BREENA FIRING SYSTEMS

SEQUENCER S 20
V 2.6.0

User Manual

EN 61210 - 2010
EN 61204 - 1995
EN 60999-22003

LVD 2014/35/CE

This sequencer BFS S 20 respects all specifications required by:

LVD 2014/35/CE

and following:

EN 61210 - 2010
EN 61204 - 1995
EN 60999-22003

Material and construction:

ISO1183, ISO62, D3363, ASTM D1003, ASTM D1925, ASTM D542A, ISO527, ISO75, ASTM 1525-00, IEC 60243, IEC 60250, IEC 6093.

And conform for electronic components at:

2002/95/CE - 2003/11/CE (RoHs)

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Dear Customer, thank you for buying our products for your valuable work.
The sequencer BFS S-20, is the most advanced tool on the market, that allows you to multiply the firing cues of any firing system, simply connecting it with an electrical wire (telephone wire or ribbon) to any cues of your firing system , and activating it with the electrical impulse (trigger In) coming from it.

S 20 is compatible with 99% of the firing systems avaible on the market; this peculiar characteristic, which makes it extremely useful, is realized with the chance to set the voltage threshold value of the trigger input channel, to a value equivalent to your firing systems output voltage cues.
This calibration is performed by Breena Fireworks before shipping.

20 S is powered by a removable and rechargeable lithium polymer battery, 12V and 4800mah.

S 20 is built with a steel case, and a front panel covered by Lexan (3M) mask.

S 20 is designed, engineered and manufactured in Italy, in compliance with the highest standards of quality and safety, in compliance with CE and RoHs certifications.

For any information, you can contact us, by using the email address: breenafireworks@gmail.com, or by calling +393391572365 or alternatively, to +393476207486.

a) SEQUENCER FUNCTIONS

BASIC FUNCTIONS

The sequencer 20 BFS let you perform:

- Accelerated sequential programs
- Decelerated sequential programs
- Constant sequential programs (up to 20 lines / sec)
- Manual programs or scripted programs (specific fire time for each cue)
- Multi sequential programs
- Semi-programmed sequentials (1or more programs / pulse)
- Fire in STEP mode (1line / pulse)
- Fire in STEP mode using 2 or more modules

ADVANCED FEATURES

Master / Slave (up to 4 modules in one)

TEST FUNCTIONS AND CONTROL

BFS S 20 enables the following:

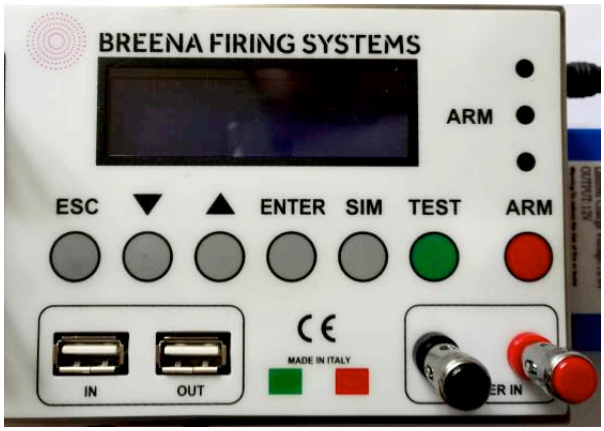
Continuity TEST of firing cues
Simulation of saved programs
Remote Trigger TEST (recognizing of S 20 from your firing system)
Check for fired cues (after the show)

b) GENERAL APPEARANCE OF THE SEQUENCER

ON indicator Led

Cues area:
a) the firing cue terminals
b) LEDs of the firing cues

Keypad for programming:
a) ESC key
b) Down Key
c) UP Key
d) ENTER key
e) SIM key
f) TEST key
g) ARM key

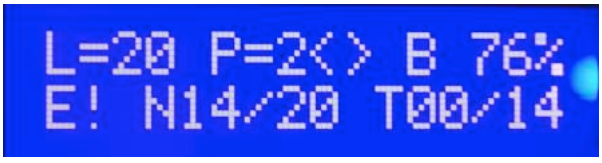


ARM indicator Led
USB in/out (for Master / Slave function)
Trigger IN connector
Battery connector IN
Battery compartment
USB caps

c) DISPLAY

HOME DISPLAY INFORMATIONS

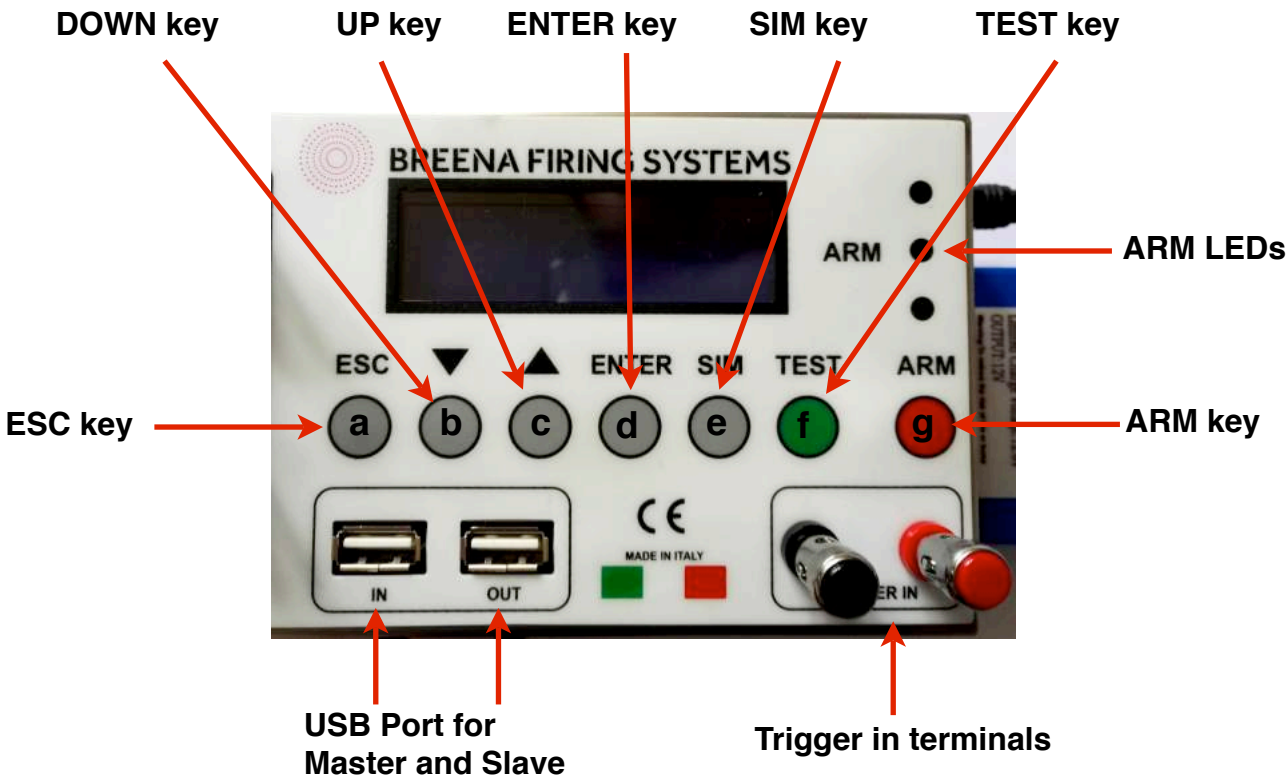
Number of programmable cues
Number of saved programs
Battery level
Continuity TEST cues
required cues / total cues
found cues / required cues

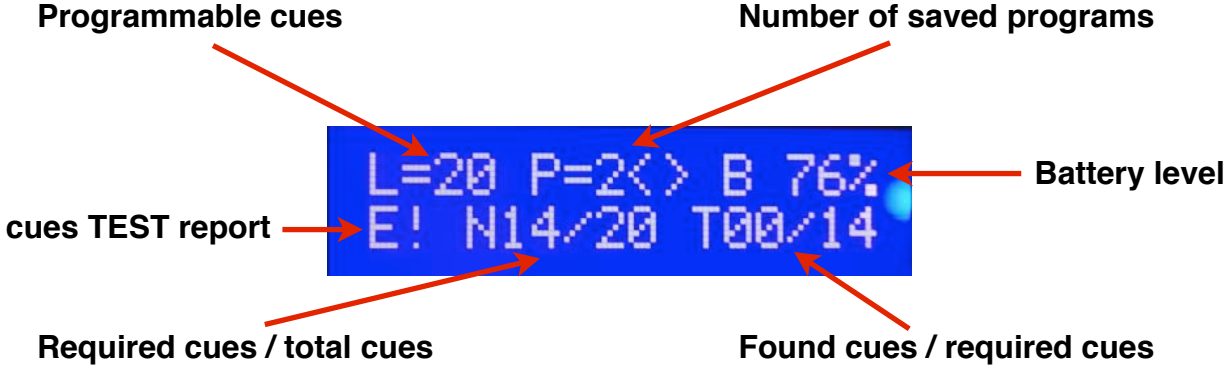


d) POWER SUPPLY

The BFS S sequencer 20 is powered by a rechargeable lithium polymer battery with 12V 4800 Mah.
The battery is sold separately, with manufacturer's specifications.
The battery is removable,to assure the total exclusion of electrical sources inside the sequencer when you transport it .
For battery usage, please see chapter 2 of this manual.
For more details on the features, see the specifications sheet, provided by the manufacturer, included in the package.


Power Connector
Battery slot


DOWN key
UP key
ENTER key
SIM key
TEST key
BREENA FIRING SYSTEMS
ARM
ARM LEDs
ESC
ENTER
SIM
TEST
ARM
ESC key
a
b
c
d
e
f
g
ARM key
IN
OUT
MADE IN ITALY
USB Port for
Master and Slave
Trigger in terminals


Programmable cues
Number of saved programs
L=20 P=2<> B 76%
E! N14/20 T00/14
Battery level
cues TEST report
Required cues / total cues
Found cues / required cues

2) Battery description and use

a) battery description
b) how to turn on the battery
c) how to connect the battery
d) how to re-charge the battery

Battery description

1) Power Switch
2) Power Led indicator
3) Power cable
4) Charging cable
5) Battery Charger
6) Battery specifications

The BFS S sequencer S 20 is powered by a rechargeable lithium polymer battery with 12V 4800 Mah.
The battery is sold separately, with the manufacturer's specifications.
The battery has 2 cables in its upper part; the power cable, you need to insert into the S20 connector, and the charging cable, to be used to recharge the battery.

How to turn on the battery

The battery is activated by turning ON the power switch and verifying that the corresponding red LED lights up; the red LED light indicates that the battery is activated.
To turn off the battery, place the power switch to OFF position and check the red LED light off.

How to connect the battery to the BFS S 20 module

To connect the battery to the sequencer BFS S 20, plug the power cable of the battery into the sequencer power connector.

