

Q-fire

by ODA ©

User's Manual

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Introduction

Q-fire by ODA is a computerized firing system with many powerful utilities to choreograph, script and fire a fireworks show to music.

In the past only large companies could afford to fire a show synchronized to music. Smaller display companies, and independent shooters could not afford to spend tens of thousands of dollars on the necessary hardware and software. Q-fire by ODA solves that problem with its unique dual purpose Sequencer+ hardware and Q-fire software. Scripting and choreographing a fireworks show with Q-fire and a music editor (such as Cool Edit or Gold Wave) has become a piece of cake. The hardest part will be deciding the music to use.

Description

Q-fire by ODA consists basically of three items, user supplied computer running Q-fire software, the Sequencer+ Slave(s) and 12 Position Slats. Q-fire communicates with each Slave with respect to Slave, and cue testing. It also controls the firing with respect to the script being used.

Q-fire by ODA may be used in one of three modes - Manual Mode, Timed Mode and Synchronized Mode. In the Synchronized Mode it uses Industry standard .wav files to provide both the music and time reference for 0.01 second accuracy.

Easy field setup - one communications cable from computer to first Slave - then daisy chain with one comm./power cable between each Slave. One power cable on the last Slave. The 12 Position Slats allow for greater flexibility in field setup. A total of 64 Slaves may be added for a total of 1536 cues. Further expansion on special order.

Sequencer+ Slave

The Q-fire by ODA computerized firing system uses the Sequencer+ Slaves as the field modules. These Slaves are therefore dual purpose - they may be used

with our stand alone Sequencer+ Master or with our Q-fire software. For further information on the Sequencer+ System contact ODA Enterprises.

The Slave is housed in a 8.7" X 7.45" X 3.9" rugged, waterproof, dustproof polypropylene enclosure and contains a microcontroller. It uses external power (12 - 24 volts) for both control as well as firing current.

All controls and connectors are located on the top panel. Two DB15 connectors labeled 'Cues 1-12' and 'Cues 13-24' are located on this panel. Readily available cables are used to connect the Slave to ODA 12 Position Slats. Also on the top panel are two XLR style connectors 'Input' and 'Output', an 'On/Off' power switch and a keyed 'ARM' switch with LED.

Also there are four green LED's for diagnostic test. The key may be removed only in the 'Off' position. *NOTE: the Slave will not fire any device until it is 'ARMED'. Slave and cue testing should be done with the 'Power' switch ON and 'DISARMED'.* The Slaves are internally addressable by means of a DIP switch. Refer to page 25 for DIP switch settings. A table of settings is also located inside all Slaves.

Q-fire Software

Q-fire runs on a Microsoft Windows based platform. It is Windows 98 and upward compatible with other Windows based Operating Systems. A minimum of 1 megabyte of storage is required for proper functioning, however when using .wav files for music, it is recommended to have a large capacity hard drive. For reference, one minute of music in a .wav file will occupy approximately 10 megabytes. Therefore a 30 minute show would easily take 300 megabytes. If required this can be reduced by using a smaller sample rate when recording, however the fidelity will be decreased.

The software is supplied on a CD ROM with installation instructions. After successful installation of the software the following folders and programs will be found on your hard drive:

Program Files

Q-fire

Q-fire.exe

Passwords.ini

ShellDataBase.txt

Show Files

The following convention for naming of files should be used:

- .wav** for wave files
- .syn** for script files used for synchronized shows
- .tim** for script files to be used for timed shows
- .man** for script files for manually fired shows

Included on the Q-fire CD is a copy of CoolEdit 96. It is a shareware version of their excellent music editing programs - CoolEdit lite, CoolEdit 2000 and CoolEdit Pro. The shareware version is limited to performing only two of the many functions available, however only two functions are required to perform the necessary tasks to produce a .wav file useable in Q-fire. (See addendum on CoolEdit).

A music editor such as Cool Edit or Gold Wave is to music what a word processor is to text. You can cut/copy/paste, you can add songs to create a show, you can add silence between songs, and much more. One of the best features with regards to fireworks is the ability to place cue markers wherever you wish. These cue markers can then be read by Q-fire for 0.01 second accuracy. This single feature makes Q-fire software one of the most user friendly for scripting/choreographing fireworks shows.

**Cool Edit is no longer available (see Addendum).
Gold Wave is available at <http://www.goldwave.com>**

Notes:

- 1. Most newer laptops do not have an RS232 port. They now come with one or more USB ports. A USB to RS232 converter is required to utilize Q-fire. We have evaluated many of the USB to RS232 converters on the market - some work, some don't. We highly recommend the USB-G4 from www.pfranc.com - it is not the cheapest - but the support is the greatest!!**
- 2. On laptops the screensaver option should be disabled.**
- 3. Also on laptops, make sure the battery will last thru the entire show.**
- 4. Our software is sold for one installation - it comes with a Piracy**

Prevention ‘dongle’. This is attached to the RS232 port on the back of the computer, the communications cable connects to the XLR receptacle on the ‘dongle’.

5. The wave file sound comes thru the sound output of the computer. On laptops this is generally the earphone jack. Connect this to your speakers, PA system etc. It may be necessary to use a preamp to boost the level if going long distances.

We have been experimenting connecting the output of the laptop to a small FM transmitter with very good results, i.e. transmitting to the audience over an unused FM station.

