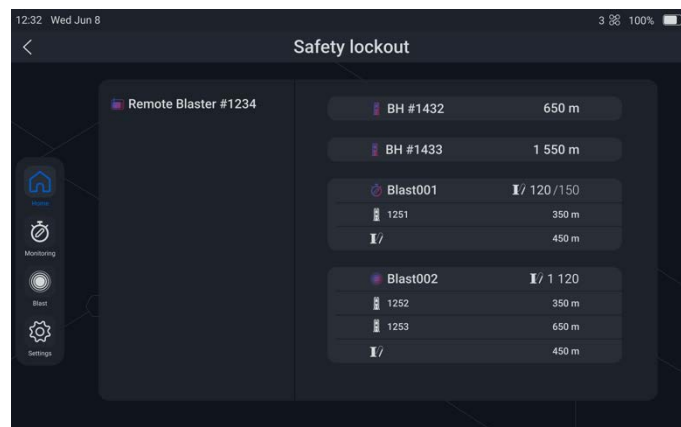
1. Go to **Home**  and tap **Communication test**.
2. All the equipment detected by the Remote Blaster are displayed. They can all be tested whether they are in Monitoring or Ready to be fired mode. To reorganize the blast plans or equipment, simply drag and drop them.
3. Tap the elements that will participate to the **Communication test** to select them. Once selected, a blast plan (or BlastHub) will be encircled in blue. To unselect it, tap it again. At least one element must be selected to enable the **Start communication test** button.
4. All blast plans or BlastHubs are tested simultaneously.
5. The results of the test are displayed.



### 3. Safety lockout

The Safety Lockout functionality displays for each detected blast plan (regardless of their mode) the distance between the Remote Blaster and:

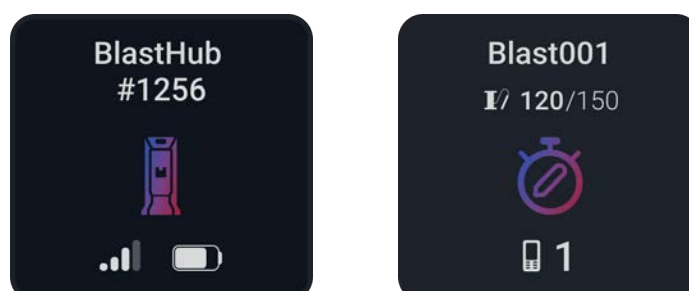
- The closest detonator (position defined by the PU during programming),
- The BlastHub,



Note: The distance between the Remote Blaster and the closest detonator of the bench can only be computed and displayed if Auto programming including GPS coordinates was used.

## D. Monitoring

The **Monitoring**  section contains the list of BlastHubs detected by the Remote Blaster in monitoring mode. Those BlastHubs either don't contain any programming data or are not in **Ready mode** thus cannot participate in a **Firing procedure**.



## E. Blast

### 1. Blast plan list

The **Blast** 📍 section contains the list of blast plans detected by the Remote Blaster in **Ready** mode. These blast plans (and their associated BHs) were locked on the field and are ready to participate in a **Firing procedure**.

All blast plans ready to be fired are represented as below:



Note: For a Synchroblast blast plan, the GPS indicator will also be displayed.

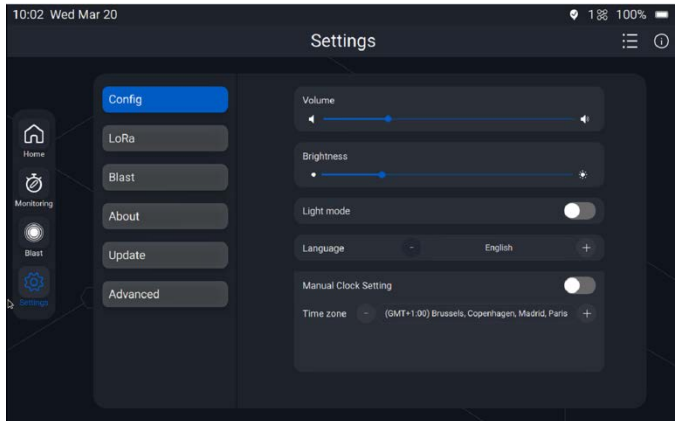
### 2. Blast plan details

Tap any blast plan card to access its details as in the example below:



## F. Settings

The **Settings** ⚙️ section is available through the side navigation bar. It offers an access to:



**Config:** Remote Blaster's display and alert settings.

**LoRa:** developer tool.

**Blast:** to set the device's safety distance (**Safety Lockout**).

**About:** view the software versions of the device and its serial number.

**Update:** to update the software and extract the logs of the device.

**Advanced:** to set the safety distance of the device.

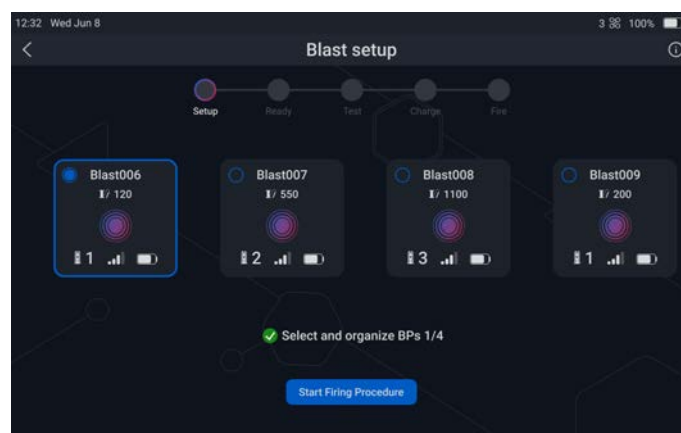
## III. Firing

### A. Multiblast

#### 1. Blast set up

1. Go to **Blast**  and tap **Blast set up**.
2. All the blast plans detected as **Ready to be fired** are displayed. To reorganize and order the blast plans, simply drag and drop them from left to right.
3. Tap the blast plans that must participate to the **Firing procedure** to select them. Once selected, the blast plans will be encircled in blue. To unselect one, tap it again.

At least one blast plan must be selected to enable the **Start firing procedure** button.



#### Notes:

The details of each selected blast plan are always accessible by tapping on **Information**  on the top navigation bar.

With this software version, only 1 blast plan can be selected to participate to a Firing procedure.

#### 2. Firing procedure

**⚠ WARNING:** Always ensure that the site has been fully evacuated before starting a Firing procedure according to the applicable local laws, regulations, and procedures.

1. Tag the **Testing card** to validate the blast sequence and start the **Firing procedure**. Upon validation of the card, the **Start test and charge** button is enabled, the BlastHubs are switched to **Operational** mode.
2. Tap **Start test and charge**. All blast plans are tested and charged altogether at the same time. The Remote Blaster transmits the test and charge commands to all the BlastHubs which will execute them on the lines of detonators.
3. Upon validation of a successful test and charge, the 9 minutes time window of authorization to fire starts counting down. All the selected blast plans must be fired within this time window or the **Firing procedure** will be aborted.
4. Tag the **Firing card** to authorize the blast.

5. By default, the first blast plan is selected. To unselect it, tap it.
6. Press and hold both **Firing keys**  for 2 seconds to initiate the selected blast plan.
7. The BlastHub transmits the encrypted firing commands to the connected detonators, the blast is initiated.
8. The list of the next available blast plans is displayed, tap to select one of them. The last fired blast plan appears as disabled.
9. This process is repeated until all the blast plans have been fired.



#### Notes:

**Abort**  on the top navigation bar remains accessible during the procedure until the **Firing keys**  have been both pressed and held for 2 seconds.

If the procedure is aborted, the system will revert to the **Blast set up**. The configuration will be saved but all tests within the **Firing procedure** will need to be authorized and run again.

## B. Synchroblast



A Synchroblast is a blast plan split on 2 BlastHubs. It can be fired as any blast plan by being selected during the **Blast Setup**. Having a positive GPS signal indicator is mandatory to participate in a **Firing Procedure**.

Note: to learn about the conditions and how to set a Synchroblast, please refer to the Programming user manual.

