

# Macrotone Joomla Audit Guide

***Macrotone***  
***Consulting Ltd.***

**Geoffrey S. Chapman**

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Macrotone

Joomla

Audit

Guide:

# *Macrotone* *Consulting Ltd.*

Geoffrey S. Chapman

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## **Abstract**

This book covers the use of the Macrotone Joomla Audit Component component which allows the auditing of data changes on your Joomla!™-powered web sites.

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# Preface

**Macrotone**

**Joomla**

**Audit**

**Component**

**Author:** G S Chapman

**Date:** 11<sup>th</sup> July 2015

**Version:** 1.1.0

## *DOCUMENT HISTORY*

<b>Version</b>	<b>Date</b>	<b>Changed By:</b>	<b>Remarks</b>
1.0.0	01/10/2013	G S Chapman	Initial release
1.0.1	13/02/2015	G S Chapman	Update for release 1.0.1.
1.1.0	11/07/2015	G S Chapman	Update for release 1.1.0

## **PURPOSE OF DOCUMENT**

This documentation describes the release 1.1.0 version of the Joomla Audit Component by Macrotone Consulting Ltd. It provides an independent mechanism for recording changes on specified table fields within the database. It required appropriate permissions on the database to enable the creation of procedural code in the form of Database Triggers.

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# Part I. Audit Guide

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# Chapter 1. Introduction

## Introducing MacroTone Joomla Audit

MacroTone Joomla Audit is a component which enables one to monitor changes to the data on a Joomla powered site using a MySQL database.

This component was created out of a feature within MacroTone Issue Tracker which is used to provide a comprehensive Audit trail, often known as Change History. It enables one to optionally generate a 'history' of changes performed upon a database table.

Our experience tends to indicate that very few (if any) Joomla components make use of the underlying database to its full advantage, preferring instead to implement features at the application layer. This is in our opinion missing a very important 'trick', since the database is 'closest' to the data itself. We have used our extensive database expertise to therefore make use of some of the database features with this component to provide the change data.

### Important

This component makes use of database features specifically database triggers. Not all host providers allow their clients to create these types of database objects. It is advisable to check your specific privileges before installing the component otherwise you will not be able to use the component if you cannot create database triggers.

Attempts to install the component upon a system without the permissions will result in the installation failing.

The 'basic' Joomla installation provides some tables with a record of who made the last change to an item (i.e. an article or a web link etc.) and when they made the change. Unfortunately it doesn't inform one of what was changed. It might have been something as simple as a correction of a typographical error, or it may have been some thing much more extensive. Some sites require much more information about any given change, especially sites that may house data that could be considered 'sensitive'. The MacroTone Joomla Audit component tries to address this requirement and provide a more comprehensive and extensive audit over all of the changes that have occurred upon table records.

This feature makes use of the underlying features of the database and creates 'database triggers' that record the changes after they are made in the database. In this way there is no need to change any of the Joomla libraries or core code, which avoids any problems if/when the core code is changed between releases.

A database trigger is procedural code that is automatically executed in response to certain events on a particular table or view in a database. The trigger is mostly used for maintaining the integrity of the information on the database. Most if not all databases provide support for database triggers. Whether a specific database user can create these triggers will depend upon the permissions granted to the database user. The database user that has to have the correct permission in the Joomla environment is the user that is used to perform all database connects as defined in the Joomla installation itself.

### Note

Different databases implement database features such as database triggers in different way, and often with slightly different syntax. For that reason the current version only supports MySQL databases, the most commonly used database for Joomla systems.

The MacroTone Joomla Audit database triggers (by default) are all created as 'AFTER' triggers, which means that they all are executed 'after' the record has been saved to the database. The implication of this is that no information is saved IF the record itself is not saved in the database. It also means that

for 'INSERT' triggers, any information automatically created by the database as a consequence of the insert, such as unique record identifiers are also recorded in the change history.

## Note

It is possible to create BEFORE triggers although in practise they do not always hold all of the required information. An example of this would be the unique identifier (id) field which is usually populated automatically by the database upon a record insertion.

The change history created by Macrotone Joomla Audit can be used to provide documentary evidence of the change activities that have affected at any time a specific table, or table column of any of the underlying Joomla database tables. The feature will prove useful for companies who need to apply audit trail (log) functionality on their Joomla sites.

For some organisations maintaining a complete audit trail for your database is important not only for internal analysis and process optimisation, but also for compliance with industry standards and regulations. One can view the ongoing activity history of a table record, including what action was taken, by whom, and the date and time the action occurred.

Complying with industry standards is important, time-consuming and expensive. Leveraging the Change History information tracking capabilities can reduce the time and effort it takes to gain and maintain any required certification, and dramatically increases the organisation's chances of successfully passing audits.

Key features:

- Any Joomla table can be monitored.
- Any number of the columns of a chosen table can be monitored.
- No Joomla core code is modified.
- Transparent to any installed Joomla extension.
- Transparent to any site users.

Please note that Macrotone Joomla Audit is solely an administration product. It has no front end access at all and prevents modification of any collected change history even by the Joomla Administrator(s) themselves.

## Important

It is still possible that a database administrator can modify the underlying data contained in the change history table. Tools such as phpadmin can still function and have the ability to disable triggers, make data changes and then re-enable the triggers, thus bypassing the change tracking. This is something that no Joomla component can possibly protect against.

# Requirements and compatibility

Macrotone Joomla Audit requires the following server-side configuration:

- Joomla!™ 3.x or 2.5. Joomla 3.3 or above recommended for JAudit 1.0.2.
- Joomla!™ 3.4 or above recommended for JAudit 1.1.0.
- PHP 5.3 and 5.4. It may work on later versions but these have not been tested yet.
- MySQL 5.1.36 or later. Earlier database server versions will not be supported. Do note that earlier releases of MySQL are obsolete and not supported any more by Oracle (the company who controls the development of MySQL).

