

DIGISEQ64 - Table Of Contents

1) Introduction	2
2) Principal of Operation.....	3
1) Trigger	4
2) Serial Data Control	4
3) Battery Box	5
4) Menu System	7
1) Main Screen	7
2) Continuity Test.....	7
3) Menu Items	7
a) Firing Order	8
b) Set Cue Delays	8
c) Reset Cue Data.....	9
d) Unit Address.....	9
e) Run Sequence.....	10
f) Menu Map	11
5) Example Configurations.....	12
1) Standalone (using trigger)	12
2) Computer Controlled (Single Unit).....	12
6) Pin-outs.....	14
1) 10 Way Output connector.....	14
2) Remote Arm & Power	14
3) Serial Data & Power	14
4) Termination Plug.....	15
5) Single Shot Plug	15

1. Introduction

The FireByWire® DIGISEQ 64 is a programmable firework ignition system. A fully choreographed fireworks display can be executed by programming a sequence of ignition delays and connecting e-match igniters to the unit's outputs. The execution of the display is then started when the sequencer receives a trigger.

There are two versions of the FireByWire® DIGISEQ 64:

- **The Compact version:**

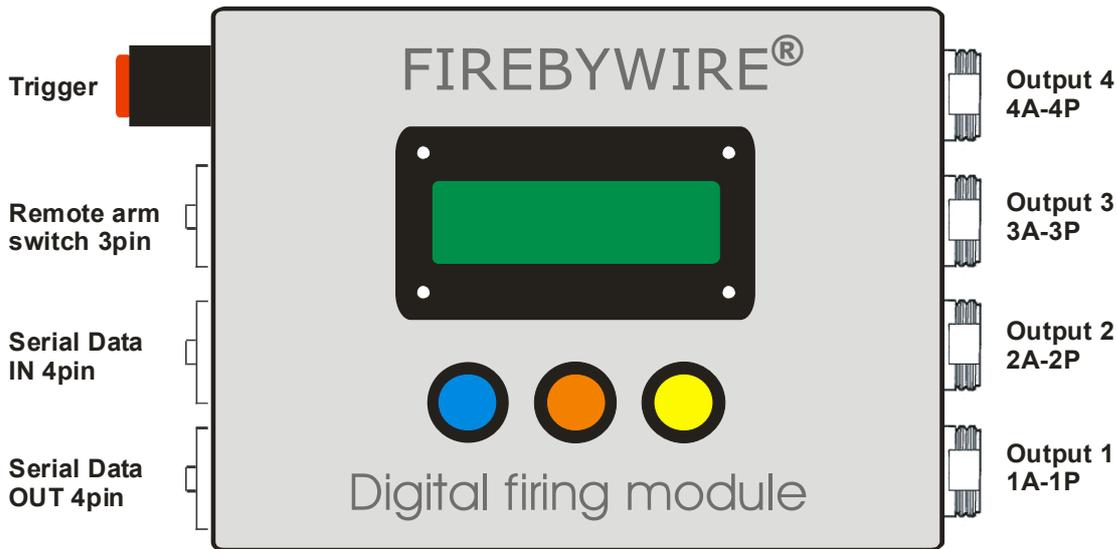


Figure 1: Front panel of the FireByWire® DIGISEQ 64 (compact version)
Remote arm = Deadmans Handle Port

- **The Robust version available in a weather-proof case:**

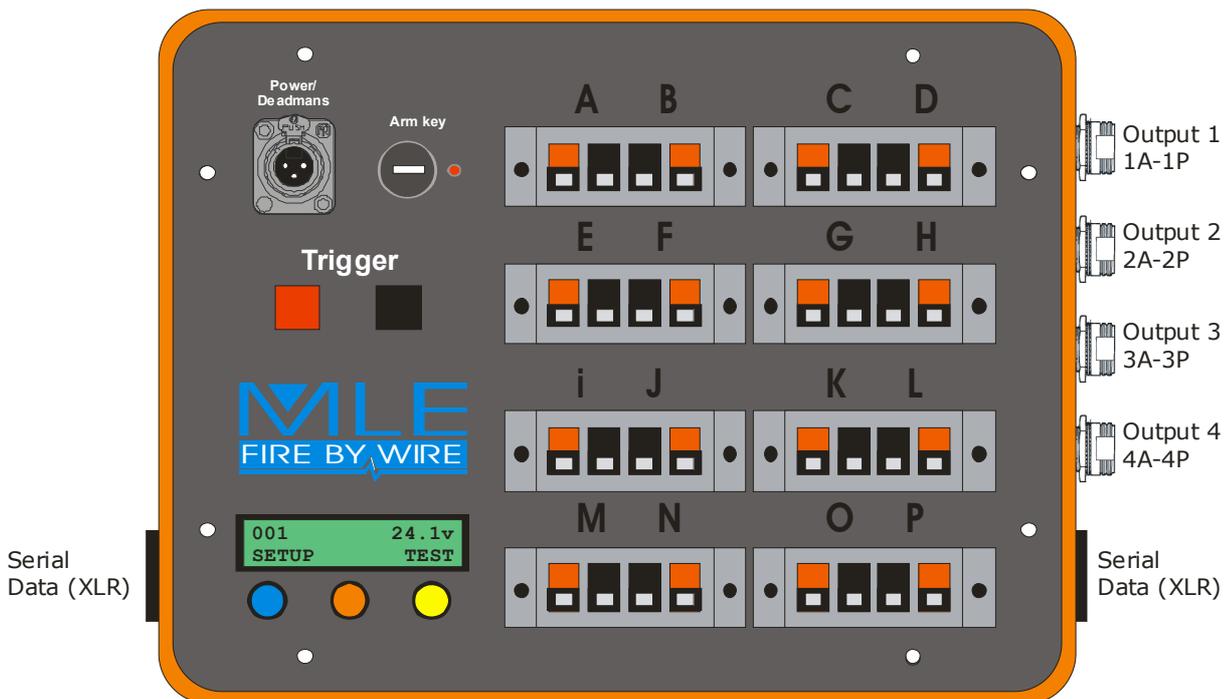


Figure 2: Front panel of the FireByWire® DIGISEQ 64 (robust pelicased version)

2. Principal of Operation

The FireByWire® DIGISEQ 64 can execute a firing sequence consisting of 64 cues. A cue consists of a time delay followed by firing pulse sent to an assignable output port. In order to program a display sequence, you will need to define two pieces of information for each firing cue:

- 1) A time delay.
- 2) The output port to which the firing pulse is sent.

