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# Analytical Sequences

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## What is a sequence?

A sequence specifies the samples to be run and the stored method to be used for each. It is divided into subsequences, each of which uses a single method, plus a priority sequence and post-sequence events.

A sequence can contain one to five subsequences, and can be either automatic liquid sampler- or valve-driven.

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## What can you do with it?

Sequences can be:

- **Created** by entering the sample and method information through the keyboard.
- **Stored** by pressing [Store] [Seq] and giving the sequence an identifying number from 1 through 5.
- **Loaded** by pressing [Load] [Seq] and specifying the sequence number.
- **Modified** by loading, making the changes you want, and then storing using the same number. The new version replaces the old one.

The stored sequence control table, [Figure 34](#), shows the times and dates that the sequences were stored. This table is accessed by pressing [Seq]. The [Seq] key toggles between the stored sequence control table and the sequence definition control table, [Figure 35](#).

<b>Sequence number</b> 1 to 5	<table><tr><th colspan="3">STORED SEQUENCES</th></tr><tr><td>1:</td><td>&lt;empty&gt;</td><td>&lt;</td></tr><tr><td>2:</td><td>13:25 16 Feb 94</td><td></td></tr><tr><td>3:</td><td>&lt;empty&gt;</td><td></td></tr><tr><td>4:</td><td>&lt;empty&gt;</td><td></td></tr><tr><td>5:</td><td>14:02 16 Feb 94</td><td></td></tr></table>	STORED SEQUENCES			1:	<empty>	<	2:	13:25 16 Feb 94		3:	<empty>		4:	<empty>		5:	14:02 16 Feb 94		<b>Sequence status</b> <empty> = no sequence with this number, time and date = when sequence was stored.
STORED SEQUENCES																				
1:	<empty>	<																		
2:	13:25 16 Feb 94																			
3:	<empty>																			
4:	<empty>																			
5:	14:02 16 Feb 94																			

**Figure 34** Stored sequence control table

**Title line**—this title will change depending on where the cursor is placed within the control table

<b>SEQUENCE (Priority)</b>		
Priority meth#	0	<
Type: Front Injector		
#Injections/vial	1	
Samples	1-1	
Use priority	On	
-----Subseq 1-----		
Method #	0	
Type: Front Injector		
#Injections/vial	1	
Samples	1-1	
-----Subseq 2-----		
Method #	1	
Type: Valve		
#Injections	1	
-----Subseq 3-----		
Method #	0	
Type: Both Injectors		
F#inj/vial	1	
F samples	2-2	
B#inj/vial	1	
B samples	3-3	
---Post Sequence---		
Method #	0	
Repeat sequence	Off	

**Priority sequence**

**Subsequences**

**Post-sequence events**

**Figure 35 Sequence definition control table**

When in the sequence control table, you will find the [Info] key useful if an explanation of sequence parameters is needed.

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## Defining a sequence

A sequence may consist of the following parts (all three are optional):

- **Priority sequence**—this is a special provision that allows you to interrupt a sequence to analyze urgent samples.
- **Subsequences**—each subsequence consists of the number of a stored method and information that defines a set of samples and calibrators to be analyzed using the method. There may be up to five subsequences.
- **Post Sequence**—names a method to be loaded and run after the last run in the last subsequence. Specifies whether the sequence is to be repeated indefinitely or halted.

## Priority sequence

A priority sequence is a way to interrupt a running sequence to analyze one or more urgent samples. It consists of a single subsequence, either sampler or valve type, and a special Use priority parameter.

- If Use priority is Off, the Priority Sequence does nothing. It can be activated at any time, even when the sequence is running, by opening the sequence and changing the value to Yes.
- If Use priority is On, then:
  1. The sequence pauses when the current run ends.
  2. The priority method is loaded. The priority samples are run, as specified in the priority sequence.
  3. The Use priority parameter is turned Off.
  4. The main sequence resumes where it paused.