- MySQL database triggers. Some web hosting providers may not permit the creation of these database objects.
- A powerful server and a lax CPU usage limit (or no CPU usage limit at all). This is important if a lot of tables with lots of columns are being monitored. The size of the change history table would also be very large in these situations.

### **Important**

Because of the impact of monitoring a lot of tables and their fields, it is strongly suggested that only 'important' data fields in important tables are monitored to minimise system resources and the enable one to 'to filter the chaff from the wheat'..

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# Chapter 2. Installation

## Installation

### Installation

Installing the package is the same as with any other Joomla component. Go to your site's back-end Extensions, Manage and click on Browse. Locate the ZIP package and click on Upload and Install. If the installation fails, please refer to the Notes (FAQ) section of this guide.

#### Note

The language (translation) files are NOT installed automatically. You can download and install them from our language download page. Do note that you will have to install both the component and the language packages for the component to work.

Macrotone Consulting Ltd only produces the English language files. All other languages are contributed freely by third parties. If you spot an error if the first instance please go to the translation project page to find the contact information of the translator. Abandoned languages will show the maintainer being our staff member "geoffc". In this case we will try to help you but our knowledge of foreign languages is very limited; if you would like to fix the language package you will need to create a Transifex account and to volunteer to take over the translation project for that language.

### Updating to the latest release

Macrotone Joomla Audit can be updated with three different methods: installing the new version on top of the old one, using the integrated Live Update system or using the extensions update feature in Joomla!.

#### Updating directly

This is the failsafe approach, but the least convenient. Download the latest Macroton Joomla Audit release from <http://macrotoneconsulting.co.uk/index.php/homepage/downloads.html>. Navigate to the Audit Component page and once you have selected the download save the ZIP file to your hard disk. Log in to your site's backend, click on Extensions Manager. Use the Browse... button to locate the ZIP file you downloaded, then click on Upload and Install. All recent Joomla versions are smart enough to understand that you're doing an upgrade instead of installation and adjust the process accordingly.

#### Important

Do NOT uninstall Macroton Joomla Audit before updating it! Uninstalling will remove all of your data, including all of your change history and the underlying database triggers!

#### Using Live Update

Macroton Joomla Audit integrates the Akeeba Live Update system. Log in to your site's back-end and go to Components, Macroton Joomla Audit. In the component Control Panel look for an icon which reads "Update found" when there is a new version available. Click on it and then click on "Update now". The new version will be downloaded and installed automatically for you. In case this doesn't work, or if "Live Update not supported" is displayed below the icon, please make sure that your host's firewall allows TCP/IP communications over port 80 and 443 to [macrotoneconsulting.co.uk](http://macrotoneconsulting.co.uk). If your host requests IP addresses instead of domain names, please ask them to trace them from the server as they are multicast hostnames, which means that they resolve to a different IP depending on where in the world you are.

## Using Joomla! Extension update

The Joomla! Extensions Manager allows directly updating your extensions. Just log in to the backend of your site and go to Extensions, Extension Manager. Click on the Update link below the tool bar. Then click on the Find Updates button. If there is a new Macrotone Joomla Audit release it will appear in the list below. Tick the box on the left of the row and then click on the Update button. If your site is compatible with this Joomla! feature, you will see the new version being installed automatically for you.

## Something not working right after the update?

Sometimes Joomla! "forgets" to copy all updated files. This is something that has been seen occasionally. In this case, simply follow the instructions in the Updating Directly section above. This will force Joomla! to retry updating the component, copying the missing files and everything will work again.

## Uninstallation

You can uninstall the component just like any other Joomla! component. In your site's back-end, just go to Extensions Manager, click on Uninstall, select Macrotone Audit Component and click on Uninstall. This will completely remove Macrotone Joomla Audit, and remove any traces of monitoring upon the underlying database.

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# Chapter 3. Configuration

This chapter describes the Macrotone Consulting Joomla Audit component options.

## Component Options

This section describes the various component options available.

There are a number of options available to configure the component. These are all accessed from the 'Option' icon in the top right hand side of most of the Administrator screens. Hovering over the option title will display tool tips explaining what the action that the selected option setting performs.

### General Options

The component currently only has a few options, one of which is whether or not to translate some of the known table fields into readable values. At the present time the contents of the 'state' field which is stored in the database as 'integer' values would be translated into the text equivalent in the natural language of the site. The other fields that would be translated include the 'checked\_out', 'created\_by' and 'modified\_by' table fields which are also stored as the user specific id value, and is translated to display the user and user name as obtained from the Joomla users table.

**Figure 3.1. JAudit Options**

The screenshot shows the JAudit configuration interface. At the top, there are four tabs: 'Jaudit' (highlighted with a dashed border), 'Logs', 'List Layouts', and 'Permissions'. Below the tabs, the title 'Joomla audit component' is displayed. There are two main settings: 'Translate Fields' with radio buttons for 'No' and 'Yes' (where 'Yes' is selected), and 'Text display length' with a text input field containing the value '50'.

