Operating manual
Service Information System

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Operating manual
Service Information System

RobotWare 6.02

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Overview of this manual

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 reset to zero (0).

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.

References

Reference	Document ID
Operating manual - IRC5 with FlexPendant	*3HAC050941-001*
Operating manual - RobotStudio	*3HAC032104-001*
Operating manual - Trouble shooting IRC5	*3HAC020738-001*
Technical reference manual - RAPID Instructions, Functions and Data types	*3HAC050917-001*
Technical reference manual - System parameters	*3HAC050948-001*

Revisions

Revision	Description
-	Released with RobotWare 6.0.
A	Released with RobotWare 6.02. • Removed section *2.4 Exporting the SIS data*.

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1 Introduction to Service Information System

1.1 What is the Service Information System (SIS)

Introduction

Service Information System (SIS) is a software function in the robot controller, that 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 *System parameters on page 21*, and *Setting the SIS parameters on page 14*.

Service Information System also supervises the motors' status on large robots during high load operations, see *Safety shutdown messages on page 18*.

Supervised functions

The following counters are available:

Calendar time

Calendar time is used for robot service intervals, based on calendar time.

Operation time

Operation time is used for robot service intervals, based on operational time.

Gearbox

Gearbox is used for estimating the service interval (remaining lifetime) of the 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.

SIS event logs reported as warnings instead of errors

By default SIS event logs are reported as errors, but it is also possible to have the SIS event logs reported as warnings instead of errors. The main difference is that warnings don't take focus on the FlexPendant, and that they have a different icon. This will affect calendar time events, production time events, and gearbox events.

For more information, see *Events as Warnings on page 29*.

1.2 SIS counters

1.2.1 Calendar time

Description

Calendar time is used for robot service intervals, based on calendar time. This timer can for example be used to schedule when it is time to change oil. This information is available in the maintenance schedule for the robot.

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

Components

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

Prev Service	Date when the counter was reset last time, that is, after last service.
Elapsed time	Elapsed time since the counter was reset the last time.
Next Service	Date when next scheduled service is planned.
Remaining time	Remaining time to the next scheduled service date.

1.2.2 Operation time

Description

Operation time is used for robot service intervals, based on operational time. Operation time uses the time that the MOTORS ON signal is active and the brakes are released. This timer can for example be used to schedule when it is time to change oil. This information is available in the maintenance schedule for the robot.

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 *ServiceInfo*.

Service Interval	The specified service interval until another service will be required.
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.

1.2.3 Gearbox

Description

Gearbox is used for estimating the service interval (remaining lifetime) of the gearbox. The estimate is based on used torque and speed (rpm). This information can be used as a guidance when planning gearbox replacement.

When the estimated gearbox life is reached, a message is stored on the event log. How to access this is detailed in section *Reading the SIS logs on page 16*.

Note	
The maximum estimated service interval is 40,000 hours.	

Components

The following information is available about the gearbox status in the service routing *ServiceInfo*.

Joint x OK	Service status for axis x, that is, 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 gearbox time in the service routine *ServiceInfo*.

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 estimated time for axis x until the gearbox is planned to be replaced.

2 Running the Service Information System

2.1 Using the SIS system

Introduction

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

Using the SIS system

Use this procedure to run the SIS system.

	Action	Reference
1	Determine which SIS functions to use.	See *Calendar time on page 10*, *Operation time on page 11* and *Gearbox on page 12*.
2	Define what values are adequate and suitable for your application in your production environment.	Recommendations for expected component life and service intervals are described in the *Product manual*, section *Maintenance*.
3	Enter these parameters in the system parameter configuration.	See *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 *Resetting values on page 15*.
6	When a time limit is exceeded, a message is stored in the event log.	See *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.	
8	Some robots (for example IRB 4600, IRB 6640, and IRB 7600) can be programmed to give warnings if the motors are overheated and need to be cooled down.	See *Safety shutdown messages on page 18*.

2.2 Setting the SIS parameters

Introduction

To use the SIS system properly, a number of system parameters must be set. The values can be be based on the maintenance schedule for the robot, but must be adapted by the operating organization as knowledge of the robot's working conditions are accumulated.

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

Setting the SIS parameters

Use this procedure to set the SIS system parameters.

	Action	Reference
1	Open the system parameters configuration on the FlexPendant (**Control Panel**), or in RobotStudio (**Configuration Editor**).	Detailed in *Operating manual - IRC5 with FlexPendant* and *Operating manual - RobotStudio*.
2	Select the topic **Motion** and then the type **SIS Parameters**, or **SIS Single Parameters**.	
3	Select the instance to define and edit the system parameters.	See detailed descriptions in chapter *System parameters on page 21*.

Examples

These examples show how the system parameters can be set.

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 warn the operator after 1800 hours in operation mode. The total amount of hours is calculated from the percentage of *Operational Limit (h)*.