How to re-charge the battery

To recharge the battery, observe the following steps:

1) connect the charging cable to the charger supplied;
2) activate the battery by placing the switch to ON (the red LED battery lights will turn on);
3) connect the charger to the electrical outlet (the led of the charger will turn red);
4) Wait until the end of the charging process (green LED on the battery charger);
5) Remove the battery from the charger and turn it off (switch OFF)

Warning! Do not recharge the battery if it is still connected to the sequencer !!!

The charging process can take up to 5 hours (depending on the remaining battery level); at the end of the charging process, the Power LED will turn green to indicate the full battery charge.
During the charging process, a special protection circuit will continuously monitor the correct progress of the procedure, avoiding overheating.
For all the relevant details, please refer to the warnings on the information of manufacturer, you find in the battery pack.

3) Switching the S 20 sequencer

a) Turn on the S 20 module
b) boot control and software version
c) check battery level

Turn on the S 20 Module

To turn on the sequencer BFS S 20, proceed as follow:

1) Connect the battery using the power cable and plugging it into the sequencer power connector
2) Turn on the battery, by turning ON the switch
3) Make sure that the 3 blue LEDs turn on and the sequencer executes the boot (see below)

Boot control and software version

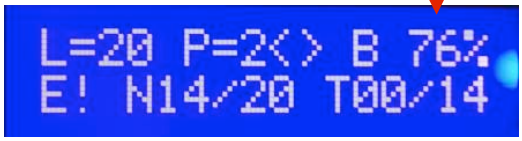
On power-up, the module performs a quick check of the entire system (Boot), showing "Breena Fir. Sys. BFS 20," and a V.xx number, which indicates the software version installed on the sequencer (es.V 1.0). The process takes about 8 seconds, then the sequencer positions itself in the Home mode.

Check battery level

We suggest to perform a check of battery level, after switching on the module; to do this, wait until the module places in HOME mode, then read the battery level shown on the screen (top right).
The indicator of the battery level, provides a value in% of the remaining charge; 100% means fully charged battery, while values close to zero (40% or less), indicating that the module is near to go off.
It is recommended to recharge the battery when the level falls below 45%.
To recharge the battery, see the instructions provided in this guide in chapter n° 2.
Warning! Do not recharge the battery if it is still connected to the sequencer !!!

Software version

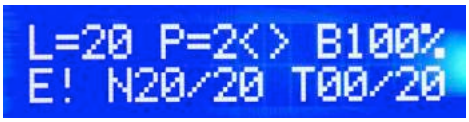
Battery level



4) Initial Settings

a) Home display informations (home screen position)
b) Set up S 20 as MASTER (for first use)
c) Set up S 20 as SLAVE
d) Set Language

Home display informations (home screen position)



On power-up, the module performs a quick check of the entire system (Boot)
The process takes about 8 seconds, then the sequencer places in the Home mode.
The HOME mode is the default mode, in which the sequencer places every time you turn it on.
From this location, you can access to the BFS 20 main menu (programming, testing, simulation), or arming the sequencer to the shot.

In the HOME mode, the screen is positioned in home position, and shows different informations:

number of programmable cues (20 default)
number of saved programs (0 if not saved, or if you are swiching it for the first time)
battery level
Cues continuity Test (E!, if not executed)
required cues / total cues (depending on the saved programs)
found cues / required cues (after the test)

Number of programmable lines - L = xx (20 by default) are the overall cues of the sequencer,i.e 20; they may be increased up to 80 cues in Master / Slave mode, when you can "unite" up to 4 modules in one, and creating a single sequencer with 80 firing cues (see Master / Slave mode chapter).

Number of saved programs - P = xx (Max 10)
In this position the display indicates the number of programs stored in the sequencer memory; you can store up to 10 different programs. At first swiching of S 20, this value will be zero; the S 20 comes to you without any saved program inside.
Stored programs keep in S 20 memory even if the module is turned off or the battery removed.

Battery level - B xx%
The indicator of the battery level, provides a value in% of the remaining charge; 100% means fully charged battery, and values close to zero (40% or less), indicate that the module is near to swich off. (recharge or change battery!)

Cue continuity Test – (E!, OK)
This indicator shows the outcome of the cues TEST ; OK if test is positive, or E! if the test detects igniters not connected or missing. When you turn on the sequencer, this indicator will always indicate E !; that to suggest you, every time you turn the S 20, to perform the TEST of firing cues.

required cues / all cues - Nxx / yy

This indicator gives the number of cues required and programmed by the saved programs, compared with total available cues; for example, 12/20, means that to run all the programs saved inside the sequencer, 12 cues are required on the 20 total available.
If any program saved, this indicator will provide the value: 0/20.
In the Master / Slave mode, this indicator could be increased with steps of 20 cues, up to the maximum value of XX / 80.

Found cues / required cues - Txx / yy

This indicator, integrated to the TEST function, provides the number of connected cues and detected by TEST (igniters connected), compared with those requested by the saved programs. If the TEST is OK (all igniters connected), the indicator must show identical numbers (eg 10/10 or 14/14). If the TEST is E !, that means that some igniters are not connected or are missing; in this case, the reported numbers will be different (eg 8/10 or 19/20). If any program saved, this values will always be "0/0". When you swich on the sequencer, just like the TEST outcome indicator, this indicator gives an incorrect result (0 / xx) because you must run the TEST every time you turn on the sequencer. This helps you to remind this.

Set up S 20 as Master

This step is preformed by Breena Fireworks at the time of preparing modules before shipping. However, in order to understand and learn how to use the Master / Slave function (see Master / Slave chapter), we suggest you to perform this simple step when you swich on the sequencer for the first time.
The unit always comes to you as setted as master, which allows you to use at 100% of its functions. The sequencer is always used in the Master mode, unless you want to connect together several modules in one: in this case, the first module will be Master, and the other modules will be setted as slave.
If the module is setted as Slave mode, the 99% of his functions are disabled; it can only fire cues.
To set the sequencer as Master, performing the following steps:

- From the HOME screen position:

Press ENTER,
With the UP / DOWN keys search for "Mode"
With the UP / DOWN keys, select "Master"
Press ENTER
In "Slaves Connect", select 00 (no slave is connected)
Press ENTER
Press ESC, and the sequencer will return to the HOME screen position.

ENTER → Mode → Master → ENTER → Slave Connected → 00 →

ENTER → ESC

Set up S 20 as slave

To set the sequencer as a slave, see chapter 12 of this manual.

Set Language (from Italian to English)

To set the language of BFS dispay, please following the procedure written below.

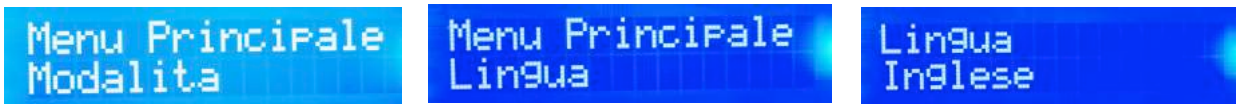
From Home Screen position :

1) ENTER (to enter in the Main menù);
2) With UP and DOWN key, search for " Lingua " ;
3) ENTER;
4) With UP and DOWN key, search for " Inglese ";
5) ENTER to confirm.

Now the display will place in the Main Menù; to go back into the Home Screen Position, please press ESC key.

Now the sequencer is set into English Language.

ENTER → " Lingua " → ENTER → Italiano / Inglese → ENTER



Set Language (from English to Italian)

To set the language of BFS dispay, please following the procedure written below.

From Home Screen position :

1) ENTER (to enter in the Main menù);
2) With UP and DOWN key, search for " Language " ;
3) ENTER;
4) With UP and DOWN key, search for " Italian ";
5) ENTER to confirm.

Now the display will place in the Main Menù; to go back into the Home Screen Position, please press ESC key.

Now the sequencer is set into Italian Language.

ENTER → " Language " → ENTER → Italian / English → ENTER

5) Description of programs

a) Program types (ACC / DEC / COST)
b) Number of Trigger (Tg)
c) Clock Function
d) Multi-Sequential Function

Program types (ACC / DEC / COST / MAN)

The sequencer BFS S 20, allows you to create 4 different program types:

1) Constant sequential programs (COST)
2) Accelerated sequential programs (ACC)
3) Decelerated sequential programs (DEC)
4) Manual programs (or scripted programs) (MAN)

a) Sequential programs with constant time: are those programs which the time between each firing cue is always constant; for example, 10 firing cues, in which interval between each cue is always the same. (10 firing cues, 1 sec between each cue)

b) accelerated sequential programs: are those programs which the time between each cue is getting shorter; for example, 10 firing cues, in which the time interval between each line is always shorter than the previous cue. Thus the sequence increases in speed as the program runs.

c) Sequential Programs decelerated: are those programs which the time between each cue is always longer; for example, 10 firing cues, in which the time interval between each line is always longer than the previous cue. Thus the sequence, decreases in speed as the program runs.

d) Manual programs: are all those scripted programs implemented by assigning for each cue a specific time; you can use it to realize also long scripted shows that can accompany pyro-musical performances, or multi-fire positions sequential with special effects.

These programs are setted using the keys on the frontal panel of sequencer, and you can save to a maximum of 10 programs inside the S 20 memory.
So you can save up to 10 program and fire them in various way.

Number of Trigger

Number of Trigger: what is it, how it works

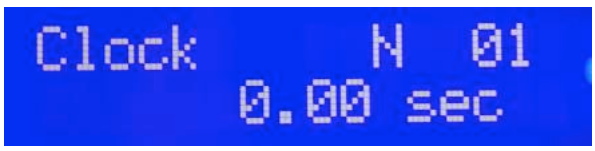
Every program setted on the sequencer, is activated by an external pulse from any firing system. Such external pulse, comes by the electrical connection realized (with a twisted pair cable or a strip) between the firing cue of your firing system, and the Trigger In terminal of BFS S 20 sequencer.

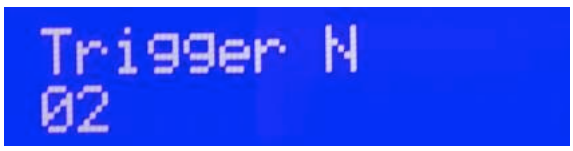
For each program saved on the sequencer, you can associate a pulse; the arrival of this pulse, make the sequencer firing that program.
The pulse you associate with the program is called Trigger; to determine the starting order of the various programs, you need to set the Trigger through a growing number, which determines the starting order of the various programs. **This number is called "the number of triggers"**.
As example, if you want to create 3 programs, P1, P2, P3, and firing them exactly in that order, simply you need to associate to each program, the respective number of triggers; P1 = Tg1, P2 = Tg2, P3 = Tg3.
In this way, when the first pulse comes, the sequencer fires the program P1 and then stops, waiting for the next pulse; at the arrival of the second pulse, the sequencer executes the second program (P2) and then stops again, waiting for the third pulse that can activate the third program (P3)
If you want to change the order of execution of the programs, you need to associate the programs with different trigger numbers.
For example P1 = Tg3, P2 = Tg1, P3 = Tg2, means that the programs will be executed in the following order P2, P3, P1, that is P1 at the first pulse, P3 at the second pulse and P1 at the third trigger pulse.
Therefore the number of Trigger (Tg1,2,3 ...) determines the starting order of the programs to which it is associated, and the 1,2,3.. number, indicates the first pulse, second pulse and third pulse...
To set the trigger number, see chapter "Programming".