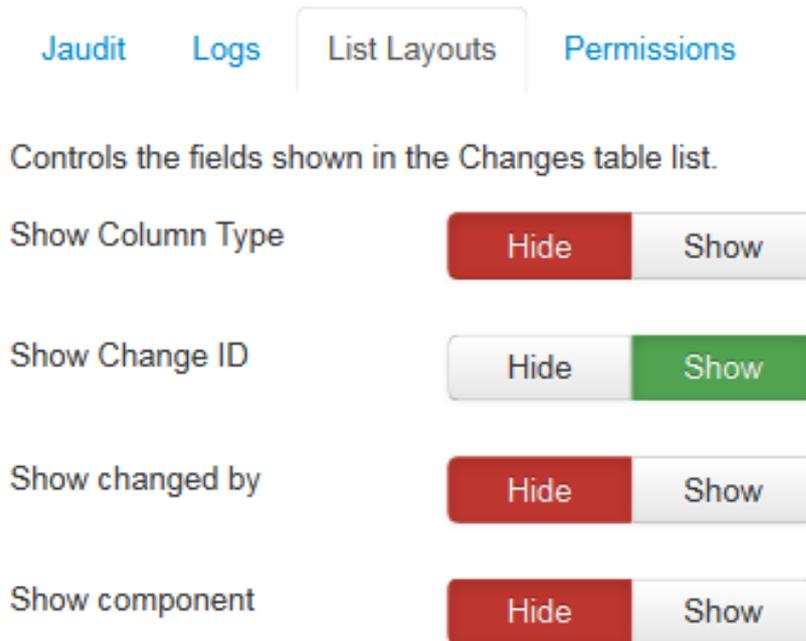
Another option specify the width of the 'change' field in the changes list display.

Other options may be added in later releases.

### List Control Options

Introduced in release 1.0.1 the list control options allow for optional display of fields in the administrator changes display. Some fields may never be populated due to the inability of the database to know the association for the field such as the 'changed\_by' field. Other fields may be chosen to be ignored such as the 'component' field, especially if only one specific Joomla component is being monitored.

**Figure 3.2. List Control options**

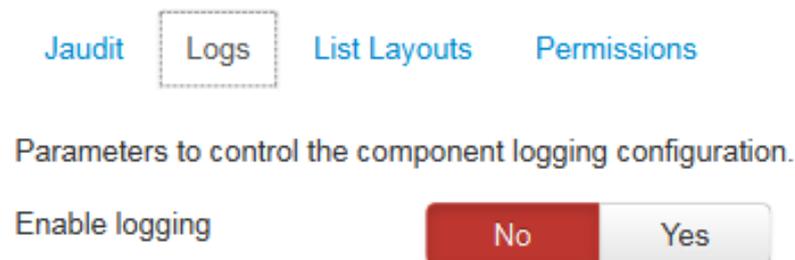


Other options may be added later if demand is sufficient.

## Log Control Options

Release 1.0.1 also introduced a log facility. In this release it is used solely to provide some additional debugging information.

**Figure 3.3. Log Control Options**



Future releases will expand upon the usage of the lo

## Permission Options

The final option enables the permissions to be specifically set for the user groups.

### Figure 3.4. Permissions Options

[Jaudit](#) [Logs](#) [List Layouts](#) **Permissions**

Default permissions used for all content in this component.  
Manage the permission settings for the user groups below. See notes at the bottom.

	Action	Select New Setting <sup>1</sup>	Calculated Setting <sup>2</sup>
<a href="#">Public</a>	Configure	Inherited	Not Allowed
<a href="#">- Guest</a>	Access Administration Interface	Inherited	Not Allowed
<a href="#">- Manager</a>	Create	Inherited	Not Allowed
<a href="#">-- Administrator</a>	Delete	Inherited	Not Allowed
<a href="#">- Registered</a>	Edit	Inherited	Not Allowed
<a href="#">-- Author</a>	Edit State	Inherited	Not Allowed
<a href="#">--- Editor</a>	Edit Own	Inherited	Not Allowed
<a href="#">---- Publisher</a>			
<a href="#">- Super Users</a>			

---

# Chapter 4. Usage and Screens

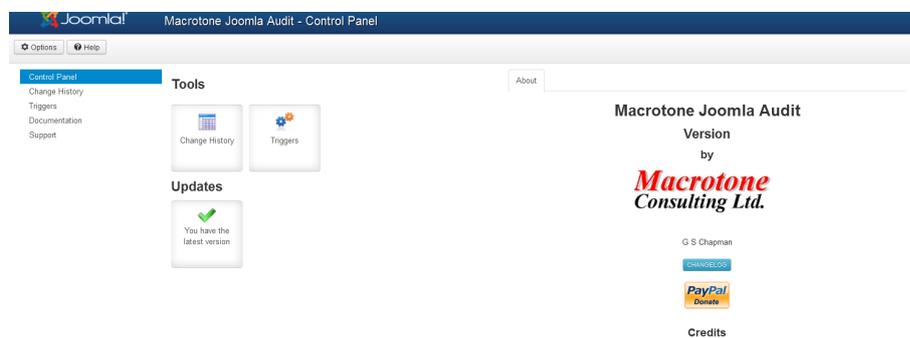
## Note

the screens shown in this document mainly reflect those visible using Joomla 3.x. The screens displayed within Joomla 2.5 are similar but reflect the difference in the administrative templates between the two versions. Functionality is identical in both Joomla version.

## Control Panel

The control panel is the first (landing page) display of the Macrotone Joomla Audit component. It is an entry location to access the Triggers used to create the Change History, sometimes known as Audit records and also to view the actual change records themselves.

**Figure 4.1. Control Panel**



There are three specific icons which enable one to navigate to the Change History list and the Triggers list, as well as the 'Live Update' icon which indicates if an update for the component is available. The button within the 'About' section to the right of the page will display the current release changelog.

## Changelog

The Changelog is a history of the different changes made to the component during each release. As initially released there would only be a single entry, but the list will obviously expand as new features and releases are made available.