You may contact us with any questions at 863-386-4243 or leave us email at octavioag@comcast.net

Thank you for purchasing

Q-fire

by ODA

The following pages show screenshots/descriptions of the various screens in Q-fire. We feel the software is very user friendly, however if you encounter any problems, just ‘BACK’ out of the program and ‘EXIT’. This will clear any stored information and you can then restart.

After clicking the Q-fire icon on the desktop, you will see the screen below, or one

very similar. Click anywhere on this screen to bring you to the login screen.

Splash Screen



Login Screen

Login

ODA Enterprises
5072 Strafford Oaks Drive
Sebring, FL 33872
(863) 386-4243

Q-fire V0.80

User Name

Password

Serial Port

OK **Exit**

This is where you enter your username and password. Initially enter '1111', and in the 'Main Menu', the passwords may be redefined.

Also on this screen, the serial port used to communicate with the Slave modules must be set. Generally the mouse is on Port #1, but try all ports till you find which is open on your computer. Press OK and you will then go to the 'Main Menu'.

Main Menu



After successfully logging in, the above screen will appear.

There are five buttons under Edit Functions:

User Passwords	Cue List Reader
Database Editor	Script Editor
Preview Show	

Under Network Functions are six buttons:

Network Test	Manual Show
Slave Test	Timed Show
Cue Test	Sync Show

You can select any of the functions by moving the cursor over the buttons and left clicking, or by pressing the ALT key and the underlined letter at the same time.

User Passwords

Password	User Names
1111	Name1
2222	Name2
3333	Name3
4444	Name4
****	None
****	None
****	None
****	None
****	None
****	None
****	None

This is where you can assign your own Username and Password. The Username can be anything you like, but the Password must be a four digit number only. You may have up to 10 different Users and Passwords. Press Save to record. Then press 'Back' to go to the 'Main Menu'.

Cue List Reader

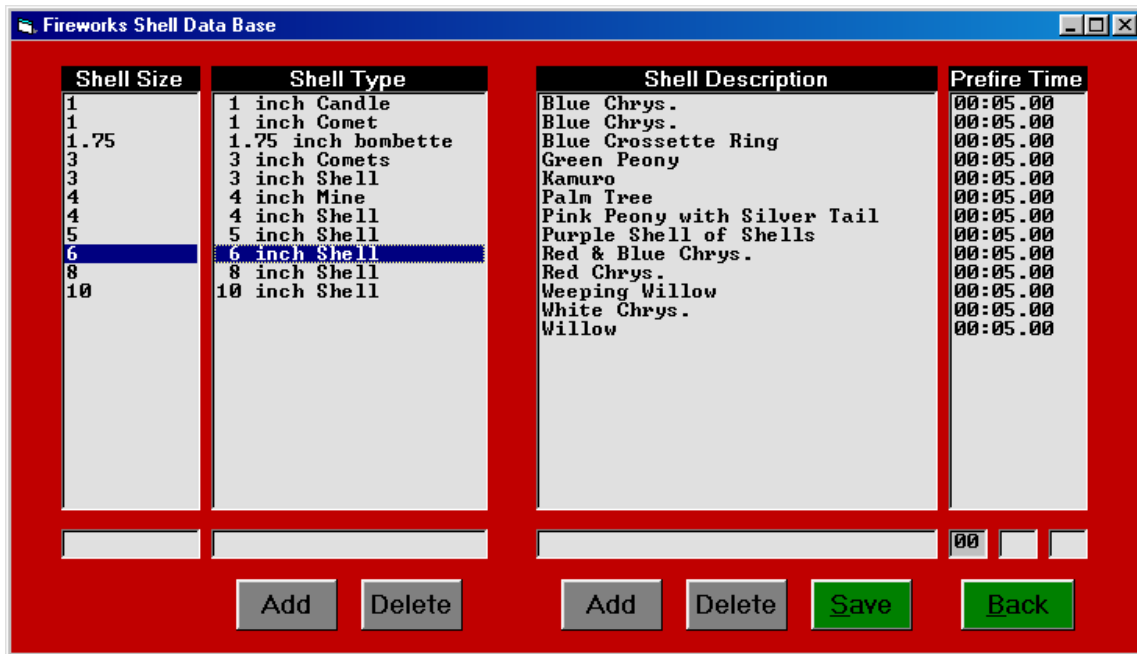


The Cue List Reader allows you to read the cue times and labels that were placed on the .wav file created using Cool Edit.

This function allows you to read the cues and labels associated with the .wav file. You can then print them out, providing a handy hardcopy where the user can then fill out the Slave Address, Cue Address, Shell Size and Shell Description. This

provides a convenient form to use with Cool Edit and choreograph the show. It also provides the appropriate information to enter into the Script Editor. You can also 'Export' - save as a comma delimited file for use with spreadsheet program.

If the printer function does not work, try assigning a different Printer Port. Press 'Back' to go to the 'Main Menu'.



The above is a screenshot of the ShellDataBase. This is where the user can input a description of their inventory of shells along with its respective 'PreFire Time'. This 'ShellDataBase' can then be used with the script editors to write a script. It will fill in the required fields in the script editor to minimize manual input.

Located in the lower portion of this screen are field entry points where the information is placed. Place the cursor over the first block on bottom left and click. This will place a blinking vertical cursor there. You may then type in the 'Shell Size'. Then press TAB to go to the next field. Enter the type of device desired (Note: for proper sorting single digit numbers should be preceded by a space). Press 'Add' and it will be entered into the ShellDataBase. You may enter up to 100 different 'Shell Type'.