CLOCK function

Clock Time: What is, how it works.

A key aspect of the sequencer BFS S 20, is the immediacy in time, between the trigger pulse coming, and the firing of the related program. Each program starts immediately on arrival of the external trigger pulse, that is, without any delay ($\Delta T = 0$).
You can delay the start of a program by determining the time which must elapse between the trigger pulse arrival and the firing of the program.
This time is called the Time Clock, or simply Clock.
For example, by setting the Clock = 3 sec for P1, we comunicate to the sequencer that the P1 program will start exactly three seconds after the arrival of the trigger pulse, and not immediately.
As basic setting, the clock is always set to zero; that means that the programs start immediately on arrival of the external trigger pulse.
The Clock time, or Clock, applies to the single program and works only for the programs in which it is set. To set the clock, see chapter "Programming"





Multi-Sequential function

Sequential Multi-function: it is, how it works.

Another fundamental characteristic of the S 20 sequencer , is the ability to fire multiple programs simultaneously, that means that it is possible to run two or more programs at the same time, by activating them with the same trigger pulse.
Each saved program, requires to be associated with a Trigger number, which is pulse number that determines the starting order of programs.
You can save 2 or more programs, and activate them with the same pulse, just setting both with the same number of triggers; in this way the sequencer, will fire two or more programs simultaneously.
This function is called multisequential.

Apply the Clock to the multi-sequential.

The Clock is the special feature of BFS S sequencer 20, which allows you to set the delay between the arrival of the trigger, and the start of the program to which it is associated.
The Clock is a delay, in seconds, which is applied individually to each program.
In the Multi sequencer function, which allows you to start 2 or more programs at the same trigger pulse, it is possible setting also the clock time, (or Clock), to ensure the programs activated by the same pulse trigger, could not fire simultaneously, but with a delay between one and the other.
For example, if we want to fire the programs P1 and P2 with the same impulse (eg. Tg1), the arrival of the first pulse will fire P1 and P2 simultaneously.
If we set the P2 program with Clock= 3 seconds, and P1 with Clock= 0 seconds, then the trigger pulse will activate both programs, but P1 and P2 will not fire at the same time.
In fact, P1 will start immediately, while P2 will fire 3 seconds after the arrival of the trigger signal.
In this way, you can activate simultaneously two or more programs, but let them start firing at different time.

6) Programming

a) Sequential programs with constant time: are those programs which the time between each firing cue is always constant; for example, 10 firing cues, in which interval between each cue is always the same. (10 firing cues, 1 sec between each cue)

b) accelerated sequential programs: are those programs which the time between each cue is getting shorter; for example, 10 firing cues, in which the time interval between each line is always shorter than the previous cue. Thus the sequence increases in speed as the program runs.

c) Sequential Programs decelerated: are those programs which the time between each cue is always longer; for example, 10 firing cues, in which the time interval between each line is always longer than the previous cue. Thus the sequence, decreases in speed as the program runs.

d) Manual programs: are those scripted programs where you can assign a specific time to each cue, in order to create a scripted program that can accompany a pyro-musical show, or a very complicated sequence, trought times and positions defined by the programmer. In this case, therefore, it is the programmer that chooses, for each line, the relative fire time..

How to create a program and save it.

To create a sequential program and save it, please follow next steps.

Example of constant sequential, with 10 cues, and a total duration of 10 seconds:

1) ENTER
2) select "Programs" with UP or DOWN key
3) ENTER (you will see the main menu of the program)
4) ENTER (type)
5) ENTER
5) Type of program: (Accelerated / Decelerated / Constant: Example Select "Constant")
6) ENTER (used lines)
7) ENTER
7) used Lines: Select the lines to be used (10)
8) ENTER (first line)
9) ENTER
9) First Line: select the starting cue (1) NB: S 20 will indicate to you the first cue avaible
10) ENTER (duration)
11) ENTER
11) Duration: select the total duration of the sequence (0.5 seconds) NB: S 20 will indicate to you the minimum duration you can set
12) ENTER (Clock)
13) ENTER
13) Clock: Set the clock time= 0 in this example
14) ENTER (Trigger)
15) ENTER
15) Trigger: Set the trigger number (Tg1)
16) ENTER (saving)
17) ENTER
17) Save: Press Enter to save, or ESC to not save.

Save the program

Summary program informations

Then the display will show you a summary about the program you just saved, with the following informations:

Program number (PROG 1)
Type (COST)
Number of Trigger associated with Tg (Tg 1)
Starting cue (S 01)
Ending cue (at 10)
Total time duration (0.5 sec)

Press ESC to return to the HOME screen position. The display will show P = 1, to indicate that there is 1 program saved inside the sequencer memory.

The programming procedure is the same for all types of programmable sequential: to program an accelerated, decelerated or constant sequential, simply selecting in step 5 of the procedure, the desired type (ACC / DEC / COST).

How to resume a saved program (program list)
To resume a previously saved program, you need to access to the programs list. To do this, you have **2 options**.
From the HOME screen:
- Press UP button (quick option), **or**
- Press ENTER, then scroll to "Programs", and press ENTER (standard option).

Both methods open the saved programs list, and let you scroll through the list with the keys UP and DOWN (if more than one saved programs; if you saved only one program, the list will report only 1 program).
For each program listed, the display will provide the main informations:

Program number (eg PROG 1)
Type (eg: COST)
Number of Trigger associated with (Ex: Tg 1)
Starting Cue (Ex: S 01)
Ending cue (Ex: 10)
Total duration time (Ex: 0.5 sec)

At the end of the saved programs list, dispaly will show you next program that you can still set up and save.

To return to HOME screen position, press ESC key.

How to edit a saved program
For quick access to the program list, press the UP key.
From this menu you can change the program, simply press the ENTER key and review the programming procedure, by scrolling with the key UP and DOWN the various settings, and press ENTER to enter and change the desired settings.
To save your changes, scroll with the cursor until "Save" then press the ENTER key.

How to delete a saved program
To delete a saved program, just go to the program list by pressing the UP button from the HOME screen, then press the ENTER key to enter into the list of the various parameters. Scroll with the DOWN key until "Delete"; press the ENTER button to delete the program.

How to save other programs after the first

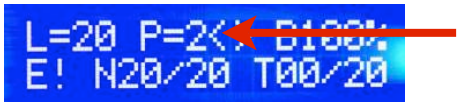
NB !!! When you set 2 or more programs, always start from the first line of those avaible, without leaving any free between 2 programs !! The unprogrammed lines, in fact, will be lost and you may not be able to use them until you delete all the other programs.

The sequencer BFS S 20, allows you to save in its internal memory up to 10 programs.
In order to save other programs after the first, proceed as follows:

From the HOME screen:

1) Press the UP key (you will enter the list of saved programs)
2) Press the ON key (you scroll through the saved programs until the new one to be programmed)
3) Repeat the entire programming procedure as described in the chapter "How to create a program and save it" of this manual; the procedure must be traced from step 4 through 17.
4) ENTER (type)
5) ENTER
5) Type of program: (Accelerated / Decelerated / constant: Select the desired sequential)
6) ENTER (used lines)
7) ENTER
7) Used lines: Select the cues you want to use with the UP or DOWN key (10)
8) ENTER (first line)
9) ENTER
9) First Line: set the starting cue (11) NB: sequencer will indicate to you the first avaible cue
10) ENTER (duration)
11) ENTER
11) Duration: set the total duration of the sequence (0.5 seconds) NOTE: sequencer will indicate you the minimum time duration avaible.
12) ENTER (Clock)
13) ENTER
13) Clock: set the clock time (0 in this example)
14) ENTER (Trigger)
15) ENTER
15) Trigger: Set the trigger number Tg2 (P1 has been set with Tg1, and will start at first impulse).
16) ENTER (saving)
17) ENTER
17) Save: Press ENTER key to save, ESC key to not save.

Then the display will show you a summary about the program you just saved, with its main informations.
All saved programs will be shown on the HOME screen position, as a number P=xx, where xx is the number of saved programs.



P=2 means
2 saved programs

NB !!! When you save 2 or more programs, it is recommended to use the following trigger numbers (1,2,3 ... 10) avoiding to leave someone empty.
For example, with 3 programs P1, P2, P3 is preferable to use (1,2,3) in this order, and not 1,2,5; the "empty trigger numbers"(3 and 4 in this example), without any program assignment, will still be counted as valid and regularly activated although any program assigned to them. So, please be careful no left any unassigned numbers, because they might offset the list of your firing program.

How to create a manual program and save the program.

To create a manual and save the program, follow the steps below.

Example of manual program, 6-line, with fire time cues, definet by the users:

1) ENTER
2) select "PROGRAMS" with the cursor
3) ENTER (you will see the main menu of the program)
4) ENTER (type)
5) ENTER
5) Type of program: (Select "Manual")
6) ENTER (Trigger N °)
7) ENTER
7) Trigger: Set the trigger number for this program (eg: 1)
8) ENTER (Used Cues)
9) ENTER
9) Used cues: set how many cues you need to use (eg: 6).
10) ENTER (first cue)
11) ENTER
11) First cue: choose the starting cue (eg: 1) NB: will display the 1st avaible cue
12) ENTER (fire time associated with the first cue L01)
13) ENTER
13) Fire time associated with the first line: set the time for the 1st cue. Use the UP and DOWN cursor 'for setting the times. Hold down for 2 seconds the UP and DOWN cursors to move between time fields. (hours, minutes, seconds...)

TIME FORMAT: **00/00/00:00** = for the first cue, time=0 means that the first cue fires at time=0 (immediate)
TIME FORMAT: eg: **01/02/3.15** = 1 hour, 2 minutes, 3 seconds, 15 cents of a second = 1h, 2m, 3.15 sec

14) ENTER (L02) firing time associated with to the second cue
15) ENTER
15) Firing time associated with the second cue: set the firing time of the second cue, with the same process seen above.

TIME FORMAT: eg: **01/05/2:55** = 1 hour, 5 minutes, 2 seconds, 55 seconds cents of seconds= 1h, 5m, 2.55sec
TIME FORMAT: **00/00/00:00** = cues with firing time set to zero (for all cues after the first cue), do not fire.

16) ENTER (L03) Firing time associated with the third cue.
17) ENTER
17) Firing time associated with the third cue: set the firing time for the third cue, with the same process seen above.

18) ENTER (L04) Firing time associated with the fourth cue.
19) ENTER
19) Firing time associated with the fourth cue: set the firing time for the fourth cue, with the same process seen above.