**Figure 4.2. Changelog Display****Macrotone Joomla Audit 1.0.1**

<b>NEW</b>	Add option to control length of text (characters) displayed in change list.
<b>NEW</b>	Add log table and view.
<b>DIFF</b>	Update all copyright dates to 2015.
<b>DIFF</b>	Update links to reflect new Kunena forum.
<b>DIFF</b>	Correct CSS for missing icons.
<b>NEW</b>	Add additional checks for Database permissions to create triggers to install script.
<b>DIFF</b>	Modify credits display to show Transifex profile of translators.
<b>NEW</b>	Add new list options for back end changes display.

**Macrotone Joomla Audit 1.0.0**

<b>NEW</b>	Initial Release
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## Change History

The change history or Audit records result from the database triggers capturing information upon the monitored tables. There are three types of activity that can be captured:

Activity	Stored Information
Update	The data in the fields both before and after the change is recorded.
Insert	Only the 'new' information is present to be stored.
Delete	The 'old' information for the field is stored.

In addition to the field changes the following information is also stored for each 'change' or 'audit' record:

- **Table name**  
The name of the table being modified.
- **Column (Field) Name**  
The name of the specific field being modified.
- **Action**  
The specific activity being performed.(Update, Insert or Delete) as described above.
- **Record Key**  
The primary key (where present) of the monitored table used in the SQL command. For example: WHERE 'id' = '6' where id is the primary key of the table.
- **Record Key List**  
Where a monitored table has an 'Alias' field (often also known as a 'slug') this is also captured. Where this does not exist the primary key value of the record is stored. This is often the same as the 'Record Key' above.

- User details

Where it can be determined the details of the user (ID) name (or guest) that performed the activity is recorded. Unfortunately this is not always determinable and in these situations the Super User id is stored. See the section about determining who made a change later in this document.

- Date and Time of change

Date Exact date and time (time stamp). Stored in the database as a UTC value (Joomla default).

## Change History List

From this view you can view the actual audit records. The records may not be changed but they may be deleted.

The Change History list display shows all of the changes captured by the database triggers. It is possible to filter upon the individual tables to display the changes made upon the specified table. It is also possible to filter by component. The component determination is a little arbitrary in that it is based upon the table name. This does mean that the determination may not be totally accurate. An example illustrates this point as follows: jos\_users table is identified as belonging to the 'users' component, similarly jos\_content is part of the 'Contents' component (Articles). However even our own Issue Tracker component uses the table names such as jos\_it\_people, and this is determined to be the component 'it'. Other third party component also use similar abbreviation so the filter is an aid but by no means completely accurate.

**Figure 4.3. Change History List Display**

States	Table Name	Component	Row Key	Row Key Link	Column Name	Column Type	Action	Old value	New value	Changed by	Change Date	ID
<input checked="" type="checkbox"/>	ic2tr_k_issues	it	16	DAAAAAAAAA16	checked_out_time	datetime	UPDATE	0000-00-00 00:00:00	2013-09-11 12:13:30	Super User (admin)	2013-09-11 13:13:30	101
<input checked="" type="checkbox"/>	ic2tr_k_issues	it	16	DAAAAAAAAA16	assigned_to_person_id	int	UPDATE		536	Super User (admin)	2013-09-11 13:14:04	102
<input checked="" type="checkbox"/>	ic2tr_k_issues	it	16	DAAAAAAAAA16	modified_on	datetime	UPDATE	2013-09-11 12:12:38	2013-09-11 12:14:04	Super User (admin)	2013-09-11 13:14:04	103
<input checked="" type="checkbox"/>	ic2tr_k_issues	it	16	DAAAAAAAAA16	checked_out	int	UPDATE	Super User (admin)		Super User (admin)	2013-09-11 13:14:04	104
<input checked="" type="checkbox"/>	ic2tr_k_issues	it	16	DAAAAAAAAA16	checked_out_time	datetime	UPDATE	2013-09-11 12:13:30	0000-00-00 00:00:00	Super User (admin)	2013-09-11 13:14:04	105
<input checked="" type="checkbox"/>	ic2tr_k_issues	it	1	DAAAAAAAAAA1	checked_out	int	UPDATE	Super User (admin)		Super User (admin)	2013-09-11 13:28:26	106
<input checked="" type="checkbox"/>	ic2tr_k_issues	it	1	DAAAAAAAAAA1	checked_out_time	datetime	UPDATE	0000-00-00 00:00:00	2013-09-11 12:28:26	Super User (admin)	2013-09-11 13:28:26	107

Release 1.1.0 introduced the ability to export the displayed change records (including filters) to a CSV or a compressed ZIP file. When the Export button is pressed a popup window is displayed where one may select how the export file is to be named and whether the file should be compressed or not. Upon making the selection a file is created and the user is presented with the standard browser download window request as to whether to open or save the file in the file system.

## Change History Entry

The change history record is the actual details of a specific field changed in a table. The change record itself contains the details of the table and the specific table field (column) that was changed and the details of the specific change.

Changes may be the result of a new record being entered into a table, in which case the 'NEW' field value is populated, there being no 'OLD' value existing prior to the change. An update of a record will result in both a before (OLD) and an after (NEW) value being present for a field. The 'OLD' value may of course be NULL (empty) in which situation the NEW value would definitely not be NULL, or alternatively the 'NEW' value may be NULL in which case the 'OLD' value would not be NULL. When a record is deleted from a table there is no 'NEW' value, but there may be an 'OLD' value.

If a value field is of a character type then the displayed information is a text box and scroll bars would be present to enable one to inspect the record entry.

