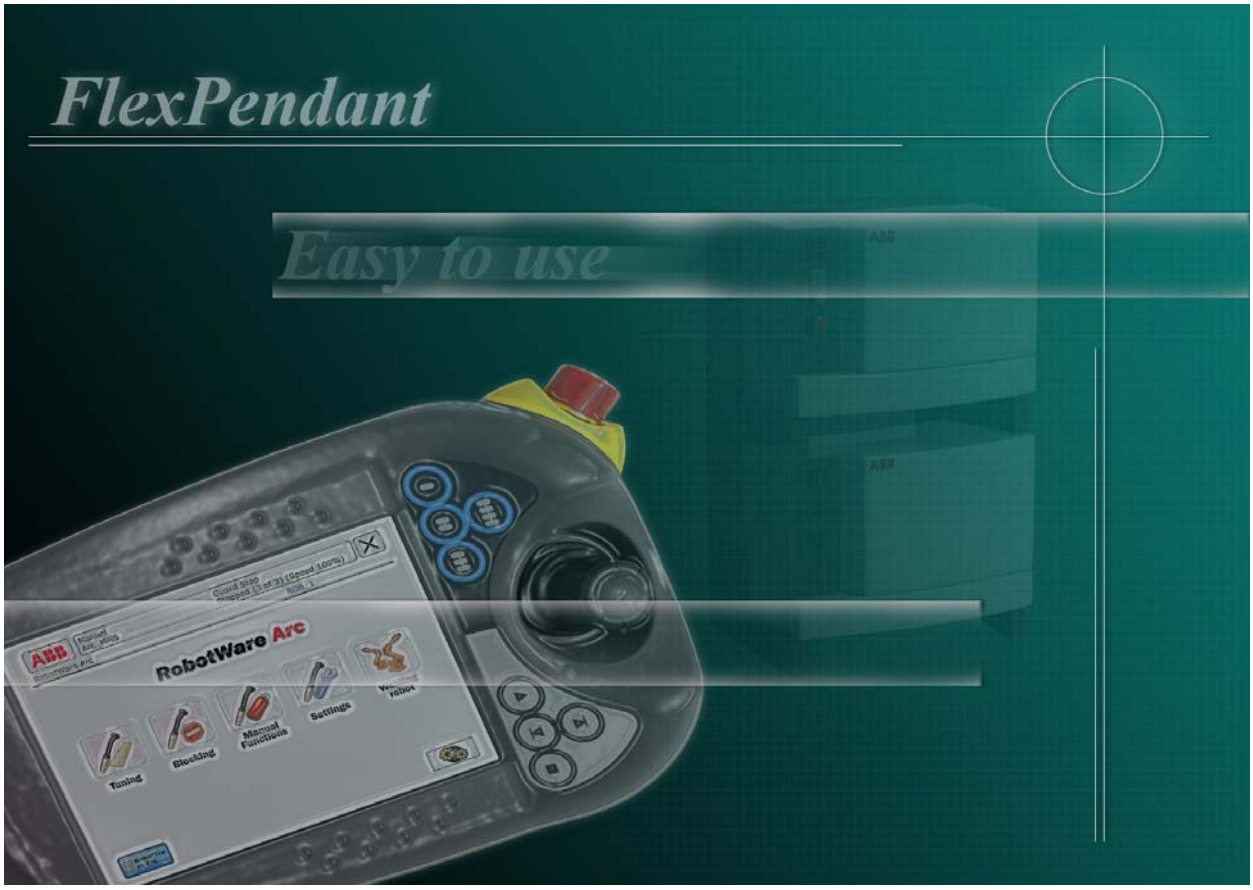
The heart of Robotics

Operating manual

Service Information System

Controller software IRC5
M2004



ABB

Operating manual

Service Information System (SIS)

RobotWare 5.0

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ABB Automation Technologies AB
Robotics
SE-721 68 Västerås
Sweden

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Overview

About this manual

This manual explains how to use the Service Information System (SIS).

Usage

This manual can be used during operation, installation and maintenance. For example during installation when the service interval is set, or after maintenance when the duty time parameter is set to zero.

Who should read this manual?

This manual is intended for:

- Installation personnel.
- Maintenance personnel.
- Repair personnel.

Prerequisites

The reader should:

- Be familiar with industrial robots and their terminology.
- Be familiar with system parameters and how to configure them.

Organization of chapters

The manual is organized in the following chapters:

Chapter	Contents
1. Introduction	Describes in general what the Service information system is.
2. Service Information System counters	Describes the following counters: calendar, operation and gearbox.
3. Running the Service Information System	Describes every step from setting the parameters to exporting the results.

References

Reference	Document ID
Operating manual - IRC5 with FlexPendant	3HAC16590-1
Operating manual - RobotStudio	3HAC032104-001
Technical reference manual - RAPID Instructions, functions and data types	3HAC16581-1
Technical reference manual - System parameters	3HAC17076-1

Revisions

Revision	Description
-	First edition
A	Minor corrections.