20) ENTER (L05) Firing time associated with the fifth cue.
21) ENTER
21) Firing time associated with the fifth cue: set the firing time for the fifth cue, with the same process seen above.

22) ENTER (L06) Firing time associated with the sixth cue.
23) ENTER
23) Firing time associated with the sixth cue: set the firing time for the sixth cue, with the same process seen above.

24) SAVE
25) ENTER (save? Press ENTER to save, ESC to discard and exit)
25) ENTER to save the program

At this point a summary screen will shown, for the manual program just saved, the following information:

Program number (PROG 1, if it is the first, PROG 2 if it is the second ... and so on.)
Type (MAN)
Number of associated Trigger (Tg. 1)
Starting cue (S 01)
End cue (A 06)
Total duration time (total time in minutes and seconds)

Press ESC to return to the HOME screen. Will be shown P = 1, indicating that in the sequencer memory one program is saved, or P = 2 if two programs saved and so on.

NOTES:

1) If the first cue iis set at time = 0, it will be fired immediately on arrival of the trigger pulse;
2) If the first cue is set to a time different than 0, it will be fired exactly at the specific set time; the count will start at the arrival of trigger pulse;
3) For the manual programs the clock function is disabled;
4) All other cues different from the first, if set to 0 time, will NOT be fired (disabilited);
5) The minimum interval time between two cues is 0.05 seconds (5 cents of a second);
6) Subsequent cue will never have a smaller time than the previous one (time goes on).

EMERGENCY STOP FOR MANUAL PROGRAMS

The manual program (scripted program), unlike the other types of programs (sequential), can have longer durations, even of several minutes. For this reason,
only for the manual programs, an emergency stop has been inserted.
If activated, the emergency stop immediately suspend the execution of the program, and places the sequencer automatically waiting for the next program.
To block the execution of a manual program, it will be enough to send a trigger pulse at any time, during the execution of the scripted program.

For example, if the trigger impulse n° 1 launches the manual program, simply send a second pulse to stop the program and placing the sequencer waiting for the next program.

In this way, in case of emergency, it will be possible to stop the sequencer in a fast, safe and effective way.

Repeat for each cue to set the specific time...

Save the program

Summary program informations

How to access the program list

To resume a previously saved program, you need to access to the programs list. To do this, you have **2 options**.
From the HOME screen:
- Press UP button (quick option), **or**
- Press ENTER, then scroll to "Programs", and press ENTER (standard option).

Both methods open the saved programs list, and let you scroll through the list with the keys UP and DOWN (if more than one saved programs; if you saved only one program, the list will report only 1 program).
For each program listed, the display will provide the main informations:

Program number (eg PROG 1)
Type (eg: COST)
Number of Trigger associated with (Ex: Tg 1)
Starting Cue (Ex: S 01)
Ending cue (Ex: 10)
Total duration time (Ex: 0.5 sec)

At the end of the saved programs list, dispaly will show you next program that you can still set up and save.

Program n°3 is still empty

To return to HOME screen position, please press the ESC key.
NB: The system automatically provides, during the setting program procedure, the first avaible parameter for each setting, taking into account the programs previously saved; the system makes unusable all the cues already used to previous program already stored.
This allows you to considerably facilitate the programming procedure, avoiding possible data overlaps. (N° of cues free to use, first avaible cue, program number, etc ...)

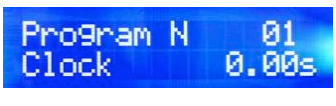
How to Set the Clock function

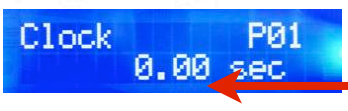
The Clock is the special feature of BFS S 20 sequencer, which allows you to set the delay between the arrival of the trigger, and the firing of the program to which it is associated.
The Clock is a delay in seconds, which is applied individually to each program.
To set the clock, you just get to the point 12 of the programming procedure and enter the desired value:

12) ENTER (Clock)
13) ENTER
13) Clock: set the clock time (xx)

The Clock value you set, will correspond to the delay in seconds between the trigger signal coming in, and the start (firing) of the program for which the clock has been set.
You can enter the Clock value during the programming phase, or subsequently, by editing the program.

12





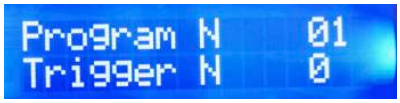
13

Set Clock parameter

How to set multi-sequential programs (same Trigger)

The multi-sequential is the function that lets you run two or more programs (sequential) simultaneously activating them with the same Trigger pulse.
To do this you must set the same number of Trigger, for 2 or more programs.
Programs with the same number of Trigger, will be simultaneously activated, and will start and fire at the set time delay (Clock).
Programs with different number of triggers, will fire according to the order of trigger number.
To set or edit the number of Trigger, just get to the point 14 of the programming procedure:

14) ENTER (Trigger)
15) ENTER
15) Trigger: Set the trigger number (Tgxx)



14

15

Using the same Tg number for 2 or more programs, let them start in the same time.

You can enter the Trigger value during the programming phase, or subsequently, by editing the program.

VERY IMPORTANT!!! Rules to follow to delete or modify the programs:

a) Latest deleted program rule

When you want to cancel or edit a program, do this starting from the last program in order of firing cue. The sequencer makes not reprogrammable, all cue of deleted or modified programs that precede the last programmed number.
For example, if I have 2 programmed sequential, P1 and P2, where:

P1 = from cue 1 to cue 13
P2 = from cue 14 to cue 20,

If you reduce or delete the cues of P1, you will be unable to use again the deleted cues (you will need to delete also P2 cues in order to use again the cues 1 to 13).
If you delete or reduce P2 cues instead, you will be able to use again cues from 14 to 20 for other programs, without deleting the previous programs, because P2 is programmed series ahead of all.
The example is valid, obviously, for 2 or more programs.

b) Unprogrammed cues rule

When your set 2 or more programs, always start from the first cue of those available, without leaving any free cues between 2 programs !! The unprogrammed cues between two consecutive programs, will be lost and you be unable to use it until the following programs will be deleted !!!

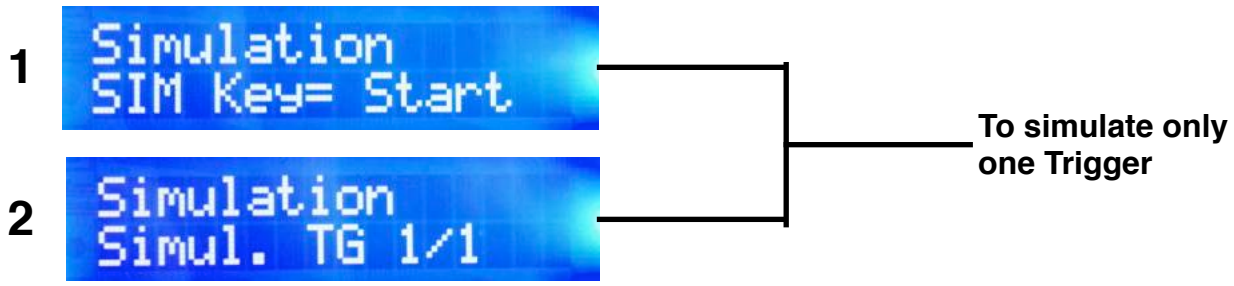
7) Simulation of saved programs

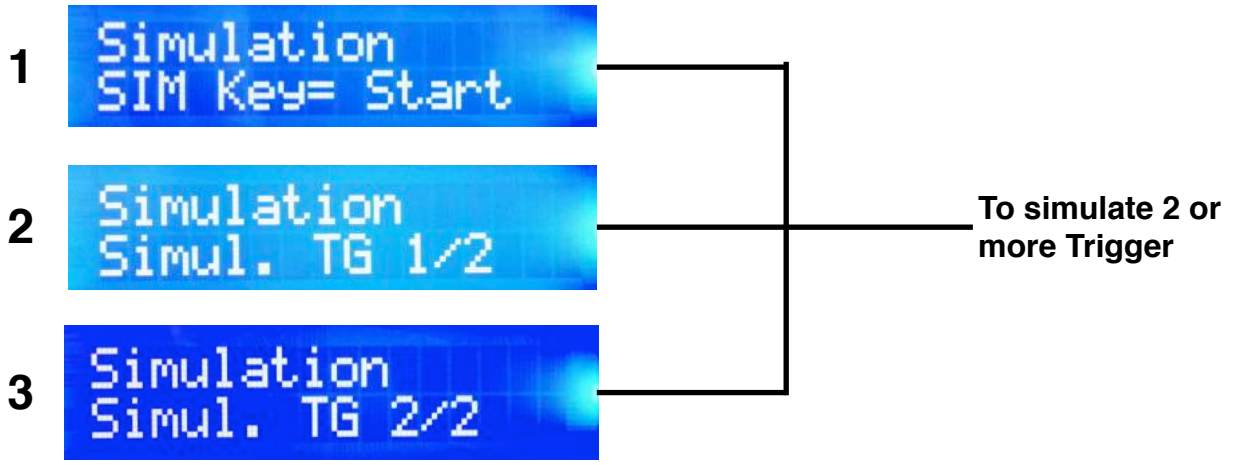
You can run a simulation of all the programs saved on the sequencer, simulating them in the exact order in which they will be fired; it will be simulated every single trigger set, with all programs associated with it. Each time you press the SIM button, every single trigger will be simulated, in the order in which they were saved (Tg1, Tg2, Tg3 etc ...).
For each simulation, the green LEDs corresponding to the firing cues programmed for the trigger (1 or more programs), will light up in the order and time as programmed.
To simulate the saved programs, proceed as described below.

From the HOME screen position:

1) Press the SIM key; the display will show: "Simulation - SIM key = Start"
2) Press the SIM key to activate the simulation of the first trigger set
3) Press the SIM for each trigger to simulate
4) After the last simulation, the display will automatically return to the HOME screen position
5) Press ESC to exit the simulation at any time

For each simulated trigger, the screen displays a "Simulation – Simul Tg 1/3, Tg 2/3, 3/3 ... etc. Tg indicates which trigger is being simulated at that moment.





8) STEP mode (step by step)

a) TEST cues
b) Firing the cues
c) Firing in STEP mode using 2 or more sequencers

In STEP mode, or step by step mode, it is possible to fire a single cue, activating it with a single external trigger pulse; for each pulse coming in, the sequencer will fire a single cue, waiting for the next pulse, to fire the next cue.
In STEP mode all programs are excluded, and the sequencer fires one cue at time, for each pulse coming, starting from the cue number 1.
In this way it is possible to multiply a single firing cue of any single pyrotechnic unit, into 20 cues of the sequencer.
Pyrotechnics unit to which the sequencer is connected, fires more pulses from the same firing cue; at each pulse, the sequencer advances and fire by one cue.

To set this mode, perform the steps described below.