### Sampler

```
SEQUENCE (Priority)
Priority meth #    0
Type: Front injector <
#Injections/vial    1
Samples            1-1
Use priority        On
```

### Valve

```
SEQUENCE (Priority)
Priority meth #    0
Type:              Valve<
#inj/position      1
Position rng       3-15
Times thru range   1
Use priority        On
```

**Figure 36 Priority sequences**

## Subsequences

A subsequence can use either an automatic liquid sampler or a sampling valve for injection. It uses one method to analyze a group of samples.

## Post Sequence

Post Sequence is a pair of events that may be applied after the last subsequence. Post Sequence may load a method—usually to shut down gases and lower temperatures—and may repeat the set of subsequences.

### Procedure: Creating a sequence

1. Press [Seq] to open the sequence control table.
2. Create a Priority Sequence, if desired. This is either a valve or sampler subsequence, with two differences. The method line is labeled `Priority meth #`. An additional line, labeled `Use priority`, may be set either `On` or `Off`.
3. Create one to five subsequences. Subsequences may be either sampler subsequences (below) or valve subsequences (page [231](#)). Both types can be used in the same sequence.
4. Change the Post Sequence events, if desired.
5. Store the completed sequence.

### Procedure: Creating a sampler subsequence

To create a sampler subsequence:

1. Press [Seq] to open the sequence control table.
2. Scroll to a subsequence `Method #` line. If this is the Priority Sequence, the line is labeled `Priority meth #`.
3. Enter a method number. Use 0 for the currently active method, 1 to 5 for the stored methods, or `Off` to end the sequence.

The active method, 0, will change during the sequence if the subsequences use stored methods. Therefore method 0 should be chosen for the Priority Sequence only if *all* subsequences use method 0.

4. Press [Mode/Type] and select one of the three injector types.

#### Sampler sequence

SEQUENCE (Priority)	
Priority meth #	0
Type: Front injector <	
#Injections/vial	1
Samples	1-1
Use priority	On

Press [Mode/Type] to select the type.

SEQUENCE TYPE	
Valve	
*Front Injector	<
Back Injector	
Both Injectors	

5. Supply the rest of the subsequence parameters. If you are using both injectors, there will be two sets of parameters.
  - #Injections/vial—the number of repeat runs from each vial. Enter 0 if no samples are to be injected.
  - Samples—the range (first-last) of sample vials to be analyzed.
6. If this is the Priority Sequence, set Use priority to On.
7. Proceed to the next subsequence or to the Post Sequence.

### Procedure: Creating a valve subsequence

If your GC is equipped with a gas sampling valve and an (optional) multiposition valve, a valve subsequence can be created.

1. Press [Seq] to open the sequence control table.
2. Scroll to a subsequence Method # line. If this is the Priority Sequence, the line is labeled Priority meth #.
3. Enter a method number. Use 0 for the currently active method, 1 to 5 for the stored methods, or Off to end the sequence.

The active method, 0, will change during the sequence if the subsequences use stored methods. Therefore, method 0 should be chosen for the Priority Sequence only if *all* subsequences use method 0.

4. Press [Mode/Type] and select Valve.

#### With multiposition valve

SEQUENCE (Subseq 2)	
-----Subseq 2-----	
Method #	0
Type:	Valve<
#inj/position	1
Position rng	3-15
Times thru range	1

#### Without multiposition valve

SEQUENCE (Subseq 2)	
-----Subseq 2-----	
Method #	0
Type:	Valve <
# injections	1

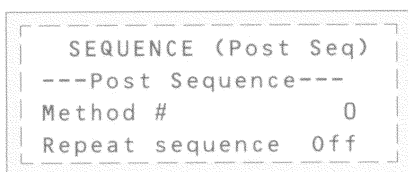
**Figure 37 Valve subsequences**

5. Enter the valve sequence parameters (the first three appear only if a multiposition valve is configured):

#inj/position	number of injections at each position, (0-99)
Position rng	first-last valve positions to sample, (1-32)
Times thru range	number of times to repeat the range, (1-99)
# injections	number of injections for each sample

