

**This sequencer generates controlled impulses of current on 32 firing lines loaded with fireworks squibs.**

**Shooting is sequential and is ordered by only one input line.**

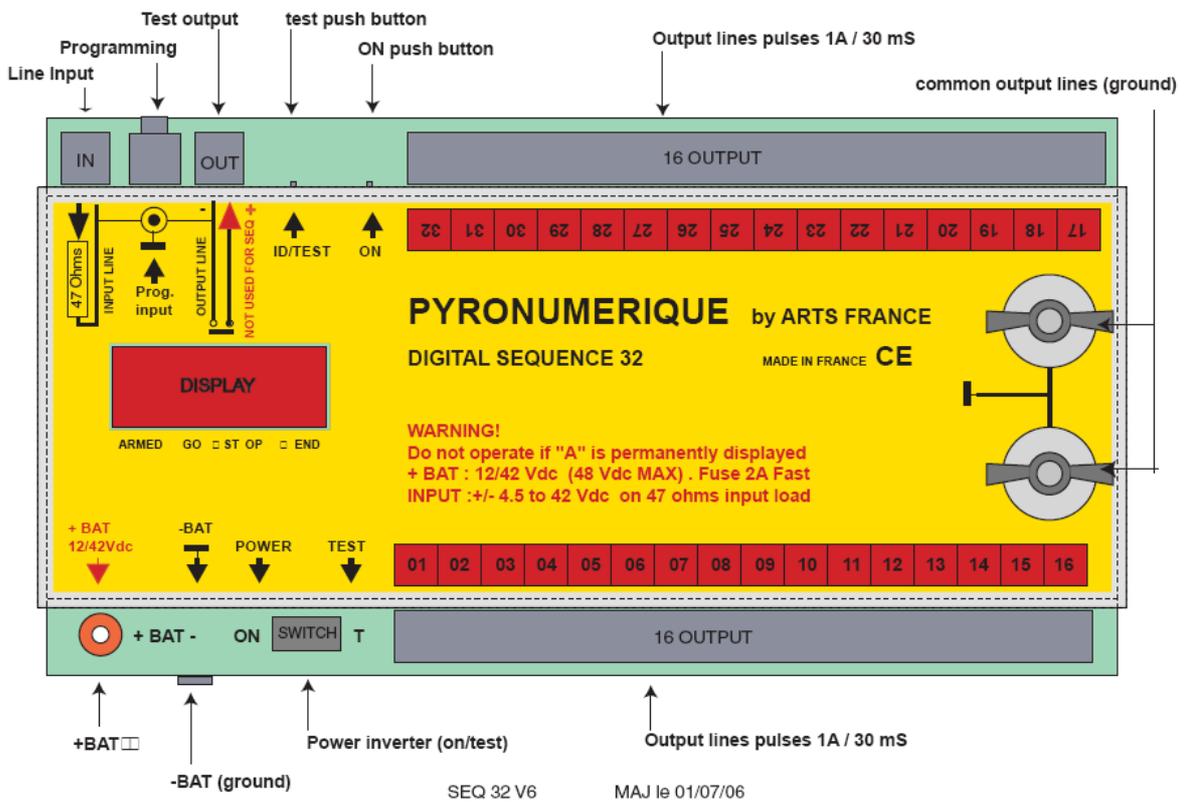
**2 operating modes are possible:**

**Automatic mode:** It is a fully automatic mode the firing sequence is memorised into the module. It starts or stops with the reception of an impulse on its input.

**External mode:** the firing sequence is ordered by an external system and moves of a step to each impulse received on its input.

This module is particularly adapted to the extension of the receivers of computerised systems of shooting.

It is then ordered like a traditional pyrotechnic squib.



For a better safety, this module does not have a principal switch. The physical disconnection of the supply cord + Bat on the +BAT input provides this function. Before the powering, the inverter switch must be in Test mode. If it is not the case the display asks to reverse its position ("E\_t").

**Ergonomics of display :**

Display is composed of 4 digits (D1 to D4) from left to right.

An armed module displays "- "on D1 (ARMED)

A module in the course of firing displays "- "on D2 (GO)

A stop of the cycle of firing displays "- "on D3 (possible STOP on the automatic mode).

The end of the firing displays "- "on D4 (END)

At any time, once the module armed, it is possible to display the line which has just been fired while pressing on the test push button.

Any moment before the arming of the module, when the point alone is displayed, a signal on the input is signalled with "S" (START) on the display.

#### **Operation in automatic mode:**

As soon as the module is supplied, the ID (identifying N°) of the module is displayed.

This mode is automatically activated when a correct ID different from zero is in memory.

The table of shooting will have been programmed in the memory according to the procedure described in & Programming.

The ID allows to recognise the programmed module in order to install it on the fireworks site.