From the HOME screen position:

1) Press ENTER
2) Set "Mode" with UP or DOWN key
3) Press ENTER
4) Use the UP and DOWN keys to select "Step"
5) Press ENTER to confirm.

The screen will display the message: "Step Mode". In this mode you can not run other programs.

2 4 5

a) TEST cues

To perform the TEST of igniters, press the TEST button; It will run a comprehensive test of all the 20 cues of the sequencer, and it will report all connected igniters found.
The green LEDs indicate the cues properly connected and the screen will show the indication XX / 20, where XX is the number of detected cues with continuity.

b) Firing the cues

To fire the cues, please arming the sequencer, with the same procedure as described in chapter 12.
For each fired cues, the screen will display the message: "Armed! Fired "CH1, CH2 ... CH20.
This counter will provide the number of fired lines.

c) Firing in STEP mode trough 2 or more sequencers

You can perform a show in STEP mode using multiple sequencers in the same position, in order to increase the firing cues avaible.
For example, if you have the need to perform a show firing in STEP mode using 40 cues in the same fire position, you will need at least two sequencers, to be used in series or in "cascade".

The software allows to the 20th cues, (only for the STEP mode) to shoot continuously, with each pulse coming after the 20th .

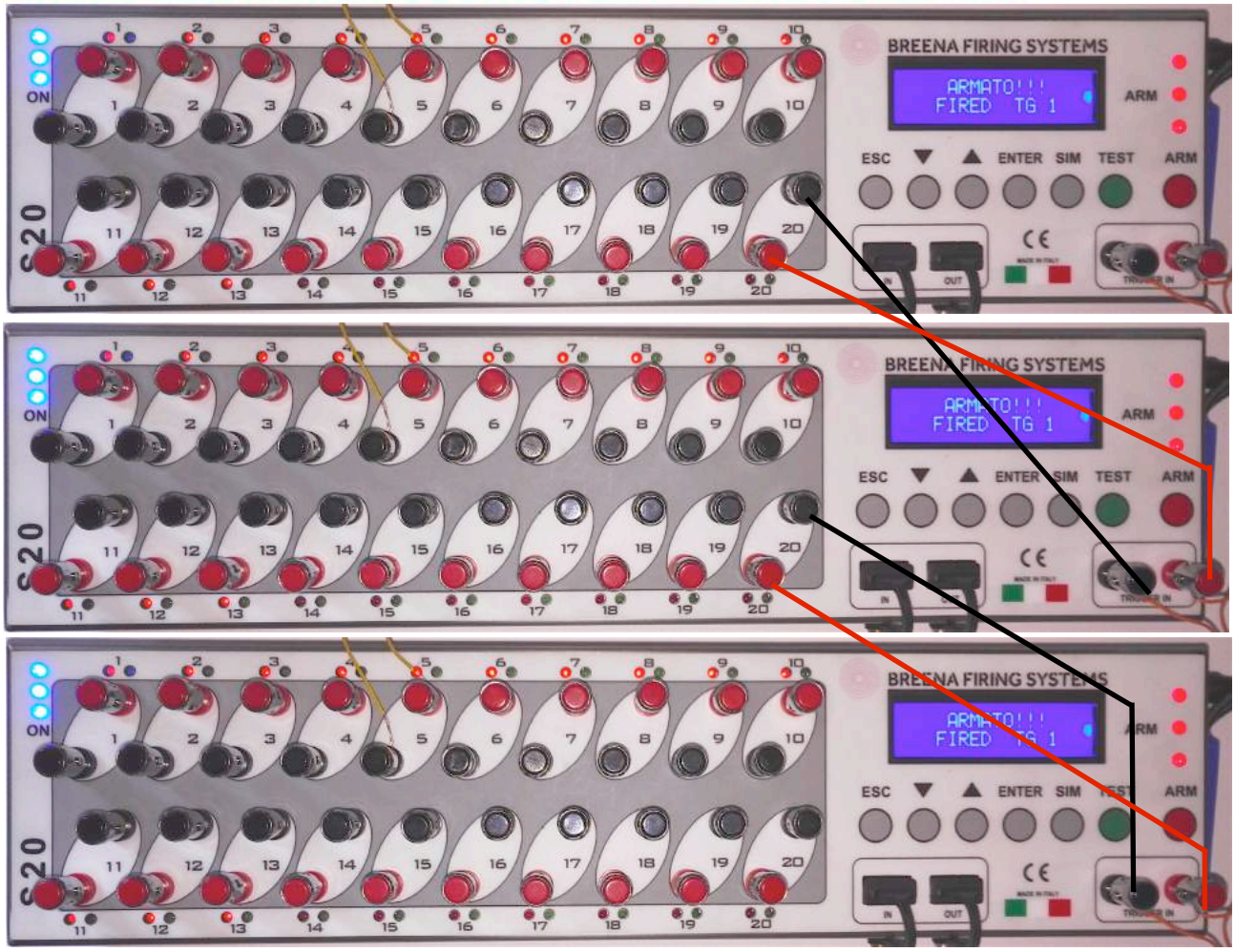
To fire on STEP mode trough two sequencers, simply connect the cue 20 of the first sequencer, to the trigger of second sequencers; in this way, when you will fire the 20th cues of the first sequencer, you will activate, at each subsequent pulse, the second sequencers to fire in STEP mode.

It is possible, with this method, to add infinite sequencers and firing trough them in STEP mode; simply connect the cue 20 of the previous sequencer, to the trigger of the following sequencer.

PLEASE NOTE!

To connect the sequencers, follow the method shown in the picture. Connecting cue 20 of the previous module, to the next module triggers, taking care to keep the polarity.

Before making connections, be sure that all modules are set in STEP mode.



9) General cues TEST

a) Executing the cues TEST
b) Cues TEST report with LEDs
c) Cues TEST report on the display
d) General cues TEST report on the display
e) STEP mode cues TEST

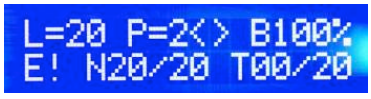
Executing the cues TEST

The continuity TEST of the connected igniters is a critical step to verify the correct set-up of the firework show.

To perform cues TEST, perform the following step:

1) Turn on your sequencer and wait for HOME screen position
2) Press the green TEST key
3) Press TEST key to start the test.

The sequencer will start monitoring all the necessary (programmed) cues, and will report the TEST result, using both LEDs and display.

1 

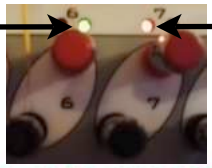
2 

3 

b) Cues TEST report with LEDs

The LEDs corresponding to the properly connected cues, will turn green for about 6 seconds.
The LEDs corresponding to not connected cues (cues with no continuity or no igniters) will turn red for about 6 seconds.
Therefore, the red LED mean that the corresponding cue has missing or not connected igniter (open circuit),
while green LED means that the corresponding cue has igniters or series of them, properly connected (closed circuit).

Green Led = igniter properly connected ⟵



⟶ **Red Led = igniter not connected**

NB! The test does not make actual values on the cues if 2 or more igniters are connected in parallel mode. It is recommended to always use series connections !!

c) Cues TEST report on the display

After the sequencer runned the cues TEST, the following messages will appear on the display (for about 6 second):

Test Good = All lines (all igniters) are properly connected.
Test Fail! = One or more cues are open (not connected to one or more igniters). In this case the red LEDs will indicate which cues have no continuity.

d) General cues Test Report on the HOME screen

After 6 seconds from the end of the TEST procedure, the sequencer will automatically go back on the HOME screen position. From the HOME screen, you can read a summary report with the main informations about the test results, found and not found cues continuity:

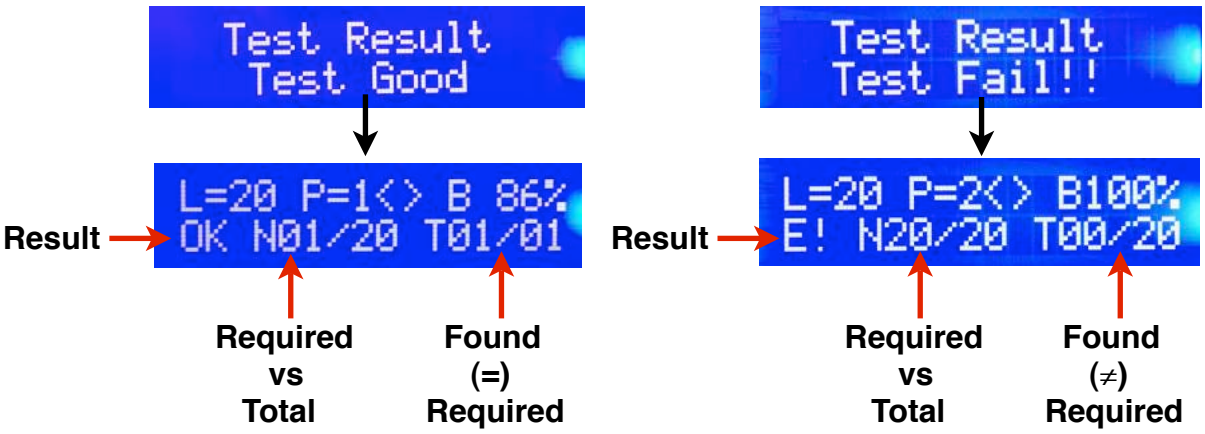
TEST result
found cues / required cues

Test Result – E! - OK

That is an indicator that shows the result of the cues TEST ; OK if test positive, or E! if the test detects cues with not connected or missing igniters. When you swich the sequencer on, this indicator will always indicate E !; this to suggest you to check the continuity TEST every time you turn on the sequencer.

Found cues / Required cues - Txx / yy

This indicator, integrated to the TEST function, provides the number of connected cues and detected by TEST (igniters connected), compared with those required by the saved programs. If the TEST is OK (all igniters connected), the indicator must show identical numbers (eg 10/10 or 14/14). If the TEST is E !, that means that some igniters are not connected or are missing; in this case, the reported numbers will be different (eg 8/10 or 19/20). If any program saved, this values will always be "0/0". When you swich on the sequencer, just like the TEST outcome indicator, this indicator gives an incorrect result (0 / xx) because you must run the TEST every time you turn on the sequencer. This helps you to remind this.



e) TEST for STEP mode

To run the cues TEST, press the TEST button; the sequencer will run a comprehensive test of all 20 lines of the sequencer, and will report all cues with properly connected igniters.
The green LEDs indicate the properly connected cues and the screen will show the indication XX / 20, where XX is the number of cues with continuity.
In this case there will be any indication as to the success or failure of the TEST, because in STEP mode all programs will be excluded; TEST will simply report the number of connected cues compared to the total and avaible cues.