Next you will want to input the 'Shell Description'. Here is where you describe the different shells within that shell size along with its respective 'PreFire Time'. Place the cursor over the entry block for 'Shell Description' and click. This will place a blinking vertical cursor there. Then type the shell description, TAB over to the next field and enter two digits for the seconds (e.g. 06 for six seconds), TAB over again

and enter the tenths (e.g. 50 for half a second). Press 'Add' and that information will be placed into the ShellDataBase. You may enter up to 100 different 'Shell Description'/'PreFire Time'. When finished be sure to press 'Save'.

Adding and deleting 'Shell Description' and 'PreFire Time' is pretty straight forward. However that is not the case with 'Shell Size' and 'Shell Type'. If you highlight a 'Shell Type' and press 'Delete', all of the 'Shell Description'/'PreFire Time' associated with that shell type will be deleted - requiring re-entry of data again. So make sure you want to delete before you actually do. A pop-up screen will remind you of this.

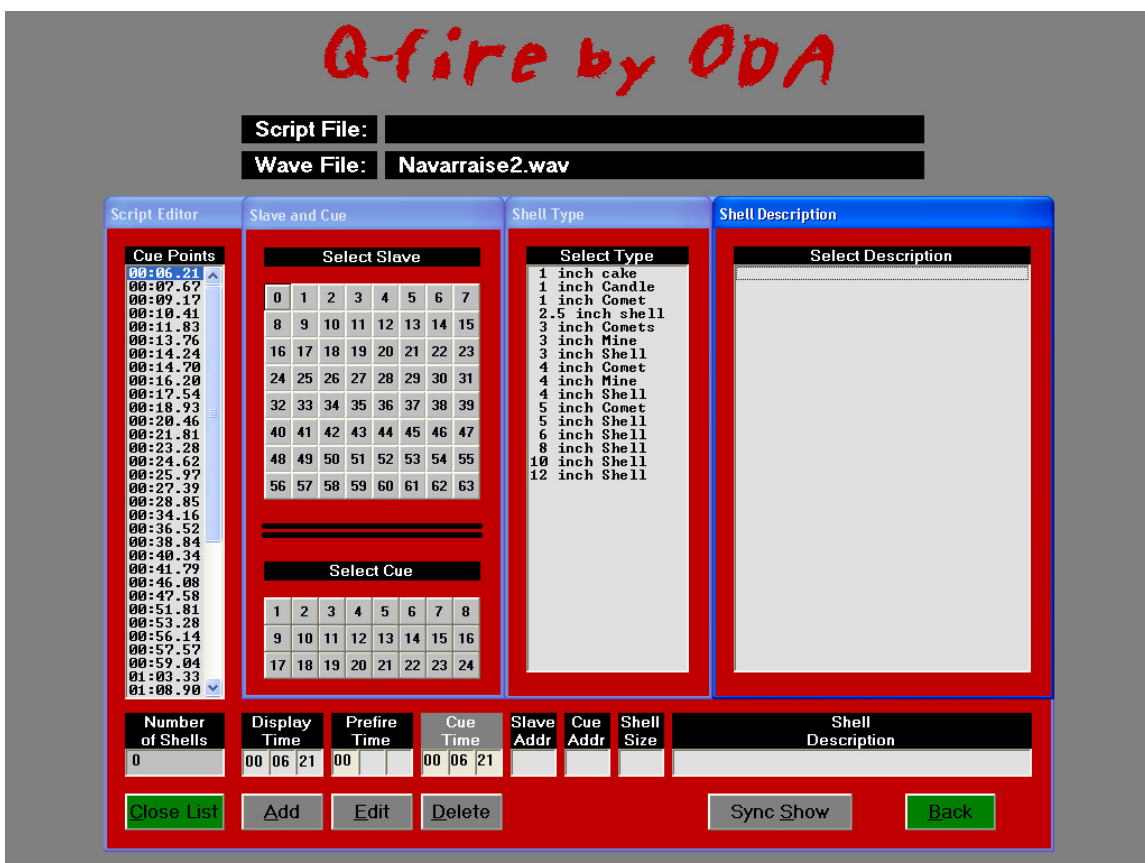


All three types of shows/modes (Manual, Timed, Synchronized) require a script. The above is a screenshot of the 'Script Editor'. The gray button on the bottom right is a toggle button. Pressing it will cause it to change from 'Manual Show' to 'Timed Show' to 'Sync Show' (shortened for 'Synchronized Show'). The screens for the three modes are slightly different.

It is easier to give examples of scripting than it is to describe, therefore we will first give an example of scripting a 'Sync Show', the most involved but actually the easiest.

First we need a .wav file of the desired music with cue points - this is done with Cool Edit. In Cool Edit be sure to save the file as a Windows PCM (*.wav), and be sure to place it into the Q-fire - Show Files directory. Next, on the desktop click on the icon for Q-fire, you will see the Q-fire splash screen - click anywhere on this screen and you will go to the 'Login' screen. Enter your 'Password' as well as the serial port and press OK. This will bring you to the 'Main Menu', press 'Script Editor' and you will see the above screen. Make sure the button on the lower right indicates 'Sync Show'. Press the button 'Wave File', a window will open displaying the saved .wav files, select the file desired. The next steps will be repeated for the entire show and therefore we will list them:

1. Press 'Cue List', this will open a window showing the cue times/labels created in Cool Edit.



2. Click on the first time listed, this will open several windows showing 'Slave and Cues', 'Shell Type', and 'Shell Description'.
3. Point and click on the desired 'Slave' and then the desired 'Cue'.