The sequence is started either by applying a voltage (5-30v) to the trigger input, by the menu system, or by command on the serial data port (4 pin XLR).

When executing a sequence, the unit will first wait for the cue delay, and then it will fire the assigned output port. A cue delay can be of any length ranging from 0.1 seconds to over 2 hours.

A cue delay of zero seconds has special meaning. Most of the time it is taken to mean, "pause execution". Once the sequence has been paused, another trigger is required to resume execution of the sequence. The only exception to this is the very first cue of the sequence; in which case a zero length delay means that the assigned output port is fired immediately on receiving the trigger.

Here are some examples to help illustrate how things work:

Example 1:

After receiving the trigger the sequencer will wait 10 seconds, then fire output 1A, then wait for 1 second and fire output 1B, then wait 1 second and output 1C, then wait 1 second and output 1D...

	Delay	Firing Order
1	10.0 seconds	1A
2	1.0 second	1B
3	1.0 second	1C
4	1.0 second	1D
5	...	

Example 2:

After receiving the trigger the sequencer will immediately fire output 1A, and then wait for 1 second and fire output 1B, then wait 1 second and output 1C, and then wait 1 second and output 1D...

Cue	Delay	Firing Order
1	0 seconds	1A
2	1.0 second	1B
3	1.0 second	1C
4	1.0 second	1D
5	...	

Example 3:

After receiving the trigger the sequencer will immediately fire output 1A, then wait for 1 second and fire output 1B, then the sequence will PAUSE. To make the sequencer continue firing another trigger must be given, after which output 1C is fired, and then wait 1 second and output 1D is fired...

Cue	Delay	Firing Order
1	0 seconds	1A
2	1.0 second	1B
3	Pause	1C
4	1.0 second	1D
5	...	

2.1. Trigger

As many FireByWire® DIGISEQ 64's can be connected together using the trigger input. A voltage of between 5 and 30 volts when applied to the trigger input will start the execution of the unit's pre-programmed sequence. Multiple units can be triggered at the same time by connecting the trigger inputs together, parallel or series wiring may be used, but be sure to ensure there is sufficient voltage when wiring in series (each unit will need a minimum of 5 volts to trigger).

A small point to note is that the Trigger Input as well as the Serial Data Port is disabled when the unit is being programmed via the front panel menu system, this is a safety feature: it prevents accidental triggering when an operator is programming the unit. The trigger is only active when either of the main screens are displayed:



The main idle screen alternates between an assignable name (left) and the voltage screen (right)

2.2. Serial Data Control

All functions of the FireByWire® DIGISEQ 64 are available via the serial data port (4 pin XLR connector). It is then possible to:

- Download pre-programmed sequences from computer to FireByWire® DIGISEQ 64
- Upload pre-programmed sequences from FireByWire® DIGISEQ 64 to computer
- Remotely perform continuity tests
- Monitor supply voltage for all connected units.
- Trigger sequencing.
- Fire individual output ports.
- Activate/Deactivate the "Remote Arm Switch" (dead man's handle)

The two serial data port connectors are wired up in a loop thru configuration to allow connection (daisy chaining) of other units. Be sure to connect the terminating resistor plug to the last sequencer in the chain.

Because it is possible to connect several FireByWire® DIGISEQ 64 units up to a computer each unit has to be given a unique number so that the computer can address a specific unit. This number is programmed via the built in menu system (see below).

When using the serial data port it is VERY important to make sure that each unit has its own unique number and there are no duplicate numbers.

Numbers range from 001 to 254.

If the address (unique number) is set to zero then the Serial Data Port is disabled. It is advised to disable the Serial Data Port when computer control is not in use.

As described above the FireByWire® DIGISEQ 64 can either execute its own pre-programmed sequence, or it can receive firing commands from a controlling computer via its Serial Data Port. It is perfectly possible to create a firing sequence in which a pre-programmed sequence is used in combination with external firing commands from a remote computer.

For instance, a FireByWire® DIGISEQ 64 can be pre-programmed to fire the first 32 of its 64 possible cues, and then wait for external firing signals from a computer to fire the remaining outputs.

When using the Serial Data Port, it is possible to connect a maximum of 128 FireByWire® DIGISEQ 64's together using a total cable length that should not exceed 1000 metres.

IMPORTANT: The last FireByWire® DIGISEQ 64 in a chain of units must have a terminating resistor (120Ω) plugged into its "Serial Data Out" connector. This is true even if you are using only one FireByWire® DIGISEQ 64.

Remote Arm Switch/dead-man's handle (Optionally removed)

This is an important safety feature that is fitted to the sequencer and provides an additional layer of safety. A 3-pin female XLR connector is provided on each sequencer. Connecting the Remote Arm wire (pin 3) to the Ground pin (pin 1) activates the Remote Arm switch. **In order to fire the Remote Arm switch must be engaged.**

Disconnecting the Remote Arm wire from ground will disarm the sequencer(s), and the outputs will stop firing. It is also important to note that full battery voltage must be used for the 'Remote Arm' switch to work correctly. Reduced battery voltage may result in the 'Remote Arm' switch engaging incorrectly. **You can check this by listening for a clicking sound at each sequencer when engaging the deadmans handle.**

VERY IMPORTANT

Every single sequencer being used in a display must each have pins 1 and 3 in the deadmans socket (3pin female XLR) connected together in order to fire any igniters.