10) Electrical connections

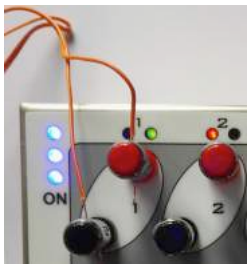
a) Connect the firing cues
b) Connect the Trigger terminal
c) Connect a single sequencer to your firing system
d) Connect several sequencers to your firing system (parallel)
e) Remote Trigger TEST

a) Connect the firing cues

The BFS S 20 sequencer, has 20 firing cues, each cue is composed by two terminals (+ , -), red and black, respectively. The terminals are of the metallic type, reverse crushing.
Each firing cues supplies 24V DC output voltage and 1.5A of current, which allows to connect up to 8 igniters in series and 2 igniters in parallel, for each firing cue.
These values can vary depending on the type of ignitor (different resistances) and the length of the wiring.
To connect the igniter to the firing cue, simply push the terminal down, insert the copper wire into the slot, and then release the terminal. Releasing the terminal, the spring will push upwards the igniter wire, ensuring the best seal.
After you fired cues, remove the igniters from the terminal, by pushing down every connector and extracting the copper wire from the slot.

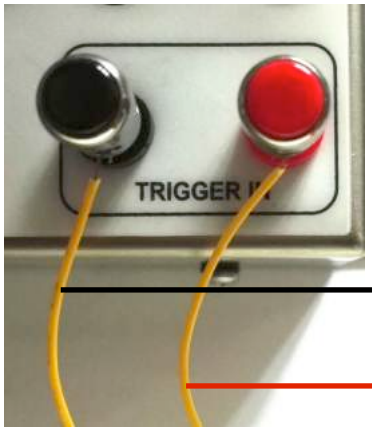
b) Connect the Trigger Terminal

The sequencer BFS S 20, in order to fire the stored programs, must receive an external electric pulse, said External Trigger. This electrical pulse, to be able to get up to the sequencer, must be transported by an electric cable (twisted pair) that comes from the firing cue of any pyrotechnic unit, and arrives at the Trigger terminal of the Sequencer.
The trigger terminal consists of two metal connectors (red and black, + and -), right placed on the sequencer frontal panel, and highlighted by the word: "Trigger In".



24V
1,5A
36W

a)



b)

-

+

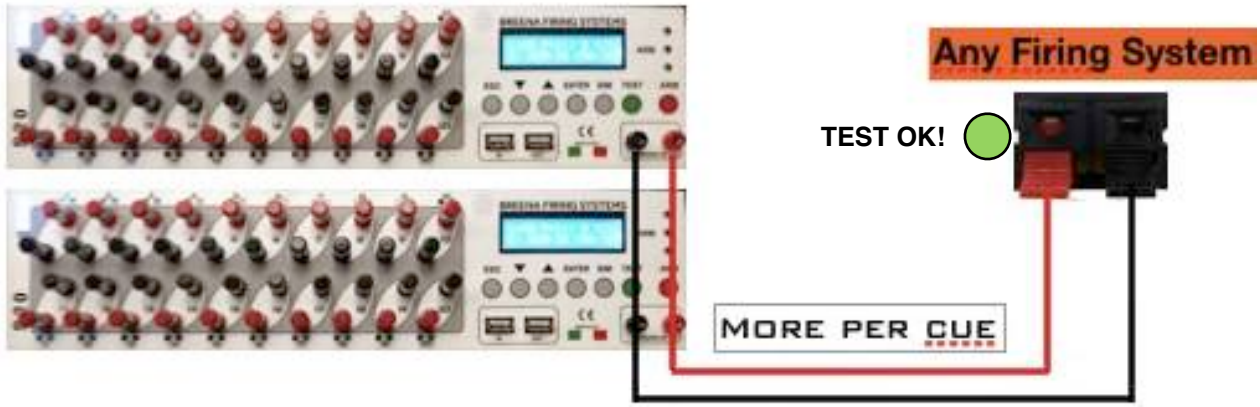
To the firing cue of any firing system

c) Connect a single sequencer to your firing system

To connect the trigger of a single sequencer to any cue of your firing system, you need to connect the two Trigger connectors to a twisted pair and then connect the two ends to any cue of your pyrotechnic unit, **KEEPING THE POLARITY !!!** (Red with red and black to black).
In this way, you will connect only one sequencer to the cue of your F.Sy. When your pyrotechnic unit fires that cue, the pulse will come to the sequencer, and this pulse will activate and fire the saved programs associated with it.
You can connect one or more sequencer to the same cue of your firing system.

d) Connect several sequencers to your firing system

You can connect 2 or more sequencer to the same cue of your firing system, to enable firing more sequencers simultaneously, with a single pulse.
To do this you need to connect 2 or more sequencers in paralel mode with the same wire, and then connect the ends of the wire to the firing cue of your Fi.Sy. used to activate the sequencer.
Always remind to KEEP THE POLARITY !!!
The maximum number of sequencers connected in parallel mode on the same cue of your firing system, depends on the voltage and current output values of your firing system cue(s); Before making connections, please check and consult carefully the table at the bottom of this manual.



e) Remote Trigger TEST.

To ensure continuity of Trigger wire and no problems on the circuit, the S sequencer 20 has a very important characteristic: in fact, S 20 can be detected as an igniter from the TEST of your firing system. This feature allows you to perform the Trigger test directly from the firing system that will be used to activate the sequencer.
Trigger TEST could be execute even if the sequencer S 20 is powered off.

11) Enable the sequencer for firing

a) How to enable the sequencer for firing (ARM position)
b) Arming the sequencer (ARM button)
c) Disarming the sequencer
d) Firing the cues

a) How to enable the sequencer for firing (ARM position)

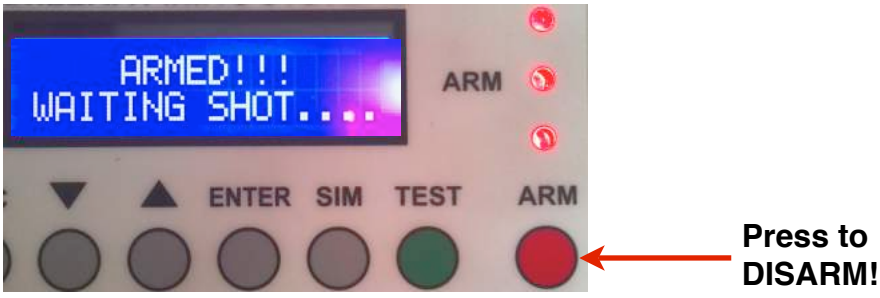
The BFS S sequencer 20, is designed to ensure maximum safety when you use it.
To enable the module to fire cues, you need to perform an "arming procedure"; without performing this procedure, any external pulse can not activate the sequencer.
ARM procedure is entrusted to an electronic system, which allows you to set the sequencer into ARM position with maximum safety, avoiding any involuntary action.
When in ARM position, the sequencer will fire only at the coming in of the external signal Trigger and never before.
Although armed, the sequencer never fires cues in the absence of the trigger input signal.

b) Arming the sequencer (ARM button)

To arm the sequencer, you must hold down the red button ARM, until the display shows the message "ARMED! Waiting SHOT ... " and the corresponding LEDs become red. In this position (ARM position), the sequencer waits for the external pulses to start fire the programs stored in its memory. Three red high brightness LEDs, indicate that the sequencer is armed.

c) Disarming the sequencer

To disarm the sequencer, you must hold down the red key ARM, as long as the sequencer will reposition in the HOME screen position. Be careful to hold the ARM button, as long as the 3 red LEDs swich off.



d) Firing the cues

To let the sequencer firing, check that the trigger terminals are connected to the cue of your pyrotechnic unit (maintaining the polarity !!!), then set the sequencer into ARM position (red LED on).
During firing, the sequencer will continue to perform programs in order established, firing them at each external pulse coming in.
In this phase, the display will show the message: "Armed !! Fired Tg xx ", reporting with a counter all trigger that have been executed, including any unassigned (empty).
All cues LEDs turn red,when these are fired.
At the end of your show, you can check which cues actually has been fired, controlling which have their own red led **"on"** and which not.

Red LED = cue fired
LED OFF = cue not fired

When your check is completed, simply disarm the sequencer by holding down the ARM key.

Fired Trigger n°1 (cue 1 to cue 13)

13 cues fired
(13 red leds on)

Fired Trigger n°2 (cue 14 to cue 20)

20 cues fired
(20 red leds on)

NB !! While sequencer is firing, screen shows a counter that gives the number of executed triggers, that is, the total number of external pulses came in to the sequencer; the counter will stay on after the end of the shot, allowing you to perform a quick check of fired cues, compared with those required by the programs stored in the sequencer memory.

12) Multi-sequencer Mode (description)

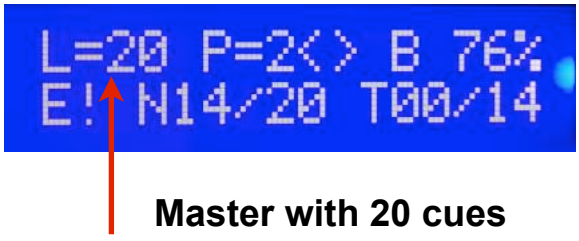
a) Multi-sequencer function
b) Set the sequencer as master for multi-sequencer
c) Set the sequencer as slave
d) Connecting more sequencer with USB
e) Programming with master
f) TEST and SIM in multi-sequencer mode
g) Firing cues in multi-sequencer mode

a) Multi-sequencer function

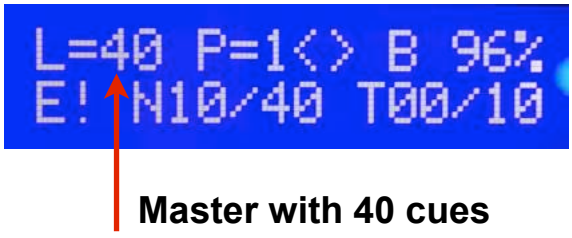
The BFS S20 has a special function, called multi-sequencer function, which allows you to connect together up to four sequencers, to obtain a single sequencer with 40, 60 or 80 cues, respectively if 2, 3 or 4 sequencer are connected together.
This feature allows you to program up to 10 sequential programs, trought up to 80 avaible cues, using the programming keyboard of a single sequencer (Master), and then to transfer data to other sequencers connected to it (slave) by an USB cable.
In this way, you can use 4 sequencer like a single 80 cues sequencer (1 Master and 3 slaves).
You need to conect the sequencers with a USB cable, only for programming, simulating and testing.
In order to use milti-sequencer mode, you must set some parameter: you need to set one sequencer as MASTER, and others connected to it, as slave.
The sequencer set as Master will be the first, to which will be connected all other sequencer set as slave.

b) Set the sequencer as Master for multi-sequencer

The sequencer S 20, it is always used in MASTER mode, but in order to use the multi-sequencer mode, it needs to be setted with the right number of slaves you will connect to it.
As basic setting, the sequencer is set as master with 00 slave. This is easily verifiable by reading on the HOME screen, at the top left, the number "20".
This number indicates how many firing cues are avaible for programming: if there are no slave set, this number is exactly equal to the cues physically present on each sequencer, i.e. 20.
When you change this configuration, setting the master with 1 or more slave, this number increases (40, 60, 80) proportionally with the number of slave are set to it. In practice, we need to comunicate to the sequencer, that it will have to manage 20, 40 or 60 cues more, depending on how many slave we will connect to it.