This will immediately enter it into the proper fields.

4. Then click on 'Shell Type' and then 'Shell Description'. This also will be entered into the proper fields.

5. Finally press 'Add' button - this information will be added to the script.

The five steps above are repeated with all the cue points until the entire show is scripted. Then press 'Save' and enter a file name. We recommend using the same name as the .wav file except with the extension .syn (for synchronized).

Next we recommend printing out a hardcopy of the script so that it can be checked - preferably by someone else. This allows two pairs of eyes to check for accuracy. If corrections are required then the 'Edit', 'Add' and 'Delete' buttons can be used to perform the requirements. The software will sort the script by 'Display Time' and print it in that form.

Note 1. The script may also be 'Exported' to a 'comma delimited' file. This is a generic file used by most spreadsheet programs. Users may then manipulate the data as they wish.

Note 2. Clicking on the background of the 'Script Editor' will display the present script for viewing. Click on the next cue time will bring you back.

Note 3. When adding or editing and the 'Cue Time' field becomes highlighted in yellow, this warns of a conflict and must be corrected, i.e. you can not fire any two shells within less than .1 second. Either change the 'Cue Time' or 'PreFire Time' by .1 seconds or more. Entries must be made into the 'Slave Address', 'Cue Address' and 'Shell Size', or they will be highlighted in yellow.

You can, however, fire more than one cue at the same time - this is what we call 'multi-fire'. Just click on the same time and add a new 'Slave Address', 'Cue Address' and 'Shell Size', etc. The only rule that must be observed is that cues #8, #16, and #24 must not be used in 'multi-fire'. An error window will pop-up if you inadvertently do this. This rule must be adhered to for the show to run.

Note 4. Under 'Display Time' are three blocks (time entry fields) representing minutes:seconds:tenths of seconds. For example an entry of 12:23:92 would be read as 12 minutes, 23 seconds and 92 tenths of a second.

Only two digits are allowed in each field.

Note 5. Once a specific Slave and Cue have been added to the script, they will be highlighted in green. Adding a duplicate cue will cause that button to turn red - warning not to add that cue.

Note 6. When manually entering information into the fields, use the TAB key to advance to the next field. All fields require data - except the 'Description' field, which may be left blank.

The next example describes how to write a script for a show with no wave file, i.e. no music, what we refer to as a 'Timed Show'. In the 'Script Editor' press the Sync./Timed/Manual button until it displays 'Timed Show'.

- 1. Enter a time into the 'Display Time' field. Use the TAB key to advance from minutes to seconds to tenths. Enter two digits only in each field.**
- 2. Press 'DataBase'; the 'Slave', 'Cue', 'Shell Type' and 'Shell Description' windows will open. Point and click on the desired Slave #, Cue #, Shell Type and Shell Description. All of this will be placed into the proper fields. Along with 'PreFire Time', and 'Cue Time'.**
- 3. Click on 'Add'. Clicking on the background of the script will display the present script for viewing. Clicking on 'DataBase' will bring**

you back.

The three steps above are repeated until the entire show is scripted. Then press 'Save' and enter a filename. We recommend using the extension .tim (for 'Timed Show').

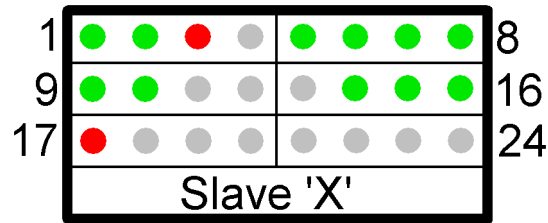
The last example describes how to write a script for a manual show, i.e. no wave file, no specified display times. Press the Sync./Timed/Manual button until it displays 'Manual'.

1. Click on 'DataBase'; the 'Slave', 'Cue', 'Shell Type' and 'Shell Description' windows will open. Point and click on the desired Slave #, Cue #, then the desired Shell Type and Shell Description. All of this will be placed into the proper fields. Along with 'PreFire Time', and 'Cue Time'.
2. Click on 'Add'. Clicking on the background of the script will display the present script for viewing. Clicking on 'DataBase' will bring you back.

The two steps above are repeated until the entire show is scripted. Then press 'Save' and enter a filename. We recommend using the extension .man (for 'Manual Show').

Note: In this example there are zero's listed in all of the time fields, this is because the operator fires each device when he/she wishes. The script only tells which Slave and cue to fire.

Preview Show



The above screenshot shows our 'Preview Show'. This is very handy in testing your script for synchronization, unused cues, and duplicate cues. Opening a script file on this screen will show all of the slaves called for in that script. It shows all 24 cues on each of the slaves. A gray circle indicates an unused cue. A green circle a cue called for in the script and a red circle, a duplicate cue, i.e.. should be corrected.

Starting the show will begin the music as well as the time elapsed indicator. Each cue will fire (green circle will then turn black) at the scripted Display Time. You can easily track the synchronization.