**Figure 4.4. Change History Entry**

The screenshot shows a Joomla! 'Change' form. At the top, there are buttons for 'Save & Close', 'Save & New', and 'Close'. The form fields are as follows:

Table Name	ic29_ik_issues	Row Key	16	Details
Component	ik	Row Key Link	0AAAAAA16	Published
Column Name	checked_out_time	Action	UPDATE	Published
Column Type	datetime	ID	101	
Old Value	0000-00-00 00:00:00			
New Value	2013-09-11 12:13:30			
Changed by	Super User (admin)	Change Date	2013-09-11 13:13:30	

The change history records can not be edited by the component. The text area boxes are 'read only' which means that any changes made on the screen would be completely ignored.

## Triggers

The following description is taken from Wikipedia:

A database trigger is procedural code that is automatically executed in response to certain events on a particular table or view in a database. The trigger is mostly used for maintaining the integrity of the information on the database. For example, when a new record (representing a new worker) is added to the employees table, new records should also be created in the tables of the taxes, vacations and salaries.

Triggers are commonly used to:

- audit changes (e.g. keep a log of the users and roles involved in changes)
- enhance changes (e.g. ensure that every change to a record is time-stamped by the server's clock)
- enforce business rules (e.g. require that every invoice have at least one line item)
- execute business rules (e.g. notify a manager every time an employee's bank account number changes)
- replicate data (e.g. store a record of every change, to be shipped to another database later)
- enhance performance (e.g. update the account balance after every detail transaction, for faster queries)

The examples above are called Data Manipulation Language (DML) triggers because the triggers are defined as part of the Data Manipulation Language and are executed at the time the data is manipulated. Some systems also support non-data triggers, which fire in response to Data Definition Language (DDL) events such as creating tables, or runtime or and events such as logon, commit and rollback. Such DDL triggers can be used for database auditing purposes.

The following are major features of database triggers and their effects:

- triggers do not accept parameters or arguments (but may store affected-data in temporary tables)
- triggers cannot perform commit or rollback operations because they are part of the triggering SQL statement (only through autonomous transactions)

## MySQL

MySQL 5.0.2 introduced support for triggers. MySQL supports these trigger types:

- Insert Trigger
- Update Trigger
- Delete Trigger

## Note

MySQL allows only one trigger of each type on each table (i.e. one before insert, one after insert, one before update, one after update, one before delete and one after delete).

## Note

MySQL does NOT fire triggers outside of a statement (i.e. API's, foreign key cascades)

## Triggers List

The triggers list display shows the database table triggers created by the component.

It does not show any triggers created by another mechanism, unless they happen to contain the specific string 'jaudit' within their name.

Triggers are names after the table upon which they are applied, followed by the specific string '\_jaudit\_' and then by a two character string, the first of which indicates whether it is a 'BEFORE' (b) or 'AFTER' (a) trigger, and the second indicates whether it is applied on an 'INSERT' (i), 'UPDATE' (u) or 'DELETE' operation.'

The screen also allows a single point where triggers may be enabled, which is where the trigger is created within the database. Disabling the trigger removes the trigger from the database.

## Important

MySQL has a few restrictions upon triggers which may be briefly summarised as follows: Only one trigger of any specific type is possible upon any given table. Triggers if present are automatically enabled. Triggers can not be disabled. Disabling a trigger requires the trigger be deleted.

The screen can also used to delete triggers. Deletion of a trigger not only removes it from the database (disabling), but also removes all trace of the trigger from the component.

**Figure 4.5. Triggers List**

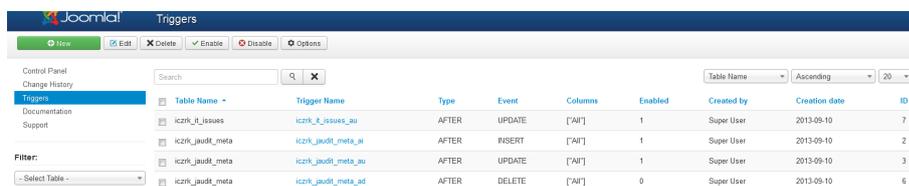


Table Name	Trigger Name	Type	Event	Columns	Enabled	Created by	Creation date	ID
iczk_e_issues	iczk_e_issues_aa	AFTER	UPDATE	['AI']	1	Super User	2013-09-10	7
iczk_jaudit_meta	iczk_jaudit_meta_ai	AFTER	INSERT	['AI']	1	Super User	2013-09-10	2
iczk_jaudit_meta	iczk_jaudit_meta_au	AFTER	UPDATE	['AI']	1	Super User	2013-09-10	3
iczk_jaudit_meta	iczk_jaudit_meta_ad	AFTER	DELETE	['AI']	0	Super User	2013-09-10	6

## Trigger Entry

Creating a trigger is performed by clicking upon the 'NEW' icon button in the Trigger list display. This would then display the figure below, which has a few fields which need to be completed. These are the table upon which the trigger is to be placed, the type of trigger required (BEFORE or AFTER), the operation to be monitored (INSERT, UPDATE or DELETE), and whether the trigger should be applied immediately after being created.

The trigger created at the end of this stage would be based upon 'ALL' of the columns that are in the selected table.

**Figure 4.6. Trigger entry (creation)**

If the 'Save' icon button is pressed then the display is changed and a few additional fields are now available. The first of these is the 'Columns' field which has to be completed. It is this field where one selects the specific columns within the table that are to be monitored. The fields are selected from the drop down list and there is also the 'All' option if one wishes to retain the previously generated trigger upon all of the table columns. If the 'ALL' option is selected then any other selected fields are ignored.

If the 'Save and Close' button is pressed the Trigger list display is shown and the 'columns' entry indicates '(array) All'. If the entry is edited then it is necessary to explicitly select the 'All' from the columns drop down list as described above otherwise an error message indicating that the column must be specified is displayed..

