CSDS User Interface
ISDAT *search* Client
User's Manual

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with change bars for changes introduced in issue 2.0 and 2.1

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1   Introduction

1.1   Intended readership

This manual is intended for the user of the ISDAT *search* client.

1.2   Applicability of the manual

The current version of the document applies to ISDAT version 2.2, delivered as release 4
within the CSDS User Interface Project.

1.3   Purpose of the software

The purpose of the ISDATsoftware package, of which *search* is one component, is to pro-
vide the scientific community with software tools to manipulate and display Cluster CSDS
summary and primary parameters and other scientific data. The *search* client is used to
search for data in the scientific data packages using very flexible, user defined, search
criteria. In the CSDS User Interface, there are other tools for browsing the catalogues
without opening the scientific data packages.

1.4   How to use this document

This document consist of an overview of the software in order to familiarize the user with
the capabilities provided. The User Instructions section (3) should be read in connection
with the first hands-on encounter with the *search*. For the experienced user, a User
reference section (4) is provided.

1.5   Related documents

An overview of the CSDS UI ISDAT Client Package is given in [Ref. 3]. It is assumed that
the reader is familiar with the information given in that manual or with some other basic
ISDAT description. The installation of the CSDS User Interface ISDAT client package is
described in [Ref. 2].

1.6   Conventions and acronyms

In the following, we will use:

- *italics* to indicate exact names or expressions.

- Courier fonts to give command line expressions.

- > to indicate the terminal prompter.

Acronyms and abbrieviations used are described in Table 1.

Acronym	Meaning
CSDS	Cluster Science data System
CUI	CSDS User Interface
IRF-U	Institutet för Rymdfysik, Uppsalaavdelningen
	Swedish Inst. of Space Phys., Uppsala Division
ISDAT	Interactive Science Data Analysis Tool
UI	User Interface

Table 1: Acronyms and abbrieviations

1.7   Problem reporting

CSDS User Interface related problems should be reported to the CSDS National Data
Centre. If used outside the CSDS User Interface, problems should be reported to al@irfu.se.

2   Overview of the ISDAT search client

search is an ISDAT client of class *general clients*, see [Ref. 3]. The *search* client allows the
user to search for data in the scientific data base using his own search profile. Searching
in catalogues is provided by other parts of the CSDS User Interface software.

The search is performed in the following steps:

1. Start the search client.

2. Define time interval for searching

3. Define quantities to be used in searching.

4. Define the search expression.

5. Define integration time and interval resolution

6. Perform the search.

7. Transfer one or several of the matching time intervals to the time manager.

8. Stop the search client.

3   User Instructions

3.1   How to get started

3.1.1   Setting up the environment and Initialization

Before starting the *search* client it is assumed that:

- You are familiar with the X-window and mouse usage. If not, consult the appropriate manuals for your work station.

- You have logged in and have a CSDS *session manager* running. If not,see [Ref. 1] for instructions.

- The ISDAT client package has been properly installed and configured at your local workstation. If not, see [Ref. 2] for instructions.

- That you are a registered user at your *CSDS National Data Centre.*

- That a CSDS UI ISDAT server is running at your National Data Centre. If not, contact your National Data Centre for information.

- That a time manager is running at your local workstation. See document [Ref. 4] how to start the time manager.

3.1.2   Starting the search client, *search*

Click with the mouse on the *clients* menu at the top of the *time manager* window (see [Ref. 4]). Select *general* and under this menu select *search*. The *search* client will then start up as an own window.

3.2   How to understand the search client user interface

The search client user interface is shown in Figure 1.

The search window consists of six fields, from the top:

1. A menu bar

2. An editable search time interval field.

3. A quantity declaration field.

4. An editable search expression field.

5. An action buttons field.

6. An error and warnings message field.
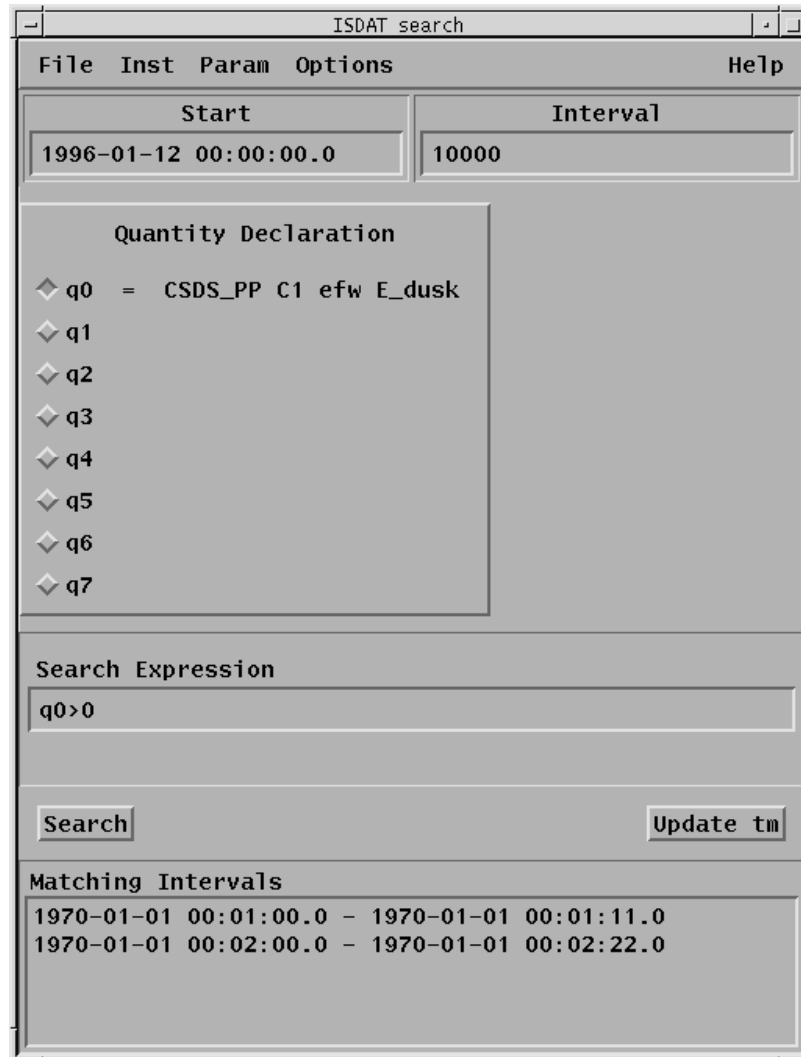
7. A result list field.

Figure 1: The search client window

3.3 How to specify the time interval

3.3.1 Two alternative ways to specify the time interval

At start time, the search client inherits the start and stop times specified in the time manager (see [Ref. 4]). The times are displayed in the *search time interval field*. This default time can be modified by

1. Updating the *cuitm* interactive time bar by using the em catalog or *content* functions of the time manager, see [Ref. 4] for further details or

2. editing the *search time interval fields* of the search window.

3.3.2 How to edit the time fields

See the *cuitm* User Manual, [Ref. 4].

3.4 How to specify quantities

The assignment of a quantity (*q0* - *q7*) will be done in the following steps, where step 2 is optional (see Figure 1):

1. Choose quantity. Press one of the quantity buttons (*q0* - *q7*). The choosen quantity will be the current quantity. Initially q0 is the current quantity.

2. Press button *Inst* and choose the desired combination of project, member and instrument. The choosen combination will be the current combination of project, member and instrument until you change it.

3. Press button *Param*. The parameters for the current combination of project, member and instrument will appear. Choose one of them. The assignment of the current quantity will now be displayed.

Quantities can be re-assigned in the same way as they are assigned.

3.5 How to specify the search expression

The *search* operation is based on a scan through the scientific data to find time periods when the *search experession* is true. As a rule, the operator follow the C conventions both with respect to meaning and prescedence and order of evaluation ([Ref. 5]). The following operators are legal in the search expressions (see Table 2):

In addition left, (, and right,), parantheses are allowed as well as the quantity symbols $q0, q1, q2, q3, q4, q5, q6, q7$ and constants. Some examples of legal expressions are thus:

$$q0 > 0$$

$$!(q0 > 0 \&\& q0 == 0)$$

Operator	Meaning
!	Logical negation
*	Multiplication
/	Division
+	Addition
−	Subtraction
<<	Left shift
>>	Right shift
>	Greater than
<	Smaller than
==	Equal
!=	Not equal
&	Bitwise and
|	Bitwise or
&&	Logical and
||	Logical or

Table 2: Legal operators

$$q0 > 0 \&\& q1 < 10.0$$

$$q0/q1 > 3.14$$

$$q0 > q1$$

If there is a syntax or semantic error in the expression, an error message will be given when the *search* button is pressed and the search is inhibited. Data related errors are not shown until after the search has been performed.

The search client can handle the search of status parameters. A status quantity consists of one or more components (bytes). Individual components (bytes) are picked out by indexing the quantity.

Example:

```
q0[2] == 4              check if value of byte 2 is 4
q0[2] & 8 == 8          check if bit 3 is set
```

3.6   How to perform the search in data

Search finds the time intervals, within the given search interval, where the *Search Expression* is true. When you have set search interval and written your *Search Expression*, press the *Search* button (see Figure 1). If the *Search Expression* is correct *ISDAT search* will respond with a list (*Matching Intervals*) of time intervals, where the *Search Expression* is true. This list can also be empty if the *Search Expression* is false in the whole search interval. If the *Search Expression* is incorrect an error message will appear just below the *Search Expression*.