Test Network

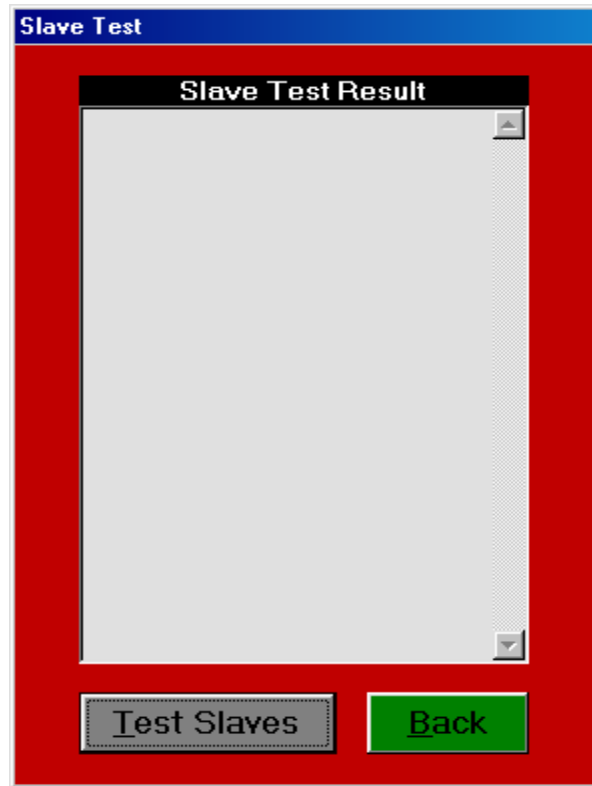
The 'Test Network' is primarily for ODA Enterprises to perform diagnostic Slave and Cue tests after assembling the Slave modules. We perform 100% testing on all product prior to shipping.

However, we decided to include these diagnostic tools to provide the user the ability to perform these bench tests to the individual Slave modules.

Pressing 'Test Slave' will indicate if the computer is communicating with the Slave. 'Test Cues' will perform continuity to attached devices/lights (We use Xmas tree lights to give continuity and a visual indication when firing - they are readily available and very inexpensive).

Pressing 'Fire Cue' will fire the cue listed in 'Cue Address'. 'Start Sequence' will fire/light the cues at the specified 'Interval' and will do so until 'Stop Sequence' is pressed. Note: 'Interval (Seconds)' of less than .1 seconds may give erratic performance.

Slave Test



In order to do 'Slave Test', a script must be loaded into memory. Go to either 'Sync Show', 'Timed Show' or 'Manual Show' and load the desired script. Then 'Back' out and press 'Slave Test'. It will check to see if those modules are connected and communicating with the computer. It will then report back on the screen all the Slaves connected and their status.

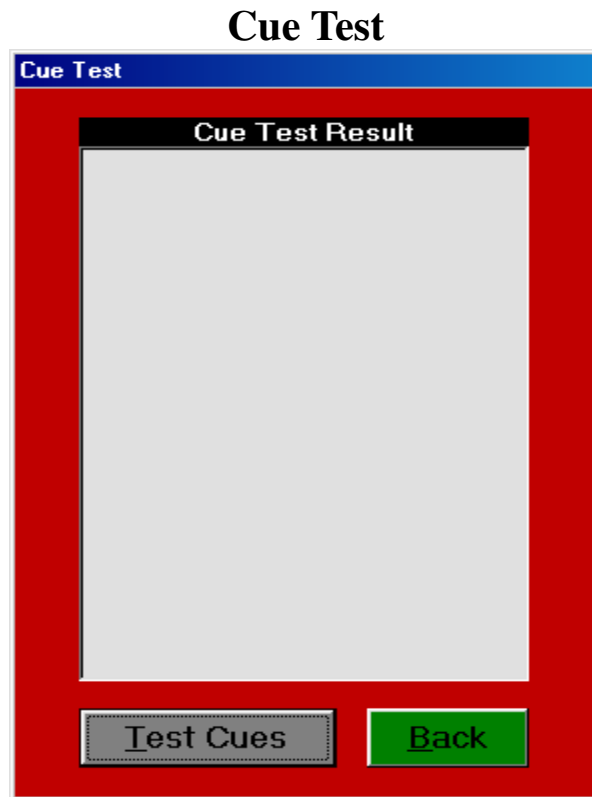
**Example: Slave: 1 - Test Good
Slave: 2 - Time Out**

this example tells us that the chosen script calls for two Slaves - Slave #1 and Slave #2. The test reveals that Slave #2 is either not connected/bad connection, Power switch not on or the unit is malfunctioning.

The Power switch on each Slave must be in the 'On' position for successful testing. It is recommended to leave the keyed 'Arm' switch in the 'Off' position, however it will perform the test armed. Note: All personnel should

be distant from the devices when performing any testing. Also remember to 'Arm' all Slaves just prior to ShowTime.

Pressing 'Back' will bring you to the 'Main Menu'.



In order to do 'Cue Test', a script must be loaded into memory. Go to either 'Sync Show', 'Timed Show' or 'Manual Show' and load the desired script. Then 'Back' out and press 'Cue Test'. Pressing 'Test Cues' will check the chosen script with the attached cues. For every cue specified in the script, 'Test Cues' will test for continuity. It will report back on the screen the status of all cues.

Example: Slave : 1 - Test Done - This tells us that all the cues on Slave #1 called for in the script are connected and there is continuity.
Slave : 2 - Bad cue: 13
Slave : 2 - Bad cue: 17
Slave : 2 - Test Done - This tells us that on Slave #2, cues 13 and 17 have problems. Either they are not connected properly or bad e-match.

The Power switch on each Slave must be in the 'On' position for successful testing. It is recommended to leave the keyed 'Arm' switch in the 'Off' position, however it will perform the test armed. Note: All personnel should be distant from the devices when performing any testing. Also remember to Arm' all Slaves just prior to ShowTime.