## Note

By design it is not currently possible to edit the generated trigger text. This design criteria may be relaxed later if demand is sufficient.

After supplying the required columns when the save button is pressed the trigger text is regenerated with the new selection.

**Figure 4.7. Trigger entry (after save)**

```

CREATE TRIGGER `iczkik_it_projects_iaudit_ai`
AFTER INSERT ON `iczkik_it_projects`
FOR EACH ROW
BEFORE
  DECLARE mal VARCHAR(255);
  DECLARE changedby VARCHAR(12);
  DECLARE component VARCHAR(255) DEFAULT '';
  DECLARE ceexists BOOLEAN;
  SELECT IF(count(*) > 0, TRUE, FALSE) INTO ceexists
  FROM INFORMATION_SCHEMA.COLUMNS
  WHERE TABLE_NAME = 'iczkik_it_projects'
  AND COLUMN_NAME = 'created_by';
  IF ( ceexists ) THEN

```

Note the entries in the 'columns' field when populated with desired values as shown in the figure below.

**Figure 4.8. Trigger entry (edit columns)**

The screenshot shows a web form for editing a trigger. At the top, there are buttons for 'Save', 'Save & Close', 'Save & New', and 'Close'. Below these is a green message box that says 'Message Item successfully saved'. The form fields are as follows:

- Table name: iczrk\_it\_projects
- Trigger Name: iczrk\_it\_projects\_jaudt\_ai
- Type: AFTER
- Event: INSERT
- Columns: asset\_id, description, level, title
- Enabled: Disabled
- Trigger text:
 

```
CREATE TRIGGER 'iczrk_it_projects_jaudt_ai'
AFTER INSERT ON 'iczrk_it_projects'
FOR EACH ROW
BEGIN
  DECLARE mval VARCHAR(255);
  DECLARE changedby VARCHAR(12);
  DECLARE component VARCHAR(255) DEFAULT '';
  DECLARE cexists BOOLEAN;
  SELECT IF(count() > 0, TRUE, FALSE) INTO cexists
  FROM INFORMATION_SCHEMA.COLUMNS
  WHERE TABLE_NAME = 'iczrk_it_projects'
  AND COLUMN_NAME = 'created_by';
  IF ( cexists ) THEN
```

When saved the selected columns field would be shown in the Triggers List as indicated in the figure below.

**Figure 4.9. Columns field in the Triggers list display**

```
["asset_id","title","description","level"]
```

The above is an example for a small selection of fields, which are stored in the table in JSON format.

## Important

Release 1.0.0 does not have any ability to incorporate the contents of any existing trigger upon a database table that may exist within the database. This restriction should not provide a problem for most systems. The reason is that most (all?) currently known components, including core components do NOT make use of database features such as database triggers, preferring instead to contain the logic within the application layer. If your system does make use of triggers the problem would be seen when an attempt is made to apply the generated trigger in the database, since MySQL does not permit more than one trigger of any given type on a database table.

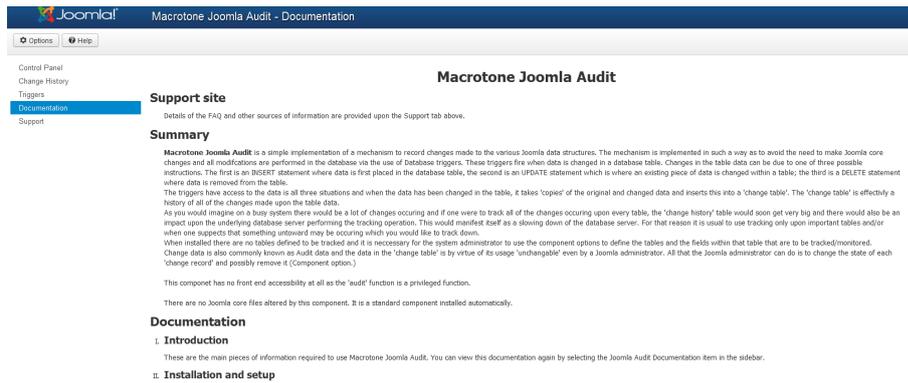
## Note

The Macrotone Issue Tracker component does make use of database triggers, however it uses 'BEFORE' triggers which do not conflict with the use of the AFTER triggers created by the Macrotone Joomla Audit component.

# Documentation Panel

The documentation panel provides a brief overview of the component.

Figure 4.10. Documentation Panel

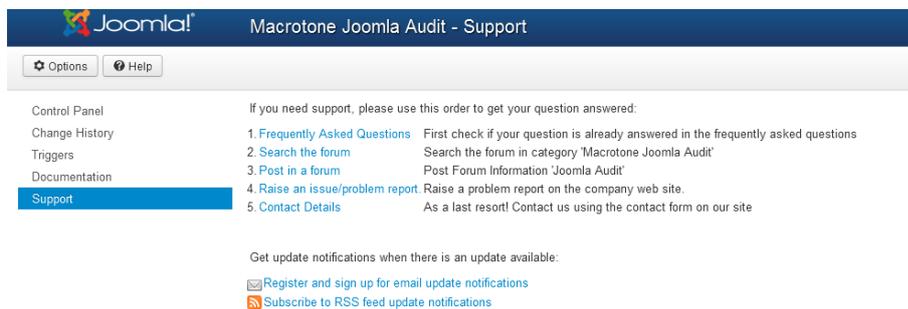


The information within the documentation panel is not intended to replace the need for documentation (this document), but instead to act as a convenient reference point if the Internet were not available at a specific time.

## Support Panel

The support panel provided details of the various options available to obtain additional information, such as the Frequently Asked Question (FAQ) article upon the Macrotone web site, Support Forum etc.