The yellow USB module has a deadmans switch as standard (emergency stop button). This ONLY works/controls the deadmans when each sequencer is connected using the 3 pin power cable. So under computer control when the 4 pin data cable is being used, alternative arrangements must be made. Usually we recommend using a "deadmans terminator plug" which is a 3pin XLR male plug with pins 1 and 3 connected inside. This is inserted into ALL sequencers being used on the show. The laptop itself provides the new deadmans facility via the software (ability to stop/pause/remove sections of the show). You can of course have a 3pin XLR plug, length of wire and switch to remotely control each sequencer. If you wish to turn on/off each sequencer at the same time, wire each of the deadmans in PARALLEL back to a switch.

3. USB Computer Interface and Power Supply Module

The USB/Power module, as its name suggests contains re-chargeable batteries to provide 24 volts of power for the FireByWire® DIGISEQ 64 units. The box also contains the USB to Serial Data system that is needed for computer-based operation, and other useful features:

1. On/Off Key Switch and power indicator. This switch will isolate the batteries from all equipment.
2. The 'Deadmans Switch'. This switch is used to disarm all the sequencers. Any sequencer that has been triggered will continue to execute its sequence, but no outputs will be fired. This is to maintain synchronisation with any music that may be playing while the show is momentarily suspended. Turning the 'Disarm Switch' off will resume firing. ONLY works when using the 3 pin power cable / socket. If you are under laptop control and using 4 pin data you'll need to make alternative provisions such as a deadmans terminator plug in each sequencer.
3. A momentary trigger push button and terminals are provided to facilitate sequencer triggering.
4. Battery Level meter. Please ensure that the batteries are fully charged for each show. The battery level indicator should be pointing at the green region.
5. Serial data and power port. The FireByWire® DIGISEQ 64 units are powered from this port. The connector is a 4 pin XLR type and also serves as the Serial Data Port for computer control.
6. USB Port. Connect a standard USB cable between the battery box and computer.

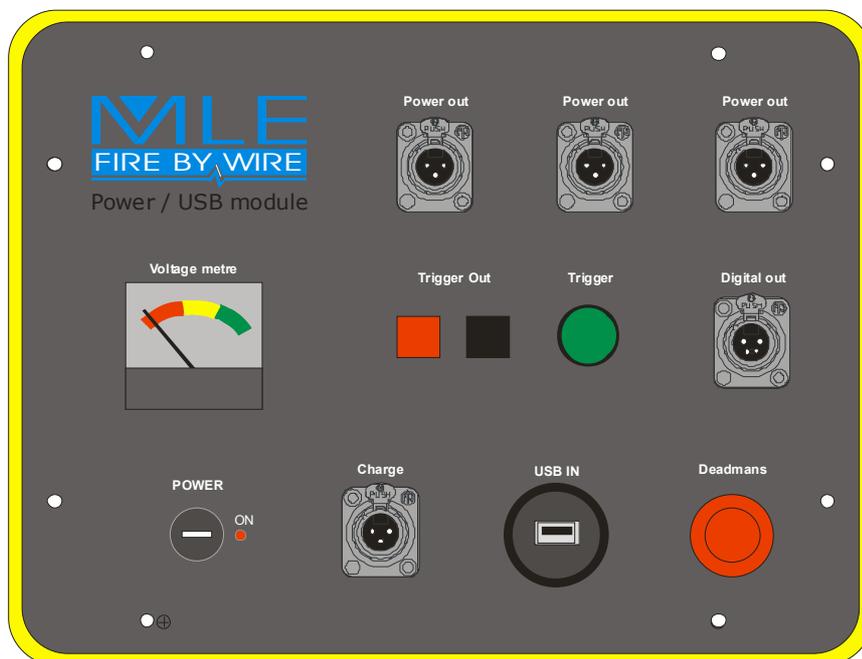


Figure 4 – Battery Box

It is possible for the user to operate the units in stand alone mode using a 24v battery power supply (usually 2 x 12v). This can be applied to either the 4 pin serial data connector or the 3 pin connector if featured. **Arrangements must be made to function the deadmans handle on EACH sequencer, see section 6 - pin outs for further information.**

4. Menu System

The sequence information described earlier can be programmed into the FireByWire® DIGISEQ 64 via the built in menu system, which is accessible by pressing the buttons positioned below the LCD display.

The bottom line of the display is used to show the function of the buttons.

4.1. Main Screen

The main screen alternates between the two examples shown. It displays the unit address, and the operating voltage of the unit.

The main screen also displays the name of the unit.

This is normally the model of the sequencer, but the name can be changed if programmed via the computer interface.

When the main screen is displayed the trigger input and serial data ports are enabled, and the system is ready to be triggered.

By pressing the 'Setup' button you will enter the menu system that allows you to configure the unit. The trigger and Serial Data port are disabled.

Pressing the 'Test' button will perform continuity tests.

```
001          24.3v
Setup       Test
```

```
Sequencer 64
Setup       Test
```

4.2. Continuity Test

After pressing the 'Test' button from the main screen the display should look something like the illustration on the right. The top line is displaying the results of the continuity test: Continuity has been detected on ports A,B,C,D,I,J,K,L,M,O, and P, on module 1 (the module that is connected to output 1)

The second line of the display is showing the function of the buttons positioned below the LCD. The first button will 'Exit' the test screen and return back to the main screen.

The middle button will repeat the test for the current output connector, in this example Module 1.