Master with 20 cues



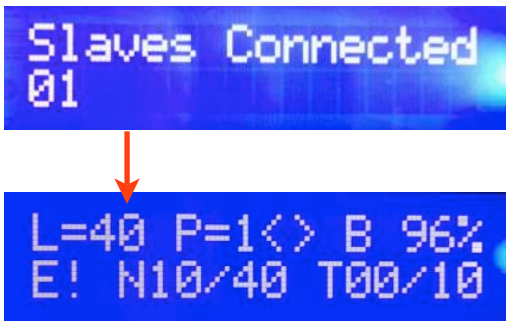
Master with 40 cues

To set the number of connected slave, performing the following steps:
- From the HOME screen:
Press ENTER,
With the UP / DOWN key scroll to "Mode"
With the UP / DOWN key, select "Master"
Press ENTER
Under "Slaves Connect", select: 01, 02, 03 ... depending on many slaves you want to connect (up to 3 slaves !!!)
Press ENTER
Press ESC key, then the sequencer will return to the HOME screen position.

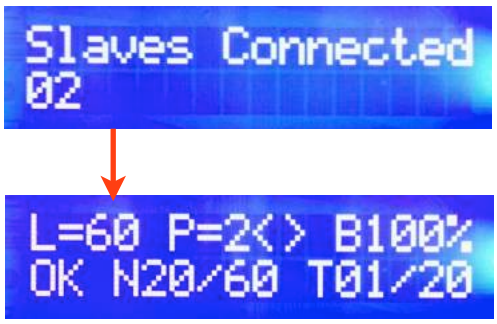
ENTER → Mode → Master → ENTER → Slave Connected →

(01, 02 or 03) → ENTER → ESC

Just saved, you'll notice at the top left of display, that the number is more than 20, because now is equivalent to the sum of all the slaves and master cues. Always perform this check to verify that the procedure was successful.



Master + 1 slave = 40 cues



Master + 2 slave = 60 cues

NOTE !!!!!:
1) When you set the number of slave, this number must correspond to the slaves that will be actually connected !!! If you use less or more slaves than those you set, the system will record the error and will report to you this error!
In this case this message will be showed on the dispaly: Send data Slave!
2) If you want to use a sequencer individually, always remember to set it as Master with 00 slave !!! (The same factory setting)

c) Set the sequencer as slave

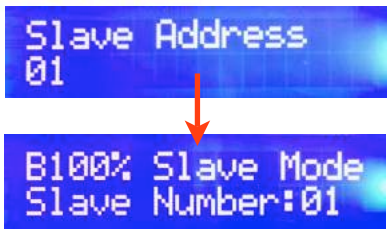
To set the multi sequencer configuration, you need to set the first sequencer as Master, and the others connected to it, as slave.
A sequencer set as Slave, is inhibited of all its functions, except the ability to receive data from the Master sequencer, and firing cues according with the programs.
Each slave must have a number that identifies it: this number can be: 1,2,3 and must match the position taken by the sequencer in the configuration chain.
The first slave after the master must have the number 01,and the others with increasing numbering.
To set a sequencer as slave, proceed as follows:

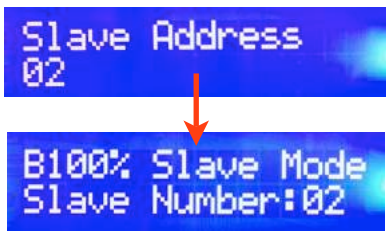
From the HOME screen:

ENTER
modality
ENTER
Scroll to Slave (with UP or DOWN keys)
ENTER
Slave address: Use the UP or DOWN keys to set 01, 02, 03 (depending on chain position)
ENTER

Then the sequencer will immediately position in slave mode; display will show this message:

Slave mode
Slave number: 01, 02, 03.





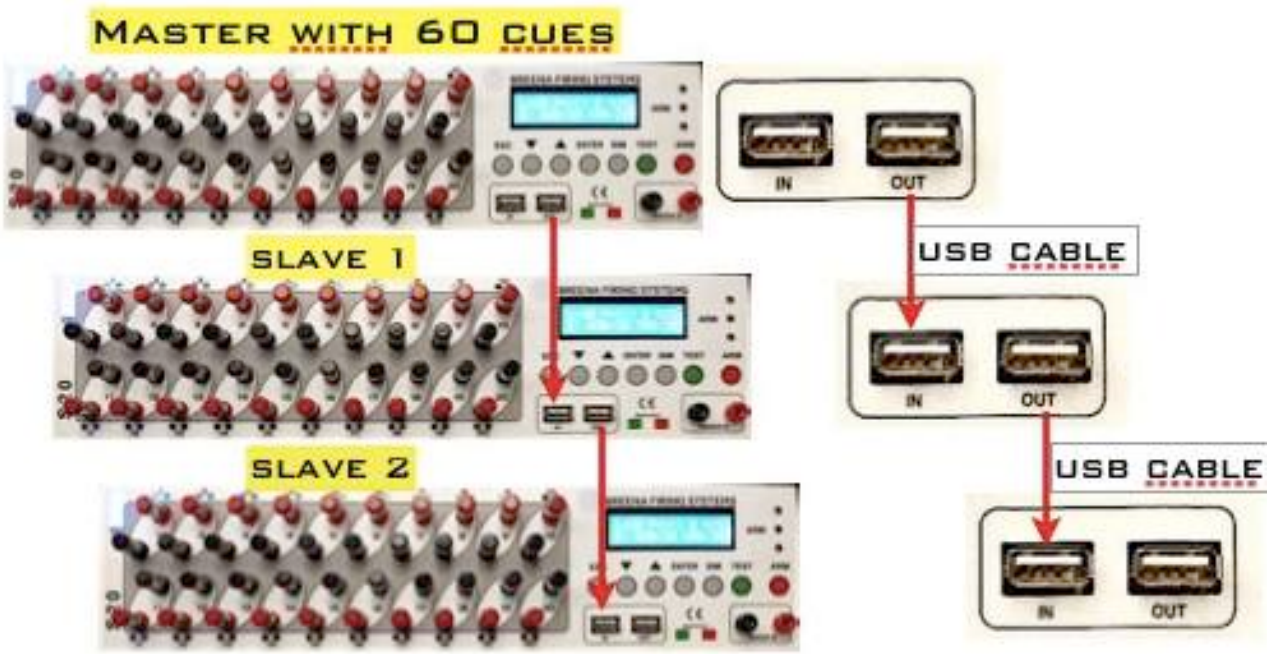
Repeat this procedure for each module you want to use as slave, and remember to set all slave with a progressive numbering, respecting the exact number of slave you will actually use.

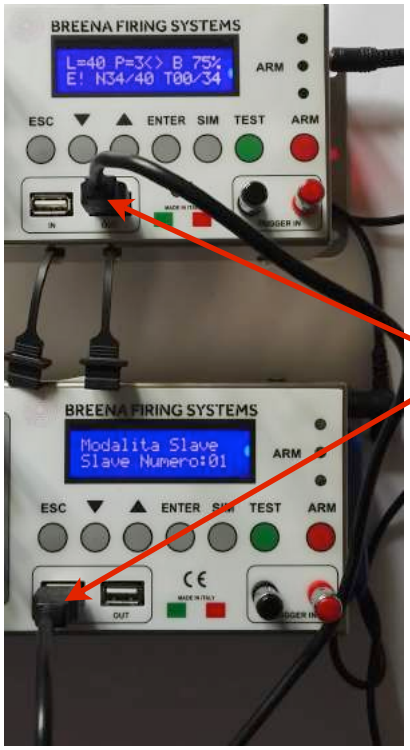
Slave mode will remain stored in the module, as long as you will re-set it to Master mode.
To set the Master mode, use the procedure explained in this manual.

NB: You can enter up to 3 slaves per Master (chain with 4 sequencer = 1Master and 3 slave).

d) Connecting more sequencer with USB

When multi-function mode is set, the master and all slaves need to be connected together to perform programmation, TEST and simulations.
The master and the slaves are connected with an male to male USB cable.
Each sequencer has 2 USB ports, IN and OUT. To connect 2 or more sequencers, connect the OUT usb port of the previous module, with the IN usb port of the next module, starting form the Masters and ending with the last slave you use.
When all the modules are connected together, you can continue programming.
NB: USB connection is required only for programming, testing and simulating; as you transfered the program to slaves, you can perform TEST and SIM control.
You need to tranfer program to slave only first time; then the program will be stored in slave memory, also if you swich off the seguncer.





USB cable Male-Male
(to program, Testing and Simulating)

e) Programming with master

You first need to connect all the sequencer (1 master + slave) with the USB cable, to be able to program in multi-sequencer mode. To perform this step, please refer to the previous paragraph of this manual.
Programming in multi-sequencer mode, requires the same procedure as for individual mode, but requires 1 extra step: **you need to transfer program from Master to the slaves.**
In fact, Master sequencer is programmed using standard procedure, except for the number of firing cues available, which will correspond to the sum of sequencer chain cues. After programmed your Master, you need to transfer data to the slaves.

Transfer the data to the slave

After programmed your sequences on Master,
from the HOME screen:

Press ENTER
Select "Send Data Slave", with the UP or DOWN keys
Press ENTER

Press ENTER key to transfer programs to all slaves chained

The system will transfer the programs to all slaves, and the dispaly of Master sequencer will show the message: "Updating Slave Number: xx", where xx indicates the slave number to which is transfering the program; this message is displayed for any updated slave. The procedure takes few seconds to be completed.
When transfer procedure finished, the dispaly of Master sequencer will show the message: "Updating Slave OK " for few seconds, then the Master screen will return to HOME position.

All slave programmed!!

In order to transfer the programs, is required all modules are connected, if not a message on the display will remind you to connect the modules.
When you finish to transfer all data, you can perform simulation of saved programs and TEST the continuity of programmed cues.

NB!!! If you not transfer the program to all slaves in your chain, you will not be able to perform TEST, Simulation and Arming the sequencers!!!

If Master and Slaves are not connected with USB cable, display will show you a message to remind checking connections!

f) TEST and SIM in multi-sequencer mode

To test the cues, is required all modules connected with the USB cable.
The procedure is the same that you use to TEST cues with a single sequencer (see chapter 9); but in this case, TEST will be extended to all modules of chain, starting from the Master until the last slave, as if it were a single sequencer.
To perform the test, from the HOME screen:

Press TEST: display will show the message: "TEST LINES, TEST = Start"
Press TEST to start.

TEST will start from the Master and will extend up to the last slave connected, for all the firing cues previously programmed. Make sure that all sequencers are connected together.

