



C interfaces to GALAHAD CONVERT

Jari Fowkes and Nick Gould
STFC Rutherford Appleton Laboratory
Sun Apr 16 2023

1 GALAHAD C package bsc	1
1.1 Introduction	1
1.1.1 Purpose	1
1.1.2 Authors	1
1.1.3 Originally released	1
1.1.4 Call order	1
1.2 Further topics	2
1.2.1 Unsymmetric matrix storage formats	2
1.2.1.1 Dense storage format	2
1.2.1.2 Dense storage format	2
1.2.1.3 Sparse co-ordinate storage format	2
1.2.1.4 Sparse row-wise storage format	2
1.2.1.5 Sparse column-wise storage format	2
2 File Index	3
2.1 File List	3
3 File Documentation	5
3.1 galahad_bsc.h File Reference	5
3.1.1 Data Structure Documentation	5
3.1.1.1 struct bsc_control_type	5
3.1.1.2 struct bsc_inform_type	6

Chapter 1

GALAHAD C package convert

1.1 Introduction

1.1.1 Purpose

Given a real matrix A stored in one format, convert it to another

Currently, only the control and inform parameters are exposed; these are provided and used by other GALAHAD packages with C interfaces.

1.1.2 Authors

N. I. M. Gould, STFC-Rutherford Appleton Laboratory, England.

C interface, additionally J. Fowkes, STFC-Rutherford Appleton Laboratory.

Julia interface, additionally A. Montoison and D. Orban, Polytechnique Montréal.

1.1.3 Originally released

June 2014, C interface February 2022.

Chapter 2

File Index

2.1 File List

Here is a list of all files with brief descriptions:

galahad_convert.h	??
-----------------------------------	-------	----

Chapter 3

File Documentation

3.1 galahad_convert.h File Reference

```
#include <stdbool.h>
#include <stdint.h>
#include "galahad_precision.h"
#include "galahad_cfunctions.h"
```

Data Structures

- struct [convert_control_type](#)
- struct [convert_time_type](#)
- struct [convert_inform_type](#)

3.1.1 Data Structure Documentation

3.1.1.1 struct convert_control_type

control derived type as a C struct

Data Fields

bool	f_indexing	use C or Fortran sparse matrix indexing
int	error	unit for error messages
int	out	unit for monitor output
int	print_level	controls level of diagnostic output
bool	transpose	obtain the transpose of the input matrix?
bool	sum_duplicates	add the values of entries in duplicate positions?
bool	order	order row or column data by increasing index?
bool	space_critical	if space is critical, ensure allocated arrays are no bigger than needed
bool	deallocate_error_fatal	exit if any deallocation fails
char	prefix[31]	all output lines will be prefixed by prefix(2:LEN(TRIM(.prefix))-1) where prefix contains the required string enclosed in quotes, e.g. "string" or 'string'

3.1.1.2 struct convert_time_type

time derived type as a C struct

Data Fields

real_wp_	total	total cpu time spent in the package
real_wp_	clock_total	total clock time spent in the package

3.1.1.3 struct convert_inform_type

inform derived type as a C struct

Data Fields

	int	status	<p>return status. Possible values are:</p> <ul style="list-style-type: none"> • 0 successful conversion • -1. An allocation error occurred. A message indicating the offending array is written on unit control.error, and the returned allocation status and a string containing the name of the offending array are held in inform.alloc_status and inform.bad_alloc respectively. • -2. A deallocation error occurred. A message indicating the offending array is written on unit control.error and the returned allocation status and a string containing the name of the offending array are held in inform.alloc_status and inform.bad_alloc respectively. • -3. The restriction $n > 0$ or $m > 0$ or requirement that a type contains its relevant string 'coordinate', 'sparse_by_rows', 'sparse_by_columns', 'dense_by_rows' or 'dense_by_columns' has been violated. • -32 provided integer workspace is not large enough. • -33 provided real workspace is not large enough. • -73 an input matrix entry has been repeated. • -79 there are missing optional arguments. • -90 a requested output format is not recognised.
	int	alloc_status	the status of the last attempted allocation/deallocation
	int	duplicates	the number of duplicates found (-ve = not checked)
	char	bad_alloc[81]	the name of the array for which an allocation/deallocation error occurred
struct convert_time_type	time		timings (see above)