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1 Introduction

1.1. What is the Service Information System (SIS)

General

Service Information System (SIS) is a software function within the robot controller, which simplifies maintenance of the robot system. It supervises the operating time and mode of the robot, and alerts the operator when a maintenance activity is scheduled.

Maintenance is scheduled by setting the system parameters of the type SIS Parameters, see *Setting the SIS parameters on page 14*. All system parameters are described in *Technical reference manual*, section *System Parameters*.

SIS also supervise large robots from damaging the motors during high load operations with a safety shutdown.

Supervised function

The following counters are available:

Calendar time

The Calendar time has a general alarm that is based on the calendar time.

Operation time

Operation time has a general alarm based on operational time.

Gearbox

Each supervised gearbox has a time counter, based on the wear of the axis and the work load on the robot. The number of supervised gearboxes on the robot are different for each model. To find out the number of supervised gearboxes on a specific model read the joint service logs, for more information see *Components on page 9*.

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1 Introduction

1.1. What is the Service Information System (SIS)

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2 SIS counters

2.1. Calendar time

Description

Calendar time keeps track of the service interval based on calendar time.

When the calendar time limit for maintenance is reached, a message is stored in the event log. How to access this is detailed in section *Reading the SIS logs on page 16*.

Components

The following information is available about the calendar time in service routine.

Prev Service	Date when the counter was reset last time i.e. after last service.
Elapsed time	Elapsed time since the counter was reset the last time
Next Service	Date when next scheduled service is planned. This date is calculated using system parameters, as detailed in *Setting the SIS parameters on page 14*.
Remaining time	Remaining time to the next scheduled service date.

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2.2. Operation time

Description

Operation time keeps track of the service interval based on the amount of time the “MOTORS ON” signal is active.

When the operation time limit for maintenance is reached, a message is stored in the event log. How to access this is detailed in section *Reading the SIS logs on page 16*.

Components

The following information is available about the operation time in service routine.

Service Interval	The specified service interval until another service will be required. This parameter was entered manually as detailed in *Setting the SIS parameters on page 14*.
Elapsed time	Operation time since the service interval was set the last time.
Remaining time	Remaining operation time until the time set in service interval has expired.

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2.3. Gearbox

Description

Based on measurements, torque and RPM on each supervised gearbox, the system calculates when service is due.

When maintenance is required a message is stored in the event log. How to access this is detailed in section *Reading the SIS logs on page 16*.

Components

The following information is available about the joint service.

Joint x OK	Service status for axis x, i.e. the automatically calculated time parameter has not been exceeded.
Joint x NOK	The service interval for the axis in question has been reached.
Joint x N/A	No service time parameter calculation available. This information is displayed when there is no supervision on gearbox x.

The following information is available for the axis service status in the service routine.

Consumed time	The consumed time as a percentage of the total amount of time.
Elapsed time	Operation time for axis x since measurement began.
Remaining time	Remaining operation time for axis x until the service time parameter value has been reached.

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2.3. Gearbox

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3 Running the Service Information System

3.1. Using the SIS system

General

This is a brief description of how to use the Service Information System.

Procedure

	Action	Reference
1.	Determine which of the system functions you require.	These are described in *Calendar time on page 9*, *Gearbox on page 11* and *Operation time on page 10*.
2.	Define what values are adequate and suitable for your application in your production environment.	Recommendations on expected component life and maintenance interval are described in the *Product manual*, section *Maintenance*.
3.	Enter these parameters in the system.	How to do this is detailed in *Setting the SIS parameters on page 14*.
4.	Run the robot in normal operation.	
5.	Reset the counter if a repair has been made, or if a counter for any other reason has been restarted.	See *Reset values on page 15*
6.	When a time limit (set by the user) is exceeded, a message is stored in the event log.	How to access this is detailed in *Reading the SIS logs on page 16*.
7.	If the log containing the message is to be available from an external PC, or if the SIS parameters are to be entered from an external PC, a set of software tools are available to build such an application.	These are described in *Exporting the SIS data on page 18*.
8.	Large robots (e.g. IRB6600 and IRB7600) can be programmed to take adequate measures if the motors are overheated and need to be cool down.	How to do this is detailed in *Safety shutdown on page 19*.

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3.2. Setting the SIS parameters

General

If the SIS system is to function properly, a number of parameters must be set. How to do this is detailed below.

Procedure

	Action	Reference
1.	Open system parameters configuration in the FlexPendant's Control Panel, or use the ConfigurationEditor in RobotStudio.	Detailed in *Operating manual - IRC5* with FlexPendant and *Operating manual - RobotStudio*.
2.	Select the **Motion topic** and then the **SIS Parameters type**.	
3.	Select the instance to define and edit the system parameters.	Detailed in *Technical reference manual - System parameters*.

Examples

This section details the system parameters that may be set with estimated values. The values can be defined by the operating organization as knowledge of the robots working conditions are accumulated.

Since the counters are to be used for purposes defined by the user, ABB cannot give any recommendations regarding their definitions.

Operational Limit (h)

If the parameter is set to “2000”, SIS will alert the operator after 2000 hours in operation mode.