Figure 4.11. Support Panel



The support panel also provides a link that enables the site administrator to raise a problem report for the component upon the company web site.

## Help Panel

The Help panel is displayed whenever the 'Help' icon is pressed. It provides a modal panel from whence one can link directly to the specified pages upon the company website.

**Figure 4.12. JAudit Help Panel**

## Macrotone Joomla Audit

**Macrotone**  
**Consulting Ltd.**

[Macrotone Joomla Audit Details](#)  
[Macrotone Joomla Audit Documentation \(Web Pages\)](#)  
[Macrotone Joomla Audit Documentation \(PDF file\)](#)  
[Macrotone FAQ](#)  
[Macrotone Joomla Audit Forum](#)

## Determining who changed a record.

The way in which it is possible to determine who changed a record is very dependant upon the structure of the specific table. Some Joomla tables possess specific fields to hold this information. These fields are typically named 'created\_by' and 'modified\_by'. If a table has these fields, which can be determined from inspection of the drop down columns when the trigger is created, it is advantageous to select these columns along with other monitors columns to capture the information they contain.

Another mechanism used by some Joomla table is the 'checked\_out' field. When present, when a table is modified the table is first 'checked out' when the record is changed and then 'checked in' when the record is saved.

### Note

When a Joomla table makes use of the checkin/checkout feature additional records will be created in the change history table if these columns are monitored. The reason is that immediately before an record is edited, the record is 'checked out' from the database this triggering a record change. The user then edits the record and saves the result, triggering another database change record being created. Then Joomla itself performs a 'check in' operation in turn triggering another record being created in the change history table.

### Important

Some Joomla tables do not contain any information that enables an easy way to determine who has made a change. Attempts to determine whether a link exists between the information contained within the Joomla session table and the database (MySQL) session information has not indicated that the information is stored in a conveniently accessible manner.

# Chapter 5. Designing the Database Objects

Once the database requirements were defined, the next step was to turn these into a database design and an outline that describes how the user interface accepts and presents data. Given the requirements described above the two main tables can be created:

- *Triggers* contains the trigger definitions to be stored in the database.

Further detail notes upon the table is provided below.

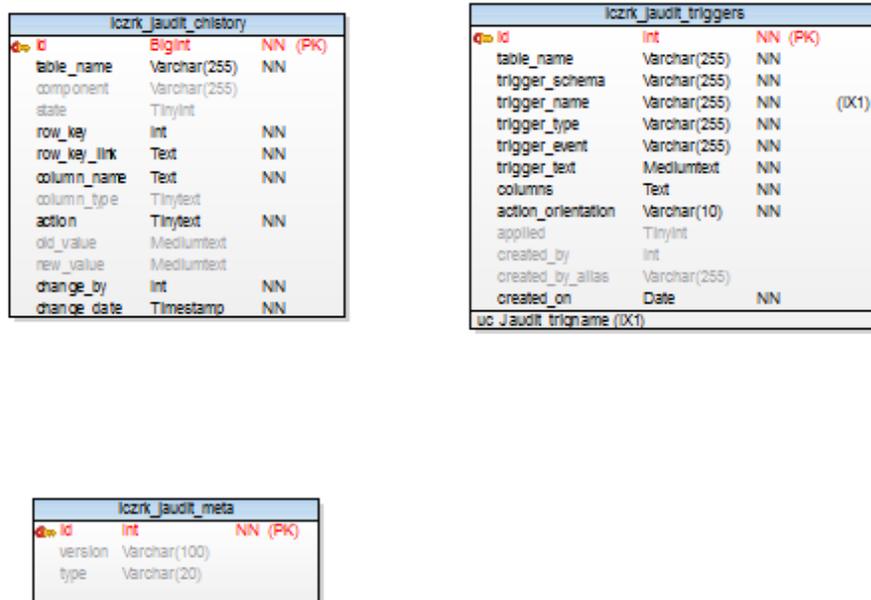
The next was the main table to contain the captured change records (audit records) from the action of the database triggers.

- *Change History* contains the actual change records.

System generated primary keys are used for all tables so that all the data can be edited without executing a cascade update.

The data model designed is shown in Data Model.

**Figure 5.1. Data model for JAudit 1.0**



The sections that follow describes the underlying tables used by the Macrotone Joomla Audit component.

## Change History Table

The Change History table contains the change records and is populated by the database triggers created and enabled in the MySQL database.

**Table 5.1. Change History table description**

Column Name	Type	Size	Not Null?	Constraints	Description
id	Bigint	20	Yes	Primary key	The system generated unique identifier for the record.  Populated by an auto-sequence.
table_name	Varchar	256	Yes	None	Name of the table for which the change is recorded.
component	Varchar	255	Yes	None	The component to which the change record applies.
state	TinyInt	4	Yes	None	State of the specific record. i.e. Published, archived, trashed etc.
row_key	Int	11	No	None	The value of the primary key for the record.
row_key_link	Text	255	No	None	The value of the alias for the record if it exists, the value of the Primary key otherwise.
column_name	Varchar	255	Yes	None	The name of the table column being recorded.
column_type	Varchar	12	Yes	Varchar	The type of column for the record. i.e. Integer, Varchar etc.
old_value	MediumText		No	None	For an DELETE or UPDATE action the former field value.
new_value	MediumText		No	None	For an UPDATE or INSERT action the new field value.
action	Varchar	12	No	None	The action of the change record. i.e.INSERT, UPDATE or DELETE.
change_date	DateTime	n/a	No	None	The date when the change was made.
change_by	Int	11	No	None	The Joomla id of the person who made the change where it can be determined otherwise the super user id.

## Triggers Table

The triggers table contains details of the triggers created by the Macrotone Joomla Audit component.