`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 warn the operator after 1 year. The total amount of years is calculated from a percentage of *Calendar Limit (years)*.

`2*0.5=1`

Gearbox 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.
- Ambient temperature.
- Other variables.

Robot temperature (C) / Single temperature (C)

This parameter defines the ambient temperature used to estimate the remaining gearbox lifetime.

Resetting values

Counters can be reset at any time by running the service routine *ServiceInfo* from the FlexPendant, see *Operating manual - IRC5 with FlexPendant*.

	Action
1	Start the **Program Editor**.
2	Tap **Debug** and then tap **Call Routine**.
3	Tap **ServiceInfo** to start the service routine.
4	If there is more than one robot, tap ROB_x to select robot.
5	Tap to select counter and then tap **Reset**.

2.3 Reading the SIS logs

Introduction

When a set counter value has been reached (for example the maximum allowed operation time before service), a message is shown in the event log.

Access to logs

The event log can be viewed online from the FlexPendant and RobotStudio. This is described in *Operating manual - IRC5 with FlexPendant* and *Operating manual - RobotStudio*. See also *Operating manual - Trouble shooting IRC5*.

Duty Time

The total duty time can be seen on the FlexPendant.

On the ABB menu, tap **System Info** and then tap to expand **Hardware devices**, and continue through **Mechanical units** and **ROB_1** to **General SIS data**.

Service interval exceeded

If the service interval has exceeded the defined value, an error message (Service interval exceeded!) is displayed.

No data available

If no data is available for the defined value, a message (No data available!) is displayed when trying to show the data.

Available messages

The following messages can be shown:

Counter	SIS log message	Description
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*.
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*.
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*.
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*.

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

2.4 Safety shutdown messages

Duty factor warning

The safety shutdown is a warning and an error message used to protect large robots (for example IRB 4600 and IRB 6640) from damaging the motors or gearboxes during high load operations. The warning/error is titled **50263 Duty factor warning**.

Usage

When robots work in high speed under heavy load for long periods of time, the motors and gearboxes will become hot. Letting the motors and gearboxes cool down occasionally will prevent damaging them.

The limit for how hard the motors and gearboxes can run depends on both torque, revolution, and also the ambient temperature. This can be simulated for an installation with the RobotStudio add-in *Gearbox Heat Prediction Tool*. The tool does not require a premium license.

If the motors or gearboxes risk being overheated the system will warn that the robot needs to cool down. A warning message is sent to the log and after 30 minutes an error message is also sent to the log. An error handler can be used to take adequate measures, for example turning off external equipment and moving the robot out of the working area.

If the warning (**50263 Duty factor warning**) is displayed often but it is verified that the motors and gearboxes are not overheated, then changing the system parameter that defines the ambient temperature (*Robot temperature (C)* or *Single temperature (C)*) can reduce the occurance.

> ⚠️ **CAUTION**
>
> If the error is ignored without letting the motor or gearbox cool down, then the lifetime of the motor or gearbox can be reduced.

Examples

These are examples of error handlers can be used. `IError` is used to order and enable an interrupt when an error occurs. Inside the TRAP function you program what actions to be done before the system is shut down.

Warning

```
TRAP trap_name_warn
  ! Your actions
END TRAP
..
..
PROC main()
  CONNECT errorint WITH trap_name_warn;
  IError MOTION_ERR\Error Id := 263, TYPE_WARN, errorint;
  ..
  ..
END main
```

Continues on next page

Error

```
TRAP trap_name_error
  ! Your actions
END TRAP
..
..
PROC main()
  CONNECT errorint WITH trap_name_error;
  IError MOTION_ERR\Error Id := 263, TYPE_ERR, errorint;
  ..
  ..
END main
```

Related information

For information about	Further information
IError	*Technical reference manual - RAPID Instructions, Functions and Data types*
TRAP	*Technical reference manual - RAPID Instructions, Functions and Data types*
StopMove	*Technical reference manual - RAPID Instructions, Functions and Data types*
StorePath	*Technical reference manual - RAPID Instructions, Functions and Data types*
Robot temperature (C) and *Single temperature (C)*	*Robot temperature (C), Single temperature (C) on page 28*
Gearbox Heat Predition Tool	*Operating manual - RobotStudio*

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3 System parameters

3.1 The SIS Parameters type and the SIS Single Parameters type

Overview

This section describes the types *SIS Parameters* and *SIS Single Parameters* which belong to the topic *Motion*. Each parameter of these types is described in a separate information topic in this section.

Cfg name

SIS_EXTERNAL

SIS_EXTERNAL_SINGLE

Type description

The type *SIS Parameters* describes the service intervals and warning levels for the robot. The service interval can be set in both production time and calendar time.