## IV. Dealing with errors

### A. System errors

| Error name                                                                                      | Cause                                                                                                                                | Resolution                                                                                                 |
|-------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|
| Remote Blaster malfunction                                                                      | A hardware problem has caused the Remote Blaster to stop working correctly.<br><br>A disconnection of the add-on could be the cause. | Restart the Remote Blaster and try again.<br><br>If the issue persists, contact your Enaex representative. |
|  No GPS signal | The Remote Blaster cannot retrieve the GPS coordinates.                                                                              |                                                                                                            |

### B. BlastHub errors

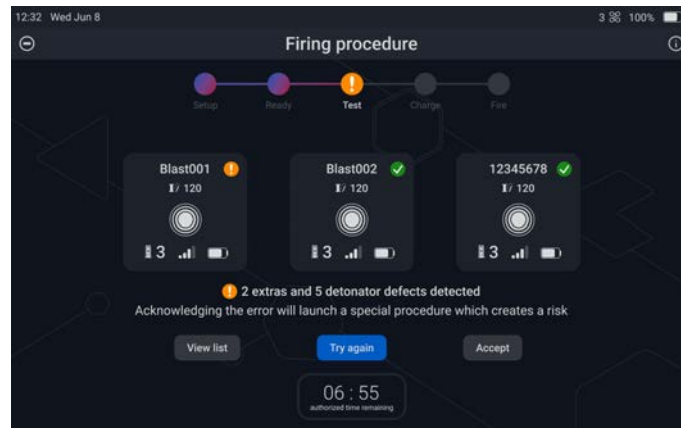
Note: see the related section [here](#) for more information regarding the wireless signal strength indicators.

| Error name                                                                                                   | Cause                                                             | Resolution                                                                                                                                                                                                                                          |
|--------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <br>BlastHub disconnected | The Remote Blaster has lost the connection to the BlastHub.       | Make sure that no obstacles have appeared between the BlastHub and the Remote Blaster.<br><br>Restart the Remote Blaster and try again.<br><br>Restart the BlastHub and try again.<br><br>If the issue persists, contact your Enaex representative. |
| Incompatible BlastHub software                                                                               | The BlastHub's software isn't compatible with the Remote Blaster. | A compatible software version must be installed on the BlastHub in order to be used with this Remote Blaster.                                                                                                                                       |

## C. Errors during the Firing procedure

### 1. Special procedure

If detonator errors are discovered during the **Test** and **Charge** steps of the **Firing procedure**, they will be displayed as below:



The following options are available:

- **View list** offers details to locate the errors and better assess their importance.
- **Try again** will re-launch the **Test** and **Charge** of the blast plan.
- **Accept** will launch a **Special procedure**.

Selecting **Special procedure** allows the **Firing procedure** to carry on despite the errors detected on the line, they are in no way corrected.

**! WARNING:** If more than:

- 10 extra detonators (programmed or not),
- Or 30 detonator defects (low firing energy, no dialogue...),

are detected, the Firing procedure will need to be aborted.

The errors, their potential risks or consequences must be assessed by the Blaster according to the applicable rules.

### 2. Detonator defects

**! WARNING:** A Special procedure can be launched to bypass these detonator defects, providing that the number of errors is within the authorized threshold.

Firing despite having detonator errors on the line will impact the results of the blast. Depending on the nature of the fault it can lead to potential misfire or an incorrect firing delay. These detonators must be treated as defective according to the applicable rules.

| Error name | Cause                                                                  | Resolution & impact                                                                                                                                                                          |
|------------|------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Missing    | The detonator is not responding. It is either missing or misconnected. | Abort the procedure, turn off the BlastHub, disconnect the firing line, identify the detonator, and disconnect it. Treat the detonator as defective in accordance with the applicable rules. |