A ID from "0020" corresponds for example to a total time of 3,2s.

If a "E" or "A" is displayed, refer to & Anomalies.

Make a short impulse on Push button Test: a point is displayed.

#### **Choice 1:** (recommended)

Measure voltage of the battery with no load and test of the continuity of the output lines:

Make a short impulse on the Push button Test: the voltage of the battery with no load is displayed.

Make a short impulse on the Push button Test: the programmed lines are tested.

When a line is opened, the test stops, N° of line is displayed during 1s at least. An impulse on the Push button Test starts again the test up to the last line programmed in memory (NN). Display is then "--NN" during 1s then a point is displayed.

There are then again choice 1 or 2

#### **Choice 2:**

Voltage of the battery under load (1A) and/or arming of the module for the shooting:

Short impulse on Push button ONE: the voltage battery under load of 1A is displayed (used for the calculation of the line resistance).

Short impulse on Push button ON: a point is displayed, one returns to choices 1 or 2.

Press more than 4s on Push button ON when the display of the voltage battery is active:

The module is armed ready for shooting and displays "-" above ARMED.

The shooting starts with an impulse on the input.

The display shift then with "-" above GO.

One can stop the automatic cycle with an impulse on the input. The display shifts with "-" above STOP.

At the end of the shooting, the display shifts with one "-" above END and the module remains blocked in this state.

It is impossible to arm the module if the input lines is activated.

#### **Operation in External mode:**

This mode is automatically detected by the module when a ID equal to zero is in memory.

If a ID different from zero is displayed (or "E"), it is possible to force the module in External Mode by pressing the 2 push buttons during the power ON.

#### **Choice 1:**

Voltage of the battery without load and test of the continuity of the output lines:

Make a short impulse on the Push button Test: The voltage of the battery with no load is displayed

Make an impulse on the Push button Test: the 32 output lines are tested

When a line is opened, the test stops, N° of line is displayed during 1s at least.

An impulse on the Push button Test starts again the test up to the last line. Display is then "--32" during 1s then a point is displayed.

There are then again choice 1 or 2

#### **Choice 2:**

Voltage of the battery with load and/or arming of the module for the shooting:

Short impulse on Push button ON: the voltage battery under 1A load is displayed.

Short impulse on Push button ON: a point is displayed. One returns to choices 1 or 2.

Press more than 4s on Push button ON when the display of the voltage battery is active:

The module is armed ready for shooting and displays "-" above ARMED.

The shooting starts with an impulse on the input.

The display shifts then with one "-" above GO.

Each new impulse on the input shifts the activated line of one unit.

When the line 32 is launched, the display is "--32" and the module remains blocked in this state.

Any moment before the armament of the module, when the point alone is displayed, an activated input conducts to "S" on the display. It is impossible to arm the module if the input line is activated.

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#### **Squib:**

Element of firing of the pyrotechnics loads.  
Squib Brand recommended: Bickfort: resistance 2 Ohms, ignition time approximately 4ms (1A).

#### **Anomalies:**

Display of "E":

In the event of error on the checking of the ID, a "E" is displayed and blocks the module in automatic mode. The data in memories are not coherent, it is necessary to reprogram the module.

Permanent display of "A":

A defect of safety is detected, the module must be repaired.

In these 2 cases the disconnection, then the reconnection of the battery makes possible to confirm the defect

The module does not display anything:

Check the fuse inside the module.

If 2 fuses are destroyed after one the other, the module must be repaired.

Display of "E\_t":

The position of the inverter ON/T is incorrect. Toggle the switch.

#### **Battery:**

You must Never feed the module SEQ32 with a supply plugged into the main for field use (fireworks)

The battery voltage must be between 12 and 48VDC. The test under 1A should not indicate less than 9V.

The voltage of the battery with no load should not be higher than 50V. If the voltage is higher than this limit, the fuse will be destroyed.

A voltage battery of 50V connected on the module with the point (only) displayed, corresponds to a value of 49,4V on the display(inverter in position T).

In order to avoid reaching the limit of the voltage protection, do not to use a battery which nominal voltage is higher than 42V (48V max, on the display with no load).

The measurement of the voltage under a load of 1A takes into account the internal resistance of the battery, the feeder and the protection of entry. It is normal that value is lower several volts than the no-load voltage.

For the calculation of the maximum resistance of authorised line, take the value under test 1A and subtract 3 Volts (falls of voltage in the generator of current of 1A).

Consumption in standby mode before an armed state is about 10mA under 24V.

The current in the Squibs is limited to 1A by an internal generator.  
Do not use a capacitor in derivation with the battery.

#### Connections:

Each of the 32 output receives one of 2 wire of the Squibs, the other being connected the common lines terminal (Ground of the case).

The 2 wires of the input line are not polarised. They transmit the input impulses. (orange connector block).