The third button will execute a test for the next output port. In this example output 2 will be tested.

```
AB-DEFG--JKLMNOP
Exit  Next  Mod1
```

```
AB-DEFG--J---NOP
Exit  Next  Mod2
```

```
-----N-
Exit  Next  Mod3
```

```
-B-----N-
Exit  Next  Mod4
```

4.3.a. Firing Order

<p>This is the top-level menu for programming the firing order. The firing order menu allows the assignment of output port for each cue of the sequence.</p> <p>Navigation to other menu screens is achieved by pressing the 'Previous' (blue) and 'Next' (orange) buttons.</p> <p>There is a separate menu for resetting the firing order to the simple sequence of 1A,1B,1C,1D.... see below.</p>	 <p>A screenshot of a green terminal-style menu with the text: "Firing Order" on the first line, and "Prev Next Set" on the second line.</p>
<p>Pressing the 'Set' (yellow) button from the above menu will navigate to the screen illustrated on the right. This screen is used to select the cue in the sequence that is to be assigned an output port.</p> <p>The screen displays the cue number and the currently assigned output port.</p> <p>Pressing the button marked 'Exit' navigates to the menu.</p> <p>Pressing the 'Next' button changes the cue number.</p> <p>Pressing the 'Set' button navigates to output port assignment screen.</p>	 <p>A screenshot of a green terminal-style menu with the text: "Cue 1 -> Fire 1A" on the first line, and "Exit Next Set" on the second line.</p>
<p>This is the cue output port assignment screen. In the example screen to the right, cue 1 of the sequence is being displayed, and output port 1A is currently assigned.</p> <p>Pressing the 'Dec' and 'Inc' buttons will change the assigned output port.</p> <p>To save the assigned output port and exit from this screen press the 'Save' button.</p>	 <p>A screenshot of a green terminal-style menu with the text: "Cue 1 -> Fire 1A" on the first line, and "Inc Dec Save" on the second line.</p>

4.3.b. Set Cue Delays

<p>This is the top-level menu screen for programming the cue delays. The cue delays are the period of time that the sequencer waits before firing the assigned output port.</p> <p>Press the 'Set' button to program cue delays.</p>	 <p>A screenshot of a green terminal-style menu with the text: "Set Cue Delays" on the first line, and "Next Prev Set" on the second line.</p>
<p>Pressing the 'Set' (yellow) button from the above menu will navigate to the screen illustrated on the right. This screen is used to select the cue in the sequence that is to be assigned a cue delay.</p> <p>The screen displays the cue number, the assigned output, and the cue delay...</p>	 <p>A screenshot of a green terminal-style menu with the text: "Cue64 (1A) 0.5" on the first line, and "Down Exit Set" on the second line.</p>

<p>Pressing the 'Down' button changes the cue number.</p> <p>Pressing the 'Exit' button will navigate back to the menu.</p> <p>Pressing the 'Set' button navigates to the next screen where the duration of the cue delay is changed.</p>	
<p>This is the cue delay assignment screen. In the example screen to the right, cue 64 of the sequence is being displayed, which has a delay of 0.1 seconds.</p> <p>Pressing the 'Inc' and 'Dec' buttons will change the duration of the cue delay. Note that a delay of zero length is displayed as 'Pause' (except for Cue 1). A 'pause' in the sequence is used if you want the sequencer to pause at this cue. Another trigger will resume the sequence.</p> <p>To save the cue delay and exit from this screen the 'Save' button is pressed.</p>	

4.3.c. Reset Cue data

<p>The 'Reset Cue Data' menu is used to reset the Firing Order back to the simple sequence of 1A, 1B, 1C ... etc and the delays all to 0.1. Use it with care, as it will over-write the existing Firing Order with this simple sequence.</p> <p>Pressing the 'Set' button navigates to the next screen.</p>	
<p>This is the confirmation screen that is displayed before the 'Firing Order' memory is reset.</p> <p>Pressing the 'Yes' button will reset the memory to the simple sequence 1A,1B,1C... and 0.1s delays.</p> <p>Pressing the 'No' button will exit this screen with no changes to the memory.</p>	

4.3.d. Unit Address

<p>The unit address is used to uniquely identify the sequencer to a computer when using the serial data port. If remote computer control is not required then set the unit address to zero.</p> <p>To change the unit address press the 'Set' button to navigate to the next screen.</p>	
<p>Press the 'Up/Down' buttons to change the unit address.</p> <p>Pressing the 'Save' button will save the unit address to memory and exit this screen.</p>	

4.3.e. Run Sequence

The 'Run Sequence' menu screen allows the unit to be triggered via the menu system and is designed to allow the user to test the programmed sequence.

Pressing the 'Go' button will start execution of the pre-programmed sequence. Please be aware that the sequencer will fire attached igniters unless the deadmans handle is activated.

It is possible to start a display using this feature.



Run Sequence
Prev Go

This screen is displayed whenever a sequence is running.

The screen displays the output port number that is to be fired (1A) and the time delay in seconds (41.5) before it is fired.

The time delay will be counting down, when it reaches zero the output port is fired, and the sequencer moves onto the next cue in the sequence.

Pressing the button marked 'Stop' will abort the execution of a sequence.

Pressing the button marked 'Pause' will stop the clock and all firing until the trigger button is pressed. This function is not to be confused with the zero length delay (PAUSE) feature described earlier. This function is not supported externally.