Pressing 'Back' will bring you to the 'Main Menu'.

Manual Show



Q-fire has three modes of firing - Manual Show, Timed Show and Synchronized Show. The screens are very similar.

Above is the 'Manual Show' screen. Pressing 'Open' will cause a window to open showing a list of scripts/files with a .man extension. Selecting one of the files will load that show into the computer for firing. Press 'Disarmed' (changes to 'Armed'). Pressing the 'Fire' button or the spacebar on the keyboard will fire the shells as they are listed in the script. Because this is a Manual show, the 'Display Time', 'PreFire Time', and 'Cue Time' will all be zero's. The 'Slave Address', 'Cue Address', 'Shell Size' and 'Shell

Description' will all be displayed in the highlighted (middle of screen) area. To the left of the 'Fire' button is a running clock for timing the show. Also in the top of the window will be the Elapsed Time/Total Time as well as Cue Number/Cue Total

Pressing 'Null Slave' during the show or after stopping the show, a window will pop up listing all the Slaves being used. Clicking on one or more will null them - prevent those Slaves from firing.

Pressing 'Back' will go to the 'Main Menu'.

Timed Show



Above screenshot shows the 'Timed Show'. This type of show uses a script that the user has written but no music. This provides a method to fire a show automatically to preprogrammed times.

Press 'Open' and a window with Scripts/Files with the extension .tim will appear. Selecting one of these files will load that show into the computer for firing. Press 'Disarmed' (changes to 'Armed'), then press 'Start Show'

(changes to 'Stop Show') and the show will begin.

The 'Display Time', 'PreFire Time', 'Cue Time', 'Slave Address', 'Cue Address', 'Shell Size' and 'Shell Description' will be displayed in the highlighted (middle of screen) area. Also in the top of the window will be the Elapsed Time/Total Time as well as Cue Number/Cue Total

Pressing 'Null Slave' during the show or after stopping the show, a window will pop up listing all the Slaves being used. Clicking on one or more will null them - prevent those Slaves from firing.

Pressing 'Stop Show' will cause the firing to stop - it can be resumed anytime by pressing 'Start Show', and it will continue from where it was stopped.

Pressing 'Back' will go to the 'Main Menu'.

Synchronized Show



Above is a screenshot of a Sync Show. This will probably be the most often used mode in Q-fire. This type of show uses a script that the user has written

synchronized to music. This is done with the aid of a music editor such as Cool Edit or Gold Wave.

Press 'Open' and a window with Scripts/Files with the extension .syn will appear. Selecting one of these files will load that show into the computer for firing. Press 'Disarmed' (changes to 'Armed'), then press 'Start Show' (changes to 'Stop Show') and the show will begin.

The 'Display Time', 'PreFire Time', 'Cue Time', 'Slave Address', 'Cue Address', 'Shell Size' and 'Shell Description' will be displayed in the highlighted (middle of screen) area. Also in the top of the window will be the Elapsed Time/Total Time as well as Cue Number/Cue Total

A unique feature only found in Q-fire is the 'Tweak Time' button. This allows the user to more accurately synchronize the firing to the music. This is done while the show is running. It also helps in compensating for sound travel of music to the audience.

On all three types of Shows the following applies:

Note 1. Pressing 'Null Slave' during the show or after stopping the show, a window will pop up listing all the Slaves being used. Clicking on one or more will null them - i.e.. prevent those Slaves from firing.

Note 2. Pressing 'Stop Show' will cause the firing to stop - it can be resumed anytime by pressing 'Start Show', and it will continue from where it was stopped.

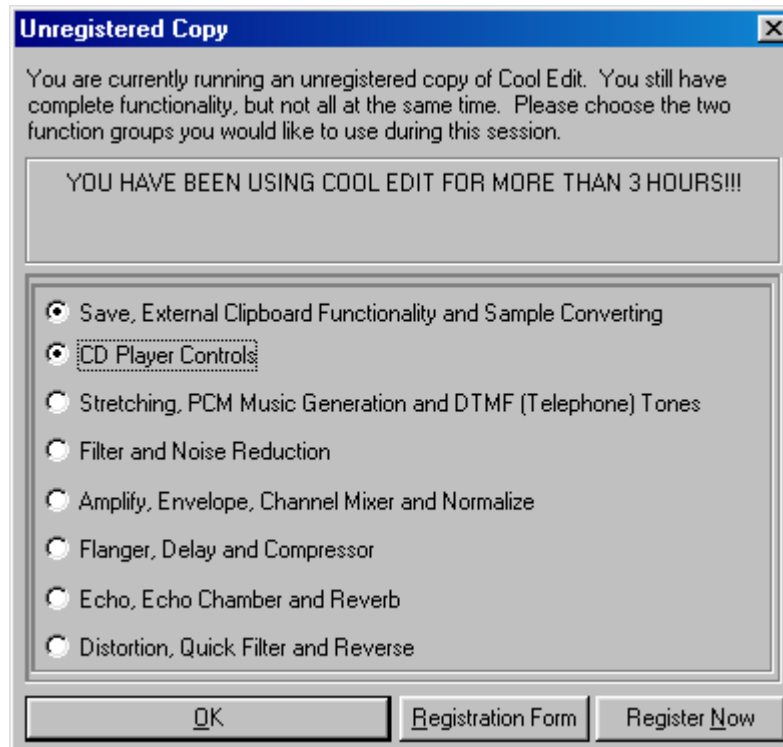
Note 3. Pressing 'Back' will go to the 'Main Menu'.