#### Hexadecimal code:

Coding of a number base 16 with the following values of them: 0,1,2,3,4,5,6,7,8,9, A, B, C, D, E, F this coding is used to display the ID.

#### Special cord RS232:

Cord equipped with a stereo jack 3.5mm on Module side, and of a DB9 RS232 on PC side.

The 3 wired points are : RX, TX and Ground.

#### Fuse:

Use only 2A 5x20 mm F fuses (marked F like "Fast")

A fuse of replacement is in the module. Take care that it is always available

The use of a fuse of the different type can bring to its destruction under normal conditions or to the final destruction of the module.

Using a different fuse cancels the warranty

#### ID:

Identifier of the module. It is the sum of total time in units of 0,1s of the sequence on 4 digit in hexadecimal code (H). (value max.= 59999 X 0,1s is: EA5F (H))

A total time of 3,2 S will have a ID of 20 (H)

A total time of 1H will have a ID of 8cA0

#### Impulse on the input line:

The starting impulse must be longer than 5ms (safety against electric perturbation)

Impulse between 4,5V and 42V on an impedance of entry of 47 ohms

Recommended: 10 to 40 ms at 24V

Note: in automatic mode, the stop and the revival of the sequence of shooting require impulses of at least 0,1s. The first launching of the sequence can be done with an impulse from 10 to 40 ms.

The connector block of input line is not polarised.

The input resistance is limited to 10W. It is mandatory to inject no more than 10W into the input line.

See table 1, at the end of the note, which determines time between the impulses according to the voltage input.

In automatic mode, only one impulse is used to start the sequence of shooting. It is then possible to use input voltages up to 48V, but limited to 0,4s (48V).

The automatic mode is recommended for the shooting of fast sequence with batteries higher than 24V.

In external mode it is necessary to respect the values of table 1 between the impulses.

For the shootings in fast sequences (20 firing/s) do not exceed 24V/40ms.

If the external system delivers a stronger voltage and duration of impulse and differences between the impulses which lead to dissipate at least 10w on resistance of entry of 47 ohms, it is necessary to add a resistance in series in the line of order (47 ohms 10w beyond 42V).

The destruction of the input 47 Ohms resistor is not taken into account by the guarantee.

#### Impulses of shooting on the 32 output lines:

15ms after the activation of the input line, an impulse of 30mS of 1A is sent on the line of the active output.

Minimum time between the input impulses is 50 ms in external mode.

Time in automatic mode is given rhythm with units of times of 0,1 second.

These output are passive. Never input a voltage into the exits!

In the exceptional case when it would be necessary to order a line manually, disconnect the squib line from the grey connector 16 points and apply a voltage to the line which can be the +BAT.



The current of test of the lines is limited to approximately 10 mA during a very short time.

It is possible to check the integrity of the safety measures by maintaining the push button "On" supported during power ON. "A" then displays during 1s, then the ID code.  
Make this test without any load of fireworks connected to the Squibs.

Check carefully that the input line cannot be activated just after the armament of the modules  
Not to use the modules without protection against the contact with water in a wet environment.  
The modules must be maintained and checked regularly. Their integrated test functions makes this operation very fast.

Never supplied module SEQ32 with a supplied plugged to the mains for field use with Squibs assembled on the pyrotechnic loads.

**Never use module SEQ 32 if a permanent posting "A" is displayed**

Armament monitoring:

A polarised exit with 2 wire can be used to state remotely that the module is armed and awaits the orders of shooting on the input line.

An entry is the Ground, the other connected to a static switch with a resistance of protection of 47 Ohms 5W. Permanent continuous maximum current: + 0,2A. Maximum voltage 48V.

State "ARMED" of the module corresponds to the closing state of the static switch.

Software version:

At the end of a firing sequence it is possible to check the software version by pressing the push button.

Fig1 : relation between input pulse length and interval between pulses to avoid overwarming the 47 Ohms input resistor (at 23°C)

V Bat (v)	Pulse length (s)	Time to next pulse (s)	V Bat (v)	Pulse length (s)	Time to next pulse (s)
48	0,10	0,49	48	0,04	0,20
46	0,10	0,45	46	0,04	0,18
44	0,10	0,41	44	0,04	0,16
42	0,10	0,38	42	0,04	0,15
40	0,10	0,34	40	0,04	0,14
38	0,10	0,31	38	0,04	0,12
36	0,10	0,28	36	0,04	0,11
34	0,10	0,25	34	0,04	0,10
32	0,10	0,22	32	0,04	0,09
30	0,10	0,19	30	0,04	0,08
28	0,10	0,17	28	0,04	0,07
26	0,10	0,14	26	0,04	0,06
24	0,10	0,12	24	0,04	0,05
22	0,10	0,10	22	0,04	0,04