**Procedure: Setting the Post Sequence events**

1. Scroll to the Post Sequence title section.



```

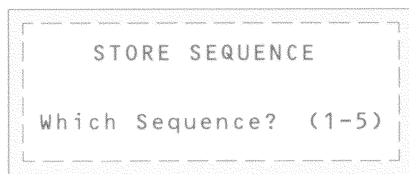
SEQUENCE (Post Seq)
---Post Sequence---
Method #           0
Repeat sequence    Off
  
```

2. Method # is the method to be loaded and run once at the end of a sequence. Enter 1 through 5 for stored methods. If there is no method to be loaded, enter 0.
3. Repeat sequence—On keeps repeating the sequence. This function is useful for valve sequences. Off halts the sequence at the end. Turn Repeat sequence On or Off.



**Procedure: Storing a sequence**

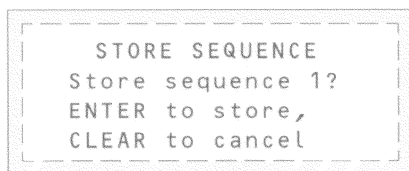
1. Press [Store][Seq] to open the Store Sequence control table.



STORE SEQUENCE

Which Sequence? (1-5)

2. Enter an identifying number for the sequence.

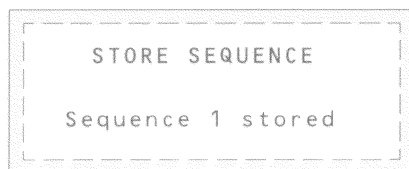


STORE SEQUENCE

Store sequence 1?

ENTER to store,  
CLEAR to cancel

3. Press [Enter] to store the sequence.



STORE SEQUENCE

Sequence 1 stored

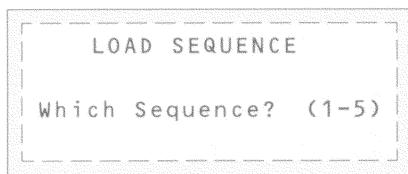
If the sequence number you specified already exists, you will be prompted to either:

- Overwrite the existing sequence, which will replace the existing sequence with the new sequence.
- Cancel the store and return to the STORED SEQUENCES status table.

Sequences can also be stored from within the STORED SEQUENCES status setpoint table by scrolling the cursor to the appropriate sequence number and pressing the [Store] key.

**Procedure: Loading a previously stored sequence**

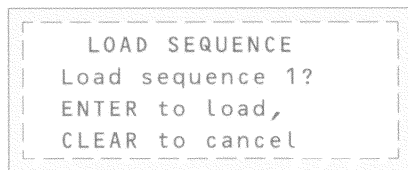
1. Sequences can be loaded by pressing [Load][Seq].



LOAD SEQUENCE

Which Sequence? (1-5)

2. Press a number key to select the sequence to be loaded.



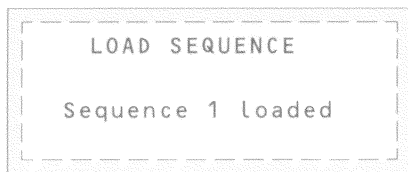
LOAD SEQUENCE

Load sequence 1?

ENTER to load,

CLEAR to cancel

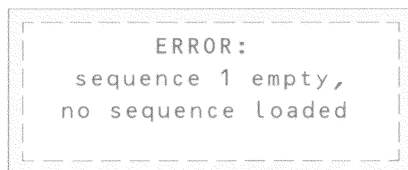
3. Press [Enter] to load the sequence or cancel this by pressing [Clear].
4. If you press [Enter], the load is confirmed. This is now the active sequence.



LOAD SEQUENCE

Sequence 1 loaded

If the sequence number you specified has not been stored previously, you will be informed by an ERROR: message.