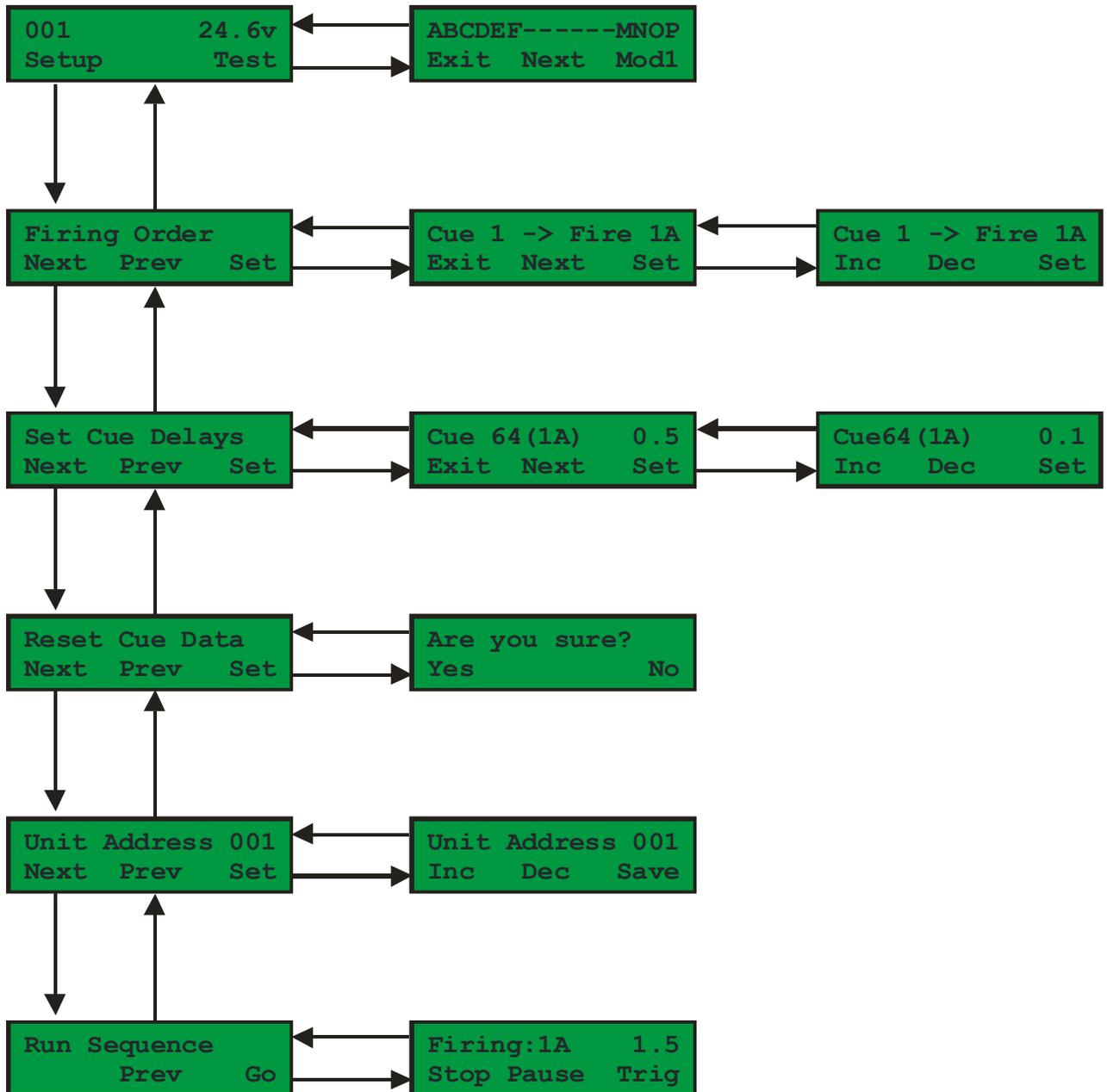
Pressing the button marked 'Trig' or applying an external trigger will restart the clock or resume a paused sequence.



Firing: 1A 41.5
Stop Pause Trig

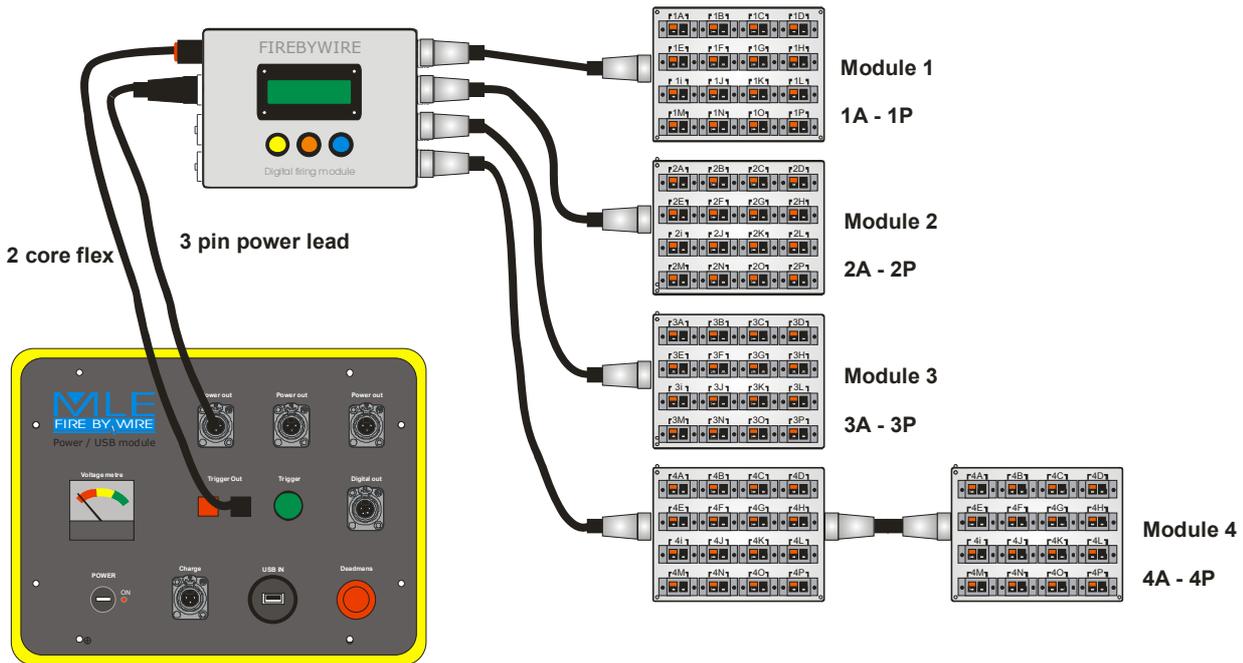
4.3.f. Menu Map

Below is a complete map of all the menu screens:



5. Example Configurations.

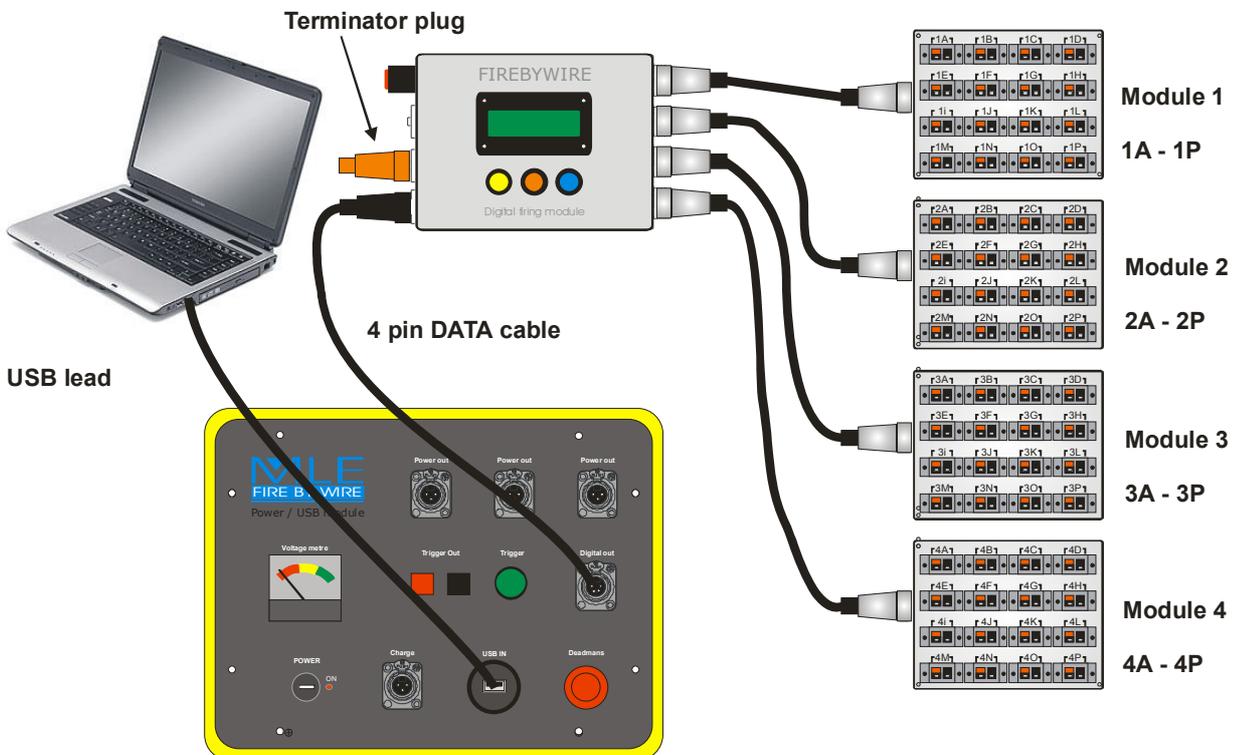
5.1. Standalone (using trigger)



Note the deadmans switch operates the deadmans on the sequencer in this mode (via the 3 pin power lead). Do not use the charge port.

Figure 6 – Diagram of a single manually triggered sequencer with battery box trigger.