CoolEdit 96 Addendum

In 2003, Syntrillium (Cool Edit originators) sold all source code/software rights to Adobe Systems. Adobe has chosen not to sell/support the CoolEdit Lite or Cool Edit 2000. They have renamed Cool Edit Pro to Audition - an excellent program - but a bit pricey to start with. We are therefore recommending Gold Wave. We have not used Gold Wave as much as Cool Edit - but the latest version appears to be as good as - if not better than Cool Edit 2000.

The following is not a tutorial on Cool Edit - that is left to the user to learn - however we would like to point out some of the features we use.

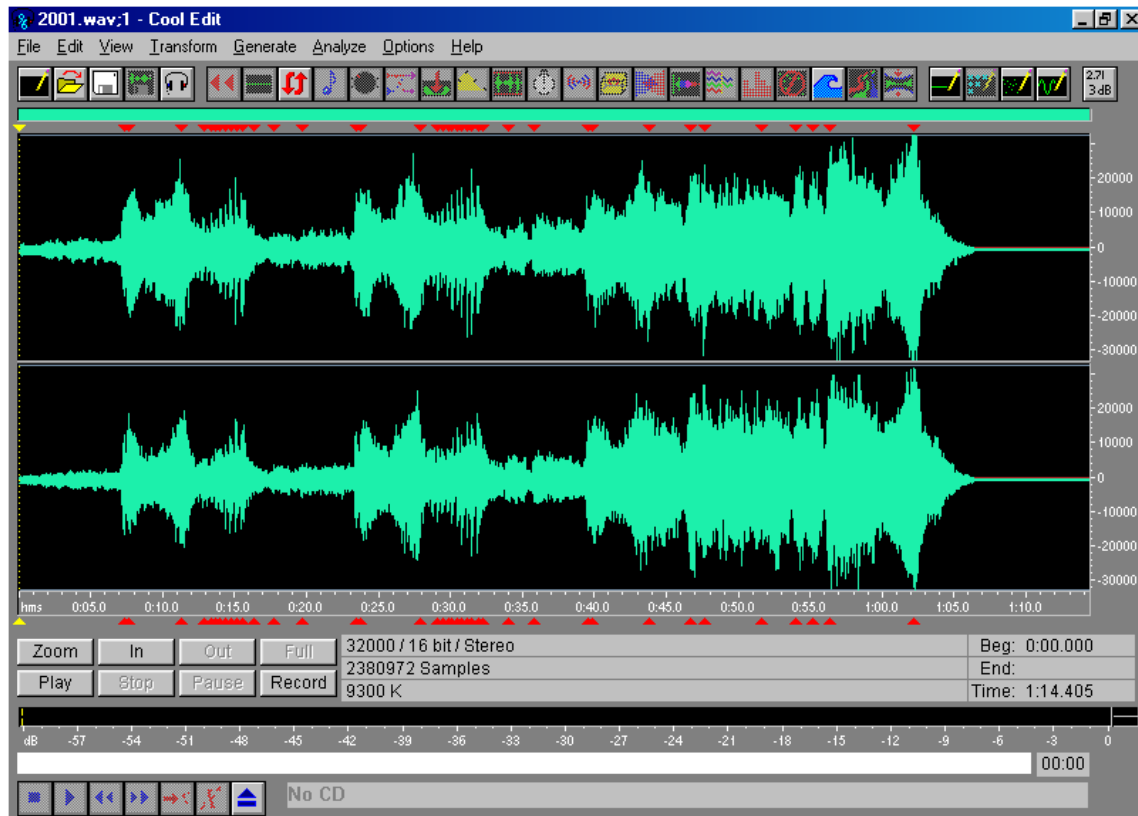
When you enter CoolEdit 96 (shareware version) this will be the first screen you see. It is here that you select two functions you want to use, we recommend checking the first two as shown below. This will allow you to use the CD Player controls as well as save the file when you are finished editing.



Generate - Silence - enter a time for silence. We use this at the beginning of a music wave file to compensate for shells being fired before the music starts. Also we use this feature to add silence between song selections, to set the mood.

Transform - Amplitude - Amplify. We use this when the music recorded from the CD is not loud enough for playback purposes. We generally amplify till the loudest (highest peaks) passages just touch the window extremes.

Most important feature is adding cue markers - this is done by pressing F8. They can be placed while listening to the song and pressing F8 or by positioning the cursor where you would like a marker and pressing F8.