ERROR:

sequence 1 empty,

no sequence loaded

**Procedure: Modifying a previously stored sequence**

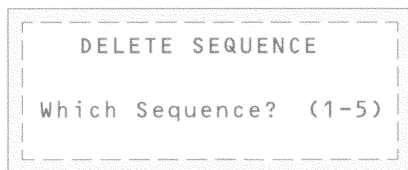
1. Load the sequence you wish to edit.
2. Open the sequence control table. Scroll to the parameter within the subsequence or Post Sequence you wish to edit.

SEQUENCE (Priority)		
Priority meth#	0	<
Type: Front Injector		
#Injections/vial	1	
Samples	1-1	
Use priority	On	
-----Subseq 1-----		
Method #	0	

3. Make the changes.
4. To save the new values, store the sequence under its original number.

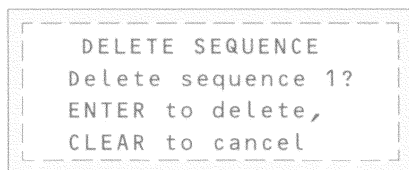
### Procedure: Deleting a sequence

1. To delete a sequence, press [Delete] [Seq]. You will be prompted with:



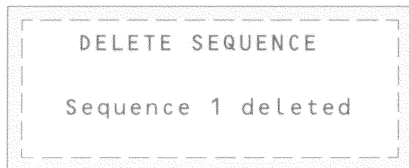
A rectangular screen with a dashed border. The text "DELETE SEQUENCE" is at the top. Below it, the prompt "Which Sequence? (1-5)" is displayed.

2. Press one of the indicated number keys to select one of the five possible sequences to be deleted.



A rectangular screen with a dashed border. The text "DELETE SEQUENCE" is at the top. Below it, the prompt "Delete sequence 1?" is displayed. At the bottom, the instructions "ENTER to delete," and "CLEAR to cancel" are shown on two separate lines.

3. To delete the sequence, press [Enter]. You will see this display:

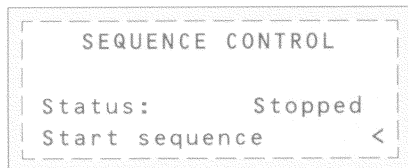


A rectangular screen with a dashed border. The text "DELETE SEQUENCE" is at the top. Below it, the message "Sequence 1 deleted" is displayed.

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## Sequence control

To access the Sequence Control table, press the [Seq control] key. This displays the current status of the active sequence.

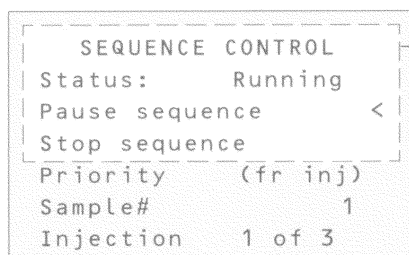


A rectangular screen with a dashed border. The text "SEQUENCE CONTROL" is at the top. Below it, the status "Status: Stopped" is displayed. At the bottom, the prompt "Start sequence" is shown with a right arrow ">" to its right.

## Sequence status

There are six possible sequence status modes:

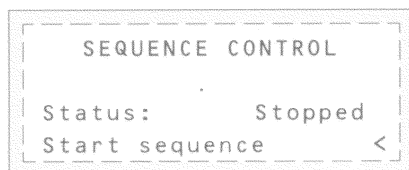
- Start/running
- Ready wait
- Paused/resume
- Stopped
- Aborted
- No sequence



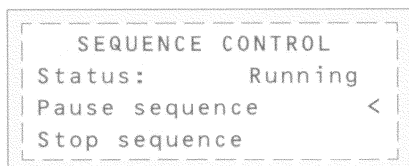
**Sequence Control**—displays the current status of the sequence, shows which subsequence is currently active, current sample # or valve position, and which injection number of multiple runs is currently executing.

### Procedure: Starting/running a sequence

To start a sequence, scroll to the `Start sequence` line and press [Enter].