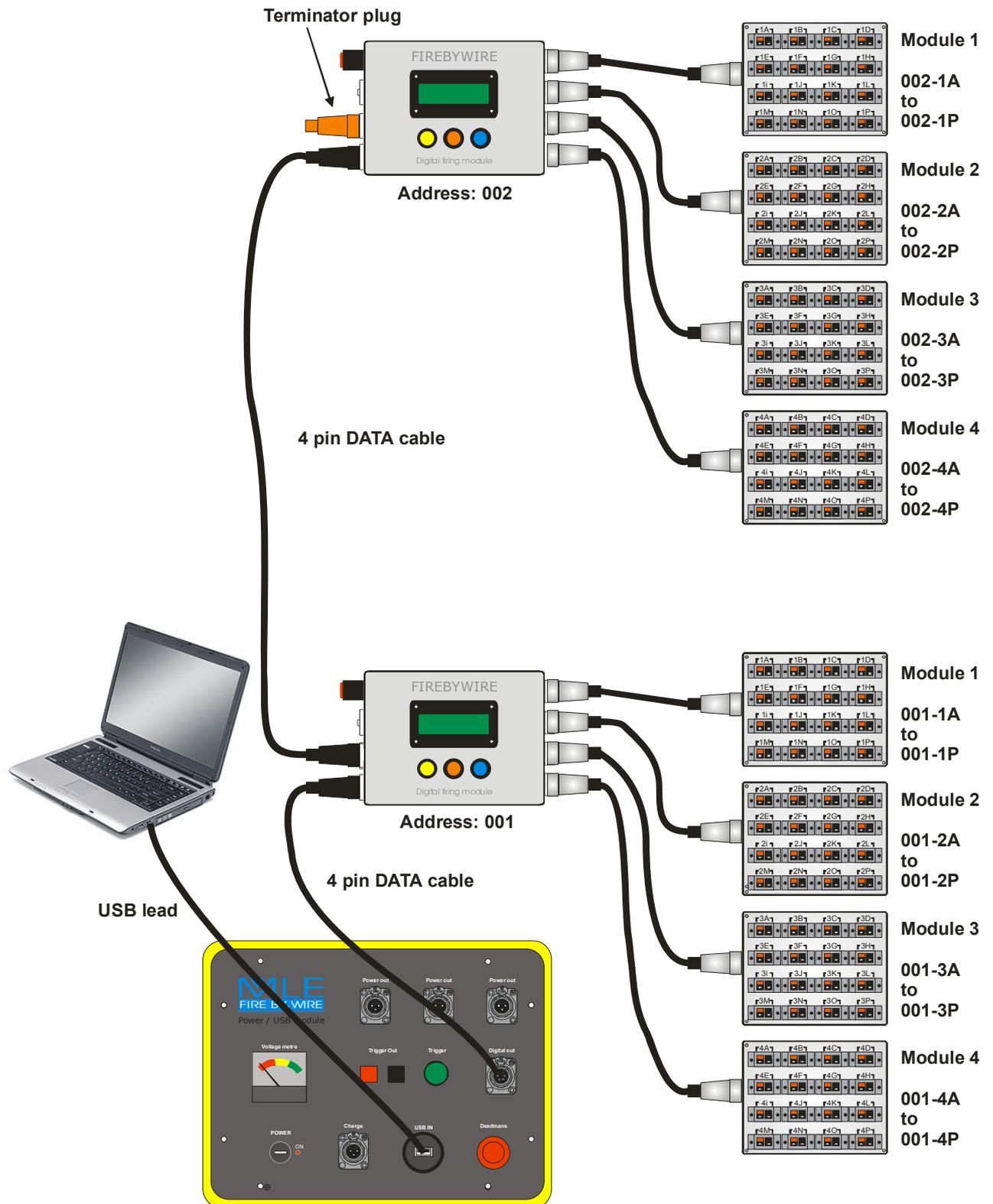
5.2. Computer Controlled (Single Unit)



Note each sequencer MUST have a 3 pin deadmans plug installed (not shown) The deadmans on the yellow USB module is defunct when using the 4 pin data cable to connect to the sequencer(s).

Figure 7 – Diagram of a single sequencer, computer controlled with battery box

5.3. Computer Controlled (Multiple Units)

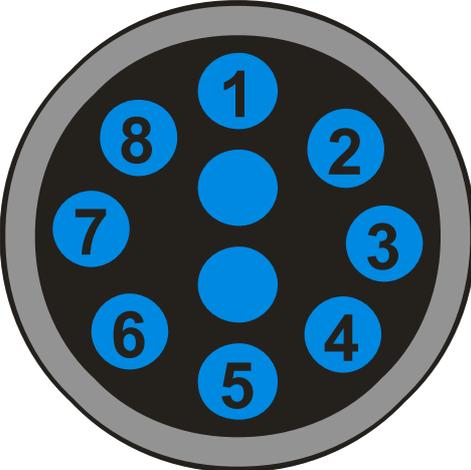


Note each sequencer MUST have a 3 pin deadmans plug (or similar provisions) installed (not shown) The deadmans on the yellow USB module is defunct when using the 4 pin data cable to connect to the sequencer(s). This diagram will not fire any igniters as it doesn't show a deadmans plug in either sequencer.

Figure 8 – Diagram of a multiple sequencers, computer controlled. Illustrating daisy chaining.

6. Pin-outs

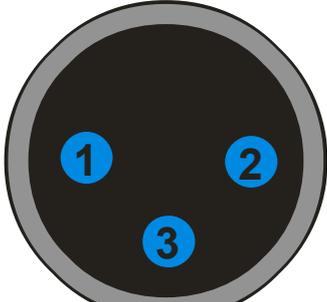
10 Way Output connector



10 way HIROSE

Pin Number	Description
1	Ground 1
2	Ground 2
3	Ground 3
4	Ground 4
5	+ve 1
6	+ve 2
7	+ve 3
8	+ve 4
9	Not connected
10	Not connected

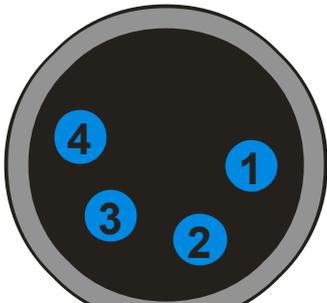
Remote Arm (deadmans handle terminator) / Power



3 pin XLR

Pin Number	Description
1	Power Ground
2	Power +ve
3	Remote Arm Switch (grounded to arm if feature fitted)

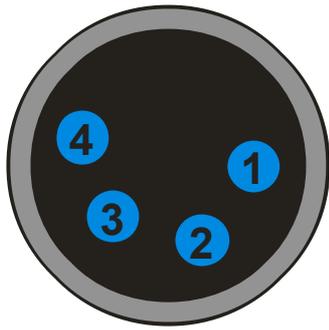
Serial Data / Power



4 pin XLR

Pin Number	Description
1	Serial A
2	Serial B
3	Ground
4	Power +ve

FireByWire Bus Data Termination plug

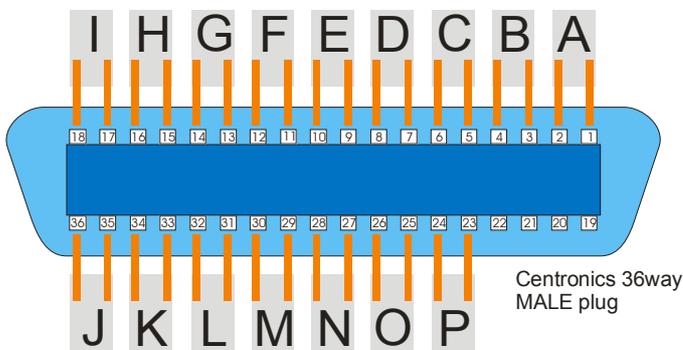


4 pin XLR

Pin Number	Description
1	120 ohm resistor connected between pins 1 and 2
2	
3	Not connected
4	Not connected