NB !! If all sequencers are not conncted with USB cable, or connected but turned off, the TEST does not run properly and display shows the message: "Com Port Error! TEST connection!" reminding you to connect the sequencer and lauching the TEST again.

Simulating program in Multi-sequencer mode

In order to simulate programs in multi-sequencer mode, the procedure is identical to that used for individual sequencer: the only difference is you need to connect Master and all Slaves with the USB cable.
To run the simulation, from the HOME screen position:

1) Press the SIM key: display shows the message: "Simulation - SIM button = Start"
2) Press the SIM key to activate the SIM of the first trigger number
3) Press the SIM key for each subsequent trigger to simulate
4) After the last simulation, the screen will automatically return to the HOME screen position
5) Press ESC to exit the program at any time.

For each simulated Trigger, display (only the master, in this case), will show the message: "Simulation - Simul. Tg 1/3, TG 2/3, 3/3 etc... where Tg indicates which trigger is being simulated at that moment.

g) Firing cues in multi-sequencer mode

NB: before firing the cues, remove all USB connecting cables used for programming: it are not required to fire.
To fire cues, the procedure is the same that you use for individual modules (see Chapter 11), but in this case it is required to connect all sequencer (master + slaves) with a twisted pair, in parallel mode, maintaining the polarity. In this way, each pulse will activate the chain in the same moment.

So the steps are as follows:

a) Connect sequencers in parallel mode with the trigger cable (that comes from your firing system)
b) Arm **all** connected modules (ARM key until the red LEDs light up)

Now all sequencers are in ARM mode: chain waits for the external pulses that will fire the individual programs, in the exactly order you programmed them.
At the end of your show, check for fired cues, then disarm the sequencer and turn off.

13) Technical specifications

External dimensions and weight:

Length:	36.5 cm
Height:	5.2 cm
Depth:	8.7 cm
Height + connectors	7.2 cm
Length + strut	40.0 cm
Weight:	1790 gr.

Power:

sequencer supply:	ext. DC 12V
Power Type:	removable Lithium Ion battery, rechargeable.

Battery Specifications:

Output voltage:	12V
Capacity:	4800 Mah / h
Dimensions:	H = 9 cm, L = 5,7cm, P = 2cm
Performance:	12 hours in stand-by, 9 in ARM

Firing Cues Voltage:

Shot:	24V, 1.5Ah (36W)
Test:	5V 2mA
Feeding Time:	0.2 Sec
Connections:	Up to 10 igniters in series Up to 2 igniters in parallel

Trigger IN:

Voltage threshold input:	9V
Maximum input voltage:	80V

Materials and construction:

Production: Designed and manufactured in Italy
Housing: stainless steel structure
Connectors and terminals; Terminals Copper and Zinc
Front panel: Front mask lexan
E: treated boards against humidity
Accessories: Special fireproof and waterproof enclosures

Certifications:

CE

RoHS Compliant

14) General information

1) The BFS S sequencer 20 is designed for fireworks use in the context of approved fireworks shows. Please follow carefully the instructions in this manual.
2) Handle in compliance with the safety standards respecting law and exclusively by specialized staff.
3) Do not immerse in water, and protect from the elements.
4) Do not use any external power supplies different from those indicated in the product specifications.
5) Do not subject to violent impacts.
6) If anchored to elevated support, check carefully the quality of the bond to avoid drops that could cause damage to property or persons.
7) Always use batteries with a maximum % of power.
8) During the execution of TEST and other operation tha require to swich on the system, please perform the operations taking care not to move into the trajectory of the fireworks attached to it.
9) Avoid direct contact with excessive heat.
10) After each use, subject the module to a thorough cleaning.
11) Carry out preventive checks before using it in your show
12) Carry out all the electrical connections as indicated in the present manual.
13) Keep the polarity of the electrical connections, as indicated on this manual.
14) Do not exceed the number of series connections as indicated in this manual
14) Do not exceed the number of parallel connections as indicated in this manual
15) Do not transport with connected igniters if the battery has not been removed.
16) Always remove the battery from the sequencer when not in use.
17) Always remove the battery from the sequencer during transport.
18) Do not tamper in any way the integrity of the module
19) Do not open the sequencer case.
20) Do not change the appearance of the sequencer, do not change the connections and the characteristics of the module.

15) Technical assistance

Breena Fireworks provides a complete technical support service that includes:

Support for first use
Field Technical Support
Technical Phone Support
Repair service
Replacement parts subject to wear service

NB! Reading and understanding the following manual, are fundamental steps for understanding and learning the use of the BFS S sequencer 20, and are integral part of the assistance provided by Breena Fireworks.

We recommend to always perform, before each use, an accurate simulation with all modules you planned to use in your show, in order to ensure the optimal programming and operation of the entire system as well as programmed to operate.

For technical assistance, please contact

breenafireworks@gmail.com
Mirco: 3391572365.

16) Problems, causes and resolutions

PROBLEMS	CAUSES	SOLUTIONS
The module does not turn on The module turns itself off	• Low battery. • Battery not activated. • Battery not connected to the module. • damaged battery • not usable battery	• Charge the battery • Activate the battery • Connect the battery to the sequencer • Replace the battery • Use a specific battery
TEST report Error (E!)	• Battery not activated.One or more igniters are not connected. • One or more igniters are connected but have no continuity • TEST not still performed	• Connect the missing • igniters. • Check the connection of the igniters. • Run the cues TEST
One or more cues have not fired the igniters connected to them	• Battery not connected to the module. Too many igniters on the same line. • Line open or badly connected. • Defective igniters. • Low battery. • Faulty cue.	• Max 8 in series and 2 in • parallel. • Always perform the TEST! • Replace them. Pay attention to those already linked to fountains and multi flash. • Charge the battery • Send the sequencer to assistance.
The module does not fire !!	• Damaged batteryThe sequencer is not in ARM mode • The sequencer is not connected to the trigger. • The trigger terminals are connected but with reversed polarity. • The trigger terminals are connected but the line is open. • The pulse coming in is not sufficient to activate the sequencer • The sequencer is not well programmed. • The battery is dead • None of these	• Arming the sequencer (ARM procedure) • Connect trigger terminals to one cue of your firing systems . • Always respect the polarity (red - black) • Always perform a remote Trigger test before firing. • Call for service • Programming following the manual. • Recharge the battery • Contacting Support
The module does not let me programming cues	• Incorrect programming procedure • cues already used by another program • It has not been respected the rule of the last program	• See the instructions on the manual • Use the remaining avaible cues • Delete all programs and reprogram again
The module does not let me save other programs	• You have exceeded the limit of 10 programs • You have used all available cues • Incorrect programming procedure	• If possible delete the last program • If you can delete some program starting from the last • Follow the manual for proper programming

PROBLEMS	CAUSES	SOLUTIONS
I can not program in a multi-sequencer mode.	• The sequencer are not well connected with usb cable. • Sequencers are not set as Master / Slave. • The Master is not set to the correct slave number or not set at all. • One or more slaves have not been numbered.	• Check that all modules are connected by USB cable. • Set the Master and Slave. • Set the number of the Master / Slave to use. • Numbering Slaves with consecutive numbering.
I can not run the TEST in Master / Slave mode	• Sequencers are not well connected with USB cable. • You have not saved any program. • You have not transferred any program or programs to the slaves.	• Check that all the modules are connected by USB cable. • You must first set 1 or more programs before you can run the TEST. • Before performing simulation, transfer the program or programs to the Slaves.
I can not run the simulation	• No program saved • Not in the HOME screen position	• Before performing simulation, save 1 or more program • Simulation is performed from the HOME screen position
I can not run simulation procedure in the Multi-Sequencer mode	• The modules are not well connected with USB cable. • You have not saved any program • You have not transferred program or programs to the slaves • Not in the HOME screen position	• Check that all the modules are connected by USB cable • Before performing simulation, save 1 or more program • Before performing simulation, transfer the program or programs to the Slaves • Simulation is performed from the HOME screen position
Some programs do not start immediately when the external pulse comes in	• You probably set a time clock for those programs	• Set the Clock to zero seconds
Two or more programs start together (at the same time) when pulse comes in	• The programs have an equal Trigger number!	• Set a different trigger number for each program.
The sequencer fires only one line at a time for each pulse that comes, instead of the stored programs.	• The sequencer is set to Step mode; Programs are not executed.	• Set the Sequencer in master mode

PROBLEMS	CAUSES	SOLUTIONS
The sequencer asks me to send the program to other sequencers, but I am using it on your own!	• The sequencer is set with a number of slave different from zero.	• Set your sequencer with a number of slaves equal to zero
The sequencer asks me to connect other slave but I am using it on your own!	• The sequencer is set with a number of slave different from zero	• Set your sequencer with a number of slaves equal to zero.
The sequencer is on, but the screen is off.	• The sequencer has entered in stand by mode	• Press ESC to exit from the stand-by and reactivated.
The sequencer shows "Slave number"message and it does not perform anything.	• The sequencer is set as Slave, and it can only receive the firing impulse	• Set the Sequencer as Master

TECHNICAL ASSISTANCE AND WARRANTY

Breena Firing Systems is a Breena Fireworks trademark and the related products are ownership of Breena Fireworks.
The BFS S 20 sequencer is a product designed, engineered and built by Breena Firewoks, in compliance with the highest quality standards.

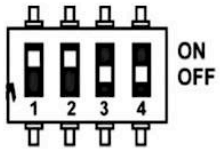
Breena Fireworks provides a complete and highly professional assistance, as well as a technical service for upgrades and repairs.
Breena Fireworks provides an international 2 year warranty on all its products.

For information and inquiries: breenafireworks@gmail.com
339 1572365 Mirco Casadei

www.breenafireworks.it 339 1572365 breenafireworks@gmail.com

BREENA FIREWORKS

MINIMUM VALUES FOR CURRENT ACTIVATION TRIGGER FOR EACH VOLTAGE RANGE

Sequencers in parallel mode on the same cue	Minimum required Amperage (9-24V) (up to 34V tollerance)	Minimum required Amperage (25-40V) (up to 50V tollerance)	Minimum required Amperage (41-60V) (up to 70V tollerance)	Minimum required Amperage (61-80V) (up to 90V tollerance)
1 Module	0.6A	1.4A	2.1A	5.0A
2 Modules	1.2A	2.8A	4.2A	10A
3 Modules	1.8A	4.2A	6.3A	15A
4 Modules	2.4A	6.0A	8.4A	20A
5 Modules	3.0A	7.4A	10.5A	25A
6 Modules	3.6A	8.8A	12.6A	30A
	1 2 3 4 ON OFF OFF OFF	1 2 3 4 OFF ON ON ON	1 2 3 4 OFF ON ON OFF	1 2 3 4 OFF ON OFF OFF

Note: For each voltage step (ex: 9-24V), you have an +10V tollerance, so the permissible voltage value is: 9-34V.
Attention! The values shown in the table, refer to a full or medium battery charge. Please test it preventively!