Overview

About This Manual

This manual explains the basics of how and when to use the following RobotWare option:

- Robot Referece Interface

Usage

This manual can be used either as a reference to find out if an option is the right choice for solving a problem, or as a description of how to use an option. Detailed information regarding syntax for RAPID routines and configuration of system parameters is not described here, but can be found in the respective reference manual.

Who should read this manual?

This manual is mainly intended for robot programmers.

Prerequisites

The reader should...

- be familiar with industrial robots and their terminology
- be familiar with the RAPID programming language
- be familiar with RobotStudio and how to work with system parameters.

References

Reference	Document ID
Technical reference manual - RAPID Instructions, Functions and Data types	3HAC16581-1
Operating manual - RobotStudio	3HAC032104-001

Revisions

Revision	Description
-	First edition

Product documentation, M2004

General

The robot documentation is divided into a number of categories. This listing is based on the type of information contained within the documents, regardless of whether the products are standard or optional. This means that any given delivery of robot products **will not contain all** documents listed, only the ones pertaining to the equipment delivered.

However, all documents listed may be ordered from ABB. The documents listed are valid for M2004 robot systems.

Product manuals

All hardware, robots and controllers, will be delivered with a **Product manual** that contains:

- Safety information
- Installation and commissioning (descriptions of mechanical installation, electrical connections)
- Maintenance (descriptions of all required preventive maintenance procedures including intervals)
- Repair (descriptions of all recommended repair procedures including spare parts)
- Additional procedures, if any (calibration, decommissioning)
- Reference information (article numbers for documentation referred to in Product manual, procedures, lists of tools, safety standards)
- Part list
- Foldouts or exploded views
- Circuit diagrams

Technical reference manuals

The following manuals describe the robot software in general and contain relevant reference information:

- **RAPID Overview**: An overview of the RAPID programming language.
- **RAPID Instructions, Functions and Data types**: Description and syntax for all RAPID instructions, functions and data types.
- **System parameters**: Description of system parameters and configuration workflows.

Application manuals

Specific applications (for example software or hardware options) are described in **Application manuals**. An application manual can describe one or several applications.

An application manual generally contains information about:

- The purpose of the application (what it does and when it is useful)
- What is included (for example cables, I/O boards, RAPID instructions, system parameters, CD with PC software)
- How to use the application
- Examples of how to use the application

Continues on next page

Operating manuals

This group of manuals is aimed at those having first hand operational contact with the robot, that is production cell operators, programmers and trouble shooters. The group of manuals includes:

- **Emergency safety information**
- **General safety information**
- **Getting started, IRC5**
- **IRC5 with FlexPendant**
- **RobotStudio**
- **Introduction to RAPID**
- **Trouble shooting**, for the controller and robot

Safety

Safety of personnel

A robot is heavy and extremely powerful regardless of its speed. A pause or long stop in movement can be followed by a fast hazardous movement. Even if a pattern of movement is predicted, a change in operation can be triggered by an external signal resulting in an unexpected movement.

Therefore, it is important that all safety regulations are followed when entering safeguarded space.

Safety regulations

Before beginning work with the robot, make sure you are familiar with the safety regulations described in Operating Manual - IRC5 With Flexpendant.

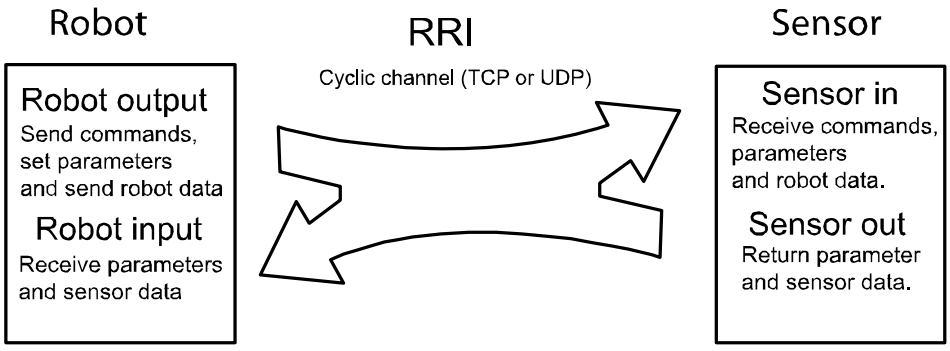
Introduction

Overview

The Robot Reference Interface (RRI) is an option, supporting data exchange on the cyclic channel. It provides the possibility to periodically send planned and actual robot position data as well as the exchange of other RAPID variables. The message contents are represented in XML format and are configurable using appropriate sensor configuration files.

Robot Referece Interface (RRI)

The cyclic communication channel (TCP or UDP) can be executed in the high-priority network environment of the IRC5 Controller which ensures a stable data exchange up to 250Hz.