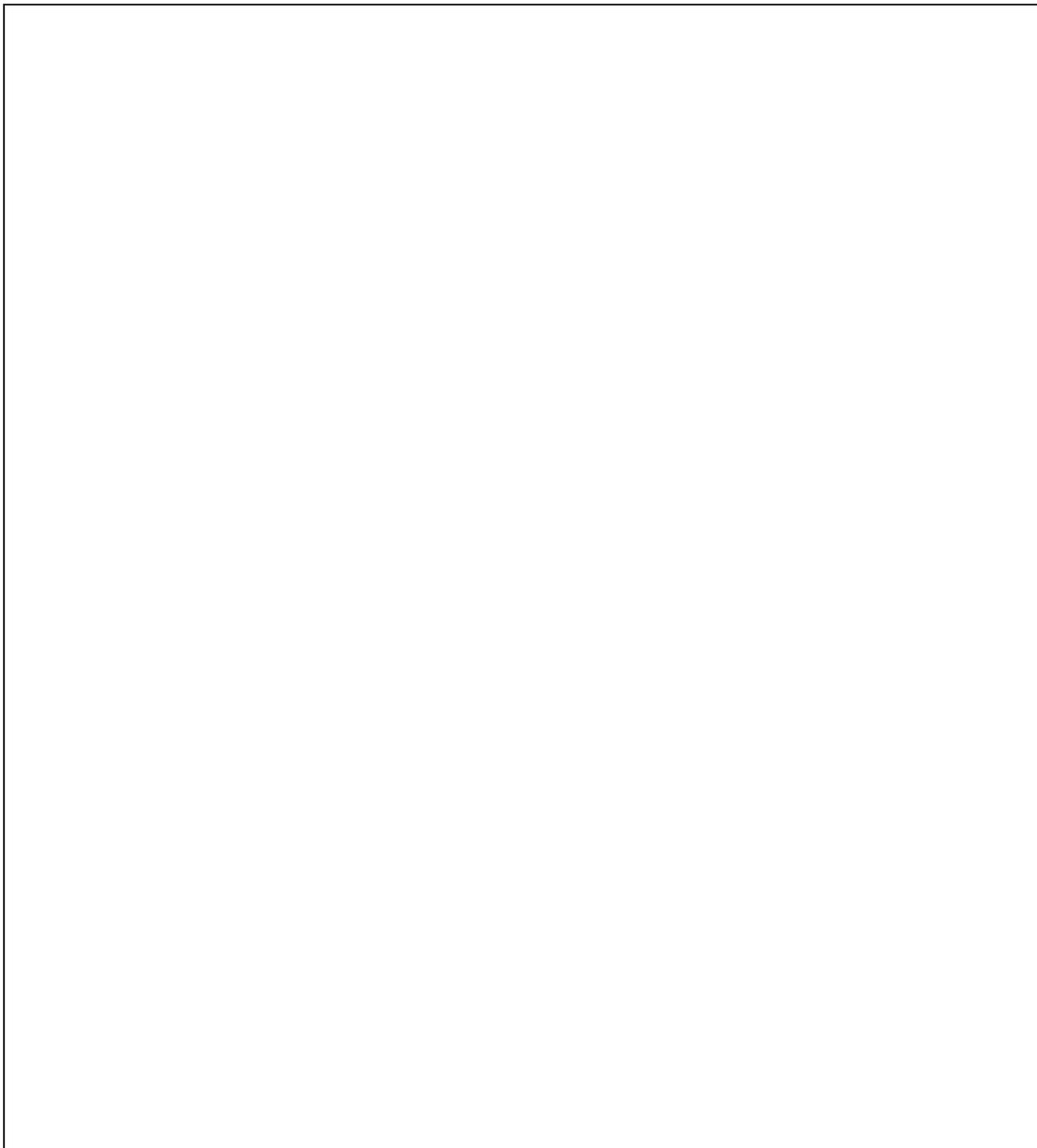
Can be installed on the last in the chain of sequencers to improve data signal (designed to stop any reflections).

FireByWire® Single Shot connector



Centronics 36way MALE plug

Pin	Fires	Pin	Fires
1	A	19	
2	A	20	
3	B	21	
4	B	22	
5	C	23	P
6	C	24	P
7	D	25	O
8	D	26	O
9	E	27	N
10	E	28	N
11	F	29	M
12	F	30	M
13	G	31	L
14	G	32	L
15	H	33	K
16	H	34	K
17	I	35	J
18	I	36	J

Notes:

(The details in this manual are subject to change without notice)

DISCLAIMER:

This equipment has the ability to initiate industry standard pyrotechnic electric igniters. When this equipment is used in conjunction with pyrotechnic devices it is the sole responsibility of the user to ensure the safety of all personal. We recommend that power is only connected when the safety of all personal is ensured. It is the sole responsibility of the user to assess the suitability of any devices used and be aware of the consequences of use. By purchasing or using this equipment the user accepts all responsibility and liability for any injury, loss or damage directly or consequentially arising from its use.

FireByWire® Limited

Unit 4, Morris Road, Royal Oak Industrial Estate, Daventry, Northants, NN11 8PD, England

+44(0)1327 876 037 fax: +44(0)1327 872 014 Web: www.firebywire.co.uk