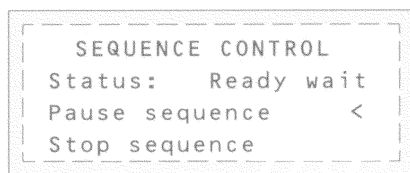
Pressing [Enter] changes the sequence status to `Running`.



The sequence continues to run until all subsequences are executed, or until one of the events described on page [239](#) occurs.

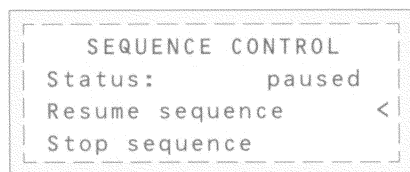
## ***Ready wait***

If a sequence is started and the instrument is not ready (due to oven temp, equilib times, etc), the sequence will not start until all instrument setpoints are ready.



### **Procedure: Pausing and resuming a sequence**

1. A running sequence can be paused by scrolling to `Pause sequence` and pressing [Enter]. Pressing [Enter] changes sequence status to `paused`, and you are given the option to resume or stop the paused sequence.



When a sequence is paused, it stops when the current sample run is complete.

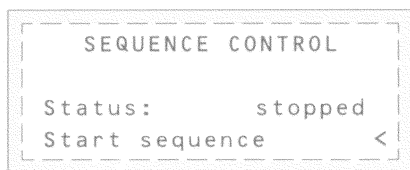
2. To continue the paused sequence, scroll to `Resume sequence` and press [Enter].

When a sequence is resumed, it starts with the next sample.

### **Procedure: Stopping a sequence**

To halt a sequence, scroll to `Stop sequence` and press [Enter].

When a sequence is stopped, it can only be restarted from the beginning and the sampler tray is halted immediately.



A sequence stops at the end of the last active subsequence unless `Repeat sequence is On` in the Post Sequence events.

## Aborting a sequence

When a sequence is aborted, it stops immediately without waiting for the current run to finish. These will cause a sequence to abort:

A run is stopped by pressing the [Stop] key.

```
SEQUENCE CONTROL
Status:      Aborted
Resume sequence  <
Stop sequence
```

A sampler error occurs producing an error message.

```
Sampler error,
sequence aborted:
nobottle in gripper
```

The GC detects a configuration mismatch during a method load

```
Sequence aborted:
configuration
mismatch in
method # 1
```

A running sequence tries to load an empty method.

```
Sequence aborted:
Method #2 empty
no method load
```

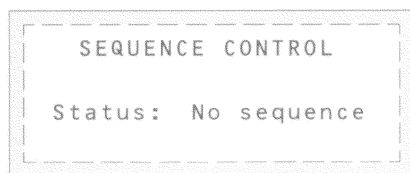
The sampler is turned off.

```
Sequence aborted:
Sampler off-line
```

You can correct the problem and then resume the sequence. The aborted sample run will be repeated.

### ***No sequence***

If the sequence is off or not defined, the sequence control status will state no sequence.



To correct this, use the [Seq] key to define a sequence or turn the sequence parameters on.

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## **Special considerations when using an integrator**

The definitions of sequence are not the same in the 6890 Series GC and in the 3396 integrator. The following points must be considered when sequences are used with this GC/integrator combination:

- The integrator has only one subsequence plus the priority sequence. Only one GC method can be used within an integrator sequence.
- The ALS method parameters are prepared using the [Front injector] and [Back injector] keys on the 6890 keyboard.
- The sample information table is prepared on the integrator.
- The injection sequence parameters can be prepared either with the [Seq] key on the 6890 keyboard or in the [PREP][SEQ] dialog of the 3396. Setting sequence parameters on either instrument changes the sequence in both places.
- The Start sequence function on the GC is inactive.
- A sequence must be started from the integrator using [SEQ][START].
- The two stop keys have different effects. The [STOP] key on the integrator stops the current run and aborts the sequence. Stop on the GC stops the current run, but the sequence continues as soon as the GC becomes Ready.