|                         |                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                         |                                                                                                                                                                                                                                                                                             | If this detonator is given a firing order, it will be a potential misfire and must be reported as such.                                                                                                                                                                                                                                                                                                                                               |
| Low accuracy delay      | Inaccurate detonator delay.<br><br>The detonator's calibration failed or the detonator is defective.                                                                                                                                                                                        | Restart the procedure, if the same error happens, disconnect the detonator, and treat the detonator as defective in accordance with applicable rules.<br><br>If this detonator is given a firing order, it will be initiated but the firing time will be incorrect.                                                                                                                                                                                   |
| Out of order            | The detonator is properly connected but its firing circuit is defective.                                                                                                                                                                                                                    | Treat the detonator as defective, in accordance with applicable rules.<br><br>If this detonator is given a firing order, it will be a potential misfire and must be reported as such.                                                                                                                                                                                                                                                                 |
| Intermittent connection | A poor intermittent connection has been detected for this detonator.<br><br>A line cut could cause this defect.                                                                                                                                                                             | If this detonator is given a firing order, it will be a potential misfire and must be reported as such.                                                                                                                                                                                                                                                                                                                                               |
| Incoherent answer       | Faulty detonator communication.<br><br>The BlastHub is receiving a response from the detonator but cannot understand it.<br><br>A bad communication due to current leakage can be affecting the communication with the line or the detonator.<br><br>The detonator could also be defective. | Identify if the cause of the error is current leakage or a defective detonator.<br><br>If current leakage is the issue, locate the origin of the problem and reduce it.<br><br>If the detonator is defective, disconnect the detonator from the line and replace it. Treat this unit as defective in accordance with applicable rules.<br><br>If this detonator is given a firing order, it will be a potential misfire and must be reported as such. |
| Firing energy low       | The detonator has a defect in its firing circuit and cannot store the energy required for safe firing within the 30 000 ms range.                                                                                                                                                           | If this detonator is given a firing order, it will be a potential misfire and must be reported as such.                                                                                                                                                                                                                                                                                                                                               |
| Extra detonator         | An unplanned detonator either programmed for another blast or unprogrammed has been detected on the line.                                                                                                                                                                                   | Abort the procedure, turn off the BlastHub, disconnect the firing line, identify the detonator and either disconnect or (re-) program it.<br><br>If a Special procedure is launched the extra detonators (programmed or not) will be timed as follows:<br><br>Maximum blast plan delay + discovering order of the extra detonator x 19 ms.                                                                                                            |

|  |  |                                                                                                                                                                                                                                                                                                                                                   |
|--|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  |  | <p><u>Example:</u></p> <p>Extra det n°1 = (max ms delay) + 1 x 19 ms;<br/>         Extra det n°2 = (max ms delay) + 2 x 19 ms;<br/>         Extra det n°3 = (max ms delay) + 3 x 19 ms;<br/>         etc...</p> <p>All calculated delays exceeding the maximum timing capability of the detonator will all be fired at its limit (30 000 ms).</p> |
|--|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### 3. Procedure errors

| Error name                               | Cause                                                                                                                                       | Resolution                                                                                                                                                                |
|------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| BlastHub didn't switch to firing channel | One or several of the BlastHubs selected during the Blast setup couldn't switch to operational mode to participate to the Firing procedure. | <p>Retry to launch a Firing procedure.</p> <p>Restart the Remote Blaster and BlastHub and try again.</p> <p>If the issue persists, contact your Enaex representative.</p> |
| Invalid Testing card                     | <p>This RFID card isn't the right one.</p> <p>This card is known by the system but not for this action.</p>                                 | Please tag the paired Testing card.                                                                                                                                       |
| Invalid Firing card                      | <p>This RFID card isn't the right one.</p> <p>This card is known by the system but not for this action.</p>                                 | Please tag the paired Firing card.                                                                                                                                        |
| Firing authorization expired             | The procedure has been aborted as the 9 minutes countdown has expired.                                                                      | Restart a Firing Procedure with the blast plans that weren't fired.                                                                                                       |

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[www.daveybickford.com](http://www.daveybickford.com)

Mining Quarrying Construction

Seismic Exploration

Customer Support

[customersupport@daveybickfordenaex.com](mailto:customersupport@daveybickfordenaex.com)

T +33 (0)3 86 47 30 00

## CONTACT US

<https://www.enaex.com/>

and click contact us