Operational Warning (%)

If the parameter is set to “90”, SIS will alert the operator after 1800 hours in operation mode. The total amount of hours is calculated from the percentage of the Operation limit.

“2000*0.9=1800”

Calendar Limit (years)

If the parameter is set to “2”, SIS will alert the operator after 2 years.

Calendar Warning (%)

If the parameter is set to “50”, SIS will alert the operator after 1 year. The total amount of years is calculated from a percentage of the Calendar limit.

“2*0.5=1”

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Gear Box warning (%)

If the parameter is set to “90”, SIS will alert the operator after 90% of the expected service interval of each gearbox.

The robot system automatically detects and stores all required variables to calculate the expected service interval of each gearbox. This is done by extrapolating data from earlier operation into a function of time, using a formula including:

- input and output torque
- gearbox spindle speed
- other variables

Reset values

Counters may be reset at any time by running the service routine,

In the call service routine tap **Serviceinfo/Rob_x/Counter/Reset**.

For more information see *Operating manual - IRC5 with FlexPendant*, section *Programming and testing - Running a Service routine*.

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3.3. Reading the SIS logs

General

Whenever a set condition has expired (e.g. the maximum allowed operation time before service), a message to this effect will be shown in the event log.

Access to logs

How to open a log and show its contents is detailed in *Operating manual - Trouble shooting IRC 5*.

Duty Time

The total duty time can be seen on the FlexPendant.

On the FlexPendant tap **System info/ Hardware devices/ Mechanical unit/ Rob1/ General SIS data/**.

Service interval exceeded

When the service interval has been exceeded for the selection made, an error message (Service interval exceeded!) is displayed.

No data available

When no data is available for the selection made, a message (No data available!) is displayed when trying to display the data.

Available messages

The following messages may be shown:

Available in:	SIS message in the log:	Meaning
Calendar time	Service message: Service is due! X calendar days since last service.	The manually set calendar time limit has expired. How to set the limit is detailed in section *Setting the SIS parameters on page 14*. Proceed with the required service as detailed in the *Product manual*.
Calendar time	Service message: X calendar days to next service.	X number of calendar days remain until the manually set calendar time limit expires. How to set the limit is detailed in section *Setting the SIS parameters on page 14*.
Operation time	Service message: Service is due! X production hours since last service.	The manually set operation time limit has expired. How to set the limit is detailed in section *Setting the SIS parameters on page 14*. Proceed with the required service as detailed in the *Product manual*.
Operation time	Service message: X production hours to next service.	X number of operation hours remain until the manually set operation time limit expires. How to set the limit is detailed in section *Setting the SIS parameters on page 14*.

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Continued

Available in:	SIS message in the log:	Meaning
Gearbox time	Service message: Gearbox x requires service!	The automatically calculated gearbox time limit has expired. Proceed with the required service as detailed in the *Product manual*.
Gearbox time	Service message: X% of the service interval has expired for gearbox x!	X percent of gearbox hours remain until the automatically calculated gearbox time limit expires. How to set the limit is detailed in *Setting the SIS parameters on page 14*.

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3.4. Exporting the SIS data

General

This section describes how to store SIS parameters and shows any values of exceeded time limits as detected by the SIS counters.

Description

These exported values can be read using OPC Server, Robot Application Builder, RobotStudio (Controller and System Properties) or on the FlexPendant (System Info).

Read in:	See
OPC Server	*OPC Server documentation*
RobotStudio	*Operating manual - RobotStudio*
Robot Application Builder	*PC SDK User's Guide*
FlexPendant	*Operating manual - IRC5 with FlexPendant*

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3.5. Safety shutdown

Overview

This function is used to protect large robots (e.g IRB6600 and IRB7600) from damaging the motors during high load operations.

Usage

When large robots work in high speed under heavy load for long periods of time, the motors are seriously stressed. Letting the motors cool down occasionally will prevent damaging the motor. If the motors risk being overheated the system will automatically shutdown the robot. Before shutting down, a message is sent to the log to enable the user to take adequate measures. Such as turning off external equipment and moving the robot out of the working area.

Example

```
TRAP trap_name
  !Replace with adequate measures for safety shutdown
END TRAP


PROC main()
  CONNECT errorint WITH trap_name;
  IError MOTION_ERR\Error Id := 263, TYPE_WARN, errorint;
  ..
  ..
  ..
  END main
```

IError is used to order and enable an interrupt when an error occurs. Inside the TRAP function the user decides what action that should be done before the system is shut down.

Related information

For information about:	See:
IError	*Technical reference manual - RAPID Instructions, Functions and Data types*, section *Instructions -IError*.
TRAP	*Technical reference manual - RAPID Instructions, Functions and Data types*, section *Instructions -TRAP*.
StopMove	*Technical reference manual - RAPID Instructions, Functions and Data types*, section *Instructions -StopMove*.
StorePath	*Technical reference manual - RAPID Instructions, Functions and Data types*, section *Instructions -StorePath*.

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3.5. Safety shutdown

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ABB AB
Robotics Products
S-721 68 VÄSTERÅS
SWEDEN
Telephone: +46 (0) 21 344000
Telefax: +46 (0) 21 132592