The type *SIS Single Parameters* describes the service intervals and warning levels for external axes. The service interval can be set in both production time and calendar time.

The parameters for the types *SIS Parameters* and *SIS Single Parameters* are identical in usage and allowed values. Therefore they are described together in this manual.

Limitations

Changing the parameter values in *SIS Single Parameters* is only useful if you have one or more external axes.

Related information

See the product manual for the robot.

3.2 Name

Parent

Name belongs to the type *SIS Parameters* in the topic *Motion*.

Cfg name

name

Description

Name defines the SIS parameter name.

Allowed values

A string with maximum 32 characters.

3.3 Operational Limit (h)

Parent

Operational Limit (h) belongs to the type *SIS Parameters* in the topic *Motion*.

Cfg name

prod_time_service_interval

Description

Operational Limit (h) describes the service interval measured in production time.

Usage

The service interval for production time, *Operational Limit (h)*, for ABB robots is normally set on delivery and should be changed if the value differs from the maintenance schedule in the product manual.

When the *Operational Limit (h)* is reached, the FlexPendant displays a message from the elog.

If *Operational Limit (h)* is set to 0, the function is disabled.

Allowed values

A value between 0 and 50,000 hours.

3.4 Calendar Limit (years)

Parent

Calendar Limit (years) belongs to the type *SIS Parameters* in the topic *Motion*.

Cfg name

calender_time_service_interval

Description

Calendar Limit (years) defines the service interval in calendar time.

Usage

The service interval for calendar time, *Calendar Limit (years)*, for ABB robots is normally set on delivery and should be changed if the value differs from the maintenance schedule in the product manual.

When the *Calendar Limit (years)* is reached, the FlexPendant displays a message from the elog.

If *Calendar Limit (years)* is set to 0, the function is disabled.

Allowed values

A value between 0 and 20 years.

3.5 Operational Warning (%)

Parent

Operational Warning (%) belongs to the type *SIS Parameters* in the topic *Motion*.

Cfg name

prod_time_warning_level

Description

Operational Warning (%) defines when the warning before reached service level for production time should occur.

Usage

The value of *Operational Warning (%)* is a percentage of the *Operational Limit (h)*. A higher number gives a shorter time between the warning and the reached service level.

If *Operational Warning (%)* is set to 0, the warning is disabled.

Allowed values

A value between 0 and 100 %.

Related information

3.6 Calendar Warning (%)

Parent

Calendar Warning (%) belongs to the type *SIS Parameters* in the topic *Motion*.

Cfg name

calender_time_warning_level

Description

Calendar Warning (%) defines when the warning before reached service level for calender time should occur.

Usage

The value of *Calendar Warning (%)* is a percentage of the *Calendar Limit (years)*. A higher number gives a shorter time between the warning and the reached service level.

If *Calendar Warning (%)* is set to 0, the warning is disabled.

Allowed values

A value between 0 and 100 %.

Related information

Calendar Limit (years) on page 24.

3.7 Gearbox Warning (%)

Parent

Gearbox Warning (%) belongs to the type *SIS Parameters* in the topic *Motion*.

Cfg name

gear_box_warning_level

Description

Gearbox Warning (%) defines when the warning before reached service level for gearbox should occur.

Usage

The estimated gearbox service interval (remaining lifetime) is calculated automatically. The value of *Gearbox Warning (%)* is a percentage of the estimated gearbox service interval. A higher number gives a shorter time between the warning and the reached service level.

For an ABB robot using SIS, the value is typically set to 100.

If *Gearbox Warning (%)* is set to 0, the warning is disabled.

Allowed values

A value between 0 and 100%.

3.8 Robot temperature (C), Single temperature (C)

Parent

Robot temperature (C) and *Single temperature (C)* belong to the type *SIS Parameters*, in the topic *Motion*.

Cfg name

ambient_temperature

Description

Robot temperature (C) and *Single temperature (C)* defines the ambient temperature (°C).

Usage

The gearbox service interval (remaining lifetime) is calculated automatically, using among other things *Robot temperature (C)* or *Single temperature (C)*. For an ABB robot using SIS, the value is typically set to 50 and should be changed if the value differs from the value defined in the product manual.

The temperature value can be changed to the actual temperature of the location where the robot is used.

Allowed values

A value between 35 and 50.

If a value lower than 35 is defined, then 35 will be used.

3.9 Events as Warnings

Parent

Events as Warnings belongs to the type *SIS Parameters* in the topic *Motion*.

Cfg name

events_as_warnings

Description

Events as Warnings defines whether SIS event logs should be warnings instead of errors.

Usage

Set to *Yes* when you want the SIS event logs to be reported as warnings instead of errors. The main difference is that warnings don't take focus on the FlexPendant, and that they have a different icon. This will affect calendar time events, production time events, and gearbox events.

Allowed values

Yes or *No*.

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