3.7 Integration time

The *integration time* concerns the search process. To avoid to get too short intervals from *search*, it is possible to set a control variable called *integration time*. If a found interval is less than the given *integration time* it will be ignored and not displayed in the *Matching Intervals* list. The default start up value for the *integration time* is 0.0. The *integration time* can be changed by the user in the following way:

- Press button *Options* and choose *Control*. Then the *ISDAT search control* window will appear.

- Change the *integration time* field.

Once set by the user, subsequent change to search intervals will not affect the interval resolution in a session. See also section 3.9.

3.8 Interval resolution

The *interval resolution* concerns the presentation of the search result. To avoid to get too many intervals from *search*, it is possible to set a control variable called *interval resolution*. If the distance between two consecutive intervals is less than the *interval resolution*, these intervals will be concatenated and displayed as one interval in the *Matching Intervals* list. With distance between two consecutive intervals means the distance between the stop time of the first interval and the start time of the second interval. The default value of the *interval resolution* depends on the *search interval* in the following way:

```
search interval                interval resolution
   > 0                             1 ms
   > 1 s                           20 ms
   > 1 min                         1 s
   > 1 hour                        1 min
   > 1 day                         20 min
   > 1 week                        3 hours
   > 1 month                       12 hours
   > 1 year                        1 week
```

The *interval resolution* can be changed by the user in the following way:

- Press button *Options* and choose *Control*. Then the *ISDAT search control* window will appear.

- Change the *interval resolution* field.

See also section 3.9.

3.9 Examples of the use of *integration time* and *interval resolution*

Search interval: 0 - 120 seconds
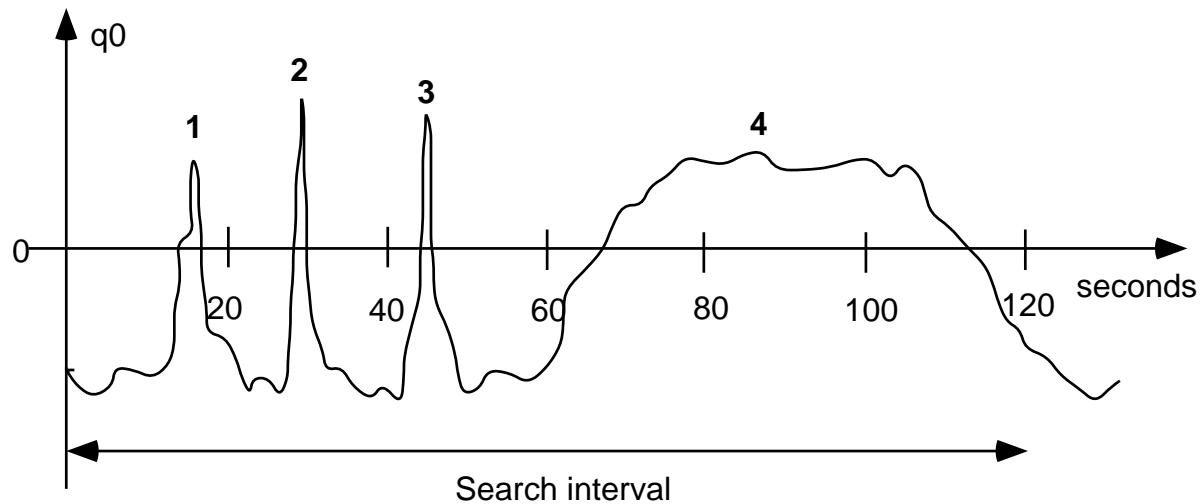Search expression: $q0 > 0$

Figure 2: Examples of the use of integration time and interval resolution

Example 1 - default settings
    Integration time: 0
    Interval Resolution: 0
    Result: 4 intervals returned

Example 2 - limit number of returned intervals by merging adjacent intervals.
    Integration time: 0
    Interval Resolution: 20
    Result: 2 intervals returned - one covering **1**, **2**, and **3** and one covering **4**. **1 - 3** occur less than interval resolution between each other.

Example 3 - disregard spikes in the data. Integration time: 10
    Interval Resolution: 0
    Result: 1 interval returned covering **4**. **1 - 3** do not qualify since they are individually shorter than the integration time.

Example 4 - disregard spikes and merge adjacent intervals. Integration time: 10
    Interval Resolution: 0
    Result: 1 interval returned covering **4**, the same result as in Example 3. Interval resolution never excludes any intervals. It can only cause merging of intervals.

See Figure 2.