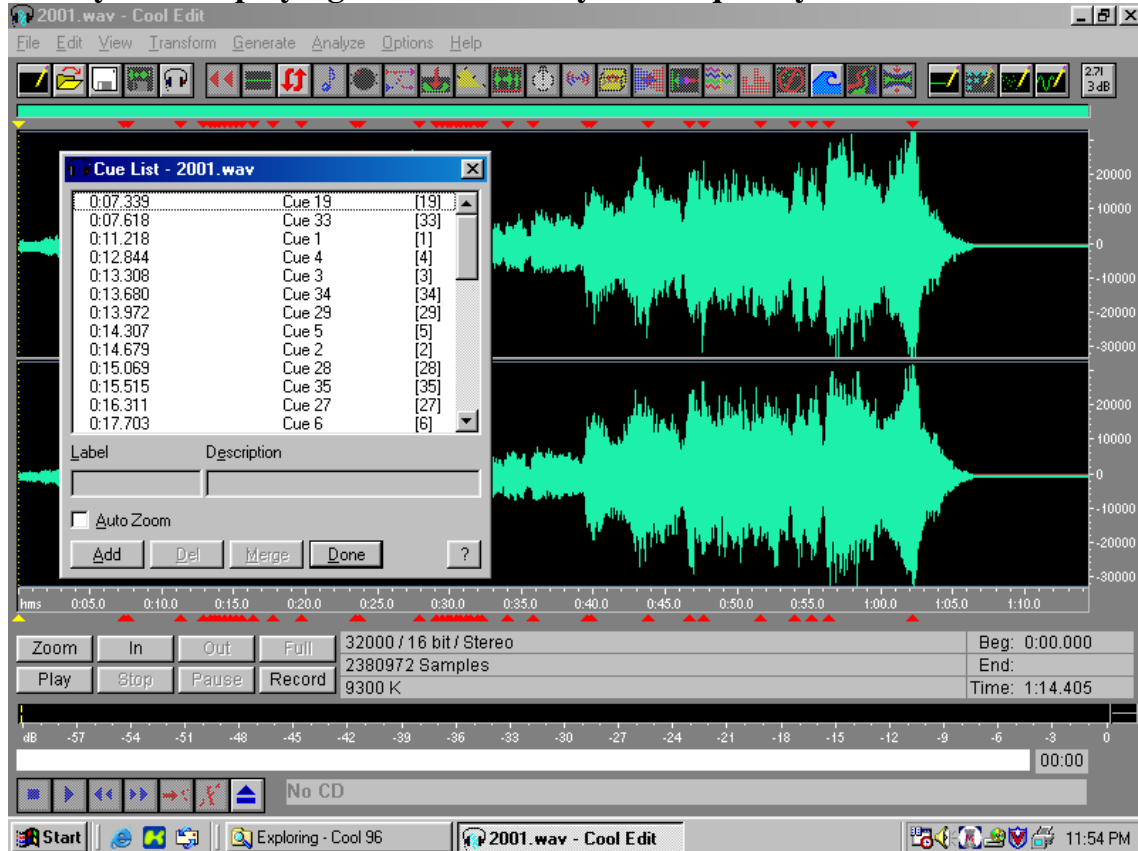


Above is a screenshot of a .wav file called 2001.wav. You actually see two waves (stereo), the top wave for the right channel, the bottom for the left channel. Clicking and dragging the mouse will highlight an area. Highlighted areas can be cut, copied and pasted just like with a word processor. Pressing the 'Play' button will cause just that portion of the wave file to be played. Pressing the 'Zoom' button will cause the highlighted area to expand to full screen. Positioning the cursor anywhere on the wave and clicking, and then pressing 'Play' will play the song from that point.

After selecting and editing the song, make sure to save it in Windows PCM (*.wav) format, and into the Q-fire - Show Files directory as well. What we generally do, is read and record songs from CD's and save them with unique file names. We then edit them, i.e. select the portions we want, and save them. We will then append a song onto the end of another etc. to create a show. Only when we have a show that we like, do we then add the cue points.

In the screen above are some very small red triangles, these are the cue markers that we placed. We did this by playing the song and at the desired moment pressed F8 on the keyboard. Every time you press F8 a cue marker is placed. Cool!!

Once you start playing with Cool Edit you will quickly learn its features.



This screenshot shows the same wave file with the Cue List window open. This is done by clicking 'View', 'Cue List'. The cues are listed according to time, i.e. the first one on the list is the earliest, not necessarily the first one selected. It is of no matter because we are most interested in the times not the order we selected them.

In this window you can highlight a cue and delete it. If you double click on a cue, the cursor will position over it. Generally when we are listening to the song and pressing F8 (adding cue markers) we do not hit the exact beat. We will then highlight and zoom in on segments of the wave, to more accurately position the cue marker. Once this new marker is placed, we then delete the old one.

Once all of the markers/cue points are set, the file should be saved.

Remember to save the file in Windows PCM (*.wav) format and into the Q-fire - Show Files directory.

Again we are not experts on Cool Edit, but will either try to, or get you an answer to your questions. If you decide to purchase Cool Edit (highly recommend), there is extensive online tutorials as well as online help.

<i>Slave #</i>	<i>Dip Switch</i>	<i>Slave #</i>	<i>Dip Switch</i>
0	00000000	32	00000100
1	10000000	33	10000100
2	01000000	34	01000100
3	11000000	35	11000100
4	00100000	36	00100100
5	10100000	37	10100100
6	01100000	38	01100100
7	11100000	39	11100100
8	00010000	40	00010100
9	10010000	41	10010100
10	01010000	42	01010100
11	11010000	43	11010100
12	00110000	44	00110100
13	10110000	45	10110100
14	01110000	46	01110100
15	11110000	47	11110100
16	00001000	48	00001100
17	10001000	49	10001100
18	01001000	50	01001100
19	11001000	51	11001100
20	00101000	52	00101100
21	10101000	53	10101100
22	01101000	54	01101100

23	11101000	55	11101100
24	00011000	56	00011100
25	10011000	57	10011100
26	01011000	58	01011100
27	11011000	59	11011100
28	00111000	60	00111100
29	10111000	61	10111100
30	01111000	62	01111100
31	11111000	63	11111100

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