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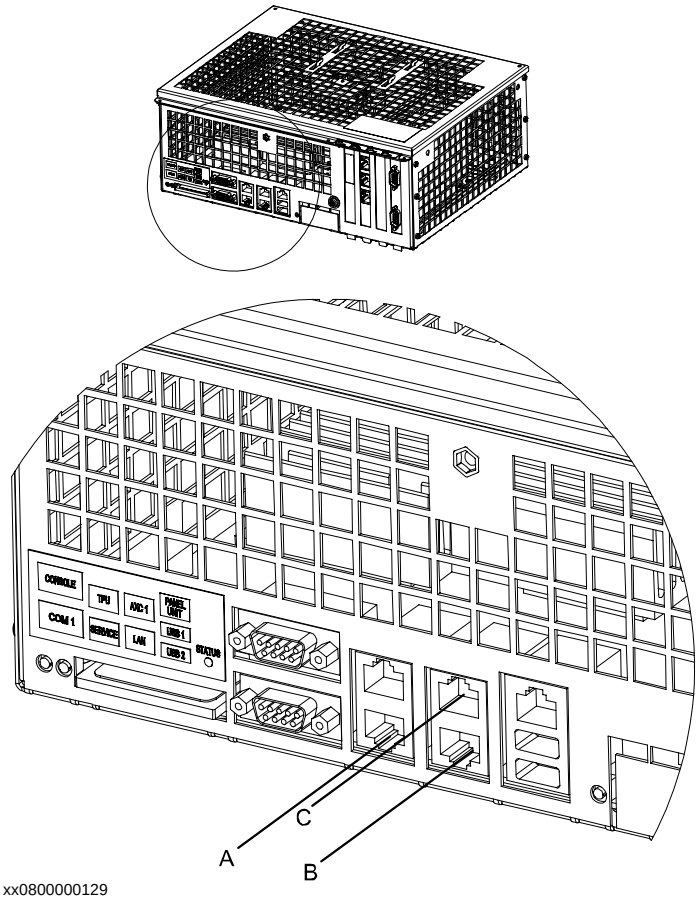
1 Installation

1.1. Connection

Overview

This section describes were to connect the comunication cable on the controller. For further instructions, please refer to the corresponding product manual of your robot system.

Location



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A	Service connection
B	Lan connection
C	Axc 1 connection (if unused)

	Action	Note
1.	Use one of these tree connections A, B or C.	**NOTE!** C. connection can only be used if it is free.

1.2. Pre-requisites

Overview

This section describes the pre-requisites for using RRI.

UDP/IP or TCP IP

RRI supports the communication over the standard IP protocols UDP or TCP.

UDP (HP-UDP)

In addition also a high-priority UDP (HP-UDP) implementation is supported, which bypasses the standard IP stack of the controller and directly accesses the IP packages. This ensures that the incoming and outgoing UDP messages are processed with a very short delay on the controller side, but does not imply real-time communication as such.

Recommendations

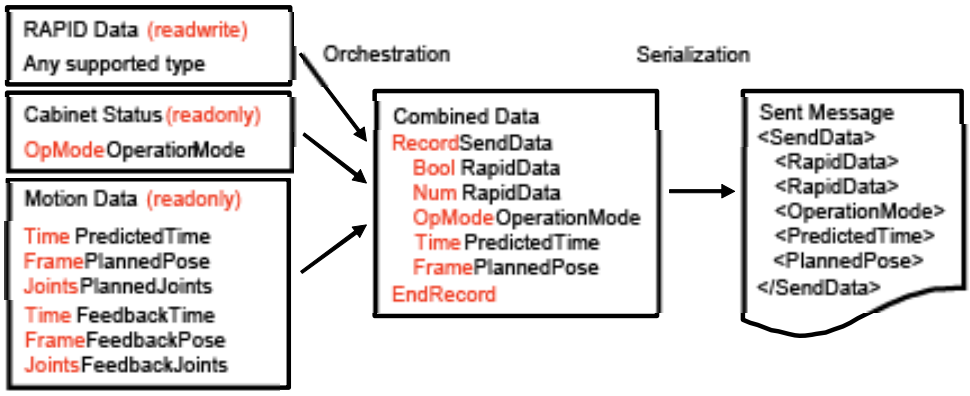
The delay in the overall communication mostly depends on the topology of the employed network. In a switched network the transmission will be delayed due to buffering of the messages in the switches, in a parallel network collisions with multiple communication partners will lead to message resends. Therefore it is recommended to use a dedicated Ethernet link between the external system and the robot controller to provide the required performance for real-time applications. RRI can be used to communicate with any processor-based devices, which support IP via Ethernet and can serialize data into XML format.

1.3. Data Orchestration

Overview

The outgoing message can be combined from any data from the RAPID level and internal data from the cabinet and motion topic. The orchestration of the data is defined in the device configuration by setting the Link attribute of internally linked data to "Intern".

Illustration



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Data from the cabinet

Name	Type	Description	Comment
OperationMode	OpMode	Operation mode of the robot	The mapping of the members for the OpMode type can be defined in the configuration file

Data from the motion topic

Name	Type	Description	Comment
FeedbackTime	Time	Timestamp for the robot position from drive feedback	There is a delay of approx. 8ms
FeedbackPose	Frame	Robot TCP calculated from drive feedback	A tool named "SiTool" and a workobject named "SiWobj" needs to be defined and used as active tool and workobject
FeedbackJoints	Joints	Robot joint values gathered from drive feedback	
PredictedTime	Time	Timestamp for planned robot TCP position and joint values	Prediction time from approx. 24ms to 60ms depending on robot type.
PlannedPose	Frame	Planned robot TCP	A tool named "SiTool" and a workobject named "SiWobj" needs to be defined and used as active tool and workobject
PlannedJoints	Joints	Planned robot joint values	

1.4. Supported data types

Overview

This section contains a short decription of the RRI supported data types, for more detailed information about the supported data types see *References on page 5*

Data types

RRI supports the following simple data types:

Type	Description	RAPID Type Mapping
`bool`	Boolean value	`bool`
`real`	Single precision, floating point value	`num`
`time`	Time in seconds expressed as floating point value	`num`
`string`	String with max. length of 80 chars	`string`
`frame`	Cartesian position and orientation in Euler Angles (Roll-Pitch-Jaw)	`pose`
`joints`	Robot joint values	`robjoint`

In addition, user-defined records can also be transferred from the external system to the robot controller, which are composed from the supported simple data types User defined record types must be specified in the configuration file of the external device. See the following section *Device configuration on page 20* for a description on how to create user-defined record types.