3.10   How make use of the search result

A correct *Search* gives us a list (*Matching Intervals*) of time intervals, where the *Search Expression* is true. The items in this list can be used to change the time interval (*Start, Stop* and *Interval*) in *ISDAT cuitm*. This will be done in the follwing steps:

1. Select one or several consecutive items in the *Matching Intervals* list.

2. Press *Update tm.*

Now, the *Start* time in the *time manager* will be start time of the first item in the list
of selected items and the *Stop* time in *ISDAT cuitm* will be stop time of the last item in
the list of selected items.

3.11   How to save the search data for future use

To save the content of *ISDAT search* press *File* and choose *Save*. Then the *ISDAT search
save* window will appear. Give the file path in the *selection* field and press *OK*. If you
give a non existing file path you will get an error message. The format of the file is as in
the example:

```
QUANTITY
q0  =  CSDS_PP C1 efw Status
q1  =  CSDS_PP C1 efw State_wec
q2  =  CSDS_PP C1 efw E_dusk
q3  =  CSDS_PP C1 efw E_pow_f1
q4  =  CSDS_PP C1 efw E_pow_f2
q5  =  CSDS_PP C1 efw E_sigma
q6  =  CSDS_PP C1 efw I_probe
EXPRESSION
q0>0
INTERVALS
start: 960101 000100.0
interval: 700101 000011.099999999
start: 960101 000200.0
interval: 700101 000022.199999999
```

Use the *file→load* entry to restore the data (see section 3.12).

3.12   How to restore old search data

To load a file to *ISDAT search* press *File* and choose *Load*. Then the *ISDAT search load*
window will appear. Give the file path in the *selection* field and press *OK*. If you give
a non existing file path you will get an error message. Otherwise the content of *ISDAT
search* will disappear and the content of the file will be read and displayed. If the given
file is of wrong format you will get an error message and *ISDAT search* will remain empty.
The format of the file is shown in section 3.11.

3.13   How to use the help functions

Use the *help* entry of the menu bar (see Figure 1) to read the help text.

3.14   How to stop the search client

To exit *ISDAT search* press *File* and choose *Exit*.

3.15   Error and warning messages

Error and warning messages are printed in the field below the *search expression* field.

4   User reference

This section is also available on-line.

```
NAME
     search - search in scientific data

SYNOPSIS
     search

ARGUMENTS
     Handles all generic ISDAT and X arguments.

DESCRIPTION
     Search is an ISDAT client of type "general clients".

     The search client can be called from the time manger, cuitm.

     Menu bar entries:
          File with buttons:
               ConfigLoad
               A file created by the save command is restored.

               ConfigSave
               The data of the search client can be written to
               a file. Pressing this button will make a file selector to
               pop up.

               Exit
               To exit the client.

          Inst
          A dynamically built menu used to select the current
          instrument.

          Param
          A dynamically built menu. The content depend on the
          instrument selected under the Inst menu. Data for the menu is
          provided by the ISDAT server.  The default instrument is given by
```

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```
        the time manager.


        Help
        gives a short description of the client, basically this man
        page.


    Button field:
        Search
        Pressing this button starts the search.


        Update tm
        Pressing this button communicates the marked time
        intervals to the time manager.


    Quantity declaration field:


    q0 - q9
    Press one of these radio buttons to set the current quantity.
    This field is not editable. The current quantity can be assigned a
    logical instrument by selection in the Inst and Param menu entries.


    Search expression field:


    Search expression
    This is an editable field where the user search
    expression is defined.  The following operators are legal: +, -, *, /,
    &&, ||, &. |, >, <, ==.  The following symbols are legal: q0, q1, q2,
    q3, q4, q5, q6, q7, q8, q9, (, ).  where q0 - q9 represent quantities
    and parenthesis are used to mark priorities. In addition constants are
    valid in the expressions.



ERROR MESSAGES
    If a non-existent file name is choosen in the file selector for saving
    data, the error message "Bad file name" will be printed in the file
    selectors error message text field.  Illegal syntax or semantics of
    the Search expression will result in an error message.



SEE ALSO
    cuitm.1, cuigr.1
```

5   Reference Documents

[1] CSDS-UI software user manual. Technical Report DS-ESR-SM-0001, ESRIN, August 1994.

[2] CSDS User Interface, ISDAT Installation Manual. Technical Report DS-IRF-IM-0001, IRF-U, September 1995.

[3] CSDS User Interface, ISDAT User Manual. Technical Report DS-IRF-UM-0001, IRF-U, September 1995.

[4] CSDS User Interface, ISDAT cuitm User Manual. Technical Report DS-IRF-UM-0004, IRF-U, September 1995.

[5] B. W. Kernighan and D. M. Ritchie. *The C Programming Language, ANSI C.* Prentice Hall, 1988.