**Table 5.2. Triggers table description**

Column Name	Type	Size	Not Null?	Constraints	Description
id	Int	11	Yes	Primary key	The system generated unique identifier for the record.  Populated by an auto-sequence.
table_name	Varchar	255	Yes	None	Name of the table for which the trigger applies.
trigger_schema	Varchar	255	Yes	None	The database schema to which the trigger applies. MySQL databases may have multiple schemas.
trigger_name	Varchar	255	Yes	None	The name of the trigger. This is automatically generated based upon the name of the table upon which it is applies.

Column Name	Type	Size	Not Null?	Constraints	Description
trigger_event	Varchar	255	Yes	AFTER	The type of trigger. i.e. BEFORE or AFTER. Some databases may contain other trigger events.
trigger_event	Varchar	255	Yes	INSERT	The type of trigger, or more accurately when the trigger fires. i.e. INSERT, UPDATE or DELETE.
trigger_text	Medium Text		Yes	None	The actual trigger text from the specified criteria.
columns	Text	255	Yes	All	The columns to which the trigger applies.
action_orientation	Varchar	10	No	ROW	How the trigger is applied.
applied	TinyInt	4	Yes	Inactive	State of the specific trigger. i.e. Active or Inactive.
created_by	Integer	11	Yes	None	The Joomla id of the use who created the trigger text. Automatically populated.
created_by_alias	Varchar	255	No	None	The name of the person who created the trigger text.
created_on	DateTime	n/a	No	None	Date the record was changed.

## Meta Data Table

The Meta table is used by the component itself to record version numbers of its component parts. i.e. Modules, plugins etc.

**Table 5.3. Meta data component table description**

Column Name	Type	Size	Not Null?	Constraints	Description
id	Int	11	Yes	Primary key	The system generated unique identifier for the record. Populated by an auto-sequence.
version	Varchar	100	Yes	None	Version number of the installed component.
type	Varchar	20	Yes	None	Type of extension.

---

# Chapter 6. Notes

## FAQ - Frequently Asked Questions

There is a FAQ article upon the website that should contain the answers to the most common questions that one might have about Macrotone Joomla Audit and its usage. If you cannot find what you seek here you may contact us by raising a forum entry. In addition this document is presented as Web pages and as a downloadable PDF file.

We produce a few of the expected common question below:

- How does Change History know when my data has been changed?

The feature captures the information passed to the database when the record is inserted, updated or deleted from the database. The specific trigger performs the action without any other involvement.

- What versions of Joomla! are supported?

Currently release version 1.1.0 is thoroughly tested on Joomla! versions 3.4.3. Joomla 3.4.3 or above recommended.

- What versions of database are supported?

Currently only MySQL databases are supported, which is the most commonly used Joomla database.

- Do I have to make any changes to my version of Joomla to make the feature work?

The component options provided enable one to control which tables and which triggers it is required to create for the specified table. Configuration consists of creating the triggers and apply them from the Triggers panel within the administration component.

- What information is captured by the feature?

Change History captures information for each row that is inserted, updated, or deleted. For each table field that is audited, the before and after values of the column are stored, as well as:

The username of the person who made the change. (Where determinable.)

The date and time of the change.

The alias of the record (if present).

The primary key (row id) in the SQL query form.

After values are present only for update and insert operations.

Before values are present only for update and delete operations.

- Where is the change history data stored?

Change History data is stored within a specific table created by the component. This table is installed in the same database being used by Joomla itself. This table is fully queryable via SQL or other data access tools.

Macrotone Joomla Audit provides an administrator (back end) display view which makes it easy for an administrator to look through the audit log records. One can filter and sort the change history records by audited table and change type.

- I don't want to audit everything in my database, just certain selected areas. What control do I have over what is audited?

You have complete control over which tables are audited. One would be wise to carefully consider your specific audit requirements, because the more tables that are audited, the more space your change history table will occupy and the more activity the database server will have to bear to perform the auditing.

- In some cases, I only care about changes to existing data, not new data or deleted data. Do I have to audit all transactions on a given table?

No. You can choose any combination of the insert, update, or delete operations, and you can change this selection table-by-table. For example, some tables might audit all three operations while others may only audit update operations.

## **Other Problems and Issues.**

Please see the FAQ and the Forum entries on the company web site which will be updated with any new problem and their resolution when or if they are discovered.

---

# Chapter 7. Version Changes

The following is a list of the principle changes that have occurred during the recent releases.

## Joomla Audit 1.1.0

- ~ Correct case where the change\_by field was not being set correctly on some tables.
- + Add ability to export change history records.
- ~ Rewrite of trigger generation code to simplify trigger code.
- Remove unused models.
- ! The minimum required Joomla! version is 3.4
- ~ Modify translation credit display so that it now displays an article upon our site via an iframe rather than hard coding it in the component.
- + Add purge button on change history display.

## Joomla Audit 1.0.2

- ~ Modify triggers to insert super user id where it is not possible to determine the change user.
- ~ Change to user renderField method in single change display.
- ~ Modify trigger to always insert a integer in the change\_by field of the audit record.

## Joomla Audit 1.0.1

- + Add option to control length of text (characters) displayed in change list.
- + Add log table and view.
- ~ Update all copyright dates to 2015.
- ~ Update links to reflect new Kunena forum.
- ~ Correct CSS for missing icons.
- + Add additional checks for Database permissions to create triggers to install script.
- ~ Modify credits display to show Transifex profile of translators.
- + Add new list options for back end changes display.

## Joomla Audit 1.0.0

This is the initial release version.

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## **Part II. Appendices**

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# Appendix A. GNU General Public License version 3

Version 3, 29 June 2007

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